



# **SUBARU**

# **IMPREZA**

## **2006 Model Year**

### PDF Service Manual

**GENERAL INFORMATION SECTION (Pub.No.G1900BE1)**

**ENGINE SECTION 1 (Pub.No.G1900BE2)**

**ENGINE SECTION 2 (Pub.No.G1900BE3)**

**TRANSMISSION SECTION (Pub.No.G1900BE4)**

**CHASSIS SECTION (Pub.No.G1900BE5)**

**BODY SECTION (Pub.No.G1900BE6)**

**WIRING SYSTEM SECTION (Pub.No.G1900BE7)**





**GENERAL INFORMATION  
SECTION**

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

**FOREWORD****FW****HOW TO USE THIS MANUALS****HU****SPECIFICATIONS****SPC****PRECAUTION****PC****NOTE****NT****IDENTIFICATION****ID****RECOMMENDED MATERIALS****RM****PRE-DELIVERY INSPECTION****PI****PERIODIC MAINTENANCE SERVICES****PM**



# FOREWORD

***FW***

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## 1. Foreword

### A: FOREWORD

These manuals are used when performing maintenance, repair, or diagnosis of the Subaru IMPREZA.

Applied model:

GD\*\*\*\*, GG\*\*\*\* from 2006 MY

The manuals contain the latest information at the time of publication. Changes in specifications, methods, etc. may be made without notice.

# HOW TO USE THIS MANUALS

***HU***

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### **1. How to Use This Manuals**

#### **A: HOW TO USE THIS MANUALS**

##### **1. STRUCTURE**

Each section consists of SCT that are broken down into SC that are divided into sections for each component. The specification, maintenance and other information for the components are included, and diagnosis information has also been added where necessary.

##### **2. INDEX**

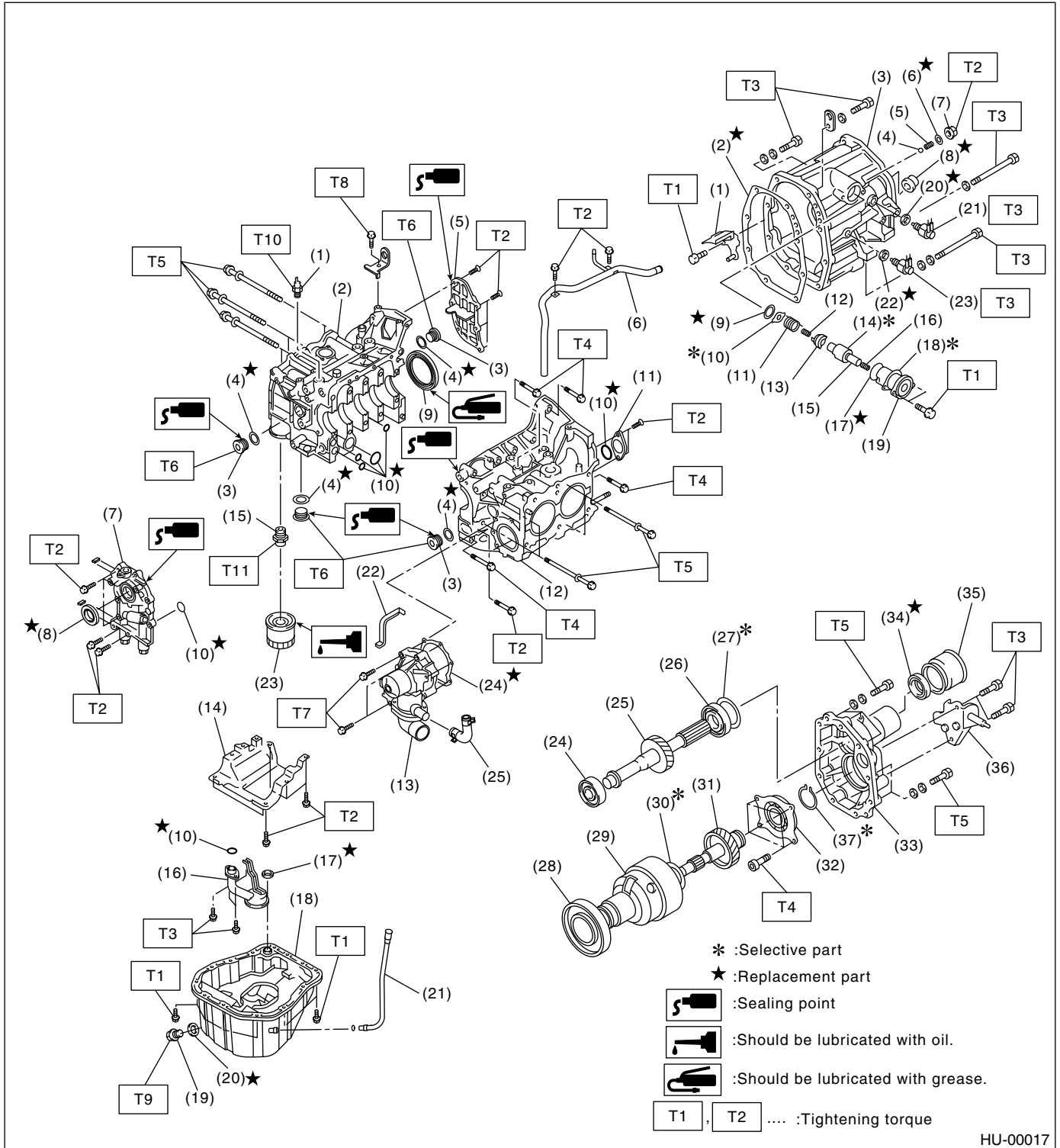
The first page has an index with tabs.

## 3. COMPONENTS

Illustrations are listed for each component. The information necessary for repair work (tightening torque, grease up points, etc.) is described on these illustrations. Information is described using symbol.

To order the parts, refer to parts catalogue.

**Example:**



HU-00017



# How to Use This Manuals

## HOW TO USE THIS MANUALS

### 4. SPECIFICATION

If necessary, specifications are also included.

### 5. INSPECTION

Inspections are included to be carried out before and after maintenance.

### 6. MAINTENANCE

- Maintenance instructions for serviceable parts describes work area and detailed steps with illustration. It also describes the use of special tool, tightening torque, cautions for each procedure.
- If many serviceable parts are included in one service procedure, appropriate reference are provided for each part.

**Example:**

#### 15. Main Shaft Assembly for Single-Range ← (A)

#### A: REMOVAL ← (B)

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.> ← (C)

11) Tighten the lock nuts to the specified torque using ST1 and ST2.

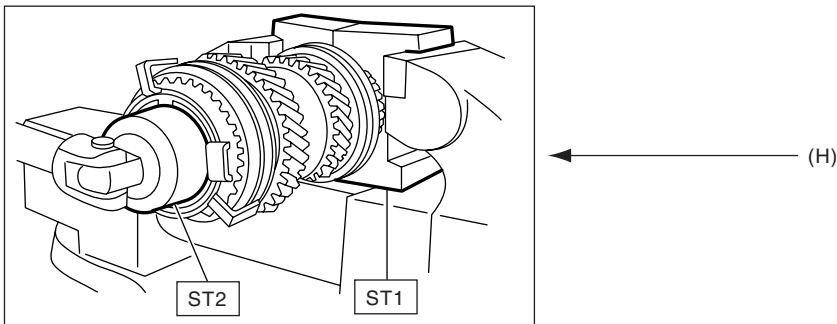
NOTE: ← (D)

Secure the lock nuts in two Places after tightening.

ST1 498937000 TRANSMISSION HOLDER

ST2 499987003 (E) SOCKET WRENCH (35) (F)

**Tightening torque:** ← (G)  
**118 N·m (12.0 kgf-m, 86.8 ft-lb)**



HU-00020

(A) Component

(B) Process

(C) Reference

(D) Caution

(E) Tool number of special tool

(F) Name of special tool

(G) Tightening torque

(H) Illustration

## 7. DIAGNOSIS

Tables showing a step-by-step process make it easy to conduct diagnosis.

## 8. SI UNITS

Measurements in these manuals are according to the SI units. Metric and yard/pound measurements are also included.

**Example:**

*Tightening torque:*

*44 N·m (4.5 kgf-m, 33 ft-lb)*

# How to Use This Manuals

## HOW TO USE THIS MANUALS

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### 9. EXPLANATION OF TERMINOLOGY

#### • List

|         |  |           |                                  |
|---------|--|-----------|----------------------------------|
| AAI     | : Air Assist Injection                         | ISC       | : Idle Speed Control             |
| A/B     | : Airbag                                       | LED       | : Light Emitting Diode           |
| ABS     | : Antilock Brake System                        | LH        | : LH (Left Hand)                 |
| A/C     | : Air Conditioner                              | LSD       | : Limited Slip Differential      |
| ACC     | : Accessory                                    | M/B       | : Main Fuse & Relay Box          |
| A/F     | : Air Fuel Ratio                               | MD        | : Mini Disk                      |
| ALT     | : Generator                                    | MPi       | : Multi Point Injection          |
| ASSY    | : Assembly                                     | MP-T      | : Multi-Plate Transfer           |
| AT      | : Automatic Transmission                       | MT        | : Manual Transmission            |
| ATF     | : Automatic Transmission Fluid                 | Non-turbo | : Natural Aspiration             |
| AVCS    | : Active Valve Control System                  | NC        | : Normal Close (Relay)           |
| AWD     | : All Wheel Drive                              | NO        | : Normal Open (Relay)            |
| BATT    | : Battery                                      | OP        | : Option Parts                   |
| CAN     | : Controller Area Network                      | OBD       | : On-Board Diagnosis             |
| CD-R/RW | : CD Recordable/ReWritable                     | P/S       | : Power Steering                 |
| COMPL   | : Complete                                     | P/W       | : Power Window                   |
| CPU     | : Central Processing Unit                      | PCD       | : Pitch Circle Diameter          |
| DCCD    | : Driver's Control Center Differential         | PCV       | : Positive Crankcase Ventilation |
| DOHC    | : Double Overhead Camshaft                     | PID       | : Parameter Identification       |
| DTC     | : Diagnosis Trouble Code                       | RAM       | : Random Access Memory           |
| DOJ     | : Double Offset Joint                          | RH        | : RH (Right Hand)                |
| DVD     | : Digital Versatile Disc or Digital Video Disc | ROM       | : Read Only Memory               |
| EBD     | : Electric Brake Distribution                  | rpm       | : Revolution Per Minute          |
| ECU     | : Engine Control Module                        | SOHC      | : Single Overhead Camshaft       |
| EGI     | : Electronic Gasoline Injection                | SRS       | : Supplemental Restraint System  |
| E/G     | : Engine                                       | SSM       | : Subaru Select Monitor          |
| EGR     | : Exhaust Gas Recirculation                    | ST        | : Special Tool                   |
| ELR     | : Emergency Locking Retractor                  | STD       | : Standard                       |
| EX      | : Exhaust                                      | SW        | : Switch                         |
| ETC     | : Electric Throttle Control                    | T/B       | : Turbocharger                   |
| F/B     | : Fuse & Joint Box                             | TGV       | : Tumble Generated Valve         |
| FL      | : Fusible Link                                 | T/M       | : Transmission                   |
| FWD     | : Front Wheel Drive                            | UV        | : Ultraviolet                    |
| GPS     | : Global Positioning System                    | VIN       | : Vehicle Identification Number  |
| HID     | : High-Intensity Discharge                     | ViS-C     | : Viscous Coupling               |
| H/U     | : Hydraulic Unit                               | VSV       | : Vacuum Switching Valve         |
| IG      | : Ignition                                     | VTD       | : Variable Torque Distribution   |
| IN      | : Intake                                       | W/H       | : Wiring Harness                 |
| INT     | : Intermittent                                 | Pr        | : Primary                        |
| I/O     | : Input / Output                               | 2ndr      | : Secondary                      |

# SPECIFICATIONS

# *SPC*



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# Impreza

## SPECIFICATIONS

### 1. Impreza

#### A: DIMENSION

| Model                    |         | Sedan         | Wagon                                       | OUTBACK                                     | STI   |              |
|--------------------------|---------|---------------|---|---|---|--------------|
| Overall length           | mm (in) | 4,465 (175.8) |   |   |   |              |
| Overall width            | mm (in) | 1,740 (68.4)  | 1,695 (66.7)                                | 1,710 (67.3)                                | 1,740 (68.1)                                |              |
| Overall height (at C.W.) | mm (in) | 1,440 (56.7)  | 1,485 (58.5)                                | 1,495 (58.9)                                | 1,430 (56.3)                                |              |
| Compartment              | Length  | mm (in)       | 1,890 (74.4)                                | 1,845 (72.6)                                |   | 1,890 (74.4) |
|                          | Width   | mm (in)       | 1,380 (54.3)                                |   |   |              |
|                          | Height  | mm (in)       | 1,180 (46.5),<br>1,125 (44.3)* <sup>2</sup> | 1,200 (47.2),<br>1,150 (45.3)* <sup>2</sup> | 1,200 (47.2),<br>1,150 (45.3)* <sup>2</sup> | 1,180 (46.5) |
| Wheelbase                | mm (in) | 2,525 (99.4)  |   |   | 2,540 (100.0)                               |              |
| Tread                    | Front   | mm (in)       | 1,485 (58.5)                                | 1,465 (57.7)                                | 1,460 (57.5)                                | 1,490 (58.7) |
|                          | Rear    | mm (in)       | 1,475 (58.1),<br>1,480 (58.3)* <sup>1</sup> | 1,455 (57.3)                                | 1,455 (57.3)                                | 1,495 (58.9) |
| Minimum road clearance   | mm (in) | 160 (6.3)     | 160 (6.3)                                   | 170 (6.7)                                   | 145 (5.7)                                   |              |

\*1: WRX

\*2: With sun roof

#### B: ENGINE

| Model                               |                         | 2.5 L Turbo   | 2.5 L                      | STI                   |
|-------------------------------------|-------------------------|---|----------------------------|-----------------------|
| Engine type                         |                         | Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine |                            |                       |
| Valve arrangement                   |                         | DOHC  | SOHC                       | DOHC                  |
| Bore × Stroke                       | mm (in)                 | 99.5 × 79 (3.92 × 3.11)   |                            |                       |
| Displacement                        | cm <sup>3</sup> (cu in) | 2,457 (149.94)  |                            |                       |
| Compression ratio                   |                         | 8.4±0.2   | 10.0±0.2                   | 8.2±0.2               |
| Firing order                        |                         | 1 — 3 — 2 — 4   |                            |                       |
| Idle speed at Park/Neutral position | rpm                     | 700±100   | MT: 650±100<br>AT: 700±100 | 700±100               |
| Maximum output                      | kW (HP)/rpm             | 172 (230)/5,600   | 129 (173)/6,000            | 224 (300)/6,000       |
| Maximum torque                      | N·m (kgf-m, ft-lb)/rpm  | 319 (32.5, 235)/3,600   | 226 (23.0, 166)/4,400      | 407 (41.5, 300)/4,000 |

#### C: ELECTRICAL

| Model                     |                         | 2.5 L Turbo  | 2.5 L                            | STI                   |
|---------------------------|-------------------------|--|----------------------------------|-----------------------|
| Ignition timing at idling | BTDC                    | 17°±10°/700  | MT: 10°±8°/650<br>AT: 15°±8°/700 | 17°±10°/700           |
| Spark plug                | Type and manufacturer   | NGK: ILFR6B  | NGK: FR5AP-11                    | NGK: ILFR6B           |
| Generator                 |                         | 12 V — 110 A   | 12 V — 90 A                      | 12 V — 90 A           |
| Battery                   | Type and capacity (5HR) | AT: 12 V — 52 AH (75D23L)<br>MT: 12 V — 48 AH (55D23L) |                                  | 12 V — 48 AH (55D23L) |

### D: TRANSMISSION

| Model                        |                    | 2.5 L Turbo  |         | 2.5 L   |         | STI     |        |
|------------------------------|--------------------|--------------|---------|---------|---------|---------|--------|
| Transmission type            |                    | 5MT          | 4AT     | 5MT     | 4AT     | 6MT     |        |
| Clutch type                  |                    | DSPD         | TCC     | DSPD    | TCC     | DSPD    |        |
| Gear ratio                   | 1st                | 3.454        | 2.785   | 3.454   | 2.785   | 3.636   |        |
|                              | 2nd                | 1.947        | 1.545   | 2.062   | 1.545   | 2.375   |        |
|                              | 3rd                | 1.366        | 1.000   | 1.448   | 1.000   | 1.761   |        |
|                              | 4th                | 0.972        | 0.694   | 1.088   | 0.694   | 1.346   |        |
|                              | 5th                | 0.738        | —       | 0.780   | —       | 0.971   |        |
|                              | 6th                | —            | —       | —       | —       | 0.756   |        |
|                              | Reverse            | 3.333        | 2.272   | 3.333   | 2.272   | 3.545   |        |
| Reduction gear (Front drive) | 1st reduction      | Type of gear | —       | Helical | —       | Helical |        |
|                              |                    | Gear ratio   | —       | 1.000   | —       | 1.000   |        |
|                              | Final reduction    | Type of gear | Hypoid  | Hypoid  | Hypoid  | Hypoid  | Hypoid |
|                              |                    | Gear ratio   | 3.700   | 3.900   | 3.900   | 4.111   | 3.900  |
| Reduction gear (Rear drive)  | Transfer reduction | Type of gear | Helical | —       | Helical | —       |        |
|                              |                    | Gear ratio   | 1.000   | —       | 1.000   | —       |        |
|                              | Final reduction    | Type of gear | Hypoid  | Hypoid  | Hypoid  | Hypoid  | Hypoid |
|                              |                    | Gear ratio   | 3.700   | 3.900   | 3.900   | 4.111   | 3.545  |

5MT: 5-forward speeds with synchromesh and 1-reverse

4AT: Electronically controlled fully-automatic, 4-forward speeds and 1-reverse

6MT: 6-forward speeds with synchromesh and 1-reverse

DSPD: Dry Single Plate Diaphragm

TCC: Torque Converter Clutch

### E: STEERING

| Model                  |        | 2.5i, OUTBACK   | WRX         | STI         |
|------------------------|--------|-----------------|-------------|-------------|
| Type                   |        | Rack and Pinion |             |             |
| Turns, lock to lock    |        | 3.0             | 2.7         | 2.6         |
| Minimum turning circle | m (ft) | Curb to curb    | 10.8 (35.4) |             |
|                        |        | Wall to wall    | 11.6 (38.1) |             |
|                        |        |                 |             | 12.0 (39.4) |

### F: SUSPENSION

|       |   |
|-------|---|
| Front | Macpherson strut type, Independent, Coil spring |
| Rear  | Dual-link type, Independent, Coil spring        |

### G: BRAKE

| Model                | 2.5i, OUTBACK   | WRX                   | STI |
|----------------------|---|-----------------------|-----|
| Service brake system | Dual circuit hydraulic with vacuum suspended power unit |                       |     |
| Front                | Ventilated disc brake                                   |                       |     |
| Rear                 | Disc brake  | Ventilated disc brake |     |
| Parking brake        | Mechanical on rear brakes                               |                       |     |

### H: TIRE

| Model     | 2.5i, OUTBACK                         | WRX           | STI           |
|-----------|---------------------------------------|---------------|---------------|
| Rim size  | 16 × 6 <sup>1</sup> / <sub>2</sub> JJ | 17 × 7JJ      | 17 × 8JJ      |
| Tire size | P205/55R16 89V                        | 215/45R17 91W | 225/45R17 90W |
| Type      | Steel belted radial, Tubeless         |               |               |

# Impreza

## SPECIFICATIONS

### I: CAPACITY

| Model                       |   | 2.5 L Turbo         |     | 2.5 L          |                                   | STI            |                                   |                |
|-----------------------------|---|---------------------|-----|----------------|-----------------------------------|----------------|-----------------------------------|----------------|
|                             |   | 5MT                 | 4AT | 5MT            | 4AT                               | 6MT            |                                   |                |
| Fuel tank                   |   | ℓ (US gal, Imp gal) |     |                |                                   |                | 60 (15.9, 13.2)                   |                |
| Engine oil                  | Total capacity (at overhaul)                              | ℓ (US qt, Imp qt)   |     | 5.0 (5.3, 4.4) |                                   | 4.8 (5.1, 4.2) | 5.0 (5.3, 4.4)                    |                |
|                             | Filling amount of engine oil (at filter replacement)      | ℓ (US qt, Imp qt)   |     | 4.3 (4.5, 3.8) |                                   | 4.2 (4.4, 3.7) | 4.3 (4.5, 3.8)                    |                |
|                             | Filling amount of engine oil (without filter replacement) | ℓ (US qt, Imp qt)   |     | 4.0 (4.2, 3.5) |                                   |                |                                   |                |
| Transmission gear oil       |   | ℓ (US qt, Imp qt)   |     | 3.5 (3.7, 3.1) | —                                 | 3.5 (3.7, 3.1) | —                                 | 4.1 (4.3, 3.6) |
| ATF                         |   | ℓ (US qt, Imp qt)   |     | —              | 9.3 — 9.6 (9.8 — 10.1, 8.2 — 8.4) | —              | 9.3 — 9.6 (9.8 — 10.1, 8.2 — 8.4) | —              |
| Front differential gear oil |   | ℓ (US qt, Imp qt)   |     | —              | 1.1 — 1.3 (1.2 — 1.4, 1.0 — 1.1)  | —              | 1.1 — 1.3 (1.2 — 1.4, 1.0 — 1.1)  | —              |
| Rear differential gear oil  |   | ℓ (US qt, Imp qt)   |     | 0.8 (0.8, 0.7) |                                   |                | 1.0 (1.1, 0.9)                    |                |
| Power steering fluid        |   | ℓ (US qt, Imp qt)   |     | 0.7 (0.7, 0.6) |                                   |                |                                   |                |
| Engine coolant              |   | ℓ (US qt, Imp qt)   |     | 7.7 (8.1, 6.8) | 7.6 (8.0, 6.7)                    | 7.0 (7.4, 6.2) | 6.9 (7.3, 6.1)                    | 7.7 (8.1, 6.8) |

## J: WEIGHT

### 1. FOR U.S. MODEL

#### Sedan

| Model                         |                 |              | Non-turbo     |               | Turbo         |               |               |
|-------------------------------|-----------------|--------------|---------------|---------------|---------------|---------------|---------------|
|                               |                 |              | 2.5i          |               | WRX           |               |               |
|                               |                 |              | 5MT           | 4AT           | 5MT           |               |               |
| Curb weight (C.W.)            | Front           | kg (lb)      | 792 (1,746)   | 818 (1,803)   | 861 (1,898)   | 870 (1,918)   | 869 (1,916)   |
|                               | Rear            | kg (lb)      | 576 (1,270)   | 573 (1,263)   | 587 (1,294)   | 599 (1,321)   | 598 (1,318)   |
|                               | Total           | kg (lb)      | 1,368 (3,016) | 1,391 (3,067) | 1,448 (3,192) | 1,469 (3,239) | 1,467 (3,234) |
| Gross axle weight (G.A.W.)    | Front           | kg (lb)      | 939 (2,070)   | 939 (2,070)   | 998 (2,200)   | 998 (2,200)   | 998 (2,200)   |
|                               | Rear            | kg (lb)      | 907 (2,000)   | 907 (2,000)   | 916 (2,020)   | 916 (2,020)   | 916 (2,020)   |
| Gross vehicle weight (G.V.W.) |                 | kg (lb)      | 1,778 (3,920) | 1,778 (3,920) | 1,850 (4,079) | 1,850 (4,079) | 1,850 (4,079) |
| Option                        | Power window    |              | ○             | ○             | ○             | ○             | ○             |
|                               | Power door lock |              | ○             | ○             | ○             | ○             | ○             |
|                               | Cruise control  |              | ○             | ○             | ○             | ○             | ○             |
|                               | ABS             |              | ○             | ○             | ○             | ○             | ○             |
|                               | Front LSD       |              | —             | —             | —             | —             | —             |
|                               | DCCD auto       |              | —             | —             | —             | —             | —             |
|                               | Cold W package  |              | —             | —             | —             | ○             | —             |
|                               | Aluminium wheel | Gold color   | —             | —             | —             | —             | —             |
|                               |                 | Silver color | —             | —             | —             | —             | —             |
|                               | Air conditioner |              | ○             | ○             | ○             | ○             | ○             |
|                               | Sun roof        |              | —             | —             | —             | ○             | ○             |
|                               | Dual airbag     |              | ○             | ○             | ○             | ○             | ○             |
|                               | Side airbag     |              | ○             | ○             | ○             | ○             | ○             |
|                               | Rear spoiler    |              | —             | —             | —             | ○             | —             |
| Seat in pure hide             |                 | —            | —             | —             | ○             | —             |               |

| Model                         |                 |              | Turbo         |               |               |
|-------------------------------|-----------------|--------------|---------------|---------------|---------------|
|                               |                 |              | WRX           |               | STI           |
|                               |                 |              | 4AT           |               | 6MT           |
| Curb weight (C.W.)            | Front           | kg (lb)      | 893 (1,969)   | 895 (1,973)   | 886 (1,953)   |
|                               | Rear            | kg (lb)      | 580 (1,279)   | 600 (1,323)   | 634 (1,398)   |
|                               | Total           | kg (lb)      | 1,473 (3,247) | 1,495 (3,296) | 1,520 (3,351) |
| Gross axle weight (G.A.W.)    | Front           | kg (lb)      | 998 (2,200)   | 998 (2,200)   | 1,030 (2,271) |
|                               | Rear            | kg (lb)      | 916 (2,020)   | 916 (2,020)   | 920 (2,028)   |
| Gross vehicle weight (G.V.W.) |                 | kg (lb)      | 1,870 (4,128) | 1,870 (4,128) | 1,900 (4,189) |
| Option                        | Power window    |              | ○             | ○             | ○             |
|                               | Power door lock |              | ○             | ○             | ○             |
|                               | Cruise control  |              | ○             | ○             | ○             |
|                               | ABS             |              | ○             | ○             | ○             |
|                               | Front LSD       |              | —             | —             | ○             |
|                               | DCCD auto       |              | —             | —             | ○             |
|                               | Cold W package  |              | —             | ○             | —             |
|                               | Aluminium wheel | Gold color   | —             | —             | ○             |
|                               |                 | Silver color | —             | —             | —             |
|                               | Air conditioner |              | ○             | ○             | ○             |
|                               | Sun roof        |              | —             | ○             | —             |
|                               | Dual airbag     |              | ○             | ○             | ○             |
|                               | Side airbag     |              | ○             | ○             | ○             |
|                               | Rear spoiler    |              | —             | ○             | —             |
| Seat in pure hide             |                 | —            | ○             | —             |               |



# Impreza

## SPECIFICATIONS

### Wagon

| Model                         |                   |              | Non-turbo     |               |               |               |
|-------------------------------|-------------------|--------------|---------------|---------------|---------------|---------------|
|                               |                   |              | 2.5i          |               | OUTBACK       |               |
|                               |                   |              | 5MT           | 4AT           | 5MT           | 4AT           |
| Curb weight (C.W.)            | Front             | kg (lb)      | 786 (1,733)   | 806 (1,777)   | 788 (1,737)   | 811 (1,788)   |
|                               | Rear              | kg (lb)      | 607 (1,338)   | 609 (1,343)   | 603 (1,329)   | 604 (1,332)   |
|                               | Total             | kg (lb)      | 1,393 (3,071) | 1,415 (3,120) | 1,391 (3,067) | 1,415 (3,120) |
| Gross axle weight (G.A.W.)    | Front             | kg (lb)      | 939 (2,070)   | 939 (2,070)   | 939 (2,070)   | 939 (2,070)   |
|                               | Rear              | kg (lb)      | 953 (2,100)   | 953 (2,100)   | 953 (2,100)   | 953 (2,100)   |
| Gross vehicle weight (G.V.W.) |                   | kg (lb)      | 1,833 (4,041) | 1,833 (4,041) | 1,833 (4,041) | 1,833 (4,041) |
| Option                        | Power window      |              | ○             | ○             | ○             | ○             |
|                               | Power door lock   |              | ○             | ○             | ○             | ○             |
|                               | Cruise control    |              | ○             | ○             | ○             | ○             |
|                               | ABS               |              | ○             | ○             | ○             | ○             |
|                               | Front LSD         |              | —             | —             | —             | —             |
|                               | DCCD auto         |              | —             | —             | —             | —             |
|                               | Cold W package    |              | —             | —             | —             | —             |
|                               | Aluminium wheel   | Gold color   | —             | —             | —             | —             |
|                               |                   | Silver color | —             | —             | —             | —             |
|                               | Air conditioner   |              | ○             | ○             | ○             | ○             |
|                               | Sun roof          |              | —             | —             | —             | —             |
|                               | Dual airbag       |              | ○             | ○             | ○             | ○             |
|                               | Side airbag       |              | ○             | ○             | ○             | ○             |
|                               | Rear spoiler      |              | —             | —             | —             | —             |
|                               | Seat in pure hide |              | —             | —             | —             | —             |

| Model                         |                   |              | Turbo         |               |               |               |
|-------------------------------|-------------------|--------------|---------------|---------------|---------------|---------------|
|                               |                   |              | WRX           |               |               |               |
|                               |                   |              | 5MT           |               | 4AT           |               |
| Curb weight (C.W.)            | Front             | kg (lb)      | 856 (1,887)   | 863 (1,903)   | 881 (1,942)   | 888 (1,958)   |
|                               | Rear              | kg (lb)      | 619 (1,365)   | 631 (1,391)   | 619 (1,365)   | 630 (1,389)   |
|                               | Total             | kg (lb)      | 1,475 (3,252) | 1,494 (3,294) | 1,500 (3,307) | 1,518 (3,347) |
| Gross axle weight (G.A.W.)    | Front             | kg (lb)      | 998 (2,200)   | 998 (2,200)   | 998 (2,200)   | 998 (2,200)   |
|                               | Rear              | kg (lb)      | 953 (2,100)   | 953 (2,100)   | 953 (2,100)   | 953 (2,100)   |
| Gross vehicle weight (G.V.W.) |                   | kg (lb)      | 1,910 (4,211) | 1,910 (4,211) | 1,930 (4,255) | 1,930 (4,255) |
| Option                        | Power window      |              | ○             | ○             | ○             | ○             |
|                               | Power door lock   |              | ○             | ○             | ○             | ○             |
|                               | Cruise control    |              | ○             | ○             | ○             | ○             |
|                               | ABS               |              | ○             | ○             | ○             | ○             |
|                               | Front LSD         |              | —             | —             | —             | —             |
|                               | DCCD auto         |              | —             | —             | —             | —             |
|                               | Cold W package    |              | —             | ○             | —             | ○             |
|                               | Aluminium wheel   | Gold color   | —             | —             | —             | —             |
|                               |                   | Silver color | —             | —             | —             | —             |
|                               | Air conditioner   |              | ○             | ○             | ○             | ○             |
|                               | Sun roof          |              | —             | ○             | —             | ○             |
|                               | Dual airbag       |              | ○             | ○             | ○             | ○             |
|                               | Side airbag       |              | ○             | ○             | ○             | ○             |
|                               | Rear spoiler      |              | —             | —             | —             | —             |
|                               | Seat in pure hide |              | —             | ○             | —             | ○             |

## 2. FOR CANADA MODEL

### Sedan

| Model                         |                 |              | Non-turbo     |               | Turbo         |               |               |
|-------------------------------|-----------------|--------------|---------------|---------------|---------------|---------------|---------------|
|                               |                 |              | 2.5i          |               | WRX           |               |               |
|                               |                 |              | 5MT           | 4AT           | 5MT           |               |               |
| Curb weight (C.W.)            | Front           | kg (lb)      | 792 (1,746)   | 818 (1,803)   | 862 (1,902)   | 870 (1,918)   | 869 (1,916)   |
|                               | Rear            | kg (lb)      | 576 (1,270)   | 573 (1,263)   | 590 (1,300)   | 599 (1,321)   | 598 (1,318)   |
|                               | Total           | kg (lb)      | 1,368 (3,016) | 1,391 (3,067) | 1,452 (3,202) | 1,469 (3,239) | 1,467 (3,234) |
| Gross axle weight (G.A.W.)    | Front           | kg (lb)      | 939 (2,070)   | 939 (2,070)   | 998 (2,200)   | 998 (2,200)   | 998 (2,200)   |
|                               | Rear            | kg (lb)      | 907 (2,000)   | 907 (2,000)   | 916 (2,020)   | 916 (2,020)   | 916 (2,020)   |
| Gross vehicle weight (G.V.W.) |                 | kg (lb)      | 1,778 (3,920) | 1,778 (3,920) | 1,850 (4,079) | 1,850 (4,079) | 1,850 (4,079) |
| Option                        | Power window    |              | ○             | ○             | ○             | ○             | ○             |
|                               | Power door lock |              | ○             | ○             | ○             | ○             | ○             |
|                               | Cruise control  |              | ○             | ○             | ○             | ○             | ○             |
|                               | ABS             |              | ○             | ○             | ○             | ○             | ○             |
|                               | Front LSD       |              | —             | —             | —             | —             | —             |
|                               | DCCD auto       |              | —             | —             | —             | —             | —             |
|                               | Cold W package  |              | —             | —             | ○             | ○             | —             |
|                               | Aluminium wheel | Gold color   | —             | —             | —             | —             | —             |
|                               |                 | Silver color | —             | —             | —             | —             | —             |
|                               | Air conditioner |              | ○             | ○             | ○             | ○             | ○             |
|                               | Sun roof        |              | —             | —             | —             | ○             | ○             |
|                               | Dual airbag     |              | ○             | ○             | ○             | ○             | ○             |
|                               | Side airbag     |              | ○             | ○             | ○             | ○             | ○             |
|                               | Rear spoiler    |              | —             | —             | ○             | ○             | —             |
| Seat in pure hide             |                 | —            | —             | —             | —             | —             |               |

| Model                         |                 |              | Turbo         |               |               |               |               |
|-------------------------------|-----------------|--------------|---------------|---------------|---------------|---------------|---------------|
|                               |                 |              | WRX           |               |               | STI           |               |
|                               |                 |              | 4AT           |               |               | 6MT           |               |
| Curb weight (C.W.)            | Front           | kg (lb)      | 889 (1,960)   | 895 (1,973)   | 888 (1,958)   | 886 (1,953)   | 886 (1,953)   |
|                               | Rear            | kg (lb)      | 589 (1,299)   | 599 (1,321)   | 588 (1,296)   | 634 (1,398)   | 634 (1,398)   |
|                               | Total           | kg (lb)      | 1,478 (3,259) | 1,494 (3,294) | 1,476 (3,254) | 1,520 (3,351) | 1,520 (3,351) |
| Gross axle weight (G.A.W.)    | Front           | kg (lb)      | 998 (2,200)   | 998 (2,200)   | 998 (2,200)   | 1,030 (2,271) | 1,030 (2,271) |
|                               | Rear            | kg (lb)      | 916 (2,020)   | 916 (2,020)   | 916 (2,020)   | 920 (2,028)   | 920 (2,028)   |
| Gross vehicle weight (G.V.W.) |                 | kg (lb)      | 1,870 (4,128) | 1,870 (4,128) | 1,870 (4,128) | 1,900 (4,189) | 1,900 (4,189) |
| Option                        | Power window    |              | ○             | ○             | ○             | ○             | ○             |
|                               | Power door lock |              | ○             | ○             | ○             | ○             | ○             |
|                               | Cruise control  |              | ○             | ○             | ○             | ○             | ○             |
|                               | ABS             |              | ○             | ○             | ○             | ○             | ○             |
|                               | Front LSD       |              | —             | —             | —             | ○             | ○             |
|                               | DCCD auto       |              | —             | —             | —             | ○             | ○             |
|                               | Cold W package  |              | ○             | ○             | —             | —             | —             |
|                               | Aluminium wheel | Gold color   | —             | —             | —             | ○             | —             |
|                               |                 | Silver color | —             | —             | —             | —             | ○             |
|                               | Air conditioner |              | ○             | ○             | ○             | ○             | ○             |
|                               | Sun roof        |              | —             | ○             | —             | —             | —             |
|                               | Dual airbag     |              | ○             | ○             | ○             | ○             | ○             |
|                               | Side airbag     |              | ○             | ○             | ○             | ○             | ○             |
|                               | Rear spoiler    |              | ○             | ○             | —             | —             | —             |
| Seat in pure hide             |                 | —            | —             | —             | —             | —             |               |

# Impreza

## SPECIFICATIONS

### Wagon

| Model                         |                   |              | Non-turbo     |               |               |               |
|-------------------------------|-------------------|--------------|---------------|---------------|---------------|---------------|
|                               |                   |              | 2.5i          |               | OUTBACK       |               |
|                               |                   |              | 5MT           | 4AT           | 5MT           | 4AT           |
| Curb weight (C.W.)            | Front             | kg (lb)      | 786 (1,733)   | 806 (1,777)   | 788 (1,737)   | 811 (1,788)   |
|                               | Rear              | kg (lb)      | 607 (1,338)   | 609 (1,343)   | 603 (1,329)   | 604 (1,332)   |
|                               | Total             | kg (lb)      | 1,393 (3,071) | 1,415 (3,120) | 1,391 (3,067) | 1,415 (3,120) |
| Gross axle weight (G.A.W.)    | Front             | kg (lb)      | 939 (2,070)   | 939 (2,070)   | 939 (2,070)   | 939 (2,070)   |
|                               | Rear              | kg (lb)      | 953 (2,100)   | 953 (2,100)   | 953 (2,100)   | 953 (2,100)   |
| Gross vehicle weight (G.V.W.) |                   | kg (lb)      | 1,833 (4,041) | 1,833 (4,041) | 1,833 (4,041) | 1,833 (4,041) |
| Option                        | Power window      |              | ○             | ○             | ○             | ○             |
|                               | Power door lock   |              | ○             | ○             | ○             | ○             |
|                               | Cruise control    |              | ○             | ○             | ○             | ○             |
|                               | ABS               |              | ○             | ○             | ○             | ○             |
|                               | Front LSD         |              | —             | —             | —             | —             |
|                               | DCCD auto         |              | —             | —             | —             | —             |
|                               | Cold W package    |              | —             | —             | —             | —             |
|                               | Aluminium wheel   | Gold color   | —             | —             | —             | —             |
|                               |                   | Silver color | —             | —             | —             | —             |
|                               | Air conditioner   |              | ○             | ○             | ○             | ○             |
|                               | Sun roof          |              | —             | —             | —             | —             |
|                               | Dual airbag       |              | ○             | ○             | ○             | ○             |
|                               | Side airbag       |              | ○             | ○             | ○             | ○             |
|                               | Rear spoiler      |              | —             | —             | —             | —             |
|                               | Seat in pure hide |              | —             | —             | —             | —             |

| Model                         |                   |              | Turbo         |               |               |               |
|-------------------------------|-------------------|--------------|---------------|---------------|---------------|---------------|
|                               |                   |              | WRX           |               |               |               |
|                               |                   |              | 5MT           |               | 4AT           |               |
| Curb weight (C.W.)            | Front             | kg (lb)      | 857 (1,889)   | 863 (1,902)   | 856 (1,887)   | 882 (1,944)   |
|                               | Rear              | kg (lb)      | 620 (1,368)   | 630 (1,390)   | 619 (1,365)   | 620 (1,368)   |
|                               | Total             | kg (lb)      | 1,477 (3,257) | 1,493 (3,292) | 1,475 (3,252) | 1,502 (3,312) |
| Gross axle weight (G.A.W.)    | Front             | kg (lb)      | 998 (2,200)   | 998 (2,200)   | 998 (2,200)   | 998 (2,200)   |
|                               | Rear              | kg (lb)      | 953 (2,100)   | 953 (2,100)   | 953 (2,100)   | 953 (2,100)   |
| Gross vehicle weight (G.V.W.) |                   | kg (lb)      | 1,910 (4,211) | 1,910 (4,211) | 1,910 (4,211) | 1,930 (4,255) |
| Option                        | Power window      |              | ○             | ○             | ○             | ○             |
|                               | Power door lock   |              | ○             | ○             | ○             | ○             |
|                               | Cruise control    |              | ○             | ○             | ○             | ○             |
|                               | ABS               |              | ○             | ○             | ○             | ○             |
|                               | Front LSD         |              | —             | —             | —             | —             |
|                               | DCCD auto         |              | —             | —             | —             | —             |
|                               | Cold W package    |              | ○             | ○             | —             | ○             |
|                               | Aluminium wheel   | Gold color   | —             | —             | —             | —             |
|                               |                   | Silver color | —             | —             | —             | —             |
|                               | Air conditioner   |              | ○             | ○             | ○             | ○             |
|                               | Sun roof          |              | —             | ○             | —             | —             |
|                               | Dual airbag       |              | ○             | ○             | ○             | ○             |
|                               | Side airbag       |              | ○             | ○             | ○             | ○             |
|                               | Rear spoiler      |              | ○             | ○             | —             | ○             |
|                               | Seat in pure hide |              | —             | —             | —             | —             |

# PRECAUTION

# *PC*

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| 1. Precaution ..... | 2    |



### 1. Precaution

#### A: CAUTION

The following precautions must be understood and strictly adhered to avoid minor or serious injury to the person doing the work or people in the area and to make an effort for environmental protection.

#### 1. ABS

Handle the ABS as a total system. Do not disassemble or attempt to repair parts which are not instructed in this manual. Follow the instructions in this manual during performing the maintenance of ABSCM&H/U. To disassemble parts without instructions could prevent the ABS system from operating when needed or cause it to operate incorrectly and result in injury.

#### 2. BRAKE FLUID

If brake fluid gets in your eyes or on your skin, do the following:

- Wash out your eyes and seek immediate medical attention.
- Wash your skin with soap and then rinse thoroughly with water.

#### 3. RADIATOR FAN

The radiator fan may rotate without warning, even when the engine is not on. Do not place your hand, cloth, tools, or other items near the fan at any time.

#### 4. ROAD TESTS

Always conduct road tests in accordance with traffic rules and regulations to avoid bodily injury and interrupting traffic.

#### 5. AIRBAG

To prevent bodily injury from unexpected deployment of airbags and unnecessary maintenance, follow the instructions in this manual when performing maintenance on airbag components or nearby, and airbag wiring harnesses or nearby.

To prevent unexpected deployment, perform the steps below and then wait at least 20 seconds to discharge electricity before beginning work.

- Step 1: Turn the ignition switch OFF.
- Step 2: Disconnect the ground cable from battery.

#### 6. AIRBAG DISPOSAL

To prevent bodily injury from unexpected airbag deployment, do not dispose airbag modules in the same way as other refuse. Follow all government regulations concerning disposal of refuse.

#### 7. AIRBAG MODULE

Adhere to the following when handling and storing the airbag module to prevent bodily injury from unexpected deployment:

- Do not hold the harnesses or connectors to carry module.
- Do not face the bag in the direction that it opens towards yourself or other people.
- Do not face the bag in the direction that it opens towards the floor or walls.

#### 8. AIRBAG SPECIAL TOOL

To prevent unexpected deployment, only use special tools.

#### 9. WINDOW

Always wear safety glasses when working around any glass to prevent glass fragments from damaging your eyes.

#### 10. WINDOW ADHESIVE

Always use the recommended or alternative adhesive when attaching glass to prevent adhesive or glass separation, resulting in accidents and injury.

#### 11. OIL

When handling oil, adhere to the following to prevent from unexpected accident.

- Prepare a container and cloth when performing work in which oil possibly spills. If oil spills, wipe it off immediately to prevent from penetrating into floor or flowing out for environmental protection.
- Follow all government and local regulations concerning disposal of refuse when disposing.

#### 12. FUEL

When handling and storing fuel, adhere to the following to prevent from unexpected accident.

- Be careful with fire.
- Prepare a container and cloth when performing work which fuel possibly spills to prevent from scatter. If it spills, wipe it off immediately to prevent from penetrating into floor or flowing out for environmental protection.
- Follow all government and local regulations concerning disposal of refuse when disposing.

### 13. ENGINE COOLANT

When handling engine coolant, adhere to the following to prevent from unexpected accident.

- Never remove the radiator cap when engine coolant is hot since it may blow out.
- Prepare a container and cloth when performing work which engine coolant possibly spills to prevent from scatter. If it spills, wipe it off immediately to prevent from penetrating into floor or flowing out for environmental protection.
- Follow all government and local regulations concerning disposal of refuse when disposing.

### 14. AIR CONDITIONER REFRIGERANT

In order to prevent from global warming, avoid releasing air conditioner refrigerant into the atmosphere. Using a refrigerant recovery system, discharge and reuse it.

### 15. HOSE REMOVAL/INSTALLATION PROCEDURES

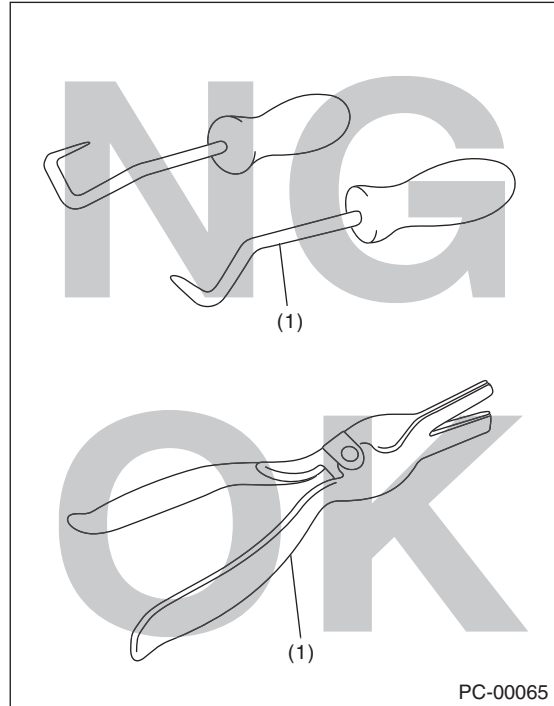
#### 1. Hose Removal/Installation Pre-Procedures

- Be careful to inspect hoses so as not to use damaged or deformed hoses. Using such hoses could cause leakage or loss of oil, with leaked oil splashing on exhaust pipes or other hot parts, resulting in smoke or fire.
- Always remove hoses when performing work. Not removing the hoses and moving parts out of the way when performing procedures may damage the inside of hoses and cause other negative affects.

#### 2. Hose Removal/Installation Procedures and Inspection

##### • Remove hoses according to the following instructions.

- If using the hose remover (general tool), do not use the sharp-pointed hose remover (hose plucker) as it may damage pipe surfaces or hoses.



(1) Hose remover

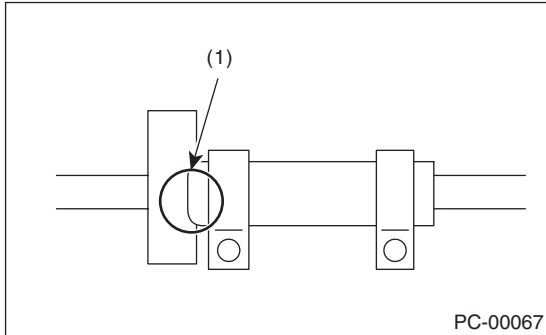
- When using pliers to make hose removal easier, always be sure to use a cloth to protect the hose, slightly rotate the hose, and then pull straight out by hand.

# Precaution

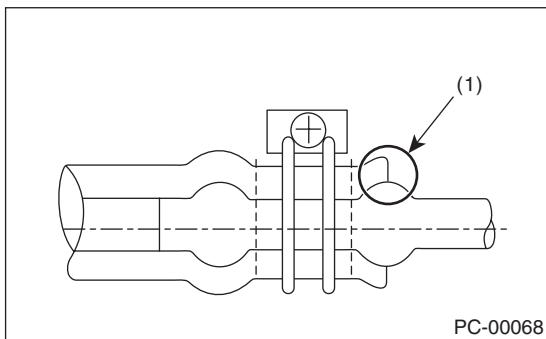
## PRECAUTION

- **Inspect the following points in continuous use, and replace any hoses that are damaged or defective with new parts.**

- Replace any hoses that are riding over the stay or spool with new parts.



(1) Hose riding over a stay

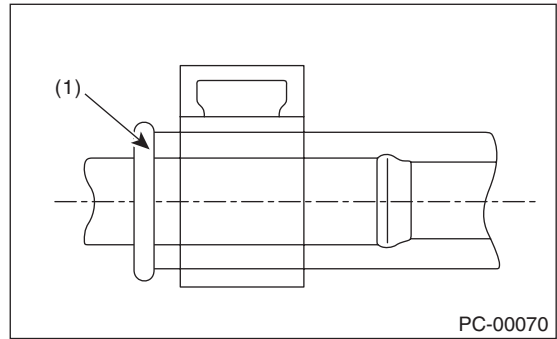
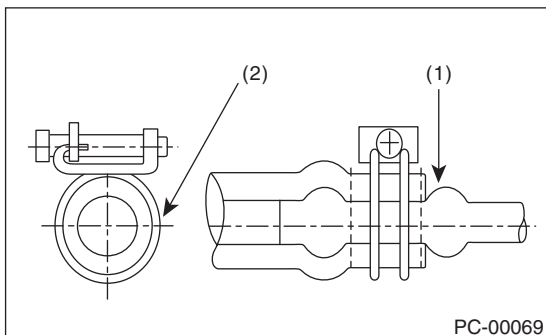


(1) Hose riding over a spool

- Check the inner and outer surfaces of the hose for damage, cracks, breakage, hardening/softening/swelling of rubber, internal peeling, and that there are no deformations caused by infiltration/adhesion of foreign matter, and no twisted hoses. Replace any defective hoses with new parts.

- **Install hoses according to the following instructions.**

- Carefully check the installation positions.
- Do not use any lubricants.
- Securely insert until the specified positions (until contacting spool).



- (1) Contacting the spool. (Do not excessively insert the hose to prevent the hose from becoming wrinkled up.)
- (2) Apply an equal clamping force all around the hose periphery.

- Check that the position and orientation of hose clamps, and the hose layout are correct. (Check that the position and orientation are matching, they are not excessively short/long, there are no differences with before performing the procedures, and that there is clearance between hoses and surrounding parts.)
- After installing, check that there are no disconnection of hoses or leakage from hoses. (Check that hoses are securely fixed by the clamps.)
- **Inspect the hose clips and clamps according to the following points, and replace any parts that are damaged or defective with new parts.**
  - Check for deformations, rust, damage, and adhering of foreign matter.
  - For clips, check that the spring functions and has clamping force.
  - For clamps, check that the screw can clinch, the clamp has not become oval shaped, and the screw is not damaged.
- **Inspect the pipes according to the following points, and replace any parts that are damaged or defective with new parts.**

Check that the pipes do not have any damage, rust, peeling (including peeling plating), foreign matter adhering, twisting, crushing, bending, or cracks.
- **Replace the following parts with new parts if the hoses have been removed or their installation positions have been changed.**

ATF cooler hose, engine oil cooler hose, MT oil cooler hose, power steering suction hose, and power steering return hose.

# NOTE

# *NT*



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| 1. Note..... | 2           |





## 1. Note

### A: NOTE

This is information that can improve efficiency of maintenance and assure sound work.

#### 1. FASTENER NOTICE

Fasteners are used to prevent parts from damage and dislocation due to looseness. Fasteners must be tightened to the specified torque.

Do not apply paint, lubricant, rust retardant, or other substances to the surface around bolts, fasteners, etc. Doing so will make it difficult to obtain the correct torque and result in looseness and other problems.

#### 2. STATIC ELECTRICITY DAMAGE

Do not touch the control unit, connectors, logic boards, and other such parts when there is a risk of static electricity. Always use a static electricity prevention cord or touch grounded metal before conducting work.

#### 3. BATTERY

When removing the battery cables, always be sure to turn the ignition off to prevent electrical damage to the control unit from rush current.

#### 4. SERVICE PARTS

Use authentic service parts for maximum performance and maintenance, when conducting repairs. Subaru/FHI will not be responsible for poor performance resulting from the use of parts not specified by a genuine dealer.

#### 5. PROTECTING VEHICLE UNDER MAINTENANCE

Make sure to attach the fender cover, seat covers, etc. before work.

#### 6. ENSURING SAFETY DURING WORK

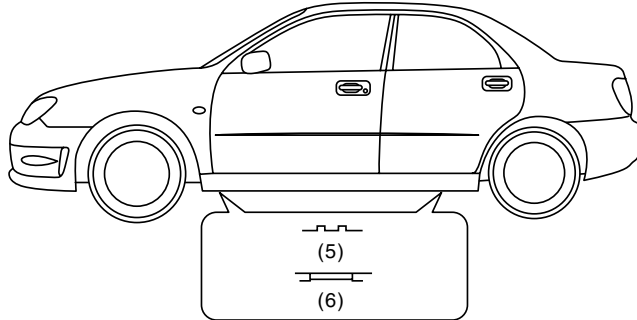
When working in a group of two or more, perform the work with calling each other to ensure mutual safety.

**7. LIFTS AND JACKS**

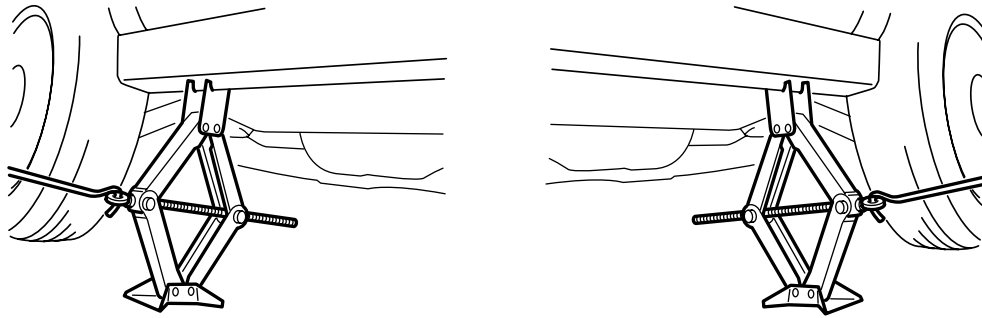
When using a lift or rigid racks to raise a vehicle, always follow instructions concerning jack-up points and weight limits to prevent the vehicle from falling, which could result in injury. Be especially careful to make sure the vehicle is balanced before raising it.

Be sure to set the wheel stoppers when jacking-up only the front or rear of the vehicle.

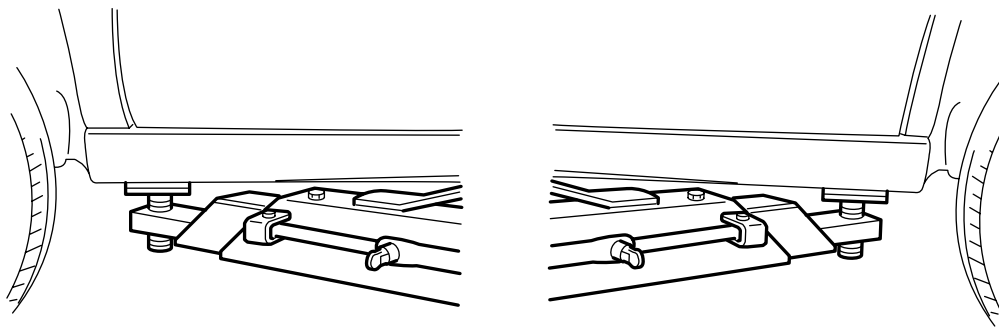
(1)



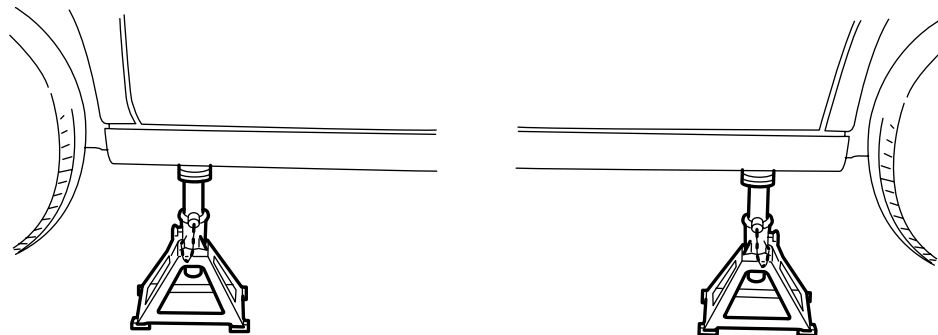
(2)



(3)



(4)



(1) Support locations  
(2) Pantograph jack

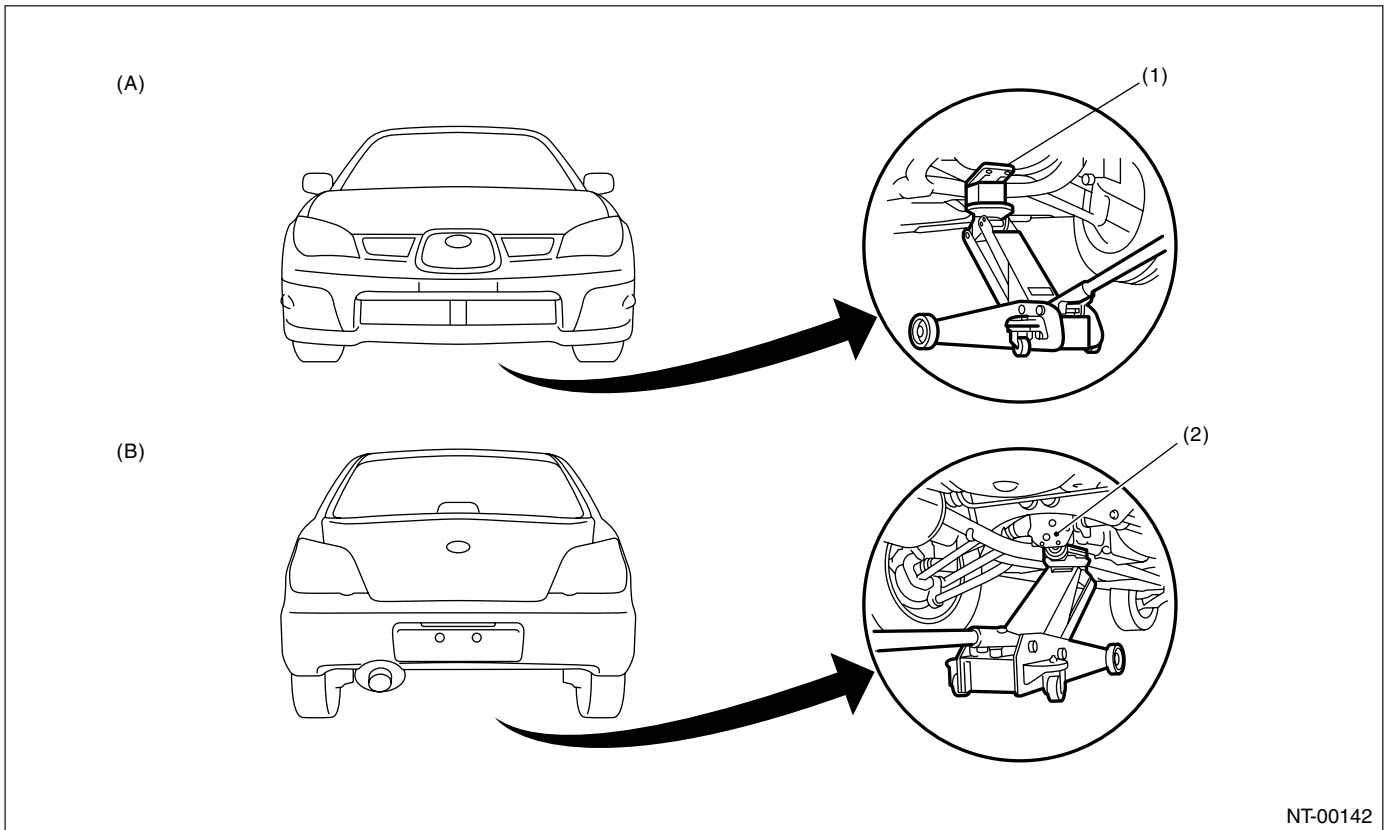
(3) Lift  
(4) Rigid rack

(5) Without side sill cover  
(6) With side sill cover

NT-00141

# Note

NOTE



NT-00142

(A) Front

(B) Rear

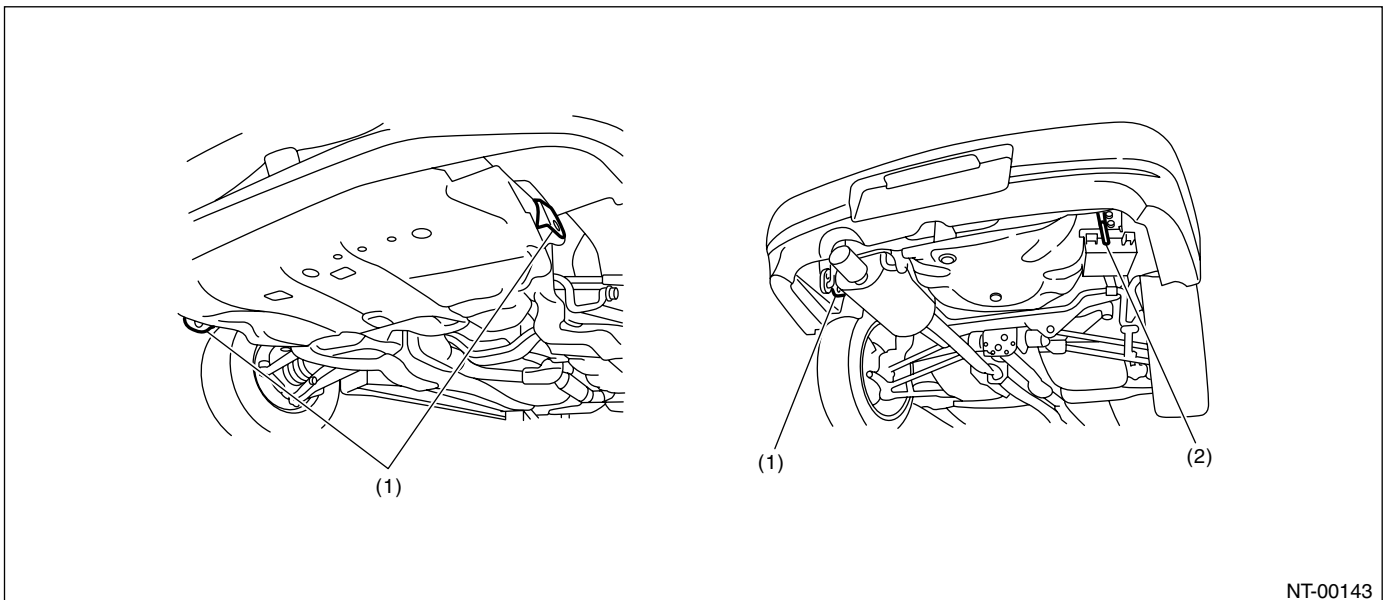
(1) Front crossmember

(2) Rear differential

## 8. TIE-DOWNS

Tie downs are used when transporting vehicles and when using the chassis dynamo. Attach tie downs only to the specified points on the vehicle.

### • Tie-down point

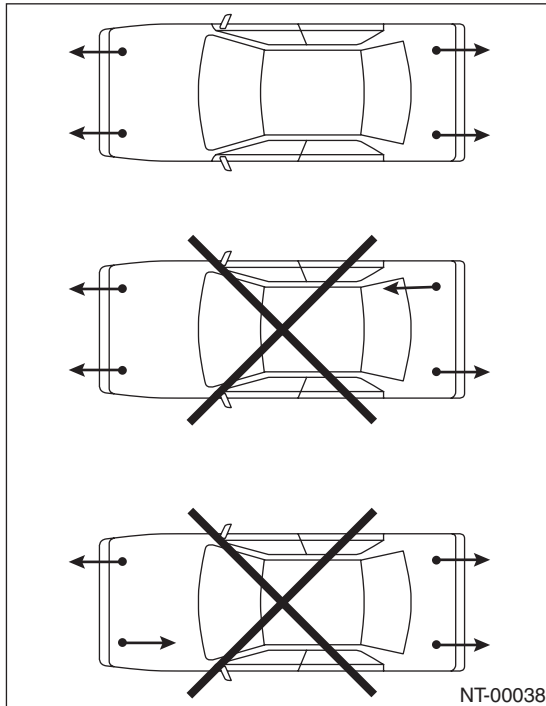


NT-00143

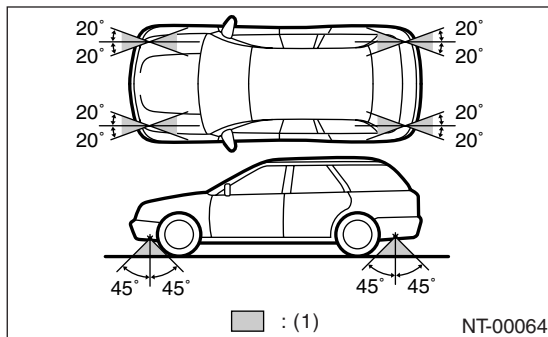
(1) Hook for tie-down

(2) Hook for towing and tie-down

• Chain direction at tie-down condition



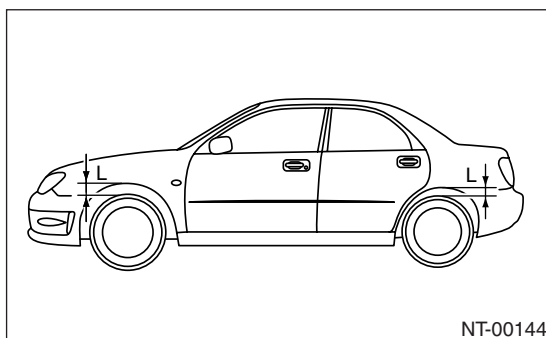
• Chain pulling range at tie-down condition



(1) Chain pulling range at tie-down condition

• Vehicle sinking volume at tie-down condition

Measure the distance “L” from tire highest point to arch highest point before tie-down and after tie-down. Difference of measurement value (drop height) shall be within 50 mm (1.97 in). Make sure to fix the vehicle securely.



## Note

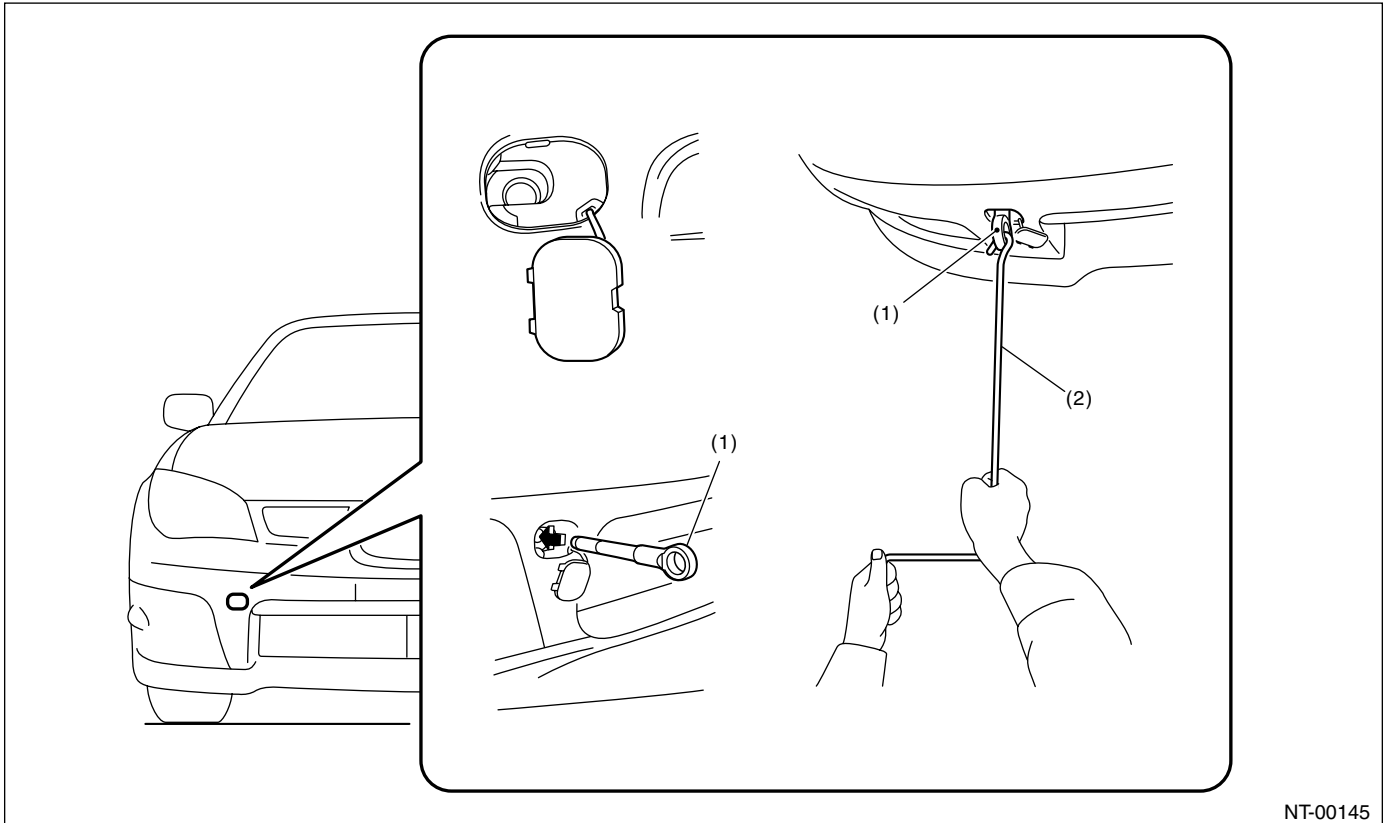
NOTE

### 9. TOWING

Avoid towing vehicles except when the vehicle cannot be driven. For models with AWD, AT, or VTD, use a loader instead of towing. When towing other vehicles, to prevent excessive weight from damaging the hook or vehicle:

- Do not install the hook except when towing.
- Do not tow other vehicles with a front hook for tie down.
- Make sure the vehicle towing is heavier than the vehicle being towed.

#### • Front

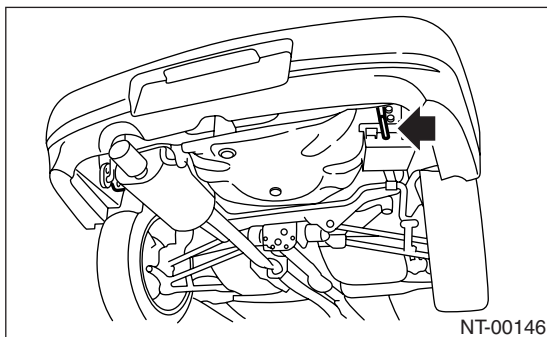


NT-00145

(1) Eye bolt

(2) Jack handle

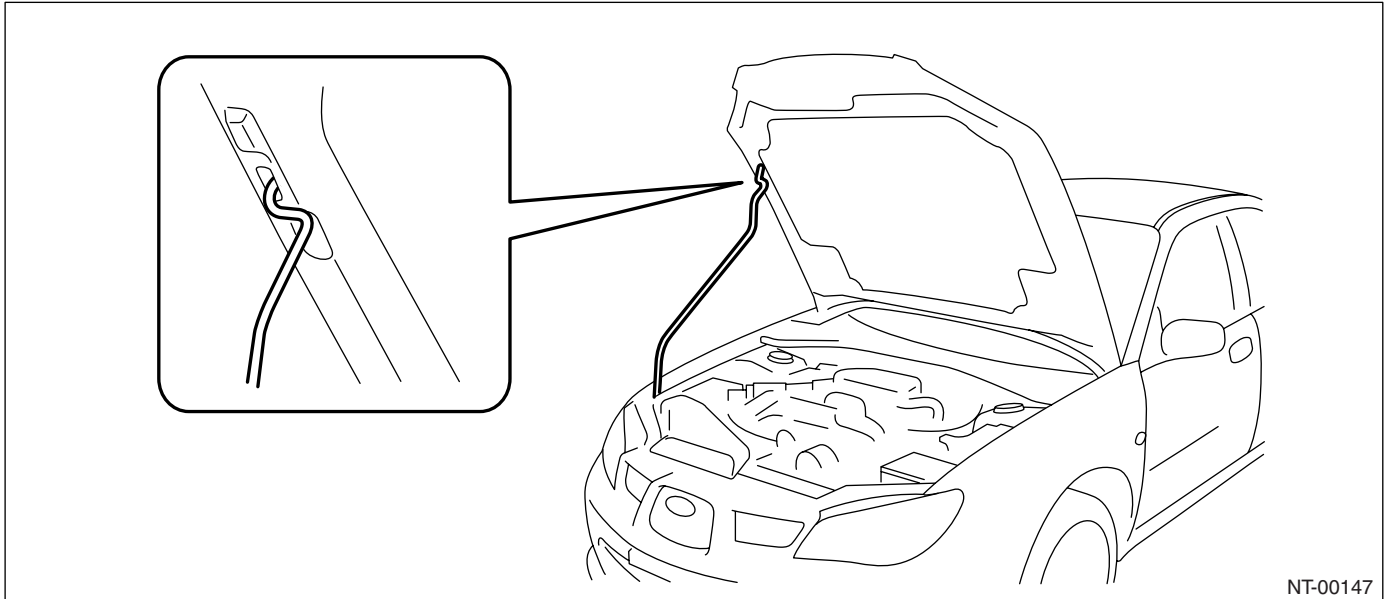
#### • Rear



NT-00146

## 10.FRONT HOOD STAY INSTALLATION

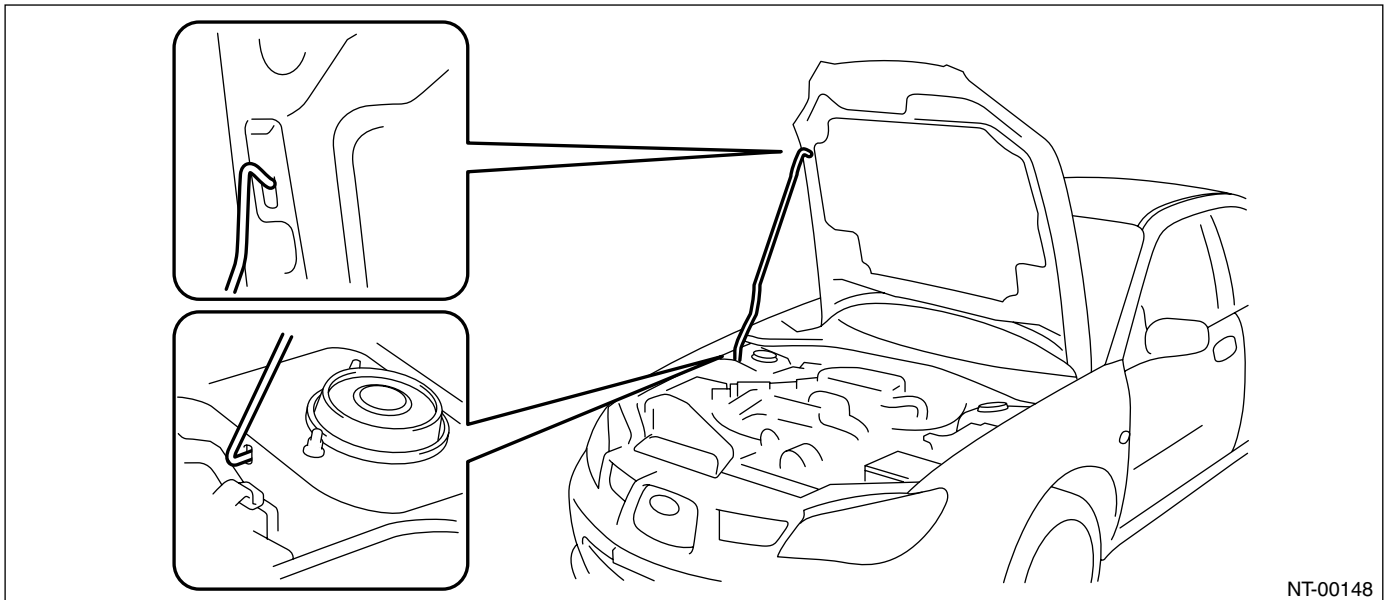
- At the check and general maintenance



NT-00147

- When wider hood opening is necessary

- 1) Remove the hook stay.
- 2) Set the upper end of stay into the hole of hood inner.
- 3) Remove the grommet in the wheel apron, and set the lower end of stay into hole.



NT-00148

## 11.TRAINING

For information about training, contact a dealer or agent.

## 12.GENERAL SCAN TOOL

Using general scan tools will greatly improve efficiency of repairing engine electronic controls. The Subaru Select Monitor can be used to diagnose the engine, ABS, AT and other parts.



# IDENTIFICATION

***ID***

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# Identification

## IDENTIFICATION

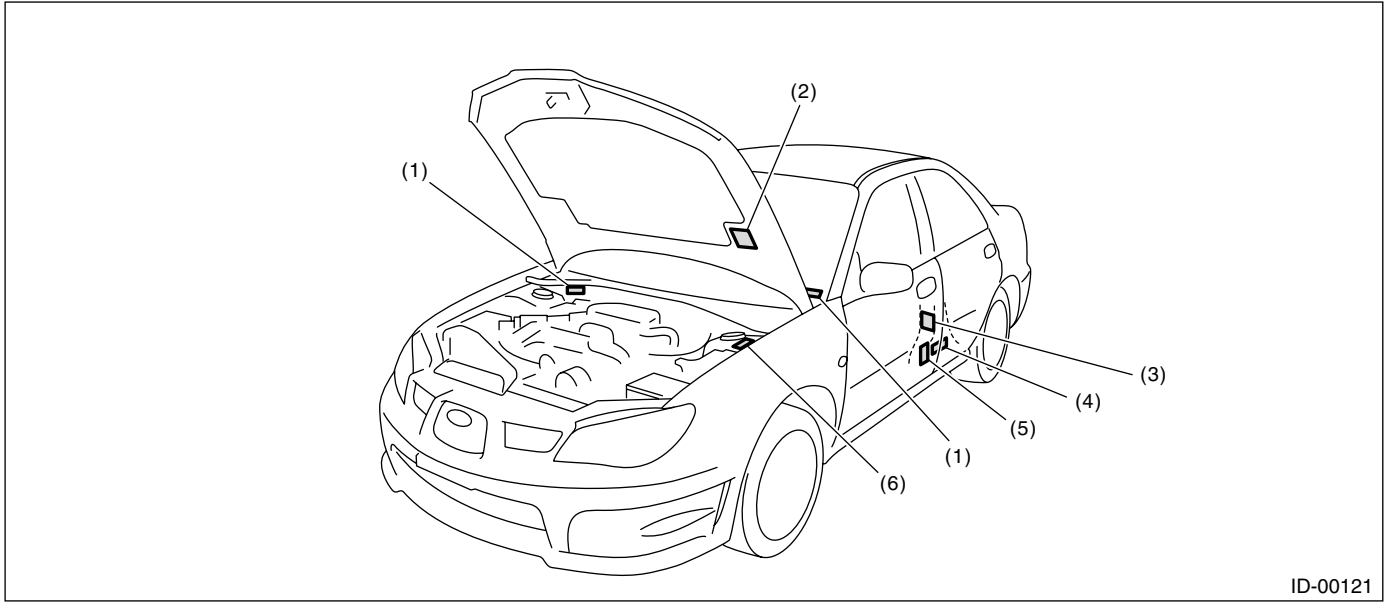
### 1. Identification

#### A: IDENTIFICATION

##### 1. IDENTIFICATION NUMBER AND LABEL LOCATIONS

The VIN (Vehicle Identification Numbers) is used to classify the vehicle.

##### • POSITIONING OF THE PLATE LABEL FOR IDENTIFICATION



ID-00121

(1) Vehicle identification number (VIN)

(3) Tire inflation pressure label

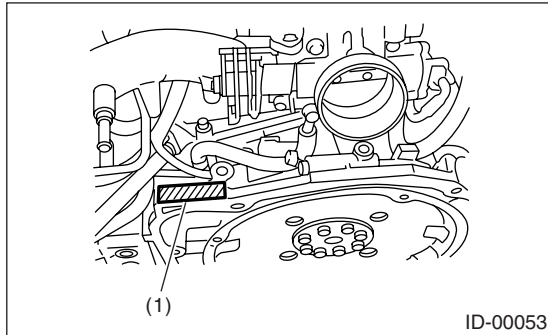
(5) Bar code label (USA model)

(2) Emission control label

(4) Certification plate

(6) Model number plate

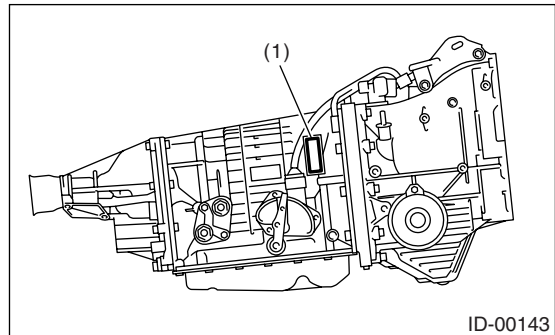
##### • ENGINE



ID-00053

(1) Engine serial number

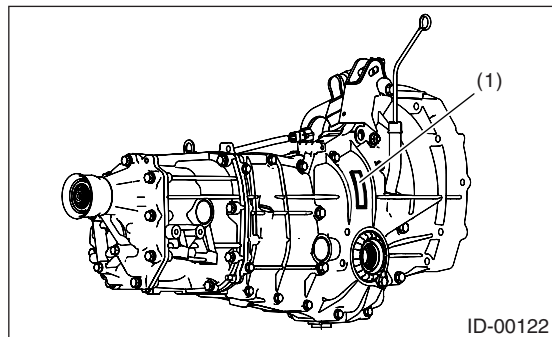
##### • AUTOMATIC TRANSMISSION



ID-00143

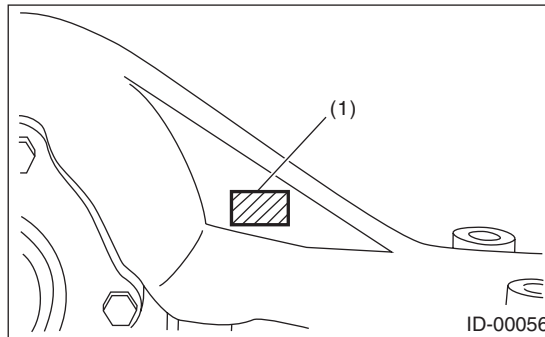
(1) AT model label

## • MANUAL TRANSMISSION (5MT)



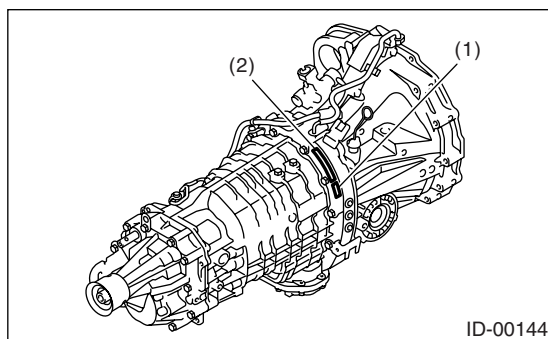
(1) MT model label

## • REAR DIFFERENTIAL



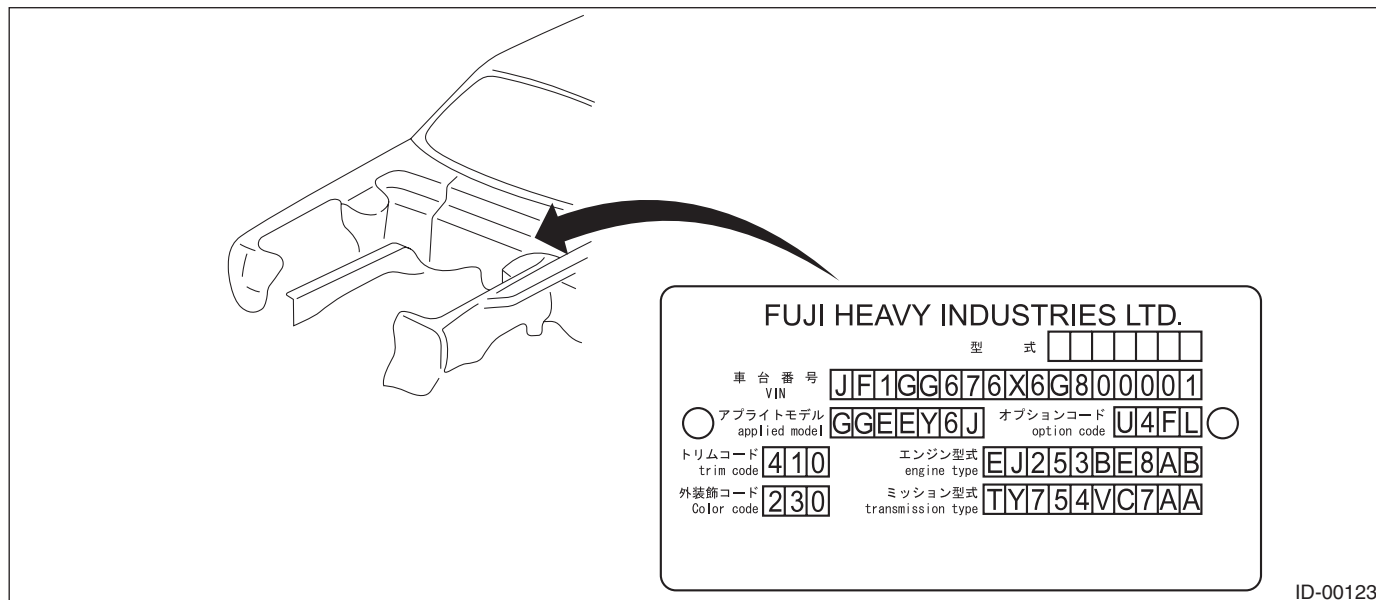
(1) Type (white paint)

## • MANUAL TRANSMISSION (6MT)



(1) Transmission serial number  
(2) MT model label

## • MODEL NUMBER PLATE



# Identification

## IDENTIFICATION

### 2. MEANING OF V.I.N.

The meaning of the VIN is as follows:

• **]JF1GG676X6G800001[**

The starting and ending brackets ( ] [ ) are stop marks.

| Digits   | Code   | Meaning                | Details   |
|----------|--------|------------------------|---|
| 1 to 3   | JF1    | Manufacturer body area | JF1: Passenger car, FHI made  |
| 4        | G      | Car line               | IMPREZA   |
| 5        | G      | Body type              | D: 4 Door Sedan<br>G: Wagon   |
| 6        | 6      | Displacement           | 6: 2.5 L AWD<br>7: 2.5 L AWD Turbo  |
| 7        | 7      | Grade                  | 7: 2.5i<br>8: OUTBACK<br>9: WRX<br>0: STI   |
| 8        | 6      | Restraint              | 6: Manual belts, dual airbag, side airbag   |
| 9        | X      | Check digit            | 0 to 9 & X  |
| 10       | 6      | Model year             | 6: 2006MY<br>7: 2007MY<br>8: 2008MY   |
| 11       | G      | Transmission type      | G: Full-time AWD 5-speed MT single range<br>H: Full-time AWD 4-speed AT<br>L: Full-time AWD 6-speed MT single range |
| 12 to 17 | 800001 | Serial number          | 500001 or more: 4-Door Sedan<br>800001 or more: Wagon   |

### 3. MODEL NUMBER PLATE

The model number plate indicates: the applied model, the option code, the trim code, the engine type, the transmission type, and the exterior color code. This information is helpful when placing orders for parts.

**GGEY6J**

| Digits | Code | Meaning  | Details  |
|--------|------|--|--|
| 1      | G    | Series   | IMPREZA  |
| 2      | G    | Body style   | D: 4 Door Sedan<br>G: Wagon  |
| 3      | E    | Engine displacement<br>Drive system<br>Suspension system | E: 2.5 L AWD<br>F: 2.5 L AWD High power turbo<br>G: 2.5 L AWD Turbo  |
| 4      | E    | Model year   | E: 2006MY  |
| 5      | Y    | Destination  | Y: Left-hand drive model for North America and Canada  |
| 6      | 6    | Grade  | 6: 2.5i<br>7: OUTBACK<br>8: WRX<br>E: STI  |
| 7      | J    | Transmission, fuel feed system                           | R: SOHC MPI 4-speed AT<br>P: DOHC B MPI 4-speed AT<br>J: SOHC MPI 5-speed MT AWD<br>D: DOHC B MPI 5-speed MT AWD<br>H: DOHC B MPI 6-speed MT AWD |

The engine and transmission type are as follows:

# Identification

IDENTIFICATION

## • Engine

### EJ253BE8AB

| Digits  | Code | Meaning                 | Details  |
|---------|------|-------------------------|--|
| 1 and 2 | EJ   | Engine type             | EJ: 4 cylinders  |
| 3 and 4 | 25   | Displacement            | 25: 2.5 L  |
| 5       | 3    | Fuel feed system        | 3: MPI-NA (SOHC)<br>5: MPI Turbo<br>7: MPI High power turbo  |
| 6       | B    | Exhaust regulations     | B: North America (FED, CAL)                                  |
| 7       | E    | Transmission            | E: 5MT<br>G: 6MT<br>P: AT<br>S: 5MT                          |
| 8       | 8    | Minor change            | 8: "8" is impressed on this vehicle.                         |
| 9 to 10 | AB   | Detailed specifications | Used when ordering parts. See the parts catalog for details. |

## • Transmission

### TY754VC7AA

| Digits  | Code | Meaning                     | Details   |
|---------|------|-----------------------------|---|
| 1       | T    | Transmission                | T: Transmission   |
| 2       | Y    | Transmission type           | Y: Full-time AWD MT center differential<br>V: Full-time AWD AT center differential<br>Z: Full-time AWD AT MP-T  |
| 3 and 4 | 75   | Classification              | 75: 5MT<br>85: 6MT<br>1B: AT (direct control system)  |
| 5       | 4    | Series                      | MT 4: 5MT<br>6: 6MT<br>AT 4: AT   |
| 6       | V    | Transmission specifications | V: Full-time AWD 5-speed MT with viscous coupling center differential single range<br>W: Full-time AWD single range 6-speed MT<br>L: Full-time AWD 4-speed AT with MP-T (direct control system)<br>M: Full-time AWD 4-speed AT with VTD (direct control system) |
| 7       | C    | Engine type                 | C: 925 SOHC<br>W: 925 DOHC Turbo  |
| 8 to 10 | 7AA  | Detailed specifications     | Used when ordering parts. See the parts catalog for details.  |

## • Rear differential

### EG

| Code | Reduction gear ratio | LSD        |
|------|----------------------|------------|
| EG   | 3.900                | No         |
| EH   | 4.111                | No         |
| ER   | 3.700                | Viscous    |
| P1   | 3.900                | Viscous    |
| HX   | 3.545                | Mechanical |

## • Option code

### U4FL

| Digits  | Code | Meaning                | Details                          |
|---------|------|------------------------|----------------------------------|
| 1 and 2 | U4   | Destination            | U4: USA (FED, CAL)<br>CO: Canada |
| 3 and 4 | FL   | Main option of vehicle | —                                |

# Identification

IDENTIFICATION

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# RECOMMENDED MATERIALS

*RM*

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# Recommended Materials

## RECOMMENDED MATERIALS

### 1. Recommended Materials

#### A: RECOMMENDED MATERIALS

##### 1. GENERAL

To insure the best performance, always use the specified oil, gasoline, adhesive, sealant, etc. or a substitute of equivalent quality.

##### 2. FUEL

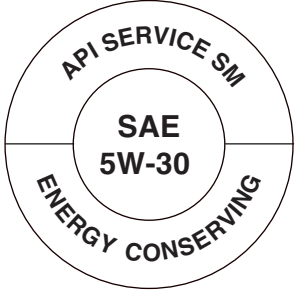

Always use a gasoline of the same or higher octane value than specified in the owner's manual. Ignoring the specifications below will result in damage or poor operation of the engine and fuel injection system. Use the specified gasoline to correct performance.

##### • Unleaded gasoline

Use unleaded gasoline and not leaded gasoline on vehicles with catalytic converter installed to reduce air pollution. Using leaded gasoline will damage the catalytic converter.

##### 3. LUBRICANTS

Use either the lubricants in the table below or equivalent lubricants. See the table below to choose the correct SAE viscosity.

| Lubricant                      | Recommended   |   |
|--------------------------------|---|---|
|                                | API standard  | ILSAC standard  |
| Engine oil                     | SM Grade "Energy conserving"<br><br>RM-00049 | GF-4<br><br>RM-00002 |
| Manual transmission oil        | GL-5  | —   |
| AT front differential gear oil | GL-5  | —   |
| Rear differential gear oil     | Except STI model  | GL-5  |
|                                | STI model   | GL-5 (For mechanical LSD)   |

# Recommended Materials

RECOMMENDED MATERIALS

| SAE viscosity No. and applicable temperature  |     |                  |     |      |    |    |    |     |  |
|---|-----|------------------|-----|------|----|----|----|-----|--|
| Engine oil  |     |                  |     |      |    |    |    |     |  |
| (°C)  | -30 | -20              | -10 | 0    | 10 | 20 | 30 | 40  |  |
| (°F)  | -22 | -4               | 14  | 32   | 50 | 68 | 86 | 104 |  |
|   |     | 10W-30 or 10W-40 |     |      |    |    |    |     |  |
| 5W-30 Recommend   |     |                  |     |      |    |    |    |     |  |
| RM-00003  |     |                  |     |      |    |    |    |     |  |
| Manual transmission oil, front differential gear oil and rear differential gear oil |     |                  |     |      |    |    |    |     |  |
| (°C)  | -30 | -20              | -10 | 0    | 10 | 20 | 30 | 40  |  |
| (°F)  | -22 | -4               | 14  | 32   | 50 | 68 | 86 | 104 |  |
|   |     |                  |     | 90 * |    |    |    |     |  |
|   |     |                  | 85W |      |    |    |    |     |  |
|   |     | 80W              |     |      |    |    |    |     |  |
|   |     | 75W-90           |     |      |    |    |    |     |  |
| RM-00047  |     |                  |     |      |    |    |    |     |  |

\*:Recommended Rear Differential Oil (STI model)



## Recommended Materials

### RECOMMENDED MATERIALS

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#### 4. FLUID

Use the fluids specified in the table below. Do not mix two different kinds or makes of fluid.

| Fluid                        | Recommended        | Alternative                             | Remarks |
|------------------------------|--------------------|---|---------|
| Automatic transmission fluid | SUBARU ATF Type-HP | Idemitsu: ATF HP<br>Castrol: Transmax J | —       |
| Power steering fluid         | DEXRON III         | —                                       | —       |
| Brake fluid                  | FMVSS No. 116 DOT3 | FMVSS No. 116 DOT4                      | —       |
| Clutch fluid                 | FMVSS No. 116 DOT3 | FMVSS No. 116 DOT4                      | —       |

#### 5. COOLANT

Use the coolant specified in the table below to protect the engine.

| Coolant                         | Recommended                | Item number | Alternative            |
|---------------------------------|----------------------------|-------------|------------------------|
| Coolant                         | SUBARU coolant             | 000016218   | None                   |
| Water for dilution              | Distilled water            | —           | Tap water (Soft water) |
| Cooling system protective agent | Cooling system conditioner | SOA635071   | None                   |

#### 6. REFRIGERANT

Standard air conditioners on Subaru vehicles use HFC134a refrigerant. Do not mix it with other refrigerants. Also, do not use any compressor oil except for DH-PR.

| Air conditioner | Recommended | Item number | Alternative |
|-----------------|-------------|-------------|-------------|
| Refrigerant     | HFC134a     | —           | None        |
| Compressor oil  | DH-PR       | —           | None        |

# Recommended Materials

## 7. GREASE

Use the grease and supplementary lubricants shown in the table below.

| Grease                   | Application point  | Recommended          | Item number | Alternative                  |
|--------------------------|--|----------------------|-------------|------------------------------|
| Supplementary lubricants | <ul style="list-style-type: none"> <li>• O<sub>2</sub> sensor</li> <li>• Bolts, etc.</li> </ul>  | Spray type lubricant | 004301003   | —                            |
| Grease                   | MT main shaft  | NICHIMOLY N-130      | —           | —                            |
|                          | Clutch master cylinder push rod  | Silicolube G-40M     | 004404003   | —                            |
|                          | <ul style="list-style-type: none"> <li>• Gear shift lever</li> <li>• Clutch operating cylinder</li> <li>• Clutch pedal</li> <li>• Brake pedal</li> <li>• Clutch bearing</li> <li>• Clutch release lever</li> <li>• Select lever</li> </ul> | KOPR-KOTE            | 003603001   | —                            |
|                          | Select lever (lock plate)  | Suncall GLO-224      | —           | —                            |
|                          | Steering gear box  | VALIANT GREASE M-2   | 003608001   | One-Luber SG<br>One-Luber MO |
|                          | Disc brake   | Niglube RX-2         | K0779GA102  | —                            |
|                          | Brake pad  | Molykote AS-880N     | K0777YA010  | —                            |
|                          | Front axle PTJ   | NKG302               | 28495AE010  | —                            |
|                          | <ul style="list-style-type: none"> <li>• Front axle EBJ</li> <li>• Rear axle EBJ</li> </ul>  | NTG2218-M            | 28395AG010  | —                            |
|                          | Front axle BJ (STI model)  | NTG2218-M            | 28395AG030  | —                            |
|                          | <ul style="list-style-type: none"> <li>• Front axle DOJ (STI model)</li> <li>• Rear axle EDJ (STI model)</li> </ul>  | NKG205               | 28495AG010  | —                            |
|                          | Rear axle DOJ (Except STI model)   | NKG205               | 28495AG000  | —                            |
|                          | <ul style="list-style-type: none"> <li>• Throttle cable end</li> <li>• Door latch</li> <li>• Door striker</li> </ul>   | Silicolube G-30M     | 004404002   | —                            |

## Recommended Materials

### RECOMMENDED MATERIALS

#### 8. ADHESIVES

Use the adhesives shown in the table below, or equivalent.

| Adhesive | Application point   | Recommended  | Item number | Alternative                                 |
|----------|---|--|-------------|---|
| Adhesive | Windshield, rear window glass, rear quarter glass, rear gate and body | Dow Automotive's Adhesive: ESSEX U-400HV or equivalent<br>Glass primer: U-401 and U-402<br>Paint surface primer: U-413 | —           | —   |
|          | Inner rearview mirror base  | REPAIR KIT IN MR   | 65029FC000  | —   |
|          | Soft vinyl  | Cemedine 540   | —           | 3M's EC-776, EC-847 or EC-1022 (Spray type) |
|          | Momentary sealant   | Cemedine 3000  | —           | Armstrong's Eastman 910                     |

#### 9. SEAL MATERIAL

Use seal material shown in the table below, or equivalent.

| Seal material | Application point  | Recommended          | Item number | Alternative            |
|---------------|--|----------------------|-------------|------------------------|
| Seal material | <ul style="list-style-type: none"> <li>• Cylinder block</li> <li>• Torque converter clutch case</li> <li>• Transmission case</li> <li>• Transmission oil pan (6MT model)</li> <li>• Oil pump</li> <li>• DOHC rocker cover</li> </ul> | Three Bond 1215B     | 004403007   | Dow Corning's No. 7038 |
|               | Transmission oil pan (AT model)  | Three Bond 1217B     | K0877YA020  | —                      |
|               | <ul style="list-style-type: none"> <li>• Rear differential</li> <li>• Oil pressure swtch</li> </ul>  | Three Bond 1324      | 004403042   | —                      |
|               | <ul style="list-style-type: none"> <li>• Rear differential</li> <li>• Service hole plug</li> </ul>   | Three Bond 1105      | 004403010   | Dow Corning's No. 7038 |
|               | Steering adjusting screw   | Three Bond 1141      | 004403006   | —                      |
| Camshaft cap  | NA model   | Three Bond 1280B     | K0877YA018  | —                      |
|               | Turbo model  | Three Bond 1215      | 004403007   | —                      |
|               | <ul style="list-style-type: none"> <li>• Front sealing cover</li> <li>• Rear sealing cover</li> </ul>  | 3M Butyl Rubber 8626 | —           | —                      |
|               | Engine pressure switch   | Three Bond 1207C     | 004403012   | —                      |
|               | <ul style="list-style-type: none"> <li>• Separator cover</li> <li>• DOHC half moon plug</li> </ul>   | Three Bond 1280B     | K0877YA018  | —                      |

# PRE-DELIVERY INSPECTION

*PI*

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# Pre-delivery Inspection

## PRE-DELIVERY INSPECTION

### 1. Pre-delivery Inspection

#### A: GENERAL DESCRIPTION

The purposes of the pre-delivery inspection (PDI) are as follows.

- Remove the additional parts used for ensuring the vehicle quality during transportation and restore the vehicle to its normal state.
- Check if the vehicle before delivery is in a normal state.
- Check for any damage to the vehicle or parts that may have taken place during transportation or storage.
- Check if the vehicle after repair is in a normal state.
- Make sure to provide a complete vehicle to the customer.

For the above reasons, all SUBARU dealers (dealerships) carry out the PDIs before delivering a vehicle. Refer to this manual unless otherwise specified.

#### B: PRE-DELIVERY INSPECTION (PDI) PROCEDURE

Follow the procedures shown in the table below.

##### Static Checks Just After Vehicle Receipt

| Step  | Check point   |
|---|---|
| 1. Appearance check   | (1) If the vehicle is covered with protective coating, visually check the vehicle body for damage and dents. If the protective coating has been removed, visually check the body paints for small areas of damage or stains.<br>(2) Visually check the glass and light lenses for any damage and cracks or excessive gaps to the body sheet metal.<br>(3) Visually check the plated parts for any damage. |
| 2. Tire check   | (1) Check the tires for damage, abnormal conditions, and dents on the wheels.<br>(2) Check the tire air pressure.   |
| 3. Fuse installation  | If the vehicle is about to be delivered to the customer, attach a room light fuse.  |
| 4. Connection of air conditioner harness                          | If the vehicle is about to be delivered to the customer, connect the air conditioner harness.   |
| 5. Check the doors for lock/unlock and open/close operations.     | (1) Using the key, check that the door can be locked and unlocked normally.<br>(2) Open and close all doors to see that there are no abnormal conditions.<br>(3) Operate the power door locking switch to check that the rear gate is locked and unlocked normally.   |
| 6. Operation check of the child safety lock system                | Check that the child safety lock system operates normally.  |
| 7. Check the trunk lid for open/close operations.                 | (1) Using the key, check that the trunk lid can be unlocked normally.<br>(2) Operate the trunk lock release lever to check that the trunk opens normally.<br>(3) Check that the trunk lid does not unlock using valet key.<br>(4) Open and close the trunk lid to see that there are no abnormal conditions.  |
| 8. Check the rear gate for lock/unlock and open/close operations. | (1) Check if the rear gate can be unlocked normally through the emergency hole.<br>(2) Open and close the rear gate to see that there are no abnormal conditions.   |
| 9. Operation check of trunk lid release handle.                   | Operate the trunk lid release handle to check that the trunk lock opens normally.   |
| 10. Operation check of fuel lid opener lock release lever         | Operate the fuel lid opener to check that the fuel filler flap lid is unlocked normally.  |
| 11. Accessory check   | Check that the following accessories are provided: <ul style="list-style-type: none"><li>• Owner's manual</li><li>• Warranty booklet</li><li>• Service booklet</li><li>• Spare key</li><li>• Jack</li><li>• Tool set</li><li>• Spare tire</li></ul>   |
| 12. Operation check of hood lock release system                   | Operate the hood lock release lever to check that the hood opens normally.  |

# Pre-delivery Inspection

PRE-DELIVERY INSPECTION

| Step                          | Check point  |
|-------------------------------|--|
| 13. Battery                   | Check the battery for any abnormal conditions such as rust and trace of battery fluid leaks.                     |
| 14. Brake fluid               | Check the fluid amount.  |
| 15. Engine oil                | Check the oil amount.  |
| 16. Transmission fluid        | Check the fluid amount.  |
| 17. AT front differential oil | Check the AT front differential oil amount.  |
| 18. Engine coolant            | Check the coolant amount.  |
| 19. Clutch fluid              | Check the clutch fluid amount.   |
| 20. Window washer fluid       | Check the window washer fluid amount.  |
| 21. Hood latch check          | Check that the hood is closed and latched securely.  |
| 22. Keyless entry system      | Check that the keyless entry system operates normally.   |
| 23. Security system           | Check that the security system operates normally.  |
| 24. Seat                      | (1) Check the seat surfaces for smears or dirt.<br>(2) Check the seat installation conditions and functionality. |
| 25. Seat belt                 | Check the seat belt installation conditions and functionality.   |

## Checks with the Engine Running

| Step                                     | Check point  |
|--|--|
| 26. Test mode connector                  | Test mode connector.   |
| 27. Immobilizer system                   | (1) Check that the engine starts with all keys that are equipped on vehicle.<br>(2) 60 seconds after turning ignition switch from ON to ACC or OFF, or immediately after removing key, check that the security indicator light blinking. |
| 28. Starting condition                   | Start the engine and check that the engine starts smoothly.  |
| 29. Exhaust system                       | Check that the exhaust noise is normal and no leaks are found.   |
| 30. Indicator light                      | Check that all the indicator lights operate normally.  |
| 31. Clock                                | Check that the clock operates normally.  |
| 32. Radio                                | Check that the radio system operates normally.   |
| 33. Front accessory power supply socket  | Check that the front accessory power supply socket operates normally.  |
| 34. Lighting system                      | Check that the lighting systems operate normally.  |
| 35. Window washer                        | Check that the window washer system operates normally.   |
| 36. Wiper                                | Check that the wiper system operates normally.   |
| 37. Power window operation check         | Check the power window for correct operations.   |
| 38. Driver's control center differential | Check that the indicator light operates normally.  |

## Dynamic Test with the Vehicle Running

| Step                     | Check point   |
|--------------------------|---|
| 39. Brake test           | Check that the foot brake operates normally.                  |
| 40. Parking brake        | Check that the parking brake operates normally.               |
| 41. AT shift control     | Check the AT shift patterns are correct.                      |
| 42. Heater & ventilation | Check that the heater & ventilation system operates normally. |
| 43. Air conditioner      | Check that the air conditioner operates normally.             |
| 44. Cruise control       | Check that the cruise control system operates normally.       |

## Checks after Dynamic Test

| Step                           | Check point  |
|--------------------------------|--|
| 45. ATF level                  | Check that the ATF level is normal.  |
| 46. Power steering fluid level | Check that the power steering fluid level is normal.   |
| 47. Fluid leak check           | Check for fluid/oil leaks.   |
| 48. Water leak check           | Spray the vehicle with water and check for water leaks.  |
| 49. Appearance check 2         | (1) Remove the protective coating (if any).<br>(2) Check the body paints for damage and smears.<br>(3) Check the plated parts for damage and rust. |

# Pre-delivery Inspection

## PRE-DELIVERY INSPECTION

### 1. APPEARANCE CHECK

- If the vehicle is covered with protective coating, visually check the vehicle body for damage and dents.
- If there is no protective coating, check the body paints for small areas of damage or stains and repair as necessary.
- Check the window glass, door glass, and lights for any cracks or damage and repair or replace the parts as necessary.
- Check the plated parts, such as the grilles and door knobs, for damage or loss of gloss and repair or replace the parts as necessary.

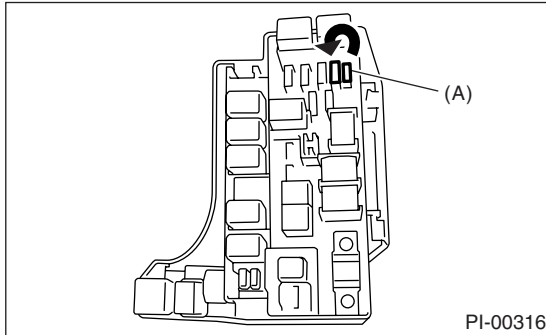
### 2. TIRE CHECK

- Check the tire outer faces for any damage.
- Check the tire air pressure by referring to the following table.

| Tire size  | Tire inflation pressure<br>kPa (kgf/cm <sup>2</sup> , psi) |               |
|------------|--|---------------|
|            | Front  | Rear          |
| P205/55R16 | 230 (2.3, 33)  | 210 (2.1, 30) |
| 215/45R17  | 230 (2.3, 33)  | 220 (2.2, 32) |
| 225/45R17  | 250 (2.5, 36)  | 210 (2.1, 30) |

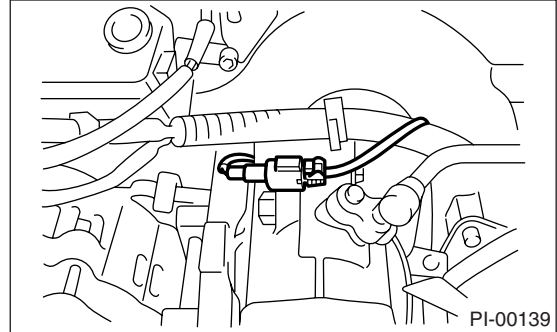
### 3. FUSE INSTALLATION

A vehicle just delivered has no fuse for the room light circuit to prevent battery discharge. Attach a 20 A fuse (A) as shown in the figure.



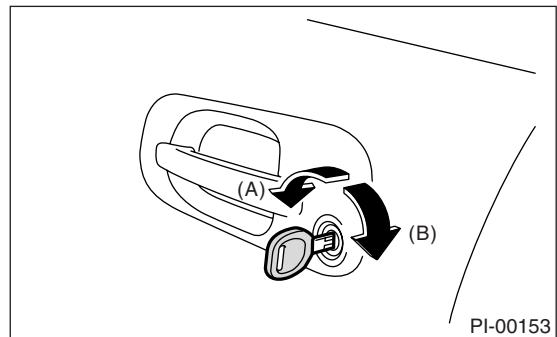
### 4. CONNECTION OF AIR CONDITIONER HARNESS

A vehicle just delivered has its air conditioner harness disconnected to protect the air conditioner compressor. Connect the harness as shown in the figure.



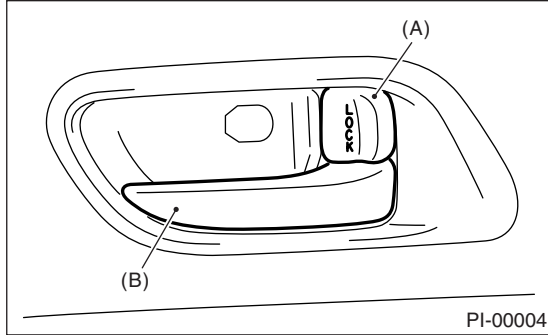
### 5. CHECK THE DOORS FOR LOCK/UNLOCK AND OPEN/CLOSE OPERATIONS

1) Using the key, lock and unlock the door several times to check for normal operation. Open and close the door several times for smooth movement.



- (A) Unlock
- (B) Lock

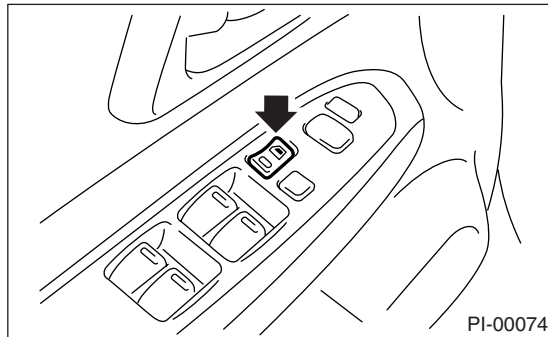
2) Close the driver's door completely, and place the door lock knob (A) to the lock position. Then pull inner remotes (B) to ensure that doors will not open. For other doors, place the door lock knob (A) to the lock positions and then pull the inner remote to check that the doors will not open.



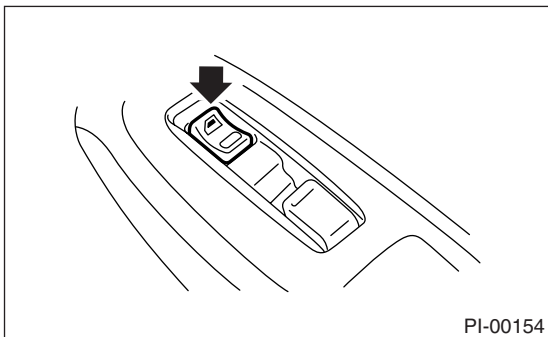
(A) Door lock knob  
(B) Inner remote

3) Close all the doors and press the driver's and passenger's side power door lock switch to lock side. Check that all doors including rear gate are locked.

- Driver's side

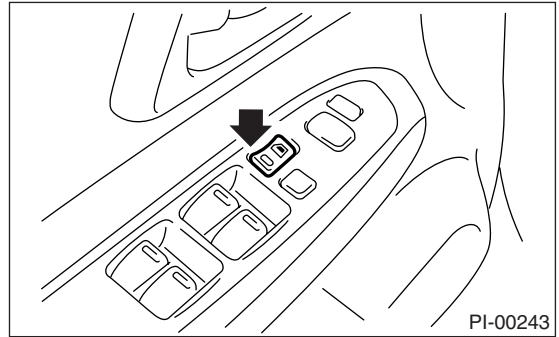


- Passenger's side

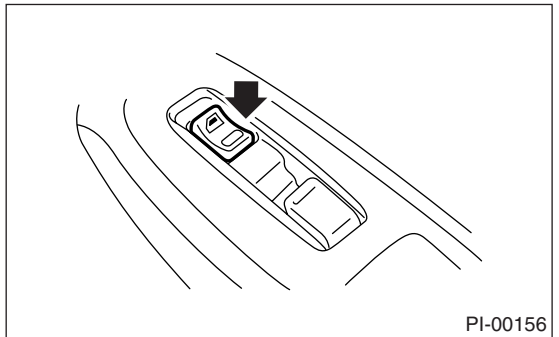


4) Press the driver's and passenger's side power door lock switch to unlock side. Check that all doors including rear gate are unlocked.

- Driver's side

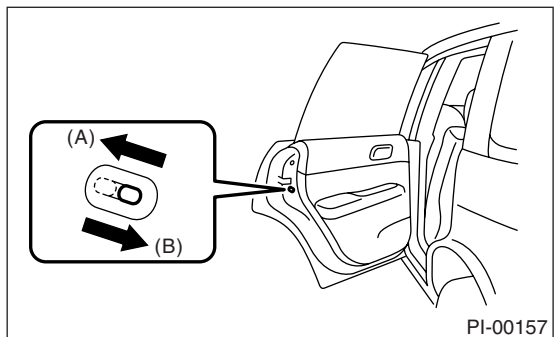


- Passenger's side



## 6. CHECK THE OPERATION OF CHILD SAFETY LOCKS SYSTEM

- 1) Set the child safety lock on both rear doors to the lock positions.
- 2) Close the rear doors completely.
- 3) Check that the lock levers of the rear doors are in the unlock positions. Then, pull the inner remotes of the rear doors to ensure that the doors will not open.
- 4) Next, pull the outside door handles of the rear doors to ensure that the doors will open.



(A) Unlock  
(B) Lock

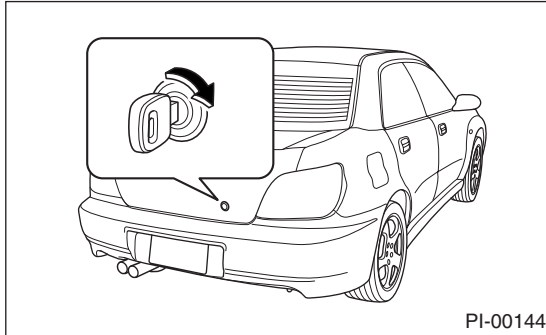


# Pre-delivery Inspection

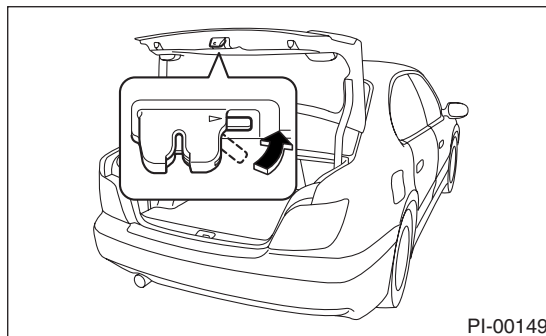
## PRE-DELIVERY INSPECTION

### 7. CHECK THE TRUNK LID FOR OPEN/CLOSE OPERATIONS

- 1) Operate the trunk lock release lever and verify that the trunk lid opens.
- 2) Using the key, open the trunk lid several times to check for normal operation.
- 3) Open and close the trunk lid several times for smooth movement.



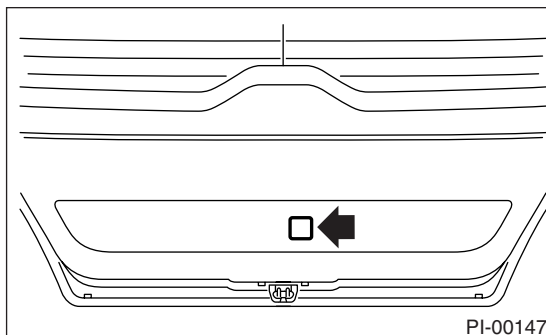
- 4) Check the trunk lid and glove box do not open using valet key.
- 5) Set the trunk lid release lever to the cancel position, and check that the trunk lid can only be opened with the key.



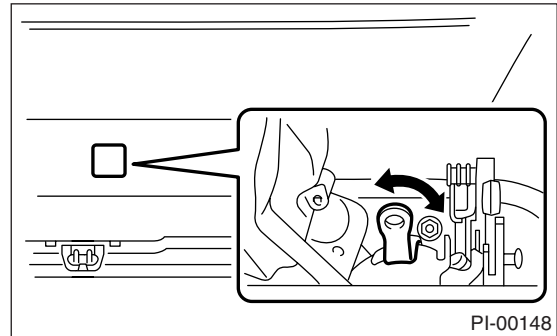
### 8. CHECK THE REAR GATE FOR LOCK/UNLOCK AND OPEN/CLOSE OPERATIONS

- 1) Open and close the rear gate several times for smooth movement.
- 2) Operate the rear gate lever to check that the rear gate is locked and unlocked normally.

- (1) Remove the blind cover inside the rear gate.

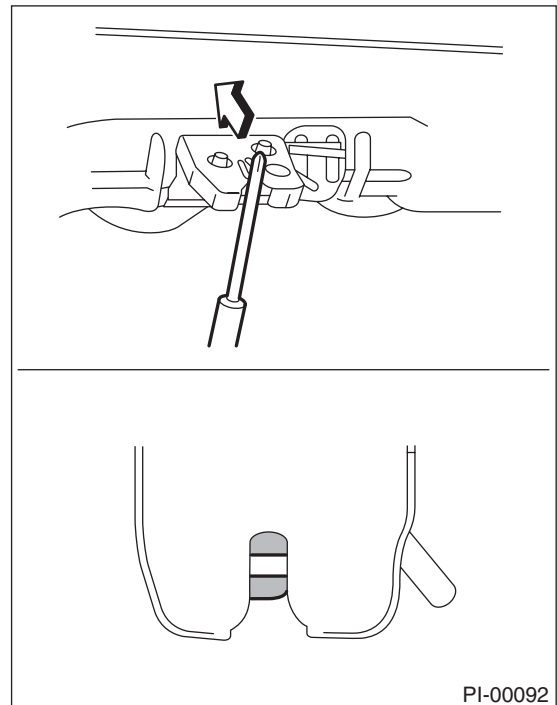


- (2) Check that the rear gate is locked correctly when lever is operated using a finger.

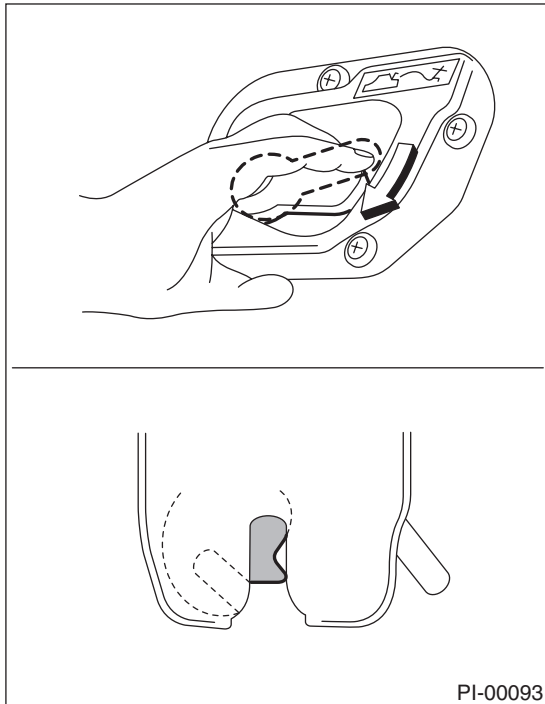


### 9. OPERATION CHECK OF TRUNK LID RELEASE HANDLE

- 1) Use a flat-tip screwdriver. Slide the screwdriver blade from the slit aperture of the lock assembly fully to the end until you hear a click. This places the latch in the locked position.



2) Move the release handle from outside the vehicle in the direction of the arrow to check if the latch is released.



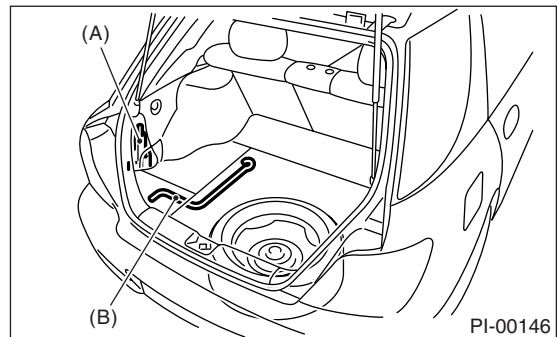
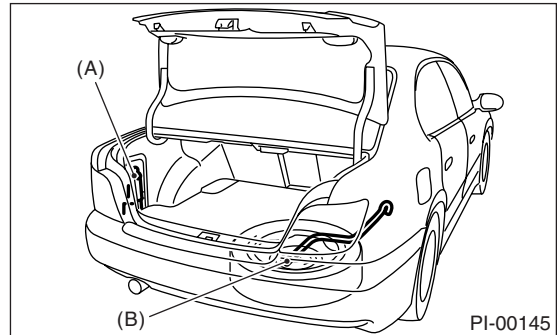
## 10. OPERATION CHECK OF FUEL LID OPENER LOCK RELEASE LEVER

Operate the fuel lid opener and verify that the fuel lid is unlocked normally. Check that the filler cap is securely closed.

## 11. ACCESSORY CHECK

Check that the following accessories are provided in the luggage compartment or cargo area.

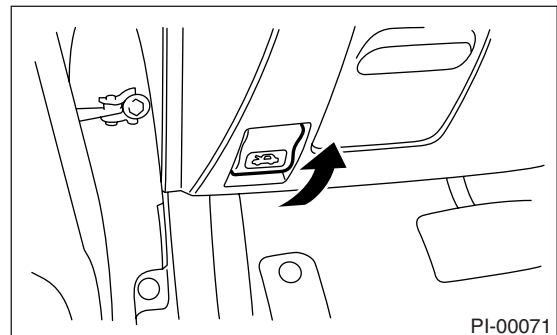
- Owner's manual
- Warranty booklet
- Service booklet
- Spare key
- Jack
- Tool set
- Spare tire



- (A) Jack
- (B) Jack handle

## 12. OPERATION CHECK OF HOOD LOCK RELEASE SYSTEM

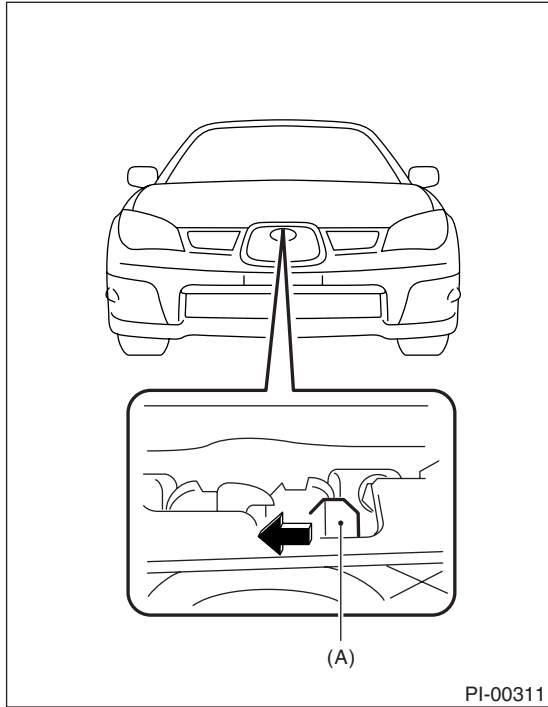
Operate the hood release knob and check that the hood is unlocked normally.



# Pre-delivery Inspection

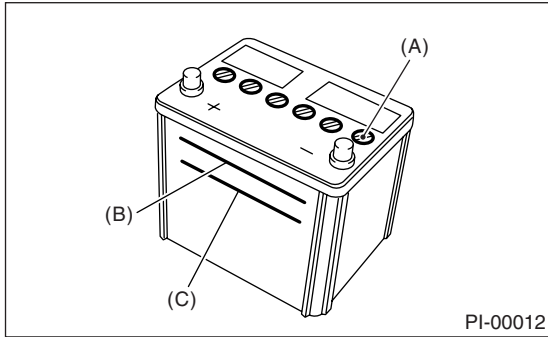
## PRE-DELIVERY INSPECTION

Operate the lever (A) and check that the hood is opened normally. Then support the hood with hood stay.



### 13. BATTERY

Check the battery terminals to make sure that no rust or corrosions due to fluid leaks are found. Check that the battery caps are securely tightened.



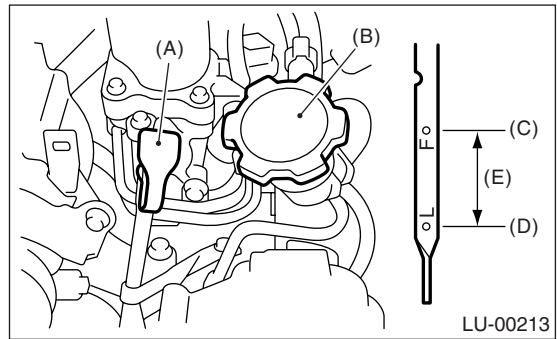
- (A) Cap
- (B) Upper level
- (C) Lower level

### 14. BRAKE FLUID

Check the brake fluid amount. If the amount is insufficient, carry out a brake line test to identify brake fluid leaks and check the brake operation. After that, refill the necessary amount of brake fluid tank with the specified type of fluid.

### 15. ENGINE OIL

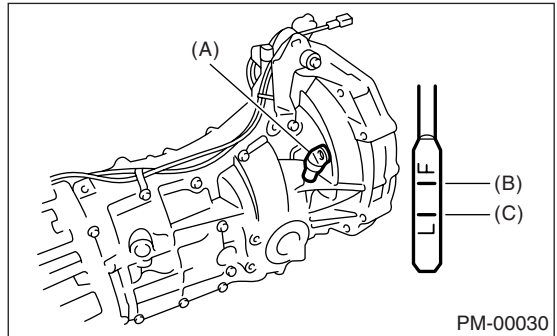
Check the engine oil amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified engine oil.



- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

### 16. TRANSMISSION FLUID

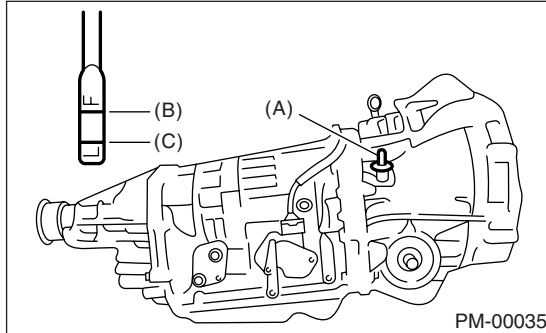
Check the transmission fluid amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified fluid.



- (A) Oil level gauge
- (B) Upper level
- (C) Lower level

## 17. AT FRONT DIFFERENTIAL OIL

Check the AT front differential oil amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified AT front differential oil.



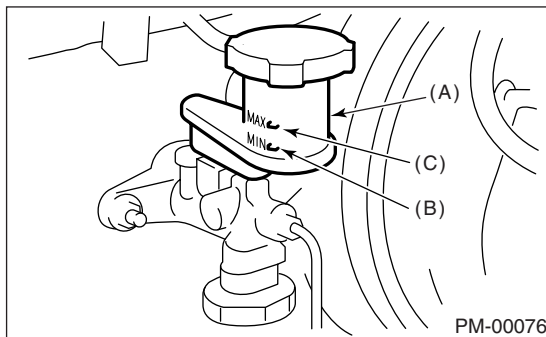
- (A) Oil level gauge
- (B) Upper level
- (C) Lower level

## 18. ENGINE COOLANT

Check the coolant amount on the reservoir. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of coolant with the specified concentration.

## 19. CLUTCH FLUID

Check the clutch fluid amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified fluid.



- (A) Reservoir tank
- (B) MIN level
- (C) MAX level

## 20. WINDOW WASHER FLUID

Check the window washer fluid amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of washer fluid commercially available.

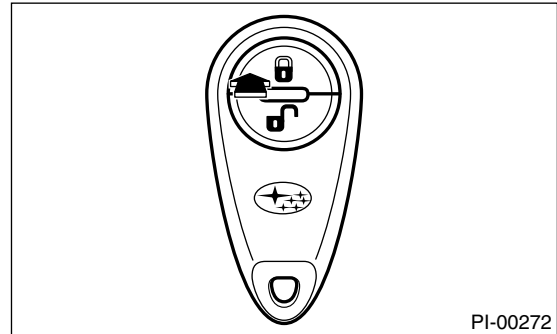
## 21. HOOD LATCH CHECK

Retract the hood stay and close the hood. Check that the hood is securely latched.

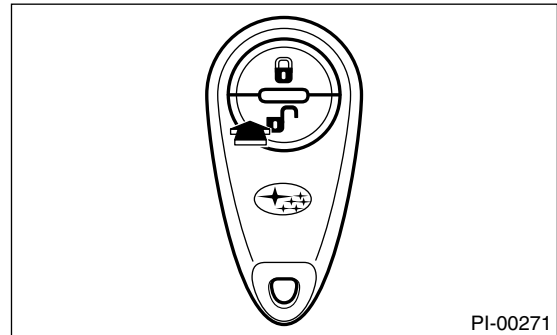
## 22. KEYLESS ENTRY SYSTEM

Check the keyless entry system operations as follows:

- Fully open all the door windows.
- Remove the key from the ignition switch and close all the doors including rear gate.
- Press the “LOCK/ARM” button on the keyless transmitter momentarily once and check if all the doors are locked, the buzzer chirps once, and the hazard light flashes once.



- Press the “UNLOCK/DISARM” button on the keyless transmitter momentarily once and check if the driver’s door is unlocked, the buzzer chirps twice, and the hazard light flashes twice.



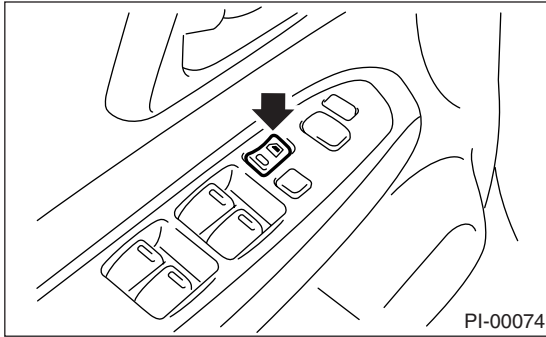
- Press the “UNLOCK/DISARM” button on the keyless transmitter momentarily once again within five seconds and check if all the doors including the rear gate on wagon are unlocked.
  - Press the “LOCK/ARM” button on the keyless transmitter a little bit of time (approx. 2 sec.) and check if a panicking condition occurs; the horn sounds continuously. Also, check if that condition lasts for 30 seconds or until any button of the keyless transmitter is pressed.
  - Press the “LOCK/ARM” button on the keyless transmitter momentarily once with one of the doors including the rear gate open. Check if the buzzer chirps five times and the hazard light flashes five times to warn of a door ajar.
- Then, bring all the doors including the rear gate in closed condition and check if all the doors are locked, the buzzer chirps once, and the hazard light flashes once.

# Pre-delivery Inspection

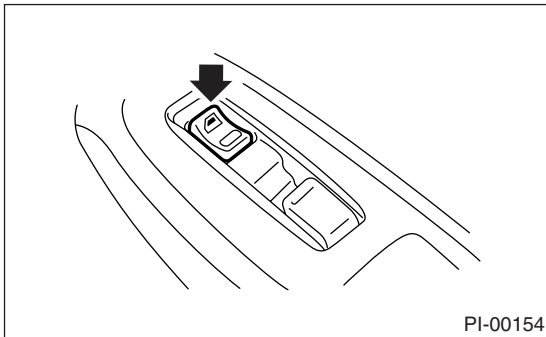
## PRE-DELIVERY INSPECTION

- Press the “LOCK” side of the power door locking switch with any one of the doors including the rear gate open. Then, bring all the doors including the rear gate in the closed condition and check if all the doors are locked, the buzzer chirps once, and the hazard light flashes once.

- Driver’s seat



- Passenger’s seat



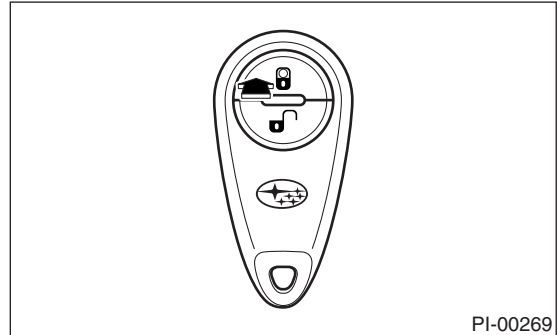
Check selecting audible signal operation.

- Using the buzzer, the system will give you an audible signal when the doors lock and unlock. If desired, you may turn the audible signal off. To turn the audible signal from ON to OFF, close all the doors (the key is not inserted into key cylinder), and insert the key into key cylinder while the “UN-LOCK” side of power door lock switch is pressed. Within 10 seconds after repeating the procedure of removing and inserting the key five times or more, open and close the door. With the door closed, the hazard light will flash three times to inform you that the audible signal has been turned to OFF. To turn the audible signal from OFF to ON, perform this procedure again. The hazard light will flash three times to inform you that the audible signal has been turned to ON.

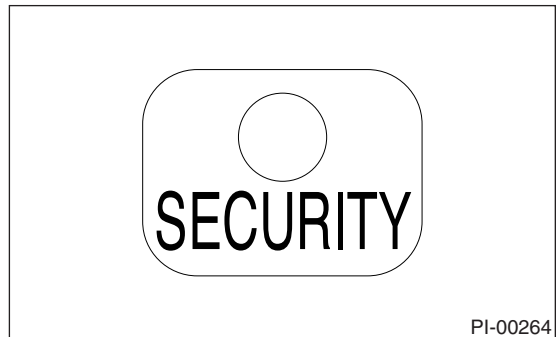
## 23.SECURITY SYSTEM

Check the security system operations as follows:

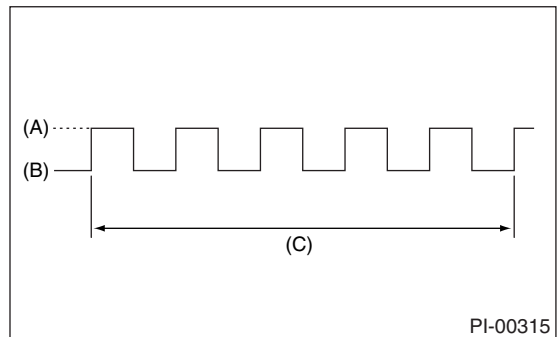
- 1) Fully open all door windows.
- 2) Remove the key from the ignition switch and close all the doors including rear gate.
- 3) Press the “LOCK/ARM” button of keyless transmitter once.



- 4) If all the doors are locked, the buzzer chirps once, the hazard lights flash once and the security indicator light flashes as shown in the figure below, the alarm system is in the monitoring preparatory state.



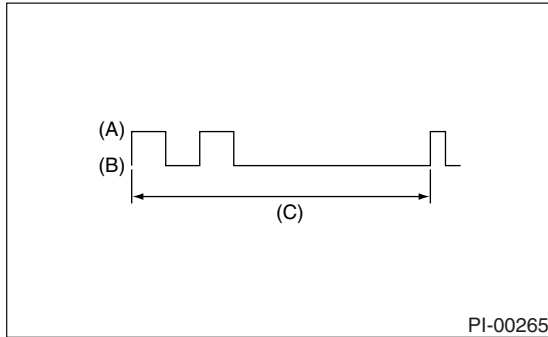
- Alarm system in monitoring preparatory state



- (A) ON
- (B) OFF
- (C) 2 seconds

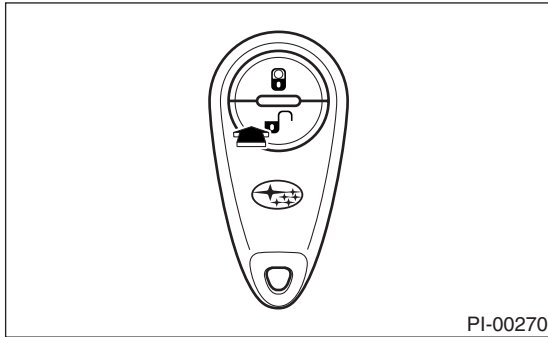
5) Check that it becomes the monitoring state 30 seconds after the state of step 4).

- Alarm system in monitoring state (all models)



- (A) ON
- (B) OFF
- (C) 2 seconds

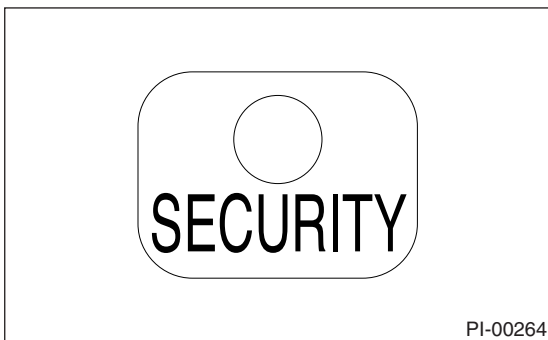
6) Press the “UNLOCK/DISARM” button of keyless transmitter once.



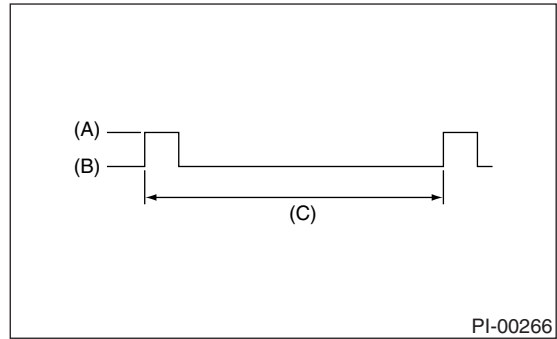
7) If the driver’s door is unlocked, the buzzer chirps twice, the hazard lights flash twice, the dome light illuminates and the security indicator light goes off, the alarm system is in the non-monitoring state.

**NOTE:**

For models without immobilizer, the security indicator light does not flash after pressing the “UNLOCK/DISARM” button of keyless transmitter.

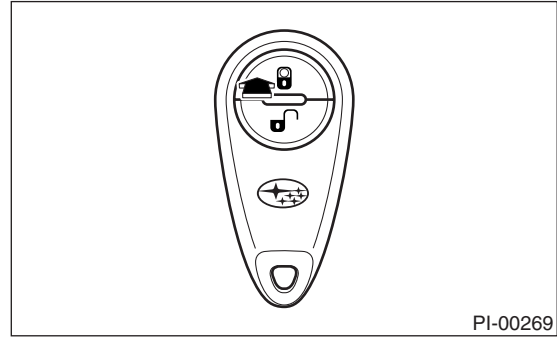


- Alarm system in non-monitoring state (Model with immobilizer)



- (A) ON
- (B) OFF
- (C) 3 seconds

8) Press the “LOCK/ARM” button on the keyless transmitter once with any one of the doors including the rear gate open.

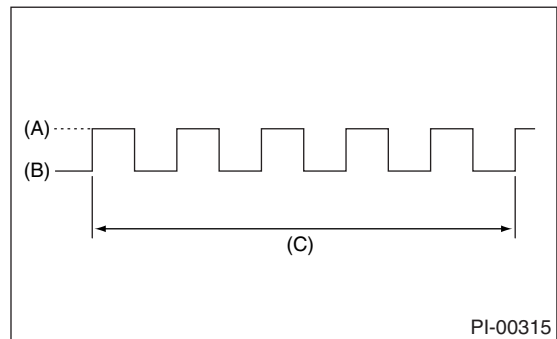


9) Check the buzzer chirps five times to warn door ajar.

10) Close all the doors including the rear gate.

11) Check if it becomes in the monitoring preparatory state (all the doors are locked, the buzzer chirps once and the hazard light flashes once).

- Alarm system in monitoring preparatory state

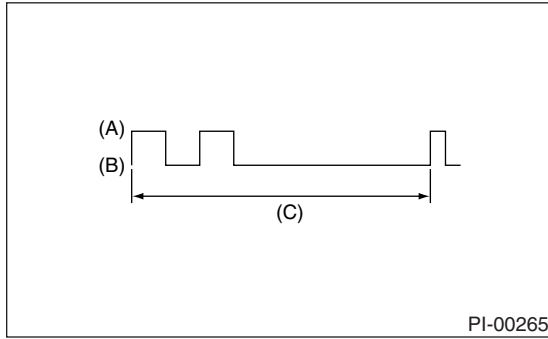


- (A) ON
- (B) OFF
- (C) 2 seconds

# Pre-delivery Inspection

## PRE-DELIVERY INSPECTION

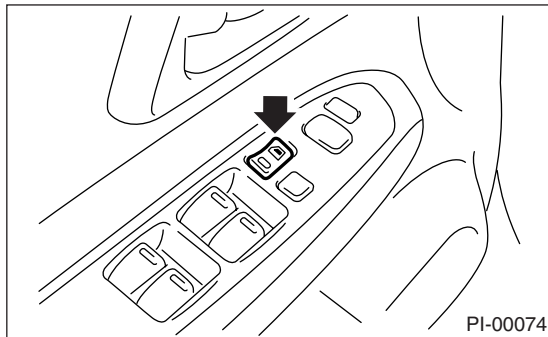
12) Check that it becomes the monitoring state 30 seconds after the state of step 11).



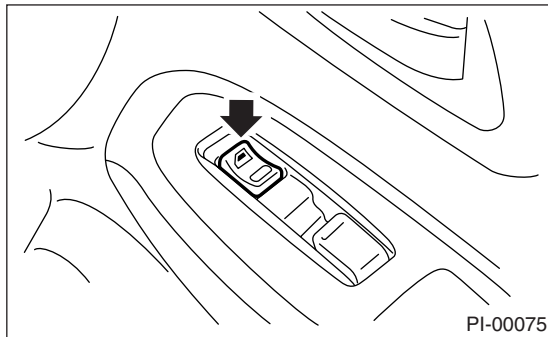
- (A) ON
- (B) OFF
- (C) 2 seconds

13) Press the “LOCK” side of the power door locking switch with any one of the doors including the rear gate open.

- Driver’s seat



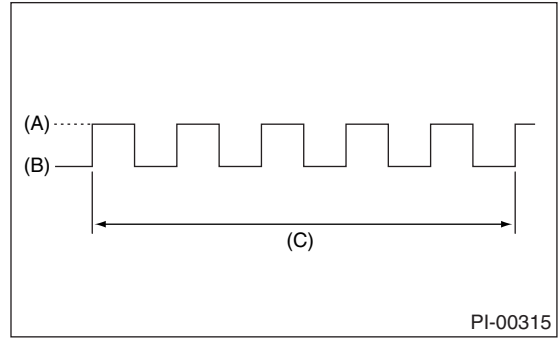
- Passenger’s seat



14) Close all the doors including the rear gate.

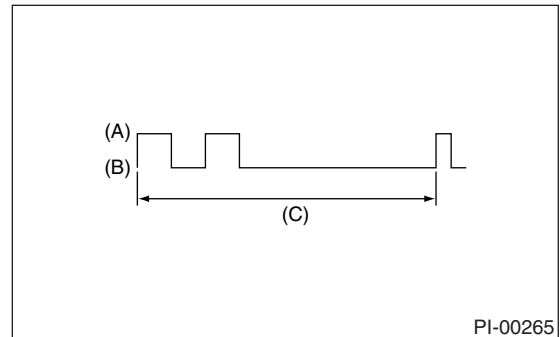
15) If all the doors are locked, the buzzer chirps once and the hazard lights flash, the alarm system is in the monitoring preparatory state.

- Alarm system in monitoring preparatory state



- (A) ON
- (B) OFF
- (C) 2 seconds

16) Check that it becomes the monitoring state 30 seconds after the state of step 15).



- (A) ON
- (B) OFF
- (C) 2 seconds

17) Unlock the door using the inner lock knob or the key, and open the door while the alarm system is in the monitoring state.

18) Make sure that the alarming condition occurs (the horn sounds continuously, the hazard lights flash and the security indicator light comes on).

19) Check that the state of step 18) lasts for more than 30 seconds or until the “UNLOCK/DISARM” button on the keyless transmitter is pressed.

20) Check that turning the ignition key to the “START” position in the monitoring state does not cause the starter motor to turn, thus the engine being prevented from starting.

21) For models with impact sensor, hit the windshield with your hands and make sure the alarming state occurs.

22) Troubleshoot the security system if any one of the above-mentioned checks does not meet the requirements. <Ref. to SL-22, INSPECTION, Security System.>

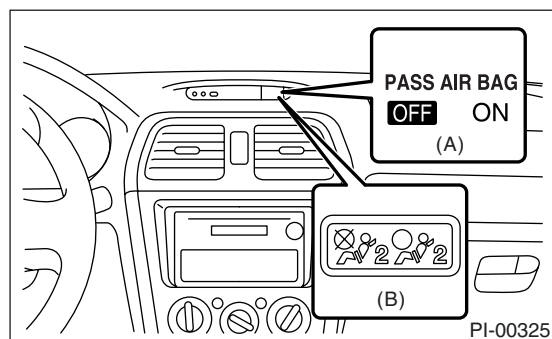


## 24. SEAT

1) Check that each seat provides full functionality in sliding and reclining. Check all available functions of the rear seat such as a trunk-through center arm rest.

2) Check occupant detection system for passenger seat.

- (1) Turn the ignition switch to ON.
- (2) Check that the both ON and OFF of passenger's airbag ON/OFF indicator light come on simultaneously for about six seconds and go off for two seconds, and then only the OFF comes on again.



- (A) Airbag ON/OFF indicator light (For U.S. Model)
- (B) Airbag ON/OFF indicator light (For Canada Model)

3) Let a person weighing more than 70 kg (155 lb) sit down on the passenger seat, and check that the ON light of passenger's airbag ON/OFF indicator light comes on.

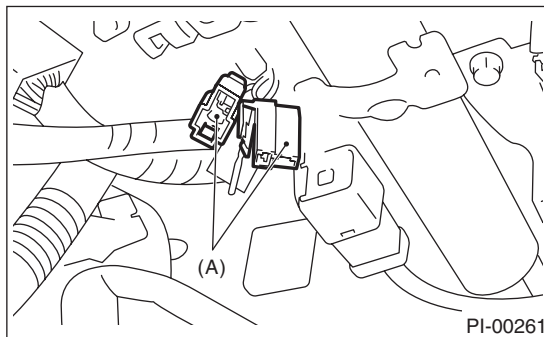
4) Let the person get off the passenger seat, and check that the OFF light of passenger's airbag ON/OFF indicator light comes on.

## 25. SEAT BELT

Pull out the seat belt and then release it. Check that the belt webbing retracts smoothly.

## 26. TEST MODE CONNECTOR

Turn the ignition switch to ON and check that the malfunction indicator light starts blinking. If the light blinks, return the ignition key to LOCK and disconnect the test mode connector. Then, turn the ignition key to ON again. If the malfunction indicator light blinks at that time in spite of the disconnected test mode connector, carry out an engine diagnosis.



(A) Test mode connector (Green)

## 27. IMMOBILIZER SYSTEM

1) Check that the engine starts with all keys that are equipped on vehicle.

2) 60 seconds after turning the ignition switch from ON to ACC or OFF, or immediately after removing the key, check that the security indicator light blinking.

## 28. STARTING CONDITION

Start the engine and check that the engine starts smoothly. If any battery voltage problems are found, recharge or replace the battery. If any abnormal noises are observed, immediately stop the engine and check and repair the necessary components.

## 29. EXHAUST SYSTEM

Listen to the exhaust noise to see if no abnormal noises are observed.

## 30. INDICATOR LIGHT

Check that all the indicator lights and warning lights operate normally.

## 31. CLOCK

Check the clock for normal operations and enough accuracy.

## 32. RADIO

Check the radio for full functionality and normal noise level. Also check the CD unit operations.



# Pre-delivery Inspection

## PRE-DELIVERY INSPECTION

### 33.FRONT ACCESSORY POWER SUPPLY SOCKET

Check the front accessory power supply socket operations.

### 34.LIGHTING SYSTEM

- 1) Check the headlight operations.
- 2) Check the stop light operations.
- 3) Check the other lights for normal operations.

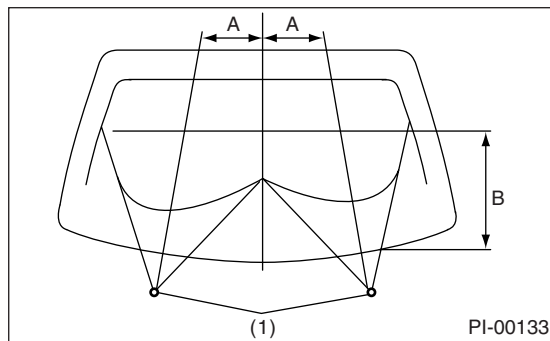
### 35.WINDOW WASHER

Check that the window washer system injects washer fluid to the specified area of windshield shown in the figure.

#### Front injection position:

**A: 257 mm (10.12 in)**

**B: 512 mm (20.16 in)**

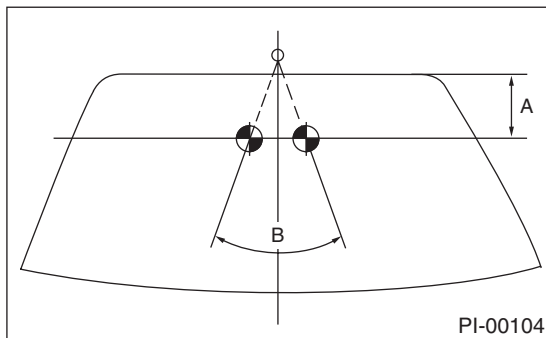


(1) Nozzle

#### Rear injection position:

**A: 39 mm (1.53 in)**

**B: 72°**



### 36.WIPER

Check the front and rear wipers for normal operations.

### 37.POWER WINDOW OPERATION CHECK

Manipulate the power window switches one by one to check that each of the power windows goes up and down with no abnormal noises.

### 38.DRIVER'S CONTROL CENTER DIFFERENTIAL

Check that the driver's control center differential indicator light operates normally.

### 39.BRAKE TEST

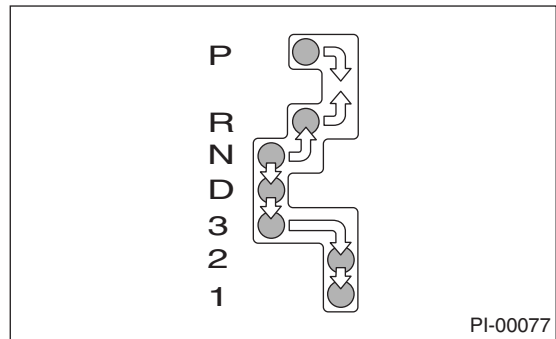
Check the foot brake for normal operations.

### 40.PARKING BRAKE

Check the parking brake for normal operations.

### 41.AT SHIFT CONTROL

- 1) Turn the ignition switch to ON.
- 2) Check that the select lever can not be moved from "P" range when brake pedal is not depressed.
- 3) Check that the select lever can be moved from "P" range when brake pedal is depressed.
- 4) Select the select lever to except "P" range.
- 5) Check that the ignition key can not be removed from ignition switch when ignition switch is turned to OFF.
- 6) Set the AT select lever to each gear position and check the shifting while driving the vehicle.



PI-00077

| Selector Position | Gear Position |     |     |     |
|-------------------|---------------|-----|-----|-----|
|                   | 1st           | 2nd | 3rd | 4th |
| D                 | Yes           | Yes | Yes | Yes |
| 3                 | Yes           | Yes | Yes | —   |
| 2                 | —             | Yes | —   | —   |
| 1                 | Yes           | —   | —   | —   |

### 42.HEATER & VENTILATION

Operate the heater and ventilation system to check for normal outlet selection, air inlet selection, air-flow and heating capacity.

### 43.AIR CONDITIONER

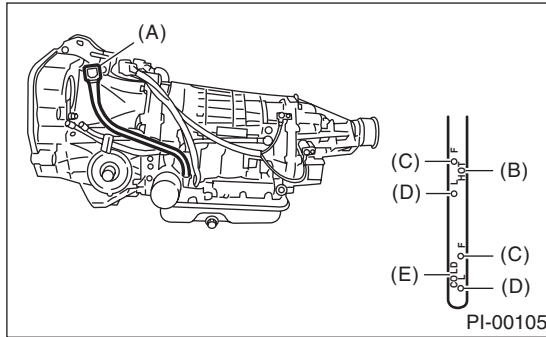
Operate the air conditioner. Check that the A/C compressor operates normally and enough cooling is provided.

### 44.CRUISE CONTROL

Operate the cruise control system. Check that the system is activated and deactivated correctly.

## 45. ATF LEVEL

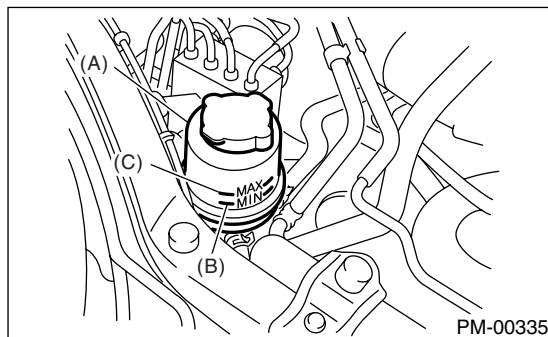
Set the select lever “P” range after selecting all positions (P, R, N, D, 3, 2, 1). Measure the ATF level after the engine idles for 1 to 2 minutes. If the amount is insufficient, check that no leaks are found. Then add the necessary amount of the specified ATF.



- (A) Level gauge
- (B) Check position when “HOT” [70 — 80°C (158 — 176°F)]
- (C) Upper level
- (D) Lower level
- (E) Check position when “COLD” [20 — 30°C (68 — 86°F)]

## 46. POWER STEERING FLUID LEVEL

Check that the power steering fluid level is normal. If insufficient, check that no leaks are found. Then add the necessary amount of the specified power steering fluid.



- (A) Reservoir tank
- (B) MIN level
- (C) MAX level

## 47. FLUID LEAK CHECK

Check the entire areas of the vehicle for any trace of coolant/oil/fluid leaks.

## 48. WATER LEAK TEST

Spray the vehicle with water and check that no water enters the passenger compartment.

- Before performing the water leakage test, remove anything that may obstruct the operation or which must be kept dry.
- Close all windows completely, and then close all doors tightly. Close the hood and trunk lid or rear gate before starting the test.
- Connect a hose to a tap, and spray water on the vehicle. The rate of water discharge must be approx. 20 — 25 ℓ (5.3 — 6.6 US gal, 4.4 — 5.5 Imp gal) per minute.

When spraying water on areas adjacent to the floor and wheel house, increase the pressure. When directing water on areas other than the floor portion and wheel house, decrease the pressure. But the force of water must be made strong occasionally by pressing the end of the hose.

### NOTE:

Be sure to keep the hose at least 10 cm (3.9 in) from the vehicle.

Check the following areas:

- Front window and body framework mating portion
- Door mating portions
- Glass mating portions
- Rear quarter window mating portions
- Rear window and body framework mating portion
- Around roof drips

If any dampness in the compartment is discovered after the water has been applied, carefully check all areas that may have possibly contributed to the leak.

## 49. APPEARANCE CHECK 2

1) When vehicle body is covered with protective film, peel it off.

### NOTE:

- Use of steam eases peeling off the warp guard.
- When performing on the vehicles left for a long time, or during low temperature period, sprinkle some water heated to 50 — 60°C (122 — 140°F) over the vehicle to raise its surface temperature before peeling off the wrap guard.

Do not use the water heated to over 60°C (140°F).

- If the adhesive remains on the coated surface, rub the portion with a flannel rag, etc. soaked with a coat of coating wax or a solvent, such as oil benzene and IPA, and then wipe it off.

- Avoid adhesion of the solvent to resin or rubber components. Do not use coating wax or a solvent while the component surface temperature is high due to hot weather, etc.

## Pre-delivery Inspection

### PRE-DELIVERY INSPECTION

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- If the coated surface is swollen out due to seams or moisture, expose the vehicle to the sun light for a few hours. Otherwise, heat the portion with seams or moisture using a dryer, etc.
- Dispose of the peeled wrap guard as burnable industrial garbage.

2) Check the whole vehicle body for stains, flaking, damage caused by transportation, rust, dirt, cracks, or blistering.

#### NOTE:

- It is better to determine an inspection pattern in order to avoid missing an area, since the total inspection area is wide.
- It is desirable not to make corrections to the body paint unless absolutely needed. However, if any corrections are required to remove scratches or rust, the area to be corrected must be limited as much as possible. Re-painting and spray painting must be avoided whenever possible.

3) Carefully check each window glass for scratches. Slight damage may be removed by polishing with cerium oxide. (Half-fill a cup with cerium oxide, and add warm water to it. Then agitate the content until it turn to wax. Apply this wax to a soft cloth, and polish the glass.)

4) Check each portion of the vehicle body and underside components for the formation of rust. If rust is discovered, remove it with #80 — #180 emery paper, and treat the surface with rust preventive. After this treatment is completed, flush the portion thoroughly, and prepare the surface for repair painting.

5) Check each portion of the body and all of the chrome parts for deformation or distortion. Also check each lamp lens for cracks.

# PERIODIC MAINTENANCE SERVICES

# PM

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### **1. General Description**

#### **A: GENERAL DESCRIPTION**

Be sure to perform periodic maintenance in order to maintain vehicle performance and find problems before they become serious.

# Schedule

## PERIODIC MAINTENANCE SERVICES

### 2. Schedule

#### A: MAINTENANCE SCHEDULE 1

##### 1. U.S.

|               |                                  | MAINTENANCE INTERVAL                                     |     |    |      |     |      |    |      |     |      |     |      |     |      |     |       |     | Remarks |
|---------------|----------------------------------|--|-----|----|------|-----|------|----|------|-----|------|-----|------|-----|------|-----|-------|-----|---------|
|               |                                  | [Number of months or km (miles), whichever occurs first] |     |    |      |     |      |    |      |     |      |     |      |     |      |     |       |     |         |
| Months        |                                  | 3  | 7.5 | 15 | 22.5 | 30  | 37.5 | 45 | 52.5 | 60  | 67.5 | 75  | 82.5 | 90  | 97.5 | 105 | 112.5 | 120 |         |
| × 1,000 km    |                                  | 4.8  | 12  | 24 | 36   | 48  | 60   | 72 | 81.4 | 96  | 108  | 120 | 132  | 144 | 156  | 168 | 180   | 192 |         |
| × 1,000 miles |                                  | 3  | 7.5 | 15 | 22.5 | 30  | 37.5 | 45 | 52.5 | 60  | 67.5 | 75  | 82.5 | 90  | 97.5 | 105 | 112.5 | 120 |         |
| 1             | Engine oil                       |  | R   | R  | R    | R   | R    | R  | R    | R   | R    | R   | R    | R   | R    | R   | R     | R   |         |
| 2             | Engine oil filter                |  | R   | R  | R    | R   | R    | R  | R    | R   | R    | R   | R    | R   | R    | R   | R     | R   |         |
| 3             | Spark plugs                      |  |     |    |      | R   |      |    |      | R   |      |     |      | R   |      |     |       | R   |         |
|               |                                  |  |     |    |      |     |      |    |      | R   |      |     |      |     |      |     |       | R   |         |
| 4             | Drive belt(s)                    |  |     |    |      | I   |      |    |      | I   |      |     |      | I   |      | R   |       |     |         |
| 5             | Camshaft Drive belt              |  |     |    |      | I   |      |    |      | I   |      |     |      | I   |      | R   |       |     |         |
| 6             | Fuel line                        |  |     |    |      | (I) |      |    |      | (I) |      |     |      | (I) |      |     |       | I   |         |
| 7             | Fuel filter                      |  |     |    |      |     |      |    |      | R   |      |     |      |     |      |     |       | R   |         |
| 8             | Air cleaner element              |  |     |    |      | R   |      |    |      | R   |      |     |      | R   |      |     |       | R   |         |
| 9             | Cooling system                   |  |     |    |      | I   |      |    |      | I   |      |     |      | I   |      |     |       | I   |         |
| 10            | Coolant                          |  |     |    |      | R   |      |    |      | R   |      |     |      | R   |      |     |       | R   |         |
| 11            | Clutch system                    |  |     | I  |      | I   |      | I  |      | I   |      | I   |      | I   |      | I   |       | I   |         |
| 12            | Transmission oil                 |  |     |    |      | I   |      |    |      | I   |      |     |      | I   |      |     |       | I   |         |
| 13            | ATF                              |  |     |    |      | I   |      |    |      | I   |      |     |      | I   |      |     |       | I   |         |
| 14            | Front & rear differential oil    |  |     |    |      | I   |      |    |      | I   |      |     |      | I   |      |     |       | I   |         |
| 15            | Brake line                       |  |     | I  |      | I   |      | I  |      | I   |      | I   |      | I   |      | I   |       | I   |         |
| 16            | Brake fluid                      |  |     |    |      | R   |      |    |      | R   |      |     |      | R   |      |     |       | R   |         |
| 17            | Disc brake pads & discs          |  |     | I  |      | I   |      | I  |      | I   |      | I   |      | I   |      | I   |       | I   |         |
| 18            | Parking brake                    |  |     | I  |      | I   |      | I  |      | I   |      | I   |      | I   |      | I   |       | I   |         |
| 19            | Suspension                       |  |     | I  |      | I   |      | I  |      | I   |      | I   |      | I   |      | I   |       | I   |         |
| 20            | Wheel bearing                    |  |     |    |      |     |      |    |      | (I) |      |     |      |     |      |     |       | (I) |         |
| 21            | Axle boots & joints              |  |     | I  |      | I   |      | I  |      | I   |      | I   |      | I   |      | I   |       | I   |         |
| 22            | Tire rotation                    |  | I   | I  | I    | I   | I    | I  | I    | I   | I    | I   | I    | I   | I    | I   | I     | I   |         |
| 23            | Steering system (Power steering) |  |     | I  |      | I   |      | I  |      | I   |      | I   |      | I   |      | I   |       | I   |         |
| 24            | Supplement restraint system      | Inspect every 10 years                                   |     |    |      |     |      |    |      |     |      |     |      |     |      |     |       |     |         |
| 25            | A/C filter                       | Inspect every 12 months or 12,000 km (7,500 miles)       |     |    |      |     |      |    |      |     |      |     |      |     |      |     |       |     |         |

Symbols used:

R: Replace

I: Inspection

(I): Recommended service for safe vehicle operation.

**NOTE:**

(1) This inspection is not required to maintain emission warranty eligibility and it does not affect the manufacturer's obligations under EPA's in-use compliance program.

(2) When the vehicle is used in extremely dusty conditions, the air cleaner element should be replaced more often.

(3) ATF filter is maintenance free part. ATF filter needs replacement, when it has physically damaged or ATF leaked.

(4) A tire should be replaced when the tread wear indicator appears as a solid band across the tread. The indicators appear when the remaining tread has been worn to 1.6 mm (0.063 in) or less.

(5) When the A/C filter is installed.

# Schedule

## PERIODIC MAINTENANCE SERVICES

### 2. CANADA

|               |                                  | MAINTENANCE INTERVAL                                     |     |    |      |     |      |    |      |     |      |     |      |     |      |     |       |     | Remarks |
|---------------|----------------------------------|--|-----|----|------|-----|------|----|------|-----|------|-----|------|-----|------|-----|-------|-----|---------|
|               |                                  | [Number of months or km (miles), whichever occurs first] |     |    |      |     |      |    |      |     |      |     |      |     |      |     |       |     |         |
| Months        |                                  | 3  | 7.5 | 15 | 22.5 | 30  | 37.5 | 45 | 52.5 | 60  | 67.5 | 75  | 82.5 | 90  | 97.5 | 105 | 112.5 | 120 |         |
| × 1,000 km    |                                  | 4.8  | 12  | 24 | 36   | 48  | 60   | 72 | 81.4 | 96  | 108  | 120 | 132  | 144 | 156  | 168 | 180   | 192 |         |
| × 1,000 miles |                                  | 3  | 7.5 | 15 | 22.5 | 30  | 37.5 | 45 | 52.5 | 60  | 67.5 | 75  | 82.5 | 90  | 97.5 | 105 | 112.5 | 120 |         |
| 1             | Engine oil                       | R  | R   | R  | R    | R   | R    | R  | R    | R   | R    | R   | R    | R   | R    | R   | R     | R   |         |
| 2             | Engine oil filter                | R  | R   | R  | R    | R   | R    | R  | R    | R   | R    | R   | R    | R   | R    | R   | R     | R   |         |
| 3             | Spark plugs                      |  |     |    |      | R   |      |    |      | R   |      |     |      | R   |      |     |       | R   |         |
|               |                                  |  |     |    |      |     |      |    |      | R   |      |     |      |     |      |     |       | R   |         |
| 4             | Drive belt(s)                    |  |     |    |      | I   |      |    |      | I   |      |     |      | I   |      | R   |       |     |         |
| 5             | Camshaft Drive belt              |  |     |    |      | I   |      |    |      | I   |      |     |      | I   |      | R   |       |     |         |
| 6             | Fuel line                        |  |     |    |      | (I) |      |    |      | (I) |      |     |      | (I) |      |     |       | I   |         |
| 7             | Fuel filter                      |  |     |    |      |     |      |    |      | R   |      |     |      |     |      |     |       | R   |         |
| 8             | Air cleaner element              |  |     |    |      | R   |      |    |      | R   |      |     |      | R   |      |     |       | R   |         |
| 9             | Cooling system                   |  |     |    |      | I   |      |    |      | I   |      |     |      | I   |      |     |       | I   |         |
| 10            | Coolant                          |  |     |    |      | R   |      |    |      | R   |      |     |      | R   |      |     |       | R   |         |
| 11            | Clutch system                    |  |     | I  |      | I   |      | I  |      | I   |      | I   |      | I   |      | I   |       | I   |         |
| 12            | Transmission oil                 |  |     |    |      | I   |      |    |      | I   |      |     |      | I   |      |     |       | I   |         |
| 13            | ATF                              |  |     |    |      | I   |      |    |      | I   |      |     |      | I   |      |     |       | I   |         |
| 14            | Front & rear differential oil    |  |     |    |      | I   |      |    |      | I   |      |     |      | I   |      |     |       | I   |         |
| 15            | Brake line                       |  |     | I  |      | I   |      | I  |      | I   |      | I   |      | I   |      | I   |       | I   |         |
| 16            | Brake fluid                      |  |     |    |      | R   |      |    |      | R   |      |     |      | R   |      |     |       | R   |         |
| 17            | Disc brake pads & discs          |  |     | I  |      | I   |      | I  |      | I   |      | I   |      | I   |      | I   |       | I   |         |
| 18            | Parking brake                    |  |     | I  |      | I   |      | I  |      | I   |      | I   |      | I   |      | I   |       | I   |         |
| 19            | Suspension                       |  |     | I  |      | I   |      | I  |      | I   |      | I   |      | I   |      | I   |       | I   |         |
| 20            | Wheel bearing                    |  |     |    |      |     |      |    |      | (I) |      |     |      |     |      |     |       | (I) |         |
| 21            | Axle boots & joints              |  |     | I  |      | I   |      | I  |      | I   |      | I   |      | I   |      | I   |       | I   |         |
| 22            | Tire rotation                    |  | I   | I  | I    | I   | I    | I  | I    | I   | I    | I   | I    | I   | I    | I   | I     | I   |         |
| 23            | Steering system (Power steering) |  |     | I  |      | I   |      | I  |      | I   |      | I   |      | I   |      | I   |       | I   |         |
| 24            | Supplement restraint system      | Inspect every 10 years                                   |     |    |      |     |      |    |      |     |      |     |      |     |      |     |       |     |         |
| 25            | A/C filter                       | Inspect every 12 months or 12,000 km (7,500 miles)       |     |    |      |     |      |    |      |     |      |     |      |     |      |     |       |     |         |

Symbols used:

R: Replace

I: Inspection

(I): Recommended service for safe vehicle operation.

**NOTE:**

(1) This inspection is not required to maintain emission warranty eligibility and it does not affect the manufacturer's obligations under EPA's in-use compliance program.

(2) When the vehicle is used in extremely dusty conditions, the air cleaner element should be replaced more often.

(3) ATF filter is maintenance free part. ATF filter needs replacement, when it has physically damaged or ATF leaked.

(4) A tire should be replaced when the tread wear indicator appears as a solid band across the tread. The indicators appear when the remaining tread has been worn to 1.6 mm (0.063 in) or less.

(5) When the A/C filter is installed.

# Schedule

## PERIODIC MAINTENANCE SERVICES

### B: MAINTENANCE SCHEDULE 2

| Item                             | Every        | Repeat short distance drive | Repeat rough/muddy road drive | Extremely cold weather area | Salt or other corrosive used or coastal area | High humidity or mountain area | Repeat towing trailer |
|----------------------------------|--------------|-----------------------------|-------------------------------|-----------------------------|--|--------------------------------|-----------------------|
| Engine oil                       | 3.75 months  | R                           |                               | R                           |  |                                | R                     |
|                                  | 6,000 km     |                             |                               |                             |  |                                |                       |
|                                  | 3,750 miles  |                             |                               |                             |  |                                |                       |
| Engine oil filter                | 3.75 months  | R                           |                               | R                           |  |                                | R                     |
|                                  | 6,000 km     |                             |                               |                             |  |                                |                       |
|                                  | 3,750 miles  |                             |                               |                             |  |                                |                       |
| Fuel line                        | 7.5 months   |                             |                               |                             | I  |                                |                       |
|                                  | 12,000 km    |                             |                               |                             |  |                                |                       |
|                                  | 7,500 miles  |                             |                               |                             |  |                                |                       |
| Transmission oil                 | 15 months    |                             |                               |                             |  |                                | R                     |
|                                  | 24,000 km    |                             |                               |                             |  |                                |                       |
|                                  | 15,000 miles |                             |                               |                             |  |                                |                       |
| ATF                              | 15 months    |                             |                               |                             |  |                                | R                     |
|                                  | 24,000 km    |                             |                               |                             |  |                                |                       |
|                                  | 15,000 miles |                             |                               |                             |  |                                |                       |
| Front & rear differential oil    | 15 months    |                             |                               |                             |  |                                | R                     |
|                                  | 24,000 km    |                             |                               |                             |  |                                |                       |
|                                  | 15,000 miles |                             |                               |                             |  |                                |                       |
| Brake line                       | 7.5 months   |                             |                               |                             | I  |                                |                       |
|                                  | 12,000 km    |                             |                               |                             |  |                                |                       |
|                                  | 7,500 miles  |                             |                               |                             |  |                                |                       |
| Brake fluid                      | 15 months    |                             |                               |                             |  | R                              |                       |
|                                  | 24,000 km    |                             |                               |                             |  |                                |                       |
|                                  | 15,000 miles |                             |                               |                             |  |                                |                       |
| Disc brake pads & discs          | 7.5 months   | I                           | I                             |                             | I  |                                | I                     |
|                                  | 12,000 km    |                             |                               |                             |  |                                |                       |
|                                  | 7,500 miles  |                             |                               |                             |  |                                |                       |
| Parking brake                    | 7.5 months   |                             |                               |                             | I  |                                |                       |
|                                  | 12,000 km    |                             |                               |                             |  |                                |                       |
|                                  | 7,500 miles  |                             |                               |                             |  |                                |                       |
| Suspension                       | 7.5 months   |                             | I                             | I                           | I  |                                |                       |
|                                  | 12,000 km    |                             |                               |                             |  |                                |                       |
|                                  | 7,500 miles  |                             |                               |                             |  |                                |                       |
| Axle boots & joints              | 7.5 months   | I                           | I                             |                             | I  |                                | I                     |
|                                  | 12,000 km    |                             |                               |                             |  |                                |                       |
|                                  | 7,500 miles  |                             |                               |                             |  |                                |                       |
| Steering system (Power steering) | 7.5 months   |                             | I                             | I                           | I  |                                |                       |
|                                  | 12,000 km    |                             |                               |                             |  |                                |                       |
|                                  | 7,500 miles  |                             |                               |                             |  |                                |                       |



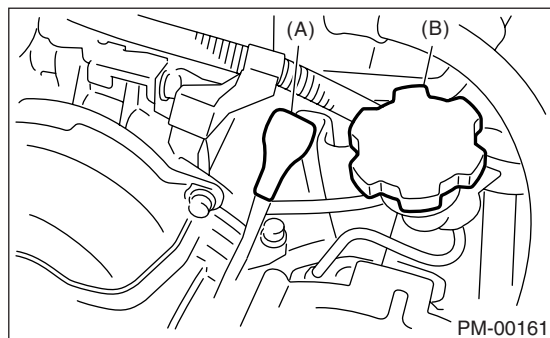
# Engine Oil

## PERIODIC MAINTENANCE SERVICES

### 3. Engine Oil

#### A: REPLACEMENT

1) Open the engine oil filler cap for quick draining of the engine oil.

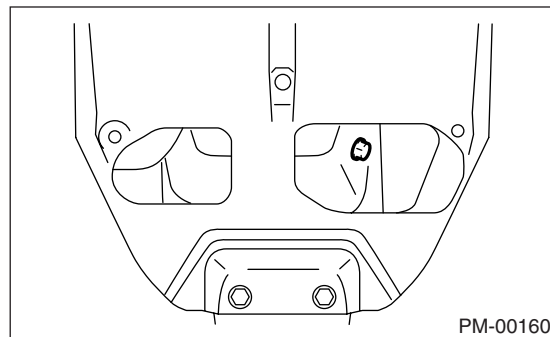


- (A) Oil level gauge  
(B) Oil filler cap

2) Drain the engine oil by loosening engine oil drain plug.

#### NOTE:

If engine oil adheres to the exhaust pipe, wipe it off completely.

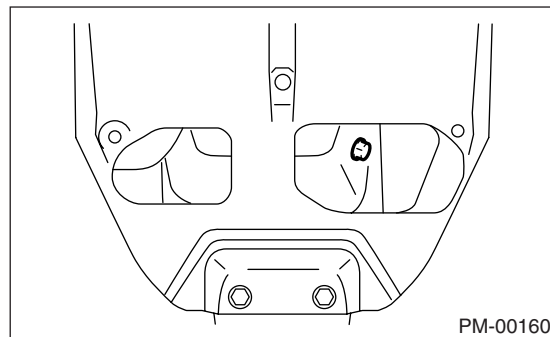


3) Replace the drain plug gasket.

4) Tighten the engine oil drain plug after draining engine oil.

#### Tightening torque:

**44 N·m (4.5 kgf·m, 32.5 ft·lb)**



5) Use the engine oil of proper quality and viscosity, fill with the engine oil through oil filler duct up to upper level on level gauge. Make sure that the vehicle is placed level when checking oil level.

#### Recommended oil:

**API standard SM with the “Energy Conserving” logo is printed**

**ILSAC standard, GF4 “Star burst mark” label is on the container.**

#### Engine oil capacity:

##### Upper level

**Approx. 4.0 ℓ (4.2 US qt, 3.5 Imp qt)**

##### Lower level

**Approx. 3.0 ℓ (3.2 US qt, 2.6 Imp qt)**

| SAE (1) |                        |
|---------|------------------------|
| (°C)    | -30 -20 -15 0 15 30 40 |
| (°F)    | -22 -4 5 32 59 86 104  |

10W-30, 10W-50

5W-30 (2)

LU-02250

- (1) SAE viscosity No. and applicable temperature  
(2) Recommended

The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

#### NOTE:

• When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API standard and SAE viscosity No. designated by SUBARU.

• If vehicle is used in desert areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used:

API standard: SM or SL.

ILSAC standard: GF-4.

SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50

6) Close the engine oil filler cap.

7) Start the engine and warm it up for a time.

8) After the engine stops, recheck the oil level. <Ref. to PM-6, INSPECTION, Engine Oil.>

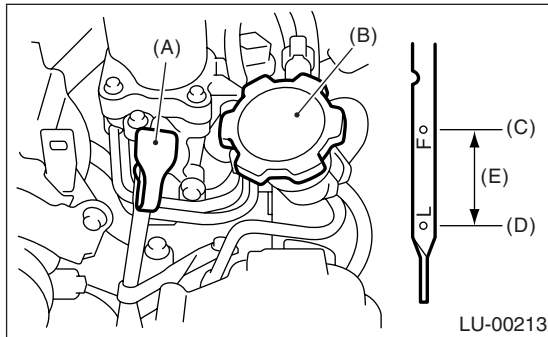
#### B: INSPECTION

1) Park the vehicle on a level surface.

2) Remove the oil level gauge and wipe it clean.

3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.

4) Remove it again and note the reading. If the engine oil level is below the “L” line, add oil to bring the level up to the “F” line.



- (A) Oil level gauge
- (B) Oil filler cap
- (C) Upper level
- (D) Lower level
- (E) Approx. 1 ℓ (1.1 Us qt, 0.9 Imp qt)

5) After turning off the engine, wait a few minutes for the oil to drain back into oil pan before checking the level.

6) Just after driving or while the engine is warm, engine oil level may show in the range between the “F” line and the notch mark. This is caused by thermal expansion of the engine oil.

7) To prevent overfilling the engine oil, do not add oil above the “F” line when the engine is cold.

# Engine Oil Filter

## PERIODIC MAINTENANCE SERVICES

### 4. Engine Oil Filter

#### A: REPLACEMENT

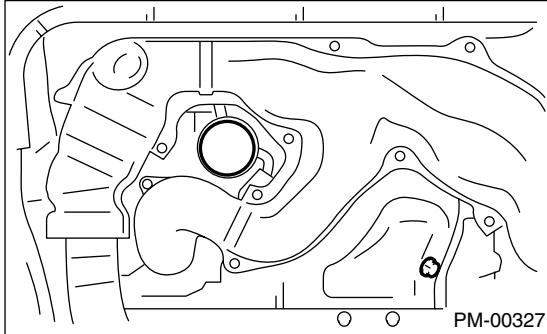
- 1) Remove the under cover.
- 2) Remove the oil filter with ST.

ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))

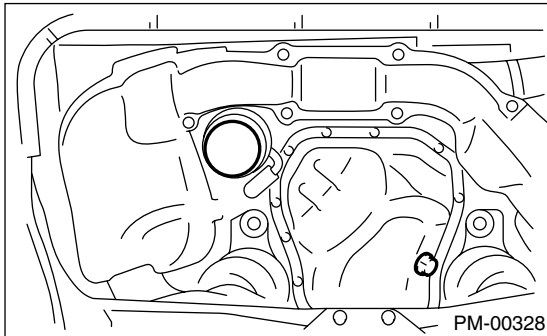
ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))

#### NOTE:

- Standard oil filter is outer diameter of 68 mm (2.68 in). However, SUBARU genuine oil filter having outer diameter of 65 mm (2.56 in) can also be used.
- If engine oil adheres to the exhaust pipe, wipe it off completely.
- Non-turbo model



- Turbo model



- 3) Wipe clean the oil filter matching surface on cylinder block or oil cooler.
- 4) Get a new engine oil filter and apply a thin coat of engine oil to the seal rubber.

#### CAUTION:

**Be careful not to use the oil filter 80 mm (3.15 in) in diameter.**

- 5) Install the oil filter by turning it by hand, being careful not to damage the seal rubber.
  - Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler. If using a torque wrench, tighten it to 14 N·m (1.4 kgf·m, 10.3 ft·lb).

- Tighten the oil filter 65 mm (2.56 in) in diameter by approx. 2/3 — 3/4 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler. If using a torque wrench, tighten it to 12 N·m (1.2 kgf·m, 8.7 ft·lb).

#### CAUTION:

**Do not tighten excessively, or oil may leak.**

- 6) After installing the oil filter, run the engine and make sure that no oil is leaking around seal rubber.

#### NOTE:

The filter element and filter case are permanently joined; therefore, interior cleaning is not necessary.

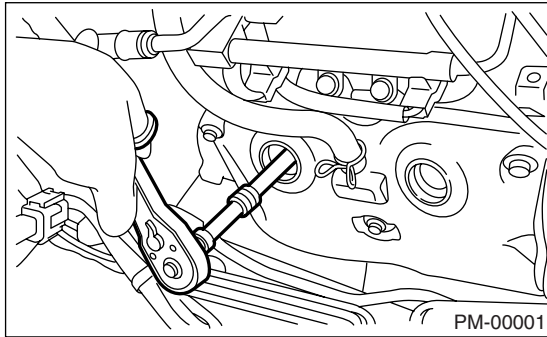
- 7) Check the engine oil level. <Ref. to PM-6, INSPECTION, Engine Oil.>

## 5. Spark Plugs

### A: REPLACEMENT

#### 1. SOHC MODEL

- 1) Disconnect the battery cables, and then remove the battery and battery carrier.
- 2) Remove the air cleaner lower case.
- 3) Disconnect the spark plug cord.
- 4) Remove the spark plug with a plug-wrench.



- 5) Set the new spark plugs.

**Recommended spark plug:**

**NGK: FR5AP-11**

- 6) Tighten the spark plug lightly with hand, and then secure with a plug-wrench to the specified torque.

**Tightening torque:**

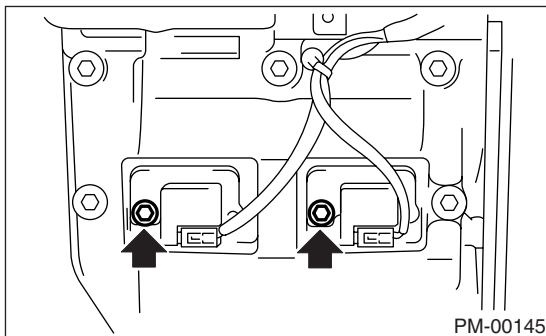
**21 N·m (2.1 kgf-m, 15.2 ft-lb)**

**NOTE:**

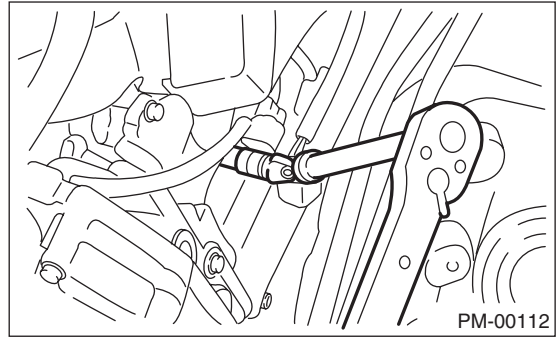
- Be sure to place the gasket between the cylinder head and spark plug.
- If a torque wrench is not available, tighten the spark plug until gasket contacts cylinder head; then tighten further 1/4 to 1/2 turns.

#### 2. DOHC MODEL

- 1) Disconnect the battery cables, and then remove the battery and battery carrier.
- 2) Remove the air cleaner lower case.
- 3) Disconnect the connector from ignition coil and ignitor assembly.
- 4) Remove the ignition coil and ignitor assembly.



- 5) Remove the spark plug with a spark plug socket.



- 6) Set new spark plugs.

**Recommended spark plug:**

**NGK: ILFR6B**

- 7) Tighten the spark plug lightly with hand, and then secure with a plug-wrench to the specified torque.

**Tightening torque:**

**21 N·m (2.1 kgf-m, 15.2 ft-lb)**

- 8) Tighten the ignition coil and ignitor assembly.

**Tightening torque:**

**16 N·m (1.6 kgf-m, 11.7 ft-lb)**

**NOTE:**

- Be sure to place the gasket between the cylinder head and spark plug.
- If a torque wrench is not available, tighten the spark plug until gasket contacts cylinder head; then tighten further 1/4 to 1/2 turns.

## 6. V-belt

### A: INSPECTION

#### 1. WITHOUT USING BELT TENSION GAUGE

- 1) Replace the belts, if cracks, fraying or wear is found.
- 2) Check the V-belt tension and adjust it if necessary by changing the generator installing position and/or idler pulley installing position. <Ref. to PM-11, REPLACEMENT, V-belt.>

#### Belt tension

(A)

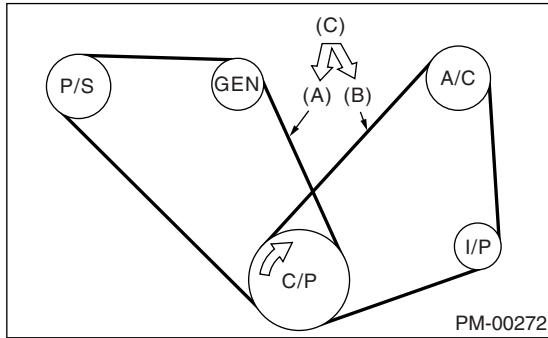
**Replaced: 7 — 9 mm (0.276 — 0.354 in)**

**Reused: 9 — 11 mm (0.354 — 0.433 in)**

(B)

**Replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)**

**Reused: 9.0 — 10.0 mm (0.354 — 0.394 in)**



(A) Front side belt

(B) Rear side belt

(C) 98 N (10 kgf, 22 lbf)

C/P Crankshaft pulley

GEN Generator

P/S Power steering oil pump pulley

A/C Air conditioning compressor pulley

I/P Idler pulley

#### 2. WITH USING BELT TENSION GAUGE

- 1) Replace the belts, if cracks, fraying or wear is found.
- 2) Remove the V-belt cover and radiator reservoir tank.
- 3) Check the belt tension using belt tension gauge. And adjust it if necessary by changing the generator installing position and/or idler pulley installing position.

#### Belt tension (Non-turbo model)

(A)

**When installing new parts:**

**618 — 755 N (63 — 77 kgf, 139 — 170 lbf)**

**At inspection:**

**490 — 640 N (50 — 65 kgf, 110 — 144 lbf)**

(B)

**When installing new parts:**

**740 — 880 N (75 — 90 kgf, 166 — 198 lbf)**

**At inspection:**

**350 — 450 N (36 — 46 kgf, 79 — 101 lbf)**

#### Belt tension (Turbo model)

(A)

**When installing new parts:**

**640 — 780 N (65 — 80 kgf, 144 — 175 lbf)**

**At inspection:**

**490 — 640 N (50 — 65 kgf, 110 — 144 lbf)**

(B)

**When installing new parts:**

**740 — 880 N (75 — 90 kgf, 166 — 198 lbf)**

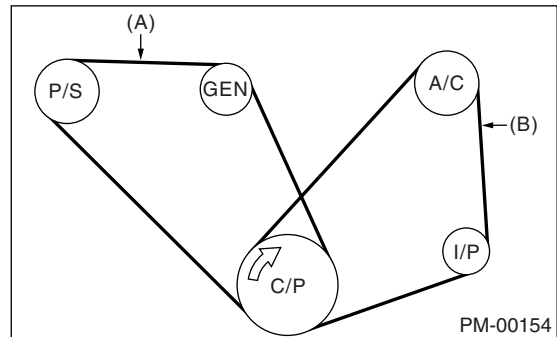
**At inspection:**

**350 — 450 N (36 — 46 kgf, 79 — 101 lbf)**

#### Belt tension (STI model)

**(A) 490 — 640 N (50 — 65 kgf, 110 — 144 lbf)**

**(B) 350 — 450 N (36 — 46 kgf, 79 — 101 lbf)**



(A) Front side belt

(B) Rear side belt

C/P Crank pulley

GEN Generator

P/S Power steering oil pump pulley

A/C A/C compressor pulley

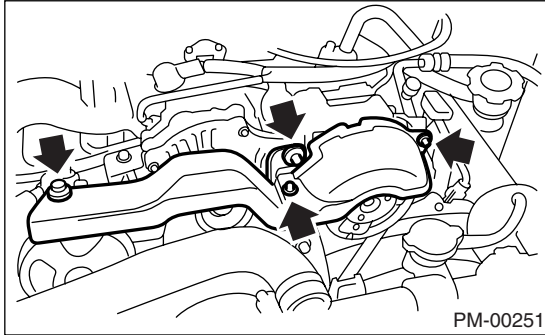
I/P Idler pulley

## B: REPLACEMENT

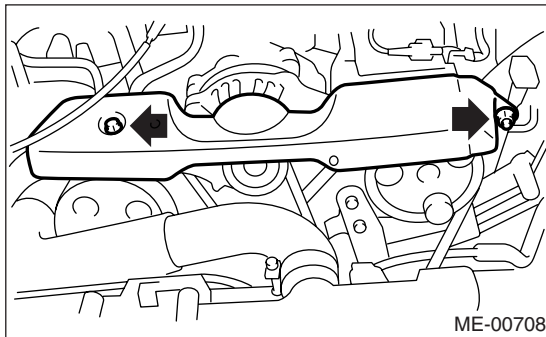
### 1. V-BELT COVER

Remove the V-belt cover.

- Non-turbo model



- Turbo model



### 2. FRONT SIDE BELT (FOR POWER STEERING OIL PUMP AND GENERATOR)

NOTE:

Wipe off any oil or water on the belt and pulley.

- 1) Loosen the lock bolt (A).
- 2) Loosen the slider bolt (B).
- 3) Remove the front side belt (C).
- 4) Install a new belt, and tighten the slider bolt so as to obtain the specified belt tension.
- 5) Tighten the lock bolt (A).
- 6) Tighten the slider bolt (B).

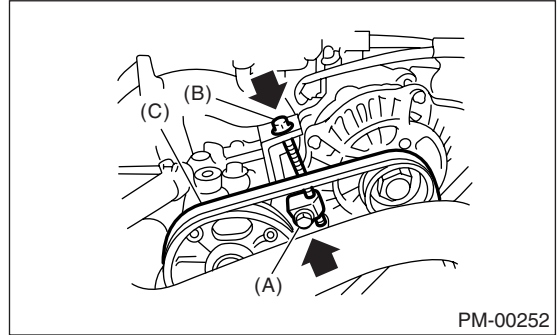
**Tightening torque:**

**Lock bolt:**

**25 N·m (2.5 kgf-m, 18.4 ft-lb)**

**Slider bolt:**

**8 N·m (0.8 kgf-m, 5.9 ft-lb)**



- 7) Idle the engine for approx. 5 min. to normalize the V-belt. (With using tension gauge)
- 8) Stop the engine, and then check the belt tension and adjust it. (With using tension gauge)
- 9) Idle the engine for approx. 1 min. to normalize the V-belt. (With using tension gauge)
- 10) Stop the engine, and then check the belt tension is within specified value. (With using tension gauge)
- 11) Adjust the belt tension until the value within specification. (With using tension gauge)

### 3. REAR SIDE BELT (FOR A/C)

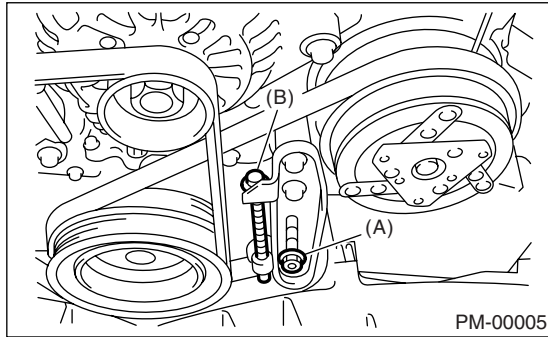
NOTE:

Wipe off any oil or water on the belt and pulley.

- 1) Remove the front side belt.
  - 2) Loosen the lock nut (A).
  - 3) Loosen the slider bolt (B).
  - 4) Remove the rear side belt.
  - 5) Install a new belt, and tighten the slider bolt so as to obtain the specified belt tension.
  - 6) Tighten the lock nut (A).
  - 7) Install the front side belt.
- Non-turbo model  
<Ref. to ME(H4SO)-40, FRONT SIDE BELT, INSTALLATION, V-belt.>
  - Turbo model  
<Ref. to ME(H4DOTC)-41, FRONT SIDE BELT, INSTALLATION, V-belt.>
  - STI model  
<Ref. to ME(STI)-40, FRONT SIDE BELT, INSTALLATION, V-belt.>

### **Tightening torque:**

**23 N·m (2.3 kgf·m, 17.0 ft·lb)**



- 8) Idle the engine for approx. 5 min. to normalize the V-belt. (With using tension gauge)
- 9) Stop the engine, and then check the belt tension and adjust it. (With using tension gauge)
- 10) Idle the engine for approx. 1 min. to normalize the V-belt. (With using tension gauge)
- 11) Stop the engine, and then check the belt tension is within specified value. (With using tension gauge)
- 12) Adjust the belt tension until the value within specification. (With using tension gauge)

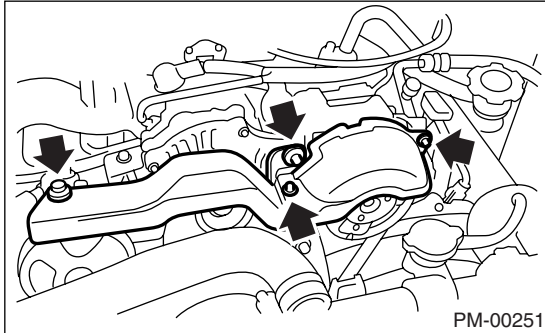


## 7. Timing Belt

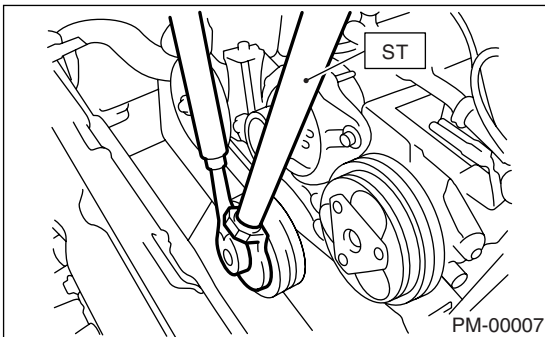
### A: REPLACEMENT

#### 1. NON-TURBO MODEL

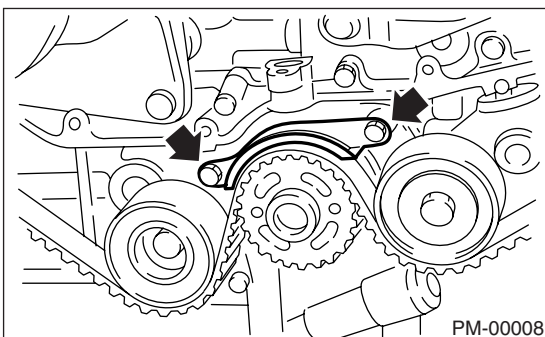
- 1) Remove the radiator fan and air conditioner fan. <Ref. to CO(H4SO)-27, Radiator Main Fan and Fan Motor.>, <Ref. to CO(H4SO)-28, Radiator Sub Fan and Fan Motor.>
- 2) Shield the radiator from any damage using cardboard and blanket.
- 3) Remove the V-belt cover.



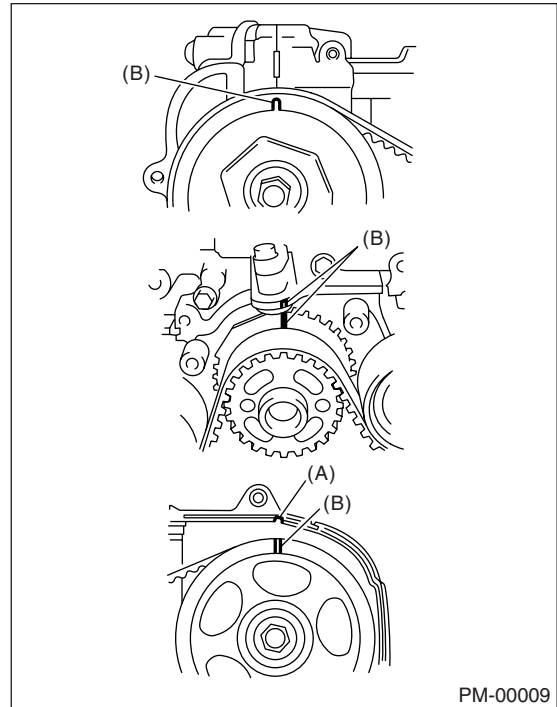
- 4) Remove the V-belts. <Ref. to ME(H4SO)-40, V-belt.>
  - 5) Remove the air conditioning compressor drive belt tensioner.
  - 6) To lock the crankshaft, use ST. Remove the pulley bolt.
- ST 499977100 CRANK PULLEY WRENCH



- 7) Remove the crankshaft pulley.
- 8) Remove the left side belt cover.
- 9) Remove the front timing belt cover.
- 10) Remove the timing belt guide. (MT model)

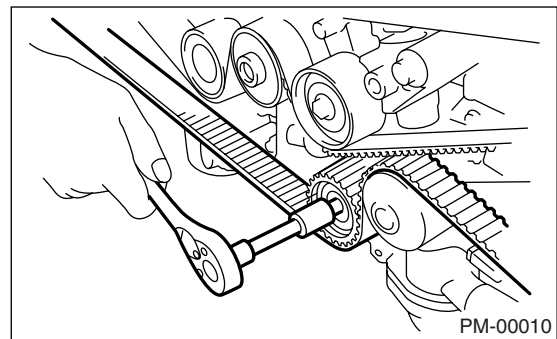


- 11) Turn the crankshaft and align alignment marks on crankshaft, and right and left cam sprockets with notches of belt cover and cylinder block.
- ST 499987500 CRANKSHAFT SOCKET

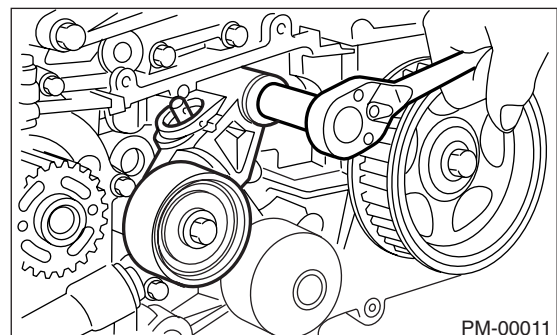


- (A) Notch  
(B) Alignment mark

- 12) Remove the belt idler.
- 13) Remove the belt idler (No. 2).



- 14) Remove the timing belt.
- 15) Remove the automatic belt tension adjuster assembly.





# Timing Belt

## PERIODIC MAINTENANCE SERVICES

16) Install in the reverse order of removal. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt.>

### 2. TURBO MODEL

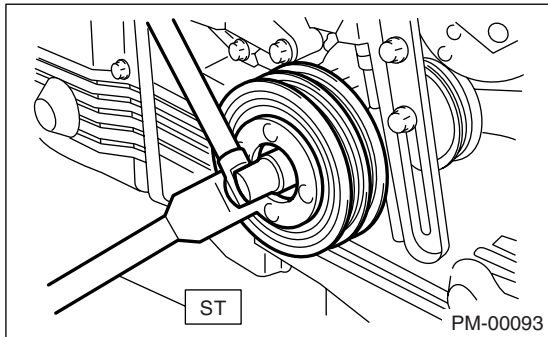
1) Remove the radiator fan and air conditioner fan. <Ref. to CO(H4DOTC)-28, Radiator Main Fan and Fan Motor.>, <Ref. to CO(H4DOTC)-30, Radiator Sub Fan and Fan Motor.>

2) Protect the radiator with cardboard and blanket.  
3) Remove the V-belts. <Ref. to ME(H4DOTC)-41, V-belt.>

4) Remove the air conditioning compressor drive belt tensioner.

5) Remove the pulley bolt. To lock the crankshaft use ST.

ST 499977100 CRANK PULLEY WRENCH



6) Remove the crank pulley.

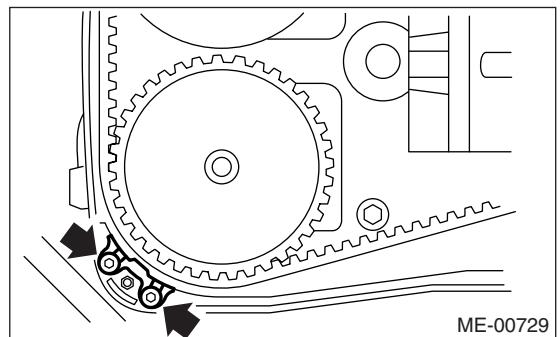
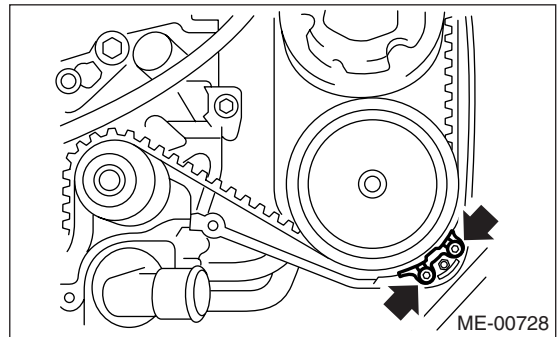
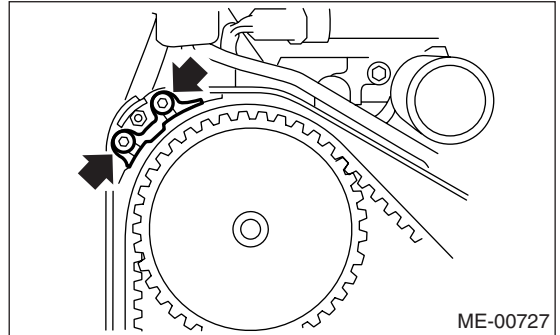
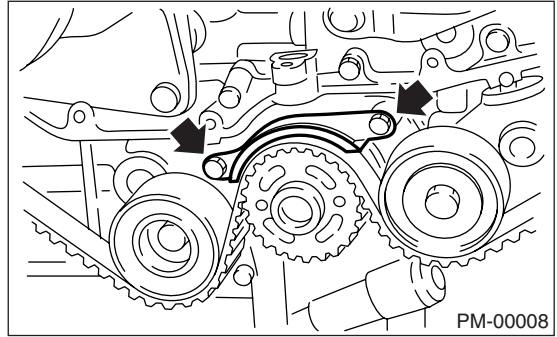
7) Remove the air conditioning compressor drive belt tensioner.

8) Remove the belt cover (LH).

9) Remove the belt cover (RH).

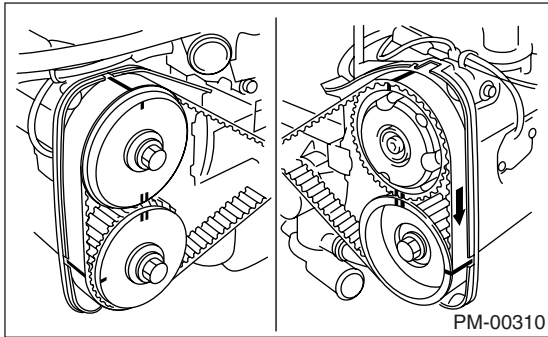
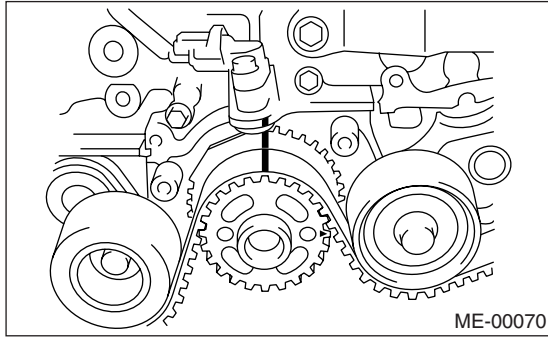
10) Remove the front belt cover.

11) Remove the timing belt guide. (MT model)

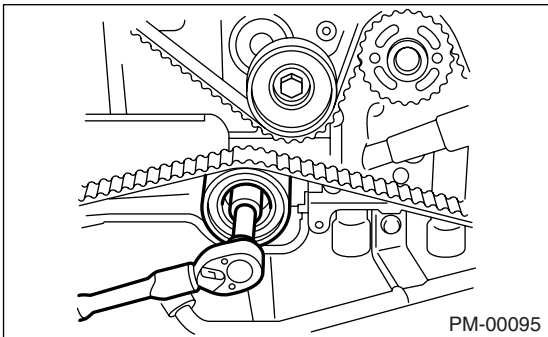


12) Turn the crankshaft and align alignment marks on crankshaft, and right and left cam sprockets with notches of belt cover and cylinder block. To turn the crankshaft, use ST.

ST 499987500 CRANKSHAFT SOCKET

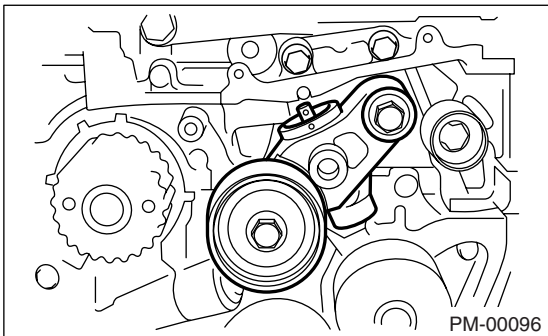


13) Remove the belt idler.



14) Remove the timing belt.

15) Remove the automatic belt tension adjuster assembly.



16) Install in the reverse order of removal. <Ref. to ME(H4DOTC)-45, Timing Belt.>

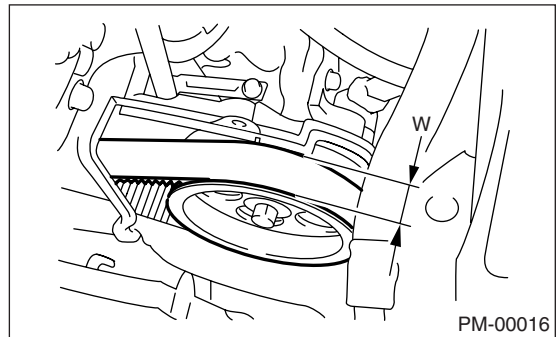
**CAUTION:**

When installing the timing belt, be sure to align all alignment marks on the belt with corresponding marks on the sprockets. If incorrectly installed, interference between pistons and valves may occur.

**B: INSPECTION**

**1. NON-TURBO MODEL**

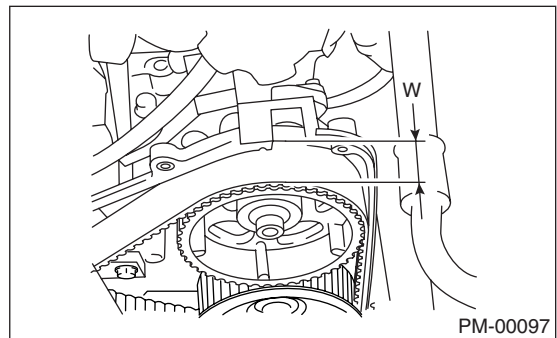
- 1) Remove the front timing belt cover and timing belt cover (LH).
- 2) While cranking the engine at least four rotations, check the timing belt back surface for cracks or damage. Replace the faulty timing belt as needed.
- 3) Measure the timing belt width W. If it is less than 26 mm (1.02 in), check idlers, tensioner, water pump pulley and cam sprocket to determine idler alignment (squareness). Replace the worn timing belt.



- 4) Install the front timing belt cover and timing belt cover (LH).

**2. TURBO MODEL**

- 1) Remove the timing belt cover (LH).
- 2) While cranking the engine at least four rotations, check the timing belt back surface for cracks or damage. Replace the faulty timing belt as needed.
- 3) Measure the timing belt width W. If it is less than 29 mm (1.14 in), check idlers, tensioner, water pump pulley and cam sprocket to determine idler alignment (squareness). Replace the worn timing belt.
- 4) Install the timing belt cover (LH).



## 8. Fuel Line

### A: INSPECTION

The fuel line is located mostly internally, so check pipes, areas near pipes, and engine compartment piping for rust, hose damage, loose bands, etc. If faulty parts are found, repair or replace them.

- Non-turbo model

<Ref. to FU(H4SO)-57, Fuel Delivery & Evaporation Lines.>

- Turbo model

<Ref. to FU(H4DOTC)-65, Fuel Delivery, Return and Evaporation lines.>

- STI model

<Ref. to FU(STI)-60, Fuel Delivery, Return and Evaporation Lines.>

## 9. Fuel Filter

### A: REPLACEMENT

For fuel filter replacement procedures, refer to “FU” section.

- Non-turbo model

<Ref. to FU(H4SO)-54, Fuel Filter.>

- Turbo model

<Ref. to FU(H4DOTC)-62, Fuel Filter.>

- STI model

<Ref. to FU(STI)-57, Fuel Filter.>

### B: INSPECTION

If it is clogged, or if replacement interval has been reached, replace it.

# Air Cleaner Element

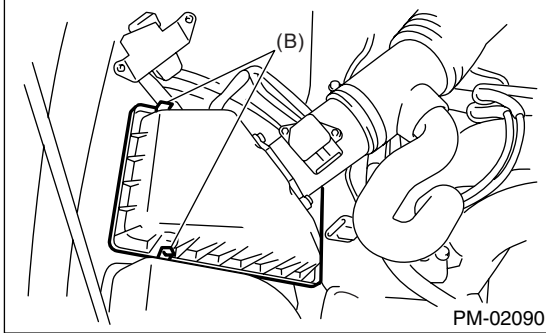
## PERIODIC MAINTENANCE SERVICES

### 10. Air Cleaner Element

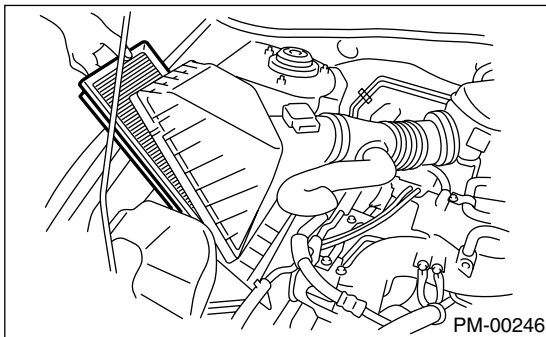
#### A: REPLACEMENT

##### 1. NON-TURBO MODEL

1) Remove the clip (B) above the air cleaner case.



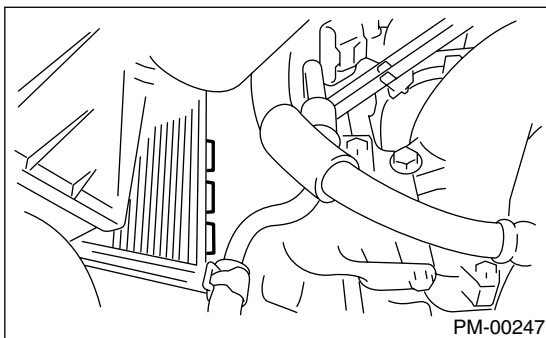
2) Remove the air cleaner.



3) Install in the reverse order of removal.

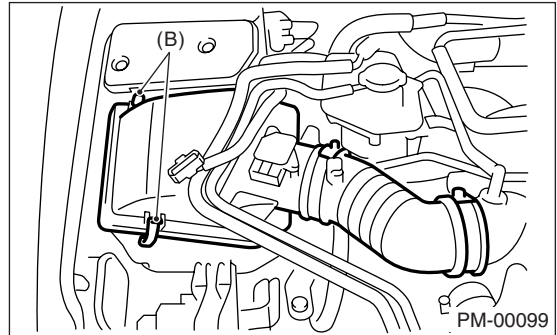
#### NOTE:

Align the hole of air cleaner upper cover with protruding portion of air cleaner lower case, then secure upper cover to case.

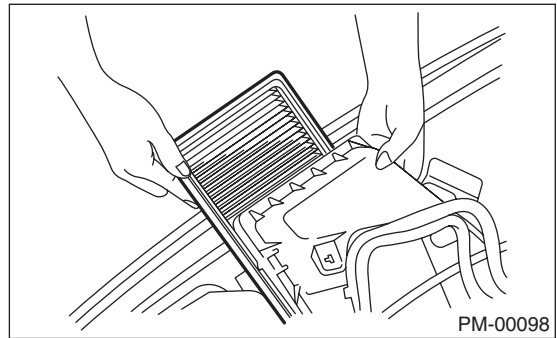


##### 2. TURBO MODEL

1) Remove the clip (B) above the air cleaner case.



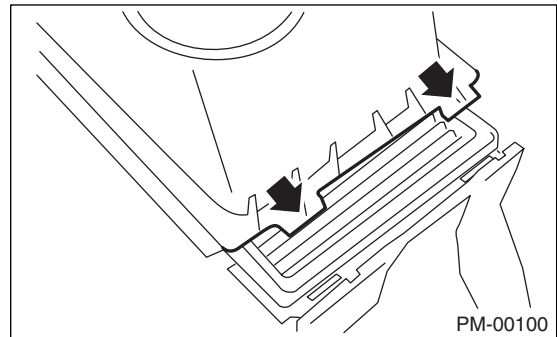
2) Remove the air cleaner.



3) Install in the reverse order of removal.

#### NOTE:

Align the protruding portion of air cleaner upper cover with holes of air cleaner lower case, then secure upper cover to case.



## 11. Cooling System

### A: INSPECTION

1) Check the radiator for leakage, filling it with coolant and attach the radiator cap tester (A) to filler neck. Then apply a pressure. Check the following points:

#### *Non-turbo model*

**157 kPa (1.6 kgf/cm<sup>2</sup>, 23 psi)**

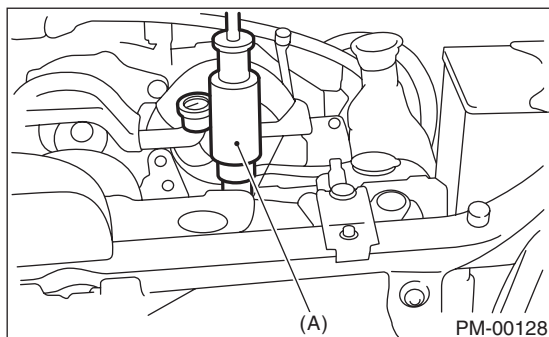
#### *Turbo model*

**122 kPa (1.2 kgf/cm<sup>2</sup>, 18 psi)**

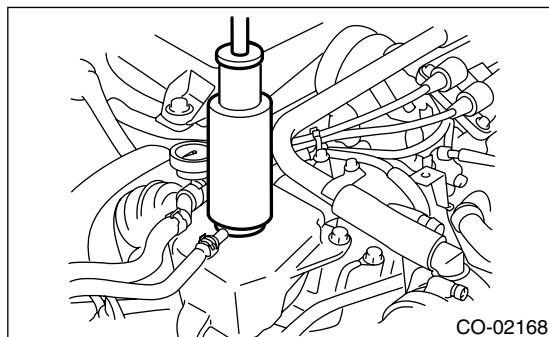
- Each portion of radiator for leakage
- Hose joints and other connections for leakage

#### NOTE:

- For turbo model, be sure to install the tester to filler tank side.
- When attaching or detaching tester and when operating tester, use special care not to deform radiator filler neck.
  - Non-turbo model



- Turbo model



- When performing this check, be sure to keep the engine stationary and fill the radiator with coolant.
  - Wipe off check points before applying pressure.
  - Use care not to spill coolant when detaching the tester from radiator.
  - If engine coolant adheres to the exhaust pipe, wipe it off completely.
  - Do not remove the radiator side cap. (Turbo model)
- 2) Check the radiator cap valve open pressure using radiator cap tester.

#### NOTE:

Rust or dirt on the cap may prevent the valve from functioning normally: be sure to clean the cap before testing.

Raise the pressure until the needle of gauge stops and see if the pressure can be retained for 5 to 6 seconds. The radiator cap is normal if a pressure above the service limit value has been maintained for this period.

#### *Radiator cap valve open pressure:*

#### *Non-turbo model*

##### *Standard value:*

**93 — 123 kPa (0.95 — 1.25 kgf/cm<sup>2</sup>, 14 — 18 psi)**

##### *Service limit:*

**83 kPa (0.85 kgf/cm<sup>2</sup>, 12 psi)**

#### *Turbo model*

#### *Filler tank side:*

##### *Standard value:*

**93 — 123 kPa (0.95 — 1.25 kgf/cm<sup>2</sup>, 14 — 18 psi)**

##### *Service limit:*

**83 kPa (0.85 kgf/cm<sup>2</sup>, 12 psi)**

# Cooling System

## PERIODIC MAINTENANCE SERVICES

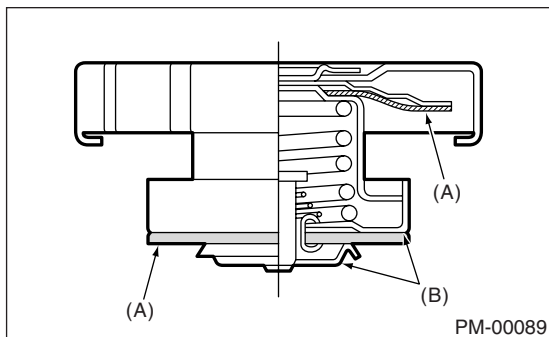
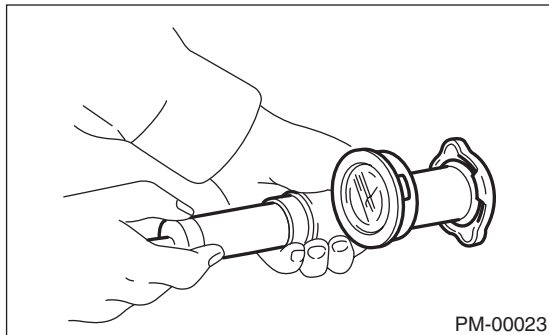
### Radiator side:

#### Standard value:

122 — 152 kPa (1.24 — 1.55 kgf/cm<sup>2</sup>, 18 — 22 psi)

#### Service limit:

112 kPa (1.14 kgf/cm<sup>2</sup>, 16 psi)



(A) Deformation

(B) Deformation, damage, rust

- Non-turbo model  
<Ref. to CO(H4SO)-6, Radiator Main Fan System.>  
<Ref. to CO(H4SO)-11, Radiator Sub Fan System.>
- Turbo model  
<Ref. to CO(H4DOTC)-7, Radiator Main Fan System.>  
<Ref. to CO(H4DOTC)-12, Radiator Sub Fan System.>
- STI model  
<Ref. to CO(H4DOTC)-7, Radiator Main Fan System.>  
<Ref. to CO(H4DOTC)-12, Radiator Sub Fan System.>

3) Start the engine, and then check it does not overheat or it is cooled excessively. If it overheats or it is cooled excessively, check the cooling system.

- Non-turbo model

<Ref. to CO(H4SO)-18, Water Pump.>

<Ref. to CO(H4SO)-21, Thermostat.>

<Ref. to CO(H4SO)-23, Radiator.>

<Ref. to CO(H4SO)-26, Radiator Cap.>

- Turbo model

<Ref. to CO(H4DOTC)-19, Water Pump.>

<Ref. to CO(H4DOTC)-21, Thermostat.>

<Ref. to CO(H4DOTC)-23, Radiator.>

<Ref. to CO(H4DOTC)-27, Radiator Cap.>

- STI model

<Ref. to CO(H4DOTC)-19, Water Pump.>

<Ref. to CO(H4DOTC)-21, Thermostat.>

<Ref. to CO(H4DOTC)-23, Radiator.>

<Ref. to CO(H4DOTC)-27, Radiator Cap.>

4) Check the electric fan operates using Subaru Select Monitor, when the coolant temperature exceeds 95°C (203°F). If not operate, check the electric fan system.



## 12.Engine Coolant

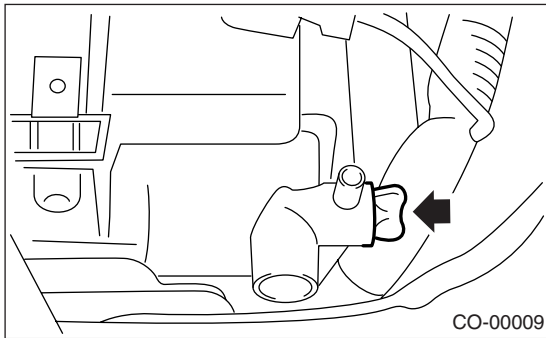
### A: REPLACEMENT

#### 1. REPLACEMENT OF COOLANT

**WARNING:**

The radiator is of the pressurized type. Do not attempt to open the radiator cap immediately after the engine has been stopped.

- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Place a container under drain pipe.
- 4) Loosen and remove the drain cock to drain engine coolant into container.



- 5) For quick draining, open the radiator cap.

**NOTE:**

- In the case of turbo model, be sure to open the radiator cap of filler tank side.
- Be careful not to spill coolant on the floor.
- If engine coolant adheres to the exhaust pipe, wipe it off completely.

- 6) Drain the coolant from reservoir tank.
- 7) Tighten the radiator drain cock securely after draining coolant.
- 8) Pour cooling system conditioner through the filler neck.

**Cooling system protective agent:**

**COOLING SYSTEM CONDITIONER (Part No. SOA635071)**

- 9) Pour the engine coolant into the radiator (for turbo model, coolant filler tank) up to the filler neck position.
- 10) Fill engine coolant into the reservoir tank up to "FULL" level.

**Coolant capacity (fill up to "FULL" level):**

**Turbo AT model:**

Approx. 7.6 ℓ (8.0 US qt, 6.7 Imp qt)

**Turbo MT model:**

Approx. 7.7 ℓ (8.1 US qt, 6.8 Imp qt)

**Non-turbo AT model:**

Approx. 6.9 ℓ (7.3 US qt, 6.1 Imp qt)

**Non-turbo MT model:**

Approx. 7.0 ℓ (7.4 US qt, 6.2 Imp qt)

**STI model:**

Approx. 7.7 ℓ (8.1 US qt, 6.8 Imp qt)

**NOTE:**

The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crankcase. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

11) Close the radiator (for turbo model, coolant filler tank) cap to start the engine and race 5 to 6 times at less than 3,000 rpm, then stop the engine. (Complete this operation within 40 seconds.)

12) Wait for one minute after the engine stops, open the radiator (for turbo model, coolant filler tank) cap. If the engine coolant level drops, add engine coolant to the filler neck position of radiator (for turbo model, coolant filler tank).

13) Perform the procedures 11) and 12) again.

14) Attach the radiator (for turbo model, coolant filler tank) cap and reservoir tank cap properly.

15) Start the engine and operate the heater at maximum hot position and the blower speed setting to "LO".

16) Run the engine at 2,000 rpm or less until radiator fan starts and stops.

**NOTE:**

- Be careful with the engine coolant temperature gauge to prevent overheating.
- If the radiator hose becomes to harden by the pressure of engine coolant, air bleeding operation seems to be almost completed.

17) Stop the engine and wait until engine coolant temperature lowers to 30°C (86°F) or less.

18) Open the radiator (for turbo model, coolant filler tank) cap. If the engine coolant level drops, add engine coolant to the filler neck position of radiator and the "FULL" level of reservoir tank.

19) Attach the radiator (for the turbo model, coolant filler tank) cap and reservoir tank cap properly.

20) Operate the heater at maximum hot position and the blower speed setting to "LO" and start the engine. Race at less than 3,000 rpm. If the flowing sound is heard, perform the procedures from 16) again.



# Engine Coolant

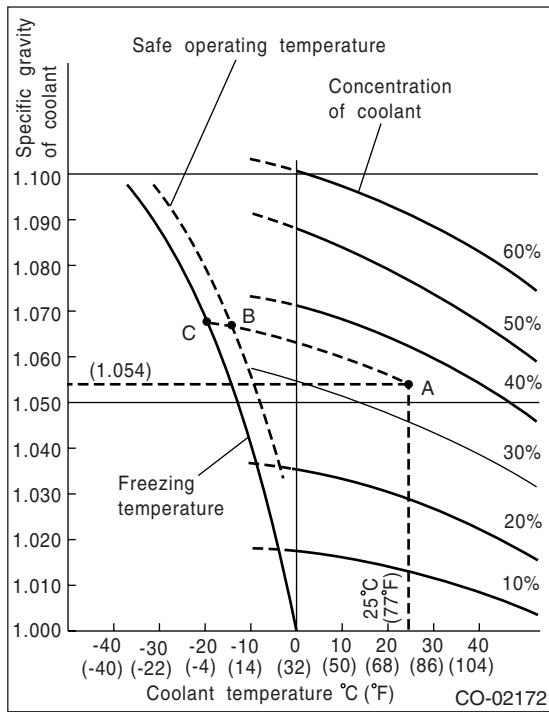
## PERIODIC MAINTENANCE SERVICES

### 2. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

Concentration and safe operating temperature of SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.

[Example]

If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054 and the concentration is 35% (point A), the safe operating temperature is -14°C (7°F) (point B), and the freezing temperature is -20°C (-4°F) (point C).



### 3. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

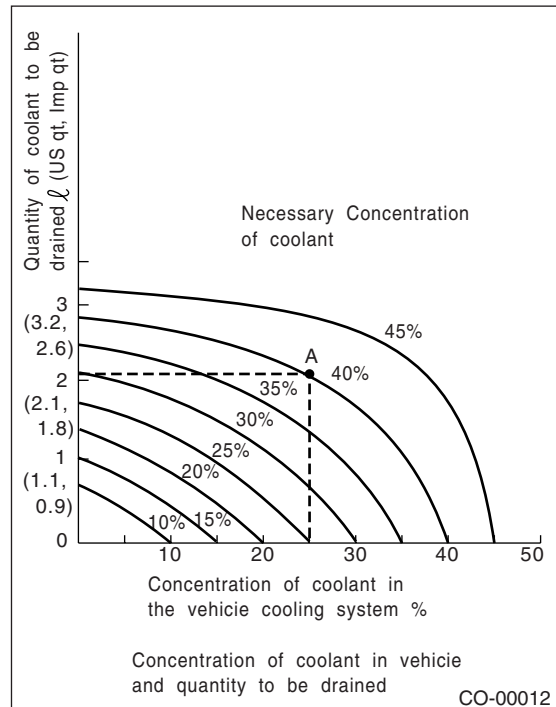
To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50%).

The amount of coolant that should be replaced can be determined using the diagram.

[Example]

Assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 ℓ (2.2 US qt, 1.8 Imp qt). Drain 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.

If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.

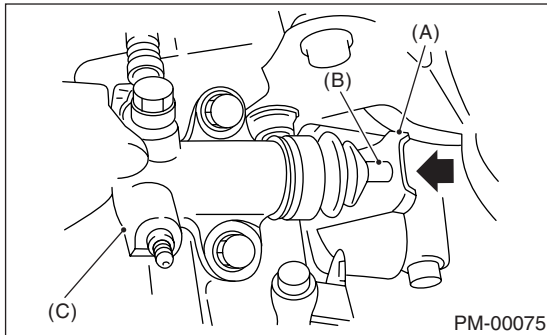


## 13. Clutch System

### A: INSPECTION AND ADJUSTMENT

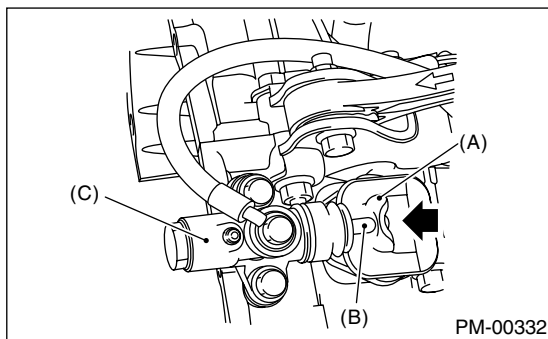
1) Push the release lever to retract the push rod of the operating cylinder and check if the fluid level in the clutch reservoir tank rises or not.

- Non-turbo model



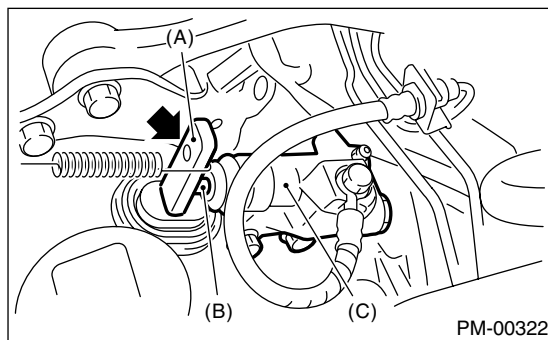
- (A) Release lever
- (B) Push rod
- (C) Operating cylinder

- Turbo model



- (A) Release lever
- (B) Push rod
- (C) Operating cylinder

- STI model



- (A) Release lever
- (B) Push rod
- (C) Operating cylinder

2) If the fluid level rises, pedal free play is correct.

3) If the fluid level does not rise, or the push rod cannot be retracted, adjust the clutch pedal. <Ref. to CL-32, Clutch Pedal.>

4) Check the fluid level using the scale on the outside of the clutch master cylinder tank (A). If the level is below "MIN" (B), inspect the clutch master cylinder, operating cylinder and hydraulic line for fluid leaks. If fluid leaks are found, repair or replace. If fluid leaks are not found, add clutch fluid to bring it up to "MAX" (C) of clutch reservoir tank.

#### Recommended clutch fluid:

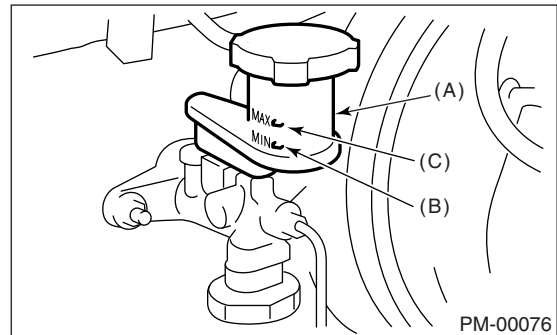
**FMVSS No. 116, fresh DOT3 or DOT4 brake fluid**

#### CAUTION:

**Prevent the clutch fluid from being splashed over vehicle body. If the clutch fluid is splashed over vehicle body, flush it, and then wipe it up.**

#### NOTE:

- Avoid mixing different brands of brake fluid to prevent degradation of the fluid.
- Be careful not to allow dirt or dust to get into the reservoir tank.
- If clutch fluid adheres to the exhaust pipe, wipe it off completely.



- (A) Reservoir tank
- (B) MIN level
- (C) MAX level

# Transmission Gear Oil

## PERIODIC MAINTENANCE SERVICES

### 14. Transmission Gear Oil

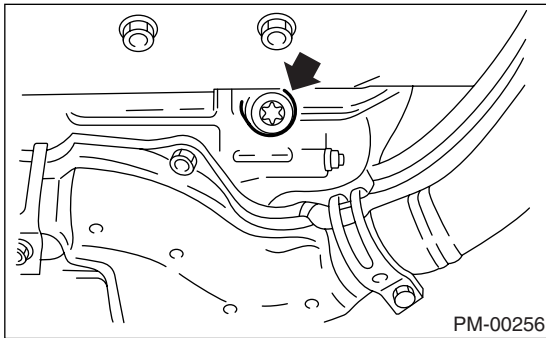
#### A: REPLACEMENT

##### 1. MANUAL TRANSMISSION

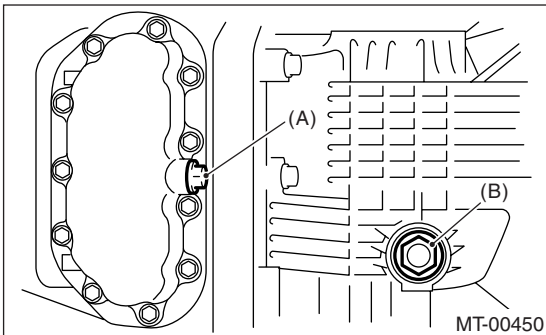
1) Drain the gear oil by removing drain plug.

NOTE:

- Before starting work, cool off the transmission gear oil well.
- If transmission gear oil adheres to the exhaust pipe, wipe it off completely.
- Drain the gear oil by removing drain plug using TORX® BIT T70. (5MT model)
- 5MT



- 6MT



- (A) Drain plug (Oil pan side)
- (B) Drain plug (Clutch housing side)

2) Replace the gasket with new one, and then tighten it to the specified torque.

**Tightening torque:**

**5MT (Aluminum gasket)**

**44 N·m (4.5 kgf·m, 32.5 ft·lb)**

**5MT (Copper gasket)**

**70 N·m (7.1 kgf·m, 51.6 ft·lb)**

**6MT (Oil pan side):**

**44 N·m (4.5 kgf·m, 32.5ft·lb)**

**6MT (Clutch housing side):**

**70 N·m (7.1 kgf·m, 51.6 ft·lb)**

3) Fill transmission gear oil through the oil level gauge hole up to the upper point of level gauge.

NOTE:

Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.

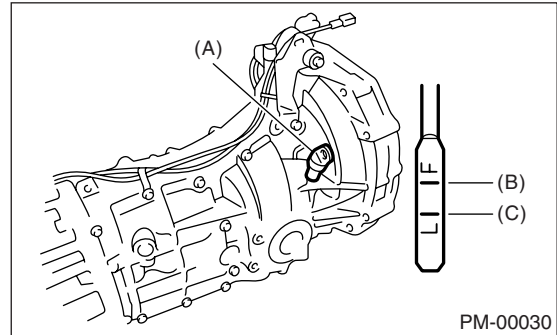
**Gear oil capacity:**

**5MT model**

**3.5 L (3.7 US qt, 3.1 Imp qt)**

**6MT model**

**4.1 L (4.3 US qt, 3.6 Imp qt)**



- (A) Oil level gauge
- (B) Upper level
- (C) Lower level

## 15.ATF

### A: INSPECTION

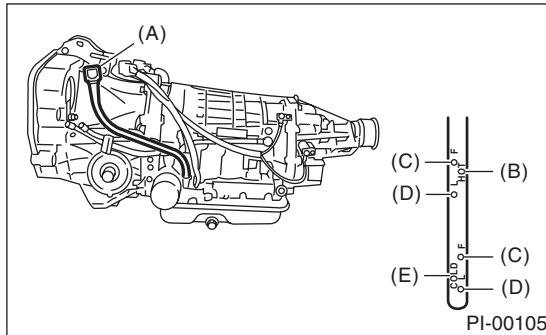
#### CAUTION:

The level of ATF varies with fluid temperature. Pay attention to the fluid temperature when checking ATF level.

1) Raise the ATF temperature by driving a distance of 5 to 10 km (3 to 6 miles). Otherwise, idle the engine to raise ATF temperature to 70 — 80°C (158 — 176°F) on Subaru Select Monitor. <Ref. to 4AT(D)(diag)-13, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>

2) Make sure the vehicle is level.

3) After selecting all positions (P, R, N, D, 3, 2, 1), set the select lever in “P” range. Measure the ATF level with the engine idling for one or two minutes.



- (A) Level gauge
- (B) Hot side
- (C) Upper level
- (D) Lower level
- (E) Cold side

4) Make sure that ATF level is between the upper and lower marks of “HOT” side.

#### CAUTION:

- Use care not to exceed the upper limit level.
- Remember that the addition of ATF to the upper limit mark when the transmission is cold will result in overfilling of ATF, causing a transmission failure.

5) Check ATF level after raising ATF temperature to 70 — 80°C (158 — 176°F) by running the vehicle or by idling the engine again.

6) Check the ATF for leaks.

Check for leaks in the transmission. If there are leaks, it is necessary to repair or replace gasket, oil seals, plugs or other parts.

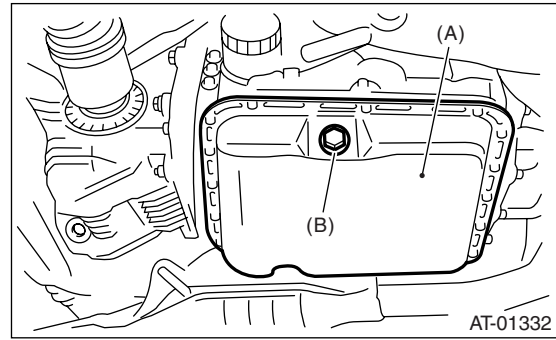
### B: REPLACEMENT

#### 1. AUTOMATIC TRANSMISSION FLUID

1) Drain the ATF (Automatic Transmission Fluid) by removing drain plug.

#### NOTE:

- Before starting work, cool off the ATF well.
- If ATF adheres to the exhaust pipe, wipe it off completely.



- (A) Oil pan
- (B) Drain plug (ATF)

2) Replace the gasket with a new one, and then tighten the specified torque.

#### Tightening torque:

**25 N·m (2.5 kgf-m, 18.4 ft-lb)**

3) Fill ATF up to the middle of the “COLD” side on level gauge by using the gauge hole.

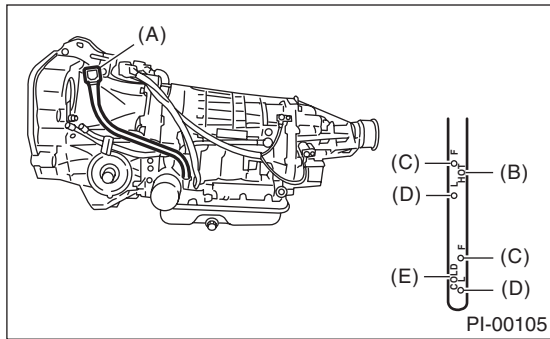
#### Recommended fluid:

**<Ref. to RM-4, FLUID, RECOMMENDED MATERIALS, Recommended Materials.>**

#### Fluid capacity:

**Fill the same amount drained from ATF drain plug hole.**

4) Check the ATF level. <Ref. to PM-25, INSPECTION, ATF.>



- (A) Level gauge
- (B) Hot side
- (C) Upper level
- (D) Lower level
- (E) Cold side

## 2. ATF FILTER

### NOTE:

ATF filter is a maintenance free part. ATF filter needs replacement, when it has physically damaged or ATF leaked.

For the replacement procedures of the ATF filter:  
<Ref. to 4AT-63, ATF Filter.>

## 16. Front and Rear Differential Gear Oil

### A: REPLACEMENT

#### 1. FRONT DIFFERENTIAL (MT MODEL)

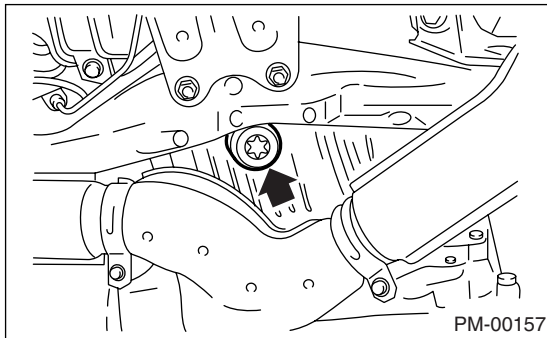
For MT vehicle, differential oil works as manual transmission oil to lubricate differential. Refer to "Transmission Oil". <Ref. to PM-24, Transmission Gear Oil.>

#### 2. FRONT DIFFERENTIAL (AT MODEL)

1) Drain the differential gear oil by removing drain plug using TORX® BIT T70.

**NOTE:**

- Before starting work, cool off the differential gear oil well.
- If front differential gear oil adheres to the exhaust pipe, wipe it off completely.



2) Replace the gasket with a new one, and then tighten the drain plug to specified torque.

**Tightening torque:**

**44 N·m (4.5 kgf·m, 32.5 ft·lb) (Aluminum gasket)**

**70 N·m (7.1 kgf·m, 51.6 ft·lb) (Copper gasket)**

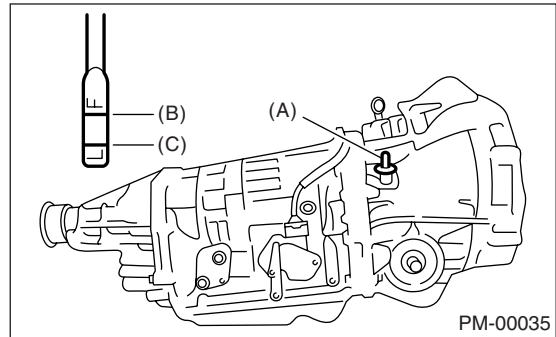
3) Fill differential gear oil through the oil level gauge hole up to the upper point of level gauge.

**NOTE:**

Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.

**Differential gear oil capacity:**

**1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)**



- (A) Oil level gauge
- (B) Upper level
- (C) Lower level

#### 3. REAR DIFFERENTIAL

- 1) Drain the oil by removing drain plug.
- 2) Remove the filler plug or rear differential oil temperature switch for quick draining oil.
- 3) Install the drain plug after draining oil.

**NOTE:**

Apply liquid gasket to the drain plug threads.

**Liquid gasket:**

**Three Bond 1105 (Part No. 004403010)**

**Tightening torque:**

**49.0 N·m (5.0 kgf·m, 36.2 ft·lb)**

4) After installing the drain plug onto rear differential gear case firmly, fill oil up fully to the mouth of filler plug.

**CAUTION:**

**Mechanical LSD oil must be used for STI model.**

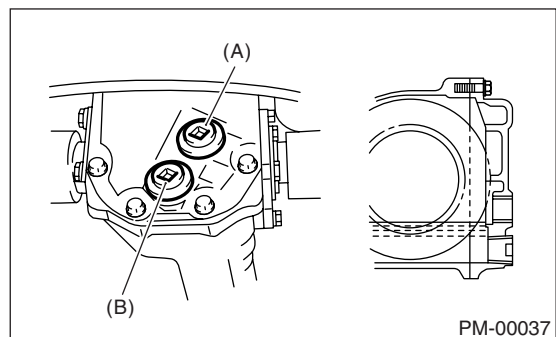
**Recommended gear oil:**

**Except STI model**

**GL-5 (75W-90) or equivalent**

**STI model**

**Gear oil LSD (Part No. K0305Y0900), GL-5 (90) or equivalent**



- (A) Filler plug
- (B) Drain plug

## Front and Rear Differential Gear Oil

### PERIODIC MAINTENANCE SERVICES

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#### **Oil capacity:**

##### **Except for STI model:**

**0.8 ℓ (0.8 US qt, 0.7 Imp qt)**

##### **STI model:**

**1.0 ℓ (1.1 US qt, 0.9 Imp qt)**

#### **NOTE:**

Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.

5) Install the filler plug or rear differential oil temperature switch onto rear differential gear case firmly.

#### **NOTE:**

Apply liquid gasket to the filler plug or rear differential oil temperature switch threads.

#### **Liquid gasket:**

**Three Bond 1105 (Part No. 004403010)**

#### **Tightening torque:**

**49.0 N·m (5.0 kgf-m, 36.2 ft-lb)**

## 17. Brake Line

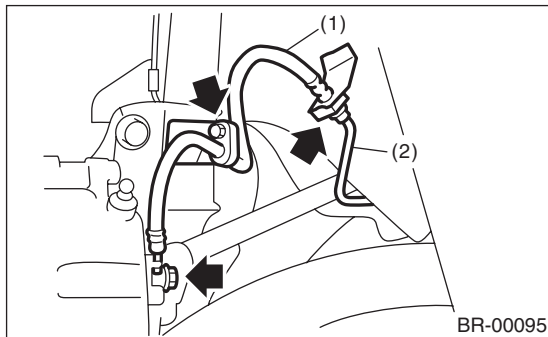
### A: INSPECTION

#### 1. BRAKE LINE

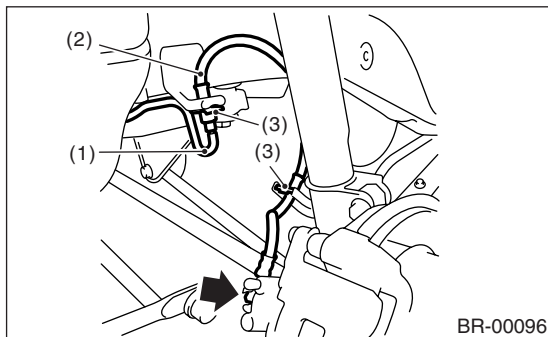
- 1) Check scratches, swelling, corrosion, traces of fluid leakage on the brake hoses or pipe joints.
- 2) Check the possibility of adjacent parts interfering with brake pipes/hoses during driving, and loose connections/clamps.
- 3) Check any trace of fluid leakage, scratches, etc. on the master cylinder, wheel cylinder and pressure control valve.

**NOTE:**

- When the brake fluid level in the reservoir tank is lower than the specified limit, the brake fluid warning light on the combination meter will come on.
- Visually check the brake hose (using a mirror where it is difficult to see) for any damage.



- (1) Front brake hose
- (2) Front brake pipe



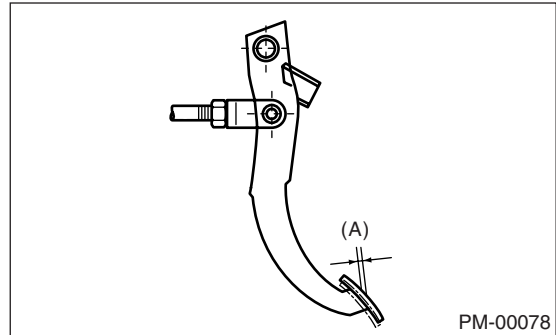
- (1) Rear brake pipe
- (2) Rear brake hose
- (3) Clamp

#### 2. SERVICE BRAKE

- 1) Check the free play of brake pedal with a force of less than 10 N (1 kgf, 2 lbf).

**Brake pedal free play:**

**0.5 — 2.0 mm (0.02 — 0.08 in)**



(A) Brake pedal free play

- 2) If the free play is out of specifications above, adjust the brake pedal as follows:

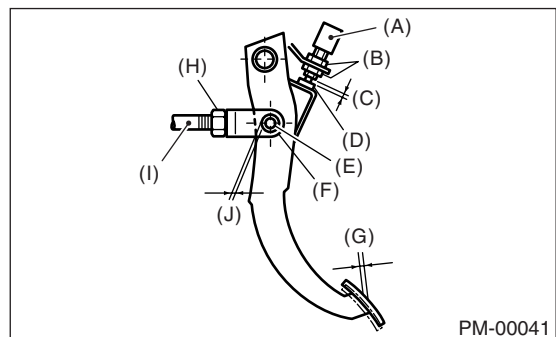
(1) Be sure the engine is off. (No vacuum is applied to brake booster.)

(2) There should be play between brake booster clevis and pin at brake pedal installing portion.

[Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lbf) to a stroke of 0.5 to 2.0 mm (0.02 to 0.08 in).]

(3) Depress the surface of brake pad by hand.

(4) If there is no free play between clevis pin and clevis, turn the brake switch adjusting nut until the clearance between stopper and screw of brake switch becomes 0.3 mm (0.012 in).



- (A) Brake switch
- (B) Adjusting nut
- (C) 0.3 mm (0.012 in)
- (D) Stopper
- (E) Clevis pin
- (F) Clevis
- (G) Brake pedal free play
- (H) Lock nut
- (I) Brake booster operating rod
- (J) Play at pin



# Brake Line

## PERIODIC MAINTENANCE SERVICES

### 3) Check the pedal stroke.

While the engine is idling, depress the brake pedal with a 490 N (50 kgf, 110 lbf) load and measure the distance between brake pedal and steering wheel. With the brake pedal released, measure the distance between pedal and steering wheel again. The difference between the two measurements must be less than specified value. If the distance is more than specified, there is possibility of air inside the hydraulic unit.

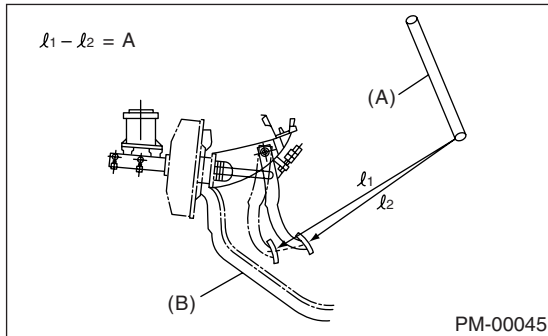
#### **Brake pedal reserve distance A:**

##### **Turbo AT model**

**105 mm (4.13 in) / 490 N (50 kgf, 110 lbf) or less**

##### **Except turbo AT model**

**90 mm (3.54 in) / 490 N (50 kgf, 110 lbf) or less**



- (A) Steering wheel
- (B) Toe board

4) Check to see if air is in the hydraulic brake line by the feel of pedal operation. If air appears to exist in the line, bleed it from the system.

5) Check for even operation of all brakes, using a brake tester or by driving the vehicle for a short distance on a straight road.

### 3. BRAKE SERVO SYSTEM

1) With the engine off, depress the brake pedal several times applying the same pedal force: Make sure the travel distance should not change.

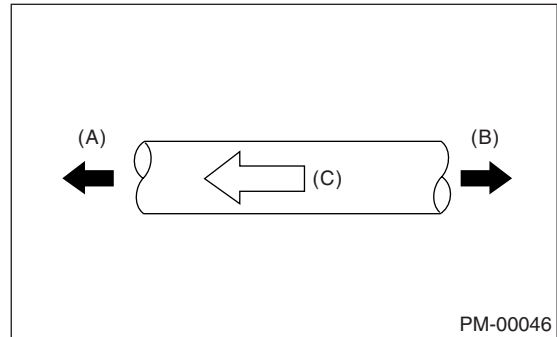
2) With the brake pedal depressed, start the engine: Make sure the pedal should move slightly toward the floor.

3) With the brake pedal depressed, stop the engine and keep the pedal depressed for 30 seconds: Make sure the pedal height should not change.

4) Check valve is built into the vacuum hose. Disconnect the vacuum hose to inspect function of check valve.

Blow air into the vacuum hose from its brake booster side end: Air must flow out of engine side end of hose. Next blow air into the hose from engine side: Air should not flow out of hose.

Replace both check valve and vacuum hose if the check valve is faulty. Engine side of vacuum hose is indicated by marking "ENG" as shown.



- (A) Engine side
- (B) Brake booster side
- (C) ENG

5) Check the vacuum hose for cracks or other damage.

#### **NOTE:**

When installing the vacuum hose on the engine and brake booster, do not use soapy water or lubricating oil on their connections.

6) Check vacuum hose to make sure it is tight and secure.

## 18.Brake Fluid

### A: REPLACEMENT

#### CAUTION:

- Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.
- Avoid mixing different brands of brake fluid to prevent degrading the quality of fluid.
- Be careful not to allow dirt or dust to get into the reservoir tank.

#### NOTE:

- During the operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
  - The brake pedal operating must be very slow.
  - For convenience and safety, two people should do the work.
  - The amount of brake fluid required is approximately 500 m ℓ (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.
  - If brake fluid adheres to the exhaust pipe, wipe it off completely.
- 1) Either jack-up the vehicle to place a rigid racks under it, or lift-up the vehicle.
  - 2) Remove both the front and rear wheels.
  - 3) Drain brake fluid from the reservoir tank.
  - 4) Refill the reservoir tank with recommended brake fluid.

#### **Recommended brake fluid:**

**Refer to the specification. <Ref. to BR-2, SPECIFICATION, General Description.>**

Perform the same procedure as bleeding operation of brake line until the new brake fluid coming out from vinyl tube. <Ref. to BR-47, PROCEDURE, Air Bleeding.>

#### NOTE:

Perform the brake fluid replacement in order from the farthest wheel cylinder from master cylinder.

# Disc Brake Pads and Discs

## PERIODIC MAINTENANCE SERVICES

### 19. Disc Brake Pads and Discs

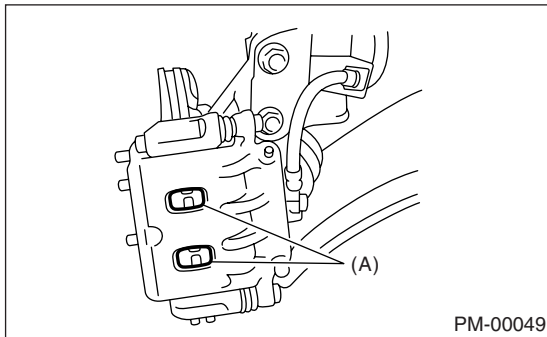
#### A: INSPECTION

##### 1. DISC BRAKE PAD AND DISC

- 1) Jack-up the vehicle and support with rigid racks. Then remove the wheels.
- 2) Visually check the pad thickness through inspection hole of disc brake assembly. Replace the pad if necessary.

#### NOTE:

When replacing a pad, always replace the pads for both the right and left wheels at the same time. Also replace the pad clips if they are twisted or worn.



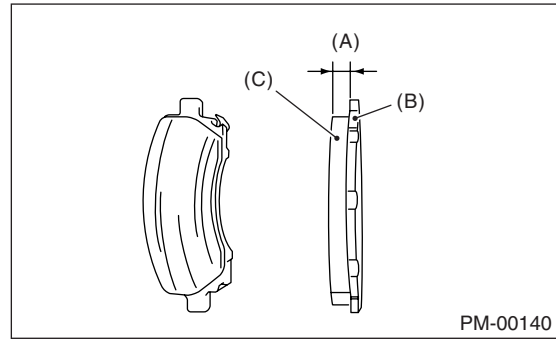
(A) Inspection hole

- Front (except back metal)

| Pad thickness |         | mm (in) |       |
|---------------|---------|---------|-------|
| Standard      | 15 inch | 11      | 0.43  |
|               | 16 inch | 10      | 0.393 |
|               | 17 inch | 9.2     | 0.362 |
| Service limit | 15 inch | 1.5     | 0.059 |
|               | 16 inch | 1.5     | 0.059 |
|               | 17 inch | 1.2     | 0.047 |

- Rear (except back metal)

| Pad thickness |         | mm (in) |       |
|---------------|---------|---------|-------|
| Standard      | 14 inch | 9       | 0.354 |
|               | 15 inch | 11.5    | 0.452 |
|               | 17 inch | 9       | 0.354 |
| Service limit | 14 inch | 1.5     | 0.059 |
|               | 15 inch | 1.5     | 0.059 |
|               | 17 inch | 1.2     | 0.047 |



- (1) Thickness of pad
- (2) Back metal
- (3) Lining

- 3) Check the disc rotor, and correct or replace if it is damaged or worn.

- Front

| Disc rotor thickness |             | mm (in) |      |
|----------------------|-------------|---------|------|
| Standard             | 15, 16 inch | 24      | 0.94 |
|                      | 17 inch     | 30      | 1.18 |
| Service limit        | 15, 16 inch | 22      | 0.87 |
|                      | 17 inch     | 28      | 1.10 |

- Rear

| Disc rotor thickness |         | mm (in) |       |
|----------------------|---------|---------|-------|
| Standard             | 14 inch | 10      | 0.39  |
|                      | 15 inch | 18      | 0.71  |
|                      | 17 inch | 20      | 0.79  |
| Service limit        | 14 inch | 8.5     | 0.335 |
|                      | 15 inch | 16      | 0.63  |
|                      | 17 inch | 18      | 0.71  |

- 4) Remove the caliper body. <Ref. to BR-23, Front Disc Brake Assembly.>, <Ref. to BR-34, Rear Disc Brake Assembly.>

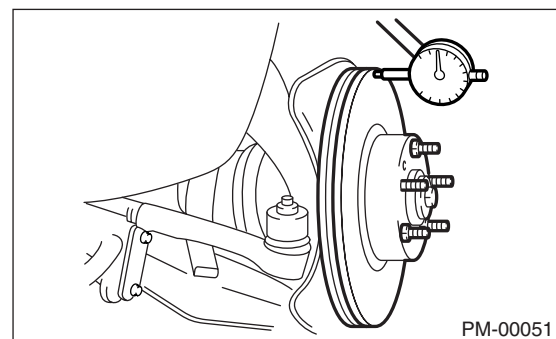
- 5) Tighten the wheel nuts to secure disk rotor.

- 6) Set a dial gauge at a point less than 10 mm (0.39 in) from outer periphery of rotor, and then measure the disk rotor runout.

#### Disc rotor runout limit:

**Front: 0.075 mm (0.0030 in)**

**Rear: 0.070 mm (0.0028 in)**



## 20. Parking Brake

### A: INSPECTION

Inspect the brake linings and drums of both sides of the rear brake at the same time by removing brake drums.

1) Inspect the brake shoes for damage or deformation and check brake linings for wear.

**NOTE:**

Always replace both primary and secondary brake shoes for the right and left wheels at the same time.

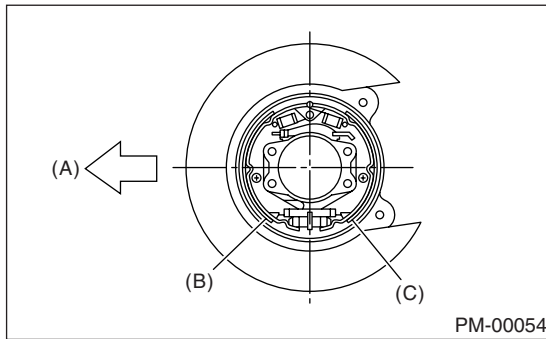
**Brake lining thickness (except back metal):**

**Standard value:**

**3.2 mm (0.126 in)**

**Wear limit:**

**1.5 mm (0.059 in)**



- (A) Forward
- (B) Brake shoe (Primary side)
- (C) Brake shoe (Secondary side)

2) Check the disk rotor for wear, dents or other damage. If the inside surface of disk rotor is streaked, correct the surface with emery cloth (#200 or more). If it is unevenly worn or tapered, correct or replace it.

**Brake drum inside diameter:**

**Except for STI model**

**Standard value:**

**170 mm (6.69 in)**

**Wear limit:**

**171 mm (6.73 in)**

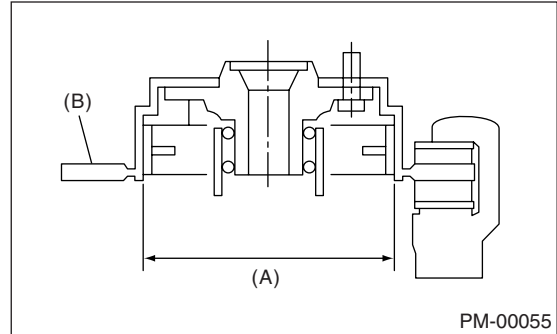
**STI model**

**Standard value:**

**190 mm (7.48 in)**

**Wear limit:**

**191 mm (7.52 in)**



- (A) Inside diameter
- (B) Disk

3) If the deformation or wear of back plate, shoe, etc. is noticeable, replace them.

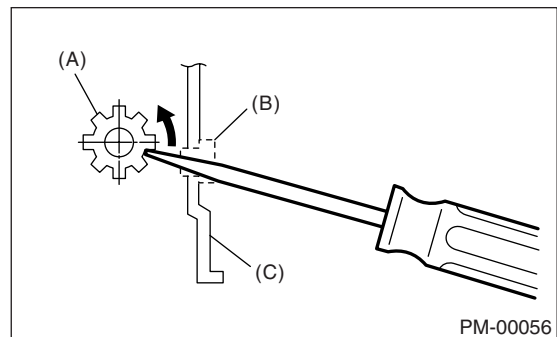
4) When the shoe return spring tension is excessively weakened, replace it.

### B: ADJUSTMENT

For rear disc brake, adjust the parking brake after bleeding air.

1) Remove the rear cover (rubber) installed at back plate.

2) Turn the adjuster toward arrow mark (upward) until it is locked slightly, by using a flat tip screwdriver as shown in illustration.



- (A) Adjuster
- (B) Cover (rubber)
- (C) Back plate

3) Turn back (downward) the adjuster 3 to 4 notches.

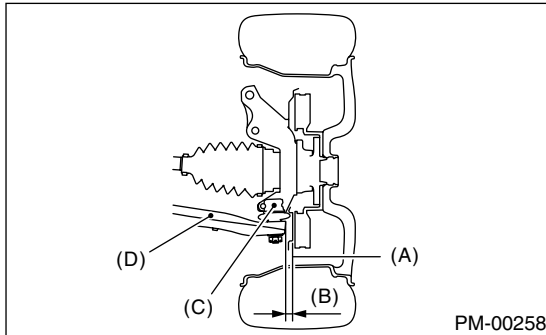
4) Install the cover (rubber) at original position correctly.

## 21. Suspension

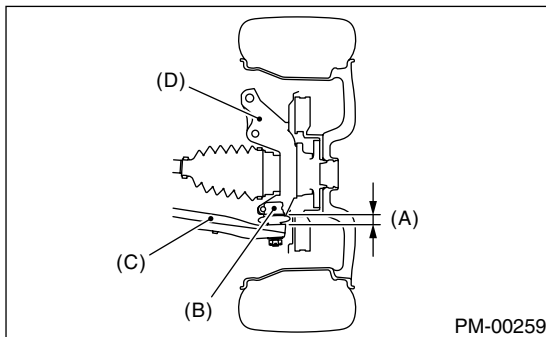
### A: INSPECTION

#### 1. SUSPENSION BALL JOINT

- 1) Jack-up the vehicle until front wheels are off ground.
- 2) Next, grasp the bottom of tire and move it in and out. If relative movement (B) is observed between the brake disc cover (A) and end of transverse link (D), ball joint (C) may be excessively worn.



- 3) Next, grasp the end of transverse link and move it up and down. Relative movement (A) between the housing (D) and transverse link (C) boss indicates ball joint (B) may be excessively worn.



- 4) If relative movement is observed in the immediately preceding two steps, remove and inspect the ball joint. If free play exceeds standard, replace the ball joint. <Ref. to FS-17, Front Ball Joint.>

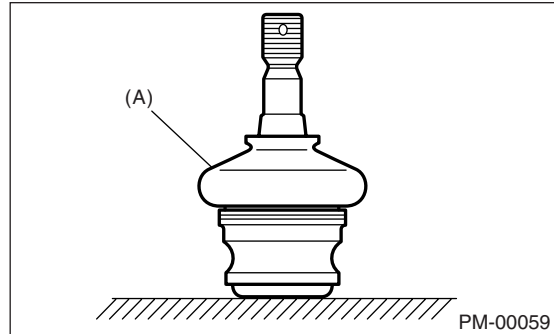
#### 5) Damage of dust seal

Visually inspect the ball joint dust seal. If it is damaged, remove the transverse link. <Ref. to FS-14, Front Transverse Link.> And measure free play of ball joint. <Ref. to FS-17, Front Ball Joint.>

- (1) When looseness exceeds standard value, replace the ball joint.
- (2) If the dust seal is damaged, replace with the new ball joint.

#### NOTE:

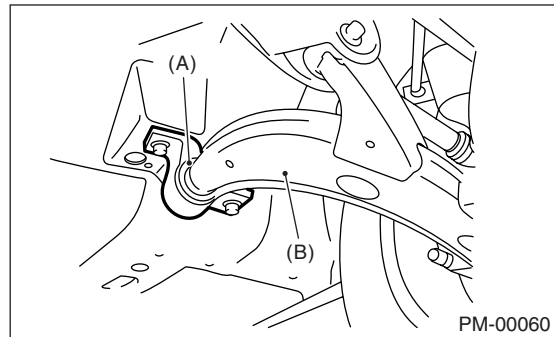
When the transverse link ball joint has been removed or replaced, check the toe-in of front wheel. If the front wheel toe-in is not at specified value, adjust the toe-in. <Ref. to FS-6, Wheel Alignment.>



(A) Dust seal

#### 2. TRANSVERSE LINK'S REAR BUSHING

Check oil leaks at around liquid-filled bushing. If oil leaks, replace the bushing.



(A) Rear bushing  
(B) Transverse link

#### 3. WHEEL ARCH HEIGHT

- 1) Unload cargoes and set the vehicle in curb weight (empty) condition.
- 2) Then, check the wheel arch height of front and rear suspensions to ensure that they are within specified values. <Ref. to FS-6, Wheel Alignment.>
- 3) When the wheel arch height is out of standard, visually inspect the following components and replace deformed parts.

- Suspension components [Front strut assembly and rear shock absorber assembly]
  - Parts connecting between suspension and body.
- 4) When no components are deformed, adjust the wheel arch height by replacing coil spring in the suspension which wheel arch height is out of standard. <Ref. to FS-6, Wheel Alignment.> <Ref. to RS-7, Wheel Alignment.>

## 4. WHEEL ALIGNMENT OF FRONT SUSPENSION

1) Check the alignment of front suspension to ensure that following items conform to standard values.

- Toe-in
- Camber angle
- Caster angle
- Steering angle

<Ref. to FS-6, Wheel Alignment.>

2) When the caster angle does not conform to reference, visually inspect the following components and replace deformed parts.

- Suspension components [Strut assembly, crossmember, transverse link, etc.]
- Body parts to which suspensions are installed.

3) When the toe-in and camber are out of standard value, adjust them so that they conform to respective service value.

4) When the right-and-left turning angles of tire are out of standard, adjust to standard value.

## 5. WHEEL ALIGNMENT OF REAR SUSPENSION

1) Check the alignment of rear suspension to ensure that following items are within standard values.

- Toe-in
- Camber angle
- Thrust angle

<Ref. to RS-7, Wheel Alignment.>

2) When the camber angle does not conform to reference, visually inspect parts listed below. If deformation is observed, replace the damaged parts.

- Suspension components [Shock absorber, link F, link R, link UPR, arm R, sub frame, etc.]
- Body parts to which suspensions are installed.

3) When the toe-in and thrust angle are out of standard value, adjust them so that they conform to respective service value.

## 6. OIL LEAKAGE OF STRUT

Visually inspect the front strut and rear strut for oil leakage as instructed. Replace front strut and rear strut if oil leaks excessively.

## 7. TIGHTNESS OF BOLTS AND NUTS

Check the bolts and nuts shown in the figure for looseness. Retighten the bolts and nuts to specified torque. If the self-lock nuts and bolts are removed, replace them with new ones.

Front suspension: <Ref. to FS-2, General Description.>

Rear suspension: <Ref. to RS-2, General Description.>

## 8. DAMAGE TO SUSPENSION PARTS

Check the following parts and the fastening portion of the vehicle body for deformation or excessive rusting which impairs the suspension. If necessary, replace the damaged parts with new ones. If minor rust formation, pitting, etc. are noted, remove the rust and apply remedial anti-corrosion measures.

- Front suspension
  - Transverse link
  - Crossmember
  - Strut
- Rear suspension
  - Crossmember
  - Lateral links
  - Trailing link
  - Strut

• In the district where salt is sprayed to melt snow on a road in winter, check suspension parts for damage caused by rust every 12 months after lapse of 60 months. Take rust prevention measure as required.

# Wheel Bearing

## 22. Wheel Bearing

### A: INSPECTION

#### 1. FRONT WHEEL BEARING

**NOTE:**

Inspect the condition of front wheel bearing grease.

- 1) Jack-up the front of vehicle.
- 2) While holding the front wheel by hand, swing it in and out to check bearing free play.
- 3) Loosen the wheel nuts and remove front wheel.
- 4) If bearing free play exists in step 2) above, attach a dial gauge to the hub and measure axial displacement in axial direction.

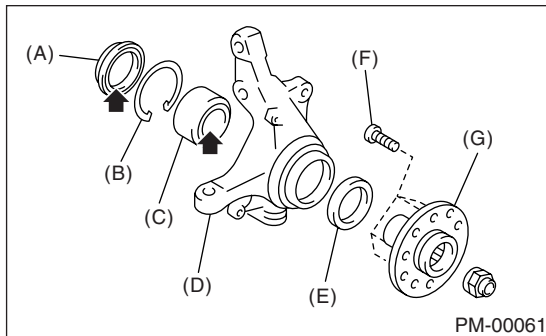
**Service limit:**

***Straight-ahead position within 0.05 mm (0.0020 in)***

- 5) Remove the bolts and self-locking nuts, and extract transverse link from front crossmember.
- 6) Remove the PTJ or DOJ of front drive shaft from transmission. <Ref. to DS-19, Front Axle.>
- 7) While supporting the front drive shaft horizontally with one hand, turn the hub with the other to check for noise or binding.

- Except STI model

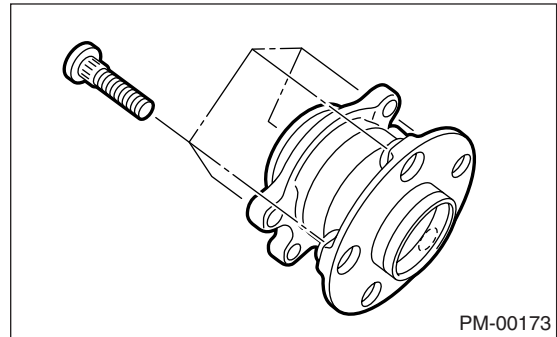
If the hub is noisy or binds, disassemble the front axle and replace oil seal or bearings.



- (A) Inner oil seal
- (B) Snap ring
- (C) Bearing
- (D) Housing
- (E) Outer oil seal
- (F) Hub bolt
- (G) Hub

- STI model

If the hub is noisy or binds, replace the front hub unit bearing.



#### 2. REAR WHEEL BEARING

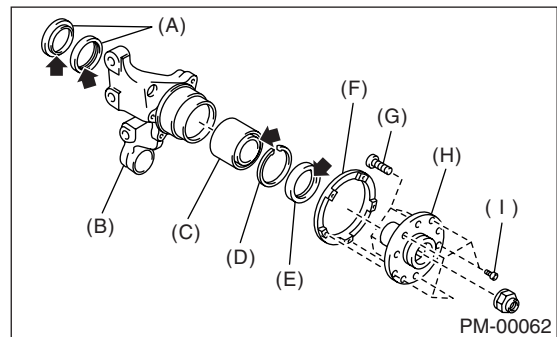
- 1) Jack-up the rear of vehicle.
- 2) While holding the rear wheel by hand, swing it in and out to check bearing free play.
- 3) Loosen the wheel nuts and remove rear wheel.
- 4) If the bearing free play exists in step 2) above, attach a dial gauge to the hub COMPL and measure axial displacement in axial direction.

**Service limit:**

***Straight-ahead position within 0.05 mm (0.0020 in)***

- 5) Remove the DOJ of rear drive shaft from rear differential. <Ref. to DS-41, Rear Drive Shaft.>
- 6) While supporting the rear drive shaft horizontally with one hand, turn the hub COMPL with the other to check for noise or binding.

If the hub COMPL is noisy or binds, disassemble the rear axle and replace the oil seals or bearings.



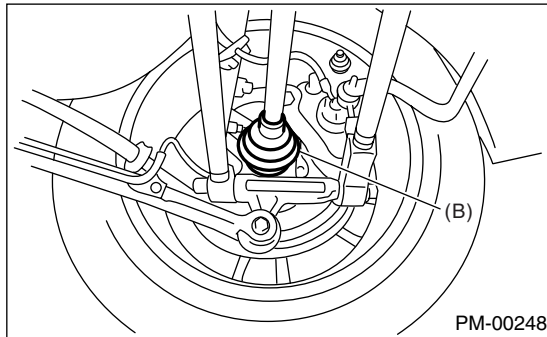
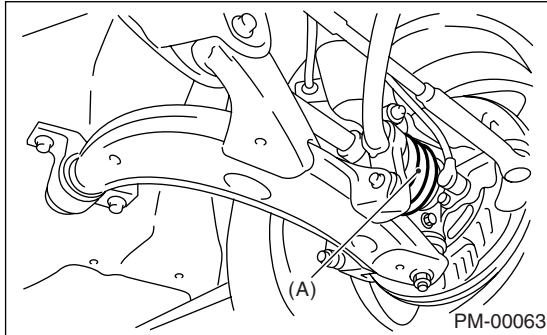
- (A) Inner oil seal
- (B) Rear housing
- (C) Bearing
- (D) Snap ring
- (E) Outer oil seal
- (F) Tone wheel
- (G) Hub bolt
- (H) Hub
- (I) Socket bolt

## 23. Axle Boots and Joints

### A: INSPECTION

#### 1. FRONT AND REAR AXLE BOOTS

Inspect the front axle boots (A) and rear axle boots (B) for deformation, damage or failure. If faulty, replace them with new ones. <Ref. to DS-33, Front Drive Shaft.> <Ref. to DS-41, Rear Drive Shaft.>



#### 2. PROPELLER SHAFT

Inspect the propeller shaft for damage or failure. If faulty, replace with a new one. <Ref. to DS-16, Propeller Shaft.>



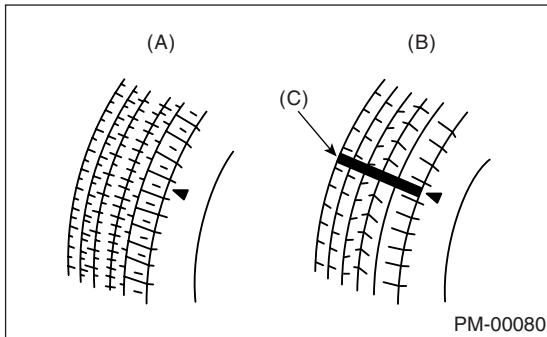
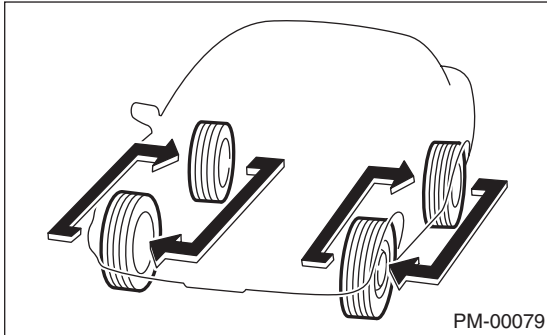
## 24. Tire Rotation

### A: INSPECTION

1) If the tread depth is less than 1.6 mm (0.063 in) or if the wear indicator appears across the tread, replace the tire. (It is recommended to replace both left and right tires as a set.)

2) If abnormal uneven wear is found on the tire, adjust the wheel alignment.

3) Also, tire rotations should be done by interchanging front and rear tires as shown to ensure even wear of the tires.



- (A) New tread
- (B) Worn tread
- (C) Tread wear indicator

## 25. Steering System (Power Steering)

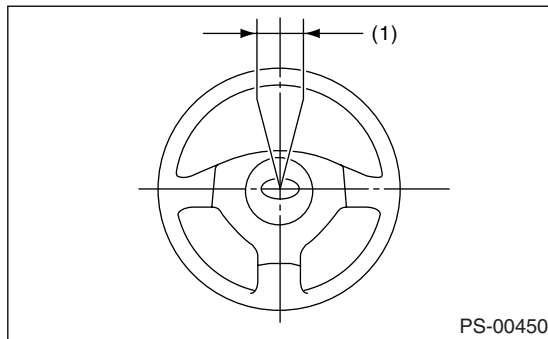
### A: INSPECTION

#### 1. STEERING WHEEL

- 1) Set the steering wheel in a straight-ahead position, and check the wheel spokes to make sure they are correctly set in their specified positions.
- 2) Lightly turn the steering wheel to the right and left to determine the point where front wheels start to move.

Measure the distance of the movement of steering wheel at the outer periphery of wheel.

**Steering wheel free play:**  
**0 — 17 mm (0 — 0.67 in)**



(1) Steering wheel free play

Move the steering wheel vertically toward the shaft to ascertain if there is play in the direction.

**Maximum permissible play:**  
**0.5 mm (0.020 in)**

- 3) Drive the vehicle and check the following items during operation.

(1) Steering force:

The effort required for steering should be smooth and even at all points, and should not vary.

(2) Pull to one side:

Steering wheel should not be pulled to either side while driving on a level surface.

(3) Wheel runout:

Steering wheel should not be runout.

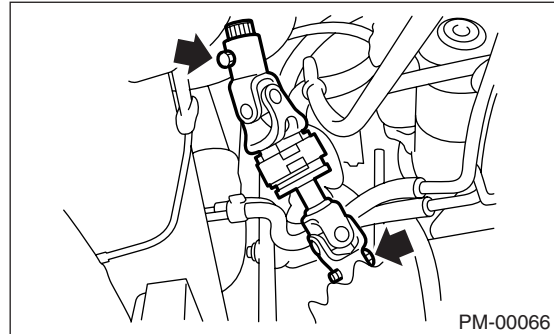
(4) Return factor:

Steering wheel should return to its original position after it has been turned and then released.

#### 2. STEERING SHAFT JOINT

When the steering wheel free play is excessive, disconnect the universal joint of steering shaft and check it for any play and yawing torque (at the point of the crossing direction). Also inspect for any damage to sealing or worn serrations. If the joint is loose, retighten the mounting bolts to the specified torque.

**Tightening torque:**  
**24 N·m (2.4 kgf-m, 17.4 ft-lb)**



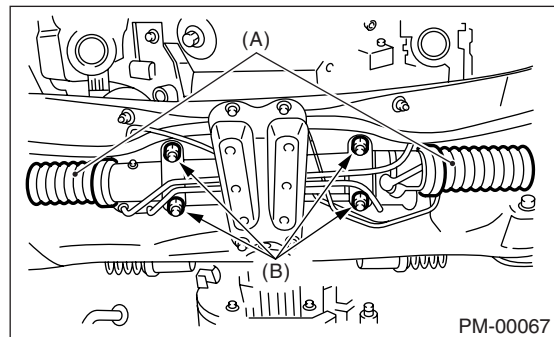
#### 3. GEARBOX

• Non-turbo model

- 1) With vehicle placed on a level surface, turn the steering wheel 90° in both the right and left directions.

While the steering wheel is being rotated, reach under the vehicle and check for looseness in gearbox.

**Tightening torque:**  
**60 N·m (6.1 kgf-m, 44.3 ft-lb)**



(A) Boot

(B) Gear box mounting bolt

- 2) Check the boot for damage, cracks or deterioration.

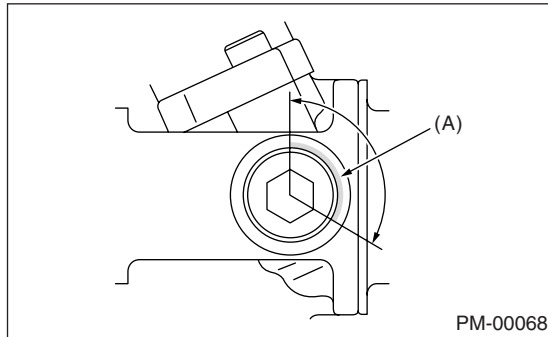
- 3) With the vehicle on a level surface, quickly turn the steering wheel to the right and left.

While the steering wheel is being rotated, check the gear backlash. If any unusual noise is noticed, adjust the gear backlash in the following manner.

# Steering System (Power Steering)

## PERIODIC MAINTENANCE SERVICES

- (1) Tighten the adjusting screw to 7.4 N·m (0.75 kgf·m, 5.4 ft·lb) and then loosen. Repeat this operation twice.
- (2) Retighten the adjusting screw to 7.4 N·m (0.75 kgf·m, 5.4 ft·lb) and back off 25°.
- (3) Apply liquid packing to at least 1/3 of entire perimeter of adjusting screw thread.



(A) Apply liquid packing to at least 1/3 of entire perimeter

- (4) Install the lock nut. While holding the adjusting screw with a wrench, tighten the lock nut using ST.

ST 926230000 SPANNER

### **Tightening torque (Lock nut):**

**40 N·m (4.1 kgf·m, 29.5 ft·lb)**

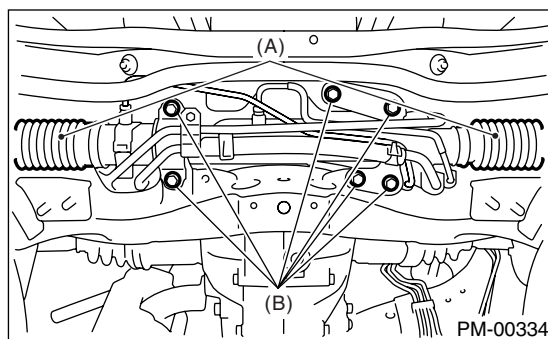
Hold the adjusting screw with a wrench to prevent it from turning, while tightening the lock nut.

### • Turbo model & STI model

- 1) With vehicle placed on a level surface, turn the steering wheel 90° in both the right and left directions. While the steering wheel is being rotated, reach under the vehicle and check for looseness in gearbox.

### **Tightening torque:**

**60 N·m (6.1 kgf·m, 44.3 ft·lb)**

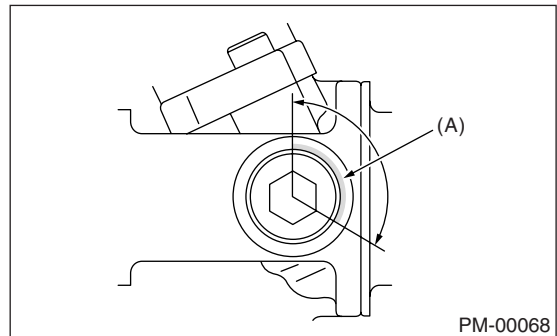


(A) Boot  
(B) Gear box mounting bolt

- 2) Check the boot for damage, cracks or deterioration.

- 3) With the vehicle on a level surface, quickly turn the steering wheel to the right and left. While the steering wheel is being rotated, check the gear backlash. If any unusual noise is noticed, adjust the gear backlash in the following manner.

- (1) Tighten the adjusting screw to 9.8 N·m (1.0 kgf·m, 7.2 ft·lb) and then loosen.
- (2) Retighten the adjusting screw to 4.8 N·m (0.49 kgf·m, 3.5 ft·lb) and then loosen.
- (3) Retighten the adjusting screw to 4.8 N·m (0.49 kgf·m, 3.5 ft·lb) and back off 37°.
- (4) Apply liquid packing to at least 1/3 of entire perimeter of adjusting screw thread.



(A) Apply liquid packing to at least 1/3 of entire perimeter

- (5) Install the lock nut. While holding the adjusting screw with a wrench, tighten the lock nut using ST.

ST 926230000 SPANNER

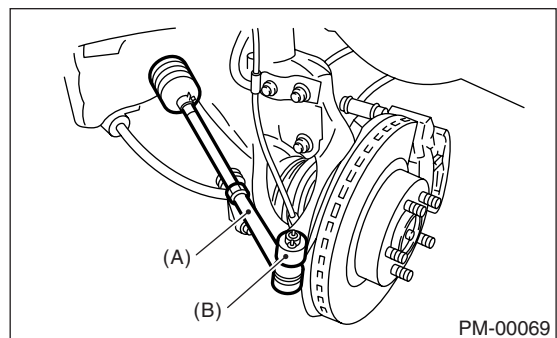
### **Tightening torque (Lock nut):**

**40 N·m (4.1 kgf·m, 29.5 ft·lb)**

Hold the adjusting screw with a wrench to prevent it from turning, while tightening the lock nut.

## 4. TIE-ROD

- 1) Check the tie-rod and tie-rod ends for bends, scratches or other damage.



(A) Tie-rod end  
(B) Knuckle arm

2) Check the connections of knuckle ball joints for play, inspect for damage on dust seals, and check free play of ball studs. If the castle nut is loose, retighten it to the specified torque, then tighten further up to 60° until the cotter pin hole is aligned.

**Tightening torque:**

**27 N·m (2.75 kgf·m, 19.9 ft·lb)**

3) Check the lock nut on tie-rod end for tightness. If it is loose, retighten it to the specified torque.

**Tightening torque:**

**83 N·m (8.5 kgf·m, 61.5 ft·lb)**

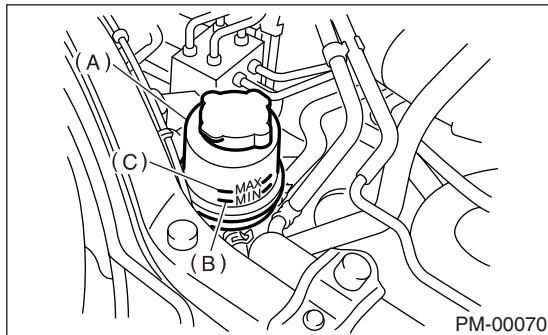
## 5. POWER STEERING FLUID LEVEL

**NOTE:**

- Check at power steering fluid temperature 20°C (68°F); read the fluid level on the “COLD” side.
- Check at power steering fluid temperature 80°C (176°F); read the fluid level on the “HOT” side.

1) Place the vehicle with engine “OFF” on a flat and level surface.

2) Check the fluid level using the scale on the outside of reservoir tank (A). If the level is below “MIN” (B), add fluid to bring it up to “MAX” (C).



**NOTE:**

- If the fluid level is at MAX level or above, drain fluid to keep the level in specified range of indicator by using a syringe or the like.
- If power steering fluid adheres to the exhaust pipe, wipe it off completely.

**Recommended fluid:**

**Dexron III**

**Fluid capacity:**

**0.7 ℓ (0.7 US qt, 0.6 Imp qt)**

## 6. POWER STEERING FLUID FOR LEAKS

Inspect the underside of oil pump and gearbox for power steering system, hoses, piping and their couplings for fluid leaks.

If fluid leaks are found, correct them by retightening their fitting bolts (or nuts) and/or replacing their parts.

**NOTE:**

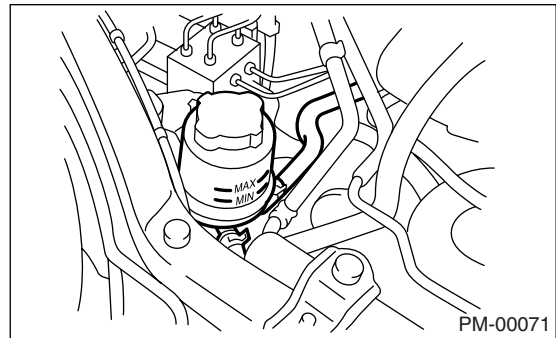
- Wipe the leakage fluid off after correcting fluid leaks, or a wrong diagnosis is taken later.
- Also pay attention to clearances between hoses (or pipings) and other parts when inspecting fluid leaks.

## 7. HOSES OF OIL PUMP FOR DAMAGES

Check the pressure hose and return hose of oil pump for crack, swell or damage. Replace the hose with a new one if necessary.

**NOTE:**

Prevent the hoses from revolving and/or turning when installing hoses.



## 8. POWER STEERING PIPES FOR DAMAGE

Check the power steering pipes for corrosion and damage.

Replace the pipes with a new one if necessary.

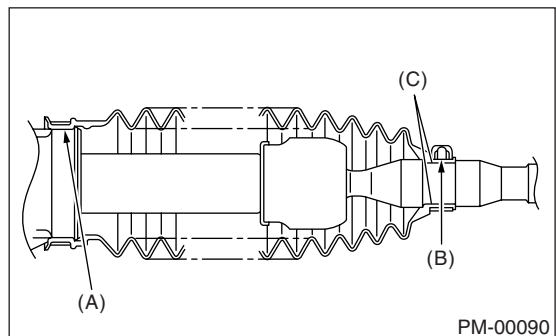
## 9. GEARBOX BOOTS

Inspect both sides of gearbox boots as follows, and correct the defects if necessary.

- 1) (A) and (B) positions of gearbox boot are fitted correspondingly in (A) and (B) grooves of gearbox and the rod (C).
- 2) Clips are fitted outside of (A) and (B) positions of boot.
- 3) Boot does not have crack and hole.

**NOTE:**

Rotate (B) the position of gearbox boot against twist of it produced by adjustment of toe-in, etc.



## Steering System (Power Steering)

PERIODIC MAINTENANCE SERVICES

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### 10.FITTING BOLTS AND NUTS

Inspect the fitting bolts and nuts of oil pump and bracket for looseness, and retighten them if necessary.

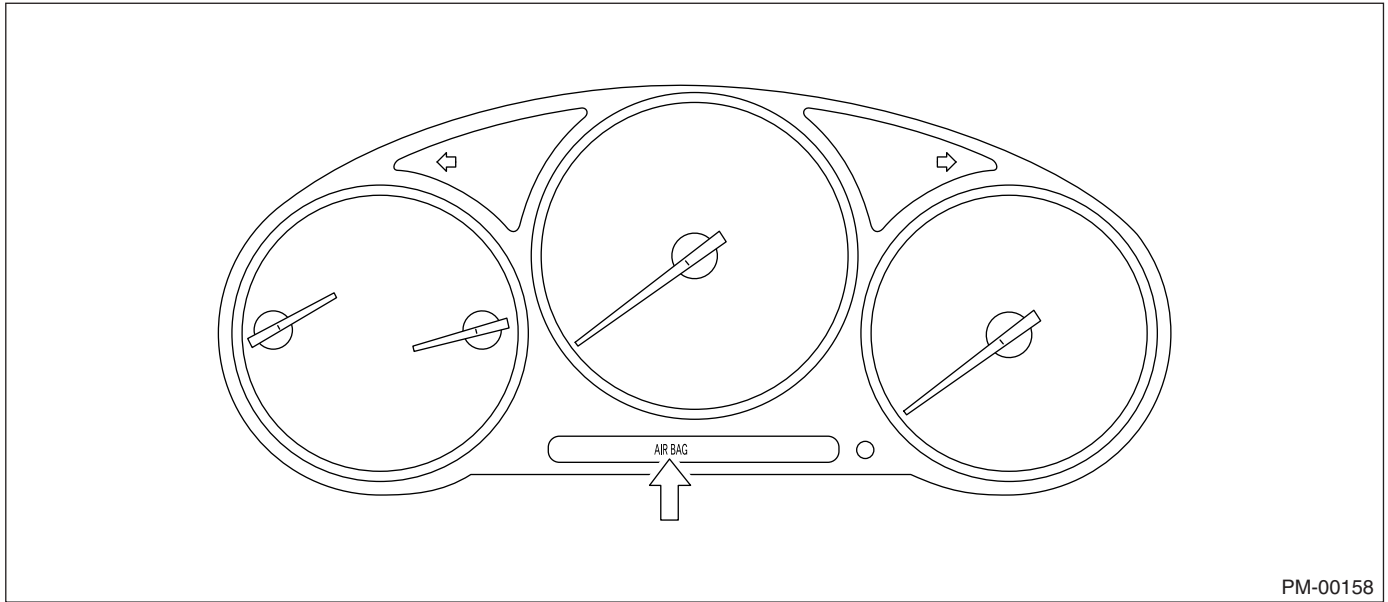
Inspect and/or retighten them when engine is cold.

## 26. Supplemental Restraint System

### A: INSPECTION

Check the airbag system in accordance with the result of the self-diagnosis. <Ref. to AB(diag)-2, Basic Diagnostic Procedure.>

1) Ensure that airbag connectors are connected. If not, properly connect. When the ignition switch is turned ON with the connector(s) disconnected, the airbag warning light blinks to identify the fault.



2) When the warning light turns on, check the airbag system in accordance with the troubleshooting procedure. <Ref. to AB(diag)-2, Basic Diagnostic Procedure.>

# Supplemental Restraint System

PERIODIC MAINTENANCE SERVICES

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**ENGINE SECTION 1**

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

**FUEL INJECTION (FUEL SYSTEMS) FU(H4SO)**

**EMISSION CONTROL  
(AUX. EMISSION CONTROL DEVICES) EC(H4SO)**

**INTAKE (INDUCTION) IN(H4SO)**

**MECHANICAL ME(H4SO)**

**EXHAUST EX(H4SO)**

**COOLING CO(H4SO)**

**LUBRICATION LU(H4SO)**

**SPEED CONTROL SYSTEMS SP(H4SO)**

**IGNITION IG(H4SO)**

**STARTING/CHARGING SYSTEMS SC(H4SO)**

**ENGINE (DIAGNOSTICS) EN(H4SO)(diag)**

**GENERAL DESCRIPTION GD(H4SO)**





# FUEL INJECTION (FUEL SYSTEMS)

## *FU(H4SO)*

---

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# General Description

FUEL INJECTION (FUEL SYSTEMS)

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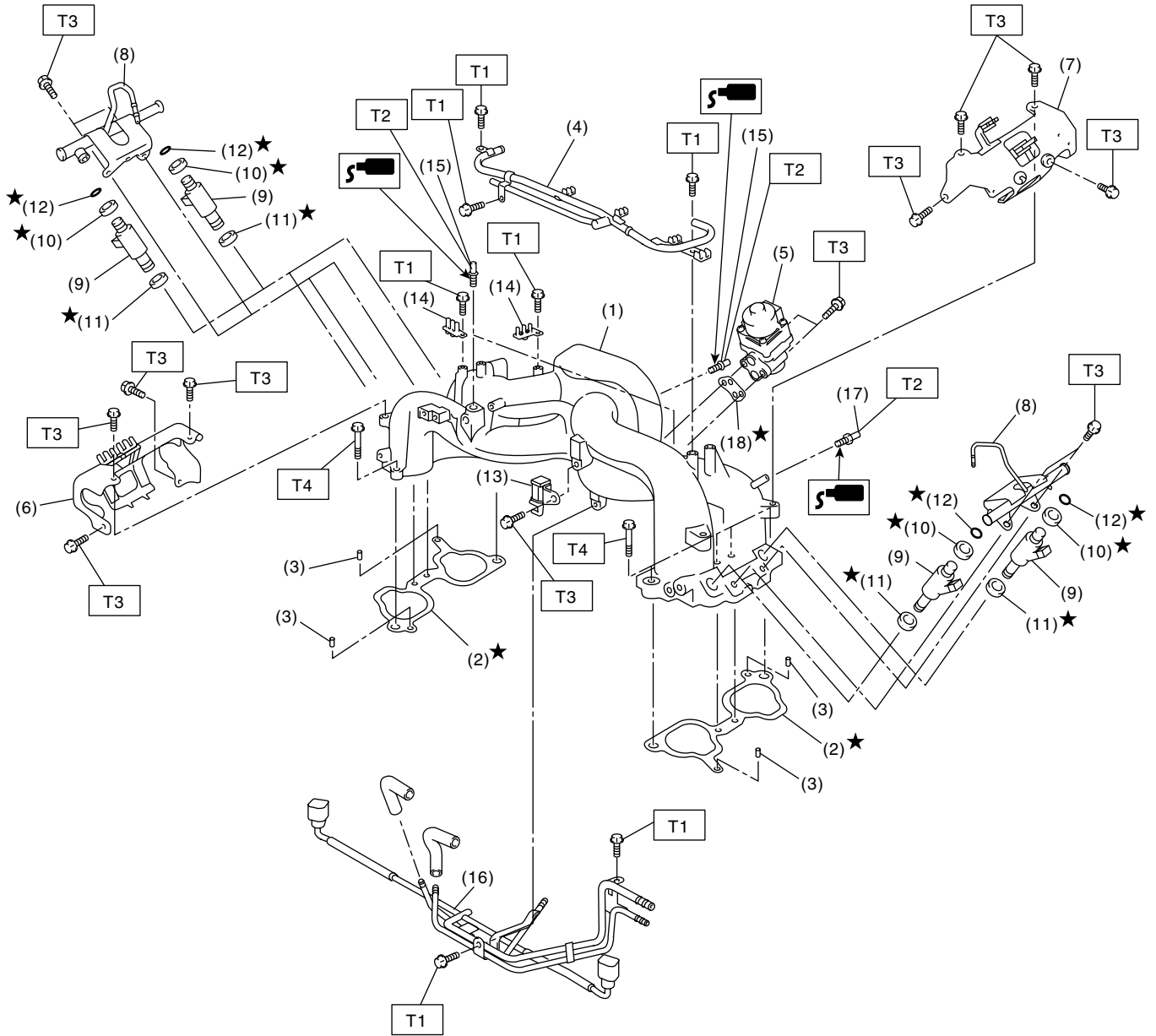
## 1. General Description

### A: SPECIFICATION

| Item        |                            | Specification   |
|-------------|----------------------------|---|
| Fuel tank   | Capacity                   | 60 ℓ (15.9 US gal, 13.2 Imp gal)  |
|             | Location                   | Under rear seat   |
| Fuel pump   | Type                       | Impeller  |
|             | Shutoff discharge pressure | 370 — 677 kPa (3.77 — 6.9 kgf/cm <sup>2</sup> , 53.6 — 98 psi)  |
|             | Discharge flow             | More than 105 ℓ (27.7 US gal, 23.1 Imp gal)/h.<br>[12 V at 300 kPa (3.06 kgf/cm <sup>2</sup> , 43.5 psi)] |
| Fuel filter |                            | Cartridge type  |

### B: COMPONENT

#### 1. INTAKE MANIFOLD



# General Description

## FUEL INJECTION (FUEL SYSTEMS)

- |                            |                                   |             |
|----------------------------|-----------------------------------|-------------|
| (1) Intake manifold        | (9) Fuel injector                 | (17) Nipple |
| (2) Gasket                 | (10) O-ring                       | (18) Gasket |
| (3) Guide pin              | (11) O-ring                       |             |
| (4) PCV pipe               | (12) O-ring                       |             |
| (5) EGR valve              | (13) Purge control solenoid valve |             |
| (6) Fuel pipe protector RH | (14) Plug cord holder             |             |
| (7) Fuel pipe protector LH | (15) Nipple                       |             |
| (8) Fuel injector pipe     | (16) Fuel pipe ASSY               |             |

**Tightening torque: N·m (kgf·m, ft·lb)**

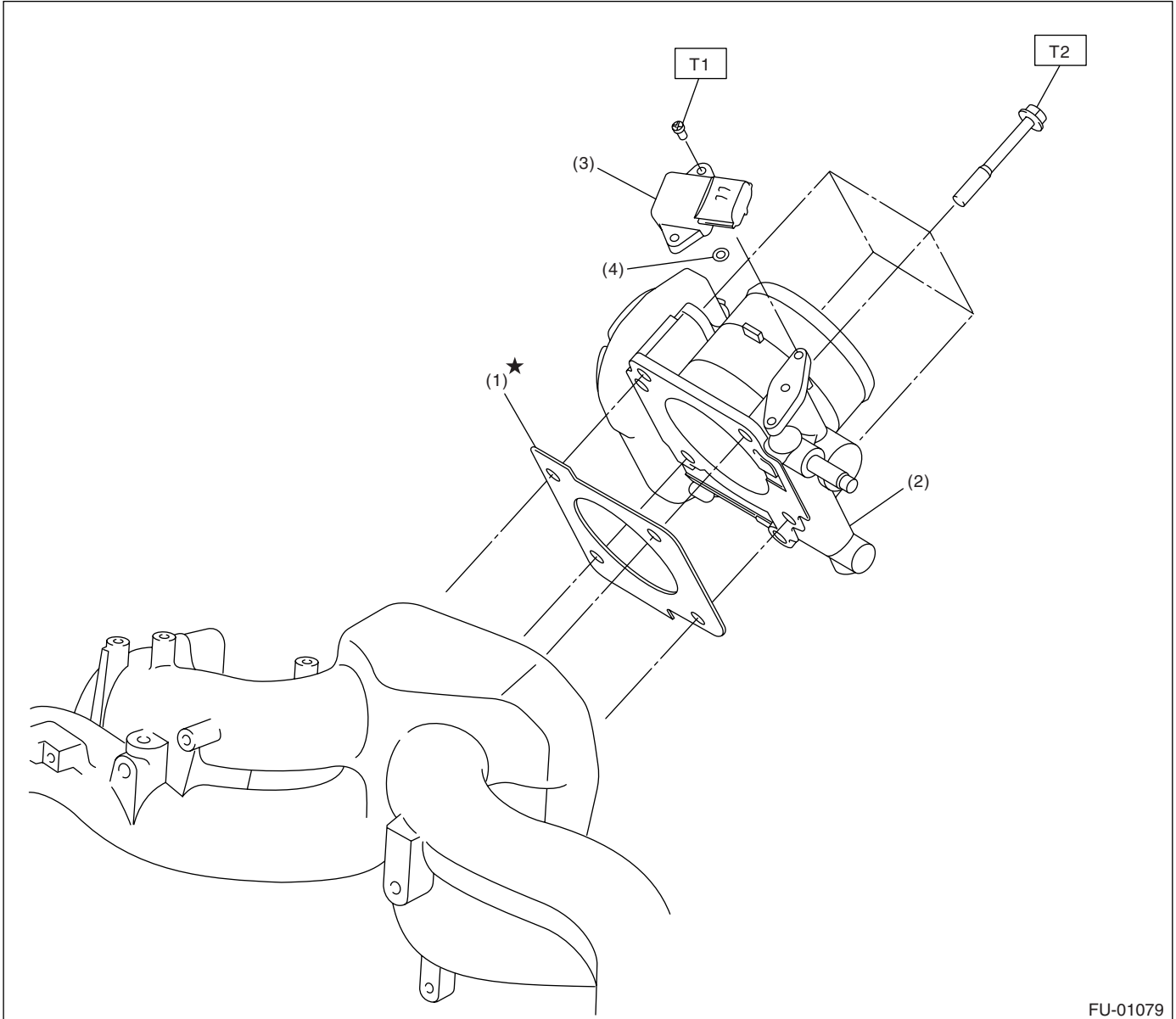
**T1: 6.4 (0.65, 4.7)**

**T2: 17 (1.7, 12.5)**

**T3: 19 (1.9, 13.7)**

**T4: 25 (2.5, 18.1)**

## 2. AIR INTAKE SYSTEM



FU-01079

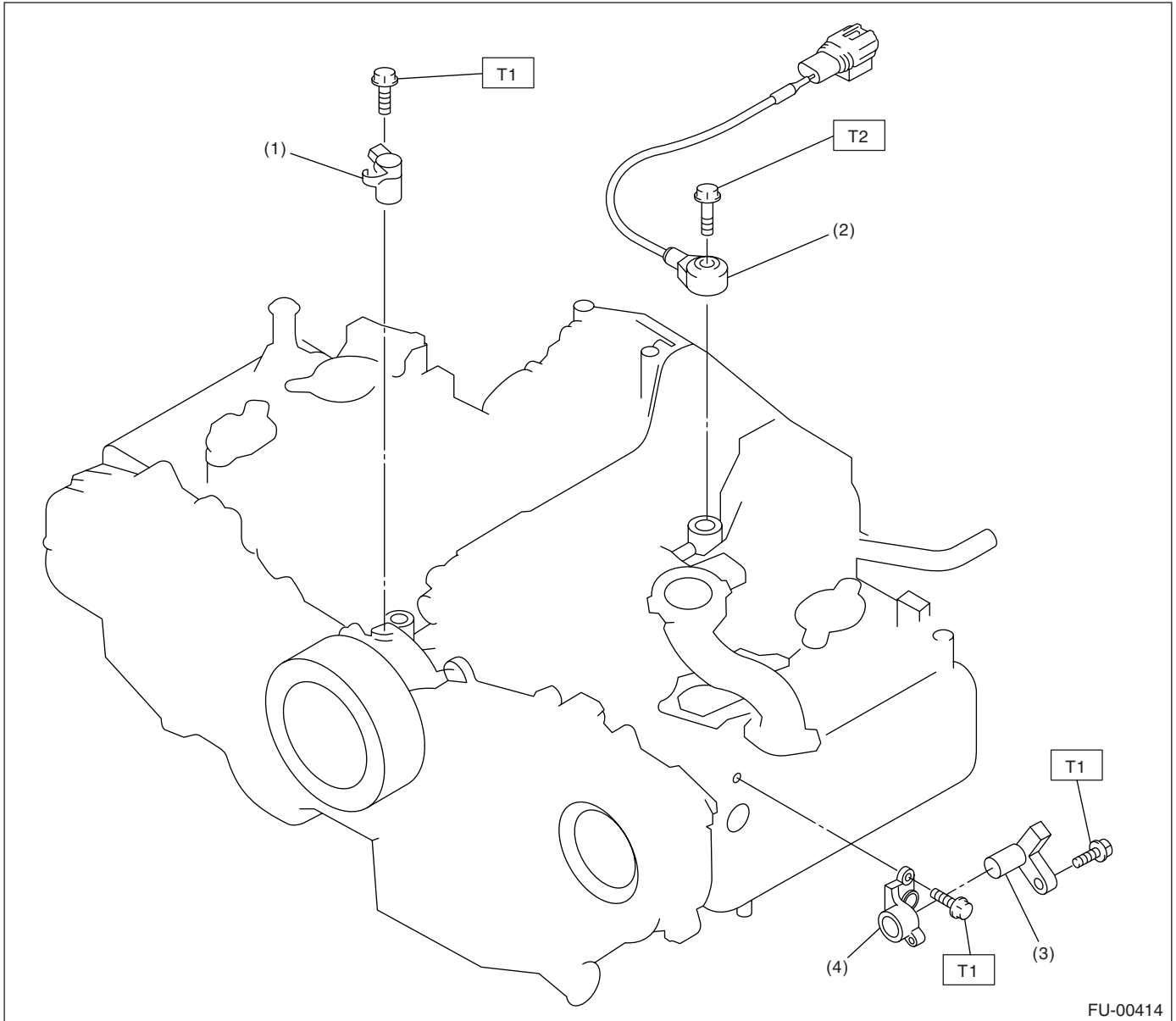
- |                                       |            |
|---------------------------------------|------------|
| (1) Gasket                            | (4) O-ring |
| (2) Throttle body                     |            |
| (3) Manifold absolute pressure sensor |            |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 2.0 (0.20, 1.5)**

**T2: 8 (0.8, 5.8)**

## 3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



- (1) Crankshaft position sensor
- (2) Knock sensor

- (3) Camshaft position sensor
- (4) Camshaft position sensor support

**Tightening torque: N·m (kgf·m, ft·lb)**

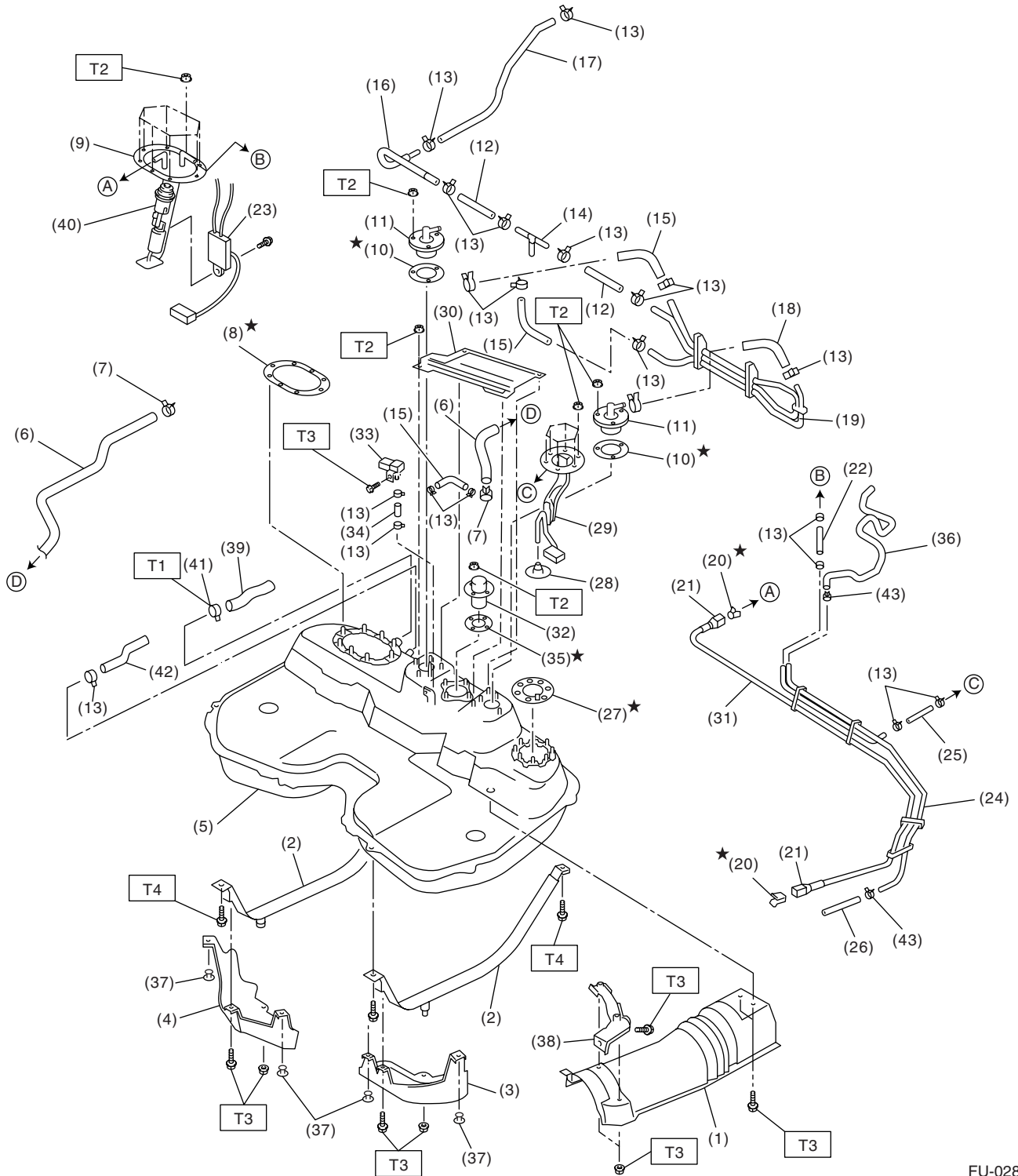
**T1: 6.4 (0.65, 4.7)**

**T2: 24 (2.4, 17.4)**

# General Description

## FUEL INJECTION (FUEL SYSTEMS)

### 4. FUEL TANK



FU-02860

# General Description

## FUEL INJECTION (FUEL SYSTEMS)

|                            |                                     |                         |
|----------------------------|-------------------------------------|-------------------------|
| (1) Heat shield cover      | (18) Evaporation hose D             | (35) Vent valve gasket  |
| (2) Fuel tank band         | (19) Evaporation pipe ASSY          | (36) Purge hose         |
| (3) Protector LH           | (20) Retainer                       | (37) Clip               |
| (4) Protector RH           | (21) Quick connector                | (38) Cover bracket      |
| (5) Fuel tank              | (22) Jet pump hose A                | (39) Fuel filler hose   |
| (6) Canister hose          | (23) Fuel level sensor              | (40) Fuel filter        |
| (7) Clamp                  | (24) Fuel pipe ASSY                 | (41) Clamp              |
| (8) Fuel pump gasket       | (25) Jet pump hose B                | (42) Evaporation hose F |
| (9) Fuel pump ASSY         | (26) Evaporation hose E             | (43) Clamp              |
| (10) Fuel cut valve gasket | (27) Fuel sub level sensor gasket   |                         |
| (11) Fuel cut valve        | (28) Jet pump filter                |                         |
| (12) Evaporation hose A    | (29) Fuel sub level sensor          |                         |
| (13) Clip                  | (30) Protector cover                |                         |
| (14) Joint pipe            | (31) Fuel delivery tube             |                         |
| (15) Evaporation hose B    | (32) Vent valve                     |                         |
| (16) Evaporation pipe      | (33) Fuel tank pressure sensor      |                         |
| (17) Evaporation hose C    | (34) Fuel tank pressure sensor hose |                         |

---

**Tightening torque: N·m (kgf-m, ft-lb)****T1: 1.96 (0.20, 1.45)****T2: 4.4 (0.45, 3.3)****T3: 7.4 (0.75, 5.4)****T4: 33 (3.4, 25)**

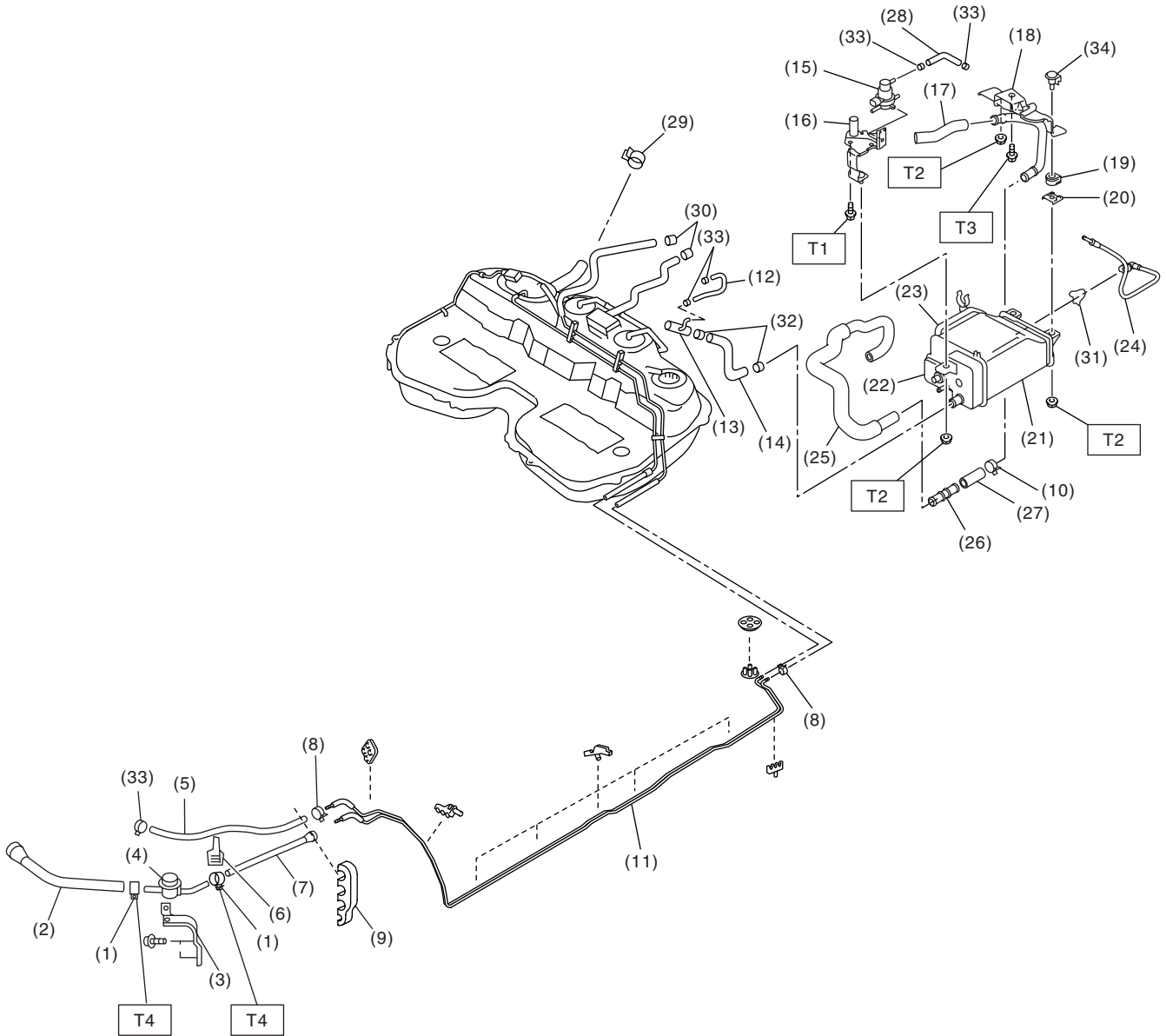
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# General Description

FUEL INJECTION (FUEL SYSTEMS)

## 5. FUEL LINE



FU-02823

FU(H4SO)-8

# General Description

## FUEL INJECTION (FUEL SYSTEMS)

---

|                                      |  |   |
|--------------------------------------|--|---|
| (1) Clamp                            | (16) Pressure control solenoid valve bracket | (28) Pressure control solenoid valve hose |
| (2) Fuel delivery hose A             | (17) Drain hose C                            | (29) Clamp                                |
| (3) Fuel damper valve bracket        | (18) Canister upper bracket                  | (30) Clamp                                |
| (4) Fuel damper valve (delivery)     | (19) Cushion rubber                          | (31) Retainer                             |
| (5) Evaporation hose A               | (20) Canister lower bracket                  | (32) Clamp                                |
| (6) Clip                             | (21) Canister                                | (33) Clamp                                |
| (7) Fuel delivery hose B             | (22) Drain valve                             | (34) Canister bracket spacer              |
| (8) Clamp                            | (23) Drain filter                            |   |
| (9) Clip                             | (24) Pressure control solenoid valve tube    |   |
| (10) Clamp                           | (25) Drain hose A                            |   |
| (11) Fuel pipe ASSY                  | (26) Drain connector                         |   |
| (12) Evaporation hose B              | (27) Drain hose B                            |   |
| (13) Joint pipe                      |  |   |
| (14) Canister hose A                 |  |   |
| (15) Pressure control solenoid valve |  |   |

---

**Tightening torque: N·m (kgf-m, ft-lb)**

**T1: 25 (2.5, 18.1)**

**T2: 23 (2.3, 16.6)**

**T3: 33 (3.4, 25)**

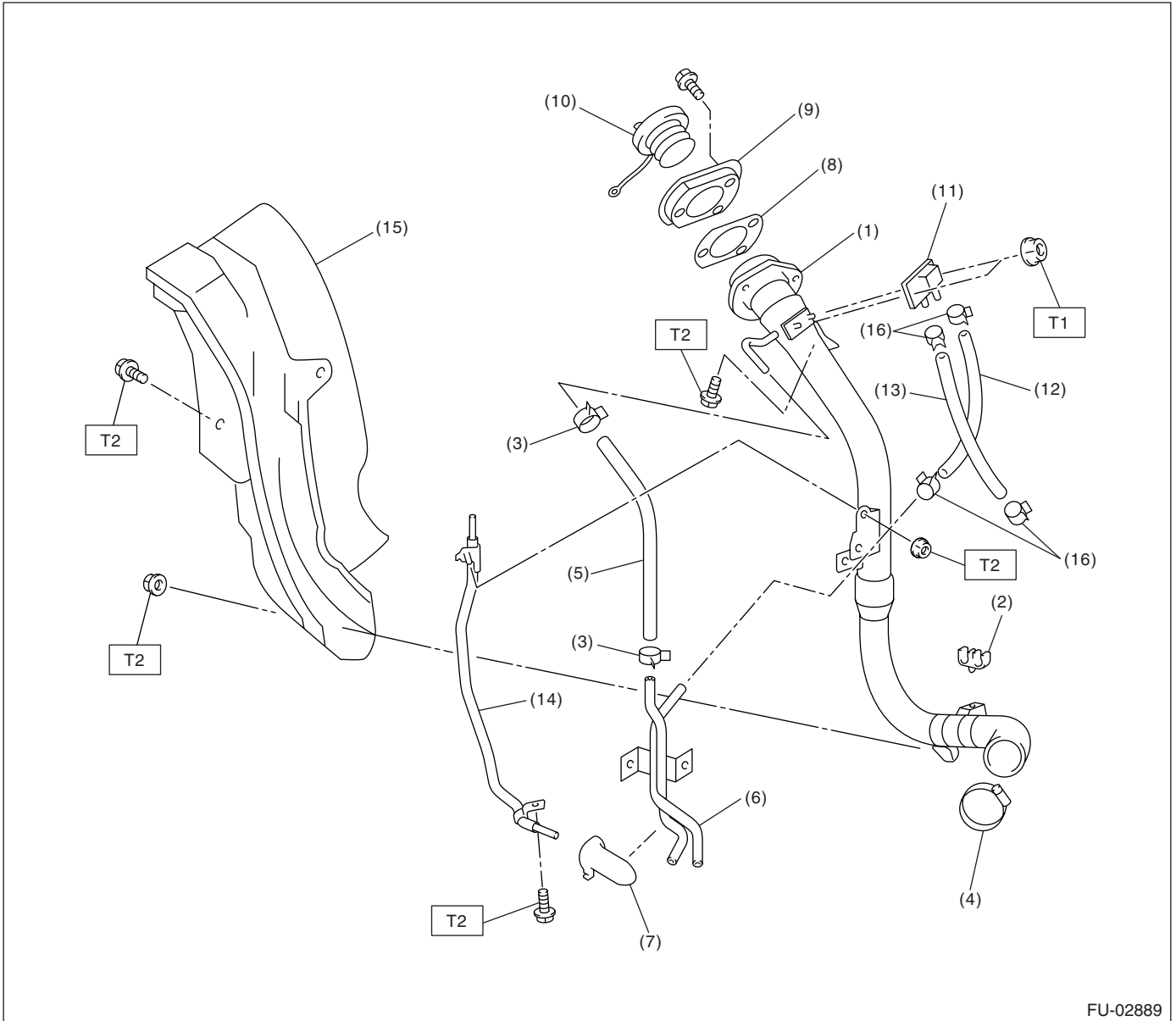
**T4: 1.25 (0.13, 0.94)**

---

# General Description

## FUEL INJECTION (FUEL SYSTEMS)

### 6. FUEL FILLER PIPE



FU-02889

- |                             |                         |                                 |
|-----------------------------|-------------------------|---------------------------------|
| (1) Fuel filler pipe ASSY   | (8) Filler pipe packing | (15) Fuel filler pipe protector |
| (2) Evaporation hose holder | (9) Filler ring         | (16) Clamp                      |
| (3) Clamp                   | (10) Filler cap         |                                 |
| (4) Clamp                   | (11) Shut valve         |                                 |
| (5) Evaporation hose A      | (12) Evaporation hose B |                                 |
| (6) Evaporation pipe        | (13) Evaporation hose C |                                 |
| (7) Evaporation pipe holder | (14) Joint pipe         |                                 |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 4.4 (0.45, 3.3)**

**T2: 7.5 (0.76, 5.5)**

# General Description

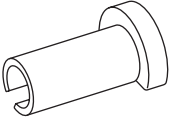
FUEL INJECTION (FUEL SYSTEMS)

## C: CAUTION

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.

- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

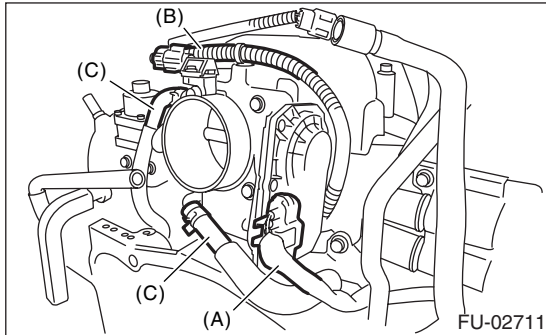
## D: PREPARATION TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION       | REMARKS  |
|---|-------------|-------------------|--|
| <br><br>ST42099AE000 | 42099AE000  | CONNECTOR REMOVER | Used for removing quick connector in engine compartment. |

## 2. Throttle Body

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the air intake chamber. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Chamber.>
- 3) Disconnect the connectors from the throttle position sensor and manifold absolute pressure sensor.
- 4) Disconnect the engine coolant hoses from throttle body.
- 5) Remove the bolts which secure throttle body to intake manifold.



- (A) Throttle position sensor
- (B) Manifold absolute pressure sensor
- (C) Engine coolant hose

### B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use a new gasket.

**Tightening torque:**

**8 N·m (0.8 kgf-m, 5.8 ft-lb)**

## 3. Intake Manifold

### A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(H4SO)-42, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Disconnect the ground cable from battery.

3) Open the fuel filler flap lid, and remove the fuel filler cap.

4) Remove the air intake duct, air cleaner case and air intake chamber. <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.> <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.> <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Chamber.>

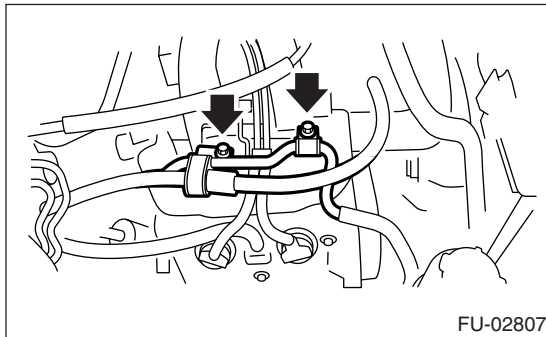
5) Remove the generator. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>

6) Remove the power steering pump and reservoir tank from bracket.

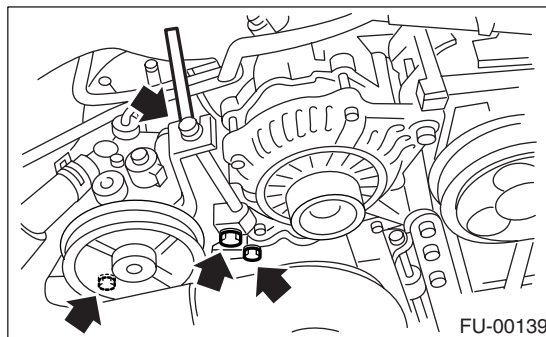
(1) Remove the bolts which hold power steering pipes onto the protector.

#### NOTE:

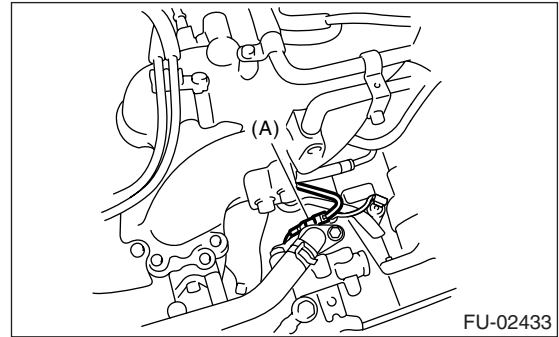
Do not disconnect the power steering hose.



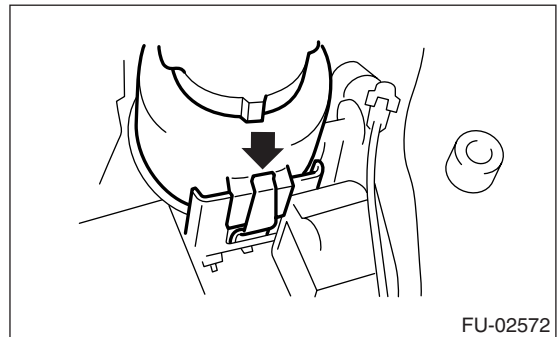
(2) Remove the bolts which install power steering pump bracket.



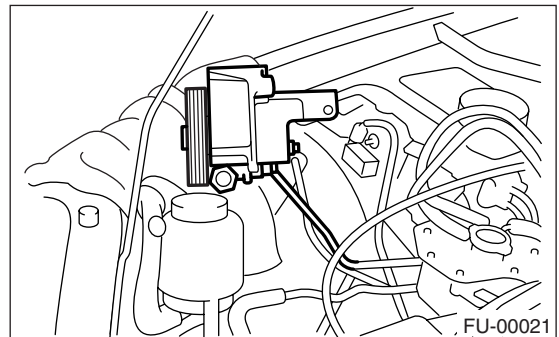
(3) Disconnect the connector (A) from the power steering pump switch.



(4) Remove the reservoir tank from the bracket by pulling it upwards.

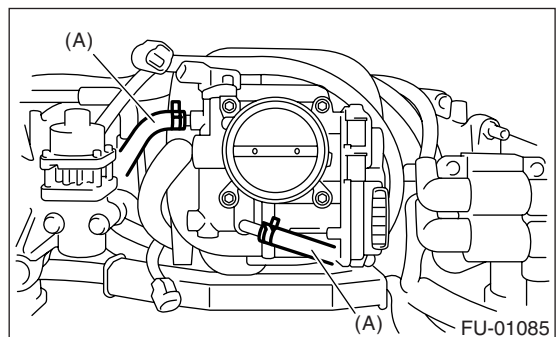


(5) Place the power steering pump on the right side wheel apron.



7) Disconnect the spark plug cords from spark plugs by pulling the plug cap. (Do not pull the cord.)

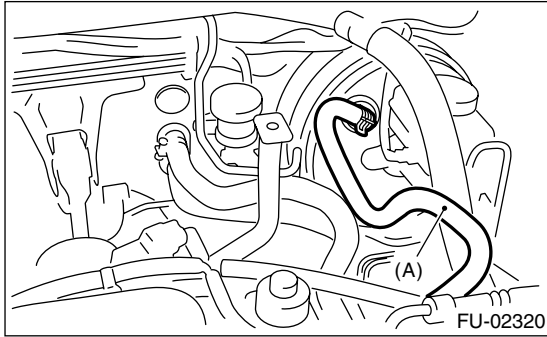
8) Disconnect the engine coolant hoses (A) from throttle body.



# Intake Manifold

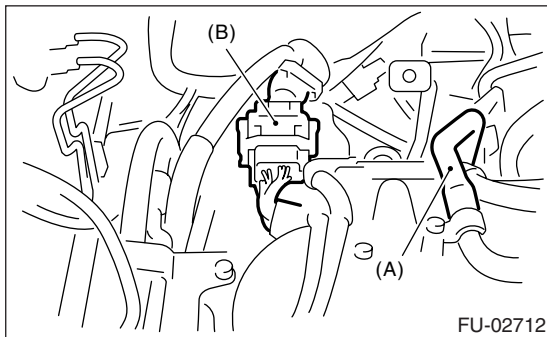
## FUEL INJECTION (FUEL SYSTEMS)

9) Disconnect the brake booster hose (A).

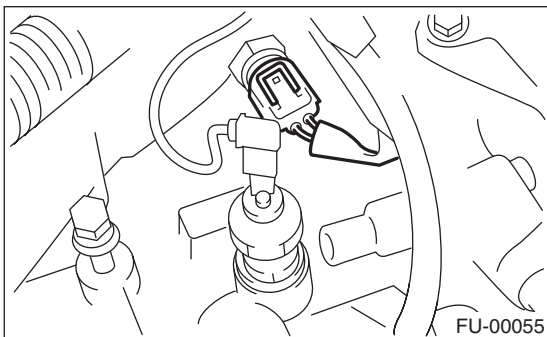


10) Disconnect the PCV hose (A) from intake manifold.

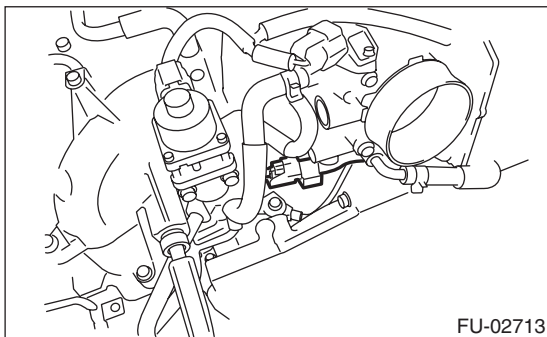
11) Disconnect the engine harness connectors (B) from bulkhead harness connectors.



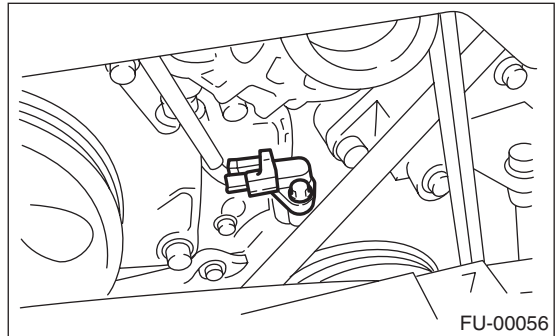
12) Disconnect the connectors from engine coolant temperature sensor.



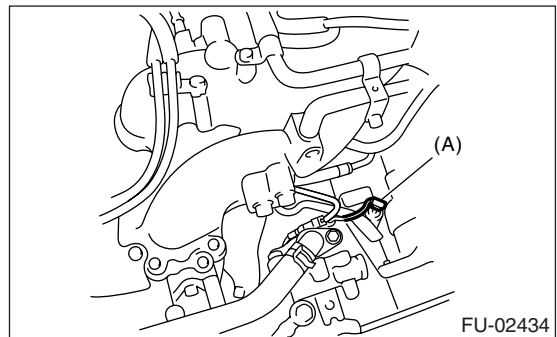
13) Disconnect the knock sensor connector.



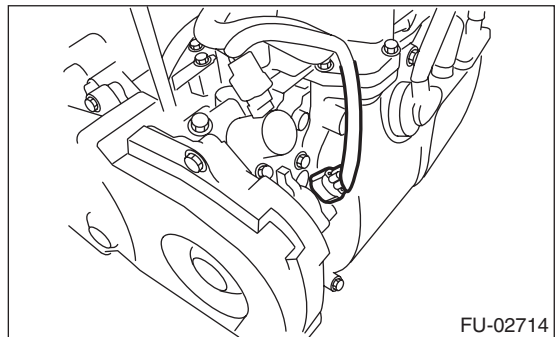
14) Disconnect the connector from crankshaft position sensor.



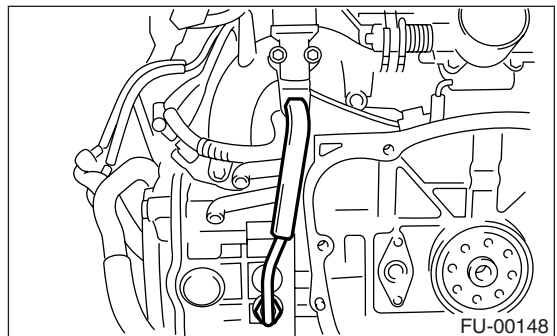
15) Disconnect the connector from oil pressure switch (A).



16) Disconnect the connector from camshaft position sensor.



17) Remove the EGR pipe from intake manifold.



18) Disconnect the fuel hoses from fuel pipes.

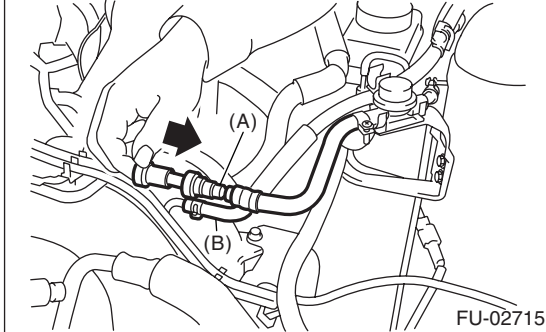
(1) Separate the quick connectors of fuel delivery line and return line by pushing the ST to the direction of arrow.

ST 42099AE00 CONNECTOR REMOVER

(2) Remove the clip, and separate the evaporation hose from pipe.

**WARNING:**

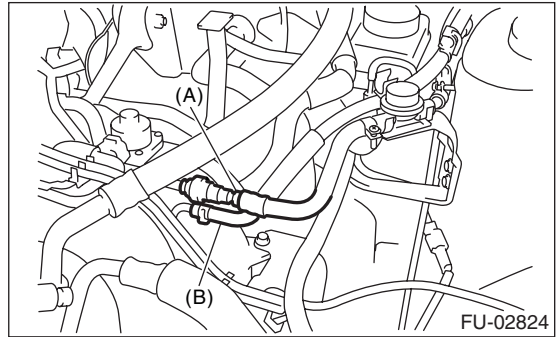
- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.



(A) Fuel delivery hose  
(B) Evaporation hose

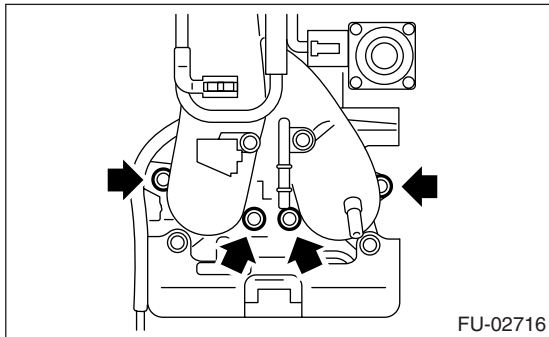
**NOTE:**

If hoses are damaged, replace them with new ones.



(A) Fuel delivery hose  
(B) Evaporation hose

19) Remove the bolts which secure intake manifold to cylinder head.



20) Remove the intake manifold.

**B: INSTALLATION**

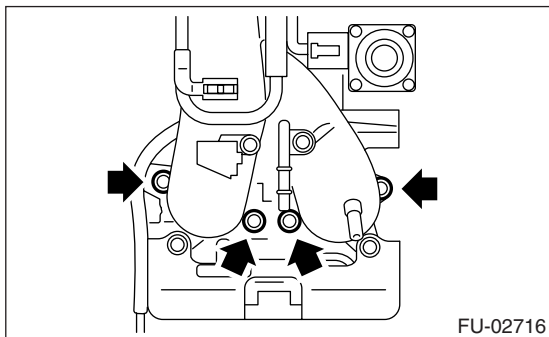
1) Install the intake manifold onto cylinder heads.

**NOTE:**

Use a new gasket.

**Tightening torque:**

**25 N-m (2.5 kgf-m, 18.1 ft-lb)**

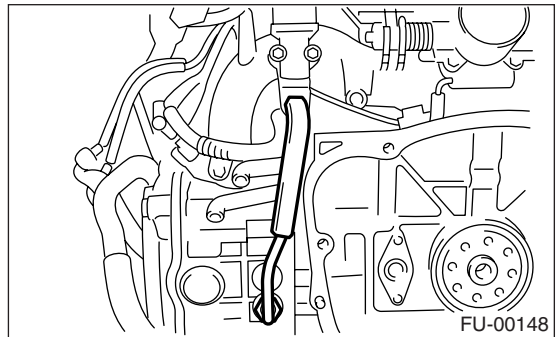


2) Connect the fuel hoses and evaporation hose to fuel pipe.

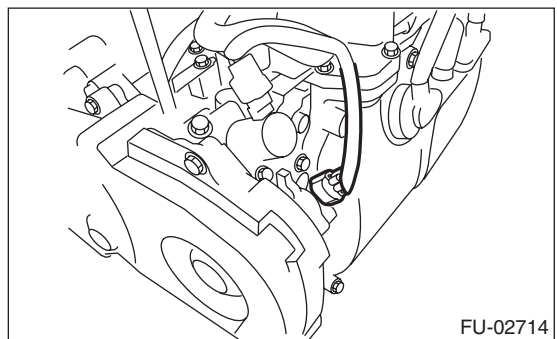
3) Install the EGR pipe to intake manifold.

**Tightening torque:**

**34 N-m (3.4 kgf-m, 24.6 ft-lb)**



4) Connect the connector to camshaft position sensor.

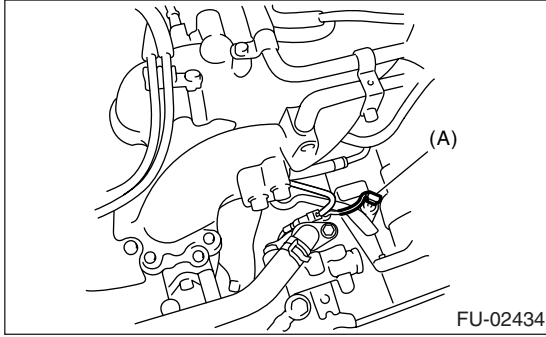




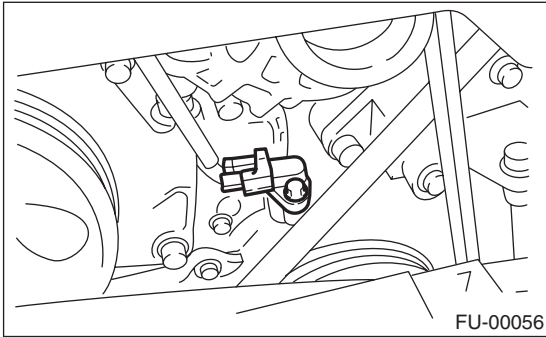
# Intake Manifold

## FUEL INJECTION (FUEL SYSTEMS)

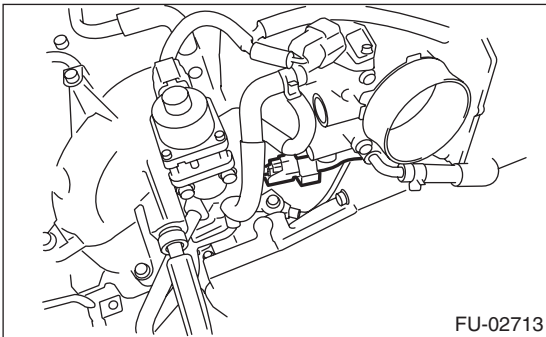
5) Connect the connector to oil pressure switch (A).



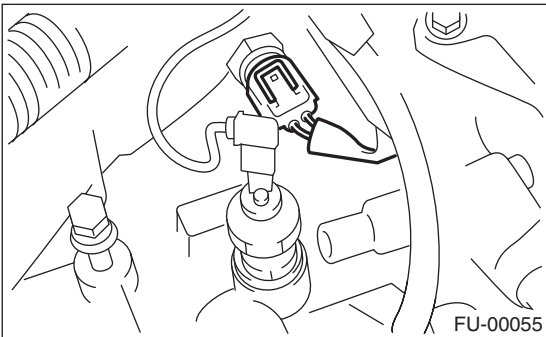
6) Connect the connector to crankshaft position sensor.



7) Connect the knock sensor connector.

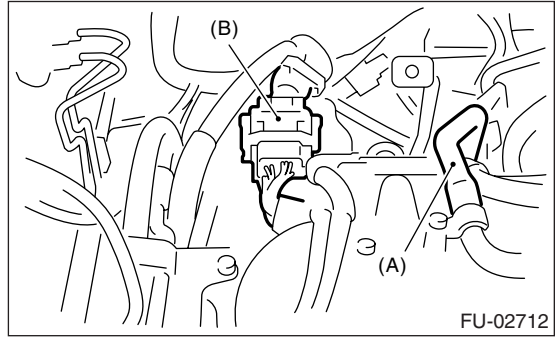


8) Connect the connectors to engine coolant temperature sensor.

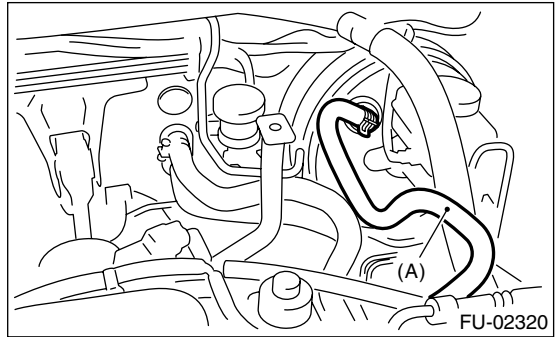


9) Connect the PCV hose (A) to intake manifold.

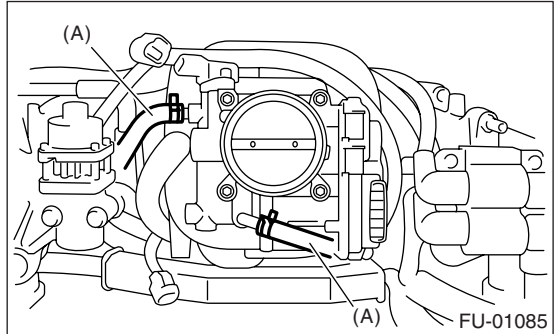
10) Connect the engine harness connectors (B) to bulkhead harness connectors.



11) Connect the brake booster hose (A).



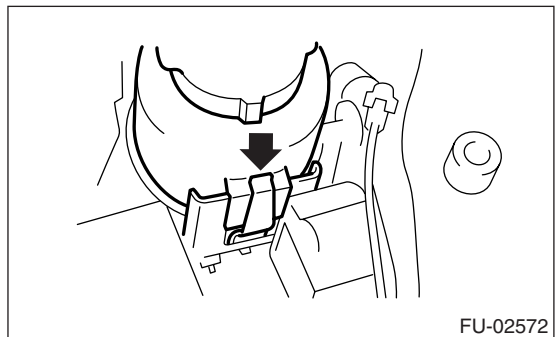
12) Connect the engine coolant hoses (A) to throttle body.



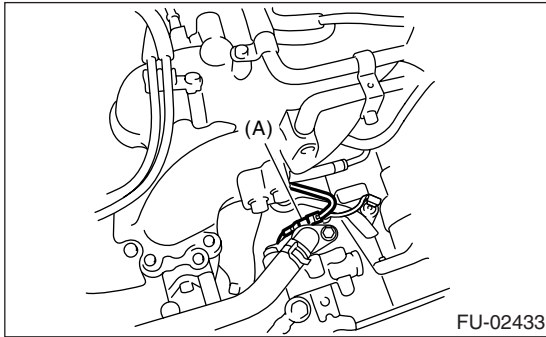
13) Connect the spark plug cords to spark plugs.

14) Install the power steering pump and reservoir tank to bracket.

(1) Install the reservoir tank to bracket.

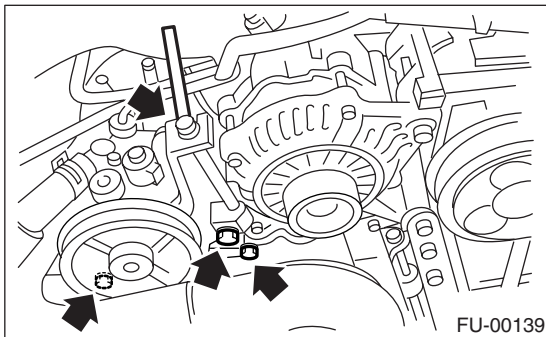


- (2) Connect the connector (A) to the power steering pump switch.



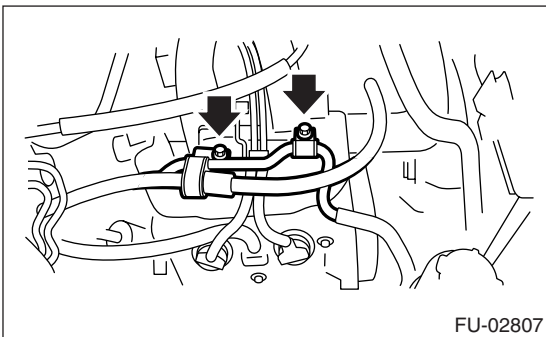
- (3) Tighten the bolts which install power steering pump bracket.

**Tightening torque:**  
**22 N·m (2.2 kgf·m, 15.9 ft·lb)**



- (4) Install the power steering pipes onto the right side intake manifold protector.

**Tightening torque:**  
**13 N·m (1.3 kgf·m, 9.4 ft·lb)**



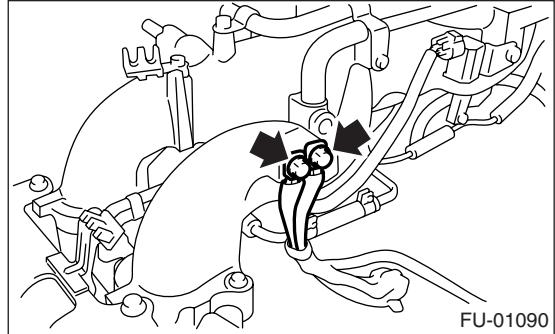
- 15) Install the generator. <Ref. to SC(H4SO)-14, INSTALLATION, Generator.>

- 16) Install the air intake duct, air cleaner case and air intake chamber. <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.> <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Chamber.>

- 17) Connect the connector to fuel pump relay.  
 18) Connect the battery ground cable to battery.

## C: DISASSEMBLY

- 1) Disconnect the engine ground terminal from intake manifold.

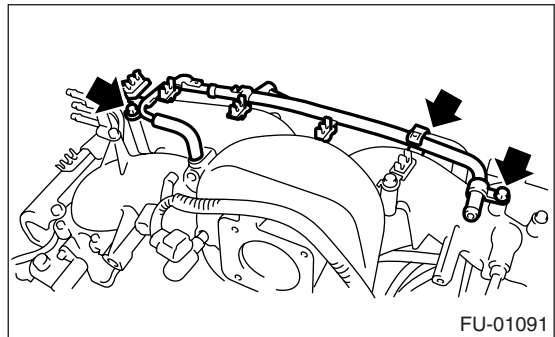


- 2) Remove the ignition coil and ignitor assembly. <Ref. to IG(H4SO)-7, REMOVAL, Ignition Coil and Ignitor Assembly.>

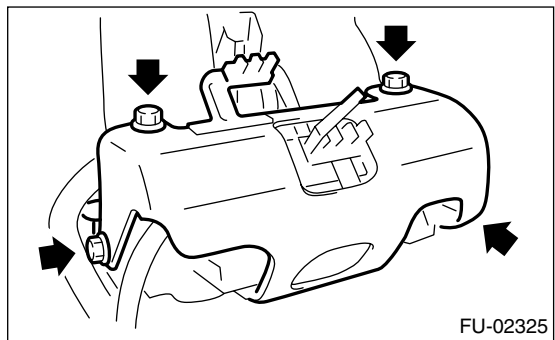
- 3) Remove the throttle body. <Ref. to FU(H4SO)-12, REMOVAL, Throttle Body.>

- 4) Remove the EGR valve. <Ref. to FU(H4SO)-29, REMOVAL, EGR Valve.>

- 5) Remove the PCV pipe.



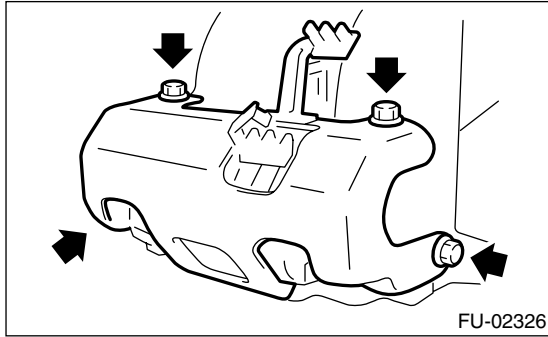
- 6) Remove the fuel pipe protector LH.



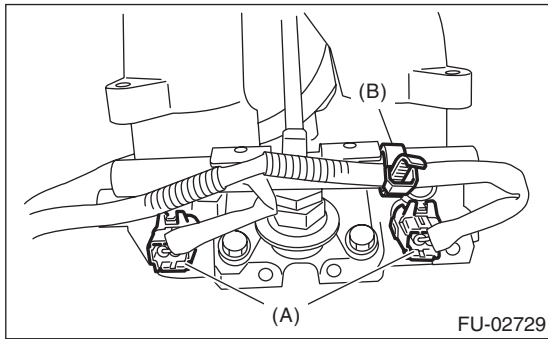
# Intake Manifold

## FUEL INJECTION (FUEL SYSTEMS)

7) Remove the fuel pipe protector RH.

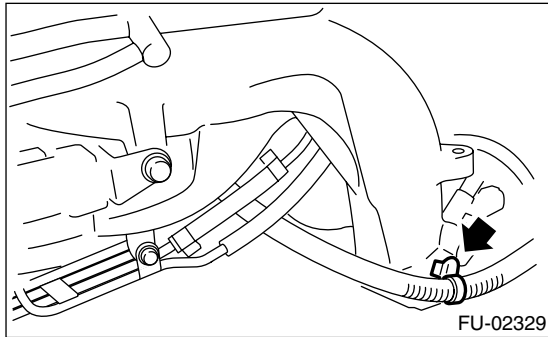


8) Disconnect the connectors (A) from fuel injector.  
9) Remove the harness band (B) which holds engine harness to fuel injector pipe.

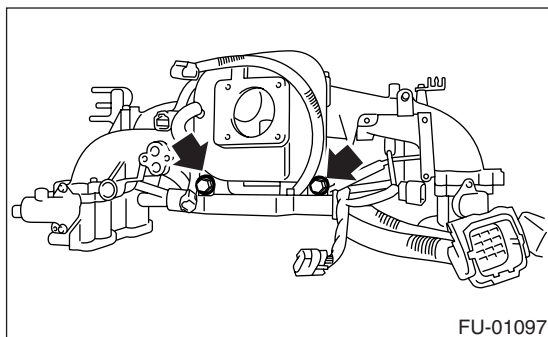


10) Remove the purge control solenoid valve.  
<Ref. to EC(H4SO)-7, REMOVAL, Purge Control Solenoid Valve.>

11) Remove the harness band clips which install the engine harness.



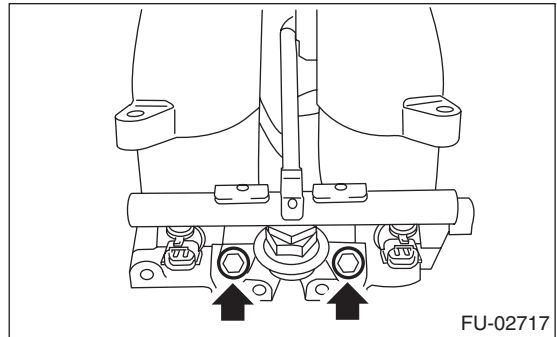
12) Remove the bolts which hold the engine harness to intake manifold.



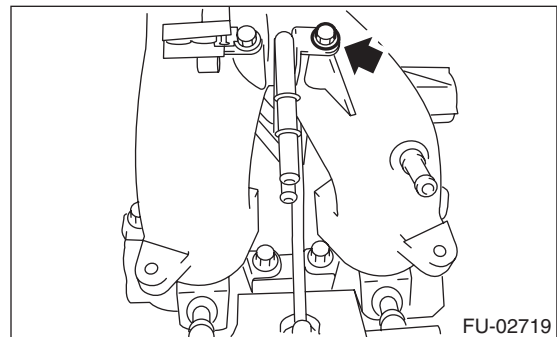
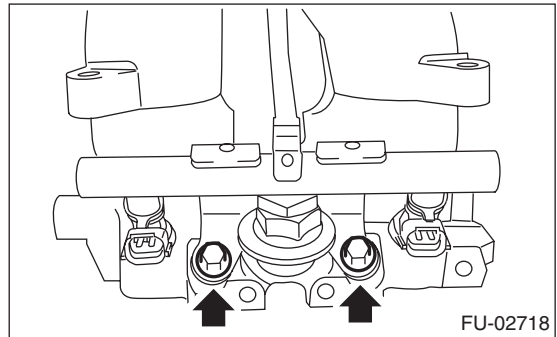
13) Remove the engine harness from intake manifold.

14) Remove the bolts which secure fuel injector pipe on the intake manifold as shown in the figure.

• RH side

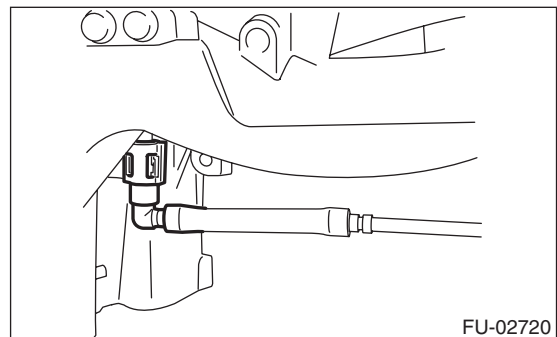


• LH side



15) Remove the fuel injectors from fuel injector pipe.

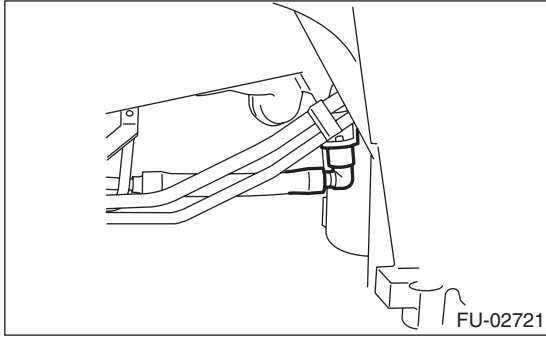
16) Disconnect the quick connector which holds the fuel injector pipe RH to fuel pipe.



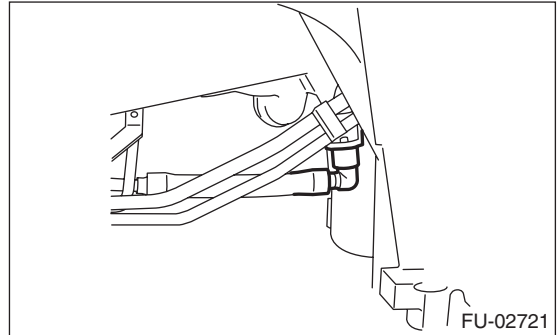
# Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

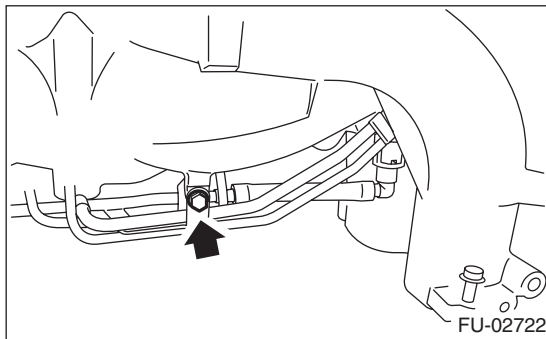
17) Disconnect the quick connector which holds the fuel injector pipe LH to fuel pipe.



NOTE:  
Connect the quick connector securely.

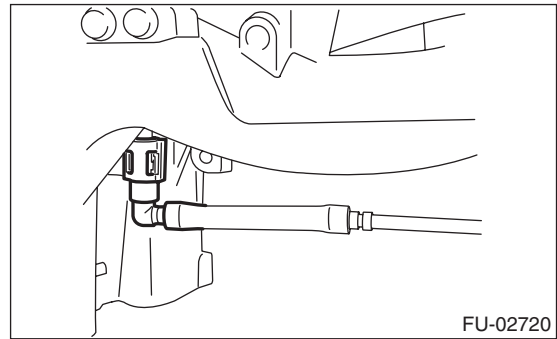


18) Remove the fuel injector pipes RH and LH.  
19) Remove the bolt which installs the fuel pipe assembly on intake manifold.



3) Connect the fuel injector pipe RH to fuel pipe.

NOTE:  
Connect the quick connector securely.



20) Remove the fuel pipe assembly from intake manifold.

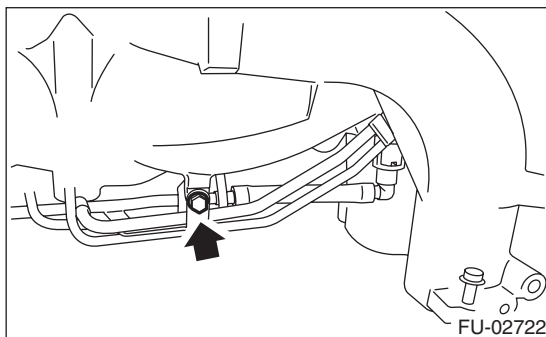
## D: ASSEMBLY

NOTE:  
When assembling the nipple, apply liquid gasket.

**Liquid gasket:**  
**THREE BOND 1105 (Part No. 004403010)**

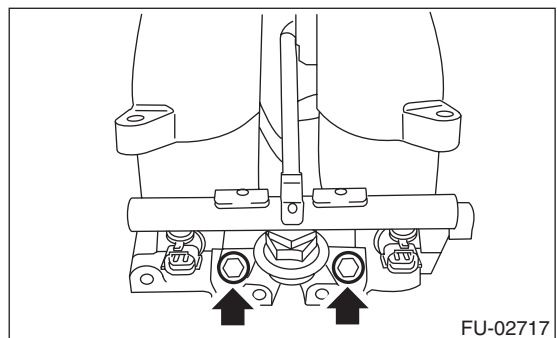
1) Tighten the bolt which installs the fuel pipe assembly on intake manifold.

**Tightening torque:**  
**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



4) Install the fuel injectors.  
5) Tighten the bolts which install fuel injector pipe on intake manifold.  
• RH side

**Tightening torque:**  
**19 N·m (1.9 kgf-m, 13.7 ft-lb)**



2) Connect the fuel injector pipe LH to fuel pipe.

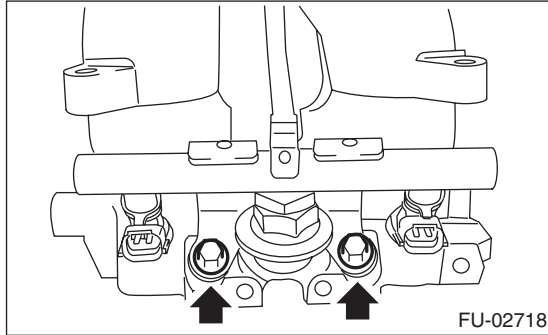
# Intake Manifold

## FUEL INJECTION (FUEL SYSTEMS)

- LH side

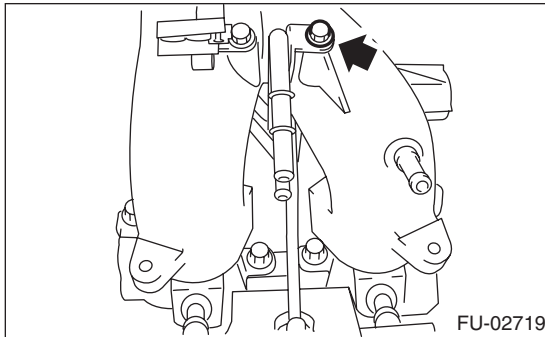
**Tightening torque:**

**19 N·m (1.9 kgf-m, 13.7 ft-lb)**



**Tightening torque:**

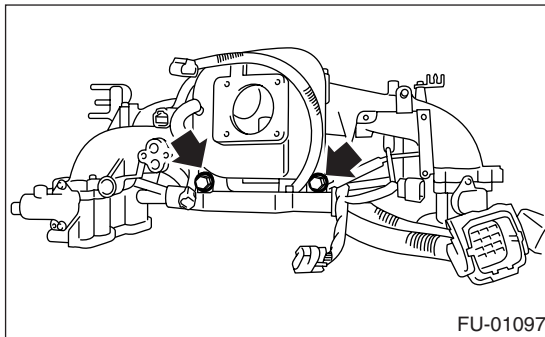
**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



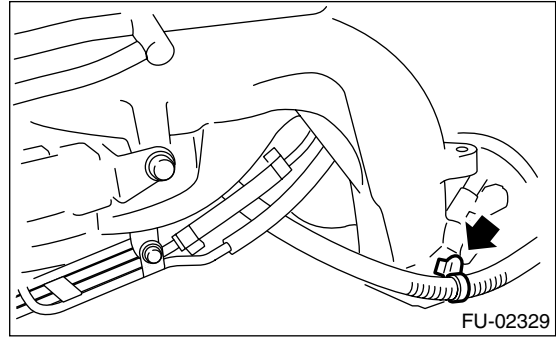
- 6) Install the engine harness onto intake manifold.
- 7) Tighten the bolts which install engine harness on intake manifold.

**Tightening torque:**

**19 N·m (1.9 kgf-m, 13.7 ft-lb)**



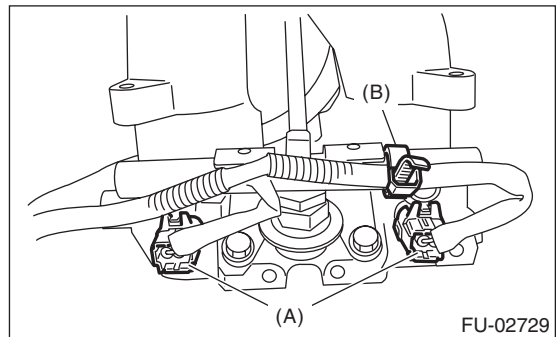
- 8) Hold the engine harness by harness band clips.



- 9) Install the purge control solenoid valve. <Ref. to EC(H4SO)-7, INSTALLATION, Purge Control Solenoid Valve.>

- 10) Connect the connectors (A) to fuel injector.

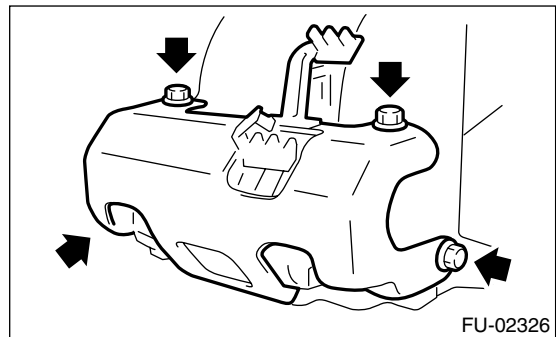
- 11) Hold the engine harness to fuel injector pipe by harness band (B).



- 12) Install the fuel pipe protector RH.

**Tightening torque:**

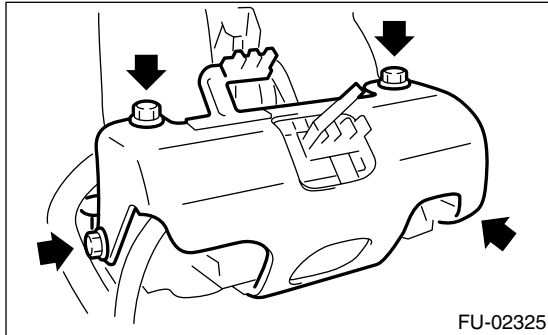
**19 N·m (1.9 kgf-m, 13.7 ft-lb)**



- 13) Install the fuel pipe protector LH.

**Tightening torque:**

**19 N·m (1.9 kgf·m, 13.7 ft·lb)**



**E: INSPECTION**

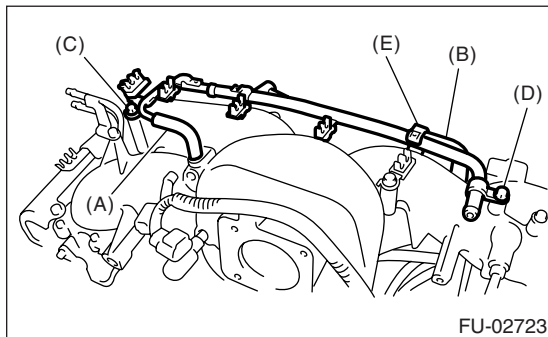
Make sure the fuel pipe and fuel hoses are not damaged and the connections are tightened firmly.

14) Install the PCV pipe.

- (1) Connect the hoses (A) and (B) to intake manifold.
- (2) Tighten the bolts (C) — (E) in alphabetical sequence.

**Tightening torque:**

**6.4 N·m (0.65 kgf·m, 4.7 ft·lb)**



15) Install the EGR valve. <Ref. to FU(H4SO)-29, INSTALLATION, EGR Valve.>

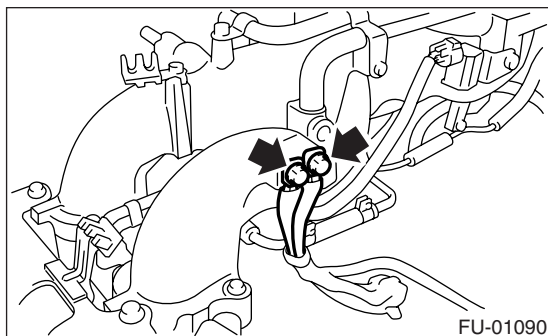
16) Install the throttle body to intake manifold. <Ref. to FU(H4SO)-12, INSTALLATION, Throttle Body.>

17) Install the ignition coil & ignitor ASSY. <Ref. to IG(H4SO)-7, INSTALLATION, Ignition Coil and Ignitor Assembly.>

18) Install the engine ground terminal to intake manifold.

**Tightening torque:**

**19 N·m (1.9 kgf·m, 13.7 ft·lb)**



# Engine Coolant Temperature Sensor

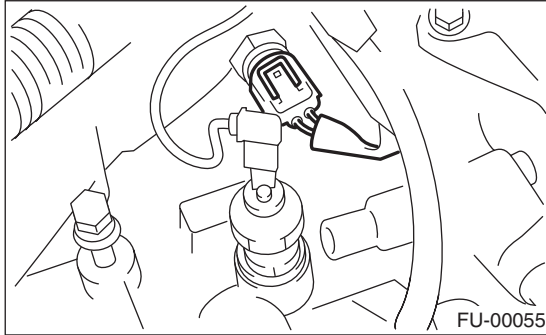
FUEL INJECTION (FUEL SYSTEMS)

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## 4. Engine Coolant Temperature Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the generator. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
- 3) Disconnect the connectors from engine coolant temperature sensor.



- 4) Remove the engine coolant temperature sensor.

### B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use a new gasket.

**Tightening torque:**

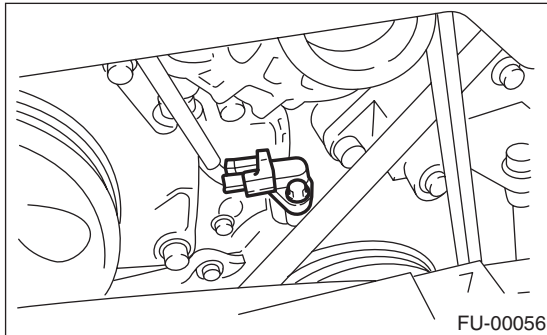
**18 N·m (1.8 kgf-m, 13.0 ft-lb)**



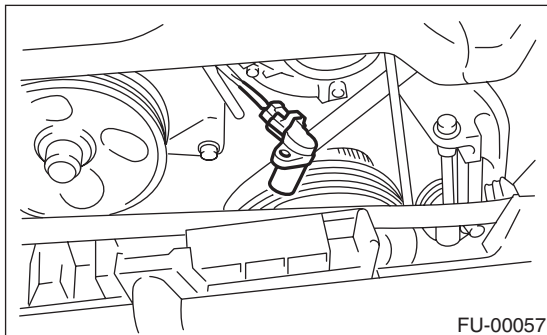
## 5. Crankshaft Position Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the generator. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
- 3) Remove the bolt which installs crankshaft position sensor to cylinder block.



- 4) Remove the crankshaft position sensor, and disconnect the connector from it.

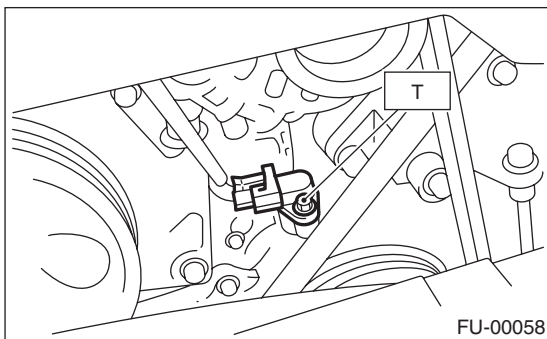


### B: INSTALLATION

Install in the reverse order of removal.

#### **Tightening torque:**

***T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)***





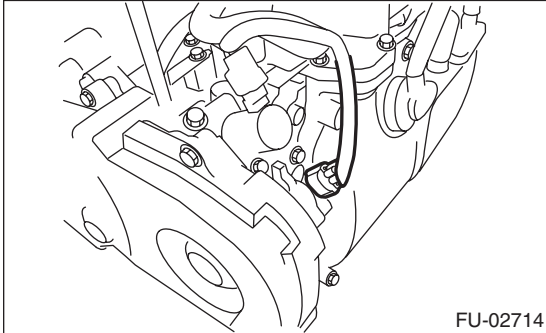
# Camshaft Position Sensor

FUEL INJECTION (FUEL SYSTEMS)

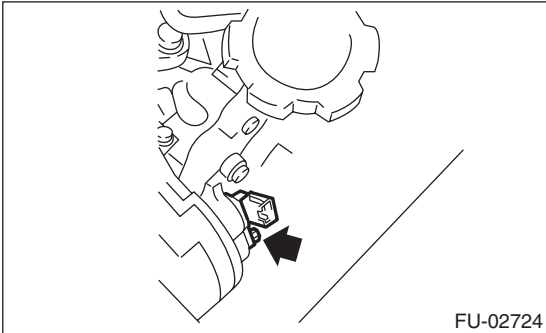
## 6. Camshaft Position Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from camshaft position sensor.



- 3) Remove the bolt which installs camshaft position sensor to the support.

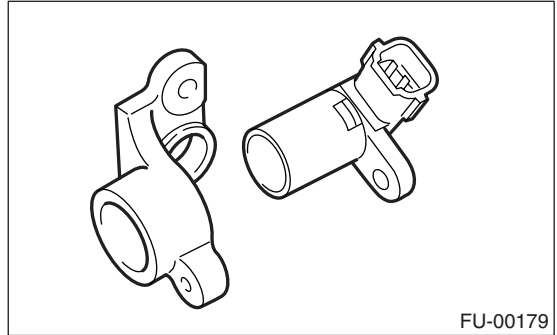


- 4) Remove the bolt which installs the camshaft position sensor support to camshaft cap LH.



- 5) Remove the camshaft position sensor and the support as a unit.

- 6) Remove the camshaft position sensor itself.



### B: INSTALLATION

Install in the reverse order of removal.

#### **Tightening torque:**

**Camshaft position sensor support**

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**

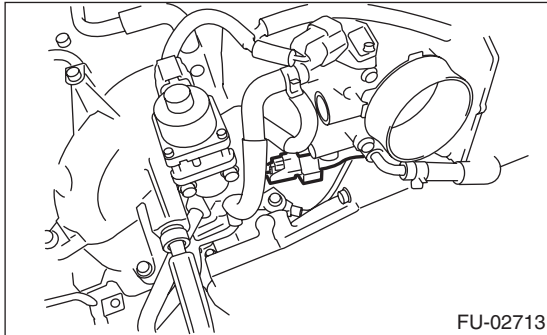
**Camshaft position sensor**

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**

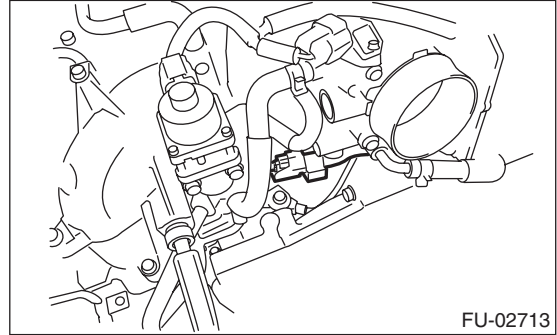
## 7. Knock Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the air intake chamber. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Chamber.>
- 3) Disconnect the knock sensor connector.

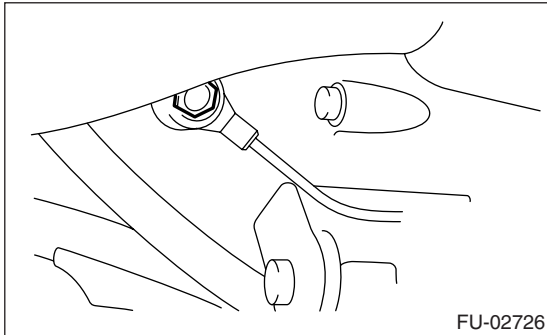


- 2) Connect the knock sensor connector.



- 3) Install the air intake chamber. <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Chamber.>
- 4) Connect the battery ground cable to battery.

- 4) Remove the knock sensor from cylinder block.



### B: INSTALLATION

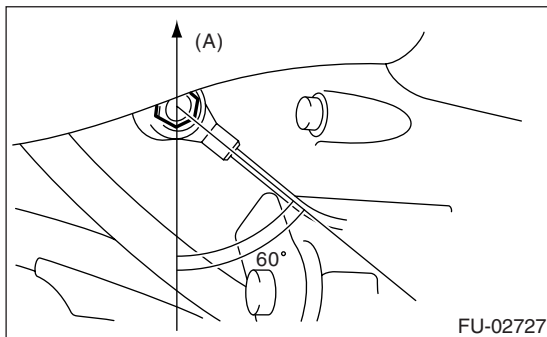
- 1) Install the knock sensor to cylinder block.

#### NOTE:

Extraction area of knock sensor cord must be positioned at a 60° angle relative to the engine rear.

#### Tightening torque:

**24 N·m (2.4 kgf-m, 17.4 ft-lb)**



(A) Front side

### 8. Throttle Position Sensor

#### A: SPECIFICATION

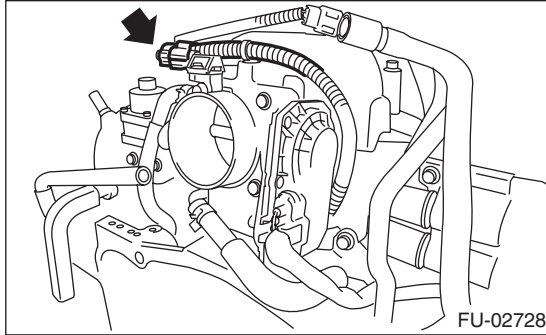
Throttle body is a non-disassembled part, so do not remove the throttle position sensor from throttle body.

Refer to “Throttle Body” for removal and installation procedure. <Ref. to FU(H4SO)-12, REMOVAL, Throttle Body.> <Ref. to FU(H4SO)-12, INSTALLATION, Throttle Body.>

## 9. Manifold Absolute Pressure Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from manifold absolute pressure sensor.



- 3) Remove the manifold absolute pressure sensor from throttle body.

### B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use new O-rings.

**Tightening torque:**

**2.0 N·m (0.20 kgf-m, 1.5 ft-lb)**

# Mass Air Flow and Intake Air Temperature Sensor

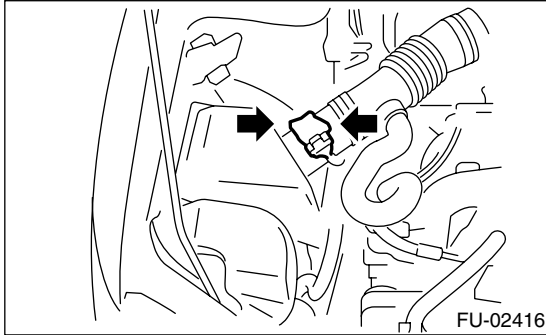
FUEL INJECTION (FUEL SYSTEMS)

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## 10. Mass Air Flow and Intake Air Temperature Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from mass air flow and intake air temperature sensor.
- 3) Remove the mass air flow and intake air temperature sensor.



### B: INSTALLATION

Install in the reverse order of removal.

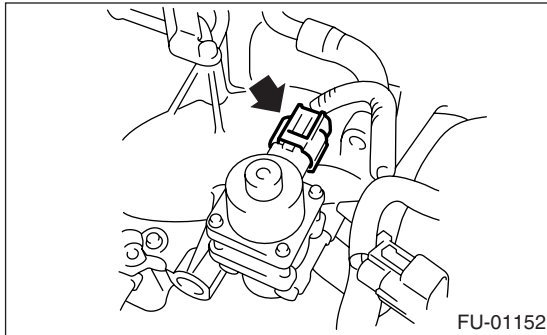
**Tightening torque:**

**1.0 N·m (0.10 kgf-m, 0.74 ft-lb)**

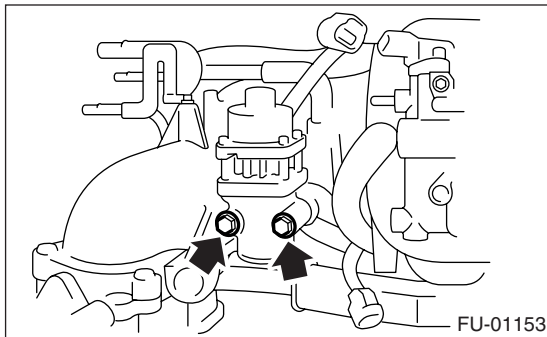
## 11.EGR Valve

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from EGR valve.



- 3) Remove the EGR valve from intake manifold.



### B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use a new gasket.

**Tightening torque:**

**19 N·m (1.9 kgf·m, 13.7 ft-lb)**

## 12. Fuel Injector

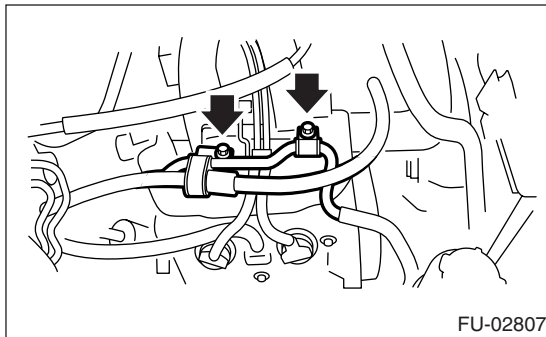
### A: REMOVAL

#### 1. RH SIDE

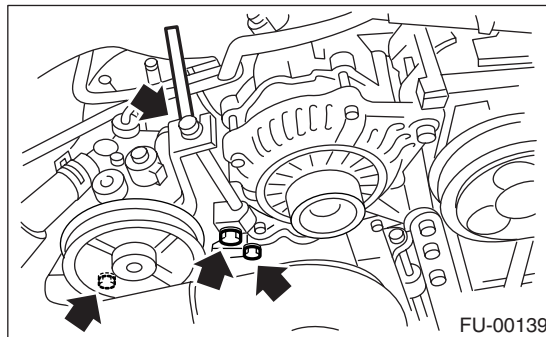
- 1) Release the fuel pressure.  
<Ref. to FU(H4SO)-42, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from battery.
- 3) Open the fuel filler flap lid, and remove the fuel filler cap.
- 4) Remove the air intake chamber and air cleaner case. <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.> <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
- 5) Remove the power steering pump and tank.
  - (1) Remove the front side V-belt. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
  - (2) Remove the bolts which hold the power steering pipes onto the intake manifold protector RH.

**NOTE:**

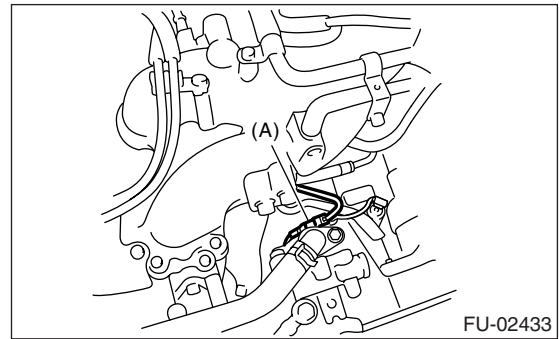
Do not disconnect the power steering hose.



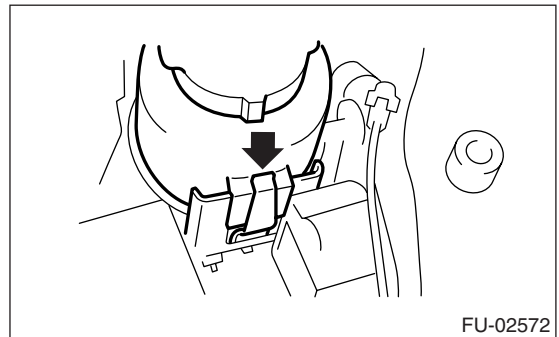
- (3) Remove the bolts which install the power steering pump to the bracket.



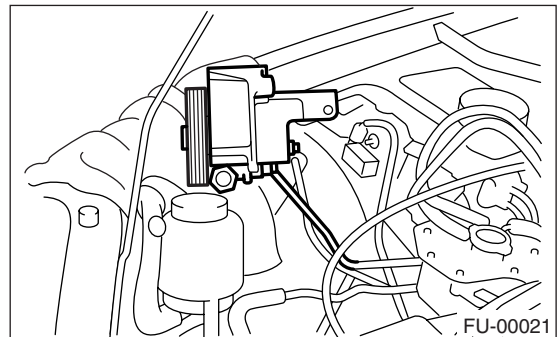
- (4) Disconnect the power steering pump switch connector (A).



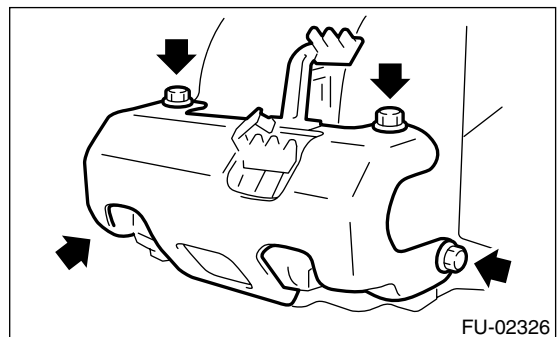
- (5) Remove the reservoir tank from the bracket by pulling it upwards.



- (6) Place the power steering pump and tank on the right side wheel apron.



- 6) Remove the spark plug cords from spark plugs (#1 and #3 cylinders).
- 7) Remove the fuel pipe protector RH.

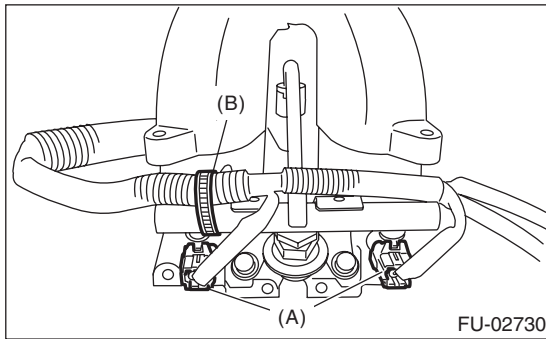


- 8) Disconnect the connector (A) from fuel injector.

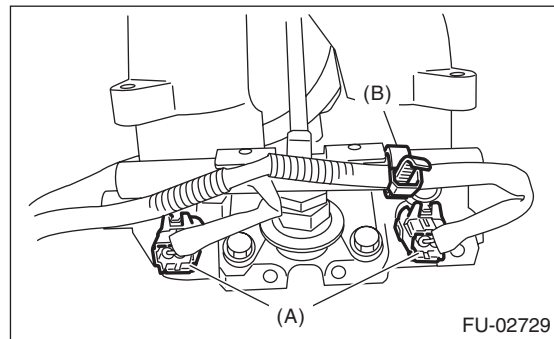
# Fuel Injector

FUEL INJECTION (FUEL SYSTEMS)

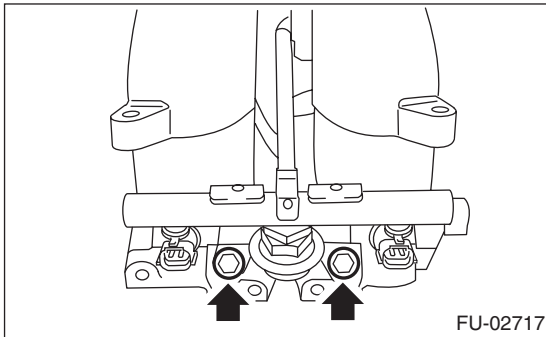
9) Remove the harness band (B) which holds engine harness to fuel injector pipe.



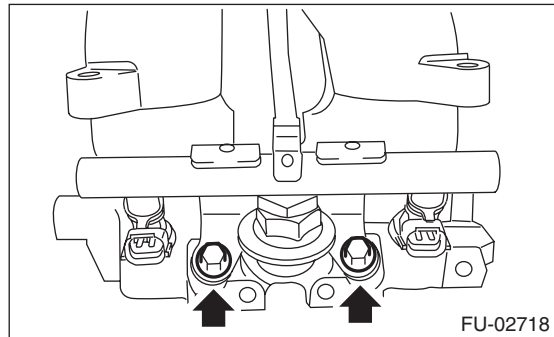
7) Remove the harness band (B) which holds engine harness to fuel injector pipe.



10) Remove the bolts which hold fuel injector pipe onto intake manifold.



8) Remove the bolts which hold fuel injector pipe onto intake manifold.



11) Remove the fuel injector while lifting up the fuel injector pipe.

## 2. LH SIDE

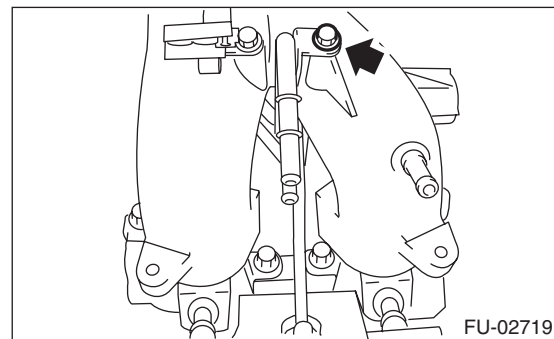
1) Release the fuel pressure. <Ref. to FU(H4SO)-42, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Remove the battery. <Ref. to SC(H4SO)-20, REMOVAL, Battery.>

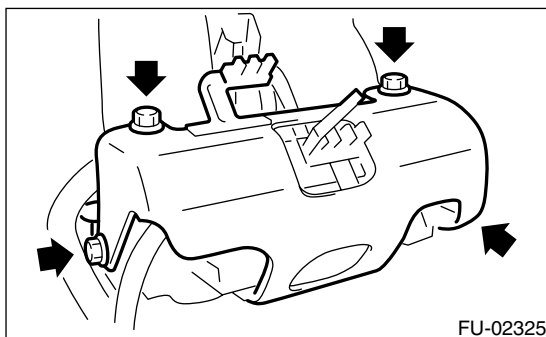
3) Open the fuel filler flap lid, and remove the fuel filler cap.

4) Remove the spark plug cords from spark plugs (#2 and #4 cylinders).

5) Remove the fuel pipe protector LH.



9) Remove the fuel injector while lifting up the fuel injector pipe.



6) Disconnect the connector (A) from fuel injector.



# Fuel Injector

## FUEL INJECTION (FUEL SYSTEMS)

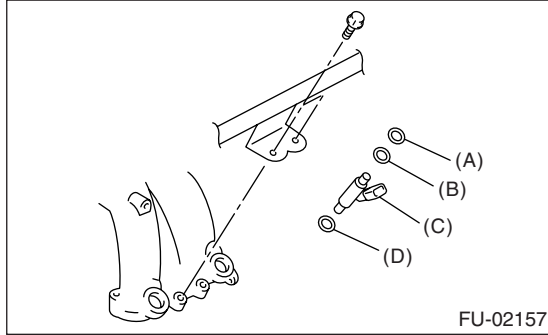
### B: INSTALLATION

#### 1. RH SIDE

Install in the reverse order of removal.

NOTE:

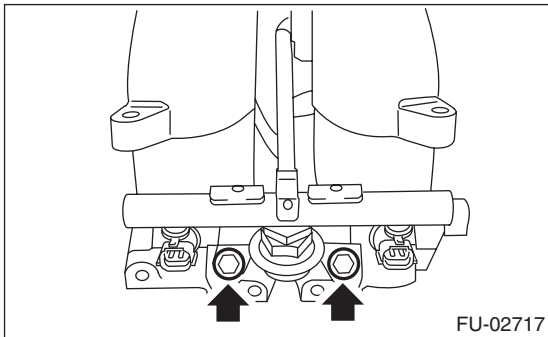
Use new O-rings.



- (A) O-ring
- (B) O-ring
- (C) Fuel injector
- (D) O-ring

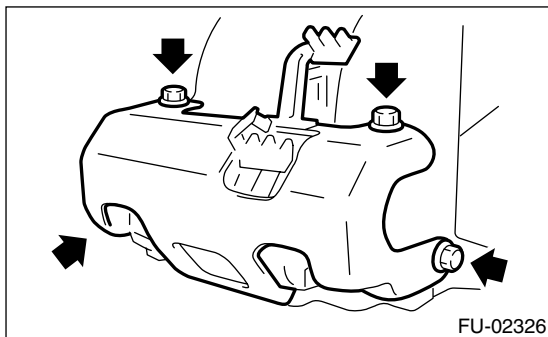
**Tightening torque:**

**19 N·m (1.9 kgf-m, 13.7 ft-lb)**



**Tightening torque:**

**19 N·m (1.9 kgf-m, 13.7 ft-lb)**

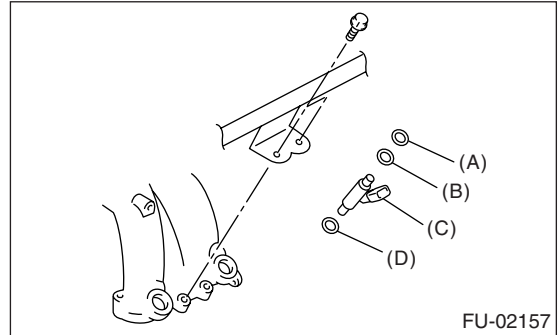


#### 2. LH SIDE

Install in the reverse order of removal.

NOTE:

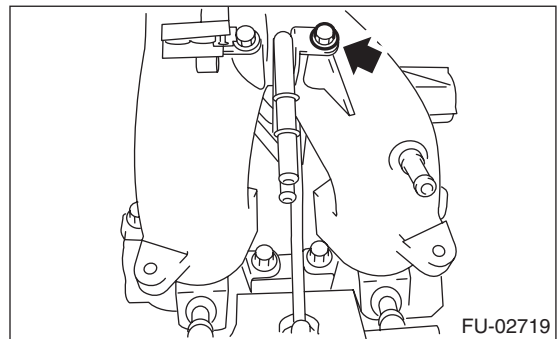
Use new O-rings.



- (A) O-ring
- (B) O-ring
- (C) Fuel injector
- (D) O-ring

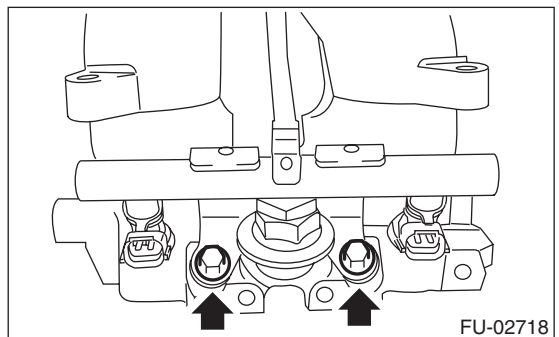
**Tightening torque:**

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**

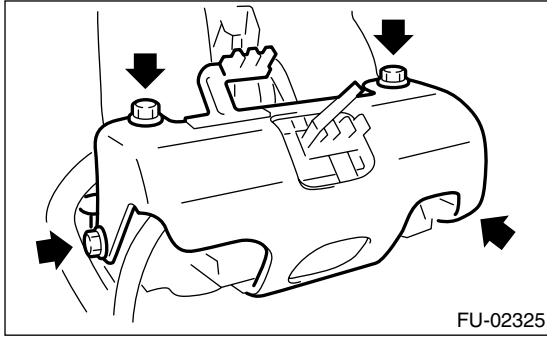


**Tightening torque:**

**19 N·m (1.9 kgf-m, 13.7 ft-lb)**



**Tightening torque:**  
**19 N·m (1.9 kgf-m, 13.7 ft-lb)**



FU-02325

# Variable Valve Lift Diagnosis Oil Pressure Switch

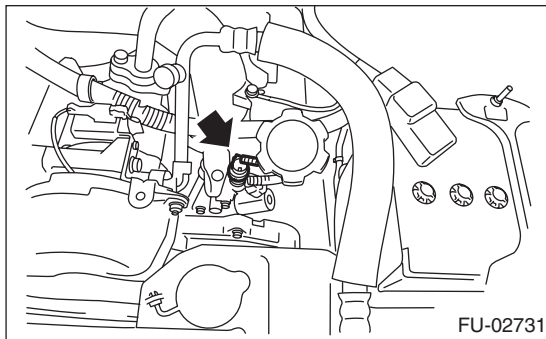
FUEL INJECTION (FUEL SYSTEMS)

## 13. Variable Valve Lift Diagnosis Oil Pressure Switch

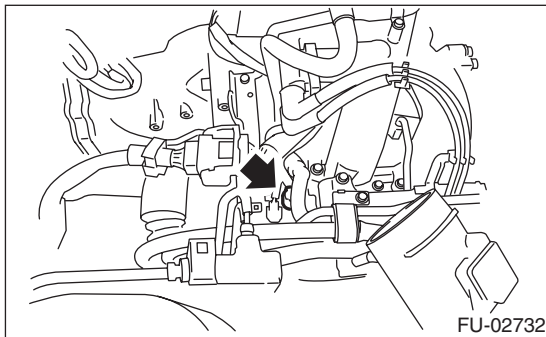
### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the air intake chamber.  
<Ref. to IN(H4SO)-6, REMOVAL, Air Intake Chamber.>
- 3) Remove the engine harness connector from bracket.
- 4) Disconnect the connector from variable valve lift diagnosis oil pressure switch.
- 5) Remove the variable valve lift diagnosis oil pressure switch.

- LH side



- RH side



### B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Apply liquid gasket to the thread of variable valve lift diagnosis oil pressure switch.

**Liquid gasket:**

**THREE BOND 1324 (Part No. 004403042) or equivalent**

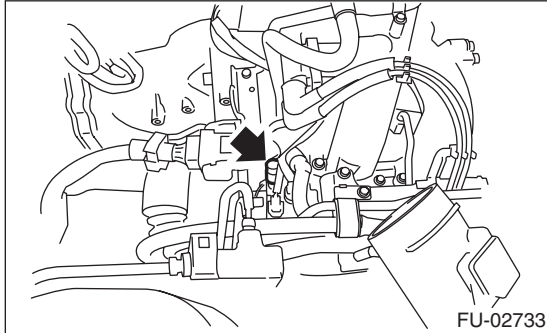
**Tightening torque:**

**17 N·m (1.7 kgf·m, 12.5 ft·lb)**

## 14. Oil Temperature Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the air intake chamber.  
<Ref. to IN(H4SO)-6, REMOVAL, Air Intake Chamber.>
- 3) Remove the engine harness connector from bracket.
- 4) Disconnect the connector from oil temperature sensor.
- 5) Remove the oil temperature sensor.



### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

**18 N·m (1.8 kgf·m, 13.3 ft·lb)**

# Front Oxygen (A/F) Sensor

FUEL INJECTION (FUEL SYSTEMS)

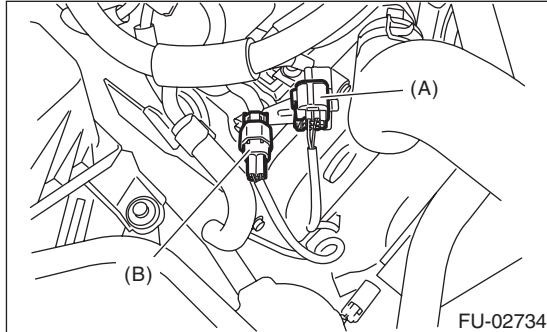
## 15. Front Oxygen (A/F) Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the front oxygen (A/F) sensor connector.

NOTE:

Remove the harness clip from bracket.

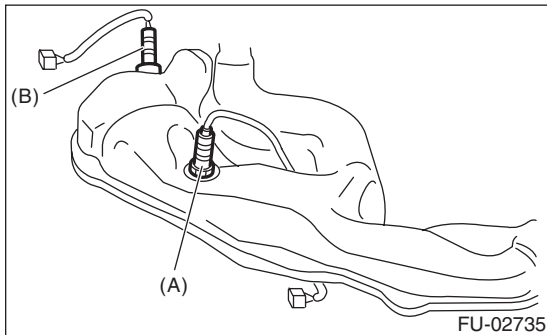


- (A) Front oxygen (A/F) sensor connector  
(B) Rear oxygen sensor connector

- 3) Lift up the vehicle.
- 4) Remove the under cover.
- 5) Apply spray type lubricant to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.
- 6) Remove the front oxygen (A/F) sensor.

**CAUTION:**

When removing the oxygen (A/F) sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.



- (A) Front oxygen (A/F) sensor  
(B) Rear oxygen sensor

### B: INSTALLATION

- 1) Before installing front oxygen (A/F) sensor, apply the anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make the next removal easier.

**Anti-seize compound:**

**NEVER-SEEZ NS-165 or equivalent**

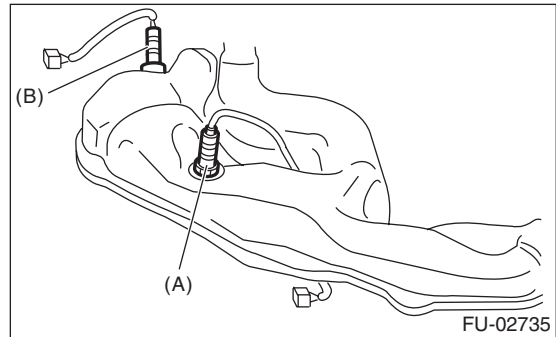
**CAUTION:**

Never apply anti-seize compound to protector of front oxygen (A/F) sensor.

- 2) Install the front oxygen (A/F) sensor.

**Tightening torque:**

**21 N·m (2.1 kgf-m, 15.2 ft-lb)**

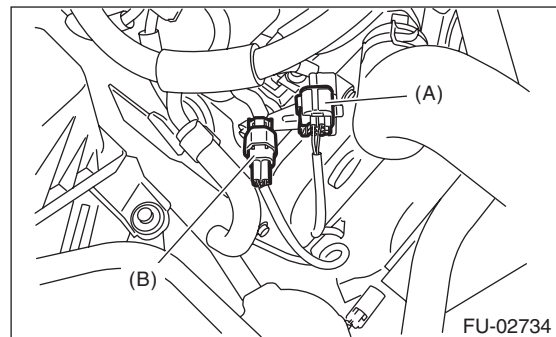


- (A) Front oxygen (A/F) sensor  
(B) Rear oxygen sensor

- 3) Install the under cover.
- 4) Lower the vehicle.
- 5) Connect the connector of front oxygen (A/F) sensor.

NOTE:

Install the harness clip to bracket.



- (A) Front oxygen (A/F) sensor connector  
(B) Rear oxygen sensor connector

- 6) Connect the battery ground cable to battery.

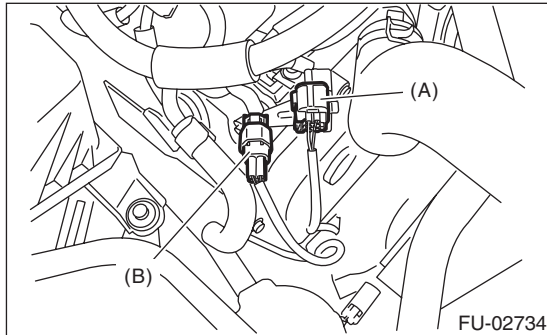
## 16.Rear Oxygen Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector of rear oxygen sensor.

**NOTE:**

Remove the harness clip from bracket.

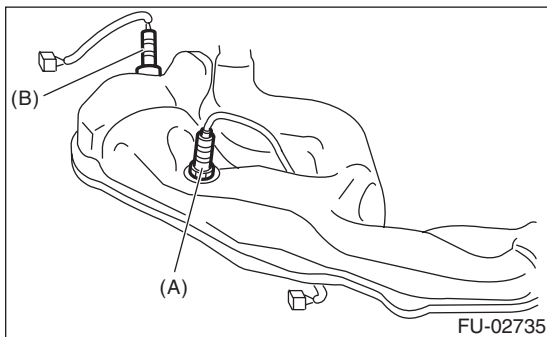


- (A) Front oxygen (A/F) sensor connector
- (B) Rear oxygen sensor connector

- 3) Lift up the vehicle.
- 4) Remove the under cover.
- 5) Apply spray type lubricant to the threaded portion of rear oxygen sensor, and leave it for one minute or more.
- 6) Remove the rear oxygen sensor.

**CAUTION:**

**When removing the rear oxygen sensor, wait until the exhaust pipe cools, otherwise it will damage the exhaust pipe.**



- (A) Front oxygen (A/F) sensor
- (B) Rear oxygen sensor

### B: INSTALLATION

- 1) Before installing the rear oxygen (A/F) sensor, apply the anti-seize compound only to the threaded portion of the rear oxygen (A/F) sensor to make the next removal easier.

**CAUTION:**

**Never apply anti-seize compound to protector of rear oxygen sensor.**

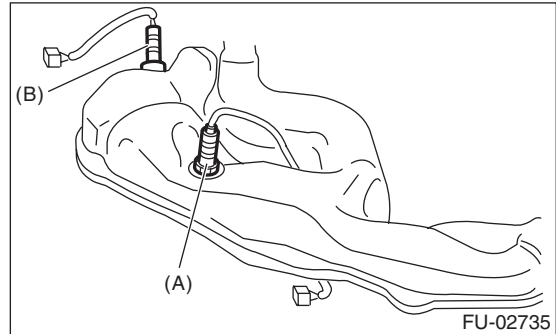
**Anti-seize compound:**

**NEVER-SEEZ NS-165 or equivalent**

- 2) Install the rear oxygen sensor.

**Tightening torque:**

**21 N·m (2.1 kgf-m, 15.2 ft-lb)**

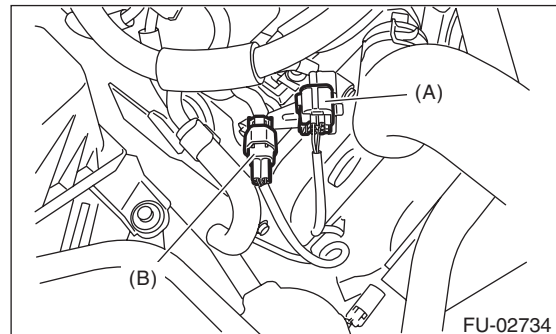


- (A) Front oxygen (A/F) sensor
- (B) Rear oxygen sensor

- 3) Install the under cover.
- 4) Lower the vehicle.
- 5) Connect the connector to the rear oxygen sensor.

**NOTE:**

Install the harness clip to bracket.



- (A) Front oxygen (A/F) sensor connector
- (B) Rear oxygen sensor connector

- 6) Connect the battery ground cable to battery.

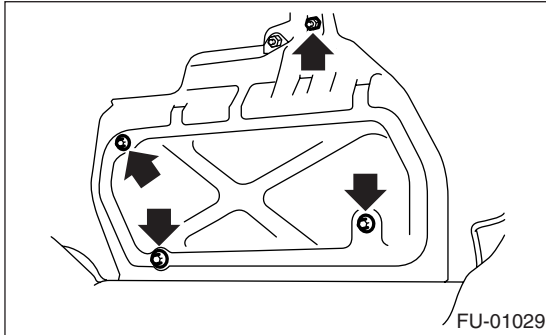
# Engine Control Module (ECM)

FUEL INJECTION (FUEL SYSTEMS)

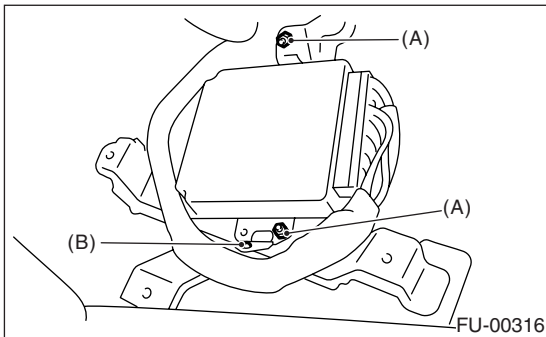
## 17.Engine Control Module (ECM)

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the lower inner trim of passenger side.  
<Ref. to EI-51, REMOVAL, Lower Inner Trim.>
- 3) Detach the floor mat of front passenger seat.
- 4) Remove the protect cover.



- 5) Remove the nuts (A) which hold ECM to the bracket.
- 6) Remove the clip (B) from the bracket.



- 7) Disconnect the ECM connectors and take out the ECM.

### B: INSTALLATION

Install in the reverse order of removal.

#### CAUTION:

- When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage to fuel injection system.
- When replacing the ECM, be careful not to damage the harnesses and connectors.

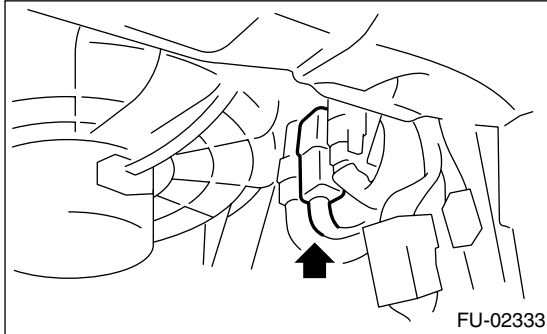
#### Tightening torque:

5 N·m (0.5 kgf·m, 3.7 ft·lb)

## 18.Main Relay

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the passenger's side front side sill cover.
- 3) Remove the bolt which holds the relay bracket on the body.
- 4) Disconnect the connectors from the main relay.



- 5) Remove the main relay from the mounting bracket.

### B: INSTALLATION

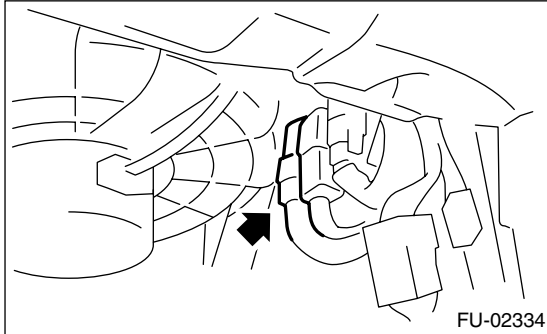
Install in the reverse order of removal.



## 19. Fuel Pump Relay

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the passenger's side front side sill cover.
- 3) Remove the bolt which holds relay bracket on the body.
- 4) Disconnect the connector from fuel pump relay.



- 5) Remove the fuel pump relay from the mounting bracket.

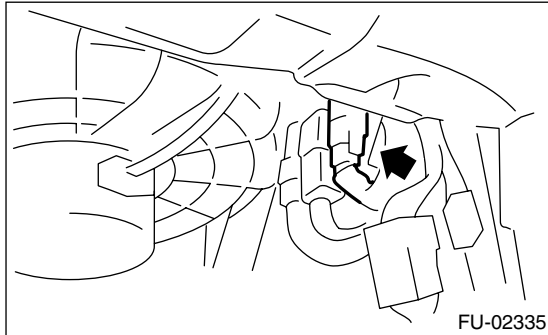
### B: INSTALLATION

Install in the reverse order of removal.

## 20. Electronic Throttle Control Relay

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the passenger's side front side sill cover.
- 3) Remove the bolt which holds relay bracket on the body.
- 4) Disconnect the connector from electronic throttle control relay.



- 5) Remove the electronic throttle control relay from the mounting bracket.

### B: INSTALLATION

Install in the reverse order of removal.

### 21. Fuel

#### A: PROCEDURE

##### 1. RELEASING OF FUEL PRESSURE

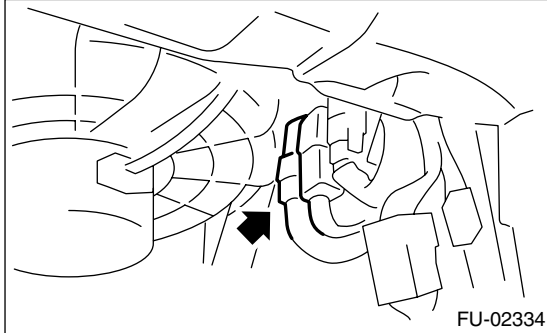
**WARNING:**

Place “NO FIRE” signs near the working area.

**CAUTION:**

Be careful not to spill the fuel.

- 1) Disconnect the connector from the fuel pump relay.



- 2) Start the engine and run it until it stalls.
- 3) After the engine stalls, crank it for five more seconds.
- 4) Turn the ignition switch to OFF.

##### 2. DRAINING FUEL

- Model with fuel drain plug

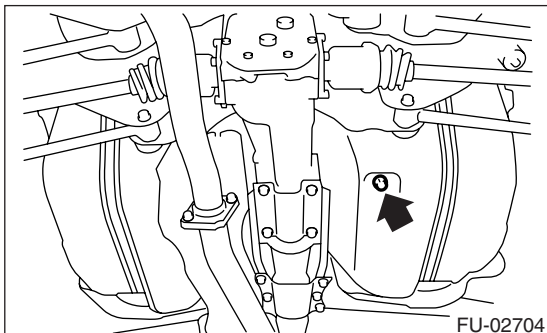
**WARNING:**

Place “NO FIRE” signs near the working area.

**CAUTION:**

Be careful not to spill the fuel.

- 1) Set the vehicle on a lift.
  - 2) Disconnect the ground cable from battery.
  - 3) Open the fuel filler flap lid, and then remove the fuel filler cap.
  - 4) Lift up the vehicle.
  - 5) Drain the fuel from the fuel tank.
- Set a container under the vehicle and remove the fuel drain plug from the fuel tank.



- 6) Tighten the fuel drain plug.

**NOTE:**

Use a new gasket.

**Tightening torque:**

26 N·m (2.65 kgf-m, 19.2 ft-lb)

- Model without fuel drain plug

**WARNING:**

Place “NO FIRE” signs near the working area.

**CAUTION:**

Be careful not to spill the fuel.

- 1) Release the fuel pressure. <Ref. to FU(H4SO)-42, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from battery.
- 3) Remove the fuel pump. <Ref. to FU(H4SO)-50, REMOVAL, Fuel Pump.>
- 4) Drain fuel from the fuel pump installing part using a pump etc.

**CAUTION:**

Use a pump resistant to gasoline.

- 5) Install the fuel pump. <Ref. to FU(H4SO)-50, INSTALLATION, Fuel Pump.>

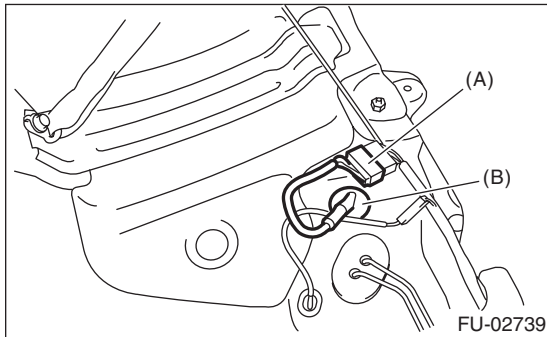
## 22. Fuel Tank

### A: REMOVAL

**WARNING:**

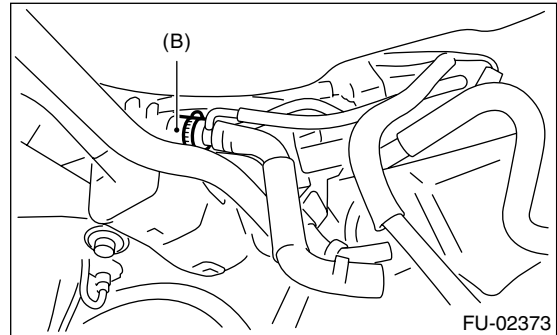
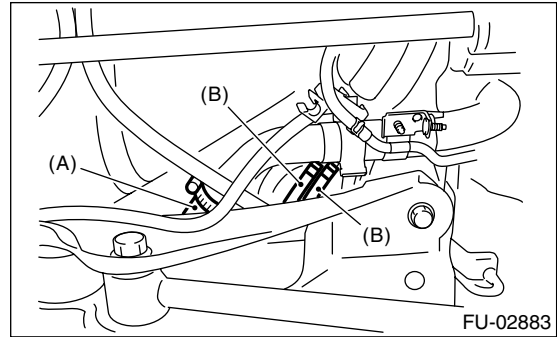
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure.  
<Ref. to FU(H4SO)-42, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 3) Drain the fuel from the fuel tank.  
<Ref. to FU(H4SO)-42, DRAINING FUEL, PROCEDURE, Fuel.>
- 4) Remove the rear seat.
- 5) Disconnect the connector (A) of fuel tank cord to the rear harness.
- 6) Push the grommet (B) which holds the fuel tank cord on floor panel into under the body.

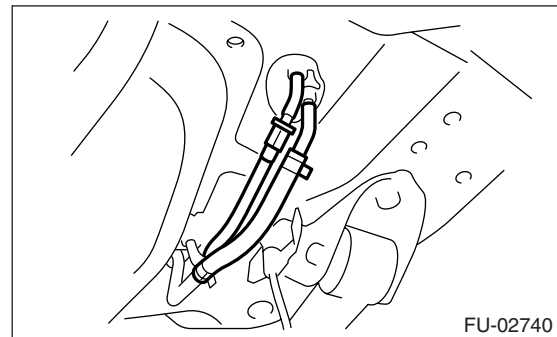


- 7) Remove the rear crossmember. <Ref. to RS-17, REMOVAL, Rear Crossmember.>
- 8) Remove the canister. <Ref. to EC(H4SO)-6, REMOVAL, Canister.>
- 9) Disconnect the connector from pressure control solenoid valve.

- 10) Loosen the clamp and disconnect the fuel filler hose (A) and evaporation hose (B) from the fuel filler pipe.



- 11) Move the clips, and disconnect the quick connector. <Ref. to FU(H4SO)-57, REMOVAL, Fuel Delivery & Evaporation Lines.>
- 12) Disconnect the fuel hoses.



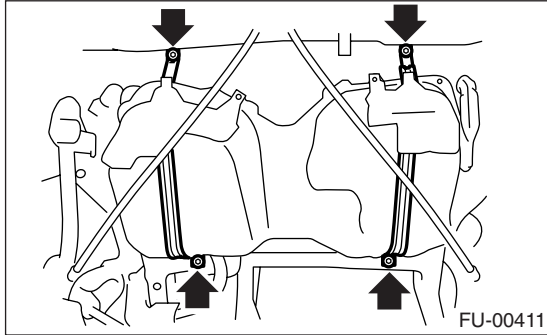
- 13) Support the fuel tank with a transmission jack, remove the bolts from bands and dismount the fuel tank from the vehicle.

# Fuel Tank

## FUEL INJECTION (FUEL SYSTEMS)

### WARNING:

- An assistant is required to perform this work.
- Fuel may be left in the side, which has no drain plug, of the fuel tank. In this case, the tank is imbalanced between right and left sides. Be careful not to drop it when removing.

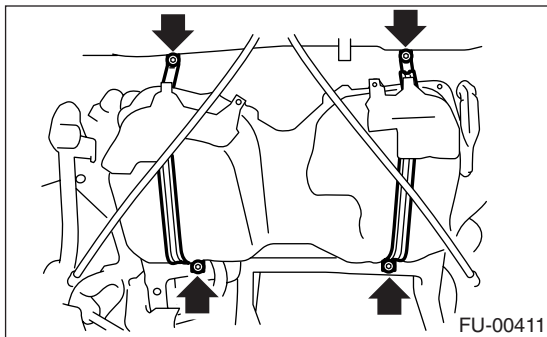


### B: INSTALLATION

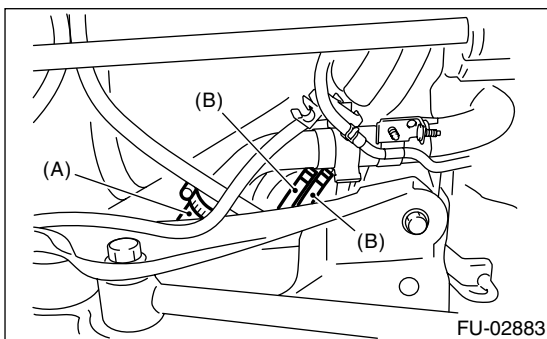
- 1) Support the fuel tank with a transmission jack and push the fuel tank harness into the access hole with the grommet.
- 2) Set the fuel tank and temporarily tighten the bolts of fuel tank bands.

### WARNING:

An assistant is required to perform this work.

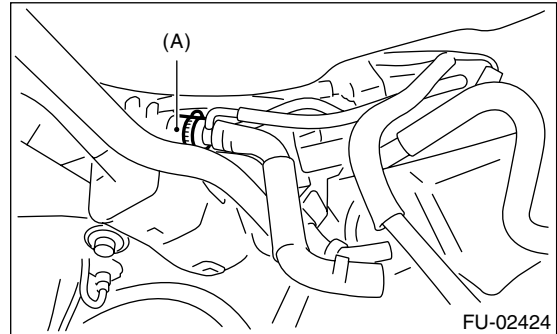


- 3) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe, and tighten the clamp.
- 4) Insert the evaporation hose (B) to the lower end of evaporation pipe, and hold the clamp and clip.

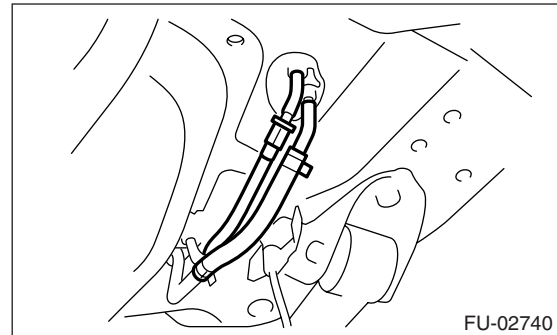


### CAUTION:

Do not allow clips to touch hose (A) and rear suspension crossmember.



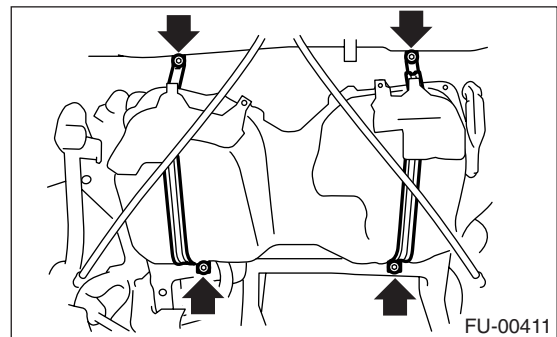
- 5) Connect the fuel hoses, and hold them with clips and quick connector. <Ref. to FU(H4SO)-57, REMOVAL, Fuel Delivery & Evaporation Lines.>



- 6) Connect the connector to the pressure control solenoid valve.
- 7) Install the canister. <Ref. to EC(H4SO)-6, INSTALLATION, Canister.>
- 8) Tighten the band mounting bolts.

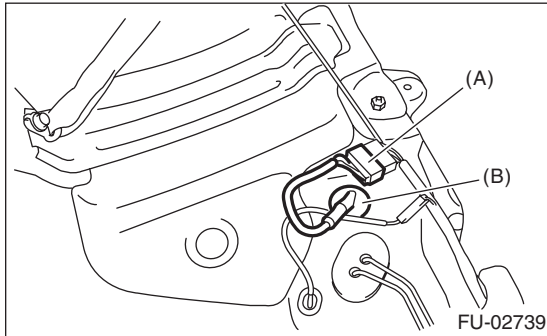
### Tightening torque:

**33 N·m (3.4 kgf-m, 25 ft-lb)**

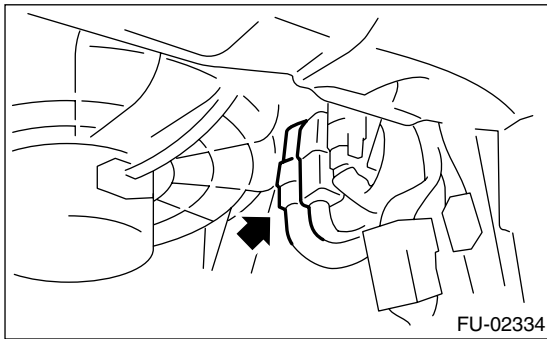


- 9) Install the rear crossmember. <Ref. to RS-17, INSTALLATION, Rear Crossmember.>

- 10) Connect the connectors (A) to the fuel tank cord and plug the service hole with grommet (B).



- 11) Set the rear seat and floor mat.
- 12) Connect the connector to the fuel pump relay.



### **C: INSPECTION**

- 1) Make sure there are no cracks, holes, or other damage on the fuel tank.
- 2) Make sure that the fuel hoses and fuel pipes are not cracked and the connections are tight.

# Fuel Filler Pipe

FUEL INJECTION (FUEL SYSTEMS)

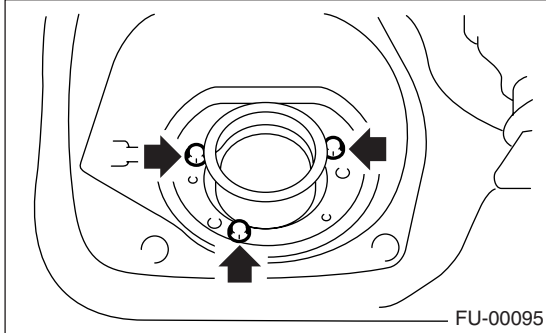
## 23. Fuel Filler Pipe

### A: REMOVAL

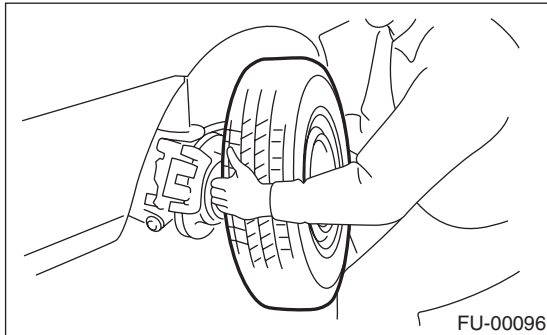
#### WARNING:

- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

- 1) Disconnect the ground cable from battery.
- 2) Open the fuel filler flap lid and remove the filler cap.
- 3) Remove the screws holding packing in place.

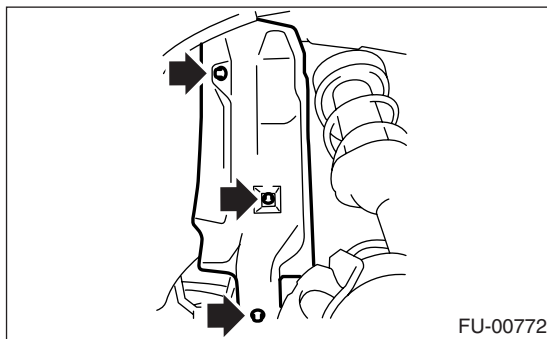


- 4) Lift up the vehicle.
- 5) Remove the rear right side wheel nuts.
- 6) Remove the rear right side wheel.

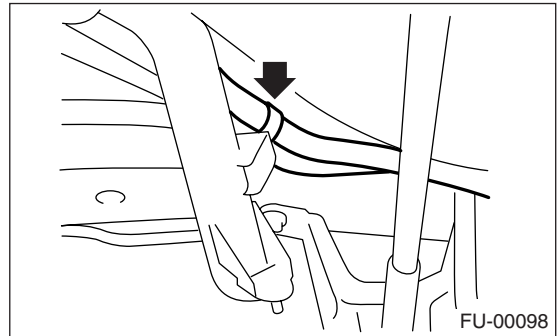


- 7) Drain the fuel from the fuel tank.  
<Ref. to FU(H4SO)-42, DRAINING FUEL, PROCEDURE, Fuel.>

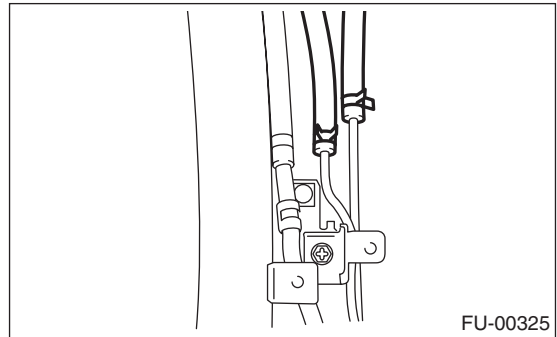
- 8) Remove the fuel filler pipe protector.



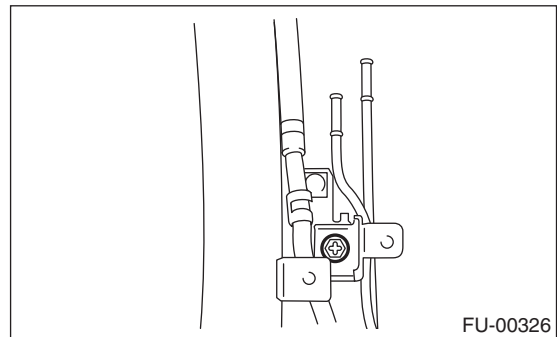
- 9) Separate the evaporation hoses from the clip of fuel filler pipe.



- 10) Disconnect the evaporation hoses from fuel pipes.

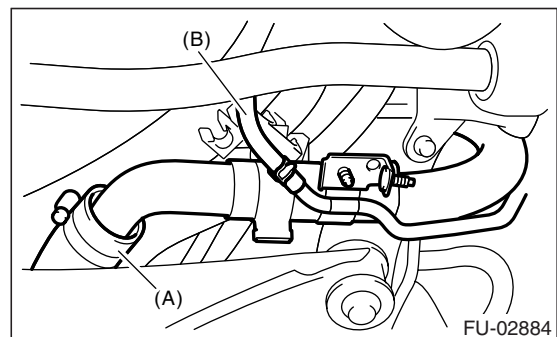


- 11) Remove the bolts which hold the fuel filler pipe bracket on the body.



- 12) Loosen the clamp and separate the fuel filler hose (A) from the fuel filler pipe.

- 13) Move the clip and separate the evaporation hose (B).

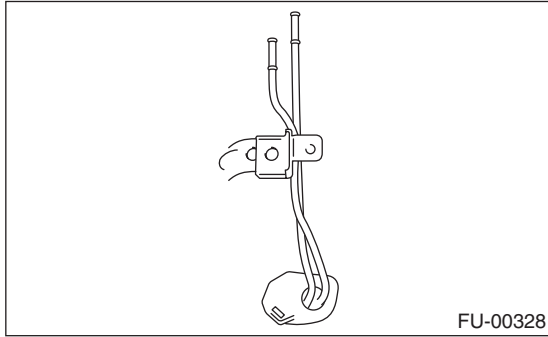


- 14) Remove the fuel filler pipe to under side of the vehicle.

# Fuel Filler Pipe

FUEL INJECTION (FUEL SYSTEMS)

15) Remove the evaporation pipe together with clip from the body.

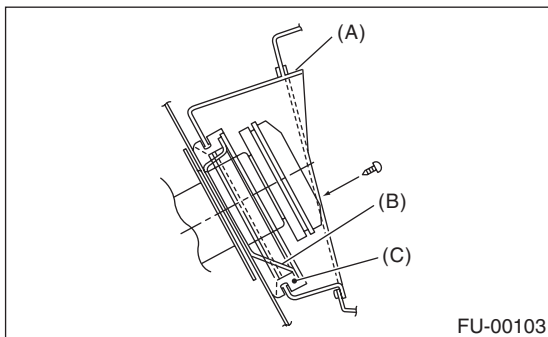


## B: INSTALLATION

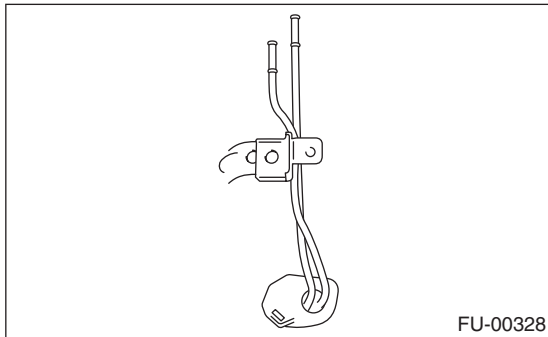
- 1) Open the fuel filler flap lid.
- 2) Set the fuel saucer (A) with rubber packing (C) and insert the fuel filler pipe into hole from the inner side of apron.
- 3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the screws.

### NOTE:

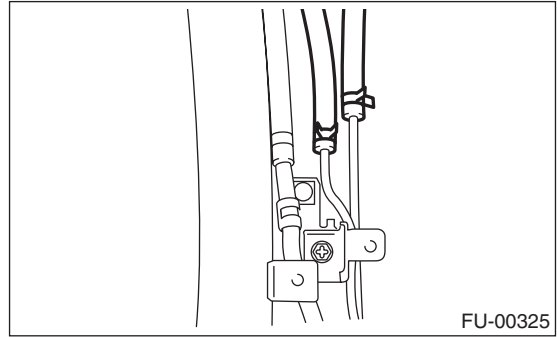
If the edges of rubber packing are folded toward the inside, straighten it with a screwdriver.



4) Install the evaporation pipe.



5) Connect the evaporation hoses to fuel pipes.

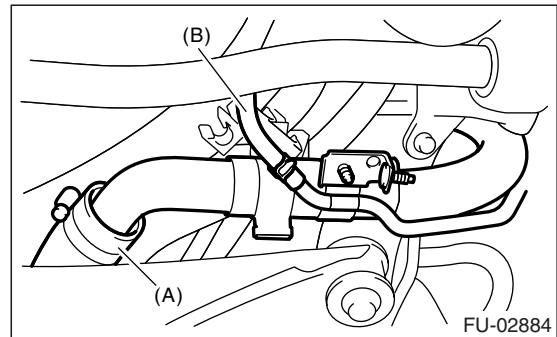


6) Insert the fuel filler hose (A) approximately 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

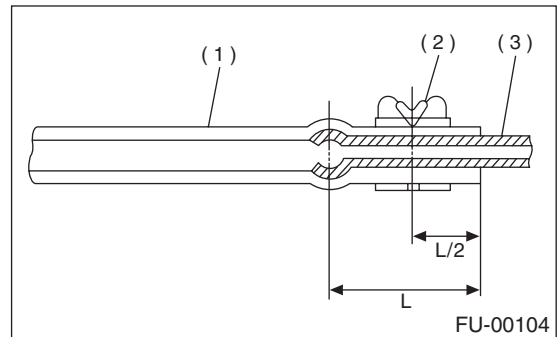
7) Insert the evaporation hose (B) approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe and hold the clip.

### CAUTION:

**Do not allow clips to touch evaporation hose (B) and rear suspension crossmember.**



**$L = 27.5 \pm 2.5 \text{ mm (1.083 \pm 0.098 in)}$**



- (1) Hose
- (2) Clip
- (3) Pipe

8) Tighten the bolt which holds the fuel filler pipe bracket on the body.

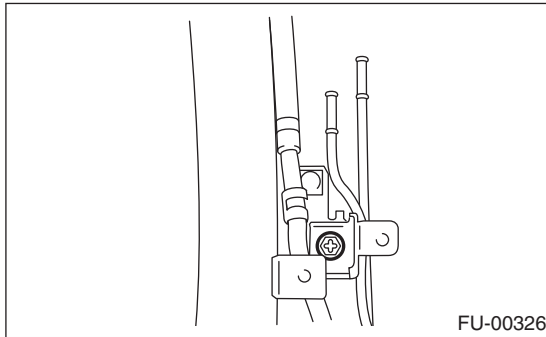


# Fuel Filler Pipe

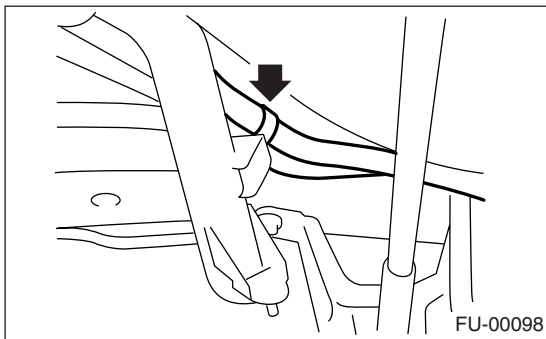
## FUEL INJECTION (FUEL SYSTEMS)

### Tightening torque:

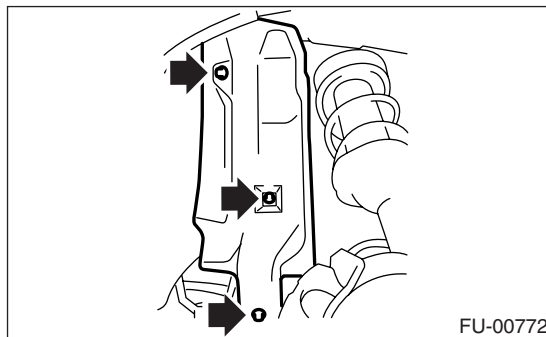
**7.5 N·m (0.76 kgf-m, 5.5 ft-lb)**



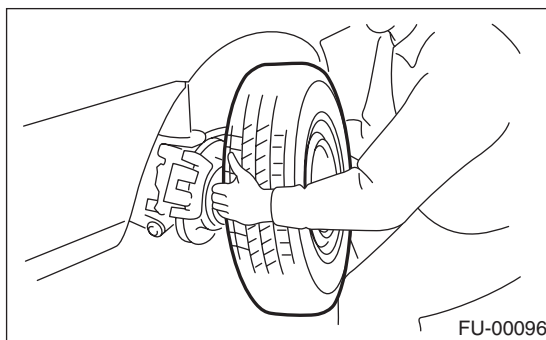
9) Secure the evaporation hose to clip of fuel filler pipe.



10) Install the fuel filler pipe protector.



11) Install the rear right wheel.



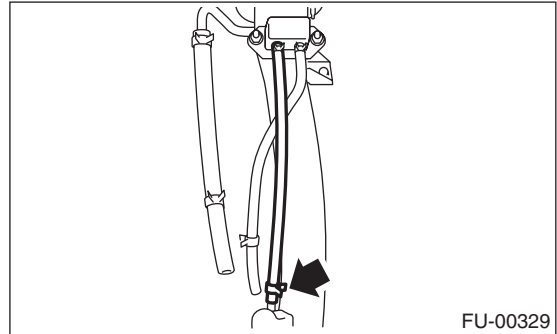
12) Lower the vehicle.

13) Tighten the wheel nuts.

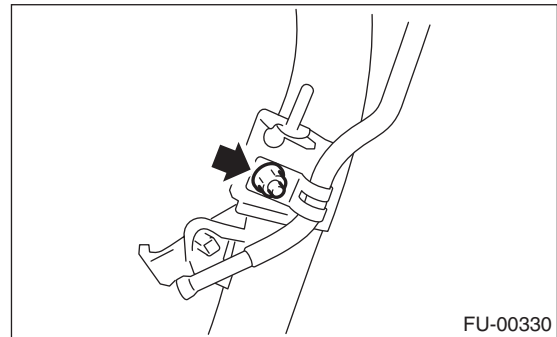
14) Connect the battery ground cable to battery.

### C: DISASSEMBLY

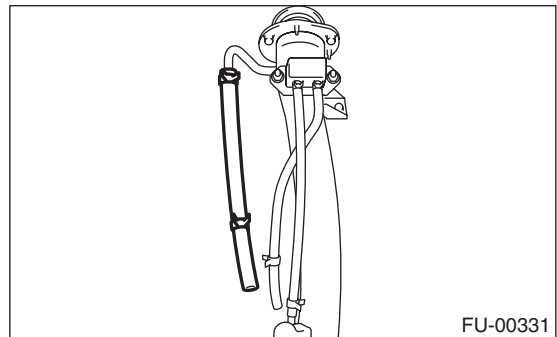
1) Move the clamp, and disconnect the evaporation hose from the joint pipe.



2) Remove the bolt which installs the joint pipe on the fuel filler pipe.



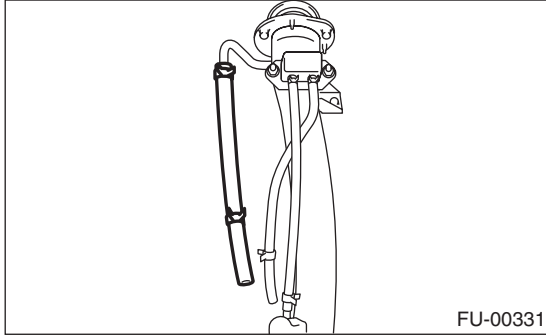
3) Disconnect the evaporation hose from the fuel filler pipe.



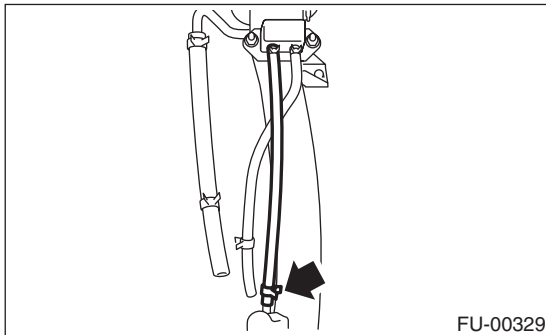
4) Remove the shut valve from the fuel filler pipe.  
<Ref. to EC(H4SO)-15, REMOVAL, Shut Valve.>

## D: ASSEMBLY

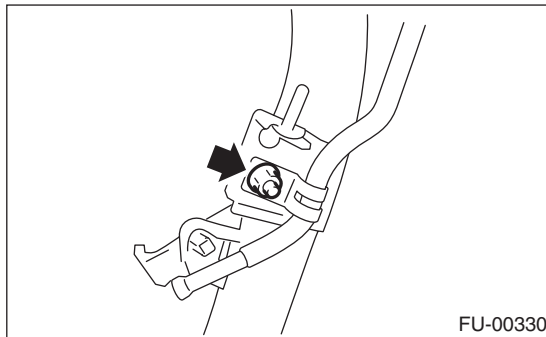
- 1) Install the shut valve on the fuel filler pipe. <Ref. to EC(H4SO)-15, INSTALLATION, Shut Valve.>
- 2) Connect the evaporation hose to the fuel filler pipe.



- 3) Connect the evaporation hose to the evaporation pipe.



- 4) Install the evaporation pipe to the fuel filler pipe.



# Fuel Pump

FUEL INJECTION (FUEL SYSTEMS)

## 24. Fuel Pump

### A: REMOVAL

#### WARNING:

Place "NO FIRE" signs near the working area.

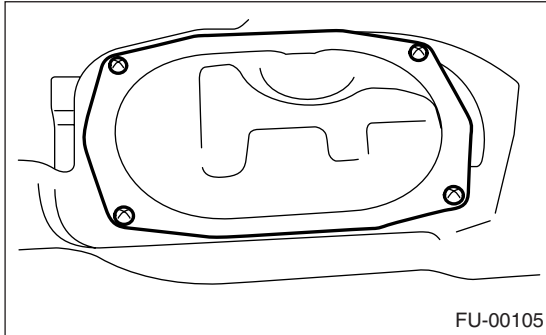
#### CAUTION:

Be careful not to spill the fuel.

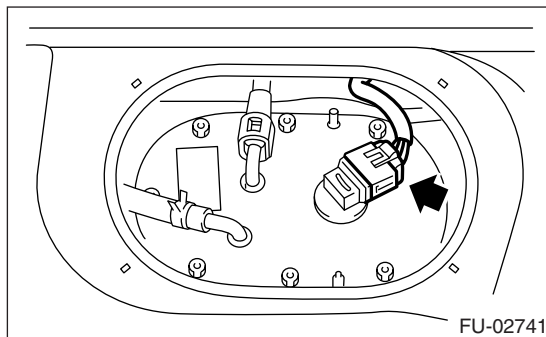
#### NOTE:

The fuel pump assembly consists of a fuel pump and a fuel level sensor.

- 1) Release the fuel pressure.  
<Ref. to FU(H4SO)-42, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from battery.
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Remove the luggage floor mat. <Ref. to EI-61, REMOVAL, Luggage Floor Mat.>
- 5) Remove the service hole cover.

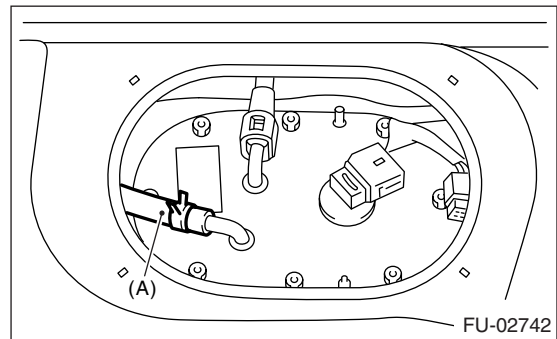


- 6) Disconnect the connector from fuel pump.

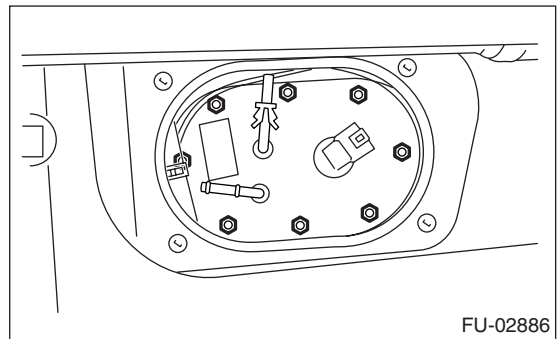


- 7) Disconnect the quick connector and then disconnect the fuel delivery hose. <Ref. to FU(H4SO)-57, REMOVAL, Fuel Delivery & Evaporation Lines.>

- 8) Move the clip and then disconnect the jet pump hose (A).



- 9) Remove the nuts which install the fuel pump assembly onto the fuel tank.



- 10) Take off the fuel pump assembly from the fuel tank.

### B: INSTALLATION

Install in the reverse order of removal. Do the following:

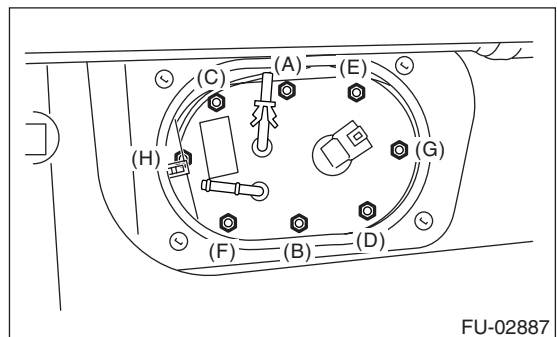
#### NOTE:

Use a new gasket and retainer.

- (1) Ensure the sealing portion is free from fuel or foreign particles before installation.
- (2) Tighten the nuts in alphabetical sequence shown in figure to specified torque.

#### Tightening torque:

**4.4 N·m (0.45 kgf·m, 3.3 ft·lb)**

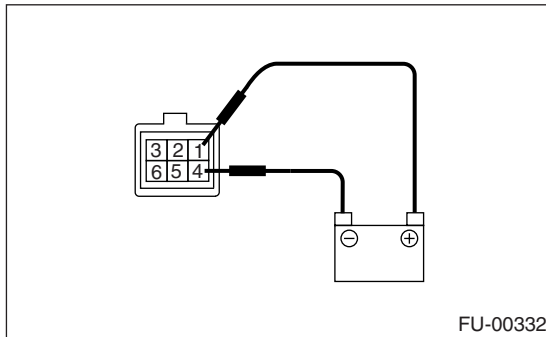


## C: INSPECTION

Connect the lead harness to the connector terminal of fuel pump and apply the battery power supply to check whether the pump operates.

### WARNING:

- Wipe off the fuel completely.
- Keep battery as far apart from fuel pump as possible.
- Be sure to turn the battery supply ON and OFF on the battery side.
- Do not run fuel pump for a long time under non-load condition.



## 25. Fuel Level Sensor

### A: REMOVAL

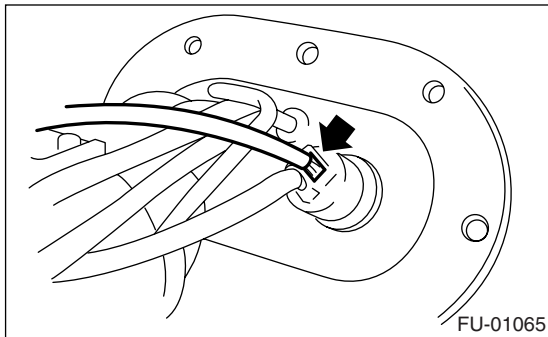
**WARNING:**

- Place “NO FIRE” signs near the working area.
- Be careful not to spill the fuel.

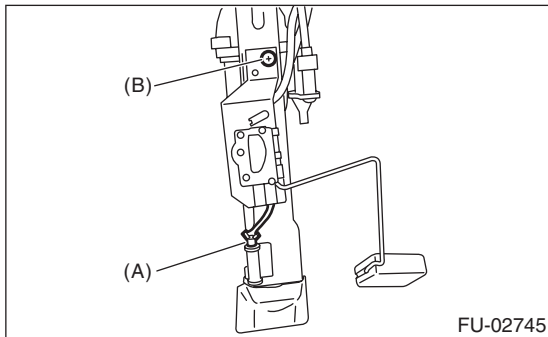
**NOTE:**

Fuel level sensor is built in fuel pump assembly.

- 1) Remove the fuel pump assembly.  
<Ref. to FU(H4SO)-50, REMOVAL, Fuel Pump.>
- 2) Disconnect the connector from the fuel pump bracket.



- 3) Remove the fuel temperature sensor (A).
- 4) Remove the bolt (B) which installs the fuel level sensor on mounting bracket.



### B: INSTALLATION

Install in the reverse order of removal.

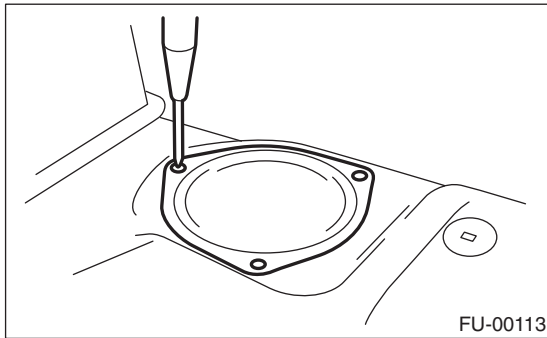
## 26. Fuel Sub Level Sensor

### A: REMOVAL

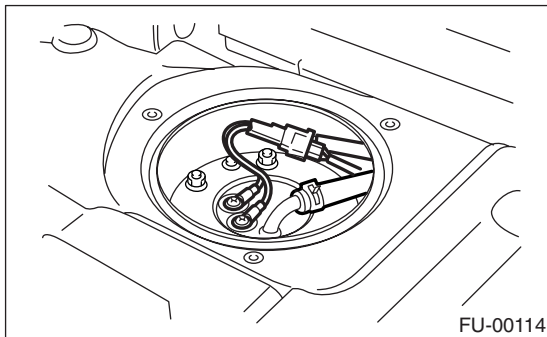
**WARNING:**

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

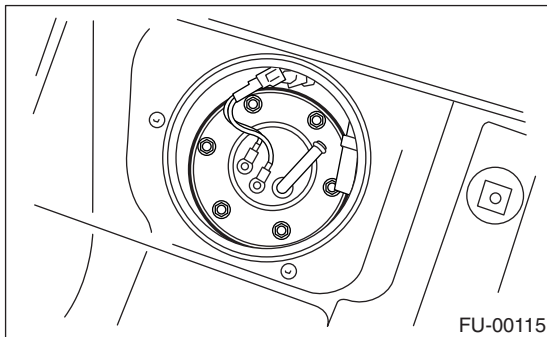
- 1) Disconnect the ground cable from battery.
- 2) Lift up the vehicle.
- 3) Drain the fuel from the fuel tank.  
<Ref. to FU(H4SO)-42, DRAINING FUEL, PROCEDURE, Fuel.>
- 4) Remove the luggage floor mat. <Ref. to EI-61, REMOVAL, Luggage Floor Mat.>
- 5) Remove the service hole cover.



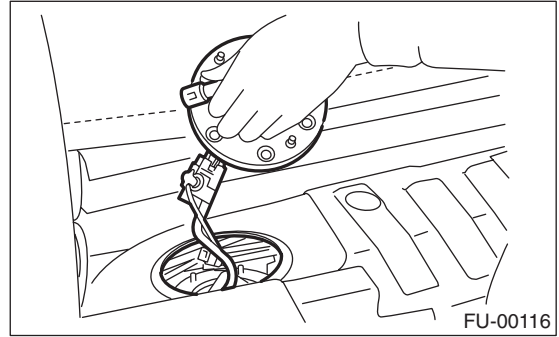
- 6) Disconnect the connector from the fuel sub level sensor.
- 7) Disconnect the fuel jet pump hose.



- 8) Remove the bolts which install the fuel sub level sensor on the fuel tank.



- 9) Remove the fuel sub level sensor.



### B: INSTALLATION

Install in the reverse order of removal.

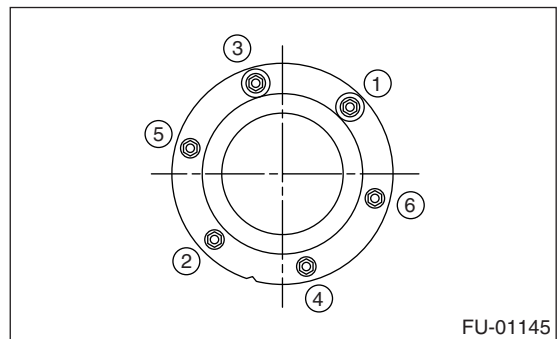
**NOTE:**

Use a new gasket.

- (1) Ensure the sealing portion is free from fuel or foreign particles before installation.
- (2) Tighten the nuts and bolts to specified torque in the order as shown in the figure.

**Tightening torque:**

**4.4 N·m (0.45 kgf·m, 3.3 ft·lb)**



# Fuel Filter

FUEL INJECTION (FUEL SYSTEMS)

## 27. Fuel Filter

### A: REMOVAL

#### WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill the fuel.

#### NOTE:

Fuel filter is built into the fuel pump assembly.

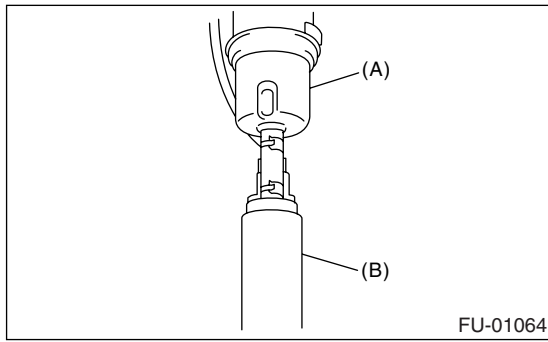
1) Release the fuel pressure.

<Ref. to FU(H4SO)-42, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Remove the fuel pump assembly. <Ref. to FU(H4SO)-50, REMOVAL, Fuel Pump.>

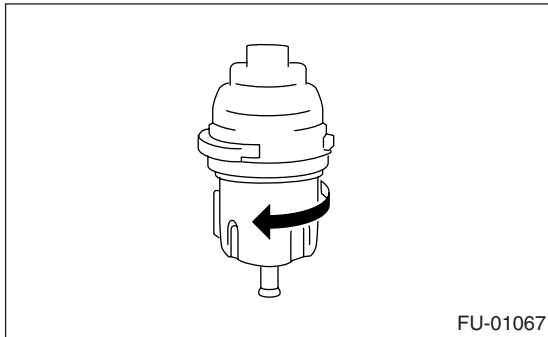
3) Remove the fuel pump. <Ref. to FU(H4SO)-50, REMOVAL, Fuel Pump.>

4) Separate the fuel filter from fuel pump.



- (A) Fuel filter
- (B) Fuel pump

5) Turn the filter holder around to the arrow direction, and then remove the filter.



### B: INSTALLATION

#### CAUTION:

- If fuel hoses are damaged at the connecting portion, replace them with new ones.
- If clamps are badly damaged, replace them with new ones.

Install in the reverse order of removal.

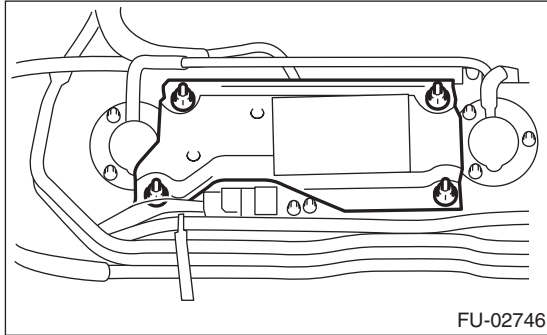
### C: INSPECTION

- 1) Check the inside of fuel filter for dirt and water sediment.
- 2) If it is clogged, or if replacement interval has been reached, replace it.

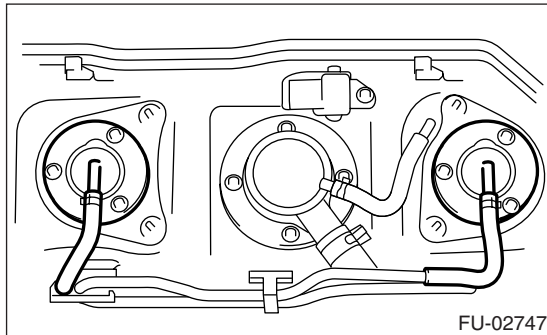
## 28. Fuel Cut Valve

### A: REMOVAL

- 1) Remove the fuel tank.  
<Ref. to FU(H4SO)-43, REMOVAL, Fuel Tank.>
- 2) Remove the protect cover.



- 3) Move the clip and disconnect the evaporation hose from fuel cut valve.



- 4) Remove the bolts which install the fuel cut valve.

### B: INSTALLATION

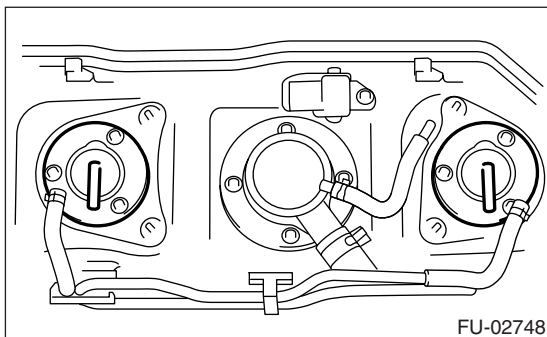
Install in the reverse order of removal.

NOTE:

Use a new gasket.

**Tightening torque:**

**4.4 N·m (0.45 kgf-m, 3.3 ft-lb)**





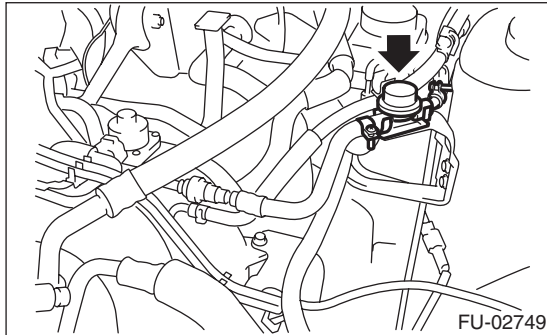
## 29. Fuel Damper Valve

### A: REMOVAL

- 1) Release the fuel pressure.  
<Ref. to FU(H4SO)-42, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Remove the fuel damper valve from the fuel delivery line.

### WARNING:

- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.



### B: INSTALLATION

Install in the reverse order of removal.

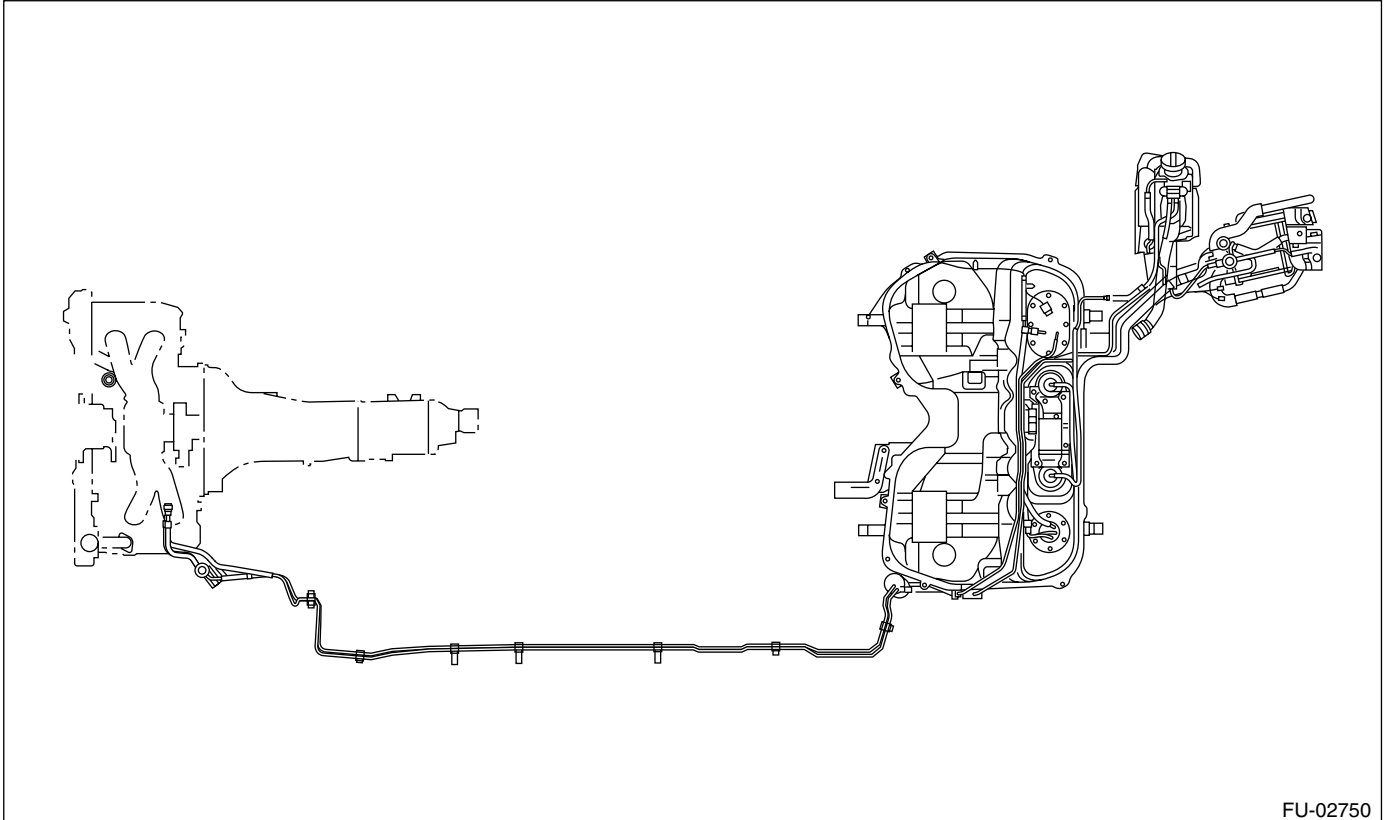
### *Tightening torque:*

***1.25 N·m (0.13 kgf-m, 0.94 ft-lb)***

## 30. Fuel Delivery & Evaporation Lines

### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(H4SO)-42, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Remove the floor mat. <Ref. to EI-60, REMOVAL, Floor Mat.>
- 5) Disconnect the fuel delivery pipes and hoses, and disconnect the evaporation pipes and hoses.



6) In engine compartment, detach the fuel delivery hoses and evaporation hose.

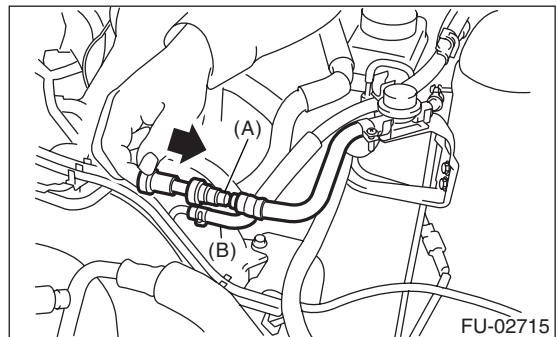
- (1) Separate the quick connectors of fuel delivery line by pushing the ST to the direction of arrow.

ST 42099AE000 CONNECTOR REMOVER

- (2) Remove the clip, and separate the evaporation hose from pipe.

#### WARNING:

- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.



(A) Fuel delivery hose

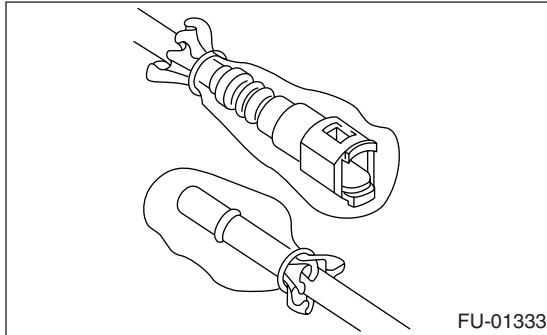
(B) Evaporation hose

- 7) Lift up the vehicle.

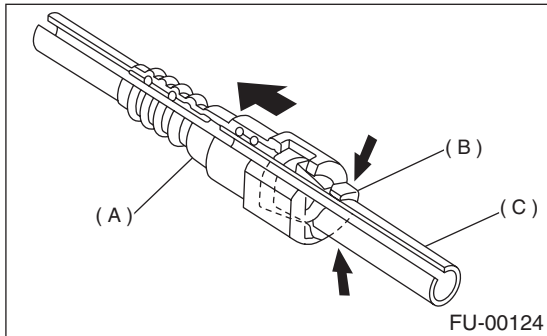
# Fuel Delivery & Evaporation Lines

## FUEL INJECTION (FUEL SYSTEMS)

- 8) Disconnect the quick connector on fuel line.
- (1) Clean the pipe and connector, if they are covered with dust.
  - (2) To prevent from damaging or entering foreign matter, wrap the pipes and connectors with plastic bag, etc.



- (3) Hold the connector (A) and push retainer (B) down.
- (4) Pull out the connector (A) from retainer (B).



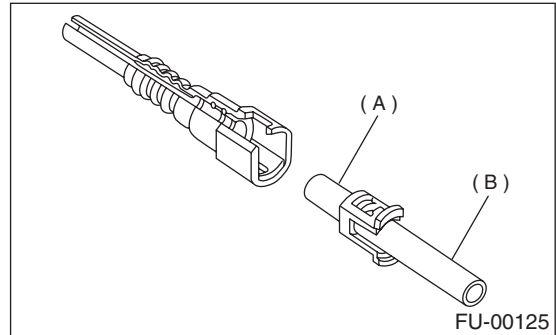
- (A) Connector
- (B) Retainer
- (C) Pipe

## B: INSTALLATION

- 1) Connect the quick connector on fuel line.

### CAUTION:

- Use a new retainer except for use of engine compartment.
- Make sure that the connected portion is not damaged or has dust. If necessary, clean seal surface of pipe.

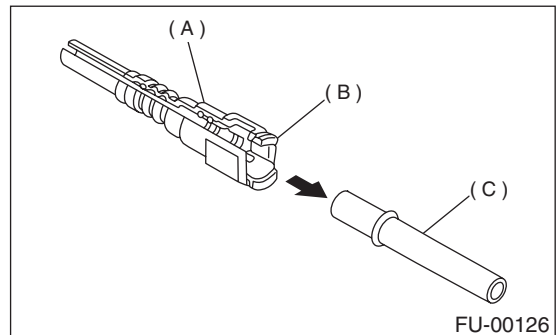


- (A) Seal surface
- (B) Pipe

- (1) Set the new retainer (B) to connector (A).
- (2) Push the pipe into the connector completely.

### NOTE:

At this time, two clicking sounds are heard.



- (A) Connector
- (B) Retainer
- (C) Pipe

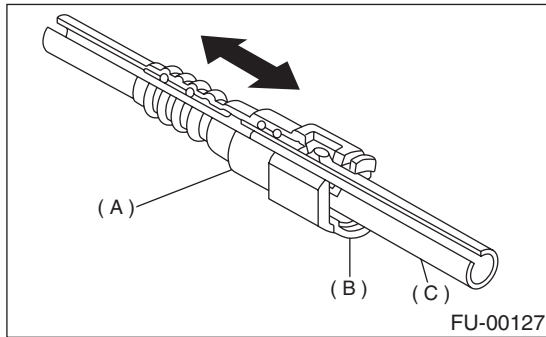
### CAUTION:

- Pull the connector to ensure it is connected securely.
- Ensure the two retainer pawls are engaged in their mating positions in the connector.

# Fuel Delivery & Evaporation Lines

FUEL INJECTION (FUEL SYSTEMS)

- Be sure to inspect hoses and their connections for any leakage of fuel.



- (A) Connector
- (B) Retainer
- (C) Pipe

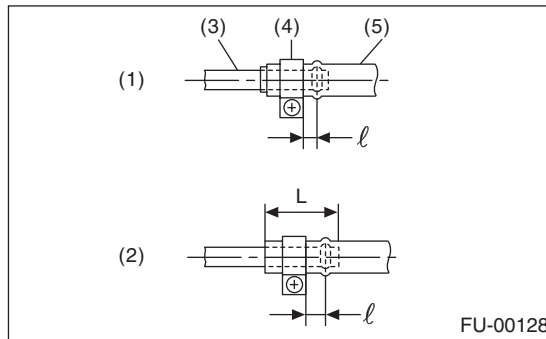
2) Connect the fuel delivery hose by inserting it into the pipe for 20 to 25 mm (0.79 to 0.98 in) in length.  
 Type A: When the fitting length is specified.  
 Type B: When the fitting length is not specified.

$\varnothing : 2.5 \pm 1.5 \text{ mm } (0.098 \pm 0.059 \text{ in})$

$L : 22.5 \pm 2.5 \text{ mm } (0.886 \pm 0.098 \text{ in})$

**CAUTION:**

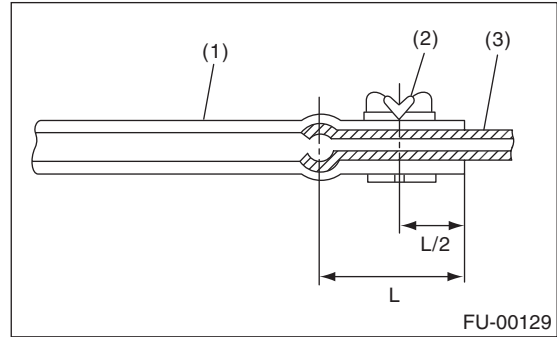
Be sure to inspect hoses and their connections for any leakage of fuel.



- (1) Type A
- (2) Type B
- (3) Pipe
- (4) Clamp
- (5) Hose

3) Connect the evaporation hose by inserting it into the pipe for 15 to 20 mm (0.59 to 0.79 in) in length.

$L = 17.5 \pm 2.5 \text{ mm } (0.689 \pm 0.098 \text{ in})$



- (1) Hose
- (2) Clip
- (3) Pipe

**C: INSPECTION**

- 1) Make sure that there are no cracks on the fuel pipes and fuel hoses.
- 2) Make sure that the fuel pipe and fuel hose connections are tight.

# Fuel System Trouble in General

FUEL INJECTION (FUEL SYSTEMS)

## 31. Fuel System Trouble in General

### A: INSPECTION

| Trouble and possible cause                     |  | Corrective action   |
|--|--|---|
| <b>1. Insufficient fuel supply to injector</b> |  |   |
| 1)   | Fuel pump does not operate.  |   |
|  | ○ Defective terminal contact.  | Inspect contact, especially ground, and tighten it securely.  |
|  | ○ Trouble in electromagnetic or electronic circuit parts.              | Replace the faulty parts.                                     |
| 2)   | Lowering of fuel pump function.  | Replace the fuel pump.  |
| 3)   | Clogged dust or water in the fuel filter.                              | Replace fuel filter, clean or replace fuel tank.              |
| 4)   | Clogged or bent fuel pipe or hose.                                     | Clean, correct or replace the fuel pipe or hose.              |
| 5)   | Air is mixed in the fuel system.                                       | Inspect or retighten each connection part.                    |
| 6)   | Clogged or bent air breather tube or pipe.                             | Clean, correct or replace air breather tube or pipe.          |
| 7)   | Damaged diaphragm of pressure regulator.                               | Replace.  |
| <b>2. Leakage or blow out of fuel</b>          |  |   |
| 1)   | Loosened joints of the fuel pipe.                                      | Retightening.   |
| 2)   | Cracked fuel pipe, hose and fuel tank.                                 | Replace.  |
| 3)   | Defective welding part on the fuel tank.                               | Replace.  |
| 4)   | Defective drain packing of the fuel tank.                              | Replace.  |
| 5)   | Clogged air breather tube or air vent tube.                            | Clean, correct or replace air breather tube or air vent tube. |
| <b>3. Gasoline smell inside of compartment</b> |  |   |
| 1)   | Loose joints at air breather tube, air vent tube and fuel filler pipe. | Retightening.   |
| 2)   | Defective packing air tightness on the fuel saucer.                    | Correct or replace the packing.                               |
| 3)   | Inoperative fuel pump modulator or circuit.                            | Replace.  |
| <b>4. Defective fuel meter indicator</b>       |  |   |
| 1)   | Defective operation of fuel level sensor.                              | Replace.  |
| 2)   | Defective operation of fuel meter.                                     | Replace.  |
| <b>5. Noise</b>                                |  |   |
| 1)   | Large operation noise or vibration of fuel pump.                       | Replace.  |

#### NOTE:

- When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank. Fill fuel fully to prevent those problem. And also drain the water condensation from fuel filter.
- In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use water removing agent in the fuel system to prevent freezing fuel system and accumulating water. Fill the water removing agent at the time when the fuel reduced at half to maintain the advantage.
- When water condensation is noticed in the fuel filter, drain the water from both the fuel filter and fuel tank or use water removing agent in the fuel tank.
- Before using a water removing agent, follow the cautions that noted on the bottle.

# EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES) *EC(H4SO)*

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| 5. Canister.....                          | 6           |
| 6. Purge Control Solenoid Valve .....     | 7           |
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# General Description

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

## 1. General Description

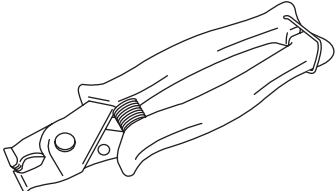
### A: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.

### B: PREPARATION TOOL

#### 1. SPECIAL TOOLS

- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

| ILLUSTRATION   | TOOL NUMBER | DESCRIPTION  | REMARKS  |
|--|-------------|--------------|--|
| <br>ST18353AA000 | 18353AA000  | CLAMP PLIERS | <ul style="list-style-type: none"><li>• Used for removing and installing PCV hose.</li><li>• This tool is a general tool that is made by CAILLAU in France. (Code: 54.0.000.205)<br/>Tool number is fixed as special tool in order to obtain it as easily as SUBARU genuine parts.</li></ul> |

# Front Catalytic Converter

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

---

## 2. Front Catalytic Converter

### A: REMOVAL

Front catalytic converter and front exhaust pipe are integrated into one unit; therefore, the removal procedure is the same as that for front exhaust pipe. <Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>

### B: INSTALLATION

Front catalytic converter and front exhaust pipe are integrated into one unit; therefore, the installation procedure is the same as that for front exhaust pipe. <Ref. to EX(H4SO)-4, INSTALLATION, Front Exhaust Pipe.>

### C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.



## Rear Catalytic Converter

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

---

### 3. Rear Catalytic Converter

#### A: REMOVAL

Rear catalytic converter and center exhaust pipe are integrated into one unit; therefore, the removal procedure is the same as that for front catalytic converter. <Ref. to EX(H4SO)-6, REMOVAL, Center Exhaust Pipe.>

#### B: INSTALLATION

Rear catalytic converter and center exhaust pipe are integrated into one unit; therefore, the installation procedure is the same as that for front catalytic converter. <Ref. to EX(H4SO)-6, INSTALLATION, Center Exhaust Pipe.>

#### C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

## **EGR Valve**

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

---

### **4. EGR Valve**

#### **A: SPECIFICATION**

Refer to "EGR Valve" for removal and installation.

<Ref. to FU(H4SO)-29, EGR Valve.>

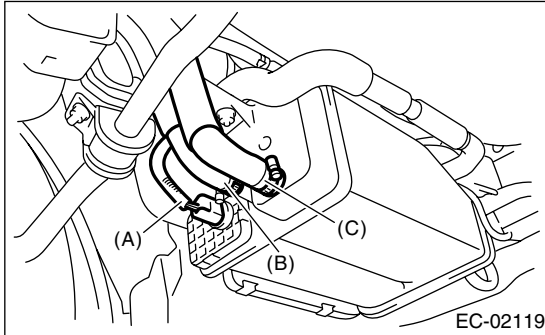
# Canister

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

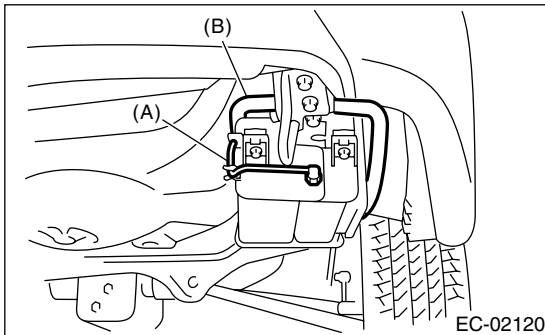
## 5. Canister

### A: REMOVAL

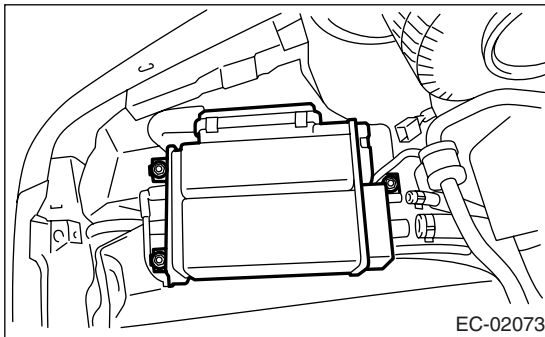
- 1) Disconnect the ground cable from battery.
- 2) Lift up the vehicle.
- 3) Disconnect connector (A) from drain valve.
- 4) Disconnect evaporation hoses (B) and (C) from canister.



- 5) Disconnect quick connector (A) from canister.
- 6) Disconnect drain hoses (B) from canister.



- 7) Remove the canister from vehicle.



### B: INSTALLATION

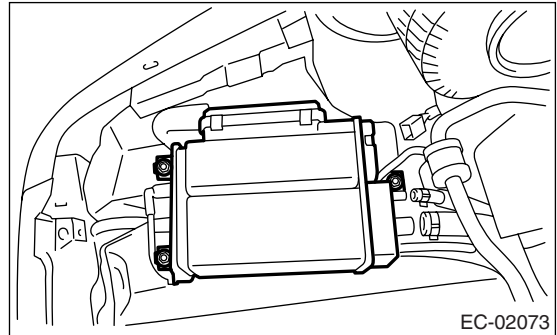
Install in the reverse order of removal.

#### NOTE:

Replace the retainer of quick connector with new one.

#### Tightening torque:

**23 N·m (2.3 kgf-m, 17 ft-lb)**



### C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

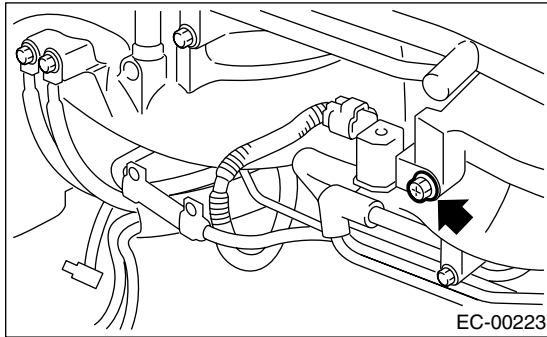
# Purge Control Solenoid Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

## 6. Purge Control Solenoid Valve

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector and hoses of purge control solenoid valve, and then remove the purge control solenoid valve.

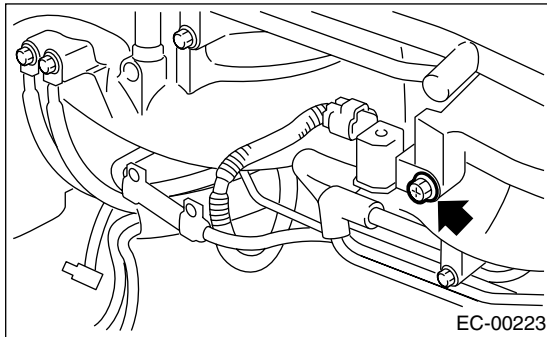


### B: INSTALLATION

Install in the reverse order of removal.

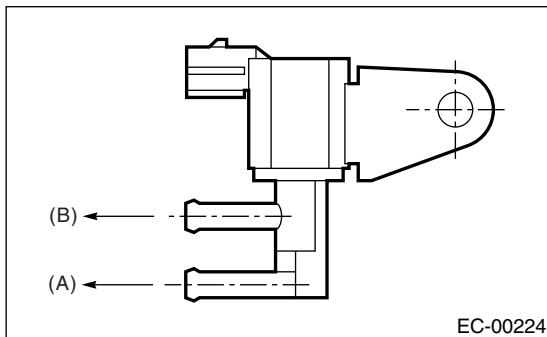
#### *Tightening torque:*

**19 N·m (1.9 kgf-m, 14.0 ft-lb)**



#### NOTE:

Connect the evaporation hose as shown in the figure.



(A) To intake manifold

(B) To fuel pipe (Evaporation line)

### C: INSPECTION

Make sure the hoses are not cracked or loose.

## Fuel Level Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

---

### 7. Fuel Level Sensor

#### A: REMOVAL

For removal procedure, refer to "FU" section. <Ref. to FU(H4SO)-52, REMOVAL, Fuel Level Sensor.>

#### B: INSTALLATION

For installation procedure, refer to "FU" section. <Ref. to FU(H4SO)-52, INSTALLATION, Fuel Level Sensor.>

## 8. Fuel Temperature Sensor

### A: REMOVAL

Fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, the removal procedure is the same as that for fuel level sensor. <Ref. to FU(H4SO)-52, REMOVAL, Fuel Level Sensor.>

### B: INSTALLATION

Fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, the installation procedure is the same as that for fuel level sensor. <Ref. to FU(H4SO)-52, INSTALLATION, Fuel Level Sensor.>

## Fuel Sub Level Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

---

### 9. Fuel Sub Level Sensor

#### A: REMOVAL

For removal procedure, refer to "FU" section. <Ref. to FU(H4SO)-53, REMOVAL, Fuel Sub Level Sensor.>

#### B: INSTALLATION

For installation procedure, refer to "FU" section. <Ref. to FU(H4SO)-53, INSTALLATION, Fuel Sub Level Sensor.>

# Fuel Tank Pressure Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

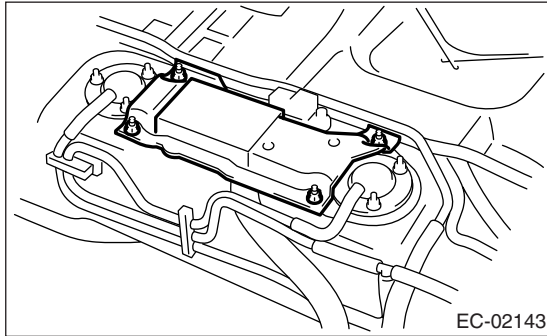
## 10. Fuel Tank Pressure Sensor

### A: REMOVAL

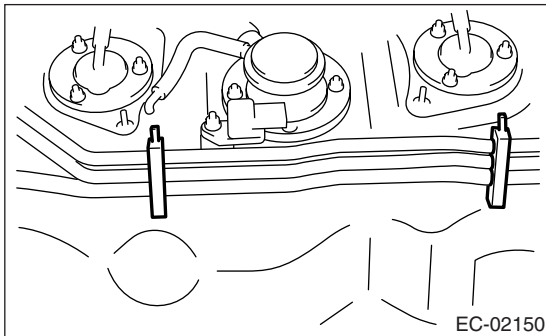
#### WARNING:

- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel.

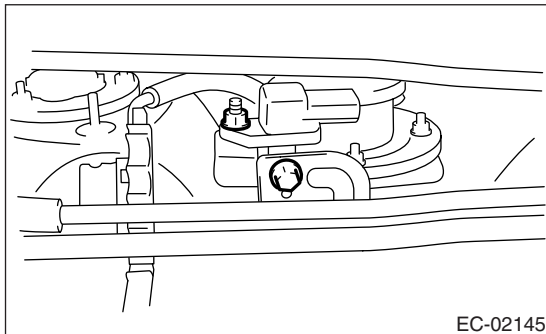
- 1) Remove the fuel tank. <Ref. to FU(H4SO)-43, REMOVAL, Fuel Tank.>
- 2) Remove the protector cover.



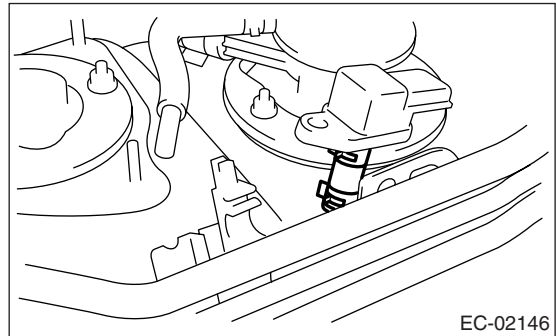
- 3) Disconnect the connector from fuel tank pressure sensor.
- 4) Release the clips which hold the fuel pipes onto fuel tank.



- 5) Remove the nuts and bolts which install the fuel tank pressure sensor on bracket.



- 6) Disconnect the pressure hose from fuel tank pressure sensor.

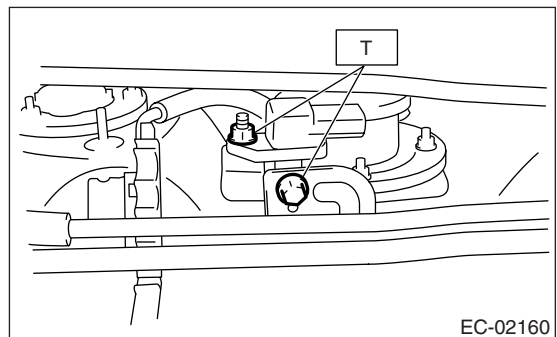


### B: INSTALLATION

Install in the reverse order of removal.

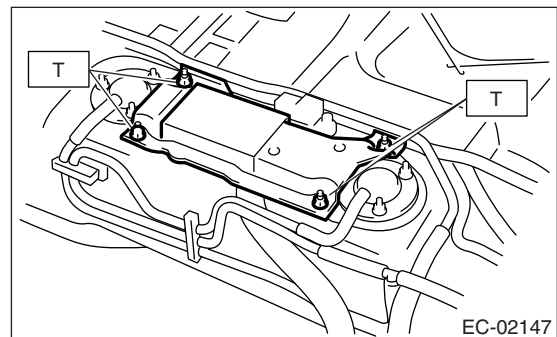
#### Tightening torque:

**7.4 N·m (0.75 kgf·m, 5.4 ft·lb)**



#### Tightening torque:

**T: 4.4 N·m (0.45 kgf·m, 3.3 ft·lb)**



### C: INSPECTION

Make sure the hoses are not cracked or loose.



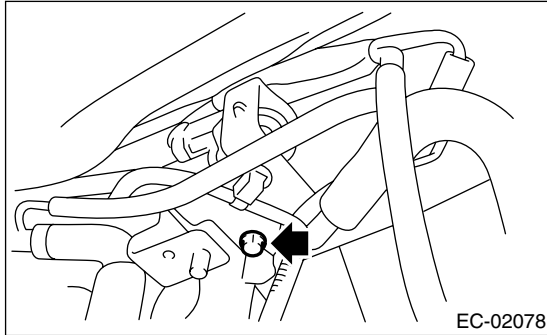
# Pressure Control Solenoid Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

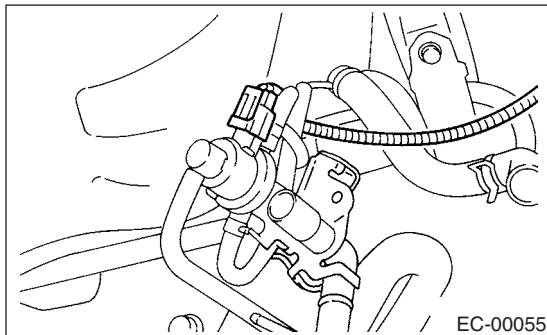
## 11. Pressure Control Solenoid Valve

### A: REMOVAL

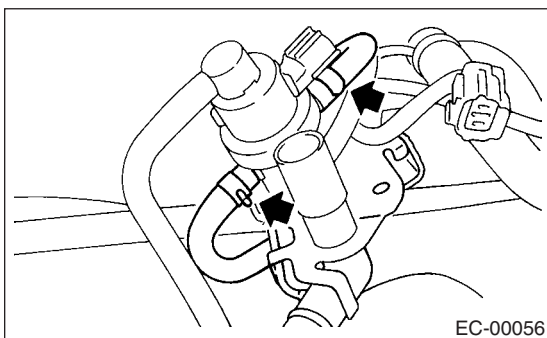
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Lift up the vehicle.
- 4) Remove the canister. <Ref. to EC(H4SO)-6, REMOVAL, Canister.>
- 5) Remove the bolt which installs the pressure control solenoid valve holding bracket on body.



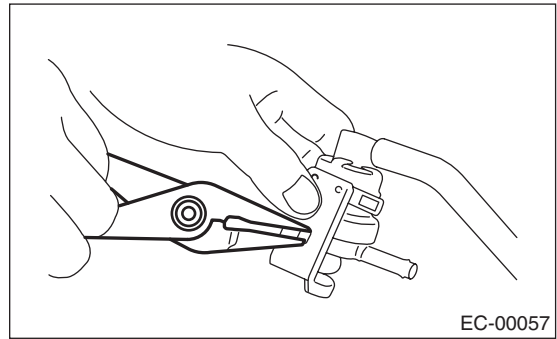
- 6) Remove the pressure control solenoid valve with bracket.
- 7) Disconnect the connector from pressure control solenoid valve.



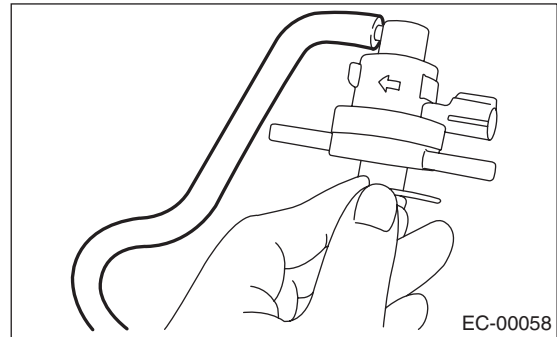
- 8) Disconnect the two evaporation hoses from pressure control solenoid valve.



- 9) Remove the pressure control solenoid valve from bracket.



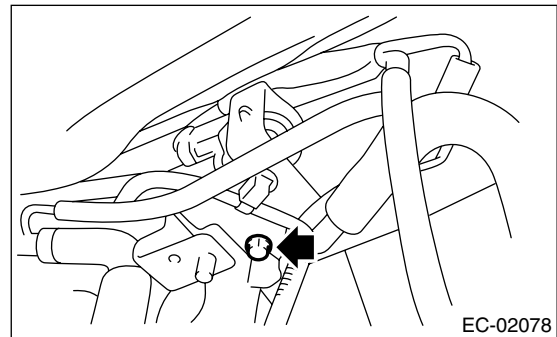
- 10) Disconnect the pressure control valve hose from pressure control solenoid valve.



### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**  
**25 N·m (2.6 kgf·m, 18.8 ft·lb)**



### C: INSPECTION

Make sure the hoses are not cracked or loose.

## **Drain Filter**

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

---

### **12.Drain Filter**

#### **A: SPECIFICATION**

Drain filter is built in the canister, and it is a part which cannot be disassembled.

# Vent Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

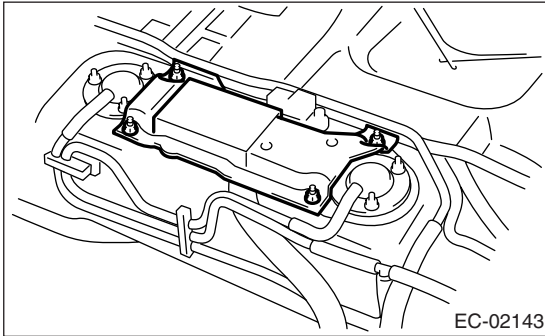
## 13. Vent Valve

### A: REMOVAL

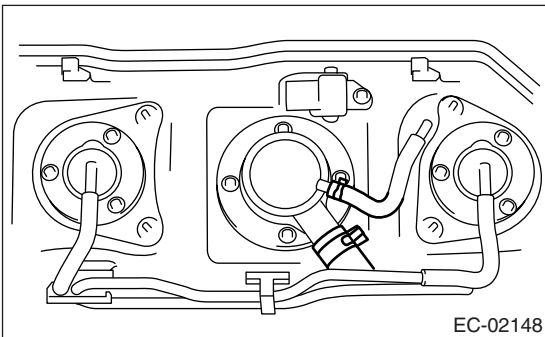
#### WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel.

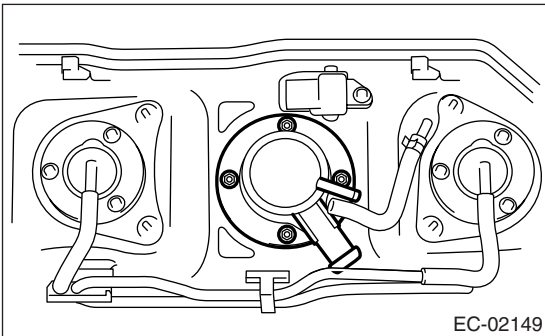
- 1) Remove the fuel tank. <Ref. to FU(H4SO)-43, REMOVAL, Fuel Tank.>
- 2) Remove the protector cover.



- 3) Remove the clips, and disconnect the hoses from vent valve.



- 4) Remove the nuts, and then remove the vent valve.



### B: INSTALLATION

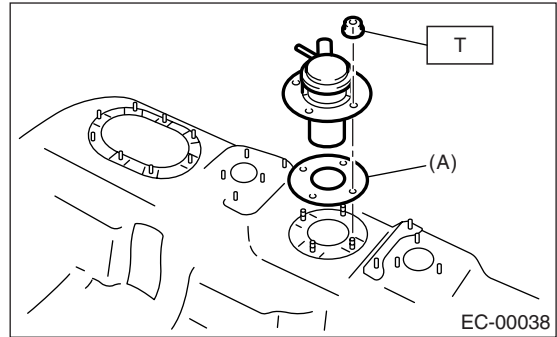
Install in the reverse order of removal.

#### NOTE:

Replace the gasket with a new one.

#### Tightening torque:

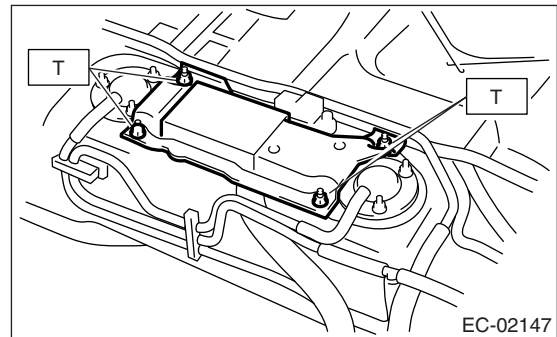
**T: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)**



(A) Gasket

#### Tightening torque:

**T: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)**



### C: INSPECTION

Make sure the hoses are not cracked or loose.

# Shut Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

## 14. Shut Valve

### A: REMOVAL

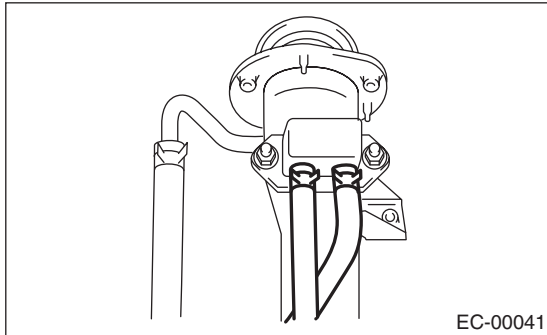
#### WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel.

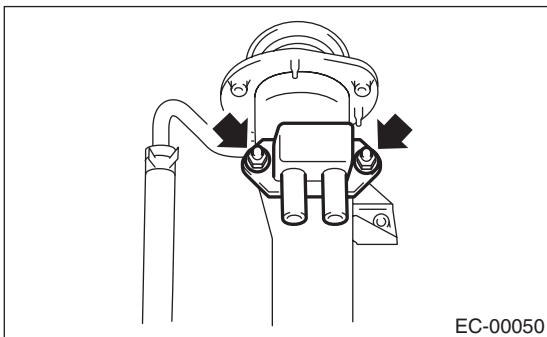
1) Remove the fuel filler pipe.

<Ref. to FU(H4SO)-46, REMOVAL, Fuel Filler Pipe.>

2) Disconnect the evaporation hoses from shut valve.



3) Remove the shut valve from fuel filler pipe.

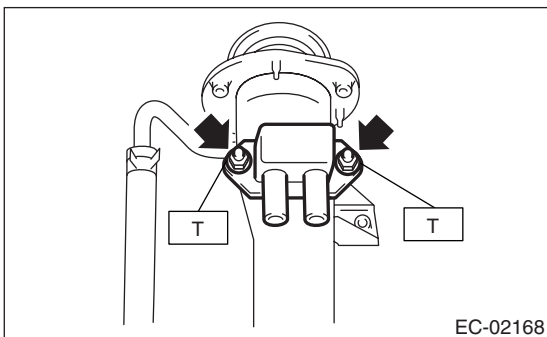


### B: INSTALLATION

Install in the reverse order of removal.

#### Tightening torque:

**4.5 N·m (0.46 kgf-m, 3.3 ft-lb)**



### C: INSPECTION

Make sure the hoses are not cracked or loose.

## Drain Valve

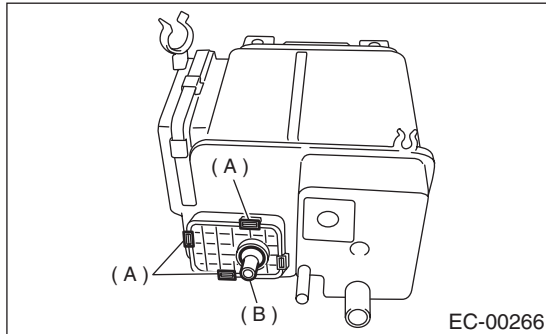
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

---

### 15.Drain Valve

#### A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Disconnect the ground cable from battery.
- 3) Lift up the vehicle.
- 4) Remove the canister. <Ref. to EC(H4SO)-6, REMOVAL, Canister.>
- 5) Remove clip (A), and then remove drain valve (B) from canister.
- 6) Remove the filter from drain valve (B).



#### B: INSTALLATION

Install in the reverse order of removal.

#### CAUTION:

- Assemble the drain valve filter without any clearance.
- Make sure the packing in the groove before assembling drain valve to canister.
- Replace the clip with new one.

#### C: INSPECTION

- 1) Make sure that all hoses are installed securely.
- 2) Make sure that hoses are not cracked or loose.

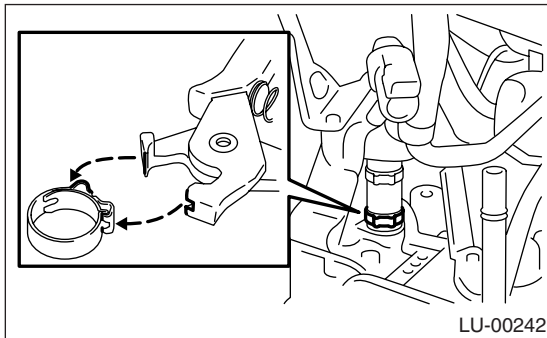
## 16.PCV Hose Assembly

### A: REMOVAL

#### CAUTION:

Removal is not allowed except for the damage of PCV hose, diagnosis connector and PCV valve.

- 1) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
  - 2) Clip the protrusion of clamp after aligning the concave portion of ST with protrusion of clamp, and then unlock the lock.
  - 3) Remove the PCV hose assembly.
- ST 18353AA000 CLAMP PLIERS

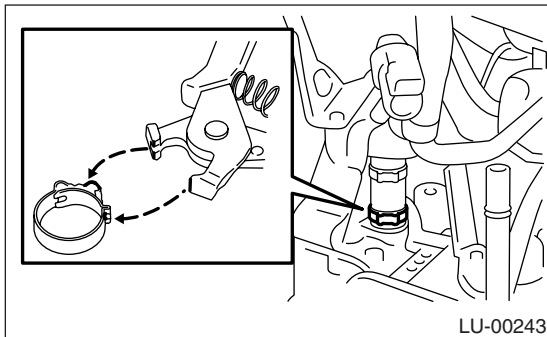


### B: INSTALLATION

#### NOTE:

Replace the clamp with a new one.

- 1) Install the PCV hose assembly, and then lock the clamp with protrusion of clamp clipped by pliers.
- ST 18353AA000 CLAMP PLIERS



- 2) Install the intake manifold. <Ref. to FU(H4DOTC)-17, INSTALLATION, Intake Manifold.>

# PCV Hose Assembly

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

---

# INTAKE (INDUCTION)

# *IN(H4SO)*

---

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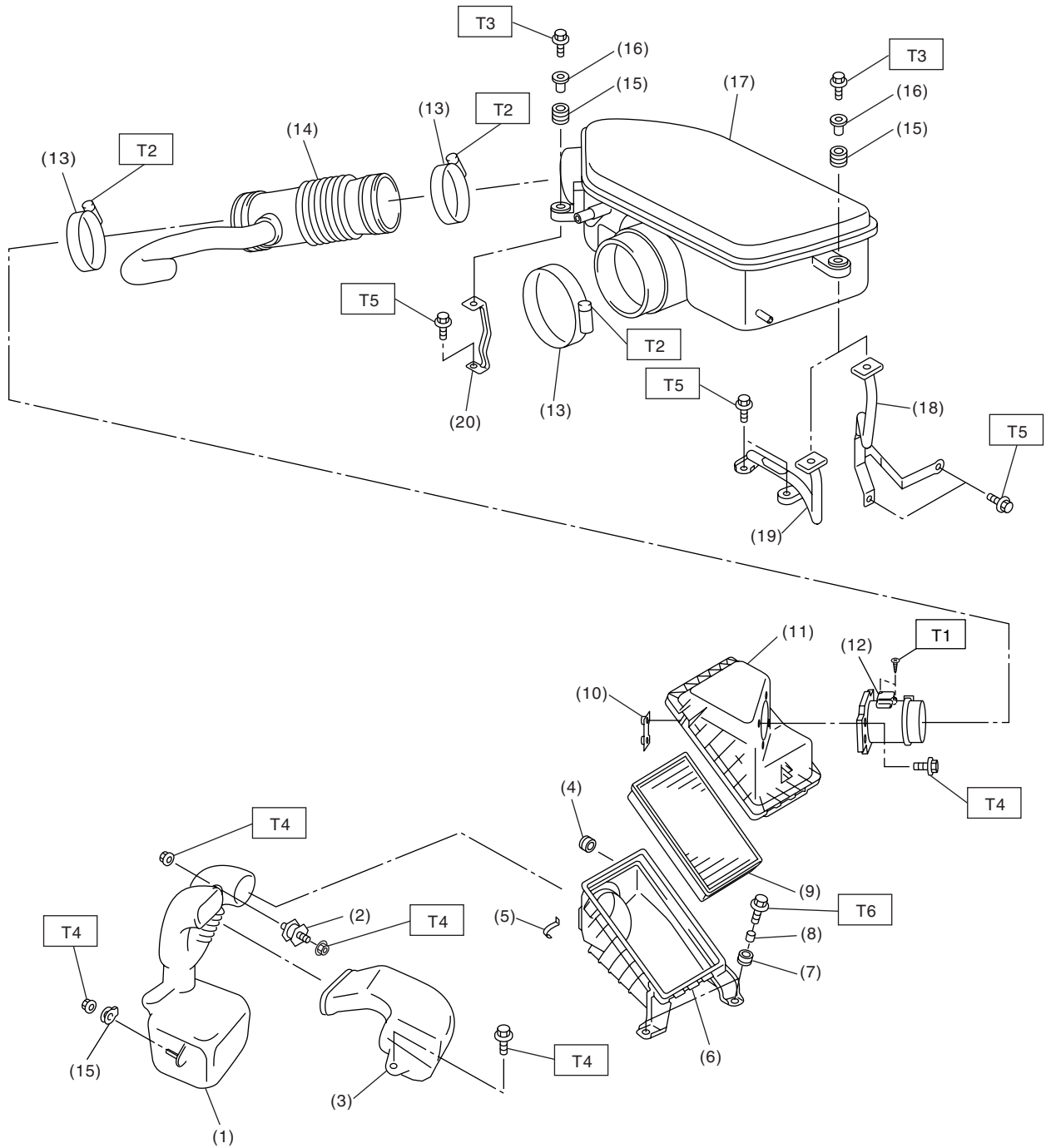


# General Description

INTAKE (INDUCTION)

## 1. General Description

### A: COMPONENT



IN-02168

# General Description

INTAKE (INDUCTION)

|                            |  |              |
|----------------------------|--|--------------|
| (1) Resonator chamber      | (11) Air cleaner upper cover                         | (20) Stay RH |
| (2) Cushion                | (12) Mass air flow and intake air temperature sensor |              |
| (3) Air intake duct        | (13) Clamp   |              |
| (4) Cushion                | (14) Intake duct                                     |              |
| (5) Clip                   | (15) Cushion   |              |
| (6) Air cleaner lower case | (16) Spacer  |              |
| (7) Cushion                | (17) Air intake chamber                              |              |
| (8) Spacer                 | (18) Stay LH (MT model)                              |              |
| (9) Air cleaner element    | (19) Stay LH (AT model)                              |              |
| (10) Guide                 |  |              |

---

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 1.0 (0.1, 0.7)**

**T2: 3.0 (0.3, 2.1)**

**T3: 6.5 (0.66, 4.8)**

**T4: 7.5 (0.76, 5.5)**

**T5: 16 (1.6, 11.6)**

**T6: 33 (3.4, 24.6)**

---

## B: CAUTION

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensor or units, be sure to disconnect the ground cable from battery.

# Air Cleaner Element

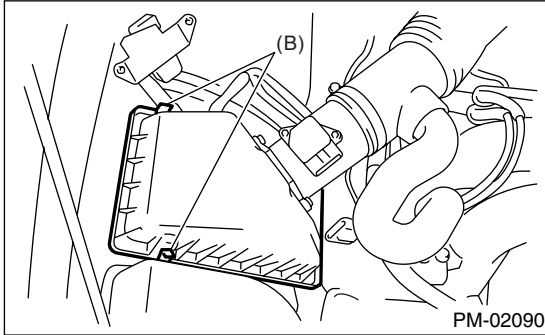
INTAKE (INDUCTION)

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## 2. Air Cleaner Element

### A: REMOVAL

1) Remove the clip (B) above air cleaner case.



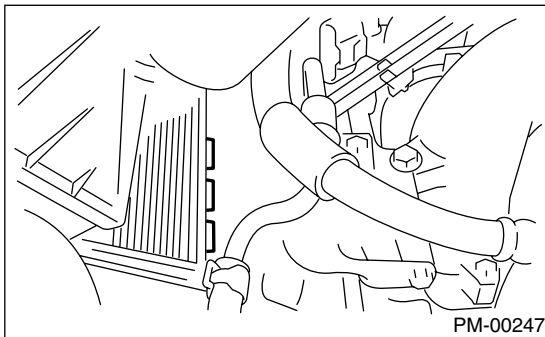
2) Remove the air cleaner element.

### B: INSTALLATION

Install in the reverse order of removal.

#### NOTE:

Fasten it with a clip after inserting the lower tab of case.



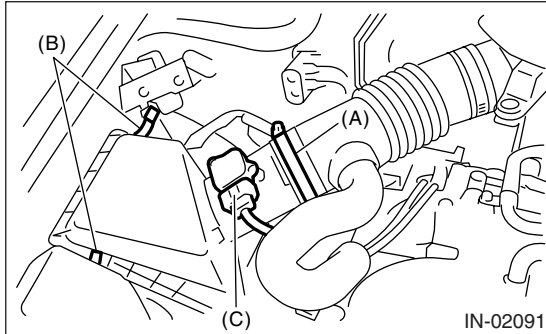
### C: INSPECTION

Replace it if excessively damaged or dirty.

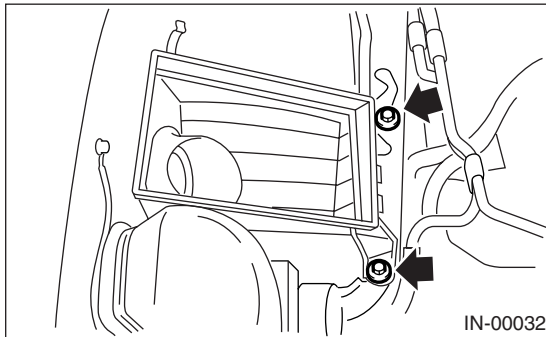
## 3. Air Cleaner Case

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Loosen the clamp (A) which connects the air cleaner case and intake duct.
- 3) Remove the clips (B) of air cleaner case.
- 4) Disconnect the connector (C) of mass air flow and intake air temperature sensor.



- 5) Remove the intake duct and upper cover from air cleaner case.
- 6) Remove the air cleaner element.
- 7) Remove the bolts which install the air cleaner case to body.



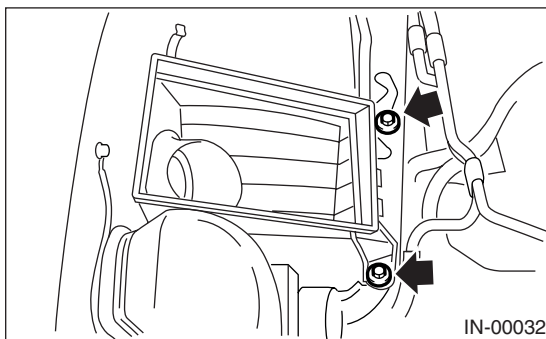
- 8) Remove the air cleaner case.

### B: INSTALLATION

Install in the reverse order of removal.

#### **Tightening torque:**

**33 N·m (3.4 kgf·m, 24.6 ft·lb)**



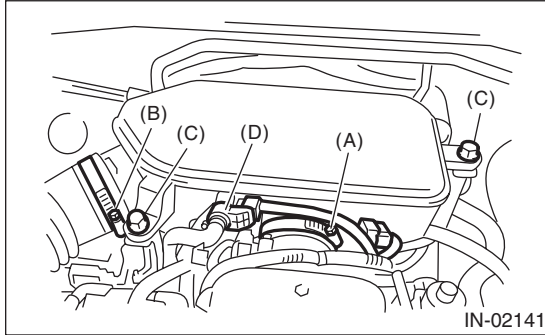
### C: INSPECTION

Inspect for cracks and loose connections.

### 4. Air Intake Chamber

#### A: REMOVAL

- 1) Loosen the clamp (A) which connects the air intake chamber and throttle body.
- 2) Loosen the clamp (B) which connects the air intake chamber and intake duct.
- 3) Remove the bolts (C) which connects the air intake chamber to the stay.
- 4) Disconnect the connector (D).



- 5) Disconnect the two blow-by hoses, and then remove the air intake chamber.

#### B: INSTALLATION

Install in the reverse order of removal.

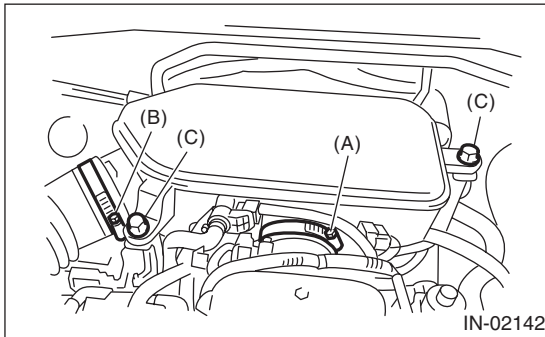
#### *Tightening torque:*

**Clamp (A), (B)**

**3 N·m (0.3 kgf-m, 2.1 ft-lb)**

**Bolt (C)**

**6.5 N·m (0.66 kgf-m, 4.8 ft-lb)**



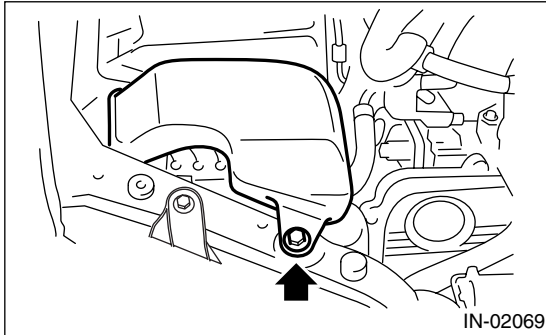
#### C: INSPECTION

- 1) Inspect for cracks and loose connections.
- 2) Inspect that no foreign objects are mixed in air intake chamber.

## 5. Air Intake Duct

### A: REMOVAL

- 1) Remove the bolts which install the air intake duct on the front side of body.
- 2) Remove the air intake duct.



### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

***7.5 N·m (0.76 kgf-m, 5.5 ft-lb)***

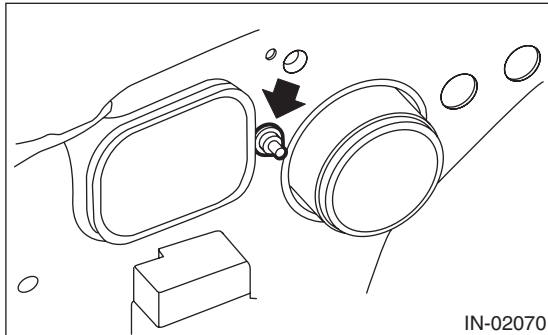
### C: INSPECTION

- 1) Inspect for cracks and loose connections.
- 2) Inspect that no foreign objects are mixed in the air intake duct.

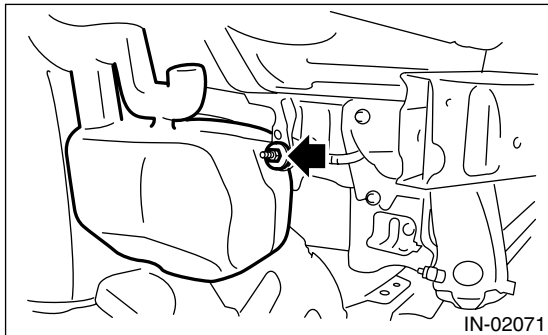
## 6. Resonator Chamber

### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Remove the air intake duct.
- 3) Remove the air cleaner lower case. <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
- 4) Remove the resonator chamber mounting nut on the right side of engine compartment.



- 5) Lift-up the vehicle, and then remove the front wheel RH.
- 6) Remove the front mud guard RH.
- 7) Remove the resonator chamber from inside front fender.



### B: INSTALLATION

Install in the reverse order of removal.

#### **Tightening torque:**

**7.5 N·m (0.76 kgf-m, 5.5 ft-lb)**

### C: INSPECTION

- 1) Inspect for cracks and loose connections.
- 2) Inspect that no foreign objects are mixed in resonator chamber.

# MECHANICAL

# ME(H4SO)

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# General Description

MECHANICAL

## 1. General Description

### A: SPECIFICATION

|   |                                   |            |   |  |
|---|-----------------------------------|------------|---|--|
|   | Model                             |            | 2.5 L   |  |
| Engine  | Cylinder arrangement              |            | Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine |  |
|   | Valve system mechanism            |            | Belt driven, single over-head camshaft, 4-valve/cylinder                  |  |
|   | Bore × Stroke                     |            | mm (in)   | 99.5 × 79.0 (3.917 × 3.110)            |
|   | Displacement                      |            | cm <sup>3</sup> (cu in)   | 2,457 (150)                            |
|   | Compression ratio                 |            |   | 10.0                                   |
|   | Compression pressure (at 350 rpm) |            | kPa (kgf/cm <sup>2</sup> , psi)   | 1,020 — 1,275 (10.4 — 13.0, 148 — 185) |
|   | Number of piston rings            |            |   | Pressure ring: 2, Oil ring: 1          |
|   | Intake valve timing               | Fixed      | Open  | BTDC 0°                                |
|   |                                   |            | Close   | ABDC 58°                               |
|   |                                   | Low speed  | Open  | BTDC 0°                                |
|   |                                   |            | Close   | ABDC -50°                              |
|   |                                   | High speed | Open  | BTDC 14°                               |
|   |                                   |            | Close   | ABDC 62°                               |
|   | Exhaust valve timing              |            | Open  | BBDC 54°                               |
|   |                                   |            | Close   | ATDC 14°                               |
| Valve clearance   |                                   | mm (in)    |   |  |
|   |                                   | Intake     | 0.20±0.04 (0.0079±0.0016)   |  |
| Idle speed [at neutral position on MT, or "P" or "N" range on AT] |                                   | rpm        |   |  |
|   |                                   | MT         | 650±100 (No load)<br>850±100 (A/C ON)                                     |  |
| Ignition order  |                                   | AT         | 700±100 (No load)<br>850±100 (A/C ON)                                     |  |
|   |                                   |            | 1 → 3 → 2 → 4   |  |
| Ignition timing   |                                   | BTDC/rpm   |   |  |
|   |                                   | MT         | 10°±8°/650  |  |
|   |                                   | AT         | 15°±8°/700  |  |

NOTE:

US: undersize OS: oversize

|                       |                                      |            |           |                                   |                                 |
|-----------------------|--------------------------------------|------------|-----------|-----------------------------------|---------------------------------|
| Belt tension adjuster | Protrusion of adjuster rod           |            | mm (in)   | 5.2 — 6.2 (0.205 — 0.244)         |                                 |
| Belt tensioner        | Spacer O.D.                          |            | mm (in)   | 17.955 — 17.975 (0.7069 — 0.7077) |                                 |
|                       | Tensioner bushing I.D.               |            | mm (in)   | 18.00 — 18.08 (0.7087 — 0.7118)   |                                 |
|                       | Clearance between spacer and bushing | mm (in)    | Standard  | 0.025 — 0.125 (0.0010 — 0.0049)   |                                 |
|                       |                                      |            | Limit     | 0.175 (0.069)                     |                                 |
|                       | Side clearance of spacer             | mm (in)    | Standard  | 0.20 — 0.55 (0.0079 — 0.0217)     |                                 |
|                       |                                      |            | Limit     | 0.81 (0.0319)                     |                                 |
| Valve rocker arm      | Clearance between shaft and arm      | Intake     | Fixed     | Standard                          | 0.020 — 0.054 (0.0008 — 0.0021) |
|                       |                                      |            |           | Limit                             | 0.10 (0.0039)                   |
|                       |                                      |            | Low speed | Standard                          | 0.010 — 0.038 (0.0004 — 0.0015) |
|                       |                                      |            |           | Limit                             | 0.10 (0.0039)                   |
|                       |                                      | High speed | Standard  | 0.010 — 0.038 (0.0004 — 0.0015)   |                                 |
|                       |                                      |            | Limit     | 0.10 (0.0039)                     |                                 |
|                       |                                      | Exhaust    |           | Standard                          | 0.020 — 0.054 (0.0008 — 0.0021) |
|                       |                                      |            |           | Limit                             | 0.10 (0.0039)                   |

# General Description

MECHANICAL

|                            |  |         |                                   |                                   |  |                                   |                                   |
|----------------------------|--|---------|-----------------------------------|-----------------------------------|--|-----------------------------------|-----------------------------------|
| Camshaft                   | Bend limit   |         | mm (in)                           | 0.025 (0.00098)                   |  |                                   |                                   |
|                            | Thrust clearance                                       |         | mm (in)                           | Standard                          | 0.030 — 0.090 (0.0012 — 0.0035)                            |                                   |                                   |
|                            |  |         |                                   | Limit                             | 0.10 (0.0039)  |                                   |                                   |
|                            | Cam lobe height  |         | mm (in)                           | Intake                            | Fixed  | Standard                          | 40.075 — 40.175 (1.5778 — 1.5817) |
|                            |  |         |                                   |                                   | Limit  | 39.975 (1.5738)                   |                                   |
|                            |  |         |                                   | Low speed                         | Standard   | 35.182 — 35.282 (1.3851 — 1.3891) |                                   |
|                            |  |         |                                   |                                   | Limit  | 35.082 (1.3812)                   |                                   |
|                            |  |         |                                   | High speed                        | Standard   | 40.315 — 40.415 (1.5872 — 1.5911) |                                   |
|                            |  |         |                                   |                                   | Limit  | 40.215 (1.5833)                   |                                   |
|                            | Exhaust  |         | Standard                          | 40.149 — 40.249 (1.5807 — 1.5846) |  |                                   |                                   |
|                            |  |         | Limit                             | 40.049 (1.5767)                   |  |                                   |                                   |
| Camshaft journal O.D.      |  | mm (in) | 31.928 — 31.945 (1.2570 — 1.2577) |                                   |  |                                   |                                   |
| Camshaft journal hole I.D. |  | mm (in) | 32.000 — 32.018 (1.2598 — 1.2605) |                                   |  |                                   |                                   |
| Oil clearance              |  | mm (in) | Standard                          | 0.055 — 0.090 (0.0022 — 0.0035)   |  |                                   |                                   |
|                            |  |         | Limit                             | 0.10 (0.0039)                     |  |                                   |                                   |
| Cylinder head              | Surface warping limit:<br>(mating with cylinder block) |         | mm (in)                           | 0.03 (0.001)                      |  |                                   |                                   |
|                            | Grinding limit   |         | mm (in)                           | 0.1 (0.004)                       |  |                                   |                                   |
|                            | Standard height  |         | mm (in)                           | 97.5 (3.84)                       |  |                                   |                                   |
| Valve seat                 | Refacing angle   |         |                                   | 90°                               |  |                                   |                                   |
|                            | Contacting width                                       |         | Intake                            | Standard                          | 0.8 — 1.4 (0.03 — 0.055)                                   |                                   |                                   |
|                            |  |         |                                   | Limit                             | 1.7 (0.067)  |                                   |                                   |
|                            |  |         | Exhaust                           | Standard                          | 1.2 — 1.8 (0.047 — 0.071)                                  |                                   |                                   |
|                            |  |         |                                   | Limit                             | 2.2 (0.087)  |                                   |                                   |
| Valve guide                | Inside diameter  |         | mm (in)                           | 6.000 — 6.012 (0.2362 — 0.2367)   |  |                                   |                                   |
|                            | Protrusion above head                                  |         | mm (in)                           | Intake                            | 20.0 — 21.0 (0.787 — 0.827)                                |                                   |                                   |
|                            |  |         |                                   | Exhaust                           | 16.5 — 17.5 (0.650 — 0.689)                                |                                   |                                   |
|                            | Head edge thickness                                    |         | mm (in)                           | Intake                            | Standard   | 0.8 — 1.2 (0.03 — 0.047)          |                                   |
| Limit                      |  |         |                                   |                                   | 0.6 (0.024)  |                                   |                                   |
| Exhaust                    |  |         |                                   | Standard                          | 1.0 — 1.4 (0.039 — 0.055)                                  |                                   |                                   |
|                            |  |         |                                   | Limit                             | 0.6 (0.024)  |                                   |                                   |
| Valve                      | Stem outer diameters                                   |         | mm (in)                           | Intake                            | 5.950 — 5.965 (0.2343 — 0.2348)                            |                                   |                                   |
|                            |  |         |                                   | Exhaust                           | 5.945 — 5.960 (0.2341 — 0.2346)                            |                                   |                                   |
|                            | Valve stem gap   |         | mm (in)                           | Standard                          | Intake   | 0.035 — 0.062 (0.0014 — 0.0024)   |                                   |
|                            |  |         |                                   |                                   | Exhaust  | 0.040 — 0.067 (0.0016 — 0.0026)   |                                   |
|                            | Overall length   |         | mm (in)                           |                                   | Intake   | 120.6 (4.75)                      |                                   |
|                            |  |         |                                   |                                   | Exhaust  | 121.7 (4.79)                      |                                   |
|                            | Free length  |         | mm (in)                           | 55.2 (2.173)                      |  |                                   |                                   |
|                            | Squareness   |         |                                   | 2.5°, 2.4 mm (0.094 in) or less   |  |                                   |                                   |
| Valve spring               | Tension/spring height                                  |         | N (kgf, lbf)/mm (in)              | Set                               | 235.3 — 270.7<br>(24 — 27.6, 52.9 — 60.8)/45.0 (1.772)     |                                   |                                   |
|                            |  |         |                                   | Lift                              | 578.9 — 639.9<br>(59.1 — 65.3, 130.3 — 143.9)/34.7 (1.366) |                                   |                                   |

# General Description

## MECHANICAL

|                                  |   |         |                  |  |                                     |
|----------------------------------|---|---------|------------------|--|-------------------------------------|
| Cylinder block                   | Surface warpage limit (mating with cylinder head) |         | mm (in)          | 0.025 (0.00098)  |                                     |
|                                  | Grinding limit                                    |         | mm (in)          | 0.1 (0.004)  |                                     |
|                                  | Standard height                                   |         | mm (in)          | 201.0 (7.91)   |                                     |
|                                  | Cylinder inner diameter                           | mm (in) | Standard         | A  | 99.505 — 99.515 (3.9175 — 3.9179)   |
|                                  |   |         |                  | B  | 99.495 — 99.505 (3.9171 — 3.9175)   |
|                                  | Taper   | mm (in) |                  | Standard   | 0.015 (0.0006)                      |
|                                  |   |         |                  | Limit  | 0.050 (0.0020)                      |
|                                  | Out-of-roundness                                  | mm (in) |                  | Standard   | 0.010 (0.0004)                      |
|                                  |   |         |                  | Limit  | 0.050 (0.0020)                      |
|                                  | Piston clearance                                  | mm (in) |                  | Standard   | -0.010 — 0.010 (-0.00039 — 0.00039) |
| Limit                            |   |         |                  | 0.030 (0.0012)   |                                     |
| Cylinder boring limit (diameter) |   | mm (in) | 100.005 (3.937)  |  |                                     |
| Piston                           | Outer diameter                                    | mm (in) | Standard         | A  | 99.505 — 99.515 (3.9175 — 3.9179)   |
|                                  |   |         |                  | B  | 99.495 — 99.505 (3.9171 — 3.9175)   |
|                                  |   |         | 0.25 (0.0098) OS |  | 99.745 — 99.765 (3.9270 — 3.9278)   |
|                                  |   |         | 0.50 (0.0197) OS |  | 99.995 — 100.015 (3.9368 — 3.9376)  |
|                                  | Piston pin standard diameter                      |         | mm (in)          | 23.000 — 23.006 (0.9055 — 0.9057)                                  |                                     |
| Piston pin                       | Outer diameter                                    |         | mm (in)          | 22.994 — 23.000 (0.9053 — 0.9055)                                  |                                     |
|                                  | Clearance between piston and piston pin           | mm (in) | Standard         | 0.004 — 0.008 (0.0002 — 0.0003)                                    |                                     |
|                                  |   |         | Limit            | 0.020 (0.0008)   |                                     |
|                                  | Degree of fit                                     |         |                  | Piston pin must be fitted into position with thumb at 20°C (68°F). |                                     |
| Piston Ring                      | Ring closed gap                                   | mm (in) | Top ring         | Standard   | 0.20 — 0.35 (0.0079 — 0.0138)       |
|                                  |   |         |                  | Limit  | 1.0 (0.039)                         |
|                                  |   |         | Second ring      | Standard   | 0.37 — 0.52 (0.0144 — 0.0203)       |
|                                  |   |         |                  | Limit  | 1.0 (0.039)                         |
|                                  | Oil ring  |         | Standard         | 0.20 — 0.50 (0.0079 — 0.0197)                                      |                                     |
|                                  |   |         | Limit            | 1.5 (0.059)  |                                     |
|                                  | Ring groove gap                                   | mm (in) | Top ring         | Standard   | 0.040 — 0.080 (0.0016 — 0.0031)     |
|                                  |   |         |                  | Limit  | 0.15 (0.0059)                       |
| Second ring                      |   |         | Standard         | 0.030 — 0.070 (0.0012 — 0.0028)                                    |                                     |
|                                  |   |         | Limit            | 0.15 (0.0059)  |                                     |
| Connecting rod                   | Bend twist per 100 mm (3.94 in) in length         |         | mm (in)          | Limit  | 0.10 (0.0039)                       |
|                                  | Side clearance of large end                       | mm (in) | Standard         | 0.070 — 0.330 (0.0028 — 0.0130)                                    |                                     |
|                                  |   |         | Limit            | 0.4 (0.016)  |                                     |
| Bearing of large end             | Oil clearance                                     | mm (in) | Standard         | 0.016 — 0.044 (0.00063 — 0.0017)                                   |                                     |
|                                  |   |         | Limit            | 0.05 (0.0020)  |                                     |
|                                  | Bearing size (Thickness at center)                | mm (in) | Standard         | 1.492 — 1.501 (0.0587 — 0.0591)                                    |                                     |
|                                  |   |         | 0.03 (0.0012) US | 1.510 — 1.513 (0.0594 — 0.0596)                                    |                                     |
|                                  |   |         | 0.05 (0.0020) US | 1.520 — 1.523 (0.0598 — 0.0600)                                    |                                     |
|                                  |   |         | 0.25 (0.0098) US | 1.620 — 1.623 (0.0638 — 0.0639)                                    |                                     |
| Bushing of small end             | Clearance between piston pin and bushing          |         | mm (in)          | Standard   | 0 — 0.022 (0 — 0.0009)              |
|                                  |   |         |                  | Limit  | 0.030 (0.0012)                      |

# General Description

MECHANICAL

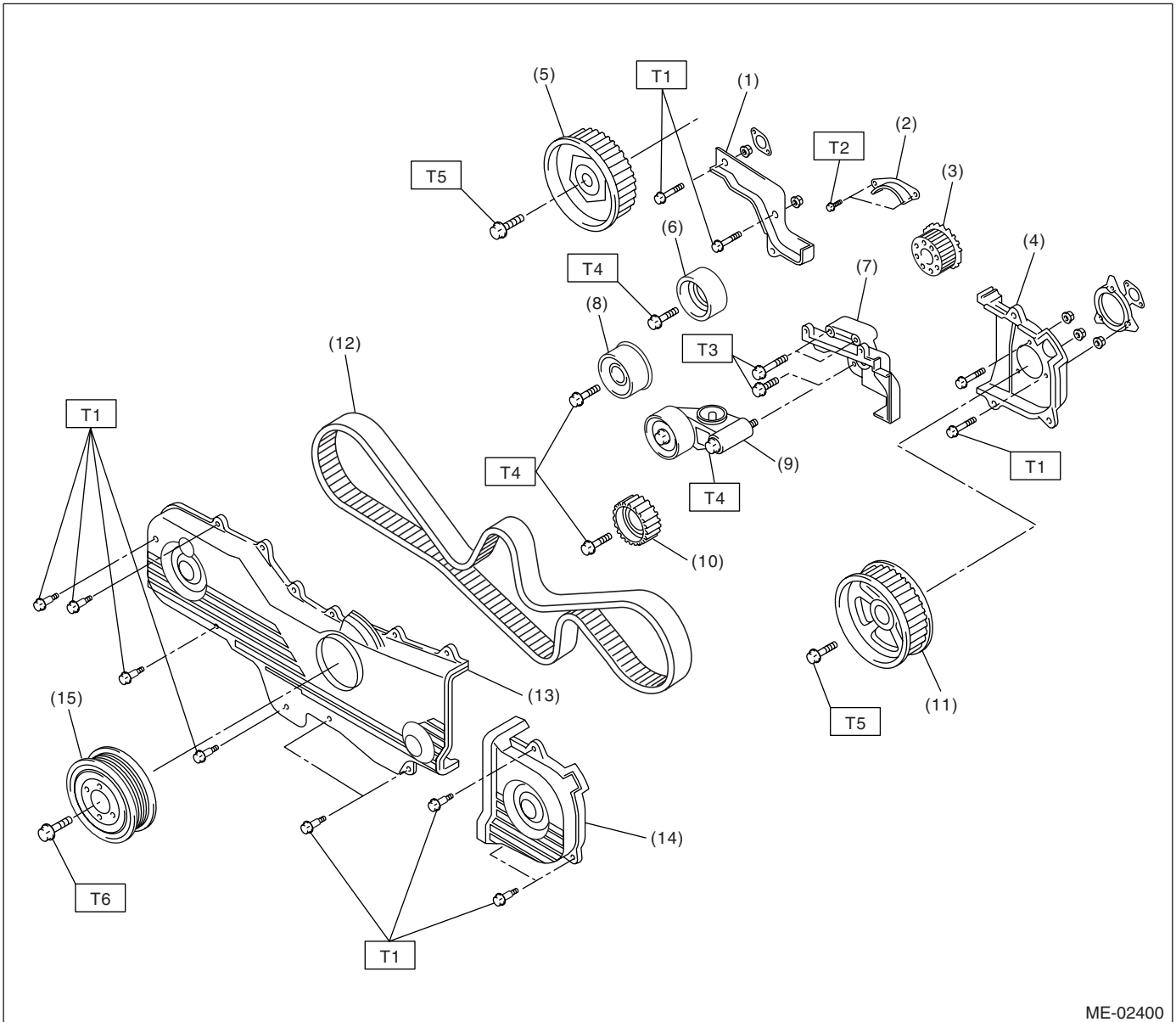
|                |                              |                       |                  |                                 |                                   |
|----------------|------------------------------|-----------------------|------------------|---------------------------------|-----------------------------------|
| Crankshaft     | Bend limit                   |                       | mm (in)          | 0.035 (0.0014)                  |                                   |
|                | Crank pin                    | Out-of-roundness      |                  | mm (in)                         | 0.003 (0.0001)                    |
|                |                              | Cylindricality        |                  | mm (in)                         | 0.004 (0.0002)                    |
|                |                              | Grinding limit (dia.) |                  | mm (in)                         | To 51.750 (2.0374)                |
|                | Crank journal                | Out-of-roundness      |                  | mm (in)                         | 0.005 (0.0002)                    |
|                |                              | Cylindricality        |                  | mm (in)                         | 0.006 (0.0002)                    |
|                |                              | Grinding limit (dia.) |                  | mm (in)                         | To 59.750 (2.3524)                |
|                | Crank pin outer diameter     | mm (in)               | Standard         |                                 | 51.984 — 52.000 (2.0466 — 2.0472) |
|                |                              |                       | 0.03 (0.0012) US |                                 | 51.954 — 51.970 (2.0454 — 2.0461) |
|                |                              |                       | 0.05 (0.0020) US |                                 | 51.934 — 51.950 (2.0446 — 2.0453) |
|                |                              |                       | 0.25 (0.0098) US |                                 | 51.734 — 51.750 (2.0368 — 2.0374) |
|                | Crank journal outer diameter | mm (in)               | Standard         |                                 | 59.992 — 60.008 (2.3619 — 2.3625) |
|                |                              |                       | 0.03 (0.0012) US |                                 | 59.962 — 59.978 (2.3607 — 2.3613) |
|                |                              |                       | 0.05 (0.0020) US |                                 | 59.942 — 59.958 (2.3599 — 2.3605) |
|                |                              |                       | 0.25 (0.0098) US |                                 | 59.742 — 59.758 (2.3520 — 2.3527) |
| Side clearance | mm (in)                      | Standard              |                  | 0.030 — 0.115 (0.0012 — 0.0045) |                                   |
|                |                              | Limit                 |                  | 0.25 (0.0098)                   |                                   |
| Oil clearance  | mm (in)                      | Standard              |                  | 0.010 — 0.030 (0.0004 — 0.0012) |                                   |
|                |                              | Limit                 |                  | 0.40 (0.0016)                   |                                   |
| Main bearing   | Main bearing<br>mm (in)      | #1, #3                | Standard         |                                 | 1.998 — 2.011 (0.0787 — 0.0792)   |
|                |                              |                       | 0.03 (0.0012) US |                                 | 2.017 — 2.020 (0.0794 — 0.0795)   |
|                |                              |                       | 0.05 (0.0020) US |                                 | 2.027 — 2.030 (0.0798 — 0.0799)   |
|                |                              |                       | 0.25 (0.0098) US |                                 | 2.127 — 2.130 (0.0837 — 0.0839)   |
|                |                              | #2, #4, #5            | Standard         |                                 | 2.000 — 2.013 (0.0787 — 0.0793)   |
|                |                              |                       | 0.03 (0.0012) US |                                 | 2.019 — 2.022 (0.0795 — 0.0796)   |
|                |                              |                       | 0.05 (0.0020) US |                                 | 2.029 — 2.032 (0.0799 — 0.0800)   |
|                |                              |                       | 0.25 (0.0098) US |                                 | 2.129 — 2.132 (0.0838 — 0.0839)   |

# General Description

MECHANICAL

## B: COMPONENT

### 1. TIMING BELT



ME-02400

- |                                  |  |
|----------------------------------|--|
| (1) Timing belt cover No. 2 (RH) | (9) Automatic belt tension adjuster ASSY |
| (2) Timing belt guide (MT model) | (10) Belt idler No. 2                    |
| (3) Crank sprocket               | (11) Cam sprocket No. 2                  |
| (4) Timing belt cover No. 2 (LH) | (12) Timing belt                         |
| (5) Cam sprocket No. 1           | (13) Front timing belt cover             |
| (6) Belt idler (No. 1)           | (14) Timing belt cover (LH)              |
| (7) Tensioner bracket            | (15) Crank pulley                        |
| (8) Belt idler (No. 2)           |  |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 5 (0.5, 3.6)**

**T2: 9.75 (1.0, 7.2)**

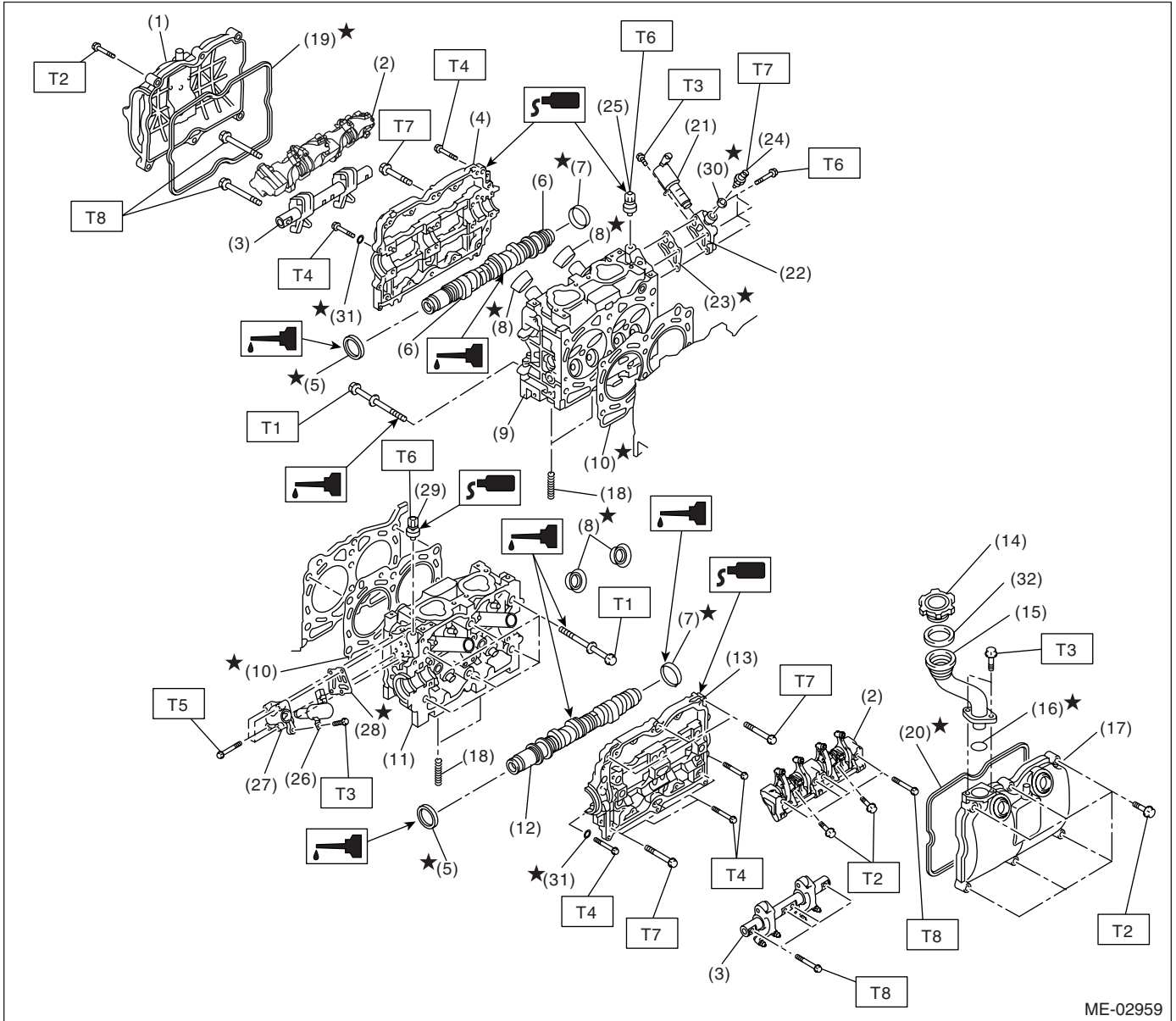
**T3: 24.5 (2.5, 18.1)**

**T4: 39 (4.0, 28.9)**

**T5: 78 (8.0, 57.9)**

**T6: <Ref. to ME(H4SO)-42, INSTALLATION, Crank Pulley.>**

## 2. CYLINDER HEAD AND CAMSHAFT



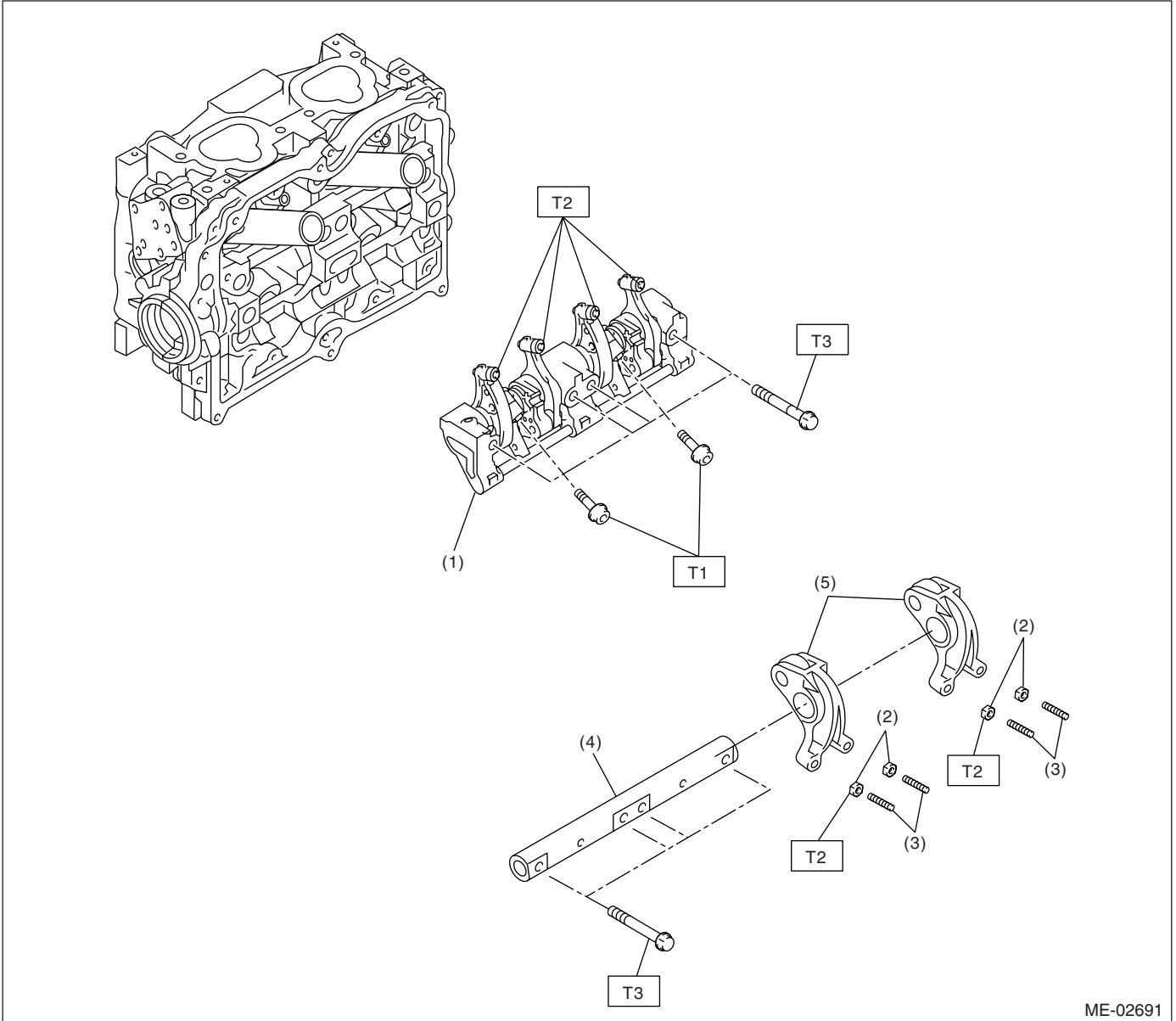
ME-02959

# General Description

## MECHANICAL

|  |   |  |
|--|---|--|
| <ul style="list-style-type: none"> <li>(1) Rocker cover (RH)</li> <li>(2) Intake valve rocker ASSY</li> <li>(3) Exhaust valve rocker ASSY</li> <li>(4) Camshaft cap (RH)</li> <li>(5) Oil seal</li> <li>(6) Camshaft (RH)</li> <li>(7) Plug</li> <li>(8) Spark plug pipe gasket</li> <li>(9) Cylinder head (RH)</li> <li>(10) Cylinder head gasket</li> <li>(11) Cylinder head (LH)</li> <li>(12) Camshaft (LH)</li> <li>(13) Camshaft cap (LH)</li> <li>(14) Oil filler cap</li> <li>(15) Oil filler duct</li> <li>(16) O-ring</li> <li>(17) Rocker cover (LH)</li> </ul> | <ul style="list-style-type: none"> <li>(18) Stud bolt</li> <li>(19) Rocker cover gasket (RH)</li> <li>(20) Rocker cover gasket (LH)</li> <li>(21) Oil switching solenoid valve (RH)</li> <li>(22) Oil switching solenoid valve holder (RH)</li> <li>(23) Gasket</li> <li>(24) Oil temperature sensor</li> <li>(25) Variable valve lift diagnosis oil pressure switch (RH)</li> <li>(26) Oil switching solenoid valve (LH)</li> <li>(27) Oil switching solenoid valve holder (LH)</li> <li>(28) Gasket</li> <li>(29) Variable valve lift diagnosis oil pressure switch (LH)</li> <li>(30) Oil temperature sensor gasket</li> </ul> | <ul style="list-style-type: none"> <li>(31) Seal washer</li> <li>(32) Gasket</li> </ul> <hr/> <p><b>Tightening torque: N·m (kgf·m, ft·lb)</b></p> <p><b>T1: &lt;Ref. to ME(H4SO)-58, INSTALLATION, Cylinder Head.&gt;</b></p> <p><b>T2: &lt;Ref. to ME(H4SO)-51, INSTALLATION, Valve Rocker Assembly.&gt;</b></p> <p><b>T3: 6.4 (0.65, 4.7)</b></p> <p><b>T4: 9.75 (1.0, 7.2)</b></p> <p><b>T5: 10 (1.0, 7.4)</b></p> <p><b>T6: 17 (1.7, 12.5)</b></p> <p><b>T7: 18 (1.8, 13.3)</b></p> <p><b>T8: 25 (2.5, 18.4)</b></p> <hr/> |
|--|---|--|

## 3. VALVE ROCKER ASSEMBLY



ME-02691

- (1) Intake valve rocker arm ASSY
- (2) Valve rocker nut
- (3) Valve rocker adjust screw
- (4) Exhaust rocker shaft
- (5) Exhaust valve rocker arm

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 8 (0.8, 5.9)**

**T2: 9.75 (1.0, 7.2)**

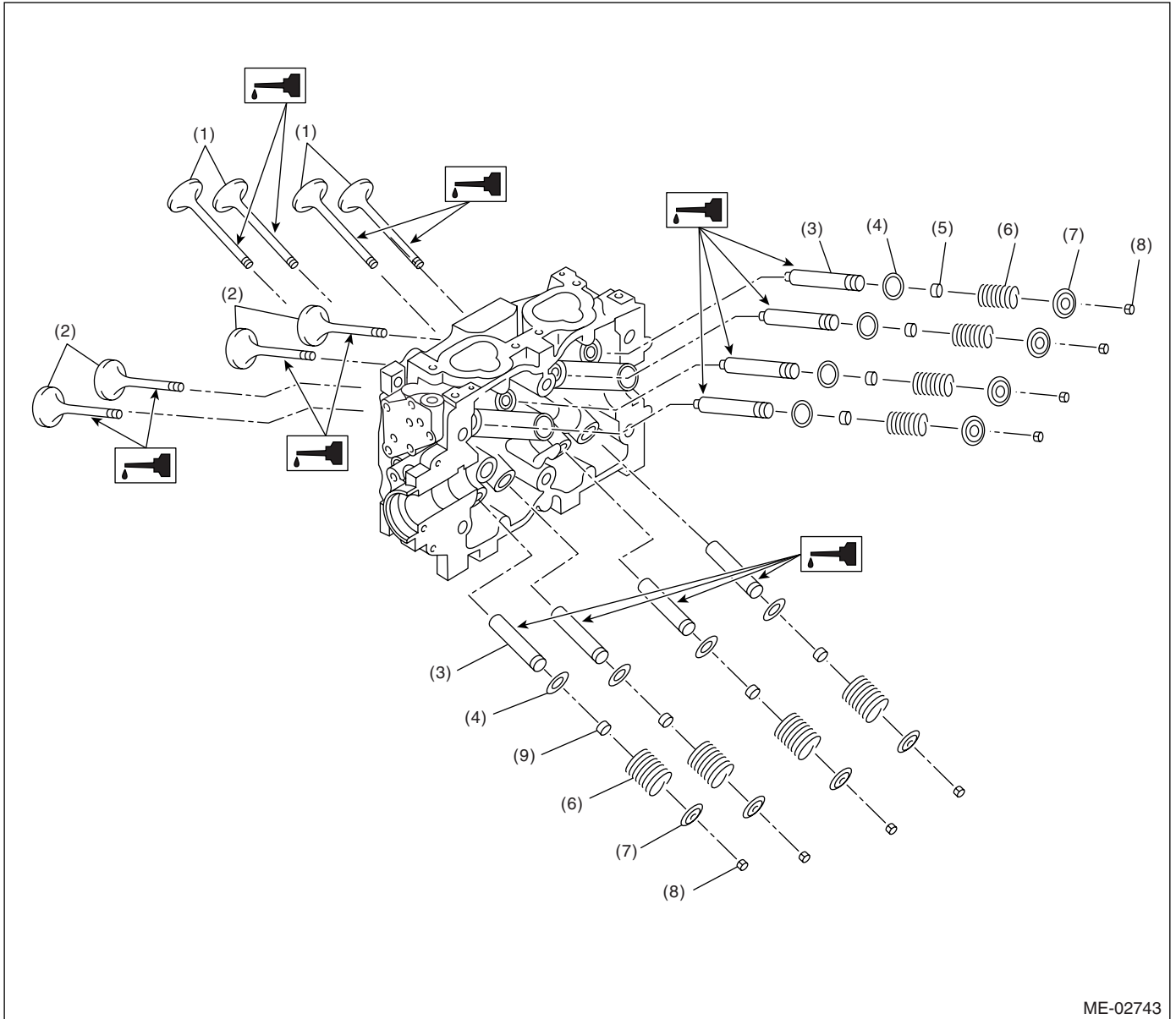
**T3: 25 (2.5, 18.4)**



# General Description

MECHANICAL

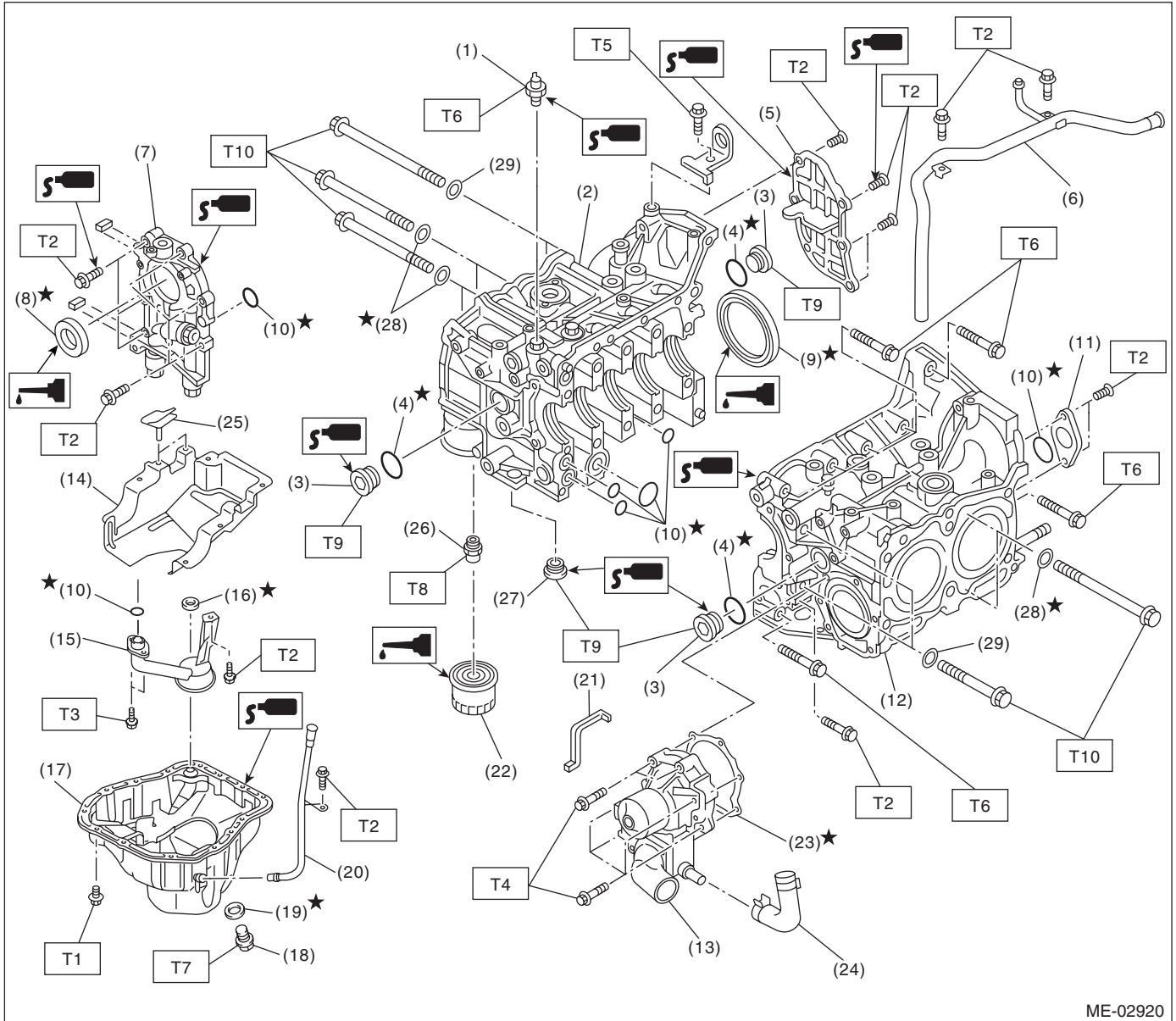
## 4. CYLINDER HEAD AND VALVE ASSEMBLY



ME-02743

- |                   |                           |                            |
|-------------------|---------------------------|----------------------------|
| (1) Exhaust valve | (4) Valve spring seat     | (7) Retainer               |
| (2) Intake valve  | (5) Intake valve oil seal | (8) Retainer key           |
| (3) Valve guide   | (6) Valve spring          | (9) Exhaust valve oil seal |

## 5. CYLINDER BLOCK



ME-02920

- |                          |                            |
|--------------------------|----------------------------|
| (1) Oil pressure switch  | (16) Gasket                |
| (2) Cylinder block (RH)  | (17) Oil pan               |
| (3) Service hole plug    | (18) Drain plug            |
| (4) Gasket               | (19) Metal gasket          |
| (5) Oil separator cover  | (20) Oil level gauge guide |
| (6) Water by-pass pipe   | (21) Water pump sealing    |
| (7) Oil pump             | (22) Oil filter            |
| (8) Front oil seal       | (23) Gasket                |
| (9) Rear oil seal        | (24) Water pump hose       |
| (10) O-ring              | (25) Seal                  |
| (11) Service hole cover  | (26) Connector             |
| (12) Cylinder block (LH) | (27) Plug                  |
| (13) Water pump          | (28) Seal washer           |
| (14) Baffle plate        | (29) Washer                |
| (15) Oil strainer        |                            |

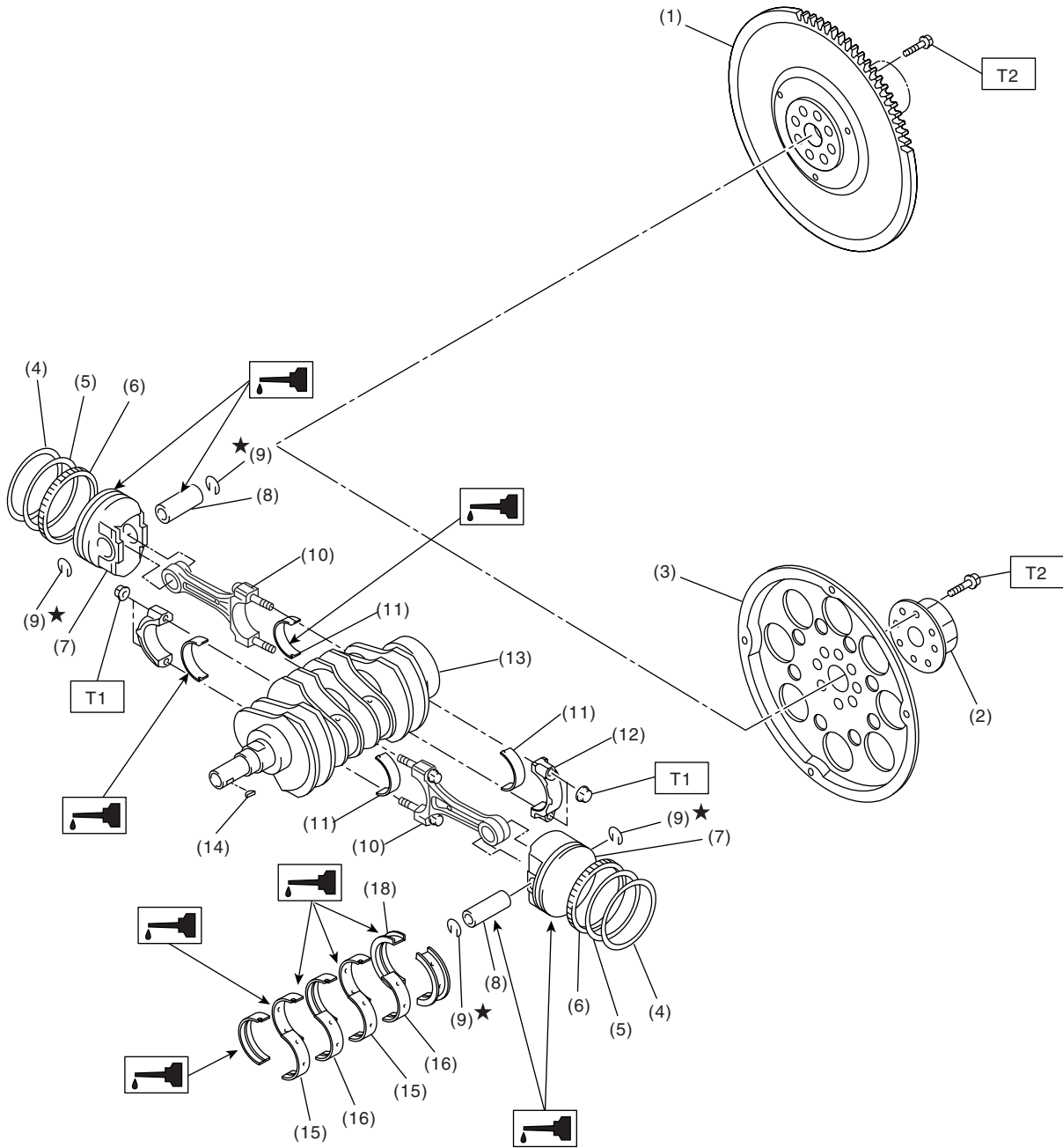
**Tightening torque: N-m (kgf-m, ft-lb)**

- T1: 5 (0.5, 3.6)**  
**T2: 6.4 (0.65, 4.7)**  
**T3: 10 (1.0, 7.4)**  
**T4: First 12 (1.2, 8.7)**  
**Second 12 (1.2, 8.7)**  
**T5: 16 (1.6, 11.6)**  
**T6: 25 (2.5, 18.4)**  
**T7: 44 (4.5, 33)**  
**T8: 45 (4.6, 33.2)**  
**T9: 70 (7.1, 50.6)**  
**T10: <Ref. to ME(H4SO)-69,**  
**INSTALLATION, Cylinder**  
**Block.>**

# General Description

MECHANICAL

## 6. CRANKSHAFT AND PISTON



ME-02693

- |                              |                             |                                |
|------------------------------|-----------------------------|--------------------------------|
| (1) Flywheel (MT model)      | (8) Piston pin              | (15) Crankshaft bearing #1, #3 |
| (2) Reinforcement (AT model) | (9) Snap ring               | (16) Crankshaft bearing #2, #4 |
| (3) Drive plate (AT model)   | (10) Connecting rod         | (17) Crankshaft bearing #5     |
| (4) Top ring                 | (11) Connecting rod bearing |                                |
| (5) Second ring              | (12) Connecting rod cap     |                                |
| (6) Oil ring                 | (13) Crankshaft             |                                |
| (7) Piston                   | (14) Woodruff key           |                                |

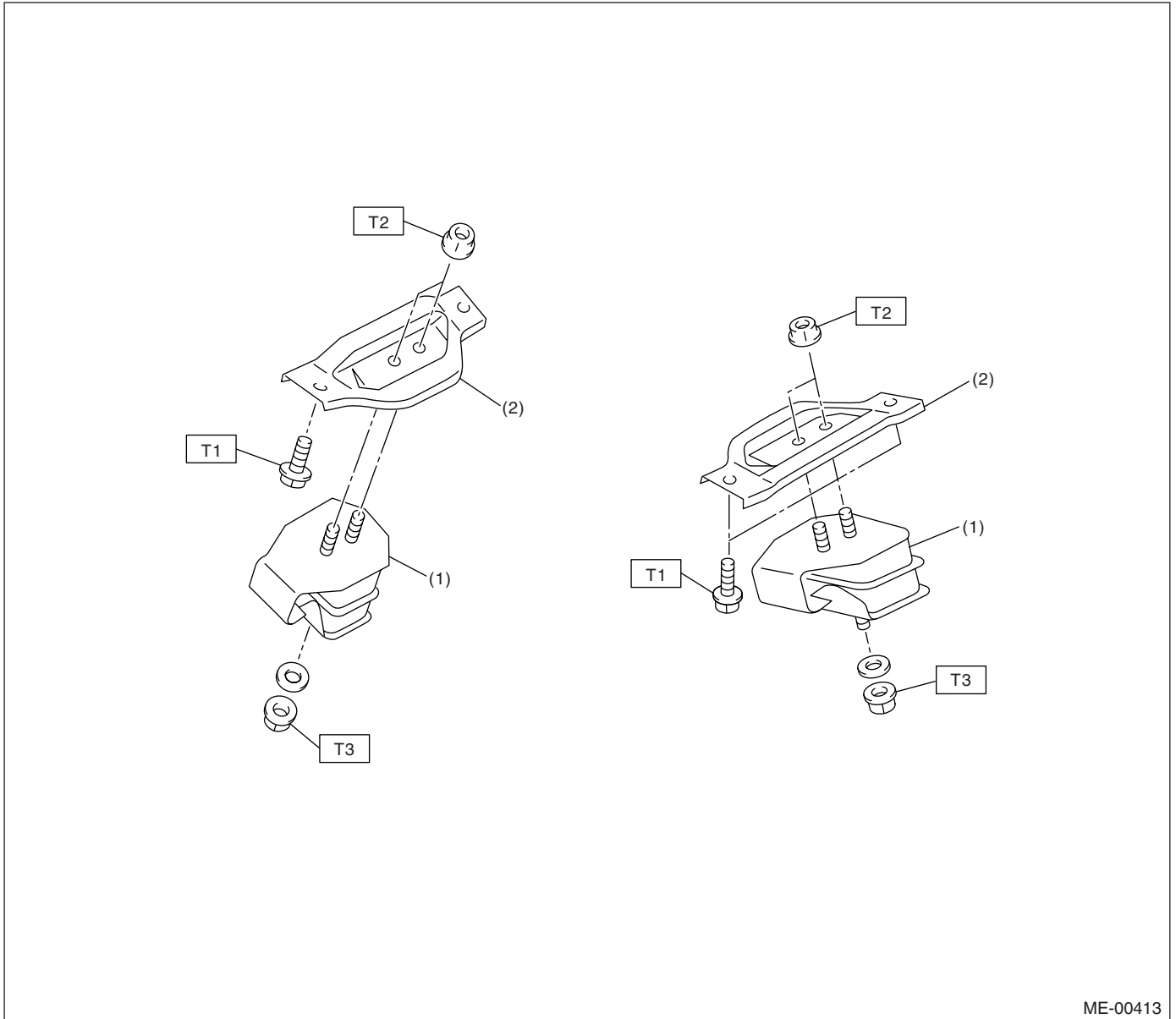
**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 45 (4.6, 33.2)**

**T2: 72 (7.3, 52.8)**

**ME(H4SO)-12**

## 7. ENGINE MOUNTING



(1) Front cushion rubber

(2) Front engine mounting bracket

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 35 (3.6, 25.8)**

**T2: 42 (4.3, 31.0)**

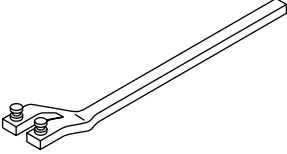
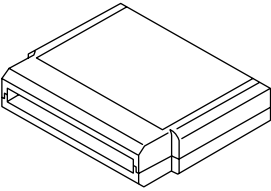

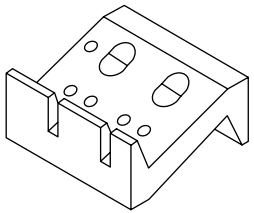
**T3: 85 (8.7, 63)**

### **C: CAUTION**

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
- Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
- Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
- All removed parts, if to be reused, should be re-installed in the original positions and directions.
- Bolts, nuts and washers should be replaced with new ones as required.
- Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
- Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
- Be sure not to damage coated surfaces of body panels with tools, or not to stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
- Prior to starting work, prepare the following:  
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
- Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

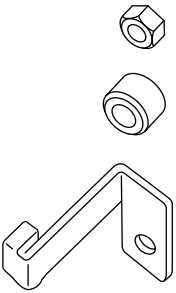
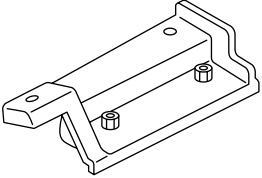
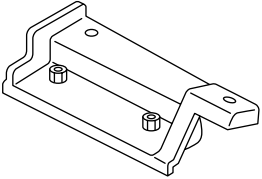
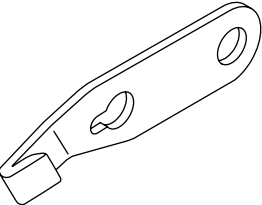
## D: PREPARATION TOOL

### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER  | DESCRIPTION                      | REMARKS   |
|---|--|----------------------------------|---|
|  <p style="text-align: center;">ST18231AA010</p>   | <p style="text-align: center;">18231AA010</p>                          | <p>CAM SPROCKET WRENCH</p>       | <ul style="list-style-type: none"> <li>• Used for removing and installing cam sprocket. (LH side)</li> <li>• CAM SPROCKET WRENCH (499207100) can also be used.</li> </ul> |
|  <p style="text-align: center;">ST18482AA010</p>   | <p style="text-align: center;">18482AA010<br/>(Newly adopted tool)</p> | <p>CARTRIDGE</p>                 | <p>Troubleshooting for electrical system.</p>   |
|  <p style="text-align: center;">ST22771AA030</p> | <p style="text-align: center;">22771AA030</p>                          | <p>SUBARU SELECT MONITOR KIT</p> | <p>Troubleshooting for electrical system.</p>   |
|  <p style="text-align: center;">ST-498267800</p> | <p style="text-align: center;">498267800</p>                           | <p>CYLINDER HEAD TABLE</p>       | <ul style="list-style-type: none"> <li>• Used for replacing valve guides.</li> <li>• Used for removing and installing valve spring.</li> </ul>                            |

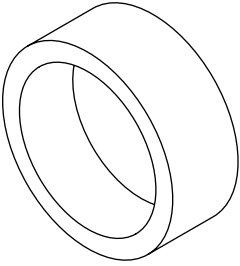
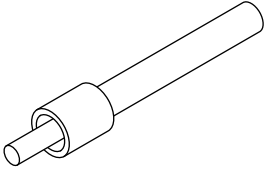
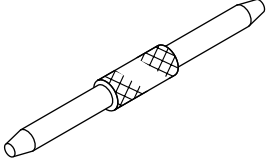
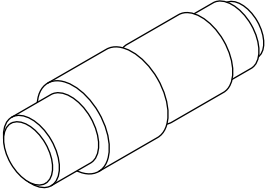
# General Description

MECHANICAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION             | REMARKS   |
|---|-------------|-------------------------|---|
|  <p style="text-align: center;">ST-498277200</p>   | 498277200   | STOPPER SET             | Used for installing automatic transmission assembly to engine.                      |
|  <p style="text-align: center;">ST-498457000</p>   | 498457000   | ENGINE STAND ADAPTER RH | Used with ENGINE STAND (499817100).   |
|  <p style="text-align: center;">ST-498457100</p> | 498457100   | ENGINE STAND ADAPTER LH | Used with ENGINE STAND (499817100).   |
|  <p style="text-align: center;">ST-498497100</p> | 498497100   | CRANKSHAFT STOPPER      | Used for stopping rotation of flywheel when loosening/tightening crank pulley bolt. |

# General Description

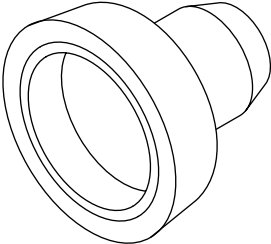
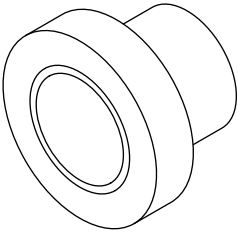
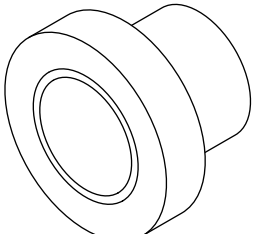
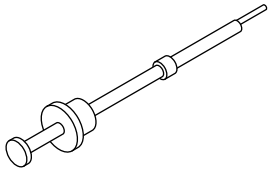
MECHANICAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION                                | REMARKS   |
|---|-------------|--|---|
|  <p style="text-align: center;">ST-498747300</p>   | 498747300   | PISTON GUIDE                               | Used for installing piston in cylinder.                             |
|  <p style="text-align: center;">ST-498857100</p>   | 498857100   | VALVE OIL SEAL GUIDE                       | Used for press-fitting of intake and exhaust valve guide oil seals. |
|  <p style="text-align: center;">ST-499017100</p> | 499017100   | PISTON PIN GUIDE                           | Used for installing piston pin, piston and connecting rod.          |
|  <p style="text-align: center;">ST-499037100</p> | 499037100   | CONNECTING ROD BUSHING REMOVER & INSTALLER | Used for removing and installing connecting rod bushing.            |



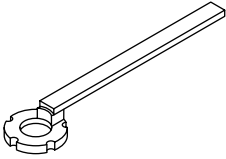
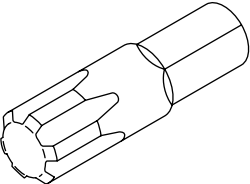
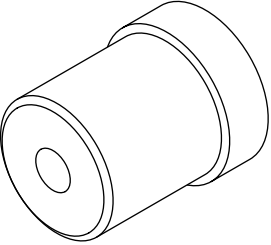
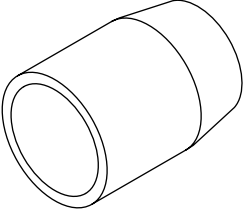
# General Description

## MECHANICAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION                   | REMARKS  |
|---|-------------|-------------------------------|--|
|  <p style="text-align: center;">ST-499587200</p>   | 499587200   | CRANKSHAFT OIL SEAL INSTALLER | <ul style="list-style-type: none"> <li>• Used for installing crankshaft oil seal.</li> <li>• Used with CRANKSHAFT OIL SEAL GUIDE (499597100).</li> </ul> |
|  <p style="text-align: center;">ST-499587500</p>   | 499587500   | OIL SEAL INSTALLER            | <ul style="list-style-type: none"> <li>• Used for installing camshaft oil seal.</li> <li>• Used with OIL SEAL GUIDE (499597000).</li> </ul>              |
|  <p style="text-align: center;">ST-499587700</p> | 499587700   | CAMSHAFT OIL SEAL INSTALLER   | Used for installing cylinder head plug.  |
|  <p style="text-align: center;">ST-499097700</p> | 499097700   | PISTON PIN REMOVER ASSY       | Used for removing piston pin.  |

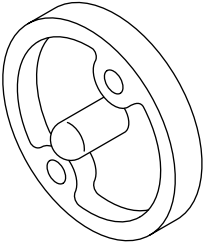
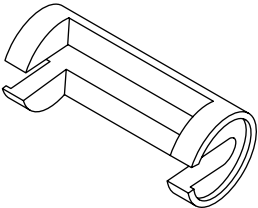
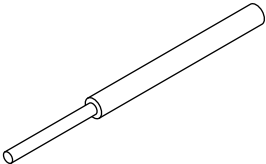
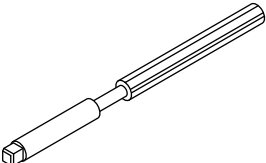
# General Description

MECHANICAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION         | REMARKS  |
|---|-------------|---------------------|--|
|  <p style="text-align: center;">ST-499207400</p>   | 499207400   | CAM SPROCKET WRENCH | Used for removing and installing cam sprocket. (RH side)   |
|  <p style="text-align: center;">ST-499497000</p>   | 499497000   | TORX PLUS®          | Used for removing and installing camshaft cap.   |
|  <p style="text-align: center;">ST-499587100</p> | 499587100   | OIL SEAL INSTALLER  | Used for installing oil pump oil seal.   |
|  <p style="text-align: center;">ST-499597000</p> | 499597000   | OIL SEAL GUIDE      | <ul style="list-style-type: none"> <li>• Used for installing camshaft oil seal.</li> <li>• Used with CAMSHAFT OIL SEAL INSTALLER (499587500).</li> </ul> |

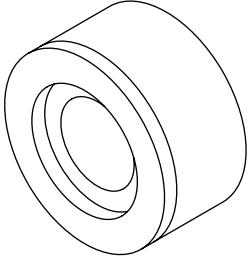
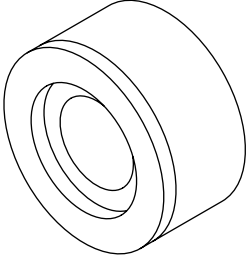
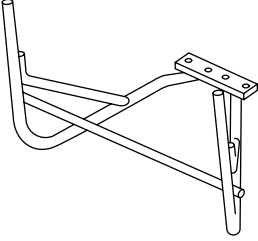
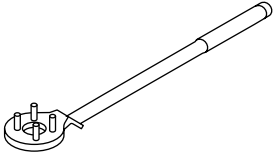
# General Description

MECHANICAL

| ILLUSTRATION  | TOOL NUMBER                                  | DESCRIPTION                      | REMARKS  |
|---|--|----------------------------------|--|
|  <p style="text-align: center;">ST-499597100</p>   | <p style="text-align: center;">499597100</p> | <p>CRANKSHAFT OIL SEAL GUIDE</p> | <ul style="list-style-type: none"> <li>• Used for installing crankshaft oil seal.</li> <li>• Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).</li> </ul> |
|  <p style="text-align: center;">ST-499718000</p>   | <p style="text-align: center;">499718000</p> | <p>VALVE SPRING REMOVER</p>      | <p>Used for removing and installing valve spring.</p>  |
|  <p style="text-align: center;">ST-499767200</p> | <p style="text-align: center;">499767200</p> | <p>VALVE GUIDE REMOVER</p>       | <p>Used for removing valve guides.</p>   |
|  <p style="text-align: center;">ST-499767400</p> | <p style="text-align: center;">499767400</p> | <p>VALVE GUIDE REAMER</p>        | <p>Used for reaming valve guides.</p>  |

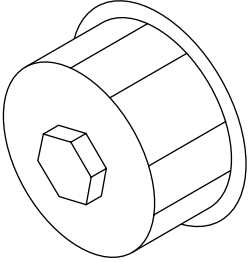
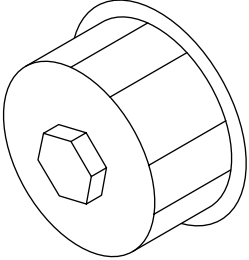
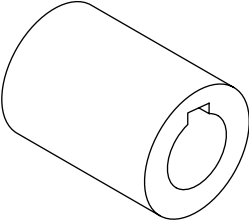
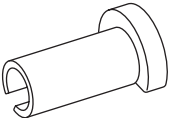
# General Description

MECHANICAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION          | REMARKS   |
|---|-------------|----------------------|---|
|  <p style="text-align: center;">ST-499767700</p>   | 499767700   | VALVE GUIDE ADJUSTER | Used for installing valve guides. (Intake side)   |
|  <p style="text-align: center;">ST-499767800</p>   | 499767800   | VALVE GUIDE ADJUSTER | Used for installing valve guides. (Exhaust side)  |
|  <p style="text-align: center;">ST-499817100</p> | 499817100   | ENGINE STAND         | <ul style="list-style-type: none"> <li>• Stand used for engine disassembly and assembly.</li> <li>• Used with ENGINE STAND ADAPTER RH (498457000)&amp; LH (498457100).</li> </ul> |
|  <p style="text-align: center;">ST-499977100</p> | 499977100   | CRANK PULLEY WRENCH  | Used for stopping rotation of crank pulley when loosening/tightening crank pulley bolt.   |

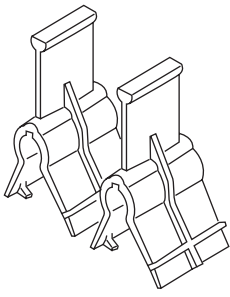
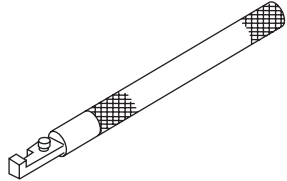
# General Description

MECHANICAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION       | REMARKS  |
|---|-------------|-------------------|--|
|  <p style="text-align: center;">ST18332AA000</p>   | 18332AA000  | OIL FILTER WRENCH | Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in)) |
|  <p style="text-align: center;">ST18332AA010</p>   | 18332AA010  | OIL FILTER WRENCH | Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in)) |
|  <p style="text-align: center;">ST-499987500</p> | 499987500   | CRANKSHAFT SOCKET | Used for rotating crankshaft.  |
|  <p style="text-align: center;">ST42099AE000</p> | 42099AE000  | CONNECTOR REMOVER | Used for removing quick connector.   |

# General Description

MECHANICAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION            | REMARKS  |
|---|-------------|------------------------|--|
| <br>ST18354AA000 | 18354AA000  | VALVE ROCKER<br>HOLDER | Used for installing valve rocker assembly (Intake). (2 in one set) |
| <br>ST18258AA000 | 18258AA000  | SPRING<br>INSTALLER    | Used for installing valve rocker assembly (Intake).                |

## 2. GENERAL TOOL

| TOOL NAME                           | REMARKS                         |
|-------------------------------------|---------------------------------|
| Compression gauge                   | Used for measuring compression. |
| Tachometer (Secondary pick-up type) | Used for measuring idle speed.  |

## E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing belt
- Valve rocker assembly
- Camshaft
- Cylinder head

## 2. Compression

### A: INSPECTION

#### CAUTION:

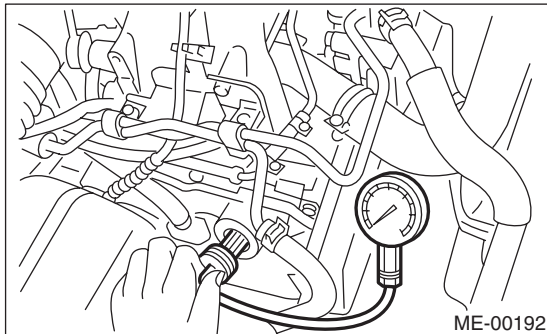
**After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.**

- 1) After warming-up the engine, turn the ignition switch to OFF.
- 2) Make sure that the battery is fully charged.
- 3) Release the fuel pressure.  
<Ref. to FU(H4SO)-42, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 4) Remove all the spark plugs. <Ref. to IG(H4SO)-4, REMOVAL, Spark Plug.>
- 5) Fully open the throttle valve.
- 6) Check the starter motor for satisfactory performance and operation.
- 7) Fix the compression gauge securely against the spark plug hole.

#### NOTE:

The screw of screw-in type compression gauge (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

- 8) Crank the engine by means of the starter motor, and then read the maximum value on the gauge when the needle of gauge is steady.



- 9) Perform at least two measurements per cylinder, and make sure that the values are correct.

#### **Compression (350 rpm and fully open throttle):**

##### **Standard:**

**1,020 — 1,275 kPa (10.4 — 13.0 kgf/cm<sup>2</sup>,  
148 — 185 psi)**

##### **Difference between cylinders:**

**49 kPa (0.5 kgf/cm<sup>2</sup>, 7 psi) or less**

## 3. Idle Speed

### A: INSPECTION

1) Before checking the idle speed, check the following:

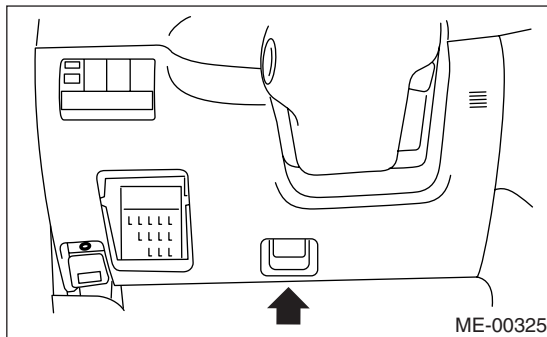
- (1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and hoses are connected properly.
- (2) Ensure the malfunction indicator light does not illuminate.

2) Idle the engine.

3) Stop the engine, and turn the ignition switch to OFF.

4) When using Subaru Select Monitor, refer to the following. <Ref. to ME(H4SO)-15, SPECIAL TOOL, PREPARATION TOOL, General Description.>

- (1) Insert the cartridge to the Subaru Select Monitor.
- (2) Connect the Subaru Select Monitor to data link connector.



(3) Turn the ignition switch to ON, and Subaru Select Monitor power switch to ON.

(4) Select {Each System Check} in the Main Menu.

(5) Select {Engine} in the Selection Menu.

(6) Select {Current Data Display & Save} in the Engine Control System Diagnosis.

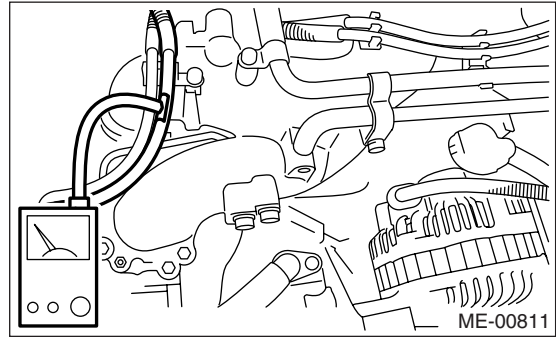
(7) Select {Data Display} in the Data Display Menu.

(8) Start the engine, and read engine idle speed.

5) When using the tachometer (Secondary pick-up type):

- (1) Attach the pick-up clip to No. 1 cylinder spark plug cord.

(2) Start the engine, and read engine idle speed.



#### NOTE:

This ignition system provides simultaneous ignition for #1 and #2 plugs. It must be noted that some tachometers may register twice that of actual engine speed.

6) Check the idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, A/C, etc. OFF)

**Idle speed [No load and gears in "N" or "P" range]:**

**MT model**  
**650±100 rpm**

**AT model**  
**700±100 rpm**

7) Check the idle speed when loaded. (Turn the A/C switch to "ON" and operate the compressor for at least one minute before measurement.)

**Idle speed [A/C "ON" and gears in "N" or "P" range]:**

**850±100 rpm**

#### NOTE:

Idle speed cannot be adjusted manually, because the idle speed is automatically adjusted. If the idle speed is out of specifications, refer to General Diagnosis Table under "Engine Control System". <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>



## 4. Ignition Timing

### A: INSPECTION

#### CAUTION:

**After warming-up, engine becomes very hot. Be careful not to burn yourself at measurement.**

1) Before checking the ignition timing, check the following:

(1) Ensure the air cleaner element is free from clogging, spark plugs are in good condition, and that hoses are connected properly.

(2) Ensure the malfunction indicator light does not illuminate.

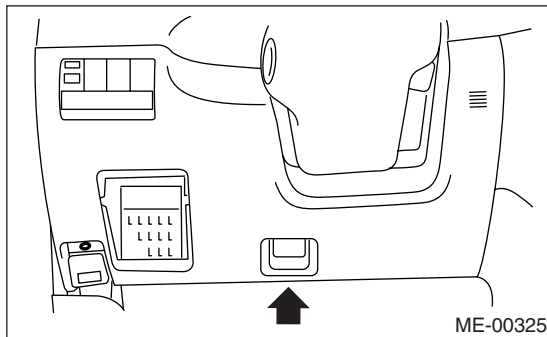
2) Idle the engine.

3) Stop the engine, and turn the ignition switch to OFF.

4) When using Subaru Select Monitor, refer to the following. <Ref. to ME(H4SO)-15, SPECIAL TOOL, PREPARATION TOOL, General Description.>

(1) Insert the cartridge to the Subaru Select Monitor.

(2) Connect the Subaru Select Monitor to data link connector.



(3) Turn the ignition switch to ON, and Subaru Select Monitor power switch to ON.

(4) Select {Each System Check} in the Main Menu.

(5) Select {Engine} in the Selection Menu.

(6) Select {Current Data Display & Save} in the Engine Control System Diagnosis.

(7) Select {Data Display} in the Data Display Menu.

(8) Start the engine, and read the ignition timing by idle speed.

#### **Ignition timing [BTDC/rpm]:**

##### **MT model**

**$10^{\circ} \pm 8^{\circ} / 650$**

##### **AT model**

**$15^{\circ} \pm 8^{\circ} / 700$**

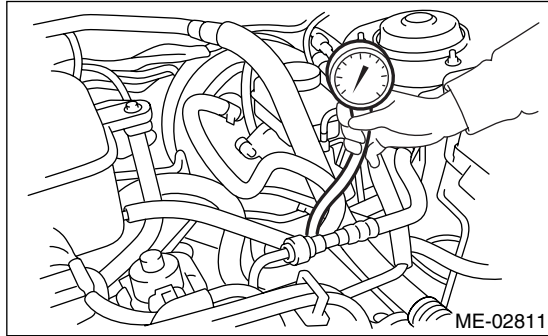
If the timing is not correct, check the ignition control system. <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>

## 5. Intake Manifold Vacuum

### A: INSPECTION

- 1) Idle the engine.
- 2) Disconnect the brake vacuum hose from the intake manifold, and then install the vacuum gauge.
- 3) Keep the engine at the idle speed, and read the vacuum gauge indication.

By observing the gauge needle movement, the internal condition of the engine can be diagnosed as described below.



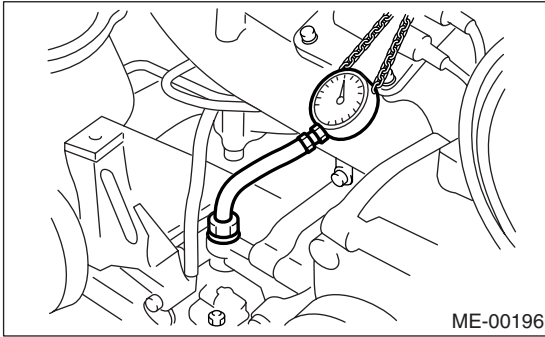
**Vacuum pressure (at idling, A/C “OFF”):**  
**Less than -60.0 kPa (-450 mmHg, -17.72 in-Hg)**

| Diagnosis of engine condition by measurement of intake manifold vacuum  |   |
|---|---|
| Vacuum gauge indication   | Possible engine condition   |
| 1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.                                     | Air leakage around intake manifold gasket, disconnection or damage of vacuum hose |
| 2. Needle intermittently drops to position lower than normal position.  | Leakage around cylinder   |
| 3. Needle drops suddenly and intermittently from normal position.   | Valve anchoring   |
| 4. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases. | Weak or broken valve springs  |
| 5. Needle vibrates above and below normal position in narrow range.   | Defective ignition system   |

## 6. Engine Oil Pressure

### A: INSPECTION

- 1) Disconnect the ground cable from battery.
- 2) Remove the generator from bracket.  
<Ref. to SC(H4SO)-14, REMOVAL, Generator.>
- 3) Disconnect the connector from oil pressure switch.
- 4) Remove the pressure switch from cylinder block.  
<Ref. to LU(H4SO)-18, REMOVAL, Oil Pressure Switch.>
- 5) Connect the oil pressure gauge hose to cylinder block.
- 6) Connect the battery ground cable to battery.
- 7) Start the engine, and measure oil pressure.



#### **Oil pressure:**

##### **Standard**

**98 kPa (1.0 kgf/cm<sup>2</sup>, 14 psi) or more at 600 rpm**

**294 kPa (3.0 kgf/cm<sup>2</sup>, 43 psi) or more at 5,000 rpm**

##### **CAUTION:**

- If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU(H4SO)-20, INSPECTION, Engine Lubrication System Trouble in General.>
- If the oil pressure warning light is turned to ON but oil pressure is within specification, replace the oil pressure switch. <Ref. to LU(H4SO)-20, INSPECTION, Engine Lubrication System Trouble in General.>

##### **NOTE:**

The specified value is based on an engine oil temperature of 80°C (176°F).

- 8) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(H4SO)-18, INSTALLATION, Oil Pressure Switch.>

##### **Tightening torque:**

**25 N·m (2.5 kgf·m, 18.4 ft·lb)**

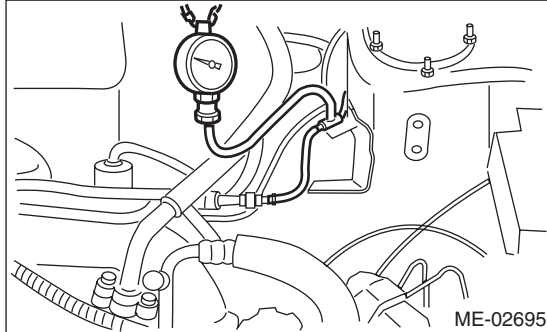
## 7. Fuel Pressure

### A: INSPECTION

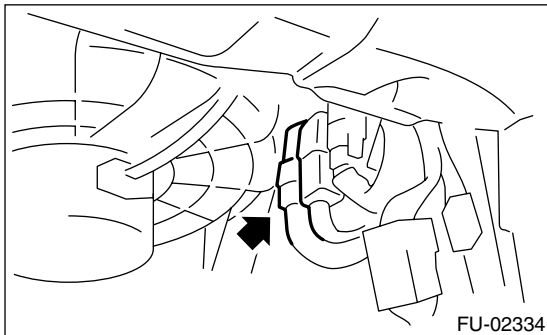
**WARNING:**

**Before removing the fuel pressure gauge, release fuel pressure.**

- 1) Release the fuel pressure.  
<Ref. to FU(H4SO)-42, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the fuel delivery hose from fuel damper, and connect a fuel pressure gauge.



- 3) Connect the connector of fuel pump relay.



- 4) Start the engine.
- 5) After warming-up the engine, measure the fuel pressure.

**Fuel pressure:**

**Standard:**

**339.5 — 360.5 kPa (3.5 — 3.7 kgf/cm<sup>2</sup>, 49 — 52 psi)**

**NOTE:**

The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm<sup>2</sup>, 1 to 3 psi) higher than standard values during high-altitude operations.

# Valve Clearance

MECHANICAL

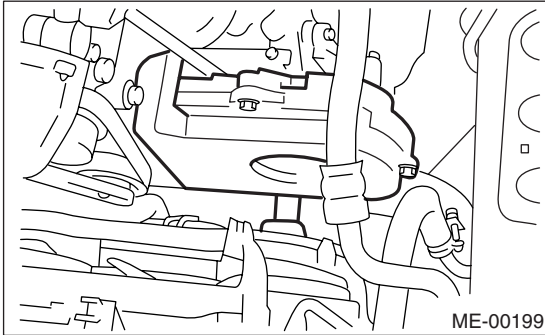
## 8. Valve Clearance

### A: INSPECTION

#### CAUTION:

Inspection and adjustment of valve clearance should be performed while engine is cold.

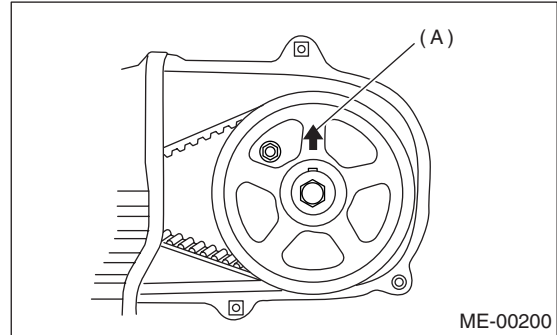
- 1) Set the vehicle on a lift.
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Lower the vehicle.
- 5) Disconnect the ground cable from battery.
- 6) Remove the timing belt cover (LH).



- 7) Remove the fuel injector.  
<Ref. to FU(H4SO)-30, REMOVAL, Fuel Injector.>
- 8) When inspecting #1 and #3 cylinders:
  - (1) Disconnect the spark plug cords from spark plugs RH side. <Ref. to IG(H4SO)-4, RH SIDE, REMOVAL, Spark Plug.>
  - (2) Disconnect the PCV hose from rocker cover (RH).
  - (3) Remove the bolts, then remove the rocker cover (RH).
- 9) When inspecting #2 and #4 cylinders:
  - (1) Disconnect the spark plug cords from spark plugs (LH Side). <Ref. to IG(H4SO)-4, LH SIDE, REMOVAL, Spark Plug.>
  - (2) Disconnect the PCV hose from rocker cover (LH).
  - (3) Remove the bolts, then remove the rocker cover (LH).
- 10) Set #1 cylinder piston to top dead center of compression stroke by rotating the crank pulley clockwise using the socket wrench.

#### NOTE:

When the arrow mark (A) on cam sprocket (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.



- 11) Measure #1 cylinder valve clearance using thickness gauge.

#### CAUTION:

- Insert the thickness gauge (A) in as horizontally as possible with respect to the valve stem end face.
- Measure the exhaust valve clearances while lifting-up the vehicle.

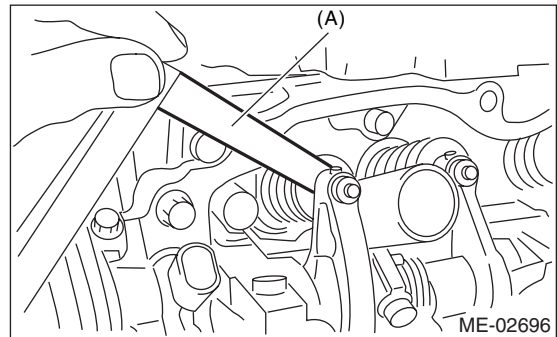
#### Valve clearance (Standard):

##### Intake:

$0.20 \pm 0.04$  mm (0.0079 ± 0.0016 in)

##### Exhaust:

$0.25 \pm 0.04$  mm (0.0098 ± 0.0016 in)



- 12) If necessary, adjust the valve clearance. <Ref. to ME(H4SO)-31, ADJUSTMENT, Valve Clearance.>

- 13) Measure the valve clearance in #3, #2 and #4 cylinder in the same measurement procedure as #1 cylinder.

#### NOTE:

- Be sure to set the cylinder pistons to their respective top dead centers on compression stroke before measuring valve clearances.

- By rotating the crank pulley clockwise every 180° from the state that #1 cylinder piston is on the top dead center of compression stroke, #3, #2 and #4 cylinder pistons come to the top dead center of compression stroke in this order.

14) After inspection, install the related parts in the reverse order of removal.

## B: ADJUSTMENT

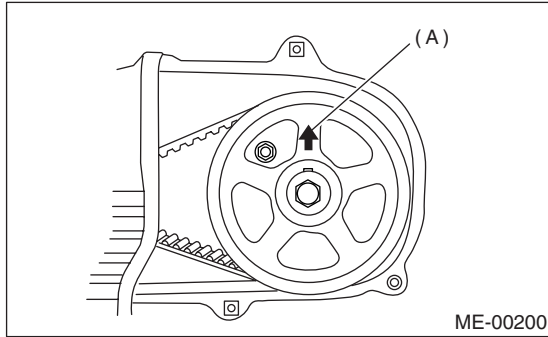
### CAUTION:

**Adjustment of valve clearance should be performed while engine is cold.**

1) Set #1 cylinder piston to top dead center of compression stroke by rotating the crank pulley clockwise using the socket wrench.

### NOTE:

When the arrow mark (A) on cam sprocket (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.



2) Adjust the #1 cylinder valve clearance.

- (1) Loosen the valve rocker nut and screw.
- (2) Place a suitable thickness gauge.
- (3) While noting the valve clearance, tighten the valve rocker adjusting screw.
- (4) When the specified valve clearance is obtained, tighten the valve rocker nut.

### Tightening torque:

**9.75 N·m (1.0 kgf·m, 7.2 ft·lb)**

### CAUTION:

- Insert the thickness gauge in as horizontally as possible with respect to the valve stem end face.
- Adjust the exhaust valve clearances while lifting-up the vehicle.

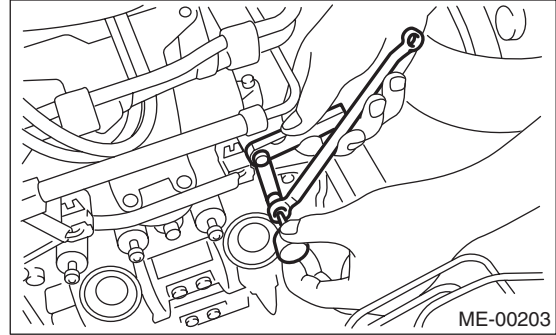
### Valve clearance

#### Intake:

**0.20±0.04 mm (0.0079±0.0016 in)**

#### Exhaust:

**0.25±0.04 mm (0.0098±0.0016 in)**



3) Adjust the valve clearance in #3, #2 and #4 cylinder in the same adjustment procedure as #1 cylinder.

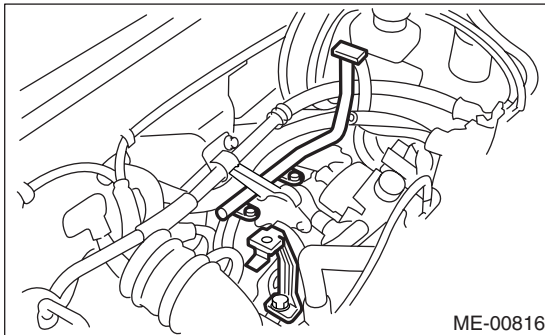
### NOTE:

- Be sure to set the cylinder pistons to their respective top dead centers on compression stroke before adjusting valve clearances.
  - By rotating the crank pulley clockwise every 180° from the state that #1 cylinder piston is on the top dead center of compression stroke, #3, #2 and #4 cylinder pistons come to the top dead center of compression stroke in this order.
- 4) Ensure the valve clearances of each cylinder are within specifications. If necessary, readjust the valve clearances.

## 9. Engine Assembly

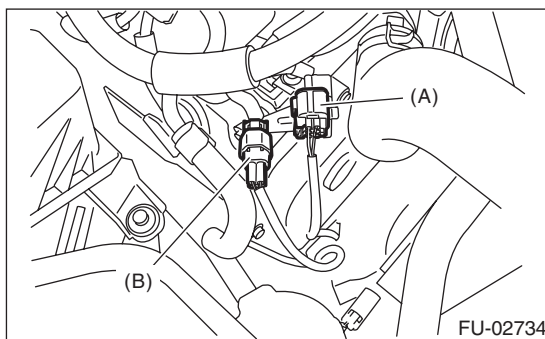
### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Open the front hood fully and support with the front food stay.
- 3) Collect the refrigerant from A/C system. <Ref. to AC-20, PROCEDURE, Refrigerant Recovery Procedure.>
- 4) Release the fuel pressure.  
<Ref. to FU(H4SO)-42, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 5) Disconnect the ground cable from battery.
- 6) Open the fuel filler flap lid and remove the fuel filler cap.
- 7) Remove the air intake duct, air cleaner case and air intake chamber.  
<Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>  
<Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.> <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Chamber.>
- 8) Remove the under cover.
- 9) Remove the radiator from vehicle. <Ref. to CO(H4SO)-23, REMOVAL, Radiator.>
- 10) Disconnect the A/C pressure hoses from A/C compressor.
- 11) Remove the air intake chamber stay.



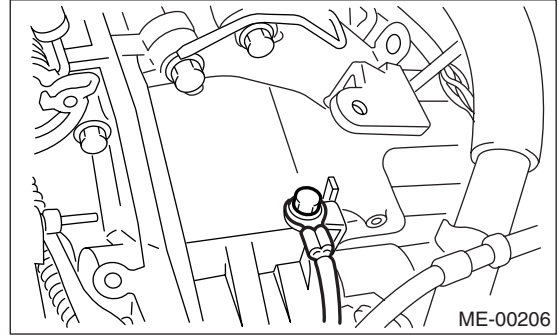
- 12) Disconnect the following connectors and cables.

- (1) Front oxygen (A/F) sensor connector
- (2) Rear oxygen sensor connector

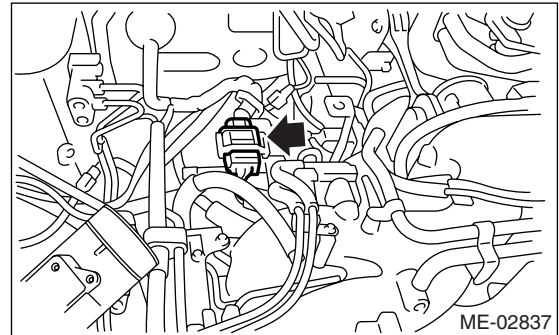


- (A) Front oxygen (A/F) sensor connector  
(B) Rear oxygen sensor connector

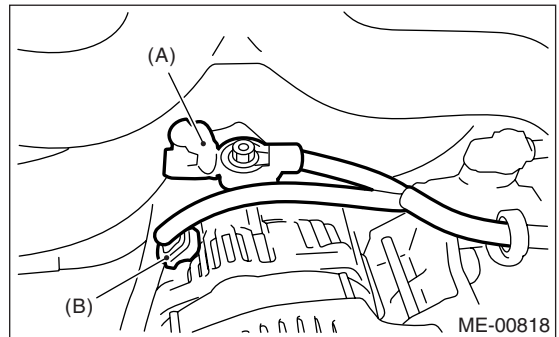
- (3) Engine ground cable



- (4) Engine harness connectors

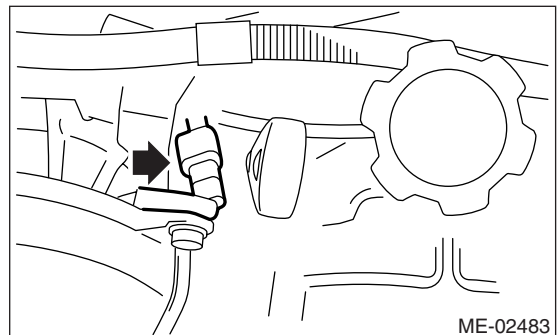


- (5) Generator connector and terminal



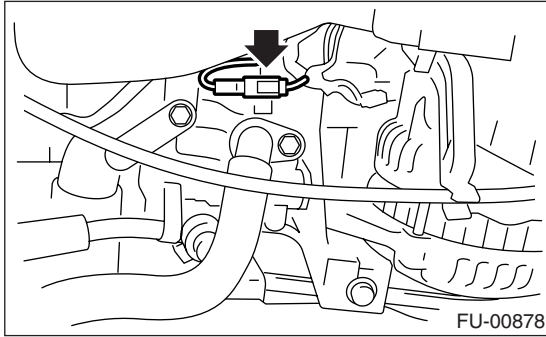
- (A) Terminal  
(B) Generator connector

- (6) A/C compressor connectors



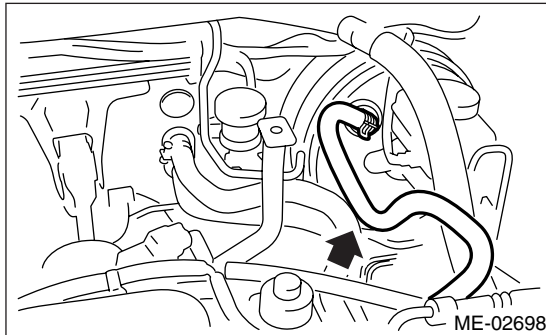


(7) Power steering switch connector



13) Disconnect the following hoses.

(1) Brake booster vacuum hose

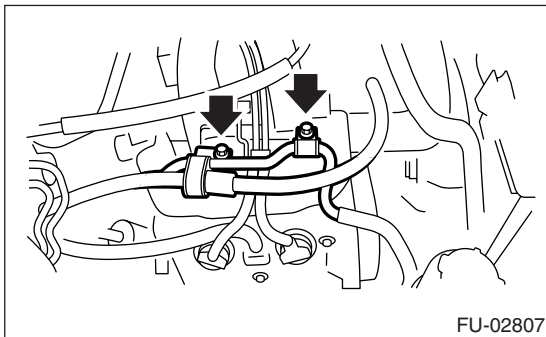


(2) Heater inlet and outlet hoses

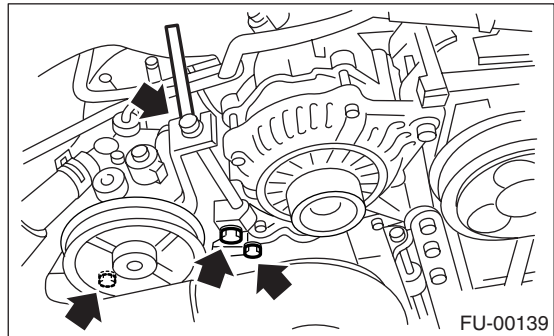
14) Remove the power steering pump from bracket.

(1) Loosen the lock bolt and slider bolt, and then remove the front side V-belt. <Ref. to ME(H4SO)-40, FRONT SIDE BELT, REMOVAL, V-belt.>

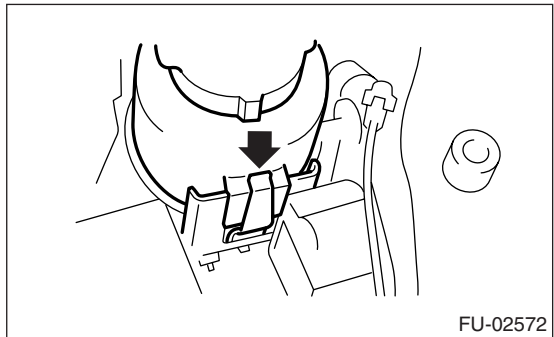
(2) Remove the pipe with bracket.



(3) Remove the bolts which install the power steering pump to bracket.



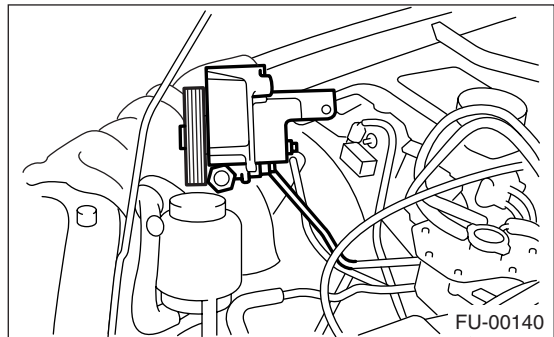
(4) Remove the power steering tank from bracket by pulling it upward.



(5) Move the power steering pump to the right side wheel apron to prevent it from falling.

NOTE:

Use a shop cloth not to scratch.



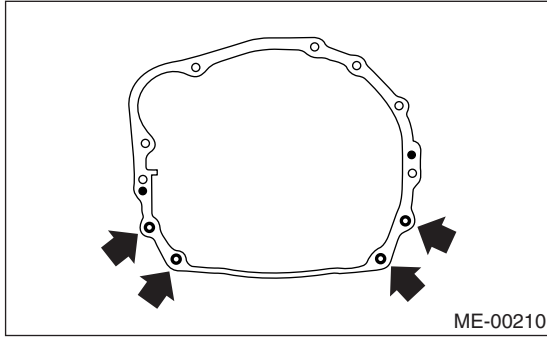
15) Remove the front and center exhaust pipe. <Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>



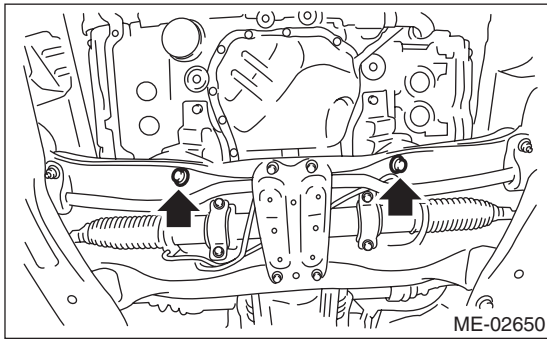
# Engine Assembly

## MECHANICAL

16) Remove the nuts which hold lower side of transmission to engine.



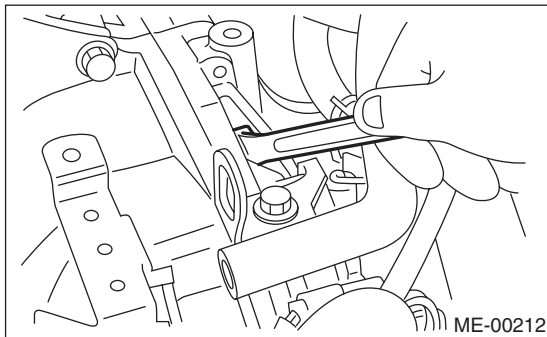
17) Remove the nuts which install front cushion rubber onto front crossmember.



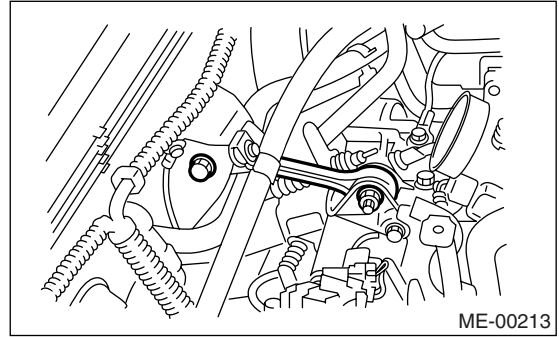
18) Remove the housing cover mounting bolts.

19) Separate the torque converter clutch from drive plate. (AT model)

- (1) Lower the vehicle.
- (2) Remove the service hole plug.
- (3) Remove the bolts which hold torque converter clutch to drive plate.
- (4) Remove all the bolts by rotating them in the direction of engine rotation little by little using a socket wrench.



20) Remove the pitching stopper.

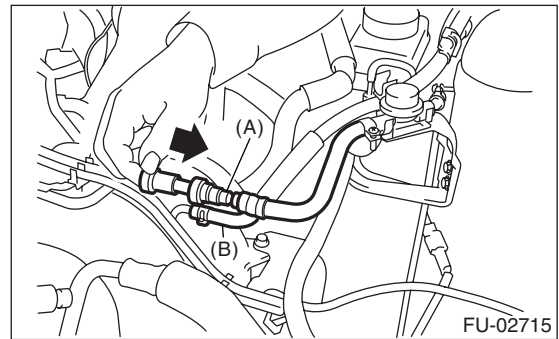


21) Disconnect the fuel delivery hose (A) and evaporation hose (B). <Ref. to FU(H4SO)-57, REMOVAL, Fuel Delivery & Evaporation Lines.>

### CAUTION:

- Catch fuel from the hose into container.
- Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.

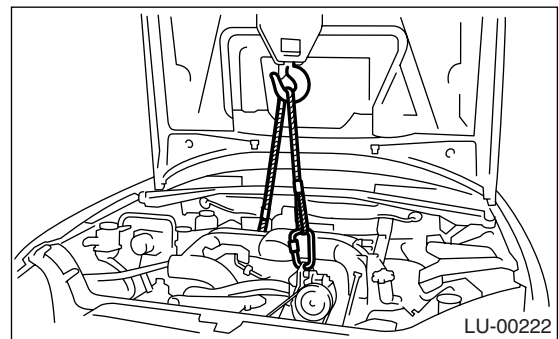
ST 42099AE000 CONNECTOR REMOVER



(A) Fuel delivery hose

(B) Evaporation hose

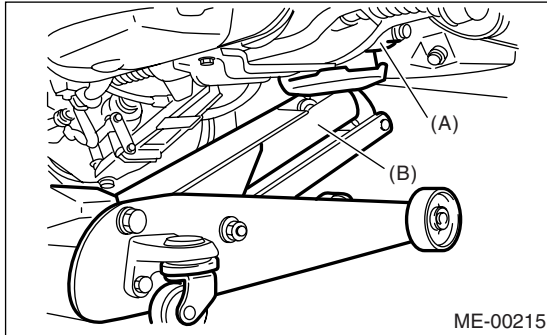
22) Support the engine with a lifting device and wire ropes.



23) Support the transmission with a garage jack.

**CAUTION:**

Doing this is very important because the transmission lowers for its own weight. This work is also of great importance for facilitating reinstallation.



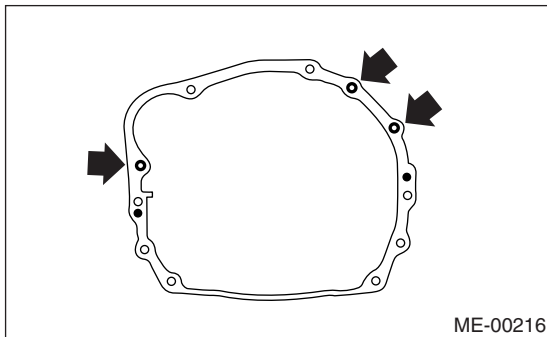
- (A) Transmission
- (B) Garage jack

**CAUTION:**

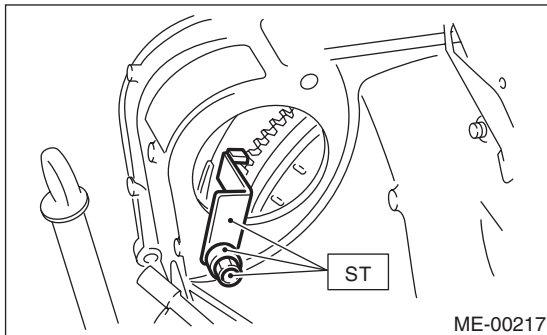
Before removing the engine away from transmission, check to be sure no work has been overlooked.

24) Separation of engine and transmission.

- (1) Remove the starter. <Ref. to SC(H4SO)-8, REMOVAL, Starter.>
- (2) Remove the bolts which hold upper side of transmission to engine.



25) Set the ST to converter case. (AT model)  
ST 498277200 STOPPER SET



26) Remove the engine from vehicle.

- (1) Slightly raise the engine.
- (2) Raise the transmission with garage jack.

(3) Move the engine horizontally until main shaft is withdrawn from clutch cover.

(4) Slowly move the engine away from engine compartment.

**NOTE:**

Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.

27) Remove the front cushion rubbers.

**B: INSTALLATION**

1) Install the front cushion rubbers.

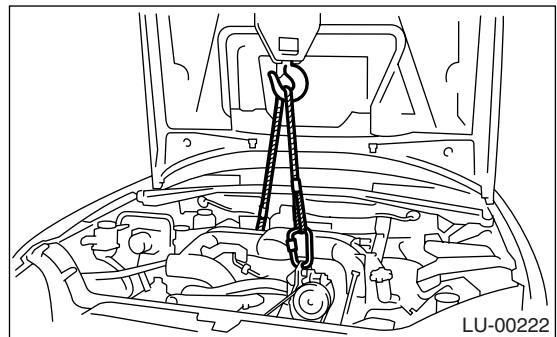
**Tightening torque:**

**35 N·m (3.6 kgf-m, 25.8 ft-lb)**

2) Position the engine in engine compartment and align it with transmission.

**NOTE:**

Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.

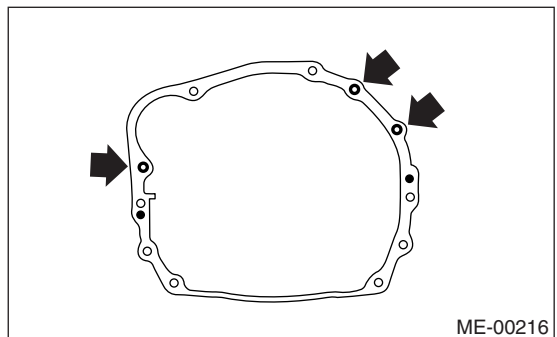


3) Apply a small amount of grease to splines of main shaft. (MT model)

4) Tighten the bolts which hold upper side of transmission to engine.

**Tightening torque:**

**50 N·m (5.1 kgf-m, 36.9 ft-lb)**



5) Remove the lifting device and wire ropes.

6) Remove the garage jack.

7) Install the pitching stopper.

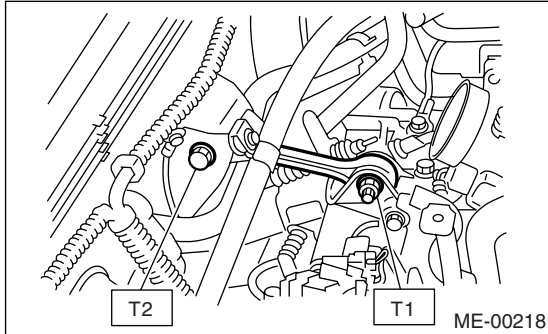
# Engine Assembly

MECHANICAL

## Tightening torque:

**T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)**

**T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)**



8) Remove the ST from converter case. (AT model)

### NOTE:

Be careful not to drop the ST into the converter case when removing the ST.

ST 498277200 STOPPER SET

9) Install the starter. <Ref. to SC(H4SO)-8, INSTALLATION, Starter.>

10) Install the torque converter clutch to drive plate. (AT model)

(1) Tighten the bolts which hold torque converter clutch to drive plate.

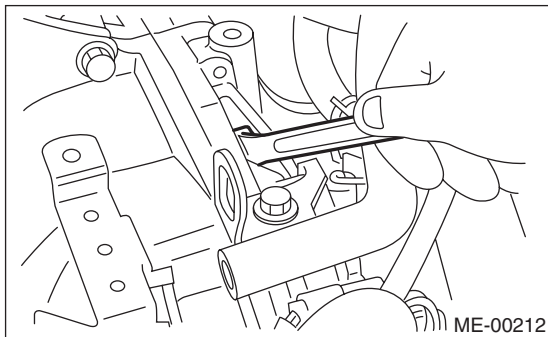
(2) Tighten all the bolts by rotating them in the direction of engine rotation little by little using a socket wrench.

### CAUTION:

Be careful not to drop bolts into the torque converter clutch housing.

## Tightening torque:

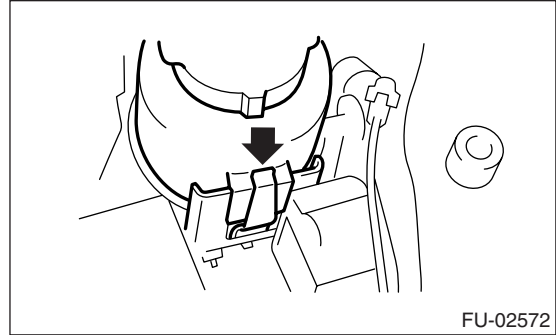
**25 N·m (2.5 kgf-m, 18.4 ft-lb)**



(3) Clog the service hole plug and prevent foreign matters from being mixed.

11) Install the power steering pump on bracket.

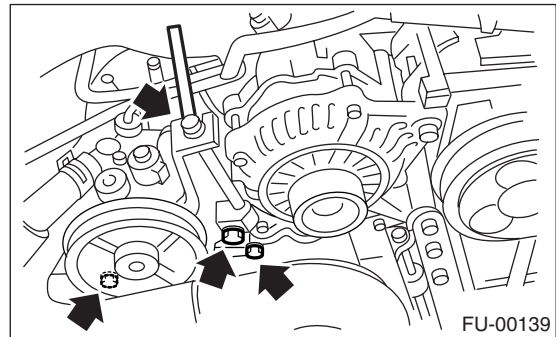
(1) Install the power steering tank to bracket.



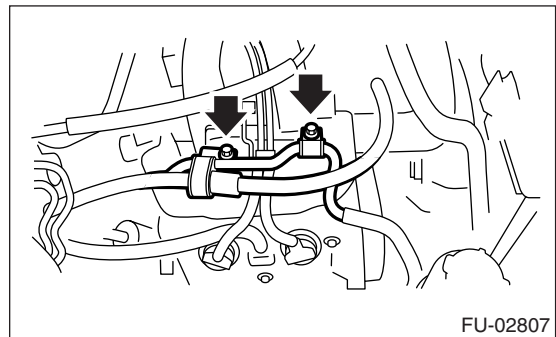
(2) Install the power steering pump on bracket, and tighten the bolts.

## Tightening torque:

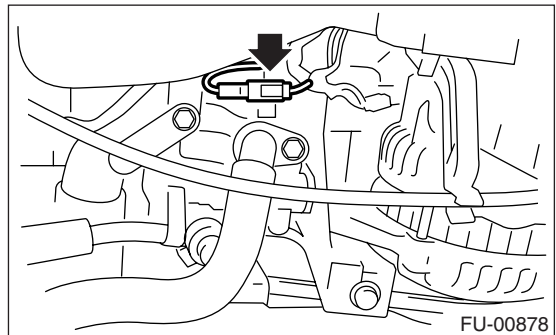
**22 N·m (2.2 kgf-m, 16 ft-lb)**



(3) Install the pipe with their bracket.



(4) Connect the power steering switch connector.

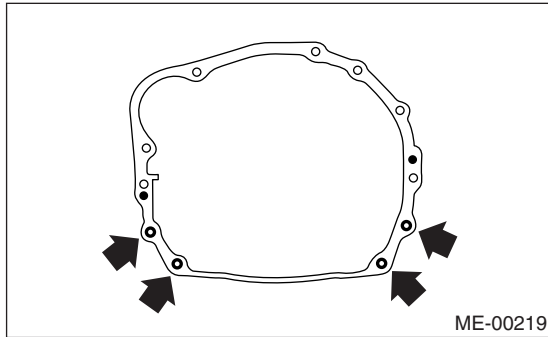


(5) Install the front side belt and adjust it. <Ref. to ME(H4SO)-40, FRONT SIDE BELT, INSTALLATION, V-belt.>

- 12) Lift-up the vehicle.
- 13) Tighten the nuts which hold lower side of transmission to engine.

**Tightening torque:**

**50 N·m (5.1 kgf·m, 36.9 ft·lb)**



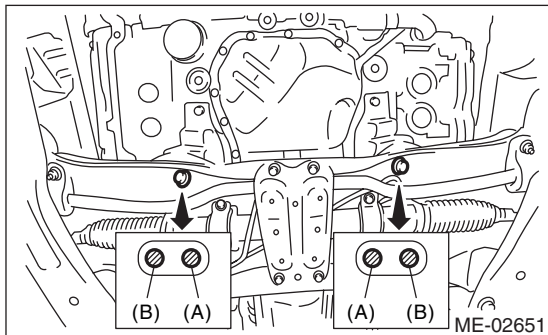
- 14) Tighten the nuts which install the front cushion rubber onto crossmember.

**Tightening torque:**

**85 N·m (8.7 kgf·m, 63 ft·lb)**

**NOTE:**

Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



- 15) Install the front and center exhaust pipe. <Ref. to EX(H4SO)-4, INSTALLATION, Front Exhaust Pipe.>

- 16) Lower the vehicle.

- 17) Connect the following hoses:

- (1) Fuel delivery hose and evaporation hose
- (2) Heater inlet and outlet hoses
- (3) Brake booster vacuum hose

- 18) Connect the following connectors:

- (1) Front oxygen (A/F) sensor connector
- (2) Rear oxygen sensor connector
- (3) Engine ground cable

**Tightening torque:**

**14 N·m (1.4 kgf·m, 10.1 ft·lb)**

- (4) Engine harness connectors
- (5) Generator connector and terminal
- (6) A/C compressor connector

- 19) Install the air intake chamber stay.

**Tightening torque:**

**16 N·m (1.6 kgf·m, 11.6 ft·lb)**

- 20) Tighten the engine ground cable.

**Tightening torque:**

**14 N·m (1.4 kgf·m, 10.1 ft·lb)**

- 21) Install the A/C pressure hoses. <Ref. to AC-36, INSTALLATION, Hose and Tube.>
- 22) Install the radiator to vehicle. <Ref. to CO(H4SO)-24, INSTALLATION, Radiator.>
- 23) Install the air intake duct, air cleaner case and air intake chamber. <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.> <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Chamber.>

- 24) Install the under cover.

- 25) Install the battery in the vehicle, and connect cables.

- 26) Fill engine coolant.

<Ref. to CO(H4SO)-16, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

- 27) Check the ATF level and replenish it if necessary.

<Ref. to 4AT-30, INSPECTION, Automatic Transmission Fluid.>

- 28) Charge the A/C system with refrigerant. <Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>

- 29) Remove the front hood stay, and close the front hood.

- 30) Take off the vehicle from a lift.

## C: INSPECTION

- 1) Check pipes, hoses, connectors and clamps are installed firmly.
- 2) Check that the engine coolant and ATF are at specified levels.
- 3) Start the engine, and make sure that no leaks of exhaust gas, engine coolant and fuel, noise and vibrations.

## 10.Engine Mounting

### A: REMOVAL

- 1) Remove the engine assembly. <Ref. to ME(H4SO)-32, REMOVAL, Engine Assembly.>
- 2) Remove the engine mounting from engine assembly.

### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

#### *Engine mounting:*

*35 N·m (3.6 kgf-m, 25.8 ft-lb)*

### C: INSPECTION

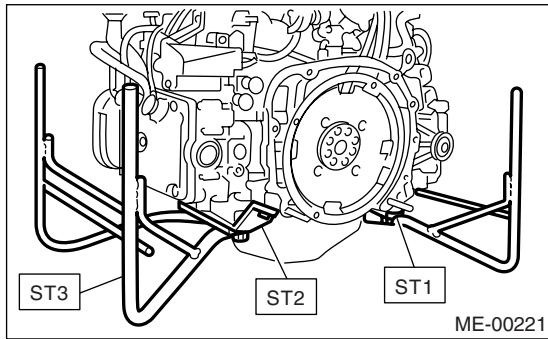
Make sure that no crack or other damages do not exist.

## 11. Preparation for Overhaul

### A: PROCEDURE

1) After removing the engine from the body, secure it in the ST shown below.

|     |           |                            |
|-----|-----------|----------------------------|
| ST1 | 498457000 | ENGINE STAND ADAPTER<br>RH |
| ST2 | 498457100 | ENGINE STAND ADAPTER<br>LH |
| ST3 | 499817100 | ENGINE STAND               |



2) In this section the procedures described under each index are all connected and stated in order. The procedure for overhauling of the engine will be completed when you go through all steps in the process.

Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.



## 12.V-belt

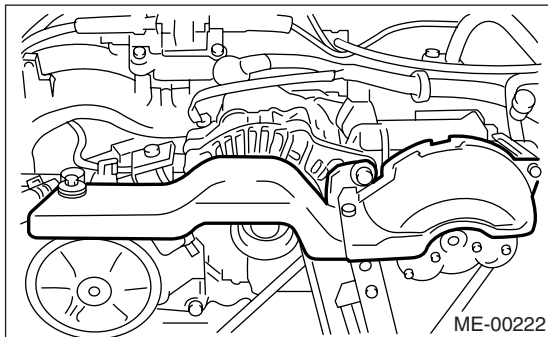
### A: REMOVAL

**NOTE:**

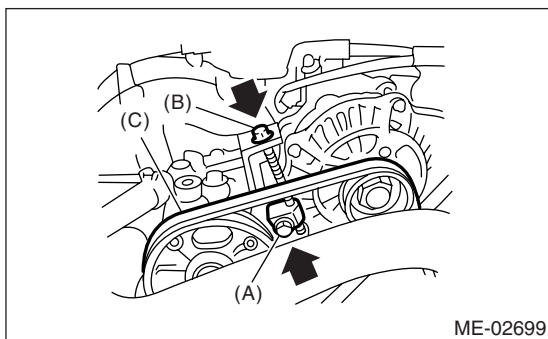
Perform the following procedures with the engine installed to the body.

#### 1. FRONT SIDE BELT

- 1) Remove the V-belt covers.

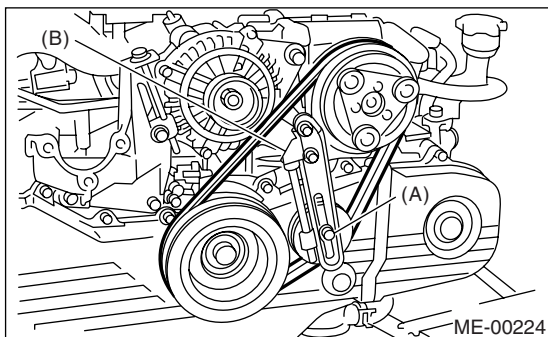


- 2) Loosen the lock bolt (A).
- 3) Loosen the slider bolt (B).
- 4) Remove the front side belt (C).



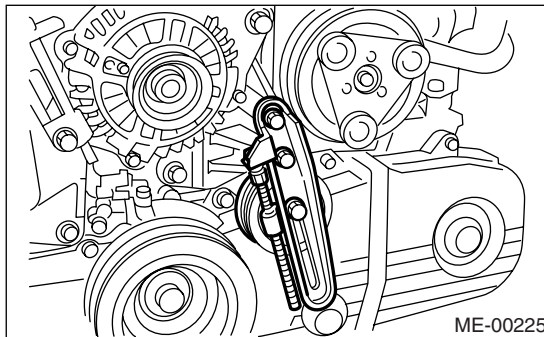
#### 2. REAR SIDE BELT

- 1) Loosen the lock nut (A).
- 2) Loosen the slider bolt (B).



- 3) Remove the rear side belt.

- 4) Remove the belt tensioner.



### B: INSTALLATION

**NOTE:**

Wipe off any oil or water on the belt and pulley.

#### 1. FRONT SIDE BELT

- 1) Install a V belt (C), and tighten the slider bolt so as to obtain the specified belt tension. <Ref. to ME(H4SO)-41, INSPECTION, V-belt.>
- 2) Tighten the lock bolt (A).
- 3) Tighten the slider bolt (B).

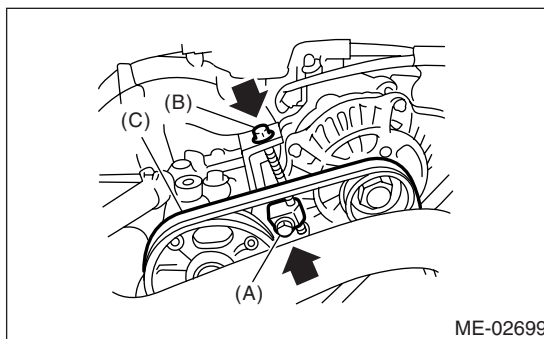
**Tightening torque:**

**Lock bolt (A):**

**25 N·m (2.5 kgf-m, 18.4 ft-lb)**

**Slider bolt (B):**

**8 N·m (0.8 kgf-m, 5.9 ft-lb)**



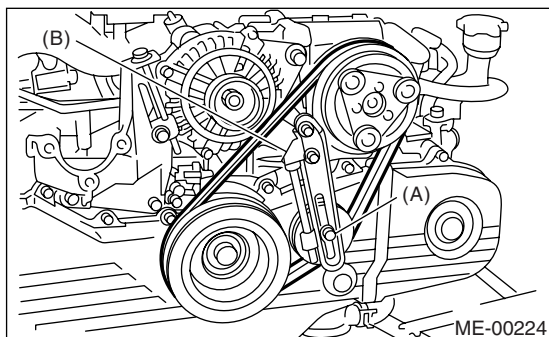
#### 2. REAR SIDE BELT

- 1) Install the belt tensioner.
- 2) Install a V belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(H4SO)-41, INSPECTION, V-belt.>
- 3) Tighten the lock nut (A).

**Tightening torque:**

**Lock nut (A):**

**23 N·m (2.3 kgf·m, 17.0 ft·lb)**



**C: INSPECTION**

- 1) Replace the belts, if cracks, fraying or wear is found.
- 2) Remove the V-belt cover and reservoir tank. (with belt tension gauge)
- 3) Check the V-belt tension and adjust it if necessary by changing the generator installing position or idler pulley installing position.

**Belt tension (with belt tension gauge)**

**(A)**

**When installing new parts:**

**618 — 755 N (63 — 77 kgf, 139 — 170 lbf)**

**At inspection:**

**490 — 640 N (50 — 65 kgf, 110 — 144 lbf)**

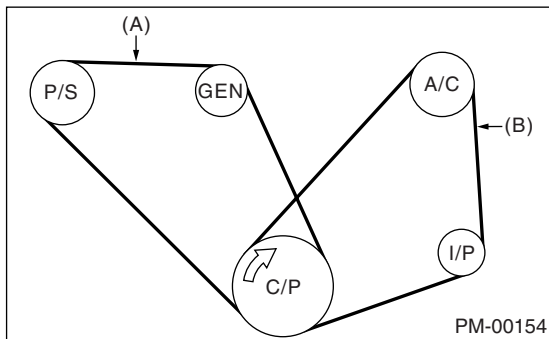
**(B)**

**When installing new parts:**

**740 — 880 N (75 — 90 kgf, 166 — 198 lbf)**

**At inspection:**

**350 — 450 N (36 — 46 kgf, 79 — 101 lbf)**



- (A) Front side belt
- (B) Rear side belt
- C/P Crank pulley
- GEN Generator
- P/S Power steering oil pump pulley
- A/C Air conditioning compressor pulley
- I/P Idler pulley

**Belt tension (without belt tension gauge)**

**(A)**

**When installing new parts:**

**7 — 9 mm (0.276 — 0.354 in)**

**At inspection:**

**9 — 11 mm (0.354 — 0.433 in)**

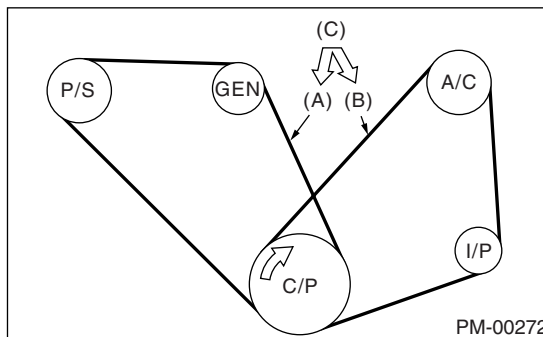
**(B)**

**When installing new parts:**

**7.5 — 8.5 mm (0.295 — 0.335 in)**

**At inspection:**

**9.0 — 10.0 mm (0.354 — 0.394 in)**



- (A) Front side belt
- (B) Rear side belt
- (C) 98 N (10 kgf, 22 lbf)
- C/P Crank pulley
- GEN Generator
- P/S Power steering oil pump pulley
- A/C Air conditioning compressor pulley
- I/P Idler pulley



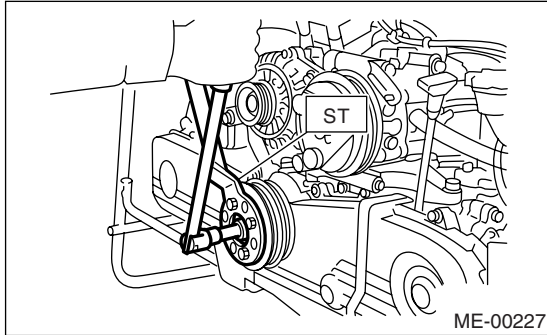
## 13.Crank Pulley

### A: REMOVAL

1) Remove the V-belts. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>

2) Remove the crank pulley bolt. To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH



3) Remove the crank pulley.

### B: INSTALLATION

1) Install the crank pulley.

2) Install the pulley bolt.

To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH

(1) Clean the crankshaft thread using compressed air.

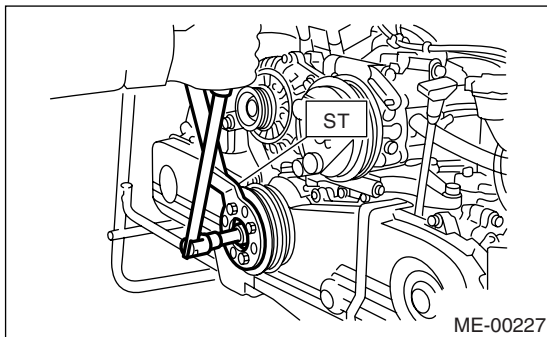
(2) Apply engine oil to the crank pulley bolt seat and thread.

(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf·m, 33 ft·lb).

(4) Tighten the crank pulley bolts.

#### Tightening torque:

**180 N·m (18.4 kgf·m, 132.8 ft·lb)**



3) Confirm that the tightening angle of crank pulley bolt is 65° or more. If the tightening angle of crank pulley bolt is less than 65°, conduct the following procedures.

(1) Replace the crank pulley bolts and clean them.

#### Crank pulley bolt:

**Part No. 12369AA011**

(2) Clean the crankshaft thread using compressed air.

(3) Apply engine oil to the crank pulley bolt seat and thread.

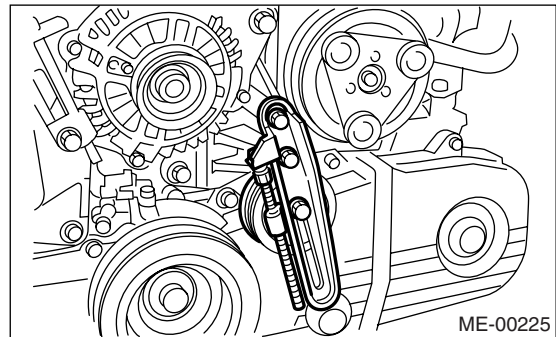
(4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf·m, 33 ft·lb).

(5) Tighten the crank pulley bolts keeping them in an angle between 65° and 75°.

#### NOTE:

Conduct the tightening procedures by confirming the turning angle of crank pulley bolt referring to the gauge indicated on timing belt cover.

4) Install the belt tensioner.



5) Install the V-belts. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>

### C: INSPECTION

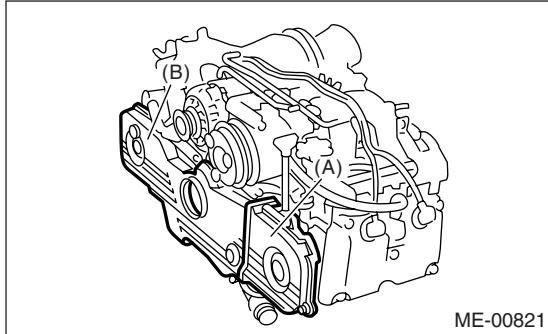
1) Make sure the V-belt is not worn or otherwise damaged.

2) Check the tension of the belt. <Ref. to ME(H4SO)-41, INSPECTION, V-belt.>

## 14. Timing Belt Cover

### A: REMOVAL

- 1) Remove the V-belts. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover (LH).
- 4) Remove the front timing belt cover.



- (A) Timing belt cover (LH)
- (B) Front timing belt cover

### B: INSTALLATION

- 1) Install the front timing belt cover.

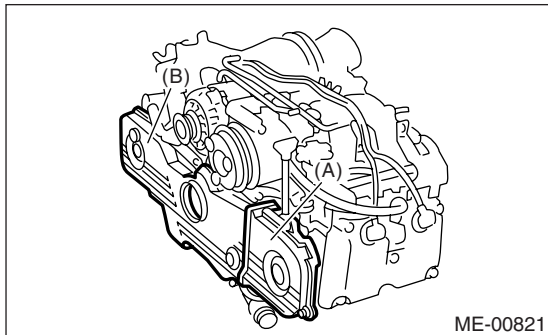
**Tightening torque:**

**5 N·m (0.5 kgf·m, 3.6 ft·lb)**

- 2) Install the timing belt cover (LH).

**Tightening torque:**

**5 N·m (0.5 kgf·m, 3.6 ft·lb)**



- (A) Timing belt cover (LH)
- (B) Front timing belt cover

- 3) Install the crank pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crank Pulley.>
- 4) Install the V-belts. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>

### C: INSPECTION

Check the cover for damage.

# Timing Belt

MECHANICAL

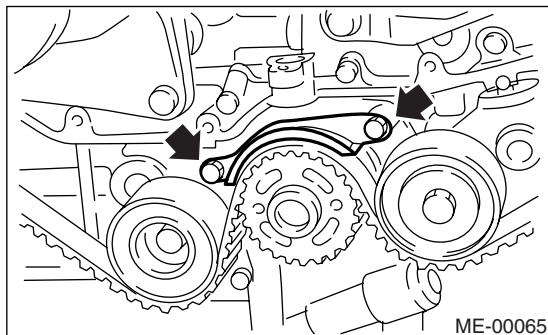
ST 499987500 CRANKSHAFT SOCKET

## 15. Timing Belt

### A: REMOVAL

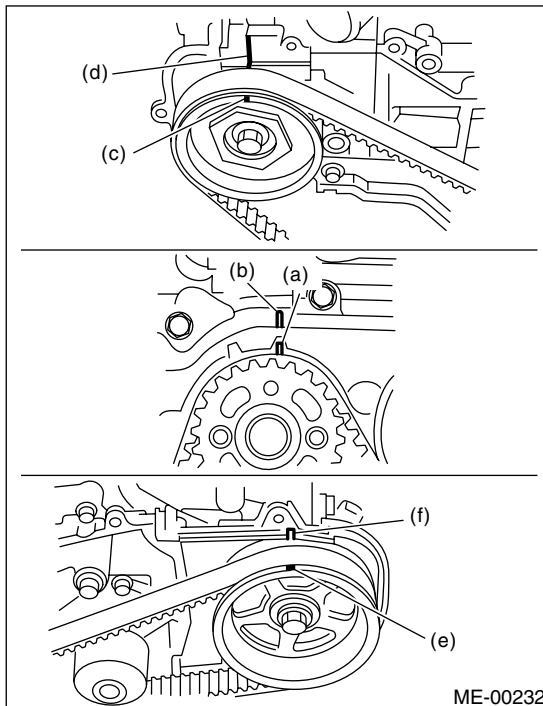
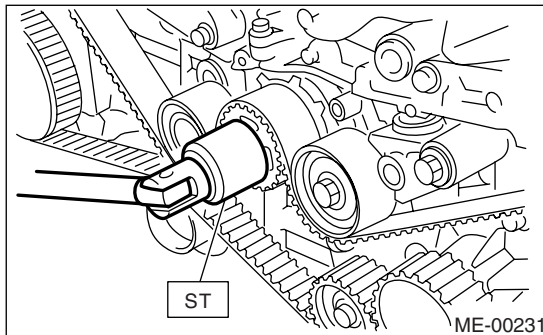
#### 1. TIMING BELT

- 1) Remove the V-belts. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt guide. (MT model)

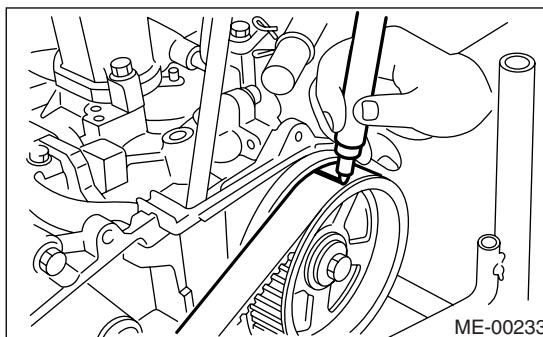


5) If the alignment mark or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as shown in procedures below.

- (1) To turn crankshaft, use the ST: Align the mark (a) of sprocket to the cylinder block notch (b), and then ensure the right side cam sprocket mark (c), cam cap and cylinder head matching surface (d) or left side cam sprocket mark (e), timing belt cover notch (f) are properly adjusted.



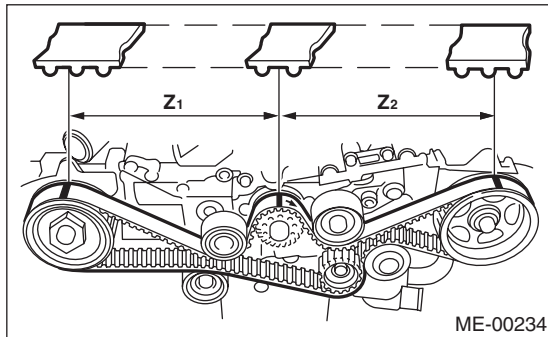
- (2) Using white paint, put alignment marks or arrow marks on the timing belts in relation to the crank sprocket and cam sprockets.



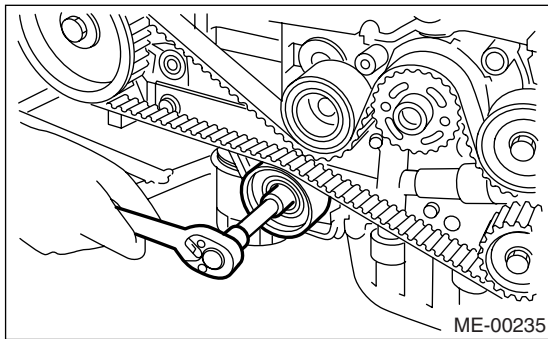
**Specified data:**

**Z<sub>1</sub>: Length of 46.8 teeth**

**Z<sub>2</sub>: Length of 43.7 teeth**

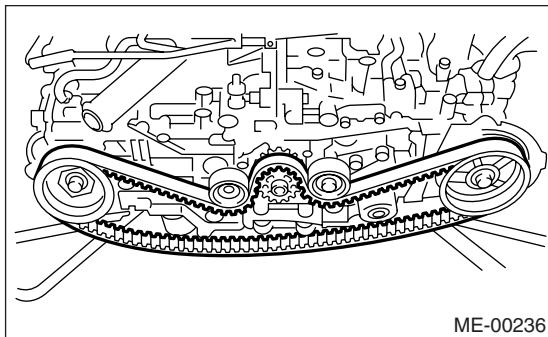


6) Remove the belt idler (No. 2).



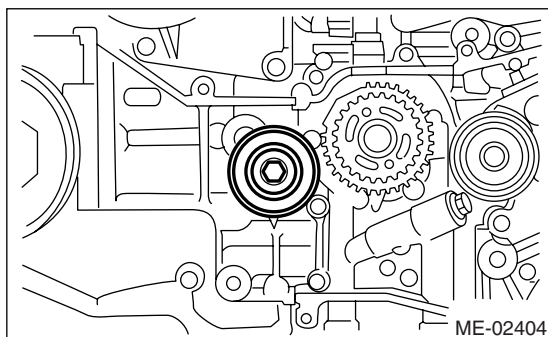
7) Remove the belt idler No. 2.

8) Remove the timing belt.

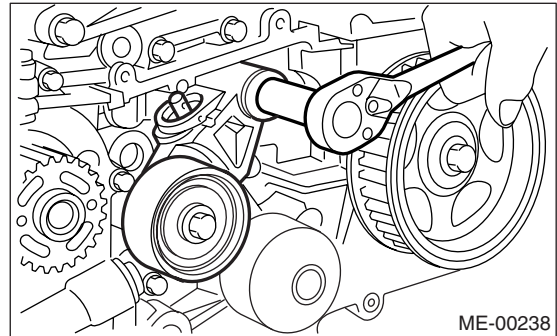


**2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY**

1) Remove the belt idler (No. 1).



2) Remove the automatic belt tension adjuster assembly.



**B: INSTALLATION**

**1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER**

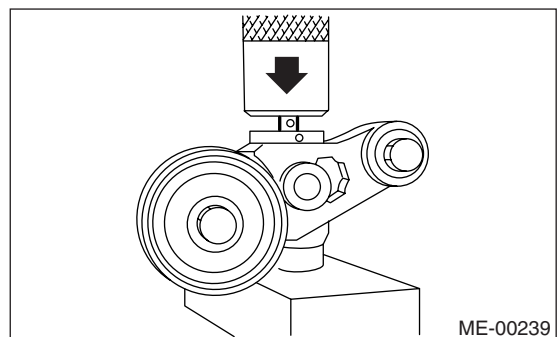
1) Preparation for installation of automatic belt tension adjuster assembly.

**CAUTION:**

- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.
- Press-in the push adjuster rod gradually taking more than three minutes.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lbf).
- Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into cylinder. Doing so may damage the cylinder.
- Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.

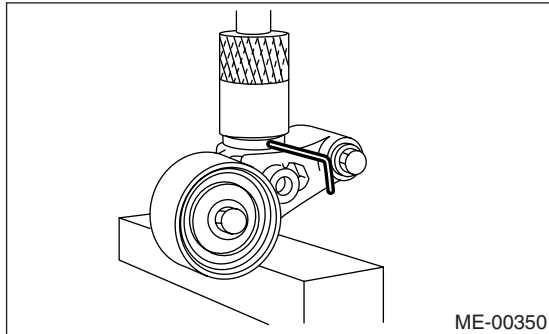
(2) Slowly move the adjuster rod down with a pressure of more than 165 N (16.8 kgf, 37.1 lbf) until the adjuster rod is aligned with the stopper pin hole in the cylinder.



# Timing Belt

## MECHANICAL

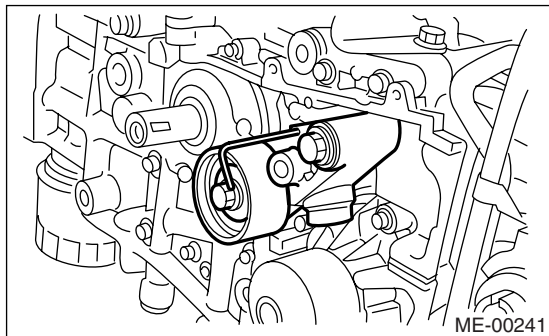
(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex wrench inserted into the stopper pin hole in cylinder, secure the adjuster rod.



2) Install the automatic belt tension adjuster assembly.

**Tightening torque:**

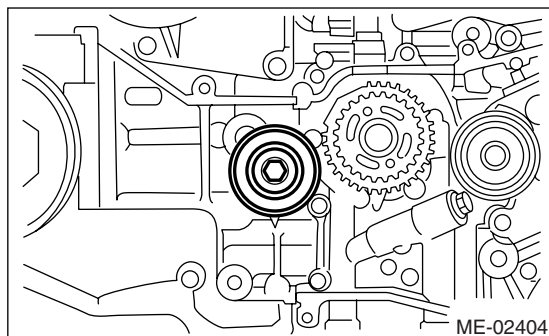
**39 N·m (4.0 kgf·m, 28.9 ft·lb)**



3) Install the belt idler (No. 1).

**Tightening torque:**

**39 N·m (4.0 kgf·m, 28.9 ft·lb)**



## 2. TIMING BELT

1) Prepare for installation of automatic belt tension adjuster assembly. <Ref. to ME(H4SO)-45, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>

2) Installation of timing belt

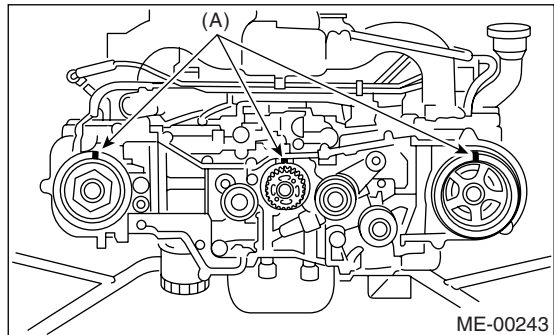
(1) Turn the cam sprocket No. 2 using ST1, and turn the cam sprocket No. 1 using ST2 so that their alignment marks (A) come to top positions.

ST1 18231AA010 CAM SPROCKET WRENCH

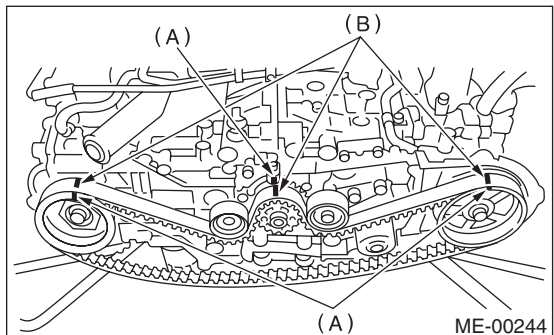
NOTE:

CAM SPROCKET WRENCH (499207100) can also be used.

ST2 499207400 CAM SPROCKET WRENCH



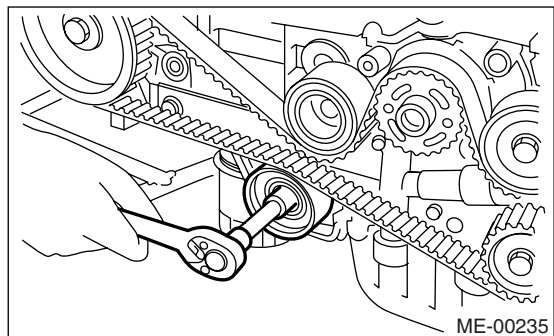
(2) While aligning the alignment mark (B) on timing belt with the mark (A) on sprockets, position the timing belt properly.



3) Install the belt idler (No. 2).

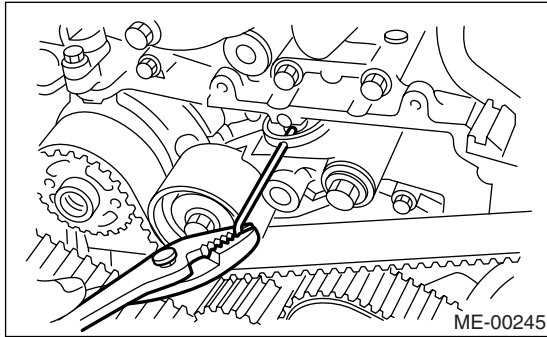
**Tightening torque:**

**39 N·m (4.0 kgf·m, 28.9 ft·lb)**

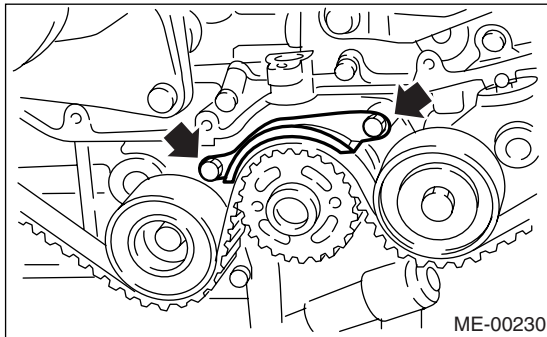




4) After ensuring the marks on timing belt and cam sprockets are aligned, remove the stopper pin from belt tension adjuster.



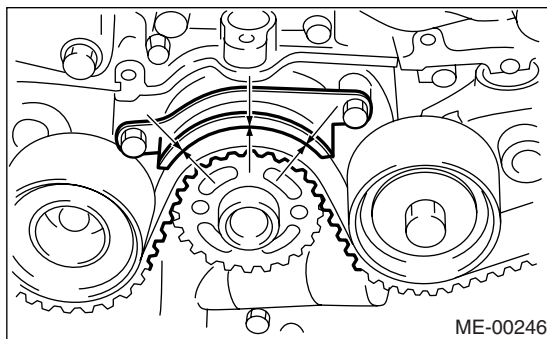
5) Install the timing belt guide. (MT model)  
 (1) Temporarily tighten the timing belt guide mounting bolts.



(2) Check and adjust the clearance between timing belt and timing belt guide by using thickness gauge.

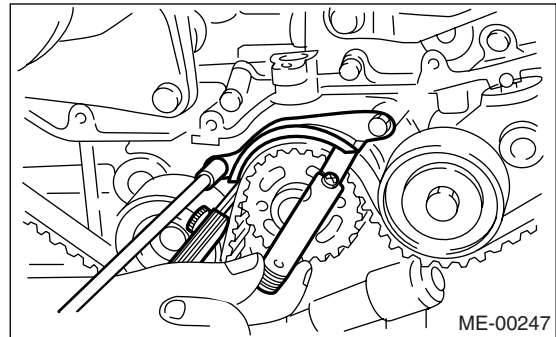
**Clearance:**

**$1.0 \pm 0.5 \text{ mm (0.039} \pm 0.020 \text{ in)}$**



(3) Tighten the timing belt guide mounting bolts.

**Tightening torque:**  
 **$9.75 \text{ N}\cdot\text{m (1.0 kgf}\cdot\text{m, 7.2 ft}\cdot\text{lb)}$**



6) Install the timing belt cover.  
 <Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>

7) Install the crank pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crank Pulley.>

8) Install the V-belts. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>

## C: INSPECTION

### 1. TIMING BELT

1) Check the timing belt teeth for breaks, cracks and wear. If any fault is found, replace the belt.

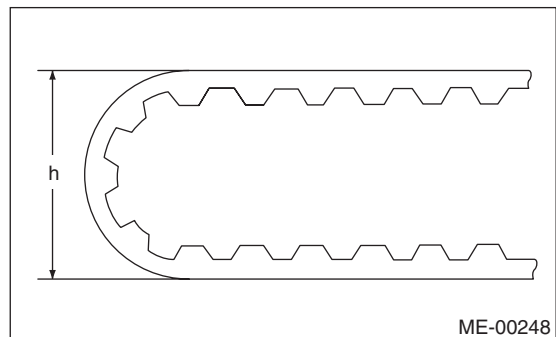
2) Check the condition of the backside of belt. If cracks are found, replace the belt.

#### CAUTION:

- Be careful not to let oil, grease or coolant contact the belt. Remove quickly and thoroughly if this happens.
- Do not bend the timing belt sharply.

**In radial diameter h:**

**$60 \text{ mm (2.36 in)}$  or more**



# Timing Belt

MECHANICAL

## 2. AUTOMATIC BELT TENSION ADJUST-ER

1) Visually check the oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace the automatic belt tension adjuster assembly.

### NOTE:

Slight traces of oil at rod's oil seal does not indicate a problem.

2) Check that the adjuster rod does not move when a pressure of 165 N (16.8 kgf, 37.1 lbf) is applied to it. This is to check adjuster rod stiffness.

3) If the adjuster rod is not stiff and moves freely when applying 165 N (16.8 kgf, 37.1 lbf), check it using the following procedures:

(1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this operation two to three times.

(2) With the adjuster rod moved all the way up, apply a pressure of 165 N (16.8 kgf, 37.1 lbf) to it. Check the adjuster rod stiffness.

(3) If the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new one.

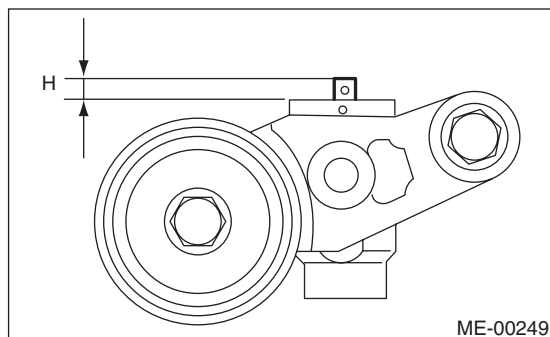
### CAUTION:

- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.
- Press the adjuster rod gradually taking more than three minutes.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lbf).
- Press the adjuster rod as far as the end surface of cylinder. Do not press the adjuster rod into cylinder. Doing so may damage the cylinder.

4) Measure the amount of rod protrusion beyond the body. If it is not within specifications, replace with a new one.

### Amount of rod protrusion H:

$5.7 \pm 0.5 \text{ mm}$  ( $0.224 \pm 0.020 \text{ in}$ )



## 3. BELT TENSION PULLEY

1) Check the mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace the automatic belt tension adjuster assembly if faulty.

2) Check the belt tension pulley for smooth rotation. Replace if noise or excessive play occurs.

3) Check the belt tension pulley for grease leakage.

## 4. BELT IDLER

1) Check the belt idler for smooth rotation. Replace if noise or excessive play occurs.

2) Check the outer contacting surfaces of idler pulley for abnormal wear and scratches.

3) Check the belt idler for grease leakage.

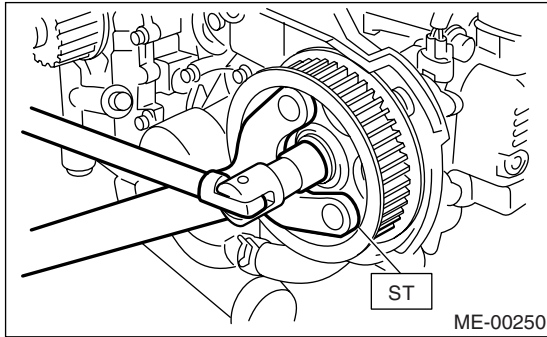
## 16. Cam Sprocket

### A: REMOVAL

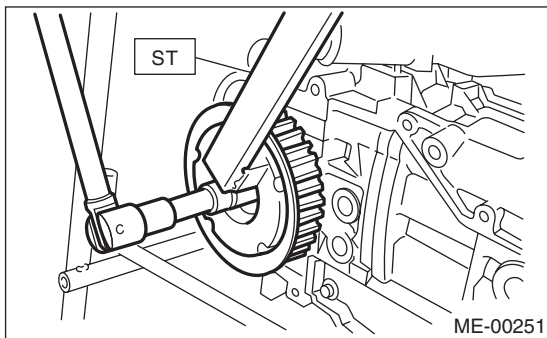
- 1) Remove the V-belts. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt.>
- 5) Remove the camshaft position sensor. <Ref. to FU(H4SO)-24, REMOVAL, Camshaft Position Sensor.>
- 6) Remove the cam sprocket No. 2. To lock the camshaft, use ST.  
ST 18231AA010 CAM SPROCKET WRENCH

**NOTE:**

CAM SPROCKET WRENCH (499207100) can also be used.



- 7) Remove the cam sprocket No. 1. To lock the camshaft, use ST.  
ST 499207400 CAM SPROCKET WRENCH



### B: INSTALLATION

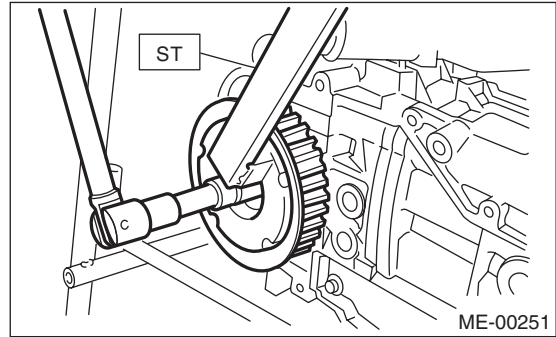
- 1) Install the cam sprocket No. 1. To lock the camshaft, use ST.  
ST 499207400 CAM SPROCKET WRENCH

**Tightening torque:**

**78 N·m (8.0 kgf·m, 57.9 ft·lb)**

**NOTE:**

Do not confuse left and right side cam sprockets during installation. Identify by indication of L or R.



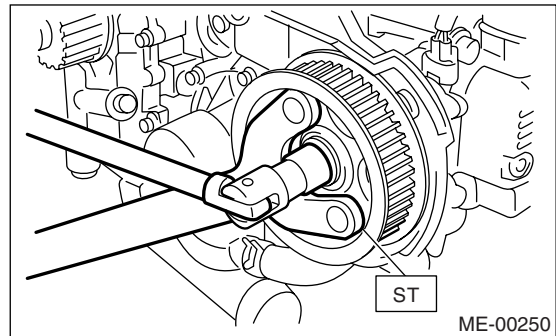
- 2) Install the cam sprocket No. 2. To lock the camshaft, use ST.  
ST 18231AA010 CAM SPROCKET WRENCH

**NOTE:**

CAM SPROCKET WRENCH (499207100) can also be used.

**Tightening torque:**

**78 N·m (8.0 kgf·m, 57.9 ft·lb)**



- 3) Install the camshaft position sensor. <Ref. to FU(H4SO)-24, INSTALLATION, Camshaft Position Sensor.>
- 4) Install the timing belt. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt.>
- 5) Install the timing belt cover. <Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>
- 6) Install the crank pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crank Pulley.>
- 7) Install the V-belts. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>

### C: INSPECTION

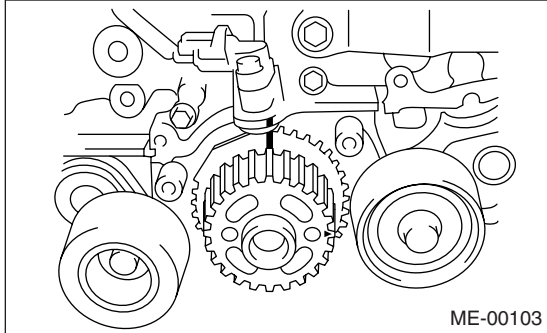
- 1) Check the cam sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between cam sprocket and key.
- 3) Check the cam sprocket protrusion used for sensor for damage and contamination of foreign matter.



## 17. Crank Sprocket

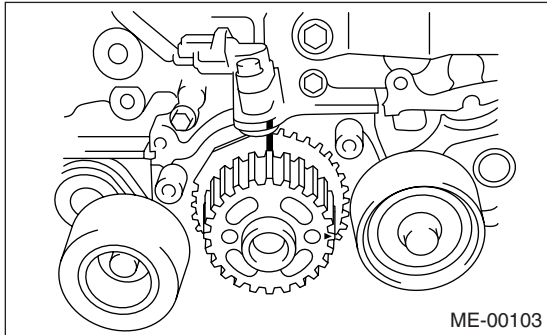
### A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt.>
- 5) Remove the crank sprocket.



### B: INSTALLATION

- 1) Install the crank sprocket.



- 2) Install the timing belt. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt.>
- 3) Install the timing belt cover. <Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>
- 4) Install the crank pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crank Pulley.>
- 5) Install the V-belts. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>

### C: INSPECTION

- 1) Check the crank sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between crank sprocket and key.
- 3) Check the crank sprocket protrusion used for sensor for damage and contamination of foreign matter.

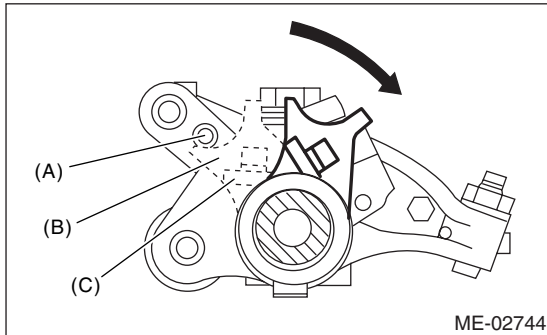
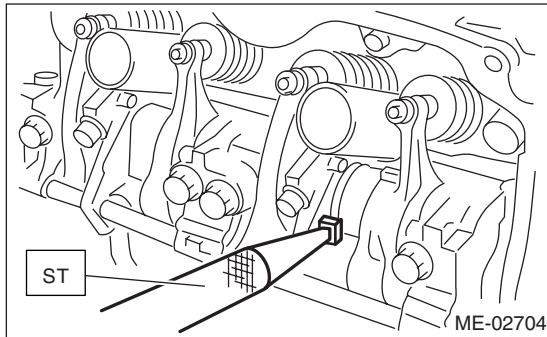
## 18. Valve Rocker Assembly

### A: REMOVAL

- 1) Remove the V-belts. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt.>
- 5) Remove the cam sprocket. <Ref. to ME(H4SO)-49, REMOVAL, Cam Sprocket.>
- 6) Disconnect the PCV hose and remove the rocker cover.
- 7) Remove the valve rocker assembly.

- (1) Using ST, rotate the spring stopper in the arrow direction to remove it from adjuster pin.

ST 18258AA000 SPRING INSTALLER

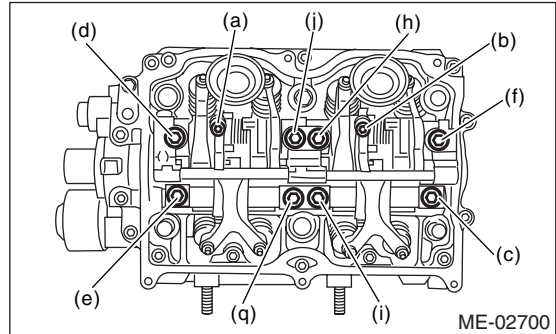


- (A) Adjuster pin
- (B) Spring stopper
- (C) Spring

- (2) Remove the bolts (a) through (j) in alphabetical sequence.

### NOTE:

Leave two or three threads of bolts (i) and (j) engaged in order to retain the valve rocker assembly.

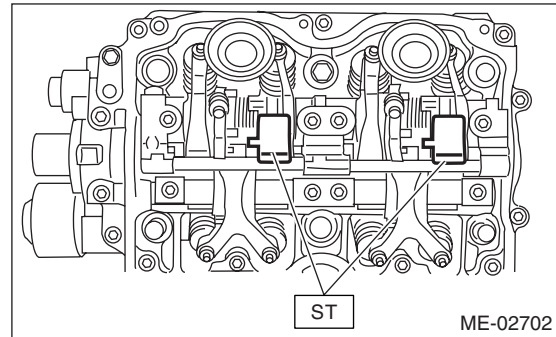


- (3) Remove the valve rocker assembly.

### NOTE:

Set the ST in the position shown in the figure to remove the intake valve rocker assembly.

ST 18354AA000 VALVE ROCKER HOLDER



### B: INSTALLATION

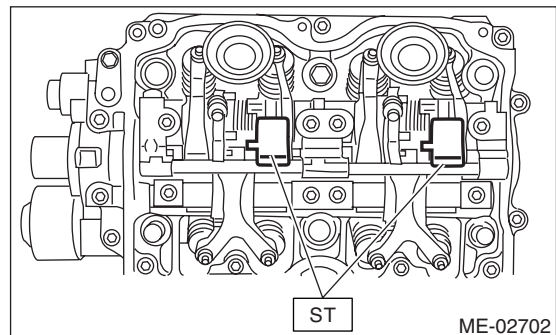
- 1) Install the valve rocker assembly.

- (1) Temporarily tighten the bolts equally in alphabetical order.

### NOTE:

- Do not temporarily tighten the bolts (i) and (j).
- Set the ST in the position shown in the figure to install the intake valve rocker assembly.

ST 18354AA000 VALVE ROCKER HOLDER



- (2) Tighten the bolts (a) through (h) to specified torque.

### Tightening torque:

25 N·m (2.5 kgf-m, 18.4 ft-lb)

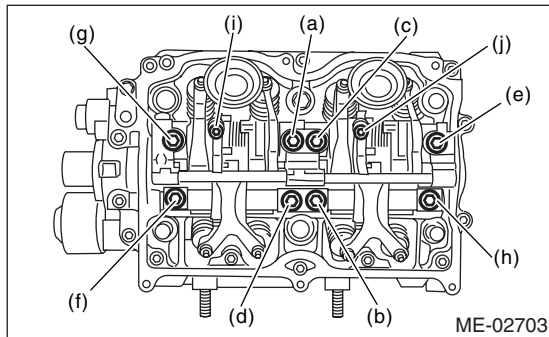
# Valve Rocker Assembly

## MECHANICAL

(3) Tighten the bolts (i) through (j) to specified torque.

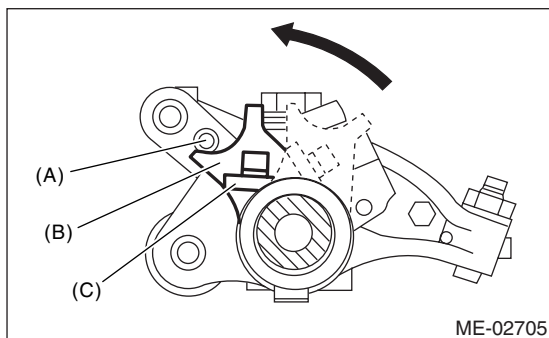
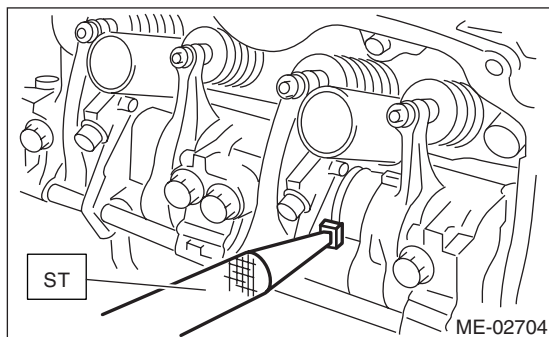
### Tightening torque:

**8 N·m (0.8 kgf·m, 5.9 ft·lb)**



(4) Using ST, rotate the spring stopper in the arrow direction to secure it to adjuster pin.

ST 18258AA000 SPRING INSTALLER



- (A) Adjuster pin
- (B) Spring stopper
- (C) Spring

2) Adjust the valve clearance. <Ref. to ME(H4SO)-31, ADJUSTMENT, Valve Clearance.>

3) Tighten the bolts of rocker cover and rocker cover gasket in alphabetical order shown in the figure, and connect the PCV hose.

### NOTE:

- Use new rocker cover gasket.
- Tighten bolts in two stages in alphabetical sequence as shown in the figure.

### Tightening torque:

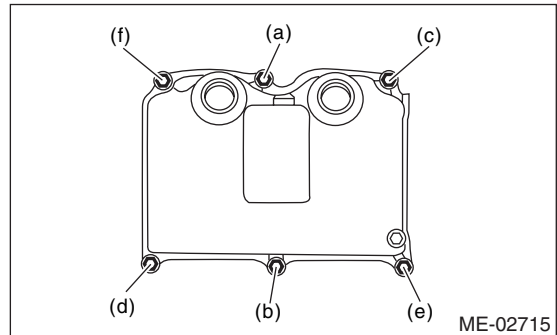
#### 1st

**6.4 N·m (0.65 kgf·m, 4.7 ft·lb)**

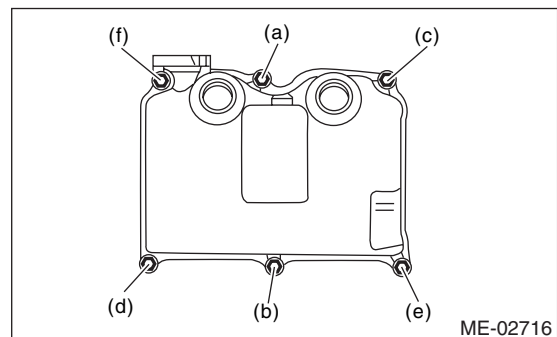
#### 2nd

**6.4 N·m (0.65 kgf·m, 4.7 ft·lb)**

- RH side



- LH side



4) Install the cam sprocket. <Ref. to ME(H4SO)-49, INSTALLATION, Cam Sprocket.>

5) Install the timing belt. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt.>

6) Install the timing belt cover.

<Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>

7) Install the crank pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crank Pulley.>

8) Install the V-belt. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>

## C: DISASSEMBLY

### NOTE:

Intake valve rocker assembly can not be disassembled.

1) Remove the exhaust valve rocker arm from rocker shaft.

### NOTE:

Keep all the removed parts in order for re-installing in their original positions.

2) Remove the nut and adjusting screw from valve rocker.

## D: ASSEMBLY

**NOTE:**

Intake valve rocker assembly can not be disassembled.

- 1) Install the adjusting screw and nut to exhaust valve rocker arm.
- 2) Insert the valve rocker arm into rocker shaft.

**NOTE:**

Valve rocker arms and rocker shaft have identification marks. Ensure the parts with same markings are properly assembled.

## E: INSPECTION

### 1. INTAKE VALVE ROCKER ASSEMBLY

- 1) If the roller or valve contact surface of valve rocker arm is worn or dented excessively, replace the valve rocker assembly.
- 2) Check that the valve rocker arm roller rotates smoothly. If not, replace the valve rocker assembly.

### 2. EXHAUST VALVE ROCKER ASSEMBLY

- 1) Measure the inner diameter of valve rocker arm and outer diameter of valve rocker shaft, and make sure the difference (oil clearance) between the two values.

**Clearance between arm and shaft:**

**Standard:**

**0.020 — 0.054 mm (0.0008 — 0.0021 in)**

**Limit:**

**0.10 mm (0.0039 in)**

- 2) If the oil clearance exceeds the limit, replace the valve rocker arm or shaft, whichever shows greater amount of wear.

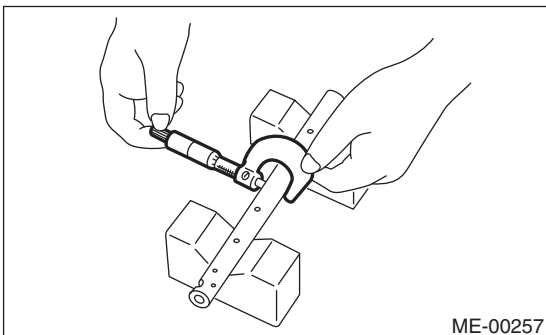
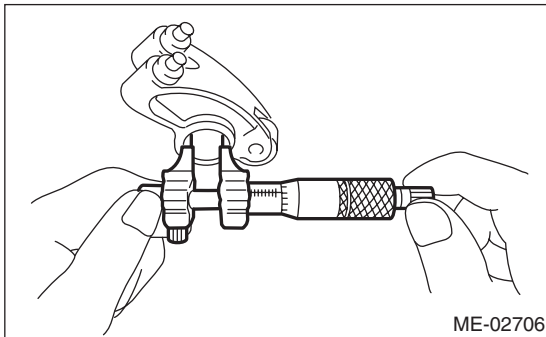
**Rocker arm inside diameter:**

**22.020 — 22.041 mm (0.8669 — 0.8678 in)**

**Rocker shaft diameter:**

**21.987 — 22.000 mm (0.8656 — 0.8661 in)**

- 3) If the cam or valve contact surface of valve rocker arm is worn or dented excessively, replace the valve rocker arm.
- 4) Check that the valve rocker arm roller rotates smoothly. If not, replace the valve rocker arm.



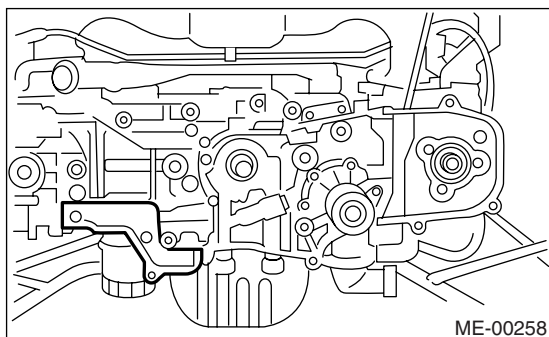
## 19. Camshaft

### A: REMOVAL

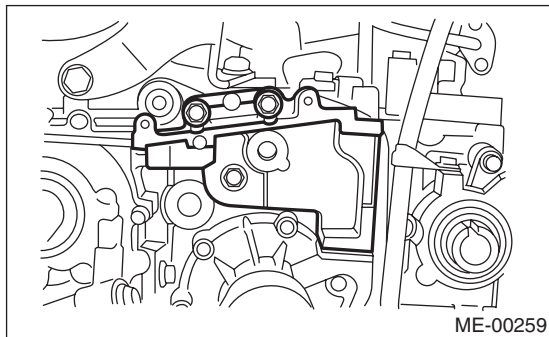
- 1) Remove the V-belts. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt.>
- 5) Remove the cam sprocket. <Ref. to ME(H4SO)-49, REMOVAL, Cam Sprocket.>
- 6) Remove the timing belt cover No. 2 (LH).
- 7) Remove the timing belt cover No. 2 (RH).

#### NOTE:

Do not damage or lose the seal rubber when removing the timing belt covers.

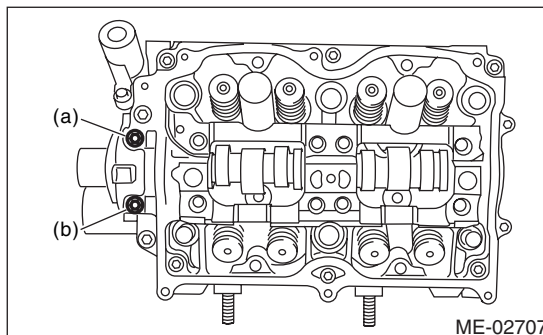


- 8) Remove the tensioner bracket.

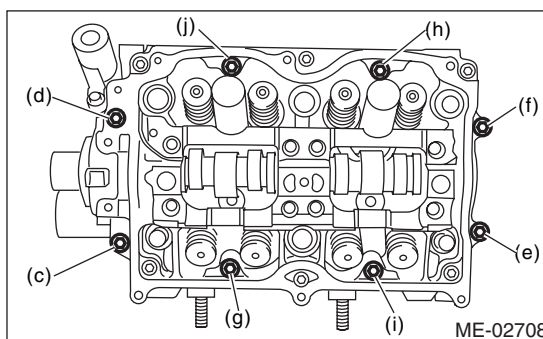


- 9) Remove the camshaft position sensor support. (LH side only)
- 10) Remove the oil level gauge guide. (LH side only)
- 11) Remove the valve rocker assembly. <Ref. to ME(H4SO)-51, REMOVAL, Valve Rocker Assembly.>

- 12) Remove the camshaft cap.
  - (1) Remove the bolts (a) and (b) in alphabetical sequence.

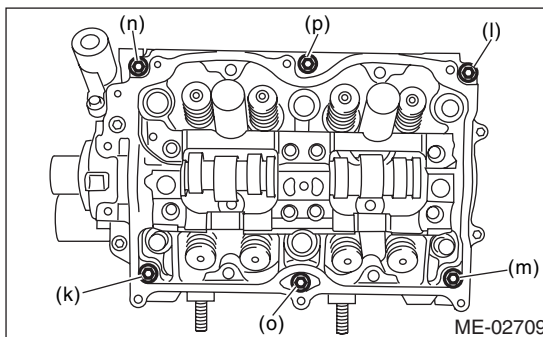


- (2) Equally loosen the bolts (c) through (j) all the way in alphabetical sequence.



- (3) Remove the bolts (k) through (p) in alphabetical sequence using ST.

ST 499497000 TORX PLUS®



- (4) Remove the camshaft cap.
- 13) Remove the camshaft.
- 14) Remove the oil seal.
- 15) Remove the plug from the rear side of camshaft.

#### CAUTION:

- Do not remove the oil seal unless necessary.
- Do not scratch the journal surface when removing the oil seal.



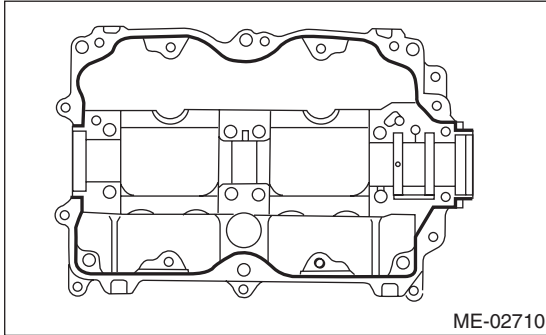
## B: INSTALLATION

- 1) Apply a coat of engine oil to camshaft journals and install the camshaft.
- 2) Install the camshaft cap.

- (1) Apply liquid gasket to the mating surfaces of camshaft cap.

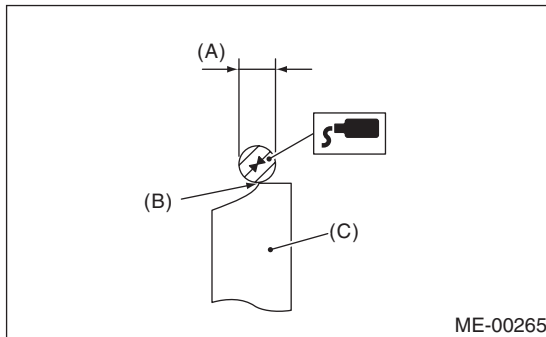
### Liquid gasket:

**THREE BOND 1280B (Part No. K0877YA018)**

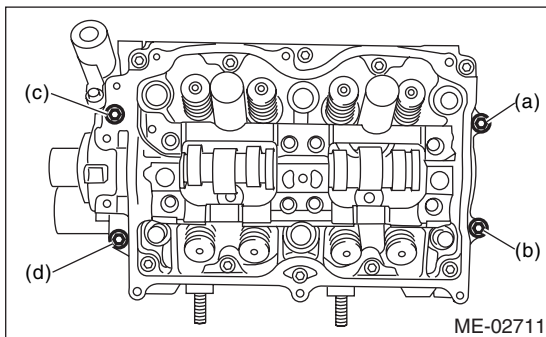


### NOTE:

- Apply a coat of liquid gasket of 3 mm (0.12 in) in diameter (A) along the edge (B) of camshaft cap (C) mating surface.
- Assemble them within 20 min. after applying liquid gasket.



- (2) Temporarily tighten the bolts (a) through (d) in alphabetical sequence.



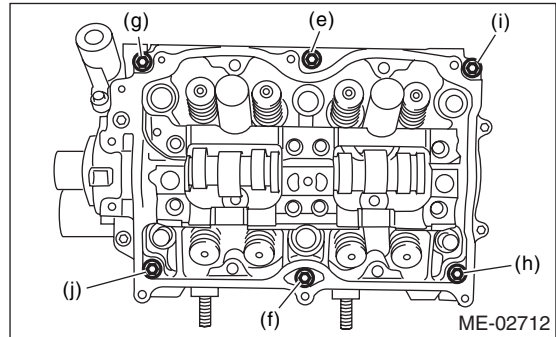
- (3) Install the valve rocker assembly.  
<Ref. to ME(H4SO)-51, INSTALLATION, Valve Rocker Assembly.>

- (4) Tighten the TORX® bolts (e) through (j) in alphabetical sequence using ST.

ST 499497000 TORX PLUS®

### Tightening torque:

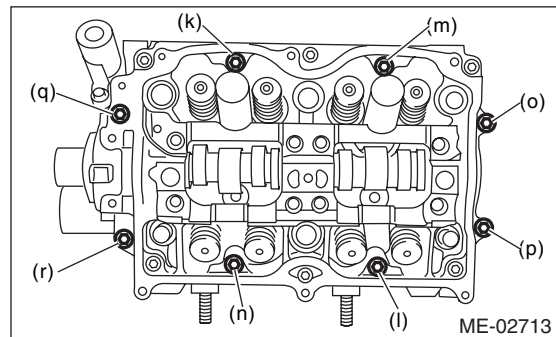
**18 N·m (1.8 kgf·m, 13.3 ft·lb)**



- (5) Tighten the bolts (k) through (r) in alphabetical sequence.

### Tightening torque:

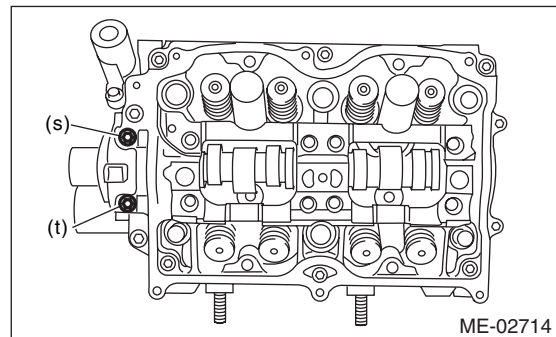
**9.75 N·m (1.0 kgf·m, 7.2 ft·lb)**



- (6) Tighten the bolts (s) and (t) in alphabetical sequence.

### Tightening torque:

**9.75 N·m (1.0 kgf·m, 7.2 ft·lb)**



- 3) Apply engine oil to the outer perimeter and lips of oil seal, and install the oil seal (A) on camshaft using ST1 and ST2.

### NOTE:

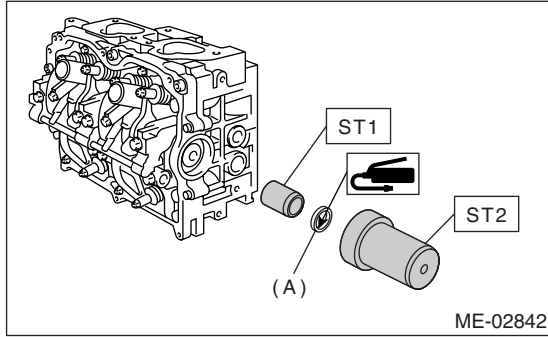
Use a new oil seal.

ST1 499597000 OIL SEAL GUIDE

# Camshaft

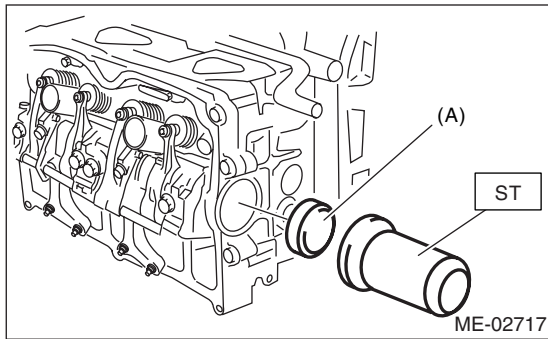
MECHANICAL

ST2 499587500 OIL SEAL INSTALLER



4) Install the plug (A) using ST.

ST 499587700 CAMSHAFT OIL SEAL INSTALLER



5) Adjust the valve clearance. <Ref. to ME(H4SO)-31, ADJUSTMENT, Valve Clearance.>

6) Tighten the bolts of rocker cover and rocker cover gasket in alphabetical order shown in the figure, and connect the PCV hose.

NOTE:

- Use new rocker cover gasket.
- Tighten bolts in two stages in alphabetical sequence as shown in the figure.

**Tightening torque:**

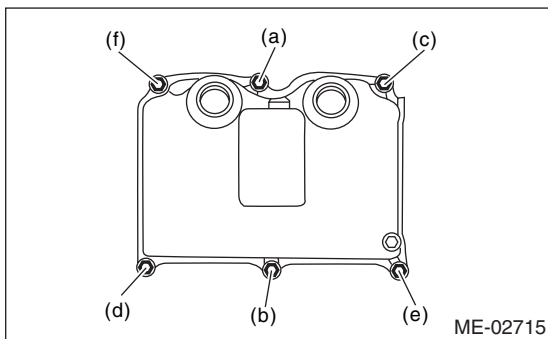
**1st**

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**

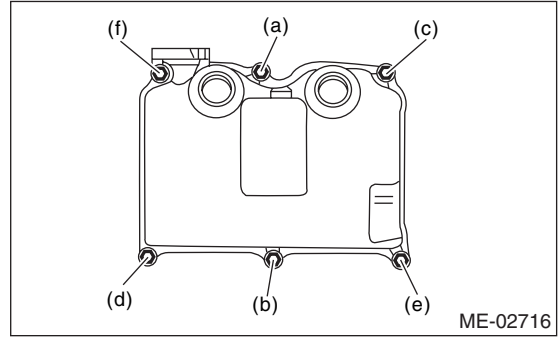
**2nd**

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**

- RH side



- LH side



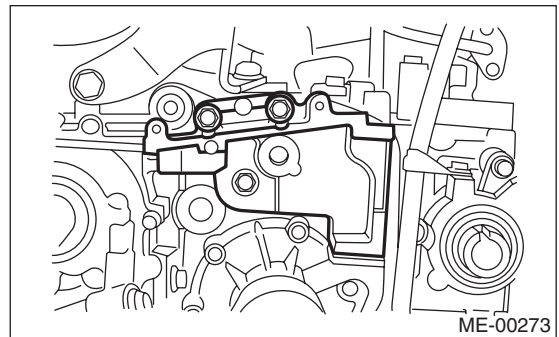
7) Install the oil level gauge guide. (LH side)

8) Install the camshaft position sensor support. (LH side)

9) Install the tensioner bracket.

**Tightening torque:**

**24.5 N·m (2.5 kgf-m, 18.1 ft-lb)**



10) Install the timing belt cover No. 2 (RH).

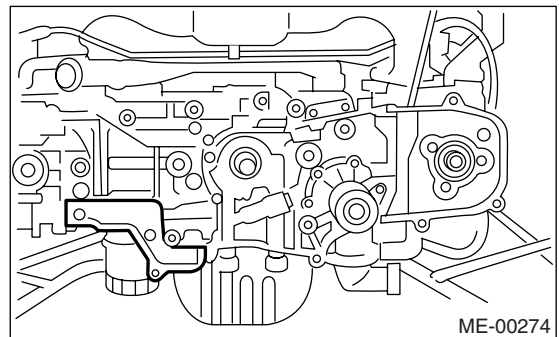
**Tightening torque:**

**5 N·m (0.5 kgf-m, 3.6 ft-lb)**

11) Install the timing belt cover No. 2 (LH).

**Tightening torque:**

**5 N·m (0.5 kgf-m, 3.6 ft-lb)**



12) Install the cam sprocket. <Ref. to ME(H4SO)-49, INSTALLATION, Cam Sprocket.>

13) Install the timing belt. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt.>

14) Install the timing belt cover.

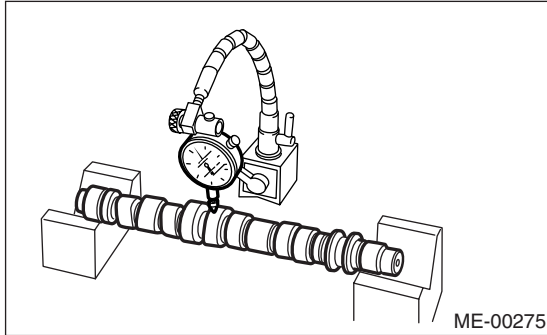
<Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>

- 15) Install the crank pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crank Pulley.>  
 16) Install the V-belt. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>

## C: INSPECTION

- 1) Measure the bend, and repair or replace if necessary.

**Service limit:**  
**0.025 mm (0.00098 in)**



- 2) Check the journal for damage and wear. Replace if faulty.  
 3) Measure the outer diameter of camshaft journal and inner diameter of cylinder head journal, and make sure the difference (oil clearance) between the two values. If the oil clearance exceeds standard value, replace the camshaft or cylinder head as necessary.

| Unit: mm (in)         |          |                                   |
|-----------------------|----------|-----------------------------------|
| Oil clearance         | Standard | 0.055 — 0.090 (0.0022 — 0.0035)   |
|                       | Limit    | 0.10 (0.0039)                     |
| Camshaft journal O.D. |          | 31.928 — 31.945 (1.2570 — 1.2577) |
| Journal hole I.D.     |          | 32.000 — 32.018 (1.2598 — 1.2605) |

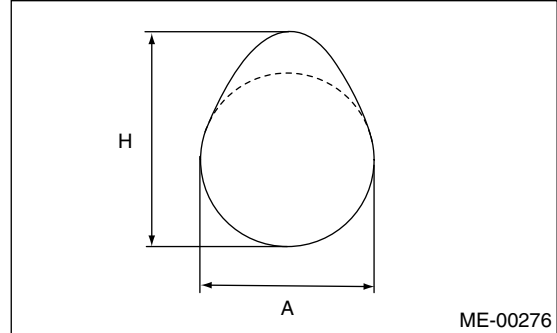
- 4) Check the cam face condition, and remove the minor faults by grinding with oil stone. Measure the cam height H. If it exceeds the limit, replace it.

### Cam height H:

| Parts   |            | Unit: mm (in)                     |                                   |
|---------|------------|-----------------------------------|-----------------------------------|
| Intake  | Fixed      | Standard                          | 40.075 — 40.175 (1.5778 — 1.5817) |
|         |            | Limit                             | 39.975 (1.5738)                   |
|         | Low speed  | Standard                          | 35.182 — 35.282 (1.3851 — 1.3891) |
|         |            | Limit                             | 35.082 (1.3812)                   |
|         | High speed | Standard                          | 40.315 — 40.415 (1.5872 — 1.5911) |
|         |            | Limit                             | 40.215 (1.5833)                   |
| Exhaust | Standard   | 40.149 — 40.249 (1.5807 — 1.5846) |                                   |
|         | Limit      | 40.049 (1.5767)                   |                                   |

**Cam base circle diameter A:**  
**Intake: 34.00 mm (1.3386 in)**  
**Exhaust: 34.00 mm (1.3386 in)**

**Difference between base circles of adjacent intake cams (low speed and high speed):**  
**0.03 mm (0.001 in) or less**



- 5) Measure the thrust clearance of camshaft with setting the dial gauge at end of camshaft. If the thrust clearance exceeds the limit, replace the camshaft cap and cylinder head as a set. If necessary, replace the camshaft.

**Standard:**  
**0.030 — 0.090 mm (0.0012 — 0.0035 in)**

**Limit:**  
**0.10 mm (0.0039 in)**



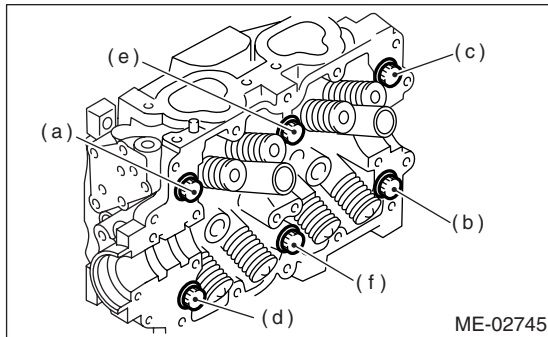
## 20. Cylinder Head

### A: REMOVAL

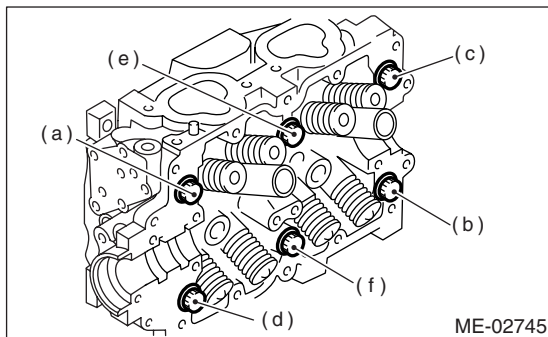
- 1) Remove the V-belts. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt.>
- 5) Remove the cam sprocket. <Ref. to ME(H4SO)-49, REMOVAL, Cam Sprocket.>
- 6) Remove the intake manifold. <Ref. to FU(H4SO)-13, REMOVAL, Intake Manifold.>
- 7) Remove the bolt which installs the A/C compressor bracket on cylinder head.
- 8) Remove the valve rocker assembly. <Ref. to ME(H4SO)-51, REMOVAL, Valve Rocker Assembly.>
- 9) Remove the camshaft. <Ref. to ME(H4SO)-54, REMOVAL, Camshaft.>
- 10) Remove the cylinder head bolts in alphabetical sequence as shown in the figure.

#### NOTE:

Leave bolts (a) and (c) engaged by three or four threads to prevent the cylinder head from falling.



- 11) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.
- 12) Remove the bolts (a) and (c) to remove the cylinder head.



- 13) Remove the cylinder head gasket.

#### CAUTION:

Be careful not to scratch the mating surface of cylinder head and cylinder block.

- 14) Similarly, remove the right side cylinder head.

### B: INSTALLATION

- 1) Install the cylinder head and gaskets on cylinder block.

#### CAUTION:

- Use new cylinder head gaskets.
- Be careful not to scratch the mating surface of cylinder block and cylinder head.

- 2) Tighten the cylinder head bolts.
  - (1) Apply a coat of engine oil to washers and bolt threads.
  - (2) Tighten all bolts to 29 N·m (3.0 kgf-m, 21.4 ft-lb) in alphabetical sequence. Then tighten all bolts to 69 N·m (7.0 kgf-m, 50.9 ft-lb) in alphabetical sequence.
  - (3) Back off all bolts by 180° in reverse order of installation, and back them off again by 180°.
  - (4) Tighten all bolts to 42 N·m (4.3 kgf-m, 31 ft-lb) in alphabetical sequence.
  - (5) Tighten all bolts by 80° — 90° in alphabetical sequence.
  - (6) Tighten all bolts by 40° — 45° in alphabetical sequence.

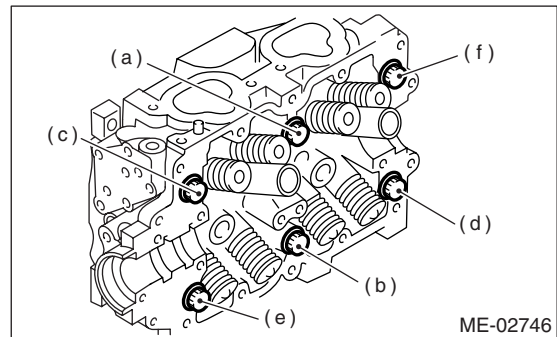
#### CAUTION:

Tightening angle of the bolt must not exceed 45°.

- (7) Further tighten bolts (a) and (b) by 40° — 45°.

#### CAUTION:

Total “re-tightening angle” of the step (6) and (7) must not exceed 90°.



- 3) Install the camshaft. <Ref. to ME(H4SO)-55, INSTALLATION, Camshaft.>
- 4) Install the valve rocker assembly. <Ref. to ME(H4SO)-51, INSTALLATION, Valve Rocker Assembly.>
- 5) Install the A/C compressor bracket on cylinder head.

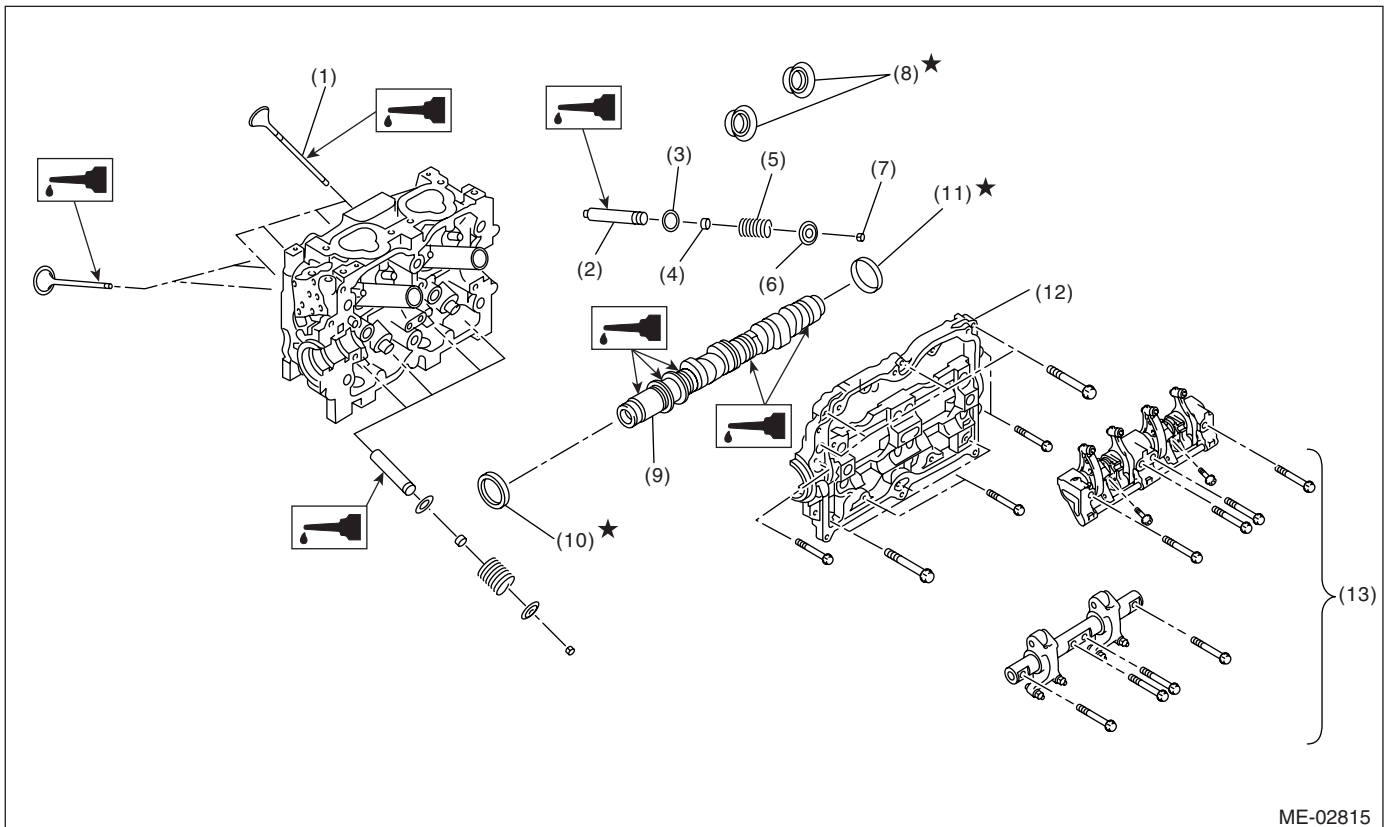
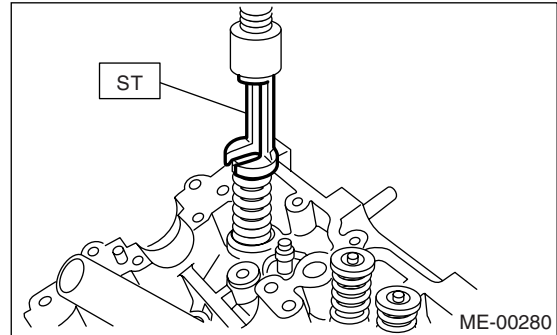
- 6) Install the intake manifold.  
<Ref. to FU(H4SO)-15, INSTALLATION, Intake Manifold.>
- 7) Install the cam sprocket. <Ref. to ME(H4SO)-49, INSTALLATION, Cam Sprocket.>
- 8) Install the timing belt. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt.>
- 9) Install the timing belt cover.  
<Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>
- 10) Install the crank pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crank Pulley.>
- 11) Install the V-belts. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>

## C: DISASSEMBLY

- 1) Place the cylinder head on the ST.  
ST 498267800 CYLINDER HEAD TABLE
- 2) Set the ST on valve spring. Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

## D: ASSEMBLY

- ST 499718000 VALVE SPRING REMOVER
- NOTE:
- Keep all the removed parts in order for re-installing in their original positions.
  - Mark each valve to prevent confusion.
  - Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve oil seals.



- |                       |                       |                        |
|-----------------------|-----------------------|------------------------|
| (1) Valve             | (6) Retainer          | (11) Plug              |
| (2) Valve guide       | (7) Retainer key      | (12) Camshaft cap      |
| (3) Valve spring seat | (8) Spark plug gasket | (13) Valve rocker ASSY |
| (4) Oil seal          | (9) Camshaft          |                        |
| (5) Valve springs     | (10) Oil seal         |                        |

# Cylinder Head

## MECHANICAL

- 1) Installation of valve spring and valve:
    - (1) Place the cylinder head on the ST.
- ST 498267800 CYLINDER HEAD TABLE
- (2) Coat the stem of each valve with engine oil and insert the valve into valve guide.

### CAUTION:

**Use extreme care not to damage the oil lips when inserting the valve into valve guide.**

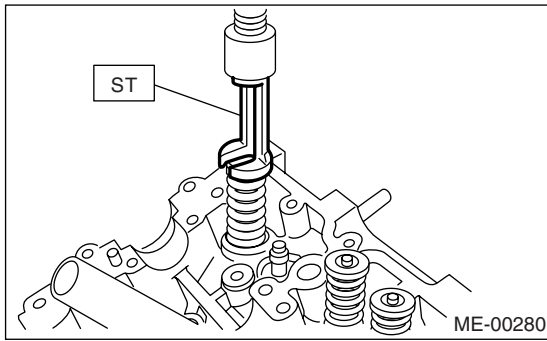
- (3) Install the valve spring and retainer.

### NOTE:

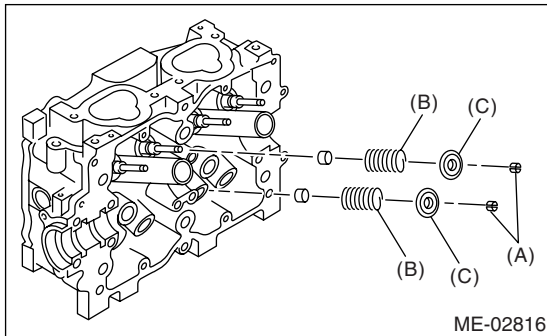
Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.

- (4) Set the ST on valve spring.

ST 499718000 VALVE SPRING REMOVER



- (5) Compress the valve spring, and then fit the valve spring retainer and valve spring retainer key.



- (A) Retainer key
- (B) Valve spring
- (C) Valve spring retainer

- (6) After installing, tap the valve spring retainers lightly with a plastic hammer for better seating.

## E: INSPECTION

### 1. CYLINDER HEAD

- 1) Make sure that no crack or other damage do not exist. In addition to visual inspection, inspect important areas by means of liquid penetrant tester.

Also make sure the gasket installing surface shows no trace of gas and water leaks.

- 2) Place the cylinder head on the ST.

ST 498267800 CYLINDER HEAD TABLE

- 3) Measure the warping of the cylinder head surface that mates with crankcase using a straight edge and thickness gauge.

If the warping exceeds the limit, regrind the surface with a surface grinder.

### Warping limit:

**0.03 mm (0.0012 in)**

### Grinding limit:

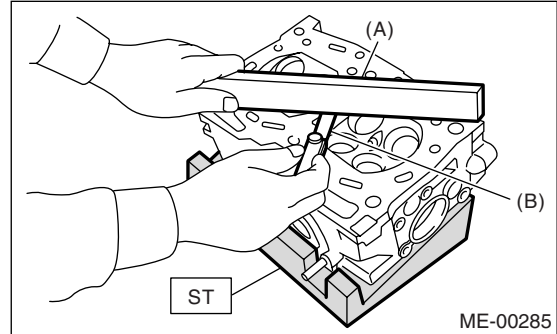
**0.1 mm (0.004 in)**

### Standard height of cylinder head:

**97.5 mm (3.84 in)**

### NOTE:

Uneven torque for the cylinder head bolts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.



- (A) Straight edge
- (B) Thickness gauge

## 2. VALVE SEAT

Inspect the intake and exhaust valve seats, and correct the contact surfaces with a valve seat cutter if they are defective or when valve guides are replaced.

**Valve seat width *W*:**

**Standard**

**Intake (A)**

0.8 — 1.4 mm (0.03 — 0.055 in)

**Exhaust (B)**

1.2 — 1.8 mm (0.047 — 0.071 in)

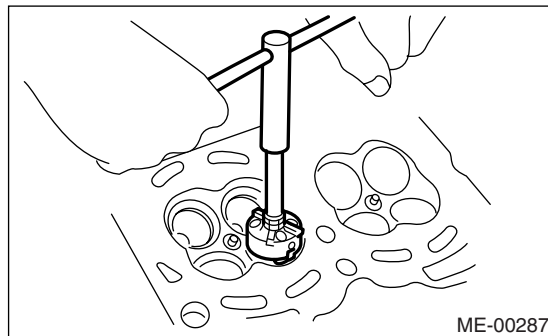
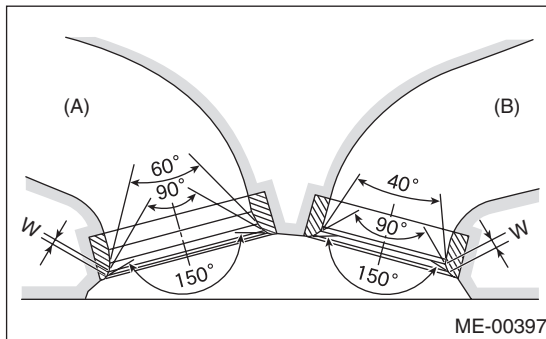
**Limit**

**Intake (A)**

1.7 mm (0.067 in)

**Exhaust (B)**

2.2 mm (0.087 in)



## 3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring respectively the outer diameter of valve stem with a micrometer and inner diameter of valve guide with a caliper gauge.

**Clearance between the valve guide and valve stem:**

**Standard**

**Intake**

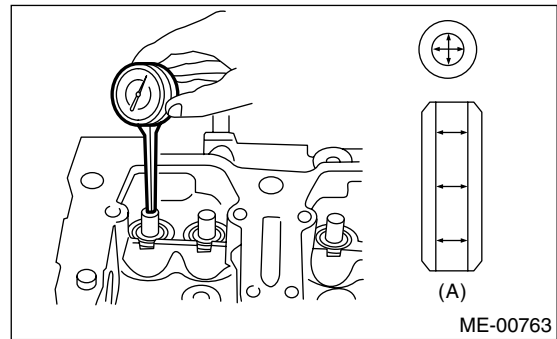
0.035 — 0.062 mm (0.0014 — 0.0024 in)

**Exhaust**

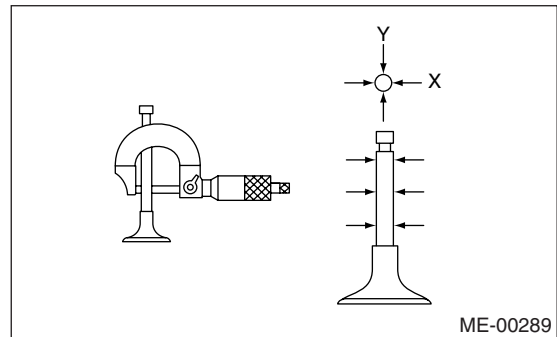
0.040 — 0.067 mm (0.0016 — 0.0026 in)

**Limit**

0.15 mm (0.059 in)



(A) Valve guide



2) If the clearance between valve guide and stem exceeds the standard value, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

**Valve guide inner diameter:**

6.000 — 6.012 mm (0.2362 — 0.2367 in)

**Valve stem outer diameters:**

**Intake**

5.950 — 5.965 mm (0.2343 — 0.2348 in)

**Exhaust**

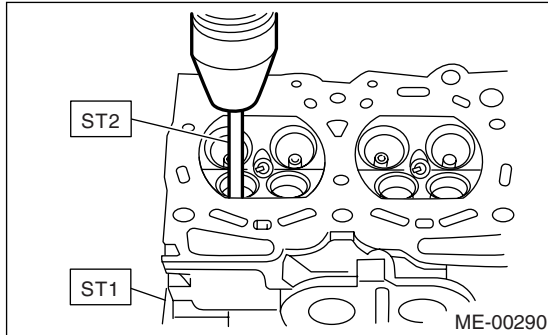
5.945 — 5.960 mm (0.2341 — 0.2346 in)

# Cylinder Head

## MECHANICAL

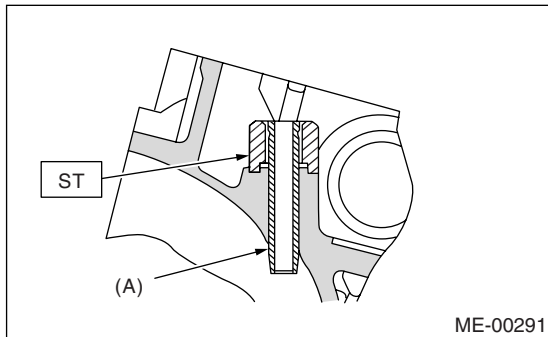
- (1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.
- (2) Insert ST2 into the valve guide and press it down to remove the valve guide.

ST1 498267800 CYLINDER HEAD TABLE  
ST2 499767200 VALVE GUIDE REMOVER



- (3) Turn the cylinder head upside down and place the ST as shown in the figure.

Intake side:  
ST 499767700 VALVE GUIDE ADJUSTER  
Exhaust side:  
ST 499767800 VALVE GUIDE ADJUSTER

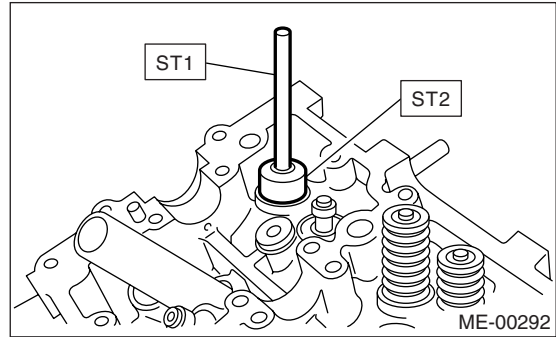


(A) Valve guide

- (4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.
- (5) Put a new valve guide, coated with sufficient oil, in cylinder, and insert the ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER  
Intake side:  
ST2 499767700 VALVE GUIDE ADJUSTER

Exhaust side:  
ST2 499767800 VALVE GUIDE ADJUSTER



- (6) Check the valve guide protrusion.

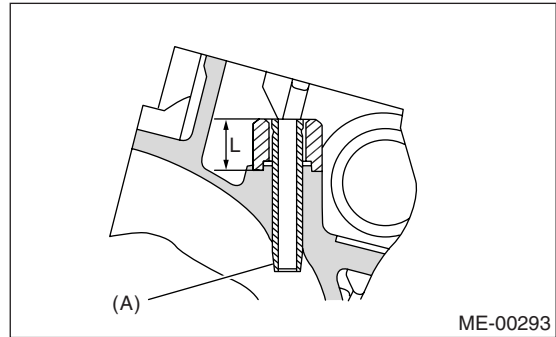
### Valve guide protrusion L:

#### Intake

20.0 — 21.0 mm (0.787 — 0.827 in)

#### Exhaust

16.5 — 17.5 mm (0.650 — 0.689 in)



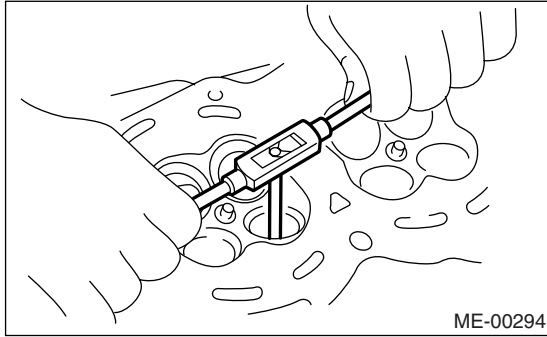
(A) Valve guide

- (7) Ream the inside of valve guide using ST. Put the reamer in valve guide, and rotate the reamer slowly clockwise while pushing it lightly. Bring the reamer back while rotating it clockwise. After reaming, clean the valve guide to remove chips.

### CAUTION:

- Apply engine oil to the reamer when reaming.
- If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
- If the inner surface of the valve guide becomes lustrous and the reamer does not chip, use a new reamer or remedy the reamer.

ST 499767400 VALVE GUIDE REAMER



(8) Recheck the contact condition between valve and valve seat after replacing the valve guide.

## 4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn or deformed, or if “H” exceed the standard value.

**H:**

**Intake**

**Standard: 0.8 — 1.2 mm (0.03 — 0.047 in)**

**Limit: 0.6 mm (0.024 in)**

**Exhaust**

**Standard: 1.0 — 1.4 mm (0.039 — 0.055 in)**

**Limit: 0.6 mm (0.024 in)**

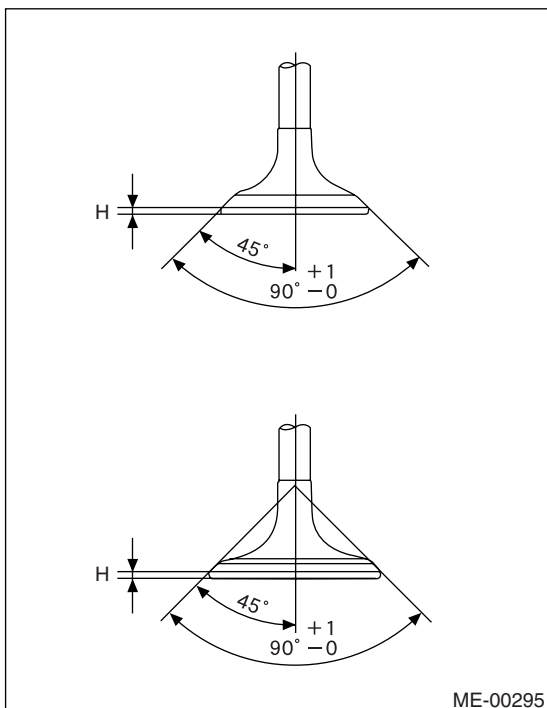
**Valve overall length:**

**Intake**

**120.6 mm (4.75 in)**

**Exhaust**

**121.7 mm (4.79 in)**



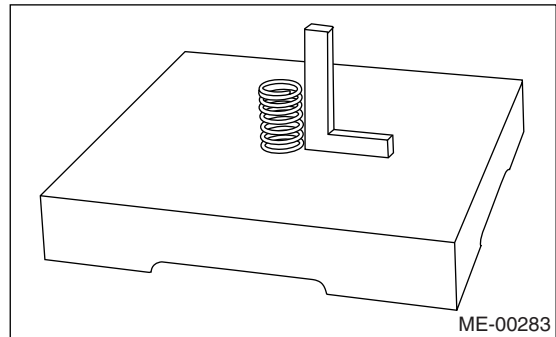
2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. <Ref. to ME(H4SO)-61, VALVE SEAT, INSPECTION, Cylinder Head.> Install a new intake valve oil seal after lapping.

## 5. VALVE SPRING

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within the standard value presented in the table.

2) To measure the squareness of the valve spring, stand the spring on a surface plate and measure its deflection at the top of spring using a try square.

|                       |                      |   |
|-----------------------|----------------------|---|
| Free length           | mm (in)              | 55.2 (2.173)  |
| Squareness            |                      | 2.5°, 2.4 mm (0.094 in) or less                         |
| Tension/spring height | Set                  | 235.3 — 270.7 (24 — 27.6, 52.9 — 60.8)/45.0 (1.772)     |
|                       | Lift                 | 578.9 — 639.9 (59.1 — 65.3, 130.3 — 143.9)/34.7 (1.366) |
|                       | N (kgf, lbf)/mm (in) |   |



## 6. INTAKE AND EXHAUST VALVE OIL SEAL

In the following case, pinch and remove the oil seal from valve using pliers, and then replace it with a new one.

- When the lip is damaged.
- When the spring is out of the specified position.
- When readjusting the surfaces of intake valve and valve sheet.
- When replacing the intake valve guide.

1) Place the cylinder head on ST1.

2) Using ST2, press-fit the oil seal.

**CAUTION:**

- Apply engine oil to oil seal before press-fitting.
- When press-fitting the oil seal, do not use a hammer or strike in.
- Differentiate between the intake valve oil seal and exhaust valve oil seal by noting their difference in color.

ST1 498267800 CYLINDER HEAD TABLE

ST2 498857100 VALVE OIL SEAL GUIDE



# Cylinder Head

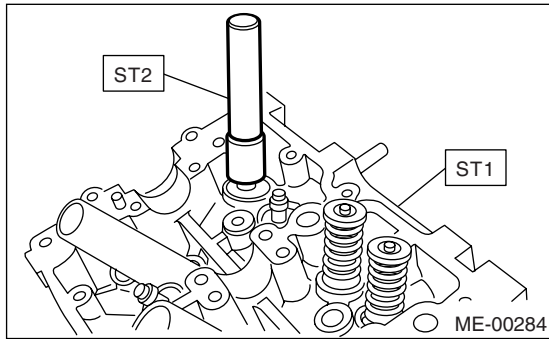
MECHANICAL

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**Color of rubber part:**

**Intake [Gray]**

**Exhaust [Green]**



## 21. Cylinder Block

### A: REMOVAL

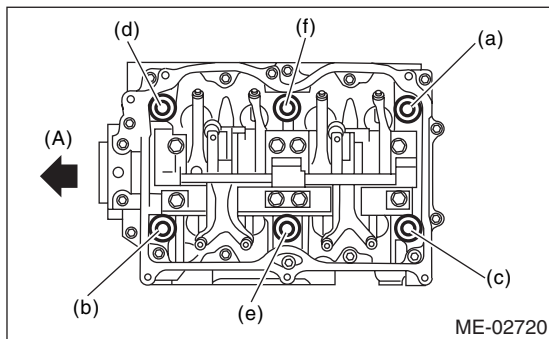
**NOTE:**

Before conducting this procedure, drain the engine oil completely.

- 1) Remove the intake manifold. <Ref. to FU(H4SO)-13, REMOVAL, Intake Manifold.>
- 2) Remove the V-belts. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
- 3) Remove the crank pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>
- 4) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
- 5) Remove the timing belt. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt.>
- 6) Remove the cam sprocket. <Ref. to ME(H4SO)-49, REMOVAL, Cam Sprocket.>
- 7) Remove the crank sprocket. <Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>
- 8) Remove the generator and A/C compressor with their brackets.
- 9) Remove the rocker cover.
- 10) Remove the cylinder head bolts in alphabetical sequence as shown in the figure.

**NOTE:**

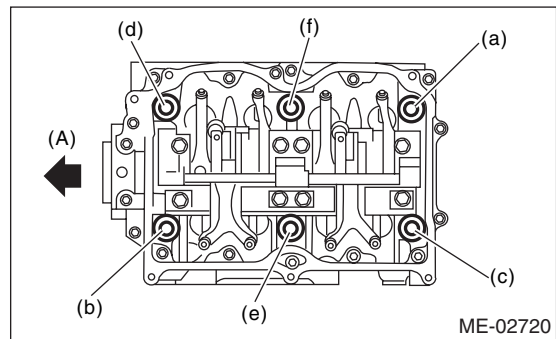
Leave bolts (a) and (d) engaged by three or four threads to prevent the cylinder head from falling.



(A) Front side

- 11) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.

- 12) Remove the bolts (a) and (d) to remove the cylinder head.



(A) Front side

- 13) Remove the cylinder head gasket.

**NOTE:**

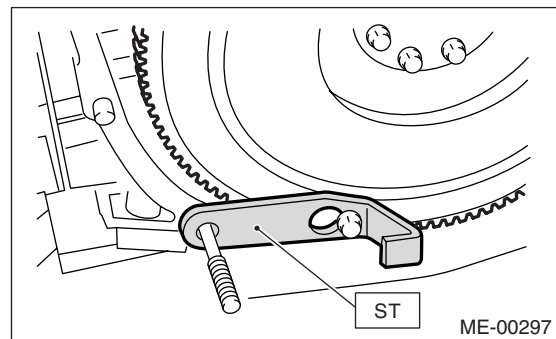
Do not scratch the mating surface of cylinder head and cylinder block.

- 14) Similarly, remove the right side cylinder head.
- 15) Remove the clutch housing cover. (MT model)
- 16) Remove the flywheel (MT model) or drive plate (AT model).

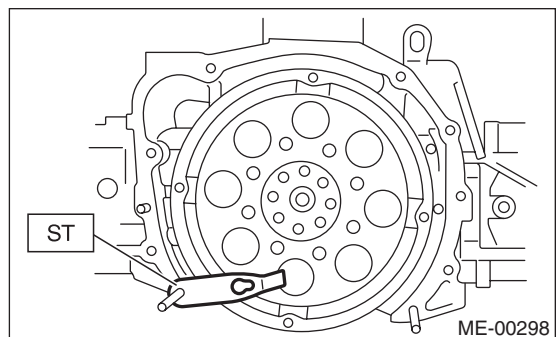
Lock the crankshaft using ST.

ST 498497100 CRANKSHAFT STOPPER

- MT model



- AT model



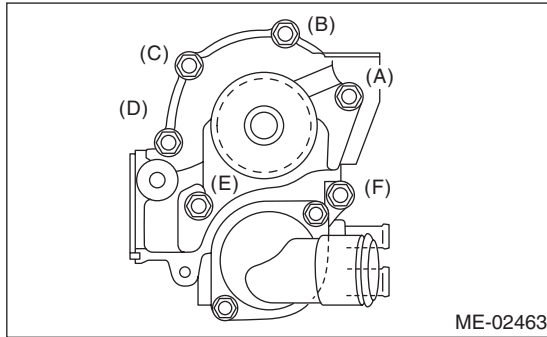
- 17) Remove the oil separator cover.
- 18) Remove the water by-pass pipe for heater.



# Cylinder Block

## MECHANICAL

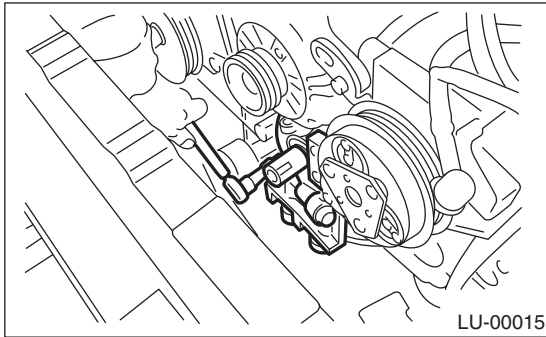
19) Remove the water pump after loosening the bolts in alphabetical sequence as shown in the figure.



20) Remove the bolts which install the oil pump onto cylinder block.

### NOTE:

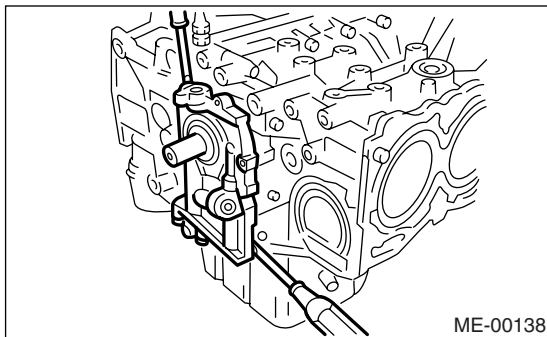
If disassembling or inspecting the oil pump, loosen the plug of relief valve before removing the oil pump.



21) Remove the oil pump from cylinder block. Use a flat tip screwdriver when removing the oil pump.

### CAUTION:

Be careful not to scratch the mating surface of cylinder block and oil pump.



22) Remove the oil pan.

- (1) Place the cylinder block to face the #2 and #4 piston side upward.
- (2) Remove the bolts which secure oil pan to cylinder block.
- (3) Insert a oil pan cutter blade between cylinder block-to-oil pan clearance and remove the oil pan.

### NOTE:

Do not use a screwdriver or similar tools in place of oil pan cutter.

23) Remove the oil strainer stay.

24) Remove the oil strainer.

25) Remove the baffle plate.

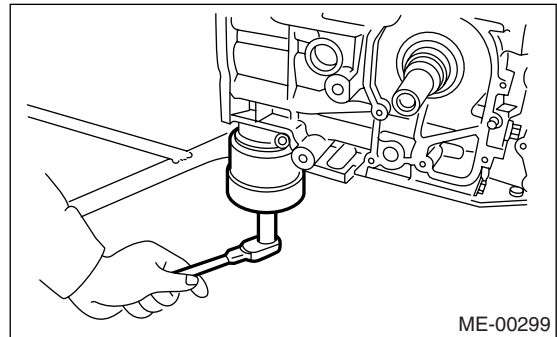
26) Remove the oil filter using ST.

ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))

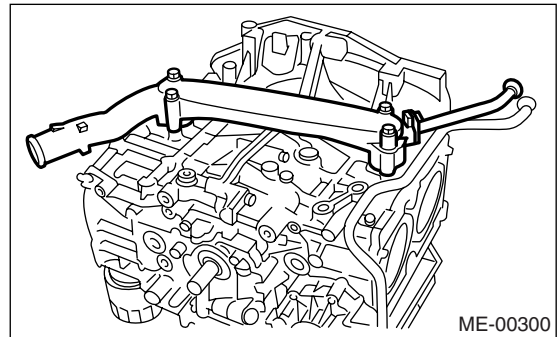
ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))

### NOTE:

Standard oil filter is outer diameter of 68 mm (2.68 in). However, SUBARU genuine oil filter having outer diameter of 65 mm (2.56 in) can also be used.

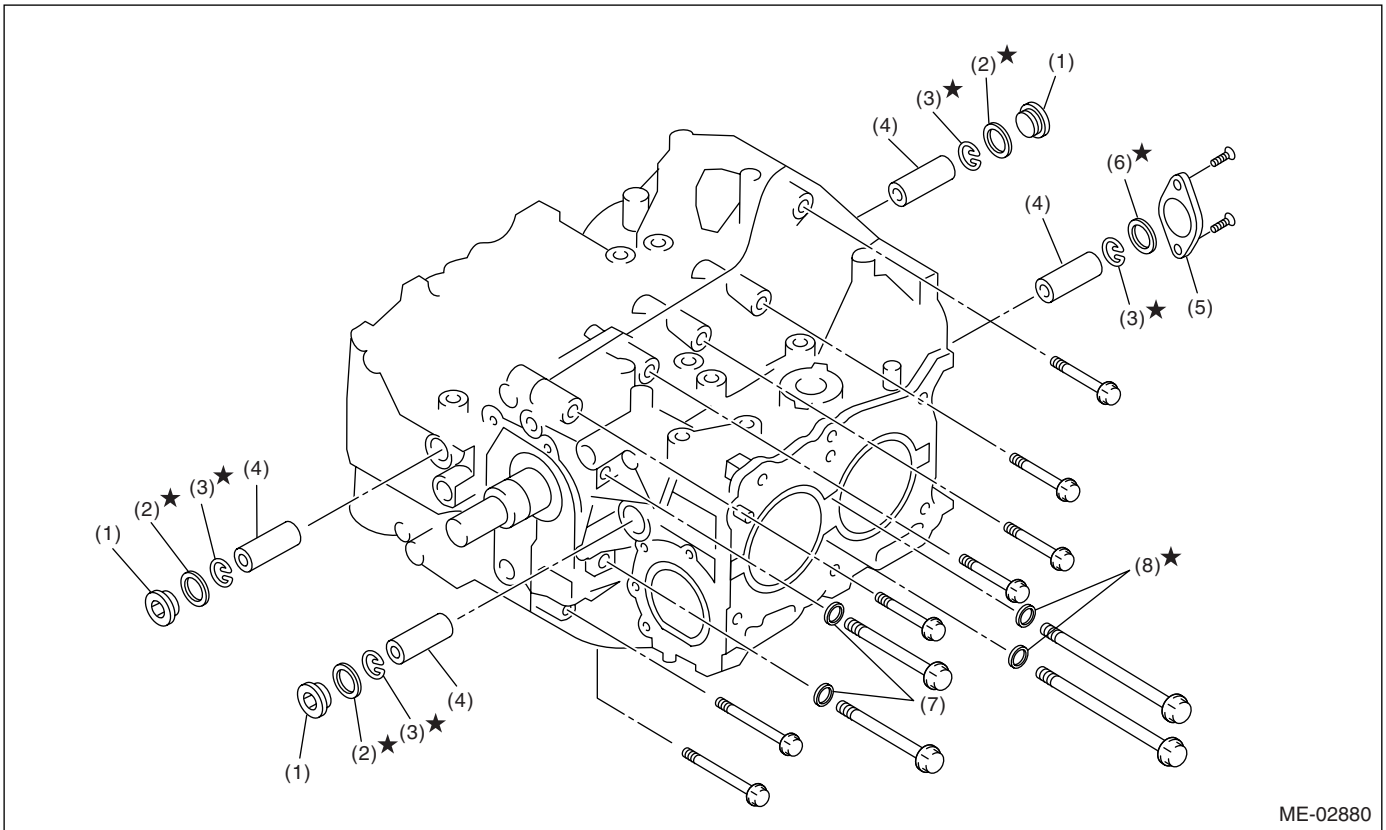


27) Remove the water pipe.



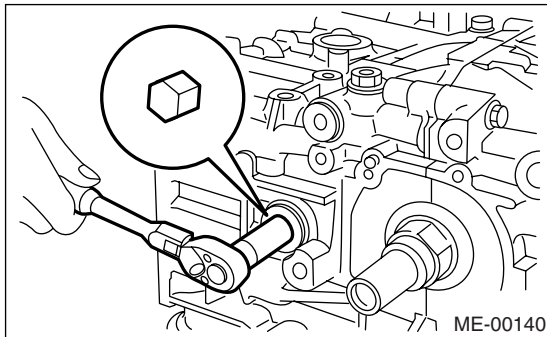
# Cylinder Block

MECHANICAL



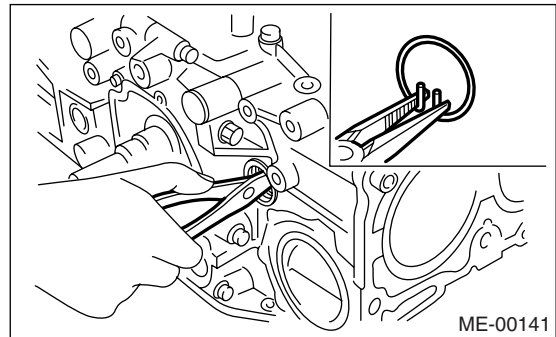
- |                       |                        |                 |
|-----------------------|------------------------|-----------------|
| (1) Service hole plug | (4) Piston pin         | (7) Washer      |
| (2) Gasket            | (5) Service hole cover | (8) Seal washer |
| (3) Snap ring         | (6) O-ring             |                 |

28) Remove the service hole cover and service hole plugs using a hexagon wrench (14 mm).



29) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove

the piston snap ring through service hole of #1 and #2 cylinders.



30) Draw out the piston pin from #1 and #2 pistons using ST.

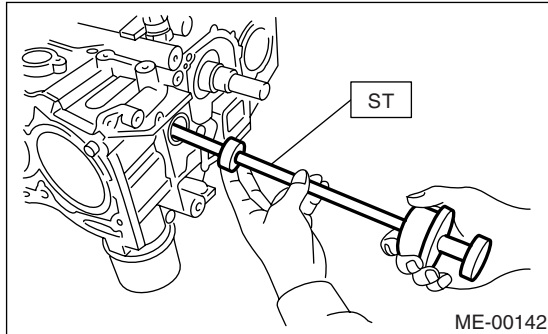
ST 499097700 PISTON PIN REMOVER ASSY

# Cylinder Block

## MECHANICAL

### NOTE:

Be careful not to confuse the original combination of piston, piston pin and cylinder.



31) Similarly remove the piston pins from #3 and #4 pistons.

32) Remove the bolts which connect cylinder block on the side of #2 and #4 cylinders.

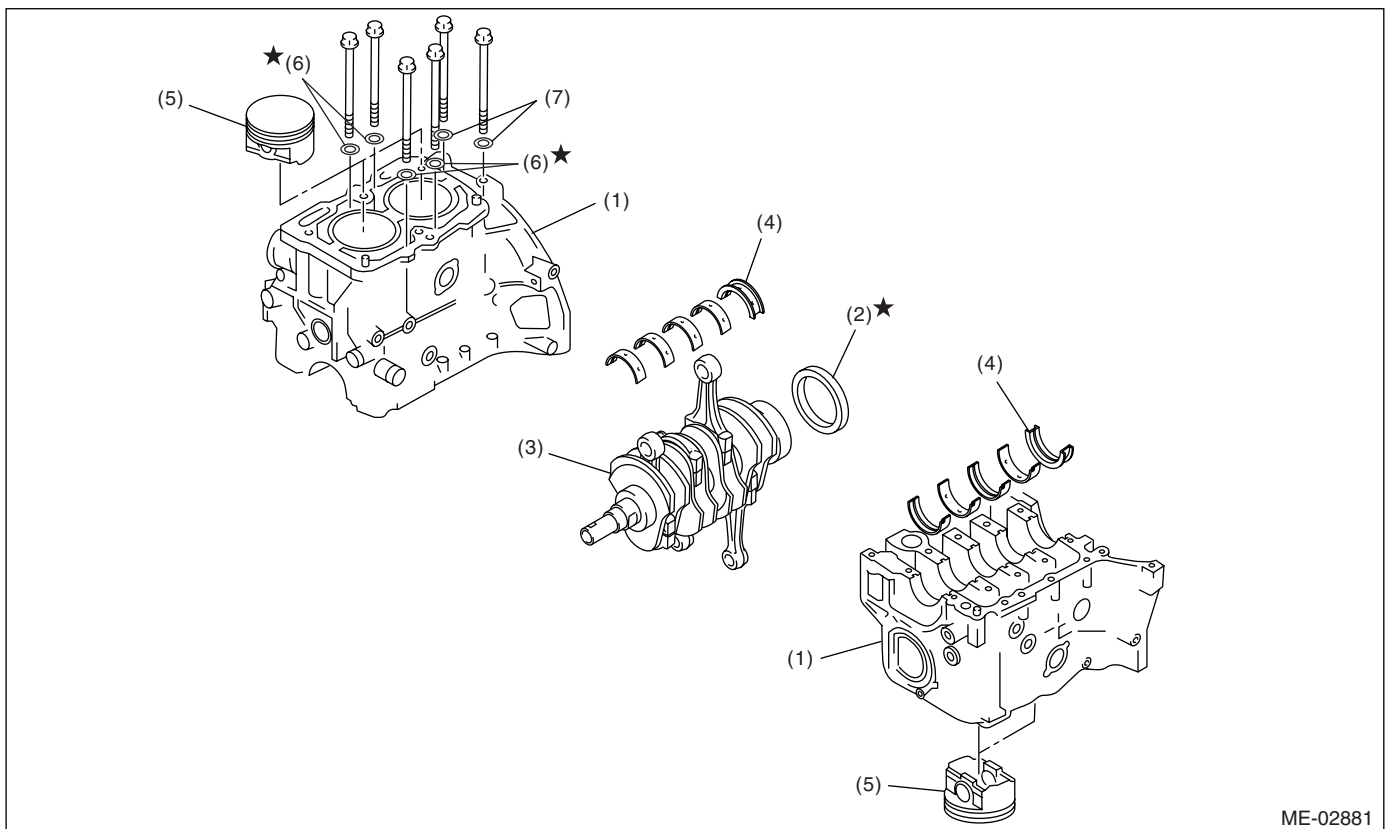
33) Back off the bolts which connect cylinder block on the side of #1 and #3 cylinders two or three turns.

34) Set up the cylinder block so that #1 and #3 cylinders are on the upper side, then remove the cylinder block connecting bolts.

35) Separate the cylinder block (RH) and (LH).

### NOTE:

When separating the cylinder block, do not allow the connecting rod to fall or damage the cylinder block.



(1) Cylinder block

(2) Rear oil seal

(3) Crankshaft

(4) Crankshaft bearing

(5) Piston

(6) Seal washer

(7) Washer

36) Remove the rear oil seal.

37) Remove the crankshaft together with connecting rod.

38) Remove the crankshaft bearings from cylinder block using a hammer handle.

### NOTE:

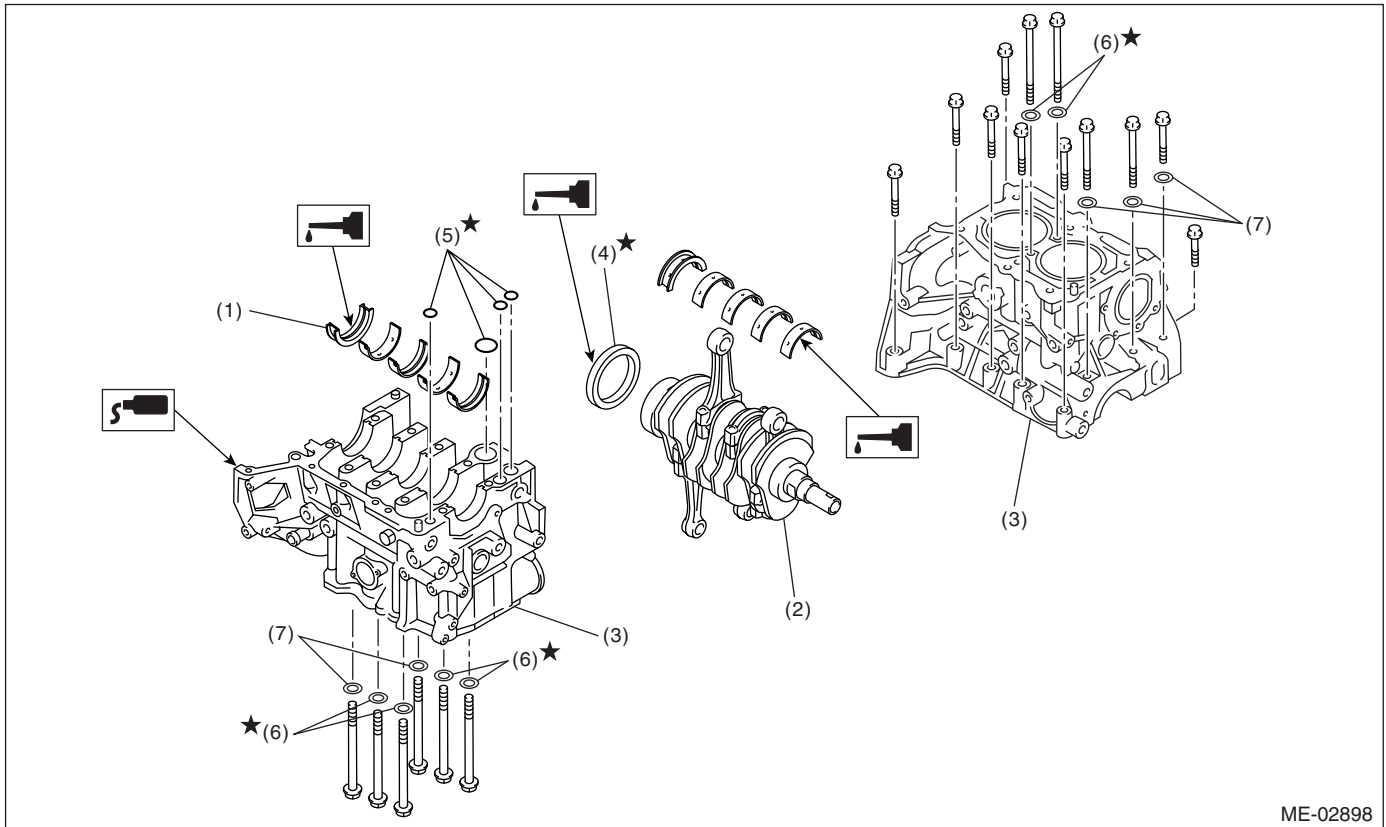
Be careful not to confuse the crankshaft bearing combination. Press the bearing at the end opposite to locking lip.

39) Draw out each piston from cylinder block using a wooden bar or hammer handle.

### NOTE:

Be careful not to confuse the original combination of piston and cylinder.

## B: INSTALLATION



- |                        |                   |            |
|------------------------|-------------------|------------|
| (1) Crankshaft bearing | (4) Rear oil seal | (7) Washer |
| (2) Crankshaft         | (5) O-ring        |            |
| (3) Cylinder block     | (6) Seal washer   |            |

**NOTE:**

Remove oil on the mating surface of bearing and cylinder block before installation. Apply engine oil to crankshaft pins.

1) Position the crankshaft and O-ring on the #1 and #3 cylinder block.

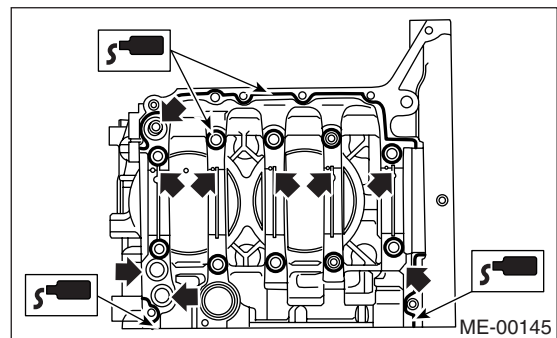
2) Apply liquid gasket to the mating surface of #1 and #3 cylinder block, and position #2 and #4 cylinder block.

**Liquid gasket:**

**THREE BOND 1215 (Part No. 004403007) or equivalent**

**NOTE:**

Do not allow liquid gasket to flow into O-ring grooves, oil passages, bearing grooves, etc.

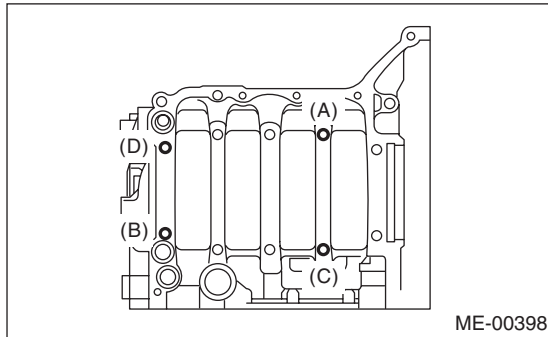


- 3) Apply engine oil to washers and thread of bolts.  
 4) Tighten the 10 mm cylinder block connecting bolts on LH side (A — D) in alphabetical sequence.

# Cylinder Block

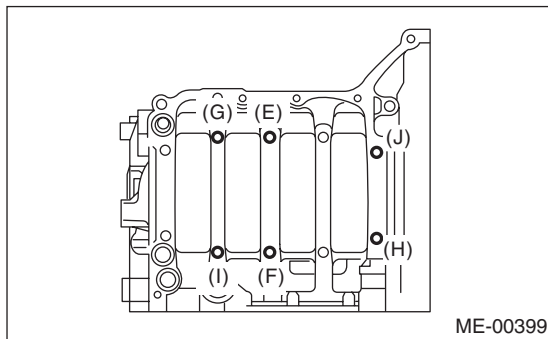
MECHANICAL

**Tightening torque:**  
**10 N·m (1.0 kgf·m, 7.4 ft·lb)**



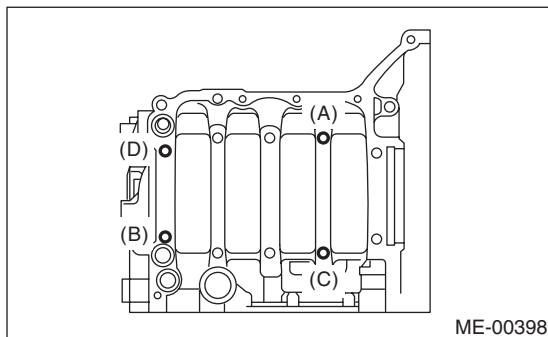
5) Tighten the 10 mm cylinder block connecting bolts on RH side (E — J) in alphabetical sequence.

**Tightening torque:**  
**10 N·m (1.0 kgf·m, 7.4 ft·lb)**



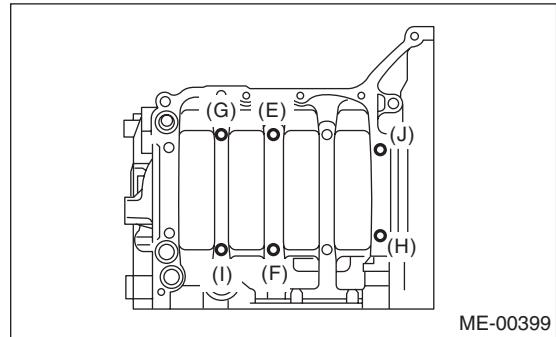
6) Further tighten the LH side bolts (A — D) in alphabetical sequence.

**Tightening torque:**  
**18 N·m (1.8 kgf·m, 13.3 ft·lb)**

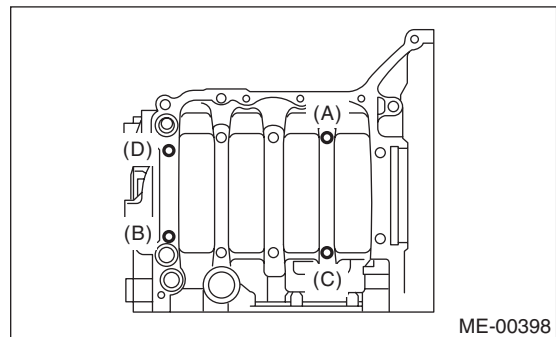


7) Further tighten the RH side bolts (E — J) in alphabetical sequence.

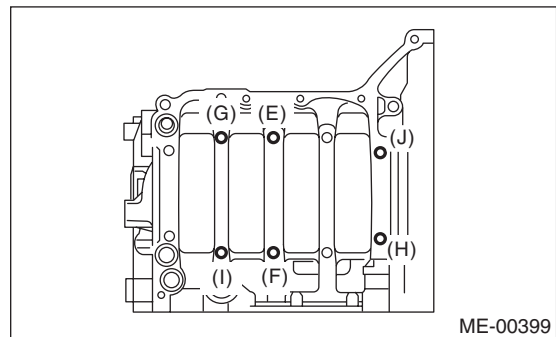
**Tightening torque:**  
**18 N·m (1.8 kgf·m, 13.3 ft·lb)**



8) Further tighten the LH side bolts (A), (C) to 90°, (B), (D) to 40 N·m (4.1 kgf·m, 29.5 ft·lb) in alphabetical sequence.



9) Further tighten the RH side bolts (E — J) to 90° in alphabetical sequence.

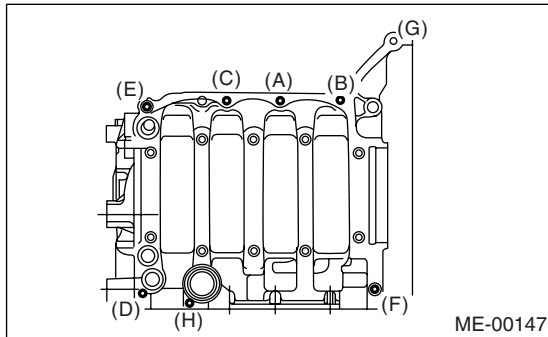


10) Tighten the 8 mm and 6 mm cylinder block connecting bolts on LH side (A — H) in alphabetical sequence.

**Tightening torque:**

(A) — (G): 25 N·m (2.5 kgf·m, 18.4 ft·lb)

(H): 6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



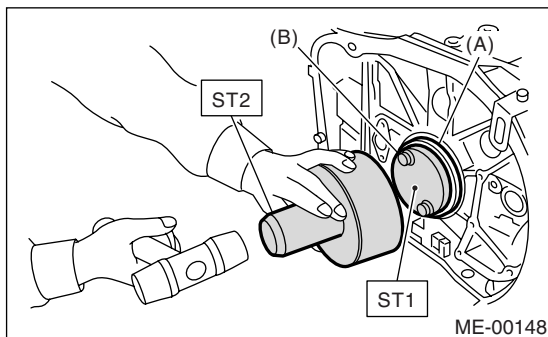
11) Apply engine oil to the outer perimeter of rear oil seal, and install the rear oil seal using ST1 and ST2.

**NOTE:**

Use a new rear oil seal.

ST1 499597100 CRANKSHAFT OIL SEAL GUIDE

ST2 499587200 CRANKSHAFT OIL SEAL INSTALLER



(A) Rear oil seal

(B) Flywheel attaching bolt

12) Position the top ring gap at (A) or (B) in the figure.

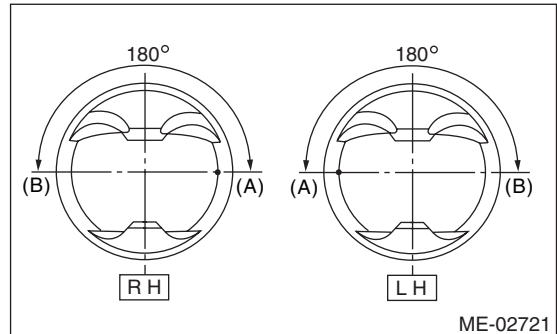
**NOTE:**

Assemble the piston ring with stamped mark “R” facing toward upside of piston.

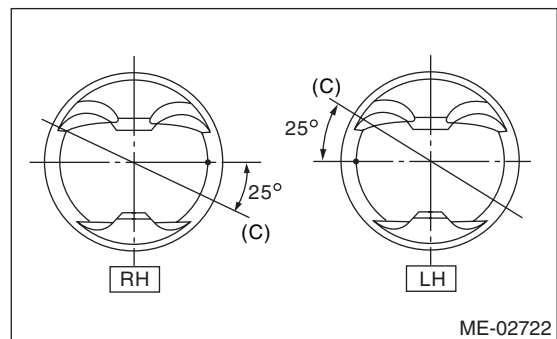
13) Position the second ring gap at 180° on the reverse side of the top ring gap.

**NOTE:**

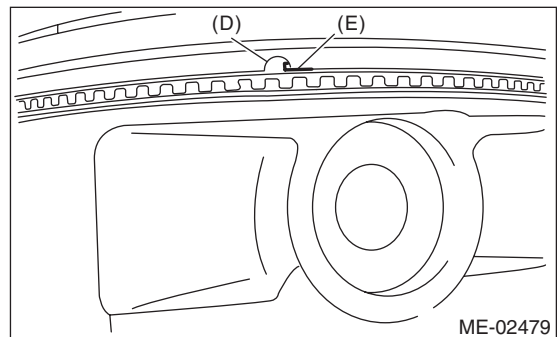
Assemble the piston ring with stamped mark “R” facing toward upside of piston.



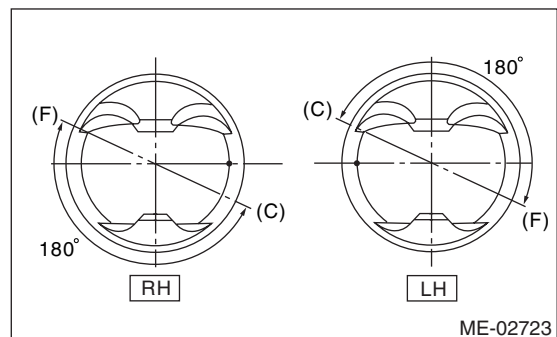
14) Position the upper rail gap at (C) in the figure.



15) Align upper rail spin stopper (E) with piston side surface hole (D).



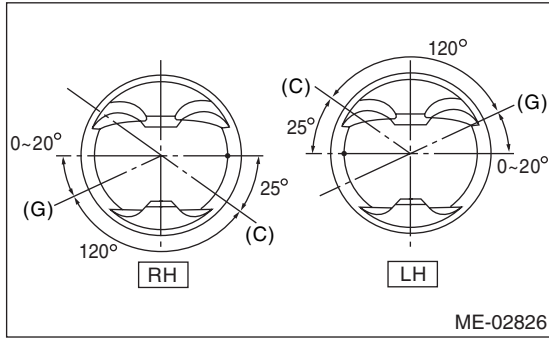
16) Position the expander gap on the opposite side position (F) 180° away from upper rail gap position (C).



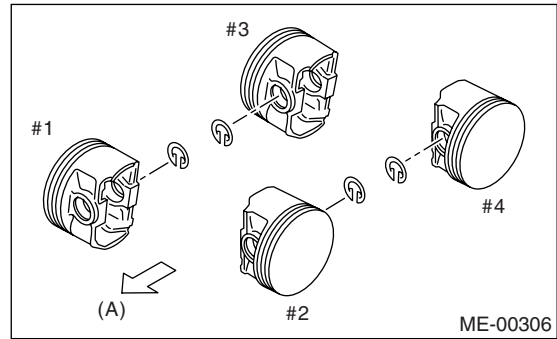
# Cylinder Block

## MECHANICAL

17) Position the lower rail gap on the position (G) 120° away from upper rail gap position (C).



NOTE:  
Use new snap rings.



### CAUTION:

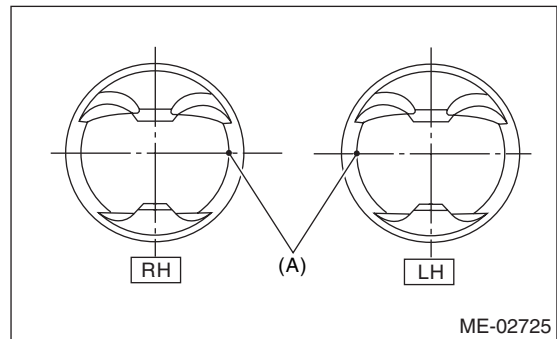
- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

18) Install the snap ring.

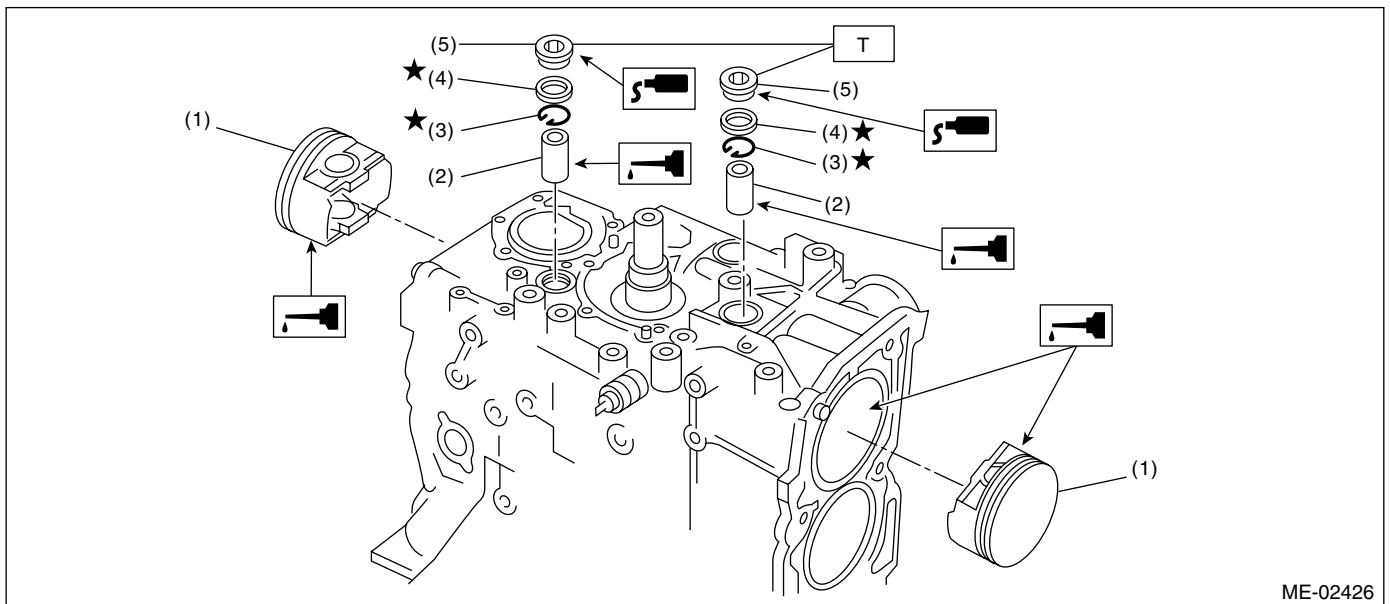
Install snap rings in the piston holes located opposite to the service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

### CAUTION:

Piston front mark faces towards the front of engine.



(A) Front mark



ME-02426

- |                |                       |
|----------------|-----------------------|
| (1) Piston     | (4) Gasket            |
| (2) Piston pin | (5) Service hole plug |
| (3) Snap ring  |                       |

**Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 70 (7.1, 50.6)**



# Cylinder Block

MECHANICAL

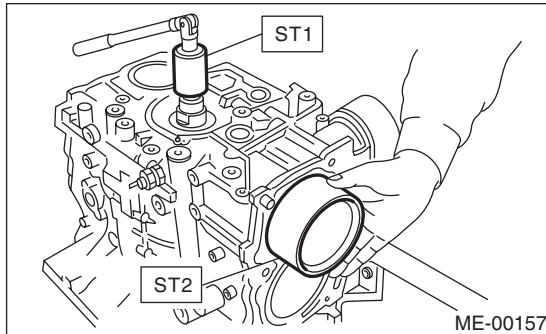
19) Install the piston.

- (1) Place the cylinder block to face the #1 and #2 cylinder side upward.
- (2) Using ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

ST1 499987500 CRANKSHAFT SOCKET

- (3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

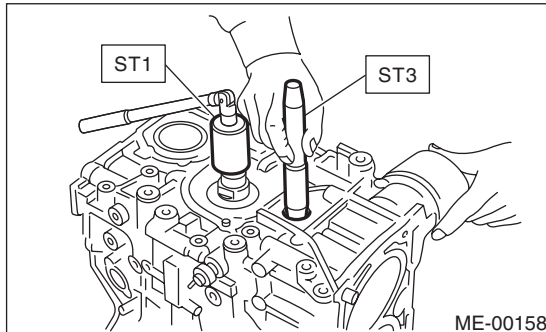
ST2 498747300 PISTON GUIDE



20) Install the piston pin.

- (1) Apply a coat of engine oil to ST3.
- (2) Insert ST3 into the service hole to align piston pin hole with connecting rod small end.

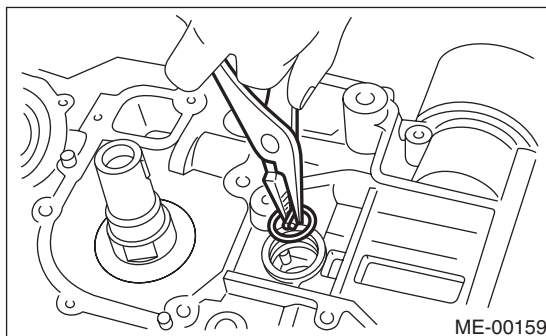
ST3 499017100 PISTON PIN GUIDE



- (3) Apply a coat of engine oil to piston pin, and insert the piston pin into piston and connecting rod through service hole.
- (4) Install the snap ring.

NOTE:

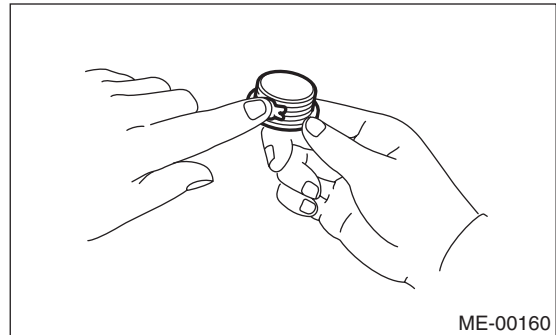
Use new snap rings.



- (5) Apply liquid gasket around the service hole plug.

**Liquid gasket:**

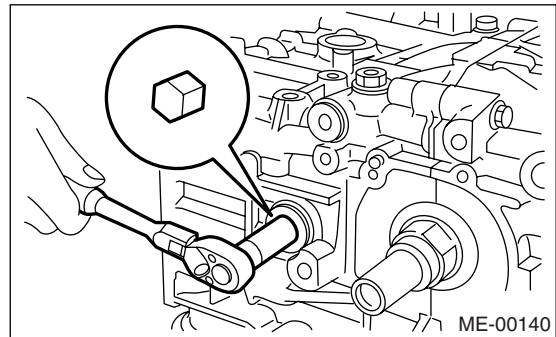
**THREE BOND 1105 (Part No. 004403010) or equivalent**



- (6) Install the service hole plug and gasket.

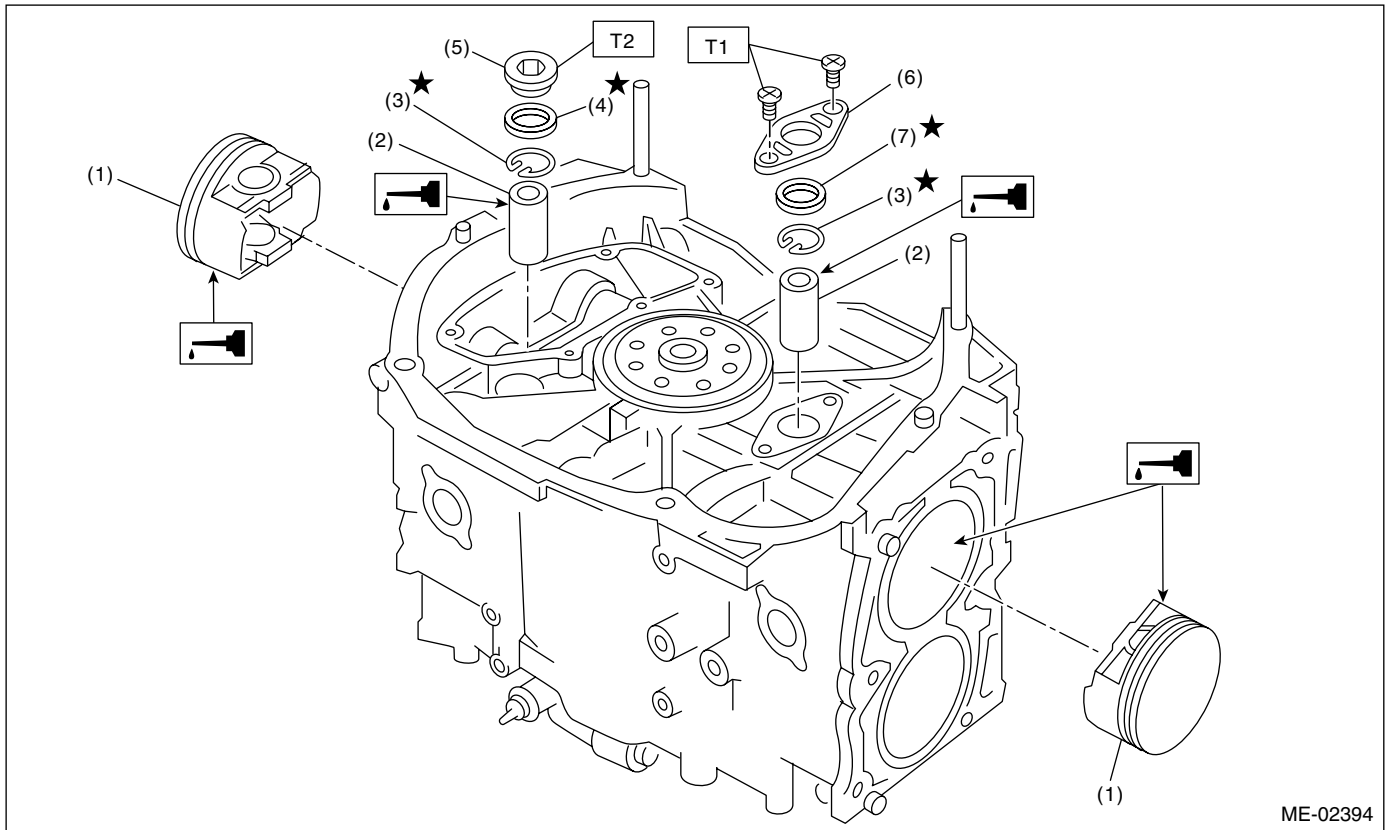
NOTE:

Use a new gasket.





# Cylinder Block



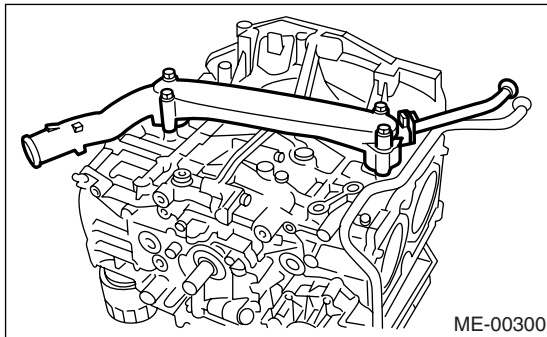
- (1) Piston
- (2) Piston pin
- (3) Snap ring
- (4) Gasket
- (5) Service hole plug
- (6) Service hole cover
- (7) O-ring

**Tightening torque: N-m (kgf-m, ft-lb)**  
**T1: 6.4 (0.65, 4.7)**  
**T2: 70 (7.1, 50.6)**

- (7) Place the cylinder block to face the #3 and #4 cylinder sides upward. Following the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.
- 21) Install the water pipe.

- 25) Apply liquid gasket to mating surfaces and install the oil pan.

**Liquid gasket:**  
**THREE BOND 1207C (Part No. 004403012) or equivalent**



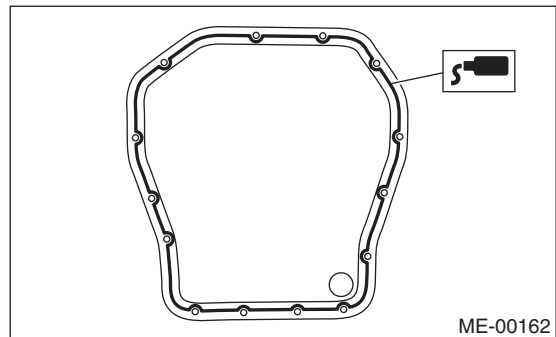
- 22) Install the baffle plate.

**Tightening torque:**  
**6.4 N-m (0.65 kgf-m, 4.7 ft-lb)**

- 23) Install the oil strainer and O-ring.

**Tightening torque:**  
**10 N-m (1.0 kgf-m, 7.4 ft-lb)**

- 24) Install the oil strainer stay.



- 26) Apply liquid gasket to the mating surfaces and threaded portion of bolt (A) as shown in the figure, and then install the oil separator cover.

# Cylinder Block

MECHANICAL

## Liquid gasket:

### Mating surface

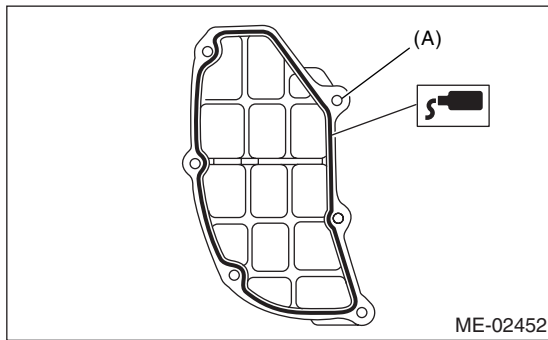
**THREE BOND 1207C (Part No. 004403012)  
or equivalent**

### Thread portion of bolt (A)

**THREE BOND 1324 (Part No. 004403042) or  
equivalent**

## Tightening torque:

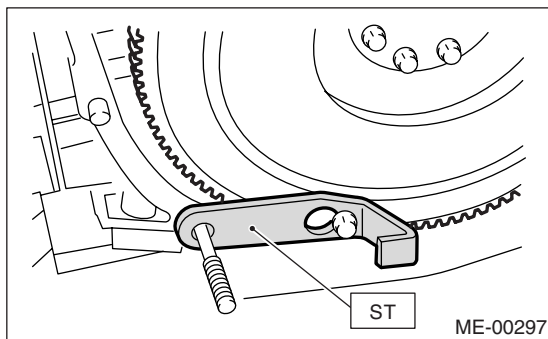
**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



- 27) Install the flywheel. (MT model)  
<Ref. to CL-17, INSTALLATION, Flywheel.>  
To lock the crankshaft, use the ST.  
ST 498497100 CRANKSHAFT STOPPER

## Tightening torque:

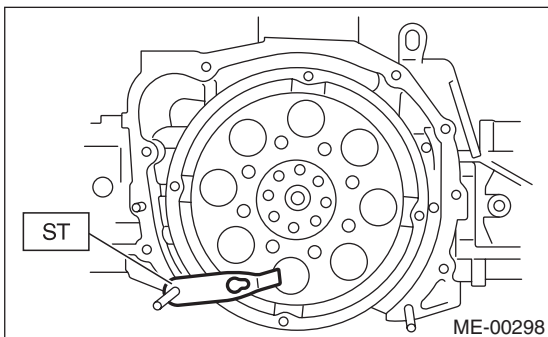
**72 N·m (7.3 kgf-m, 52.8 ft-lb)**



- 28) Install the drive plate.  
To lock the crankshaft, use the ST.  
ST 498497100 CRANKSHAFT STOPPER

## Tightening torque:

**72 N·m (7.3 kgf-m, 52.8 ft-lb)**

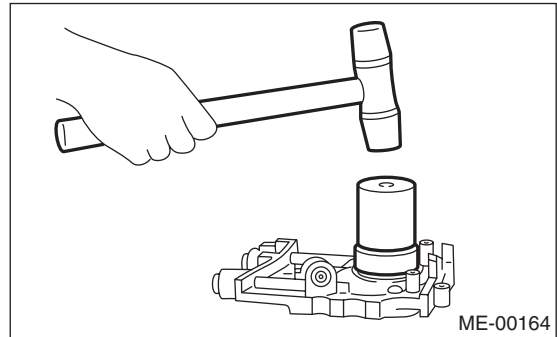


- 29) Install the housing cover.

## 30) Installation of oil pump:

- (1) Discard the front oil seal after removal. Re-  
place with a new one using ST.

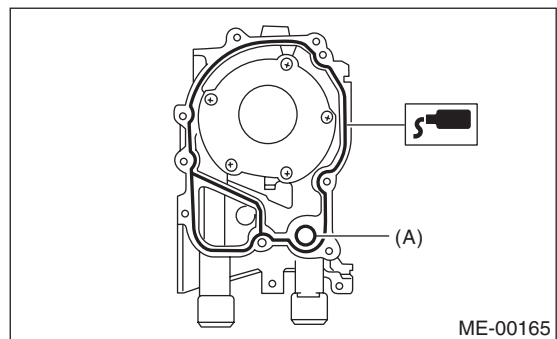
ST 499587100 OIL SEAL INSTALLER



- (2) Apply liquid gasket to the matching surface  
of oil pump.

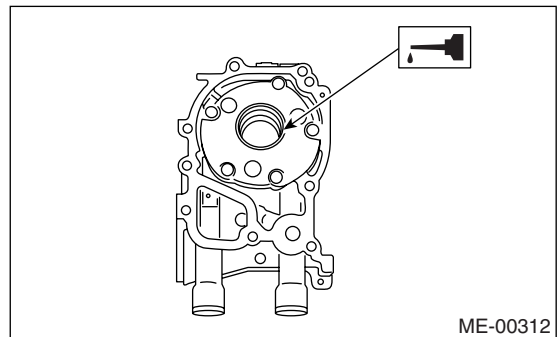
## Liquid gasket:

**THREE BOND 1215 (Part No. 004403007) or  
equivalent**



(A) O-ring

- (3) Apply a coat of engine oil to the inside of oil  
seal.



- (4) Install the oil pump on cylinder block. Be  
careful not to damage the oil seal during instal-  
lation.

## CAUTION:

- Make sure the oil seal lip is not folded.
- Do not forget to install the O-ring and seal  
when installing the oil pump.

- (5) Apply liquid gasket to the threaded portion  
of three bolts.

# Cylinder Block

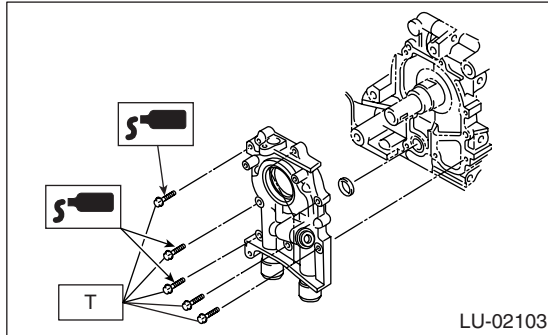
MECHANICAL

## Liquid gasket:

**THREE BOND 1324 (Part No. 004403042) or equivalent**

## Tightening torque:

**T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



31) Install the water pump and gasket.

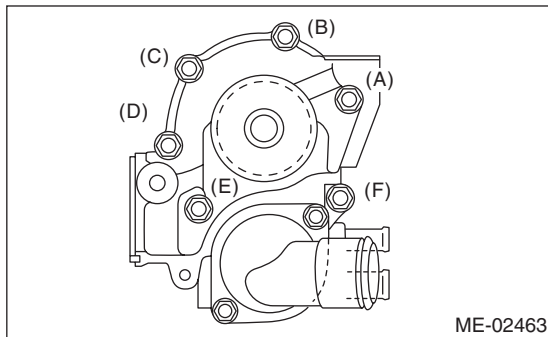
## Tightening torque:

**First: 12 N·m (1.2 kgf-m, 8.7 ft-lb)**

**Second: 12 N·m (1.2 kgf-m, 8.7 ft-lb)**

## CAUTION:

- Be sure to use a new gasket.
- When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.



32) Install the water by-pass pipe for heater.

33) Install the oil filter using ST.

ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))

ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))

## NOTE:

Standard oil filter is outer diameter of 68 mm (2.68 in). However, SUBARU genuine oil filter having outer diameter of 65 mm (2.56 in) can also be used.

Install the oil filter by turning it by hand, being careful not to damage the seal rubber.

- Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler. If using a torque wrench, tighten it to 14 N·m (1.4 kgf-m, 10.3 ft-lb).

- Tighten the oil filter 65 mm (2.56 in) in diameter by approx. 2/3 — 3/4 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler. If using a torque wrench, tighten it to 12 N·m (1.2 kgf-m, 8.7 ft-lb).

## CAUTION:

**Do not tighten excessively, or oil may leak.**

34) Tighten the cylinder head bolts.

- (1) Apply a coat of engine oil to washers and bolt threads.
- (2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence. Then tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence.
- (3) Back off all bolts by 180° in reverse order of installation, and back them off again by 180°.
- (4) Tighten all bolts to 42 N·m (4.3 kgf-m, 31 ft-lb) in alphabetical sequence.
- (5) Tighten all bolts by 80 — 90° in alphabetical sequence.
- (6) Tighten all bolts by 40 — 45° in alphabetical sequence.

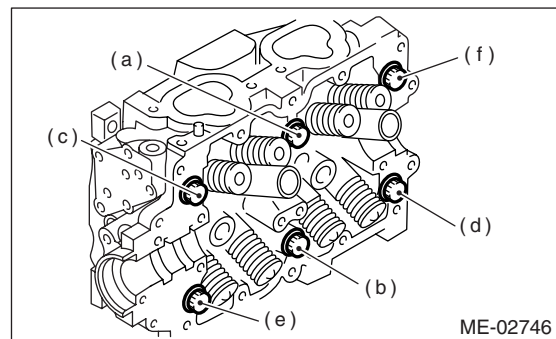
## CAUTION:

**Tightening angle of the bolt must not exceed 45°.**

- (7) Further tighten the bolts (a) and (b) by 40 — 45°.

## CAUTION:

**Total “re-tightening angle” of the step (6) and (7) must not exceed 90°.**



35) Install the oil level gauge guide and tighten the bolt. (LH side)

36) Install the rocker cover and rocker cover gasket.

## NOTE:

Use new rocker cover gasket.

37) Install the crank sprocket.

<Ref. to ME(H4SO)-50, INSTALLATION, Crank Sprocket.>

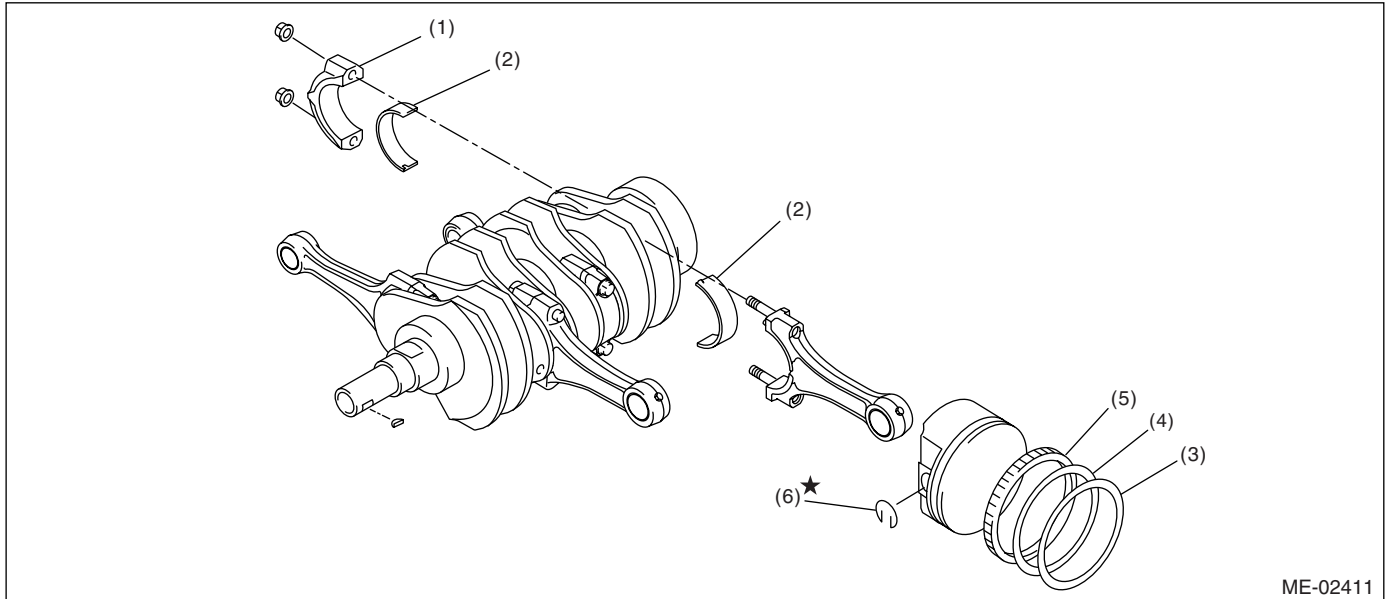
38) Install the cam sprocket. <Ref. to ME(H4SO)-49, INSTALLATION, Cam Sprocket.>

39) Install the timing belt. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt.>

- 40) Install the timing belt cover.  
<Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>
- 41) Install the crank pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crank Pulley.>
- 42) Install the generator and A/C compressor brackets on cylinder head.

- 43) Install the V-belts. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>
- 44) Install the intake manifold.  
<Ref. to FU(H4SO)-15, INSTALLATION, Intake Manifold.>

## C: DISASSEMBLY



- |                            |                 |               |
|----------------------------|-----------------|---------------|
| (1) Connecting rod cap     | (3) Top ring    | (5) Oil ring  |
| (2) Connecting rod bearing | (4) Second ring | (6) Snap ring |

- 1) Remove the connecting rod cap.
- 2) Remove the connecting rod bearing.

### NOTE:

Arrange the removed connecting rod, connecting rod cap and bearing in order, to prevent confusion.

- 3) Remove the piston rings using the piston ring expander.
- 4) Remove the oil ring by hand.

### NOTE:

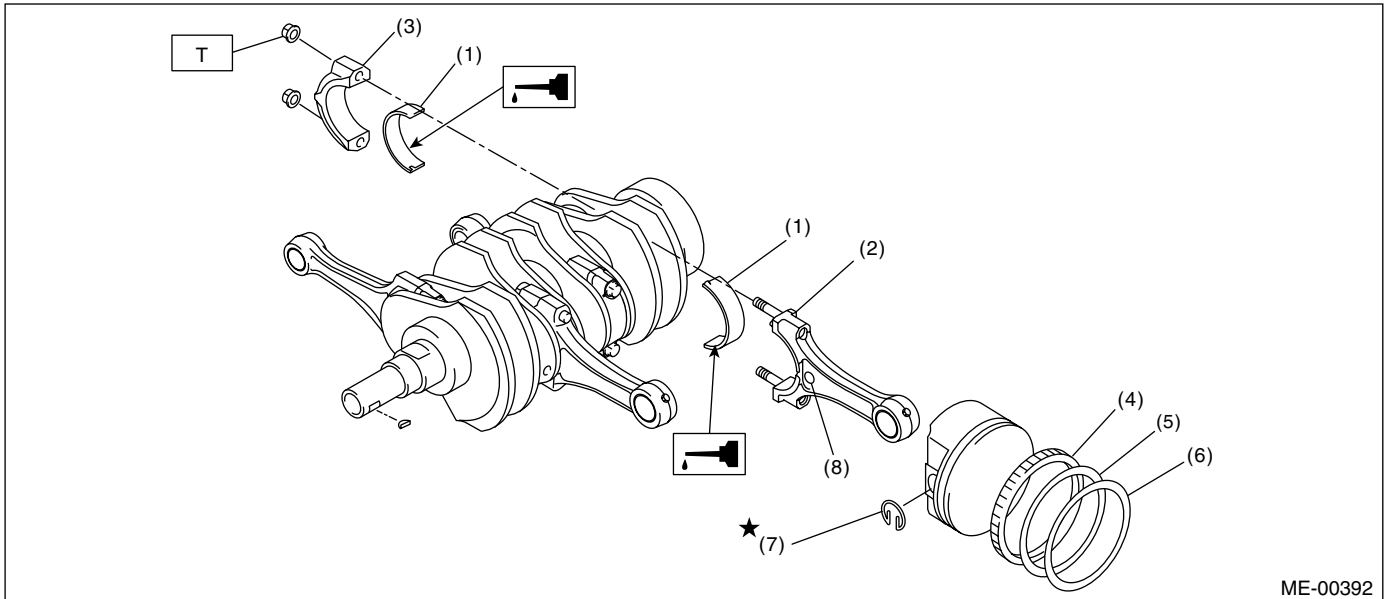
Arrange the removed piston rings in proper order, to prevent confusion.

- 5) Remove the snap ring.

# Cylinder Block

MECHANICAL

## D: ASSEMBLY



ME-00392

- |                            |                 |
|----------------------------|-----------------|
| (1) Connecting rod bearing | (5) Second ring |
| (2) Connecting rod         | (6) Top ring    |
| (3) Connecting rod cap     | (7) Snap ring   |
| (4) Oil ring               | (8) Side mark   |

**Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 45 (4.6, 33.2)**

- 1) Apply oil to the surfaces of the connecting rod bearings.
- 2) Install the connecting rod bearings on connecting rods and connecting rod caps.
- 3) Position each connecting rod with the marked side facing forward, and install it.
- 4) Install the connecting rod cap with connecting rod nut.  
Ensure the connecting rod side mark faces toward front during installation.

### CAUTION:

- Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
- When tightening the connecting rod nuts, apply oil on the threads.

- 5) Install the expander, lower rail and upper rail in this order by hand. Install the second ring and top ring with a piston ring expander.

## E: INSPECTION

### 1. CYLINDER BLOCK

- 1) Visually check for cracks and damage. Especially, inspect the important parts by means of liquid penetrant tester.
- 2) Check the oil passages for clogging.
- 3) Inspect the cylinder block surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

### Warping limit:

**0.025 mm (0.00098 in)**

### Grinding limit:

**0.1 mm (0.004 in)**

### Standard height of cylinder block:

**201.0 mm (7.91 in)**

## 2. CYLINDER AND PISTON

- 1) The cylinder bore size is stamped on the cylinder block's front upper surface.

### NOTE:

- Measurement should be performed at a temperature of 20°C (68°F).
- Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as guide lines in selecting a standard piston.

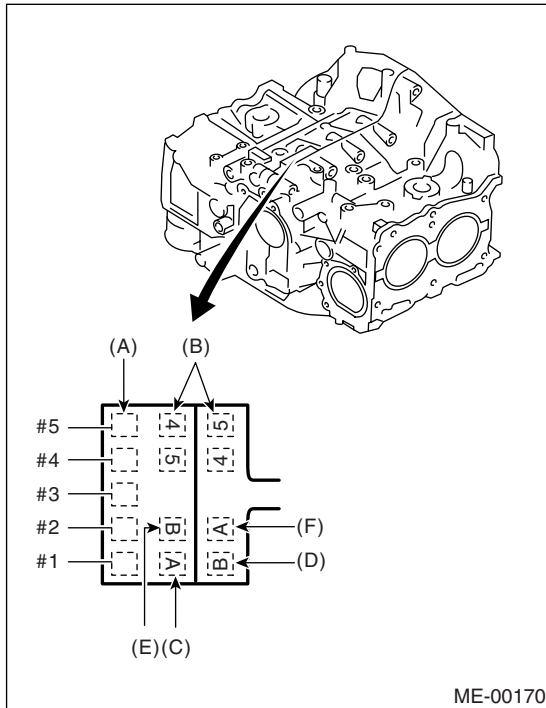
# Cylinder Block

MECHANICAL

## Standard diameter:

**A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)**

**B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)**



- (A) Main journal size mark
- (B) Cylinder block (RH)- (LH) combination mark
- (C) #1 cylinder bore size mark
- (D) #2 cylinder bore size mark
- (E) #3 cylinder bore size mark
- (F) #4 cylinder bore size mark

2) How to measure the inner diameter of each cylinder:

Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights as shown in the figure, using a cylinder bore gauge.

### NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

## Taper:

### Standard

**0.015 mm (0.0006 in)**

### Limit

**0.050 mm (0.0020 in)**

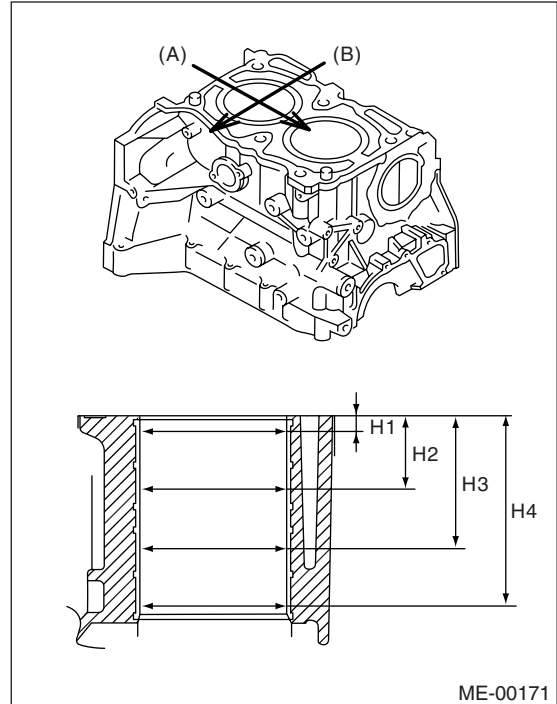
## Out-of-roundness:

### Standard

**0.010 mm (0.0004 in)**

### Limit

**0.050 mm (0.0020 in)**



- (A) Piston pin direction
- (B) Thrust direction
- H1 10 mm (0.39 in)
- H2 45 mm (1.77 in)
- H3 80 mm (3.15 in)
- H4 115 mm (4.53 in)

3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

4) How to measure the outer diameter of each piston:

Measure the outer diameter of each piston at the height as shown in the figure. (Thrust direction)

### NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

## Piston grade point H:

**38.2 mm (1.504 in)**

### Standard

**A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)**

**B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)**

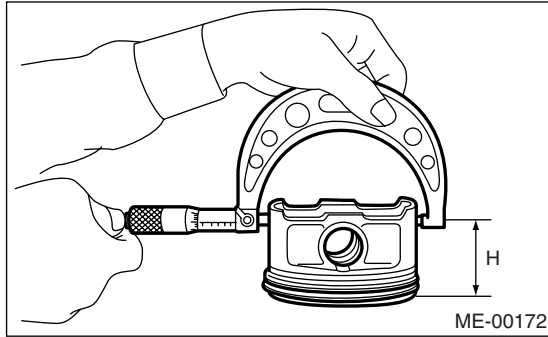
### 0.25 mm (0.0098 in) oversize

**99.745 — 99.765 mm (3.9270 — 3.9278 in)**

# Cylinder Block

MECHANICAL

**0.50 mm (0.0197 in) oversize**  
**99.995 — 100.015 mm (3.9368 — 3.9376 in)**



5) Calculate the clearance between cylinder and piston.

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

**Cylinder to piston clearance at 20°C (68°F):**

**Standard**

**-0.010 — 0.010 mm (-0.00039 — 0.00039 in)**

**Limit**

**0.030 mm (0.0012 in)**

6) Boring and honing

(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the standard value or if there is any damage on the cylinder wall, rebores it to use an oversize piston.

**CAUTION:**

**When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only. Nor use an oversize piston for one cylinder only.**

(2) If the cylinder inner diameter exceeds limit after boring and honing, replace the cylinder block.

**Limit of cylinder inner diameter (diameter):**

**100.005 mm (3.937 in)**

NOTE:

Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention when measuring the cylinder diameter.

## 3. PISTON AND PISTON PIN

1) Check the pistons and piston pins for damage, cracks and wear, and the piston ring grooves for wear and damage. Replace if defective.

2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H4SO)-78, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not within the standard value, replace the piston. Or bore the cylinder to use an oversize piston.

3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

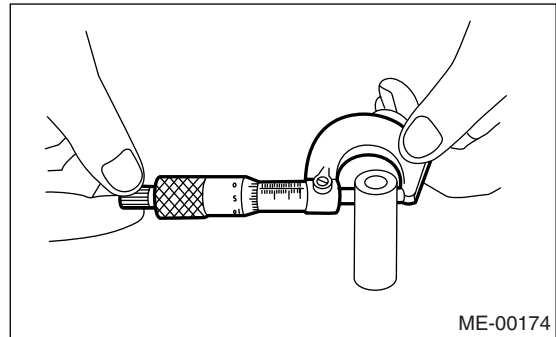
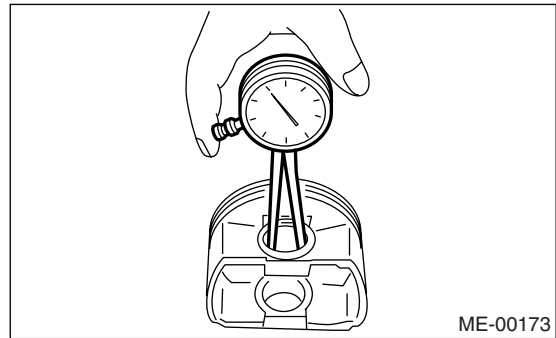
**Clearance between piston hole and piston pin:**

**Standard**

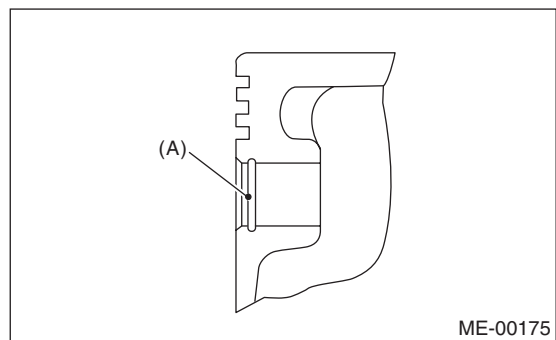
**0.004 — 0.008 mm (0.0002 — 0.0003 in)**

**Limit**

**0.020 mm (0.0008 in)**



4) Check the snap ring installation groove (A) on the piston for burr. If necessary, remove burr from the groove so that the piston pin can lightly move.



5) Check the piston pin snap ring for distortion, cracks and wear.

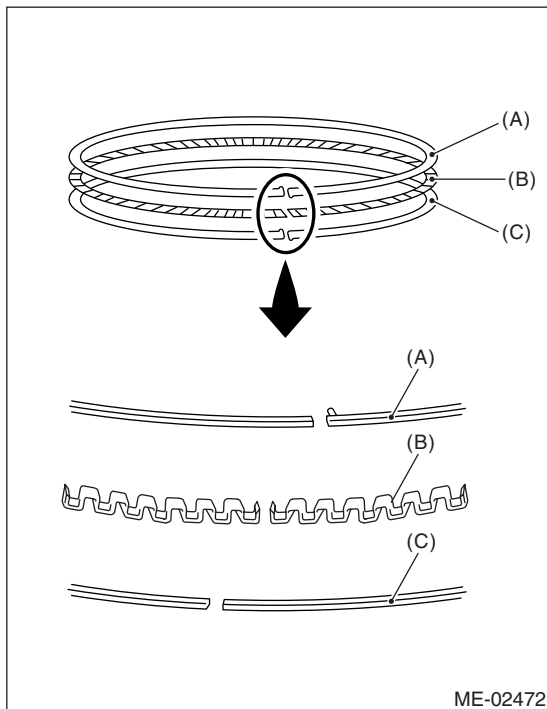


## 4. PISTON RING

1) If the piston ring is broken, damaged or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

**CAUTION:**

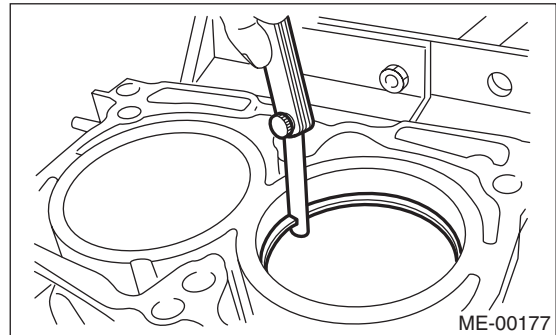
- Mark is displayed on the end of top and second rings. When installing the rings to the piston, face these marks upward.
- Oil ring consists of the upper rail, expander and lower rail. Be careful about the direction of rail when installing the oil ring to piston.



- (A) Upper rail
- (B) Expander
- (C) Lower rail

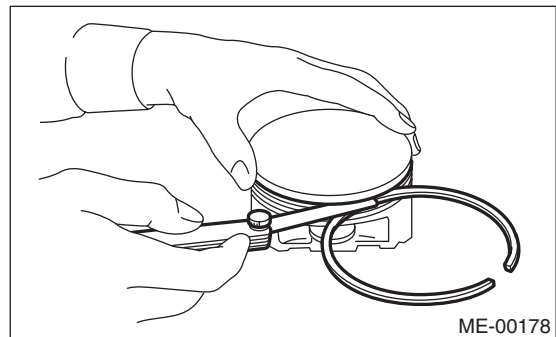
2) Clean the piston ring groove and piston ring.  
 3) Squarely place the piston ring and oil ring in cylinder, and measure the piston ring gap with a thickness gauge.

|                           |                | Standard<br>mm (in)                 | Limit<br>mm (in) |
|---------------------------|----------------|-------------------------------------|------------------|
| Piston ring<br>closed gap | Top ring       | 0.20 — 0.35<br>(0.0079 —<br>0.0138) | 1.0 (0.039)      |
|                           | Second<br>ring | 0.37 — 0.52<br>(0.0144 —<br>0.0203) | 1.0 (0.039)      |
|                           | Oil ring rail  | 0.20 — 0.50<br>(0.0079 —<br>0.0197) | 1.5 (0.059)      |



4) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

|  |                | Standard<br>mm (in)                   | Limit<br>mm (in) |
|--|----------------|---------------------------------------|------------------|
| Clearance<br>between<br>piston ring<br>and piston<br>ring groove | Top ring       | 0.040 — 0.080<br>(0.0016 —<br>0.0031) | 0.15 (0.0059)    |
|  | Second<br>ring | 0.030 — 0.070<br>(0.0012 —<br>0.0028) | 0.15 (0.0059)    |



## 5. CONNECTING ROD

1) Replace the connecting rod, if the large or small end thrust surface is damaged.  
 2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

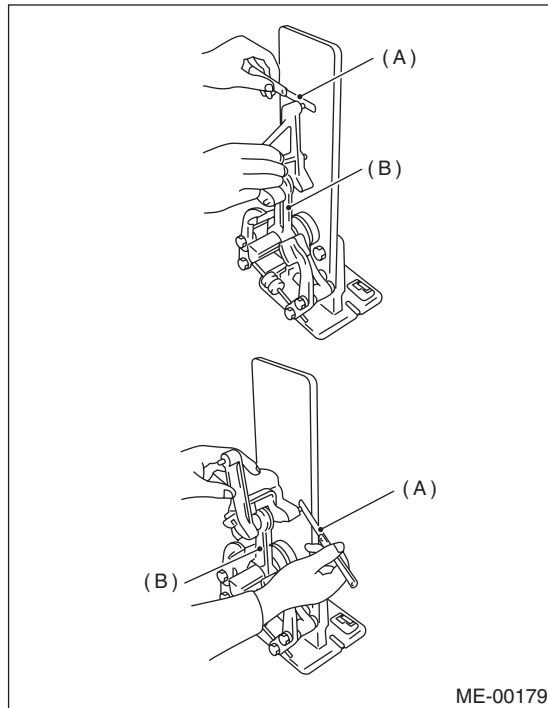


# Cylinder Block

MECHANICAL

**Limit of bend or twist per 100 mm (3.94 in) in length:**

**0.10 mm (0.0039 in)**



- (A) Thickness gauge
- (B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft and measure the side clearance (thrust clearance). If side clearance exceeds the limit, replace the connecting rod.

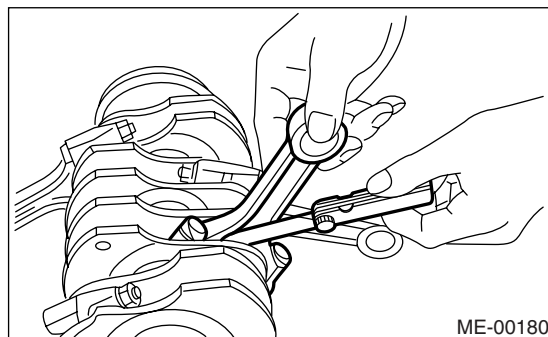
**Connecting rod side clearance:**

**Standard**

**0.070 — 0.330 mm (0.0028 — 0.0130 in)**

**Limit**

**0.4 mm (0.016 in)**



4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.

5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within the specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

**Connecting rod oil clearance:**

**Standard**

**0.016 — 0.044 mm (0.00063 — 0.0017 in)**

**Limit**

**0.05 mm (0.0020 in)**

| Unit: mm (in)                 |                                       |                                      |
|-------------------------------|---------------------------------------|--------------------------------------|
| Bearings                      | Bearing size<br>(Thickness at center) | Outer diameter of<br>crank pin       |
| Standard                      | 1.492 — 1.501<br>(0.0587 — 0.0591)    | 51.984 — 52.000<br>(2.0466 — 2.0472) |
| 0.03<br>(0.0012)<br>undersize | 1.510 — 1.513<br>(0.0594 — 0.0596)    | 51.954 — 51.970<br>(2.0454 — 2.0461) |
| 0.05<br>(0.0020)<br>undersize | 1.520 — 1.523<br>(0.0598 — 0.0600)    | 51.934 — 51.950<br>(2.0446 — 2.0453) |
| 0.25<br>(0.0098)<br>undersize | 1.620 — 1.623<br>(0.0638 — 0.0639)    | 51.734 — 51.750<br>(2.0368 — 2.0374) |

6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at the connecting rod small end.

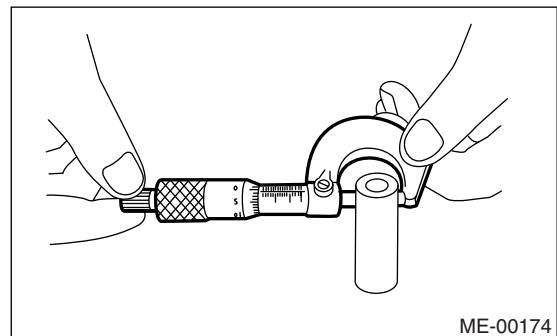
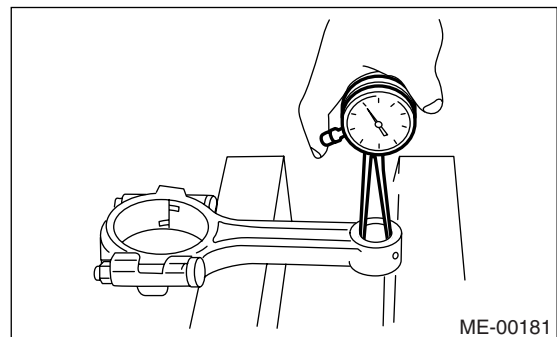
**Clearance between piston pin and bushing:**

**Standard**

**0 — 0.022 mm (0 — 0.0009 in)**

**Limit**

**0.030 mm (0.0012 in)**

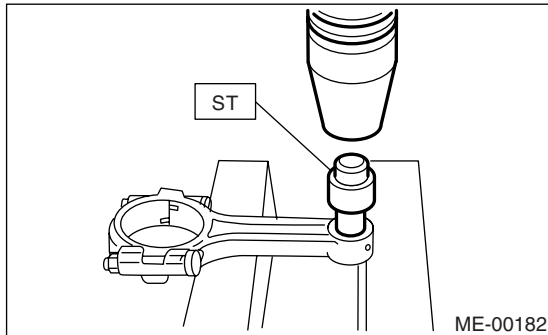


7) Replacement procedure is as follows.

(1) Remove the bushing from connecting rod with ST and press.

(2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER & INSTALLER



(3) Make two 3 mm (0.12 in)-holes in bushing. Ream the inside of bushing.

(4) After completion of reaming, clean the bushing to remove chips.

## 6. CRANKSHAFT AND CRANKSHAFT BEARING

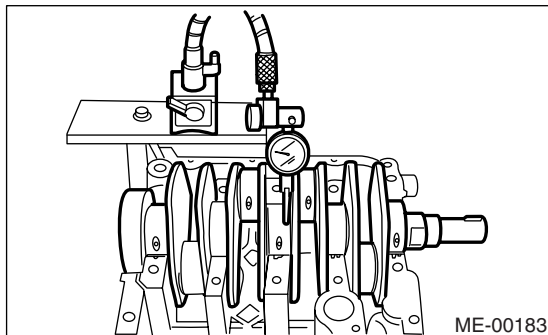
1) Clean the crankshaft completely, and check it for cracks using liquid penetrant tester. Replace if faulty.

2) Measure the bend of crankshaft. If it exceeds the limit, repair or replace it.

### NOTE:

If a suitable V-block is not available, install #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings, and then measure the crankshaft bend using a dial gauge.

**Crankshaft bend limit:**  
**0.035 mm (0.0014 in)**



3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and replace or recondition crankshaft as necessary. When grinding the crank journal or crank pin, finish them to the specified dimensions according to the undersize bearing to be used.

### Crank pin:

**Out-of-roundness**

**0.003 mm (0.0001 in)**

**Cylindricality**

**0.004 mm (0.0002 in)**

**Grinding limit**

**To 51.750 mm (2.0374 in) dia.**

### Crank journal:

**Out-of-roundness**

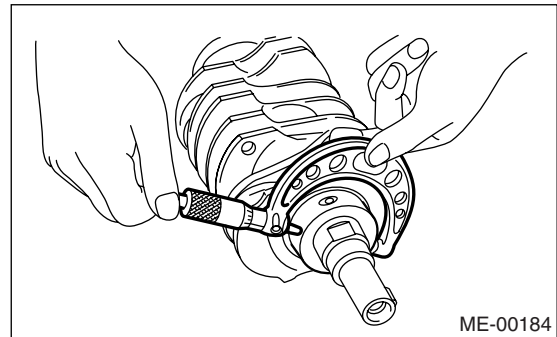
**0.005 mm (0.0002 in)**

**Cylindricality**

**0.006 mm (0.0002 in)**

**Grinding limit**

**To 59.750 mm (2.3524 in) dia.**



# Cylinder Block

MECHANICAL

|                            |                                       | Unit: mm (in)                        |                                      |                                      |
|----------------------------|---------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
|                            |                                       | Crank journal outer diameter         |                                      | Crank pin outer diameter             |
|                            |                                       | #1, #3                               | #2, #4, #5                           |                                      |
| Standard                   | Journal O.D.                          | 59.992 — 60.008<br>(2.3619 — 2.3625) | 59.992 — 60.008<br>(2.3619 — 2.3625) | 51.984 — 52.000<br>(2.0466 — 2.0472) |
|                            | Bearing size<br>(Thickness at center) | 1.998 — 2.011<br>(0.0787 — 0.0792)   | 2.000 — 2.013<br>(0.0787 — 0.0793)   | 1.492 — 1.501<br>(0.0587 — 0.0591)   |
| 0.03 (0.0012)<br>undersize | Journal O.D.                          | 59.962 — 59.978<br>(2.3607 — 2.3613) | 59.962 — 59.978<br>(2.3607 — 2.3613) | 51.954 — 51.970<br>(2.0454 — 2.0461) |
|                            | Bearing size<br>(Thickness at center) | 2.017 — 2.020<br>(0.0794 — 0.0795)   | 2.019 — 2.022<br>(0.0795 — 0.0796)   | 1.510 — 1.513<br>(0.0594 — 0.0596)   |
| 0.05 (0.0020)<br>undersize | Journal O.D.                          | 59.942 — 59.958<br>(2.3599 — 2.3605) | 59.942 — 59.958<br>(2.3599 — 2.3605) | 51.934 — 51.950<br>(2.0446 — 2.0453) |
|                            | Bearing size<br>(Thickness at center) | 2.027 — 2.030<br>(0.0798 — 0.0799)   | 2.029 — 2.032<br>(0.0799 — 0.0800)   | 1.520 — 1.523<br>(0.0598 — 0.0600)   |
| 0.25 (0.0098)<br>undersize | Journal O.D.                          | 59.742 — 59.758<br>(2.3520 — 2.3527) | 59.742 — 59.758<br>(2.3520 — 2.3527) | 51.734 — 51.750<br>(2.0368 — 2.0374) |
|                            | Bearing size<br>(Thickness at center) | 2.127 — 2.130<br>(0.0837 — 0.0839)   | 2.129 — 2.132<br>(0.0838 — 0.0839)   | 1.620 — 1.623<br>(0.0638 — 0.0639)   |

4) Measure the side clearance of crankshaft at center bearing. If clearance exceeds the limit, replace the bearing.

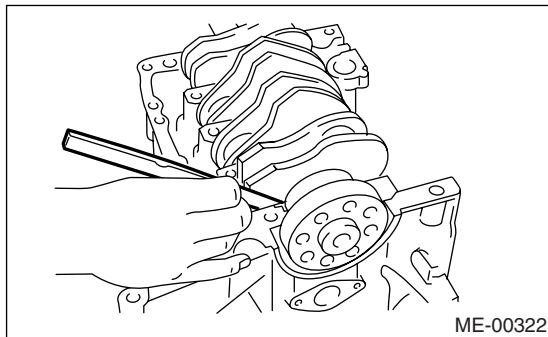
### **Crankshaft side clearance:**

#### **Standard**

**0.030 — 0.115 mm (0.0012 — 0.0045 in)**

#### **Limit**

**0.25 mm (0.0098 in)**



5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting and wear.

6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace the defective bearing with an undersize one, and replace or recondition the crankshaft as necessary.

### **Crankshaft oil clearance:**

#### **Standard**

**0.010 — 0.030 mm (0.0004 — 0.0012 in)**

#### **Limit**

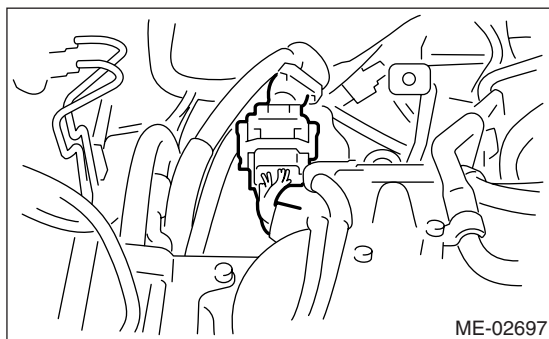
**0.040 mm (0.0016 in)**

## 22. Oil Switching Solenoid Valve

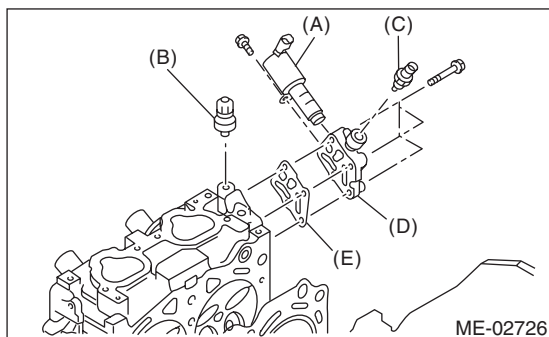
### A: REMOVAL

#### 1. RH SIDE

- 1) Disconnect the ground cable from battery.
- 2) Remove the air intake chamber. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Chamber.>
- 3) Remove the engine harness connector from bracket.



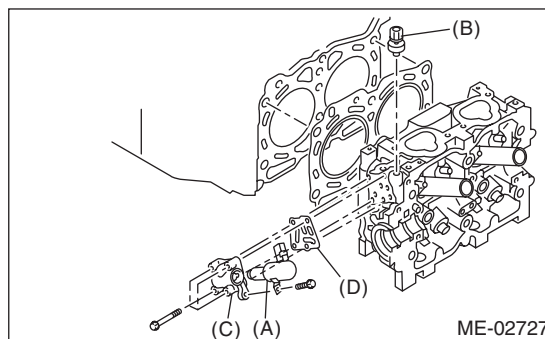
- 4) Disconnect the connector from the oil switching solenoid valve.
- 5) Remove the oil switching solenoid valve.
- 6) Remove the variable valve lift diagnosis oil pressure switch. <Ref. to FU(H4SO)-34, REMOVAL, Variable Valve Lift Diagnosis Oil Pressure Switch.>
- 7) Remove the oil temperature sensor. <Ref. to FU(H4SO)-35, REMOVAL, Oil Temperature Sensor.>
- 8) Remove the oil switching solenoid valve holder from cylinder head.



- (A) Oil switching solenoid valve
- (B) Variable valve lift diagnosis oil pressure switch
- (C) Oil temperature sensor
- (D) Oil switching solenoid valve holder
- (E) Gasket

#### 2. LH SIDE

- 1) Disconnect the ground cable from battery.
- 2) Remove the V-belt. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
- 3) Remove the crank pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>
- 4) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
- 5) Remove the timing belt. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt.>
- 6) Remove the cam sprocket. <Ref. to ME(H4SO)-49, REMOVAL, Cam Sprocket.>
- 7) Remove the timing belt cover No. 2 (LH).
- 8) Disconnect the connector from the oil switching solenoid valve.
- 9) Remove the oil switching solenoid valve.
- 10) Remove the variable valve lift diagnosis oil pressure switch. <Ref. to FU(H4SO)-34, REMOVAL, Variable Valve Lift Diagnosis Oil Pressure Switch.>
- 11) Remove the oil switching solenoid valve holder from cylinder head.



- (A) Oil switching solenoid valve
- (B) Variable valve lift diagnosis oil pressure switch
- (C) Oil switching solenoid valve holder
- (D) Gasket

# Oil Switching Solenoid Valve

MECHANICAL

## B: INSTALLATION

### 1. RH SIDE

Install in the reverse order of removal.

NOTE:

- Apply liquid gasket to the thread of variable valve lift diagnosis oil pressure switch.
- Use a new gasket.

**Liquid gasket:**

**THREE BOND 1324 (Part No. 004403042)**

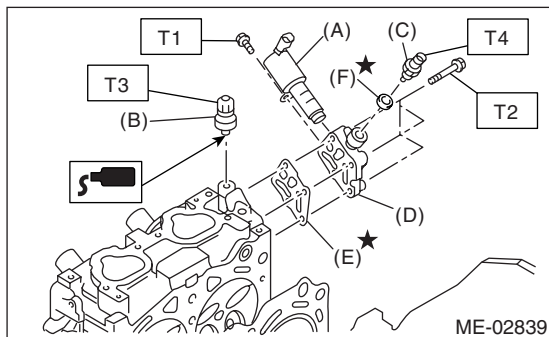
**Tightening torque:**

**T1: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**

**T2: 10 N·m (1.0 kgf-m, 7.4 ft-lb)**

**T3: 17 N·m (1.7 kgf-m, 12.5 ft-lb)**

**T4: 18 N·m (1.8 kgf-m, 13.3 ft-lb)**



- (A) Oil switching solenoid valve
- (B) Variable valve lift diagnosis oil pressure switch
- (C) Oil temperature sensor
- (D) Oil switching solenoid valve holder
- (E) Gasket
- (F) Oil temperature sensor gasket

### 2. LH SIDE

Install in the reverse order of removal.

NOTE:

- Apply liquid gasket to the thread of variable valve lift diagnosis oil pressure switch.
- Use a new gasket.

**Liquid gasket:**

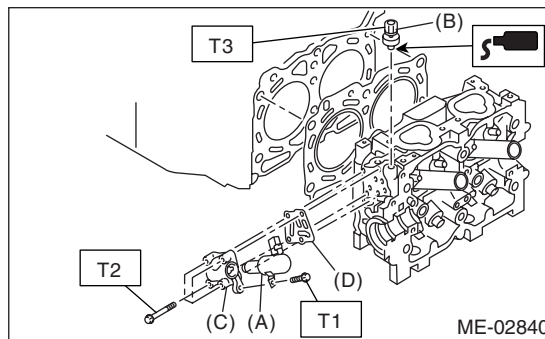
**THREE BOND 1324 (Part No. 004403042)**

**Tightening torque:**

**T1: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**

**T2: 10 N·m (1.0 kgf-m, 7.4 ft-lb)**

**T3: 17 N·m (1.7 kgf-m, 12.5 ft-lb)**



- (A) Oil switching solenoid valve
- (B) Variable valve lift diagnosis oil pressure switch
- (C) Oil switching solenoid valve holder
- (D) Gasket

## 23.Intake and Exhaust Valve

### A: SPECIFICATION

For the removal and installation procedure of intake and exhaust valve, refer to "Cylinder Head". <Ref. to ME(H4SO)-58, REMOVAL, Cylinder Head.>  
<Ref. to ME(H4SO)-58, INSTALLATION, Cylinder Head.>

## 24.Piston

### A: SPECIFICATION

For the removal and installation procedure of piston, refer to "Cylinder Block". <Ref. to ME(H4SO)-65, REMOVAL, Cylinder Block.> <Ref. to ME(H4SO)-69, INSTALLATION, Cylinder Block.>

## 25.Connecting Rod

### A: SPECIFICATION

For the removal and installation procedure of connecting rod, refer to "Cylinder Block". <Ref. to ME(H4SO)-65, REMOVAL, Cylinder Block.> <Ref. to ME(H4SO)-69, INSTALLATION, Cylinder Block.>



## 26.Crankshaft

### A: SPECIFICATION

For the removal and installation procedure of crankshaft, refer to "Cylinder Block". <Ref. to ME(H4SO)-65, REMOVAL, Cylinder Block.> <Ref. to ME(H4SO)-69, INSTALLATION, Cylinder Block.>

## 27.Engine Trouble in General

### A: INSPECTION

NOTE:

“RANK” shown in the chart refers to the possibility of reason for the trouble in order (“Very often” to “Rarely”)

A — Very often

B — Sometimes

C — Rarely

| Symptom                               | Problem parts, etc.   | Possible cause                                   | RANK |
|---------------------------------------|---|--|------|
| 1. Engine does not start.             |   |  |      |
| 1) Starter does not turn.             | Starter   | Defective battery-to-starter harness             | B    |
|                                       |   | Defective starter switch                         | C    |
|                                       |   | Defective inhibitor switch                       | C    |
|                                       |   | Defective starter                                | B    |
|                                       | Battery   | Poor terminal connection                         | A    |
|                                       |   | Run-down battery                                 | A    |
|                                       |   | Defective charging system                        | B    |
|                                       | Friction  | Seizure of crankshaft and connecting rod bearing | C    |
|                                       |   | Seized camshaft                                  | C    |
| Seized or stuck piston and cylinder   |   | C  |      |
| 2) Initial combustion does not occur. | Starter   | Defective starter                                | C    |
|                                       | Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|                                       | Fuel line   | Defective fuel pump and relay                    | A    |
|                                       |   | Clogged fuel line                                | A    |
|                                       |   | Lack of or insufficient fuel                     | B    |
|                                       | Belt  | Trouble  | B    |
|                                       |   | Defective timing                                 | B    |
|                                       | Compression   | Incorrect valve clearance                        | C    |
|                                       |   | Loosened spark plug or defective gasket          | C    |
|                                       |   | Loosened cylinder head bolt or defective gasket  | C    |
|                                       |   | Improper valve sealing                           | C    |
|                                       |   | Defective valve stem                             | C    |
|                                       |   | Worn or broken valve spring                      | B    |
|                                       |   | Worn or stuck piston rings, cylinder and piston  | C    |
| Incorrect valve timing                |   | B  |      |
| Improper engine oil (low viscosity)   | B   |  |      |

# Engine Trouble in General

MECHANICAL

| Symptom   | Problem parts, etc.   | Possible cause                                  | RANK |
|---|---|---|------|
| 3) Initial combustion occurs.                   | Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.> |   | A    |
|   | Intake system   | Defective intake manifold gasket                | B    |
|   |   | Defective throttle body gasket                  | B    |
|   | Fuel line   | Defective fuel pump and relay                   | C    |
|   |   | Clogged fuel line                               | C    |
|   |   | Lack of or insufficient fuel                    | B    |
|   | Belt  | Trouble   | B    |
|   |   | Defective timing                                | B    |
|   | Compression   | Incorrect valve clearance                       | C    |
|   |   | Loosened spark plug or defective gasket         | C    |
|   |   | Loosened cylinder head bolt or defective gasket | C    |
|   |   | Improper valve sealing                          | C    |
|   |   | Defective valve stem                            | C    |
|   |   | Worn or broken valve spring                     | B    |
|   |   | Worn or stuck piston rings, cylinder and piston | C    |
| Incorrect valve timing                          |   | B   |      |
| Improper engine oil (low viscosity)             |   | B   |      |
| 4) Engine stalls after initial combustion.      | Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.> |   | A    |
|   | Intake system   | Loosened or cracked intake duct                 | B    |
|   |   | Loosened or cracked PCV hose                    | C    |
|   |   | Loosened or cracked vacuum hose                 | C    |
|   |   | Defective intake manifold gasket                | B    |
|   |   | Defective throttle body gasket                  | B    |
|   |   | Dirty air cleaner element                       | C    |
|   | Fuel line   | Clogged fuel line                               | C    |
|   |   | Lack of or insufficient fuel                    | B    |
|   | Belt  | Trouble   | B    |
|   |   | Defective timing                                | B    |
|   | Compression   | Incorrect valve clearance                       | C    |
|   |   | Loosened spark plug or defective gasket         | C    |
|   |   | Loosened cylinder head bolt or defective gasket | C    |
|   |   | Improper valve sealing                          | C    |
| Defective valve stem                            |   | C   |      |
| Worn or broken valve spring                     |   | B   |      |
| Worn or stuck piston rings, cylinder and piston |   | C   |      |
| Incorrect valve timing                          |   | B   |      |
| Improper engine oil (low viscosity)             | B   |   |      |

# Engine Trouble in General

MECHANICAL

| Symptom                        | Problem parts, etc.   | Possible cause                                  | RANK |
|--------------------------------|---|---|------|
| 2. Rough idle and engine stall | Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.> |   | A    |
|                                | Intake system   | Loosened or cracked intake duct                 | A    |
|                                |   | Loosened or cracked PCV hose                    | A    |
|                                |   | Loosened or cracked vacuum hose                 | A    |
|                                |   | Defective intake manifold gasket                | B    |
|                                |   | Defective throttle body gasket                  | B    |
|                                |   | Defective PCV valve                             | C    |
|                                |   | Loosened oil filler cap                         | B    |
|                                |   | Dirty air cleaner element                       | C    |
|                                | Fuel line   | Defective fuel pump and relay                   | C    |
|                                |   | Clogged fuel line                               | C    |
|                                |   | Lack of or insufficient fuel                    | B    |
|                                | Belt  | Defective timing                                | C    |
|                                | Compression   | Incorrect valve clearance                       | B    |
|                                |   | Loosened spark plug or defective gasket         | B    |
|                                |   | Loosened cylinder head bolt or defective gasket | B    |
|                                |   | Improper valve sealing                          | B    |
|                                |   | Defective valve stem                            | C    |
|                                |   | Worn or broken valve spring                     | B    |
|                                |   | Worn or stuck piston rings, cylinder and piston | B    |
|                                |   | Incorrect valve timing                          | A    |
|                                |   | Improper engine oil (low viscosity)             | B    |
|                                | Lubrication system  | Incorrect oil pressure                          | B    |
| Defective rocker cover gasket  |   | C   |      |
| Cooling system                 | Over-heating  | C   |      |
| Other                          | Evaporative emission control system malfunction                               | A   |      |
|                                | Stuck or damaged throttle valve   | B   |      |

# Engine Trouble in General

MECHANICAL

| Symptom   | Problem parts, etc.   | Possible cause                                  | RANK |
|---|---|---|------|
| 3. Low output, hesitation and poor acceleration | Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.> |   | A    |
|   | Intake system   | Loosened or cracked intake duct                 | A    |
|   |   | Loosened or cracked PCV hose                    | A    |
|   |   | Loosened or cracked vacuum hose                 | B    |
|   |   | Defective intake manifold gasket                | B    |
|   |   | Defective throttle body gasket                  | B    |
|   |   | Defective PCV valve                             | B    |
|   |   | Loosened oil filler cap                         | B    |
|   |   | Dirty air cleaner element                       | A    |
|   | Fuel line   | Defective fuel pump and relay                   | B    |
|   |   | Clogged fuel line                               | B    |
|   |   | Lack of or insufficient fuel                    | C    |
|   | Belt  | Defective timing                                | B    |
|   | Compression   | Incorrect valve clearance                       | B    |
|   |   | Loosened spark plug or defective gasket         | B    |
|   |   | Loosened cylinder head bolt or defective gasket | B    |
|   |   | Improper valve sealing                          | B    |
|   |   | Defective valve stem                            | C    |
|   |   | Worn or broken valve spring                     | B    |
|   |   | Worn or stuck piston rings, cylinder and piston | C    |
|   |   | Incorrect valve timing                          | A    |
|   | Improper engine oil (low viscosity)   | B   |      |
|   | Lubrication system  | Incorrect oil pressure                          | B    |
| Cooling system                                  | Over-heating  | C   |      |
|   | Over-cooling  | C   |      |
| Other   | Evaporative emission control system malfunction                               | A   |      |
| 4. Surging                                      | Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.> |   | A    |
|   | Intake system   | Loosened or cracked intake duct                 | A    |
|   |   | Loosened or cracked PCV hose                    | A    |
|   |   | Loosened or cracked vacuum hose                 | A    |
|   |   | Defective intake manifold gasket                | B    |
|   |   | Defective throttle body gasket                  | B    |
|   |   | Defective PCV valve                             | B    |
|   |   | Loosened oil filler cap                         | B    |
|   |   | Dirty air cleaner element                       | B    |
|   | Fuel line   | Defective fuel pump and relay                   | B    |
|   |   | Clogged fuel line                               | B    |
|   |   | Lack of or insufficient fuel                    | C    |
|   | Belt  | Defective timing                                | B    |
|   | Compression   | Incorrect valve clearance                       | B    |
|   |   | Loosened spark plug or defective gasket         | C    |
|   |   | Loosened cylinder head bolt or defective gasket | C    |
|   |   | Improper valve sealing                          | C    |
|   |   | Defective valve stem                            | C    |
|   |   | Worn or broken valve spring                     | C    |
|   |   | Worn or stuck piston rings, cylinder and piston | C    |
|   |   | Incorrect valve timing                          | A    |
|   | Improper engine oil (low viscosity)   | B   |      |
|   | Cooling system  | Over-heating                                    | B    |
| Other   | Evaporative emission control system malfunction                               | C   |      |

# Engine Trouble in General

MECHANICAL

| Symptom                             | Problem parts, etc.   | Possible cause   | RANK |
|-------------------------------------|---|--|------|
| 5. Engine does not return to idle.  | Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|                                     | Intake system   | Loosened or cracked vacuum hose                        | A    |
|                                     | Other   | Stuck or damaged throttle valve                        | A    |
| 6. Dieseling (Run-on)               | Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|                                     | Cooling system  | Over-heating   | B    |
|                                     | Other   | Evaporative emission control system malfunction        | B    |
| 7. After burning in exhaust system  | Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|                                     | Intake system   | Loosened or cracked intake duct                        | C    |
|                                     |   | Loosened or cracked PCV hose                           | C    |
|                                     |   | Loosened or cracked vacuum hose                        | B    |
|                                     |   | Defective PCV valve                                    | B    |
|                                     |   | Loosened oil filler cap                                | C    |
|                                     | Belt  | Defective timing                                       | B    |
|                                     | Compression   | Incorrect valve clearance                              | B    |
|                                     |   | Loosened spark plug or defective gasket                | C    |
|                                     |   | Loosened cylinder head bolt or defective gasket        | C    |
|                                     |   | Improper valve sealing                                 | B    |
|                                     |   | Defective valve stem                                   | C    |
|                                     |   | Worn or broken valve spring                            | C    |
|                                     |   | Worn or stuck piston rings, cylinder and piston        | C    |
|                                     | Incorrect valve timing  | A  |      |
| Lubrication system                  | Incorrect oil pressure  | C  |      |
| Cooling system                      | Over-cooling  | C  |      |
| Other                               | Evaporative emission control system malfunction                               | C  |      |
| 8. Knocking                         | Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|                                     | Intake system   | Loosened oil filler cap                                | B    |
|                                     | Belt  | Defective timing                                       | B    |
|                                     | Compression   | Incorrect valve clearance                              | C    |
|                                     |   | Incorrect valve timing                                 | B    |
|                                     | Cooling system  | Over-heating   | A    |
| 9. Excessive engine oil consumption | Intake system   | Loosened or cracked PCV hose                           | A    |
|                                     |   | Defective PCV valve                                    | B    |
|                                     |   | Loosened oil filler cap                                | C    |
|                                     | Compression   | Defective valve stem                                   | A    |
|                                     |   | Worn or stuck piston rings, cylinder and piston        | A    |
|                                     | Lubrication system  | Loosened oil pump attaching bolts and defective gasket | B    |
|                                     |   | Defective oil filter seal                              | B    |
|                                     |   | Defective crankshaft oil seal                          | B    |
|                                     |   | Defective rocker cover gasket                          | B    |
|                                     |   | Loosened oil drain plug or defective gasket            | B    |
|                                     | Loosened oil pan fitting bolts or defective oil pan                           | B  |      |

## Engine Trouble in General

### MECHANICAL

| Symptom                        | Problem parts, etc.   | Possible cause                                  | RANK |   |
|--------------------------------|---|---|------|---|
| 10. Excessive fuel consumption | Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.> |   | A    |   |
|                                | Intake system   | Dirty air cleaner element                       | A    |   |
|                                | Belt  | Defective timing                                | B    |   |
|                                | Compression   | Incorrect valve clearance                       |      | B |
|                                |   | Loosened spark plug or defective gasket         |      | C |
|                                |   | Loosened cylinder head bolt or defective gasket |      | C |
|                                |   | Improper valve sealing                          |      | B |
|                                |   | Defective valve stem                            |      | C |
|                                |   | Worn or broken valve spring                     |      | C |
|                                |   | Worn or stuck piston rings, cylinder and piston |      | B |
|                                |   | Incorrect valve timing                          |      | B |
|                                | Lubrication system  | Incorrect oil pressure                          | C    |   |
|                                | Cooling system  | Over-cooling                                    | C    |   |

## 28.Engine Noise

### A: INSPECTION

| Type of sound   | Condition  | Possible cause  |
|---|--|---|
| Regular clicking sound  | Sound increases as engine speed increases.   | <ul style="list-style-type: none"> <li>• Valve mechanism is defective.</li> <li>• Incorrect valve clearance</li> <li>• Worn valve rocker</li> <li>• Worn camshaft</li> <li>• Broken valve spring</li> </ul> |
| Heavy and dull clank  | Oil pressure is low.   | <ul style="list-style-type: none"> <li>• Worn crankshaft main bearing</li> <li>• Worn connecting rod bearing (big end)</li> </ul>   |
|   | Oil pressure is normal.  | Damaged engine mounting   |
| High-pitched clank (Spark knock)  | Sound is noticeable when accelerating with an overload.                                  | <ul style="list-style-type: none"> <li>• Ignition timing advanced</li> <li>• Accumulation of carbon inside combustion chamber</li> <li>• Wrong spark plug</li> <li>• Improper gasoline</li> </ul>           |
| Clank when engine speed is 1,000 to 2,000 rpm                                 | Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*) | <ul style="list-style-type: none"> <li>• Worn crankshaft main bearing</li> <li>• Worn bearing at crankshaft end of connecting rod</li> </ul>  |
| Knocking sound when engine is operating under idling speed and engine is warm | Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*) | <ul style="list-style-type: none"> <li>• Worn cylinder liner and piston ring</li> <li>• Broken or stuck piston ring</li> <li>• Worn piston pin and hole at piston end of connecting rod</li> </ul>          |
|   | Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)    | <ul style="list-style-type: none"> <li>• Worn cam sprocket</li> <li>• Worn camshaft journal bore in cylinder head assembly</li> </ul>   |
| Squeaky sound   | —  | Insufficient generator lubrication  |
| Rubbing sound   | —  | Defective generator brush and rotor contact   |
| Gear scream when starting engine  | —  | <ul style="list-style-type: none"> <li>• Defective ignition starter switch</li> <li>• Worn gear and starter pinion</li> </ul>   |
| Sound like polishing glass with a dry cloth                                   | —  | <ul style="list-style-type: none"> <li>• Loose drive belt</li> <li>• Defective water pump shaft</li> </ul>  |
| Hissing sound   | —  | <ul style="list-style-type: none"> <li>• Loss of compression</li> <li>• Air leakage in air intake system, hoses, connections or manifolds</li> </ul>  |
| Timing belt noise   | —  | <ul style="list-style-type: none"> <li>• Loose timing belt</li> <li>• Belt contacting with case/adjacent part</li> </ul>  |
| Valve noise   | —  | Incorrect valve clearance   |

NOTE\*)

When disconnecting the fuel injector connector, the malfunction indicator light illuminates and DTC is stored in ECM memory. Therefore, carry out the clear memory mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and inspection mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.> after connecting the fuel injector connector.





# EXHAUST

# *EX(H4SO)*

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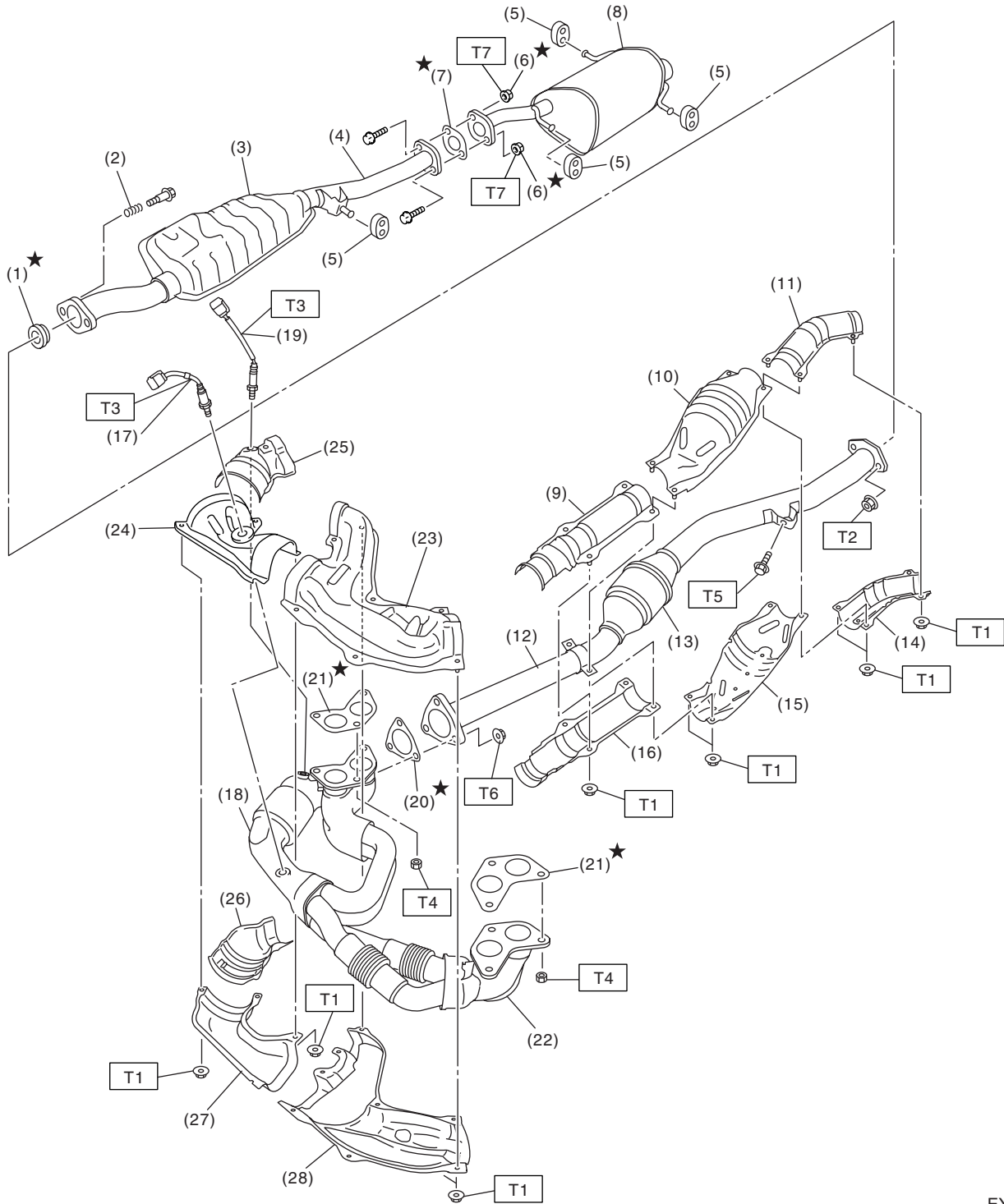
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# General Description

EXHAUST

## 1. General Description

A: COMPONENT



EX-02142

# General Description

EXHAUST

|   |  |  |
|---|--|--|
| (1) Gasket                                | (14) Center exhaust pipe rear lower cover  | (25) Front catalytic converter upper cover |
| (2) Spring                                | (15) Rear catalytic converter lower cover  | (26) Front catalytic converter lower cover |
| (3) Chamber                               | (16) Center exhaust pipe front lower cover | (27) Front exhaust pipe lower cover RH     |
| (4) Rear exhaust pipe                     | (17) Front oxygen (A/F) sensor             | (28) Front exhaust pipe lower cover LH     |
| (5) Cushion rubber                        | (18) Front catalytic converter             |  |
| (6) Self-locking nut                      | (19) Rear oxygen sensor                    |  |
| (7) Gasket                                | (20) Gasket                                |  |
| (8) Muffler                               | (21) Gasket                                |  |
| (9) Center exhaust pipe front upper cover | (22) Front exhaust pipe                    |  |
| (10) Rear catalytic converter upper cover | (23) Front exhaust pipe upper cover LH     |  |
| (11) Center exhaust pipe rear upper cover | (24) Front exhaust pipe upper cover RH     |  |
| (12) Center exhaust pipe                  |  |  |
| (13) Rear catalytic converter             |  |  |

---

**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 13 (1.3, 9.4)**

**T2: 18 (1.8, 13.0)**

**T3: 21 (2.1, 15.2)**

**T4: 30 (3.1, 22.4)**

**T5: 35 (3.6, 26.0)**

**T6: 40 (4.1, 29.5)**

**T7: 48 (4.9, 35.4)**

---

## B: CAUTION

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

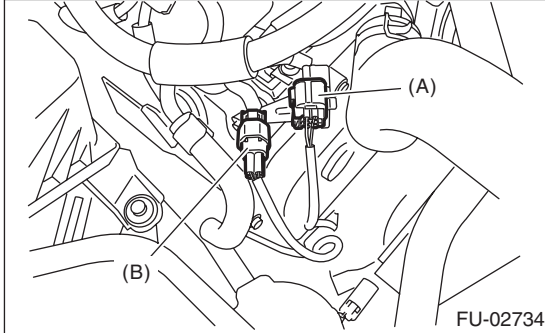
# Front Exhaust Pipe

EXHAUST

## 2. Front Exhaust Pipe

### A: REMOVAL

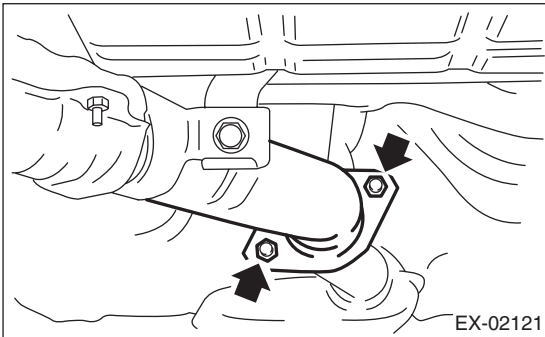
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the front oxygen (A/F) sensor connector (A) and rear oxygen sensor connector (B).



- 3) Lift-up the vehicle.
- 4) Separate the front and center exhaust pipe assembly and rear exhaust pipe.

#### CAUTION:

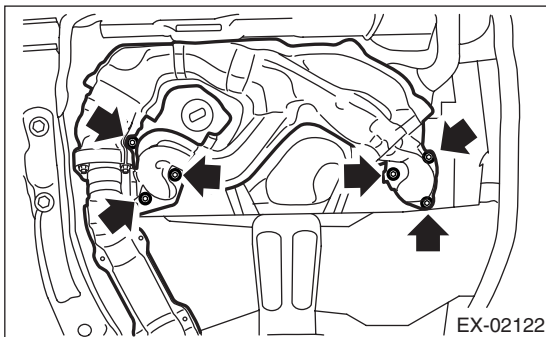
Be careful, the exhaust pipe is hot.



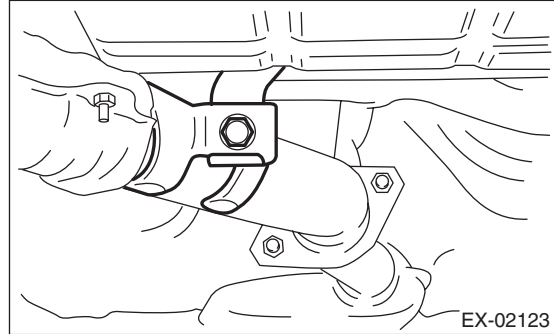
- 5) Remove the under cover.
- 6) Remove the nuts which hold the front exhaust pipe onto cylinder heads.

#### CAUTION:

Be careful not to pull down the front and center exhaust pipe assembly.



- 7) Remove the bolt which installs the front and center exhaust pipe assembly to hanger bracket.

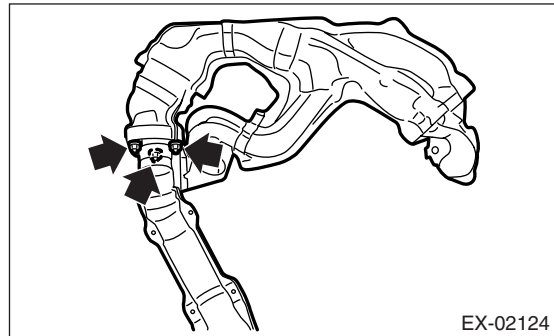


- 8) Remove the front and center exhaust pipe assembly from vehicle.

#### CAUTION:

- Be careful not to let the front and center exhaust pipe assembly fall off when removing as it is quite heavy.
- After removing the front and center exhaust pipe assembly, do not apply excessive pulling force on the rear exhaust pipe.

- 9) Separate the front exhaust pipe from center exhaust pipe.



- 10) Remove the front oxygen (A/F) sensor and the rear oxygen sensor. <Ref. to FU(H4SO)-36, REMOVAL, Front Oxygen (A/F) Sensor.> <Ref. to FU(H4SO)-37, REMOVAL, Rear Oxygen Sensor.>

### B: INSTALLATION

#### CAUTION:

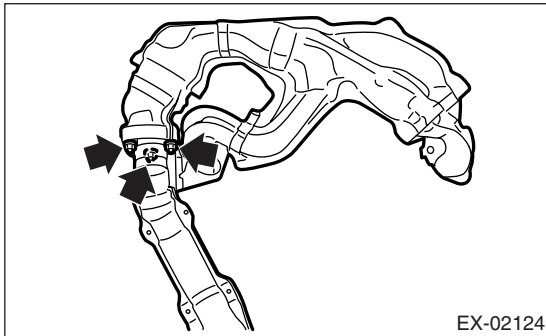
If the covers have been removed, tighten the front catalytic converter cover first for noise suppression. Then install the other covers.

- 1) Install the front oxygen (A/F) sensor and the rear oxygen sensor. <Ref. to FU(H4SO)-36, INSTALLATION, Front Oxygen (A/F) Sensor.> <Ref. to FU(H4SO)-37, INSTALLATION, Rear Oxygen Sensor.>
- 2) Install the front exhaust pipe to center exhaust pipe.

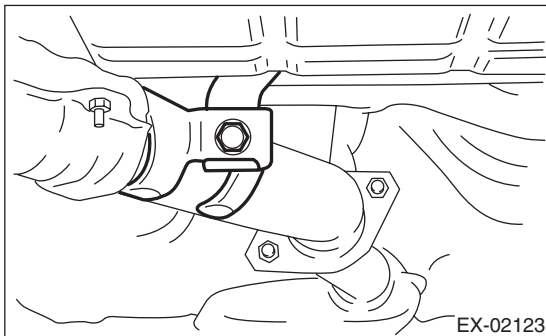
#### NOTE:

Replace the gaskets with new ones.

**Tightening torque:**  
**40 N·m (4.1 kgf·m, 29.5 ft·lb)**

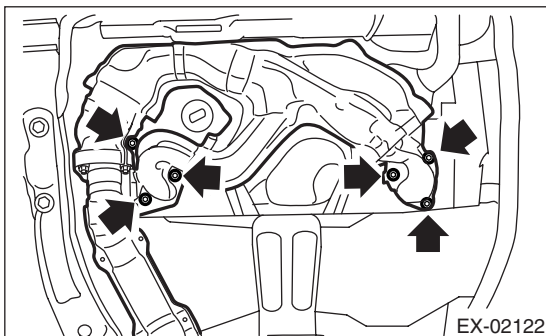


- 3) Install the front and center exhaust pipe assembly to vehicle.
- 4) Temporarily tighten the bolt which installs the front and center exhaust pipe assembly to hanger bracket.



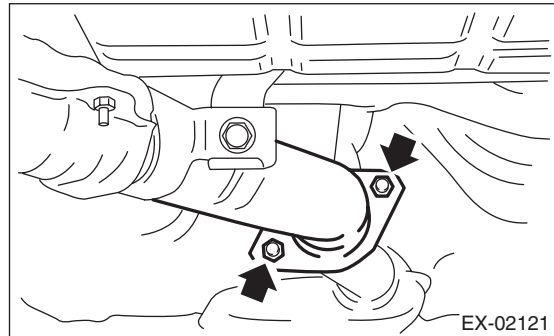
- 5) Tighten the nuts which hold the front exhaust pipe onto cylinder heads.

**Tightening torque:**  
**30 N·m (3.1 kgf·m, 22.4 ft·lb)**



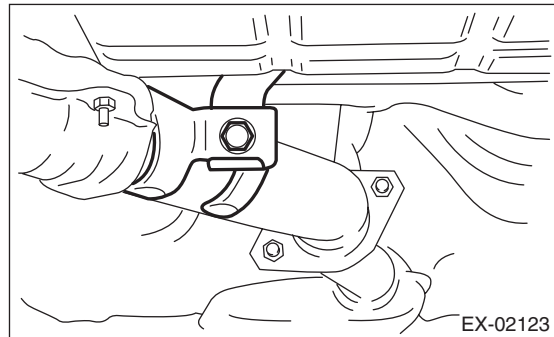
- 6) Install the under cover.
- 7) Tighten the bolts which install the front and center exhaust pipe assembly to rear exhaust pipe.

**Tightening torque:**  
**18 N·m (1.8 kgf·m, 13.0 ft·lb)**

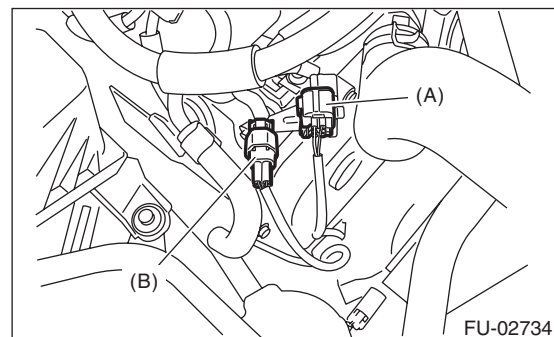


- 8) Tighten the bolt which holds the front and center exhaust pipe assembly to hanger bracket.

**Tightening torque:**  
**35 N·m (3.6 kgf·m, 26.0 ft·lb)**



- 9) Lower the vehicle.
- 10) Connect the front oxygen (A/F) sensor connector (A) and rear oxygen sensor connector (B).



- 11) Connect the ground cable to battery.

## C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

## 3. Center Exhaust Pipe

### A: REMOVAL

After removing the center and front exhaust pipes as one unit, separate them. Refer to the procedure for removing the front exhaust pipe. <Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>

### B: INSTALLATION

Install the center exhaust pipe and front exhaust pipe as one unit. Refer to the procedure for installing the front exhaust pipe. <Ref. to EX(H4SO)-4, INSTALLATION, Front Exhaust Pipe.>

### C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

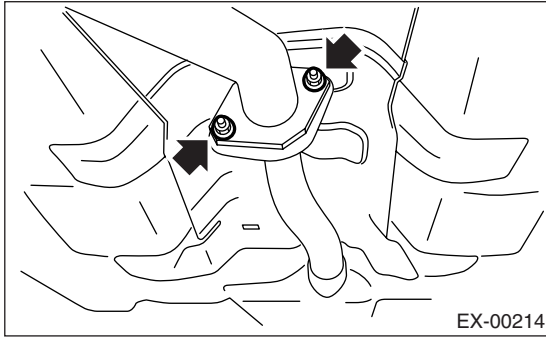
## 4. Rear Exhaust Pipe

### A: REMOVAL

1) Separate the rear exhaust pipe from center exhaust pipe.

**CAUTION:**

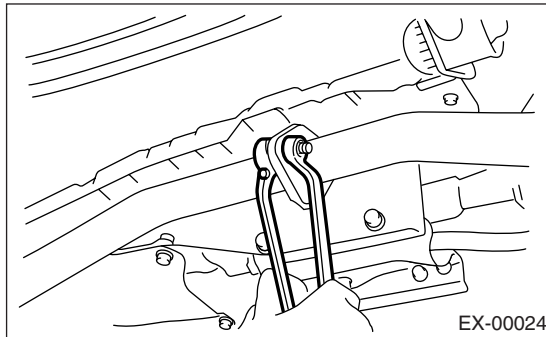
Be careful, the exhaust pipe is hot.



2) Separate the rear exhaust pipe from muffler.

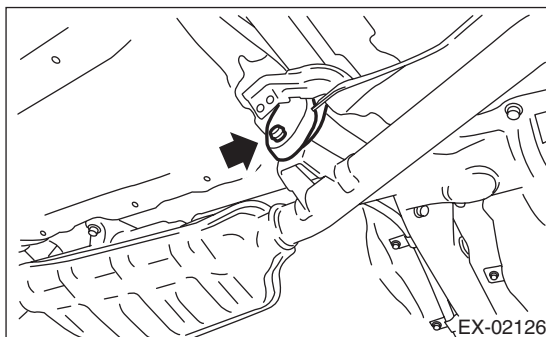
**CAUTION:**

Be careful not to pull down the rear exhaust pipe.



3) Apply a coat of spray type lubricant to the mating area of cushion rubbers in advance.

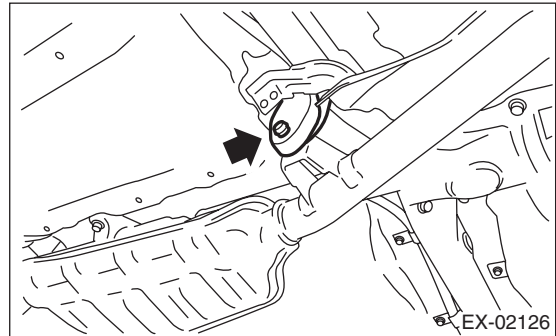
4) Remove the rear exhaust pipe bracket from cushion rubber.



### B: INSTALLATION

1) Apply a coat of spray type lubricant to the mating area of cushion rubbers in advance.

2) Install the rear exhaust pipe bracket to cushion rubber.



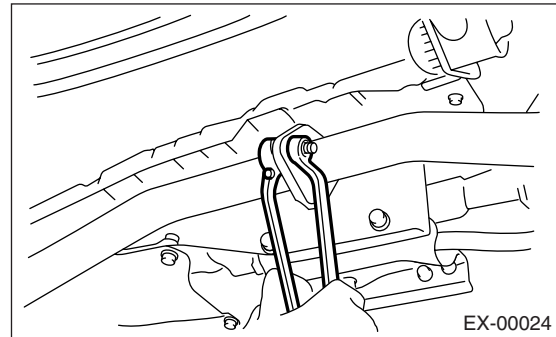
3) Install the rear exhaust pipe to muffler.

**NOTE:**

Replace the gaskets and self-locking nuts with new ones.

**Tightening torque:**

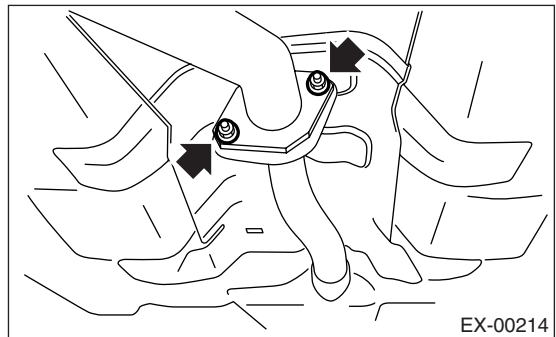
**48 N·m (4.9 kgf-m, 35.4 ft-lb)**



4) Install the rear exhaust pipe to center exhaust pipe.

**Tightening torque:**

**18 N·m (1.8 kgf-m, 13.0 ft-lb)**



### C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.

2) Make sure there are no holes or rusting.

3) Make sure the cushion rubber is not worn or cracked.



# Muffler

## EXHAUST

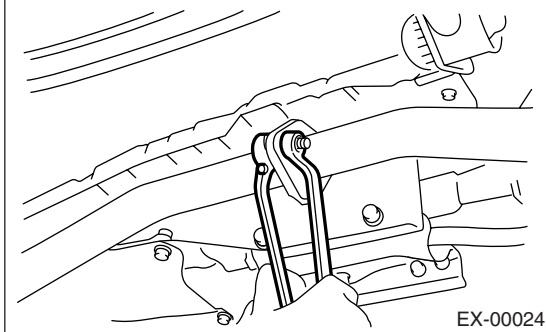
### 5. Muffler

#### A: REMOVAL

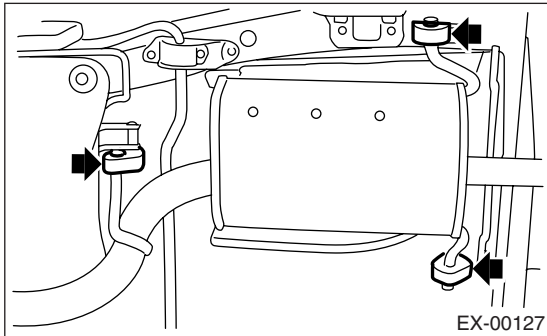
1) Separate the muffler from rear exhaust pipe.

#### CAUTION:

Be careful, the exhaust pipe is hot.



2) Apply a coat of spray type lubricant to the mating area of cushion rubbers in advance.



3) Remove the front, right and left cushion rubber, and detach the muffler assembly.

#### B: INSTALLATION

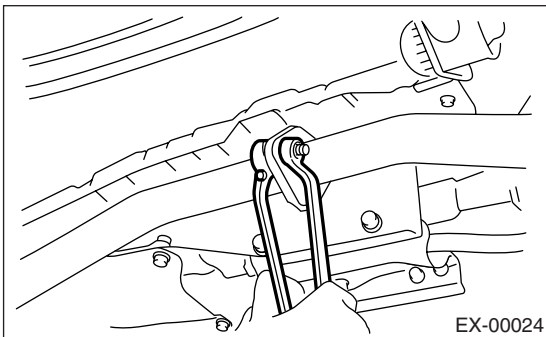
Install in the reverse order of removal.

#### NOTE:

Replace the gasket and self-locking nuts with new ones.

#### Tightening torque:

**48 N·m (4.9 kgf·m, 35.4 ft·lb)**



#### C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.

2) Make sure there are no holes or rusting.

3) Make sure the cushion rubber is not worn or cracked.

# COOLING

# CO(H4SO)

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# General Description

COOLING

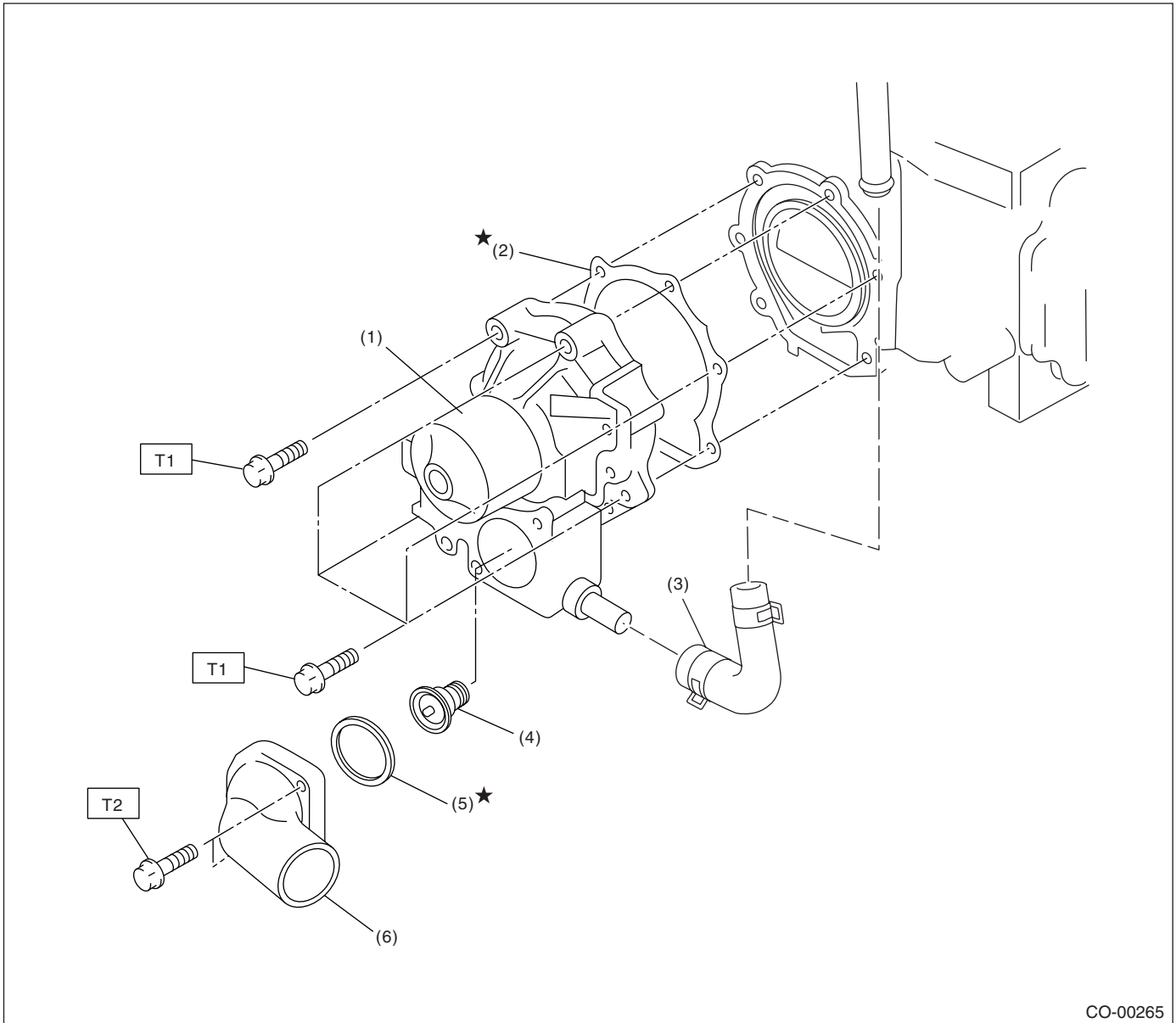
## 1. General Description

### A: SPECIFICATION

|                                     |   |  |  |
|-------------------------------------|---|--|--|
| Cooling system                      |   | Electric fan + Forced engine coolant circulation system  |  |
| Total engine coolant capacity       |   | $\varnothing$ (US qt, Imp qt)<br>AT model:<br>Approx. 6.9 (7.3, 6.1)<br>MT model:<br>Approx. 7.0 (7.4, 6.2)  |  |
| Water pump                          | Type                                      | Centrifugal impeller type  |  |
|                                     | Discharge performance I                   | Discharge  | 20 $\varnothing$ (5.3 US gal, 4.4 Imp gal)/min.    |
|                                     |   | Pump speed — Discharge pressure  | 760 rpm — 2.9 kPa (0.3 mAq)                        |
|                                     |   | Engine coolant temperature   | 80°C (176°F)                                       |
|                                     | Discharge performance II                  | Discharge  | 100 $\varnothing$ (26.4 US gal, 22.0 Imp gal)/min. |
|                                     |   | Pump speed — Discharge pressure  | 3,000 rpm — 49.0 kPa (5.0 mAq)                     |
|                                     |   | Engine coolant temperature   | 80°C (176°F)                                       |
|                                     | Discharge performance III                 | Discharge  | 200 $\varnothing$ (52.8 US gal, 44.0 Imp gal)/min. |
|                                     |   | Pump speed — Discharge pressure  | 6,000 rpm — 225.4 kPa (23.0 mAq)                   |
|                                     |   | Engine coolant temperature   | 80°C (176°F)                                       |
| Impeller diameter                   |   | 76 mm (2.99 in)  |  |
| Number of impeller vanes            |   | 8  |  |
| Pump pulley diameter                |   | 60 mm (2.36 in)  |  |
| Clearance between impeller and case | Standard                                  | 0.5 — 1.5 mm (0.020 — 0.060 in)  |  |
| Thermostat                          | Type                                      | Wax pellet type  |  |
|                                     | Starts to open                            | 80 — 84°C (176 — 183°F)  |  |
|                                     | Fully opened                              | 95°C (203°F)   |  |
|                                     | Valve lift                                | 9.0 mm (0.354 in) or more  |  |
|                                     | Valve bore                                | 35 mm (1.38 in)  |  |
| Radiator fan                        | Motor                                     | Main fan   | 120 W  |
|                                     |   | Sub fan  | 120 W  |
| Fan diameter × Blade                |   | 320 mm (12.60 in) × 5 (main fan)<br>320 mm (12.60 in) × 7 (sub fan)  |  |
| Radiator                            | Type                                      | Down flow  |  |
|                                     | Core dimensions                           | Width × Height × Thickness<br>691.5 × 340 × 16 mm<br>(27.22 × 13.39 × 0.63 in)   |  |
|                                     | Pressure range in which cap valve is open | Above: 108±15 kPa<br>(1.1±0.15 kgf/cm <sup>2</sup> , 16±2 psi)<br>Below: -1.0 to -4.9 kPa<br>(-0.01 to -0.05 kgf/cm <sup>2</sup> , -0.1 to -0.7 psi) |  |
|                                     | Fins                                      | Corrugated fin type  |  |
| Reservoir tank                      | Capacity                                  | 0.5 $\varnothing$ (0.5 US qt, 0.4 Imp qt)  |  |

**B: COMPONENT**

**1. WATER PUMP**



CO-00265

- |                         |                      |
|-------------------------|----------------------|
| (1) Water pump ASSY     | (5) Gasket           |
| (2) Gasket              | (6) Thermostat cover |
| (3) Heater by-pass hose |                      |
| (4) Thermostat          |                      |

**Tightening torque: N·m (kgf·m, ft·lb)**

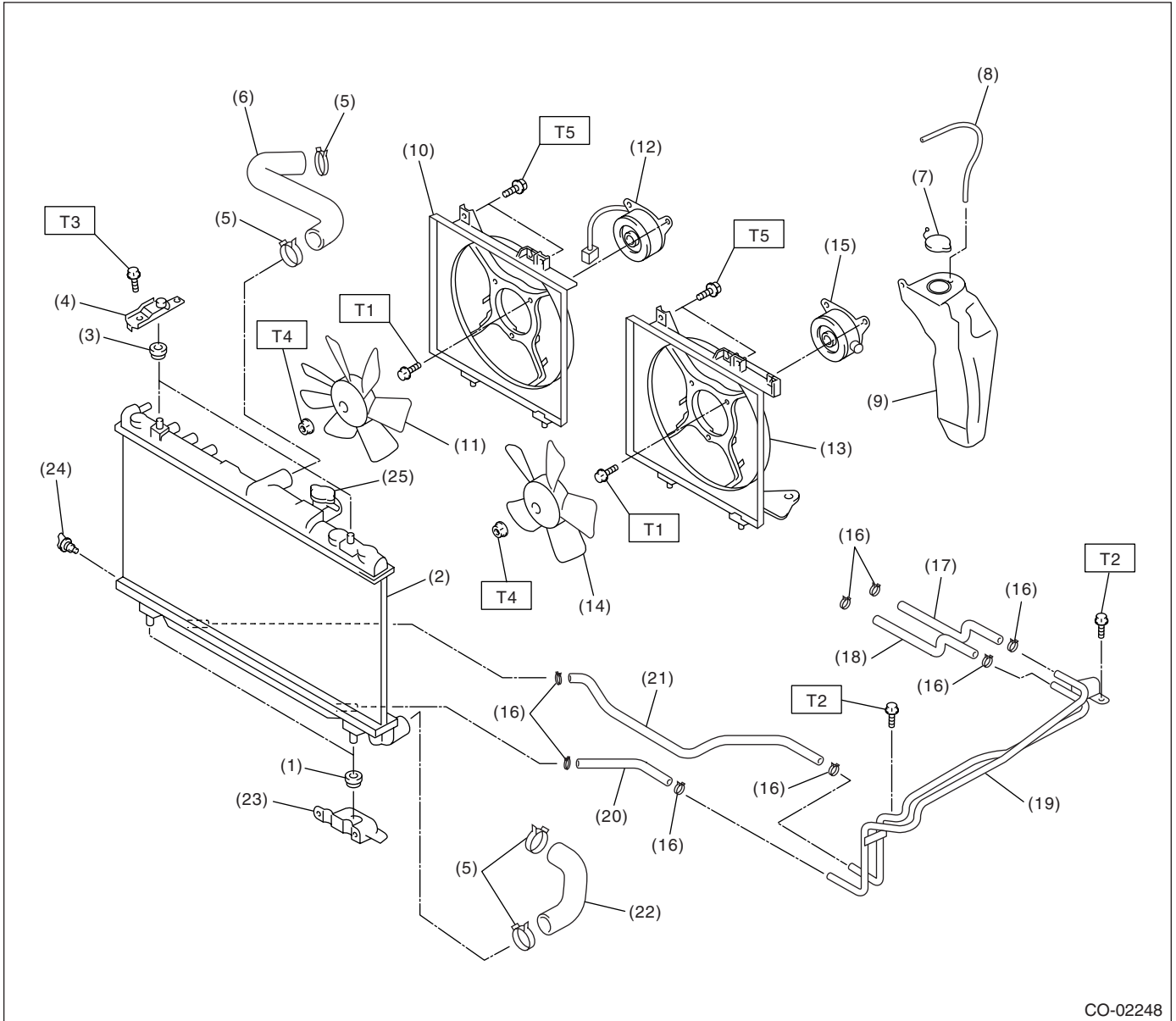
**T1: First 12 (1.2, 8.7)  
Second 12 (1.2, 8.7)**

**T2: 12 (1.2, 8.7)**

# General Description

## COOLING

### 2. RADIATOR AND RADIATOR FAN



CO-02248

- |                                       |                                   |                             |
|---------------------------------------|-----------------------------------|-----------------------------|
| (1) Radiator lower cushion            | (12) Radiator sub fan motor       | (23) Radiator lower bracket |
| (2) Radiator                          | (13) Radiator main fan shroud     | (24) Radiator drain plug    |
| (3) Radiator upper cushion            | (14) Radiator main fan            | (25) Radiator cap           |
| (4) Radiator upper bracket            | (15) Radiator main fan motor      |                             |
| (5) Clamp                             | (16) ATF hose clamp (AT model)    |                             |
| (6) Radiator inlet hose               | (17) ATF inlet hose A (AT model)  |                             |
| (7) Engine coolant reservoir tank cap | (18) ATF outlet hose A (AT model) |                             |
| (8) Overflow hose                     | (19) ATF pipe (AT model)          |                             |
| (9) Engine coolant reservoir tank     | (20) ATF inlet hose B (AT model)  |                             |
| (10) Radiator sub fan shroud          | (21) ATF outlet hose B (AT model) |                             |
| (11) Radiator sub fan                 | (22) Radiator outlet hose         |                             |

---

**Tightening torque: N·m (kgf-m, ft-lb)**

**T1: 4.4 (0.45, 3.3)**

**T2: 12 (1.2, 8.7)**

**T3: 18 (1.8, 13.0)**

**T4: 3.4 (0.35, 2.5)**

**T5: 4.9 (0.50, 3.6)**

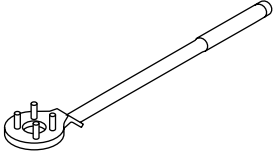
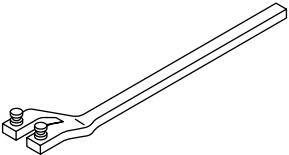
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## C: CAUTION

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

## D: PREPARATION TOOL

### 1. SPECIAL TOOL

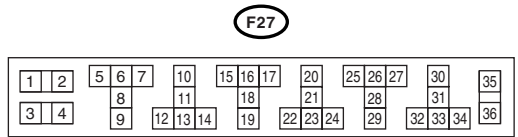
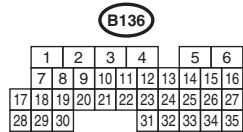
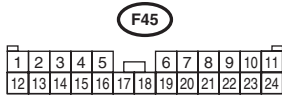
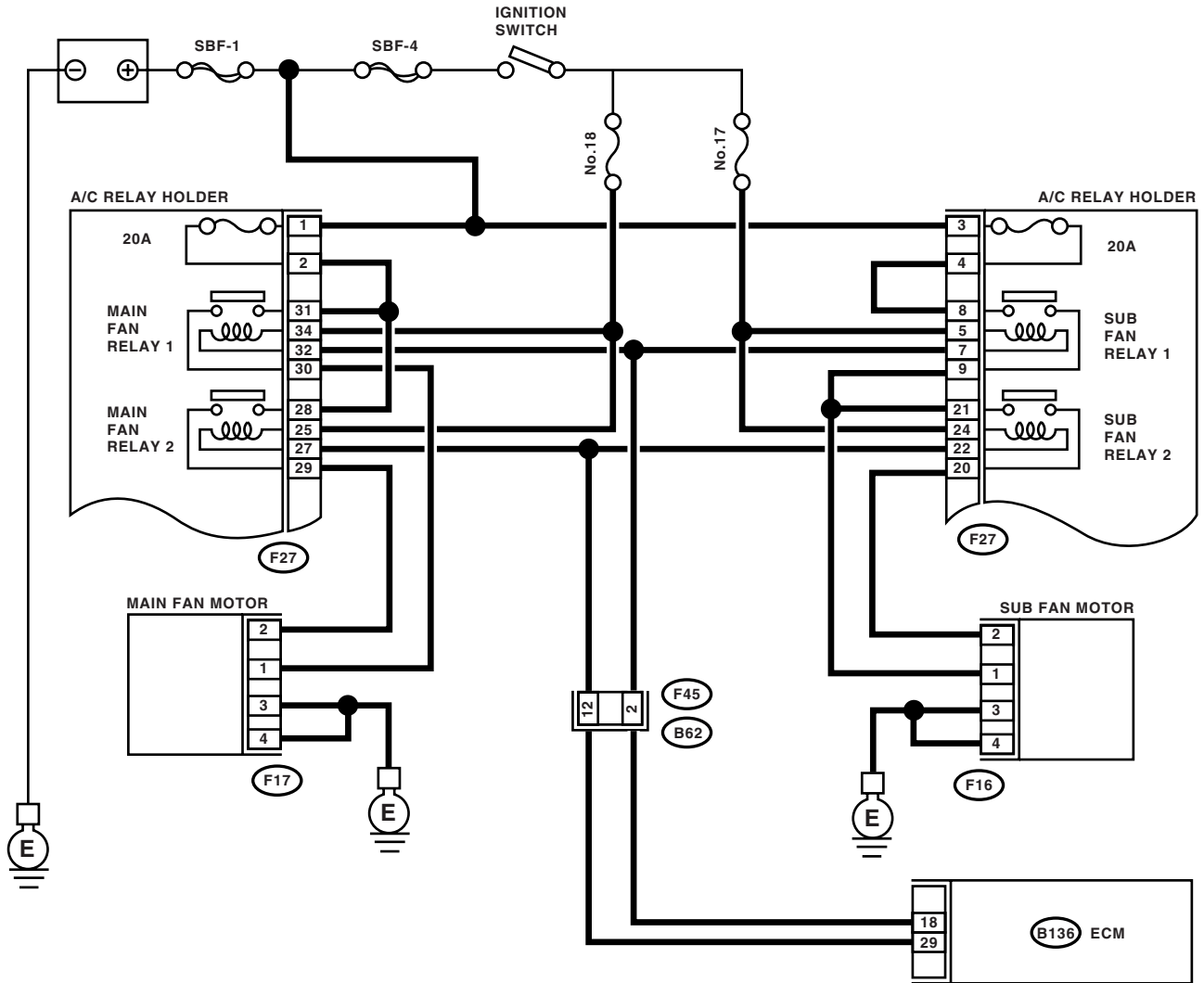
| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION            | REMARKS   |
|---|-------------|------------------------|---|
|  <p style="text-align: center;">ST-499977100</p>   | 499977100   | CRANK PULLEY<br>WRENCH | Used for stopping rotation of crank pulley when loosening and tightening crankshaft pulley bolt.  |
|  <p style="text-align: center;">ST18231AA010</p> | 18231AA010  | CAM SPROCKET<br>WRENCH | <ul style="list-style-type: none"> <li>• Used for removing and installing cam sprocket.</li> <li>• Also the CAM SPROCKET WRENCH (499207100) can be used.</li> </ul> |

# Radiator Main Fan System

COOLING

## 2. Radiator Main Fan System

### A: WIRING DIAGRAM



RELAY HOLDER (BLACK)

CO-02237

## B: INSPECTION

### DETECTING CONDITION:

- Engine coolant temperature is above 96°C (205°F).
- A/C compressor is rotated.
- Vehicle speed is below 19 km/h (12 MPH).

### TROUBLE SYMPTOM:

- Radiator main fan does not rotate under the above conditions.
- Radiator main fan does not rotate at high speed when the following conditions are both met:
  - (1) Engine coolant temperature is above 90°C (194°F).
  - (2) A/C is ON.

| Step   | Check   | Yes  | No  |
|--|---|--|---|
| <b>1</b><br><b>CHECK OPERATION OF RADIATOR.</b><br>1) Run the engine at idle. (Vehicle stationary)<br>2) Turn the A/C switch to OFF.<br>3) Warm the engine coolant temperature over 96°C (205°F).  | Does the main radiator fan rotate?  | Go to step 2.  | Go to step 3.   |
| <b>2</b><br><b>CHECK OPERATION OF RADIATOR.</b><br>Turn the A/C switch to ON at condition of step 1.   | Does the main radiator fan rotate faster when A/C compressor is operated? | Radiator main fan system is okay.                    | Go to step 17.  |
| <b>3</b><br><b>CHECK POWER SUPPLY TO MAIN FAN MOTOR.</b><br><b>CAUTION:</b><br><b>Be careful not to overheat the engine during repair.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from main fan motor.<br>3) Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F).<br>4) Stop the engine and turn ignition switch to ON.<br>5) Measure the voltage between main fan motor connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F17) No. 1 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?  | Go to step 4.  | Go to step 7.   |
| <b>4</b><br><b>CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between main fan motor connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F17) No. 3 — Chassis ground:</b><br><b>(F17) No. 4 — Chassis ground:</b>   | Is the resistance less than 5 Ω?  | Go to step 5.  | Repair the open circuit in harness between main fan motor connector and chassis ground. |
| <b>5</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in main fan motor connector.  | Is there poor contact in main fan motor connector?                        | Repair the poor contact in main fan motor connector. | Go to step 6.   |
| <b>6</b><br><b>CHECK MAIN FAN MOTOR.</b><br>Connect the battery positive (+) terminal to terminal No. 1, and ground (-) terminal to terminal No. 3 or No. 4 of main fan motor connector.   | Does the main fan rotate?   | Repair the poor contact in main fan motor connector. | Replace the main fan motor with a new one.  |



# Radiator Main Fan System

## COOLING

| Step  | Check                                      | Yes   | No   |
|---|--|---|--|
| <b>7 CHECK POWER SUPPLY TO MAIN FAN RELAY1.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the main fan relay1 from A/C relay holder.<br>3) Measure the voltage between main fan relay1 terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F27) No. 31 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?             | Go to step 8.   | Go to step 9.  |
| <b>8 CHECK POWER SUPPLY TO MAIN FAN RELAY1.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between main fan relay1 terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F27) No. 34 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?             | Go to step 12.  | Go to step 11.   |
| <b>9 CHECK 20 A FUSE.</b><br>1) Remove the 20 A fuse from A/C relay holder.<br>2) Check the condition of fuse.  | Is the fuse blown out?                     | Replace the fuse.   | Go to step 10.   |
| <b>10 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL.</b><br>Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F27) No. 1 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?             | Repair the open circuit in harness between 20 A fuse and main fan relay terminal. | Repair the open circuit in harness between main fuse box connector and 20 A fuse terminal.       |
| <b>11 CHECK FUSE.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the fuse No. 18 from joint box.<br>3) Check the condition of fuse.  | Is the fuse blown out?                     | Replace the fuse.   | Repair the open circuit in harness between main fan relay and ignition switch.                   |
| <b>12 CHECK MAIN FAN RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the main fan relay1.<br>3) Measure the resistance of main fan relay1.<br><b>Terminals</b><br><b>No. 30 — No. 31:</b>  | Is the resistance more than 1 M $\Omega$ ? | Go to step 13.  | Replace the main fan relay.  |
| <b>13 CHECK MAIN FAN RELAY.</b><br>1) Connect the battery to terminals No. 34 and No. 32 of main fan relay1.<br>2) Measure the resistance of main fan relay1.<br><b>Terminals</b><br><b>No. 30 — No. 31:</b>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 14.  | Replace the main fan relay.  |
| <b>14 CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR.</b><br>Measure the resistance of harness between main fan motor connector and main fan relay terminal.<br><b>Connector &amp; terminal</b><br><b>(F17) No. 1 — (F27) No. 30:</b>   | Is the resistance less than 1 $\Omega$ ?   | Go to step 15.  | Repair the open circuit in harness between main fan motor connector and main fan relay terminal. |

# Radiator Main Fan System

COOLING

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <b>15 CHECK HARNESS BETWEEN MAIN FAN RELAY AND ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between main fan relay connector and ECM connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F27) No. 32 — (B136) No. 18:</b></i>  | Is the resistance less than 1 $\Omega$ ?                           | Go to step 16.                                       | Repair the open circuit in harness between main fan relay and ECM.   |
| <b>16 CHECK POOR CONTACT.</b><br>Check poor contact in connector between main fan and ECM.  | Is there poor contact in connector between main fan motor and ECM? | Repair the poor contact connector.                   | Record the DTC. Repair the trouble cause. <Ref. to EN(H4SO)(diag)-35, Read Diagnostic Trouble Code (DTC).> |
| <b>17 CHECK POWER SUPPLY TO MAIN FAN MOTOR.</b><br><b>CAUTION:</b><br><b>Be careful not to overheat the engine during repair.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from main fan motor.<br>3) Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F).<br>4) Turn the A/C switch ON.<br>5) Measure the voltage while A/C compressor is rotating.<br>6) Measure the voltage between main fan motor connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F17) No. 2 (+) — Chassis ground (-):</b></i> | Is the voltage more than 10 V?                                     | Go to step 18.                                       | Go to step 20.   |
| <b>18 CHECK POOR CONTACT.</b><br>Check poor contact in main fan motor connector.  | Is there poor contact in main fan motor connector?                 | Repair the poor contact in main fan motor connector. | Go to step 19.   |
| <b>19 CHECK MAIN FAN MOTOR.</b><br>Connect the battery positive (+) terminal to terminal No. 2, and ground (-) terminal to terminal No. 3 or No. 4 of main fan motor connector.   | Does the main fan rotate?  | Repair the poor contact in main fan motor connector. | Replace the main fan motor with a new one.   |
| <b>20 CHECK POWER SUPPLY TO MAIN FAN RELAY2.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the main fan relay2 from A/C relay holder.<br>3) Measure the voltage between main fan relay2 terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F27) No. 28 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10 V?                                     | Go to step 21.                                       | Go to step 22.   |
| <b>21 CHECK POWER SUPPLY TO MAIN FAN RELAY2.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between main fan relay2 terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F27) No. 25 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 10 V?                                     | Go to step 25.                                       | Go to step 24.   |

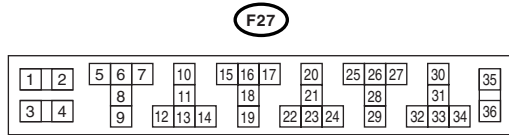
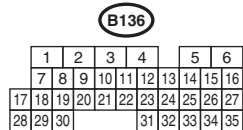
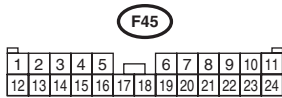
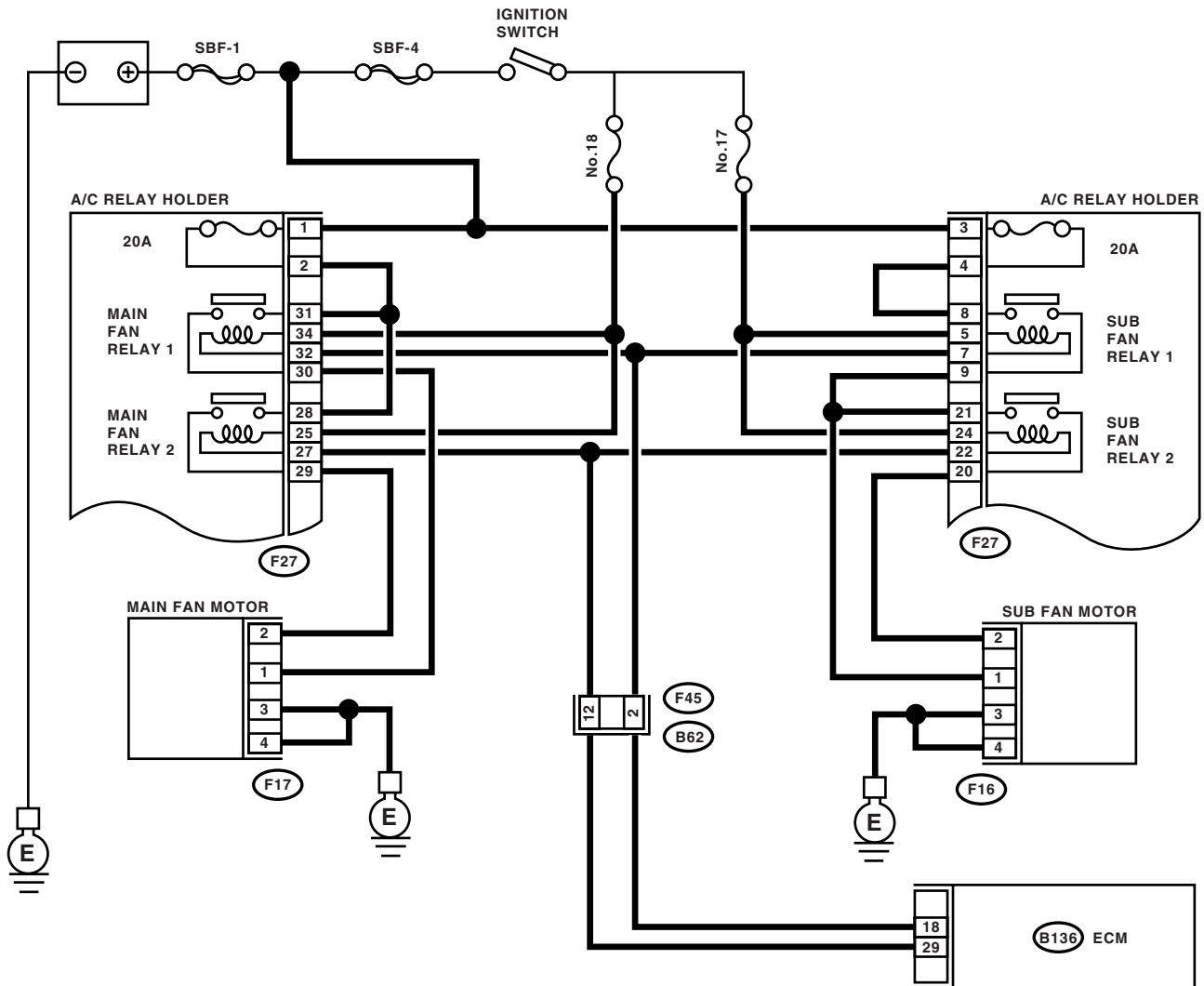
# Radiator Main Fan System

## COOLING

| Step   | Check  | Yes   | No   |
|--|--|---|--|
| <b>22 CHECK 20 A FUSE.</b><br>1) Remove the 20 A fuse from A/C relay holder.<br>2) Check the condition of fuse.  | Is the fuse blown out?   | Replace the fuse.   | Go to step 23.   |
| <b>23 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL.</b><br>Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground.<br><i>Connector &amp; terminal<br/>(F27) No. 1 (+) — Chassis ground (-):</i>  | Is the voltage more than 10 V?                                     | Repair the open circuit in harness between 20 A fuse and main fan relay terminal. | Repair the open circuit in harness between main fuse box connector and 20 A fuse terminal.                 |
| <b>24 CHECK FUSE.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the fuse No. 18 from joint box.<br>3) Check the condition of fuse.   | Is the fuse blown out?   | Replace the fuse.   | Repair the open circuit in harness between main fan relay and ignition switch.                             |
| <b>25 CHECK MAIN FAN RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the main fan relay.<br>3) Measure the resistance of main fan relay.<br><i>Terminals<br/>No. 28 — No. 29:</i>   | Is the resistance more than 1 M $\Omega$ ?                         | Go to step 26.  | Replace the main fan relay.  |
| <b>26 CHECK MAIN FAN RELAY.</b><br>1) Connect the battery to terminals No. 25 and No. 27 of main fan relay.<br>2) Measure the resistance of main fan relay.<br><i>Terminals<br/>No. 28 — No. 29:</i>   | Is the resistance less than 1 $\Omega$ ?                           | Go to step 27.  | Replace the main fan relay.  |
| <b>27 CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR.</b><br>Measure the resistance of harness between main fan motor connector and main fan relay terminal.<br><i>Connector &amp; terminal<br/>(F17) No. 2 — (F27) No. 29:</i>  | Is the resistance less than 1 $\Omega$ ?                           | Go to step 28.  | Repair the open circuit in harness between main fan motor connector and main fan relay terminal.           |
| <b>28 CHECK HARNESS BETWEEN MAIN FAN RELAY AND ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between main fan relay connector and ECM connector.<br><i>Connector &amp; terminal<br/>(F27) No. 27 — (B136) No. 29:</i> | Is the resistance less than 1 $\Omega$ ?                           | Go to step 29.  | Repair the open circuit in harness between main fan relay and ECM.   |
| <b>29 CHECK POOR CONTACT.</b><br>Check poor contact in connector between main fan and ECM.   | Is there poor contact in connector between main fan motor and ECM? | Repair the poor contact connector.  | Record the DTC. Repair the trouble cause. <Ref. to EN(H4SO)(diag)-35, Read Diagnostic Trouble Code (DTC).> |

## 3. Radiator Sub Fan System

### A: WIRING DIAGRAM



RELAY HOLDER (BLACK)

CO-02237

# Radiator Sub Fan System

COOLING

## B: INSPECTION

### DETECTING CONDITION:

- Engine coolant temperature is above 96°C (205°F).
- A/C compressor is rotated.
- Vehicle speed is below 19 km/h (12 MPH).

### TROUBLE SYMPTOM:

- Radiator sub fan does not rotate under the above conditions.
- Radiator sub fan does not rotate at high speed when the following conditions are both met:
  - (1) Engine coolant temperature is above 90°C (194°F).
  - (2) A/C is ON.

|   | Step  | Check  | Yes   | No   |
|---|---|--|---|--|
| 1 | <b>CHECK OPERATION OF RADIATOR.</b><br>1) Run the engine at idle. (Vehicle stationary)<br>2) Turn the A/C switch to OFF.<br>3) Warm the engine coolant temperature over 96°C (205°F).   | Does the radiator sub fan rotate?  | Go to step 2.                                       | Go to step 3.  |
| 2 | <b>CHECK OPERATION OF RADIATOR.</b><br>Turn the A/C switch to ON at condition of step 1.  | Does the radiator sub fan rotate faster when A/C compressor is operated? | Radiator sub fan system is okay.                    | Go to step 17.   |
| 3 | <b>CHECK POWER SUPPLY TO SUB FAN MOTOR.</b><br><b>CAUTION:</b><br><b>Be careful not to overheat the engine during repair.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from sub fan motor.<br>3) Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F).<br>4) Stop the engine and turn ignition switch to ON.<br>5) Measure the voltage between sub fan motor connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F16) No. 1 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?   | Go to step 4.                                       | Go to step 7.  |
| 4 | <b>CHECK GROUND CIRCUIT OF SUB FAN MOTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between sub fan motor connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F16) No. 3 — Chassis ground:</b><br><b>(F16) No. 4 — Chassis ground:</b>  | Is the resistance less than 5 Ω?   | Go to step 5.                                       | Repair the open circuit in harness between sub fan motor connector and chassis ground. |
| 5 | <b>CHECK POOR CONTACT.</b><br>Check poor contact in sub fan motor connector.  | Is there poor contact in sub fan motor connector?                        | Repair the poor contact in sub fan motor connector. | Go to step 6.  |
| 6 | <b>CHECK SUB FAN MOTOR.</b><br>Connect the battery positive (+) terminal to terminal No. 1, and ground (-) terminal to terminal No. 3 or No. 4 of sub fan motor connector.  | Does the sub fan rotate?   | Repair the poor contact in sub fan motor connector. | Replace the sub fan motor with a new one.  |

# Radiator Sub Fan System

COOLING

| Step  | Check                                      | Yes  | No   |
|---|--|--|--|
| <b>7 CHECK POWER SUPPLY TO SUB FAN RELAY1.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the sub fan relay1 from A/C relay holder.<br>3) Measure the voltage between sub fan relay1 terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F27) No. 8 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?             | Go to step 8.  | Go to step 9.  |
| <b>8 CHECK POWER SUPPLY TO SUB FAN RELAY1.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between sub fan relay1 terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F27) No. 5 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?             | Go to step 12.   | Go to step 11.   |
| <b>9 CHECK 20 A FUSE.</b><br>1) Remove the 20 A fuse from A/C relay holder.<br>2) Check the condition of fuse.  | Is the fuse blown out?                     | Replace the fuse.  | Go to step 10.   |
| <b>10 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL.</b><br>Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F27) No. 3 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?             | Repair the open circuit in harness between 20 A fuse and sub fan relay terminal. | Repair the open circuit in harness between sub fuse box connector and 20 A fuse terminal.      |
| <b>11 CHECK FUSE.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the fuse No. 17 from joint box.<br>3) Check the condition of fuse.  | Is the fuse blown out?                     | Replace the fuse.  | Repair the open circuit in harness between sub fan relay and ignition switch.                  |
| <b>12 CHECK SUB FAN RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the sub fan relay1.<br>3) Measure the resistance of sub fan relay1.<br><b>Terminals</b><br><b>No. 8 — No. 9:</b>   | Is the resistance more than 1 M $\Omega$ ? | Go to step 13.   | Replace the sub fan relay.   |
| <b>13 CHECK SUB FAN RELAY.</b><br>1) Connect the battery to terminals No. 5 and No. 7 of sub fan relay1.<br>2) Measure the resistance of sub fan relay.<br><b>Terminals</b><br><b>No. 8 — No. 9:</b>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 14.   | Replace the sub fan relay.   |
| <b>14 CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.</b><br>Measure the resistance of harness between sub fan motor connector and sub fan relay terminal.<br><b>Connector &amp; terminal</b><br><b>(F16) No. 1 — (F27) No. 9:</b>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 15.   | Repair the open circuit in harness between sub fan motor connector and sub fan relay terminal. |

# Radiator Sub Fan System

COOLING

| Step   | Check   | Yes   | No   |
|--|---|---|--|
| <b>15 CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between sub fan relay connector and ECM connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F27) No. 7 — (B136) No. 18:</b></i>  | Is the resistance less than 1 $\Omega$ ?                          | Go to step 16.                                      | Repair the open circuit in harness between sub fan relay and ECM.  |
| <b>16 CHECK POOR CONTACT.</b><br>Check poor contact in connector between sub fan and ECM.  | Is there poor contact in connector between sub fan motor and ECM? | Repair the poor contact connector.                  | Record the DTC. Repair the trouble cause. <Ref. to EN(H4SO)(diag)-35, Read Diagnostic Trouble Code (DTC).> |
| <b>17 CHECK POWER SUPPLY TO SUB FAN MOTOR.</b><br><b>CAUTION:</b><br><b>Be careful not to overheat the engine during repair.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from sub fan motor.<br>3) Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F).<br>4) Turn the A/C switch ON.<br>5) Measure the voltage while A/C compressor is rotating.<br>6) Measure the voltage between sub fan motor connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F16) No. 2 (+) — Chassis ground (-):</b></i> | Is the voltage more than 10 V?                                    | Go to step 18.                                      | Go to step 20.   |
| <b>18 CHECK POOR CONTACT.</b><br>Check poor contact in sub fan motor connector.  | Is there poor contact in sub fan motor connector?                 | Repair the poor contact in sub fan motor connector. | Go to step 19.   |
| <b>19 CHECK SUB FAN MOTOR.</b><br>Connect the battery positive (+) terminal to terminal No. 2, and ground (-) terminal to terminal No. 3 or No. 4 of sub fan motor connector.  | Does the sub fan rotate?  | Repair the poor contact in sub fan motor connector. | Replace the sub fan motor with a new one.  |
| <b>20 CHECK POWER SUPPLY TO SUB FAN RELAY2.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the sub fan relay2 from A/C relay holder.<br>3) Measure the voltage between sub fan relay2 terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F27) No. 21 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10 V?                                    | Go to step 21.                                      | Go to step 22.   |
| <b>21 CHECK POWER SUPPLY TO SUB FAN RELAY2.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between sub fan relay2 terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F27) No. 24 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10 V?                                    | Go to step 25.                                      | Go to step 24.   |

# Radiator Sub Fan System

COOLING

| Step   | Check   | Yes  | No   |
|--|---|--|--|
| <b>22 CHECK 20 A FUSE.</b><br>1) Remove the 20 A fuse from A/C relay holder.<br>2) Check the condition of fuse.  | Is the fuse blown out?  | Replace the fuse.  | Go to step <b>23</b> .   |
| <b>23 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL.</b><br>Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(F27) No. 3 (+) — Chassis ground (-):</i>  | Is the voltage more than 10 V?                                    | Repair the open circuit in harness between 20 A fuse and sub fan relay terminal. | Repair the open circuit in harness between sub fuse box connector and 20 A fuse terminal.                  |
| <b>24 CHECK FUSE.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the fuse No. 17 from joint box.<br>3) Check the condition of fuse.   | Is the fuse blown out?  | Replace the fuse.  | Repair the open circuit in harness between sub fan relay and ignition switch.                              |
| <b>25 CHECK SUB FAN RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the sub fan relay.<br>3) Measure the resistance of sub fan relay.<br><i>Terminals</i><br><i>No. 20 — No. 21:</i>  | Is the resistance more than 1 M $\Omega$ ?                        | Go to step <b>26</b> .   | Replace the sub fan relay.   |
| <b>26 CHECK SUB FAN RELAY.</b><br>1) Connect the battery to terminals No. 22 and No. 24 of sub fan relay.<br>2) Measure the resistance of sub fan relay.<br><i>Terminals</i><br><i>No. 20 — No. 21:</i>  | Is the resistance less than 1 $\Omega$ ?                          | Go to step <b>27</b> .   | Replace the sub fan relay.   |
| <b>27 CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.</b><br>Measure the resistance of harness between sub fan motor connector and sub fan relay terminal.<br><i>Connector &amp; terminal</i><br><i>(F16) No. 2 — (F27) No. 20:</i>  | Is the resistance less than 1 $\Omega$ ?                          | Go to step <b>28</b> .   | Repair the open circuit in harness between sub fan motor connector and sub fan relay terminal.             |
| <b>28 CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between sub fan relay connector and ECM connector.<br><i>Connector &amp; terminal</i><br><i>(F27) No. 22 — (B136) No. 29:</i> | Is the resistance less than 1 $\Omega$ ?                          | Go to step <b>29</b> .   | Repair the open circuit in harness between sub fan relay and ECM.  |
| <b>29 CHECK POOR CONTACT.</b><br>Check poor contact in connector between sub fan and ECM.  | Is there poor contact in connector between sub fan motor and ECM? | Repair the poor contact connector.   | Record the DTC. Repair the trouble cause. <Ref. to EN(H4SO)(diag)-35, Read Diagnostic Trouble Code (DTC).> |



## 4. Engine Coolant

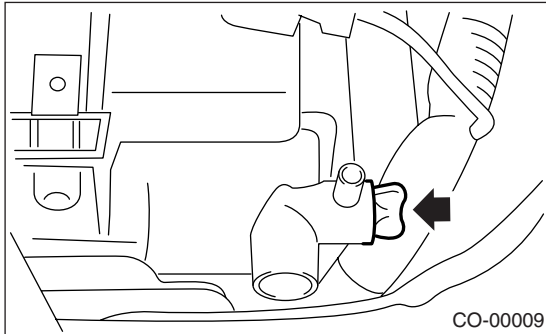
### A: REPLACEMENT

#### 1. DRAINING OF ENGINE COOLANT

- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Remove the drain plug to drain engine coolant into container.

**NOTE:**

- Remove the radiator cap so that engine coolant will drain faster.
- If engine coolant adheres to the exhaust pipe, wipe it off completely.



- 4) Install the drain plug.

#### 2. FILLING OF ENGINE COOLANT

- 1) Pour cooling system conditioner through the filler neck.

**Cooling system protective agent:**

**COOLING SYSTEM CONDITIONER (Part No. SOA635071)**

- 2) Fill engine coolant into the radiator up to filler neck position.

**Coolant capacity (fill up to "FULL" level):**

**AT model:**

**Approx. 6.9 ℓ (7.3 US qt, 6.1 Imp qt)**

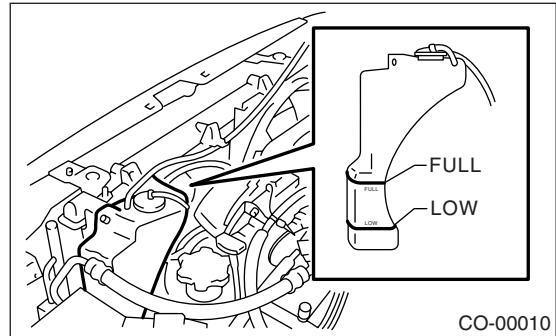
**MT model:**

**Approx. 7.0 ℓ (7.4 US qt, 6.2 Imp qt)**

**NOTE:**

The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crankcase. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

- 3) Fill engine coolant into the reservoir tank up to "FULL" level.



- 4) Close the radiator cap and start the engine. Race 5 to 6 times at less than 3,000 rpm, then stop the engine. (Complete this operation within 40 seconds.)
- 5) Wait for one minute after the engine stops, open the radiator cap. If the engine coolant level drops, add engine coolant into radiator up to the filler neck position.
- 6) Perform the procedures 4) and 5) again.
- 7) Attach the radiator cap and reservoir tank cap properly.
- 8) Start the engine and operate the heater at maximum hot position and the blower speed setting to "LO".
- 9) Run the engine at 2,000 rpm or less until radiator fan starts and stops.

**NOTE:**

- Be careful with the engine coolant temperature gauge to prevent overheating.
  - If the radiator hose becomes to harden by the pressure of engine coolant, air bleeding operation seems to be almost completed.
- 10) Stop the engine and wait until engine coolant temperature lowers to 30°C (86°F).
  - 11) Open the radiator cap. If the engine coolant level drops, add engine coolant into radiator up to the filler neck position and reservoir tank to "FULL" level.
  - 12) Attach the radiator cap and reservoir tank cap properly.
  - 13) Operate the heater at maximum hot position and the blower speed setting to "LO" and start the engine. Race at less than 3,000 rpm. If the flowing sound is heard at this time, perform the procedures from 9) again.

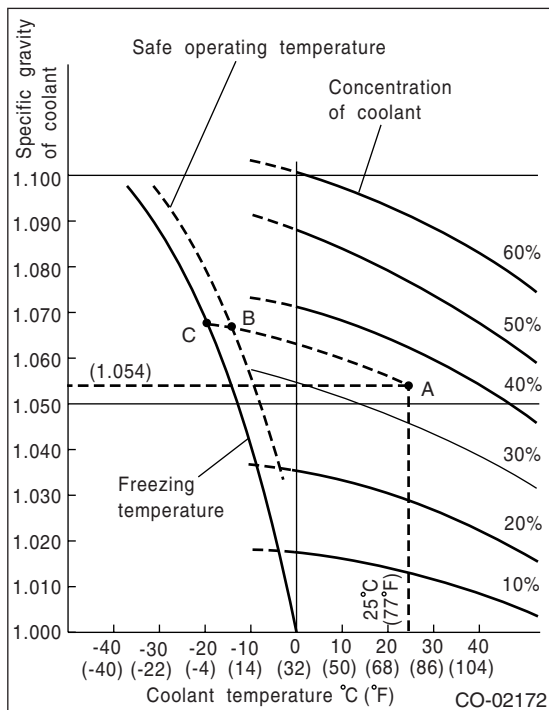
## B: INSPECTION

### 1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.

[Example]

If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054 and the concentration is 35% (point A), the safe operating temperature is -14°C (7°F) (point B), and the freezing temperature is -20°C (-4°F) (point C).



### 2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

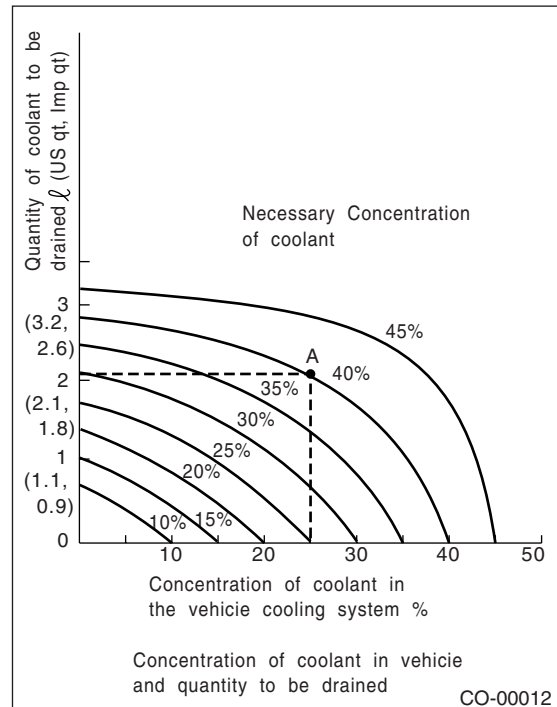
To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50%).

The amount of coolant that should be replaced can be determined using the diagram.

[Example]

Assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 ℓ (2.2 US qt, 1.8 Imp qt). Drain 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.

If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.



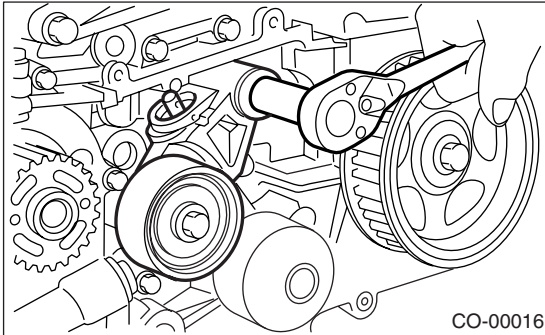
# Water Pump

COOLING

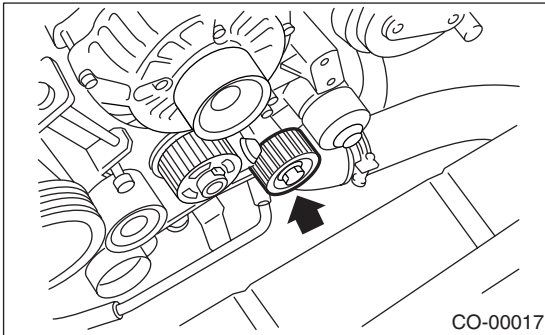
## 5. Water Pump

### A: REMOVAL

- 1) Remove the radiator. <Ref. to CO(H4SO)-23, REMOVAL, Radiator.>
- 2) Remove the V-belts.  
<Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
- 3) Remove the crank pulley.  
<Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>
- 4) Remove the timing belt.  
<Ref. to ME(H4SO)-44, TIMING BELT, REMOVAL, Timing Belt.>
- 5) Remove the automatic belt tension adjuster.



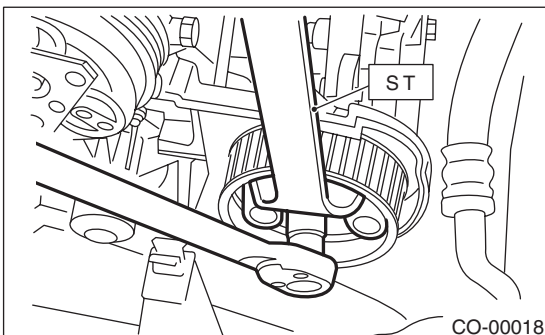
- 6) Remove the belt idler No. 2.



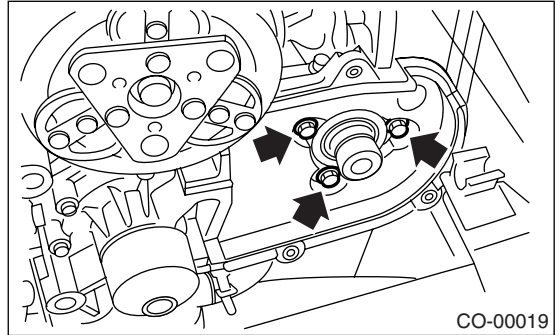
- 7) Remove the cam sprocket (LH) by using ST.  
ST 18231AA010 CAM SPROCKET WRENCH

#### NOTE:

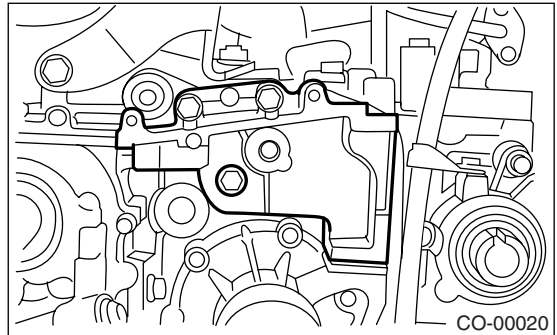
Also the CAM SPROCKET WRENCH (499207100) can be used.



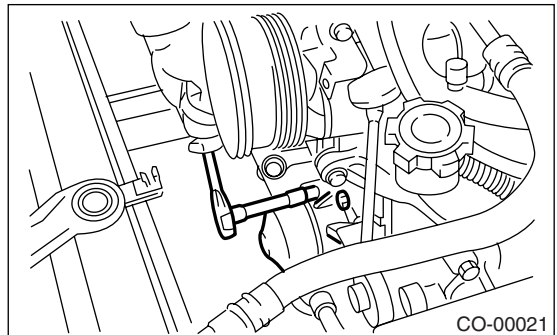
- 8) Remove the belt cover No. 2 (LH).



- 9) Remove the tensioner bracket.



- 10) Disconnect the hose from water pump.
- 11) Remove the water pump.



### B: INSTALLATION

- 1) Install the water pump onto cylinder block (LH).

#### NOTE:

- Replace the gasket with a new one.
- When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in the figure.

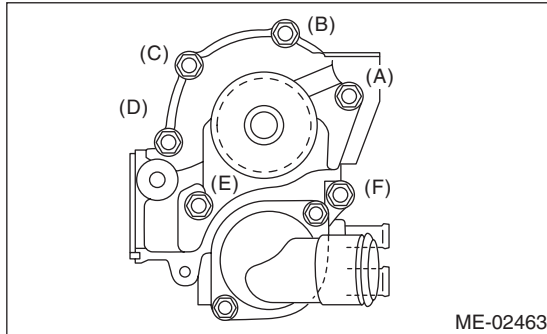
**Tightening torque:**

**First:**

**12 N·m (1.2 kgf·m, 8.7 ft·lb)**

**Second:**

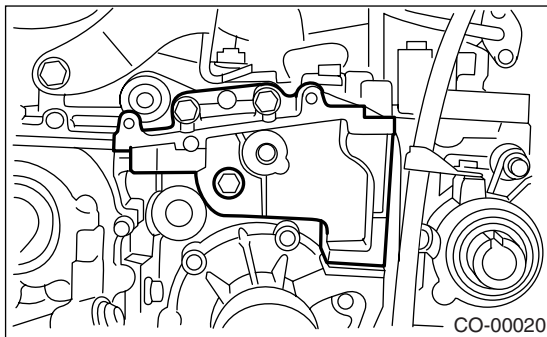
**12 N·m (1.2 kgf·m, 8.7 ft·lb)**



- 2) Connect the hose to water pump.
- 3) Install the tensioner bracket.

**Tightening torque:**

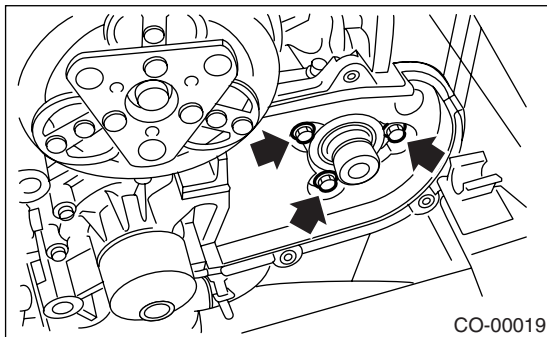
**24.5 N·m (2.5 kgf·m, 18.1 ft·lb)**



- 4) Install the belt cover No. 2 (LH).

**Tightening torque:**

**5 N·m (0.5 kgf·m, 3.6 ft·lb)**



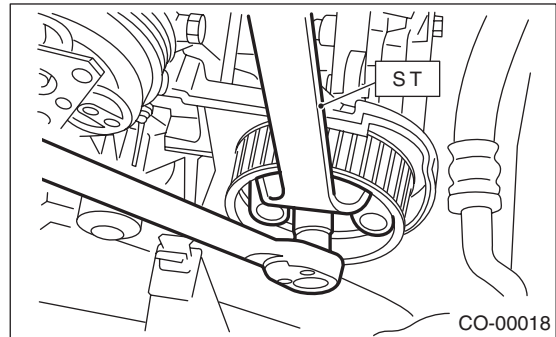
- 5) Install the cam sprockets (LH) by using ST.  
ST 18231AA010 CAM SPROCKET WRENCH

**NOTE:**

Also the CAM SPROCKET WRENCH (499207100) can be used.

**Tightening torque:**

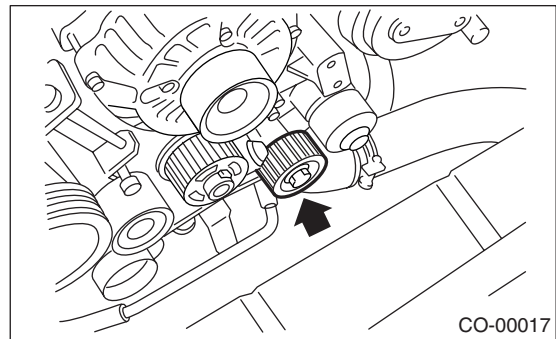
**78 N·m (8.0 kgf·m, 57.9 ft·lb)**



- 6) Install the belt idler No. 2.

**Tightening torque:**

**39 N·m (4.0 kgf·m, 28.9 ft·lb)**



- 7) Install the automatic belt tension adjuster whose tension rod is held with pin. <Ref. to ME(H4SO)-45, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>
- 8) Install the timing belt. <Ref. to ME(H4SO)-46, TIMING BELT, INSTALLATION, Timing Belt.>
- 9) Install the crank pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crank Pulley.>
- 10) Install the V-belts. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>
- 11) Install the radiator. <Ref. to CO(H4SO)-24, INSTALLATION, Radiator.>

**C: INSPECTION**

- 1) Check the water pump bearing for smooth rotation.
- 2) Check the water pump pulley for abnormalities.
- 3) Check the impeller for damage or abnormal deformation.
- 4) Check the clearance between impeller and pump case.

# Water Pump

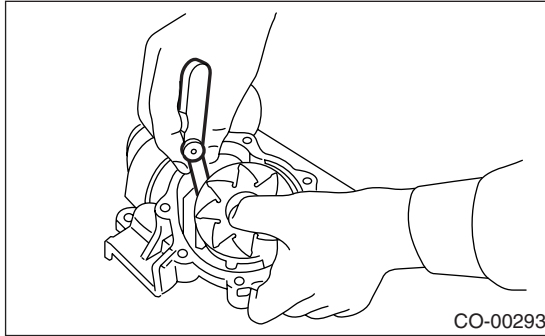
COOLING

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**Clearance between impeller and pump case:**

**Standard**

**0.5 — 1.5 mm (0.020 — 0.060 in)**

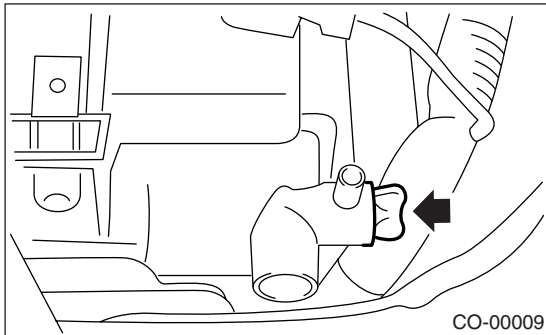


5) After water pump installation, check the pulley shaft for engine coolant leaks. If leaks are noted, replace the water pump assembly.

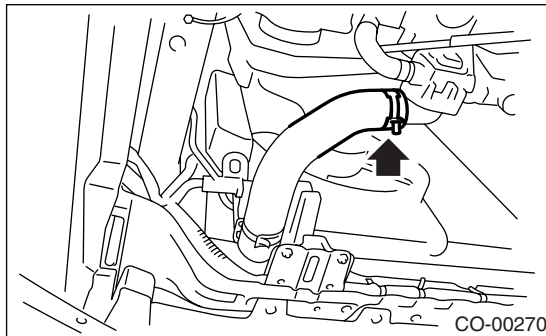
## 6. Thermostat

### A: REMOVAL

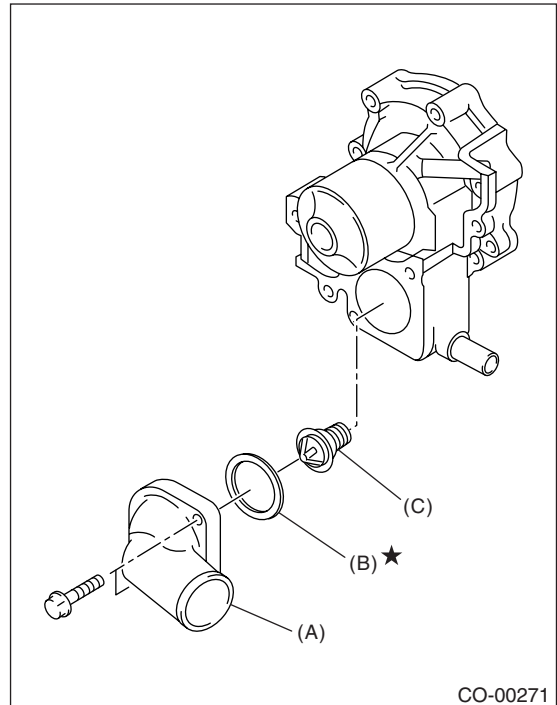
- 1) Set the vehicle on a lift.
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Drain the engine coolant completely. <Ref. to CO(H4SO)-16, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>



- 5) Disconnect the radiator outlet hose from thermostat cover.



- 6) Remove the thermostat cover, and then remove the gasket and thermostat.



- (A) Thermostat cover
- (B) Gasket
- (C) Thermostat

### B: INSTALLATION

- 1) Install a gasket to thermostat, and install the thermostat and gasket to water pump as a unit. Then, install the thermostat cover.

#### NOTE:

- When reinstalling the thermostat, use a new gasket.
- The thermostat must be installed with the jiggle pin facing to the up side.

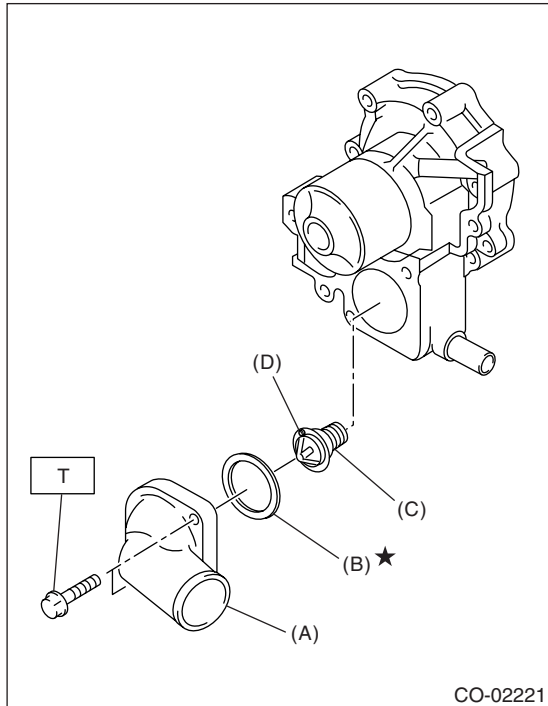


# Thermostat

## COOLING

### Tightening torque:

**12 N·m (1.2 kgf·m, 8.7 ft·lb)**



- (A) Thermostat cover
- (B) Gasket
- (C) Thermostat
- (D) Jiggle pin

- 2) Connect the radiator outlet hose to thermostat cover.
- 3) Install the under cover.
- 4) Lower the vehicle.
- 5) Fill with engine coolant. <Ref. to CO(H4SO)-16, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

## C: INSPECTION

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.

### • Inspection method

Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measured value should meet the specification.

### NOTE:

- Leave the thermostat in the boiling water for more than five minutes before measuring the valve lift.
- Hold the thermostat with a wire or the like to avoid contacting with container bottom.

### Starting temperature to open:

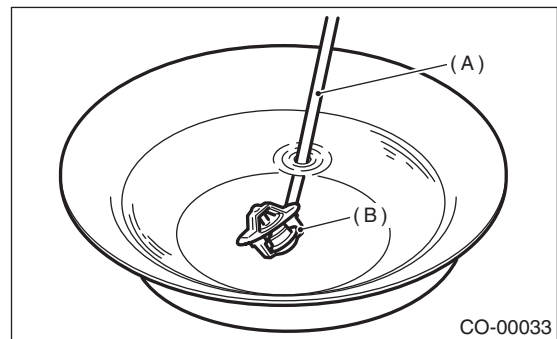
**80 — 84°C (176 — 183°F)**

### Fully opens:

**95°C (203°F)**

### Valve lift:

**9.0 mm (0.354 in) or more.**

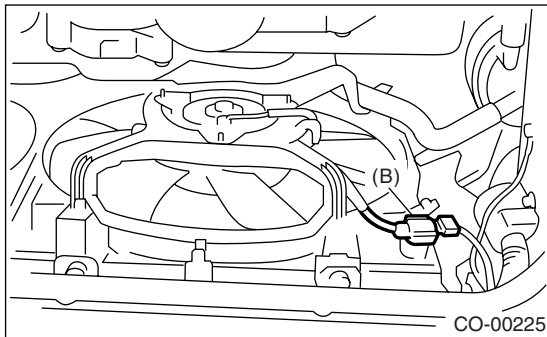
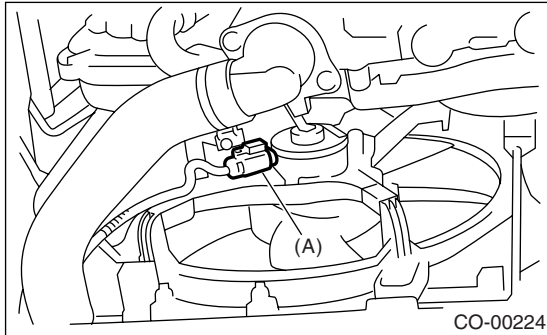


- (A) Thermometer
- (B) Thermostat

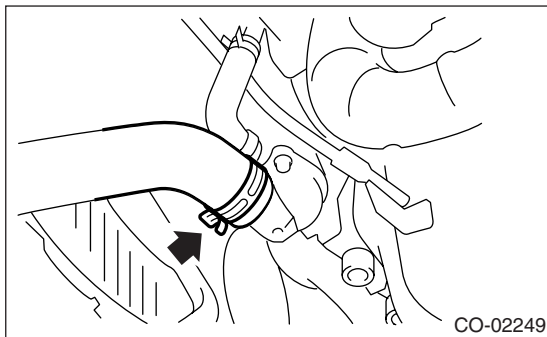
## 7. Radiator

### A: REMOVAL

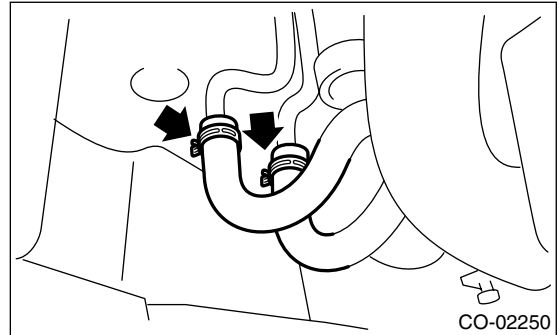
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Lift-up the vehicle.
- 4) Remove the under cover.
- 5) Drain the engine coolant completely. <Ref. to CO(H4SO)-16, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 6) Disconnect the connectors of radiator main fan motor (A) and sub fan motor (B).



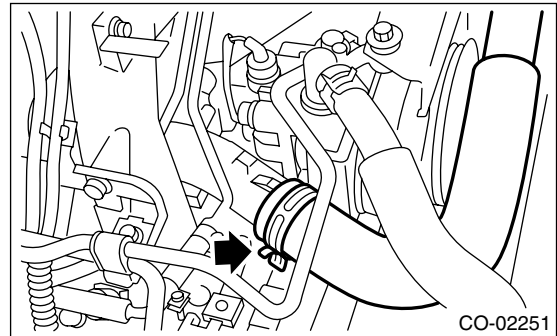
- 7) Disconnect the radiator outlet hose from water pump.



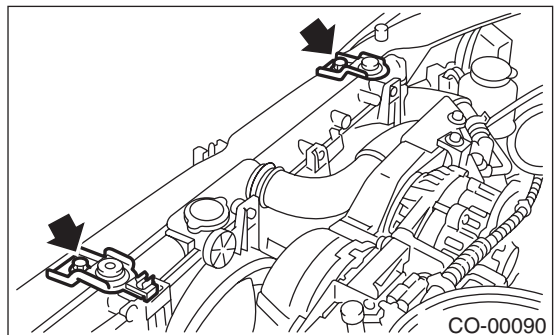
- 8) Disconnect the ATF cooler hoses from ATF pipe. (AT model) Plug the openings in the hose and radiator with caps in order to prevent ATF from leaking.



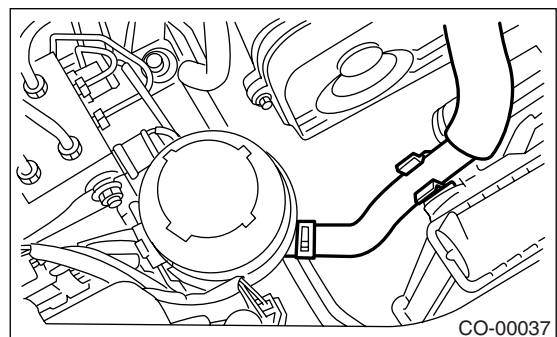
- 9) Lower the vehicle.
- 10) Disconnect the overflow hose.
- 11) Remove the reservoir tank. <Ref. to CO(H4SO)-29, REMOVAL, Reservoir Tank.>
- 12) Remove the air intake duct.
- 13) Disconnect the radiator inlet hose from engine.



- 14) Remove the radiator upper brackets.



- 15) Detach the power steering hose from clip on radiator.





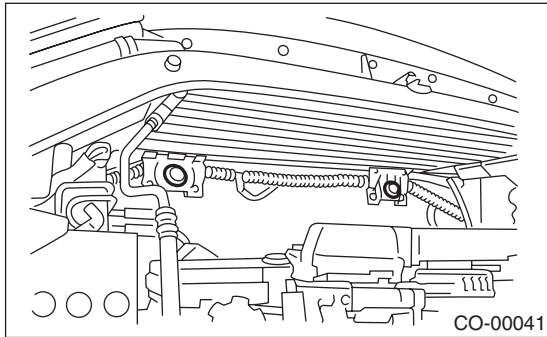
# Radiator

## COOLING

16) Lift the radiator up and away from the vehicle.

### B: INSTALLATION

1) Attach the radiator lower cushions to holes on the radiator lower bracket.



2) Install the radiator to vehicle.

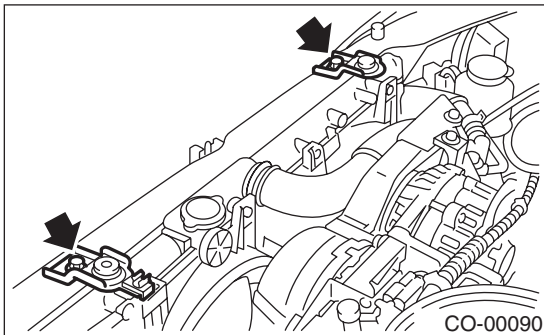
#### NOTE:

Fit the pins on lower side of radiator into the cushions on the body side.

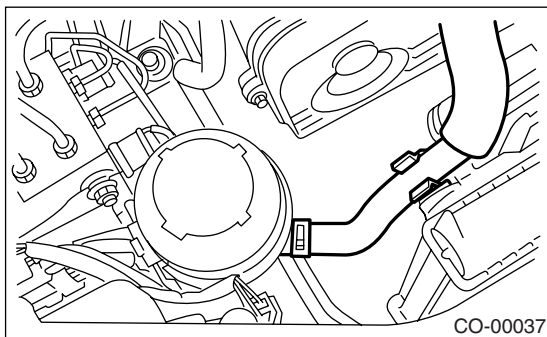
3) Install the radiator upper brackets, and then tighten the bolts.

#### Tightening torque:

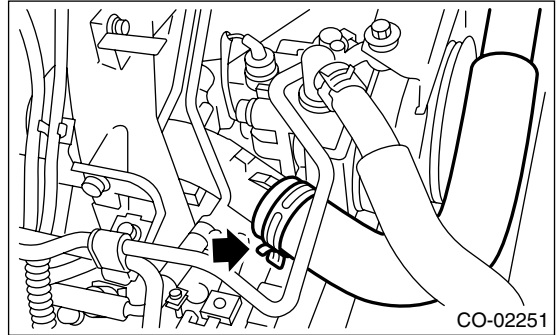
**18 N·m (1.8 kgf-m, 13.0 ft-lb)**



4) Attach the power steering hose to radiator.



5) Connect the radiator inlet hose.



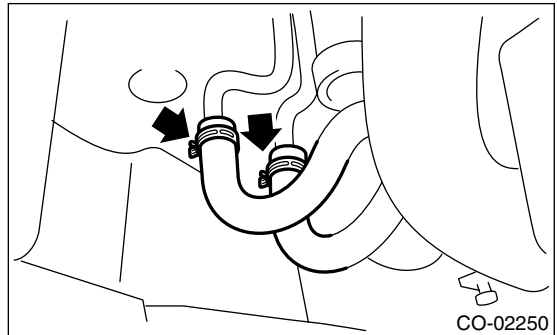
6) Install the air intake duct.

7) Install the reservoir tank.

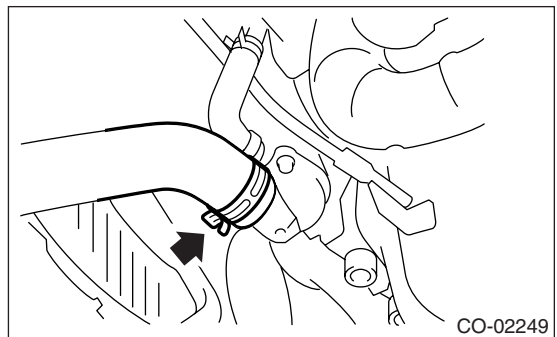
8) Connect the overflow hose.

9) Lift-up the vehicle.

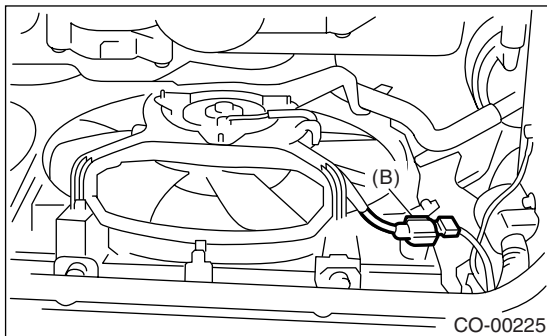
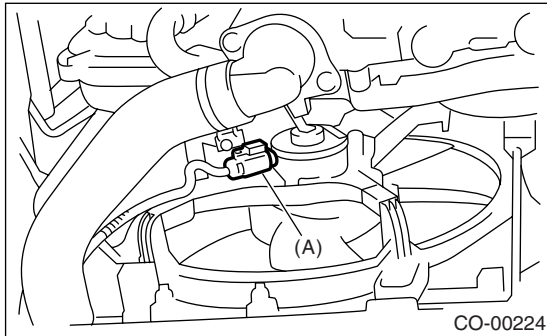
10) Connect the ATF cooler hoses. (AT model)



11) Connect the radiator outlet hose.



12) Connect the connectors to radiator main fan motor (A) and sub fan motor (B).



- If engine coolant adheres to the exhaust pipe, wipe it off completely.
- Be careful to prevent engine coolant from spurting out when removing the tester.
- Be careful also not to deform the filler neck of radiator when installing or removing tester.

13) Install the under cover.

14) Lower the vehicle.

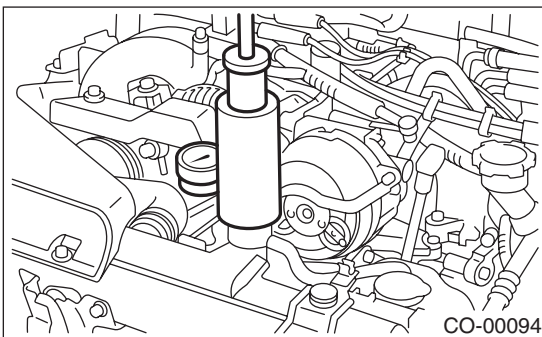
15) Connect the battery ground cable to battery.

16) Fill engine coolant. <Ref. to CO(H4SO)-16, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

17) Check the ATF level. <Ref. to 4AT-30, INSPECTION, Automatic Transmission Fluid.>

## C: INSPECTION

1) Remove the radiator cap, top off radiator, and then attach the tester to radiator in place of cap.



2) Apply a pressure of 157 kPa (1.6 kgf/cm<sup>2</sup>, 23 psi) to the radiator in the follow cases.

(1) Engine coolant leaks at/around radiator.

(2) Engine coolant leaks at/around hoses or connections.

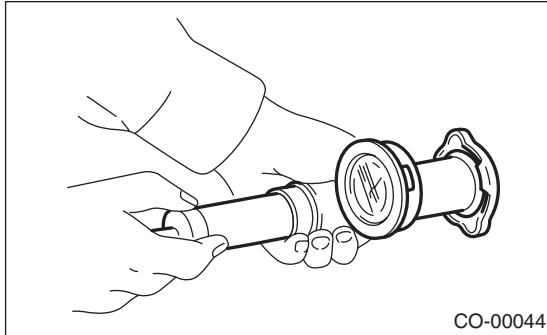
### CAUTION:

- Engine should be turned off.
- Wipe engine coolant from check points in advance.

## 8. Radiator Cap

### A: INSPECTION

1) Attach the radiator cap to tester.



2) Increase the pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for 5 to 6 seconds.

**Standard pressure:**

**93 — 123 kPa (0.95 — 1.25 kgf/cm<sup>2</sup>, 14 — 18 psi)**

**Service limit pressure:**

**83 kPa (0.85 kgf/cm<sup>2</sup>, 12 psi)**

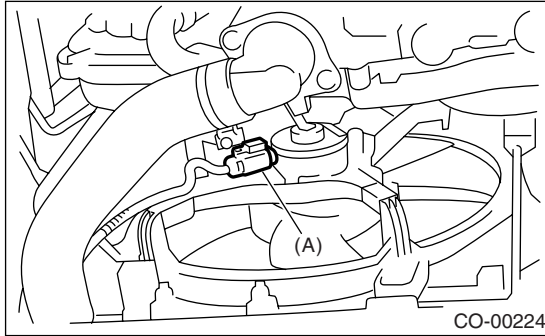
**CAUTION:**

**Be sure to remove foreign matter and rust from the cap in advance. Otherwise, results of pressure test will be incorrect.**

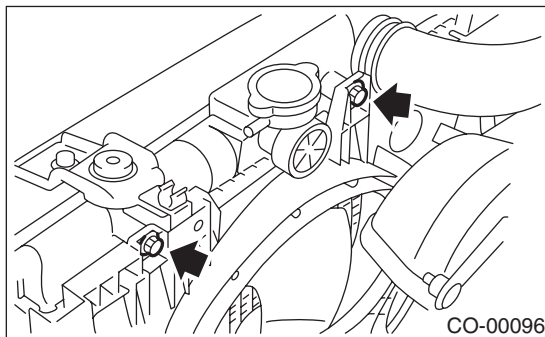
## 9. Radiator Main Fan and Fan Motor

### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Lift-up the vehicle.
- 4) Remove the under cover.
- 5) Disconnect the connector of main fan motor (A).



- 6) Remove the ATF hose from clip of radiator main fan motor assembly. (AT model)
- 7) Lower the vehicle.
- 8) Disconnect the overflow hose.
- 9) Remove the reservoir tank. <Ref. to CO(H4SO)-29, REMOVAL, Reservoir Tank.>
- 10) Remove the bolts which secure the radiator main fan shroud to radiator.



- 11) Remove the radiator fan motor assembly.

### B: INSTALLATION

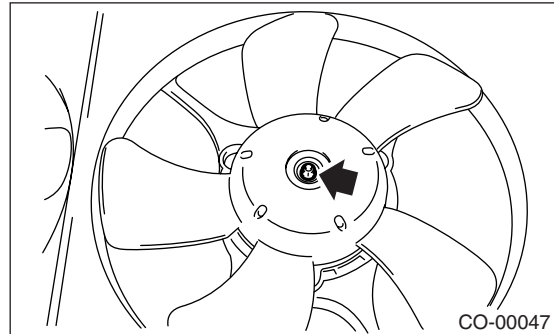
Install in the reverse order of removal.

#### NOTE:

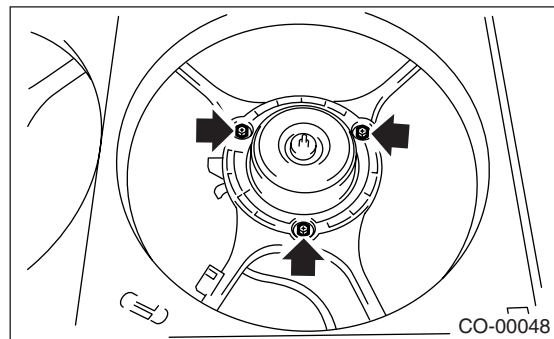
- If it is difficult to install the radiator main fan motor assembly, first loosen the bolts which hold the radiator sub fan motor assembly.
- Refer to COMPONENT for tightening torque. <Ref. to CO(H4SO)-3, COMPONENT, General Description.>

### C: DISASSEMBLY

- 1) Remove the nut which holds the fan onto fan motor.



- 2) Remove the bolts which install the fan motor onto shroud.

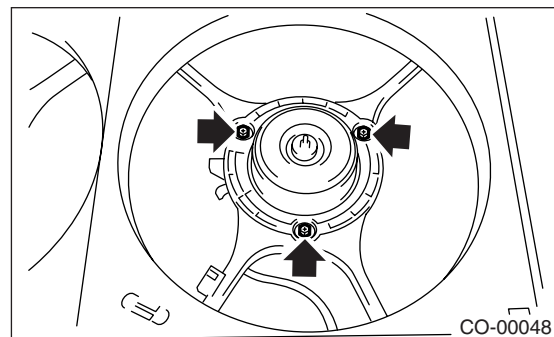


### D: ASSEMBLY

Assemble in the reverse order of disassembly.

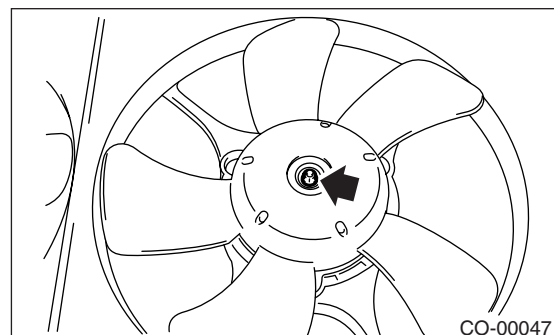
#### Tightening torque:

**4.4 N·m (0.45 kgf·m, 3.3 ft·lb)**



#### Tightening torque:

**3.4 N·m (0.35 kgf·m, 2.5 ft·lb)**



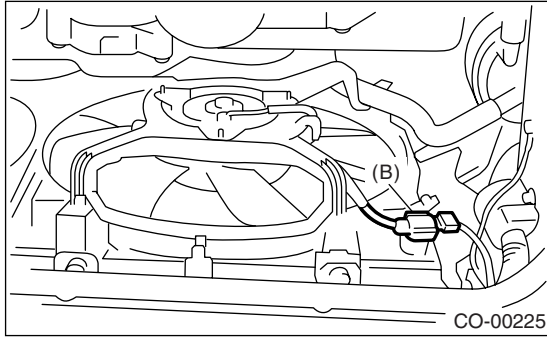
# Radiator Sub Fan and Fan Motor

COOLING

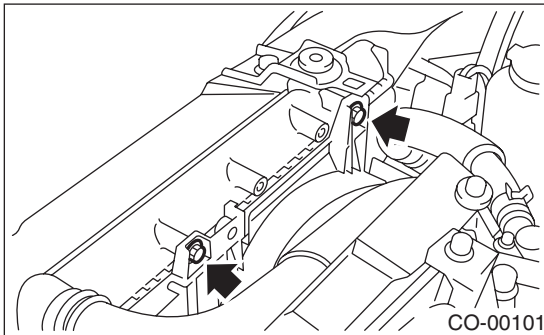
## 10. Radiator Sub Fan and Fan Motor

### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Lift-up the vehicle.
- 4) Remove the under cover.
- 5) Disconnect the connector of sub fan motor (B).



- 6) Remove the ATF hose from clips of radiator sub fan motor assembly. (AT model)
- 7) Lower the vehicle.
- 8) Remove the air intake duct.
- 9) Remove the bolts which hold the radiator sub fan shroud to radiator.



- 10) Remove the radiator sub fan motor assembly through the under side of vehicle.

### B: INSTALLATION

Install in the reverse order of removal.

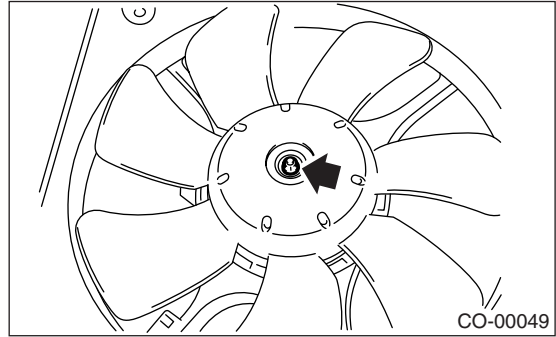
#### NOTE:

Refer to COMPONENT for tightening torque. <Ref. to CO(H4SO)-3, COMPONENT, General Description.>

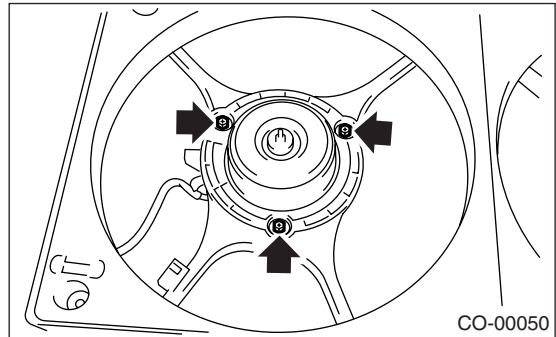
### C: DISASSEMBLY

- 1) Remove the clip which holds the motor connector onto shroud.

- 2) Remove the nut which holds the fan onto fan motor.



- 3) Remove the bolts which install the fan motor onto shroud.

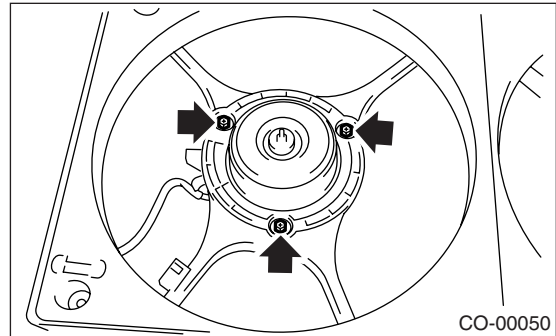


### D: ASSEMBLY

Assemble in the reverse order of disassembly.

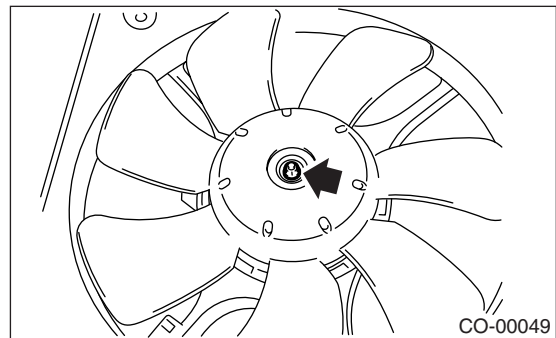
#### Tightening torque:

**4.4 N·m (0.45 kgf·m, 3.3 ft·lb)**



#### Tightening torque:

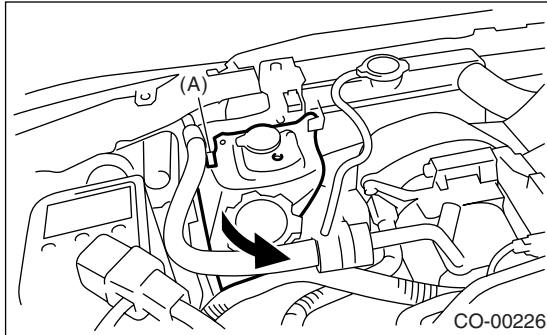
**3.4 N·m (0.35 kgf·m, 2.5 ft·lb)**



## 11. Reservoir Tank

### A: REMOVAL

- 1) Disconnect the overflow hose from the radiator filler neck position.
- 2) While pressing the pawl (A), remove the reservoir tank by pulling in the direction of arrow.



### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

Make sure the engine coolant level is between "FULL" and "LOW".

# Engine Cooling System Trouble in General

COOLING

## 12.Engine Cooling System Trouble in General

### A: INSPECTION

| Trouble                        | Possible cause  | Corrective action  |
|--------------------------------|---|--|
| Over-heating                   | a. Insufficient engine coolant  | Replenish the engine coolant, inspect for leakage, and repair.   |
|                                | b. Loose timing belt  | Repair or replace the timing belt tensioner.   |
|                                | c. Oil on timing belt   | Replace.   |
|                                | d. Malfunction of thermostat  | Replace.   |
|                                | e. Malfunction of water pump  | Replace.   |
|                                | f. Clogged engine coolant passage   | Clean.   |
|                                | g. Improper ignition timing   | Inspect and repair the ignition control system.<br><Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.> |
|                                | h. Clogged or leaking radiator  | Clean or repair, or replace.   |
|                                | i. Improper engine oil in engine coolant  | Replace the engine coolant.  |
|                                | j. Air/fuel mixture ratio too lean  | Inspect and repair the fuel injection system.<br><Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>   |
|                                | k. Excessive back pressure in exhaust system  | Clean or replace.  |
|                                | l. Insufficient clearance between piston and cylinder   | Adjust or replace.   |
|                                | m. Slipping clutch  | Repair or replace.   |
| n. Dragging brake              | Adjust.   |  |
| o. Malfunction of radiator fan | Inspect the radiator fan relay, engine coolant temperature sensor or radiator motor and replace them. |  |
| Over-cooling                   | a. Atmospheric temperature extremely low  | Partly cover the radiator front area.  |
|                                | b. Defective thermostat   | Replace.   |
| Engine coolant leaks           | a. Loosened or damaged connecting units on hoses  | Repair or replace.   |
|                                | b. Leakage from water pump  | Replace.   |
|                                | c. Leakage from water pipe  | Repair or replace.   |
|                                | d. Leakage around cylinder head gasket  | Retighten the cylinder head bolts or replace gasket.   |
|                                | e. Damaged or cracked cylinder head and cylinder block  | Repair or replace.   |
|                                | f. Damaged or cracked thermostat case   | Repair or replace.   |
|                                | g. Leakage from radiator  | Repair or replace.   |
| Noise                          | a. Defective timing belt  | Replace.   |
|                                | b. Defective radiator fan   | Replace.   |
|                                | c. Defective water pump bearing   | Replace the water pump.  |
|                                | d. Defective water pump mechanical seal   | Replace the water pump.  |

# LUBRICATION

# *LU(H4SO)*

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|  | <b>Page</b> |
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| 5. Oil Pan and Strainer.....                         | 15          |
| 6. Oil Pressure Switch.....                          | 18          |
| 7. Engine Oil Filter.....                            | 19          |
| 8. Engine Lubrication System Trouble in General..... | 20          |



# General Description

LUBRICATION

## 1. General Description

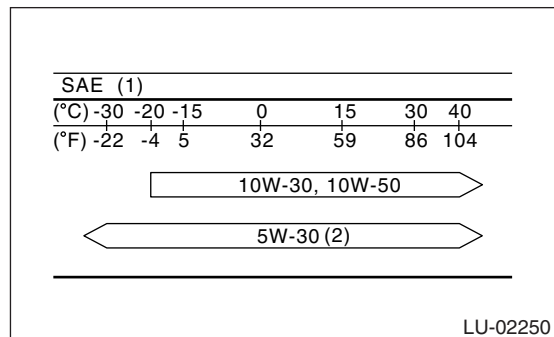
### A: SPECIFICATION

| Lubrication method               |  |                          | Forced lubrication                                   |
|----------------------------------|--|--------------------------|--|
| Oil pump                         | Pump type  |                          | Trochoid type  |
|                                  | Number of teeth                                  | Inner rotor              | 9  |
|                                  |  | Outer rotor              | 10   |
|                                  | Outer rotor diameter × thickness                 |                          | 78 × 10 mm (3.07 × 0.39 in)                          |
|                                  | Tip clearance between inner and outer rotor      | STANDARD                 | 0.04 — 0.14 mm (0.0016 — 0.0055 in)                  |
|                                  |  | LIMIT                    | 0.18 mm (0.0071 in)                                  |
|                                  | Side clearance between inner rotor and pump case | STANDARD                 | 0.02 — 0.07 mm (0.0008 — 0.0028 in)                  |
|                                  |  | LIMIT                    | 0.12 mm (0.0047 in)                                  |
|                                  | Case clearance between outer rotor and pump case | STANDARD                 | 0.10 — 0.175 mm (0.0039 — 0.0069 in)                 |
|                                  |  | LIMIT                    | 0.20 mm (0.0079 in)                                  |
| Capacity at 80°C (176°F)         | 600 rpm  | Discharge pressure       | 98 kPa (1.0 kgf/cm <sup>2</sup> , 14 psi)            |
|                                  |  | Discharge quantity       | 4.6 ℓ (4.9 US qt, 4.0 Imp qt)/min.                   |
|                                  | 5,000 rpm  | Discharge pressure       | 294 kPa (3.0 kgf/cm <sup>2</sup> , 43 psi)           |
|                                  |  | Discharge quantity       | 47 ℓ (49.7 US qt, 41.4 Imp qt)/min.                  |
| Relief valve operation pressure  |  |                          | 588 kPa (6.0 kgf/cm <sup>2</sup> , 85 psi)           |
| Oil filter                       | Type   |                          | Full-flow filter type                                |
|                                  | Filtration area                                  | Diameter 65 mm (2.56 in) | 470 cm <sup>2</sup> (73 sq in)                       |
|                                  |  | Diameter 68 mm (2.68 in) | 800 cm <sup>2</sup> (124 sq in)                      |
|                                  | By-pass valve opening pressure                   |                          | 160 kPa (1.63 kgf/cm <sup>2</sup> , 23.2 psi)        |
|                                  | Outer diameter × width                           | Diameter 65 mm (2.56 in) | 65 × 74.4 mm (2.56 × 2.93 in)                        |
|                                  |  | Diameter 68 mm (2.68 in) | 68 × 65 mm (2.68 × 2.56 in)                          |
| Oil filter to engine thread size |  | M 20 × 1.5               |  |
| Oil pressure switch              | Type   |                          | Immersed contact point type                          |
|                                  | Working voltage — wattage                        |                          | 12 V — 3.4 W or less                                 |
|                                  | Warning light activation pressure                |                          | 14.7 kPa (0.15 kgf/cm <sup>2</sup> , 2.1 psi)        |
|                                  | Proof pressure                                   |                          | More than 981 kPa (10 kgf/cm <sup>2</sup> , 142 psi) |
| Engine oil                       | Capacity (at overhaul)                           |                          | 4.8 ℓ (5.1 US qt, 4.2 Imp qt)                        |
|                                  | When replacing engine oil and oil filter         |                          | 4.2 ℓ (4.4 US qt, 3.7 Imp qt)                        |
|                                  | When replacing engine oil only                   |                          | 4.0 ℓ (4.2 US qt, 3.5 Imp qt)                        |

#### Recommended oil:

**API standard SM with the “Energy Conserving” logo is printed.**

**ILSAC standard, GF4 “Star burst mark” label is on the container.**



- (1) SAE viscosity No. and applicable temperature  
 (2) Recommended

The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

**CAUTION:**

**When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API standard and SAE viscosity No. designated by SUBARU.**

**NOTE:**

If the vehicle is used in areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API standard:

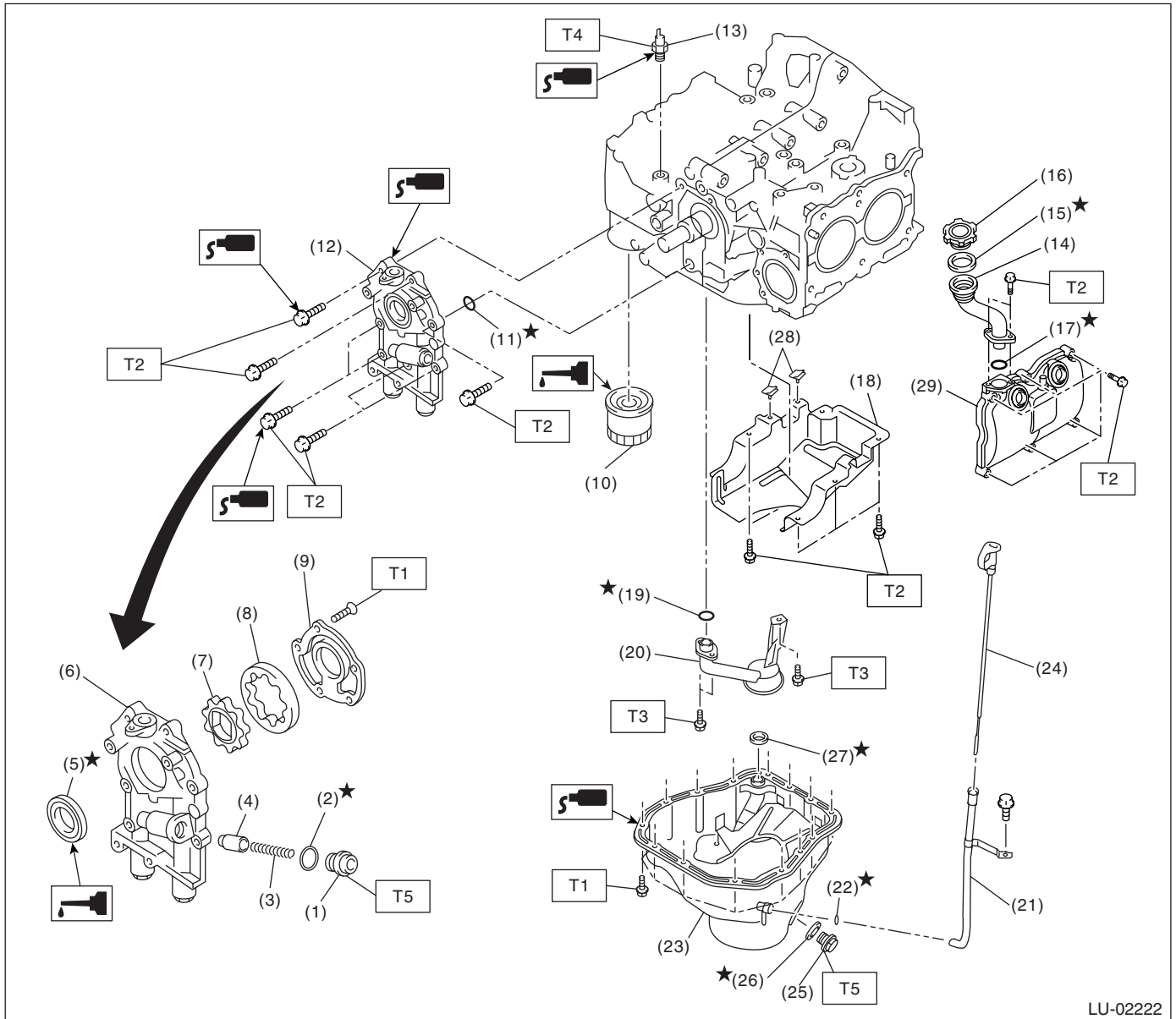
SM or SL

SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.

# General Description

LUBRICATION

## B: COMPONENT



LU-02222

- |                         |                            |                   |
|-------------------------|----------------------------|-------------------|
| (1) Plug                | (13) Oil pressure switch   | (25) Drain plug   |
| (2) Gasket              | (14) Oil filler duct       | (26) Metal gasket |
| (3) Relief valve spring | (15) O-ring                | (27) Gasket       |
| (4) Relief valve        | (16) Oil filler cap        | (28) Seal         |
| (5) Oil seal            | (17) O-ring                | (29) Rocker cover |
| (6) Oil pump case       | (18) Baffle plate          |                   |
| (7) Inner rotor         | (19) O-ring                |                   |
| (8) Outer rotor         | (20) Oil strainer          |                   |
| (9) Oil pump cover      | (21) Oil level gauge guide |                   |
| (10) Oil filter         | (22) O-ring                |                   |
| (11) O-ring             | (23) Oil pan               |                   |
| (12) Oil pump ASSY      | (24) Oil level gauge       |                   |

### Tightening torque: N-m (kgf-m, ft-lb)

**T1: 5.4 (0.55, 4.0)**

**T2: 6.4 (0.65, 4.7)**

**T3: 10 (1.0, 7.2)**

**T4: 25 (2.5, 18.1)**

**T5: 44 (4.5, 32.5)**

LU(H4SO)-4

### **C: CAUTION**

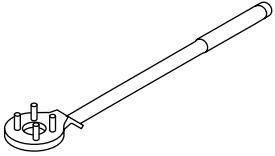
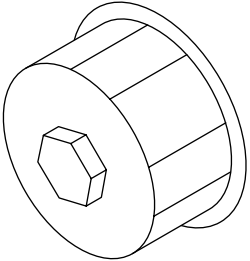
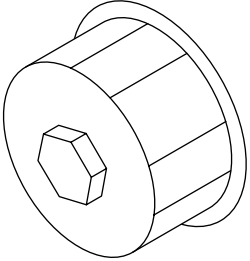
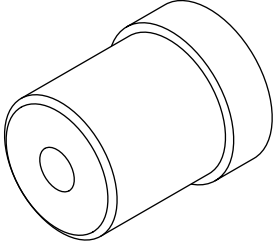
- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

# General Description

LUBRICATION

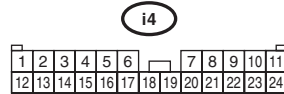
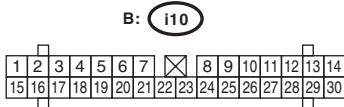
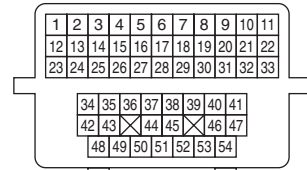
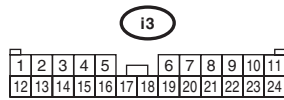
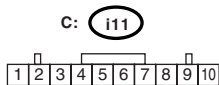
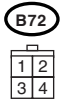
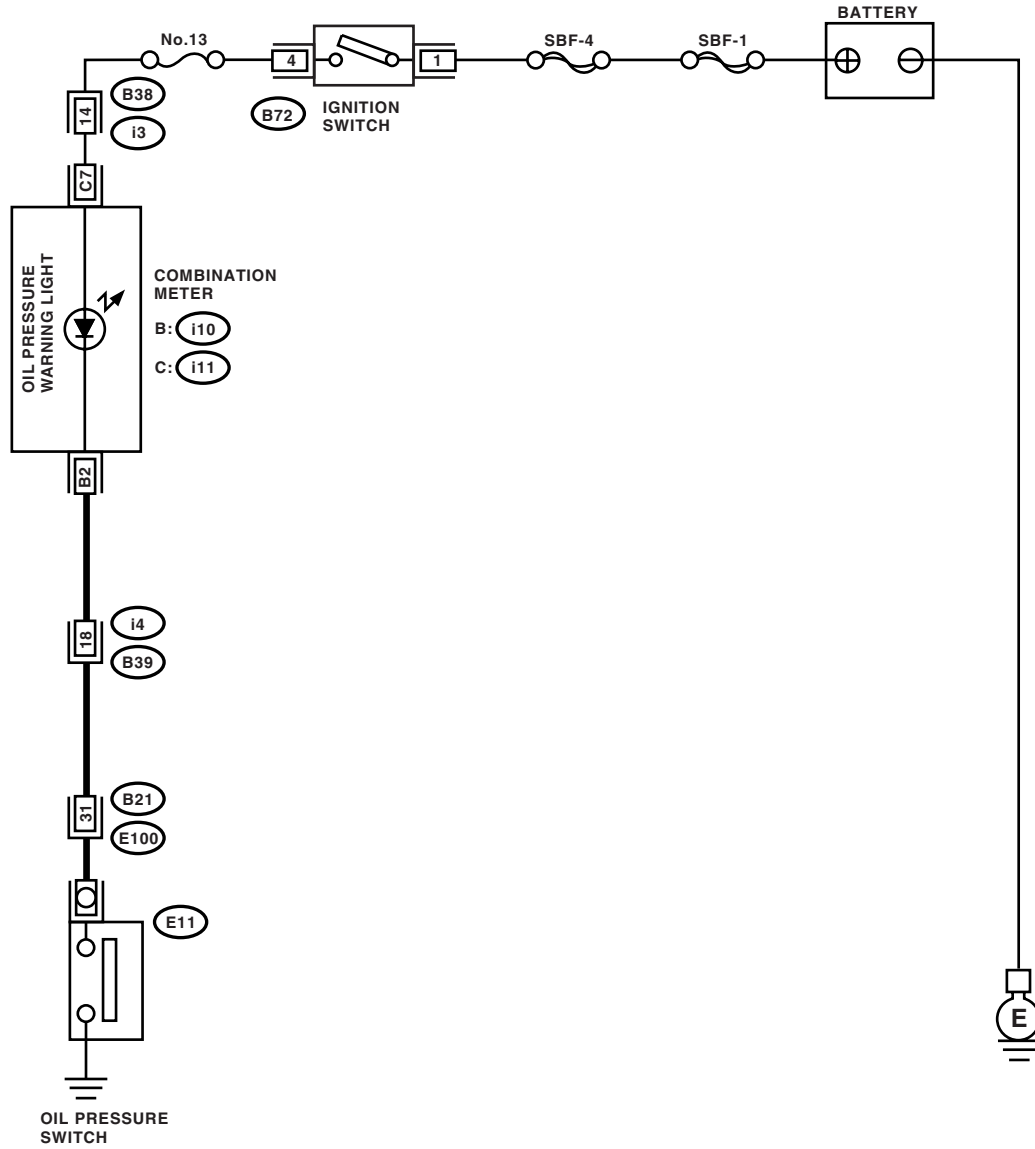
## D: PREPARATION TOOL

### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION         | REMARKS   |
|---|-------------|---------------------|---|
|  <p style="text-align: center;">ST-499977100</p>   | 499977100   | CRANK PULLEY WRENCH | Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt. |
|  <p style="text-align: center;">ST18332AA000</p>  | 18332AA000  | OIL FILTER WRENCH   | Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))                        |
|  <p style="text-align: center;">ST18332AA010</p> | 18332AA010  | OIL FILTER WRENCH   | Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))                        |
|  <p style="text-align: center;">ST-499587100</p> | 499587100   | OIL SEAL INSTALLER  | Used for installing oil pump oil seal.  |

## 2. Oil Pressure System

### A: WIRING DIAGRAM



LU-02241

# Oil Pressure System

LUBRICATION

## B: INSPECTION

| Step  | Check                                     | Yes  | No  |
|---|---|--|---|
| <b>1 CHECK COMBINATION METER.</b><br>1) Turn the ignition switch to ON (engine OFF).<br>2) Check other warning lights.  | Does the warning lights go on?            | Go to step 2.  | Repair or replace the combination meter. <Ref. to IDI-3, INSPECTION, Combination Meter System.> |
| <b>2 CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from oil pressure switch.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage of harness between the oil pressure switch connector and chassis ground.<br><i>Connector &amp; terminal<br/>(E11) No. 1 (+) — Chassis ground (-):</i> | Is the voltage more than 10 V?            | Replace the oil pressure switch.   | Go to step 3.   |
| <b>3 CHECK COMBINATION METER.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the combination meter.<br>3) Measure the resistance of combination meter.<br><i>Terminals<br/>(i11) No. 7 — (i10) No. 2:</i>  | Is the resistance less than 10 $\Omega$ ? | Replace the harness connector between combination meter and oil pressure switch. | Repair or replace the combination meter. <Ref. to IDI-3, INSPECTION, Combination Meter System.> |

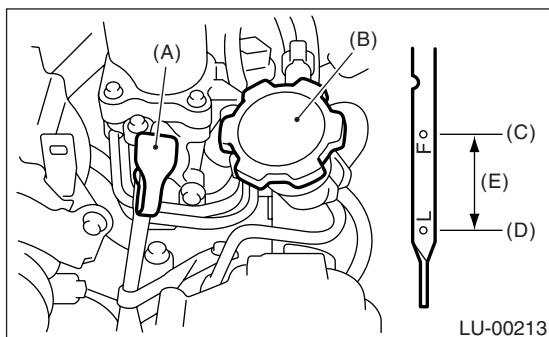
## 3. Engine Oil

### A: INSPECTION

- 1) Park the vehicle on a level surface.
- 2) After turning off the engine, wait a few minutes for the oil to drain back into the oil pan before checking the level.
- 3) Just after driving or while the engine is warm, engine oil level may show in the range between the "F" line and notch mark. This is caused by thermal expansion of the engine oil.
- 4) Remove the oil level gauge and wipe it clean.
- 5) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
- 6) Remove it again and note the reading. If the engine oil level is below the "L" line, add oil to bring the level up to "F" line.

**NOTE:**

To prevent overfilling the engine oil, do not add oil above the "F" line when the engine is cold.



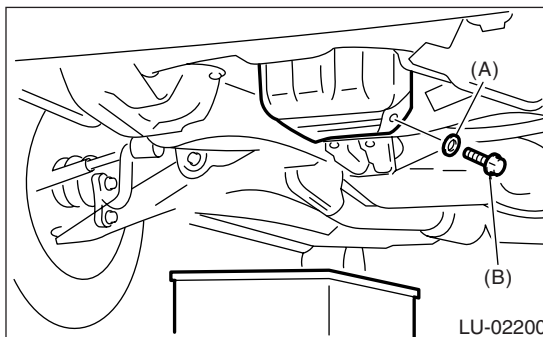
- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

### B: REPLACEMENT

- 1) Open the engine oil filler cap for quick draining of the engine oil.
- 2) Lift up the vehicle.
- 3) Drain the engine oil by loosening the engine oil drain plug.

**NOTE:**

Prepare the container for draining of engine oil.



- (A) Gasket
- (B) Drain plug

- 4) Replace the drain plug gasket.
- 5) Tighten the engine oil drain plug after draining engine oil.

**Tightening torque:**

**44 N·m (4.5 kgf-m, 32.5 ft-lb)**

- 6) Use the engine oil of proper quality and viscosity, fill engine oil through the oil filler duct up to upper level on level gauge. Make sure that the vehicle is placed level when checking oil level.

**Recommended oil:**

**API standard SM with the "Energy Conserving" logo is printed.**

**ILSAC standard, GF4 "Star burst mark" label is on the container.**

**Engine oil capacity:**

**Upper level**

**4.0 ℓ (4.2 US qt, 3.5 Imp qt)**

**Lower level**

**3.0 ℓ (3.2 US qt, 2.6 Imp qt)**

| SAE (1) |                        |
|---------|------------------------|
| (°C)    | -30 -20 -15 0 15 30 40 |
| (°F)    | -22 -4 5 32 59 86 104  |
|         | 10W-30, 10W-50         |
|         | 5W-30 (2)              |

LU-02250

- (1) SAE viscosity No. and applicable temperature
- (2) Recommended

The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.



# Engine Oil

## LUBRICATION

### CAUTION:

When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API standard and SAE viscosity No. designated by SUBARU.

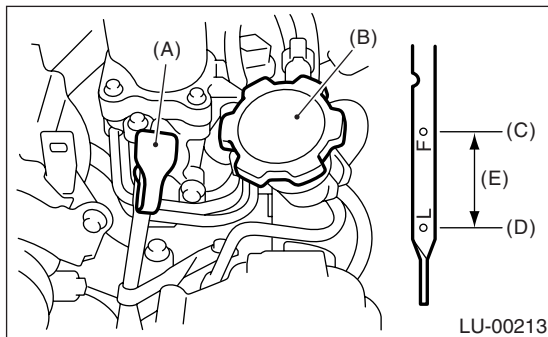
### NOTE:

If the vehicle is used in areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API standard: SM or SL  
SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.

7) Close the engine oil filler cap.

8) Start the engine and warm it up for a time.

9) After the engine stops, recheck the oil level. If necessary, add engine oil up to the upper level on level gauge.

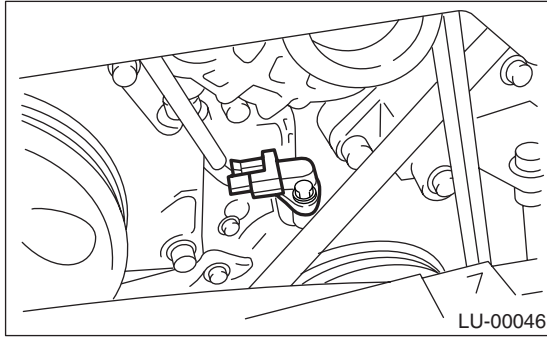


- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

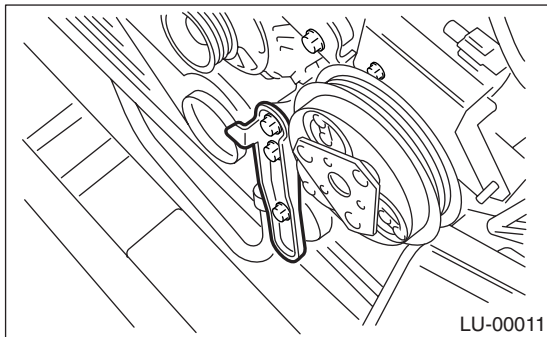
## 4. Oil Pump

### A: REMOVAL

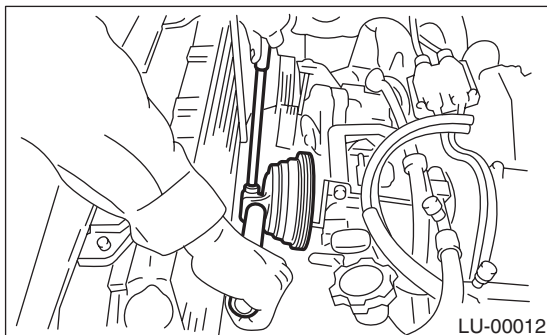
- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Lower the vehicle.
- 5) Remove the radiator. <Ref. to CO(H4SO)-23, REMOVAL, Radiator.>
- 6) Remove the crankshaft position sensor.



- 7) Remove the V-belts.  
<Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
- 8) Remove the belt tensioner.

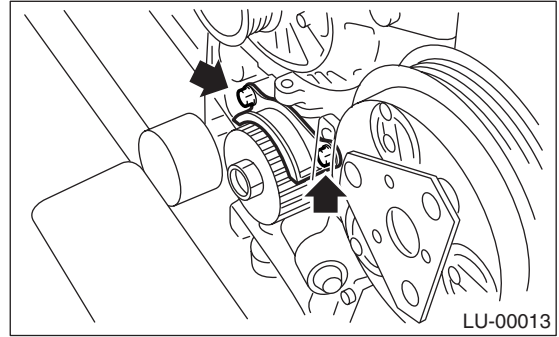


- 9) Remove the crankshaft pulley by using ST.  
ST 499977100 CRANK PULLEY WRENCH

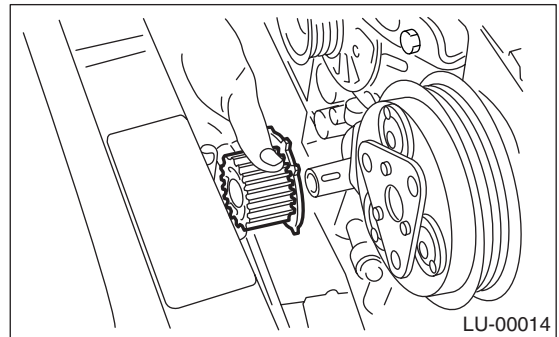


- 10) Remove the timing belt. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt.>

- 11) Remove the timing belt guide. (MT model)



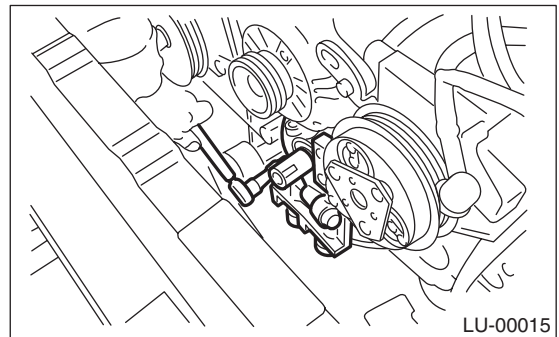
- 12) Remove the water pump. <Ref. to CO(H4SO)-18, REMOVAL, Water Pump.>
- 13) Remove the crank sprocket.



- 14) Remove the bolts which install the oil pump onto cylinder block.

#### NOTE:

If disassembling or inspecting the oil pump, loosen the plug of relief valve before removing the oil pump.



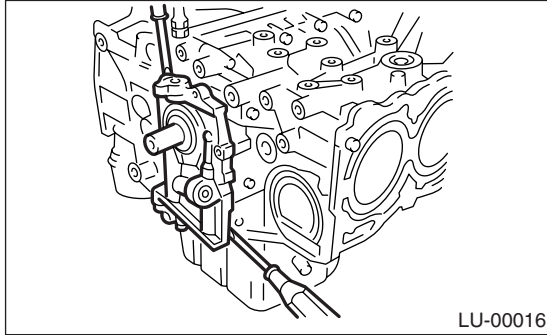
- 15) Remove the oil pump by using flat tip screwdriver.

# Oil Pump

## LUBRICATION

### CAUTION:

Be careful not to scratch the mating surfaces of cylinder block and oil pump.



### B: INSTALLATION

Install in the reverse order of removal.

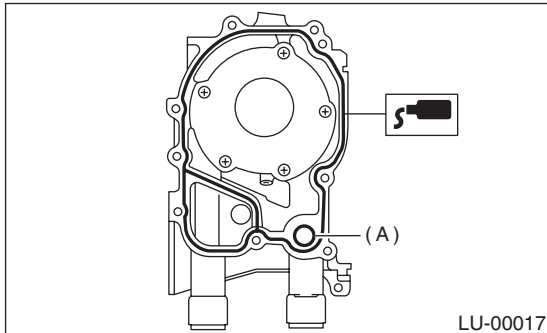
Do the following:

1) Apply liquid gasket to the matching surfaces of oil pump.

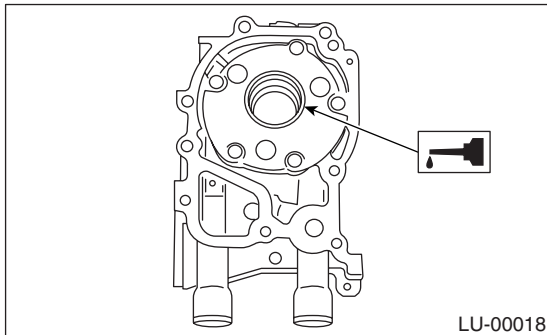
#### Liquid gasket:

**THREE BOND 1215 (Part No. 004403007) or equivalent**

2) Replace the O-ring (A) with a new one.



3) Apply a coat of engine oil to the inside of oil seal.



4) Be careful not to scratch the oil seal when installing oil pump on cylinder block.

5) Position the oil pump, aligning the notched area with crankshaft, and push the oil pump straight.

### CAUTION:

Make sure the oil seal lip is not folded.

6) Install the oil pump.

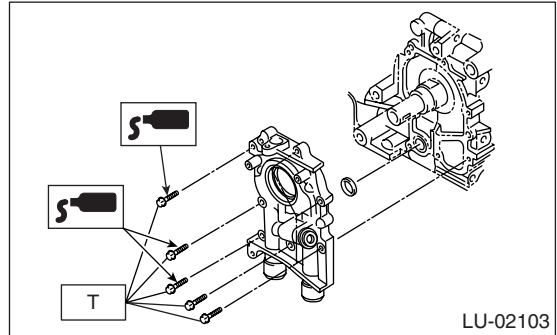
7) Apply liquid gasket to the threaded portion of three bolts in.

#### Liquid gasket:

**THREE BOND 1324 (Part No. 004403042) or equivalent**

#### Tightening torque:

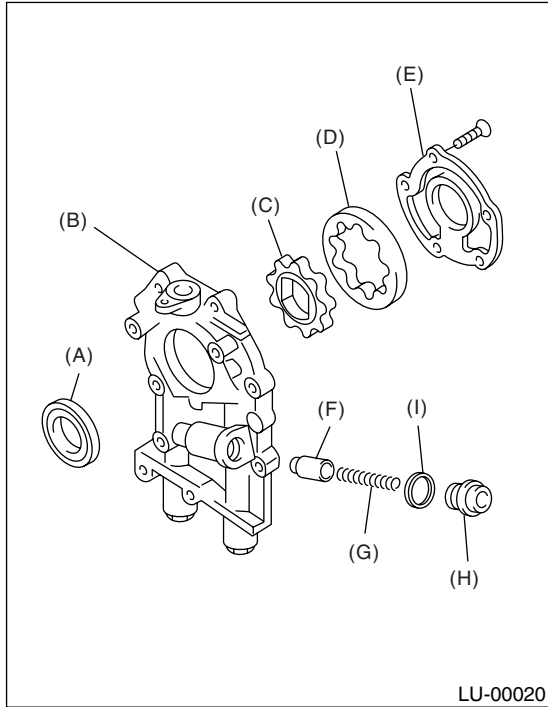
**6.4 N·m (0.65 kgf·m, 4.7 ft·lb)**



### C: DISASSEMBLY

Remove the screws which secure the oil pump cover and disassemble oil pump. Inscribe alignment marks on the inner and outer rotors so that they can be replaced in their original positions during reassembly.

**CAUTION:**  
Before disassembling the oil pump, remove the relief valve.

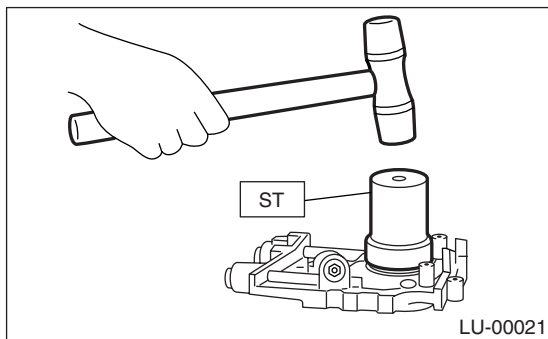


- (A) Oil seal
- (B) Oil pump case
- (C) Inner rotor
- (D) Outer rotor
- (E) Oil pump cover
- (F) Relief valve
- (G) Relief valve spring
- (H) Plug
- (I) Gasket

## D: ASSEMBLY

1) Install the front oil seal by using ST.  
ST 499587100 OIL SEAL INSTALLER

**NOTE:**  
Use a new oil seal.



2) Apply a coat of engine oil to the inner and outer rotors.

- 3) Install the inner and outer rotors in their original positions.
- 4) Install the oil relief valve and relief valve spring and plug.

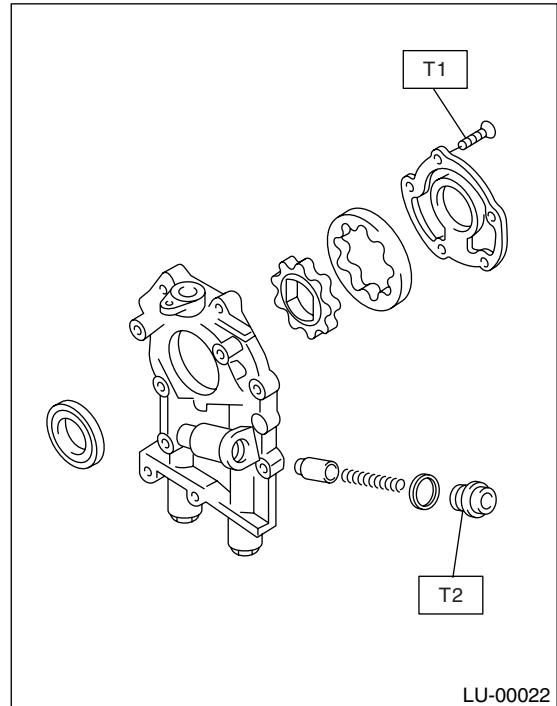
**NOTE:**  
Use a new gasket.

5) Install the oil pump cover.

### Tightening torque:

**T1: 5.4 N·m (0.55 kgf-m, 4.0 ft-lb)**

**T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)**



## E: INSPECTION

### 1. TIP CLEARANCE

Measure the tip clearance of rotors. If clearance exceeds the standard, replace the rotors as a matched set.

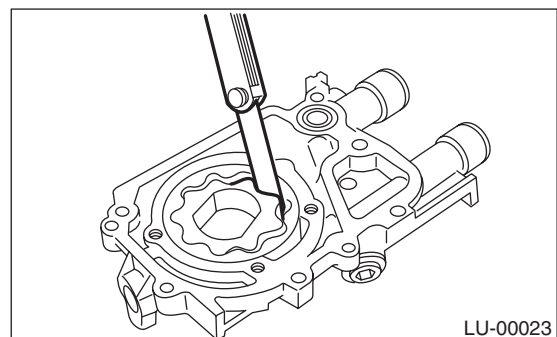
#### Tip clearance:

**Standard**

**0.04 — 0.14 mm (0.0016 — 0.0055 in)**

**Limit**

**0.18 mm (0.0071 in)**



## 2. CASE CLEARANCE

Measure the clearance between the outer rotor and oil pump rotor housing. If clearance exceeds the standard, replace the rotor.

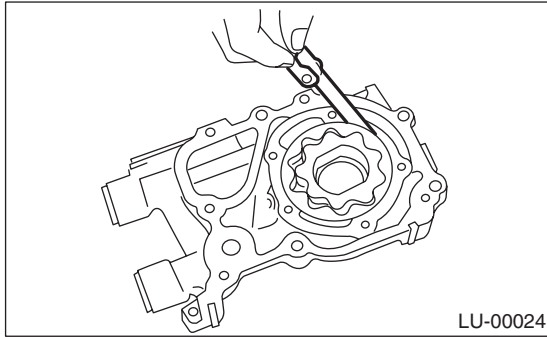
### **Case clearance:**

#### **Standard**

**0.10 — 0.175 mm (0.0039 — 0.0069 in)**

#### **Limit**

**0.20 mm (0.0079 in)**



## 3. SIDE CLEARANCE

Measure the clearance between the oil pump inner rotor and pump cover. If clearance exceeds the standard, replace the rotor or pump body.

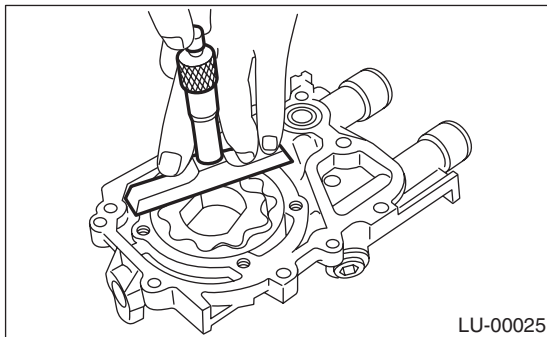
### **Side clearance:**

#### **Standard**

**0.02 — 0.07 mm (0.0008 — 0.0028 in)**

#### **Limit**

**0.12 mm (0.0047 in)**



## 4. OIL RELIEF VALVE

Check the valve for fitting condition and damage, and the relief valve spring for damage and deterioration. Replace the parts if defective.

### **Relief valve spring:**

#### **Free length**

**73.7 mm (2.902 in)**

#### **Installed length**

**54.7 mm (2.154 in)**

#### **Load when installed**

**93.1 N (9.49 kgf, 20.88 lbf)**

## 5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks, and other faults.

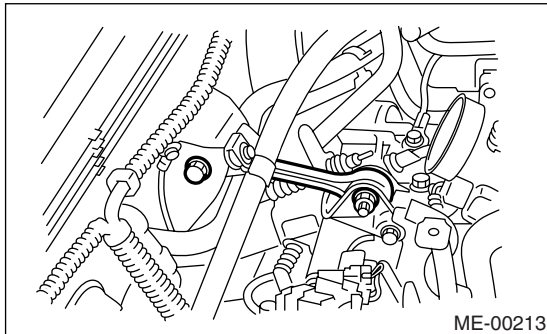
## 6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

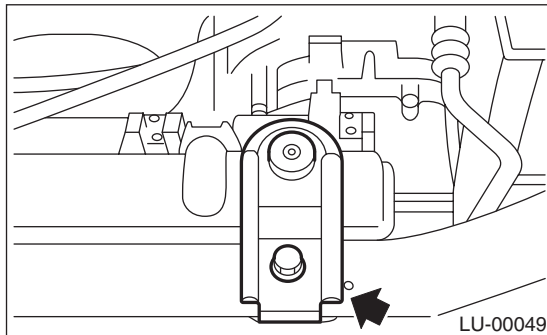
## 5. Oil Pan and Strainer

### A: REMOVAL

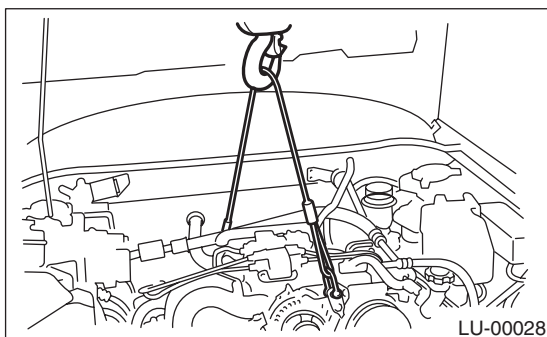
- 1) Set the vehicle on a lift.
- 2) Remove the front wheels.
- 3) Disconnect the ground cable from battery.
- 4) Remove the air intake duct and air cleaner case.  
<Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>  
and <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
- 5) Remove the resonator chamber. <Ref. to IN(H4SO)-8, REMOVAL, Resonator Chamber.>
- 6) Remove the pitching stopper.



- 7) Remove the radiator upper brackets.



- 8) Support the engine with a lifting device and wire ropes.



- 9) Lift-up the vehicle.

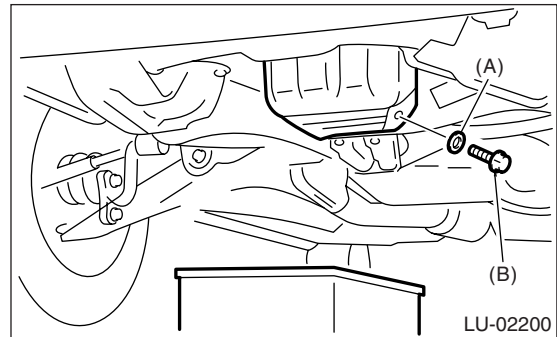
**CAUTION:**

**When lifting up the vehicle, rise up the wire rope together.**

- 10) Remove the under cover.

- 11) Drain the engine oil.

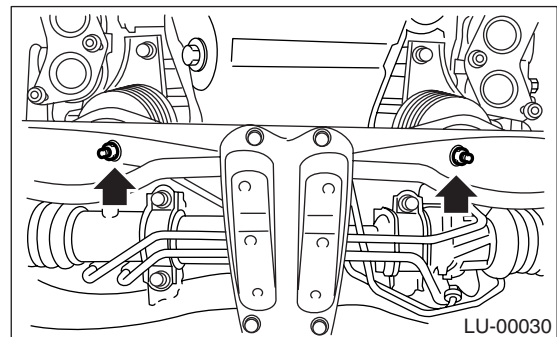
Set a container under the vehicle, and then remove the drain plug from oil pan.



- (A) Gasket
- (B) Drain plug

- 12) Remove the front and center exhaust pipes.  
<Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>

- 13) Remove the nuts which install the front cushion rubber onto front crossmember.



- 14) Remove the bolts which install the oil pan on cylinder block while raising up engine.

- 15) Insert the oil pan cutter blade to the clearance between the cylinder block and oil pan.

**CAUTION:**

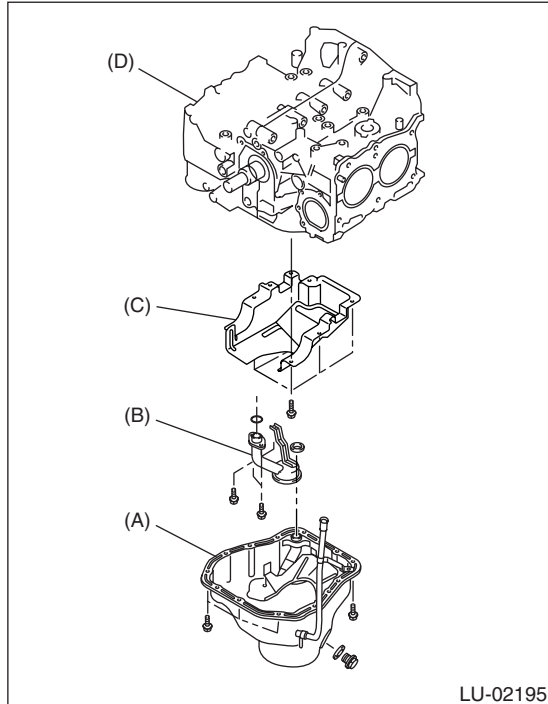
**Do not use a screwdriver or similar tool in place of oil pan cutter.**

- 16) Remove the oil strainer.

# Oil Pan and Strainer

## LUBRICATION

17) Remove the baffle plate.



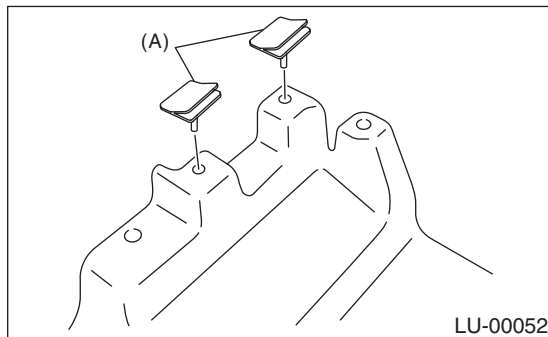
- (A) Oil pan
- (B) Oil strainer
- (C) Baffle plate
- (D) Cylinder block

## B: INSTALLATION

### CAUTION:

**Before installing the oil pan, clean the sealant from oil pan and engine block.**

1) Check the seal (A) is securely installed in baffle plate in the direction as shown in the figure.



2) Install the baffle plate.

### Tightening torque:

**6.4 N·m (0.65 kgf·m, 4.7 ft·lb)**

3) Install the oil strainer onto baffle plate.

### NOTE:

Replace the O-ring with a new one.

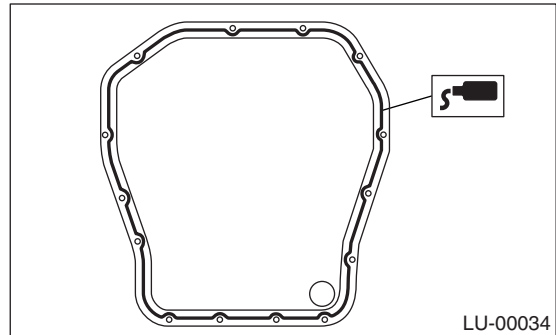
### Tightening torque:

**10 N·m (1.0 kgf·m, 7.2 ft·lb)**

4) Apply liquid gasket to the mating surfaces, and then install the oil pan.

### Liquid gasket:

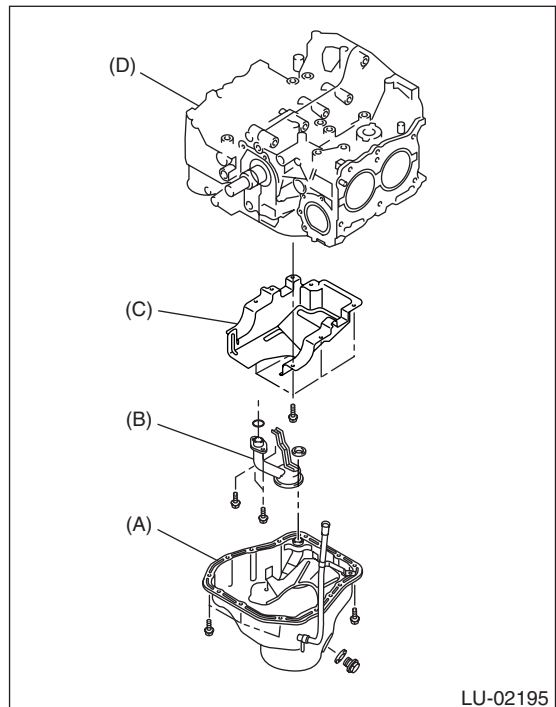
**THREE BOND 1207C (Part No. 004403012) or equivalent**



5) Tighten the bolts which install the oil pan onto engine block.

### Tightening torque:

**5.4 N·m (0.55 kgf·m, 4.0 ft·lb)**



- (A) Oil pan
- (B) Oil strainer
- (C) Baffle plate
- (D) Cylinder block

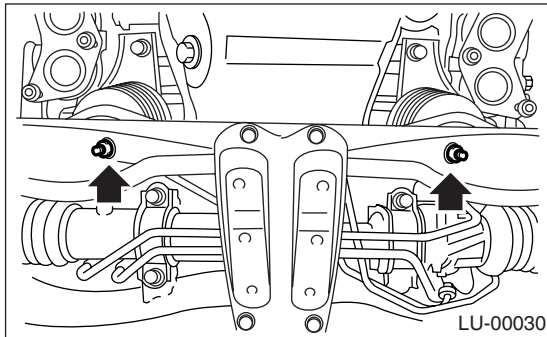
6) Lower the engine onto front crossmember.

7) Tighten the nuts which install the front cushion rubber onto front crossmember.



**Tightening torque:**

**69 N·m (7.0 kgf-m, 50.9 ft-lb)**



8) Install the front and center exhaust pipes. <Ref. to EX(H4SO)-4, INSTALLATION, Front Exhaust Pipe.>

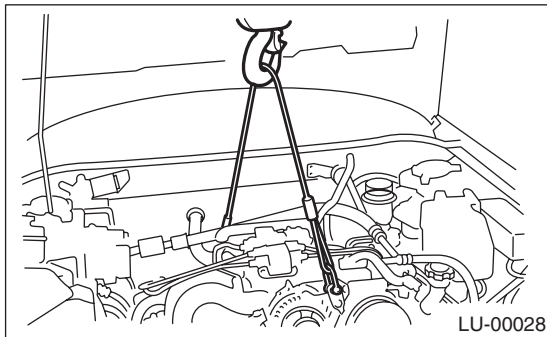
9) Install the under cover.

10) Lower the vehicle.

**CAUTION:**

**When lowering the vehicle, lower the lifting device and wire rope together.**

11) Remove the lifting device and steel cables.

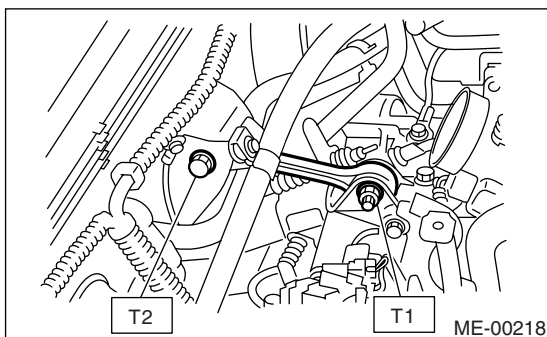


12) Install the pitching stopper.

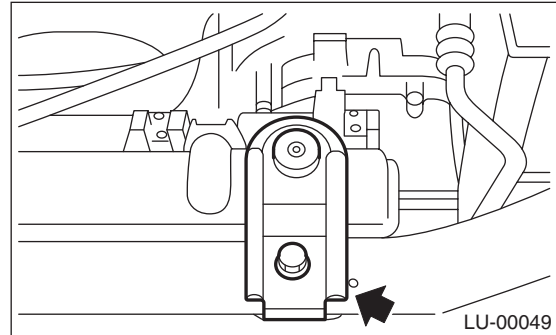
**Tightening torque:**

**T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)**

**T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)**



13) Install the radiator upper brackets.



14) Install the resonator chamber. <Ref. to IN(H4SO)-8, INSTALLATION, Resonator Chamber.>

15) Install the air intake duct and air cleaner case. <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.> and <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>

16) Install the front wheels.

17) Connect the battery ground cable to battery.

18) Fill engine oil. <Ref. to LU(H4SO)-9, INSPECTION, Engine Oil.>

**C: INSPECTION**

By visual check, make sure the oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.



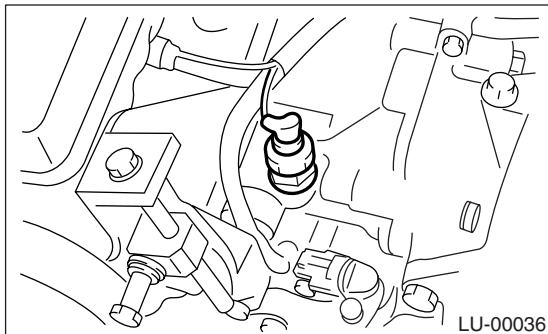
# Oil Pressure Switch

LUBRICATION

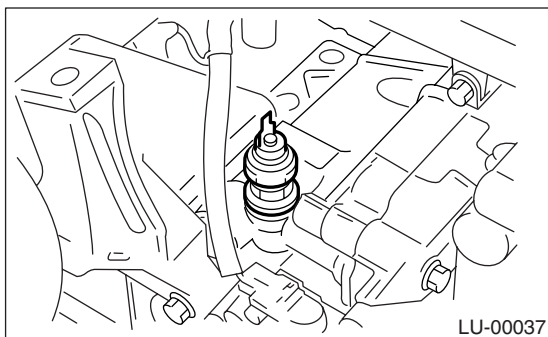
## 6. Oil Pressure Switch

### A: REMOVAL

- 1) Remove the generator from bracket. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
- 2) Disconnect the terminal from oil pressure switch.



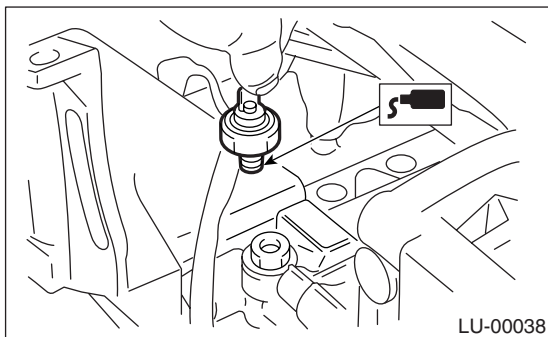
- 3) Remove the oil pressure switch.



### B: INSTALLATION

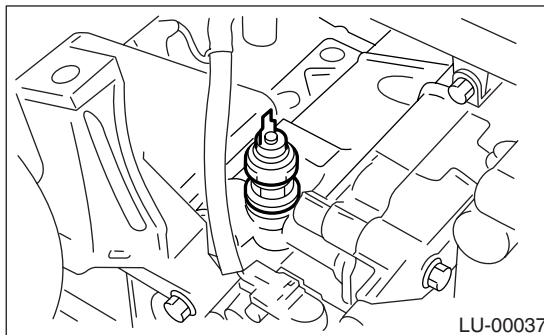
- 1) Apply liquid gasket to the oil pressure switch threads.

**Liquid gasket:**  
**THREE BOND 1324 (Part No. 004403042) or equivalent**

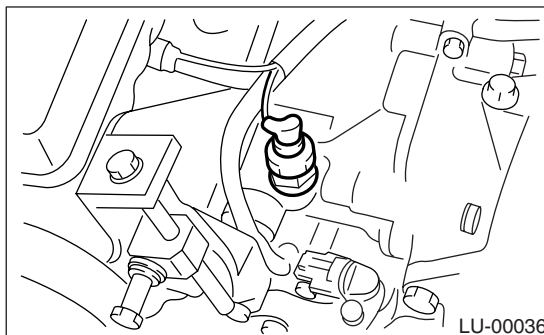


- 2) Install the oil pressure switch onto engine block.

**Tightening torque:**  
**25 N·m (2.5 kgf·m, 18.1 ft·lb)**



- 3) Connect the terminal of oil pressure switch.



- 4) Install the generator on bracket. <Ref. to SC(H4SO)-14, INSTALLATION, Generator.>

### C: INSPECTION

Make sure oil does not leak or seep from the place where the oil pressure switch is installed.

## 7. Engine Oil Filter

### A: REMOVAL

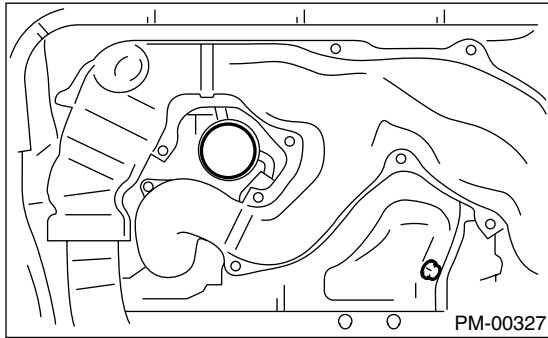
- 1) Lift up the vehicle.
- 2) Remove the under cover.
- 3) Remove the oil filter with ST.

ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))

ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))

#### NOTE:

Standard oil filter is outer diameter of 68 mm (2.68 in). However, SUBARU genuine oil filter having outer diameter of 65 mm (2.56 in) can also be used.



### B: INSTALLATION

- 1) Get a new oil filter and apply a thin coat of engine oil to the seal rubber.
- 2) Install the oil filter by turning it by hand, being careful not to damage seal rubber.
  - Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with cylinder block. If using a torque wrench, tighten it to 14 N·m (1.4 kgf-m, 10.3 ft-lb).
  - Tighten the oil filter 65 mm (2.56 in) in diameter by approx. 2/3 — 3/4 rotation more after the seal rubber of oil filter comes in contact with cylinder block. If using a torque wrench, tighten it to 12 N·m (1.2 kgf-m, 8.7 ft-lb).

#### CAUTION:

**Do not tighten excessively, or oil may leak.**

### C: INSPECTION

- 1) After installing the oil filter, run the engine and make sure no oil is leaking around seal rubber.

#### NOTE:

The filter element and filter case are permanently jointed; therefore, interior cleaning is not necessary.

- 2) Check the engine oil level. <Ref. to LU(H4SO)-9, INSPECTION, Engine Oil.>

# Engine Lubrication System Trouble in General

LUBRICATION

## 8. Engine Lubrication System Trouble in General

### A: INSPECTION

Before performing diagnostics, make sure the engine oil level is correct and no oil leakage exists.

| Symptom                                | Possible cause                           |   | Corrective action  |
|--|--|---|--|
| 1. Warning light remains on.           | 1) Oil pressure switch failure           | Cracked diaphragm or oil leakage within switch                        | Replace.   |
|  |  | Broken spring or seized contacts                                      | Replace.   |
|  | 2) Low oil pressure                      | Clogged oil filter  | Replace.   |
|  |  | Malfunition of oil by-pass valve of oil filter                        | Clean or replace.  |
|  |  | Malfunition of oil relief valve of oil pump                           | Clean or replace.  |
|  |  | Clogged oil passage   | Clean.   |
|  |  | Excessive tip clearance and side clearance of oil pump rotor and gear | Replace.   |
|  |  | Clogged oil strainer or broken pipe                                   | Clean or replace.  |
|  | 3) No oil pressure                       | Shortage of engine oil  | Replenish.   |
|  |  | Broken pipe of oil strainer   | Replace.   |
| Stuck oil pump rotor                   |  | Replace.  |  |
| 2. Warning light does not go on.       | 1) Malfunition of combination meter      |   | Replace.   |
|  | 2) Poor contact of switch contact points |   | Replace.   |
|  | 3) Disconnection of wiring               |   | Repair.  |
| 3. Warning light flickers momentarily. | 1) Poor contact at terminals             |   | Repair.  |
|  | 2) Defective wiring harness              |   | Repair.  |
|  | 3) Low oil pressure                      |   | Check for the same possible causes as listed in 1. — 2). |

# SPEED CONTROL SYSTEMS

# *SP(H4SO)*

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|                              | <b>Page</b> |
|------------------------------|-------------|
| 1. General Description ..... | 2           |
| 2. Accelerator Pedal.....    | 3           |

# General Description

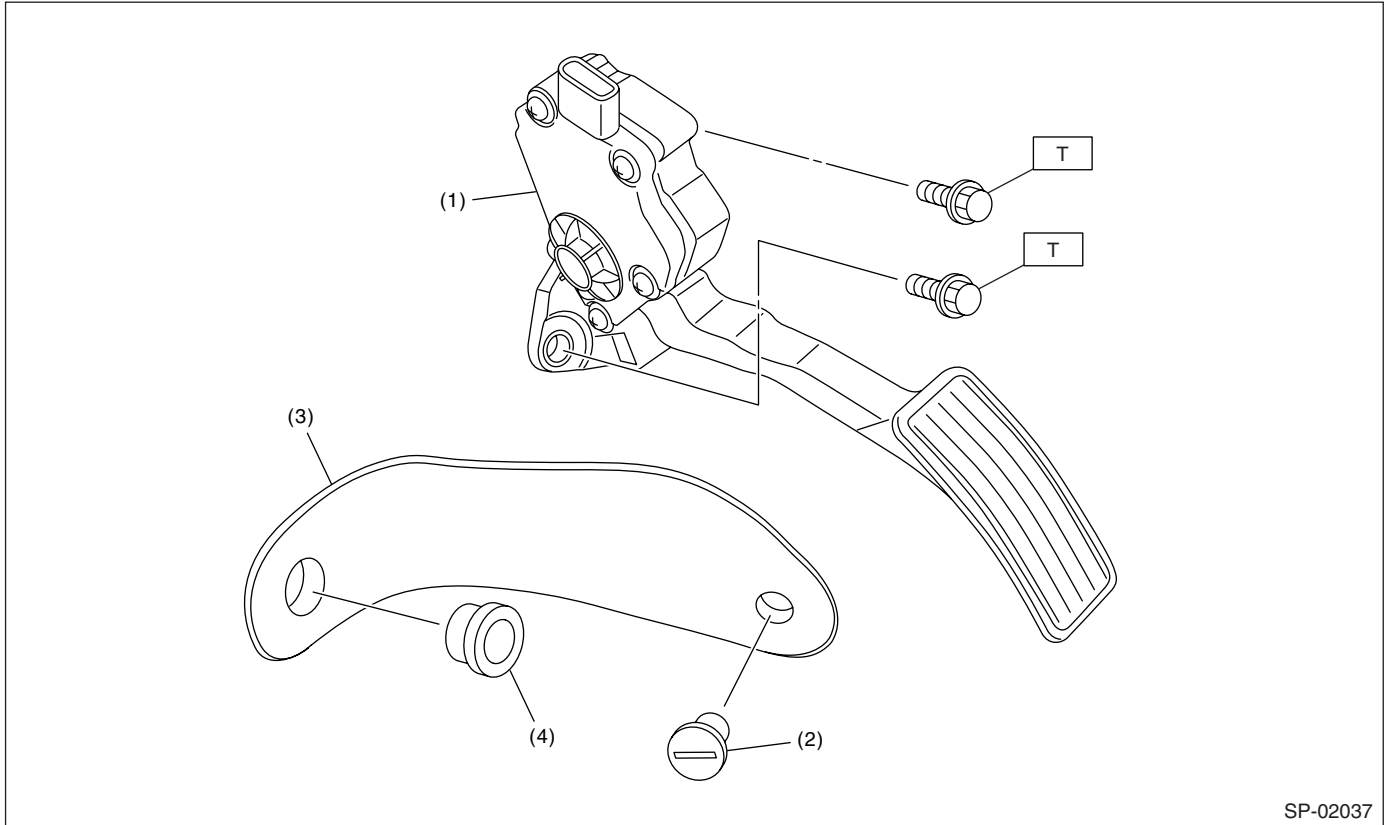
SPEED CONTROL SYSTEMS

## 1. General Description

### A: SPECIFICATION

|                   |        |              |                             |
|-------------------|--------|--------------|-----------------------------|
| Accelerator pedal | Stroke | At pedal pad | 50 — 55 mm (1.97 — 2.17 in) |
|-------------------|--------|--------------|-----------------------------|

### B: COMPONENT



- |                            |                       |
|----------------------------|-----------------------|
| (1) Accelerator pedal ASSY | (3) Accelerator plate |
| (2) Clip                   | (4) Stopper           |

**Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 18 (1.8, 13.0)**

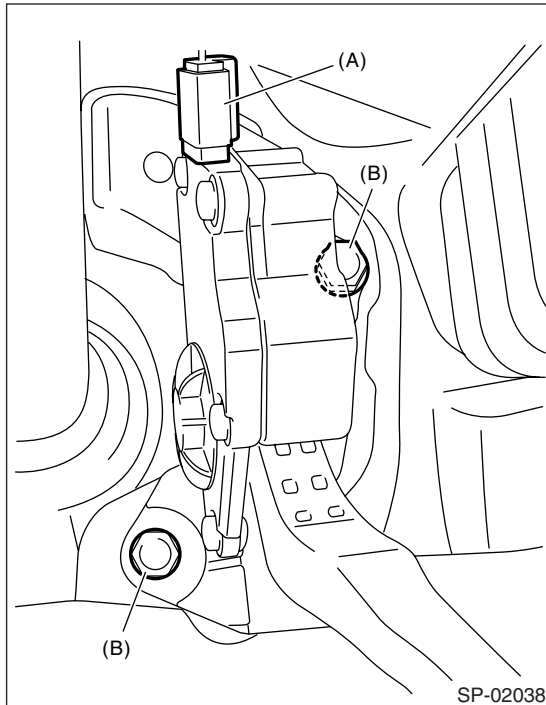
### C: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

## 2. Accelerator Pedal

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector (A).
- 3) Remove the bolt (B) securing accelerator pedal assembly.



### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

**18 N·m (1.8 kgf·m, 13.0 ft·lb)**

### C: DISASSEMBLY

NOTE:

Accelerator pedal cannot be disassembled.



# IGNITION

# *IG(H4SO)*

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|  | <b>Page</b> |
|--|-------------|
| 1. General Description .....               | 2           |
| 2. Spark Plug.....                         | 4           |
| 3. Ignition Coil and Ignitor Assembly..... | 7           |
| 4. Spark Plug Cord.....                    | 8           |



# General Description

IGNITION

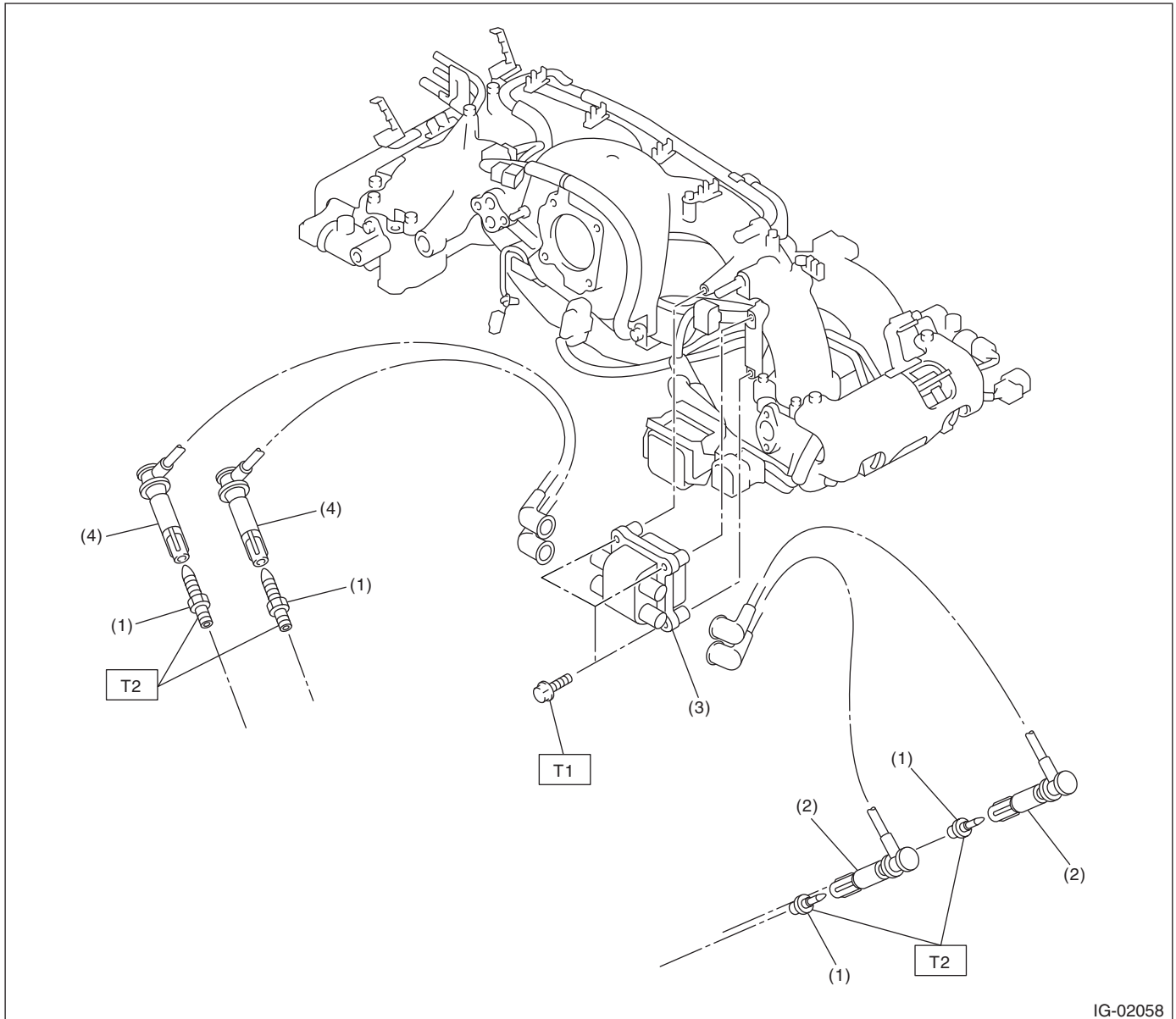
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## 1. General Description

### A: SPECIFICATION

|                                    | Item                                     | Designation               |
|------------------------------------|--|---------------------------|
| Ignition coil and ignitor assembly | Model                                    | FH 0286                   |
|                                    | Manufacturer                             | DIAMOND                   |
|                                    | Secondary coil resistance                | 11.7 k $\Omega$ ±15%      |
| Spark plug                         | Manufacturer and Type                    | NGK: FR5AP-11             |
|                                    | Thread size (diameter, pitch, length) mm | 14, 1.25, 19              |
|                                    | Spark plug gap mm (in)                   | 1.0 — 1.1 (0.039 — 0.043) |
|                                    | Electrode                                | Platinum                  |

## B: COMPONENT



- (1) Spark plug
- (2) Spark plug cord (#1, #3)
- (3) Ignition coil and ignitor ASSY
- (4) Spark plug cord (#2, #4)

**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 6.4 (0.65, 4.7)**

**T2: 21 (2.1, 15.2)**

### C: CAUTION

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.

- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

# Spark Plug

IGNITION

## 2. Spark Plug

### A: REMOVAL

#### CAUTION:

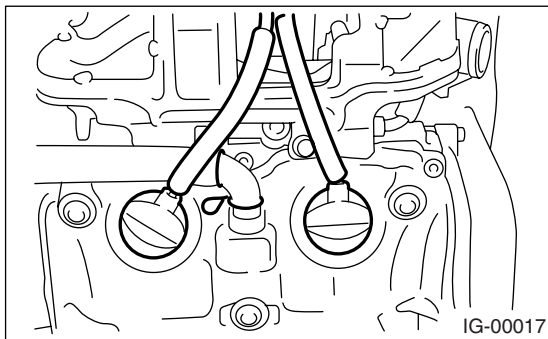
All spark plugs installed on an engine must be of the same heat range.

#### Spark plug:

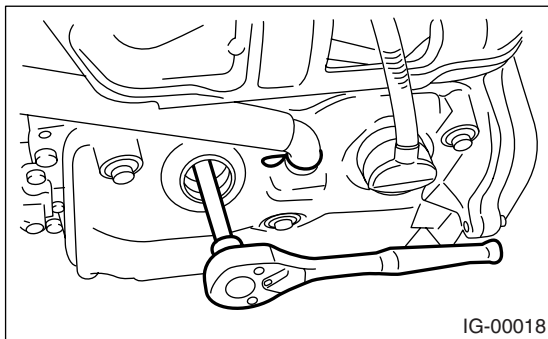
<Ref. to IG(H4SO)-2, SPECIFICATION, General Description.>

### 1. RH SIDE

- 1) Disconnect the ground cable from battery.
- 2) Remove the air cleaner case. <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
- 3) Remove the spark plug cords by pulling the boot. (Do not pull the cord itself.)

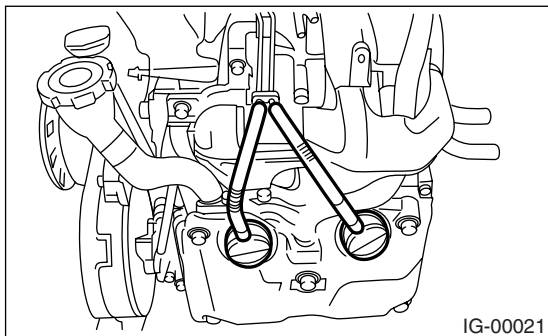


- 4) Remove the spark plug with a spark plug socket.

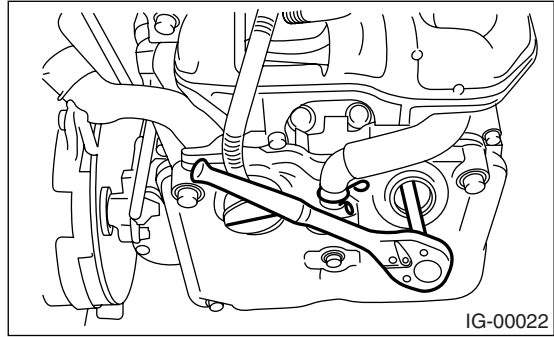


### 2. LH SIDE

- 1) Remove the battery.
- 2) Remove the spark plug cords by pulling the boot. (Do not pull the cord itself.)



- 3) Remove the spark plug with a spark plug socket.



### B: INSTALLATION

#### 1. RH SIDE

Install in the reverse order of removal.

#### Tightening torque:

**21 N·m (2.1 kgf-m, 15.2 ft-lb)**

#### NOTE:

The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

#### 2. LH SIDE

Install in the reverse order of removal.

#### Tightening torque:

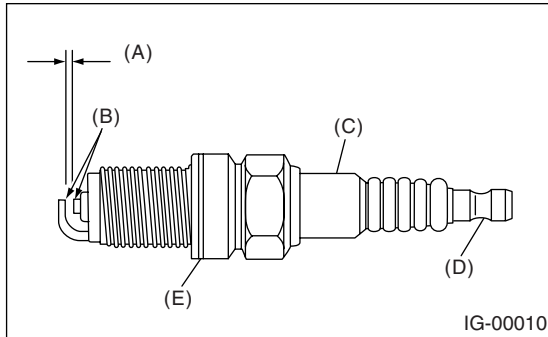
**21 N·m (2.1 kgf-m, 15.2 ft-lb)**

#### NOTE:

The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

## C: INSPECTION

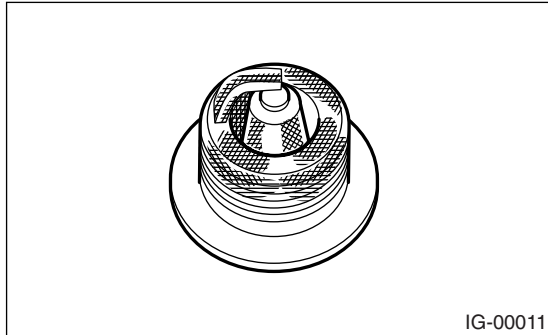
Check the electrodes and inner and outer ceramic insulator of plugs, noting the type of deposits and the degree of electrode erosion.



- (A) Spark plug gap
- (B) Carbon accumulation or wear
- (C) Crack
- (D) Damage
- (E) Damaged gasket

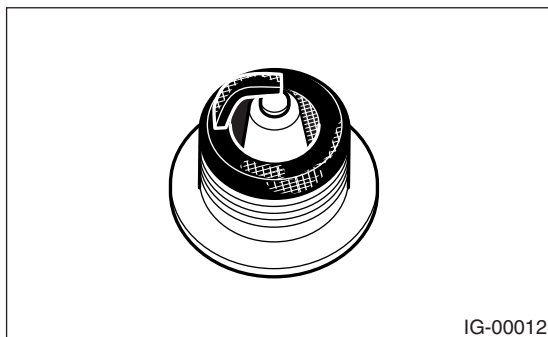
### 1) Normal:

Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



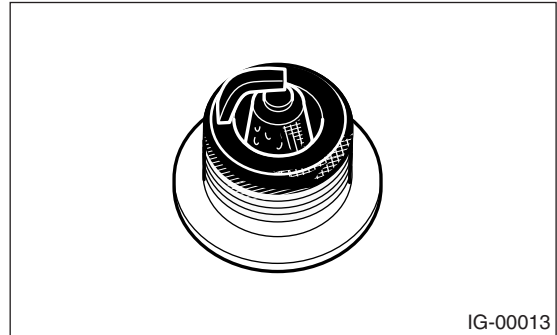
### 2) Carbon fouled:

Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in the city, weak ignition, too rich fuel mixture and dirty air cleaner.



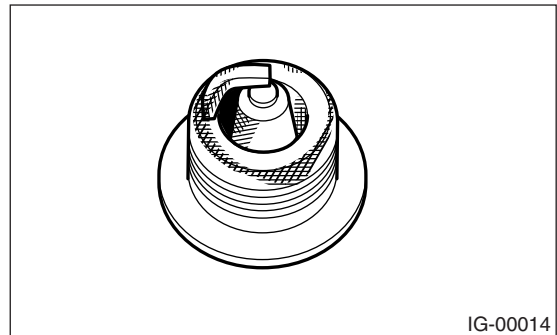
### 3) Oil fouled:

Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems.



### 4) Overheating:

White or light gray insulator with black or brown spots and bluish burnt electrodes indicate engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, etc.



### CAUTION:

**Avoid using a plug cleaner because of the spark plug with a platinum tip.**

## D: ADJUSTMENT

Clean the spark plugs with a wire brush. Clean and remove the carbon or oxide deposits, but do not wear away ceramic insulator.

If deposits are too stubborn, replace the plugs.

After cleaning the spark plugs, correct the spark plug gap using a gap gauge.

### NOTE:

Do not use spark plug cleaners, because the spark plugs are applied with platinum tips.

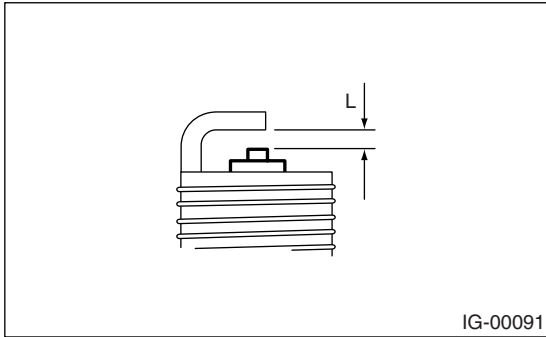
# Spark Plug

IGNITION

---

**Spark plug gap L:**

**1.0 — 1.1 mm (0.039 — 0.043 in)**

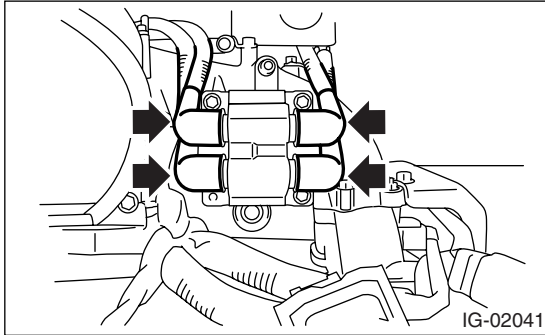


**IG(H4SO)-6**

## 3. Ignition Coil and Ignitor Assembly

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the spark plug cords from ignition coil and ignitor assembly.



*Specified resistance:*

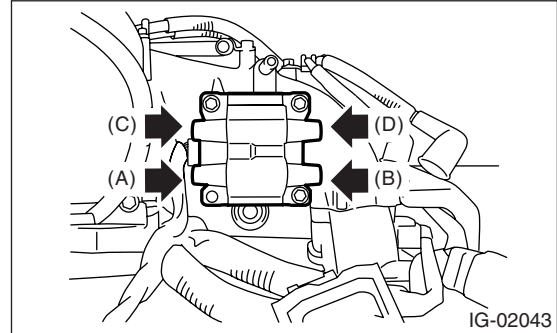
*[Secondary side]*

*Between (A) and (B)*

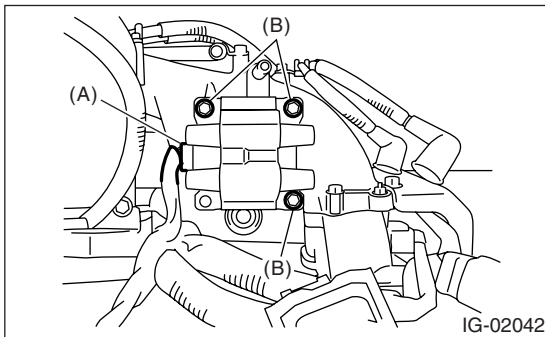
*11.7 kΩ±15%*

*Between (C) and (D)*

*11.7 kΩ±15%*



- 3) Disconnect the connector (A) from ignition coil and ignitor assembly.
- 4) Remove the bolt (B) which secures the ignition coil and ignitor assembly to intake manifold.



### B: INSTALLATION

Install in the reverse order of removal.

*Tightening torque:*

*6.4 N·m (0.65 kgf-m, 4.7 ft-lb)*

**CAUTION:**

Connect the spark plug cords to correct positions. Failure to do so will damage the unit.

### C: INSPECTION

Check the following using a tester. Replace if defective.

- Secondary coil resistance

**CAUTION:**

- If the resistance is extremely low, it indicates the presence of a short-circuit.
- Ignitor is integrated with the coil. Therefore the resistance of primary side coil cannot be measured.

## 4. Spark Plug Cord

### A: INSPECTION

Check the following items:

- Damage to cords, deformation, burning, or rust formation of terminals
- Resistance values of cords

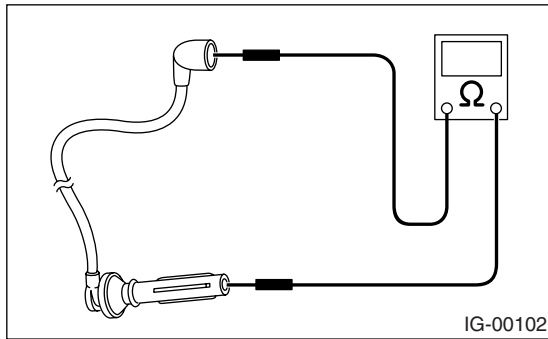
#### **Resistance value:**

**#1 cord: 7.1 — 12.1 k $\Omega$**

**#2 cord: 12.1 — 19.9 k $\Omega$**

**#3 cord: 7.7 — 13.0 k $\Omega$**

**#4 cord: 12.3 — 20.2 k $\Omega$**



# STARTING/CHARGING SYSTEMS

# *SC(H4SO)*

---

|                              | <b>Page</b> |
|------------------------------|-------------|
| 1. General Description ..... | 2           |
| 2. Starter .....             | 8           |
| 3. Generator .....           | 14          |
| 4. Battery.....              | 20          |



# General Description

STARTING/CHARGING SYSTEMS

## 1. General Description

### A: SPECIFICATION

#### 1. NON-TURBO MODEL

| Item                     |                             | Designation  |   |  |
|--------------------------|-----------------------------|--|---|--|
| Starter                  | Type                        | Reduction type   |   |  |
|                          | Vehicle type                | MT   | AT                                      |  |
|                          | Model                       | M000T30471   | M000T20171                              |  |
|                          | Manufacturer                | Mitsubishi Electric  |   |  |
|                          | Voltage and output          | 12 V — 1.0 kW  | 12 V — 1.4 kW                           |  |
|                          | Direction of rotation       | Counterclockwise (when observed from pinion)   |   |  |
|                          | Number of pinion teeth      | 8  | 9                                       |  |
|                          | No-load characteristics     | Voltage  | 11 V                                    |  |
|                          |                             | Current  | 95 A or less                            | 90 A or less                           |
|                          |                             | Rotating speed   | 2,500 rpm or more                       | 2,000 rpm or more                      |
|                          | Load characteristics        | Voltage  | 8 V                                     | 8 V                                    |
|                          |                             | Current  | 280 A                                   | 280 A                                  |
|                          |                             | Torque   | 8.5 N·m (0.87 kgf·m, 6.3 ft·lb) or more | 9.8 N·m (1.0 kgf·m, 7.2 ft·lb) or more |
|                          |                             | Rotating speed   | 970 rpm or more                         | 1,000 rpm or more                      |
|                          | Lock characteristics        | Voltage  | 4 V                                     | 3.5 V                                  |
| Current                  |                             | 680 A or less  | 960 A or less                           |  |
| Torque                   |                             | 17 N·m (1.73 kgf·m, 12.5 ft·lb) or more  | 31 N·m (3.16 kgf·m, 22.9 ft·lb) or more |  |
| Generator                | Type                        | Rotating-field three-phase, voltage regulator built-in type, with load response control system |   |  |
|                          | Model                       | A002TG0391   |   |  |
|                          | Manufacturer                | Mitsubishi Electric  |   |  |
|                          | Voltage and output          | 12 V — 90 A  |   |  |
|                          | Polarity on ground side     | Negative   |   |  |
|                          | Direction of rotation       | Clockwise (when observed from pulley side)   |   |  |
|                          | Armature connection         | Three-phase Y-type   |   |  |
|                          | Output current              | 1,500 rpm — 40 A or more   |   |  |
|                          |                             | 2,500 rpm — 74 A or more   |   |  |
| 5,000 rpm — 84 A or more |                             |  |   |  |
| Regulated voltage        | 14.1 — 14.8 V [20°C (68°F)] |  |   |  |
| Battery                  | Type and capacity           | 12 V — 48 AH (55D 23L)   | 12 V — 52 AH (75D 23L)                  |  |

# General Description

STARTING/CHARGING SYSTEMS

## 2. TURBO MODEL

| Item      |                         | Designation  |   |  |
|-----------|-------------------------|--|---|--|
| Starter   | Type                    | Reduction type   |   |  |
|           | Vehicle type            | MT   | AT                                      |  |
|           | Model                   | 228000 — 9270  | M001T20171                              |  |
|           | Manufacturer            | DENSO  | Mitsubishi Electric                     |  |
|           | Voltage and output      | 12 V — 1.0 kW  | 12 V — 1.4 kW                           |  |
|           | Direction of rotation   | Counterclockwise (when observed from pinion)   |   |  |
|           | Number of pinion teeth  | 9  |   |  |
|           | No-load characteristics | Voltage  | 11 V                                    |  |
|           |                         | Current  | 90 A or less                            |  |
|           |                         | Rotating speed   | 2,860 rpm or more                       | 2,000 rpm or more                      |
|           | Load characteristics    | Voltage  | 8 V                                     | 8 V                                    |
|           |                         | Current  | 280 A                                   | 280 A                                  |
|           |                         | Torque   | 9.3 N·m (0.95 kgf·m, 6.9 ft·lb) or more | 9.8 N·m (1.0 kgf·m, 7.2 ft·lb) or more |
|           |                         | Rotating speed   | 860 rpm or more                         | 710 rpm or more                        |
|           | Lock characteristics    | Voltage  | 4 V                                     | 3.5 V                                  |
| Current   |                         | 515 A or less  | 960 A or less                           |  |
| Torque    |                         | 16 N·m (1.63 kgf·m, 11.8 ft·lb) or more  | 31 N·m (3.16 kgf·m, 22.9 ft·lb) or more |  |
| Generator | Type                    | Rotating-field three-phase, voltage regulator built-in type, with load response control system |   |  |
|           | Model                   | A3TG0491   |   |  |
|           | Manufacturer            | Mitsubishi Electric  |   |  |
|           | Voltage and output      | 12 V — 110 A   |   |  |
|           | Polarity on ground side | Negative   |   |  |
|           | Direction of rotation   | Clockwise (when observed from pulley side)   |   |  |
|           | Armature connection     | Three-phase Y-type   |   |  |
|           | Output current          | 1,500 rpm — 50 A or more<br>2,500 rpm — 91 A or more<br>5,000 rpm — 105 A or more              |   |  |
|           | Regulated voltage       | 14.1 — 14.8 V [20°C (68°F)]  |   |  |
| Battery   | Type and capacity       | 12 V — 48 AH (55D 23L)   | 12 V — 52 AH (75D 23L)                  |  |

# General Description

## STARTING/CHARGING SYSTEMS

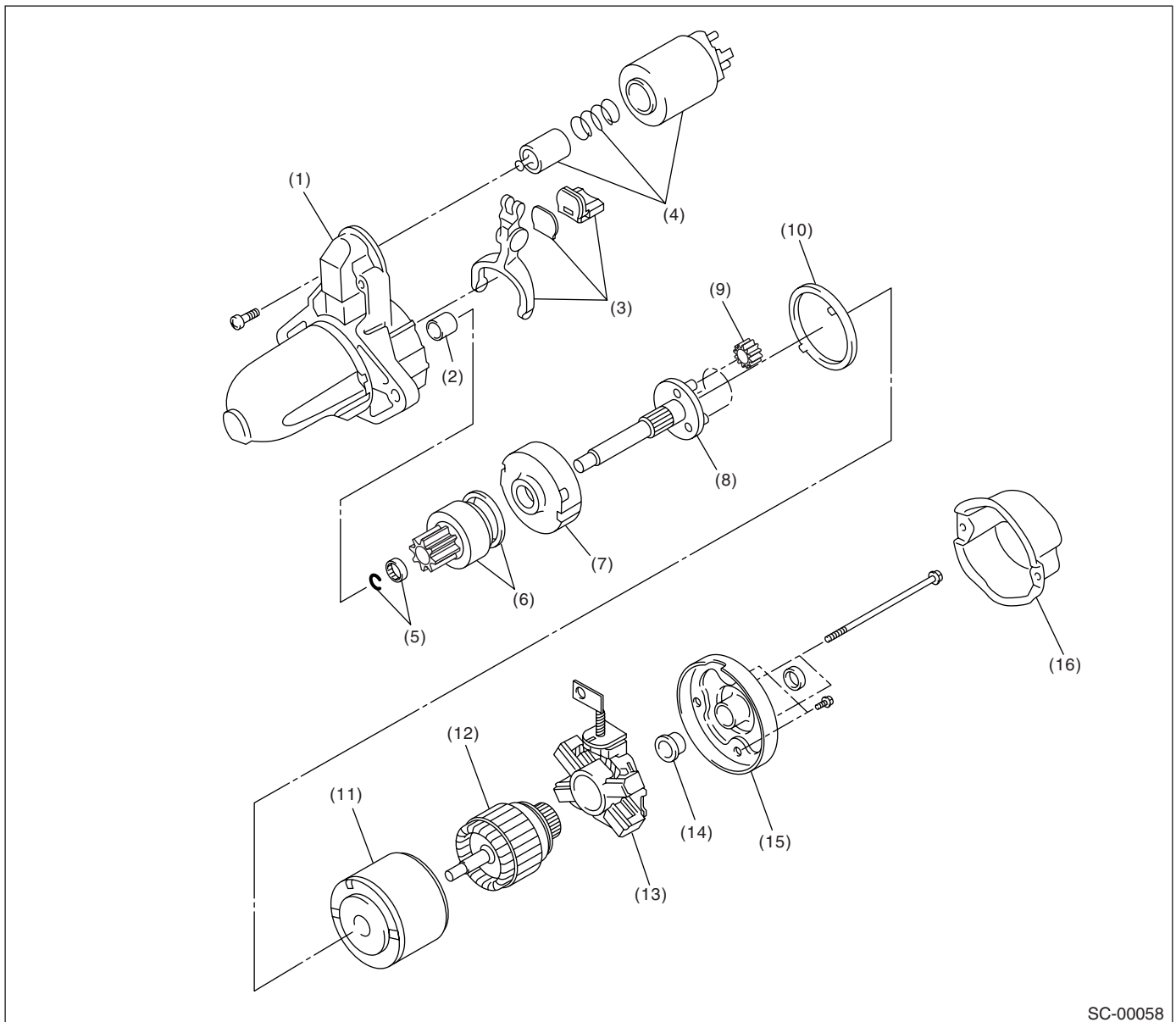
### 3. STI MODEL

| Item                     |                             | Designation  |   |
|--------------------------|-----------------------------|--|---|
| Starter                  | Type                        | Reduction type   |   |
|                          | Vehicle type                | MT   |   |
|                          | Model                       | 228000 — 9270  |   |
|                          | Manufacturer                | DENSO  |   |
|                          | Voltage and output          | 12 V — 1.0 kW  |   |
|                          | Direction of rotation       | Counterclockwise (when observed from pinion)   |   |
|                          | Number of pinion teeth      | 9  |   |
|                          | No-load characteristics     | Voltage  | 11 V                                    |
|                          |                             | Current  | 90 A or less                            |
|                          |                             | Rotating speed   | 2,860 rpm or more                       |
|                          | Load characteristics        | Voltage  | 8 V                                     |
|                          |                             | Current  | 280 A                                   |
|                          |                             | Torque   | 9.3 N·m (0.95 kgf-m, 6.9 ft-lb) or more |
|                          |                             | Rotating speed   | 860 rpm or more                         |
|                          | Lock characteristics        | Voltage  | 4 V                                     |
| Current                  |                             | 515 A or less  |   |
| Torque                   |                             | 16 N·m (1.63 kgf-m, 11.8 ft-lb) or more  |   |
| Generator                | Type                        | Rotating-field three-phase, voltage regulator built-in type, with load response control system |   |
|                          | Model                       | A2TG0391   |   |
|                          | Manufacturer                | Mitsubishi Electric  |   |
|                          | Voltage and output          | 12 V — 90 A  |   |
|                          | Polarity on ground side     | Negative   |   |
|                          | Direction of rotation       | Clockwise (when observed from pulley side)   |   |
|                          | Armature connection         | Three-phase Y-type   |   |
|                          | Output current              | 1,500 rpm — 40 A or more   |   |
|                          |                             | 2,500 rpm — 74 A or more   |   |
| 5,000 rpm — 84 A or more |                             |  |   |
| Regulated voltage        | 14.1 — 14.8 V [20°C (68°F)] |  |   |
| Battery                  | Type and capacity           | 12 V — 48 AH (55D 23L)   |   |

## B: COMPONENT

### 1. STARTER

• EXCEPT TURBO MT MODEL AND STI MODEL



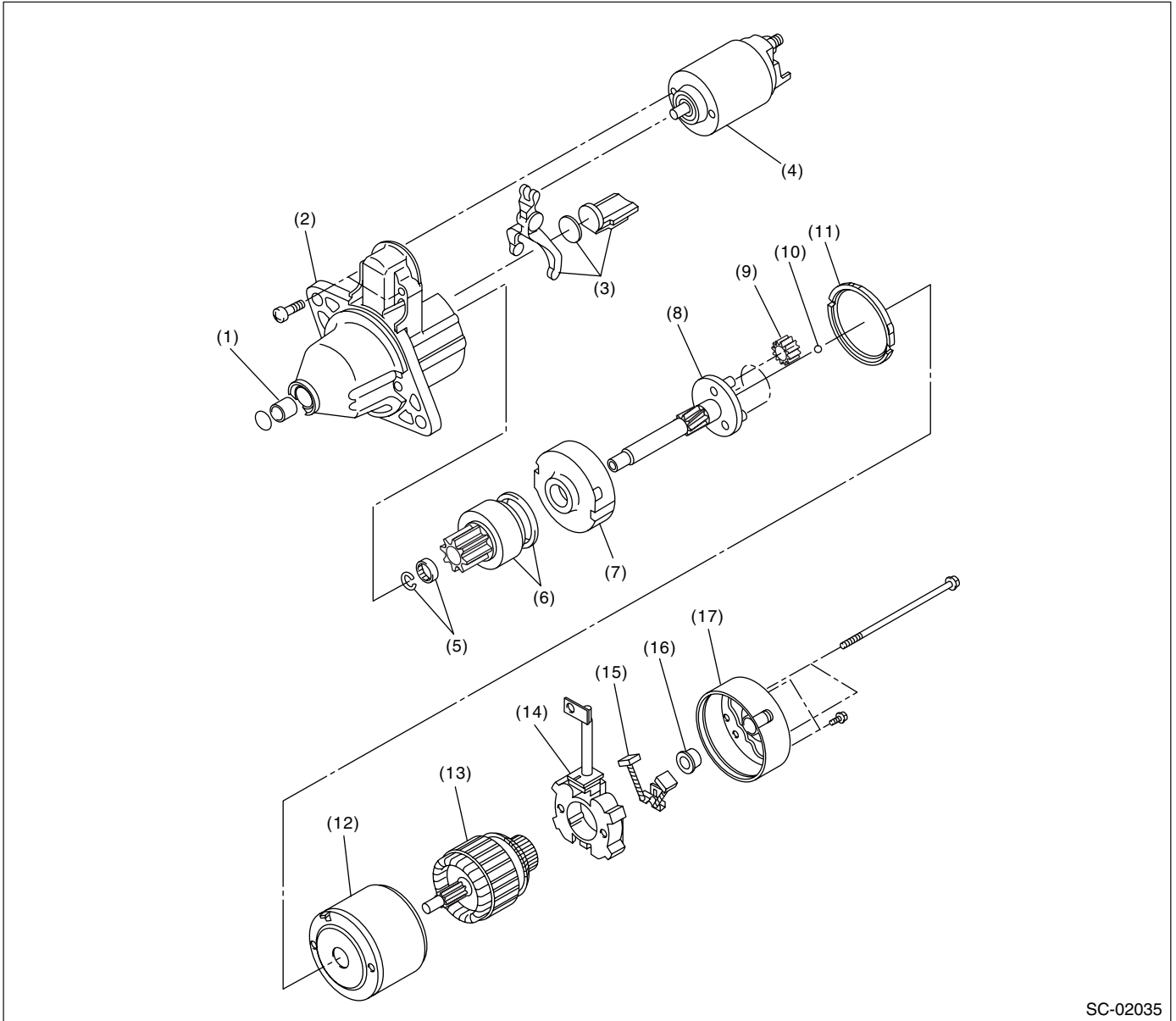
SC-00058

- |                        |                        |                        |
|------------------------|------------------------|------------------------|
| (1) Front bracket      | (7) Internal gear ASSY | (13) Brush holder ASSY |
| (2) Sleeve bearing     | (8) Shaft ASSY         | (14) Sleeve bearing    |
| (3) Lever set          | (9) Gear ASSY          | (15) Rear cover        |
| (4) Magnet switch ASSY | (10) Packing           | (16) Rear cover set    |
| (5) Stopper set        | (11) Yoke ASSY         |                        |
| (6) Overrunning clutch | (12) Armature          |                        |

# General Description

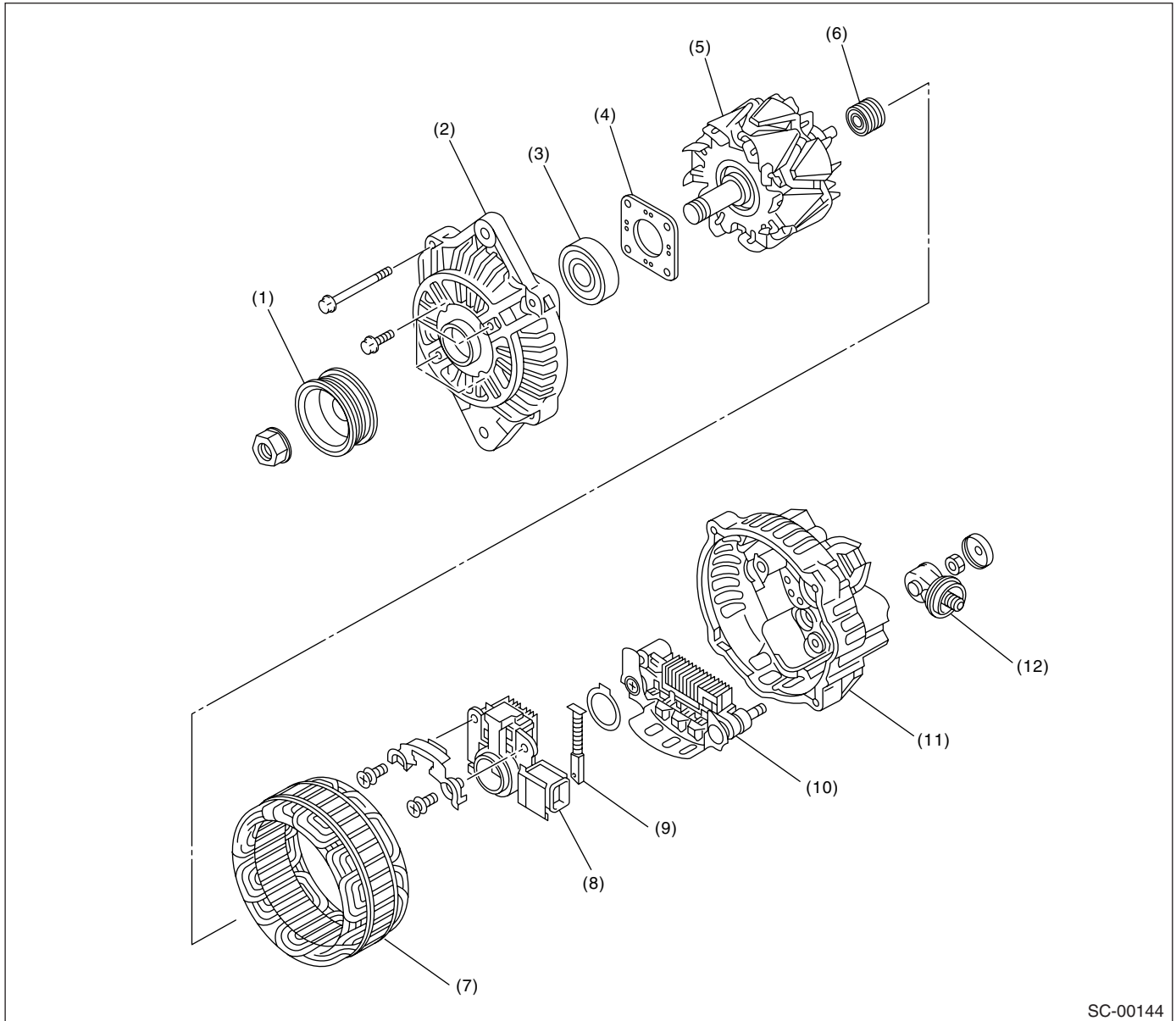
## STARTING/CHARGING SYSTEMS

### • TURBO MT MODEL AND STI MODEL



- |                        |                        |                        |
|------------------------|------------------------|------------------------|
| (1) Sleeve bearing     | (7) Internal gear ASSY | (13) Armature          |
| (2) Front bracket      | (8) Shaft ASSY         | (14) Brush holder ASSY |
| (3) Lever set          | (9) Gear ASSY          | (15) Brush             |
| (4) Magnet switch ASSY | (10) Ball              | (16) Sleeve bearing    |
| (5) Stopper set        | (11) Packing           | (17) Rear bracket      |
| (6) Overrunning clutch | (12) Yoke ASSY         |                        |

## 2. GENERATOR



SC-00144

- |                      |                             |                 |
|----------------------|-----------------------------|-----------------|
| (1) Pulley           | (5) Rotor                   | (9) Brush       |
| (2) Front cover      | (6) Bearing                 | (10) Rectifier  |
| (3) Ball bearing     | (7) Stator coil             | (11) Rear cover |
| (4) Bearing retainer | (8) IC regulator with brush | (12) Terminal   |

### C: CAUTION

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.

- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

# Starter

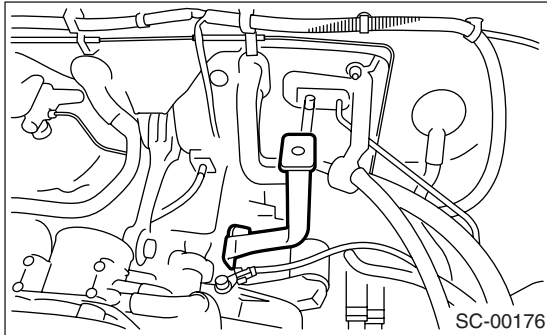
## STARTING/CHARGING SYSTEMS

### 2. Starter

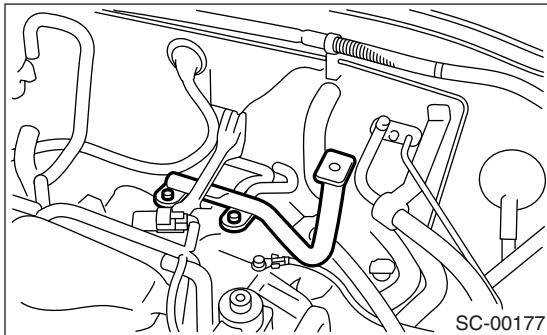
#### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the air cleaner case. (Non-turbo model)  
<Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
- 3) Remove the intercooler. (Turbo model)  
<Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 4) Remove the air cleaner case stay. (Non-turbo model)

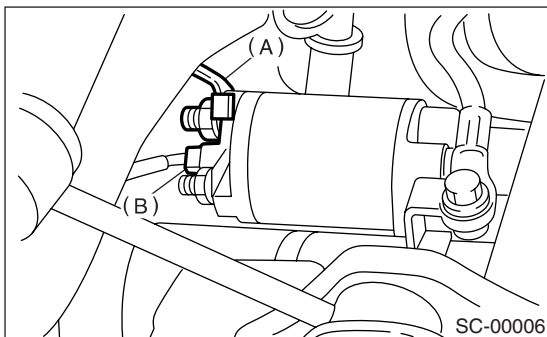
- MT model



- AT model

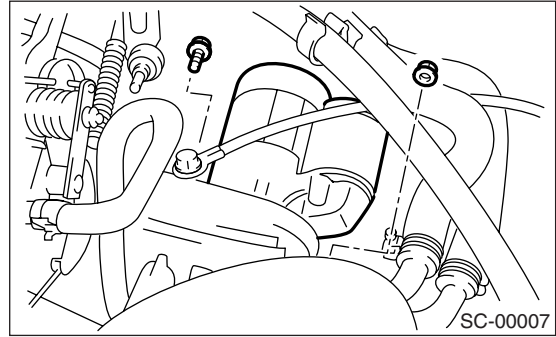


- 5) Disconnect the connector and terminal from starter.



- (A) Terminal
- (B) Connector

- 6) Remove the starter from transmission.

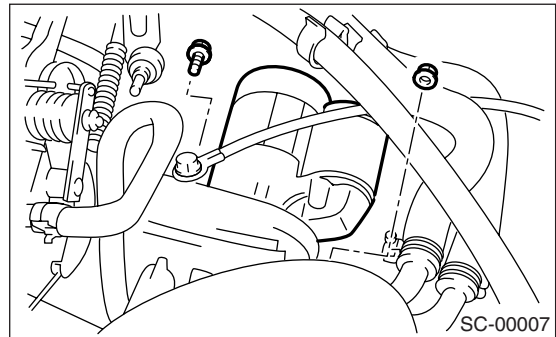


#### B: INSTALLATION

Install in the reverse order of removal.

#### Tightening torque:

**50 N·m (5.1 kgf·m, 37 ft·lb)**



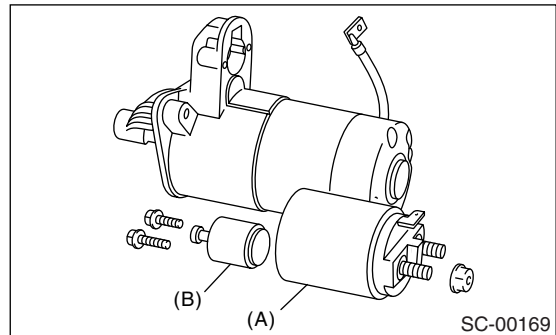
#### C: DISASSEMBLY

##### 1. STARTER ASSEMBLY

- 1) Loosen the nut which holds the terminal M of switch assembly, and then disconnect the connector.
- 2) Remove the bolts which hold the switch assembly, and then remove switch assembly, plunger and plunger spring from starter as a unit.

#### NOTE:

Be careful because the pinion gap adjustment washer may sometimes be used on the mounting surface of switch assembly.

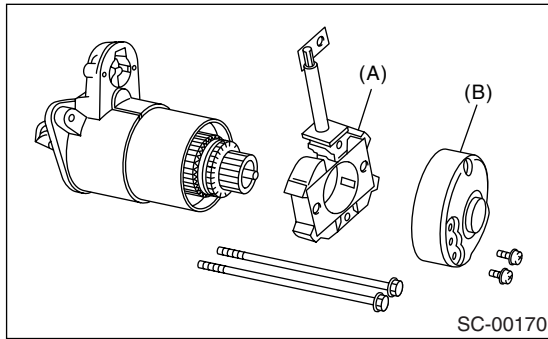


- (A) Magnet switch ASSY
- (B) Plunger

# Starter

## STARTING/CHARGING SYSTEMS

3) Remove both through-bolts and brush holder screws, and then detach the rear cover and brush holder.

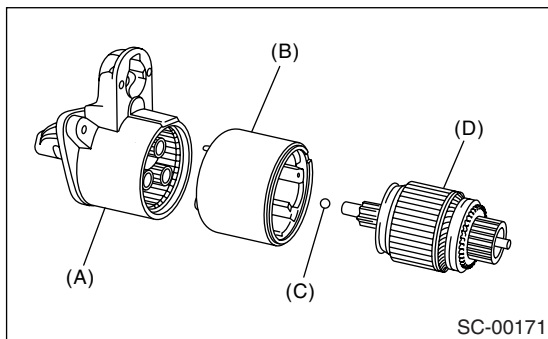


- (A) Brush holder
- (B) Rear cover

4) Remove the armature and yoke assembly from front bracket. The ball used as a bearing will come off from the armature end.

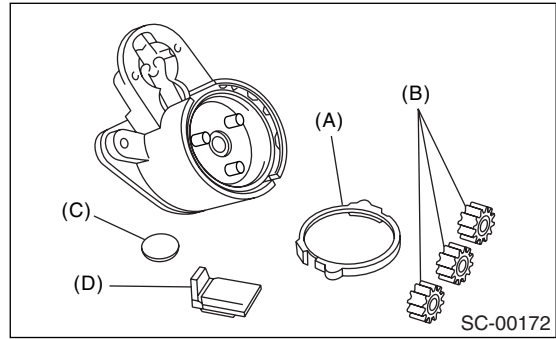
**NOTE:**

Before removal of the yoke, put alignment marks on the yoke assembly and front bracket.



- (A) Front bracket
- (B) Yoke ASSY
- (C) Ball
- (D) Armature

5) Remove packing A, planetary gears, packing B and plate.

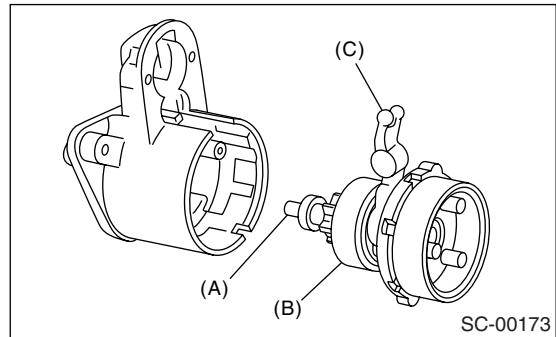


- (A) Packing A
- (B) Planetary gear
- (C) Plate
- (D) Packing B

6) Remove the shaft assembly and overrunning clutch as a unit.

**NOTE:**

Note the direction of the lever before removing.



- (A) Shaft ASSY
- (B) Overrunning clutch
- (C) Lever

7) Remove the overrunning clutch from shaft assembly as follows:

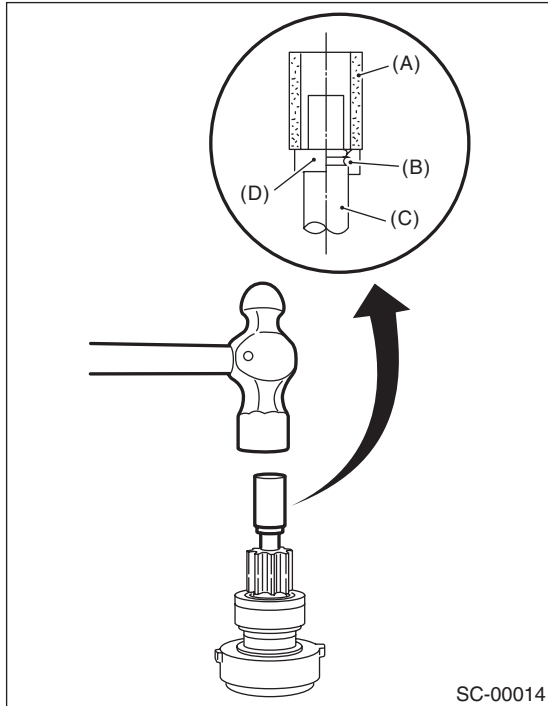
(1) Remove the stopper from ring by lightly tapping the stopper with an appropriate tool (such as a fit socket wrench).



# Starter

## STARTING/CHARGING SYSTEMS

(2) Remove the ring, stopper and clutch from shaft.



- (A) Socket wrench
- (B) Ring
- (C) Shaft
- (D) Stopper

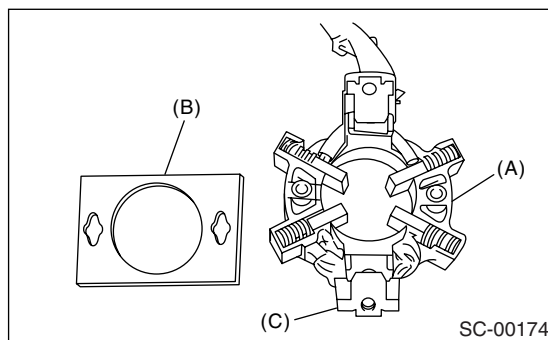
## 2. BRUSH HOLDER

### NOTE:

Only the brush holder of turbo MT model and STI model starters can be disassembled.

Slightly open the metal fitting while holding the insulating plate against the brush holder. Remove the insulating plate.

The brush and spring can be easily removed from the brush holder at this time.



- (A) Brush holder
- (B) Insulating plate
- (C) Metal fitting

## D: ASSEMBLY

1) Assemble in the reverse order of disassembly.  
2) Apply grease to the following parts before assembly.

- Front and rear bracket sleeve bearings
- Armature shaft gear
- Outer periphery of plunger
- Mating surfaces of plunger and lever
- Gear shaft splines
- Mating surfaces of lever and clutch
- Ball at armature shaft end
- Planetary gear

## E: INSPECTION

### 1. ARMATURE

1) Check the commutator for any sign of burns of rough surfaces or stepped wear. If wear is of a minor nature, correct it by using sand paper.

2) Run-out test

Check the commutator run-out, and then replace if it exceeds the limit.

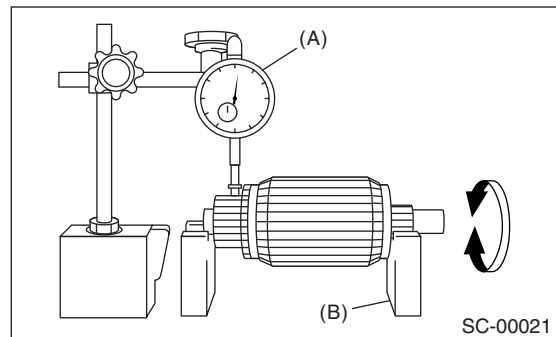
### Commutator run-out:

#### Standard

**0.05 mm (0.0020 in)**

#### Service limit

**Less than 0.10 mm (0.0039 in)**

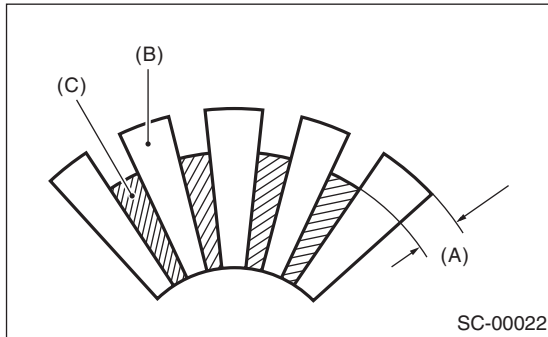


- (A) Dial gauge
- (B) V-block

3) Depth of segment mold

Check the depth of segment mold.

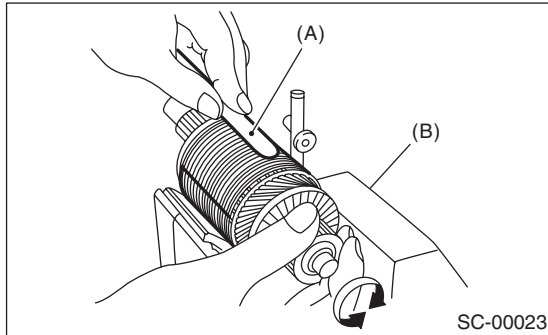
**Depth of segment mold:**  
**0.5 mm (0.020 in)**



- (A) Depth of mold
- (B) Segment
- (C) Mold

#### 4) Armature short-circuit test

Check the armature for short-circuit by placing it on a growler tester. Hold an iron sheet against the armature core while slowly rotating armature. A short-circuited armature will cause the iron sheet to vibrate and to be attracted to core. If the iron sheet is attracted or vibrates, the armature, which is short-circuited, must be replaced or repaired.

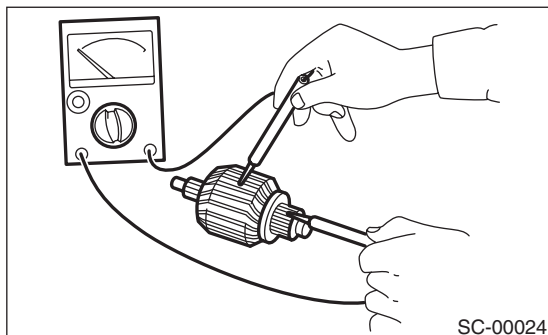


- (A) Iron sheet
- (B) Growler tester

#### 5) Armature ground test

Using a circuit tester, touch one probe to the commutator segment and the other to shaft. There should be no continuity. If there is continuity, the armature is grounded.

Replace the armature if it is grounded.



## 2. YOKE

Make sure the pole is set in position.

## 3. OVERRUNNING CLUTCH

Inspect the teeth of pinion for wear and damage. Replace if it is damaged. It is normal if the pinion rotates smoothly in direction of rotation (counterclockwise) and does not rotate in the opposite direction.

### CAUTION:

**Do not clean the overrunning clutch with oil to prevent grease from flowing out.**

## 4. BRUSH AND BRUSH HOLDER

### 1) Brush length

Measure the brush length, and then replace if it is worn down to under the service limit.

Replace if abnormal wear or cracks are noticed.

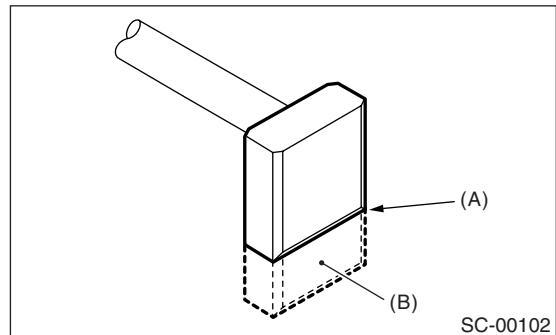
### Brush length:

#### Standard

**12.3 mm (0.484 in)**

#### Service limit

**7.0 mm (0.276 in)**



- (A) Service limit line
- (B) Brush

### 2) Brush movement

Be sure the brush moves smoothly inside brush holder.

### 3) Brush spring force

Measure the brush spring force with a spring scale. If it is less than the service limit, replace the brush holder.

# Starter

## STARTING/CHARGING SYSTEMS

### Brush spring force:

#### Standard

*Except turbo MT model and STI model*

15.9 — 19.5 N (1.62 — 1.99 kgf, 3.57 — 4.38 lbf) (when new)

*Turbo MT model and STI model*

21.6 N (2.2 kgf, 4.9 lbf) (when new)

#### Service limit

*Except turbo MT model and STI model*

2.5 N (0.25 kgf, 0.56 lbf)

*Turbo MT model and STI model*

5.9 N (0.6 kgf, 1.3 lbf)

## 5. SWITCH ASSEMBLY

Using a circuit tester (set in “ohm”), check that there is continuity between terminals S and M, and between terminal S and ground.

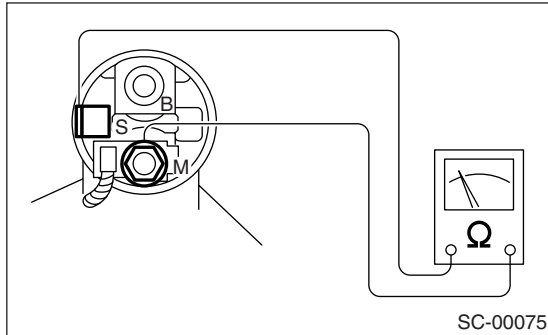
Also check to be sure there is no continuity between terminals M and B.

### Terminal/Specified resistance:

**S — M/Less than 1  $\Omega$**

**S — Ground/Less than 1  $\Omega$**

**M — B/More than 1 M $\Omega$**



## 6. SWITCH ASSEMBLY OPERATION

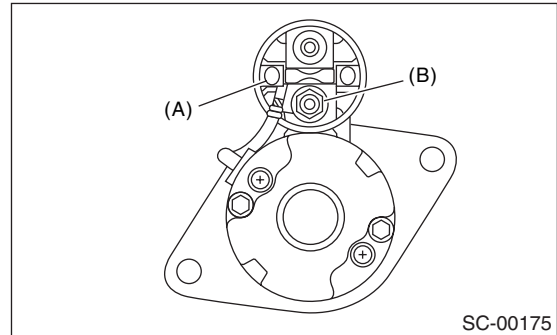
1) Connect the terminal S of switch assembly to positive terminal of battery with a lead wire, and starter body to ground terminal of battery. The pinion should be forced endwise on shaft.

### CAUTION:

**With the pinion forced endwise on shaft, the starter motor may rotate because current flows through the pull-in coil to motor, however, this is not a problem.**

2) Disconnect the connector from terminal M, and then connect the positive terminal of battery and terminal M using a lead wire and ground terminal to starter body.

In this test set up, the pinion should return to its original position even when it is pulled out with a screwdriver.



(A) Terminal S

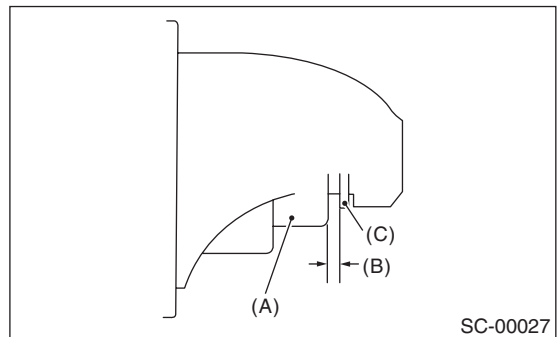
(B) Terminal M

## 7. PINION GAP

Measure the pinion gap while the pinion is pulled out as shown in the figure.

### Pinion gap:

**0.5 — 2.0 mm (0.020 — 0.079 in)**



(A) Pinion

(B) Gap

(C) Stopper

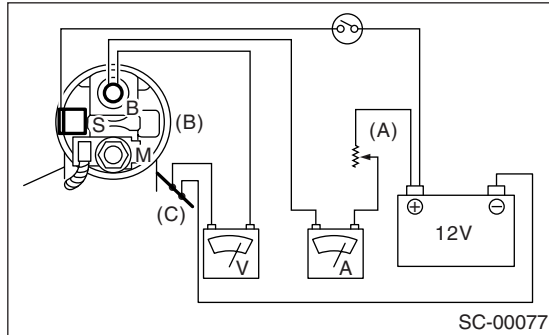
If the motor is running with the pinion forced endwise on shaft, disconnect the connector from terminal M of magnet switch assembly, and then connect terminal M to ground terminal (–) of battery with a lead wire. Next, gently push the pinion back with your fingertips, and then measure the pinion gap.

## 8. PERFORMANCE TEST

The starter should be submitted to performance tests whenever it has been overhauled, to assure its satisfactory performance when installed on the engine.

Three performance tests, no-load test, load test, and lock test, are presented here; however, if the load test and lock test cannot be performed, carry out at least the no-load test.

For these performance tests, use the circuit shown in figure.



- (A) Variable resistor
- (B) Magnet switch
- (C) Starter body

### 1) No-load test

With switch on, adjust the variable resistor to obtain 11 V, take the ammeter reading, and then measure the starter speed. Compare these values with the specifications.

#### No-load test (standards):

##### Voltage/Current

**Non-turbo, MT model**

**MAX. 11 V/95 A**

**Turbo MT model and STI model**

**MAX. 11 V/90 A**

**AT model**

**MAX. 11 V/90 A**

##### Rotating speed

**Non-turbo, MT model**

**More than 2,500 rpm**

**Turbo MT model and STI model**

**More than 2,860 rpm**

**AT model**

**More than 2,000 rpm**

### 2) Load test

Apply the specified braking torque to starter. The condition is satisfactory if the current draw and starter speed are within the specifications.

#### Load test (standards):

##### Voltage/Load

**Non-turbo, MT model**

**8 V/8.5 N·m (0.87 kgf-m, 6.3 ft-lb)**

**Turbo MT model and STI model**

**8 V/9.3 N·m (0.95 kgf-m, 6.9 ft-lb)**

**AT model**

**8 V/9.8 N·m (1.0 kgf-m, 7.2 ft-lb)**

##### Current/Speed

**Non-turbo, MT model**

**More than 280 A/970 rpm**

**Turbo MT model and STI model**

**More than 280 A/860 rpm**

**AT model**

**More than 280 A/1,000 rpm**

### 3) Lock test

With the starter stalled, or not rotating, measure the torque developed and current draw when the voltage is adjusted to the specified voltage.

#### Lock test (standards):

##### Voltage/Current

**Non-turbo, MT model**

**Less than 4 V/680 A**

**Turbo MT model and STI model**

**Less than 4 V/515 A**

**AT model**

**Less than 3.5 V/960 A**

##### Torque

**Non-turbo, MT model**

**17 N·m (1.73 kgf-m, 12.5 ft-lb)**

**Turbo MT model and STI model**

**16 N·m (1.63 kgf-m, 11.8 ft-lb)**

**AT model**

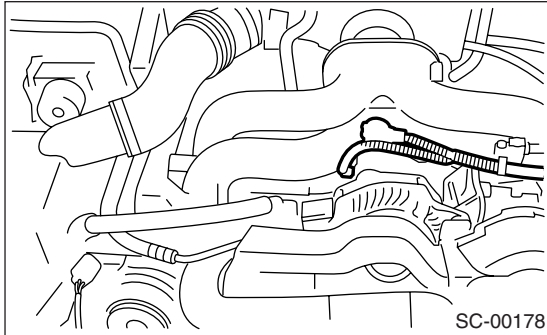
**31 N·m (3.16 kgf-m, 22.9 ft-lb)**

## 3. Generator

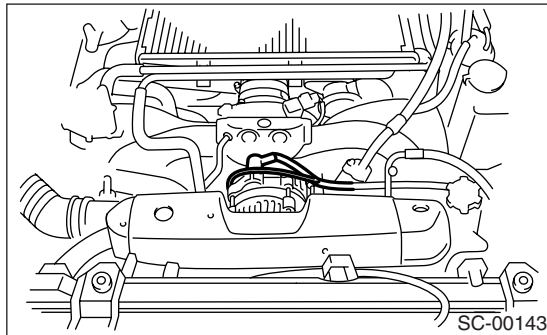
### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector and terminal from generator.

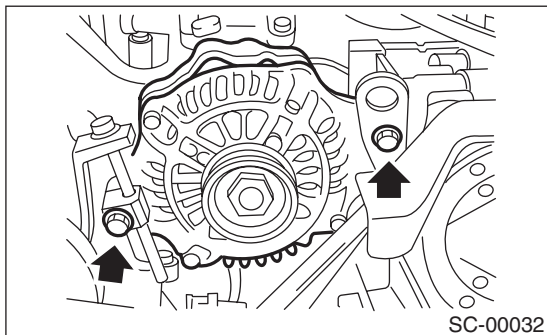
- Non-turbo model



- Turbo model and STI model



- 3) Remove the V-belt cover.
- 4) Remove the front side V-belt.  
<Ref. to ME(H4SO)-40, FRONT SIDE BELT, REMOVAL, V-belt.> <Ref. to ME(H4DOTC)-41, FRONT SIDE BELT, REMOVAL, V-belt.>
- 5) Remove the bolts which install generator onto bracket.



### B: INSTALLATION

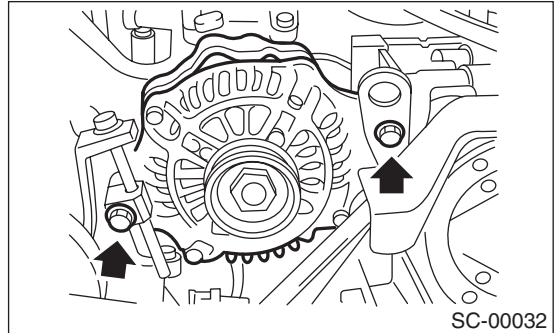
Install in the reverse order of removal.

#### Tightening torque:

**25 N·m (2.5 kgf-m, 18.1 ft-lb)**

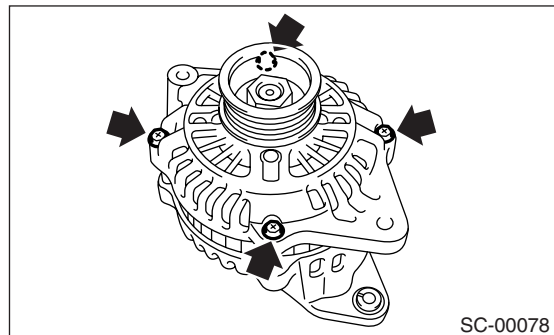
#### CAUTION:

Check and adjust the V-belt tension. <Ref. to ME(H4SO)-41, INSPECTION, V-belt.> <Ref. to ME(H4DOTC)-41, INSPECTION, V-belt.>

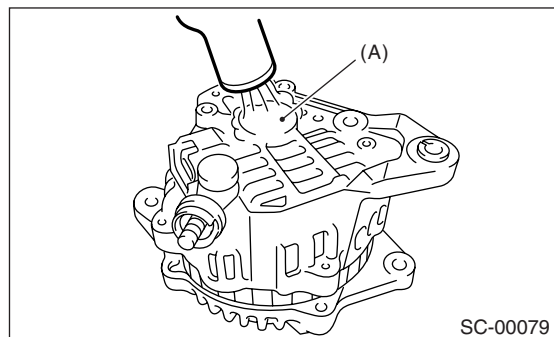


### C: DISASSEMBLY

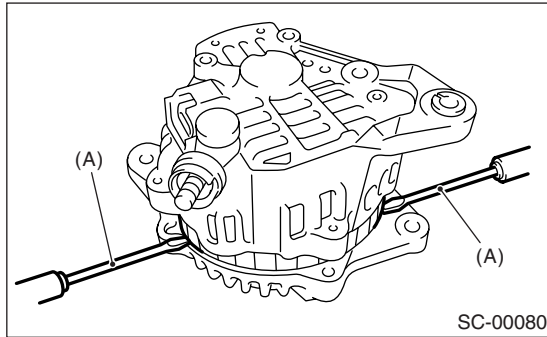
- 1) Remove the four through-bolts.



- 2) Heat portion (A) of rear cover to 50°C (122°F) with a heater drier.

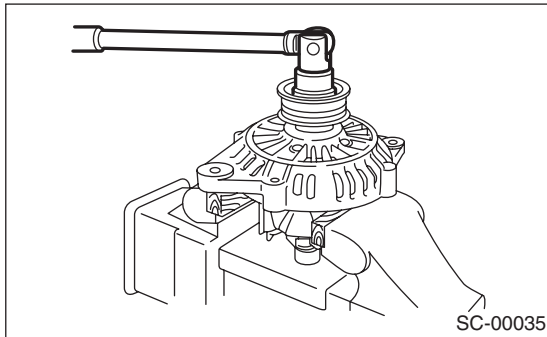


3) Then insert the tip of a flat tip screwdriver into the gap between stator core and front cover. Pry them apart to disassemble.

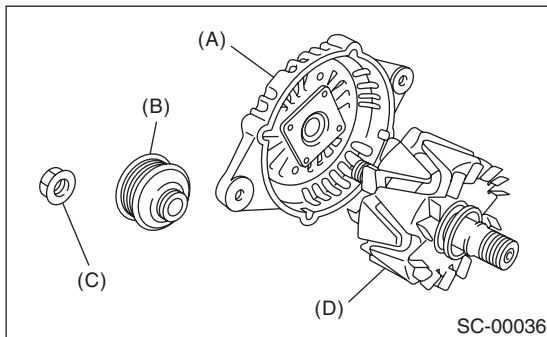


(A) Screwdriver

4) Hold the rotor with a vise and remove pulley nut.



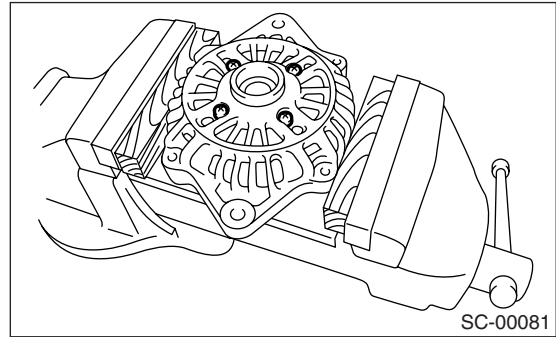
**CAUTION:**  
When holding the rotor with a vise, place aluminum plates or wooden pieces on the vise jaws to prevent rotor from damage.



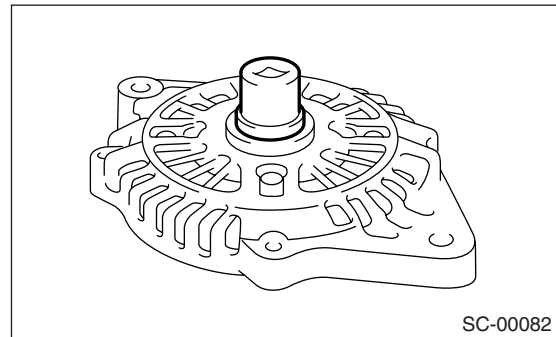
- (A) Front cover
- (B) Pulley
- (C) Nut
- (D) Rotor

5) Remove the ball bearing as follows.

(1) Remove the bolt, and then remove the bearing retainer.

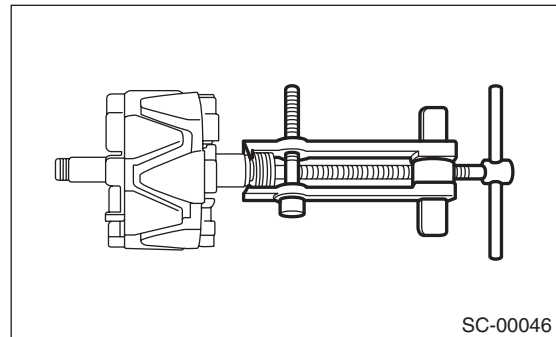


(2) Firmly install an appropriate tool (such as a fit socket wrench) to bearing inner race.



(3) Push the ball bearing off the front cover using a press.

6) Remove the bearing from rotor using a bearing puller.



7) Unsolder connection between rectifier and stator coil to remove the stator coil.

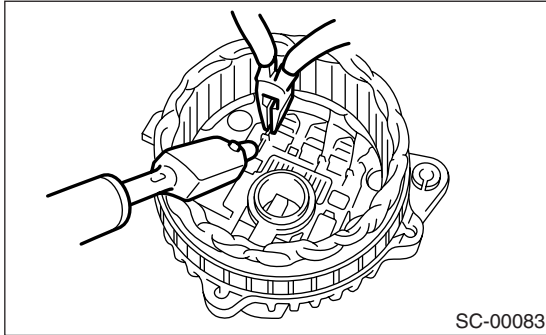


# Generator

## STARTING/CHARGING SYSTEMS

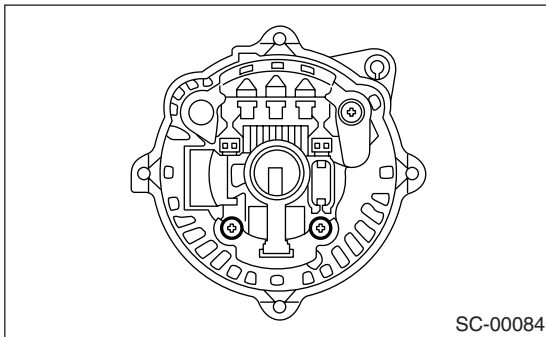
### CAUTION:

Do not allow a 180 — 270 W soldering iron to contact the terminals for more than 5 seconds at once because the rectifier cannot withstand so much heat.

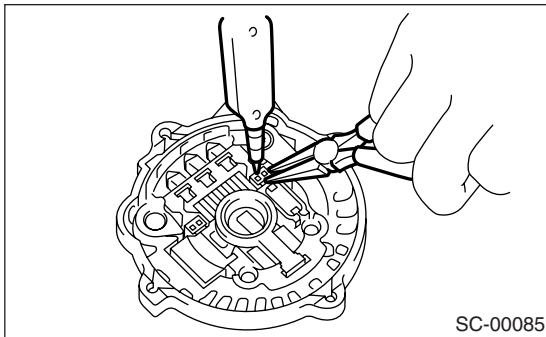


8) Remove the IC regulator as follows.

(1) Remove the screws which secure IC regulator to rear cover.

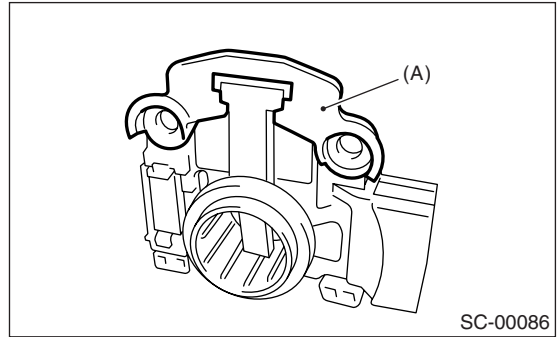


(2) Unsolder the connection between IC regulator and rectifier to remove the IC regulator.



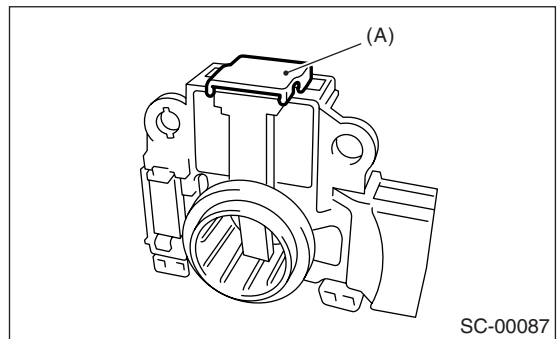
9) Remove the brush as follows.

(1) Remove cover A.



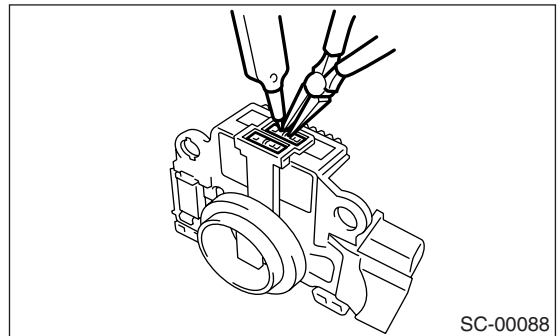
(A) Cover A

(2) Remove cover B.



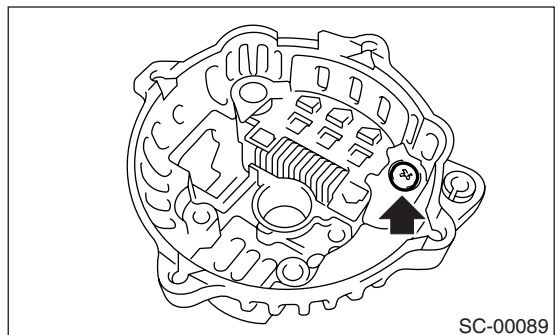
(A) Cover B

(3) Separate the brush from connection to remove.

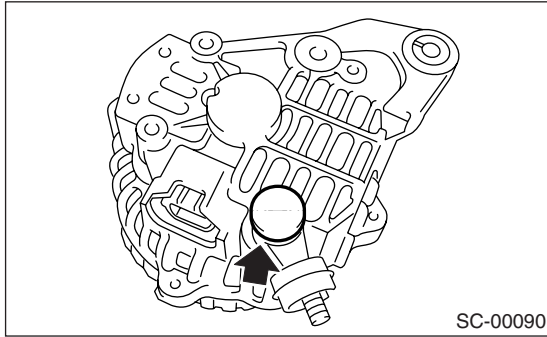


10) Remove the rectifier as follows.

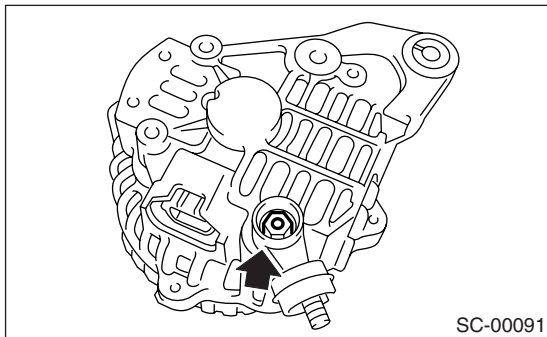
(1) Remove the bolts which secure the rectifier.



(2) Remove the cover of terminal B.



(3) Remove the nut of terminal B, and then remove the rectifier.



### D: ASSEMBLY

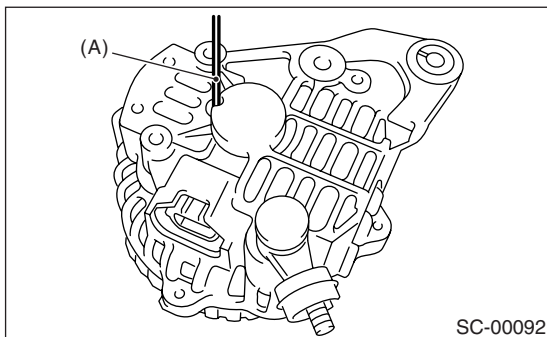
Assemble in the reverse order of disassembly.

1) Pulling up brush

Before assembling, press the brush down into brush holder, and then fix them in that position by passing a [1 mm (0.08 in) dia. 40 to 50 mm (1.6 to 2.0 in) long] wire through the hole as shown in the figure.

#### CAUTION:

**Be sure to remove the wire after reassembly.**



(A) Wire

2) Install the ball bearing.

(1) Set the ball bearing on the front cover, and then securely install an appropriate tool (such as a fit socket wrench) to the bearing outer race.

(2) Press the ball bearing into the specified position using a press.

(3) Install the bearing retainer.

3) Press the bearing (rear side) into the rotor shaft using a press to install.

4) Heat the bearing box in rear cover [50 to 60°C (122 to 140°F)], and then press the rear bearing into rear cover.

#### CAUTION:

**Grease should not be applied to rear bearing. Remove the oil completely if it is found on bearing box.**

5) After reassembly, turn the pulley by hand to check that rotor turns smoothly.

### E: INSPECTION

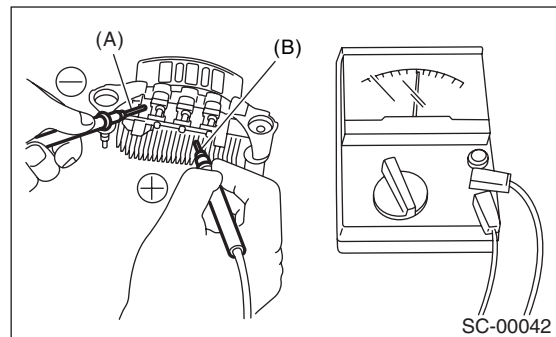
1. DIODE

#### CAUTION:

**Never use a mega tester (designed for reading high voltage) or any other similar instrument for this test; otherwise, the diodes may be damaged.**

1) Checking positive diode

Check for continuity between the diode lead and positive side heat sink. The positive diode is in good condition if resistance is 1 Ω or less only in the direction from the diode lead to heat sink.



(A) Diode lead

(B) Heat sink (positive side)

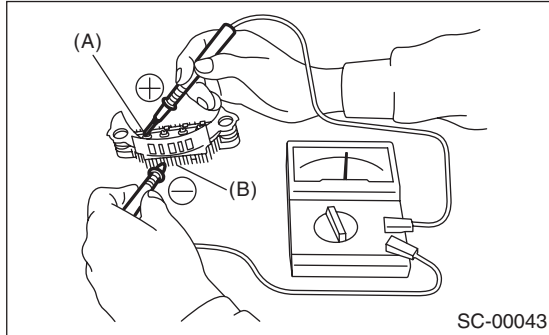


# Generator

## STARTING/CHARGING SYSTEMS

### 2) Checking negative diode

Check for continuity between the negative side heat sink and diode lead. The negative diode is in good condition if resistance is  $1\ \Omega$  or less only in the direction from the heat sink to diode lead.



- (A) Diode lead
- (B) Heat sink (negative side)

## 2. ROTOR

### 1) Slip ring surface

Inspect the slip rings for contamination or any roughness on the sliding surface. Repair the slip ring surface using a lathe or sand paper.

### 2) Slip ring outer diameter

Measure the slip ring outer diameter. If the slip ring is worn, replace the rotor assembly.

#### **Slip ring outer diameter:**

##### **Standard**

**22.7 mm (0.894 in)**

##### **Limit**

**22.1 mm (0.870 in)**

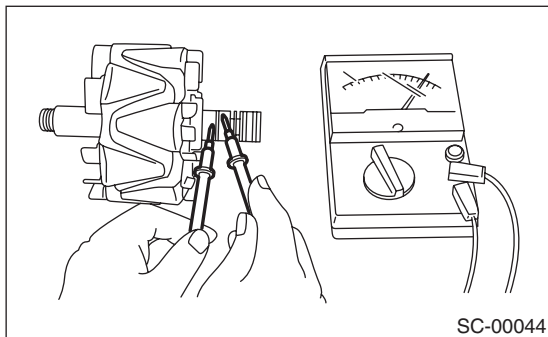
### 3) Continuity test

Check the resistance between slip rings using circuit tester.

If the resistance is not within the specified range, replace the rotor assembly.

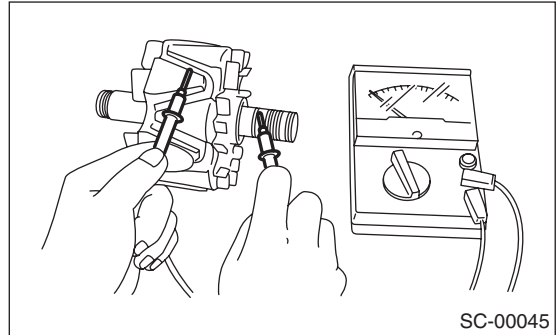
#### **Specified resistance:**

**Approx. 1.8 — 2.2  $\Omega$**



### 4) Insulation test

Check the continuity between slip ring and rotor core or shaft. If resistance is  $1\ \Omega$  or less, the rotor coil is grounded, and so replace the rotor assembly.



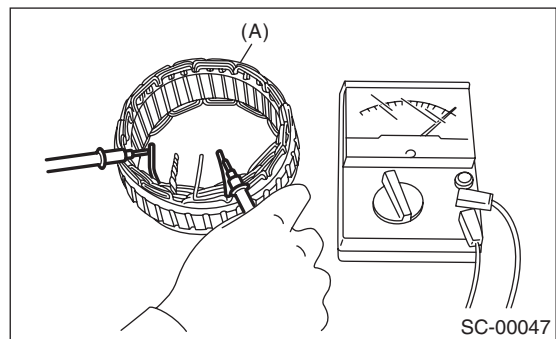
### 5) Ball bearing (rear side)

Check the rear ball bearing. Replace if it is noisy or if the rotor does not turn smoothly.

## 3. STATOR

### 1) Continuity test

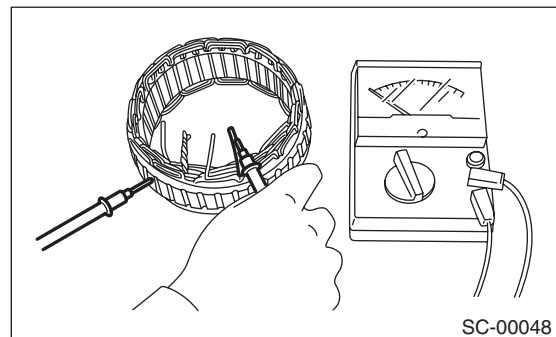
Inspect the stator coil for continuity between each end of the lead wires. If resistance is  $1\ M\Omega$  or more, the lead wire is broken, and so replace the stator assembly.



(A) Stator

### 2) Insulation test

Inspect the stator coil for continuity between stator core and each end of lead wire. If resistance is  $1\ \Omega$  or less, the stator coil is grounded, and so replace the stator assembly.



#### 4. BRUSH

1) Measure the length of each brush. If wear exceeds the service limit, replace the brush. Each brush has the service limit mark (A) on it.

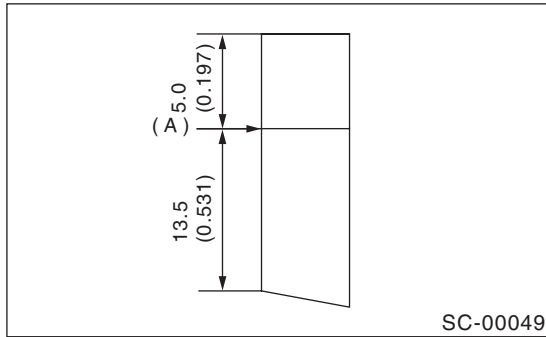
**Brush length:**

**Standard**

**18.5 mm (0.728 in)**

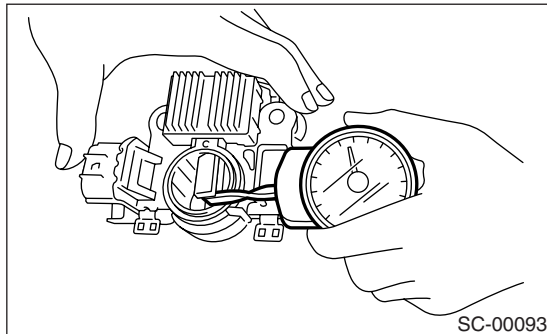
**Service limit**

**5.0 mm (0.197 in)**



2) Checking brush spring for proper pressure

Using a spring pressure indicator, push the brush into the brush holder until its tip protrudes 2 mm (0.08 in). Then measure the pressure of brush spring. If the pressure is less than 2.648 N (270 g, 9.52 oz), replace the brush spring with a new one. The new spring must have a pressure of 4.609 to 5.786 N (470 to 590 g, 16.58 to 20.810 oz).



#### 5. BEARING (FRONT SIDE)

Check the front ball bearing. If the resistance is felt while rotating, or if abnormal noise is heard, replace the ball bearing.

# Battery

## STARTING/CHARGING SYSTEMS

### 4. Battery

#### A: REMOVAL

- 1) Disconnect the positive (+) cable after disconnecting the ground (-) cable of battery.
- 2) Remove the flange nuts from battery rods, and then take off the battery holder.
- 3) Remove the battery.

#### B: INSTALLATION

Install in the reverse order of removal.

##### **Tightening torque:**

**3.4 N·m (0.35 kgf-m, 2.5 ft-lb)**

##### **NOTE:**

- Clean the battery cable terminals, and then apply grease to retard formation of corrosion.
- Connect the positive (+) cable of battery and then the ground (-) cable of battery.
- Starting engine should be performed more than 10 seconds after the ignition switch is turned to ON because initial diagnosis for electronic throttle control is performed after installation of battery.

#### C: INSPECTION

##### **WARNING:**

- Electrolyte has toxicity; be careful handling the fluid.
- Avoid contact with skin, eyes or clothing. Especially at contact with eyes, flush with running water for 15 minutes and get prompt medical attention.
- Batteries produce explosive gasses. Keep sparks, flame, cigarettes away.
- Ventilate when charging or using in enclosed space.
- For safety, in case an explosion does occur, wear eye protection or shield your eyes when working near any battery. Never lean over a battery.
- Do not let the battery fluid contact eyes, skin, fabrics, and paint-work because battery fluid is corrosive acid.
- To lessen the risk of sparks, remove rings, metal watch-bands, and other metal jewelry. Never allow metal tools to contact the positive battery terminal and anything connected to it while you are at the same time in contact with any other metallic portion of the vehicle. This may cause a short circuit.

#### 1. EXTERNAL PARTS

Check for the existence of dirt or cracks on battery case, top cover, vent plugs, and terminal posts. If necessary, clean with water and wipe with a dry cloth.

Apply a thin coat of grease on the terminal posts to prevent corrosion.

#### 2. ELECTROLYTE LEVEL

Check the electrolyte level in each cell. If the level is below MIN LEVEL, bring the level to MAX LEVEL by pouring distilled water into the battery cell. Do not fill beyond MAX LEVEL.

#### 3. SPECIFIC GRAVITY OF ELECTROLYTE

1) Measure the specific gravity of electrolyte using a hydrometer and a thermometer.

Specific gravity varies with temperature of electrolyte so that it must be corrected at 20°C (68°F) using the following equation:

$$S_{20} = St + 0.0007 \times (t - 20)$$

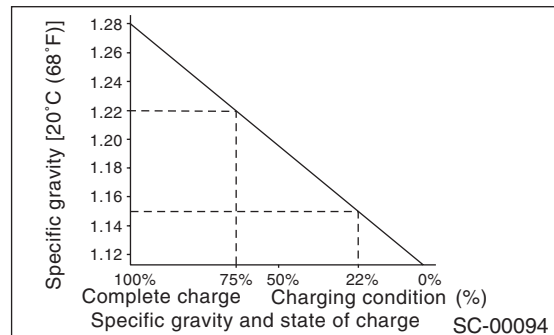
***S<sub>20</sub>***: Specific gravity corrected at electrolyte temperature of 20°C

***St***: Measured specific gravity

***t***: Measured temperature (°C)

**Determine whether or not battery must be charged, according to corrected specific gravity.**

**Standard specific gravity: 1.220 — 1.290 [at 20°C (68°F)]**



2) Measuring the specific gravity of the electrolyte in battery will disclose the state of charge of battery. The relation between specific gravity and state of charge is as shown in the figure.

#### D: MEASUREMENT

##### **WARNING:**

Do not bring an open flame close to the battery at this time.

##### **CAUTION:**

- Prior to charging, corroded terminals should be cleaned with a brush and common caustic soda solution.

- Be careful since the battery electrolyte overflows while charging the battery.
- Observe the instructions when handling battery charger.
- Before charging the battery on vehicle, disconnect battery ground terminal to prevent damage of generator diodes or other electrical units.

## 1. JUDGMENT OF BATTERY IN CHARGED CONDITION

1) Specific gravity of electrolyte is held within the specified range from 1.250 to 1.290 for more than one hour.

2) Voltage per battery cell is held at the specified range from 2.5 to 2.8 volts for more than one hour.

## 2. STATE OF CHARGE CHECK USING A HYDROMETER

| Hydrometer indicator | State of charge | Corrective action                              |
|----------------------|-----------------|--|
| Green dot            | Above 65%       | Load test                                      |
| Dark dot             | Below 65%       | Charge battery                                 |
| Clear dot            | Low electrolyte | Replace battery*<br>(If cranking is difficult) |

\*: Check electrical system before replacement.

## 3. NORMAL CHARGING

Charge the battery at current value specified by manufacturer or at approx. 1/10 of the battery's ampere-hour rating.

## 4. QUICK CHARGING

Quick charging is a method in which the battery is charged in a short period of time with a relatively large current by using a quick charger.

Since a large current flow raises electrolyte temperature, the battery is subject to damage if large current is used for prolonged time. For this reason, the quick charging must be carried out within a current range that will not increase the electrolyte temperature above 40°C (104°F).

It should be also remembered that the quick charging is a temporary means to bring battery voltage up to a fair value and, as a rule, a battery should be charged slowly with a low current.

### CAUTION:

- Observe the items in 3. NORMAL CHARGING.
- Never use more than 10 amperes when charging the battery because that will shorten battery life.

# Battery

STARTING/CHARGING SYSTEMS

---

SC(H4SO)-22

# ENGINE (DIAGNOSTICS)

# *EN(H4SO)(diag)*

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# Basic Diagnostic Procedure

ENGINE (DIAGNOSTICS)

## 1. Basic Diagnostic Procedure

### A: PROCEDURE

#### 1. ENGINE

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <b>1 CHECK ENGINE START FAILURE.</b><br>1) Ask the customer when and how the trouble occurred using the check list for interview. <Ref. to EN(H4SO)(diag)-3, CHECK, Check List for Interview.><br>2) Start the engine.   | Does the engine start?  | Go to step 2.   | Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H4SO)(diag)-58, Diagnostics for Engine Starting Failure.>  |
| <b>2 CHECK ILLUMINATION OF MALFUNCTION INDICATOR LIGHT.</b>  | Does malfunction indicator light illuminate?                      | Go to step 3.   | Inspection using "General Diagnostics Table". <Ref. to EN(H4SO)(diag)-342, INSPECTION, General Diagnostic Table.>   |
| <b>3 CHECK INDICATION OF DTC ON DISPLAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the Subaru Select Monitor or the general scan tool to data link connector.<br>3) Turn the ignition switch to ON and the Subaru Select Monitor or general scan tool power switch to ON.<br>4) Read the DTC on the Subaru Select Monitor or general scan tool. | Does the Subaru Select Monitor or general scan tool indicate DTC? | Record the DTC. Repair the trouble cause. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> Go to step 4.                                     | Repair the related parts.<br><br>NOTE:<br>If DTC is not shown on display although the malfunction indicator light illuminates, perform diagnostics of malfunction indicator light circuit or combination meter. <Ref. to EN(H4SO)(diag)-49, Malfunction Indicator Light.> |
| <b>4 PERFORM THE DIAGNOSIS.</b><br>1) Perform the clear memory mode. <Ref. to EN(H4SO)(diag)-46, Clear Memory Mode.><br>2) Perform the inspection mode. <Ref. to EN(H4SO)(diag)-36, Inspection Mode.>  | Does the Subaru Select Monitor or general scan tool indicate DTC? | Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-80, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> | Complete the diagnosis.   |

# Check List for Interview

ENGINE (DIAGNOSTICS)

## 2. Check List for Interview

### A: CHECK

#### 1. CHECK LIST No. 1

Check the following items when problem has occurred.

NOTE:

Use copies of this page for interviewing customers.

|                     |   |                  |  |
|---------------------|---|------------------|--|
| Customer's name     |   | Engine No.       |  |
| Date of sale        |   | Fuel brand       |  |
| Date of repair      |   | Odometer reading | km   |
| VIN No.             |   |                  | miles  |
| Weather             | <input type="checkbox"/> Fine<br><input type="checkbox"/> Cloudy<br><input type="checkbox"/> Rainy<br><input type="checkbox"/> Snowy<br><input type="checkbox"/> Various/Others:  |                  |  |
| Outdoor temperature | °C (°F)   |                  |  |
|                     | <input type="checkbox"/> Hot<br><input type="checkbox"/> Warm<br><input type="checkbox"/> Cool<br><input type="checkbox"/> Cold   |                  |  |
| Place               | <input type="checkbox"/> Highway<br><input type="checkbox"/> Suburbs<br><input type="checkbox"/> Inner city<br><input type="checkbox"/> Uphill<br><input type="checkbox"/> Downhill<br><input type="checkbox"/> Rough road<br><input type="checkbox"/> Others:  |                  |  |
| Engine temperature  | <input type="checkbox"/> Cold<br><input type="checkbox"/> Warming-up<br><input type="checkbox"/> After warming-up<br><input type="checkbox"/> Any temperature<br><input type="checkbox"/> Others:   |                  |  |
| Engine speed        | rpm   |                  |  |
| Vehicle speed       | MPH   |                  |  |
| Driving conditions  | <input type="checkbox"/> Not affected<br><input type="checkbox"/> At starting<br><input type="checkbox"/> While idling<br><input type="checkbox"/> At racing<br><input type="checkbox"/> While accelerating<br><input type="checkbox"/> While cruising<br><input type="checkbox"/> While decelerating<br><input type="checkbox"/> While turning (RH/LH) |                  |  |
| Headlight           | <input type="checkbox"/> ON / <input type="checkbox"/> OFF  | Rear defogger    | <input type="checkbox"/> ON / <input type="checkbox"/> OFF |
| Blower              | <input type="checkbox"/> ON / <input type="checkbox"/> OFF  | Radio            | <input type="checkbox"/> ON / <input type="checkbox"/> OFF |
| A/C compressor      | <input type="checkbox"/> ON / <input type="checkbox"/> OFF  | CD/Cassette      | <input type="checkbox"/> ON / <input type="checkbox"/> OFF |
| Radiator fan        | <input type="checkbox"/> ON / <input type="checkbox"/> OFF  | Car phone        | <input type="checkbox"/> ON / <input type="checkbox"/> OFF |
| Front wiper         | <input type="checkbox"/> ON / <input type="checkbox"/> OFF  | CB               | <input type="checkbox"/> ON / <input type="checkbox"/> OFF |
| Rear wiper          | <input type="checkbox"/> ON / <input type="checkbox"/> OFF  |                  |  |



# Check List for Interview

ENGINE (DIAGNOSTICS)

## 2. CHECK LIST No. 2

Check the following items about the vehicle's state when malfunction indicator light turns on.

NOTE:

Use copies of this page for interviewing customers.

|  |
|--|
| a) Other warning lights or indicators turn on. <input type="checkbox"/> Yes / <input type="checkbox"/> No  |
| <input type="checkbox"/> Low fuel warning light<br><input type="checkbox"/> Charge indicator light<br><input type="checkbox"/> AT diagnostics indicator light<br><input type="checkbox"/> ABS warning light<br><input type="checkbox"/> Engine oil pressure warning light  |
| b) Fuel level  |
| <ul style="list-style-type: none"><li>• Lack of gasoline: <input type="checkbox"/> Yes / <input type="checkbox"/> No</li><li>• Indicator position of fuel gauge:</li><li>• Experienced running out of fuel?: <input type="checkbox"/> Yes / <input type="checkbox"/> No</li></ul>  |
| c) Intentional connecting or disconnecting of harness connectors or spark plug cords: <input type="checkbox"/> Yes / <input type="checkbox"/> No   |
| <ul style="list-style-type: none"><li>• What:</li></ul>  |
| d) Intentional connecting or disconnecting of hoses: <input type="checkbox"/> Yes / <input type="checkbox"/> No  |
| <ul style="list-style-type: none"><li>• What:</li></ul>  |
| e) Installing of parts other than genuine parts: <input type="checkbox"/> Yes / <input type="checkbox"/> No  |
| <ul style="list-style-type: none"><li>• What:</li><li>• Where:</li></ul>   |
| f) Occurrence of noise: <input type="checkbox"/> Yes / <input type="checkbox"/> No   |
| <ul style="list-style-type: none"><li>• From where:</li><li>• What kind:</li></ul>   |
| g) Occurrence of smell: <input type="checkbox"/> Yes / <input type="checkbox"/> No   |
| <ul style="list-style-type: none"><li>• From where:</li><li>• What kind:</li></ul>   |
| h) Intrusion of water into engine compartment or passenger compartment: <input type="checkbox"/> Yes / <input type="checkbox"/> No   |
| i) Troubles occurred   |
| <input type="checkbox"/> Engine does not start.<br><input type="checkbox"/> Engine stalls during idling.<br><input type="checkbox"/> Engine stalls while driving.<br><input type="checkbox"/> Engine speed decreases.<br><input type="checkbox"/> Engine speed does not decrease.<br><input type="checkbox"/> Rough idling<br><input type="checkbox"/> Poor acceleration<br><input type="checkbox"/> Back fire<br><input type="checkbox"/> After fire<br><input type="checkbox"/> No shift<br><input type="checkbox"/> Excessive shift shock |

## 3. General Description

### A: CAUTION

1) Airbag system wiring harness is routed near the ECM, main relay and fuel pump relay.

#### CAUTION:

- Airbag system connectors are colored yellow. Do not use electrical test equipment on these circuit.
- Be careful not to damage the airbag system wiring harness when servicing the ECM, TCM, main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.

- The ECM will be destroyed instantly.
- The fuel injector and other part will be damaged.

3) Do not disconnect the battery terminals while the engine is running.

A large counter electromotive force will be generated in the generator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn OFF the ignition switch.

5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

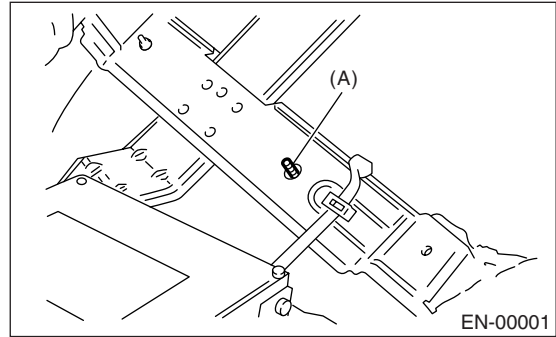
6) Before removing the ECM from the located position, disconnect two cables on battery. Otherwise, the ECM may be damaged.

#### CAUTION:

**When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on fuel injection system.**

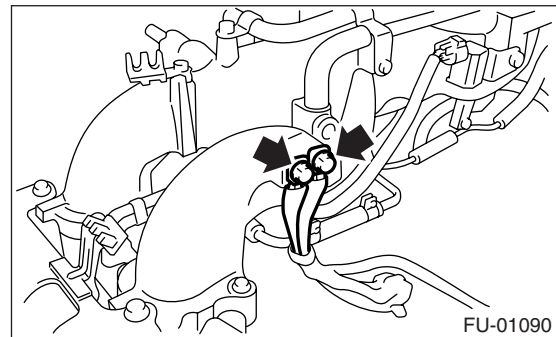
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use ECM mounting stud bolts at the body side grounding point when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

9) Use engine grounding terminal or engine proper as the grounding point to the body when measuring voltage and resistance in the engine compartment.



10) Every MFI-related part is a precision part. Do not drop them.

11) Observe the following cautions when installing a radio in MFI equipped models.

#### CAUTION:

- The antenna must be kept as far apart as possible from the control unit. (The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
- The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
- Carefully adjust the antenna for correct matching.
- When mounting a large power type radio, pay special attention to the three items above mentioned.
- Incorrect installation of the radio may affect the operation of the ECM.

12) Before disconnecting the fuel hose, release the fuel pressure. <Ref. to FU(H4SO)-42, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

# General Description

## ENGINE (DIAGNOSTICS)

13) On models with ABS, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis system.

### B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

#### 1. BATTERY

1) Measure battery voltage and specific gravity of electrolyte.

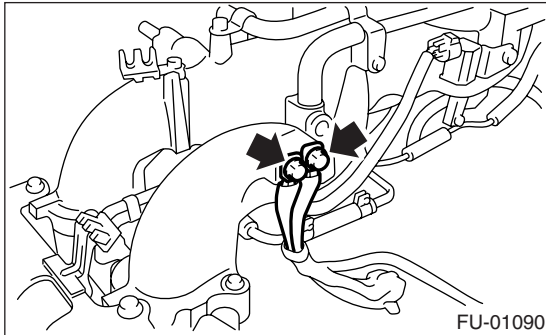
**Standard voltage: 12 V**

**Specific gravity: Above 1.260**

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

#### 2. ENGINE GROUNDING

Make sure the engine grounding terminal is properly connected to the engine.



### C: NOTE

#### 1. DESCRIPTION

- The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. Malfunction indicator light in the combination meter indicates occurrence of a fault or trouble.
- Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
- The OBD system incorporated with the vehicles within this engine family complies with OBD-II Regulations. The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.

- When the system decides that a malfunction occurs, malfunction indicator light illuminates. At the same time of the malfunction indicator light illumination or blinking, a DTC and a freeze frame engine conditions are stored into on-board computer.
- The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
- If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
- When the malfunction does not occur again for three consecutive driving cycles, malfunction indicator light is turned off, but DTC remains at on-board computer.
- When troubleshooting the vehicle which complies with OBD-II Regulations, connect the Subaru Select Monitor or general scan tool to the vehicle.

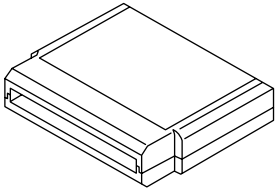

#### 2. ENGINE AND EMISSION CONTROL SYSTEM

- The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology. With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.
  - Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.
- The MFI system also has the following features:
- Reduced emission of harmful exhaust gases.
  - Reduction in fuel consumption.
  - Increased engine output.
  - Superior acceleration and deceleration.
  - Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

# General Description

ENGINE (DIAGNOSTICS)

## D: PREPARATION TOOL

| ILLUSTRATION  | TOOL NUMBER                        | DESCRIPTION                  | REMARKS                                 |
|---|------------------------------------|------------------------------|---|
| <br>ST18482AA010 | 18482AA010<br>(Newly adopted tool) | CARTRIDGE                    | Troubleshooting for electrical systems. |
| <br>ST22771AA030 | 22771AA030                         | SUBARU SELECT<br>MONITOR KIT | Troubleshooting for electrical systems. |

# Electrical Component Location

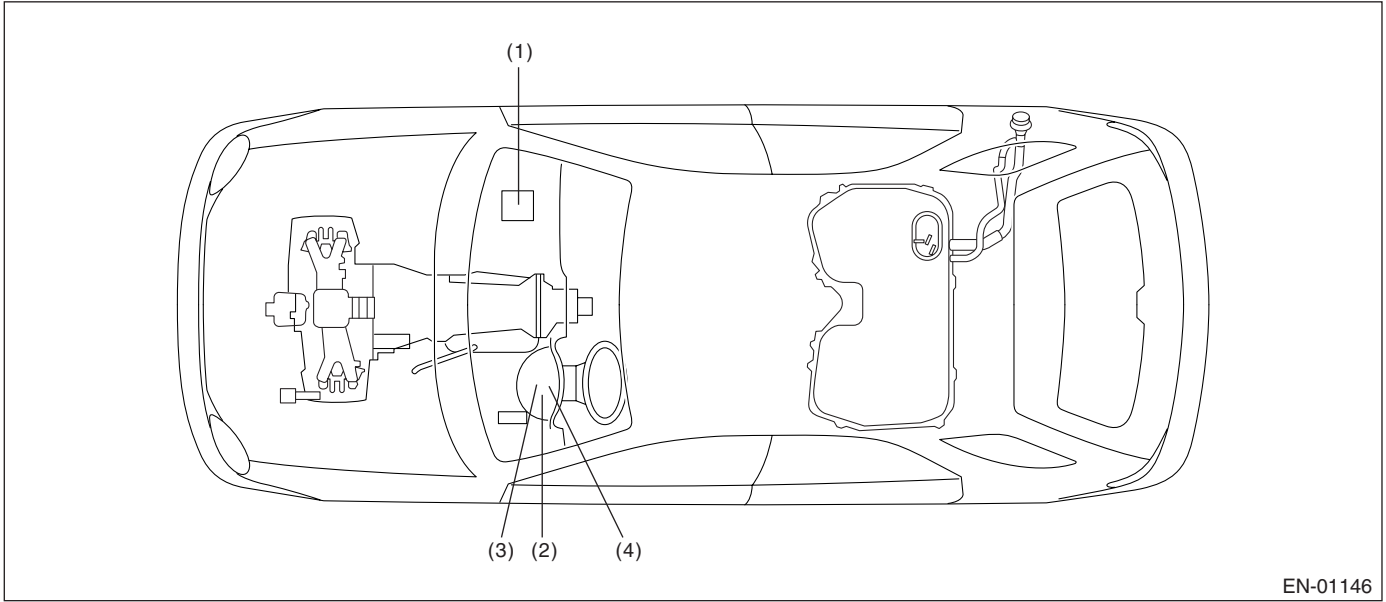
ENGINE (DIAGNOSTICS)

## 4. Electrical Component Location

### A: LOCATION

#### 1. ENGINE

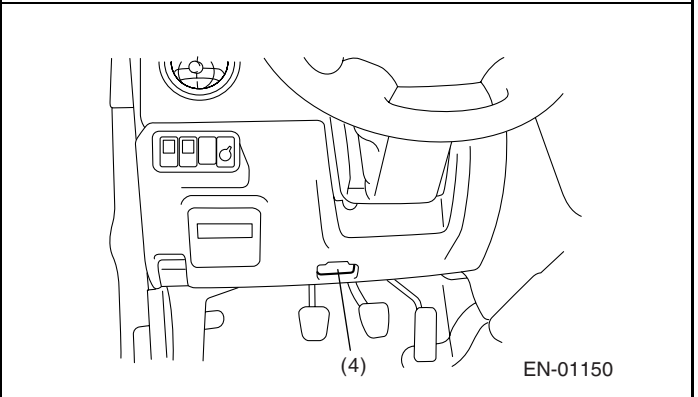
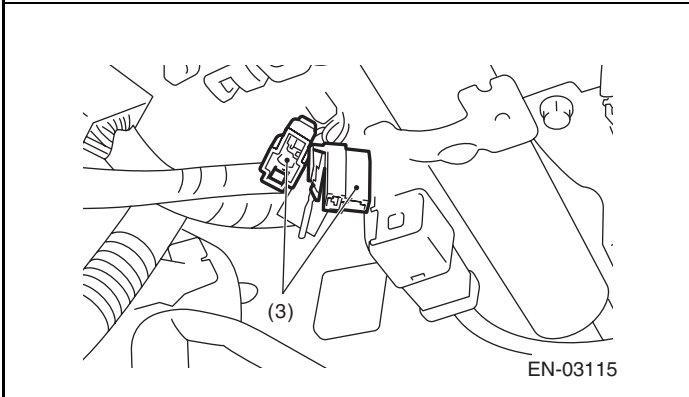
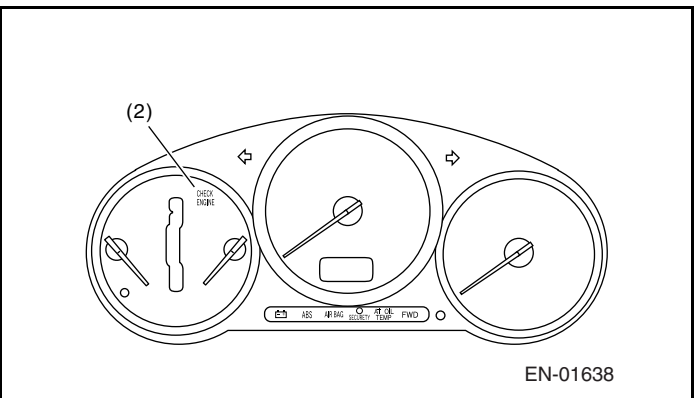
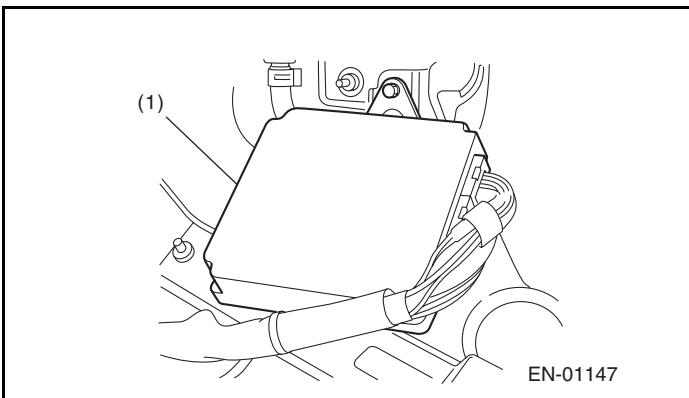
##### • CONTROL MODULE



- (1) Engine control module (ECM)
- (2) Malfunction indicator light

- (3) Test mode connector

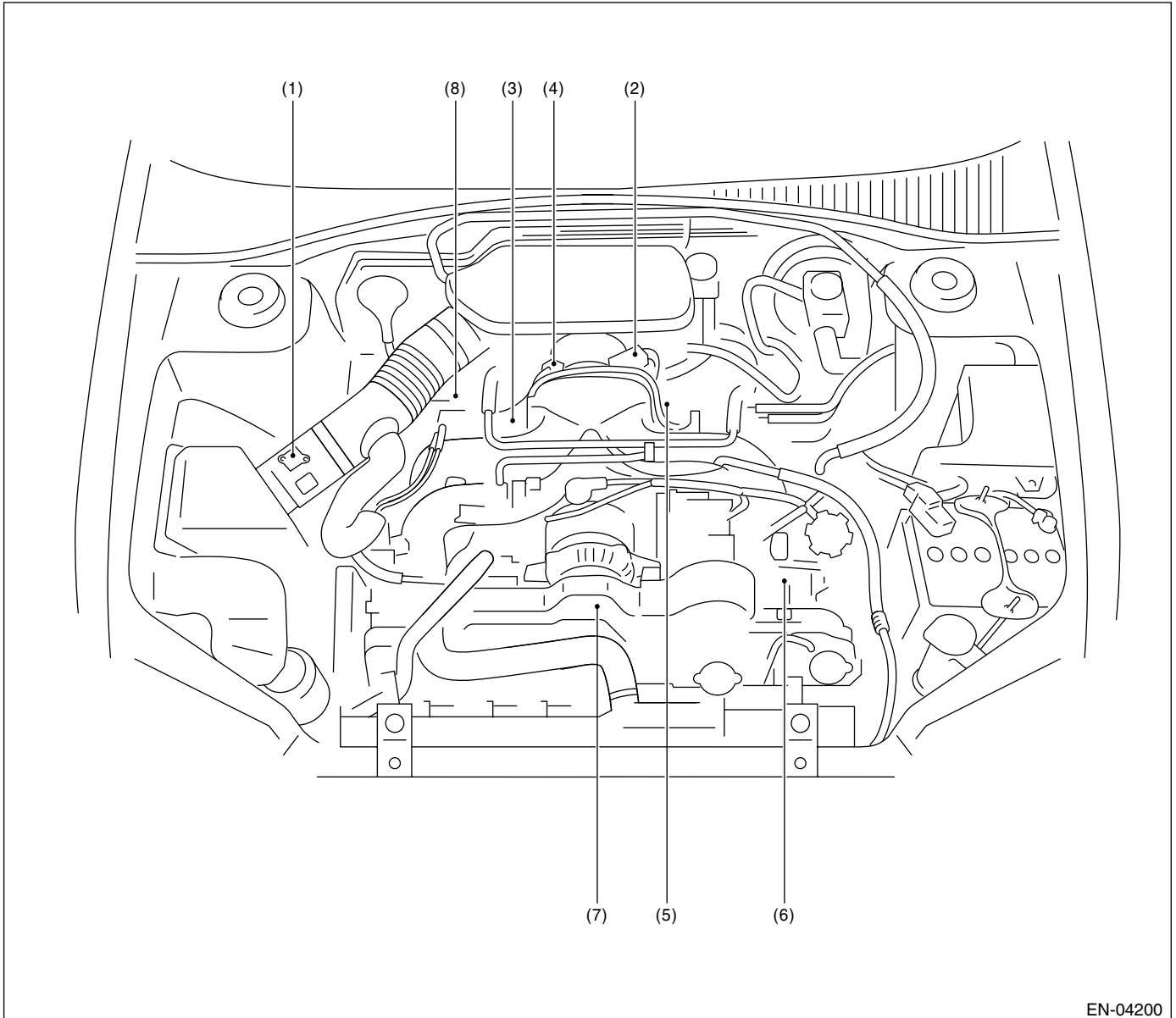
- (4) Data link connector



# Electrical Component Location

ENGINE (DIAGNOSTICS)

## • SENSOR

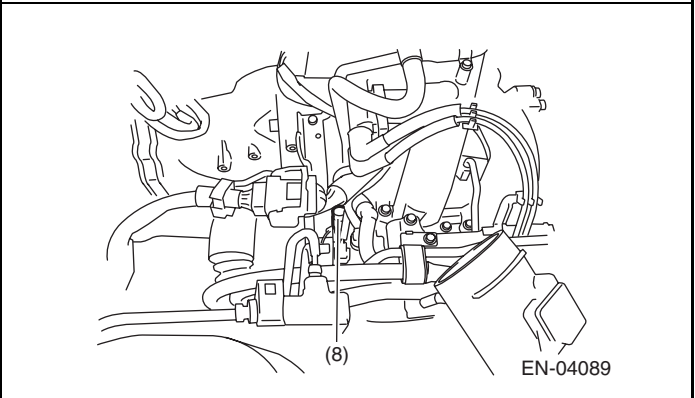
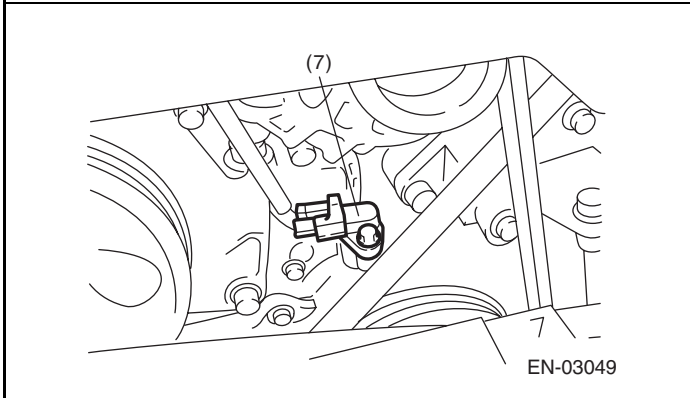
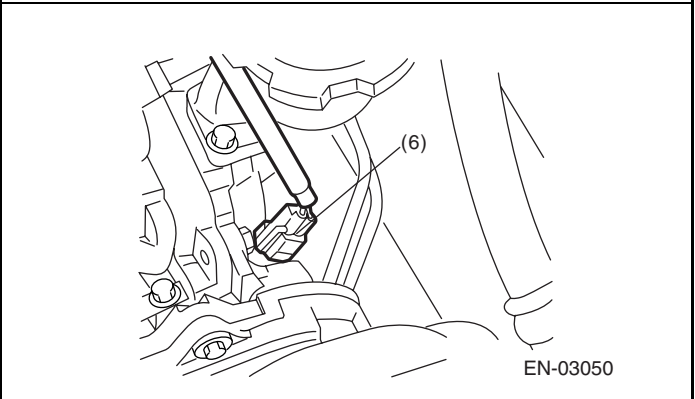
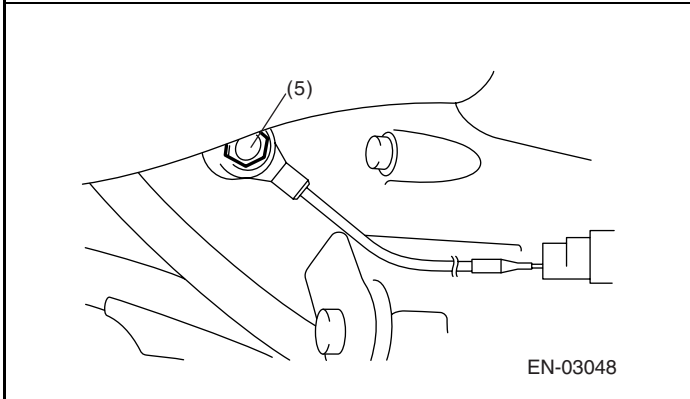
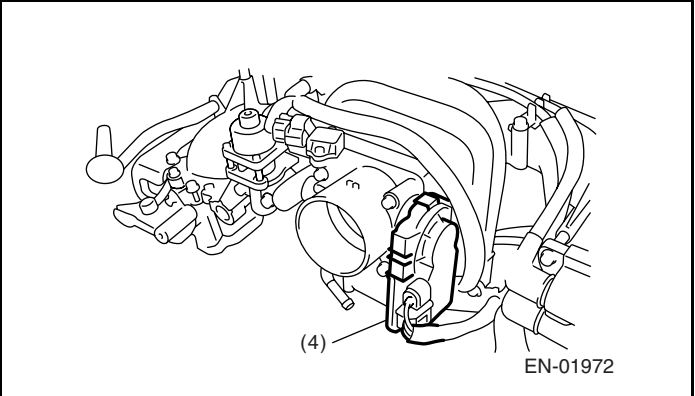
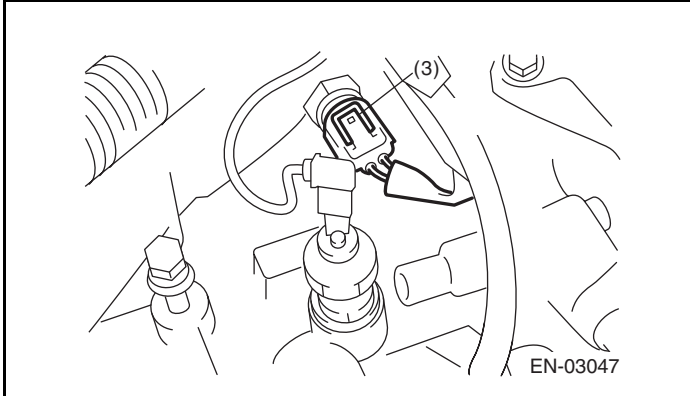
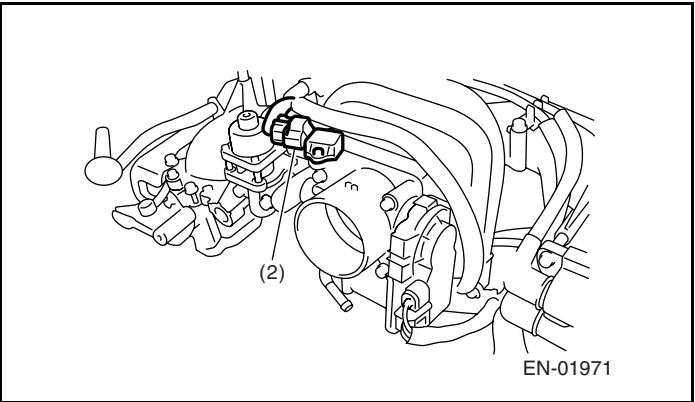
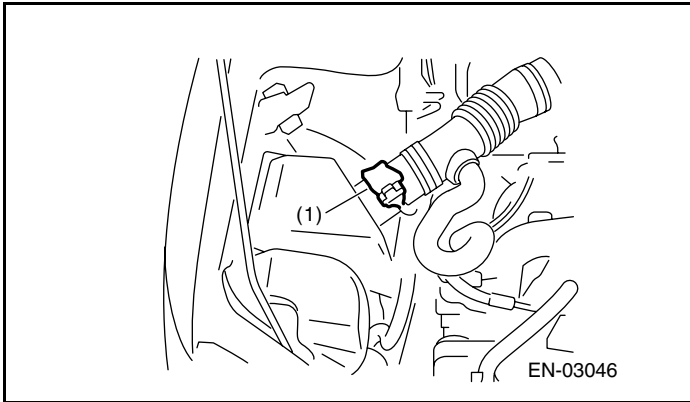


EN-04200

- |   |                                       |                                |
|---|---------------------------------------|--------------------------------|
| (1) Mass air flow and intake air temperature sensor | (3) Engine coolant temperature sensor | (6) Camshaft position sensor   |
| (2) Manifold absolute pressure sensor               | (4) Throttle position sensor          | (7) Crankshaft position sensor |
|   | (5) Knock sensor                      | (8) Oil temperature sensor     |

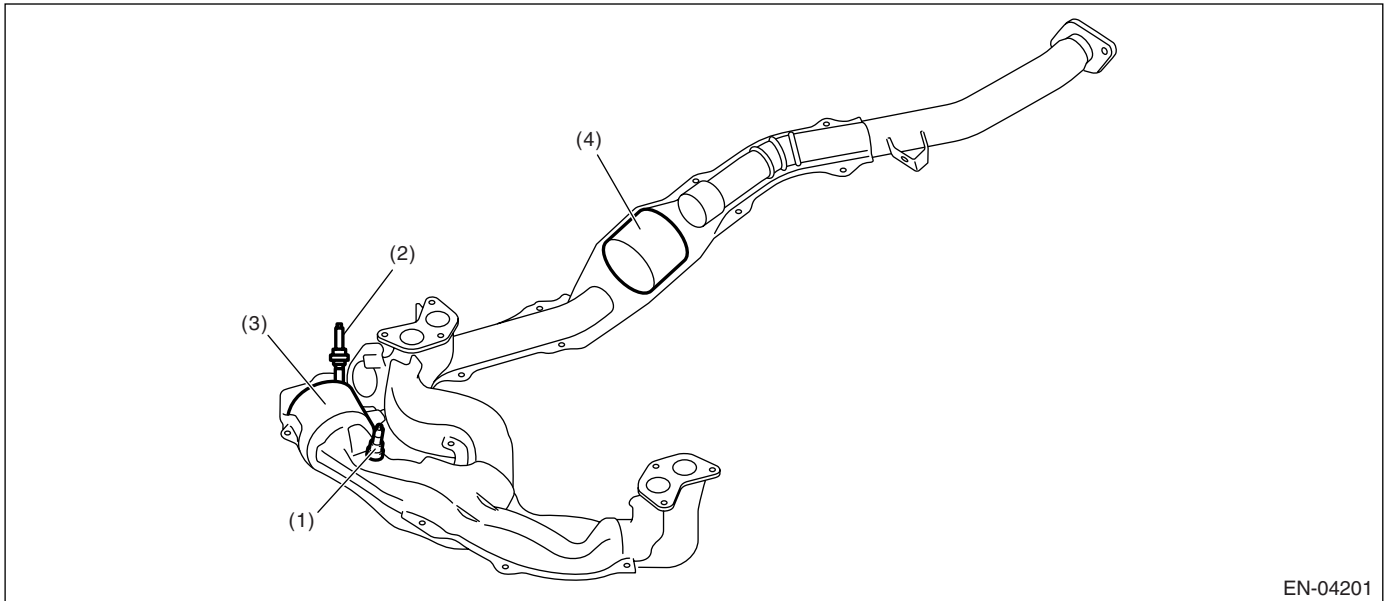
# Electrical Component Location

## ENGINE (DIAGNOSTICS)



# Electrical Component Location

ENGINE (DIAGNOSTICS)



EN-04201

(1) Front oxygen (A/F) sensor  
(2) Rear oxygen sensor

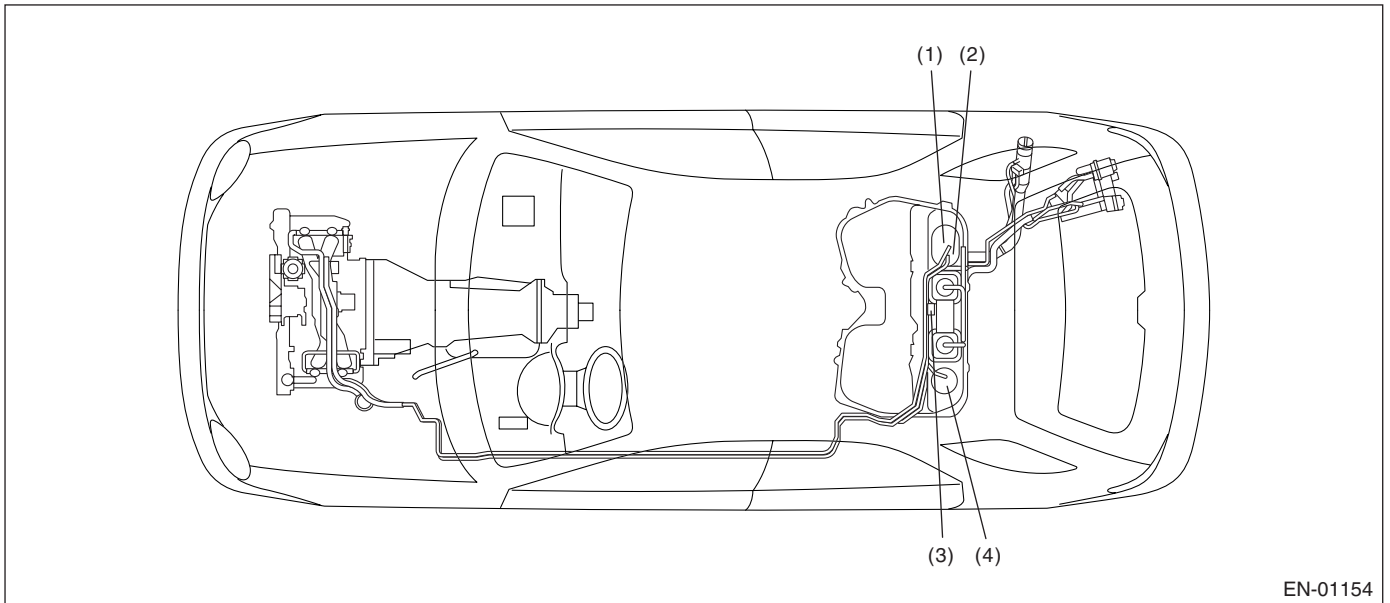
(3) Front catalytic converter

(4) Rear catalytic converter



# Electrical Component Location

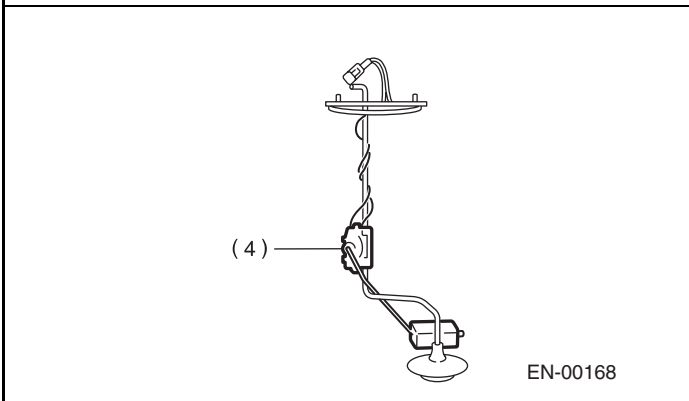
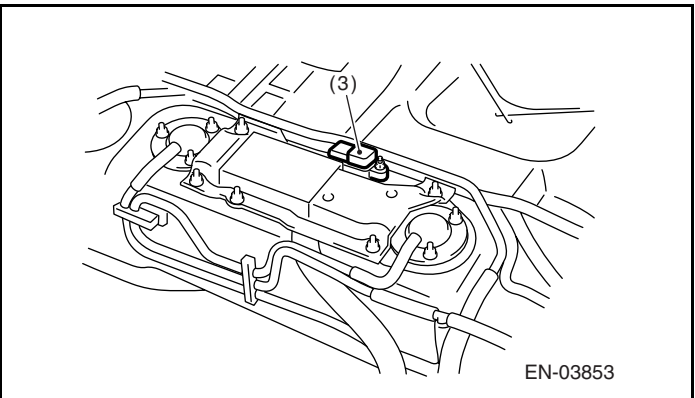
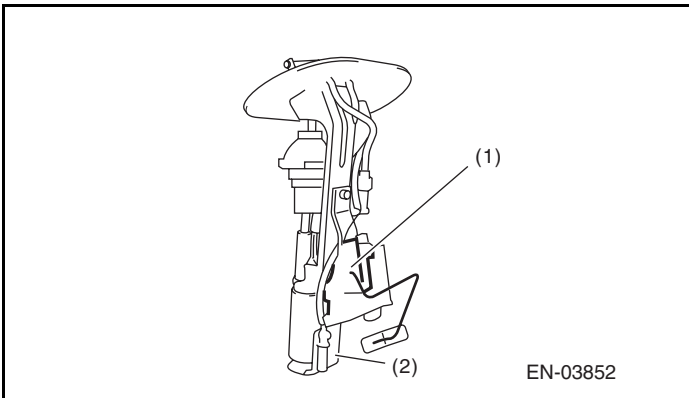
ENGINE (DIAGNOSTICS)



- (1) Fuel level sensor
- (2) Fuel temperature sensor

- (3) Fuel tank pressure sensor

- (4) Fuel sub level sensor

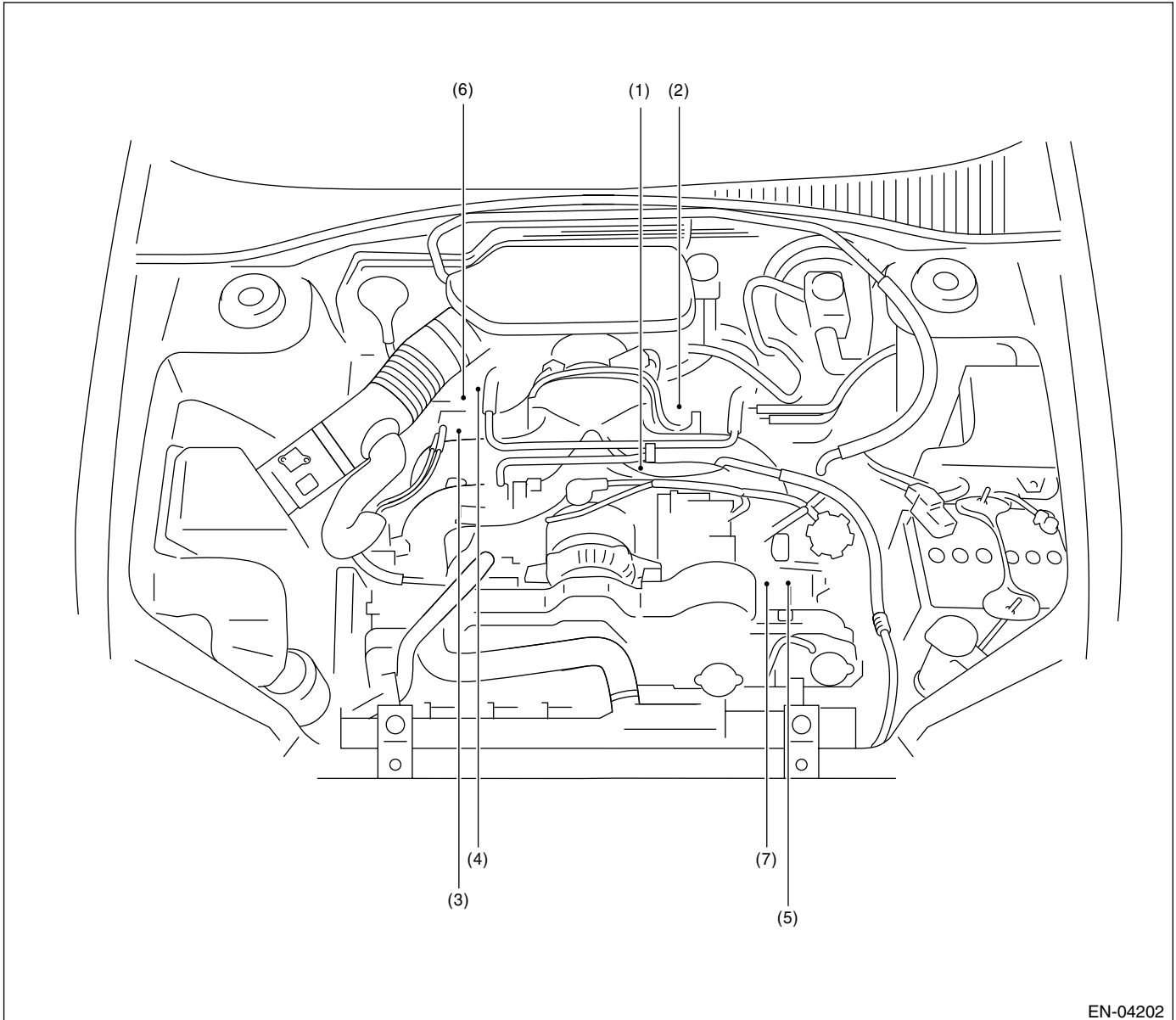


**SUBARU.**

# Electrical Component Location

ENGINE (DIAGNOSTICS)

## • SOLENOID VALVE, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



EN-04202

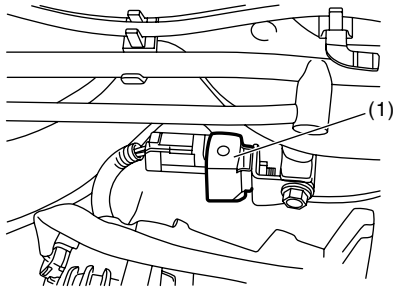
- (1) Purge control solenoid valve
- (2) EGR valve
- (3) Ignition coil and ignitor ASSY

- (4) Oil switching solenoid valve RH
- (5) Oil switching solenoid valve LH
- (6) Variable valve lift diagnosis oil pressure switch RH

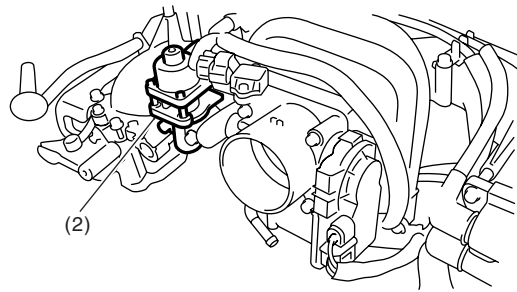
- (7) Variable valve lift diagnosis oil pressure switch LH

# Electrical Component Location

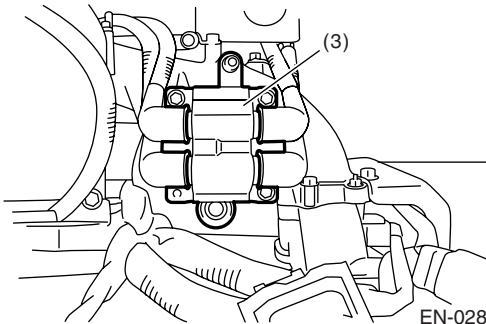
ENGINE (DIAGNOSTICS)



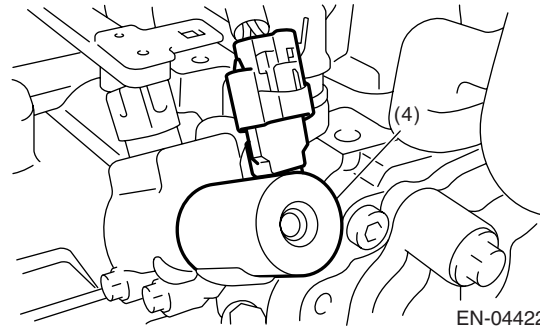
EN-03052



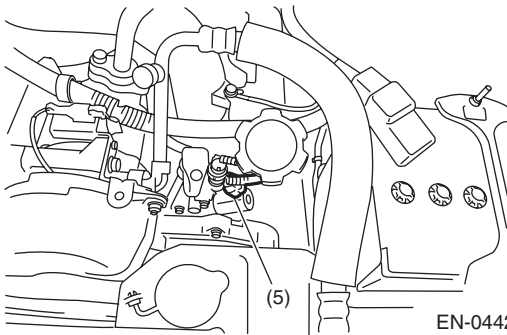
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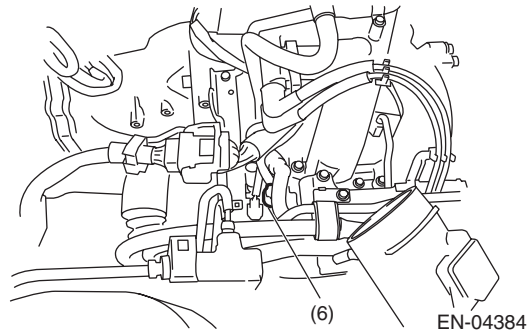
EN-02864



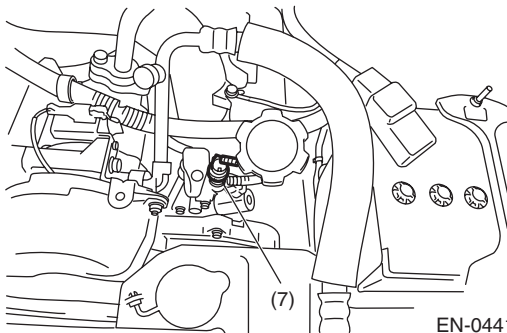
EN-04422



EN-04420



EN-04384

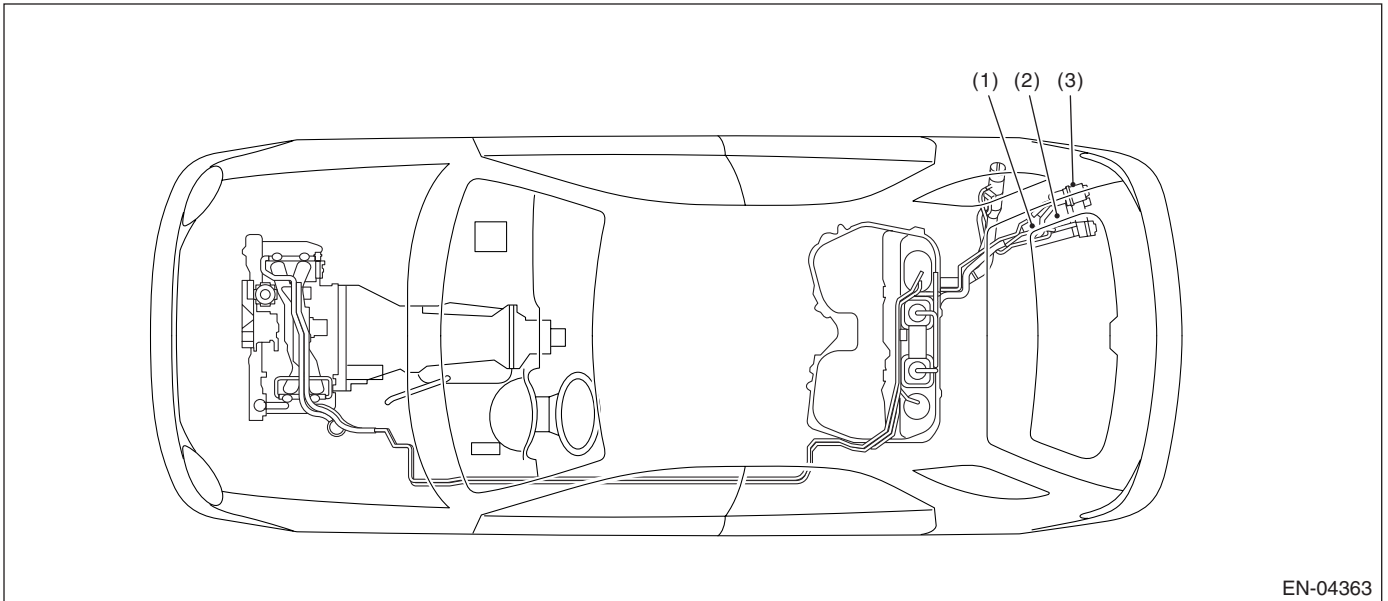


EN-04419

**SUBARU.**

# Electrical Component Location

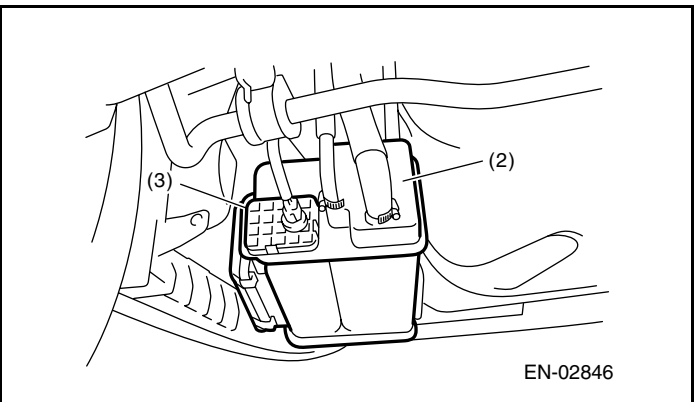
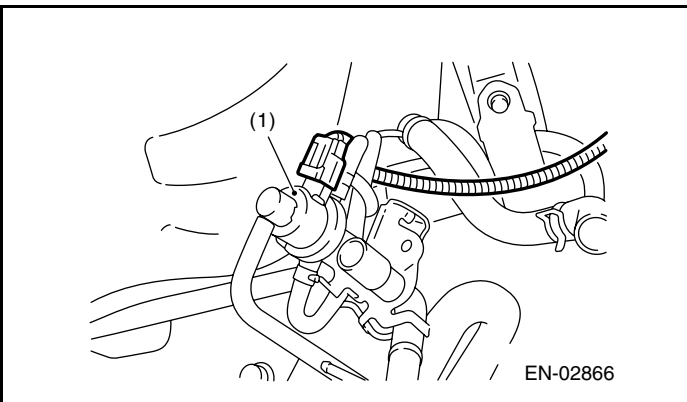
ENGINE (DIAGNOSTICS)



(1) Pressure control solenoid valve

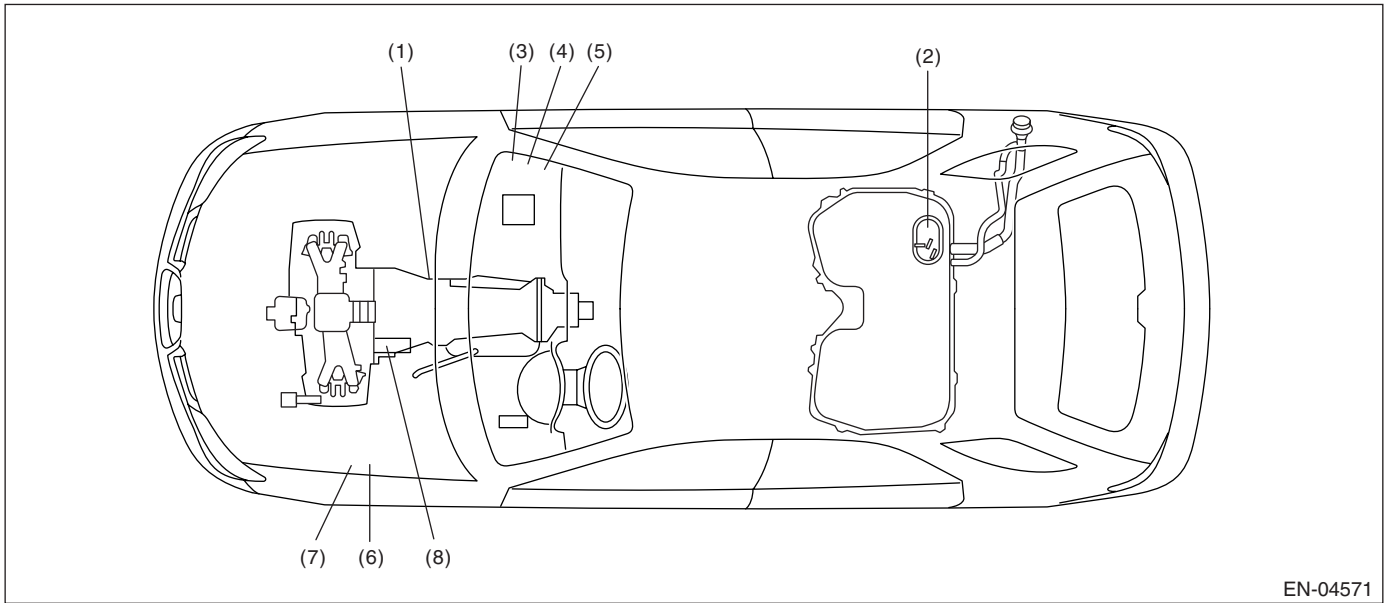
(2) Canister

(3) Drain valve

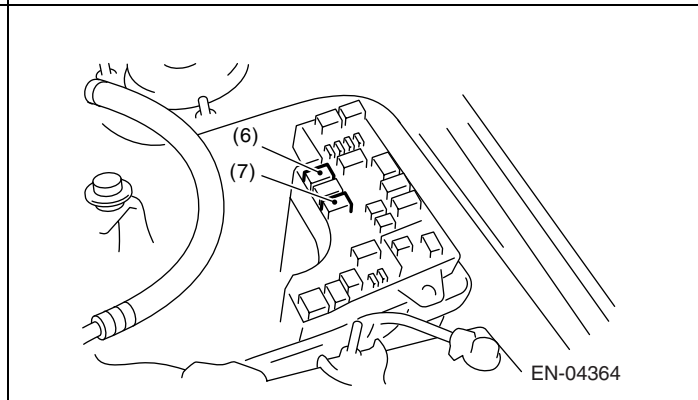
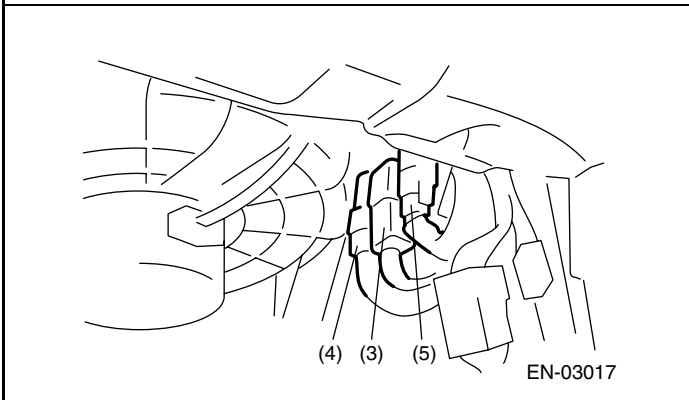
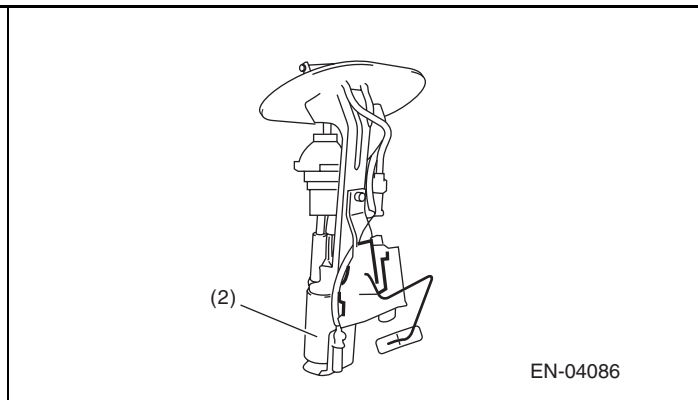
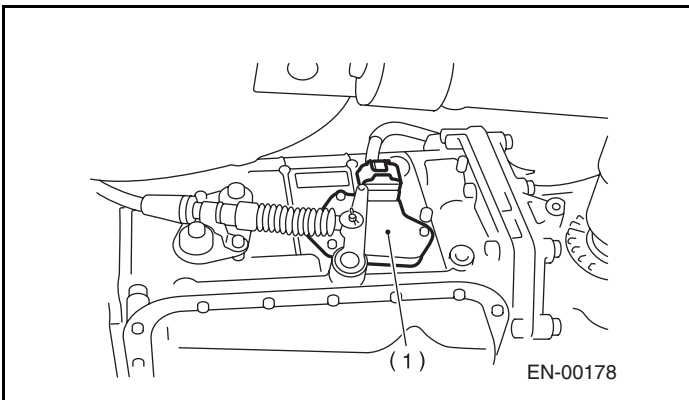


# Electrical Component Location

## ENGINE (DIAGNOSTICS)

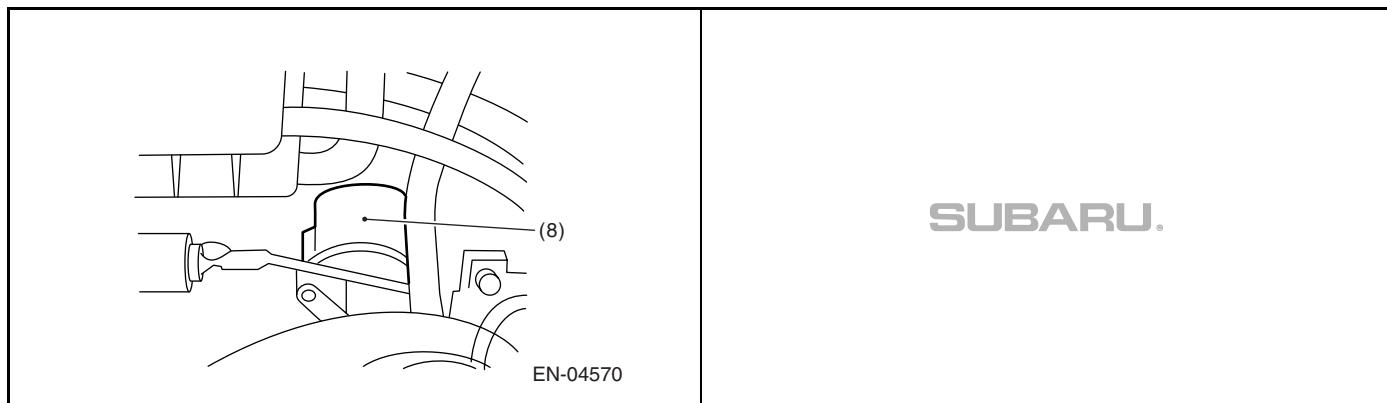


- |                      |                                       |                            |
|----------------------|---------------------------------------|----------------------------|
| (1) Inhibitor switch | (4) Fuel pump relay                   | (7) Radiator sub fan relay |
| (2) Fuel pump        | (5) Electronic throttle control relay | (8) Starter                |
| (3) Main relay       | (6) Radiator main fan relay           |                            |



# Electrical Component Location

ENGINE (DIAGNOSTICS)

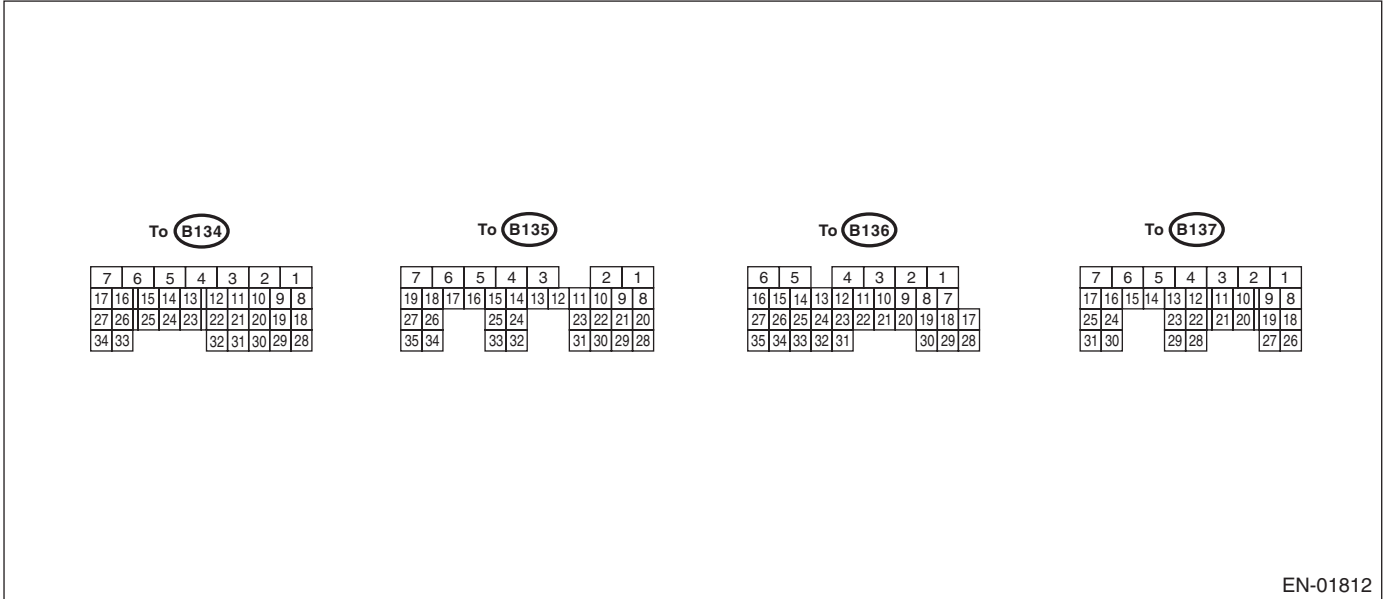


# Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

## 5. Engine Control Module (ECM) I/O Signal

### A: ELECTRICAL SPECIFICATION



EN-01812

| Content                              |              | Connector No. | Terminal No. | Signal (V)                  |                       | Note   |
|--------------------------------------|--------------|---------------|--------------|-----------------------------|-----------------------|--|
|                                      |              |               |              | Ignition SW ON (Engine OFF) | Engine ON (Idling)    |  |
| Crankshaft position sensor           | Signal (+)   | B134          | 13           | 0                           | -7 — +7               | Sensor output waveform                                       |
|                                      | Signal (-)   | B134          | 14           | 0                           | 0                     | —  |
|                                      | Shield       | B134          | 24           | 0                           | 0                     | —  |
| Rear oxygen sensor                   | Signal       | B135          | 4            | 0                           | 0 — 0.9               | —  |
|                                      | Shield       | B135          | 1            | 0                           | 0                     | —  |
|                                      | GND (sensor) | B134          | 29           | 0                           | 0                     | —  |
| Front oxygen (A/F) sensor heater     | Signal 1     | B136          | 3            | 10 — 13                     | 1 — 14                | Waveform   |
|                                      | Signal 2     | B136          | 2            | 10 — 13                     | 1 — 14                | Waveform   |
| Rear oxygen sensor heater signal     |              | B136          | 4            | 10 — 13                     | 1 — 14                | Waveform   |
| Engine coolant temperature sensor    | Signal       | B134          | 34           | 1.0 — 1.4                   | 1.0 — 1.4             | After warm-up the engine.                                    |
|                                      | GND (sensor) | B134          | 29           | 0                           | 0                     | After warm-up the engine.                                    |
| Vehicle speed signal                 |              | B136          | 12           | 0 or 5                      | 0 or 5                | "5" and "0" are repeatedly displayed when vehicle is driven. |
| Mass air flow sensor                 | Signal       | B135          | 26           | —                           | 0.3 — 4.5             | —  |
|                                      | Shield       | B135          | 35           | 0                           | 0                     | —  |
|                                      | GND          | B135          | 34           | 0                           | 0                     | —  |
| Intake air temperature sensor signal |              | B135          | 18           | 0.3 — 4.6                   | 0.3 — 4.6             | —  |
| Camshaft position sensor             | Signal (+)   | B134          | 12           | 0                           | -7 — +7               | Sensor output waveform                                       |
|                                      | Signal (-)   | B134          | 22           | 0                           | 0                     | —  |
|                                      | Shield       | B134          | 24           | 0                           | 0                     | —  |
| Starter switch                       |              | B136          | 32           | 0                           | 0                     | Cranking: 8 — 14   |
| A/C switch                           |              | B136          | 23           | ON: 10 — 13<br>OFF: 0       | ON: 12 — 14<br>OFF: 0 | —  |
| Ignition switch                      |              | B135          | 27           | 10 — 13                     | 12 — 14               | —  |

# Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

| Content                            | Connector No. | Terminal No. | Signal (V)                      |                                 | Note  |   |
|------------------------------------|---------------|--------------|---------------------------------|---------------------------------|---|---|
|                                    |               |              | Ignition SW ON (Engine OFF)     | Engine ON (Idling)              |   |   |
| Neutral position switch            | B136          | 31           | ON: 0<br>OFF: 10 — 13           | ON: 0<br>OFF: 12 — 14           | —   |   |
| Test mode connector                | B135          | 19           | 10 — 13                         | 12 — 14                         | When connected: 0                             |   |
| Knock sensor                       | Signal        | B134         | 15                              | 2.5                             | 2.5   | —   |
|                                    | Shield        | B134         | 25                              | 0                               | 0   | —   |
| Back-up power supply               | B135          | 5            | 10 — 13                         | 12 — 14                         | Ignition switch "OFF": 10 — 13                |   |
| Control unit power supply          | B134          | 7            | 10 — 13                         | 12 — 14                         | —   |   |
|                                    | B135          | 2            | 10 — 13                         | 12 — 14                         | —   |   |
| Ignition control                   | 1             | B137         | 18                              | 0                               | 1 — 3.4                                       | Waveform  |
|                                    | 2             | B137         | 19                              | 0                               | 1 — 3.4                                       | Waveform  |
| Fuel injector                      | #1            | B137         | 8                               | 10 — 13                         | 1 — 14  | Waveform  |
|                                    | #2            | B137         | 9                               | 10 — 13                         | 1 — 14  | Waveform  |
|                                    | #3            | B137         | 10                              | 10 — 13                         | 1 — 14  | Waveform  |
|                                    | #4            | B137         | 11                              | 10 — 13                         | 1 — 14  | Waveform  |
| Fuel pump control relay            | B136          | 13           | ON: 0.5 or less<br>OFF: 10 — 13 | ON: 0.5 or less<br>OFF: 12 — 14 | —   |   |
| A/C relay control                  | B136          | 9            | ON: 0.5 or less<br>OFF: 10 — 13 | ON: 0.5 or less<br>OFF: 12 — 14 | —   |   |
| Radiator fan relay 1 control       | B136          | 18           | ON: 0.5 or less<br>OFF: 10 — 13 | ON: 0.5 or less<br>OFF: 12 — 14 | —   |   |
| Radiator fan relay 2 control       | B136          | 29           | ON: 0.5 or less<br>OFF: 10 — 13 | ON: 0.5 or less<br>OFF: 12 — 14 | Model with A/C only                           |   |
| Starter relay control              | B136          | 20           | ON: 0.5 or less<br>OFF: 10 — 13 | ON: 0.5 or less<br>OFF: 12 — 14 | —   |   |
| Self shut relay control            | B136          | 24           | 0.5 or less                     | 0.5 or less                     | —   |   |
| Malfunction indicator lamp         | B136          | 11           | —                               | —                               | Light "ON": 1 or less<br>Light "OFF": 10 — 14 |   |
| Engine speed output                | B136          | 22           | —                               | 0 — 13                          | Waveform                                      |   |
| Purge control solenoid valve       | B137          | 29           | ON: 1 or less<br>OFF: 10 — 13   | ON: 1 or less<br>OFF: 12 — 14   | Sensor output waveform                        |   |
| Manifold absolute pressure sensor  | Signal        | B134         | 6                               | 3.4 — 3.8                       | 1.4 — 1.8                                     | —   |
|                                    | GND (sensor)  | B134         | 29                              | 0                               | 0   |   |
| Fuel tank pressure sensor          | Signal        | B135         | 32                              | 2.3 — 2.7                       | 2.3 — 2.7                                     | The valve operates when fuel filler cap is removed and reinstalled. |
|                                    | GND (sensor)  | B135         | 30                              | 0                               | 0   | —   |
| Pressure control solenoid valve    | B136          | 28           | ON: 1 or less<br>OFF: 10 — 13   | ON: 1 or less<br>OFF: 12 — 14   | —   |   |
| Drain valve                        | B136          | 17           | ON: 1 or less<br>OFF: 10 — 13   | ON: 1 or less<br>OFF: 12 — 14   | —   |   |
| Fuel level sensor                  | B135          | 10           | 0.3 — 4.5                       | 0.3 — 4.5                       | —   |   |
| Fuel temperature sensor signal     | B135          | 17           | 1 — 4                           | 1 — 4                           | —   |   |
| Small light switch                 | B135          | 15           | ON: 0<br>OFF: 10 — 13           | ON: 0<br>OFF: 12 — 14           | —   |   |
| Blower fan switch                  | B135          | 16           | ON: 0<br>OFF: 10 — 13           | ON: 0<br>OFF: 12 — 14           | —   |   |
| Rear defogger switch               | B135          | 14           | ON: 0<br>OFF: 10 — 13           | ON: 0<br>OFF: 12 — 14           | —   |   |
| Power steering oil pressure switch | B134          | 33           | ON: 1 or less<br>OFF: 10 — 13   | ON: 0<br>OFF: 12 — 14           | —   |   |



## Engine Control Module (ECM) I/O Signal

### ENGINE (DIAGNOSTICS)

| Content  | Connector No.      | Terminal No. | Signal (V)  |   | Note                                   |  |
|--|--------------------|--------------|---|---|--|--|
|  |                    |              | Ignition SW ON (Engine OFF)   | Engine ON (Idling)  |  |  |
| Front oxygen (A/F) sensor signal (+)           | B135               | 9            | —   | 2.7 — 2.9   | —                                      |  |
| Front oxygen (A/F) sensor signal (-)           | B135               | 8            | —   | 2.35 — 2.55   | —                                      |  |
| Front oxygen (A/F) sensor shield               | B135               | 1            | 0   | 0   | —                                      |  |
| SSM/GST communication line                     | B136               | 16           | Less than 1 ←→<br>More than 4   | Less than 1 ←→<br>More than 4   | —                                      |  |
| Ground   | Engine 1           | B134         | 5   | 0   | 0                                      | —  |
|  | Engine 2           | B137         | 7   | 0   | 0                                      | —  |
|  | Engine 3           | B137         | 2   | 0   | 0                                      | —  |
|  | Engine 4           | B137         | 1   | 0   | 0                                      | —  |
|  | Engine 5           | B137         | 3   | 0   | 0                                      | —  |
|  | Ignition 1         | B137         | 26  | 0   | 0                                      | —  |
|  | Ignition 2         | B137         | 6   | 0   | 0                                      | —  |
| Body   | B136               | 6            | 0   | 0   | —                                      |  |
| Electronic throttle control                    | Main               | B134         | 18  | 0.64 — 0.72<br>Fully opened: 3.96   | 0.64 — 0.72<br>(After engine warm-up)  | Fully closed: 0.6<br>Fully opened: 3.96  |
|  | Sub                | B134         | 28  | 1.51 — 1.58<br>Fully opened: 4.17   | 1.51 — 1.58<br>(After engine warm-up)  | Fully closed: 1.48<br>Fully opened: 4.17 |
|  | Power supply       | B134         | 19  | 5   | 5                                      | —  |
|  | GND (sensor)       | B134         | 29  | 0   | 0                                      | —  |
| Electronic throttle control motor (+)          | B137               | 5            | Duty waveform   | Duty waveform   | Driving frequency: 500 Hz              |  |
| Electronic throttle control motor (-)          | B137               | 4            | Duty waveform   | Duty waveform   | Driving frequent: 500 Hz               |  |
| Electronic throttle control motor power supply | B136               | 1            | 10 — 13   | 12 — 14   | —                                      |  |
| Electronic throttle control motor relay        | B136               | 21           | ON: 0<br>OFF: 10 — 13   | ON: 0<br>OFF: 12 — 14   | When ignition switch is ON: ON         |  |
| Accelerator pedal position sensor              | Main sensor signal | B135         | 23  | Fully closed: 0.7<br>Fully opened: 3.0                                      | Fully closed: 0.7<br>Fully opened: 3.0 | —  |
|  | Main power supply  | B135         | 21  | 5   | 5                                      | —  |
|  | GND (Main sensor)  | B135         | 29  | 0   | 0                                      | —  |
|  | Sub sensor signal  | B135         | 31  | Fully closed: 0.7<br>Fully opened: 3.0                                      | Fully closed: 0.7<br>Fully opened: 3.0 | —  |
|  | Sub power supply   | B135         | 22  | 5   | 5                                      | —  |
|  | GND (Sub sensor)   | B135         | 30  | 0   | 0                                      | —  |
| Cruise control set light                       | B135               | 3            | ON: 0<br>OFF: 10 — 13   | ON: 0<br>OFF: 12 — 14   | —                                      |  |
| Main light                                     | B135               | 6            | ON: 1 or less<br>OFF: 10 — 13   | ON: 0<br>OFF: 12 — 14   | —                                      |  |
| Clutch switch                                  | B136               | 25           | When clutch pedal is depressed: 0<br>When clutch pedal is released: 10 — 13 | When clutch pedal is depressed: 0<br>When clutch pedal is released: 12 — 14 | —                                      |  |

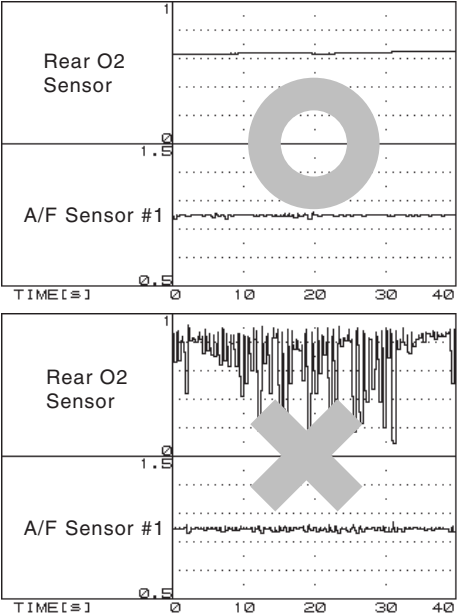
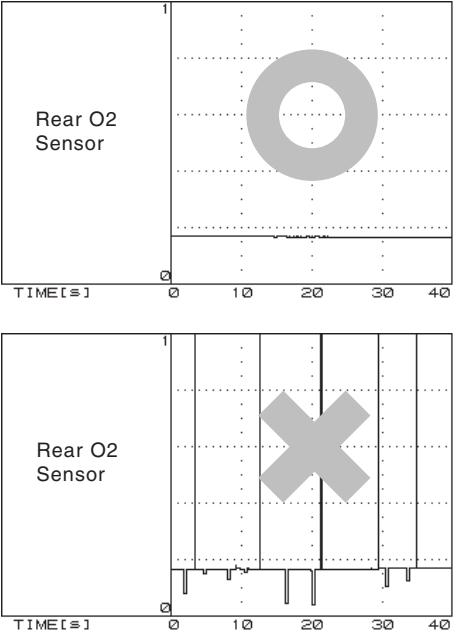
# Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

| Content  | Connector No. | Terminal No. | Signal (V)  |   | Note                      |                           |
|--|---------------|--------------|---|---|---------------------------|---------------------------|
|  |               |              | Ignition SW ON (Engine OFF)   | Engine ON (Idling)  |                           |                           |
| SET/COAST switch                                     | B135          | 24           | ON: 10 — 13<br>OFF: 0   | ON: 12 — 14<br>OFF: 0   | —                         |                           |
| Brake switch 1                                       | B135          | 20           | When brake pedal is depressed: 0<br>When brake pedal is released: 10 — 13 | When brake pedal is depressed: 0<br>When brake pedal is released: 12 — 14 | —                         |                           |
| Brake switch 2                                       | B135          | 28           | When brake pedal is depressed: 10 — 13<br>When brake pedal is released: 0 | When brake pedal is depressed: 12 — 14<br>When brake pedal is released: 0 | —                         |                           |
| RESUME/ACCEL switch                                  | B135          | 13           | ON: 10 — 13<br>OFF: 0   | ON: 12 — 14<br>OFF: 0   | —                         |                           |
| Main switch  | B135          | 12           | ON: 10 — 13<br>OFF: 0   | ON: 12 — 14<br>OFF: 0   | —                         |                           |
| CAN communication                                    | Signal (+)    | B136         | 27  | Pulse signal  |                           | —                         |
|  | Signal (-)    | B136         | 35  | Pulse signal  |                           | —                         |
| EGR solenoid valve                                   | Signal 1      | B134         | 8   | 0 or 10 — 13  | 0 or 12 — 14              | —                         |
|  | Signal 2      | B134         | 9   | 0 or 10 — 13  | 0 or 12 — 14              | —                         |
|  | Signal 3      | B134         | 10  | 0 or 10 — 13  | 0 or 12 — 14              | —                         |
|  | Signal 4      | B134         | 20  | 0 or 10 — 13  | 0 or 12 — 14              | —                         |
| Oil switching solenoid valve RH                      | Signal (+)    | B137         | 25  | 0   | Duty waveform             | Driving frequency: 300 Hz |
|  | Signal (-)    | B137         | 24  | 0   | 0                         | —                         |
| Oil switching solenoid valve LH                      | Signal (+)    | B137         | 31  | 0   | Duty waveform             | Driving frequency: 300 Hz |
|  | Signal (-)    | B137         | 30  | 0   | 0                         | —                         |
| Oil temperature sensor signal                        | B134          | 23           | 1.0 — 1.4   | 1.0 — 1.4   | After warm-up the engine. |                           |
| Variable valve lift diagnosis oil pressure switch RH | B134          | 31           | 0   | 0   | —                         |                           |
| Variable valve lift diagnosis oil pressure switch LH | B134          | 32           | 0   | 0   | —                         |                           |

# Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

| Input/Output          | Measuring condition  | Waveform  |
|-----------------------|--|---|
| 1. Rear oxygen sensor | 5 minutes after driving at a constant speed of 80 — 113 km/h (50 — 70 MPH) |  <p>The top waveform shows a stable signal for the Rear O2 Sensor around 1.0V, with a large circle indicating a good signal. The bottom waveform shows a noisy signal for the Rear O2 Sensor, with a large 'X' indicating a bad signal. Both graphs show the A/F Sensor #1 signal below it.</p> |
| 2. Rear oxygen sensor | While idling (Oxygen sensor in active status)                              |  <p>The top waveform shows a stable signal for the Rear O2 Sensor around 1.0V, with a large circle indicating a good signal. The bottom waveform shows a signal with sharp spikes for the Rear O2 Sensor, with a large 'X' indicating a bad signal.</p>                                       |

EN-04680

EN-04681

## 6. Engine Condition Data

### A: ELECTRICAL SPECIFICATION

| Content     | Specified data                     |
|-------------|------------------------------------|
| Engine load | 17.6 — 40.5 (%): Idling            |
|             | 14.72 — 29.8 (%): 2,500 rpm racing |

Measuring condition:

- After the engine is warmed-up.
- Gear position is in “N” or “P” range.
- A/C is turned OFF.
- All accessory switches are turned OFF.

# Data Link Connector

ENGINE (DIAGNOSTICS)

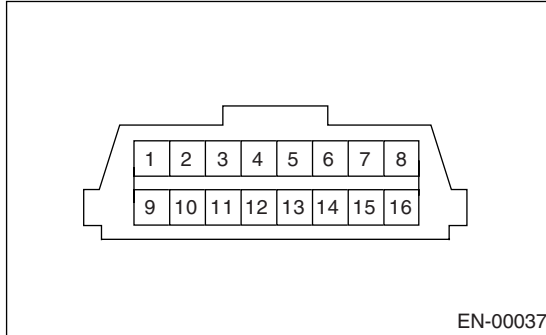
## 7. Data Link Connector

### A: NOTE

This connector is used both for general scan tools and the Subaru Select Monitor.

### CAUTION:

Do not connect any scan tools other than the general scan tools and the Subaru Select Monitor, because the circuit for the Subaru Select Monitor may be damaged.



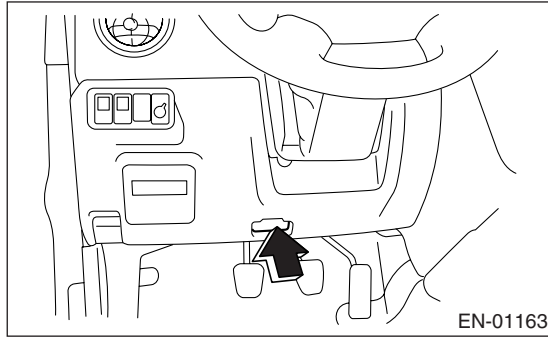
| Terminal No. | Contents     | Terminal No. | Contents                     |
|--------------|--------------|--------------|------------------------------|
| 1            | Power supply | 9            | Blank                        |
| 2            | Blank        | 10           | Subaru Select Monitor signal |
| 3            | Blank        | 11           | Blank                        |
| 4            | Blank        | 12           | Ground                       |
| 5            | Blank        | 13           | Ground                       |
| 6            | Blank        | 14           | Blank                        |
| 7            | Blank        | 15           | Blank                        |
| 8            | Blank        | 16           | Blank                        |

## 8. General Scan Tool

### A: OPERATION

#### 1. HOW TO USE GENERAL SCAN TOOL

- 1) Prepare a general scan tool required by SAE J1978.
- 2) Open the cover and connect the general scan tool to data link connector located in the lower portion of instrument panel (on the driver's side).



- 3) Using the general scan tool, call up DTC and freeze frame data.

General scan tool functions consist of:

#### 2. MODE \$01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.

A list of the support data and PID (Parameter Identification) codes are shown in the following table.

| PID | Data   | Unit of measure |
|-----|--|-----------------|
| 01  | Number of emission-related powertrain DTC and malfunction indicator light status and diagnosis support information | —               |
| 03  | Fuel system control status   | —               |
| 04  | Calculated engine load value   | %               |
| 05  | Engine coolant temperature   | °C              |
| 06  | Short term fuel trim   | %               |
| 07  | Long term fuel trim  | %               |
| 0B  | Intake manifold absolute pressure  | kPa             |
| 0C  | Engine revolution  | rpm             |
| 0D  | Vehicle speed  | km/h            |
| 0E  | Ignition timing advance  | °               |
| 0F  | Intake air temperature   | °C              |
| 10  | Air flow rate from mass air flow sensor  | g/sec           |
| 11  | Throttle valve absolute opening angle  | %               |
| 13  | Check whether oxygen sensor is installed.  | —               |
| 15  | Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor                                | V and %         |
| 1C  | Supporting OBD system  | —               |
| 24  | A/F value and A/F sensor output voltage  | — and V         |
| 34  | A/F value and A/F current  | — and mA        |

NOTE:

Refer to general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE \$01).

- (1) MODE \$01: Current powertrain diagnostic data
- (2) MODE \$02: Powertrain freeze frame data
- (3) MODE \$03: Emission-related powertrain DTC
- (4) MODE \$04: Clear/Reset emission-related diagnostic information
- (5) MODE \$06: Request on-board monitoring test results for non-continuously monitored systems
- (6) MODE \$07: Request on-board monitoring test results for continuously monitored systems
- (7) MODE \$09: Request vehicle information

Read out the data according to repair procedures. (For detailed operation procedures, refer to the General Scan Tool Operation Manual.)

NOTE:

For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>

# General Scan Tool

## ENGINE (DIAGNOSTICS)

### 3. MODE \$02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

| PID | Data  | Unit of measure |
|-----|---|-----------------|
| 02  | DTC that caused CARB required freeze frame data storage                             | —               |
| 03  | Fuel system control status  | —               |
| 04  | Calculated engine load value  | %               |
| 05  | Engine coolant temperature  | °C              |
| 06  | Short term fuel trim  | %               |
| 07  | Long term fuel trim   | %               |
| 0B  | Intake manifold absolute pressure   | kPa             |
| 0C  | Engine revolution   | rpm             |
| 0D  | Vehicle speed   | km/h            |
| 0E  | Ignition timing advance   | °               |
| 0F  | Intake air temperature  | °C              |
| 10  | Air flow rate from mass air flow sensor   | g/sec           |
| 11  | Throttle valve opening angle  | %               |
| 15  | Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor | V and %         |
| 1C  | Supporting OBD system   | —               |

**NOTE:**

Refer to general scan tool manufacturer's instruction manual to access freeze frame data (MODE \$02).

### 4. MODE \$03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE (DTC))

Refer to Read Diagnostic Trouble Code (DTC) for information about data denoting emission-related powertrain DTC. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>

### 5. MODE \$04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

**NOTE:**

Refer to general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE \$04).

## 6. MODE \$06

Refer to test value of troubleshooting and data of test limit on support data bit sequence table. List of support data is shown in the following table.

| TID  | CID  | Test value & Test limit  |
|------|------|--|
| \$41 | \$81 | Rear oxygen sensor circuit (Bank 1 Sensor 2)                                   |
|      | \$02 |  |
| \$81 | \$01 | Catalyst system  |
| \$82 | \$01 | Exhaust gas recirculation system   |
|      | \$02 |  |
| \$83 | \$01 | Evaporative emission control system (0.04 inch leak)                           |
|      | \$02 | Evaporative emission control system (0.04 inch leak)                           |
|      | \$03 | Evaporative emission control system (0.04 inch leak)                           |
|      | \$04 | Evaporative emission control system (0.04 inch leak)                           |
|      | \$05 | Evaporative emission control system (0.02 inch leak)                           |
|      | \$06 | Evaporative emission control system (0.02 inch leak)                           |
| \$84 | \$01 | Front oxygen (A/F) sensor circuit slow response (Bank 1 Sensor 1)              |
| \$85 | \$01 | Rear O <sub>2</sub> sensor circuit slow response (Bank 1 Sensor 2) Rich → Lean |
|      | \$02 | Rear O <sub>2</sub> sensor circuit slow response (Bank 1 Sensor 2) Lean → Rich |

## 7. MODE \$07

Refer to data of DTC (pending code) for troubleshooting result about emission in first time.

## 8. MODE \$09

Refer to data of vehicle specification (VIN, calibration ID, diagnosis frequency etc.).



# Subaru Select Monitor

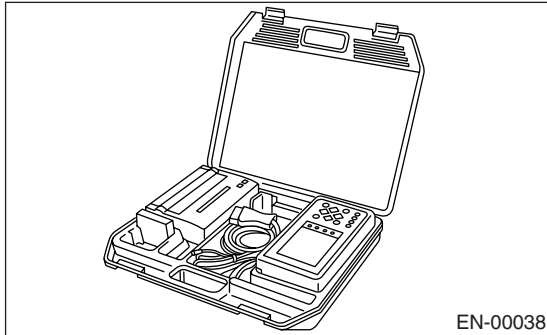
ENGINE (DIAGNOSTICS)

## 9. Subaru Select Monitor

### A: OPERATION

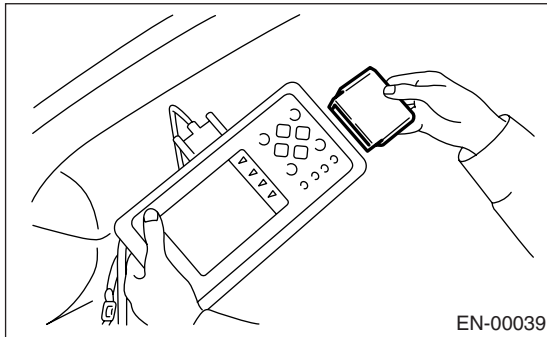
#### 1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4SO)(diag)-7, PREPARATION TOOL, General Description.>



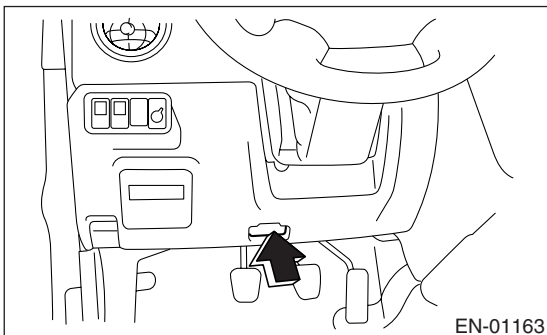
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4SO)(diag)-7, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector located in the lower portion of instrument panel (on driver's side).

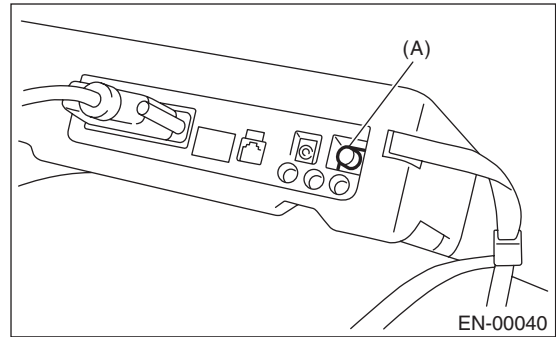


(2) Connect the diagnosis cable to data link connector.

#### CAUTION:

Do not connect scan tools except for Subaru Select Monitor and general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor power switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up DTC and various data, then record them.

#### 2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (NORMAL MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(H4SO)(diag)-35, Read Diagnostic Trouble Code (DTC).>

#### 3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (OBD MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(H4SO)(diag)-35, Read Diagnostic Trouble Code (DTC).>

## 4. READ CURRENT DATA FOR ENGINE. (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
  - 2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
  - 3) Press the [YES] key after the information of engine type has been displayed.
  - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display/Save}, and then press the [YES] key.
  - 5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
  - 6) Using the scroll key, scroll the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

| Remarks                           | Display                  | Unit of measure         | Note (at idling)   |
|-----------------------------------|--------------------------|-------------------------|--|
| Engine load                       | Engine Load              | %                       | 21.0%  |
| Engine coolant temperature signal | Coolant Temp.            | °C or °F                | 92°C or 198F   |
| A/F correction 1                  | A/F Correction #1        | %                       | -0.8%  |
| A/F learning 1                    | A/F Learning #1          | %                       | 0.0%   |
| Intake manifold absolute pressure | Mani. Absolute Pressure  | mmHg, kPa, inHg or psig | 200 — 300 mmHg, 26.7 — 40 kPa, 7.8 — 11.8 inHg or 3.8 — 5.8 psig |
| Engine speed signal               | Engine Speed             | rpm                     | 600 — 800 rpm (Agree with the tachometer indication)             |
| Vehicle speed signal              | Vehicle Speed            | km/h or MPH             | 0 km/h or 0 MPH (at parking)                                     |
| Ignition timing signal            | Ignition Timing          | deg                     | 14 — 16 deg  |
| Intake air temperature signal     | Intake Air Temp.         | °C or °F                | (Ambient air temperature)  |
| Amount of intake air              | Mass Air Flow            | g/s or lb/m             | 2.8 — 3.2 g/s or 0.37 — 0.42 lb/m                                |
| Throttle opening angle signal     | Throttle Opening Angle   | %                       | 2.0%   |
| Rear oxygen sensor voltage        | Rear O2 Sensor           | V                       | 0.1 — 0.7 V  |
| Battery voltage                   | Battery Voltage          | V                       | 12 — 14 V  |
| Mass air flow voltage             | Air Flow Sensor Voltage  | V                       | 1.26 V   |
| Injection 1 pulse width           | Fuel Injection #1 Pulse  | ms                      | 2.82 ms  |
| Knock sensor correction           | Knocking Correction      | deg                     | 0.0 deg  |
| Atmospheric pressure signal       | Atmosphere Pressure      | mmHg, kPa, inHg or psig | (Atmosphere pressure)  |
| Intake manifold relative pressure | Mani. Relative Pressure  | mmHg, kPa, inHg or psig | (Mani. Absolute Pressure – Atmosphere pressure)                  |
| Fuel tank pressure signal         | Fuel Tank Pressure       | mmHg, kPa, inHg or psig | +7.9 mmHg, +1.1 kPa, +0.31 inHg or +0.15 psig                    |
| Fuel temperature signal           | Fuel Temp                | °C or °F                | +20°C or +68°F   |
| Fuel level signal                 | Fuel Level               | V                       | 0 — 5 V  |
| Acceleration opening angle signal | Accel. Opening Angle     | %                       | 0.0%   |
| Purge control solenoid duty ratio | CPC Valve Duty Ratio     | %                       | 0 — 3%   |
| EGR steps                         | No. of EGR Steps         | STEP                    | 0 STEP   |
| A/F sensor current value 1        | A/F Sensor #1 Current    | mA                      | -0.2 — 0.2 mA  |
| A/F sensor resistance value 1     | A/F Sensor #1 Resistance | Ω                       | 32 Ω   |
| A/F sensor output lambda 1        | A/F Sensor #1            | —                       | 1.0  |
| A/F correction 3                  | A/F Correction #3        | %                       | 0.3%   |
| A/F learning 3                    | A/F Learning #3          | %                       | 0.00%  |
| Throttle motor duty               | Throttle Motor Duty      | %                       | -15%   |
| Throttle power supply voltage     | Throttle Motor Voltage   | V                       | (Battery voltage)  |
| Sub throttle sensor voltage       | Sub-throttle Sensor      | V                       | 1.52 V   |
| Main throttle sensor voltage      | Main-throttle Sensor     | V                       | 0.66 V   |

# Subaru Select Monitor

## ENGINE (DIAGNOSTICS)

| Remarks  | Display                  | Unit of measure | Note (at idling)              |
|--|--------------------------|-----------------|-------------------------------|
| Sub acceleration sensor voltage                            | Sub-accelerator Sensor   | V               | 0.68 V                        |
| Main acceleration sensor voltage                           | Main-accelerator Sensor  | V               | 0.68 V                        |
| Memory vehicle speed                                       | Memorized Cruise Speed   | km/h or MPH     | 0 km/h or 0 MPH               |
| Engine oil temperature                                     | Oil Temperature          | °C              | ≥ 85°C (After engine warm-up) |
| Oil switching solenoid valve duty R                        | OSV Duty R               | %               | 16.9%                         |
| Oil switching solenoid valve duty L                        | OSV Duty L               | %               | 16.9%                         |
| Oil switching solenoid valve current R                     | OSV Current R            | mA              | 192 mA                        |
| Oil switching solenoid valve current L                     | OSV Current L            | mA              | 192 mA                        |
| Variable valve lift mode                                   | VVL Lift Mode            | —               | 1                             |
| #1 cylinder roughness monitor                              | Roughness Monitor #1     | —               | 0                             |
| #2 cylinder roughness monitor                              | Roughness Monitor #2     | —               | 0                             |
| #3 cylinder roughness monitor                              | Roughness Monitor #3     | —               | 0                             |
| #4 cylinder roughness monitor                              | Roughness Monitor #4     | —               | 0                             |
| AT/MT identification terminal                              | AT Vehicle ID Signal     | —               | ON/OFF                        |
| Test mode terminal   | Test Mode Signal         | —               | OFF                           |
| Neutral position switch signal                             | Neutral Position Switch  | —               | ON                            |
| Soft idle switch signal                                    | Idle Switch Signal       | —               | ON                            |
| Ignition switch signal                                     | Ignition Switch          | —               | ON                            |
| Power steering switch input signal                         | P/S Switch               | —               | OFF (At OFF)                  |
| Air conditioning switch signal                             | A/C Switch               | —               | OFF (At OFF)                  |
| Starter switch signal                                      | Starter Switch           | —               | OFF                           |
| Rear O <sub>2</sub> monitor                                | Rear O2 Rich Signal      | —               | ON/OFF                        |
| Knocking signal  | Knocking Signal          | —               | OFF                           |
| Crankshaft position sensor signal                          | Crankshaft Position Sig. | —               | ON                            |
| Camshaft position sensor signal                            | Camshaft Position Sig.   | —               | ON                            |
| Rear defogger switch signal                                | Rear Defogger SW         | —               | OFF (At OFF)                  |
| Blower fan switch signal                                   | Blower Fan SW            | —               | OFF (At OFF)                  |
| Light switch signal  | Light Switch             | —               | OFF (At OFF)                  |
| A/C middle pressure switch signal                          | A/C Mid Pressure Switch  | —               | OFF (At OFF)                  |
| Air conditioner compressor relay output signal             | A/C Compressor Signal    | —               | OFF (At OFF)                  |
| Radiator fan relay 1 signal                                | Radiator Fan Relay #1    | —               | OFF (At OFF)                  |
| Radiator fan relay 2 signal                                | Radiator Fan Relay #2    | —               | OFF (At OFF)                  |
| Fuel pump relay signal                                     | Fuel Pump Relay          | —               | ON                            |
| Pressure control solenoid valve signal                     | PCV Solenoid             | —               | OFF                           |
| PCV hose ASSY diagnosis signal                             | Blow-by leak Connector   | —               | ON                            |
| Drain valve signal   | Vent Control Solenoid    | —               | OFF                           |
| Variable valve lift diagnosis oil pressure switch signal 1 | Eng. Oil Press. SW1      | —               | ON                            |
| Variable valve lift diagnosis oil pressure switch signal 2 | Eng. Oil Press. SW2      | —               | ON                            |
| AT coordinate retard angle demand signal                   | Retard Signal from AT    | —               | OFF                           |
| AT coordinate fuel cut demand signal                       | Fuel Cut Signal from AT  | —               | OFF                           |
| AT coordinate permission demand                            | Torque Permission Signal | —               | ON                            |
| Electronic throttle control motor relay signal             | ETC Motor Relay          | —               | ON                            |
| Clutch switch signal                                       | Clutch Switch            | —               | OFF (At OFF)                  |
| Stop light switch signal                                   | Stop Light Switch        | —               | OFF (At OFF)                  |
| SET/COAST switch signal                                    | SET/COAST Switch         | —               | OFF (At OFF)                  |
| RES/ACC switch signal                                      | RESUME/ACCEL Switch      | —               | OFF (At OFF)                  |
| Brake switch signal  | Brake Switch             | —               | OFF (At OFF)                  |
| Main switch signal   | Main Switch              | —               | OFF (At OFF)                  |

# Subaru Select Monitor

ENGINE (DIAGNOSTICS)

| Remarks                              | Display      | Unit of measure | Note (at idling) |
|--------------------------------------|--------------|-----------------|------------------|
| Crusise control cancel switch signal | CC Cancel SW | —               | OFF (At OFF)     |

**NOTE:**

For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

## 5. READ CURRENT DATA FOR ENGINE (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type has been displayed.
- 4) On the «Engine Diagnosis» display screen, select the {OBD system} and press the [YES] key.
- 5) On the «OBD Menu» display screen, select the {Current Data Display/Save}, and press the [YES] key.
- 6) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
- 7) Using the scroll key, scroll the display screen up or down until the desired data is shown.

- A list of the support data is shown in the following table.

| DESCRIPTION                                       | Display                  | Unit of measure         | Note (at idling)                           |
|---|--------------------------|-------------------------|--|
| Number of diagnosis code                          | Number of Diag. Code:    | —                       | 0  |
| Condition of malfunction indicator light          | MI (MIL)                 | —                       | OFF  |
| Monitoring test of misfire                        | Misfire monitoring       | —                       | complete                                   |
| Monitoring test of fuel system                    | Fuel system monitoring   | —                       | complete                                   |
| Monitoring test of comprehensive component        | Component monitoring     | —                       | complete                                   |
| Test of catalyst                                  | Catalyst Diagnosis       | —                       | incomplete                                 |
| Test of heating-type catalyst                     | Heated catalyst          | —                       | no support                                 |
| Test of evaporative emission purge control system | Evaporative purge system | —                       | incomplete                                 |
| Test of secondary air system                      | Secondary air system     | —                       | no support                                 |
| Test of air conditioning system refrigerant       | A/C system refrigerant   | —                       | no support                                 |
| Test of oxygen sensor                             | O1 Sensor Diagnosis      | —                       | incomplete                                 |
| Test of oxygen sensor heater                      | O2 Heater Diagnosis      | —                       | complete                                   |
| Test of EGR system                                | EGR system               | —                       | incomplete                                 |
| A/F control #1                                    | Fuel system for Bank 1   | —                       | CLOSE normal                               |
| Load  | Calculated load valve    | %                       | 23.0%                                      |
| Engine coolant temperature signal                 | Coolant Temp.            | °C                      | 92°C or 198°F                              |
| A/F correction 1                                  | A/F Correction #1        | %                       | -0.8%                                      |
| A/F learning 1                                    | A/F Learning #1          | %                       | +0.0%                                      |
| Intake manifold absolute pressure                 | Mani. Absolute Pressure  | mmHg, kPa, inHg or psig | 211 mmHg, 28.1 kPa, 8.31 inHg or 4.08 psig |
| Engine speed signal                               | Engine Speed             | rpm                     | 700 rpm                                    |
| Vehicle speed signal                              | Vehicle Speed            | km/h or MPH             | 0 km/h or 0 MPH                            |
| Ignition timing #1                                | Ignition timing adv. #1  | °                       | +16.0°                                     |
| Intake air temperature signal                     | Intake Air Temp.         | °C or °F                | 36°C or 97°F                               |
| Amount of intake air                              | Mass Air Flow            | g/s or lb/m             | 2.7 g/s or 0.36 lb/m                       |
| Throttle opening angle signal                     | Throttle Opening Angle   | %                       | 13%  |
| Oxygen sensor (Bank 1 Sensor 2)                   | Oxygen sensor #12        | V                       | 0.7 V                                      |
| A/F correction (Bank 1 Sensor 2)                  | A/F Correction #12       | %                       | 0.0%                                       |
| OBD system  | OBD system               | —                       | CARB — OBD2                                |
| Front oxygen (A/F) sensor (Bank 1 Sensor 1)       | Oxygen sensor #11        | —                       | Support                                    |
| Oxygen sensor (Bank 1 Sensor 2)                   | Oxygen sensor #12        | —                       | Support                                    |
| Front oxygen (A/F) sensor (Bank 1 Sensor 1)       | A/F sensor #11           | —                       | 1.001                                      |
| Front oxygen (A/F) sensor (Bank 1 Sensor 1)       | A/F sensor #11           | V                       | 2.79 V                                     |
| Front oxygen (A/F) sensor (Bank 1 Sensor 1)       | A/F sensor #11           | —                       | 1.001                                      |

# Subaru Select Monitor

## ENGINE (DIAGNOSTICS)

| DESCRIPTION                                 | Display        | Unit of measure | Note (at idling) |
|---|----------------|-----------------|------------------|
| Front oxygen (A/F) sensor (Bank 1 Sensor 1) | A/F sensor #11 | mA              | 0.00 mA          |

**NOTE:**

For detailed operation procedure, refer to “SUBARU SELECT MONITOR OPERATION MANUAL”.

### 6. READ FREEZE FRAME DATA FOR ENGINE (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
  - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
  - 3) Press the [YES] key after the information of engine type has been displayed.
  - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
  - 5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.
- A list of support data is shown in the following table.

| Contents  | Display                  | Unit of measure              |
|---|--------------------------|------------------------------|
| DTC for freeze frame data                         | Freeze frame data        | DTC                          |
| Air fuel ratio control system for bank 1          | Fuel system for Bank1    | CLOSE normal or OPEN initial |
| Engine load data                                  | Engine Load              | %                            |
| Engine coolant temperature signal                 | Coolant Temp.            | °C or °F                     |
| Short term fuel trim by front oxygen (A/F) sensor | Short term fuel trim B1  | %                            |
| Long term fuel trim by front oxygen (A/F) sensor  | Long term fuel trim B1   | %                            |
| Intake manifold absolute pressure signal          | Mani. Absolute Pressure  | mmHg, kPa, inHg or psig      |
| Engine speed signal                               | Engine Speed             | rpm                          |
| Vehicle speed signal                              | Vehicle Speed            | km/h or MPH                  |
| Ignition timing signal                            | Ignition Timing          | °                            |
| Intake air volume                                 | Mass Air Flow            | g/sec                        |
| Intake air temperature signal                     | Intake Air Temp          | °C                           |
| Throttle position signal                          | Throttle Opening Angle   | %                            |
| Oxygen sensor (Bank 1 Sensor 2)                   | Oxygen sensor #12        | V                            |
| A/F correction (Bank 1 Sensor 2)                  | Short term fuel trim #12 | %                            |
| Front oxygen (A/F) sensor (Bank 1 Sensor 1)       | Oxygen sensor #11        | Support                      |
| Oxygen sensor (Bank 1 Sensor 2)                   | Oxygen sensor #12        | Support                      |

**NOTE:**

For detailed operation procedure, refer to SUBARU SELECT MONITOR OPERATION MANUAL.

## 7. LED OPERATION MODE FOR ENGINE

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
  - 2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
  - 3) Press the [YES] key after the information of engine type has been displayed.
  - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display/Save}, and then press the [YES] key.
  - 5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press the [YES] key.
  - 6) Using the scroll key, scroll the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

| Remarks  | Display                    | Message   | LED "ON" requirements  |
|--|----------------------------|-----------|--|
| AT/MT identification signal                                | AT Vehicle ID Signal       | ON or OFF | Illuminate (AT model)  |
| Test mode signal   | Test Mode Signal           | ON or OFF | D check  |
| Neutral position switch signal                             | Neutral Position Switch    | ON or OFF | When neutral position signal is entered.                             |
| Idle switch signal   | Idle Switch Signal         | ON or OFF | When idle switch signal is entered.                                  |
| Ignition switch signal                                     | Ignition Switch            | ON or OFF | When ignition switch is turned to ON.                                |
| Power steering switch signal                               | P/S Switch                 | ON or OFF | When power steering switch is entered.                               |
| Air conditioning switch signal                             | A/C Switch                 | ON or OFF | When air conditioning switch is input.                               |
| Starter switch signal                                      | Starter Switch             | ON or OFF | When starter switch is input.  |
| Rear oxygen sensor rich signal                             | Rear O2 Rich Signal        | ON or OFF | When rear oxygen sensor mixture ratio is rich.                       |
| Knocking signal  | Knocking Signal            | ON or OFF | When knocking signal is input.                                       |
| Crankshaft position sensor signal                          | Crankshaft Position Signal | ON or OFF | When crankshaft position sensor signal is input.                     |
| Camshaft position sensor signal                            | Camshaft Position Signal   | ON or OFF | When camshaft position sensor signal is entered.                     |
| Rear defogger switch signal                                | Rear Defogger Switch       | ON or OFF | When rear defogger switch is turned to ON.                           |
| Blower fan switch signal                                   | Blower Fan Switch          | ON or OFF | When blower fan switch is turned to ON.                              |
| Light switch signal  | Light Switch               | ON or OFF | When light switch is turned to ON.                                   |
| A/C middle pressure switch signal                          | A/C Mid Pressure Switch    | ON or OFF | When A/C middle pressure switch is turned to ON.                     |
| Air conditioning relay signal                              | A/C Compressor Signal      | ON or OFF | When air conditioning relay is in function.                          |
| Radiator fan relay 1 signal                                | Radiator Fan Relay #1      | ON or OFF | When radiator fan relay 1 is in function.                            |
| Radiator fan relay 2 signal                                | Radiator Fan Relay #2      | ON or OFF | When radiator fan relay 2 is in function.                            |
| Fuel pump relay signal                                     | Fuel Pump Relay            | ON or OFF | ON output  |
| PCV hose ASSY diagnosis signal                             | Blow-by leak Connector     | ON or OFF | PCV hose ASSY is connected.  |
| Pressure control solenoid valve signal                     | PCV Solenoid               | ON or OFF | When pressure control solenoid valve is in operation.                |
| Drain valve signal   | Vent Control Solenoid      | ON or OFF | When drain valve is in operation.                                    |
| Variable valve lift diagnosis oil pressure switch signal 1 | Engine Oil Pressure SW1    | ON or OFF | Variable valve lift diagnosis oil pressure switch signal 1 is input. |

# Subaru Select Monitor

## ENGINE (DIAGNOSTICS)

| Remarks  | Display                   | Message   | LED "ON" requirements  |
|--|---------------------------|-----------|--|
| Variable valve lift diagnosis oil pressure switch signal 2 | Engine Oil Pressure SW2   | ON or OFF | Variable valve lift diagnosis oil pressure switch signal 2 is input. |
| AT retard angle demand signal                              | Retard Signal             | ON or OFF | When AT retard angle demand signal is input.                         |
| AT fuel cut signal   | Fuel Cut                  | ON or OFF | When AT fuel cut signal is input.                                    |
| AT coordinate permission signal                            | Torque Control Permission | ON or OFF | When AT coordinate permission signal is input.                       |
| Electronic throttle control motor relay signal             | ETC Motor Relay           | ON or OFF | When electronic throttle control is in function.                     |
| Clutch switch signal                                       | Clutch Switch             | ON or OFF | When clutch switch is turned to ON.                                  |
| Stop light switch signal                                   | Stop Light Switch         | ON or OFF | When stop switch is turned to ON.                                    |
| SET/COAST switch signal                                    | SET/COAST Switch          | ON or OFF | When SET/COAST switch is turned to ON.                               |
| RES/ACC switch signal                                      | RESUME/ACCEL Switch       | ON or OFF | When RES/ACC switch is turned to ON.                                 |
| Brake switch signal  | Brake Switch              | ON or OFF | When brake switch is turned to ON.                                   |
| Main switch signal   | Main Switch               | ON or OFF | When main switch is turned to ON.                                    |
| Cancel switch signal                                       | Cancel Switch             | ON or OFF | When cancel switch is turned to ON.                                  |

**NOTE:**

For detailed operation procedure, refer to "SUBARU SELECT MONITOR OPERATION MANUAL".

### 8. VIN REGISTRATION

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type has been displayed.
- 4) On the «Engine Diagnosis» display screen, select the {VIN registration} and press the [YES] key.
- 5) Perform the procedure as shown in the display.

**NOTE:**

For detailed operation procedure, refer to "SUBARU SELECT MONITOR OPERATION MANUAL".

## 10. Read Diagnostic Trouble Code (DTC)

### A: OPERATION

#### 1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.
- 5) On «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press the [YES] key.

NOTE:

- For detailed operation procedure, refer to SUBARU SELECT MONITOR OPERATION MANUAL.
- For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>

#### 2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
- 5) On «OBD Menu» display screen, select the {Diagnosis Code(s) Display} and press the [YES] key.
- 6) Make sure that a DTC is shown on display screen.

NOTE:

- For detailed operation procedure, refer to SUBARU SELECT MONITOR OPERATION MANUAL.
- For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>

#### 3. GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain DTC.

For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>

NOTE:

Refer to general scan tool manufacturer's instruction manual to access emission-related powertrain DTC (MODE \$03).



# Inspection Mode

ENGINE (DIAGNOSTICS)

## 11. Inspection Mode

### A: PROCEDURE

Carry out trouble diagnosis shown in the following DTC table.

When performing trouble diagnosis which is not shown in the DTC table, refer to the next item Drive cycle.

<Ref. to EN(H4SO)(diag)-41, Drive Cycle.>

| DTC   | Item   |
|-------|--|
| P0031 | HO2S Heater Control Circuit Low (Bank 1 Sensor 1)                                |
| P0032 | HO2S Heater Control Circuit High (Bank 1 Sensor 1)                               |
| P0037 | HO2S Heater Control Circuit Low (Bank 1 Sensor 2)                                |
| P0038 | HO2S Heater Control Circuit High (Bank 1 Sensor 2)                               |
| P0077 | Intake Valve Control Solenoid Circuit High (Bank 1)                              |
| P0083 | Intake Valve Control Solenoid Circuit High (Bank 2)                              |
| P0102 | Mass or Volume Air Flow Circuit Low Input  |
| P0103 | Mass or Volume Air Flow Circuit High Input                                       |
| P0107 | Manifold Absolute Pressure/Barometric Pressure Circuit Low Input                 |
| P0108 | Manifold Absolute Pressure/Barometric Pressure Circuit High Input                |
| P0112 | Intake Air Temperature Circuit Low Input   |
| P0113 | Intake Air Temperature Circuit High Input  |
| P0117 | Engine Coolant Temperature Circuit Low Input                                     |
| P0118 | Engine Coolant Temperature Circuit High Input                                    |
| P0122 | Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input                      |
| P0123 | Throttle/Pedal Position Sensor/Switch "A" Circuit High Input                     |
| P0131 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 1)                      |
| P0132 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 1)                     |
| P0137 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 2)                      |
| P0138 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 2)                     |
| P0140 | O <sub>2</sub> Sensor Circuit No Activity Detected (Bank 1 Sensor 2)             |
| P0182 | Fuel Temperature Sensor "A" Circuit Low Input                                    |
| P0183 | Fuel Temperature Sensor "A" Circuit High Input                                   |
| P0197 | Engine Oil Temperature Sensor Low  |
| P0198 | Engine Oil Temperature Sensor High   |
| P0222 | Throttle/Pedal Position Sensor/Switch "B" Circuit Low Input                      |
| P0223 | Throttle/Pedal Position Sensor/Switch "B" Circuit High Input                     |
| P0327 | Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)                       |
| P0328 | Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)                      |
| P0335 | Crankshaft Position Sensor "A" Circuit   |
| P0336 | Crankshaft Position Sensor "A" Circuit Range/Performance                         |
| P0340 | Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)                   |
| P0341 | Camshaft Position Sensor "A" Circuit Range/Performance (Bank 1 or Single Sensor) |
| P0447 | Evaporative Emission Control System Vent Control Circuit Open                    |
| P0448 | Evaporative Emission Control System Vent Control Circuit Shorted                 |
| P0452 | Evaporative Emission Control System Pressure Sensor Low Input                    |
| P0453 | Evaporative Emission Control System Pressure Sensor High Input                   |
| P0458 | Evaporative Emission Control System Purge Control Valve Circuit Low              |
| P0462 | Fuel Level Sensor Circuit Low Input  |
| P0463 | Fuel Level Sensor Circuit High Input   |
| P0502 | Vehicle Speed Sensor Circuit Low Input   |
| P0503 | Vehicle Speed Sensor Intermittent/Erratic/High                                   |
| P0512 | Starter Request Circuit  |
| P0600 | CAN Communication Circuit  |
| P0604 | Internal Control Module Random Access Memory (RAM) Error                         |

# Inspection Mode

ENGINE (DIAGNOSTICS)

| DTC   | Item   |
|-------|--|
| P0605 | Internal Control Module Read Only Memory (ROM) Error                     |
| P0607 | Control Module Performance   |
| P0638 | Throttle Actuator Control Range/Performance (Bank 1)                     |
| P0691 | Cooling Fan 1 Control Circuit Low  |
| P0692 | Cooling Fan 1 Control Circuit High                                       |
| P0700 | Request AT Mil ON  |
| P0851 | Neutral Switch Input Circuit Low   |
| P0852 | Neutral Switch Input Circuit High  |
| P1152 | O <sub>2</sub> Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)  |
| P1153 | O <sub>2</sub> Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1) |
| P1160 | Return Spring Failure  |
| P1400 | Fuel Tank Pressure Control Solenoid Valve Circuit Low                    |
| P1420 | Fuel Tank Pressure Control Solenoid Valve Circuit High                   |
| P1491 | Positive Crankcase Ventilation (Blow-by) Function Problem                |
| P1518 | Starter Switch Circuit Low Input   |
| P1560 | Back-up Voltage Circuit Malfunction                                      |
| P2101 | Throttle Actuator Control Motor Circuit Range/Performance                |
| P2102 | Throttle Actuator Control Motor Circuit Low                              |
| P2103 | Throttle Actuator Control Motor Circuit High                             |
| P2109 | Throttle/Pedal Position Sensor A Minimum Stop Performance                |
| P2122 | Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input              |
| P2123 | Throttle/Pedal Position Sensor/Switch "D" Circuit High Input             |
| P2127 | Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input              |
| P2128 | Throttle/Pedal Position Sensor/Switch "E" Circuit High Input             |
| P2135 | Throttle/Pedal Position Sensor/Switch "A" / "B" Voltage Rationality      |
| P2138 | Throttle/Pedal Position Sensor/Switch "D" / "E" Voltage Rationality      |
| P2227 | Atmospheric Pressure Sensor Circuit Range/Performance                    |
| P2228 | Atmospheric Pressure Sensor Circuit Malfunction (Low Input)              |
| P2229 | Atmospheric Pressure Sensor Circuit Malfunction (High Input)             |

# Inspection Mode

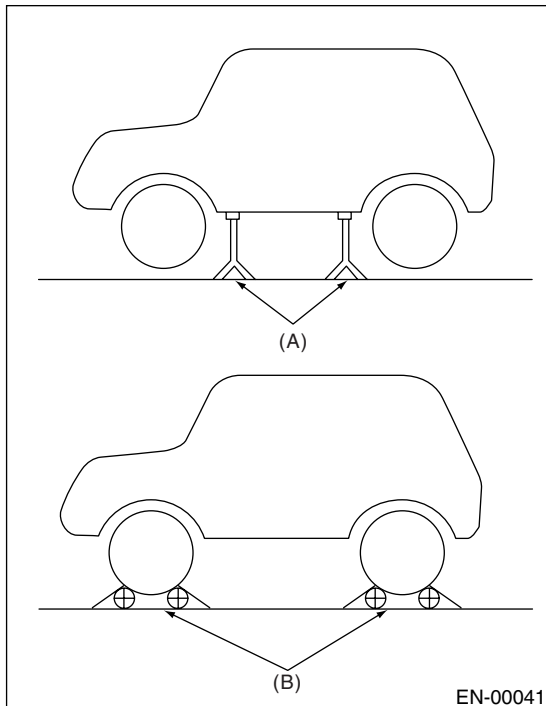
## ENGINE (DIAGNOSTICS)

### 1. PREPARATION FOR THE INSPECTION MODE

- 1) Make sure the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)] and the battery voltage is 12 V or more.
- 2) Raise the vehicle using a garage jack and place on rigid racks or drive the vehicle onto free rollers.

#### WARNING:

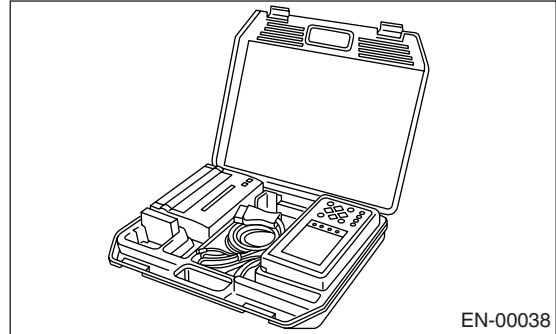
- Before raising the vehicle, ensure the parking brake is applied.
- Do not use a pantograph jack in place of a rigid rack.
- Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
- Do not abruptly depress/release the clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
- In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the rigid racks and the vehicle.
- Since the rear wheels will also rotate, do not place anything near them. Also, make sure nobody goes in front of the vehicle.



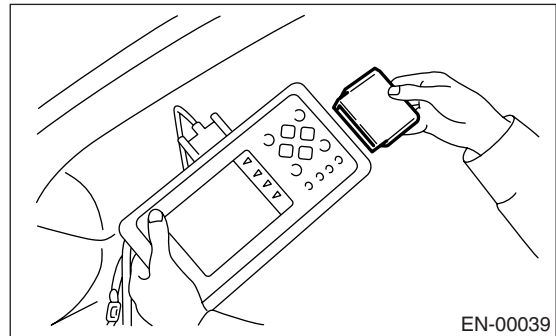
- (A) Rigid rack  
(B) Free rollers

### 2. SUBARU SELECT MONITOR

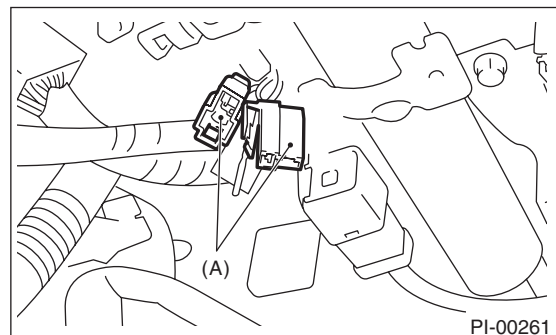
- 1) After clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4SO)(diag)-46, Clear Memory Mode.>
- 2) Warm up the engine.
- 3) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4SO)(diag)-7, PREPARATION TOOL, General Description.>



- 4) Connect the diagnosis cable to Subaru Select Monitor.
- 5) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4SO)(diag)-7, PREPARATION TOOL, General Description.>

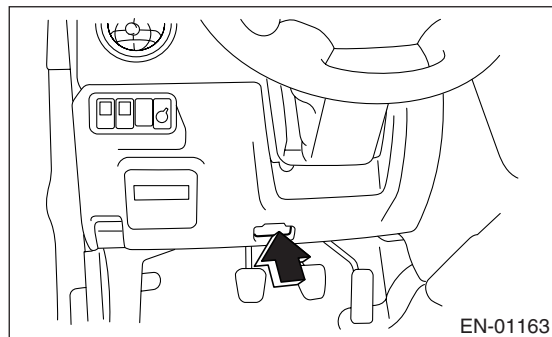


- 6) Connect the test mode connector (A) at the lower portion of instrument panel (on driver's side).



- 7) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).

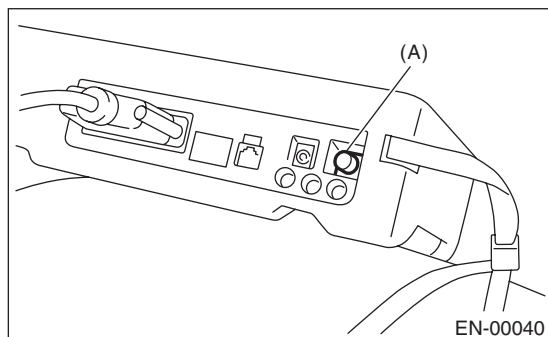


(2) Connect the diagnosis cable to data link connector.

**CAUTION:**

**Do not connect the scan tools except for Subaru Select Monitor and general scan tool.**

8) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor power switch to ON.



(A) Power switch

9) On «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.

10) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.

11) Press the [YES] key after the information of engine type is displayed.

12) On «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.

13) When the “Perform Inspection (Dealer Check) Mode?” is shown on display screen, press the [YES] key.

14) Perform subsequent procedures as instructed on display screen.

- If trouble still remains in memory, the corresponding DTC appears on display screen.

**NOTE:**

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

- For details concerning the DTC, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>

- Release the parking brake.

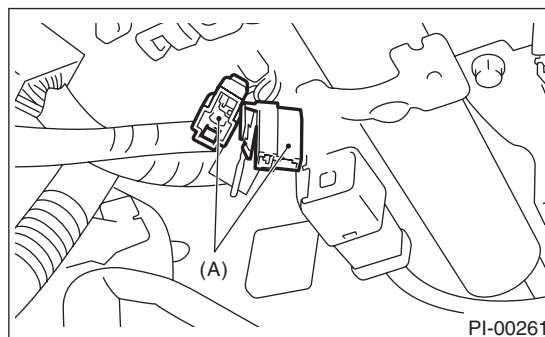
- The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

### 3. GENERAL SCAN TOOL

1) After clearing memory, check for any remaining unresolved trouble data: <Ref. to EN(H4SO)(diag)-46, Clear Memory Mode.>

2) Warm up the engine.

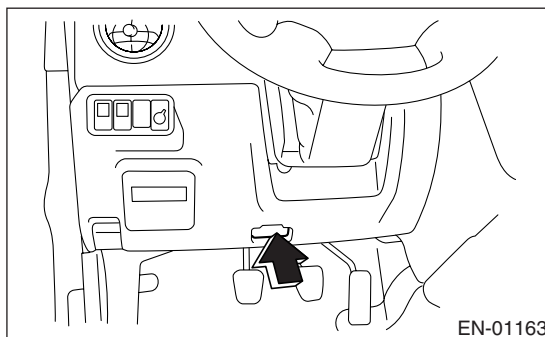
3) Connect the test mode connector (A) at the lower side of instrument panel (on the driver's side).



4) Connect the general scan tool to its data link connector.

**CAUTION:**

**Do not connect the scan tools except for Subaru Select Monitor and general scan tool.**



5) Start the engine.

**NOTE:**

- Ensure the selector lever is placed in “P” position before starting. (AT models)

- Depress the clutch pedal when starting engine. (MT models)

6) Using the selector lever or shift lever, turn the “P” position switch and “N” position switch to ON.

## Inspection Mode

### ENGINE (DIAGNOSTICS)

---

7) Depress the brake pedal to turn brake switch ON. (AT models)

8) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.

9) Place the selector lever or shift lever in “D” position (AT models) or “1st” gear (MT models) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

#### NOTE:

- On AWD vehicles, release the parking brake.
- The speed difference between front and rear wheels may light ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

10) Using the general scan tool, check for DTC and record the result(s).

#### NOTE:

- For detailed operation procedures, refer to the General Scan Tool Instruction Manual.
- For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>

## 12. Drive Cycle

### A: PROCEDURE

There are some drive patterns shown below for the trouble diagnosis. Performing the specified drive pattern allows to diagnose malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check if they correctly resume their functions by performing the required drive pattern.

#### 1. PREPARATION FOR DRIVE CYCLE

- 1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12 V or more.
- 2) After performing the diagnostics and cleaning memory, check for any remaining unresolved trouble data. <Ref. to EN(H4SO)(diag)-46, Clear Memory Mode.>
- 3) Disconnect the test mode connector.

#### NOTE:

- Except for the water temperature specified items at starting, the diagnosis is carried out after engine warm up.
- Carry out the diagnosis which is marked \* on DTC twice, then, after finishing first diagnosis, stop the engine and do second time at the same condition.

#### 2. DRIVE CYCLE A (AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE ENGINE FOR 1 MINUTE.)

| DTC    | Item   | Condition  |
|--------|--|--|
| *P0125 | Insufficient Coolant Temperature for Closed Loop Fuel Control                    | Coolant temperature at start is less than 20°C (68°F). |
| *P0128 | Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature) | —  |
| *P0133 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 1)                    | —  |
| *P0171 | System too Lean (Bank 1)   | Diagnosis completes in drive cycle B or C as well.     |
| *P0172 | System too Rich (Bank 1)   | Diagnosis completes in drive cycle B or C as well.     |
| *P0196 | Engine Oil Temperature Sensor Circuit Range/Performance                          | —  |
| *P0301 | Cylinder 1 Misfire Detected  | Diagnosis completes in drive cycle B or C as well.     |
| *P0302 | Cylinder 2 Misfire Detected  | Diagnosis completes in drive cycle B or C as well.     |
| *P0303 | Cylinder 3 Misfire Detected  | Diagnosis completes in drive cycle B or C as well.     |
| *P0304 | Cylinder 4 Misfire Detected  | Diagnosis completes in drive cycle B or C as well.     |
| *P0420 | Catalyst System Efficiency Below Threshold (Bank 1)                              | —  |
| *P0442 | Evaporative Emission Control System Leak Detected (small leak)                   | Coolant temperature at start is less than 25°C (77°F). |
| *P0451 | Evaporative Emission Control System Pressure Sensor Range/Performance            | —  |
| *P0456 | Evaporative Emission Control System Leak Detected (very small leak)              | Coolant temperature at start is less than 25°C (77°F). |
| *P0457 | Evaporative Emission Control System Leak Detected (fuel cap loose/off)           | Coolant temperature at start is less than 25°C (77°F). |
| *P0459 | Evaporative Emission Control System Purge Control Valve Circuit High             | —  |
| P1443  | Vent Control Solenoid Valve Function Problem                                     | —  |
| *P2096 | Post Catalyst Fuel Trim System Too Lean Bank 1                                   | Diagnosis completes in drive cycle B or C as well.     |
| *P2097 | Post Catalyst Fuel Trim System Too Rich Bank 1                                   | Diagnosis completes in drive cycle B or C as well.     |

# Drive Cycle

## ENGINE (DIAGNOSTICS)

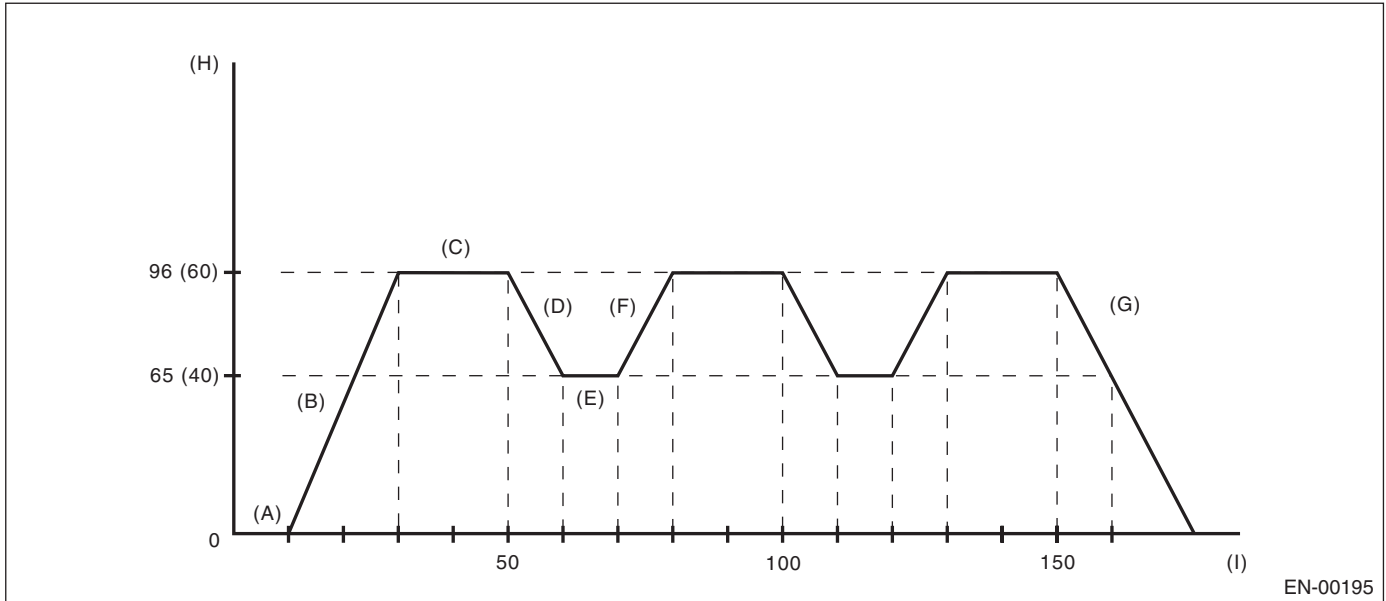
### 3. DRIVE CYCLE B (TEN MINUTES IDLING)

**NOTE:**

Drive the vehicle at 10 km/h (6 MPH) or more before diagnosis.

| DTC    | Item  | Condition  |
|--------|---|--|
| *P0126 | Insufficient Coolant Temperature for Stable Operation | —  |
| *P0171 | System Too Lean (Bank 1)                              | Diagnosis completes in drive cycle A or C as well. |
| *P0172 | System Too Rich (Bank 1)                              | Diagnosis completes in drive cycle A or C as well. |
| *P0301 | Cylinder 1 Misfire Detected                           | Diagnosis completes in drive cycle A or C as well. |
| *P0302 | Cylinder 2 Misfire Detected                           | Diagnosis completes in drive cycle A or C as well. |
| *P0303 | Cylinder 3 Misfire Detected                           | Diagnosis completes in drive cycle A or C as well. |
| *P0304 | Cylinder 4 Misfire Detected                           | Diagnosis completes in drive cycle A or C as well. |
| *P0464 | Fuel Level Sensor Circuit Intermittent                | —  |
| *P0483 | Cooling Fan Rationality Check                         | —  |
| *P0506 | Idle Control System RPM Lower Than Expected           | —  |
| *P0507 | Idle Control System RPM Higher Than Expected          | —  |
| *P2096 | Post Catalyst Fuel Trim System Too Lean Bank 1        | Diagnosis completes in drive cycle A or C as well. |
| *P2097 | Post Catalyst Fuel Trim System Too Rich Bank 1        | Diagnosis completes in drive cycle A or C as well. |

## 4. DRIVE CYCLE C (DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN)



- |  |   |  |
|--|---|--|
| (A) Idle engine for 1 minute.                                  | (E) Drive vehicle at 65 km/h (40 MPH) for 10 seconds. | (G) Stop vehicle with throttle fully closed. |
| (B) Accelerate to 96 km/h (60 MPH) within 20 seconds.          | (F) Accelerate to 96 km/h (60 MPH) within 10 seconds. | (H) Vehicle speed km/h (MPH)                 |
| (C) Drive vehicle at 96 km/h (60 MPH) for 20 seconds.          |   | (I) Seconds                                  |
| (D) Decelerate with fully closed throttle to 65 km/h (40 MPH). |   |  |

| DTC    | Item   | Condition  |
|--------|--|--|
| P0026  | Intake Valve Control Solenoid Circuit Range/Performance (Bank 1)                 | —  |
| P0028  | Intake Valve Control Solenoid Circuit Range/Performance (Bank 2)                 | —  |
| *P0030 | HO2S Heater Control Circuit (Bank 1 Sensor 1)                                    | —  |
| *P0068 | Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance Problem | —  |
| P0076  | Intake Valve Control Solenoid Circuit Low (Bank 1)                               | —  |
| P0082  | Intake Valve Control Solenoid Circuit Low (Bank 2)                               | —  |
| *P0101 | Mass or Volume Air Flow Circuit Range/Performance                                | —  |
| *P0134 | O <sub>2</sub> Sensor Circuit No Activity Detected (Bank 1 Sensor 1)             | —  |
| *P0139 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 2)                    | —  |
| *P0171 | System too Lean (Bank 1)   | Diagnosis completes in drive cycle A or B as well. |
| *P0172 | System too Rich (Bank 1)   | Diagnosis completes in drive cycle A or B as well. |
| *P0301 | Cylinder 1 Misfire Detected  | Diagnosis completes in drive cycle A or B as well. |
| *P0302 | Cylinder 2 Misfire Detected  | Diagnosis completes in drive cycle A or B as well. |
| *P0303 | Cylinder 3 Misfire Detected  | Diagnosis completes in drive cycle A or B as well. |
| *P0304 | Cylinder 4 Misfire Detected  | Diagnosis completes in drive cycle A or B as well. |
| *P0400 | Exhaust Gas Recirculation  | —  |
| P1492  | EGR Solenoid Valve Signal #1 Circuit Malfunction (Low Input)                     | —  |
| P1493  | EGR Solenoid Valve Signal #1 Circuit Malfunction (High Input)                    | —  |



# Drive Cycle

## ENGINE (DIAGNOSTICS)

| DTC    | Item  | Condition  |
|--------|---|--|
| P1494  | EGR Solenoid Valve Signal #2 Circuit Malfunction (Low Input)  | —  |
| P1495  | EGR Solenoid Valve Signal #2 Circuit Malfunction (High Input) | —  |
| P1496  | EGR Solenoid Valve Signal #3 Circuit Malfunction (Low Input)  | —  |
| P1497  | EGR Solenoid Valve Signal #3 Circuit Malfunction (High Input) | —  |
| P1498  | EGR Solenoid Valve Signal #4 Circuit Malfunction (Low Input)  | —  |
| P1499  | EGR Solenoid Valve Signal #5 Circuit Malfunction (High Input) | —  |
| *P2096 | Post Catalyst Fuel Trim System Too Lean Bank 1                | Diagnosis completes in drive cycle A or B as well. |
| *P2097 | Post Catalyst Fuel Trim System Too Rich Bank 1                | Diagnosis completes in drive cycle A or B as well. |

### 5. DRIVE CYCLE D

#### • DRIFT DIAGNOSIS

- 1) Make sure that the engine coolant temperature at engine starting is less than 30°C (86°F).
- 2) Make sure that fuel of more than 9.0 ℓ (2.4 US gal, 2.0 Imp gal) remains and the battery voltage is more than 10.9 V.
- 3) Make sure that the engine coolant temperature rises for more than 10°C (50°F) from the level of engine starting and is also more than 75°C (167°F).
- 4) Idle the engine for more than 120 seconds in the condition of step 3).

#### • STUCK DIAGNOSIS

- 1) Make sure that the battery voltage is more than 10.9 V.
- 2) Perform the clear memory mode. <Ref. to EN(H4SO)(diag)-46, Clear Memory Mode.>
- 3) Drive the vehicle for the distance equal to fuel of 50 ℓ (13.2 US gal, 11 Imp gal).

#### NOTE:

- It is possible to drive intermittently.
- Do not disconnect the terminal of battery during diagnosis. (If disconnecting the terminal of battery, the data will be cleared.)

| DTC   | Item  | Condition |
|-------|---|-----------|
| P0181 | Fuel Temperature Sensor "A" Circuit Range/Performance | —         |

### 6. DRIVE CYCLE E

- 1) Make sure that the battery voltage is more than 10.9 V.
- 2) Perform the clear memory mode. <Ref. to EN(H4SO)(diag)-46, Clear Memory Mode.>
- 3) Drive the vehicle for the distance equal to fuel of 30 ℓ (7.9 US gal, 6.6 Imp gal).

#### NOTE:

- It is possible to drive intermittently.
- Do not disconnect the terminal of battery during diagnosis. (If disconnecting the terminal of battery, the data will be cleared.)

| DTC   | Item  | Condition |
|-------|---|-----------|
| P0461 | Fuel Level Sensor Circuit Range/Performance | —         |

## 7. DRIVE CYCLE F

- 1) Make sure that the engine coolant temperature at engine starting is less than 30°C (86°F).
- 2) Warm-up the engine until the engine coolant temperature is more than 95°C (203°F) from engine starting.
- 3) Idle the engine for more than 10 minutes in the condition of step 2).

**NOTE:**

Do not disconnect the terminal of battery during diagnosis. (If disconnecting the terminal of battery, the data will be cleared.)

| DTC   | Item   | Condition |
|-------|--|-----------|
| P0111 | Intake Air Temperature Circuit Range/Performance | —         |

## 13. Clear Memory Mode

### A: OPERATION

#### 1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On «Engine Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
- 5) When the 'Done' and 'Turn Ignition Switch OFF' are shown on display screen, turn the ignition switch to OFF, and then turn the Subaru Select Monitor to OFF.

**NOTE:**

For detailed operation procedure, refer to SUBARU SELECT MONITOR OPERATION MANUAL.

#### 2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
- 5) On «OBD Menu» display screen, select the {4. Diagnosis Code(s) Cleared} and press the [YES] key.
- 6) When the 'Clear Diagnostic Code?' is shown on the display screen, press the [YES] key.
- 7) Turn the Subaru Select Monitor and ignition switch to OFF.

**NOTE:**

For detailed operation procedure, refer to SUBARU SELECT MONITOR OPERATION MANUAL.

#### 3. GENERAL SCAN TOOL

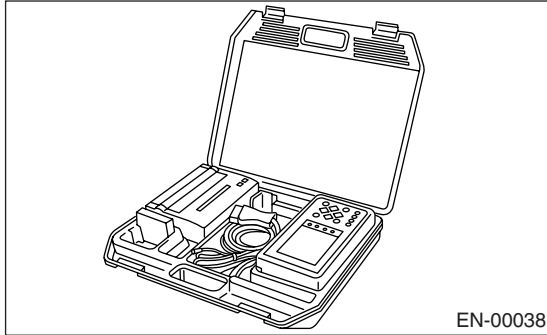
For clear memory procedures using the general scan tool, refer to General Scan Tool Instruction Manual.

After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to ON position. Wait 3 seconds before starting the engine.

## 14. Compulsory Valve Operation Check Mode

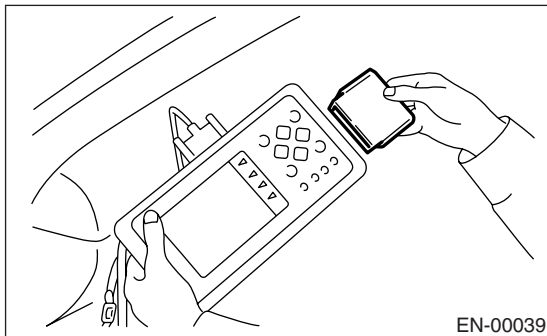
### A: OPERATION

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4SO)(diag)-7, PREPARATION TOOL, General Description.>

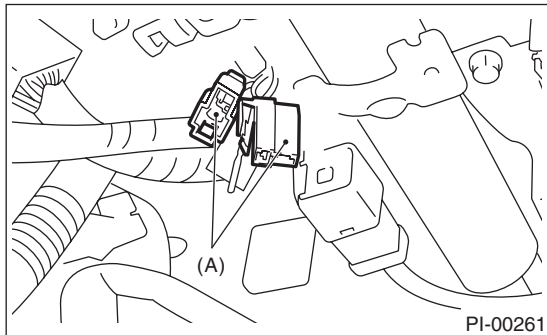


2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4SO)(diag)-7, PREPARATION TOOL, General Description.>

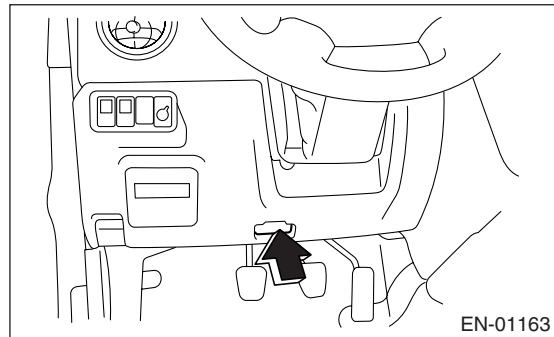


4) Connect the test mode connector (A) at the lower portion of instrument panel (on driver's side).



5) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector is located in the lower portion of instrument panel (on driver's side).

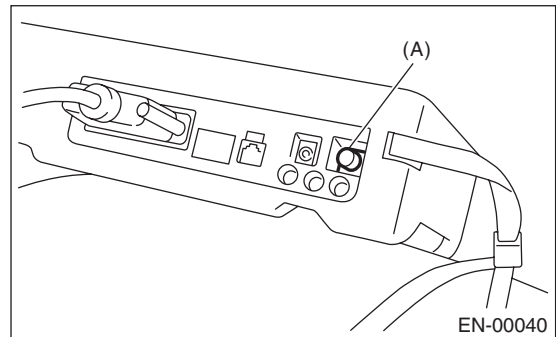


(2) Connect the diagnosis cable to data link connector.

### CAUTION:

**Do not connect scan tools except for Subaru Select Monitor and general scan tool.**

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor power switch to ON.



(A) Power switch

7) On «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.

8) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.

9) Press the [YES] key after the information of engine type is displayed.

10) On «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.

11) On «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press the [YES] key.

12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.

13) Pressing the [NO] key completes the compulsory valve operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

# Compulsory Valve Operation Check Mode

## ENGINE (DIAGNOSTICS)

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- A list of support data is shown in the following table.

| Contents  | Display                     |
|---|-----------------------------|
| Compulsory fuel pump relay operation check                        | Fuel Pump Relay             |
| Compulsory radiator fan relay operation check                     | Radiator Fan Relay          |
| Compulsory air conditioning relay operation check                 | A/C Compressor Relay        |
| Compulsory purge control solenoid valve operation check           | CPC Solenoid Valve          |
| Compulsory pressure control solenoid valve operation check        | PCV Solenoid Valve          |
| Compulsory air assist vent control solenoid valve operation check | Vent Control Solenoid Valve |

### NOTE:

- The following parts will be displayed but not functional.

| Display                               |
|---------------------------------------|
| EGR Solenoid Valve                    |
| ASV Solenoid Valve                    |
| FICD Solenoid                         |
| Pressure Switching Sol. 1             |
| Pressure Switching Sol. 2             |
| Turbocharger Wastegate Solenoid       |
| AAI Solenoid                          |
| Emission-bypass valve permission flag |

- For detailed operation procedure, refer to SUBARU SELECT MONITOR OPERATION MANUAL.

## 15. Malfunction Indicator Light

### A: PROCEDURE

|   |
|---|
| 1. Activation of malfunction indicator light. <Ref. to EN(H4SO)(diag)-49, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>  |
| ↓   |
| 2. Malfunction indicator light does not come on. <Ref. to EN(H4SO)(diag)-51, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>  |
| ↓   |
| 3. Malfunction indicator light does not go off. <Ref. to EN(H4SO)(diag)-53, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF., Malfunction Indicator Light.>   |
| ↓   |
| 4. Malfunction indicator light does not blink at a cycle of 3 Hz. <Ref. to EN(H4SO)(diag)-54, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 HZ., Malfunction Indicator Light.>     |
| ↓   |
| 5. Malfunction indicator light remains blinking at a cycle of 3 Hz. <Ref. to EN(H4SO)(diag)-56, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 HZ., Malfunction Indicator Light.> |

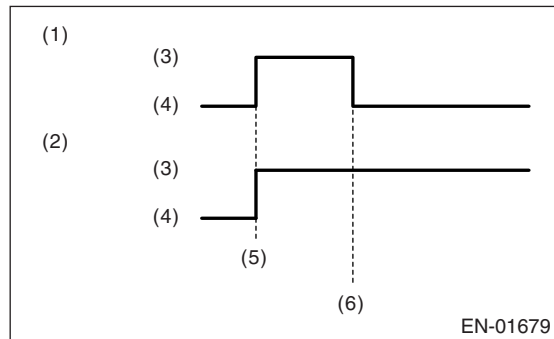
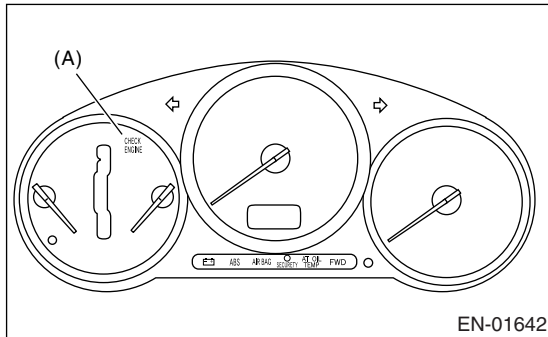
### B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

1) When the ignition switch is turned to ON (engine off), the malfunction indicator light (A) in the combination meter illuminates.

**NOTE:**

If the malfunction indicator light does not illuminate, perform diagnostics of the malfunction indicator light circuit or the combination meter circuit. <Ref. to EN(H4SO)(diag)-51, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>

2) After starting the engine, the malfunction indicator light goes out. If it does not, either the engine or the emission control system is malfunctioning.

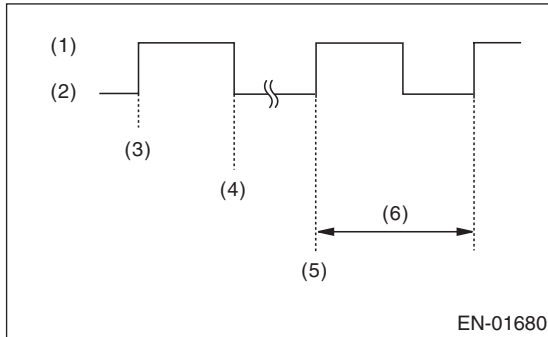


- (1) No trouble
- (2) Trouble occurs
- (3) ON
- (4) OFF
- (5) Ignition switch ON
- (6) Engine start

# Malfunction Indicator Light

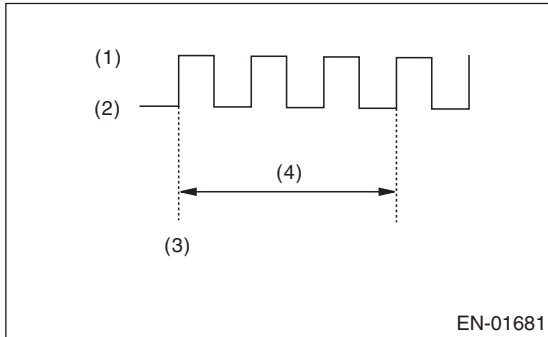
## ENGINE (DIAGNOSTICS)

3) If the diagnosis system detects a misfire which could damage the catalyst, the malfunction indicator light blink at a cycle of 1 Hz.



- (1) ON
- (2) OFF
- (3) Ignition switch ON
- (4) Engine start
- (5) Misfire start
- (6) 1 second

4) When the ignition switch is turned to ON (engine off) or to "START" with test mode connector connected, the malfunction indicator light blinks at a cycle of 3 Hz.



- (1) ON
- (2) OFF
- (3) Ignition switch ON
- (4) 1 second

# Malfuction Indicator Light

ENGINE (DIAGNOSTICS)

## C: MALFUNCTION INDICATOR LIGHT DOES NOT COME ON

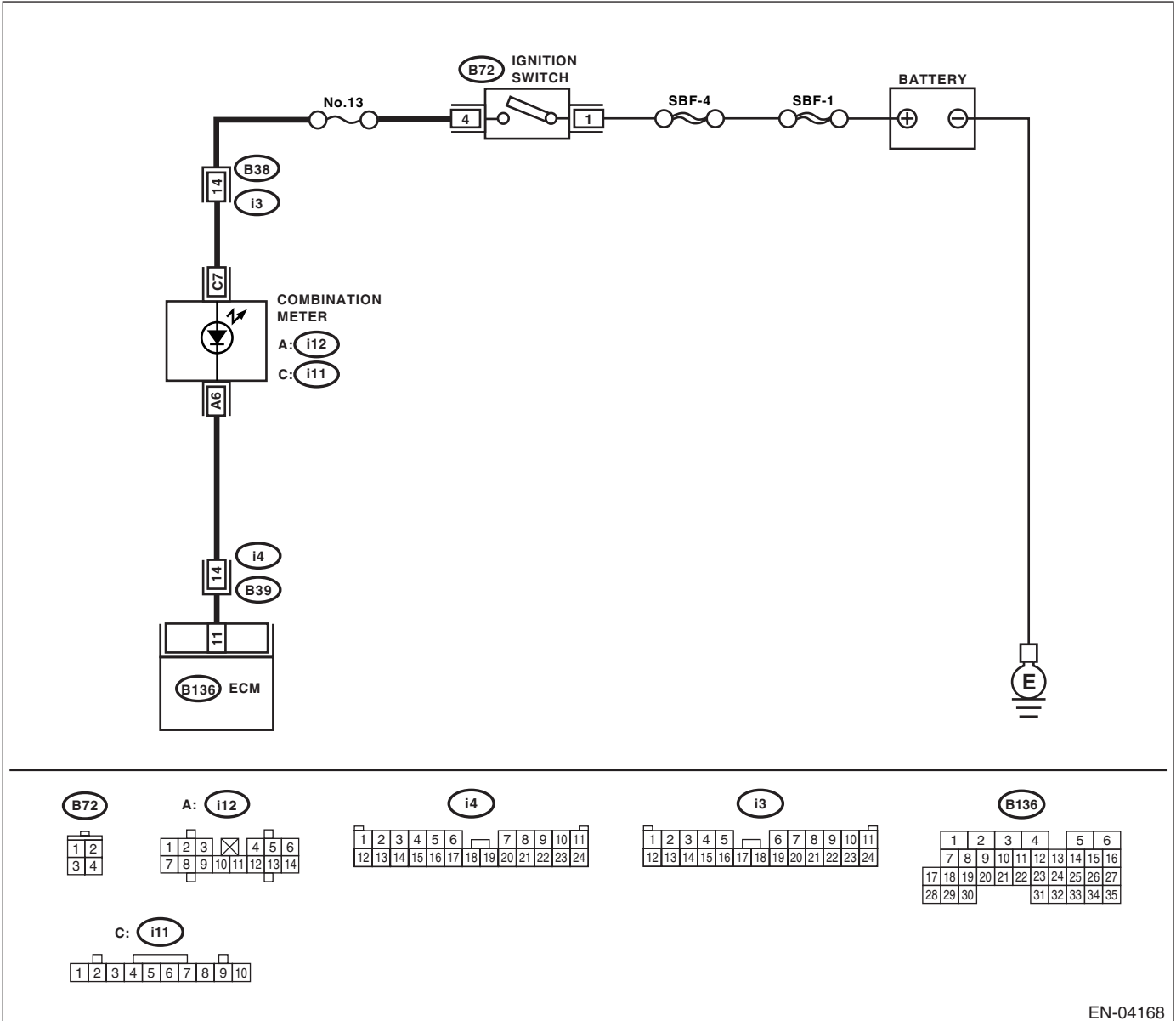
### DIAGNOSIS:

The malfunction indicator light circuit is open or shorted.

### TROUBLE SYMPTOM:

When the ignition switch is turned ON (engine OFF), malfunction indicator light does not come on.

### WIRING DIAGRAM:



EN-04168



## Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <b>1 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 11 (+) — Chassis ground (-):</b>   | Is the voltage less than 1 V?                         | Go to step 4.   | Go to step 2.   |
| <b>2 CHECK POOR CONTACT.</b><br>Check poor contact by shaking or pulling ECM connector and harness.   | Does the malfunction indicator light illuminate?      | Repair poor contact in ECM connector.   | Go to step 3.   |
| <b>3 CHECK ECM CONNECTOR.</b><br>Check the ECM connector connection.  | Is the ECM connector correctly connected?             | Replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).>           | Repair connection of ECM connector.   |
| <b>4 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the combination meter. <Ref. to IDI-10, Combination Meter.><br>3) Disconnect the connector from ECM and combination meter.<br>4) Measure the resistance of harness between ECM and combination meter connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 11 — (i12) No. 6:</b> | Is the resistance less than 1 $\Omega$ ?              | Go to step 5.   | Repair harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and combination meter connector</li> <li>• Poor contact in coupling connector</li> </ul>                           |
| <b>5 CHECK POOR CONTACT.</b><br>Check poor contact in combination meter connector.  | Is there poor contact in combination meter connector? | Repair poor contact in combination meter connector.                               | Go to step 6.   |
| <b>6 CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between combination meter connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(i11) No. 7 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?                        | Replace the combination meter circuit board. <Ref. to IDI-10, Combination Meter.> | Check the following and repair if necessary.<br>NOTE: <ul style="list-style-type: none"> <li>• Blown out fuse (No. 13)</li> <li>• Open or short circuit in harness between fuse (No. 13) and battery terminal</li> <li>• Poor contact in ignition switch connector</li> </ul> |

## D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF.

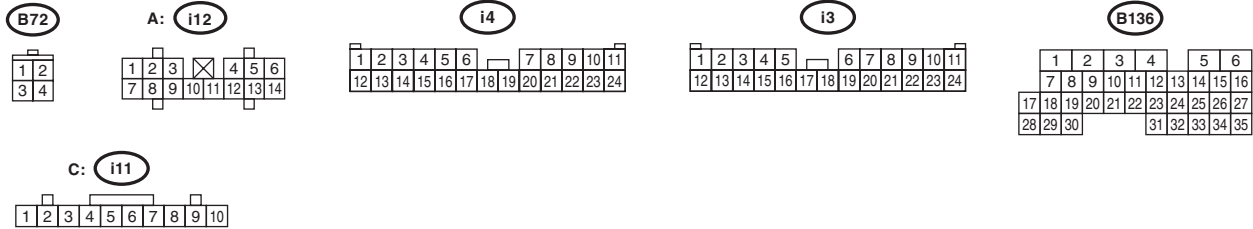
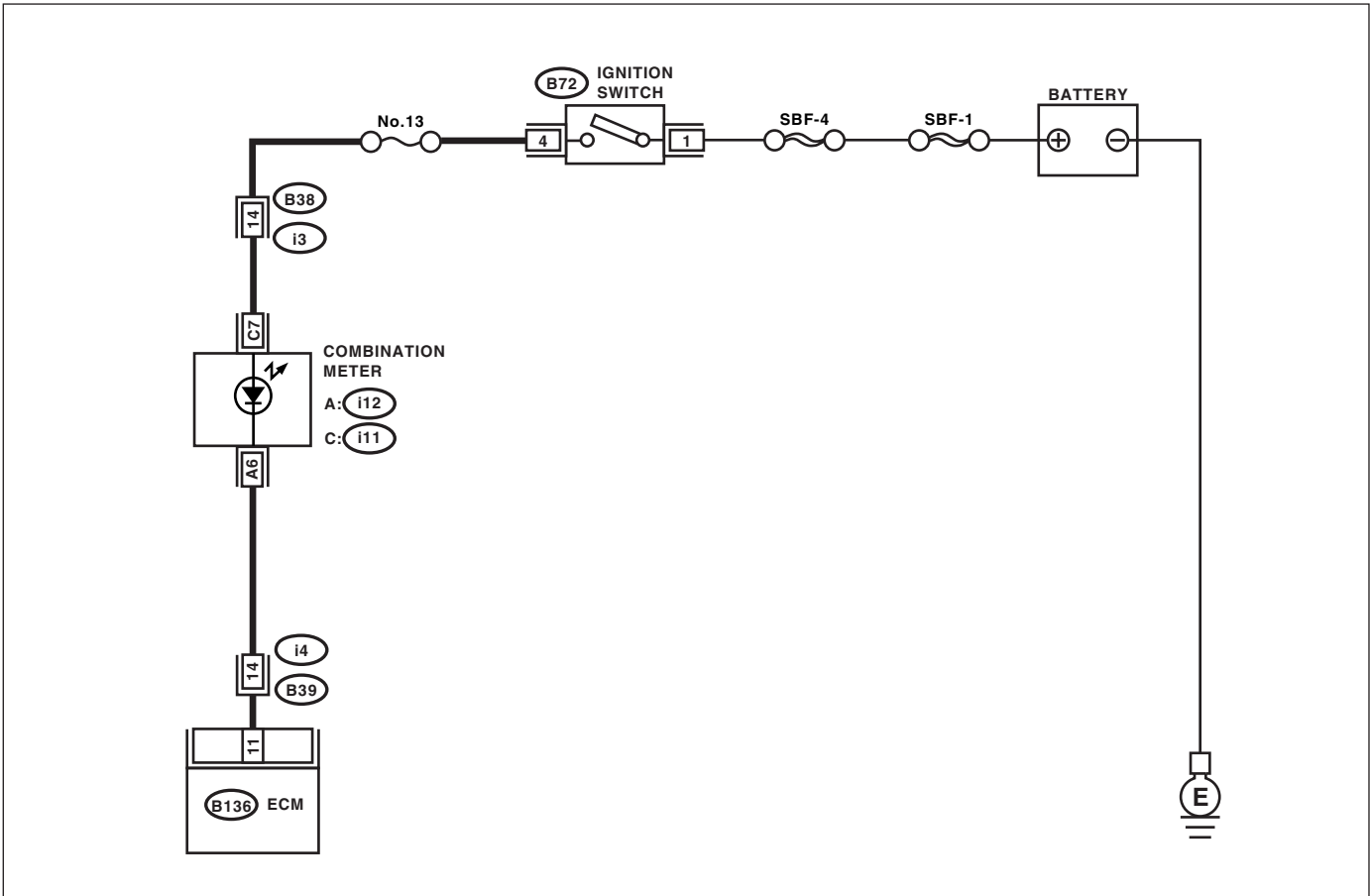
### DIAGNOSIS:

The malfunction indicator light circuit is shorted.

### TROUBLE SYMPTOM:

Although malfunction indicator light comes on when the engine runs, DTC is not shown on Subaru select monitor or general scan tool display.

### WIRING DIAGRAM:



EN-04168

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <b>1</b><br><b>CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Turn the ignition switch to ON. | Does the malfunction indicator light illuminate? | Repair short circuit in harness between combination meter and ECM connector. | Replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |

# Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

## E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 Hz.

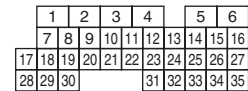
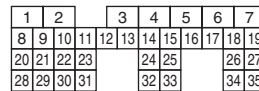
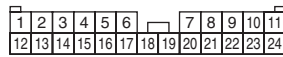
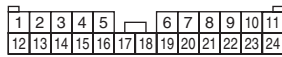
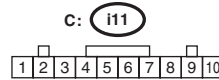
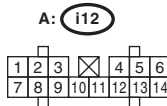
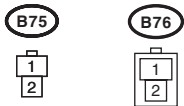
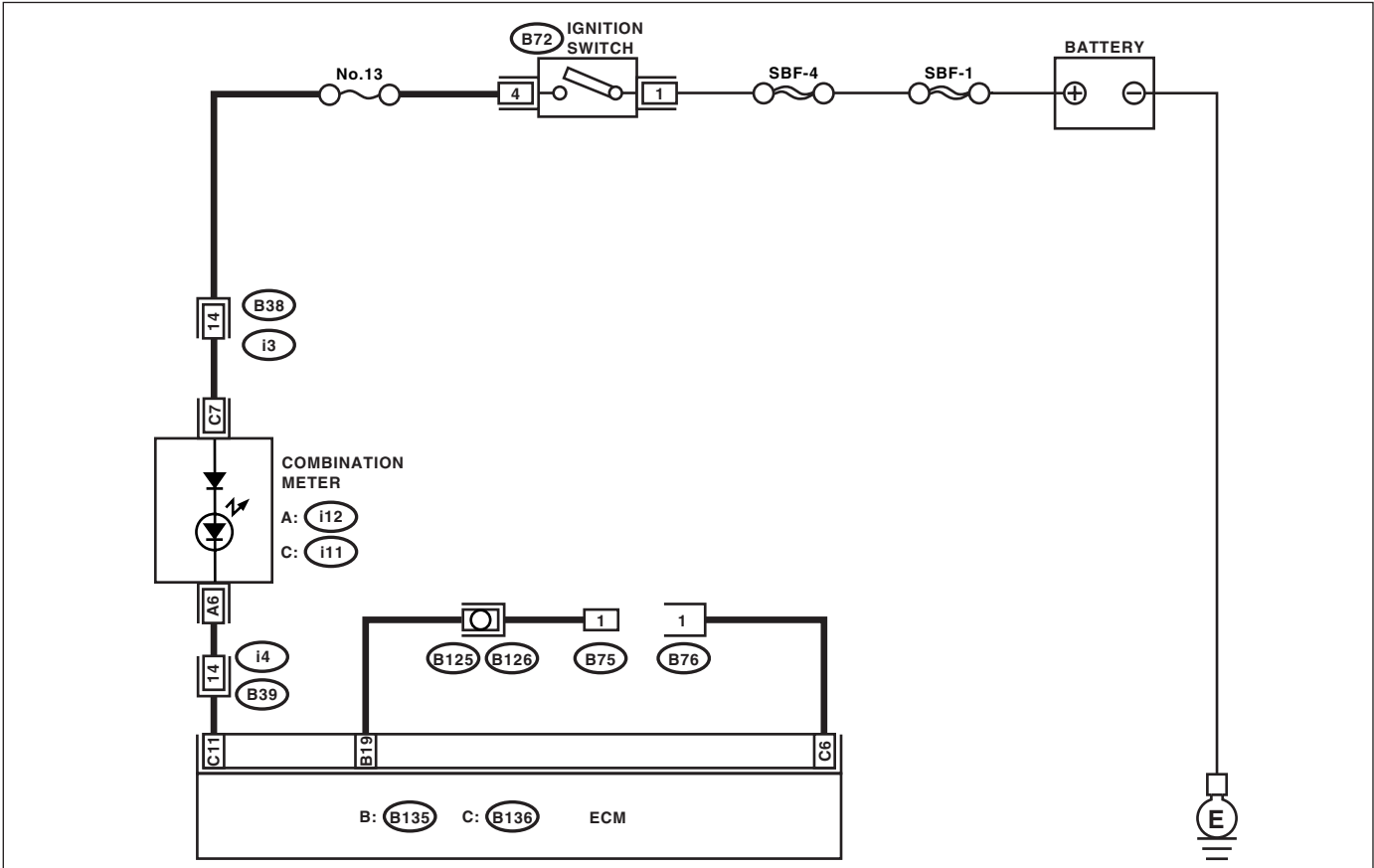
### DIAGNOSIS:

- The malfunction indicator light circuit is open or shorted.
- Test mode connector circuit is in open.

### TROUBLE SYMPTOM:

When in inspection mode, malfunction indicator light does not blink at a cycle of 3 Hz.

### WIRING DIAGRAM:



EN-04660

# Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <b>1 CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the test mode connector.<br>3) Turn the ignition switch to ON. (engine OFF)   | Does the malfunction indicator light illuminate? | Go to step 2.   | Repair the malfunction indicator light circuit. <Ref. to EN(H4SO)(diag)-51, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.> |
| <b>2 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Turn the ignition switch to ON.   | Does the malfunction indicator light illuminate? | Repair ground short circuit in harness between combination meter and ECM connector. | Go to step 3.   |
| <b>3 CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between test mode connector and ECM.<br><b>Connector &amp; terminal</b><br><b>(B76) No. 1 — (B136) No. 6:</b> | Is the resistance less than 1 $\Omega$ ?         | Go to step 4.   | Repair the open circuit in harness between test mode connector and ECM.   |
| <b>4 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.  | Is there poor contact in ECM connector?          | Repair poor contact in ECM connector.   | Go to step 5.   |
| <b>5 CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.</b><br>Measure the resistance of harness between ECM and test mode connector.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 19 — (B75) No. 1:</b>   | Is the resistance less than 1 $\Omega$ ?         | Go to step 6.   | Repair the open circuit in harness between ECM and test mode connector.   |
| <b>6 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.  | Is there poor contact in ECM connector?          | Repair poor contact in ECM connector.   | Replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).>  |

# Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

## F: MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 Hz.

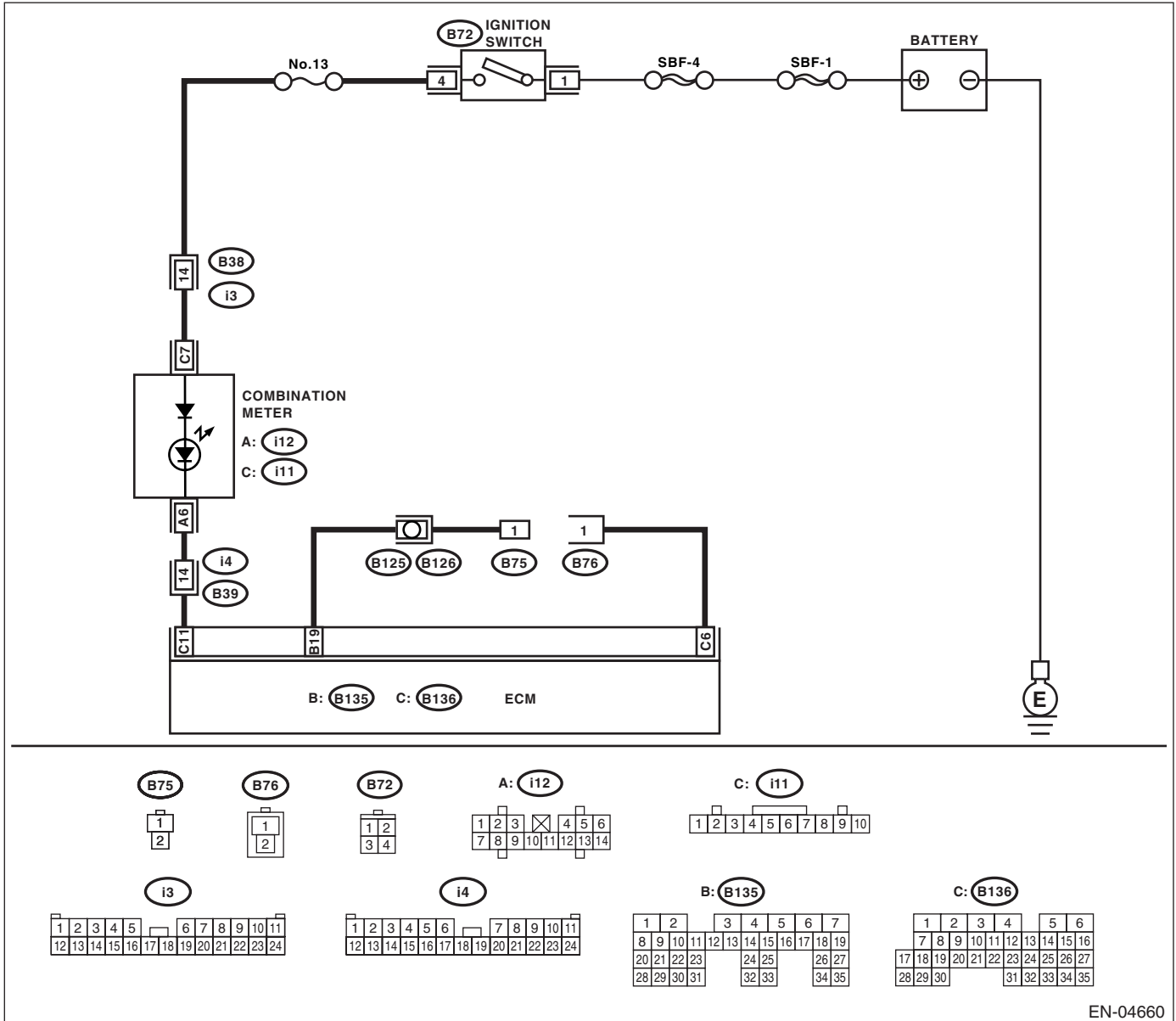
### DIAGNOSIS:

Test mode connector circuit is shorted.

### TROUBLE SYMPTOM:

Malfunction indicator light blinks at a cycle of 3 Hz when the ignition switch is turned to ON.

### WIRING DIAGRAM:



EN-04660

# Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

| Step   | Check                                       | Yes  | No  |
|--|---|--|---|
| <b>1</b><br><b>CHECK TEST MODE CONNECTOR.</b><br>1) Disconnect the test mode connector.<br>2) Turn the ignition switch to ON.  | Does the malfunction indicator light blink? | Go to step 2.  | System is in good order.<br>NOTE:<br>Malfunction indicator light blinks at a cycle of 3 Hz when test mode connector is connected. |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 19 — Chassis ground:</b> | Is the resistance less than 5 $\Omega$ ?    | Repair short circuit in harness between ECM and test mode connector. | Replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).>   |

# Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

## 16. Diagnostics for Engine Starting Failure

### A: PROCEDURE

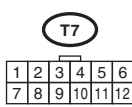
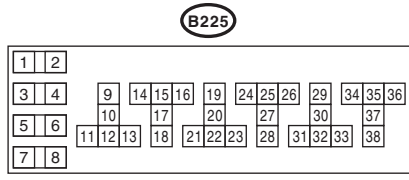
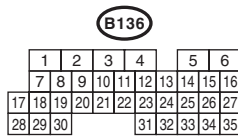
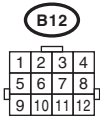
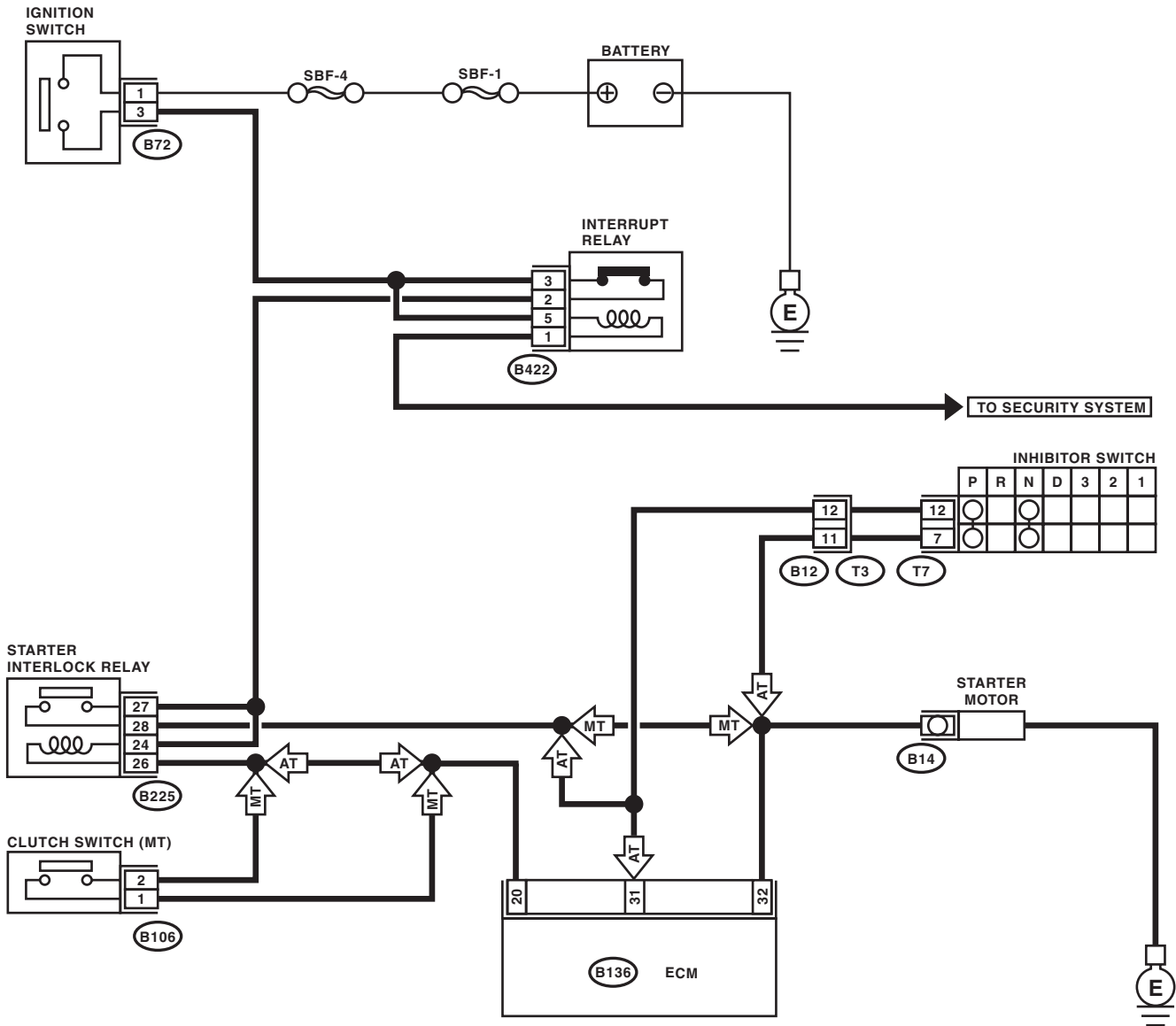
|   |
|---|
| 1. Check the fuel level.  |
| ↓   |
| 2. Inspection of starter motor circuit. <Ref. to EN(H4SO)(diag)-59, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>  |
| ↓   |
| 3. Inspection of ECM power supply and ground line. <Ref. to EN(H4SO)(diag)-63, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.> |
| ↓   |
| 4. Inspection of ignition control system. <Ref. to EN(H4SO)(diag)-65, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>  |
| ↓   |
| 5. Inspection of fuel pump circuit. <Ref. to EN(H4SO)(diag)-68, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>  |
| ↓   |
| 6. Inspection of fuel injector circuit. <Ref. to EN(H4SO)(diag)-71, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>  |

## B: STARTER MOTOR CIRCUIT

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:





# Diagnostics for Engine Starting Failure

## ENGINE (DIAGNOSTICS)

| Step | Check   | Yes   | No  |   |
|------|---|---|---|---|
| 1    | <b>CHECK BATTERY.</b><br>Check the battery voltage.   | Is the voltage more than 12 V?  | Go to step 2.   | Charge or replace the battery.  |
| 2    | <b>CHECK OPERATION OF STARTER MOTOR.</b>  | Does the starter motor operate?   | Go to step 3.   | Go to step 4.   |
| 3    | <b>CHECK DTC.</b>   | Is the DTC displayed? <Ref. to EN(H4SO)(diag)-35, OPERATION, Read Diagnostic Trouble Code (DTC).> | Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> | Repair the poor contact in ECM connector.   |
| 4    | <b>CHECK INPUT SIGNAL FOR STARTER MOTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from starter motor.<br>3) Turn the ignition switch to START.<br>4) Measure the power supply voltage between starter motor connector terminal and engine ground.<br><b>Connector &amp; terminal</b><br><b>(B14) No. 1 (+) — Engine ground (-):</b><br>NOTE:<br>• On AT models, place the select lever in the "P" or "N" range.<br>• On MT models, depress the clutch pedal. | Is the voltage more than 10 V?  | Check the starter motor. <Ref. to SC(H4SO)-8, Starter.>   | Go to step 5.   |
| 5    | <b>CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.</b><br>1) Disconnect the connector from ignition switch.<br>2) Measure the power supply voltage between ignition switch connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B72) No. 1 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?  | Go to step 6.   | Repair open circuit in harness between ignition switch and battery, and check fuse SBF No. 4 and SBF No. 1.   |
| 6    | <b>CHECK IGNITION SWITCH.</b><br>1) Disconnect the connector from ignition switch.<br>2) Measure the resistance between ignition switch terminals while turning ignition switch to the START position.<br><b>Terminals</b><br><b>(B72) No. 1 — No. 3:</b>   | Is the resistance less than 5 Ω?  | Go to step 7.   | Replace the ignition switch.  |
| 7    | <b>CHECK TRANSMISSION TYPE.</b>   | Is the target AT model?   | Go to step 8.   | Go to step 12.  |
| 8    | <b>CHECK INPUT VOLTAGE OF STARTER INTERLOCK RELAY.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from starter interlock relay.<br>3) Connect the connector to ignition switch.<br>4) Measure the input voltage between starter interlock relay connector and chassis ground while turning ignition switch to START.<br><b>Connector &amp; terminal</b><br><b>(B225) No. 24 (+) — Chassis ground (-):</b><br><b>(B225) No. 27 (+) — Chassis ground (-):</b>            | Is the voltage more than 10 V?  | Go to step 9.   | Repair open or short circuit to ground in harness between starter interlock relay and ignition switch.<br>NOTE:<br>Check security system (if equipped). <Ref. to SL-21, Security System.> |

# Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes  | No   |
|--|--|--|--|
| <p><b>9 CHECK STARTER INTERLOCK RELAY.</b><br/>                     1) Using a lead wire, connect the terminal No. 24 of starter interlock relay to positive terminal of battery, and terminal No. 26 to ground terminal of battery.<br/>                     2) Measure the resistance between starter interlock relay terminals.<br/> <b>Terminals</b><br/> <b>No. 27 — No. 28:</b></p>  | Is the resistance less than 1 $\Omega$ ? | Go to step 10.   | Replace the starter interlock relay.   |
| <p><b>10 CHECK INPUT VOLTAGE OF INHIBITOR SWITCH.</b><br/>                     1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from inhibitor switch.<br/>                     3) Connect the connector to ignition switch.<br/>                     4) Measure the input voltage between inhibitor switch connector terminal and engine ground while turning ignition switch to START.<br/> <b>Connector &amp; terminal</b><br/> <b>(B12) No. 12 (+) — Engine ground (-):</b></p>  | Is the voltage more than 10 V?           | Go to step 11.   | Repair open or ground short circuit in harness between inhibitor switch and starter interlock relay.<br><br>NOTE: Check security system (if equipped). <Ref. to SL-21, Security System.>   |
| <p><b>11 CHECK INHIBITOR SWITCH.</b><br/>                     1) Place the select lever in the "P" or "N" range.<br/>                     2) Measure the resistance between inhibitor switch terminals.<br/> <b>Connector &amp; terminal</b><br/> <b>(T3) No. 11 — No. 12:</b></p>   | Is the resistance less than 1 $\Omega$ ? | Repair open or ground short circuit in harness between inhibitor switch and starter motor. | Replace the inhibitor switch. <Ref. to 4AT-48, Inhibitor Switch.>  |
| <p><b>12 CHECK INPUT VOLTAGE OF STARTER INTERLOCK RELAY.</b><br/>                     1) Turn ignition switch to OFF.<br/>                     2) Disconnect the connector from starter interlock relay.<br/>                     3) Connect the connector to ignition switch.<br/>                     4) Measure the input voltage between starter interlock relay connector and chassis ground while turning ignition switch to START.<br/> <b>Connector &amp; terminal</b><br/> <b>(B225) No. 24 (+) — Chassis ground (-):</b><br/> <b>(B225) No. 27 (+) — Chassis ground (-):</b></p> | Is the voltage more than 10 V?           | Go to step 13.   | Repair open or short circuit to ground in harness between starter interlock relay and ignition switch.<br><br>NOTE: Check security system (if equipped). <Ref. to SL-21, Security System.> |
| <p><b>13 CHECK STARTER INTERLOCK RELAY.</b><br/>                     1) Using a lead wire, connect the terminal No. 24 of starter interlock relay to positive terminal of battery, and terminal No. 26 to ground terminal of battery.<br/>                     2) Measure the resistance between starter interlock relay terminals.<br/> <b>Terminals</b><br/> <b>No. 27 — No. 28:</b></p>   | Is the resistance less than 1 $\Omega$ ? | Go to step 14.   | Replace the starter interlock relay.   |
| <p><b>14 CHECK GROUND CIRCUIT OF CLUTCH SWITCH.</b><br/>                     1) Disconnect the connector from clutch switch.<br/>                     2) Measure the resistance between clutch switch connector and chassis ground.<br/> <b>Connector &amp; terminal</b><br/> <b>(B106) No. 1 — Chassis ground:</b></p>  | Is the resistance less than 1 $\Omega$ ? | Go to step 15.   | Repair open circuit of ground cable.   |

## Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes  | No  |
|--|--|--|---|
| <b>15</b><br><b>CHECK CLUTCH SWITCH.</b><br>Measure the resistance between clutch switch terminals while depressing the clutch pedal.<br><i>Terminals</i><br><i>No. 1 — No. 2:</i>   | Is the resistance less than 1 $\Omega$ ? | Go to step <b>16</b> .   | Replace the clutch switch. <Ref. to CL-36, Clutch Switch.>                        |
| <b>16</b><br><b>CHECK CLUTCH SWITCH CIRCUIT.</b><br>1) Connect the connector to clutch switch.<br>2) Measure the resistance between starter interlock relay connector and chassis ground while depressing the clutch pedal.<br><i>Connector &amp; terminal</i><br><i>(B225) No. 26 — Chassis ground:</i> | Is the resistance less than 1 $\Omega$ ? | Repair short circuit to ground in harness between starter interlock relay and starter motor. | Repair open circuit in harness between starter interlock relay and clutch switch. |

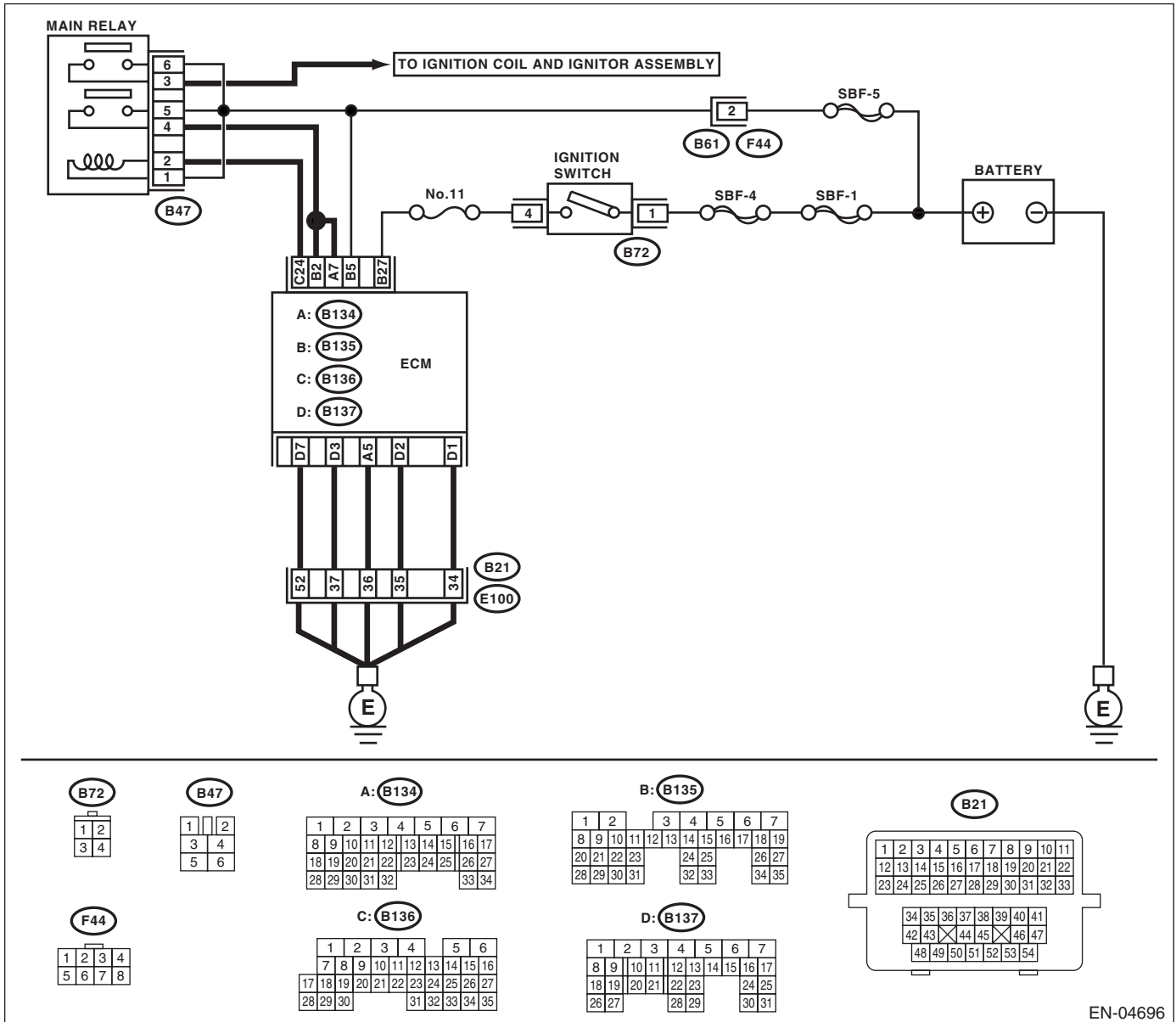
# Diagnostics for Engine Starting Failure

## C: CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM)

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



## Diagnostics for Engine Starting Failure

### ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No   |
|--|---|--|--|
| <b>1 CHECK MAIN RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the main relay.<br>3) Using a lead wire, connect the terminal No. 1 of main relay to positive terminal of battery, and terminal No. 2 to ground terminal of battery.<br>4) Measure the resistance between main relay terminals.<br><b>Terminals</b><br><b>No. 3 — No. 6:</b><br><b>No. 4 — No. 5:</b>                   | Is the measured value less than 10 $\Omega$ ? | Go to step 2.  | Replace the main relay.  |
| <b>2 CHECK GROUND CIRCUIT OF ECM.</b><br>1) Disconnect the connector from ECM.<br>2) Measure the resistance of harness between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 5 — Chassis ground:</b><br><b>(B137) No. 1 — Chassis ground:</b><br><b>(B137) No. 2 — Chassis ground:</b><br><b>(B137) No. 3 — Chassis ground:</b><br><b>(B137) No. 7 — Chassis ground:</b> | Is the measured value less than 5 $\Omega$ ?  | Go to step 3.  | Repair the open circuit in harness between ECM connector and engine grounding terminal or poor contact in connector. |
| <b>3 CHECK INPUT VOLTAGE OF ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 5 (+) — Chassis ground (-):</b><br><b>(B135) No. 27 (+) — Chassis ground (-):</b>  | Is the measured value more than 10 V?         | Go to step 4.  | Repair the open or ground short circuit of power supply circuit.   |
| <b>4 CHECK INPUT VOLTAGE OF MAIN RELAY.</b><br>Measure the voltage between main relay connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B47) No. 1 (+) — Chassis ground (-):</b><br><b>(B47) No. 5 (+) — Chassis ground (-):</b><br><b>(B47) No. 6 (+) — Chassis ground (-):</b>   | Is the measured value more than 10 V?         | Go to step 5.  | Repair the open or ground short circuit in harness of power supply circuit.  |
| <b>5 CHECK INPUT VOLTAGE OF ECM.</b><br>1) Connect the main relay connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 2 (+) — Chassis ground (-):</b><br><b>(B134) No. 7 (+) — Chassis ground (-):</b><br><b>(B136) No. 24 (+) — Chassis ground (-):</b>                          | Is the measured value more than 10 V?         | Check the ignition control system.<br><Ref. to EN(H4SO)(diag)-65, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.> | Repair the open or ground short circuit in harness between ECM connector and main relay connector.                   |

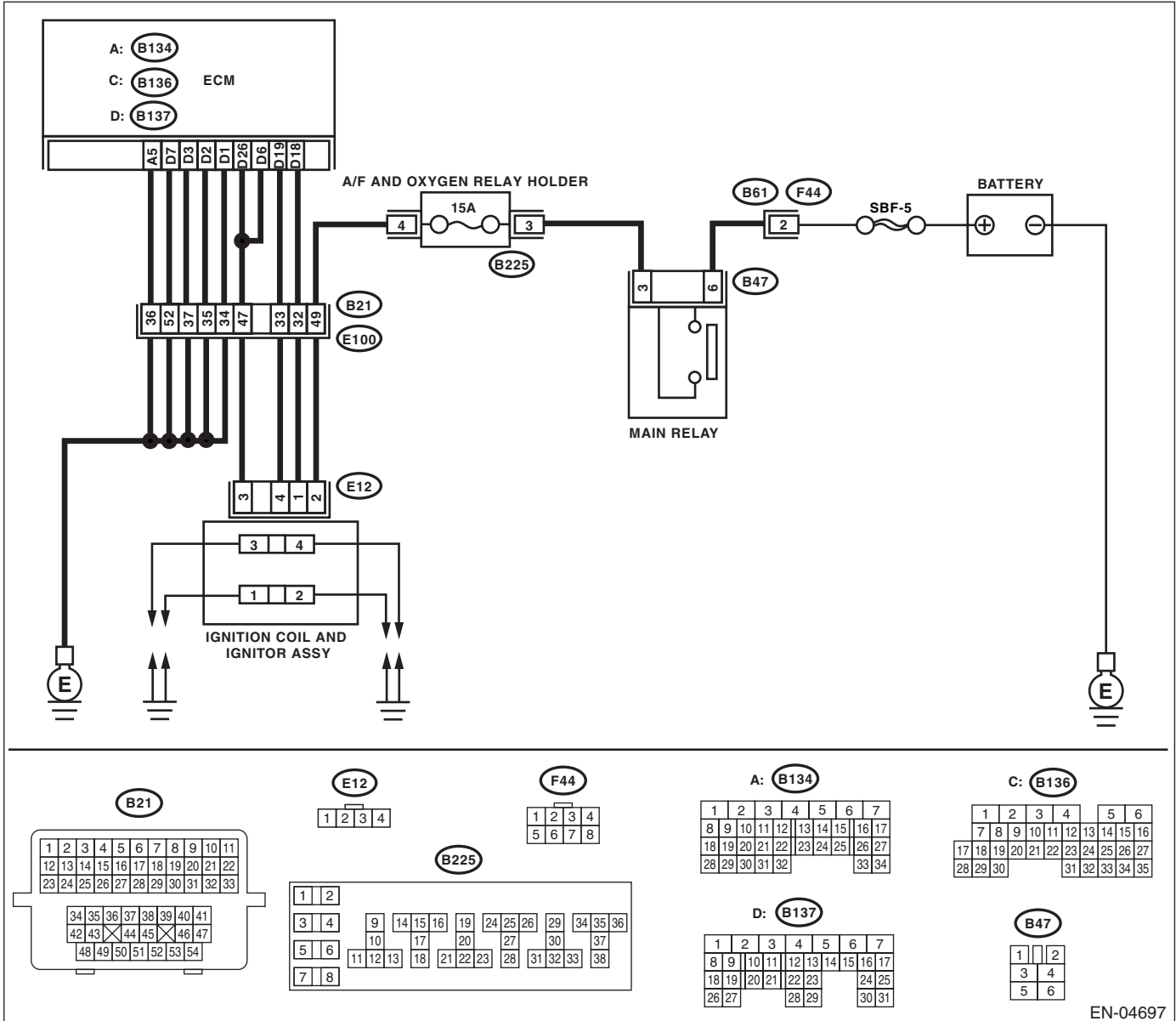
# Diagnostics for Engine Starting Failure

## D: IGNITION CONTROL SYSTEM

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04697

## Diagnostics for Engine Starting Failure

### ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes  | No  |
|--|--|--|---|
| <p><b>1</b></p> <p><b>CHECK IGNITION SYSTEM FOR SPARKS.</b><br/>                     1) Remove the plug cord cap from each spark plug.<br/>                     2) Install the new spark plug on plug cord cap.</p> <p><b>CAUTION:</b><br/> <b>Do not remove the spark plug from engine.</b></p> <p>3) Contact the spark plug's thread portion on engine.<br/>                     4) While opening the throttle valve fully, crank the engine to check that spark occurs at each cylinder.</p>  | Does spark occur at each cylinder?       | Check fuel pump system. <Ref. to EN(H4SO)(diag)-68, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.> | Go to step 2.   |
| <p><b>2</b></p> <p><b>CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL AND IGNITOR ASSEMBLY.</b><br/>                     1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from ignition coil and ignitor assembly.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the power supply voltage between ignition coil and ignitor assembly connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(E12) No. 2 (+) — Engine ground (-):</b></p> | Is the voltage more than 10 V?           | Go to step 3.  | Repair harness and connector.<br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ignition coil and ignitor assembly, and ignition switch connector<br>• Poor contact in coupling connectors |
| <p><b>3</b></p> <p><b>CHECK HARNESS OF IGNITION COIL AND IGNITOR ASSEMBLY GROUND CIRCUIT.</b><br/>                     1) Turn the ignition switch to OFF.<br/>                     2) Measure the resistance between ignition coil and ignitor assembly connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(E12) No. 3 — Engine ground:</b></p>  | Is the resistance less than 5 $\Omega$ ? | Go to step 4.  | Repair harness and connector.<br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ignition coil and ignitor assembly connector and engine grounding terminal                                 |
| <p><b>4</b></p> <p><b>CHECK IGNITION COIL AND IGNITOR ASSEMBLY.</b><br/>                     1) Remove the spark plug cords.<br/>                     2) Measure the resistance between spark plug cord contact portions to check secondary coil.</p> <p><b>Terminals</b><br/> <b>No. 1 — No. 2:</b><br/> <b>No. 3 — No. 4:</b></p>  | Is the resistance 10 — 15 k $\Omega$ ?   | Go to step 5.  | Replace the ignition coil and ignitor assembly. <Ref. to IG(H4SO)-7, Ignition Coil and Ignitor Assembly.>   |
| <p><b>5</b></p> <p><b>CHECK INPUT SIGNAL FOR IGNITION COIL AND IGNITOR ASSEMBLY.</b><br/>                     1) Connect the connector to ignition coil and ignitor assembly.<br/>                     2) Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignition coil and ignitor assembly connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(E12) No. 1 (+) — Engine ground (-):</b><br/> <b>(E12) No. 4 (+) — Engine ground (-):</b></p>                       | Does the voltage vary more than 10 V?    | Go to step 6.  | Replace the ignition coil and ignitor assembly. <Ref. to IG(H4SO)-7, Ignition Coil and Ignitor Assembly.>   |

# Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No  |
|--|--|--|---|
| <p><b>6</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM.<br/>                     3) Disconnect the connector from ignition coil and ignitor assembly.<br/>                     4) Measure the resistance of harness between ECM and ignition coil and ignitor assembly connector.</p> <p><b>Connector &amp; terminal</b><br/> <i>(B137) No. 18 — (E12) No. 1:</i><br/> <i>(B137) No. 19 — (E12) No. 4:</i></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | <p>Go to step 7.</p>                         | <p>Repair harness and connector.</p> <p>NOTE:<br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and ignition coil and ignitor assembly connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <p><b>7</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR.</b></p> <p>Measure the resistance of harness between ECM and engine ground.</p> <p><b>Connector &amp; terminal:</b><br/> <i>(B137) No. 18 — Engine ground:</i><br/> <i>(B137) No. 19 — Engine ground:</i></p>  | <p>Is the resistance more than 1 <math>M\Omega</math>?</p> | <p>Go to step 8.</p>                         | <p>Repair ground short circuit in harness between ECM and ignition coil and ignitor assembly connector.</p>   |
| <p><b>8</b></p> <p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in ECM connector.</p>  | <p>Is there poor contact in ECM connector?</p>             | <p>Repair poor contact in ECM connector.</p> | <p>Check fuel pump circuit. &lt;Ref. to EN(H4SO)(diag)-68, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.&gt;</p>  |



# Diagnostics for Engine Starting Failure

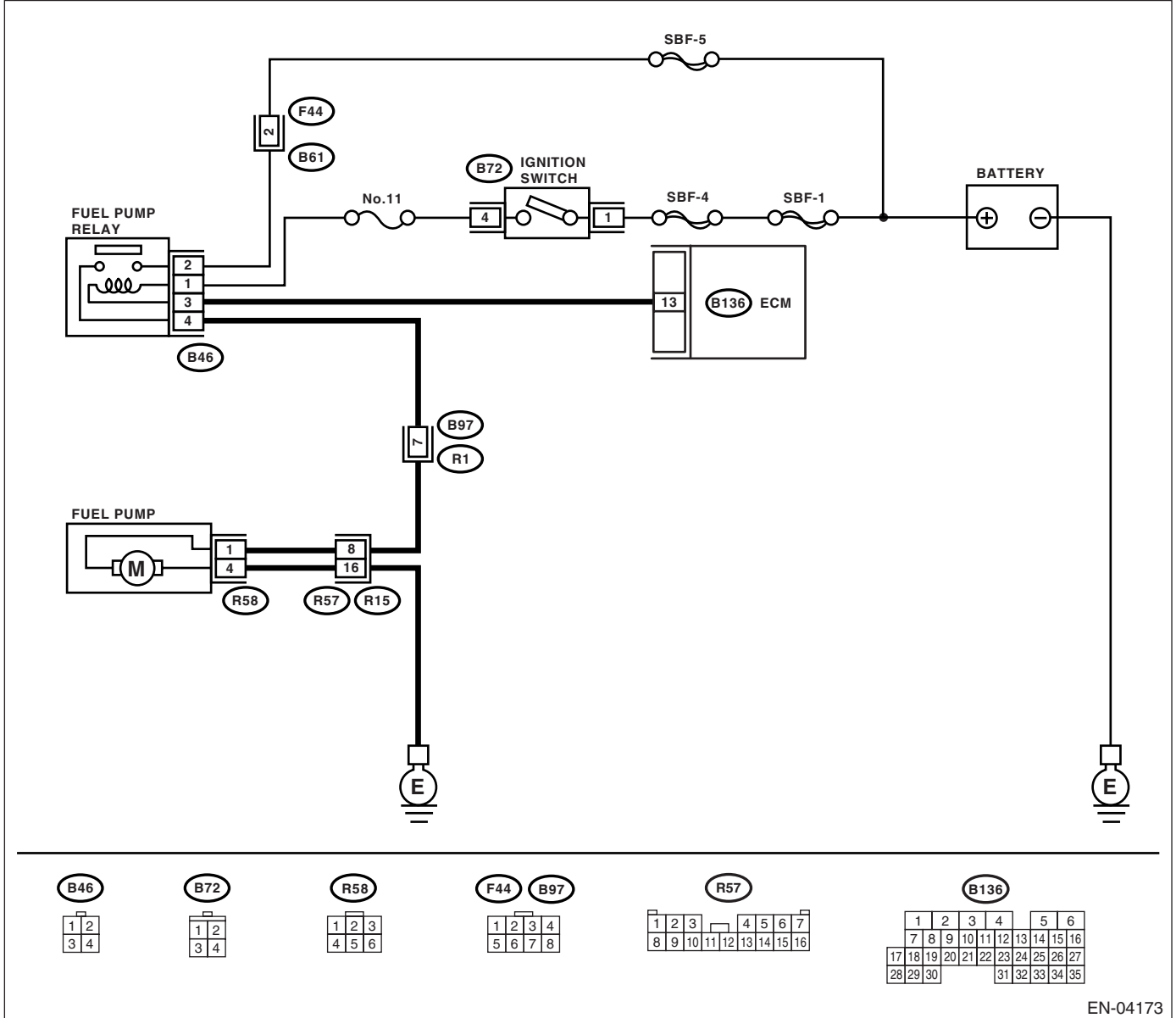
ENGINE (DIAGNOSTICS)

## E: FUEL PUMP CIRCUIT

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04173

# Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

| Step  | Check                                       | Yes   | No   |
|---|---|---|--|
| <p><b>1 CHECK OPERATING SOUND OF FUEL PUMP.</b><br/>Make sure that fuel pump is in operation for two seconds when turning the ignition switch to ON.<br/>NOTE:<br/>Fuel pump operation can also be executed using Subaru Select Monitor.<br/>For the procedure, refer to "Compulsory Valve Operation Check Mode". &lt;Ref. to EN(H4SO)(diag)-47, Compulsory Valve Operation Check Mode.&gt;</p> | Does the fuel pump produce operating sound? | Check fuel injector circuit. <Ref. to EN(H4SO)(diag)-71, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.> | Go to step 2.  |
| <p><b>2 CHECK GROUND CIRCUIT OF FUEL PUMP.</b><br/>1) Turn the ignition switch to OFF.<br/>2) Remove the fuel pump access hole lid.<br/>3) Disconnect the connector from fuel pump.<br/>4) Measure the resistance of harness connector between fuel pump and chassis ground.<br/><b>Connector &amp; terminal</b><br/><b>(R58) No. 4 — Chassis ground:</b></p>                                   | Is the resistance less than 5 $\Omega$ ?    | Go to step 3.   | Repair harness and connector.<br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between fuel pump connector and chassis grounding terminal<br>• Poor contact in coupling connector  |
| <p><b>3 CHECK POWER SUPPLY TO FUEL PUMP.</b><br/>1) Turn the ignition switch to ON.<br/>2) Measure the voltage of power supply circuit between fuel pump connector and chassis ground.<br/><b>Connector &amp; terminal</b><br/><b>(R58) No. 1 (+) — Chassis ground (-):</b></p>   | Is the voltage more than 10 V?              | Replace the fuel pump. <Ref. to FU(H4SO)-50, Fuel Pump.>  | Go to step 4.  |
| <p><b>4 CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.</b><br/>1) Turn the ignition switch to OFF.<br/>2) Measure the resistance of harness connector between fuel pump and fuel pump relay.<br/><b>Connector &amp; terminal</b><br/><b>(R58) No. 1 — (B46) No. 4:</b></p>  | Is the resistance less than 1 $\Omega$ ?    | Go to step 5.   | Repair harness and connector.<br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between fuel pump connector and chassis grounding terminal<br>• Poor contact in coupling connectors |
| <p><b>5 CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.</b><br/>Measure the resistance of harness between fuel pump and fuel pump relay connector.<br/><b>Connector &amp; terminal</b><br/><b>(R58) No. 1 — Chassis ground:</b></p>  | Is the resistance more than 1 M $\Omega$ ?  | Go to step 6.   | Repair short circuit in harness between fuel pump and fuel pump relay connector.   |

## Diagnostics for Engine Starting Failure

### ENGINE (DIAGNOSTICS)

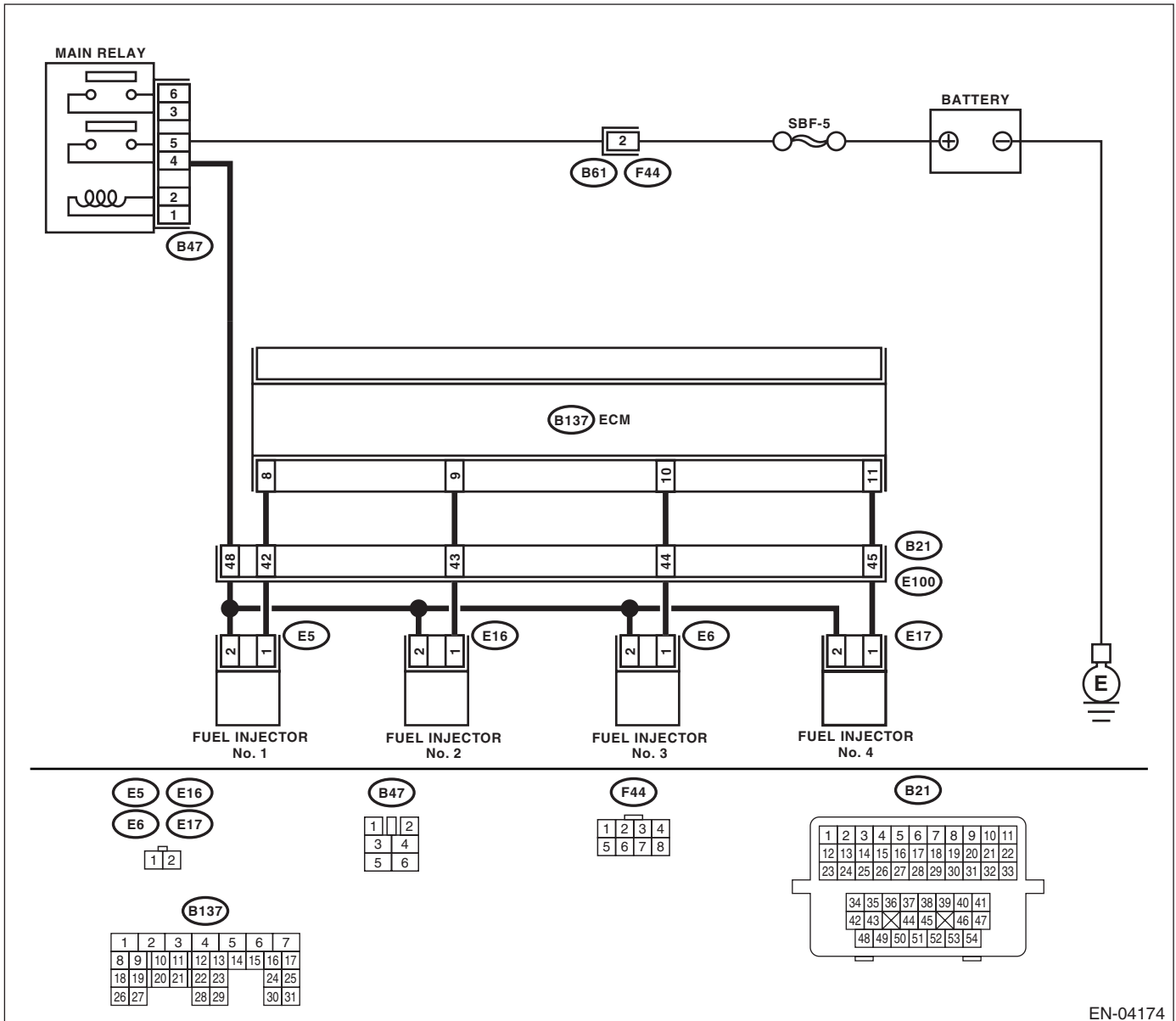
| Step   | Check                                     | Yes                                   | No  |
|--|---|---------------------------------------|---|
| <b>6 CHECK FUEL PUMP RELAY.</b><br>1) Disconnect the connectors from fuel pump relay and main relay.<br>2) Remove the fuel pump relay and main relay with bracket.<br>3) Using a lead wire, connect the terminal No. 1 of fuel pump relay to positive terminal of battery, and No. 3 terminal to ground terminal of battery.<br>4) Measure the resistance between connector terminals of fuel pump relay.<br><i><b>Terminals</b></i><br><i><b>No. 2 — No. 4:</b></i> | Is the resistance less than 10 $\Omega$ ? | Go to step 7.                         | Replace the fuel pump relay. <Ref. to FU(H4SO)-40, Fuel Pump Relay.>  |
| <b>7 CHECK HARNESS BETWEEN ECM AND FUEL PUMP RELAY CONNECTOR.</b><br>1) Disconnect the connectors from ECM.<br>2) Measure the resistance of harness between ECM and fuel pump relay connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 13 — (B46) No. 3:</b></i>   | Is the resistance less than 1 $\Omega$ ?  | Go to step 8.                         | Repair open circuit in harness between ECM and fuel pump relay connector.   |
| <b>8 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.   | Is there poor contact in ECM connector?   | Repair poor contact in ECM connector. | Check fuel injector circuit. <Ref. to EN(H4SO)(diag)-71, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.> |

## F: FUEL INJECTOR CIRCUIT

### CAUTION:

- Check or repair only faulty parts.
- After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04174

# Diagnostics for Engine Starting Failure

## ENGINE (DIAGNOSTICS)

| Step   | Check                                      | Yes  | No   |
|--|--|--|--|
| <p><b>1</b></p> <p><b>CHECK OPERATION OF EACH FUEL INJECTOR.</b><br/>While cranking the engine, check that each fuel injector emits “operating” sound. Use a sound scope or put a screwdriver on the injector for this check.</p>  | Does the fuel injector operate?            | Check the fuel pressure. <Ref. to ME(H4SO)-29, INSPECTION, Fuel Pressure.> | Go to step 2.  |
| <p><b>2</b></p> <p><b>CHECK POWER SUPPLY TO EACH FUEL INJECTOR.</b><br/>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from fuel injector.<br/>3) Turn the ignition switch to ON.<br/>4) Measure the power supply voltage between the fuel injector terminal and engine ground.<br/><b>Connector &amp; terminal</b><br/><b>#1 (E5) No. 2 (+) — Engine ground (-):</b><br/><b>#2 (E16) No. 2 (+) — Engine ground (-):</b><br/><b>#3 (E6) No. 2 (+) — Engine ground (-):</b><br/><b>#4 (E17) No. 2 (+) — Engine ground (-):</b></p> | Is the voltage more than 10 V?             | Go to step 3.  | Repair harness and connector.<br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between main relay and fuel injector connector<br>• Poor contact in main relay connector<br>• Poor contact in coupling connector (B22)<br>• Poor contact in fuel injector connector |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.</b><br/>1) Disconnect the connector from ECM.<br/>2) Measure the resistance of harness between ECM and fuel injector connector.<br/><b>Connector &amp; terminal</b><br/><b>#1 (B137) No. 8 — (E5) No. 1:</b><br/><b>#2 (B137) No. 9 — (E16) No. 1:</b><br/><b>#3 (B137) No. 10 — (E6) No. 1:</b><br/><b>#4 (B137) No. 11 — (E17) No. 1:</b></p>   | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.  | Repair harness and connector.<br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ECM and fuel injector connector<br>• Poor contact in coupling connector   |
| <p><b>4</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.</b><br/>Measure the resistance of harness between ECM and fuel injector connector.<br/><b>Connector &amp; terminal</b><br/><b>#1 (B137) No. 8 — Chassis ground:</b><br/><b>#2 (B137) No. 9 — Chassis ground:</b><br/><b>#3 (B137) No. 10 — Chassis ground:</b><br/><b>#4 (B137) No. 11 — Chassis ground:</b></p>  | Is the resistance more than 1 M $\Omega$ ? | Go to step 5.  | Repair ground short circuit in harness between ECM and fuel injector connector.  |
| <p><b>5</b></p> <p><b>CHECK EACH FUEL INJECTOR.</b><br/>1) Turn the ignition switch to OFF.<br/>2) Measure the resistance between each fuel injector terminals.<br/><b>Terminals</b><br/><b>No. 1 — No. 2:</b></p>   | Is the resistance 5 — 20 $\Omega$ ?        | Go to step 6.  | Replace the faulty fuel injector.  |
| <p><b>6</b></p> <p><b>CHECK POOR CONTACT.</b><br/>Check poor contact in ECM connector.</p>   | Is there poor contact in ECM connector?    | Repair poor contact in ECM connector.                                      | Inspection using “General Diagnostic Table”. <Ref. to EN(H4SO)(diag)-342, INSPECTION, General Diagnostic Table.>   |

# List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## 17. List of Diagnostic Trouble Code (DTC)

### A: LIST

| DTC   | Item   | Index   |
|-------|--|---|
| P0026 | Intake Valve Control Solenoid Circuit Range/Performance (Bank 1)                 | <Ref. to EN(H4SO)(diag)-80, DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0028 | Intake Valve Control Solenoid Circuit Range/Performance (Bank 2)                 | <Ref. to EN(H4SO)(diag)-82, DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0030 | HO2S Heater Control Circuit (Bank 1 Sensor 1)                                    | <Ref. to EN(H4SO)(diag)-84, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P0031 | HO2S Heater Control Circuit Low (Bank 1 Sensor 1)                                | <Ref. to EN(H4SO)(diag)-86, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                  |
| P0032 | HO2S Heater Control Circuit High (Bank 1 Sensor 1)                               | <Ref. to EN(H4SO)(diag)-89, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                 |
| P0037 | HO2S Heater Control Circuit Low (Bank 1 Sensor 2)                                | <Ref. to EN(H4SO)(diag)-91, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                  |
| P0038 | HO2S Heater Control Circuit High (Bank 1 Sensor 2)                               | <Ref. to EN(H4SO)(diag)-94, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                 |
| P0068 | Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance Problem | <Ref. to EN(H4SO)(diag)-96, DTC P0068 MANIFOLD ABSOLUTE PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                |
| P0076 | Intake Valve Control Solenoid Circuit Low (Bank 1)                               | <Ref. to EN(H4SO)(diag)-98, DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                 |
| P0077 | Intake Valve Control Solenoid Circuit High (Bank 1)                              | <Ref. to EN(H4SO)(diag)-100, DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>               |
| P0082 | Intake Valve Control Solenoid Circuit Low (Bank 2)                               | <Ref. to EN(H4SO)(diag)-102, DTC P0082 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                |
| P0083 | Intake Valve Control Solenoid Circuit High (Bank 2)                              | <Ref. to EN(H4SO)(diag)-104, DTC P0083 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>               |
| P0101 | Mass or Volume Air Flow Circuit Range/Performance                                | <Ref. to EN(H4SO)(diag)-106, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                 |
| P0102 | Mass or Volume Air Flow Circuit Low Input  | <Ref. to EN(H4SO)(diag)-108, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                         |
| P0103 | Mass or Volume Air Flow Circuit High Input                                       | <Ref. to EN(H4SO)(diag)-111, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                        |
| P0107 | Manifold Absolute Pressure/Barometric Pressure Circuit Low Input                 | <Ref. to EN(H4SO)(diag)-113, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0108 | Manifold Absolute Pressure/Barometric Pressure Circuit High Input                | <Ref. to EN(H4SO)(diag)-116, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0111 | Intake Air Temperature Circuit Range/Performance                                 | <Ref. to EN(H4SO)(diag)-119, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                  |

## List of Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| DTC   | Item   | Index  |
|-------|--|--|
| P0112 | Intake Air Temperature Circuit Low Input   | <Ref. to EN(H4SO)(diag)-121, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0113 | Intake Air Temperature Circuit High Input  | <Ref. to EN(H4SO)(diag)-123, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0117 | Engine Coolant Temperature Circuit Low Input                                     | <Ref. to EN(H4SO)(diag)-126, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                     |
| P0118 | Engine Coolant Temperature Circuit High Input                                    | <Ref. to EN(H4SO)(diag)-128, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                    |
| P0122 | Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input                      | <Ref. to EN(H4SO)(diag)-130, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P0123 | Throttle/Pedal Position Sensor/Switch "A" Circuit High Input                     | <Ref. to EN(H4SO)(diag)-133, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P0125 | Insufficient Coolant Temperature for Closed Loop Fuel Control                    | <Ref. to EN(H4SO)(diag)-136, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P0126 | Insufficient Coolant Temperature for Stable Operation                            | <Ref. to EN(H4SO)(diag)-138, DTC P0126 INSUFFICIENT COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0128 | Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature) | <Ref. to EN(H4SO)(diag)-140, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0131 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 1)                      | <Ref. to EN(H4SO)(diag)-141, DTC P0131 O <sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P0132 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 1)                     | <Ref. to EN(H4SO)(diag)-143, DTC P0132 O <sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P0133 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 1)                    | <Ref. to EN(H4SO)(diag)-145, DTC P0133 O <sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P0134 | O <sub>2</sub> Sensor Circuit No Activity Detected (Bank 1 Sensor 1)             | <Ref. to EN(H4SO)(diag)-147, DTC P0134 O <sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>             |
| P0137 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 2)                      | <Ref. to EN(H4SO)(diag)-149, DTC P0137 O <sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P0138 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 2)                     | <Ref. to EN(H4SO)(diag)-152, DTC P0138 O <sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P0139 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 2)                    | <Ref. to EN(H4SO)(diag)-155, DTC P0139 O <sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P0140 | O <sub>2</sub> Sensor Circuit No Activity Detected (Bank 1 Sensor 2)             | <Ref. to EN(H4SO)(diag)-157, DTC P0140 O <sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>             |
| P0171 | System too Lean (Bank 1)   | <Ref. to EN(H4SO)(diag)-159, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0172 | System too Rich (Bank 1)   | <Ref. to EN(H4SO)(diag)-160, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |

# List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| DTC   | Item   | Index  |
|-------|--|--|
| P0181 | Fuel Temperature Sensor "A" Circuit Range/Performance                            | <Ref. to EN(H4SO)(diag)-162, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0182 | Fuel Temperature Sensor "A" Circuit Low Input                                    | <Ref. to EN(H4SO)(diag)-164, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                    |
| P0183 | Fuel Temperature Sensor "A" Circuit High Input                                   | <Ref. to EN(H4SO)(diag)-166, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                   |
| P0196 | Engine Oil Temperature Sensor Circuit Range/Performance                          | <Ref. to EN(H4SO)(diag)-169, DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                          |
| P0197 | Engine Oil Temperature Sensor Low  | <Ref. to EN(H4SO)(diag)-171, DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0198 | Engine Oil Temperature Sensor High   | <Ref. to EN(H4SO)(diag)-173, DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0222 | Throttle/Pedal Position Sensor/Switch "B" Circuit Low Input                      | <Ref. to EN(H4SO)(diag)-175, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P0223 | Throttle/Pedal Position Sensor/Switch "B" Circuit High Input                     | <Ref. to EN(H4SO)(diag)-178, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P0301 | Cylinder 1 Misfire Detected  | <Ref. to EN(H4SO)(diag)-181, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0302 | Cylinder 2 Misfire Detected  | <Ref. to EN(H4SO)(diag)-181, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0303 | Cylinder 3 Misfire Detected  | <Ref. to EN(H4SO)(diag)-181, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0304 | Cylinder 4 Misfire Detected  | <Ref. to EN(H4SO)(diag)-182, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0327 | Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)                       | <Ref. to EN(H4SO)(diag)-188, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                       |
| P0328 | Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)                      | <Ref. to EN(H4SO)(diag)-190, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P0335 | Crankshaft Position Sensor "A" Circuit   | <Ref. to EN(H4SO)(diag)-192, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0336 | Crankshaft Position Sensor "A" Circuit Range/Performance                         | <Ref. to EN(H4SO)(diag)-194, DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                         |
| P0340 | Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)                   | <Ref. to EN(H4SO)(diag)-196, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                   |
| P0341 | Camshaft Position Sensor "A" Circuit Range/Performance (Bank 1 or Single Sensor) | <Ref. to EN(H4SO)(diag)-198, DTC P0341 CAMSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0400 | Exhaust Gas Recirculation  | <Ref. to EN(H4SO)(diag)-201, DTC P0400 EXHAUST GAS RECIRCULATION FLOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0420 | Catalyst System Efficiency Below Threshold (Bank 1)                              | <Ref. to EN(H4SO)(diag)-203, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                              |
| P0442 | Evaporative Emission Control System Leak Detected (small leak)                   | <Ref. to EN(H4SO)(diag)-207, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                   |



## List of Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| DTC   | Item   | Index  |
|-------|--|--|
| P0447 | Evaporative Emission Control System Vent Control Circuit Open          | <Ref. to EN(H4SO)(diag)-211, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>          |
| P0448 | Evaporative Emission Control System Vent Control Circuit Shorted       | <Ref. to EN(H4SO)(diag)-214, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>       |
| P0451 | Evaporative Emission Control System Pressure Sensor Range/Performance  | <Ref. to EN(H4SO)(diag)-216, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0452 | Evaporative Emission Control System Pressure Sensor Low Input          | <Ref. to EN(H4SO)(diag)-218, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>          |
| P0453 | Evaporative Emission Control System Pressure Sensor High Input         | <Ref. to EN(H4SO)(diag)-221, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>         |
| P0456 | Evaporative Emission Control System Leak Detected (very small leak)    | <Ref. to EN(H4SO)(diag)-224, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>    |
| P0457 | Evaporative Emission Control System Leak Detected (fuel cap loose/off) | <Ref. to EN(H4SO)(diag)-227, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0458 | Evaporative Emission Control System Purge Control Valve Circuit Low    | <Ref. to EN(H4SO)(diag)-231, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>    |
| P0459 | Evaporative Emission Control System Purge Control Valve Circuit High   | <Ref. to EN(H4SO)(diag)-233, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0461 | Fuel Level Sensor Circuit Range/Performance                            | <Ref. to EN(H4SO)(diag)-235, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0462 | Fuel Level Sensor Circuit Low Input                                    | <Ref. to EN(H4SO)(diag)-237, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                    |
| P0463 | Fuel Level Sensor Circuit High Input                                   | <Ref. to EN(H4SO)(diag)-240, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                   |
| P0464 | Fuel Level Sensor Circuit Intermittent                                 | <Ref. to EN(H4SO)(diag)-243, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                 |
| P0483 | Cooling Fan Rationality Check  | <Ref. to EN(H4SO)(diag)-244, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0502 | Vehicle Speed Sensor Circuit Low Input                                 | <Ref. to EN(H4SO)(diag)-246, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                 |
| P0503 | Vehicle Speed Sensor Intermittent/Erratic/High                         | <Ref. to EN(H4SO)(diag)-247, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                         |
| P0506 | Idle Control System RPM Lower Than Expected                            | <Ref. to EN(H4SO)(diag)-249, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0507 | Idle Control System RPM Higher Than Expected                           | <Ref. to EN(H4SO)(diag)-251, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                           |
| P0512 | Starter Request Circuit  | <Ref. to EN(H4SO)(diag)-253, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0513 | Incorrect Immobilizer Key  | <Ref. to IM(diag)-21, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |

# List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| DTC   | Item   | Index   |
|-------|--|---|
| P0519 | Idle Control System Malfunction (Fail-Safe)                              | <Ref. to EN(H4SO)(diag)-255, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0600 | CAN Communication Circuit  | <Ref. to EN(H4SO)(diag)-258, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0604 | Internal Control Module Random Access Memory (RAM) Error                 | <Ref. to EN(H4SO)(diag)-260, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0605 | Internal Control Module Read Only Memory (ROM) Error                     | <Ref. to EN(H4SO)(diag)-261, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0607 | Control Module Performance   | <Ref. to EN(H4SO)(diag)-262, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0638 | Throttle Actuator Control Range/Performance (Bank 1)                     | <Ref. to EN(H4SO)(diag)-263, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0691 | Cooling Fan 1 Control Circuit Low  | <Ref. to EN(H4SO)(diag)-264, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0692 | Cooling Fan 1 Control Circuit High                                       | <Ref. to EN(H4SO)(diag)-264, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0700 | Request AT Mil ON  | <Ref. to EN(H4SO)(diag)-264, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0851 | Neutral Switch Input Circuit Low   | <Ref. to EN(H4SO)(diag)-265, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to EN(H4SO)(diag)-267, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0852 | Neutral Switch Input Circuit High  | <Ref. to EN(H4SO)(diag)-269, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to EN(H4SO)(diag)-272, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P1152 | O <sub>2</sub> Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)  | <Ref. to EN(H4SO)(diag)-274, DTC P1152 O <sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P1153 | O <sub>2</sub> Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1) | <Ref. to EN(H4SO)(diag)-277, DTC P1153 O <sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1160 | Return Spring Failure  | <Ref. to EN(H4SO)(diag)-280, DTC P1160 RETURN SPRING FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P1400 | Fuel Tank Pressure Control Solenoid Valve Circuit Low                    | <Ref. to EN(H4SO)(diag)-281, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P1420 | Fuel Tank Pressure Control Solenoid Valve Circuit High                   | <Ref. to EN(H4SO)(diag)-284, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1443 | Vent Control Solenoid Valve Function Problem                             | <Ref. to EN(H4SO)(diag)-286, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1491 | Positive Crankcase Ventilation (Blow-by) Function Problem                | <Ref. to EN(H4SO)(diag)-288, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P1492 | EGR Solenoid Valve Signal #1 Circuit Malfunction (Low Input)             | <Ref. to EN(H4SO)(diag)-290, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |

## List of Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| DTC   | Item  | Index   |
|-------|---|---|
| P1493 | EGR Solenoid Valve Signal #1 Circuit Malfunction (High Input) | <Ref. to EN(H4SO)(diag)-290, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P1494 | EGR Solenoid Valve Signal #2 Circuit Malfunction (Low Input)  | <Ref. to EN(H4SO)(diag)-290, DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1495 | EGR Solenoid Valve Signal #2 Circuit Malfunction (High Input) | <Ref. to EN(H4SO)(diag)-290, DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P1496 | EGR Solenoid Valve Signal #3 Circuit Malfunction (Low Input)  | <Ref. to EN(H4SO)(diag)-290, DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1497 | EGR Solenoid Valve Signal #3 Circuit Malfunction (High Input) | <Ref. to EN(H4SO)(diag)-290, DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P1498 | EGR Solenoid Valve Signal #4 Circuit Malfunction (Low Input)  | <Ref. to EN(H4SO)(diag)-291, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1499 | EGR Solenoid Valve Signal #4 Circuit Malfunction (High Input) | <Ref. to EN(H4SO)(diag)-294, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P1518 | Starter Switch Circuit Low input                              | <Ref. to EN(H4SO)(diag)-296, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                              |
| P1560 | Back-up Voltage Circuit Malfunction                           | <Ref. to EN(H4SO)(diag)-299, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                           |
| P1570 | Antenna   | <Ref. to IM(diag)-22, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1571 | Reference Code Incompatibility                                | <Ref. to IM(diag)-15, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                       |
| P1574 | Key Communication Failure                                     | <Ref. to IM(diag)-20, DTC P1574 KEY IMMOBILIZER COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1576 | EGI Control Module EEPROM                                     | <Ref. to IM(diag)-21, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1577 | IMM Control Module EEPROM                                     | <Ref. to IM(diag)-21, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P2096 | Post Catalyst Fuel Trim System Too Lean Bank 1                | <Ref. to EN(H4SO)(diag)-300, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                |
| P2097 | Post Catalyst Fuel Trim System Too Rich Bank 1                | <Ref. to EN(H4SO)(diag)-306, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                |
| P2101 | Throttle Actuator Control Motor Circuit Range/Performance     | <Ref. to EN(H4SO)(diag)-312, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>     |
| P2102 | Throttle Actuator Control Motor Circuit Low                   | <Ref. to EN(H4SO)(diag)-318, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                   |
| P2103 | Throttle Actuator Control Motor Circuit High                  | <Ref. to EN(H4SO)(diag)-321, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                  |
| P2109 | Throttle/Pedal Position Sensor A Minimum Stop Performance     | <Ref. to EN(H4SO)(diag)-323, DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>     |
| P2122 | Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input   | <Ref. to EN(H4SO)(diag)-324, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |

# List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| DTC   | Item  | Index   |
|-------|---|---|
| P2123 | Throttle/Pedal Position Sensor/<br>Switch "D" Circuit High Input      | <Ref. to EN(H4SO)(diag)-326, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>      |
| P2127 | Throttle/Pedal Position Sensor/<br>Switch "E" Circuit Low Input       | <Ref. to EN(H4SO)(diag)-328, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>       |
| P2128 | Throttle/Pedal Position Sensor/<br>Switch "E" Circuit High Input      | <Ref. to EN(H4SO)(diag)-330, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>      |
| P2135 | Throttle/Pedal Position Sensor/<br>Switch "A"/"B" Voltage Rationality | <Ref. to EN(H4SO)(diag)-332, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE RATIONALITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P2138 | Throttle/Pedal Position Sensor/<br>Switch "D"/"E" Voltage Rationality | <Ref. to EN(H4SO)(diag)-337, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE RATIONALITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P2227 | Atmospheric Pressure Sensor Circuit<br>Range/Performance              | <Ref. to EN(H4SO)(diag)-340, DTC P2227 BAROMETRIC PRESSURE TOO LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                       |
| P2228 | Atmospheric Pressure Sensor Circuit<br>Malfunction (Low Input)        | <Ref. to EN(H4SO)(diag)-340, DTC P2228 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>       |
| P2229 | Atmospheric Pressure Sensor Circuit<br>Malfunction (High Input)       | <Ref. to EN(H4SO)(diag)-341, DTC P2229 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>      |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## 18. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### A: DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1)

#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-8, DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

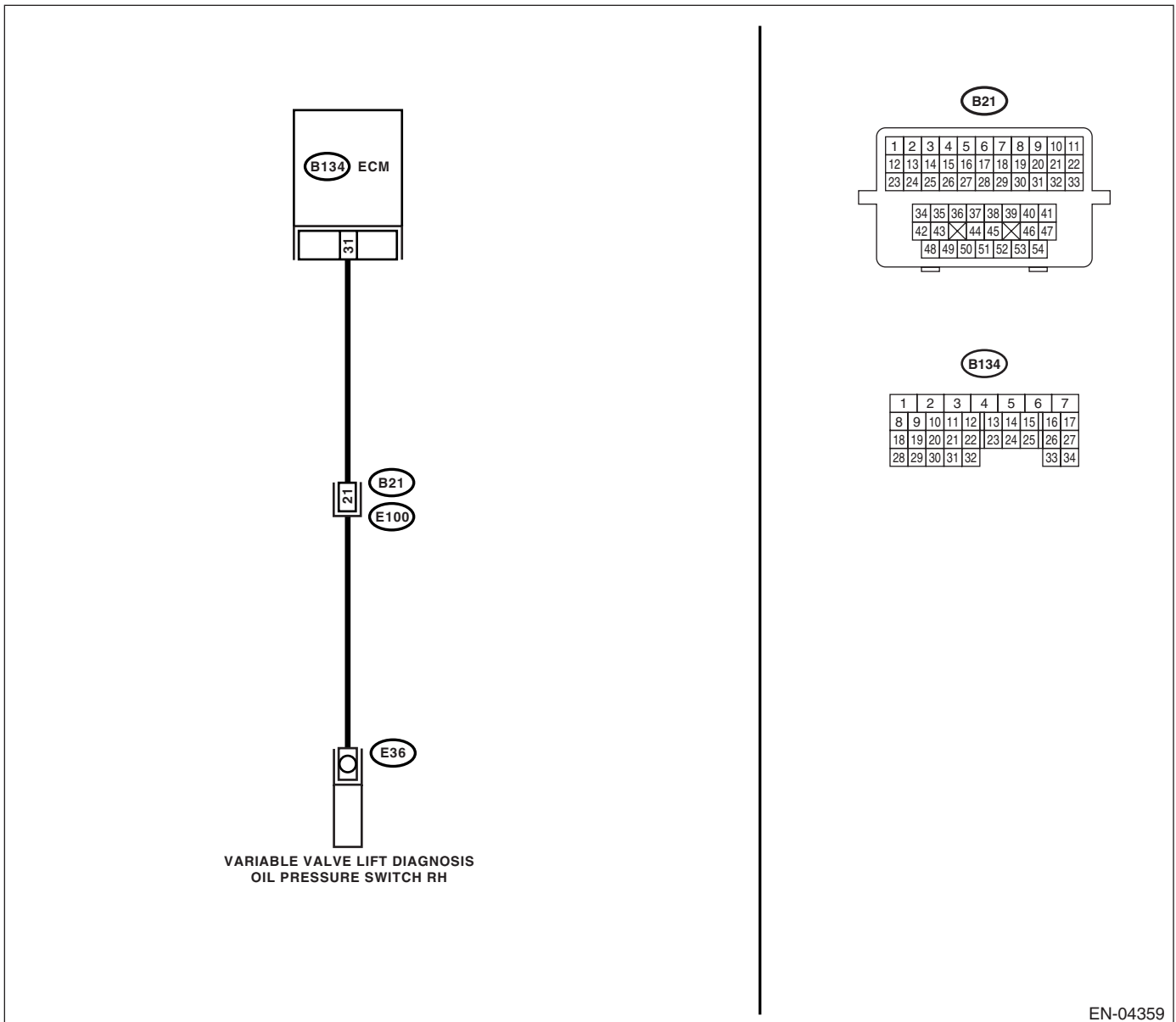
#### TROUBLE SYMPTOM:

Erroneous idling

#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

#### WIRING DIAGRAM:



EN-04359

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                             | Yes  | No  |
|---|-----------------------------------|--|---|
| <b>1</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?       | Using the List of "Diagnostic Trouble Code (DTC)", check the appropriate DTC. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>      | Go to step 2.   |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE LIFT DIAGNOSIS OIL PRESSURE SWITCH CONNECTOR.</b><br>1) Idle the engine.<br>2) Turn the ignition switch to OFF.<br>3) Disconnect the connector from ECM and variable valve lift diagnosis oil pressure switch connector.<br>4) Measure the resistance of harness between variable valve lift diagnosis oil pressure switch connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E36) No. 1 — Engine ground:</b> | Is the resistance more than 1 MΩ? | Go to step 3.  | Repair the ground short circuit in harness between ECM and variable valve lift diagnosis oil pressure switch connector. |
| <b>3</b><br><b>CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE LIFT DIAGNOSIS OIL PRESSURE SWITCH CONNECTOR.</b><br>Measure the resistance of harness between ECM and variable valve lift diagnosis oil pressure switch connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 31 — (E36) No. 1:</b>   | Is the resistance less than 1 Ω?  | Replace the variable valve lift diagnosis oil pressure switch. <Ref. to FU(H4SO)-34, Variable Valve Lift Diagnosis Oil Pressure Switch.> Go to step 4. | Repair the open circuit in harness between ECM and variable valve lift diagnosis oil pressure switch connector.         |
| <b>4</b><br><b>CHECK DTC.</b><br>1) Erase the memory. <Ref. to EN(H4SO)(diag)-46, Clear Memory Mode.><br>2) After idling the engine, check the DTC.   | Is the DTC displayed?             | Replace the oil switching solenoid valve. <Ref. to ME(H4SO)-85, Oil Switching Solenoid Valve.>   | Finish the diagnosis.   |
| <b>5</b><br><b>CHECK DTC.</b><br>1) Erase the memory. <Ref. to EN(H4SO)(diag)-46, Clear Memory Mode.><br>2) After idling the engine, check the DTC.   | Is the DTC displayed?             | Check the oil passage.<br>Contact your SOA Service Center since deterioration of some parts may be the cause.  | Finish the diagnosis.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## B: DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 2)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-10, DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

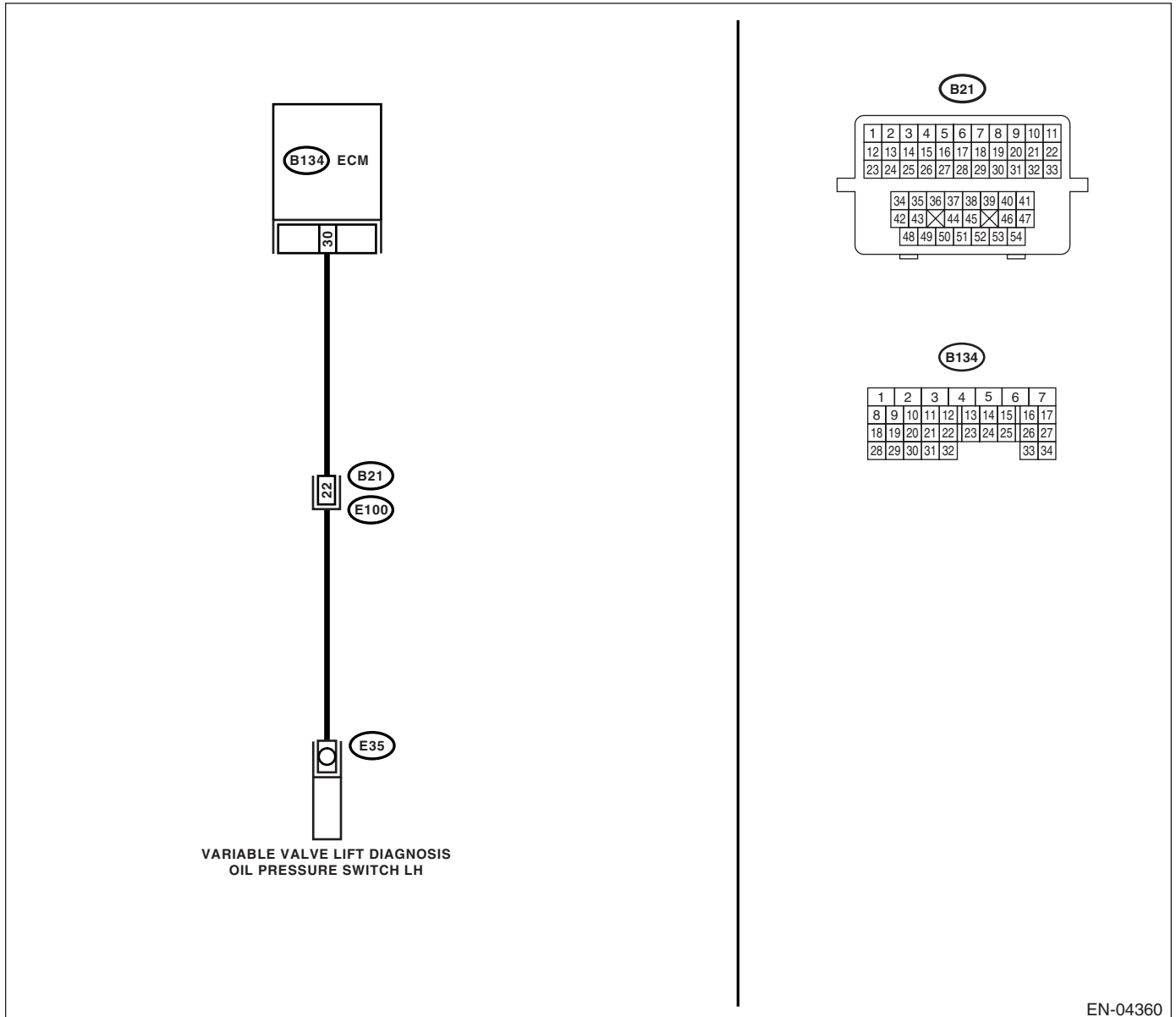
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes  | No  |
|---|--|--|---|
| <b>1</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?                | Using the List of "Diagnostic Trouble Code (DTC)", check the appropriate DTC. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>      | Go to step 2.   |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE LIFT DIAGNOSIS OIL PRESSURE SWITCH CONNECTOR.</b><br>1) Idle the engine.<br>2) Turn the ignition switch to OFF.<br>3) Disconnect the connector from ECM and variable valve lift diagnosis oil pressure switch connector.<br>4) Measure the resistance of harness between variable valve lift diagnosis oil pressure switch connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E35) No. 1 — Engine ground:</b> | Is the resistance more than 1 M $\Omega$ ? | Go to step 3.  | Repair the ground short circuit in harness between ECM and variable valve lift diagnosis oil pressure switch connector. |
| <b>3</b><br><b>CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE LIFT DIAGNOSIS OIL PRESSURE SWITCH CONNECTOR.</b><br>Measure the resistance of harness between ECM and variable valve lift diagnosis oil pressure switch connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 30 — (E35) No. 1:</b>   | Is the resistance less than 1 $\Omega$ ?   | Replace the variable valve lift diagnosis oil pressure switch. <Ref. to FU(H4SO)-34, Variable Valve Lift Diagnosis Oil Pressure Switch.> Go to step 4. | Repair the open circuit in harness between ECM and variable valve lift diagnosis oil pressure switch connector.         |
| <b>4</b><br><b>CHECK DTC.</b><br>1) Erase the memory. <Ref. to EN(H4SO)(diag)-46, Clear Memory Mode.><br>2) After idling the engine, check the DTC.   | Is the DTC displayed?                      | Replace the oil switching solenoid valve. <Ref. to ME(H4SO)-85, Oil Switching Solenoid Valve.> Go to step 5.   | Finish the diagnosis.   |
| <b>5</b><br><b>CHECK DTC.</b><br>1) Erase the memory. <Ref. to EN(H4SO)(diag)-46, Clear Memory Mode.><br>2) After idling the engine, check the DTC.   | Is the DTC displayed?                      | Check the oil passage.<br>Contact your SOA Service Center since deterioration of some parts may be the cause.  | Finish the diagnosis.   |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## C: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

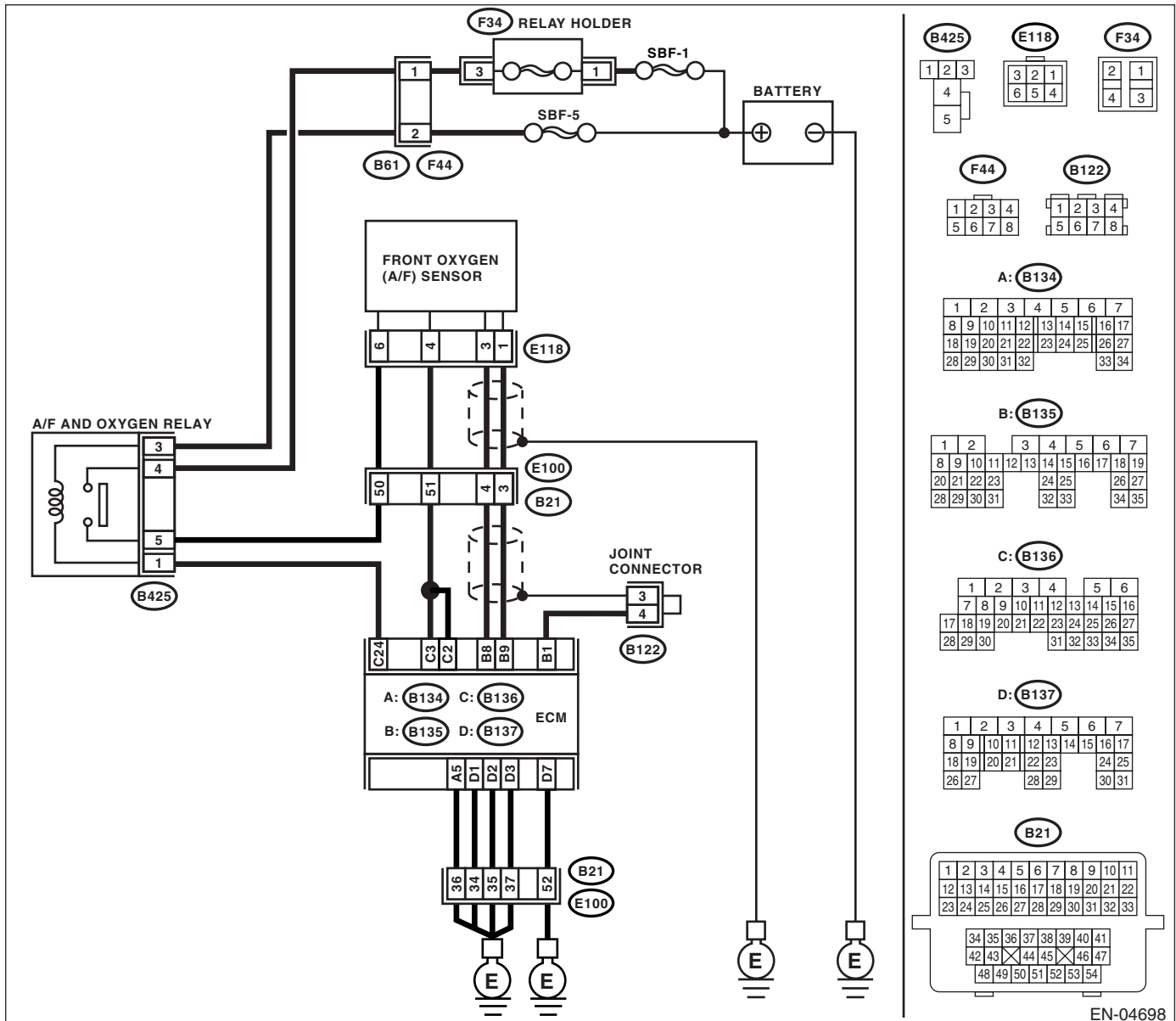
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-11, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No  |
|--|--|--|---|
| <p><b>1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>1) Start the engine and warm-up engine.<br/>                     2) Turn the ignition switch to OFF.<br/>                     3) Disconnect the connectors from ECM and front oxygen (A/F) sensor.<br/>                     4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p><b>Connector &amp; terminal</b><br/>                     (B136) No. 2 — (E118) No. 4:<br/>                     (B136) No. 3 — (E118) No. 4:</p> | Is the resistance less than 1 $\Omega$ ?                             | Go to step 2.  | Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.                         |
| <p><b>2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p><b>Connector &amp; terminal</b><br/>                     (B135) No. 9 — (E118) No. 1:<br/>                     (B135) No. 8 — (E118) No. 3:</p>  | Is the resistance less than 1 $\Omega$ ?                             | Go to step 3.  | Repair the open circuit in harness between main relay and front oxygen (A/F) sensor connector.                  |
| <p><b>3 CHECK HARNESS BETWEEN A/F AND OXYGEN SENSOR RELAY AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>Measure the resistance of harness between main relay and front oxygen (A/F) sensor connector.</p> <p><b>Connector &amp; terminal</b><br/>                     (B425) No. 5 — (E118) No. 6:</p>   | Is the resistance less than 1 $\Omega$ ?                             | Go to step 4.  | Repair the open circuit in harness between A/F and oxygen sensor relay and front oxygen (A/F) sensor connector. |
| <p><b>4 CHECK FRONT OXYGEN (A/F) SENSOR.</b></p> <p>Measure the resistance between front oxygen (A/F) sensor connector terminals.</p> <p><b>Terminals</b><br/>                     No. 3 — No. 4:</p>  | Is the resistance less than 5 $\Omega$ ?                             | Go to step 5.  | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>                        |
| <p><b>5 CHECK POOR CONTACT.</b></p> <p>Check the poor contact in ECM and front oxygen (A/F) sensor connector.</p>  | Is there poor contact in ECM or front oxygen (A/F) sensor connector? | Repair the poor contact in ECM or front oxygen (A/F) sensor connector. | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>                        |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## D: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

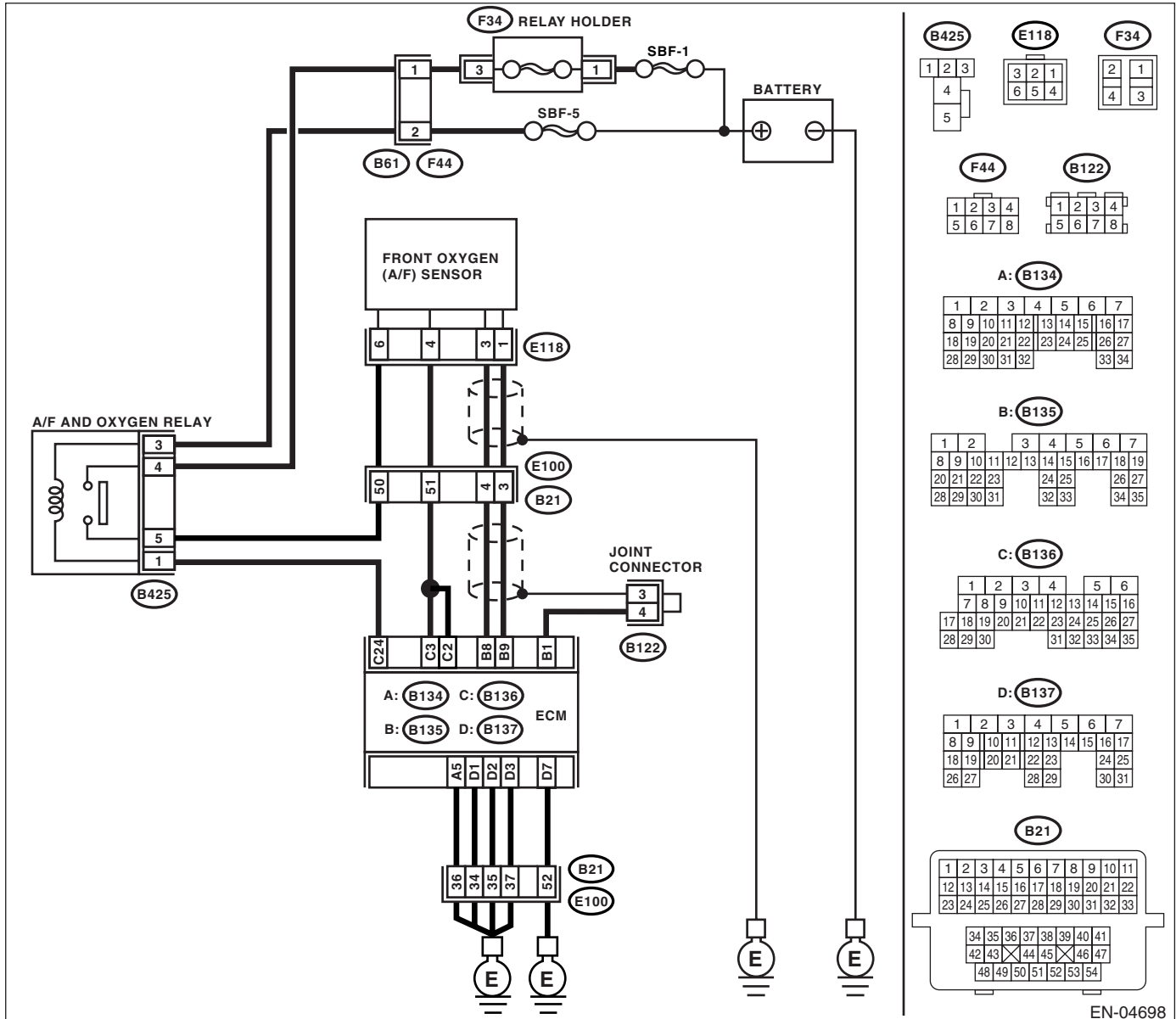
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-12, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Does the Subaru Select Monitor or general scan tool display DTC P0031 and P0037 at the same time? | Go to step 2.   | Go to step 5.   |
| <b>2</b><br><b>CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from front oxygen (A/F) sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E118) No. 6 (+) — Engine ground (-):</b>  | Is the voltage more than 10 V?  | Go to step 3.   | Repair the power supply line or replace the main relay.<br><br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between A/F and oxygen relay and front oxygen (A/F) sensor connector<br>• Poor contact in A/F and oxygen relay connector<br>• Poor contact in coupling connector |
| <b>3</b><br><b>CHECK GROUND CIRCUIT OF ECM.</b><br>Measure the resistance of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 5 — Chassis ground:</b><br><b>(B137) No. 1 — Chassis ground:</b><br><b>(B137) No. 2 — Chassis ground:</b><br><b>(B137) No. 3 — Chassis ground:</b><br><b>(B137) No. 7 — Chassis ground:</b>   | Is the resistance less than 5 $\Omega$ ?  | Go to step 4.   | Repair harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ECM and engine ground terminal<br>• Poor contact in ECM connector<br>Poor contact in coupling connector  |
| <b>4</b><br><b>CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the current more than 0.2 A?   | Repair poor contact in connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Poor contact in front oxygen (A/F) sensor connector<br>• Poor contact in ECM connector | Go to step 5.   |
| <b>5</b><br><b>CHECK INPUT SIGNAL FROM ECM.</b><br>1) Start and idle the engine.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 3 (+) — Chassis ground (-):</b><br><b>(B136) No. 2 (+) — Chassis ground (-):</b>  | Is the voltage less than 1 V?   | Go to step 7.   | Go to step 6.   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>6</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 3 (+) — Chassis ground (-):</b></i><br><i><b>(B136) No. 2 (+) — Chassis ground (-):</b></i> | Does the voltage change by shaking the ECM harness and connector? | Repair poor contact in ECM connector.   | Go to step 7.  |
| <b>7</b><br><b>CHECK FRONT OXYGEN (A/F) SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between front oxygen (A/F) sensor connector terminals.<br><i><b>Terminals</b></i><br><i><b>No. 4 — No. 6:</b></i>                                   | Is the resistance less than 10 $\Omega$ ?                         | Repair harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector</li> <li>• Poor contact in front oxygen (A/F) sensor connector</li> <li>• Poor contact in ECM connector</li> </ul> | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## E: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

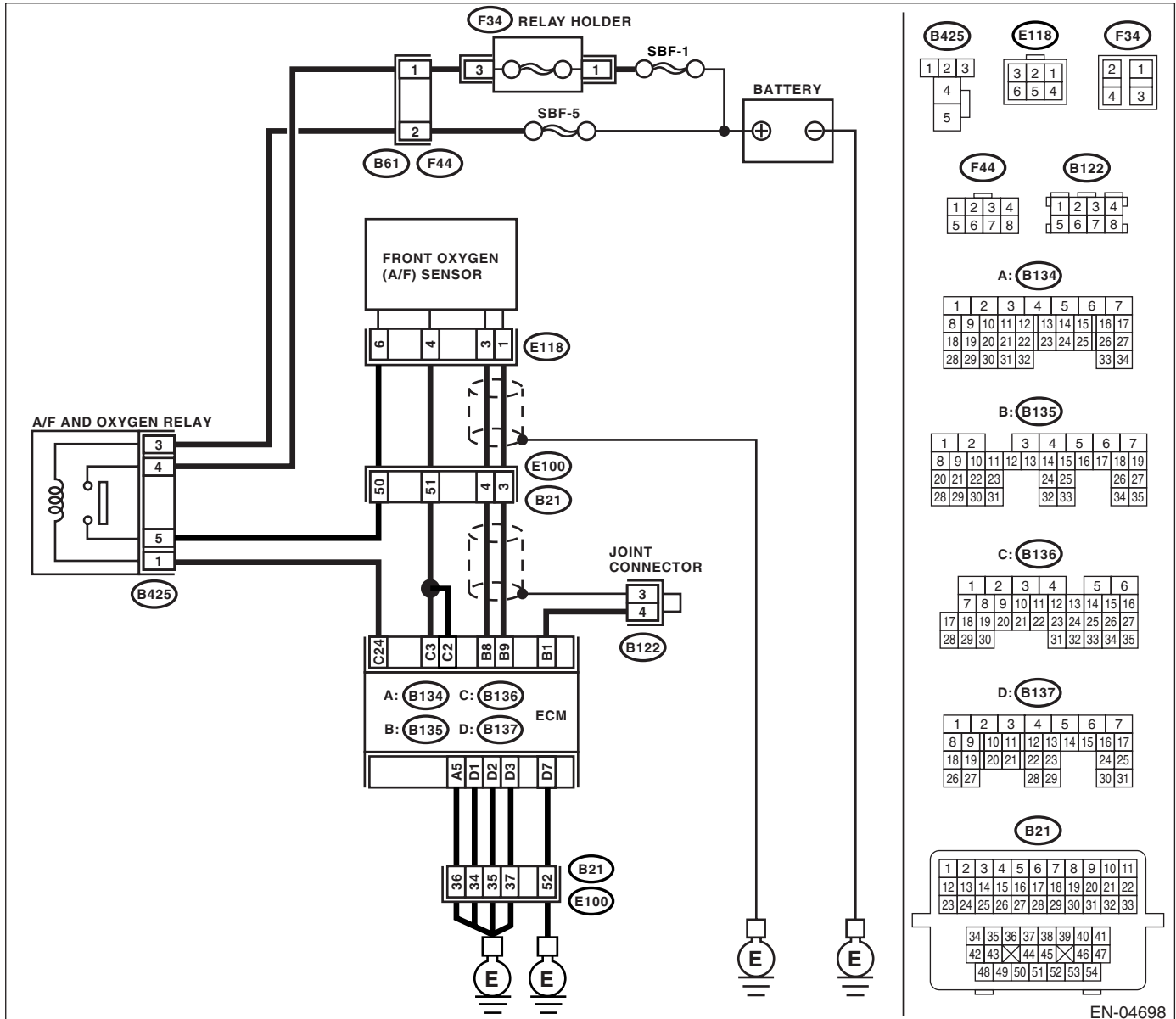
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-14, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No                    |
|--|---|--|-----------------------|
| <b>1 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B136) No. 2 (+) — Chassis ground (-):</i><br><i>(B136) No. 3 (+) — Chassis ground (-):</i>  | Is the voltage more than 8 V?                                     | Go to step 2.  | Go to step 3.         |
| <b>2 CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.</b><br>1) Turn the ignition switch to OFF.<br>2) Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>3) Turn the ignition switch to ON.<br>4) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the general scan tool.<br><b>NOTE:</b><br><ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br><ul style="list-style-type: none"> <li>• General scan tool</li> </ul> For detailed operation procedure, refer to the General Scan Tool Instruction Manual. | Is the current more than 2.3 A?                                   | Replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).>                      | Finish the diagnosis. |
| <b>3 CHECK OUTPUT SIGNAL FROM ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B136) No. 2 (+) — Chassis ground (-):</i><br><i>(B136) No. 3 (+) — Chassis ground (-):</i>   | Does the voltage change by shaking the ECM harness and connector? | Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. | Finish the diagnosis. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## F: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

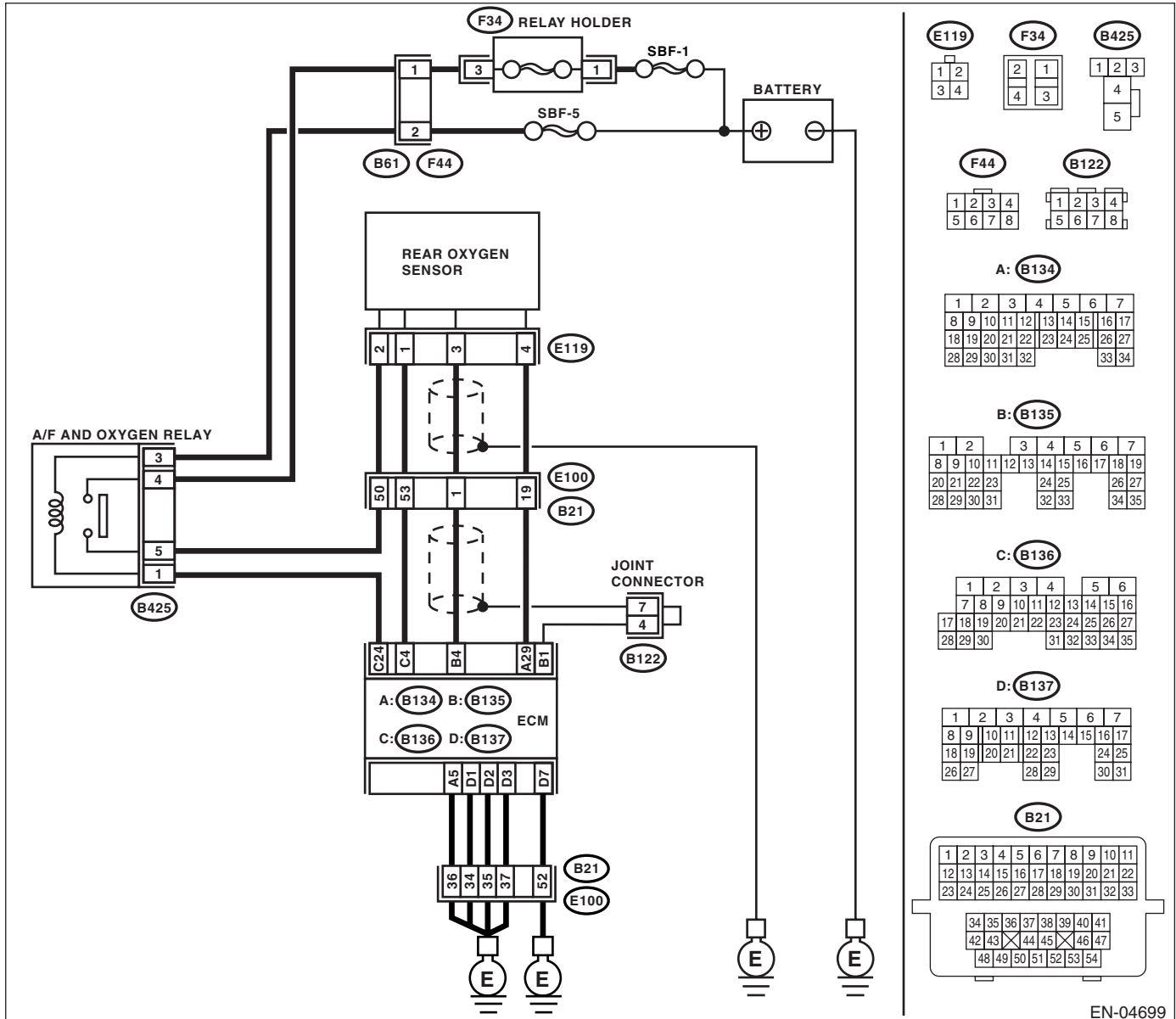
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-16, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04699



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>1 CHECK GROUND CIRCUIT OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B134) No. 5 — Chassis ground:</i><br><i>(B137) No. 1 — Chassis ground:</i><br><i>(B137) No. 2 — Chassis ground:</i><br><i>(B137) No. 3 — Chassis ground:</i><br><i>(B137) No. 7 — Chassis ground:</i>   | Is the resistance less than 5 Ω?                                  | Go to step 2.   | Repair harness and connector.<br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and engine ground terminal</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>2 CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or general scan tool.<br>NOTE:<br><ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br><ul style="list-style-type: none"> <li>• General scan tool</li> </ul> For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the current more than 0.2 A?                                   | Repair the connector.<br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in rear oxygen sensor connecting harness connector</li> <li>• Poor contact in ECM connector</li> </ul> | Go to step 3.  |
| <b>3 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Start and idle the engine.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B136) No. 4 (+) — Chassis ground (-):</i>   | Is the voltage less than 1 V?                                     | Go to step 6.   | Go to step 4.  |
| <b>4 CHECK OUTPUT SIGNAL FROM ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B136) No. 4 (+) — Chassis ground (-):</i>   | Does the voltage change by shaking the ECM harness and connector? | Repair poor contact in ECM connector.   | Go to step 5.  |
| <b>5 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Disconnect the connector from rear oxygen sensor.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B136) No. 4 (+) — Chassis ground (-):</i>  | Is the voltage less than 1 V?                                     | Replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).>   | Repair battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <p><b>6</b></p> <p><b>CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from rear oxygen sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between rear oxygen sensor connector and engine ground or chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(E119) No. 2 (+) — Chassis ground (-):</b></p> | <p>Is the voltage more than 10 V?</p>                      | <p>Go to step 7.</p>  | <p>Repair the power supply line or replace the main relay.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between A/F and oxygen relay and rear oxygen sensor connector</li> <li>• Poor contact in A/F and oxygen relay connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <p><b>7</b></p> <p><b>CHECK REAR OXYGEN SENSOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Measure the resistance between rear oxygen sensor connector terminals.</p> <p><b>Terminals</b><br/> <b>No. 1 — No. 2:</b></p>   | <p>Is the resistance less than 30 <math>\Omega</math>?</p> | <p>Repair harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> | <p>Replace the rear oxygen sensor.</p> <p>&lt;Ref. to FU(H4SO)-37, Rear Oxygen Sensor.&gt;</p>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## G: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

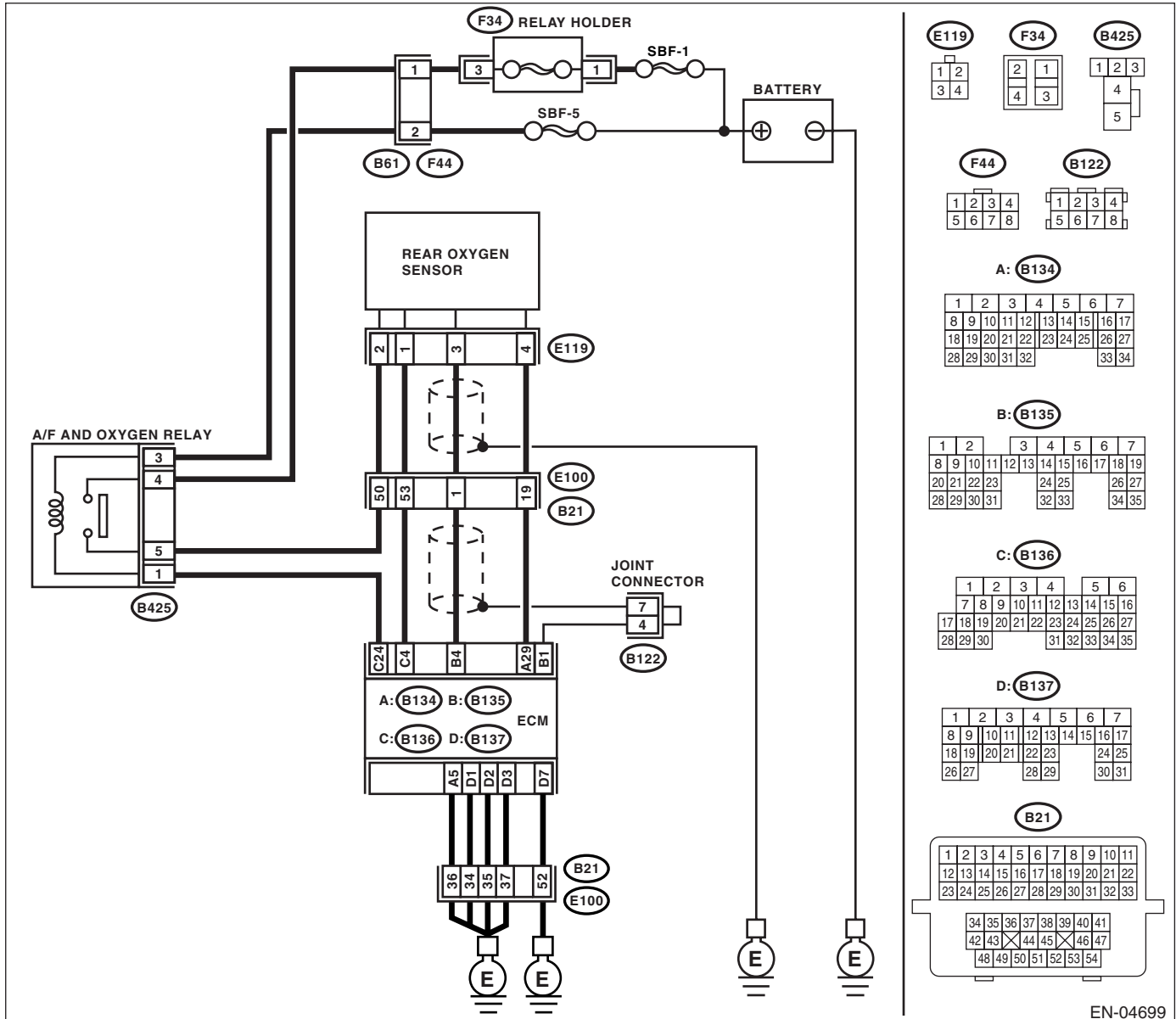
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-17, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04699

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                   | Yes   | No                    |
|---|---|---|-----------------------|
| <b>1</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 4 (+) — Chassis ground (-):</i>   | Is the voltage more than 8 V?           | Go to step 2.   | Go to step 3.         |
| <b>2</b><br><b>CHECK CURRENT DATA.</b><br>1) Turn the ignition switch to OFF.<br>2) Repair the battery short circuit in harness between ECM and rear oxygen sensor connector.<br>3) Turn the ignition switch to ON.<br>4) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or the general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedure, refer to the General Scan Tool Instruction Manual. | Is the current more than 7 A?           | Replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).> | Finish the diagnosis. |
| <b>3</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.  | Is there poor contact in ECM connector? | Repair poor contact in ECM connector.                                   | Finish the diagnosis. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## H: DTC P0068 MANIFOLD ABSOLUTE PRESSURE SENSOR RANGE/PERFORMANCE

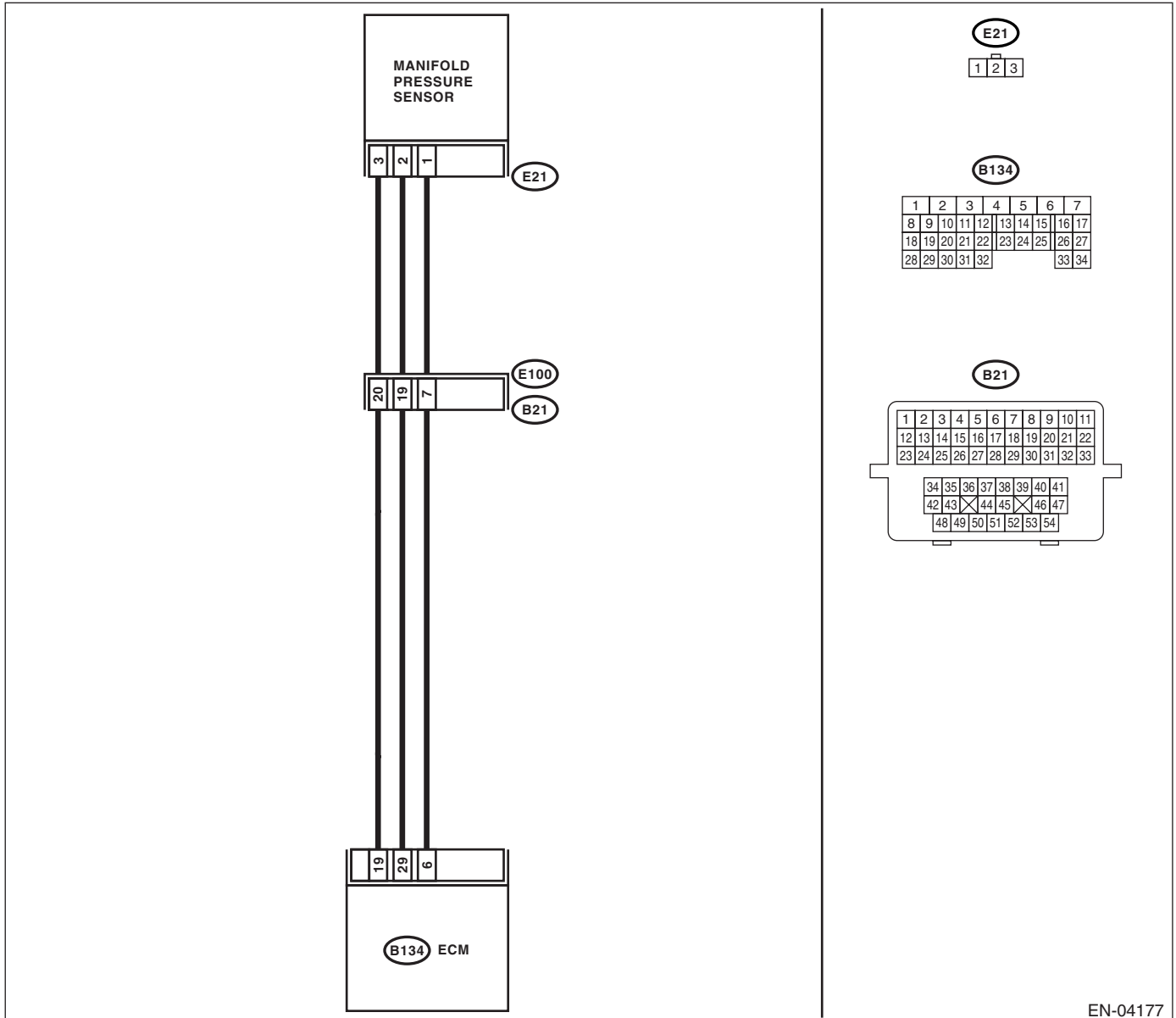
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-19, DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04177

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step     | Check   | Yes  | No   |  |
|----------|---|--|--|--|
| <b>1</b> | <b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?  | Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> | Go to step 2.  |
| <b>2</b> | <b>CHECK AIR INTAKE SYSTEM.</b>   | Are there holes, loose bolts or disconnection of hose on air intake system?  | Repair air intake system.  | Go to step 3.  |
| <b>3</b> | <b>CHECK MANIFOLD ABSOLUTE PRESSURE SENSOR.</b><br>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).<br>2) Place the selector lever or shift lever in "P" or "N" position.<br>3) Turn the A/C switch to OFF.<br>4) All accessory switches OFF.<br>5) Read the data of intake manifold absolute pressure sensor signal using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Ignition ON: Is the measured value 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)? Idling: Is the measured value 20.0 — 46.7 kPa (150 — 350 mmHg, 5.91 — 13.78 inHg)? | Go to step 4.  | Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-27, Manifold Absolute Pressure Sensor.> |
| <b>4</b> | <b>CHECK THROTTLE POSITION.</b><br>Read the data of throttle position signal using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.   | Is the measured value less than 5% when throttle is fully closed?  | Go to step 5.  | Adjust or replace the throttle position sensor. <Ref. to FU(H4SO)-26, Throttle Position Sensor.>         |
| <b>5</b> | <b>CHECK THROTTLE POSITION.</b>   | Is the measured value more than 85% when throttle is wide open?  | Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-27, Manifold Absolute Pressure Sensor.>                       | Replace the throttle position sensor. <Ref. to FU(H4SO)-26, Throttle Position Sensor.>                   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## I: DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-21, DTC P0076 INTAKE VALVE CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

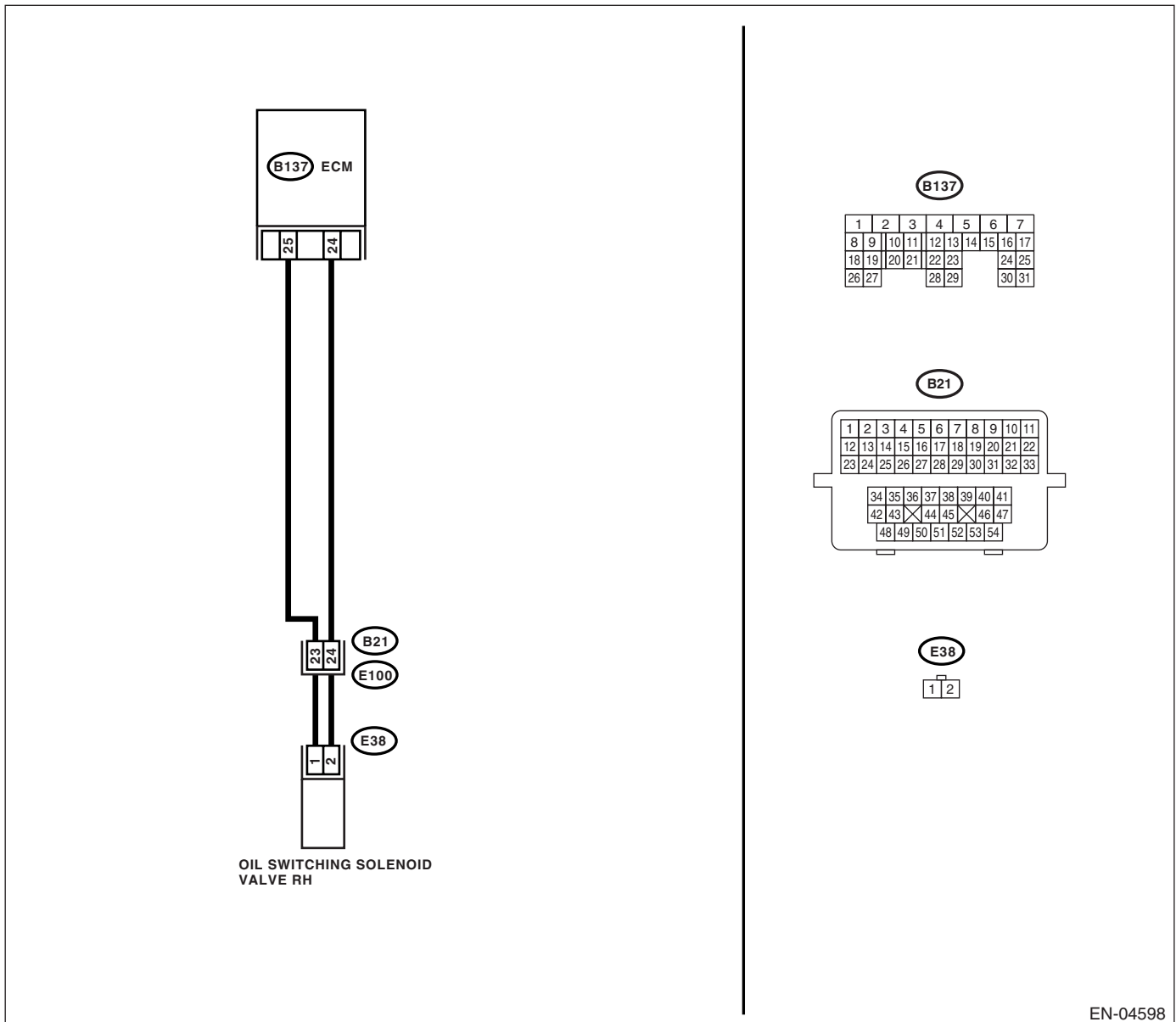
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04598

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND OIL SWITCHING SOLENOID VALVE.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from ECM and oil switching solenoid valve.</p> <p>3) Measure the resistance between ECM and oil switching solenoid valve connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B137) No. 25 — (E38) No. 1:</b><br/> <b>(B137) No. 24 — (E38) No. 2:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p> | <p>Go to step 2.</p>  | <p>Repair the open circuit in harness between ECM and oil switching solenoid valve connector.</p> <p>NOTE:<br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and oil switching solenoid valve connector</li> <li>• Poor contact in coupling connectors</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK OIL SWITCHING SOLENOID VALVE.</b></p> <p>1) Remove the oil switching solenoid valve connector.</p> <p>2) Measure the resistance between oil switching solenoid valve terminals.</p> <p><b>Terminal</b><br/> <b>No. 1 — No. 2:</b></p>  | <p>Is the resistance 6 — 12 <math>\Omega</math>?</p>      | <p>Repair the poor contact in ECM and oil switching solenoid valve.</p> | <p>Replace the oil switching solenoid valve. &lt;Ref. to ME(H4SO)-85, Oil Switching Solenoid Valve.&gt;</p>   |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## J: DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-22, DTC P0077 INTAKE VALVE CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

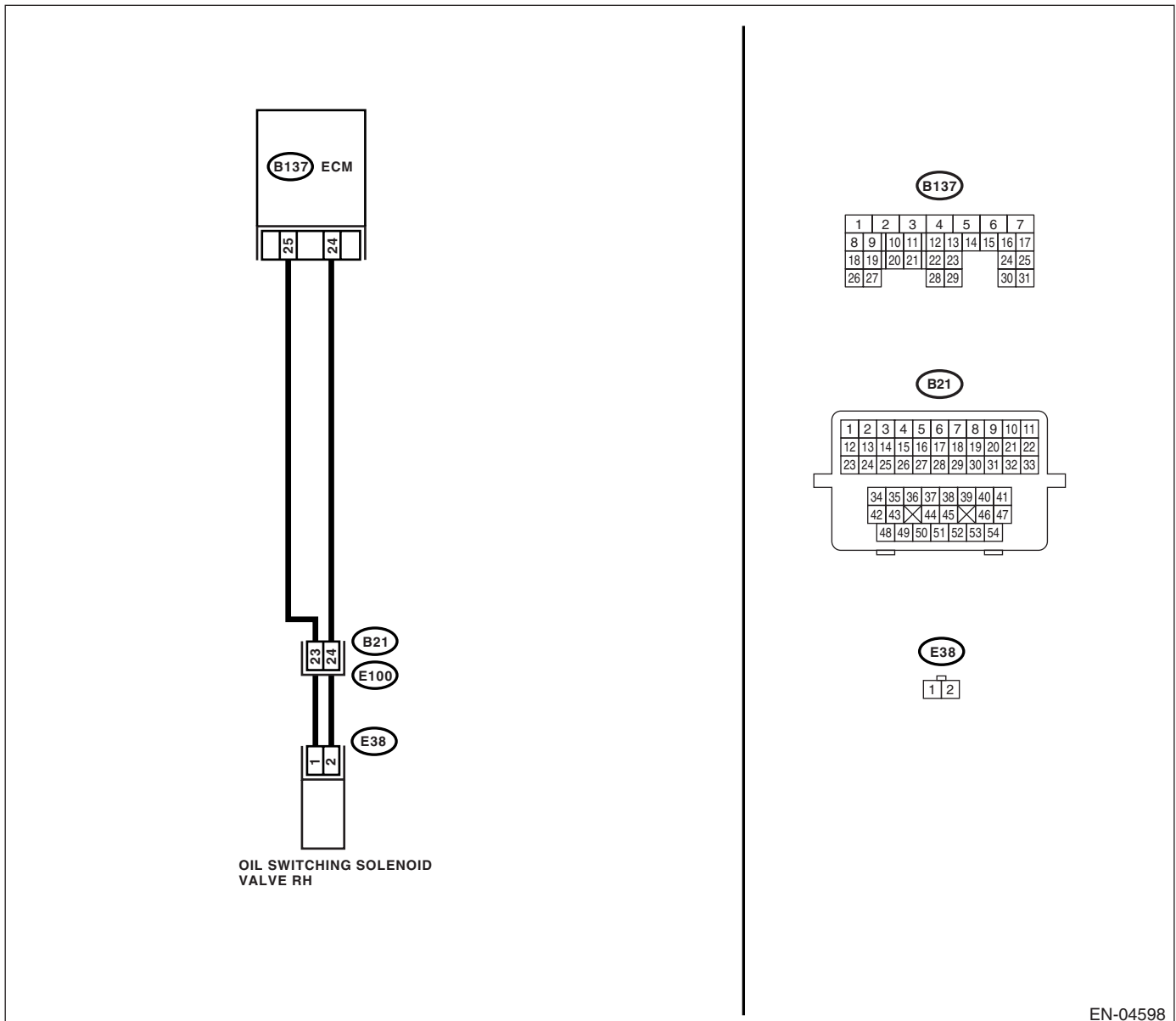
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04598

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes  | No   |
|---|--|--|--|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND OIL SWITCHING SOLENOID VALVE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and oil switching solenoid valve.<br>3) Measure the resistance between oil switching solenoid valve connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E38) No. 1 — Engine ground:</i><br><i>(E38) No. 2 — Engine ground:</i> | Is the resistance more than 1 M $\Omega$ ? | Go to step 2.  | Repair the short circuit in harness between ECM and oil switching solenoid valve connector.    |
| <b>2</b><br><b>CHECK OIL SWITCHING SOLENOID VALVE.</b><br>1) Remove the oil switching solenoid valve connector.<br>2) Measure the resistance between oil switching solenoid valve terminals.<br><i>Terminal</i><br><i>No. 1 — No. 2:</i>  | Is the resistance 6 — 12 $\Omega$ ?        | Repair the poor contact in ECM and oil switching solenoid valve. | Replace the oil switching solenoid valve. <Ref. to ME(H4SO)-85, Oil Switching Solenoid Valve.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## K: DTC P0082 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 2)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-23, DTC P0082 INTAKE VALVE CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

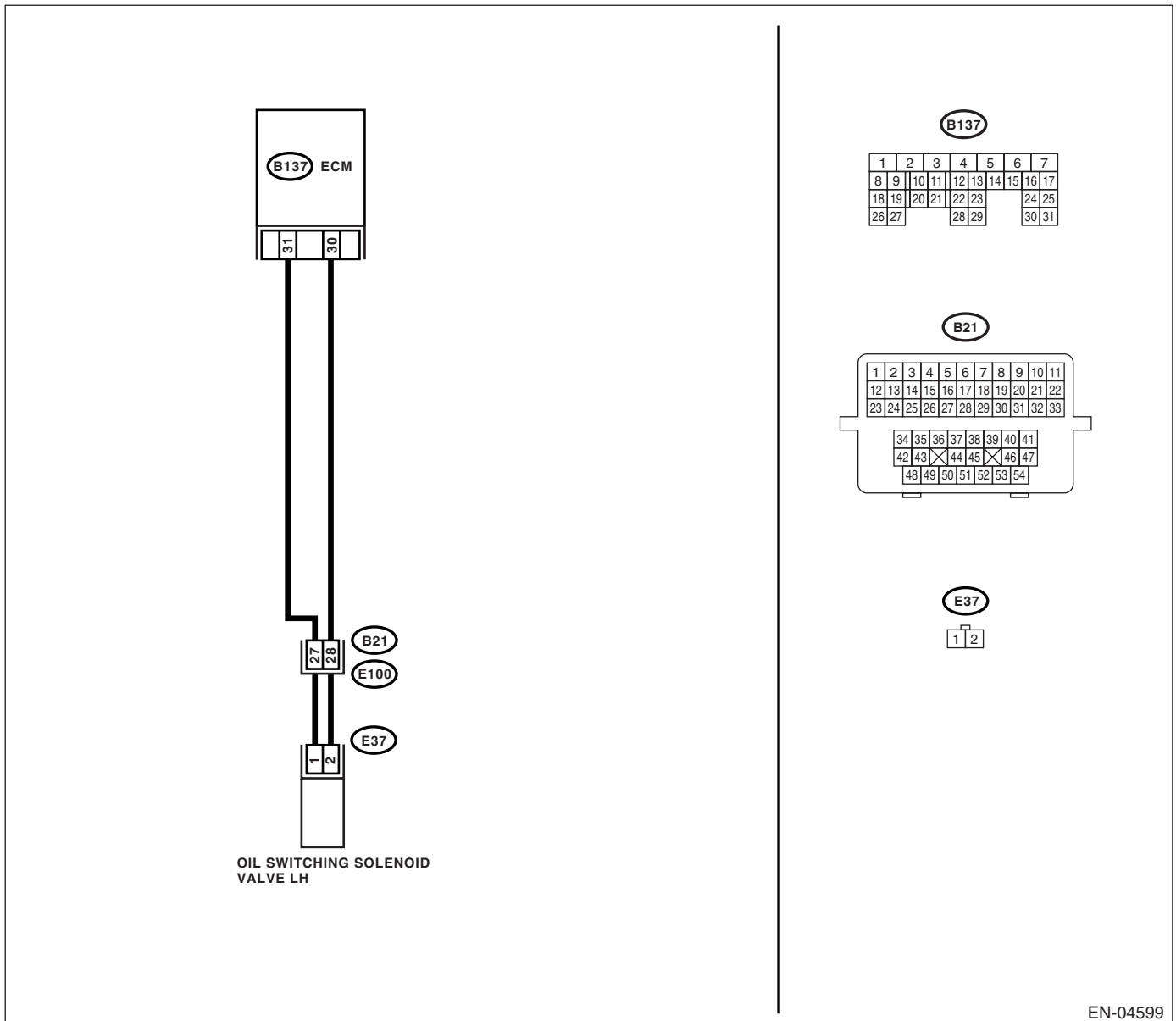
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04599

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND OIL SWITCHING SOLENOID VALVE.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from ECM and oil switching solenoid valve.</p> <p>3) Measure the resistance between ECM and oil switching solenoid valve connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B137) No. 31 — (E37) No. 1:</b><br/> <b>(B137) No. 30 — (E37) No. 2:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p> | <p>Go to step 2.</p>  | <p>Repair the open circuit in harness between ECM and oil switching solenoid valve connector.</p> <p>NOTE:<br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and oil switching solenoid valve connector</li> <li>• Poor contact in coupling connectors</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK OIL SWITCHING SOLENOID VALVE.</b></p> <p>1) Remove the oil switching solenoid valve connector.</p> <p>2) Measure the resistance between oil switching solenoid valve terminals.</p> <p><b>Terminal</b><br/> <b>No. 1 — No. 2:</b></p>  | <p>Is the resistance 6 — 12 <math>\Omega</math>?</p>      | <p>Repair the poor contact in ECM and oil switching solenoid valve.</p> | <p>Replace the oil switching solenoid valve. &lt;Ref. to ME(H4SO)-85, Oil Switching Solenoid Valve.&gt;</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## L: DTC P0083 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 2)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-23, DTC P0083 INTAKE VALVE CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

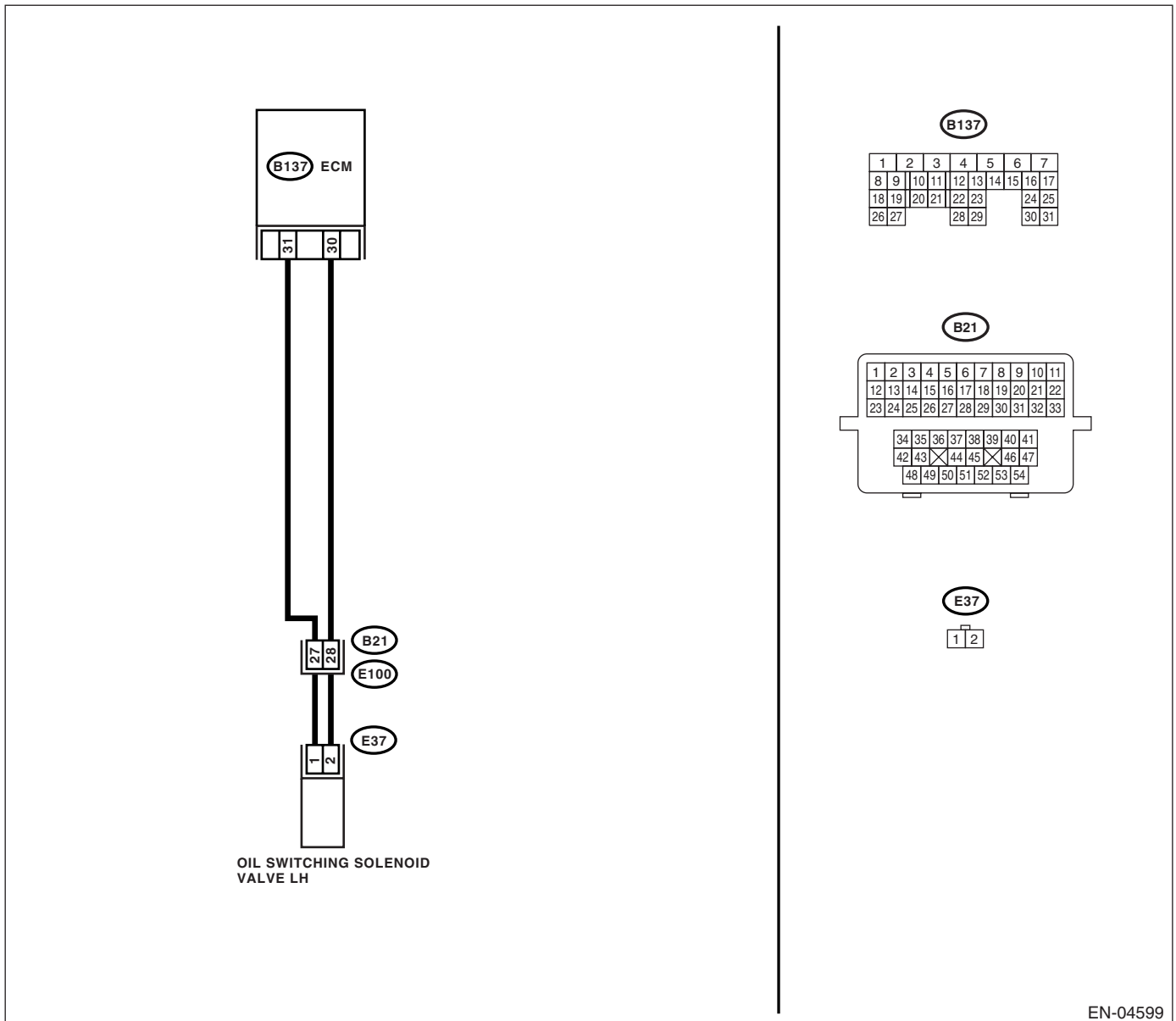
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04599

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes  | No   |
|---|--|--|--|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND OIL SWITCHING SOLENOID VALVE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and oil switching solenoid valve.<br>3) Measure the resistance between oil switching solenoid valve connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E37) No. 1 — Engine ground:</i><br><i>(E37) No. 2 — Engine ground:</i> | Is the resistance more than 1 M $\Omega$ ? | Go to step 2.  | Repair the short circuit in harness between ECM and oil switching solenoid valve connector.    |
| <b>2</b><br><b>CHECK OIL SWITCHING SOLENOID VALVE.</b><br>1) Remove the oil switching solenoid valve connector.<br>2) Measure the resistance between oil switching solenoid valve terminals.<br><i>Terminal</i><br><i>No. 1 — No. 2:</i>  | Is the resistance 6 — 12 $\Omega$ ?        | Repair the poor contact in ECM and oil switching solenoid valve. | Replace the oil switching solenoid valve. <Ref. to ME(H4SO)-85, Oil Switching Solenoid Valve.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## M: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-23, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

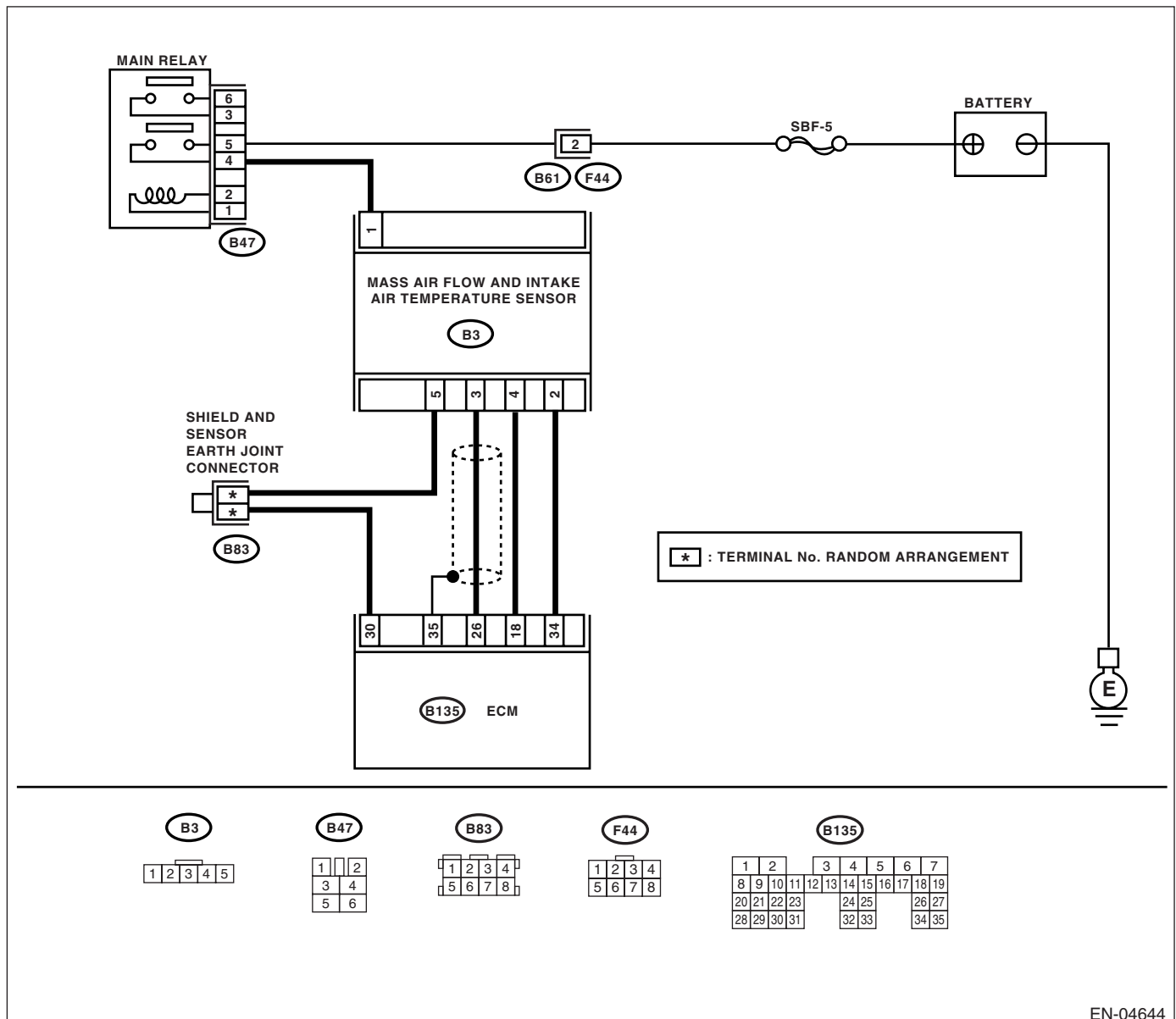
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04644

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                       | Yes   | No   |
|---|-----------------------------|---|--|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0101. | Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.> |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## N: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-25, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

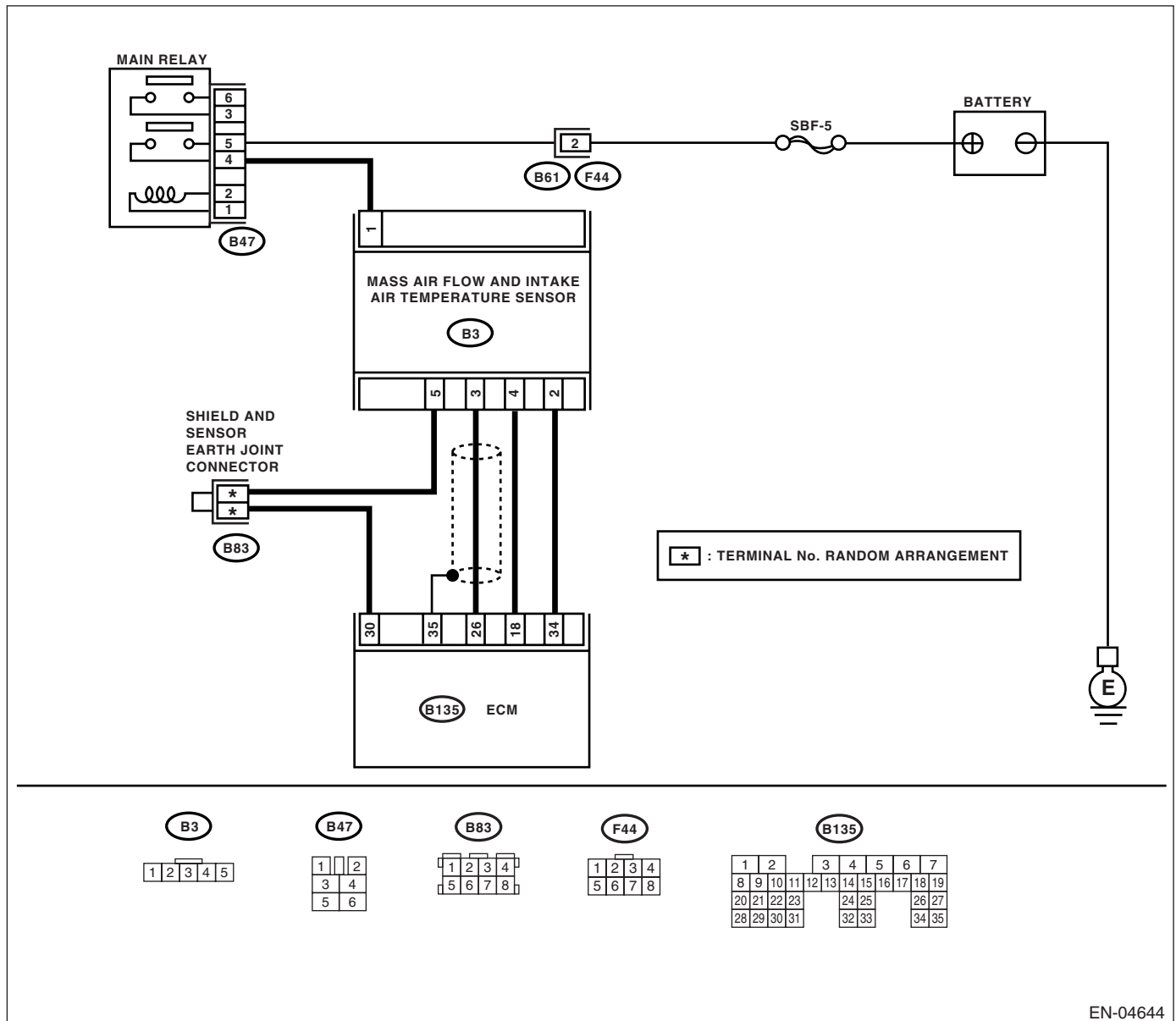
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04644

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <p><b>1 CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Connect the Subaru Select Monitor or general scan tool to data link connector.<br/>                     3) Turn the ignition switch to ON and Subaru Select Monitor or the general scan tool power switch to ON.<br/>                     4) Start the engine.<br/>                     5) Read the mass air flow sensor voltage using Subaru Select Monitor or general scan tool.</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the measured value within 0.2 to 4.7 V?</p>   | <p>Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in the mass air flow sensor.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open or ground short circuit in harness between mass air flow sensor and ECM connector</li> <li>• Poor contact in mass air flow sensor or ECM connector</li> </ul> | <p>Go to step 2.</p>   |
| <p><b>2 CHECK INPUT SIGNAL FOR ECM.</b></p> <p>Measure the voltage between ECM connector and chassis ground while engine is idling.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B135) No. 26 (+) — Chassis ground (-):</b></p>  | <p>Is the measured value less than 0.2 V?</p>   | <p>Go to step 4.</p>  | <p>Go to step 3.</p>   |
| <p><b>3 CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).</b></p> <p>Measure the voltage between ECM connector and chassis ground while engine is idling.</p>   | <p>Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?</p> | <p>Repair the poor contact in ECM connector.</p>  | <p>Contact your SOA Service Center since deterioration of some parts may be the cause.</p> |
| <p><b>4 CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from mass air flow sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between mass air flow sensor connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B3) No. 1 (+) — Chassis ground (-):</b></p>   | <p>Is the voltage more than 5 V?</p>  | <p>Go to step 5.</p>  | <p>Repair the open circuit between mass air flow sensor and main relay.</p>                |
| <p><b>5 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM.<br/>                     3) Measure the resistance of harness between ECM and mass air flow sensor connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B135) No. 26 — (B3) No. 3:</b><br/> <b>(B135) No. 30 — (B3) No. 5:</b><br/> <b>(B135) No. 34 — (B3) No. 2:</b></p>  | <p>Is the measured value less than 1 Ω?</p>   | <p>Go to step 6.</p>  | <p>Repair the open circuit between ECM and mass air flow sensor connector.</p>             |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <b>6</b><br><b>CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR</b><br>Measure the resistance of harness between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 26 — Chassis ground:</b><br><b>(B135) No. 30 — Chassis ground:</b><br><b>(B135) No. 34 — Chassis ground:</b> | Is the measured value more than 1 MΩ?                    | Go to step 7.  | Repair the ground short circuit between ECM and mass air flow sensor connector.  |
| <b>7</b><br><b>CHECK POOR CONTACT</b><br>Check poor contact in mass air flow sensor connector.  | Is there poor contact in mass air flow sensor connector? | Repair the poor contact in mass air flow sensor connector. | Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## O: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-26, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

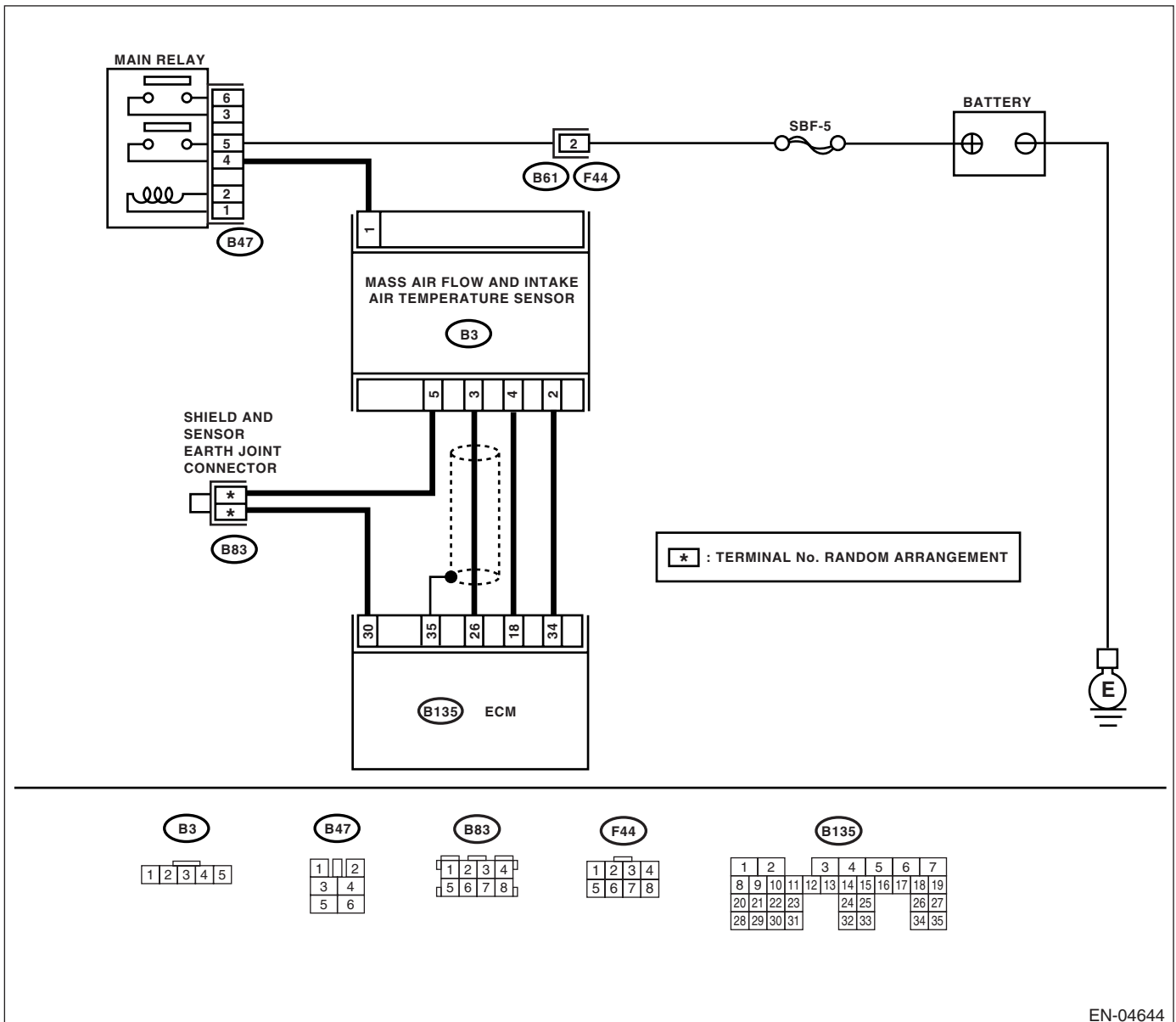
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04644

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <p><b>1 CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Connect the Subaru Select Monitor or general scan tool to data link connector.<br/>                     3) Turn the ignition switch to ON and Subaru Select Monitor or general scan tool power switch to ON.<br/>                     4) Start the engine.<br/>                     5) Read the mass air flow sensor voltage using Subaru Select Monitor or general scan tool.</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the measured value within 0.2 to 4.7 V?</p> | <p>Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.</p>                              | <p>Go to step 2.</p>   |
| <p><b>2 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from mass air flow sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between mass air flow sensor connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B3) No. 3 (+) — Chassis ground (-):</b></p>   | <p>Is the measured value more than 5 V?</p>       | <p>Repair the battery short of harness between mass air flow sensor connector and ECM connector.</p>  | <p>Go to step 3.</p>   |
| <p><b>3 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM.<br/>                     3) Measure the resistance between ECM connector and mass air flow sensor connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B3) No. 2 — (B135) No. 34:</b></p>   | <p>Is the measured value less than 1 Ω?</p>       | <p>Replace the mass air flow sensor.<br/>                     &lt;Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p> | <p>Repair the open harness between mass air flow sensor connector and ECM connector.</p> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## P: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

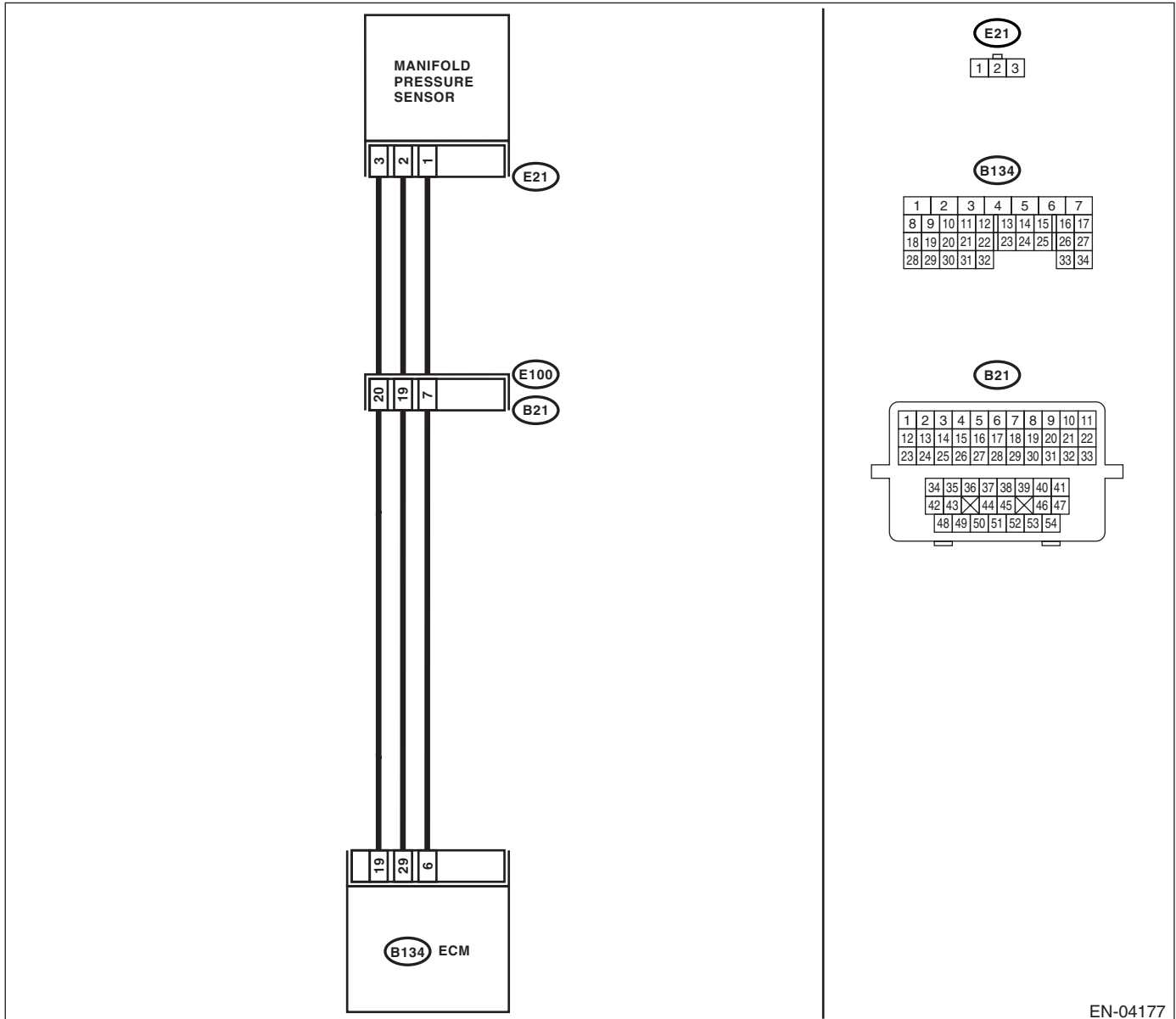
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-28, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04177

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No  |
|--|---|--|---|
| <b>1 CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the measured value less than 13.3 kPa (100 mmHg, 3.94 inHg)?   | Go to step 3.  | Go to step 2.   |
| <b>2 CHECK POOR CONTACT.</b><br>Check poor contact in ECM and manifold absolute pressure sensor connector.   | Is there poor contact in ECM or manifold absolute pressure sensor connector?                                | Repair poor contact in ECM or manifold absolute pressure sensor connector. | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. |
| <b>3 CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 6 (+) — Chassis ground (-):</i>   | Is the voltage more than 4.5 V?   | Go to step 5.  | Go to step 4.   |
| <b>4 CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 6 (+) — Chassis ground (-):</i>   | Does the voltage change by shaking the ECM harness and connector?   | Repair poor contact in ECM connector.                                      | Contact your SOA Service Center since deterioration of some parts may be the cause.                         |
| <b>5 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 29 (+) — Chassis ground (-):</i>   | Is the voltage less than 0.2 V?   | Go to step 7.  | Go to step 6.   |
| <b>6 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)</b><br>Read the data of atmospheric absolute pressure signal using Subaru Select Monitor.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.>   | Is the measured value more than 13.3 kPa (100 mmHg, 3.94 inHg) by shaking the harness and connector of ECM? | Repair poor contact in ECM connector.                                      | Go to step 7.   |
| <b>7 CHECK HARNESS BETWEEN MANIFOLD ABSOLUTE PRESSURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from manifold absolute pressure sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between manifold absolute pressure sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E21) No. 3 (+) — Engine ground (-):</i>   | Is the voltage more than 4.5 V?   | Go to step 8.  | Repair open circuit in harness between ECM and manifold absolute pressure sensor connector.                 |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No   |
|--|---|---|--|
| <b>8</b><br><b>CHECK HARNESS BETWEEN MANIFOLD ABSOLUTE PRESSURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector.<br><i>Connector &amp; terminal<br/>(B134) No. 19 — (E21) No. 3:</i> | Is the resistance less than 1 $\Omega$ ?                              | Go to step <b>9</b> .   | Repair open circuit in harness between ECM and manifold absolute pressure sensor connector.              |
| <b>9</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in manifold absolute pressure sensor connector.   | Is there poor contact in manifold absolute pressure sensor connector? | Repair poor contact in manifold absolute pressure sensor connector. | Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-27, Manifold Absolute Pressure Sensor.> |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## Q: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

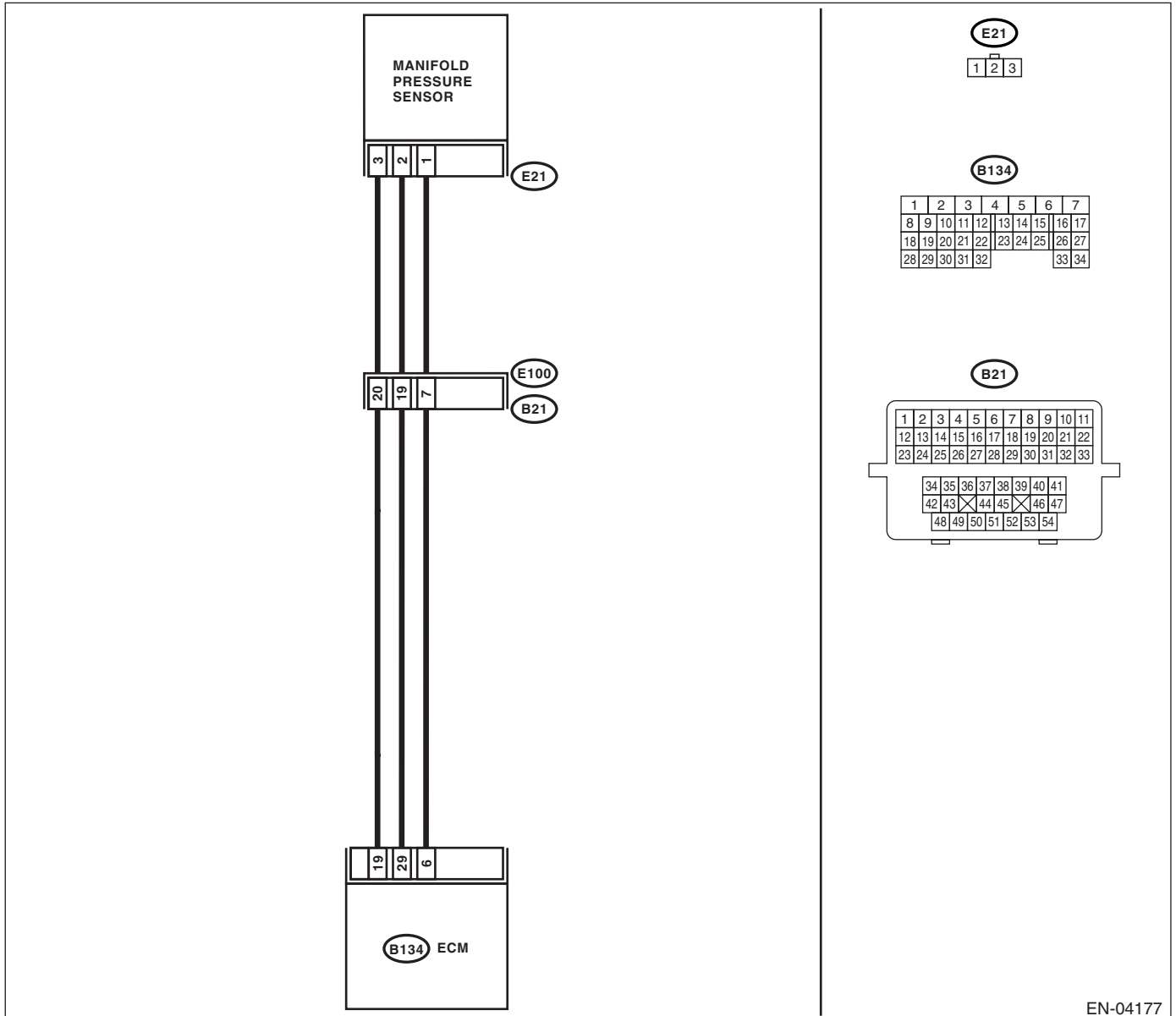
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-29, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04177

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes                                   | No  |
|--|---|---------------------------------------|---|
| <b>1 CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the measured value more than 119.5 kPa (896.5 mmHg, 35.29 inHg)?   | Go to step 10.                        | Go to step 2.   |
| <b>2 CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 6 (+) — Chassis ground (-):</i>   | Is the voltage more than 4.5 V?   | Go to step 4.                         | Go to step 3.   |
| <b>3 CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 6 (+) — Chassis ground (-):</i>   | Does the voltage change by shaking the ECM harness and connector?   | Repair poor contact in ECM connector. | Contact your SOA Service Center since deterioration of some parts may be the cause.         |
| <b>4 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 29 (+) — Chassis ground (-):</i>   | Is the voltage less than 0.2 V?   | Go to step 6.                         | Go to step 5.   |
| <b>5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)</b><br>Read the data of atmospheric absolute pressure signal using Subaru Select Monitor.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.>   | Is the measured value more than 13.3 kPa (100 mmHg, 3.94 inHg) by shaking the harness and connector of ECM? | Repair poor contact in ECM connector. | Go to step 6.   |
| <b>6 CHECK HARNESS BETWEEN MANIFOLD ABSOLUTE PRESSURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from manifold absolute pressure sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between manifold absolute pressure sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E21) No. 3 (+) — Engine ground (-):</i>   | Is the voltage more than 4.5 V?   | Go to step 7.                         | Repair open circuit in harness between ECM and manifold absolute pressure sensor connector. |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <b>7</b><br><b>CHECK HARNESS BETWEEN MANIFOLD ABSOLUTE PRESSURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector.<br><i>Connector &amp; terminal<br/>(B134) No. 29 — (E21) No. 2:</i>  | Is the resistance less than 1 $\Omega$ ?                              | Go to step <b>8</b> .  | Repair open circuit in harness between ECM and manifold absolute pressure sensor connector.              |
| <b>8</b><br><b>CHECK HARNESS BETWEEN MANIFOLD ABSOLUTE PRESSURE SENSOR AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM and manifold absolute pressure sensor connector.<br><i>Connector &amp; terminal<br/>(B134) No. 19 — (E21) No. 3:</i>   | Is the resistance less than 1 $\Omega$ ?                              | Go to step <b>9</b> .  | Repair open circuit in harness between ECM and manifold absolute pressure sensor connector.              |
| <b>9</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in manifold absolute pressure sensor connector.  | Is there poor contact in manifold absolute pressure sensor connector? | Repair poor contact in manifold absolute pressure sensor connector.                                  | Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-27, Manifold Absolute Pressure Sensor.> |
| <b>10</b><br><b>CHECK HARNESS BETWEEN MANIFOLD ABSOLUTE PRESSURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF and Subaru Select Monitor or the general scan tool power switch to OFF.<br>2) Disconnect the connector from manifold absolute pressure sensor.<br>3) Turn the ignition switch to ON and Subaru Select Monitor or the general scan tool power switch to ON.<br>4) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool.<br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the measured value more than 119.5 kPa (896.5 mmHg, 35.29 inHg)?   | Repair battery short circuit in harness between ECM and manifold absolute pressure sensor connector. | Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-27, Manifold Absolute Pressure Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## R: DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-30, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

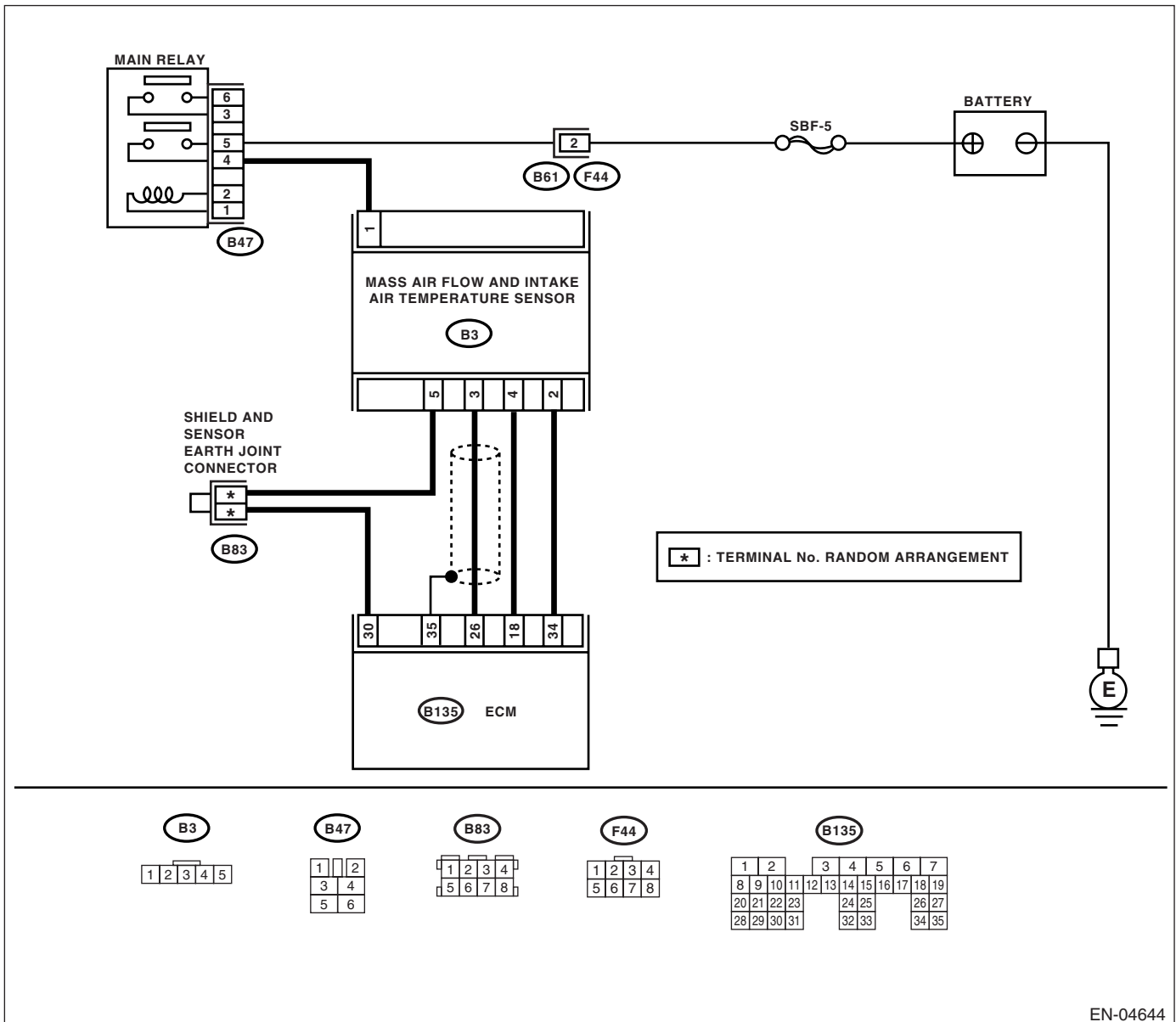
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04644

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                       | Yes  | No   |
|---|-----------------------------|--|--|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0111. | Replace the intake air temperature sensor. <Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## S: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-32, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

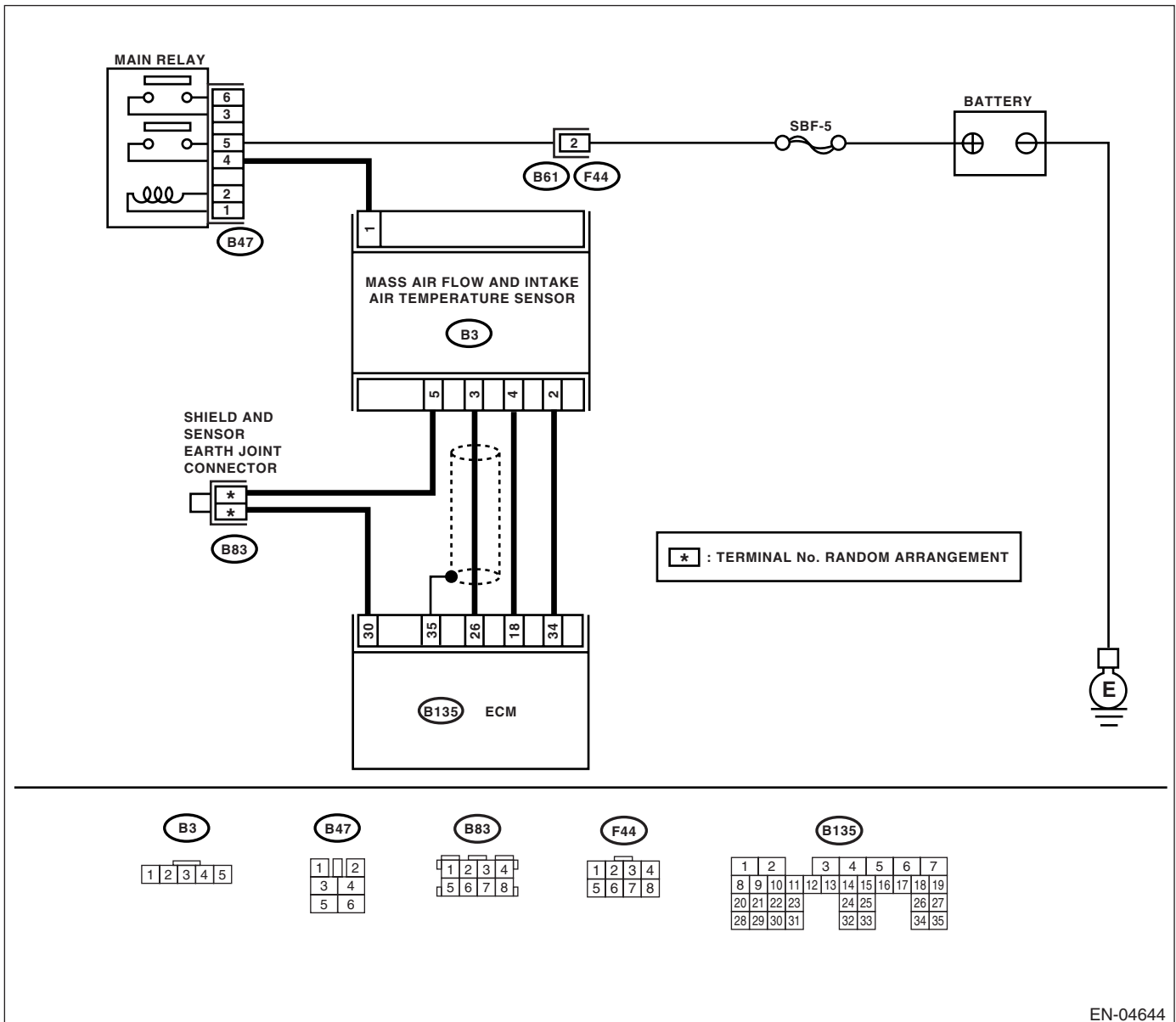
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04644

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <p><b>1</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Start the engine.</p> <p>2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the General Scan Tool Instruction Manual.</p>  | <p>Is the measured value more than 120°C (248°F)?</p> | <p>Go to step 2.</p>  | <p>Repair poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Poor contact in intake air temperature sensor</li> <li>• Poor contact in ECM</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from intake air temperature sensor.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the measured value less than -40°C (-40°F)?</p> | <p>Replace the intake air temperature sensor. &lt;Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p> | <p>Repair ground short circuit in harness between intake air temperature sensor and ECM connector.</p>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## T: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-33, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

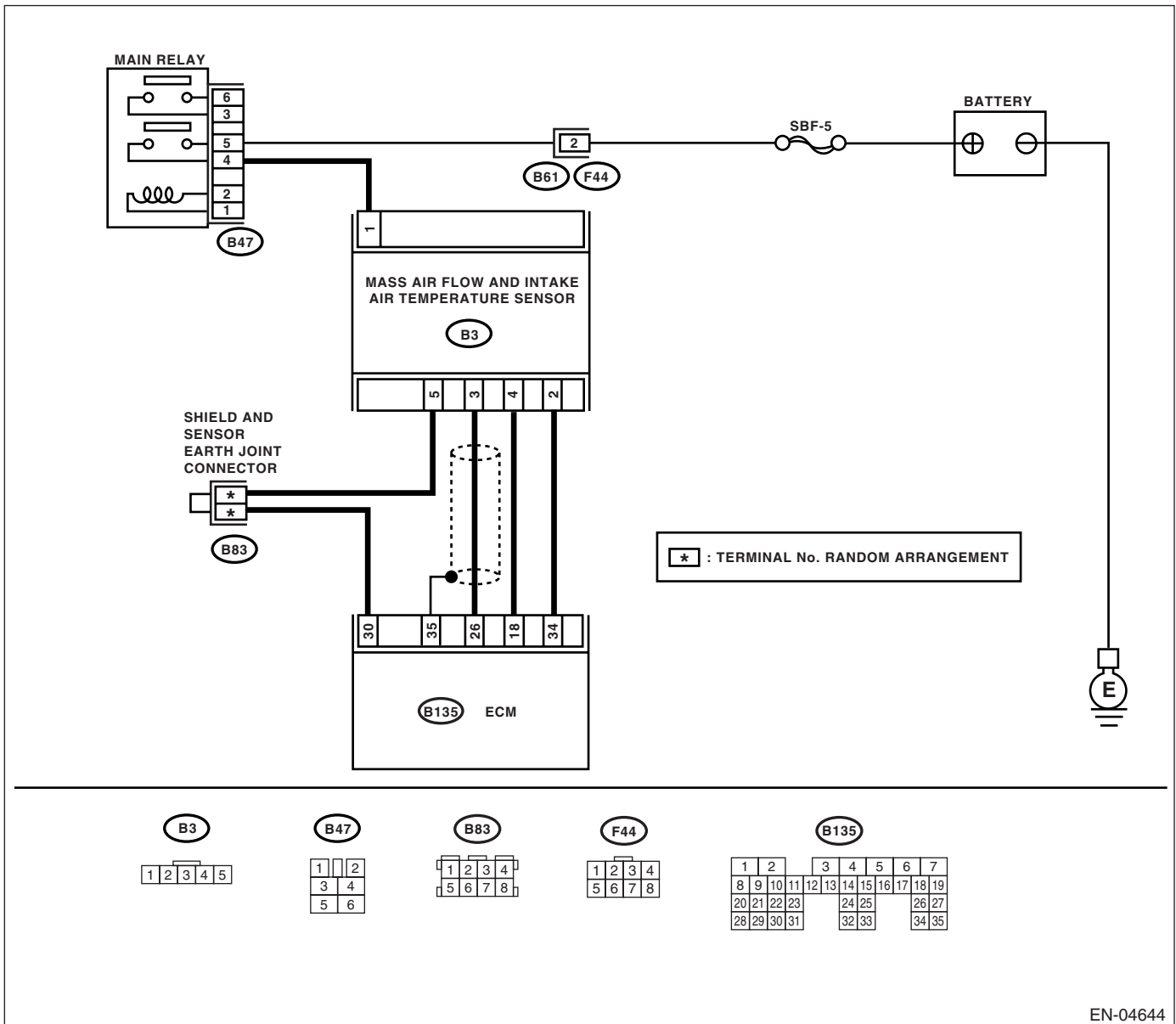
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04644



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <b>1 CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedure, refer to the General Scan Tool Instruction Manual. | Is the measured value less than $-40^{\circ}\text{C}$ ( $-40^{\circ}\text{F}$ )? | Go to step 2.  | Repair poor contact.<br><br>NOTE:<br>In this case, repair the following:<br>• Poor contact in intake air temperature sensor<br>• Poor contact in ECM<br>• Poor contact in coupling connector<br>• Poor contact in joint connector   |
| <b>2 CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from intake air temperature sensor.<br>3) Measure the voltage between intake air temperature and manifold absolute pressure sensor connector and engine ground.<br><br><i>Connector &amp; terminal</i><br><i>(B3) No. 4 (+) — Engine ground (-):</i>  | Is the measured value more than 10 V?  | Repair battery short circuit in harness between intake air temperature sensor and ECM connector. | Go to step 3.   |
| <b>3 CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between intake air temperature sensor connector and engine ground.<br><br><i>Connector &amp; terminal</i><br><i>(B3) No. 4 (+) — Engine ground (-):</i>   | Is the measured value more than 10 V?  | Repair battery short circuit in harness between intake air temperature sensor and ECM connector. | Go to step 4.   |
| <b>4 CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>Measure the voltage between intake air temperature sensor connector and engine ground.<br><br><i>Connector &amp; terminal</i><br><i>(B3) No. 4 (+) — Engine ground (-):</i>  | Is the measured value more than 3 V?   | Go to step 5.  | Repair harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between intake air temperature sensor and ECM connector<br>• Poor contact in intake air temperature sensor<br>• Poor contact in ECM<br>• Poor contact in coupling connector<br>• Poor contact in joint connector |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <p><b>5</b></p> <p><b>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Measure the resistance of harness between intake air temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B3) No. 5 — Engine ground:</b></p> | <p>Is the measured value less than 5 <math>\Omega</math>?</p> | <p>Replace the intake air temperature sensor. &lt;Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p> | <p>Repair harness and connector.</p> <p><b>NOTE:</b><br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between intake air temperature sensor and ECM connector</li> <li>• Poor contact in intake air temperature sensor</li> <li>• Poor contact in ECM</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <p><b>1</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Start the engine.</p> <p>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p>  | <p>Is the engine coolant temperature more than 150°C (302°F)?</p> | <p>Go to step 2.</p>  | <p>Repair poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Poor contact in engine coolant temperature sensor</li> <li>• Poor contact in ECM</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from engine coolant temperature sensor.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the engine coolant temperature less than -40°C (-40°F)?</p> | <p>Replace the engine coolant temperature sensor. &lt;Ref. to FU(H4SO)-22, Engine Coolant Temperature Sensor.&gt;</p> | <p>Repair battery short circuit in harness between engine coolant temperature sensor and ECM connector.</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## V: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-36, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

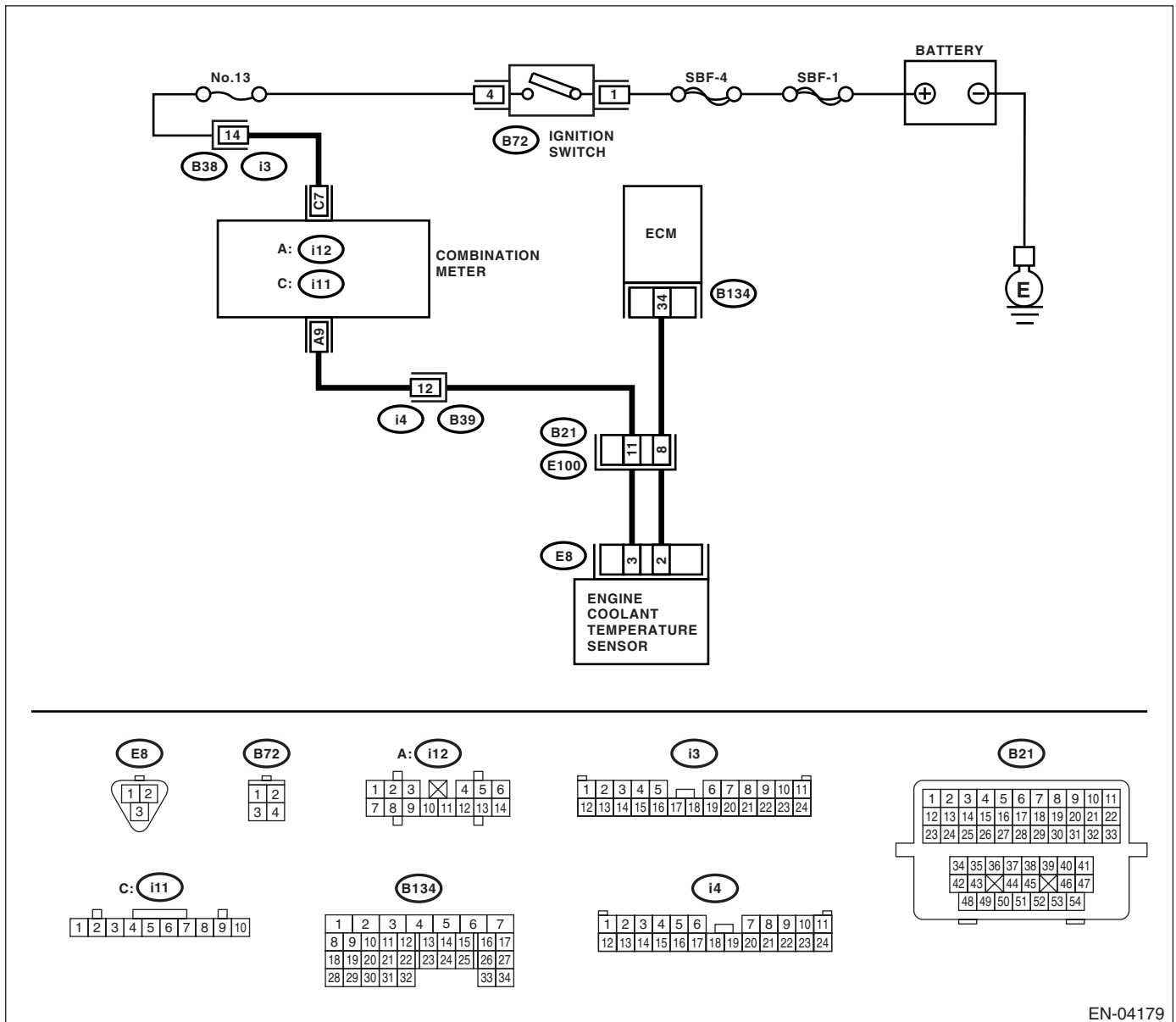
### TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04179

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <p><b>1</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Start the engine.</p> <p>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the engine coolant temperature less than -40°C (-40°F)?</p> | <p>Go to step 2.</p>  | <p>Repair poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Poor contact in engine coolant temperature sensor</li> <li>• Poor contact in ECM</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul>   |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from engine coolant temperature sensor.</p> <p>3) Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E8) No. 3 (+) — Engine ground (-):</b></p>   | <p>Is the voltage more than 10 V?</p>                             | <p>Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.</p> | <p>Go to step 3.</p>  |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E8) No. 3 (+) — Engine ground (-):</b></p>   | <p>Is the voltage more than 10 V?</p>                             | <p>Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.</p> | <p>Go to step 4.</p>  |
| <p><b>4</b></p> <p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E8) No. 3 (+) — Engine ground (-):</b></p>  | <p>Is the voltage more than 4 V?</p>                              | <p>Go to step 5.</p>  | <p>Repair harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and engine coolant temperature sensor connector</li> <li>• Poor contact in engine coolant temperature sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <p><b>5</b></p> <p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal (E8) No. 2 — Engine ground:</b></p> | <p>Is the resistance less than 5 <math>\Omega</math>?</p> | <p>Replace the engine coolant temperature sensor. &lt;Ref. to FU(H4SO)-22, Engine Coolant Temperature Sensor.&gt;</p> | <p>Repair harness and connector.</p> <p><b>NOTE:</b><br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and engine coolant temperature sensor connector</li> <li>• Poor contact in engine coolant temperature sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |

## **W: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT**

### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-38, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

- Erroneous idling
- Engine stalls.
- Poor driving performance

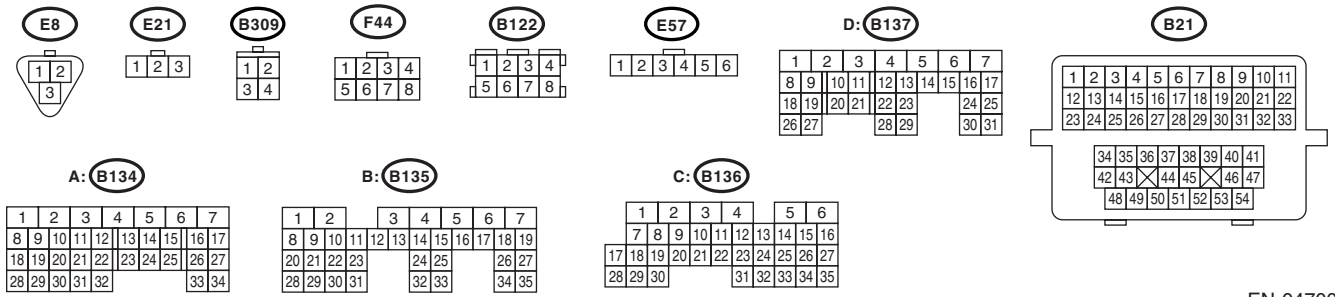
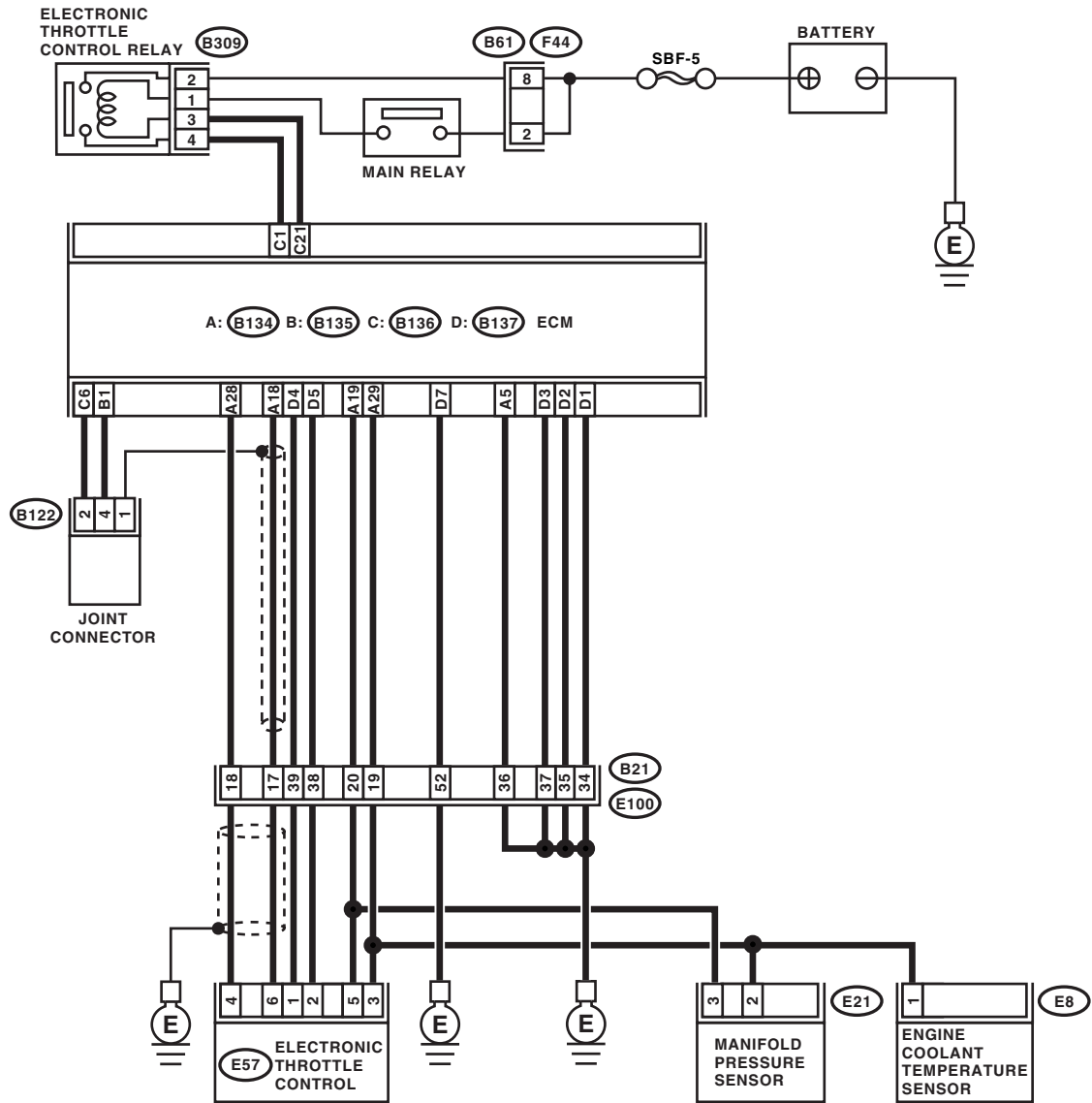
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04700



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No   |
|--|---|---|--|
| <b>1 CHECK SENSOR OUTPUT.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of main throttle sensor signal using Subaru Select Monitor.  | Is the voltage more than 0.4 V?   | Go to step 2.   | Go to step 3.  |
| <b>2 CHECK POOR CONTACT.</b><br>Check poor contact in connector between ECM and electronic throttle control.   | Is there poor contact in connector between ECM and electronic throttle control? | Repair the poor contact.  | Temporary poor contact occurred, but it is normal at present.  |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connectors from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 18 — (E57) No. 6:</i><br><i>(B134) No. 19 — (E57) No. 5:</i> | Is the resistance less than 1 $\Omega$ ?  | Go to step 4.   | Repair the open circuit of harness connector.  |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>Measure the resistance between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 18 — Chassis ground:</i><br><i>(B134) No. 19 — Chassis ground:</i>   | Is the resistance more than 1 M $\Omega$ ?                                      | Go to step 5.   | Repair the ground short circuit of harness.  |
| <b>5 CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 5 (+) — Engine ground (-):</i>  | Is the voltage 4.5 — 5.5 V?   | Go to step 6.   | Repair the poor contact in ECM connector.<br>Replace the ECM if defective. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |
| <b>6 CHECK SHORT CIRCUIT INSIDE THE ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 6 — Engine ground:</i>  | Is the resistance more than 10 $\Omega$ ?                                       | Repair poor contact of electronic throttle control connector.<br>Replace the electronic throttle control. <Ref. to FU(H4SO)-12, Throttle Body.> | Repair the poor contact in ECM connector.<br>Replace the ECM if defective. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |

## **X: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT**

### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-39, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

- Erroneous idling
- Engine stalls.
- Poor driving performance

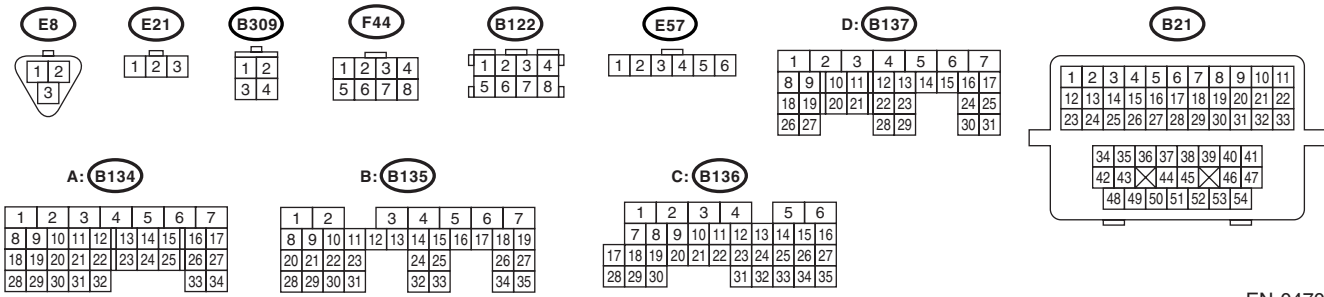
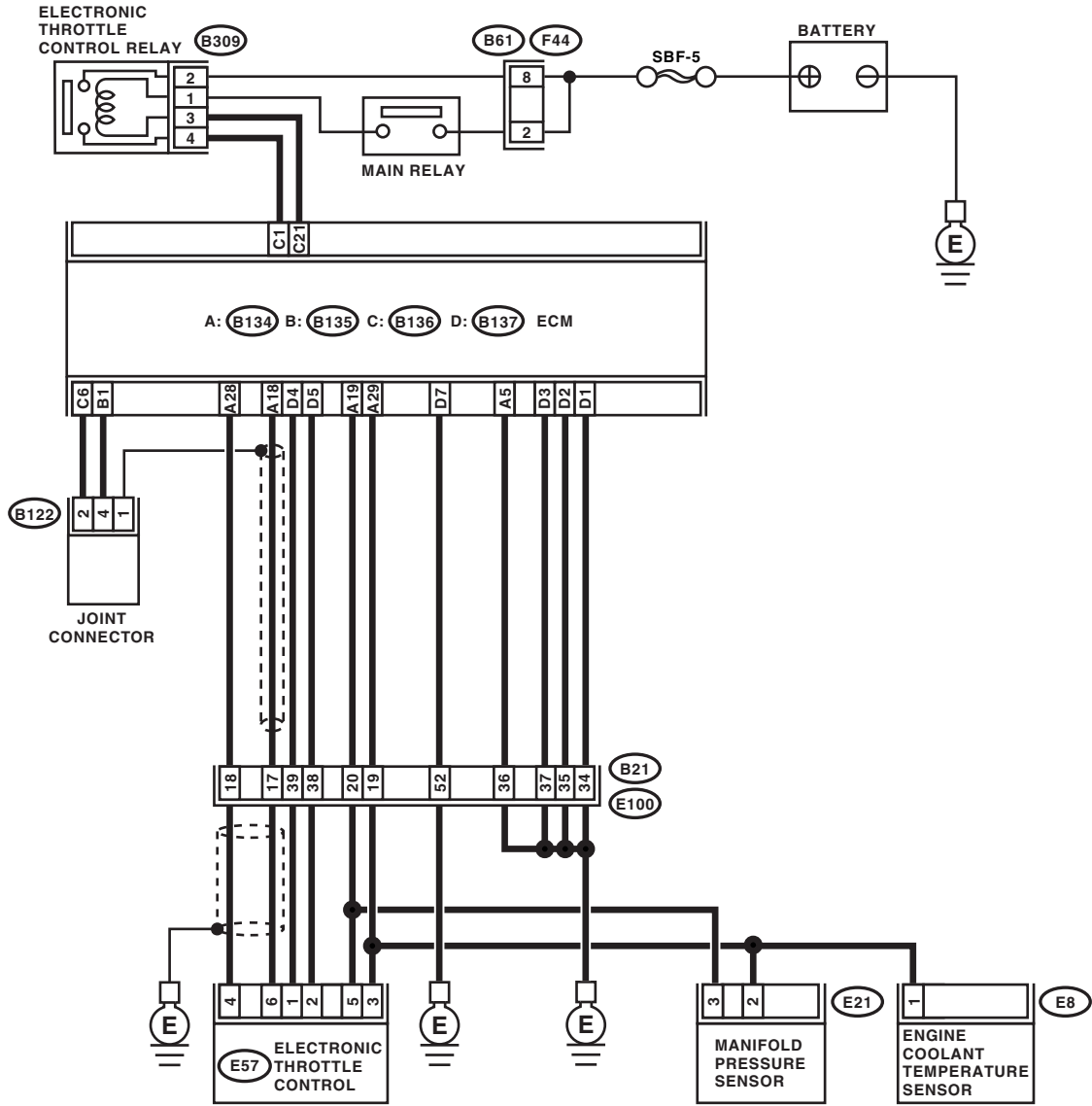
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04700

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <b>1</b><br><b>CHECK SENSOR OUTPUT.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of main throttle sensor signal using Subaru Select Monitor.   | Is the voltage less than 4.63 V?  | Go to step 2.  | Go to step 3.  |
| <b>2</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in connector between ECM and electronic throttle control.  | Is there poor contact in connector between ECM and electronic throttle control? | Repair the poor contact.   | Temporary poor contact occurred, but it is normal at present.  |
| <b>3</b><br><b>CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connectors from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 18 — (E57) No. 6:</i> | Is the resistance less than 1 $\Omega$ ?  | Go to step 4.  | Repair the open circuit of harness connector.  |
| <b>4</b><br><b>CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 3 — Engine ground:</i>  | Is the resistance less than 1 $\Omega$ ?  | Go to step 5.  | Repair the poor contact in ECM connector.<br>Replace the ECM if defective. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |
| <b>5</b><br><b>CHECK SENSOR OUTPUT POWER SUPPLY.</b><br>Measure the voltage between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 6 (+) — Engine ground (-):</i>  | Is the voltage less than 10 V?  | Replace the electronic throttle control. <Ref. to FU(H4SO)-12, Throttle Body.> | Repair battery short circuit in harness between ECM connector and electronic throttle control connector.                       |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## Y: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-40, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

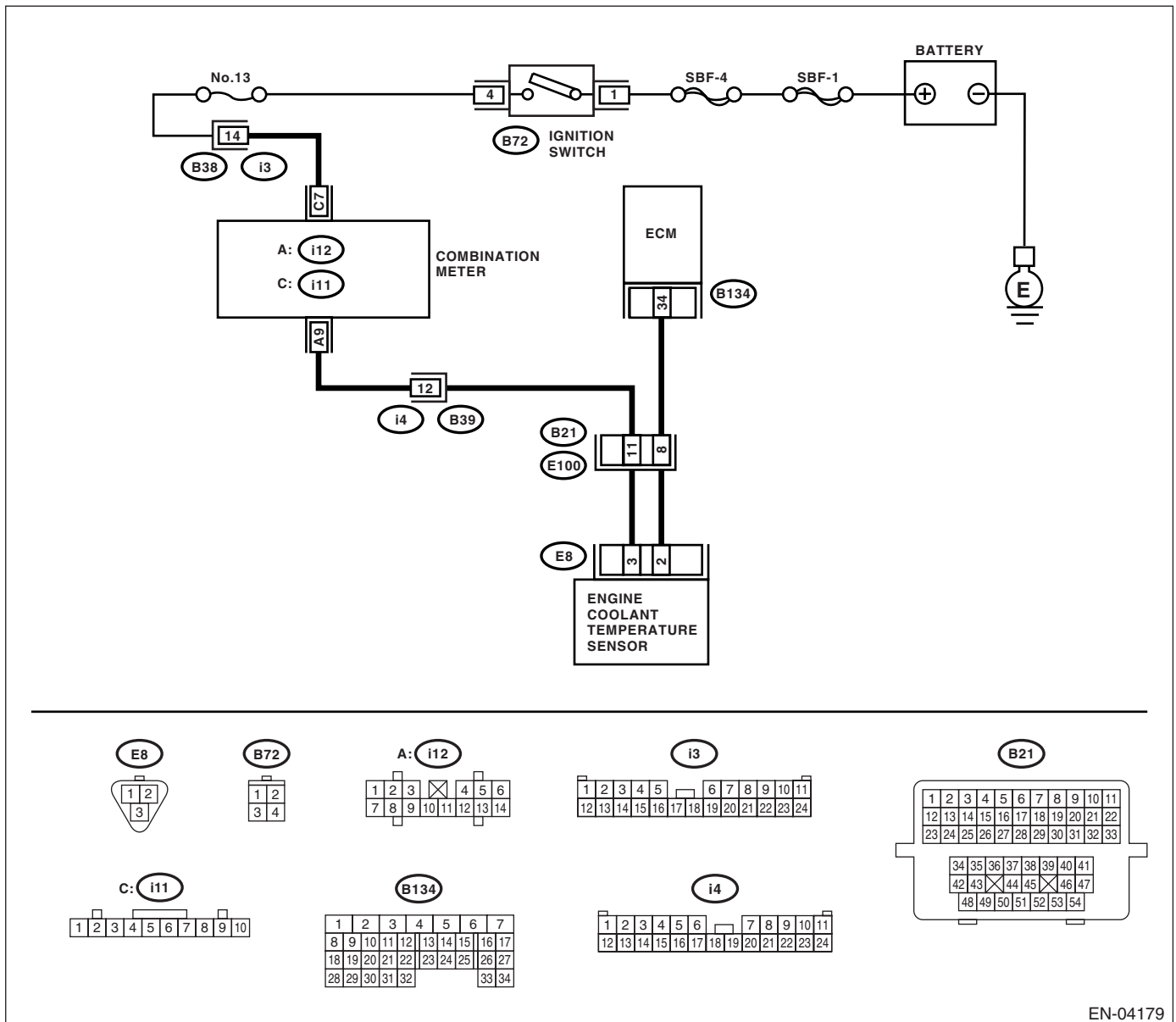
### TROUBLE SYMPTOM:

Engine would not return to idling.

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04179

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                              | Yes  | No   |
|---|------------------------------------|--|--|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed?        | Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0125. | Go to step 2.  |
| 2<br><b>CHECK THERMOSTAT.</b>               | Does the thermostat remain opened? | Replace the thermostat. <Ref. to CO(H4SO)-21, Thermostat.>   | Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-22, Engine Coolant Temperature Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## Z: DTC P0126 INSUFFICIENT COOLANT TEMPERATURE FOR STABLE OPERATION

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-42, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

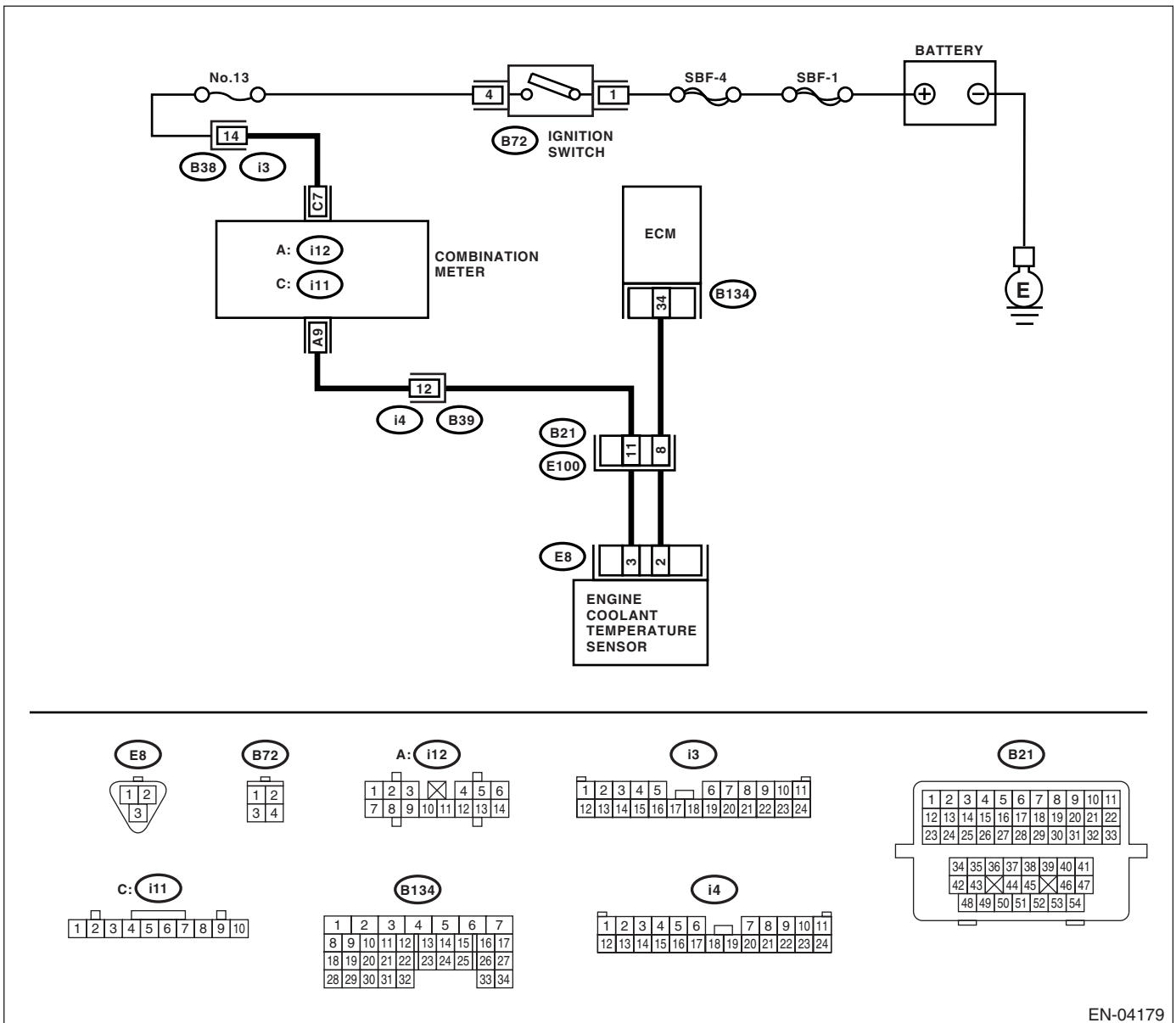
### TROUBLE SYMPTOM:

Engine would not return to idling.

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04179

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check   | Yes   | No  |  |
|------|---|---|---|--|
| 1    | <b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Inspect the DTC using "List of Diagnostic Trouble Code (DTC)".<br><Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> | Go to step 2.  |
| 2    | <b>CHECK ENGINE COOLANT TEMPERATURE SENSOR.</b><br>Measure the resistance between engine coolant temperature sensor terminals when engine coolant is cold and after warmed-up.<br><b>Terminals</b><br><b>No. 2 — No. 3:</b> | Is the resistance of engine coolant temperature sensor different between when engine coolant is cold and after warmed-up? | Contact your SOA Service Center since deterioration of some parts may be the cause.   | Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-22, Engine Coolant Temperature Sensor.> |



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

### AA:DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

**DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-44, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

**TROUBLE SYMPTOM:**

Thermostat remains open.

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

| Step | Check  | Yes   | No  |   |
|------|--|---|---|---|
| 1    | <b>CHECK VEHICLE CONDITION.</b>  | Was the vehicle driven or idled with the engine partially submerged under water?      | In this case, it is not necessary to inspect DTC P0128.   | Go to step 2.   |
| 2    | <b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>                  | Go to step 3.   |
| 3    | <b>CHECK ENGINE COOLANT.</b>   | Are coolant level and mixture ratio of cooling water to anti-freeze solution correct? | Go to step 4.   | Replace the engine coolant. <Ref. to CO(H4SO)-16, REPLACEMENT, Engine Coolant.> |
| 4    | <b>CHECK RADIATOR FAN.</b><br>1) Start the engine.<br>2) Check radiator fan operation. | Does the radiator fan continuously rotate for more than 3 minutes during idling?      | Repair radiator fan circuit. <Ref. to CO(H4SO)-27, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-28, Radiator Sub Fan and Fan Motor.> | Replace the thermostat. <Ref. to CO(H4SO)-21, Thermostat.>                      |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AB:DTC P0131 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

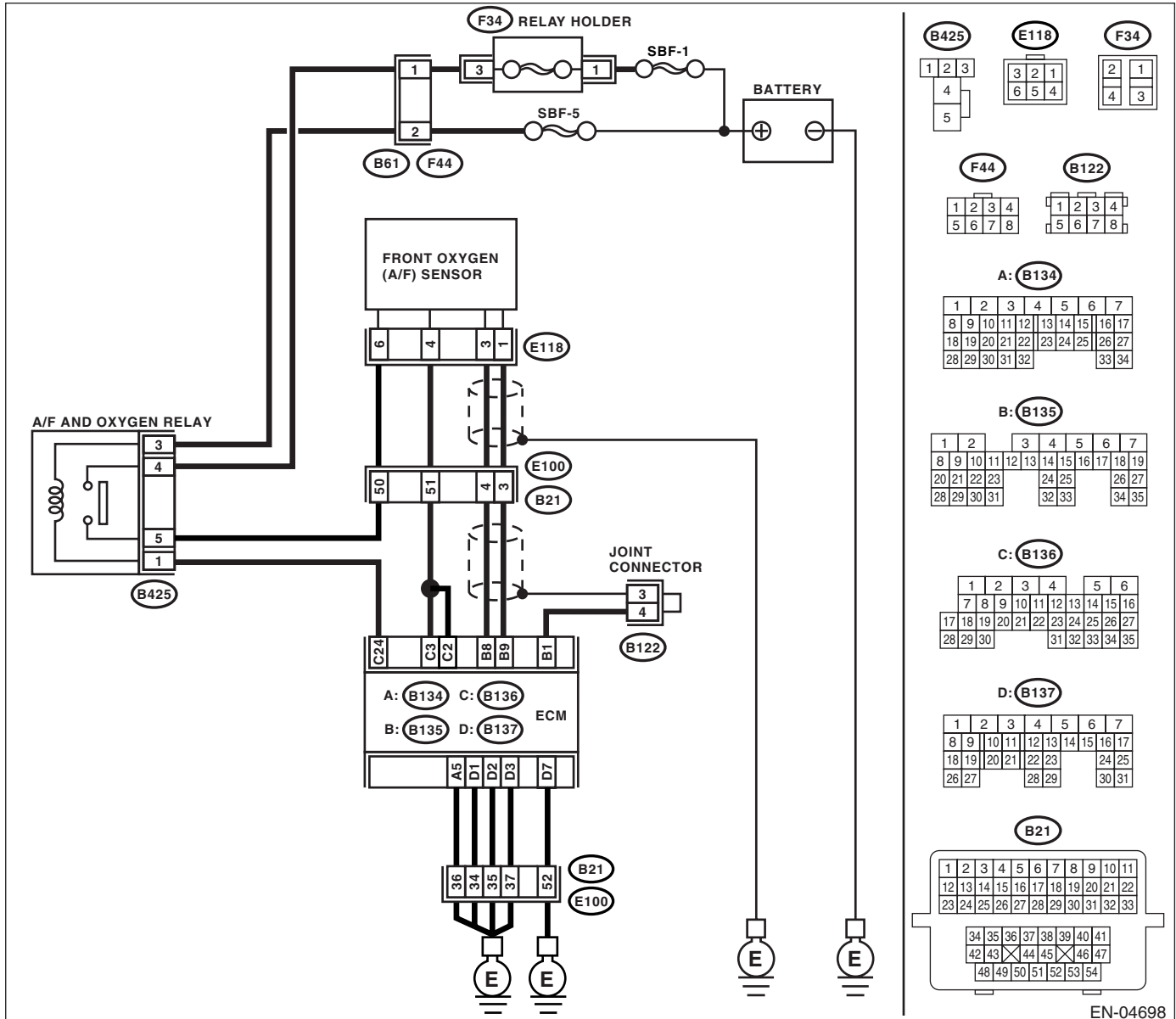
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-46, DTC P0131 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                             | Yes  | No  |
|--|-----------------------------------|--|---|
| <b>1</b><br><b>CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>   | Is there water in connector?      | Remove infiltrating water completely.  | Go to step 2.   |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br>3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><br><i>Connector &amp; terminal</i><br><i>(B135) No. 9 — Chassis ground:</i><br><i>(B135) No. 8 — Chassis ground:</i> | Is the resistance more than 1 MΩ? | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.> | Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AC:DTC P0132 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

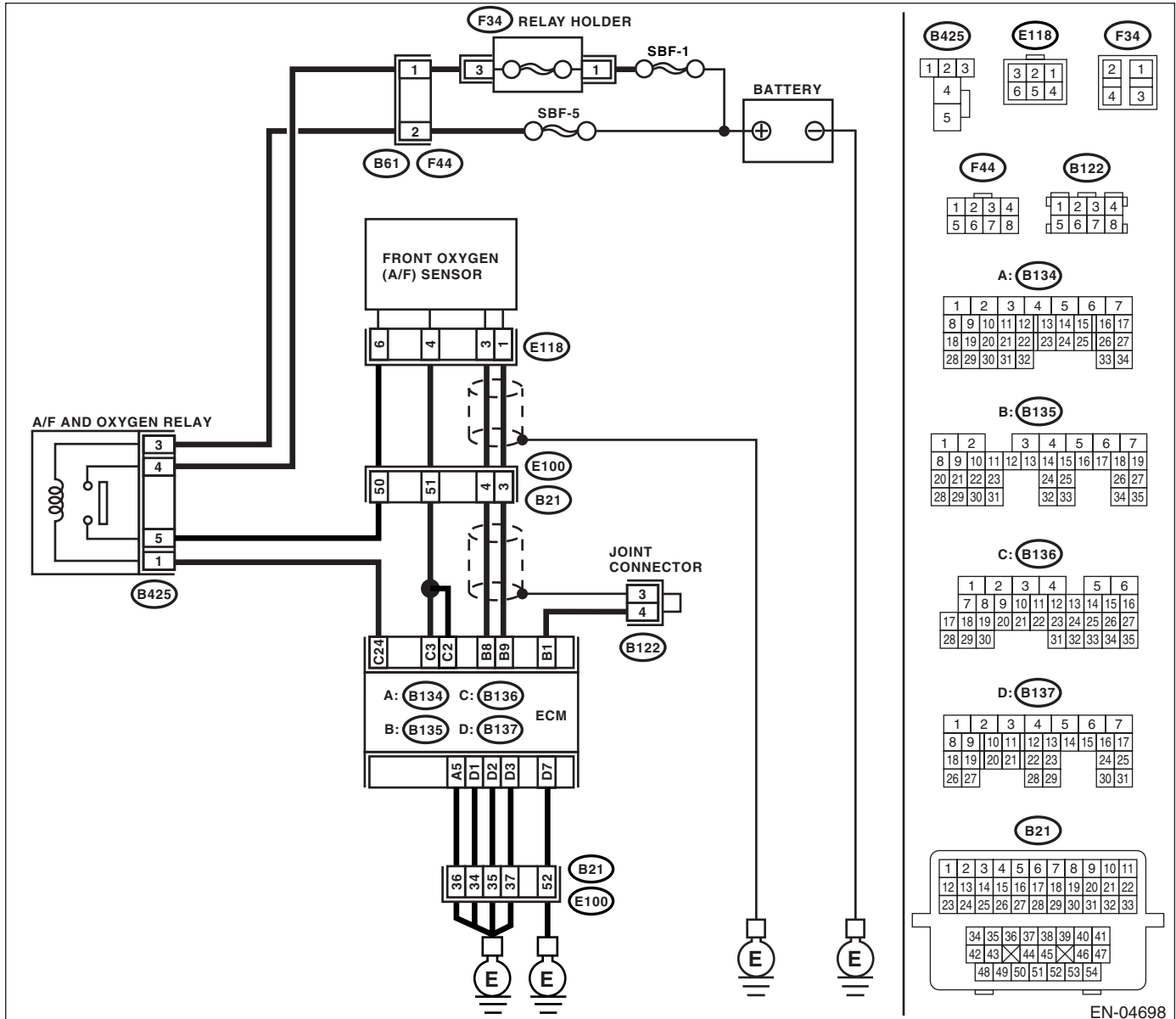
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-47, DTC P0132 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                         | Yes  | No   |
|--|-------------------------------|--|--|
| <b>1</b><br><b>CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>   | Is there water in connector?  | Remove infiltrating water completely.  | Go to step 2.  |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to ON.<br>2) Disconnect the connectors from front oxygen (A/F) sensor.<br>3) Measure the voltage of harness between ECM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B135) No. 8 (+) — Chassis ground (-):</b></i><br><i><b>(B135) No. 9 (+) — Chassis ground (-):</b></i> | Is the voltage more than 8 V? | Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AD:DTC P0133 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

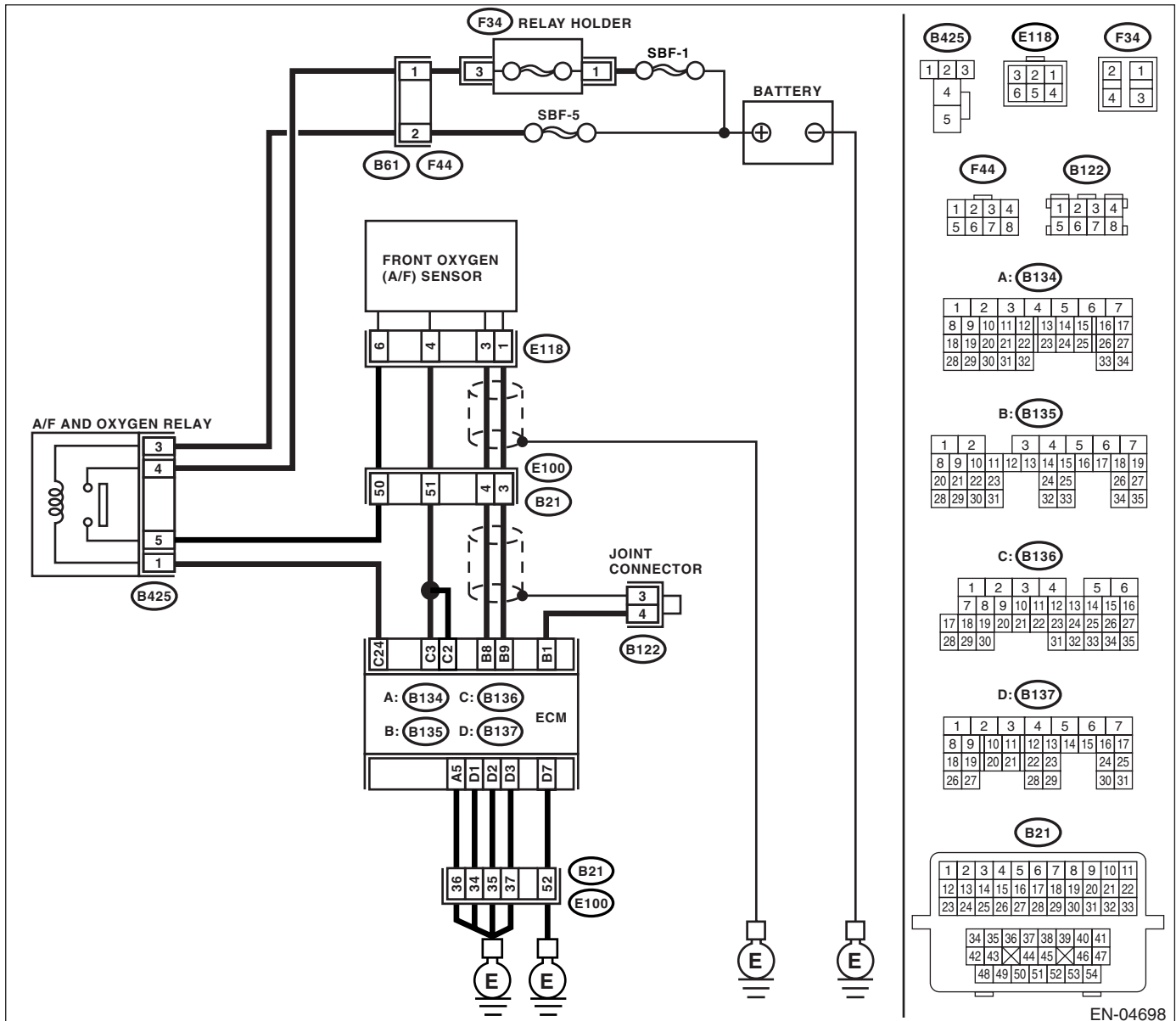
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-49, DTC P0133 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check                               | Yes  | No   |
|--|-------------------------------------|--|--|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?         | Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0133. | Go to step 2.  |
| <b>2</b><br><b>CHECK EXHAUST SYSTEM.</b><br><br>NOTE:<br>Check the following items. <ul style="list-style-type: none"><li>• Loose installation of front portion of exhaust pipe onto cylinder heads</li><li>• Loose connection between front exhaust pipe and front catalytic converter</li><li>• Damage of exhaust pipe resulting in a hole</li></ul> | Is there a fault in exhaust system? | Repair exhaust system.   | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AE:DTC P0134 O<sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

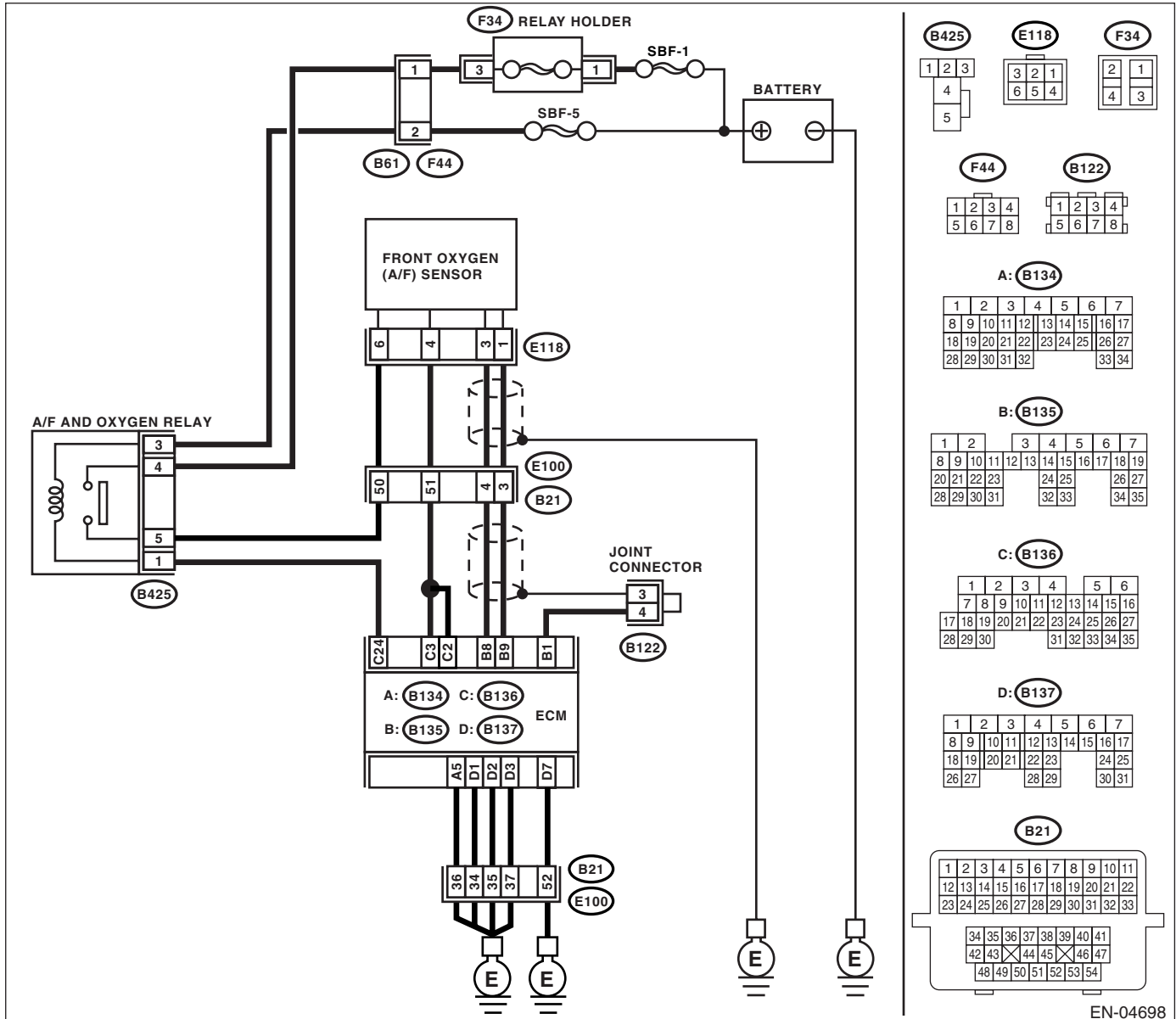
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-51, DTC P0134 O<sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04698



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br/>                     3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p><b>Connector &amp; terminal</b><br/>                     (B135) No. 8 — (E118) No. 3:<br/>                     (B135) No. 9 — (E118) No. 1:</p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p>            | <p>Go to step 2.</p>   | <p>Repair harness and connector.</p> <p>NOTE:<br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and front oxygen (A/F) sensor connector</li> <li>• Poor contact in front oxygen (A/F) sensor connector</li> <li>• Poor contact in ECM connector</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in front oxygen (A/F) sensor connector.</p>   | <p>Is there poor contact in front oxygen (A/F) sensor connector?</p> | <p>Repair poor contact in front oxygen (A/F) sensor connector.</p> | <p>Replace the front oxygen (A/F) sensor. &lt;Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.&gt;</p>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AF:DTC P0137 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

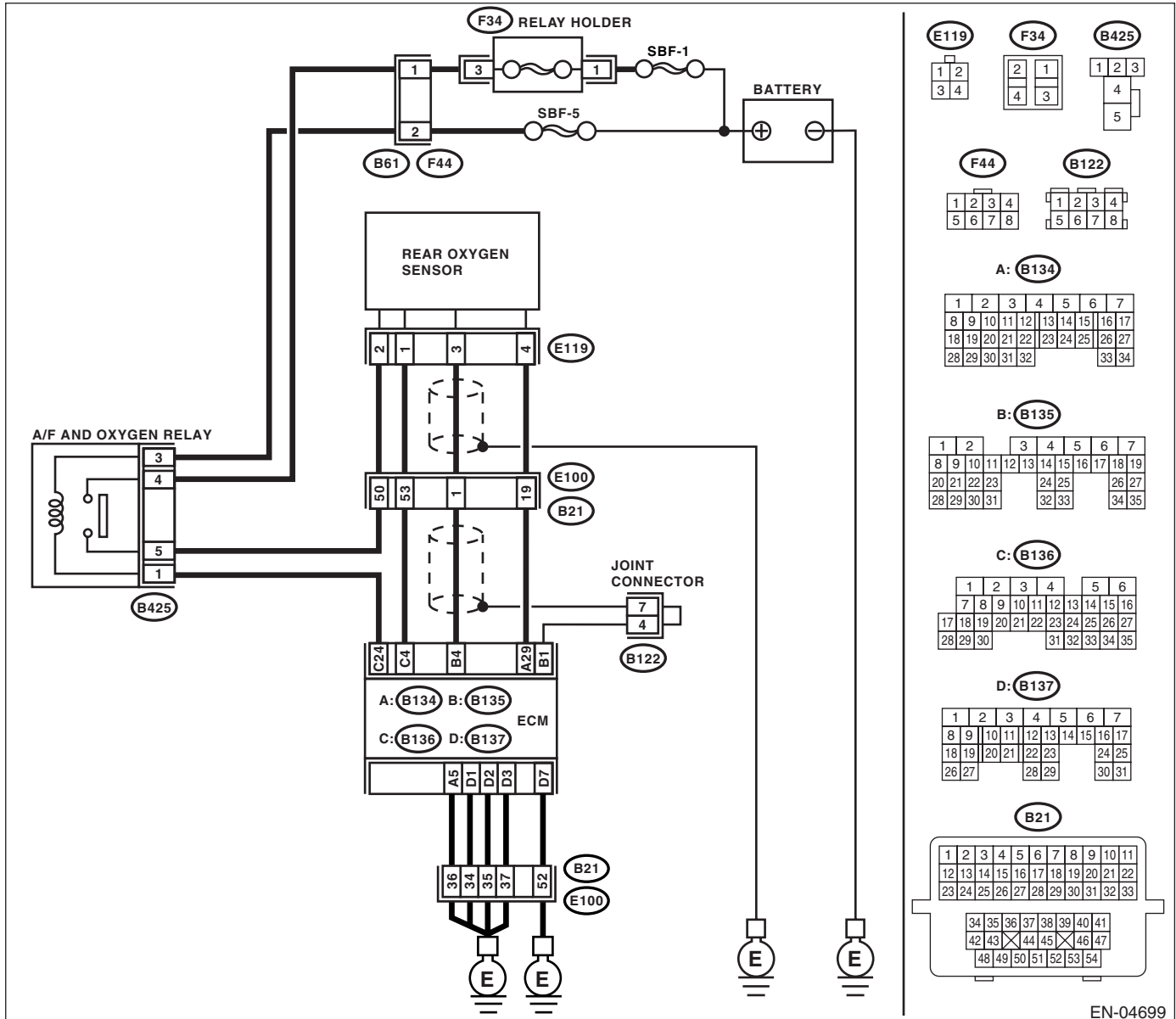
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-53, DTC P0137 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04699

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step | Check  | Yes                              | No   |  |
|------|--|----------------------------------|--|--|
| 1    | <b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?      | Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0137. | Go to step 2.  |
| 2    | <b>CHECK REAR OXYGEN SENSOR DATA.</b><br>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest)<br>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• For MT model, depress the clutch pedal.<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the voltage more than 490 mV? | Go to step 6.  | Go to step 3.  |
| 3    | <b>CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>  | Is there water in connector?     | Remove infiltrating water completely.  | Go to step 4.  |
| 4    | <b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and rear oxygen sensor.<br>3) Measure the resistance of harness between ECM and rear oxygen sensor connector.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 4 — (E119) No. 3:</b><br><b>(B134) No. 29 — (E119) No. 4:</b>   | Is the resistance more than 3 Ω? | Repair open circuit in harness between ECM and rear oxygen sensor connector.   | Go to step 5.  |
| 5    | <b>CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from rear oxygen sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(E119) No. 3 (+) — Engine ground (-):</b>   | Is the voltage 0.2 — 0.5 V?      | Replace the rear oxygen sensor.<br><Ref. to FU(H4SO)-37, Rear Oxygen Sensor.>  | Repair harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between rear oxygen sensor and ECM connector<br>• Poor contact in rear oxygen sensor connector<br>• Poor contact in ECM connector |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

|   | Step   | Check                               | Yes                             | No  |
|---|--|-------------------------------------|---------------------------------|---|
| 6 | <b>CHECK EXHAUST SYSTEM.</b><br>Check exhaust system parts.<br>NOTE:<br>Check the following items. <ul style="list-style-type: none"><li>• Loose installation of portions</li><li>• Damage (crack, hole etc.) of parts</li><li>• Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor</li></ul> | Is there a fault in exhaust system? | Repair or replace faulty parts. | Replace the rear oxygen sensor.<br><Ref. to FU(H4SO)-37, Rear Oxygen Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AG:DTC P0138 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

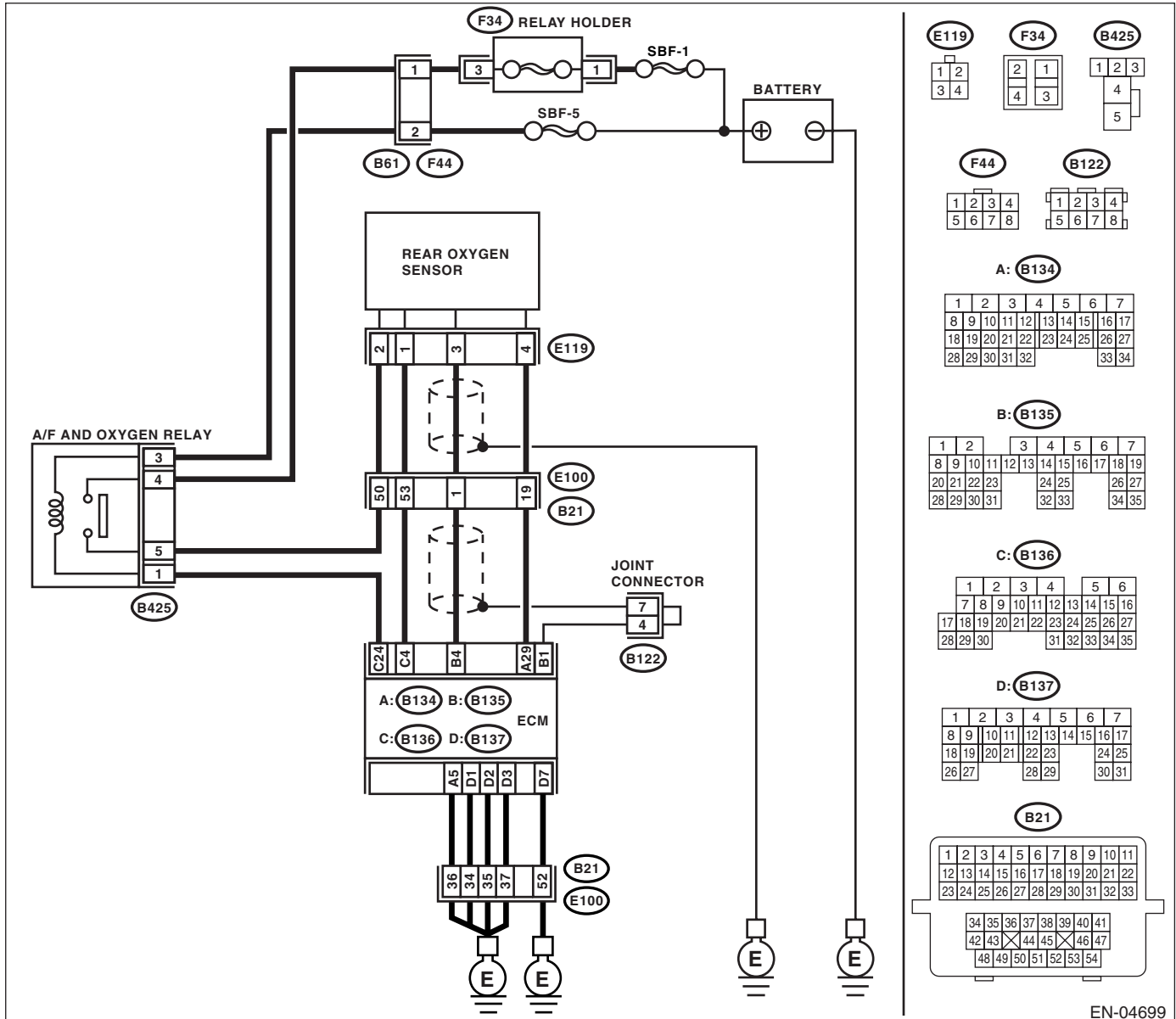
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-56, DTC P0138 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04699

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check   | Yes                              | No   |  |
|------|---|----------------------------------|--|--|
| 1    | <b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?      | Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0138. | Go to step 2.  |
| 2    | <b>CHECK REAR OXYGEN SENSOR DATA.</b><br>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed from 3,000 rpm.<br>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• For MT model, depress the clutch pedal.<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the voltage less than 250 mV? | Go to step 6.  | Go to step 3.  |
| 3    | <b>CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>   | Is there water in connector?     | Remove infiltrating water completely.  | Go to step 4.  |
| 4    | <b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and rear oxygen sensor.<br>3) Measure the resistance of harness between ECM and rear oxygen sensor connector.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 4 — (E119) No. 3:</b><br><b>(B134) No. 29 — (E119) No. 4:</b>  | Is the resistance more than 3 Ω? | Repair open circuit in harness between ECM and rear oxygen sensor connector.   | Go to step 5.  |
| 5    | <b>CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from rear oxygen sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(E119) No. 3 (+) — Engine ground (-):</b>  | Is the voltage 0.2 — 0.5 V?      | Replace the rear oxygen sensor.<br><Ref. to FU(H4SO)-37, Rear Oxygen Sensor.>  | Repair harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between rear oxygen sensor and ECM connector<br>• Poor contact in rear oxygen sensor connector<br>• Poor contact in ECM connector |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

|   | Step   | Check                               | Yes                             | No  |
|---|--|-------------------------------------|---------------------------------|---|
| 6 | <b>CHECK EXHAUST SYSTEM.</b><br>Check exhaust system parts.<br>NOTE:<br>Check the following items. <ul style="list-style-type: none"><li>• Loose installation of portions</li><li>• Damage (crack, hole etc.) of parts</li><li>• Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor</li></ul> | Is there a fault in exhaust system? | Repair or replace faulty parts. | Replace the rear oxygen sensor.<br><Ref. to FU(H4SO)-37, Rear Oxygen Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AH:DTC P0139 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

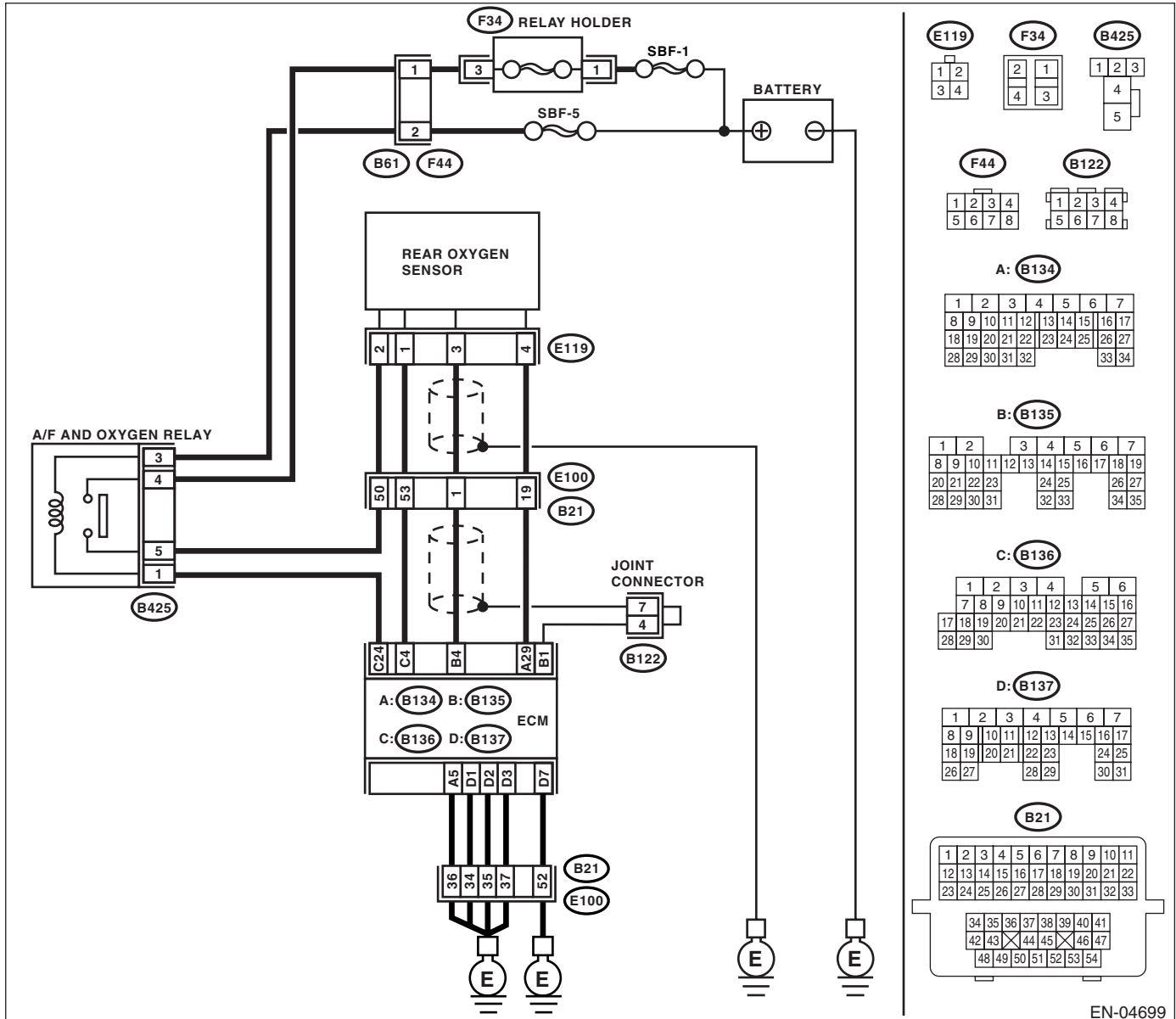
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-56, DTC P0139 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04699



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                      | Yes  | No  |
|--|--|--|---|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?                | Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0139. | Go to step 2.   |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and rear oxygen sensor.<br>3) Measure the resistance of harness between ECM and rear oxygen sensor connector.<br><br><i>Connector &amp; terminal</i><br><i>(B135) No. 4 — (E119) No. 3:</i> | Is the resistance less than 1 $\Omega$ ?   | Go to step 3.  | Repair open circuit in harness between rear oxygen sensor and ECM connectors. |
| <b>3</b><br><b>CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b><br>Measure the resistance between rear oxygen sensor harness connector and chassis ground.<br><br><i>Connector &amp; terminal</i><br><i>(E119) No. 3 — Chassis ground:</i>  | Is the resistance more than 1 M $\Omega$ ? | Go to step 4.  | Repair short circuit ground in harness.                                       |
| <b>4</b><br><b>CHECK REAR OXYGEN SENSOR DATA.</b><br>Measure the resistance between connector terminals of rear oxygen sensor.<br><br><i>terminals</i><br><i>No. 3 — No. 4:</i>  | Is the resistance less than 1 $\Omega$ ?   | Replace the rear oxygen sensor.<br><Ref. to FU(H4SO)-37, Rear Oxygen Sensor.>  | Temporary poor contact occurs.<br>Check poor contact in connector.            |

## AI: DTC P0140 O<sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2)

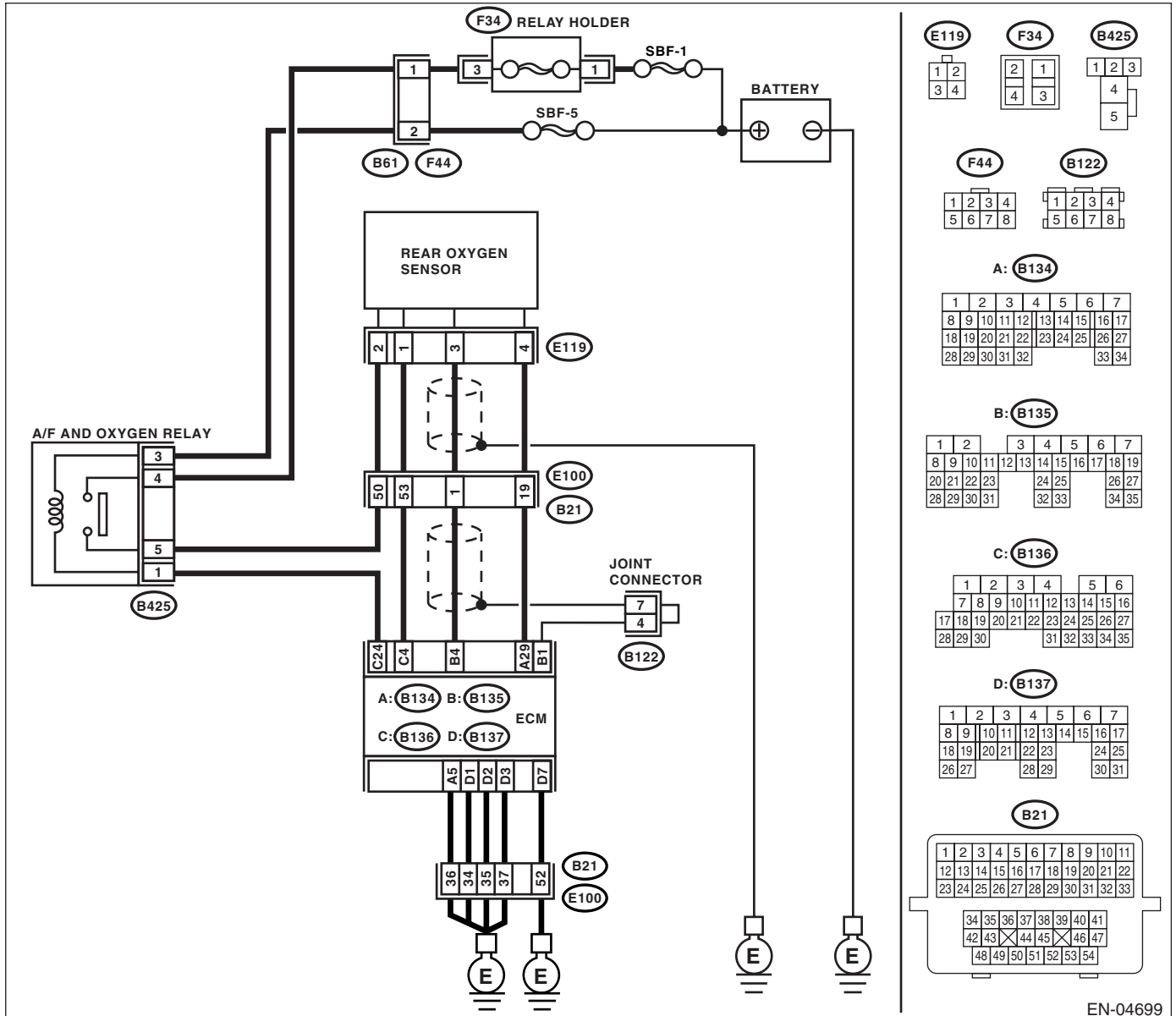
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-62, DTC P0140 O<sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04699

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                            | Yes   | No            |
|---|----------------------------------|---|---------------|
| <b>1</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?      | Using the List of "Diagnostic Trouble Code (DTC)", check the appropriate DTC. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0140. | Go to step 2. |
| <b>2</b><br><b>CHECK REAR OXYGEN SENSOR DATA.</b><br>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest)<br>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• For MT model, depress the clutch pedal.<br>• Subaru Select Monitor<br>For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedure, refer to the General Scan Tool Instruction Manual. | Is the voltage more than 490 mV? | Go to step 7.   | Go to step 3. |
| <b>3</b><br><b>CHECK REAR OXYGEN SENSOR DATA.</b><br>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed at 3,000 rpm.<br>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• For MT model, depress the clutch pedal.<br>• Subaru Select Monitor<br>For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedure, refer to the General Scan Tool Instruction Manual.            | Is the voltage less than 250 mV? | Go to step 7.   | Go to step 4. |
| <b>4</b><br><b>CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>   | Is there water in connector?     | Remove infiltrating water completely.   | Go to step 5. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No  |
|--|---|--|---|
| <p><b>5</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connectors from ECM and rear oxygen sensor.</p> <p>3) Measure the resistance of harness between ECM and rear oxygen sensor connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B135) No. 4 — (E119) No. 3:</b><br/> <b>(B134) No. 29 — (E119) No. 4:</b></p>                                  | <p>Is the resistance more than 3 <math>\Omega</math>?</p> | <p>Repair the open circuit in harness between ECM and rear oxygen sensor connector.</p>                          | <p>Go to step 6.</p>  |
| <p><b>6</b></p> <p><b>CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from rear oxygen sensor.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Measure the voltage between rear oxygen sensor connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(E119) No. 3 (+) — Chassis ground (-):</b></p>                                    | <p>Is the voltage 0.2 — 0.5 V?</p>                        | <p>Replace the rear oxygen sensor.<br/>                     &lt;Ref. to FU(H4SO)-37, Rear Oxygen Sensor.&gt;</p> | <p>Repair harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in ECM connector</li> </ul> |
| <p><b>7</b></p> <p><b>CHECK EXHAUST SYSTEM.</b></p> <p>Check the exhaust system parts.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Looseness and incomplete installation of exhaust system parts</li> <li>• Damage (crack, hole etc.) of parts</li> <li>• Looseness and incomplete installation of parts between front oxygen (A/F) sensor and rear oxygen sensor</li> </ul> | <p>Is there any fault in exhaust system?</p>              | <p>Repair or replace faulty parts.</p>   | <p>Replace the rear oxygen sensor.<br/>                     &lt;Ref. to FU(H4SO)-37, Rear Oxygen Sensor.&gt;</p>  |

## AJ:DTC P0171 SYSTEM TOO LEAN (BANK 1)

Refer to DTC P0172 for diagnostic procedure. <Ref. to EN(H4SO)(diag)-160, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AK:DTC P0172 SYSTEM TOO RICH (BANK 1)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-65, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**

| Step     | Check  | Yes   | No  |
|----------|--|---|---|
| <b>1</b> | <b>CHECK EXHAUST SYSTEM.</b>   | Are there holes or loose bolts on exhaust system?                                     | Repair exhaust system.<br>Go to step 2.   |
| <b>2</b> | <b>CHECK AIR INTAKE SYSTEM.</b>  | Are there holes, loose bolts or disconnection of hose on air intake system?           | Repair air intake system.<br>Go to step 3.  |
| <b>3</b> | <b>CHECK FUEL PRESSURE.</b><br><b>Warning:</b> <ul style="list-style-type: none"> <li>• Place “NO FIRE” signs near the working area.</li> <li>• Be careful not to spill fuel on the floor.</li> </ul> Measure the fuel pressure. <Ref. to ME(H4SO)-29, INSPECTION, Fuel Pressure.><br><b>Warning:</b><br>Before removing the fuel pressure gauge, release fuel pressure.<br>NOTE:<br>If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.  | Is the fuel pressure 339.5 — 360.5 kPa (3.5 — 3.7 kgf/cm <sup>2</sup> , 49 — 52 psi)? | Go to step 4.<br><br>Repair the following items.<br>Fuel pressure too high: <ul style="list-style-type: none"> <li>• Clogged fuel return line or bent hose</li> </ul> Fuel pressure too low: <ul style="list-style-type: none"> <li>• Improper fuel pump discharge</li> <li>• Clogged fuel supply line</li> </ul> |
| <b>4</b> | <b>CHECK ENGINE COOLANT TEMPERATURE SENSOR.</b><br>1) Start the engine and warm-up completely.<br>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.<br>NOTE:<br><ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br><ul style="list-style-type: none"> <li>• General scan tool</li> </ul> For detailed operation procedures, refer to the general scan tool instruction manual. | Is the engine coolant temperature more than 60°C (140°F)?                             | Go to step 5.<br><br>Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-22, Engine Coolant Temperature Sensor.>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No  |
|--|---|--|---|
| <p><b>5</b></p> <p><b>CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR SIGNAL.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2) Place the select lever or shift lever in “N” or “P” range.</p> <p>3) Turn the A/C switch to OFF.</p> <p>4) Turn all accessory switches to OFF.</p> <p>5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the general scan tool instruction manual.</p>   | <p>Is the measured value 2.1 — 3.4 g/s (0.28 — 0.45 lb/m)?</p>  | <p>Go to step 6.</p>   | <p>Replace the mass air flow and intake air temperature sensor. &lt;Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p> |
| <p><b>6</b></p> <p><b>CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2) Place the select lever or shift lever in neutral position.</p> <p>3) Turn the A/C switch to OFF.</p> <p>4) Turn all accessory switches to OFF.</p> <p>5) Open the front hood.</p> <p>6) Measure the ambient temperature.</p> <p>7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p> | <p>Subtract ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?</p> | <p>Contact your SOA Service Center since deterioration of some parts may be the cause.</p> | <p>Check the mass air flow and intake air temperature sensor. &lt;Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AL:DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE

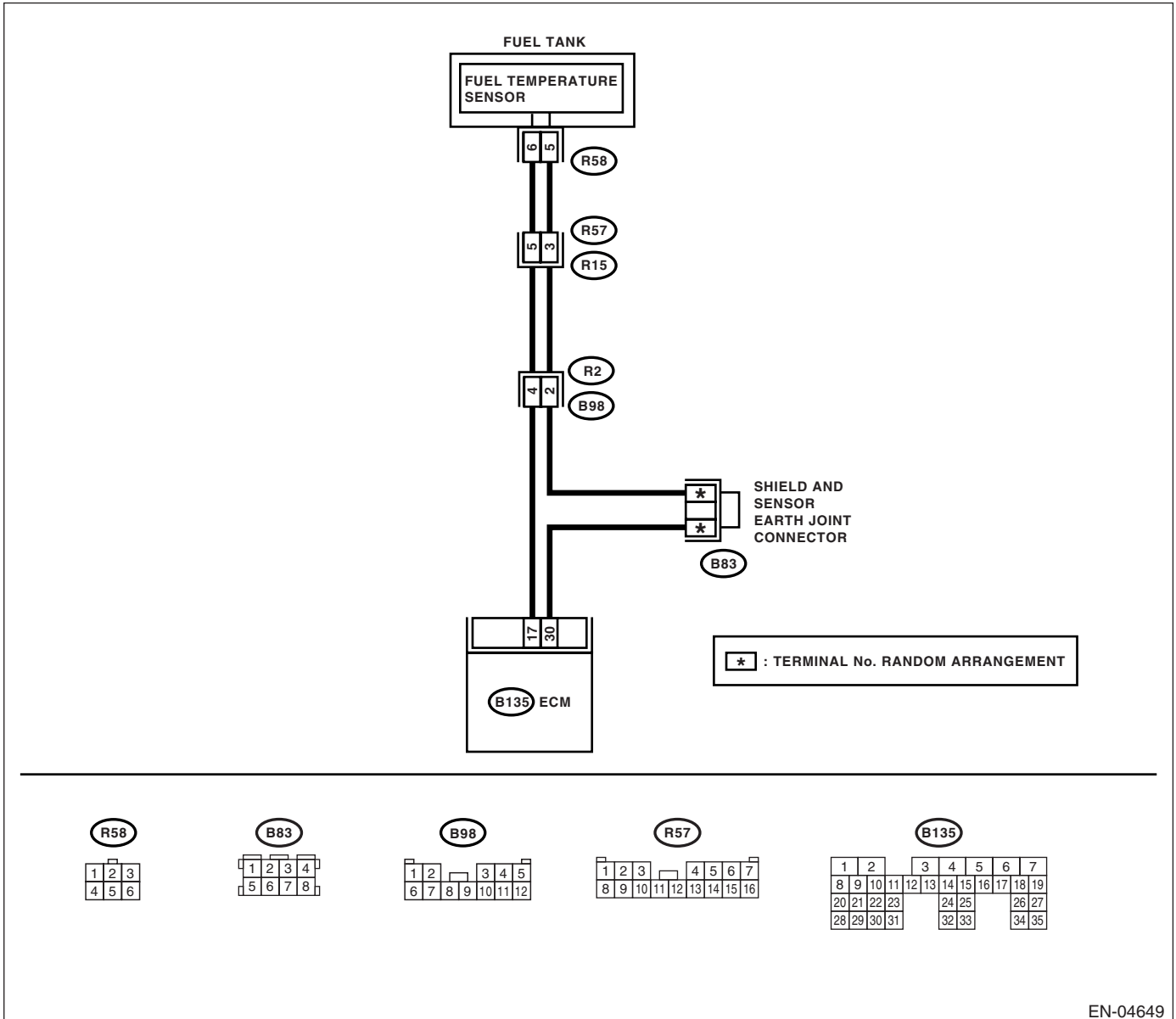
### DTC DETECTING CONDITION:

- Fault occurs in two consecutive driving cycles
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-67, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                       | Yes  | No  |
|---|-----------------------------|--|---|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0181. | Replace the fuel temperature sensor. <Ref. to EC(H4SO)-9, Fuel Temperature Sensor.> |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AM:DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT

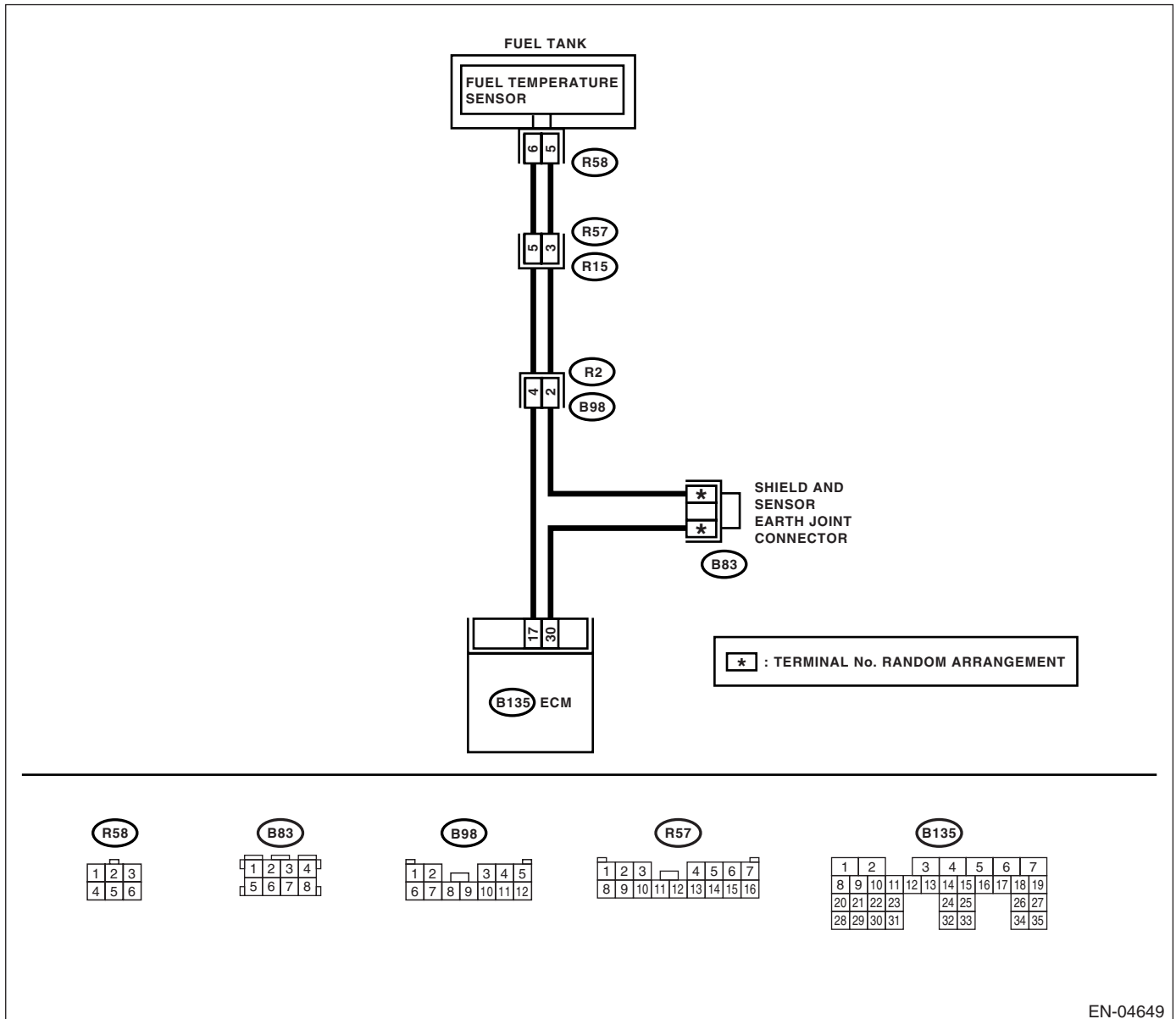
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-70, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04649

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No  |
|--|---|--|---|
| <p><b>1</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Start the engine.</p> <p>2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"><li>• Subaru Select Monitor</li></ul> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"><li>• General scan tool</li></ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p>   | <p>Is the fuel temperature 150°C (302°F)?</p> | <p>Go to step 2.</p>   | <p>The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.</p> |
| <p><b>2</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Turn ignition switch to OFF.</p> <p>2) Remove the access hole lid.</p> <p>3) Disconnect the connector from fuel pump.</p> <p>4) Turn ignition switch to ON.</p> <p>5) Read the data of fuel temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"><li>• Subaru Select Monitor</li></ul> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"><li>• General scan tool</li></ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the fuel temperature -40°C (-40°F)?</p> | <p>Replace the fuel temperature sensor. &lt;Ref. to EC(H4SO)-9, Fuel Temperature Sensor.&gt;</p> | <p>Repair short circuit to ground in harness between fuel pump and ECM connector.</p>                                     |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AN:DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT

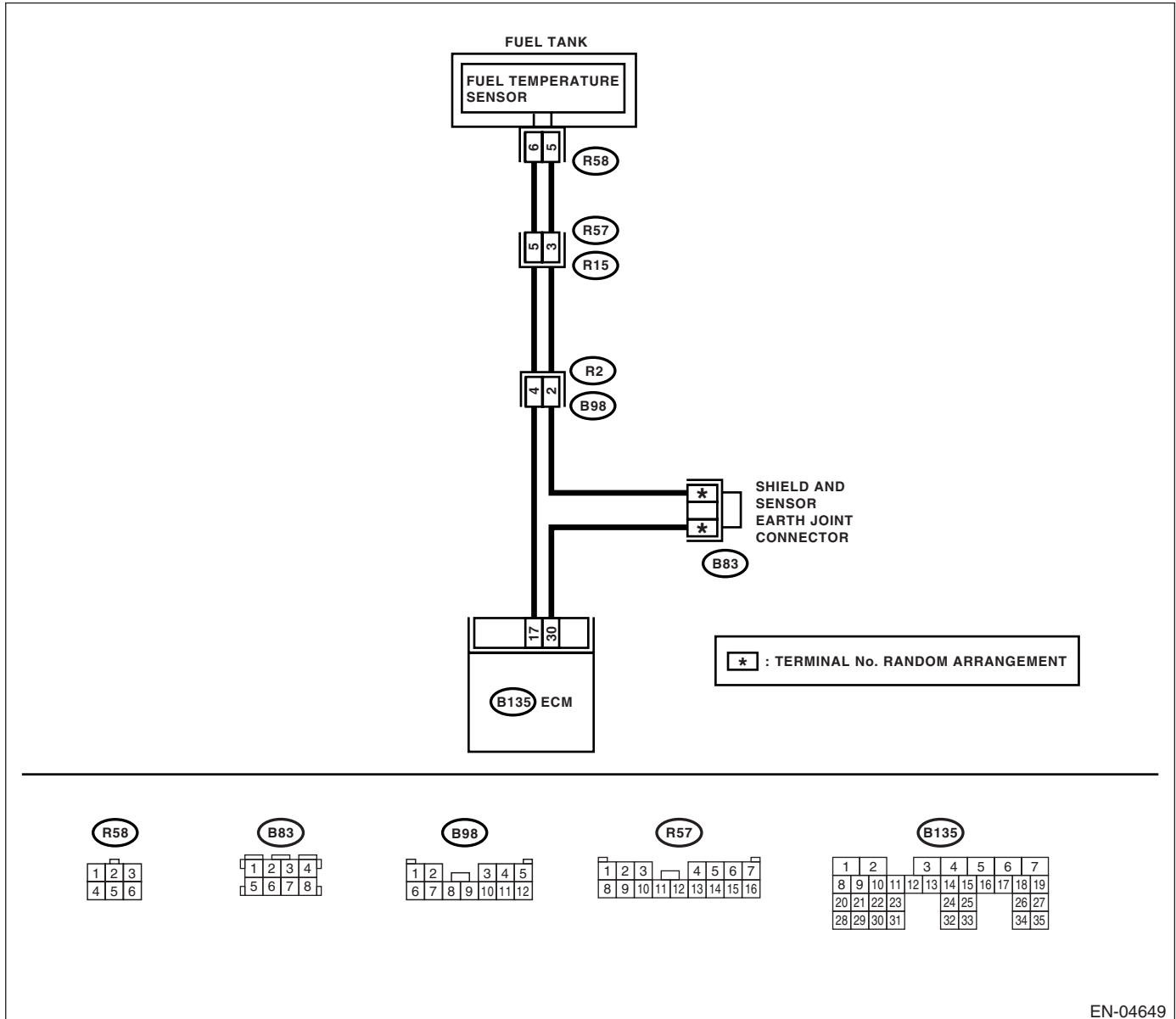
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-71, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04649

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <b>1 CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the fuel temperature $-40^{\circ}\text{C}$ ( $-40^{\circ}\text{F}$ )? | Go to step 2.   | Repair poor contact.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Poor contact in fuel pump connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector<br>• Poor contact in joint connector                                      |
| <b>2 CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Remove the access hole lid.<br>3) Disconnect the connector from fuel pump.<br>4) Measure the voltage between fuel pump connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(R58) No. 6 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?   | Repair short circuit to battery in harness between ECM and fuel pump connector. | Go to step 3.   |
| <b>3 CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between fuel pump connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(R58) No. 6 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?   | Repair short circuit to battery in harness between ECM and fuel pump connector. | Go to step 4.   |
| <b>4 CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>Measure the voltage between fuel pump connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(R58) No. 6 (+) — Chassis ground (-):</b>  | Is the voltage more than 4 V?  | Go to step 5.   | Repair harness and connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM and fuel pump connector<br>• Poor contact in fuel pump connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <p><b>5</b></p> <p><b>CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM.<br/>                     3) Measure the resistance of harness between fuel pump connector and ECM.</p> <p><b>Connector &amp; terminal</b><br/> <b>(R58) No. 5 — (B135) No. 30:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p> | <p>Replace the fuel temperature sensor. &lt;Ref. to EC(H4SO)-9, Fuel Temperature Sensor.&gt;</p> | <p>Repair harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and fuel pump connector</li> <li>• Poor contact in fuel pump connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AO:DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-73, DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

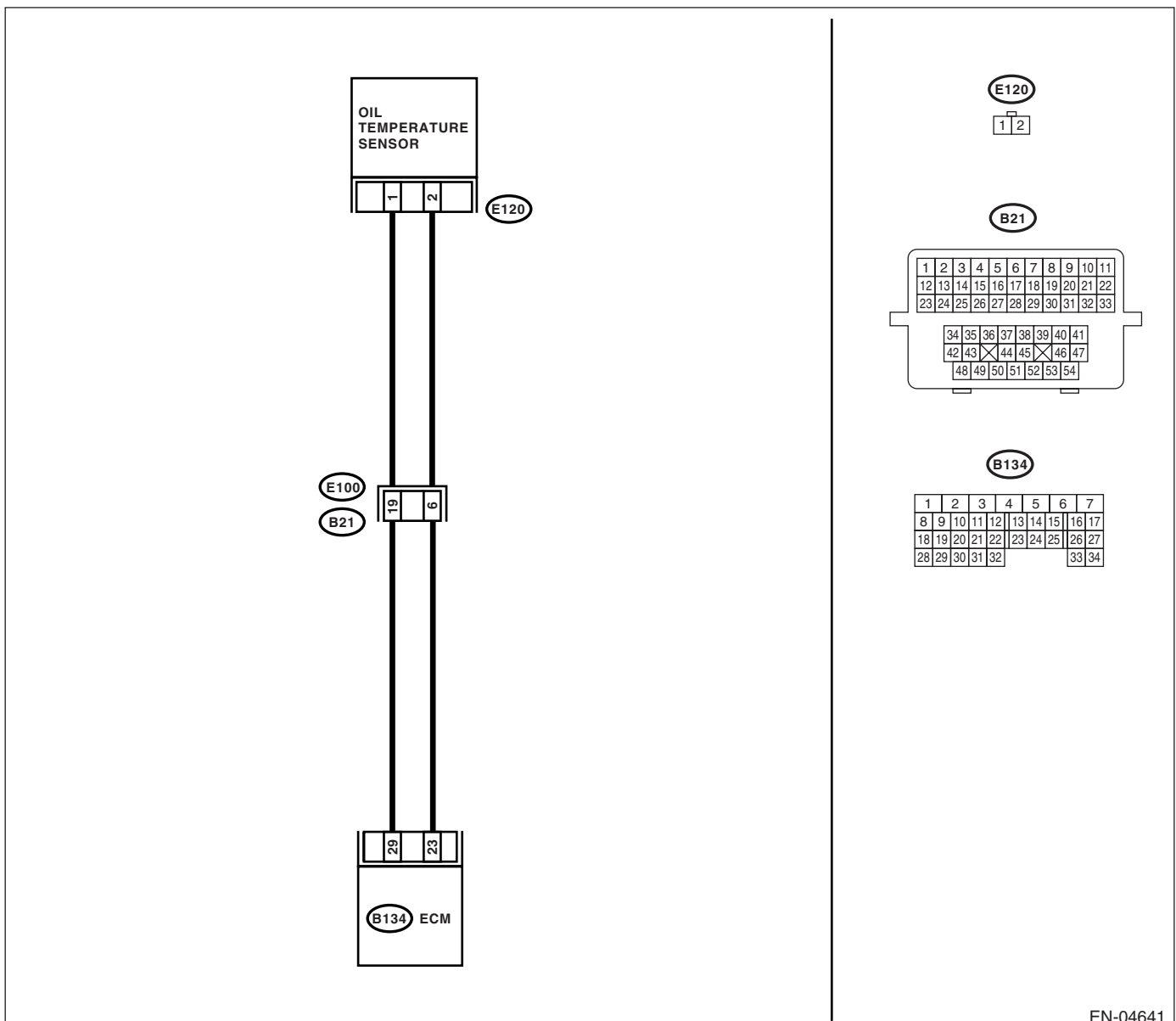
### TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04641

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                       | Yes   | No   |
|---|-----------------------------|---|--|
| 1<br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Using the List of "Diagnostic Trouble Code (DTC)", check the appropriate DTC. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0196. | Replace the oil temperature sensor. <Ref. to FU(H4SO)-35, Oil Temperature Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AP:DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-74, DTC P0197 ENGINE OIL TEMPERATURE SENSOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

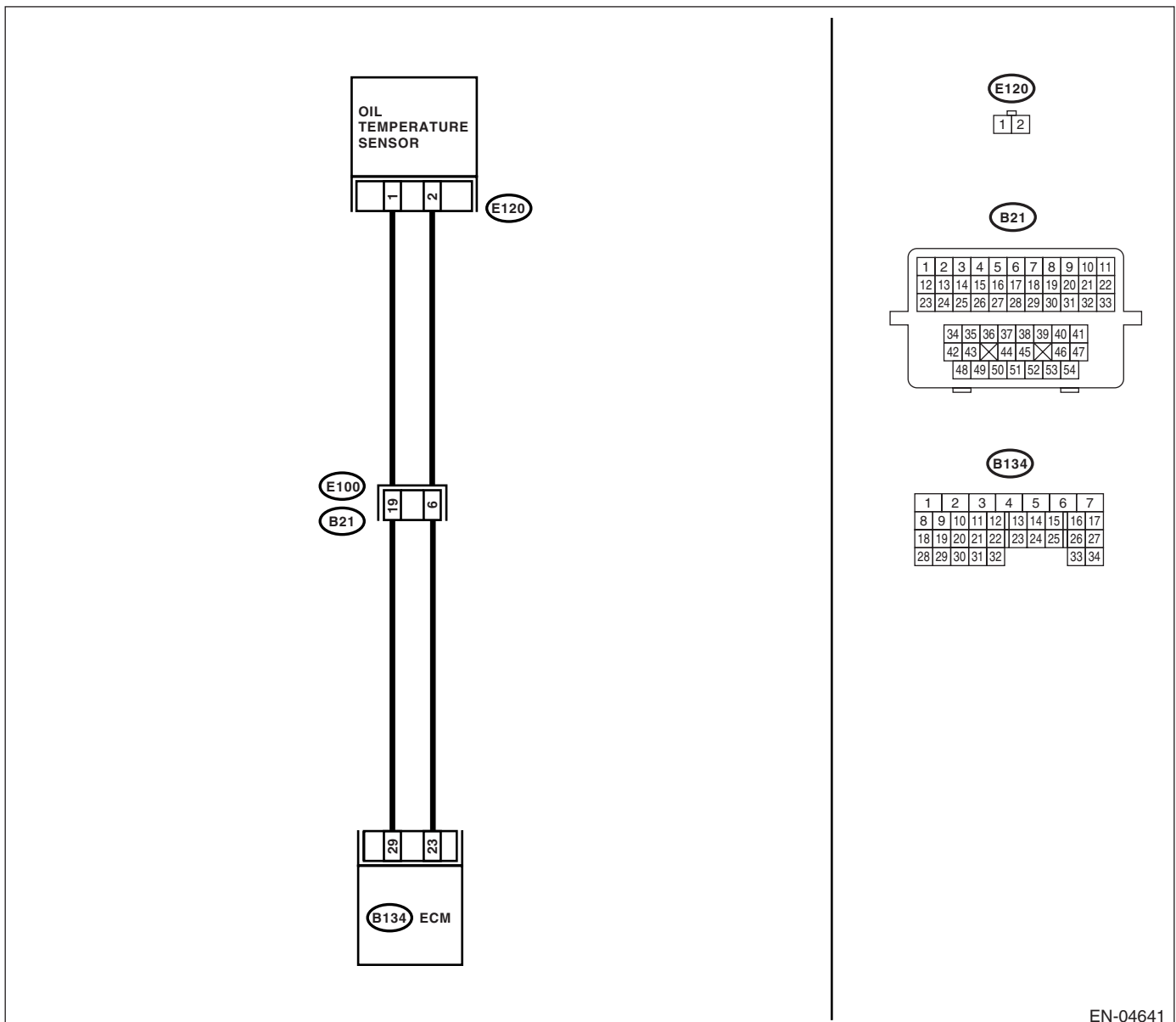
### TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04641



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes                      | No   |
|--|--|--------------------------|--|
| <b>1</b><br><b>CHECK HARNESS BETWEEN OIL TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Disconnect the ECM connector and oil temperature sensor connector.<br>2) Measure the resistance of harness between oil temperature sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 23 — Engine ground:</i><br><i>(B134) No. 29 — Engine ground:</i> | Is the resistance more than 1 M $\Omega$ ?                 | Go to step 2.            | Repair the ground short circuit between ECM and oil temperature sensor connector.  |
| <b>2</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in oil temperature sensor connector.  | Is there poor contact in oil temperature sensor connector? | Repair the poor contact. | Replace the oil temperature sensor. <Ref. to FU(H4SO)-35, Oil Temperature Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AQ:DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-75, DTC P0198 ENGINE OIL TEMPERATURE SENSOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

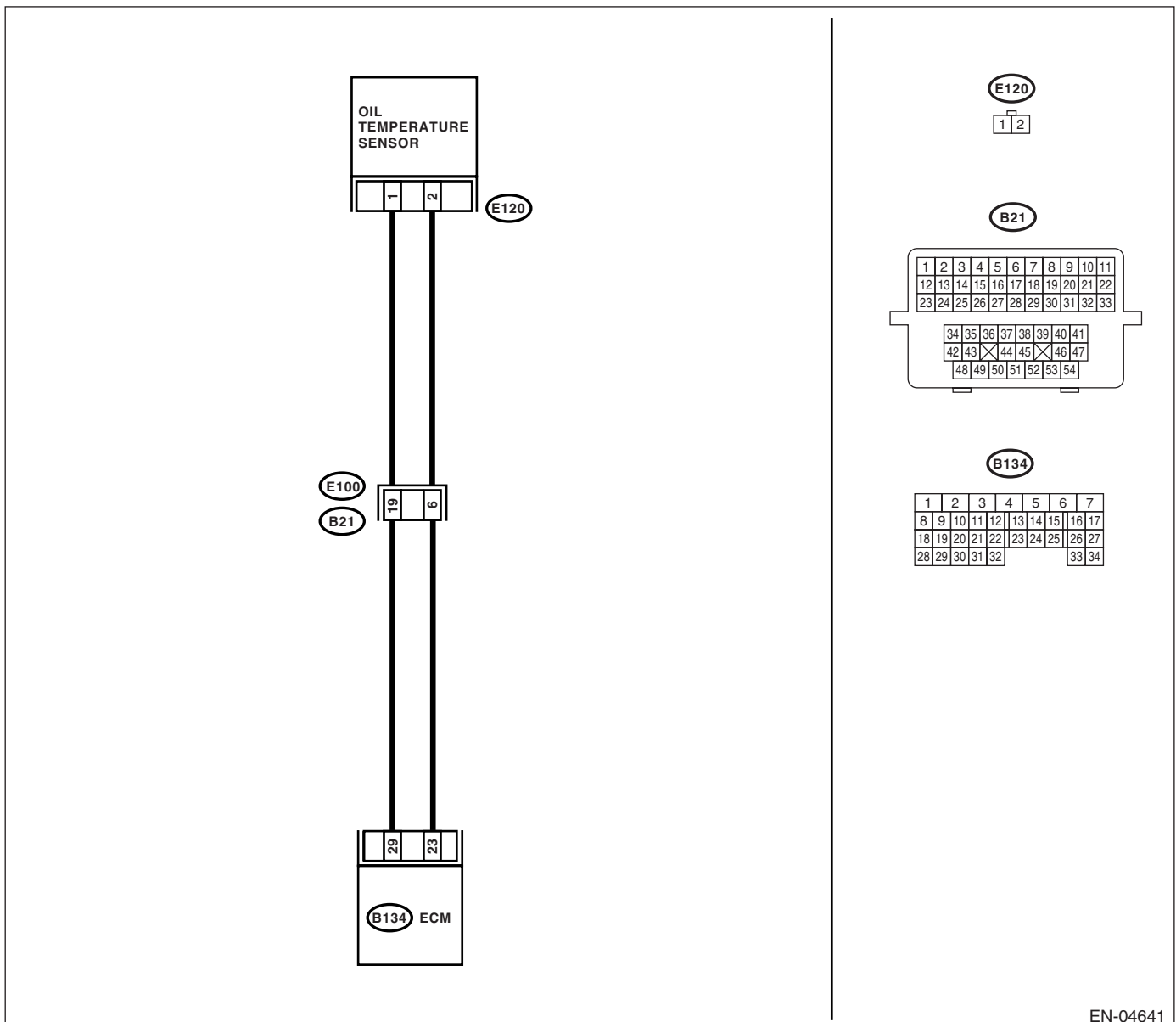
### TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04641

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes   | No  |
|--|--|---|---|
| <b>1</b><br><b>CHECK HARNESS BETWEEN OIL TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from oil temperature sensor.<br>3) Measure the voltage between oil temperature sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E120) No. 2 (+) — Engine ground (-):</b> | Is the voltage more than 10 V?           | Repair the battery short circuit in harness between ECM and oil temperature sensor connector. | Go to step 2.   |
| <b>2</b><br><b>CHECK HARNESS BETWEEN OIL TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between oil temperature sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E120) No. 2 (+) — Engine ground (-):</b>  | Is the voltage more than 10 V?           | Repair the battery short circuit in harness between ECM and oil temperature sensor connector. | Go to step 3.   |
| <b>3</b><br><b>CHECK HARNESS BETWEEN OIL TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>Measure the voltage between oil temperature sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E120) No. 2 (+) — Engine ground (-):</b>   | Is the voltage more than 4 V?            | Go to step 4.   | Repair harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and oil temperature sensor connector</li> <li>• Poor contact in oil temperature sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connectors</li> </ul>  |
| <b>4</b><br><b>CHECK HARNESS BETWEEN OIL TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the voltage between oil temperature sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E120) No. 1 — Engine ground:</b>   | Is the resistance less than 5 $\Omega$ ? | Replace the oil temperature sensor. <Ref. to FU(H4SO)-35, Oil Temperature Sensor.>            | Repair harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and oil temperature sensor connector</li> <li>• Poor contact in oil temperature sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connectors</li> <li>• Poor contact in joint connector</li> </ul> |

## **AR:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT**

### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-76, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance
- Engine stalls.

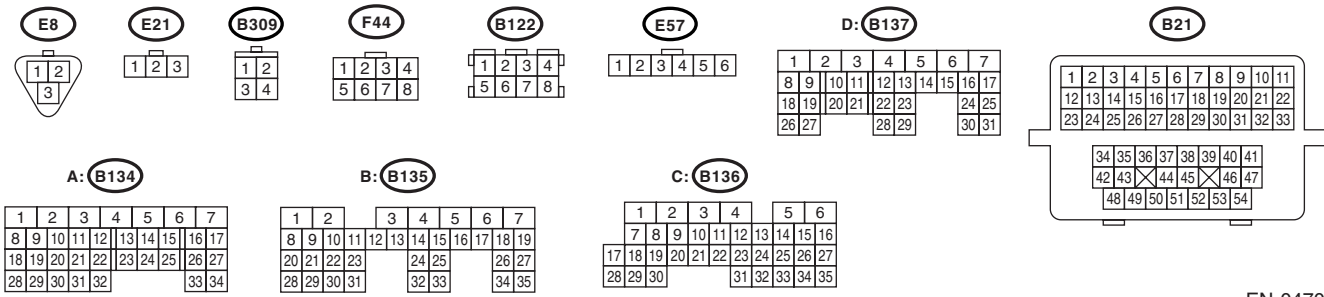
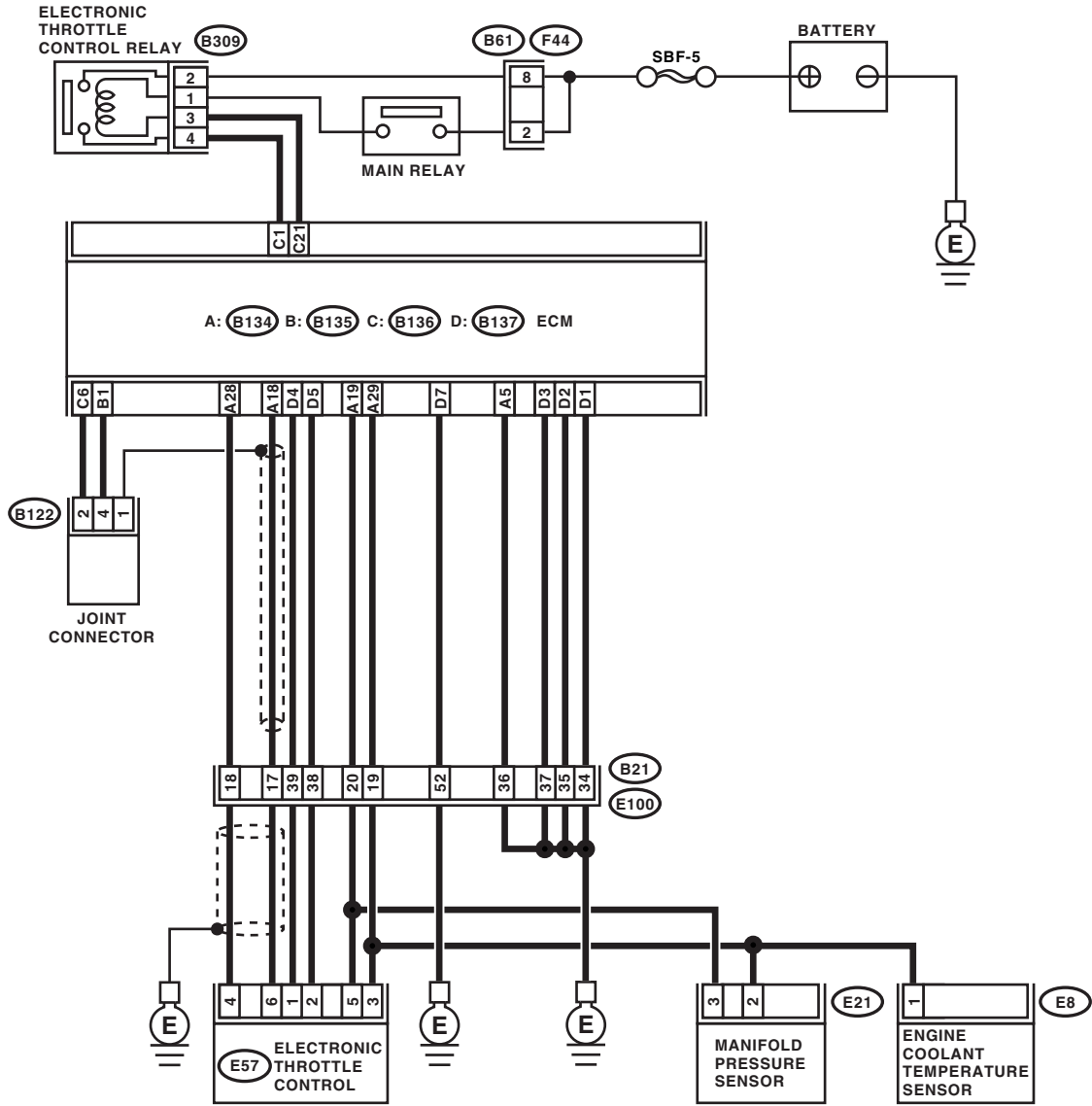
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04700

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No   |
|--|--|---|--|
| <b>1 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Read data of sub throttle sensor signal using Subaru Select Monitor.  | Is the measured value more than 0.8 V?   | Go to step 2.   | Go to step 3.  |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in the connectors between the ECM and electronic throttle control.  | Is there poor contact in the connectors between ECM and electronic throttle control? | Repair the poor contact in connectors.  | Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.               |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from electronic throttle control.<br>4) Measure the resistance between the ECM connector and electronic throttle control connector.<br><br><i>Connector &amp; terminal<br/>(B134) No. 28 — (E57) No. 4:</i> | Is the measured value less than 1 Ω?   | Go to step 4.   | Repair the open harness connector.   |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>Check the resistance between the ECM connector and chassis ground.<br><br><i>Connector &amp; terminal<br/>(B134) No. 28 — Chassis ground:</i>   | Is the measured value more than 1 MΩ?  | Go to step 5.   | Repair the ground short of harness.  |
| <b>5 CHECK POWER SUPPLY TO SENSOR.</b><br>1) Connect the ECM connectors.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electronic throttle control connector and engine ground.<br><br><i>Connector &amp; terminal<br/>(E57) No. 5 (+) — Engine ground (-):</i>  | Is the measured value within 4.5 to 5.5 V?   | Go to step 6.   | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).>  |
| <b>6 CHECK SHORT OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electronic throttle control connector and engine ground.<br><br><i>Connector &amp; terminal<br/>(E57) No. 4 — Engine ground:</i>  | Is the measured value more than 10 Ω?  | Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control. <Ref. to FU(H4SO)-12, Throttle Body.> | Repair the poor contact in ECM connectors. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **AS:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT**

#### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-77, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance
- Engine stalls.

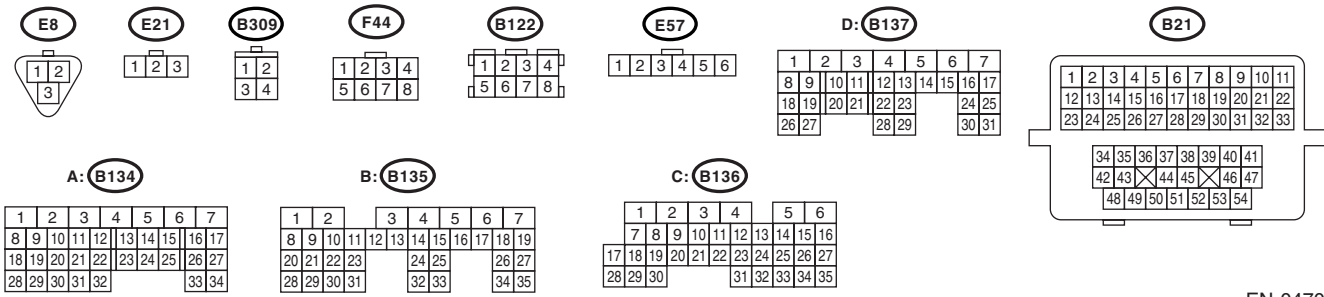
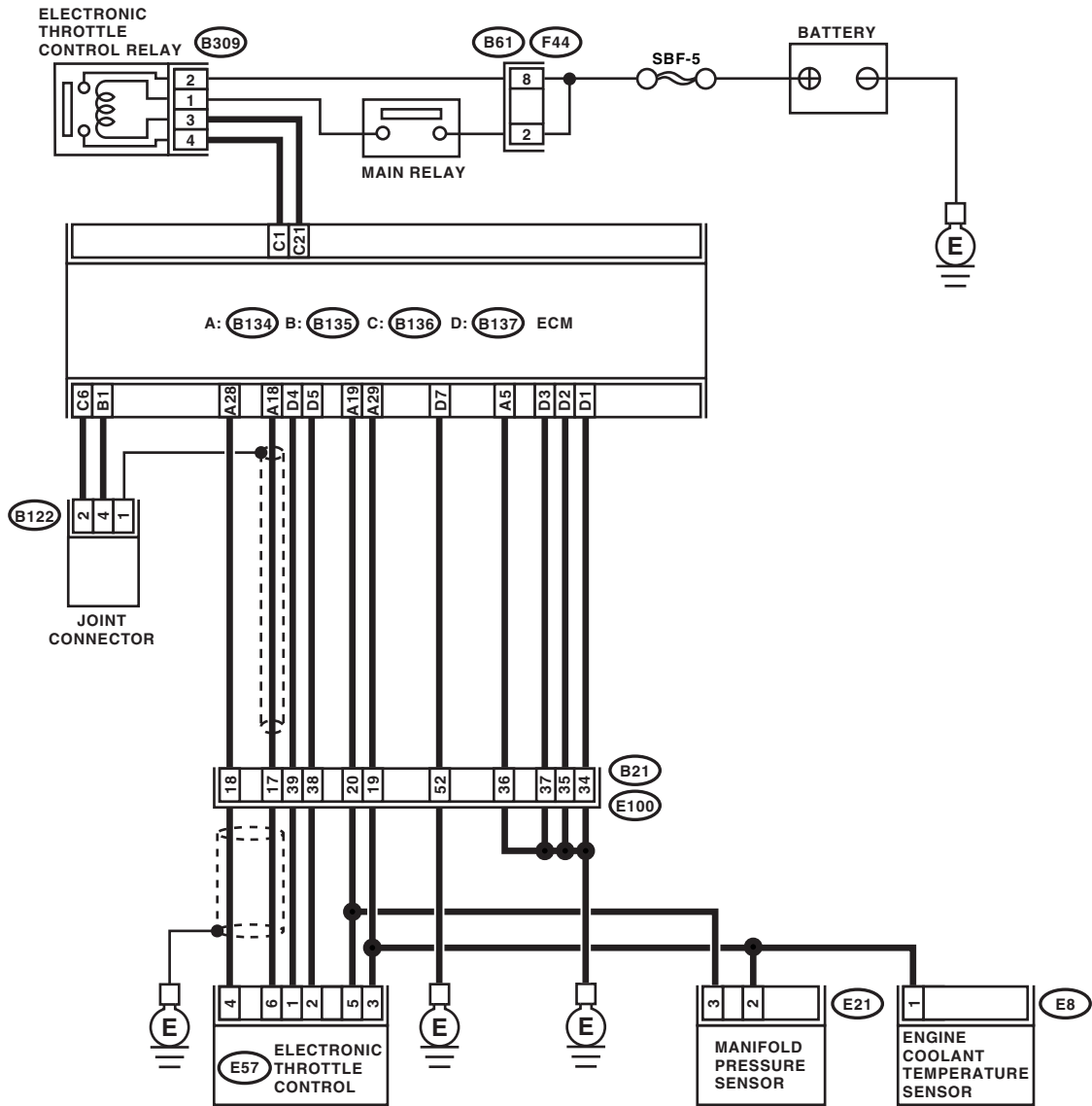
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04700



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <b>1 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of sub throttle sensor signals, using the Subaru Select Monitor.  | Is the measured value less than 4.73 V?  | Go to step 2.   | Go to step 3.   |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electronic throttle control.  | Is there poor contact in the connectors between ECM and electronic throttle control? | Repair the poor contact in connectors.  | Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.                  |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM.<br>3) Disconnect the connectors from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 28 — (E57) No. 4:</b> | Is the measured value less than 1 Ω?   | Go to step 4.   | Repair the open circuit of harness connector.   |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between the electronic throttle control connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 3 — Engine ground:</b>   | Is the measured value less than 5 Ω?   | Go to step 5.   | Repair the poor contact in ECM connector. If the problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |
| <b>5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electronic throttle control connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 5 (+) — Engine ground (-):</b>  | Is the measured value less than 10 V?  | Go to step 6.   | Repair the battery short of harness between ECM connector and electronic throttle control connector.                                    |
| <b>6 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>Measure the voltage between the electronic throttle control connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 4 (+) — Engine ground (-):</b>  | Is the measured value less than 10 V?  | Go to step 7.   | Repair the short of harness between ECM connector and electronic throttle control connector.  |
| <b>7 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the voltage between connectors.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 28 — (B134) No. 19:</b>  | Is the measured value more than 1 MΩ?  | Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control. <Ref. to FU(H4SO)-12, Throttle Body.> | Short circuit of sensor power supply may be the cause.  |

## **AT:DTC P0301 CYLINDER 1 MISFIRE DETECTED**

**NOTE:**

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO)(diag)-182, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## **AU:DTC P0302 CYLINDER 2 MISFIRE DETECTED**

**NOTE:**

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO)(diag)-182, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## **AV:DTC P0303 CYLINDER 3 MISFIRE DETECTED**

**NOTE:**

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO)(diag)-182, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AW:DTC P0304 CYLINDER 4 MISFIRE DETECTED

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-83, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

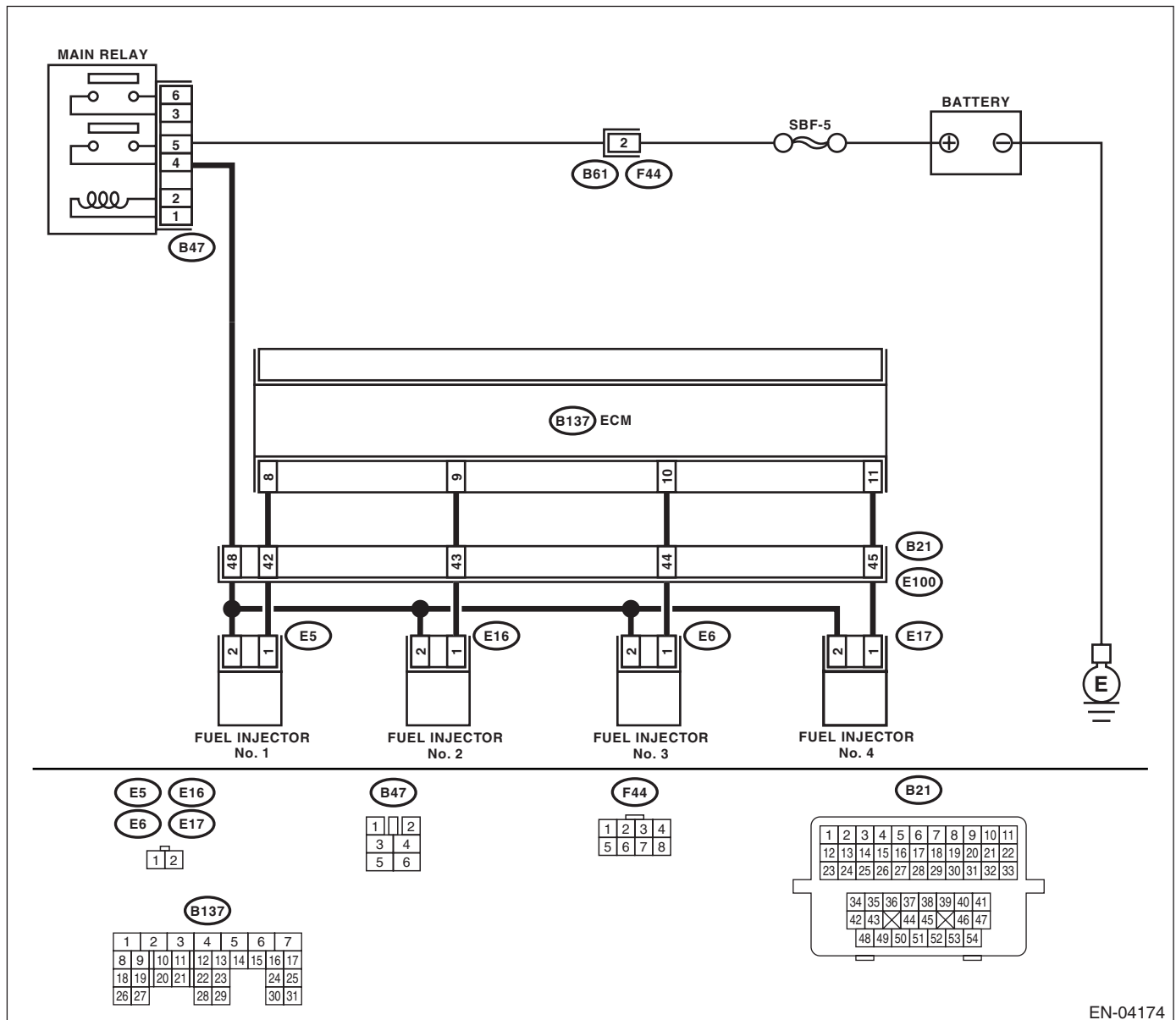
### TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling
- Rough driving

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04174

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                             | Yes  | No   |
|--|-----------------------------------|--|--|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?       | Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0301, P0302, P0303 and P0304. | Go to step 2.  |
| <b>2</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector and chassis ground on faulty cylinders.<br><b>Connector &amp; terminal</b><br><i>#1 (B137) No. 8 (+) — Chassis ground (-):</i><br><i>#2 (B137) No. 9 (+) — Chassis ground (-):</i><br><i>#3 (B137) No. 10 (+) — Chassis ground (-):</i><br><i>#4 (B137) No. 11 (+) — Chassis ground (-):</i>  | Is the voltage more than 10 V?    | Go to step 7.  | Go to step 3.  |
| <b>3</b><br><b>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from fuel injector on faulty cylinders.<br>3) Measure the resistance between ECM connector and engine ground on faulty cylinders.<br><b>Connector &amp; terminal</b><br><i>#1 (E5) No. 1 — Engine ground:</i><br><i>#2 (E16) No. 1 — Engine ground:</i><br><i>#3 (E6) No. 1 — Engine ground:</i><br><i>#4 (E17) No. 1 — Engine ground:</i> | Is the resistance more than 1 MΩ? | Go to step 4.  | Repair ground short circuit in harness between fuel injector and ECM connector.  |
| <b>4</b><br><b>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</b><br>Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders.<br><b>Connector &amp; terminal</b><br><i>#1 (B137) No. 8 — (E5) No. 1:</i><br><i>#2 (B137) No. 9 — (E16) No. 1:</i><br><i>#3 (B137) No. 10 — (E6) No. 1:</i><br><i>#4 (B137) No. 11 — (E17) No. 1:</i>   | Is the resistance less than 1 Ω?  | Go to step 5.  | Repair harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ECM and fuel injector connector<br>• Poor contact in coupling connector |
| <b>5</b><br><b>CHECK FUEL INJECTOR.</b><br>Measure the resistance between fuel injector terminals on faulty cylinder.<br><b>Terminals</b><br><i>No. 1 — No. 2:</i>   | Is the resistance 5 — 20 Ω?       | Go to step 6.  | Replace the faulty fuel injector. <Ref. to FU(H4SO)-30, Fuel Injector.>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <b>6 CHECK POWER SUPPLY LINE.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between fuel injector and engine ground on faulty cylinders.<br><b>Connector &amp; terminal</b><br><b>#1 (E5) No. 2 (+) — Engine ground (-):</b><br><b>#2 (E16) No. 2 (+) — Engine ground (-):</b><br><b>#3 (E6) No. 2 (+) — Engine ground (-):</b><br><b>#4 (E17) No. 2 (+) — Engine ground (-):</b>   | Is the voltage more than 10 V?   | Repair poor contact in all connectors in fuel injector circuit.   | Repair harness and connector.<br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and fuel injector connector on faulty cylinders</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in main relay connector</li> <li>• Poor contact in fuel injector connector on faulty cylinders</li> </ul> |
| <b>7 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from fuel injector on faulty cylinder.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between ECM connector and chassis ground on faulty cylinders.<br><b>Connector &amp; terminal</b><br><b>#1 (B137) No. 8 (+) — Chassis ground (-):</b><br><b>#2 (B137) No. 9 (+) — Chassis ground (-):</b><br><b>#3 (B137) No. 10 (+) — Chassis ground (-):</b><br><b>#4 (B137) No. 11 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?   | Repair battery short circuit in harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> | Go to step 8.  |
| <b>8 CHECK FUEL INJECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between fuel injector terminals on faulty cylinder.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>  | Is the resistance less than 1 $\Omega$ ?   | Replace the faulty fuel injector <Ref. to FU(H4SO)-30, Fuel Injector.> and ECM <Ref. to FU(H4SO)-38, Engine Control Module (ECM).>                        | Go to step 9.  |
| <b>9 CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.</b>   | Is the camshaft position sensor or crankshaft position sensor loosely installed? | Tighten camshaft position sensor or crankshaft position sensor.   | Go to step 10.   |
| <b>10 CHECK CRANK SPROCKET.</b><br>Remove the timing belt cover.  | Is the crank sprocket rusted or does it have broken teeth?                       | Replace the crank sprocket. <Ref. to ME(H4SO)-50, Crank Sprocket.>  | Go to step 11.   |
| <b>11 CHECK INSTALLATION CONDITION OF TIMING BELT.</b><br>Turn the crankshaft using ST, and align alignment mark on crank sprocket with alignment mark on cylinder block.<br>ST 499987500 CRANKSHAFT SOCKET   | Is the timing belt dislocated from its proper position?                          | Repair installation condition of timing belt. <Ref. to ME(H4SO)-44, Timing Belt.>   | Go to step 12.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No   |
|--|---|--|--|
| <b>12</b><br><b>CHECK FUEL LEVEL.</b>  | Is the fuel meter indication higher than the "Lower" level?   | Go to step <b>13</b> .   | Replenish fuel so fuel meter indication is higher than the "Lower" level. After replenishing fuel, Go to step <b>13</b> .  |
| <b>13</b><br><b>CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.</b><br>1) Clear the memory using Subaru Select Monitor.<br><Ref. to EN(H4SO)(diag)-46, Clear Memory Mode.><br>2) Start the engine, and drive the vehicle more than 10 minutes.  | Does the malfunction indicator light illuminate or blink?   | Go to step <b>16</b> .   | Go to step <b>14</b> .   |
| <b>14</b><br><b>CHECK CAUSE OF MISFIRE DIAGNOSED.</b>  | Was the cause of misfire identified when the engine is running? Ex. Disconnection of spark plug cord. | Finish diagnostics operation, if the engine has no abnormality.  | Go to step <b>15</b> .   |
| <b>15</b><br><b>CHECK FOR POOR CONTACT.</b>  | Is there poor contact in the ignition coil, fuel injector, ECM and coupling connector?                | Repair poor contact.   | Contact your SOA Service Center after checking followings.<br><b>NOTE:</b><br>In this case, check the following:<br><ul style="list-style-type: none"> <li>• Condition of fuel</li> <li>• Fuel additive used or not</li> <li>• Visually check spark plug</li> <li>• Visually check spark plug cord</li> <li>• Condition of engine oil</li> </ul> |
| <b>16</b><br><b>CHECK AIR INTAKE SYSTEM.</b>   | Is there a fault in air intake system?  | Repair air intake system.<br><b>NOTE:</b><br>Check the following items:<br><ul style="list-style-type: none"> <li>• Are there air leaks or air suction caused by loose or dislocated nuts and bolts?</li> <li>• Are there cracks or any disconnection of hoses?</li> </ul> | Go to step <b>17</b> .   |
| <b>17</b><br><b>CHECK MISFIRE SYMPTOM.</b><br>1) Turn the ignition switch to ON.<br>2) Read the DTC.<br><b>NOTE:</b><br><ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br><ul style="list-style-type: none"> <li>• General scan tool</li> </ul> For detailed operation procedures, refer to the General Scan Tool Operation Manual. | Does the Subaru Select Monitor or general scan tool display only one DTC?                             | Go to step <b>22</b> .   | Go to step <b>18</b> .   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step      | Check   | Yes   | No   |  |
|-----------|---|---|--|--|
| <b>18</b> | <b>CHECK DTC ON DISPLAY.</b><br>Is any other DTC displayed? | Does the Subaru Select Monitor or general scan tool indicate DTC P0301 and P0302? | Go to step <b>23</b> .   | Go to step <b>19</b> .   |
| <b>19</b> | <b>CHECK DTC ON DISPLAY.</b><br>Is any other DTC displayed? | Does the Subaru Select Monitor or general scan tool indicate DTC P0303 and P0304? | Go to step <b>24</b> .   | Go to step <b>20</b> .   |
| <b>20</b> | <b>CHECK DTC ON DISPLAY.</b><br>Is any other DTC displayed? | Does the Subaru Select Monitor or general scan tool indicate DTC P0301 and P0303? | Go to step <b>25</b> .   | Go to step <b>21</b> .   |
| <b>21</b> | <b>CHECK DTC ON DISPLAY.</b><br>Is any other DTC displayed? | Does the Subaru Select Monitor or general scan tool indicate DTC P0302 and P0304? | Go to step <b>26</b> .   | Go to step <b>27</b> .   |
| <b>22</b> | <b>ONLY ONE CYLINDER</b>                                    | Is there a fault in that cylinder?  | Repair or replace faulty parts.<br><br>NOTE:<br>Check the following items.<br><ul style="list-style-type: none"> <li>• Spark plug</li> <li>• Spark plug cord</li> <li>• Fuel injector</li> <li>• Compression ratio</li> </ul>  | Go to DTC P0171.<br><Ref. to EN(H4SO)(diag)-159, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| <b>23</b> | <b>GROUP OF #1 AND #2 CYLINDERS</b>                         | Are there faults in #1 and #2 cylinders?  | Repair or replace faulty parts.<br><br>NOTE:<br><ul style="list-style-type: none"> <li>• Check the following items. <ul style="list-style-type: none"> <li>• Spark plugs</li> <li>• Fuel injectors</li> <li>• Ignition coil</li> <li>• Compression ratio</li> </ul> </li> <li>• If no abnormal is discovered, check for "IGNITION CONTROL SYSTEM" of #1 and #2 cylinders side.<br/>&lt;Ref. to EN(H4SO)(diag)-65, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.&gt;</li> </ul> | Go to DTC P0171.<br><Ref. to EN(H4SO)(diag)-159, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step                                      | Check                                    | Yes  | No   |
|---|--|--|--|
| 24<br><b>GROUP OF #3 AND #4 CYLINDERS</b> | Are there faults in #3 and #4 cylinders? | Repair or replace faulty parts.<br>NOTE:<br>• Check the following items.<br>• Spark plugs<br>• Fuel injectors<br>• Ignition coil<br>• If no abnormal is discovered, check for "IGNITION CONTROL SYSTEM" of #3 and #4 cylinders side.<br><Ref. to EN(H4SO)(diag)-65, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.> | Go to DTC P0171.<br><Ref. to EN(H4SO)(diag)-159, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 25<br><b>GROUP OF #1 AND #3 CYLINDERS</b> | Are there faults in #1 and #3 cylinders? | Repair or replace faulty parts.<br>NOTE:<br>Check the following items.<br>• Spark plugs<br>• Fuel injectors<br>• Skipping timing belt teeth  | Go to DTC P0171.<br><Ref. to EN(H4SO)(diag)-159, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 26<br><b>GROUP OF #2 AND #4 CYLINDERS</b> | Are there faults in #2 and #4 cylinders? | Repair or replace faulty parts.<br>NOTE:<br>Check the following items.<br>• Spark plugs<br>• Fuel injectors<br>• Compression ratio<br>• Skipping timing belt teeth   | Go to DTC P0171.<br><Ref. to EN(H4SO)(diag)-159, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 27<br><b>CYLINDER AT RANDOM</b>           | Is the engine idle rough?                | Go to DTC P0171.<br><Ref. to EN(H4SO)(diag)-159, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   | Repair or replace faulty parts.<br>NOTE:<br>Check the following items.<br>• Spark plugs<br>• Fuel injectors<br>• Compression ratio             |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AX:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-84, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

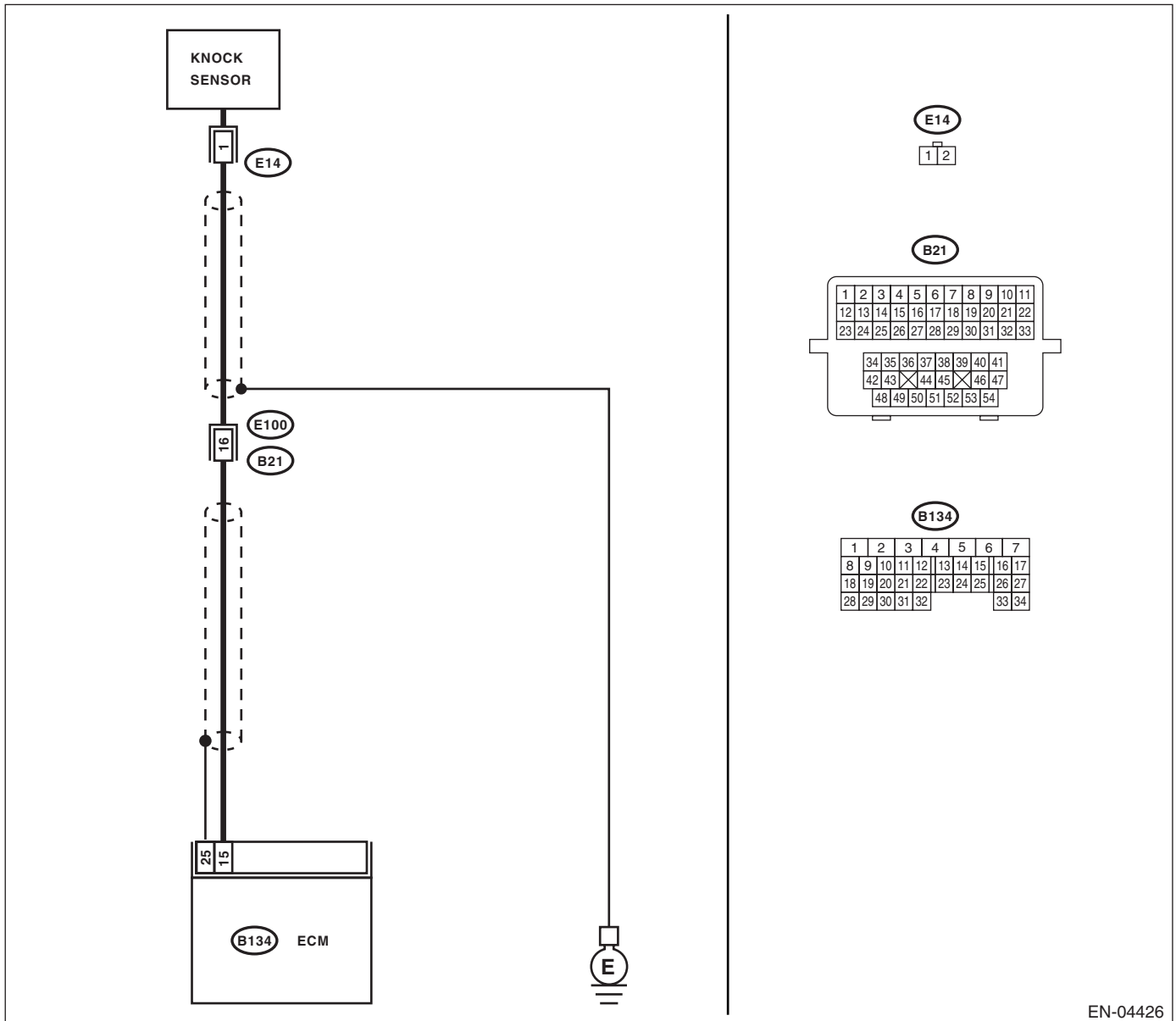
### TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04426

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No  |
|--|---|--|---|
| <b>1</b><br><b>CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance between ECM harness connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 15 — Chassis ground:</b></i> | Is the resistance more than 700 k $\Omega$ ?              | Go to step 2.  | Repair harness and connector.<br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between knock sensor and ECM connector</li> <li>• Poor contact in knock sensor connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>2</b><br><b>CHECK KNOCK SENSOR.</b><br>1) Disconnect the connector from knock sensor.<br>2) Measure the resistance between knock sensor connector terminal and engine ground.<br><i><b>Terminals</b></i><br><i><b>No. 1 — Engine ground:</b></i>  | Is the resistance more than 700 k $\Omega$ ?              | Go to step 3.  | Repair harness and connector.<br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Poor contact in knock sensor connector</li> </ul>   |
| <b>3</b><br><b>CHECK CONDITION OF KNOCK SENSOR INSTALLATION.</b>   | Is the knock sensor installation bolt tightened securely? | Replace the knock sensor. <Ref. to FU(H4SO)-25, Knock Sensor.> | Tighten knock sensor installation bolt securely.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AY:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-86, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

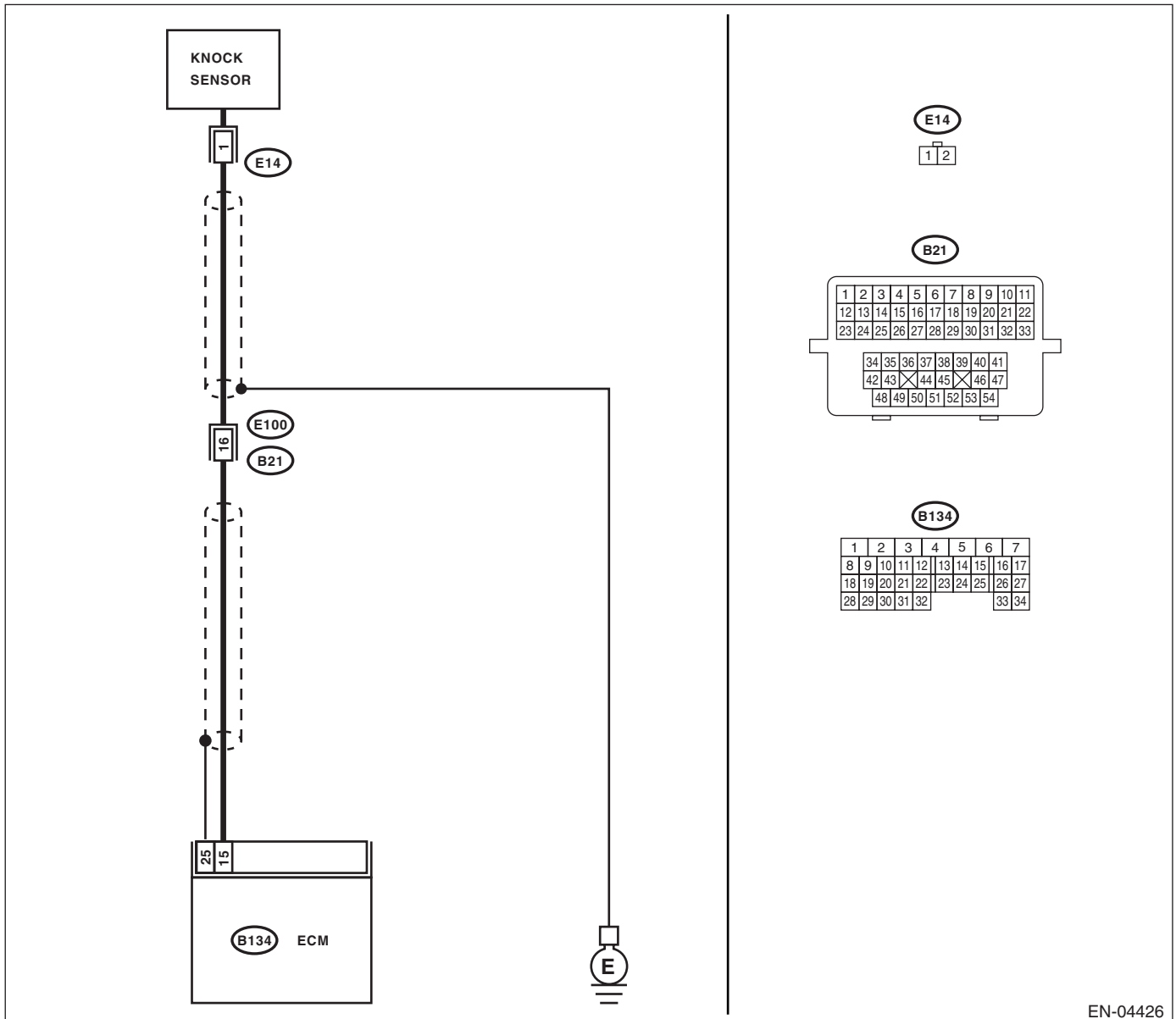
### TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04426

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <b>1</b><br><b>CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 15 — Chassis ground:</b></i>  | Is the resistance less than 400 k $\Omega$ ? | Go to step 2.  | Go to step 3.   |
| <b>2</b><br><b>CHECK KNOCK SENSOR.</b><br>1) Disconnect the connector from knock sensor.<br>2) Measure the resistance between knock sensor connector terminal and engine ground.<br><i><b>Terminals</b></i><br><i><b>No. 1 — Engine ground:</b></i>   | Is the resistance less than 400 k $\Omega$ ? | Replace the knock sensor. <Ref. to FU(H4SO)-25, Knock Sensor.>   | Repair ground short circuit in harness between knock sensor connector and ECM connector.<br><br>NOTE:<br>The harness between both connectors is shielded. Repair short circuit of harness together with shield. |
| <b>3</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Connect the connectors to ECM and knock sensor.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 15 (+) — Chassis ground (-):</b></i> | Is the voltage more than 2 V?                | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.)<br><br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Poor contact in knock sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> | Repair poor contact in ECM connector.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AZ:DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-88, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

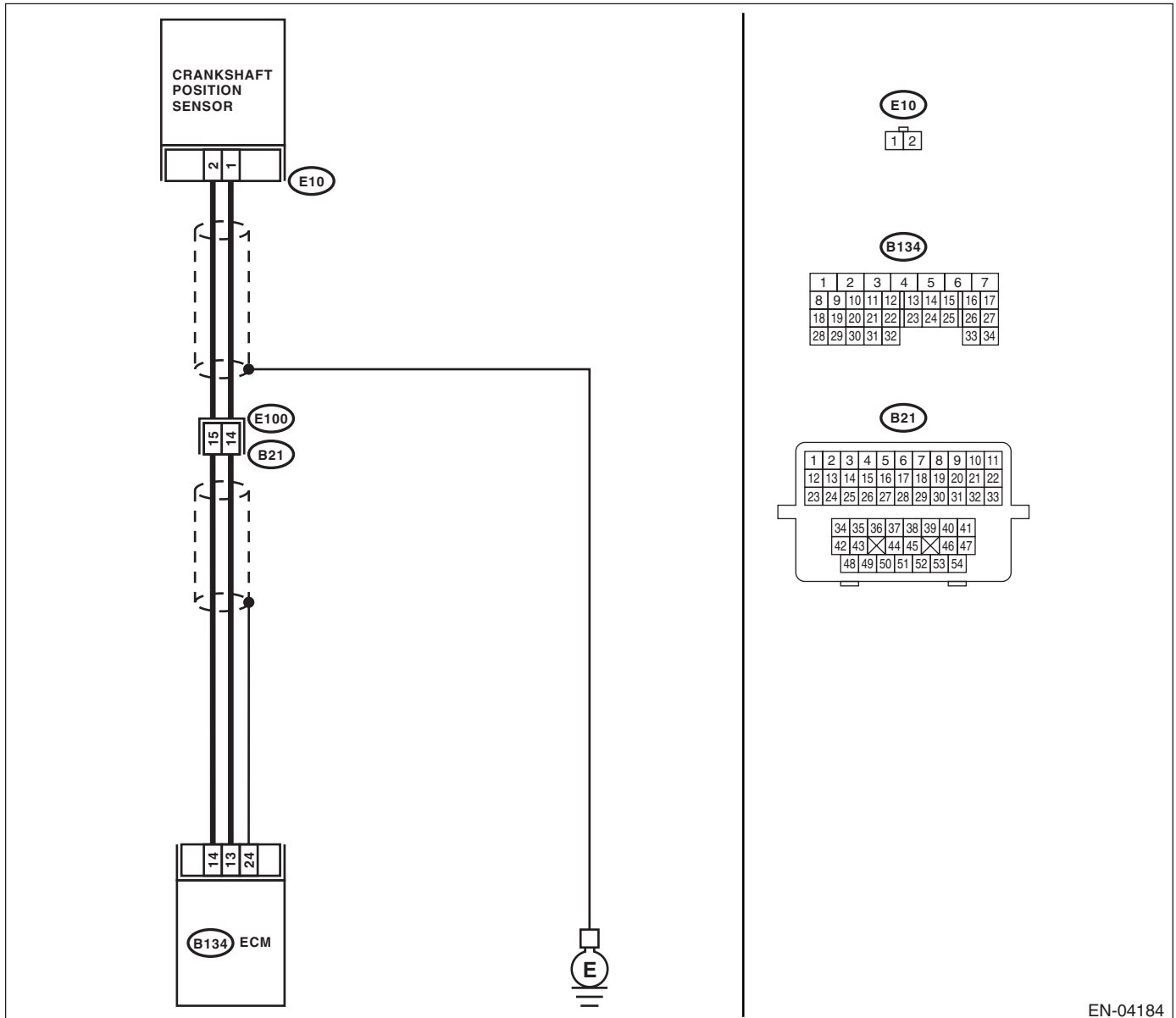
### TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04184

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from crankshaft position sensor.<br/>3) Measure the resistance of harness between crankshaft position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E10) No. 1 — Engine ground:</b></p> | <p>Is the resistance more than 100 k<math>\Omega</math>?</p>                   | <p>Repair harness and connector.</p> <p>NOTE:<br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between crankshaft position sensor and ECM connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> | <p>Go to step 2.</p>  |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</b></p> <p>Measure the resistance of harness between crankshaft position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E10) No. 1 — Engine ground:</b></p>   | <p>Is the resistance less than 10 <math>\Omega</math>?</p>                     | <p>Repair ground short circuit in harness between crankshaft position sensor and ECM connector.</p> <p>NOTE:<br/>The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.</p>   | <p>Go to step 3.</p>  |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</b></p> <p>Measure the resistance of harness between crankshaft position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E10) No. 2 — Engine ground:</b></p>   | <p>Is the resistance less than 5 <math>\Omega</math>?</p>                      | <p>Go to step 4.</p>  | <p>Repair harness and connector.</p> <p>NOTE:<br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between crankshaft position sensor and ECM connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <p><b>4</b></p> <p><b>CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.</b></p>  | <p>Is the crankshaft position sensor installation bolt tightened securely?</p> | <p>Go to step 5.</p>  | <p>Tighten crankshaft position sensor installation bolt securely.</p>   |
| <p><b>5</b></p> <p><b>CHECK CRANKSHAFT POSITION SENSOR.</b></p> <p>1) Remove the crankshaft position sensor.<br/>2) Measure the resistance between connector terminals of crankshaft position sensor.</p> <p><b>Terminals</b><br/><b>No. 1 — No. 2:</b></p>   | <p>Is the resistance 1 — 4 k<math>\Omega</math>?</p>                           | <p>Repair poor contact in crankshaft position sensor connector.</p>   | <p>Replace the crankshaft position sensor. &lt;Ref. to FU(H4SO)-23, Crankshaft Position Sensor.&gt;</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BA:DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-90, DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

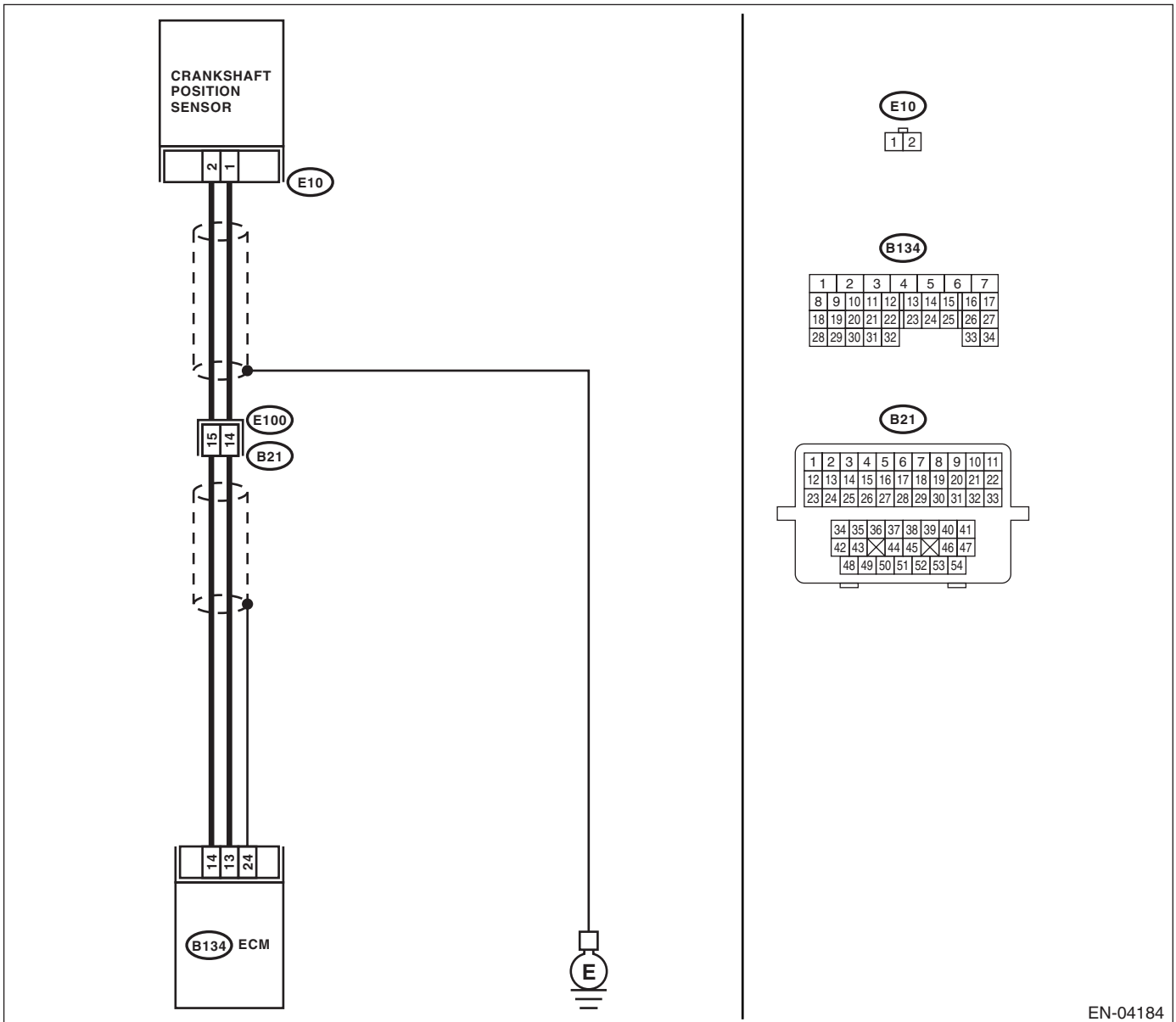
### TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No   |
|--|---|--|--|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> | Go to step <b>2</b> .  |
| <b>2</b><br><b>CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.</b><br>Turn the ignition switch to OFF.  | Is the crankshaft position sensor installation bolt tightened securely? | Go to step <b>3</b> .  | Tighten crankshaft position sensor installation bolt securely.                             |
| <b>3</b><br><b>CHECK CRANK SPROCKET.</b><br>Remove the timing belt cover.  | Are crank sprocket teeth cracked or damaged?                            | Replace the crank sprocket. <Ref. to ME(H4SO)-50, Crank Sprocket.>   | Go to step <b>4</b> .  |
| <b>4</b><br><b>CHECK INSTALLATION CONDITION OF TIMING BELT.</b><br>Turn the crankshaft using ST, and align alignment mark on crank sprocket with alignment mark on cylinder block.<br>ST 499987500 CRANKSHAFT SOCKET | Is the timing belt dislocated from its proper position?                 | Repair installation condition of timing belt. <Ref. to ME(H4SO)-44, Timing Belt.>  | Replace the crankshaft position sensor. <Ref. to FU(H4SO)-23, Crankshaft Position Sensor.> |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BB:DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-92, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

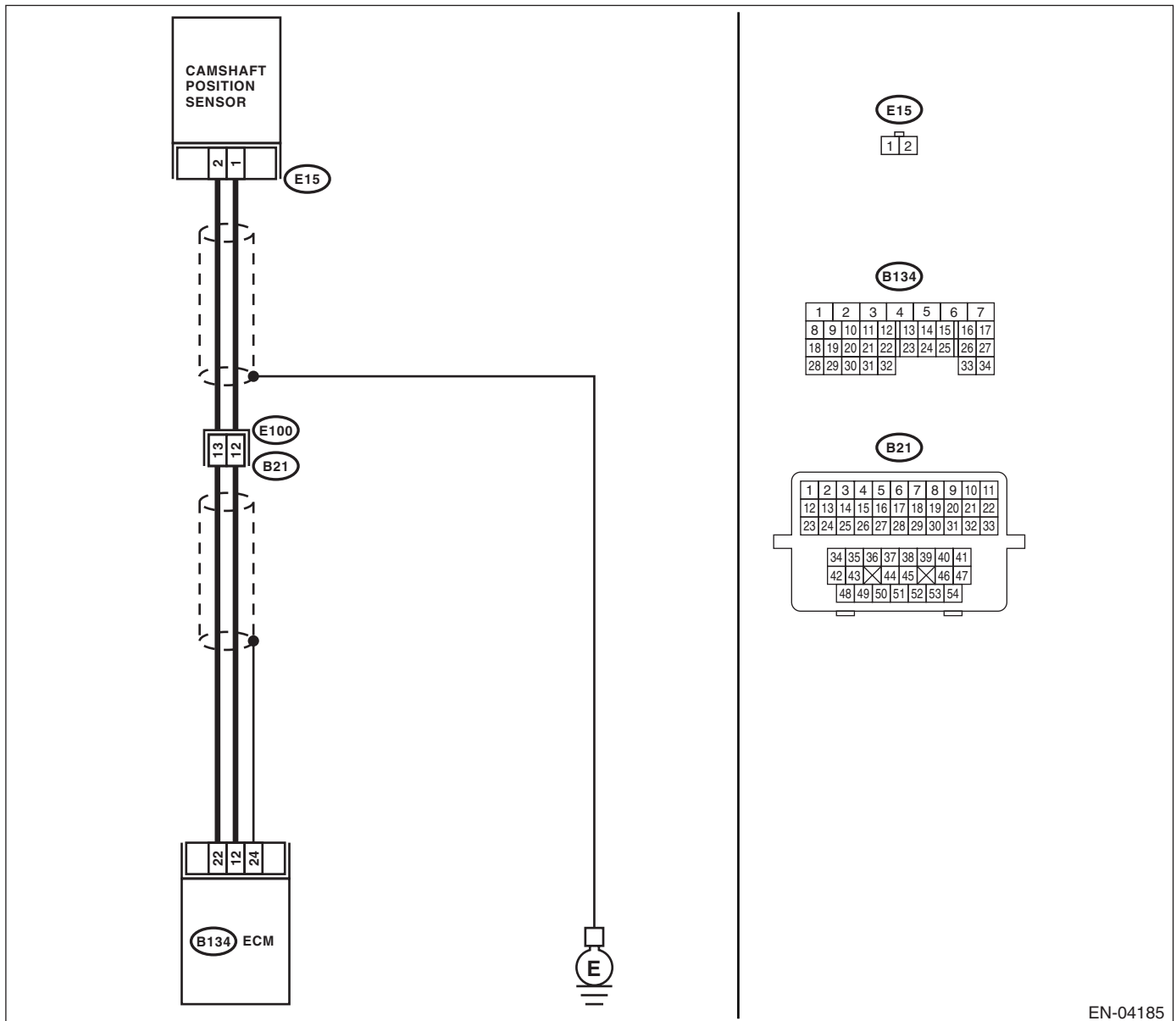
### TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04185

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from camshaft position sensor.<br/>3) Measure the resistance of harness between camshaft position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E15) No. 1 — Engine ground:</b></p> | <p>Is the resistance more than 100 k<math>\Omega</math>?</p>                 | <p>Repair harness and connector.</p> <p>NOTE:<br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between camshaft position sensor and ECM connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> | <p>Go to step 2.</p>  |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.</b></p> <p>Measure the resistance of harness between camshaft position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E15) No. 1 — Engine ground:</b></p>   | <p>Is the resistance less than 10 <math>\Omega</math>?</p>                   | <p>Repair ground short circuit in harness between camshaft position sensor and ECM connector.</p> <p>NOTE:<br/>The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.</p>   | <p>Go to step 3.</p>  |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.</b></p> <p>Measure the resistance of harness between camshaft position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E15) No. 2 — Engine ground:</b></p>   | <p>Is the resistance less than 5 <math>\Omega</math>?</p>                    | <p>Go to step 4.</p>  | <p>Repair harness and connector.</p> <p>NOTE:<br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between camshaft position sensor and ECM connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <p><b>4</b></p> <p><b>CHECK CONDITION OF CAMSHAFT POSITION SENSOR.</b></p>  | <p>Is the camshaft position sensor installation bolt tightened securely?</p> | <p>Go to step 5.</p>  | <p>Tighten camshaft position sensor installation bolt securely.</p>   |
| <p><b>5</b></p> <p><b>CHECK CAMSHAFT POSITION SENSOR.</b></p> <p>1) Remove the camshaft position sensor.<br/>2) Measure the resistance between connector terminals of camshaft position sensor.</p> <p><b>Terminals</b><br/><b>No. 1 — No. 2:</b></p>   | <p>Is the resistance 1 — 4 k<math>\Omega</math>?</p>                         | <p>Repair poor contact in camshaft position sensor connector.</p>   | <p>Replace the camshaft position sensor. &lt;Ref. to FU(H4SO)-24, Camshaft Position Sensor.&gt;</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BC:DTC P0341 CAMSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-94, DTC P0341 CAMSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

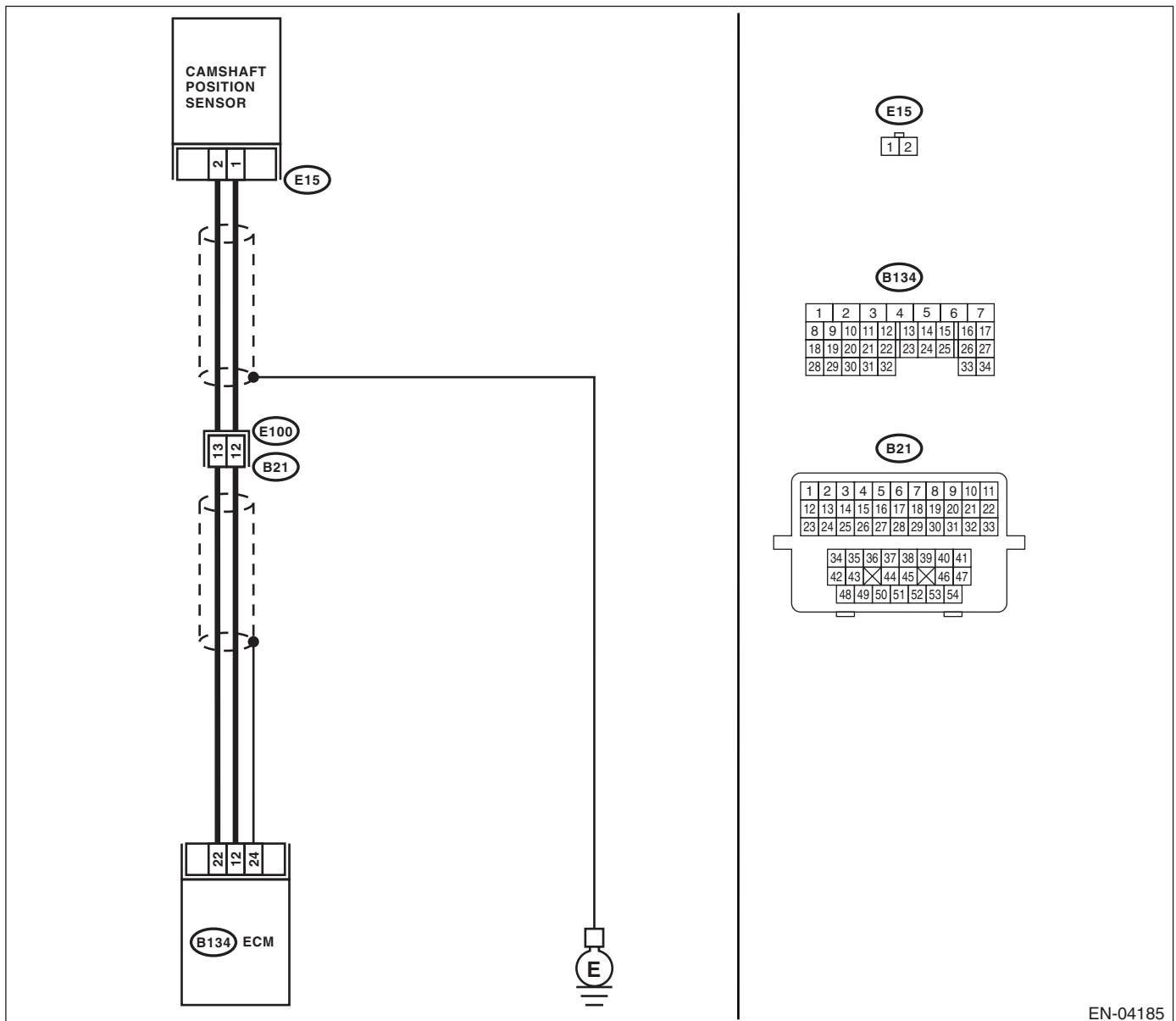
### TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04185

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check   | Yes   | No   |
|------|---|---|--|
| 1    | <b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>   |
| 2    | <b>CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from camshaft position sensor.<br>3) Measure the resistance of harness between camshaft position sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E15) No. 1 — Engine ground:</b> | Is the resistance more than 100 k $\Omega$ ?                          | Repair harness and connector.<br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between camshaft position sensor and ECM connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector                      |
| 3    | <b>CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.</b><br>Measure the resistance of harness between camshaft position sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E15) No. 1 — Engine ground:</b>   | Is the resistance less than 10 $\Omega$ ?                             | Repair ground short circuit in harness between camshaft position sensor and ECM connector.<br><b>NOTE:</b><br>The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.   |
| 4    | <b>CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.</b><br>Measure the resistance of harness between camshaft position sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E15) No. 2 — Engine ground:</b>   | Is the resistance less than 5 $\Omega$ ?                              | Go to step 5.<br><br>Repair harness and connector.<br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between camshaft position sensor and ECM connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector |
| 5    | <b>CHECK CONDITION OF CAMSHAFT POSITION SENSOR.</b>   | Is the camshaft position sensor installation bolt tightened securely? | Go to step 6.<br><br>Tighten camshaft position sensor installation bolt securely.  |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No   |
|--|---|---|--|
| <b>6 CHECK CAMSHAFT POSITION SENSOR.</b><br>1) Remove the camshaft position sensor.<br>2) Measure the resistance between connector terminals of camshaft position sensor.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b> | Is the resistance 1 — 4 k $\Omega$ ?                                  | Go to step 7.   | Replace the camshaft position sensor. <Ref. to FU(H4SO)-24, Camshaft Position Sensor.> |
| <b>7 CHECK CONDITION OF CAMSHAFT POSITION SENSOR.</b><br>Turn the ignition switch to OFF.  | Is the camshaft position sensor installation bolt tightened securely? | Go to step 8.   | Tighten camshaft position sensor installation bolt securely.                           |
| <b>8 CHECK CAM SPROCKET.</b><br>Remove the timing belt cover. <Ref. to ME(H4SO)-43, Timing Belt Cover.>  | Are cam sprocket teeth cracked or damaged?                            | Replace the cam sprocket. <Ref. to ME(H4SO)-49, Cam Sprocket.>                    | Go to step 9.  |
| <b>9 CHECK INSTALLATION CONDITION OF TIMING BELT.</b><br>Turn the camshaft using ST, and align alignment mark on cam sprocket with alignment mark on timing belt cover LH.<br>ST 499987500 CAMSHAFT SOCKET             | Is the timing belt dislocated from its proper position?               | Repair installation condition of timing belt. <Ref. to ME(H4SO)-44, Timing Belt.> | Replace the camshaft position sensor. <Ref. to FU(H4SO)-24, Camshaft Position Sensor.> |

## BD:DTC P0400 EXHAUST GAS RECIRCULATION FLOW

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-96, DTC P0400 EXHAUST GAS RECIRCULATION FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

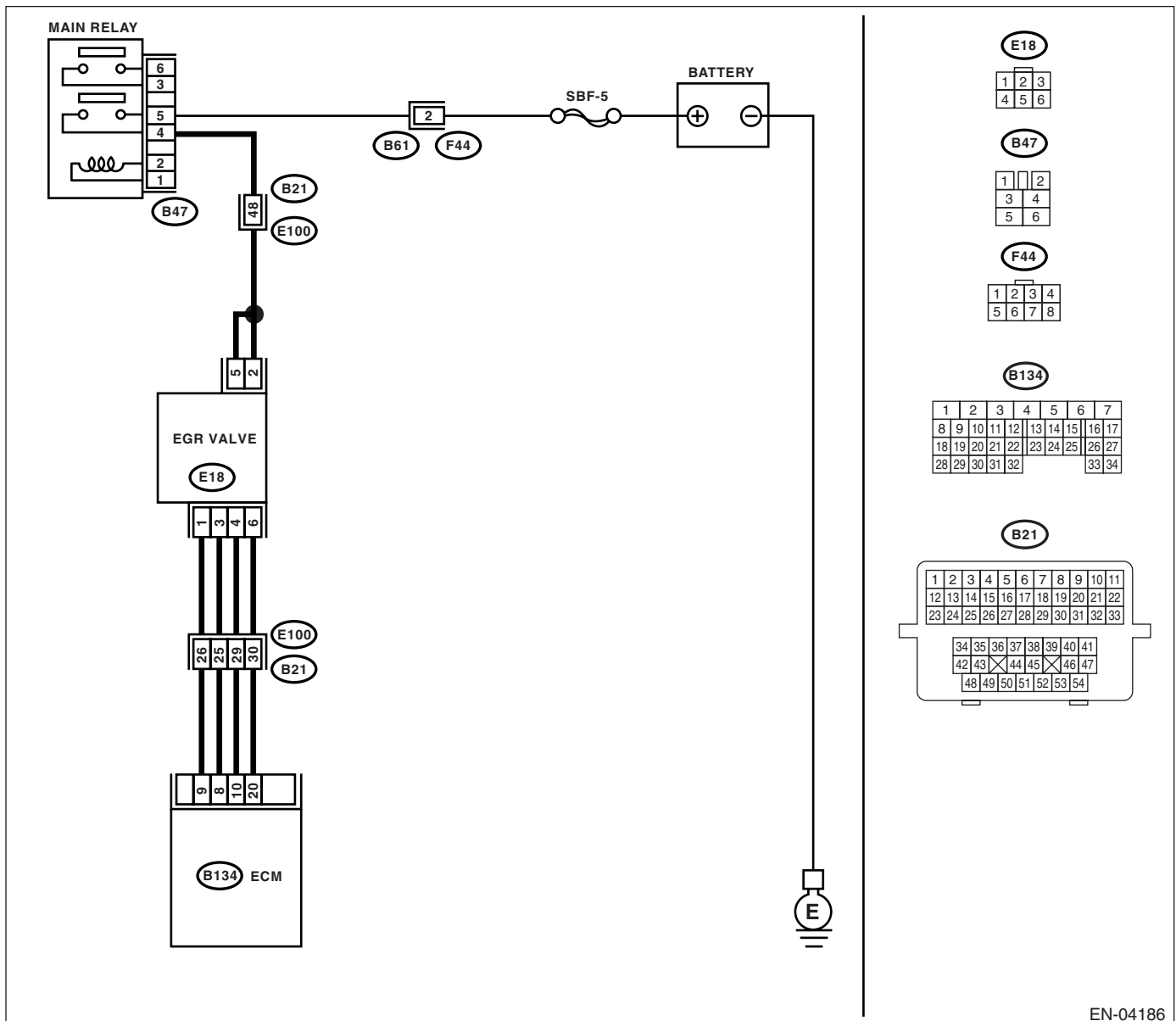
### TROUBLE SYMPTOM:

- Poor driving performance at low engine speed
- Faulty idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04186

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?                                      | Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> | Go to step 2.   |
| <b>2</b><br><b>CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the measured value more than 53.3 kPa (400 mmHg, 15.75 inHg)? | Make sure that EGR valve, manifold absolute pressure sensor and throttle body are securely installed.                          | Go to step 3.   |
| <b>3</b><br><b>CHECK POWER SUPPLY TO EGR SOLENOID VALVE.</b><br>1) Disconnect connector from EGR solenoid valve.<br>2) Turn ignition switch ON.<br>3) Measure voltage between EGR solenoid valve and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E15) No. 2 (+) — Engine ground (-):</b><br><b>(E18) No. 5 (+) — Engine ground (-):</b>  | Is the measured value more than 10 V?                            | Go to step 4.  | Repair the open circuit in harness between main relay and EGR solenoid valve connector. |
| <b>4</b><br><b>CHECK EGR SOLENOID VALVE.</b><br>Measure resistance between EGR solenoid valve terminals.<br><br>NOTE:<br>Measure resistance between EGR solenoid valve terminals.<br><br><b>Connector &amp; terminal</b><br><b>No. 1 — No. 2:</b><br><b>No. 3 — No. 2:</b><br><b>No. 4 — No. 5:</b><br><b>No. 6 — No. 5:</b>  | Is the measured value within 20 to 30 Ω?                         | Go to step 5.  | Replace EGR solenoid valve. <Ref. to FU(H4SO)-29, EGR Valve.>                           |
| <b>5</b><br><b>OUTPUT SIGNAL FROM ECM</b><br>1) Turn ignition switch OFF.<br>2) Connect connectors to ECM and EGR solenoid valve.<br>3) Turn ignition switch ON.<br>4) Measure voltage between ECM and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B134) No. 8 (+) — Chassis ground (-):</b><br><b>(B134) No. 9 (+) — Chassis ground (-):</b><br><b>(B134) No. 10 (+) — Chassis ground (-):</b><br><b>(B134) No. 20 (+) — Chassis ground (-):</b>     | Is the measured value within 0 to 10 V?                          | Repair poor contact in ECM connector.  | Go to step 6.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <b>6 CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.</b><br>1) Turn ignition switch OFF.<br>2) Disconnect connector from EGR solenoid valve and ECM.<br>3) Measure resistance of harness between EGR solenoid valve and ECM connector.<br><i>Connector &amp; terminal</i><br>(B134) No. 8 — (E18) No. 3:<br>(B134) No. 9 — (E18) No. 1:<br>(B134) No. 10 — (E18) No. 4:<br>(B134) No. 20 — (E18) No. 6: | Is the measured value less than 1 Ω?                           | Go to step 7.  | Repair open circuit in harness between ECM and EGR solenoid valve connector.         |
| <b>7 CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.</b><br>Measure resistance of harness between EGR solenoid valve and chassis ground.<br><i>Connector &amp; terminal</i><br>(B134) No. 8 — Chassis ground:<br>(B134) No. 9 — Chassis ground:<br>(B134) No. 10 — Chassis ground:<br>(B134) No. 20 — Chassis ground:   | Is the measured value more than 1 MΩ?                          | Go to step 8.  | Repair short circuit in harness between main relay and EGR solenoid valve connector. |
| <b>8 CHECK POOR CONTACT.</b><br>Check poor contact in ECM and EGR solenoid valve connector.   | Is there poor contact in ECM and EGR solenoid valve connector? | Repair poor contact in ECM and EGR solenoid valve connector. | Even if MIL lights up, the circuit has returned to a normal condition at this time.  |

## BE:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-99, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

- Engine stalls.
- Idle mixture is out of specifications.

### CAUTION:

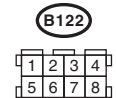
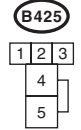
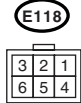
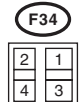
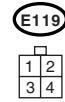
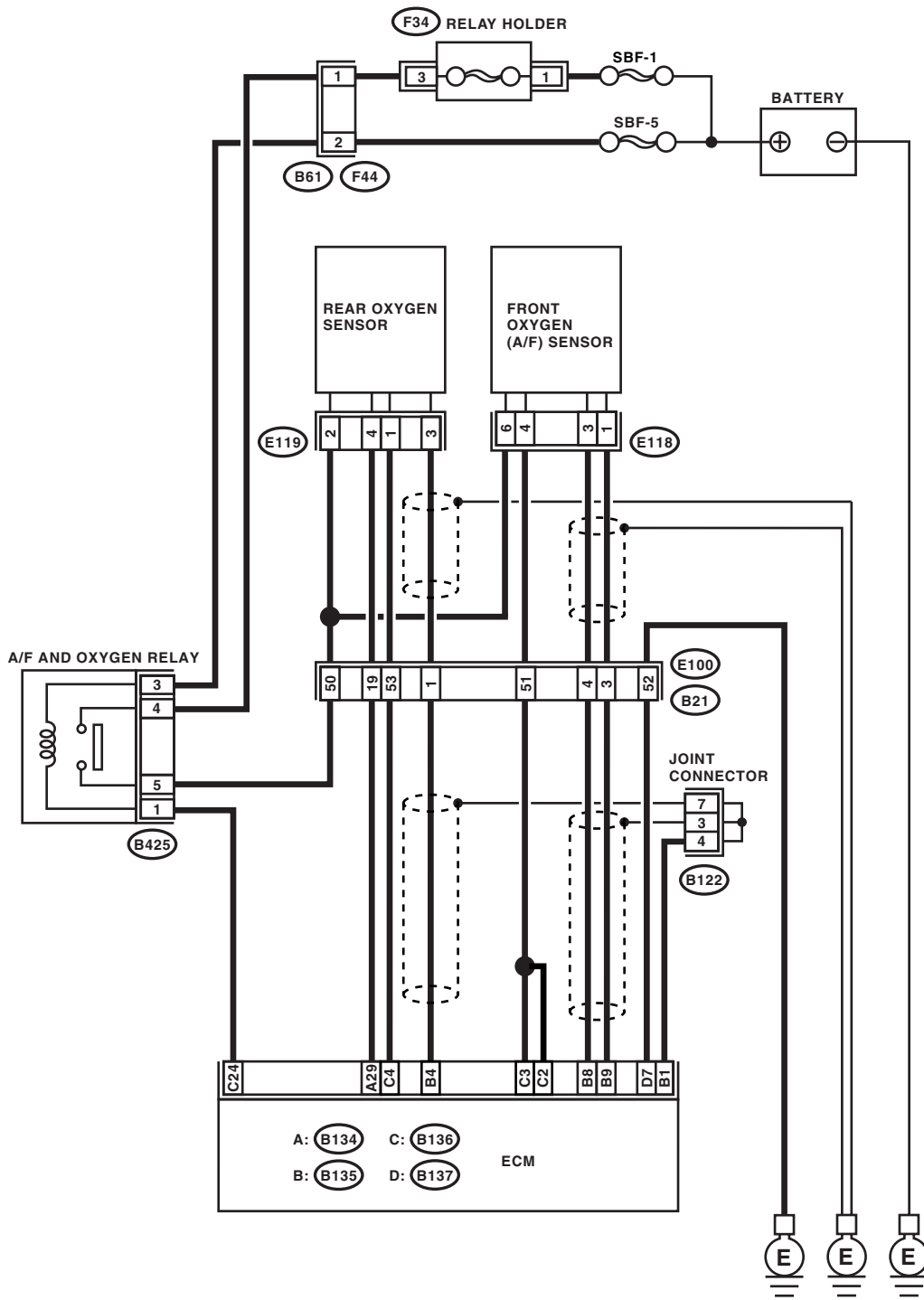
**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**



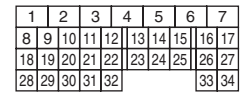
# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

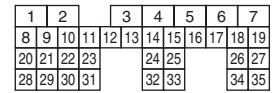
## WIRING DIAGRAM:



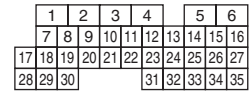
A: B134



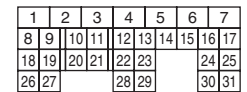
B: B135



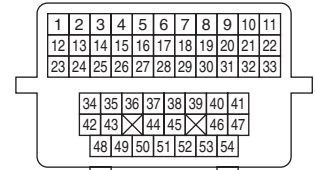
C: B136



D: B137



B21



EN-04626

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                               | Yes   | No            |
|---|-------------------------------------|---|---------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?         | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0420. | Go to step 2. |
| <b>2</b><br><b>CHECK EXHAUST SYSTEM.</b><br>Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes.<br><br>NOTE:<br>Check the following positions. <ul style="list-style-type: none"> <li>• Between cylinder head and front exhaust pipe</li> <li>• Between front exhaust pipe and front catalytic converter</li> <li>• Between front catalytic converter and rear catalytic converter</li> <li>• Looseness and incomplete installation of front oxygen (A/F) sensor and rear oxygen sensor</li> </ul> | Is there a fault in exhaust system? | Repair or replace the exhaust system. <Ref. to EX(H4SO)-2, General Description.>  | Go to step 3. |
| <b>3</b><br><b>CHECK WAVEFORM ON SUBARU SELECT MONITOR. (DURING DRIVING)</b><br>1) Drive at a constant speed of 80 — 113 km/h (50 — 70 MPH).<br>2) After leaving it in the condition of Step 1) for 5 minutes, read the waveform data using Subaru Select Monitor while driving. <Ref. to EN(H4SO)(diag)-18, ELECTRICAL SPECIFICATION, Engine Control Module (ECM) I/O Signal.>   | Is normal waveform displayed?       | Contact your SOA-Service Center since deterioration of some parts may be the cause.   | Go to step 4. |
| <b>4</b><br><b>CHECK WAVEFORM ON SUBARU SELECT MONITOR. (DURING IDLING)</b><br>1) Run the vehicle at idle.<br>2) In the condition of Step 1), read the waveform data using Subaru Select Monitor. <Ref. to EN(H4SO)(diag)-18, ELECTRICAL SPECIFICATION, Engine Control Module (ECM) I/O Signal.>  | Is normal waveform displayed?       | Go to step 10.  | Go to step 5. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check                                   | Yes   | No  |
|--|---|---|---|
| <p><b>5 CHECK VOLTAGE OF REAR OXYGEN SENSOR.</b></p> <p>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest)</p> <p>2) Read the rear oxygen sensor voltage using Subaru Select Monitor.</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• For MT model, depress the clutch pedal.</li> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the general scan tool instruction manual.</p> | <p>Is the voltage more than 490 mV?</p> | <p>Go to step 9.</p>  | <p>Go to step 6.</p>  |
| <p><b>6 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</b></p>   | <p>Is there water in connector?</p>     | <p>Remove infiltrating water completely.</p>  | <p>Go to step 7.</p>  |
| <p><b>7 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connectors from ECM and rear oxygen sensor.</p> <p>3) Measure the resistance of harness between ECM and rear oxygen sensor connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B135) No. 4 — (E119) No. 3:</b><br/> <b>(B134) No. 29 — (E119) No. 4:</b></p>  | <p>Is the resistance more than 3 Ω?</p> | <p>Repair the open circuit in harness between ECM and rear oxygen sensor connector.</p> | <p>Go to step 8.</p>  |
| <p><b>8 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between rear oxygen sensor connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(E119) No. 3 (+) — Chassis ground:</b></p>   | <p>Is the voltage 0.2 — 0.5 V?</p>      | <p>Go to step 11.</p>   | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>           Repair the following items.</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>• Poor contact of rear oxygen sensor and ECM connector</li> <li>• Poor contact in ECM connector</li> </ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                               | Yes  | No  |
|--|-------------------------------------|--|---|
| <b>9 CHECK VOLTAGE OF REAR OXYGEN SENSOR.</b><br>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed at 3,000 rpm.<br>2) Read the rear oxygen sensor voltage using Subaru Select Monitor.<br><b>NOTE:</b><br><ul style="list-style-type: none"> <li>• For MT model, depress the clutch pedal.</li> <li>• Subaru Select Monitor</li> </ul> For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br><ul style="list-style-type: none"> <li>• General scan tool</li> </ul> For detailed operation procedures, refer to the general scan tool instruction manual. | Is the voltage less than 250 mV?    | Contact your SOA Service Center since deterioration of some parts may be the cause.  | Go to step 7.   |
| <b>10 CHECK CATALYTIC CONVERTER.</b>   | Is the catalytic converter damaged? | Replace the catalytic converter.<br><Ref. to EC(H4SO)-3, Front Catalytic Converter.> | Contact your SOA Service Center since deterioration of some parts may be the cause. |
| <b>11 CHECK REAR OXYGEN SENSOR SHIELD.</b><br>1) Turn the ignition switch to OFF.<br>2) Bare the sensor shield of body side harness of rear oxygen sensor connector.<br>3) Measure the resistance between sensor shield and chassis ground.  | Is the resistance less than 1 Ω?    | Replace the rear oxygen sensor.<br><Ref. to FU(H4SO)-37, Rear Oxygen Sensor.>        | Repair the open circuit in rear oxygen sensor harness.                              |

## BF:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-101, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

- Fuel odor
- There is a hole of more than 1.0 mm (0.04 in) dia. in evaporation system or fuel tank.

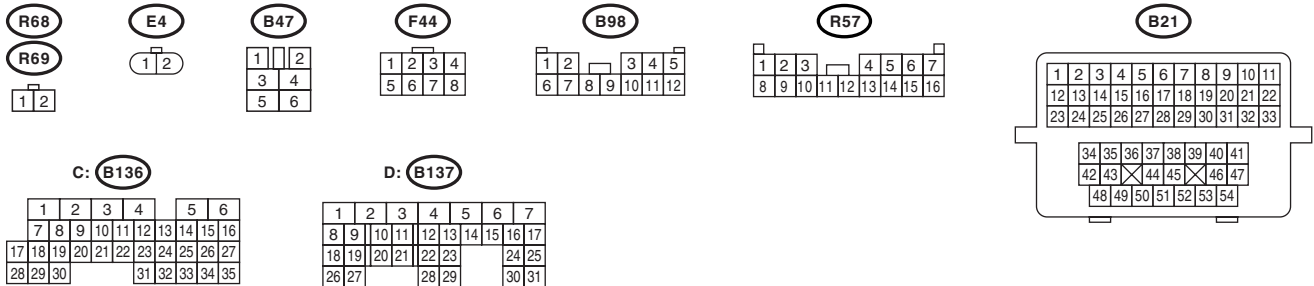
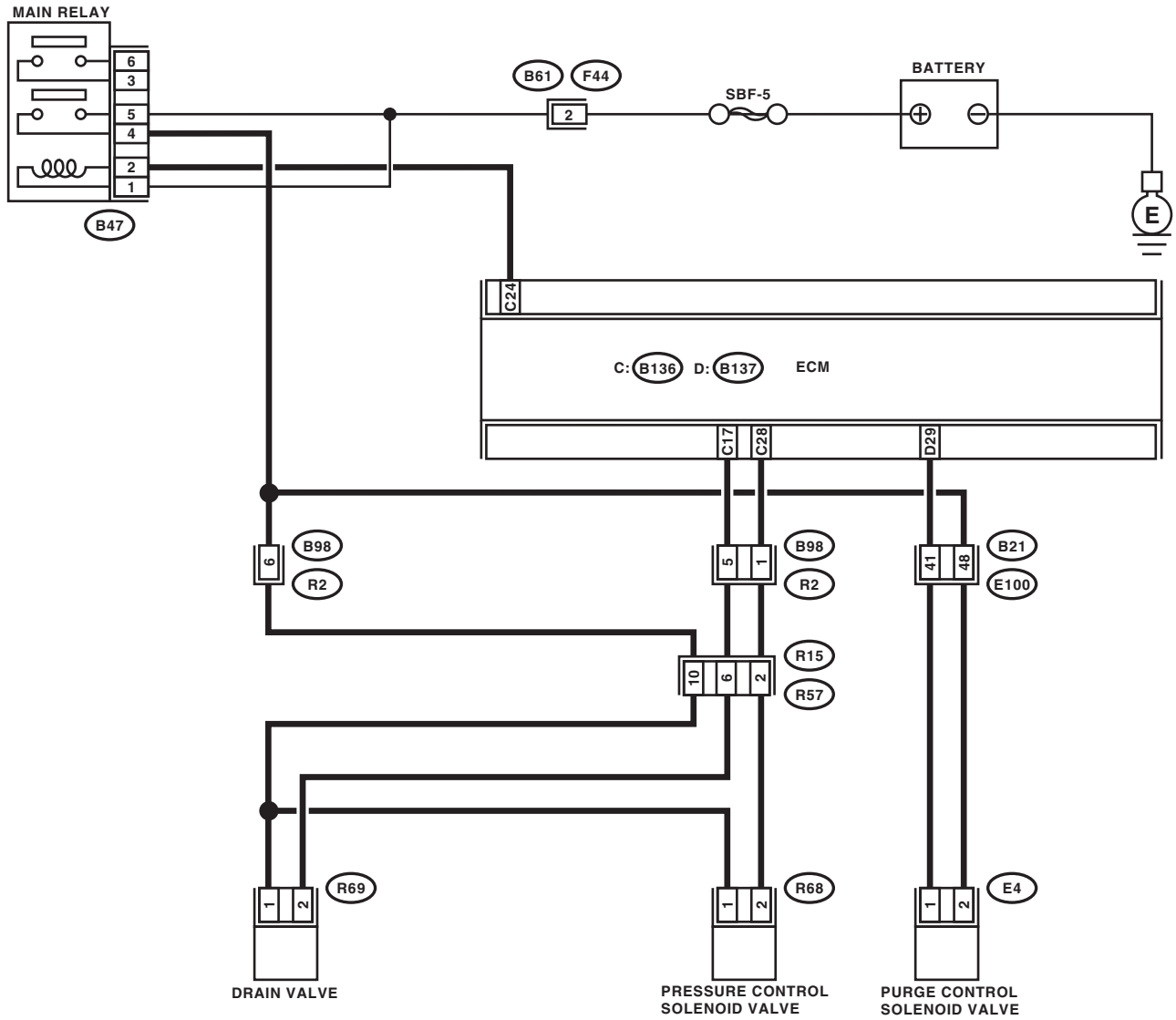
### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04188

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check   | Yes   | No  |
|------|---|---|---|
| 1    | <b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> |
| 2    | <b>CHECK FUEL FILLER CAP.</b><br>1) Turn ignition switch to OFF.<br>2) Check the fuel filler cap.<br><br>NOTE:<br>The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.   | Is the fuel filler cap tightened securely?                                    | Go to step 3.<br><br>Tighten fuel filler cap securely.  |
| 3    | <b>CHECK FUEL FILLER CAP.</b>   | Is the fuel filler cap SUBARU genuine?  | Go to step 4.<br><br>Replace with a genuine fuel filler cap.  |
| 4    | <b>CHECK FUEL FILLER PIPE PACKING.</b>  | Is there any damage to the seal between fuel filler cap and fuel filler pipe? | Repair or replace the fuel filler cap and fuel filler pipe.<br><Ref. to FU(H4SO)-46, Fuel Filler Pipe.>                                     |
| 5    | <b>CHECK DRAIN VALVE.</b><br>1) Connect the test mode connector.<br>2) Turn ignition switch to ON.<br>3) Operate the drain valve.<br><br>NOTE:<br>Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-47, Compulsory Valve Operation Check Mode.> | Does the drain valve operate?   | Go to step 6.<br><br>Replace the drain valve. <Ref. to EC(H4SO)-16, Drain Valve.>   |
| 6    | <b>CHECK PURGE CONTROL SOLENOID VALVE.</b><br>Operate the purge control solenoid valve.<br><br>NOTE:<br>Purge control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-47, Compulsory Valve Operation Check Mode.>                          | Does the purge control solenoid valve operate?                                | Go to step 7.<br><br>Replace the purge control solenoid valve. <Ref. to EC(H4SO)-7, Purge Control Solenoid Valve.>                          |
| 7    | <b>CHECK PRESSURE CONTROL SOLENOID VALVE.</b><br>Operate the pressure control solenoid valve.<br><br>NOTE:<br>Pressure control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-47, Compulsory Valve Operation Check Mode.>                 | Does the pressure control solenoid valve operate?                             | Go to step 8.<br><br>Replace the pressure control solenoid valve. <Ref. to EC(H4SO)-12, Pressure Control Solenoid Valve.>                   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <b>8</b><br><b>CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.</b><br>Turn ignition switch to OFF. | Is there a hole of more than 1.0 mm (0.04 in) dia. on evaporation line?  | Repair or replace the evaporation line. <Ref. to FU(H4SO)-57, Fuel Delivery & Evaporation Lines.> | Go to step <b>9</b> .   |
| <b>9</b><br><b>CHECK CANISTER.</b>   | Is the canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?   | Repair or replace the canister. <Ref. to EC(H4SO)-6, Canister.>                                   | Go to step <b>10</b> .  |
| <b>10</b><br><b>CHECK FUEL TANK.</b><br>Remove the fuel tank. <Ref. to FU(H4SO)-43, Fuel Tank.>    | Is the fuel tank damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?  | Repair or replace the fuel tank. <Ref. to FU(H4SO)-43, Fuel Tank.>                                | Go to step <b>11</b> .  |
| <b>11</b><br><b>CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.</b>     | Are there holes of more than 1.0 mm (0.04 in) dia., cracks, clogging, disconnections or bend of hoses or pipes in evaporative emission control system? | Repair or replace the hoses or pipes.   | Contact your SOA Service Center since deterioration of some parts may be the cause. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BG:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

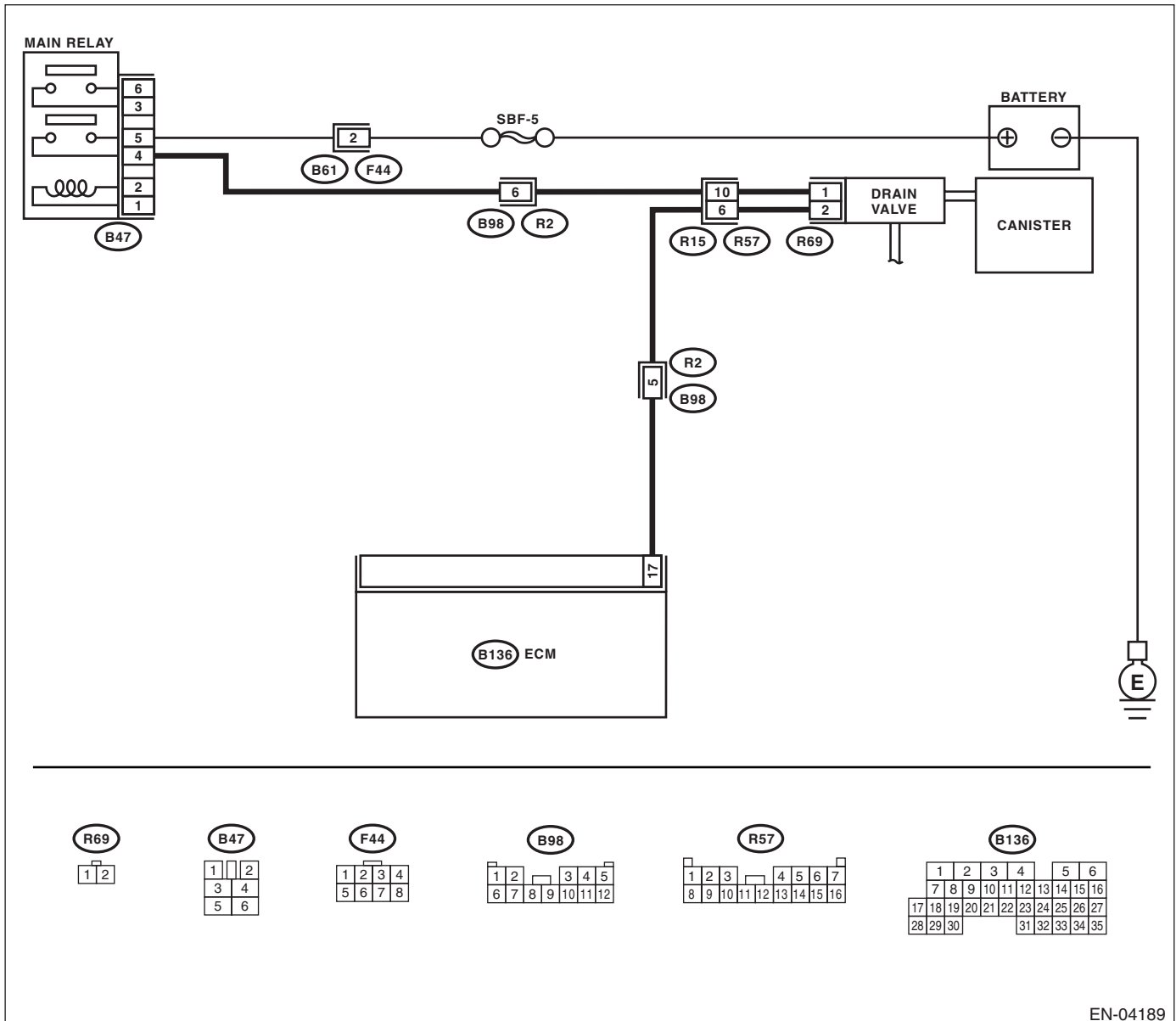
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-116, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04189



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes                                   | No   |
|---|--|---------------------------------------|--|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 17 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 10 V?             | Go to step 2.                         | Go to step 3.  |
| <b>2</b><br><b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.  | Is there poor contact in ECM connector?    | Repair poor contact in ECM connector. | The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.<br>(However, the possibility of poor contact still remains.)<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Poor contact in drain valve connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>3</b><br><b>CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connectors from drain valve and ECM.<br>3) Measure the resistance of harness between drain valve connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(R69) No. 2 — Chassis ground:</b></i> | Is the resistance more than 1 M $\Omega$ ? | Go to step 4.                         | Repair short circuit to ground in harness between ECM and drain valve connector.   |
| <b>4</b><br><b>CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM and drain valve connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 17 — (R69) No. 2:</b></i>   | Is the resistance less than 1 $\Omega$ ?   | Go to step 5.                         | Repair harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and drain valve connector</li> <li>• Poor contact in coupling connector</li> </ul>  |
| <b>5</b><br><b>CHECK DRAIN VALVE.</b><br>Measure the resistance between drain valve terminals.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i>   | Is the resistance 10 — 100 $\Omega$ ?      | Go to step 6.                         | Replace the drain valve. <Ref. to EC(H4SO)-16, Drain Valve.>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <b>6</b><br><b>CHECK POWER SUPPLY TO DRAIN VALVE.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between drain valve and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R69) No. 1 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?                  | Go to step 7.                                 | Repair harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and drain valve</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in main relay connector</li> </ul> |
| <b>7</b><br><b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in drain valve connector.   | Is there poor contact in drain valve connector? | Repair poor contact in drain valve connector. | Contact your SOA Service Center since deterioration of some parts may be the cause.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BH:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

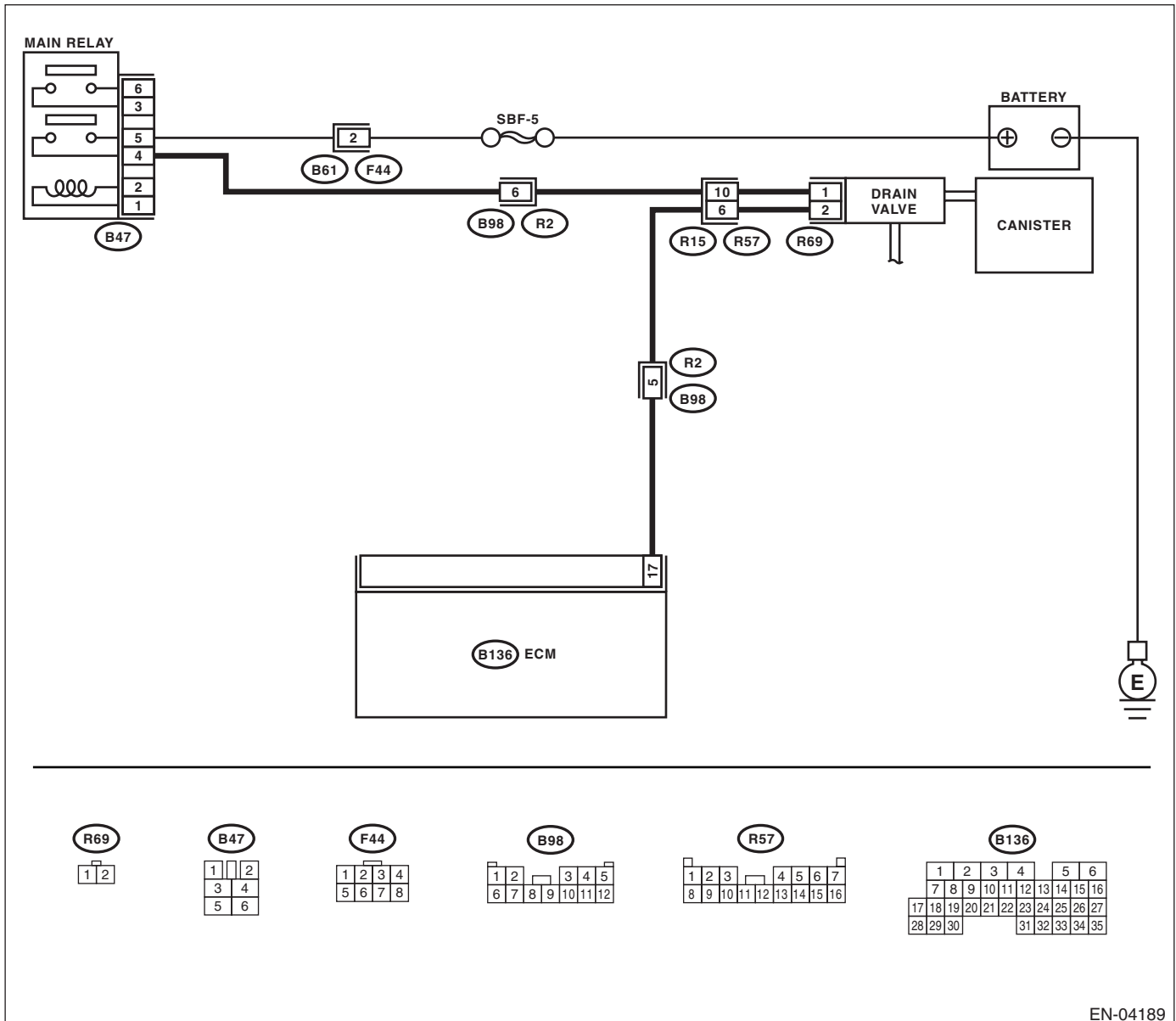
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-118, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04189

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                    | Yes   | No   |
|---|--|---|--|
| <b>1 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn ignition switch to OFF.<br>2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side).<br>3) Turn ignition switch to ON.<br>4) While operating the drain valve, measure voltage between ECM and chassis ground.<br>NOTE:<br>Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode".<br><Ref. to EN(H4SO)(diag)-47, Compulsory Valve Operation Check Mode.><br><b>Connector &amp; terminal</b><br><b>(B136) No. 17 (+) — Chassis ground (-):</b> | Is the voltage 0 — 10 V?                 | Go to step 2.   | The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector. |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 17 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?           | Go to step 4.   | Go to step 3.  |
| <b>3 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.  | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.   | Replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).>  |
| <b>4 CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from drain valve.<br>3) Turn ignition switch to ON.<br>4) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 17 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?           | Repair short circuit to battery in harness between ECM and drain valve connector. After repair, replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).> | Go to step 5.  |
| <b>5 CHECK DRAIN VALVE.</b><br>1) Turn ignition switch to OFF.<br>2) Measure the resistance between drain valve terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>   | Is the resistance less than 1 $\Omega$ ? | Replace the drain valve <Ref. to EC(H4SO)-16, Drain Valve.> and ECM <Ref. to FU(H4SO)-38, Engine Control Module (ECM).>.  | Go to step 6.  |
| <b>6 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.  | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.   | Replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BI: DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

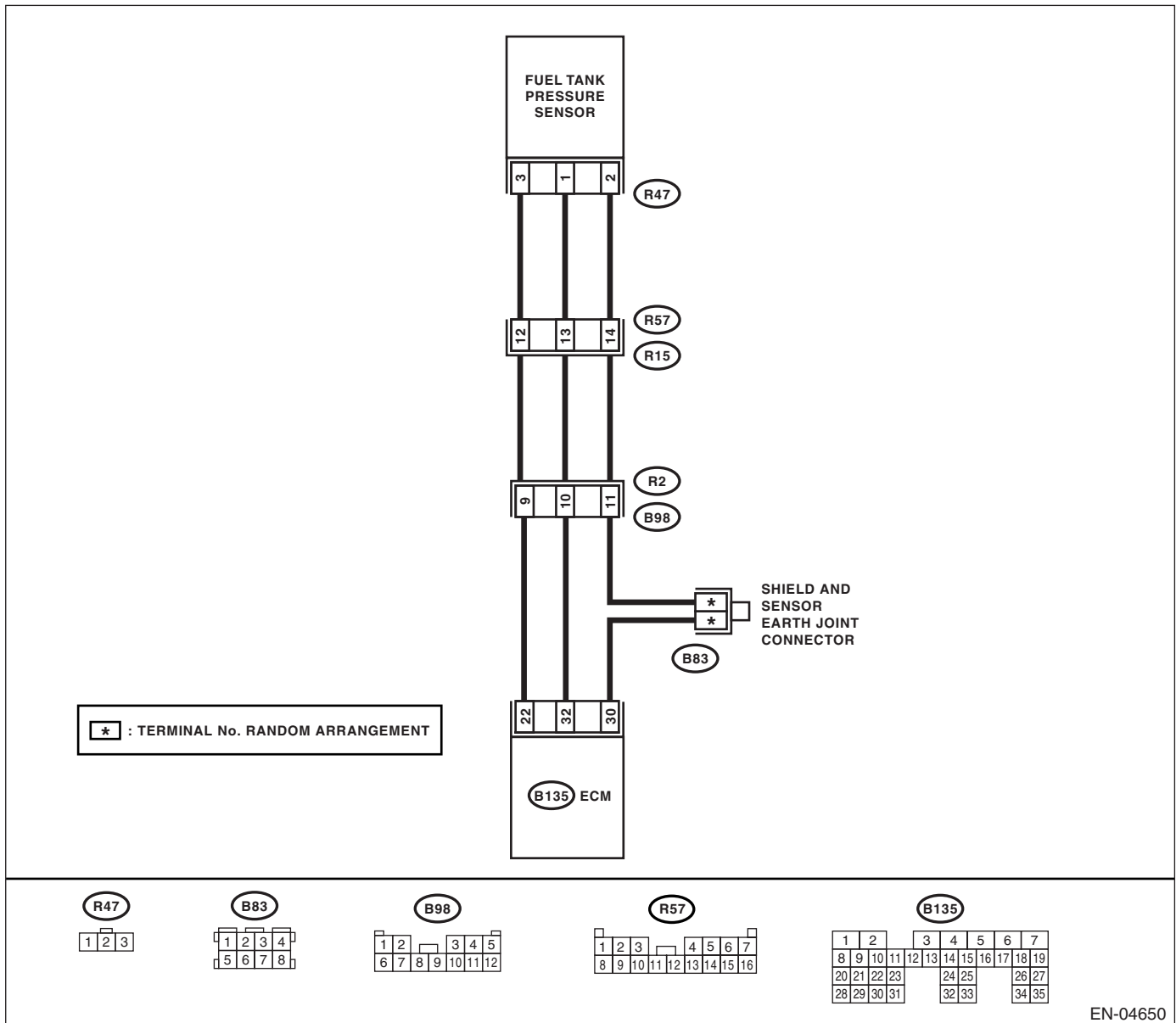
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-120, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04650

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes   | No   |
|---|--|---|--|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?                | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> | Go to step <b>2</b> .  |
| <b>2</b><br><b>CHECK FUEL FILLER CAP.</b><br>1) Turn ignition switch to OFF.<br>2) Open the fuel filler flap lid.   | Is the fuel filler cap tightened securely? | Go to step <b>3</b> .   | Tighten fuel filler cap securely.  |
| <b>3</b><br><b>CHECK PRESSURE/VACUUM LINE.</b><br>NOTE:<br>Check the following items. <ul style="list-style-type: none"><li>• Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank</li><li>• Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank</li></ul> | Is there a fault in pressure/vacuum line?  | Repair or replace the hoses and pipes.  | Replace the fuel tank pressure sensor. <Ref. to EC(H4SO)-11, Fuel Tank Pressure Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BJ:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

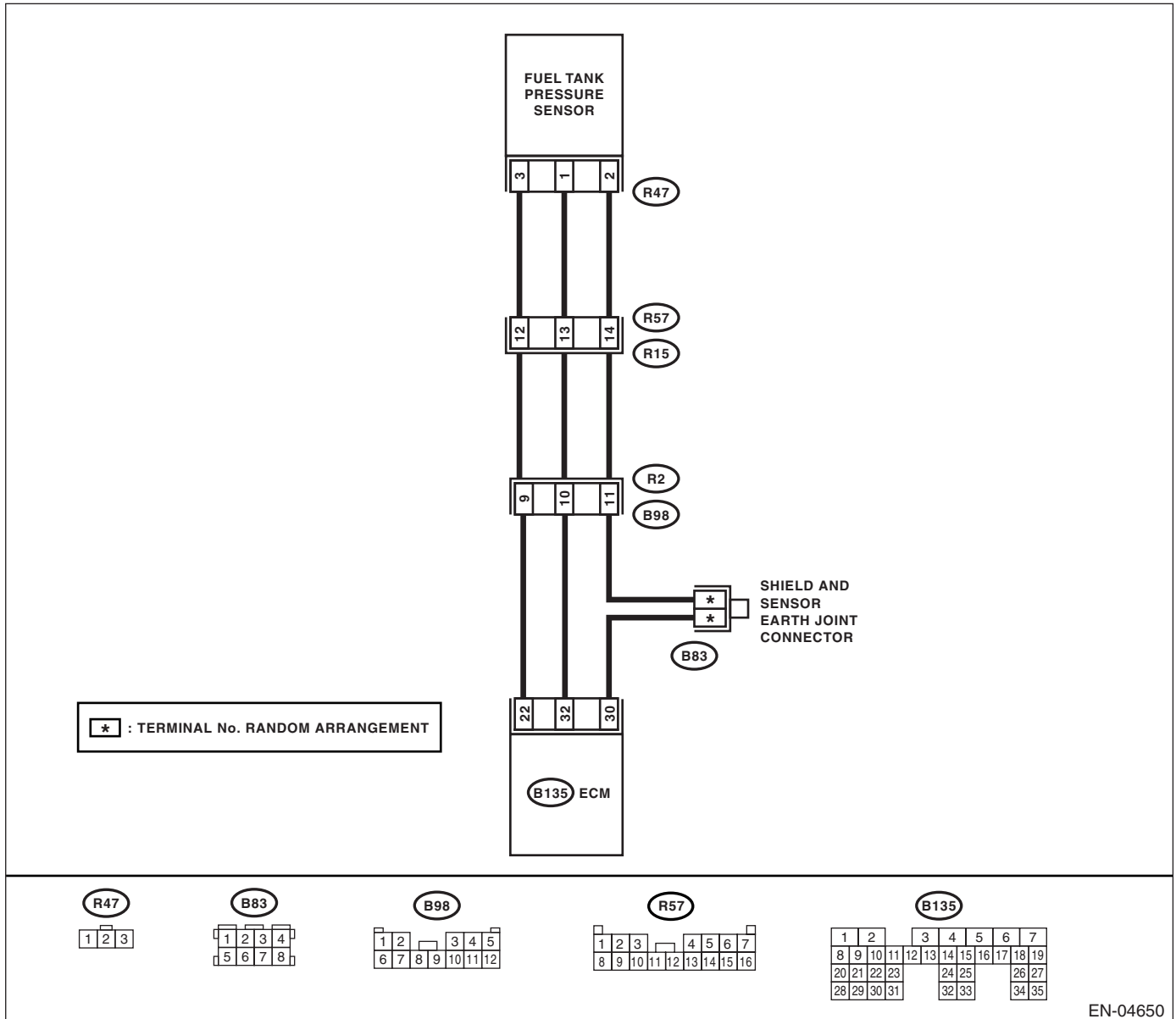
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-122, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <p><b>1</b></p> <p><b>CHECK CURRENT DATA.</b></p> <ol style="list-style-type: none"> <li>1) Turn ignition switch to OFF.</li> <li>2) Remove the fuel filler cap.</li> <li>3) Install the fuel filler cap.</li> <li>4) Turn ignition switch to ON.</li> <li>5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the general scan tool.</li> </ol> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the measured value less than -2.8 kPa (-21.0 mmHg, -0.827 inHg)?</p>      | <p>Go to step 2.</p>                         | <p>The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.</p>  |
| <p><b>2</b></p> <p><b>CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b></p> <p>Measure the voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B135) No. 22 (+) — Chassis ground (-):</b></p>   | <p>Is the voltage more than 4.5 V?</p>  | <p>Go to step 4.</p>                         | <p>Go to step 3.</p>   |
| <p><b>3</b></p> <p><b>CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b></p> <p>Measure the voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B135) No. 22 (+) — Chassis ground (-):</b></p>   | <p>Does the voltage change by shaking the ECM harness and connector?</p>        | <p>Repair poor contact in ECM connector.</p> | <p>Contact your SOA Service Center since deterioration of some parts may be the cause.</p>   |
| <p><b>4</b></p> <p><b>CHECK INPUT SIGNAL FOR ECM.</b></p> <p>Measure the voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B135) No. 32 (+) — Chassis ground (-):</b></p>  | <p>Is the voltage less than 0.2 V?</p>  | <p>Go to step 6.</p>                         | <p>Go to step 5.</p>   |
| <p><b>5</b></p> <p><b>CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)</b></p> <p>Read the data of fuel tank pressure sensor signal using Subaru Select Monitor.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p>  | <p>Does the measured value change by shaking the ECM harness and connector?</p> | <p>Repair poor contact in ECM connector.</p> | <p>Go to step 6.</p>   |
| <p><b>6</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b></p> <ol style="list-style-type: none"> <li>1) Turn ignition switch to OFF.</li> <li>2) Remove the rear seat cushion.</li> <li>3) Separate rear wiring harness and fuel tank cord.</li> <li>4) Turn ignition switch to ON.</li> <li>5) Measure the voltage between rear wiring harness connector and chassis ground.</li> </ol> <p><b>Connector &amp; terminal</b><br/><b>(R15) No. 12 (+) — Chassis ground (-):</b></p>  | <p>Is the voltage more than 4.5 V?</p>  | <p>Go to step 7.</p>                         | <p>Repair harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and rear wiring harness connector</li> <li>• Poor contact in coupling connector</li> </ul> |



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <b>7 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM and rear wiring harness connector.<br><i>Connector &amp; terminal</i><br><i>(B135) No. 30 — (R15) No. 14:</i> | Is the resistance less than 1 $\Omega$ ?                      | Go to step 8.   | Repair harness and connector.<br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and rear wiring harness connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |
| <b>8 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b><br>Measure the resistance of harness between rear wiring harness connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(R15) No. 14 — Chassis ground:</i>  | Is the resistance more than 1 $M\Omega$ ?                     | Go to step 9.   | Repair short circuit to ground in harness between ECM and rear wiring harness connector.  |
| <b>9 CHECK FUEL TANK CORD.</b><br>1) Disconnect the connector from fuel tank pressure sensor.<br>2) Measure the resistance of fuel tank cord.<br><i>Connector &amp; terminal</i><br><i>(R57) No. 12 — (R47) No. 3:</i>  | Is the resistance less than 1 $\Omega$ ?                      | Go to step 10.  | Repair open circuit in fuel tank cord.  |
| <b>10 CHECK FUEL TANK CORD.</b><br>Measure the resistance of fuel tank cord.<br><i>Connector &amp; terminal</i><br><i>(R57) No. 14 — (R47) No. 2:</i>   | Is the resistance less than 1 $\Omega$ ?                      | Go to step 11.  | Repair open circuit in fuel tank cord.  |
| <b>11 CHECK FUEL TANK CORD.</b><br>Measure the resistance of harness between fuel tank pressure sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(R47) No. 1 — Chassis ground:</i>  | Is the resistance more than 1 $M\Omega$ ?                     | Go to step 12.  | Repair short circuit to ground in fuel tank cord.   |
| <b>12 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in fuel tank pressure sensor connector.   | Is there poor contact in fuel tank pressure sensor connector? | Repair poor contact in fuel tank pressure sensor connector. | Replace the fuel tank pressure sensor. <Ref. to EC(H4SO)-11, Fuel Tank Pressure Sensor.>  |

## BK:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

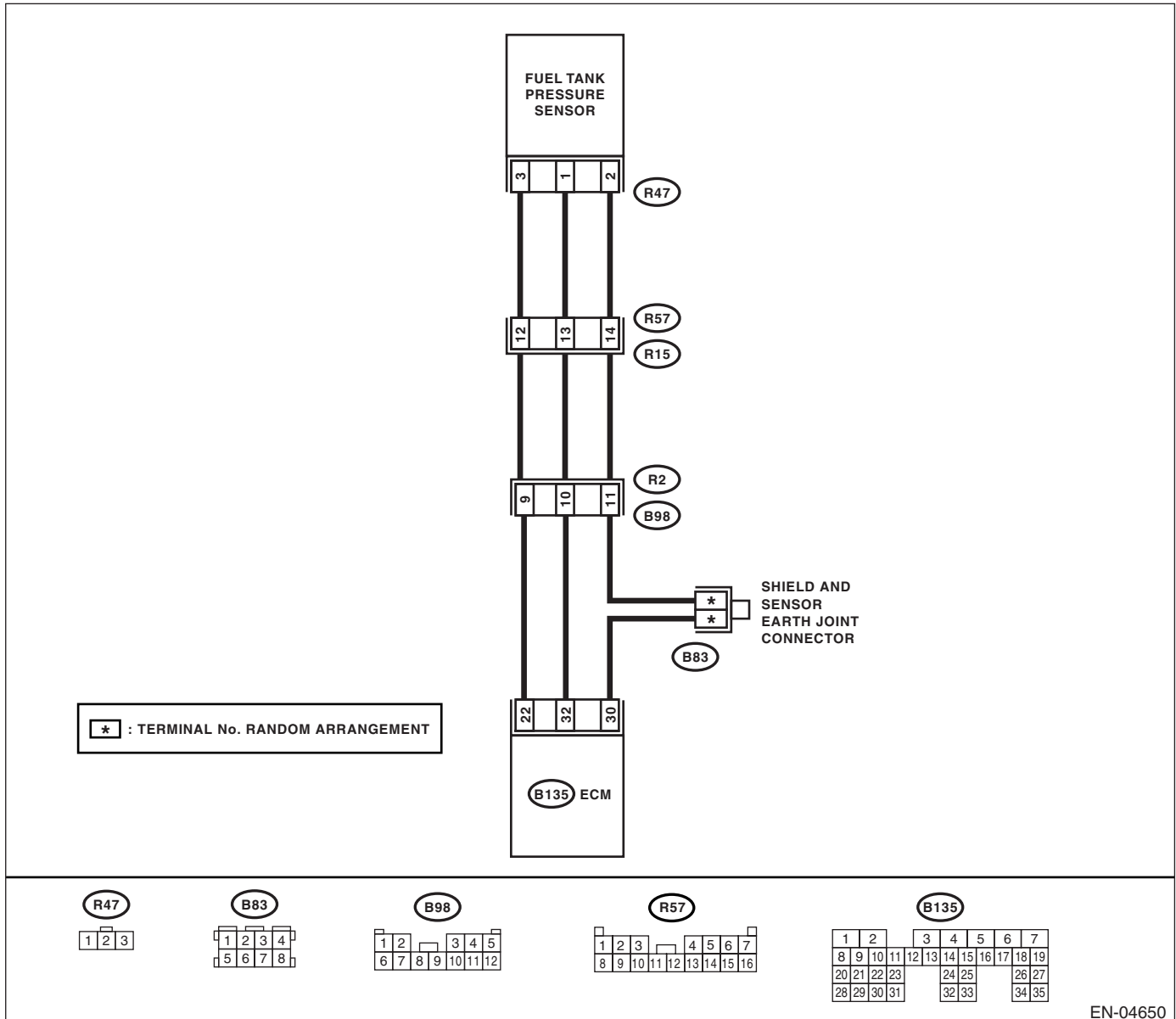
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-124, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes                                   | No   |
|---|--|---------------------------------------|--|
| <b>1 CHECK CURRENT DATA.</b><br>1) Turn ignition switch to OFF.<br>2) Remove the fuel filler cap.<br>3) Install the fuel filler cap.<br>4) Turn ignition switch to ON.<br>5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?         | Go to step 11.                        | Go to step 2.  |
| <b>2 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><i>Connector &amp; terminal</i><br><i>(B135) No. 22 (+) — Chassis ground (-):</i>   | Is the voltage more than 4.5 V?  | Go to step 4.                         | Go to step 3.  |
| <b>3 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><i>Connector &amp; terminal</i><br><i>(B135) No. 22 (+) — Chassis ground (-):</i>   | Does the voltage change by shaking the ECM harness and connector?        | Repair poor contact in ECM connector. | Replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).>   |
| <b>4 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM and chassis ground.<br><br><i>Connector &amp; terminal</i><br><i>(B135) No. 32 (+) — Chassis ground (-):</i>  | Is the voltage less than 0.2 V?  | Go to step 6.                         | Go to step 5.  |
| <b>5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)</b><br>Read the data of fuel tank pressure sensor signal using Subaru Select Monitor.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.>  | Does the measured value change by shaking the ECM harness and connector? | Repair poor contact in ECM connector. | Go to step 6.  |
| <b>6 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b><br>1) Turn ignition switch to OFF.<br>2) Remove the rear seat cushion.<br>3) Separate rear wiring harness and fuel tank cord.<br>4) Turn ignition switch to ON.<br>5) Measure the voltage between rear wiring harness connector and chassis ground.<br><br><i>Connector &amp; terminal</i><br><i>(R15) No. 12 (+) — Chassis ground (-):</i>   | Is the voltage more than 4.5 V?  | Go to step 7.                         | Repair harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ECM and rear wiring harness connector<br>• Poor contact in coupling connector |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <p><b>7 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b></p> <p>1) Turn ignition switch to OFF.<br/>2) Disconnect the connector from ECM.<br/>3) Measure the resistance of harness between ECM and rear wiring harness connector.</p> <p><b>Connector &amp; terminal</b><br/><b>(B135) No. 32 — (R15) No. 13:</b><br/><b>(B135) No. 30 — (R15) No. 14:</b></p>  | Is the resistance less than 1 $\Omega$ ?                         | Go to step 8.   | Repair harness and connector.<br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ECM and rear wiring harness connector<br>• Poor contact in coupling connector |
| <p><b>8 CHECK FUEL TANK CORD.</b></p> <p>1) Disconnect the connector from fuel tank pressure sensor.<br/>2) Measure the resistance of fuel tank cord.</p> <p><b>Connector &amp; terminal</b><br/><b>(R57) No. 13 — (R47) No. 1:</b></p>   | Is the resistance less than 1 $\Omega$ ?                         | Go to step 9.   | Repair open circuit in fuel tank cord.   |
| <p><b>9 CHECK FUEL TANK CORD.</b></p> <p>Measure the resistance of fuel tank cord.</p> <p><b>Connector &amp; terminal</b><br/><b>(R57) No. 14 — (R47) No. 2:</b></p>  | Is the resistance less than 1 $\Omega$ ?                         | Go to step 10.  | Repair open circuit in fuel tank cord.   |
| <p><b>10 CHECK FOR POOR CONTACT.</b></p> <p>Check for poor contact in fuel tank pressure sensor connector.</p>  | Is there poor contact in fuel tank pressure sensor connector?    | Repair poor contact in fuel tank pressure sensor connector.                                     | Replace the fuel tank pressure sensor. <Ref. to EC(H4SO)-11, Fuel Tank Pressure Sensor.>   |
| <p><b>11 CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF.<br/>2) Disconnect the connector from fuel tank pressure sensor.<br/>3) Turn ignition switch to ON.<br/>4) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the general scan tool.</p> <p>NOTE:<br/>• Subaru Select Monitor<br/>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;<br/>• General scan tool<br/>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)? | Repair short circuit to battery in harness between ECM and fuel tank pressure sensor connector. | Replace the fuel tank pressure sensor. <Ref. to EC(H4SO)-11, Fuel Tank Pressure Sensor.>   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **BL:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)**

#### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-125, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Fuel odor
- There is a hole of more than 0.5 mm (0.020 in) dia. in evaporation system or fuel tank.

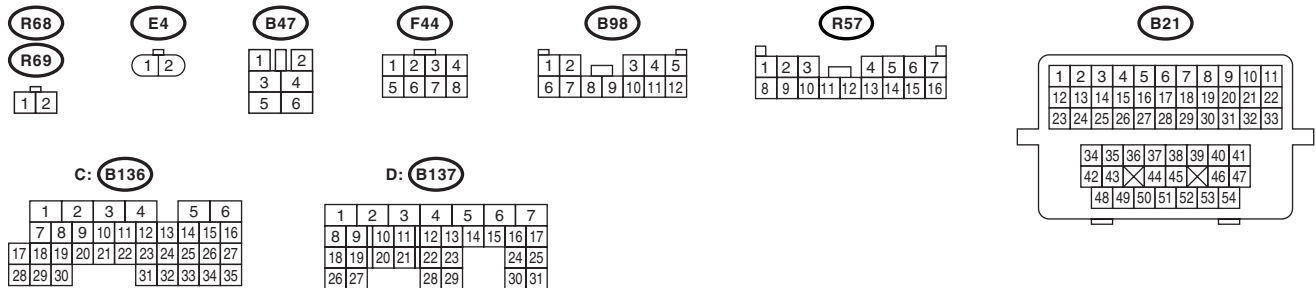
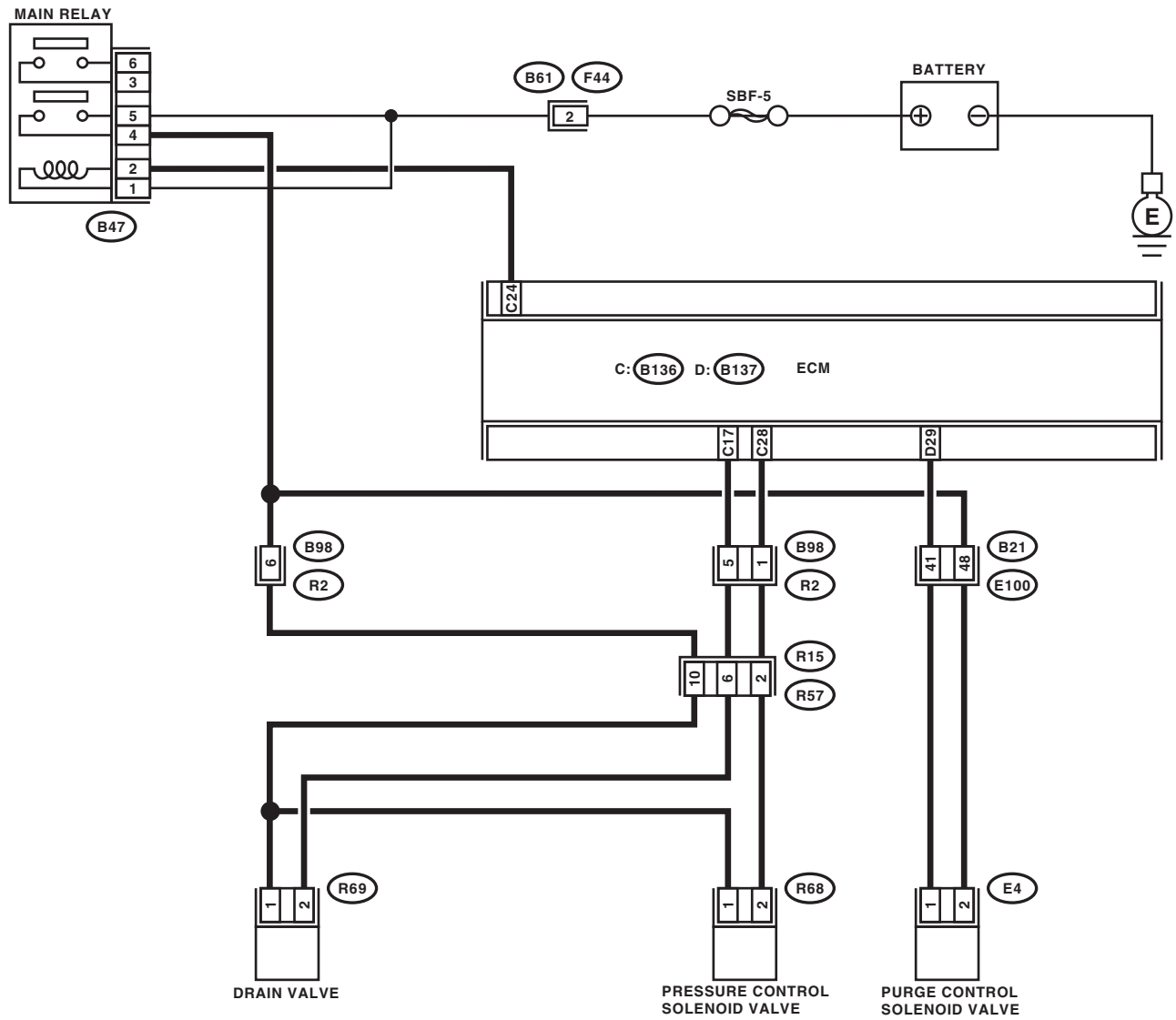
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04188

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step     | Check   | Yes   | No  |  |
|----------|---|---|---|--|
| <b>1</b> | <b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> | Go to step 2.  |
| <b>2</b> | <b>CHECK FUEL FILLER CAP.</b><br>1) Turn ignition switch to OFF.<br>2) Check the fuel filler cap.<br><br>NOTE:<br>The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.   | Is the fuel filler cap tightened securely?                                    | Go to step 3.   | Tighten fuel filler cap securely.  |
| <b>3</b> | <b>CHECK FUEL FILLER CAP.</b>   | Is the fuel filler cap SUBARU genuine?  | Go to step 4.   | Replace with a SUBARU genuine fuel filler cap.   |
| <b>4</b> | <b>CHECK FUEL FILLER PIPE PACKING.</b>  | Is there any damage to the seal between fuel filler cap and fuel filler pipe? | Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4SO)-46, Fuel Filler Pipe.>  | Go to step 5.  |
| <b>5</b> | <b>CHECK DRAIN VALVE.</b><br>1) Connect the test mode connector.<br>2) Turn ignition switch to ON.<br>3) Operate the drain valve.<br><br>NOTE:<br>Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-47, Compulsory Valve Operation Check Mode.> | Does the drain valve operate?   | Go to step 6.   | Replace the drain valve. <Ref. to EC(H4SO)-16, Drain Valve.>                                     |
| <b>6</b> | <b>CHECK PURGE CONTROL SOLENOID VALVE.</b><br>Operate the purge control solenoid valve.<br><br>NOTE:<br>Purge control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-47, Compulsory Valve Operation Check Mode.>                          | Does the purge control solenoid valve operate?                                | Go to step 7.   | Replace the purge control solenoid valve. <Ref. to EC(H4SO)-7, Purge Control Solenoid Valve.>    |
| <b>7</b> | <b>CHECK PRESSURE CONTROL SOLENOID VALVE.</b><br>Operate the pressure control solenoid valve.<br><br>NOTE:<br>Pressure control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-47, Compulsory Valve Operation Check Mode.>                 | Does the pressure control solenoid valve operate?                             | Go to step 8.   | Replace the pressure control solenoid valve. <Ref. to EC(H4SO)-7, Purge Control Solenoid Valve.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <b>8</b><br><b>CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.</b><br>Turn ignition switch to OFF. | Is there a hole of more than 0.5 mm (0.020 in) dia. on evaporation line?  | Repair or replace the evaporation line. <Ref. to FU(H4SO)-57, Fuel Delivery & Evaporation Lines.> | Go to step <b>9</b> .   |
| <b>9</b><br><b>CHECK CANISTER.</b>   | Is the canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?   | Repair or replace the canister. <Ref. to EC(H4SO)-6, Canister.>                                   | Go to step <b>10</b> .  |
| <b>10</b><br><b>CHECK FUEL TANK.</b><br>Remove the fuel tank. <Ref. to FU(H4SO)-43, Fuel Tank.>    | Is the fuel tank damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?  | Repair or replace the fuel tank. <Ref. to FU(H4SO)-43, Fuel Tank.>                                | Go to step <b>11</b> .  |
| <b>11</b><br><b>CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.</b>     | Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, disconnections or bend of hoses or pipes in evaporative emission control system? | Repair or replace the hoses or pipes.   | Contact your SOA Service Center since deterioration of some parts may be the cause. |

## **BM:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)**

### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-101, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

- Fuel odor
- Fuel filler cap is loose or not installed.

### **CAUTION:**

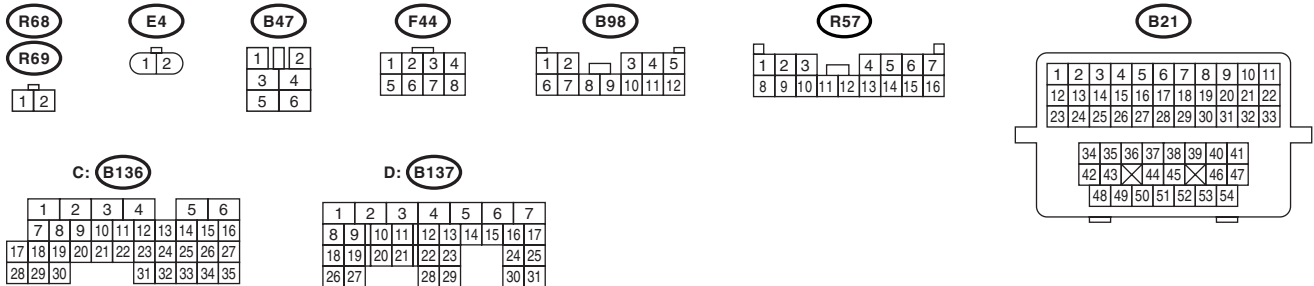
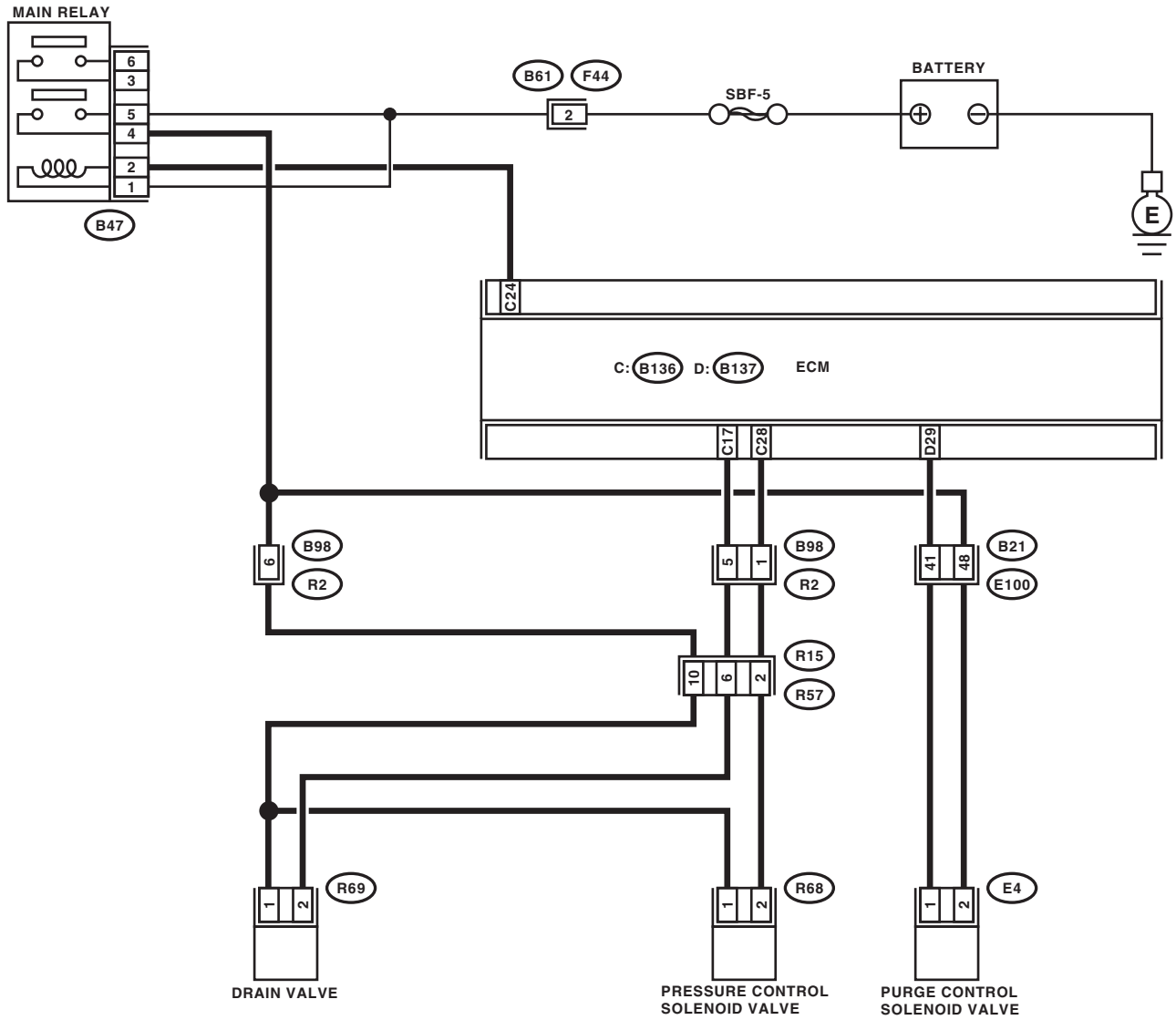
**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04188

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step     | Check   | Yes   | No  |
|----------|---|---|---|
| <b>1</b> | <b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> |
| <b>2</b> | <b>CHECK FUEL FILLER CAP.</b><br>1) Turn ignition switch to OFF.<br>2) Check the fuel filler cap.<br><br>NOTE:<br>The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.   | Is the fuel filler cap tightened securely?                                    | Go to step 3.<br><br>Tighten fuel filler cap securely.  |
| <b>3</b> | <b>CHECK FUEL FILLER CAP.</b>   | Is the fuel filler cap SUBARU genuine?  | Go to step 4.<br><br>Replace with a SUBARU genuine fuel filler cap.   |
| <b>4</b> | <b>CHECK FUEL FILLER PIPE PACKING.</b>  | Is there any damage to the seal between fuel filler cap and fuel filler pipe? | Repair or replace the fuel filler cap and fuel filler pipe.<br><Ref. to FU(H4SO)-46, Fuel Filler Pipe.>                                     |
| <b>5</b> | <b>CHECK DRAIN VALVE.</b><br>1) Connect the test mode connector.<br>2) Turn ignition switch to ON.<br>3) Operate the drain valve.<br><br>NOTE:<br>Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-47, Compulsory Valve Operation Check Mode.> | Does the drain valve operate?   | Go to step 6.<br><br>Replace the drain valve. <Ref. to EC(H4SO)-16, Drain Valve.>   |
| <b>6</b> | <b>CHECK PURGE CONTROL SOLENOID VALVE.</b><br>Operate the purge control solenoid valve.<br><br>NOTE:<br>Purge control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-47, Compulsory Valve Operation Check Mode.>                          | Does the purge control solenoid valve operate?                                | Go to step 7.<br><br>Replace the purge control solenoid valve. <Ref. to EC(H4SO)-7, Purge Control Solenoid Valve.>                          |
| <b>7</b> | <b>CHECK PRESSURE CONTROL SOLENOID VALVE.</b><br>Operate the pressure control solenoid valve.<br><br>NOTE:<br>Pressure control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-47, Compulsory Valve Operation Check Mode.>                 | Does the pressure control solenoid valve operate?                             | Go to step 8.<br><br>Replace the pressure control solenoid valve. <Ref. to EC(H4SO)-7, Purge Control Solenoid Valve.>                       |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes  | No  |
|---|---|--|---|
| <b>8</b> <b>CHECK CANISTER.</b>   | Is the canister damaged?  | Repair or replace the canister. <Ref. to EC(H4SO)-6, Canister.>    | Go to step <b>9</b> .   |
| <b>9</b> <b>CHECK FUEL TANK.</b><br>Remove the fuel tank. <Ref. to FU(H4SO)-43, Fuel Tank.> | Is the fuel tank damaged?   | Repair or replace the fuel tank. <Ref. to FU(H4SO)-43, Fuel Tank.> | Go to step <b>10</b> .  |
| <b>10</b> <b>CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.</b> | Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging or disconnections of hoses or pipes in evaporative emission control system? | Repair or replace the hoses or pipes.                              | Contact your SOA Service Center since deterioration of some parts may be the cause. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BN:DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-126, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

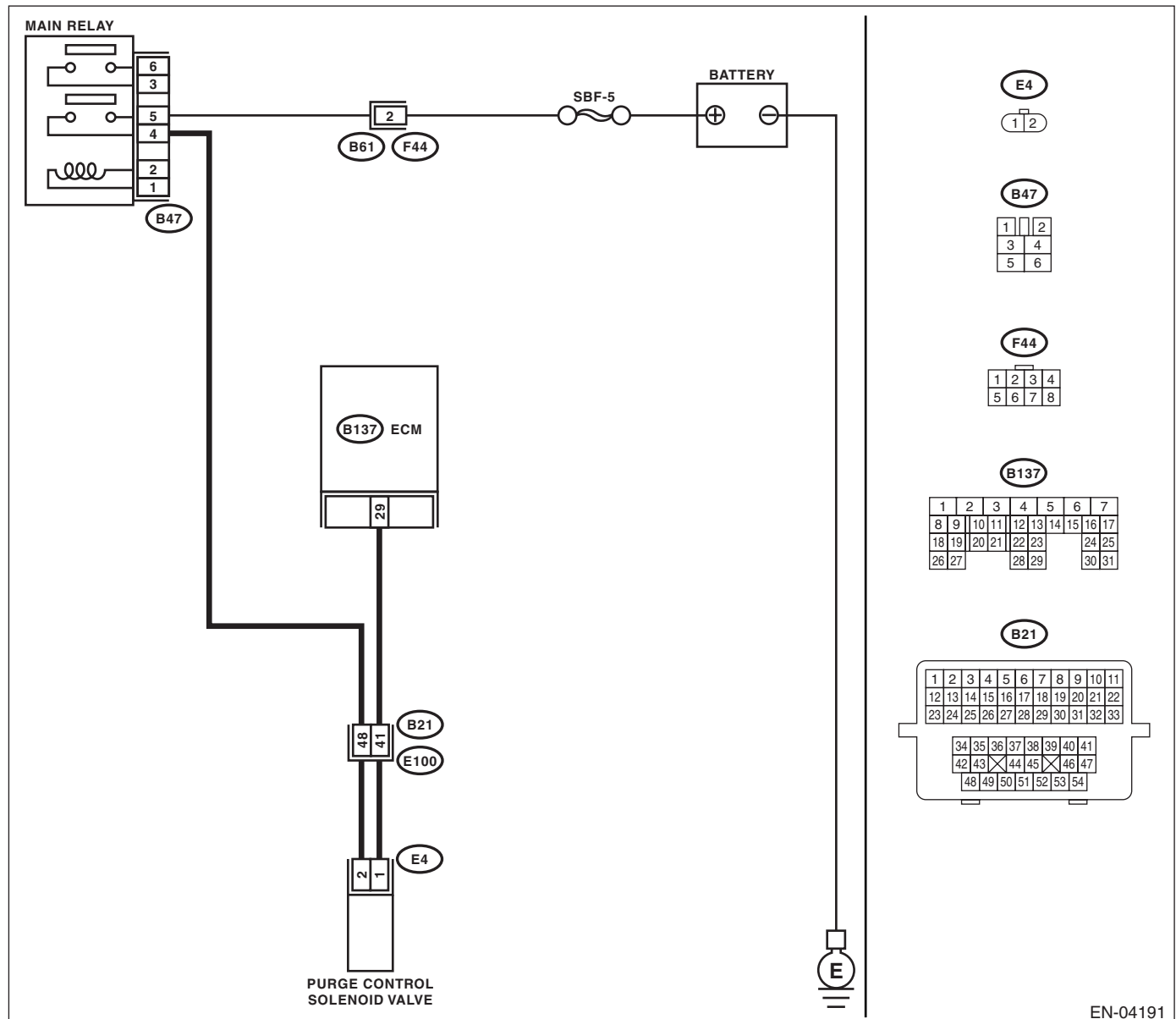
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04191

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <b>1 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B137) No. 29 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?                                   | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. Contact your SOA Service Center since deterioration of some parts may be the cause. | Go to step 2.  |
| <b>2 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from purge control solenoid valve and ECM.<br>3) Measure the resistance of harness between purge control solenoid valve connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E4) No. 2 — Engine ground:</b> | Is the resistance more than 1 M $\Omega$ ?                       | Go to step 3.   | Repair ground short circuit in harness between ECM and purge control solenoid valve connector.   |
| <b>3 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM and purge control solenoid valve of harness connector.<br><b>Connector &amp; terminal</b><br><b>(B137) No. 29 — (E4) No. 1:</b>   | Is the resistance less than 1 $\Omega$ ?                         | Go to step 4.   | Repair open circuit in harness between ECM and purge control solenoid valve connector.<br><br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and purge control solenoid valve connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>4 CHECK PURGE CONTROL SOLENOID VALVE.</b><br>1) Remove the purge control solenoid valve.<br>2) Measure the resistance between purge control solenoid valve terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>   | Is the resistance 10 — 100 $\Omega$ ?                            | Go to step 5.   | Replace the purge control solenoid valve. <Ref. to EC(H4SO)-7, Purge Control Solenoid Valve.>  |
| <b>5 CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between purge control solenoid valve and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E4) No. 1 (+) — Engine ground (-):</b>   | Is the voltage more than 10 V?                                   | Go to step 6.   | Repair open circuit in harness between main relay and purge control solenoid valve connector.  |
| <b>6 CHECK POOR CONTACT.</b><br>Check poor contact in purge control solenoid valve connector.   | Is there poor contact in purge control solenoid valve connector? | Repair poor contact in purge control solenoid valve connector.  | Contact your SOA Service Center since deterioration of some parts may be the cause.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BO:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-127, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

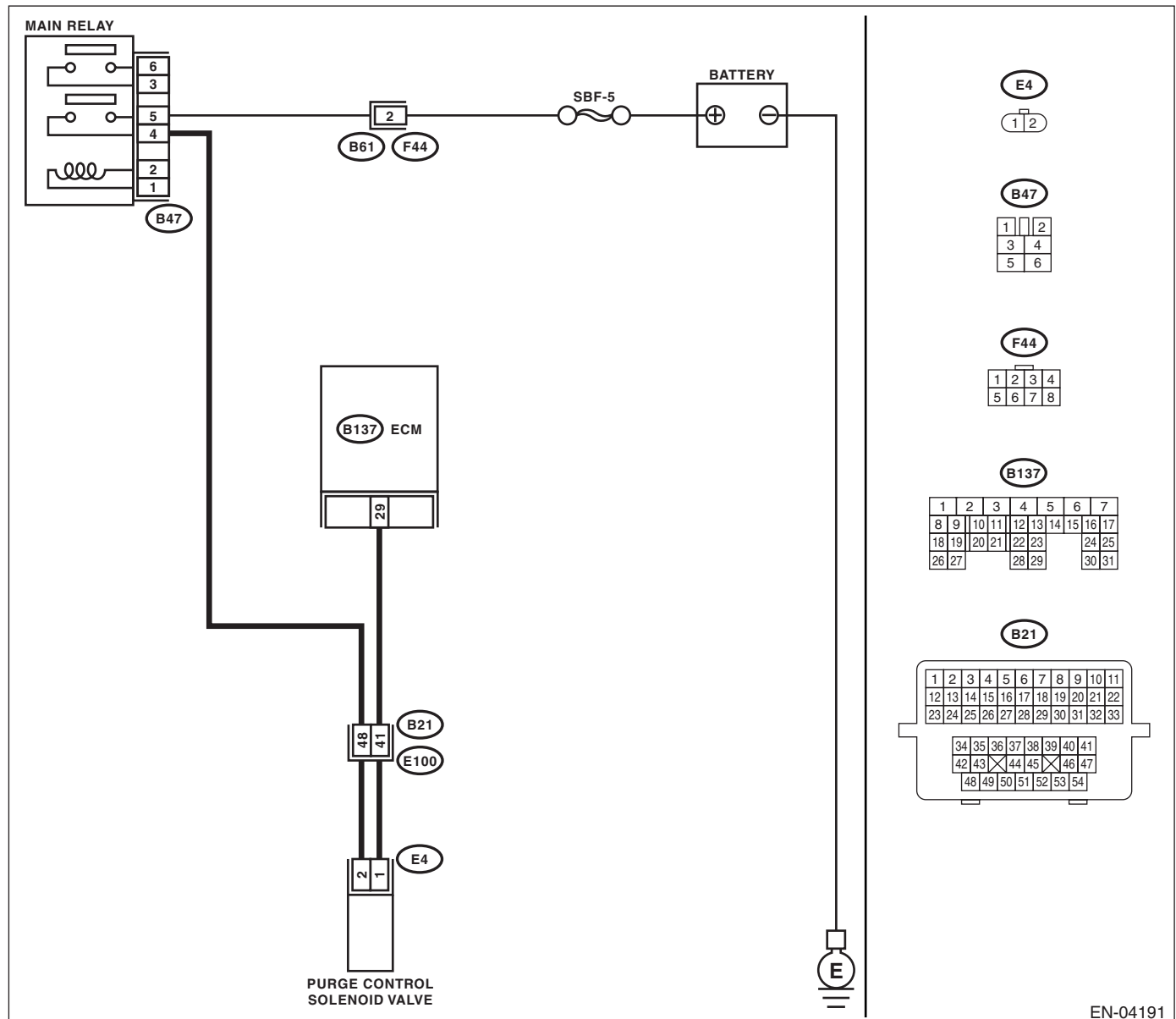
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04191

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check                                    | Yes  | No   |
|---|--|--|--|
| <b>1 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side).<br>3) Turn the ignition switch to ON.<br>4) While operating the purge control solenoid valve, measure voltage between ECM and chassis ground.<br><br><b>NOTE:</b><br>Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-47, Compulsory Valve Operation Check Mode.><br><br><b>Connector &amp; terminal</b><br><b>(B137) No. 29 (+) — Chassis ground (-):</b> | Is the voltage 0 — 10 V?                 | Go to step 2.  | Even if malfunction indicator light light up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector. |
| <b>2 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B137) No. 29 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?           | Go to step 4.  | Go to step 3.  |
| <b>3 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.  | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.  | Replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).>   |
| <b>4 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from purge control solenoid valve.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between ECM and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B137) No. 29 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?           | Repair battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> | Go to step 5.  |
| <b>5 CHECK PURGE CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between purge control solenoid valve terminals.<br><br><b>Terminals</b><br><b>No. 1 — No. 2:</b>   | Is the resistance less than 1 $\Omega$ ? | Replace the purge control solenoid valve <Ref. to EC(H4SO)-7, Purge Control Solenoid Valve.> and ECM <Ref. to FU(H4SO)-38, Engine Control Module (ECM).>                           | Go to step 6.  |
| <b>6 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.  | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.  | Replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BP:DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE

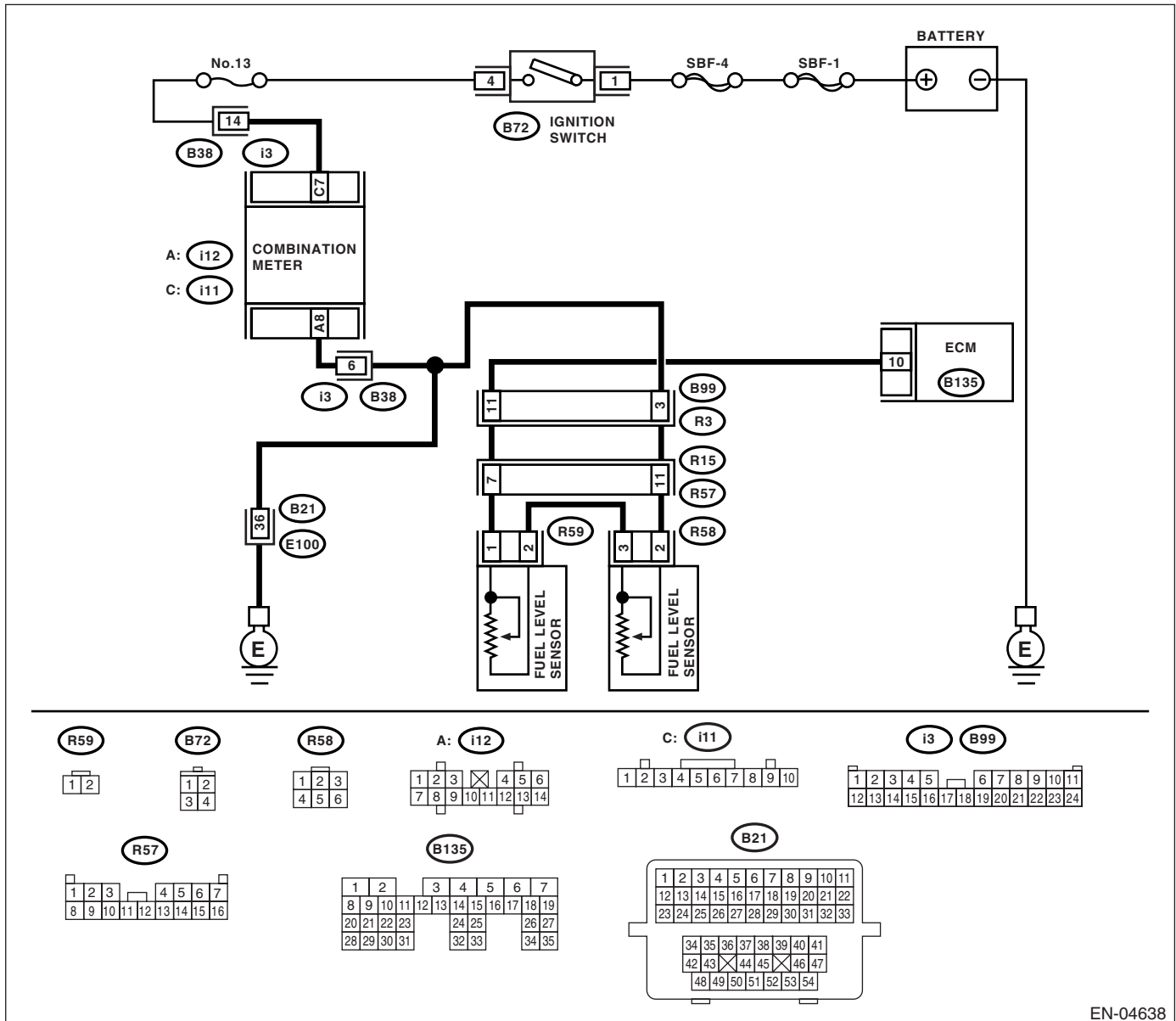
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-129, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04638



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                       | Yes   | No   |
|---|-----------------------------|---|--|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect this trouble. | Replace the fuel level sensor <Ref. to FU(H4SO)-52, Fuel Level Sensor.> and fuel sub level sensor. <Ref. to FU(H4SO)-53, Fuel Sub Level Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BQ:DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT

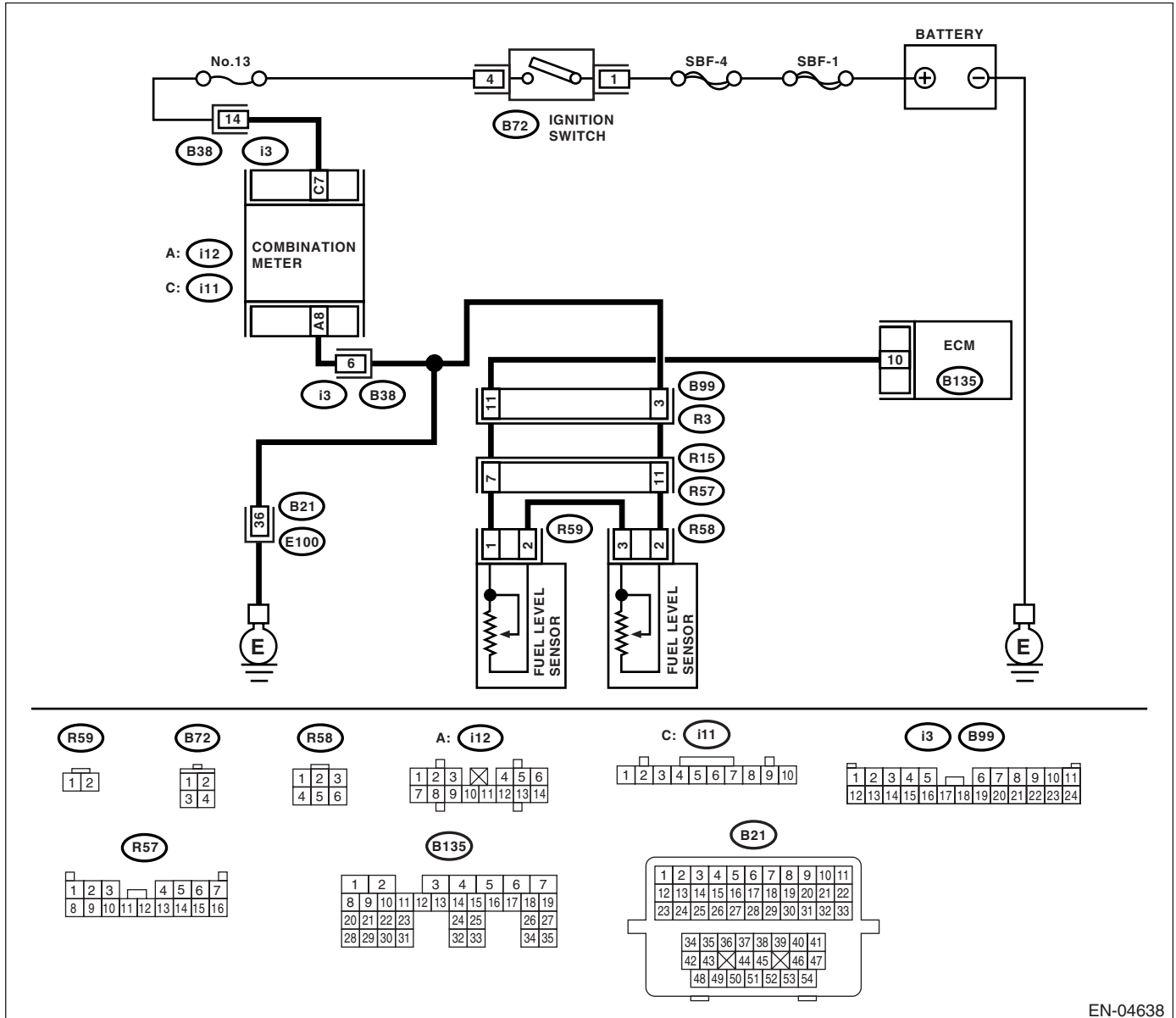
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-131, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04638

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step | Check  | Yes  | No   |
|------|--|--|--|
| 1    | <b>CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.</b>  | Go to step 2.  | Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>  |
| 2    | <b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to ON. (Engine OFF)<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 10 (+) — Chassis ground (-):</b>   | Go to step 4.  | Go to step 3.  |
| 3    | <b>CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)</b><br>Read the data of fuel level sensor signal using Subaru Select Monitor.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.>  | Is the voltage less than 0.12 V by shaking the harness and connector of ECM?<br><br>Repair poor contact in ECM connector.    | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.<br><br>NOTE:<br>In this case, repair the following:<br>• Poor contact in combination meter connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connectors |
| 4    | <b>CHECK INPUT VOLTAGE OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15).<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 10 (+) — Chassis ground (-):</b> | Is the voltage more than 0.12 V?<br><br>Go to step 5.  | Go to step 6.  |
| 5    | <b>CHECK HARNESS BETWEEN ECM AND COMBINATION METER.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from connector (i11) and ECM connector.<br>3) Measure the resistance between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 10 — Chassis ground:</b>  | Is the resistance more than 1 MΩ?<br><br>Go to step 7.   | Repair ground short circuit in harness between ECM and combination meter connector.  |
| 6    | <b>CHECK HARNESS BETWEEN ECM AND COMBINATION METER.</b><br>Measure the resistance between ECM and combination meter connector.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 10 — (i12) No. 8:</b>   | Is the resistance less than 10 Ω?<br><br>Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.> | Repair open circuit between ECM and combination meter connector.<br><br>NOTE:<br>In this case, repair the following:<br>Poor contact in coupling connector   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes   | No  |
|---|--|---|---|
| <b>7</b><br><b>CHECK FUEL TANK CORD.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from fuel sub level sensor.<br>3) Measure the resistance between fuel sub level sensor and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R59) No. 1 — Chassis ground:</b>      | Is the resistance more than 1 M $\Omega$ ? | Go to step <b>8</b> .   | Repair short circuit to ground in fuel tank cord. |
| <b>8</b><br><b>CHECK FUEL TANK CORD.</b><br>1) Disconnect the connector from fuel pump assembly.<br>2) Measure the resistance between fuel pump assembly and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R59) No. 2 — Chassis ground:</b>   | Is the resistance more than 1 M $\Omega$ ? | Go to step <b>9</b> .   | Repair ground short circuit in fuel tank cord.    |
| <b>9</b><br><b>CHECK FUEL LEVEL SENSOR.</b><br>1) Remove the fuel pump assembly. <Ref. to FU(H4SO)-50, Fuel Pump.><br>2) Measure the resistance between fuel level sensor and terminals with its float set to the full position.<br><b>Terminals</b><br><b>No. 3 — No. 2:</b>                         | Is the resistance 0.5 — 2.5 $\Omega$ ?     | Go to step <b>10</b> .  | Replace the fuel level sensor.                    |
| <b>10</b><br><b>CHECK FUEL SUB LEVEL SENSOR.</b><br>1) Remove the fuel sub level sensor. <Ref. to FU(H4SO)-53, Fuel Sub Level Sensor.><br>2) Measure the resistance between fuel sub level sensor and terminals with its float set to the full position.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b> | Is the resistance 0.5 — 2.5 $\Omega$ ?     | Repair poor contact in harness between ECM and combination meter connector. | Replace the fuel sub level sensor.                |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BR:DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT

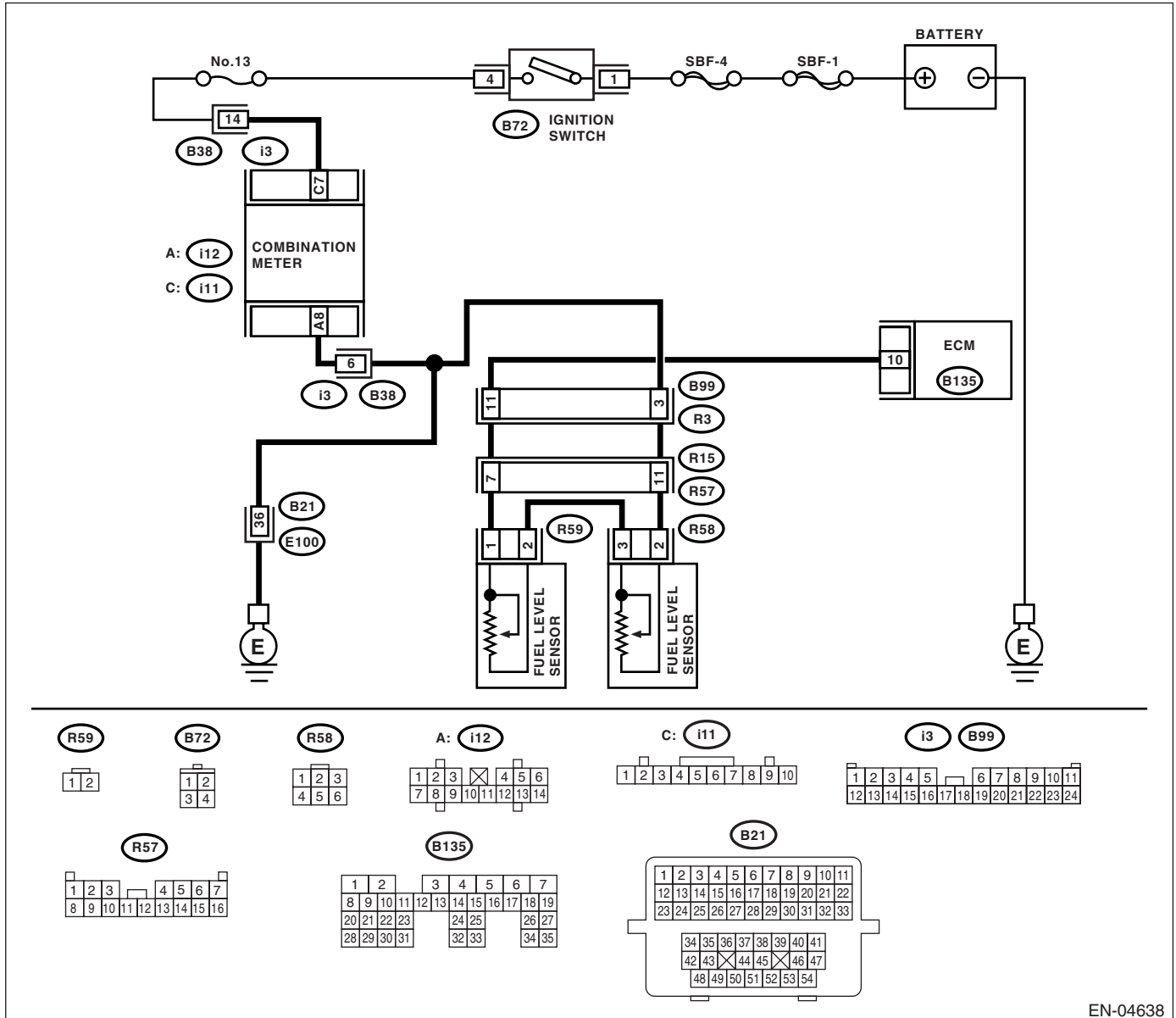
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-133, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04638

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check   | Yes   | No  |
|------|---|---|---|
| 1    | <b>CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.</b>   | Go to step 2.   | Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>   |
| 2    | <b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to ON. (Engine OFF)<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 10 (+) — Chassis ground (-):</b>  | Go to step 3.   | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Poor contact in fuel pump connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| 3    | <b>CHECK INPUT VOLTAGE OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the combination meter connector (i11) and ECM connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage of harness between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 10 (+) — Chassis ground (-):</b> | Repair battery short circuit between ECM and combination meter connector. | Go to step 4.   |
| 4    | <b>CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.</b><br>1) Turn the ignition switch to OFF.<br>2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15).<br>3) Measure the resistance between ECM and fuel tank cord.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 10 — (R15) No. 7:</b>                           | Go to step 5.   | Repair open circuit in harness between ECM and fuel tank cord.  |
| 5    | <b>CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.</b><br>Measure the resistance between fuel tank cord and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R15) No. 11 — Chassis ground:</b>  | Go to step 6.   | Repair open circuit in harness between fuel tank cord and chassis ground.<br><br>NOTE:<br>In this case, repair the following:<br>Poor contact in coupling connectors  |
| 6    | <b>CHECK FUEL TANK CORD.</b><br>1) Disconnect the connector from fuel level sensor.<br>2) Measure the resistance between fuel level sensor and coupling connector.<br><b>Connector &amp; terminal</b><br><b>(R57) No. 11 — (R58) No. 2:</b>   | Go to step 7.   | Repair open circuit in harness between coupling connector and fuel level sensor.  |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check                                       | Yes  | No  |
|---|---|--|---|
| <b>7</b><br><b>CHECK FUEL TANK CORD.</b><br>1) Disconnect the connector from fuel sub level sensor.<br>2) Measure the resistance between fuel level sensor and fuel sub level sensor.<br><b>Connector &amp; terminal</b><br><b>(R58) No. 3 — (R59) No. 2:</b>   | Is the resistance less than 10 $\Omega$ ?   | Go to step <b>8</b> .  | Repair open circuit in harness between fuel level sensor and fuel sub level sensor. |
| <b>8</b><br><b>CHECK FUEL TANK CORD.</b><br>Measure the resistance between fuel level sensor and coupling connector.<br><b>Connector &amp; terminal</b><br><b>(R57) No. 7 — (R59) No. 1:</b>  | Is the resistance less than 10 $\Omega$ ?   | Go to step <b>9</b> .  | Repair open circuit in harness between coupling connector and fuel level sensor.    |
| <b>9</b><br><b>CHECK FUEL LEVEL SENSOR.</b><br>1) Remove the fuel pump assembly. <Ref. to FU(H4SO)-50, Fuel Pump.><br>2) While moving the fuel level sensor float up and down, measure resistance between fuel level sensor terminals.<br><b>Terminals</b><br><b>No. 3 — No. 2:</b>                             | Is the resistance more than 54.5 $\Omega$ ? | Replace the fuel level sensor. <Ref. to FU(H4SO)-52, Fuel Level Sensor.>         | Go to step <b>10</b> .  |
| <b>10</b><br><b>CHECK FUEL SUB LEVEL SENSOR.</b><br>1) Remove the fuel sub level sensor. <Ref. to FU(H4SO)-53, Fuel Sub Level Sensor.><br>2) While moving the fuel sub level sensor float up and down, measure resistance between fuel sub level sensor terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b> | Is the resistance more than 41.5 $\Omega$ ? | Replace the fuel sub level sensor. <Ref. to FU(H4SO)-53, Fuel Sub Level Sensor.> | Replace the combination meter. <Ref. to IDI-10, Combination Meter.>                 |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BS:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

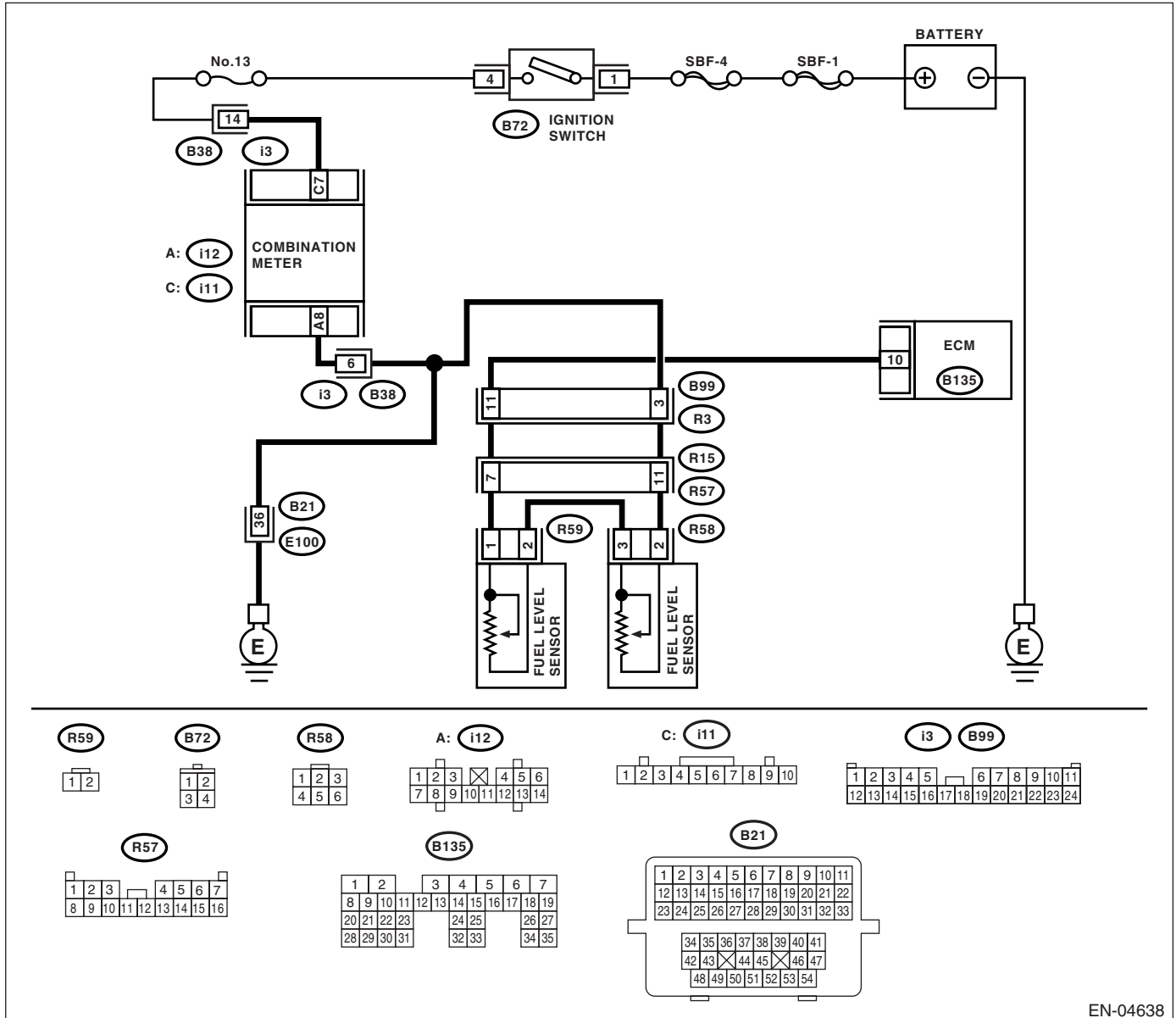
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-135, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04638



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                | Yes  | No   |
|--|--------------------------------------|--|--|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?          | Inspect DTC P0462 or P0463 using "List of Diagnostic Trouble Code (DTC)".<br><Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> | Go to step 2.  |
| <b>2</b><br><b>CHECK FUEL LEVEL SENSOR.</b><br>1) Remove the fuel pump assembly. <Ref. to FU(H4SO)-50, Fuel Pump.><br>2) While moving the fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly.<br><b>Terminals</b><br><b>No. 3 — No. 2:</b>                    | Does the resistance change smoothly? | Go to step 3.  | Replace the fuel level sensor. <Ref. to FU(H4SO)-52, Fuel Level Sensor.>     |
| <b>3</b><br><b>CHECK FUEL SUB LEVEL SENSOR.</b><br>1) Remove the fuel sub level sensor. <Ref. to FU(H4SO)-52, Fuel Level Sensor.><br>2) While moving the fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b> | Does the resistance change smoothly? | Repair poor contact in ECM, combination meter and coupling connectors.   | Replace the fuel sub level sensor. <Ref. to FU(H4SO)-52, Fuel Level Sensor.> |

### BT:DTC P0483 COOLING FAN RATIONALITY CHECK

#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-138, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### TROUBLE SYMPTOM:

- Occurrence of noise
- Overheating

#### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**

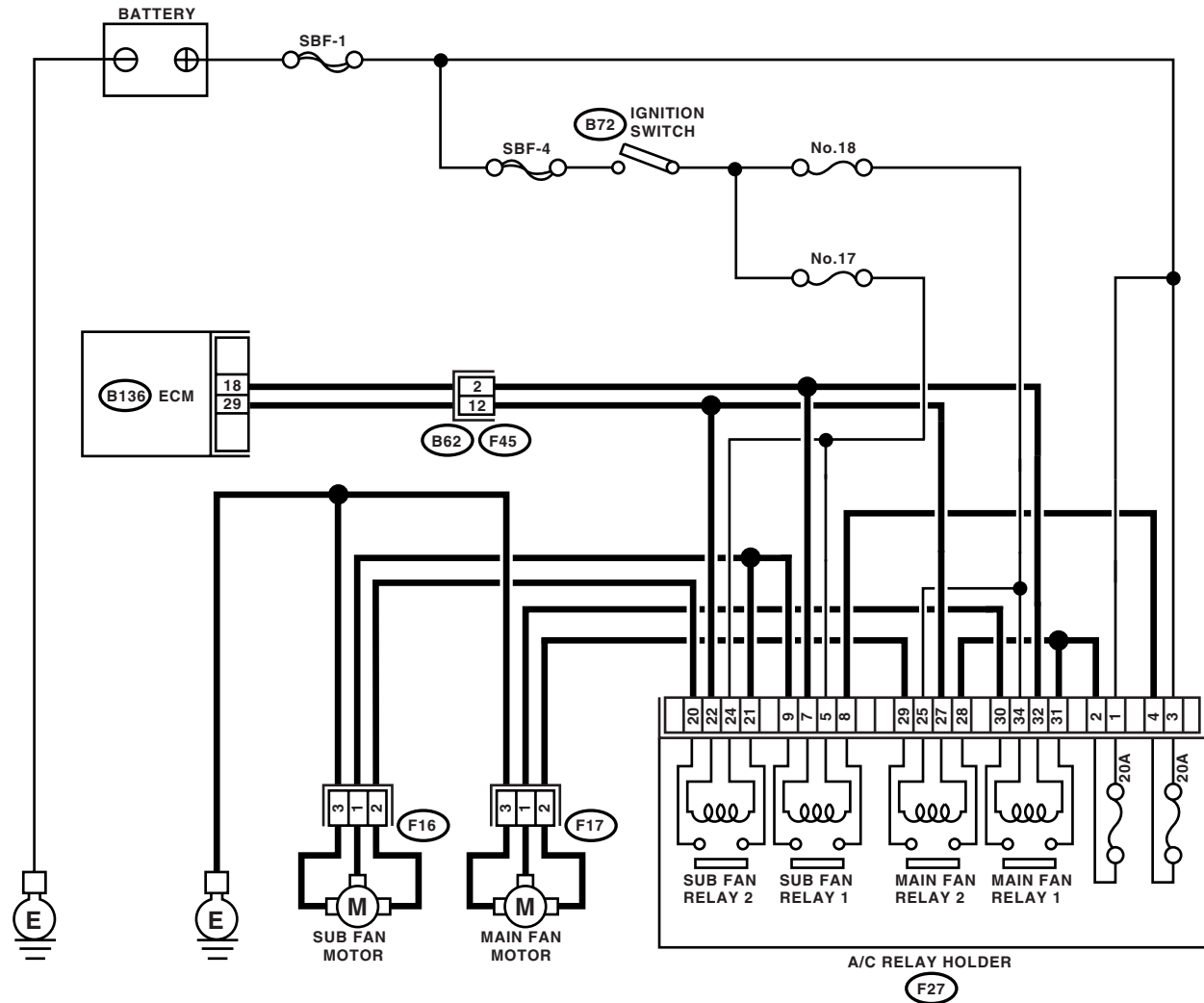
#### NOTE:

If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



(B72)

|   |   |
|---|---|
| 1 | 2 |
| 3 | 4 |

(F27)

|   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1 | 2  | 5  | 6  | 7  | 10 | 15 | 16 | 17 | 20 | 25 | 26 | 27 | 30 | 35 |
| 3 | 4  | 8  | 11 | 18 | 21 | 28 | 31 | 36 |    |    |    |    |    |    |
| 9 | 12 | 13 | 14 | 19 | 22 | 23 | 24 | 29 | 32 | 33 | 34 |    |    |    |

(B136)

|    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  |    |    |    |    |    |
| 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 |    |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |    |    |    |

(F45)

|    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 |    |    |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |

(F16)

|   |   |
|---|---|
| 1 | 2 |
| 3 | 4 |

(F17)

|   |   |
|---|---|
| 1 | 2 |
| 3 | 4 |

EN-04193

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                       | Yes   | No   |
|---|-----------------------------|---|--|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> | Check radiator fan and fan motor. <Ref. to CO(H4SO)-27, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-28, Radiator Sub Fan and Fan Motor.> |

### BU:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT

**NOTE:**

For the diagnostic procedure, refer to DTC P0503. <Ref. to EN(H4SO)(diag)-247, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BV:DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH

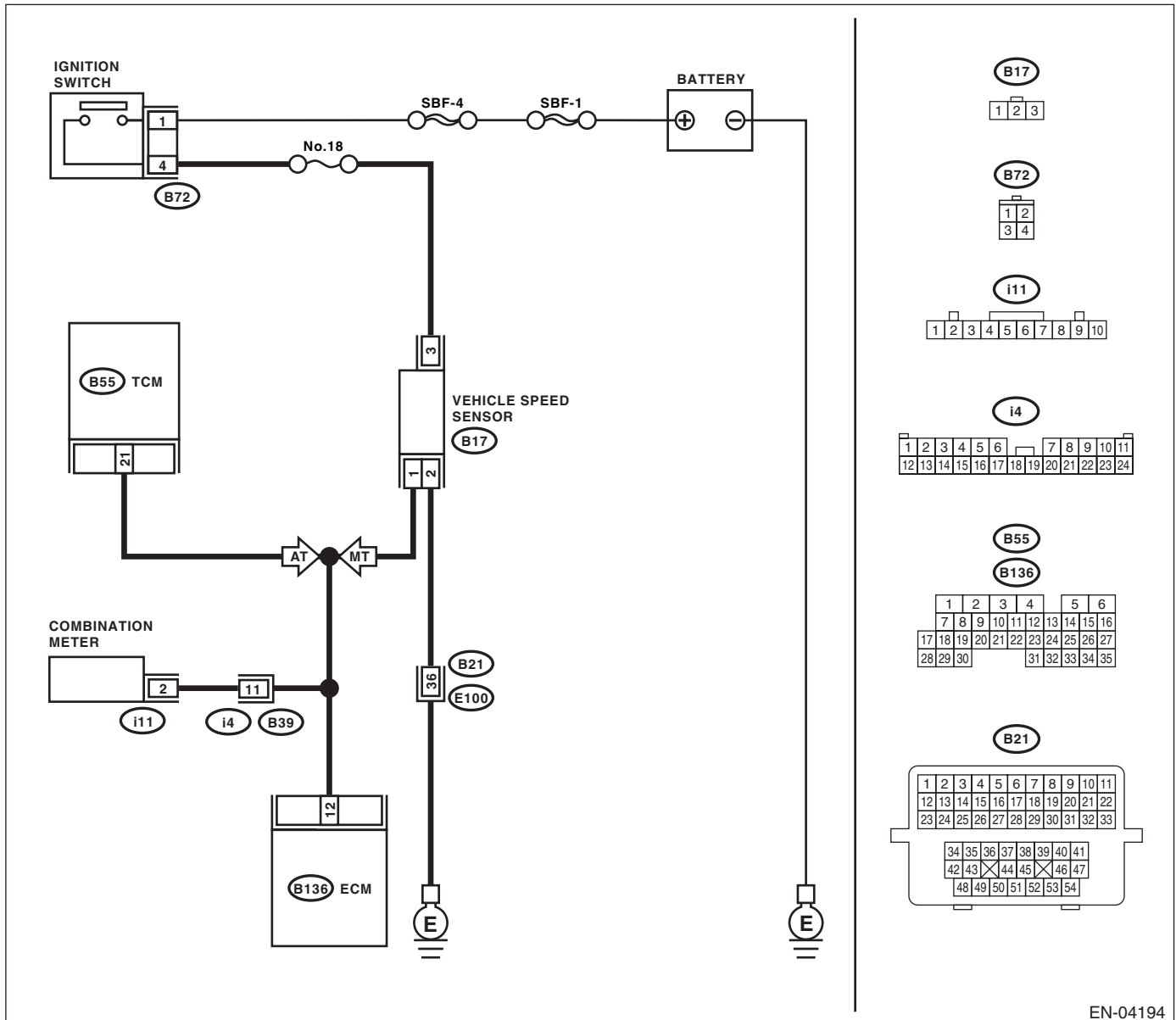
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-140, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04194

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step     | Check   | Yes   | No  |
|----------|---|---|---|
| <b>1</b> | <b>CHECK TRANSMISSION TYPE.</b>   | Is the target AT model?   | Go to step 2.   |
| <b>2</b> | <b>CHECK DTC P0720 ON DISPLAY.</b>  | Go to step 3.   | Does the Subaru Select Monitor or general scan tool indicate DTC P0720?   |
| <b>3</b> | <b>CHECK SPEEDOMETER OPERATION IN COMBINATION METER.</b>  | Check front vehicle speed sensor signal circuit.<br><Ref. to 4AT(D)(diag)-52, DTC P0720 OUTPUT SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  | Go to step 3.   |
| <b>4</b> | <b>CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from combination meter.<br>3) Measure the resistance between ECM and combination meter.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 12 — (i11) No. 2:</b> | Does the speedometer operate normally?  | Go to step 4.   |
| <b>5</b> | Is the resistance less than 10 Ω?   | Repair poor contact in ECM connector.   | Check speedometer and vehicle speed sensor.<br><Ref. to IDI-13, Speedometer.> and <Ref. to 4AT-51, Front Vehicle Speed Sensor.> and <Ref. to 4AT-55, Rear Vehicle Speed Sensor.> and <Ref. to 4AT-56, Torque Converter Turbine Speed Sensor.> |
|          |   | Repair harness and connector.<br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM and combination meter connector<br>• Poor contact in ECM connector<br>• Poor contact in combination meter connector<br>• Poor contact in coupling connector |   |

## **BW:DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED**

### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-141, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

- Engine is difficult to start.
- Engine does not start.
- Erroneous idling
- Engine stalls.

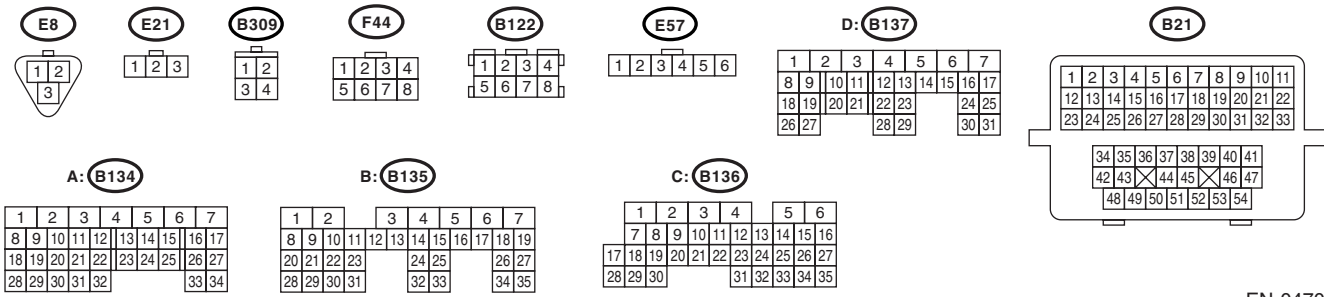
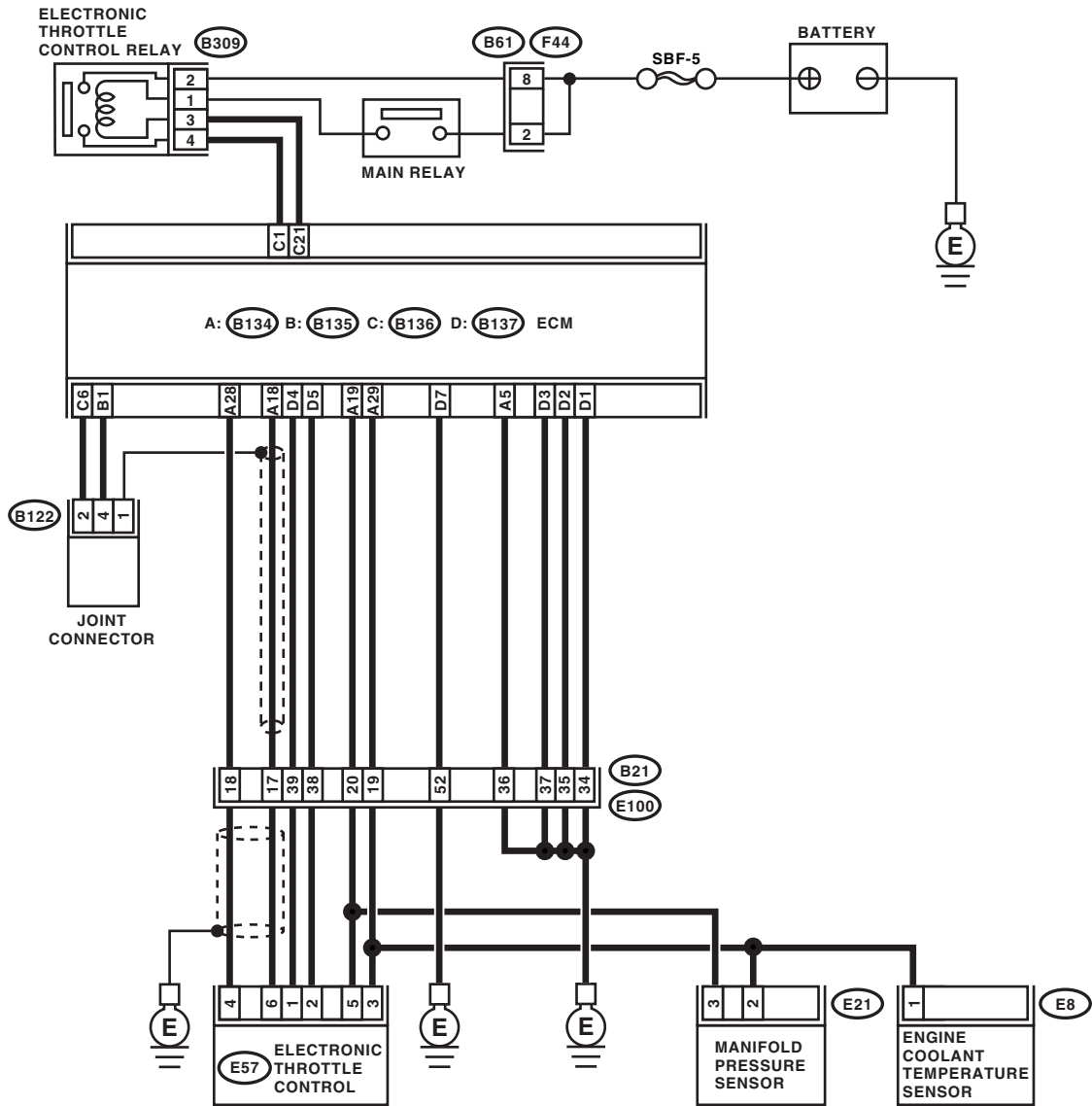
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04700

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No                                  |
|--|---|---|-------------------------------------|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?                                 | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0506. | Go to step 2.                       |
| 2<br><b>CHECK AIR CLEANER ELEMENT.</b><br>1) Turn the ignition switch to OFF.<br>2) Check air cleaner element.   | Is there excessive clogging on air cleaner element.         | Replace the air cleaner element.<br><Ref. to IN(H4SO)-4, Air Cleaner Element.>  | Go to step 3.                       |
| 3<br><b>CHECK ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electronic throttle control.<br>3) Check the electronic throttle control. | Are there foreign particles in electronic throttle control? | Remove the foreign particles from electronic throttle control.  | Perform the diagnosis of DTC P2101. |

## **BX:DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED**

### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-142, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

Engine keeps running at higher revolution than specified idling revolution.

### **CAUTION:**

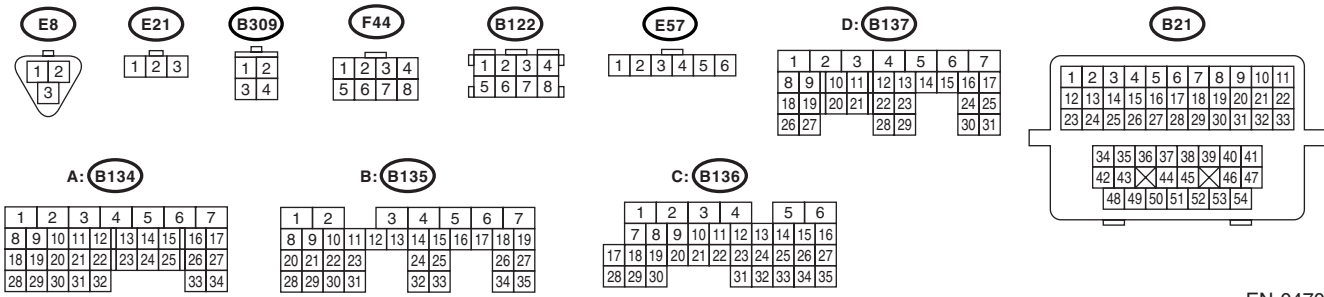
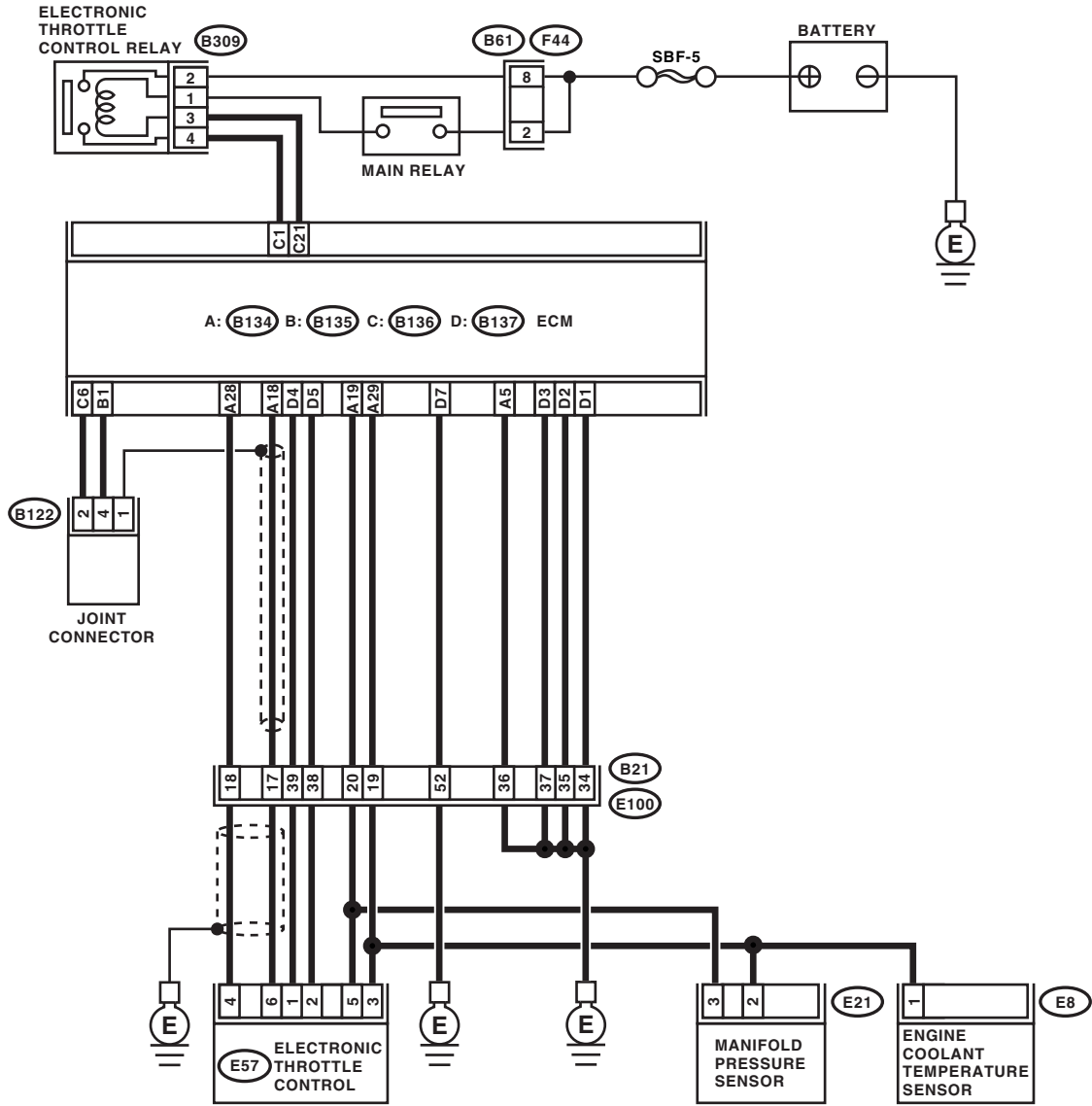
**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04700

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No                                  |
|--|---|---|-------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?                                 | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0507. | Go to step 2.                       |
| <b>2</b><br><b>CHECK AIR INTAKE SYSTEM.</b><br>1) Turn the ignition switch to ON.<br>2) Start the engine, and idle it.<br>3) Check the following items. <ul style="list-style-type: none"><li>Loose installation of intake manifold and throttle body</li><li>Cracks of intake manifold gasket and throttle body gasket</li><li>Disconnections of vacuum hoses</li></ul> | Is there a fault in air intake system?                      | Repair the air suction and leaks.   | Go to step 3.                       |
| <b>3</b><br><b>CHECK ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electronic throttle control.<br>3) Check the electronic throttle control.  | Are there foreign particles in electronic throttle control? | Remove the foreign particles from electronic throttle control.  | Perform the diagnosis of DTC P2101. |

## BY:DTC P0512 STARTER REQUEST CIRCUIT

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-143, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

Failure of engine to start

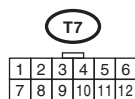
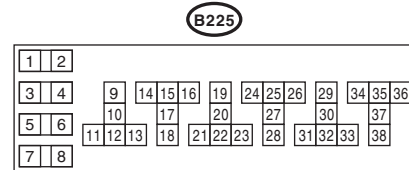
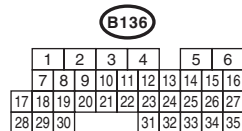
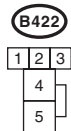
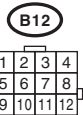
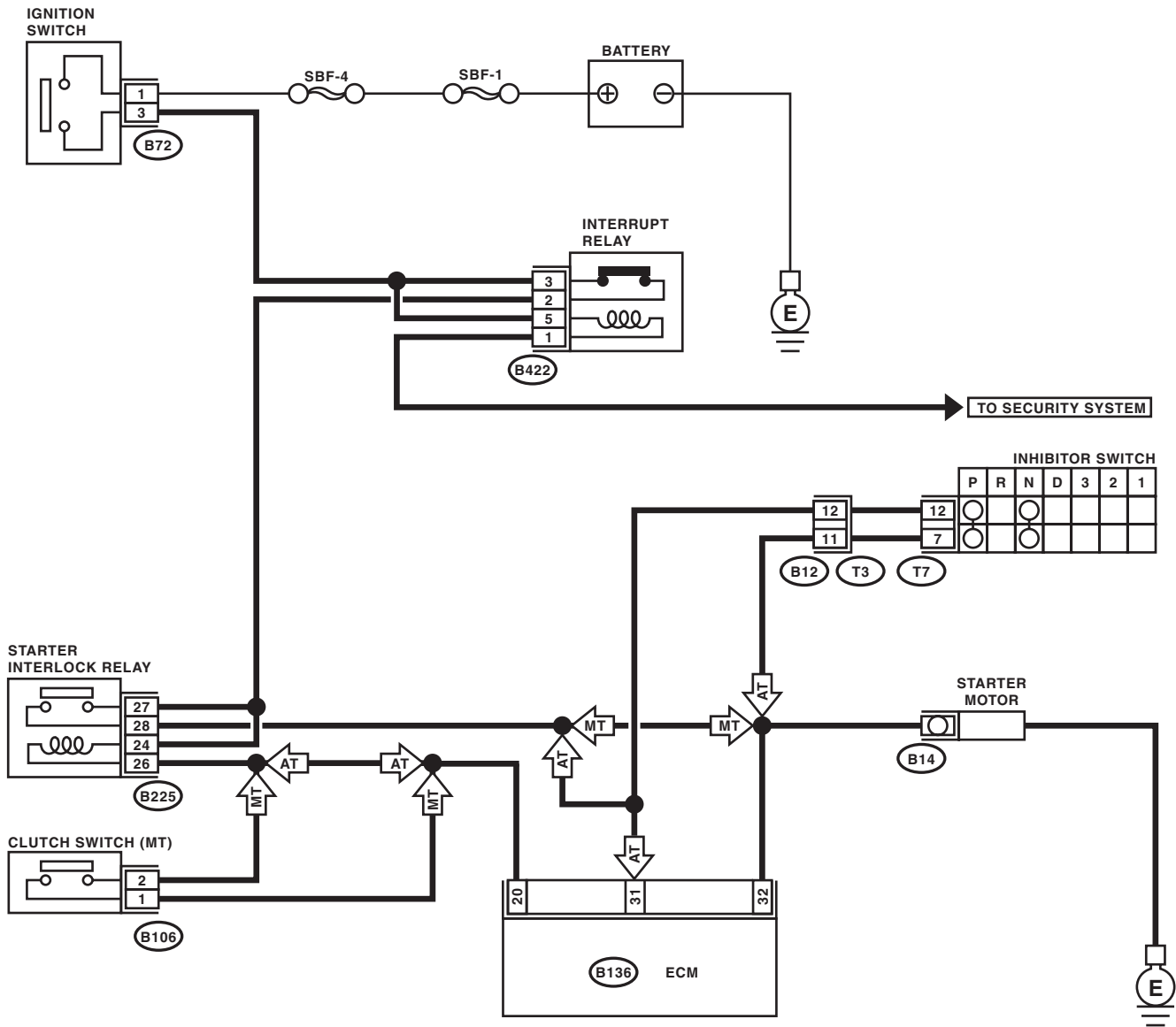
### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04637

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                           | Yes  | No  |
|--|---------------------------------|--|---|
| 1<br><b>CHECK OPERATION OF STARTER MOTOR.</b><br>Turn the ignition switch to ON.<br><b>NOTE:</b><br>Place the inhibitor switch in each position. (AT model)<br>Depress or release the clutch pedal. (MT model) | Does the starter motor operate? | Repair battery short circuit in starter motor circuit. | Check starter motor circuit. <Ref. to EN(H4SO)(diag)-59, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.> |

## BZ:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-145, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

Engine keeps running at higher revolution than specified idling revolution.

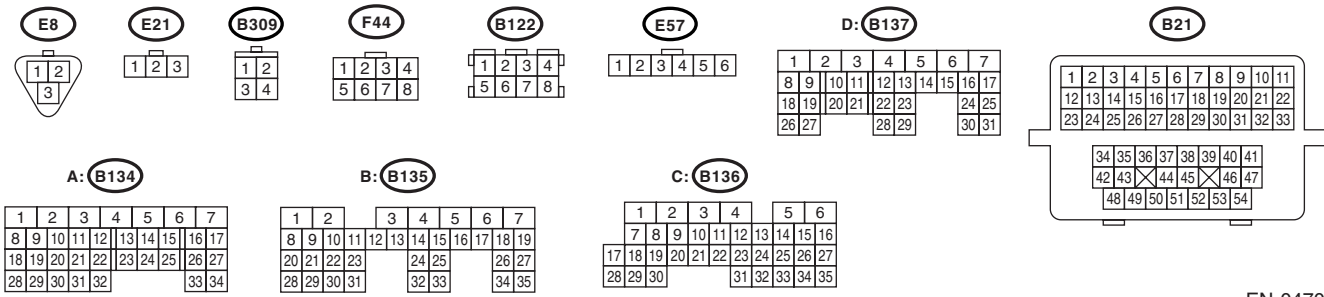
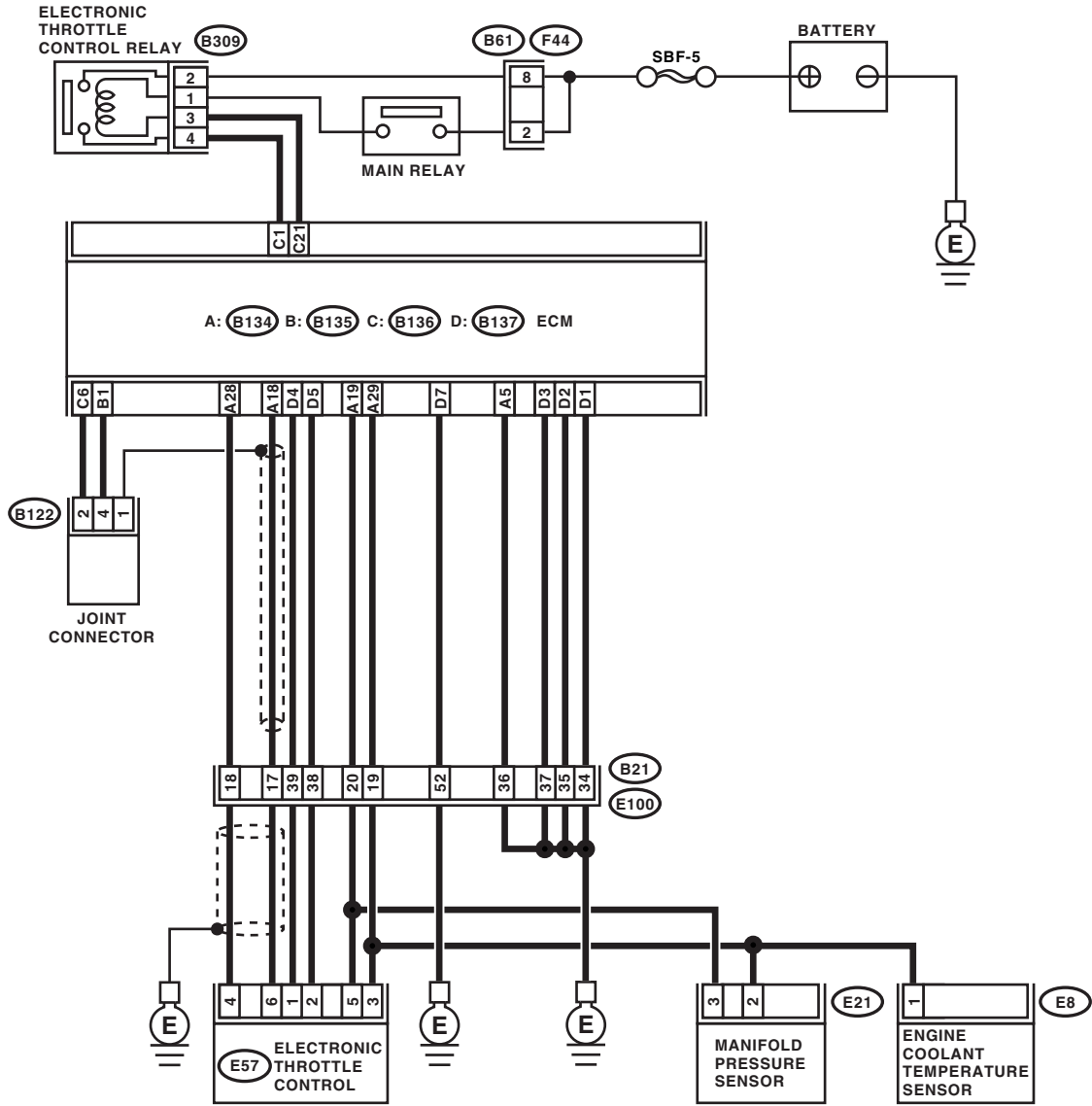
### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04700

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No                                  |
|--|---|--|-------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?                       | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><b>NOTE:</b><br>In this case, it is not necessary to inspect DTC P0519. | Go to step 2.                       |
| <b>2</b><br><b>CHECK AIR INTAKE SYSTEM.</b><br>1) Turn the ignition switch to ON.<br>2) Start the engine, and idle it.<br>3) Check the following items. <ul style="list-style-type: none"><li>• Loose installation of intake manifold and throttle body</li><li>• Cracks of intake manifold gasket and throttle body gasket</li><li>• Disconnections of vacuum hoses</li></ul> | Is there a fault in air intake system?            | Repair the air suction and leaks.  | Go to step 3.                       |
| <b>3</b><br><b>CHECK ELECTRIC THROTTLE.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electric throttle.<br>3) Check the electric throttle.  | Are there foreign particles in electric throttle? | Remove the foreign particles from electric throttle.   | Perform the diagnosis of DTC P2101. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CA:DTC P0600 SERIAL COMMUNICATION LINK

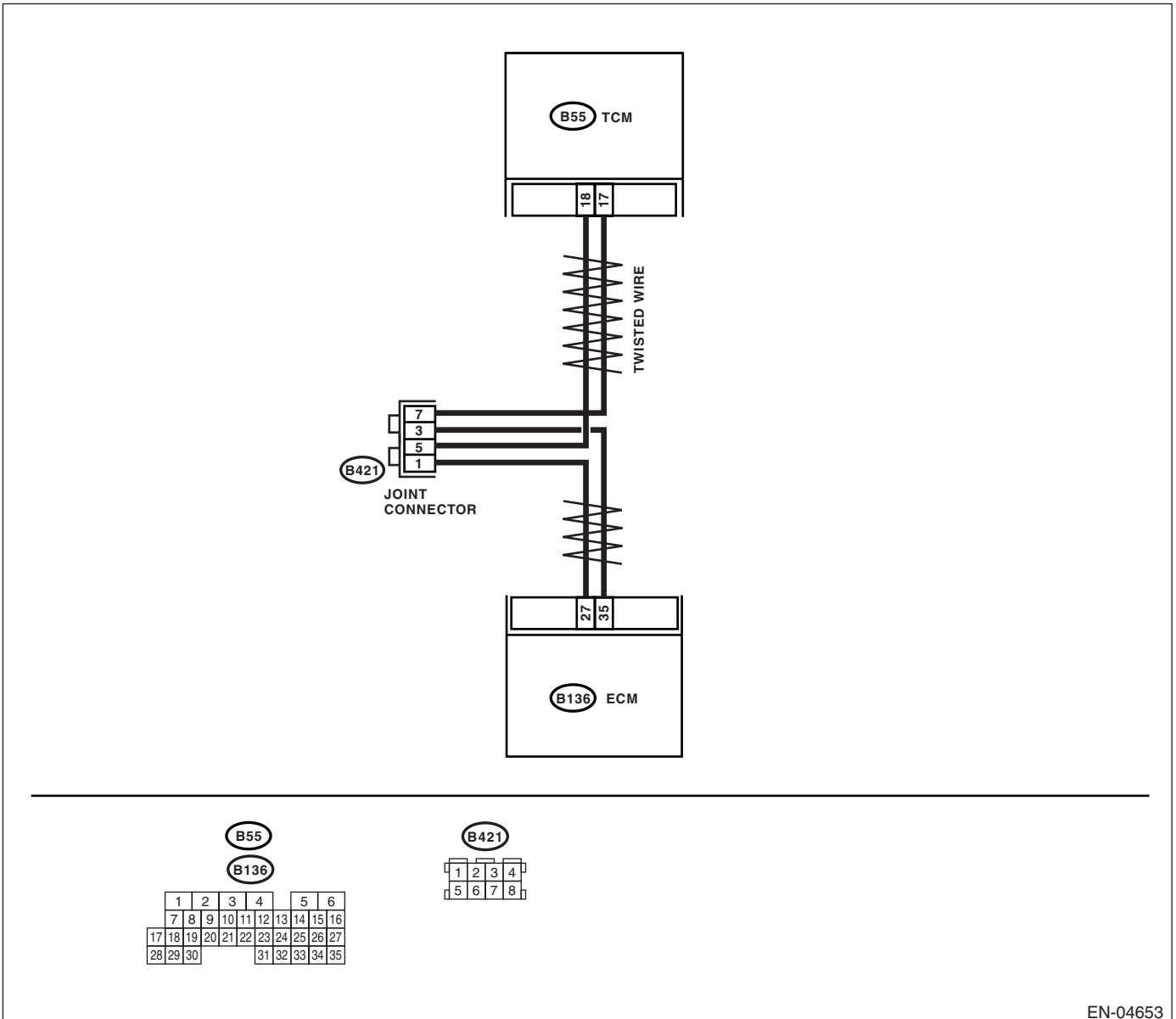
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-146, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04653

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                 | Yes              | No  |
|--|---------------------------------------|------------------|---|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND TCM.</b><br>1) Turn the ignition switch to ON.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from TCM.<br>4) Measure the resistance between ECM and TCM.<br><br><i>Connector &amp; terminal</i><br>(B136) No. 35 — (B55) No. 17:<br>(B136) No. 27 — (B55) No. 18: | Is the measured value less than 1 Ω?  | Go to step 2.    | Repair the harness or connector.  |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND TCM.</b><br>Measure the resistance between ECM connector and chassis ground.<br><br><i>Connector &amp; terminal</i><br>(B136) No. 35 — Chassis ground:<br>(B136) No. 27 — Chassis ground:   | Is the measured value more than 1 MΩ? | Go to step 3.    | Repair the harness or connector.  |
| <b>3</b><br><b>CHECK HARNESS BETWEEN ECM AND TCM.</b><br>Check the resistance between ECM connectors.<br><br><i>Connector &amp; terminal</i><br>(B136) No. 35 — (B136) No. 27:   | Is the measured value more than 1 MΩ? | Go to step 4.    | Repair the harness or connector.  |
| <b>4</b><br><b>CHECK STATUS OF AT SYSTEM.</b><br>Perform AT diagnosis using Subaru Select Monitor.<br>Check if DTC P1718 is displayed.   | Is DTC P1718 displayed?               | Check AT system. | Replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CB:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-147, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

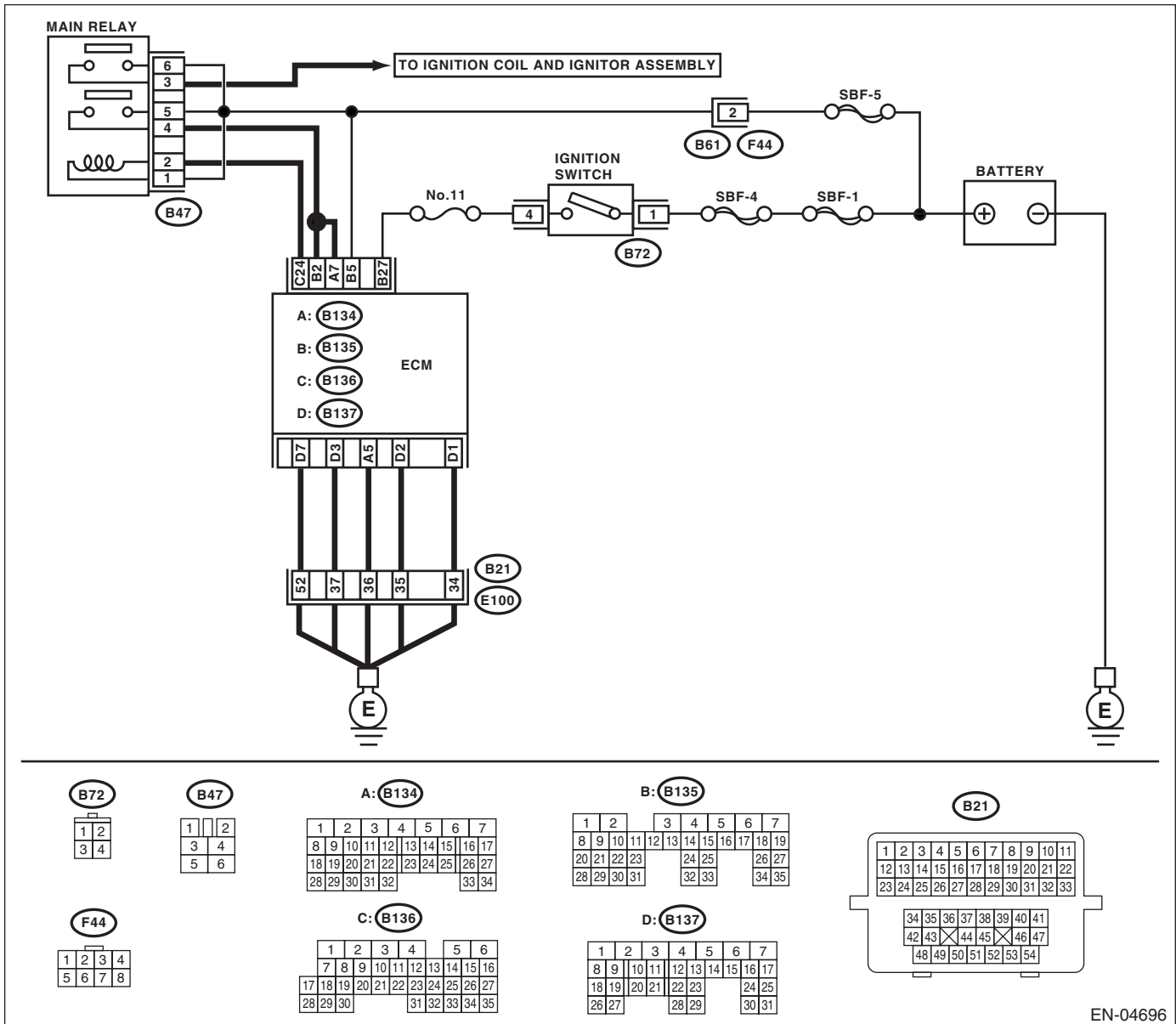
### TROUBLE SYMPTOM:

- Engine does not start.
- Engine stalls.

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04696

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                       | Yes   | No                               |
|---|-----------------------------|---|----------------------------------|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Check the relevant DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> | A temporary poor contact occurs. |

## **CC:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR**

### NOTE:

For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H4SO)(diag)-262, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CD:DTC P0607 CONTROL MODULE PERFORMANCE

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-148, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(H4SO)-149, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

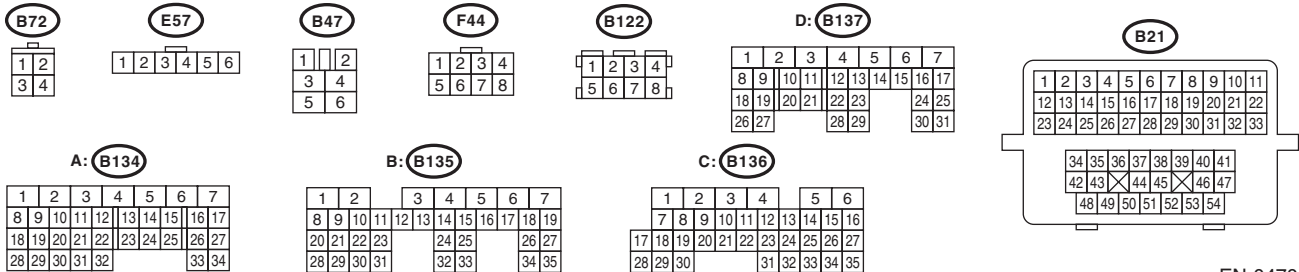
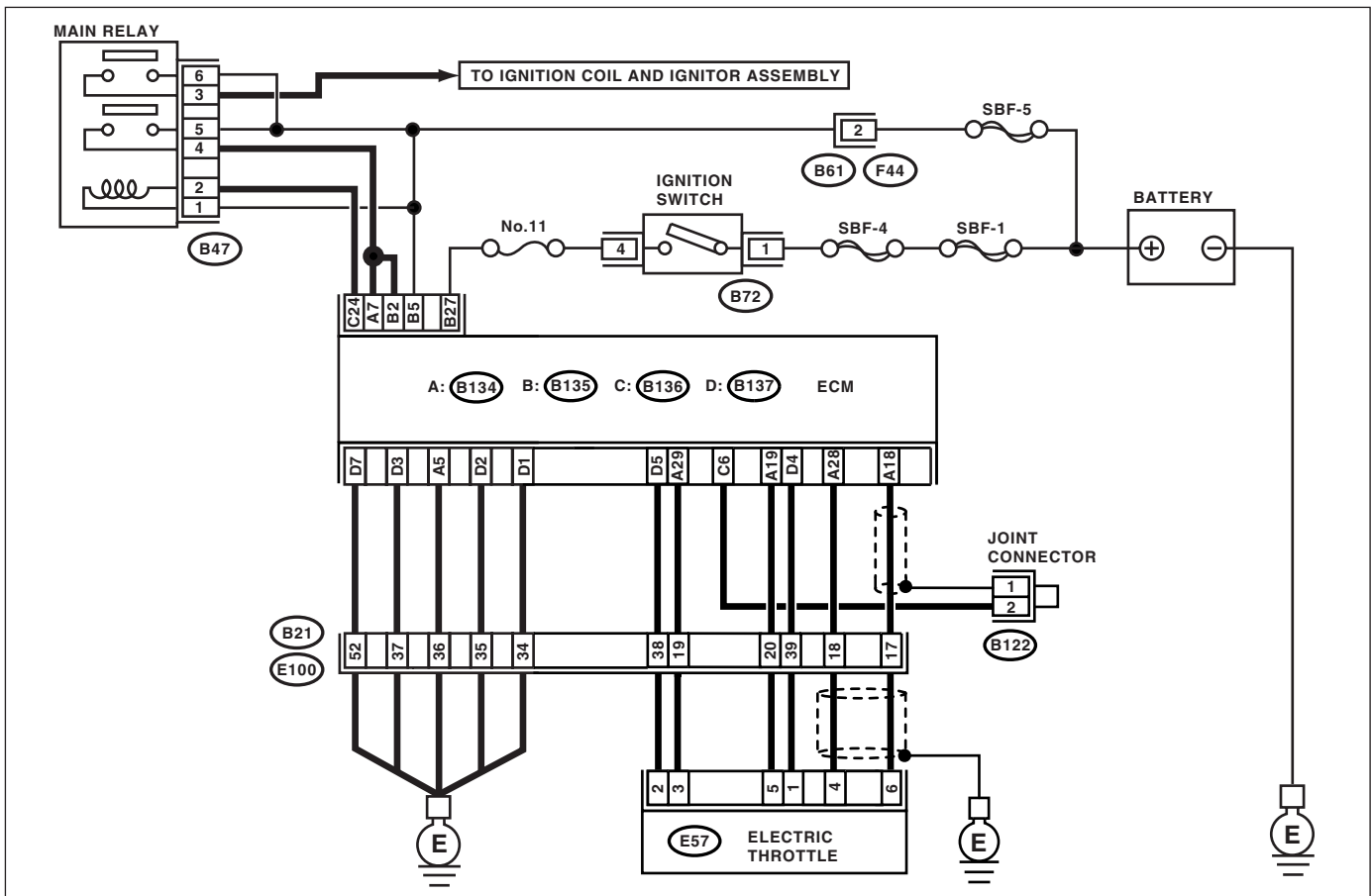
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04701

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                    | Yes   | No   |
|---|--|---|--|
| <b>1 CHECK INPUT VOLTAGE OF ECM</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B134) No. 7 (+) — Chassis ground (-):</i><br><i>(B135) No. 2 (+) — Chassis ground (-):</i>  | Is the voltage 10 — 13 V?                | Go to step 2.   | Repair the open circuit or ground short of power supply circuit.   |
| <b>2 CHECK INPUT VOLTAGE OF ECM</b><br>1) Start the engine.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B134) No. 7 (+) — Chassis ground (-):</i><br><i>(B135) No. 2 (+) — Chassis ground (-):</i>  | Is the voltage 13 — 15 V?                | Go to step 3.   | Repair the open circuit or ground short of power supply circuit.   |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and electronic throttle control.<br>3) Measure the resistance of harness between ECM and electronic throttle control.<br><b>Connector &amp; terminal</b><br><i>(E57) No. 5 — (B134) No. 19:</i><br><i>(E57) No. 3 — (B134) No. 29:</i>     | Is the resistance less than 1 $\Omega$ ? | Go to step 4.   | Repair the open circuit in harness between ECM and electronic throttle control.  |
| <b>4 CHECK GROUND HARNESS OF ECM</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B134) No. 5 (+) — Chassis ground (-):</i><br><i>(B137) No. 7 (+) — Chassis ground (-):</i><br><i>(B137) No. 1 (+) — Chassis ground (-):</i><br><i>(B137) No. 2 (+) — Chassis ground (-):</i><br><i>(B137) No. 3 (+) — Chassis ground (-):</i> | Is the voltage less than 1 V?            | Replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).> | Repair the following items. <ul style="list-style-type: none"> <li>• Retighten the engine ground terminal.</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |

## CE:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

**NOTE:**

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4SO)(diag)-312, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CF:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-153, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

| Step                                     | Check                       | Yes   | No                               |
|--|-----------------------------|---|----------------------------------|
| 1<br>CHECK FOR ANY OTHER DTC ON DISPLAY. | Is the DTC P0691 displayed? | Check the radiator fan relay. <Ref. to CO(H4SO)-6, Radiator Main Fan System.> <Ref. to CO(H4SO)-11, Radiator Sub Fan System.> | A temporary poor contact occurs. |

## CG:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-154, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

| Step                                     | Check                       | Yes   | No                               |
|--|-----------------------------|---|----------------------------------|
| 1<br>CHECK FOR ANY OTHER DTC ON DISPLAY. | Is the DTC P0692 displayed? | Check the radiator fan relay. <Ref. to CO(H4SO)-6, Radiator Main Fan System.> <Ref. to CO(H4SO)-11, Radiator Sub Fan System.> | A temporary poor contact occurs. |

## CH:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

GENERAL DESCRIPTION <Ref. to GD(H4SO)-155, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### NOTE:

For the diagnostic procedure, refer to AT section. <Ref. to 4AT(D)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CI: DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-156, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

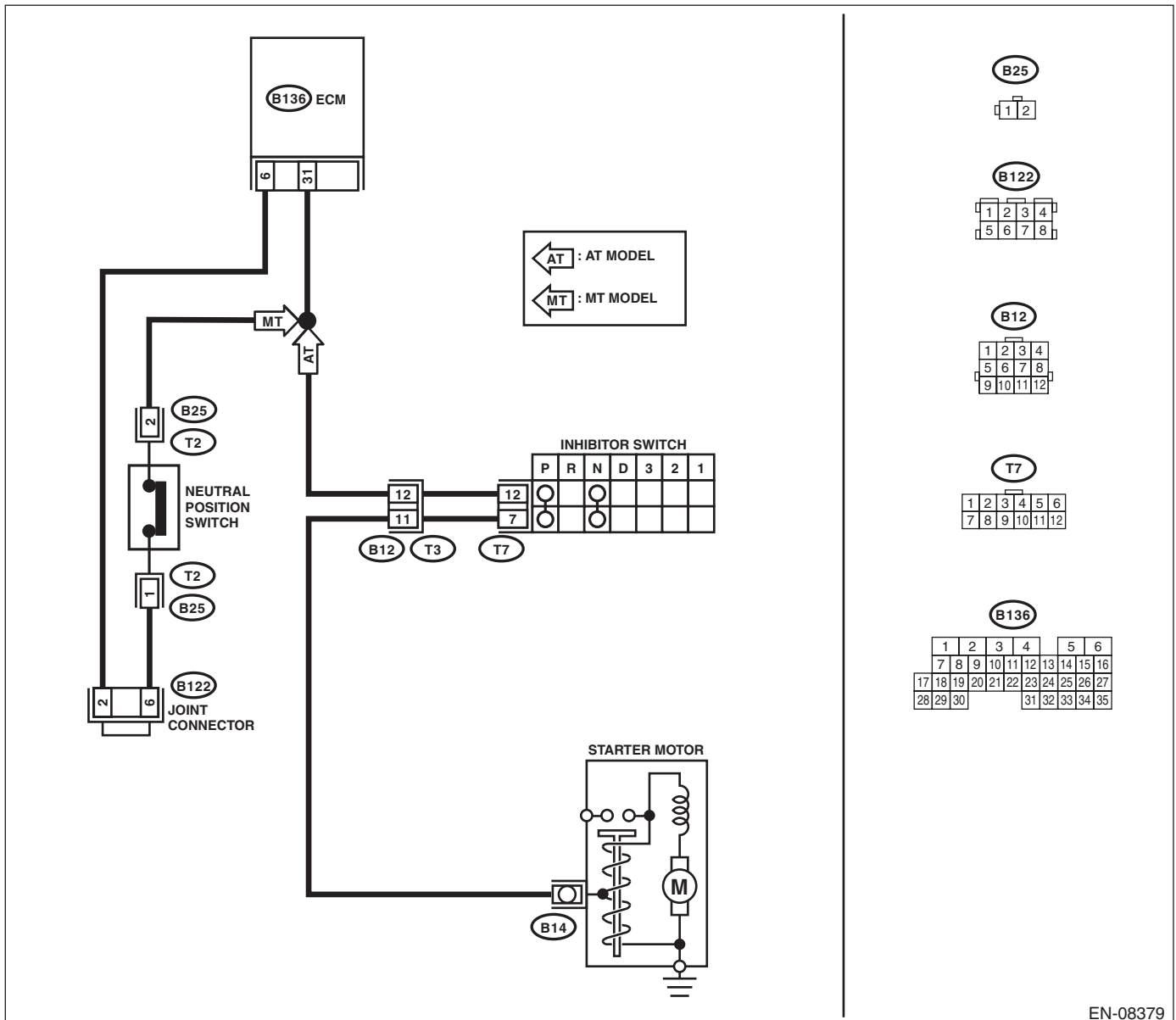
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-08379

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?  | Inspect DTC P0705 using "List of Diagnostic Trouble Code (DTC)".<br><Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> | Go to step 2.   |
| <b>2</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Place the select lever except for "N" and "P" ranges.<br>3) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 31 (+) — Chassis ground (-):</b>  | Is the voltage 4.5 — 5.5 V?  | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.                             | Go to step 3.   |
| <b>3</b><br><b>CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and transmission harness connector (T3).<br>3) Measure the resistance of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 31 — Chassis ground:</b> | Is the resistance more than 1 MΩ?                                    | Go to step 4.   | Repair ground short circuit in harness between ECM and transmission harness connector.              |
| <b>4</b><br><b>CHECK TRANSMISSION HARNESS CONNECTOR.</b><br>1) Disconnect the connector from inhibitor switch.<br>2) Measure the resistance of harness between transmission harness connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(T3) No. 12 — Engine ground:</b>   | Is the resistance more than 1 MΩ?                                    | Go to step 5.   | Repair ground short circuit in harness between transmission harness and inhibitor switch connector. |
| <b>5</b><br><b>CHECK INHIBITOR SWITCH.</b><br>Measure the resistance between inhibitor switch connector the receptacle's terminals in select lever except for "N" and "P" range.<br><b>Terminals</b><br><b>No. 7 — No. 12:</b>   | Is the resistance more than 1 MΩ?                                    | Go to step 6.   | Replace the inhibitor switch. <Ref. to 4AT-48, Inhibitor Switch.>                                   |
| <b>6</b><br><b>CHECK SELECTOR CABLE CONNECTION.</b>  | Is there any fault in selector cable connection to inhibitor switch? | Repair selector cable connection.<br><Ref. to CS-28, INSPECTION, Select Cable.>   | Contact your SOA Service Center since deterioration of some parts may be the cause.                 |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CJ:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-157, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

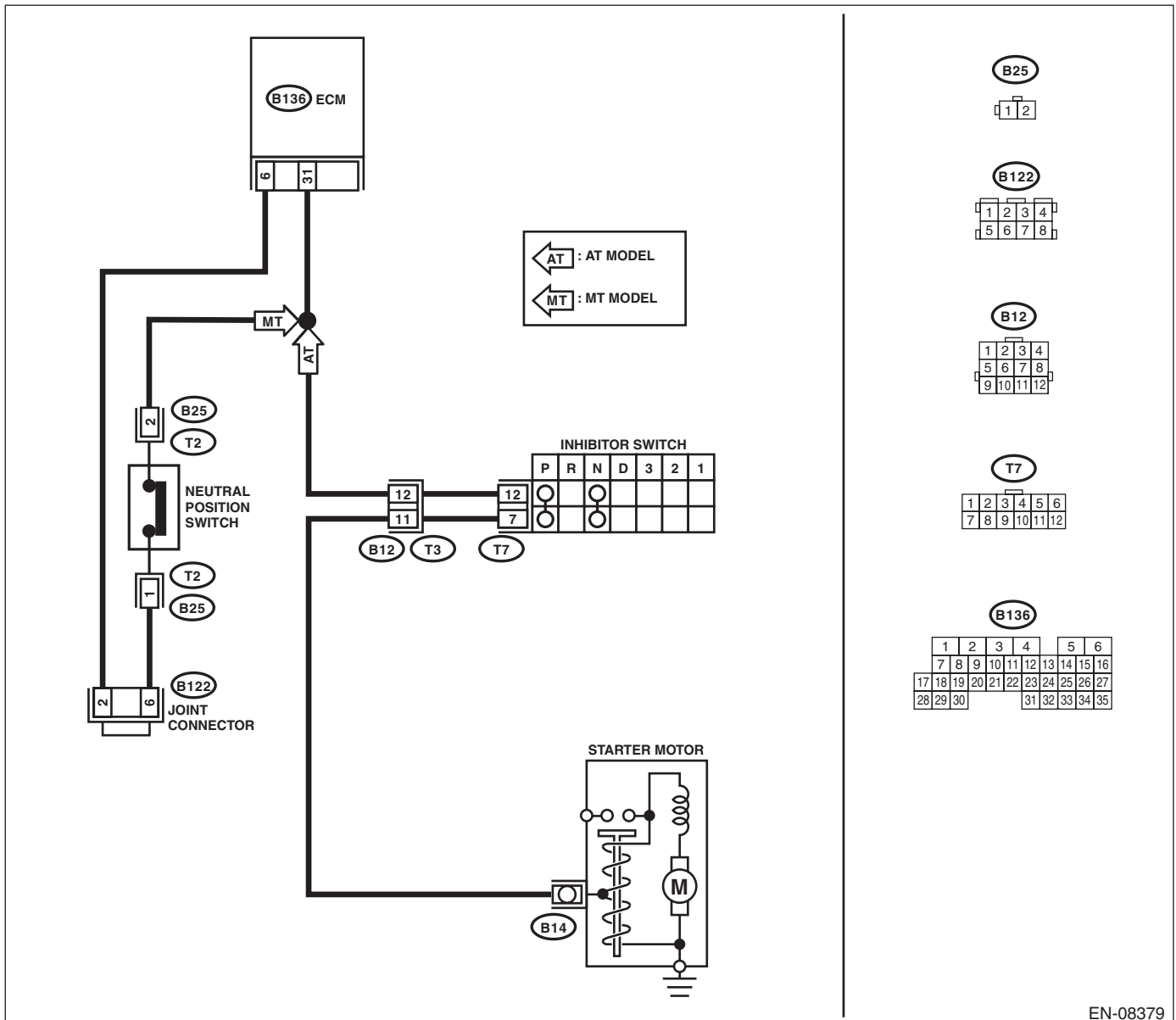
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-08379



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No   |
|--|--|--|--|
| <b>1 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Place the shift lever in neutral.<br>3) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 31 (+) — Chassis ground (-):</b>  | Is the voltage less than 1 V?                            | Go to step 2.  | Go to step 4.  |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Place the shift lever in a position except for neutral.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 31 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?                           | Go to step 3.  | Go to step 4.  |
| <b>3 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.   | Is there poor contact in ECM connector?                  | Repair poor contact in ECM connector.                  | Contact your SOA Service Center since deterioration of some parts may be the cause.    |
| <b>4 CHECK NEUTRAL POSITION SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from transmission harness.<br>3) Place the shift lever in neutral.<br>4) Measure the resistance between transmission harness and connector terminals.<br><b>Connector &amp; terminal</b><br><b>(T2) No. 1 — No. 2:</b> | Is the resistance less than 1 $\Omega$ ?                 | Go to step 5.  | Repair short circuit in transmission harness or replace neutral position switch.       |
| <b>5 CHECK NEUTRAL POSITION SWITCH.</b><br>1) Place the shift lever in a position except for neutral.<br>2) Measure the resistance between transmission harness connector terminals.<br><b>Connector &amp; terminal</b><br><b>(T2) No. 1 — No. 2:</b>  | Is the resistance more than 1 M $\Omega$ ?               | Go to step 6.  | Repair short circuit in transmission harness or replace neutral position switch.       |
| <b>6 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.</b><br>Measure the resistance between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 31 — Chassis ground:</b>   | Is the resistance more than 1 M $\Omega$ ?               | Go to step 7.  | Repair ground short circuit in harness between ECM and transmission harness connector. |
| <b>7 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.</b><br>1) Disconnect the connector from ECM.<br>2) Measure the resistance of harness between ECM and transmission harness connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 31 — (B25) No. 2:</b>   | Is the resistance less than 1 $\Omega$ ?                 | Go to step 8.  | Repair open circuit in harness between ECM and transmission harness connector.         |
| <b>8 CHECK POOR CONTACT.</b><br>Check poor contact in transmission harness connector.  | Is there poor contact in transmission harness connector? | Repair poor contact in transmission harness connector. | Contact your SOA Service Center since deterioration of some parts may be the cause.    |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CK:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-158, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

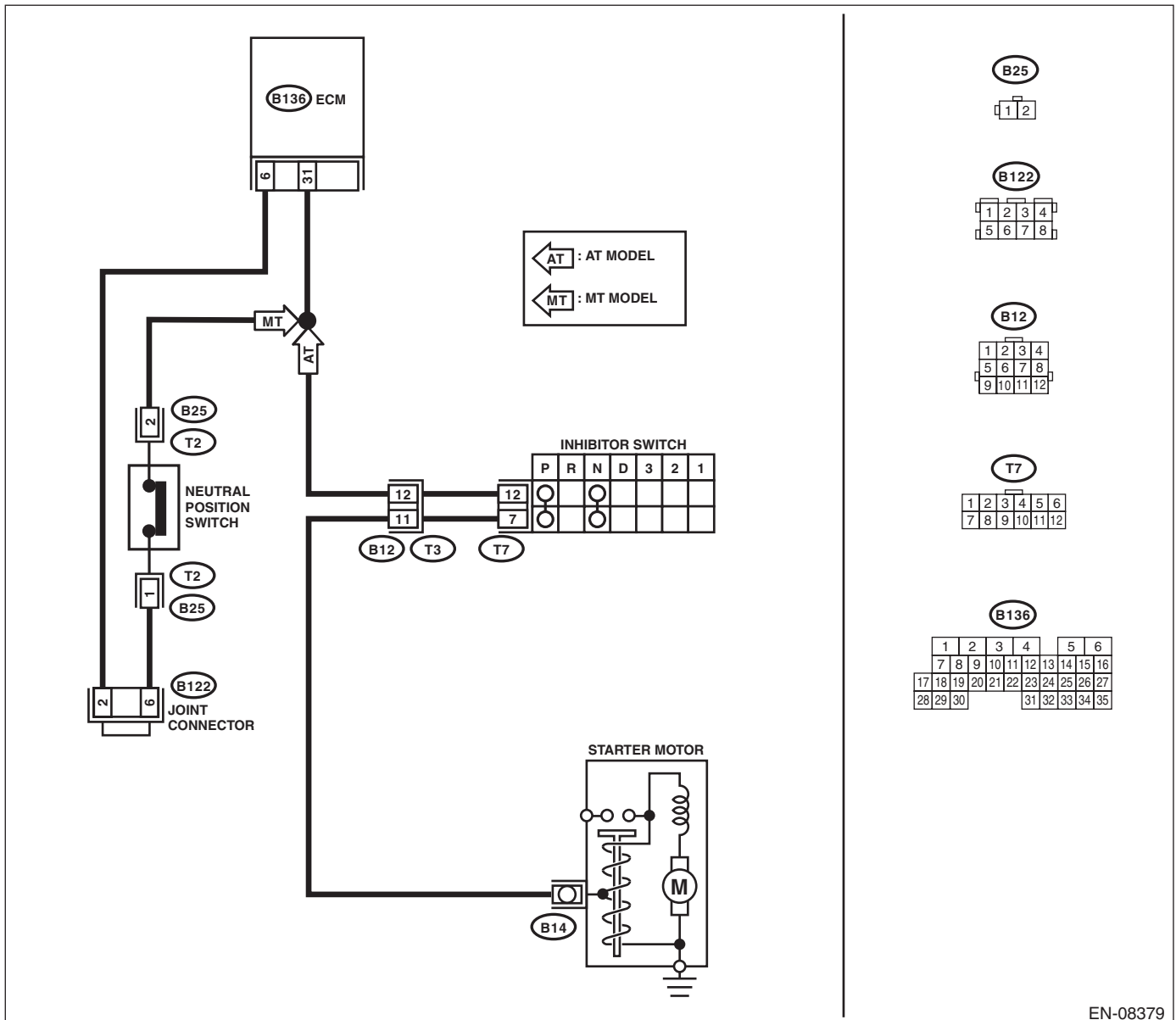
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-08379

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes  | No  |
|--|--|--|---|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?              | Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> | Go to step 2.   |
| <b>2</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground in select lever "N" and "P" ranges.<br><i>Connector &amp; terminal</i><br><b>(B136) No. 31 (+) — Chassis ground (-):</b>   | Is the voltage less than 1 V?            | Go to step 3.  | Go to step 5.   |
| <b>3</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM and chassis ground in select lever except for "N" and "P" ranges.<br><i>Connector &amp; terminal</i><br><b>(B136) No. 31 (+) — Chassis ground (-):</b>   | Is the voltage 4.5 — 5.5 V?              | Go to step 4.  | Go to step 5.   |
| <b>4</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.   | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.  | Contact your SOA Service Center since deterioration of some parts may be the cause.   |
| <b>5</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM and chassis ground.<br><i>Connector &amp; terminal</i><br><b>(B136) No. 31 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?           | Repair battery short circuit in harness between ECM and inhibitor switch connector.  | Go to step 6.   |
| <b>6</b><br><b>CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and inhibitor switch.<br>3) Measure the resistance of harness between ECM and inhibitor switch connector.<br><i>Connector &amp; terminal</i><br><b>(B136) No. 31 — (T7) No. 12:</b> | Is the resistance less than 1 $\Omega$ ? | Go to step 7.  | Repair harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and inhibitor switch connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in inhibitor switch connector</li> <li>• Poor contact in ECM connector</li> </ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <b>7</b><br><b>CHECK INHIBITOR SWITCH GROUND LINE.</b><br>Measure the resistance of harness between inhibitor switch connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(T7) No. 12 — Engine ground:</b></i> | Is the resistance less than 5 $\Omega$ ?                             | Go to step <b>8</b> .   | Repair open circuit in harness between inhibitor switch connector and starter motor ground line.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between inhibitor switch connector and starter motor ground line</li> <li>• Poor contact in starter motor connector</li> <li>• Poor contact in starter motor ground</li> <li>• Starter motor</li> </ul> |
| <b>8</b><br><b>CHECK INHIBITOR SWITCH.</b><br>Measure the resistance between inhibitor switch connector receptacle's terminals in select lever "N" and "P" ranges.<br><i><b>Terminals</b></i><br><i><b>No. 7 — No. 12:</b></i>            | Is the resistance less than 1 $\Omega$ ?                             | Go to step <b>9</b> .   | Replace the inhibitor switch. <Ref. to 4AT-48, Inhibitor Switch.>   |
| <b>9</b><br><b>CHECK SELECTOR CABLE CONNECTION.</b>   | Is there any fault in selector cable connection to inhibitor switch? | Repair selector cable connection.<br><Ref. to CS-28, INSPECTION, Select Cable.> | Contact your SOA Service Center since deterioration of some parts may be the cause.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CL:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-159, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

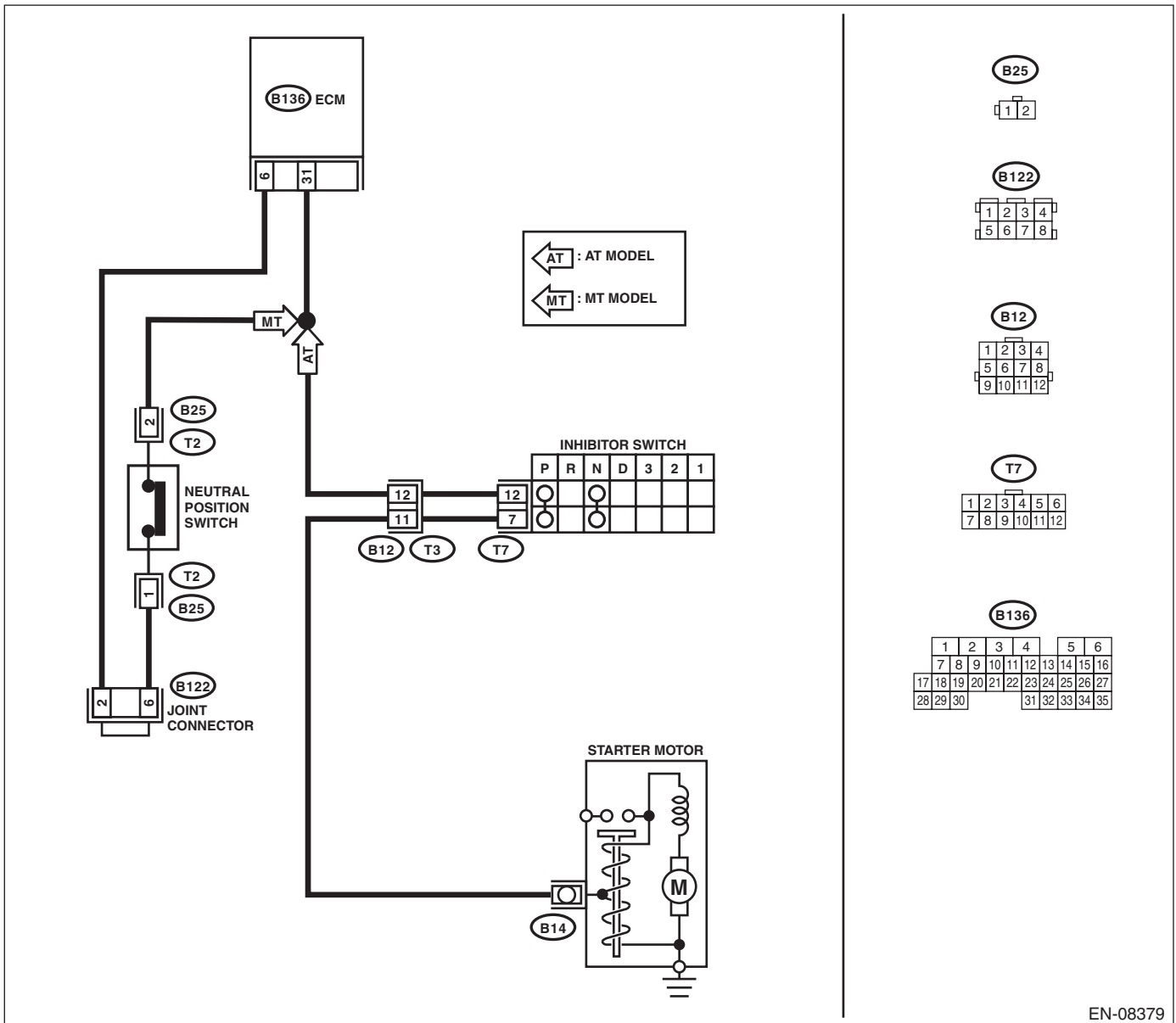
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-08379

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <b>1 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn ignition switch to ON.<br>2) Place the shift lever in a position except for neutral.<br>3) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 31 (+) — Chassis ground (-):</b>                               | Is the voltage more than 10 V?                                 | Go to step 2.  | Go to step 4.   |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Place the shift lever in a position except for neutral.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 31 (+) — Chassis ground (-):</b>   | Is the voltage less than 1 V?                                  | Go to step 3.  | Go to step 4.   |
| <b>3 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.  | Is there poor contact in ECM connector?                        | Repair poor contact in ECM connector.                  | Contact your SOA Service Center since deterioration of some parts may be the cause. |
| <b>4 CHECK NEUTRAL SWITCH.</b><br>1) Place the shift lever in neutral.<br>2) Measure the resistance between transmission harness connector terminals.<br><b>Connector &amp; terminal</b><br><b>(T2) No. 1 — No. 2:</b>  | Is the resistance less than 1 $\Omega$ ?                       | Go to step 5.  | Repair open circuit in transmission harness or replace neutral switch.              |
| <b>5 CHECK HARNESS BETWEEN ECM AND NEUTRAL SWITCH CONNECTOR.</b><br>1) Disconnect the connector from ECM.<br>2) Measure the resistance of harness between ECM and transmission harness connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 31 — (B25) No. 2:</b><br><b>(B136) No. 6 — (B25) No. 1:</b> | Is the resistance less than 1 $\Omega$ ?                       | Go to step 6.  | Repair open circuit in harness between ECM and transmission harness connector.      |
| <b>6 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in transmission harness connector.   | Is there a poor contact in the transmission harness connector? | Repair poor contact in transmission harness connector. | Contact your SOA Service Center since deterioration of some parts may be the cause. |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **CM:DTC P1152 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1)**

#### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-160, DTC P1152 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

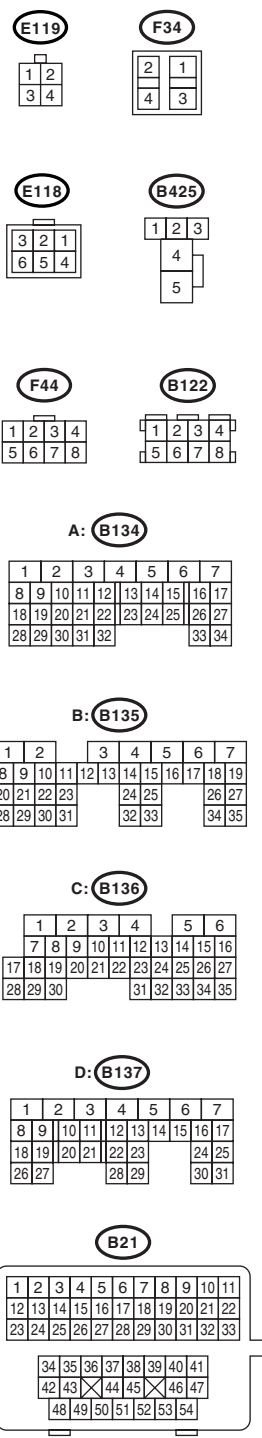
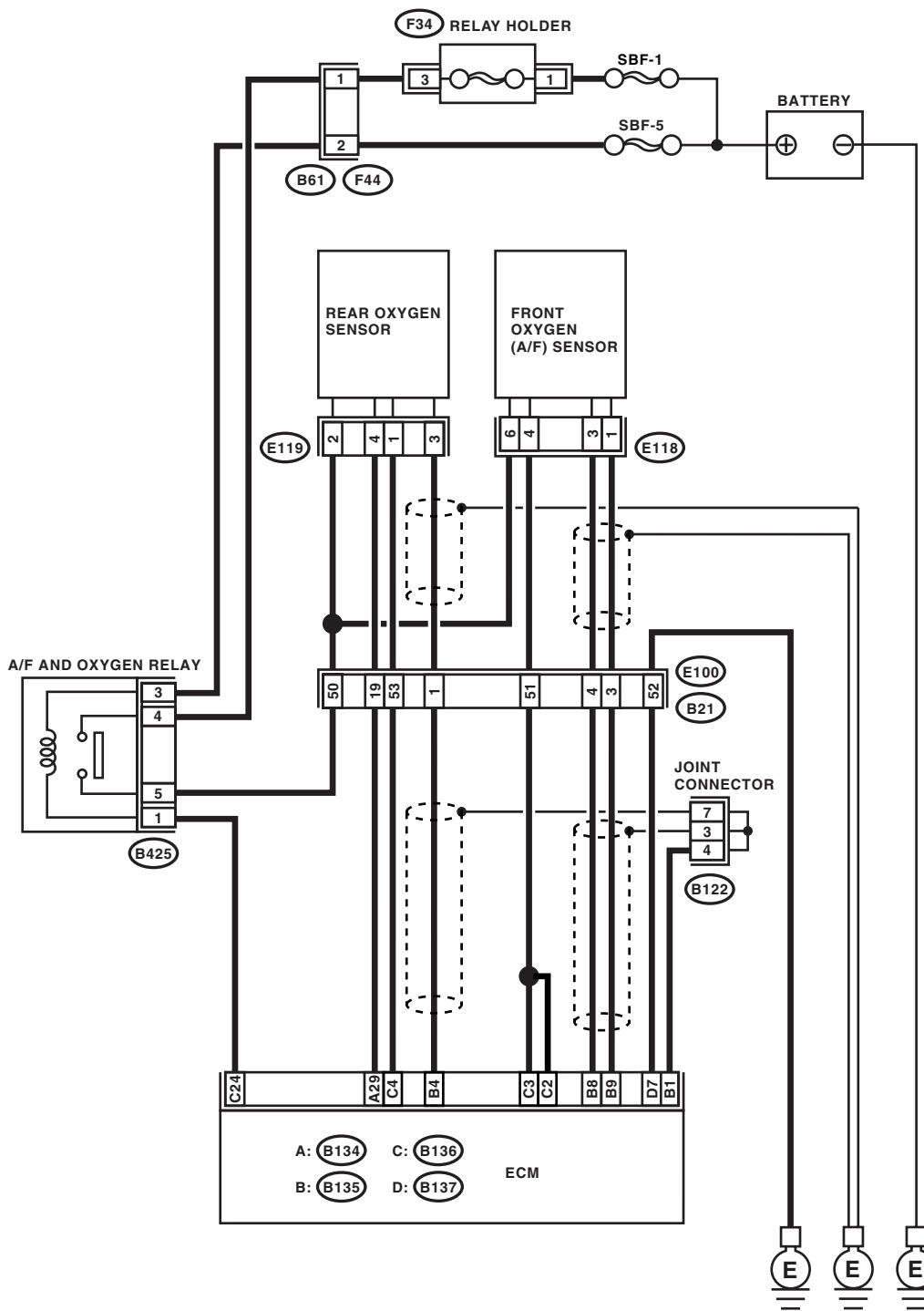
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04626



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>1</b><br><b>CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>  | Is there water in connector?                                  | Remove infiltrating water completely.                           | Go to step 2.  |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br>3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><br><i><b>Connector &amp; terminal</b></i><br><i><b>(B135) No. 8 — (E118) No. 3:</b></i><br><i><b>(B135) No. 9 — (E118) No. 1:</b></i> | Is the measured value less than 1 Ω?                          | Go to step 3.   | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ECM and front oxygen (A/F) sensor connector<br>• Poor contact in front oxygen (A/F) sensor connector<br>• Poor contact in ECM connector |
| <b>3</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in front oxygen (A/F) sensor connector.  | Is there poor contact in front oxygen (A/F) sensor connector? | Repair the poor contact in front oxygen (A/F) sensor connector. | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>   |

**CN:DTC P1153 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1)**

**DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-162, DTC P1153 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

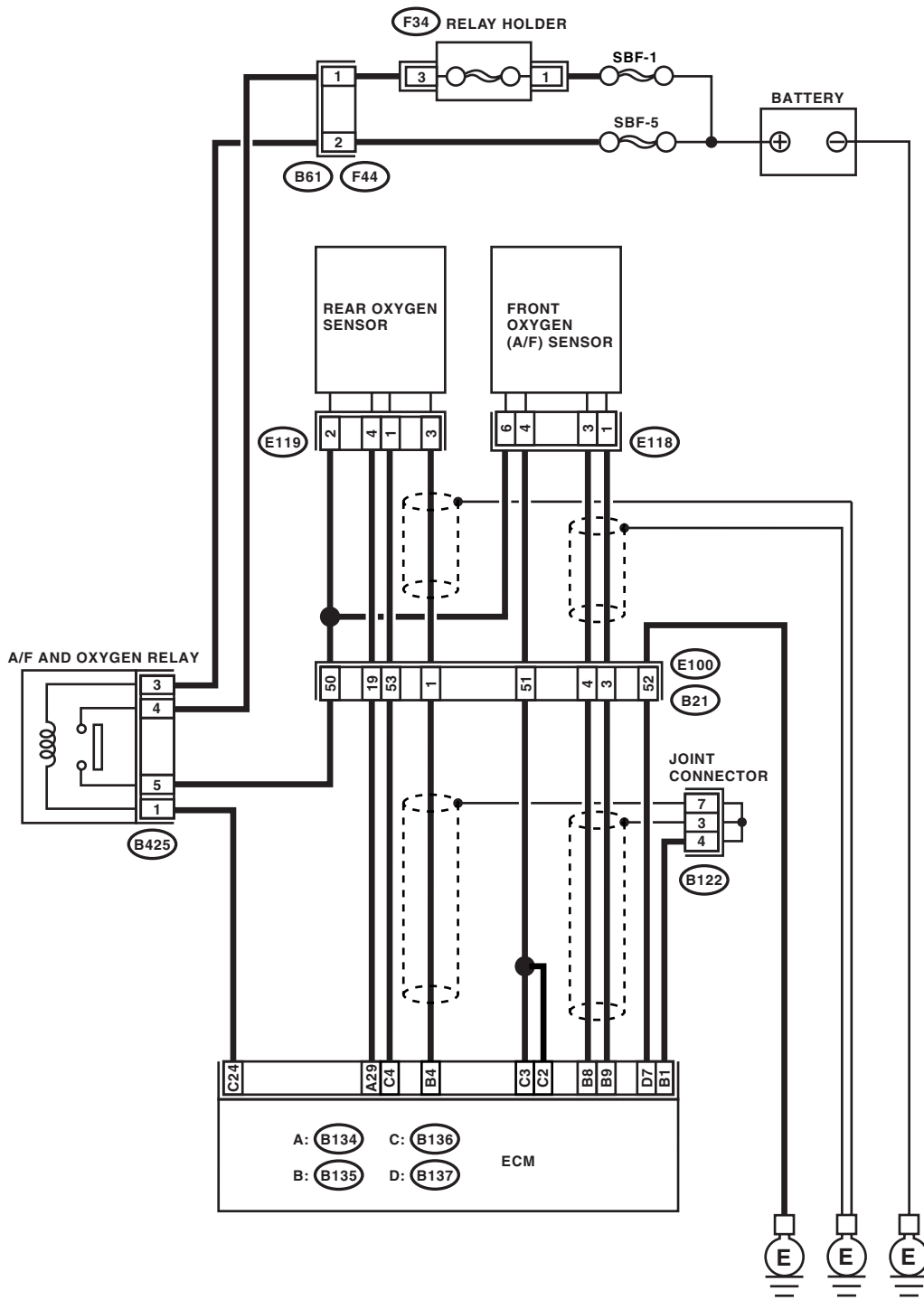
**CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



**E119**

|   |   |
|---|---|
| 1 | 2 |
| 3 | 4 |

**F34**

|   |   |
|---|---|
| 2 | 1 |
| 4 | 3 |

**E118**

|   |   |   |
|---|---|---|
| 3 | 2 | 1 |
| 6 | 5 | 4 |

**B425**

|   |   |   |
|---|---|---|
| 1 | 2 | 3 |
| 4 |   |   |
| 5 |   |   |

**F44**

|   |   |   |   |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |

**B122**

|   |   |   |   |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |

A: **B134**

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |    |    |    |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | 32 |    |    |    | 33 | 34 |

B: **B135**

|    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  |    |    | 3  | 4  | 5  | 6  | 7  |    |    |    |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 | 21 | 22 | 23 |    | 24 | 25 |    | 26 | 27 |    |    |
| 28 | 29 | 30 | 31 |    | 32 | 33 |    | 34 | 35 |    |    |

C: **B136**

|    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  |    | 5  | 6  |    |    |    |    |
| 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 |    |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 |    |    | 31 | 32 | 33 | 34 | 35 |    |

D: **B137**

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |    |    |    |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 |    | 24 | 25 |    |
| 26 | 27 |    |    | 28 | 29 |    | 30 | 31 |    |

**B21**

|    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 |    |    |    |
| 42 | 43 | 44 | 45 | 46 | 47 |    |    |    |    |    |
| 48 | 49 | 50 | 51 | 52 | 53 | 54 |    |    |    |    |

EN-04626

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check   | Yes   | No  |
|------|---|---|---|
| 1    | <b>CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>  | Remove infiltrating water completely.   | Go to step 2.   |
| 2    | <b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 — Chassis ground:</b> | Go to step 3.   | Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector. |
| 3    | <b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>Measure the resistance of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 9 — Chassis ground:</b>  | Go to step 4.   | Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector. |
| 4    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>1) Connect the connector to ECM.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 (+) — Chassis ground (-):</b>   | Go to step 5.   | Go to step 6.   |
| 5    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 (+) — Chassis ground (-):</b>  | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>After repair, replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).> | Repair the poor contact in ECM connector.   |
| 6    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 9 (+) — Chassis ground (-):</b>  | Go to step 7.   | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>        |
| 7    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 9 (+) — Chassis ground (-):</b>  | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>After repair, replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).> | Repair the poor contact in ECM connector.   |

## **Diagnostic Procedure with Diagnostic Trouble Code (DTC)**

ENGINE (DIAGNOSTICS)

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### **CO:DTC P1160 RETURN SPRING FAILURE**

**NOTE:**

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4SO)(diag)-312, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## CP:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

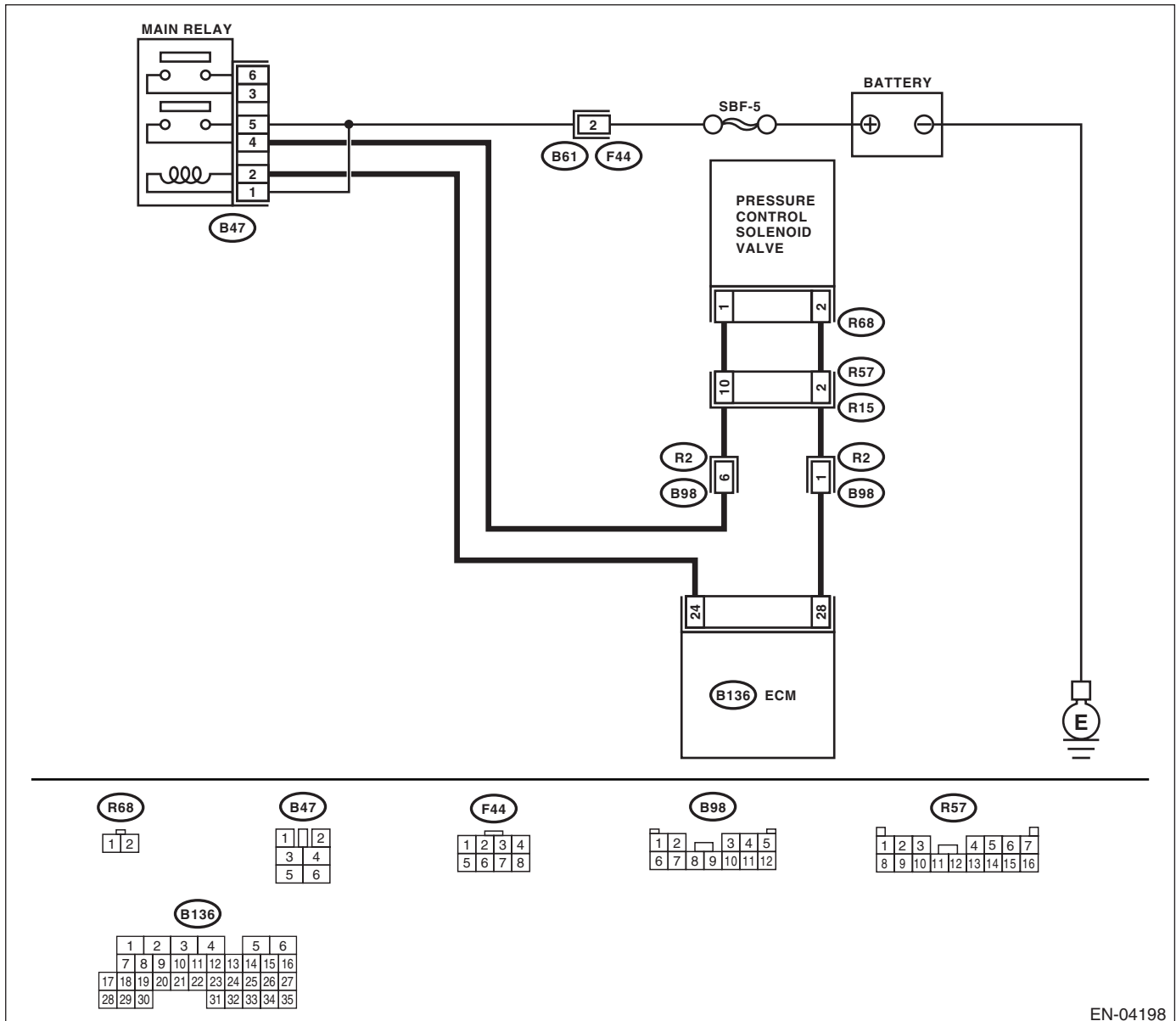
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-165, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04198

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check                                     | Yes  | No   |
|---|---|--|--|
| <b>1 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 28 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?            | Go to step 2.  | Go to step 3.  |
| <b>2 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.  | Is there poor contact in ECM connector?   | Repair poor contact in ECM connector.  | Contact your SOA Service Center since deterioration of some parts may be the cause.  |
| <b>3 CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connectors from pressure control solenoid valve and ECM.<br>3) Measure the resistance of harness between pressure control solenoid valve connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R68) No. 2 — Chassis ground:</b> | Is the resistance less than 10 $\Omega$ ? | Repair short circuit to ground in harness between ECM and pressure control solenoid valve connector. | Go to step 4.  |
| <b>4 CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM and pressure control solenoid valve connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 28 — (R68) No. 2:</b>   | Is the resistance less than 1 $\Omega$ ?  | Go to step 5.  | Repair harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and pressure control solenoid valve connector</li> <li>• Poor contact in coupling connector</li> </ul>  |
| <b>5 CHECK PRESSURE CONTROL SOLENOID VALVE.</b><br>Measure the resistance between pressure control solenoid valve terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>   | Is the resistance 10 — 100 $\Omega$ ?     | Go to step 6.  | Replace the pressure control solenoid valve. <Ref. to EC(H4SO)-12, Pressure Control Solenoid Valve.>   |
| <b>6 CHECK POWER SUPPLY TO PRESSURE CONTROL SOLENOID VALVE.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between pressure control solenoid valve and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R68) No. 1 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?            | Go to step 7.  | Repair harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and pressure control solenoid valve connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in main relay connector</li> </ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

|   | Step   | Check   | Yes   | No  |
|---|--|---|---|---|
| 7 | <b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in pressure control solenoid valve connector. | Is there poor contact in pressure control solenoid valve connector? | Repair poor contact in pressure control solenoid valve connector. | Contact your SOA Service Center since deterioration of some parts may be the cause. |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

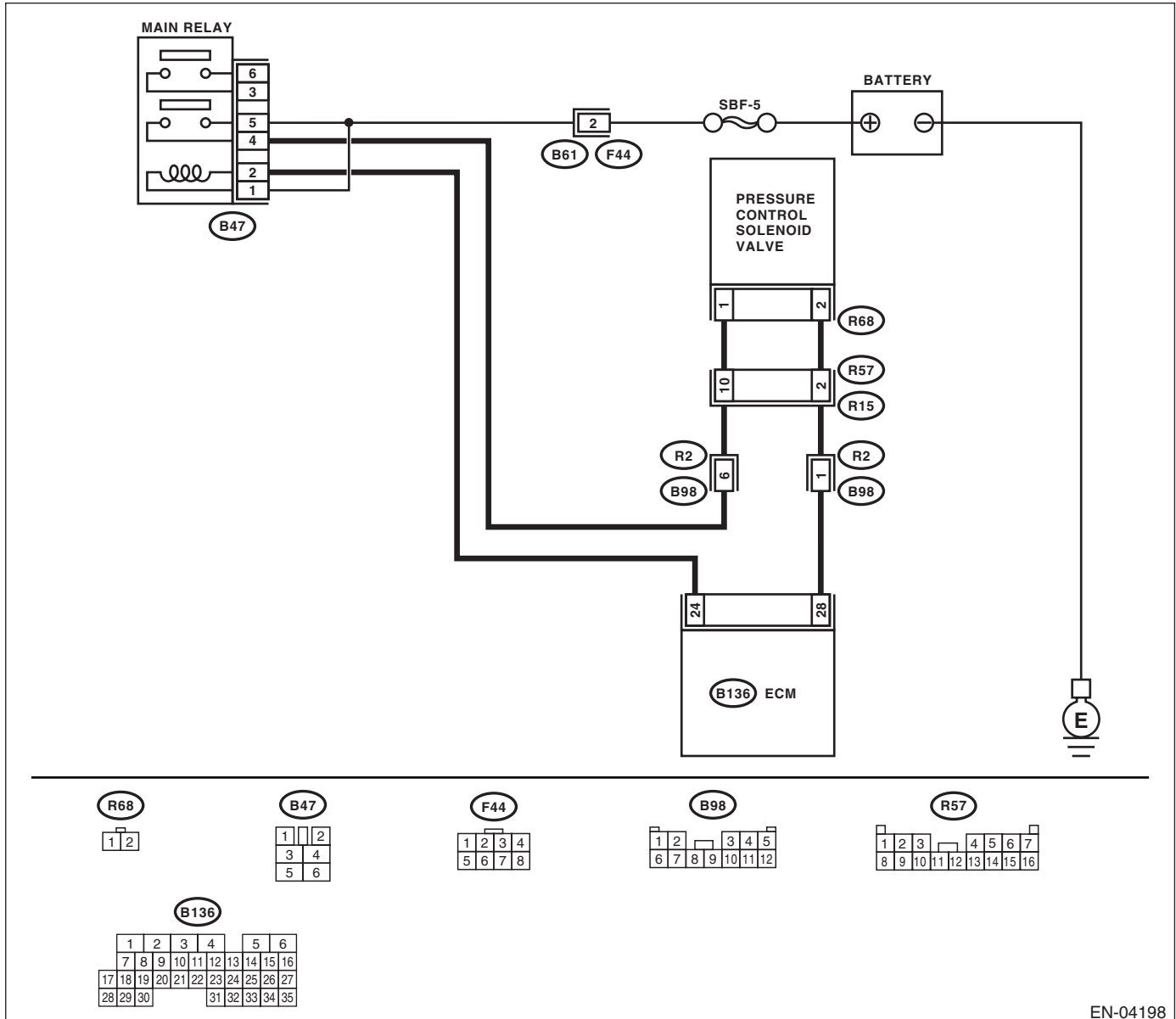
## CQ:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-167, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04198

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes  | No   |
|--|--|--|--|
| <p><b>1</b></p> <p><b>CHECK INPUT SIGNAL FOR ECM.</b></p> <p>1) Turn ignition switch to OFF.<br/>2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side).<br/>3) Turn ignition switch to ON.<br/>4) While operating the pressure control solenoid valve, measure voltage between ECM and chassis ground.</p> <p>NOTE:<br/>Pressure control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". &lt;Ref. to EN(H4SO)(diag)-47, Compulsory Valve Operation Check Mode.&gt;</p> <p><b>Connector &amp; terminal</b><br/><b>(B136) No. 28 (+) — Chassis ground (-):</b></p> | Is the voltage 0 — 10 V?                 | Go to step 2.  | The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector. |
| <p><b>2</b></p> <p><b>CHECK INPUT SIGNAL FOR ECM.</b></p> <p>1) Turn ignition switch to ON.<br/>2) Measure the voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B136) No. 28 (+) — Chassis ground (-):</b></p>   | Is the voltage more than 10 V?           | Go to step 4.  | Go to step 3.  |
| <p><b>3</b></p> <p><b>CHECK FOR POOR CONTACT.</b><br/>Check for poor contact in ECM connector.</p>   | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.  | Replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).>   |
| <p><b>4</b></p> <p><b>CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF.<br/>2) Disconnect the connector from pressure control solenoid valve.<br/>3) Turn ignition switch to ON.<br/>4) Measure the voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B136) No. 28 (+) — Chassis ground (-):</b></p>  | Is the voltage more than 10 V?           | Repair short circuit to battery in harness between ECM and pressure control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> | Go to step 5.  |
| <p><b>5</b></p> <p><b>CHECK PRESSURE CONTROL SOLENOID VALVE.</b></p> <p>1) Turn ignition switch to OFF.<br/>2) Measure the resistance between pressure control solenoid valve terminals.</p> <p><b>Terminals</b><br/><b>No. 1 — No. 2:</b></p>   | Is the resistance less than 1 $\Omega$ ? | Replace the pressure control solenoid valve <Ref. to EC(H4SO)-12, Pressure Control Solenoid Valve.> and the ECM <Ref. to FU(H4SO)-38, Engine Control Module (ECM).>.                     | Go to step 6.  |
| <p><b>6</b></p> <p><b>CHECK FOR POOR CONTACT.</b><br/>Check for poor contact in ECM connector.</p>   | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.  | Replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CR:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-168, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

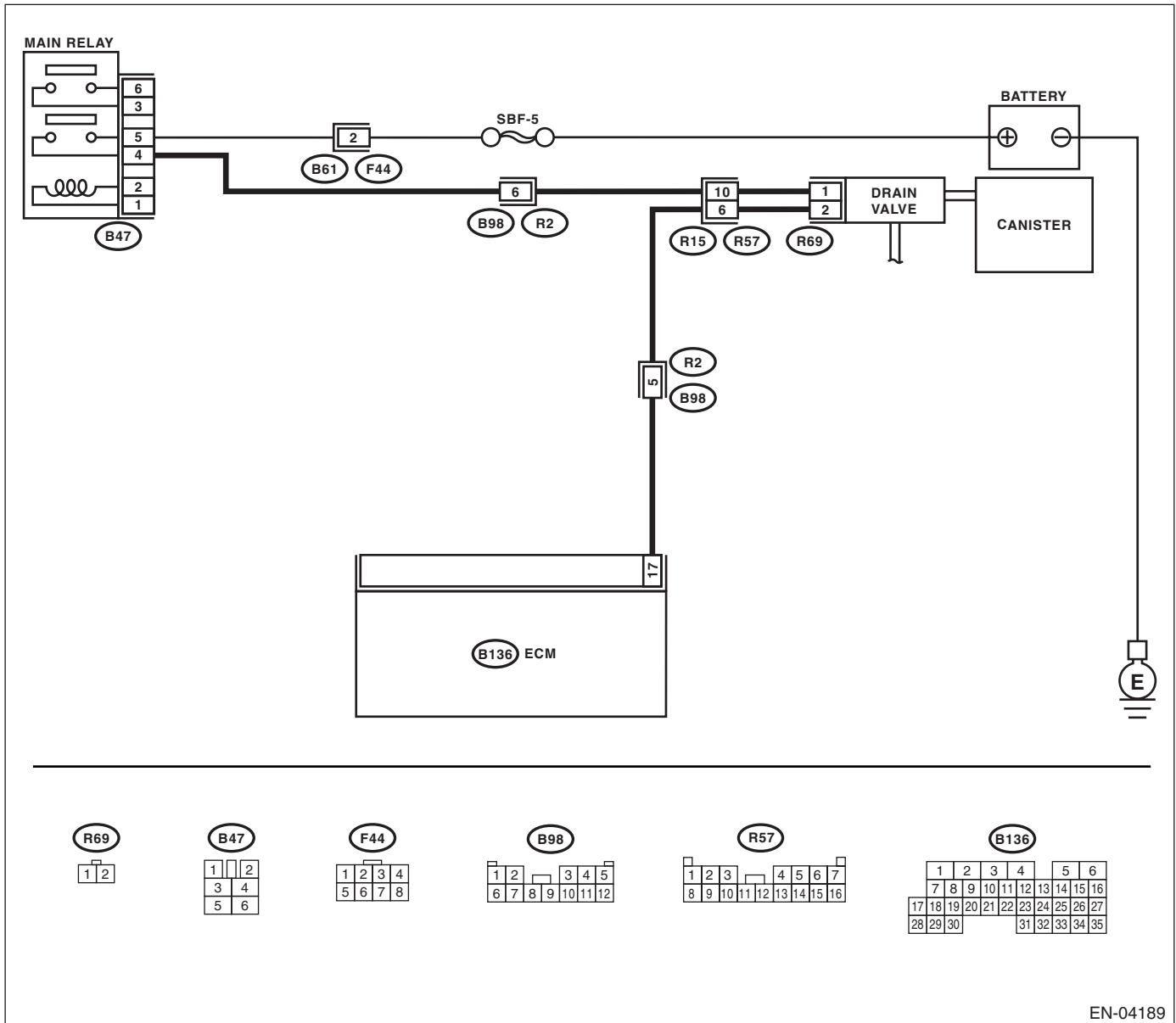
### TROUBLE SYMPTOM:

Improper fuel supply

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04189

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                 | Yes   | No   |
|---|---------------------------------------|---|--|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?           | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> | Go to step 2.  |
| <b>2</b><br><b>CHECK DRAIN HOSES.</b><br>Check the drain hoses for clogging.  | Is there clogging in the drain hoses? | Replace the drain hoses.  | Go to step 3.  |
| <b>3</b><br><b>CHECK DRAIN VALVE OPERATION.</b><br>1) Turn ignition switch to OFF.<br>2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side).<br>3) Turn ignition switch to ON.<br>4) Operate the drain valve.<br><b>NOTE:</b><br>Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-47, Compulsory Valve Operation Check Mode.> | Does the drain valve operate?         | Contact your SOA Service Center since deterioration of some parts may be the cause.   | Replace the drain valve. <Ref. to EC(H4SO)-16, Drain Valve.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CS:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-170, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

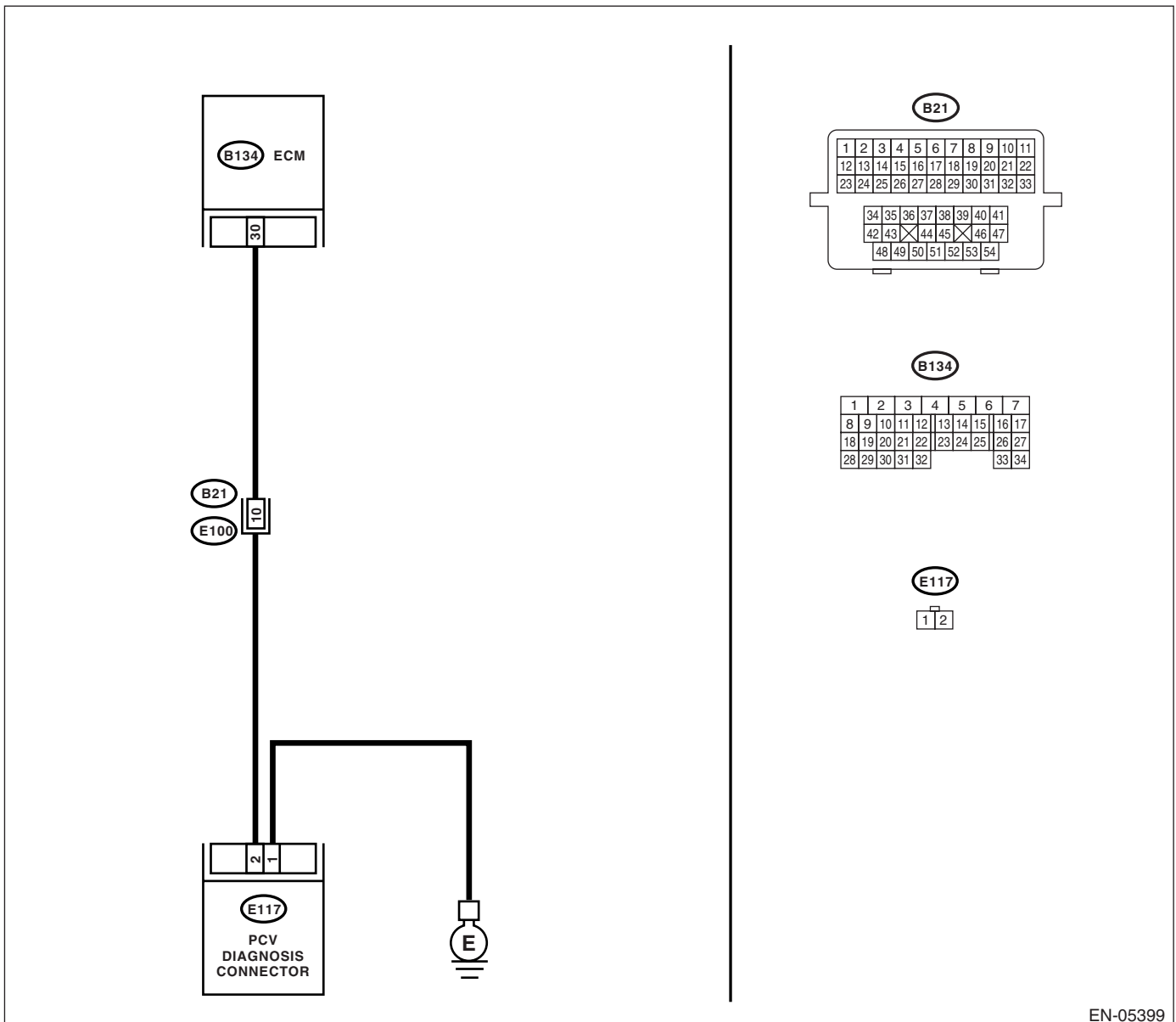
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-05399

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <b>1 CHECK BLOW-BY HOSE.</b><br>Check the blow-by hose.   | Is there disconnection or crack in blow-by hose? | Replace or repair blow-by hose.                         | Go to step 2.  |
| <b>2 INSPECT HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from PCV diagnosis connector and ECM.<br>3) Measure the resistance of harness between PCV diagnosis connector and ECM connector.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 30 — (E117) No. 2:</i> | Is the resistance less than 1 $\Omega$ ?         | Go to step 3.   | Repair open circuit in harness between PCV diagnosis connector and ECM.                    |
| <b>3 INSPECT HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR.</b><br>Measure the resistance of harness between PCV diagnosis connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 30 — Chassis ground:</i>   | Is the resistance more than 1 M $\Omega$ ?       | Go to step 4.   | Repair short circuit to chassis ground in harness between PCV diagnosis connector and ECM. |
| <b>4 INSPECT PCV DIAGNOSIS CONNECTOR GROUND CIRCUIT.</b><br>Measure the resistance between PCV diagnosis connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E117) No. 1 — Engine ground:</i>  | Is the resistance less than 5 $\Omega$ ?         | Go to step 5.   | Repair PCV diagnosis connector ground circuit.   |
| <b>5 INSPECT PCV DIAGNOSIS CONNECTOR.</b><br>Measure the resistance between PCV diagnosis connector and terminal.<br><i>Terminals</i><br><i>No. 1 — No. 2:</i>  | Is the resistance less than 1 $\Omega$ ?         | Repair poor contact in ECM and PCV diagnosis connector. | Replace PCV diagnosis connector.   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **CT:DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT)**

NOTE:

Refer to DTC P1498 for diagnostic procedure. <Ref. to EN(H4SO)(diag)-291, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **CU:DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT)**

NOTE:

Refer to DTC P1499 for diagnostic procedure. <Ref. to EN(H4SO)(diag)-294, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **CV:DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT)**

NOTE:

Refer to DTC P1498 for diagnostic procedure. <Ref. to EN(H4SO)(diag)-291, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **CW:DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT)**

NOTE:

Refer to DTC P1499 for diagnostic procedure. <Ref. to EN(H4SO)(diag)-294, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **CX:DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT)**

NOTE:

Refer to DTC P1498 for diagnostic procedure. <Ref. to EN(H4SO)(diag)-291, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **CY:DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT)**

NOTE:

Refer to DTC P1499 for diagnostic procedure. <Ref. to EN(H4SO)(diag)-294, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## **CZ:DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT)**

### **DTC DETECTING CONDITION:**

- Immediately at fault recognition.
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-172, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>, <Ref. to GD(H4SO)-175, DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>, <Ref. to GD(H4SO)-175, DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(H4SO)-176, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance
- Engine breathing

### **CAUTION:**

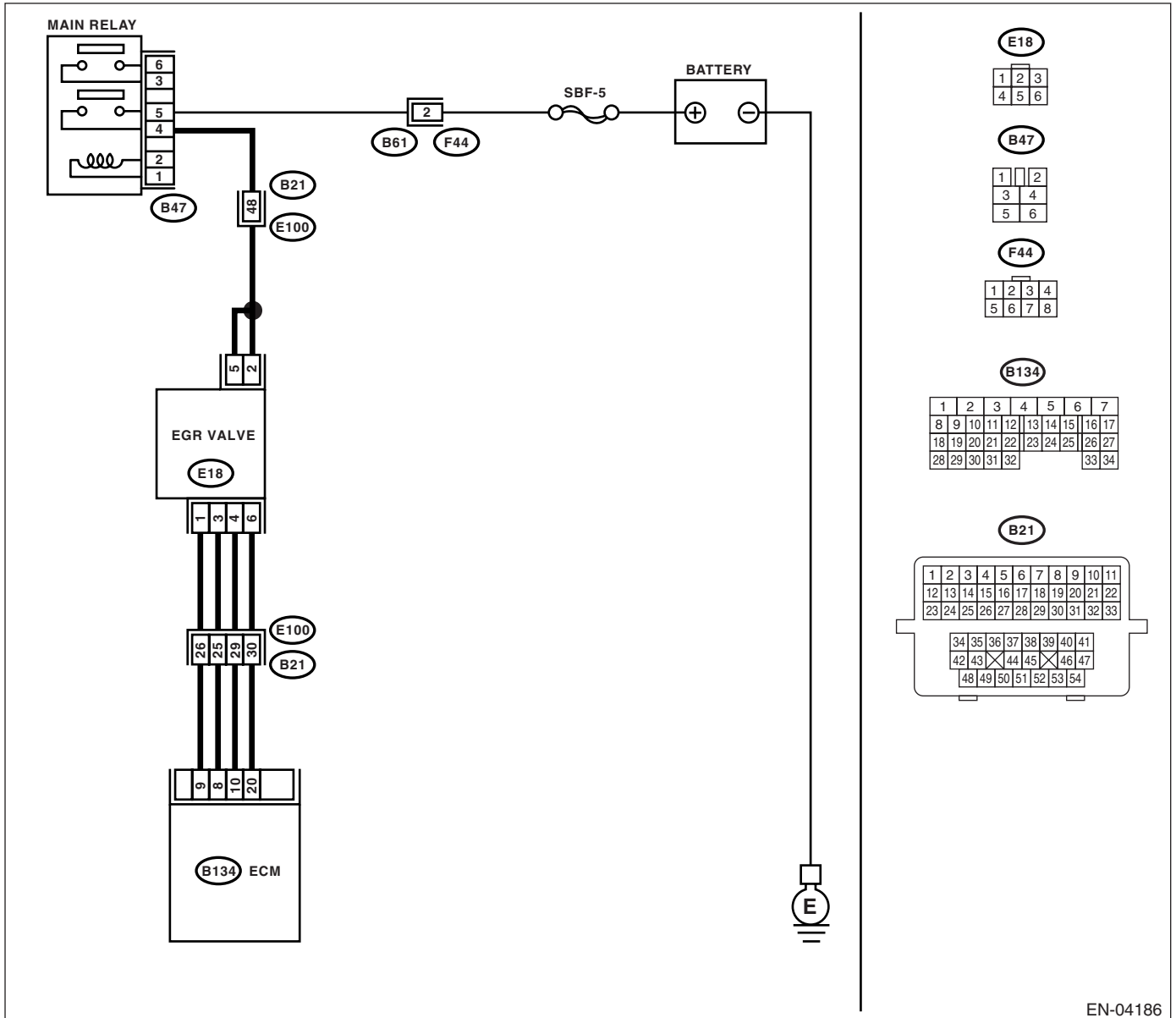
**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04186

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No   |
|--|--|--|--|
| <p><b>1 CHECK POWER SUPPLY TO EGR SOLENOID VALVE.</b></p> <p>1) Turn ignition switch to OFF.<br/>                     2) Disconnect connector from EGR solenoid valve.<br/>                     3) Turn ignition switch to ON.<br/>                     4) Measure the power supply voltage between EGR solenoid valve and engine ground.</p> <p><b>Connector &amp; terminal</b><br/>                     (E18) No. 2 (+) — Engine ground (-):<br/>                     (E18) No. 5 (+) — Engine ground (-):</p>         | <p>Is the measured value more than 10 V?</p>                         | <p>Go to step 2.</p>   | <p>Repair harness and connector.</p> <p>NOTE:<br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between EGR solenoid valve connector and main relay connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <p><b>2 CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE.</b></p> <p>1) Turn ignition switch to OFF.<br/>                     2) Measure resistance between ECM and EGR solenoid valve connector.</p> <p><b>Connector &amp; terminal</b><br/>                     DTC P1492; (B134) No. 10 — (E18) No. 4:<br/>                     DTC P1494; (B134) No. 9 — (E18) No. 1:<br/>                     DTC P1496; (B134) No. 8 — (E18) No. 3:<br/>                     DTC P1498; (B134) No. 20 — (E18) No. 6:</p>           | <p>Is the measured value less than 1 Ω?</p>                          | <p>Go to step 3.</p>   | <p>Repair harness and connector.</p> <p>NOTE:<br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between EGR solenoid valve connector and main relay connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <p><b>3 CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE.</b></p> <p>1) Disconnect connector from ECM.<br/>                     2) Measure resistance between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/>                     DTC P1492; (B134) No. 10 — Chassis ground:<br/>                     DTC P1494; (B134) No. 9 — Chassis ground:<br/>                     DTC P1496; (B134) No. 8 — Chassis ground:<br/>                     DTC P1498; (B134) No. 20 — Chassis ground:</p> | <p>Is the measured value more than 1 MΩ?</p>                         | <p>Go to step 4.</p>   | <p>Repair open or ground short circuit in harness between ECM and EGR solenoid valve connector.</p>  |
| <p><b>4 CHECK POOR CONTACT.</b></p> <p>Check poor contact in ECM and EGR solenoid valve connector.</p>   | <p>Is there poor contact in ECM or EGR solenoid valve connector?</p> | <p>Repair poor contact in ECM or EGR solenoid valve connector.</p> | <p>Replace EGR solenoid valve.<br/>                     &lt;Ref. to FU(H4SO)-29, EGR Valve.&gt;</p>  |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **DA:DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT)**

#### **DTC DETECTING CONDITION:**

- Immediately at fault recognition.
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-174, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>, <Ref. to GD(H4SO)-175, DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>, <Ref. to GD(H4SO)-175, DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(H4SO)-176, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance
- Engine breathing

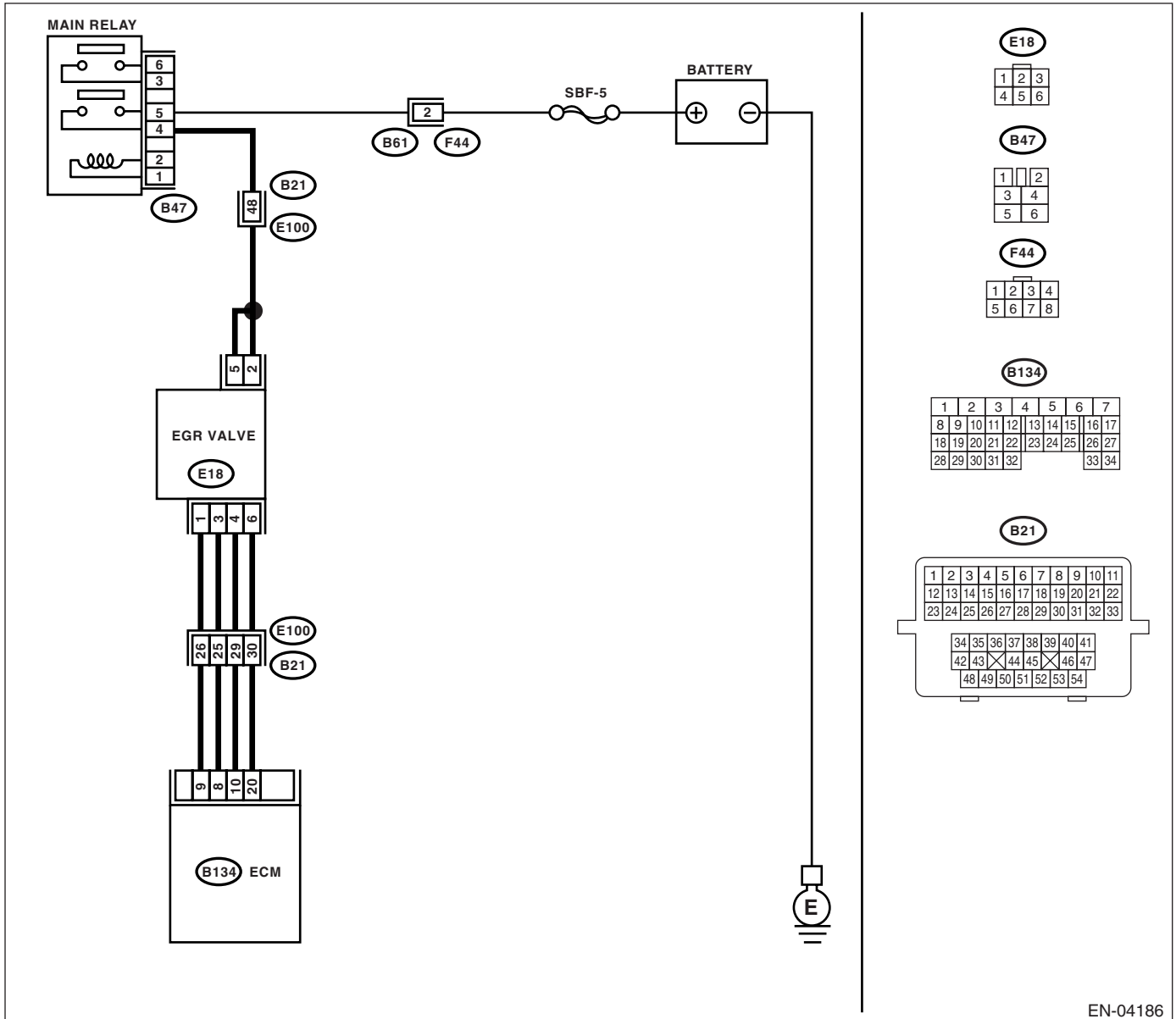
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04186

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                 | Yes  | No   |
|---|---------------------------------------|--|--|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?           | Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>                           | Go to step 2.  |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect connector from EGR solenoid valve.<br>3) Turn ignition switch to OFF.<br>4) Measure voltage between EGR solenoid valve and engine ground.<br><b>Connector &amp; terminal</b><br><i>DTC P1493; (B134) No. 10 (+) — Chassis ground (-):</i><br><i>DTC P1495; (B134) No. 9 (+) — Chassis ground (-):</i><br><i>DTC P1497; (B134) No. 8 (+) — Chassis ground (-):</i><br><i>DTC P1499; (B134) No. 20 (+) — Chassis ground (-):</i> | Is the measured value more than 10 V? | Repair ground short circuit between ECM and EGR solenoid valve connector. After repair, replace ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> | Replace ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |

## DB:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-176, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

Failure of engine to start

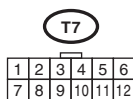
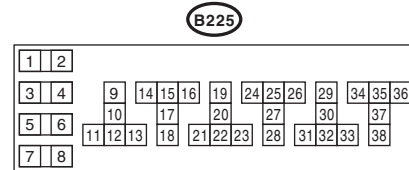
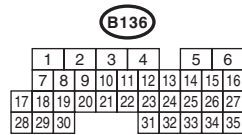
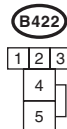
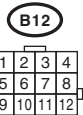
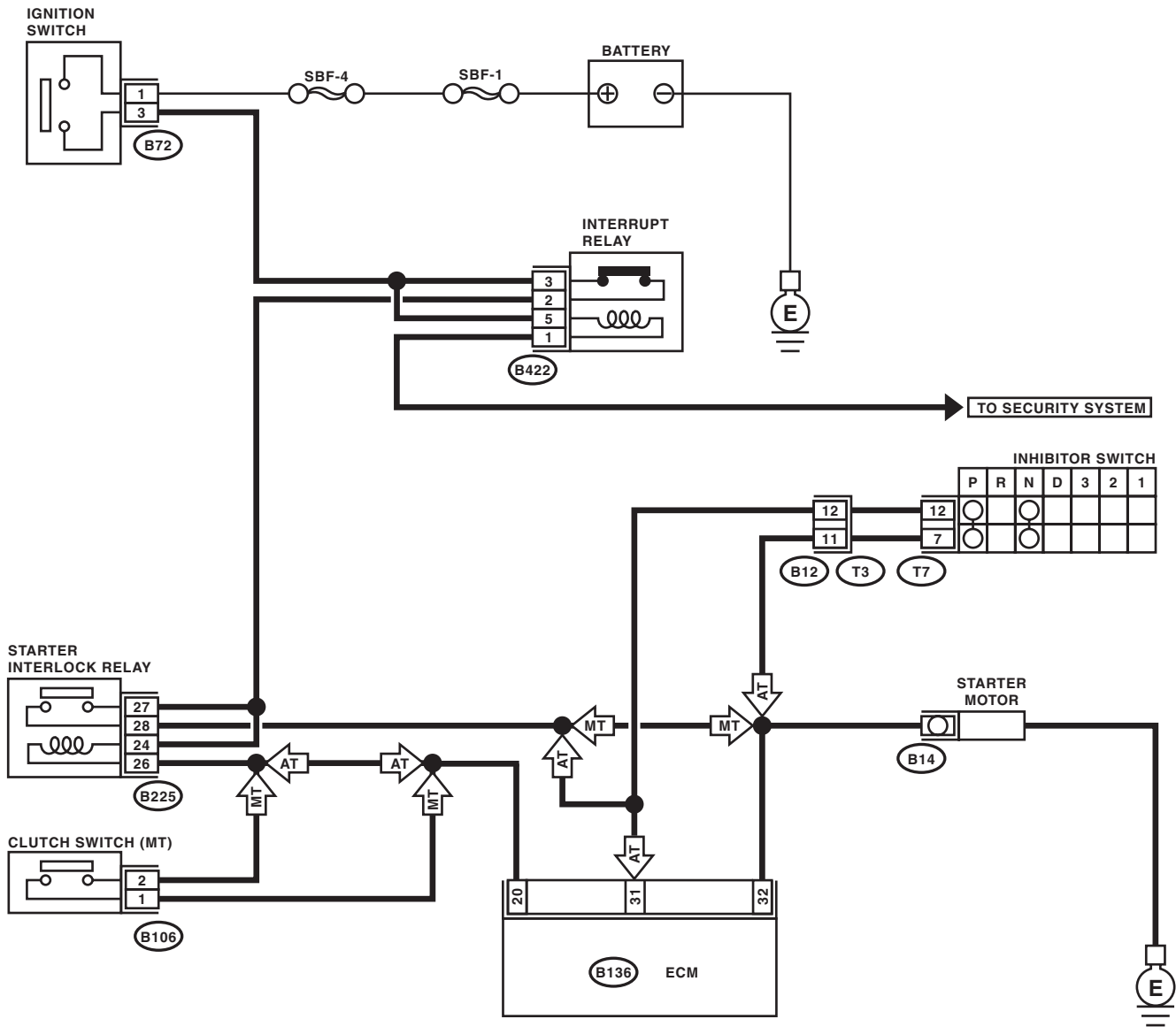
### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04637

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <b>1</b><br><b>CHECK OPERATION OF STARTER MOTOR.</b><br>Place the inhibitor switch in the "P" or "N" range. (AT model)<br>Depress the clutch pedal. (MT model) | Does the starter motor operate when ignition switch is turned to START? | Repair harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"><li>• Open or ground short circuit in harness between ECM and starter motor connector</li><li>• Poor contact in ECM connector</li></ul> | Check starter motor circuit. <Ref. to EN(H4SO)(diag)-59, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DC:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

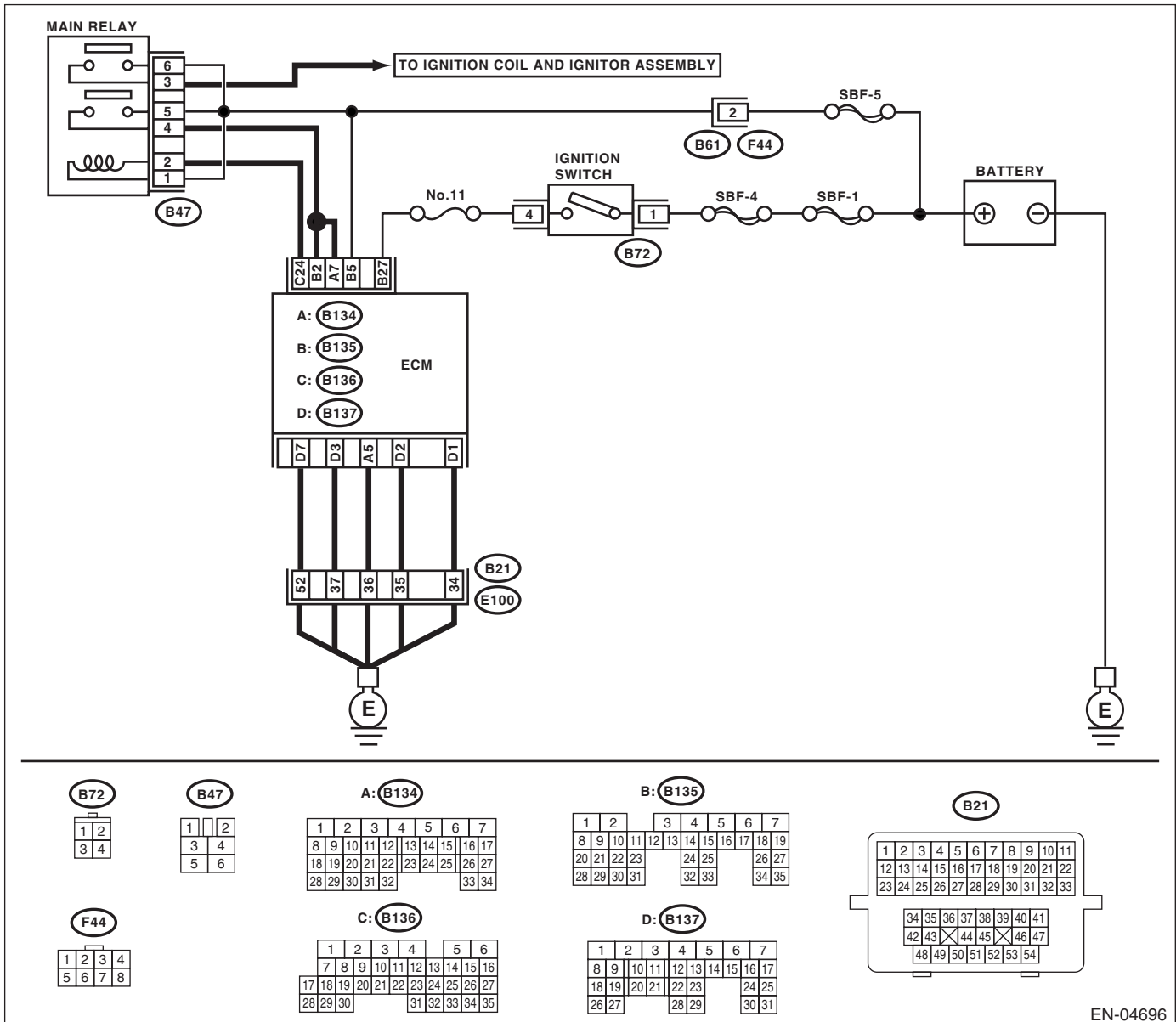
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-177, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04696



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                     | Yes  | No   |
|--|---|--|--|
| <b>1</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B135) No. 5 (+) — Chassis ground (-):</b></i>                                    | Is the voltage more than 10 V?            | Repair poor contact in ECM connector.  | Go to step 2.  |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.</b><br>1) Disconnect the connector from ECM.<br>2) Measure the resistance of harness between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B135) No. 5 — Chassis ground:</b></i> | Is the resistance less than 10 $\Omega$ ? | Repair ground short circuit in harness between ECM connector and battery terminal. | Go to step 3.  |
| <b>3</b><br><b>CHECK FUSE SBF-5.</b>   | Is the fuse blown out?                    | Replace the fuse.  | Repair harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and battery</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in battery terminal</li> </ul> |

### DD:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-179, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

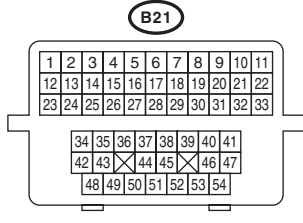
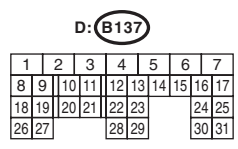
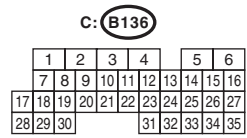
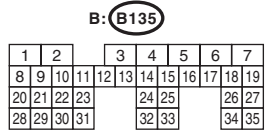
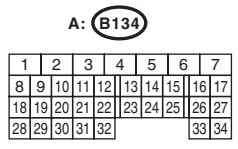
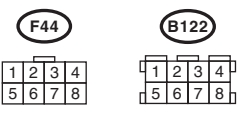
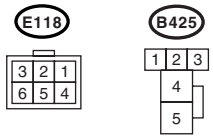
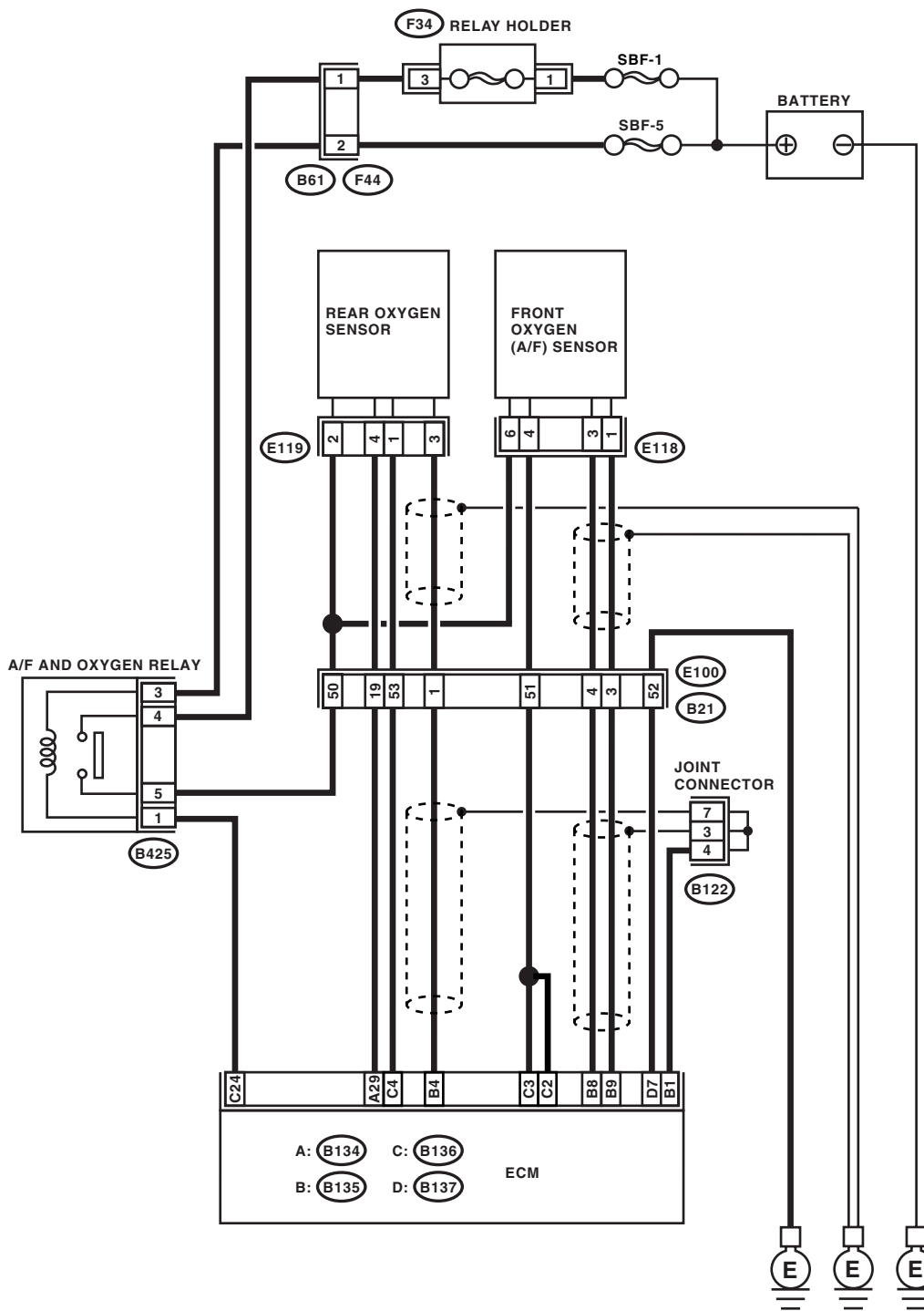
#### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04626

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check  | Yes                                    | No  |
|------|--|--|---|
| 1    | <b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?            | Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P2096.  |
| 2    | <b>CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>   | Is there water in connector?           | Remove infiltrating water completely.<br><br>Go to step 3.  |
| 3    | <b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br>3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 — (E118) No. 3:</b><br><b>(B135) No. 9 — (E118) No. 1:</b> | Is the measured value less than 1 Ω?   | Go to step 4.<br><br>Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ECM and front oxygen (A/F) sensor connector<br>• Poor contact in front oxygen (A/F) sensor connector<br>• Poor contact in ECM connector |
| 4    | <b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>Measure the resistance of harness between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 — Chassis ground:</b><br><b>(B135) No. 9 — Chassis ground:</b>  | Is the measured value more than 1 MΩ?  | Go to step 5.<br><br>Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.  |
| 5    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>1) Connect the connector to ECM.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 (+) — Chassis ground (-):</b>  | Is the measured value more than 4.5 V? | Go to step 6.<br><br>Go to step 7.  |
| 6    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 (+) — Chassis ground (-):</b>   | Is the measured value more than 10 V?  | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>After repair, replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).><br><br>Repair the poor contact in ECM connector.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <b>7</b><br><b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B135) No. 9 (+) — Chassis ground (-):</i>  | Is the measured value more than 4.95 V?  | Go to step <b>8</b> .   | Go to step <b>9</b> .  |
| <b>8</b><br><b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B135) No. 9 (+) — Chassis ground (-):</i>  | Is the measured value more than 10 V?  | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>After repair, replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).> | Repair the poor contact in ECM connector.  |
| <b>9</b><br><b>CHECK EXHAUST SYSTEM.</b>  | Are there holes or loose bolts on exhaust system?                                      | Repair the exhaust system.  | Go to step <b>10</b> .   |
| <b>10</b><br><b>CHECK AIR INTAKE SYSTEM.</b>  | Are there holes, loose bolts or disconnection of hose on air intake system?            | Repair the air intake system.   | Go to step <b>11</b> .   |
| <b>11</b><br><b>CHECK FUEL PRESSURE.</b><br><b>Warning:</b><br><ul style="list-style-type: none"> <li>• Place “NO FIRE” signs near the working area.</li> <li>• Be careful not to spill fuel on the floor.</li> </ul> Measure the fuel pressure. <Ref. to ME(H4SO)-29, INSPECTION, Fuel Pressure.><br><b>Warning:</b><br>Before removing the fuel pressure gauge, release fuel pressure.  | Is the measured value 339.5 — 360.5 kPa (3.5 — 3.7 kgf/cm <sup>2</sup> , 49 — 52 psi)? | Go to step <b>12</b> .  | Repair the following items.<br>Fuel pressure too high: <ul style="list-style-type: none"> <li>• Clogged fuel line or bent hose</li> </ul> Fuel pressure too low: <ul style="list-style-type: none"> <li>• Improper fuel pump discharge</li> <li>• Clogged fuel line</li> </ul> |
| <b>12</b><br><b>CHECK ENGINE COOLANT TEMPERATURE SENSOR.</b><br>1) Start the engine and warm-up completely.<br>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.<br><b>NOTE:</b><br><ul style="list-style-type: none"> <li>• Subaru Select Monitor<br/>For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</li> <li>• General scan tool<br/>For detailed operation procedure, refer to the general scan tool instruction manual.</li> </ul> | Is the temperature more than 60°C (140°F)?   | Go to step <b>13</b> .  | Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-22, Engine Coolant Temperature Sensor.>   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes                   | No  |
|---|---|-----------------------|---|
| <p><b>13 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2) Place the shift lever in neutral position.</p> <p>3) Turn the A/C switch to OFF.</p> <p>4) Turn all accessory switches to OFF.</p> <p>5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p>   | <p>Is the measured value 2.1 — 3.4 g/s (0.28 — 0.45 lb/m)?</p>  | <p>Go to step 14.</p> | <p>Replace the mass air flow and intake air temperature sensor. &lt;Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p> |
| <p><b>14 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2) Place the shift lever in neutral position.</p> <p>3) Turn the A/C switch to OFF.</p> <p>4) Turn all accessory switches to OFF.</p> <p>5) Open the front hood.</p> <p>6) Measure the ambient temperature.</p> <p>7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p> | <p>Subtract ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?</p> | <p>Go to step 15.</p> | <p>Check the mass air flow and intake air temperature sensor. &lt;Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p>   |
| <p><b>15 CHECK REAR OXYGEN SENSOR DATA.</b></p> <p>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest)</p> <p>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• For MT model, depress the clutch pedal.</li> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p>   | <p>Is the measured value more than 490 mV?</p>  | <p>Go to step 16.</p> | <p>Go to step 17.</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No                    |
|---|---|---|-----------------------|
| <p><b>16 CHECK REAR OXYGEN SENSOR DATA.</b></p> <p>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed from 3,000 rpm.</p> <p>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• For MT model, depress the clutch pedal.</li> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p> | <p>Is the measured value less than 250 mV?</p>              | <p>Go to step 18.</p>   | <p>Go to step 17.</p> |
| <p><b>17 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</b></p>   | <p>Is there water in connector?</p>                         | <p>Remove infiltrating water completely.</p>  | <p>Go to step 19.</p> |
| <p><b>18 CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA.</b></p> <p>1) Warm-up the engine until the engine coolant temperature exceeds 70°C (158°F), and leave it at idle for more than 5 minutes.</p> <p>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p>                               | <p>Does the voltage keep 0.8 V for more than 5 minutes?</p> | <p>Replace the front oxygen (A/F) sensor. &lt;Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.&gt;</p> | <p>Go to step 19.</p> |
| <p><b>19 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connectors from ECM and rear oxygen sensor.</p> <p>3) Measure the resistance of harness between ECM and rear oxygen sensor connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B135) No. 4 — (E119) No. 3:</b><br/> <b>(B134) No. 29 — (E119) No. 4:</b></p>  | <p>Is the measured value more than 3 Ω?</p>                 | <p>Repair open circuit in harness between ECM and rear oxygen sensor connector.</p>                   | <p>Go to step 20.</p> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes   | No  |
|---|--|---|---|
| <b>20</b><br><b>CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from rear oxygen sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E119) No. 3 (+) — Engine ground (-):</b></i> | Is the measured value within 0.2 to 0.5 V? | Replace the rear oxygen sensor.<br><Ref. to FU(H4SO)-37, Rear Oxygen Sensor.> | Repair harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in ECM connector</li> </ul> |

### DE:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-180, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

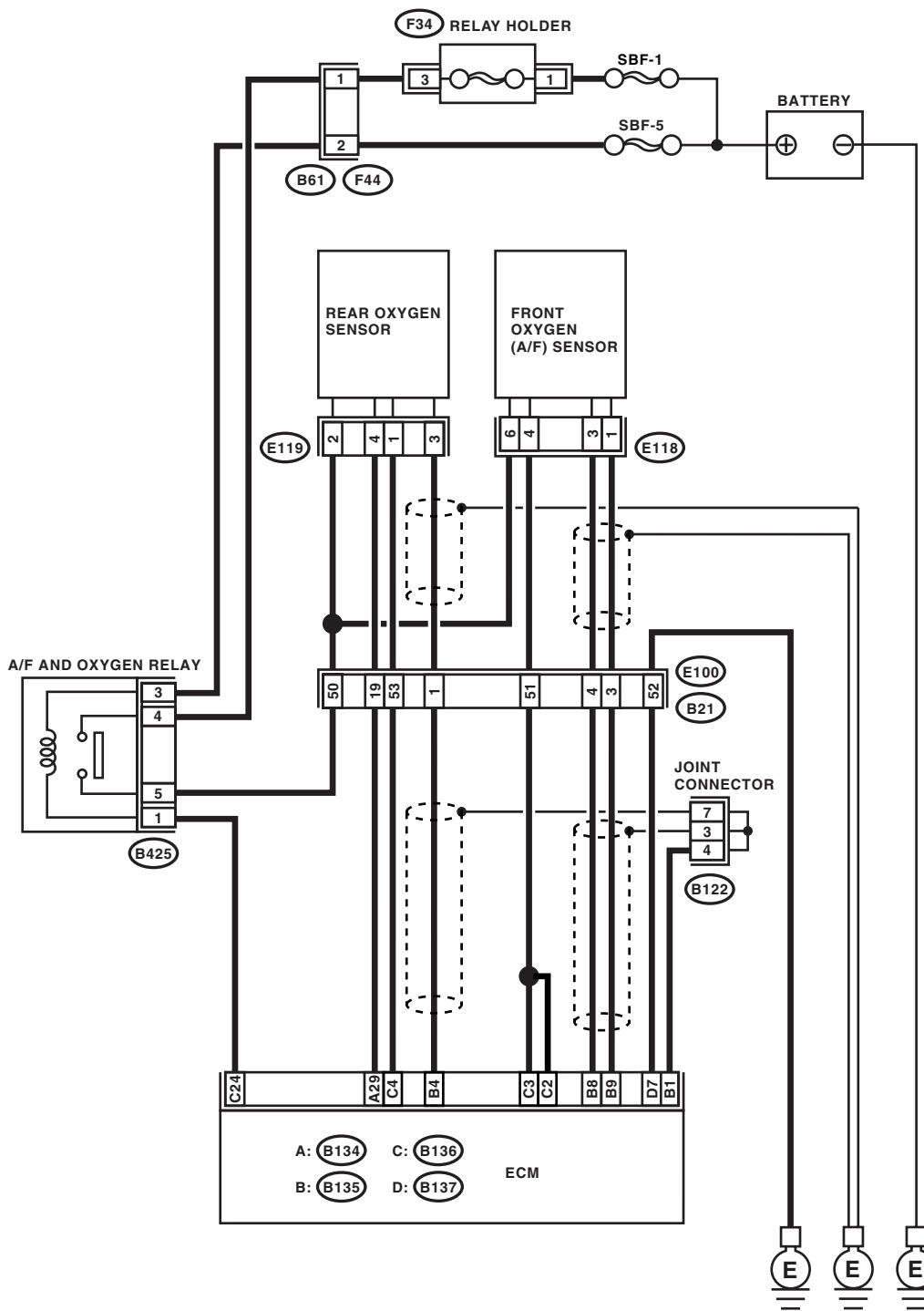
#### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



|   |                    |
|---|--------------------|
| <b>E119</b>   | <b>F34</b>         |
| 1 2<br>3 4  | 2 1<br>4 3         |
| <b>E118</b>   | <b>B425</b>        |
| 3 2 1<br>6 5 4  | 1 2 3<br>4<br>5    |
| <b>F44</b>  | <b>B122</b>        |
| 1 2 3 4<br>5 6 7 8  | 1 2 3 4<br>5 6 7 8 |
| <b>A: B134</b>  |                    |
| 1 2 3 4 5 6 7<br>8 9 10 11 12 13 14 15 16 17<br>18 19 20 21 22 23 24 25 26 27<br>28 29 30 31 32 33 34   |                    |
| <b>B: B135</b>  |                    |
| 1 2 3 4 5 6 7<br>8 9 10 11 12 13 14 15 16 17 18 19<br>20 21 22 23 24 25 26 27<br>28 29 30 31 32 33 34 35  |                    |
| <b>C: B136</b>  |                    |
| 1 2 3 4 5 6<br>7 8 9 10 11 12 13 14 15 16<br>17 18 19 20 21 22 23 24 25 26 27<br>28 29 30 31 32 33 34 35  |                    |
| <b>D: B137</b>  |                    |
| 1 2 3 4 5 6 7<br>8 9 10 11 12 13 14 15 16 17<br>18 19 20 21 22 23 24 25<br>26 27 28 29 30 31  |                    |
| <b>B21</b>  |                    |
| 1 2 3 4 5 6 7 8 9 10 11<br>12 13 14 15 16 17 18 19 20 21 22<br>23 24 25 26 27 28 29 30 31 32 33<br>34 35 36 37 38 39 40 41<br>42 43 44 45 46 47<br>48 49 50 51 52 53 54 |                    |

EN-04626



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step | Check  | Yes                                    | No  |
|------|--|--|---|
| 1    | <b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?            | Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P2097.  |
| 2    | <b>CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>   | Is there water in connector?           | Remove infiltrating water completely.<br><br>Go to step 3.  |
| 3    | <b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br>3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 — (E118) No. 3:</b><br><b>(B135) No. 9 — (E118) No. 1:</b> | Is the measured value less than 1 Ω?   | Go to step 4.<br><br>Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ECM and front oxygen (A/F) sensor connector<br>• Poor contact in front oxygen (A/F) sensor connector<br>• Poor contact in ECM connector |
| 4    | <b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>Measure the resistance of harness between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 — Chassis ground:</b><br><b>(B135) No. 9 — Chassis ground:</b>  | Is the measured value more than 1 MΩ?  | Go to step 5.<br><br>Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.  |
| 5    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>1) Connect the connector to ECM.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 (+) — Chassis ground (-):</b>  | Is the measured value more than 4.5 V? | Go to step 6.<br><br>Go to step 7.  |
| 6    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 (+) — Chassis ground (-):</b>   | Is the measured value more than 10 V?  | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>After repair, replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).><br><br>Repair the poor contact in ECM connector.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <b>7</b><br><b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B135) No. 9 (+) — Chassis ground (-):</i>  | Is the measured value more than 4.95 V?  | Go to step <b>8</b> .   | Go to step <b>9</b> .  |
| <b>8</b><br><b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B135) No. 9 (+) — Chassis ground (-):</i>  | Is the measured value more than 10 V?  | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>After repair, replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).> | Repair the poor contact in ECM connector.  |
| <b>9</b><br><b>CHECK EXHAUST SYSTEM.</b>  | Are there holes or loose bolts on exhaust system?                                      | Repair the exhaust system.  | Go to step <b>10</b> .   |
| <b>10</b><br><b>CHECK AIR INTAKE SYSTEM.</b>  | Are there holes, loose bolts or disconnection of hose on air intake system?            | Repair the air intake system.   | Go to step <b>11</b> .   |
| <b>11</b><br><b>CHECK FUEL PRESSURE.</b><br><b>Warning:</b><br><ul style="list-style-type: none"> <li>• Place “NO FIRE” signs near the working area.</li> <li>• Be careful not to spill fuel on the floor.</li> </ul> Measure the fuel pressure. <Ref. to ME(H4SO)-29, INSPECTION, Fuel Pressure.><br><b>Warning:</b><br>Before removing the fuel pressure gauge, release fuel pressure.  | Is the measured value 339.5 — 360.5 kPa (3.5 — 3.7 kgf/cm <sup>2</sup> , 49 — 52 psi)? | Go to step <b>12</b> .  | Repair the following items.<br>Fuel pressure too high: <ul style="list-style-type: none"> <li>• Clogged fuel line or bent hose</li> </ul> Fuel pressure too low: <ul style="list-style-type: none"> <li>• Improper fuel pump discharge</li> <li>• Clogged fuel line</li> </ul> |
| <b>12</b><br><b>CHECK ENGINE COOLANT TEMPERATURE SENSOR.</b><br>1) Start the engine and warm-up completely.<br>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.<br><b>NOTE:</b><br><ul style="list-style-type: none"> <li>• Subaru Select Monitor<br/>For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</li> <li>• General scan tool<br/>For detailed operation procedure, refer to the general scan tool instruction manual.</li> </ul> | Is the temperature more than 60°C (140°F)?   | Go to step <b>13</b> .  | Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-22, Engine Coolant Temperature Sensor.>   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes                   | No  |
|---|---|-----------------------|---|
| <p><b>13 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2) Place the shift lever in neutral position.</p> <p>3) Turn the A/C switch to OFF.</p> <p>4) Turn all accessory switches to OFF.</p> <p>5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p>   | <p>Is the measured value 2.1 — 3.4 g/s (0.28 — 0.45 lb/m)?</p>  | <p>Go to step 14.</p> | <p>Replace the mass air flow and intake air temperature sensor. &lt;Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p> |
| <p><b>14 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2) Place the shift lever in neutral position.</p> <p>3) Turn the A/C switch to OFF.</p> <p>4) Turn all accessory switches to OFF.</p> <p>5) Open the front hood.</p> <p>6) Measure the ambient temperature.</p> <p>7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p> | <p>Subtract ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?</p> | <p>Go to step 15.</p> | <p>Check the mass air flow and intake air temperature sensor. &lt;Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p>   |
| <p><b>15 CHECK REAR OXYGEN SENSOR DATA.</b></p> <p>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest)</p> <p>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• For MT model, depress the clutch pedal.</li> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p>   | <p>Is the measured value more than 490 mV?</p>  | <p>Go to step 16.</p> | <p>Go to step 17.</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No                    |
|---|---|---|-----------------------|
| <p><b>16 CHECK REAR OXYGEN SENSOR DATA.</b></p> <p>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed from 3,000 rpm.</p> <p>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• For MT model, depress the clutch pedal.</li> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p> | <p>Is the measured value less than 250 mV?</p>              | <p>Go to step 18.</p>   | <p>Go to step 17.</p> |
| <p><b>17 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</b></p>   | <p>Is there water in connector?</p>                         | <p>Remove infiltrating water completely.</p>  | <p>Go to step 19.</p> |
| <p><b>18 CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA.</b></p> <p>1) Warm-up the engine until the engine coolant temperature exceeds 70°C (158°F), and leave it at idle for more than 5 minutes.</p> <p>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". &lt;Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p>                               | <p>Does the voltage keep 0.8 V for more than 5 minutes?</p> | <p>Replace the front oxygen (A/F) sensor. &lt;Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.&gt;</p> | <p>Go to step 19.</p> |
| <p><b>19 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connectors from ECM and rear oxygen sensor.</p> <p>3) Measure the resistance of harness between ECM and rear oxygen sensor connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B135) No. 4 — (E119) No. 3:</b><br/> <b>(B134) No. 29 — (E119) No. 4:</b></p>  | <p>Is the measured value more than 3 Ω?</p>                 | <p>Repair open circuit in harness between ECM and rear oxygen sensor connector.</p>                   | <p>Go to step 20.</p> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes   | No   |
|---|--|---|--|
| <b>20 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from rear oxygen sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground.<br><b>Connector &amp; terminal</b><br><b>(E119) No. 3 (+) — Engine ground (-):</b> | Is the measured value within 0.2 to 0.5 V? | Replace the rear oxygen sensor.<br><Ref. to FU(H4SO)-37, Rear Oxygen Sensor.> | Repair harness and connector.<br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in ECM connector</li> </ul> |

## DF:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-151, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>, <Ref. to GD(H4SO)-164, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(H4SO)-187, DTC P2109 THROTTLE ANGLE SENSOR CLOSED POSITION ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

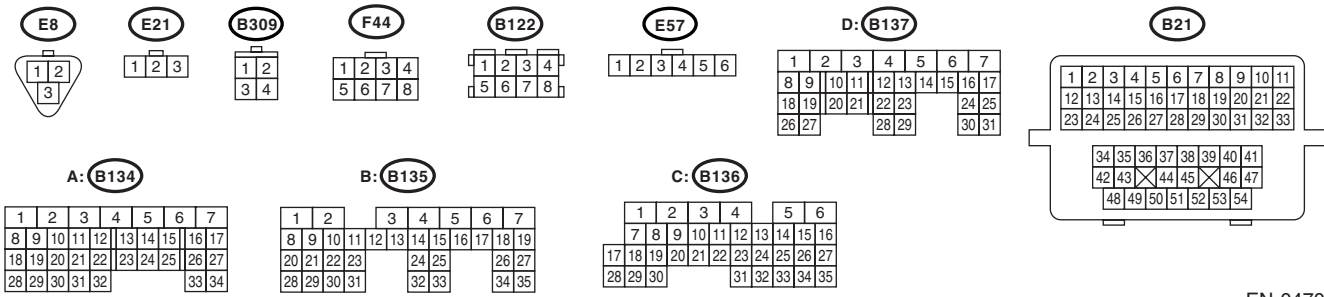
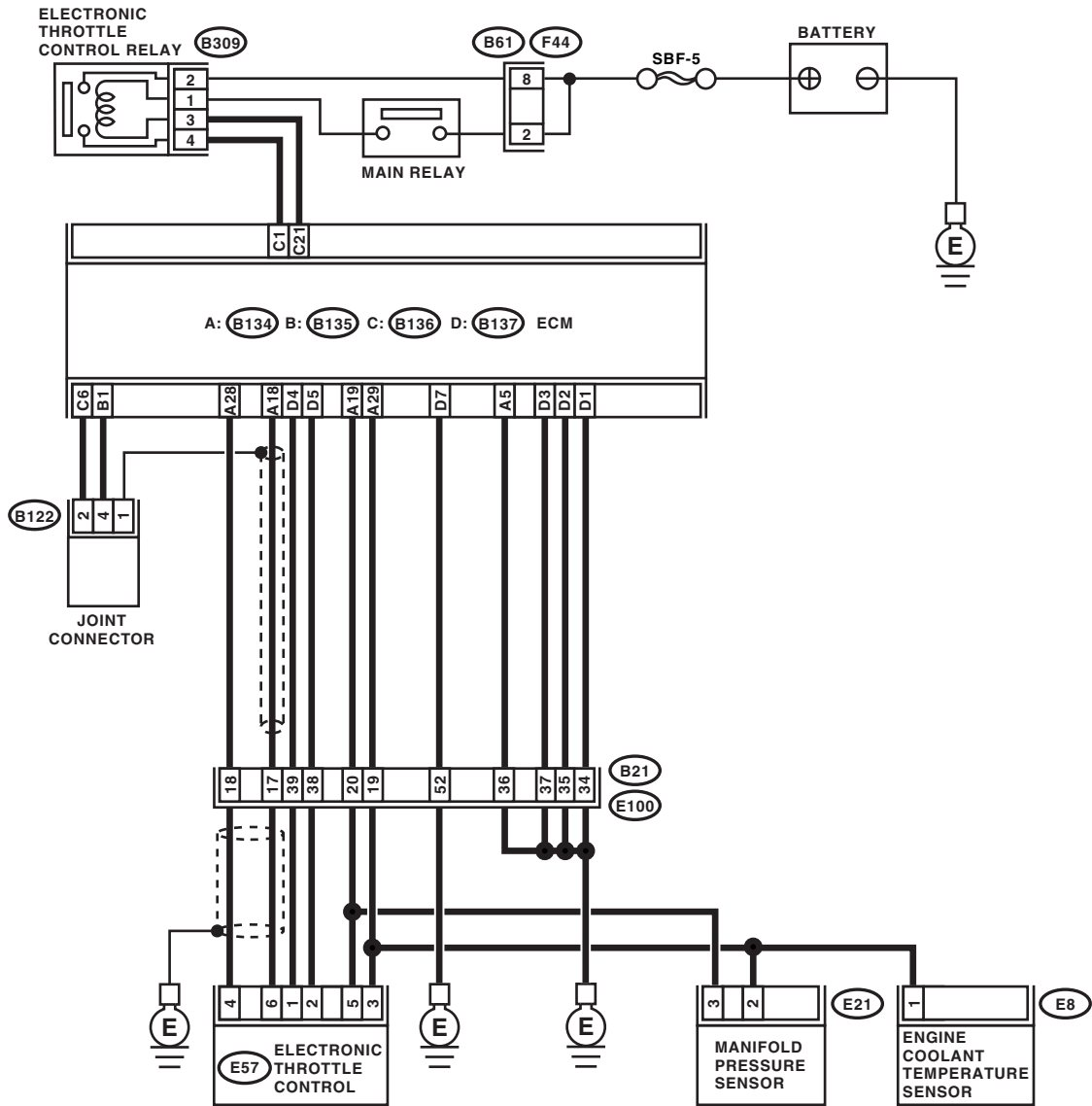
### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04700

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check                                     | Yes   | No  |
|--|---|---|---|
| <b>1 CHECK ELECTRONIC THROTTLE CONTROL RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electronic throttle control relay.<br>3) Using a lead wire, connect the terminal No. 1 of electronic throttle control to positive terminal of battery, and terminal No. 3 to battery ground terminal.<br>4) Measure the resistance between electronic throttle control relay terminals.<br><i>Terminals</i><br><i>No. 2 — No. 4:</i> | Is the resistance less than 1 $\Omega$ ?  | Go to step 2.   | Replace the electronic throttle control relay.  |
| <b>2 CHECK POWER SUPPLY TO ELECTRONIC THROTTLE CONTROL RELAY.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between electronic throttle control relay connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B309) No. 1 (+) — Chassis ground (-):</i><br><i>(B309) No. 2 (+) — Chassis ground (-):</i>   | Is the voltage more than 10 V?            | Go to step 3.   | Repair the open power supply circuit.   |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between electronic throttle control relay connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B309) No. 3 (+) — Chassis ground (-):</i>  | Is the voltage more than 10 V?            | Repair short of the power supply circuit between ECM and electronic throttle control. | Go to step 4.   |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electronic throttle control electronic throttle control relay connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B309) No. 3 — Chassis ground:</i><br><i>(B309) No. 4 — Chassis ground:</i>   | Is the resistance more than 1 $M\Omega$ ? | Go to step 5.   | Repair the ground short of harness between ECM and electronic throttle control relay. |
| <b>5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electronic throttle control connector and electronic throttle control relay connector.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 21 — (B309) No. 3:</i><br><i>(B136) No. 1 — (B309) No. 4:</i>   | Is the resistance less than 1 $\Omega$ ?  | Go to step 6.   | Repair the open circuit of harness between ECM and electronic throttle control relay. |
| <b>6 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Connect all the connectors.<br>2) Turn the ignition switch to ON.<br>3) Read the data of main throttle sensor signal, using the Subaru Select Monitor.  | Is the voltage more than 0.4 V?           | Go to step 7.   | Go to step 9.   |
| <b>7 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Connect all the connectors.<br>2) Turn the ignition switch to ON.<br>3) Read the data of sub throttle sensor signal, using the Subaru Select Monitor.   | Is the voltage more than 0.8 V?           | Go to step 8.   | Go to step 9.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step      | Check   | Yes  | No                                     |   |
|-----------|---|--|--|---|
| <b>8</b>  | <b>CHECK POOR CONTACT.</b><br>Check poor contact between ECM connector and electronic throttle control connector.   | Is there poor contact between ECM connector and electronic throttle control connector? | Repair the poor contact.               | Go to step <b>13</b> .  |
| <b>9</b>  | <b>CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 18 — (E57) No. 6:</b><br><b>(B134) No. 28 — (E57) No. 4:</b> | Is the resistance less than 1 $\Omega$ ?   | Go to step <b>10</b> .                 | Repair the open harness connector.  |
| <b>10</b> | <b>CHECK THE HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>Measure the resistance between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 18 — Chassis ground:</b><br><b>(B134) No. 28 — Chassis ground:</b>  | Is the resistance more than 1 M $\Omega$ ?   | Go to step <b>11</b> .                 | Repair the ground short of harness.   |
| <b>11</b> | <b>CHECK POWER SUPPLY TO SENSOR.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the resistance between electronic throttle control connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 5 (+) — Engine ground (-):</b>   | Is the voltage 4.5 — 5.5 V?  | Go to step <b>12</b> .                 | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |
| <b>12</b> | <b>CHECK SHORT OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electronic throttle control connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 6 — Engine ground:</b><br><b>(E57) No. 4 — Engine ground:</b>  | Is the resistance more than 10 $\Omega$ ?  | Go to step <b>13</b> .                 | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |
| <b>13</b> | <b>CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Connect all the connectors.<br>2) Turn the ignition switch to ON.<br>3) Read the data of main throttle sensor signal, using the Subaru Select Monitor.   | Is the voltage less than 4.63 V?   | Go to step <b>14</b> .                 | Go to step <b>16</b> .  |
| <b>14</b> | <b>CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>Read the data of sub throttle sensor signal, using the Subaru Select Monitor.   | Is the voltage less than 4.73 V?   | Go to step <b>15</b> .                 | Go to step <b>16</b> .  |
| <b>15</b> | <b>CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electronic throttle control?   | Is there poor contact in connectors between ECM and electronic throttle control?       | Repair the poor contact in connectors. | Go to step <b>21</b> .  |



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check                                      | Yes            | No  |
|--|--|----------------|---|
| <b>16 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 18 — (E57) No. 6:</i><br><i>(B134) No. 28 — (E57) No. 4:</i> | Is the resistance less than 1 $\Omega$ ?   | Go to step 17. | Repair the open harness connector.  |
| <b>17 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 3 — Engine ground:</i>  | Is the resistance less than 5 $\Omega$ ?   | Go to step 18. | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).>                                   |
| <b>18 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 5 (+) — Engine ground (-):</i>  | Is the voltage less than 10 V?             | Go to step 19. | Repair the battery short of harness between ECM connector and electronic throttle control connector.  |
| <b>19 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>Measure the voltage between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 6 (+) — Engine ground (-):</i><br><i>(E57) No. 4 (+) — Engine ground (-):</i>  | Is the voltage less than 10 V?             | Go to step 20. | Repair the short of harness between ECM connector and electronic throttle control connector.  |
| <b>20 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the ECM.<br>3) Measure the voltage between ECM connectors.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 18 — (B136) No. 21:</i><br><i>(B134) No. 28 — (B136) No. 21:</i>   | Is the resistance more than 1 M $\Omega$ ? | Go to step 21. | Repair the short of sensor power supply.  |
| <b>21 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect all the connectors except electronic throttle control replay.<br>3) Turn the ignition switch to ON.<br>4) Read the data of main throttle sensor signals, using Subaru Select Monitor.   | Is the voltage 0.81 — 0.87 V?              | Go to step 22. | Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control. <Ref. to FU(H4SO)-12, Throttle Body.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                     | Yes                    | No  |
|--|---|------------------------|---|
| <b>22 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>Read the data of sub throttle sensor signals, using Subaru Select Monitor.  | Is the voltage 1.64 — 1.70 V?             | Go to step <b>23</b> . | Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control. <Ref. to FU(H4SO)-12, Throttle Body.> |
| <b>23 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connectors from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B137) No. 5 — (E57) No. 2:</b></i><br><i><b>(B137) No. 4 — (E57) No. 1:</b></i> | Is the resistance less than 1 $\Omega$ ?  | Go to step <b>24</b> . | Repair the open harness connector.  |
| <b>24 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.</b><br>1) Connect the connectors to ECM.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electronic throttle control connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E57) No. 2 (+) — Engine ground (-):</b></i><br><i><b>(E57) No. 1 (+) — Engine ground (-):</b></i>   | Is the voltage less than 5 V?             | Go to step <b>25</b> . | Repair the short of harness to power supply circuit between ECM and electronic throttle control.  |
| <b>25 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance between electronic throttle control connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E57) No. 2 — Engine ground:</b></i><br><i><b>(E57) No. 1 — Engine ground:</b></i>   | Is the resistance more than 1 $M\Omega$ ? | Go to step <b>26</b> . | Repair the short of harness.  |
| <b>26 CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS.</b><br>Measure the resistance between electronic throttle control connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E57) No. 2 — (E57) No. 1:</b></i>  | Is the resistance more than 1 $M\Omega$ ? | Go to step <b>27</b> . | Repair the short of harness.  |
| <b>27 CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT.</b><br>Measure the resistance between ECM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 5 — Chassis ground:</b></i><br><i><b>(B137) No. 1 — Chassis ground:</b></i><br><i><b>(B137) No. 2 — Chassis ground:</b></i><br><i><b>(B137) No. 3 — Chassis ground:</b></i><br><i><b>(B137) No. 7 — Chassis ground:</b></i>                                      | Is the resistance less than 10 $\Omega$ ? | Go to step <b>28</b> . | Repair the open circuit harness.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No   |
|--|---|--|--|
| <b>28</b><br><b>CHECK ELECTRONIC THROTTLE CONTROL.</b><br>Measure the resistance between electronic throttle control terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b> | Is the resistance less than 50 $\Omega$ ?   | Go to step <b>29</b> .   | Replace the electronic throttle control. <Ref. to FU(H4SO)-12, Throttle Body.> |
| <b>29</b><br><b>CHECK ELECTRONIC THROTTLE CONTROL.</b><br>Open and close the throttle valve to its full width with finger.   | Does it return to specified position (3 mm (0.12 in) open from fully closed position.) when finger is released? | Repair the poor contact in ECM connector. If problem persists, replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).> | Replace the electronic throttle control. <Ref. to FU(H4SO)-12, Throttle Body.> |

## DG:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-184, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

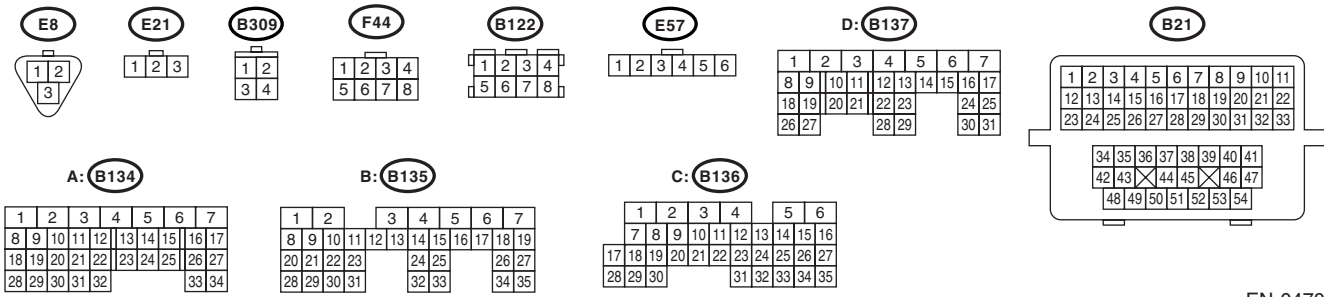
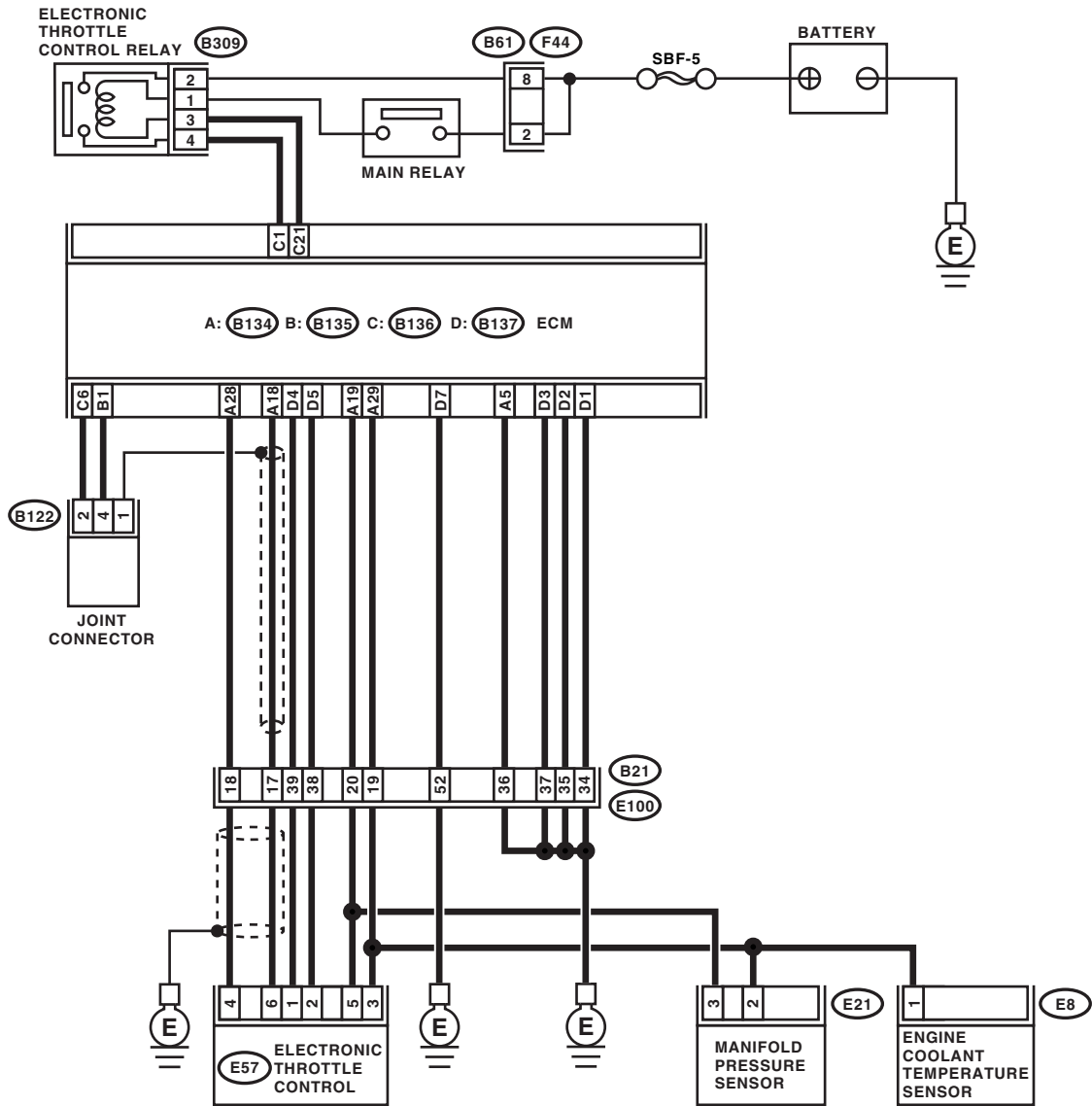
### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04700

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check                                     | Yes  | No  |
|---|---|--|---|
| <b>1 CHECK ELECTRONIC THROTTLE CONTROL RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electronic throttle control relay.<br>3) Using a lead wire, connect the terminal No. 1 of electronic throttle control to positive terminal of battery, and terminal No. 3 to battery ground terminal.<br>4) Measure the resistance between electronic throttle control relay terminals.<br><i>Connector &amp; terminal</i><br><b>No. 2 — No. 4:</b> | Is the resistance less than 1 $\Omega$ ?  | Go to step 2.  | Replace the electronic throttle control relay.  |
| <b>2 CHECK POWER TO ELECTRONIC THROTTLE CONTROL RELAY</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between electronic throttle control relay connector and chassis ground.<br><i>Connector &amp; terminal</i><br><b>(B309) No. 1 (+) — Chassis ground (-):</b><br><b>(B309) No. 2 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?            | Go to step 3.  | Repair the open power supply circuit or ground short.                                 |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between electronic throttle control relay connector and chassis ground.<br><i>Connector &amp; terminal</i><br><b>(B309) No. 3 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?            | Repair the short of power supply circuit between ECM and electronic throttle control.  | Go to step 4.   |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electronic throttle control relay connector and chassis ground.<br><i>Connector &amp; terminal</i><br><b>(B309) No. 3 — Chassis ground:</b><br><b>(B309) No. 4 — Chassis ground:</b>  | Is the resistance more than 1 $M\Omega$ ? | Go to step 5.  | Repair the ground short of harness between ECM and electronic throttle control relay. |
| <b>5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</b><br>Measure the resistance between ECM connector and electronic throttle control relay connector.<br><i>Connector &amp; terminal</i><br><b>(B136) No. 21 — (B309) No. 3:</b><br><b>(B136) No. 1 — (B309) No. 4:</b>  | Is the resistance less than 1 $\Omega$ ?  | Repair the poor contact in ECM connector. If problem persists, replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).> | Repair the open circuit in harness between ECM and electronic throttle control relay. |

## **DH:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH**

### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-185, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

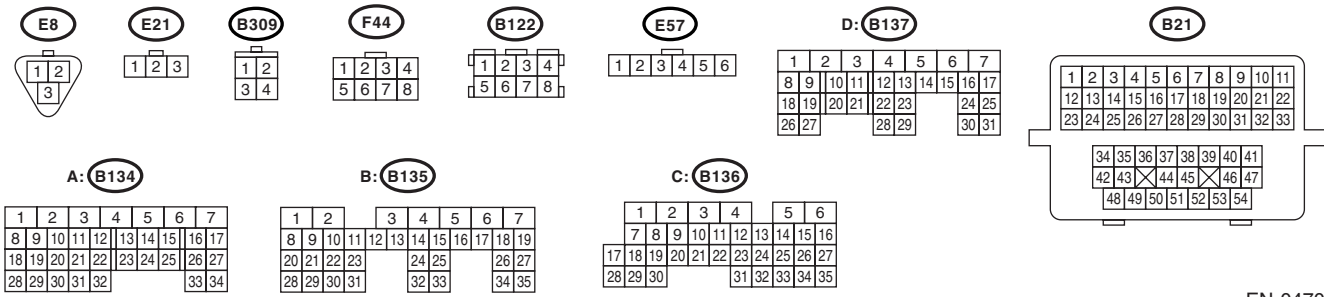
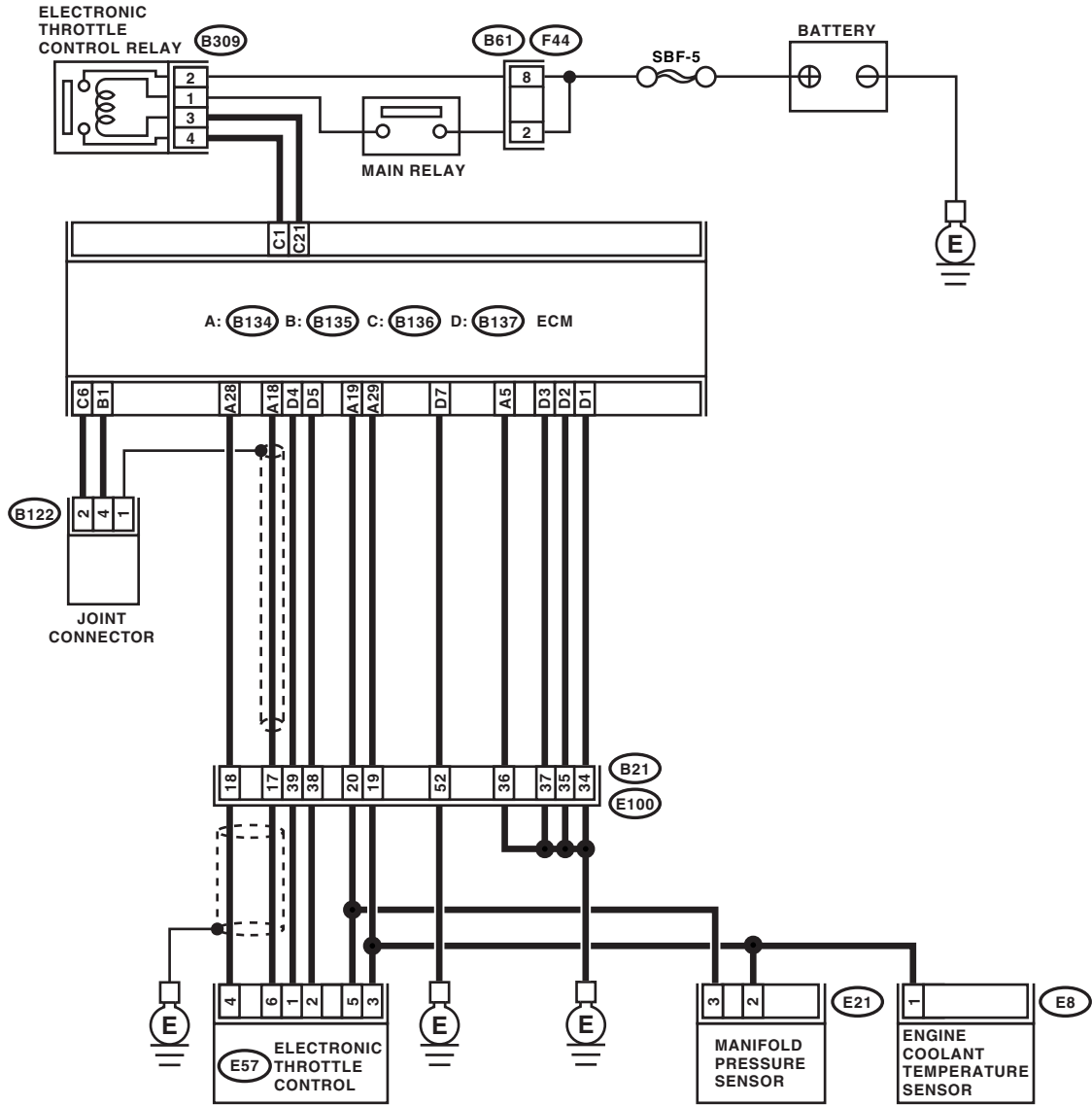
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04700

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                      | Yes  | No  |
|--|--|--|---|
| <b>1 CHECK ELECTRONIC THROTTLE CONTROL RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electronic throttle control relay.<br>3) Measure the resistance between electronic throttle control relay terminals.<br><i>Terminals</i><br><i>No. 2 — No. 4:</i>                                  | Is the resistance more than 1 M $\Omega$ ? | Go to step 2.  | Replace the electronic throttle control relay.  |
| <b>2 CHECK SHORT OF ELECTRONIC THROTTLE CONTROL RELAY POWER SUPPLY CIRCUIT.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between electronic throttle control relay connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B309) No. 4 (+) — Chassis ground (-):</i>  | Is the voltage more than 5 V?              | Repair the short of power supply to harness between ECM and electronic throttle control relay.   | Go to step 3.   |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM.<br>3) Measure the resistance between ECM connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 21 — Engine ground:</i> | Is the resistance more than 1 M $\Omega$ ? | Repair the poor contact in ECM connector. If problem persists, replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).> | Repair the ground short of harness between ECM and electronic throttle control relay. |

## DI: DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE

**NOTE:**

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4SO)(diag)-312, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DJ:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-188, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

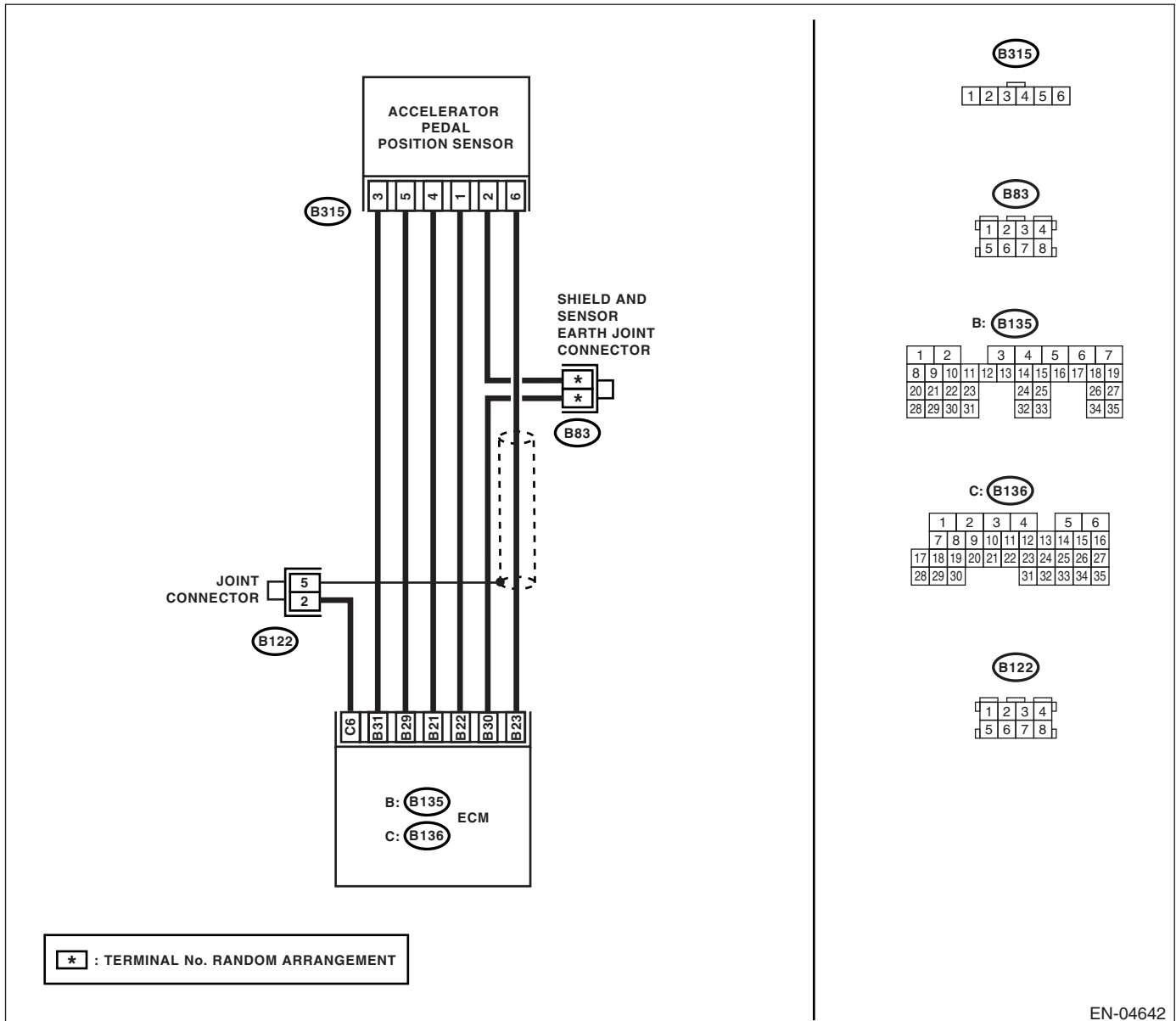
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04642

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <b>1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of main accelerator pedal position sensor signal using Subaru Select Monitor.   | Is the voltage more than 0.4 V?  | Go to step 2.   | Go to step 3.   |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and accelerator pedal position sensor.   | Is there poor contact in connectors between ECM and accelerator pedal position sensor? | Repair the poor contact in connectors.                                  | Connector has returned to its normal condition at this time. A temporary poor contact of the connector may be the cause.            |
| <b>3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator pedal position sensor.<br>4) Measure the resistance between ECM connector and accelerator pedal position sensor.<br><i>Connector &amp; terminal</i><br>(B135) No. 21 — (B315) No. 4:<br>(B135) No. 23 — (B315) No. 6: | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.   | Repair the open harness connector.  |
| <b>4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>Measure the resistance between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br>(B135) No. 21 — Chassis ground:<br>(B135) No. 23 — Chassis ground:  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 5.   | Repair the ground short circuit in harness.   |
| <b>5 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between accelerator pedal position sensor connector and chassis ground.<br><i>Connector &amp; terminal</i><br>(B315) No. 5 — Chassis ground:  | Is the resistance less than 5 $\Omega$ ?   | Go to step 6.   | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |
| <b>6 CHECK ACCELERATOR PEDAL POSITION SENSOR POWER SUPPLY</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between accelerator pedal position sensor connector and chassis ground.<br><i>Connector &amp; terminal</i><br>(B315) No. 4 (+) — Chassis ground (-):   | Is the voltage 4.5 — 5.5 V?  | Replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.> | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DK:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-189, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

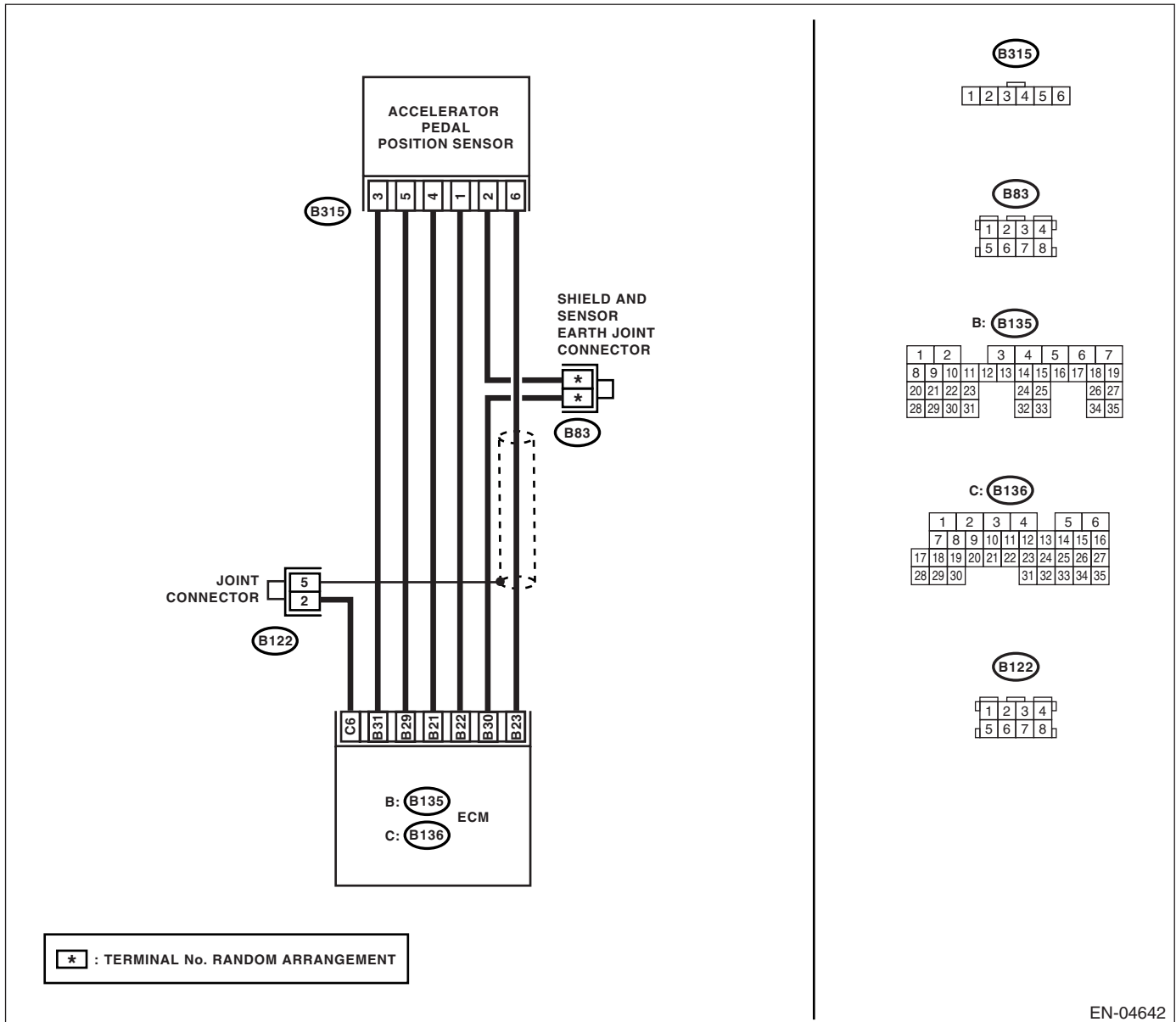
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No   |
|--|--|---|--|
| <b>1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of main accelerator pedal position sensor signals, using Subaru Select Monitor.  | Is the voltage less than 4.8 V?  | Go to step 2.   | Go to step 3.  |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and accelerator pedal position sensor.  | Is there any poor contact in connectors between ECM and accelerator pedal position sensor? | Repair the poor contact in connectors.  | Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.  |
| <b>3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator pedal position sensor.<br>4) Measure the resistance between ECM connector and accelerator pedal position sensor.<br><i>Connector &amp; terminal</i><br>(B135) No. 21 — (B315) No. 4:<br>(B135) No. 29 — (B315) No. 5:<br>(B135) No. 23 — (B315) No. 6: | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.   | Repair the open circuit and trouble cause of harness connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).>  |
| <b>4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between accelerator pedal position sensor and chassis ground.<br><i>Connector &amp; terminal</i><br>(B315) No. 5 — Chassis ground:   | Is the resistance less than 5 $\Omega$ ?   | Go to step 5.   | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).>  |
| <b>5 CHECK ACCELERATOR PEDAL POSITION SENSOR POWER SUPPLY.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between accelerator pedal position sensor connector and chassis ground.<br><i>Connector &amp; terminal</i><br>(B315) No. 4 (+) — Chassis ground (-):  | Is the voltage 4.5 — 5.5 V?  | Go to step 6.   | Repair the short circuit of harness between ECM connector and accelerator pedal position sensor connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |
| <b>6 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the accelerator pedal position sensor connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br>(B135) No. 23 (+) — Chassis ground (-):  | Is the voltage less than 4.8 V?  | Repair the poor contact in connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> | Repair the poor contact in accelerator pedal position sensor connector. If problem persists, replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.>                                 |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DL:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-191, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

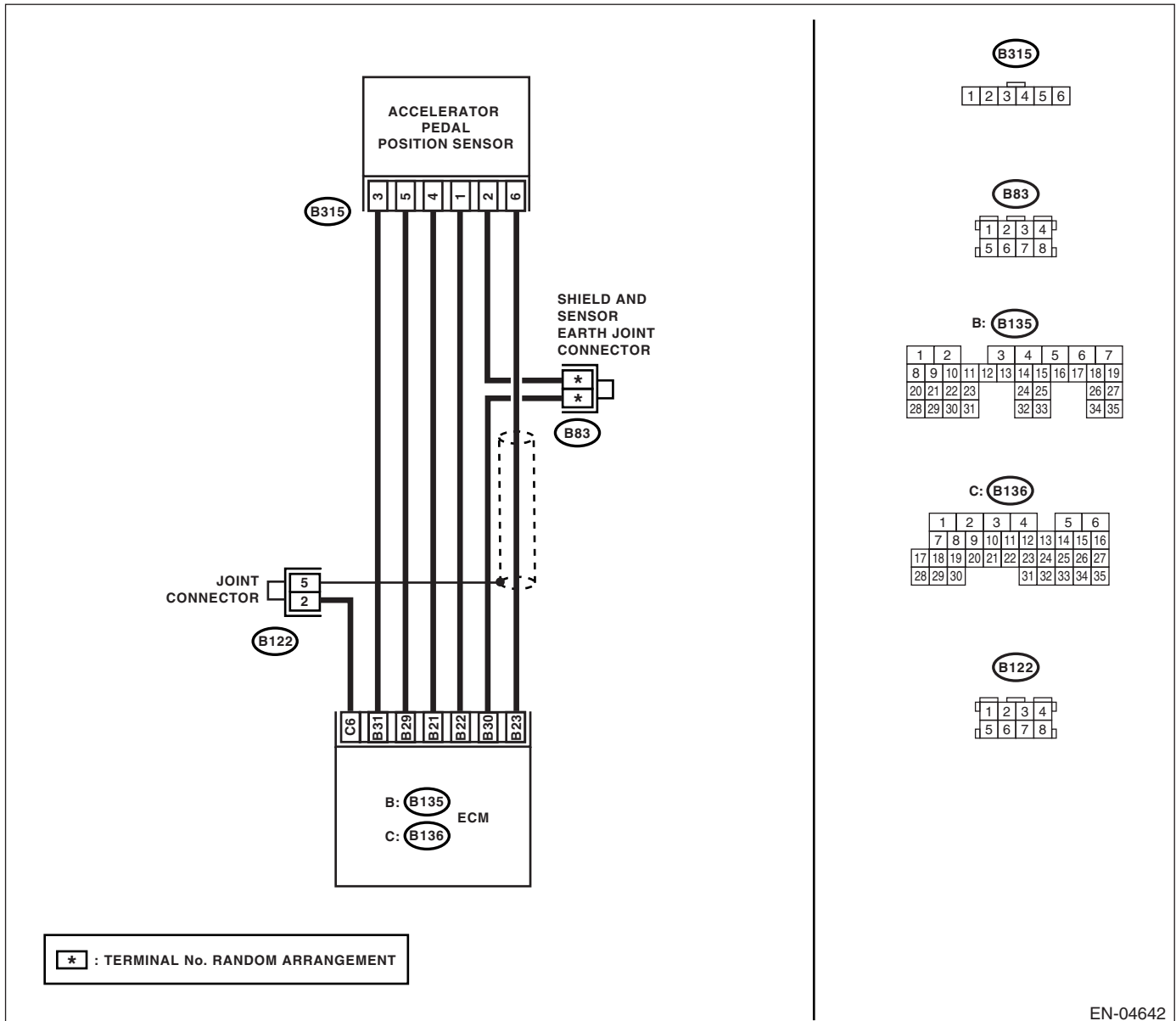
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04642

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <b>1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of sub accelerator pedal position sensor signal using Subaru Select Monitor.  | Is the voltage more than 0.4 V?  | Go to step 2.   | Go to step 3.   |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and accelerator pedal position sensor.   | Is there any poor contact in connectors between ECM and accelerator pedal position sensor? | Repair the poor contact in connectors.                                  | Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.   |
| <b>3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator pedal position sensor.<br>4) Measure the resistance between ECM connector and accelerator pedal position sensor.<br><i>Connector &amp; terminal</i><br>(B135) No. 22 — (B315) No. 1:<br>(B135) No. 31 — (B315) No. 3: | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.   | Repair the open harness connector.  |
| <b>4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>Measure the resistance between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br>(B135) No. 22 — Chassis ground:<br>(B135) No. 31 — Chassis ground:  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 5.   | Repair the ground short circuit in harness.   |
| <b>5 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between accelerator pedal position sensor connector and chassis ground.<br><i>Connector &amp; terminal</i><br>(B315) No. 2 — Chassis ground:  | Is the resistance less than 5 $\Omega$ ?   | Go to step 6.   | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |
| <b>6 CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between accelerator pedal position sensor connector and chassis ground.<br><i>Connector &amp; terminal</i><br>(B315) No. 1 (+) — Chassis ground (-):  | Is the voltage 4.5 — 5.5 V?  | Replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.> | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DM:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-192, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

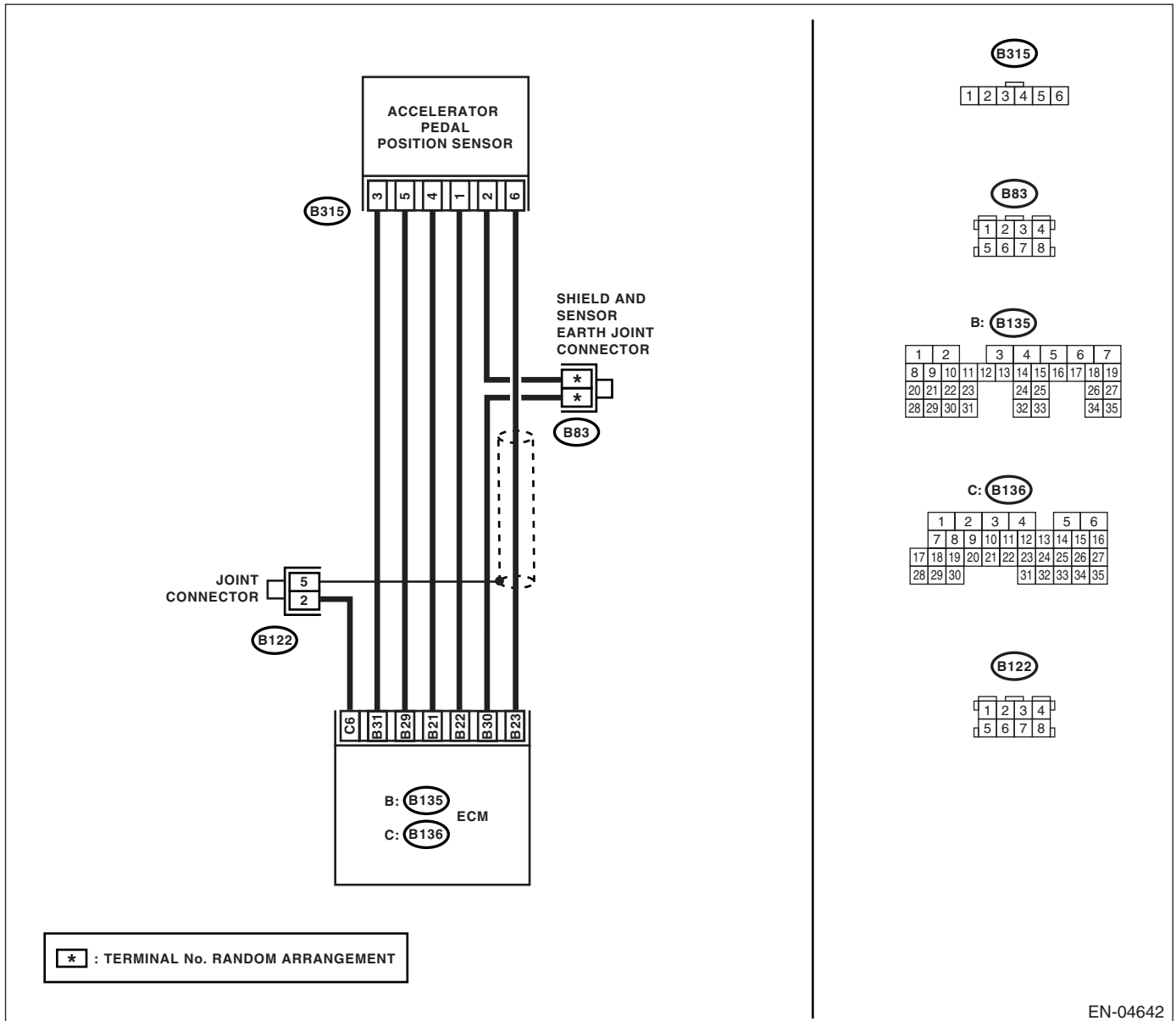
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes                                    | No  |
|--|--|--|---|
| <b>1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of sub accelerator pedal position sensor signals, using Subaru Select Monitor.   | Is the voltage less than 4.8 V?  | Go to step 2.                          | Go to step 3.   |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and accelerator pedal position sensor.  | Is there any poor contact in connectors between ECM and accelerator pedal position sensor? | Repair the poor contact in connectors. | Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.   |
| <b>3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator pedal position sensor.<br>4) Measure the resistance between ECM connector and accelerator pedal position sensor.<br><i>Connector &amp; terminal</i><br>(B135) No. 22 — (B315) No. 1:<br>(B135) No. 30 — (B315) No. 2:<br>(B135) No. 31 — (B315) No. 3: | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.                          | Repair the open circuit and trouble cause of harness connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).>   |
| <b>4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between accelerator pedal position sensor connector and chassis ground.<br><i>Connector &amp; terminal</i><br>(B315) No. 2 — Chassis ground:   | Is the resistance less than 5 $\Omega$ ?   | Go to step 5.                          | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).>   |
| <b>5 CHECK ACCELERATOR PEDAL POSITION SENSOR POWER SUPPLY.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between accelerator pedal position sensor connector and chassis ground.<br><i>Connector &amp; terminal</i><br>(B315) No. 1 (+) — Chassis ground (-):  | Is the voltage 4.5 — 5.5 V?  | Go to step 6.                          | Repair the short circuit of harness between ECM connector and accelerator pedal position sensor connector.<br>Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                           | Yes   | No   |
|--|---------------------------------|---|--|
| <b>6</b><br><b>CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the accelerator pedal position sensor connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 31 (+) — Chassis ground (-):</b> | Is the voltage less than 4.8 V? | Repair the poor contact in connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> | Repair the poor contact in accelerator pedal position sensor connector. If problem persists, replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.> |

## DN:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE RATIONALITY

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-193, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

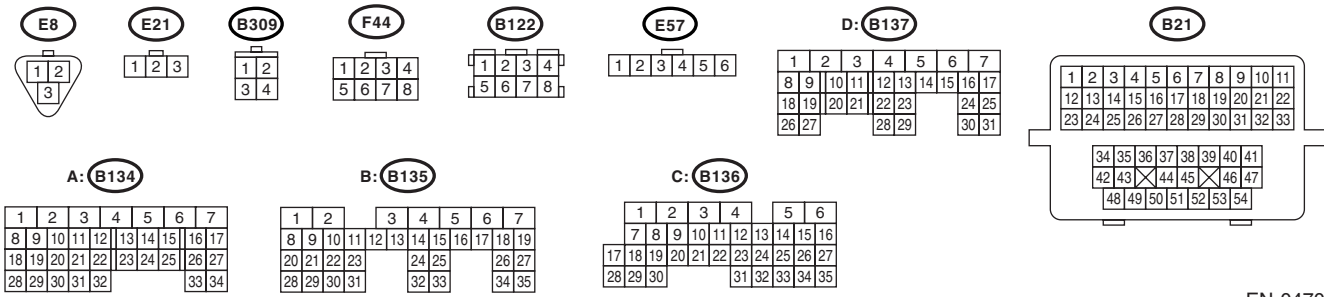
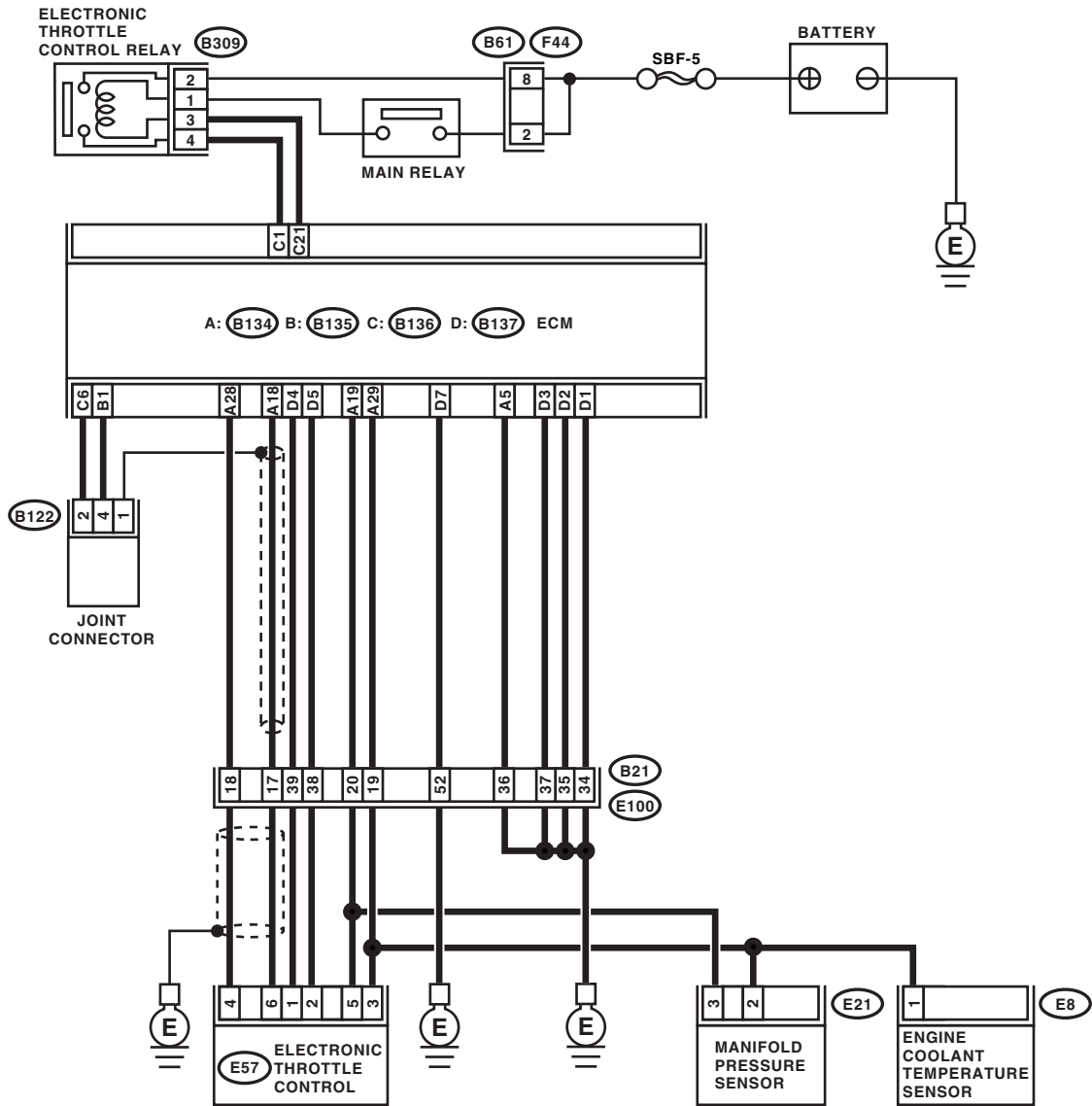
### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04700

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes                                    | No  |
|---|--|--|---|
| <b>1 CHECK SENSOR OUTPUT.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of main throttle sensor signal, using Subaru Select Monitor.  | Is the measured value more than 0.4 V?   | Go to step 2.                          | Go to step 4.   |
| <b>2 CHECK SENSOR OUTPUT.</b><br>Read the data of sub throttle sensor signal, using Subaru Select Monitor.  | Is the measured value more than 0.8 V?   | Go to step 3.                          | Go to step 4.   |
| <b>3 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electronic throttle control.   | Is there any poor contact in connectors between ECM and electronic throttle control? | Repair the poor contact in connectors. | Go to step 14.  |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 18 — (E57) No. 6:</b><br><b>(B134) No. 28 — (E57) No. 4:</b> | Is the measured value less than 1 $\Omega$ ?   | Go to step 5.                          | Repair the open harness connector.  |
| <b>5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>Measure the resistance between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 18 — Chassis ground:</b><br><b>(B134) No. 28 — Chassis ground:</b>  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 6.                          | Repair the ground short of harness.   |
| <b>6 CHECK POWER SUPPLY TO SENSOR.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electronic throttle control connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 5 (+) — Engine ground (-):</b>  | Is the measured value within 4.5 to 5.5 V?   | Go to step 7.                          | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |
| <b>7 CHECK SHORT OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electronic throttle control connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 6 — Engine ground:</b><br><b>(E57) No. 4 — Engine ground:</b>  | Is the measured value more than 10 $\Omega$ ?  | Go to step 8.                          | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |
| <b>8 CHECK SENSOR OUTPUT.</b><br>1) Connect all the connectors.<br>2) Turn the ignition switch to ON.<br>3) Read the data of main throttle sensor signals, using Subaru Select Monitors.  | Is the measured value less than 4.63 V?  | Go to step 9.                          | Go to step 11.  |
| <b>9 CHECK SENSOR OUTPUT.</b><br>Read the data of sub throttle sensor signals, using Subaru Select Monitors.  | Is the measured value less than 4.73 V?  | Go to step 10.                         | Go to step 11.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes                                    | No  |
|--|--|--|---|
| <b>10 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electronic throttle control.   | Is there any poor contact in connectors between ECM and electronic throttle control? | Repair the poor contact in connectors. | Connector has returned to a normal condition at this time. A temporary poor contact in the connector might have been the cause.     |
| <b>11 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 18 — (E57) No. 6:</i><br><i>(B134) No. 28 — (E57) No. 4:</i> | Is the measured value less than 1 $\Omega$ ?   | Go to step 12.                         | Repair the open harness connector.  |
| <b>12 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 3 — Engine ground:</i>  | Is the measured value less than 5 $\Omega$ ?   | Go to step 13.                         | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |
| <b>13 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 5 (+) — Engine ground (-):</i>   | Is the measured value less than 10 V?  | Go to step 14.                         | Repair the battery short of harness between ECM connector and electronic throttle control connector.                                |
| <b>14 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>Measure the voltage between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 6 (+) — Engine ground (-):</i><br><i>(E57) No. 4 (+) — Engine ground (-):</i>  | Is the measured value less than 10 V?  | Go to step 15.                         | Repair the short of harness between ECM connector and electronic throttle control connector.  |
| <b>15 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the electronic throttle control connector.<br>3) Measure the resistance between ECM connectors.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 18 — (B134) No. 19:</i><br><i>(B134) No. 28 — (B134) No. 19:</i>  | Is the measured value more than 1 M $\Omega$ ?                                       | Go to step 16.                         | Repair the short of power supply sensor.  |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

|    | Step  | Check                                 | Yes  | No                           |
|----|---|---------------------------------------|--|------------------------------|
| 16 | <b>CHECK ELECTRONIC THROTTLE CONTROL HARNESS.</b><br>1) Disconnect the connector from ECM.<br>2) Disconnect the connector from electronic throttle control.<br>3) Measure the resistance between electronic throttle control connector terminals.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 6 — (E57) No. 4:</b> | Is the measured value more than 1 MΩ? | Repair the poor contact in ECM connector. If problem persists, replace the ECM.<br><Ref. to FU(H4SO)-38, Engine Control Module (ECM).> | Repair the short of harness. |

## DO:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE RATIONALITY

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-195, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

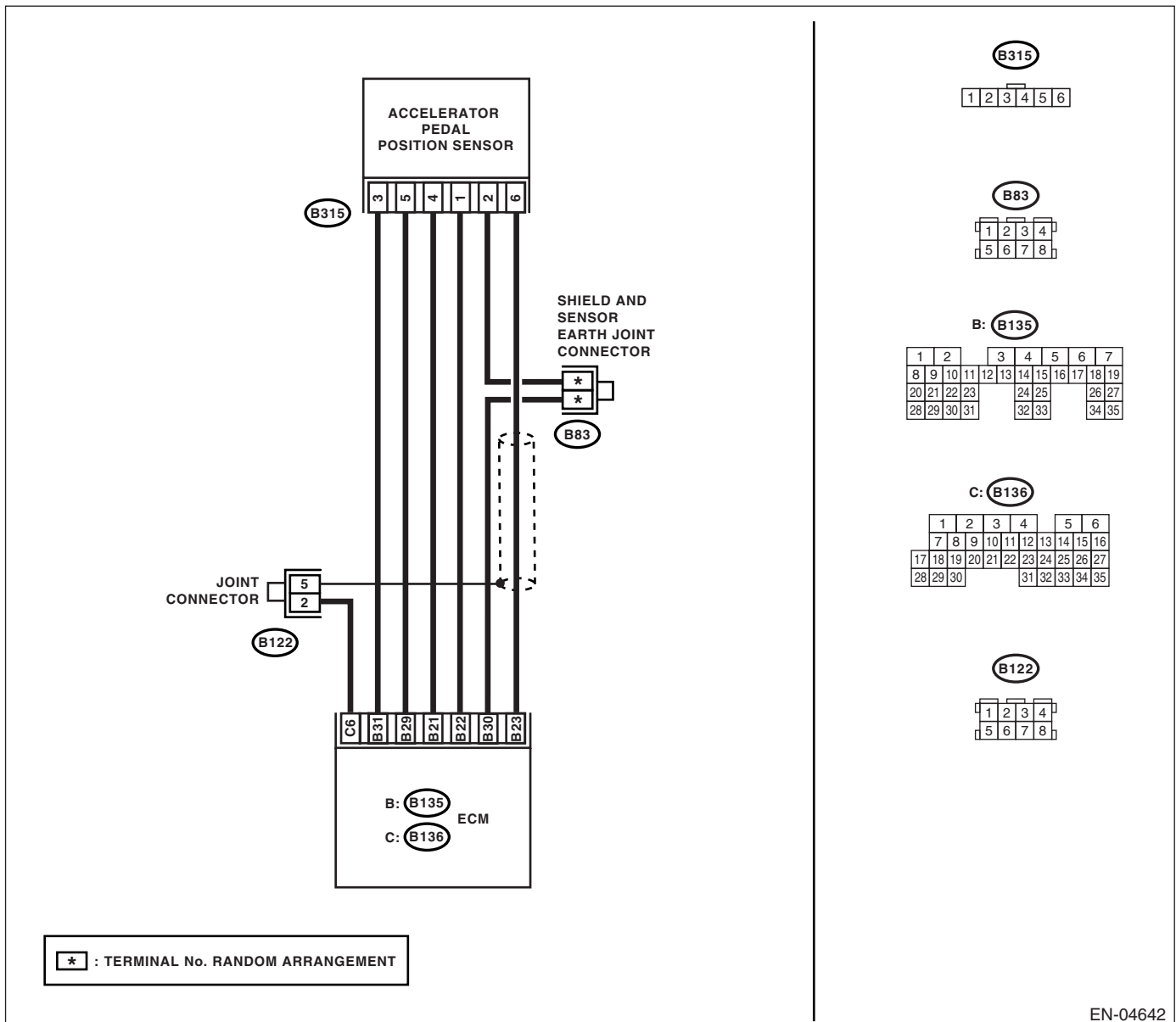
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes                                    | No  |
|---|--|--|---|
| <b>1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of main and sub accelerator pedal position sensor signals using Subaru Select Monitor.<br><br><b>NOTE:</b><br>Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.>   | Is the measured value more than 0.4 V?   | Go to step 2.                          | Go to step 4.   |
| <b>2 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>Read the data of main accelerator pedal position sensor signals and sub accelerator pedal position sensor signals, using Subaru Select Monitor.<br><br><b>NOTE:</b><br>Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-28, Subaru Select Monitor.>   | Is the measured value less than 4.8 V?   | Go to step 3.                          | Go to step 4.   |
| <b>3 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and accelerator pedal position sensor.   | Is there any poor contact in connectors between ECM and accelerator pedal position sensor? | Repair the poor contact in connectors. | Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause. |
| <b>4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator pedal position sensor.<br>4) Measure the resistance between ECM connector and accelerator pedal position sensor connector.<br><br><b>Connector &amp; terminal</b><br>(B135) No. 21 — (B315) No. 4:<br>(B135) No. 22 — (B315) No. 1:<br>(B135) No. 23 — (B315) No. 6:<br>(B135) No. 29 — (B315) No. 5:<br>(B135) No. 30 — (B315) No. 2:<br>(B135) No. 31 — (B315) No. 3: | Is the measured value less than 1 Ω?   | Go to step 5.                          | Repair the open harness connector.  |
| <b>5 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>Measure the resistance between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br>(B135) No. 21 — Chassis ground:<br>(B135) No. 22 — Chassis ground:<br>(B135) No. 23 — Chassis ground:<br>(B135) No. 31 — Chassis ground:  | Is the measured value more than 1 MΩ?  | Go to step 6.                          | Repair the ground short of harness.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                      | Yes   | No   |
|--|--|---|--|
| <b>6</b><br><b>CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between accelerator pedal position sensor and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B315) No. 2 — Chassis ground:</i><br><i>(B315) No. 5 — Chassis ground:</i>   | Is the measured value less than 5 Ω?       | Go to step 7.   | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).>                                  |
| <b>7</b><br><b>CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between accelerator pedal position sensor connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B315) No. 4 (+) — Chassis ground (-):</i><br><i>(B315) No. 1 (+) — Chassis ground (-):</i>   | Is the measured value within 4.5 to 5.5 V? | Go to step 8.   | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).>                                  |
| <b>8</b><br><b>CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the accelerator pedal position sensor connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B135) No. 23 (+) — Chassis ground (-):</i><br><i>(B135) No. 31 (+) — Chassis ground (-):</i> | Is the measured value less than 4.8 V?     | Go to step 9.   | Repair the poor contact in accelerator pedal position sensor connector. If problem persists, replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.> |
| <b>9</b><br><b>CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator pedal position sensor.<br>4) Measure the resistance between terminals of accelerator pedal position sensor connector.<br><b>Connector &amp; terminal</b><br><i>(B315) No. 6 — (B315) No. 3:</i>                        | Is the measured value more than 1 MΩ?      | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> | Repair the short of harness between ECM connector and accelerator pedal position sensor connector.   |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DP:DTC P2227 BAROMETRIC PRESSURE TOO LOW

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-197, DTC P2227 BAROMETRIC PRESSURE TOO LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

| Step                                 | Check                       | Yes  | No   |
|--------------------------------------|-----------------------------|--|--|
| 1<br>CHECK ANY OTHER DTC ON DISPLAY. | Is any other DTC displayed? | Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> | Replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |

## DQ:DTC P2228 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-198, DTC P2228 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

| Step                                 | Check                       | Yes  | No   |
|--------------------------------------|-----------------------------|--|--|
| 1<br>CHECK ANY OTHER DTC ON DISPLAY. | Is any other DTC displayed? | Check DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>It is not necessary to inspect DTC P2228. | Replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DR:DTC P2229 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-199, DTC P2229 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-36, PROCEDURE, Inspection Mode.>.

| Step                                 | Check                       | Yes  | No   |
|--------------------------------------|-----------------------------|--|--|
| 1<br>CHECK ANY OTHER DTC ON DISPLAY. | Is any other DTC displayed? | Check DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>It is not necessary to inspect DTC P2229. | Replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> |

# General Diagnostic Table

ENGINE (DIAGNOSTICS)

## 19. General Diagnostic Table

### A: INSPECTION

#### 1. ENGINE

NOTE:

Malfunction of parts other than those listed is also possible. <Ref. to ME(H4SO)-91, Engine Trouble in General.>

| Symptom   | Problem parts  |
|---|--|
| 1. Engine stalls during idling.                               | 1) Manifold absolute pressure sensor<br>2) Mass air flow and intake air temperature sensor<br>3) Ignition parts (*1)<br>4) Engine coolant temperature sensor (*2)<br>5) Crankshaft position sensor (*3)<br>6) Camshaft position sensor (*3)<br>7) Fuel injection parts (*4)  |
| 2. Rough idling   | 1) Manifold absolute pressure sensor<br>2) Mass air flow and intake air temperature sensor<br>3) Engine coolant temperature sensor (*2)<br>4) Ignition parts (*1)<br>5) Air intake system (*5)<br>6) Fuel injection parts (*4)<br>7) Electronic throttle control<br>8) Crankshaft position sensor (*3)<br>9) Camshaft position sensor (*3)<br>10) Oxygen sensor<br>11) Fuel pump and fuel pump relay<br>12) EGR valve  |
| 3. Engine does not return to idle.                            | 1) Engine coolant temperature sensor<br>2) Throttle position sensor<br>3) Manifold absolute pressure sensor<br>4) Mass air flow and intake air temperature sensor<br>5) EGR valve  |
| 4. Poor acceleration  | 1) Manifold absolute pressure sensor<br>2) Mass air flow and intake air temperature sensor<br>3) Electronic throttle control<br>4) Fuel injection parts (*4)<br>5) Fuel pump and fuel pump relay<br>6) Engine coolant temperature sensor (*2)<br>7) Crankshaft position sensor (*3)<br>8) Camshaft position sensor (*3)<br>9) A/C switch and A/C cut relay<br>10) Engine torque control signal circuit<br>11) Ignition parts (*1)<br>12) EGR valve<br>13) Tumble generator valve |
| 5. Engine stalls or engine sags or hesitates at acceleration. | 1) Manifold absolute pressure sensor<br>2) Mass air flow and intake air temperature sensor<br>3) Engine coolant temperature sensor (*2)<br>4) Crankshaft position sensor (*3)<br>5) Camshaft position sensor (*3)<br>6) Purge control solenoid valve<br>7) Fuel injection parts (*4)<br>8) Electronic throttle control<br>9) Fuel pump and fuel pump relay<br>10) EGR valve<br>11) Tumble generator valve  |

# General Diagnostic Table

ENGINE (DIAGNOSTICS)

| Symptom                            | Problem parts   |
|------------------------------------|---|
| 6. Surge                           | 1) Mass air flow and intake air temperature sensor<br>2) Manifold absolute pressure sensor<br>3) Engine coolant temperature sensor (*2)<br>4) Crankshaft position sensor (*3)<br>5) Camshaft position sensor (*3)<br>6) Fuel injection parts (*4)<br>7) Electronic throttle control<br>8) Fuel pump and fuel pump relay<br>9) EGR valve<br>10) Tumble generator valve |
| 7. Spark knock                     | 1) Mass air flow and intake air temperature sensor<br>2) Manifold absolute pressure sensor<br>3) Engine coolant temperature sensor<br>4) Knock sensor<br>5) Fuel injection parts (*4)<br>6) Fuel pump and fuel pump relay<br>7) EGR valve<br>8) Tumble generator valve  |
| 8. After burning in exhaust system | 1) Mass air flow and intake air temperature sensor<br>2) Manifold absolute pressure sensor<br>3) Engine coolant temperature sensor (*2)<br>4) Fuel injection parts (*4)<br>5) Fuel pump and fuel pump relay   |

- \*1: Check ignition coil and ignitor assembly and spark plug.
- \*2: Indicate the symptom occurring only in cold temperatures.
- \*3: Ensure the secure installation.
- \*4: Check fuel injector, fuel pressure regulator and fuel filter.
- \*5: Inspect air leak in air intake system.

## 2. AUTOMATIC TRANSMISSION

### NOTE:

Check general diagnostics table with non-conformity symptom for automatic transmission. <Ref. to 4AT(D)(diag)-2, Basic Diagnostic Procedure.>

# General Diagnostic Table

ENGINE (DIAGNOSTICS)

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# GENERAL DESCRIPTION

# *GD(H4SO)*

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| 2. Diagnostic Trouble Code (DTC) Detecting Criteria ..... | 8           |

# List of Diagnostic Trouble Code (DTC)

## GENERAL DESCRIPTION

### 1. List of Diagnostic Trouble Code (DTC)

#### A: LIST

| DTC   | Item   | Index   |
|-------|--|---|
| P0026 | Intake Valve Control Solenoid Circuit Range/Performance (Bank 1)         | <Ref. to GD(H4SO)-8, DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P0028 | Intake Valve Control Solenoid Circuit Range/Performance (Bank 2)         | <Ref. to GD(H4SO)-10, DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0030 | HO2S Heater Control Circuit (Bank 1 Sensor 1)                            | <Ref. to GD(H4SO)-11, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0031 | HO2S Heater Control Circuit Low (Bank 1 Sensor 1)                        | <Ref. to GD(H4SO)-12, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                 |
| P0032 | HO2S Heater Control Circuit High (Bank 1 Sensor 1)                       | <Ref. to GD(H4SO)-14, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                |
| P0037 | HO2S Heater Control Circuit Low (Bank 1 Sensor 2)                        | <Ref. to GD(H4SO)-16, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                 |
| P0038 | HO2S Heater Control Circuit High (Bank 1 Sensor 2)                       | <Ref. to GD(H4SO)-17, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                |
| P0068 | Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance | <Ref. to GD(H4SO)-19, DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                        |
| P0076 | Intake Valve Control Solenoid Circuit Low (Bank 1)                       | <Ref. to GD(H4SO)-21, DTC P0076 INTAKE VALVE CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                         |
| P0077 | Intake Valve Control Solenoid Circuit High (Bank 1)                      | <Ref. to GD(H4SO)-22, DTC P0077 INTAKE VALVE CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                        |
| P0082 | Intake Valve Control Solenoid Circuit Low (Bank 2)                       | <Ref. to GD(H4SO)-23, DTC P0082 INTAKE VALVE CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                         |
| P0083 | Intake Valve Control Solenoid Circuit High (Bank 2)                      | <Ref. to GD(H4SO)-23, DTC P0083 INTAKE VALVE CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                        |
| P0101 | Mass or Volume Air Flow Circuit Range/Performance                        | <Ref. to GD(H4SO)-23, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                 |
| P0102 | Mass or Volume Air Flow Circuit Low Input                                | <Ref. to GD(H4SO)-25, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                         |
| P0103 | Mass or Volume Air Flow Circuit High Input                               | <Ref. to GD(H4SO)-26, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                        |
| P0107 | Manifold Absolute Pressure/Barometric Pressure Circuit Low Input         | <Ref. to GD(H4SO)-28, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0108 | Manifold Absolute Pressure/Barometric Pressure Circuit High Input        | <Ref. to GD(H4SO)-29, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P0111 | Intake Air Temperature Circuit Range/Performance                         | <Ref. to GD(H4SO)-30, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                  |
| P0112 | Intake Air Temperature Circuit Low Input                                 | <Ref. to GD(H4SO)-32, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                          |
| P0113 | Intake Air Temperature Circuit High Input                                | <Ref. to GD(H4SO)-33, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                         |
| P0117 | Engine Coolant Temperature Circuit Low Input                             | <Ref. to GD(H4SO)-35, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |

# List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

| DTC   | Item   | Index  |
|-------|--|--|
| P0118 | Engine Coolant Temperature Circuit High Input                                    | <Ref. to GD(H4SO)-36, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                    |
| P0122 | Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input                      | <Ref. to GD(H4SO)-38, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P0123 | Throttle/Pedal Position Sensor/Switch "A" Circuit High Input                     | <Ref. to GD(H4SO)-39, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0125 | Insufficient Coolant Temperature for Closed Loop Fuel Control                    | <Ref. to GD(H4SO)-40, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>                    |
| P0126 | Insufficient Coolant Temperature for Stable Operation                            | <Ref. to GD(H4SO)-42, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0128 | Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature) | <Ref. to GD(H4SO)-44, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P0131 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 1)                      | <Ref. to GD(H4SO)-46, DTC P0131 O <sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P0132 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 1)                     | <Ref. to GD(H4SO)-47, DTC P0132 O <sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0133 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 1)                    | <Ref. to GD(H4SO)-49, DTC P0133 O <sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                    |
| P0134 | O <sub>2</sub> Sensor Circuit No Activity Detected (Bank 1 Sensor 1)             | <Ref. to GD(H4SO)-51, DTC P0134 O <sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>             |
| P0137 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 2)                      | <Ref. to GD(H4SO)-53, DTC P0137 O <sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P0138 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 2)                     | <Ref. to GD(H4SO)-56, DTC P0138 O <sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0139 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 2)                    | <Ref. to GD(H4SO)-56, DTC P0139 O <sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                    |
| P0140 | O <sub>2</sub> Sensor Circuit No Activity Detected (Bank1 Sensor 2)              | <Ref. to GD(H4SO)-62, DTC P0140 O <sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>              |
| P0171 | System too Lean (Bank 1)   | <Ref. to GD(H4SO)-63, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P0172 | System too Rich (Bank 1)   | <Ref. to GD(H4SO)-65, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P0181 | Fuel Temperature Sensor "A" Circuit Range/Performance                            | <Ref. to GD(H4SO)-67, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0182 | Fuel Temperature Sensor "A" Circuit Low Input                                    | <Ref. to GD(H4SO)-70, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                    |
| P0183 | Fuel Temperature Sensor "A" Circuit High Input                                   | <Ref. to GD(H4SO)-71, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                   |
| P0196 | Engine Oil Temperature Sensor Circuit Range/Performance                          | <Ref. to GD(H4SO)-73, DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                          |
| P0197 | Engine Oil Temperature Sensor Low  | <Ref. to GD(H4SO)-74, DTC P0197 ENGINE OIL TEMPERATURE SENSOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |



## List of Diagnostic Trouble Code (DTC)

### GENERAL DESCRIPTION

| DTC   | Item   | Index  |
|-------|--|--|
| P0198 | Engine Oil Temperature Sensor High   | <Ref. to GD(H4SO)-75, DTC P0198 ENGINE OIL TEMPERATURE SENSOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                       |
| P0222 | Throttle/Pedal Position Sensor/Switch "B" Circuit Low Input                      | <Ref. to GD(H4SO)-76, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P0223 | Throttle/Pedal Position Sensor/Switch "B" Circuit High Input                     | <Ref. to GD(H4SO)-77, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0301 | Cylinder 1 misfire detected  | <Ref. to GD(H4SO)-78, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0302 | Cylinder 2 misfire detected  | <Ref. to GD(H4SO)-83, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0303 | Cylinder 3 misfire detected  | <Ref. to GD(H4SO)-83, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0304 | Cylinder 4 misfire detected  | <Ref. to GD(H4SO)-83, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0327 | Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)                       | <Ref. to GD(H4SO)-84, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>                       |
| P0328 | Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)                      | <Ref. to GD(H4SO)-86, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P0335 | Crankshaft Position Sensor "A" Circuit   | <Ref. to GD(H4SO)-88, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P0336 | Crankshaft Position Sensor "A" Circuit Range/Performance                         | <Ref. to GD(H4SO)-90, DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                         |
| P0340 | Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)                   | <Ref. to GD(H4SO)-92, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>                   |
| P0341 | Camshaft Position Sensor "A" Circuit Range/Performance (Bank 1 or Single Sensor) | <Ref. to GD(H4SO)-94, DTC P0341 CAMSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P0400 | Exhaust Gas Recirculation Flow   | <Ref. to GD(H4SO)-96, DTC P0400 EXHAUST GAS RECIRCULATION FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P0420 | Catalyst System Efficiency Below Threshold (Bank 1)                              | <Ref. to GD(H4SO)-99, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                              |
| P0442 | Evaporative Emission Control System Leak Detected (small leak)                   | <Ref. to GD(H4SO)-101, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>                  |
| P0447 | Evaporative Emission Control System Vent Control Circuit Open                    | <Ref. to GD(H4SO)-116, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>                   |
| P0448 | Evaporative Emission Control System Vent Control Circuit Shorted                 | <Ref. to GD(H4SO)-118, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>                |
| P0451 | Evaporative Emission Control System Pressure Sensor Range/Performance            | <Ref. to GD(H4SO)-120, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>           |
| P0452 | Evaporative Emission Control System Pressure Sensor Low Input                    | <Ref. to GD(H4SO)-122, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                   |
| P0453 | Evaporative Emission Control System Pressure Sensor High Input                   | <Ref. to GD(H4SO)-124, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                  |

# List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

| DTC   | Item   | Index   |
|-------|--|---|
| P0456 | Evaporative Emission Control System Leak Detected (very small leak)    | <Ref. to GD(H4SO)-125, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>    |
| P0457 | Evaporative Emission Control System Leak Detected (fuel cap loose/off) | <Ref. to GD(H4SO)-125, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P0458 | Evaporative Emission Control System Purge Control Valve Circuit Low    | <Ref. to GD(H4SO)-126, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>    |
| P0459 | Evaporative Emission Control System Purge Control Valve Circuit High   | <Ref. to GD(H4SO)-127, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P0461 | Fuel Level Sensor Circuit Range/Performance                            | <Ref. to GD(H4SO)-129, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0462 | Fuel Level Sensor Circuit Low Input                                    | <Ref. to GD(H4SO)-131, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                    |
| P0463 | Fuel Level Sensor Circuit High Input                                   | <Ref. to GD(H4SO)-133, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                   |
| P0464 | Fuel Level Sensor Circuit Intermittent                                 | <Ref. to GD(H4SO)-135, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                 |
| P0483 | Cooling Fan Rationality Check  | <Ref. to GD(H4SO)-138, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0502 | Vehicle Speed Sensor Circuit Low Input                                 | <Ref. to GD(H4SO)-139, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                 |
| P0503 | Vehicle Speed Sensor Intermittent/Erratic/High                         | <Ref. to GD(H4SO)-140, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>                         |
| P0506 | Idle Control System RPM Lower Than Expected                            | <Ref. to GD(H4SO)-141, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0507 | Idle Control System RPM Higher Than Expected                           | <Ref. to GD(H4SO)-142, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>                           |
| P0512 | Starter Request Circuit  | <Ref. to GD(H4SO)-143, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0513 | Incorrect Immobilizer Key  | <Ref. to GD(H4SO)-144, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0519 | Idle Control System Malfunction (Fail-Safe)                            | <Ref. to GD(H4SO)-145, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0600 | Serial Communication Link  | <Ref. to GD(H4SO)-146, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0604 | Internal Control Module Random Access Memory (RAM) Error               | <Ref. to GD(H4SO)-147, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>               |
| P0605 | Internal Control Module Read Only Memory (ROM) Error                   | <Ref. to GD(H4SO)-148, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>                   |
| P0607 | Control Module Performance   | <Ref. to GD(H4SO)-149, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P0638 | Throttle Actuator Control Range/Performance (Bank 1)                   | <Ref. to GD(H4SO)-151, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                   |
| P0691 | Cooling Fan 1 Control Circuit Low                                      | <Ref. to GD(H4SO)-153, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                      |
| P0692 | Cooling Fan 1 Control Circuit High                                     | <Ref. to GD(H4SO)-154, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                     |

## List of Diagnostic Trouble Code (DTC)

### GENERAL DESCRIPTION

| DTC   | Item   | Index   |
|-------|--|---|
| P0700 | AT MIL Light up Request  | <Ref. to GD(H4SO)-155, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Trouble Code (DTC) Detecting Criteria.>                              |
| P0851 | Neutral Switch Input Circuit Low (AT model)                              | <Ref. to GD(H4SO)-156, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0851 | Neutral Switch Input Circuit Low (MT model)                              | <Ref. to GD(H4SO)-157, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0852 | Neutral Switch Input Circuit High (AT model)                             | <Ref. to GD(H4SO)-158, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>                           |
| P0852 | Neutral Switch Input Circuit High (MT model)                             | <Ref. to GD(H4SO)-159, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>                           |
| P1152 | O <sub>2</sub> Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)  | <Ref. to GD(H4SO)-160, DTC P1152 O <sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P1153 | O <sub>2</sub> Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1) | <Ref. to GD(H4SO)-162, DTC P1153 O <sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P1160 | Return Spring Failure  | <Ref. to GD(H4SO)-164, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P1400 | Fuel Tank Pressure Control Solenoid Valve Circuit Low                    | <Ref. to GD(H4SO)-165, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>                  |
| P1420 | Fuel Tank Pressure Control Sol. Valve Circuit High                       | <Ref. to GD(H4SO)-167, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P1443 | Vent Control Solenoid Valve Function Problem                             | <Ref. to GD(H4SO)-168, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>                           |
| P1491 | Positive Crankcase Ventilation (Blow-by) Function Problem                | <Ref. to GD(H4SO)-170, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>              |
| P1492 | EGR Solenoid Valve Signal #1 Circuit Malfunction (Low Input)             | <Ref. to GD(H4SO)-172, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>           |
| P1493 | EGR Solenoid Valve Signal #1 Circuit Malfunction (High Input)            | <Ref. to GD(H4SO)-174, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>          |
| P1494 | EGR Solenoid Valve Signal #2 Circuit Malfunction (Low Input)             | <Ref. to GD(H4SO)-175, DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>           |
| P1495 | EGR Solenoid Valve Signal #2 Circuit Malfunction (High Input)            | <Ref. to GD(H4SO)-175, DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>          |
| P1496 | EGR Solenoid Valve Signal #3 Circuit Malfunction (Low Input)             | <Ref. to GD(H4SO)-175, DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>           |
| P1497 | EGR Solenoid Valve Signal #3 Circuit Malfunction (High Input)            | <Ref. to GD(H4SO)-175, DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>          |
| P1498 | EGR Solenoid Valve Signal #4 Circuit Malfunction (Low Input)             | <Ref. to GD(H4SO)-176, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>           |
| P1499 | EGR Solenoid Valve Signal #4 Circuit Malfunction (High Input)            | <Ref. to GD(H4SO)-176, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>          |
| P1518 | Starter Switch Circuit Low Input   | <Ref. to GD(H4SO)-176, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                       |
| P1560 | Back-Up Voltage Circuit Malfunction                                      | <Ref. to GD(H4SO)-177, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                    |

# List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

| DTC   | Item  | Index  |
|-------|---|--|
| P1570 | Antenna   | <Ref. to GD(H4SO)-178, DTC P1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P1571 | Reference Code Incompatibility                                    | <Ref. to GD(H4SO)-178, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                      |
| P1572 | IMM Circuit Failure (Except Antenna Circuit)                      | <Ref. to GD(H4SO)-178, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Trouble Code (DTC) Detecting Criteria.>                        |
| P1574 | Key Communication Failure   | <Ref. to GD(H4SO)-178, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P1576 | EGI Control Module EEPROM   | <Ref. to GD(H4SO)-178, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P1577 | IMM Control Module EEPROM   | <Ref. to GD(H4SO)-178, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P2096 | Post Catalyst Fuel Trim System Too Lean Bank 1                    | <Ref. to GD(H4SO)-179, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P2097 | Post Catalyst Fuel Trim System Too Rich Bank 1                    | <Ref. to GD(H4SO)-180, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P2101 | Throttle Actuator Control Motor Circuit Range/Performance         | <Ref. to GD(H4SO)-182, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>           |
| P2102 | Throttle Actuator Control Motor Circuit Low                       | <Ref. to GD(H4SO)-184, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>                         |
| P2103 | Throttle Actuator Control Motor Circuit High                      | <Ref. to GD(H4SO)-185, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>                        |
| P2109 | Throttle/Pedal Position Sensor A Minimum Stop Performance         | <Ref. to GD(H4SO)-187, DTC P2109 THROTTLE ANGLE SENSOR CLOSED POSITION ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>                         |
| P2122 | Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input       | <Ref. to GD(H4SO)-188, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>         |
| P2123 | Throttle/Pedal Position Sensor/Switch "D" Circuit High Input      | <Ref. to GD(H4SO)-189, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>        |
| P2127 | Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input       | <Ref. to GD(H4SO)-191, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>         |
| P2128 | Throttle/Pedal Position Sensor/Switch "E" Circuit High Input      | <Ref. to GD(H4SO)-192, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>        |
| P2135 | Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Rationality | <Ref. to GD(H4SO)-193, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" / "B" VOLTAGE RATIONALITY, Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P2138 | Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Rationality | <Ref. to GD(H4SO)-195, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" / "E" VOLTAGE RATIONALITY, Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P2227 | Atmospheric Pressure Sensor Circuit Range/Performance             | <Ref. to GD(H4SO)-197, DTC P2227 BAROMETRIC PRESSURE TOO LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P2228 | Atmospheric Pressure Sensor Circuit Malfunction (Low Input)       | <Ref. to GD(H4SO)-198, DTC P2228 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>         |
| P2229 | Atmospheric Pressure Sensor Circuit Malfunction (High Input)      | <Ref. to GD(H4SO)-199, DTC P2229 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>        |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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## 2. Diagnostic Trouble Code (DTC) Detecting Criteria

### A: DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect NG from Low NG or High NG.

Variable valve lift diagnosis oil pressure switch is attached for diagnosis, ON or OFF of variable valve lift diagnosis oil pressure switch shows whether intake valve is in High mode (increasing the lift amount) or Low mode (decreasing the lift amount).

#### • Normal condition

| Oil switching solenoid valve duty | Intake valve | Variable valve lift diagnosis oil pressure switch |
|-----------------------------------|--------------|---|
| Large                             | High mode    | OFF   |
| Small                             | Low mode     | ON  |

#### • Low NG

Judge Low NG when variable valve lift diagnosis oil pressure switch remains ON though the intake valve is being shifted to High mode (Oil switching solenoid valve duty: large).

#### • High NG

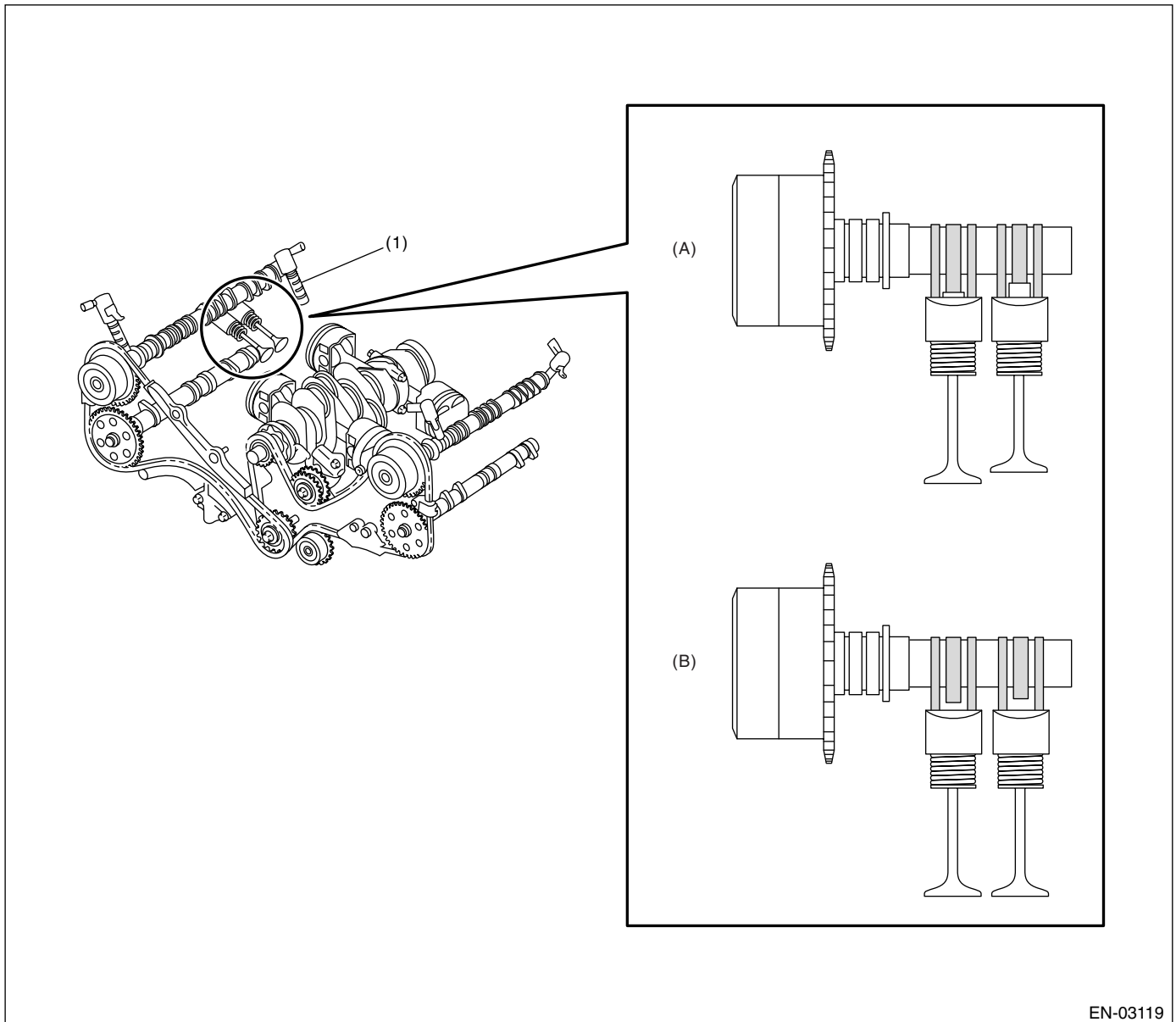
Judge High NG when variable valve lift diagnosis oil pressure switch remains OFF though the intake valve is being shifted to Low mode (Oil switching solenoid valve duty: small).

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 2. COMPONENT DESCRIPTION

Variable valve lift system optimizes the lift amount of intake valve with switching low lift cam and high lift cam depending on engine speed. Variable valve system changes the lift amount of intake valve with duty controlling oil switching solenoid valve.



EN-03119

(1) Oil switching solenoid valve

(A) Engine low speed

(B) Engine high speed

## 3. ENABLE CONDITION

| Secondary Parameters        | Enable Conditions              |
|-----------------------------|--------------------------------|
| Battery voltage             | $\geq 10.9 \text{ V}$          |
| After engine starting       | $\geq 6 \text{ sec.}$          |
| Engine oil temperature      | $\geq 15^\circ\text{C}$ (59°F) |
| Variable Valve lift control | In operation                   |

## 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after 6 seconds from engine starting with controlling of variable valve lift.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the specified time.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Low NG<br>Duty ratio<br>Variable valve lift diagnosis oil pressure switch  | ≥ 62%<br>ON     |
| High NG<br>Duty ratio<br>Variable valve lift diagnosis oil pressure switch | < 33%<br>OFF    |

#### Time needed for diagnosis:

0.784 seconds (Low side)

3.0 seconds (High side)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear NG when the continuous time of completing malfunction criteria becomes more than 3 seconds.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Low OK<br>Duty ratio<br>Variable valve lift diagnosis oil pressure switch  | ≥ 62%<br>OFF    |
| High OK<br>Duty ratio<br>Variable valve lift diagnosis oil pressure switch | < 33%<br>ON     |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## **B: DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 2)**

#### NOTE:

For the diagnostic procedure, refer to DTC P0026. <Ref. to GD(H4SO)-8, DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

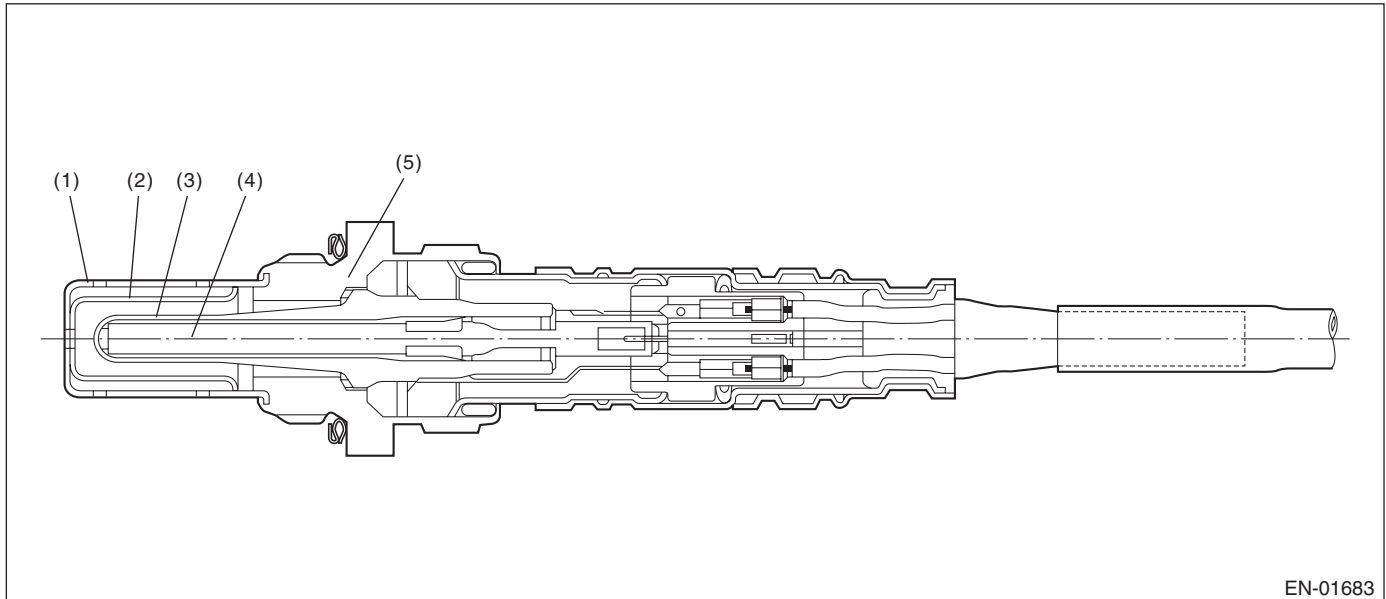
## C: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of front oxygen (A/F) sensor heater.

Judge NG when impedance of front oxygen (A/F) sensor is larger than the standard value by referring to the engine condition such as fuel shut-off in deceleration, etc.

### 2. COMPONENT DESCRIPTION



- |                           |                    |                    |
|---------------------------|--------------------|--------------------|
| (1) Element cover (Outer) | (3) Sensor element | (5) Sensor housing |
| (2) Element cover (Inner) | (4) Ceramic heater |                    |

### 3. ENABLE CONDITION

| Secondary Parameters   | Enable Conditions  |
|--|--------------------|
| Continuous time which all the following conditions were filled | 30 seconds or more |
| Battery voltage  | > 10.9 V           |
| After fuel shut-off  | 20 seconds or more |
| Heater current   | In operation       |
| Front oxygen (A/F) sensor duty $\geq$ 35%                      | Experienced        |

### 4. GENERAL DRIVING CYCLE

Perform diagnosis continuously in 50 seconds after starting engine.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the continuous time of not completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

#### Judgment Value

| Malfunction Criteria                   | Threshold Value |
|--|-----------------|
| Impedance of front oxygen (A/F) sensor | > 50 $\Omega$   |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Front oxygen (A/F) sensor sub learning correction: Do not calculate.
- Purge control: Not allowed to purge

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## D: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

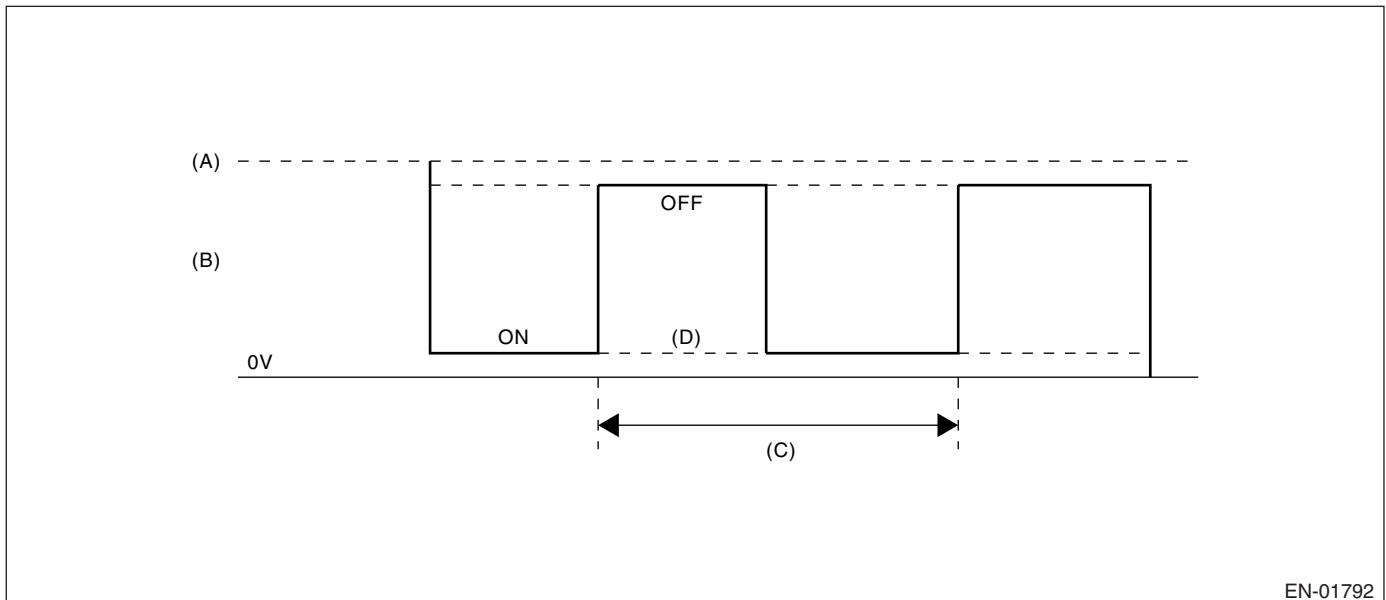
### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.

The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.

Judge NG when the terminal voltage remains to be Low.

### 2. COMPONENT DESCRIPTION



EN-01792

- |   |                                    |
|---|------------------------------------|
| (A) Battery voltage                                 | (C) 128 milliseconds               |
| (B) Front oxygen (A/F) sensor heater output voltage | (D) Low abnormality output voltage |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | $\geq 10.9$ V     |

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second (8 cycles).

### Judgment Value

| Malfunction Criteria                          | Threshold Value |
|---|-----------------|
| Output voltage level                          | Low             |
| Front oxygen (A/F) sensor heater control duty | < 87.5%         |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage level | High            |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turn on the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Purge control: Not allowed to purge.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### E: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

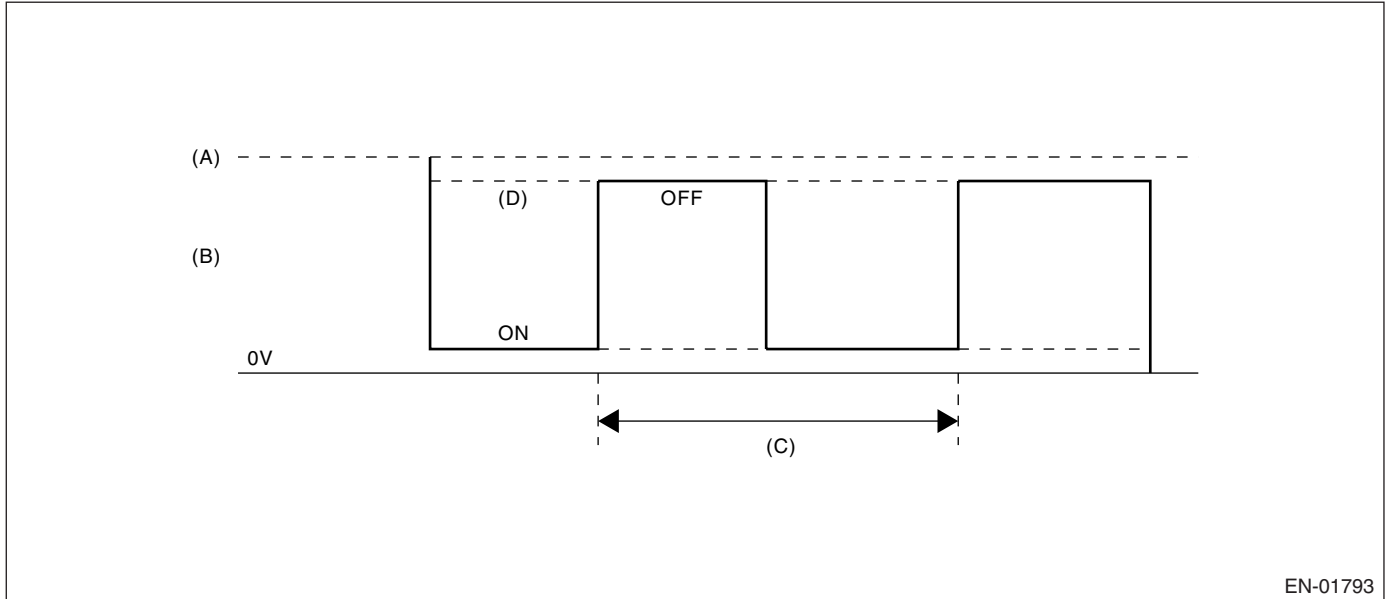
#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.

The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.

Judge NG when the terminal voltage remains to be High.

#### 2. COMPONENT DESCRIPTION



EN-01793

- |   |                                     |
|---|-------------------------------------|
| (A) Battery voltage                                 | (C) 128 milliseconds                |
| (B) Front oxygen (A/F) sensor heater output voltage | (D) High abnormality output voltage |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions     |
|----------------------|-----------------------|
| Battery voltage      | $\geq 10.9 \text{ V}$ |

#### 4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes 1 second (8 cycles).

##### Judgment Value

| Malfunction Criteria                          | Threshold Value |
|---|-----------------|
| Output voltage level                          | High            |
| Front oxygen (A/F) sensor heater control duty | $\geq 12.5\%$   |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage level | Low             |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turn on the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Purge control: Not allowed to purge.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### F: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

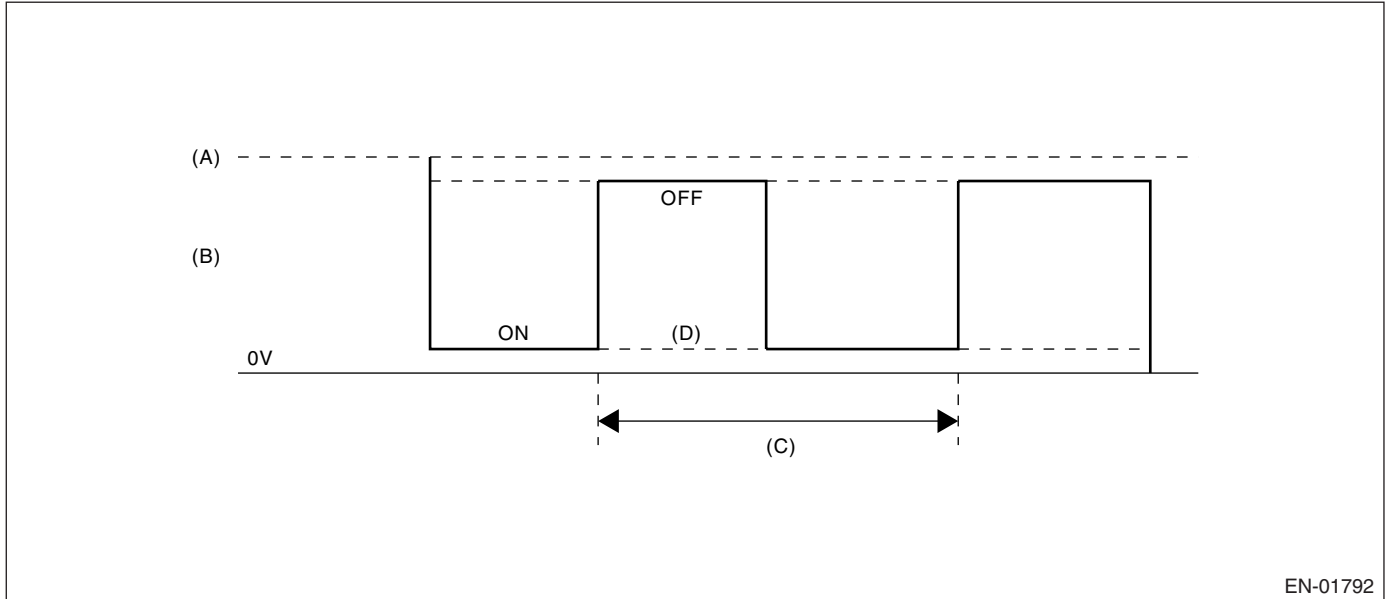
#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oxygen sensor heater.

Oxygen sensor heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains to be Low.

#### 2. COMPONENT DESCRIPTION



EN-01792

- |   |                               |
|---|-------------------------------|
| (A) Battery voltage                     | (C) 256 milliseconds (cycles) |
| (B) Oxygen sensor heater output voltage | (D) Low malfunction           |

#### 3. ENABLE CONDITION

| Secondary Parameters               | Enable Conditions |
|------------------------------------|-------------------|
| Battery voltage                    | > 10.9 V          |
| Elapsed time after engine starting | ≥ 1 second        |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2,560 millisecond (10 cycles).

##### Judgment Value

| Malfunction Criteria              | Threshold Value |
|-----------------------------------|-----------------|
| Output voltage level              | Low             |
| Oxygen sensor heater control duty | < 75%           |

**Time Needed for Diagnosis:** 2.56 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage level | High            |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Sub feedback control: Not allowed

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## G: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

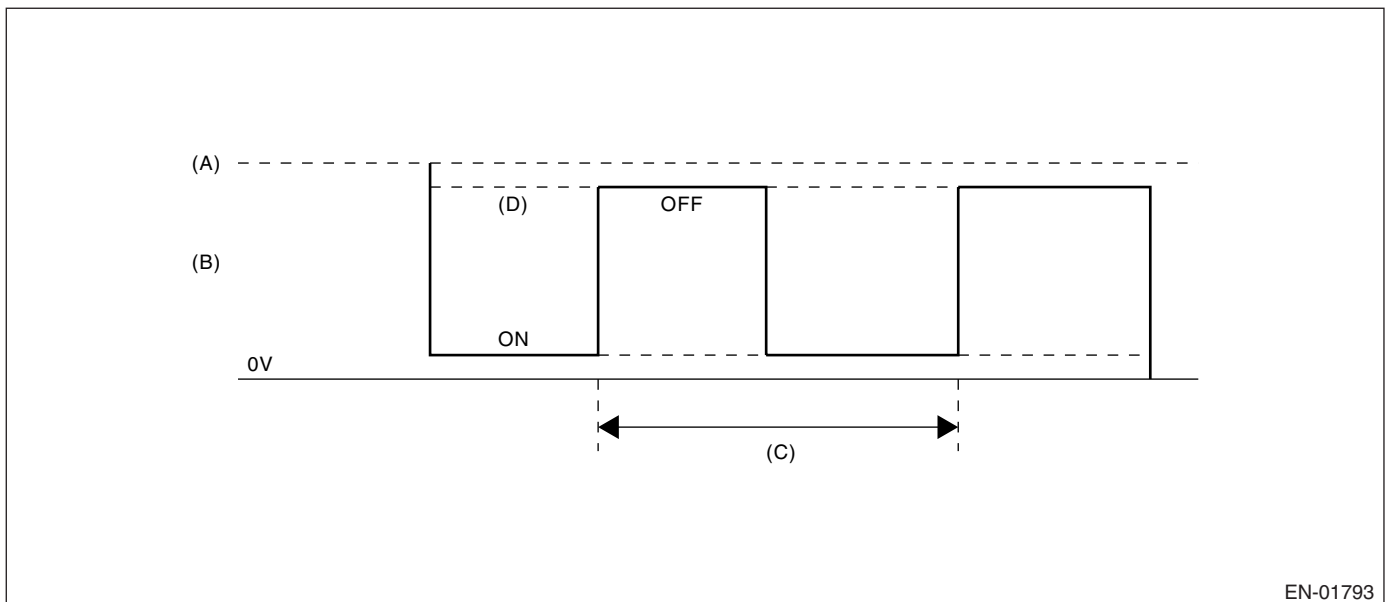
### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oxygen heater.

Oxygen heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains to be High.

### 2. COMPONENT DESCRIPTION



EN-01793

- |   |                               |
|---|-------------------------------|
| (A) Battery voltage                     | (C) 256 milliseconds (cycles) |
| (B) Oxygen sensor heater output voltage | (D) High malfunction          |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 3. ENABLE CONDITION

| Secondary Parameters               | Enable Conditions |
|------------------------------------|-------------------|
| Battery voltage                    | > 10.9 V          |
| Elapsed time after engine starting | ≥ 1 second        |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2,560 milliseconds (10 cycles).

#### Judgment Value

| Malfunction Criteria              | Threshold Value |
|-----------------------------------|-----------------|
| Output voltage level              | High            |
| Oxygen sensor heater control duty | ≥ 20%           |

**Time Needed for Diagnosis:** 2.56 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage level | Low             |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Sub feedback control: Not allowed

### 9. ECM OPERATION AT DTC SETTING

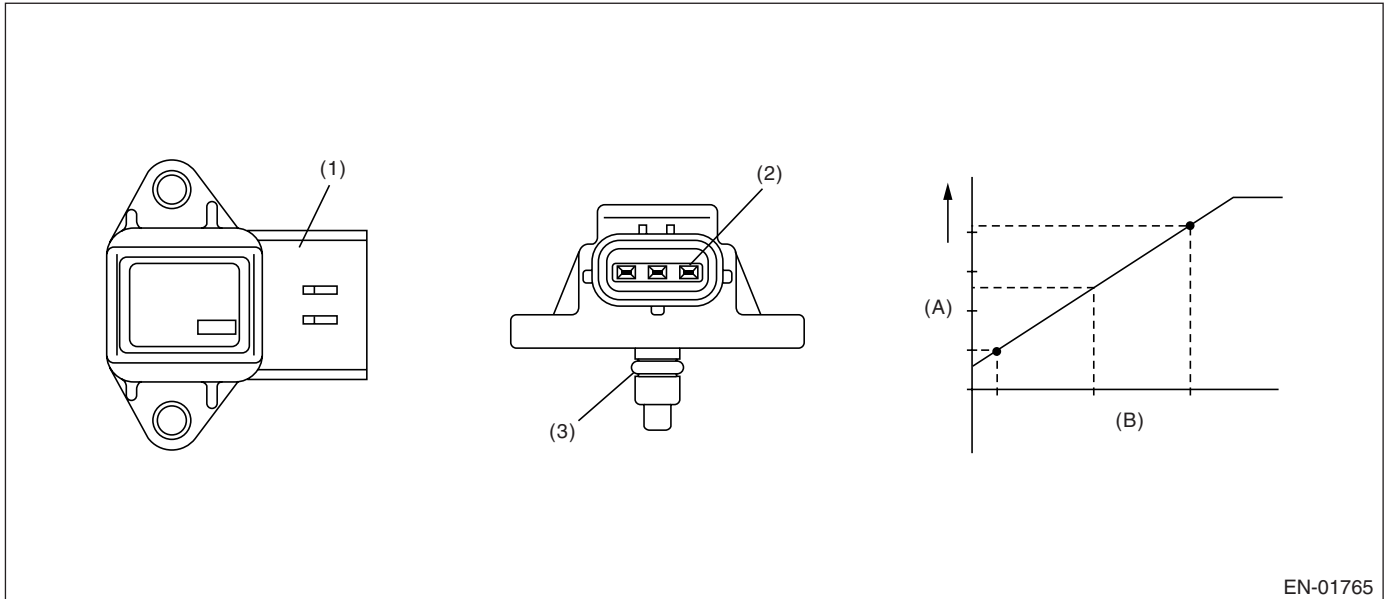
Memorize the freeze frame data. (For test mode \$02)

## H: DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake manifold pressure sensor output property. Judge NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

### 2. COMPONENT DESCRIPTION



EN-01765

- |               |                       |
|---------------|-----------------------|
| (1) Connector | (A) Output voltage    |
| (2) Terminal  | (B) Absolute pressure |
| (3) O-ring    |                       |

### 3. ENABLE CONDITION

| Secondary Parameters       | Enable Conditions |
|----------------------------|-------------------|
| Engine coolant temperature | ≥ 75°C (167°F)    |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when either Low side or High side becomes NG. Judge NG when the continuous time of completing the malfunction criteria below becomes more than the predetermined time.

#### Judgment Value

| Malfunction Criteria                  | Threshold Value         |
|---------------------------------------|-------------------------|
| Low side                              |                         |
| Engine speed                          | < 2,500 rpm             |
| Throttle position                     | ≥ 12°                   |
| Intake air amount per engine 0.5 rev. | ≥ 0.55 g (0.019 oz)/rev |
| Output voltage                        | < 1.4 V                 |
| High side                             |                         |
| Engine speed                          | 600 ←→ 900 rpm          |
| Throttle position                     | ≤ 2.44°                 |
| Intake air amount per engine 0.5 rev. | < 0.54 g (0.014 oz)/rev |
| Output voltage                        | ≥ 3.4 V                 |

**Time Needed for Diagnosis:**Low side 3 seconds, high side 7 seconds

**Malfunction Indicator Light Illumination:**Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear the NG when both Low side and High side become OK. Judge OK when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                  | Threshold Value         |
|---------------------------------------|-------------------------|
| Low side                              |                         |
| Engine speed                          | < 2,500 rpm             |
| Throttle position                     | ≥ 12°                   |
| Intake air amount per engine 0.5 rev. | ≥ 0.55 g (0.019 oz)/rev |
| Output voltage                        | ≥ 1.4 V                 |
| High side                             |                         |
| Engine speed                          | 600 ←→ 900 rpm          |
| Throttle position                     | ≤ 2.44°                 |
| Intake air amount per engine 0.5 rev. | < 0.4 g (0.014 oz)/rev  |
| Output voltage                        | < 3.4 V                 |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## I: DTC P0076 INTAKE VALVE CONTROL CIRCUIT LOW (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the open circuit of oil switching solenoid valve.

Judge open circuit NG when the current is small though output duty is large.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | $\geq 10.9$ V     |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality judgment

Judge NG when the continuous time of completing malfunction criteria below becomes more than 2 seconds.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Duty ratio           | $\geq 30\%$     |
| Control current      | $< 0.026$ A     |

**Time needed for diagnosis:** 2 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Oil switching solenoid valve target current value – Oil switching solenoid valve current value | $< 0.08$ A      |
| Control current  | $\geq 0.11$ A   |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Memory Clear" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Memory Clear" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### J: DTC P0077 INTAKE VALVE CONTROL CIRCUIT HIGH (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the short circuit of oil switching solenoid valve.  
Judge short circuit NG when the current is large though output duty is small.

#### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | $\geq 10.9$ V     |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality judgment

Judge NG when the continuous time of completing malfunction criteria below becomes more than 2 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Duty ratio           | $< 7\%$         |
| Control current      | $\geq 0.465$ A  |

**Time needed for diagnosis:** 2 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Oil switching solenoid valve target current value – Oil switching solenoid valve current value | $< 0.08$ A      |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Memory Clear” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Memory Clear” was performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## K: DTC P0082 INTAKE VALVE CONTROL CIRCUIT LOW (BANK 2)

NOTE:

For the detecting criteria, refer to P0076. <Ref. to GD(H4SO)-21, DTC P0076 INTAKE VALVE CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

## L: DTC P0083 INTAKE VALVE CONTROL CIRCUIT HIGH (BANK 2)

NOTE:

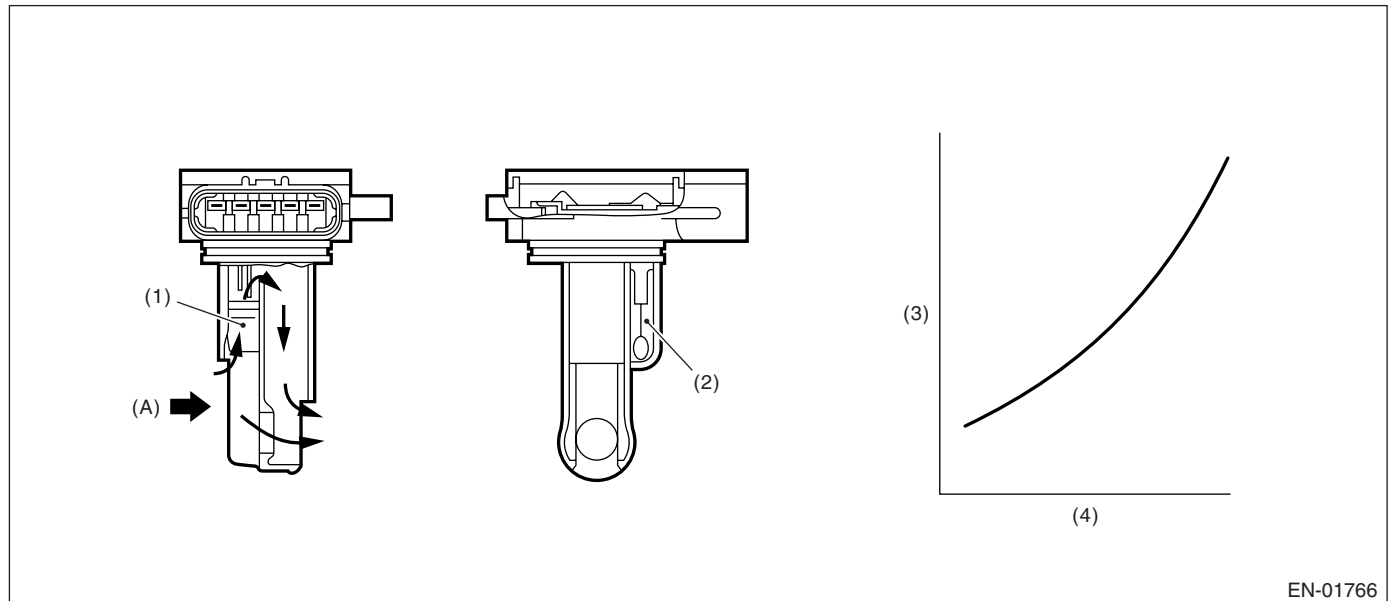
For the detecting criteria, refer to P0077. <Ref. to GD(H4SO)-22, DTC P0077 INTAKE VALVE CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

## M: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output property. Judge Low side NG when the air flow voltage indicates low value in spite of the driving condition that the air flow voltage might be high; otherwise, judge High side NG when the air flow voltage indicates high value in spite of the driving condition that the air flow voltage might be low. Judge air flow sensor property NG when the Low side or High side becomes NG.

### 2. COMPONENT DESCRIPTION



EN-01766

- (1) Air flow sensor
- (2) Intake air temperature sensor
- (3) Voltage (V)
- (4) Intake air volume (kg/s)
- (A) Air

### 3. ENABLE CONDITION

| Secondary Parameters       | Enable Conditions                                   |
|----------------------------|---|
| Engine coolant temperature | $\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ ) |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis.

#### Judgment Value

| Malfunction Criteria  | Threshold Value   |
|---|---|
| Low side NG<br>Output voltage<br>Engine speed<br>Throttle angle<br>Intake manifold pressure                             | < 1.2 V<br>≥ 2,000 rpm<br>≥ 13°<br>≥ 53.3 kPa (400 mmHg, 15.7 inHg)                               |
| High side NG 1<br>Output voltage<br>Engine speed<br>Throttle angle<br>Intake manifold pressure                          | ≥ 2.66 V<br>600 ↔ 900 rpm<br>< 2.44°<br>< 40.0 kPa (300 mmHg, 11.8 inHg)                          |
| High side NG 2<br>Output voltage<br>Engine speed<br>Throttle angle<br>Intake manifold pressure<br>Fuel system diagnosis | ≥ 1.45 V<br>600 ↔ 900 rpm<br>< 2.44°<br>< 40.0 kPa (300 mmHg, 11.8 inHg)<br>Rich side malfunction |

#### Time Needed for Diagnosis:

|           |            |
|-----------|------------|
| Low side  | 3 seconds  |
| High side | 10 seconds |

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK the when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value  |
|--|--|
| Low side NG<br>Output voltage<br>Engine speed<br>Throttle angle<br>Intake manifold pressure  | ≥ 1.2 V<br>≥ 2,000 rpm<br>≥ 13°<br>≥ 53.3 kPa (400 mmHg, 15.7 inHg)      |
| High side NG<br>Output voltage<br>Engine speed<br>Throttle angle<br>Intake manifold pressure | < 2.66 V<br>600 ↔ 900 rpm<br>< 2.44°<br>< 40.0 kPa (300 mmHg, 11.8 inHg) |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

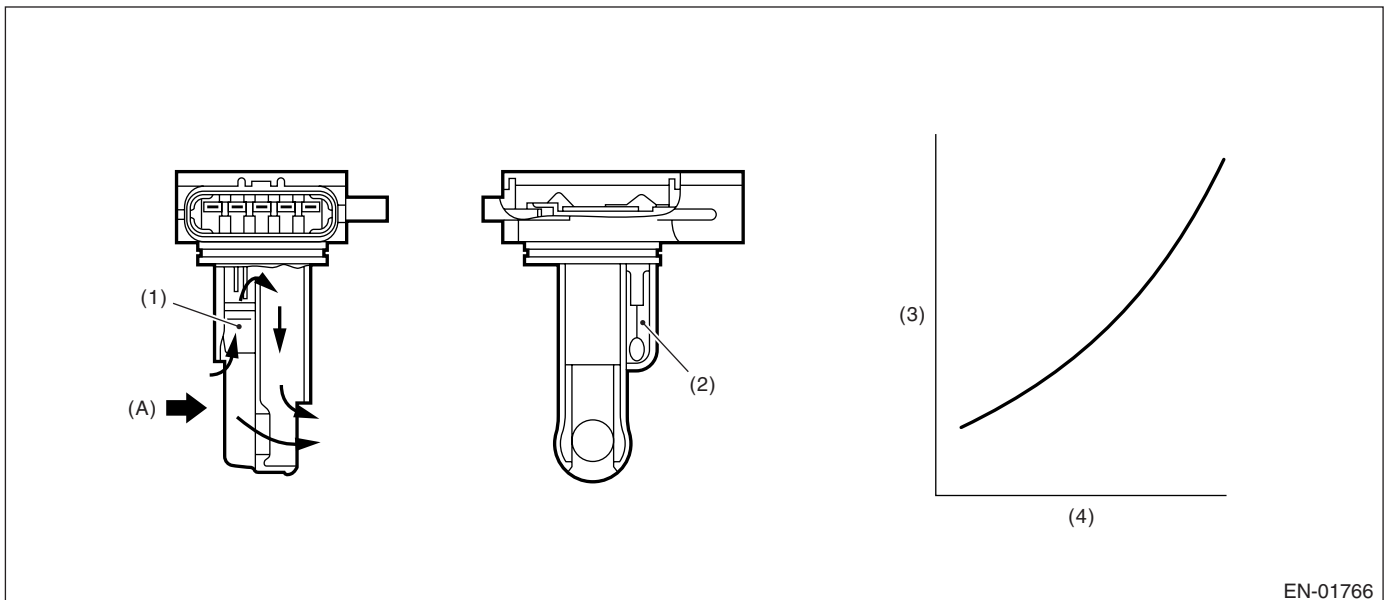
Memorize the freeze frame data. (For test mode \$02)

## N: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01766

- (1) Air flow sensor  
(2) Intake air temperature sensor  
(3) Voltage (V)  
(4) Intake air volume (kg/s)  
(A) Air

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\leq 0.2$ V    |

**Time Needed for Diagnosis:**0.5 seconds

**Malfunction Indicator Light Illumination:**Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

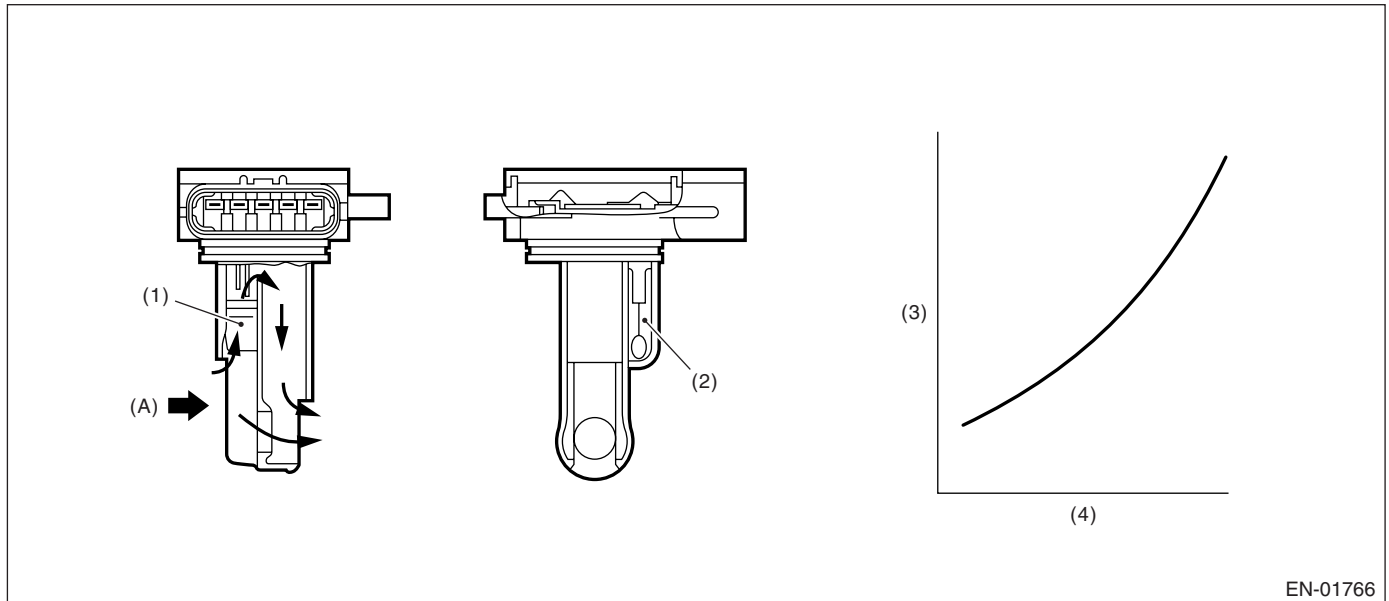
Memorize the freeze frame data. (For test mode \$02)

## O: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01766

(1) Air flow sensor

(3) Voltage (V)

(A) Air

(2) Intake air temperature sensor

(4) Intake air volume (kg/s)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.985$ V  |

**Time Needed for Diagnosis:**0.5 seconds

**Malfunction Indicator Light Illumination:**Illuminates as soon as the malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

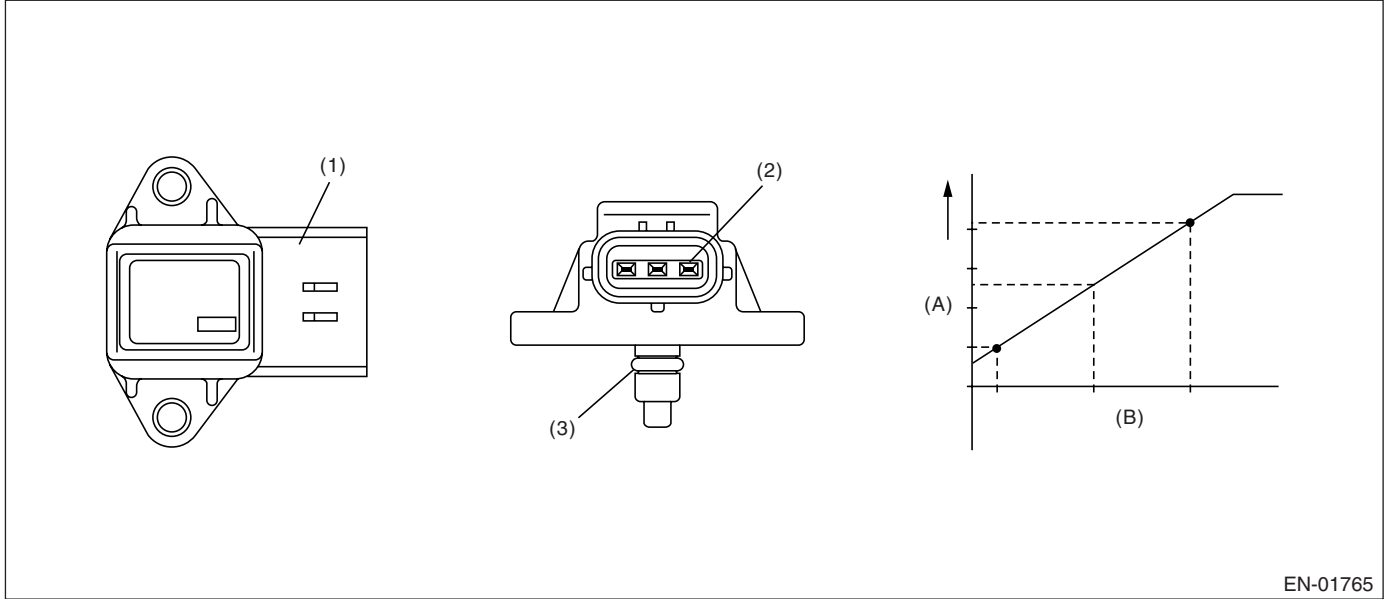
## GENERAL DESCRIPTION

### P: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01765

- |               |                       |
|---------------|-----------------------|
| (1) Connector | (A) Output voltage    |
| (2) Terminal  | (B) Absolute pressure |
| (3) O-ring    |                       |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.568 V       |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

ISC feedback: Not allowed to calculate the amount of feedback.

## 9. ECM OPERATION AT DTC SETTING

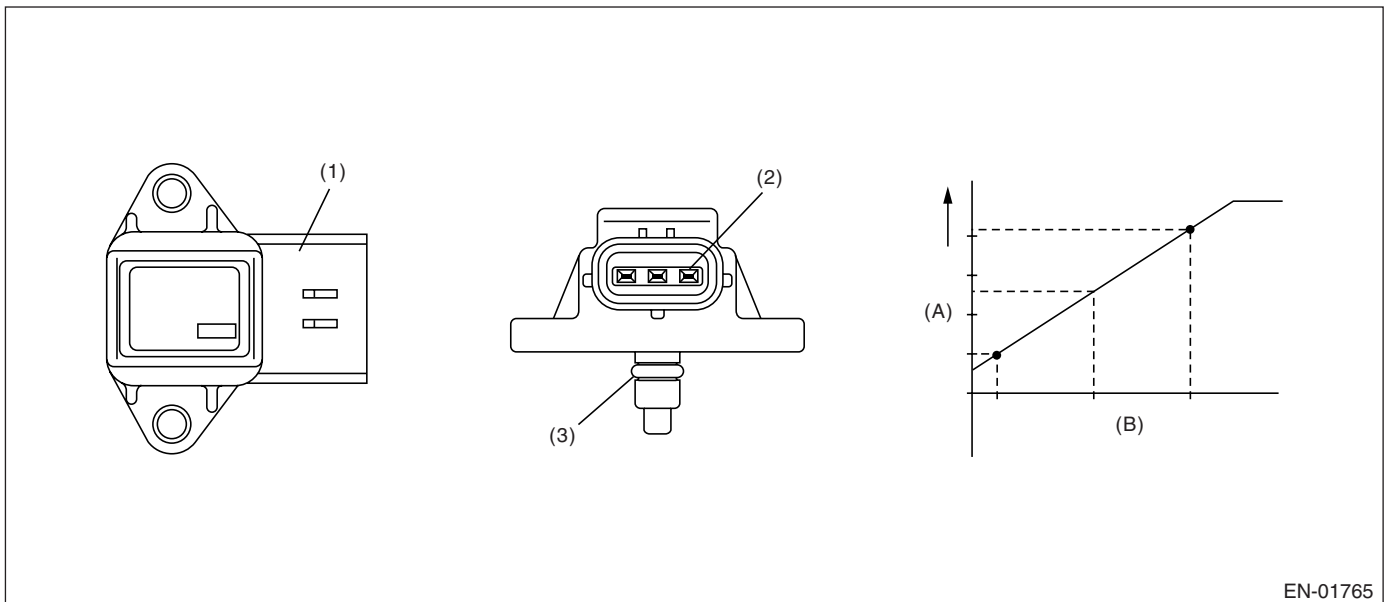
Memorize the freeze frame data. (For test mode \$02)

## Q: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



(1) Connector

(2) Terminal

(3) O-ring

(A) Output voltage

(B) Absolute pressure

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.921$ V  |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

ISC feedback: Not allowed to calculate the amount of feedback.

### 9. ECM OPERATION AT DTC SETTING

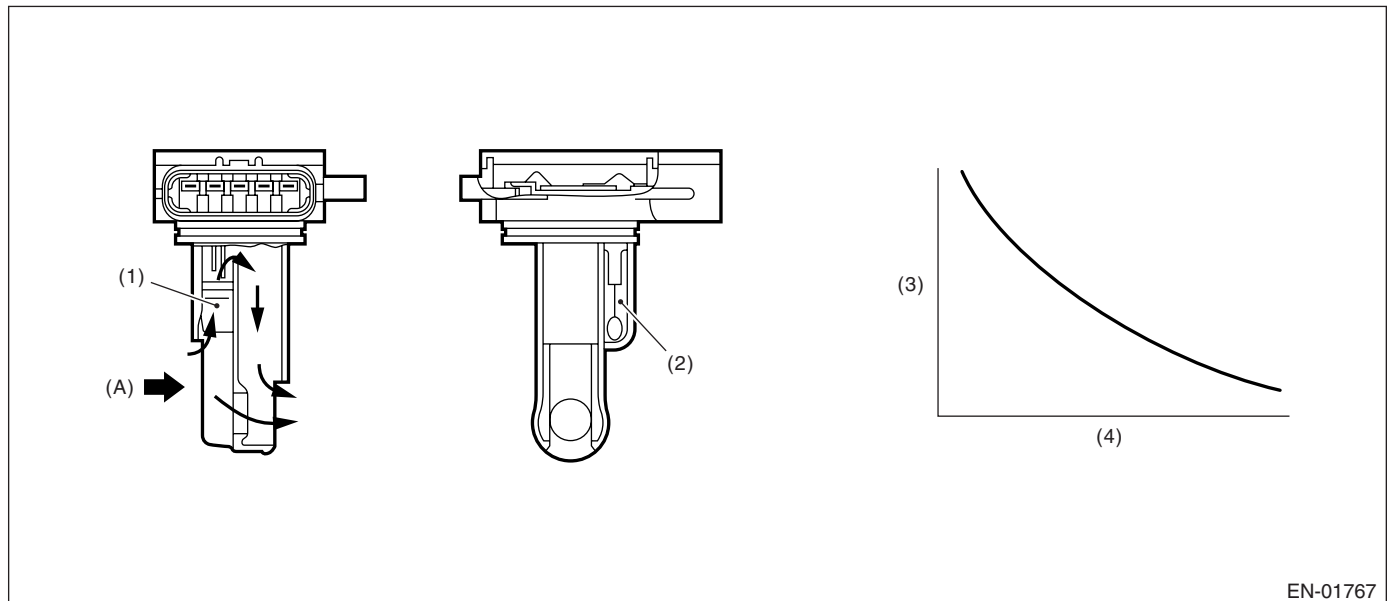
Memorize the freeze frame data. (For test mode \$02)

## R: DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property. Judge NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

### 2. COMPONENT DESCRIPTION



EN-01767

(1) Air flow sensor

(3) Resistance value ( $\Omega$ )

(A) Air

(2) Intake air temperature sensor

(4) Intake air temperature °C (°F)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 3. ENABLE CONDITION

| Secondary Parameters   | Enable Conditions   |
|--|---------------------|
| Coolant temp. before engine start                                    | < 30°C (86°F)       |
| Engine coolant temperature   | > 100°C (212°F)     |
| Battery voltage  | ≥ 10.9 V            |
| Continuous time when the vehicle speed is less than 60 km/h (37 MPH) | 600 seconds or more |

## 4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after idling from starting the cooled engine.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

### Judgment Value

| Malfunction Criteria                            | Threshold Value  |
|---|--|
| Output voltage difference between Max. and Min. | < 20 mV (It is equal to approx. 0.5°C (0.9°F) around 25°.) |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria                            | Threshold Value |
|---|-----------------|
| Output voltage difference between Max. and Min. | ≥ 20 mV         |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

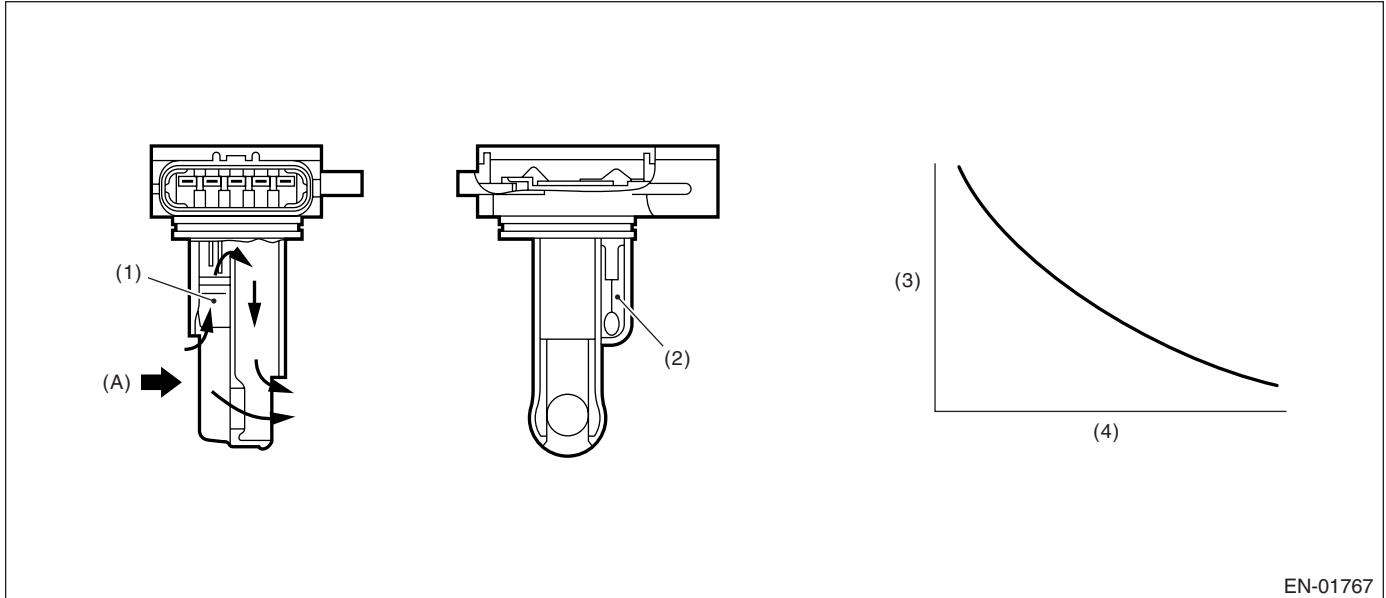
## GENERAL DESCRIPTION

### S: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01767

- (1) Air flow sensor
- (2) Intake air temperature sensor
- (3) Resistance value ( $\Omega$ )
- (4) Intake air temperature °C (°F)
- (A) Air

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.166 V       |
| Ignition switch      | ON              |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 0.166$ V  |
| Ignition switch      | ON              |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

## 9. ECM OPERATION AT DTC SETTING

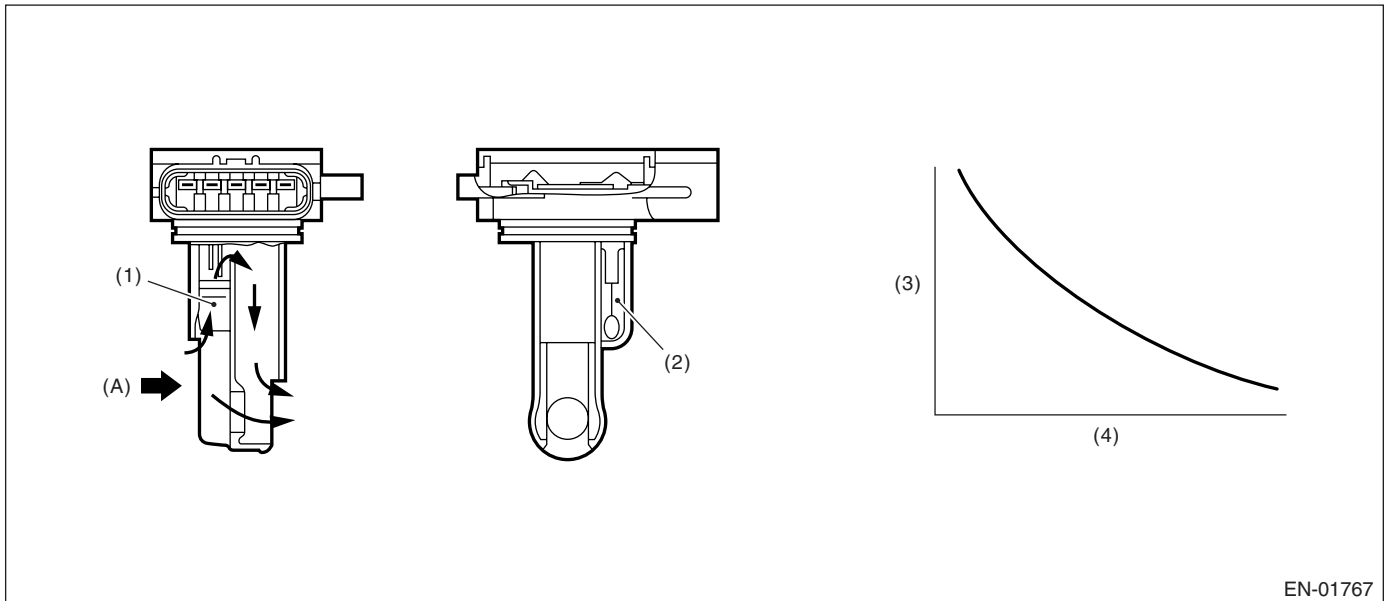
Memorize the freeze frame data. (For test mode \$02)

## T: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01767

(1) Air flow sensor

(3) Resistance value ( $\Omega$ )

(A) Air

(2) Intake air temperature sensor

(4) Intake air temperature °C (°F)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.716$ V  |
| Ignition switch      | ON              |

**Time Needed for Diagnosis:**0.5 seconds

**Malfunction Indicator Light Illumination:**Illuminates as soon as the malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $< 4.716$ V     |
| Ignition switch      | ON              |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

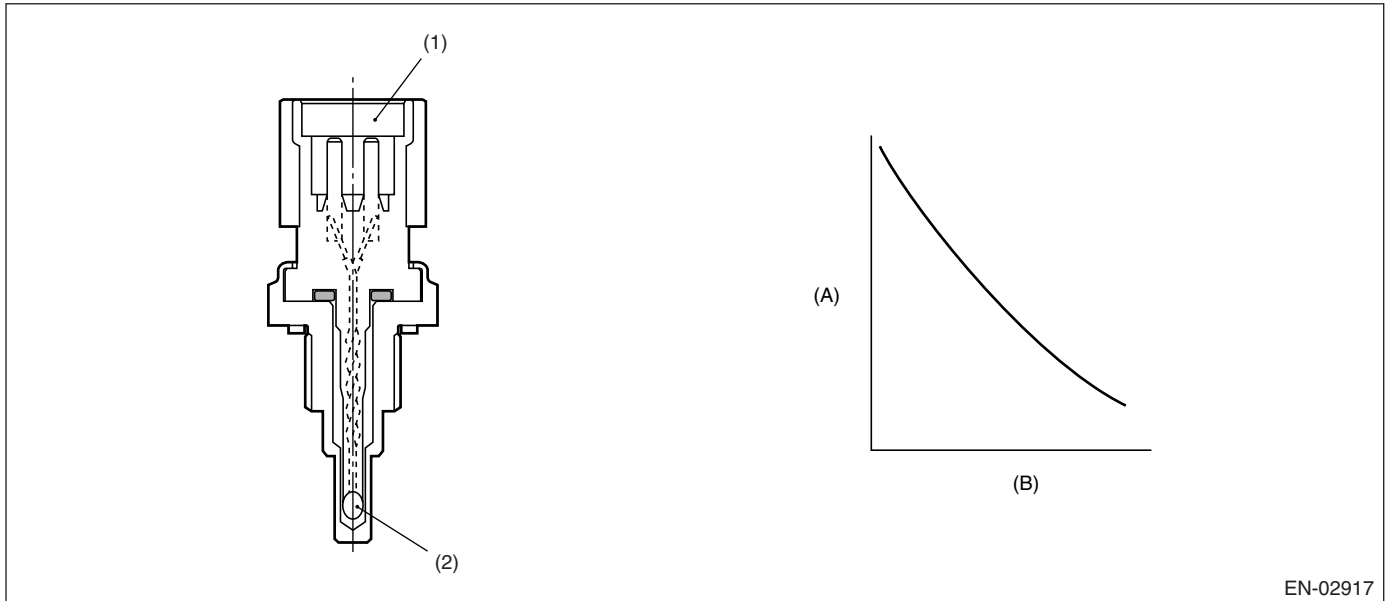
GENERAL DESCRIPTION

## U: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-02917

- (1) Connector
- (2) Thermistor element

- (A) Resistance value (k $\Omega$ )
- (B) Temperature °C (°F)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.166 V       |

**Time Needed for Diagnosis:**0.5 seconds

**Malfunction Indicator Light Illumination:**Illuminates as soon as the malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan turn to ON.
- Tumble generator valve control: Open the tumble generator valve.

### 9. ECM OPERATION AT DTC SETTING

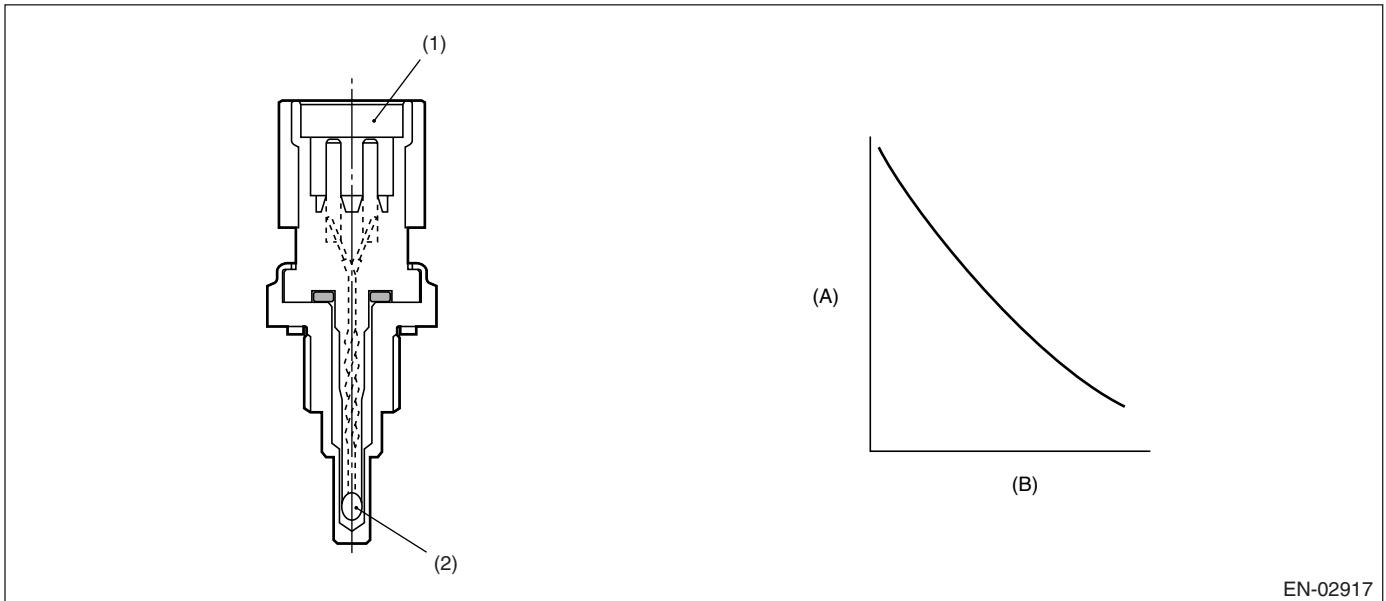
Memorize the freeze frame data. (For test mode \$02)

## V: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-02917

- (1) Connector  
(2) Thermistor element

- (A) Resistance value (kΩ)  
(B) Temperature °C (°F)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.716$ V  |

**Time Needed for Diagnosis:**0.5 seconds

**Malfunction Indicator Light Illumination:**Illuminates as soon as the malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan turn to ON.
- Tumble generator valve control: Open the tumble generator valve.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

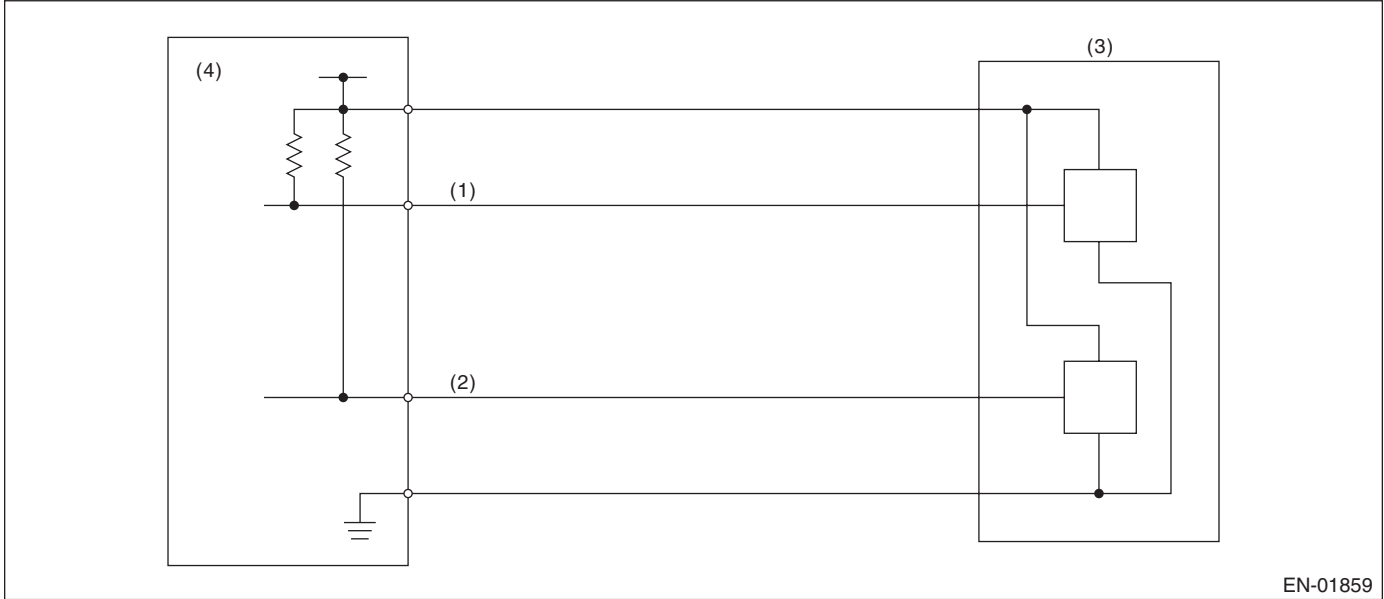
## GENERAL DESCRIPTION

### W: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01859

- (1) Throttle position sensor 1 signal      (3) Throttle position sensor  
(2) Throttle position sensor 2 signal      (4) Engine control module (ECM)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\geq 0.309$ V  |

**Time Needed for Diagnosis:** 24 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

## 9. ECM OPERATION AT DTC SETTING

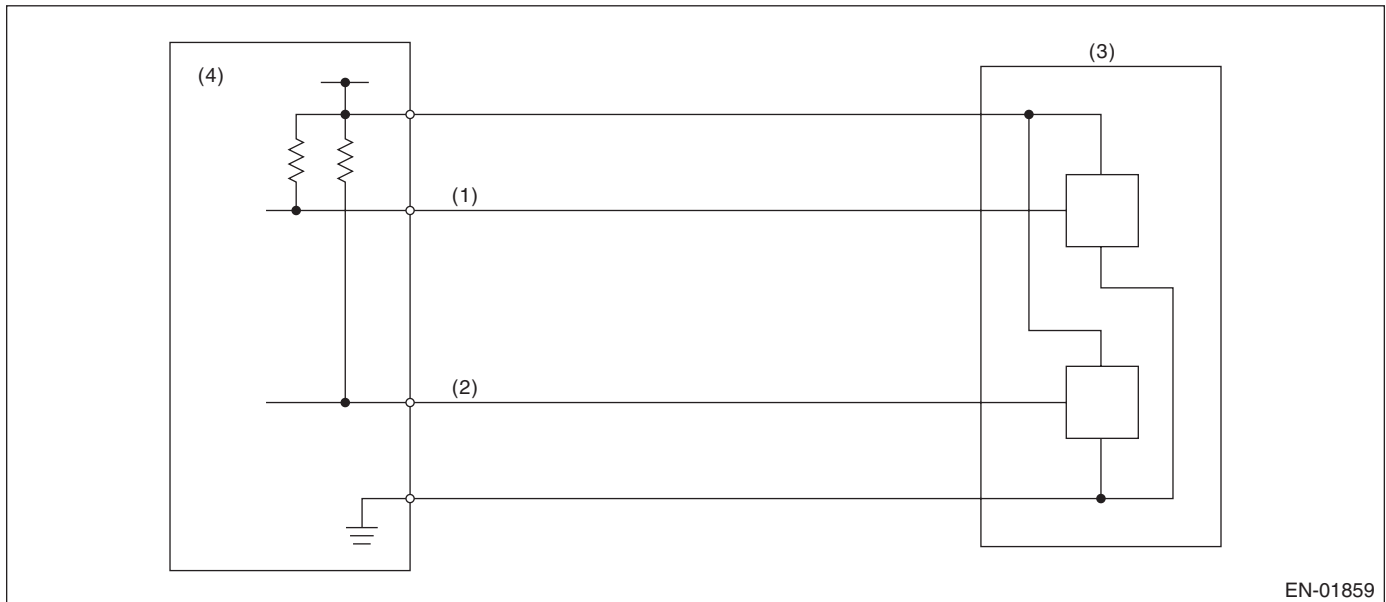
Memorize the freeze frame data. (For test mode \$02)

## X: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal      (3) Throttle position sensor  
(2) Throttle position sensor 2 signal      (4) Engine control module (ECM)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\leq 4.646$ V  |

**Time Needed for Diagnosis:**24 milliseconds

**Malfunction Indicator Light Illumination:**Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

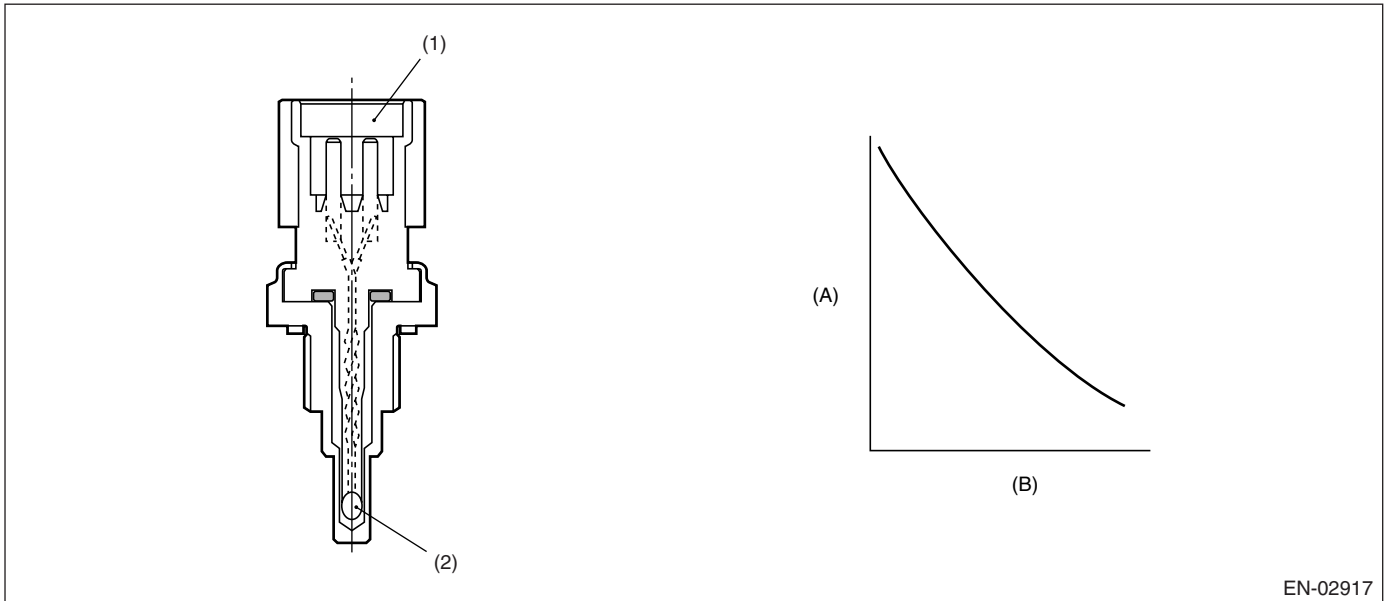
Memorize the freeze frame data. (For test mode \$02)

## Y: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property. Judge NG when the engine coolant temperature does not rise whereas it seemed to rise from the viewpoint of the engine condition.

### 2. COMPONENT DESCRIPTION



EN-02917

- (1) Connector  
(2) Thermistor element

- (A) Resistance value (k $\Omega$ )  
(B) Temperature °C (°F)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Engine speed         | $\geq 500$ rpm    |
| Battery voltage      | $> 10.9$ V        |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine starting.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                      | Threshold Value                              |
|---|--|
| Engine coolant temperature                | < 20°C (68°F)                                |
| Timer for diagnosis after engine starting | ≥ Timer judgment value after engine starting |

Timer for diagnosis after engine starting

- Timer stop at fuel cut mode.
- During the driving conditions (except a) above), timer count up by 64 milliseconds + TWCNT milliseconds at every 64 milliseconds.

Where, TWCNT is determined as follows,

TWCNT = 0 at idle switch ON,

TWCNT show on the following table at idle switch OFF.

|                        |          | Vehicle speed km/h (MPH) |           |           |           |           |            |            |            |
|------------------------|----------|--------------------------|-----------|-----------|-----------|-----------|------------|------------|------------|
|                        |          | 0 (0)                    | 8 (4.97)  | 16 (9.94) | 24 (14.9) | 32 (19.9) | 40 (24.9)  | 48 (29.8)  | 56 (34.8)  |
| Temperature<br>°C (°F) | -20 (-4) | 0 ms                     | 32.076 ms | 39.977 ms | 47.879 ms | 82.544 ms | 117.209 ms | 154.214 ms | 185.206 ms |
|                        | -10 (14) | 0 ms                     | 25.704 ms | 33.606 ms | 41.508 ms | 68.520 ms | 95.532 ms  | 125.667 ms | 155.802 ms |
|                        | 0 (32)   | 0 ms                     | 17.646 ms | 25.548 ms | 33.450 ms | 53.652 ms | 73.855 ms  | 97.120 ms  | 120.386 ms |
|                        | 10 (50)  | 0 ms                     | 7.901 ms  | 15.802 ms | 23.704 ms | 37.941 ms | 52.177 ms  | 68.573 ms  | 82.538 ms  |

Judgment value of timer after engine starting

$$t = 574 - 33 \times T_i \text{ (Sec.)}$$

$T_i$  is the lowest coolant temperature after starting the engine.

**Time Needed for Diagnosis:** To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria       | Threshold Value |
|----------------------------|-----------------|
| Engine coolant temperature | ≥ 20°C (68°F)   |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan turn to ON.
- Tumble generator valve control: Open the tumble generator valve.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

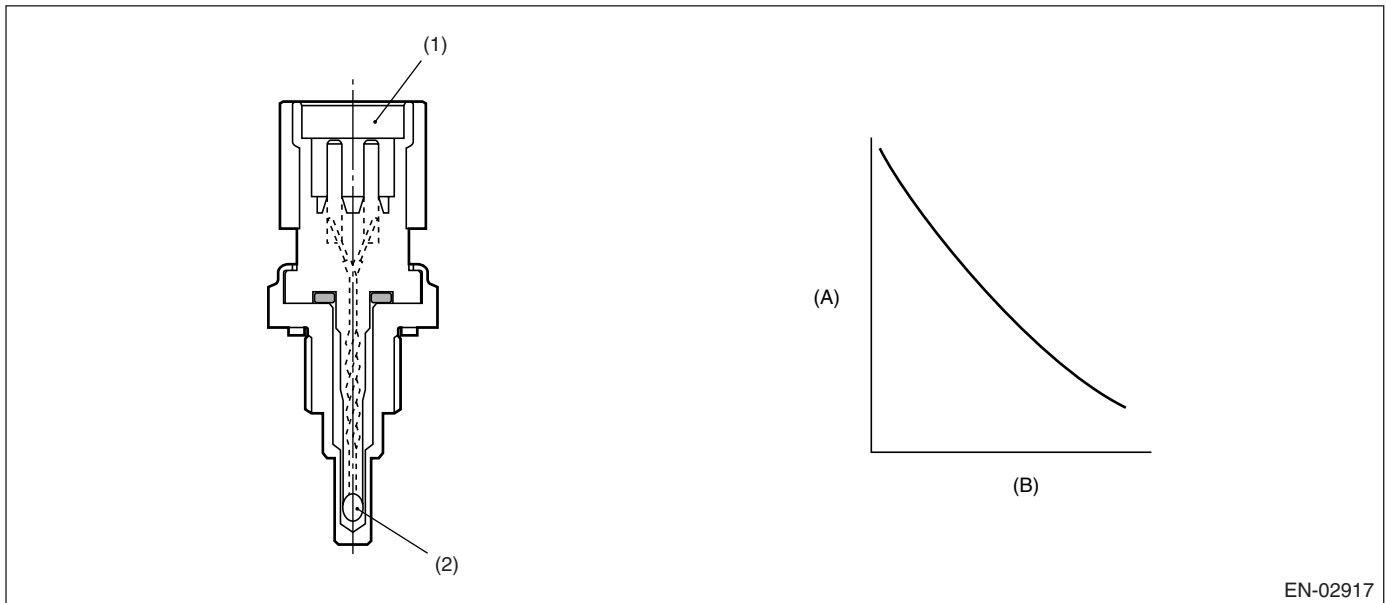
## Z: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature sensor property.

The engine coolant temperature and fuel temperature are memorized when stopping the engine at the previous time. Judge NG when the engine coolant temperature does not decrease in the case the engine coolant temperature seems to decrease after starting the engine this time.

### 2. COMPONENT DESCRIPTION



EN-02917

- (1) Connector
- (2) Thermistor element

- (A) Resistance value (k $\Omega$ )
- (B) Temperature °C (°F)

### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions   |
|---|---|
| Battery voltage   | $\geq 10.9$ V   |
| Filling fuel from stopping engine at the previous time to starting it this time | No  |
| Fuel level  | 15 $\ell$   |
| Engine coolant temperature when stopping engine at the previous time            | $\geq 75^{\circ}\text{C}$ (167°F) and $< 100^{\circ}\text{C}$ (212°F) |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Engine coolant temperature when stopping engine at the previous time – The lowest engine coolant temperature after starting engine | < 2.5°C (4.5°F) |
| Fuel temperature when stopping engine at the previous time – Fuel temperature  | 5°C (9°F)       |
| Intake air temperature – Fuel temperature  | 2.5°C (4.5°F)   |
| Fuel temperature   | 35°C (95°F)     |

### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Engine coolant temperature when stopping engine at the previous time – The lowest engine coolant temperature after starting engine | ≥ 2.5°C (4.5°F) |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illuminations:** Detect when malfunction occurs in 2 continuous driving cycles.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

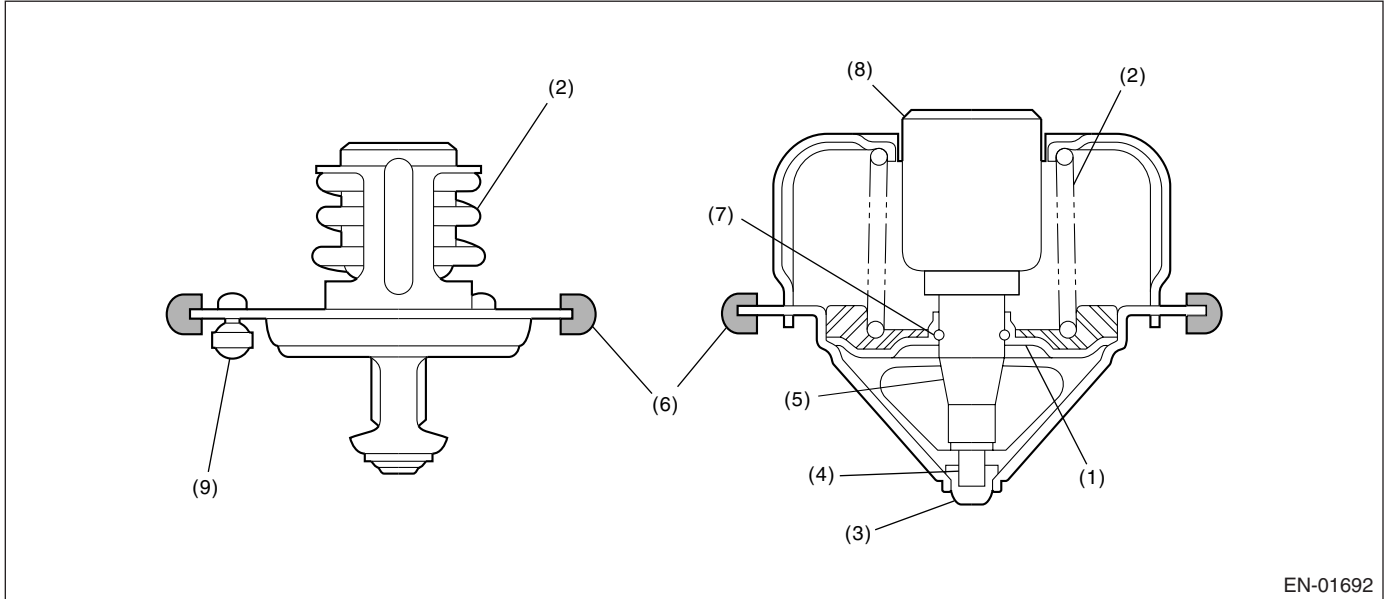
## GENERAL DESCRIPTION

### AA:DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of thermostat function. Judge NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge OK when the engine coolant temperature becomes 70°C (158°F) and the difference is small before judging NG.

#### 2. COMPONENT DESCRIPTION



- |             |                    |                  |
|-------------|--------------------|------------------|
| (1) Valve   | (4) Piston         | (7) Stop ring    |
| (2) Spring  | (5) Guide          | (8) Wax element  |
| (3) Stopper | (6) Rubber packing | (9) Jiggle valve |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 30 seconds.

### Judgment Value

| Malfunction Criteria                          | Threshold Value                   |
|---|-----------------------------------|
| Battery voltage                               | $\geq 10.9 \text{ V}$             |
| Engine coolant temperature at engine starting | $< 55^{\circ}\text{C}$ (131°F)    |
| Engine coolant temperature                    | $< 75^{\circ}\text{C}$ (167°F)    |
| (Estimated – measured) coolant temperature    | $> 30^{\circ}\text{C}$ (54°F)     |
| Vehicle speed                                 | $\geq 30 \text{ km/h}$ (18.6 MPH) |
| Estimated engine coolant temperature          | $\geq 75^{\circ}\text{C}$ (167°F) |
| Estimated ambient temperature                 | $\geq -7^{\circ}\text{C}$ (19°F)  |

**Time Needed for Diagnosis:** Not fixed.

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria                          | Threshold Value                   |
|---|-----------------------------------|
| Battery voltage                               | $\geq 10.9 \text{ V}$             |
| Engine coolant temperature at engine starting | $< 55^{\circ}\text{C}$ (131°F)    |
| Engine coolant temperature                    | $\geq 75^{\circ}\text{C}$ (167°F) |
| (Estimated – measured) coolant temperature    | $\leq 30^{\circ}\text{C}$ (54°F)  |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

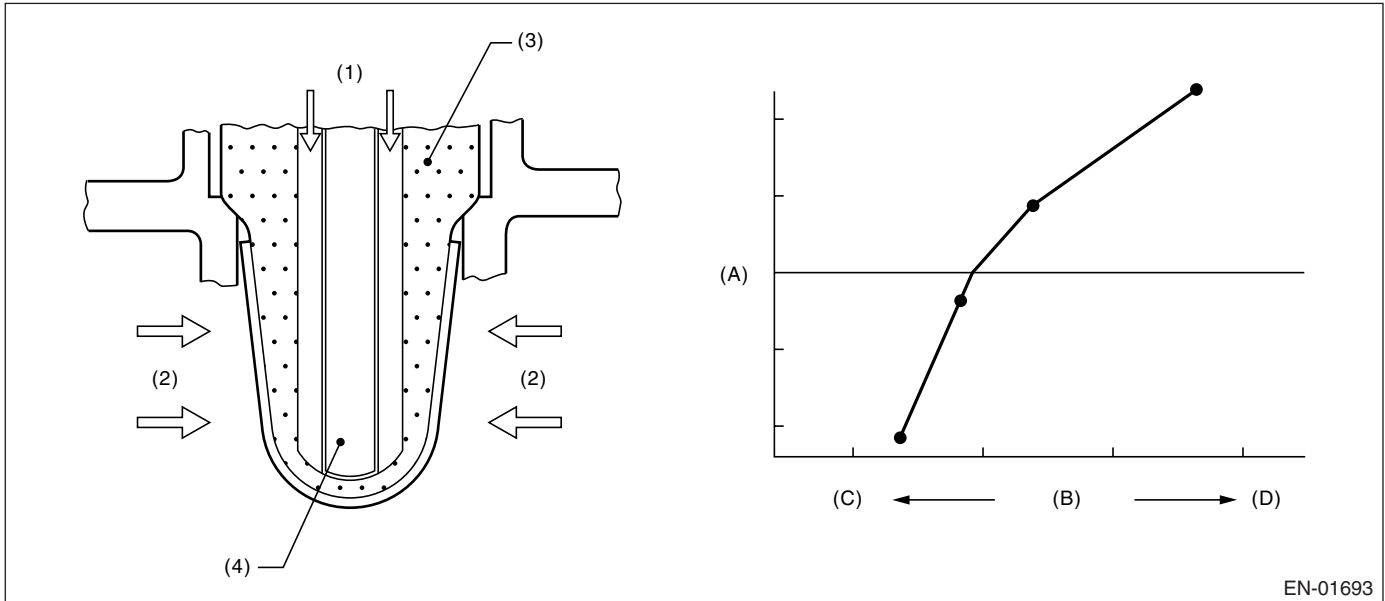
### AB:DTC P0131 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge NG when the element impressed voltage is out of range, or the element current is out of range.

#### 2. COMPONENT DESCRIPTION



EN-01693

- |                      |                         |
|----------------------|-------------------------|
| (1) Atmosphere       | (A) Electromotive force |
| (2) Exhaust          | (B) Air fuel ratio      |
| (3) ZrO <sub>2</sub> | (C) Lean                |
| (4) Ceramic heater   | (D) Rich                |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | ≥ 10.9 V          |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Input voltage        | < 1.8 V         |
| Input current        | < -0.005 A      |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turned on the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Purge control: Not allowed to purge.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

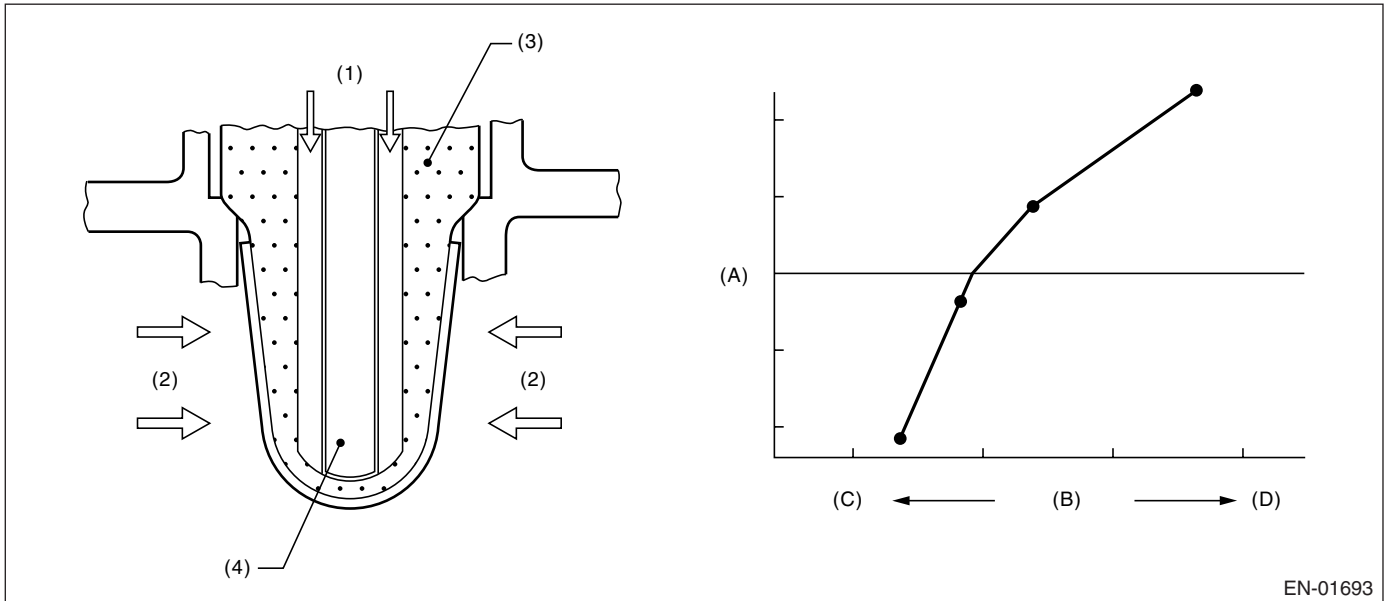
### AC:DTC P0132 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge NG when the element impressed voltage is out of range, or the element current is out of range.

#### 2. COMPONENT DESCRIPTION



- |                      |                         |
|----------------------|-------------------------|
| (1) Atmosphere       | (A) Electromotive force |
| (2) Exhaust          | (B) Air fuel ratio      |
| (3) ZrO <sub>2</sub> | (C) Lean                |
| (4) Ceramic heater   | (D) Rich                |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | ≥ 10.9 V          |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Input voltage        | $\geq 3.8$ V    |
| Input current        | $\geq 0.005$ A  |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turned on the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

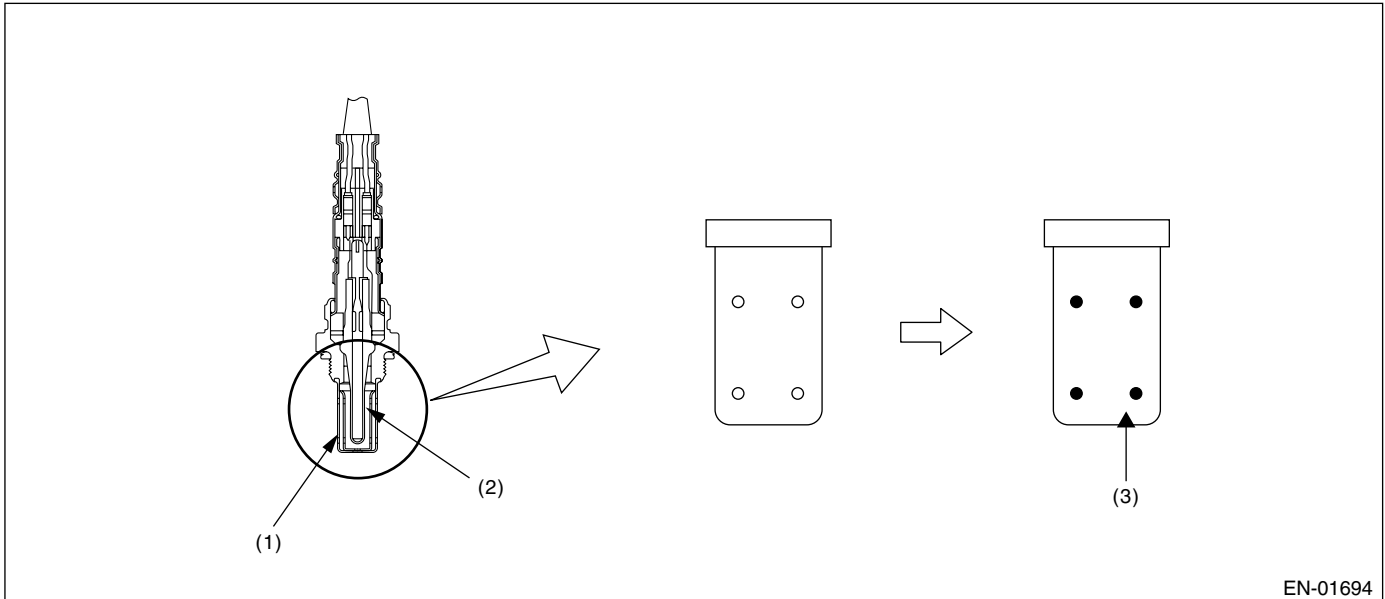
# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## AD:DTC P0133 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

### 1. OUTLINE OF DIAGNOSIS

Detect time-lag of front oxygen (A/F) sensor response. Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed. When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the cover has clogged holes, the rich to lean judgment in ECM is delayed when the change from rich to lean is caused. Judge NG when the actual A/F variation is slow comparing with the ECM control amount.



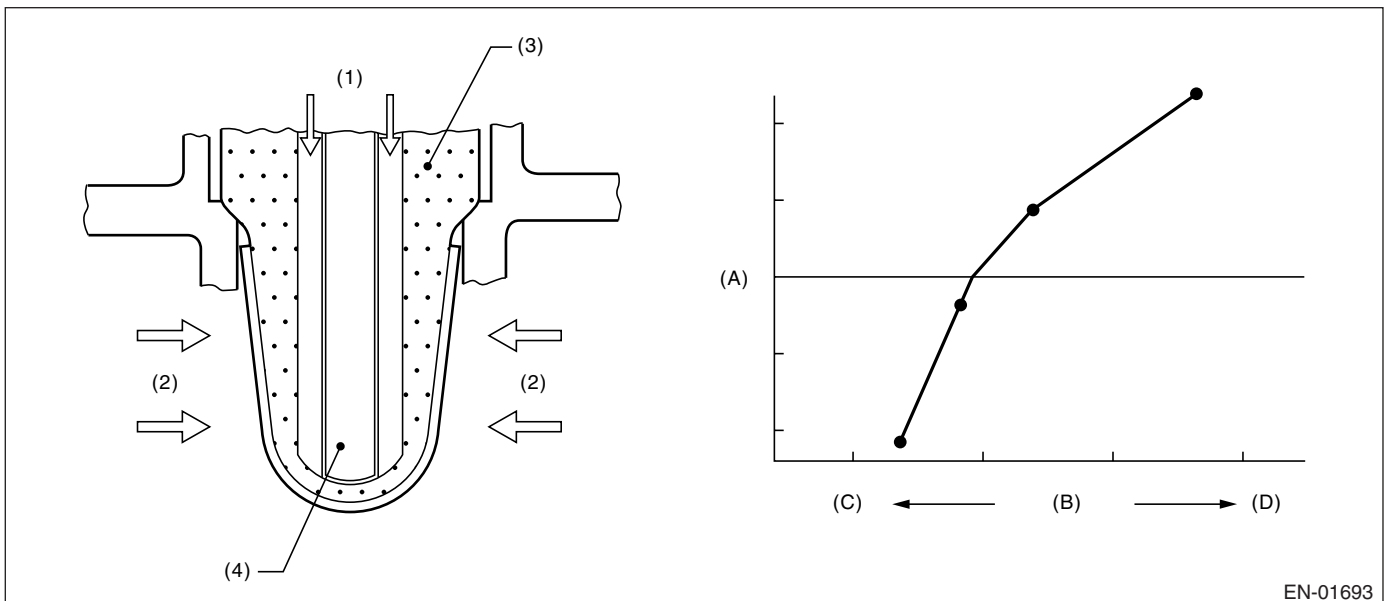
EN-01694

(1) Cover

(2) Zirconia

(3) Clogging

### 2. COMPONENT DESCRIPTION



EN-01693

(1) Atmosphere

(2) Exhaust

(3) ZrO<sub>2</sub>

(4) Ceramic heater

(A) Electromotive force

(B) Air fuel ratio

(C) Lean

(D) Rich

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 3. ENABLE CONDITION

| Secondary Parameters                      | Enable Conditions  |
|---|--|
| All secondary parameter enable conditions | More than 1 second   |
| Battery voltage                           | > 10.9 V   |
| Atmospheric pressure                      | > 75.1 kPa (563 mmHg, 22.2 inHg)   |
| Closed loop control with main feedback    | Operating  |
| Impedance of front oxygen (A/F) sensor    | 0 $\longleftrightarrow$ 50 $\Omega$  |
| After engine starting                     | 120 seconds or more  |
| Engine coolant temperature                | $\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ )                        |
| Engine speed                              | 1,000 $\longleftrightarrow$ 3,200 rpm                                      |
| Vehicle speed                             | 10 $\longleftrightarrow$ 120 km/h<br>(6.21 $\longleftrightarrow$ 74.6 MPH) |
| Amount of intake air                      | 10 $\longleftrightarrow$ 40 g (0.35 $\longleftrightarrow$ 1.41 oz)/s       |
| Engine load change during 0.5 engine rev. | $\leq 0.02$ g (0.001 oz)/rev   |
| Learning value of EVAP conc. during purge | $\leq 0.2$   |
| Total time of operating canister purge    | 20 seconds or more   |

### 4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 to 120 km/h (6.21 to 74.6 MPH) in 120 seconds after starting the engine.

### 5. DIAGNOSTIC METHOD

Integrate the difference of  $f_{af}$  in every 128 milliseconds and difference of  $\lambda$  value.

After integrate 210 seconds, calculate the diagnosis value.

Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| $para_{fca} = td_{2f_{af}}/td_{2l_{md}}$<br>where,<br>$td_{2f_{af}}(N) = td_{2f_{af}}(n-1) +  d_{2f_{af}}(n) $<br>$td_{2l_{md}}(N) = td_{2l_{md}}(n-1) +  d_{2l_{md}}(n) $<br>add up for a total of 210 seconds<br>$d_{2f_{af}}(n) = (f_{af}(n) - f_{af}(n-1)) - (f_{af}(n-1) - f_{af}(n-2))$<br>$d_{2l_{md}}(n) = (l_{md}(n) - l_{md}(n-1)) - (l_{md}(n-1) - l_{md}(n-2))$<br>$f_{af}$ = main feedback compensation coefficient every 128 milliseconds<br>$l_{md}$ = output lambda every 128 milliseconds | $\geq 0.44$     |

**Time Needed for Diagnosis:** 210 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate.
- A/F sub learning correction: Not allowed to calculate.
- Purge control: Not allowed to purge.

## 9. ECM OPERATION AT DTC SETTING

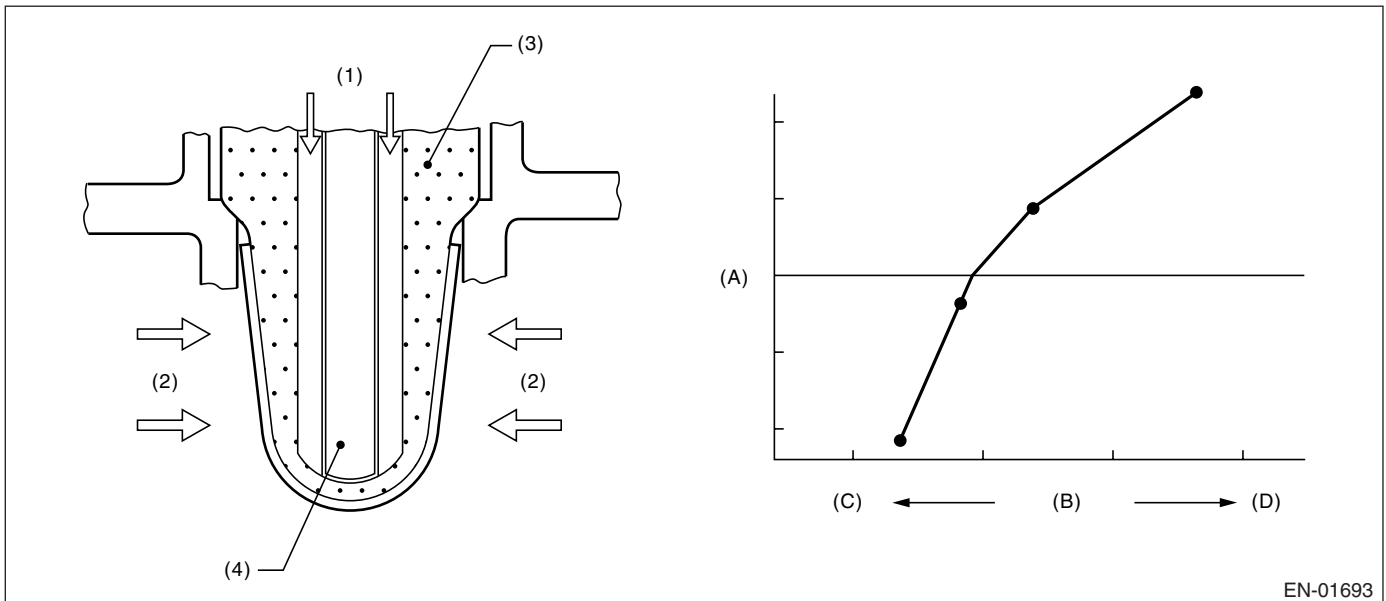
- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## AE:DTC P0134 O<sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the open circuit of sensor.  
Judge NG when the element impedance is large.

### 2. COMPONENT DESCRIPTION



EN-01693

- |                      |                         |
|----------------------|-------------------------|
| (1) Atmosphere       | (A) Electromotive force |
| (2) Exhaust          | (B) Air fuel ratio      |
| (3) ZrO <sub>2</sub> | (C) Lean                |
| (4) Ceramic heater   | (D) Rich                |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

#### Judgment Value

| Malfunction Criteria            | Threshold Value     |
|---------------------------------|---------------------|
| Battery voltage                 | $\geq 10.9$ V       |
| Time of heater duty $\geq 70\%$ | $\geq 30$ seconds   |
| Front lambda sensor impedance   | $\geq 500$ $\Omega$ |

**Time Needed for Diagnosis:**5 seconds

**Malfunction Indicator Light Illumination:**Illuminates as soon as the malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turned on the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

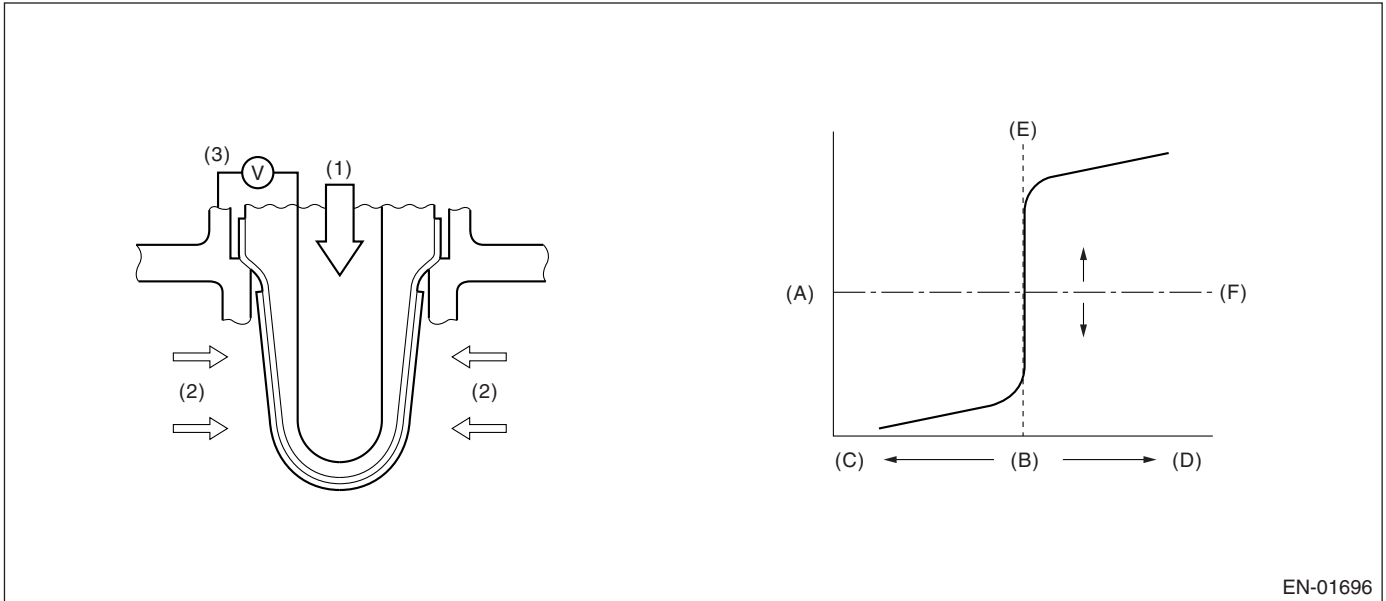
GENERAL DESCRIPTION

## AF:DTC P0137 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of oxygen sensor power distribution NG. Judge NG when the oxygen sensor voltage is abnormal with considering the operating conditions.

### 2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 3. ENABLE CONDITION

#### Abnormality Judgement

| Secondary Parameters                              | Enable Conditions  |
|---|--------------------|
| High side   |                    |
| Secondary air system                              | Not in operation   |
| Closed loop control of oxygen sensor              | In operation       |
| Misfire detection during 200 engine revs.         | < 5 times          |
| Compensation factor for front oxygen (A/F) sensor | Not in limit value |
| Battery voltage                                   | > 10.9 V           |
| Low side 1  |                    |
| Secondary air system                              | Not in operation   |
| Closed loop control of oxygen sensor              | In operation       |
| Misfire detection during 200 engine revs.         | < 5 times          |
| Compensation factor for front oxygen (A/F) sensor | Not in limit value |
| Battery voltage                                   | > 10.9 V           |
| Amount of intake air                              | ≥ 10 g (0.35 oz)/s |
| Low side 2  |                    |
| Secondary air system                              | Not in operation   |
| Closed loop control of oxygen sensor              | In operation       |
| Misfire detection during 200 engine revs.         | < 5 times          |
| Compensation factor for front oxygen (A/F) sensor | Not in limit value |
| Battery voltage                                   | > 10.9 V           |
| Amount of intake air                              | < 10 g (0.35 oz)/s |
| Continuous time of rear oxygen heater current     | 25 seconds or more |
| Low side 3  |                    |
| Secondary air system                              | Not in operation   |
| Closed loop control of oxygen sensor              | In operation       |
| Misfire detection during 200 engine revs.         | < 5 times          |
| Compensation factor for front oxygen (A/F) sensor | Not in limit value |
| Battery voltage                                   | > 10.9 V           |
| Amount of intake air                              | < 10 g (0.35 oz)/s |
| Continuous time of rear oxygen heater current     | 25 seconds or more |
| Fuel cut  | Experienced        |

#### Normality Judgement

| Secondary Parameters                              | Enable conditions  |
|---|--------------------|
| Secondary air system                              | No operation       |
| Closed loop control of oxygen sensor              | In operation       |
| Misfire detection during 200 engine revs.         | < 5 times          |
| Compensation factor for front oxygen (A/F) sensor | Not in limit value |
| Battery voltage                                   | > 10.9 V           |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine at engine steady operation condition.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis. Judge OK when the malfunction criteria below are not completed.

### Judgment Value

| Malfunction Criteria                                | Threshold Value | DTC   |
|---|-----------------|-------|
| High side<br>Max. output voltage without continuity | $\geq 1,200$ mV | P0138 |
| Low side<br>Min. output voltage without continuity  | $< 30$ mV       | P0137 |

### Time Needed for Diagnosis:

High side: 2.5 seconds

Low side 1: 20 seconds

Low side 2: 40 seconds

Low side 3: Value of Map

### Map

| Fuel shut-off time (sec.) | Time Needed for Diagnosis (sec.) |
|---------------------------|----------------------------------|
| 0                         | 40                               |
| 2                         | 40                               |
| 10                        | 60                               |

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Sub feedback control: Not allowed

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### AG:DTC P0138 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

#### NOTE:

For the detection criteria, refer to DTC P0137. <Ref. to GD(H4SO)-53, DTC P0137 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### AH:DTC P0139 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

#### 1. OUTLINE OF DIAGNOSIS

Detect the slow response of rear oxygen sensor.

Judge NG when the Rich → Lean response diagnosis or Lean → Rich response diagnosis is NG and judge OK when both response diagnoses are OK.

[Rich → Lean diagnosis response]

(1) When the measured response time is larger than a threshold, since the A/F ratio is rich, the response time of the output change of O<sub>2</sub> sensor when changing from Rich to Lean is measured, and it judges with NG, and when small, it judges with OK.

(2) When O<sub>2</sub> sensor voltage at the time of a fuel shut-off in deceleration return is large (rich), it judges with NG.

[Lean → Rich diagnosis response]

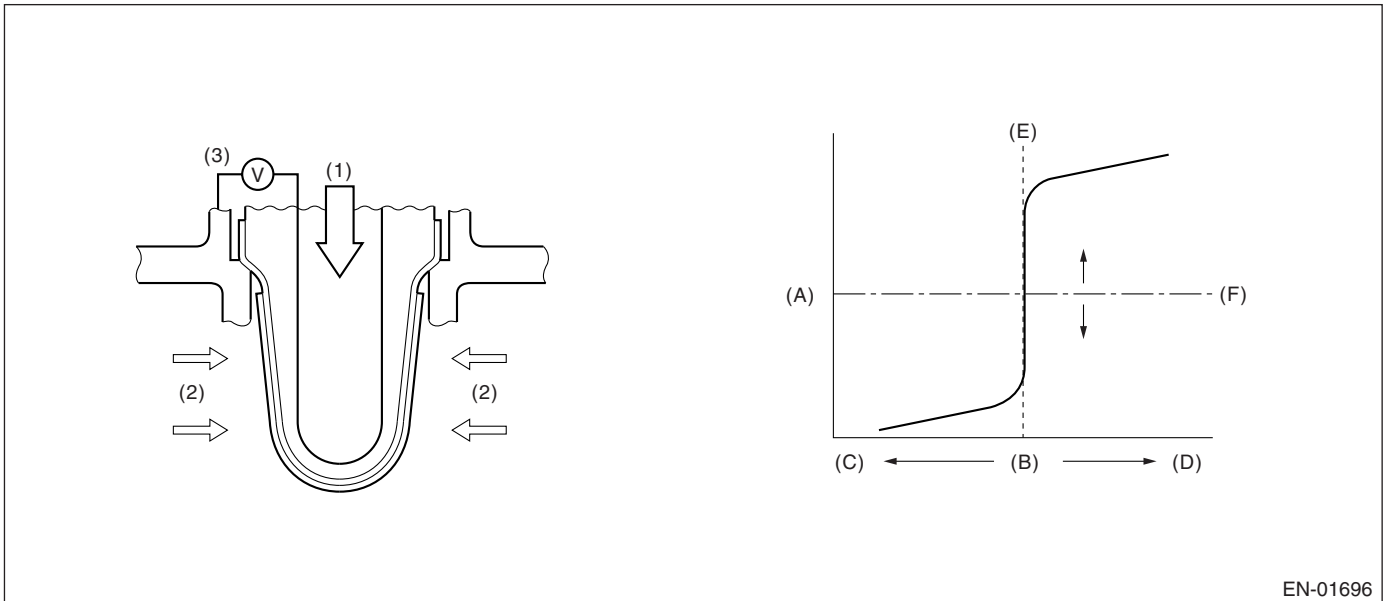
(1) The response time of output change of O<sub>2</sub> sensor when an A/F ratio changes from Lean to Rich is measured, and it is referred to as NG when the measured response time is larger than a threshold.

(2) It is referred to as NG when O<sub>2</sub> sensor voltage after recovery of fuel shut-off in deceleration is small and still small.

#### • Diagnostic Method

Measure the response time of the output change of the oxygen sensor when the A/F ratio changes from rich to lean. And Judge NG when the measured response time is larger than the threshold value.

#### 2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 3. ENABLE CONDITION

- Rich → Lean response diagnosis

| Secondary Parameters                            | Enable Conditions |
|---|-------------------|
| Battery voltage                                 | > 10.9 V          |
| A/F sub feedback control condition              | Completed         |
| 6 seconds or more fuel shut-off indecel. time   | Experienced       |
| After fuel cut                                  | ≥ 2 seconds       |
| Accumulative time of rear oxygen heater current | ≥ 60 seconds      |
| Continuous time of rear oxygen heater current   | ≥ 30 seconds      |
| Catalyst warm-up counter                        | ≥ 9000            |

## 4. GENERAL DRIVING CYCLE

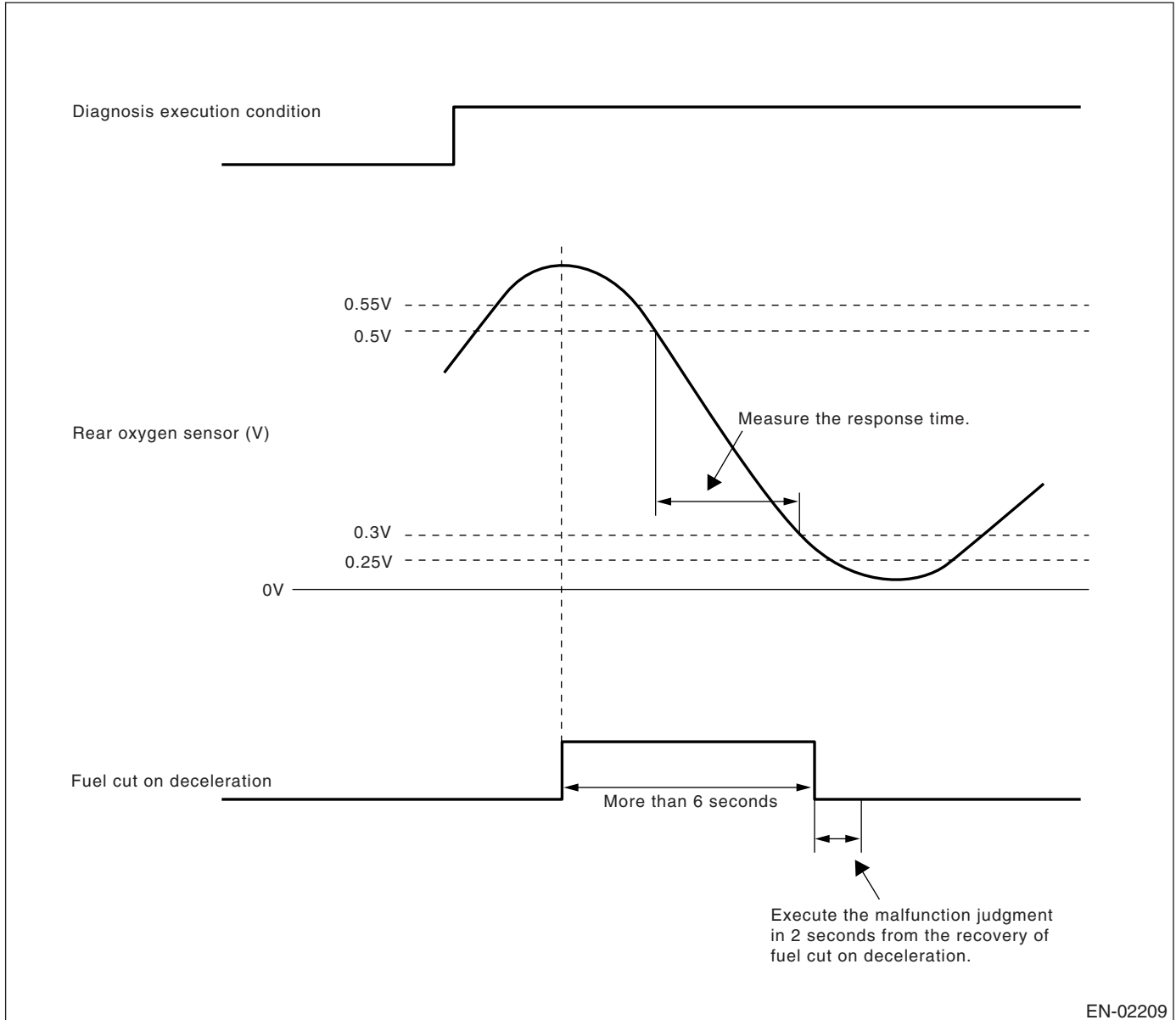
Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration. (Pay attention to oxygen sensor voltage for the timing of deceleration.)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 5. DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.55 V (rich) to 0.25 V (lean), calculate the Min. value of response time regarded as judgment value while the output varies from 0.5 V to 0.3 V.



#### • Abnormality Judgment

(1) Judge NG when the judgment value is larger than the threshold value after fuel shut-off in deceleration. Response time (Diagnosis value) > Threshold value → Abnormal

#### NOTE:

Variation time of rear oxygen sensor output voltage is short during fuel shut-off in deceleration. Carry out the NG judgment only after the fuel shut-off in deceleration. As for OK judgment, without the condition of fuel shut-off in deceleration, judge OK if the value is below the threshold value.

Judge NG when the malfunction criteria below are completed in 2 seconds after the recovery of fuel shut-off in deceleration which requires 6 seconds or more.

(2) Judge NG when the O<sub>2</sub> sensor voltage after recovery of fuel shut-off in deceleration is large. Judge NG when fuel shut-off in deceleration is also long (6 sec. or more), and although carried out the fuel shut-off in deceleration cut return, when O<sub>2</sub> sensor voltage is large (more than 0.55V).

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## Judgment Value

| Malfunction Criteria   | Threshold Value    |
|--|--------------------|
| Shortest time change from rich (500 mV O <sub>2</sub> output) to lean (300 mV) if voltage reduces from 550 mV to 250 mV. | > 327 milliseconds |
| Time when more than 550 mV   | > 2 seconds        |

**Time Needed for Diagnosis:** 1 time

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgement

(1) Judge Normal when the response time (diagnostic value) is smaller than threshold (judgment value) when changing to lean since O<sub>2</sub> sensor voltage.

(2) A normal judging is not carried out.

## Judgment Value

Judge OK when the following standards value are completed.

| Malfunction Criteria   | Threshold Value    |
|--|--------------------|
| Change of the shortest time from rich (500 mV O <sub>2</sub> output), when voltage decreases from 550 mV to 250 mV to lean (300 mV). | ≤ 327 milliseconds |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Sub feedback control: Not allowed

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## 10. ENABLE CONDITION

- Lean → Rich response diagnosis

| Secondary Parameters                 | Enable Conditions |
|--------------------------------------|-------------------|
| Battery voltage                      | > 10.9 V          |
| A/F main feedback control condition  | Completed         |
| Fuel cut on deceleration ≥ 6 seconds | Experienced       |
| After fuel cut                       | ≥ 2 seconds       |

## 11. GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration. (Pay attention to oxygen sensor voltage for the timing of deceleration.)

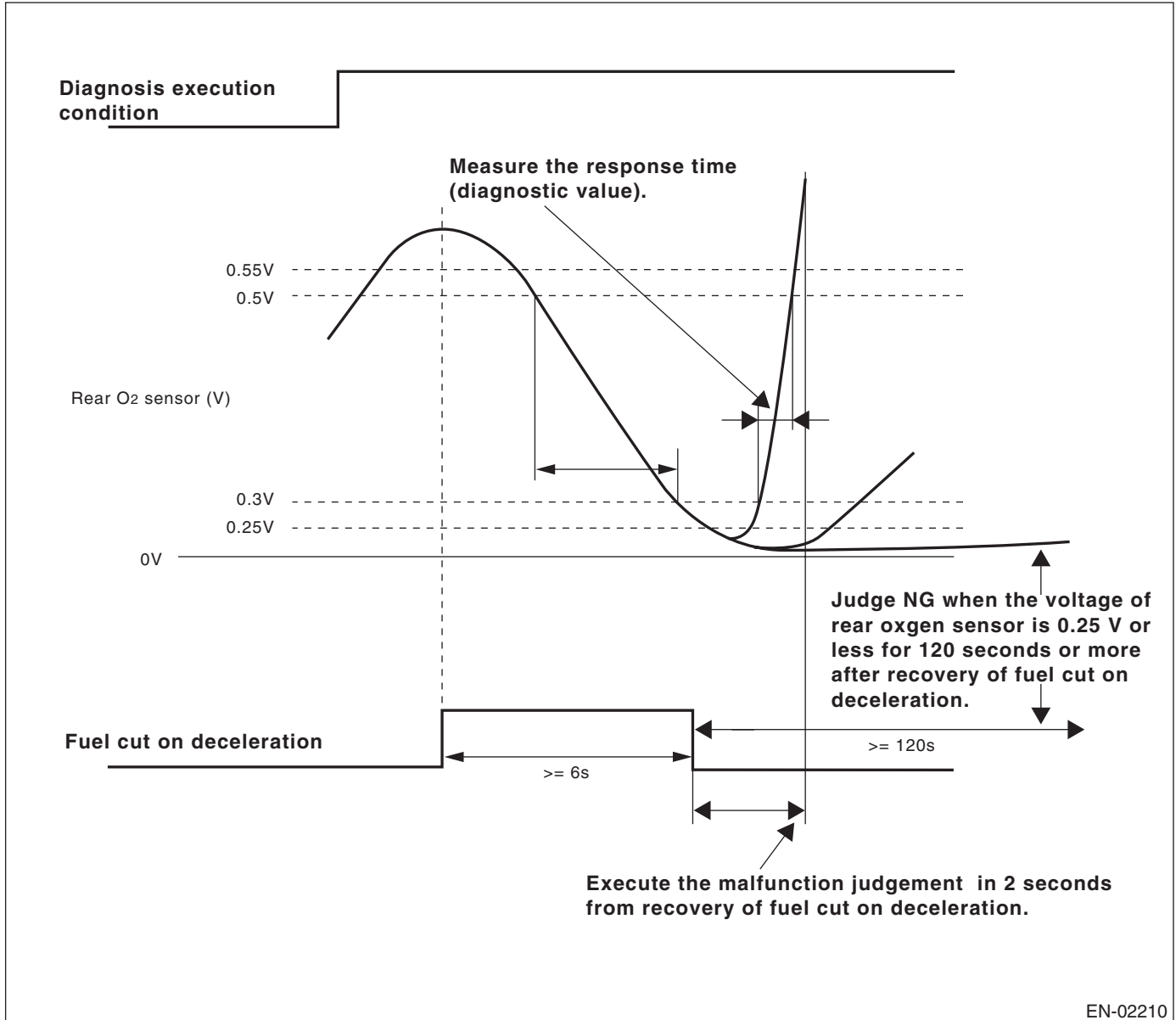


# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 12. DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich), calculate the Min. value of response time regarded as judgment value while the output varies from 0.3 V to 0.5 V.



#### • Abnormality Judgment

(1) Judge NG when the judgment value is larger than the threshold value after recovery of fuel shut-off in deceleration.

Response time (Diagnosis value) > Threshold value → Abnormal

(2) Judge NG when the O<sub>2</sub> sensor voltage after recovery of fuel shut-off in deceleration is small.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Shortest time change from lean (300 mV O <sub>2</sub> output) to rich (500 mV) if voltage reduces from 500 mV to 250 mV. | > 2 seconds     |
| Time when less than 250 mV   | > 120 seconds   |

**Time Needed for Diagnosis:** 1 time

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Normality Judgement

(1) Judge Normal when the response time (diagnostic value) is smaller than threshold (judgment value) when changing to lean since O<sub>2</sub> sensor voltage.

Response Time (diagnosis value) ≤ Threshold value → Normal

(2) A normal judging is not carried out.

## Judgment Value

Judge OK when the following standards value are completed.

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Change of the shortest time from rich (300 mV O <sub>2</sub> output), when voltage decreases from 550 mV to 250 mV to lean (500 mV). | ≤ 2 seconds     |

## 13.DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 14.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 15.FAIL SAFE

Sub feedback control: Not allowed

## 16.ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### AI: DTC P0140 O<sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR 2)

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor output property.

Judge Low side NG when the rear oxygen sensor voltage indicates low, otherwise, judge High side NG when the rear oxygen sensor voltage indicates high, in spite of the driving condition that the voltage might move, by referring to the driving condition such as amount of intake air, coolant temperature, main feedback control, fuel shut-off in deceleration, etc.

Judge rear oxygen sensor property NG when the Low side or High side becomes NG.

#### 2. ENABLE CONDITION

| Secondary Parameters                              | Enable Conditions           |
|---|-----------------------------|
| Engine coolant temperature                        | ≥ 75°C (167°F)              |
| Target output voltage of rear oxygen sensor       | ≥ 0.6 V                     |
| Amount of intake air                              | 10 g (0.35 oz)/sec. or more |
| Battery voltage                                   | > 10.9 V                    |
| Closed loop with oxygen sensor                    | In operation                |
| Misfire detection during 200 engine revs.         | 5 times or less             |
| Compensation factor for front oxygen (A/F) sensor | Not in limit value          |
| 5 seconds or more fuel shut-off in decel.         | Experienced                 |

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis once after warming-up the engine.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when any of the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria                       | Threshold Value |
|--|-----------------|
| Low side diagnosis of max. output voltage  | < 0.55 V        |
| High side diagnosis of min. output voltage | > 0.25 V        |

**Time Needed for Diagnosis:**200 second

**Malfunction Indicator Light Illumination:**Detect when malfunction occurs in 2 continuous driving cycles.

##### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria                       | Threshold Value |
|--|-----------------|
| Low side diagnosis of max. output voltage  | ≥ 0.55 V        |
| High side diagnosis of min. output voltage | ≤ 0.25 V        |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 7. FAIL SAFE

Sub feedback control: Not allowed

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## AJ:DTC P0171 SYSTEM TOO LEAN (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

#### • Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

### 2. ENABLE CONDITION

- Lean side

| Secondary Parameters                     | Enable Conditions                 |
|--|-----------------------------------|
| A/F main learning system                 | In operation                      |
| Engine coolant temperature               | $\geq 75^{\circ}\text{C}$ (167°F) |
| Intake air amount                        | $\geq$ Map 5                      |
| Intake air change during 0.5 engine rev. | $\leq 0.02$ g (0.001 oz)/rev      |

Map 5

| Engine speed (rpm)          | idle | 650               | 1000              | 1500              | 2000              | 2500              | 3000              | 3500             | 4000              | 4500              |
|-----------------------------|------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------------|-------------------|-------------------|
| Measured value (g (oz)/rev) | NA   | 0.203<br>(0.0072) | 0.183<br>(0.0065) | 0.155<br>(0.0055) | 0.149<br>(0.0053) | 0.157<br>(0.0055) | 0.162<br>(0.0057) | 0.18<br>(0.0063) | 0.193<br>(0.0068) | 0.205<br>(0.0072) |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at engine idling after warm-up or a constant speed.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge that the fuel system malfunction occurs when the continuous time of completing the malfunction criteria below becomes more than 50 seconds by comparing the diagnosed value (fsobd) with threshold value.

#### Judgment Value

| Malfunction Criteria  | Threshold Value  |
|---|--|
| $\text{fsobd} = (\text{sglmd} - \text{tglm da}) + \text{faf} + \text{flaf}$<br>where,<br>sglmd = measured lambda<br>tglm da = target lambda<br><br>faf = main feedback compensation coefficient every 64 milliseconds<br>flaf = main feedback learning compensation coefficient | $\geq \text{fsobdL1}$<br>See Map 4<br><br>fsobdL1 = lean side threshold value of fsobd |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

Map 4 Threshold value for fuel system malfunction criteria

|                         |       |                |                |                |                 |               |                 |
|-------------------------|-------|----------------|----------------|----------------|-----------------|---------------|-----------------|
| Amount of air [g(oz)/s] | 0 (0) | 3.2<br>(0.113) | 6.4<br>(0.226) | 9.6<br>(0.339) | 12.8<br>(0.451) | 16<br>(0.564) | 19.2<br>(0.677) |
| fsobdL1 (%)             | 40    | 40             | 33.2           | 26.5           | 26.5            | 26.5          | 26.5            |

**Time Needed for Diagnosis:** 10 seconds × 5 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK when the continuous time of completing the malfunction criteria below becomes more than 10 seconds.

### Judgment Value

| Malfunction Criteria                    | Threshold Value |
|---|-----------------|
| $fsobd = (sglmd - tglmda) + faf + flaf$ | < 19%           |

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 driving cycles.
- When "Clear Memory" was performed

## 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## AK:DTC P0172 SYSTEM TOO RICH (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

#### • Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

### 2. ENABLE CONDITION

| Secondary Parameters                                 | Enable Conditions       |
|--|-------------------------|
| A/F main learning system                             | In operation            |
| Engine coolant temperature                           | ≥ 75°C (167°F)          |
| Intake air amount                                    | ≥ Map 5                 |
| Intake air change during 0.5 engine rev.             | ≤ 0.02 g (0.001 oz)/rev |
| Learning value of EVAP conc. during purge            | < 0.1                   |
| Cumulative time of canister purge after engine start | 20 seconds or more      |
| Continuous period after canister purge starting      | 30 seconds or more      |

Map 5

| Engine speed (rpm)          | idle | 650               | 1000              | 1500              | 2000              | 2500              | 3000              | 3500             | 4000              | 4500              |
|-----------------------------|------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------------|-------------------|-------------------|
| Measured value (g (oz)/rev) | NA   | 0.203<br>(0.0072) | 0.183<br>(0.0065) | 0.155<br>(0.0055) | 0.149<br>(0.0053) | 0.157<br>(0.0055) | 0.162<br>(0.0057) | 0.18<br>(0.0063) | 0.193<br>(0.0068) | 0.205<br>(0.0072) |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at engine idling after warm-up or a constant speed.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge that the fuel system malfunction occurs when the continuous time of completing the malfunction criteria below becomes more than 50 seconds by comparing the diagnosed value (fsobd) with threshold value.

#### Judgment Value

| Malfunction Criteria   | Threshold Value  |
|--|--|
| $fsobd = (sglmd - tglmda) + faf + flaf$<br>where,<br>sglmd = measured lambda<br><br>tglmda = target lambda<br>faf = main feedback compensation coefficient every 64 milliseconds<br>flaf = main feedback learning compensation coefficient | ≤ fsobdR1<br>See Map 4<br>fsobdR1 = rich side threshold value of fsobd |

Map 4 Threshold value for fuel system malfunction criteria

| Amount of air [g(oz)/s] | 0 (0) | 3.2<br>(0.113) | 6.4<br>(0.226) | 9.6<br>(0.339) | 12.8<br>(0.451) | 11.7<br>(0.413) | 19.2<br>(0.677) |
|-------------------------|-------|----------------|----------------|----------------|-----------------|-----------------|-----------------|
| fsobdR1 (%)             | -40   | -40            | -33.2          | -26.5          | -26.5           | -26.5           | -26.5           |

**Time Needed for Diagnosis:** 10 seconds × 5 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK when the continuous time of completing the malfunction criteria below becomes more than 10 seconds.

### Judgment Value

| Malfunction Criteria                    | Threshold Value |
|---|-----------------|
| $fsobd = (sglmd - tglmda) + faf + flaf$ | $\geq -20\%$    |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When "Clear Memory" was performed

### 7. FAIL SAFE

Purge control solenoid valve control: Not allowed to purge.

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## AL:DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE

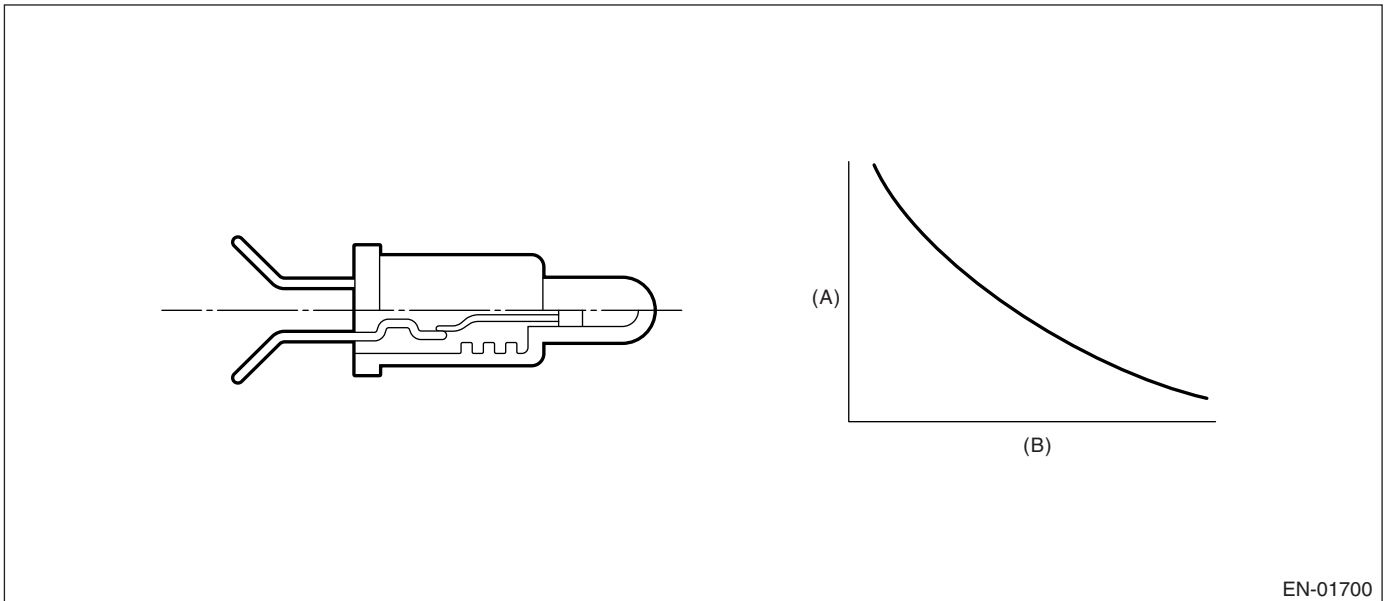
### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel temperature sensor output property. Perform the diagnosis in two methods; namely, drift diagnosis and stuck diagnosis. Judge NG when either of them results in NG, and judge OK when both of them result in OK.

#### • Drift Diagnosis

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and make an NG judgment.

### 2. COMPONENT DESCRIPTION



(A) Resistance value ( $\Omega$ )

(B) Fuel temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 120 seconds.

#### Judgment Value

| Malfunction Criteria   | Threshold Value                             |
|--|---|
| Fuel level   | $\geq 9.0 \ell$ (2.38 US gal, 1.98 Imp gal) |
| After engine starting  | 20 seconds or more                          |
| Engine coolant temperature – engine coolant temperature at engine starting | $> 10^{\circ}\text{C}$ (18°F)               |
| Fuel temperature – engine coolant temperature                              | $\geq 10^{\circ}\text{C}$ (18°F)            |
| Battery voltage  | $> 10.9 \text{ V}$                          |

**Time Needed for Diagnosis:** 120 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value                             |
|--|---|
| Fuel level   | $\geq 9.0 \ell$ (2.38 US gal, 1.98 Imp gal) |
| After engine starting  | 20 seconds or more                          |
| Engine coolant temperature – engine coolant temperature at engine starting | $> 10^{\circ}\text{C}$ (18°F)               |
| Fuel temperature – engine coolant temperature                              | $< 10^{\circ}\text{C}$ (18°F)               |
| Engine coolant temperature   | $< 75^{\circ}\text{C}$ (167°F)              |
| Battery voltage  | $> 10.9 \text{ V}$                          |

#### • Stuck Diagnosis

If the fuel temperature which might rise along with the engine idling (the cumulative amount of intake air after engine starting is large) does not increase, the engine is considered to be stuck and make an NG judgment.

### 6. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions  |
|-----------------------|--------------------|
| After engine starting | 20 seconds or more |
| Battery voltage       | $> 10.9 \text{ V}$ |

### 7. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 20 seconds or more after starting the engine.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 8. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                              | Threshold Value     |
|---|---------------------|
| Accumulated amount of intake air                  | ≥ 551 kg (1,215 lb) |
| Fuel temperature difference between Max. and Min. | < 2°C (3.6°F)       |

**Time Needed for Diagnosis:**To be determined.

**Malfunction Indicator Light Illumination:**Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                              | Threshold Value     |
|---|---------------------|
| Accumulated amount of intake air                  | ≥ 551 kg (1,215 lb) |
| Fuel temperature difference between Max. and Min. | ≥ 2°C (3.6°F)       |

## 9. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 10.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 11.FAIL SAFE

None

## 12.ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

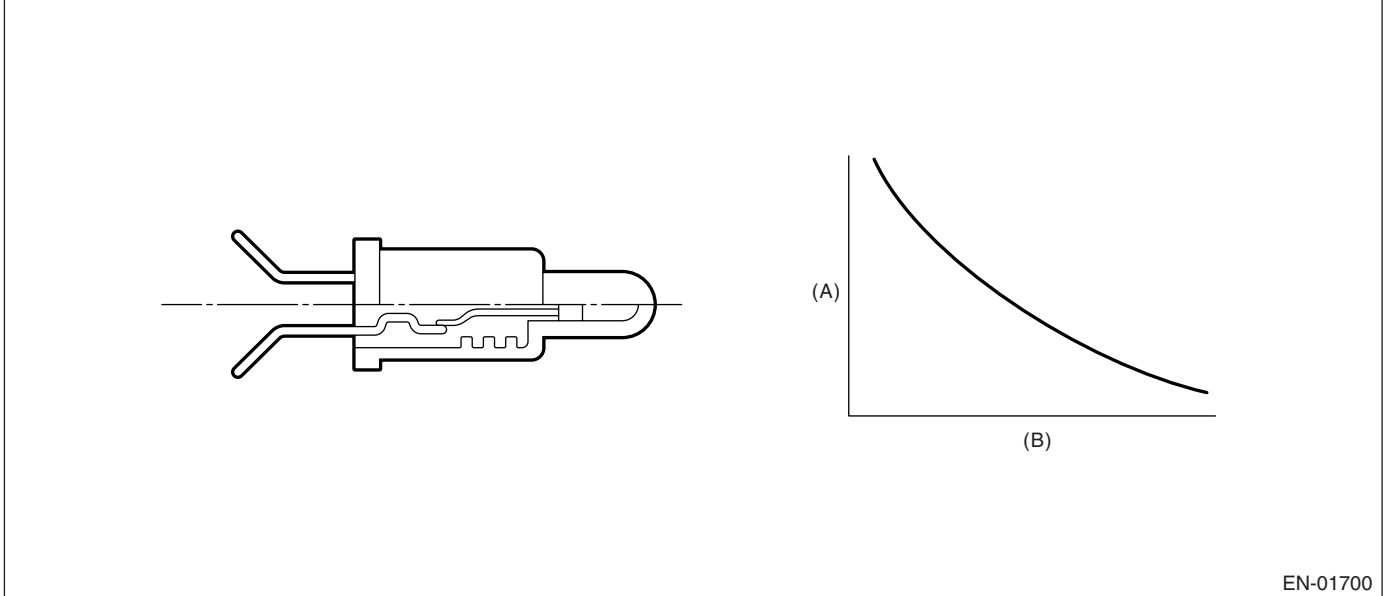
## GENERAL DESCRIPTION

### AM:DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



(A) Resistance value ( $\Omega$ )

(B) Fuel temperature °C (°F)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.166 V       |
| Battery voltage      | $\geq 10.9$ V   |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

##### • Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 0.166$ V  |
| Battery voltage      | $\geq 10.9$ V   |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

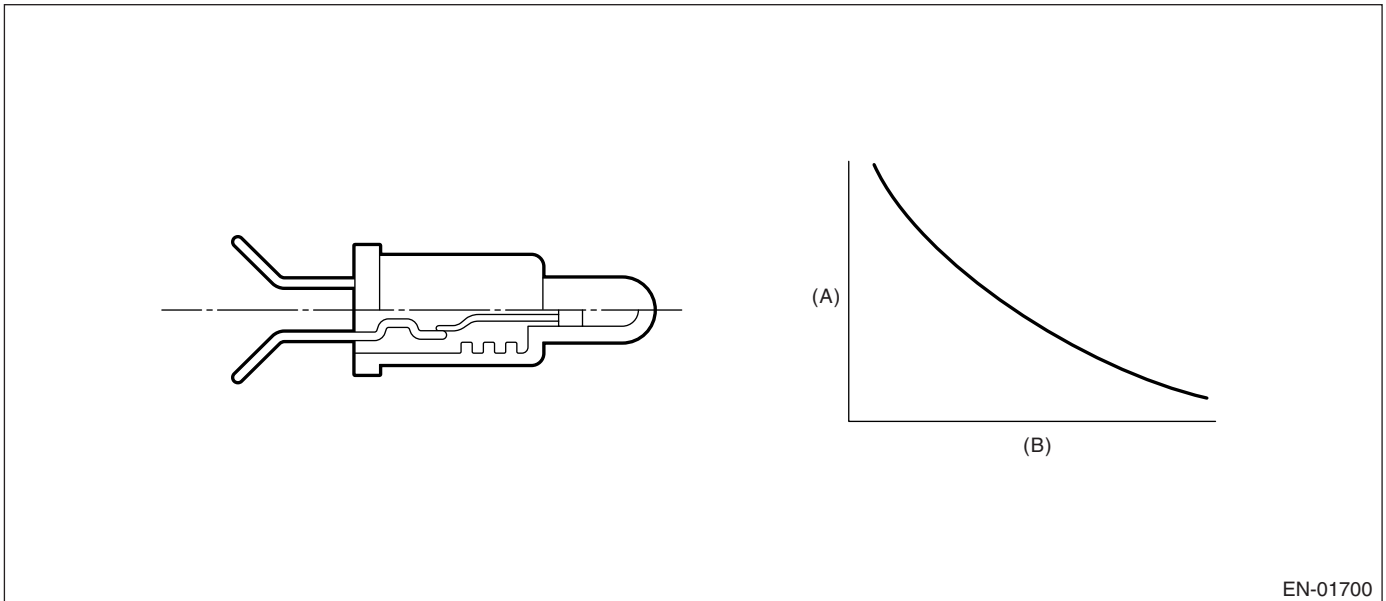
Memorize the freeze frame data. (For test mode \$02)

## AN:DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



(A) Resistance value ( $\Omega$ )

(B) Fuel temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria | Threshold Value        |
|----------------------|------------------------|
| Output voltage       | $\geq 4.716 \text{ V}$ |
| Battery voltage      | $\geq 10.9 \text{ V}$  |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### • Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria | Threshold Value       |
|----------------------|-----------------------|
| Output voltage       | $< 4.716 \text{ V}$   |
| Battery voltage      | $\geq 10.9 \text{ V}$ |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## AO:DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine oil temperature sensor output property.

Judge NG when the engine oil temperature does not increase regardless of the driving condition that engine oil temperature may be thought to increase.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | ≥ 10.9 V          |
| Engine speed         | 500 rpm           |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below is completed.

#### Judgment Value

| Malfunction Criteria  | Threshold Value   |
|---|---|
| Engine oil temperature  | < 15°C (59°F)   |
| Timer for diagnosis of oil temperature sensor after engine starting | ≥ Judgment value of timer for diagnosis of oil temperature sensor after engine starting |

Timer for diagnosis of oil temperature sensor after engine starting (Timer for diagnosis)

a) Timer stop at fuel cut mode.

b) During the driving condition (except a) above), timer count up by 64ms + TOILCNT ms at every 64ms.

Where, TOILCNT is determined as follows,

TOILCNT = 0 at idle switch on,

Refer to the following table for TWCNT with idle switch OFF.

|                  |           | Vehicle speed km/h (MPH) |          |          |          |          |          |          |          |
|------------------|-----------|--------------------------|----------|----------|----------|----------|----------|----------|----------|
|                  |           | 0 (0)                    | 8 (5)    | 16 (10)  | 24 (15)  | 32 (20)  | 40 (25)  | 48 (30)  | 56 (35)  |
| Temp.<br>°C (°F) | -30 (-22) | 64 ms                    | 73.2 ms  | 83.9 ms  | 96.3 ms  | 113.2 ms | 133.9 ms | 160.2 ms | 194.6 ms |
|                  | -20 (-4)  | 64 ms                    | 73.3 ms  | 84 ms    | 96.6 ms  | 113.7 ms | 135 ms   | 162 ms   | 197.4 ms |
|                  | -10 (14)  | 64 ms                    | 73.4 ms  | 84.2 ms  | 96.9 ms  | 114.5 ms | 136.4 ms | 164.4 ms | 201.5 ms |
|                  | 0 (32)    | 64 ms                    | 73.5 ms  | 84.5 ms  | 97.4 ms  | 115.6 ms | 138.5 ms | 168 ms   | 207.6 ms |
|                  | 10 (50)   | 102.2 ms                 | 114.8 ms | 129.4 ms | 146.7 ms | 171.7 ms | 203.4 ms | 245.1 ms | 302.1 ms |

Judgment value of Timer for diagnosis of oil temperature sensor after engine starting (t)

$$t = 1,882,940 - 43,302 \times T_i \quad (t \geq 1,882,940)$$

T<sub>i</sub> is a lowest engine coolant temperature after starting the engine.

**Time needed for diagnosis:** To be determined.

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK when the malfunction criteria below is completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Engine oil temperature | ≥ 15°C (59°F)   |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Memory Clear" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK idling cycle was completed 3 times in a row
- When "Memory Clear" was performed

### 7. FAIL SAFE

Oil temperature sensor process: Fix the engine oil temperature 70°C (158°F)

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## AP:DTC P0197 ENGINE OIL TEMPERATURE SENSOR CIRCUIT LOW

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of engine oil temperature sensor.  
Judge NG when out of the standard value.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing malfunction criteria below becomes more than 0.5 seconds.

Judge OK and clear NG when the malfunction criteria below is not completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | ≤ 0.166 V       |

**Time needed for diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Memory Clear" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK idling cycle was completed 3 times in a row
- When "Memory Clear" was performed

### 7. FAIL SAFE

Oil temperature sensor process: Fix the engine oil temperature 70°C (158°F)

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## AQ:DTC P0198 ENGINE OIL TEMPERATURE SENSOR CIRCUIT HIGH

### 1. OUTLINE OF DIAGNOSIS

Detect the open or the short circuit of engine oil temperature sensor.  
Judge NG when out of the judgment value.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing malfunction criteria below becomes more than 0.5 seconds.

Judge OK and clear NG when the malfunction criteria below is not completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.716$ V  |

**Time needed for diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Memory Clear" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK idling cycle was completed 3 times in a row
- When "Memory Clear" was performed

### 7. FAIL SAFE

Oil temperature sensor process: Fix the engine oil temperature 70°C (158°F)

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

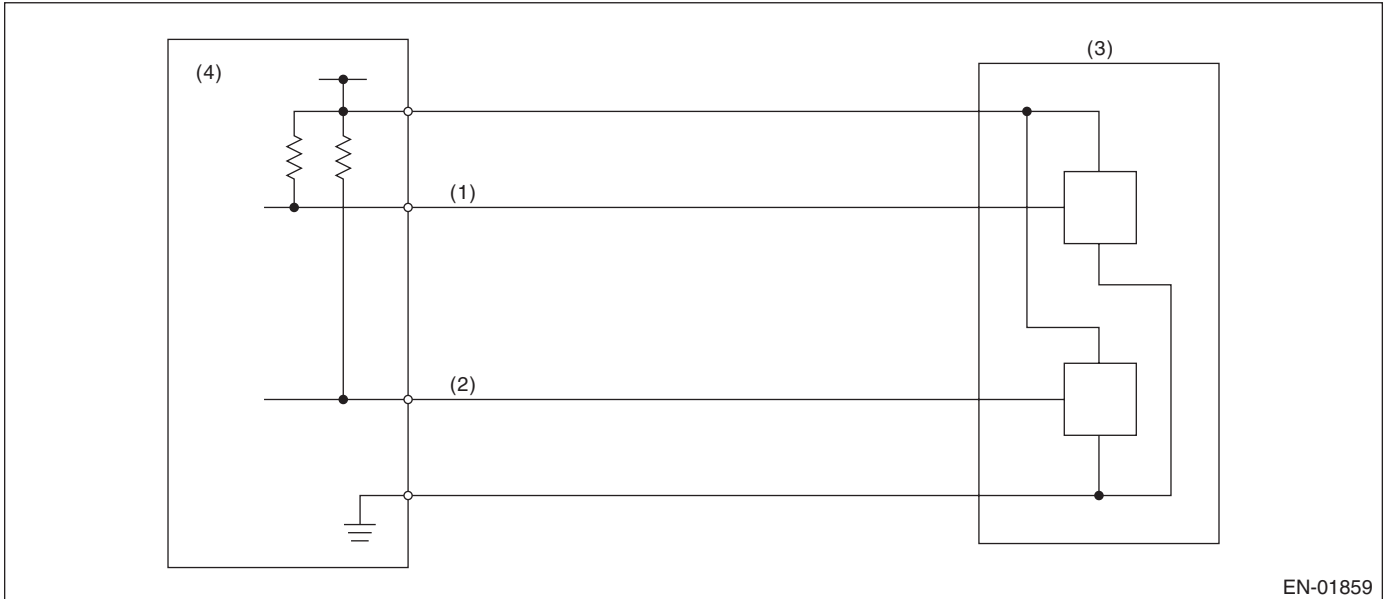
## GENERAL DESCRIPTION

### AR:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- |                                       |                                 |
|---------------------------------------|---------------------------------|
| (1) Throttle position sensor 1 signal | (3) Throttle position sensor    |
| (2) Throttle position sensor 2 signal | (4) Engine control module (ECM) |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 2 input voltage | $\geq 0.749$ V  |

**Time Needed for Diagnosis:**24 milliseconds

**Malfunction Indicator Light Illumination:**Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

## 8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

## 9. ECM OPERATION AT DTC SETTING

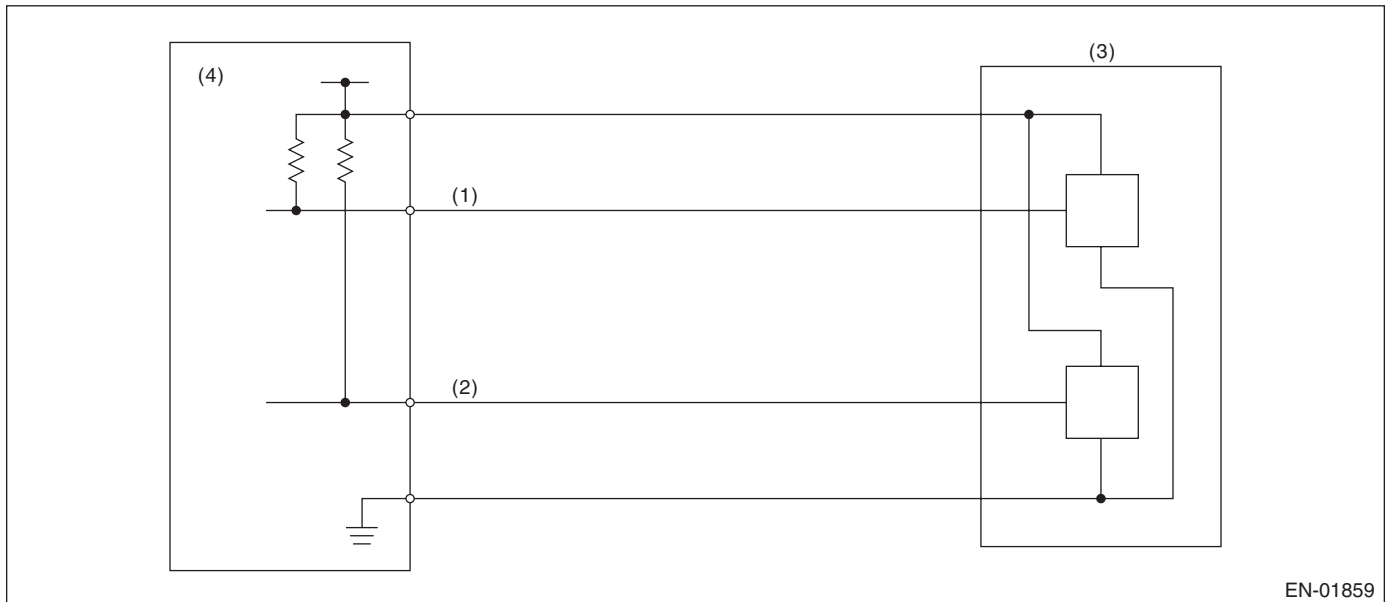
Memorize the freeze frame data. (For test mode \$02)

# AS:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



- |                                       |                                 |
|---------------------------------------|---------------------------------|
| (1) Throttle position sensor 1 signal | (3) Throttle position sensor    |
| (2) Throttle position sensor 2 signal | (4) Engine control module (ECM) |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 2 input voltage | $\leq 4.747$ V  |

**Time Needed for Diagnosis:** 24 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## AT:DTC P0301 CYLINDER 1 MISFIRE DETECTED

### 1. OUTLINE OF DIAGNOSIS

Detect whether the misfire occurred or not. (Revolution fluctuation method) Monitoring the misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has three patterns below.

- Intermittent misfire (The same cylinder misfires in random, or different cylinders misfire in random.): FTP 1.5 times misfire
- Every time misfire (The same cylinder misfires every time.): FTP 1.5 times misfire, Catalyst damage misfire

The following detecting methods are adopted for these detection.

1) Intermittent misfire: FTP 1.5 times misfire

- 180° Interval Difference Method (MT: 1,800 rpm or less; AT: None)
- 360° Interval Difference Method (whole range)
- 720° Interval Difference Method (3,000 rpm or less)

2) Every time misfire: FTP 1.5 times misfire, Catalyst damage misfire

- 360° Interval Difference Method

### 2. ENABLE CONDITION

| Secondary Parameters                                   | Enable Conditions                   |
|--|-------------------------------------|
| All secondary parameter enable conditions              | More than 1 second                  |
| Intake manifold pressure change during 0.5 engine rev. | < 13.3 kPa (100 mmHg, 3.94 inHg)    |
| Throttle position change during 16 milliseconds        | < 21°                               |
| Fuel shut-off function                                 | Not operating                       |
| Atmospheric pressure                                   | ≥ 75.0 kPa (563 mmHg, 22.2 inHg)    |
| Fuel level   | ≥ 9.0 ℓ (2.38 US gal, 1.98 Imp gal) |
| AT torque control                                      | Not in operation                    |
| Evaporative system leak check                          | Not in operation                    |
| Engine speed   | 460 — 6,200 rpm                     |
| Intake manifold pressure                               | > Map 3                             |
| Battery voltage  | ≥ 8 V                               |
| Conclusion of fuel parameter                           | Not supervolatile                   |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## Map3

### MT (Vehicle Speed < 64.4 km/h (40 MPH))

| rpm             | 650            | 1000           | 1500           | 2000           | 2500           | 3000           | 3500           | 4000           | 4500           | 5000           | 5500            | 6000            | 6400            |
|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-----------------|-----------------|
| kPa             | 25.6           | 23.1           | 20.0           | 20.0           | 20.0           | 21.6           | 26.4           | 28.0           | 29.5           | 32.4           | 36.4            | 39.9            | 44.5            |
| (mmHg,<br>inHg) | (192,<br>7.56) | (173,<br>6.82) | (150,<br>5.91) | (150,<br>5.91) | (150,<br>5.91) | (162,<br>6.38) | (198,<br>7.80) | (210,<br>8.27) | (221,<br>8.71) | (243,<br>9.57) | (273,<br>10.75) | (299,<br>11.78) | (324,<br>13.14) |

### MT (Vehicle Speed ≥ 64.4 km/h (40 MPH))

| rpm             | 650            | 1000           | 1500           | 2000           | 2500           | 3000           | 3500            | 4000           | 4500           | 5000           | 5500            | 6000            | 6400            |
|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|----------------|----------------|----------------|-----------------|-----------------|-----------------|
| kPa             | 31.6           | 31.6           | 31.6           | 31.1           | 31.3           | 33.1           | 33.9            | 28.8           | 30.1           | 33.3           | 36.9            | 40.1            | 44.5            |
| (mmHg,<br>inHg) | (237,<br>9.33) | (237,<br>9.33) | (237,<br>9.33) | (233,<br>9.19) | (235,<br>9.24) | (248,<br>9.78) | (254,<br>10.01) | (216,<br>8.51) | (226,<br>8.89) | (250,<br>9.84) | (277,<br>10.90) | (301,<br>11.84) | (324,<br>13.14) |

## AT

| rpm             | 700            | 1000           | 1500           | 2000           | 2500           | 3000           | 3500           | 4000           | 4500           | 5000            | 5500            | 6000            | 6400            |
|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-----------------|-----------------|-----------------|
| kPa             | 25.6           | 24.4           | 22.0           | 22.4           | 22.8           | 23.9           | 29.9           | 31.3           | 29.9           | 35.6            | 39.3            | 43.3            | 44.5            |
| (mmHg,<br>inHg) | (192,<br>7.56) | (183,<br>7.21) | (165,<br>6.50) | (168,<br>6.62) | (171,<br>6.73) | (179,<br>7.06) | (224,<br>8.83) | (235,<br>9.24) | (244,<br>8.83) | (267,<br>10.51) | (295,<br>11.61) | (325,<br>12.79) | (334,<br>13.14) |

## 3. GENERAL DRIVING CYCLE

- Detecting misfire between idling and high revolution.
- Perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 4. DIAGNOSTIC METHOD

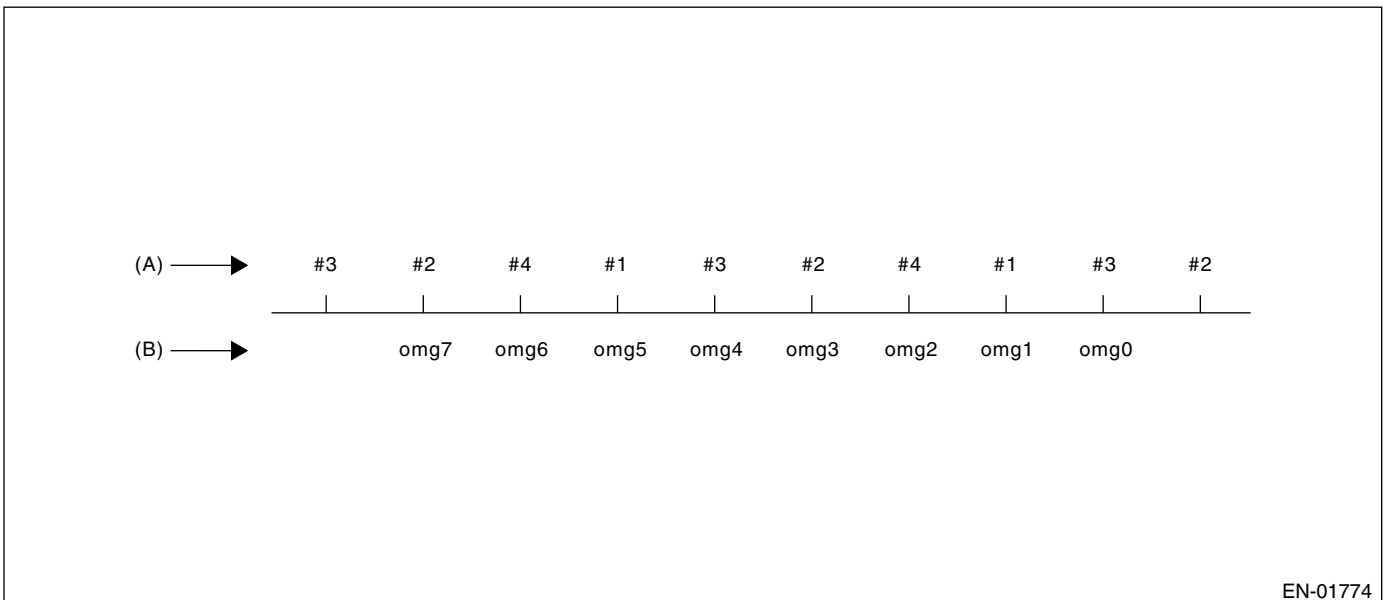
When the misfire occurred, the engine speed is decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether the misfire occurs or not comparing the calculated result with judgment value. Counting the number of misfire up, and if the misfire ratio is higher during 1,000 rev. or 200 rev., judge NG for the corresponding cylinder.

Calculate the diagnostic value (from crankshaft position speed)

- Misfire detection every single ignition (Compare diagnostic value with judgment value)
- 180° Interval Difference Method
  - 360° Interval Difference Method
  - 720° Interval Difference Method

- NG judgment (Judge misfire occurrence required by the law) (Compare number of misfire with judgment)
- FTP1.5 times misfire NG judgment
  - Catalyst damage misfire NG judgment

As the following figure, pick out a random cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, and the following is the same.



EN-01774

(A) Ignition order

(B) Crankshaft position speed

# Diagnostic Trouble Code (DTC) Detecting Criteria

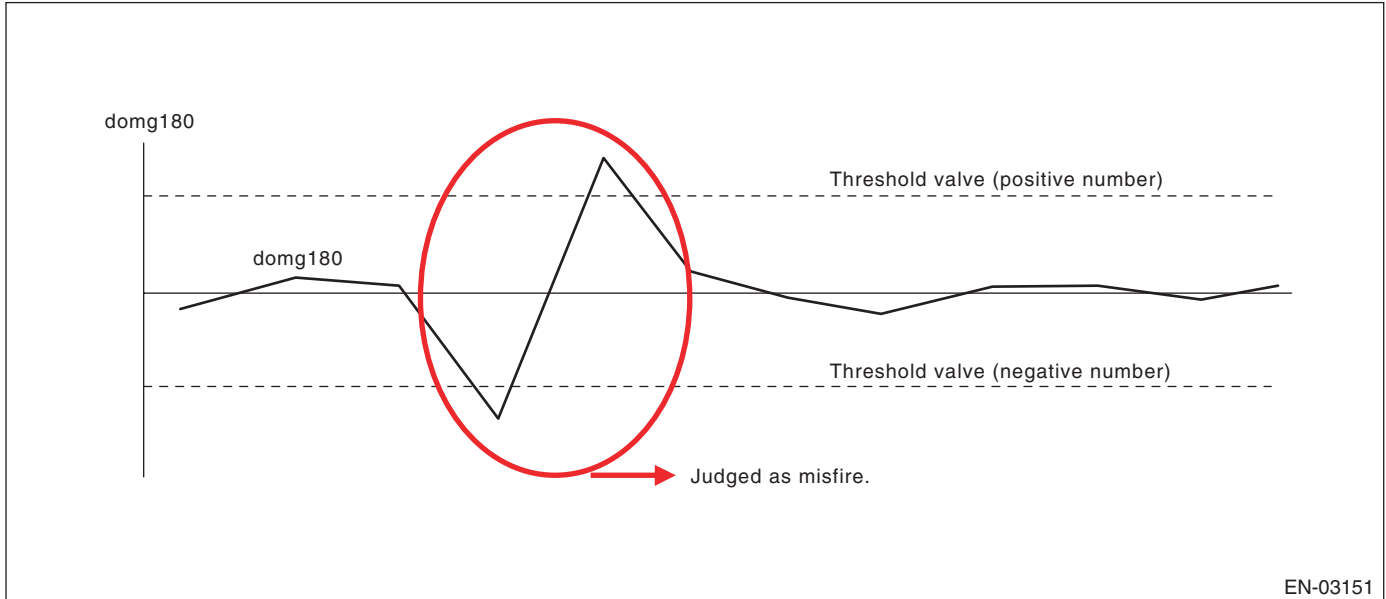
GENERAL DESCRIPTION

## • 180° Interval Difference Method

Diagnosis value  $domg\ 180 = (omg\ -1\ omg\ 0) - (omg\ 5 - omg\ 1)/4$

Judge misfire occurs in the following cases.

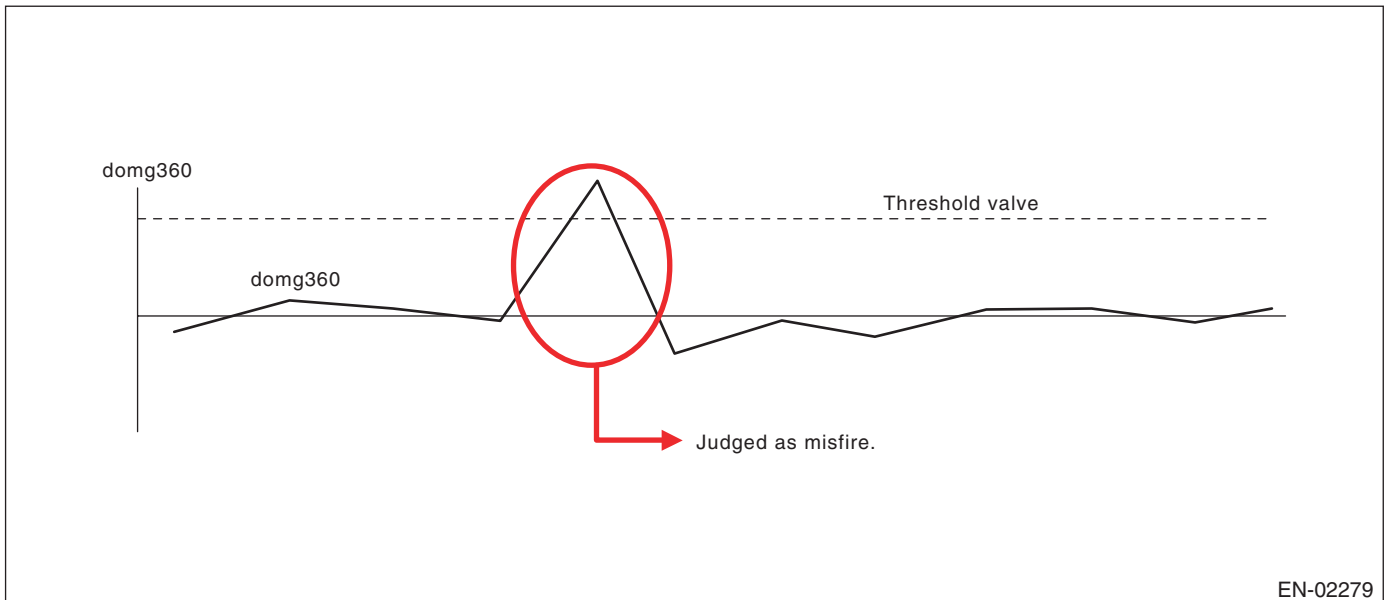
- $domg\ 180 >$  judgment value of positive side
- $domg\ 180 \leq$  judgment value of negative side  
(judgment value before 180°CA)



## • 360° Interval Difference Method

Diagnosis value  $domg\ 360 = (omg\ 1 - omg\ 0) - (omg\ 3 - omg\ 2)$

Misfire judgment  $domg\ 360 >$  judgment value  $\rightarrow$  Misfire occurs



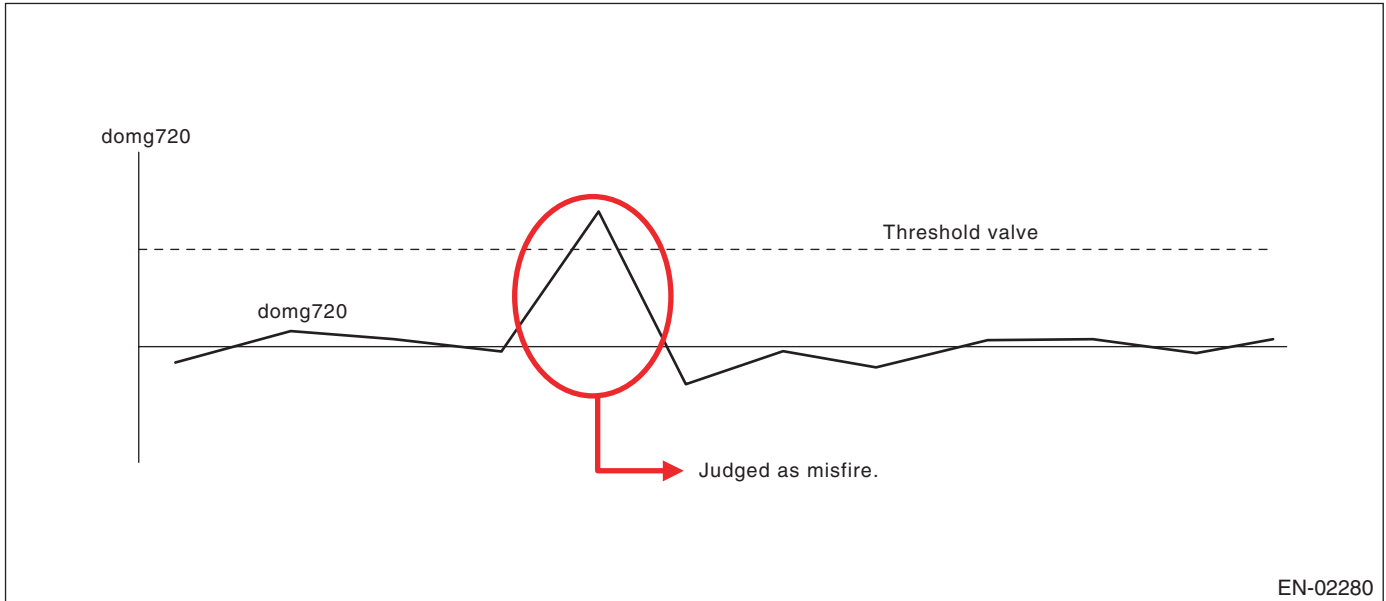
# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • 720° Interval Difference Method

Diagnosis value  $domg\ 720 = (omg\ 1 - omg\ 0) - (omg\ 5 - omg\ 4)$

Misfire judgment  $domg\ 720 > \text{judgment value} \rightarrow \text{Misfire occurs}$



### • FTP 1.5 times misfire (Misfire occurrence level affecting exhaust gas)

**Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1,000 engine revs.)**

| Malfunction Criteria        | Threshold Value       |
|-----------------------------|-----------------------|
| FTP emission judgment value | > 1.0% in 1,000 revs. |

**Time Needed for Diagnosis:** 1,000 engine revs.

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Catalyst damage misfire (Misfire occurrence level damaging catalyst)

**Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 200 engine revs. (400 ignitions))**

| Malfunction Criteria                   | Threshold Value |
|--|-----------------|
| Catalyst damage misfire judgment value | See Map 1       |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## Map 1 Fault criteria threshold for misfire which would result in catalyst damage

| percentage               |      | Intake air (g (oz)/rev.) |                 |                |                 |                 |                 |                 |                |                |                |
|--------------------------|------|--------------------------|-----------------|----------------|-----------------|-----------------|-----------------|-----------------|----------------|----------------|----------------|
|                          |      | 0.16<br>(0.0006)         | 0.28<br>(0.010) | 0.4<br>(0.014) | 0.52<br>(0.018) | 0.64<br>(0.023) | 0.76<br>(0.027) | 0.92<br>(0.032) | 1.1<br>(0.039) | 1.2<br>(0.042) | 1.3<br>(0.046) |
| Engine<br>speed<br>(rpm) | 700  | 25                       | 25              | 25             | 25              | 22.5            | 20              | 16              | 12             | 12             | 12             |
|                          | 1000 | 25                       | 25              | 25             | 25              | 22.5            | 20              | 15.75           | 11             | 11             | 11             |
|                          | 1500 | 25                       | 25              | 22.5           | 20              | 18.25           | 16.75           | 13.5            | 10             | 10             | 10             |
|                          | 2000 | 20                       | 20              | 20             | 20              | 17              | 14.25           | 12.75           | 11             | 11             | 11             |
|                          | 2500 | 20                       | 20              | 18.25          | 16.75           | 15.5            | 14.25           | 12.75           | 11             | 11             | 11             |
|                          | 3000 | 16.75                    | 16.75           | 15.5           | 14.25           | 12.75           | 11              | 11              | 11             | 11             | 11             |
|                          | 3500 | 16.75                    | 16.75           | 14             | 11              | 10              | 9               | 8.5             | 7.75           | 7.75           | 7.75           |
|                          | 4000 | 14.25                    | 14.25           | 11             | 7.75            | 6               | 5               | 5               | 5              | 5              | 5              |
|                          | 4500 | 11                       | 11              | 8.25           | 7.75            | 5               | 5               | 5               | 5              | 5              | 5              |
|                          | 5000 | 11                       | 11              | 9.5            | 7.75            | 5               | 5               | 5               | 5              | 5              | 5              |
|                          | 5500 | 9                        | 9               | 7.75           | 6.75            | 5               | 5               | 5               | 5              | 5              | 5              |
|                          | 6000 | 9                        | 5               | 5              | 5               | 5               | 5               | 5               | 5              | 5              | 5              |
| 6400                     | 9    | 5                        | 5               | 5              | 5               | 5               | 5               | 5               | 5              | 5              |                |

These figures mean the misfire ratio (%) in 400 ignitions; for example, 22.5 (%) means 400 (ignition) × 22.5 (%) = 90 (ignition) or more, so this case is judged misfire.

**Time Needed for Diagnosis:** 200 engine revs.

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## AU: DTC P0302 CYLINDER 2 MISFIRE DETECTED

### 1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4SO)-78, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

## AV: DTC P0303 CYLINDER 3 MISFIRE DETECTED

### 1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4SO)-78, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

## AW: DTC P0304 CYLINDER 4 MISFIRE DETECTED

### 1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4SO)-78, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>



# Diagnostic Trouble Code (DTC) Detecting Criteria

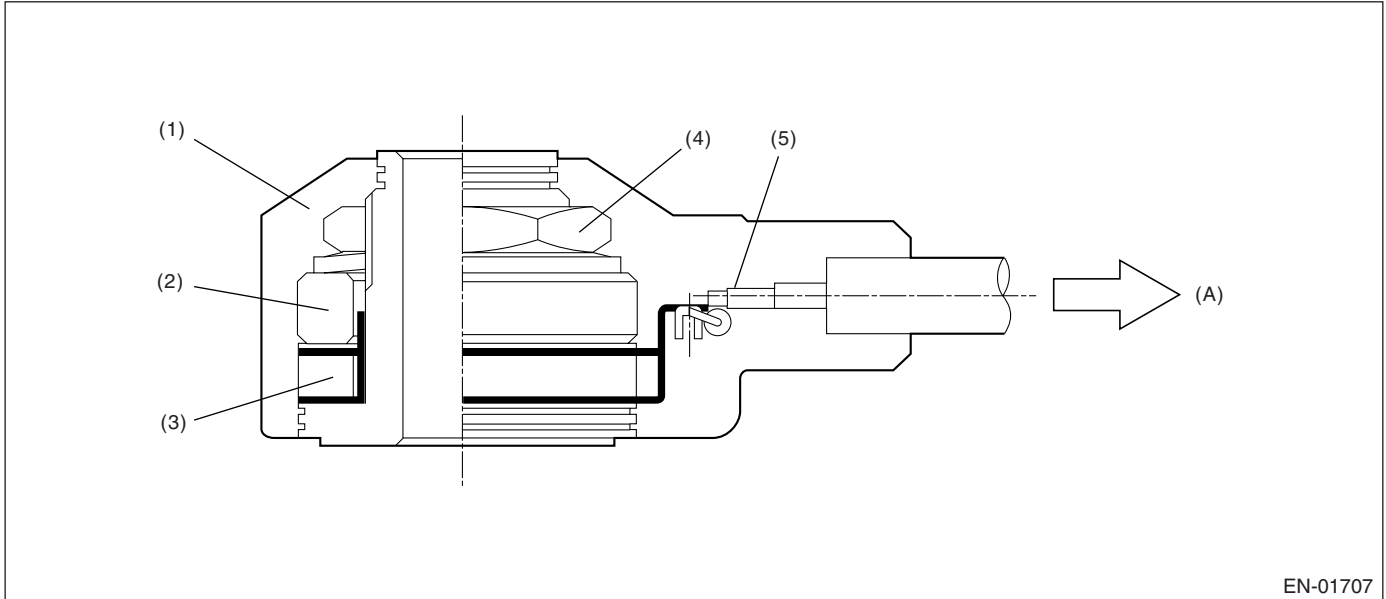
## GENERAL DESCRIPTION

### AX:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Case
- (2) Weight
- (3) Piezoelectric element

- (4) Nut
- (5) Resistance

- (A) To knock sensor harness

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.238 V       |
| Ignition switch      | ON              |

**Time Needed for Diagnosis:**1 second

**Malfunction Indicator Light Illumination:**Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 0.25$ V   |
| Ignition switch      | ON              |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

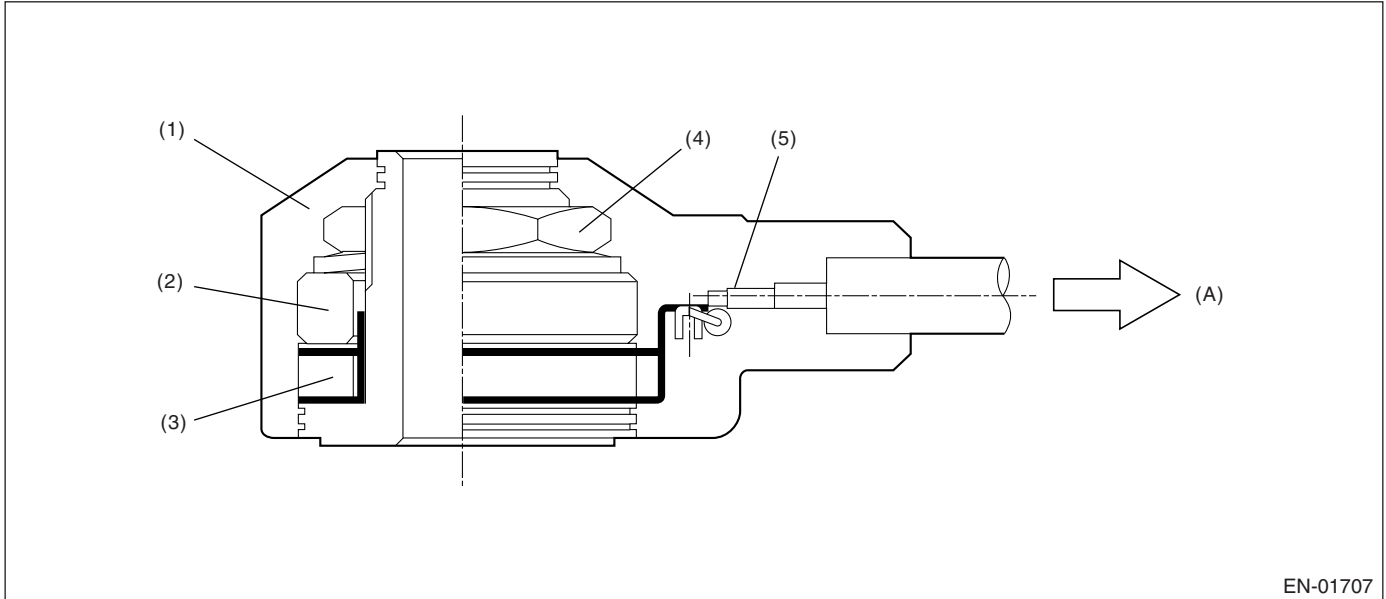
## GENERAL DESCRIPTION

### AY:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Case
- (2) Weight
- (3) Piezoelectric element

- (4) Nut
- (5) Resistance

- (A) To knock sensor harness

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.714$ V  |
| Ignition switch      | ON              |

**Time Needed for Diagnosis:**1 second

**Malfunction Indicator Light Illumination:**Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 4.7 V         |
| Ignition switch      | ON              |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

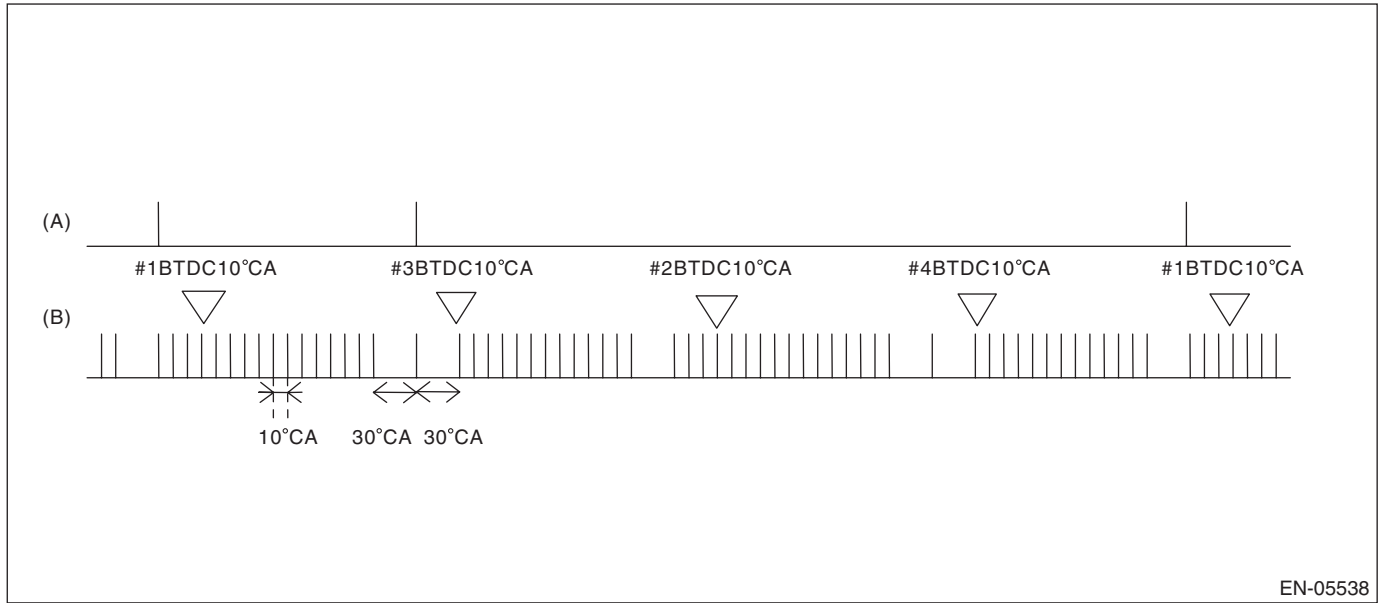
## GENERAL DESCRIPTION

### AZ:DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT

#### 1. OUTLINE OF DIAGNOSIS

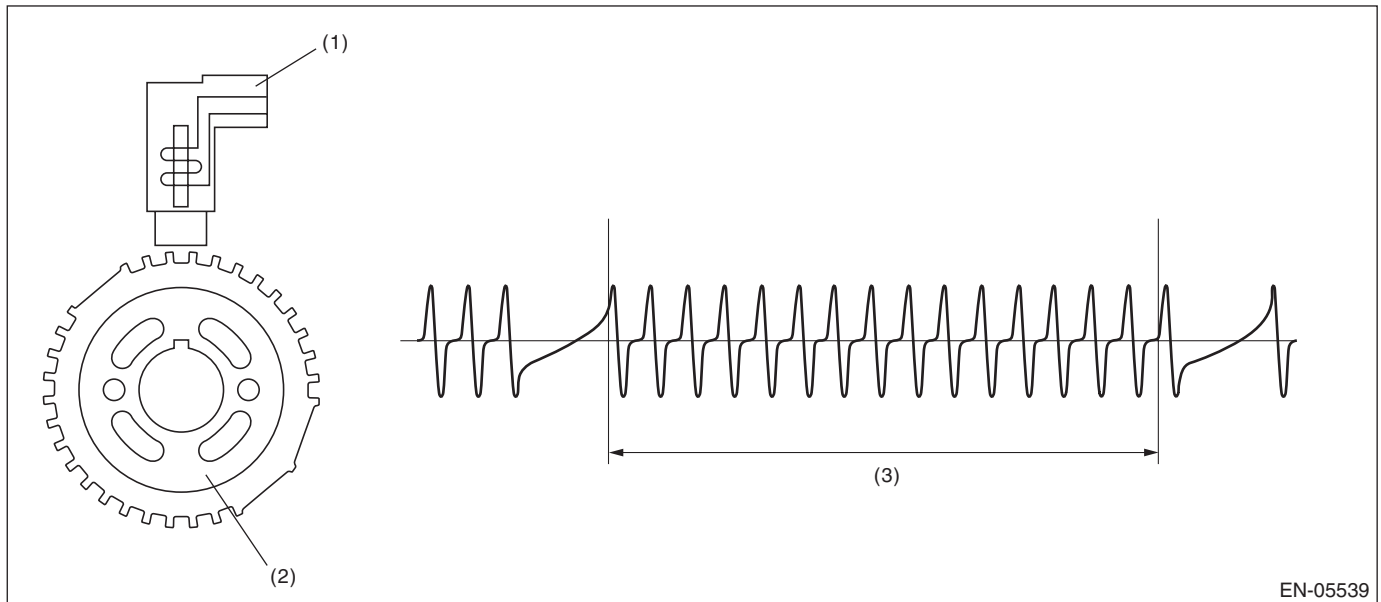
Detect the open or short circuit of crankshaft position sensor. Judge NG when the crankshaft signal does not input regardless of turning the starter.

#### 2. COMPONENT DESCRIPTION



(A) Camshaft signal

(B) Crankshaft signal



(1) Crankshaft position sensor

(2) Crank sprocket

(3) Crankshaft half-turn

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

### Judgment Value

| Malfunction Criteria              | Threshold Value |
|-----------------------------------|-----------------|
| Starter switch                    | ON              |
| Crankshaft position sensor signal | Not detected    |
| Battery voltage                   | $\geq 8$ V      |

**Time Needed for Diagnosis:**3 seconds

**Malfunction Indicator Light Illumination:**Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria              | Threshold Value |
|-----------------------------------|-----------------|
| Crankshaft position sensor signal | Input exists    |
| Battery voltage                   | $\geq 8$ V      |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

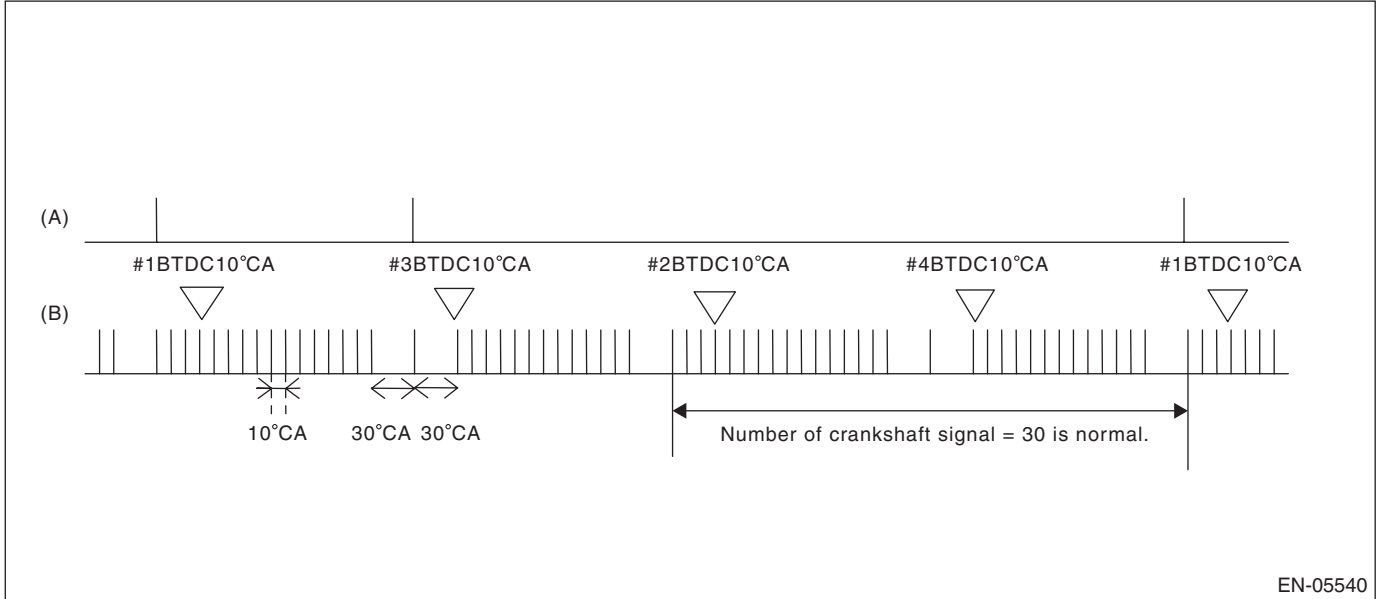
## GENERAL DESCRIPTION

### BA:DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE

#### 1. OUTLINE OF DIAGNOSIS

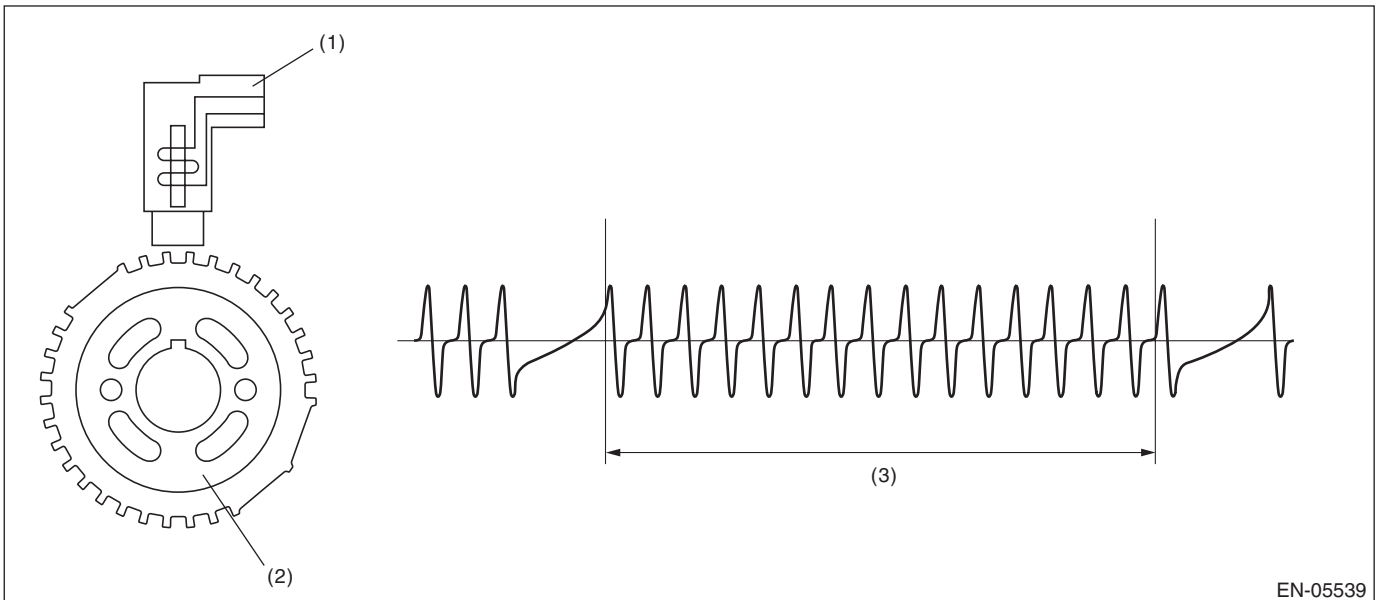
Detect the malfunction of crankshaft position sensor output property. Judge NG when the number of crankshaft signal every 1 revolution becomes abnormal.

#### 2. COMPONENT DESCRIPTION



(A) Camshaft signal

(B) Crankshaft signal



(1) Crankshaft position sensor

(2) Crank sprocket

(3) Crankshaft half-turn

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions     |
|----------------------|-----------------------|
| Battery voltage      | $\geq 8 \text{ V}$    |
| Engine speed         | $< 4,000 \text{ rpm}$ |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 4,000 rpm engine speed.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when all the malfunction criteria below are completed more than 10 times in a row.

### Judgment Value

| Malfunction Criteria                        | Threshold Value |
|---|-----------------|
| Cylinder number distinction                 | Completed       |
| Amount of crank sensor signal during 1 rev. | Not = 30        |

**Time Needed for Diagnosis:**10 engine revs.

**Malfunction Indicator Light Illumination:**Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria                        | Threshold Value |
|---|-----------------|
| Cylinder number distinction                 | Completed       |
| Amount of crank sensor signal during 1 rev. | = 30            |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

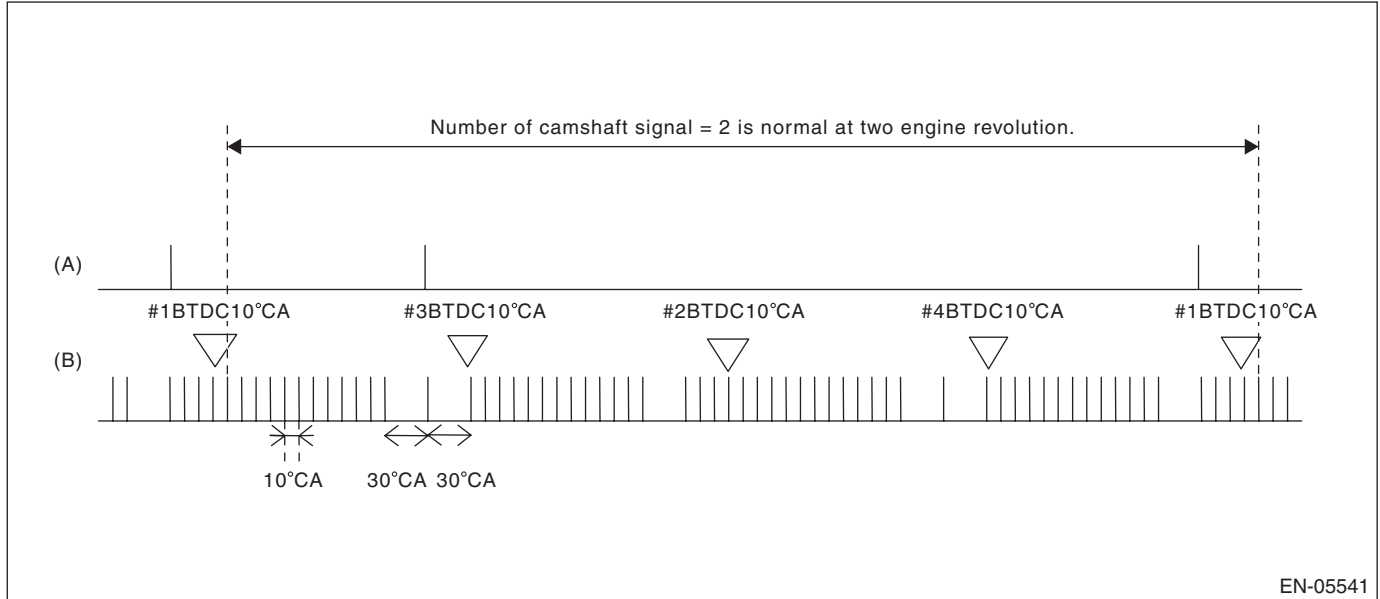
## GENERAL DESCRIPTION

### BB:DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of camshaft position sensor. Judge NG when the number of camshaft signal remains to be abnormal.

#### 2. COMPONENT DESCRIPTION



- (A) Camshaft signal
- (B) Crankshaft signal

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the engine speed continues 8 revolutions or more for the malfunction criteria below.

##### Judgment Value

| Malfunction Criteria                                    | Threshold Value |
|---|-----------------|
| Voltage   | ≥ 8 V           |
| Number of camshaft position sensor signal during 2 rev. | Except 2        |

**Time Needed for Diagnosis:** 8 rev.

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria                                    | Threshold Value    |
|---|--------------------|
| Voltage   | $\geq 8 \text{ V}$ |
| Number of camshaft position sensor signal during 2 rev. | 2                  |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

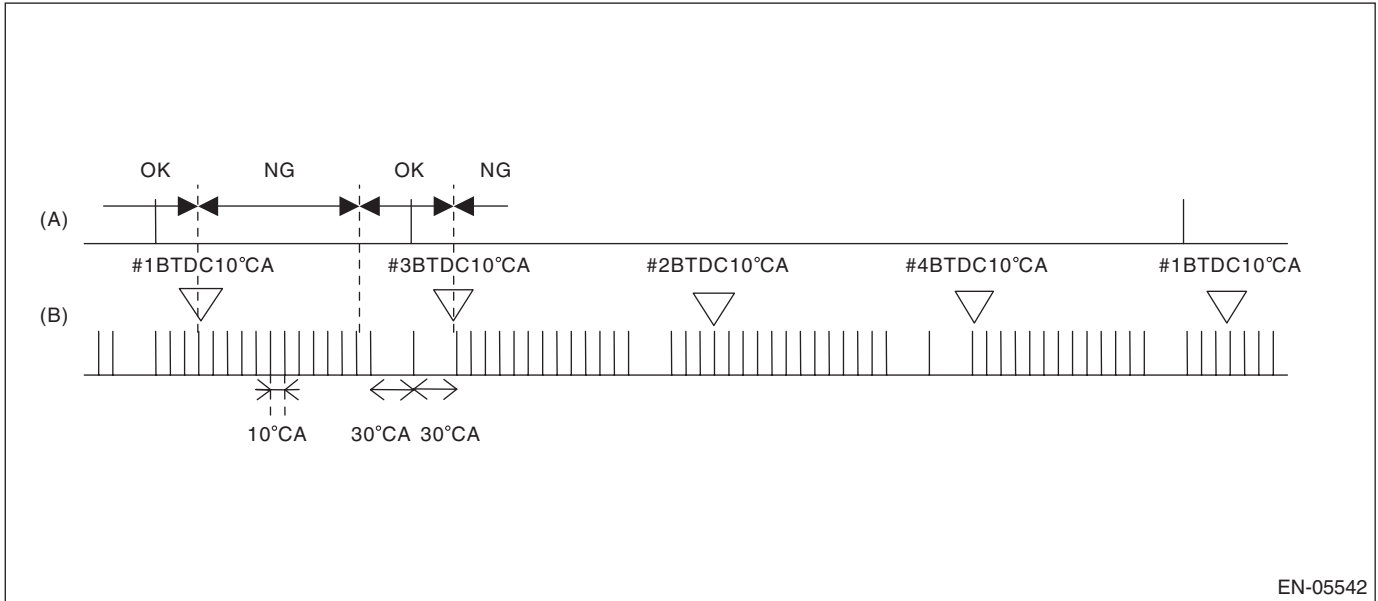
## GENERAL DESCRIPTION

### BC:DTC P0341 CAMSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR)

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of camshaft position sensor output property. Judge NG when the camshaft line signal input timing is shifted from the crankshaft signal because of timing belt tooth chip, etc.

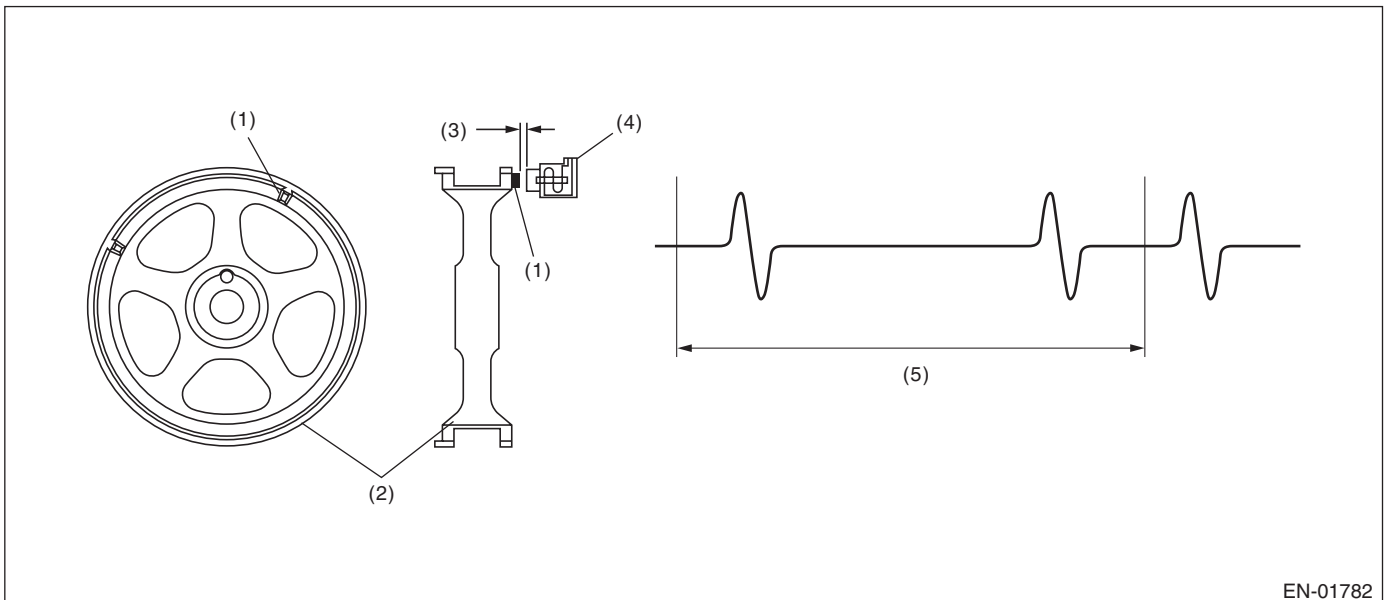
#### 2. COMPONENT DESCRIPTION



EN-05542

(A) Camshaft signal

(B) Crankshaft signal



EN-01782

- (1) Boss
- (2) Cam sprocket

- (3) Air gap
- (4) Camshaft position sensor

- (5) Camshaft one revolution (Engine two revolutions)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 3. ENABLE CONDITION

| Secondary Parameters        | Enable Conditions                   |
|-----------------------------|-------------------------------------|
| Cylinder number distinction | Completed                           |
| Battery voltage             | $\geq 8\text{ V}$                   |
| Engine speed                | 550 $\longleftrightarrow$ 1,000 rpm |
| Engine operation            | In idle                             |
| Misfire                     | Not detect                          |

## 4. GENERAL DRIVING CYCLE

Perform the diagnosis at idling continuously.

## 5. DIAGNOSTIC METHOD

Judge NG when the engine speed continues 4 revolutions for the malfunction criteria below. Judge OK and clear the NG when the malfunction criteria below are not completed.

### Judgment Value

| Malfunction Criteria                        | Threshold Value                             |
|---|---|
| Position of camshaft position sensor signal | Not between BTDC<br>10°CA and BTDC<br>80°CA |

**Time Needed for Diagnosis:**4 revs.

**Malfunction Indicator Light Illumination:**Illuminates when malfunction occurs in 2 continuous driving cycles.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

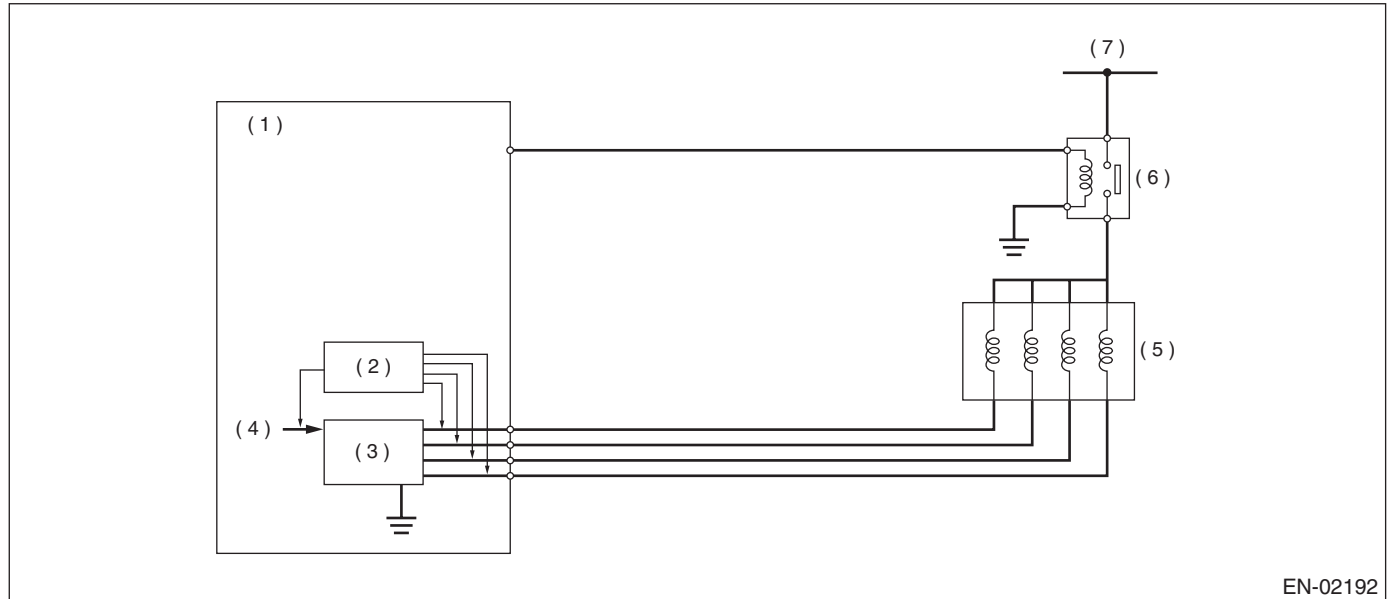
### BD:DTC P0400 EXHAUST GAS RECIRCULATION FLOW

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of EGR system.

Intake manifold pressure (negative pressure) is stable because the throttle valve is fully closed during the fuel shut-off in deceleration. In this case, the intake manifold pressure changes when EGR valve is opened or closed. Judge EGR system is OK or NG according to intake manifold pressure change amount.

#### 2. COMPONENT DESCRIPTION



- |                       |                |                     |
|-----------------------|----------------|---------------------|
| (1) ECM               | (4) CPU        | (7) Battery voltage |
| (2) Detecting circuit | (5) EGR valve  |                     |
| (3) Switching circuit | (6) Main relay |                     |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions                                   |
|---|---|
| After engine starting   | 40 secs. or more                                    |
| Engine coolant temperature  | $\geq 75^{\circ}\text{C}$ ( $167^{\circ}\text{F}$ ) |
| Engine speed  | 1,200 $\longleftrightarrow$ 2,950 rpm               |
| Intake manifold pressure (absolute pressure)  | $< 40.0$ kPa (300 mmHg, 11.81 inHg)                 |
| Estimated ambient temperature   | $\geq 5^{\circ}\text{C}$ ( $41^{\circ}\text{F}$ )   |
| Throttle position   | $< 0.25^{\circ}$                                    |
| Battery voltage   | $> 10.9$ V  |
| Atmospheric pressure  | $\geq 75.0$ kPa (563 mmHg, 22.17 inHg)              |
| Vehicle speed   | $\geq 53$ km/h (33 MPH)                             |
| Fuel shut-off function  | Operation   |
| Neutral switch  | OFF and 1 second after changing from "ON" to "OFF"  |
| Load (air conditioner, power steering, lights, rear defroster, heater fan and radiator fan) | 5 secs. or more no change                           |

## 4. GENERAL DRIVING CYCLE

Perform the diagnosis only once at the fuel shut-off in deceleration in vehicle speed more than 53 km/h (approx. 33 MPH). Pay attention to vehicle speed and engine speed. (The diagnosis is not completed if vehicle speed and engine speed are out of condition due to deceleration.)

## 5. DIAGNOSTIC METHOD

Measure the pressure in the following procedures when the enable conditions are completed, and then diagnosis by calculating the result.

- (1) PMOF1 is equal to the intake manifold pressure at enable condition completed, and EGR target step is set to 50 steps (almost fully opened).
- (2) PMON is equal to the intake manifold pressure in 1 second after EGR target step is set 50 steps (when enable conditions are completed), and EGR target step is set to 0 step.
- (3) PMOF2 is equal to the intake manifold pressure in 1 second after EGR target step is set to 0 step (in 2 seconds after enable conditions are completed).

### • Abnormality Judgment

Judge NG when the malfunction criteria below is completed. Judge OK when not completed.

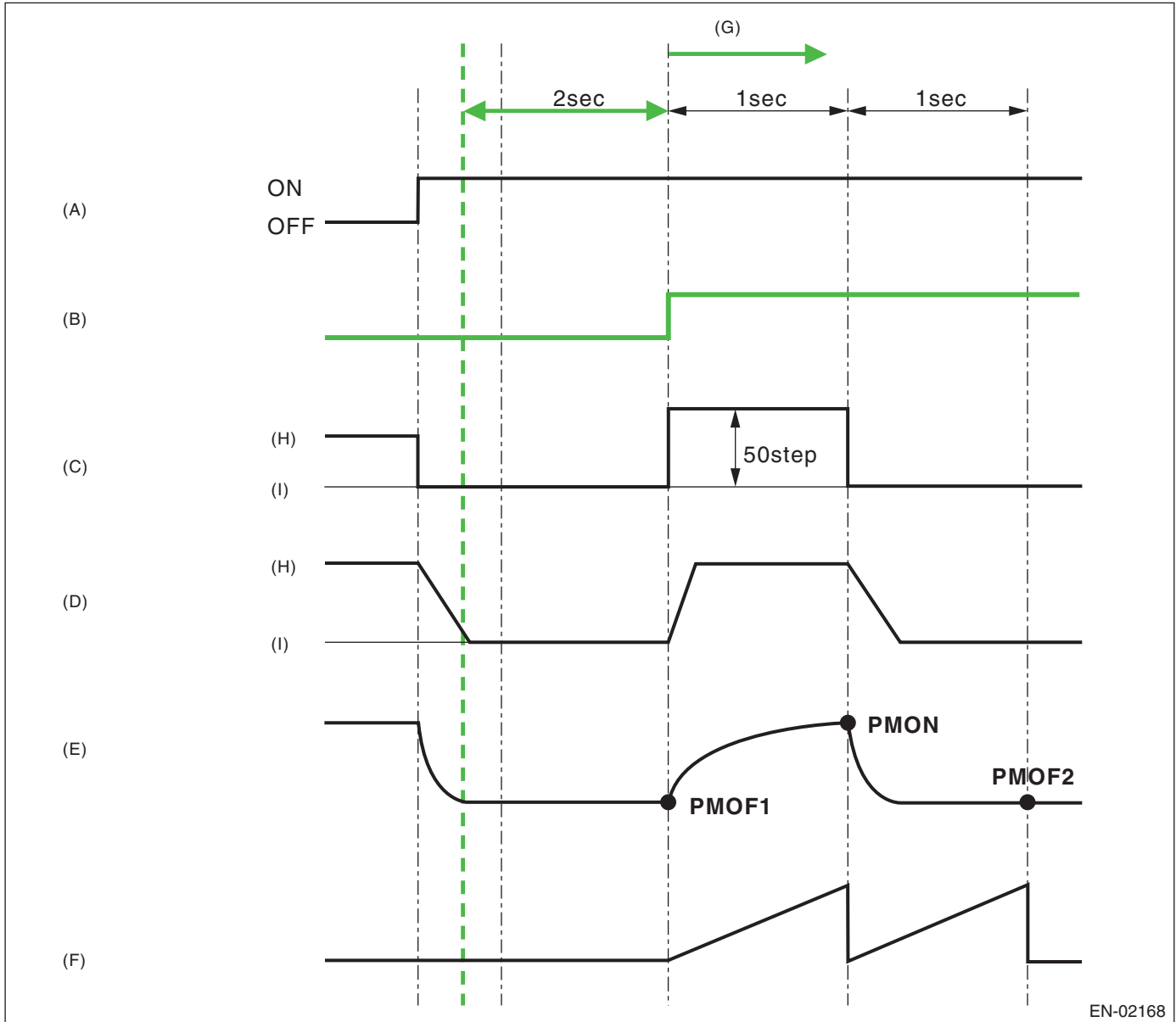
$\text{PMON} - (\text{PMOF1} + \text{PMOF2})/2 < 2.48$  kPa (18.63 mmHg, 0.733 inHg)

**Time Needed for Diagnosis:** Once

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.



EN-02168

- |                                   |  |           |
|-----------------------------------|--|-----------|
| (A) Fuel shut-off in deceleration | (E) Intake manifold pressure (At normal condition) | (H) Open  |
| (B) Diagnosis enable condition    | (F) Diagnosis mode timer                           | (I) Close |
| (C) EGR target step               | (G) Diagnosis starts.                              |           |
| (D) EGR actual step               |  |           |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

A/F main learning: Not allowed  
 Knock learning: Not allowed  
 EGR control: Not allowed to operate

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnosis value and trouble standard value. (For test mode \$06)

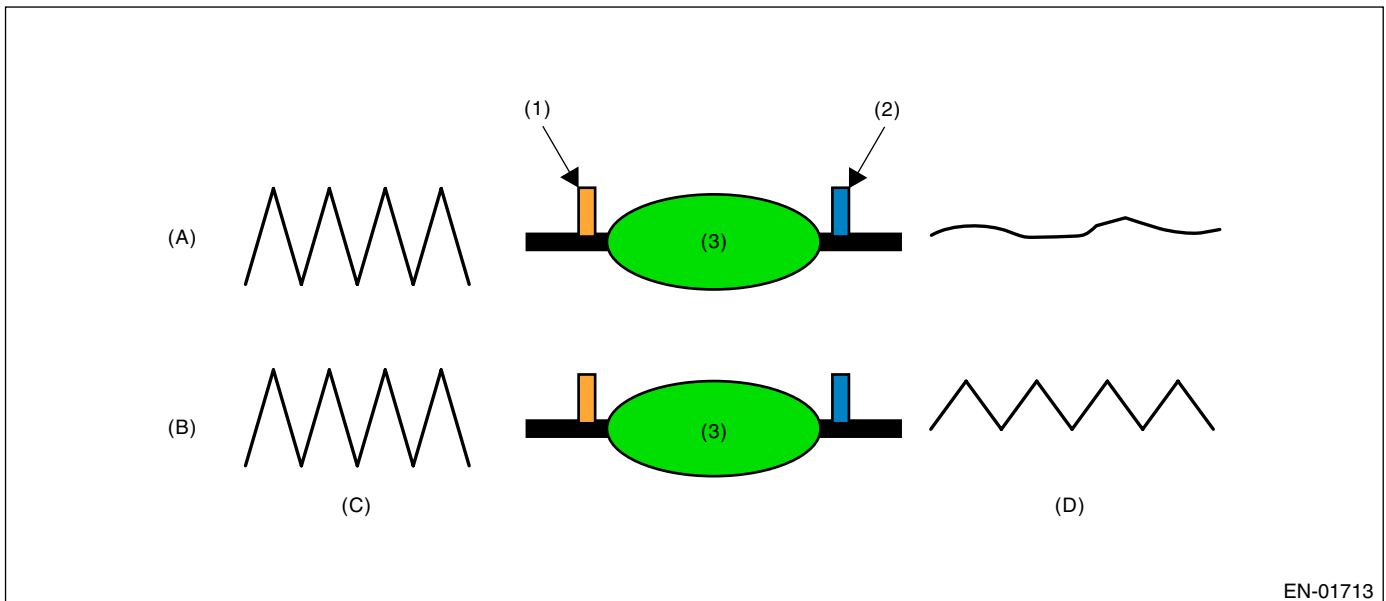
## BE: DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the deterioration of catalyst function.

Though the front oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened. For this reason, the catalyst diagnosis is carried out by monitoring the front oxygen sensor output and comparing it with the front A/F sensor output.

### 2. COMPONENT DESCRIPTION



- (1) Front oxygen (A/F) sensor
- (2) Front oxygen sensor
- (3) Catalyst

- (A) Normal
- (B) Deterioration

- (C) Front oxygen (A/F) sensor waveform
- (D) Front oxygen sensor waveform



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions                |
|---|----------------------------------|
| Battery voltage   | > 10.9 V                         |
| Atmospheric pressure  | > 75.1 kPa (563 mmHg, 22.2 inHg) |
| Engine coolant temperature                                  | ≥ 70°C (158°F)                   |
| Catalyst warm-up counter on Map 2                           | ≥ 8000                           |
| Misfire detection during 200 engine revs.                   | < 5 times                        |
| Learning value of evaporation gas density                   | ≤ 0.20                           |
| Sub feedback  | Operating                        |
| Evaporative system diagnostic                               | Not in operation                 |
| Difference between actual and target time lambda < 0.10     | 1,000 milliseconds or more       |
| Vehicle speed   | > 70 km/h (43.5 MPH)             |
| Amount of intake air  | 10 ↔ 40 g (0.35 ↔ 1.41 oz)/s     |
| Engine load change every 0.5 engine revs.                   | < 0.02 g/rev                     |
| Rear O <sub>2</sub> output change from below 660 mV to over | Experienced after fuel cut       |
| After engine starting                                       | ≥ 205 seconds                    |
| Purge execution cumulative time                             | 5 seconds or more                |

#### • Map 2

Add the following value every 512 milliseconds.

|                                      |       |             |             |             |              |            |              |              |              |              |            |              |
|--------------------------------------|-------|-------------|-------------|-------------|--------------|------------|--------------|--------------|--------------|--------------|------------|--------------|
| Amount of intake air (g (oz)/s)      | 0 (0) | 3.2 (0.113) | 6.4 (0.226) | 9.6 (0.339) | 12.8 (0.451) | 16 (0.564) | 19.2 (0.677) | 22.4 (0.790) | 25.6 (0.903) | 28.8 (1.016) | 32 (1.129) | 35.2 (1.242) |
| Integrated value for warm-up counter | -5    | -5          | 15          | 31          | 46           | 62         | 77           | 92           | 108          | 123          | 127        | 127          |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once at the constant vehicle speed 70 km/h (43 MPH).

### 5. DIAGNOSTIC METHOD

After the malfunction criteria are completed, calculate cumulative value of front oxygen (A/F) sensor lambda deviation ( $\sum |(\text{sglmd}_n - \text{sglmd}_{n-1})|$ ) every 128 milliseconds and cumulative value of rear oxygen sensor output voltage deviation ( $\sum |(\text{ro2sad}_n - \text{ro2sad}_{n-1})|$ ).

Calculate the diagnosis value when the front oxygen (A/F) sensor output fluctuation value more than specified value.

Judge NG when the malfunction criteria below are completed, and judge OK when they are not completed.

#### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| $\sum  (\text{ro2sad}_n - \text{ro2sad}_{n-1})  / \sum  (\text{sglmd}_n - \text{sglmd}_{n-1}) $ | > 1.0           |

**Time Needed for Diagnosis:** 30 — 55 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

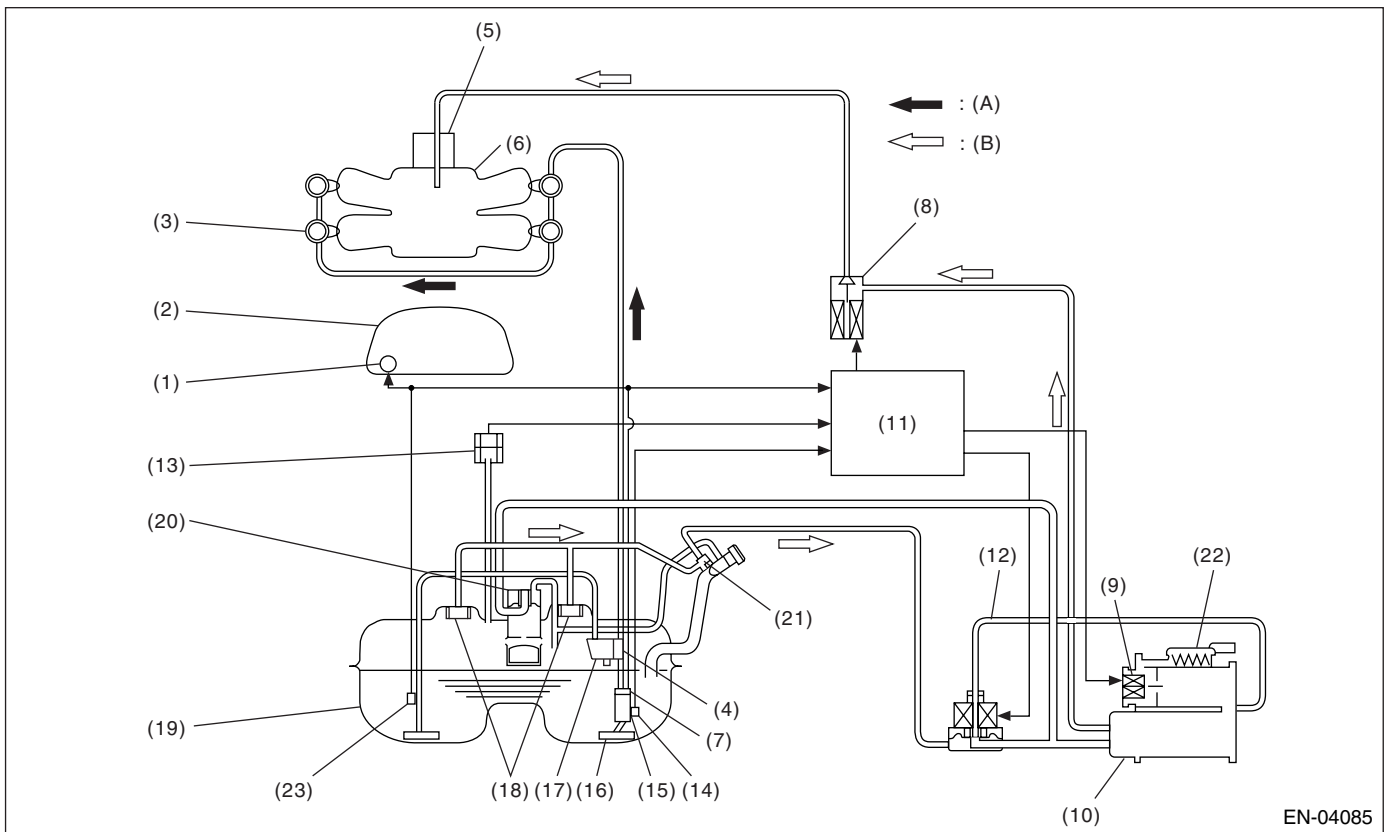
## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## BF:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

### 1. OUTLINE OF DIAGNOSIS

Perform the diagnosis of leakage of fuels system and valve functions.



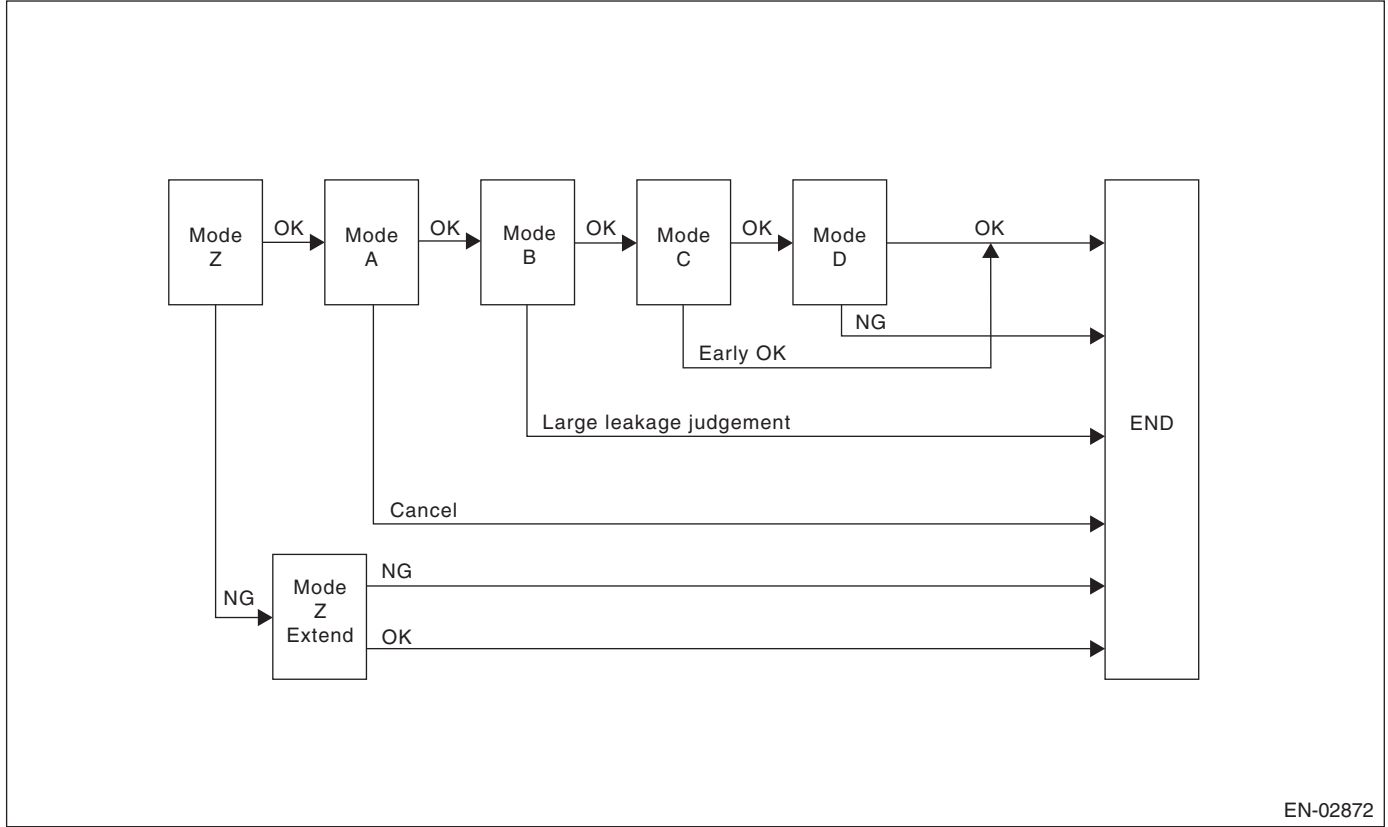
- |                                  |                                      |                            |
|----------------------------------|--------------------------------------|----------------------------|
| (1) Fuel gauge                   | (10) Canister                        | (19) Fuel tank             |
| (2) Combination meter            | (11) Engine control module (ECM)     | (20) Vent valve            |
| (3) Fuel injector                | (12) Pressure control solenoid valve | (21) Shut-off valve        |
| (4) Pressure regulator           | (13) Fuel tank pressure sensor       | (22) Drain filter          |
| (5) Throttle body                | (14) Fuel temperature sensor         | (23) Fuel sub level sensor |
| (6) Intake manifold              | (15) Fuel level sensor               |                            |
| (7) Fuel filter                  | (16) Fuel pump                       | (A) Fuel line              |
| (8) Purge control solenoid valve | (17) Jet pump                        | (B) Fuel evaporation line  |
| (9) Drain valve                  | (18) Fuel cut valve                  |                            |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

In this system diagnosis, checking for leakage and valve function is conducted by changing the fuel tank pressure, and monitoring the pressure change using the fuel tank pressure sensor. 0.04 inch diagnosis is performed in the order of mode Z, mode A, mode B, mode C and mode D, and 0.02 inch diagnosis is performed in the order of mode A, mode B, mode C, mode D and mode E.

### • 0.04-inch Diagnosis



EN-02872

| Mode  | Mode Description   | Diagnosis Period |
|---|--|------------------|
| Mode Z<br>(CPC abnormal open diagnosis)   | Diagnosis starts when there is a change in fuel tank pressure amount. Purge control solenoid valve open trouble diagnosis begins.  | 3 — 16 seconds   |
| Mode A<br>(Estimated evaporation amount)  | Calculate the tank pressure change amount (P1).  | 10 seconds       |
| Mode B<br>(Sealed negative pressure/large leakage judgment)                       | Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value.<br>If the tank pressure cannot be reduced, it is diagnosed as large leak. | 5 — 25 seconds   |
| Mode C<br>(Pressure increase check/advanced OK judgment)                          | Wait until the tank pressure becomes the desired value (detection starting pressure of P2). If the tank pressure does not become the value, make advanced OK judgment.               | 1 — 15 seconds   |
| Mode D<br>(Negative pressure variation measurement/evaporation leakage diagnosis) | Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode A. Perform the evaporation leakage diagnosis using the diagnostic value.                | 10 seconds       |

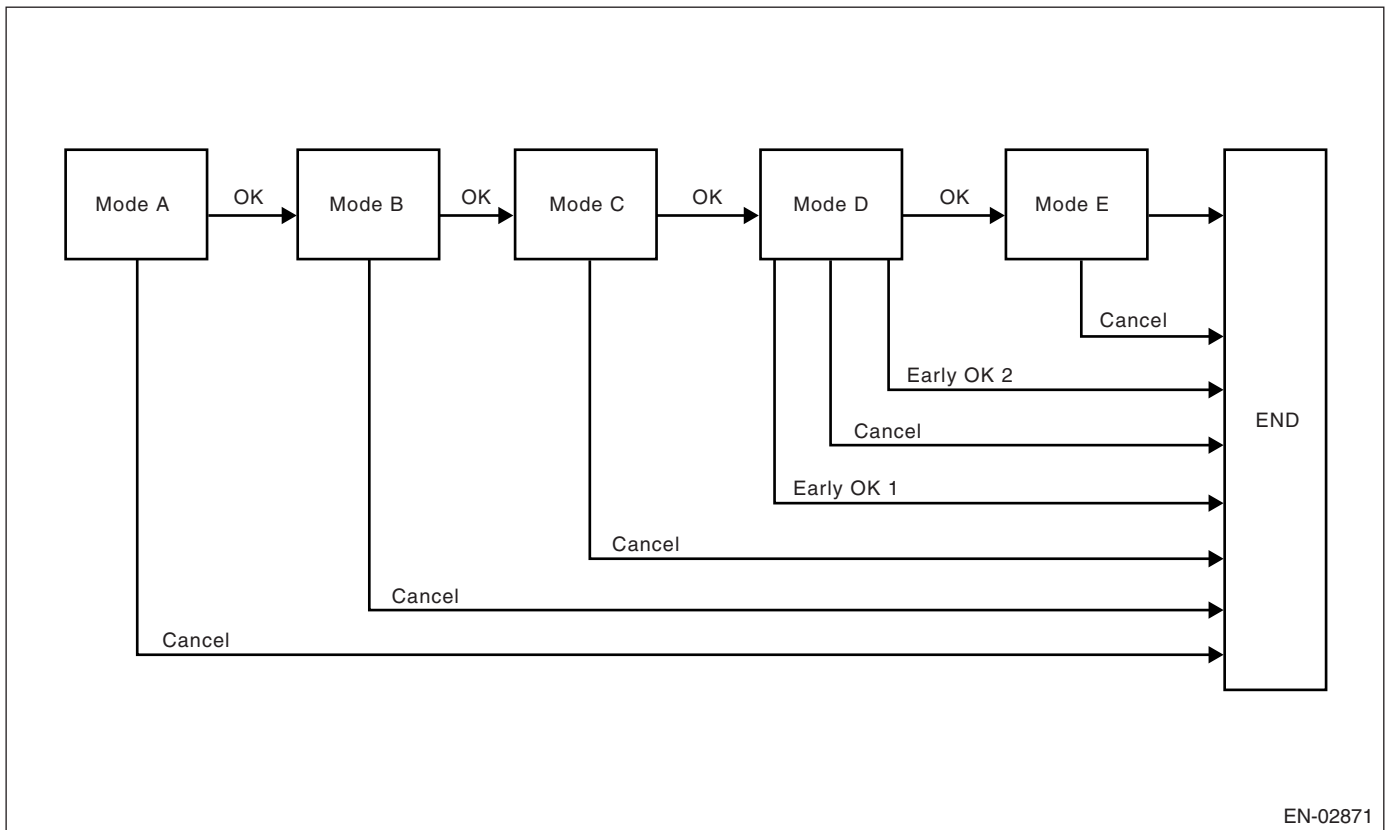
# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Mode Table for Evaporative Emission Control System Diagnosis

| Mode   | Behavior of tank internal pressure under normal conditions                          | Diagnostic item  | DTC   |
|--------|---|--|-------|
| Mode Z | Nearly same as atmospheric pressure (equivalent pressure of 0 kPa (0 mmHg, 0 inHg)) | CPC is judged to be stuck open.                              | P0457 |
| Mode A | Pressure is in proportion to amount of evaporative emission.                        |  |       |
| Mode B | Negative pressure is formed due to intake manifold negative pressure                | Large leakage  | P0457 |
| Mode C | Target pressure is reached.   |  | None  |
| Mode D | Pressure change is small.   | EVAP system is judged to have large leak [1.0 mm (0.04 in)]. | P0442 |

## • 0.02-inch Diagnosis



EN-02871

| Mode   | Mode Description  | Diagnosis Period |
|--|---|------------------|
| Mode A<br>(0 point correction)                         | Wait until the tank pressure returns to 0 point (near 0 mm Hg) when tank pressure is high.  | 0 s — 12 s       |
| Mode B<br>(Negative pressure Introduction)             | Introduce the intake manifold pressure into fuel tank to reduce the tank pressure to the desired value.   | 0 s — 27 s       |
| Mode C<br>(Holding negative pressure)                  | Wait until the tank pressure becomes the desired value (detection starting pressure of P2).   | 0 s — 20 s       |
| Mode D<br>(Calculation of negative pressure variation) | Calculate the time that takes the tank pressure to return to detection completing pressure of P2. When the tank pressure does not return to the detection completing pressure of P2, make advanced OK judgment. | 0 s — 200 s      |
| Mode E<br>(Calculation of yielded evaporation amount)  | Calculate the yielded evaporation amount (P1).  | 0 s — 280 s      |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

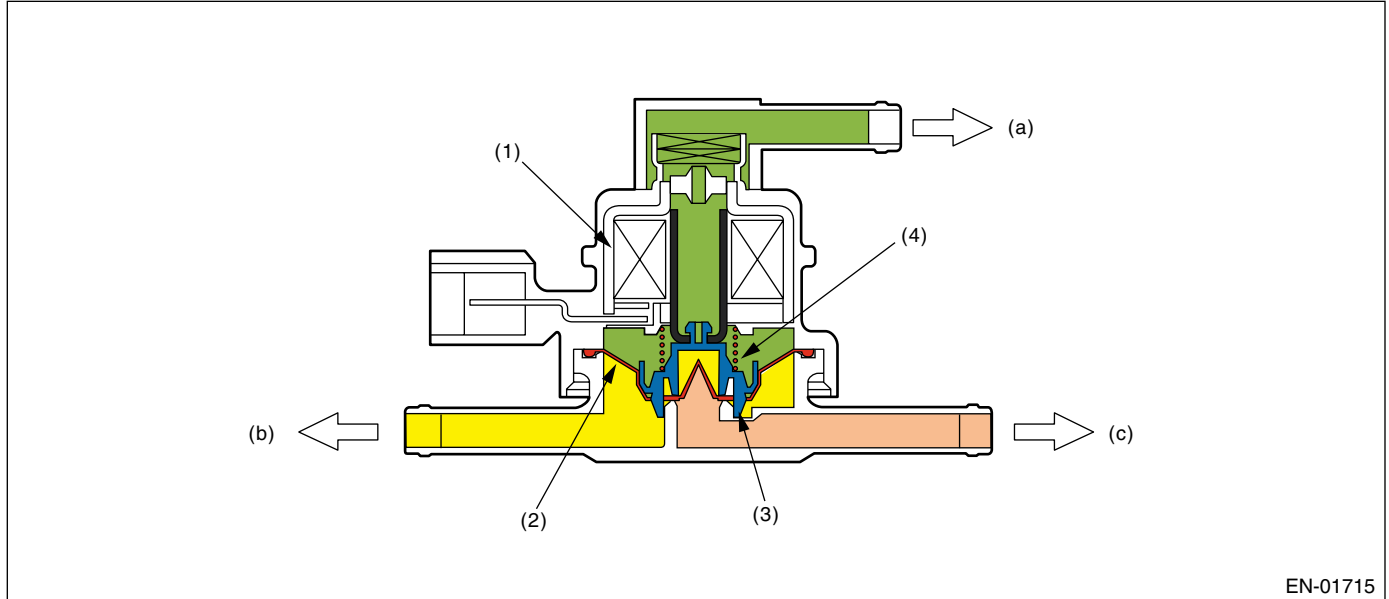
### 2. COMPONENT DESCRIPTION

#### • Pressure Control Solenoid Valve

PCV controls the fuel tank pressure to be equal to the atmospheric air pressure.

Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.

The valve is forcibly opened by setting the solenoid to ON at the time of diagnosis.



- |               |                          |
|---------------|--------------------------|
| (1) Solenoid  | (a) Atmospheric pressure |
| (2) Diaphragm | (b) Fuel tank            |
| (3) Valve     | (c) Canister             |
| (4) Spring    |                          |

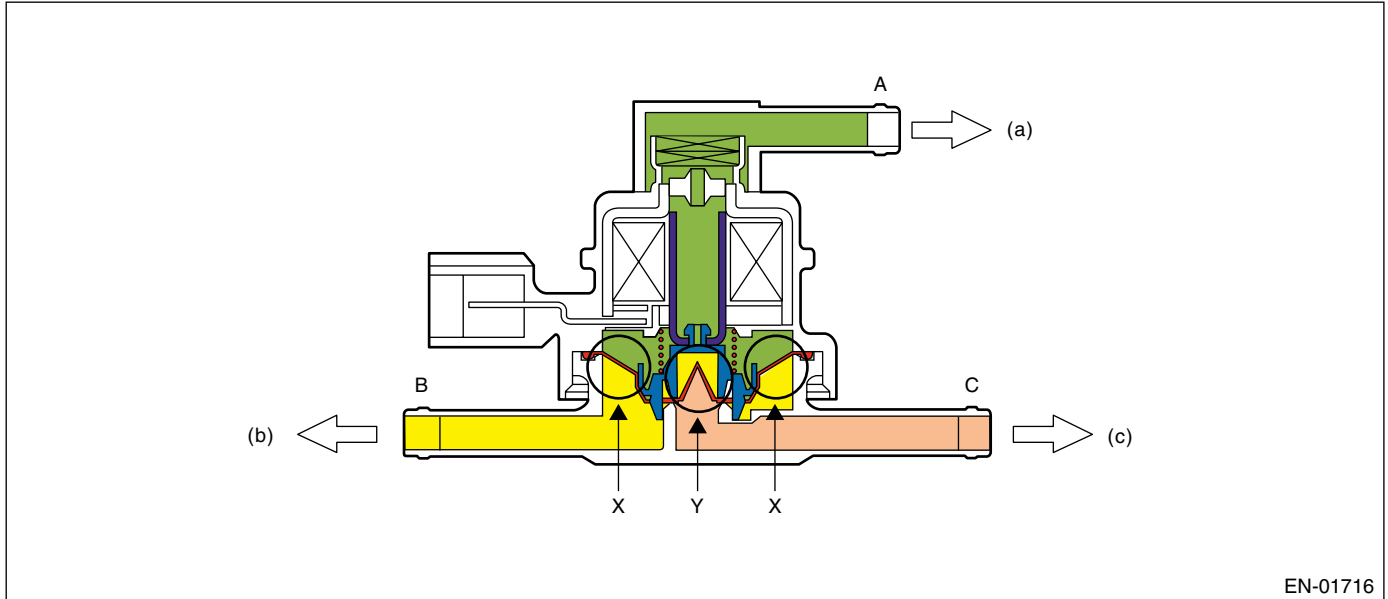
# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Valve Operation and Air Flow

In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.

If the atmospheric air pressure port is A, tank pressure port is B, and canister pressure port is C, the air flows according to pressure difference from each port as shown in the table below.



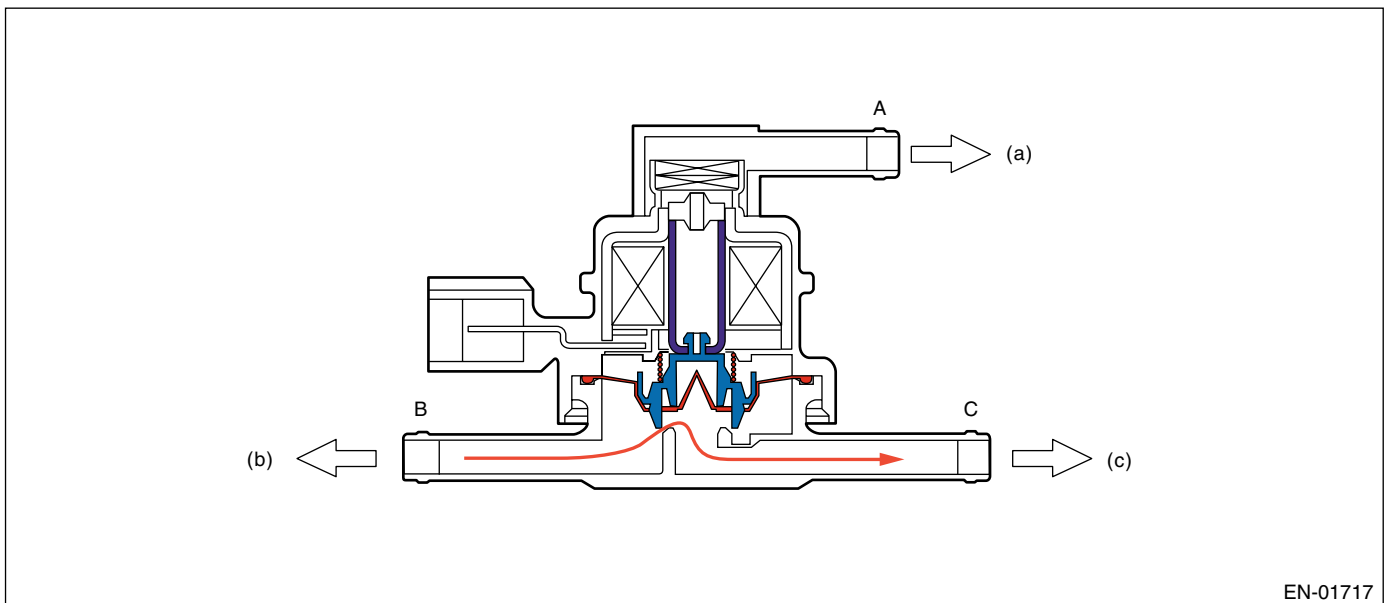
(a) Atmospheric pressure

(b) Fuel tank

(c) Canister

| Condition of pressure  | Flow                  |
|------------------------|-----------------------|
| $A < B$ (solenoid OFF) | $B \rightarrow C$     |
| $B < C$ (solenoid OFF) | $C \rightarrow B$     |
| Solenoid ON            | $B \leftrightarrow C$ |

### When $A < B$ (Solenoid OFF)



(a) Atmospheric pressure

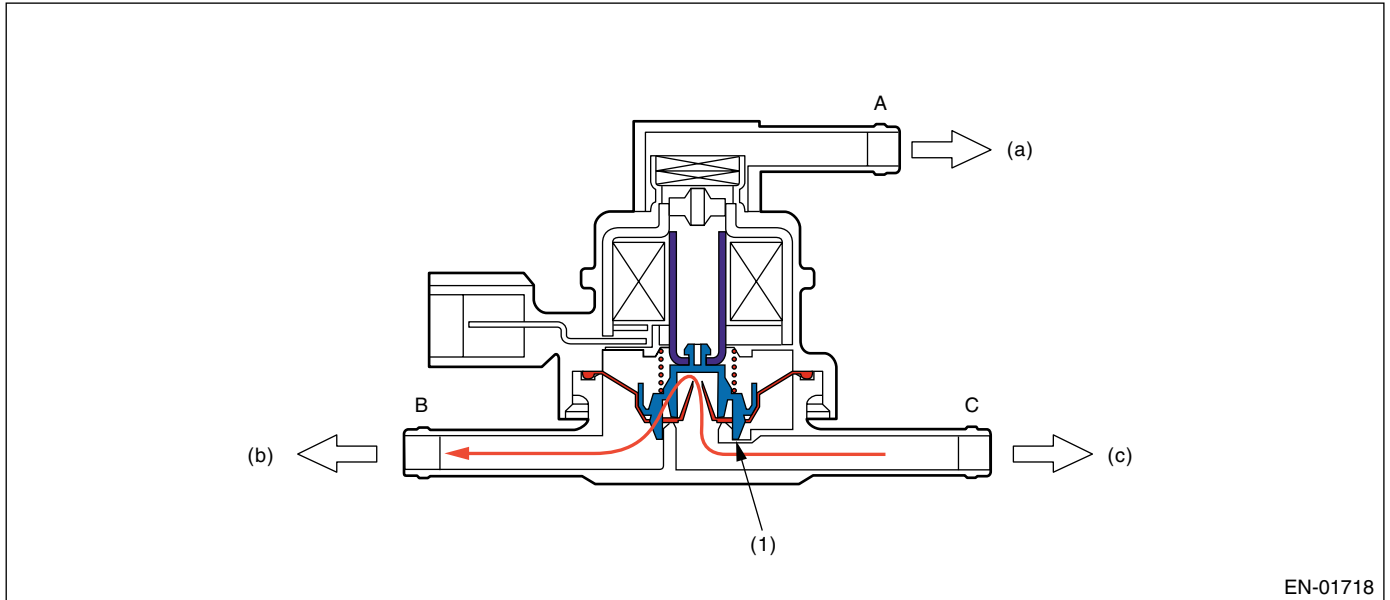
(b) Fuel tank

(c) Canister

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### When $B < C$ (Solenoid OFF)



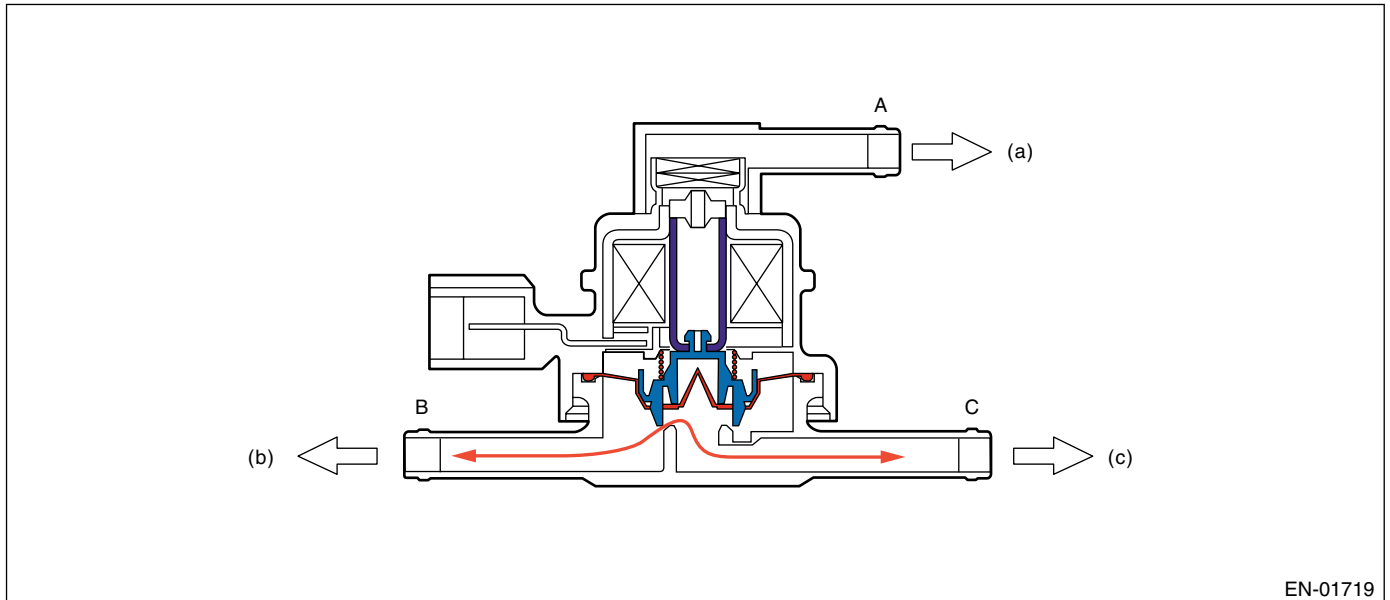
(1) Valve

(a) Atmospheric pressure

(b) Fuel tank

(c) Canister

### When Solenoid is ON



(a) Atmospheric pressure

(b) Fuel tank

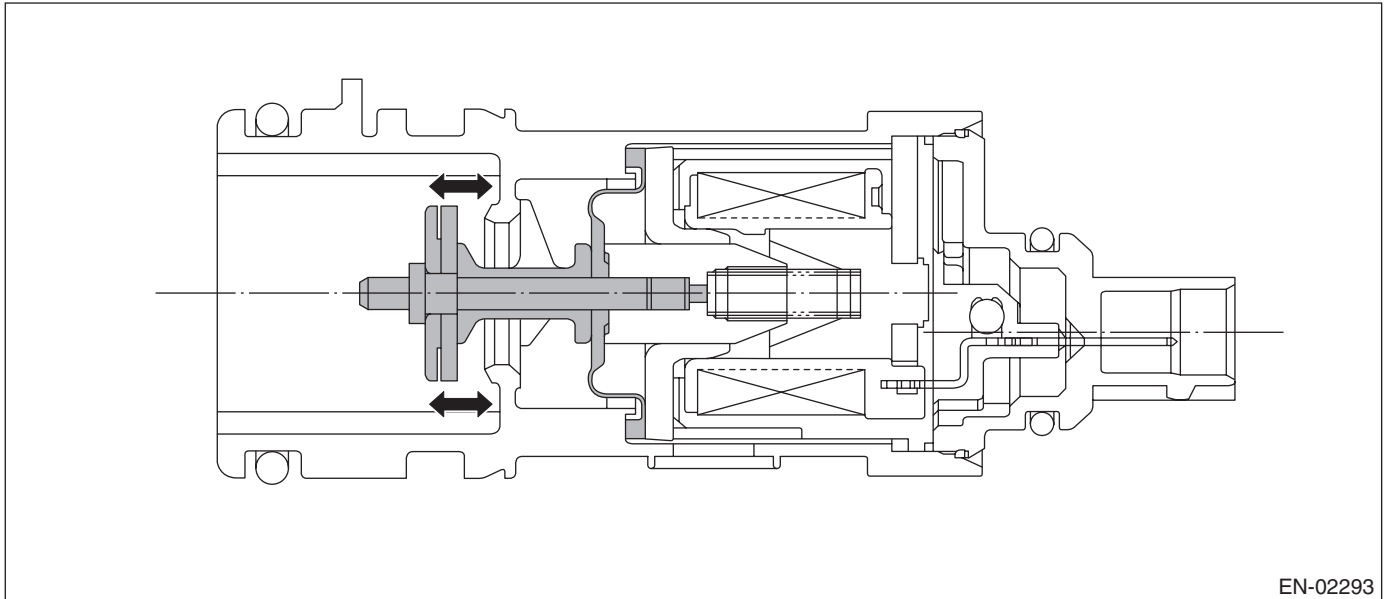
(c) Canister

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Drain valve

Drain valve controls the ambient air to be introduced to the canister.



EN-02293

## 3. ENABLE CONDITION

### • 0.04-inch Diagnosis

| Secondary Parameters  | Enable Conditions  |
|---|--|
| Battery voltage   | $\geq 10.9 \text{ V}$  |
| Barometric pressure   | $\geq 75.1 \text{ kPa}$ (563 mmHg, 22.17 inHg)   |
| Cumulative time of canister purge                                 | 120 seconds or more  |
| After engine starting   | 856 seconds or more  |
| Learning value of evaporation gas density                         | $\leq 0.08$  |
| Engine speed  | 1,050 $\leftrightarrow$ 6,000 rpm  |
| Fuel tank pressure  | $\geq -4.00 \text{ kPa}$ ( $-30 \text{ mmHg}$ , $-1.18 \text{ inHg}$ )   |
| Intake manifold vacuum (relative pressure)                        | $< -26.7 \text{ kPa}$ ( $-200 \text{ mmHg}$ , $-7.87 \text{ inHg}$ )   |
| Vehicle speed   | $\geq 32 \text{ km/h}$ (20 MPH)  |
| Fuel level  | 9 $\leftrightarrow$ 51 $\varnothing$ (2.38 $\leftrightarrow$ 13.47 US gal, 1.98 $\leftrightarrow$ 11.22 Imp gal) |
| Closed air/fuel ratio control                                     | In operation   |
| Fuel temperature  | $-10 \leftrightarrow 45^\circ\text{C}$ (14 $\leftrightarrow$ 113 $^\circ\text{F}$ )                              |
| Intake air temperature  | $\geq -10^\circ\text{C}$ (14 $^\circ\text{F}$ )  |
| Pressure change per second  | $< 0.23 \text{ kPa}$ (1.7 mmHg, 0.07 inHg)   |
| Min. pressure change per second – Max. pressure change per second | $< 0.23 \text{ kPa}$ (1.7 mmHg, 0.07 inHg)   |
| Fuel level change   | $< 2.5 \varnothing / 128 \text{ milliseconds}$ (0.66 US gal/128 milliseconds, 0.55 Imp gal/128 milliseconds)     |
| Air fuel ratio  | 0.76 — 1.25  |



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • 0.02-inch Diagnosis

| Secondary Parameters  | Enable Conditions                                     |
|---|---|
| (At starting a diagnosis)   |   |
| Evaporation diagnosis   | Not completed   |
| Battery voltage   | ≥ 10.9 V  |
| Atmospheric pressure  | ≥ 75.1 kPa (563 mmHg, 22.2 inHg)                      |
| Since last incomplete diagnosis event of 0.02-inch leakage                  |   |
| Cancelled at mode A   | > 120 seconds   |
| Cancelled other than at mode A  | > 600 seconds   |
| Cumulative time of canister purge   | 120 seconds or more                                   |
| After engine starting   | 120 second or more                                    |
| Fuel temperature  | -10 ↔ 70°C (14 ↔ 158°F)                               |
| Fuel level  | 9 ↔ 51 ℓ (2.38 ↔ 13.47 US gal, 1.98 ↔ 11.22 Imp gal)  |
| Intake manifold vacuum (relative pressure)                                  | < -8.0 kPa (-60 mmHg, -2.36 inHg)                     |
| Fuel tank pressure  | -0.67 — 1.43 kPa (-5 — 10.7 mmHg, -0.20 — 0.42 inHg)  |
| Vehicle speed   | ≥ 30 km/h (19 MPH)                                    |
| Closed air/fuel ratio control   | In operation  |
| Engine speed  | 550 ↔ 6,000 rpm                                       |
| (During diagnosis)  |   |
| Fuel level change   | ≤ Value of Map  |
| Pressure change per second  | < 0.06 kPa (0.44 mmHg, 0.02 inHg)                     |
| Min. tank pressure change per second – Max. tank pressure change per second | < 0.07 kPa (0.51 mmHg, 0.02 inHg)                     |
| Tank pressure change per second   | ≤ 0.1 kPa (0.75 mmHg, 0.03 inHg)                      |
| Pressure change (Mode D)  | -0.48 ↔ 0.32 kPa (-3.6 ↔ 2.4 mmHg, -0.14 ↔ 0.09 inHg) |
| Pressure change (Mode E)  | -0.32 ↔ 0.32 kPa (-2.4 ↔ 2.4 mmHg, -0.09 ↔ 0.09 inHg) |

### Map

|                                    |                    |                    |                   |                    |                    |                   |                    |
|------------------------------------|--------------------|--------------------|-------------------|--------------------|--------------------|-------------------|--------------------|
| Fuel level<br>(ℓ, US gal, Imp gal) | 0                  | 10, 2.64,<br>2.2   | 20, 5.28,<br>4.4  | 30, 7.93,<br>6.6   | 40, 10.57,<br>8.8  | 50, 13.21,<br>11  | 60, 15.85,<br>13.2 |
| Variation<br>(ℓ, US gal, Imp gal)  | 4.2, 1.11,<br>0.92 | 4.2, 1.11,<br>0.92 | 4.1, 1.08,<br>0.9 | 4.0, 1.06,<br>0.88 | 3.9, 1.03,<br>0.86 | 3.8, 1.0,<br>0.84 | 3.8, 1.0,<br>0.84  |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 4. GENERAL DRIVING CYCLE

### • 0.04-inch Diagnosis

- Perform the diagnosis only once in more than 856 seconds after the engine start at the constant driving speed of 32 km/h (20 MPH) or more.
- Pay attention to the fuel temperature and fuel level.

### • 0.02-inch Diagnosis

- Perform diagnosis in more than 770 seconds after engine start at the constant speed of 68 km/h (42 MPH) or more, and judged OK or NG.
- If not judged OK or NG, repeat the diagnosis.
- Pay attention to the fuel level.

## 5. DIAGNOSTIC METHOD

### • Purge control solenoid valve open malfunction diagnosis

DTC

P0457 Evaporative Emission Control System Leak Detected (fuel cap loose/off)

#### Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, CPC has to operate normally. Therefore, mode Z is used to diagnose the CPC open fixation.

If the CPC open fixation trouble is detected, the EVAP system leakage diagnosis is cancelled.

#### Diagnostic method

CPC functional diagnosis is performed by monitoring the tank pressure in Mode Z.

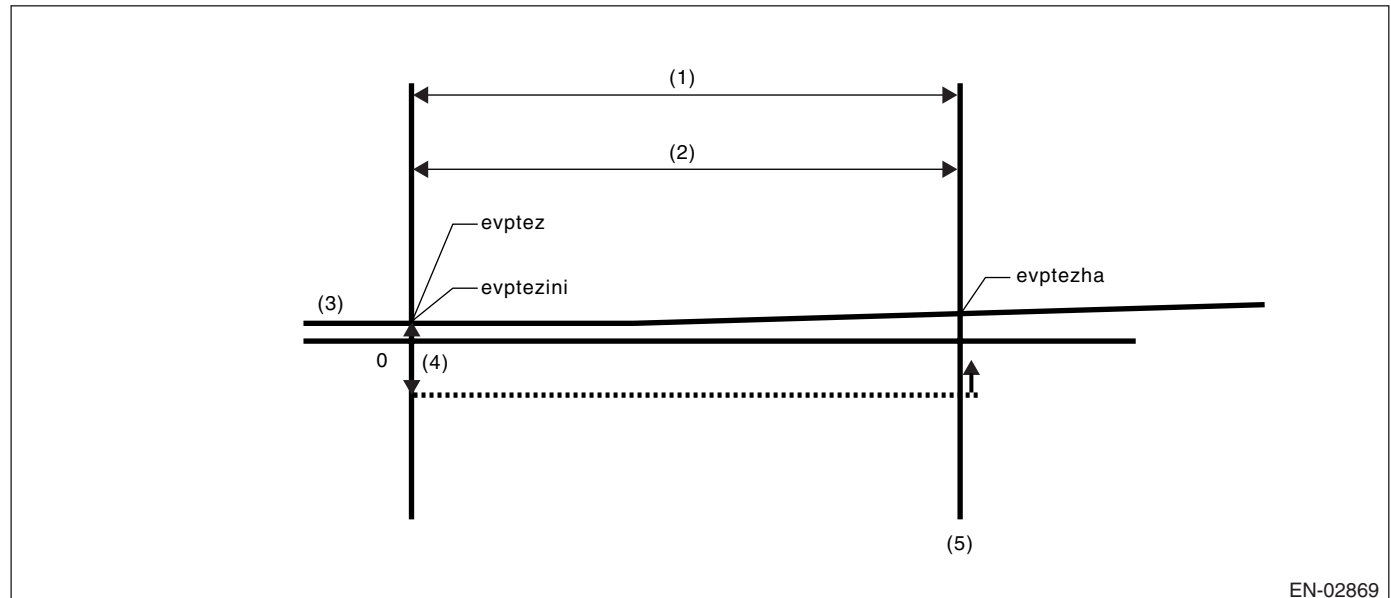
#### Normality Judgment

Judge OK when the following criteria are satisfied in 3 seconds after Mode Z started, and change to Mode A.

#### Judgment Value

| Malfunction Criteria  | Threshold Value                       | DTC   |
|---|---------------------------------------|-------|
| (Tank pressure when Mode Z started) —<br>(Tank pressure when Mode Z finished) | $\leq 0.4$ kPa (3 mmHg,<br>0.12 inHg) | P0457 |

### • Normal Operation



EN-02869

- |               |                                   |                  |
|---------------|-----------------------------------|------------------|
| (1) Mode Z    | (3) Fuel tank pressure            | (5) OK judgement |
| (2) 3 seconds | (4) 0.4 kPa (3.0 mmHg, 0.12 inHg) |                  |

- $evptez - evptezha \leq 0.4$  kPa (3.0 mmHg, 0.12 inHg)
  - $evptezini - evptezha \leq 0.4$  kPa (3.0 mmHg, 0.12 inHg)
- Judge normal when both calculations are completed.

## Diagnostic Trouble Code (DTC) Detecting Criteria

### GENERAL DESCRIPTION

---

#### Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge NG when the criteria below are completed in 16 seconds.

#### Judgment Value

| Malfunction Criteria  | Threshold Value                      | DTC   |
|---|--------------------------------------|-------|
| (Tank pressure when Mode Z started) –<br>(Tank pressure when Mode Z finished) | > 0.6 kPa (4.5 mmHg,<br>0.18 inHg)   | P0457 |
| Tank pressure when Mode Z started   | ≤ 1.43 kPa (10.7<br>mmHg, 0.42 inHg) |       |
| Time for no fuel rolling of 2 0 or more                                       | ≥ 40 seconds                         |       |

**Time Needed for Diagnosis:** 16 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

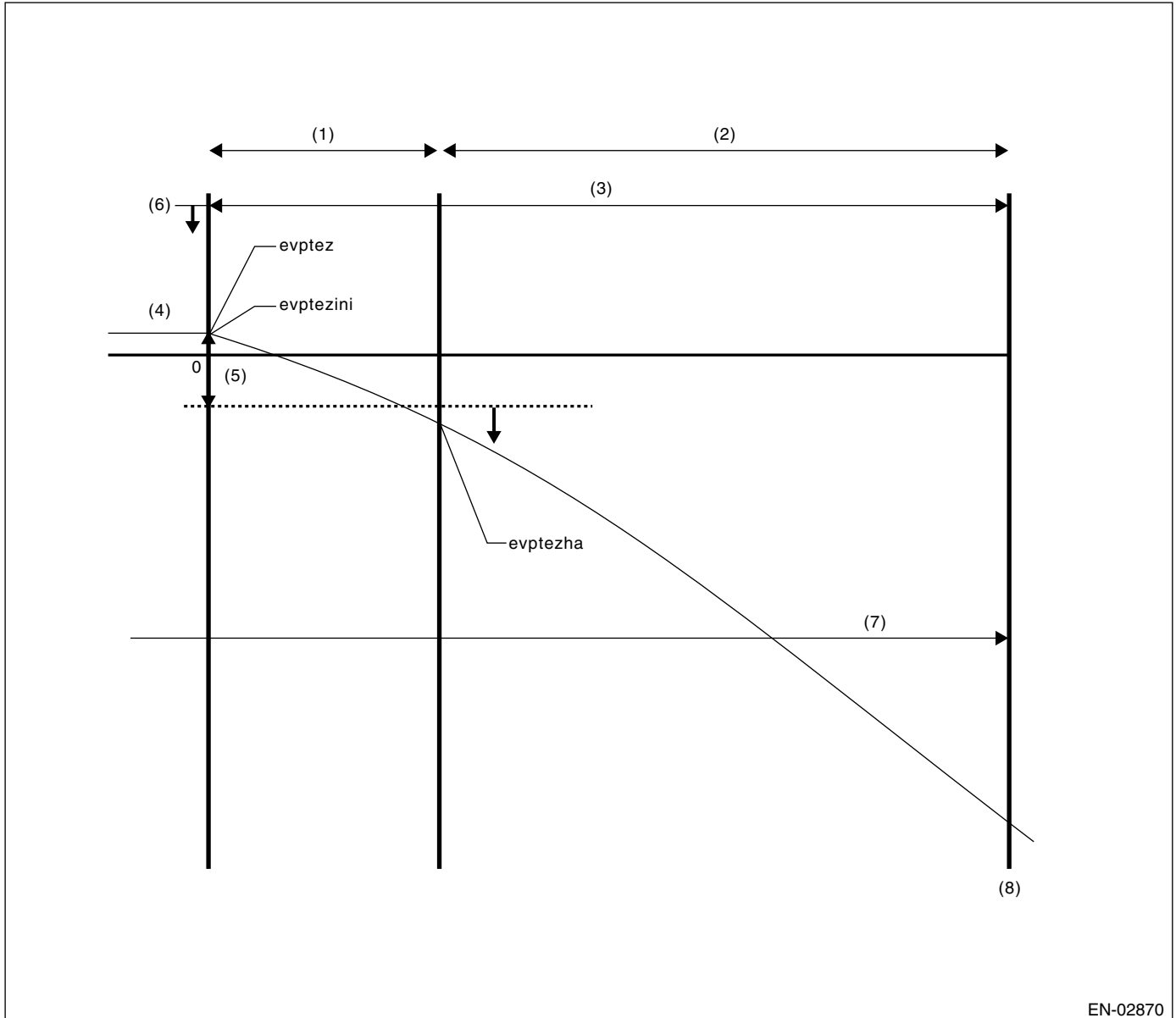
Finish the Evap. diagnosis when making NG judgment for purge control solenoid valve open fixation.

Cancel the Evap. diagnosis when the OK/NG judgment for purge control solenoid valve open fixation cannot be made in Mode Z.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Purge Control Solenoid Valve Open Fixation



EN-02870

- |                     |                                     |  |
|---------------------|-------------------------------------|--|
| (1) Mode Z          | (4) Fuel tank pressure              | (7) No fuel rolling for more than 40 seconds |
| (2) Extended mode Z | (5) 0.87 kPa (6.5 mmHg, 0.26 inHg)  | (8) NG judgement                             |
| (3) 16 seconds      | (6) 1.43 kPa (10.7 mmHg, 0.42 inHg) |  |

- $evptezini, evptez \leq 1.43 \text{ kPa (10.7 mmHg, 0.42 inHg)}$
  - $evptez - evptezha \leq 0.87 \text{ kPa (6.5 mmHg, 0.26 inHg)}$
  - $evptezini - evptezha \leq 0.87 \text{ kPa (6.5 mmHg, 0.26 inHg)}$
  - No fuel rolling of above 2  $\varnothing$  (0.53 US gal, 0.44 Imp gal) for more than 40 seconds.
- Judge normal when all the calculations are completed.

### • Leak Diagnosis

DTC

P0442 Evaporative Emission Control System Leak Detected (small leak)

P0457 Evaporative Emission Control System Leak Detected (fuel cap loose/off)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • Diagnostic method

- The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
- The diagnosis is divided into the following five phases.

#### Mode A: (Estimation of evaporation gas yield)

The amount of change of tank pressure (P1) in Mode A is calculated. After calculating P1, change to Mode B.

#### Mode B: (Seal negative pressure)

Introduce the negative pressure in the intake manifold to the tank.

Approx. 0 → -1.4 kPa (0 → -10.5 mmHg, 0 → -0.41 inHg)

When the pressure above (desired negative pressure) is reached, Mode C is entered.

In this case, if the tank pressure does not become the desired negative pressure, judge that there is a large leakage in the system, finish the Evap. diagnosis when judging large leak (10 or 25 seconds).

### • Abnormality Judgment

Judge NG (large leak) when the criteria below are completed in the specified time.

#### Judgment Value

| Malfunction Criteria  | Threshold Value                   | DTC   |
|---|-----------------------------------|-------|
| Time before reaching desired negative pressure                                    | ≥ 25 seconds                      | P0457 |
| Or time for Mode B  | ≥ 10 seconds                      |       |
| (Min. value of tank pressure during Mode B) – (Tank pressure when Mode B started) | < -0.53 kPa (-4 mmHg, -0.16 inHg) |       |

#### Mode C: (Check increasing pressure)

Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)

Change to Mode D when the tank pressure returns to the start level of P2 calculation.

Judge immediate OK and change to Mode E when it does not return in spite of spending the specified time.

| Tank pressure when P2 calculation started | Time for immediate OK judgment |
|---|--------------------------------|
| -1.3 kPa (-9.75 mmHg, -0.38 inHg)         | 15 seconds                     |

#### Mode D: (Measurement of negative pressure changes)

Monitor the pressure variation in the tank in Mode Z. In this case, the tank pressure increases, that is, the pressure becomes as high as the atmospheric air pressure, because evaporator is generated. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.

After calculating P2, perform following small leak diagnosis.

#### After Mode D

Assigning P1 and P2, which are tank variations measured in Mode A and Mode D, to the formula below, judge the small leakage of the system. If the measured judgment value exceeds the threshold value, it is judged to be malfunction.

### • Abnormality Judgment

Judge NG when the criteria below are completed. Judge OK when not completed and clear the NG.

#### Judgment Value

| Malfunction Criteria  | Threshold Value   | DTC   |
|---|---|-------|
| P2 – 1.5 × P1<br>P2: Change of tank pressure within 10 seconds on Mode D<br>P1: Change of tank pressure within 10 seconds on Mode A | > Value on map 7.<br>*Threshold value: Map (Fuel level vs Tank temperature) | P0442 |

\*1.5: Compensation value of the amount of evaporator occurrence. (Because evaporator increases more when becoming negative pressure.)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## Map 7 Limit of malfunction criteria as Evap. diagnosis.

| Fuel temperature vs Fuel level   | 5°C (41°F)                             | 15°C (59°F)                            | 25°C (77°F)                            | 35°C (95°F)                            | 45°C (113°F)                           |
|----------------------------------|--|--|--|--|--|
| 10 L (2.6 US gal, 2.2 Imp gal)   | 0.49 kPa<br>(3.68 mmHg,<br>0.145 inHg) | 0.49 kPa<br>(3.68 mmHg,<br>0.145 inHg) | 0.53 kPa<br>(3.95 mmHg,<br>0.156 inHg) | 0.54 kPa<br>(4.07 mmHg,<br>0.160 inHg) | 0.56 kPa<br>(4.17 mmHg,<br>0.164 inHg) |
| 20 L (5.3 US gal, 4.4 Imp gal)   | 0.50 kPa<br>(3.77 mmHg,<br>0.148 inHg) | 0.51 kPa<br>(3.79 mmHg,<br>0.149 inHg) | 0.53 kPa<br>(4.01 mmHg,<br>0.158 inHg) | 0.56 kPa<br>(4.17 mmHg,<br>0.164 inHg) | 0.57 kPa<br>(4.27 mmHg,<br>0.168 inHg) |
| 30 L (7.9 US gal, 6.6 Imp gal)   | 0.51 kPa<br>(3.85 mmHg,<br>0.152 inHg) | 0.52 kPa<br>(3.9 mmHg,<br>0.154 inHg)  | 0.54 kPa<br>(4.06 mmHg,<br>0.160 inHg) | 0.57 kPa<br>(4.27 mmHg,<br>0.168 inHg) | 0.60 kPa<br>(4.48 mmHg,<br>0.176 inHg) |
| 40 L (10.6 US gal, 8.8 Imp gal)  | 0.65 kPa<br>(4.88 mmHg,<br>0.192 inHg) | 0.65 kPa<br>(4.90 mmHg,<br>0.193 inHg) | 0.66 kPa<br>(4.98 mmHg,<br>0.196 inHg) | 0.71 kPa<br>(5.32 mmHg,<br>0.209 inHg) | 0.76 kPa<br>(5.73 mmHg,<br>0.226 inHg) |
| 50 L (13.2 US gal, 11.0 Imp gal) | 0.79 kPa<br>(5.90 mmHg,<br>0.232 inHg) | 0.79 kPa<br>(5.90 mmHg,<br>0.232 inHg) | 0.79 kPa<br>(5.90 mmHg,<br>0.232 inHg) | 0.85 kPa<br>(6.38 mmHg,<br>0.251 inHg) | 0.88 kPa<br>(6.60 mmHg,<br>0.260 inHg) |

**Time Needed for Diagnosis:** 30 — 100 Seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous drive cycles.

• **Leak diagnosis**

DTC

P0456 Evaporative Emission Control System Leak Detected (very small leak)

• **Diagnostic method**

- The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
- The diagnosis is divided into the following five phases.

**Mode A: (0 point correction)**

Wait until the tank pressure returns to 0 point (near 0 mmHg) when tank pressure is high. Then change to Mode B. If the tank pressure does not return to 0 point in the specified time, cancel the diagnosis.

**Mode B: (Negative pressure introduction)**

Introduce the negative pressure in the intake manifold to the tank.

Approx. 0 → -2.0 kPa (0 → -15 mmHg, 0 → -0.59 inHg)

When the pressure above (desired negative pressure) is reached, Mode C is entered.

In this case, if the tank pressure does not become the desired negative pressure, cancel the diagnosis.

**Mode C: (Holding negative pressure)**

Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)

Change to Mode D when the tank pressure returns to the start level of P2 calculation, or when spending the specified time.

**Mode D: (Calculation of negative pressure variation)**

By monitoring the tank pressure at Mode D, calculate the pressure variation (P2) and measure the time (evp-dset) it takes the tank pressure to return to the detection completing pressure of P2. Then change to Mode E. When the tank pressure does not return to the detection completing pressure of P2 in the specified time, make advanced OK judgment or cancel the diagnosis according to P2 value.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • Normality judgment

Judge OK when the following criteria are satisfied.

#### Judgment Value

| Malfunction Criteria   | Threshold Value  |
|--|--|
| Advanced OK judgment 1<br>Mode D holding time<br>Tank pressure | $\geq 30$ seconds<br>$\leq -1.8$ kPa (-13.4 mmHg, -0.53 inHg)                  |
| Advanced OK judgment 2<br>Mode D holding time<br>P2            | $\geq 200$ seconds<br>$\leq 0.9 - 1.3$ kPa<br>(7 - 9.6 mmHg, 0.28 - 0.38 inHg) |

### Mode E (Calculation of yielded evaporation amount)

Calculate the pressure variation (P1) at the time (evpdset), and make NG/OK judgment according to P1 value (ambiguous determination acceptable).

### • Abnormality Judgment

Judge NG when the following criteria are satisfied.

#### Judgment Value

| Malfunction Criteria | Threshold Value   |
|----------------------|---|
| P1                   | < Value from Map 7<br>* Threshold value:<br>Map (Fuel level vs evpdset) |

### Map 7 Limit of malfunction criteria as Evap. diagnosis

| Time (evpdset) vs Fuel level     | 0 seconds                    | 30 seconds                            | 80 seconds                            | 100 seconds                           | 150 seconds                           | 200 seconds                           |
|----------------------------------|------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 10 L (2.6 US gal, 2.2 Imp gal)   | 0 kPa<br>(0 mmHg,<br>0 inHg) | 0.21 kPa<br>(1.6 mmHg,<br>0.063 inHg) | 0.29 kPa<br>(2.2 mmHg,<br>0.087 inHg) | 0.29 kPa<br>(2.2 mmHg,<br>0.087 inHg) | 0.29 kPa<br>(2.2 mmHg,<br>0.087 inHg) | 0.29 kPa<br>(2.2 mmHg,<br>0.087 inHg) |
| 30 L (7.9 US gal, 6.6 Imp gal)   | 0 kPa<br>(0 mmHg,<br>0 inHg) | 0.21 kPa<br>(1.6 mmHg,<br>0.063 inHg) | 0.29 kPa<br>(2.2 mmHg,<br>0.087 inHg) | 0.29 kPa<br>(2.2 mmHg,<br>0.087 inHg) | 0.29 kPa<br>(2.2 mmHg,<br>0.087 inHg) | 0 kPa<br>(0 mmHg,<br>0 inHg)          |
| 50 L (13.2 US gal, 11.0 Imp gal) | 0 kPa<br>(0 mmHg,<br>0 inHg) | 0.24 kPa<br>(1.8 mmHg,<br>0.071 inHg) | 0.29 kPa<br>(2.2 mmHg,<br>0.087 inHg) | 0.29 kPa<br>(2.2 mmHg,<br>0.087 inHg) | 0 kPa<br>(0 mmHg,<br>0 inHg)          | 0 kPa<br>(0 mmHg,<br>0 inHg)          |

### • Normality judgment

Judge OK when the following criteria are satisfied.

#### Judgment Value

| Malfunction Criteria | Threshold Value   |
|----------------------|---|
| P1                   | > Value from Map 8<br>* Threshold value:<br>Map (Fuel level vs evpdset) |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## Map 8 Limit of malfunction criteria as Evap. diagnosis

| Time (evpdset) vs Fuel level     | 0 seconds                             | 30 seconds                            | 80 seconds                            | 100 seconds                           | 150 seconds                           | 200 seconds                           |
|----------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 10 L (2.6 US gal, 2.2 Imp gal)   | 0.16 kPa<br>(1.2 mmHg,<br>0.047 inHg) | 0.37 kPa<br>(2.8 mmHg,<br>0.110 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.134 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.134 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.134 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.134 inHg) |
| 30 L (7.9 US gal, 6.6 Imp gal)   | 0.16 kPa<br>(1.2 mmHg,<br>0.047 inHg) | 0.37 kPa<br>(2.8 mmHg,<br>0.110 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.134 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.134 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.134 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.134 inHg) |
| 50 L (13.2 US gal, 11.0 Imp gal) | 0.16 kPa<br>(1.2 mmHg,<br>0.047 inHg) | 0.40 kPa<br>(3 mmHg,<br>0.118 inHg)   | 0.45 kPa<br>(3.4 mmHg,<br>0.134 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.134 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.134 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.134 inHg) |

**Time Needed for Diagnosis:** 65 — 514 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous drive cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

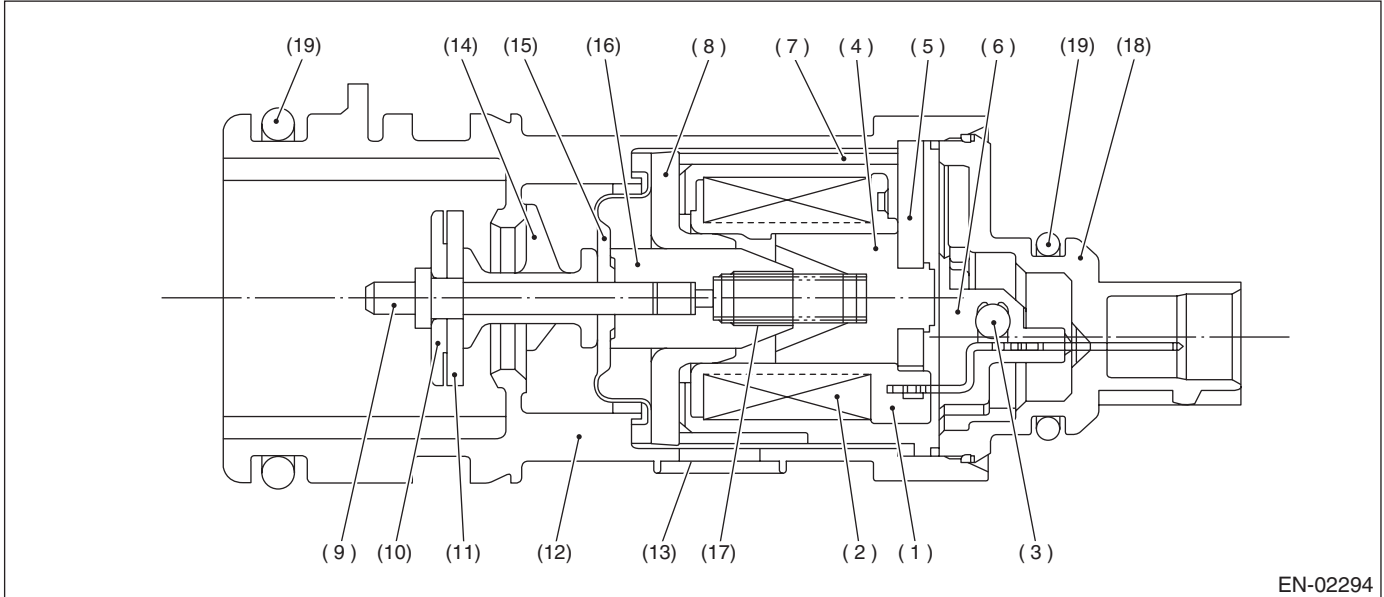
### BG:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.

Judge NG when the ECM output level is different from the actual terminal level.

#### 2. COMPONENT DESCRIPTION



EN-02294

- |                 |                    |                  |
|-----------------|--------------------|------------------|
| (1) Bobbin      | (8) Magnetic plate | (15) Diaphragm   |
| (2) Coil        | (9) Shaft          | (16) Moving core |
| (3) Diode       | (10) Plate         | (17) Spring      |
| (4) Stator core | (11) Valve         | (18) Cover       |
| (5) End plate   | (12) Housing       | (19) O-ring      |
| (6) Body        | (13) Filter        |                  |
| (7) Yoke        | (14) Retainer      |                  |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

### Judgment Value

| Malfunction Criteria                              | Threshold Value  |
|---|------------------|
| Ignition switch                                   | ON               |
| Battery voltage                                   | $\geq 10.9$ V    |
| After engine starting                             | 1 second or more |
| Terminal output voltage when ECM sends OFF signal | Low              |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria                              | Threshold Value  |
|---|------------------|
| Ignition switch                                   | ON               |
| Battery voltage                                   | $\geq 10.9$ V    |
| After engine starting                             | 1 second or more |
| Terminal output voltage when ECM sends OFF signal | High             |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

PCV control: Open the PCV solenoid.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

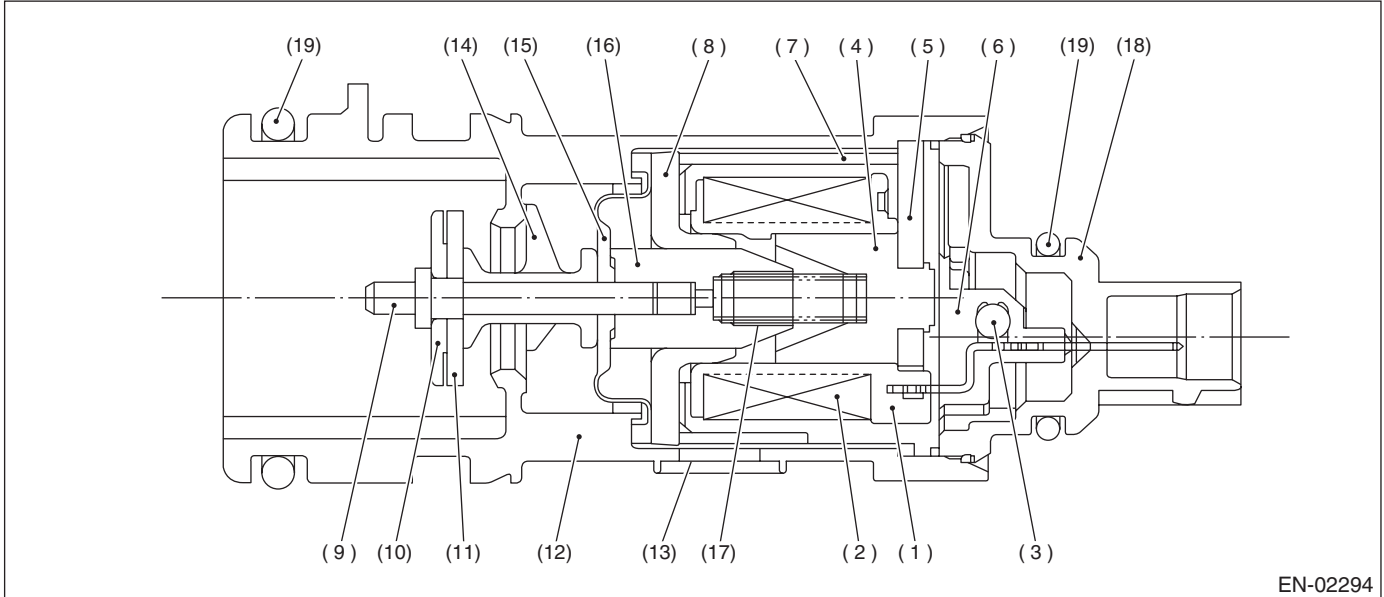
### BH:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.

Judge NG when the ECM output level is different from the actual terminal level.

#### 2. COMPONENT DESCRIPTION



- |                 |                    |                  |
|-----------------|--------------------|------------------|
| (1) Bobbin      | (8) Magnetic plate | (15) Diaphragm   |
| (2) Coil        | (9) Shaft          | (16) Moving core |
| (3) Diode       | (10) Plate         | (17) Spring      |
| (4) Stator core | (11) Valve         | (18) Cover       |
| (5) End plate   | (12) Housing       | (19) O-ring      |
| (6) Body        | (13) Filter        |                  |
| (7) Yoke        | (14) Retainer      |                  |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

### Judgment Value

| Malfunction Criteria                             | Threshold Value  |
|--|------------------|
| Ignition switch                                  | ON               |
| Battery voltage                                  | $\geq 10.9$ V    |
| After engine starting                            | 1 second or more |
| Terminal output voltage when ECM sends ON signal | High             |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria                             | Threshold Value  |
|--|------------------|
| Ignition switch                                  | ON               |
| Battery voltage                                  | $\geq 10.9$ V    |
| After engine starting                            | 1 second or more |
| Terminal output voltage when ECM sends ON signal | Low              |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

PCV control: Open the PCV solenoid.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

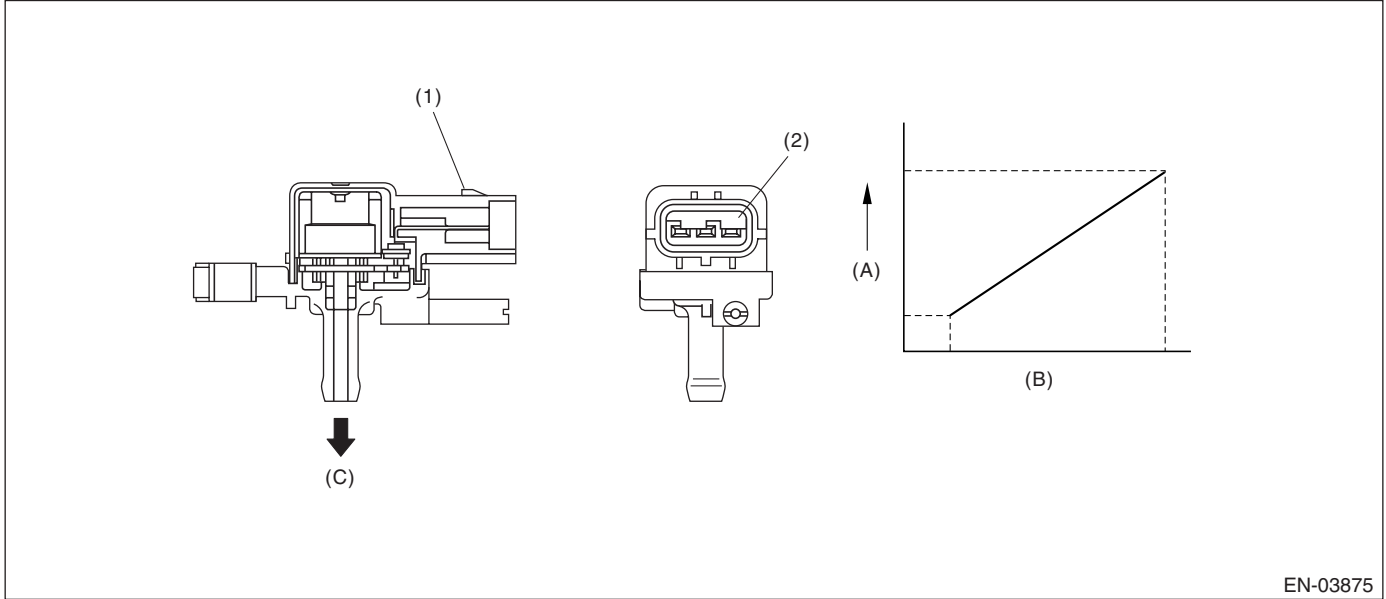
### BI: DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

#### 1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.

Judge NG when there is no pressure variation, which should exist in the tank, considering the engine status.

#### 2. COMPONENT DESCRIPTION



EN-03875

(1) Connector

(2) Terminal

(A) Output voltage

(B) Input voltage

(C) To fuel tank

#### 3. ENABLE CONDITION

| Secondary Parameters      | Enable Conditions                               |
|---------------------------|---|
| After starting the engine | 60 second or more                               |
| Fuel level                | $\geq 9.0 \ell$ (2.4 US gal, 2.0 Imp gal)       |
| Fuel temperature          | $< 35^{\circ}\text{C}$ ( $95^{\circ}\text{F}$ ) |
| Battery voltage           | $\geq 10.9 \text{ V}$                           |
| Atmospheric pressure      | $> 75.1 \text{ kPa}$ (563 mmHg, 22.2 inHg)      |

#### 4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in 60 seconds or more after starting the engine.
- Be sure to check the fuel level and fuel temperature.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the malfunction criteria below is completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value                     |
|--|-------------------------------------|
| Number of times when the difference between the Max. fuel level and the Min. fuel level every 60 seconds is 2 ℓ (0.53 US gal, 0.44Imp gal) or more (with enable condition completed) | ≥ 16 times                          |
| Max. – Min. tank pressure (with enable condition completed)  | < 0.05 kPa (0.375 mmHg, 0.015 inHg) |
| Max. – Min. fuel temperature (with enable condition completed)   | ≥ 7°C (12.6°F)                      |

If the fuel level (Max. – Min.) in every 60 seconds is less than 2 ℓ, extend 60 seconds more and make judgment with the Max. and Min. fuel level in 120 seconds.

If the difference did not appear though the time extended, extend the time (180, 240, 300 seconds) and continue the judgment.

Diagnosis counter will count up when the difference of fuel level (Max. – Min.) is more than 2 ℓ.

**Time Needed for Diagnosis:** 1 minute × 16 times or more

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below is completed.

#### Judgment Value

| Malfunction Criteria      | Threshold Value                     |
|---------------------------|-------------------------------------|
| Max. – Min. tank pressure | ≥ 0.05 kPa (0.375 mmHg, 0.015 inHg) |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

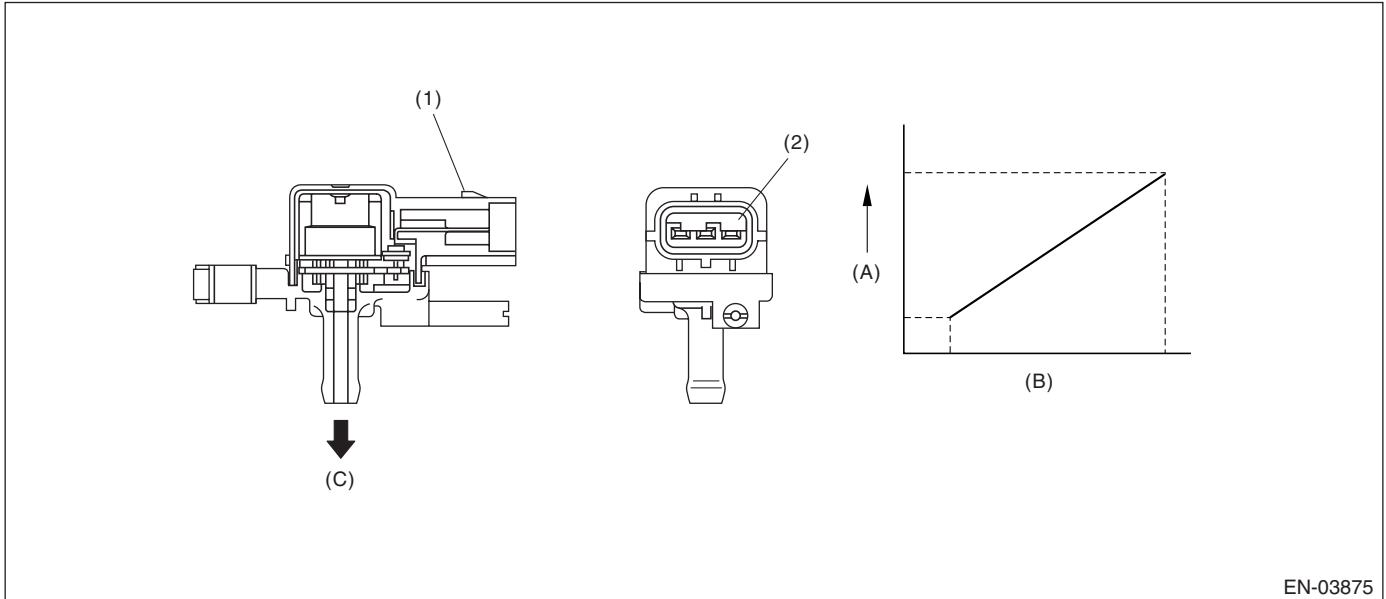
## GENERAL DESCRIPTION

### BJ:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-03875

(1) Connector

(A) Output voltage

(C) To fuel tank

(2) Terminal

(B) Input voltage

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | $\geq 10.9$ V     |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 15 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value                                 |
|----------------------|---|
| Fuel tank pressure   | $\leq -7.48$ kPa ( $-56.15$ mmHg, $-2.21$ inHg) |

**Time Needed for Diagnosis:** 15 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Normality Judgment

Judge OK when the malfunction criteria below is completed.

### Judgment Value

| Malfunction Criteria | Threshold Value                       |
|----------------------|---------------------------------------|
| Fuel tank pressure   | > -7.48 kPa (-56.15 mmHg, -2.21 inHg) |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

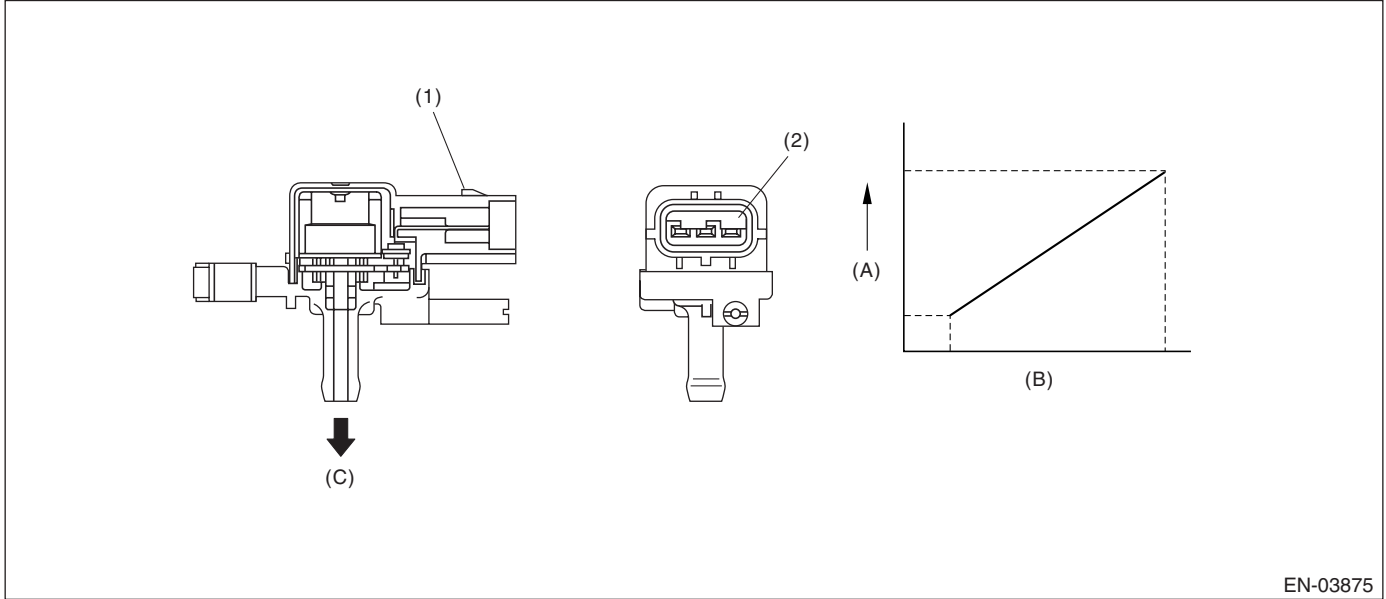
## GENERAL DESCRIPTION

### BK:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the breaking/shortage of the fuel tank pressure sensor.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-03875

(1) Connector

(A) Output voltage

(C) To fuel tank

(2) Terminal

(B) Input voltage

#### 3. ENABLE CONDITION

| Secondary Parameters                   | Enable Conditions        |
|--|--------------------------|
| Vehicle speed                          | $\geq 2$ km/h (1.24 MPH) |
| All conditions of EVAP canister purge  | Complete                 |
| Evaporation gas density learning value | $\leq 0.08$              |
| Main feedback compensation coefficient | $\geq 0.9$               |
| Battery voltage                        | $\geq 10.9$ V            |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when purging.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 15 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value                                 |
|----------------------|---|
| Fuel tank pressure   | $> 7.98$ kPa (59.86 mmHg, 2.36 inHg)            |
| Fuel temperature     | $< 35^{\circ}\text{C}$ (95 $^{\circ}\text{F}$ ) |
| Atmospheric pressure | $\geq 75.1$ kPa (563 mmHg, 22.2 inHg)           |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

**Time Needed for Diagnosis:** 15 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

• **Normality Judgment**

Judge OK when the malfunction criteria below is completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value                    |
|----------------------|------------------------------------|
| Fuel tank pressure   | ≤ 7.98 kPa (59.86 mmHg, 2.36 inHg) |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## **BL:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)**

### 1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4SO)-101, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

## **BM:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)**

### 1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4SO)-101, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

# Diagnostic Trouble Code (DTC) Detecting Criteria

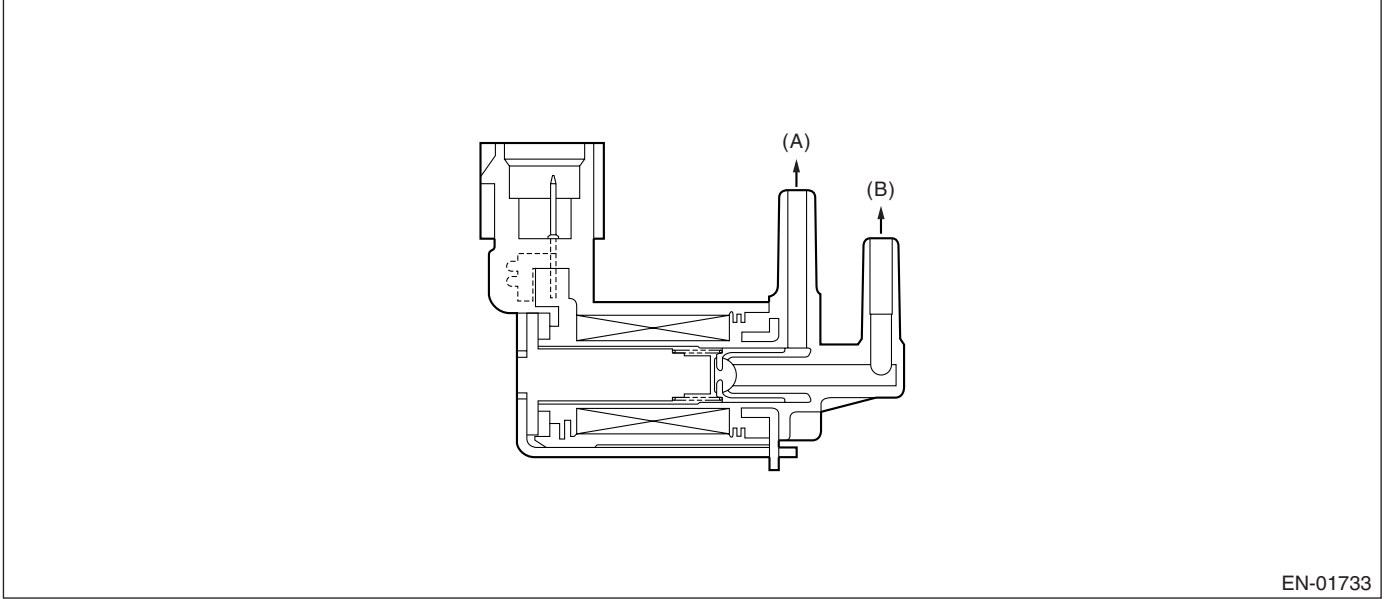
## GENERAL DESCRIPTION

### BN:DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.  
Judge NG when ECM output level is different from actual terminal level.

#### 2. COMPONENT DESCRIPTION



EN-01733

(A) To canister

(B) To intake manifold

#### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions     |
|-----------------------|-----------------------|
| Ignition switch       | ON                    |
| Battery voltage       | $\geq 10.9 \text{ V}$ |
| After engine starting | 1 second or more      |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria                          | Threshold Value            |
|---|----------------------------|
| Continuous time of completing criteria below. | $\geq 2.5 \text{ seconds}$ |
| Duty ratio of 'ON'                            | $< 75\%$                   |
| Terminal output voltage                       | Low                        |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

### Judgment Value

| Malfunction Criteria    | Threshold Value |
|-------------------------|-----------------|
| Terminal output voltage | High            |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

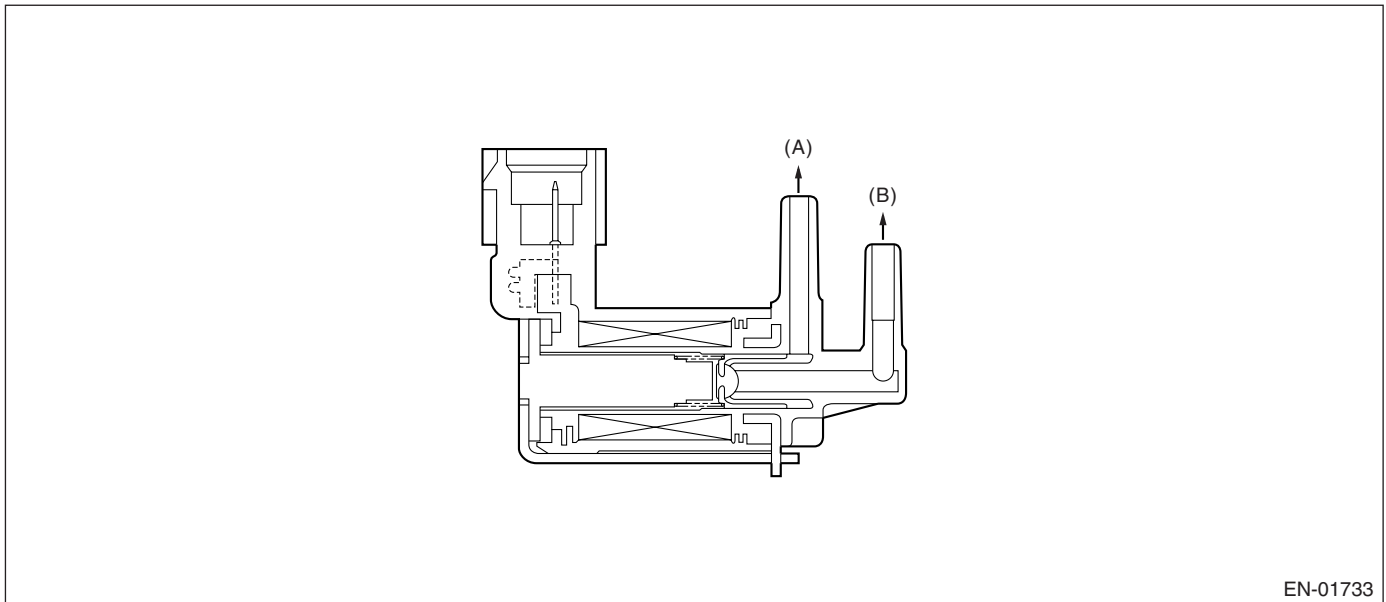
## BO:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.

Judge NG when ECM output level is different from actual terminal level.

### 2. COMPONENT DESCRIPTION



EN-01733

(A) To canister

(B) To intake manifold

### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions     |
|-----------------------|-----------------------|
| Ignition switch       | ON                    |
| Battery voltage       | $\geq 10.9 \text{ V}$ |
| After engine starting | 1 second or more      |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                          | Threshold Value |
|---|-----------------|
| Continuous time of completing criteria below. | ≥ 2.5 seconds   |
| Duty ratio of 'ON'                            | ≥ 25%           |
| Terminal output voltage                       | High            |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

#### Judgment Value

| Malfunction Criteria    | Threshold Value |
|-------------------------|-----------------|
| Terminal output voltage | Low             |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

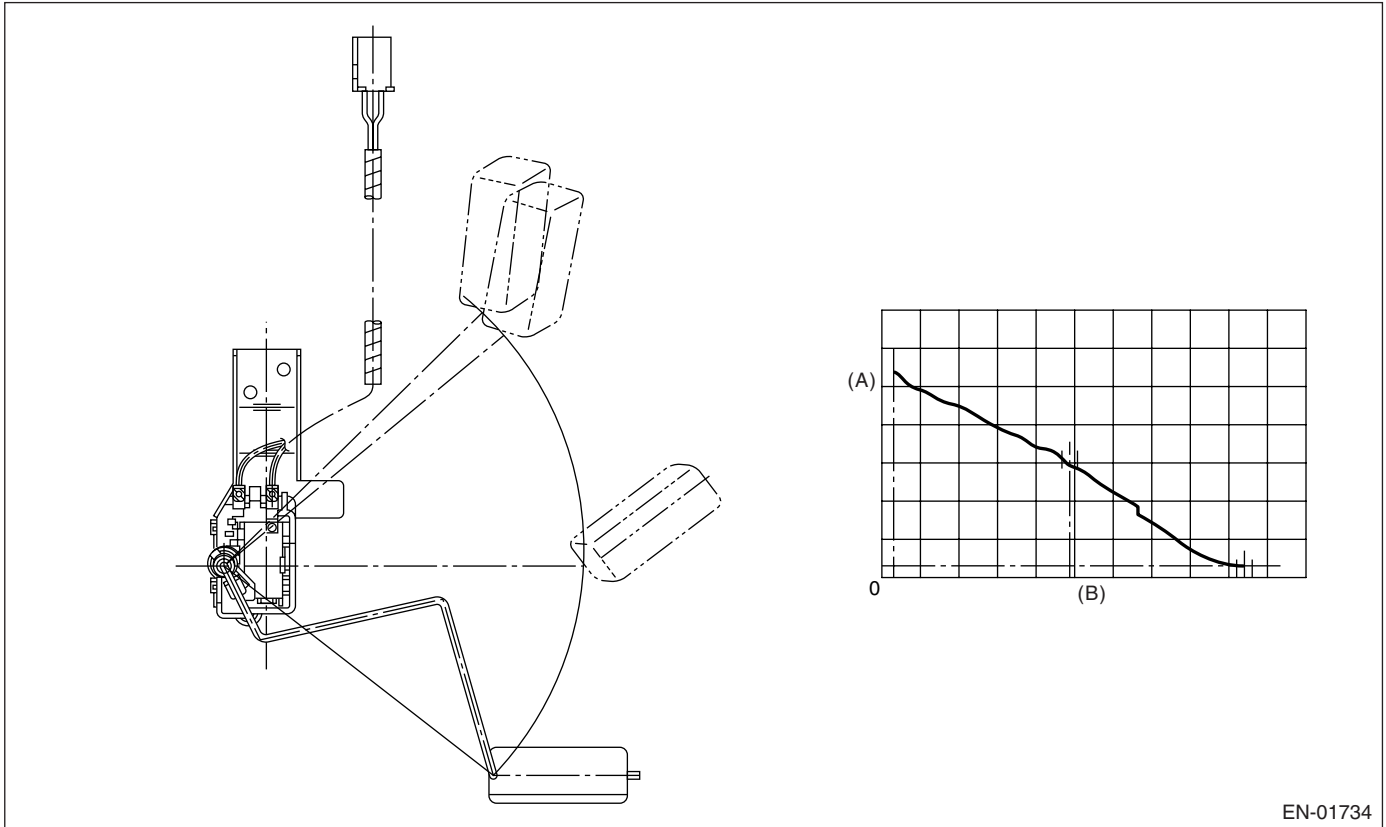
## BP:DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel level sensor output property.

Judge NG when the fuel level does not vary whereas it seemed to vary be in a usual driving speed.

### 2. COMPONENT DESCRIPTION



(A) Fuel level

(B) Resistance

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria             | Threshold Value                        |
|----------------------------------|--|
| Accumulated amount of intake air | > 331 kg (729.9 lb)                    |
| Max. – Min. fuel level output    | < 2.6 ℓ (0.69 US gal,<br>0.57 Imp gal) |
| Battery voltage                  | ≥ 10.9 V                               |
| After engine start               | More than 5 seconds                    |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

**Time Needed for Diagnosis:** To be determined.

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

• **Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria             | Threshold Value                        |
|----------------------------------|--|
| Accumulated amount of intake air | > 331 kg (729.9 lb)                    |
| Max.– Min. fuel level output     | ≥ 2.6 ℓ (0.69 US gal,<br>0.57 Imp gal) |
| Battery voltage                  | ≥ 10.9 V                               |
| After engine start               | More than 5 seconds                    |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

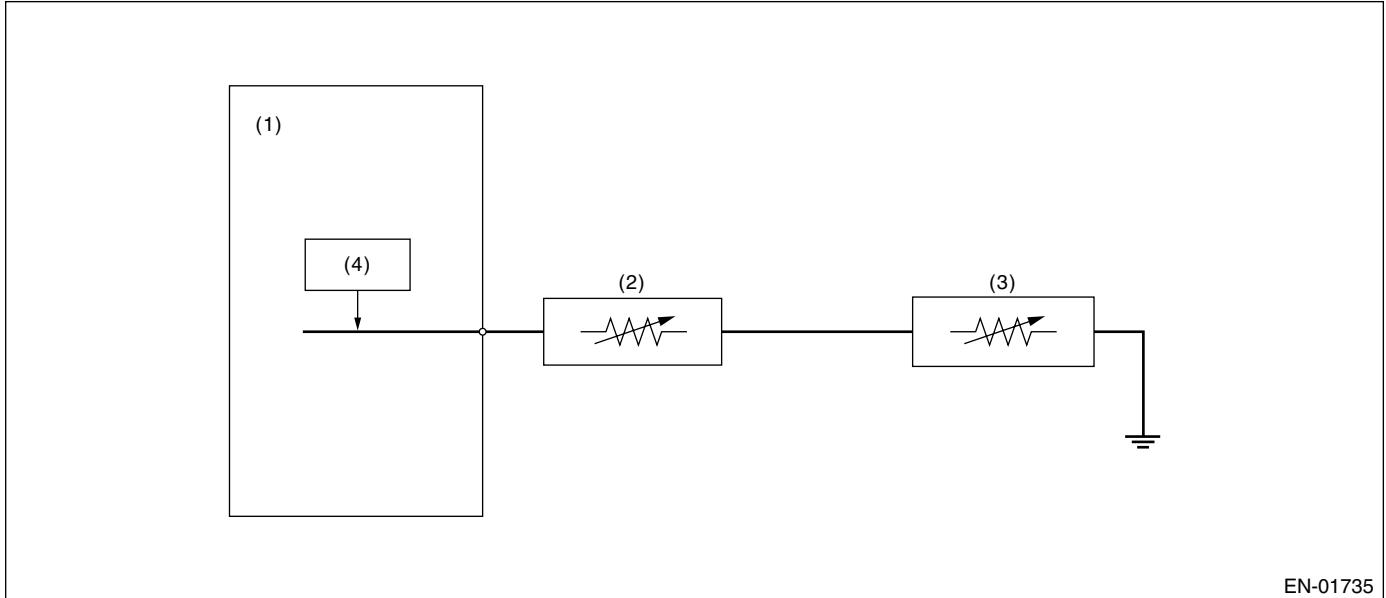
GENERAL DESCRIPTION

## BQ:DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01735

- (1) Engine control module (ECM)      (3) Fuel sub level sensor  
(2) Fuel level sensor                      (4) Detecting circuit

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria  | Threshold Value        |
|-----------------------|------------------------|
| Ignition switch       | ON                     |
| Battery voltage       | $\geq 10.9 \text{ V}$  |
| After engine starting | 3 seconds or more      |
| Output voltage        | $\leq 0.035 \text{ V}$ |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria  | Threshold Value   |
|-----------------------|-------------------|
| Ignition switch       | ON                |
| Battery voltage       | $\geq 10.9$ V     |
| After engine starting | 3 seconds or more |
| Output voltage        | $> 0.035$ V       |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

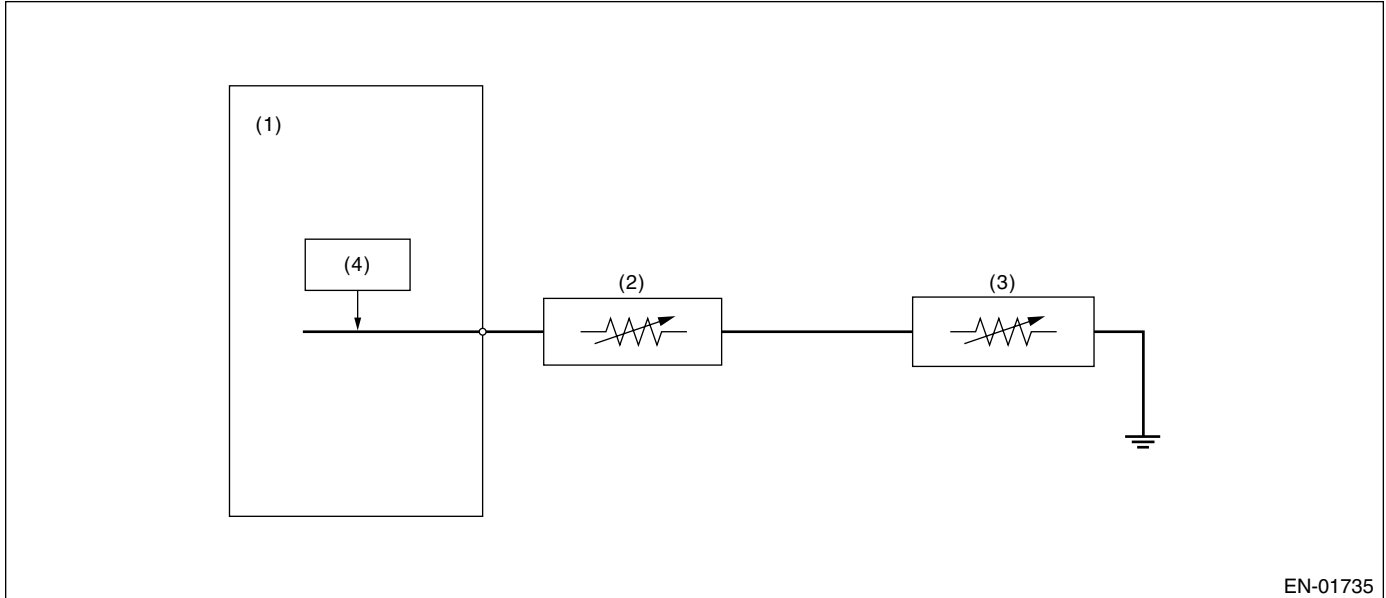
GENERAL DESCRIPTION

## BR:DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)      (3) Fuel sub level sensor  
(2) Fuel level sensor                      (4) Detecting circuit

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria  | Threshold Value   |
|-----------------------|-------------------|
| Ignition switch       | ON                |
| Battery voltage       | $\geq 10.9$ V     |
| After engine starting | 3 seconds or more |
| Output voltage        | $\geq 4.911$ V    |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria  | Threshold Value   |
|-----------------------|-------------------|
| Ignition switch       | ON                |
| Battery voltage       | $\geq 10.9$ V     |
| After engine starting | 3 seconds or more |
| Output voltage        | $< 4.911$ V       |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## BS:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of unstable output from fuel level sensor caused by noise.

Judge NG when the max. value and cumulative value of output voltage variation of fuel level sensor is larger than the threshold value.

### 2. ENABLE CONDITION

| Secondary Parameters           | Enable Conditions                                       |
|--------------------------------|---|
| Engine speed                   | ≥ 500 rpm   |
| After engine starting          | 1 second or more  |
| Ignition switch                | ON  |
| Battery voltage                | > 10.9 V  |
| Idle switch                    | ON  |
| Fuel level                     | 9.0 ↔ 51 ℓ (2.38<br>↔ 13.5 US gal, 2<br>↔ 11.2 Imp gal) |
| Vehicle speed = 0 km/h (0 MPH) | 10 seconds or more                                      |

### 3. GENERAL DRIVING CYCLE

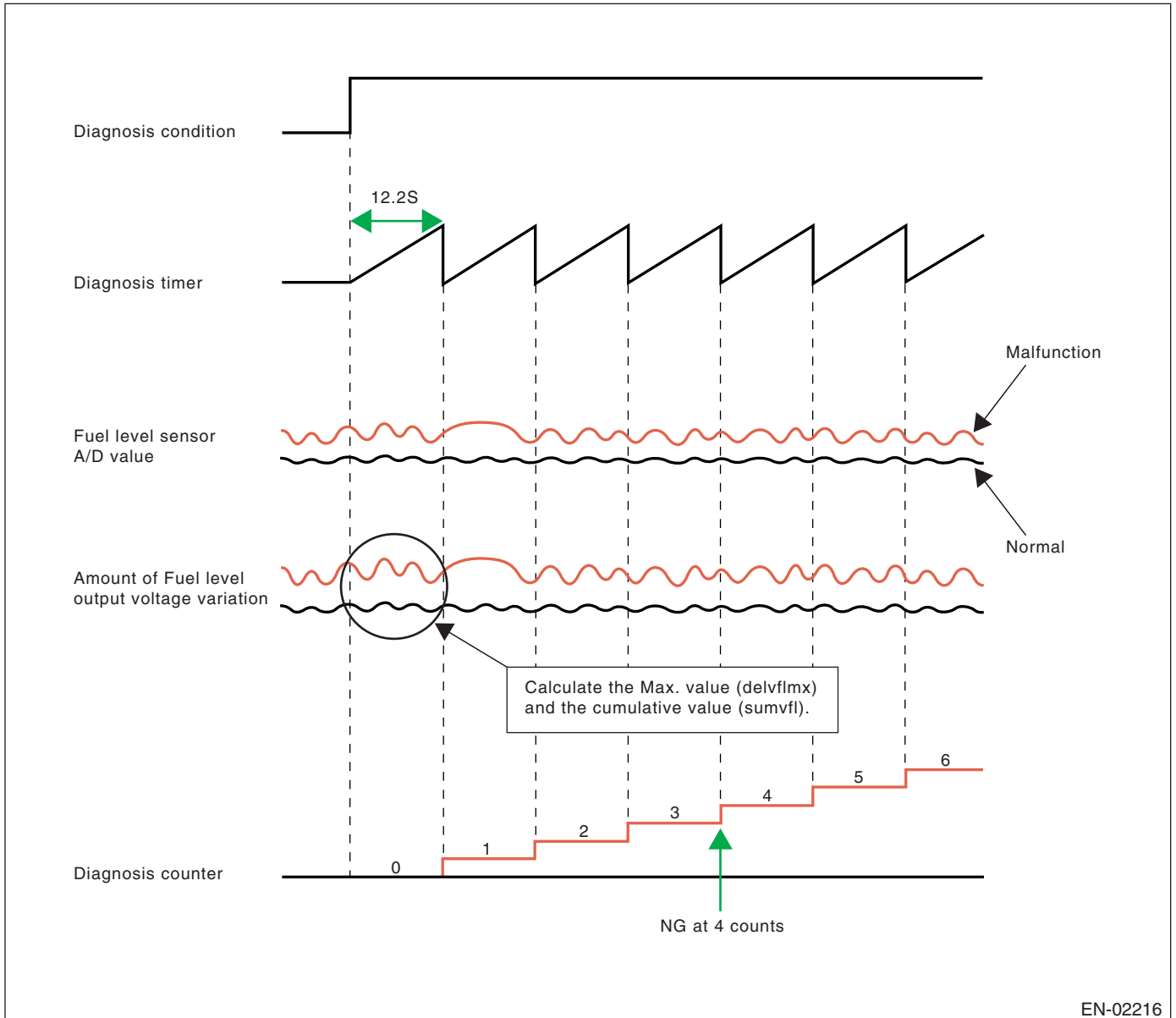
- Perform the diagnosis continuously in idling condition.
- Pay attention to the fuel level.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 4. DIAGNOSTIC METHOD

Calculate the Max. value (delflmax) and cumulative value (sumfl) of output voltage variation of fuel level sensor during 12.2 seconds. Judge it normal when both max. and cumulative values are not over the threshold value. Otherwise, when either of them is over the threshold value, count the diagnosis counter up. And judge NG if the counter indicated 4 counts.



# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Integrated times of the condition reaching follows,<br>DELFLMAX $\geq 0.2 \leftrightarrow 0.26$ V or SUMFL $\geq 16$ V<br>where,<br>DELFLMAX is Max. deviation of sensor output during 12.2 seconds.<br>SUMFL is integrated value of sensor output deviation during 12.2 seconds. | $\geq 4$ times  |

Do not count the diagnosis counter up when the following conditions are completed during 12.2 seconds.

|  |  |
|--|--|
| Max – Min of tank pressure during 12.2 seconds   | $\geq 0.05$ kPa (0.375 mmHg, 0.015 inHg) |
| Max – Min of battery voltage during 12.2 seconds | $\geq 1.65$ V                            |

**Time Needed for Diagnosis:** 12.2 seconds  $\times$  4 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria  | Threshold Value                            |
|---|--|
| DELFLMAX<br>SUMFL<br>Where, DELFLMAX is Max. deviation of sensor output during 12.2 seconds.<br>SUMFL is integrated value of sensor output deviation during 12.2 seconds. | $< 0.2 \leftrightarrow 0.26$ V<br>$< 16$ V |

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### BT:DTC P0483 COOLING FAN RATIONALITY CHECK

#### 1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the radiator fan.

Judge NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

#### 2. ENABLE CONDITION

Diagnostic enable condition is completed if the radiator fan changes from OFF to ON when all of the conditions below are completed. When one of the conditions below is not completed, the diagnostic enable condition is not completed.

| Secondary Parameters | Enable Conditions  |
|----------------------|--------------------|
| Engine Speed         | 560 — 900 rpm      |
| Idle switch          | ON                 |
| Vehicle speed        | < 2 km/h (1.2 MPH) |
| Battery voltage      | ≥ 10.9 V           |

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the radiator fan changes from OFF to ON when idling.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 minutes.

##### Judgment Value

| Malfunction Criteria        | Threshold Value |
|-----------------------------|-----------------|
| Engine coolant temperature  | ≥ 100°C (212°F) |
| Radiator fan signal changes | OFF to ON       |
| Engine coolant temperature  | Not reducing    |

**Time Needed for Diagnosis:** 5 minutes

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

##### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria        | Threshold Value |
|-----------------------------|-----------------|
| Radiator fan signal changes | OFF to ON       |
| Engine coolant temperature  | Reducing        |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## BU:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.

Judge NG when low vehicle speed (0 km/h (0 MPH)) remains whereas it seemed to be in a usual driving speed.

### 2. ENABLE CONDITION (USED WITH ABNORMAL JUDGEMENT)

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Engine speed         | < 4,000 rpm       |
| Fuel cut in decel.   | Operating         |
| Battery voltage      | ≥ 10.9 V          |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 4 seconds.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Vehicle speed        | < 1             |

**Time Needed for Diagnosis:** 4 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria               | Threshold Value |
|------------------------------------|-----------------|
| Vehicle speed                      | ≥ 1             |
| Starter switch                     | OFF             |
| Time after starter switch ON → OFF | ≥ 3 seconds     |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- ISC control: Set the open loop compensation to specified value (1 g (0.04 oz)/s). Not allowed ISC feedback volume calculation.
- Radiator fan control: ON both main/sub.
- Tumble generator valve control: Open the tumble generator valve.

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### BV:DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.

Judge NG when high vehicle speed (240 km/h (149.1 MPH) or more) remains whereas it seemed to be in a usual driving speed.

#### 2. ENABLE CONDITION (USED WITH ABNORMAL JUDGEMENT)

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Engine speed         | < 4,000 rpm       |
| Fuel cut in decel.   | Operating         |
| Battery voltage      | ≥ 10.9 V          |

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 4 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Vehicle speed        | ≥ 240           |

**Time Needed for Diagnosis:** 4 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria               | Threshold Value |
|------------------------------------|-----------------|
| Vehicle speed                      | < 240           |
| Starter switch                     | OFF             |
| Time after starter switch ON → OFF | ≥ 3 seconds     |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- ISC control: Set the open loop compensation to specified value (1 g (0.04 oz)/s). Not allowed ISC feedback volume calculation.
- Radiator fan control: ON both main/sub.
- Tumble generator valve control: Open the tumble generator valve.

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## BW:DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.  
Judge NG when actual engine speed is not close to target engine speed during idling.

### 2. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions                 |
|---|-----------------------------------|
| Engine coolant temperature  | ≥ 75°C (167°F)                    |
| Battery voltage   | ≥ 10.9 V                          |
| Atmospheric pressure  | > 75.1 kPa (563 mmHg, 22.2 inHg)  |
| Fuel level  | ≥ 9 ℓ (2.38 US gal, 1.98 Imp gal) |
| After engine starting   | ≥ 10.5 seconds                    |
| Feedback in ISC   | In operation                      |
| Measured lambda   | 0.81 ←→ 1.1                       |
| After air condition switching ON-OFF, OFF-ON                          | > 5.1 seconds                     |
| After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg) | > 5.1 seconds                     |
| After neutral switch ON-OFF event                                     | > 5.1 seconds                     |
| Vehicle speed   | 0 km/h (0 MPH)                    |

### 3. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after engine warmed.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).

#### Judgment Value

| Malfunction Criteria                                    | Threshold Value |
|---|-----------------|
| Actual – target engine speed                            | < –100 rpm      |
| Feedback correction for idle air control solenoid valve | Max.            |

**Time Needed for Diagnosis:** 10 seconds × 3 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

#### Judgment Value

| Malfunction Criteria         | Threshold Value |
|------------------------------|-----------------|
| Actual – target engine speed | ≥ –100 rpm      |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## **BX:DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED**

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.  
Judge NG when actual engine speed is not close to target engine speed during idling.

### 2. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions                 |
|---|-----------------------------------|
| Engine coolant temperature  | ≥ 75°C (167°F)                    |
| Battery voltage   | ≥ 10.9 V                          |
| Atmospheric pressure  | > 75.1 kPa (563 mmHg, 22.2 inHg)  |
| Fuel level  | ≥ 9 ℓ (2.38 US gal, 1.98 Imp gal) |
| After engine starting   | ≥ 10.5 seconds                    |
| Feedback in ISC   | In operation                      |
| Lambda  | 0.81 ↔ 1.1                        |
| After air condition switching ON-OFF, OFF-ON                          | > 5.1 seconds                     |
| After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg) | > 5.1 seconds                     |
| After neutral switch ON-OFF event                                     | > 5.1 seconds                     |
| Vehicle speed   | 0 km/h (0 MPH)                    |

### 3. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after engine warmed.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).

#### Judgment Value

| Malfunction Criteria                                    | Threshold Value |
|---|-----------------|
| Actual – target eng. speed                              | ≥ 200 rpm       |
| Feedback correction for idle air control solenoid valve | Min.            |

**Time Needed for Diagnosis:** 10 seconds × 3 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

#### Judgment Value

| Malfunction Criteria       | Threshold Value |
|----------------------------|-----------------|
| Actual – target eng. speed | < 200 rpm       |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## BY:DTC P0512 STARTER REQUEST CIRCUIT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge ON NG when the starter SW signal remains on.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 minutes.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Engine speed         | > 500 rpm       |
| Starter OFF signal   | Not detect      |
| Battery voltage      | > 8 V           |

**Time Needed for Diagnosis:** 180 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge ON OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Starter OFF signal   | Detect          |
| Battery voltage      | > 8 V           |

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## **BZ:DTC P0513 INCORRECT IMMOBILIZER KEY**

### 1. OUTLINE OF DIAGNOSIS

| DTC   | ITEM   | OUTLINE OF DIAGNOSIS   |
|-------|--|--|
| P0513 | Incorrect Immobilizer Key                    | Incorrect immobilizer key (Use of key not registered in body integrated module)                          |
| P1570 | Antenna                                      | Improper antenna   |
| P1571 | Reference Code Incompatibility               | Unmatched reference code between body integrated module and ECM  |
| P1572 | IMM Circuit Failure (Except Antenna Circuit) | Communication malfunction between body integrated module and ECM   |
| P1574 | Key Communication Failure                    | Malfunction of body integrated module that check the key (transponder) ID or Malfunction of transponder. |
| P1576 | EGI Control Module EEPROM                    | Abnormality of ECM   |
| P1577 | IMM Control Module EEPROM                    | Malfunction of body integrated module.   |

### 2. ENABLE CONDITION

When the engine started.

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis only when engine started.

### 4. DIAGNOSTIC METHOD

Judge NG when conditions of the above outline of diagnosis are completed.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## CA:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction that engine speed increases more than that in normal condition during idling.

### 2. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions     |
|-----------------------|-----------------------|
| Battery voltage       | $\geq 10.9$ V         |
| Feedback in ISC       | In operation          |
| Vehicle speed         | $< 4$ km/h (2.49 MPH) |
| After engine starting | 1 seconds or more     |

### 3. GENERAL DRIVING CYCLE

Always perform diagnosis at less than 4 km/h (2.49 MPH) of vehicle speed.

### 4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

#### Judgment Value

| Malfunction Criteria                             | Threshold Value |
|--|-----------------|
| Engine speed – target eng. speed                 | $> 2,000$ rpm   |
| Feedback value for ISC                           | $\leq 0$        |
| Engine speed change every 180 degree engine rev. | $\geq -5$ rpm   |

**Time Needed for Diagnosis:** 2 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

#### Judgment Value

| Malfunction Criteria             | Threshold Value |
|----------------------------------|-----------------|
| Engine speed – target eng. speed | $< 200$ rpm     |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 7. FAIL SAFE

Fuel shut-off: Shut-off fuel for only #1 and #2 cylinder, or for all cylinder in accordance with vehicle speed, engine speed, throttle position

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### CB:DTC P0600 SERIAL COMMUNICATION LINK

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of CAN communication.

It judges as NG when CAN communication becomes impossible, the CAN communication with AT becomes impossible, and the data from AT is not normal.

#### 2. COMPONENT DESCRIPTION

CAN connects between ECM and TCM with high speed.

*(Common Specification)*

*CAN PROTOCOL 2.0B (active)*

*Frame format: 11 bit ID Frame (Standard frame)*

*(High Speed CAN)*

*ISO 11898 compliance*

*Communication Speed: 500 kbps*

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery Voltages     | ≥ 10.9 V          |
| Starter switch       | OFF               |
| Engine               | Run               |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

#### 5. DIAGNOSTIC METHOD

##### • JUDGMENT OF MALFUNCTION

Judge NG when any of the malfunction criteria below are completed. Judge OK and clear the NG when the continuous time of not completing the malfunction criteria below becomes more than 1 second.

##### Judgement Value

| Malfunction Criteria           | Threshold Value    |
|--------------------------------|--------------------|
| Buss off flag or warning flag  | Set                |
| ID cannot be received from TCM | = 500 milliseconds |

**Time needed for Diagnosis:** 1 time

**Malfunction Indicator Light Illumination:** Illuminates simultaneously when malfunction is detected.

#### 6. DTC CLEAR CONDITION

When the OK driving cycle was completed 40 consecutive times.

When "Clear Memory" was performed.

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 consecutive times.
- When "Clear Memory" was performed.

#### 8. FAIL-SAFE

None

#### 9. ECM OPERATION AT DTC SETTING

Store the freeze frame data. (For test mode \$02)

## CC:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

### 1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the micro-computer (RAM).

Judge NG when either the main CPU normal RAM or sub CPU normal RAM is abnormal. Judge OK when both of them are normal.

At initial routine, write the data to all area of RAM. Judge OK when same data can be read out, and judge NG when same data cannot be read out.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

Perform the diagnosis in the initial routine.

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis immediately after IG key SW is turned ON.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value  |
|--|--|
| Main CPU normal RAM abnormality<br>Write 5AA5A55A, and read out. (All area of RAM)<br>Or write A55A5AA5, and read out. (All area of RAM) | Cannot be read out 5AA5A55A.<br>Cannot be read out A55A5AA5. |
| Sub CPU normal RAM abnormality.<br>Write 5AA5, and read out. (All area of RAM)<br>Or write A55A, and read out. (All area of RAM)         | Cannot be read out 5AA5.<br>Cannot be read out A55A.         |

**Time Needed for Diagnosis:** To be determined.

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value  |
|--|--|
| Main CPU normal RAM abnormality<br>Write 5AA5A55A, and read out. (All area of RAM)<br>Or write A55A5AA5, and read out. (All area of RAM) | Can be read out 5AA5A55A.<br>Can be read out A55A5AA5. |
| Sub CPU normal RAM abnormality.<br>Write 5AA5, and read out. (All area of RAM)<br>Or write A55A, and read out. (All area of RAM)         | Can be read out 5AA5.<br>Can be read out A55A.         |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## CD:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

### 1. OUTLINE OF DIAGNOSIS

Judge NG when SUM value of ROM is out of the standard value.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| SUM value of ROM     | Standard value  |

**Time Needed for Diagnosis:** To be determined

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only at engine stop)

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

Stop the current to electronic throttle control motor. (Fix the throttle opening angle to 6°.)

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

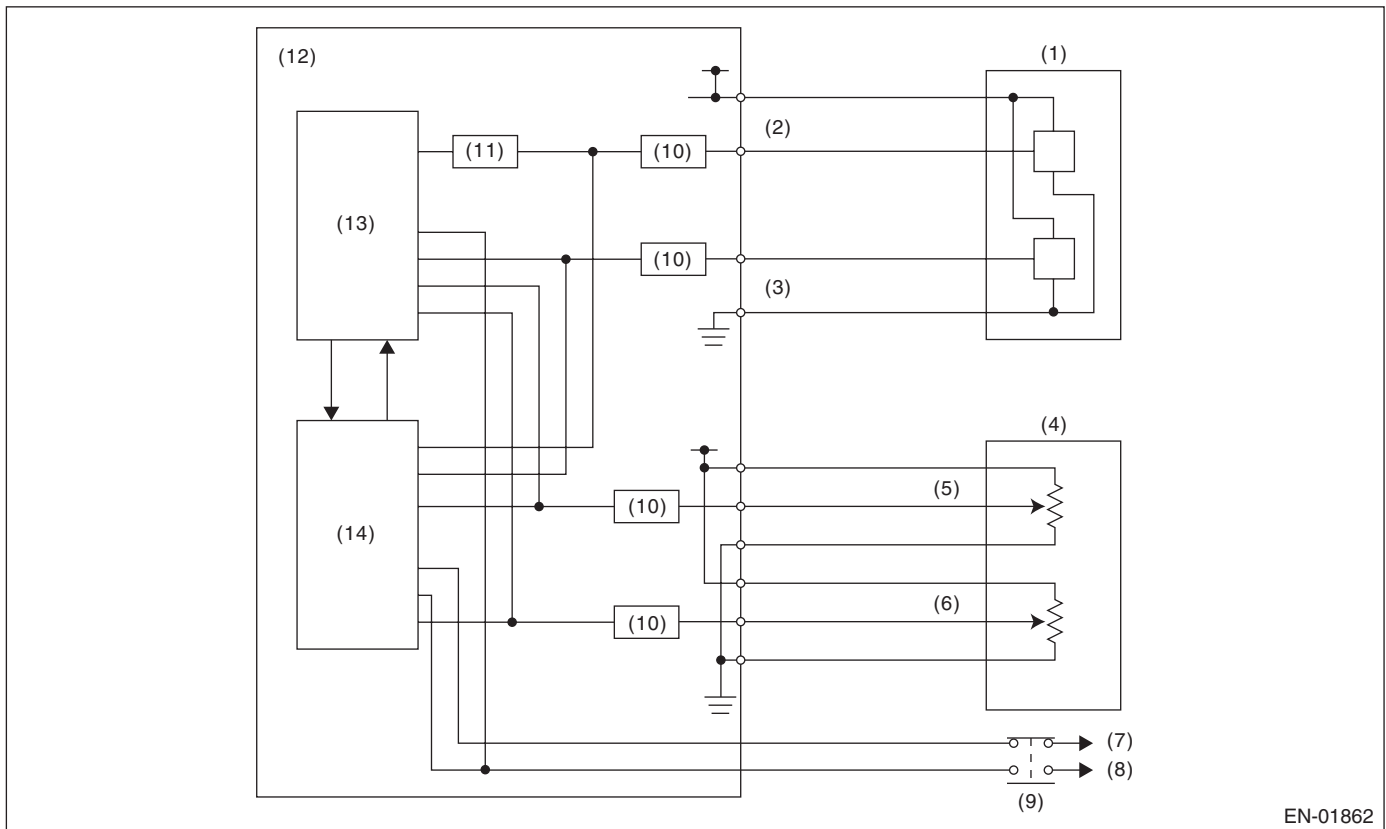
## CE:DTC P0607 CONTROL MODULE PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Judge NG when either the following is completed.

- When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the read value of accelerator pedal position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU and sub CPU is abnormal.
- When the input amplifier circuit of throttle position sensor 1 is abnormal.
- When the cruise control cannot be canceled correctly.
- When the signal of brake SW1 and 2 is mismatched.
- When the directed angle from main CPU is abnormal.

### 2. COMPONENT DESCRIPTION



EN-01862

- |   |   |                                  |
|---|---|----------------------------------|
| (1) Throttle position sensor            | (6) Accelerator pedal position sensor 2 | (11) Amplifier circuit           |
| (2) Throttle position sensor 1          | (7) Battery                             | (12) Engine control module (ECM) |
| (3) Throttle position sensor 2          | (8) Stop light                          | (13) Sub CPU                     |
| (4) Accelerator pedal position sensor   | (9) Brake switch                        | (14) Main CPU                    |
| (5) Accelerator pedal position sensor 1 | (10) I/F circuit                        |                                  |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 3. ENABLE CONDITION

| Secondary Parameters               | Enable Conditions |
|------------------------------------|-------------------|
| (1) Ignition switch                | ON                |
| (2) Ignition switch                | ON                |
| (3) None                           | —                 |
| (4) None                           | —                 |
| (5) Throttle opening angle         |                   |
| (6) Brake SW (with cruise control) | ON                |
| (7) None                           | —                 |
| (8) Cruise control                 | OFF               |

### 4. GENERAL DRIVING CYCLE

- (1) — (4): Always perform the diagnosis continuously.  
(5): Always perform the diagnosis continuously on idling.  
(6): Perform the diagnosis when the brake pedal is depressed.  
(7): Always perform the diagnosis continuously.  
(8): Always perform the diagnosis continuously when the cruise control pedal is not operating.

### 5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value                 |
|--|---------------------------------|
| (1) Difference of CPU on reading value of throttle position sensor signal  | 0.0858 V                        |
| (2) Difference of CPU on reading value of accelerator pedal position sensor signal                                   | 0.038 V                         |
| (3) WD pulse from sub CPU  | WD pulse occur                  |
| (4) Communication between CPU  | Possible to communicate         |
| (5) Throttle position sensor 1 opening angle – (Throttle position sensor 1 opening angle after amplifier passed) 1/4 | < 3°                            |
| (6) Cruise control cancel signal at brake ON   | Cruise control cancel signal ON |
| (7) Brake switch 1, 2 signal   | SW 1 and 2 are matched          |

#### Time Needed for Diagnosis:

- (1) 250 milliseconds  
(2) 250 milliseconds  
(3) 200 milliseconds  
(4) 200 milliseconds  
(5) 24 milliseconds  
(6) 250 milliseconds  
(7) 200 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 8. FAIL SAFE

Stop the current to electronic throttle control motor. (Fix the throttle opening angle to 6°.)

## 9. ECM OPERATION AT DTC SETTING

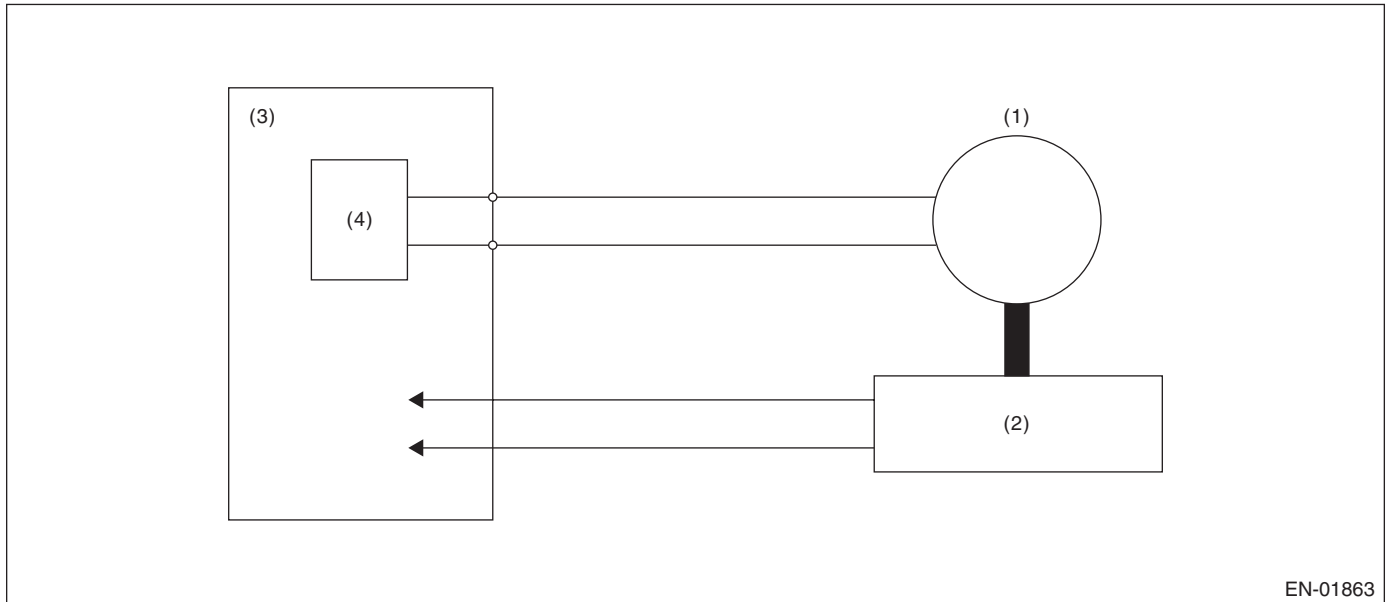
Memorize the freeze frame data. (For test mode \$02)

## CF:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the target opening angle and actual opening angle is mismatched or the current to motor is more than specified duty for specified time continuously.

### 2. COMPONENT DESCRIPTION



EN-01863

- (1) Motor  
(2) Throttle position sensor  
(3) Engine control module (ECM)  
(4) Drive circuit

### 3. ENABLE CONDITION

| Secondary Parameters                            | Enable Conditions |
|---|-------------------|
| Ignition switch                                 | ON                |
| Normal operation of electronic throttle control | ON                |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electronic throttle control is operating.

### 5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Difference between target opening angle and actual opening angle | Less than 3.5°  |
| Output duty to drive circuit                                     | Less than 95%   |

# Diagnostic Trouble Code (DTC) Detecting Criteria

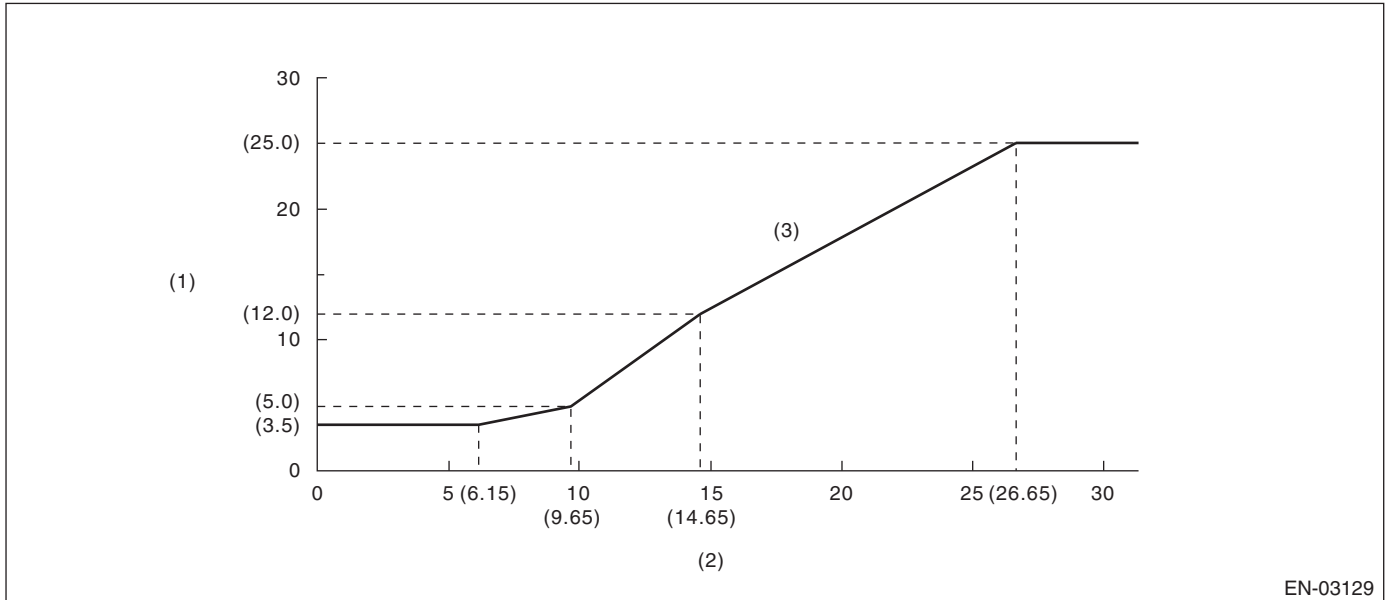
## GENERAL DESCRIPTION

### Time Needed for Diagnosis:

Target opening angle and actual opening angle: 250 milliseconds (For NG) 2,000 milliseconds (For OK)

Output duty to drive circuit: 2,000 milliseconds

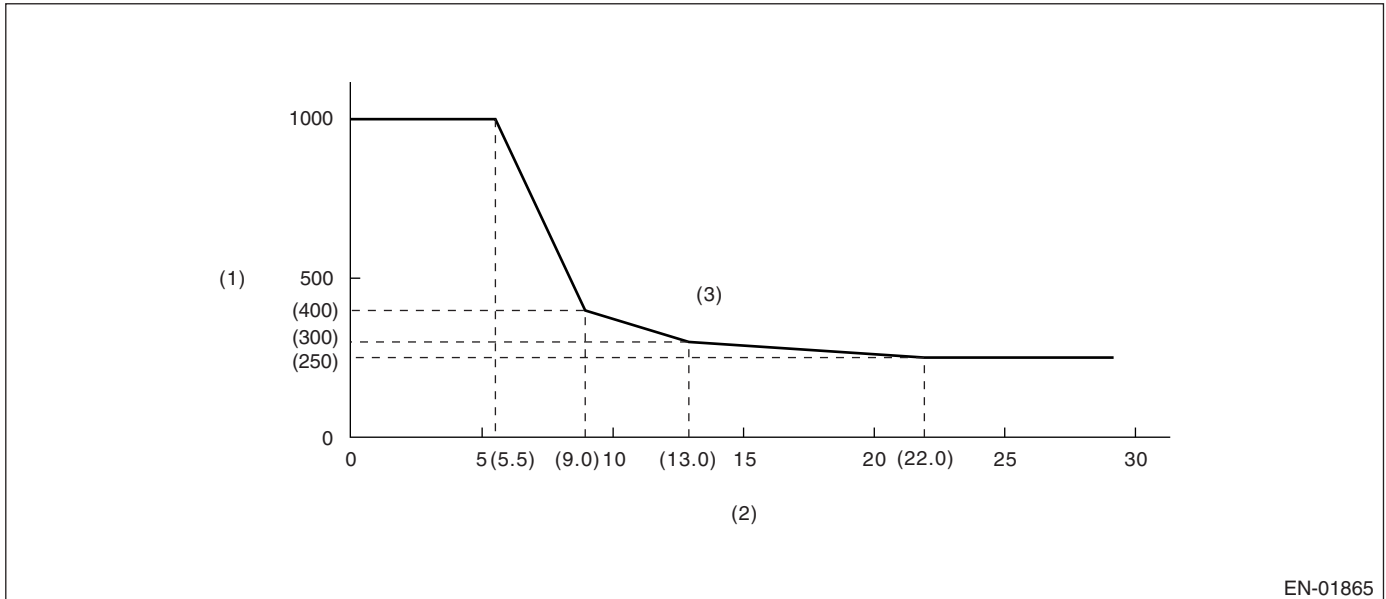
### Details of Judgment



EN-03129

- (1) Difference between target opening angle and actual opening angle (°)      (2) Target throttle opening angle (°)  
 (3) NG area

### Details of Judgment (Always 1,000 milliseconds when the actual opening angle $\leq$ target opening angle)



EN-01865

- (1) Judgment time (milliseconds)      (2) Throttle position sensor 1 opening angle      (3) NG area

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stopped)

## 8. FAIL SAFE

Stop the current to electronic throttle control motor. (Fix the throttle opening angle to 6°.)

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## CG:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.

Judge NG when the ECM output level differs from the actual terminal level.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria                                 | Threshold Value   |
|--|-------------------|
| After starting the engine                            | 1 seconds or more |
| Engine speed   | ≥ 500 rpm         |
| Ignition switch                                      | ON                |
| Battery voltage                                      | ≥ 10.9 V          |
| Terminal voltage level when ECM transmits OFF signal | Low level         |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                                 | Threshold Value   |
|--|-------------------|
| After starting the engine                            | 1 seconds or more |
| Engine speed   | ≥ 500 rpm         |
| Ignition switch                                      | ON                |
| Battery voltage                                      | ≥ 10.9 V          |
| Terminal voltage level when ECM transmits OFF signal | High level        |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## CH:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.

Judge NG when the ECM output level differs from the actual terminal level.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria                                | Threshold Value   |
|---|-------------------|
| After starting the engine                           | 1 seconds or more |
| Engine speed  | ≥ 500 rpm         |
| Ignition switch                                     | ON                |
| Battery voltage                                     | ≥ 10.9 V          |
| Terminal voltage level when ECM transmits ON signal | High level        |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                                | Threshold Value   |
|---|-------------------|
| After starting the engine                           | 1 seconds or more |
| Engine speed  | ≥ 500 rpm         |
| Ignition switch                                     | ON                |
| Battery voltage                                     | ≥ 10.9 V          |
| Terminal voltage level when ECM transmits ON signal | Low level         |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## CI: DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

### 1. OUTLINE OF DIAGNOSIS

AT C/U performs CAN communication. It judges as NG if malfunction is detected.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery Voltage      | $\geq 10.9$ V     |

### 3. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

### 4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

#### Judgement Value

| Malfunction Criteria          | Threshold Value |
|-------------------------------|-----------------|
| MIL light up request from TCM | Set             |

**Time needed for diagnosis:**2.5 seconds

**Malfunction Indicator Light Illumination:**Illuminates simultaneously when malfunction is detected.

### 5. DTC CLEAR CONDITION

- When the OK driving cycle was completed 40 consecutive times.
- When "Clear Memory" was performed.

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 consecutive times.
- When "Clear Memory" was performed.

## 7. FAIL-SAFE

None

## 8. ECM OPERATING AT DTC SETTING

Store the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### CJ:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.

Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

#### 2. ENABLE CONDITION

| Secondary Parameters      | Enable Conditions     |
|---------------------------|-----------------------|
| Ignition switch           | ON                    |
| Battery voltage           | $\geq 10.9 \text{ V}$ |
| After starting the engine | 2 seconds or more     |
| Starter switch            | OFF                   |

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

#### 4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.56 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Neutral switch signal when park/neutral = "OFF" & any other switches = "ON" on AT | LOW (ON)        |

**Time Needed for Diagnosis:** 2.56 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

Cruise control: Not allowed to command cruise control.

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## CK:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

### 1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

### 2. ENABLE CONDITION

| Secondary Parameters      | Enable Conditions |
|---------------------------|-------------------|
| Ignition switch           | ON                |
| Battery voltage           | $\geq 10.9$ V     |
| After starting the engine | 2 seconds or more |
| Starter switch            | OFF               |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

### 4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change.

Judge OK and clear NG if there is change in the neutral SW.

#### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Neutral switch signal (while changing from a to b below)                  | LOW (ON)        |
| Driving condition change  | a) to b)        |
| a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm            |                 |
| b) Vehicle speed $\geq 64$ km/h (40 MPH) & engine speed 1,600 — 2,550 rpm |                 |

**Time Needed for Diagnosis:** 3 monitoring

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

Cruise control: Not allowed to command cruise control.

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### CL:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.

Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

#### 2. ENABLE CONDITION

| Secondary Parameters      | Enable Conditions     |
|---------------------------|-----------------------|
| Ignition switch           | ON                    |
| Battery voltage           | $\geq 10.9 \text{ V}$ |
| After starting the engine | 2 seconds or more     |
| Starter switch            | OFF                   |

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

#### 4. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 2.56 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Neutral switch signal when park/neutral = "ON" & any other switches = "OFF" on AT | HIGH (OFF)      |

**Time Needed for Diagnosis:** 2.56 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

Cruise control: Not allowed to command cruise control.

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## CM:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

### 1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

### 2. ENABLE CONDITION

| Secondary Parameters      | Enable Conditions     |
|---------------------------|-----------------------|
| Ignition switch           | ON                    |
| Battery voltage           | $\geq 10.9 \text{ V}$ |
| After starting the engine | 2 seconds or more     |
| Starter switch            | OFF                   |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

### 4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change.

Judge OK and clear NG if there is change in the neutral SW.

#### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Neutral switch signal (while changing from a to b below)                          | HIGH (OFF)      |
| Driving condition change  | a) to b)        |
| a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm                    |                 |
| b) Vehicle speed $\geq 64 \text{ km/h}$ (40 MPH) & engine speed 1,600 — 2,550 rpm |                 |

**Time Needed for Diagnosis:** 3 monitoring

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

Cruise control: Not allowed to command cruise control.

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### CN:DTC P1152 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

#### 1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains Low.

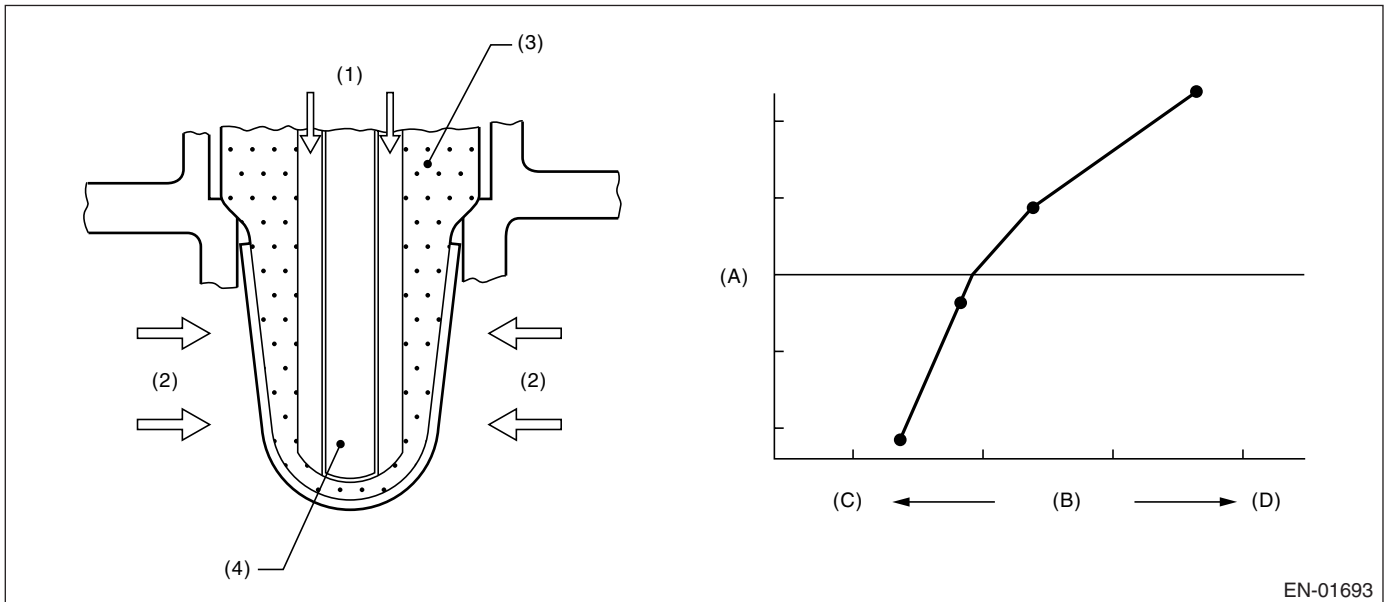
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.

**Lambda value = Actual air fuel ratio/Theoretical air fuel ratio**

Lambda > 1: Lean

Lambda < 1: Rich

#### 2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust
- (3) ZrO<sub>2</sub>
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions                |
|---|----------------------------------|
| All secondary parameters to be in enable conditions         | 4 seconds or more                |
| Battery voltage   | > 10.9 V                         |
| Atmospheric pressure  | > 75.1 kPa (563 mmHg, 22.2 inHg) |
| Rear oxygen sensor sub feedback                             | Operating                        |
| Rear oxygen sensor output voltage – feedback target voltage | –0.2 V ↔ 0.1 V                   |
| or rear oxygen sensor sub feedback compensation coefficient | On Min.                          |
| or rear oxygen sensor sub feedback compensation coefficient | On Max.                          |
| After engine starting                                       | 60 seconds or more               |
| Engine coolant temperature                                  | ≥ 75°C (167°F)                   |
| Vehicle speed   | ≥ 20 km/h (12 MPH)               |
| Amount of intake air  | ≥ 6 g (0.21 oz)/s                |
| Load change during 0.5 engine rev.                          | ≤ 0.02 g (0.001 oz)/rev          |
| Impedance of front oxygen (A/F) sensor                      | 0 ↔ 50 Ω                         |
| Learning value of evaporation gas density                   | ≤ 0.2                            |
| Total time of operating canister purge                      | 20 seconds or more               |
| Target lambda load compensation coefficient                 | –0.03 ↔ 0                        |

## 4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

## 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 10 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.

### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Output lambda when rear oxygen sensor sub feedback compensation coefficient being at not high limit | ≤ 0.85          |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Front oxygen (A/F) sensor sub learning compensation: Not allowed to calculate
- Purge control: Not allowed to purge

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## CO:DTC P1153 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

### 1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains High.

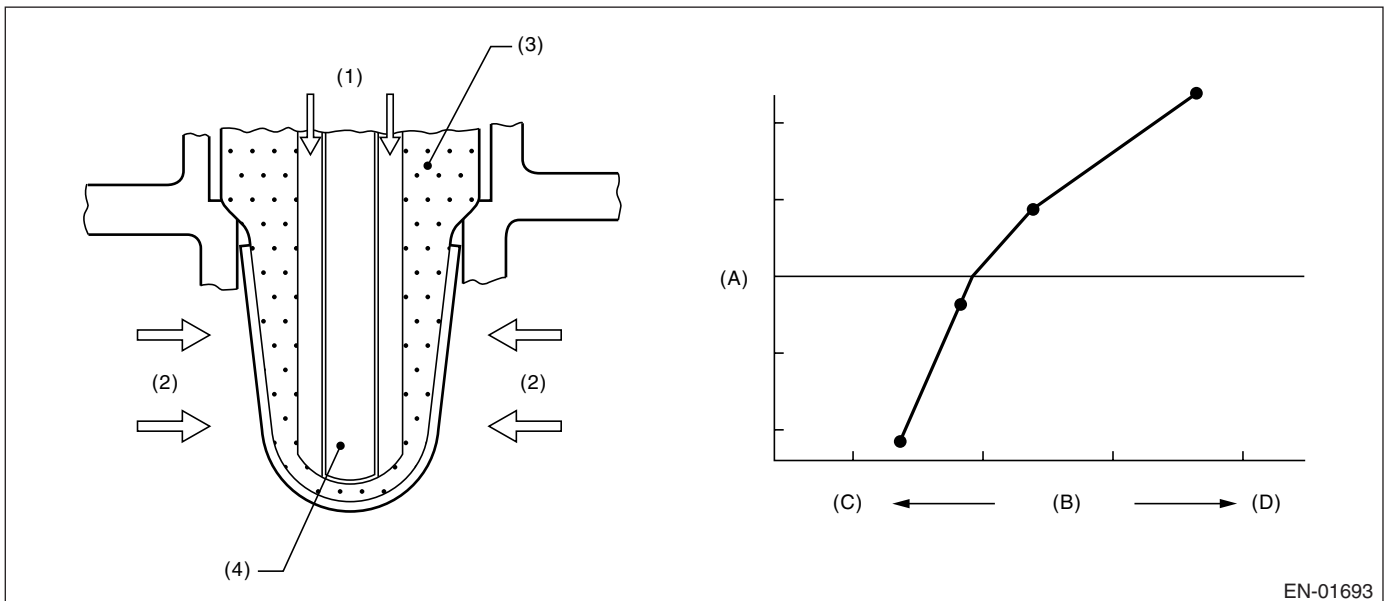
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.

**Lambda value = Actual air fuel ratio/Theoretical air fuel ratio**

Lambda > 1: Lean

Lambda < 1: Rich

### 2. COMPONENT DESCRIPTION



EN-01693

- (1) Atmosphere
- (2) Exhaust
- (3) ZrO<sub>2</sub>
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions                |
|---|----------------------------------|
| All secondary parameters to be in enable conditions         | 4 seconds or more                |
| Battery voltage   | > 10.9 V                         |
| Atmospheric pressure  | > 75.1 kPa (563 mmHg, 22.2 inHg) |
| Rear oxygen sensor sub feedback                             | Operating                        |
| Rear oxygen sensor output voltage – feedback target voltage | –0.2 V ↔ 0.1 V                   |
| or rear oxygen sensor sub feedback compensation coefficient | On Min.                          |
| or rear oxygen sensor sub feedback compensation coefficient | On Max.                          |
| After engine starting                                       | 60 seconds or more               |
| Engine coolant temperature                                  | ≥ 75°C (167°F)                   |
| Vehicle speed   | ≥ 20 km/h (12 MPH)               |
| Amount of intake air  | ≥ 6 g (0.21 oz)/s                |
| Load change during 0.5 engine rev.                          | ≤ 0.02 g (0.001 oz)/rev          |
| Impedance of front oxygen (A/F) sensor                      | 0 ↔ 50 Ω                         |
| Learning value of evaporation gas density                   | ≤ 0.2                            |
| Total time of operating canister purge                      | 20 seconds or more               |
| Target lambda load compensation coefficient                 | –0.03 ↔ 0                        |

## 4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

## 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 10 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.

### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Output lambda when rear O <sub>2</sub> sensor sub feedback compensation coefficient value being at not low limit | ≥ 1.15          |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Front oxygen (A/F) sensor sub learning compensation: Not allowed to calculate.
- Purge control: Not allowed to purge



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 9. ECM OPERATION AT DTC SETTING

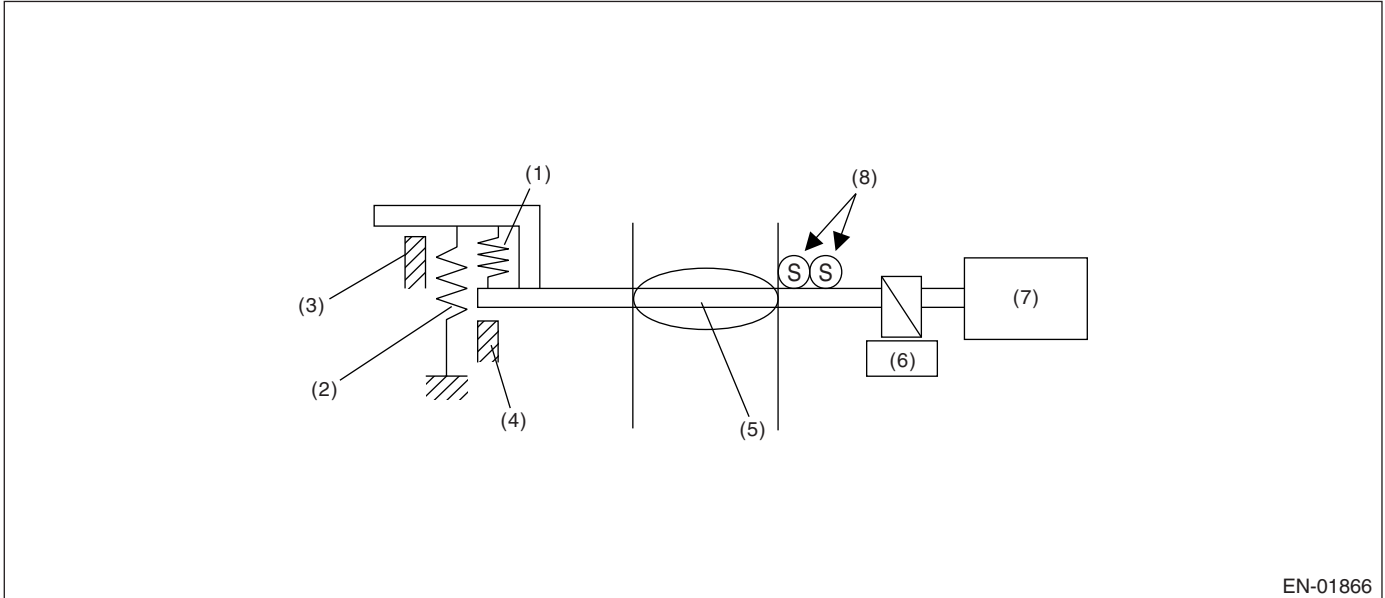
Memorize the freeze frame data. (For test mode \$02)

### CP:DTC P1160 RETURN SPRING FAILURE

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the valve does not move to the close direction with the motor power stopped and the valve open more than the default opening.

#### 2. COMPONENT DESCRIPTION



EN-01866

- |                          |                         |                                  |
|--------------------------|-------------------------|----------------------------------|
| (1) Opener spring        | (4) Full closed stopper | (7) DC motor                     |
| (2) Return spring        | (5) Throttle valve      | (8) Main and sub throttle sensor |
| (3) Intermediate stopper | (6) Gear                |                                  |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Throttle opening     | OFF               |
| Motor continuity     | OFF               |

#### 4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria                             | Threshold Value |
|--|-----------------|
| Opening variation after continuity is set to OFF | $\geq 2^\circ$  |

**Time Needed for Diagnosis:** 1,880 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 8. FAIL SAFE

Fix the throttle opening to 6°.

## 9. ECM OPERATION AT DTC SETTING

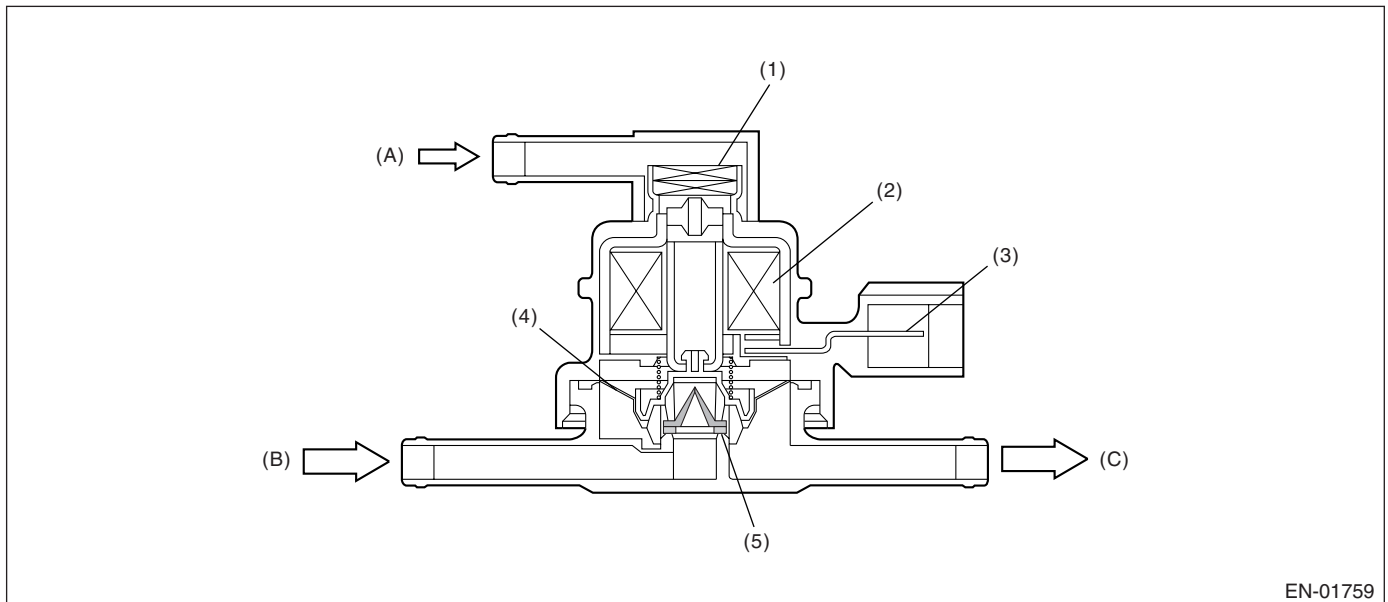
Memorize the freeze frame data. (For test mode \$02)

## CQ:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve. Judge NG when ECM output level is different from actual terminal level.

### 2. COMPONENT DESCRIPTION



EN-01759

- |                        |               |                          |
|------------------------|---------------|--------------------------|
| (1) Filter             | (4) Diaphragm | (A) Atmospheric pressure |
| (2) Coil               | (5) Valve     | (B) Shut off valve       |
| (3) Connector terminal |               | (C) To fuel tank         |

### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions |
|-----------------------|-------------------|
| Ignition switch       | ON                |
| Battery voltage       | ≥ 10.9 V          |
| After engine starting | 1 second or more  |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

#### Judgment Value

| Malfunction Criteria                         | Threshold Value |
|--|-----------------|
| Terminal voltage when ECM outputs off signal | Low             |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

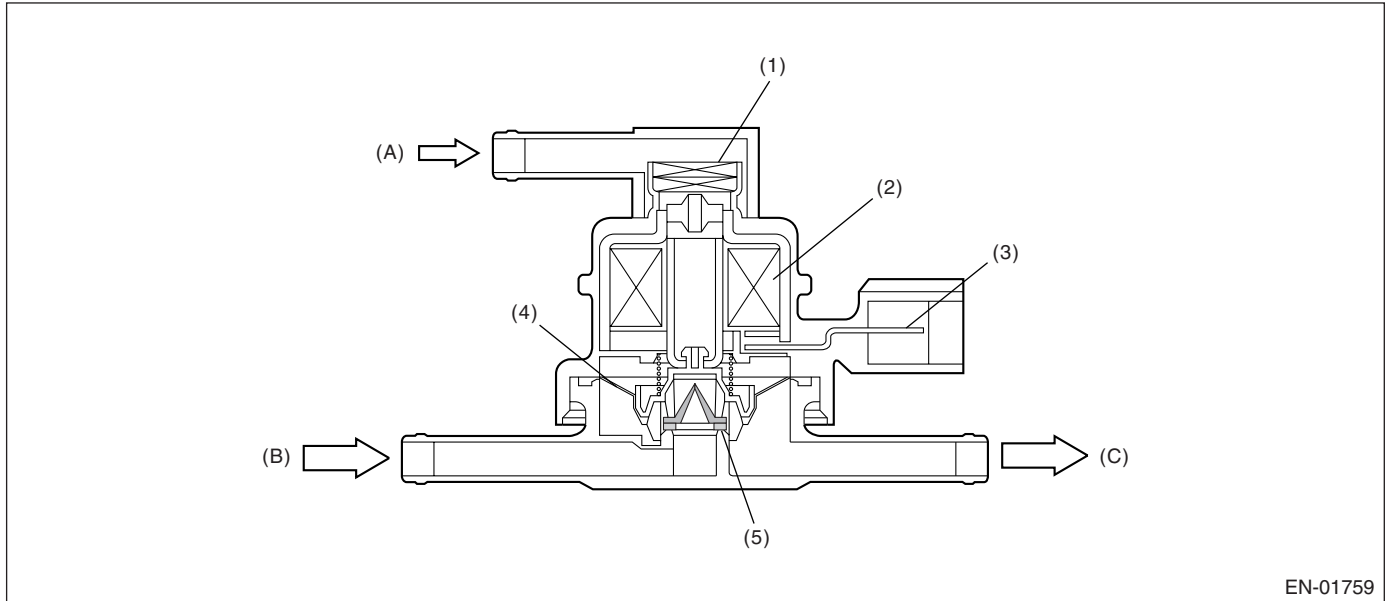
Memorize the freeze frame data. (For test mode \$02)

## CR:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve.  
 Judge NG when ECM output level is different from actual terminal level.

### 2. COMPONENT DESCRIPTION



EN-01759

- |                        |               |                          |
|------------------------|---------------|--------------------------|
| (1) Filter             | (4) Diaphragm | (A) Atmospheric pressure |
| (2) Coil               | (5) Valve     | (B) Shut off valve       |
| (3) Connector terminal |               | (C) To fuel tank         |

### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions |
|-----------------------|-------------------|
| Ignition switch       | ON                |
| Battery voltage       | ≥ 10.9 V          |
| After engine starting | 1 second or more  |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

#### Judgment Value

| Malfunction Criteria                         | Threshold Value |
|--|-----------------|
| Terminal voltage when ECM outputs off signal | High            |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

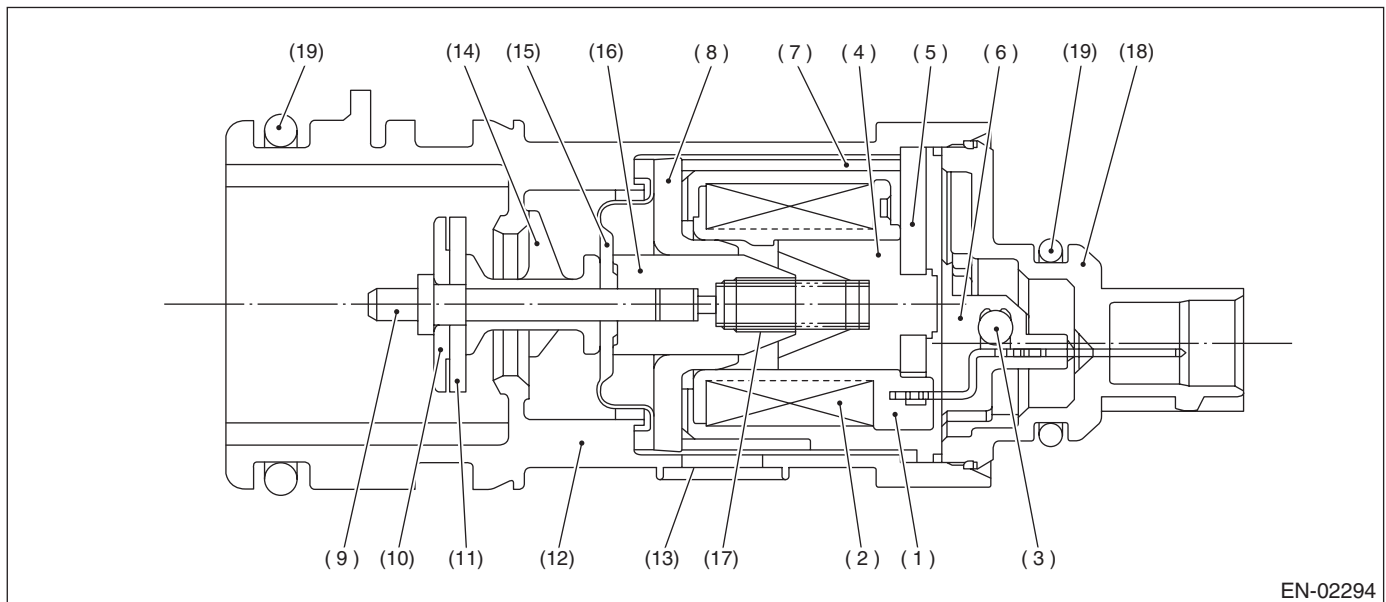
Memorize the freeze frame data. (For test mode \$02)

## CS:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

### 1. OUTLINE OF DIAGNOSIS

Detect the drain valve function abnormality.  
Judge NG when the fuel tank pressure is small.

### 2. COMPONENT DESCRIPTION



EN-02294

- |                 |                    |                   |
|-----------------|--------------------|-------------------|
| (1) Bobbin      | (8) Magnetic plate | (15) Diaphragm    |
| (2) Coil        | (9) Shaft          | (16) Movable core |
| (3) Diode       | (10) Plate         | (17) Spring       |
| (4) Stator core | (11) Valve         | (18) Cover        |
| (5) End plate   | (12) Housing       | (19) O-ring       |
| (6) Body        | (13) Filter        |                   |
| (7) Yoke        | (14) Retainer      |                   |

### 3. ENABLE CONDITION

| Secondary Parameter                 | Enable Condition  |
|-------------------------------------|---|
| Drain valve                         | Open  |
| Battery voltage                     | $\geq 10.9 \text{ V}$   |
| Atmospheric pressure                | $\geq 75.0 \text{ kPa}$ (563 mmHg, 22.17 inHg)  |
| Tank pressure when starter ON → OFF | $-0.7 \leftrightarrow 1.4 \text{ kPa}$ ( $-5 \leftrightarrow 10.7 \text{ mmHg}$ , $-0.20 \leftrightarrow 0.42 \text{ inHg}$ ) |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

### Judgment Value

| Malfunction Criteria | Threshold Value                             |
|----------------------|---|
| Tank pressure        | $\leq -4.0$ kPa ( $-30$ mmHg, $-1.18$ inHg) |

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria  | Threshold Value   |
|---|---|
| Tank pressure   | $> -4.0$ kPa ( $-30$ mmHg, $-1.18$ inHg)  |
| Cumulative time when the malfunction criteria below are completed | $\geq 30$ seconds   |
| Duty ratio of purge control solenoid valve                        | Except 0  |
| Fuel temperature  | $-10 \leftrightarrow 45^\circ\text{C}$ ( $14 \leftrightarrow 113^\circ\text{F}$ ) |
| Relative ratio of intake manifold                                 | $\leq -26.7$ kPa ( $-200$ mmHg, $-7.87$ inHg)                                     |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

PCV control: Open the PCV solenoid.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

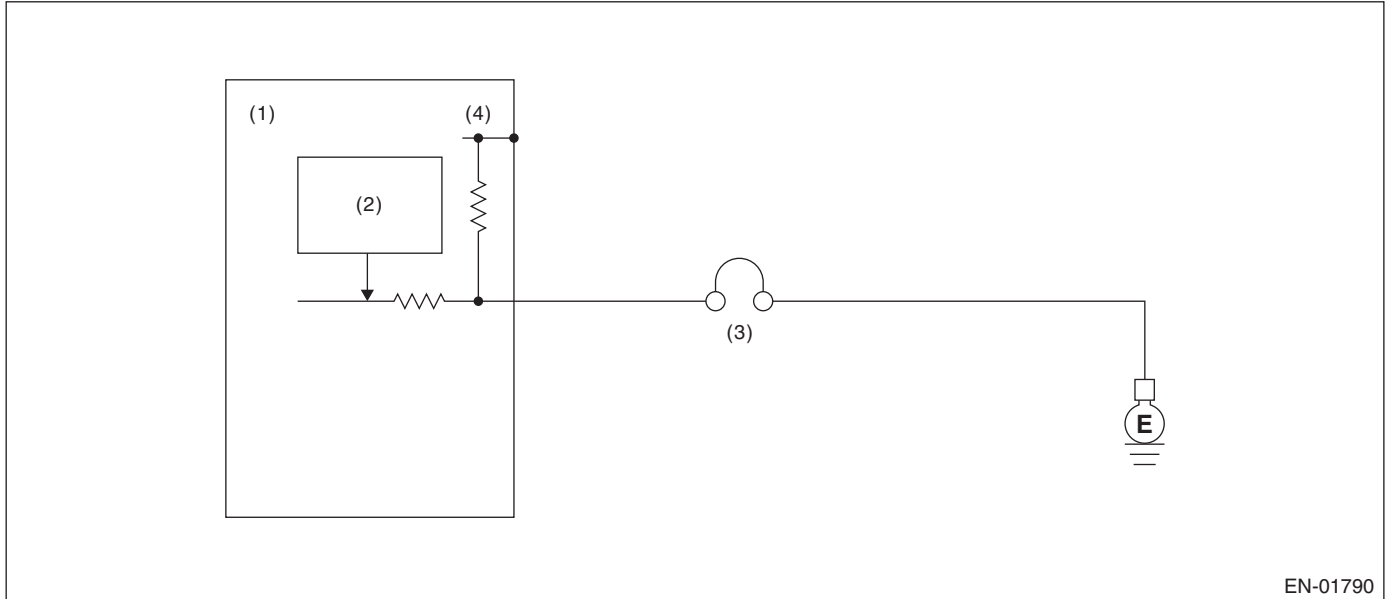
## GENERAL DESCRIPTION

### CT:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

#### 1. OUTLINE OF DIAGNOSIS

Detect the blow-by hose release abnormality.  
Judge NG when the diagnosis terminal voltage is high.

#### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Detecting circuit
- (3) PCV diagnosis connector
- (4) 5 V

#### 3. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---------------------|------------------|
| None                |                  |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSIS METHOD

##### • Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 2.5 second.

##### Judgment Value

| Malfunction Criteria                                      | Threshold Value |
|---|-----------------|
| Battery voltage   | > 10.9 V        |
| Positive crankcase ventilation diagnosis terminal voltage | High            |
| Engine speed  | ≥ 500 rpm       |

**Time Needed for Diagnosis:** 2.5 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

### Judgment Value

| Malfunction Criteria                                      | Threshold Value |
|---|-----------------|
| Battery voltage   | > 10.9 V        |
| Positive crankcase ventilation diagnosis terminal voltage | Low             |
| Engine speed  | ≥ 500 rpm       |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was performed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

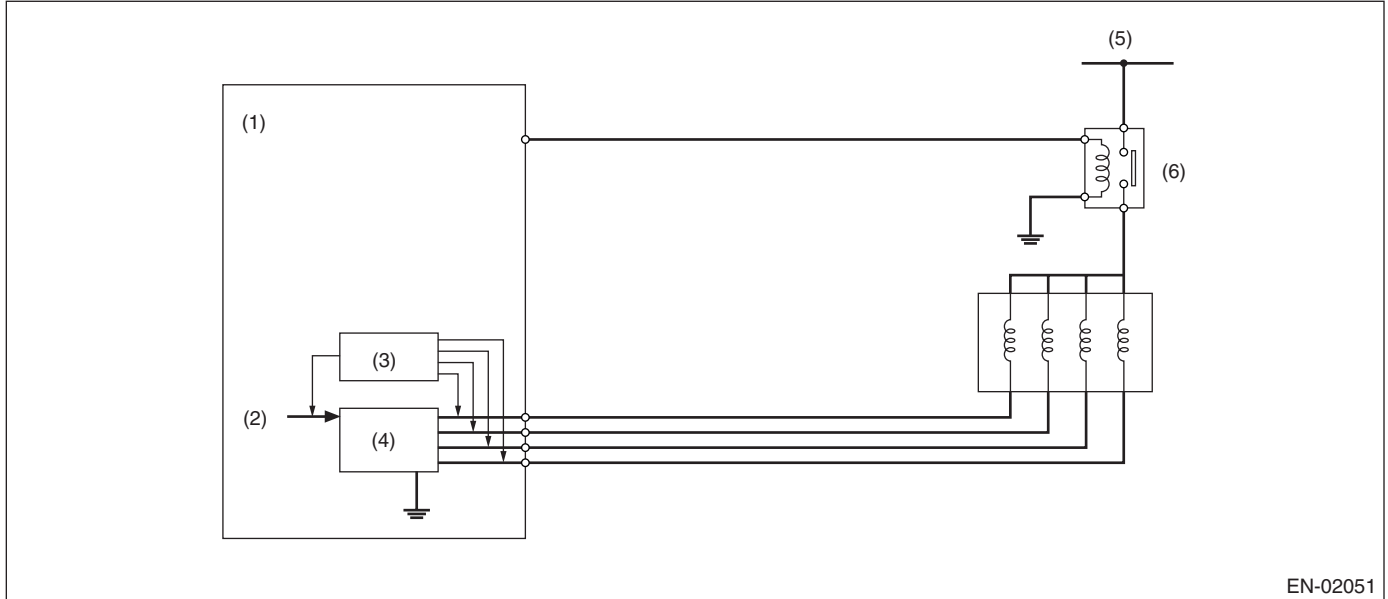
## GENERAL DESCRIPTION

### CU:DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT)

#### 1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

#### 2. COMPONENT DESCRIPTION



EN-02051

- |                                 |                       |                     |
|---------------------------------|-----------------------|---------------------|
| (1) Engine Control Module (ECM) | (3) Detecting circuit | (5) Battery voltage |
| (2) CPU                         | (4) Switching circuit | (6) Main relay      |

#### 3. ENABLE CONDITION

| Secondary Parameters         | Enable Conditions |
|------------------------------|-------------------|
| Target position of EGR valve | > 0 step          |
| Battery voltage              | > 10.9 V          |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when EGR operating.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 2.5 seconds.

| Malfunction Criteria                               | Threshold Value |
|--|-----------------|
| Terminal voltage level when ECM outputs OFF signal | Low level       |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.

### Judgment Value

| Malfunction Criteria                              | Threshold Value |
|---|-----------------|
| Terminal voltage level when ECM outputs ON signal | High level      |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Knock sensor learning compensation: Not allowed to calculate
- EGR control: Not allowed to operate

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

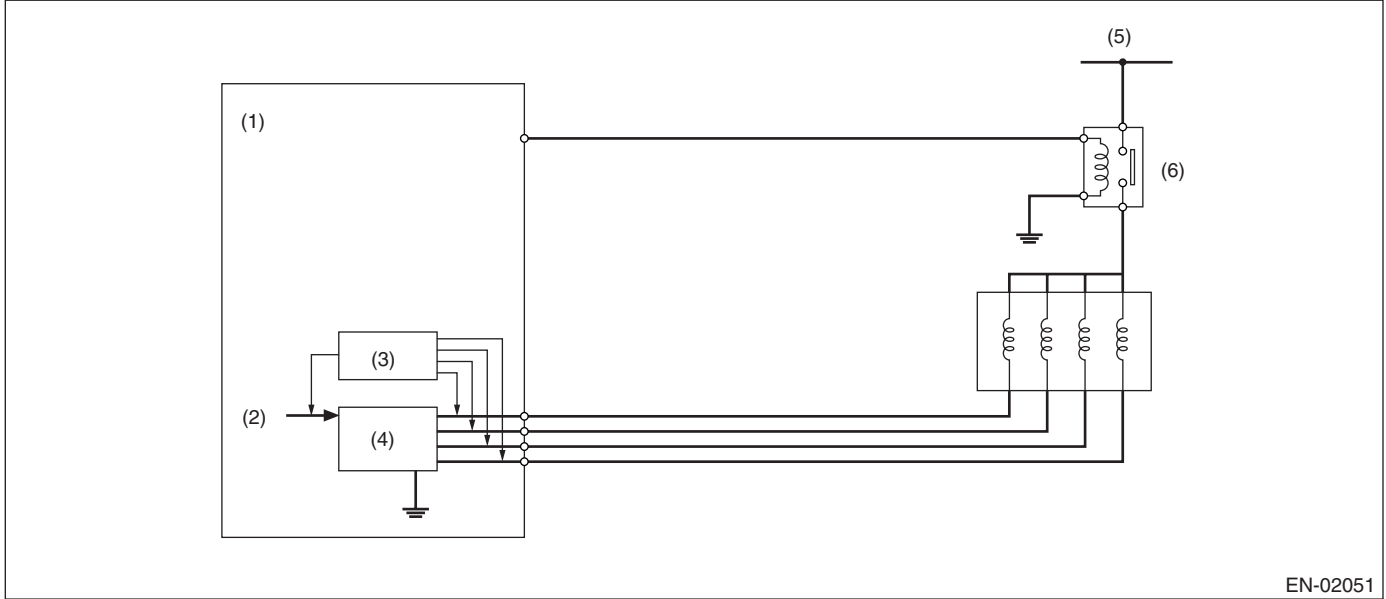
## GENERAL DESCRIPTION

### CV:DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT)

#### 1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

#### 2. COMPONENT DESCRIPTION



EN-02051

- |                                 |                       |                     |
|---------------------------------|-----------------------|---------------------|
| (1) Engine Control Module (ECM) | (3) Detecting circuit | (5) Battery voltage |
| (2) CPU                         | (4) Switching circuit | (6) Main relay      |

#### 3. ENABLE CONDITION

| Secondary Parameters      | Enable Conditions |
|---------------------------|-------------------|
| Battery voltage           | > 10.9 V          |
| EGR valve target position | > 0 step          |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 2.5 seconds.

| Malfunction Criteria                              | Threshold Value |
|---|-----------------|
| Terminal voltage level when ECM outputs ON signal | High level      |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.

### Judgment Value

| Malfunction Criteria                               | Threshold Value |
|--|-----------------|
| Terminal voltage level when ECM outputs OFF signal | Low level       |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Knock sensor learning compensation: Not allowed to calculate
- EGR control: Not allowed to operate

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

### **CW:DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT)**

NOTE:

For the detecting criteria, refer to DTC P1492. <Ref. to GD(H4SO)-172, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **CX:DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT)**

NOTE:

For the detecting criteria, refer to DTC P1493. <Ref. to GD(H4SO)-174, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **CY:DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT)**

NOTE:

For the detecting criteria, refer to DTC P1492. <Ref. to GD(H4SO)-172, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **CZ:DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT)**

NOTE:

For the detecting criteria, refer to DTC P1493. <Ref. to GD(H4SO)-174, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### DA:DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT)

#### NOTE:

For the detecting criteria, refer to DTC P1492. <Ref. to GD(H4SO)-172, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### DB:DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT)

#### NOTE:

For the detecting criteria, refer to DTC P1493. <Ref. to GD(H4SO)-174, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### DC:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge OFF NG when it turns to “after engine starting” while the starter has never been set to ON.

#### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge OFF NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value     |
|--|---------------------|
| Vehicle speed  | < 1 km/h (0.62 MPH) |
| Starter ON signal  | Not detected        |
| Engine speed after the engine speed of less than 500 rpm continues 0.8 seconds or more | ≥ 500 rpm           |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

##### • Normality Judgment

Judge OFF OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Starter ON           | Experienced     |
| Battery voltage      | > 8 V           |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## DD:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the back-up voltage circuit.

Judge NG when the back-up voltage becomes smaller than the battery voltage.

### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---------------------|------------------|
| None                |                  |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria     | Threshold Value |
|--------------------------|-----------------|
| Voltage of back-up power | Low             |
| Battery voltage          | $\geq 10.9$ V   |
| Engine speed             | $\geq 500$ rpm  |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

#### Judgment Value

| Malfunction Criteria            | Threshold Value |
|---------------------------------|-----------------|
| Voltage of back-up power supply | High            |
| Battery voltage                 | $\geq 10.9$ V   |
| Engine speed                    | $\geq 500$ rpm  |

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 7. FAIL SAFE

None

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

#### **DE:DTC P1570 ANTENNA**

##### 1. OUTLINE OF DIAGNOSIS

For the detecting criteria, refer to DTC P0513. <Ref. to GD(H4SO)-144, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **DF:DTC P1571 REFERENCE CODE INCOMPATIBILITY**

##### 1. OUTLINE OF DIAGNOSIS

For the detecting criteria, refer to DTC P0513. <Ref. to GD(H4SO)-144, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **DG:DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)**

##### 1. OUTLINE OF DIAGNOSIS

For the detecting criteria, refer to DTC P0513. <Ref. to GD(H4SO)-144, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **DH:DTC P1574 KEY COMMUNICATION FAILURE**

##### 1. OUTLINE OF DIAGNOSIS

For the detecting criteria, refer to DTC P0513. <Ref. to GD(H4SO)-144, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **DI: DTC P1576 EGI CONTROL MODULE EEPROM**

##### 1. OUTLINE OF DIAGNOSIS

For the detecting criteria, refer to DTC P0513. <Ref. to GD(H4SO)-144, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **DJ:DTC P1577 IMM CONTROL MODULE EEPROM**

##### 1. OUTLINE OF DIAGNOSIS

For the detecting criteria, refer to DTC P0513. <Ref. to GD(H4SO)-144, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

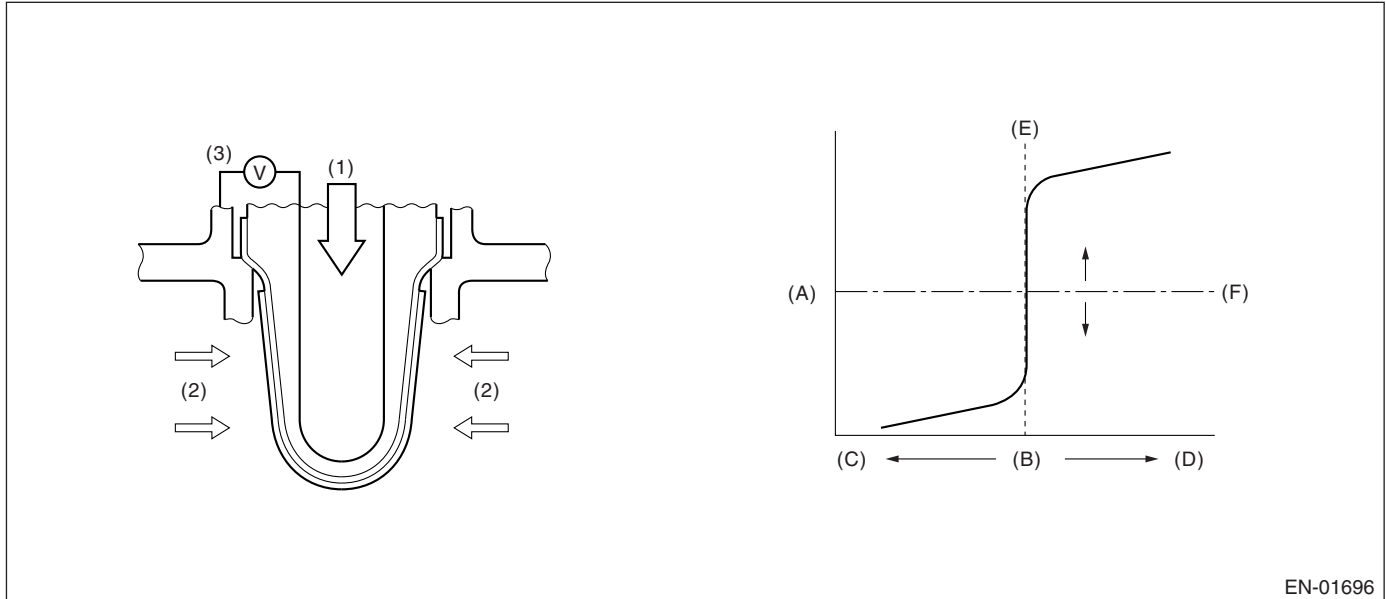
## DK:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.

Judge NG when the sub feedback learning value sticks to lean sides during sub feedback learning control.

### 2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

### 3. ENABLE CONDITION

| Secondary Parameters                          | Enable Conditions |
|---|-------------------|
| Continuous time of completing condition below | 1 second or more  |
| Sub feedback leaning enable condition         | Complete          |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed of 50 to 100 km/h (31 to 62 MPH).

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds. Judge OK when it becomes less than 5 seconds.

#### Judgment Value

| Malfunction Criteria        | Threshold Value |
|-----------------------------|-----------------|
| Sub feedback learning value | $\leq -0.02$    |

**Time Needed for Diagnosis:** 5 seconds  $\times$  1 time

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

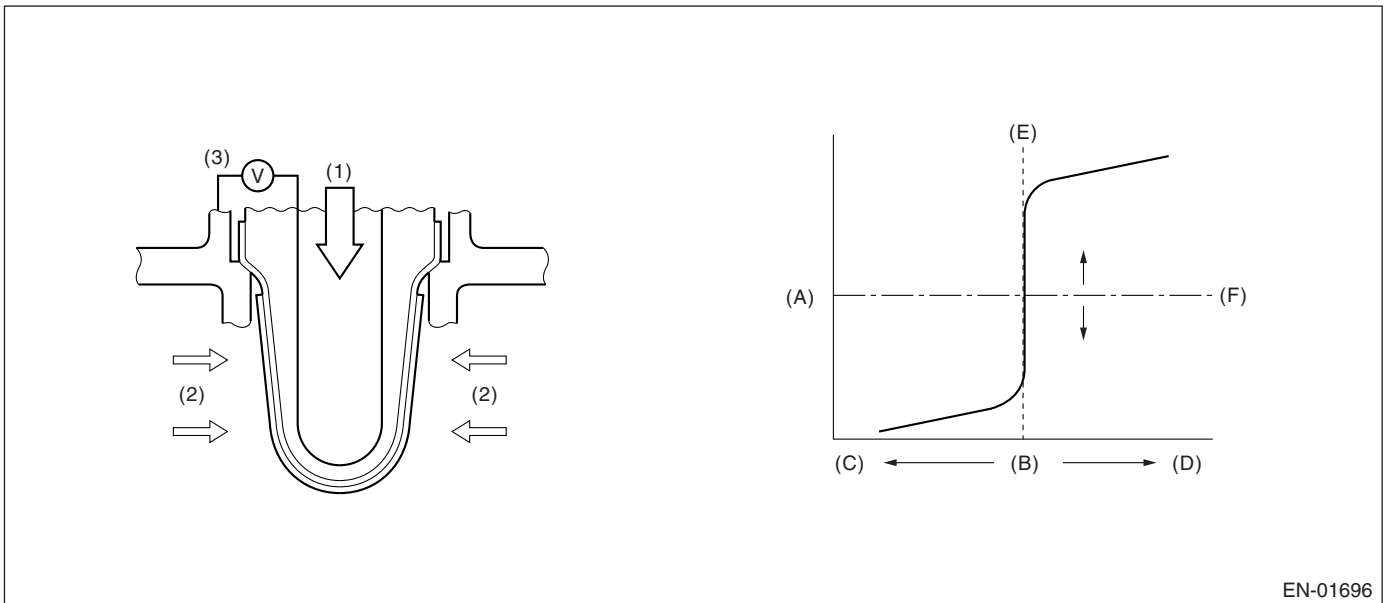
## DL:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.

Judge NG when the sub feedback learning value sticks to rich sides during sub feedback learning control.

### 2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

### 3. ENABLE CONDITION

| Secondary Parameters                          | Enable Conditions |
|---|-------------------|
| Continuous time of completing condition below | 1 second or more  |
| Sub feedback leaning enable condition         | Complete          |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed 50 to 100 km/h (31 to 62 MPH).

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds. Judge OK when it becomes less than 5 seconds.

### Judgment Value

| Malfunction Criteria        | Threshold Value |
|-----------------------------|-----------------|
| Sub feedback learning value | $\geq 0.038$    |

**Time Needed for Diagnosis:** 5 seconds  $\times$  1 time

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous drive cycles.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

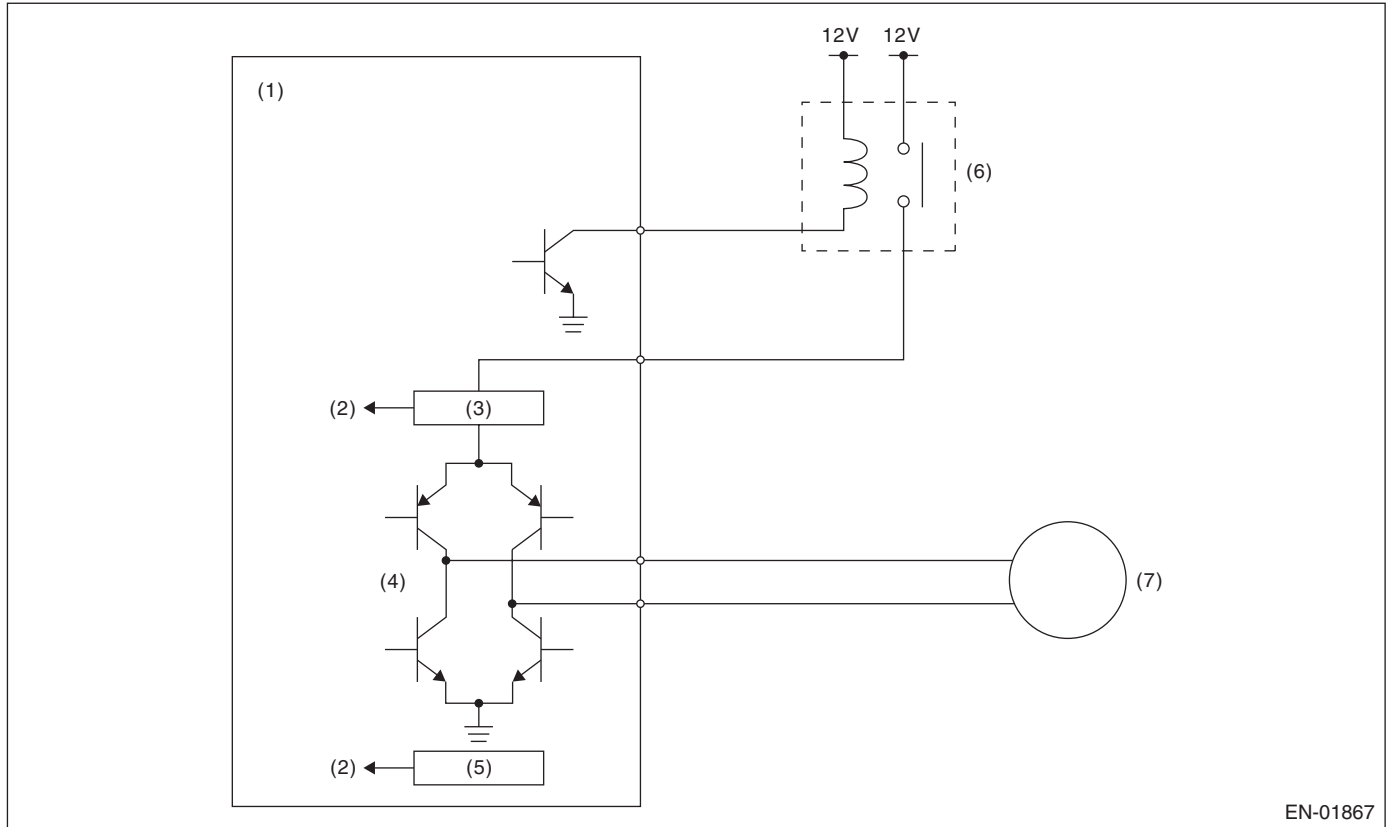
## GENERAL DESCRIPTION

### DM:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the motor current becomes large or drive circuit is heated.

#### 2. COMPONENT DESCRIPTION



EN-01867

- |                                   |                                       |           |
|-----------------------------------|---------------------------------------|-----------|
| (1) Engine control unit (ECM)     | (4) Drive circuit                     | (7) Motor |
| (2) Detection circuit             | (5) Temperature detection circuit     |           |
| (3) Overcurrent detection circuit | (6) Electronic control throttle relay |           |

#### 3. ENABLE CONDITION

| Secondary Parameters                         | Enable Conditions |
|--|-------------------|
| Under control of electronic control throttle | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria            | Threshold Value                    |
|---------------------------------|------------------------------------|
| Motor current                   | $\leq 8$ A                         |
| Drive circuit inner temperature | $\leq 175^{\circ}\text{C}$ (347°F) |

### Time Needed for Diagnosis:

- 500 milliseconds (NG judgment)
- 2,000 milliseconds (OK judgment)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

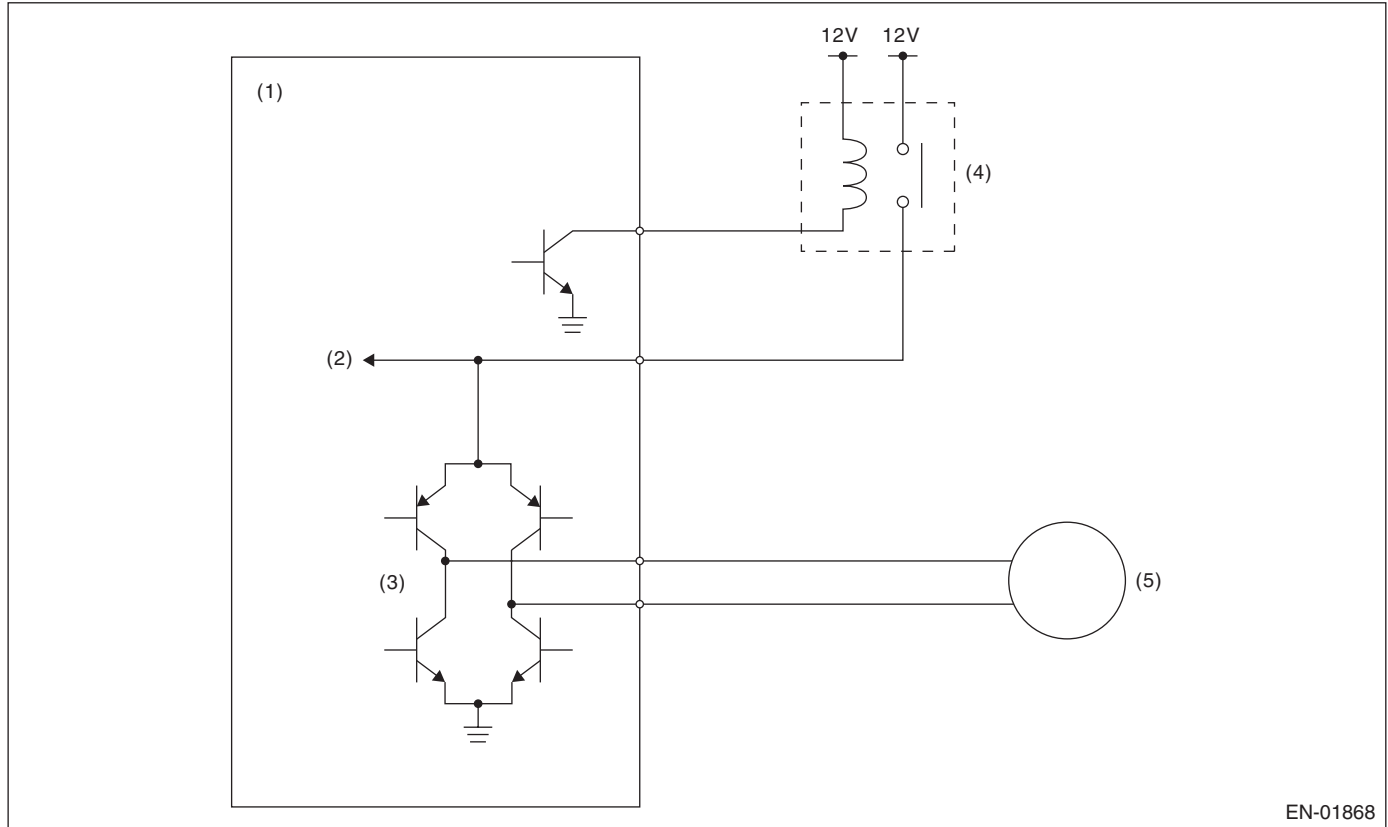
## GENERAL DESCRIPTION

### DN:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electronic throttle control relay to ON.

#### 2. COMPONENT DESCRIPTION



EN-01868

- (1) Engine control module (ECM)      (3) Drive circuit      (5) Motor  
 (2) Voltage detection circuit      (4) Electronic control throttle relay

#### 3. ENABLE CONDITION

| Secondary Parameters                     | Enable Conditions |
|--|-------------------|
| Electronic control throttle relay output | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Motor power voltage  | $\geq 5$ V      |

##### Time Needed for Diagnosis:

- 400 milliseconds (For NG)
- 2,000 milliseconds (For OK)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

## 9. ECM OPERATION AT DTC SETTING

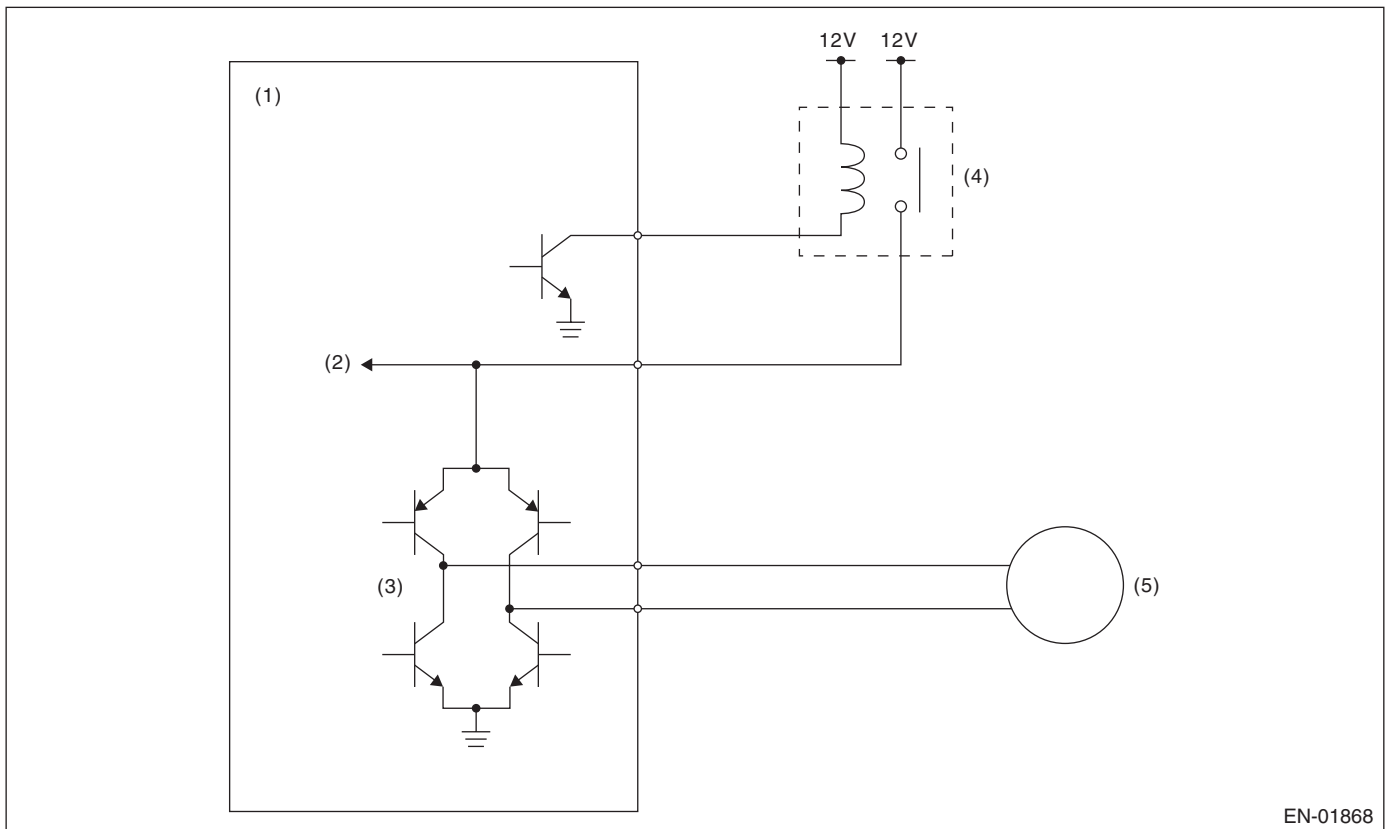
Memorize the freeze frame data. (For test mode \$02)

## DO:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electronic throttle control relay to OFF.

### 2. COMPONENT DESCRIPTION



EN-01868

- |                                 |                                       |           |
|---------------------------------|---------------------------------------|-----------|
| (1) Engine control module (ECM) | (3) Drive circuit                     | (5) Motor |
| (2) Voltage detection circuit   | (4) Electronic control throttle relay |           |

### 3. ENABLE CONDITION

| Secondary Parameters                     | Enable Conditions |
|--|-------------------|
| Electronic control throttle relay output | OFF               |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Motor power voltage  | ≤ 5 V           |

#### Time Needed for Diagnosis:

- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

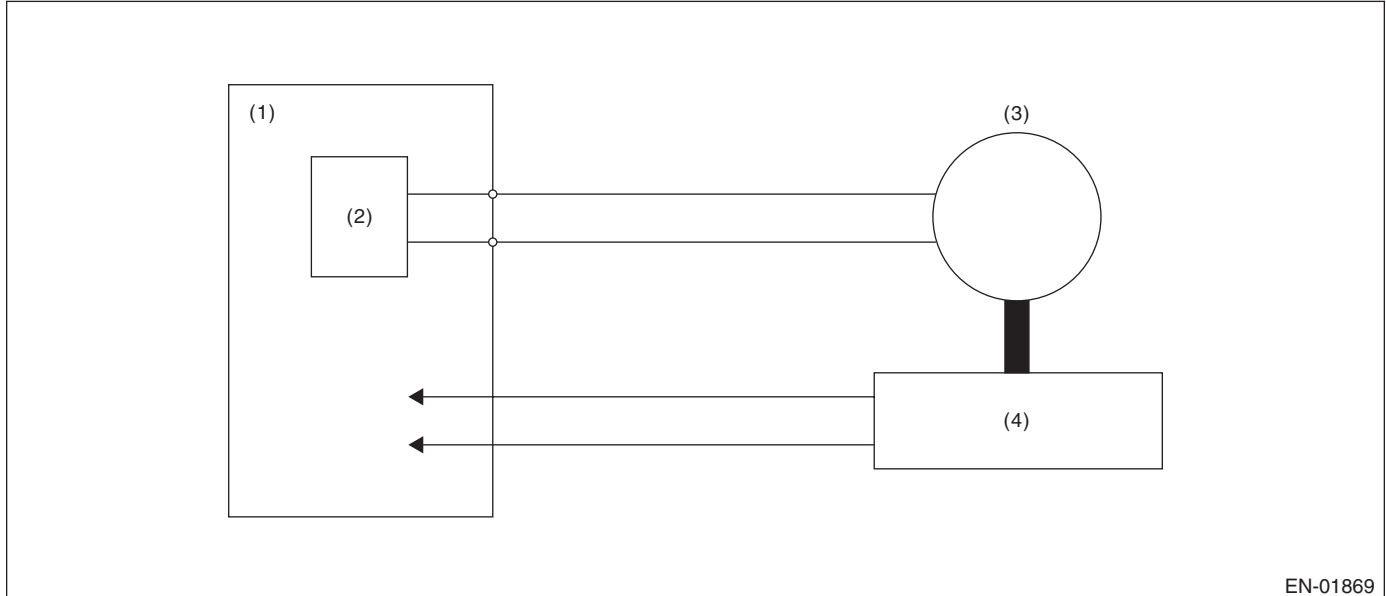
GENERAL DESCRIPTION

## DP:DTC P2109 THROTTLE ANGLE SENSOR CLOSED POSITION ERROR

### 1. OUTLINE OF DIAGNOSIS

Judge NG when all close point learning cannot conducted or abnormal value is detected.

### 2. COMPONENT DESCRIPTION



EN-01869

- (1) Engine control module (ECM)
- (2) Drive circuit
- (3) Motor
- (4) Throttle position sensor

### 3. ENABLE CONDITION

| Secondary Parameters                      | Enable Conditions |
|---|-------------------|
| Ignition switch                           | ON → OFF          |
| Ignition switch (after clear memory only) | OFF → ON          |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis at all close point learning.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value                     |
|--|-------------------------------------|
| Throttle sensor opening angle at all close point learning                    | 10.127° or more,<br>19.872° or less |
| Throttle opening angle when ignition switch ON – Throttle min. stop position | ≥ 1.683°                            |

**Time Needed for Diagnosis:** 8 — 80 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

### 9. ECM OPERATION AT DTC SETTING

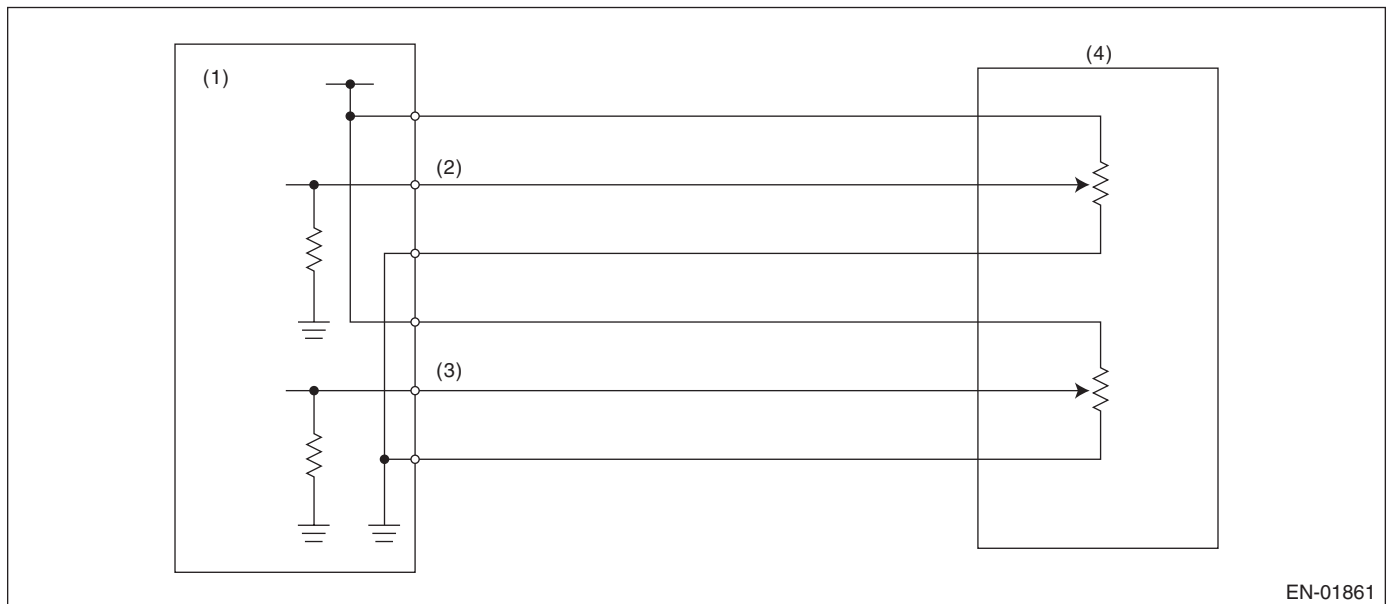
Memorize the freeze frame data. (For test mode \$02)

## DQ:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



- |  |  |
|--|--|
| (1) Engine control module (ECM)                | (3) Accelerator pedal position sensor 2 signal |
| (2) Accelerator pedal position sensor 1 signal | (4) Accelerator pedal position sensor          |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | ≥ 0.308 V       |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

## 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

## 9. ECM OPERATION AT DTC SETTING

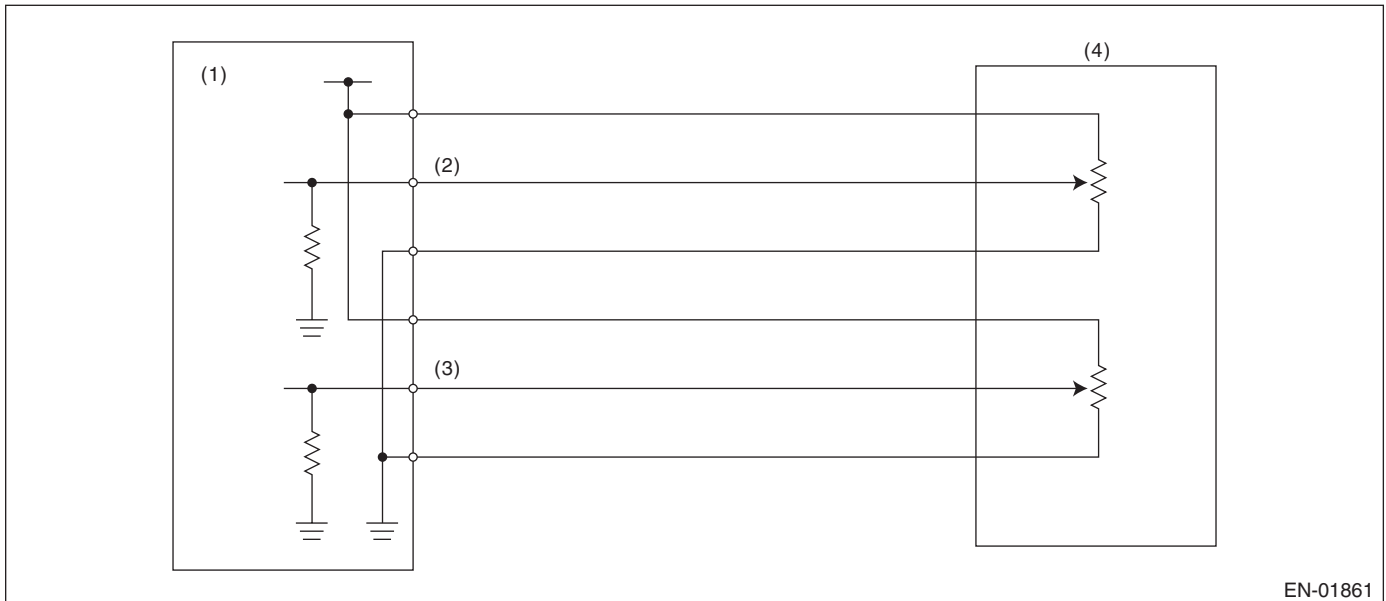
Memorize the freeze frame data. (For test mode \$02)

## DR:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01861

- |  |  |
|--|--|
| (1) Engine control module (ECM)                | (3) Accelerator pedal position sensor 2 signal |
| (2) Accelerator pedal position sensor 1 signal | (4) Accelerator pedal position sensor          |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\leq 4.865$ V  |

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

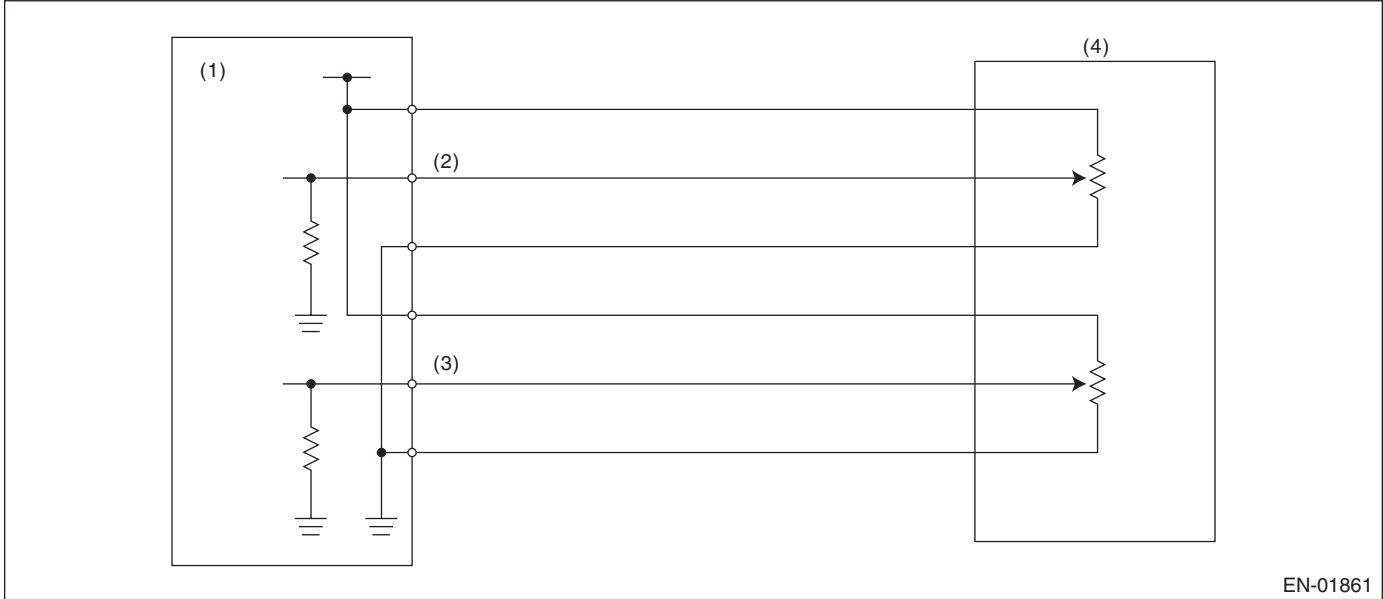
Memorize the freeze frame data. (For test mode \$02)

## DS:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



- |  |  |
|--|--|
| (1) Engine control module (ECM)                | (3) Accelerator pedal position sensor 2 signal |
| (2) Accelerator pedal position sensor 1 signal | (4) Accelerator pedal position sensor          |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 2 input voltage | $\geq 0.308$ V  |

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

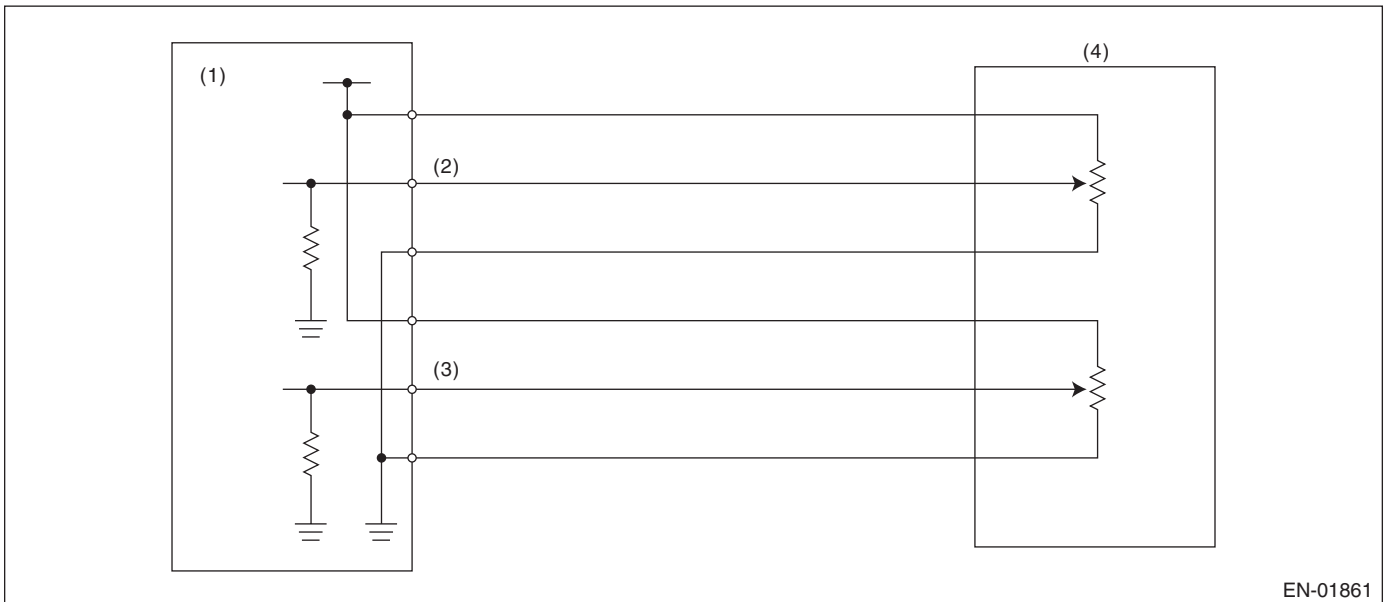
Memorize the freeze frame data. (For test mode \$02)

## DT:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01861

- |  |  |
|--|--|
| (1) Engine control module (ECM)                | (3) Accelerator pedal position sensor 2 signal |
| (2) Accelerator pedal position sensor 1 signal | (4) Accelerator pedal position sensor          |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 2 input voltage | $\leq 4.865$ V  |

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

## 9. ECM OPERATION AT DTC SETTING

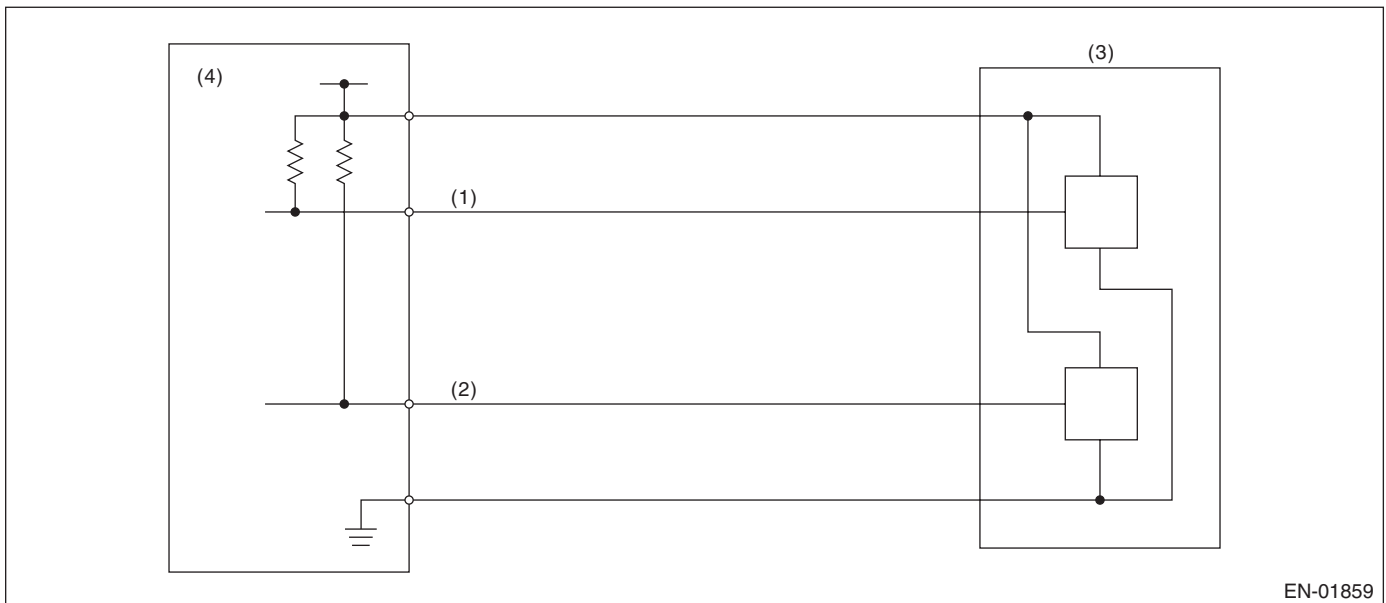
Memorize the freeze frame data. (For test mode \$02)

## DU:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" / "B" VOLTAGE RATIONALITY

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

### 2. COMPONENT DESCRIPTION



- |                                       |                                 |
|---------------------------------------|---------------------------------|
| (1) Throttle position sensor 1 signal | (3) Throttle position sensor    |
| (2) Throttle position sensor 2 signal | (4) Engine control module (ECM) |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

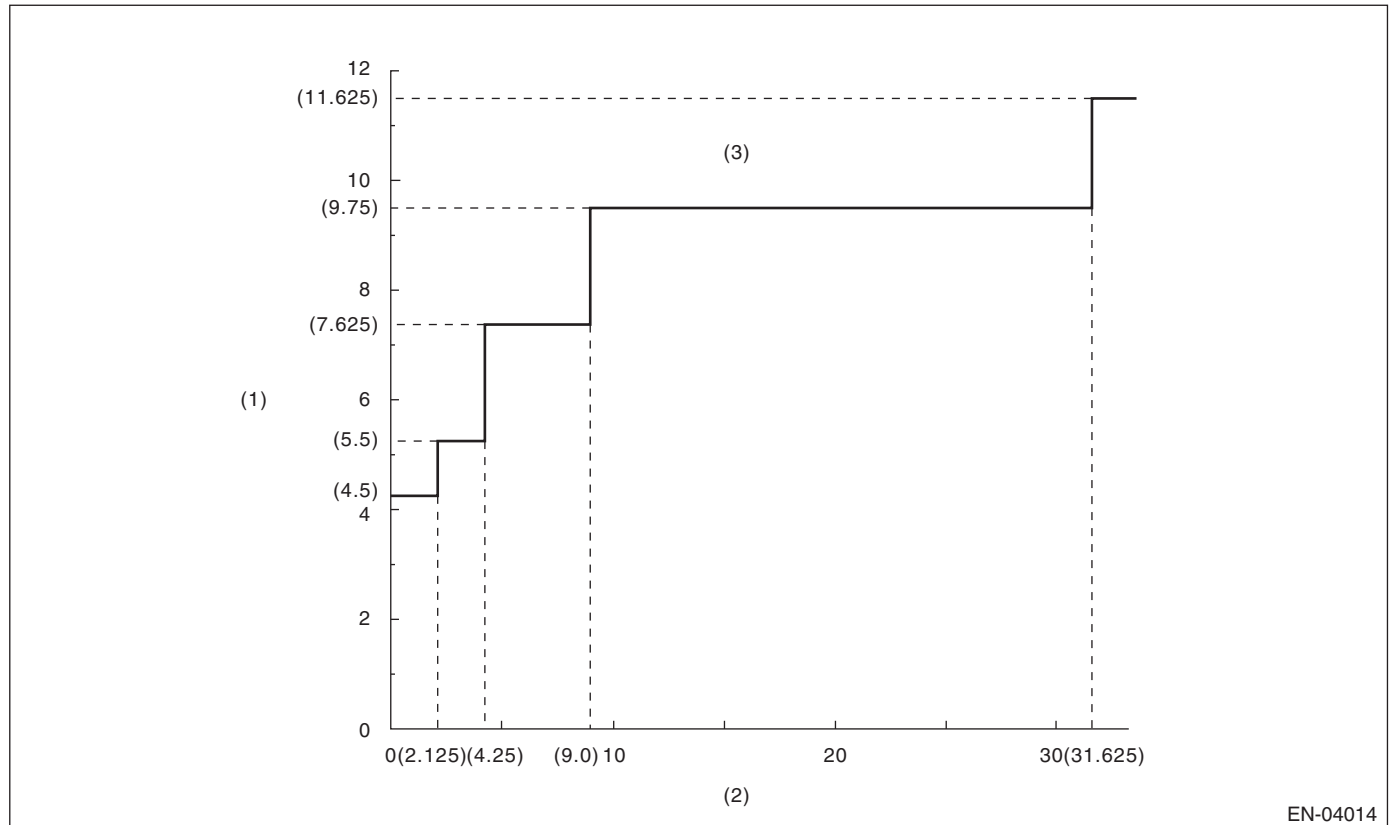
### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                  | Threshold Value  |
|---------------------------------------|------------------|
| Signal difference between two sensors | $\leq 4.5^\circ$ |

#### Details of Judgment Value



EN-04014

(1) Sensor output difference (°)

(2) Throttle position sensor 1 opening angle (°)

(3) NG area

**Time Needed for Diagnosis:** 24 milliseconds (NG judgment), 24 milliseconds (OK judgment)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop the continuity to electronic control throttle motor. (Fix the throttle opening angle to 6°.)

### 9. ECM OPERATION AT DTC SETTING

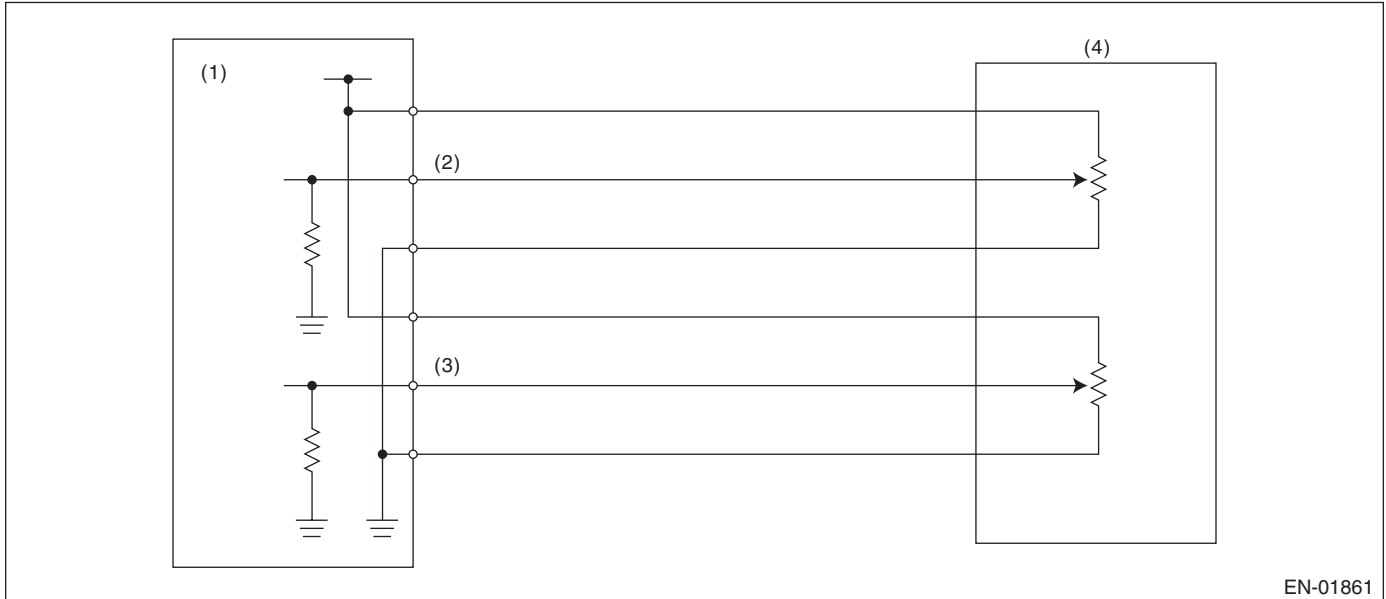
Memorize the freeze frame data. (For test mode \$02)

## DV:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

### 2. COMPONENT DESCRIPTION



EN-01861

- |  |  |
|--|--|
| (1) Engine control module (ECM)                | (3) Accelerator pedal position sensor 2 signal |
| (2) Accelerator pedal position sensor 1 signal | (4) Accelerator pedal position sensor          |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |
| Battery voltage      | $\geq 6\text{ V}$ |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

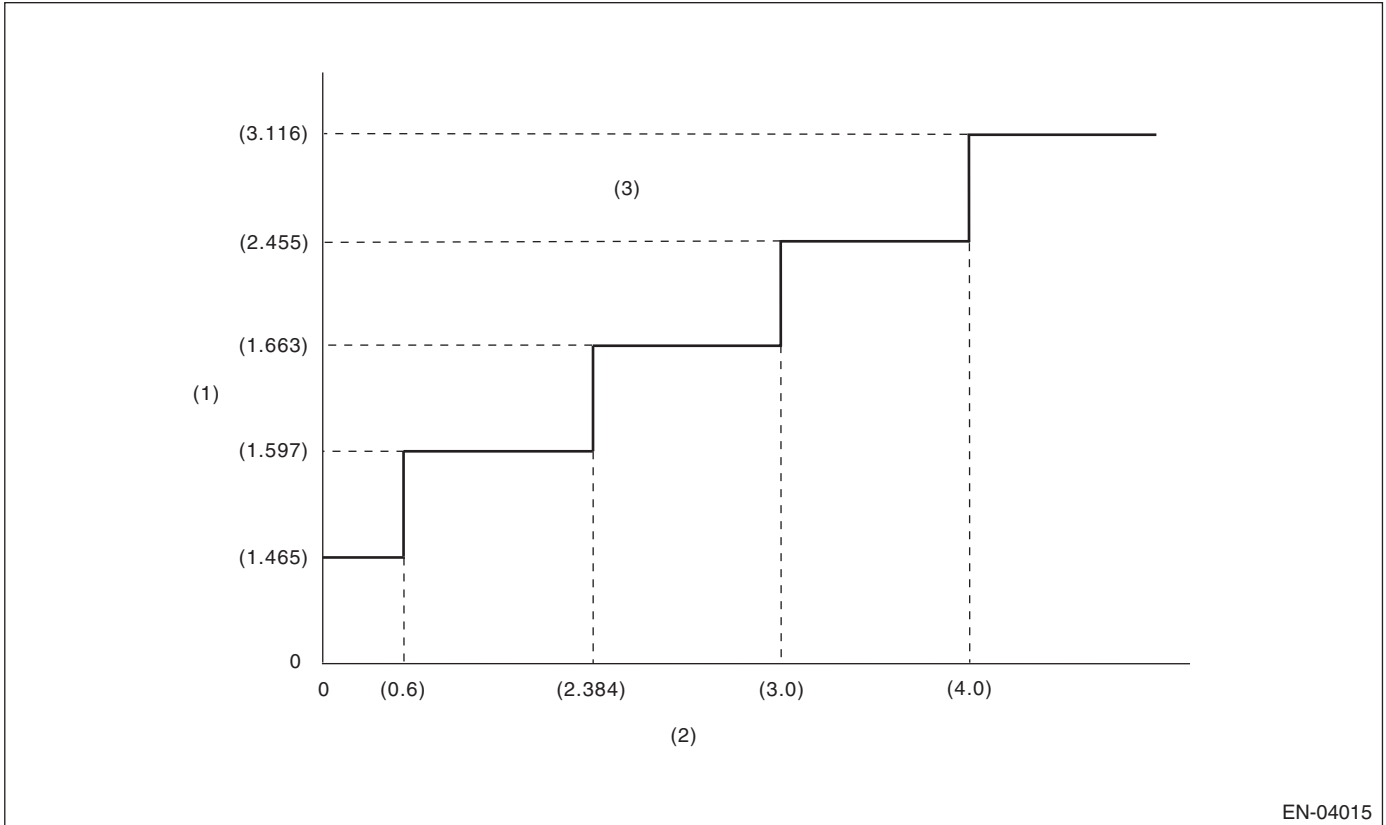
| Malfunction Criteria                  | Threshold Value    |
|---------------------------------------|--------------------|
| Signal difference between two sensors | $\leq 1.465^\circ$ |



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### Details of Judgment Value



EN-04015

(1) Sensor output difference (°)

(2) Accelerator pedal position sensor  
2 opening angle (°)

(3) NG area

### Time Needed for Diagnosis:

- 116 milliseconds (For NG)
- 1,000 milliseconds (For OK)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## DW:DTC P2227 BAROMETRIC PRESSURE TOO LOW

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of atmospheric pressure sensor output property. Judge NG when the atmospheric pressure sensor output is largely different from the intake manifold pressure at engine starting.

### 2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions   |
|----------------------|---------------------|
| Engine speed         | < 300 rpm           |
| Vehicle speed        | < 1 km/h (0.62 MPH) |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis before engine starting with the ignition switch ON.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.3 seconds.

#### Judgment Value

| Malfunction Criteria   | Threshold Value                  |
|--|----------------------------------|
| IAtmospheric – manifold absolute pressureI                                 | ≥ 26.7 kPa (200 mmHg, 7.88 inHg) |
| IIntake manifold pressure at engine starting – manifold absolute pressureI | < 1.33 kPa (10 mmHg, 0.39 inHg)  |

**Time Needed for Diagnosis:**0.3 seconds

**Malfunction Indicator Light Illumination:**Detect when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 0.3 seconds.

#### Judgment Value

| Malfunction Criteria                     | Threshold Value                  |
|--|----------------------------------|
| Atmospheric – manifold absolute pressure | < 26.7 kPa (200 mmHg, 7.88 inHg) |

### 6. DTC CLEAR CONDITION n

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101 kPa (760 mmHg, 29.8 inHg).

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### DX:DTC P2228 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | < 0.118 V       |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | ≥ 0.118 V       |

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101 kPa (760 mmHg, 29.8 inHg).

#### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## DY:DTC P2229 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | $\geq 4.936$ V  |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | $< 4.936$ V     |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101 kPa (760 mmHg, 29.8 inHg).

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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**ENGINE SECTION 2**

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

|   |                         |
|---|-------------------------|
| <b>FUEL INJECTION (FUEL SYSTEMS)</b>                    | <b>FU(H4DOTC)</b>       |
| <b>EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)</b> | <b>EC(H4DOTC)</b>       |
| <b>INTAKE (INDUCTION)</b>                               | <b>IN(H4DOTC)</b>       |
| <b>MECHANICAL</b>                                       | <b>ME(H4DOTC)</b>       |
| <b>EXHAUST</b>  | <b>EX(H4DOTC)</b>       |
| <b>COOLING</b>  | <b>CO(H4DOTC)</b>       |
| <b>LUBRICATION</b>                                      | <b>LU(H4DOTC)</b>       |
| <b>SPEED CONTROL SYSTEMS</b>                            | <b>SP(H4DOTC)</b>       |
| <b>IGNITION</b>   | <b>IG(H4DOTC)</b>       |
| <b>STARTING/CHARGING SYSTEMS</b>                        | <b>SC(H4DOTC)</b>       |
| <b>ENGINE (DIAGNOSTICS)</b>                             | <b>EN(H4DOTC)(diag)</b> |
| <b>GENERAL DESCRIPTION</b>                              | <b>GD(H4DOTC)</b>       |
| <b>FUEL INJECTION (FUEL SYSTEMS)</b>                    | <b>FU(STI)</b>          |
| <b>EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)</b> | <b>EC(STI)</b>          |
| <b>INTAKE (INDUCTION)</b>                               | <b>IN(STI)</b>          |
| <b>MECHANICAL</b>                                       | <b>ME(STI)</b>          |
| <b>EXHAUST</b>  | <b>EX(STI)</b>          |



ENGINE SECTION 2

COOLING CO(STI)

LUBRICATION LU(STI)

SPEED CONTROL SYSTEMS SP(STI)

IGNITION IG(STI)

STARTING/CHARGING SYSTEMS SC(STI)

ENGINE (DIAGNOSTICS) EN(STI)(diag)

GENERAL DESCRIPTION GD(STI)





# FUEL INJECTION (FUEL SYSTEMS)

# *FU(H4DOTC)*

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# General Description

FUEL INJECTION (FUEL SYSTEMS)

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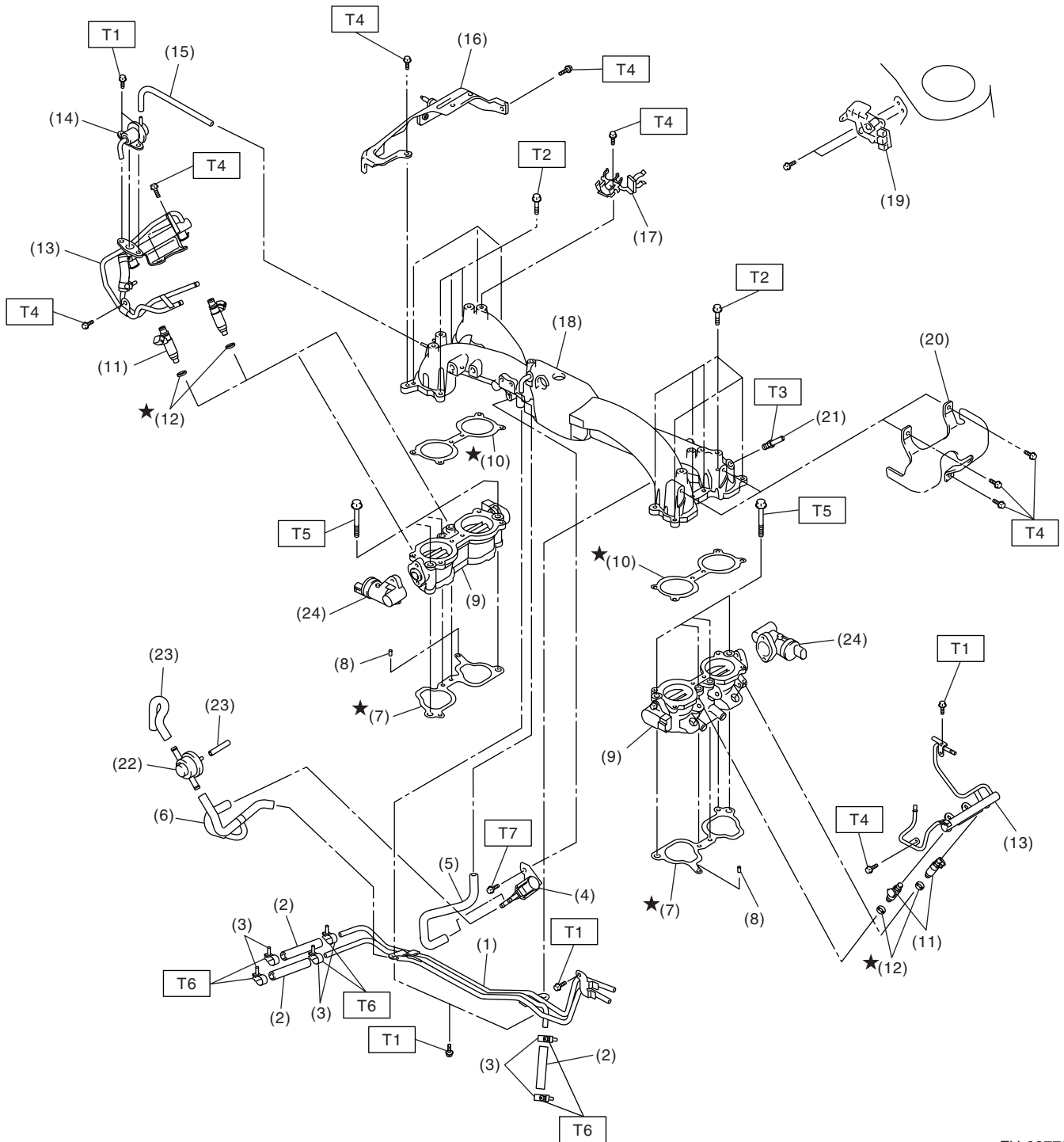
## 1. General Description

### A: SPECIFICATION

|             |                            |  |
|-------------|----------------------------|--|
| Fuel tank   | Capacity                   | 60 ℓ (15.9 US gal, 13.2 Imp gal)   |
|             | Location                   | Under rear seat  |
| Fuel pump   | Type                       | Impeller   |
|             | Shutoff discharge pressure | 450 — 677 kPa (4.59 — 6.9 kgf/cm <sup>2</sup> , 65.27 — 98.2 psi)  |
|             | Discharge flow             | More than 145 ℓ (38.3 US gal, 31.9 Imp gal)/h<br>[12 V at 300 kPa (3.06 kgf/cm <sup>2</sup> , 43.5 psi)] |
| Fuel filter |                            | Cartridge type   |

### B: COMPONENT

#### 1. INTAKE MANIFOLD



FU-02770

# General Description

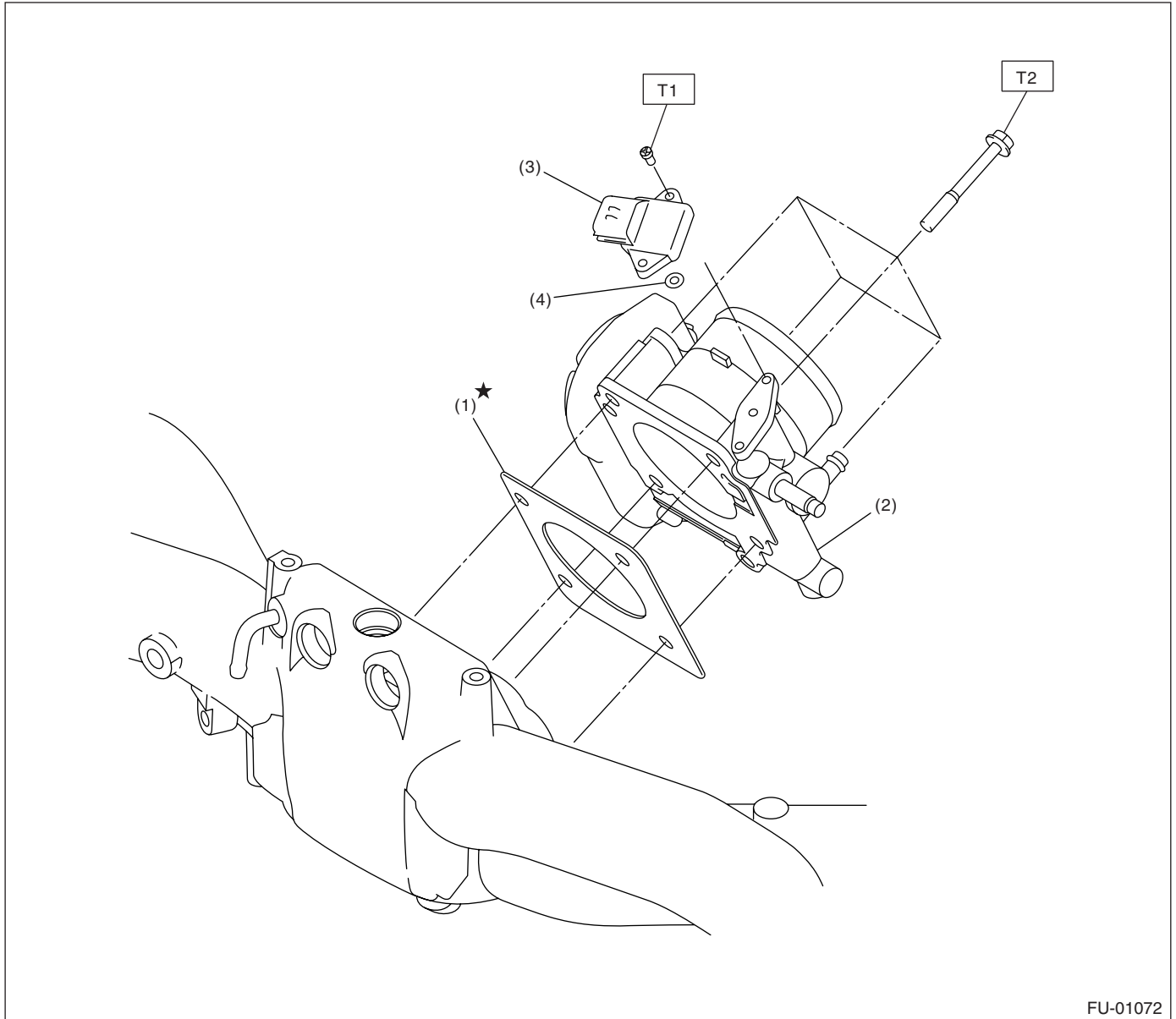
## FUEL INJECTION (FUEL SYSTEMS)

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|                                    |  |  |
|------------------------------------|--|--|
| (1) Fuel pipe ASSY                 | (12) Insulator                             | (22) Purge valve                                   |
| (2) Fuel hose                      | (13) Fuel injector pipe                    | (23) Purge hose                                    |
| (3) Clip                           | (14) Pressure regulator                    | (24) Tumble generator valve actuator               |
| (4) Purge control solenoid valve   | (15) Pressure regulator hose               |  |
| (5) Vacuum hose                    | (16) Fuel pipe protector RH                | <hr/> <b>Tightening torque: N·m (kgf-m, ft-lb)</b> |
| (6) Vacuum control hose            | (17) Blow-by hose stay                     | <b>T1: 6.4 (0.65, 4.7)</b>                         |
| (7) Intake manifold gasket         | (18) Intake manifold                       | <b>T2: 8.25 (0.84, 6.1)</b>                        |
| (8) Guide pin                      | (19) Wastegate control solenoid valve ASSY | <b>T3: 17 (1.73, 12.5)</b>                         |
| (9) Tumble generator valve ASSY    | (20) Fuel pipe protector LH                | <b>T4: 19 (1.94, 13.7)</b>                         |
| (10) Tumble generator valve gasket | (21) Nipple                                | <b>T5: 25 (2.5, 18.1)</b>                          |
| (11) Fuel injector                 |  | <b>T6: 1.25 (0.13, 0.94)</b>                       |
|                                    |  | <b>T7: 16 (1.6, 11.6)</b>                          |

---

## 2. AIR INTAKE SYSTEM



FU-01072

- (1) Gasket
- (2) Throttle body

- (3) Manifold absolute pressure sensor
- (4) O-ring

**Tightening torque: N·m (kgf·m, ft·lb)**

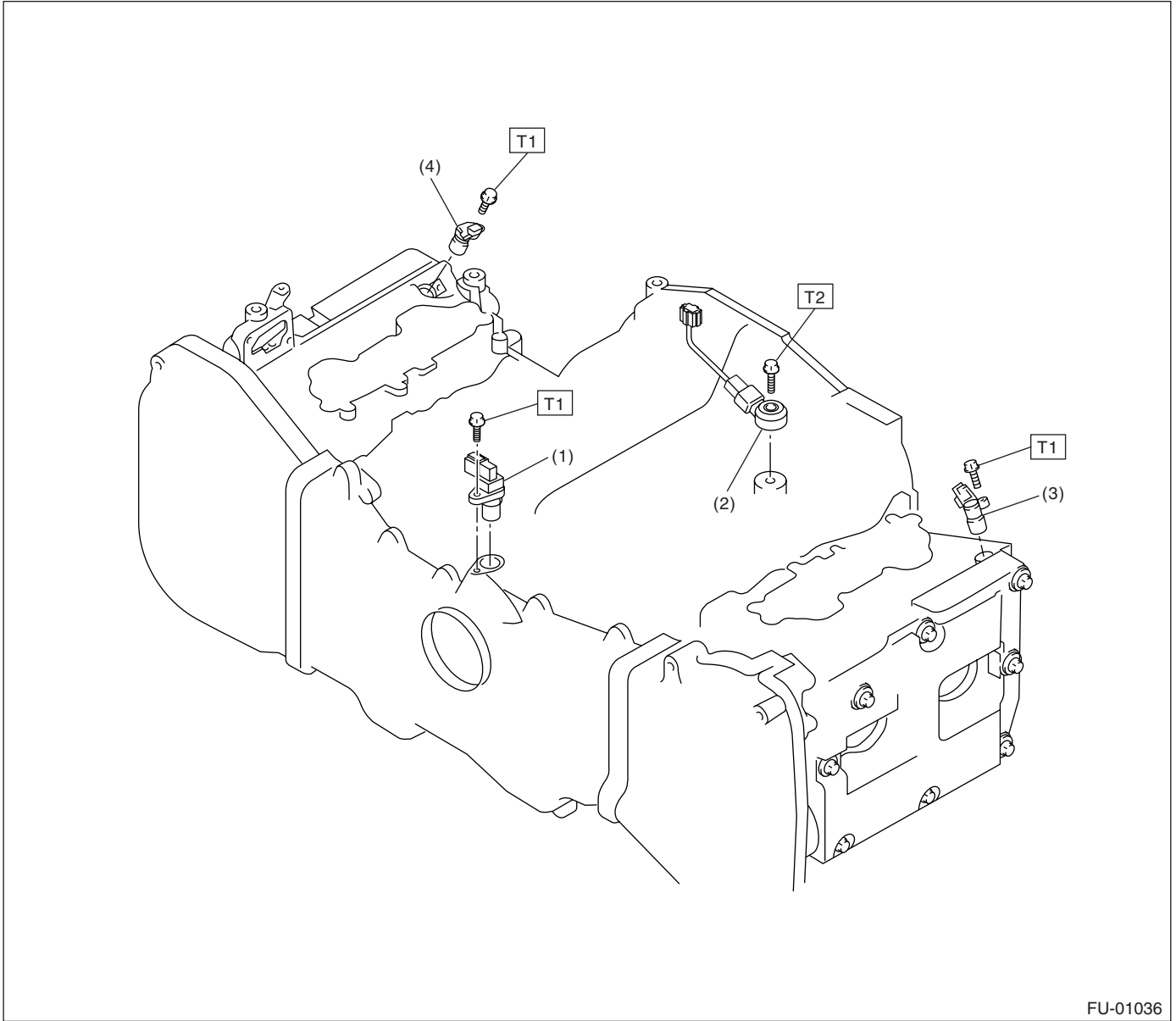
**T1: 1.6 (0.16, 1.2)**

**T2: 8 (0.8, 5.8)**

# General Description

FUEL INJECTION (FUEL SYSTEMS)

## 3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



FU-01036

- (1) Crankshaft position sensor
- (2) Knock sensor

- (3) Camshaft position sensor LH
- (4) Camshaft position sensor RH

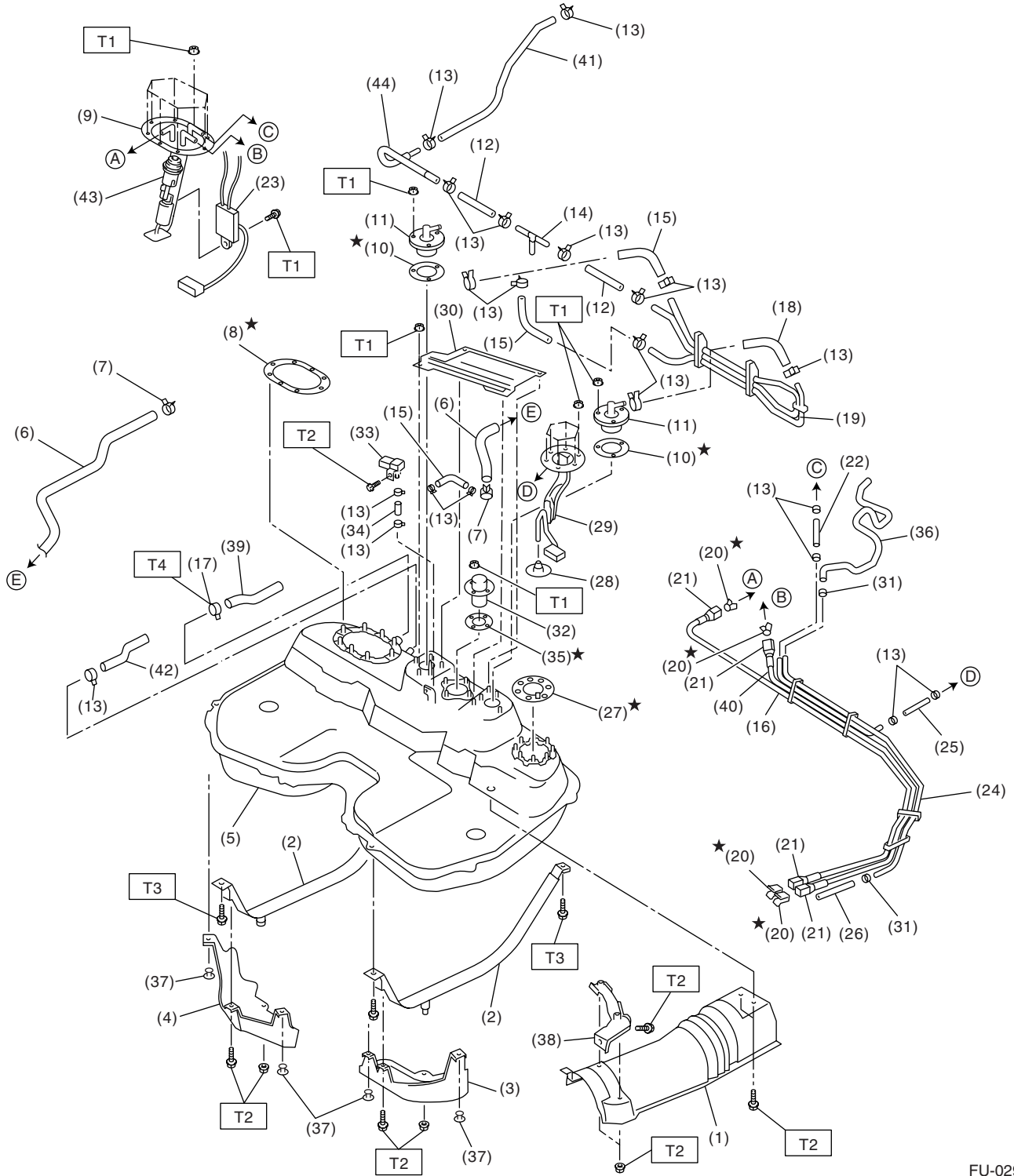
**Tightening torque: N·m (kgf-m, ft-lb)**

**T1: 6.4 (0.65, 4.7)**

**T2: 24 (2.4, 17.4)**

# General Description

## 4. FUEL TANK



FU-02907



# General Description

## FUEL INJECTION (FUEL SYSTEMS)

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|                            |                                     |                         |
|----------------------------|-------------------------------------|-------------------------|
| (1) Heat shield cover      | (18) Evaporation hose C             | (35) Vent valve gasket  |
| (2) Fuel tank band         | (19) Evaporation pipe ASSY          | (36) Purge hose         |
| (3) Protector LH           | (20) Retainer                       | (37) Clip               |
| (4) Protector RH           | (21) Quick connector                | (38) Cover bracket      |
| (5) Fuel tank              | (22) Jet pump hose A                | (39) Fuel filler hose   |
| (6) Canister hose A        | (23) Fuel level sensor              | (40) Fuel return tube   |
| (7) Clamp                  | (24) Fuel pipe ASSY                 | (41) Evaporation hose E |
| (8) Fuel pump gasket       | (25) Jet pump hose B                | (42) Evaporation hose F |
| (9) Fuel pump ASSY         | (26) Evaporation hose D             | (43) Fuel filter        |
| (10) Fuel cut valve gasket | (27) Fuel sub level sensor gasket   | (44) Evaporation pipe   |
| (11) Fuel cut valve        | (28) Jet pump filter                |                         |
| (12) Evaporation hose A    | (29) Fuel sub level sensor          |                         |
| (13) Clip                  | (30) Protect cover                  |                         |
| (14) Joint pipe            | (31) Clip                           |                         |
| (15) Evaporation hose B    | (32) Vent valve                     |                         |
| (16) Fuel delivery tube    | (33) Fuel tank pressure sensor      |                         |
| (17) Clamp                 | (34) Fuel tank pressure sensor hose |                         |

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**Tightening torque: N·m (kgf-m, ft-lb)**

**T1: 4.4 (0.45, 3.3)**

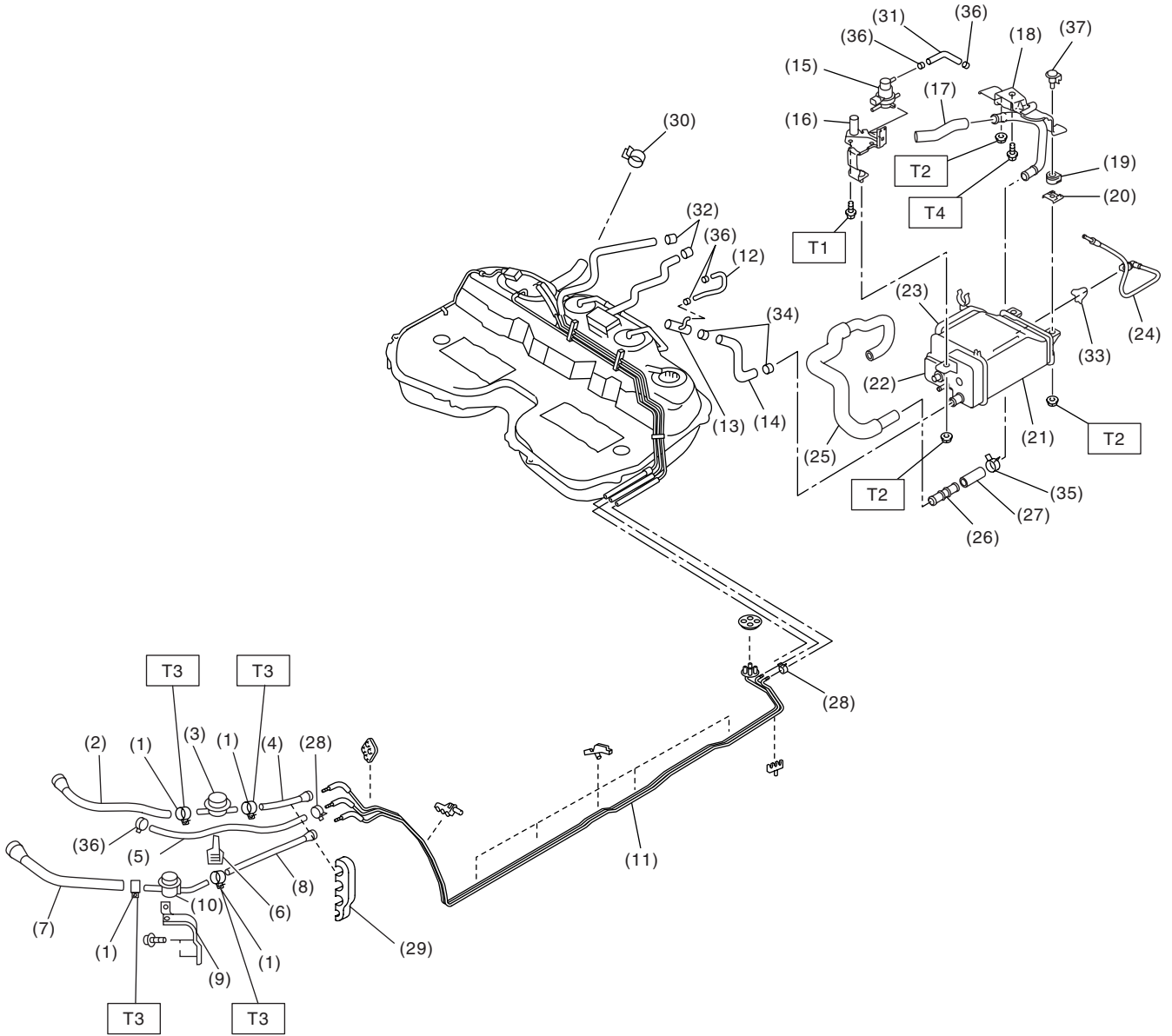
**T2: 7.4 (0.75, 5.4)**

**T3: 33 (3.4, 25)**

**T4: 1.96 (0.20, 1.45)**

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### 5. FUEL LINE



FU-02888

# General Description

## FUEL INJECTION (FUEL SYSTEMS)

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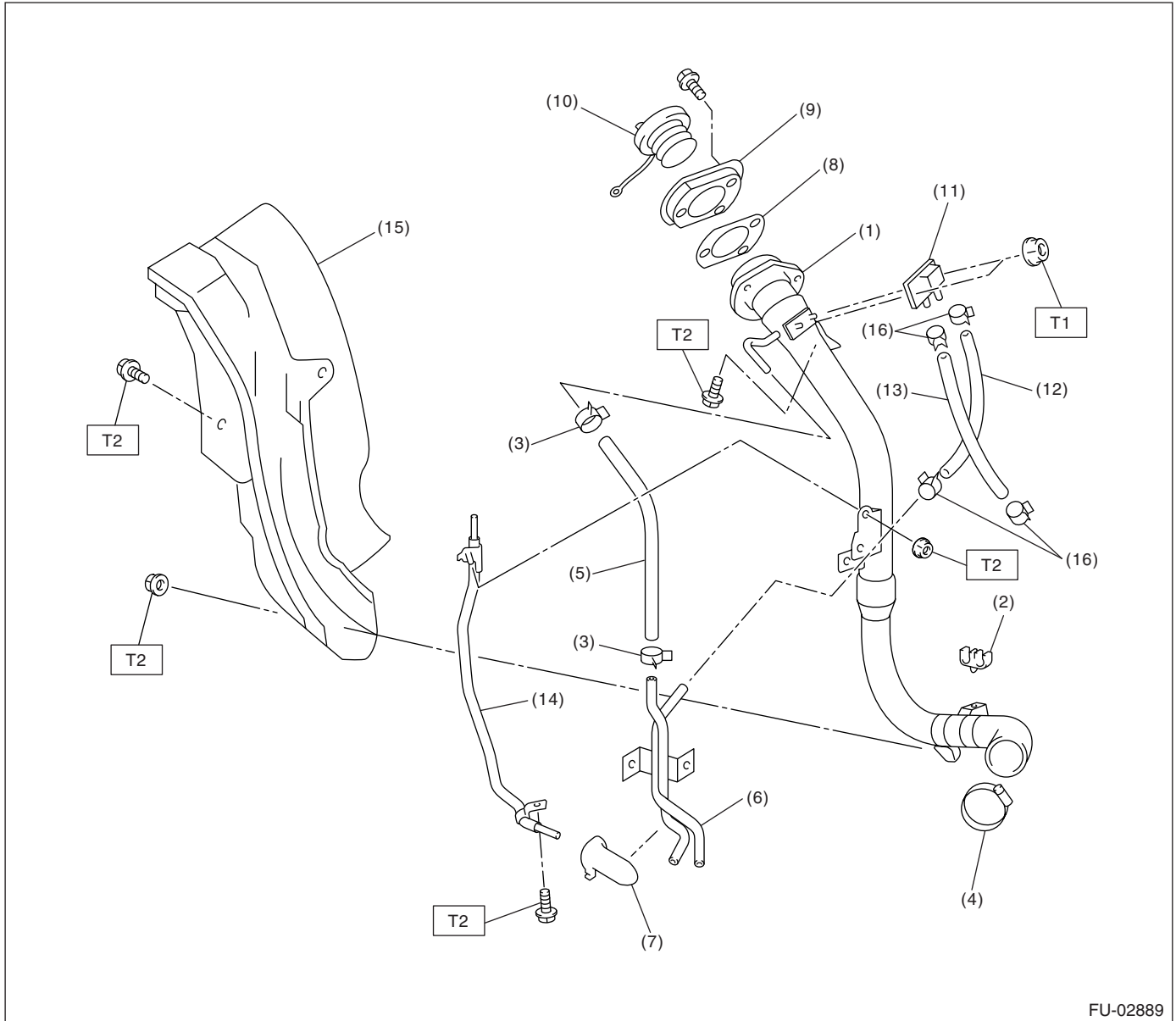
|  |   |                              |
|--|---|------------------------------|
| (1) Clamp                                    | (17) Drain hose C                         | (32) Clamp                   |
| (2) Fuel return hose A                       | (18) Canister upper bracket               | (33) Retainer                |
| (3) Fuel damper valve (return)               | (19) Cushion rubber                       | (34) Clamp                   |
| (4) Fuel return hose B                       | (20) Canister lower bracket               | (35) Clamp                   |
| (5) Evaporation hose A                       | (21) Canister                             | (36) Clamp                   |
| (6) Clip                                     | (22) Drain valve                          | (37) Canister bracket spacer |
| (7) Fuel delivery hose A                     | (23) Drain filter                         |                              |
| (8) Fuel delivery hose B                     | (24) Pressure control solenoid valve tube |                              |
| (9) Fuel damper valve bracket                | (25) Drain hose A                         |                              |
| (10) Fuel damper valve (delivery)            | (26) Connector drain                      |                              |
| (11) Fuel pipe ASSY                          | (27) Drain hose B                         |                              |
| (12) Evaporation hose B                      | (28) Clamp                                |                              |
| (13) Joint pipe                              | (29) Clip                                 |                              |
| (14) Canister hose A                         | (30) Clamp                                |                              |
| (15) Pressure control solenoid valve         | (31) Pressure control solenoid valve hose |                              |
| (16) Pressure control solenoid valve bracket |   |                              |

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**Tightening torque: N-m (kgf-m, ft-lb)****T1: 25 (2.5, 18.1)****T2: 23 (2.3, 16.6)****T3: 1.25 (0.13, 0.94)****T4: 33 (3.4, 25)**

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## 6. FUEL FILLER PIPE



FU-02889

- |                             |                         |                                 |
|-----------------------------|-------------------------|---------------------------------|
| (1) Fuel filler pipe ASSY   | (8) Filler pipe packing | (15) Fuel filler pipe protector |
| (2) Evaporation hose holder | (9) Filler ring         | (16) Clamp                      |
| (3) Clip                    | (10) Filler cap         |                                 |
| (4) Clamp                   | (11) Shut valve         |                                 |
| (5) Evaporation hose A      | (12) Evaporation hose B |                                 |
| (6) Evaporation pipe        | (13) Evaporation hose C |                                 |
| (7) Evaporation pipe holder | (14) Joint pipe         |                                 |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 4.4 (0.45, 3.3)**

**T2: 7.5 (0.76, 5.5)**

## General Description

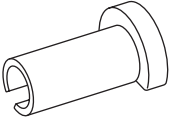
### FUEL INJECTION (FUEL SYSTEMS)

#### C: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.

- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

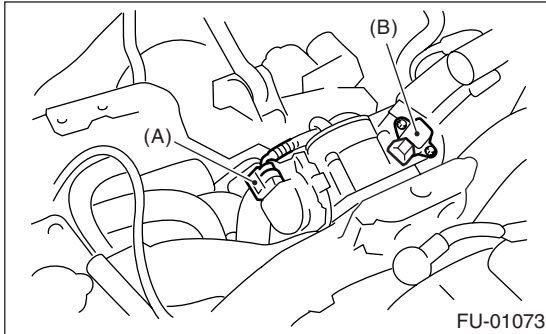
#### D: PREPARATION TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION       | REMARKS  |
|---|-------------|-------------------|--|
| <br><br>ST42099AE000 | 42099AE000  | CONNECTOR REMOVER | Used for removing quick connector in engine compartment. |

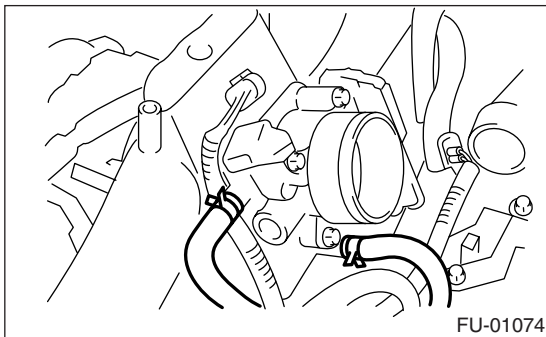
## 2. Throttle Body

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Disconnect the connector from the throttle position sensor (A) and manifold absolute pressure sensor (B).



- 4) Disconnect the engine coolant hoses from the throttle body.



- 5) Remove the bolts which secure the throttle body to intake manifold.

### B: INSTALLATION

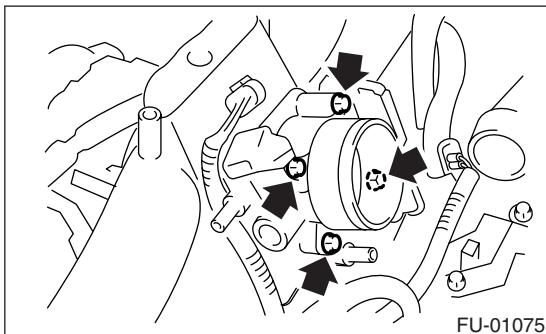
- 1) Install in the reverse order of removal.

NOTE:

Always use a new gasket.

**Tightening torque:**

**8 N·m (0.8 kgf·m, 5.8 ft·lb)**



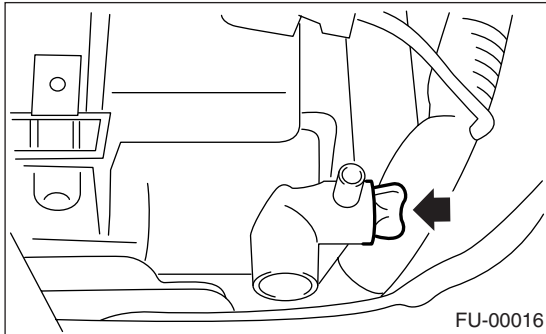
# Intake Manifold

## FUEL INJECTION (FUEL SYSTEMS)

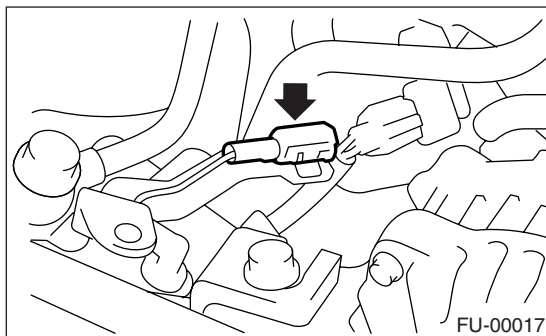
### 3. Intake Manifold

#### A: REMOVAL

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from battery.
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Lift up the vehicle.
- 5) Remove the under cover.
- 6) Drain the engine coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).



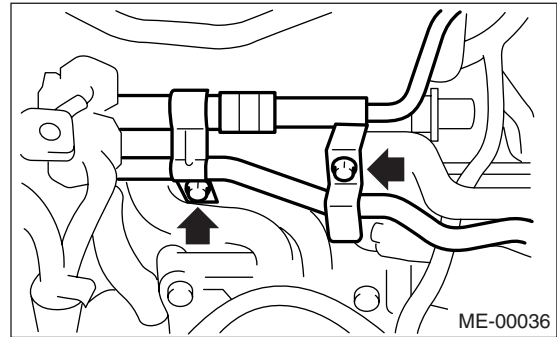
- 7) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- 8) Remove the air cleaner element.
- 9) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 10) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-33, REMOVAL, Coolant Filler Tank.>
- 11) Remove the power steering pump.
  - (1) Remove the front side V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
  - (2) Disconnect the power steering switch connector.



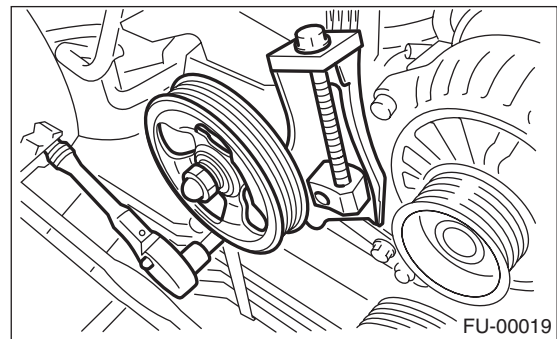
- (3) Remove the bolts which secure the power steering pipe brackets to the intake manifold.

#### NOTE:

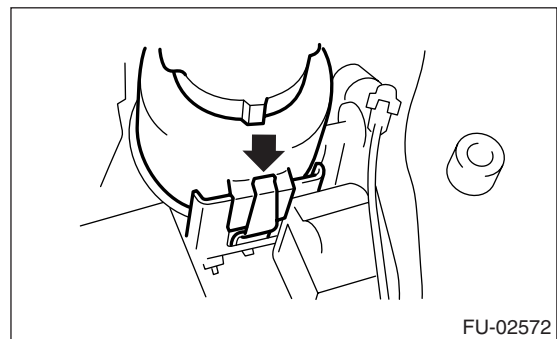
Do not disconnect the power steering hose.



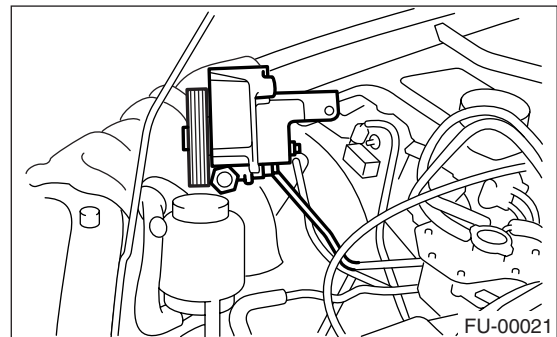
- (4) Remove the bolts which secure the power steering pump bracket.



- (5) Remove the power steering tank from the bracket by pulling it upward.



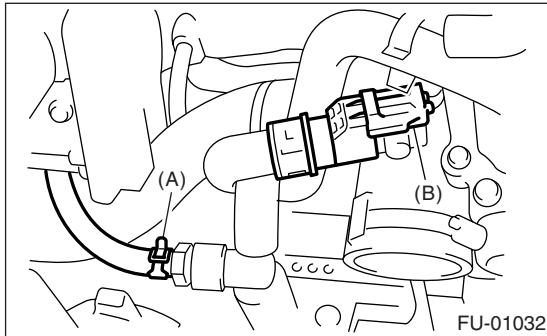
- (6) Place the power steering pump on the right side wheel apron.



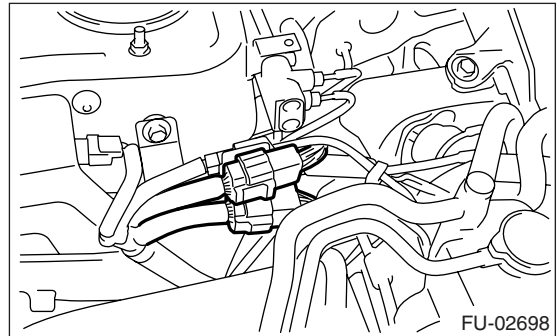
# Intake Manifold

## FUEL INJECTION (FUEL SYSTEMS)

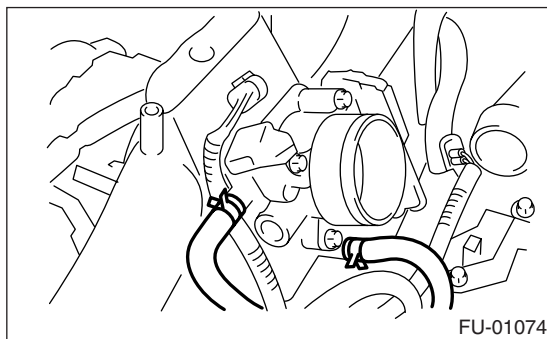
12) Disconnect the emission hose (A) and connector (B) from the PCV hose assembly.



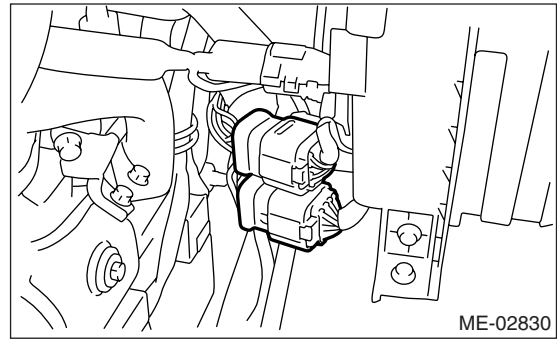
16) Disconnect the engine harness connectors from the bulkhead harness connectors.



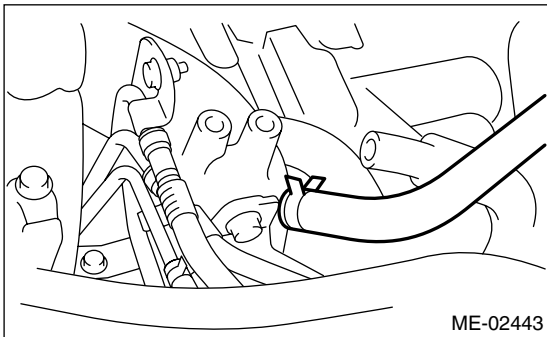
13) Disconnect the engine coolant hoses from the throttle body.



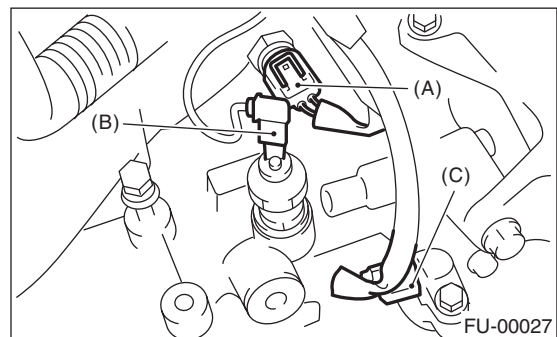
17) Remove the engine harness connector from front harness connector.



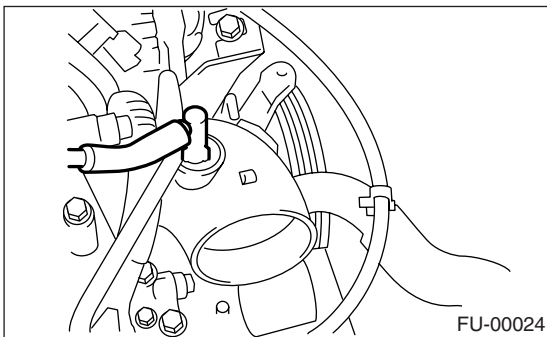
14) Disconnect the brake booster vacuum hose.



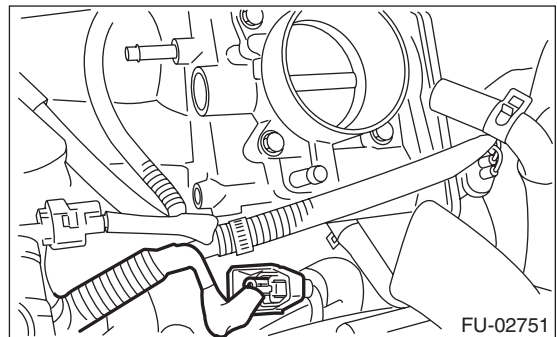
18) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



15) Disconnect the pressure hose from the intake duct.



19) Disconnect the knock sensor connector.

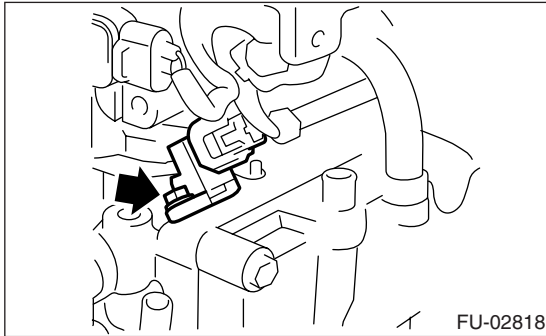




# Intake Manifold

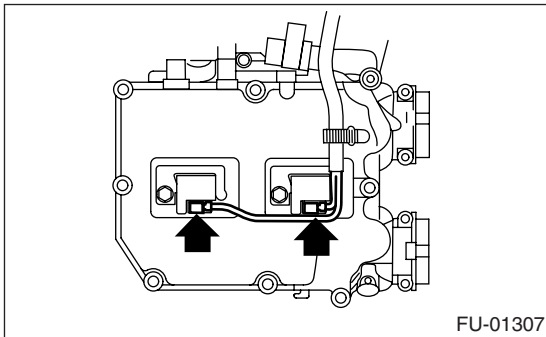
## FUEL INJECTION (FUEL SYSTEMS)

20) Disconnect the connector from the camshaft position sensor.

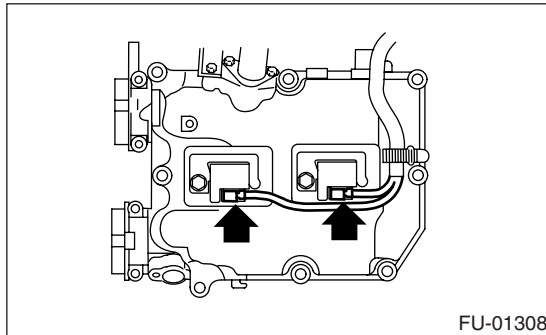


21) Disconnect the connector from the ignition coil and ignitor assembly.

- RH side

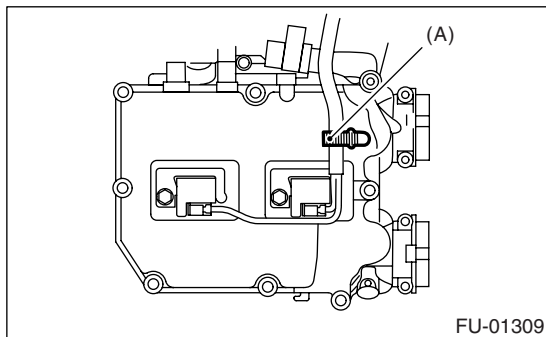


- LH side

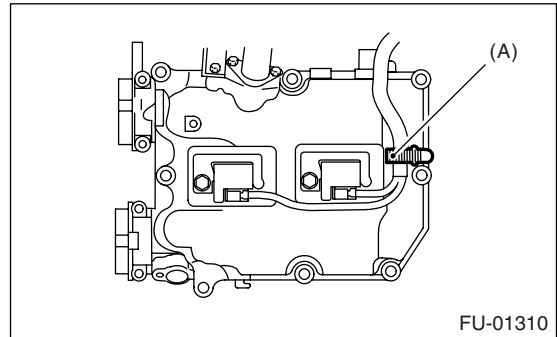


22) Disconnect the engine harness fixed by clip (A) from the rocker cover.

- RH side



- LH side

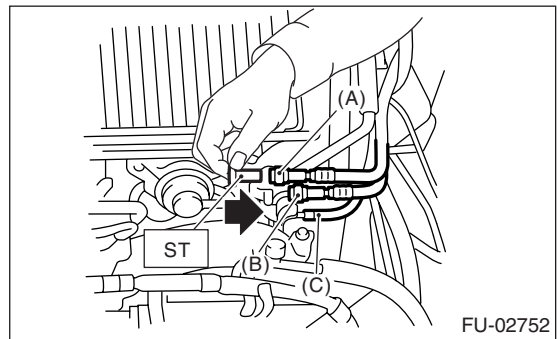


23) Using ST, disconnect fuel hoses from fuel pipes. <Ref. to FU(H4DOTC)-65, REMOVAL, Fuel Delivery, Return and Evaporation lines.>

### CAUTION:

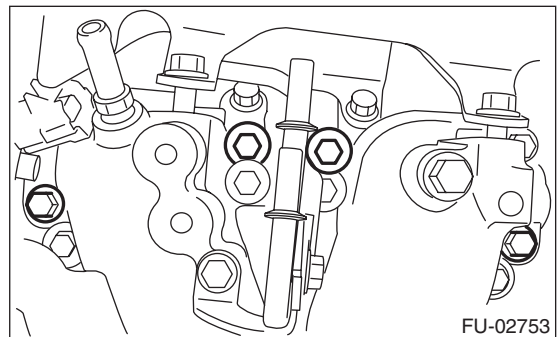
- Be careful not to spill fuel.
- Catch fuel from hoses using a container or cloth.

ST 42099AE000 CONNECTOR REMOVER



- (A) Fuel delivery hose
- (B) Return hose
- (C) Evaporation hose

24) Remove the bolts which secure the intake manifold to the cylinder heads.



25) Remove the intake manifold.

## B: INSTALLATION

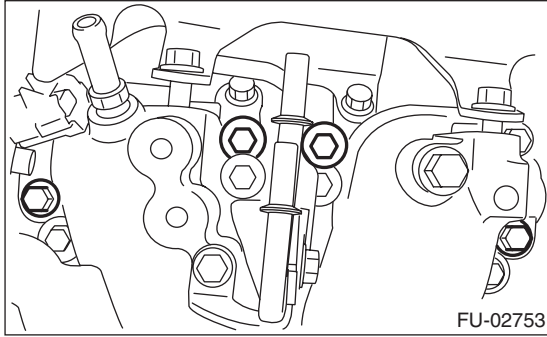
1) Install the intake manifold onto cylinder heads.

NOTE:

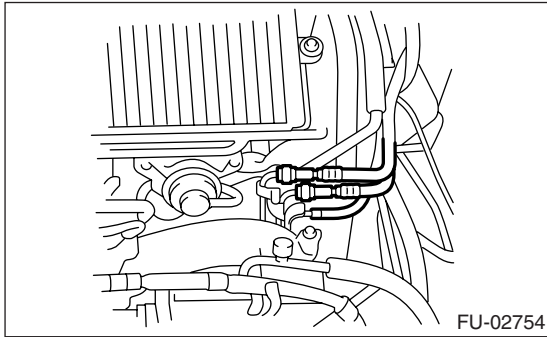
Always use new gaskets.

**Tightening torque:**

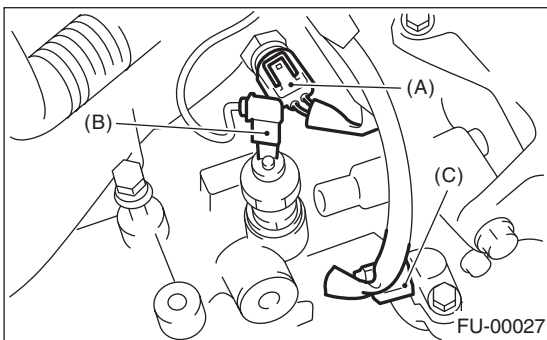
**25 N·m (2.5 kgf·m, 18.1 ft·lb)**



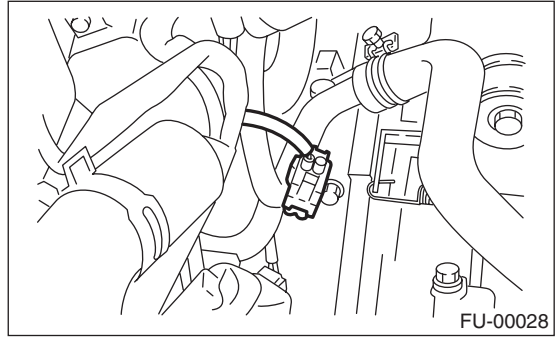
2) Connect the fuel delivery hose, return hose and evaporation hose.



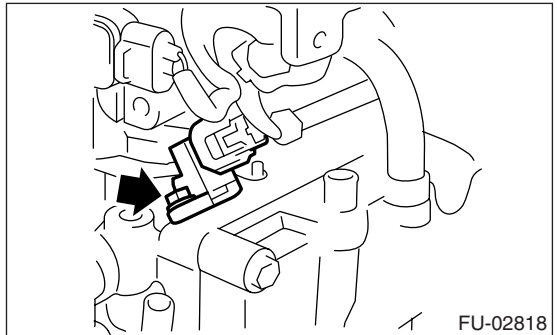
3) Connect the connector to the oil pressure switch (B), crankshaft position sensor (A) and engine coolant temperature sensor (A).



4) Connect the connector to the knock sensor.

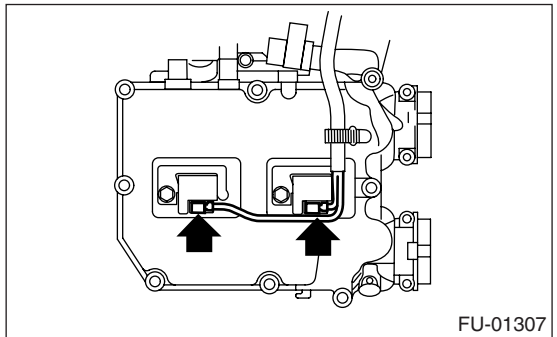


5) Connect the connector to the camshaft position sensor.

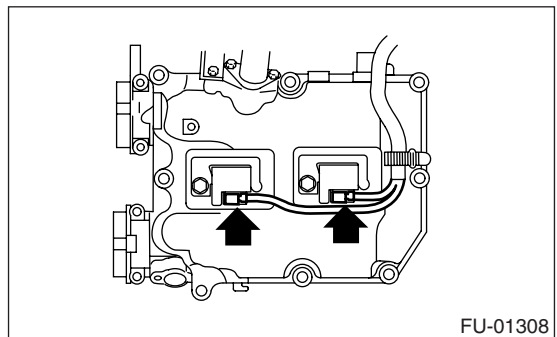


6) Connect the connector to the ignition coil and ignitor assembly.

- RH side



- LH side

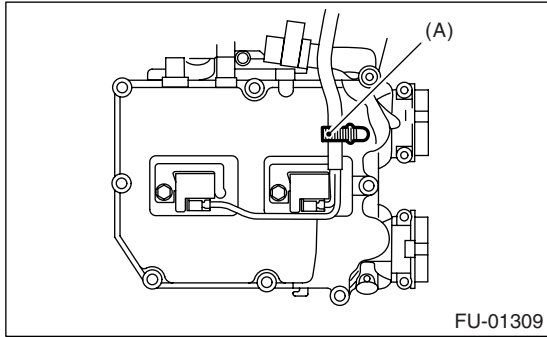


# Intake Manifold

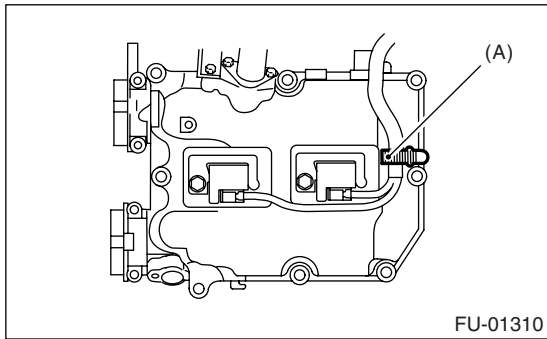
## FUEL INJECTION (FUEL SYSTEMS)

7) Connect the engine harness with clip (A) to the rocker cover.

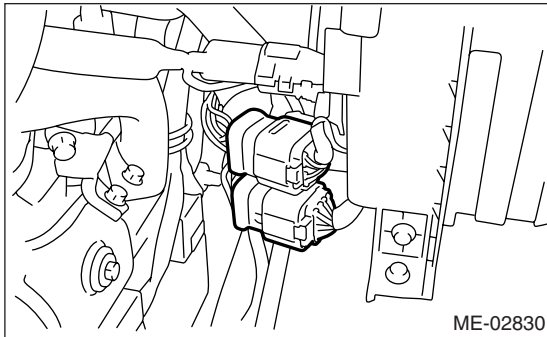
- RH side



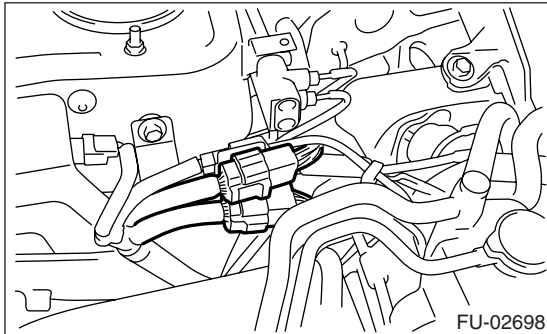
- LH side



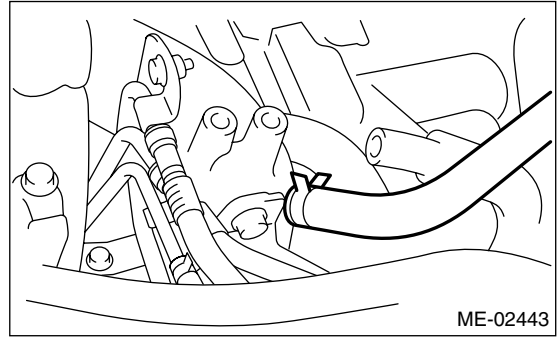
8) Connect the engine harness connector to front harness connector.



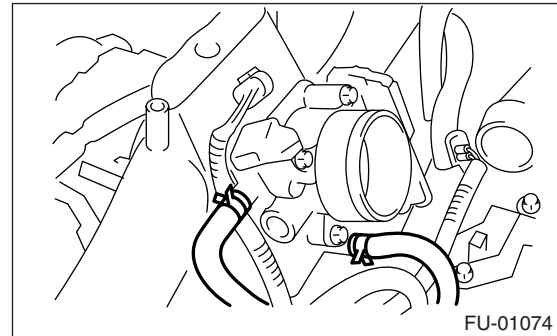
9) Connect the engine harness connector to the bulkhead harness connectors.



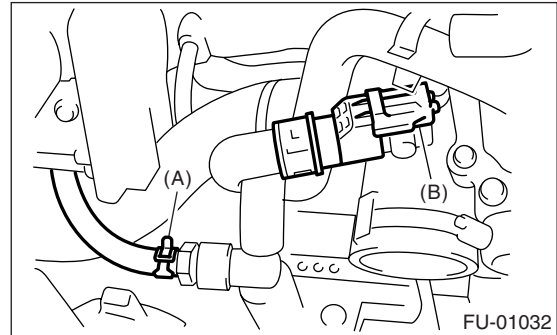
10) Connect the brake booster vacuum hose.



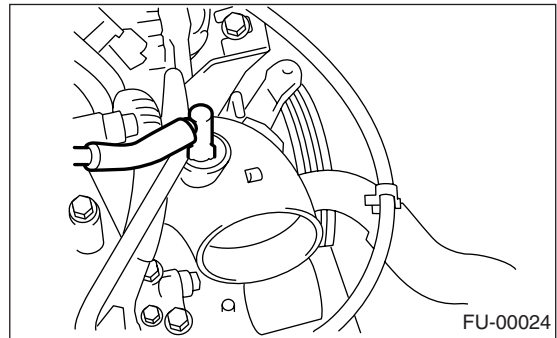
11) Connect the engine coolant hoses to the throttle body.



12) Connect the emission hose (A) and connector (B) to the PCV hose assembly.



13) Connect the pressure hose to the intake duct.

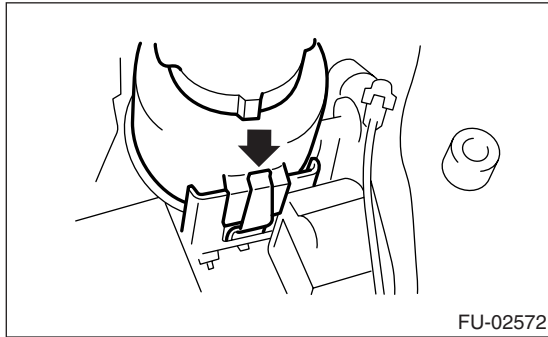


# Intake Manifold

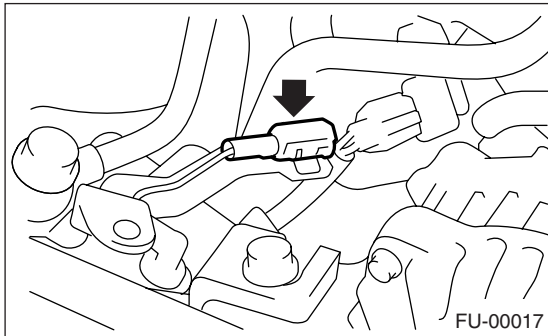
FUEL INJECTION (FUEL SYSTEMS)

14) Install the power steering pump.

(1) Install the power steering tank on the bracket.



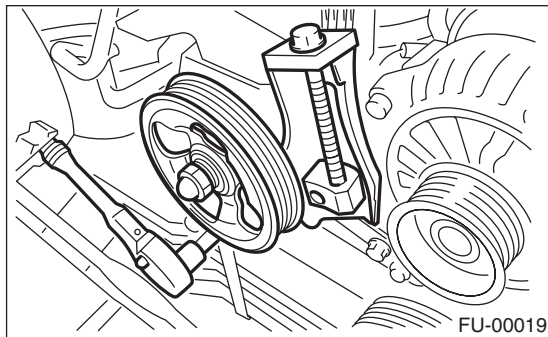
(2) Connect the connector to the power steering pump switch.



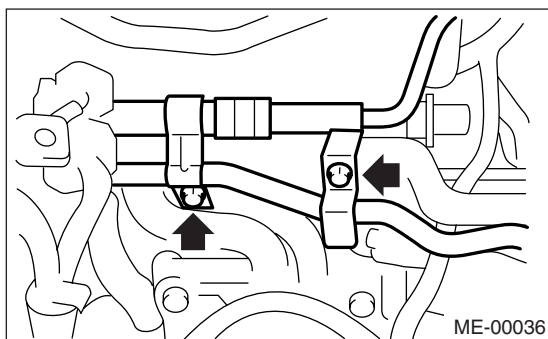
(3) Install the power steering pump, and tighten the bolts.

**Tightening torque:**

**22 N·m (2.2 kgf·m, 15.9 ft·lb)**



(4) Install the power steering pipe brackets on the intake manifold RH.



(5) Install the front side V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>

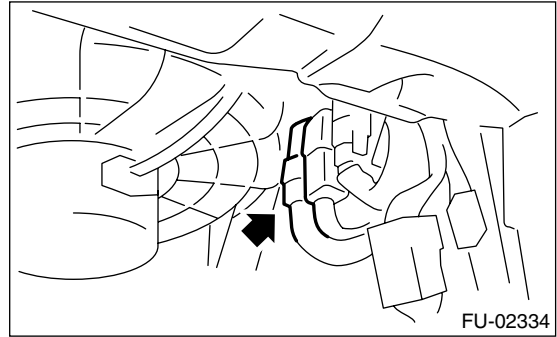
15) Install the coolant filler tank. <Ref. to CO(H4DOTC)-33, INSTALLATION, Coolant Filler Tank.>

16) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

17) Install the air cleaner element.

18) Install the air cleaner upper cover and air intake duct as a unit. <Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner Case.>

19) Connect the connector to the fuel pump relay.



20) Connect the battery ground cable to battery.

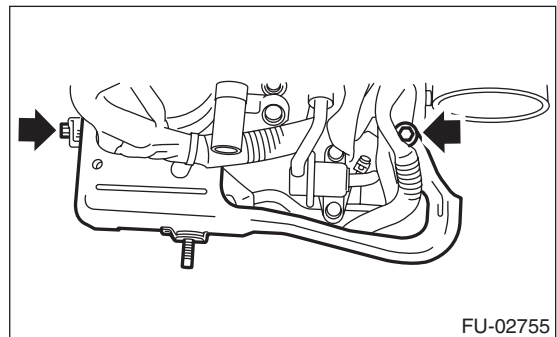
21) Lift up the vehicle.

22) Install the under cover.

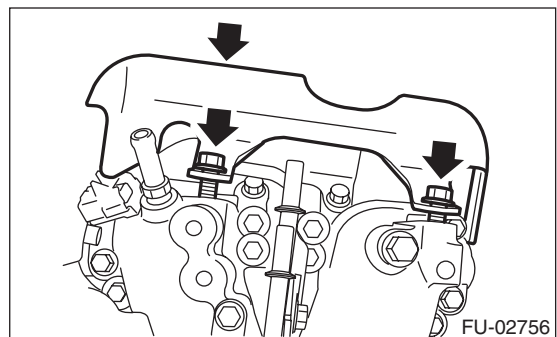
23) Fill the engine coolant. <Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

## C: DISASSEMBLY

1) Remove the fuel pipe protector RH.



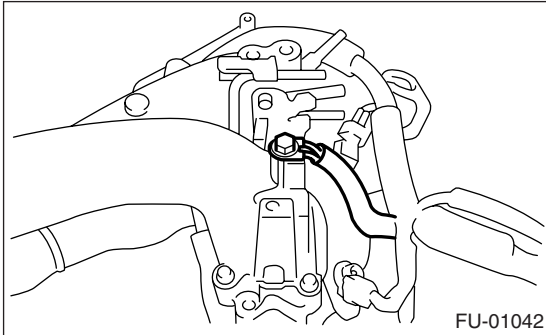
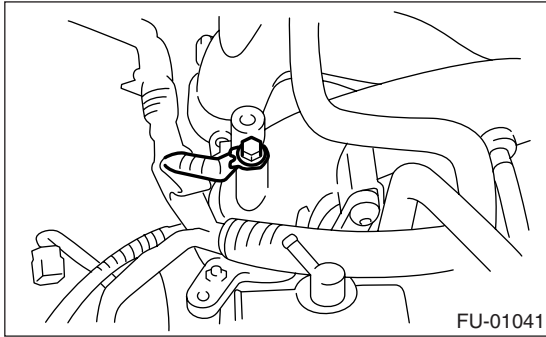
2) Remove the fuel pipe protector LH.



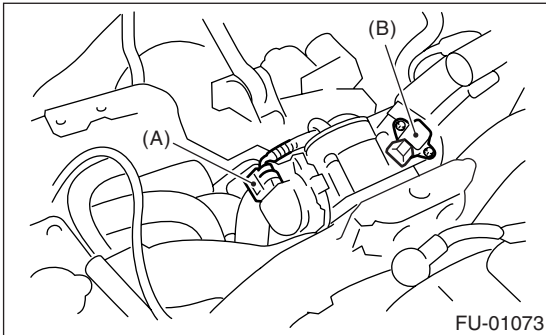
# Intake Manifold

## FUEL INJECTION (FUEL SYSTEMS)

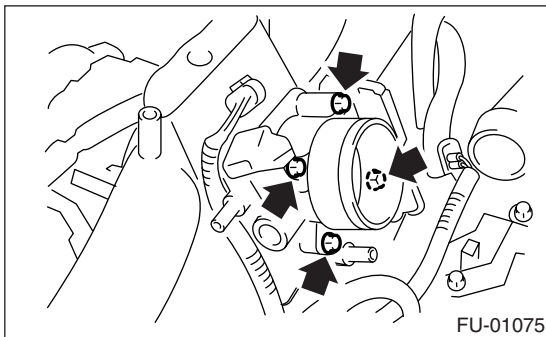
3) Remove the engine ground terminal from the intake manifold.



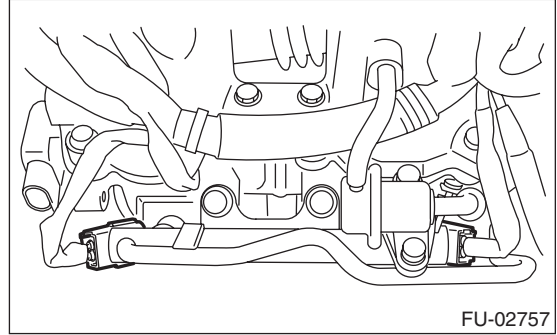
4) Disconnect the connector from the throttle position sensor (A) and manifold absolute pressure sensor (B).



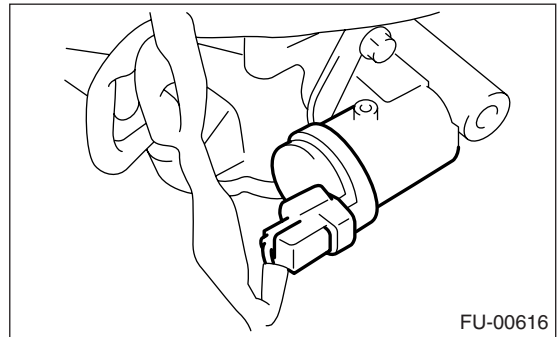
5) Remove the throttle body from the intake manifold.



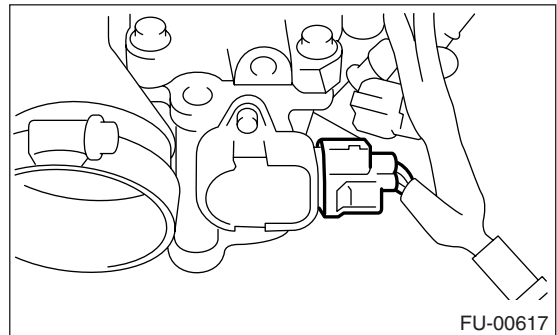
6) Disconnect the connector from the fuel injector.



7) Disconnect the connector from the tumble generator valve actuator.

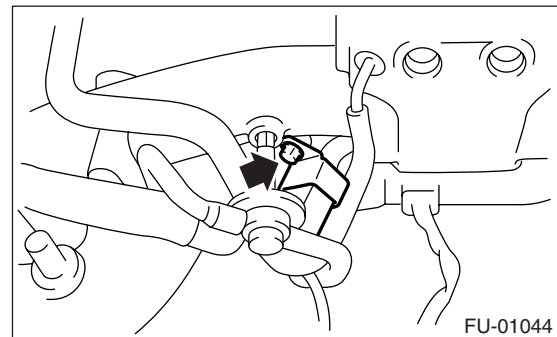


8) Disconnect the connector from the tumble generator valve sensor.



9) Disconnect the connector from the purge control solenoid valve.

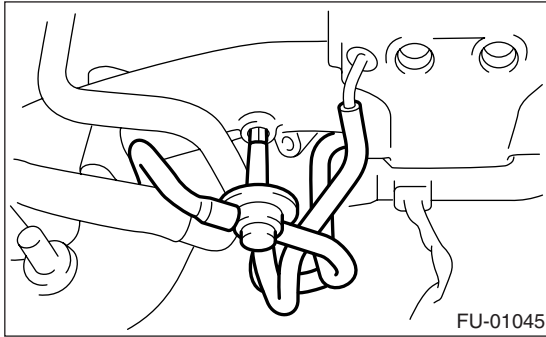
10) Remove the purge control solenoid valve.



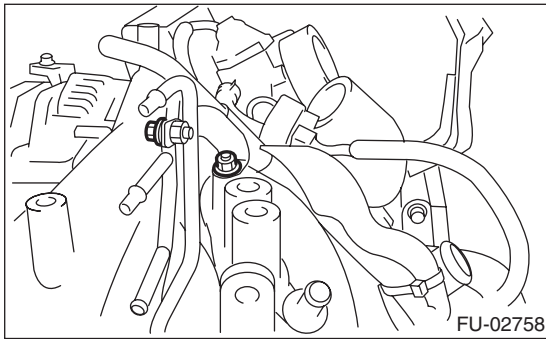
# Intake Manifold

## FUEL INJECTION (FUEL SYSTEMS)

11) Disconnect the evaporation hose and purge valve from the intake manifold.

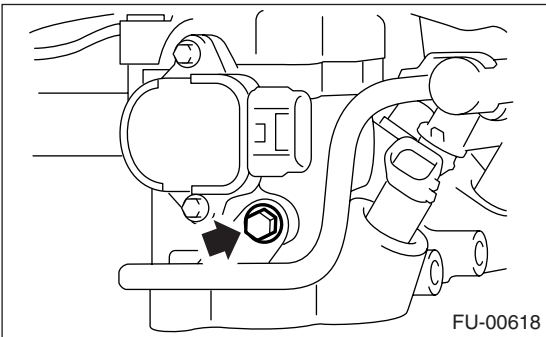
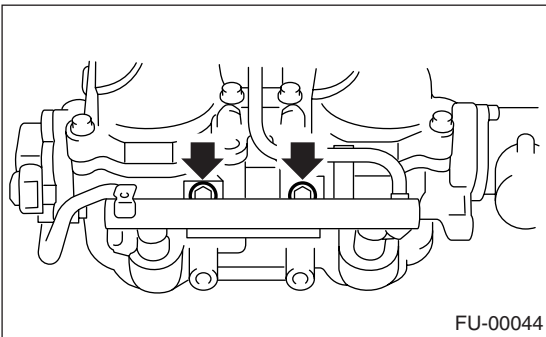


12) Remove the two bolts which hold the fuel pipes on the left side of intake manifold.

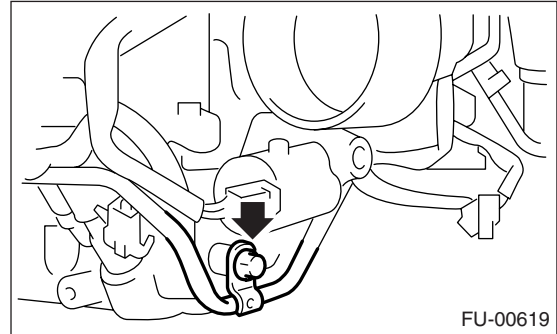
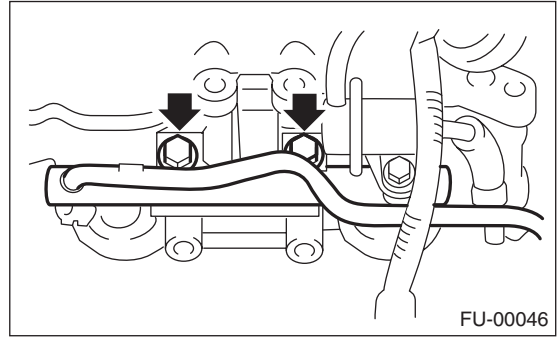


13) Remove the bolt which hold the fuel injector pipe onto intake manifold.

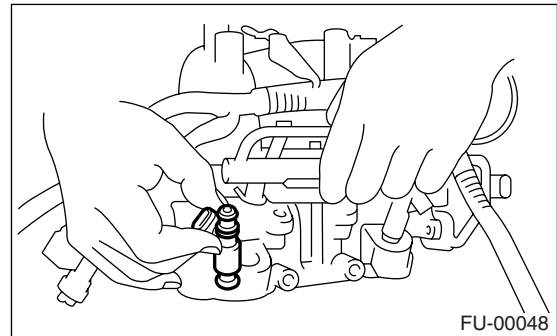
• LH side



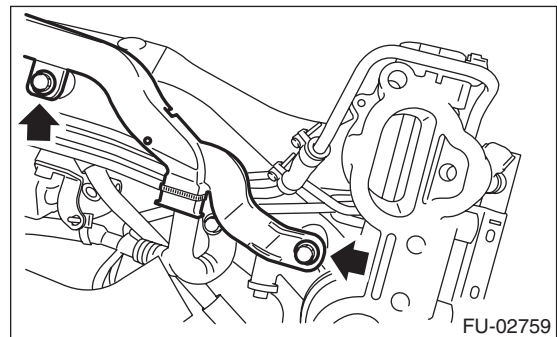
• RH side



14) Remove the fuel injector.



15) Remove the harness bracket which holds the engine harness onto intake manifold.



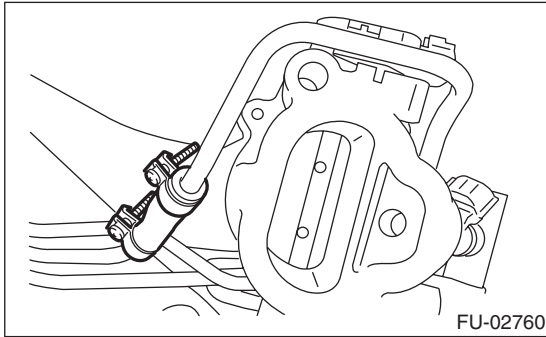
16) Remove the engine harness from the intake manifold.



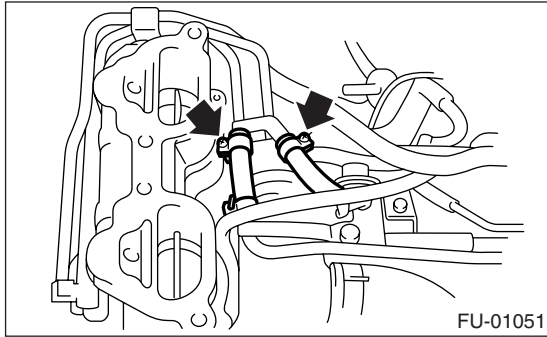
# Intake Manifold

## FUEL INJECTION (FUEL SYSTEMS)

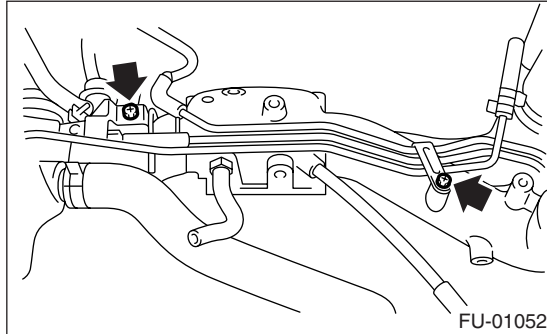
17) Loosen the clamp which holds the front left side fuel hose to fuel injector pipe and remove the pipe from clamp.



18) Loosen the clamp which hold RH side fuel hose to fuel injector pipe, and remove the fuel injector pipe from clamp.

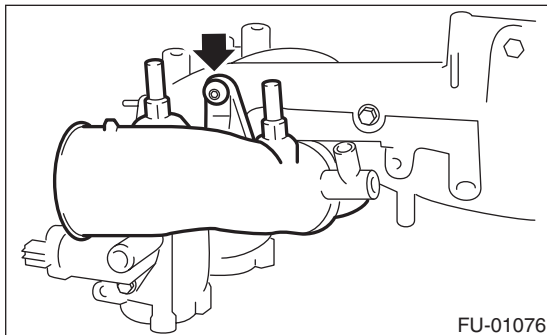


19) Remove the bolts which install the fuel pipe assembly on intake manifold.

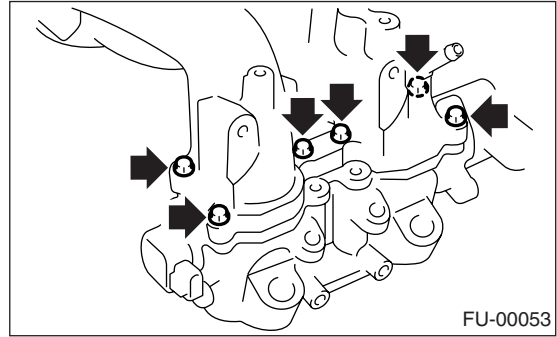


20) Remove the fuel pipe assembly and pressure regulator, from the intake manifold.

21) Remove the intake duct from the intake manifold.



22) Remove the tumble generator valve assembly from the intake manifold.



## D: ASSEMBLY

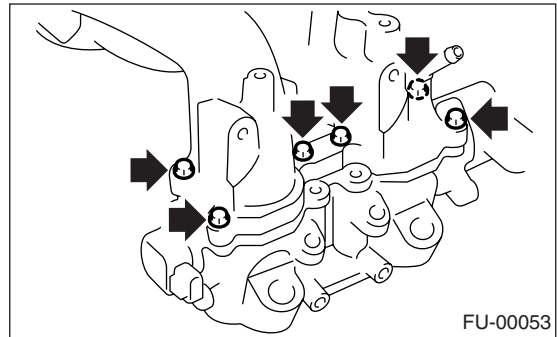
### NOTE:

Replace the gasket with a new one.

1) Install the tumble generator valve assembly to the intake manifold.

### Tightening torque:

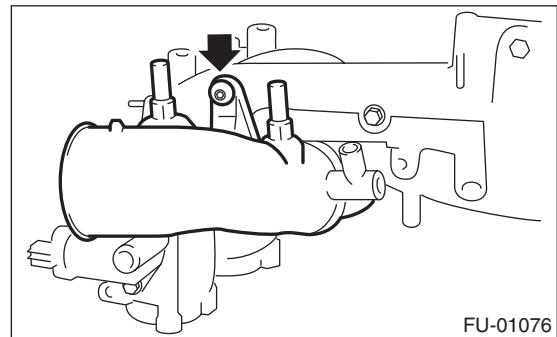
**8.25 N·m (0.84 kgf-m, 6.1 ft-lb)**



2) Install the air intake duct to the intake manifold.

### Tightening torque:

**19 N·m (1.94 kgf-m, 13.7 ft-lb)**

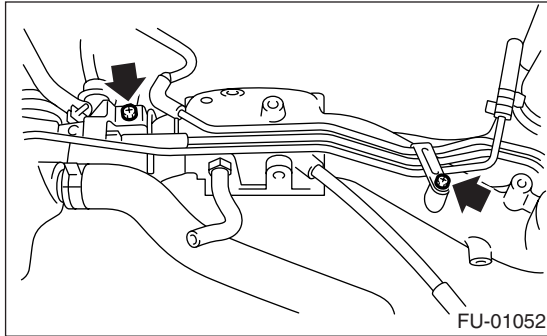


# Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

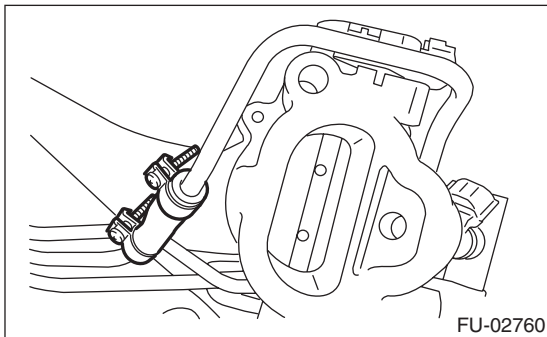
3) Install the fuel pipe assembly and pressure regulator to the intake manifold.

**Tightening torque:**  
**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



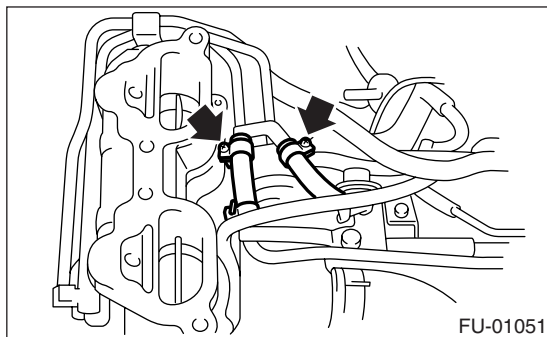
4) Install the fuel injector pipe LH.  
5) Connect the left side fuel hose LH to fuel injector pipe, and tighten the clamp screw.

**Tightening torque:**  
**1.25 N·m (0.13 kgf-m, 0.94 ft-lb)**



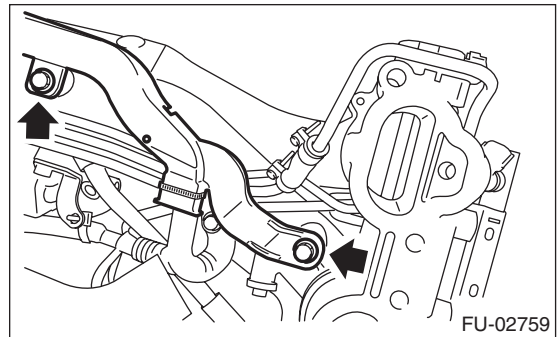
6) Install the fuel injector pipe RH.  
7) Connect the fuel hose RH to fuel injector pipe, and tighten the clamp screw.

**Tightening torque:**  
**1.25 N·m (0.13 kgf-m, 0.94 ft-lb)**

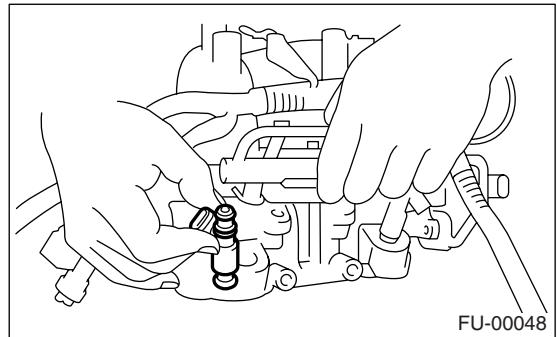


8) Install the engine harness to the intake manifold.  
9) Install the harness bracket which holds the engine harness onto intake manifold.

**Tightening torque:**  
**19 N·m (1.94 kgf-m, 13.7 ft-lb)**



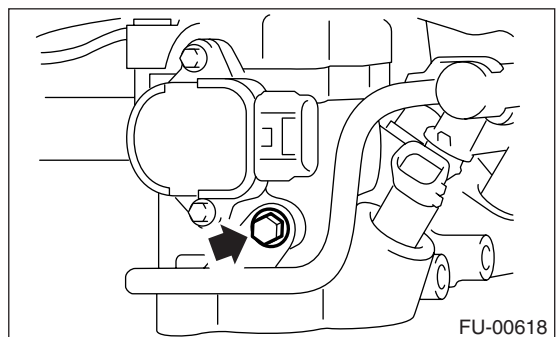
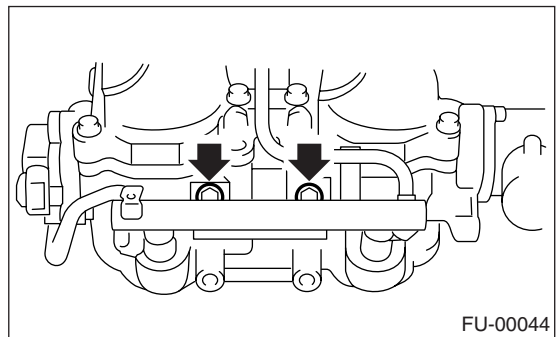
10) Install the fuel injector.



11) Tighten the bolts which install the fuel injector pipe onto intake manifold.

**Tightening torque:**  
**19 N·m (1.94 kgf-m, 13.7 ft-lb)**

- LH side

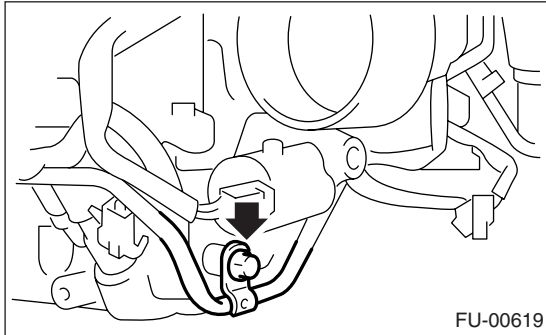
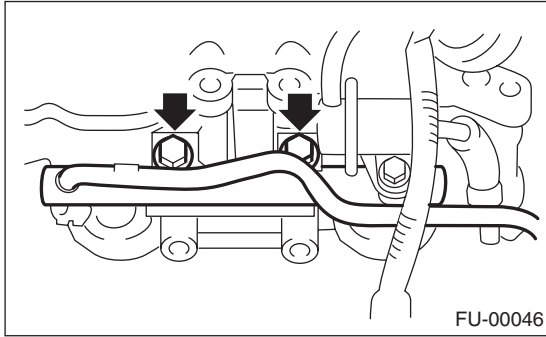




# Intake Manifold

## FUEL INJECTION (FUEL SYSTEMS)

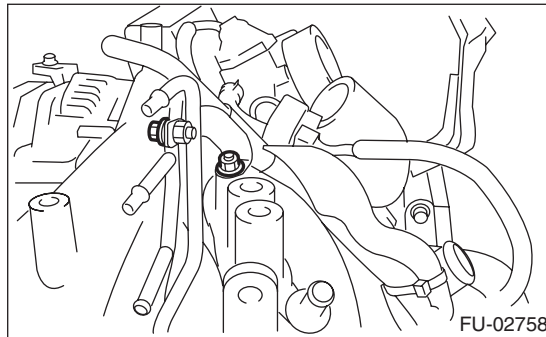
- RH side



12) Tighten the two bolts which install the fuel injector pipes on the left side of intake manifold.

**Tightening torque:**

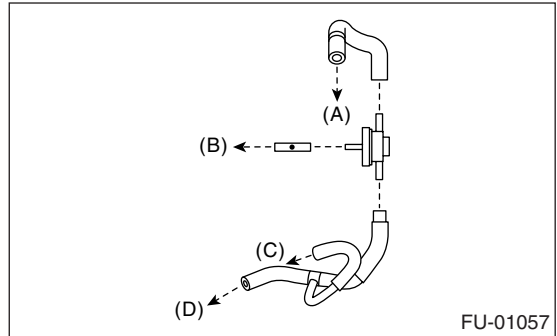
**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



13) Connect the evaporation hoses to the purge valve.

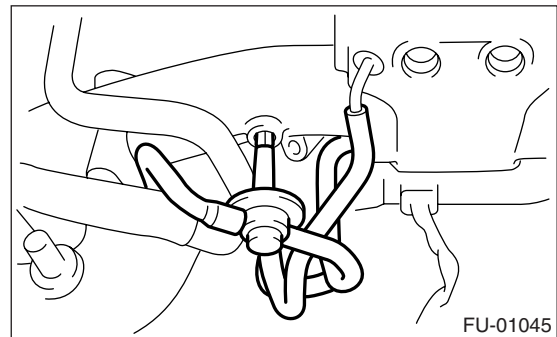
**NOTE:**

Connect the evaporation hoses as shown in the figure.



- (A) To intake duct
- (B) To intake manifold
- (C) To purge control solenoid valve
- (D) To fuel pipe ASSY

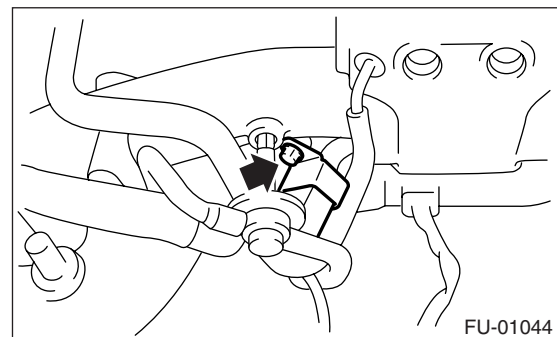
14) Connect the evaporation hose and purge valve to the intake manifold.



15) Install the purge control solenoid valve.

**Tightening torque:**

**16 N·m (1.6 kgf-m, 11.6 ft-lb)**

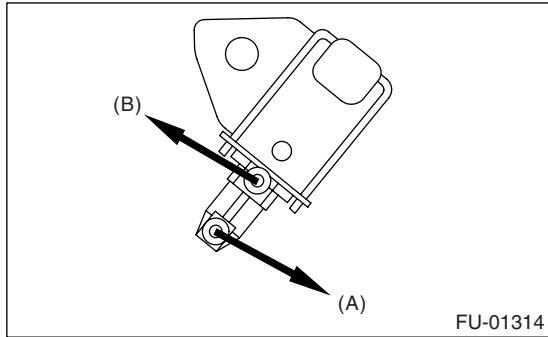


16) Connect the hoses to the purge control solenoid valve.

# Intake Manifold

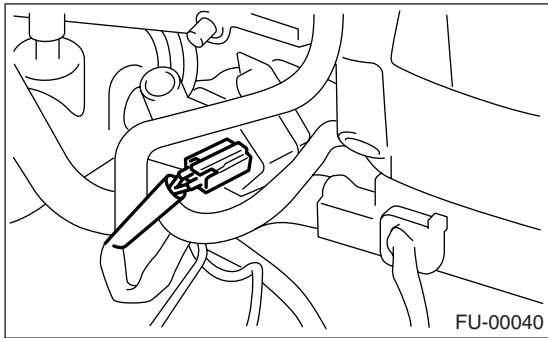
## FUEL INJECTION (FUEL SYSTEMS)

**NOTE:**  
Connect the evaporation hoses as shown in the figure.

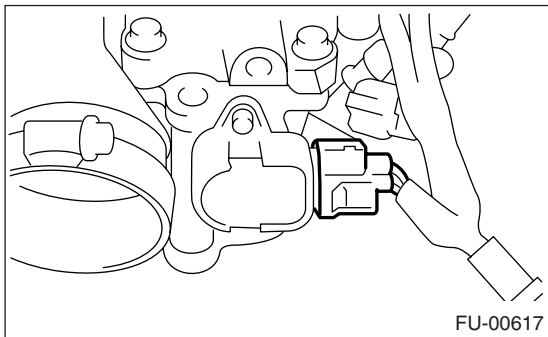


- (A) To purge valve
- (B) To intake manifold

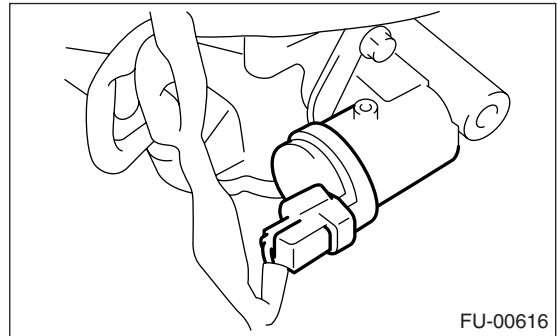
17) Connect the connector to the purge control solenoid valve.



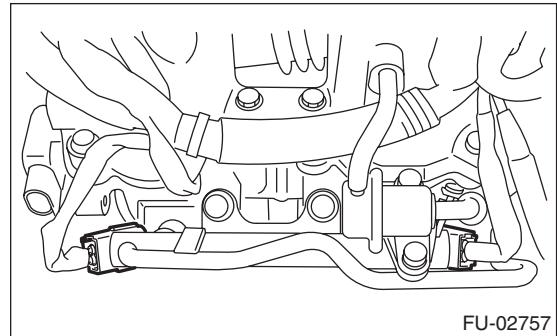
18) Connect the connector to the tumble generator valve sensor.



19) Connect the connector to the tumble generator valve actuator.



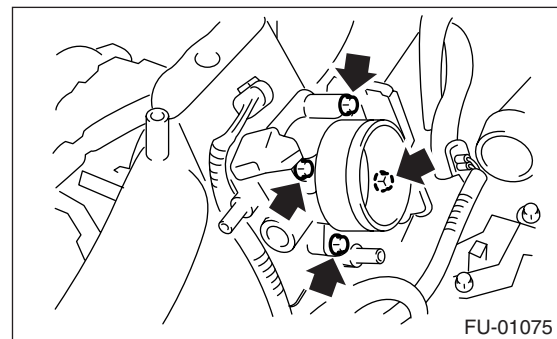
20) Connect the connector to the fuel injector.



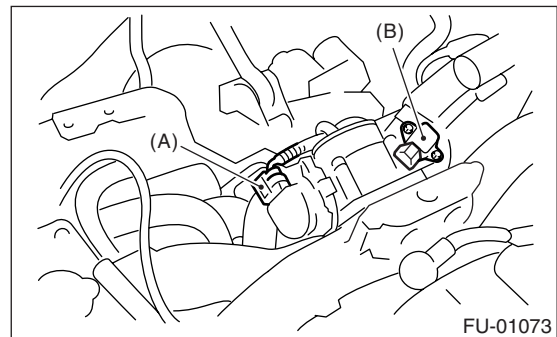
21) Install the throttle body to the intake manifold.

**NOTE:**  
Replace the gasket with a new one.

**Tightening torque:**  
**8 N·m (0.8 kgf·m, 5.8 ft·lb)**



22) Connect the connector to the throttle position sensor (A) and manifold absolute pressure sensor (B).



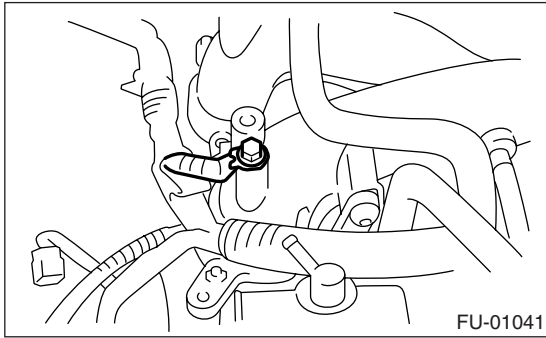
# Intake Manifold

## FUEL INJECTION (FUEL SYSTEMS)

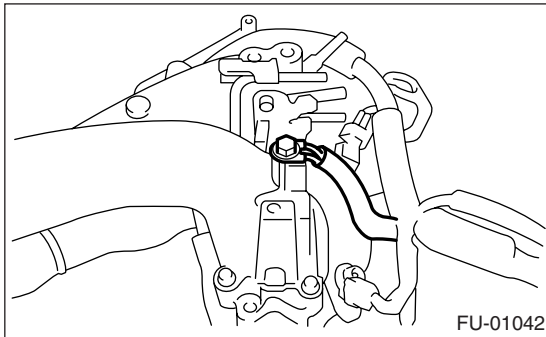
23) Install the engine ground terminal to the intake manifold.

**Tightening torque:**

**19 N·m (1.94 kgf-m, 13.7 ft-lb)**



FU-01041

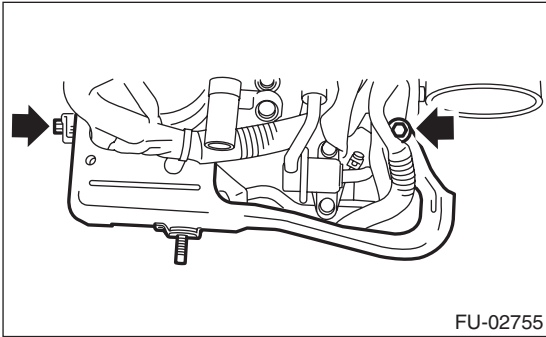


FU-01042

24) Install the fuel pipe protector RH.

**Tightening torque:**

**19 N·m (1.94 kgf-m, 13.7 ft-lb)**

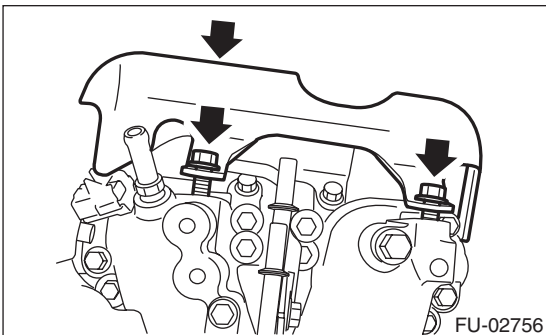


FU-02755

25) Install the fuel pipe protector LH.

**Tightening torque:**

**19 N·m (1.94 kgf-m, 13.7 ft-lb)**



FU-02756

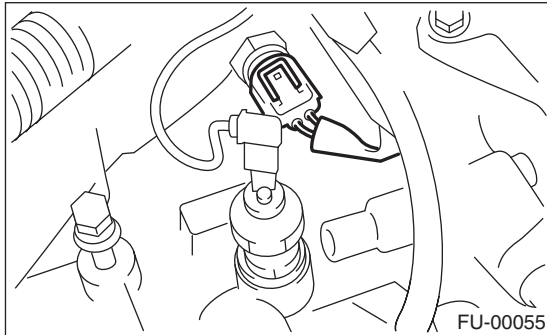
## E: INSPECTION

Make sure the fuel pipe and fuel hoses are not cracked and the connections are tightened.

## 4. Engine Coolant Temperature Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the generator. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
- 3) Drain the engine coolant. <Ref. to CO(H4DOTC)-17, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 4) Disconnect the connector from the engine coolant temperature sensor.



- 5) Remove the engine coolant temperature sensor.

### B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use a new gasket.

**Tightening torque:**

**18 N·m (1.8 kgf·m, 13.3 ft·lb)**

# Crankshaft Position Sensor

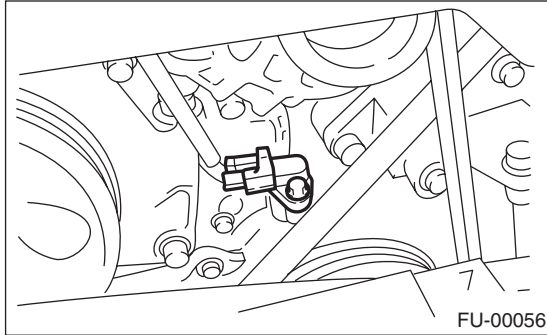
FUEL INJECTION (FUEL SYSTEMS)

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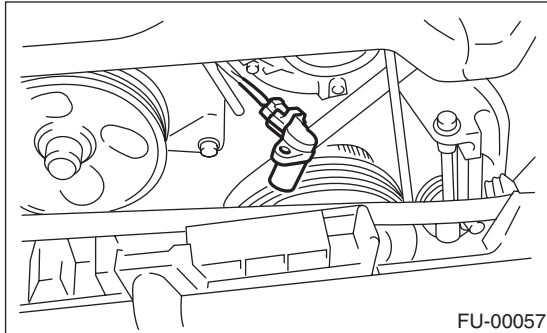
## 5. Crankshaft Position Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the bolt which installs the crankshaft position sensor to cylinder block.



- 3) Remove the crankshaft position sensor, and disconnect the connector from it.

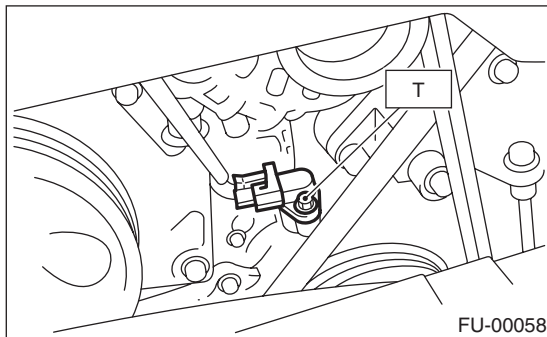


### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**

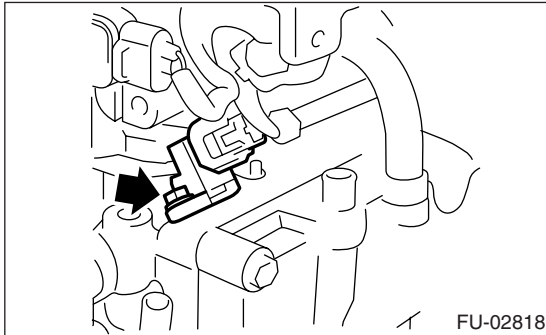
***T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)***



## 6. Camshaft Position Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from the camshaft position sensor RH.
- 3) Remove the camshaft position sensor RH from the rear side of cylinder head.



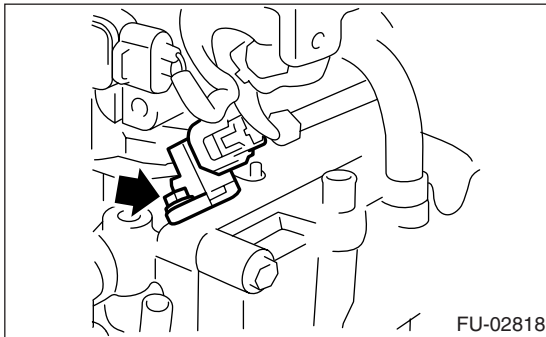
- 4) Remove the camshaft position sensor LH in the same procedure as RH side.

### B: INSTALLATION

Install in the reverse order of removal.

#### **Tightening torque:**

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



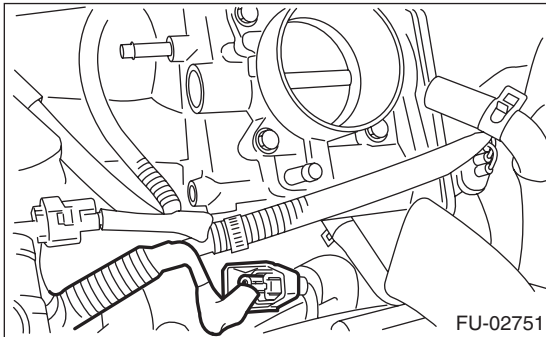
# Knock Sensor

FUEL INJECTION (FUEL SYSTEMS)

## 7. Knock Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Disconnect the knock sensor connector.



- 4) Remove the knock sensor from the cylinder block.



### B: INSTALLATION

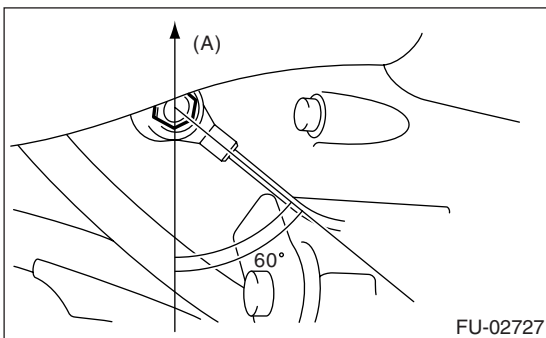
- 1) Install the knock sensor to the cylinder block.

#### **Tightening torque:**

**24 N·m (2.4 kgf·m, 17.4 ft·lb)**

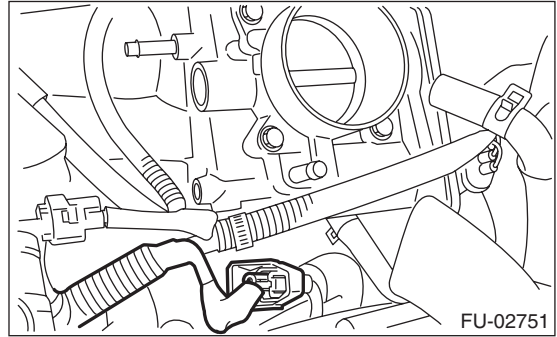
#### **NOTE:**

Extraction area of the knock sensor cord must be positioned at a 60° angle relative to the engine rear.



(A) Front side

- 2) Connect the knock sensor connector.

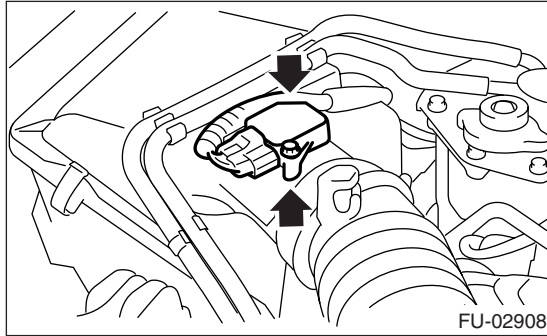


- 3) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
- 4) Connect the battery ground cable to battery.

## 8. Mass Air Flow and Intake Air Temperature Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from mass air flow and intake air temperature sensor.
- 3) Remove the mass air flow and intake air temperature sensor.



### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**

**1.7 N·m (0.17 kgf-m, 1.3 ft-lb)**



# Manifold Absolute Pressure Sensor

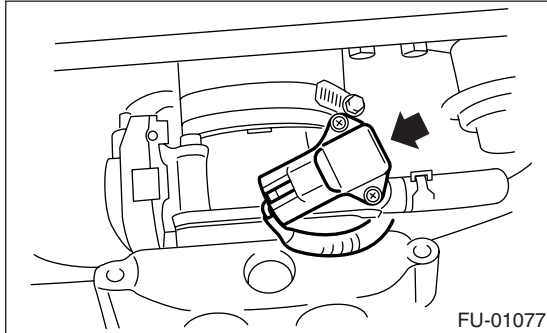
FUEL INJECTION (FUEL SYSTEMS)

---

## 9. Manifold Absolute Pressure Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connectors from manifold absolute pressure sensor.



- 3) Remove the manifold absolute pressure sensor from the throttle body.

### B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Replace the O-rings for the manifold absolute pressure sensor with new ones.

**Tightening torque:**

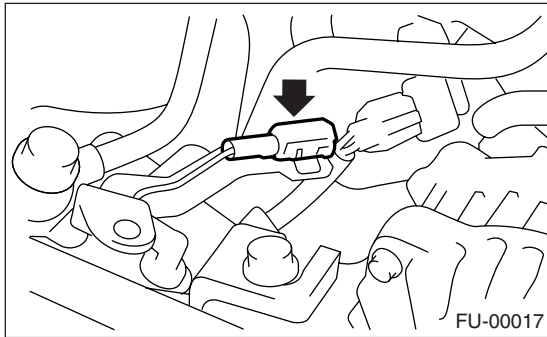
**1.6 N·m (0.16 kgf-m, 1.2 ft-lb)**

## 10. Fuel Injector

### A: REMOVAL

#### 1. RH SIDE

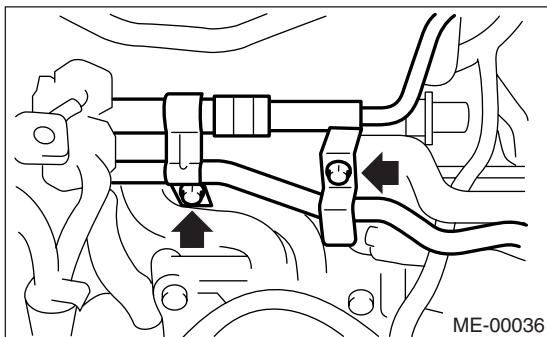
- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from battery.
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- 5) Remove the air cleaner element.
- 6) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-33, REMOVAL, Coolant Filler Tank.>
- 7) Remove the power steering pump.
  - (1) Remove the front side V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
  - (2) Disconnect the power steering switch connector.



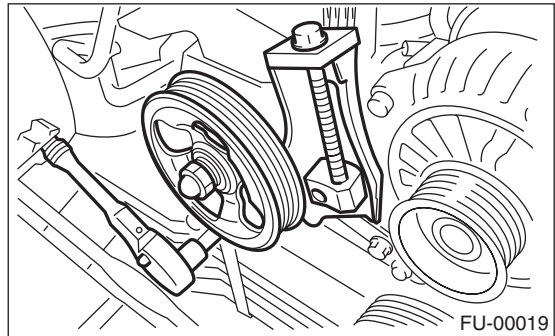
- (3) Remove the bolts which secure the power steering pipe brackets to the intake manifold.

**NOTE:**

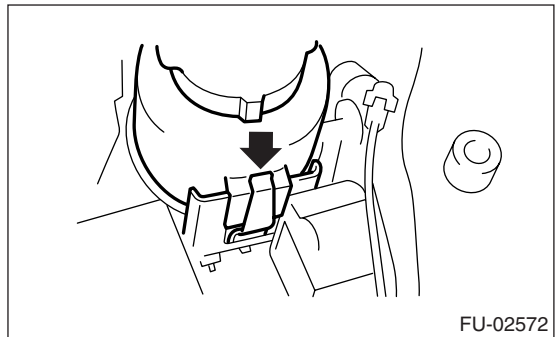
Do not disconnect the power steering hose.



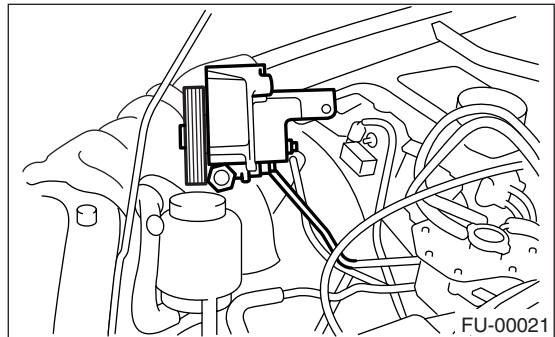
- (4) Remove the bolts which secure the power steering pump bracket.



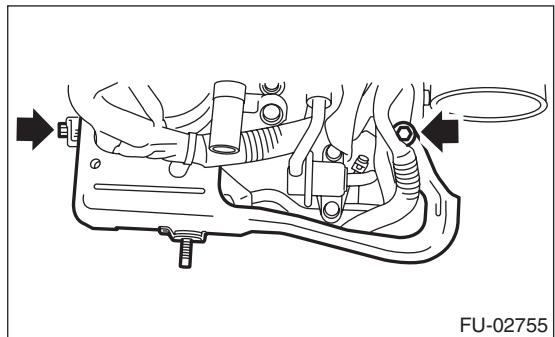
- (5) Remove the power steering tank from the bracket by pulling it upward.



- (6) Place the power steering pump on the right side wheel apron.



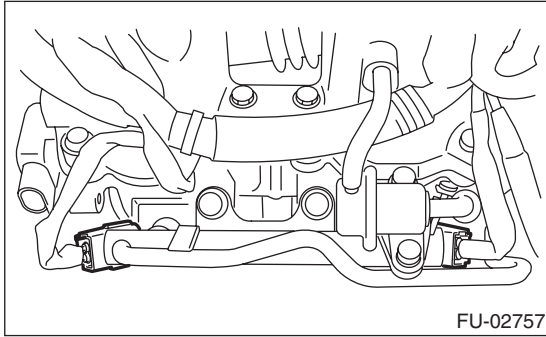
- 8) Remove the fuel pipe protector RH.



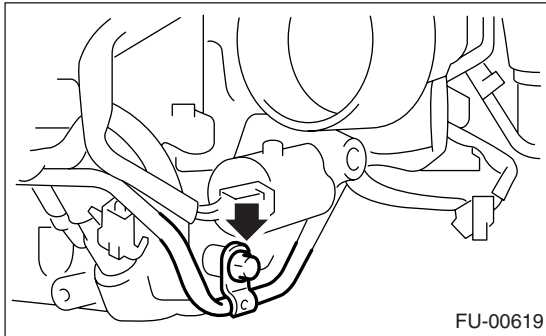
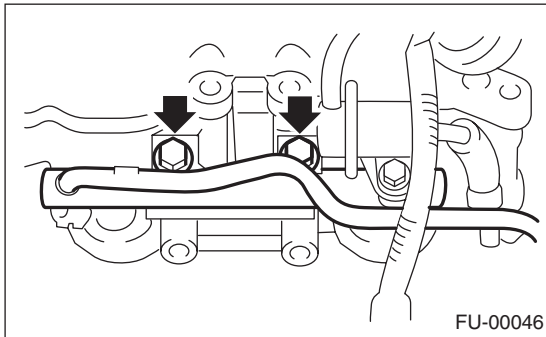
# Fuel Injector

## FUEL INJECTION (FUEL SYSTEMS)

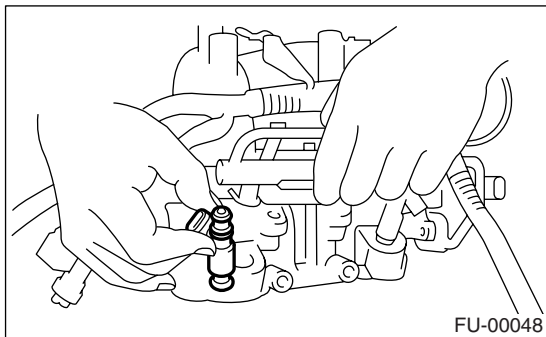
9) Disconnect the connector from the fuel injector.



10) Remove the bolts which hold the injector pipe to intake manifold.



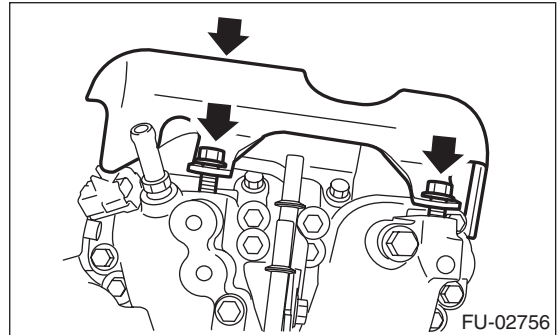
11) Remove the fuel injector while lifting up the fuel injector pipe.



3) Open the fuel filler flap lid and remove the fuel filler cap.

4) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>

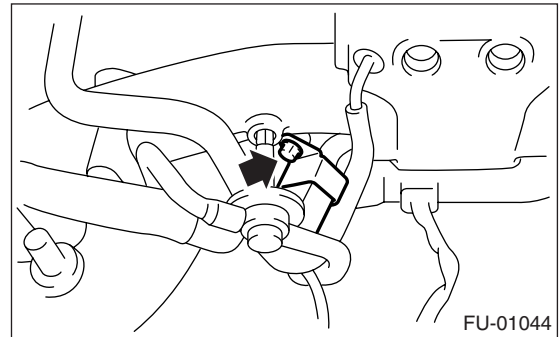
5) Remove the fuel pipe protector LH.



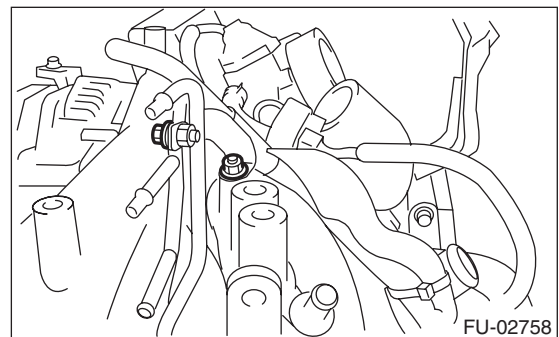
6) Disconnect the connector from the fuel injector.

7) Disconnect the connector from purge control solenoid valve.

8) Remove the purge control solenoid valve.



9) Remove the two bolts which hold the fuel injector pipe to the left side of intake manifold.

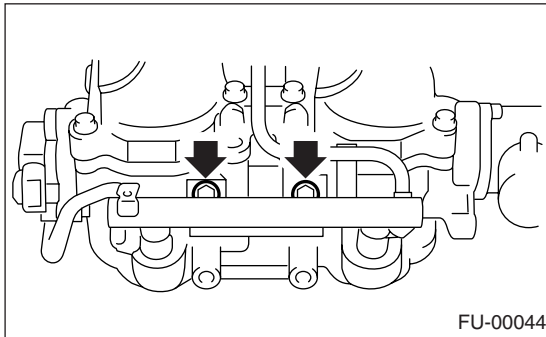
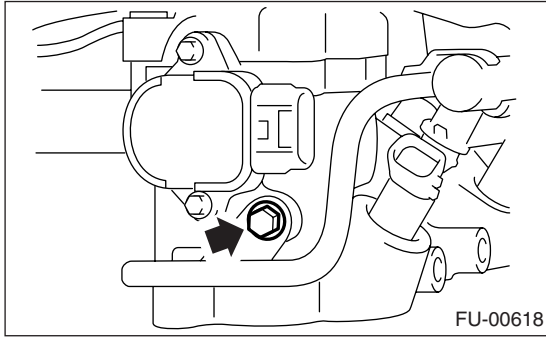


## 2. LH SIDE

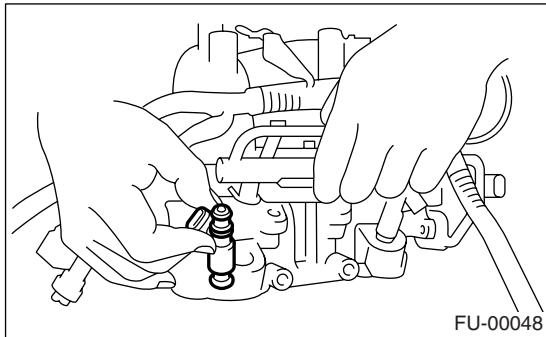
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Disconnect the ground cable from battery.

10) Remove the bolt which secure fuel injector pipe to intake manifold.



11) Remove the fuel injector while lifting up the fuel injector pipe.



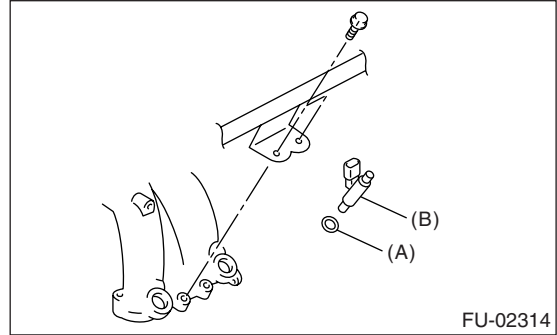
## B: INSTALLATION

### 1. RH SIDE

Install in the reverse order of removal.

#### NOTE:

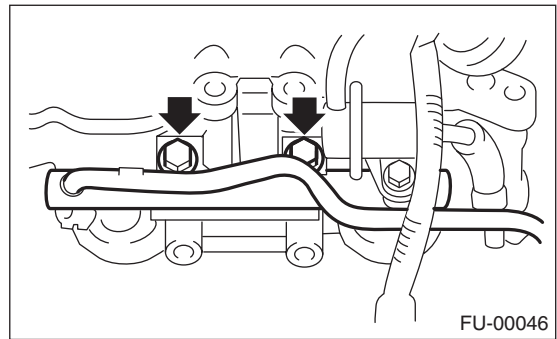
Replace the O-ring and insulators with new ones.



- (A) Insulator
- (B) Fuel injector

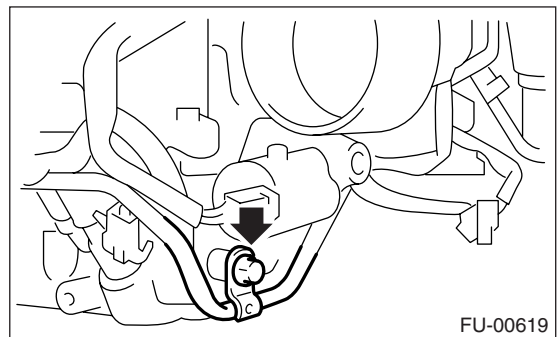
#### Tightening torque:

**19 N·m (1.94 kgf-m, 13.7 ft-lb)**



#### Tightening torque:

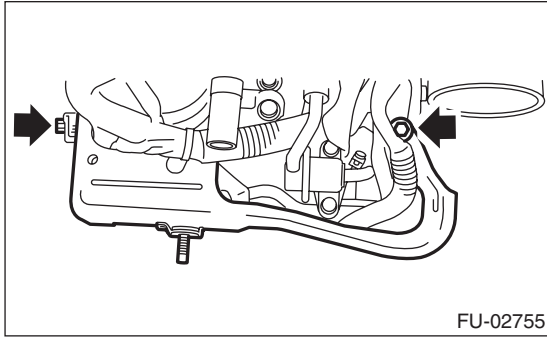
**19 N·m (1.94 kgf-m, 13.7 ft-lb)**



# Fuel Injector

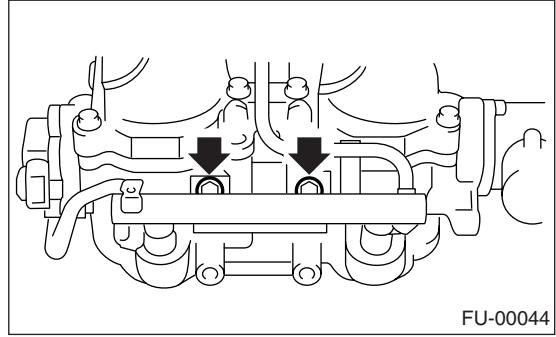
## FUEL INJECTION (FUEL SYSTEMS)

**Tightening torque:**  
**19 N·m (1.94 kgf-m, 13.7 ft-lb)**



FU-02755

**Tightening torque:**  
**19 N·m (1.94 kgf-m, 13.7 ft-lb)**



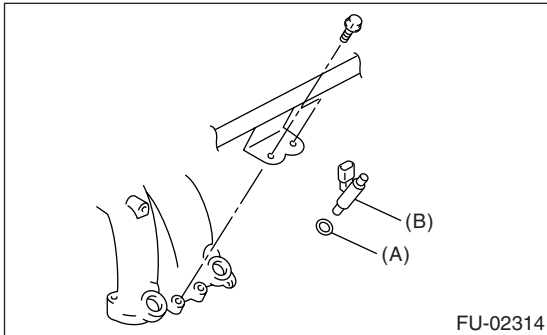
FU-00044

## 2. LH SIDE

Install in the reverse order of removal.

### NOTE:

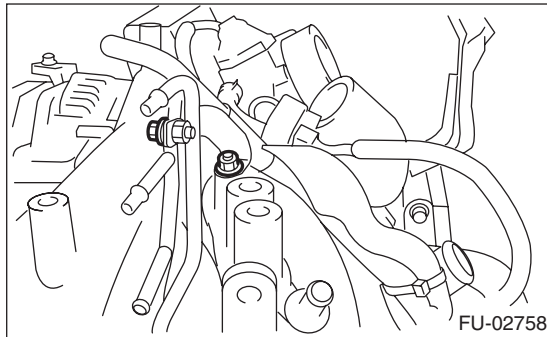
Replace the O-ring and insulators with new ones.



FU-02314

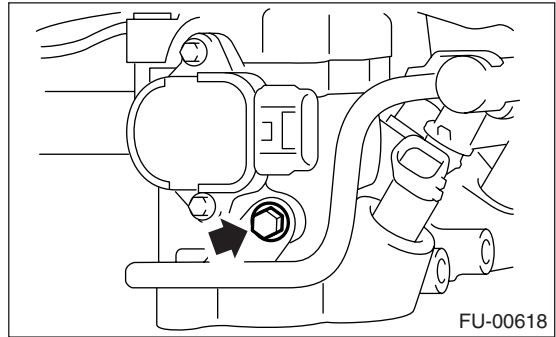
- (A) Insulator
- (B) Fuel injector

**Tightening torque:**  
**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



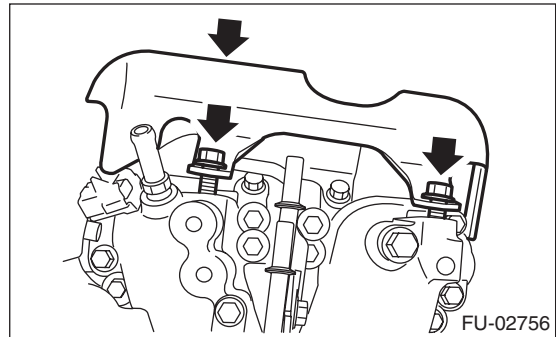
FU-02758

**Tightening torque:**  
**19 N·m (1.94 kgf-m, 13.7 ft-lb)**



FU-00618

**Tightening torque:**  
**19 N·m (1.94 kgf-m, 13.7 ft-lb)**

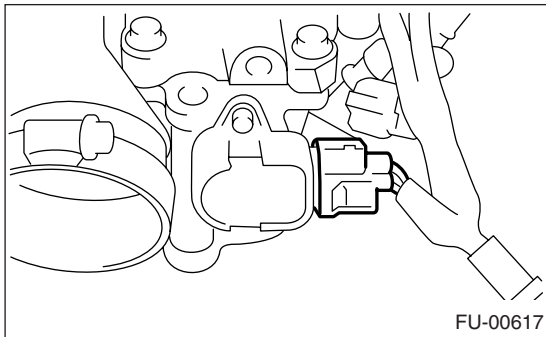


FU-02756

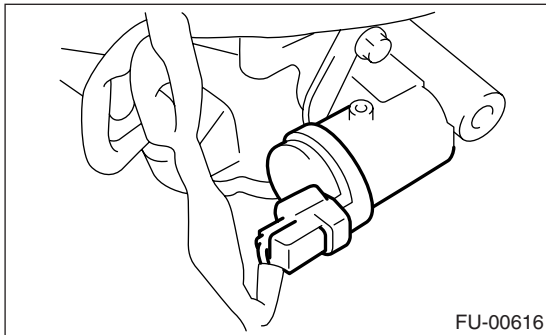
## 11. Tumble Generator Valve Assembly

### A: REMOVAL

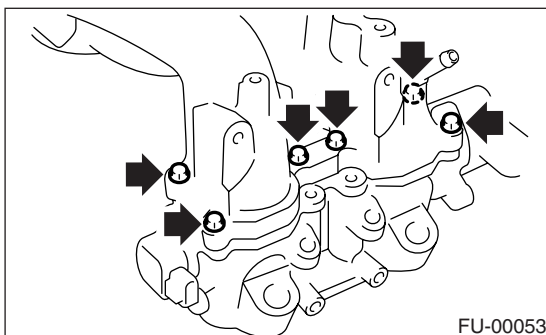
- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from battery.
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
- 5) Disconnect the connector from the tumble generator valve sensor.



- 6) Disconnect the connector from the tumble generator valve actuator.



- 7) Remove the fuel injector. <Ref. to FU(H4DOTC)-33, REMOVAL, Fuel Injector.>
- 8) Remove the tumble generator valve body from the intake manifold.



### B: INSTALLATION

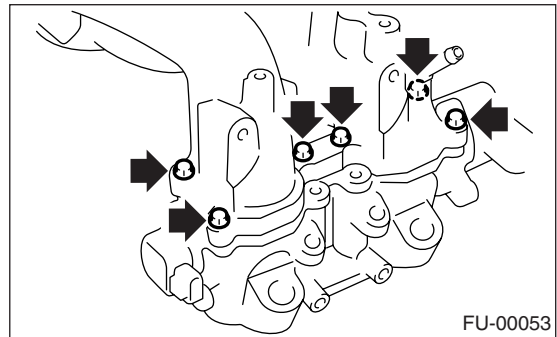
Install in the reverse order of removal.

#### NOTE:

Always use new gaskets.

#### Tightening torque:

**8.25 N·m (0.84 kgf-m, 6.1 ft-lb)**



### 12. Tumble Generator Valve Position Sensor

#### A: SPECIFICATION

Do not remove the tumble generator valve position sensor from tumble generator valve assembly, since it cannot be adjusted during installation.

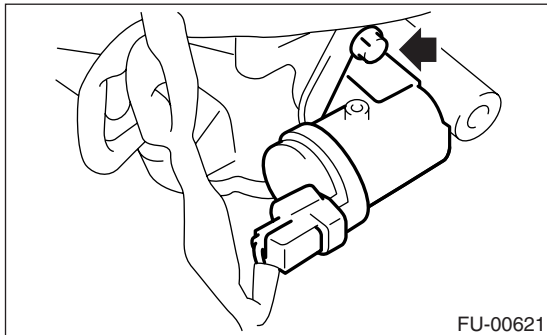
Refer to "Tumble Generator Valve Assembly" for removal and installation procedures. <Ref. to FU(H4DOTC)-37, REMOVAL, Tumble Generator Valve Assembly.> <Ref. to FU(H4DOTC)-37, INSTALLATION, Tumble Generator Valve Assembly.>

## 13. Tumble Generator Valve Actuator

### A: REMOVAL

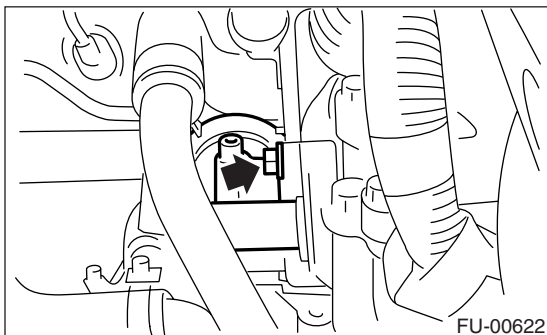
#### 1. RH SIDE

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from battery.
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
- 5) Disconnect the connector from tumble generator valve actuator RH.
- 6) Remove the tumble generator valve actuator RH.



#### 2. LH SIDE

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from battery.
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Remove the secondary air pump. <Ref. to EC(H4DOTC)-9, REMOVAL, Secondary Air Pump.>
- 5) Disconnect the connector from tumble generator valve actuator LH.
- 6) Remove the tumble generator valve actuator LH.



### B: INSTALLATION

#### 1. RH SIDE

Install in the reverse order of removal.

#### 2. LH SIDE

Install in the reverse order of removal.



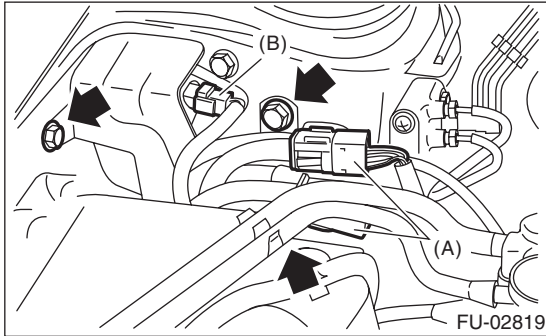
# Wastegate Control Solenoid Valve

FUEL INJECTION (FUEL SYSTEMS)

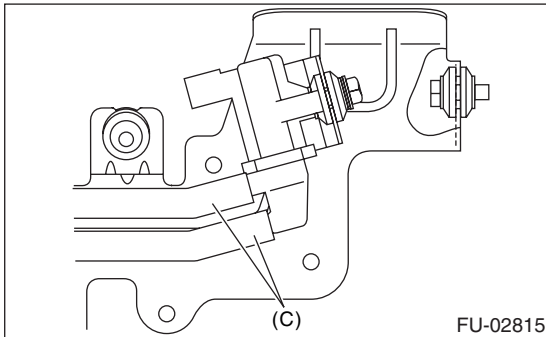
## 14. Wastegate Control Solenoid Valve

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the engine harness connector (A) from bracket.
- 3) Disconnect the connector (B) from wastegate control solenoid valve.
- 4) Remove the bracket from body.



- 5) Disconnect the pressure hoses (C) from wastegate control solenoid valve.



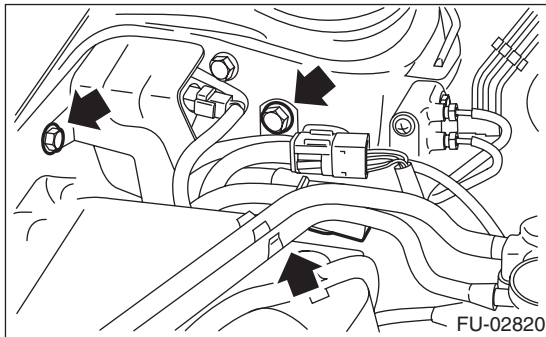
- 6) Remove the wastegate control solenoid valve from bracket.

### B: INSTALLATION

Install in the reverse order of removal.

#### **Tightening torque:**

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



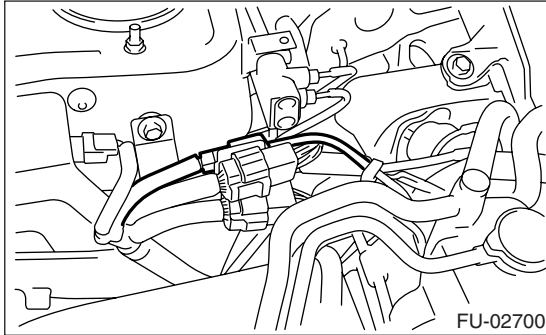
# Front Oxygen (A/F) Sensor

FUEL INJECTION (FUEL SYSTEMS)

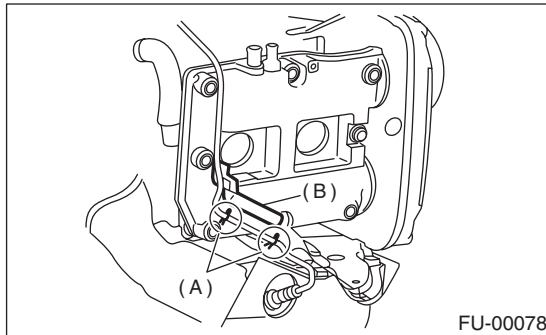
## 15. Front Oxygen (A/F) Sensor

### A: REMOVAL

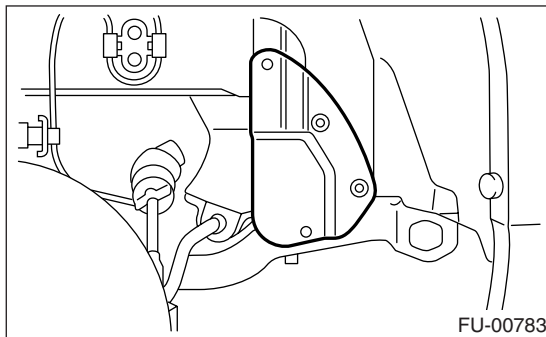
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from the front oxygen (A/F) sensor.



- 3) Disconnect the engine harness fixed by clip (A) from the bracket (B).



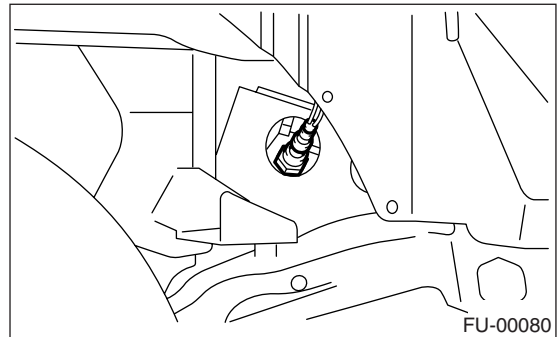
- 4) Remove the front right side wheel.
- 5) Lift-up the vehicle.
- 6) Remove the service hole cover.



- 7) Apply spray type lubricant to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.
- 8) Remove the front oxygen (A/F) sensor.

### CAUTION:

When removing the front oxygen (A/F) sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.



### B: INSTALLATION

- 1) Before installing front oxygen (A/F) sensor, apply anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make the next removal easier.

#### Anti-seize compound:

**NEVER-SEEZ NS-165 or equivalent**

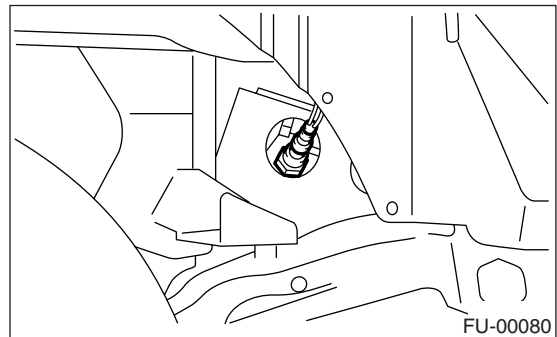
### CAUTION:

Never apply anti-seize compound to protector of front oxygen (A/F) sensor.

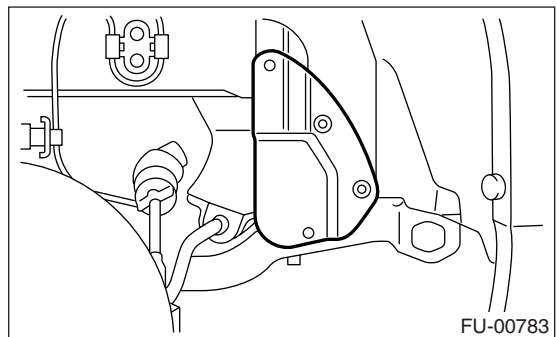
- 2) Install the front oxygen (A/F) sensor.

#### Tightening torque:

**30 N·m (3.1 kgf-m, 22.1 ft-lb)**



- 3) Install the service hole cover.



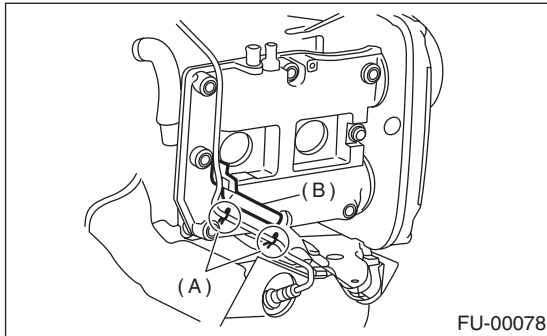
- 4) Lower the vehicle.
- 5) Install the front right side wheel.

## Front Oxygen (A/F) Sensor

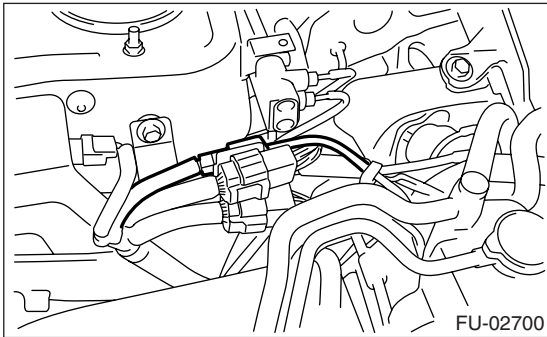
### FUEL INJECTION (FUEL SYSTEMS)

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6) Connect the engine harness to the bracket (B) using clips (A).



7) Connect the connector of front oxygen (A/F) sensor.

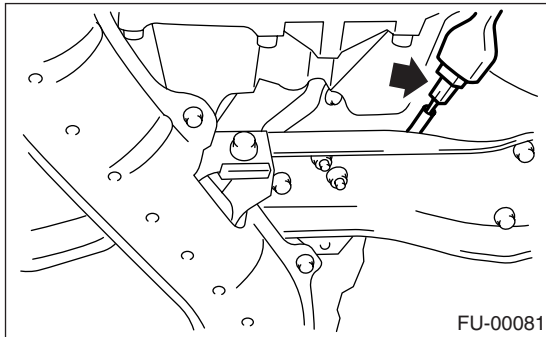


8) Connect the battery ground cable to battery.

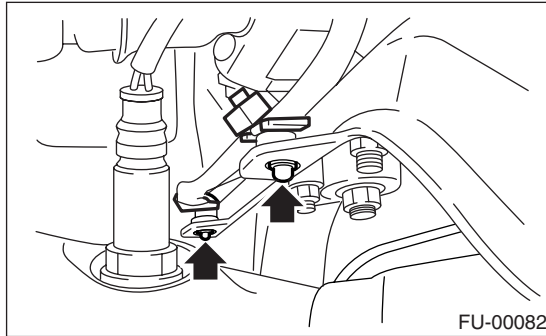
## 16.Rear Oxygen Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Disconnect the connector from the rear oxygen sensor.



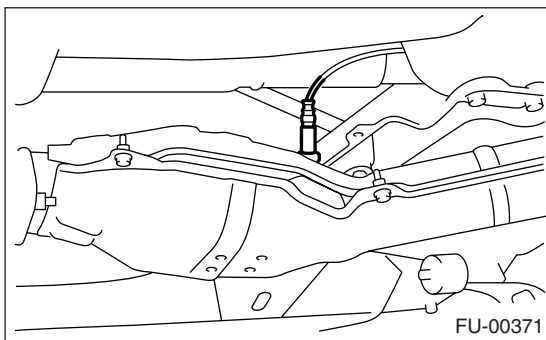
- 4) Remove the clip by pulling out from the upper side of crossmember.



- 5) Apply spray type lubricant to the threaded portion of rear oxygen sensor, and leave it for one minute or more.
- 6) Remove the rear oxygen sensor.

### CAUTION:

**When removing the rear oxygen sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.**



### B: INSTALLATION

- 1) Before installing rear oxygen sensor, apply anti-seize compound only to the threaded portion of rear oxygen sensor to make the next removal easier.

### CAUTION:

**Never apply anti-seize compound to protector of rear oxygen sensor.**

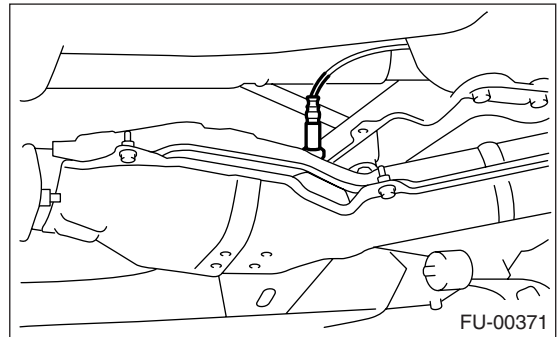
### Anti-seize compound:

**NEVER-SEEZ NS-165 or equivalent**

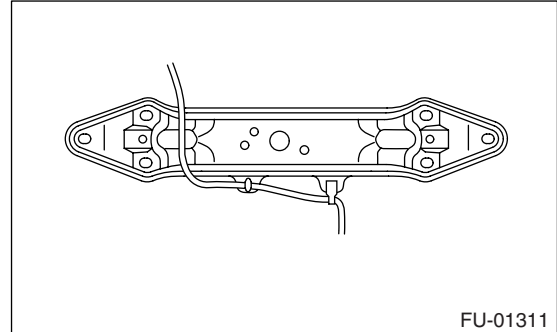
- 2) Install the rear oxygen sensor.

### Tightening torque:

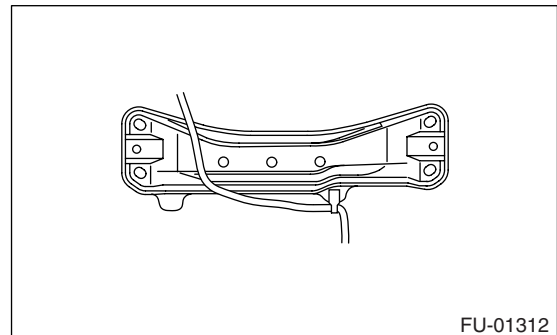
**21 N·m (2.1 kgf-m, 15.2 ft-lb)**



- AT model



- MT model

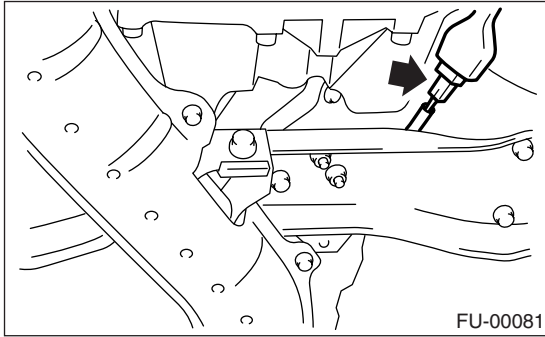


## Rear Oxygen Sensor

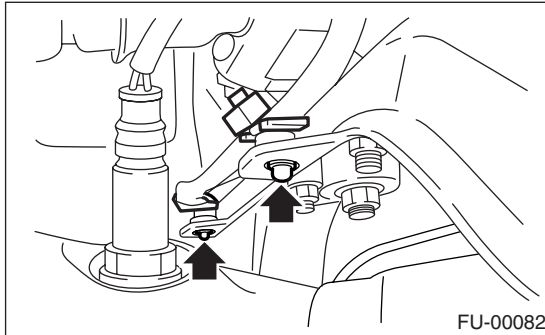
### FUEL INJECTION (FUEL SYSTEMS)

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- 3) Connect the connector to the rear oxygen sensor.



- 4) Connect the clip to the crossmember.

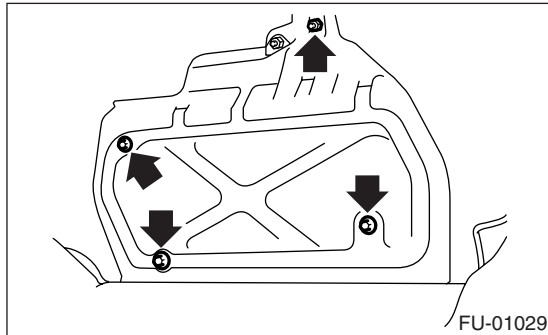


- 5) Lower the vehicle.  
6) Connect the battery ground cable to battery.

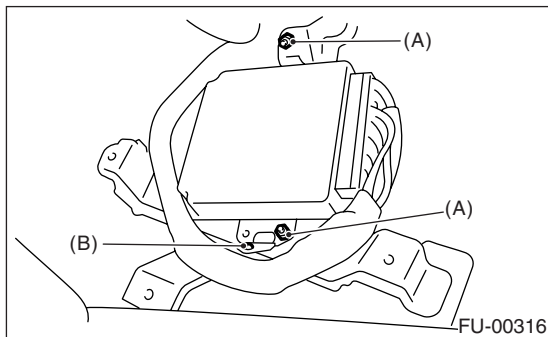
## 17.Engine Control Module (ECM)

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the lower inner trim of the passenger side. <Ref. to EI-51, REMOVAL, Lower Inner Trim.>
- 3) Detach the floor mat of the front passenger seat.
- 4) Remove the protect cover.



- 5) Remove the nuts (A) which hold ECM to the bracket.
- 6) Remove the clip (B) from the bracket.



- 7) Disconnect the ECM connectors and take out the ECM.

### B: INSTALLATION

Install in the reverse order of removal.

#### CAUTION:

- When replacing ECM, use of wrong spec. ECM may lead to damage to the fuel injection system.
- When replacing ECM, do not damage the harnesses and connectors.

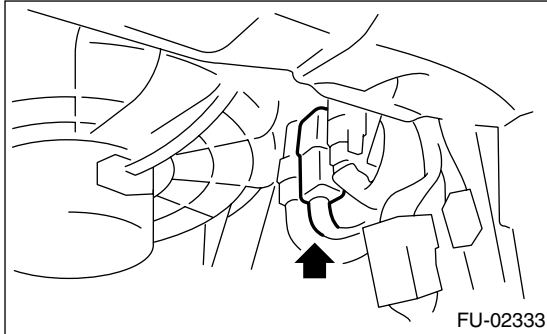
#### Tightening torque:

**5 N·m (0.5 kgf·m, 3.7 ft·lb)**

## 18.Main Relay

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the passenger's side front side sill cover.
- 3) Remove the bolt which holds the relay bracket on the body.
- 4) Disconnect the connectors from the main relay.



- 5) Remove the main relay from the mounting bracket.

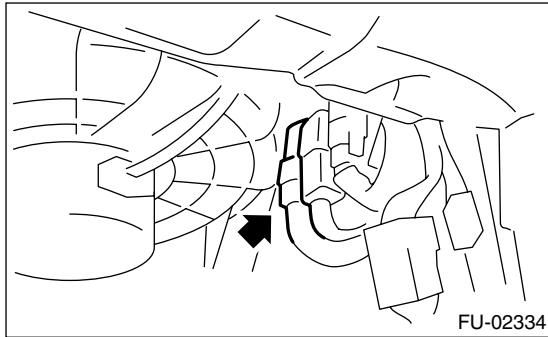
### B: INSTALLATION

Install in the reverse order of removal.

## 19. Fuel Pump Relay

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the passenger's side front side sill cover.
- 3) Remove the bolt which holds relay bracket on the body.
- 4) Disconnect the connector from the fuel pump relay.



- 5) Remove the fuel pump relay from the mounting bracket.

### B: INSTALLATION

Install in the reverse order of removal.



# Electronic Throttle Control Relay

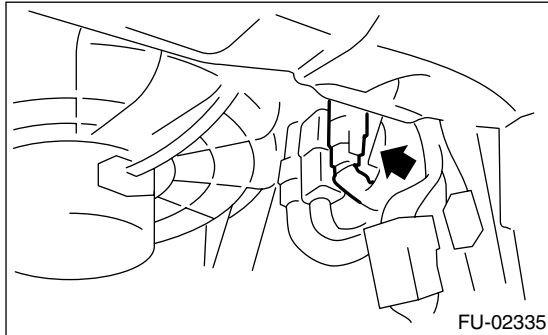
FUEL INJECTION (FUEL SYSTEMS)

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## 20. Electronic Throttle Control Relay

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the passenger's side front side sill cover.
- 3) Remove the bolt which holds relay bracket on the body.
- 4) Disconnect the connector from electronic throttle control relay.



- 5) Remove the electronic throttle control relay from the mounting bracket.

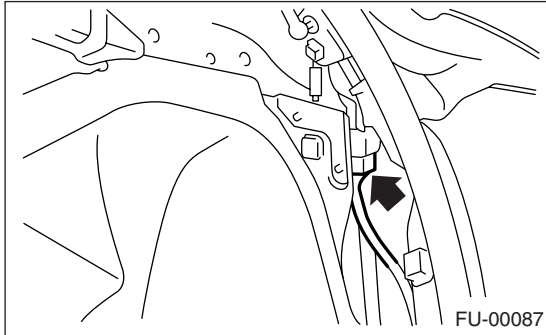
### B: INSTALLATION

Install in the reverse order of removal.

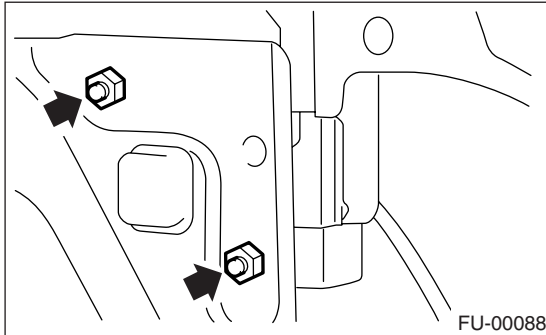
## 21. Fuel Pump Control Unit

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the rear quarter trim. <Ref. to EI-52, REMOVAL, Rear Quarter Trim.>
- 3) Disconnect the connector from the fuel pump control unit.



- 4) Remove the fuel pump control unit.



### B: INSTALLATION

Install in the reverse order of removal.

### 22. Fuel

#### A: PROCEDURE

##### 1. RELEASING OF FUEL PRESSURE

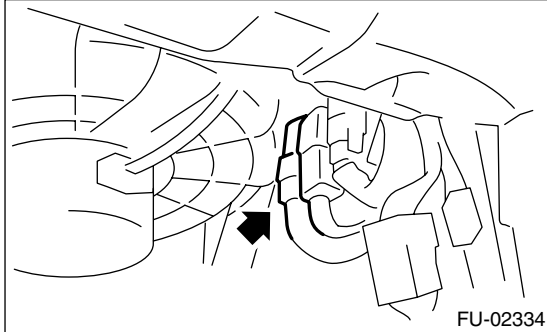
**WARNING:**

Place “NO FIRE” signs near the working area.

**CAUTION:**

Be careful not to spill the fuel.

- 1) Disconnect the connector from the fuel pump relay.



- 2) Start and run the engine until it stalls.
- 3) After the engine stalls, crank it for five more seconds.
- 4) Turn the ignition switch to OFF.

##### 2. DRAINING FUEL

• Model with fuel drain plug

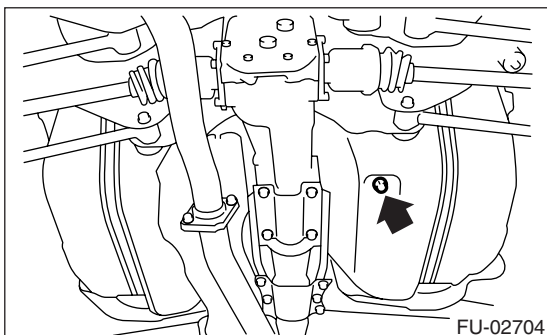
**WARNING:**

Place “NO FIRE” signs near the working area.

**CAUTION:**

Be careful not to spill the fuel.

- 1) Set the vehicle on the lift.
- 2) Disconnect the ground cable from battery.
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Lift-up the vehicle.
- 5) Drain the fuel from the fuel tank. Set a container under the vehicle and remove drain plug from the fuel tank.



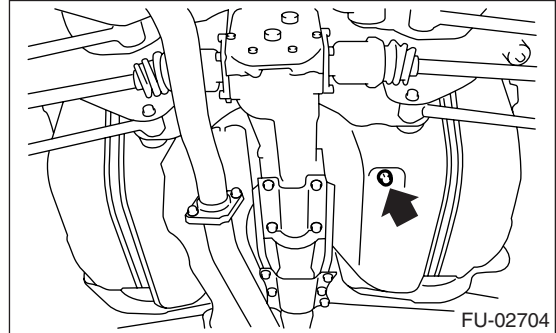
- 6) Tighten the fuel drain plug.

**NOTE:**

Use a new gasket.

**Tightening torque:**

**26 N·m (2.65 kgf-m, 19.2 ft-lb)**



• Model without fuel drain plug

**WARNING:**

Place “NO FIRE” signs near the working area.

**CAUTION:**

Be careful not to spill the fuel.

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from battery.
- 3) Remove the fuel pump. <Ref. to FU(H4DOTC)-58, REMOVAL, Fuel Pump.>
- 4) Drain fuel from the fuel pump installing part using a pump etc.

**CAUTION:**

Use a pump resistant to gasoline.

- 5) Install the fuel pump. <Ref. to FU(H4DOTC)-58, INSTALLATION, Fuel Pump.>

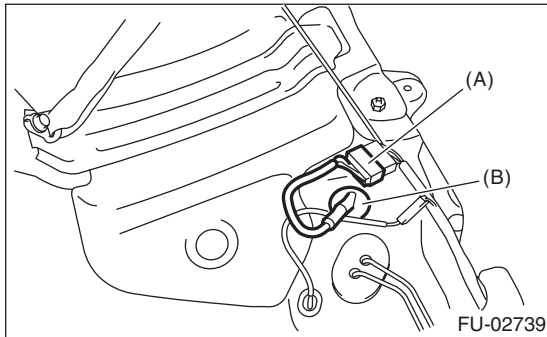
## 23. Fuel Tank

### A: REMOVAL

**WARNING:**

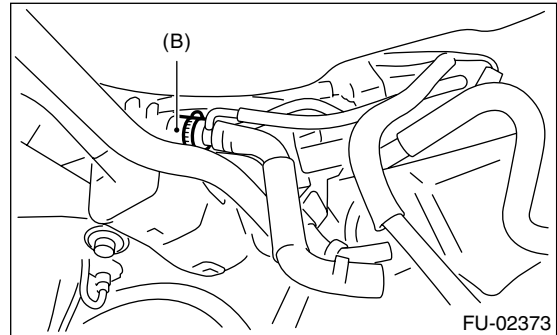
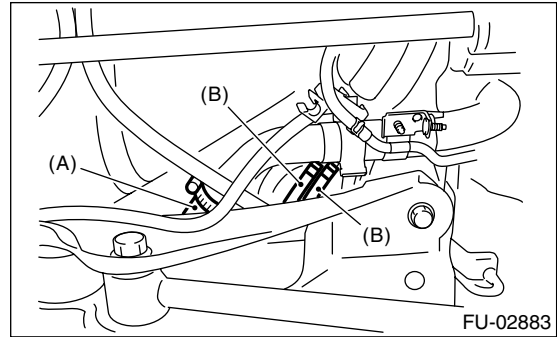
- Place “NO FIRE” signs near the working area.
- Be careful not to spill the fuel.

- 1) Set the vehicle on the lift.
- 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 3) Drain the fuel from the fuel tank. <Ref. to FU(H4DOTC)-50, DRAINING FUEL, PROCEDURE, Fuel.>
- 4) Remove the rear seat.
- 5) Disconnect the connector (A) of rear harness from fuel tank cord.
- 6) Push the grommet (B) which holds the fuel tank cord on floor panel into under the body.

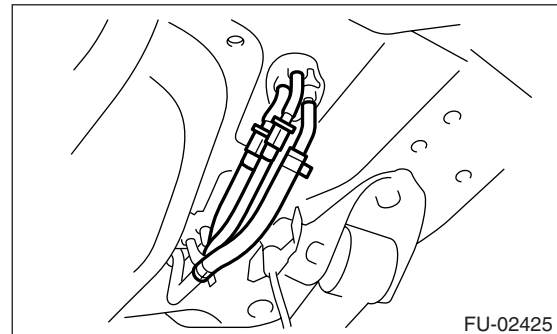


- 7) Remove the rear crossmember. <Ref. to RS-17, REMOVAL, Rear Crossmember.>
- 8) Remove the canister. <Ref. to EC(H4DOTC)-7, REMOVAL, Canister.>
- 9) Disconnect the connector from the pressure control solenoid valve.

- 10) Loosen the clamp, and disconnect the fuel filler hose (A) and evaporation hose (B) from fuel filler pipe.



- 11) Move the clips, and disconnect the quick connector. <Ref. to FU(H4DOTC)-65, REMOVAL, Fuel Delivery, Return and Evaporation lines.>
- 12) Disconnect the fuel hoses.



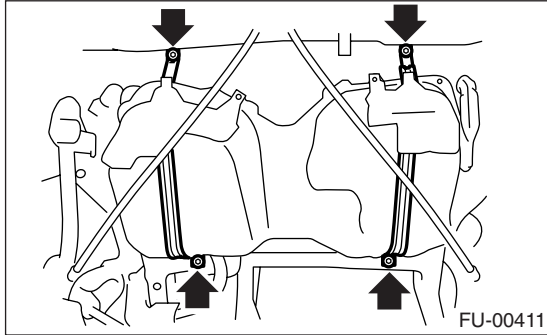
- 13) Support the fuel tank with transmission jack, remove the bolts from bands and dismount the fuel tank from vehicle.

# Fuel Tank

## FUEL INJECTION (FUEL SYSTEMS)

### WARNING:

- A helper is required to perform this work.
- Fuel may be left in the side, which has no drain plug, of the fuel tank. In this case, the tank is imbalanced between right and left sides. Be careful not to drop it when removing.

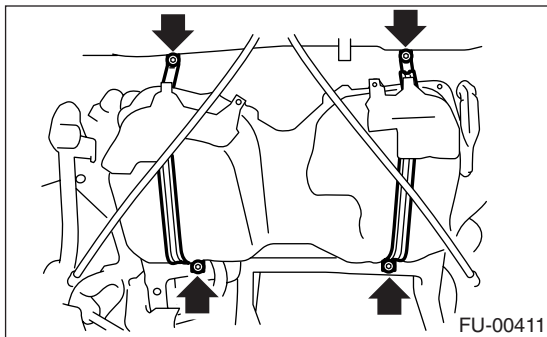


### B: INSTALLATION

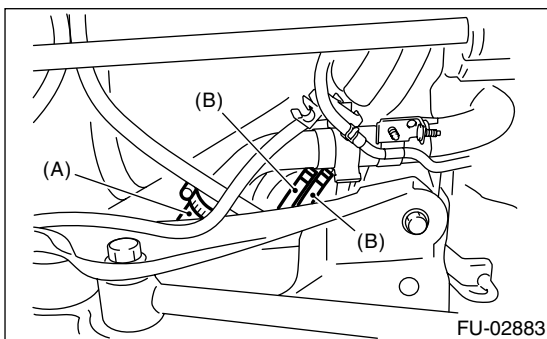
- 1) Support the fuel tank with transmission jack and push the fuel tank harness into the access hole with grommet.
- 2) Set the fuel tank and temporarily tighten the bolts of fuel tank bands.

### WARNING:

A helper is required to perform this work.

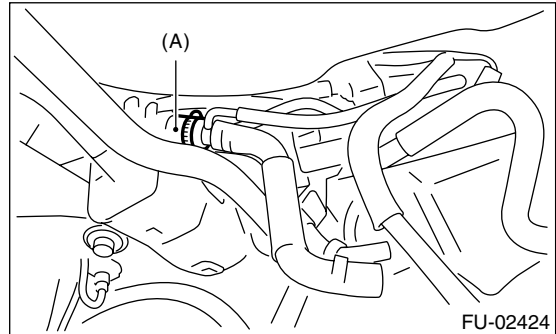


- 3) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.
- 4) Insert the evaporation hose (B) to the lower end of evaporation pipe, and hold the clamp and clip.

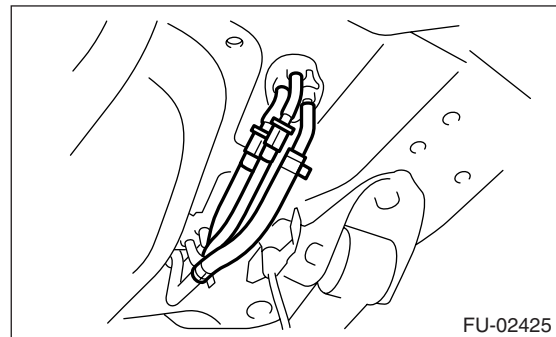


### CAUTION:

Do not allow clips to touch hose (A) and rear suspension crossmember.



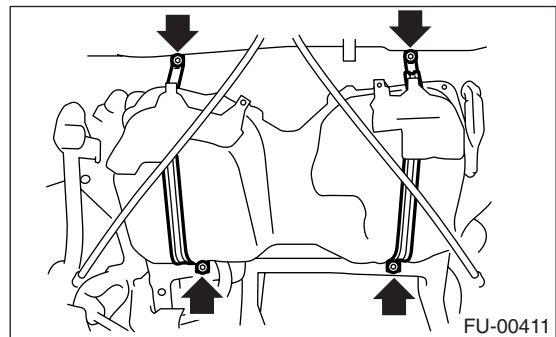
- 5) Connect the fuel hoses, and hold them with clips and quick connector. <Ref. to FU(H4DOTC)-66, INSTALLATION, Fuel Delivery, Return and Evaporation lines.>



- 6) Connect the connector to the pressure control solenoid valve.
- 7) Install the canister. <Ref. to EC(H4DOTC)-7, INSTALLATION, Canister.>
- 8) Tighten the band mounting bolts.

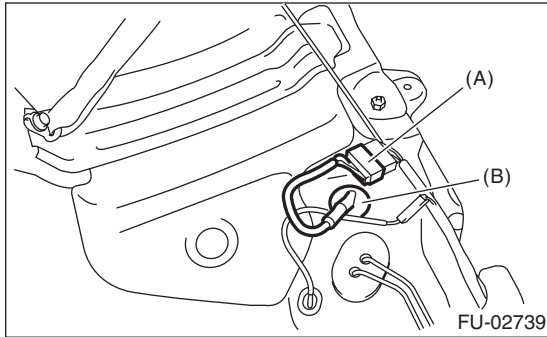
### Tightening torque:

**33 N·m (3.4 kgf-m, 25 ft-lb)**

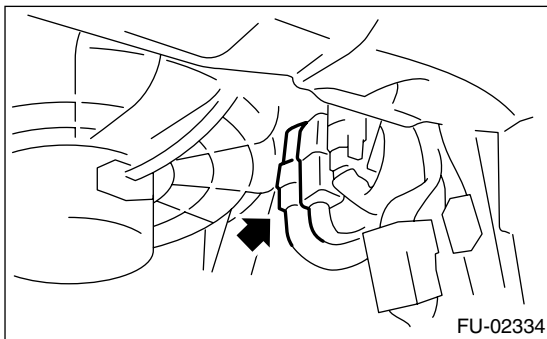


- 9) Install the rear crossmember. <Ref. to RS-17, INSTALLATION, Rear Crossmember.>

- 10) Connect the connector (A) to the fuel tank cord and plug the service hole with grommet (B).



- 11) Set the rear seat and floor mat.
- 12) Connect the connector to the fuel pump relay.



### **C: INSPECTION**

- 1) Make sure there are no cracks, holes, or other damage on the fuel tank.
- 2) Make sure that the fuel hoses and fuel pipes are not cracked and the connections are tightened firmly.

# Fuel Filler Pipe

FUEL INJECTION (FUEL SYSTEMS)

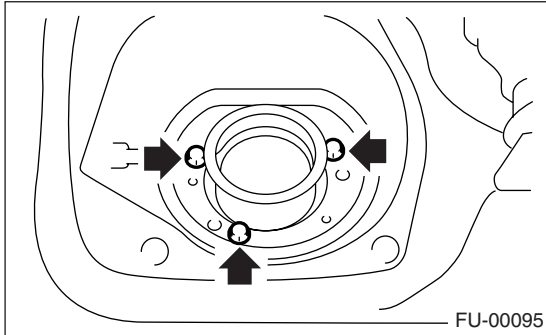
## 24. Fuel Filler Pipe

### A: REMOVAL

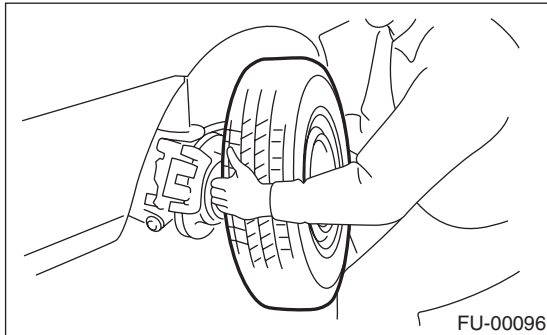
#### WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

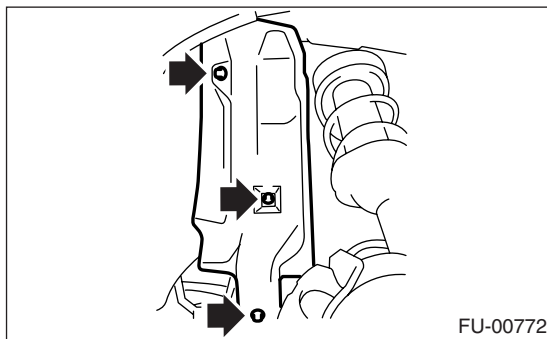
- 1) Disconnect the ground cable from battery.
- 2) Open the fuel filler flap lid and remove the filler cap.
- 3) Remove the screws holding packing in place.



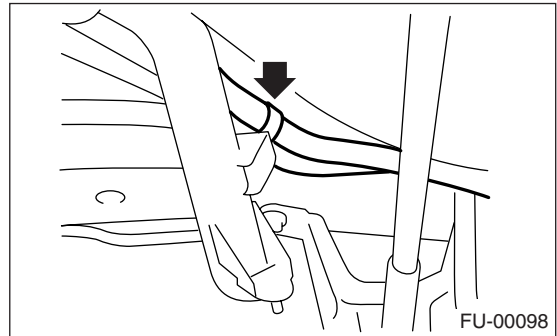
- 4) Lift up the vehicle.
- 5) Remove the rear right side wheel nuts.
- 6) Remove the rear right side wheel.



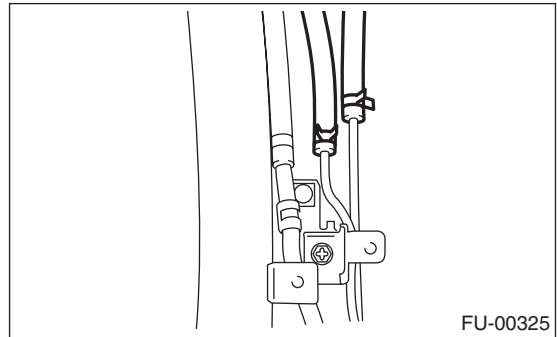
- 7) Drain the fuel from the fuel tank. <Ref. to FU(H4DOTC)-50, DRAINING FUEL, PROCEDURE, Fuel.>
- 8) Remove the fuel filler pipe protector.



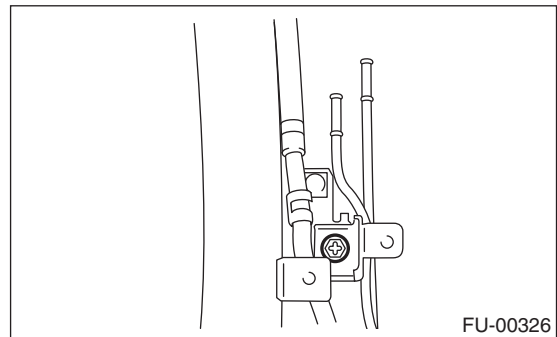
- 9) Separate the evaporation hoses from the clip of fuel filler pipe.



- 10) Disconnect the evaporation hoses from fuel pipes.

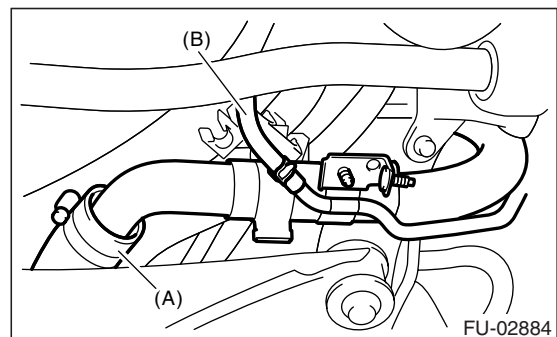


- 11) Remove the bolts which hold the fuel filler pipe bracket on the body.



- 12) Loosen the clamp and separate the fuel filler hose (A) from the fuel filler pipe.

- 13) Move the clip and separate the evaporation hose (B).

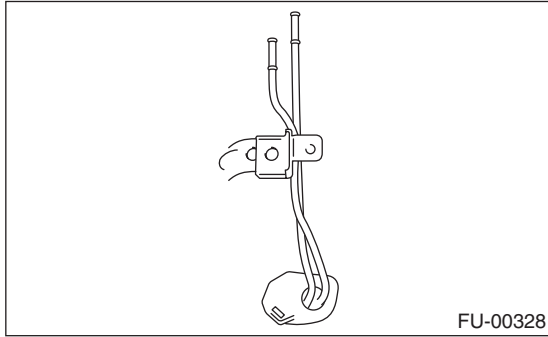


- 14) Remove the fuel filler pipe to under side of the vehicle.

# Fuel Filler Pipe

FUEL INJECTION (FUEL SYSTEMS)

15) Remove the evaporation pipe together with clip from the body.

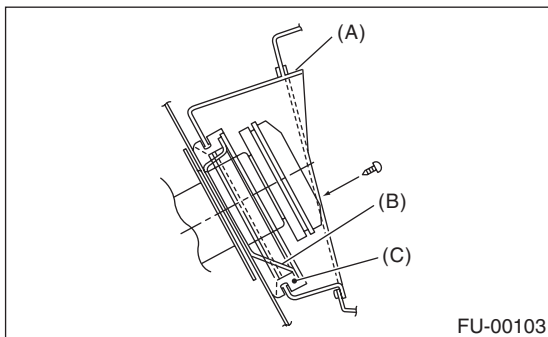


## B: INSTALLATION

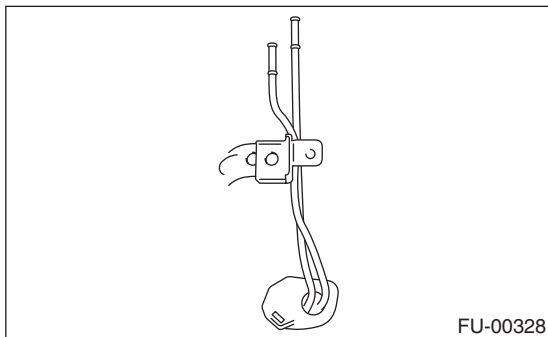
- 1) Open the fuel filler flap lid.
- 2) Set the fuel saucer (A) with rubber packing (C) and insert the fuel filler pipe into hole from the inner side of apron.
- 3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the screws.

### NOTE:

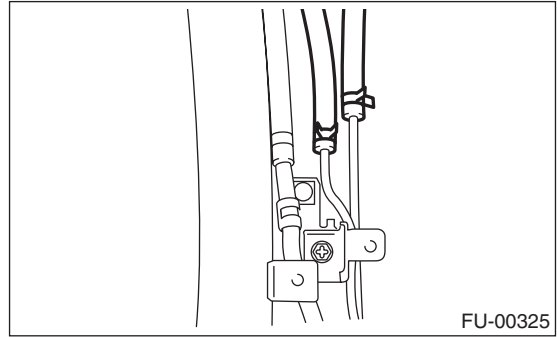
If the edges of rubber packing are folded toward the inside, straighten it with a screwdriver.



4) Install the evaporation pipe.



5) Connect the evaporation hoses to fuel pipes.

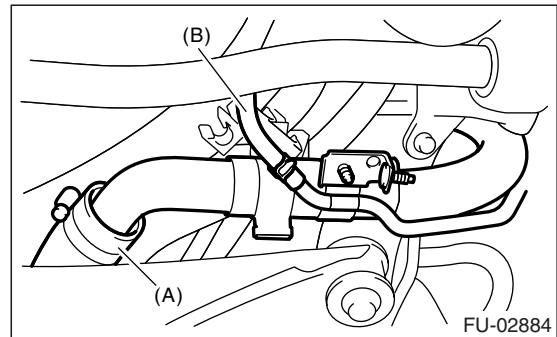


6) Insert the fuel filler hose (A) approximately 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

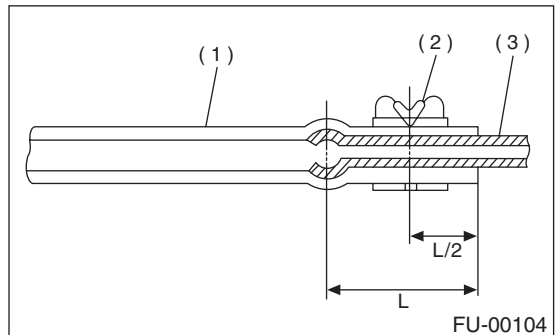
7) Insert the evaporation hose (B) approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe and hold the clip.

### CAUTION:

Do not allow clips to touch evaporation hose (B) and rear suspension crossmember.



$L = 27.5 \pm 2.5 \text{ mm (1.083} \pm 0.098 \text{ in)}$



- (1) Hose
- (2) Clip
- (3) Pipe

8) Tighten the bolt which holds the fuel filler pipe bracket on the body.

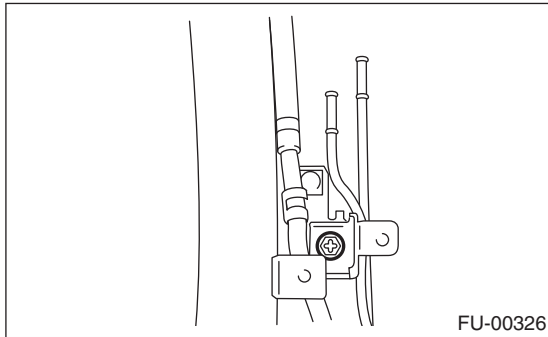


# Fuel Filler Pipe

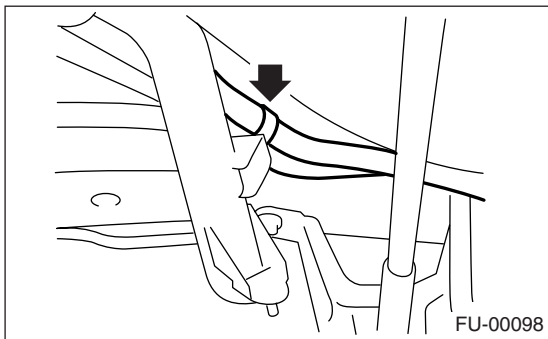
## FUEL INJECTION (FUEL SYSTEMS)

### Tightening torque:

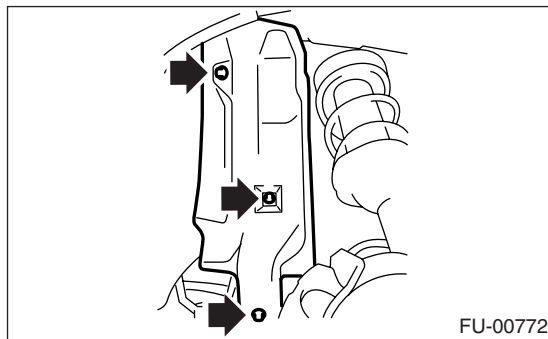
**7.5 N·m (0.76 kgf-m, 5.5 ft-lb)**



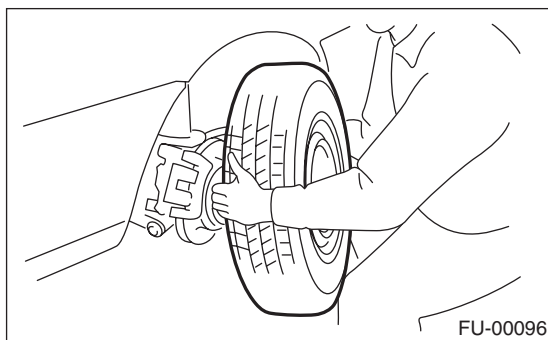
9) Secure the evaporation hose to clip of fuel filler pipe.



10) Install the fuel filler pipe protector.



11) Install the rear right wheel.



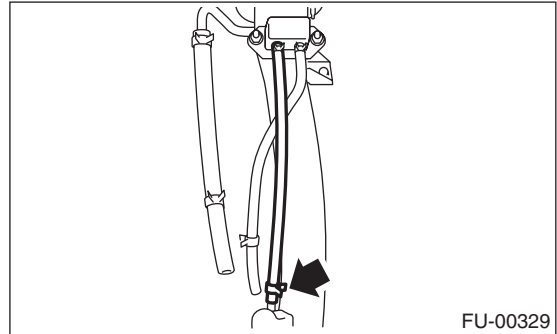
12) Lower the vehicle.

13) Tighten the wheel nuts.

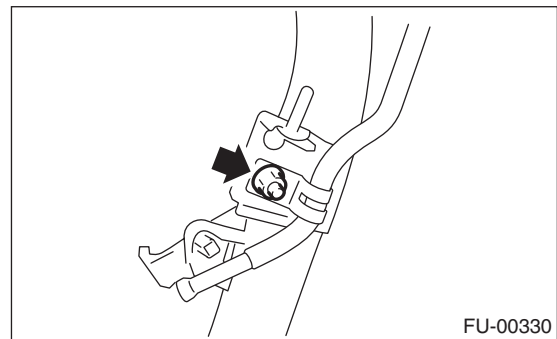
14) Connect the battery ground cable to battery.

### C: DISASSEMBLY

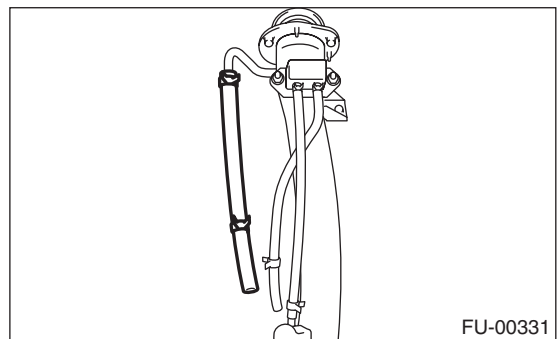
1) Move the clamp, and disconnect the evaporation hose from the joint pipe.



2) Remove the bolt which installs the joint pipe on the fuel filler pipe.



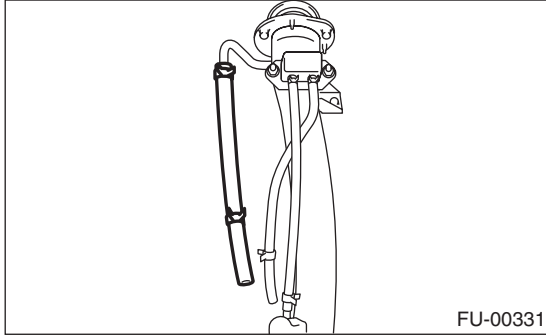
3) Disconnect the evaporation hose from the fuel filler pipe.



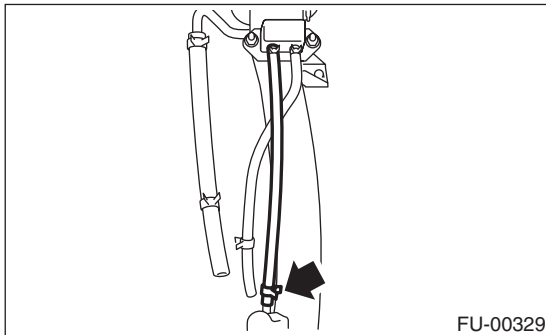
4) Remove the shut valve from the fuel filler pipe.  
<Ref. to EC(H4DOTC)-19, REMOVAL, Shut Valve.>

## D: ASSEMBLY

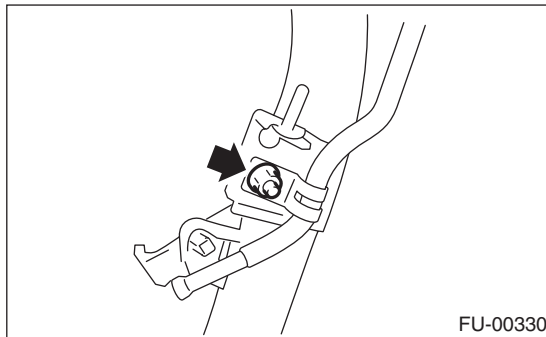
- 1) Install the shut valve on the fuel filler pipe. <Ref. to EC(H4DOTC)-7, INSTALLATION, Canister.>
- 2) Connect the evaporation hose to the fuel filler pipe.



- 3) Connect the evaporation hose to the evaporation pipe.



- 4) Install the evaporation pipe to the fuel filler pipe.



# Fuel Pump

FUEL INJECTION (FUEL SYSTEMS)

## 25. Fuel Pump

### A: REMOVAL

#### WARNING:

Place "NO FIRE" signs near the working area.

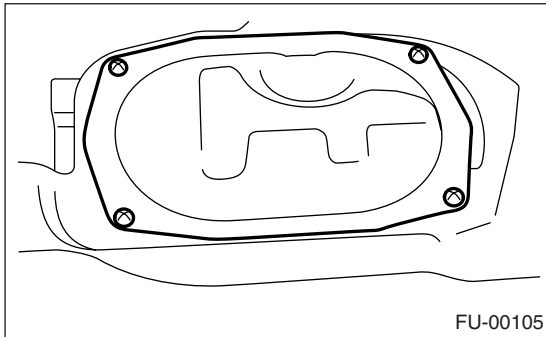
#### CAUTION:

Be careful not to spill the fuel.

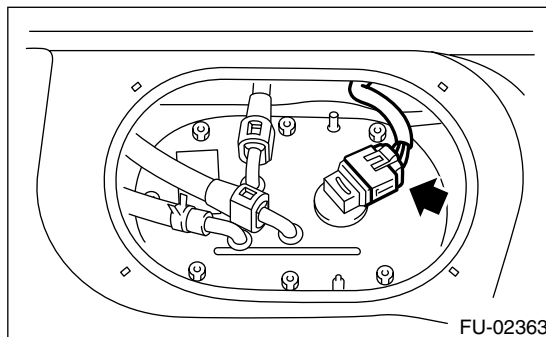
#### NOTE:

The fuel pump assembly consists of a fuel pump and a fuel level sensor.

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from battery.
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Remove the luggage floor mat. <Ref. to EI-61, REMOVAL, Luggage Floor Mat.>
- 5) Remove the service hole cover.

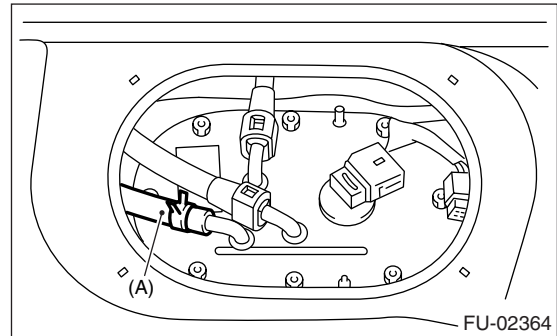


- 6) Disconnect the connector from fuel pump.

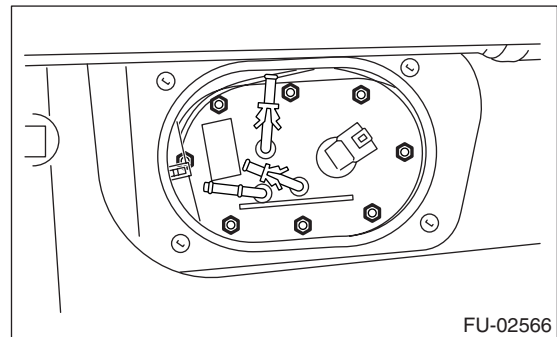


- 7) Disconnect the quick connector and then disconnect the fuel delivery hose and return hose. <Ref. to FU(H4DOTC)-65, REMOVAL, Fuel Delivery, Return and Evaporation lines.>

- 8) Move the clip and then disconnect the jet pump hose (A).



- 9) Remove the nuts which install the fuel pump assembly onto the fuel tank.



- 10) Take off the fuel pump assembly from the fuel tank.

### B: INSTALLATION

Install in the reverse order of removal.

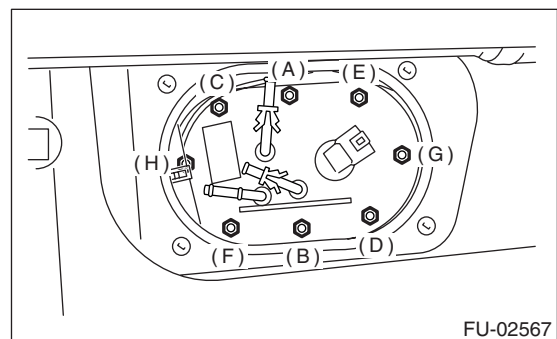
#### NOTE:

Use a new gasket and retainer.

- (1) Ensure the sealing portion is free from fuel or foreign particles before installation.
- (2) Tighten the nuts in alphabetical sequence shown in figure to specified torque.

#### Tightening torque:

**4.4 N·m (0.45 kgf-m, 3.3 ft-lb)**

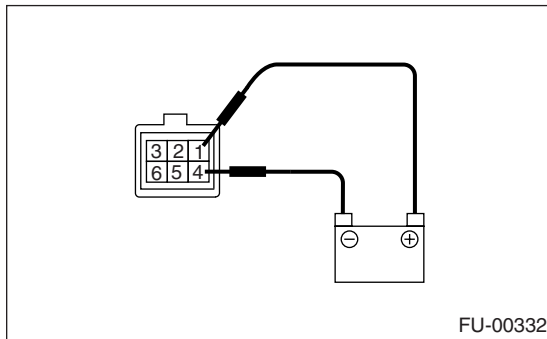


## C: INSPECTION

Connect the lead harness to the connector terminal of fuel pump and apply the battery power supply to check whether the pump operates.

### WARNING:

- Wipe off the fuel completely.
- Keep battery as far apart from fuel pump as possible.
- Be sure to turn the battery supply ON and OFF on the battery side.
- Do not run fuel pump for a long time under non-load condition.



## 26. Fuel Level Sensor

### A: REMOVAL

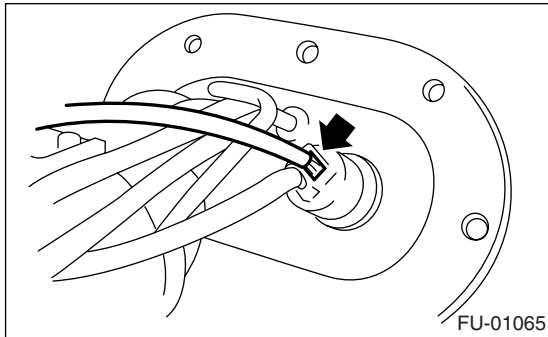
**WARNING:**

- Place “NO FIRE” signs near the working area.
- Be careful not to spill the fuel.

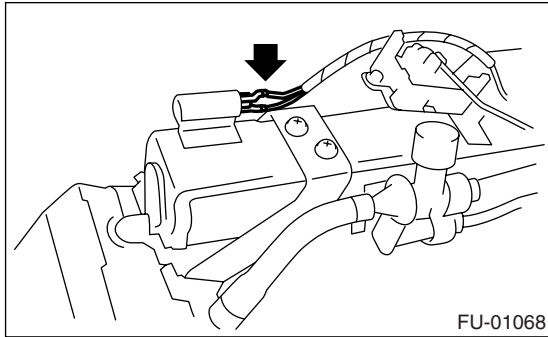
**NOTE:**

Fuel level sensor is built in fuel pump assembly.

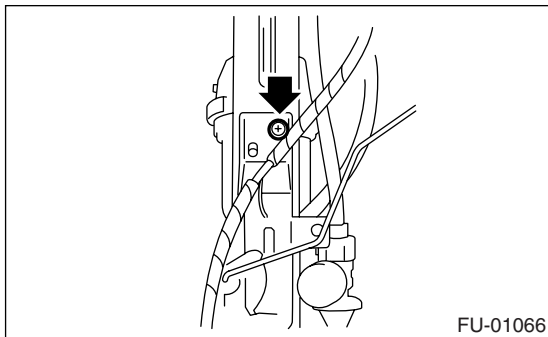
- 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-58, REMOVAL, Fuel Pump.>
- 2) Disconnect the connector from the fuel pump bracket.



- 3) Remove the fuel temperature sensor.



- 4) Remove the bolt which installs the fuel level sensor on mounting bracket.



### B: INSTALLATION

Install in the reverse order of removal.

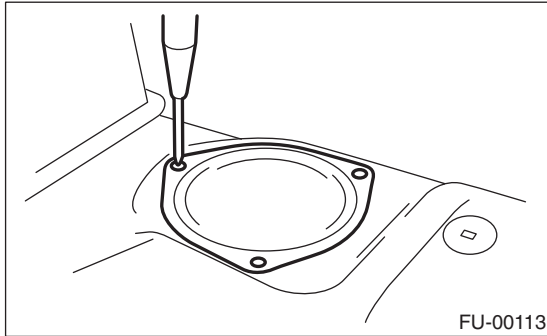
## 27. Fuel Sub Level Sensor

### A: REMOVAL

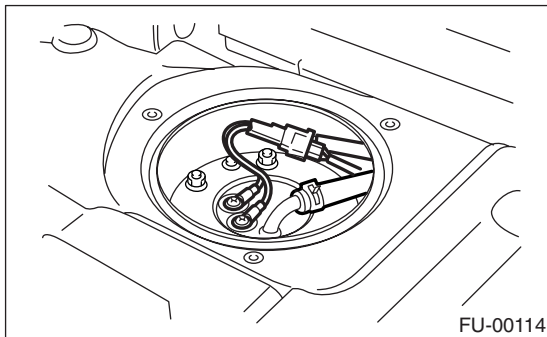
**WARNING:**

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

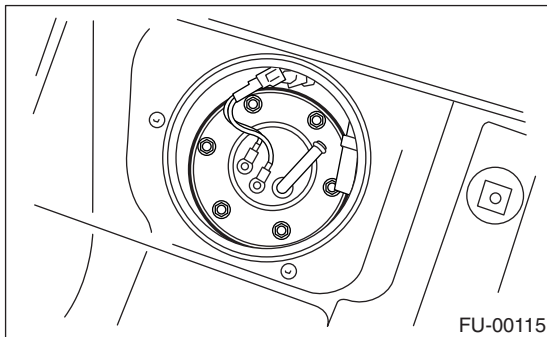
- 1) Disconnect the ground cable from battery.
- 2) Lift up the vehicle.
- 3) Drain the fuel from the fuel tank. <Ref. to FU(H4DOTC)-50, DRAINING FUEL, PROCEDURE, Fuel.>
- 4) Remove the luggage floor mat. <Ref. to EI-61, REMOVAL, Luggage Floor Mat.>
- 5) Remove the service hole cover.



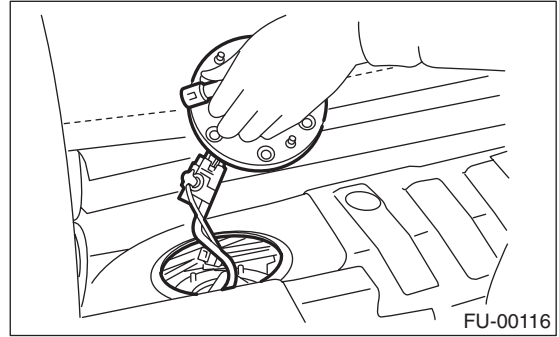
- 6) Disconnect the connector from the fuel sub level sensor.
- 7) Disconnect the fuel jet pump hose.



- 8) Remove the bolts which install the fuel sub level sensor on the fuel tank.



- 9) Remove the fuel sub level sensor.



### B: INSTALLATION

Install in the reverse order of removal.

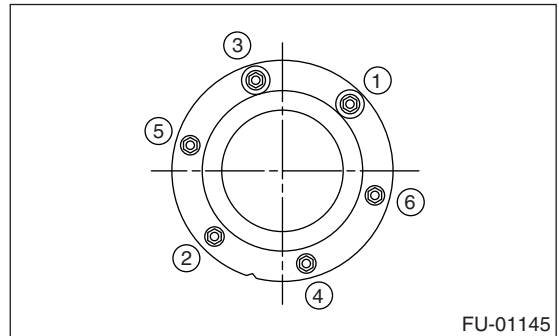
**NOTE:**

Use a new gasket.

- (1) Ensure the sealing portion is free from fuel or foreign particles before installation.
- (2) Tighten the nuts and bolts to specified torque in the order as shown in the figure.

**Tightening torque:**

**4.4 N·m (0.45 kgf·m, 3.3 ft·lb)**



# Fuel Filter

## FUEL INJECTION (FUEL SYSTEMS)

### 28. Fuel Filter

#### A: REMOVAL

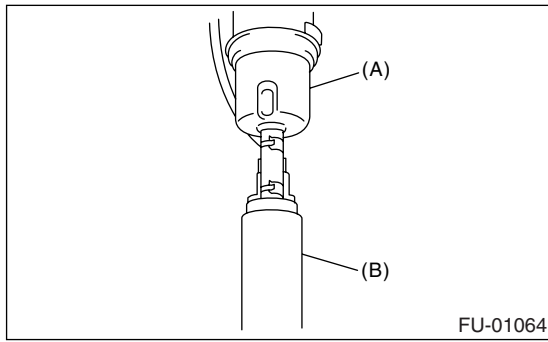
##### WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill the fuel.

##### NOTE:

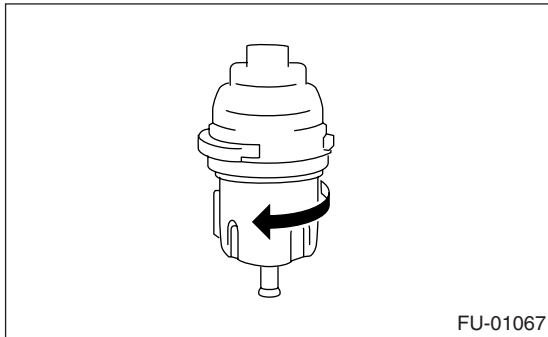
Fuel filter is built into the fuel pump assembly.

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-58, REMOVAL, Fuel Pump.>
- 3) Remove the fuel pump. <Ref. to FU(H4DOTC)-58, REMOVAL, Fuel Pump.>
- 4) Separate the fuel filter from fuel pump.



- (A) Fuel filter  
(B) Fuel pump

- 5) Turn the filter holder around to the arrow direction, and then remove the filter.



#### B: INSTALLATION

##### CAUTION:

- If fuel hoses are damaged at the connecting portion, replace them with new ones.
- If clamps are badly damaged, replace them with new ones.

Install in the reverse order of removal.

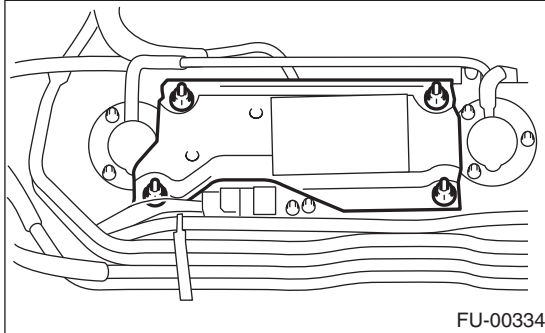
#### C: INSPECTION

- 1) Check the inside of fuel filter for dirt and water sediment.
- 2) If it is clogged, or if replacement interval has been reached, replace it.

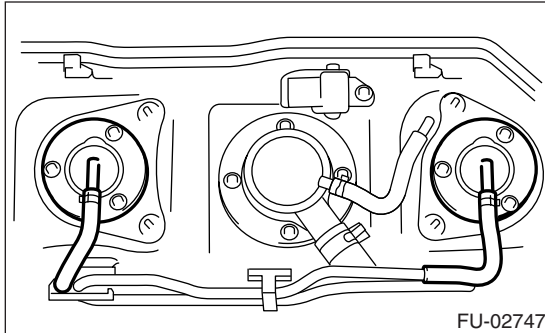
## 29. Fuel Cut Valve

### A: REMOVAL

- 1) Remove the fuel tank. <Ref. to FU(H4DOTC)-51, REMOVAL, Fuel Tank.>
- 2) Remove the protect cover.



- 3) Move the clip and disconnect the evaporation hose from fuel cut valve.



- 4) Remove the bolts which install the fuel cut valve.

### B: INSTALLATION

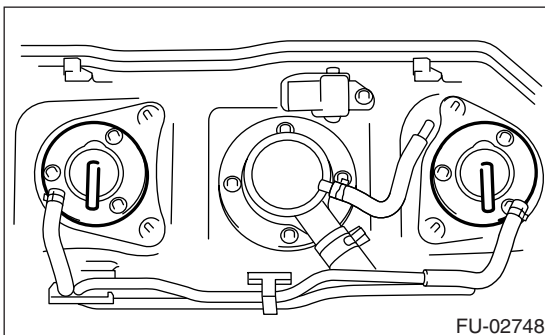
Install in the reverse order of removal.

NOTE:

Use a new gasket.

**Tightening torque:**

**4.4 N·m (0.45 kgf-m, 3.3 ft-lb)**





## 30. Fuel Damper Valve

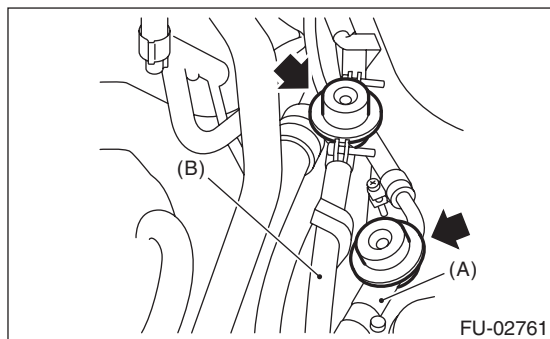
### A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Remove the fuel damper valve from the fuel delivery line (A) and fuel return line (B).

### WARNING:

- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.



### B: INSTALLATION

Install in the reverse order of removal.

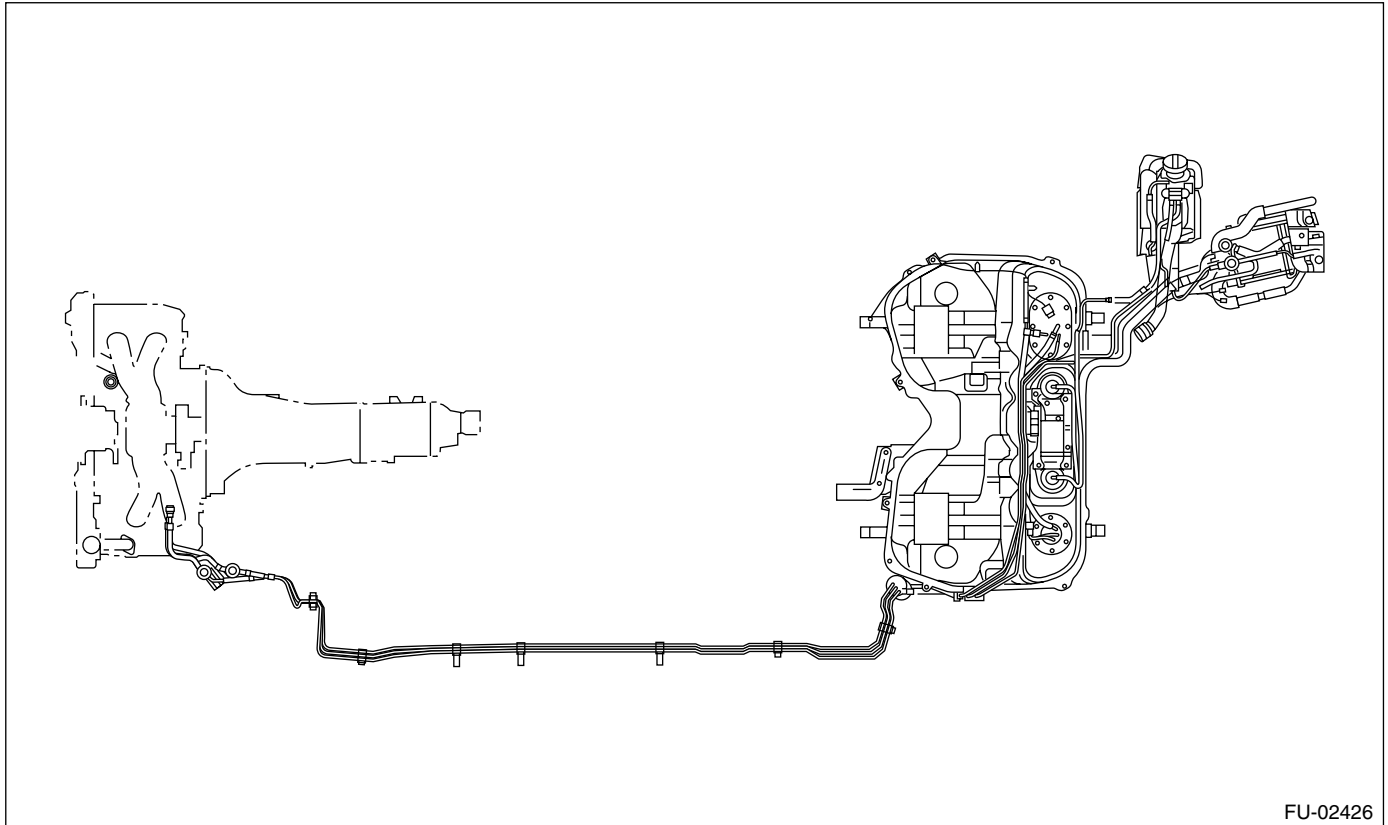
### *Tightening torque:*

***1.25 N·m (0.13 kgf-m, 0.94 ft-lb)***

## 31. Fuel Delivery, Return and Evaporation lines

### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Remove the floor mat. <Ref. to EI-60, REMOVAL, Floor Mat.>
- 5) Disconnect the fuel delivery pipes and hoses, and disconnect the fuel return pipes and hoses, evaporation pipes and hoses.



6) In engine compartment, detach the fuel delivery hoses, return hoses and evaporation hose.

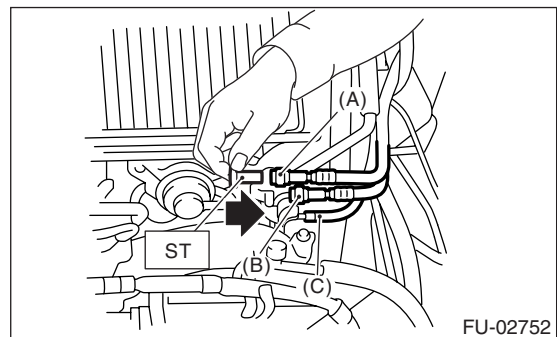
- (1) Disconnect the quick connectors of fuel delivery line and return line by pushing the ST to the direction of arrow.

ST 42099AE000 CONNECTOR REMOVER

- (2) Remove the clip, and disconnect the evaporation hose from pipe.

### WARNING:

- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.



- (A) Fuel delivery hose
- (B) Return hose
- (C) Evaporation hose

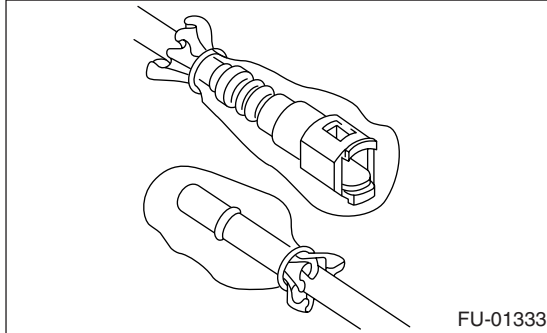
7) Lift up the vehicle.

# Fuel Delivery, Return and Evaporation lines

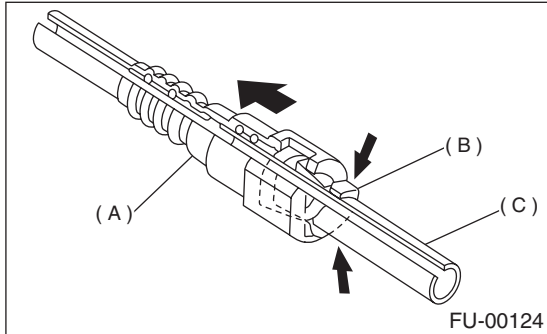
## FUEL INJECTION (FUEL SYSTEMS)

8) Disconnect the quick connector on fuel line.

- (1) Clean the pipe and connector, if they are covered with dust.
- (2) To prevent from damaging or entering foreign matter, wrap the pipes and connectors with plastic bag, etc.



- (3) Hold the connector (A) and push retainer (B) down.
- (4) Pull out the connector (A) from retainer (B).



- (A) Connector
- (B) Retainer
- (C) Pipe

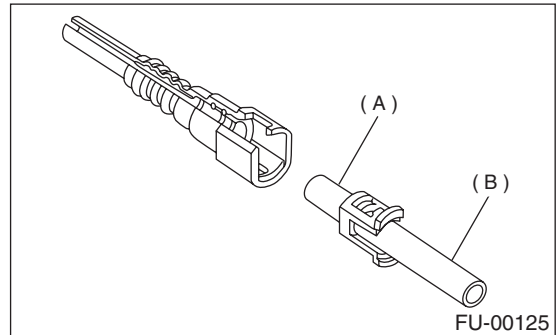
### B: INSTALLATION

1) Connect the quick connector on fuel line.

#### CAUTION:

- Use a new retainer except for use of engine compartment.

- Make sure that the connected portion is not damaged or has dust. If necessary, clean seal surface of pipe.

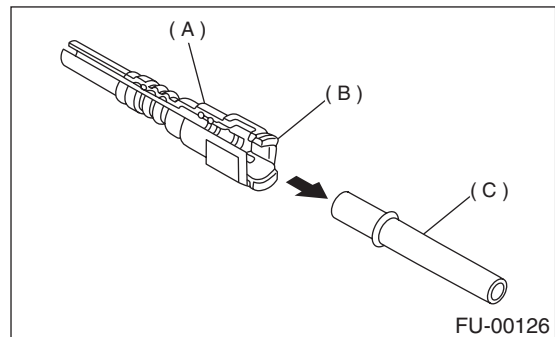


- (A) Seal surface
- (B) Pipe

- (1) Set the new retainer (B) to connector (A).
- (2) Push the pipe into the connector completely.

#### NOTE:

At this time, two clicking sounds are heard.



- (A) Connector
- (B) Retainer
- (C) Pipe

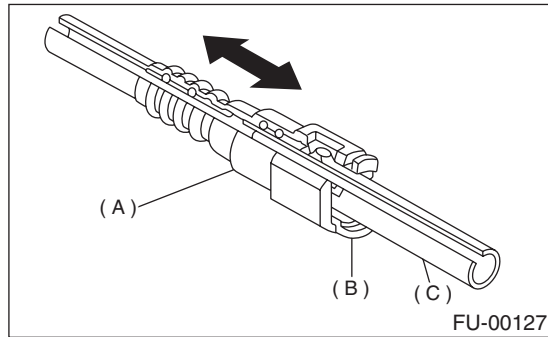
#### CAUTION:

- Pull the connector to ensure it is connected securely.
- Ensure the two retainer pawls are engaged in their mating positions in the connector.

# Fuel Delivery, Return and Evaporation lines

FUEL INJECTION (FUEL SYSTEMS)

- Be sure to inspect hoses and their connections for any leakage of fuel.



- (A) Connector
- (B) Retainer
- (C) Pipe

2) Connect the fuel delivery hose and return hose by inserting them into the pipe for 20 to 25 mm (0.79 to 0.98 in) in length.

Type A: When the fitting length is specified.

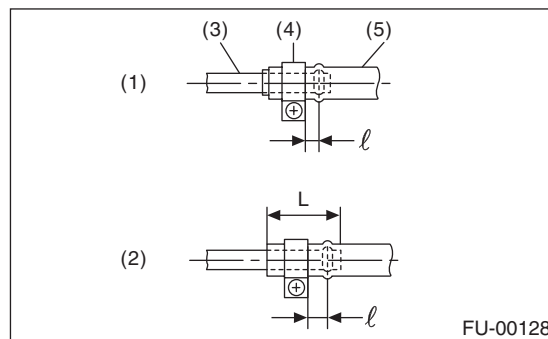
Type B: When the fitting length is not specified.

$\varnothing : 2.5 \pm 1.5 \text{ mm } (0.098 \pm 0.059 \text{ in})$

$L : 22.5 \pm 2.5 \text{ mm } (0.886 \pm 0.098 \text{ in})$

### CAUTION:

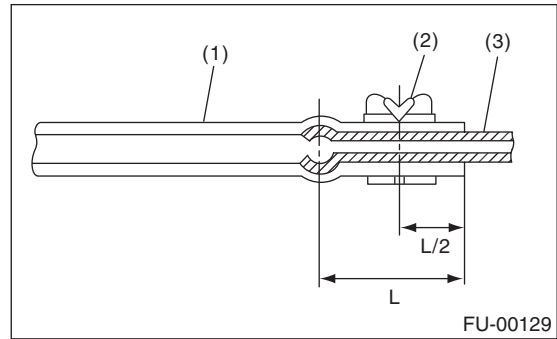
Be sure to inspect hoses and their connections for any leakage of fuel.



- (1) Type A
- (2) Type B
- (3) Pipe
- (4) Clamp
- (5) Hose

3) Connect the evaporation hose by inserting it into the pipe for 15 to 20 mm (0.59 to 0.79 in) in length.

$L = 17.5 \pm 2.5 \text{ mm } (0.689 \pm 0.098 \text{ in})$



- (1) Hose
- (2) Clip
- (3) Pipe

### C: INSPECTION

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.

2) Make sure that the fuel pipe and fuel hose connections are tight.

# Fuel System Trouble in General

FUEL INJECTION (FUEL SYSTEMS)

## 32. Fuel System Trouble in General

### A: INSPECTION

| Trouble and possible cause                     |  | Corrective action   |
|--|--|---|
| <b>1. Insufficient fuel supply to injector</b> |  |   |
| 1)   | Fuel pump does not operate.  |   |
|  | ○ Defective terminal contact.  | Inspect contact, especially ground, and tighten it securely.  |
|  | ○ Trouble in electromagnetic or electronic circuit parts.              | Replace the faulty parts.                                     |
| 2)   | Lowering of fuel pump function.  | Replace the fuel pump.  |
| 3)   | Clogged dust or water in the fuel filter.                              | Replace fuel filter, clean or replace fuel tank.              |
| 4)   | Clogged or bent fuel pipe or hose.                                     | Clean, correct or replace the fuel pipe or hose.              |
| 5)   | Air is mixed in the fuel system.                                       | Inspect or retighten each connection part.                    |
| 6)   | Clogged or bent air breather tube or pipe.                             | Clean, correct or replace air breather tube or pipe.          |
| 7)   | Damaged diaphragm of pressure regulator.                               | Replace.  |
| <b>2. Leakage or blow out of fuel</b>          |  |   |
| 1)   | Loosened joints of the fuel pipe.                                      | Retightening.   |
| 2)   | Cracked fuel pipe, hose and fuel tank.                                 | Replace.  |
| 3)   | Defective welding part on the fuel tank.                               | Replace.  |
| 4)   | Defective drain packing of the fuel tank.                              | Replace.  |
| 5)   | Clogged air breather tube or air vent tube.                            | Clean, correct or replace air breather tube or air vent tube. |
| <b>3. Gasoline smell inside of compartment</b> |  |   |
| 1)   | Loose joints at air breather tube, air vent tube and fuel filler pipe. | Retightening.   |
| 2)   | Defective packing air tightness on the fuel saucer.                    | Correct or replace the packing.                               |
| 3)   | Inoperative fuel pump modulator or circuit.                            | Replace.  |
| <b>4. Defective fuel meter indicator</b>       |  |   |
| 1)   | Defective operation of fuel level sensor.                              | Replace.  |
| 2)   | Defective operation of fuel meter.                                     | Replace.  |
| <b>5. Noise</b>                                |  |   |
| 1)   | Large operation noise or vibration of fuel pump.                       | Replace.  |

#### NOTE:

- When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank. Fill fuel fully to prevent those problem. And also drain the water condensation from fuel filter.
- In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use water removing agent in the fuel system to prevent freezing fuel system and accumulating water. Fill the water removing agent at the time when the fuel reduced at half to maintain the advantage.
- When water condensation is noticed in the fuel filter, drain the water from both the fuel filter and fuel tank or use water removing agent in the fuel tank.
- Before using a water removing agent, follow the cautions that noted on the bottle.

# EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES) *EC(H4DOTC)*

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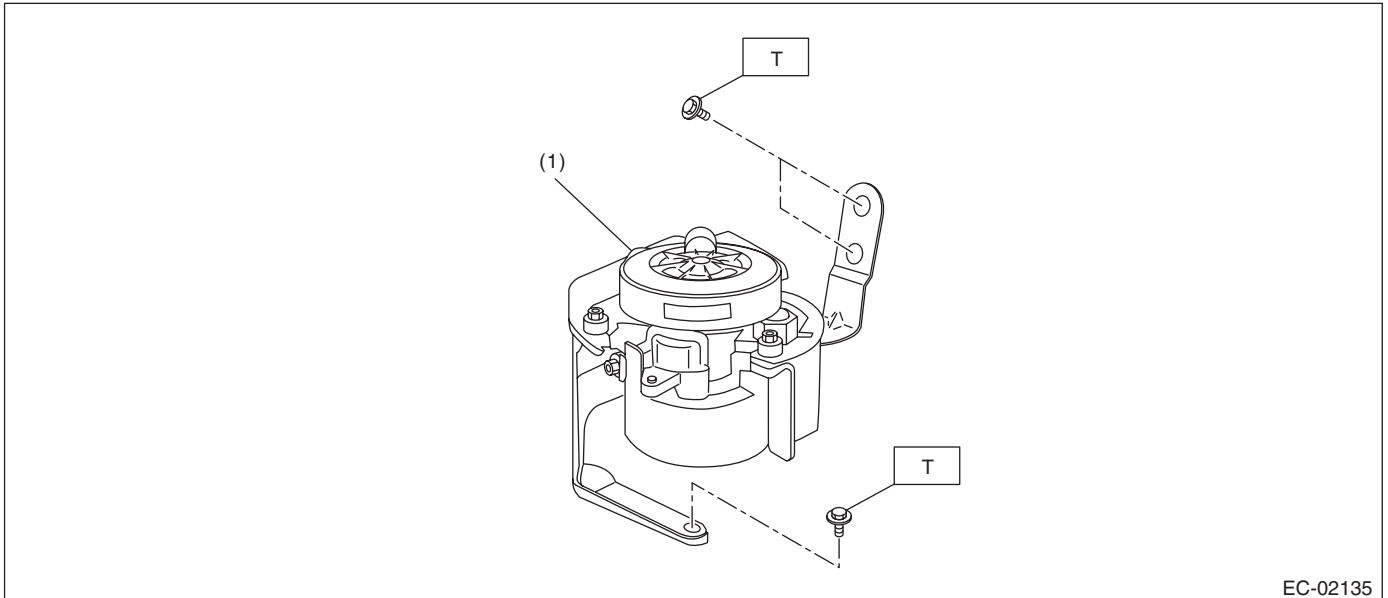
# General Description

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

## 1. General Description

### A: COMPONENT

#### 1. SECONDARY AIR PUMP



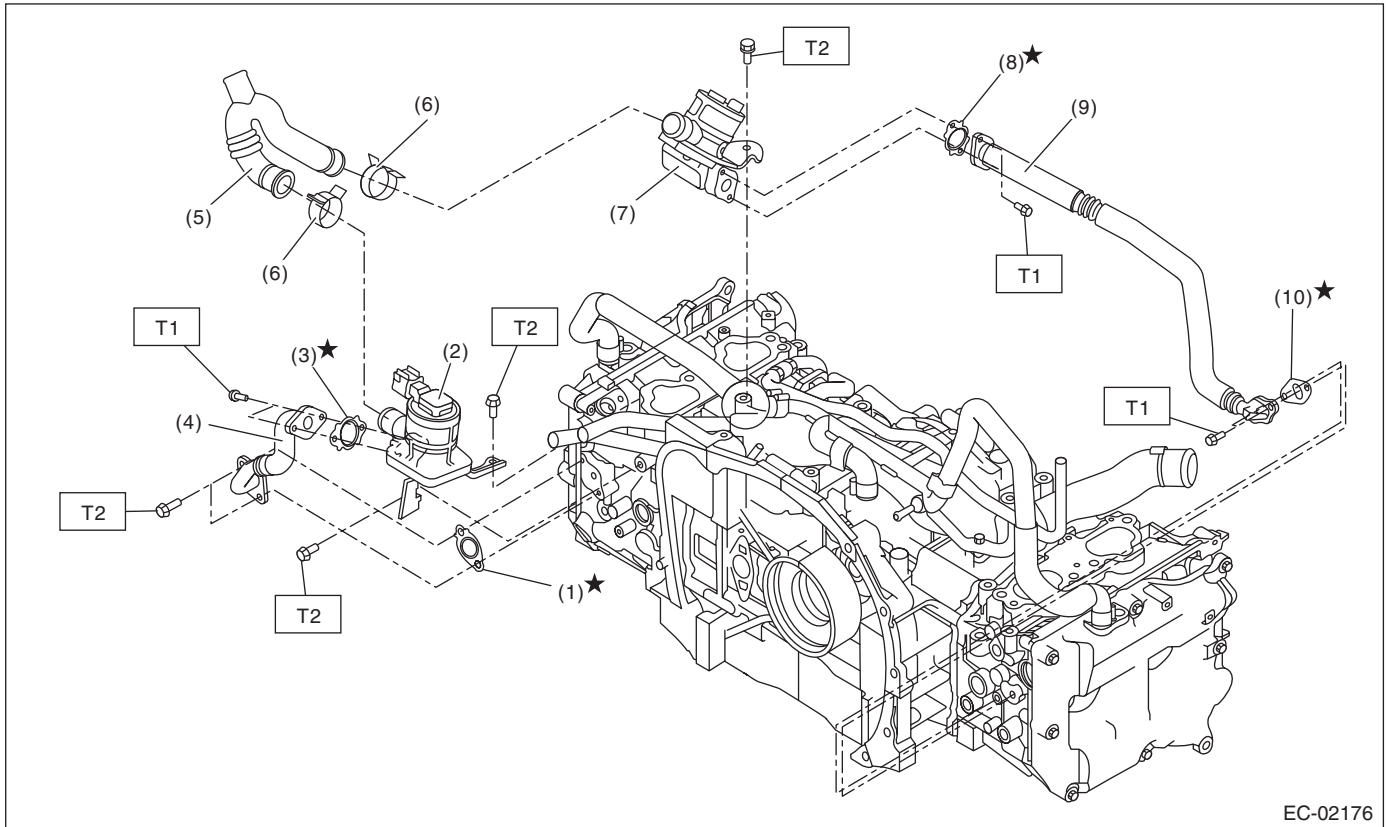
(1) Secondary air pump

**Tightening torque: N·m (kgf-m, ft-lb)**  
**T: 5 (0.5, 3.7)**

# General Description

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

## 2. SECONDARY AIR COMBI VALVE



- |                                  |                                  |
|----------------------------------|----------------------------------|
| (1) Gasket                       | (6) Clamp                        |
| (2) Secondary air combi valve LH | (7) Secondary air combi valve RH |
| (3) Gasket                       | (8) Gasket                       |
| (4) Pipe LH                      | (9) Pipe RH                      |
| (5) Air duct                     | (10) Gasket                      |

**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 9 (0.9, 6.6)**

**T2: 19 (1.9, 13.7)**

### B: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

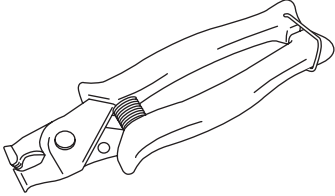


## General Description

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

### C: PREPARATION TOOL

#### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION  | REMARKS  |
|---|-------------|--------------|--|
| <br><br>ST18353AA000 | 18353AA000  | CLAMP PLIERS | <ul style="list-style-type: none"><li>• Used for removing and installing PCV hose.</li><li>• This tool is a general tool that is made by CAILLAU in France. (Code: 54.0.000.205)</li></ul> Tool number is fixed as special tool in order to obtain it as easily as SUBARU genuine parts. |

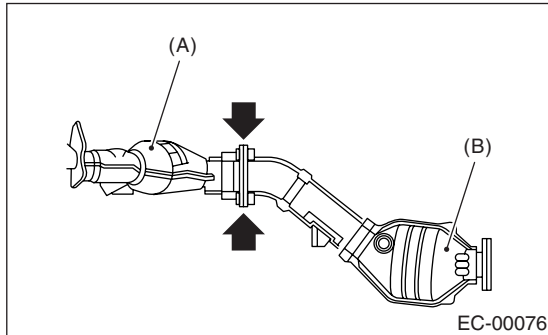
# Front Catalytic Converter

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

## 2. Front Catalytic Converter

### A: REMOVAL

- 1) Remove the center exhaust pipe.  
<Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>
- 2) Separate the front catalytic converter (A) from rear catalytic converter (B).



### B: INSTALLATION

NOTE:

- Replace the gaskets with new ones.
- Install in the reverse order of removal.

### C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

# Rear Catalytic Converter

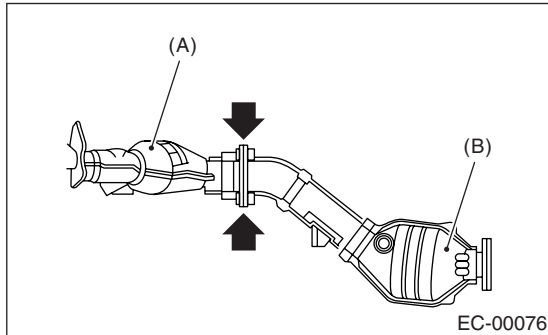
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

---

## 3. Rear Catalytic Converter

### A: REMOVAL

- 1) Remove the center exhaust pipe.  
<Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>
- 2) Separate the rear catalytic converter (B) from front catalytic converter (A).



### B: INSTALLATION

NOTE:

- Replace the gaskets with new ones.
- Install in the reverse order of removal.

### C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

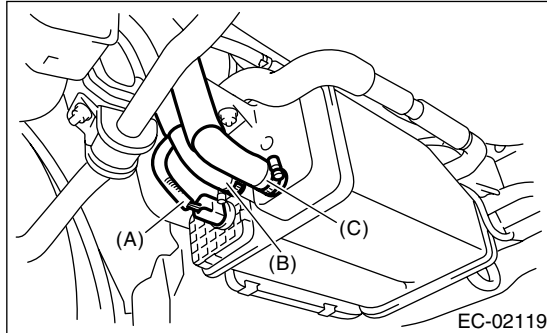
# Canister

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

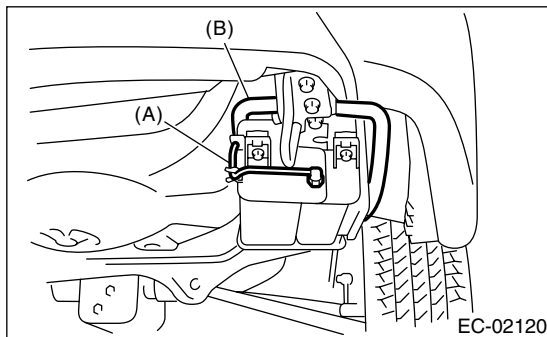
## 4. Canister

### A: REMOVAL

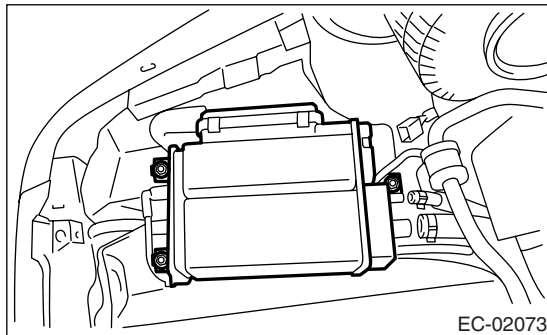
- 1) Disconnect the ground cable from battery.
- 2) Lift up the vehicle.
- 3) Disconnect connector (A) from drain valve.
- 4) Disconnect evaporation hoses (B) and (C) from canister.



- 5) Disconnect quick connector (A) from canister.
- 6) Disconnect drain hoses (B) from canister.



- 7) Remove the canister from vehicle.



### B: INSTALLATION

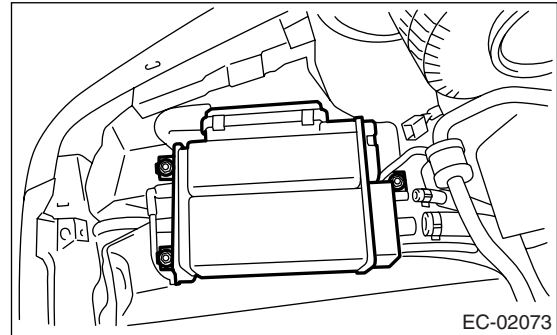
Install in the reverse order of removal.

#### NOTE:

Replace the retainer of quick connector with new one.

**Tightening torque:**

**23 N·m (2.3 kgf-m, 17 ft-lb)**



### C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

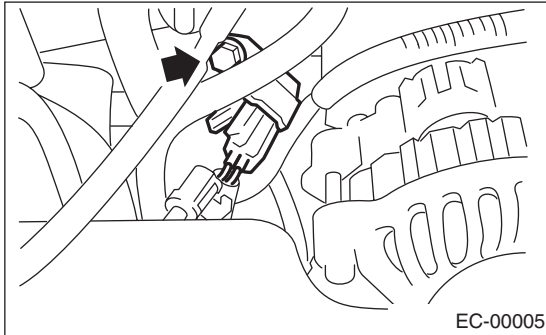
# Purge Control Solenoid Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

## 5. Purge Control Solenoid Valve

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector and hoses from purge control solenoid valve.
- 3) Remove the bolt which installs the purge control solenoid valve onto intake manifold.

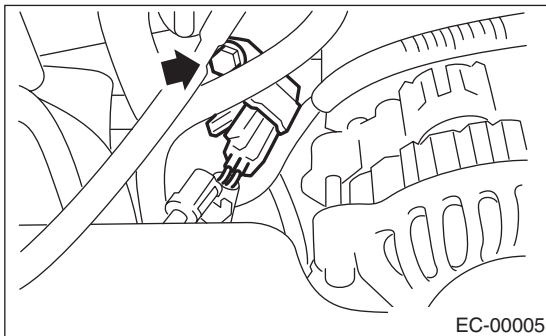


### B: INSTALLATION

Install in the reverse order of removal.

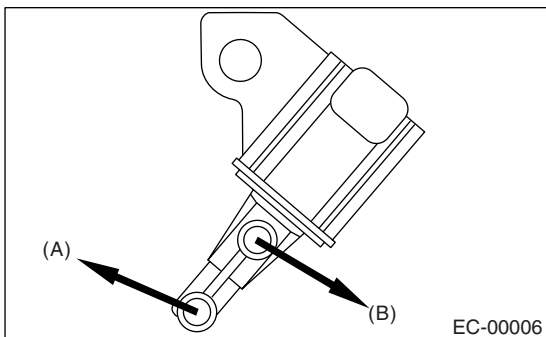
#### *Tightening torque:*

**16 N·m (1.6 kgf·m, 11.6 ft·lb)**



#### NOTE:

Connect the evaporation hoses as shown in the figure.



- (A) To purge valve
- (B) To intake manifold

### C: INSPECTION

Make sure the hoses are not cracked or loose.

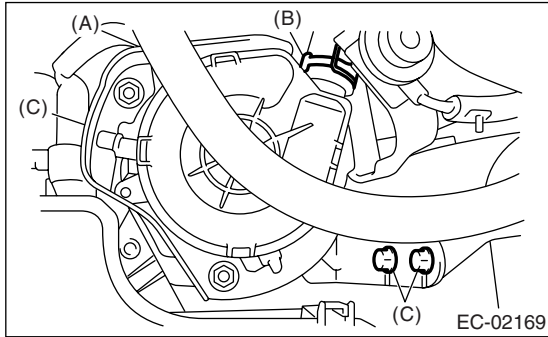
# Secondary Air Pump

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

## 6. Secondary Air Pump

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector (A) from secondary air pump.
- 3) Disconnect the hose (B) from secondary air pump.
- 4) Remove the bolt (C) which secures the secondary air pump to the vehicle.



### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

*5 N·m (0.5 kgf-m, 3.7 ft-lb)*

### C: INSPECTION

Make sure the hoses are not cracked or loose.

# Secondary Air Combi Valve

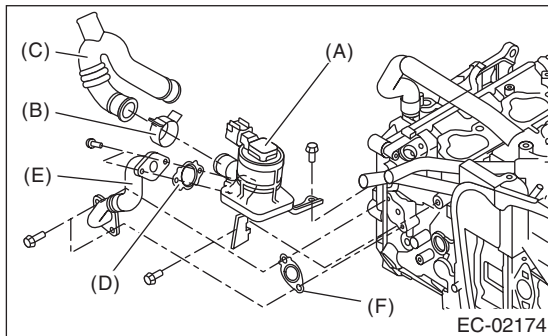
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

## 7. Secondary Air Combi Valve

### A: REMOVAL

#### 1. SECONDARY AIR COMBI VALVE LH

- 1) Disconnect the ground cable from battery.
- 2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Disconnect the connector from secondary air combi valve LH.
- 4) Disconnect the air duct.
- 5) Disconnect the pipe LH.
- 6) Remove the secondary air combi valve LH.

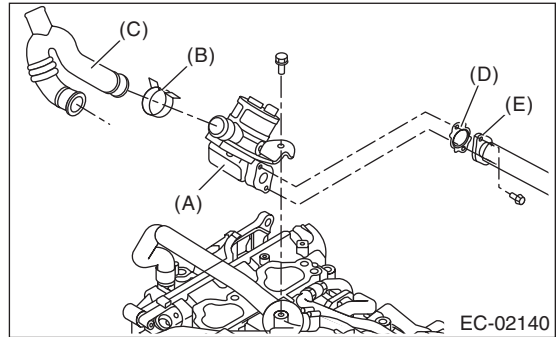


- (A) Secondary air combi valve LH
- (B) Clamp
- (C) Air duct
- (D) Gasket
- (E) Pipe LH
- (F) Gasket

#### 2. SECONDARY AIR COMBI VALVE RH

- 1) Disconnect the ground cable from battery.
- 2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Remove the secondary air combi valve LH. <Ref. to EC(H4DOTC)-10, SECONDARY AIR COMBI VALVE LH, REMOVAL, Secondary Air Combi Valve.>
- 4) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
- 5) Disconnect the connector from secondary air combi valve RH.
- 6) Disconnect the pipe RH.

- 7) Remove the secondary air combi valve RH.



- (A) Secondary air combi valve RH
- (B) Clamp
- (C) Air duct
- (D) Gasket
- (E) Pipe RH

### B: INSTALLATION

#### 1. SECONDARY AIR COMBI VALVE LH

Install in the reverse order of removal.

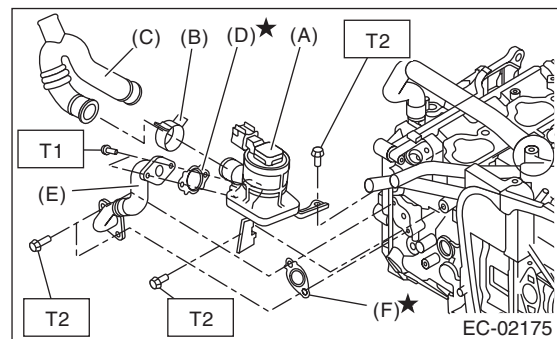
#### NOTE:

Use a new gasket.

#### Tightening torque:

**T1: 9 N·m (0.9 kgf-m, 6.6 ft-lb)**

**T2: 19 N·m (1.9 kgf-m, 13.7 ft-lb)**



- (A) Secondary air combi valve LH
- (B) Clamp
- (C) Air duct
- (D) Gasket
- (E) Pipe LH
- (F) Gasket

## Secondary Air Combi Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

### 2. SECONDARY AIR COMBI VALVE RH

Install in the reverse order of removal.

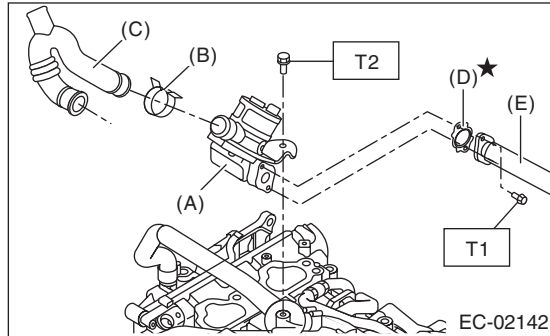
NOTE:

Use a new gasket.

**Tightening torque:**

**T1: 9 N·m (0.9 kgf-m, 6.6 ft-lb)**

**T2: 19 N·m (1.9 kgf-m, 13.7 ft-lb)**



- (A) Secondary air combi valve RH
- (B) Clamp
- (C) Air duct
- (D) Gasket
- (E) Pipe RH

### C: INSPECTION

Make sure the hoses are not cracked or loose.



## Fuel Level Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

---

### 8. Fuel Level Sensor

#### A: REMOVAL

For removal procedure, refer to FU(H4DOTC) section. <Ref. to FU(H4DOTC)-60, REMOVAL, Fuel Level Sensor.>

#### B: INSTALLATION

For installation procedure, refer to FU(H4DOTC) section. <Ref. to FU(H4DOTC)-60, INSTALLATION, Fuel Level Sensor.>

## 9. Fuel Temperature Sensor

### A: REMOVAL

Fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, the removal procedure is the same as that for fuel level sensor. <Ref. to FU(H4DOTC)-60, REMOVAL, Fuel Level Sensor.>

### B: INSTALLATION

Fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, the installation procedure is the same as that for fuel level sensor. <Ref. to FU(H4DOTC)-60, INSTALLATION, Fuel Level Sensor.>

## Fuel Sub Level Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

---

### 10. Fuel Sub Level Sensor

#### **A: REMOVAL**

For removal procedure, refer to FU(H4DOTC) section. <Ref. to FU(H4DOTC)-61, REMOVAL, Fuel Sub Level Sensor.>

#### **B: INSTALLATION**

For installation procedure, refer to FU(H4DOTC) section. <Ref. to FU(H4DOTC)-61, INSTALLATION, Fuel Sub Level Sensor.>

# Fuel Tank Pressure Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

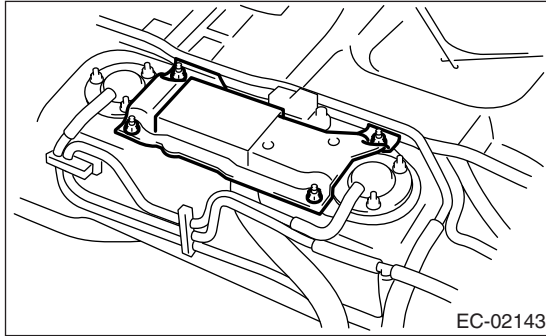
## 11. Fuel Tank Pressure Sensor

### A: REMOVAL

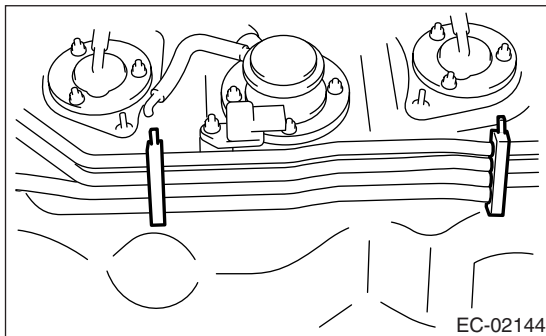
#### WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel.

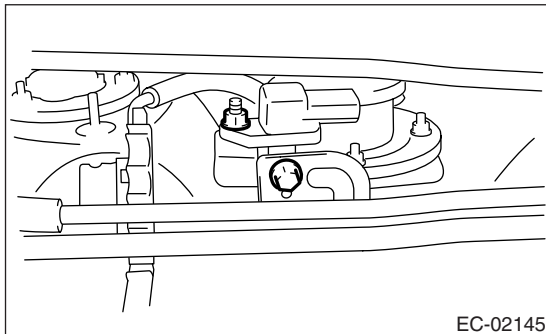
- 1) Remove the fuel tank. <Ref. to FU(H4DOTC)-51, REMOVAL, Fuel Tank.>
- 2) Remove the protector cover.



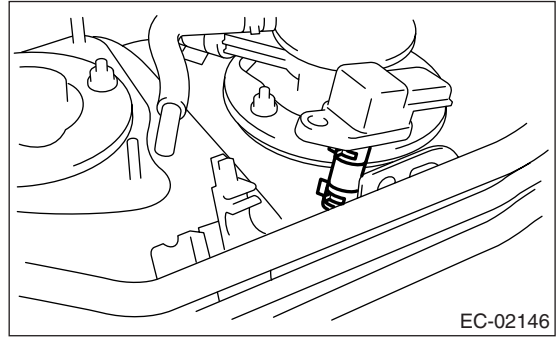
- 3) Disconnect the connector from fuel tank pressure sensor.
- 4) Release the clips which hold fuel pipes onto fuel tank.



- 5) Remove the bolt and nut which hold the fuel tank pressure sensor onto the bracket.



- 6) Disconnect the pressure hose from fuel tank pressure sensor.

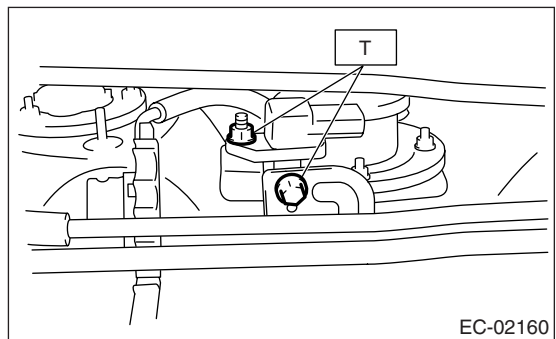


### B: INSTALLATION

Install in the reverse order of removal.

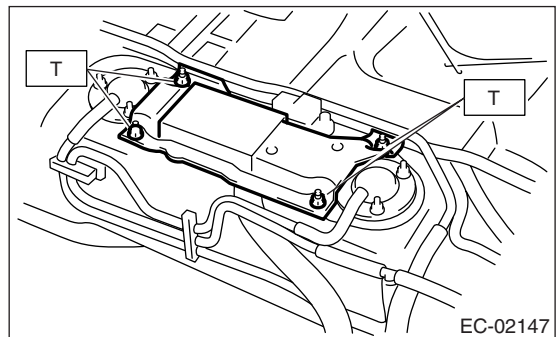
#### Tightening torque:

**7.4 N·m (0.75 kgf-m, 5.4 ft-lb)**



#### Tightening torque:

**T: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)**



### C: INSPECTION

Make sure the hoses are not cracked or loose.

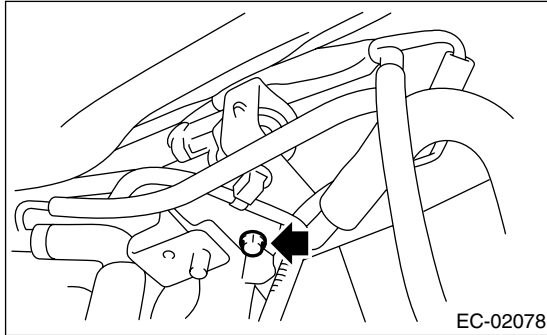
# Pressure Control Solenoid Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

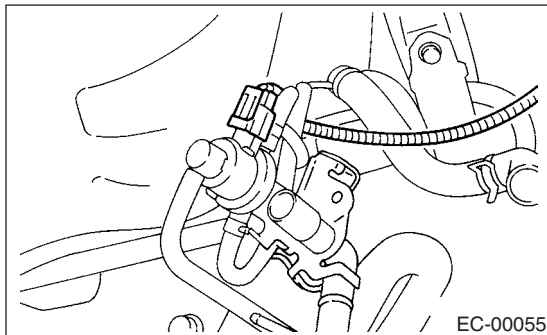
## 12. Pressure Control Solenoid Valve

### A: REMOVAL

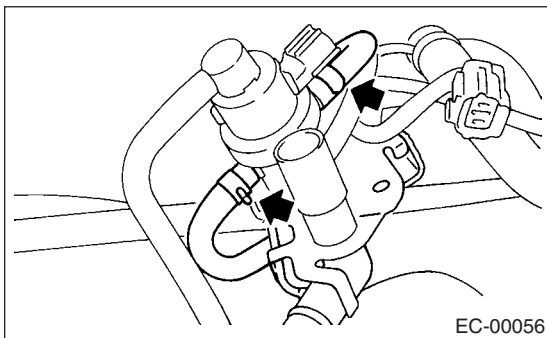
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Lift up the vehicle.
- 4) Remove the canister. <Ref. to EC(H4DOTC)-7, REMOVAL, Canister.>
- 5) Remove the bolt which installs the pressure control solenoid valve holding bracket on body.



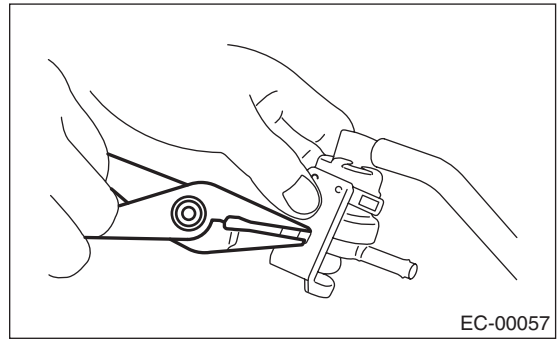
- 6) Remove the pressure control solenoid valve with bracket.
- 7) Disconnect the connector from pressure control solenoid valve.



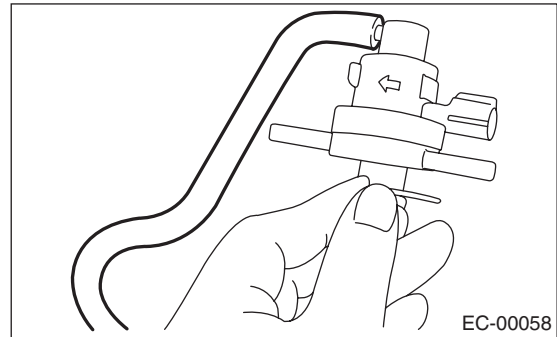
- 8) Disconnect the two evaporation hoses from pressure control solenoid valve.



- 9) Remove the pressure control solenoid valve from bracket.



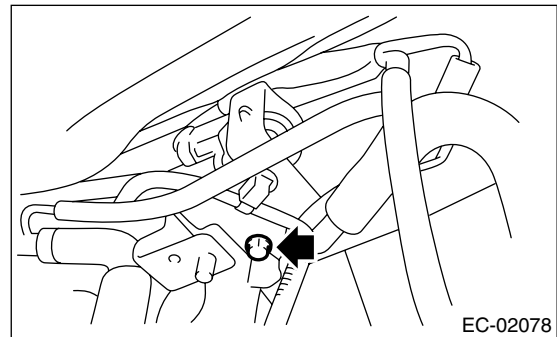
- 10) Disconnect the pressure control valve hose from pressure control solenoid valve.



### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**  
**25 N·m (2.6 kgf·m, 18.8 ft·lb)**



### C: INSPECTION

Make sure the hoses are not cracked or loose.

## **Drain Filter**

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

---

### **13.Drain Filter**

#### **A: SPECIFICATION**

Drain filter is built in the canister, and it is a part which cannot be disassembled.

# Vent Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

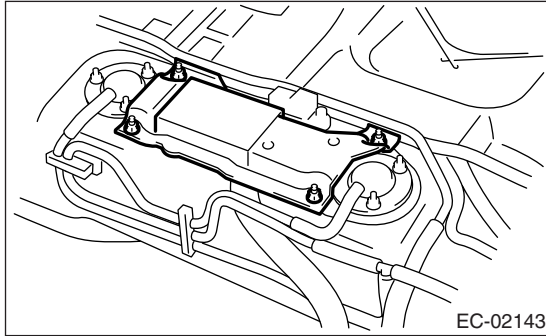
## 14. Vent Valve

### A: REMOVAL

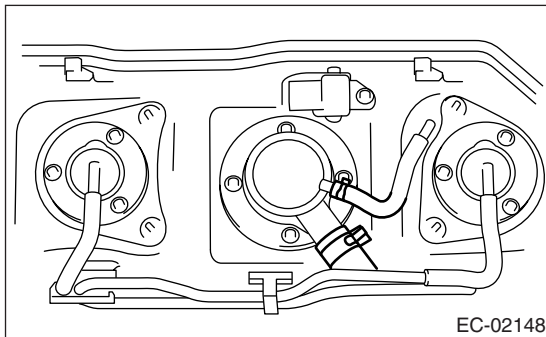
#### WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel.

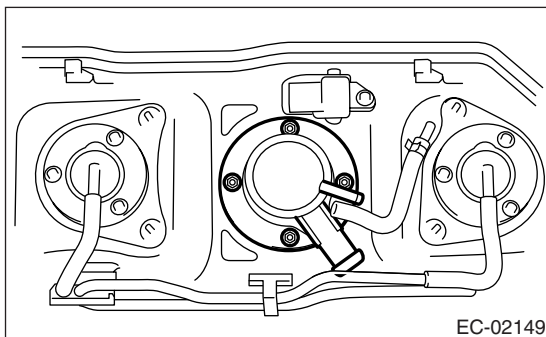
- 1) Remove the fuel tank. <Ref. to FU(H4DOTC)-51, REMOVAL, Fuel Tank.>
- 2) Remove the protector cover.



- 3) Remove the clips, and disconnect the hoses from vent valve.



- 4) Remove the nuts and then remove the vent valve.



### B: INSTALLATION

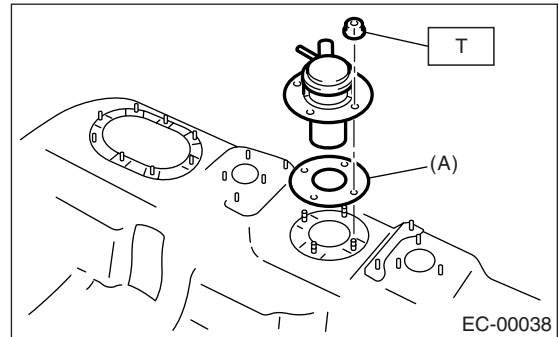
Install in the reverse order of removal.

#### NOTE:

Replace the gasket with a new one.

#### Tightening torque:

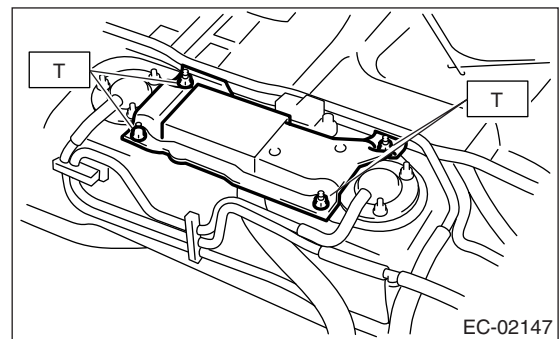
**T: 4.4 N·m (0.45 kgf·m, 3.3 ft·lb)**



(A) Gasket

#### Tightening torque:

**T: 4.4 N·m (0.45 kgf·m, 3.3 ft·lb)**



### C: INSPECTION

Make sure the hoses are not cracked or loose.

# Shut Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

## 15. Shut Valve

### A: REMOVAL

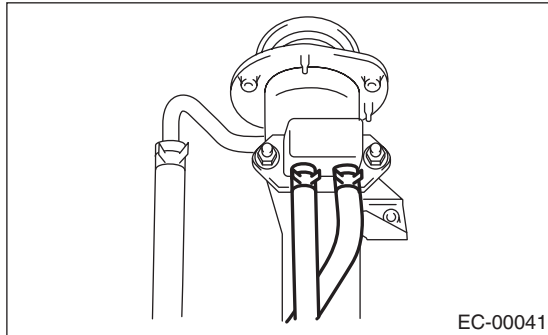
#### WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel.

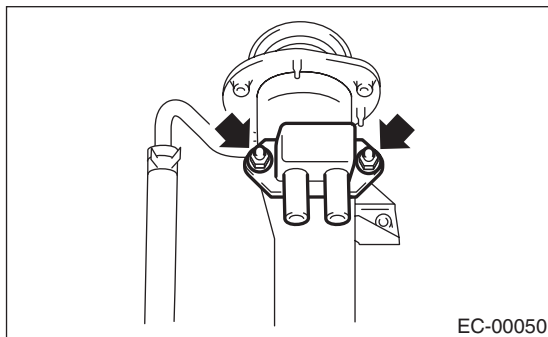
1) Remove the fuel filler pipe.

<Ref. to FU(H4DOTC)-54, REMOVAL, Fuel Filler Pipe.>

2) Disconnect the evaporation hoses from shut valve.



3) Remove the shut valve from fuel filler pipe.

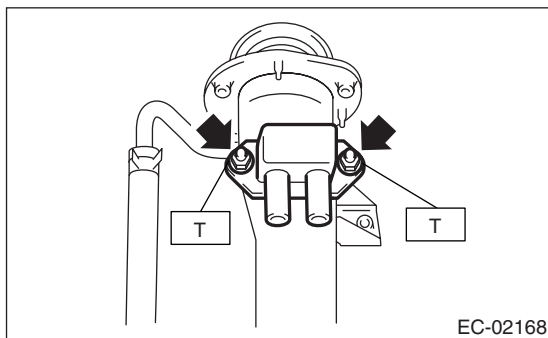


### B: INSTALLATION

Install in the reverse order of removal.

#### Tightening torque:

**4.5 N·m (0.46 kgf-m, 3.3 ft-lb)**



### C: INSPECTION

Make sure the hoses are not cracked or loose.



## Drain Valve

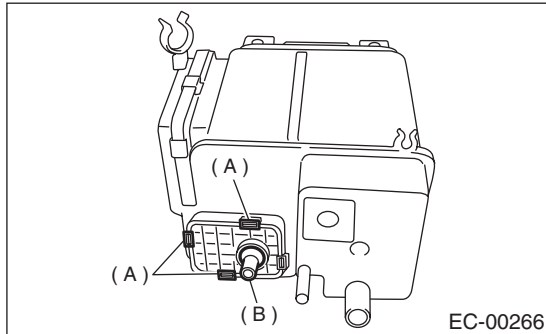
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

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### 16.Drain Valve

#### A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Disconnect the ground cable from battery.
- 3) Lift up the vehicle.
- 4) Remove the canister. <Ref. to EC(H4DOTC)-7, REMOVAL, Canister.>
- 5) Remove clip (A), and then remove drain valve (B) from canister.
- 6) Remove the filter from drain valve (B).



#### B: INSTALLATION

Install in the reverse order of removal.

#### CAUTION:

- Assemble the drain valve filter without any clearance.
- Make sure the packing in the groove before assembling drain valve to canister.
- Replace the clip with a new one.

#### C: INSPECTION

- 1) Make sure that all hoses are installed securely.
- 2) Make sure that hoses are not cracked or loose.

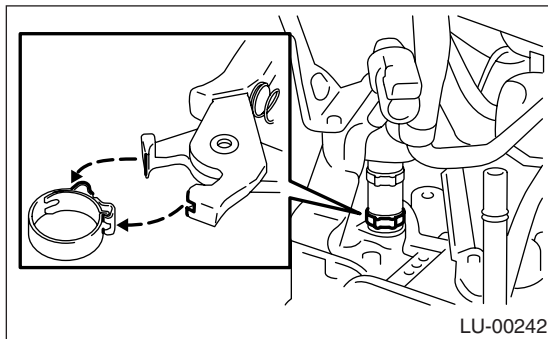
## 17.PCV Hose Assembly

### A: REMOVAL

#### CAUTION:

Removal is not allowed except for the damage of PCV hose, diagnosis connector and PCV valve.

- 1) Remove the intake manifold.  
<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
- 2) Clip the protrusion of clamp after aligning the concave portion of ST with protrusion of clamp, and then unlock the lock.
- 3) Remove the PCV hose assembly.  
ST 18353AA000 CLAMP PLIERS

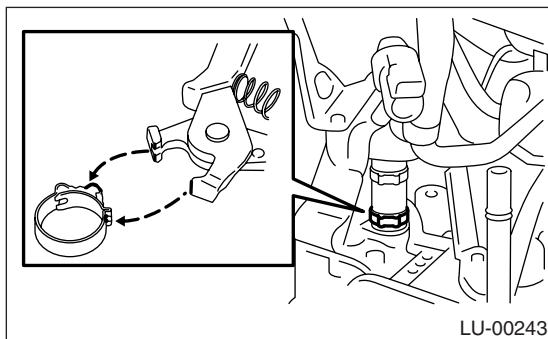


### B: INSTALLATION

#### NOTE:

Replace the clamp with a new one.

- 1) Install the PCV hose assembly, and then lock the clamp with protrusion of clamp clipped by pliers.  
ST 18353AA000 CLAMP PLIERS



- 2) Install the intake manifold.  
<Ref. to FU(H4DOTC)-17, INSTALLATION, Intake Manifold.>

# PCV Hose Assembly

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

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# INTAKE (INDUCTION)

# *IN(H4DOTC)*

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|                              | <b>Page</b> |
|------------------------------|-------------|
| 1. General Description ..... | 2           |
| 2. Air Cleaner Element ..... | 7           |
| 3. Air Cleaner Case .....    | 8           |
| 4. Air Intake Duct .....     | 9           |
| 5. Intake Duct .....         | 10          |
| 6. Intercooler .....         | 11          |
| 7. Turbocharger .....        | 13          |
| 8. Air By-pass Valve .....   | 15          |
| 9. Resonator Chamber .....   | 16          |

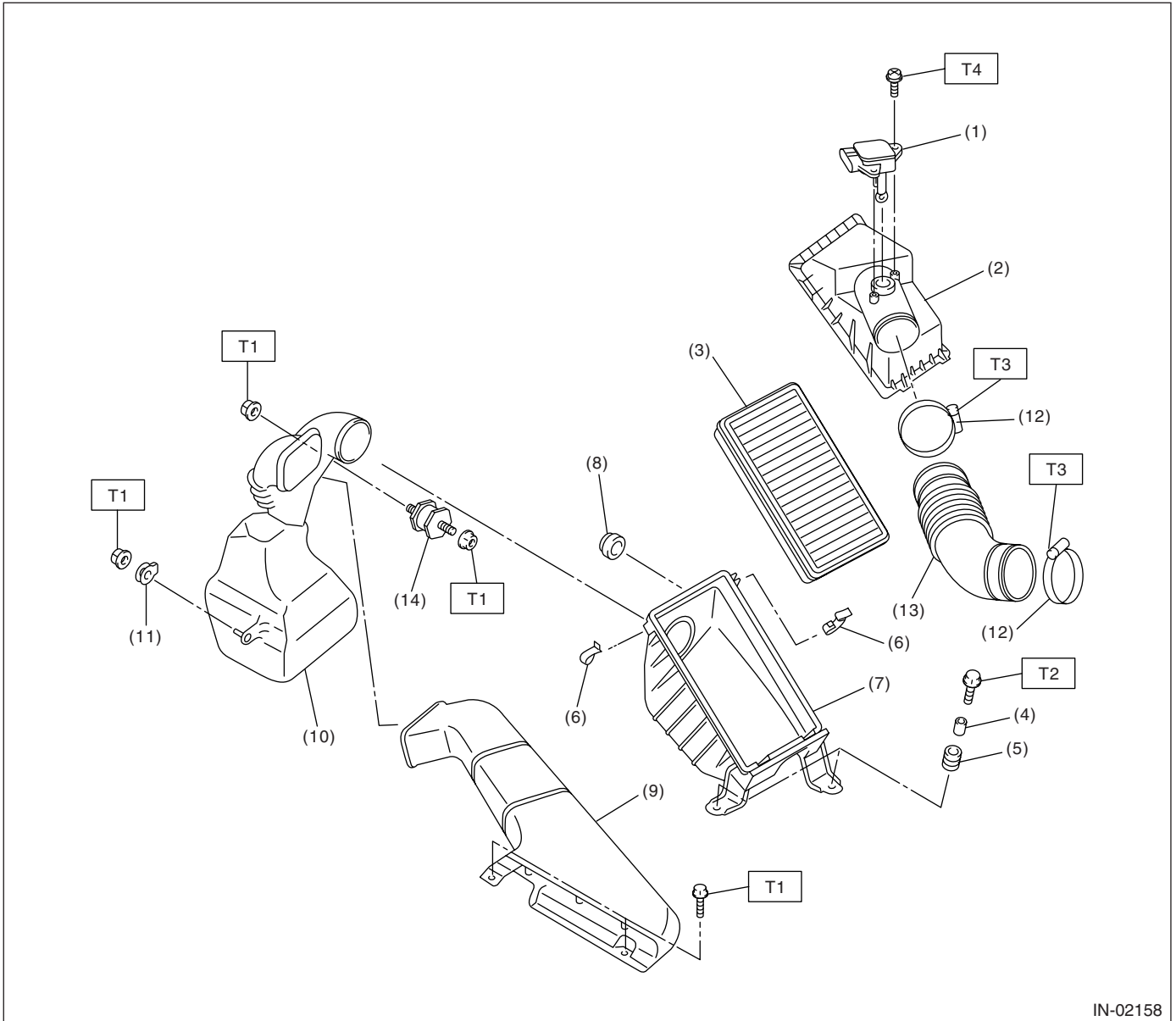
# General Description

INTAKE (INDUCTION)

## 1. General Description

### A: COMPONENT

#### 1. AIR CLEANER



IN-02158

- |   |                             |              |
|---|-----------------------------|--------------|
| (1) Mass air flow and intake air temperature sensor | (7) Air cleaner lower case  | (14) Cushion |
| (2) Air cleaner upper cover                         | (8) Cushion rubber          |              |
| (3) Air cleaner element                             | (9) Air intake duct         |              |
| (4) Spacer  | (10) Resonator chamber ASSY |              |
| (5) Bushing   | (11) Cushion rubber         |              |
| (6) Clip  | (12) Clamp                  |              |
|   | (13) Air intake boot        |              |

**Tightening torque: N-m (kgf-m, ft-lb)**

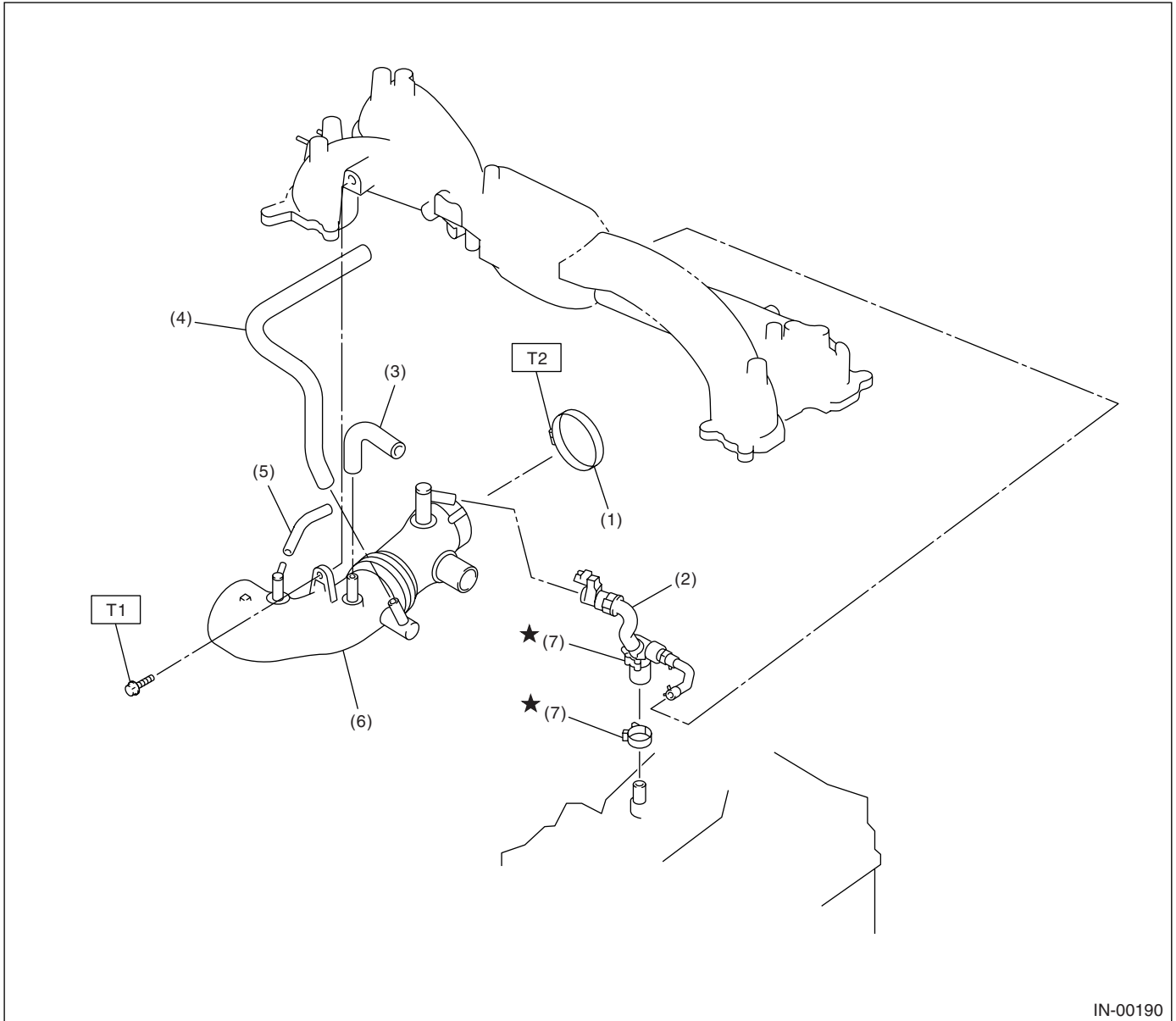
**T1: 7.5 (0.76, 5.5)**

**T2: 33 (3.4, 24.6)**

**T3: 2.5 (0.25, 1.8)**

**T4: 1.7 (0.17, 1.2)**

## 2. INTAKE DUCT



IN-00190

- |                        |                        |
|------------------------|------------------------|
| (1) Clamp              | (5) Air by-pass hose C |
| (2) PCV hose ASSY      | (6) Intake duct        |
| (3) Air by-pass hose A | (7) Clamp              |
| (4) Air by-pass hose B |                        |

**Tightening torque: N·m (kgf-m, ft-lb)**

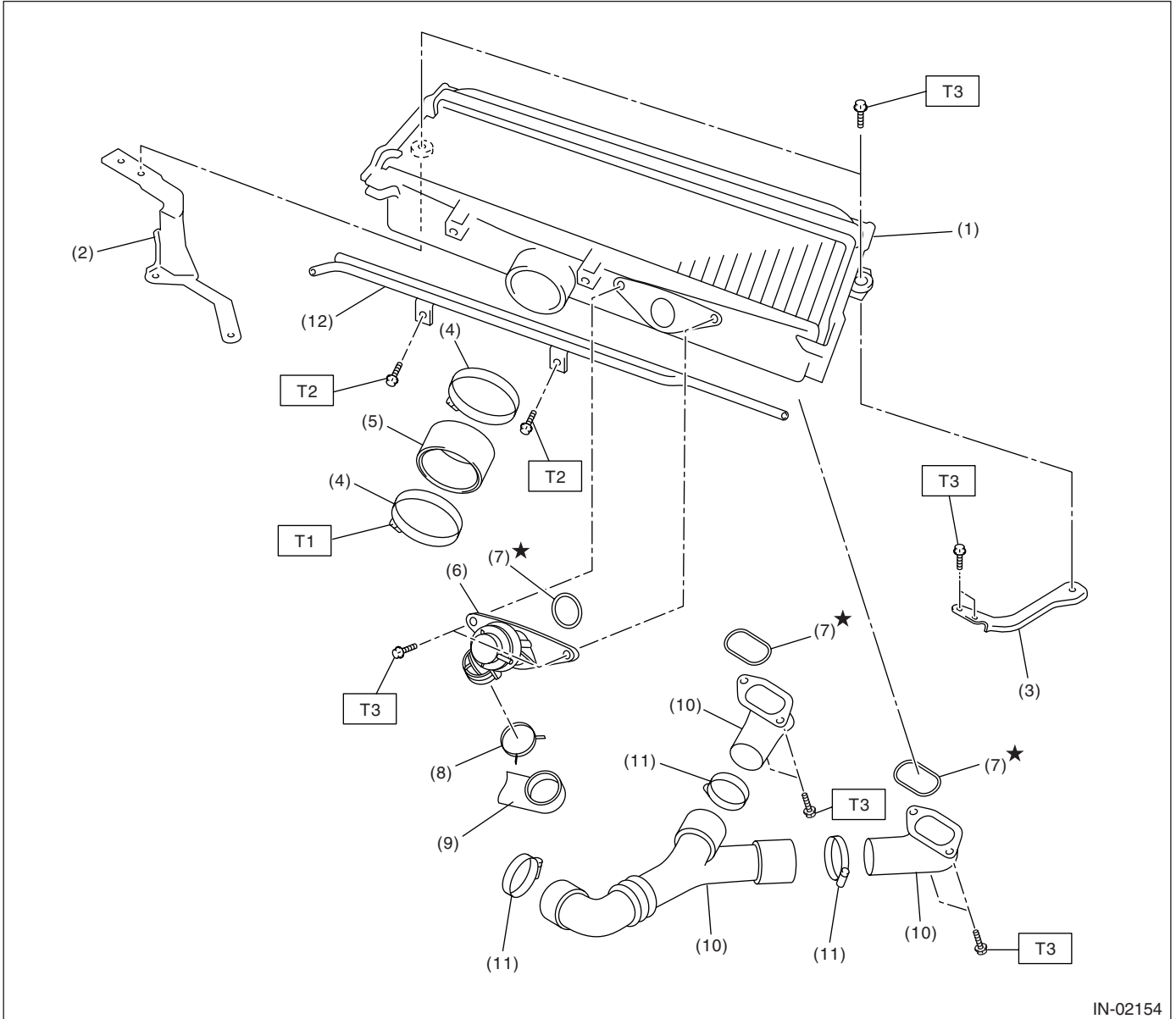
**T1: 19 (1.9, 13.7)**

**T2: 3 (0.3, 2.2)**

# General Description

INTAKE (INDUCTION)

## 3. INTERCOOLER



IN-02154

- |                            |                        |
|----------------------------|------------------------|
| (1) Intercooler            | (7) O-ring             |
| (2) Intercooler bracket RH | (8) Clamp              |
| (3) Intercooler bracket LH | (9) Air by-pass hose A |
| (4) Clamp                  | (10) Intercooler duct  |
| (5) Air intake duct        | (11) Clamp             |
| (6) Air by-pass valve      | (12) PCV pipe          |

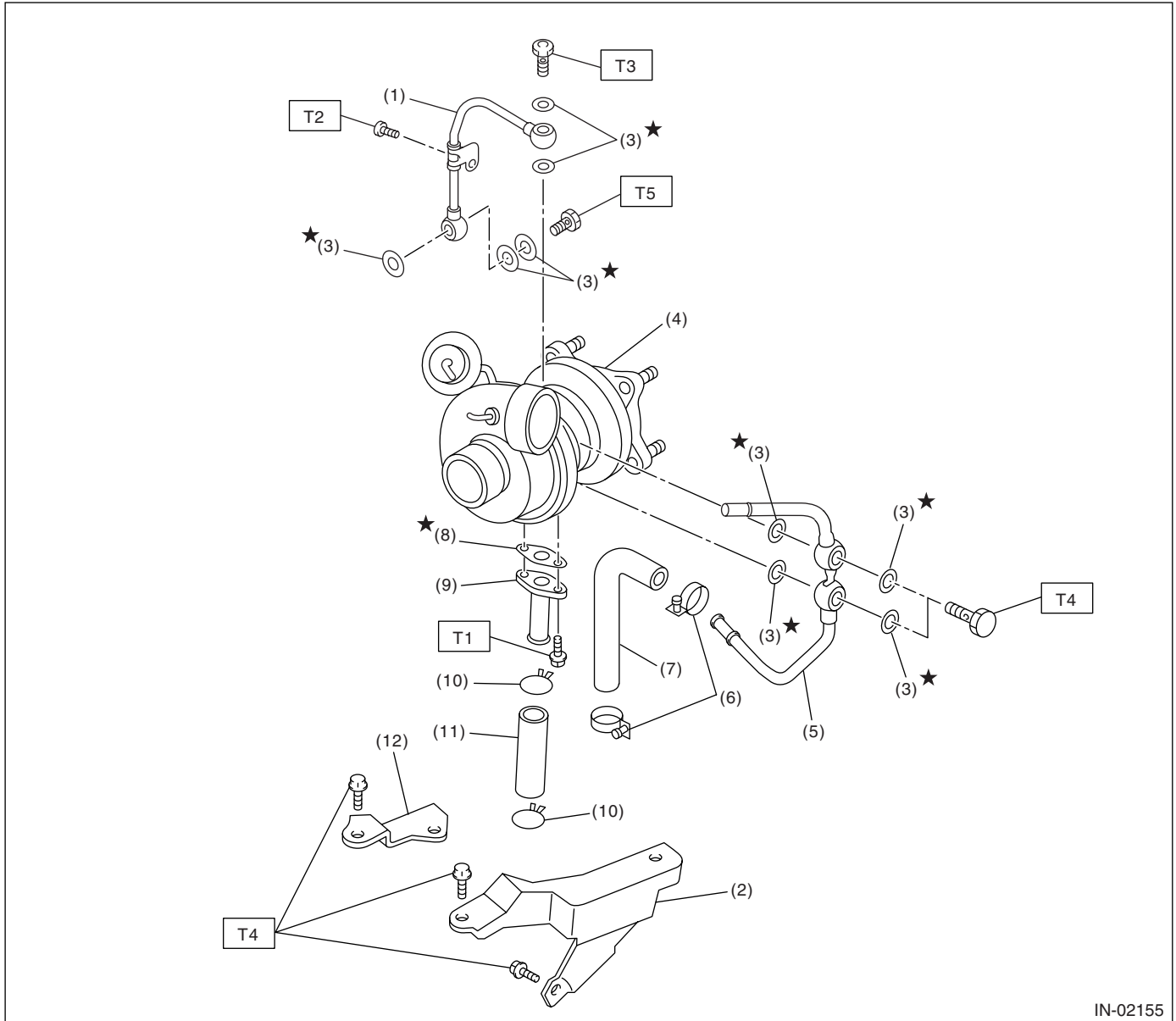
**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 3 (0.3, 2.2)**

**T2: 6.3 (0.64, 4.6)**

**T3: 16 (1.6, 11.6)**

## 4. TURBOCHARGER



IN-02155

- |                             |                              |
|-----------------------------|------------------------------|
| (1) Oil inlet pipe A        | (7) Engine coolant hose      |
| (2) Turbocharger bracket LH | (8) Gasket                   |
| (3) Metal gasket            | (9) Oil outlet pipe          |
| (4) Turbocharger            | (10) Clip                    |
| (5) Water pipe              | (11) Oil outlet hose         |
| (6) Clamp                   | (12) Turbocharger bracket RH |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 4.4 (0.45, 3.3)**

**T2: 4.9 (0.50, 3.6)**

**T3: 16 (1.6, 11.6)**

**T4: 33 (3.4, 24.6)**

**T5: 29 (3.0, 21.7)**



## General Description

### INTAKE (INDUCTION)

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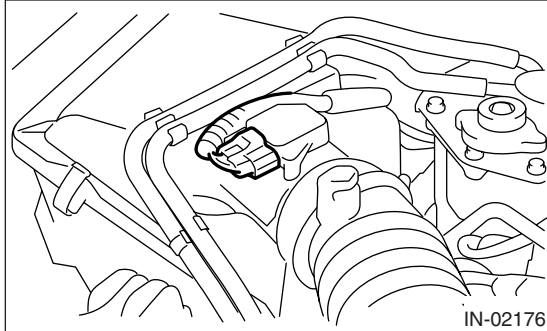
#### **B: CAUTION**

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensor or units, be sure to disconnect the ground cable from battery.

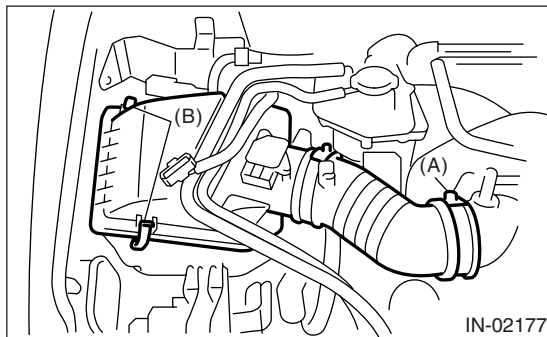
## 2. Air Cleaner Element

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from mass air flow and intake air temperature sensor.



- 3) Loosen the clamp (A) which connects the air intake boot and intake duct.
- 4) Remove the clip (B) from air cleaner upper cover.



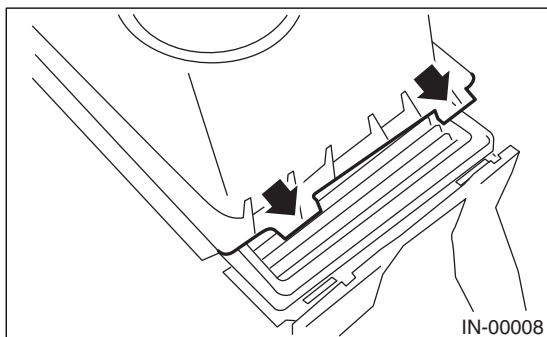
- 5) Remove the air cleaner upper cover.
- 6) Remove the air cleaner element.

### B: INSTALLATION

Install in the reverse order of removal.

#### NOTE:

Before installing the air cleaner upper cover, align the holes with protruding portions of air cleaner lower case, then secure the upper cover to the lower case.



### C: INSPECTION

Replace it if excessively damaged or dirty.

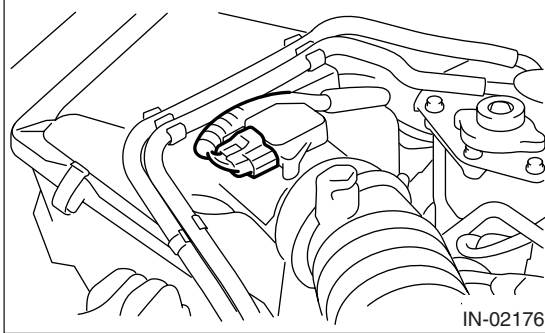
# Air Cleaner Case

INTAKE (INDUCTION)

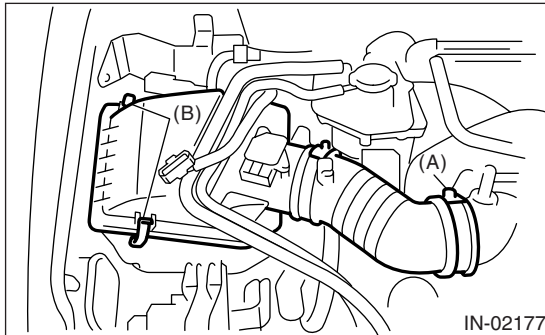
## 3. Air Cleaner Case

### A: REMOVAL

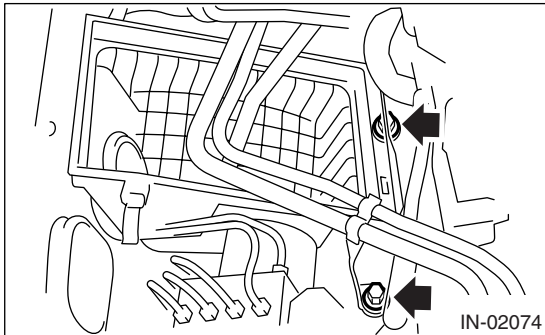
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from mass air flow and intake air temperature sensor.



- 3) Loosen the clamp (A) which connects the air intake boot and intake duct.
- 4) Remove the clip (B) from air cleaner upper cover.



- 5) Remove the air cleaner upper cover.
- 6) Remove the air cleaner element.
- 7) Remove the air cleaner lower case.

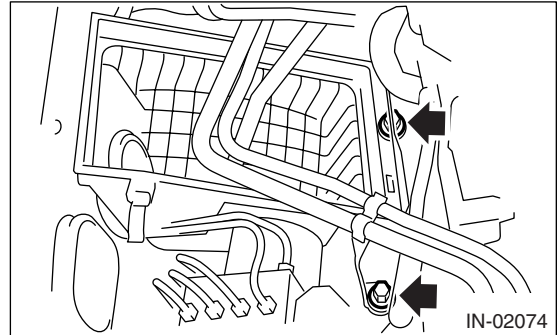


### B: INSTALLATION

Install in the reverse order of removal.

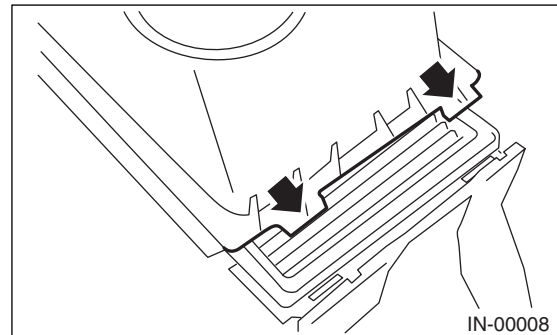
#### Tightening torque:

**33 N·m (3.4 kgf-m, 24.6 ft-lb)**



#### NOTE:

Before installing the air cleaner upper cover, align the holes with protruding portions of air cleaner lower case, then secure the upper cover to the lower case.



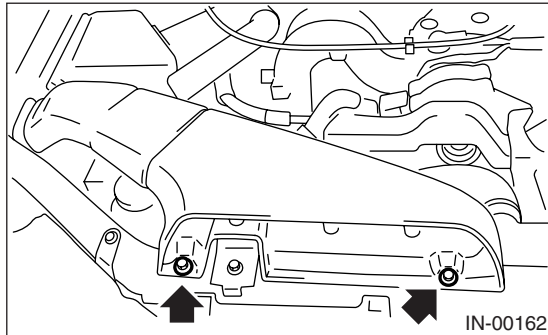
### C: INSPECTION

Inspect for cracks and loose connections.

## 4. Air Intake Duct

### A: REMOVAL

Remove the bolts which install the air intake duct on front side of body.

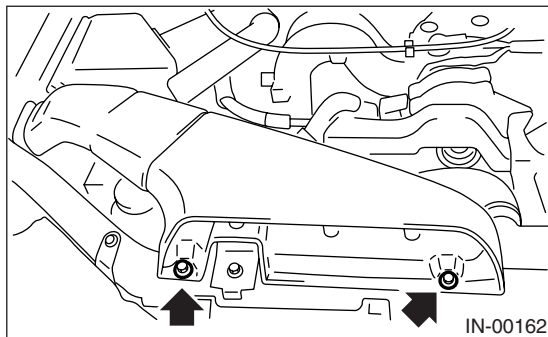


### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

**7.5 N·m (0.76 kgf-m, 55 ft-lb)**



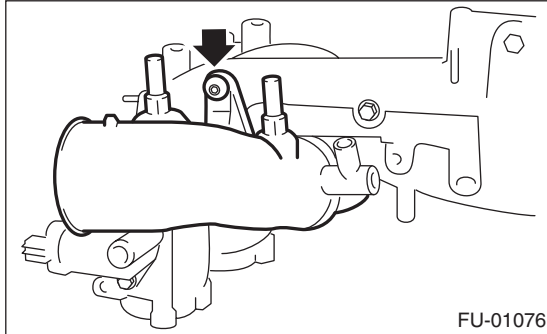
### C: INSPECTION

- 1) Inspect for cracks and loose connections.
- 2) Inspect that no foreign objects are mixed in air intake duct.

## 5. Intake Duct

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
- 3) Remove the sensor, engine harness and fuel pipe attached to intake manifold. <Ref. to FU(H4DOTC)-19, DISASSEMBLY, Intake Manifold.>
- 4) Remove the intake duct from intake manifold.

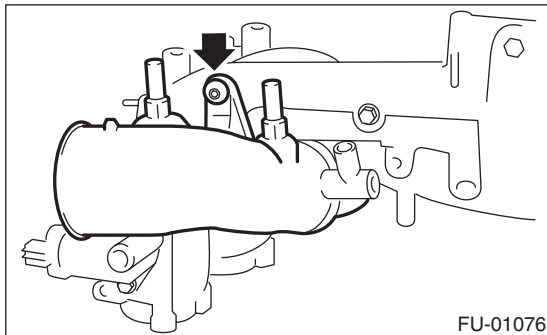


### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

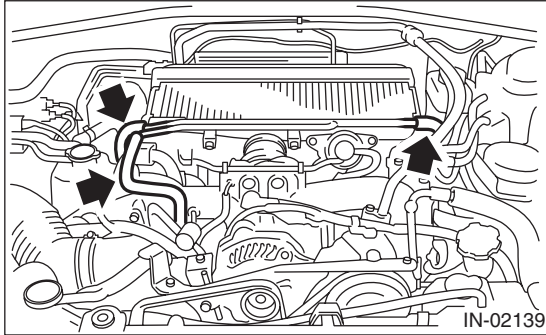
**19 N·m (1.9 kgf·m, 13.7 ft·lb)**



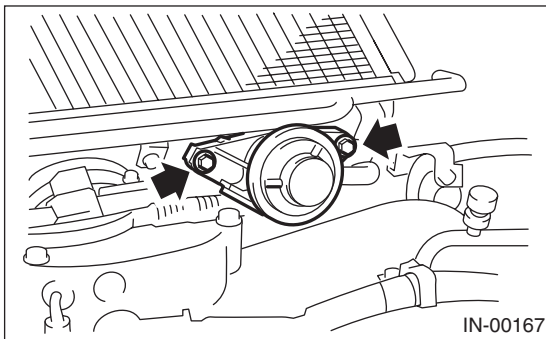
## 6. Intercooler

### A: REMOVAL

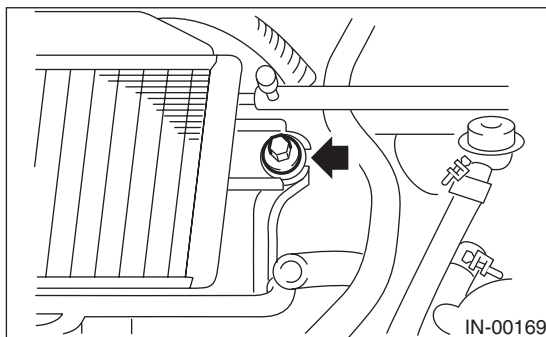
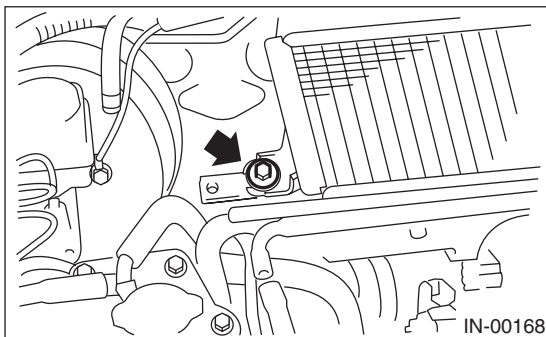
1) Disconnect the PCV hoses from PCV pipe.



2) Remove the air by-pass valve from intercooler.

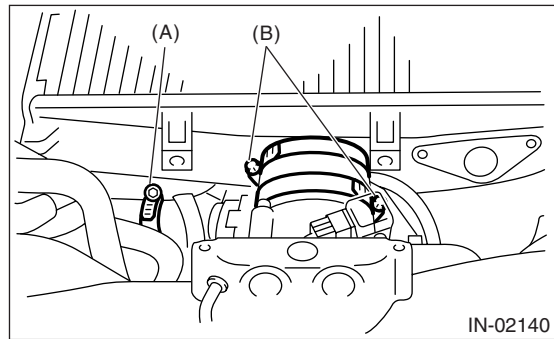


3) Remove the bolts which secure the intercooler to bracket.



4) Loosen the clamp (A) which connects the turbocharger to intercooler ducts.

5) Loosen the clamp (B) which connects the throttle body to intercooler.



6) Remove the intercooler air duct from turbocharger.

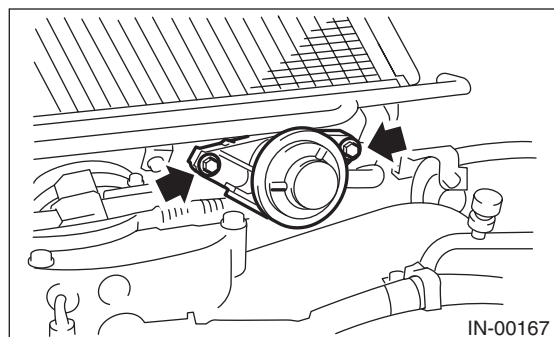
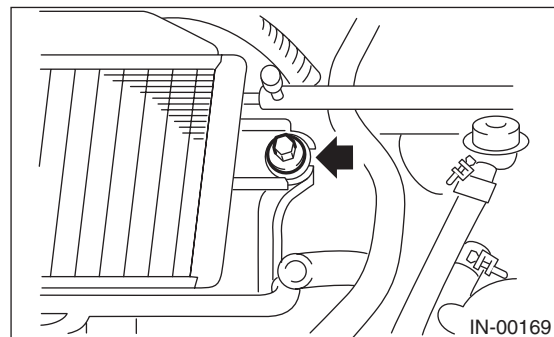
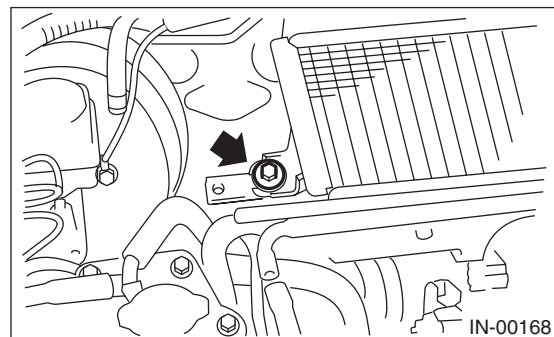
7) Remove the intercooler from throttle body.

### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**

**16 N·m (1.6 kgf-m, 11.6 ft-lb)**

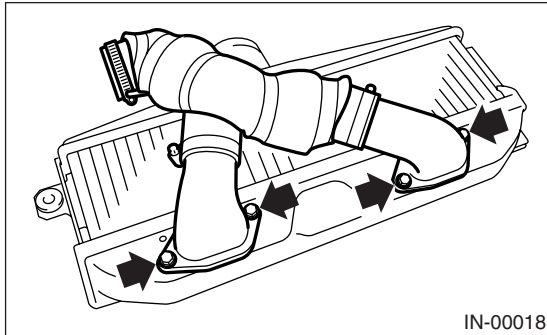


# Intercooler

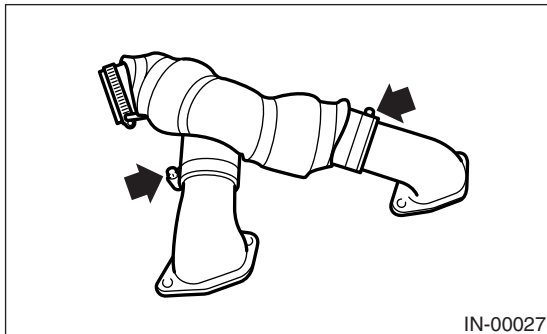
INTAKE (INDUCTION)

## C: DISASSEMBLY

1) Remove the intercooler ducts from intercooler.



2) Separate the intercooler ducts.



## D: ASSEMBLY

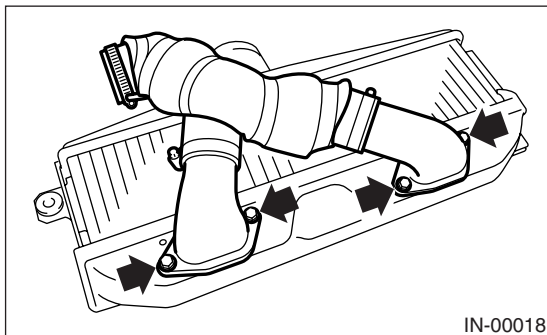
Assemble in the reverse order of disassembly.

NOTE:

Do not let the O-ring bite.

**Tightening torque:**

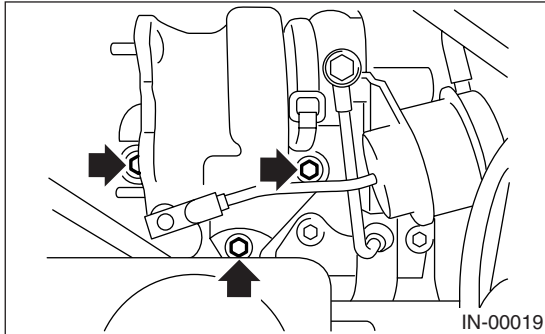
**16 N·m (1.6 kgf·m, 11.6 ft·lb)**



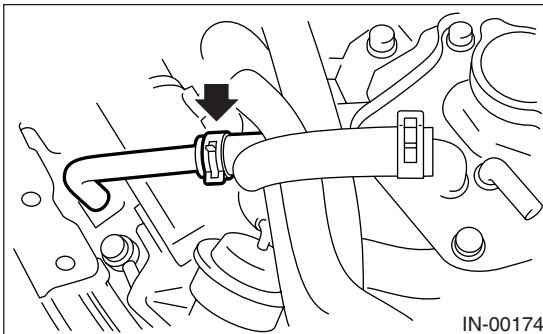
## 7. Turbocharger

### A: REMOVAL

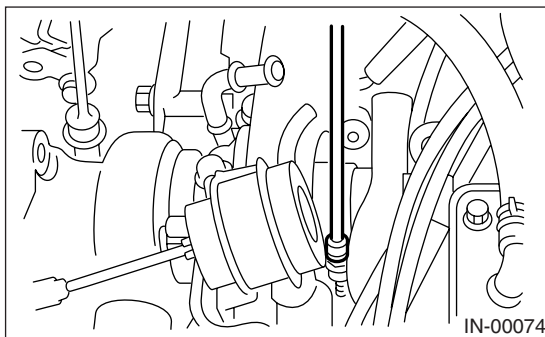
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>
- 4) Lower the vehicle.
- 5) Disconnect the turbocharger joint pipe from turbo-charger.



- 6) Disconnect the engine coolant hose which is connected to coolant filler tank.

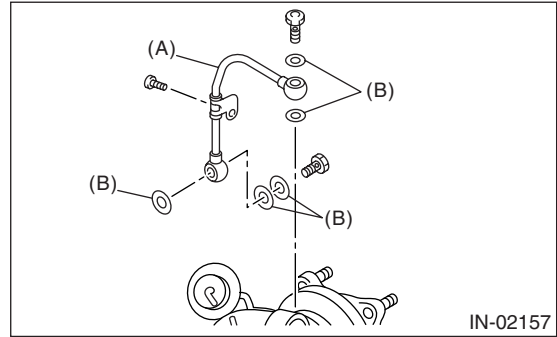


- 7) Loosen the clamp which secures the turbocharger to intake duct.

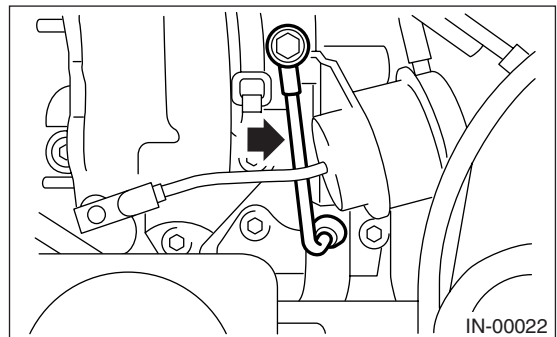


- 8) Remove the bolt which secures the bracket of oil inlet pipe to turbocharger.

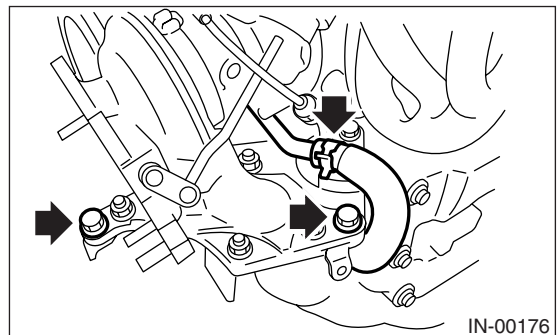
- 9) Remove the oil inlet pipe from turbocharger.



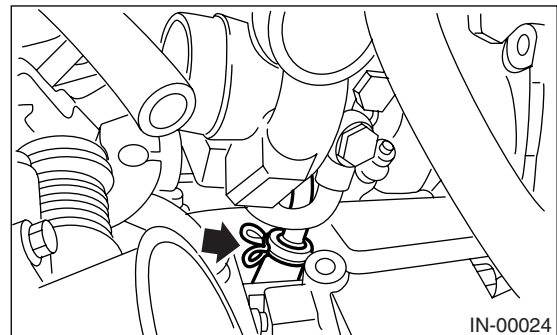
- (A) Oil inlet pipe  
(B) Metal gasket



- 10) Disconnect the engine coolant hose.
- 11) Remove the turbocharger bracket.



- 12) Disconnect the oil outlet hose from pipe.



- 13) Take out the turbocharger from engine compartment.



# Turbocharger

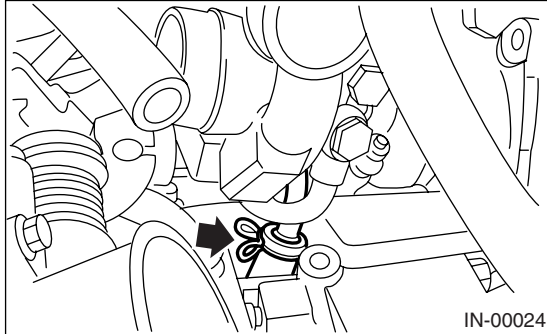
## INTAKE (INDUCTION)

### B: INSTALLATION

#### CAUTION:

When replacing the turbocharger, check the filter part of union screw for clogging. <Ref. to LU(H4DOTC)-20, INSPECTING UNION SCREW WITH FILTER, INSPECTION, Oil Pipe.>

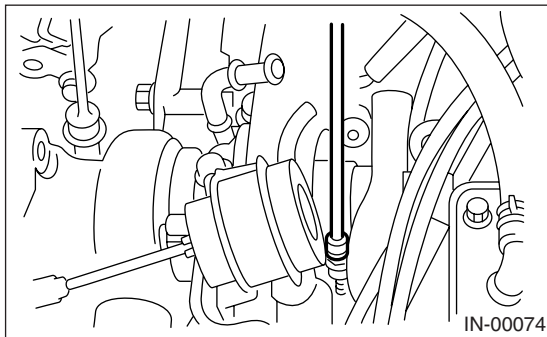
1) Connect the oil outlet hose to outlet pipe.



2) Install the turbocharger to intake duct.

#### Tightening torque:

**3 N·m (0.3 kgf-m, 2.2 ft-lb)**



3) Install the oil inlet pipe to turbocharger.

#### NOTE:

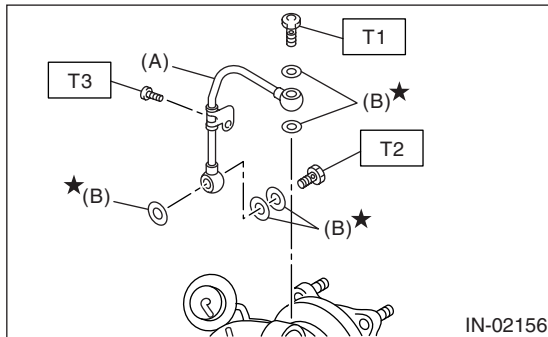
Replace the gasket with new one.

#### Tightening torque:

**T1: 16 N·m (1.6 kgf-m, 11.6 ft-lb)**

**T2: 29 N·m (3.0 kgf-m, 21.7 ft-lb)**

**T3: 4.9 N·m (0.50 kgf-m, 3.6 ft-lb)**



- (A) Oil inlet pipe
- (B) Metal gasket

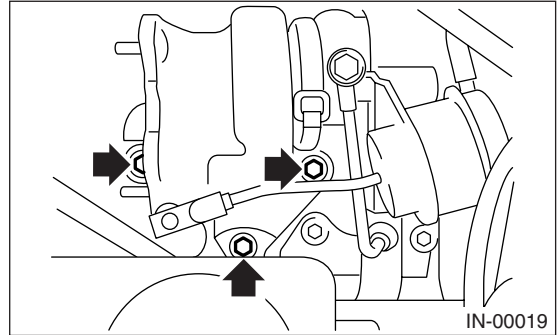
4) Install the joint pipe to turbocharger.

#### NOTE:

Replace the gasket with a new one.

#### Tightening torque:

**35 N·m (3.6 kgf-m, 25.8 ft-lb)**

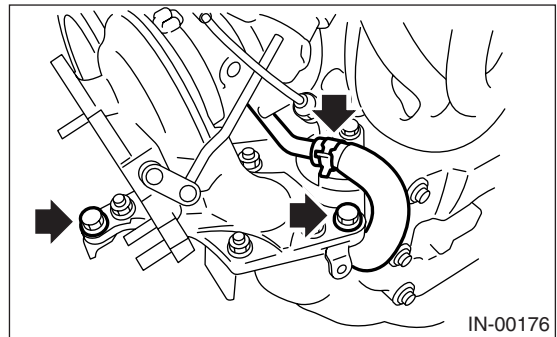


5) Connect the engine coolant hose.

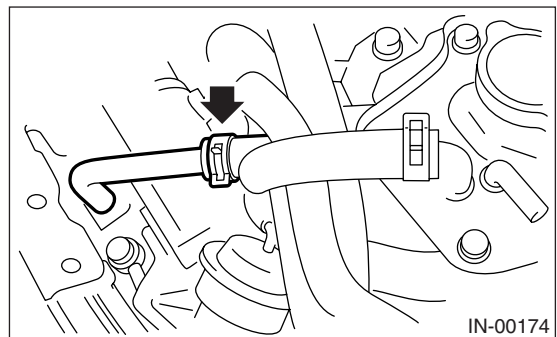
6) Install the turbocharger bracket.

#### Tightening torque:

**33 N·m (3.4 kgf-m, 24.6 ft-lb)**



7) Connect the engine coolant hose which is connected to coolant filler tank.



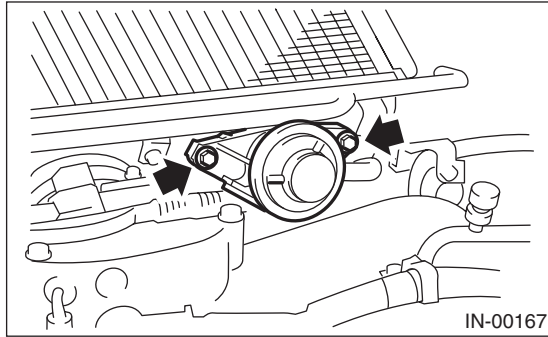
8) Lift-up the vehicle.

9) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-11, INSTALLATION, Center Exhaust Pipe.>

## 8. Air By-pass Valve

### A: REMOVAL

1) Remove the air by-pass valve from intercooler.



2) Disconnect the air by-pass hoses from air by-pass valve.

### B: INSTALLATION

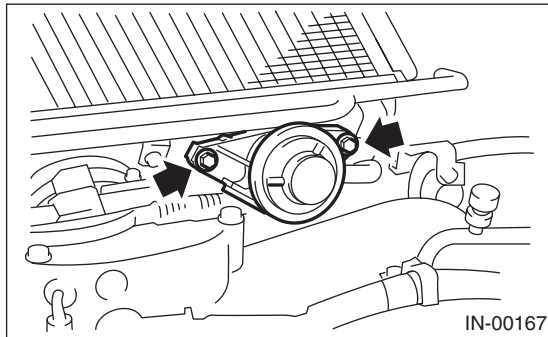
Install in the reverse order of removal.

NOTE:

Do not let the O-ring bite.

**Tightening torque:**

**16 N·m (1.6 kgf·m, 11.6 ft·lb)**



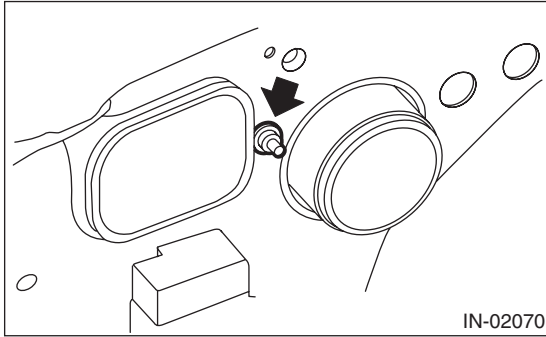
# Resonator Chamber

INTAKE (INDUCTION)

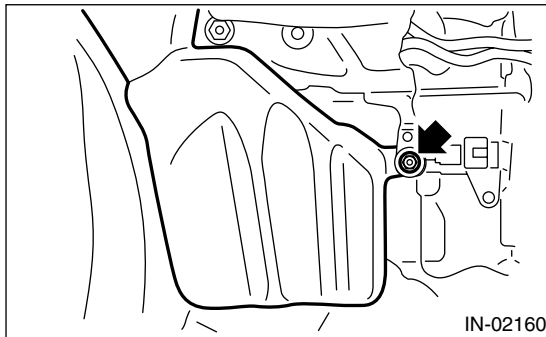
## 9. Resonator Chamber

### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
- 3) Remove the air cleaner lower case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- 4) Remove the resonator chamber mounting nut on right side of engine compartment.



- 5) Remove the front wheel RH, and lift up the vehicle.
- 6) Remove the front mud guard RH.
- 7) Remove the resonator chamber from the inside front fender.

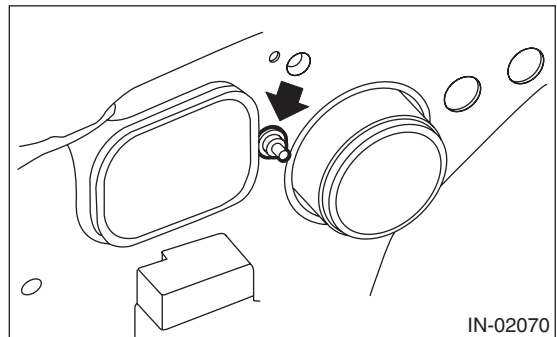
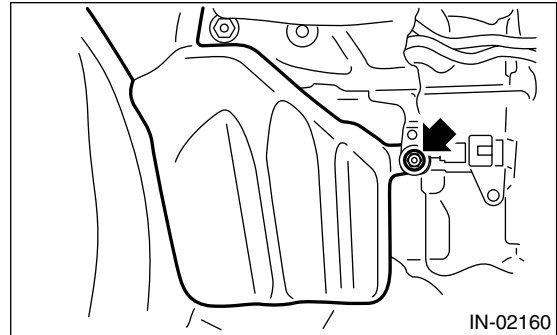


### B: INSTALLATION

Install in the reverse order of removal.

#### **Tightening torque:**

**7.5 N·m (0.76 kgf-m, 5.5 ft-lb)**



### C: INSPECTION

- 1) Inspect for cracks and loose connections.
- 2) Inspect that no foreign objects are mixed in resonator chamber.

# MECHANICAL

# *ME(H4DOTC)*

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# General Description

MECHANICAL

## 1. General Description

### A: SPECIFICATION

|  |   |               |   |                                  |                            |                           |
|--|---|---------------|---|----------------------------------|----------------------------|---------------------------|
| Engine   | Type                                    |               | Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine |                                  |                            |                           |
|  | Valve arrangement                       |               | Belt driven, double overhead camshaft, 4-valve/cylinder                   |                                  |                            |                           |
|  | Bore × Stroke                           |               | mm (in)   | 99.5 × 79.0 (3.92 × 3.11)        |                            |                           |
|  | Piston displacement                     |               | cm <sup>3</sup> (cu in)   | 2,457 (149.94)                   |                            |                           |
|  | Compression ratio                       |               | 8.4   |                                  |                            |                           |
|  | Compression pressure (at 200 — 300 rpm) |               | kPa (kgf/cm <sup>2</sup> , psi)   | 981 — 1,177 (10 — 12, 142 — 171) |                            |                           |
|  | Number of piston rings                  |               | Pressure ring: 2, Oil ring: 1   |                                  |                            |                           |
|  | Intake valve timing                     |               | Opening   | Max. retard                      | 5° ATDC                    |                           |
|  |   |               |   | Max. advance                     | 15° BTDC                   |                           |
|  |   |               | Closing   | Max. retard                      | 65° ABDC                   |                           |
|  |   |               |   | Max. advance                     | 45° ABDC                   |                           |
|  | Exhaust valve timing                    |               | Opening   |                                  | 55° BBDC                   |                           |
|  |   |               | Closing   |                                  | 5° ATDC                    |                           |
|  | Valve clearance                         |               | mm (in)   | Intake                           | STD                        | 0.20±0.02 (0.0079±0.0008) |
|  |   |               |   | Exhaust                          | STD                        | 0.35±0.02 (0.0138±0.0008) |
| Idling speed [At neutral position on MT or "P" or "N" range on AT] |   | rpm           | No load   |                                  | MT: 700±100<br>AT: 700±100 |                           |
|  |   |               | A/C ON  | A/C Refrigerant pressure (LOW)   | MT: 725±100<br>AT: 750±100 |                           |
|  |   |               |   | A/C Refrigerant pressure (HIGH)  | MT: 800±100<br>AT: 825±100 |                           |
| Firing order   |   | 1 → 3 → 2 → 4 |   |                                  |                            |                           |
| Ignition timing  |   | BTDC/rpm      | MT model  | 17°±10°/700                      |                            |                           |
|  |   |               | AT model  | 17°±10°/700                      |                            |                           |

**NOTE:**

STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter OS: Oversize US: Undersize

|                          |                                      |         |                              |                                   |  |
|--------------------------|--------------------------------------|---------|------------------------------|-----------------------------------|--|
| Belt tension adjuster    | Protrusion of adjuster rod           |         | mm (in)                      | 5.2 — 6.2 (0.205 — 0.244)         |  |
| Belt tensioner           | Spacer O.D.                          |         | mm (in)                      | 17.955 — 17.975 (0.7069 — 0.7077) |  |
|                          | Tensioner bushing I.D.               |         | mm (in)                      | 18.0 — 18.08 (0.7087 — 0.7118)    |  |
|                          | Clearance between spacer and bushing | mm (in) | STD                          | 0.025 — 0.125 (0.0010 — 0.0049)   |  |
|                          |                                      |         | Limit                        | 0.175 (0.069)                     |  |
| Side clearance of spacer | mm (in)                              | STD     | 0.2 — 0.55 (0.0079 — 0.0217) |                                   |  |
|                          |                                      | Limit   | 0.81 (0.0319)                |                                   |  |

# General Description

MECHANICAL

|  |   |         |                      |                                 |   |                                   |
|--|---|---------|----------------------|---------------------------------|---|-----------------------------------|
| Camshaft                                 | Bend limit  |         | mm (in)              | 0.020 (0.00079)                 |   |                                   |
|  | Thrust clearance                                  |         | mm (in)              | STD                             | 0.068 — 0.116 (0.0027 — 0.0046)                   |                                   |
|  |   |         |                      | Limit                           | 0.14 (0.0055)                                     |                                   |
|  | Cam lobe height                                   |         | mm (in)              | Intake                          | STD   | 46.55 — 46.65 (1.833 — 1.837)     |
|  |   |         |                      | Limit                           | 46.45(1.829)                                      |                                   |
|  |   |         | Exhaust              | STD                             | 46.75 — 46.85 (1.841 — 1.844)                     |                                   |
|  |   |         |                      | Limit                           | 46.65(1.837)                                      |                                   |
|  | Journal O.D.                                      |         | mm (in)              | STD                             | Front   | 37.946 — 37.963 (1.4939 — 1.4946) |
|  |   |         |                      |                                 | Center rear                                       | 29.946 — 29.963 (1.1790 — 1.1796) |
|  |   |         |                      |                                 | Oil clearance                                     | mm (in)                           |
|  |   |         | Limit                | 0.10 (0.0039)                   |   |                                   |
| Cylinder head                            | Surface warpage limit (mating with cylinder head) |         | mm (in)              | 0.035 (0.0014)                  |   |                                   |
|  | Surface grinding limit                            |         | mm (in)              | 0.3 (0.012)                     |   |                                   |
|  | Standard height                                   |         | mm (in)              | 127.5 (5.02)                    |   |                                   |
| Valve seat                               | Refacing angle                                    |         |                      | 90°                             |   |                                   |
|  | Contacting width                                  |         | mm (in)              | Intake                          | STD   | 0.6 — 1.4 (0.024 — 0.055)         |
|  |   |         |                      | Limit                           | 1.7 (0.067)                                       |                                   |
|  |   |         | Exhaust              | STD                             | 1.2 — 1.8 (0.047 — 0.071)                         |                                   |
|  |   |         |                      | Limit                           | 2.2 (0.087)                                       |                                   |
| Valve guide                              | Inside diameter                                   |         | mm (in)              | 6.000 — 6.012 (0.2362 — 0.2367) |   |                                   |
|  | Protrusion above head                             |         | mm (in)              | 15.8 — 16.2 (0.622 — 0.638)     |   |                                   |
| Valve                                    | Head edge thickness                               |         | mm (in)              | Intake                          | STD   | 1.0 — 1.4 (0.039 — 0.055)         |
|  |   |         |                      | Limit                           | 0.8 (0.031)                                       |                                   |
|  |   |         | Exhaust              | STD                             | 1.3 — 1.7 (0.051 — 0.067)                         |                                   |
|  |   |         |                      | Limit                           | 0.8 (0.031)                                       |                                   |
|  | Stem diameter                                     |         | mm (in)              | Intake                          | 5.955 — 5.970 (0.2344 — 0.2350)                   |                                   |
|  |   |         |                      | Exhaust                         | 5.945 — 5.960 (0.2341 — 0.2346)                   |                                   |
|  | Stem oil clearance                                |         | mm (in)              | STD                             | Intake  | 0.030 — 0.057 (0.0012 — 0.0022)   |
|  |   |         |                      |                                 | Exhaust   | 0.040 — 0.067 (0.0016 — 0.0026)   |
|  |   |         | Limit                | —                               | 0.15 (0.0059)                                     |                                   |
| Overall length                           |   | mm (in) | Intake               | 104.4 (4.110)                   |   |                                   |
|  |   |         | Exhaust              | 104.65 (4.120)                  |   |                                   |
| Valve spring                             | Free length                                       |         | mm (in)              | 47.32 (1.863)                   |   |                                   |
|  | Squareness  |         |                      | 2.5°, 2.1 mm (0.083 in) or less |   |                                   |
|  | Tension/spring height                             |         | N (kgf, lbf)/mm (in) | Set                             | 205 — 235 (20.9 — 24.0, 46.1 — 52.8)/36.0 (1.417) |                                   |
|  |   |         |                      | Lift                            | 426 — 490 (43.4 — 50.0, 95.8 — 110)/26.50 (1.043) |                                   |
| Cylinder block                           | Surface warpage limit (mating with cylinder head) |         | mm (in)              | 0.025 (0.00098)                 |   |                                   |
|  | Surface grinding limit                            |         | mm (in)              | 0.1 (0.004)                     |   |                                   |
|  | Standard height                                   |         | mm (in)              | 201.0 (7.91)                    |   |                                   |
|  | Inside diameter                                   |         | mm (in)              | STD                             | A   | 99.505 — 99.515 (3.9175 — 3.9179) |
|  |   |         |                      |                                 | B   | 99.495 — 99.505 (3.9171 — 3.9175) |
|  | Taper   |         | mm (in)              | STD                             | 0.015 (0.0006)                                    |                                   |
|  |   |         |                      | Limit                           | 0.050 (0.0020)                                    |                                   |
|  | Out-of-roundness                                  |         | mm (in)              | STD                             | 0.010 (0.0004)                                    |                                   |
|  |   |         |                      | Limit                           | 0.050 (0.0020)                                    |                                   |
|  | Piston clearance                                  |         | mm (in)              | STD                             | -0.010 — 0.010 (-0.0004 — 0.0004)                 |                                   |
| Limit                                    |   |         |                      | 0.030 (0.0012)                  |   |                                   |
| Cylinder enlarging (boring) limit (dia.) |   | mm (in) | To 100.005 (3.937)   |                                 |   |                                   |

# General Description

## MECHANICAL

|                        |  |  |                  |  |  |
|------------------------|--|--|------------------|--|--|
| Piston                 | Outer diameter   | mm (in)                                  | STD              | A  | 99.505 — 99.515 (3.9175 — 3.9179)                |
|                        |  |  |                  | B  | 99.495 — 99.505 (3.9171 — 3.9175)                |
|                        |  |  | 0.25 (0.0098) OS |  | 99.745 — 99.765 (3.9270 — 3.9278)                |
|                        |  |  | 0.50 (0.0197) OS |  | 99.995 — 100.015 (3.9368 — 3.9376)               |
| Piston pin             | Standard clearance between piston pin and hole in piston |  | mm (in)          | STD  | 0.004 — 0.008 (0.0002 — 0.0003)                  |
|                        |  |  |                  | Limit  | 0.020 (0.0008)                                   |
|                        | Degree of fit  |  |                  | Piston pin must be fitted into position with thumb at 20°C (68°F). |  |
| Piston ring            | Piston ring gap  | mm (in)                                  | Top ring         | STD  | Outer circle side: 0.20 — 0.25 (0.0079 — 0.0098) |
|                        |  |  |                  | Limit  | Inner circle side: 0.20 — 0.30 (0.0079 — 0.0117) |
|                        |  |  | Second ring      | STD  | 1.0 (0.039)                                      |
|                        |  |  |                  | Limit  | 0.37 — 0.52 (0.015 — 0.020)                      |
|                        |  |  | Oil ring         | STD  | 1.0 (0.039)                                      |
|                        |  |  |                  | Limit  | 0.20 — 0.50 (0.0079 — 0.0197)                    |
|                        | Clearance between piston ring and piston ring groove     | mm (in)                                  | Top ring         | STD  | 0.04 — 0.08 (0.0016 — 0.0031)                    |
|                        |  |  |                  | Limit  | 0.15 (0.0059)                                    |
|                        |  |  | Second ring      | STD  | 0.030 — 0.070 (0.0012 — 0.0028)                  |
|                        |  |  |                  | Limit  | 0.15 (0.0059)                                    |
| Connecting rod         | Bend twist per 100 mm (3.94 in) in length                |  | mm (in)          | Limit  | 0.10 (0.0039)                                    |
|                        | Side clearance   |  | mm (in)          | STD  | 0.070 — 0.330 (0.0028 — 0.0130)                  |
|                        |  |  |                  | Limit  | 0.4 (0.016)                                      |
| Connecting rod bearing | Oil clearance  |  | mm (in)          | STD  | 0.017 — 0.045 (0.0007 — 0.0018)                  |
|                        |  |  |                  | Limit  | 0.05 (0.0020)                                    |
|                        | Thickness at center portion                              |  | mm (in)          | STD  | 1.490 — 1.502 (0.0587 — 0.0591)                  |
|                        |  |  |                  | 0.03 (0.0012) US   | 1.504 — 1.512 (0.0592 — 0.0595)                  |
|                        |  |  |                  | 0.05 (0.0020) US   | 1.514 — 1.522 (0.0596 — 0.0599)                  |
|                        |  |  |                  | 0.25 (0.0098) US   | 1.614 — 1.622 (0.0635 — 0.0639)                  |
|                        | Connecting rod bushing                                   | Clearance between piston pin and bushing |                  | mm (in)  | STD  |
| Limit                  |  |  |                  |  | 0.030 (0.0012)                                   |

# General Description

MECHANICAL

|              |                              |            |                           |                                   |
|--------------|------------------------------|------------|---------------------------|-----------------------------------|
| Crankshaft   | Bend limit                   |            | mm (in)                   | 0.035 (0.0014)                    |
|              | Crank pin                    | mm (in)    | Out-of-roundness          | 0.003 (0.0001)                    |
|              |                              |            | Cylindricality            | 0.004 (0.0002)                    |
|              |                              |            | Grinding limit (diameter) | To 51.750 (2.0374)                |
|              |                              |            | Out-of-roundness          | 0.005 (0.0002)                    |
|              | Crank journal                | mm (in)    | Cylindricality            | 0.006 (0.0002)                    |
|              |                              |            | Grinding limit (diameter) | To 59.750 (2.3524)                |
|              |                              |            | STD                       | 51.984 — 52.000 (2.0466 — 2.0472) |
|              | Crank pin outer diameter     | mm (in)    | 0.03 (0.0012) US          | 51.954 — 51.970 (2.0454 — 2.0461) |
|              |                              |            | 0.05 (0.0020) US          | 51.934 — 51.950 (2.0447 — 2.0453) |
|              |                              |            | 0.25 (0.0098) US          | 51.734 — 51.750 (2.0368 — 2.0374) |
|              |                              |            | STD                       | 59.992 — 60.008 (2.3619 — 2.3625) |
|              | Crank journal outer diameter | mm (in)    | 0.03 (0.0012) US          | 59.962 — 59.978 (2.3607 — 2.3613) |
|              |                              |            | 0.05 (0.0020) US          | 59.942 — 59.958 (2.3599 — 2.3605) |
|              |                              |            | 0.25 (0.0098) US          | 59.742 — 59.758 (2.3520 — 2.3527) |
|              |                              |            | STD                       | 0.030 — 0.115 (0.0012 — 0.0045)   |
|              | Side clearance               | mm (in)    | Limit                     | 0.25 (0.0098)                     |
|              |                              |            | STD                       | 0.010 — 0.030 (0.0004 — 0.0012)   |
|              | Oil clearance                | mm (in)    | Limit                     | 0.40 (0.016)                      |
|              |                              |            | STD                       | 1.998 — 2.011 (0.0787 — 0.0792)   |
| Main bearing | Thickness at center          | #1, #3     | mm (in)                   | 2.017 — 2.020 (0.0794 — 0.0795)   |
|              |                              |            | 0.03 (0.0012) US          | 2.027 — 2.030 (0.0798 — 0.0799)   |
|              |                              |            | 0.05 (0.0020) US          | 2.127 — 2.130 (0.0837 — 0.0839)   |
|              |                              |            | 0.25 (0.0098) US          | 2.000 — 2.013 (0.0787 — 0.0793)   |
|              |                              | #2, #4, #5 | STD                       | 2.019 — 2.022 (0.0795 — 0.0796)   |
|              |                              |            | 0.03 (0.0012) US          | 2.029 — 2.032 (0.0799 — 0.0800)   |
|              |                              |            | 0.05 (0.0020) US          | 2.129 — 2.132 (0.0838 — 0.0839)   |
|              |                              |            | 0.25 (0.0098) US          |                                   |

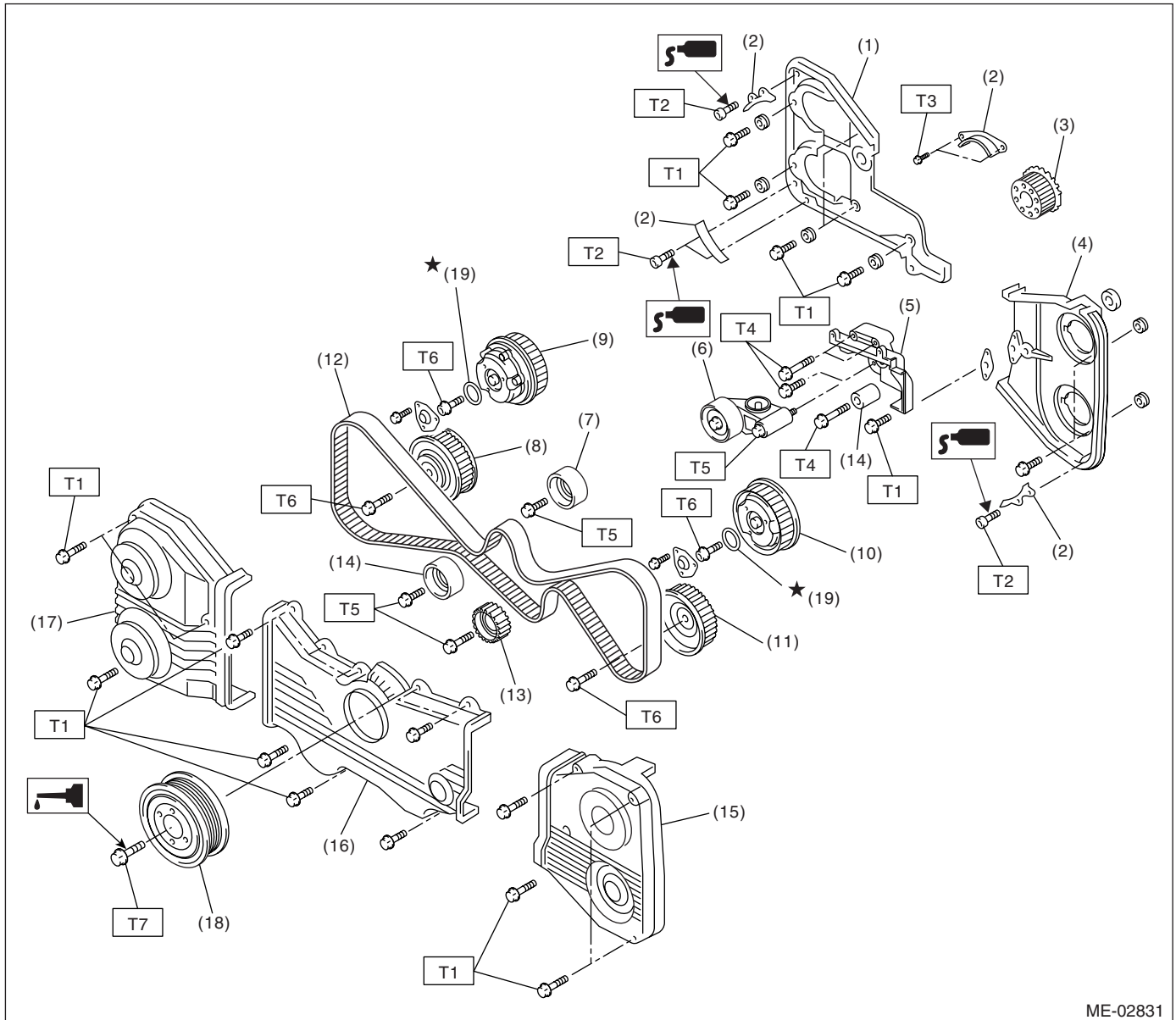


# General Description

MECHANICAL

## B: COMPONENT

### 1. TIMING BELT



ME-02831

- |  |                                |
|--|--------------------------------|
| (1) Timing belt cover No. 2 (RH)         | (10) Intake cam sprocket (LH)  |
| (2) Timing belt guide (MT model)         | (11) Exhaust cam sprocket (LH) |
| (3) Crank sprocket                       | (12) Timing belt               |
| (4) Timing belt cover No. 2 (LH)         | (13) Belt idler No. 2          |
| (5) Tensioner bracket                    | (14) Belt idler                |
| (6) Automatic belt tension adjuster ASSY | (15) Timing belt cover (LH)    |
| (7) Belt idler                           | (16) Front belt cover          |
| (8) Exhaust cam sprocket (RH)            | (17) Timing belt cover (RH)    |
| (9) Intake cam sprocket (RH)             | (18) Crank pulley              |
|  | (19) O-ring                    |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 5 (0.5, 3.6)**

**T2: 6.4 (0.65, 4.7)**

**T3: 9.75 (1.0, 7.2)**

**T4: 24.5 (2.5, 18.1)**

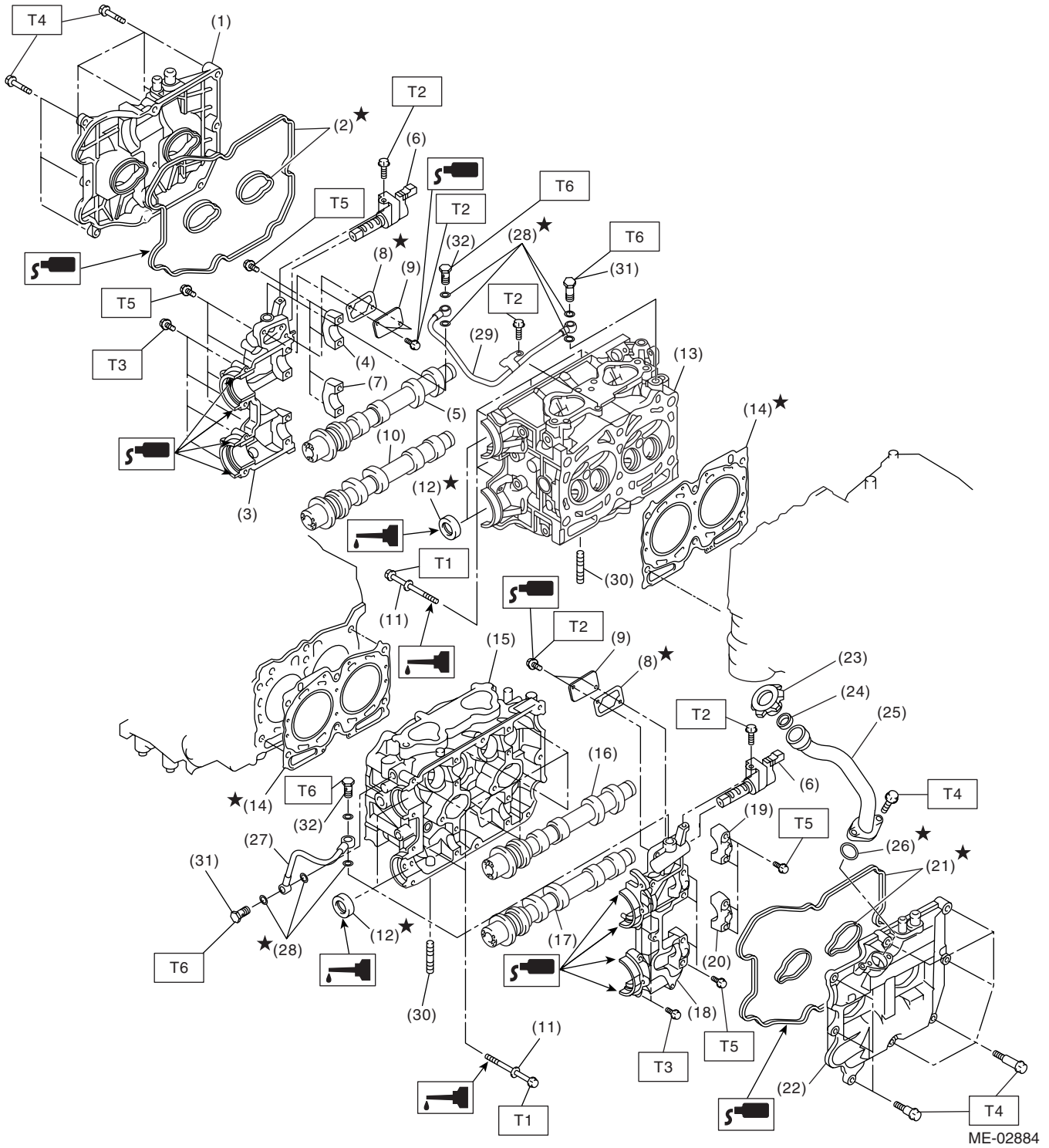
**T5: 39 (4.0, 28.9)**

**T6: <Ref. to ME(H4DOTC)-53, INSTALLATION, Cam Sprocket.>**

**T7: <Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>**

**ME(H4DOTC)-6**

## 2. CYLINDER HEAD AND CAMSHAFT



ME-02884

# General Description

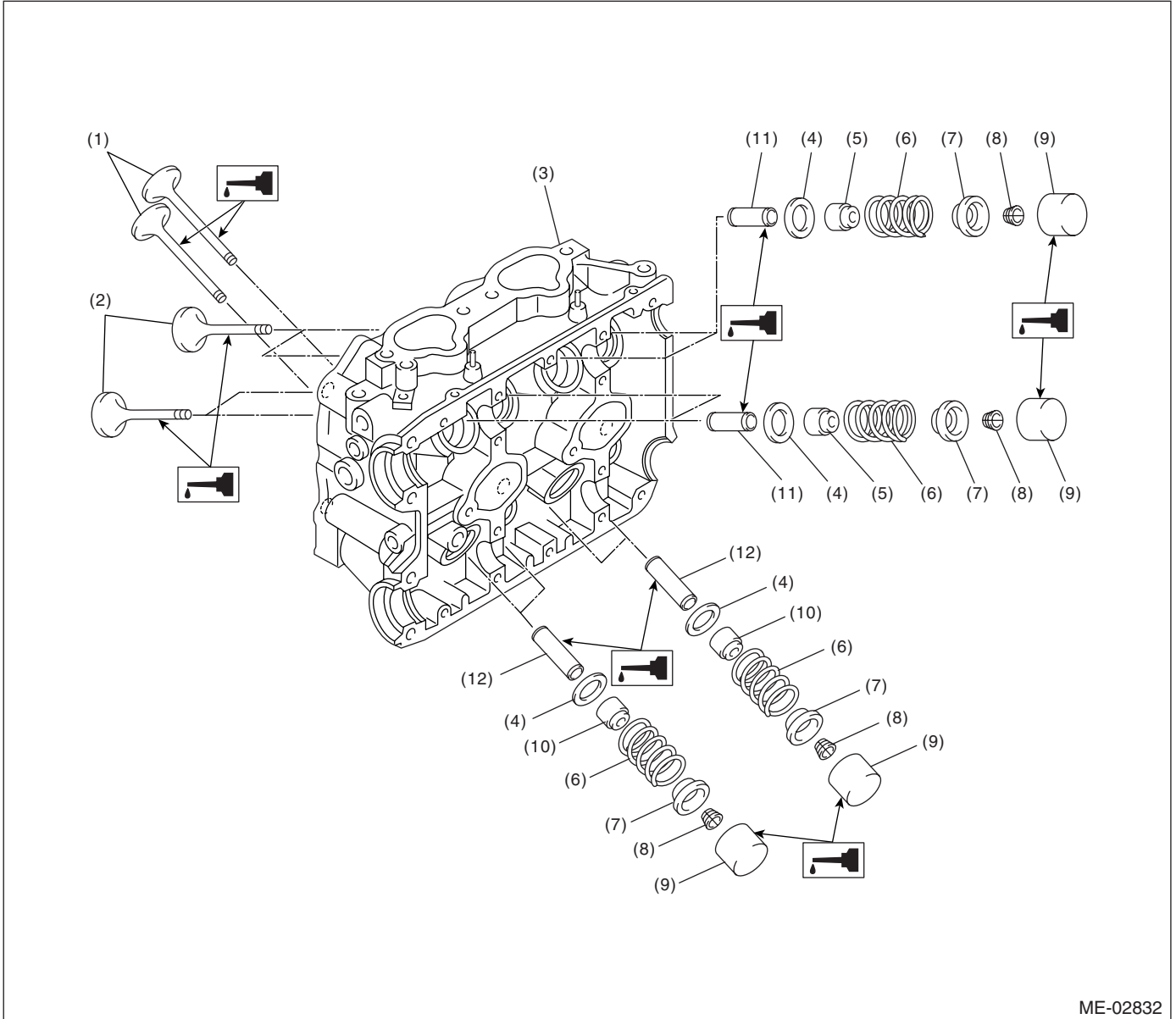
## MECHANICAL

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|                                     |                                     |  |
|-------------------------------------|-------------------------------------|--|
| (1) Rocker cover (RH)               | (15) Cylinder head (LH)             | (30) Stud bolt   |
| (2) Rocker cover gasket (RH)        | (16) Intake camshaft (LH)           | (31) Union screw with filter (with protrusion)                         |
| (3) Intake camshaft cap (Front RH)  | (17) Exhaust camshaft (LH)          | (32) Union screw without filter (without protrusion)                   |
| (4) Intake camshaft cap (Rear RH)   | (18) Camshaft cap (Front LH)        |  |
| (4) Intake camshaft cap (Rear RH)   | (19) Intake camshaft cap (Rear LH)  |  |
| (5) Intake camshaft (RH)            | (20) Exhaust camshaft cap (Rear LH) |  |
| (6) Oil flow control solenoid valve | (21) Rocker cover gasket (LH)       | <hr/> <b>Tightening torque: N·m (kgf·m, ft·lb)</b>                     |
| (7) Exhaust camshaft cap (Rear RH)  | (22) Rocker cover (LH)              | <b>T1: &lt;Ref. to ME(H4DOTC)-61, INSTALLATION, Cylinder Head.&gt;</b> |
| (8) Gasket                          | (23) Oil filler cap                 |  |
| (9) Oil return cover                | (24) Gasket                         |  |
| (10) Exhaust camshaft (RH)          | (25) Oil filler duct                | <b>T2: 8 (0.8, 5.9)</b>  |
| (11) Cylinder head bolt             | (26) O-ring                         | <b>T3: 9.75 (1.0, 7.2)</b>   |
| (12) Oil seal                       | (27) Oil pipe (LH)                  | <b>T4: 6.4 (0.65, 4.7)</b>   |
| (13) Cylinder head (RH)             | (28) Gasket                         | <b>T5: 20 (2.0, 14.8)</b>  |
| (14) Cylinder head gasket           | (29) Oil pipe (RH)                  | <b>T6: 29 (3.0, 21.4)</b>  |

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## 3. CYLINDER HEAD AND VALVE ASSEMBLY



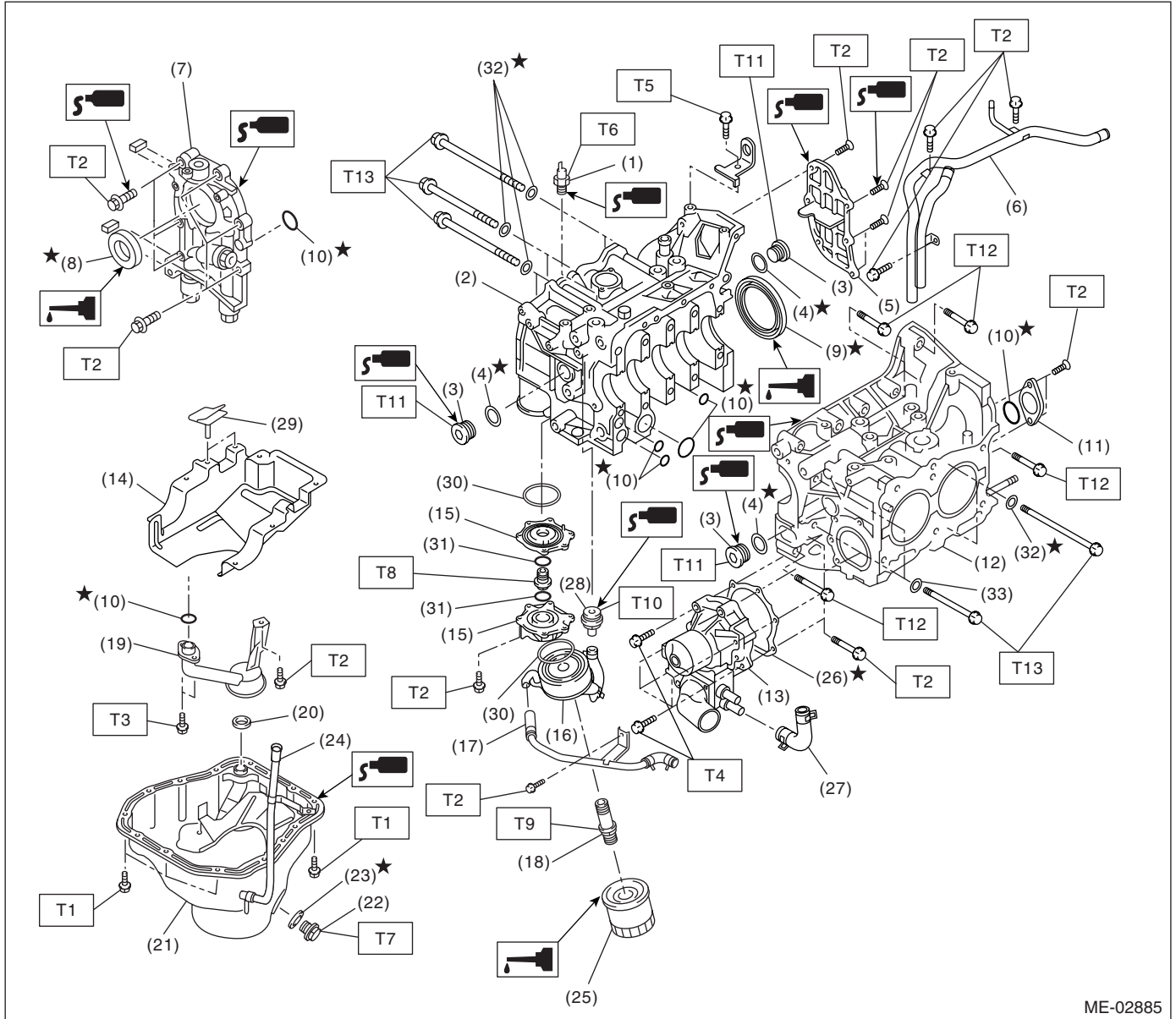
ME-02832

- |                       |                           |                             |
|-----------------------|---------------------------|-----------------------------|
| (1) Exhaust valve     | (5) Intake valve oil seal | (9) Valve lifter            |
| (2) Intake valve      | (6) Valve spring          | (10) Exhaust valve oil seal |
| (3) Cylinder head     | (7) Retainer              | (11) Intake valve guide     |
| (4) Valve spring seat | (8) Retainer key          | (12) Exhaust valve guide    |

# General Description

MECHANICAL

## 4. CYLINDER BLOCK



ME-02885

# General Description

MECHANICAL

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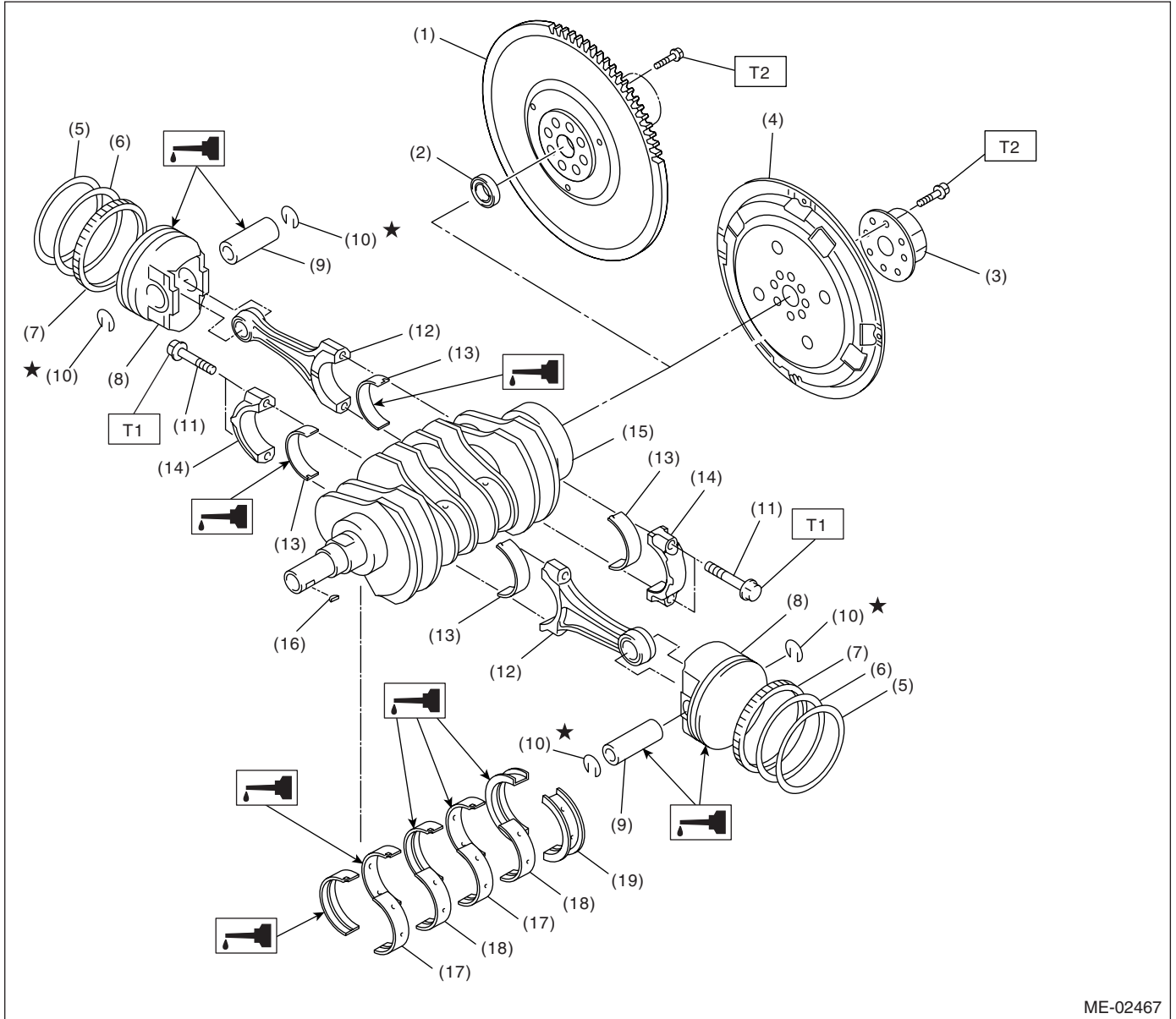
|                          |                            |  |
|--------------------------|----------------------------|--|
| (1) Oil pressure switch  | (18) Connector             | <b>Tightening torque: N-m (kgf-m, ft-lb)</b> |
| (2) Cylinder block (RH)  | (19) Oil strainer          | <b>T1: 5 (0.5, 3.6)</b>                      |
| (3) Service hole plug    | (20) Gasket                | <b>T2: 6.4 (0.65, 4.7)</b>                   |
| (4) Gasket               | (21) Oil pan               | <b>T3: 10 (1.0, 7.4)</b>                     |
| (5) Oil separator cover  | (22) Drain plug            | <b>T4: First 12 (1.2, 8.7)</b>               |
| (6) Water by-pass pipe   | (23) Metal gasket          | <b>Second 12 (1.2, 8.7)</b>                  |
| (7) Oil pump             | (24) Oil level gauge guide | <b>T5: 16 (1.6, 11.6)</b>                    |
| (8) Front oil seal       | (25) Oil filter            | <b>T6: 25 (2.5, 18.4)</b>                    |
| (9) Rear oil seal        | (26) Gasket                | <b>T7: 44 (4.5, 33)</b>                      |
| (10) O-ring              | (27) Water pump hose       | <b>T8: 45 (4.6, 33)</b>                      |
| (11) Service hole cover  | (28) Plug                  | <b>T9: 54 (5.3, 40)</b>                      |
| (12) Cylinder block (LH) | (29) Seal                  | <b>T10: 69 (7.0, 50.9)</b>                   |
| (13) Water pump          | (30) Gasket                | <b>T11: 70 (7.1, 51.6)</b>                   |
| (14) Baffle plate        | (31) O-ring                | <b>T12: &lt;Ref. to ME(H4DOTC)-71,</b>       |
| (15) Adapter             | (32) Seal washer           | <b>INSTALLATION, Cylinder</b>                |
| (16) Oil cooler          | (33) Washer                | <b>Block.&gt;</b>                            |
| (17) Water by-pass pipe  |                            | <b>T13: &lt;Ref. to ME(H4DOTC)-71,</b>       |
|                          |                            | <b>INSTALLATION, Cylinder</b>                |
|                          |                            | <b>Block.&gt;</b>                            |

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# General Description

MECHANICAL

## 5. CRANKSHAFT AND PISTON



ME-02467

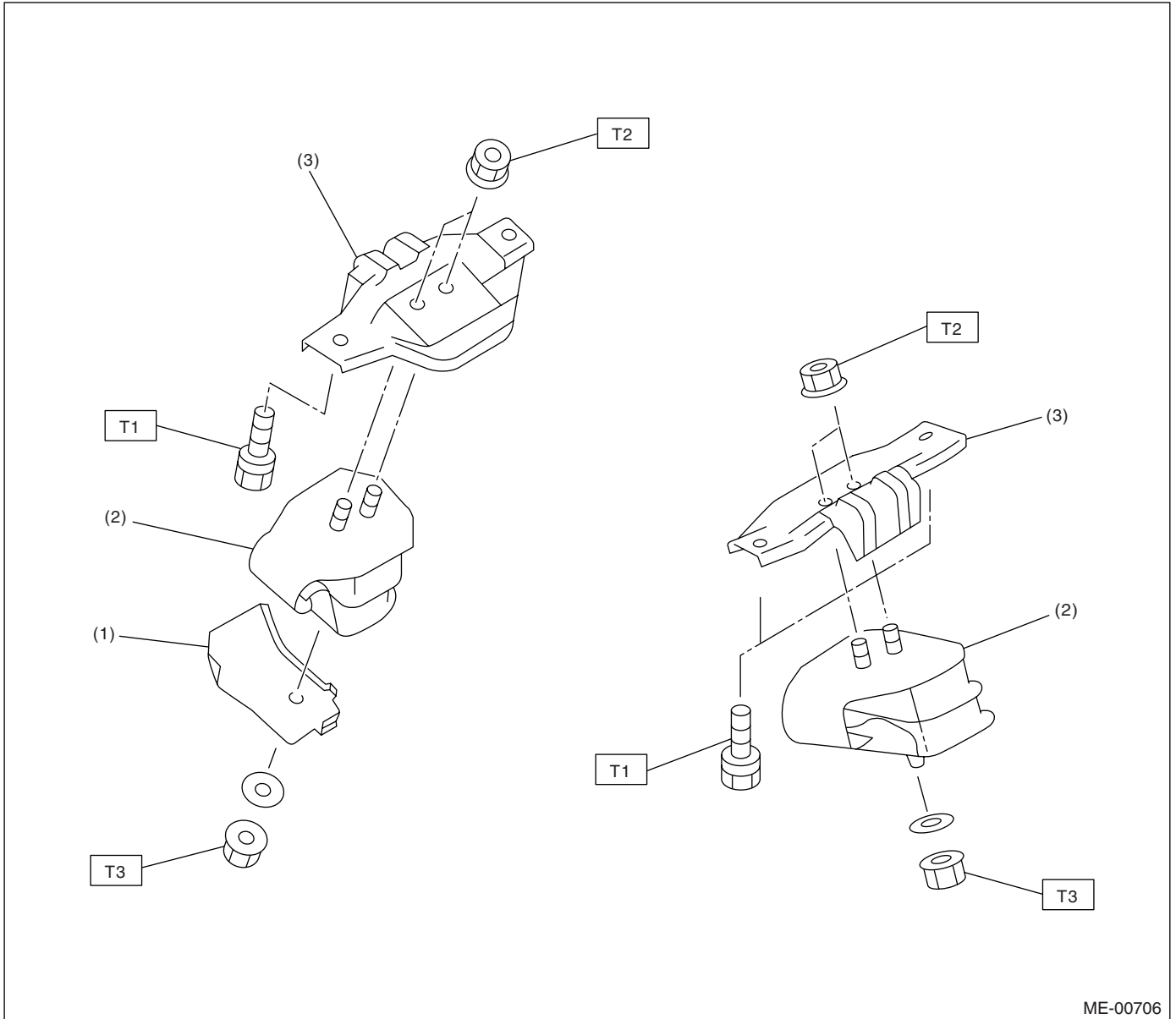
- |                              |                             |                                |
|------------------------------|-----------------------------|--------------------------------|
| (1) Flywheel (MT model)      | (9) Piston pin              | (17) Crankshaft bearing #1, #3 |
| (2) Ball bearing (MT model)  | (10) Snap ring              | (18) Crankshaft bearing #2, #4 |
| (3) Reinforcement (AT model) | (11) Connecting rod bolt    | (19) Crankshaft bearing #5     |
| (4) Drive plate (AT model)   | (12) Connecting rod         |                                |
| (5) Top ring                 | (13) Connecting rod bearing |                                |
| (6) Second ring              | (14) Connecting rod cap     |                                |
| (7) Oil ring                 | (15) Crankshaft             |                                |
| (8) Piston                   | (16) Woodruff key           |                                |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 52 (5.3, 38.4)**

**T2: 72 (7.3, 52.8)**

## 6. ENGINE MOUNTING



ME-00706

- (1) Heat shield cover
- (2) Front cushion rubber

- (3) Front engine mounting bracket

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 35 (3.6, 25.8)**

**T2: 42 (4.3, 30.9)**

**T3: 85 (8.7, 62.7)**

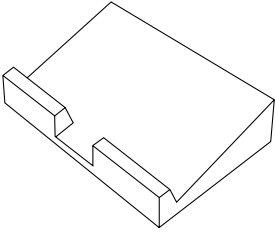
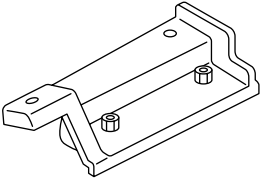
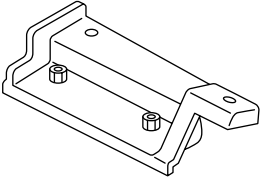
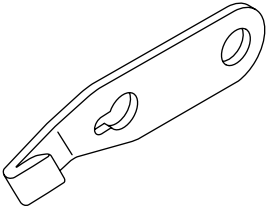


## **C: CAUTION**

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
- Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
- Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
- All removed parts, if to be reused, should be reinstalled in the original positions and directions.
- Bolts, nuts and washers should be replaced with new ones as required.
- Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
- Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
- Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
- Prior to starting work, prepare the following:  
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
- Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

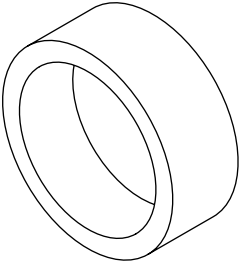
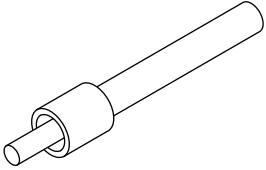
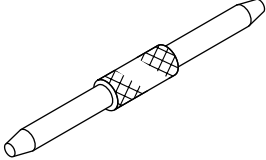
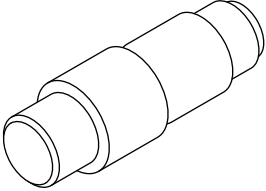
## D: PREPARATION TOOL

### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION             | REMARKS   |
|---|-------------|-------------------------|---|
|  <p style="text-align: center;">ST-498267600</p>   | 498267600   | CYLINDER HEAD TABLE     | <ul style="list-style-type: none"> <li>• Used for replacing valve guides.</li> <li>• Used for removing and installing valve springs.</li> </ul> |
|  <p style="text-align: center;">ST-498457000</p>   | 498457000   | ENGINE STAND ADAPTER RH | Used with ENGINE STAND (499817100).   |
|  <p style="text-align: center;">ST-498457100</p> | 498457100   | ENGINE STAND ADAPTER LH | Used with ENGINE STAND (499817100).   |
|  <p style="text-align: center;">ST-498497100</p> | 498497100   | CRANKSHAFT STOPPER      | Used for stopping rotation of flywheel when loosening and tightening crank pulley bolt, etc.  |

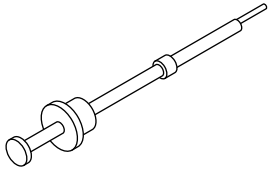
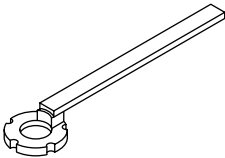
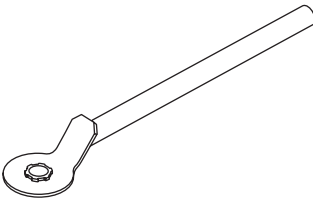
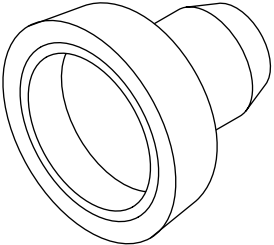
# General Description

MECHANICAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION                                | REMARKS   |
|---|-------------|--|---|
|  <p style="text-align: center;">ST-498747300</p>   | 498747300   | PISTON GUIDE                               | Used for installing piston in cylinder.                             |
|  <p style="text-align: center;">ST-498857100</p>   | 498857100   | VALVE OIL SEAL GUIDE                       | Used for press-fitting of intake and exhaust valve guide oil seals. |
|  <p style="text-align: center;">ST-499017100</p> | 499017100   | PISTON PIN GUIDE                           | Used for installing piston pin, piston and connecting rod.          |
|  <p style="text-align: center;">ST-499037100</p> | 499037100   | CONNECTING ROD BUSHING REMOVER & INSTALLER | Used for removing and installing connecting rod bushing.            |

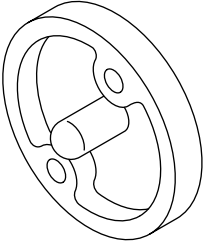
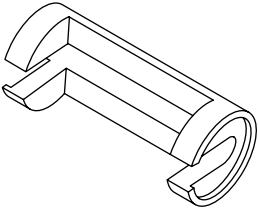
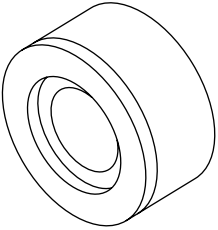
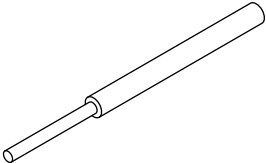
# General Description

MECHANICAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION                      | REMARKS  |
|---|-------------|----------------------------------|--|
|  <p style="text-align: center;">ST-499097700</p>   | 499097700   | PISTON PIN<br>REMOVER ASSY       | Used for removing piston pin.  |
|  <p style="text-align: center;">ST-499207400</p>   | 499207400   | CAM SPROCKET<br>WRENCH           | Used for removing and installing cam sprocket.<br>(Exhaust side)   |
|  <p style="text-align: center;">ST-499977500</p> | 499977500   | CAM SPROCKET<br>WRENCH           | Used for removing and installing cam sprocket.<br>(Intake side)  |
|  <p style="text-align: center;">ST-499587200</p> | 499587200   | CRANKSHAFT OIL<br>SEAL INSTALLER | <ul style="list-style-type: none"> <li>• Used for installing crankshaft oil seal.</li> <li>• Used with CRANKSHAFT OIL SEAL GUIDE (499597100).</li> </ul> |

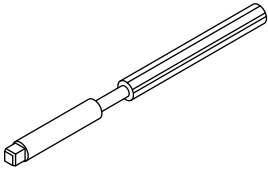
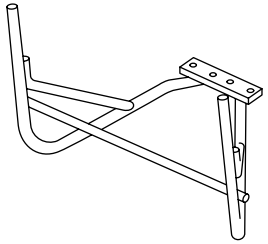
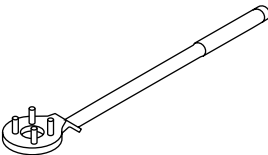
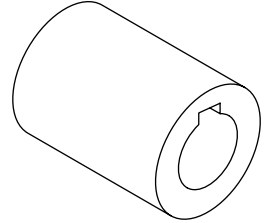
# General Description

MECHANICAL

| ILLUSTRATION  | TOOL NUMBER                                   | DESCRIPTION                      | REMARKS  |
|---|---|----------------------------------|--|
|  <p style="text-align: center;">ST-499597100</p>   | <p style="text-align: center;">499597100</p>  | <p>CRANKSHAFT OIL SEAL GUIDE</p> | <ul style="list-style-type: none"> <li>• Used for installing crankshaft oil seal.</li> <li>• Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).</li> </ul> |
|  <p style="text-align: center;">ST-499718000</p>   | <p style="text-align: center;">499718000</p>  | <p>VALVE SPRING REMOVER</p>      | <p>Used for removing and installing valve spring.</p>  |
|  <p style="text-align: center;">ST18251AA020</p> | <p style="text-align: center;">18251AA020</p> | <p>VALVE GUIDE ADJUSTER</p>      | <p>Used for installing intake and exhaust valve guides.</p>  |
|  <p style="text-align: center;">ST-499767200</p> | <p style="text-align: center;">499767200</p>  | <p>VALVE GUIDE REMOVER</p>       | <p>Used for removing valve guides.</p>   |

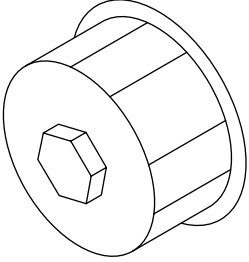
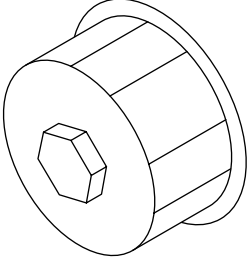
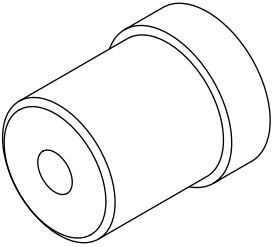
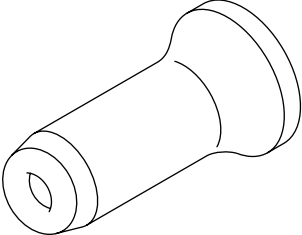
# General Description

MECHANICAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION         | REMARKS  |
|---|-------------|---------------------|--|
|  <p style="text-align: center;">ST-499767400</p>   | 499767400   | VALVE GUIDE REAMER  | Used for reaming valve guides.   |
|  <p style="text-align: center;">ST-499817100</p>   | 499817100   | ENGINE STAND        | <ul style="list-style-type: none"> <li>• Stand used for engine disassembly and assembly.</li> <li>• Used with ENGINE STAND ADAPTER RH (498457000) &amp; LH (498457100).</li> </ul> |
|  <p style="text-align: center;">ST-499977100</p> | 499977100   | CRANK PULLEY WRENCH | Used for stopping rotation of crank pulley when loosening and tightening crank pulley bolts.   |
|  <p style="text-align: center;">ST-499987500</p> | 499987500   | CRANKSHAFT SOCKET   | Used for rotating crankshaft.  |

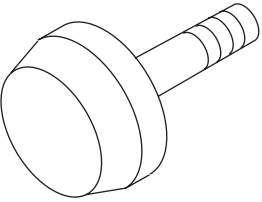
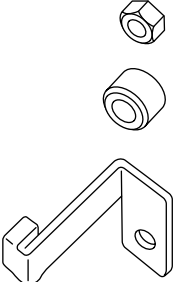
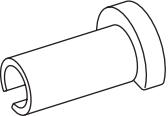
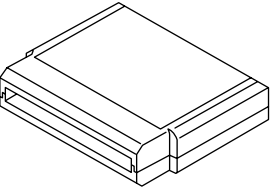
# General Description

## MECHANICAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION        | REMARKS  |
|---|-------------|--------------------|--|
|  <p style="text-align: center;">ST18332AA000</p>   | 18332AA000  | OIL FILTER WRENCH  | Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in)) |
|  <p style="text-align: center;">ST18332AA010</p>   | 18332AA010  | OIL FILTER WRENCH  | Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in)) |
|  <p style="text-align: center;">ST-499587100</p> | 499587100   | OIL SEAL INSTALLER | Used for installing oil pump oil seal.   |
|  <p style="text-align: center;">ST-499587600</p> | 499587600   | OIL SEAL GUIDE     | Used for installing camshaft oil seal for DOHC engine.                         |

# General Description


MECHANICAL

| ILLUSTRATION  | TOOL NUMBER  | DESCRIPTION                  | REMARKS   |
|---|--|------------------------------|---|
|  <p style="text-align: center;">ST-499597200</p>   | <p style="text-align: center;">499597200</p>                           | <p>OIL SEAL GUIDE</p>        | <ul style="list-style-type: none"> <li>• Used for installing camshaft oil seal for DOHC engine.</li> <li>• Used with OIL SEAL GUIDE (499587600).</li> </ul> |
|  <p style="text-align: center;">ST-498277200</p>   | <p style="text-align: center;">498277200</p>                           | <p>STOPPER SET</p>           | <p>Used for installing automatic transmission assembly to engine.</p>   |
|  <p style="text-align: center;">ST42099AE000</p> | <p style="text-align: center;">42099AE000</p>                          | <p>CONNECTOR<br/>REMOVER</p> | <p>Used for removing quick connector in engine compartment.</p>   |
|  <p style="text-align: center;">ST18482AA010</p> | <p style="text-align: center;">18482AA010<br/>(Newly adopted tool)</p> | <p>CARTRIDGE</p>             | <p>Troubleshooting for electrical systems.</p>  |



# General Description

## MECHANICAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION               | REMARKS                                 |
|---|-------------|---------------------------|---|
| <br>ST22771AA030 | 22771AA030  | SUBARU SELECT MONITOR KIT | Troubleshooting for electrical systems. |

## 2. GENERAL TOOL

| TOOL NAME         | REMARKS                         |
|-------------------|---------------------------------|
| Compression gauge | Used for measuring compression. |

## E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing Belt
- Camshaft
- Cylinder Head

## 2. Compression

### A: INSPECTION

**CAUTION:**

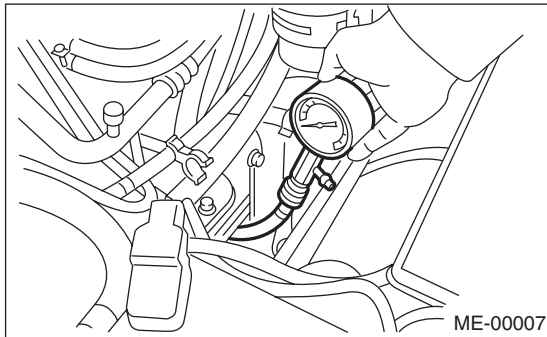
**After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.**

- 1) After warming-up the engine, turn the ignition switch to OFF.
- 2) Make sure that the battery is fully charged.
- 3) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 4) Remove all the spark plugs. <Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.>
- 5) Fully open the throttle valve.
- 6) Check the starter motor for satisfactory performance and operation.
- 7) Fix the compression gauge securely against spark plug hole.

**NOTE:**

The screw of screw-in type compression gauge (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

- 8) Crank the engine by means of starter motor, and then read the maximum value on the gauge when the gauge needle is steady.



- 9) Perform at least two measurements per cylinder, and make sure that the values are correct.

**Compression (at 200 — 300 rpm):**

**Standard:**

**981 — 1,177 kPa (10 — 12 kgf/cm<sup>2</sup>, 142 — 171 psi)**

**Difference between cylinders**

**Less than 49 kPa (0.5 kgf/cm<sup>2</sup>, 7 psi)**

# Idle Speed

MECHANICAL

## 3. Idle Speed

### A: INSPECTION

1) Before checking the idle speed, check the following:

(1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that the hoses are connected properly.

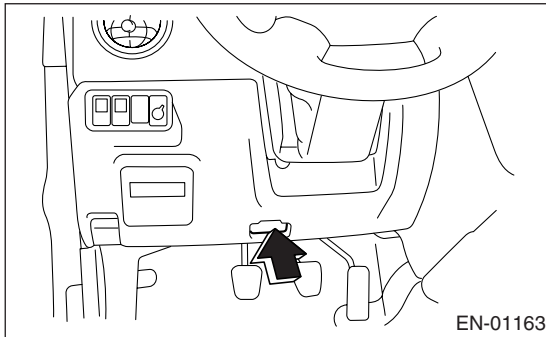
(2) Ensure the malfunction indicator light does not illuminate.

2) Warm-up the engine.

3) Stop the engine, and then turn the ignition switch to OFF.

4) Insert the cartridge to Subaru Select Monitor.

5) Connect the Subaru Select Monitor to data link connector.



6) Turn the ignition switch to ON, and Subaru Select Monitor power switch to ON.

7) Select the {2. Each System Check} in Main Menu.

8) Select the {Engine Control System} in Selection Menu.

9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.

10) Select the {1. 12 Data Display} in Data Display Menu.

11) Start the engine, and then read the engine idle speed.

12) Check the idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

**Idle speed [No load and gears in neutral]:**

**700±100 rpm**

13) Check the idle speed when loaded. (Turn the air conditioning switch to “ON” and operate the compressor for at least 1 minute before measurement.)

**Idle speed [A/C “ON”, no load and gears in neutral]:**

**When the A/C refrigerant pressure is low**

**MT: 725±100 rpm**

**AT: 750±100 rpm**

**When the A/C refrigerant pressure is high**

**MT: 800±100 rpm**

**AT: 825±100 rpm**

**NOTE:**

As idle speed is controlled by the automatic adjustment type, it can not be adjusted manually. If the idle speed is out of specifications, refer to General On-board Diagnosis Table under “Engine Control System”. <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

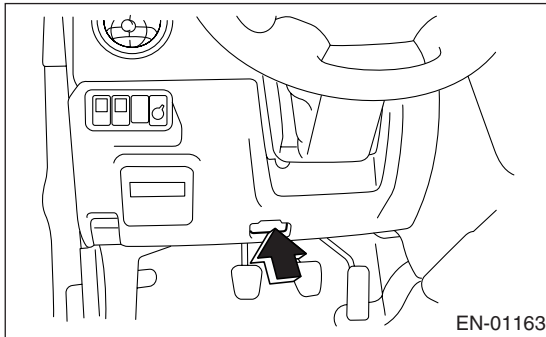
## 4. Ignition Timing

### A: INSPECTION

**CAUTION:**

**After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.**

- 1) Before checking the ignition timing speed, check the following:
  - (1) Ensure the air cleaner element is free from clogging, spark plugs are in good condition, and that hoses are connected properly.
  - (2) Ensure the malfunction indicator light does not illuminate.
- 2) Warm-up the engine.
- 3) Stop the engine, and then turn the ignition switch to OFF.
- 4) Insert the cartridge to Subaru Select Monitor.
- 5) Connect the Subaru Select Monitor to data link connector.



- 6) Turn the ignition switch to ON, and Subaru Select Monitor power switch to ON.
- 7) Select the {2. Each System Check} in Main Menu.
- 8) Select the {Engine Control System} in Selection Menu.
- 9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
- 10) Select the {1. 12 Data Display} in Data Display Menu.
- 11) Start the engine and check the ignition timing at idle speed.

**Ignition timing [BTDC/rpm]:**

**$17^{\circ} \pm 10^{\circ} / 700$**

If the timing is not correct, check the ignition control system. Refer to Engine Control System. <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

# Intake Manifold Vacuum

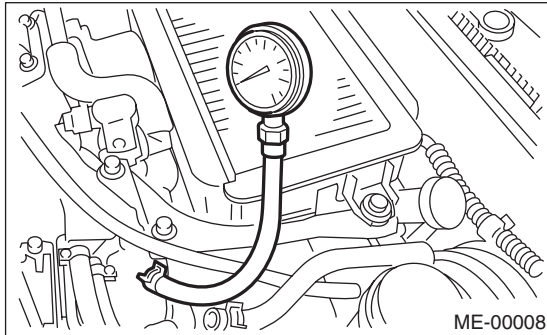
MECHANICAL

## 5. Intake Manifold Vacuum

### A: INSPECTION

- 1) Warm-up the engine.
- 2) Disconnect the brake vacuum hose from the intake manifold, and then install the vacuum gauge.
- 3) Keep the engine at the idle speed, and then read the vacuum gauge indication.

By observing the gauge needle movement, the internal condition of engine can be diagnosed as described below.



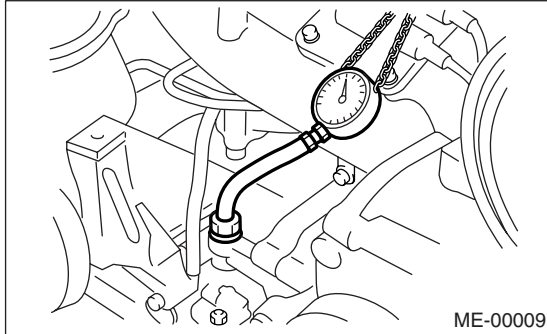
**Vacuum pressure (at idling, A/C "OFF"):**  
**Less than -60.0 kPa (-450 mmHg, -17.72 inHg)**

| Diagnosis of engine condition by measurement of intake manifold vacuum  |   |
|---|---|
| Vacuum gauge indication   | Possible engine condition   |
| 1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.                                     | Leakage around intake manifold gasket or disconnection or damaged vacuum hose |
| 2. Needle intermittently drops to position lower than normal position.  | Leakage around cylinder   |
| 3. Needle drops suddenly and intermittently from normal position.   | Sticky valves   |
| 4. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases. | Weak or broken valve springs  |
| 5. Needle vibrates above and below normal position in narrow range.   | Defective ignition system or throttle chamber idle adjustment                 |

## 6. Engine Oil Pressure

### A: INSPECTION

- 1) Remove the oil pressure switch. <Ref. to LU(H4DOTC)-18, REMOVAL, Oil Pressure Switch.>
- 2) Connect the oil pressure gauge hose to cylinder block.
- 3) Connect the battery ground cable to battery.
- 4) Start the engine, and then measure the oil pressure.



#### **Oil pressure:**

**98 kPa (1.0 kgf/cm<sup>2</sup>, 14 psi) or more at 600 rpm**

**294 kPa (3.0 kgf/cm<sup>2</sup>, 43 psi) or more at 5,000 rpm**

#### **CAUTION:**

- If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU(H4DOTC)-24, INSPECTION, Engine Lubrication System Trouble in General.>
- If the oil pressure warning light is turned ON and oil pressure is in specification, replace the oil pressure switch. <Ref. to LU(H4DOTC)-24, INSPECTION, Engine Lubrication System Trouble in General.>

#### **NOTE:**

The specified data is based on an engine oil temperature of 80°C (176°F).

- 5) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(H4DOTC)-18, INSTALLATION, Oil Pressure Switch.>

#### **Tightening torque:**

**25 N·m (2.5 kgf·m, 18.4 ft·lb)**

## 7. Fuel Pressure

### A: INSPECTION

#### WARNING:

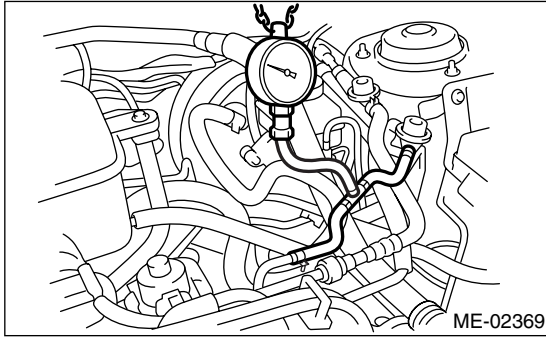
Before removing the fuel pressure gauge, release the fuel pressure.

#### NOTE:

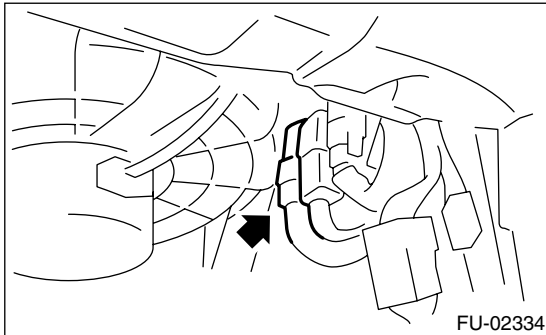
If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Disconnect the fuel delivery hoses from fuel damper, and then connect the fuel pressure gauge.



3) Connect the connector of fuel pump relay.



4) Start the engine.

5) Measure the fuel pressure while disconnecting the pressure regulator vacuum hose from intake manifold.

#### **Fuel pressure:**

**Standard: 284 — 314 kPa (2.9 — 3.2 kgf/cm<sup>2</sup>, 41 — 46 psi)**

6) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

#### **Fuel pressure:**

**Standard: 230 — 260 kPa (2.35 — 2.65 kgf/cm<sup>2</sup>, 33 — 38 psi)**

#### NOTE:

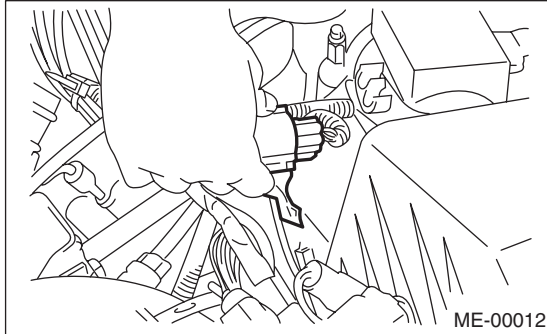
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm<sup>2</sup>, 1 to 3 psi) higher than standard values during high-altitude operations.

## 8. Valve Clearance

### A: INSPECTION

Inspection and adjustment of the valve clearance should be performed while engine is cold.

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
- 4) Remove the bolts which secure the timing belt cover (RH).
- 5) Lift-up the vehicle.
- 6) Remove the under cover.
- 7) Loosen the remaining bolts which secure the timing belt cover (RH), and then remove the timing belt cover.
- 8) Lower the vehicle.
- 9) When inspecting the #1 and #3 cylinders:
  - (1) Pull out the engine harness connector with bracket from air cleaner upper cover.

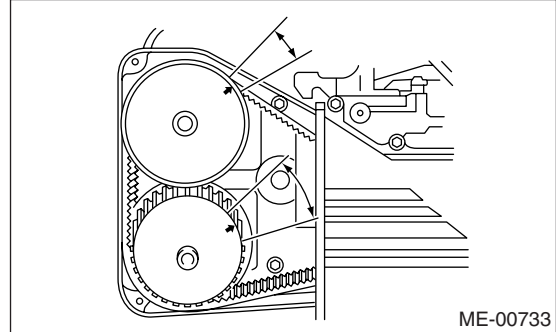


- (2) Remove the air cleaner case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- (3) Disconnect the ignition coil connector.
- (4) Remove the ignition coil.
- (5) Place a suitable container under the vehicle.
- (6) Disconnect the PCV hose from rocker cover (RH).
- (7) Remove the bolts, and then remove the rocker cover (RH).
- 10) When inspecting the #2 and #4 cylinders:
  - (1) Disconnect the battery cable, and then remove the battery and battery carrier.
  - (2) Remove the secondary air pump. <Ref. to EC(H4DOTC)-9, REMOVAL, Secondary Air Pump.>
  - (3) Disconnect the ignition coil connector.
  - (4) Remove the ignition coil.
  - (5) Place a suitable container under the vehicle.
  - (6) Disconnect the PCV hose from rocker cover (LH).
  - (7) Remove the bolts, and then remove the rocker cover (LH).

- 11) Turn the crank pulley clockwise until arrow mark on the cam sprocket is set to position shown in the figure.

**NOTE:**

Turn the crankshaft using socket wrench.



- 12) Measure the #1 cylinder intake valve and #3 cylinder exhaust valve clearance by using thickness gauge (A).

**NOTE:**

- Insert the thickness gauge (A) in as horizontal a direction as possible with respect to the shim.
- Measure the exhaust valve clearances while lifting-up the vehicle.

**Valve clearance:**

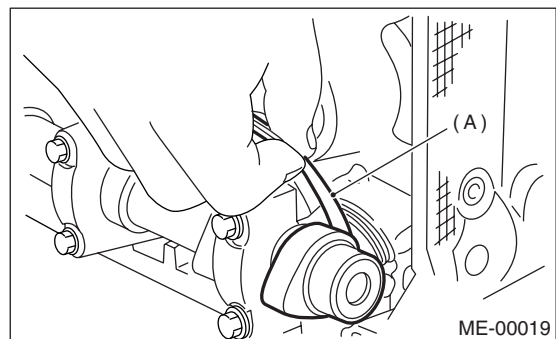
**STD**

**Intake:  $0.20 \pm 0.02$  mm ( $0.0079 \pm 0.0008$  in)**

**Exhaust:  $0.35 \pm 0.02$  mm ( $0.0138 \pm 0.0008$  in)**

**NOTE:**

If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



- 13) If necessary, adjust the valve clearance. <Ref. to ME(H4DOTC)-30, ADJUSTMENT, Valve Clearance.>

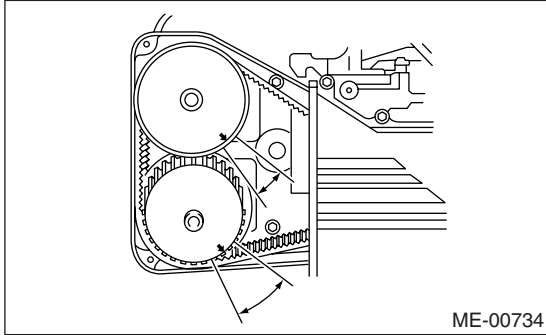


# Valve Clearance

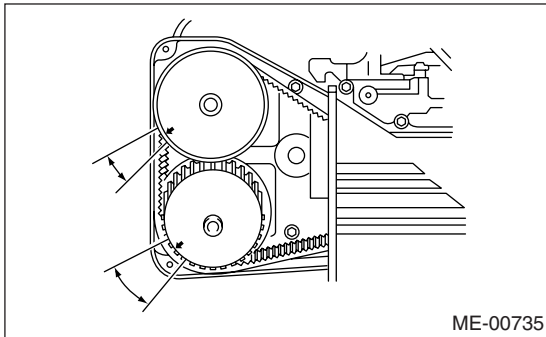
## MECHANICAL

14) Further turn the crank pulley clockwise. Using the same procedures described previously, and then measure the valve clearances again.

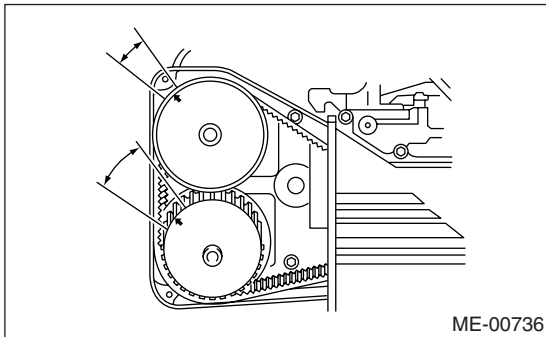
(1) Set the arrow mark on cam sprocket to position shown in the figure, and then measure the #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



(2) Set the arrow mark on cam sprocket to position shown in the figure, and then measure the #2 cylinder intake valve and #4 cylinder exhaust valve clearances.

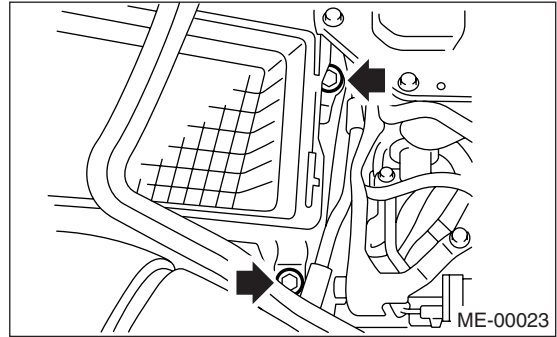


(3) Set the arrow mark on cam sprocket to position shown in the figure, and then measure the #1 cylinder exhaust valve and #4 cylinder intake valve clearances.



15) After inspection, install the related parts in the reverse order of removal.

**Tightening torque:**  
**33 N·m (3.4 kgf-m, 25 ft-lb)**



## B: ADJUSTMENT

### CAUTION:

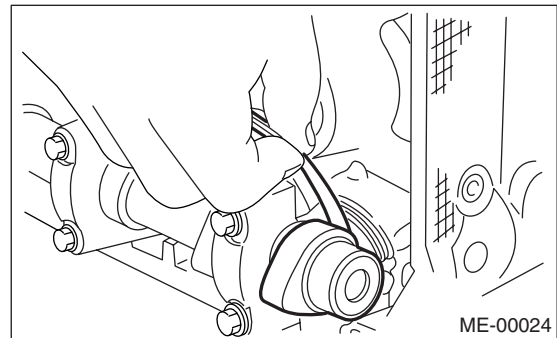
**Adjustment of the valve clearance should be performed while engine is cold.**

1) Measure all valve clearances.

<Ref. to ME(H4DOTC)-29, INSPECTION, Valve Clearance.>

### NOTE:

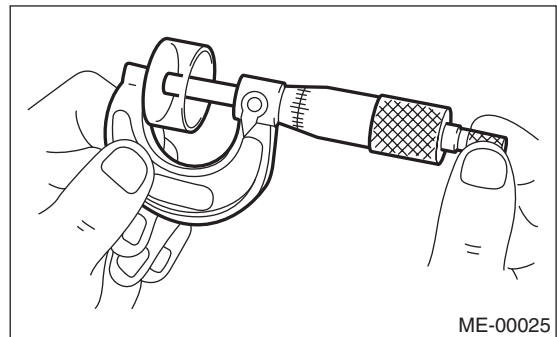
Record each valve clearance after it has been measured.



2) Remove the camshaft. <Ref. to ME(H4DOTC)-55, REMOVAL, Camshaft.>

3) Remove the valve lifter.

4) Measure the thickness of valve lifter with a micrometer.



5) Select a shim of suitable thickness using measured valve clearance and valve lifter thickness, by referring to the following table.

# Valve Clearance

MECHANICAL

|                                       |
|---------------------------------------|
| Unit: mm                              |
| Intake valve: $S = (V + T) - 0.20$    |
| Exhaust valve: $S = (V + T) - 0.35$   |
| S: Required thickness of valve lifter |
| V: Measured valve clearance           |
| T: Used valve lifter thickness        |

| Part No.    | Thickness mm (in) |
|-------------|-------------------|
| 13228 AB102 | 4.68 (0.1843)     |
| 13228 AB112 | 4.69 (0.1846)     |
| 13228 AB122 | 4.70 (0.1850)     |
| 13228 AB132 | 4.71 (0.1854)     |
| 13228 AB142 | 4.72 (0.1858)     |
| 13228 AB152 | 4.73 (0.1862)     |
| 13228 AB162 | 4.74 (0.1866)     |
| 13228 AB172 | 4.75 (0.1870)     |
| 13228 AB182 | 4.76 (0.1874)     |
| 13228 AB192 | 4.77 (0.1878)     |
| 13228 AB202 | 4.78 (0.1882)     |
| 13228 AB212 | 4.79 (0.1886)     |
| 13228 AB222 | 4.80 (0.1890)     |
| 13228 AB232 | 4.81 (0.1894)     |
| 13228 AB242 | 4.82 (0.1898)     |
| 13228 AB252 | 4.83 (0.1902)     |
| 13228 AB262 | 4.84 (0.1906)     |
| 13228 AB272 | 4.85 (0.1909)     |
| 13228 AB282 | 4.86 (0.1913)     |
| 13228 AB292 | 4.87 (0.1917)     |
| 13228 AB302 | 4.88 (0.1921)     |
| 13228 AB312 | 4.89 (0.1925)     |
| 13228 AB322 | 4.90 (0.1929)     |
| 13228 AB332 | 4.91 (0.1933)     |
| 13228 AB342 | 4.92 (0.1937)     |
| 13228 AB352 | 4.93 (0.1941)     |
| 13228 AB362 | 4.94 (0.1945)     |
| 13228 AB372 | 4.95 (0.1949)     |
| 13228 AB382 | 4.96 (0.1953)     |
| 13228 AB392 | 4.97 (0.1957)     |
| 13228 AB402 | 4.98 (0.1961)     |
| 13228 AB412 | 4.99 (0.1965)     |
| 13228 AB422 | 5.00 (0.1969)     |
| 13228 AB432 | 5.01 (0.1972)     |
| 13228 AB442 | 5.02 (0.1976)     |
| 13228 AB452 | 5.03 (0.1980)     |
| 13228 AB462 | 5.04 (0.1984)     |
| 13228 AB472 | 5.05 (0.1988)     |
| 13228 AB482 | 5.06 (0.1992)     |
| 13228 AB492 | 5.07 (0.1996)     |
| 13228 AB502 | 5.08 (0.2000)     |
| 13228 AB512 | 5.09 (0.2004)     |
| 13228 AB522 | 5.10 (0.2008)     |
| 13228 AB532 | 5.11 (0.2012)     |

| Part No.    | Thickness mm (in) |
|-------------|-------------------|
| 13228 AB542 | 5.12 (0.2016)     |
| 13228 AB552 | 5.13 (0.2020)     |
| 13228 AB562 | 5.14 (0.2024)     |
| 13228 AB572 | 5.15 (0.2028)     |
| 13228 AB582 | 5.16 (0.2031)     |
| 13228 AB592 | 5.17 (0.2035)     |
| 13228 AB602 | 5.18 (0.2039)     |
| 13228 AB612 | 5.19 (0.2043)     |
| 13228 AB622 | 5.20 (0.2047)     |
| 13228 AB632 | 5.21 (0.2051)     |
| 13228 AB642 | 5.22 (0.2055)     |
| 13228 AB652 | 5.23 (0.2059)     |
| 13228 AB662 | 5.24 (0.2063)     |
| 13228 AB672 | 5.25 (0.2067)     |
| 13228 AB682 | 5.26 (0.2071)     |
| 13228 AB692 | 5.27 (0.2075)     |
| 13228 AB702 | 4.38 (0.1724)     |
| 13228 AB712 | 4.40 (0.1732)     |
| 13228 AB722 | 4.42 (0.1740)     |
| 13228 AB732 | 4.44 (0.1748)     |
| 13228 AB742 | 4.46 (0.1756)     |
| 13228 AB752 | 4.48 (0.1764)     |
| 13228 AB762 | 4.50 (0.1771)     |
| 13228 AB772 | 4.52 (0.1780)     |
| 13228 AB782 | 4.54 (0.1787)     |
| 13228 AB792 | 4.56 (0.1795)     |
| 13228 AB802 | 4.58 (0.1803)     |
| 13228 AB812 | 4.60 (0.1811)     |
| 13228 AB822 | 4.62 (0.1819)     |
| 13228 AB832 | 4.64 (0.1827)     |
| 13228 AB842 | 4.66 (0.1835)     |
| 13228 AB852 | 5.29 (0.2083)     |
| 13228 AB862 | 5.31 (0.2091)     |
| 13228 AB872 | 5.33 (0.2098)     |
| 13228 AB882 | 5.35 (0.2106)     |
| 13228 AB892 | 5.37 (0.2114)     |
| 13228 AB902 | 5.39 (0.2122)     |
| 13228 AB912 | 5.41 (0.2126)     |
| 13228 AB922 | 5.43 (0.2138)     |
| 13228 AB932 | 5.45 (0.2146)     |
| 13228 AB942 | 5.47 (0.2154)     |
| 13228 AB952 | 5.49 (0.2161)     |
| 13228 AB962 | 5.51 (0.2169)     |
| 13228 AB972 | 5.53 (0.2177)     |
| 13228 AB982 | 5.55 (0.2185)     |
| 13228 AB992 | 5.57 (0.2193)     |
| 13228 AC002 | 5.59 (0.2201)     |
| 13228 AC012 | 5.61 (0.2209)     |
| 13228 AC022 | 5.63 (0.2217)     |
| 13228 AC032 | 5.65 (0.2224)     |

## Valve Clearance

### MECHANICAL

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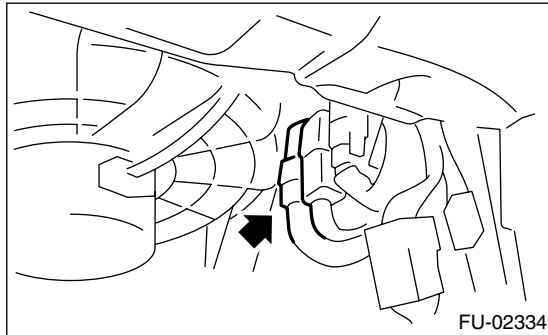
- 6) Inspect all valves for clearance again at this stage. If the valve clearance is not correct, repeat the procedure over again from the first step.
- 7) After inspection, install the related parts in the reverse order of removal.

## 9. Engine Assembly

### A: REMOVAL

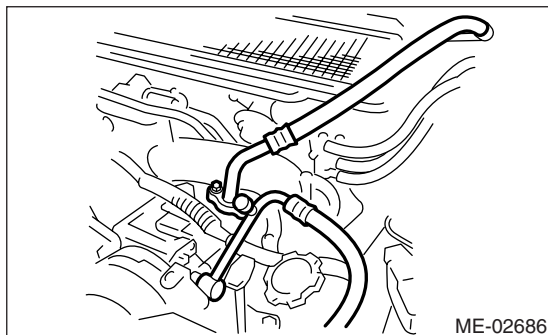
- 1) Set the vehicle on a lift.
- 2) Open the front hood fully, and then support with the hood stay.
- 3) Collect the refrigerant from A/C system. <Ref. to AC-20, Refrigerant Recovery Procedure.>
- 4) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

- (1) Disconnect the fuel pump relay connector.



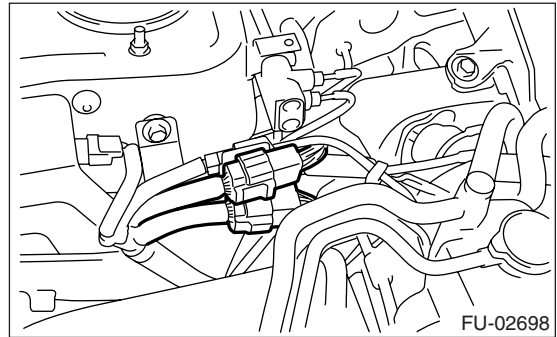
- (2) Start the engine, and run until stalls.
- (3) After the engine stalls, crank it for 5 seconds more.
- (4) Turn the ignition switch to OFF.

- 5) Remove the fuel filler cap.
- 6) Disconnect the ground cable from battery.
- 7) Remove the radiator from vehicle. <Ref. to CO(H4DOTC)-23, REMOVAL, Radiator.>
- 8) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-33, REMOVAL, Coolant Filler Tank.>
- 9) Remove the secondary air pump. <Ref. to EC(H4DOTC)-9, REMOVAL, Secondary Air Pump.>
- 10) Disconnect the A/C pressure hoses from A/C compressor.

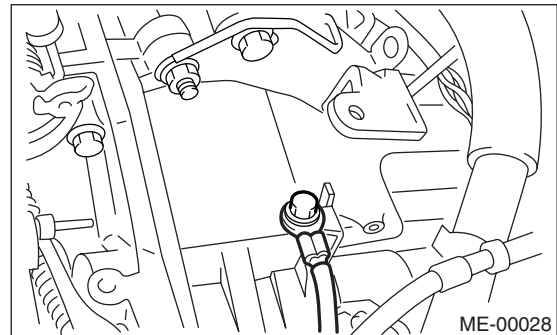


- 11) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>

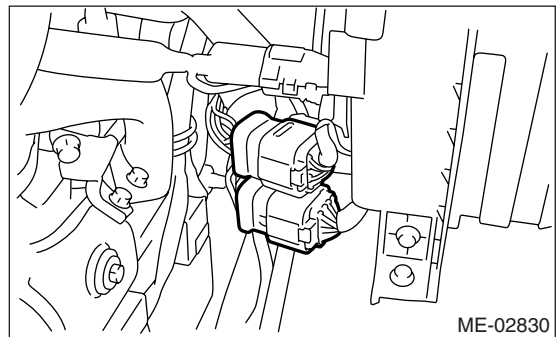
- 12) Disconnect the following connectors and cable.
  - (1) Engine harness connector



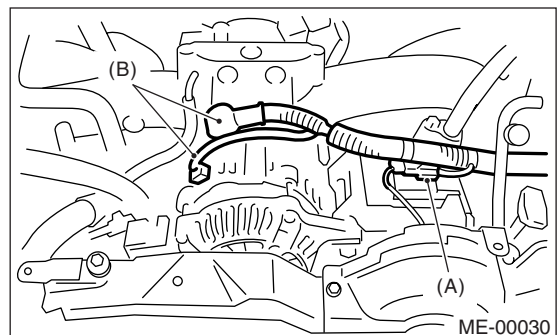
- (2) Engine ground terminal



- (3) Engine harness connector



- (4) Generator connector, terminal and A/C compressor connectors

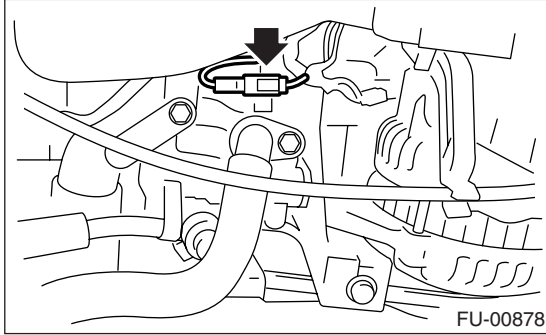


- (A) A/C compressor connector
- (B) Generator connector and terminal

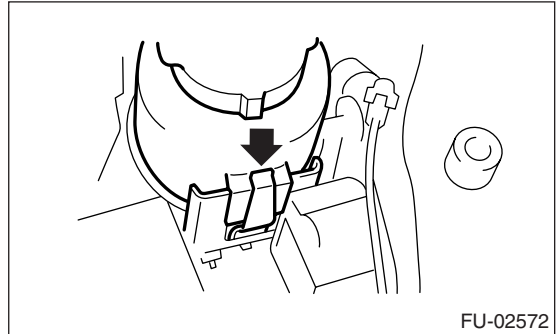
# Engine Assembly

MECHANICAL

(5) Power steering switch connector

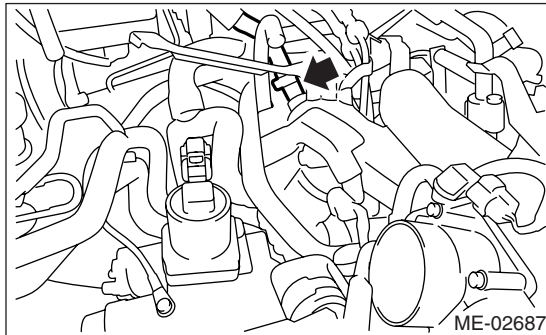


(4) Remove the reservoir tank from bracket by pulling it upward.



13) Disconnect the following hoses.

(1) Brake booster vacuum hose

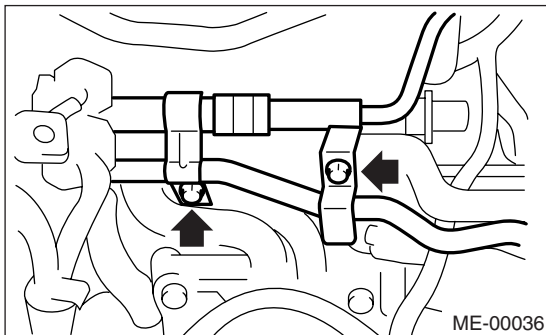


(2) Heater inlet and outlet hose

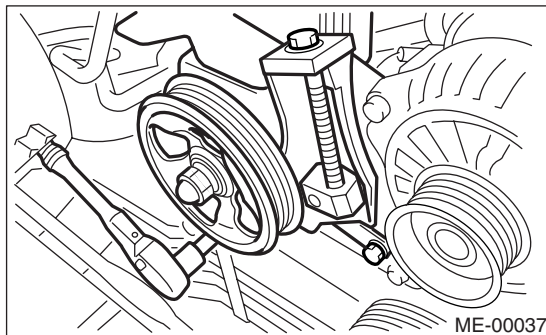
14) Remove the power steering pump.

(1) Remove the front side V-belt. <Ref. to ME(H4DOTC)-41, FRONT SIDE BELT, REMOVAL, V-belt.>

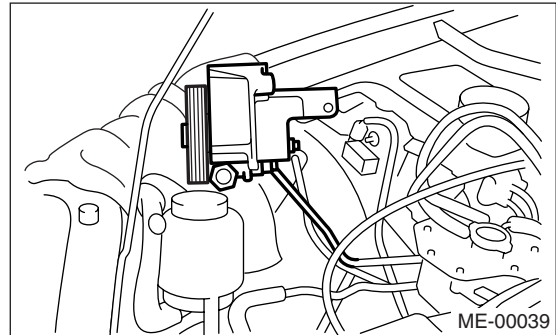
(2) Remove the power steering pipe with bracket from fuel pipe protector RH.



(3) Remove the power steering pump.



(5) Place the power steering pump on right side wheel apron.



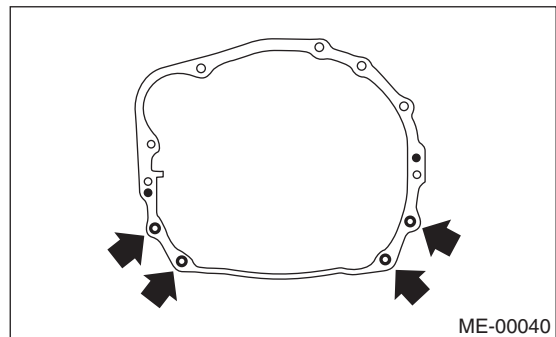
15) Lift-up the vehicle.

16) Remove the ATF cooler pipe from frame. (AT model)

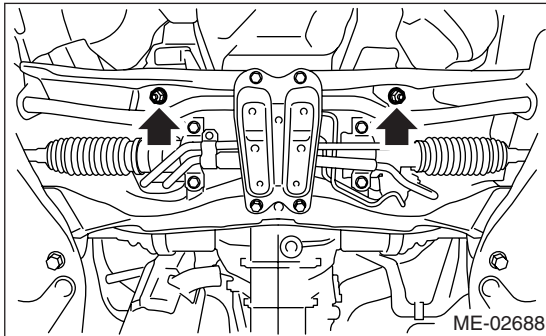
17) Remove the center exhaust pipe.

<Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>

18) Remove the nuts which hold the lower side of transmission to engine.



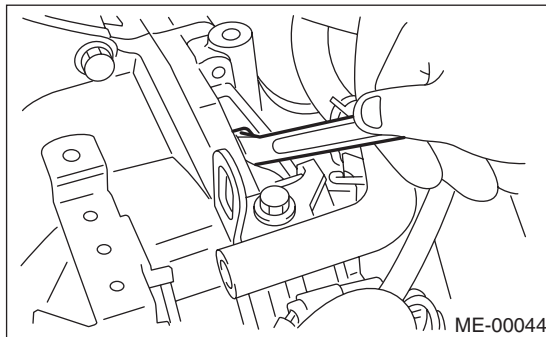
19) Remove the nuts which install the front cushion rubber onto front crossmember.



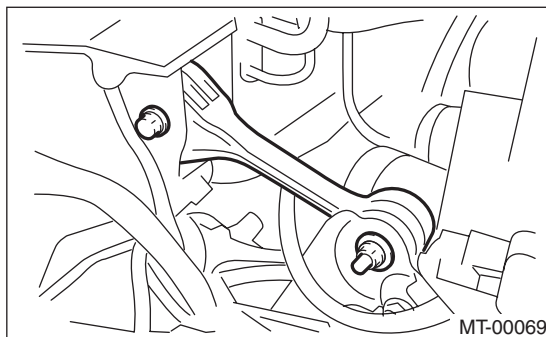
20) Separate the clutch release fork from release bearing. (MT model) <Ref. to CL-18, REMOVAL, Release Bearing and Lever.>

21) Separate the torque converter clutch from drive plate. (AT model)

- (1) Lower the vehicle.
- (2) Remove the service hole plug.
- (3) Remove the bolts which hold the torque converter clutch to drive plate.
- (4) While rotating the crank pulley in the direction of engine rotation little by little using a socket wrench, remove all the bolts.



22) Remove the pitching stopper.

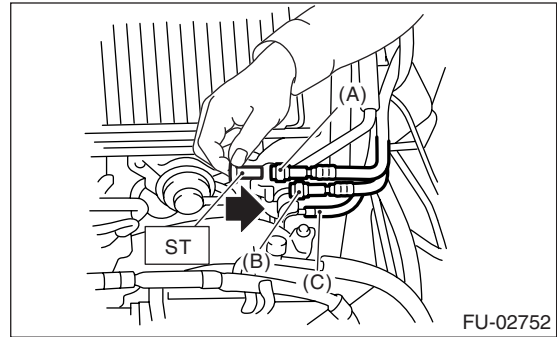


23) Using ST, disconnect fuel hoses from fuel pipes. <Ref. to FU(H4DOTC)-65, REMOVAL, Fuel Delivery, Return and Evaporation lines.>

**CAUTION:**

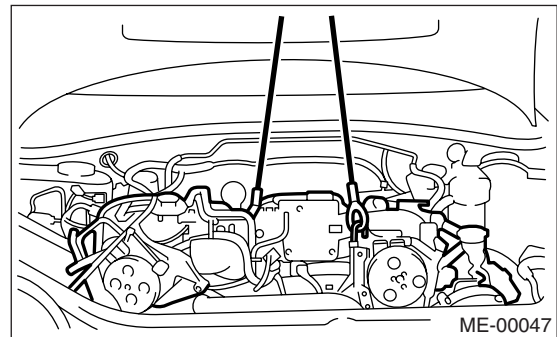
- Be careful not to spill fuel.
- Catch fuel from hoses using a container or cloth.

ST 42099AE000 CONNECTOR REMOVER



- (A) Fuel delivery hose
- (B) Return hose
- (C) Evaporation hose

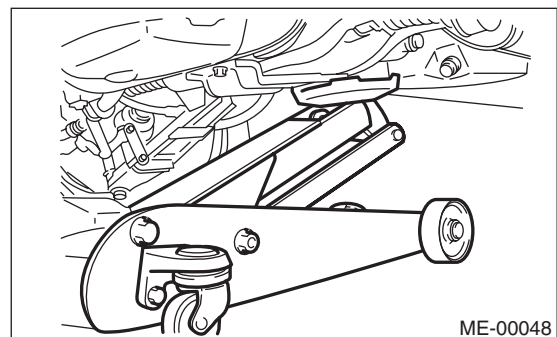
24) Support the engine with a lifting device and wire ropes.



25) Support the transmission with a garage jack.

**CAUTION:**

Before moving the engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because transmission lowers under its own weight.



26) Separation of the engine and transmission

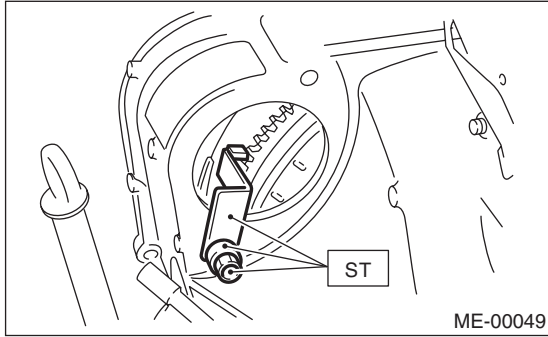
- (1) Remove the starter. <Ref. to SC(H4SO)-8, REMOVAL, Starter.>
- (2) Install the ST to torque converter clutch case. (AT model)



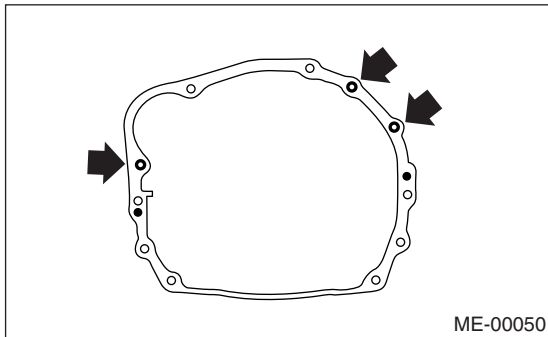
# Engine Assembly

MECHANICAL

ST 498277200 STOPPER SET



(3) Remove the bolts which hold the right upper side of transmission to engine.



- 27) Remove the engine from vehicle.
- (1) Slightly raise the engine.
  - (2) Raise the transmission with garage jack.
  - (3) Move the engine horizontally until the mainshaft is withdrawn from clutch cover.
  - (4) Slowly move the engine away from engine compartment.

### NOTE:

Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

28) Remove the front cushion rubbers.

## B: INSTALLATION

- 1) Install the clutch release fork and bearing to transmission. (MT model) <Ref. to CL-18, INSTALLATION, Release Bearing and Lever.>
- 2) Install the front cushion rubbers to engine.

### Tightening torque:

**35 N·m (3.6 kgf-m, 25.8 ft-lb)**

- 3) Install the engine onto transmission.
  - (1) Position the engine in engine compartment, and then align it with the transmission.

### NOTE:

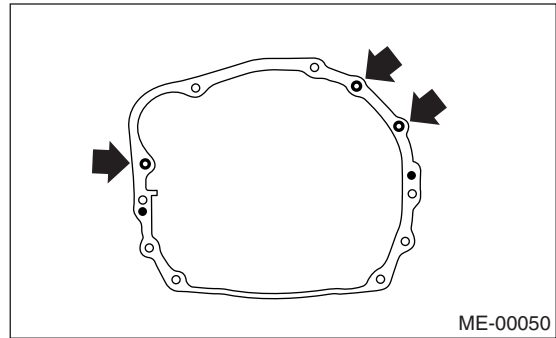
Be careful not to damage the adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

- (2) Apply a small amount of grease to the splines of mainshaft. (MT model)

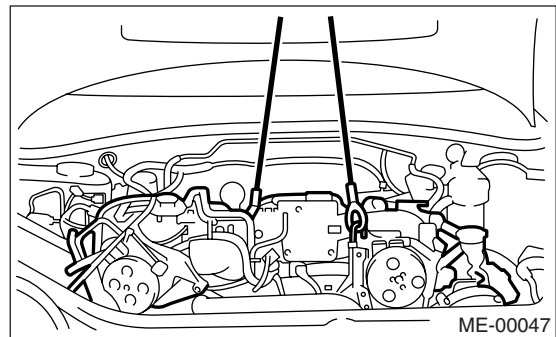
- 4) Tighten the bolts which hold the right upper side of transmission to engine.

### Tightening torque:

**50 N·m (5.1 kgf-m, 37 ft-lb)**



- 5) Remove the lifting device and wire ropes.

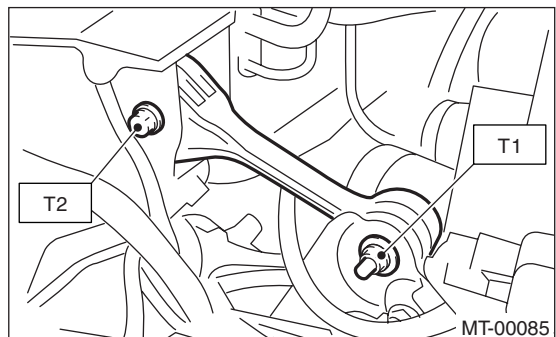


- 6) Remove the garage jack.
- 7) Install the pitching stopper.

### Tightening torque:

**T1: 50 N·m (5.1 kgf-m, 37 ft-lb)**

**T2: 58 N·m (5.9 kgf-m, 43 ft-lb)**



- 8) Remove the ST from torque converter clutch case. (AT model)

### NOTE:

Be careful not to drop the ST into torque converter clutch case when removing ST.

ST 498277200 STOPPER SET

- 9) Install the starter. <Ref. to SC(H4SO)-8, INSTALLATION, Starter.>

10) Install the torque converter clutch onto drive plate. (AT model)

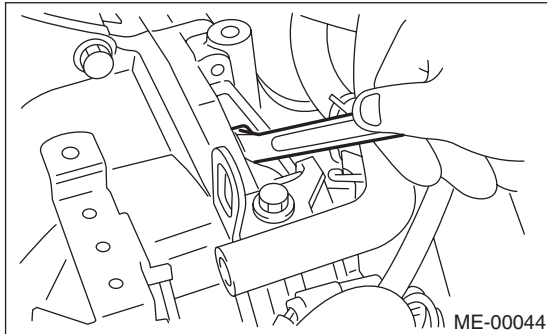
- (1) Tighten the bolts which hold the torque converter clutch to drive plate.
- (2) While rotating the crank pulley in the direction of engine rotation little by little using a socket wrench, remove all the bolts.

**CAUTION:**

Be careful not to drop bolts into the torque converter clutch housing.

**Tightening torque:**

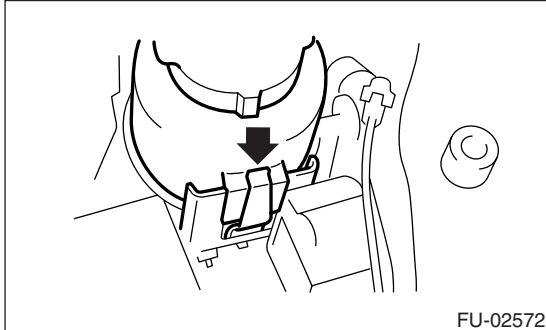
**25 N·m (2.5 kgf·m, 18.4 ft·lb)**



(3) Install the service hole plug.

11) Install the power steering pump on bracket.

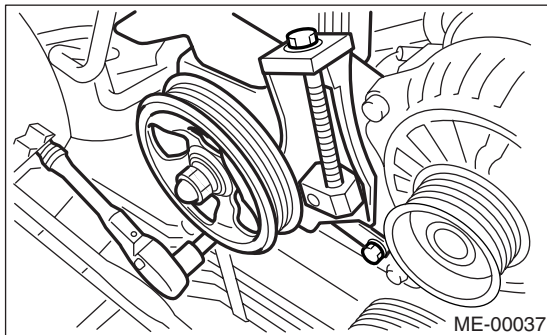
- (1) Install the power steering tank on bracket.



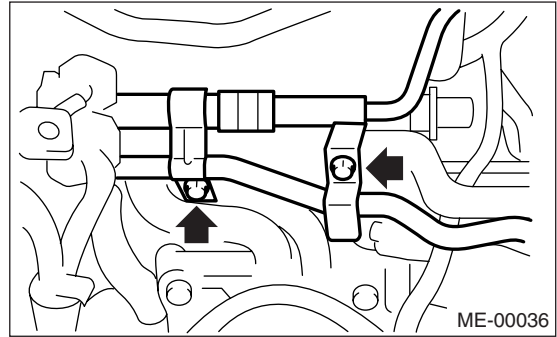
(2) Install the power steering pump.

**Tightening torque:**

**20.1 N·m (2.05 kgf·m, 14.8 ft·lb)**



(3) Install the power steering pipe bracket on intake manifold RH.



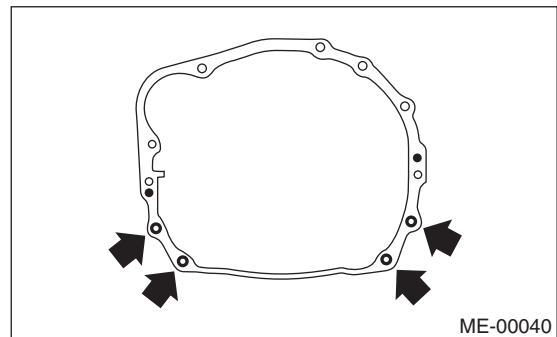
(4) Install the front side V-belt, and adjust it. <Ref. to ME(H4DOTC)-41, FRONT SIDE BELT, INSTALLATION, V-belt.>

12) Lift-up the vehicle.

13) Tighten the nuts which hold the lower side of transmission to engine.

**Tightening torque:**

**50 N·m (5.1 kgf·m, 37 ft·lb)**



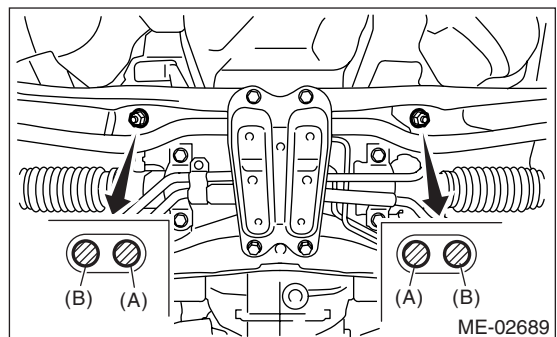
14) Tighten the nuts which install the front cushion rubber onto crossmember.

**Tightening torque:**

**85 N·m (8.7 kgf·m, 62.7 ft·lb)**

**NOTE:**

Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



15) Install the ATF cooler pipe to frame. (AT model)

16) Install the center exhaust pipe.

<Ref. to EX(H4DOTC)-11, INSTALLATION, Center Exhaust Pipe.>



# Engine Assembly

## MECHANICAL

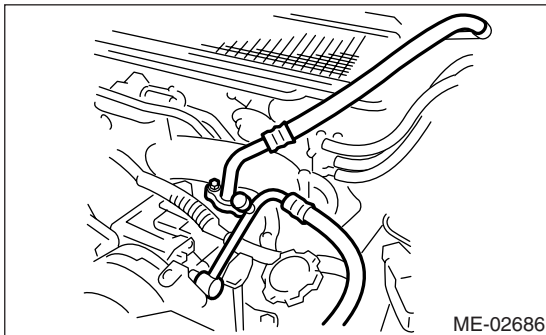
- 17) Lower the vehicle.
- 18) Connect the following hoses:
  - (1) Fuel delivery hose, return hose and evaporation hose
  - (2) Heater inlet and outlet hoses
  - (3) Brake booster vacuum hose
- 19) Connect the following connectors and terminals:
  - (1) Engine ground terminal
  - (2) Engine harness connectors
  - (3) Generator connector and terminal
  - (4) A/C compressor connectors
  - (5) Power steering switch connector
- 20) After connecting each cable, adjust them.
- 21) Install the air intake system.
  - (1) Install the intercooler.  
<Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
  - (2) Install the air cleaner element and air cleaner upper cover.
  - (3) Install the engine harness connector bracket.
  - (4) Install the filler hose to air cleaner case.
- 22) Install the A/C pressure hoses.

### NOTE:

Use new O-rings.

### **Tightening torque:**

**15 N·m (1.5 kgf·m, 10.8 ft·lb)**



- 23) Install the radiator. <Ref. to CO(H4DOTC)-24, INSTALLATION, Radiator.>
- 24) Install the coolant filler tank.  
<Ref. to CO(H4DOTC)-33, INSTALLATION, Coolant Filler Tank.>
- 25) Install the secondary air pump. <Ref. to EC(H4DOTC)-9, INSTALLATION, Secondary Air Pump.>
- 26) Install the battery in the vehicle, and then connect the cables.
- 27) Fill engine coolant.  
<Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 28) Charge the A/C system with refrigerant.  
<Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>

## 10.Engine Mounting

### A: REMOVAL

- 1) Remove the engine assembly. <Ref. to ME(H4DOTC)-33, REMOVAL, Engine Assembly.>
- 2) Remove the engine mounting from engine assembly.

### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

##### *Engine mounting*

*35 N·m (3.6 kgf-m, 25.8 ft-lb)*

### C: INSPECTION

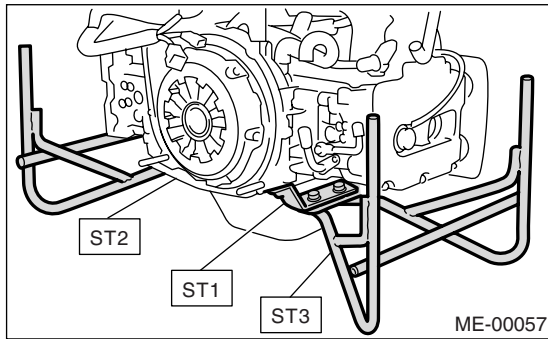
Make sure there are no cracks or other damage.

## 11. Preparation for Overhaul

### A: PROCEDURE

1) After removing the engine from body, secure it in the ST shown below.

|     |           |                            |
|-----|-----------|----------------------------|
| ST1 | 498457000 | ENGINE STAND ADAPTER<br>RH |
| ST2 | 498457100 | ENGINE STAND ADAPTER<br>LH |
| ST3 | 499817100 | ENGINE STAND               |



2) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for overhauling of the engine itself when you go through all steps in the process.

Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

## 12.V-belt

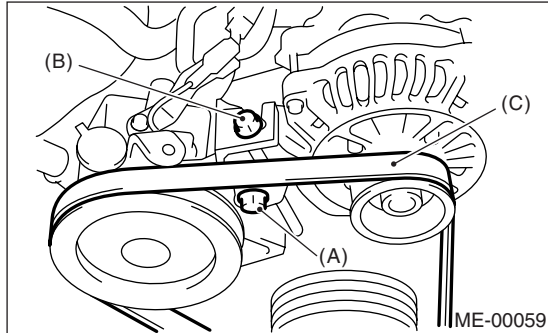
### A: REMOVAL

#### NOTE:

Perform the following procedures with the engine installed to the body.

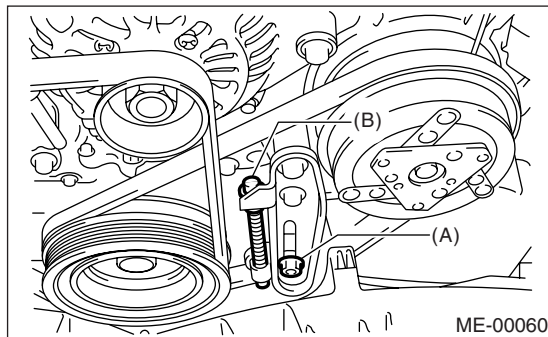
#### 1. FRONT SIDE BELT

- 1) Loosen the lock bolt (A).
- 2) Loosen the slider bolt (B).
- 3) Remove the front side belt (C).

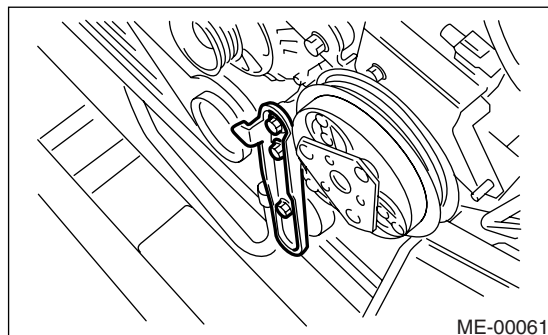


#### 2. REAR SIDE BELT

- 1) Loosen the lock nut (A).
- 2) Loosen the slider bolt (B).



- 3) Remove the A/C belt.
- 4) Remove the A/C belt tensioner.



### B: INSTALLATION

#### 1. FRONT SIDE BELT

#### NOTE:

Wipe off any oil or water on the belt and pulley.

- 1) Install the V-belt (C), and tighten the slider bolt so as to obtain the specified belt tension. <Ref. to ME(H4DOTC)-41, INSPECTION, V-belt.>
- 2) Tighten the lock bolt (A).
- 3) Tighten the slider bolt (B).

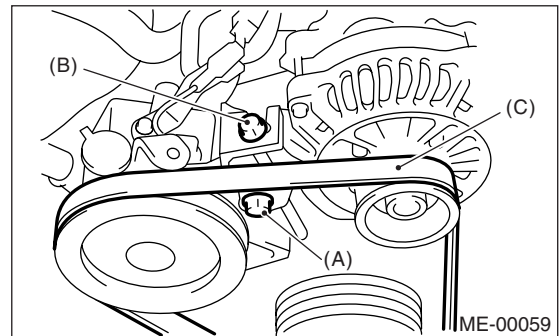
#### Tightening torque:

##### Lock bolt through bolt

**25 N·m (2.5 kgf-m, 18.4 ft-lb)**

##### Slider bolt:

**8 N·m (0.8 kgf-m, 5.9 ft-lb)**



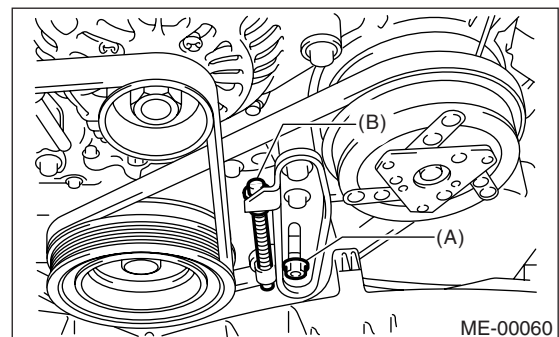
#### 2. REAR SIDE BELT

- 1) Install the belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(H4DOTC)-41, INSPECTION, V-belt.>
- 2) Tighten the lock nut (A).

#### Tightening torque:

##### Lock nut (A)

**23 N·m (2.3 kgf-m, 17.0 ft-lb)**



### C: INSPECTION

- 1) Replace the belts, if cracks, fraying or wear is found.
- 2) Check the V-belt tension and adjust it if necessary by changing generator installing position and idler pulley installing position.

# V-belt

## MECHANICAL

### Belt tension (with belt tension gauge)

(A)

**When installing new parts:**

640 — 780 N (65 — 80 kgf, 144 — 175 lbf)

**At inspection:**

490 — 640 N (50 — 65 kgf, 110 — 144 lbf)

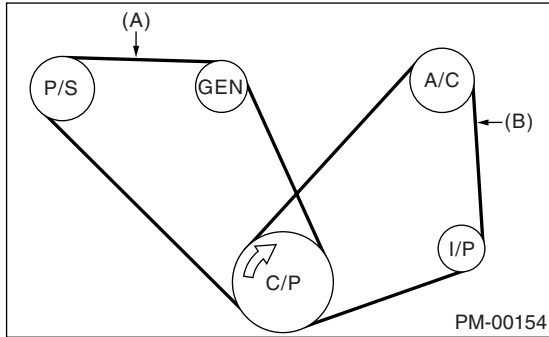
(B)

**When installing new parts:**

740 — 880 N (75 — 90 kgf, 166 — 198 lbf)

**At inspection:**

350 — 450 N (36 — 46 kgf, 79 — 101 lbf)



(A) Front side belt

(B) Rear side belt

C/P Crank pulley

GEN Generator

P/S Power steering oil pump pulley

A/C A/C compressor pulley

I/P Idler pulley

### Belt tension (without belt tension gauge)

(A)

**When installing new parts:**

7 — 9 mm (0.276 — 0.354 in)

**At inspection:**

9 — 11 mm (0.354 — 0.433 in)

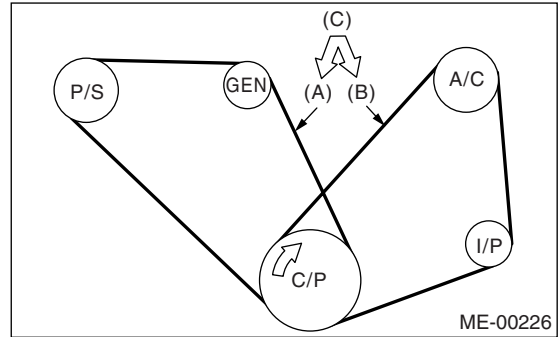
(B)

**When installing new parts:**

7.5 — 8.5 mm (0.295 — 0.335 in)

**At inspection:**

9.0 — 10.0 mm (0.354 — 0.394 in)



(A) Front side belt

(B) Rear side belt

(C) 98 N (10 kgf, 22 lbf)

C/P Crank pulley

GEN Generator

P/S Power steering oil pump pulley

A/C Air conditioning compressor pulley

I/P Idler pulley

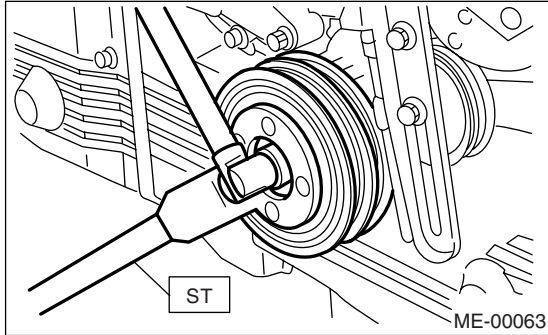
## 13.Crank Pulley

### A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>

2) Remove the crank pulley bolt. To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH



3) Remove the crank pulley.

### B: INSTALLATION

1) Install the crank pulley.

2) Install the pulley bolt.

To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH

(1) Clean the crank pulley thread using compressed air.

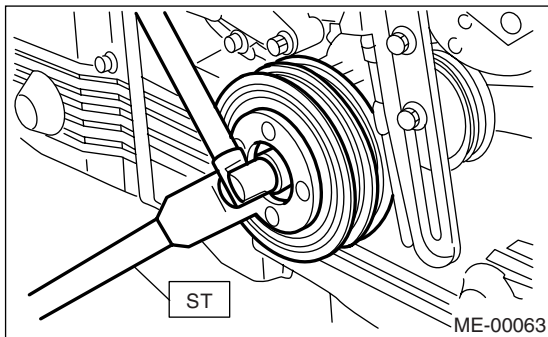
(2) Apply engine oil to the crank pulley bolt seat and thread.

(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf·m, 33 ft-lb).

(4) Tighten the crank pulley bolts.

#### Tightening torque:

**180 N·m (18.4 kgf·m, 132.8 ft-lb)**



3) Confirm that the tightening angle of crank pulley bolt is 65 degrees or more. If the tightening angle of crank pulley bolt is less than 65 degrees, conduct the following procedures.

#### CAUTION:

**If the tightening angle of crank pulley bolt is less than 65 degrees, the bolt should be damaged. In this case, the bolt must be replaced.**

(1) Replace the crank pulley bolts and clean them.

#### Crank pulley bolt: 12369AA011

(2) Clean the crankshaft thread using compressed air.

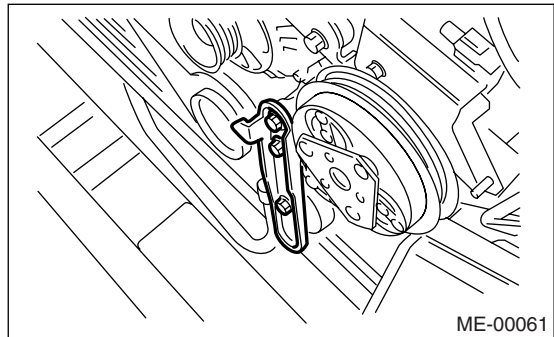
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf·m, 33 ft-lb).

(4) Tighten the crank pulley bolts keeping them in an angle between 65 degrees and 75 degrees.

#### NOTE:

Conduct the tightening procedures by confirming the turning angle of crank pulley bolt referring to the gauge indicated on timing belt cover.

4) Install the A/C belt tensioner.



5) Install the V-belt. <Ref. to ME(H4DOTC)-41, INSTALLATION, V-belt.>

### C: INSPECTION

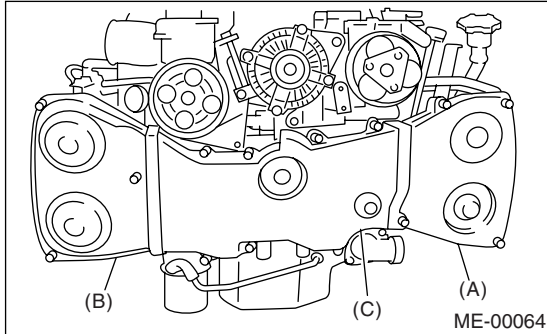
1) Make sure the V-belt is not worn or otherwise damaged.

2) Check the tension of the belt. <Ref. to ME(H4DOTC)-41, INSPECTION, V-belt.>

## 14. Timing Belt Cover

### A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover (LH) (A).
- 4) Remove the timing belt cover (RH) (B).
- 5) Remove the front timing belt cover (C).



### B: INSTALLATION

- 1) Install the front timing belt cover (C).

**Tightening torque:**

**5 N·m (0.5 kgf·m, 3.6 ft·lb)**

- 2) Install the timing belt cover (RH) (B).

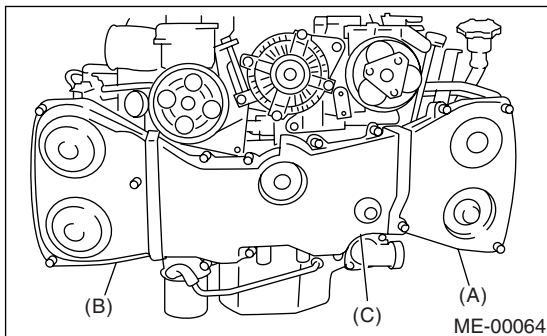
**Tightening torque:**

**5 N·m (0.5 kgf·m, 3.6 ft·lb)**

- 3) Install the timing belt cover (LH) (A).

**Tightening torque:**

**5 N·m (0.5 kgf·m, 3.6 ft·lb)**



- 4) Install the crank pulley. <Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>
- 5) Install the V-belt. <Ref. to ME(H4DOTC)-41, INSTALLATION, V-belt.>

### C: INSPECTION

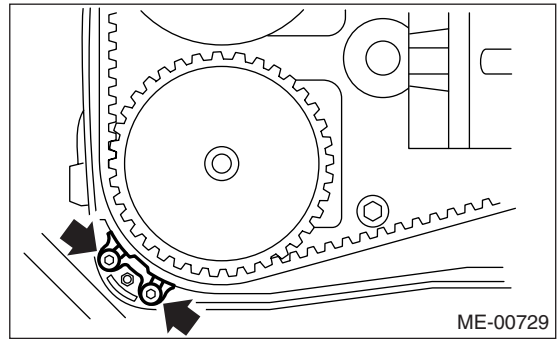
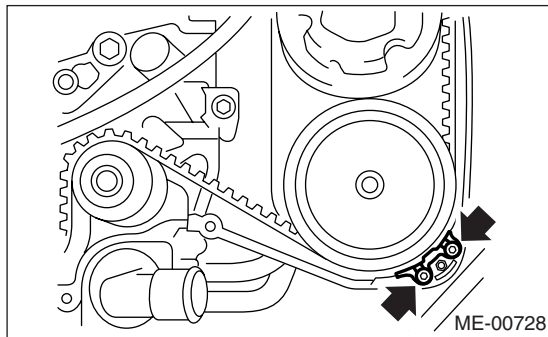
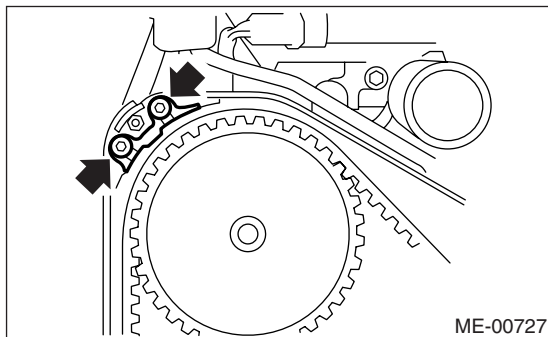
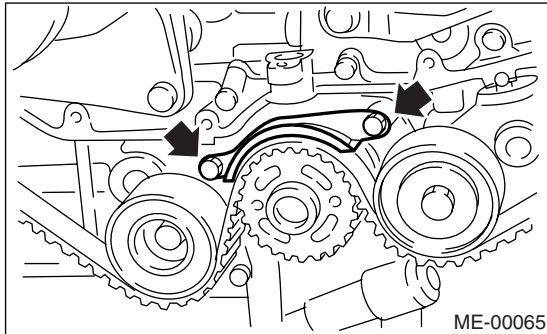
Make sure the cover is not damaged.

## 15. Timing Belt

### A: REMOVAL

#### 1. TIMING BELT

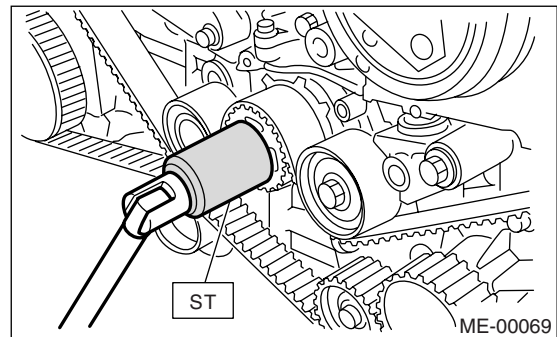
- 1) Remove the V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-44, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt guides. (MT model)



5) If the alignment mark and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as follows:

- (1) Turn the crankshaft using ST, and align the alignment marks on crank sprocket, intake cam sprocket (LH), exhaust cam sprocket (LH), intake cam sprocket (RH) and exhaust cam sprocket (RH) with notches of timing belt cover and cylinder block.

ST 499987500 CRANKSHAFT SOCKET

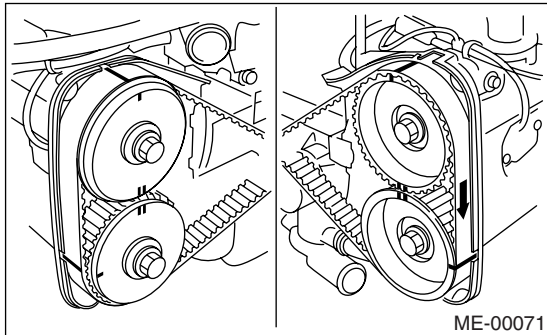
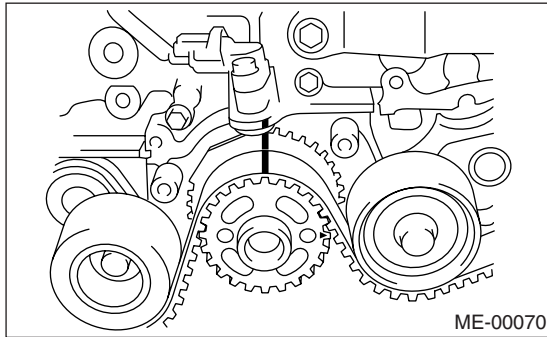




# Timing Belt

## MECHANICAL

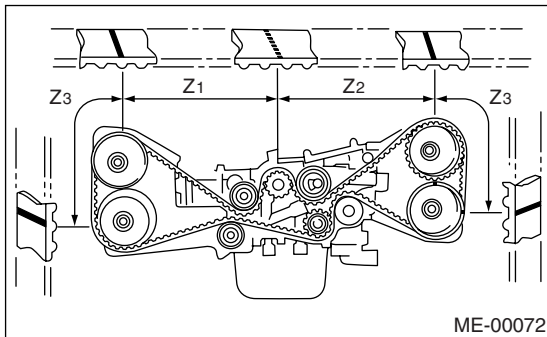
(2) Using white paint, put alignment and/or arrow marks on the timing belts in relation to the sprockets.



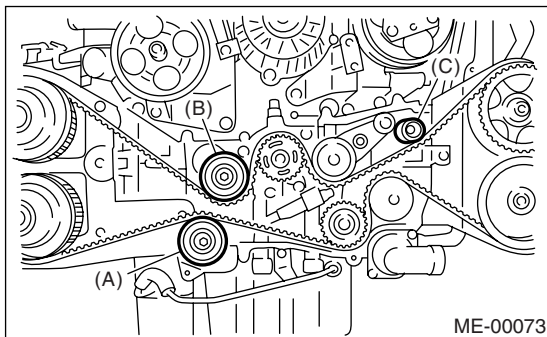
**Z<sub>1</sub>: 54.5 tooth length**

**Z<sub>2</sub>: 51 tooth length**

**Z<sub>3</sub>: 28 tooth length**



6) Remove the belt idler (A).



7) Remove the timing belt.

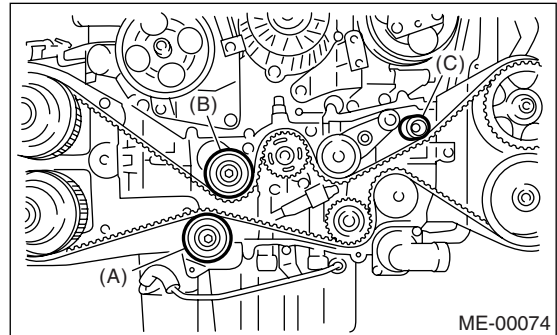
### CAUTION:

After the timing belt has been removed, never rotate the intake and exhaust, cam sprocket. If

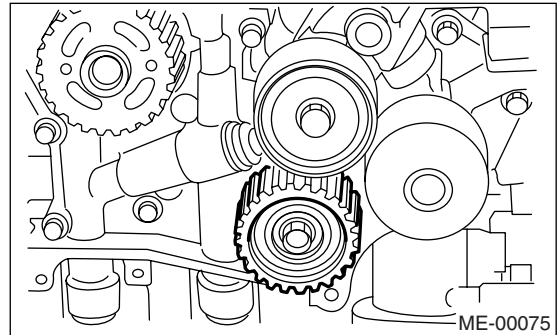
the cam sprocket is rotated, the intake and exhaust valve heads strike together and valve stems are bent.

## 2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

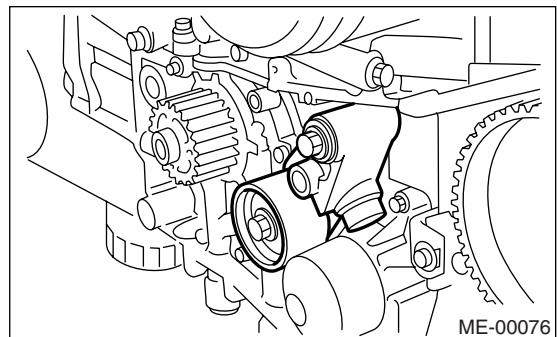
1) Remove the belt idler (B) and (C).



2) Remove the belt idler No. 2.



3) Remove the automatic belt tension adjuster assembly.



## B: INSTALLATION

### 1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

1) Preparation for installation of automatic belt tension adjuster assembly:

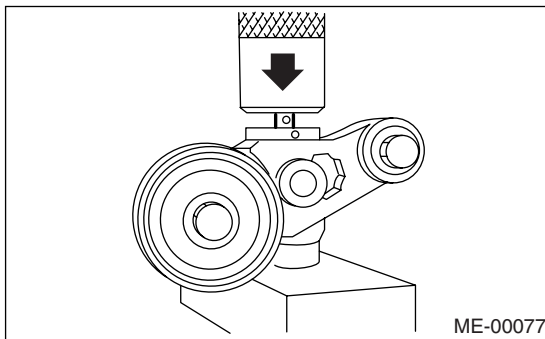
#### CAUTION:

- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.

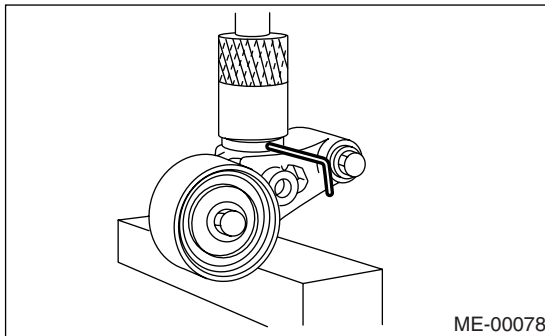
- Press-in the push adjuster rod gradually taking more than 3 minutes.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lbf).
- Press the adjuster rod as far as the end surface of cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
- Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.

(2) Slowly move the adjuster rod down with a pressure of 165 N (16.8 kgf, 37.1 lbf) or more until the adjuster rod is aligned with the stopper pin hole in the cylinder.

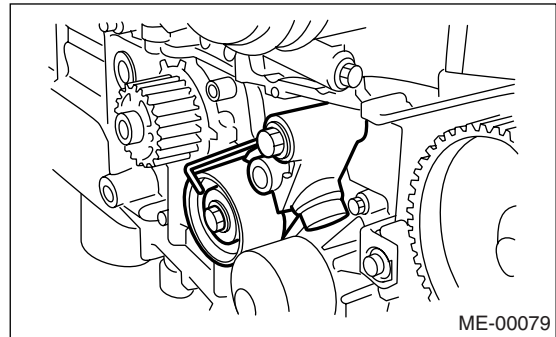


(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



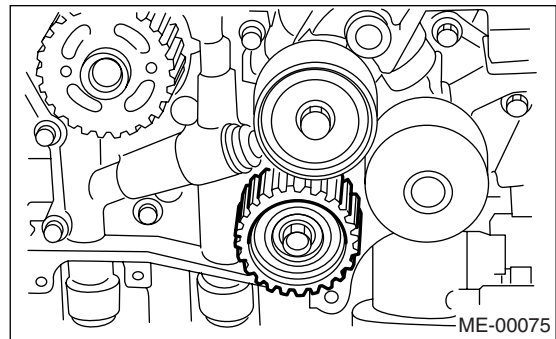
2) Install the automatic belt tension adjuster assembly.

**Tightening torque:**  
**39 N·m (4.0 kgf·m, 28.9 ft·lb)**



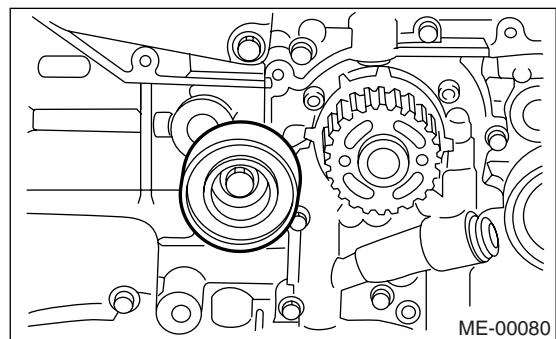
3) Install the belt idler No. 2.

**Tightening torque:**  
**39 N·m (4.0 kgf·m, 28.9 ft·lb)**



4) Install the belt idlers.

**Tightening torque:**  
**39 N·m (4.0 kgf·m, 28.9 ft·lb)**



## 2. TIMING BELT

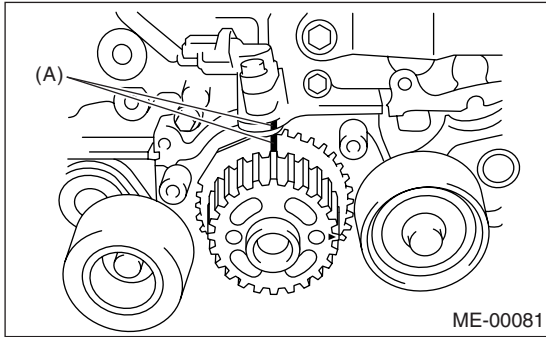
1) Preparation for installation of automatic belt tension adjuster assembly. <Ref. to ME(H4DOTC)-46, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>

# Timing Belt

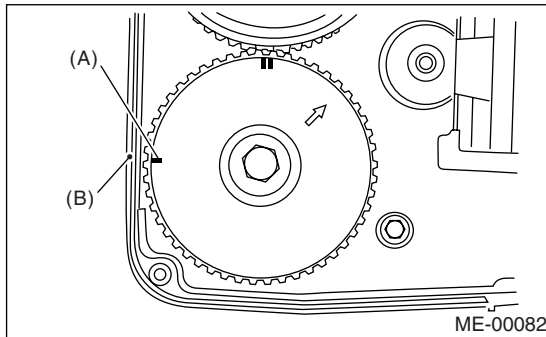
## MECHANICAL

### 2) Crankshaft and cam sprocket alignment

(1) Align mark (A) on the crank sprocket with mark on the oil pump cover at cylinder block.

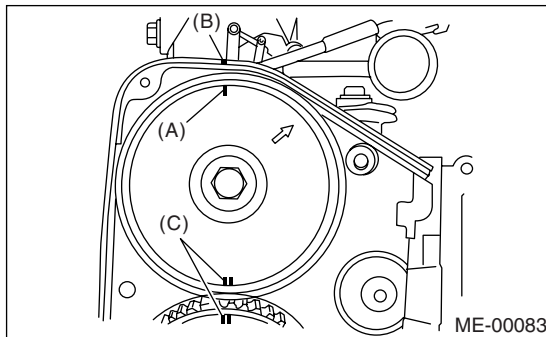


(2) Align single line mark (A) on the exhaust cam sprocket (RH) with notch (B) on timing belt cover.

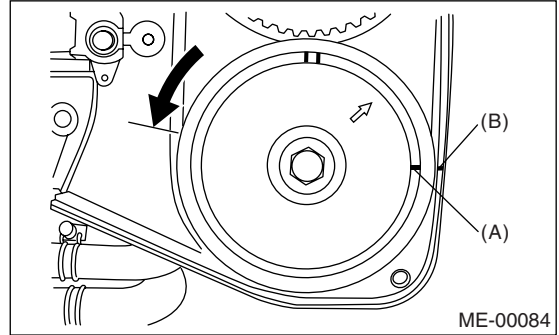


(3) Align single line mark (A) on the intake cam sprocket (RH) with notch (B) on timing belt cover.

(Make sure double lines (C) on intake camshaft and exhaust cam sprockets are aligned.)

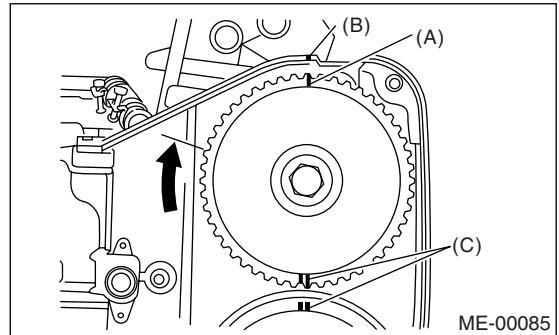


(4) Align single line mark (A) on exhaust cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket counterclockwise (as viewed from front of engine).



(5) Align the single line mark (A) on intake cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket clockwise (as viewed from front of engine).

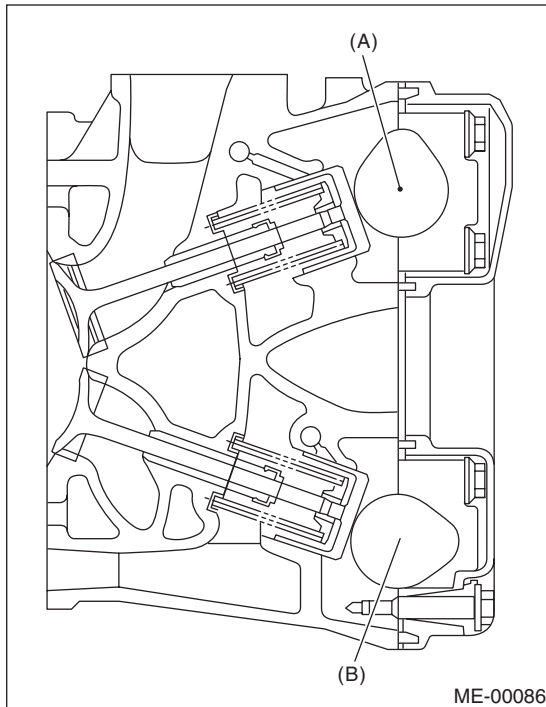
(Ensure the double lines (C) on intake and exhaust cam sprockets are aligned.)



(6) Ensure the camshaft and crank sprockets are positioned properly.

**CAUTION:**

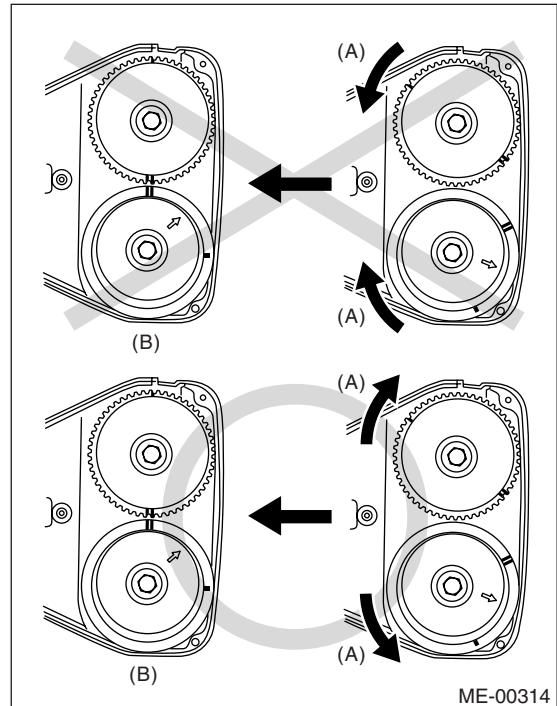
• Intake and exhaust camshafts for this DOHC engine can be independently rotated with the timing belts removed. As can be seen from the figure, if the intake and exhaust valves are lifted simultaneously, their heads will interfere with each other, resulting in bent valves.



(A) Intake camshaft  
(B) Exhaust camshaft

- When the timing belts are not installed, four camshafts are held at the “zero-lift” position, where all cams on camshafts do not push the intake and exhaust valves down. (Under this condition, all valves remain unlifted.)
- When the camshafts are rotated to install the timing belts, #2 intake and #4 exhaust cam of camshafts (LH) are held to push their corresponding valves down. (Under this condition, these valves are held lifted.) Camshafts (RH) are held so that their cams do not push valves down.
- Camshafts (LH) must be rotated from the “zero-lift” position to the position where the timing belt is to be installed at as small an angle as possible, in order to prevent mutual interference of intake and exhaust valve heads.

- Do not allow the camshafts to rotate in the direction shown by the upper illustration in the figure as this causes both intake and exhaust valves to lift simultaneously, resulting in interference with their heads.



(A) Rotating direction  
(B) Timing belt installation position

**3) Installation of timing belt**

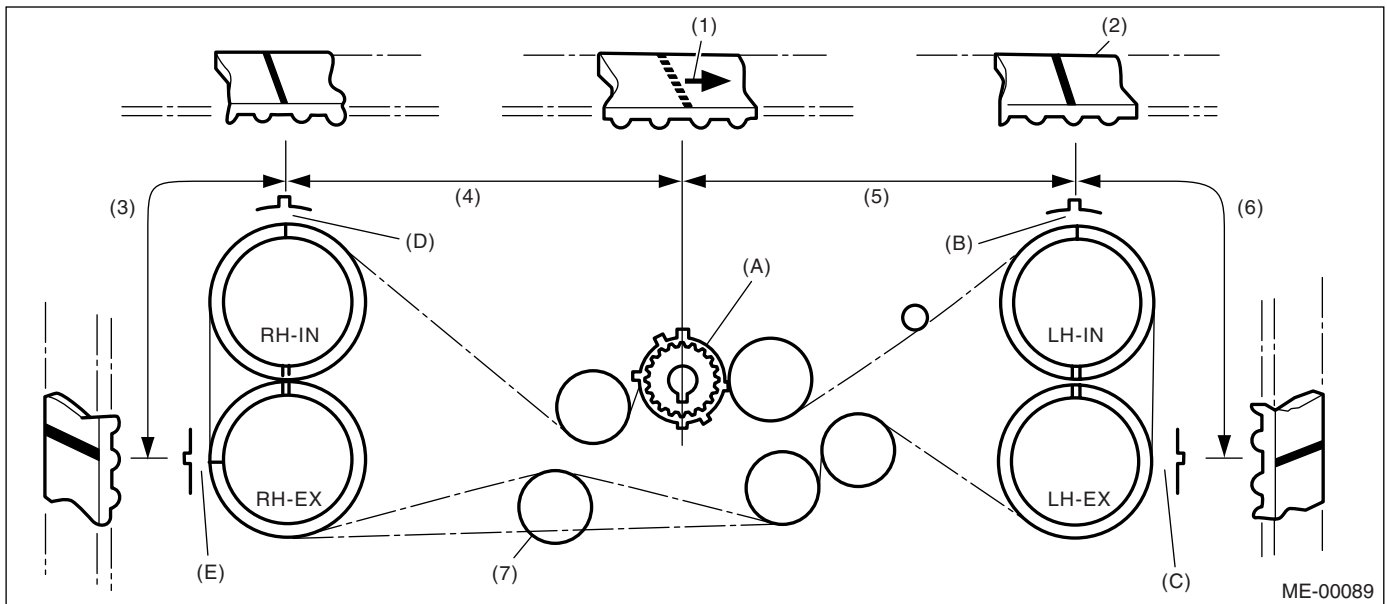
Align the alignment mark on timing belt with marks on sprockets in alphabetical order shown in the figure. While aligning marks, position the timing belt properly.

**CAUTION:**

- Disengagement of more than three timing belt teeth may result in interference between the valve and piston.
- Ensure the belt’s rotating direction is correct.

# Timing Belt

MECHANICAL



- |                     |                       |                           |
|---------------------|-----------------------|---------------------------|
| (1) Arrow mark      | (4) 54.5 tooth length | (7) Install it in the end |
| (2) Timing belt     | (5) 51 tooth length   |                           |
| (3) 28 tooth length | (6) 28 tooth length   |                           |

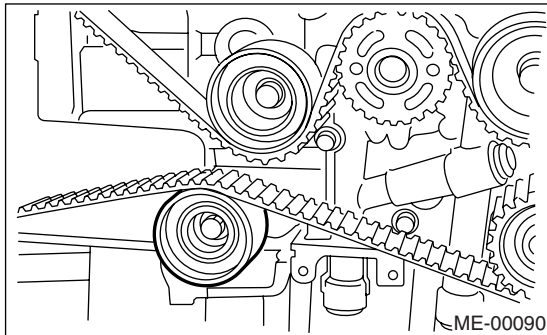
4) Install the belt idler.

### **Tightening torque:**

**39 N·m (4.0 kgf·m, 28.9 ft·lb)**

### **NOTE:**

Make sure that the marks on the timing belt and sprockets are aligned.



5) After ensuring that the marks on the timing belt and sprockets are aligned, remove the stopper pin from tensioner adjuster.

6) Install the timing belt guide. (MT model)

### **CAUTION:**

- Before installing the bolts, clean the threaded portion of timing belt cover.
- Apply liquid gasket to the threaded portion of bolts. (Cam sprocket side only)

### **Liquid gasket:**

**THREE BOND 1324 (Part No. 004403042) or equivalent**

- (1) Temporarily tighten the bolts.



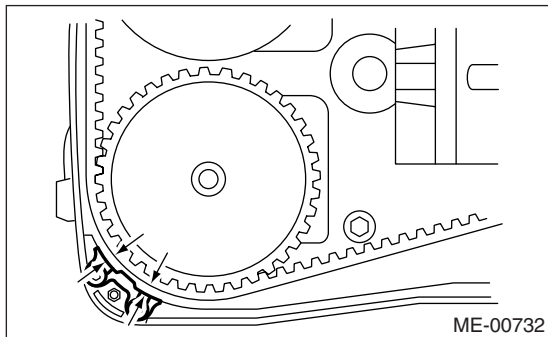
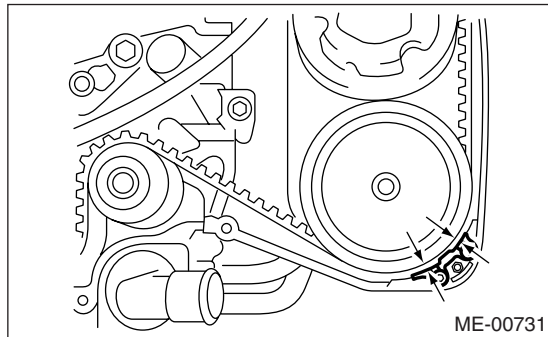
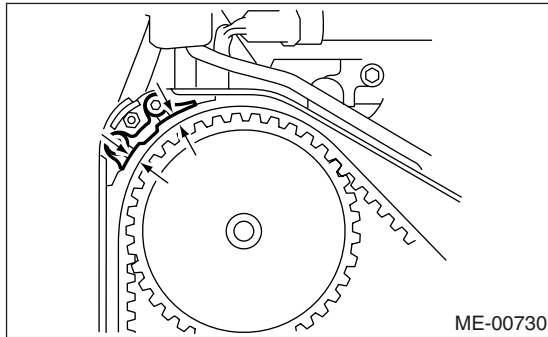
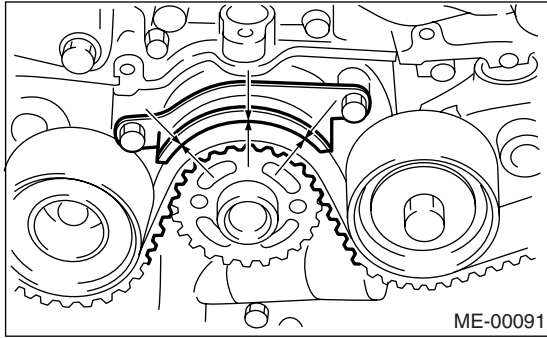
# Timing Belt

MECHANICAL

(2) Check and adjust the clearance between timing belt and timing belt guide.

**Clearance:**

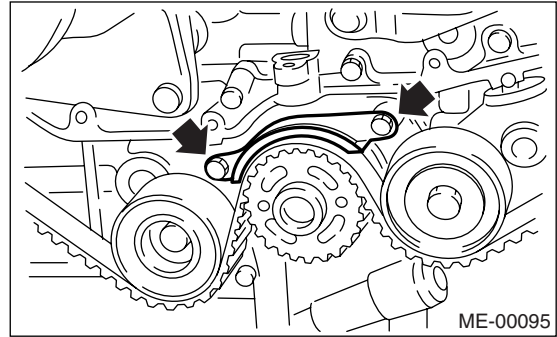
**$1.0 \pm 0.5$  mm ( $0.039 \pm 0.020$  in)**



(3) Tighten the bolts.

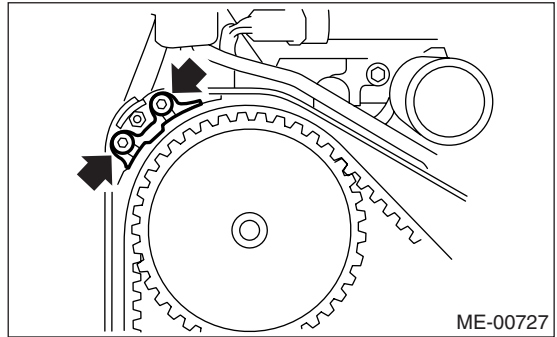
**Tightening torque:**

**$9.75$  N·m ( $1.0$  kgf·m,  $7.2$  ft·lb)**



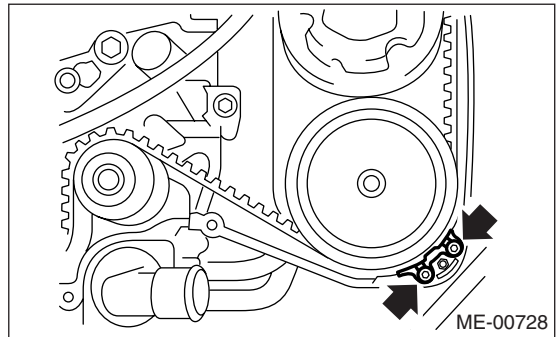
**Tightening torque:**

**$6.4$  N·m ( $0.65$  kgf·m,  $4.7$  ft·lb)**



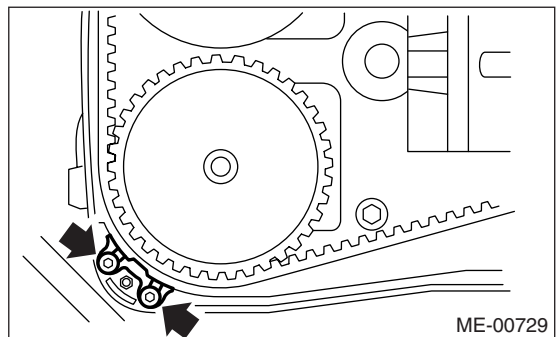
**Tightening torque:**

**$6.4$  N·m ( $0.65$  kgf·m,  $4.7$  ft·lb)**



**Tightening torque:**

**$6.4$  N·m ( $0.65$  kgf·m,  $4.7$  ft·lb)**



# Timing Belt

## MECHANICAL

- 7) Install the timing belt cover.  
<Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt Cover.>
- 8) Install the crank pulley.  
<Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>
- 9) Install the V-belt. <Ref. to ME(H4DOTC)-41, INSTALLATION, V-belt.>

## C: INSPECTION

### 1. TIMING BELT

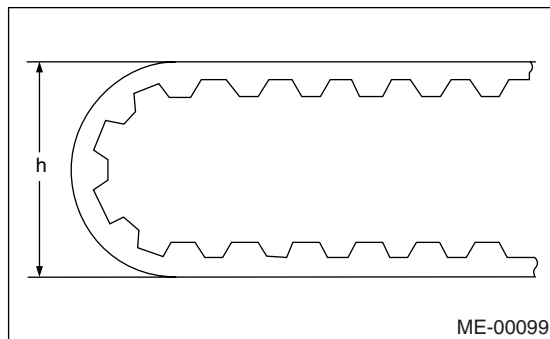
- 1) Check the timing belt teeth for breaks, cracks, and wear. If any fault is found, replace the belt.
- 2) Check the condition of back side of timing belt; if any crack is found, replace the timing belt.

#### CAUTION:

- Be careful not to let oil, grease or coolant contact the timing belt. Remove quickly and thoroughly if this happens.
- Do not bend the timing belt sharply.

#### Bending diameter h:

60 mm (2.36 in) or more



### 2. AUTOMATIC BELT TENSION ADJUST-ER

- 1) Visually check the oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace the automatic belt tension adjuster assembly.

#### NOTE:

Slight traces of oil at rod's oil seal does not indicate a problem.

- 2) Check that the adjuster rod does not move when a pressure of 165 N (16.8 kgf, 37.1 lbf) is applied to it. This is to check adjuster rod stiffness.
- 3) If the adjuster rod is not stiff and moves freely when applying 165 N (16.8 kgf, 37.1 lbf), check it using the following procedures:

- (1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this motion 2 or 3 times.

- (2) With the adjuster rod moved all the way up, apply a pressure of 165 N (16.8 kgf, 37.1 lbf) to it. Check the adjuster rod stiffness.
- (3) If the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new one.

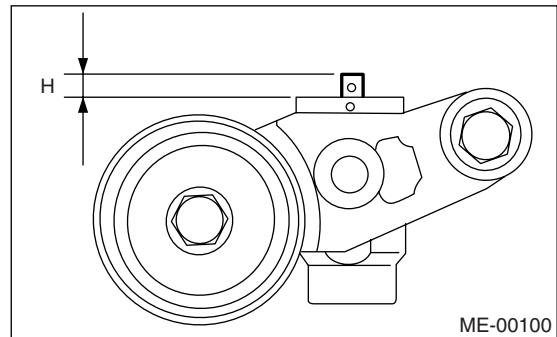
#### CAUTION:

- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.
- Press-in the push adjuster rod gradually taking more than 3 minutes.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lbf).
- Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.

- 4) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

#### Rod extension H:

5.7±0.5 mm (0.224±0.020 in)



### 3. BELT TENSION PULLEY

- 1) Check the mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace the belt tension pulley if faulty.
- 2) Check the belt tension pulley for smooth rotation. Replace if noise or excessive play is noted.
- 3) Check the belt tension pulley for grease leakage.

### 4. BELT IDLER

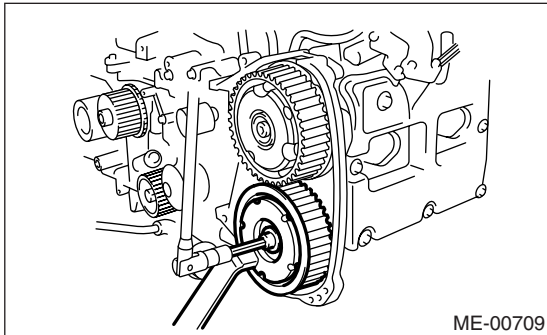
- 1) Check the belt idler for smooth rotation. Replace if noise or excessive play is noted.
- 2) Check the outer contacting surfaces of idler pulley for abnormal wear and scratches.
- 3) Check the belt idler for grease leakage.

## 16. Cam Sprocket

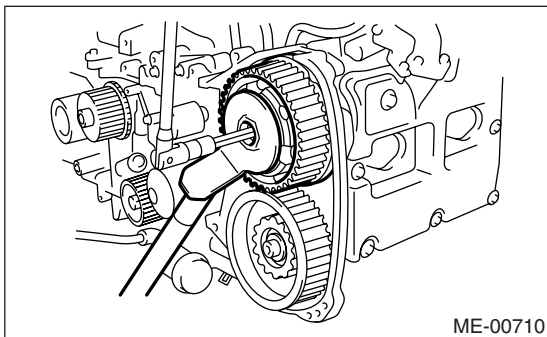
### A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-44, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt.>
- 5) Remove the cam sprockets. To lock the camshaft, use ST.

ST 499207400 CAM SPROCKET WRENCH



ST 499977500 CAM SPROCKET WRENCH



### B: INSTALLATION

- 1) Install the cam sprocket. To lock the camshaft, use ST.

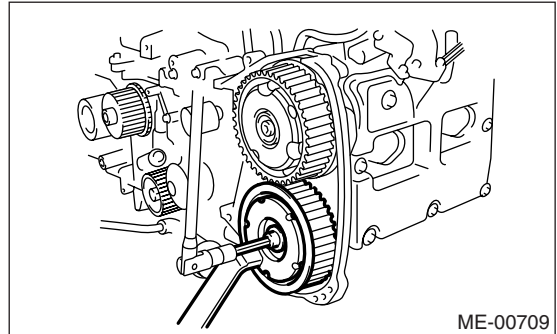
ST 499207400 CAM SPROCKET WRENCH

#### **Tightening torque:**

**Tighten to 30 N·m (3.1 kgf·m, 22.1 ft·lb), then further tighten by 45°.**

#### NOTE:

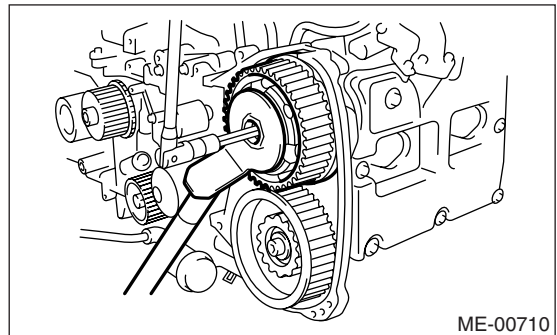
Do not confuse the cam sprockets (RH) and (LH) intake side during installation.



ST 499977500 CAM SPROCKET WRENCH

#### **Tightening torque:**

**Tighten to 30 N·m (3.1 kgf·m, 22.1 ft·lb), then further tighten by 45°.**



- 2) Install the timing belt. <Ref. to ME(H4DOTC)-46, INSTALLATION, Timing Belt.>

- 3) Install the timing belt cover. <Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt Cover.>

- 4) Install the crank pulley. <Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>

- 5) Install the V-belt. <Ref. to ME(H4DOTC)-41, INSTALLATION, V-belt.>

### C: INSPECTION

- 1) Check the cam sprocket teeth for abnormal wear and scratches.

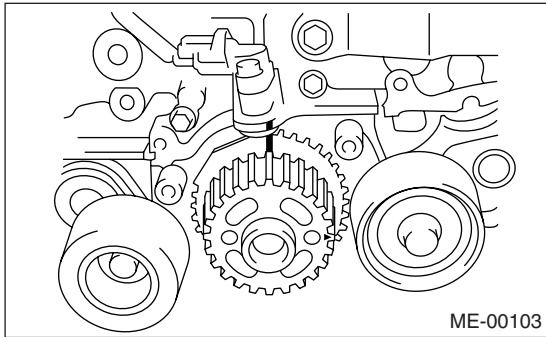
- 2) Make sure there is no free play between cam sprocket and key.



## 17. Crank Sprocket

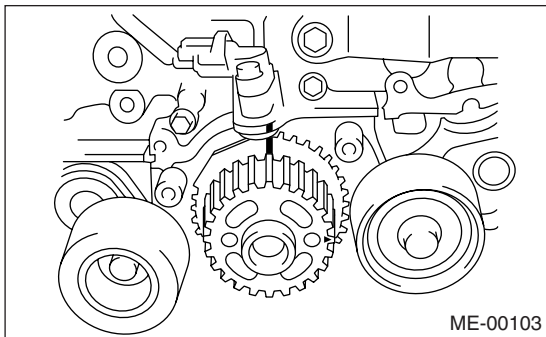
### A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-44, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt.>
- 5) Remove the crank sprocket.



### B: INSTALLATION

- 1) Install the crank sprocket.



- 2) Install the timing belt. <Ref. to ME(H4DOTC)-46, INSTALLATION, Timing Belt.>
- 3) Install the timing belt cover. <Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt Cover.>
- 4) Install the crank pulley. <Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>
- 5) Install the V-belt. <Ref. to ME(H4DOTC)-41, INSTALLATION, V-belt.>

### C: INSPECTION

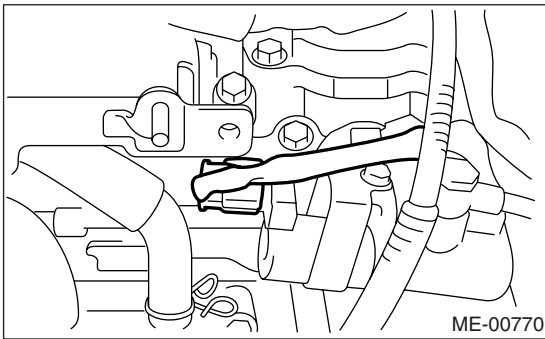
- 1) Check the crank sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between crank sprocket and key.

- 3) Check the crank sprocket notch used for sensor for damage and contamination of foreign matter.

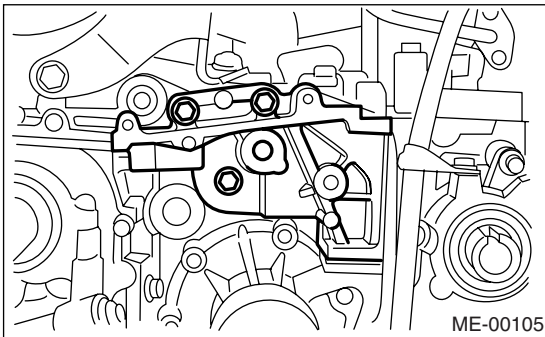
## 18. Camshaft

### A: REMOVAL

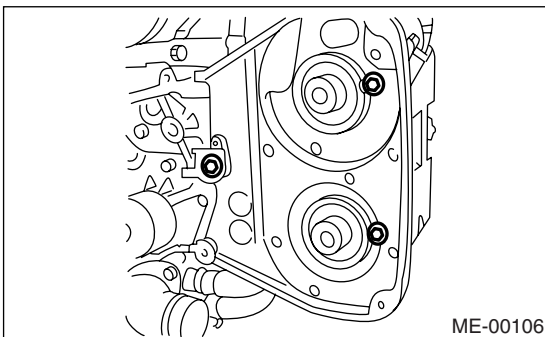
- 1) Remove the V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-44, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt.>
- 5) Remove the cam sprocket. <Ref. to ME(H4DOTC)-53, REMOVAL, Cam Sprocket.>
- 6) Disconnect the oil flow control solenoid valve assembly connector.



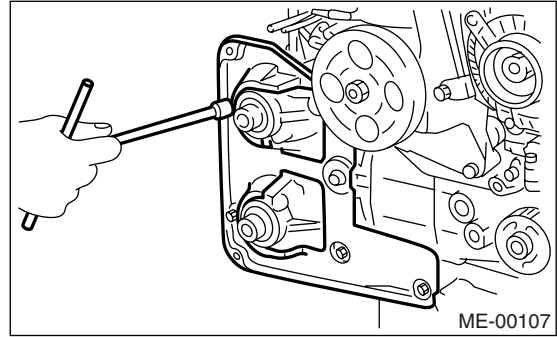
- 7) Remove the tensioner bracket.



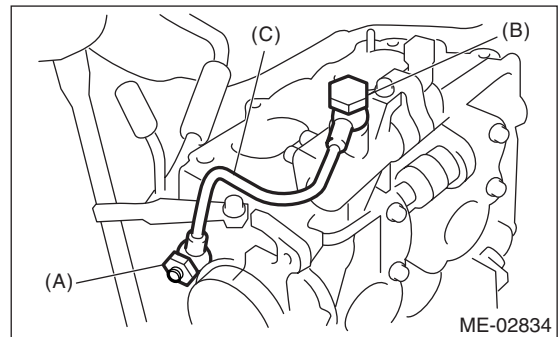
- 8) Remove the timing belt cover No. 2 (LH).



- 9) Remove the timing belt cover No. 2 (RH).

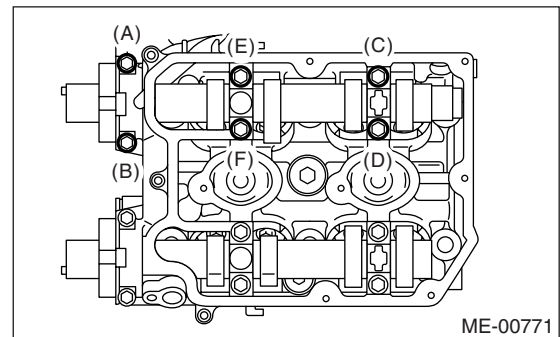


- 10) Remove the spark plug cord.
- 11) Remove the oil level gauge guide. (LH side)
- 12) Remove the rocker cover and gasket.
- 13) Remove the oil pipe.



- (A) Union screw with filter (with protrusion)
- (B) Union screw without filter (without protrusion)
- (C) Oil pipe

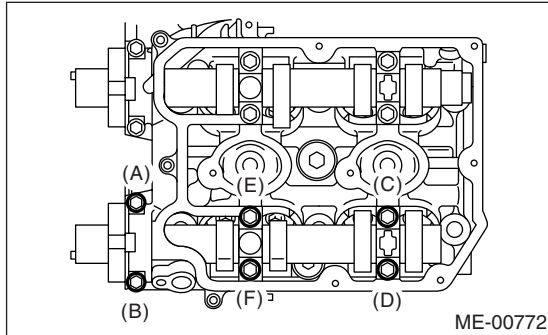
- 14) Loosen the oil flow control solenoid valve assembly and intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



# Camshaft

## MECHANICAL

15) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



16) Remove the oil flow control solenoid valve assembly, intake camshaft cap, and camshaft.  
17) Remove the exhaust camshaft cap and camshaft.

### NOTE:

Arrange the camshaft caps in order so that they can be installed in their original positions.

18) Similarly, remove the camshafts (RH) and related parts.

## B: INSTALLATION

### 1) Camshaft installation

Apply engine oil to the cylinder head at camshaft bearing installing location before installing the camshaft. Install the camshaft so that each valve is close to or in contact with “base circle” of cam lobe.

### NOTE:

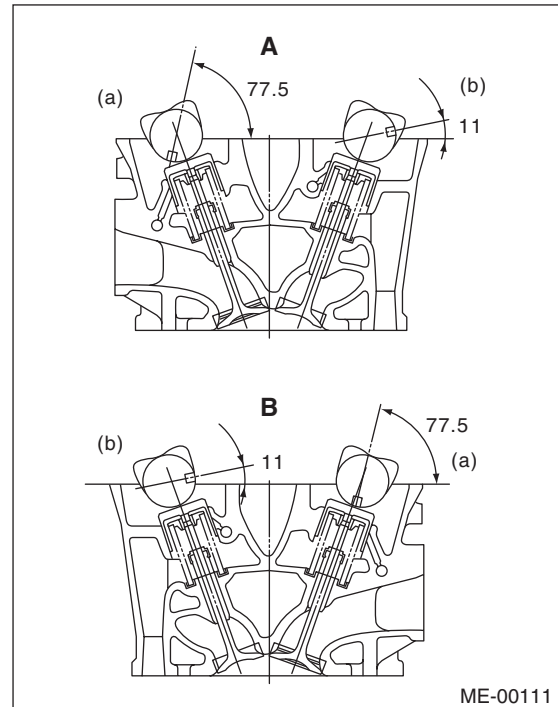
- When the camshafts are positioned as shown in the figure, camshaft (LH) needs to be rotated at a minimum to align with the timing belt during installation.
- Camshaft (RH) need not be rotated when set at the position shown in the figure.

Intake camshaft (LH):

Rotate 80° clockwise.

Exhaust camshaft (LH):

Rotate 45° counterclockwise.



A Cylinder head (LH)

B Cylinder head (RH)

(a) Intake camshaft

(b) Exhaust camshaft

### 2) Camshaft cap and oil flow control solenoid valve assembly installation

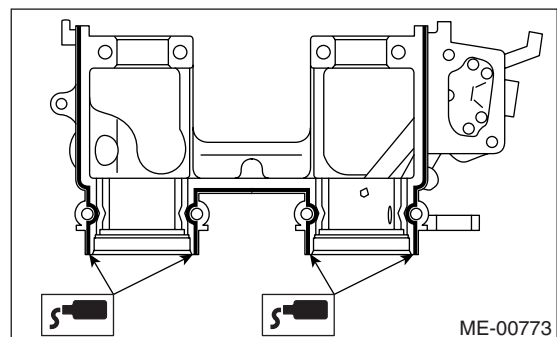
- (1) Apply small amount of liquid gasket to the cap mating surface.

### NOTE:

Do not apply liquid gasket excessively. Otherwise, the excessive liquid gasket may come out and flow toward oil seal, resulting in oil leaks.

### Liquid gasket:

**THREE BOND 1215 (Part No. 004403007) or equivalent**



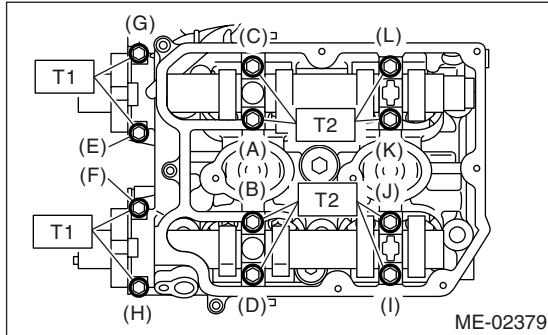
(2) Apply engine oil to the cap bearing surface, and install the cap on camshaft as shown by identification mark.

(3) Gradually tighten the camshaft cap and oil control valve assembly in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.

**Tightening torque:**

**T1: 9.75 N·m (1.0 kgf·m, 7.2 ft·lb)**

**T2: 20 N·m (2.0 kgf·m, 14.8 ft·lb)**



(4) After tightening the camshaft cap, ensure the camshaft rotates only slightly while holding it at “base” circle.

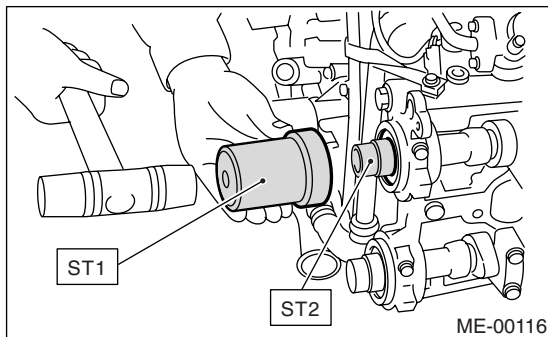
3) Apply engine oil to the outer perimeter and lips of oil seal, and install the oil seal on camshaft using ST1 and ST2.

**NOTE:**

Use a new oil seal.

ST1 499587600 OIL SEAL GUIDE

ST2 499597200 OIL SEAL GUIDE



**4) Rocker cover installation**

(1) Install the gasket on rocker cover. Install the peripheral gasket and ignition coil gasket.

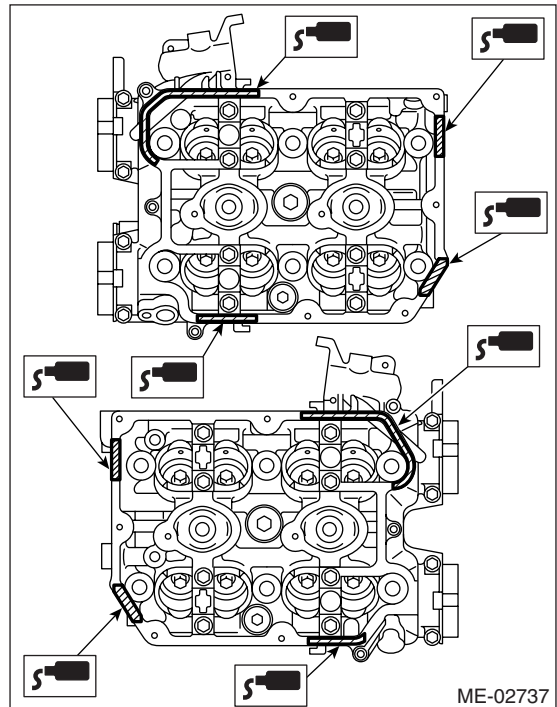
(2) Apply liquid gasket to the designated point of cylinder head.

**NOTE:**

Apply liquid gasket to the half moon plug portion with sticking out more than 5 mm (0.2 in).

**Liquid gasket:**

**THREE BOND 1215 (Part No. 004403007) or equivalent**



(3) Install the rocker cover on cylinder head. Ensure the gasket is properly positioned during installation.

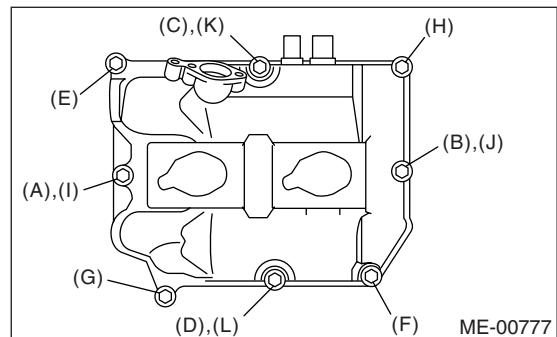
**CAUTION:**

**Use a new rocker cover gasket.**

(4) Tighten the rocker cover tightening bolts in alphabetical sequence shown in the figure, and then tighten to specified torque.

**Tightening torque:**

**6.4 N·m (0.65 kgf·m, 4.7 ft·lb)**



5) Install the oil pipe.

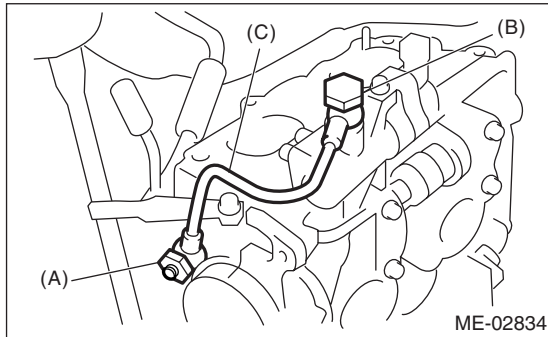
**NOTE:**

Installing location of the union screw varies depending on with or without filter. Be careful of this.

# Camshaft

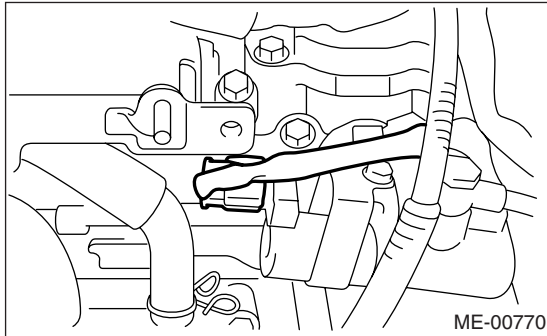
MECHANICAL

**Tightening torque:**  
**29 N·m (3.0 kgf·m, 21.4 ft·lb)**



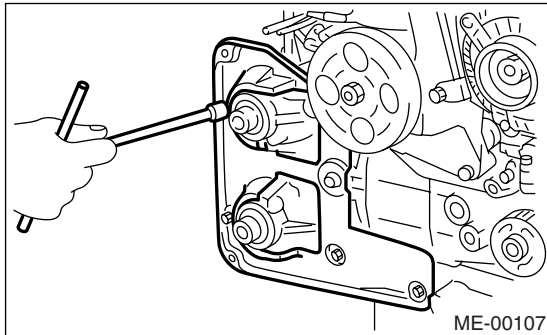
- (A) Union screw with filter (with protrusion)
- (B) Union screw without filter (without protrusion)
- (C) Oil pipe

6) Connect the oil flow control solenoid valve connector.



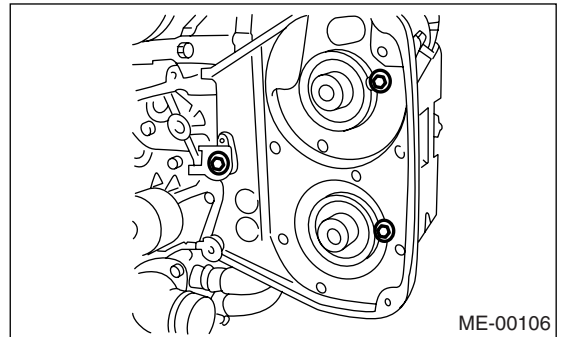
7) Similarly, install the parts on RH side.  
8) Install the timing belt cover No. 2 (RH).

**Tightening torque:**  
**5 N·m (0.5 kgf·m, 3.6 ft·lb)**



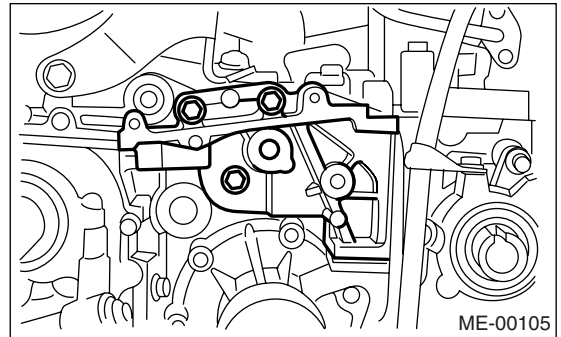
9) Install the timing belt cover No. 2 (LH).

**Tightening torque:**  
**5 N·m (0.5 kgf·m, 3.6 ft·lb)**



10) Install the tensioner bracket.

**Tightening torque:**  
**24.5 N·m (2.5 kgf·m, 18.1 ft·lb)**



- 11) Install the cam sprocket.  
<Ref. to ME(H4DOTC)-53, INSTALLATION, Cam Sprocket.>
- 12) Install the timing belt. <Ref. to ME(H4DOTC)-46, INSTALLATION, Timing Belt.>
- 13) Install the timing belt cover.  
<Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt Cover.>
- 14) Install the crank pulley.  
<Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>
- 15) Install the V-belt. <Ref. to ME(H4DOTC)-41, INSTALLATION, V-belt.>

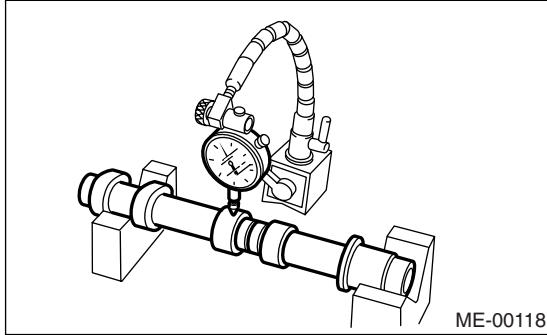


## C: INSPECTION

1) Measure the bend, and repair or replace if necessary.

**Limit:**

**0.020 mm (0.00079 in)**



2) Check the journal for damage and wear. Replace if faulty.

3) Measure the outside diameter of camshaft journal. If the journal diameter is not within standard, check the oil clearance.

|                     | Camshaft journal                     |                                      |
|---------------------|--------------------------------------|--------------------------------------|
|                     | Front                                | Center, rear                         |
| Standard<br>mm (in) | 37.946 — 37.963<br>(1.4939 — 1.4946) | 29.946 — 29.963<br>(1.1790 — 1.1796) |

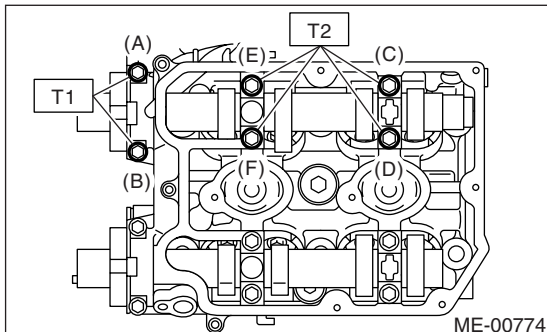
4) Measurement of the camshaft journal oil clearance

- (1) Clean the bearing caps and camshaft journals.
- (2) Place the camshafts on cylinder head. (Without installing the valve rocker.)
- (3) Place a plastigauge across each of the camshaft journals.
- (4) Gradually tighten the cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque. Do not turn the camshaft.

**Tightening torque:**

**T1: 9.75 N·m (1.0 kgf·m, 7.2 ft·lb)**

**T2: 20 N·m (2.0 kgf·m, 14.8 ft·lb)**



(5) Remove the bearing caps.

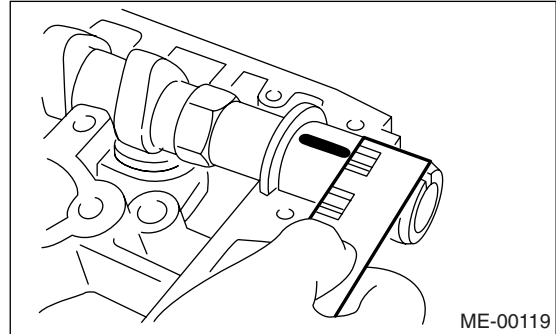
(6) Measure the widest point of the plastigauge on each journal. If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

**Standard:**

**0.037 — 0.072 mm (0.0015 — 0.0028 in)**

**Limit:**

**0.10 mm (0.0039 in)**



- (7) Completely remove the plastigauge.
- 5) Check the cam face condition, and remove the minor faults by grinding with oil stone. Measure the cam height H. If it exceeds the limit or offset wear occurs, replace the camshaft.

**Cam height H:**

**Standard**

**Intake**

**46.55 — 46.65 mm (1.833 — 1.837 in)**

**Exhaust**

**46.75 — 46.85 mm (1.841 — 1.844 in)**

**Limit**

**Intake**

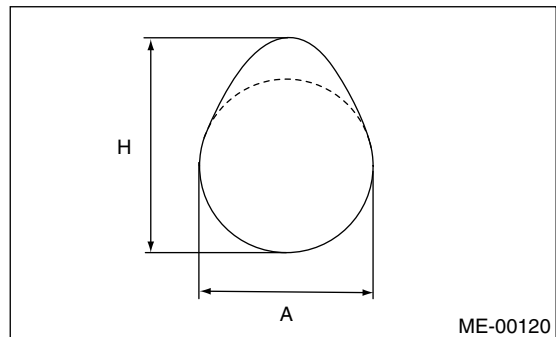
**46.45 mm (1.829 in)**

**Exhaust**

**46.65 mm (1.837 in)**

**Cam base circle diameter A:**

**37.0 mm (1.457 in)**



6) Measure the thrust clearance of camshaft with dial gauge. If the thrust clearance exceeds the limit or offset wear occurs, replace the caps and cylinder head as a set. If necessary, replace the camshaft.

# Camshaft

MECHANICAL

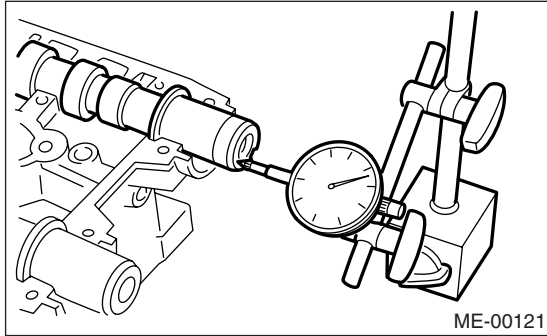
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**Standard:**

**0.068 — 0.116 mm (0.0027 — 0.0046 in)**

**Limit:**

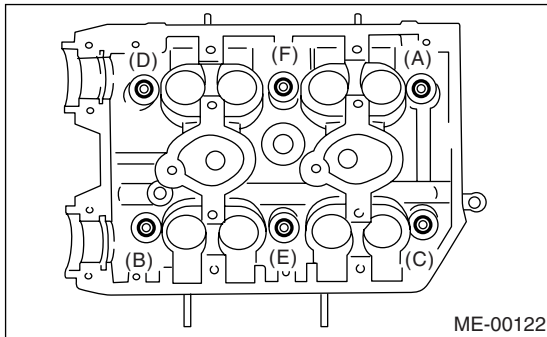
**0.14 mm (0.0055 in)**



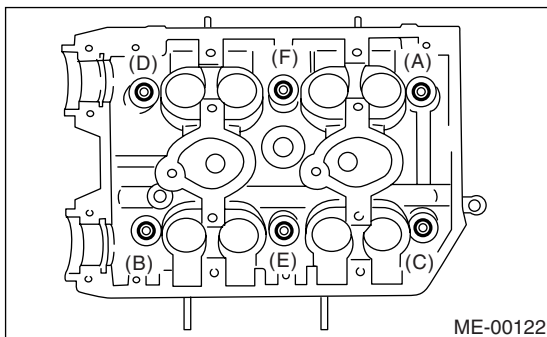
## 19. Cylinder Head

### A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-44, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt.>
- 5) Remove the cam sprockets. <Ref. to ME(H4DOTC)-53, REMOVAL, Cam Sprocket.>
- 6) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
- 7) Remove the bolt which installs the A/C compressor bracket on cylinder head.
- 8) Remove the camshaft. <Ref. to ME(H4DOTC)-55, REMOVAL, Camshaft.>
- 9) Remove the cylinder head bolts in alphabetical sequence shown in the figure.  
Leave bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.



- 10) While tapping the cylinder head with a plastic hammer, separate it from cylinder block. Remove the bolts (A) and (D) to remove cylinder head.



- 11) Remove the cylinder head gasket.

### CAUTION:

Be careful not to scratch the mating surface of cylinder head and cylinder block.

- 12) Similarly, remove the cylinder head (RH).

### B: INSTALLATION

- 1) Install the cylinder head and gaskets on cylinder block.

### CAUTION:

- Use new cylinder head gaskets.
- Be careful not to scratch the mating surface of cylinder head and cylinder block.

- 2) Tighten the cylinder head bolts.
  - (1) Apply a coat of engine oil to the washers and bolt threads.
  - (2) Tighten all bolts to 29 N·m (3.0 kgf·m, 22 ft·lb) in alphabetical sequence.
  - (3) Tighten all bolts to 69 N·m (7.0 kgf·m, 51 ft·lb) in alphabetical sequence again.
  - (4) Back off all bolts by 180° first; back them off by 180° again in reverse order of installation.
  - (5) Tighten all bolts to 49 N·m (5.0 kgf·m, 36 ft·lb) in alphabetical sequence.
  - (6) Tighten all bolts 80 to 90° in alphabetical sequence.
  - (7) Tighten all bolts by 40 to 45° in alphabetical sequence again.

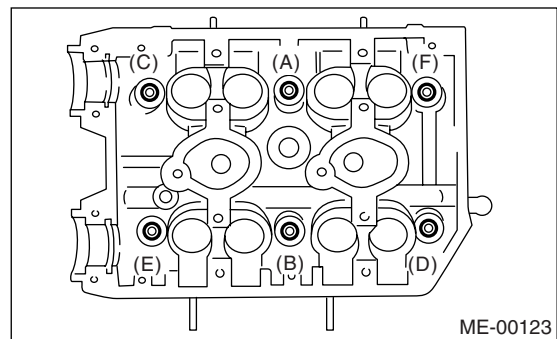
### CAUTION:

Do not tighten the bolts by more than 45°.

- (8) Further tighten all bolts (A) and (B) by 40 to 45°.

### CAUTION:

Ensure that the total “re-tightening angle” in the previous two steps do not exceed 90°.



- 3) Install the camshaft. <Ref. to ME(H4DOTC)-56, INSTALLATION, Camshaft.>
- 4) Install the A/C compressor bracket on cylinder head.
- 5) Install the intake manifold. <Ref. to FU(H4DOTC)-17, INSTALLATION, Intake Manifold.>



# Cylinder Head

## MECHANICAL

---

6) Install the cam sprocket.

<Ref. to ME(H4DOTC)-53, INSTALLATION, Cam Sprocket.>

7) Install the timing belt.

<Ref. to ME(H4DOTC)-46, INSTALLATION, Timing Belt.>

8) Install the timing belt cover.

<Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt Cover.>

9) Install the crank pulley.

<Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>

10) Install the V-belt. <Ref. to ME(H4DOTC)-41, INSTALLATION, V-belt.>

## C: DISASSEMBLY

1) Remove the valve lifters.

2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

ST1 498267600 CYLINDER HEAD TABLE

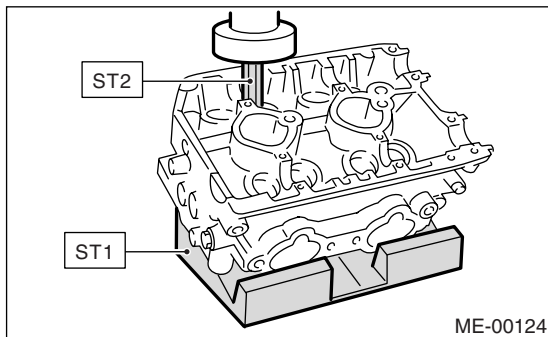
ST2 499718000 VALVE SPRING REMOVER

### NOTE:

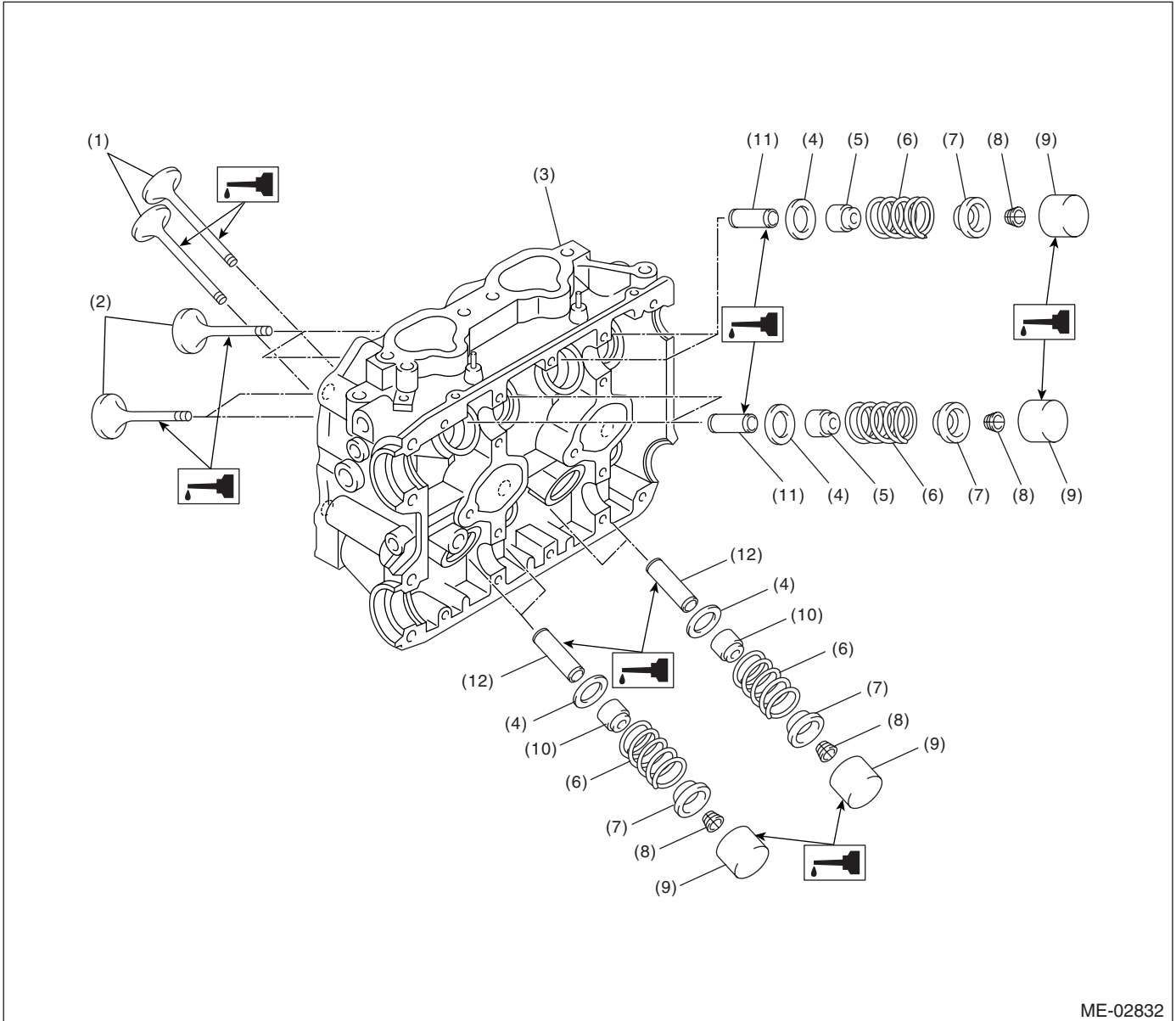
Keep the removed parts in order for re-installing in their original positions.

### CAUTION:

- Mark each valve to prevent confusion.
- Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve oil seals.



## D: ASSEMBLY



ME-02832

- |                       |                           |                             |
|-----------------------|---------------------------|-----------------------------|
| (1) Exhaust valve     | (5) Intake valve oil seal | (9) Valve lifter            |
| (2) Intake valve      | (6) Valve spring          | (10) Exhaust valve oil seal |
| (3) Cylinder head     | (7) Retainer              | (11) Intake valve guide     |
| (4) Valve spring seat | (8) Retainer key          | (12) Exhaust valve guide    |

### 1) Installation of valve spring and valve:

- (1) Coat the stem of each valve with engine oil and insert the valve into valve guide.

#### NOTE:

When inserting the valve into valve guide, use special care not to damage the oil seal lip.

- (2) Set the cylinder head on ST1.  
 (3) Install the valve spring and retainer using ST2.

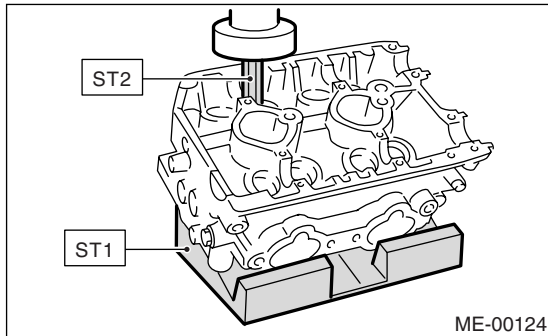
ST1 498267600 CYLINDER HEAD TABLE  
 ST2 499718000 VALVE SPRING REMOVER

# Cylinder Head

## MECHANICAL

### NOTE:

Be sure to install the valve springs with their close-coiled end facing the seat on cylinder head.



(4) Compress the valve spring, and then fit the valve spring retainer key.

(5) After installing, tap the valve spring retainers lightly with wooden hammer for better seating.

2) Apply oil to the surface of the valve lifter.

3) Install the valve lifter.

## E: INSPECTION

### 1. CYLINDER HEAD

1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect the important areas by means of liquid penetrant tester.

2) Measure the warping of the cylinder head surface that mates with crankcase by using a straight edge (A) and thickness gauge (B).

If the warping exceeds 0.035 mm (0.0014 in), re-grind the surface with a surface grinder.

#### **Warping limit:**

**0.035 mm (0.0014 in)**

#### **Grinding limit:**

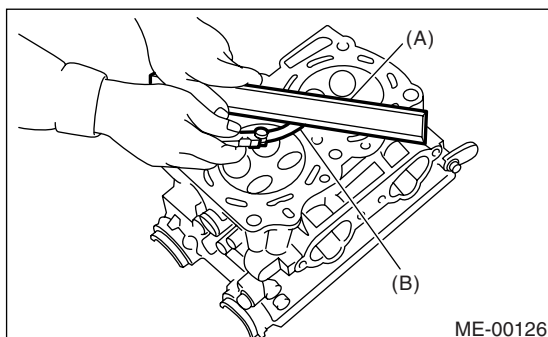
**0.3 mm (0.012 in)**

#### **Standard height of cylinder head:**

**127.5 mm (5.02 in)**

### NOTE:

Uneven torque for the cylinder head nuts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.



### 2. VALVE SEAT

Inspect the intake and exhaust valve seats, and then correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

#### **Valve seat contact width W:**

##### **Intake**

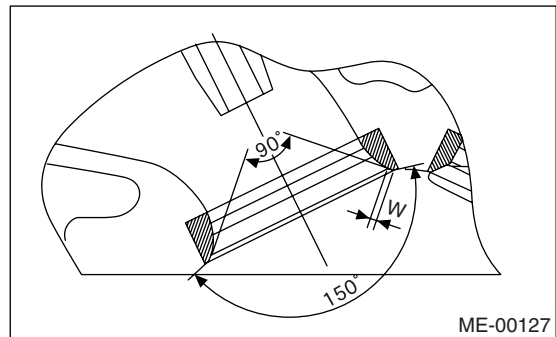
**Standard 0.6 — 1.4 mm (0.024 — 0.055 in)**

**Limit 1.7 mm (0.067 in)**

##### **Exhaust**

**Standard 1.2 — 1.8 mm (0.047 — 0.071 in)**

**Limit 2.2 mm (0.087 in)**



### 3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

#### **Clearance between the valve guide and valve stem:**

##### **Standard**

###### **Intake**

**0.030 — 0.057 mm (0.0012 — 0.0022 in)**

###### **Exhaust**

**0.040 — 0.067 mm (0.0016 — 0.0026 in)**

##### **Limit**

**0.15 mm (0.0059 in)**

2) If the clearance between valve guide and stem exceeds the standard value, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

#### **Valve guide inner diameter:**

**6.000 — 6.012 mm (0.2362 — 0.2367 in)**

#### **Valve stem outer diameters:**

##### **Intake**

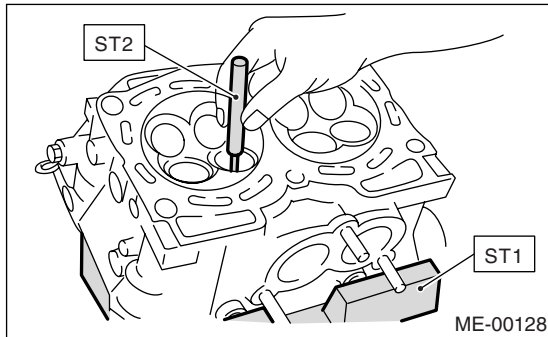
**5.955 — 5.970 mm (0.2344 — 0.2350 in)**

##### **Exhaust**

**5.945 — 5.960 mm (0.2341 — 0.2346 in)**

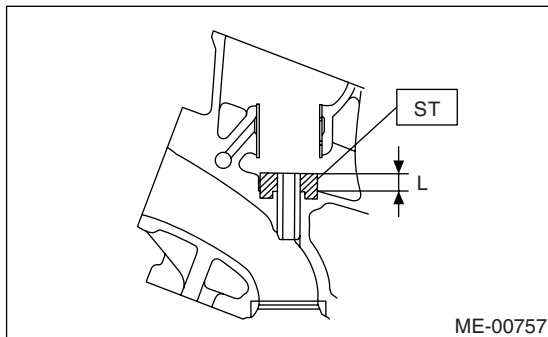
- (1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.
- (2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE  
 ST2 499767200 VALVE GUIDE REMOVER



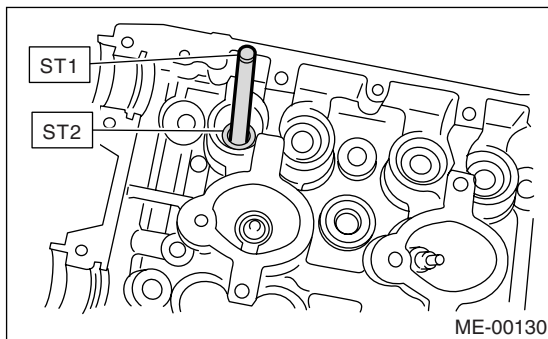
- (3) Turn the cylinder head upside down and place ST as shown in the figure.

ST 18251AA020 VALVE GUIDE ADJUSTER



- (4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.
- (5) Put a new valve guide, coated with sufficient oil, in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER  
 ST2 18251AA020 VALVE GUIDE ADJUSTER



- (6) Check the valve guide protrusion.

### Valve guide protrusion L:

**15.8 — 16.2 mm (0.622 — 0.638 in)**

- (7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into the valve guide, and return it also rotating clockwise. After reaming, clean the valve guide to remove chips.

ST 499767400 VALVE GUIDE REAMER

### NOTE:

- Apply engine oil to the reamer when reaming.
- If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
- If the inner surface of the valve guide becomes lustrous and the reamer does not chip, use a new reamer or remedy the reamer.

- (8) Recheck the contact condition between valve and valve seat after replacing the valve guide.

## 4. INTAKE AND EXHAUST VALVE

- 1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if "H" exceeds the standard value.

### H:

#### Intake (A)

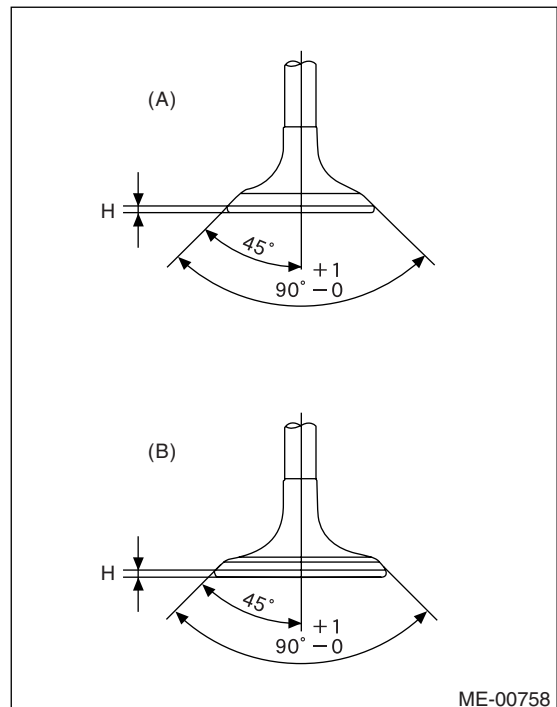
**Standard 1.0 — 1.4 mm (0.039 — 0.055 in)**

**Limit 0.8 mm (0.031 in)**

#### Exhaust (B)

**Standard 1.3 — 1.7 mm (0.051 — 0.067 in)**

**Limit 0.8 mm (0.031 in)**



# Cylinder Head

## MECHANICAL

2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

### NOTE:

- Replace the valve oil seal with new one after lapping.
- Intake valve and exhaust valve can be identified by their overall length.

### Valve overall length:

#### Intake (A)

104.4 mm (4.110 in)

#### Exhaust (B)

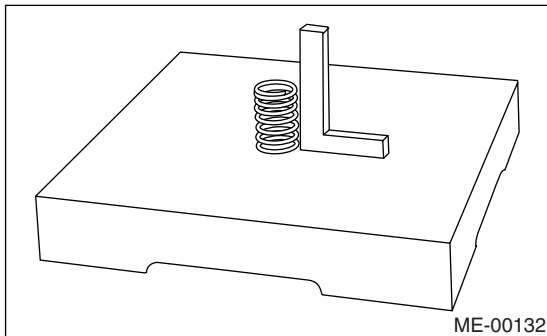
104.65 mm (4.120 in)

## 5. VALVE SPRINGS

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within specifications presented in the table.

2) To measure the squareness of valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

|                       |      | Valve spring  |
|-----------------------|------|---|
| Free length           |      | 47.32 mm (1.863 in)   |
| Tension/spring height | Set  | 205 — 235 N (20.9 — 24.0 kgf, 46.1 — 52.8 lbf)/36.0 mm (1.417 in) |
|                       | Lift | 426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lbf)/26.50 mm (1.043 in) |
| Squareness            |      | 2.5°, 2.1 mm (0.083 in) or less                                   |



## 6. INTAKE AND EXHAUST VALVE OIL SEAL

In the following case, pinch and remove the oil seal from valve using pliers, and then replace it with a new one.

- When the lip is damaged.
- When the spring is out of the specified position.
- When readjusting the surfaces of intake valve and valve sheet.
- When replacing the intake valve guide.

- 1) Place the cylinder head on ST1.
- 2) Using ST2, press-fit the oil seal.

### CAUTION:

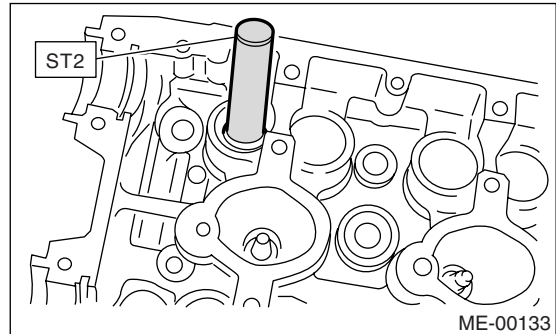
- Apply engine oil to oil seal before press-fitting.
- When press-fitting the oil seal, do not use a hammer or strike in.
- Differentiate between the intake valve oil seal and exhaust valve oil seal by noting their difference in color.

ST1 498267600 CYLINDER HEAD TABLE

ST2 498857100 VALVE OIL SEAL GUIDE

### Color of rubber part:

Intake [Gray] Exhaust [Green]

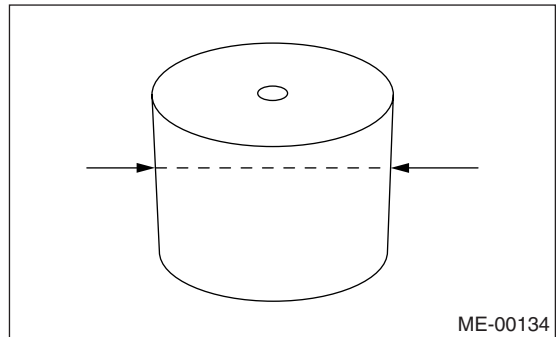


## 7. VALVE LIFTER

- 1) Visually check the valve lifter.
- 2) Measure the outer diameter of valve lifter.

### Outer diameter:

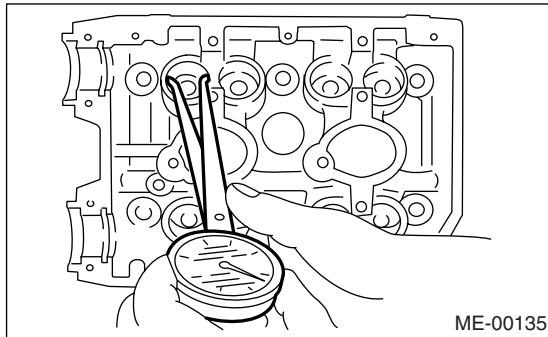
34.959 — 34.975 mm (1.3763 — 1.3770 in)



- 3) Measure the inner diameter of valve lifter mating part on cylinder head.

**Inner diameter:**

**34.994 — 35.016 mm (1.3777 — 1.3786 in)**



**NOTE:**

If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the standard, replace the cylinder head.

**Standard:**

**0.019 — 0.057 mm (0.0007 — 0.0022 in)**

**Limit:**

**0.100 mm (0.0039 in)**

**F: DISPOSAL**

**CAUTION:**

- Metallic sodium is enclosed in the exhaust valve. Metallic sodium is extremely alkaline and may produce severe chemical reactions. Full consideration must therefore be given to the following points when handling or disposing of the valve.
- Since metallic sodium may cause blindness if contacted with the eyes, burns if contacted with the skin, and fire, do not deliberately take the valve apart.

If the valve is damaged, remove the valve and neutralize it by immersing it in water, and dispose of it in the same way that general steel materials are disposed of. The disposal method is described in the following.

- 1) Wearing rubber gloves, remove the damaged valve from the cylinder head.
- 2) Prepare a large receptacle (bucket or other container) in a well ventilated location, and fill the receptacle with water (at least 10 liters).
- 3) Immerse the damaged valve in the receptacle.

**CAUTION:**

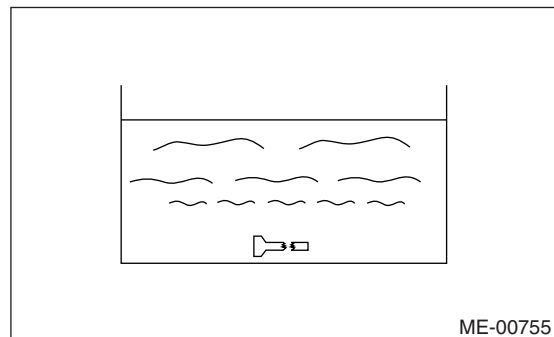
**A severe reaction may occur, so stand at least 2 — 3 m from the receptacle. Because the reaction will produce hydrogen gas, moreover, keep the receptacle away from sparks or flames.**

4) Once the reaction is completed (about 4 — 5 hours have elapsed), carefully remove the valve using large pincers so that the reaction liquid does not contact your skin, and dispose of it with other parts that are being disposed of.

5) The reaction liquid is a strong alkaline solution, so it must be disposed of in accordance with local regulations.

**CAUTION:**

**Make sure the reaction liquid does not contact your skin. If contact with skin occurs, immediately wash the affected area with large quantities of water.**





# Cylinder Block

MECHANICAL

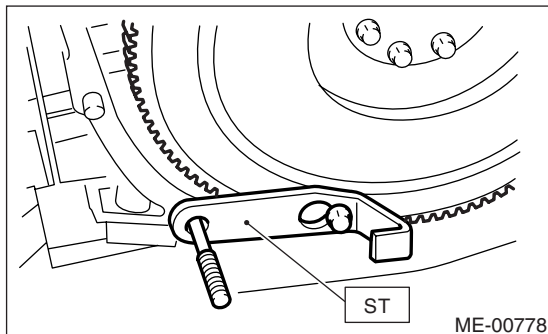
## 20. Cylinder Block

### A: REMOVAL

#### NOTE:

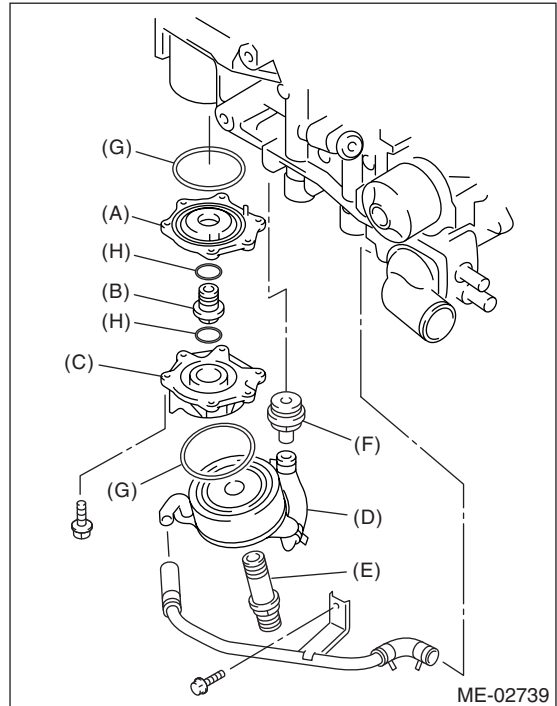
Before conducting this procedure, drain the engine oil completely if applicable.

- 1) Remove the intake manifold.  
<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
  - 2) Remove the V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
  - 3) Remove the crank pulley.  
<Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
  - 4) Remove the timing belt cover.  
<Ref. to ME(H4DOTC)-44, REMOVAL, Timing Belt Cover.>
  - 5) Remove the timing belt.  
<Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt.>
  - 6) Remove the cam sprockets.  
<Ref. to ME(H4DOTC)-53, REMOVAL, Cam Sprocket.>
  - 7) Remove the crank sprocket.  
<Ref. to ME(H4DOTC)-54, REMOVAL, Crank Sprocket.>
  - 8) Remove the generator and A/C compressor with their brackets.
  - 9) Remove the cylinder head.  
<Ref. to ME(H4DOTC)-61, REMOVAL, Cylinder Head.>
  - 10) Remove the clutch disc and cover. (MT model)  
<Ref. to CL-14, REMOVAL, Clutch Disc and Cover.>
  - 11) Remove the flywheel. (MT model)  
<Ref. to CL-17, REMOVAL, Flywheel.>
- ST 498497100 CRANKSHAFT STOPPER



- 12) Remove the oil separator cover.
- 13) Remove the water by-pass pipe for heater.
- 14) Remove the oil filter.  
ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))  
ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))

- 15) Remove the oil cooler.



- (A) Adapter A
- (B) Adapter connector
- (C) Adapter B
- (D) Oil cooler
- (E) Oil cooler connector
- (F) Plug
- (G) Gasket
- (H) O-ring

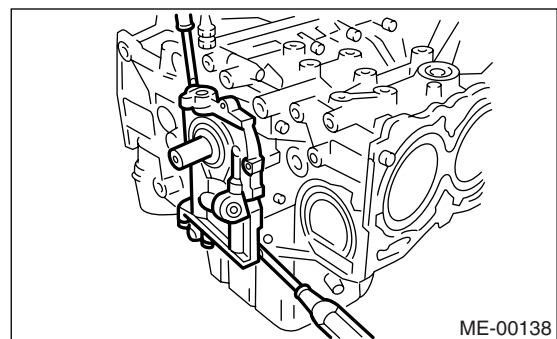
- 16) Remove the water pump.
- 17) Remove the oil pump from cylinder block.

#### NOTE:

- If disassembling or inspecting the oil pump, loosen the plug of relief valve before removing the oil pump.
- Remove the oil pump from cylinder block. Use a flat tip screwdriver when removing the oil pump.

#### CAUTION:

**Be careful not to scratch the mating surface of cylinder block and oil pump.**



# Cylinder Block

MECHANICAL

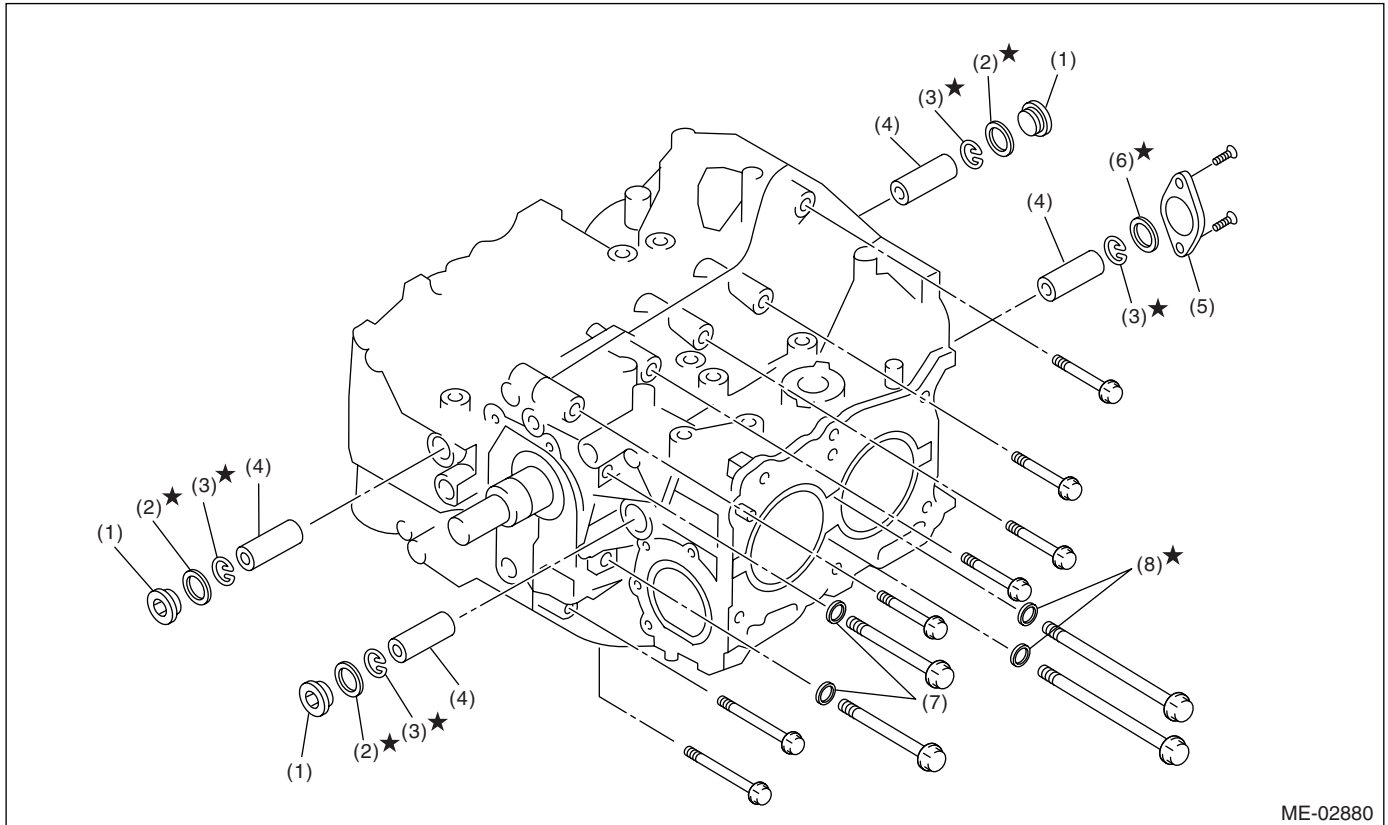
## 18) Removal of oil pan:

- (1) Turn the cylinder block with #2 and #4 piston sides facing upward.
- (2) Remove the bolts which secure oil pan to cylinder block.
- (3) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance, and then remove the oil pan.

## CAUTION:

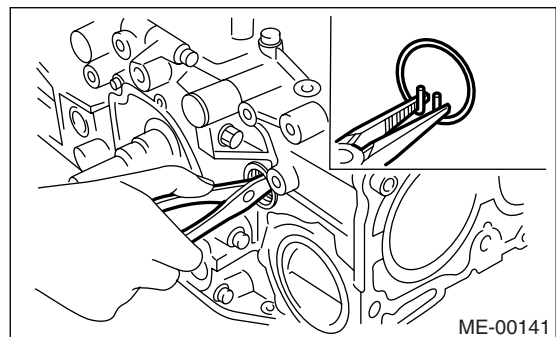
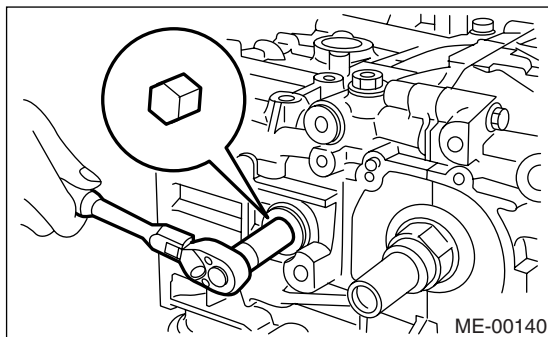
**Do not use a screwdriver or similar tool in place of oil pan cutter.**

- 19) Remove the oil strainer stay.
- 20) Remove the oil strainer.
- 21) Remove the baffle plate.
- 22) Remove the water pipes.



- |                       |                        |                 |
|-----------------------|------------------------|-----------------|
| (1) Service hole plug | (4) Piston pin         | (7) Washer      |
| (2) Gasket            | (5) Service hole cover | (8) Seal washer |
| (3) Snap ring         | (6) O-ring             |                 |

## 23) Remove the service hole cover and service hole plugs using hexagon wrench [14 mm].



## 24) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, and then remove the piston snap ring through service hole of #1 and #2 cylinders.

## 25) Draw out the piston pin from #1 and #2 pistons using ST.

ST 499097700 PISTON PIN REMOVER

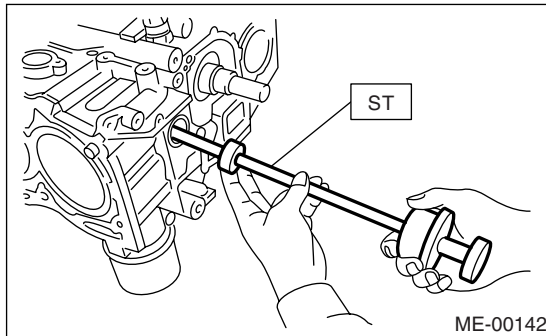


# Cylinder Block

## MECHANICAL

### NOTE:

Be careful not to confuse the original combination of piston, piston pin and cylinder.



26) Similarly remove the piston pins from #3 and #4 pistons.

27) Remove the bolts which connect the cylinder block on the side of #2 and #4 cylinders.

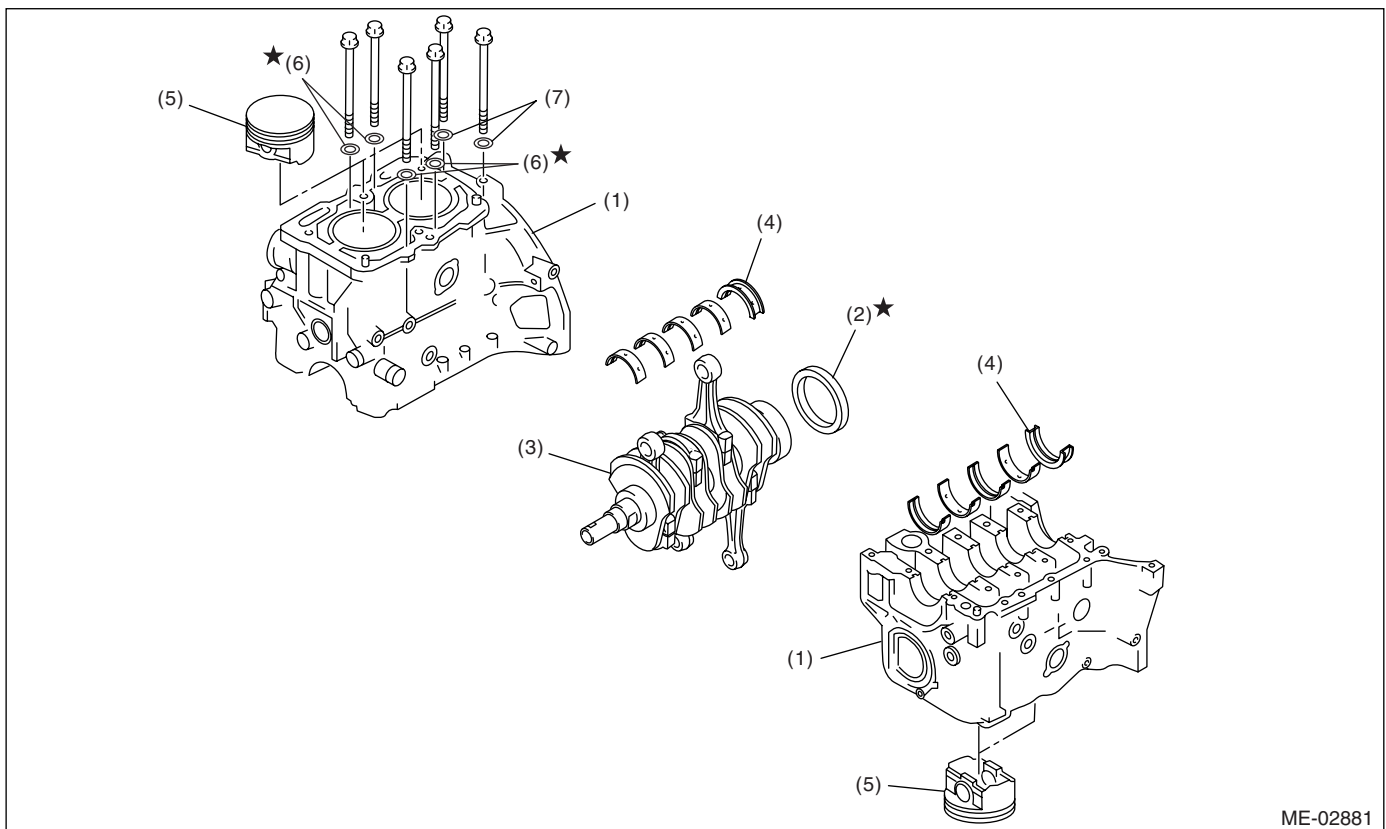
28) Back off the bolts which connect the cylinder block on the side of #1 and #3 cylinders two or three turns.

29) Set up the cylinder block so that #1 and #3 cylinders are on the upper side, then remove the cylinder block connecting bolts.

30) Separate the cylinder blocks (LH) and (RH).

### NOTE:

When separating the cylinder block, do not allow the connecting rod to fall and damage the cylinder block.



(1) Cylinder block

(2) Rear oil seal

(3) Crankshaft

(4) Crankshaft bearing

(5) Piston

(6) Seal washer

(7) Washer

31) Remove the rear oil seal.

32) Remove the crankshaft together with connecting rod.

33) Remove the crankshaft bearings from cylinder block using a hammer handle.

### NOTE:

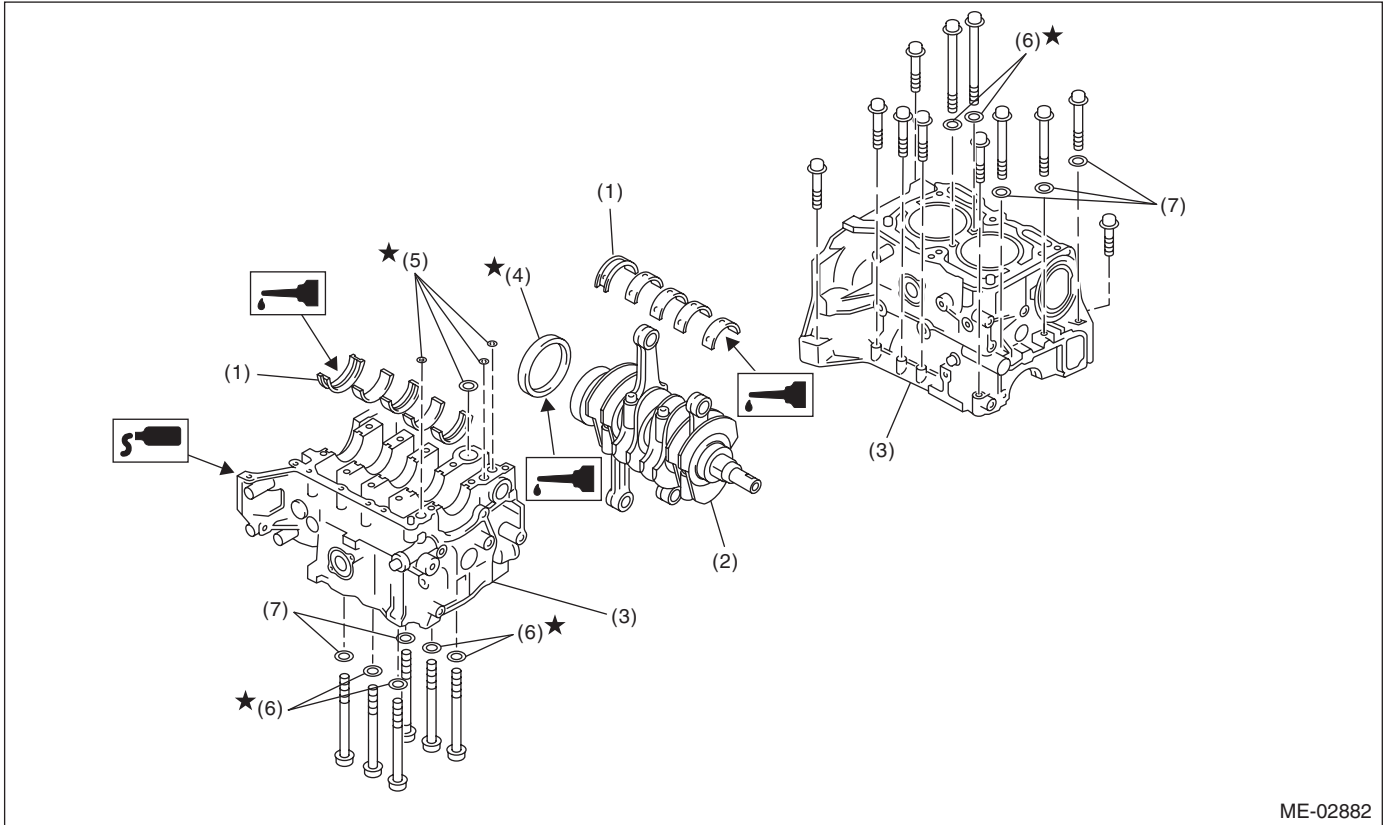
Do not confuse the combination of crankshaft bearings. Press the bearing at the end opposite to locking lip.

34) Draw out each piston from cylinder block using a hammer handle.

### NOTE:

Do not confuse the combination of piston and cylinder.

## B: INSTALLATION



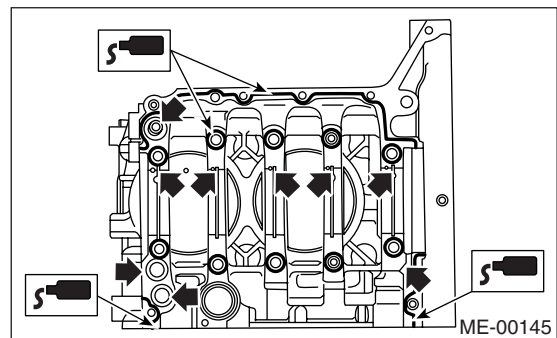
ME-02882

- |                        |                   |            |
|------------------------|-------------------|------------|
| (1) Crankshaft bearing | (4) Rear oil seal | (7) Washer |
| (2) Crankshaft         | (5) O-ring        |            |
| (3) Cylinder block     | (6) Seal washer   |            |

- 1) Remove oil in the mating surface of bearing and cylinder block before installation. Also apply engine oil to crankshaft pins.
- 2) Install the crankshaft bearing to cylinder block, apply engine oil to crankshaft bearing, and position the crankshaft and O-ring on #1 and #3 cylinder block.
- 3) Apply liquid gasket to the mating surface of #1 and #3 cylinder block, and position #2 and #4 cylinder block.

**Liquid gasket:**  
**Part No. 004403007**  
**THREE BOND 1215 or equivalent**

**NOTE:**  
 Do not allow liquid gasket to jut into O-ring grooves, oil passages, bearing grooves, etc.

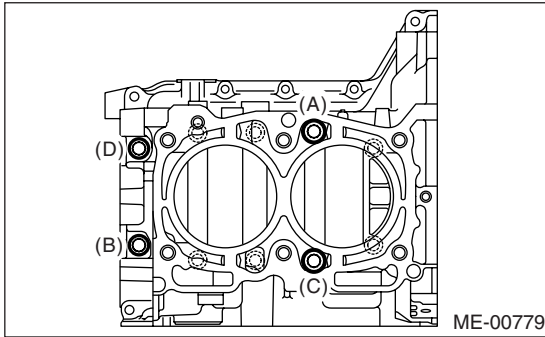


- 4) Apply engine oil to washers and thread of bolts.
- 5) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (LH side)

# Cylinder Block

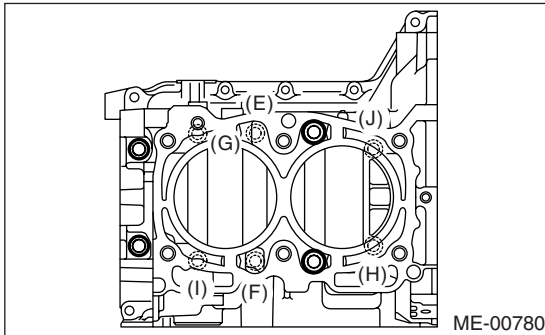
MECHANICAL

**Tightening torque:**  
**10 N·m (1.0 kgf·m, 7.4 ft·lb)**



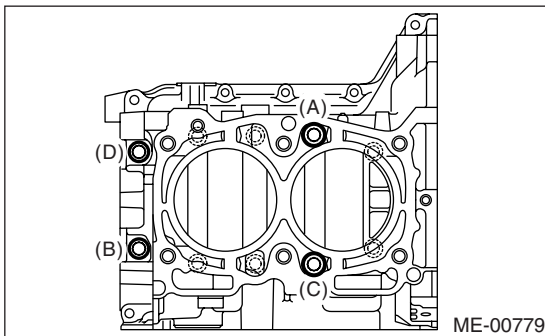
6) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (RH side)

**Tightening torque:**  
**10 N·m (1.0 kgf·m, 7.4 ft·lb)**



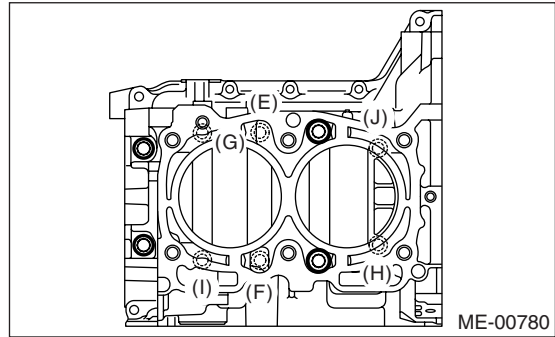
7) Tighten the LH side bolts (A — D) in alphabetical sequence.

**Tightening torque:**  
**18 N·m (1.8 kgf·m, 13.3 ft·lb)**

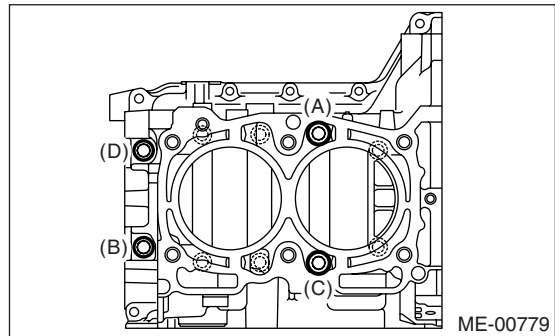


8) Tighten the RH side bolts (E — J) in alphabetical sequence.

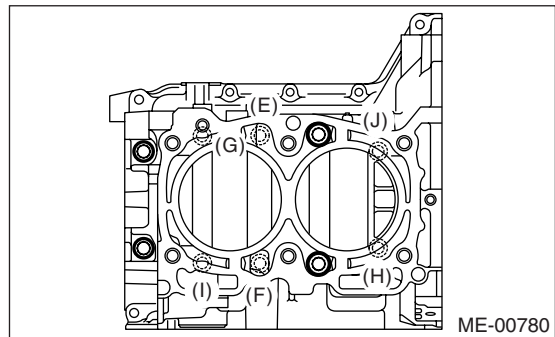
**Tightening torque:**  
**18 N·m (1.8 kgf·m, 13.3 ft·lb)**



9) Further tighten the LH side bolts (A — D) in alphabetical sequence, by 90° for (A) and (C), and to 40 N·m (4.1 kgf·m, 29.5 ft·lb) for (B) and (D).



10) Further tighten the RH side bolts (E — J) to 90° in alphabetical sequence.

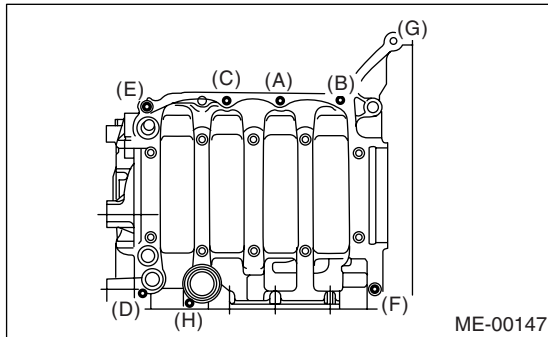


11) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

**Tightening torque:**

(A)— (G): 25 N·m (2.5 kgf·m, 18.4 ft·lb)

(H): 6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



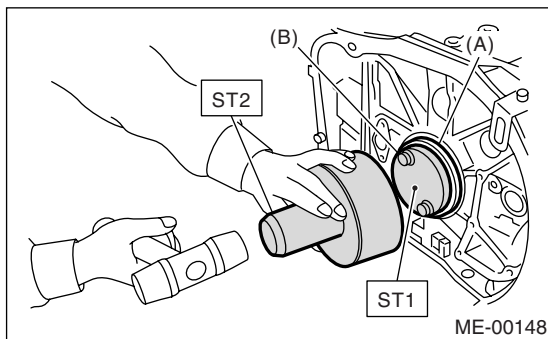
12) Apply engine oil to the outer perimeter of rear oil seal, and install the rear oil seal using ST1 and ST2.

**NOTE:**

Use a new rear oil seal.

ST1 499597100 CRANKSHAFT OIL SEAL GUIDE

ST2 499587200 CRANKSHAFT OIL SEAL INSTALLER

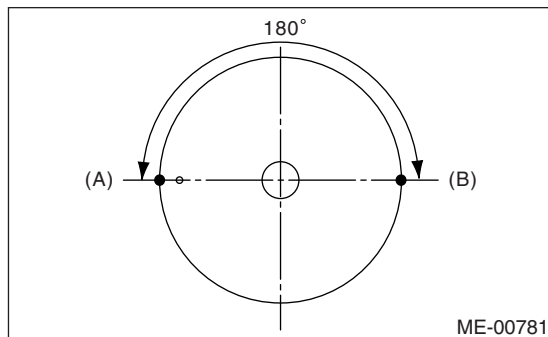


(A) Rear oil seal

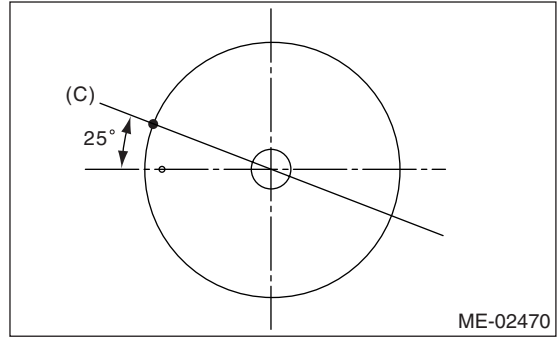
(B) Flywheel attaching bolt

13) Position the top ring gap at (A) or (B) in the figure.

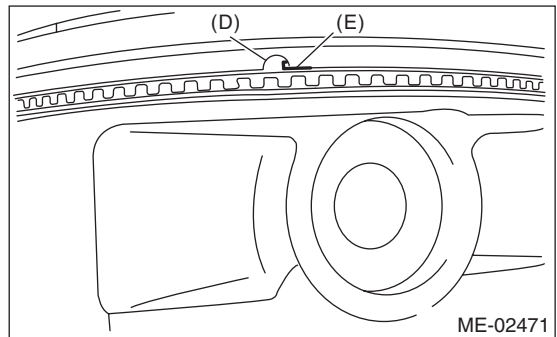
14) Position the second ring gap at 180° on the reverse side for the top ring gap.



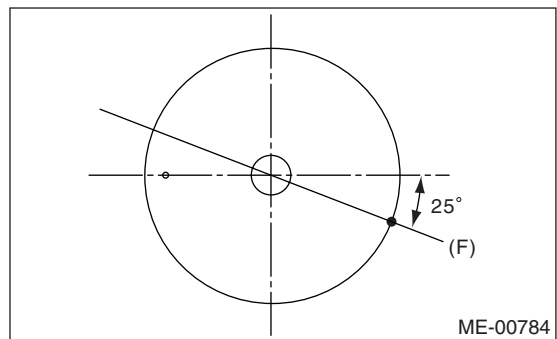
15) Position the upper rail gap at (C) in the figure.



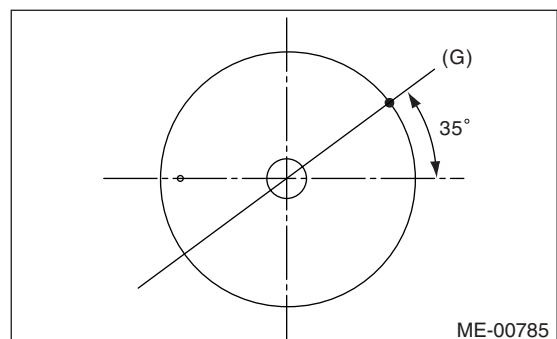
16) Align upper rail spin stopper (E) with piston side surface hole (D).



17) Position the expander gap at (F) in the figure.



18) Position the lower rail gap at (G) in the figure.



**CAUTION:**

- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

# Cylinder Block

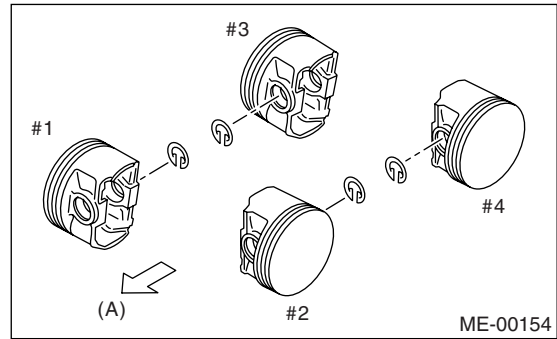
## MECHANICAL

19) Install the snap ring.

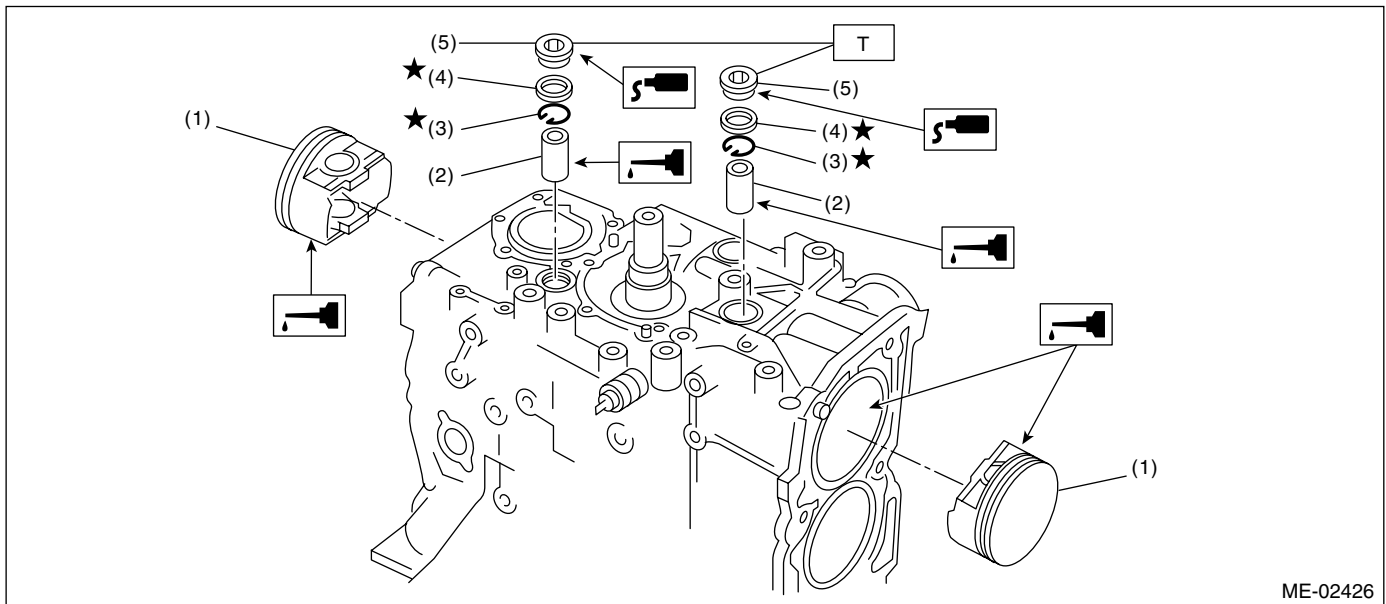
Install the snap rings in piston holes located opposite of service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

NOTE:

Use new snap rings.



(A) Front



- |                |                       |
|----------------|-----------------------|
| (1) Piston     | (4) Gasket            |
| (2) Piston pin | (5) Service hole plug |
| (3) Snap ring  |                       |

**Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 70 (7.1, 51.6)**

20) Installing the piston

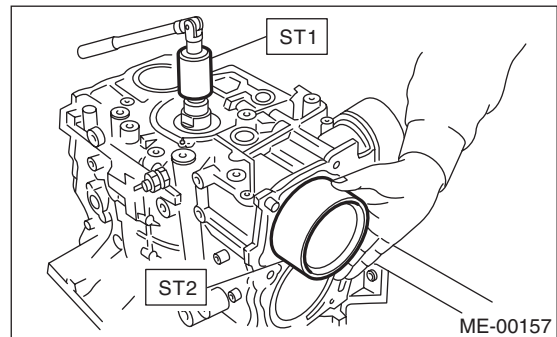
(1) Turn the cylinder block so that #1 and #2 cylinders face upward.

(2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

ST1 499987500 CRANKSHAFT SOCKET

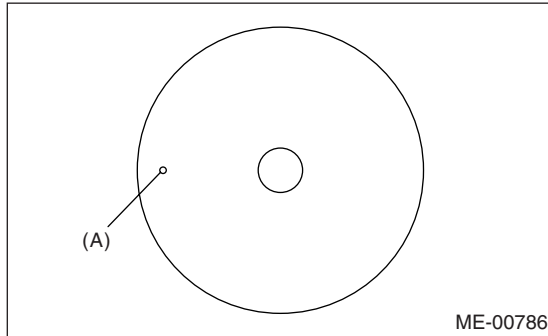
(3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 498747300 PISTON GUIDE



**NOTE:**

Piston front mark faces towards the front of the engine.

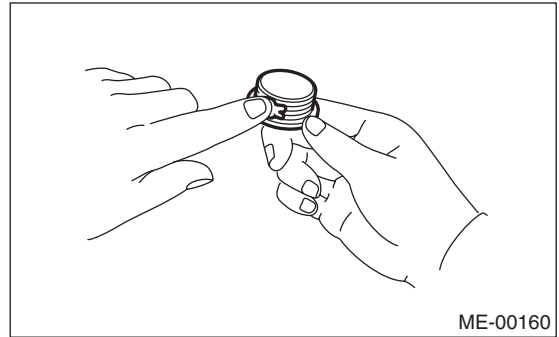


(A) Front mark

**Liquid gasket:**

**Part No. 004403010**

**THREE BOND 1105 or equivalent**

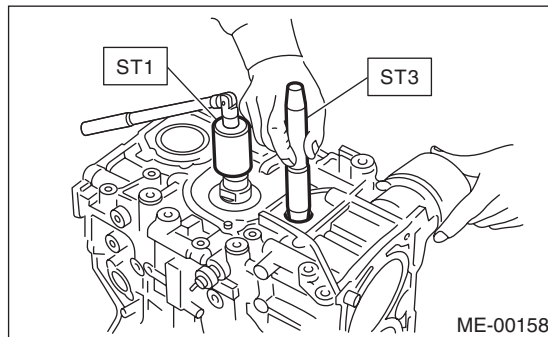


(6) Install the service hole plug and gasket.

**21) Installing piston pin**

- (1) Apply a coat of engine oil to ST3.
- (2) Insert ST3 into the service hole to align piston pin hole with connecting rod small end.

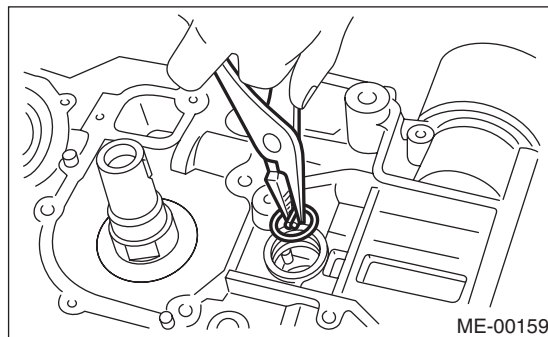
ST3 499017100 PISTON PIN GUIDE



- (3) Apply a coat of engine oil to the piston pin and insert piston pin into piston and connecting rod through service hole.
- (4) Install the snap ring.

**NOTE:**

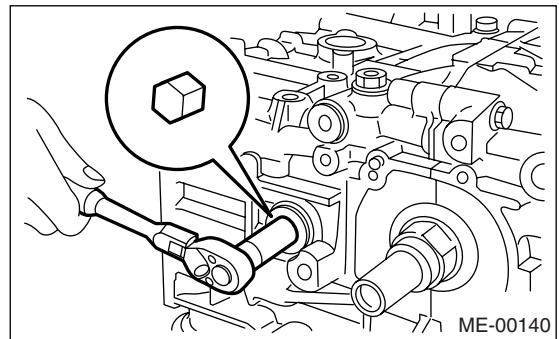
Use new snap rings.



- (5) Apply liquid gasket around the service hole plug.

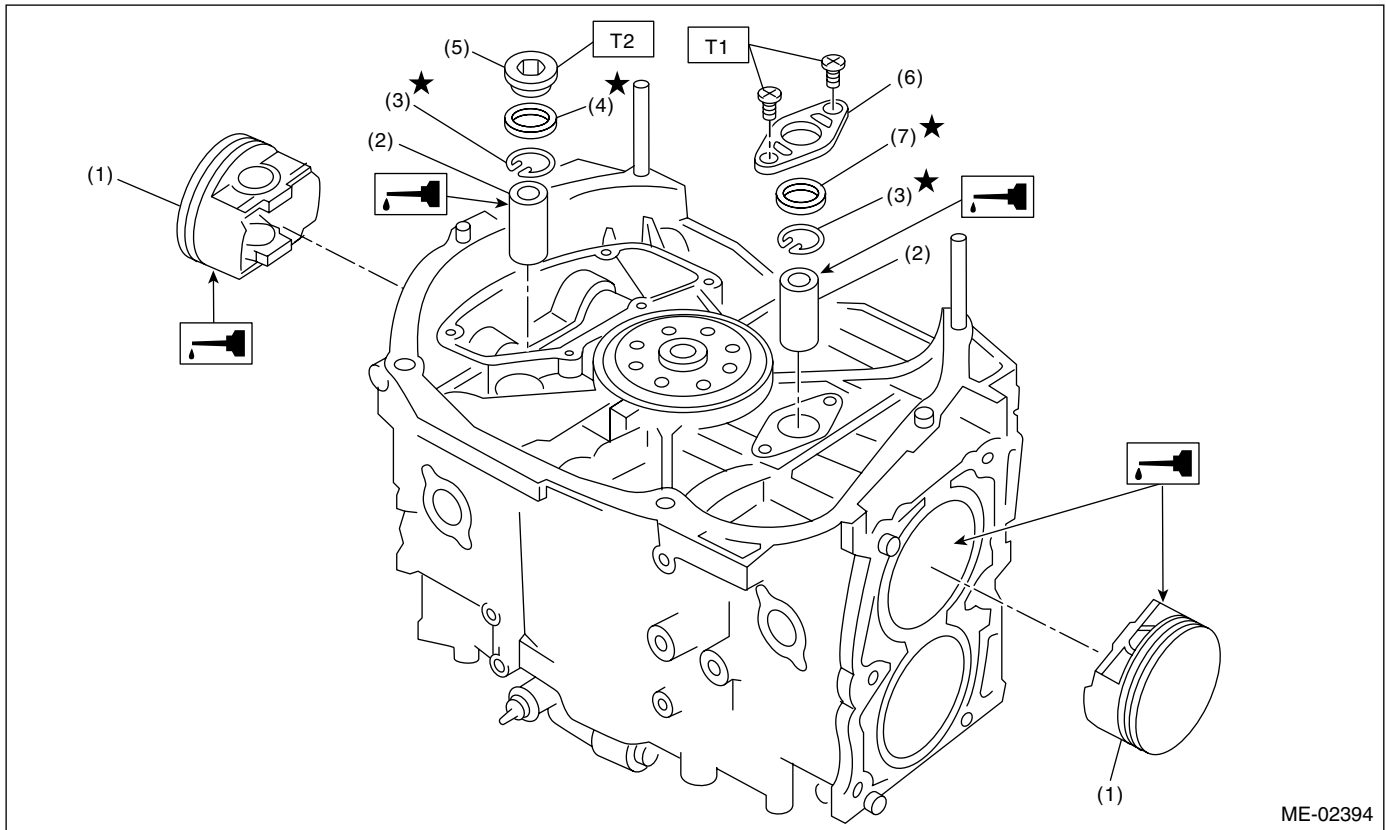
**NOTE:**

Use a new gasket.



# Cylinder Block

MECHANICAL



ME-02394

- |                |                        |
|----------------|------------------------|
| (1) Piston     | (5) Service hole plug  |
| (2) Piston pin | (6) Service hole cover |
| (3) Snap ring  | (7) O-ring             |
| (4) Gasket     |                        |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 6.4 (0.65, 4.7)**

**T2: 70 (7.1, 51.6)**

- (7) Turn the cylinder block so that #3 and #4 cylinders face upward. Using the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.
- 22) Install the water pipe.  
23) Install the baffle plate.

**Tightening torque:**  
**6.4 N·m (0.65 kgf·m, 4.7 ft·lb)**

- 24) Install the oil strainer and O-ring.

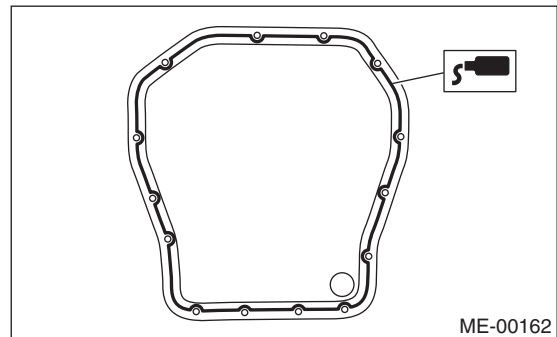
**Tightening torque:**  
**10 N·m (1.0 kgf·m, 7.4 ft·lb)**

- 25) Install the oil strainer stay.  
26) Apply liquid gasket to the matching surfaces, and then install the oil pan.

**NOTE:**  
Install it within 20 min. after applying liquid gasket.

**Liquid gasket:**  
**Part No. 004403012 THREE BOND 1207C or equivalent**

**Tightening torque:**  
**5 N·m (0.5 kgf·m, 3.6 ft·lb)**

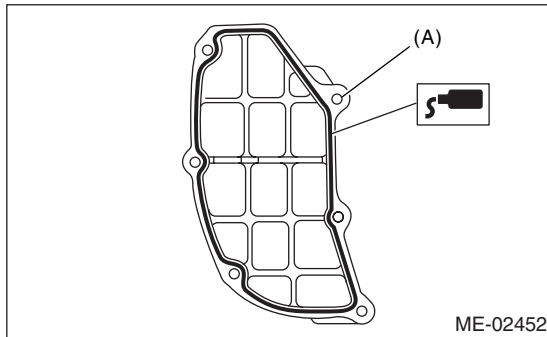


- 27) Apply liquid gasket to the mating surfaces and threaded portion of bolt (A) as shown in the figure, and then install the oil separator cover.

**Liquid gasket:**  
**Mating surface**  
**Part No. 004403012 THREE BOND 1207C or equivalent**  
**Threaded portion of bolt (A)**  
**Part No. 004403042 THREE BOND 1324 or equivalent**

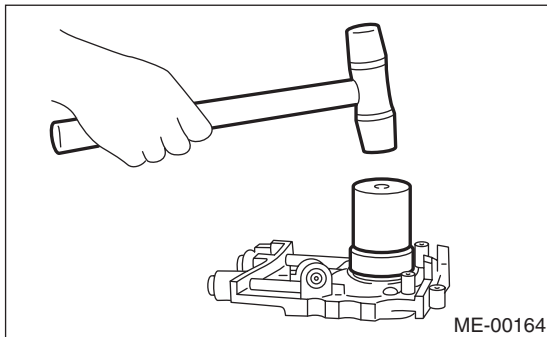


**Tightening torque:**  
**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



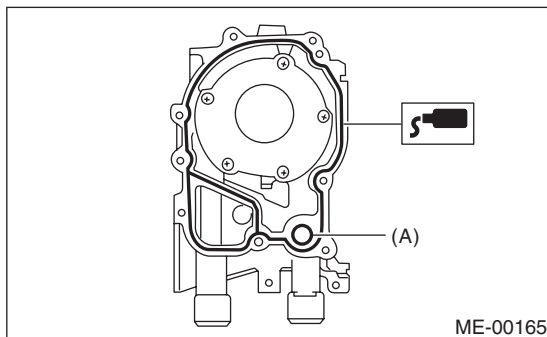
- 28) Install the flywheel.  
 <Ref. to CL-17, INSTALLATION, Flywheel.>  
 29) Install the clutch disc and cover. <Ref. to CL-14, INSTALLATION, Clutch Disc and Cover.>  
 30) Installation of oil pump:

- (1) Discard the front oil seal after removal. Replace with a new one using the ST.  
**ST 499587100 OIL SEAL INSTALLER**



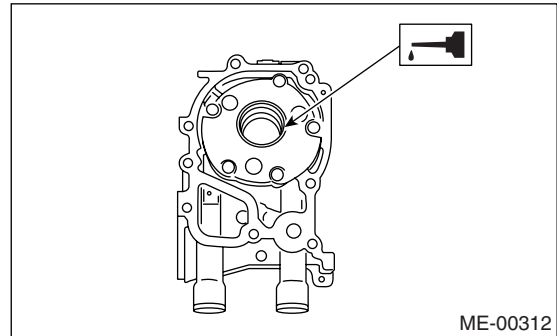
- (2) Apply liquid gasket to the matching surface of oil pump.

**Liquid gasket:**  
**Part No. 004403007 THREE BOND 1215 or equivalent**



(A) O-ring

- (3) Apply a coat of engine oil to the inside of the oil seal.



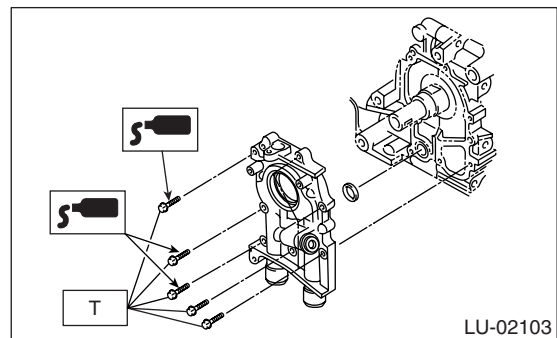
- (4) Install the oil pump on cylinder block. Be careful not to damage the oil seal during installation.  
 (5) Apply liquid gasket to the threaded portion of three bolts.

**CAUTION:**

- Do not forget to install the O-ring and seal when installing the oil pump.
- Align the flat surface of oil pump's inner rotor with crankshaft before installation.

**Liquid gasket:**  
**THREE BOND 1324 (Part No. 004403042) or equivalent**

**Tightening torque:**  
**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



- 31) Install the water pump and gasket.

**Tightening torque:**  
**First: 12 N·m (1.2 kgf-m, 8.7 ft-lb)**  
**Second: 12 N·m (1.2 kgf-m, 8.7 ft-lb)**

**CAUTION:**

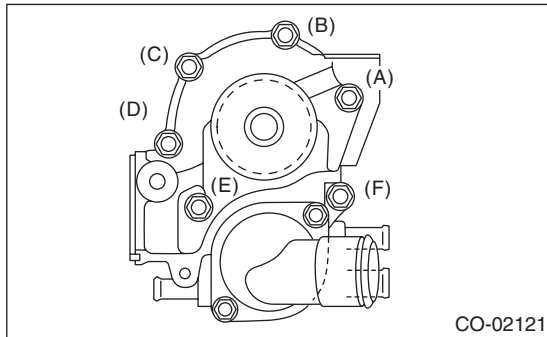
- Be sure to use a new gasket.



# Cylinder Block

## MECHANICAL

- When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in the figure.



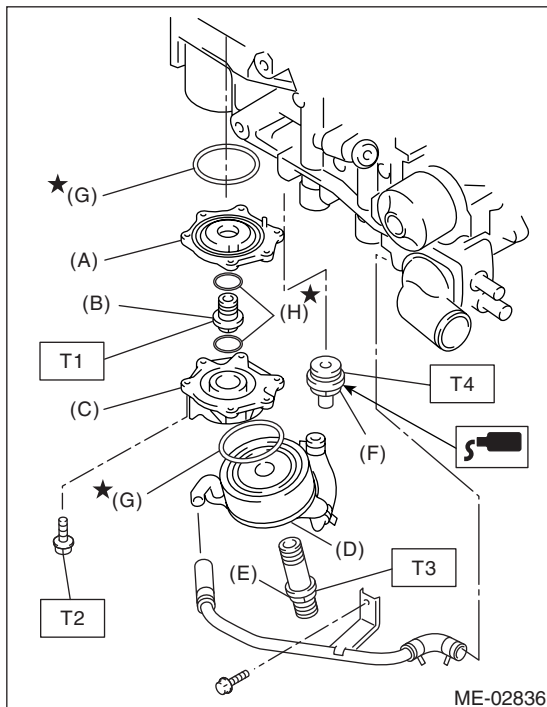
- 32) Install the water by-pass pipe for heater.  
33) Install the oil cooler.

### CAUTION:

Use a new O-ring.

### Tightening torque:

- T1: 45 N·m (4.6 kgf-m, 33 ft-lb)**  
**T2: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**  
**T3: 54 N·m (5.3 kgf-m, 40 ft-lb)**  
**T4: 69 N·m (7.0 kgf-m, 50.9 ft-lb)**



- (A) Adapter A  
 (B) Adapter connector  
 (C) Adapter B  
 (D) Oil cooler  
 (E) Oil cooler connector  
 (F) Plug  
 (G) Gasket  
 (H) O-ring

- 34) Install the oil filter using ST.

- ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))  
 ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))

- 35) Install the oil filter by turning it by hand, being careful not to damage the seal rubber.

- Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with oil cooler. If using a torque wrench, tighten it to 14 N·m (1.4 kgf-m, 10.3 ft-lb).

- Tighten the oil filter 65 mm (2.56 in) in diameter by approx. 2/3 — 3/4 rotation more after the seal rubber of oil filter comes in contact with oil cooler. If using a torque wrench, tighten it to 12 N·m (1.2 kgf-m, 8.8 ft-lb).

### CAUTION:

- Do not tighten excessively, or oil may leak.
- Be careful not to use the oil filter 80 mm (3.15 in) in diameter to Turbo model.

- 36) Install the water by-pass pipe between oil cooler and water pump.

- 37) Install the water pipe.

### NOTE:

Always use a new O-ring.

- 38) Install the cylinder head.

<Ref. to ME(H4DOTC)-61, INSTALLATION, Cylinder Head.>

- 39) Install the oil level gauge guide and tighten the attaching bolt (LH side).

- 40) Install the rocker cover and rocker cover gasket.

### NOTE:

Use a new rocker cover gasket.

- 41) Install the crank sprocket.

<Ref. to ME(H4DOTC)-54, INSTALLATION, Crank Sprocket.>

- 42) Install the cam sprocket.

<Ref. to ME(H4DOTC)-53, INSTALLATION, Cam Sprocket.>

- 43) Install the timing belt.

<Ref. to ME(H4DOTC)-46, INSTALLATION, Timing Belt.>

- 44) Install the timing belt cover.

<Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt Cover.>

- 45) Install the crank pulley.

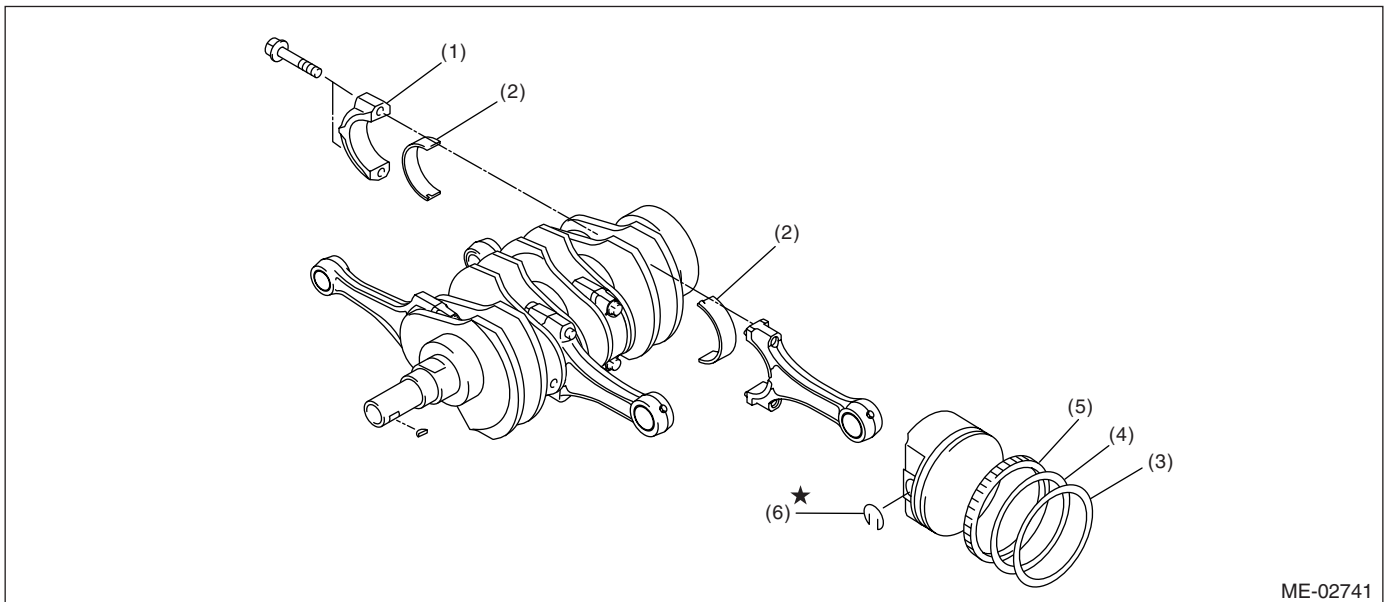
<Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>

- 46) Install the generator and A/C compressor brackets on cylinder head.

- 47) Install the V-belt. <Ref. to ME(H4DOTC)-41, INSTALLATION, V-belt.>

48) Install the intake manifold.  
 <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>

## C: DISASSEMBLY



ME-02741

- |                            |                 |               |
|----------------------------|-----------------|---------------|
| (1) Connecting rod cap     | (3) Top ring    | (5) Oil ring  |
| (2) Connecting rod bearing | (4) Second ring | (6) Snap ring |

- 1) Remove the connecting rod cap.
- 2) Remove the connecting rod bearing.

**NOTE:**

Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

- 3) Remove the piston rings using the piston ring expander.
- 4) Remove the oil ring by hand.

**NOTE:**

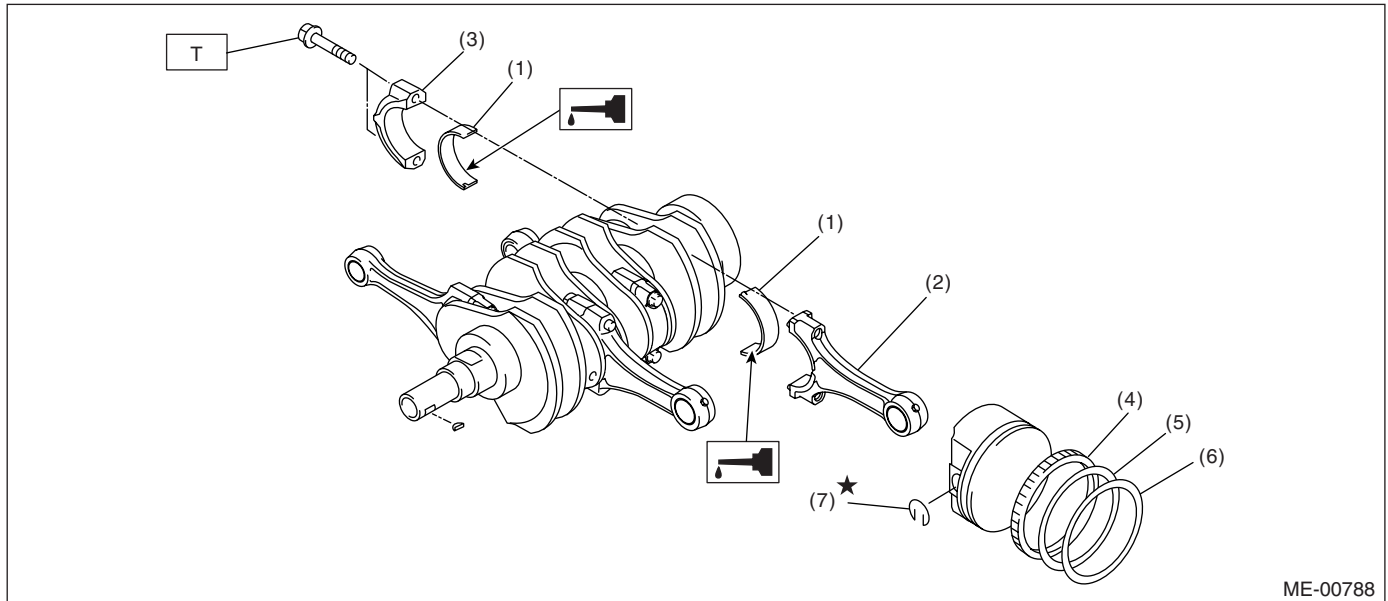
Arrange the removed piston rings in proper order to prevent confusion.

- 5) Remove the snap ring.

# Cylinder Block

MECHANICAL

## D: ASSEMBLY



- |                            |                 |
|----------------------------|-----------------|
| (1) Connecting rod bearing | (5) Second ring |
| (2) Connecting rod         | (6) Top ring    |
| (3) Connecting rod cap     | (7) Snap ring   |
| (4) Oil ring               |                 |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T: 52 (5.3, 38.4)**

- 1) Apply oil to the surfaces of the connecting rod bearings. Install the connecting rod bearings on connecting rods and connecting rod caps.
- 2) Install the connecting rod on crankshaft.

### NOTE:

Position each connecting rod with the side marked facing forward.

3) Tighten the connecting rod cap with connecting rod bolt.

Ensure the arrow on connecting rod cap faces the front during installation.

### Tightening torque:

**52 N·m (5.3 kgf·m, 38.4 ft·lb)**

### CAUTION:

- Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
  - When tightening the connecting rod bolts, apply oil on the threads.
- 4) Install the oil ring upper rail, expander and lower rail in this order by hand. Then install the second ring and top ring using a piston ring expander.

## E: INSPECTION

### 1. CYLINDER BLOCK

- 1) Visually check for cracks and damage. Especially, inspect the important parts by means of liquid penetrant tester.
- 2) Check the oil passages for clogging.
- 3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

### Warping limit:

**0.025 mm (0.00098 in)**

### Grinding limit:

**0.1 mm (0.004 in)**

### Standard height of cylinder block:

**201.0 mm (7.91 in)**

### 2. CYLINDER AND PISTON

- 1) The cylinder bore size is stamped on cylinder block's front upper surface.

### NOTE:

- Measurement should be performed at a temperature of 20°C (68°F).
- Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as a guide line in selecting a standard piston.

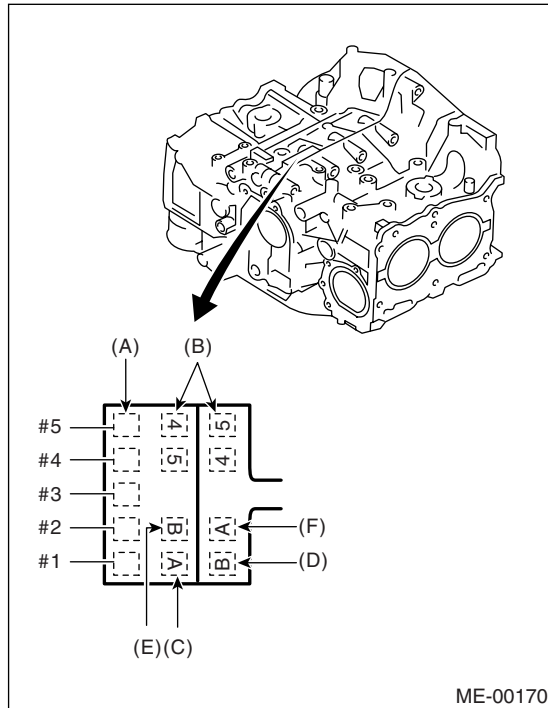
# Cylinder Block

MECHANICAL

## Standard diameter:

**A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)**

**B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)**



ME-00170

- (A) Main journal size mark
- (B) Cylinder block (RH)–(LH) combination mark
- (C) #1 cylinder bore size mark
- (D) #2 cylinder bore size mark
- (E) #3 cylinder bore size mark
- (F) #4 cylinder bore size mark

## 2) How to measure the inner diameter of each cylinder

Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

### NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

## Taper:

### Standard

**0.015 mm (0.0006 in)**

### Limit

**0.050 mm (0.0020 in)**

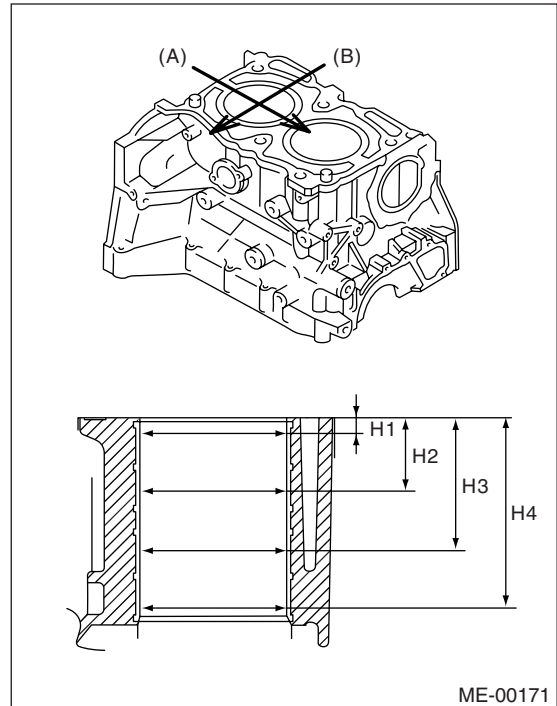
## Out-of-roundness:

### Standard

**0.010 mm (0.0004 in)**

### Limit

**0.050 mm (0.0020 in)**



ME-00171

- (A) Piston pin direction
- (B) Thrust direction
- H1: 10 mm (0.39 in)
- H2: 45 mm (1.77 in)
- H3: 80 mm (3.15 in)
- H4: 115 mm (4.53 in)

3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

4) How to measure the outer diameter of each piston:

Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

### NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

### Piston grade point H:

**38.2 mm (1.50 in)**

# Cylinder Block

MECHANICAL

## Piston outer diameter:

### Standard

A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)

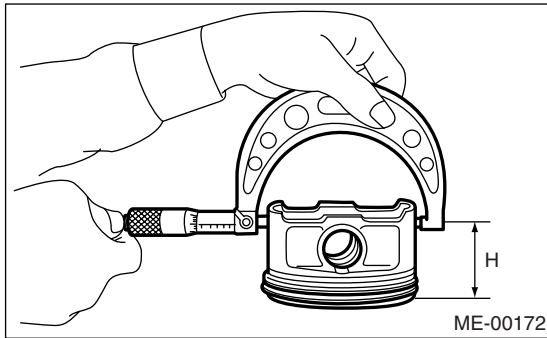
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)

### 0.25 mm (0.0098 in) oversize

99.745 — 99.765 mm (3.9270 — 3.9278 in)

### 0.50 mm (0.0197 in) oversize

99.995 — 100.015 mm (3.9368 — 3.9376 in)



5) Calculate the clearance between cylinder and piston.

### NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

## Cylinder to piston clearance at 20°C (68°F):

### Standard

-0.010 — 0.010 mm (-0.0004 — 0.0004 in)

### Limit

0.030 mm (0.0012 in)

6) Boring and honing

- (1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the limit or if there is any damage on the cylinder wall, reboring it to use an oversize piston.

### CAUTION:

- When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons.
- Do not perform boring on one cylinder only, nor use an oversize piston for one cylinder only.

- (2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the crankcase.

### NOTE:

Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

## Cylinder enlarging (boring) limit (dia.):

To 100.005 mm (3.937 in)

## 3. PISTON AND PISTON PIN

1) Check the pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.

2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H4DOTC)-80, CYLINDER AND PISTON, INSPECTION, Cylinder Block.>

If any of the clearances is not within specification, replace the piston or bore the cylinder to use an oversize piston.

3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

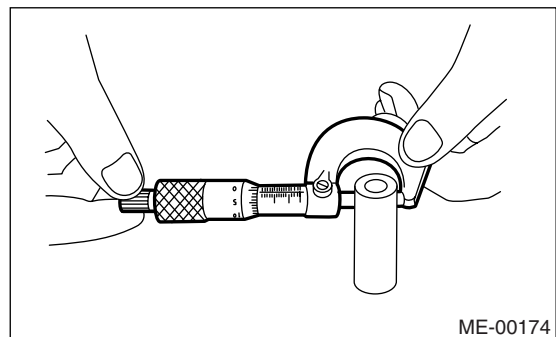
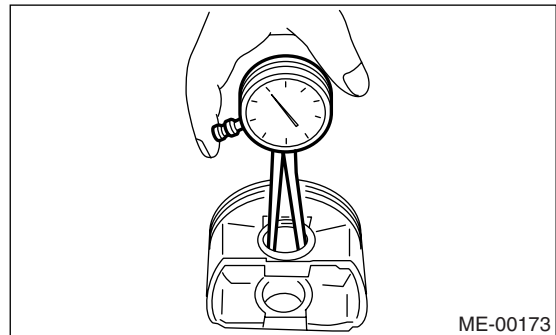
## Standard clearance between piston pin and hole in piston:

### Standard

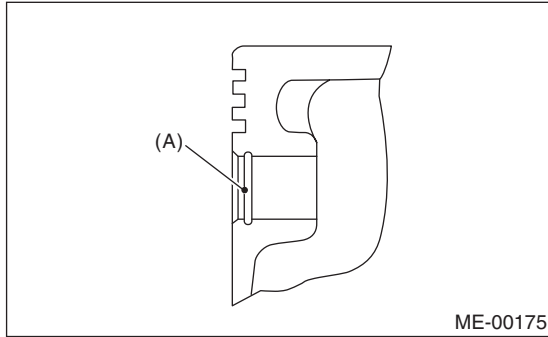
0.004 — 0.008 mm (0.0002 — 0.0003 in)

### Limit

0.020 mm (0.0008 in)



4) Check the snap ring installation groove (A) on piston for burr. If necessary, remove the burr from groove so that the piston pin can lightly move.



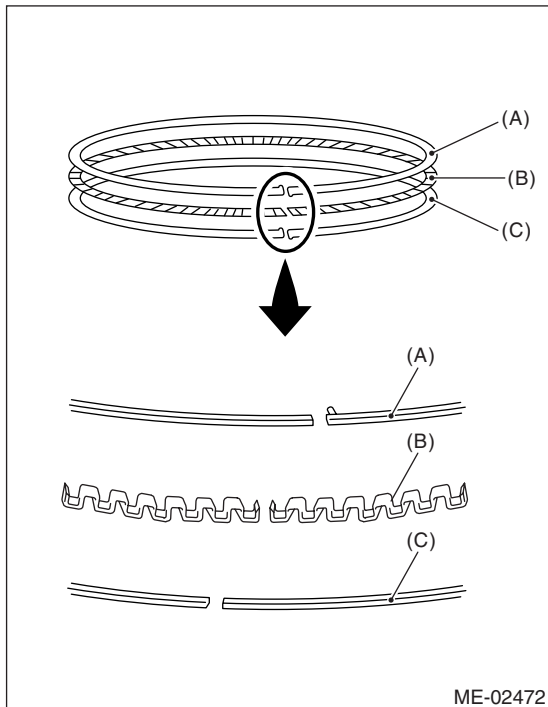
5) Check the piston pin snap ring for distortion, cracks and wear.

## 4. PISTON RING

1) If the piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

### CAUTION:

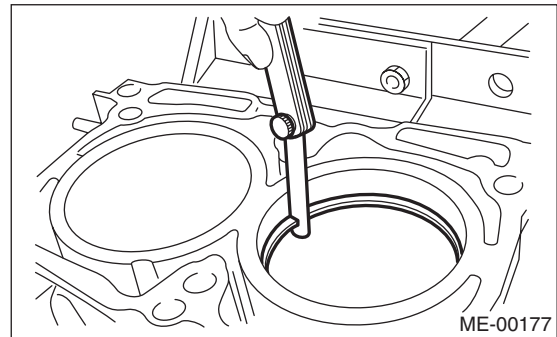
- Marks are shown on the end of top and second rings. When installing the rings to piston, face this mark upward.
- Oil ring consists of upper rail, expander and lower rail. When installing on piston, be careful of each rail's direction.



- (A) Upper rail
- (B) Expander
- (C) Lower rail

2) Squarely place the piston ring and oil ring in cylinder, and then measure the piston ring closed gap with a thickness gauge.

|                        |               | Unit: mm (in)                    |             |
|------------------------|---------------|----------------------------------|-------------|
|                        |               | Standard                         | Limit       |
| Piston ring closed gap | Top ring      | 0.20 — 0.25<br>(0.0079 — 0.0098) | 1.0 (0.039) |
|                        | Second ring   | 0.37 — 0.52<br>(0.015 — 0.020)   | 1.0 (0.039) |
|                        | Oil ring rail | 0.20 — 0.50<br>(0.0079 — 0.0197) | 1.5 (0.059) |

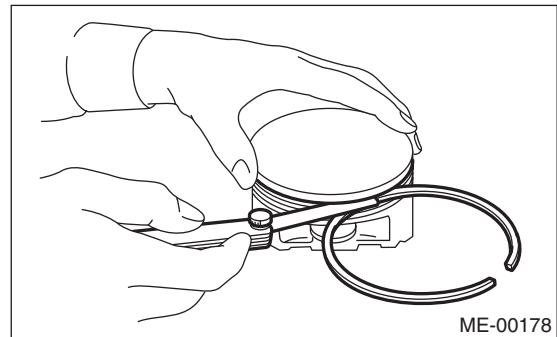


3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

### NOTE:

Before measuring the clearance, clean the piston ring groove and piston ring.

|  |             | Unit: mm (in)                      |                  |
|--|-------------|------------------------------------|------------------|
|  |             | Standard                           | Limit            |
| Clearance between piston ring and piston ring groove | Top ring    | 0.040 — 0.080<br>(0.0016 — 0.0031) | 0.15<br>(0.0059) |
|  | Second ring | 0.030 — 0.070<br>(0.0012 — 0.0028) | 0.15<br>(0.0059) |



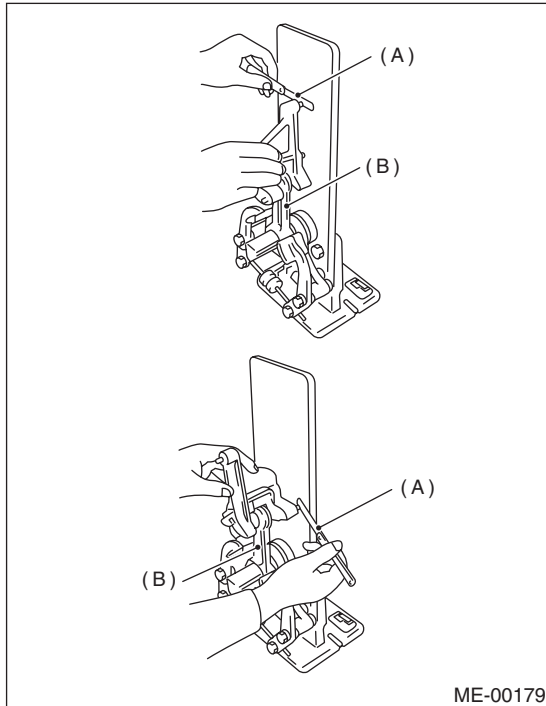
# Cylinder Block

MECHANICAL

## 5. CONNECTING ROD

- 1) Replace the connecting rod, if the large or small end thrust surface is damaged.
- 2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

**Limit of bend or twist per 100 mm (3.94 in) in length:**  
**0.10 mm (0.0039 in)**



- (A) Thickness gauge  
 (B) Connecting rod

- 3) Install the connecting rod fitted with bearing to crankshaft, and then measure the side clearance (thrust clearance). Replace the connecting rod if the side clearance exceeds the specified limit.

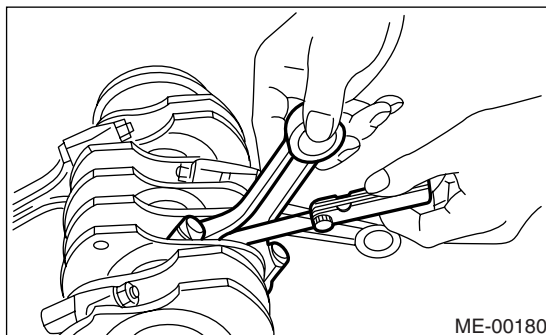
**Connecting rod side clearance:**

**Standard**

**0.070 — 0.330 mm (0.0028 — 0.0130 in)**

**Limit**

**0.4 mm (0.016 in)**



- 4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.

- 5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within the specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

**Connecting rod oil clearance:**

**Standard**

**0.017 — 0.045 mm (0.0007 — 0.0018 in)**

**Limit**

**0.05 mm (0.0020 in)**

| Unit: mm (in)                 |                                       |                                      |
|-------------------------------|---------------------------------------|--------------------------------------|
| Bearing                       | Bearing size<br>(Thickness at center) | Outer diameter of<br>crank pin       |
| Standard                      | 1.490 — 1.502<br>(0.0587 — 0.0591)    | 51.984 — 52.000<br>(2.0466 — 2.0472) |
| 0.03<br>(0.0012)<br>undersize | 1.504 — 1.512<br>(0.0592 — 0.0595)    | 51.954 — 51.970<br>(2.0454 — 2.0461) |
| 0.05<br>(0.0020)<br>undersize | 1.514 — 1.522<br>(0.0596 — 0.0599)    | 51.934 — 51.950<br>(2.0447 — 2.0453) |
| 0.25<br>(0.0098)<br>undersize | 1.614 — 1.622<br>(0.0635 — 0.0639)    | 51.734 — 51.750<br>(2.0368 — 2.0374) |

- 6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at connecting rod small end.



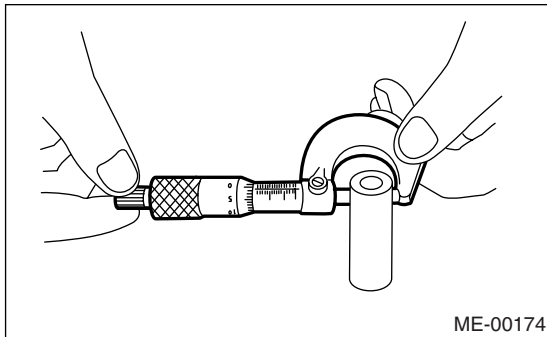
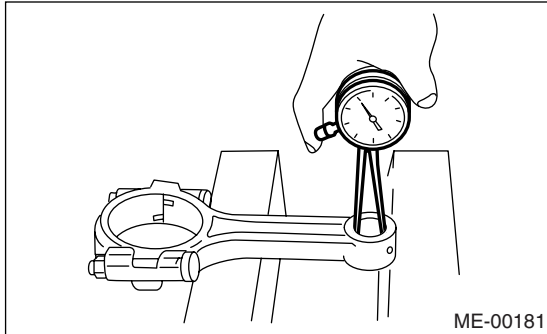
## Clearance between piston pin and bushing:

### Standard

0 — 0.022 mm (0 — 0.0009 in)

### Limit

0.030 mm (0.0012 in)

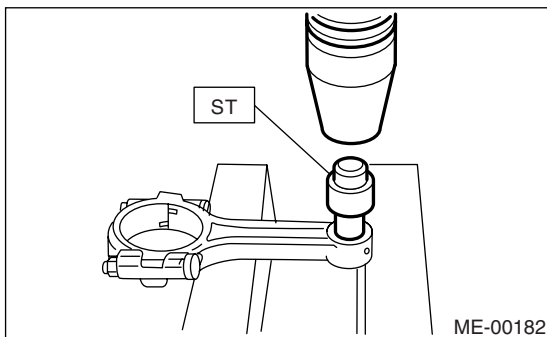


7) Replacement procedure is as follows.

(1) Remove the bushing from connecting rod with ST and press.

(2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.

(4) After the completion of reaming, clean the bushing to remove chips.

## 6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean the crankshaft completely and check for cracks by means of liquid penetrant tester etc., and replace if defective.

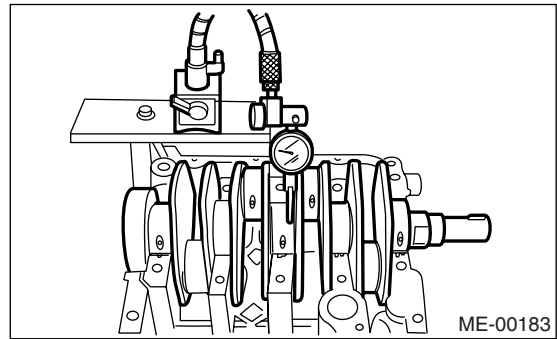
2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

### NOTE:

If a suitable V-block is not available, install the #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

### Crankshaft bend limit:

0.035 mm (0.0014 in)



3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and then replace or recondition the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to specified dimensions according to the undersize bearing to be used.

### Crank pin:

#### Out-of-roundness

0.003 mm (0.0001 in)

#### Cylindricity

0.004 mm (0.0002 in)

#### Grinding limit

To 51.750 mm (2.0374 in) dia.

### Crank journal:

#### Out-of-roundness

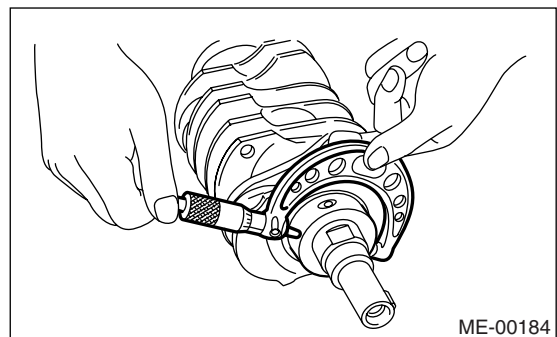
0.005 mm (0.0002 in)

#### Cylindricity

0.006 mm (0.0002 in)

#### Grinding limit

To 59.750 mm (2.3524 in) dia.





# Cylinder Block

MECHANICAL

|                            |                                       | Unit: mm (in)                        |                                      |                                      |
|----------------------------|---------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
|                            |                                       | Crank journal diameter               |                                      | Crank pin diameter                   |
|                            |                                       | #1, #3                               | #2, #4, #5                           |                                      |
| Standard                   | Journal O.D.                          | 59.992 — 60.008<br>(2.3619 — 2.3625) | 59.992 — 60.008<br>(2.3619 — 2.3625) | 51.984 — 52.000<br>(2.0466 — 2.0472) |
|                            | Bearing size<br>(Thickness at center) | 1.998 — 2.011<br>(0.0787 — 0.0792)   | 2.000 — 2.013<br>(0.0787 — 0.0793)   | 1.490 — 1.502<br>(0.0587 — 0.0591)   |
| 0.03 (0.0012)<br>undersize | Journal O.D.                          | 59.962 — 59.978<br>(2.3607 — 2.3613) | 59.962 — 59.978<br>(2.3607 — 2.3613) | 51.954 — 51.970<br>(2.0454 — 2.0461) |
|                            | Bearing size<br>(Thickness at center) | 2.017 — 2.020<br>(0.0794 — 0.0795)   | 2.019 — 2.022<br>(0.0795 — 0.0796)   | 1.504 — 1.512<br>(0.0592 — 0.0595)   |
| 0.05 (0.0020)<br>undersize | Journal O.D.                          | 59.942 — 59.958<br>(2.3599 — 2.3605) | 59.942 — 59.958<br>(2.3599 — 2.3605) | 51.934 — 51.950<br>(2.0447 — 2.0453) |
|                            | Bearing size<br>(Thickness at center) | 2.027 — 2.030<br>(0.0798 — 0.0799)   | 2.029 — 2.032<br>(0.0799 — 0.0800)   | 1.514 — 1.522<br>(0.0596 — 0.0599)   |
| 0.25 (0.0098)<br>undersize | Journal O.D.                          | 59.742 — 59.758<br>(2.3520 — 2.3527) | 59.742 — 59.758<br>(2.3520 — 2.3527) | 51.734 — 51.750<br>(2.0368 — 2.0374) |
|                            | Bearing size<br>(Thickness at center) | 2.127 — 2.130<br>(0.0837 — 0.0839)   | 2.129 — 2.132<br>(0.0838 — 0.0839)   | 1.614 — 1.622<br>(0.0635 — 0.0639)   |

O.D.: Outer Diameter

4) Measure the side clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace the bearing.

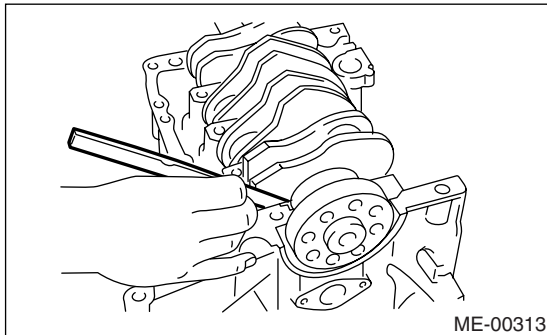
**Crankshaft side clearance:**

**Standard**

**0.030 — 0.115 mm (0.0012 — 0.0045 in)**

**Limit**

**0.25 mm (0.0098 in)**



5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.

6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace the defective bearing with an undersize one, and replace or recondition the crankshaft as necessary.

**Crankshaft oil clearance:**

**Standard**

**0.010 — 0.030 mm (0.0004 — 0.0012 in)**

**Limit**

**0.040 mm (0.0016 in)**

## 21. Intake and Exhaust Valve

### A: SPECIFICATION

For operations related to intake and exhaust valve, refer to "Cylinder Head".

<Ref. to ME(H4DOTC)-61, REMOVAL, Cylinder Head.> <Ref. to ME(H4DOTC)-61, INSTALLATION, Cylinder Head.>

## 22.Piston

### A: SPECIFICATION

For operations related to piston, refer to “Cylinder Block”.

<Ref. to ME(H4DOTC)-68, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-71, INSTALLATION, Cylinder Block.>

## 23.Connecting Rod

### A: SPECIFICATION

For operations related to connecting rod, refer to "Cylinder Block".

<Ref. to ME(H4DOTC)-68, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-71, INSTALLATION, Cylinder Block.>

## 24.Crankshaft

### A: SPECIFICATION

For operations related to crankshaft, refer to “Cylinder Block”.

<Ref. to ME(H4DOTC)-68, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-71, INSTALLATION, Cylinder Block.>

## 25.Engine Trouble in General

### A: INSPECTION

NOTE:

“RANK” shown in the chart refers to the possibility of reason for the trouble in order (“Very often” to “Rarely”)

A — Very often

B — Sometimes

C — Rarely

| TROUBLE                               | PROBLEM PARTS, ETC.   | POSSIBLE CAUSE                                   | RANK |
|---------------------------------------|---|--|------|
| 1. Engine will not start.             |   |  |      |
| 1) Starter does not turn.             | Starter   | Defective battery-to-starter harness             | B    |
|                                       |   | Defective starter switch                         | C    |
|                                       |   | Defective inhibitor switch or neutral switch     | C    |
|                                       |   | Defective starter                                | B    |
|                                       | Battery   | Poor terminal connection                         | A    |
|                                       |   | Run-down battery                                 | A    |
|                                       |   | Defective charging system                        | B    |
|                                       | Friction  | Seizure of crankshaft and connecting rod bearing | C    |
|                                       |   | Seized camshaft                                  | C    |
| Seized or stuck piston and cylinder   |   | C  |      |
| 2) Initial combustion does not occur. | Starter   | Defective starter                                | C    |
|                                       | Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|                                       | Fuel line   | Defective fuel pump and relay                    | A    |
|                                       |   | Lack of or insufficient fuel                     | B    |
|                                       | Belt  | Defective  | B    |
|                                       |   | Defective timing                                 | B    |
|                                       | Compression   | Incorrect valve clearance                        | C    |
|                                       |   | Loosened spark plug or defective gasket          | C    |
|                                       |   | Loosened cylinder head bolt or defective gasket  | C    |
|                                       |   | Improper valve sealing                           | C    |
|                                       |   | Defective valve stem                             | C    |
|                                       |   | Worn or broken valve spring                      | B    |
|                                       |   | Worn or stuck piston rings, cylinder and piston  | C    |
|                                       |   | Incorrect valve timing                           | B    |
|                                       | Improper engine oil (low viscosity)   | B  |      |
| 3) Initial combustion occurs.         | Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|                                       | Intake system   | Defective intake manifold gasket                 | B    |
|                                       |   | Defective throttle body gasket                   | B    |
|                                       | Fuel line   | Defective fuel pump and relay                    | C    |
|                                       |   | Clogged fuel line                                | C    |
|                                       |   | Lack of or insufficient fuel                     | B    |
|                                       | Belt  | Defective  | B    |
|                                       |   | Defective timing                                 | B    |
|                                       | Compression   | Incorrect valve clearance                        | C    |
|                                       |   | Loosened spark plug or defective gasket          | C    |
|                                       |   | Loosened cylinder head bolt or defective gasket  | C    |
|                                       |   | Improper valve sealing                           | C    |
|                                       |   | Defective valve stem                             | C    |
|                                       |   | Worn or broken valve spring                      | B    |
|                                       |   | Worn or stuck piston rings, cylinder and piston  | C    |
| Incorrect valve timing                |   | B  |      |
| Improper engine oil (low viscosity)   | B   |  |      |

# Engine Trouble in General

MECHANICAL

| TROUBLE                                    | PROBLEM PARTS, ETC.   | POSSIBLE CAUSE                                     | RANK |
|--|---|--|------|
| 4) Engine stalls after initial combustion. | Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|  | Intake system   | Loosened or cracked intake duct                    | B    |
|  |   | Loosened or cracked PCV hose                       | C    |
|  |   | Loosened or cracked vacuum hose                    | C    |
|  |   | Defective intake manifold gasket                   | B    |
|  |   | Defective throttle body gasket                     | B    |
|  |   | Dirty air cleaner element                          | C    |
|  | Fuel line   | Clogged fuel line                                  | C    |
|  |   | Lack of or insufficient fuel                       | B    |
|  | Belt  | Defective  | B    |
|  |   | Defective timing                                   | B    |
|  | Compression   | Incorrect valve clearance                          | C    |
|  |   | Loosened spark plug or defective gasket            | C    |
|  |   | Loosened cylinder head bolt or defective gasket    | C    |
|  |   | Improper valve sealing                             | C    |
|  |   | Defective valve stem                               | C    |
|  |   | Worn or broken valve spring                        | B    |
|  |   | Worn or stuck piston rings, cylinder and piston    | C    |
| Incorrect valve timing                     |   | B  |      |
| Improper engine oil (low viscosity)        | B   |  |      |
| 2. Rough idle and engine stall             | Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|  | Intake system   | Loosened or cracked intake duct                    | A    |
|  |   | Loosened or cracked PCV hose                       | A    |
|  |   | Loosened or cracked vacuum hose                    | A    |
|  |   | Defective intake manifold gasket                   | B    |
|  |   | Defective throttle body gasket                     | B    |
|  |   | Defective PCV valve                                | C    |
|  |   | Loosened oil filler cap                            | B    |
|  |   | Dirty air cleaner element                          | C    |
|  | Fuel line   | Defective fuel pump and relay                      | C    |
|  |   | Clogged fuel line                                  | C    |
|  |   | Lack of or insufficient fuel                       | B    |
|  | Belt  | Defective timing                                   | C    |
|  | Compression   | Incorrect valve clearance                          | B    |
|  |   | Loosened spark plug or defective gasket            | B    |
|  |   | Loosened cylinder head bolt or defective gasket    | B    |
|  |   | Improper valve sealing                             | B    |
|  |   | Defective valve stem                               | C    |
|  |   | Worn or broken valve spring                        | B    |
|  |   | Worn or stuck piston rings, cylinder and piston    | B    |
|  |   | Incorrect valve timing                             | A    |
|  | Improper engine oil (low viscosity)   | B  |      |
|  | Lubrication system  | Incorrect oil pressure                             | B    |
|  |   | Defective rocker cover gasket                      | C    |
|  | Cooling system  | Over-heating                                       | C    |
|  | Others  | Malfunction of evaporative emission control system | A    |
|  |   | Stuck or damaged throttle valve                    | B    |

# Engine Trouble in General

MECHANICAL

| TROUBLE   | PROBLEM PARTS, ETC.   | POSSIBLE CAUSE                                  | RANK |
|---|---|---|------|
| 3. Low output, hesitation and poor acceleration | Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.> |   | A    |
|   | Intake system   | Loosened or cracked intake duct                 | A    |
|   |   | Loosened or cracked PCV hose                    | A    |
|   |   | Loosened or cracked vacuum hose                 | B    |
|   |   | Defective intake manifold gasket                | B    |
|   |   | Defective throttle body gasket                  | B    |
|   |   | Defective PCV valve                             | B    |
|   |   | Loosened oil filler cap                         | B    |
|   |   | Dirty air cleaner element                       | A    |
|   | Fuel line   | Defective fuel pump and relay                   | B    |
|   |   | Clogged fuel line                               | B    |
|   |   | Lack of or insufficient fuel                    | C    |
|   | Belt  | Defective timing                                | B    |
|   | Compression   | Incorrect valve clearance                       | B    |
|   |   | Loosened spark plug or defective gasket         | B    |
|   |   | Loosened cylinder head bolt or defective gasket | B    |
|   |   | Improper valve sealing                          | B    |
|   |   | Defective valve stem                            | C    |
|   |   | Worn or broken valve spring                     | B    |
|   |   | Worn or stuck piston rings, cylinder and piston | C    |
|   |   | Incorrect valve timing                          | A    |
|   | Improper engine oil (low viscosity)   | B   |      |
|   | Lubrication system  | Incorrect oil pressure                          | B    |
| Cooling system                                  | Over-heating  | C   |      |
|   | Over cooling  | C   |      |
| Others  | Malfunction of evaporative emission control system                              | A   |      |
| 4. Surging                                      | Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.> |   | A    |
|   | Intake system   | Loosened or cracked intake duct                 | A    |
|   |   | Loosened or cracked PCV hose                    | A    |
|   |   | Loosened or cracked vacuum hose                 | A    |
|   |   | Defective intake manifold gasket                | B    |
|   |   | Defective throttle body gasket                  | B    |
|   |   | Defective PCV valve                             | B    |
|   |   | Loosened oil filler cap                         | B    |
|   |   | Dirty air cleaner element                       | B    |
|   | Fuel line   | Defective fuel pump and relay                   | B    |
|   |   | Clogged fuel line                               | B    |
|   |   | Lack of or insufficient fuel                    | C    |
|   | Belt  | Defective timing                                | B    |
|   | Compression   | Incorrect valve clearance                       | B    |
|   |   | Loosened spark plug or defective gasket         | C    |
|   |   | Loosened cylinder head bolt or defective gasket | C    |
|   |   | Improper valve sealing                          | C    |
|   |   | Defective valve stem                            | C    |
|   |   | Worn or broken valve spring                     | C    |
|   |   | Worn or stuck piston rings, cylinder and piston | C    |
|   |   | Incorrect valve timing                          | A    |
|   | Improper engine oil (low viscosity)   | B   |      |
|   | Cooling system  | Overheating                                     | B    |
| Others  | Malfunction of evaporative emission control system                              | C   |      |



# Engine Trouble in General

MECHANICAL

| TROUBLE                             | PROBLEM PARTS, ETC.   | POSSIBLE CAUSE   | RANK |
|-------------------------------------|---|--|------|
| 5. Engine does not return to idle.  | Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|                                     | Intake system   | Loosened or cracked vacuum hose                        | A    |
|                                     | Others  | Stuck or damaged throttle valve                        | A    |
| 6. Dieseling (Run-on)               | Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|                                     | Cooling system  | Overheating  | B    |
|                                     | Others  | Malfunction of evaporative emission control system     | B    |
| 7. Afterburning in exhaust system   | Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|                                     | Intake system   | Loosened or cracked intake duct                        | C    |
|                                     |   | Loosened or cracked PCV hose                           | C    |
|                                     |   | Loosened or cracked vacuum hose                        | B    |
|                                     |   | Defective PCV valve                                    | B    |
|                                     |   | Loosened oil filler cap                                | C    |
|                                     | Belt  | Defective timing                                       | B    |
|                                     | Compression   | Incorrect valve clearance                              | B    |
|                                     |   | Loosened spark plug or defective gasket                | C    |
|                                     |   | Loosened cylinder head bolt or defective gasket        | C    |
|                                     |   | Improper valve sealing                                 | B    |
|                                     |   | Defective valve stem                                   | C    |
|                                     |   | Worn or broken valve spring                            | C    |
|                                     |   | Worn or stuck piston rings, cylinder and piston        | C    |
|                                     |   | Incorrect valve timing                                 | A    |
|                                     | Lubrication system  | Incorrect oil pressure                                 | C    |
| Cooling system                      | Over cooling  | C  |      |
| Others                              | Malfunction of evaporative emission control system                              | C  |      |
| 8. Knocking                         | Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|                                     | Intake system   | Loosened oil filler cap                                | B    |
|                                     | Belt  | Defective timing                                       | B    |
|                                     | Compression   | Incorrect valve clearance                              | C    |
|                                     |   | Incorrect valve timing                                 | B    |
|                                     | Cooling system  | Overheating  | A    |
| 9. Excessive engine oil consumption | Intake system   | Loosened or cracked PCV hose                           | A    |
|                                     |   | Defective PCV valve                                    | B    |
|                                     |   | Loosened oil filler cap                                | C    |
|                                     | Compression   | Defective valve stem                                   | A    |
|                                     |   | Worn or stuck piston rings, cylinder and piston        | A    |
|                                     | Lubrication system  | Loosened oil pump attaching bolts and defective gasket | B    |
|                                     |   | Defective oil filter o-ring                            | B    |
|                                     |   | Defective crankshaft oil seal                          | B    |
|                                     |   | Defective rocker cover gasket                          | B    |
|                                     |   | Loosened oil drain plug or defective gasket            | B    |
|                                     | Loosened oil pan fitting bolts or defective oil pan                             | B  |      |

# Engine Trouble in General

MECHANICAL

| TROUBLE                        | PROBLEM PARTS, ETC.   | POSSIBLE CAUSE                                  | RANK |   |
|--------------------------------|---|---|------|---|
| 10. Excessive fuel consumption | Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.> |   | A    |   |
|                                | Intake system   | Dirty air cleaner element                       | A    |   |
|                                | Belt  | Defective timing                                | B    |   |
|                                | Compression   | Incorrect valve clearance                       |      | B |
|                                |   | Loosened spark plug or defective gasket         |      | C |
|                                |   | Loosened cylinder head bolt or defective gasket |      | C |
|                                |   | Improper valve sealing                          |      | B |
|                                |   | Defective valve stem                            |      | C |
|                                |   | Worn or broken valve spring                     |      | C |
|                                |   | Worn or stuck piston rings, cylinder and piston |      | B |
|                                |   | Incorrect valve timing                          |      | B |
|                                | Lubrication system  | Incorrect oil pressure                          | C    |   |
|                                | Cooling system  | Over cooling                                    | C    |   |

# Engine Noise

MECHANICAL

## 26.Engine Noise

### A: INSPECTION

| Type of sound   | Condition  | Possible cause   |
|---|--|--|
| Regular clicking sound  | Sound increases as engine speed increases.                                       | <ul style="list-style-type: none"> <li>Valve mechanism is defective.</li> <li>Incorrect valve clearance</li> <li>Worn camshaft</li> <li>Broken valve spring</li> </ul>                       |
| Heavy and dull clank  | Oil pressure is low.   | <ul style="list-style-type: none"> <li>Worn crankshaft main bearing</li> <li>Worn connecting rod bearing (big end)</li> </ul>  |
|   | Oil pressure is normal.  | <ul style="list-style-type: none"> <li>Loose flywheel mounting bolts</li> <li>Damaged engine mounting</li> </ul>   |
| High-pitched clank (Spark knock)  | Sound is noticeable when accelerating with an overload.                          | <ul style="list-style-type: none"> <li>Ignition timing advanced</li> <li>Accumulation of carbon inside combustion chamber</li> <li>Wrong spark plug</li> <li>Improper gasoline</li> </ul>    |
| Clank when engine speed is medium (1,000 to 2,000 rpm).                       | Sound is reduced when fuel injector connector of noisy cylinder is disconnected. | <ul style="list-style-type: none"> <li>Worn crankshaft main bearing</li> <li>Worn bearing of connecting rod (Large end)</li> </ul>   |
| Knocking sound when engine is operating under idling speed and engine is warm | Sound is reduced when fuel injector connector of noisy cylinder is disconnected. | <ul style="list-style-type: none"> <li>Worn cylinder liner and piston ring</li> <li>Broken or stuck piston ring</li> <li>Worn piston pin and hole at piston end of connecting rod</li> </ul> |
|   | Sound is not reduced if each fuel injector connector is disconnected in turn.    | <ul style="list-style-type: none"> <li>Unusually worn valve lifter</li> <li>Worn cam sprocket</li> <li>Worn camshaft journal in cylinder head assembly</li> </ul>                            |
| Squeaky sound   | —  | <ul style="list-style-type: none"> <li>Insufficient generator lubrication</li> </ul>   |
| Rubbing sound   | —  | <ul style="list-style-type: none"> <li>Defective generator brush and rotor contact</li> </ul>  |
| Gear scream when starting engine  | —  | <ul style="list-style-type: none"> <li>Defective ignition starter switch</li> <li>Worn gear and starter pinion</li> </ul>  |
| Sound like polishing glass with a dry cloth                                   | —  | <ul style="list-style-type: none"> <li>Loose drive belt</li> <li>Defective water pump shaft</li> </ul>   |
| Hissing sound   | —  | <ul style="list-style-type: none"> <li>Loss of compression</li> <li>Air leakage in air intake system, hoses, connections or manifolds</li> </ul>   |
| Timing belt noise   | —  | <ul style="list-style-type: none"> <li>Loose timing belt</li> <li>Belt contacting case or adjacent part</li> </ul>   |
| Valve noise   | —  | <ul style="list-style-type: none"> <li>Incorrect valve clearance</li> </ul>  |

**NOTE\*)**

When disconnecting the fuel injector connector, the malfunction indicator light illuminates and DTC is stored in ECM memory. Therefore, carry out the clear memory mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and inspection mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.> after connecting the fuel injector connector.

# EXHAUST

# *EX(H4DOTC)*

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# General Description

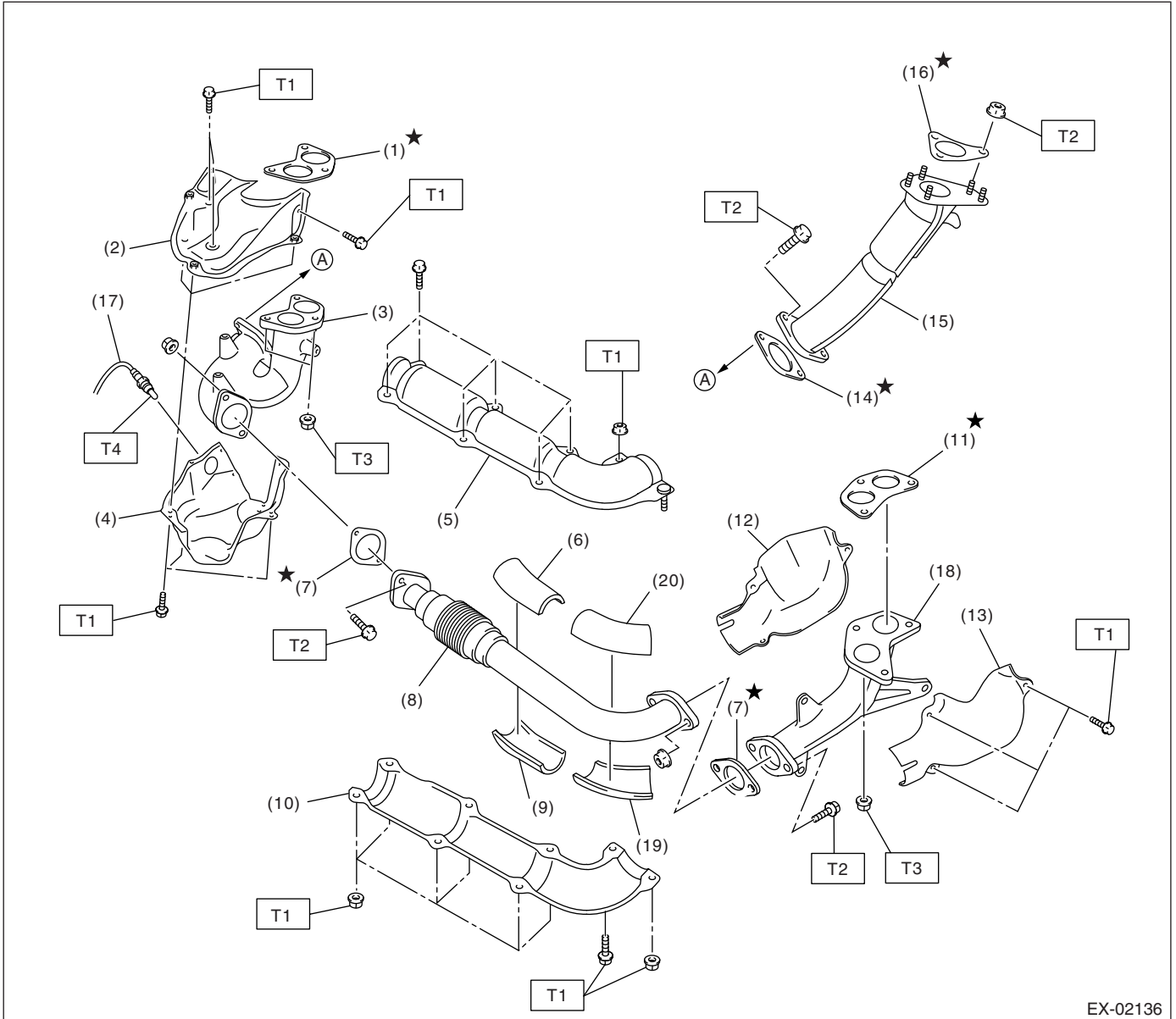
EXHAUST

## 1. General Description

### A: COMPONENT

#### 1. FRONT EXHAUST PIPE

• Turbo model



# General Description

EXHAUST

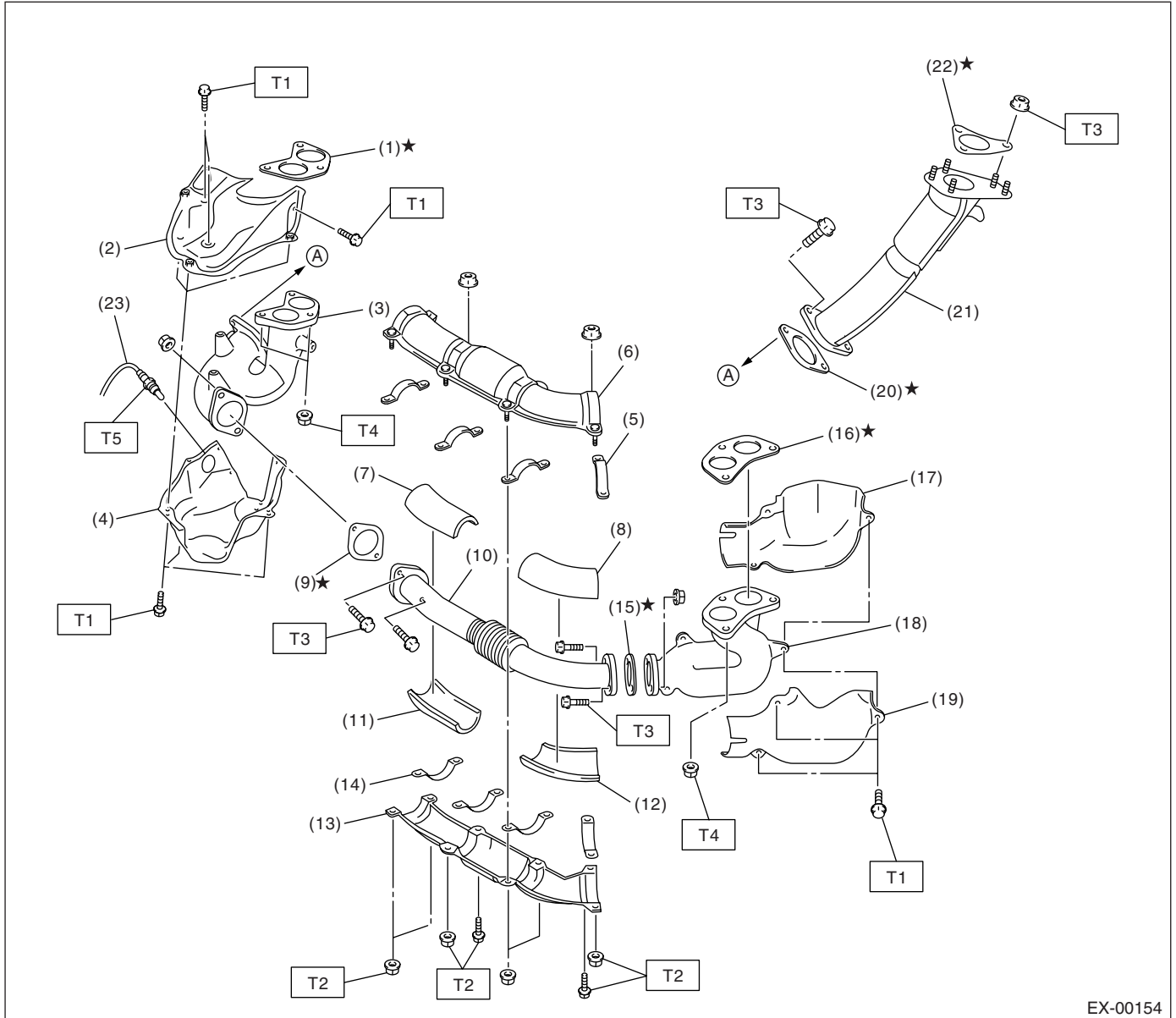
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|   |  |  |
|---|--|--|
| (1) Gasket                                  | (10) Front exhaust pipe lower cover          | (20) Front exhaust pipe upper insulator (LH)                                       |
| (2) Exhaust manifold upper cover (RH)       | (11) Gasket                                  |  |
| (3) Exhaust manifold (RH)                   | (12) Exhaust manifold upper cover (LH)       |  |
| (4) Exhaust manifold lower cover (RH)       | (13) Exhaust manifold lower cover (LH)       | <hr/> <b>Tightening torque: N·m (kgf·m, ft·lb)</b>                                 |
| (5) Front exhaust pipe upper cover          | (14) Gasket                                  | <b>T1: 7.5 (0.8, 5.5)</b>  |
| (6) Front exhaust pipe upper insulator (RH) | (15) Turbocharger joint pipe                 | <b>T2: 35 (3.6, 26)</b>  |
| (7) Gasket                                  | (16) Gasket                                  | <b>T3: 40 (4, 28.9)</b>  |
| (8) Front exhaust pipe                      | (17) Front oxygen (A/F) sensor               | <b>T4: &lt;Ref. to FU(H4DOTC)-41, INSTALLATION, Front Oxygen (A/F) Sensor.&gt;</b> |
| (9) Front exhaust pipe lower insulator (RH) | (18) Exhaust manifold (LH)                   | <hr/>  |
|   | (19) Front exhaust pipe lower insulator (LH) |  |

# General Description

## EXHAUST

### • STI model



EX-00154

- |   |  |                                |
|---|--|--------------------------------|
| (1) Gasket                                  | (10) Front exhaust pipe                      | (20) Gasket                    |
| (2) Exhaust manifold upper cover (RH)       | (11) Front exhaust pipe lower insulator (RH) | (21) Turbocharger joint pipe   |
| (3) Exhaust manifold (RH)                   | (12) Front exhaust pipe lower insulator (LH) | (22) Gasket                    |
| (4) Exhaust manifold lower cover (RH)       | (13) Front exhaust pipe lower cover          | (23) Front oxygen (A/F) sensor |
| (5) Front exhaust pipe upper clamp          | (14) Front exhaust pipe lower clamp          |                                |
| (6) Front exhaust pipe upper cover          | (15) Gasket                                  |                                |
| (7) Front exhaust pipe upper insulator (RH) | (16) Gasket                                  |                                |
| (8) Front exhaust pipe upper insulator (LH) | (17) Exhaust manifold upper cover (LH)       |                                |
| (9) Gasket                                  | (18) Exhaust manifold (LH)                   |                                |
|   | (19) Exhaust manifold lower cover (LH)       |                                |

#### **Tightening torque: N·m (kgf-m, ft-lb)**

**T1: 19 (1.9, 13.7)**

**T2: 25 (2.5, 18.1)**

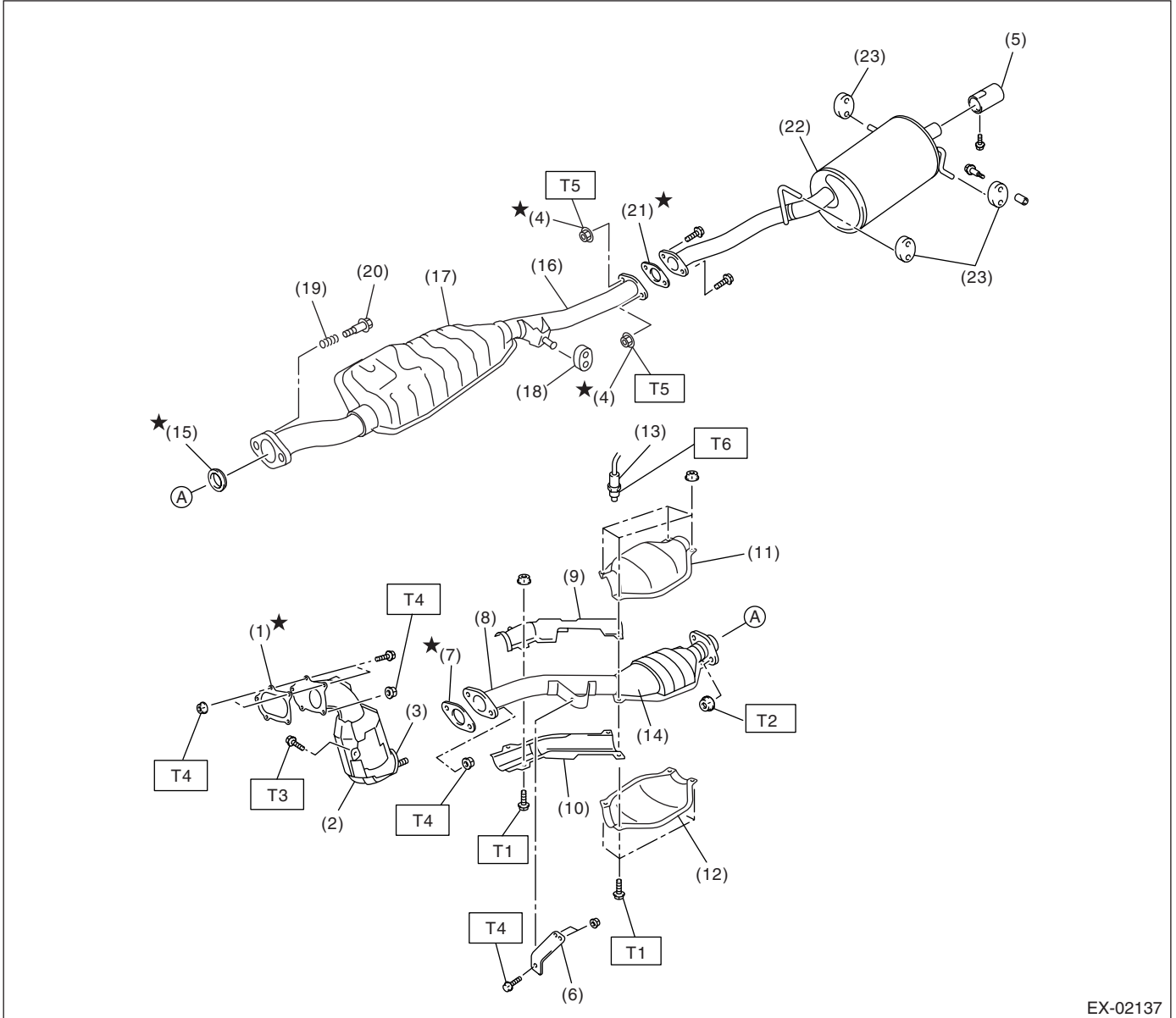
**T3: 35 (3.6, 26)**

**T4: 40 (4, 28.9)**

**T5: <Ref. to FU(H4DOTC)-41, INSTALLATION, Front Oxygen (A/F) Sensor.>**

## 2. CENTER AND REAR EXHAUST PIPE, AND MUFFLER

• Turbo model



EX-02137

- |   |   |
|---|---|
| (1) Gasket                                | (12) Rear catalytic converter lower cover |
| (2) Front catalytic converter             | (13) Rear oxygen sensor                   |
| (3) Center exhaust pipe (Front)           | (14) Rear catalytic converter             |
| (4) Self-locking nut                      | (15) Gasket                               |
| (5) Muffler cutter                        | (16) Rear exhaust pipe                    |
| (6) Bracket                               | (17) Chamber                              |
| (7) Gasket                                | (18) Cushion rubber                       |
| (8) Center exhaust pipe (Rear)            | (19) Spring                               |
| (9) Center pipe upper cover (Rear)        | (20) Bolt                                 |
| (10) Center pipe lower cover (Rear)       | (21) Gasket                               |
| (11) Rear catalytic converter upper cover |   |

- |                     |
|---------------------|
| (22) Muffler        |
| (23) Cushion rubber |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 13 (1.3, 9.6)**

**T2: 18 (1.8, 13)**

**T3: 30 (3.1, 22.4)**

**T4: 35 (3.6, 26)**

**T5: 48 (4.9, 35.4)**

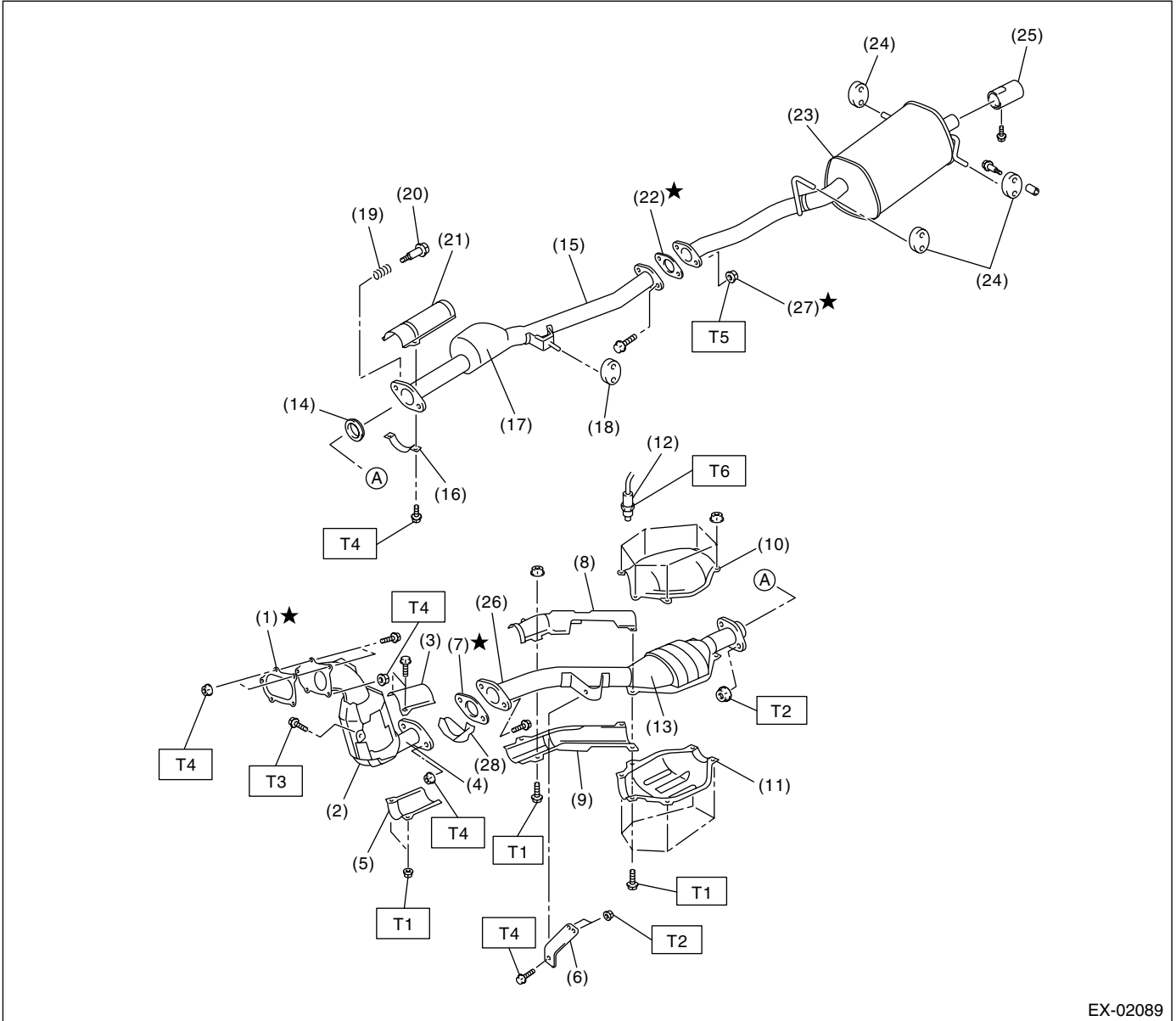
**T6: <Ref. to FU(H4DOTC)-43, INSTALLATION, Rear Oxygen Sensor.>**



# General Description

## EXHAUST

### • STI model



- |   |  |                                 |
|---|--|---------------------------------|
| (1) Gasket                                | (13) Rear catalytic converter              | (26) Center exhaust pipe (Rear) |
| (2) Front catalytic converter             | (14) Gasket                                | (27) Self-locking nut           |
| (3) Center pipe upper cover (Front)       | (15) Rear exhaust pipe                     |                                 |
| (4) Center exhaust pipe (Front)           | (16) Clamp                                 |                                 |
| (5) Center pipe lower cover (Front)       | (17) Chamber                               |                                 |
| (6) Bracket                               | (18) Cushion rubber                        |                                 |
| (7) Gasket                                | (19) Spring                                |                                 |
| (8) Center pipe upper cover (Rear)        | (20) Bolt                                  |                                 |
| (9) Center pipe lower cover (Rear)        | (21) Rear exhaust pipe upper cover (Front) |                                 |
| (10) Rear catalytic converter upper cover | (22) Gasket                                |                                 |
| (11) Rear catalytic converter lower cover | (23) Muffler                               |                                 |
| (12) Rear oxygen sensor                   | (24) Cushion rubber                        |                                 |
|   | (25) Muffler cutter                        |                                 |

#### **Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 13 (1.3, 9.6)**

**T2: 18 (1.8, 13)**

**T3: 30 (3.1, 22.4)**

**T4: 35 (3.6, 26)**

**T5: 48 (4.9, 35.4)**

**T6: <Ref. to FU(H4DOTC)-43, INSTALLATION, Rear Oxygen Sensor.>**

### **B: CAUTION**

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

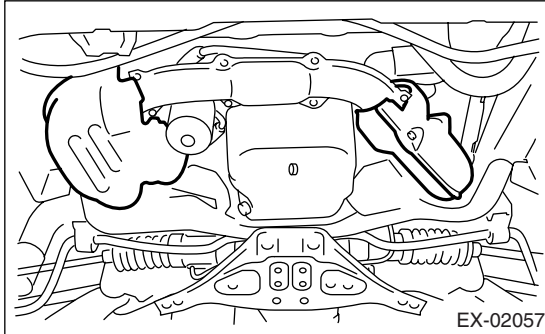
# Front Exhaust Pipe

EXHAUST

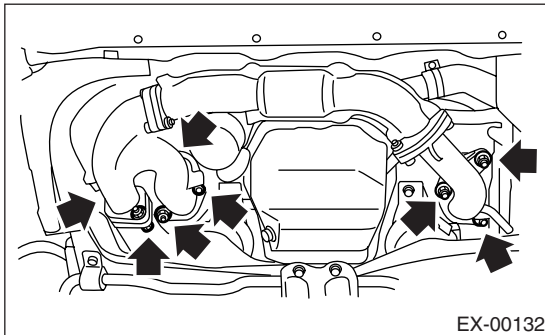
## 2. Front Exhaust Pipe

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, REMOVAL, Front Oxygen (A/F) Sensor.>
- 3) Remove the under cover.
- 4) Remove the lower exhaust manifold cover (RH).
- 5) Remove the lower and upper exhaust manifold covers (LH).

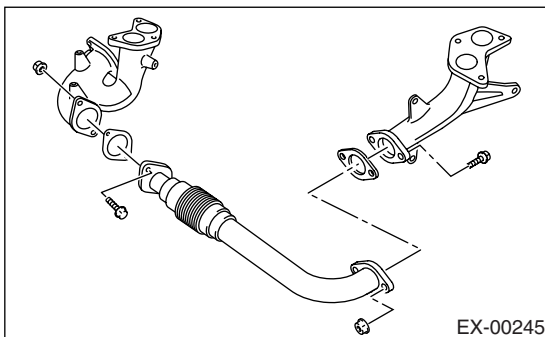


- 6) Remove the bolts and nuts which hold the front exhaust pipe assembly to turbocharger joint pipe.
- 7) While holding the front exhaust pipe assembly with one hand, remove the nuts which hold the front exhaust pipe assembly to cylinder head exhaust port.

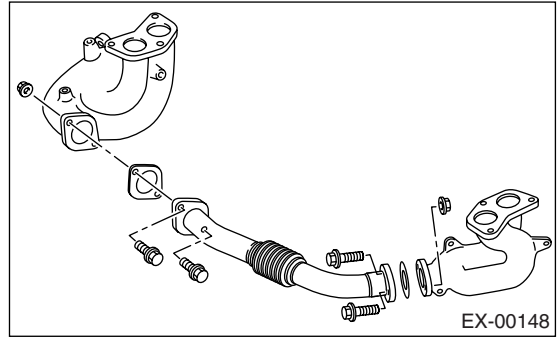


- 8) Remove the front exhaust pipe assembly.
- 9) Remove the covers from exhaust manifold and front exhaust pipe.
- 10) Separate the front exhaust pipe from exhaust manifolds.

- Turbo model



- STI model



### B: INSTALLATION

#### NOTE:

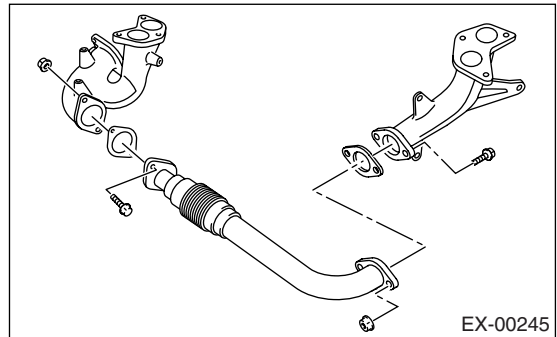
Replace the gaskets with new ones.

- 1) Assemble the front exhaust pipe and exhaust manifolds.

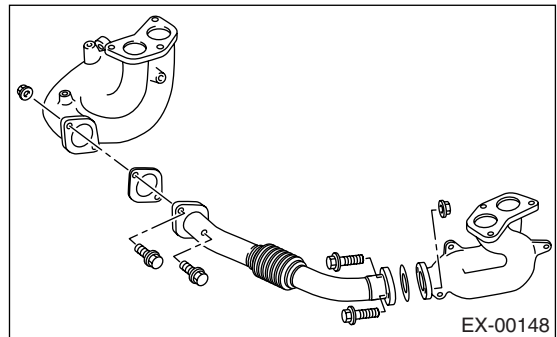
#### Tightening torque:

**35 N·m (3.6 kgf-m, 26 ft-lb)**

- Turbo model



- STI model



- 2) Install the front exhaust pipe covers.

#### Tightening torque:

**Turbo model**

**7.5 N·m (0.8 kgf-m, 5.5 ft-lb)**

**STI model**

**25 N·m (2.5 kgf-m, 18.1 ft-lb)**

3) Install the upper exhaust manifold cover (RH).

**Tightening torque:**

*Turbo model*

**7.5 N·m (0.8 kgf-m, 5.5 ft-lb)**

*STI model*

**19 N·m (1.9 kgf-m, 13.7 ft-lb)**

4) Install the front exhaust pipe assembly.

**Tightening torque:**

**35 N·m (3.6 kgf-m, 26 ft-lb)**

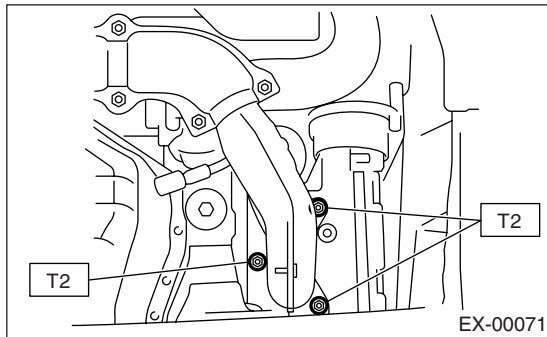
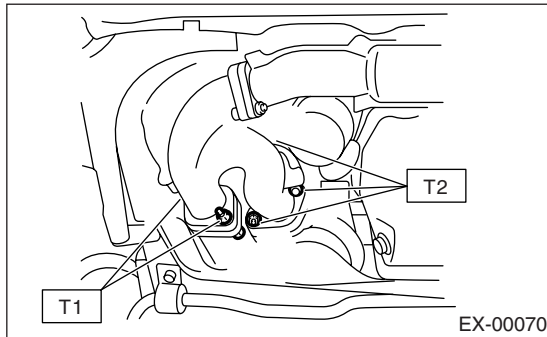
5) Connect the exhaust manifold (RH) to turbo-charger joint pipe.

- Turbo model

**Tightening torque:**

**T1: 35 N·m (3.6 kgf-m, 26 ft-lb)**

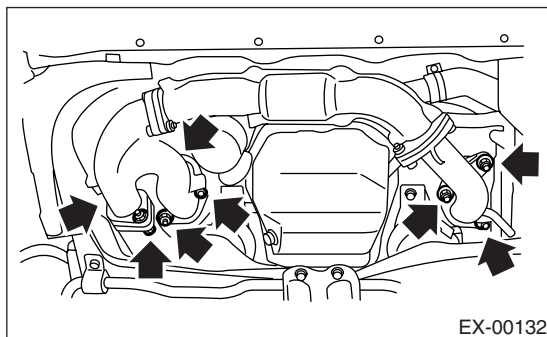
**T2: 40 N·m (4 kgf-m, 28.9 ft-lb)**



- STI model

**Tightening torque:**

**35 N·m (3.6 kgf-m, 26 ft-lb)**



6) Install the upper and lower exhaust manifold covers (LH).

**Tightening torque:**

*Turbo model*

**7.5 N·m (0.8 kgf-m, 5.5 ft-lb)**

*STI model*

**19 N·m (1.9 kgf-m, 13.7 ft-lb)**

7) Install the lower exhaust manifold cover (RH).

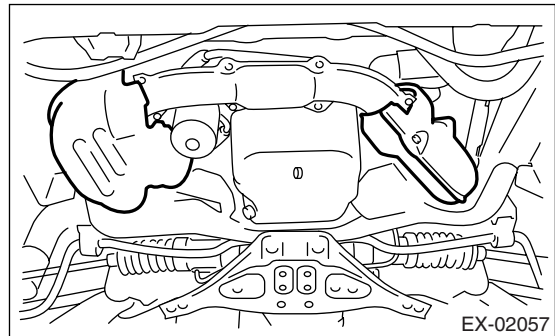
**Tightening torque:**

*Turbo model*

**7.5 N·m (0.8 kgf-m, 5.5 ft-lb)**

*STI model*

**19 N·m (1.9 kgf-m, 13.7 ft-lb)**



8) Install the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, INSTALLATION, Front Oxygen (A/F) Sensor.>

9) Install the under cover.

10) Connect the battery ground cable to battery.

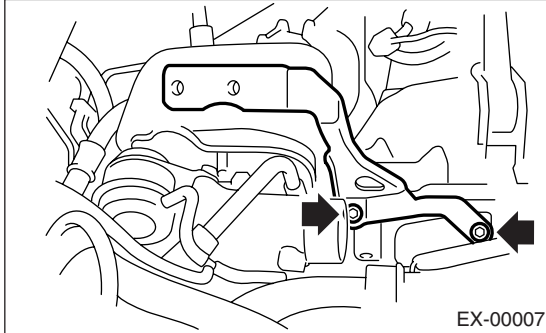
# Center Exhaust Pipe

EXHAUST

## 3. Center Exhaust Pipe

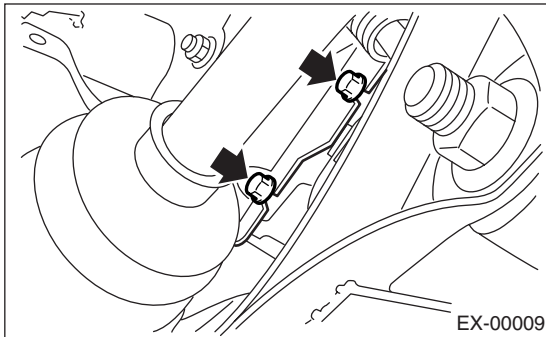
### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 4) Remove the intercooler bracket.

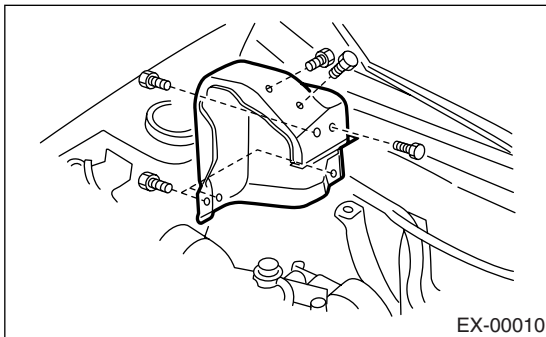


- 5) Lift-up the vehicle.
- 6) Remove the under cover.
- 7) Remove the bolts which install the under side of turbocharger lower cover.

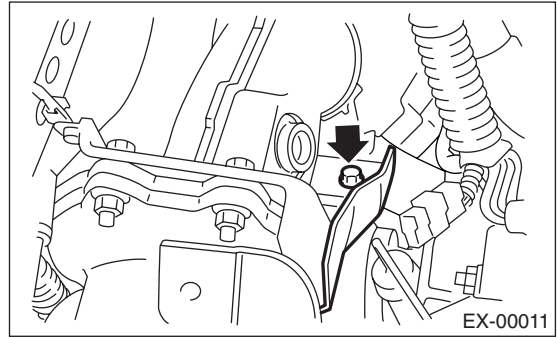
**CAUTION:**  
Be careful, the turbocharger and exhaust pipe are hot.



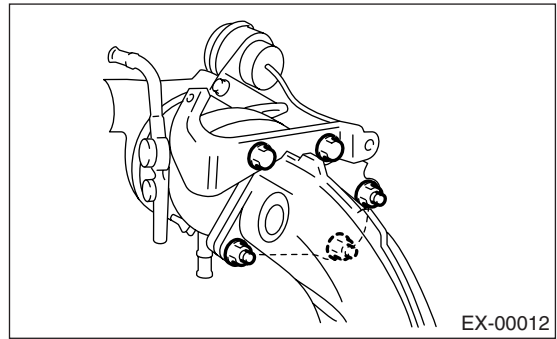
- 8) Lower the vehicle.
- 9) Remove the turbocharger upper cover.



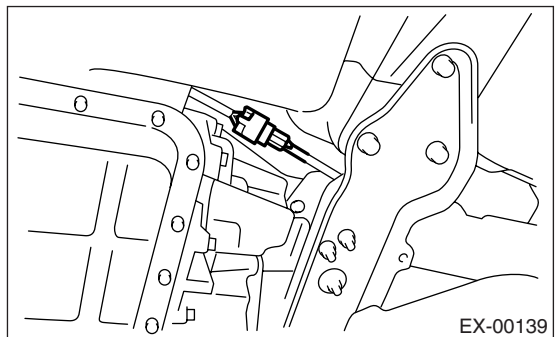
- 10) Remove the bolts which install the upper side of turbocharger lower cover, and remove it.



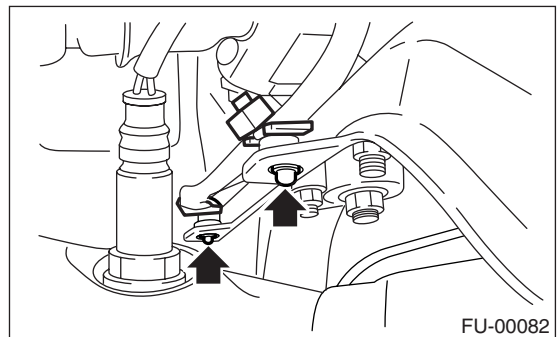
- 11) Separate the center exhaust pipe from turbocharger.



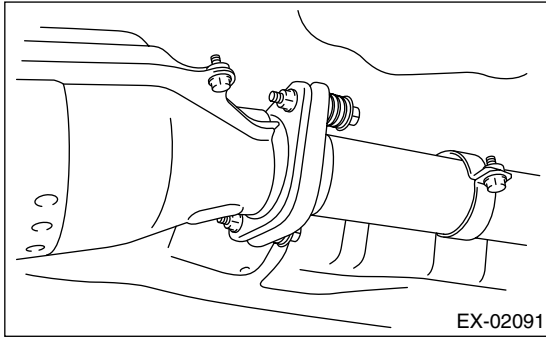
- 12) Lift-up the vehicle.
- 13) Disconnect the connector from rear oxygen sensor.



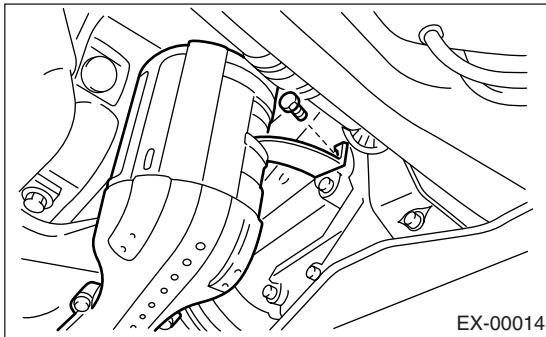
- 14) Vertically draw out the clip from crossmember.



15) Separate the center exhaust pipe from rear exhaust pipe.



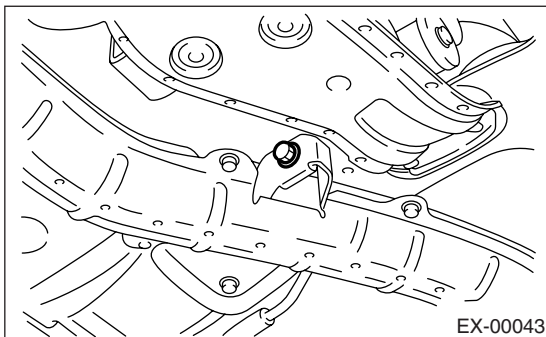
16) Remove the bolt which holds the center exhaust pipe bracket to transmission.



17) Remove the intercooler bracket.

18) Remove the bolt which holds the center exhaust pipe to hanger bracket.

**CAUTION:**  
Be careful not to pull down the center exhaust pipe.



19) Remove the center exhaust pipe.



## B: INSTALLATION

**NOTE:**

Replace the gaskets with new ones.

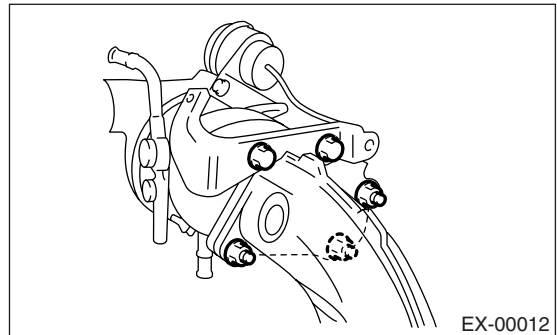
1) Install the center exhaust pipe and temporarily tighten the bolt which holds the center exhaust pipe to hanger bracket.

2) Temporarily tighten the bolt which holds the center pipe to transmission.

3) Connect the center exhaust pipe to turbocharger.

**Tightening torque:**

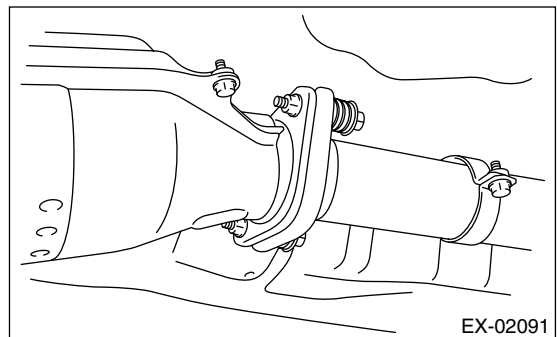
**35 N·m (3.6 kgf-m, 26 ft-lb)**



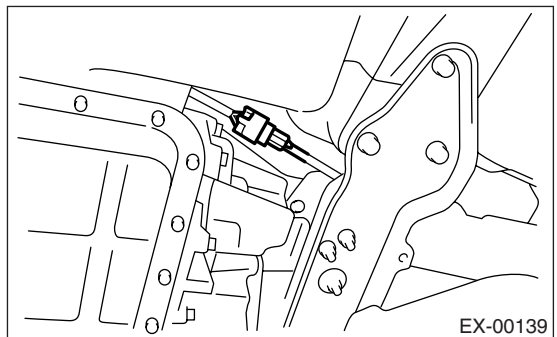
4) Install the center exhaust pipe to rear exhaust pipe.

**Tightening torque:**

**18 N·m (1.8 kgf-m, 13 ft-lb)**



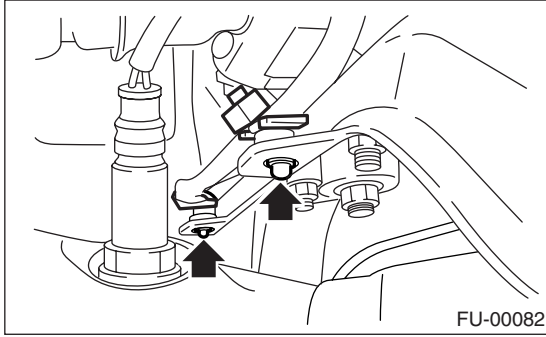
5) Connect the connector to rear oxygen sensor.



# Center Exhaust Pipe

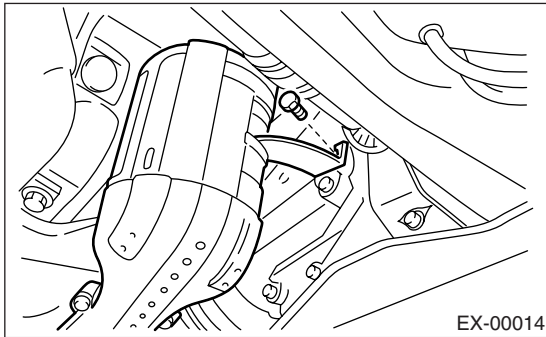
## EXHAUST

6) Secure the clip on crossmember.



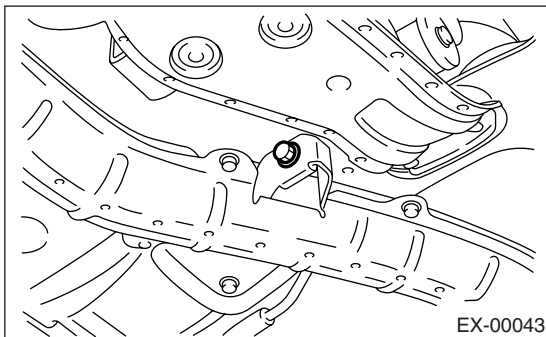
7) Tighten the bolt which holds the center exhaust pipe bracket to transmission.

**Tightening torque:**  
**30 N·m (3.1 kgf-m, 22.4 ft-lb)**



8) Tighten the bolt which holds the center exhaust pipe to hanger bracket.

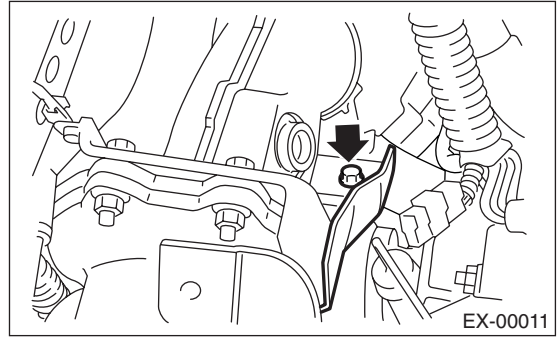
**Tightening torque:**  
**35 N·m (3.6 kgf-m, 26 ft-lb)**



9) Lower the vehicle.

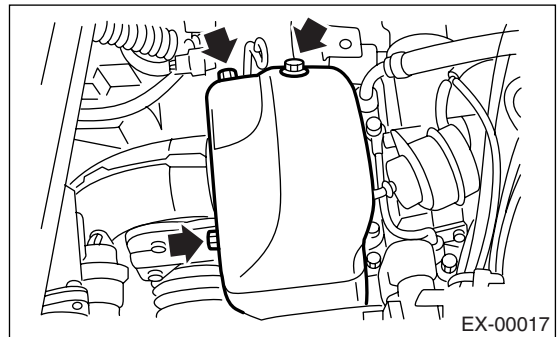
10) Place the turbocharger lower cover, and tighten the bolts which install the upper side of lower cover.

**Tightening torque:**  
**7.5 N·m (0.8 kgf-m, 5.5 ft-lb)**



11) Place the turbocharger upper cover, and tighten the bolts which install the upper side of upper cover.

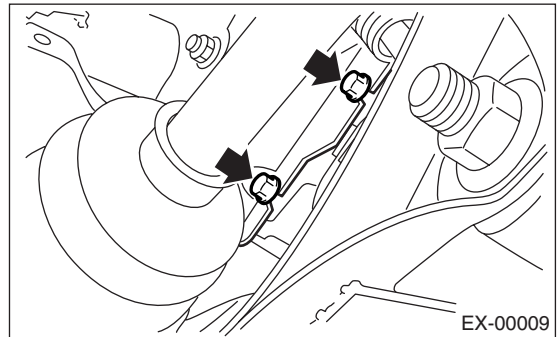
**Tightening torque:**  
**7.5 N·m (0.8 kgf-m, 5.5 ft-lb)**



12) Lift-up the vehicle.

13) Tighten the bolts which install the under side of turbocharger lower cover.

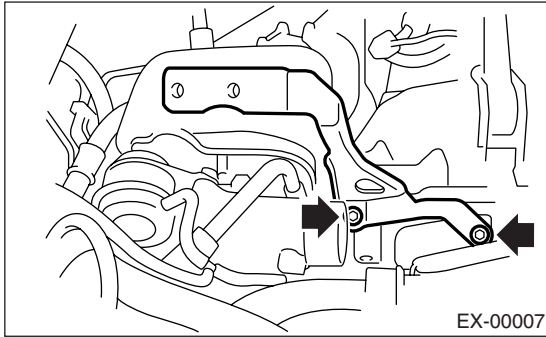
**Tightening torque:**  
**7.5 N·m (0.8 kgf-m, 5.5 ft-lb)**



14) Install the under cover.

15) Lower the vehicle.

16) Install the intercooler bracket.



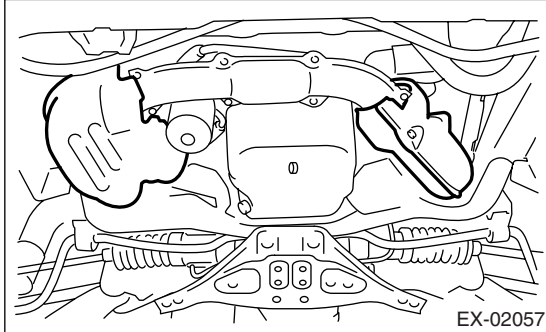
17) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>



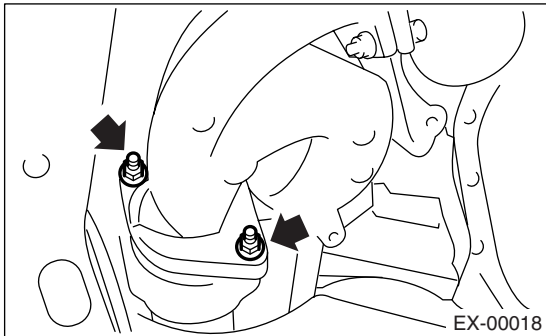
## 4. Joint Pipe

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, REMOVAL, Front Oxygen (A/F) Sensor.>
- 3) Remove the under cover.
- 4) Remove the exhaust manifold lower cover (RH).



- 5) Remove the nuts which hold the front exhaust manifold to joint pipe.



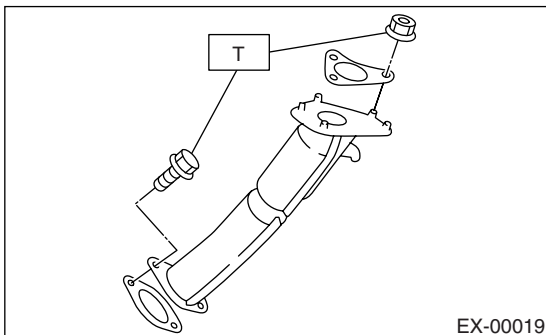
- 6) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>
- 7) Remove the turbocharger. <Ref. to IN(H4DOTC)-13, REMOVAL, Turbocharger.>
- 8) Take off the joint pipe in the upward direction.

### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

***T: 35 N·m (3.6 kgf-m, 26 ft-lb)***



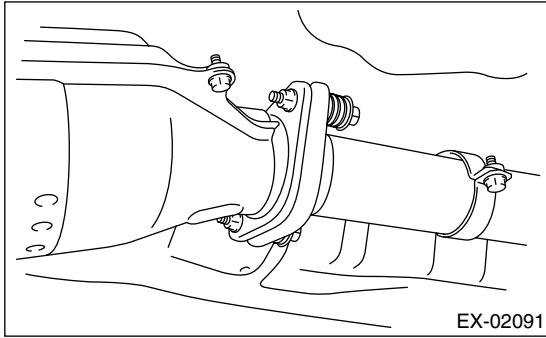
## 5. Rear Exhaust Pipe

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Separate the rear exhaust pipe from center exhaust pipe.

**CAUTION:**

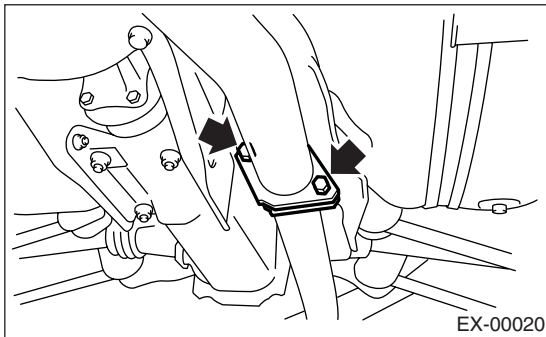
Be careful, the exhaust pipe is hot.



- 4) Separate the rear exhaust pipe from muffler.

**CAUTION:**

Be careful not to pull down the rear exhaust pipe.



- 5) Remove the rear exhaust pipe.

### B: INSTALLATION

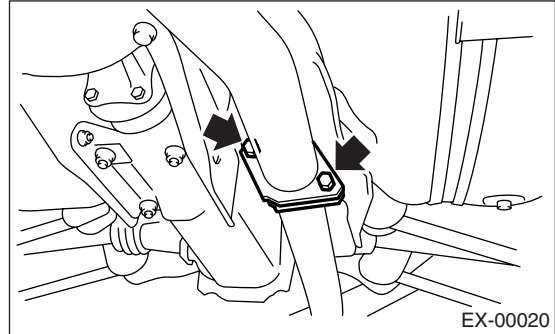
**NOTE:**

Replace the gaskets and self-locking nut with new ones.

- 1) Install the rear exhaust pipe to muffler.

**Tightening torque:**

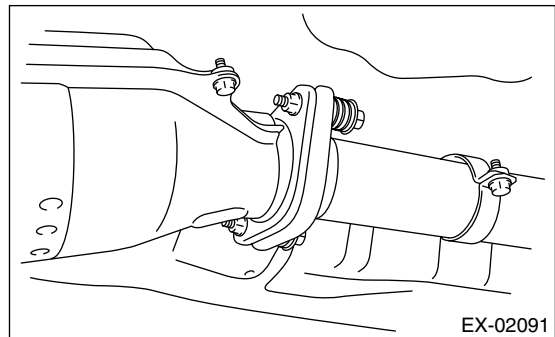
**48 N·m (4.9 kgf-m, 35.4 ft-lb)**



- 2) Install the rear exhaust pipe to center exhaust pipe.

**Tightening torque:**

**18 N·m (1.8 kgf-m, 13 ft-lb)**



- 3) Lower the vehicle.
- 4) Connect the battery ground cable to battery.

### C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.
- 3) Make sure the cushion rubber is not worn or cracked.

# Muffler

## EXHAUST

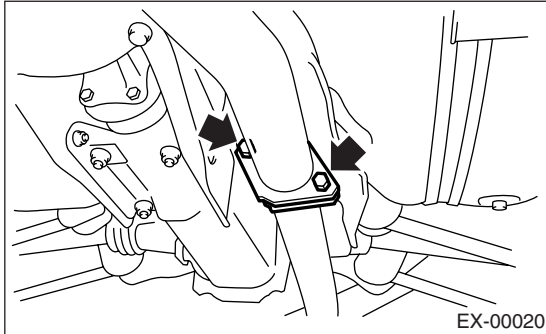
### 6. Muffler

#### A: REMOVAL

1) Separate the muffler from rear exhaust pipe.

#### CAUTION:

Be careful, the exhaust pipe is hot.



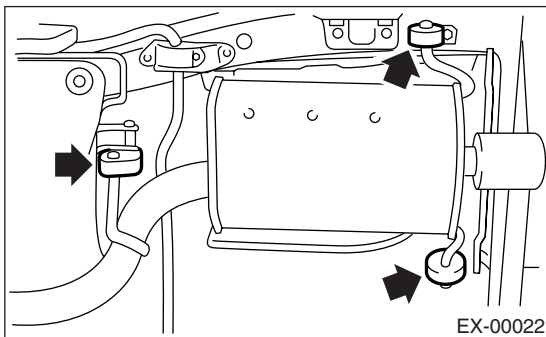
2) Remove the rubber cushions, and detach the muffler.

#### CAUTION:

Be careful not to drop the muffler during removal.

#### NOTE:

To facilitate removal, apply a coat of spray type lubricant to the mating area of rubber cushions in advance.



#### B: INSTALLATION

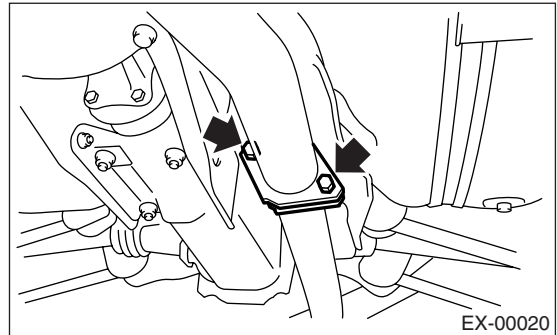
Install in the reverse order of removal.

#### NOTE:

Replace the gasket and self-locking nut with a new one.

#### Tightening torque:

48 N·m (4.9 kgf-m, 35.4 ft-lb)



#### C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.
- 3) Make sure the cushion rubber is not worn or cracked.

# COOLING

# *CO(H4DOTC)*

---

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# General Description

COOLING

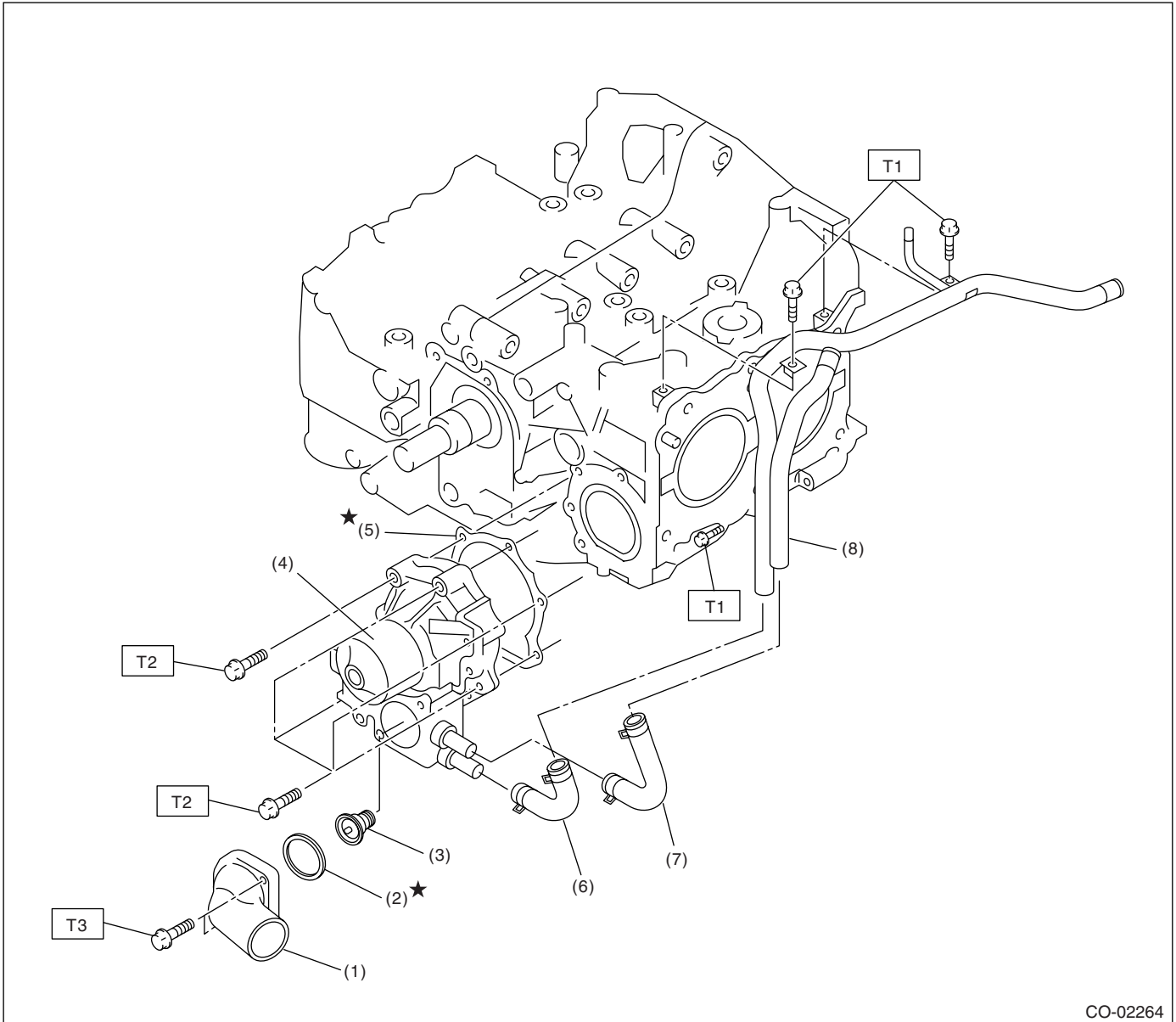
## 1. General Description

### A: SPECIFICATION

|                                     |   |  |  |
|-------------------------------------|---|--|--|
| Model                               |   | DOHC TURBO   |  |
| Cooling system                      |   | Electric fan + Forced engine coolant circulation system  |  |
| Total engine coolant capacity       |   | ℓ (US qt, Imp qt)  |  |
|                                     |   | AT: Approx. 7.6 (8.0, 6.7)<br>MT: Approx. 7.7 (8.1, 6.8) |  |
| Water pump                          | Type                                      |  | Centrifugal impeller type  |
|                                     | Discharge performance I                   | Discharge  | 20 ℓ (5.3 US gal, 4.4 Imp gal)/min.  |
|                                     |   | Pump speed — Discharge pressure                          | 760 rpm — 2.9 kPa (0.3 mAq)  |
|                                     |   | Engine coolant temperature                               | 80°C (176°F)   |
|                                     | Discharge performance II                  | Discharge  | 100 ℓ (26.4 US gal, 22.0 Imp gal)/min.   |
|                                     |   | Pump speed — Discharge pressure                          | 3,000 rpm — 49.0 kPa (5.0 mAq)   |
|                                     |   | Engine coolant temperature                               | 80°C (176°F)   |
|                                     | Discharge performance III                 | Discharge  | 200 ℓ (52.8 US gal, 44.0 Imp gal)/min.   |
|                                     |   | Pump speed — Discharge pressure                          | 6,000 rpm — 225.4 kPa (23.0 mAq)   |
|                                     |   | Engine coolant temperature                               | 80°C (176°F)   |
|                                     | Impeller diameter                         |  | 76 mm (2.99 in)  |
| Number of impeller vanes            |   | 8  |  |
| Pump pulley diameter                |   | 60 mm (2.36 in)  |  |
| Clearance between impeller and case | Standard                                  | 0.5 — 1.5 mm (0.020 — 0.059 in)                          |  |
| Thermostat                          | Type                                      |  | Wax pellet type  |
|                                     | Starts to open                            |  | 76 — 80°C (169 — 176°F)  |
|                                     | Fully opened                              |  | 91°C (196°F)   |
|                                     | Valve lift                                |  | 9.0 mm (0.354 in) or more/91°C (196°F)   |
|                                     | Valve bore                                |  | 35 mm (1.38 in)  |
| Radiator fan                        | Motor                                     | Main fan   | 120 W  |
|                                     |   | Sub fan  | 120 W  |
|                                     | Fan diameter/Blade                        |  | 320 mm (12.60 in) × 5 (main fan)<br>320 mm (12.60 in) × 7 (sub fan)  |
| Radiator                            | Type                                      |  | Down flow  |
|                                     | Core dimensions                           | Width × Height × Thickness                               | 691.5 × 340 × 27 mm (27.22 × 13.39 × 1.06 in)  |
|                                     | Pressure range in which cap valve is open | Coolant filler tank side                                 | Above: 108±15 kPa<br>(1.1±0.15 kgf/cm <sup>2</sup> , 16±2 psi)<br>Below: -1.0 to -4.9 kPa<br>(-0.01 to -0.05 kgf/cm <sup>2</sup> , -0.1 to -0.7 psi) |
|                                     |   | Radiator side  | Above only: 137±14.7 kPa<br>(1.40±0.15 kgf/cm <sup>2</sup> , 20±2.1 psi)   |
| Fins                                |   | Corrugated fin type                                      |  |
| Reservoir tank                      | Capacity                                  |  | 0.5 ℓ (0.5 US qt, 0.4 Imp qt)  |

## B: COMPONENT

### 1. WATER PUMP



CO-02264

- |                      |                                      |
|----------------------|--------------------------------------|
| (1) Thermostat cover | (5) Gasket                           |
| (2) Gasket           | (6) Heater by-pass hose              |
| (3) Thermostat       | (7) Coolant filler tank by-pass hose |
| (4) Water pump ASSY  | (8) Water by-pass pipe               |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 6.4 (0.65, 4.7)**

**T2: First 12 (1.2, 8.7)**

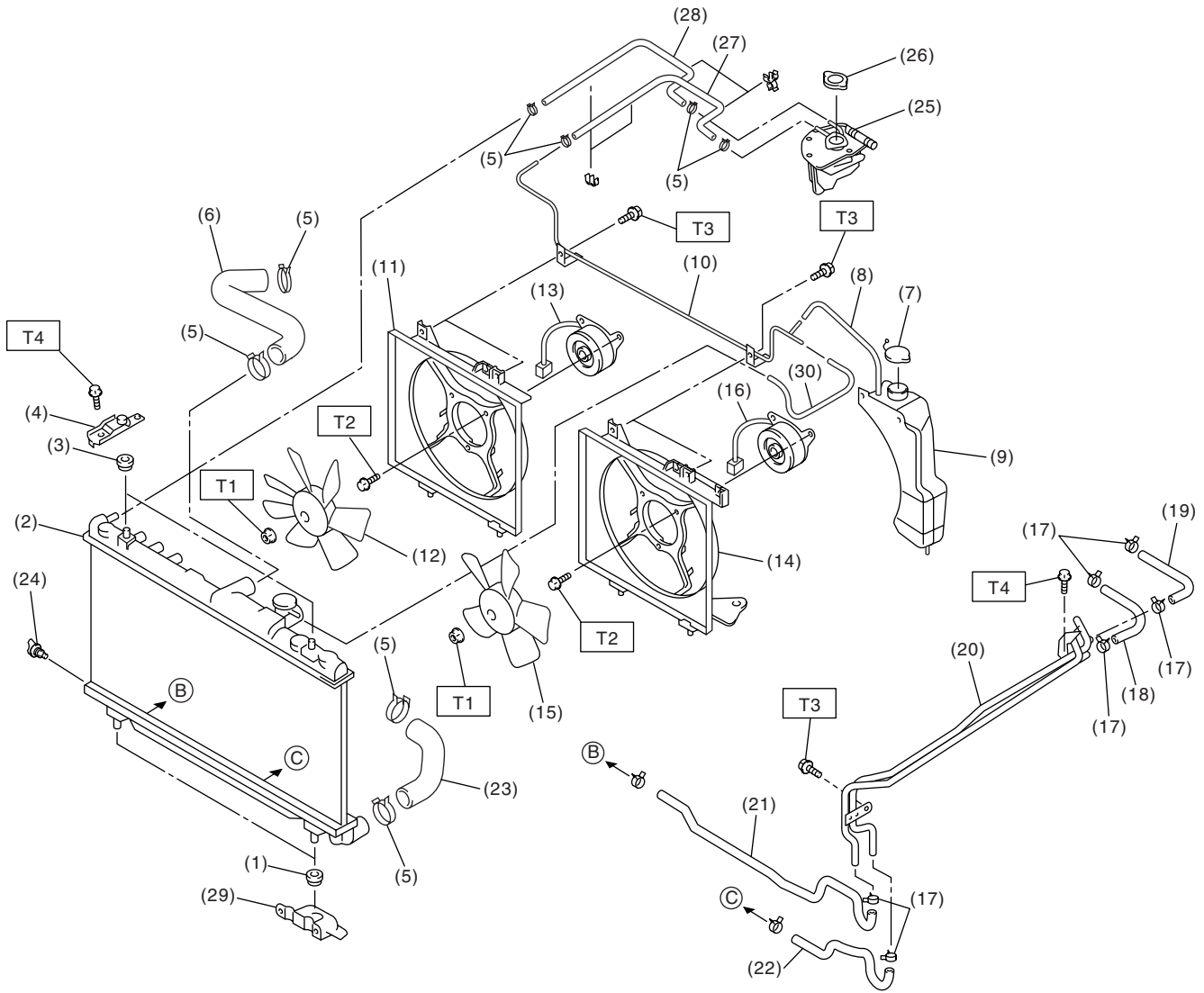
**Second 12 (1.2, 8.7)**

**T3: 12 (1.2, 8.7)**

# General Description

COOLING

## 2. RADIATOR AND RADIATOR FAN



CO-02245

CO(H4DOTC)-4

# General Description

COOLING

|                                       |                                   |  |
|---------------------------------------|-----------------------------------|--|
| (1) Radiator lower cushion            | (14) Radiator main fan shroud     | (26) Radiator cap (engine coolant filler tank cap) |
| (2) Radiator                          | (15) Radiator main fan            | (27) Engine overflow hose                          |
| (3) Radiator upper cushion            | (16) Radiator main fan motor      | (28) Engine air breather hose                      |
| (4) Radiator upper bracket            | (17) ATF hose clamp (AT model)    | (29) Radiator lower bracket                        |
| (5) Clamp                             | (18) ATF inlet hose A (AT model)  | (30) Overflow hose B                               |
| (6) Radiator inlet hose               | (19) ATF outlet hose A (AT model) |  |
| (7) Engine coolant reservoir tank cap | (20) ATF pipe (AT model)          |  |
| (8) Overflow hose A                   | (21) ATF inlet hose B (AT model)  |  |
| (9) Engine coolant reservoir tank     | (22) ATF outlet hose B (AT model) |  |
| (10) Overflow pipe                    | (23) Radiator outlet hose         |  |
| (11) Radiator sub fan shroud          | (24) Radiator drain plug          |  |
| (12) Radiator sub fan                 | (25) Engine coolant filler tank   |  |
| (13) Radiator sub fan motor           |                                   |  |

---

**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 3.4 (0.35, 2.5)**

**T2: 4.4 (0.45, 3.3)**

**T3: 7.5 (0.76, 5.5)**

**T4: 18 (1.8, 13.0)**

---

## C: CAUTION

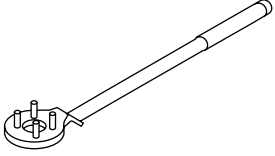
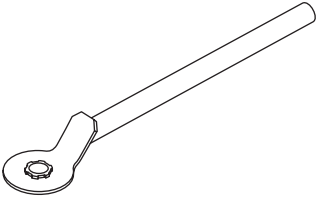
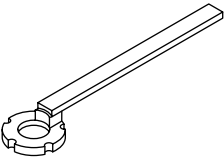
- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn yourself, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.



# General Description

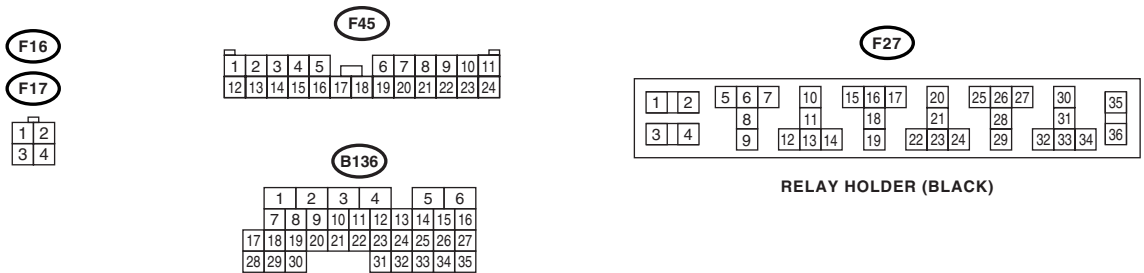
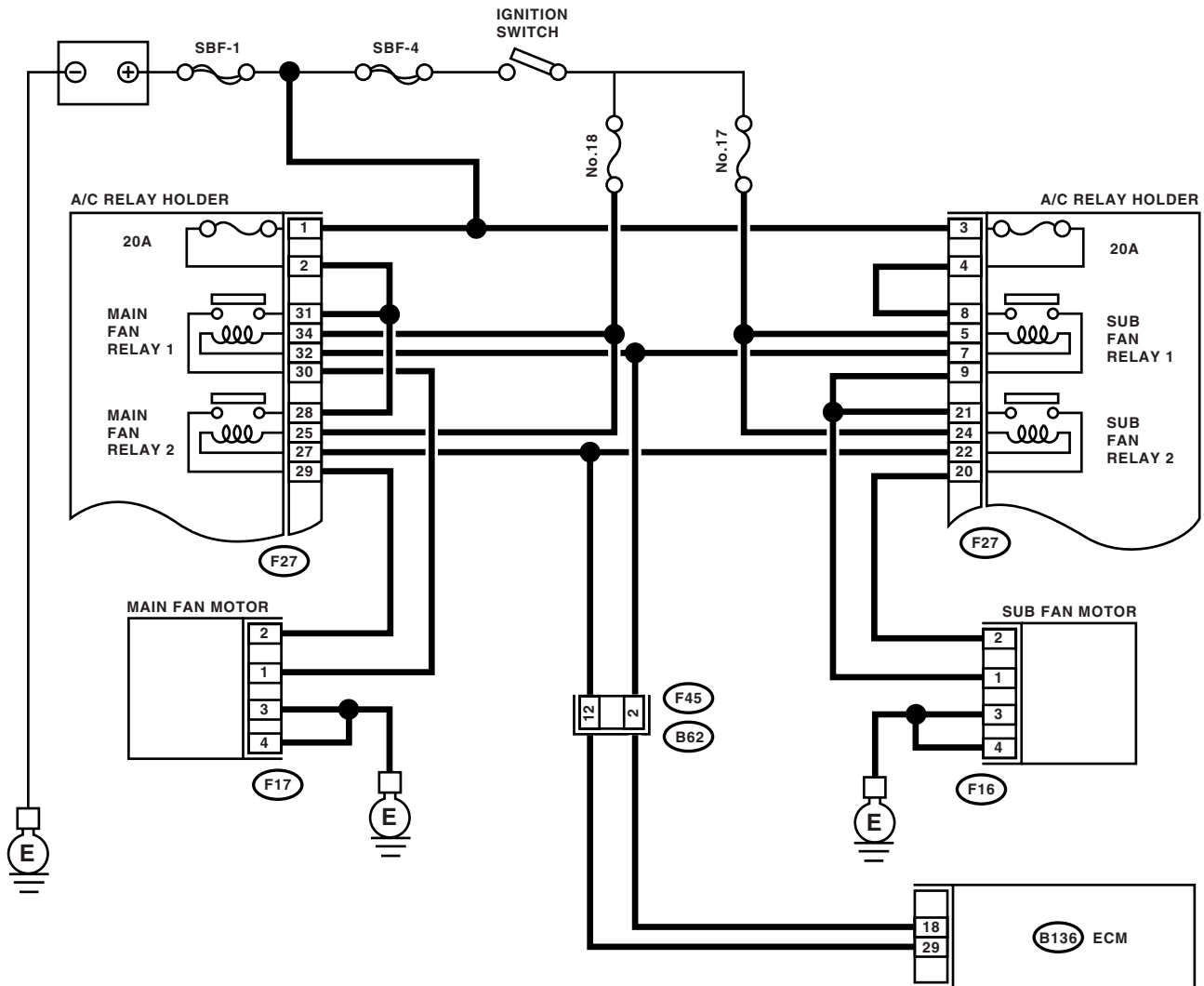
COOLING

## D: PREPARATION TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION         | REMARKS  |
|---|-------------|---------------------|--|
| <br>ST-499977100   | 499977100   | CRANK PULLEY WRENCH | Used for stopping crank pulley when loosening and tightening crank pulley bolts. |
| <br>ST-499977500   | 499977500   | CAM SPROCKET WRENCH | Used for removing and installing intake cam sprocket.                            |
| <br>ST-499207400 | 499207400   | CAM SPROCKET WRENCH | Used for removing and installing exhaust cam sprocket.                           |

## 2. Radiator Main Fan System

### A: WIRING DIAGRAM



RELAY HOLDER (BLACK)

# Radiator Main Fan System

COOLING

## B: INSPECTION

### DETECTING CONDITION:

- Engine coolant temperature is above 96°C (205°F).
- A/C compressor is rotated.
- Vehicle speed is below 19 km/h (12 MPH).

### TROUBLE SYMPTOM:

- Radiator main fan does not rotate under the above conditions.
- Radiator main fan does not rotate at high speed when the following conditions are both met:
  - (1) Engine coolant temperature is above 90°C (194°F).
  - (2) A/C is ON.

|   | Step   | Check   | Yes  | No  |
|---|--|---|--|---|
| 1 | <b>CHECK OPERATION OF RADIATOR.</b><br>1) Run the engine at idle. (Vehicle stationary)<br>2) Turn the A/C switch to OFF.<br>3) Warm the engine coolant temperature over 96°C (205°F).  | Does the main radiator fan rotate?  | Go to step 2.  | Go to step 3.   |
| 2 | <b>CHECK OPERATION OF RADIATOR.</b><br>Turn the A/C switch to ON at condition of step 1.   | Does the main radiator fan rotate faster when A/C compressor is operated? | Radiator main fan system is okay.                    | Go to step 17.  |
| 3 | <b>CHECK POWER SUPPLY TO MAIN FAN MOTOR.</b><br><b>CAUTION:</b><br><b>Be careful not to overheat the engine during repair.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from main fan motor.<br>3) Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F).<br>4) Stop the engine and turn ignition switch to ON.<br>5) Measure the voltage between main fan motor connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F17) No. 1 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?  | Go to step 4.  | Go to step 7.   |
| 4 | <b>CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between main fan motor connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F17) No. 3 — Chassis ground:</b><br><b>(F17) No. 4 — Chassis ground:</b>   | Is the resistance less than 5 Ω?  | Go to step 5.  | Repair the open circuit in harness between main fan motor connector and chassis ground. |
| 5 | <b>CHECK POOR CONTACT.</b><br>Check poor contact in main fan motor connector.  | Is there poor contact in main fan motor connector?                        | Repair the poor contact in main fan motor connector. | Go to step 6.   |
| 6 | <b>CHECK MAIN FAN MOTOR.</b><br>Connect the battery positive (+) terminal to terminal No. 1, and ground (-) terminal to terminal No. 3 or No. 4 of main fan motor connector.   | Does the main fan rotate?   | Repair the poor contact in main fan motor connector. | Replace the main fan motor with a new one.  |

# Radiator Main Fan System

COOLING

| Step  | Check                                      | Yes   | No   |
|---|--|---|--|
| <b>7 CHECK POWER SUPPLY TO MAIN FAN RELAY1.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the main fan relay1 from A/C relay holder.<br>3) Measure the voltage between main fan relay1 terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F27) No. 31 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?             | Go to step 8.   | Go to step 9.  |
| <b>8 CHECK POWER SUPPLY TO MAIN FAN RELAY1.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between main fan relay1 terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F27) No. 34 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?             | Go to step 12.  | Go to step 11.   |
| <b>9 CHECK 20 A FUSE.</b><br>1) Remove the 20 A fuse from A/C relay holder.<br>2) Check the condition of fuse.  | Is the fuse blown out?                     | Replace the fuse.   | Go to step 10.   |
| <b>10 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL.</b><br>Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F27) No. 1 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?             | Repair the open circuit in harness between 20 A fuse and main fan relay terminal. | Repair the open circuit in harness between main fuse box connector and 20 A fuse terminal.       |
| <b>11 CHECK FUSE.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the fuse No. 18 from joint box.<br>3) Check the condition of fuse.  | Is the fuse blown out?                     | Replace the fuse.   | Repair the open circuit in harness between main fan relay and ignition switch.                   |
| <b>12 CHECK MAIN FAN RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the main fan relay1.<br>3) Measure the resistance of main fan relay1.<br><b>Terminals</b><br><b>No. 30 — No. 31:</b>  | Is the resistance more than 1 M $\Omega$ ? | Go to step 13.  | Replace the main fan relay.  |
| <b>13 CHECK MAIN FAN RELAY.</b><br>1) Connect the battery to terminals No. 34 and No. 32 of main fan relay1.<br>2) Measure the resistance of main fan relay1.<br><b>Terminals</b><br><b>No. 30 — No. 31:</b>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 14.  | Replace the main fan relay.  |
| <b>14 CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR.</b><br>Measure the resistance of harness between main fan motor connector and main fan relay terminal.<br><b>Connector &amp; terminal</b><br><b>(F17) No. 1 — (F27) No. 30:</b>   | Is the resistance less than 1 $\Omega$ ?   | Go to step 15.  | Repair the open circuit in harness between main fan motor connector and main fan relay terminal. |

# Radiator Main Fan System

COOLING

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <b>15 CHECK HARNESS BETWEEN MAIN FAN RELAY AND ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between main fan relay connector and ECM connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F27) No. 32 — (B136) No. 18:</b></i>  | Is the resistance less than 1 Ω?                                   | Go to step 16.                                       | Repair the open circuit in harness between main fan relay and ECM.   |
| <b>16 CHECK POOR CONTACT.</b><br>Check poor contact in connector between main fan and ECM.  | Is there poor contact in connector between main fan motor and ECM? | Repair the poor contact connector.                   | Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-39, Read Diagnostic Trouble Code (DTC).> |
| <b>17 CHECK POWER SUPPLY TO MAIN FAN MOTOR.</b><br><b>CAUTION:</b><br><b>Be careful not to overheat the engine during repair.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from main fan motor.<br>3) Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F).<br>4) Turn the A/C switch ON.<br>5) Measure the voltage while A/C compressor is rotating.<br>6) Measure the voltage between main fan motor connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F17) No. 2 (+) — Chassis ground (-):</b></i> | Is the voltage more than 10 V?                                     | Go to step 18.                                       | Go to step 20.   |
| <b>18 CHECK POOR CONTACT.</b><br>Check poor contact in main fan motor connector.  | Is there poor contact in main fan motor connector?                 | Repair the poor contact in main fan motor connector. | Go to step 19.   |
| <b>19 CHECK MAIN FAN MOTOR.</b><br>Connect the battery positive (+) terminal to terminal No. 2, and ground (-) terminal to terminal No. 3 or No. 4 of main fan motor connector.   | Does the main fan rotate?  | Repair the poor contact in main fan motor connector. | Replace the main fan motor with a new one.   |
| <b>20 CHECK POWER SUPPLY TO MAIN FAN RELAY2.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the main fan relay2 from A/C relay holder.<br>3) Measure the voltage between main fan relay2 terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F27) No. 28 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10 V?                                     | Go to step 21.                                       | Go to step 22.   |
| <b>21 CHECK POWER SUPPLY TO MAIN FAN RELAY2.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between main fan relay2 terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F27) No. 25 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 10 V?                                     | Go to step 25.                                       | Go to step 24.   |

# Radiator Main Fan System

COOLING

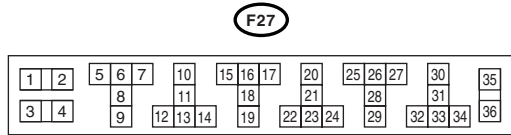
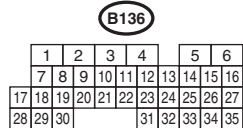
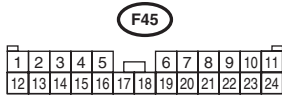
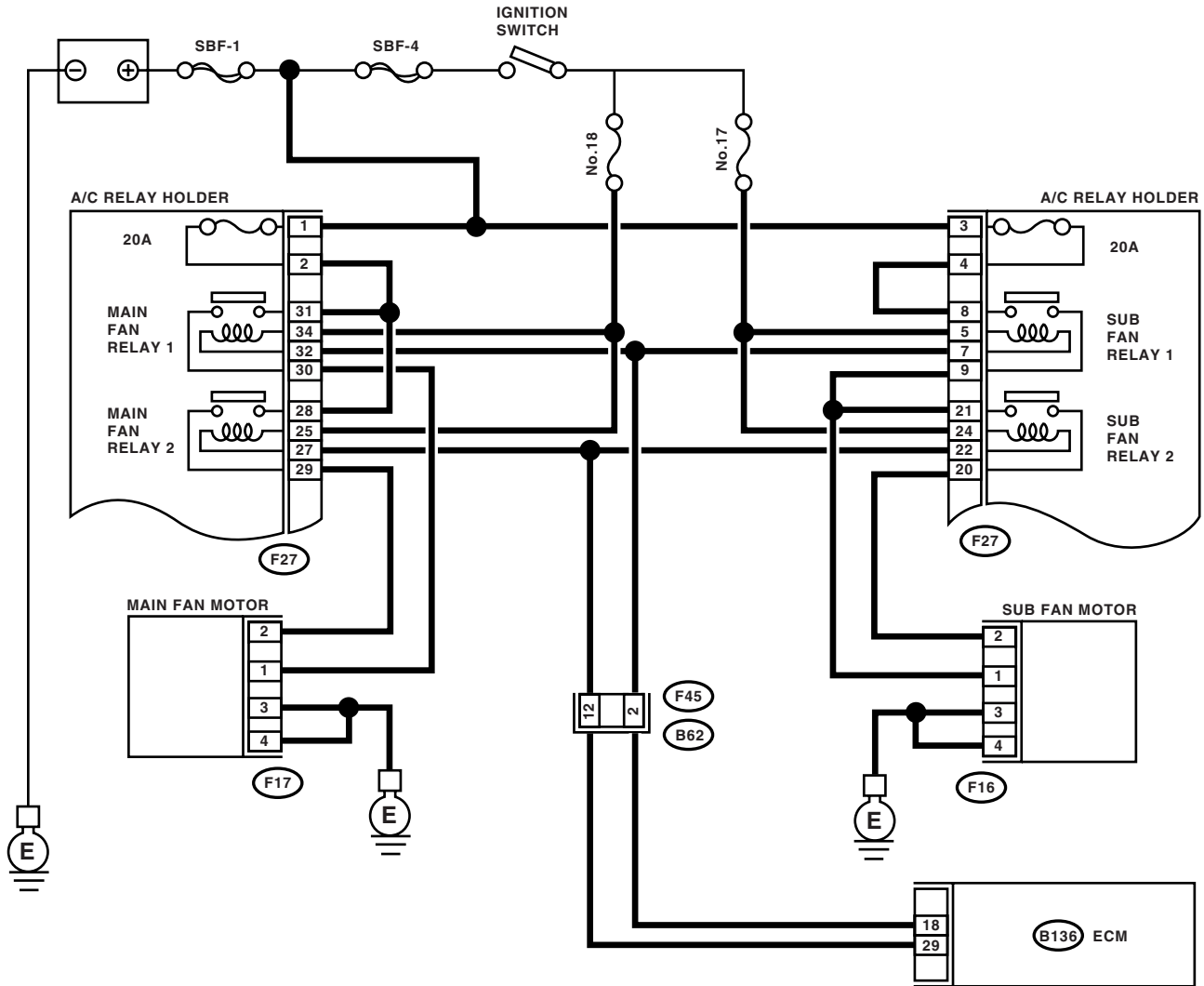
| Step   | Check  | Yes   | No   |
|--|--|---|--|
| <b>22 CHECK 20 A FUSE.</b><br>1) Remove the 20 A fuse from A/C relay holder.<br>2) Check the condition of fuse.  | Is the fuse blown out?   | Replace the fuse.   | Go to step <b>23</b> .   |
| <b>23 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL.</b><br>Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(F27) No. 1 (+) — Chassis ground (-):</i>  | Is the voltage more than 10 V?                                     | Repair the open circuit in harness between 20 A fuse and main fan relay terminal. | Repair the open circuit in harness between main fuse box connector and 20 A fuse terminal.                   |
| <b>24 CHECK FUSE.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the fuse No. 18 from joint box.<br>3) Check the condition of fuse.   | Is the fuse blown out?   | Replace the fuse.   | Repair the open circuit in harness between main fan relay and ignition switch.                               |
| <b>25 CHECK MAIN FAN RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the main fan relay.<br>3) Measure the resistance of main fan relay.<br><i>Terminals</i><br><i>No. 28 — No. 29:</i>   | Is the resistance more than 1 M $\Omega$ ?                         | Go to step <b>26</b> .  | Replace the main fan relay.  |
| <b>26 CHECK MAIN FAN RELAY.</b><br>1) Connect the battery to terminals No. 25 and No. 27 of main fan relay.<br>2) Measure the resistance of main fan relay.<br><i>Terminals</i><br><i>No. 28 — No. 29:</i>   | Is the resistance less than 1 $\Omega$ ?                           | Go to step <b>27</b> .  | Replace the main fan relay.  |
| <b>27 CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR.</b><br>Measure the resistance of harness between main fan motor connector and main fan relay terminal.<br><i>Connector &amp; terminal</i><br><i>(F17) No. 2 — (F27) No. 29:</i>  | Is the resistance less than 1 $\Omega$ ?                           | Go to step <b>28</b> .  | Repair the open circuit in harness between main fan motor connector and main fan relay terminal.             |
| <b>28 CHECK HARNESS BETWEEN MAIN FAN RELAY AND ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between main fan relay connector and ECM connector.<br><i>Connector &amp; terminal</i><br><i>(F27) No. 27 — (B136) No. 29:</i> | Is the resistance less than 1 $\Omega$ ?                           | Go to step <b>29</b> .  | Repair the open circuit in harness between main fan relay and ECM.   |
| <b>29 CHECK POOR CONTACT.</b><br>Check poor contact in connector between main fan and ECM.   | Is there poor contact in connector between main fan motor and ECM? | Repair the poor contact connector.  | Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-39, Read Diagnostic Trouble Code (DTC).> |

# Radiator Sub Fan System

COOLING

## 3. Radiator Sub Fan System

### A: WIRING DIAGRAM



RELAY HOLDER (BLACK)

CO-02237

## B: INSPECTION

### DETECTING CONDITION:

- Engine coolant temperature is above 96°C (205°F).
- A/C compressor is rotated.
- Vehicle speed is below 19 km/h (12 MPH).

### TROUBLE SYMPTOM:

- Radiator sub fan does not rotate under the above conditions.
- Radiator sub fan does not rotate at high speed when the following conditions are both met:
  - (1) Engine coolant temperature is above 90°C (194°F).
  - (2) A/C is ON.

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <b>1</b><br><b>CHECK OPERATION OF RADIATOR.</b><br>1) Run the engine at idle. (Vehicle stationary)<br>2) Turn the A/C switch to OFF.<br>3) Warm the engine coolant temperature over 96°C (205°F).   | Does the radiator sub fan rotate?  | Go to step 2.                                       | Go to step 3.  |
| <b>2</b><br><b>CHECK OPERATION OF RADIATOR.</b><br>Turn the A/C switch to ON at condition of step 1.  | Does the radiator sub fan rotate faster when A/C compressor is operated? | Radiator sub fan system is okay.                    | Go to step 17.   |
| <b>3</b><br><b>CHECK POWER SUPPLY TO SUB FAN MOTOR.</b><br><b>CAUTION:</b><br><b>Be careful not to overheat the engine during repair.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from sub fan motor.<br>3) Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F).<br>4) Stop the engine and turn ignition switch to ON.<br>5) Measure the voltage between sub fan motor connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F16) No. 1 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?   | Go to step 4.                                       | Go to step 7.  |
| <b>4</b><br><b>CHECK GROUND CIRCUIT OF SUB FAN MOTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between sub fan motor connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F16) No. 3 — Chassis ground:</b><br><b>(F16) No. 4 — Chassis ground:</b>  | Is the resistance less than 5 Ω?   | Go to step 5.                                       | Repair the open circuit in harness between sub fan motor connector and chassis ground. |
| <b>5</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in sub fan motor connector.  | Is there poor contact in sub fan motor connector?                        | Repair the poor contact in sub fan motor connector. | Go to step 6.  |
| <b>6</b><br><b>CHECK SUB FAN MOTOR.</b><br>Connect the battery positive (+) terminal to terminal No. 1, and ground (-) terminal to terminal No. 3 or No. 4 of sub fan motor connector.  | Does the sub fan rotate?   | Repair the poor contact in sub fan motor connector. | Replace the sub fan motor with a new one.  |



# Radiator Sub Fan System

COOLING

| Step  | Check                             | Yes  | No   |
|---|-----------------------------------|--|--|
| <b>7 CHECK POWER SUPPLY TO SUB FAN RELAY1.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the sub fan relay1 from A/C relay holder.<br>3) Measure the voltage between sub fan relay1 terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F27) No. 8 (+) — Chassis ground (-):</b></i> | Is the voltage more than 10 V?    | Go to step 8.  | Go to step 9.  |
| <b>8 CHECK POWER SUPPLY TO SUB FAN RELAY1.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between sub fan relay1 terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F27) No. 5 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 10 V?    | Go to step 12.   | Go to step 11.   |
| <b>9 CHECK 20 A FUSE.</b><br>1) Remove the 20 A fuse from A/C relay holder.<br>2) Check the condition of fuse.  | Is the fuse blown out?            | Replace the fuse.  | Go to step 10.   |
| <b>10 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL.</b><br>Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F27) No. 3 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 10 V?    | Repair the open circuit in harness between 20 A fuse and sub fan relay terminal. | Repair the open circuit in harness between sub fuse box connector and 20 A fuse terminal.      |
| <b>11 CHECK FUSE.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the fuse No. 17 from joint box.<br>3) Check the condition of fuse.  | Is the fuse blown out?            | Replace the fuse.  | Repair the open circuit in harness between sub fan relay and ignition switch.                  |
| <b>12 CHECK SUB FAN RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the sub fan relay1.<br>3) Measure the resistance of sub fan relay1.<br><i><b>Terminals</b></i><br><i><b>No. 8 — No. 9:</b></i>   | Is the resistance more than 1 MΩ? | Go to step 13.   | Replace the sub fan relay.   |
| <b>13 CHECK SUB FAN RELAY.</b><br>1) Connect the battery to terminals No. 5 and No. 7 of sub fan relay1.<br>2) Measure the resistance of sub fan relay.<br><i><b>Terminals</b></i><br><i><b>No. 8 — No. 9:</b></i>  | Is the resistance less than 1 Ω?  | Go to step 14.   | Replace the sub fan relay.   |
| <b>14 CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.</b><br>Measure the resistance of harness between sub fan motor connector and sub fan relay terminal.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F16) No. 1 — (F27) No. 9:</b></i>  | Is the resistance less than 1 Ω?  | Go to step 15.   | Repair the open circuit in harness between sub fan motor connector and sub fan relay terminal. |

# Radiator Sub Fan System

COOLING

| Step   | Check   | Yes   | No   |
|--|---|---|--|
| <b>15 CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between sub fan relay connector and ECM connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F27) No. 7 — (B136) No. 18:</b></i>  | Is the resistance less than 1 $\Omega$ ?                          | Go to step 16.                                      | Repair the open circuit in harness between sub fan relay and ECM.  |
| <b>16 CHECK POOR CONTACT.</b><br>Check poor contact in connector between sub fan and ECM.  | Is there poor contact in connector between sub fan motor and ECM? | Repair the poor contact connector.                  | Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-39, Read Diagnostic Trouble Code (DTC).> |
| <b>17 CHECK POWER SUPPLY TO SUB FAN MOTOR.</b><br><b>CAUTION:</b><br><b>Be careful not to overheat the engine during repair.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from sub fan motor.<br>3) Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F).<br>4) Turn the A/C switch ON.<br>5) Measure the voltage while A/C compressor is rotating.<br>6) Measure the voltage between sub fan motor connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F16) No. 2 (+) — Chassis ground (-):</b></i> | Is the voltage more than 10 V?                                    | Go to step 18.                                      | Go to step 20.   |
| <b>18 CHECK POOR CONTACT.</b><br>Check poor contact in sub fan motor connector.  | Is there poor contact in sub fan motor connector?                 | Repair the poor contact in sub fan motor connector. | Go to step 19.   |
| <b>19 CHECK SUB FAN MOTOR.</b><br>Connect the battery positive (+) terminal to terminal No. 2, and ground (-) terminal to terminal No. 3 or No. 4 of sub fan motor connector.  | Does the sub fan rotate?  | Repair the poor contact in sub fan motor connector. | Replace the sub fan motor with a new one.  |
| <b>20 CHECK POWER SUPPLY TO SUB FAN RELAY2.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the sub fan relay2 from A/C relay holder.<br>3) Measure the voltage between sub fan relay2 terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F27) No. 21 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10 V?                                    | Go to step 21.                                      | Go to step 22.   |
| <b>21 CHECK POWER SUPPLY TO SUB FAN RELAY2.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between sub fan relay2 terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(F27) No. 24 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10 V?                                    | Go to step 25.                                      | Go to step 24.   |

# Radiator Sub Fan System

COOLING

| Step   | Check   | Yes  | No   |
|--|---|--|--|
| <b>22 CHECK 20 A FUSE.</b><br>1) Remove the 20 A fuse from A/C relay holder.<br>2) Check the condition of fuse.  | Is the fuse blown out?  | Replace the fuse.  | Go to step <b>23</b> .   |
| <b>23 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL.</b><br>Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(F27) No. 3 (+) — Chassis ground (-):</i>  | Is the voltage more than 10 V?                                    | Repair the open circuit in harness between 20 A fuse and sub fan relay terminal. | Repair the open circuit in harness between sub fuse box connector and 20 A fuse terminal.                    |
| <b>24 CHECK FUSE.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the fuse No. 17 from joint box.<br>3) Check the condition of fuse.   | Is the fuse blown out?  | Replace the fuse.  | Repair the open circuit in harness between sub fan relay and ignition switch.                                |
| <b>25 CHECK SUB FAN RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the sub fan relay.<br>3) Measure the resistance of sub fan relay.<br><i>Terminals</i><br><i>No. 20 — No. 21:</i>  | Is the resistance more than 1 M $\Omega$ ?                        | Go to step <b>26</b> .   | Replace the sub fan relay.   |
| <b>26 CHECK SUB FAN RELAY.</b><br>1) Connect the battery to terminals No. 22 and No. 24 of sub fan relay.<br>2) Measure the resistance of sub fan relay.<br><i>Terminals</i><br><i>No. 20 — No. 21:</i>  | Is the resistance less than 1 $\Omega$ ?                          | Go to step <b>27</b> .   | Replace the sub fan relay.   |
| <b>27 CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.</b><br>Measure the resistance of harness between sub fan motor connector and sub fan relay terminal.<br><i>Connector &amp; terminal</i><br><i>(F16) No. 2 — (F27) No. 20:</i>  | Is the resistance less than 1 $\Omega$ ?                          | Go to step <b>28</b> .   | Repair the open circuit in harness between sub fan motor connector and sub fan relay terminal.               |
| <b>28 CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between sub fan relay connector and ECM connector.<br><i>Connector &amp; terminal</i><br><i>(F27) No. 22 — (B136) No. 29:</i> | Is the resistance less than 1 $\Omega$ ?                          | Go to step <b>29</b> .   | Repair the open circuit in harness between sub fan relay and ECM.  |
| <b>29 CHECK POOR CONTACT.</b><br>Check poor contact in connector between sub fan and ECM.  | Is there poor contact in connector between sub fan motor and ECM? | Repair the poor contact connector.   | Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-39, Read Diagnostic Trouble Code (DTC).> |

## 4. Engine Coolant

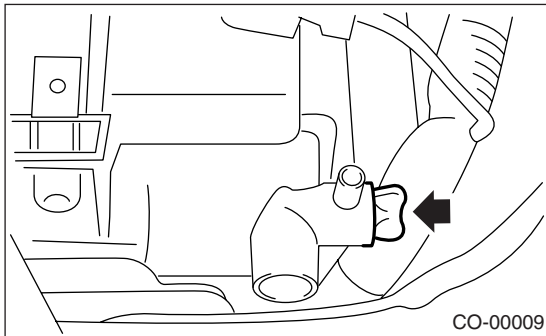
### A: REPLACEMENT

#### 1. DRAINING OF ENGINE COOLANT

- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Remove the drain cock to drain engine coolant into container.

**NOTE:**

- Remove the coolant filler tank cap so that engine coolant will drain faster.
- If engine coolant adheres to the exhaust pipe, wipe it off completely.



- 4) Install the drain cock.

#### 2. FILLING OF ENGINE COOLANT

- 1) Pour cooling system conditioner through the filter neck.

**Cooling system protective agent:**

**COOLING SYSTEM CONDITIONER (Part No. SOA635071)**

- 2) Fill engine coolant into the coolant filler tank up to filler neck position.

**Coolant capacity (fill up to "FULL" level):**

**AT model**

**Approx. 7.6 ℓ (8.0 US qt, 6.7 Imp qt)**

**MT model**

**Approx. 7.7 ℓ (8.1 US qt, 6.8 Imp qt)**

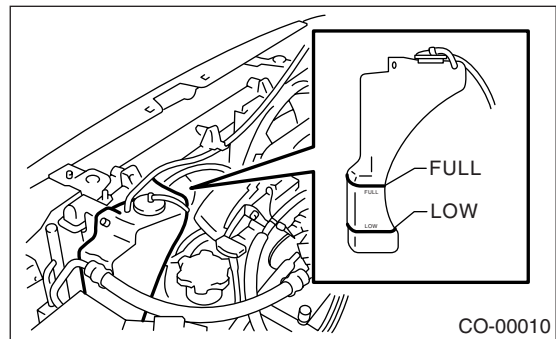
**CAUTION:**

**Do not mix up the coolant filler tank side cap with radiator side cap.**

**NOTE:**

- Do not remove the radiator side cap when filling engine coolant.
- The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crank-case. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

- 3) Fill engine coolant into the reservoir tank up to "FULL" level.



- 4) Close the coolant filler tank cap, start the engine and race 5 to 6 times at less than 3,000 rpm, then stop the engine. (Complete this operation within 40 seconds.)

- 5) Wait for one minute after the engine stops, open the coolant filler tank cap. If the engine coolant level drops, add engine coolant to the filler neck position of radiator.

- 6) Perform the procedures 4) and 5) again.

- 7) Attach the coolant filler tank cap and reservoir tank cap properly.

- 8) Start the engine and operate the heater at maximum hot position and the blower speed setting to "LO".

- 9) Run the engine at 2,000 rpm or less until radiator fan starts and stops.

**NOTE:**

- Be careful with the engine coolant temperature gauge to prevent overheating.
- If the radiator hose becomes to harden by the pressure of engine coolant, air bleeding operation seems to be almost completed.

- 10) Stop the engine and wait until engine coolant temperature lowers to 30°C (86°F) or less.

- 11) Open the coolant filler tank cap. If the engine coolant level drops, add engine coolant into the coolant filler tank up to the filler neck position and the reservoir tank to "FULL" level.

- 12) Attach the coolant filler tank cap and reservoir tank cap properly.

- 13) Operate the heater at maximum hot position and the blower speed setting to "LO" and start the engine. Race at less than 3,000 rpm. If the flowing sound is heard from heater core, repeat the procedures from step 9).

- 14) Install the collector cover.

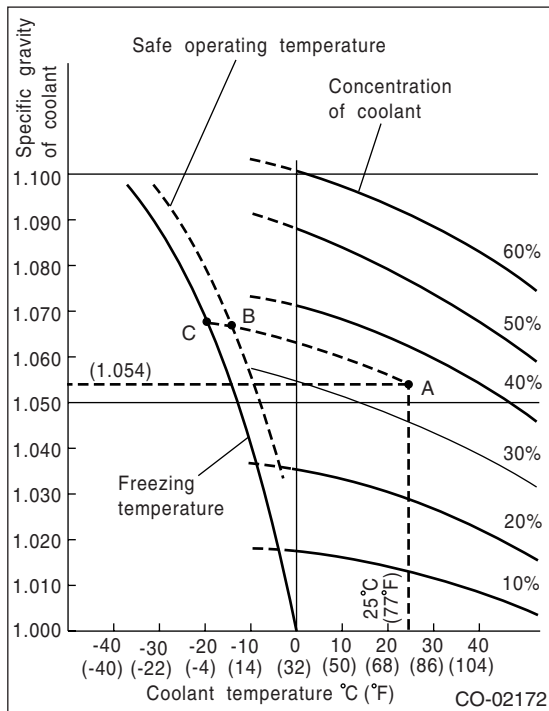
## B: INSPECTION

### 1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.

[Example]

If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054 and the concentration is 35% (point A), the safe operating temperature is -14°C (7°F) (point B), and the freezing temperature is -20°C (-4°F) (point C).



### 2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

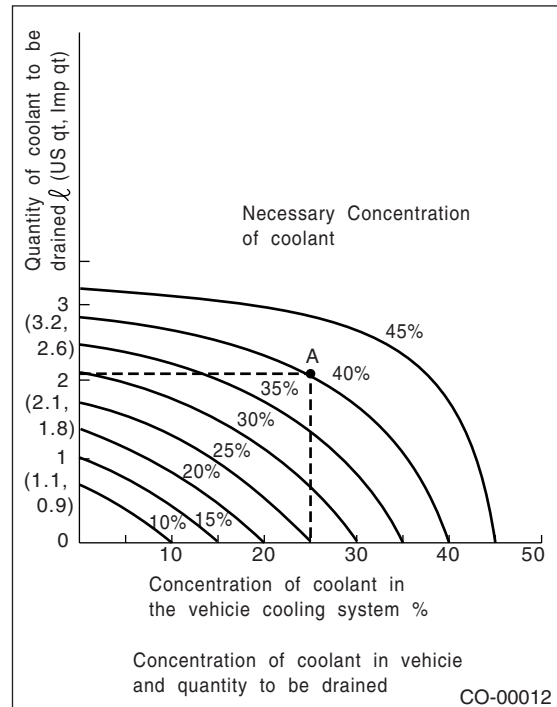
To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50%).

The amount of coolant that should be replaced can be determined using the diagram.

[Example]

Assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 ℓ (2.2 US qt, 1.8 Imp qt). Drain 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.

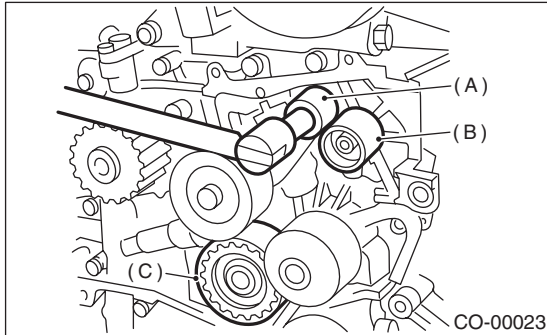
If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.



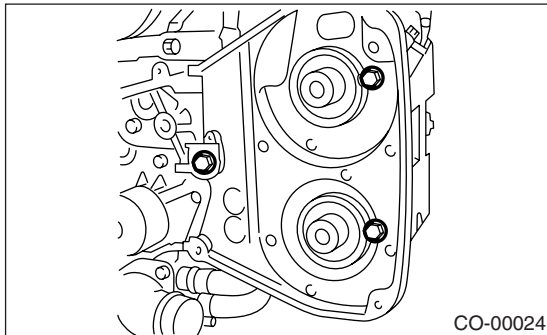
## 5. Water Pump

### A: REMOVAL

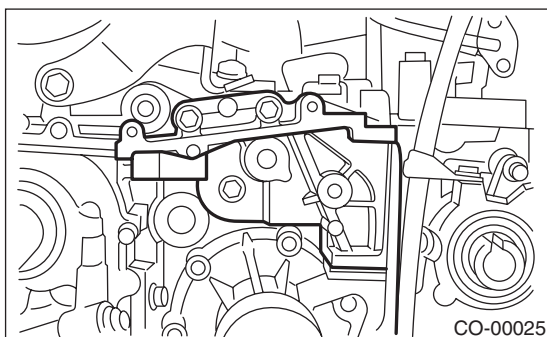
- 1) Remove the radiator. <Ref. to CO(H4DOTC)-23, REMOVAL, Radiator.>
- 2) Remove the V-belts. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
- 3) Remove the timing belt. <Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt.>
- 4) Remove the automatic belt tension adjuster (A).
- 5) Remove the belt idler (B).
- 6) Remove the belt idler No. 2 (C).



- 7) Remove the camshaft position sensor. <Ref. to FU(H4DOTC)-29, REMOVAL, Camshaft Position Sensor.>
- 8) Remove the cam sprockets (LH) by using ST. <Ref. to ME(H4DOTC)-53, REMOVAL, Cam Sprocket.>
- 9) Remove the belt cover No. 2 (LH).

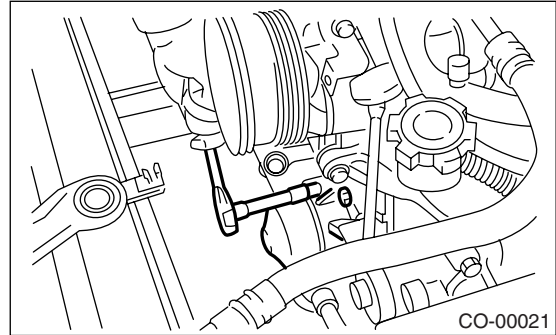


- 10) Remove the tensioner bracket.



- 11) Disconnect the hose from water pump.

- 12) Remove the water pump.



### B: INSTALLATION

- 1) Install the water pump onto cylinder block (LH).

#### NOTE:

- Replace the gasket with a new one.
- When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.

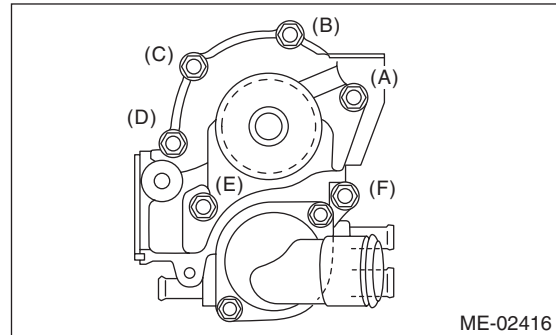
#### Tightening torque:

##### First:

**12 N·m (1.2 kgf-m, 8.7 ft-lb)**

##### Second:

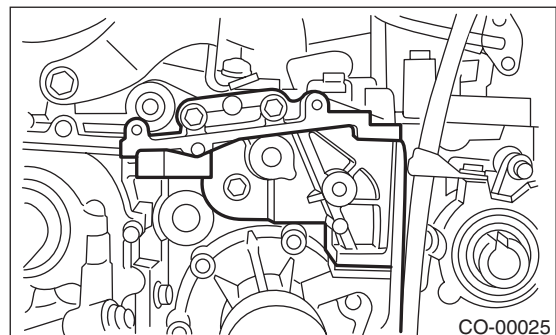
**12 N·m (1.2 kgf-m, 8.7 ft-lb)**



- 2) Connect the hose to water pump.
- 3) Install the tensioner bracket.

#### Tightening torque:

**24.5 N·m (2.5 kgf-m, 18.1 ft-lb)**



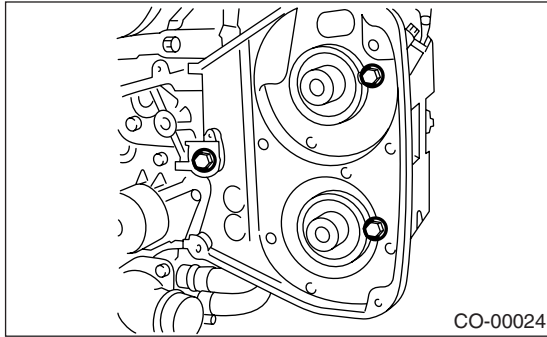
# Water Pump

## COOLING

4) Install the belt cover No. 2 (LH).

**Tightening torque:**

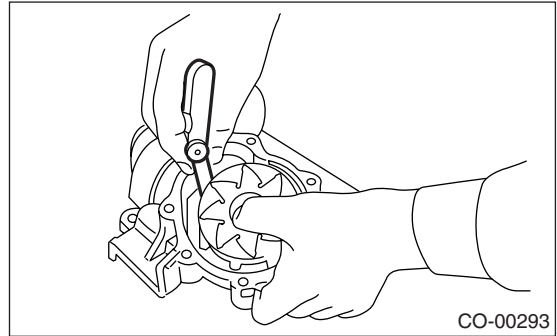
**5 N·m (0.5 kgf·m, 3.6 ft·lb)**



**Clearance between impeller and pump case:**

**Standard**

**0.5 — 1.5 mm (0.020 — 0.059 in)**



5) Install the cam sprockets (LH) by using ST. <Ref. to ME(H4DOTC)-53, INSTALLATION, Cam Sprocket.>

6) Install the camshaft position sensor. <Ref. to FU(H4DOTC)-29, INSTALLATION, Camshaft Position Sensor.>

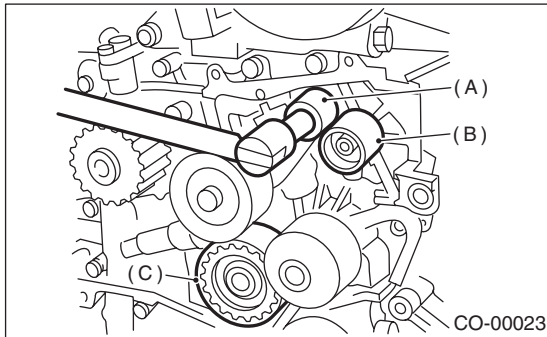
7) Install the belt idler No. 2 (C).

8) Install the belt idler (B).

9) Install the automatic belt tension adjuster (A) which has tension rod held by pin. <Ref. to ME(H4DOTC)-46, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>

**Tightening torque:**

**39 N·m (4.0 kgf·m, 28.9 ft·lb)**



10) Install the timing belt. <Ref. to ME(H4DOTC)-47, TIMING BELT, INSTALLATION, Timing Belt.>

11) Install the V-belts. <Ref. to ME(H4DOTC)-41, INSTALLATION, V-belt.>

12) Install the radiator. <Ref. to CO(H4DOTC)-24, INSTALLATION, Radiator.>

## C: INSPECTION

1) Check the water pump bearing for smooth rotation.

2) Check the water pump pulley for abnormalities.

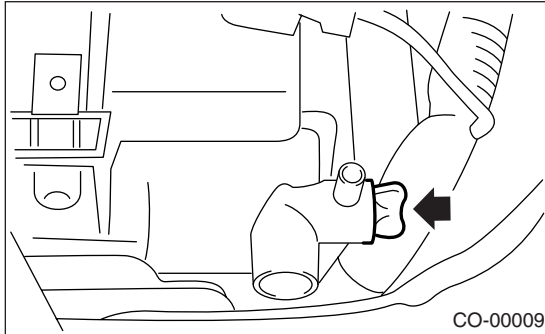
3) Make sure the impeller is not deformed or damaged.

4) Check the clearance between impeller and pump case.

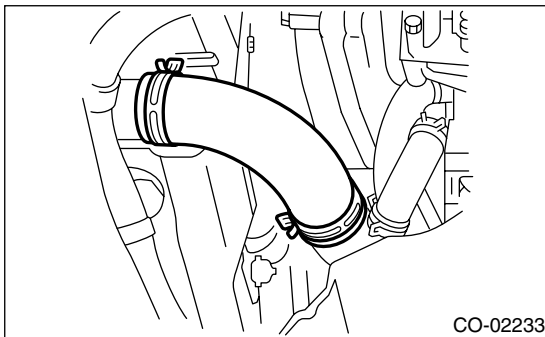
## 6. Thermostat

### A: REMOVAL

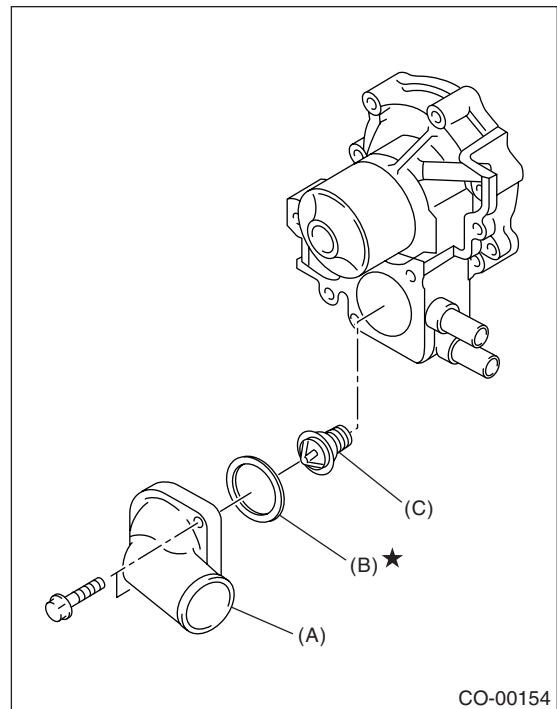
- 1) Set the vehicle on a lift.
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Drain the engine coolant completely. <Ref. to CO(H4DOTC)-17, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>



- 5) Disconnect the radiator outlet hose.



- 6) Remove the thermostat cover, and then remove the gasket and thermostat.



- (A) Thermostat cover
- (B) Gasket
- (C) Thermostat

### B: INSTALLATION

- 1) Install the gasket to thermostat, and install the thermostat and gasket to water pump as a unit.

#### NOTE:

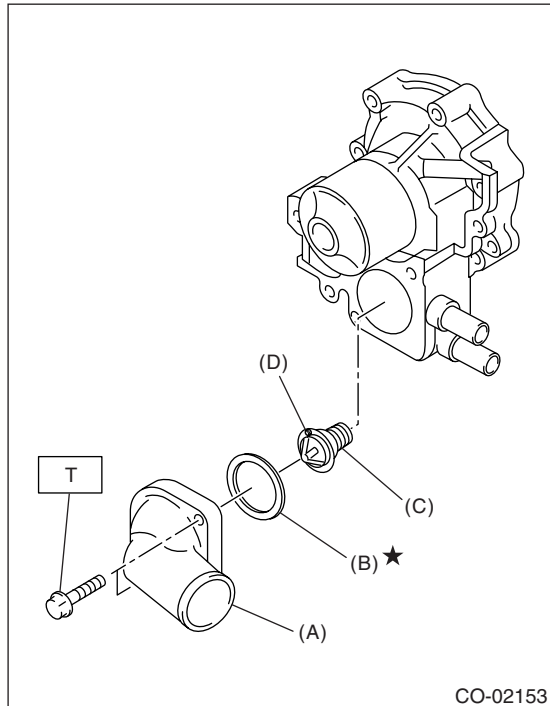
- When reinstalling the thermostat, use a new gasket.
- The thermostat must be installed with the jiggle pin (D) facing upward.



# Thermostat

## COOLING

**Tightening torque:**  
**12 N·m (1.2 kgf·m, 8.7 ft·lb)**

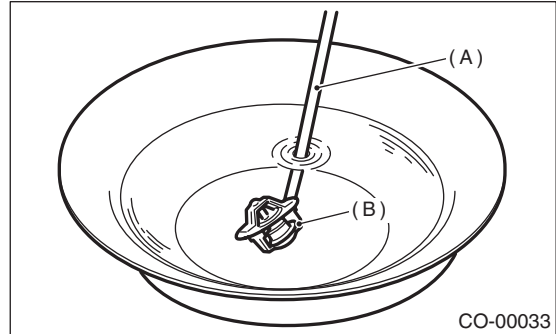


- (A) Thermostat cover
- (B) Gasket
- (C) Thermostat
- (D) Jiggle pin

**Starts to open:**  
**76 — 80°C (169 — 176°F)**

**Fully opens:**  
**91°C (196°F)**

**Valve lift:**  
**9.0 mm (0.35 in) or more**



- (A) Thermometer
- (B) Thermostat

2) Fill engine coolant. <Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

## C: INSPECTION

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.

Immerse the thermostat and thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measurement should be to the specification.

### NOTE:

- Leave the thermostat in a boiled water for more than five minutes before measuring the valve lift.
- Hold the thermostat with a wire or the like to avoid contacting with the bottom of container.

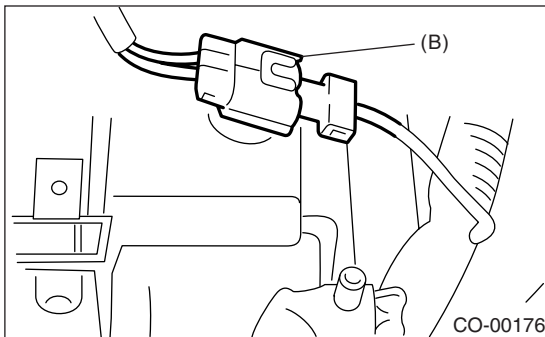
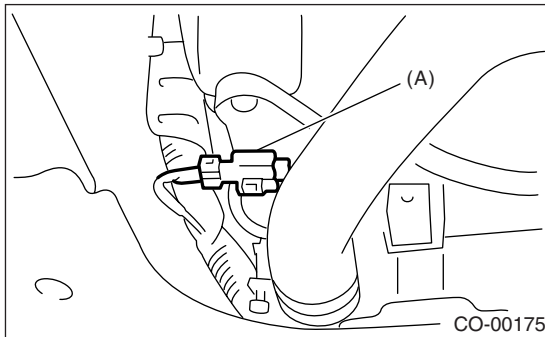
## 7. Radiator

### A: REMOVAL

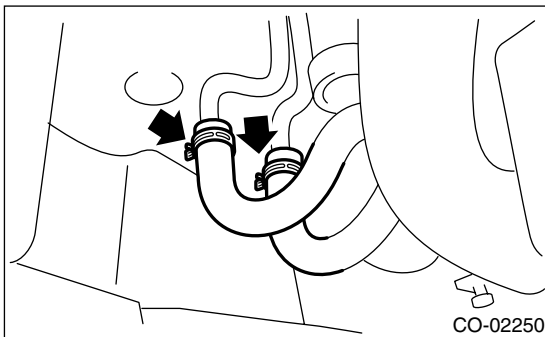
**WARNING:**

The radiator is pressurized. Wait until the engine cools down before working on the radiator.

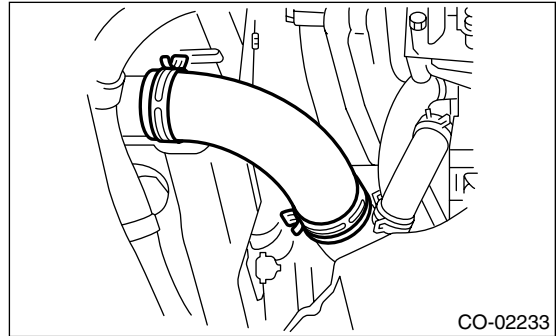
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Lift-up the vehicle.
- 4) Remove the under cover.
- 5) Drain the engine coolant completely. <Ref. to CO(H4DOTC)-17, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 6) Disconnect the connectors of radiator main fan motor (A) and sub fan motor (B).



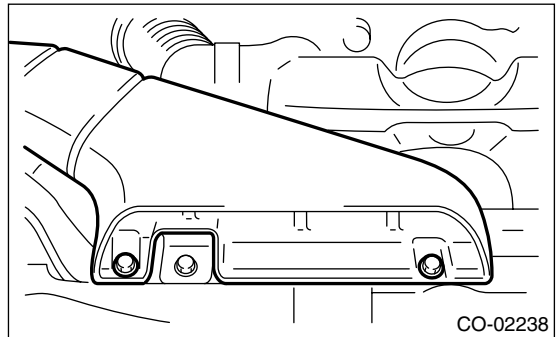
- 7) Disconnect the ATF cooler hose from ATF pipe. (AT model) Plug the openings in the hose and radiator with caps in order to prevent ATF from leaking.



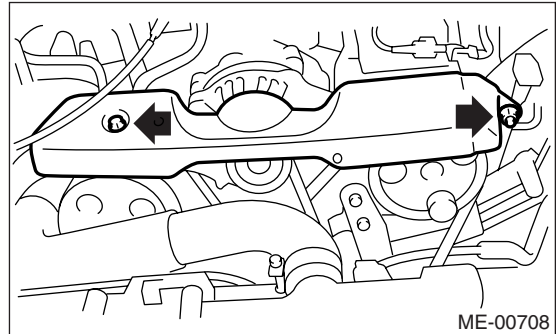
- 8) Disconnect the radiator outlet hose from thermostat cover.



- 9) Lower the vehicle.
- 10) Remove the air intake duct.



- 11) Remove the V-belt covers.

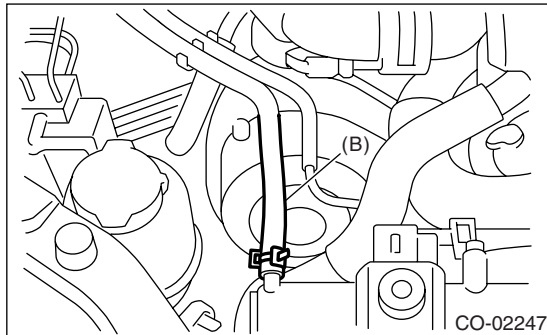
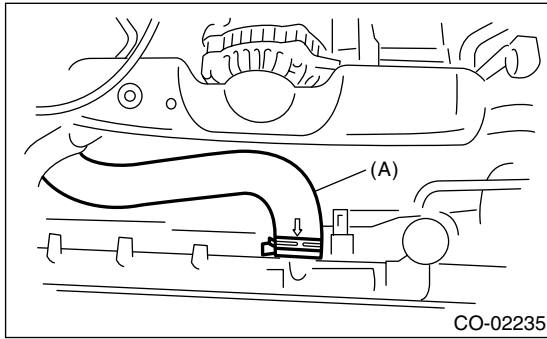


- 12) Disconnect the overflow hose.
- 13) Remove the reservoir tank. <Ref. to CO(H4DOTC)-32, REMOVAL, Reservoir Tank.>

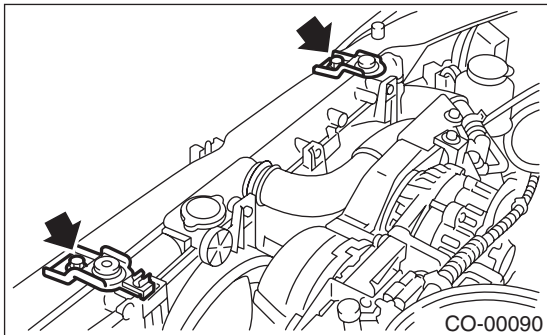
# Radiator

## COOLING

- 14) Disconnect the radiator inlet hose (A) and water tank hose (B) from radiator.



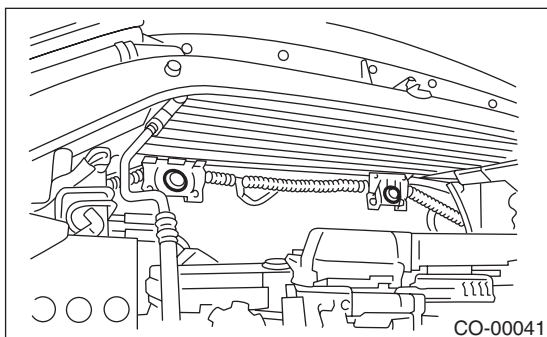
- 15) Remove the radiator upper brackets.



- 16) While lifting the radiator up, slide it to the left.  
17) Lift-up the radiator, and then remove it from vehicle.

## B: INSTALLATION

- 1) Attach the radiator mounting cushions to the holes on vehicle.



- 2) Install the radiator to vehicle.

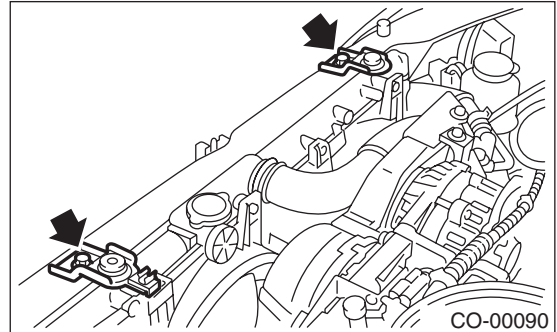
### NOTE:

Fit the pins on lower side of radiator into the cushions on body side.

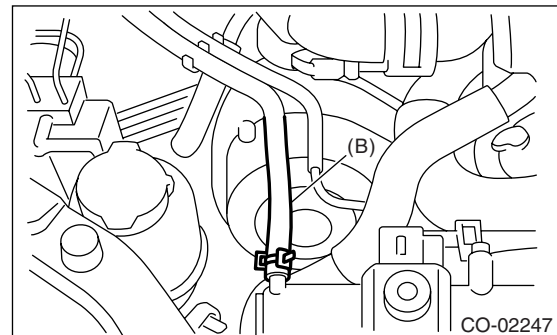
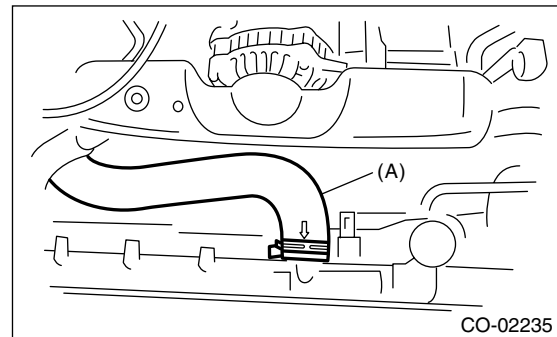
- 3) Install the radiator brackets, and then tighten the bolts.

### Tightening torque:

**18 N·m (1.8 kgf-m, 13.0 ft-lb)**



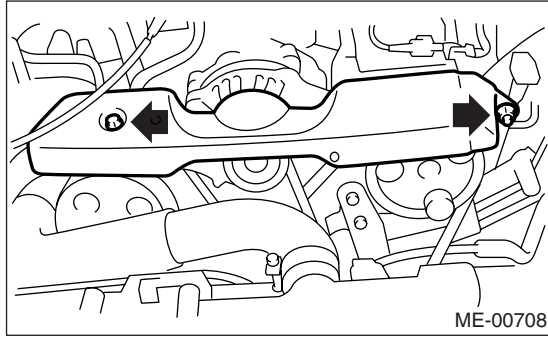
- 4) Connect the radiator inlet hose (A) and water tank hose (B).



- 5) Install the reservoir tank. <Ref. to CO(H4DOTC)-32, INSTALLATION, Reservoir Tank.>

- 6) Connect the overflow hose.

7) Install the V-belt cover.

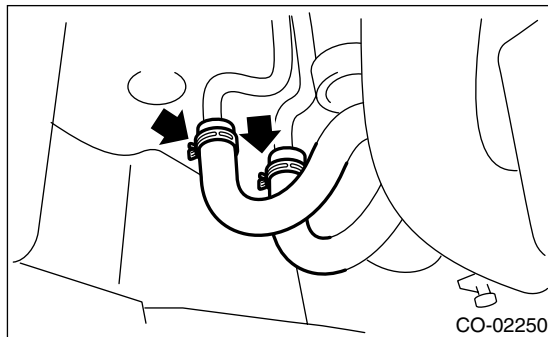


8) Install the air intake duct.

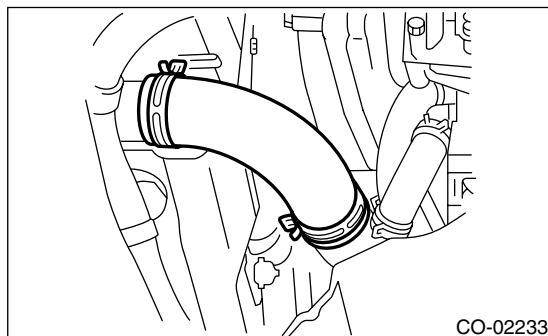
<Ref. to IN(H4DOTC)-9, INSTALLATION, Air Intake Duct.>

9) Lift-up the vehicle.

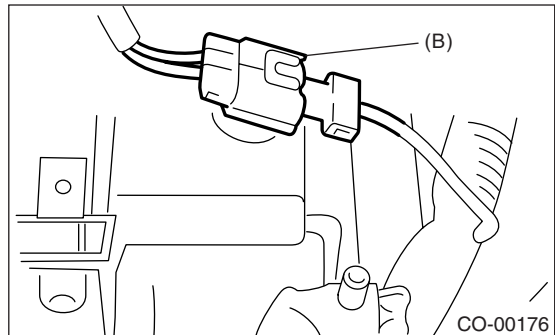
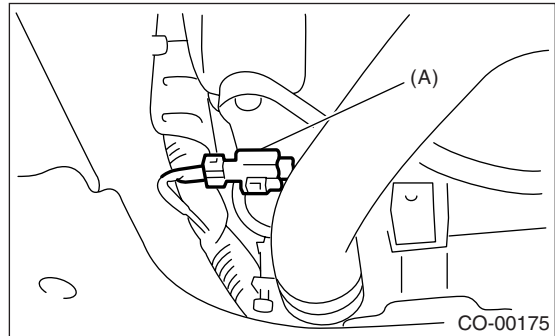
10) Connect the ATF cooler hoses. (AT model).



11) Connect the radiator outlet hose.



12) Connect the connectors to radiator main fan motor (A) and sub fan motor (B).



13) Install the under cover.

14) Lower the vehicle.

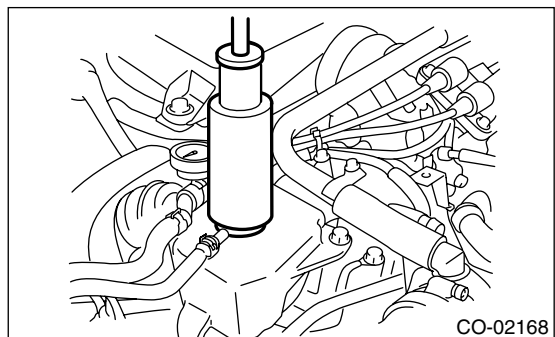
15) Connect the battery ground cable to battery.

16) Fill engine coolant. <Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

17) Check the ATF level. <Ref. to 4AT-30, INSPECTION, Automatic Transmission Fluid.>

## C: INSPECTION

1) Remove the coolant filler tank cap, top off coolant filler tank, and then attach the tester to coolant filler tank in place of cap.



2) Apply a pressure of 122 kPa (1.2 kgf/cm<sup>2</sup>, 18 psi) to the coolant filler tank to check if:

- (1) Engine coolant leaks at/around radiator.
- (2) Engine coolant leaks at/around hoses or connections.

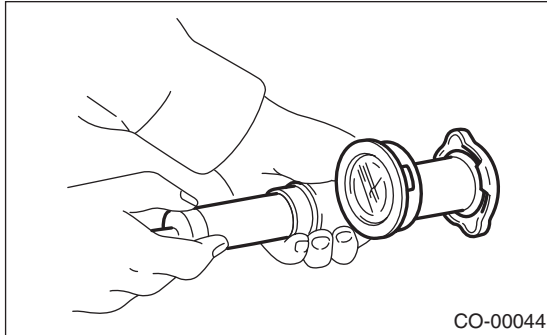
**CAUTION:**

- Inspection must be carried out at the side of coolant filler tank, not at the side of radiator.
- Engine should be turned off.
- Wipe engine coolant from check points in advance.
- If engine coolant adheres to the exhaust pipe, wipe it off completely.
- Be careful to prevent engine coolant from spurting out when removing the tester.
- Be careful also not to deform the filler neck of coolant filler tank when installing or removing tester.

## 8. Radiator Cap

### A: INSPECTION

1) Attach the radiator cap to tester.



2) Increase the pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for 5 to 6 seconds.

#### **Coolant filler tank side**

##### **Standard pressure:**

**93 — 123 kPa (0.95 — 1.25 kgf/cm<sup>2</sup>, 14 — 18 psi)**

##### **Service limit pressure:**

**83 kPa (0.85 kgf/cm<sup>2</sup>, 12 psi)**

#### **Radiator side**

##### **Standard pressure:**

**122 — 152 kPa (1.24 — 1.55 kgf/cm<sup>2</sup>, 18 — 22 psi)**

##### **Service limit pressure:**

**112 kPa (1.14 kgf/cm<sup>2</sup>, 16 psi)**

#### **CAUTION:**

- Be sure to remove foreign matter and rust from the cap in advance. Otherwise, results of pressure test will be incorrect.
- Do not mix up the coolant filler tank side cap with radiator side cap.

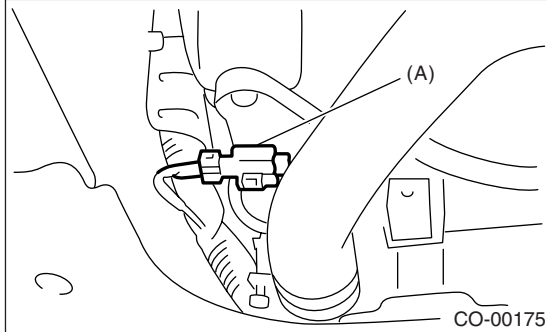
# Radiator Main Fan and Fan Motor

COOLING

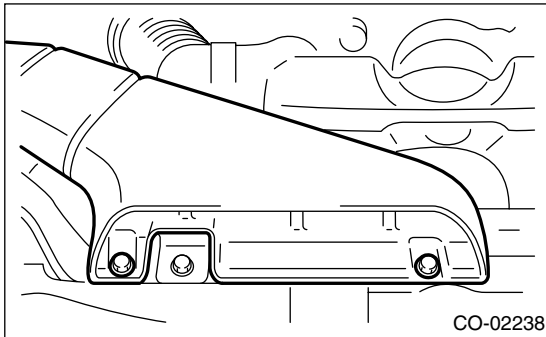
## 9. Radiator Main Fan and Fan Motor

### A: REMOVAL

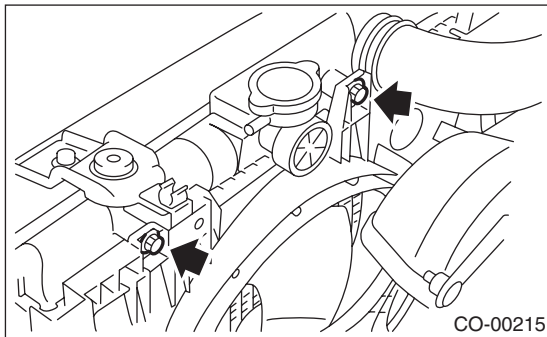
- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Disconnect the connector of main fan motor (A).



- 5) Lower the vehicle.
- 6) Remove the air intake duct.



- 7) Disconnect the overflow hose.
- 8) Remove the overflow pipe.
- 9) Remove the reservoir tank. <Ref. to CO(H4DOTC)-32, REMOVAL, Reservoir Tank.>
- 10) Remove the radiator main fan motor assembly.



### B: INSTALLATION

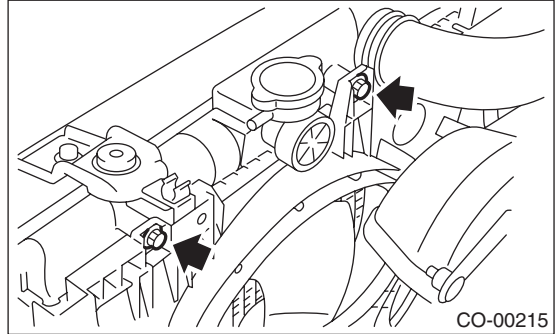
Install in the reverse order of removal.

#### NOTE:

When the main fan motor assembly cannot be installed as is, loosen the sub fan motor assembly securing bolts to install it.

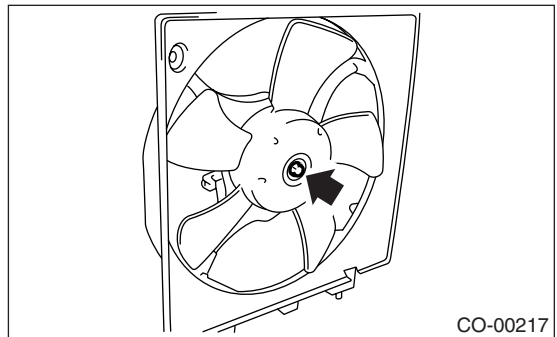
#### Tightening torque:

**4.9 N·m (0.50 kgf-m, 3.6 ft-lb)**

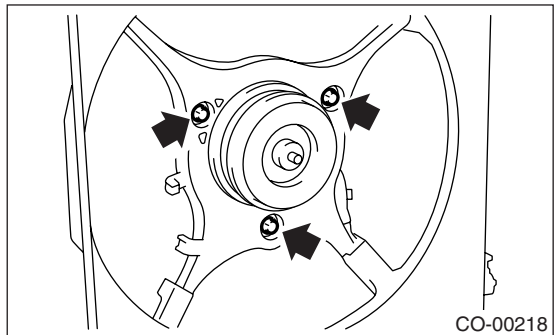


### C: DISASSEMBLY

- 1) Remove the nut which holds the fan onto fan motor and shroud assembly.



- 2) Remove the bolts which install the fan motor onto shroud.

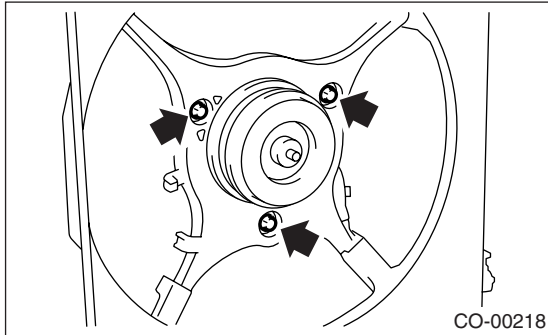


## D: ASSEMBLY

Assemble in the reverse order of disassembly.

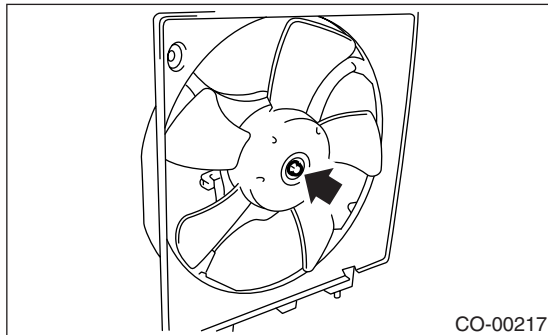
### *Tightening torque:*

**4.4 N·m (0.45 kgf-m, 3.3 ft-lb)**



### *Tightening torque:*

**3.4 N·m (0.35 kgf-m, 2.5 ft-lb)**





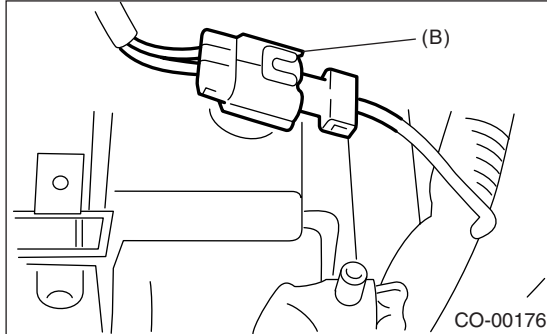
# Radiator Sub Fan and Fan Motor

COOLING

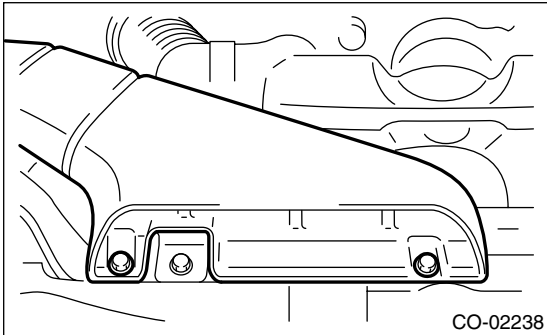
## 10. Radiator Sub Fan and Fan Motor

### A: REMOVAL

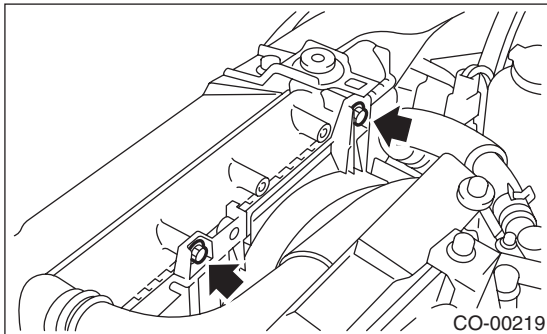
- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Disconnect the connector of sub fan motor (B).



- 5) Lower the vehicle.
- 6) Remove the air intake duct.



- 7) Remove the bolts which hold the sub fan shroud to radiator.
- 8) Remove the overflow pipe.
- 9) Remove the radiator sub fan shroud through the under side of vehicle.

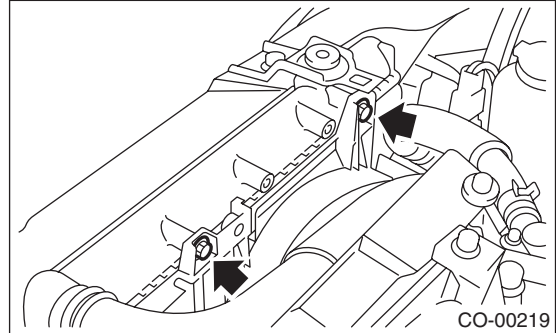


### B: INSTALLATION

Install in the reverse order of removal.

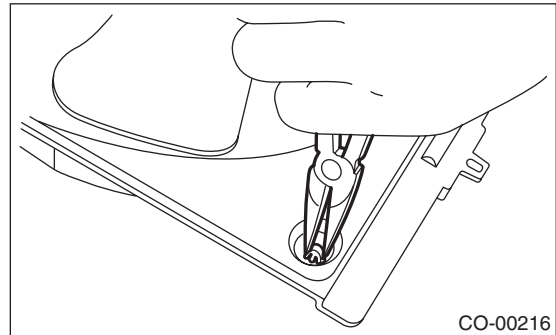
#### Tightening torque:

**4.9 N·m (0.50 kgf·m, 3.6 ft·lb)**

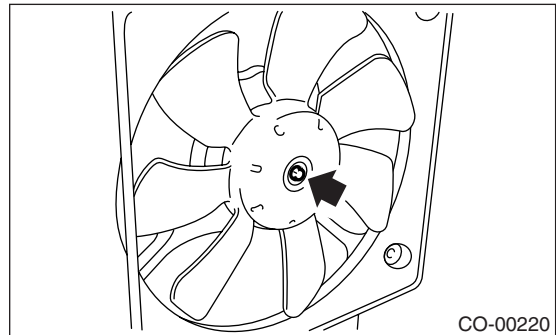


### C: DISASSEMBLY

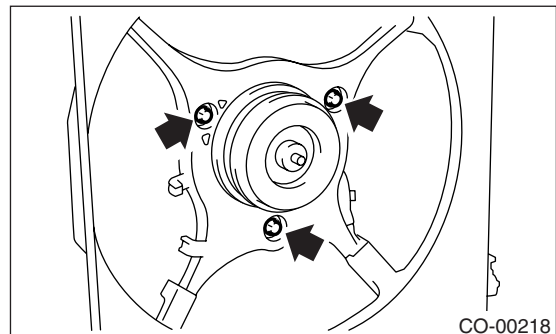
- 1) Remove the clip which holds the motor harness onto shroud.



- 2) Remove the nut which holds the fan onto fan motor and shroud assembly.



- 3) Remove the bolts which install the fan motor onto shroud.

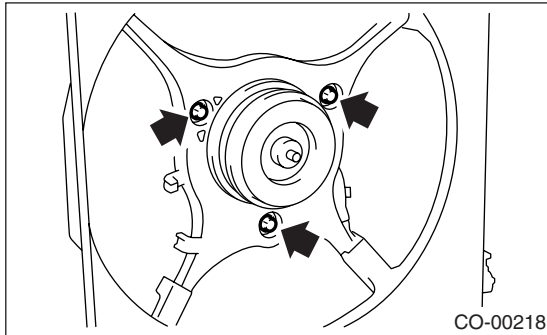


## D: ASSEMBLY

Assemble in the reverse order of disassembly.

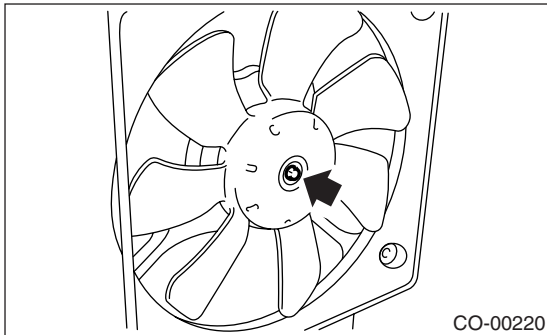
### *Tightening torque:*

**4.4 N·m (0.45 kgf-m, 3.3 ft-lb)**



### *Tightening torque:*

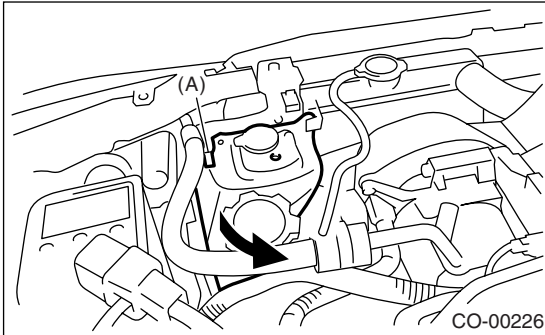
**3.4 N·m (0.35 kgf-m, 2.5 ft-lb)**



## 11. Reservoir Tank

### A: REMOVAL

- 1) Disconnect the overflow hose from the radiator filler neck position.
- 2) Pull out the reservoir tank to the direction of arrow while pushing the pawl (A).



### B: INSTALLATION

Install in the reverse order of removal.

#### NOTE:

Refer to COMPONENT for tightening torque. <Ref. to CO(H4DOTC)-3, COMPONENT, General Description.>

### C: INSPECTION

Make sure the engine coolant level is between "FULL" and "LOW".

## 12. Coolant Filler Tank

### A: REMOVAL

#### WARNING:

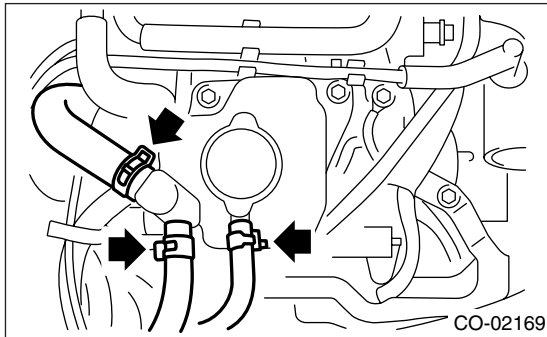
The radiator is pressurized. Wait until the engine cools down before working on the radiator.

1) Drain the coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt). <Ref. to CO(H4DOTC)-17, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

2) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>

3) Remove the air cleaner element.

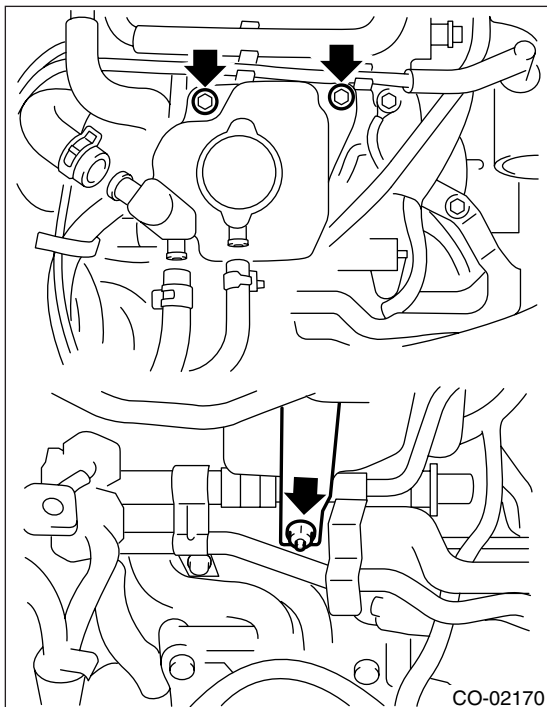
4) Disconnect the engine coolant hoses from coolant filler tank.



5) Remove the bolts and nut which install the coolant filler tank.

6) Disconnect the engine coolant hose which connects the under side of coolant filler tank.

7) Remove the coolant filler tank.



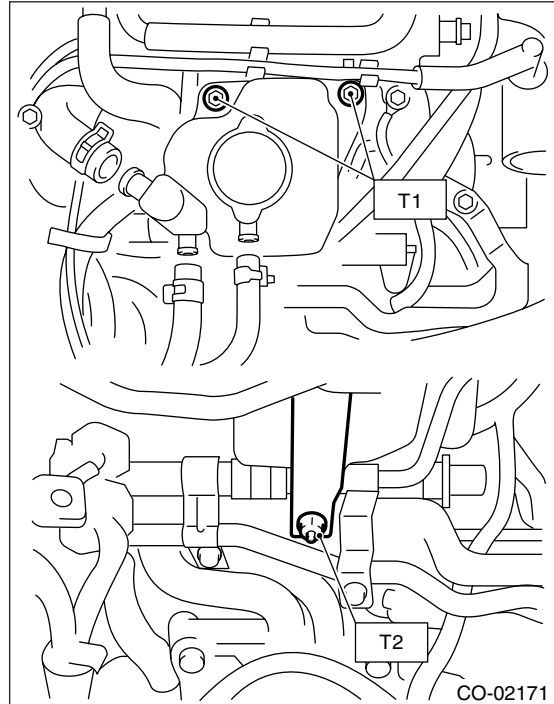
### B: INSTALLATION

1) Install in the reverse order of removal.

#### Tightening torque:

**T1: 16 N·m (1.6 kgf-m, 11.8 ft-lb)**

**T2: 13 N·m (1.3 kgf-m, 9.6 ft-lb)**



2) Fill engine coolant. <Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

## Engine Cooling System Trouble in General

COOLING

### 13.Engine Cooling System Trouble in General

#### A: INSPECTION

| Trouble                        | Possible cause  | Corrective action   |
|--------------------------------|---|---|
| Over-heating                   | a. Insufficient engine coolant  | Replenish the engine coolant, inspect for leakage, and repair.  |
|                                | b. Loose timing belt  | Repair or replace the timing belt tensioner.  |
|                                | c. Oil on timing belt   | Replace.  |
|                                | d. Malfunction of thermostat  | Replace.  |
|                                | e. Malfunction of water pump  | Replace.  |
|                                | f. Clogged engine coolant passage   | Clean.  |
|                                | g. Improper ignition timing   | Inspect and repair the ignition control system.<br><Ref. to EN(H4DOTC)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.> |
|                                | h. Clogged or leaking radiator  | Clean or repair, or replace.  |
|                                | i. Improper engine oil in engine coolant  | Replace the engine coolant.   |
|                                | j. Air/fuel mixture ratio too lean  | Inspect and repair the fuel injection system.<br><Ref. to EN(H4DOTC)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>   |
|                                | k. Excessive back pressure in exhaust system  | Clean or replace.   |
|                                | l. Insufficient clearance between piston and cylinder   | Adjust or replace.  |
|                                | m. Slipping clutch  | Repair or replace.  |
| n. Dragging brake              | Adjust.   |   |
| o. Malfunction of radiator fan | Inspect the radiator fan relay, engine coolant temperature sensor or radiator motor and replace them. |   |
| Over-cooling                   | a. Atmospheric temperature extremely low  | Partly cover the radiator front area.   |
|                                | b. Defective thermostat   | Replace.  |
| Engine coolant leaks           | a. Loosened or damaged connecting units on hoses  | Repair or replace.  |
|                                | b. Leakage from water pump  | Replace.  |
|                                | c. Leakage from water pipe  | Repair or replace.  |
|                                | d. Leakage around cylinder head gasket  | Retighten the cylinder head bolts or replace gasket.  |
|                                | e. Damaged or cracked cylinder head and cylinder block  | Repair or replace.  |
|                                | f. Damaged or cracked thermostat case   | Repair or replace.  |
|                                | g. Leakage from radiator  | Repair or replace.  |
| Noise                          | a. Defective timing belt  | Replace.  |
|                                | b. Defective radiator fan   | Replace.  |
|                                | c. Defective water pump bearing   | Replace the water pump.   |
|                                | d. Defective water pump mechanical seal   | Replace the water pump.   |

# LUBRICATION

# *LU(H4DOTC)*

---

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# General Description

LUBRICATION

## 1. General Description

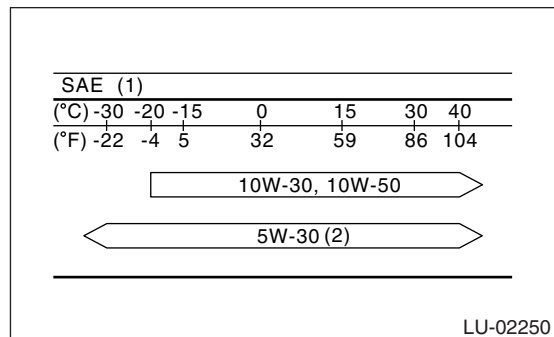
### A: SPECIFICATION

| Lubrication method               |  |                          | Forced lubrication                                   |
|----------------------------------|--|--------------------------|--|
| Oil pump                         | Pump type  |                          | Trochoid type  |
|                                  | Number of teeth                                  | Inner rotor              | 9  |
|                                  |  | Outer rotor              | 10   |
|                                  | Outer rotor diameter × thickness                 |                          | 78 × 10 mm (3.07 × 0.39 in)                          |
|                                  | Tip clearance between inner and outer rotor      | STANDARD                 | 0.04 — 0.14 mm (0.0016 — 0.0055 in)                  |
|                                  |  | LIMIT                    | 0.18 mm (0.0071 in)                                  |
|                                  | Side clearance between inner rotor and pump case | STANDARD                 | 0.02 — 0.07 mm (0.0008 — 0.0028 in)                  |
|                                  |  | LIMIT                    | 0.12 mm (0.0047 in)                                  |
|                                  | Case clearance between outer rotor and pump case | STANDARD                 | 0.10 — 0.175 mm (0.0039 — 0.0069 in)                 |
|                                  |  | LIMIT                    | 0.20 mm (0.0079 in)                                  |
|                                  | Capacity at 80°C (176°F)                         | 600 rpm                  | Discharge pressure                                   |
| Discharge quantity               |  |                          | 4.6 ℓ (4.9 US qt, 4.0 Imp qt)/min.                   |
| 5,000 rpm                        |  | Discharge pressure       | 294 kPa (3.0 kgf/cm <sup>2</sup> , 43 psi)           |
|                                  |  | Discharge quantity       | 47.0 ℓ (49.7 US qt, 41.4 Imp qt)/min.                |
| Relief valve operation pressure  |  |                          | 588 kPa (6.0 kgf/cm <sup>2</sup> , 85 psi)           |
| Oil filter                       | Type   |                          | Full-flow filter type                                |
|                                  | Filtration area                                  | Diameter 68 mm (2.68 in) | 800 cm <sup>2</sup> (124 sq in)                      |
|                                  |  | Diameter 65 mm (2.56 in) | 470 cm <sup>2</sup> (73 sq in)                       |
|                                  | By-pass valve opening pressure                   |                          | 160 kPa (1.63 kgf/cm <sup>2</sup> , 23.2 psi)        |
|                                  | Outer diameter × width                           | Diameter 68 mm (2.68 in) | 68 × 65 mm (2.68 × 2.56 in)                          |
|                                  |  | Diameter 65 mm (2.56 in) | 65 × 74.4 mm (2.56 × 2.93 in)                        |
| Oil filter to engine thread size |  | M 20 × 1.5               |  |
| Oil pressure switch              | Type   |                          | Immersed contact point type                          |
|                                  | Working voltage — wattage                        |                          | 12 V — 3.4 W or less                                 |
|                                  | Warning light activation pressure                |                          | 14.7 kPa (0.15 kgf/cm <sup>2</sup> , 2.1 psi)        |
|                                  | Proof pressure                                   |                          | More than 981 kPa (10 kgf/cm <sup>2</sup> , 142 psi) |
| Engine oil                       | Capacity (at overhaul)                           |                          | 5.0 ℓ (5.3 US qt, 4.4 Imp qt)                        |
|                                  | When replacing engine oil and oil filter         |                          | 4.3 ℓ (4.5 US qt, 3.8 Imp qt)                        |
|                                  | When replacing engine oil only                   |                          | 4.0 ℓ (4.2 US qt, 3.5 Imp qt)                        |

**Recommended oil:**

**API standard SM with the “Energy Conserving” logo is printed.**

**ILSAC standard, GF4 “Star burst mark” label is on the container.**



- (1) SAE viscosity No. and applicable temperature
- (2) Recommended

The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

**CAUTION:**

**When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API standard and SAE viscosity No. designated by SUBARU.**

**NOTE:**

If the vehicle is used in areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API standard:

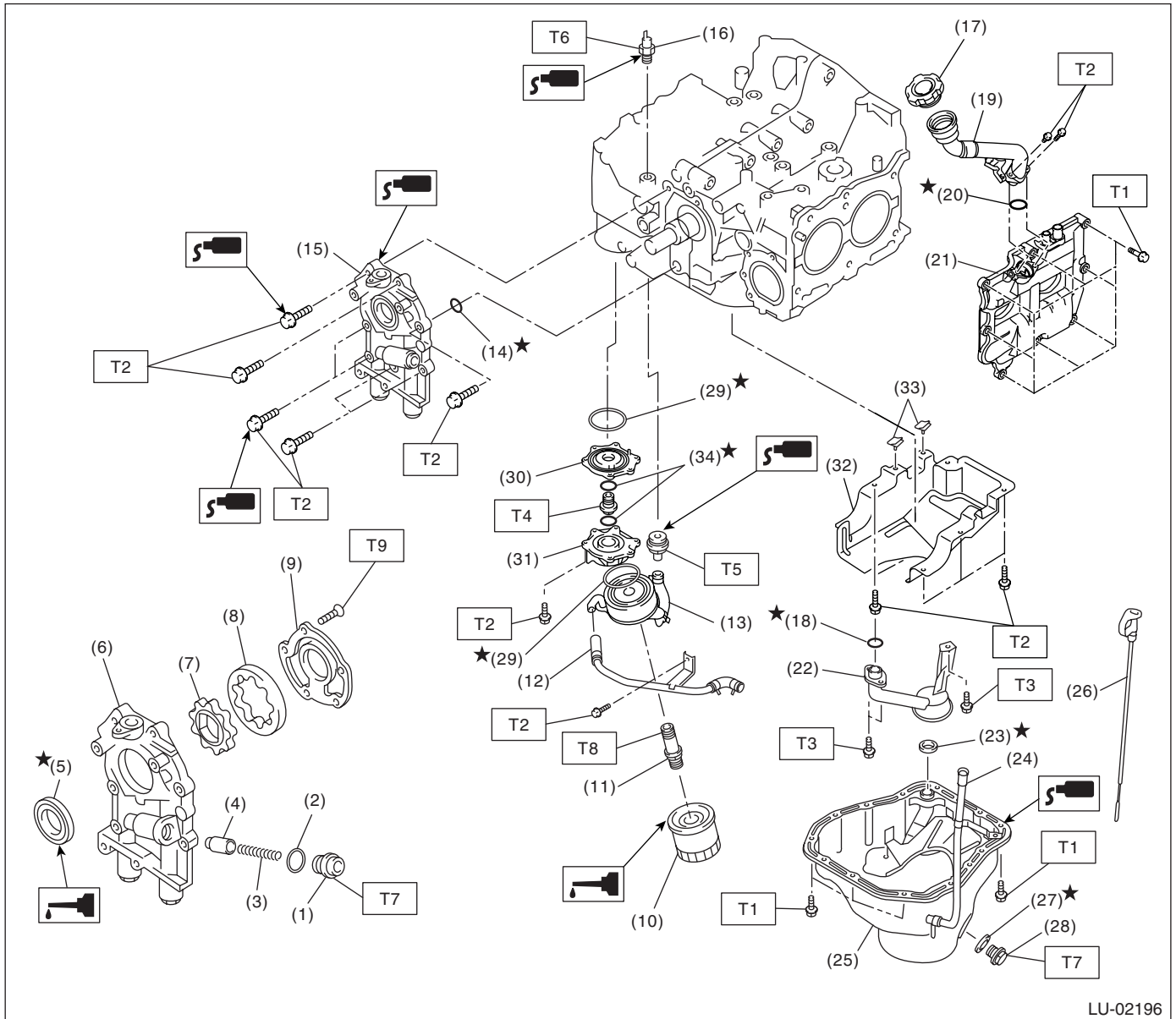
SM or SL

SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.



# General Description

## B: COMPONENT



LU-02196

- |                           |                            |
|---------------------------|----------------------------|
| (1) Plug                  | (16) Oil pressure switch   |
| (2) Gasket                | (17) Oil filler duct       |
| (3) Relief valve spring   | (18) O-ring                |
| (4) Relief valve          | (19) Oil filler duct       |
| (5) Oil seal              | (20) O-ring                |
| (6) Oil pump case         | (21) Rocker cover          |
| (7) Inner rotor           | (22) Oil strainer          |
| (8) Outer rotor           | (23) Gasket                |
| (9) Oil pump cover        | (24) Oil level gauge guide |
| (10) Oil filter           | (25) Oil pan               |
| (11) Oil cooler connector | (26) Oil level gauge       |
| (12) Water by-pass pipe   | (27) Metal gasket          |
| (13) Oil cooler           | (28) Drain plug            |
| (14) O-ring               | (29) Gasket                |
| (15) Oil pump ASSY        | (30) Adapter A             |

- |                   |
|-------------------|
| (31) Adapter B    |
| (32) Baffle plate |
| (33) Seal         |
| (34) O-ring       |

**Tightening torque: N-m (kgf-m, ft-lb)**

- |                            |
|----------------------------|
| <b>T1: 5 (0.5, 3.6)</b>    |
| <b>T2: 6.4 (0.65, 4.7)</b> |
| <b>T3: 10 (1.0, 7.2)</b>   |
| <b>T4: 45 (4.6, 33.2)</b>  |
| <b>T5: 69 (7.0, 50.9)</b>  |
| <b>T6: 25 (2.5, 18.1)</b>  |
| <b>T7: 44 (4.5, 32.5)</b>  |
| <b>T8: 54 (5.5, 40)</b>    |
| <b>T9: 5.4 (0.55, 4.0)</b> |

### **C: CAUTION**

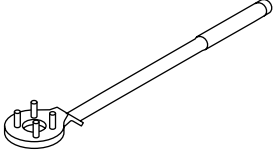
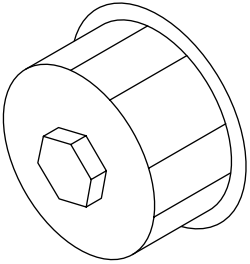
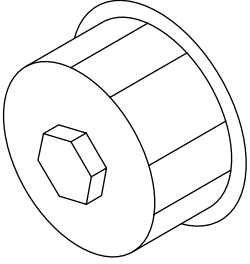
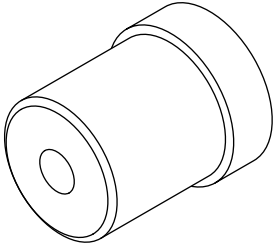
- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

# General Description

LUBRICATION

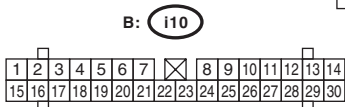
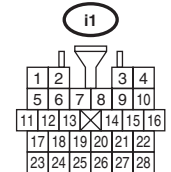
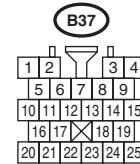
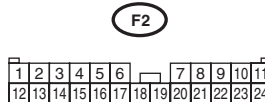
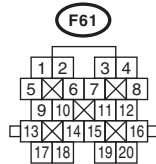
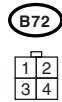
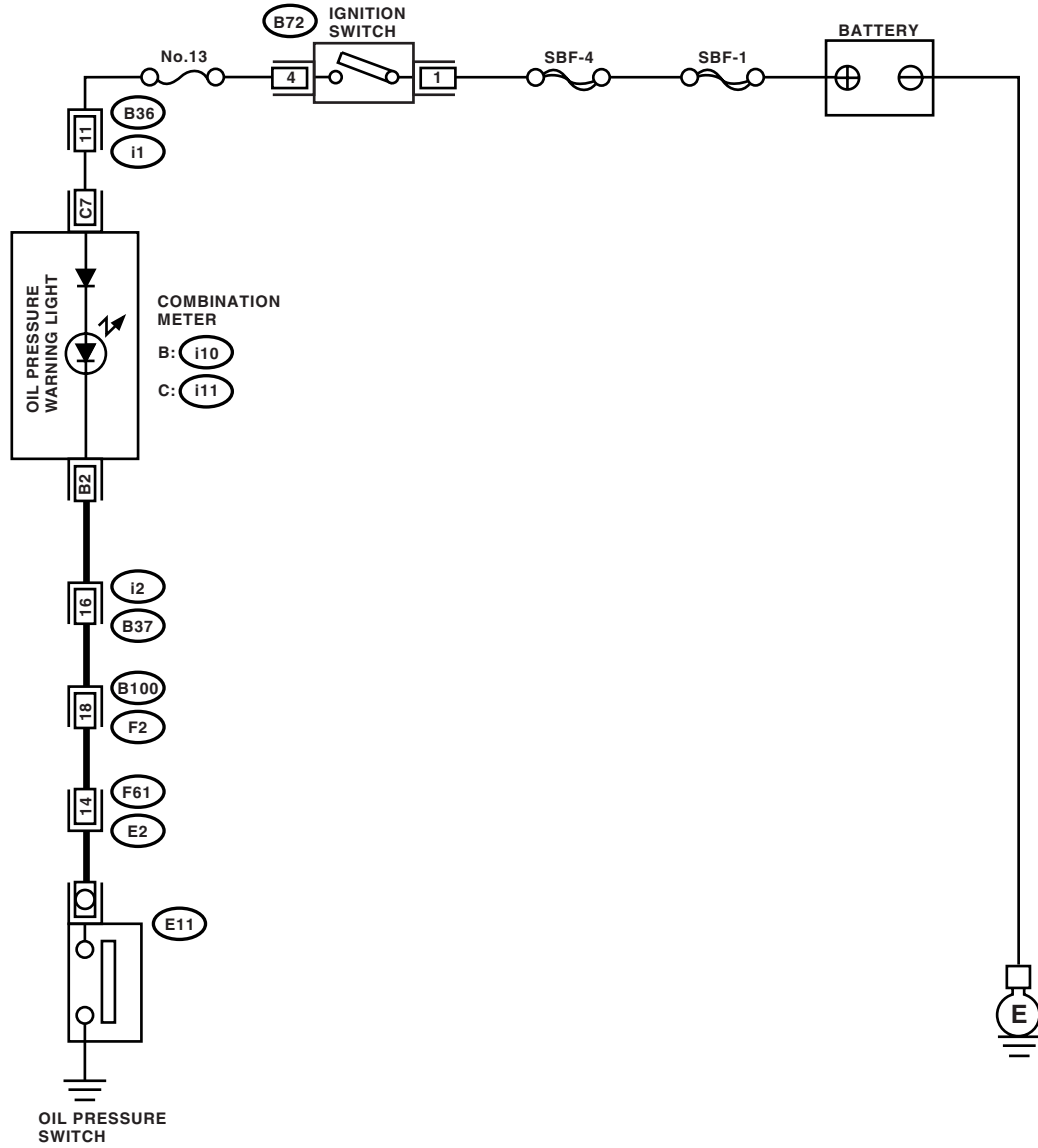
## D: PREPARATION TOOL

### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION         | REMARKS   |
|---|-------------|---------------------|---|
|  <p style="text-align: center;">ST-499977100</p>   | 499977100   | CRANK PULLEY WRENCH | Used for stopping rotation of crank pulley when loosening and tightening crank pulley bolt. |
|  <p style="text-align: center;">ST18332AA000</p>  | 18332AA000  | OIL FILTER WRENCH   | Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))              |
|  <p style="text-align: center;">ST18332AA010</p> | 18332AA010  | OIL FILTER WRENCH   | Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))              |
|  <p style="text-align: center;">ST-499587100</p> | 499587100   | OIL SEAL INSTALLER  | Used for installing oil seal to oil pump.   |

## 2. Oil Pressure System

### A: WIRING DIAGRAM



LU-02125

# Oil Pressure System

LUBRICATION

## B: INSPECTION

| Step   | Check                                     | Yes  | No  |
|--|---|--|---|
| <b>1 CHECK COMBINATION METER.</b><br>1) Turn the ignition switch to ON. (engine OFF)<br>2) Check other warning lights.   | Does the warning lights go on?            | Go to step 2.  | Repair or replace the combination meter. <Ref. to IDI-3, INSPECTION, Combination Meter System.> |
| <b>2 CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from oil pressure switch.<br>3) Turn the ignition switch ON.<br>4) Measure the voltage of harness between the combination meter connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(E11) No. 1 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?            | Replace the oil pressure switch.   | Go to step 3.   |
| <b>3 CHECK COMBINATION METER.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the combination meter.<br>3) Measure the resistance of combination meter.<br><b>Terminals</b><br><b>(i11) No. 7 — (i10) No. 2:</b>   | Is the resistance less than 10 $\Omega$ ? | Replace the harness connector between combination meter and oil pressure switch. | Repair or replace the combination meter. <Ref. to IDI-3, INSPECTION, Combination Meter System.> |

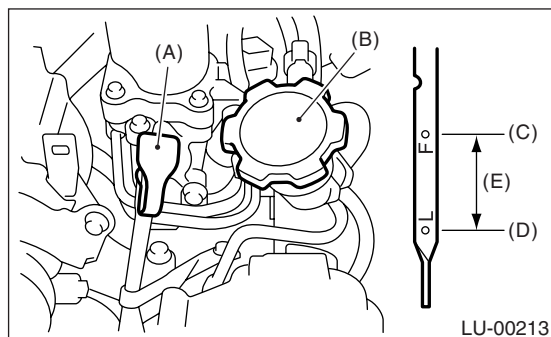
## 3. Engine Oil

### A: INSPECTION

- 1) Park the vehicle on a level surface.
- 2) After turning off the engine, wait a few minutes for oil to drain back into the oil pan before checking the level.
- 3) Just after driving or while the engine is warm, engine oil level may show in the range between the "F" line and notch mark. This is caused by thermal expansion of engine oil.
- 4) Remove the oil level gauge and wipe it clean.
- 5) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in proper orientation.
- 6) Remove it again and note the reading. If the engine oil level is below the "L" line, add oil to bring the level up to "F" line.

#### NOTE:

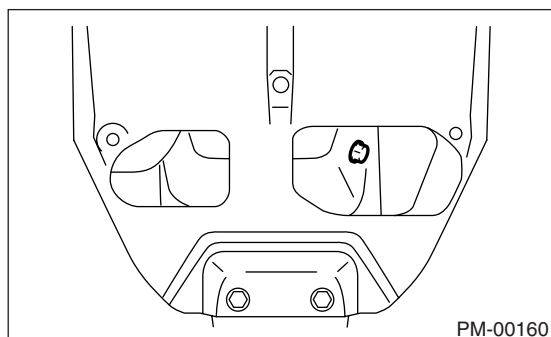
To prevent overfilling the engine oil, do not add oil above "F" line when the engine is cold.



- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

### B: REPLACEMENT

- 1) Open the engine oil filler cap for quick draining of engine oil.
- 2) Drain the engine oil by loosening the engine oil drain plug.

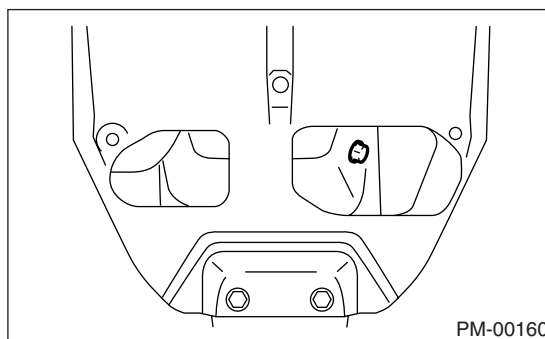


- 3) Replace the drain plug gasket.

- 4) Tighten the engine oil drain plug after draining engine oil.

#### Tightening torque:

**44 N·m (4.5 kgf-m, 32.5 ft-lb)**



- 5) Install the service hole cover.
- 6) Use the engine oil of proper quality and viscosity, fill engine oil through the oil filler duct up to upper level on level gauge. Make sure that the vehicle is placed level when checking oil level.

#### Recommended oil:

**API standard SM with the "Energy Conserving" logo is printed.**

**ILSAC standard, GF4 "Star burst mark" label is on the container.**

#### Engine oil capacity:

##### Upper level

**4.0 ℓ (4.2 US qt, 3.5 Imp qt)**

##### Lower level

**3.0 ℓ (3.2 US qt, 2.6 Imp qt)**

| SAE (1) |     |                |     |    |    |    |     |
|---------|-----|----------------|-----|----|----|----|-----|
| (°C)    | -30 | -20            | -15 | 0  | 15 | 30 | 40  |
| (°F)    | -22 | -4             | 5   | 32 | 59 | 86 | 104 |
|         |     | 10W-30, 10W-50 |     |    |    |    |     |
|         |     | 5W-30 (2)      |     |    |    |    |     |

LU-02250

- (1) SAE viscosity No. and applicable temperature
- (2) Recommended

The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

#### CAUTION:

**When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API standard and SAE viscosity No. designated by SUBARU.**

# Engine Oil

## LUBRICATION

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### NOTE:

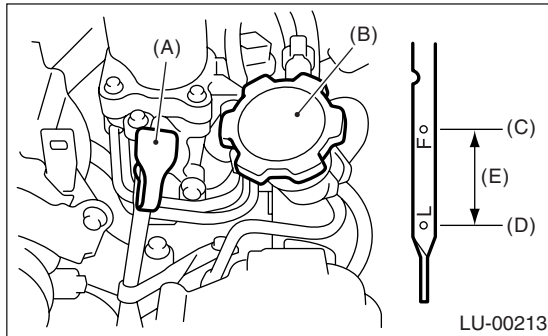
If the vehicle is used in areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API standard: SM or SL

SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.

7) Close the engine oil filler cap.

8) Start the engine and warm it up for a time.

9) After the engine stops, recheck the oil level. If necessary, add engine oil up to the upper level on level gauge.

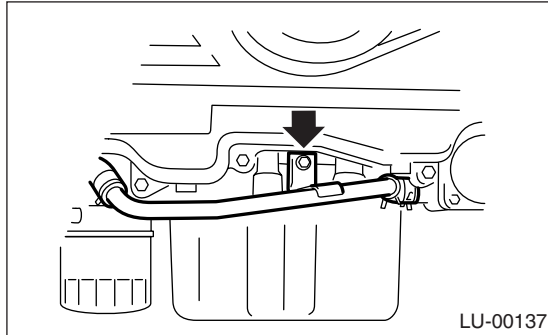


- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

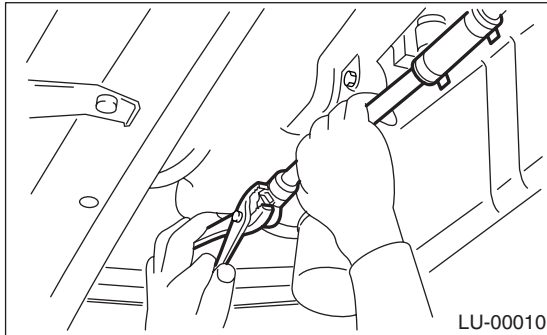
## 4. Oil Pump

### A: REMOVAL

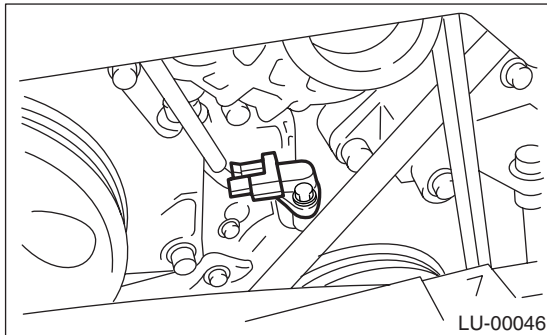
- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Remove the bolts which install the water pipe of oil cooler to oil pump.



- 5) Remove the water pipe and hoses between oil cooler and water pump.

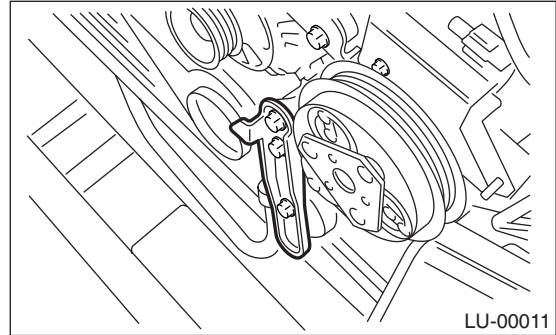


- 6) Remove the radiator. <Ref. to CO(H4DOTC)-23, REMOVAL, Radiator.>
- 7) Remove the crank position sensor.

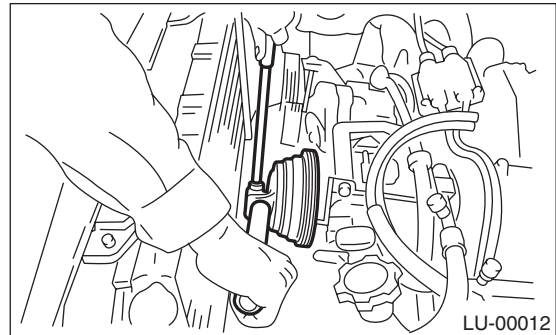


- 8) Remove the V-belts. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>

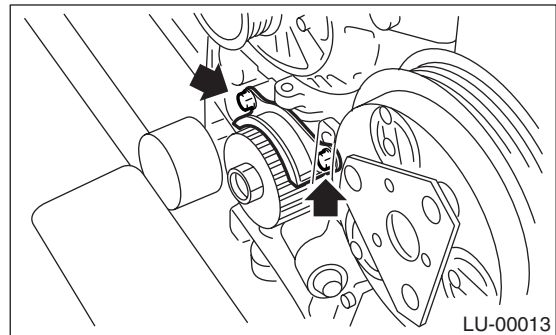
- 9) Remove the rear side V-belt tensioner.



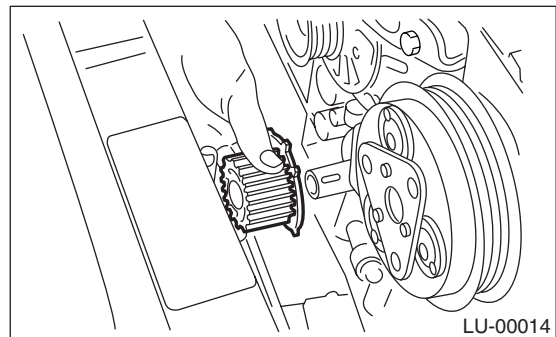
- 10) Remove the crank pulley by using ST. ST 499977100 CRANK PULLEY WRENCH



- 11) Remove the timing belt. <Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt.>
- 12) Remove the timing belt guide. (MT model)



- 13) Remove the water pump. <Ref. to CO(H4DOTC)-19, REMOVAL, Water Pump.>
- 14) Remove the crank sprocket.

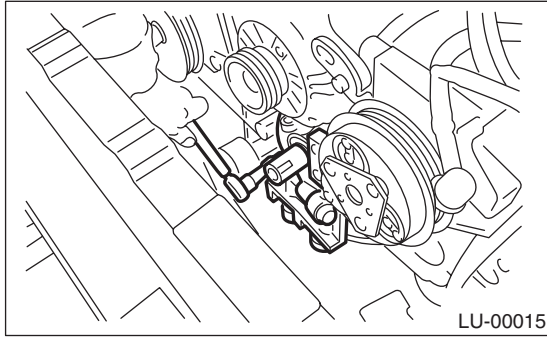




# Oil Pump

## LUBRICATION

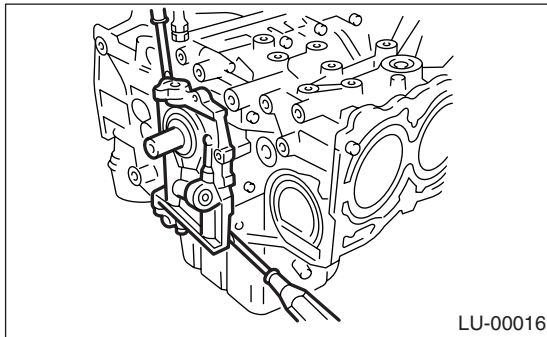
15) Remove the bolts which install the oil pump onto cylinder block.



16) Remove the oil pump using the flat tip screwdriver.

### CAUTION:

**Be careful not to scratch the mating surfaces of cylinder block and oil pump.**



## B: INSTALLATION

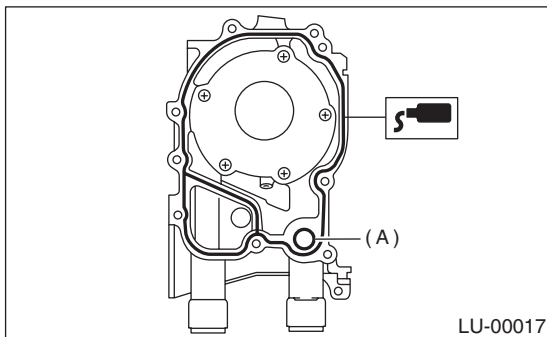
Install in the reverse order of removal.

Do the following:

1) Apply liquid gasket to the matching surfaces of oil pump.

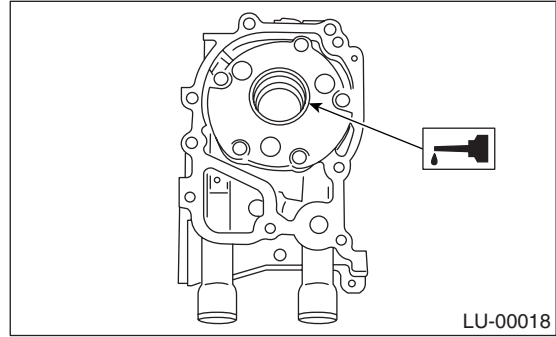
### Liquid gasket:

**THREE BOND 1215 (Part No. 004403007) or equivalent**



2) Replace the O-ring (A) with a new one.

3) Apply a coat of engine oil to the inside of oil seal.



4) Be careful not to scratch the oil seal when installing the oil pump on cylinder block.

5) Position the oil pump, aligning the notched area with crankshaft, and push the oil pump straight.

### CAUTION:

**Make sure the oil seal lip is not folded.**

6) Install the oil pump.

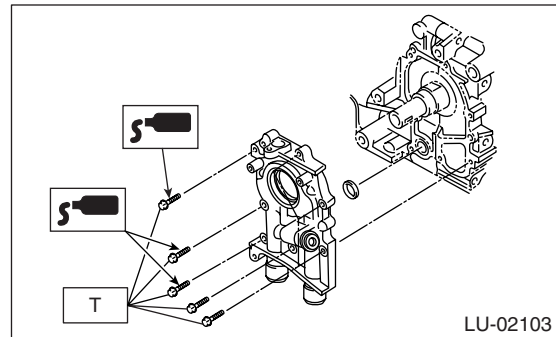
7) Apply liquid gasket to the threaded portion of three bolts.

### Liquid gasket:

**THREE BOND 1324 (Part No. 004403042) or equivalent**

### Tightening torque:

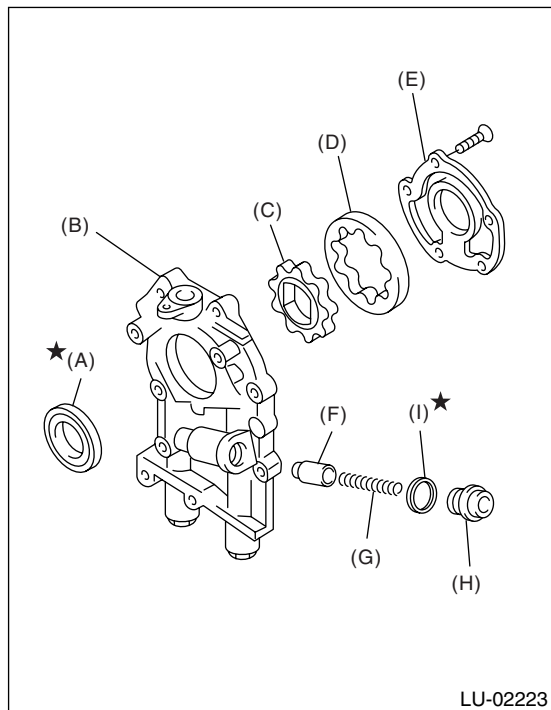
**6.4 N·m (0.65 kgf·m, 4.7 ft·lb)**



## C: DISASSEMBLY

Remove the screws which secure the oil pump cover and disassemble oil pump. Inscribe alignment marks on the inner and outer rotors so that they can be replaced in their original positions during reassembly.

**CAUTION:**  
Before disassembling the oil pump, remove the relief valve.

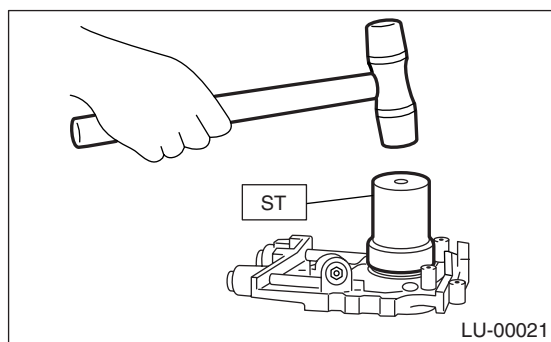


- (A) Oil seal
- (B) Pump case
- (C) Inner rotor
- (D) Outer rotor
- (E) Pump cover
- (F) Relief valve
- (G) Relief valve spring
- (H) Plug
- (I) Gasket

## D: ASSEMBLY

1) Install the front oil seal by using ST.  
ST 499587100 OIL SEAL INSTALLER

**NOTE:**  
Use a new oil seal.

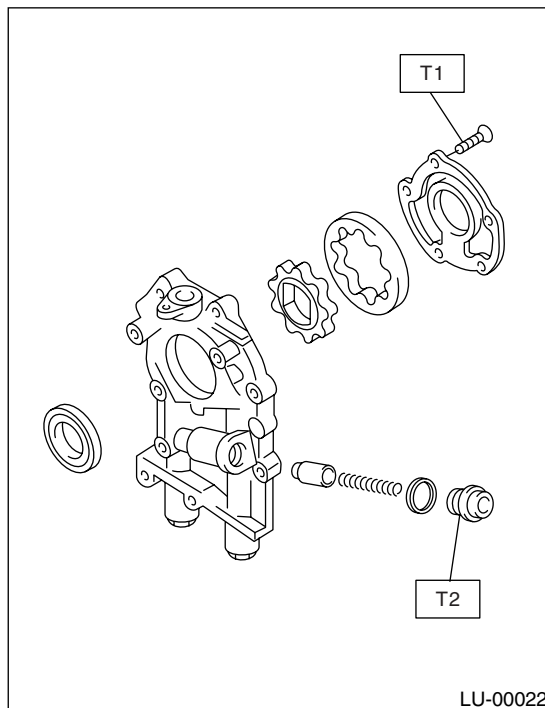


2) Apply a coat of engine oil to the inner and outer rotors.

3) Install the inner and outer rotors in their original positions.  
4) Install the oil relief valve, relief valve spring and plug.

**NOTE:**  
Use a new gasket.  
5) Install the oil pump cover.

**Tightening torque:**  
**T1: 5.4 N·m (0.55 kgf-m, 4.0 ft-lb)**  
**T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)**

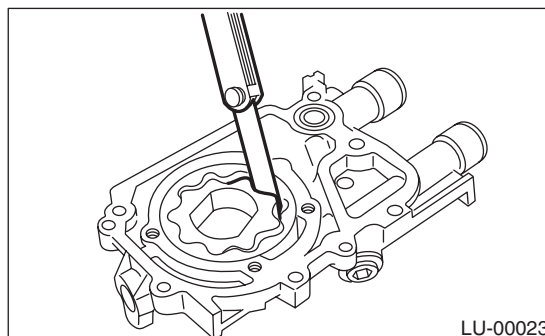


## E: INSPECTION

### 1. TIP CLEARANCE

Measure the tip clearance of rotors. If clearance exceeds the limit, replace the rotors as a matched set.

**Tip clearance:**  
**Standard**  
**0.04 — 0.14 mm (0.0016 — 0.0055 in)**  
**Limit**  
**0.18 mm (0.0071 in)**



# Oil Pump

## LUBRICATION

### 2. CASE CLEARANCE

Measure the clearance between outer rotor and oil pump rotor housing. If clearance exceeds the limit, replace the rotor.

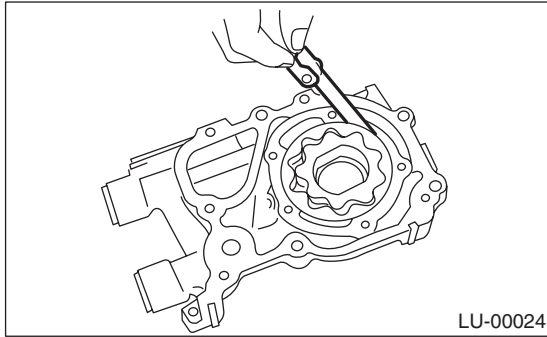
**Case clearance:**

**Standard**

**0.10 — 0.175 mm (0.0039 — 0.0069 in)**

**Limit**

**0.20 mm (0.0079 in)**



### 3. SIDE CLEARANCE

Measure the clearance between the oil pump inner rotor and pump cover. If clearance exceeds the limit, replace the rotor or pump body.

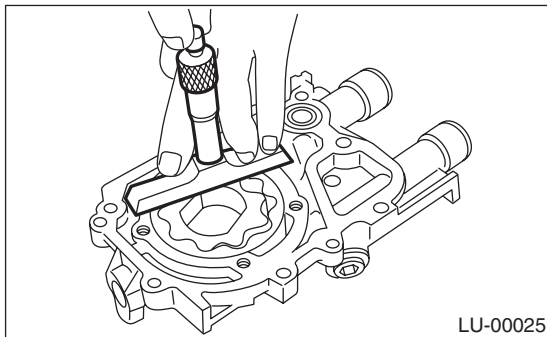
**Side clearance:**

**Standard**

**0.02 — 0.07 mm (0.0008 — 0.0028 in)**

**Limit**

**0.12 mm (0.0047 in)**



### 4. OIL RELIEF VALVE

Check the valve for fitting condition and damage, and the relief valve spring for damage and deterioration. Replace the parts if defective.

**Relief valve spring:**

**Free length**

**73.7 mm (2.902 in)**

**Installed length**

**54.7 mm (2.154 in)**

**Load when installed**

**93.1 N (9.49 kgf, 20.88 lbf)**

### 5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks, and other faults.

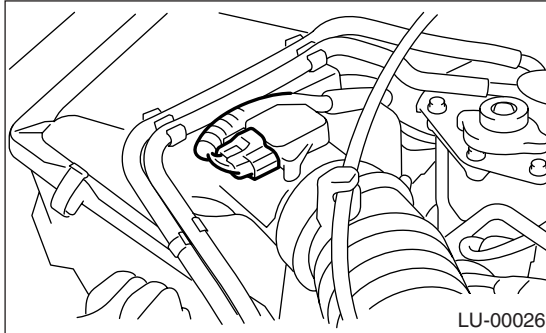
### 6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

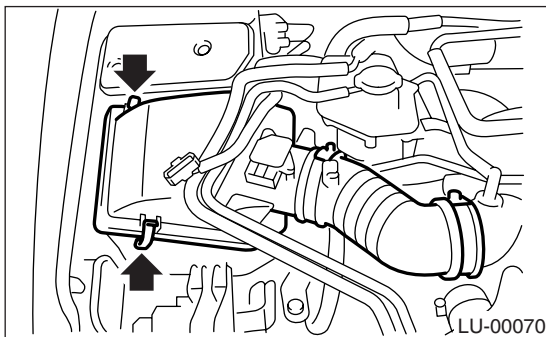
## 5. Oil Pan and Strainer

### A: REMOVAL

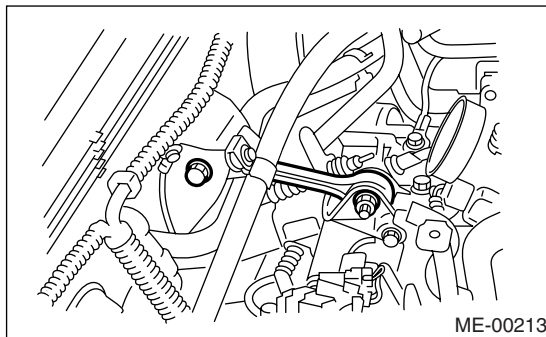
- 1) Set the vehicle on a lift.
- 2) Remove the front wheels.
- 3) Disconnect the ground cable from battery.
- 4) Disconnect the connector from mass air flow and intake air temperature sensor.



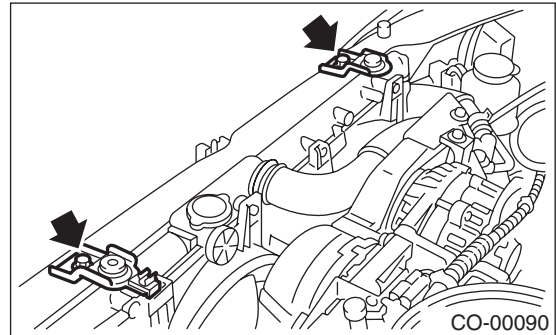
- 5) Remove the air intake boot and air cleaner upper cover.



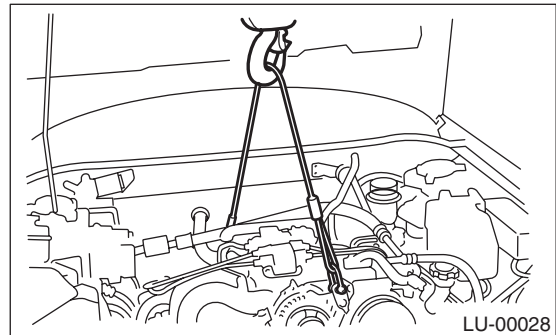
- 6) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 7) Remove the pitching stopper.



- 8) Remove the radiator upper brackets.



- 9) Support the engine with a lifting device and wire ropes.

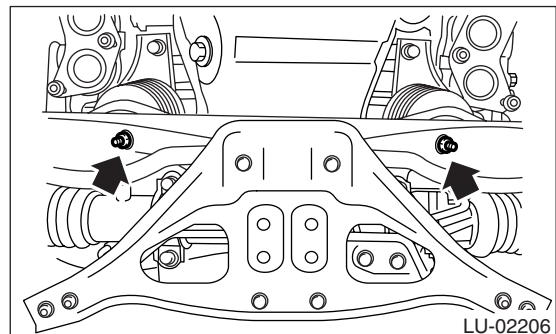


- 10) Lift-up the vehicle.

### CAUTION:

**When lifting up the vehicle, rise up the wire rope together.**

- 11) Remove the under cover.
- 12) Drain the engine oil. <Ref. to LU(H4DOTC)-9, REPLACEMENT, Engine Oil.>
- 13) Remove the front exhaust pipe assembly. <Ref. to EX(H4DOTC)-8, REMOVAL, Front Exhaust Pipe.>
- 14) Remove the nuts which install the front cushion rubber onto front crossmember.



- 15) Remove the bolts which install the oil pan on cylinder block while raising up engine.
- 16) Insert the oil pan cutter blade between cylinder block-to-oil pan clearance.

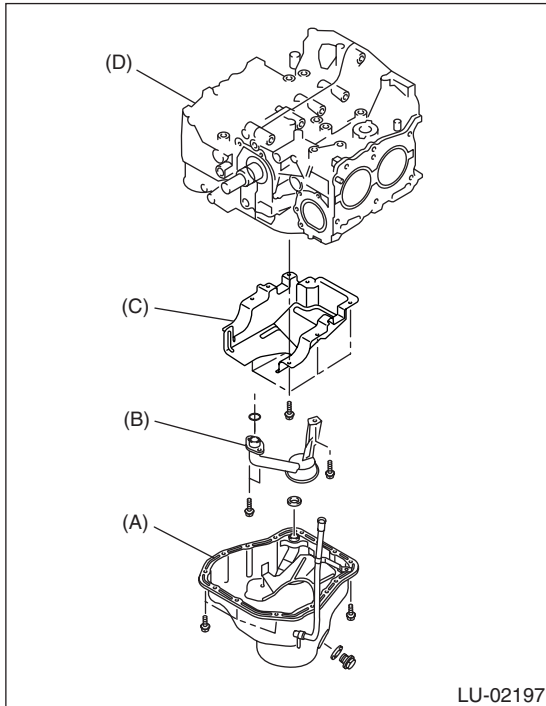
### CAUTION:

**Do not use a screwdriver or similar tool in place of oil pan cutter.**

# Oil Pan and Strainer

## LUBRICATION

- 17) Remove the oil strainer.
- 18) Remove the baffle plate.



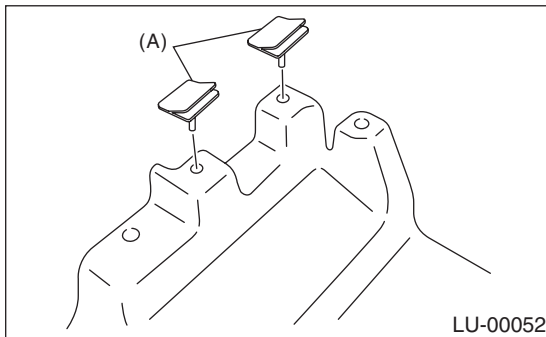
- (A) Oil pan
- (B) Oil strainer
- (C) Baffle plate
- (D) Cylinder block

## B: INSTALLATION

### CAUTION:

**Before installing the oil pan, clean sealant from oil pan and engine block.**

- 1) Check the seal (A) is securely installed in baffle plate in the direction as shown in the figure.



- 2) Install the baffle plate.

### Tightening torque:

**6.4 N·m (0.65 kgf·m, 4.7 ft·lb)**

- 3) Install the oil strainer onto baffle plate.

### NOTE:

Replace the O-ring with a new one.

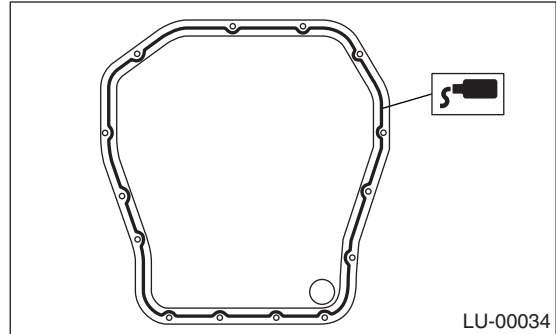
### Tightening torque:

**10 N·m (1.0 kgf·m, 7.2 ft·lb)**

- 4) Apply liquid gasket to the mating surfaces, and then install the oil pan.

### Liquid gasket:

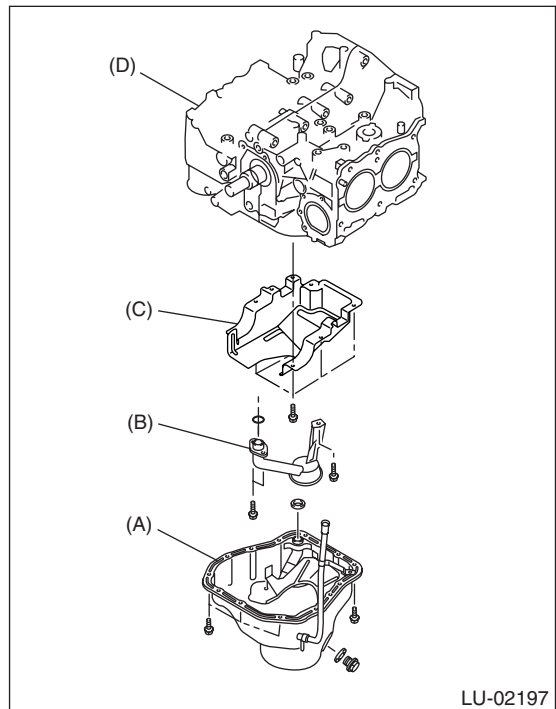
**THREE BOND 1207C (Part No. 004403012) or equivalent**



- 5) Tighten the bolts which install the oil pan onto engine block.

### Tightening torque:

**5 N·m (0.5 kgf·m, 3.6 ft·lb)**



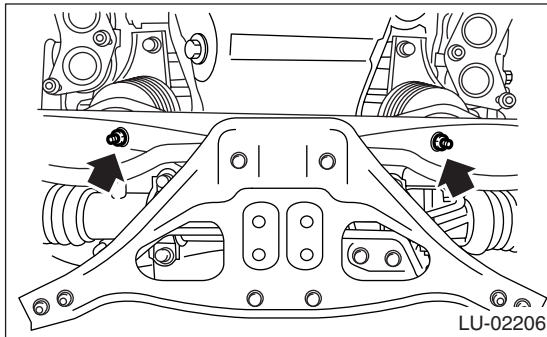
- (A) Oil pan
- (B) Oil strainer
- (C) Baffle plate
- (D) Cylinder block

- 6) Lower the engine onto front crossmember.

- 7) Tighten the nuts which install the front cushion rubber onto front crossmember.

**Tightening torque:**

**83 N·m (8.5 kgf·m, 61 ft·lb)**



8) Install the front exhaust pipe assembly. <Ref. to EX(H4DOTC)-8, INSTALLATION, Front Exhaust Pipe.>

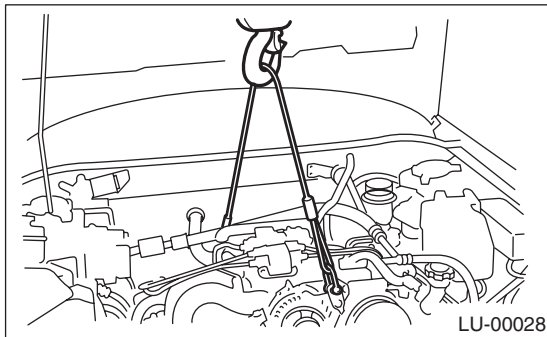
9) Install the under cover.

10) Lower the vehicle.

**CAUTION:**

**When lowering the vehicle, lower the lifting device and wire rope together.**

11) Remove the lifting device and steel cables.

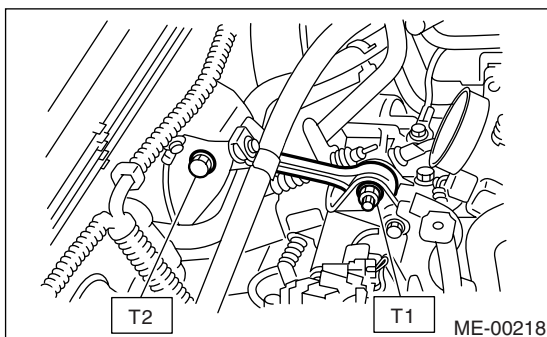


12) Install the pitching stopper.

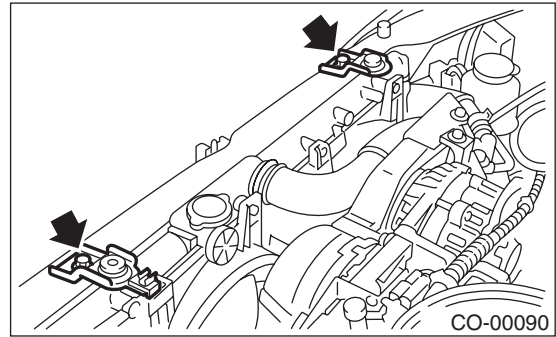
**Tightening torque:**

**T1: 50 N·m (5.1 kgf·m, 36.9 ft·lb)**

**T2: 58 N·m (5.9 kgf·m, 42.8 ft·lb)**

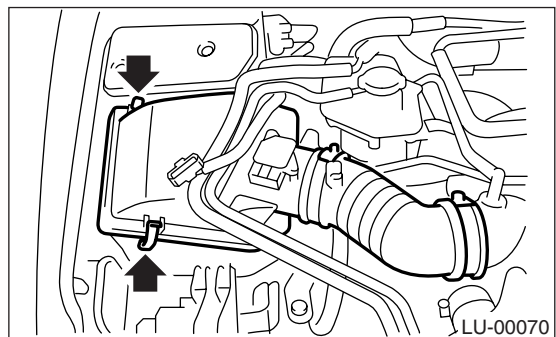


13) Install the radiator upper brackets.

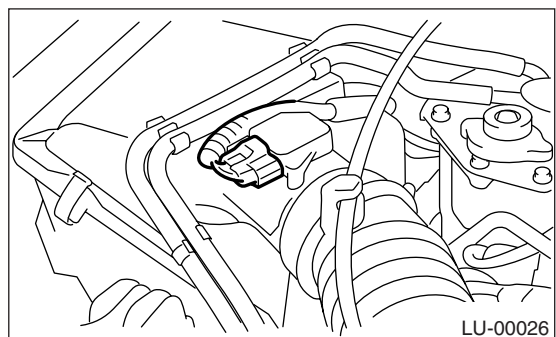


14) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

15) Install the air intake boot and air cleaner upper cover.



16) Connect the connector to mass air flow and intake air temperature sensor.



17) Install the front wheels.

18) Connect the battery ground cable to battery.

19) Fill engine oil. <Ref. to LU(H4DOTC)-9, INSPECTION, Engine Oil.>

**C: INSPECTION**

By visual check, make sure the oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.



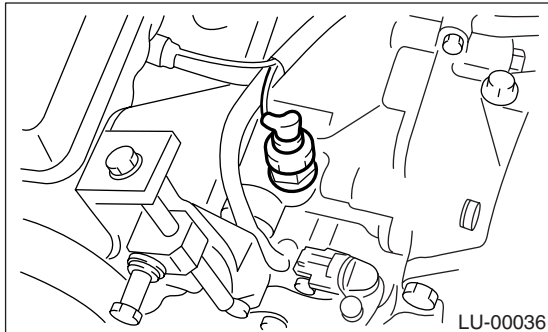
# Oil Pressure Switch

LUBRICATION

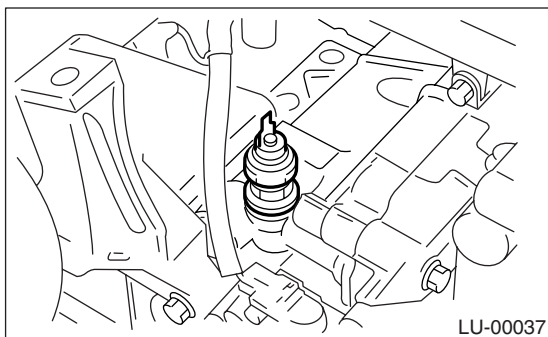
## 6. Oil Pressure Switch

### A: REMOVAL

- 1) Remove the generator from bracket. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
- 2) Disconnect the terminal from oil pressure switch.



- 3) Remove the oil pressure switch.

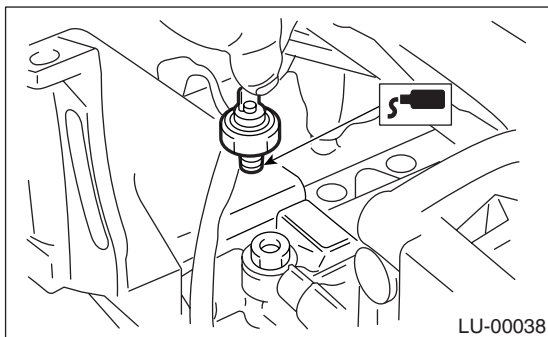


### B: INSTALLATION

- 1) Apply liquid gasket to the oil pressure switch threads.

#### Liquid gasket:

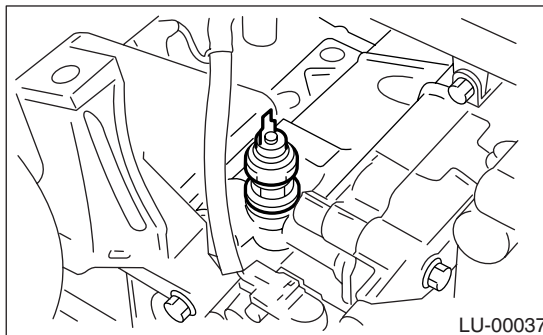
**THREE BOND 1324 (Part No. 004403042) or equivalent**



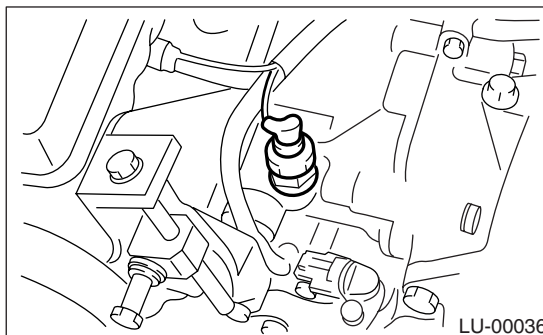
- 2) Install the oil pressure switch onto engine block.

#### Tightening torque:

**25 N·m (2.5 kgf·m, 18.1 ft·lb)**



- 3) Connect the terminal of oil pressure switch.



- 4) Install the generator on bracket. <Ref. to SC(H4SO)-14, INSTALLATION, Generator.>

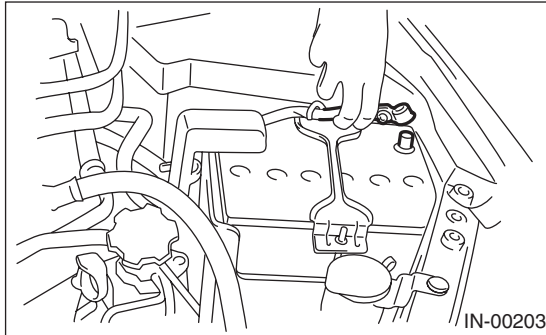
### C: INSPECTION

Make sure oil does not leak or seep from where the oil pressure switch is installed.

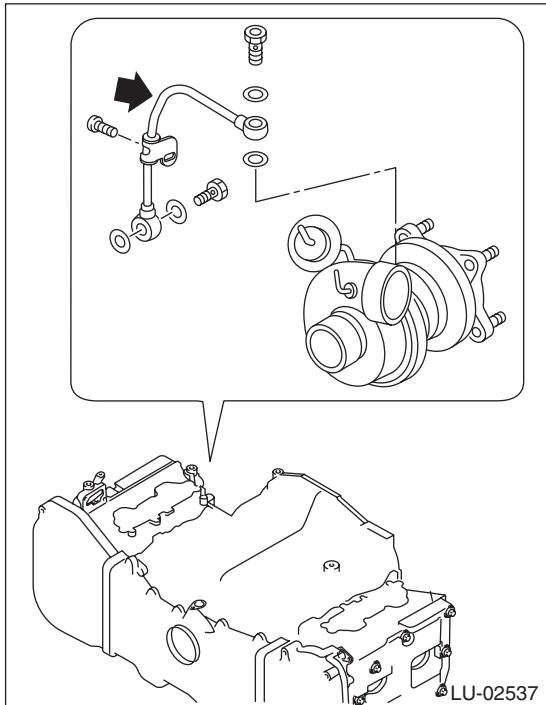
## 7. Oil Pipe

### A: REMOVAL

- 1) Disconnect the ground cable from battery.



- 2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Remove the intercooler bracket RH.
- 4) Remove the oil inlet pipe from the turbocharger.

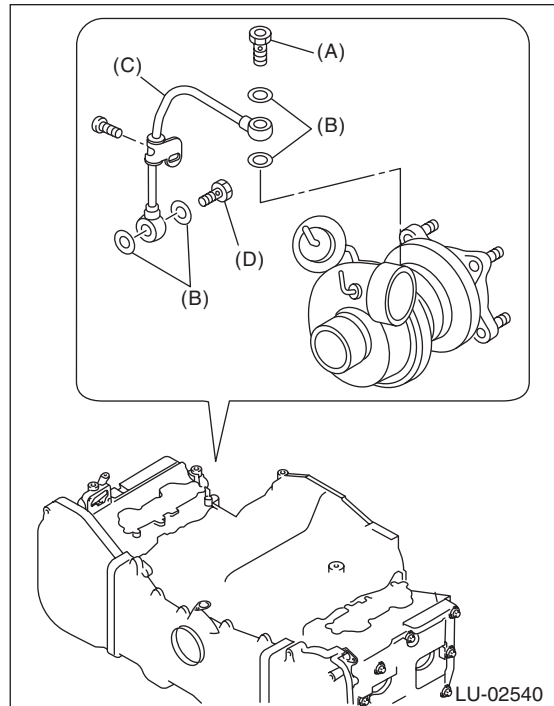


### B: INSTALLATION

- 1) Inspect the union screw with filter. <Ref. to LU(H4DOTC)-20, INSPECTING UNION SCREW WITH FILTER, INSPECTION, Oil Pipe.>
- 2) Temporarily tighten the oil pipe.

#### NOTE:

- Make sure not to mix up the union screws with filter and without filter as their installation positions are different.
- Use a new gasket.



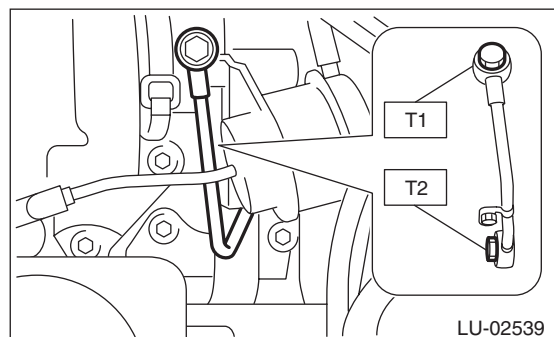
- (A) Union screw without filter (without protrusion)
- (B) Gasket
- (C) Oil inlet pipe
- (D) Union screw with filter (with protrusion)

- 3) Tighten the union screws of oil inlet pipe.

#### Tightening torque:

**T1: 16 N·m (1.6 kgf-m, 11.6 ft-lb)**

**T2: 29 N·m (3.0 kgf-m, 21.7 ft-lb)**





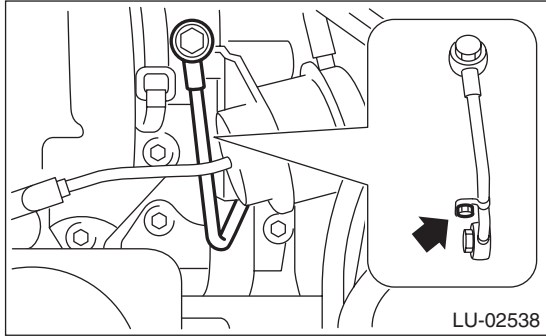
# Oil Pipe

## LUBRICATION

4) Tighten the bolts which hold the oil inlet pipe stay to the turbocharger.

**Tightening torque:**

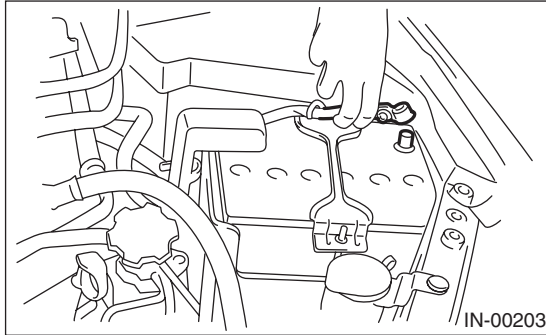
**4.9 N·m (0.50 kgf-m, 3.6 ft-lb)**



5) Install the intercooler bracket RH.

6) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

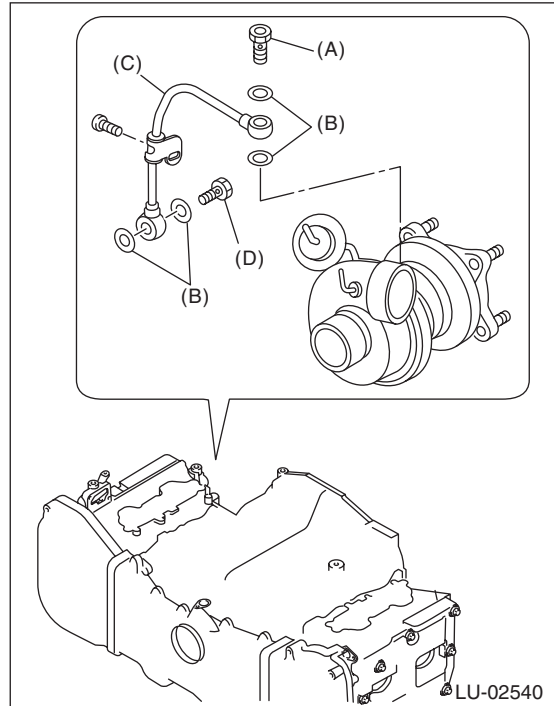
7) Connect the ground cable to battery.



## C: INSPECTION

### 1. INSPECTING UNION SCREW WITH FILTER

Check the filter part of union screw for clogging or damage, and if defective, replace the union screw with filter with a new part.



- (A) Union screw without filter (without protrusion)
- (B) Gasket
- (C) Oil inlet pipe
- (D) Union screw with filter (with protrusion)

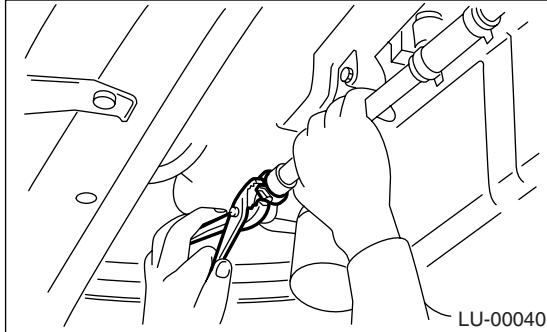
### 2. OTHER INSPECTIONS

- 1) Check that the oil pipe and union screw have no deformation, cracks and other damages.
- 2) Check that there are no oil leaks or oil oozing from the oil pipe attachment section.

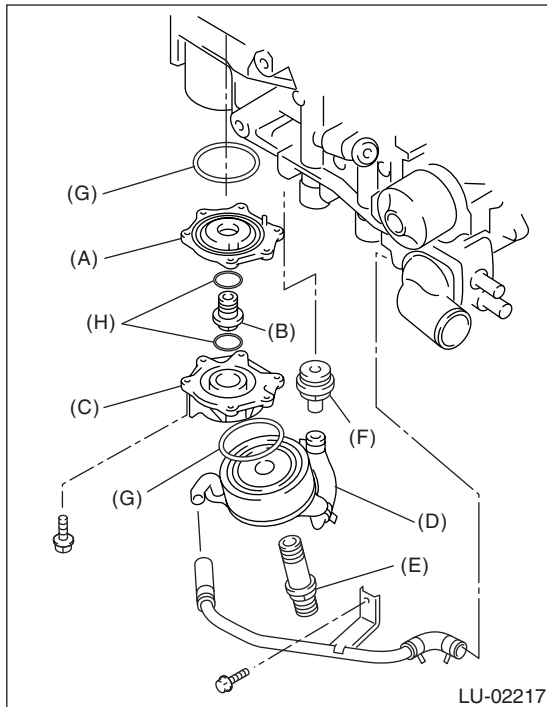
## 8. Engine Oil Cooler

### A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Drain the engine oil.
- 4) Drain the engine coolant.
- 5) Remove the water by-pass pipe between oil cooler and water pump.



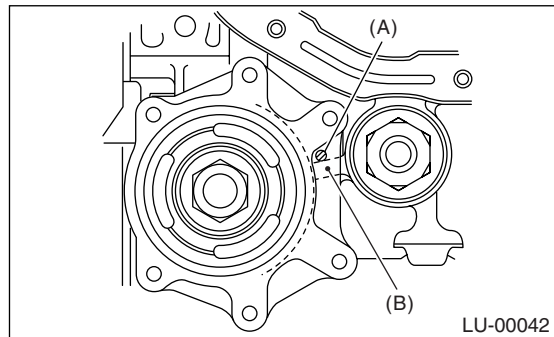
- 6) Remove the engine oil filter. <Ref. to LU(H4DOTC)-23, REMOVAL, Engine Oil Filter.>
- 7) Remove the connector, and then remove the oil cooler.



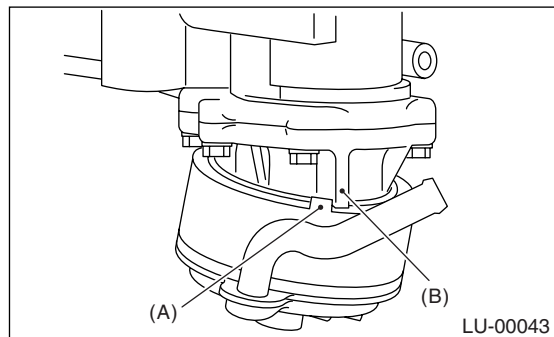
- (A) Adapter A
- (B) Adapter connector
- (C) Adapter B
- (D) Oil cooler
- (E) Oil cooler connector
- (F) Plug
- (G) Gasket
- (H) O-ring

### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Contact the knock pin (A) of adapter A to cylinder block rib (B) to install adapter A.



- 3) Install the adapter B.
- 4) Contact the engine oil cooler stopper (A) to adapter B rib (B) to install engine oil cooler.



- 5) Apply liquid gasket to the plug thread when installing it.

#### Liquid gasket:

**THREE BOND 1215 (Part No. 004403007) or equivalent**

#### Tightening torque:

**T1: 45 N·m (4.6 kgf-m, 33.2 ft-lb)**

**T2: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**

**T3: 54 N·m (5.5 kgf-m, 40 ft-lb)**

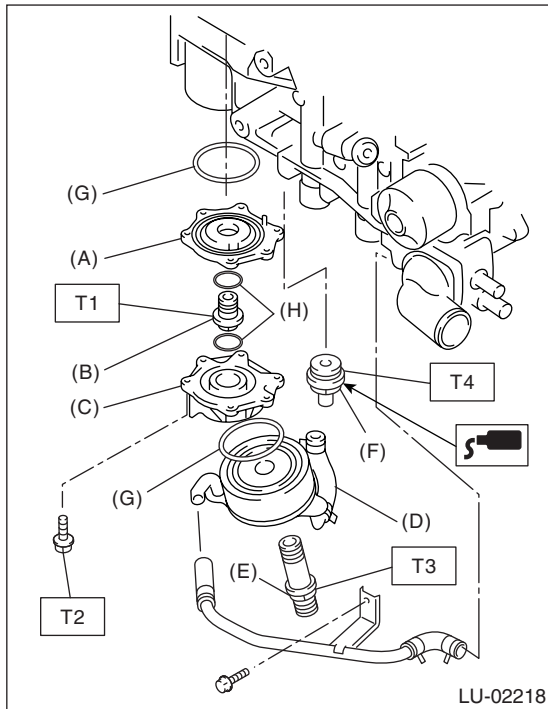
**T4: 69 N·m (7.0 kgf-m, 50.9 ft-lb)**

# Engine Oil Cooler

## LUBRICATION

### NOTE:

Always use new gasket and O-ring.



- (A) Adapter A
- (B) Adapter connector
- (C) Adapter B
- (D) Oil cooler
- (E) Oil cooler connector
- (F) Plug
- (G) Gasket
- (H) O-ring

### C: INSPECTION

- 1) Check the coolant passages are not clogged using air blow method.
- 2) Check the mating surfaces of cylinder block, O-ring groove and oil filter for damage.

## 9. Engine Oil Filter

### A: REMOVAL

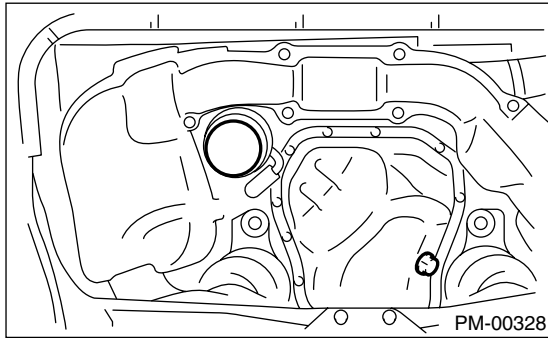
- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Remove the oil filter with ST.

ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))

ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))

#### NOTE:

Standard oil filter is outer diameter of 68 mm (2.68 in). However, SUBARU genuine oil filter having outer diameter of 65 mm (2.56 in) can also be used.



### B: INSTALLATION

- 1) Get a new oil filter and apply a thin coat of engine oil to seal rubber.
- 2) Install the oil filter by turning it by hand, being careful not to damage seal rubber.
  - Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler. If using a torque wrench, tighten it to 14 N·m (1.4 kgf·m, 10.3 ft·lb).
  - Tighten the oil filter 65 mm (2.56 in) in diameter by approx. 2/3 — 3/4 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler. If using a torque wrench, tighten it to 12 N·m (1.2 kgf·m, 8.7 ft·lb).

#### CAUTION:

**Do not tighten excessively, or oil may leak.**

### C: INSPECTION

- 1) After installing the oil filter, run the engine and make sure that no oil is leaking around seal rubber.

#### NOTE:

The filter element and filter case are permanently jointed; therefore, interior cleaning is not necessary.

- 2) Check the engine oil level. <Ref. to LU(H4DOTC)-9, INSPECTION, Engine Oil.>

# Engine Lubrication System Trouble in General

LUBRICATION

## 10.Engine Lubrication System Trouble in General

### A: INSPECTION

Before performing diagnostics, make sure that the engine oil level is correct and no oil leakage exists.

| Symptom                                | Possible cause                           |   | Corrective action  |
|--|--|---|--|
| 1. Warning light remains on.           | 1) Oil pressure switch failure           | Cracked diaphragm or oil leakage within switch                        | Replace.   |
|  |  | Broken spring or seized contacts                                      | Replace.   |
|  | 2) Low oil pressure                      | Clogged oil filter  | Replace.   |
|  |  | Malfunition of oil by-pass valve of oil filter                        | Clean or replace.  |
|  |  | Malfunition of oil relief valve of oil pump                           | Clean or replace.  |
|  |  | Clogged oil passage   | Clean.   |
|  |  | Excessive tip clearance and side clearance of oil pump rotor and gear | Replace.   |
|  |  | Clogged oil strainer or broken pipe                                   | Clean or replace.  |
|  | 3) No oil pressure                       | Shortage of engine oil  | Replenish.   |
|  |  | Broken pipe of oil strainer   | Replace.   |
| Stuck oil pump rotor                   |  | Replace.  |  |
| 2. Warning light does not go on.       | 1) Malfunition of combination meter      |   | Replace.   |
|  | 2) Poor contact of switch contact points |   | Replace.   |
|  | 3) Disconnection of wiring               |   | Repair.  |
| 3. Warning light flickers momentarily. | 1) Poor contact at terminals             |   | Repair.  |
|  | 2) Defective wiring harness              |   | Repair.  |
|  | 3) Low oil pressure                      |   | Check for the same possible causes as listed in 1. — 2). |

# SPEED CONTROL SYSTEMS

# *SP(H4DOTC)*

---

|                              |             |
|------------------------------|-------------|
|                              | <b>Page</b> |
| 1. General Description ..... | 2           |



### 1. General Description

#### A: SPECIFICATION

Specifications for turbo model are the same as SP(H4SO) section. <Ref. to SP(H4SO)-2, General Description.>

# IGNITION

# *IG(H4DOTC)*

---

|  | <b>Page</b> |
|--|-------------|
| 1. General Description .....               | 2           |
| 2. Spark Plug.....                         | 4           |
| 3. Ignition Coil and Ignitor Assembly..... | 7           |



# General Description

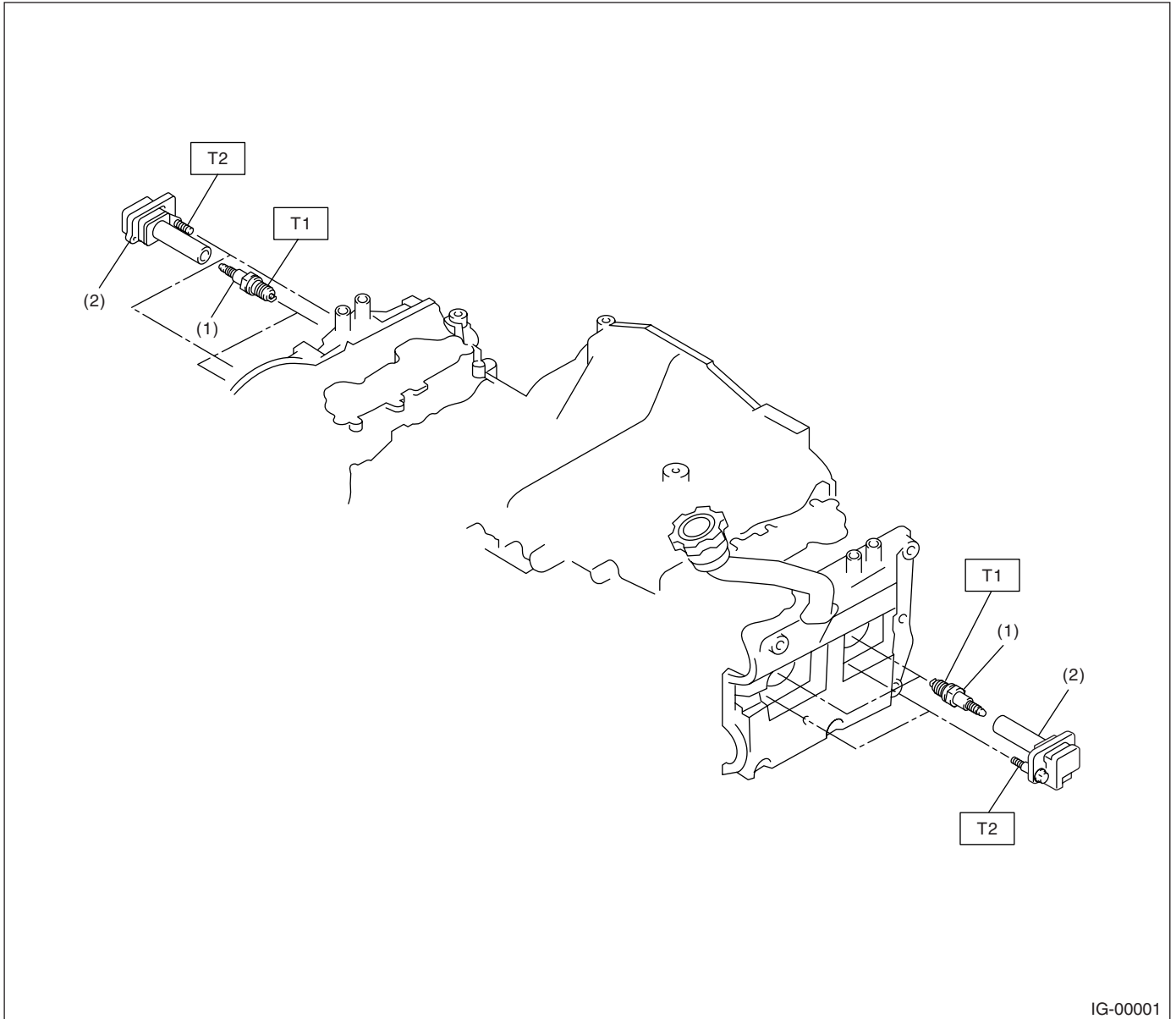
IGNITION

## 1. General Description

### A: SPECIFICATION

| Item                               |  | Designation               |
|------------------------------------|--|---------------------------|
| Ignition coil and ignitor assembly | Model                                    | FK0186                    |
|                                    | Ignition type                            | Direct ignition           |
|                                    | Manufacturer                             | DIAMOND                   |
| Spark plug                         | Type and manufacturer                    | NGK: ILFR6B               |
|                                    | Thread size (diameter, pitch, length) mm | 14, 1.25, 26.5            |
|                                    | Spark plug gap mm (in)                   | 0.7 — 0.8 (0.028 — 0.031) |
|                                    | Electrode                                | Iridium                   |

### B: COMPONENT



IG-00001

- (1) Spark plug
- (2) Ignition coil and ignitor ASSY

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 21 (2.1, 15.2)**

**T2: 16 (1.6, 11.7)**

### **C: CAUTION**

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

# Spark Plug

IGNITION

## 2. Spark Plug

### A: REMOVAL

#### CAUTION:

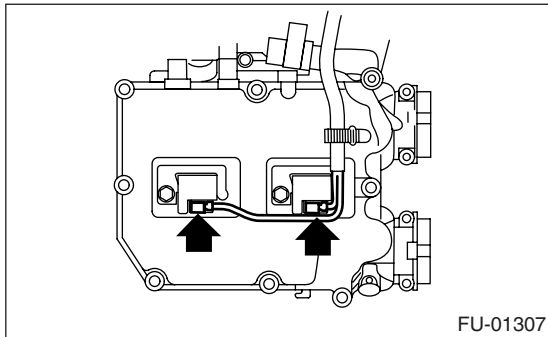
All spark plugs installed on an engine, must be of the same heat range.

*Spark plug:*

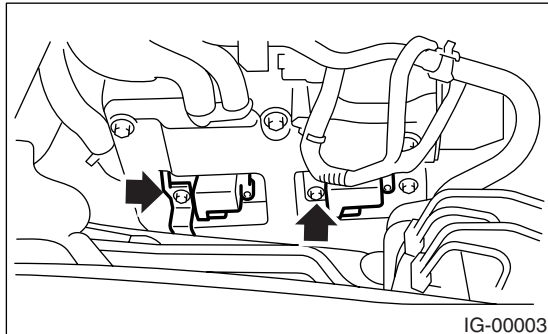
**NGK: ILFR6B**

#### 1. RH SIDE

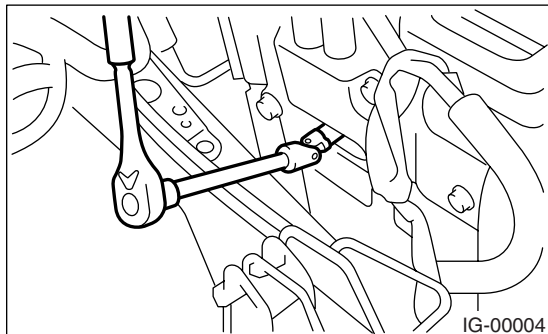
- 1) Disconnect the ground cable from battery.
- 2) Remove the air cleaner lower case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- 3) Disconnect the connector from ignition coil and ignitor assembly.



- 4) Remove the ignition coil and ignitor assembly.

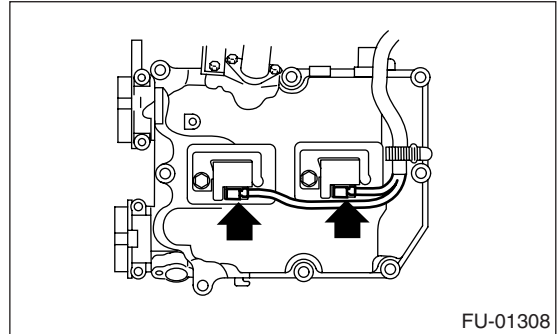


- 5) Remove the spark plugs with the spark plug sockets.

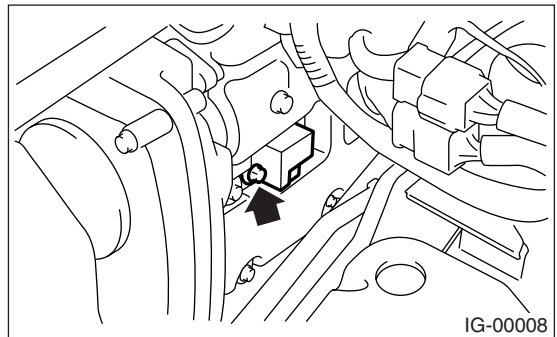


#### 2. LH SIDE

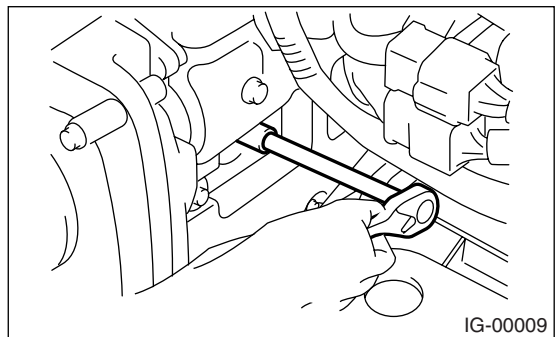
- 1) Remove the battery and battery carrier. <Ref. to SC(H4SO)-20, REMOVAL, Battery.>
- 2) Remove the secondary air pump. <Ref. to EC(H4DOTC)-9, REMOVAL, Secondary Air Pump.>
- 3) Disconnect the connector from ignition coil and ignitor assembly.



- 4) Remove the ignition coil and ignitor assembly.



- 5) Remove the spark plugs with the spark plug sockets.



### B: INSTALLATION

#### 1. RH SIDE

Install in the reverse order of removal.

**Tightening torque (Spark plug):**  
**21 N·m (2.1 kgf-m, 15.2 ft-lb)**

**Tightening torque (Ignition coil and ignitor assembly):**  
**16 N·m (1.6 kgf-m, 11.7 ft-lb)**

**NOTE:**

The above torque should be only applied to new spark plugs without oil on their threads.

In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

**2. LH SIDE**

Install in the reverse order of removal.

**Tightening torque (Spark plug):**

**21 N·m (2.1 kgf·m, 15.2 ft·lb)**

**Tightening torque (Ignition coil and ignitor assembly):**

**16 N·m (1.6 kgf·m, 11.7 ft·lb)**

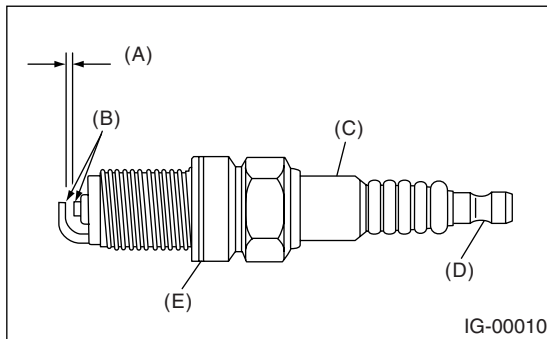
**NOTE:**

The above torque should be only applied to new spark plugs without oil on their threads.

In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

**C: INSPECTION**

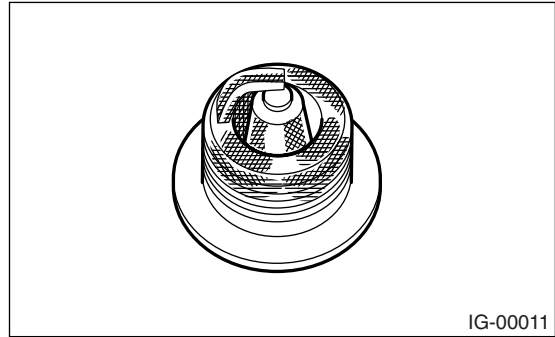
Check the electrodes and inner and outer ceramic insulator of plugs, noting the type of deposits and the degree of electrode erosion.



- (A) Spark plug gap
- (B) Carbon accumulation or wear
- (C) Cracks
- (D) Damage
- (E) Damaged gasket

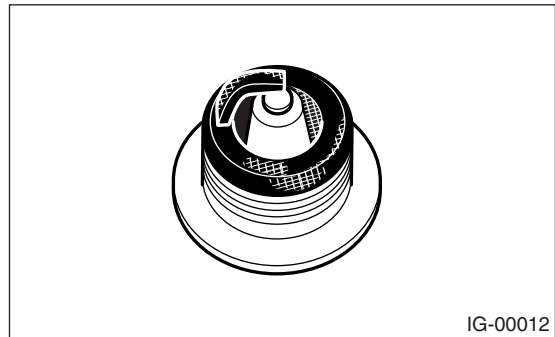
**1) Normal:**

Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.



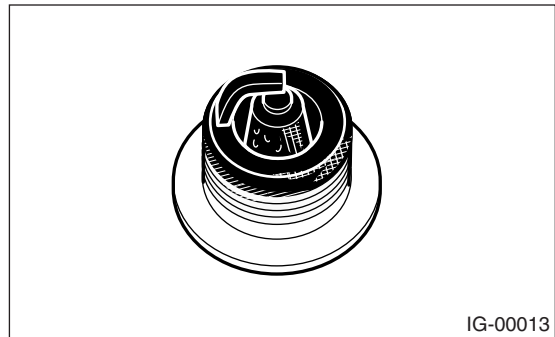
**2) Carbon fouled:**

Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture and dirty air cleaner, etc.



**3) Oil fouled:**

Wet black deposits show oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems.



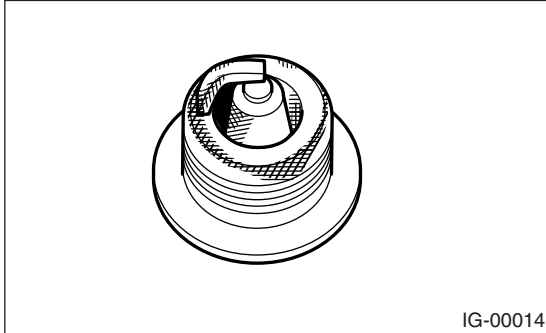
# Spark Plug

## IGNITION

---

### 4) Overheating:

White or light gray insulator with black or brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc.



## D: ADJUSTMENT

Clean the spark plugs with a wire brush. Clean and remove the carbon or oxide deposits, but do not wear away ceramic insulator.

If deposits are too stubborn, replace the plugs.

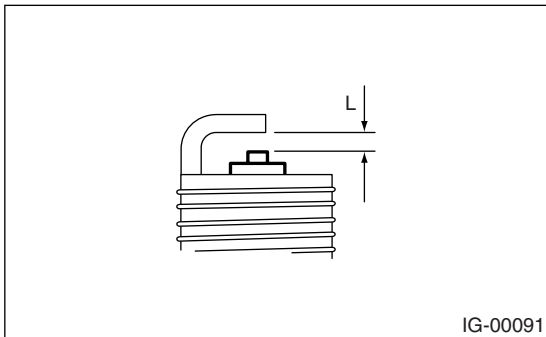
After cleaning the spark plugs, correct the spark plug gap using a gap gauge.

### NOTE:

Do not use spark plug cleaners, because the spark plugs are applied with iridium tips.

### **Spark plug gap L:**

**0.7 — 0.8 mm (0.028 — 0.031 in)**



## 3. Ignition Coil and Ignitor Assembly

### A: REMOVAL

Direct ignition type has been adopted. Refer to the "Spark Plug Removal" for removal procedure. <Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.>

### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

**16 N·m (1.6 kgf-m, 11.7 ft-lb)**

### C: INSPECTION

For inspection, refer to the following. <Ref. to EN(H4DOTC)(diag)-68, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

# Ignition Coil and Ignitor Assembly

IGNITION

---

# STARTING/CHARGING SYSTEMS

# *SC(H4DOTC)*

---

|                              | Page |
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| 1. General Description ..... | 2    |





### 1. General Description

#### A: SPECIFICATION

Specifications for Turbo model are included in SC (H4SO) section. <Ref. to SC(H4SO)-2, General Description.>

# ENGINE (DIAGNOSTICS)

# *EN(H4DOTC)(diag)*

---

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# Basic Diagnostic Procedure

ENGINE (DIAGNOSTICS)

## 1. Basic Diagnostic Procedure

### A: PROCEDURE

#### 1. ENGINE

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <b>1 CHECK ENGINE START FAILURE.</b><br>1) Ask the customer when and how trouble occurred using the interview check list. <Ref. to EN(H4DOTC)(diag)-3, CHECK, Check List for Interview.><br>2) Start the engine.   | Does the engine start?  | Go to step 2.   | Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H4DOTC)(diag)-62, Diagnostics for Engine Start-ing Failure.>   |
| <b>2 CHECK ILLUMINATION OF MALFUNCTION INDICATOR LIGHT.</b>  | Does the malfunction indicator light illuminate?                  | Go to step 3.   | Inspection using "General Diagnostics Table". <Ref. to EN(H4DOTC)(diag)-394, General Diagnostic Table.>   |
| <b>3 CHECK INDICATION OF DTC ON DISPLAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the Subaru Select Monitor or general scan tool to data link connector.<br>3) Turn the ignition switch to ON and the Subaru Select Monitor or general scan tool power switch to ON.<br>4) Read the DTC on Subaru Select Monitor or general scan tool. | Does the Subaru Select Monitor or general scan tool indicate DTC? | Record the DTC code. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> Go to step 4.                                | Repair the related parts.<br>NOTE:<br>If a DTC is not shown on display although malfunction indicator light illuminates, perform diagnostics of malfunction indicator light circuit or combination meter. <Ref. to EN(H4DOTC)(diag)-53, Malfunction Indicator Light.> |
| <b>4 PERFORM THE DIAGNOSIS.</b><br>1) Perform the clear memory mode. <Ref. to EN(H4DOTC)(diag)-50, Clear Memory Mode.><br>2) Perform the inspection mode. <Ref. to EN(H4DOTC)(diag)-40, Inspection Mode.>  | Does the Subaru Select Monitor or general scan tool indicate DTC? | Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-82, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> | Complete the diagnosis.   |

# Check List for Interview

ENGINE (DIAGNOSTICS)

## 2. Check List for Interview

### A: CHECK

#### 1. CHECK LIST No. 1

Check the following items when problem has occurred.

NOTE:

Use copies of this page for interviewing customers.

|                     |   |                  |  |
|---------------------|---|------------------|--|
| Customer's name     |   | Engine No.       |  |
| Date of sale        |   | Fuel brand       |  |
| Date of repair      |   | Odometer reading | km   |
| VIN                 |   |                  | miles  |
| Weather             | <input type="checkbox"/> Fine<br><input type="checkbox"/> Cloudy<br><input type="checkbox"/> Rainy<br><input type="checkbox"/> Snowy<br><input type="checkbox"/> Various/Others:  |                  |  |
| Outdoor temperature | °C (°F)   |                  |  |
|                     | <input type="checkbox"/> Hot<br><input type="checkbox"/> Warm<br><input type="checkbox"/> Cool<br><input type="checkbox"/> Cold   |                  |  |
| Place               | <input type="checkbox"/> Highway<br><input type="checkbox"/> Suburbs<br><input type="checkbox"/> Inner city<br><input type="checkbox"/> Uphill<br><input type="checkbox"/> Downhill<br><input type="checkbox"/> Rough road<br><input type="checkbox"/> Others:  |                  |  |
| Engine temperature  | <input type="checkbox"/> Cold<br><input type="checkbox"/> Warming-up<br><input type="checkbox"/> After warming-up<br><input type="checkbox"/> Any temperature<br><input type="checkbox"/> Others:   |                  |  |
| Engine speed        | rpm   |                  |  |
| Vehicle speed       | MPH   |                  |  |
| Driving conditions  | <input type="checkbox"/> Not affected<br><input type="checkbox"/> At starting<br><input type="checkbox"/> While idling<br><input type="checkbox"/> At racing<br><input type="checkbox"/> While accelerating<br><input type="checkbox"/> While cruising<br><input type="checkbox"/> While decelerating<br><input type="checkbox"/> While turning (RH/LH) |                  |  |
| Headlight           | <input type="checkbox"/> ON / <input type="checkbox"/> OFF  | Rear defogger    | <input type="checkbox"/> ON / <input type="checkbox"/> OFF |
| Blower              | <input type="checkbox"/> ON / <input type="checkbox"/> OFF  | Radio            | <input type="checkbox"/> ON / <input type="checkbox"/> OFF |
| A/C compressor      | <input type="checkbox"/> ON / <input type="checkbox"/> OFF  | CD/Cassette      | <input type="checkbox"/> ON / <input type="checkbox"/> OFF |
| Cooling fan         | <input type="checkbox"/> ON / <input type="checkbox"/> OFF  | Car phone        | <input type="checkbox"/> ON / <input type="checkbox"/> OFF |
| Front wiper         | <input type="checkbox"/> ON / <input type="checkbox"/> OFF  | CB               | <input type="checkbox"/> ON / <input type="checkbox"/> OFF |
| Rear wiper          | <input type="checkbox"/> ON / <input type="checkbox"/> OFF  |                  |  |

# Check List for Interview

ENGINE (DIAGNOSTICS)

---

## 2. CHECK LIST No. 2

Check the following items about the vehicle's state when malfunction indicator light turns on.

NOTE:

Use copies of this page for interviewing customers.

|  |
|--|
| a) Other warning lights or indicators turn on. <input type="checkbox"/> Yes / <input type="checkbox"/> No  |
| <input type="checkbox"/> Low fuel warning light<br><input type="checkbox"/> Charge indicator light<br><input type="checkbox"/> AT diagnostics indicator light<br><input type="checkbox"/> ABS warning light<br><input type="checkbox"/> Engine oil pressure warning light  |
| b) Fuel level  |
| <ul style="list-style-type: none"><li>• Lack of gasoline: <input type="checkbox"/> Yes / <input type="checkbox"/> No</li><li>• Indicator position of fuel gauge:</li><li>• Experienced running out of fuel: <input type="checkbox"/> Yes / <input type="checkbox"/> No</li></ul>   |
| c) Intentional connecting or disconnecting of harness connectors or spark plug cords: <input type="checkbox"/> Yes / <input type="checkbox"/> No   |
| <ul style="list-style-type: none"><li>• What:</li></ul>  |
| d) Intentional connecting or disconnecting of hoses: <input type="checkbox"/> Yes / <input type="checkbox"/> No  |
| <ul style="list-style-type: none"><li>• What:</li></ul>  |
| e) Installing of parts other than genuine parts: <input type="checkbox"/> Yes / <input type="checkbox"/> No  |
| <ul style="list-style-type: none"><li>• What:</li><li>• Where:</li></ul>   |
| f) Occurrence of noise: <input type="checkbox"/> Yes / <input type="checkbox"/> No   |
| <ul style="list-style-type: none"><li>• From where:</li><li>• What kind:</li></ul>   |
| g) Occurrence of smell: <input type="checkbox"/> Yes / <input type="checkbox"/> No   |
| <ul style="list-style-type: none"><li>• From where:</li><li>• What kind:</li></ul>   |
| h) Intrusion of water into engine compartment or passenger compartment: <input type="checkbox"/> Yes / <input type="checkbox"/> No   |
| i) Troubles occurred   |
| <input type="checkbox"/> Engine does not start.<br><input type="checkbox"/> Engine stalls during idling.<br><input type="checkbox"/> Engine stalls while driving.<br><input type="checkbox"/> Engine speed decreases.<br><input type="checkbox"/> Engine speed does not decrease.<br><input type="checkbox"/> Rough idling<br><input type="checkbox"/> Poor acceleration<br><input type="checkbox"/> Back fire<br><input type="checkbox"/> After fire<br><input type="checkbox"/> No shift<br><input type="checkbox"/> Excessive shift shock |

## 3. General Description

### A: CAUTION

1) Airbag system wiring harness is routed near the ECM, main relay and fuel pump relay.

#### CAUTION:

- Airbag system connectors are colored yellow. Do not use the electrical test equipment on these circuit.
- Be careful not to damage the airbag system wiring harness when servicing the ECM, TCM, main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.

- The ECM will be destroyed instantly.
- The fuel injector and other part will be damaged in just a few minutes more.

3) Do not disconnect the battery cables while the engine is running.

A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn the ignition switch to OFF.

5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Before removing the ECM from located position, disconnect two cables on battery.

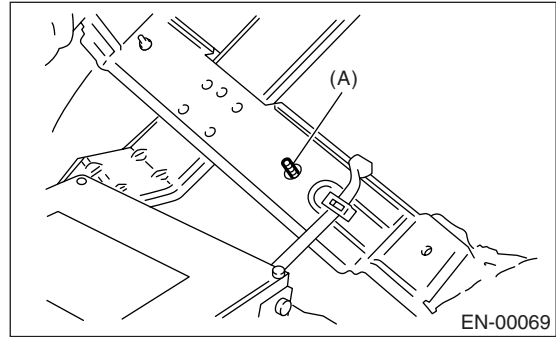
Otherwise, the ECM may be damaged.

#### CAUTION:

**When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on the fuel injection system.**

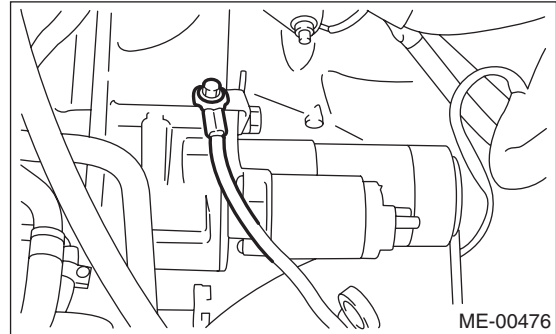
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use the ECM mounting stud bolt at the body head grounding points when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

9) Use the engine grounding terminal or engine proper as the grounding point to the body, when measuring voltage and resistance in the engine compartment.



10) Every MFI-related part is a precision part. Do not drop them.

11) Observe the following cautions when installing a radio in MFI equipped models.

#### CAUTION:

- The antenna must be kept as far apart as possible from the control unit.

(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)

- The antenna feeder must be placed as far as possible from ECM and MFI harness.
- Carefully adjust the antenna for correct matching.
- When mounting a large power type radio, pay special attention to the three items above mentioned.
- Incorrect installation of the radio may affect the operation of ECM.

12) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than 5 seconds to release pressure in the fuel system. If the engine starts during this operation, run it until it stops.

# General Description

## ENGINE (DIAGNOSTICS)

13) On model with ABS, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis system.

### B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

#### 1. BATTERY

1) Measure the battery voltage and specific gravity of electrolyte.

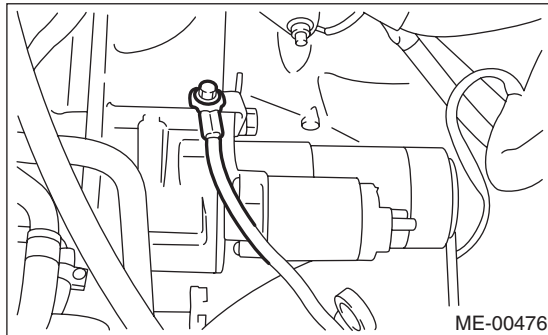
**Standard voltage: 12 V**

**Specific gravity: Above 1.260**

2) Check the condition of main and other fuses, and harnesses and connectors. Also check for proper grounding.

#### 2. ENGINE GROUNDING

Make sure the engine grounding terminal is properly connected to engine.



### C: NOTE

#### 1. DESCRIPTION

- The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. Malfunction indicator light in the combination meter indicates occurrence of a fault or trouble.
- Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
- The OBD system incorporated with the vehicles within this engine family complies with OBD-II Regulations. The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.
- When the system decides that a malfunction occurs, malfunction indicator light illuminates. At the same time of the malfunction indicator light illumi-

nation or blinking, a DTC and a freeze frame engine conditions are stored into on-board computer.

- The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
- If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
- When the malfunction does not occur again for three consecutive driving cycles, malfunction indicator light is turned off, but DTC remains at on-board computer.
- When troubleshooting the vehicle which complies with OBD-II Regulations, connect the Subaru Select Monitor or general scan tool to the vehicle.

#### 2. ENGINE AND EMISSION CONTROL SYSTEM

- The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.

With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.

- Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.

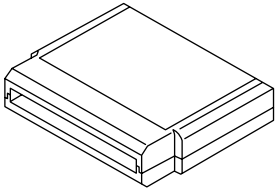

The MFI system also has the following features:

- Reduced emission of harmful exhaust gases.
- Reduced in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

# General Description

ENGINE (DIAGNOSTICS)

## D: PREPARATION TOOL

| ILLUSTRATION  | TOOL NUMBER                        | DESCRIPTION                  | REMARKS                                 |
|---|------------------------------------|------------------------------|---|
| <br>ST18482AA010 | 18482AA010<br>(Newly adopted tool) | CARTRIDGE                    | Troubleshooting for electrical systems. |
| <br>ST22771AA030 | 22771AA030                         | SUBARU SELECT<br>MONITOR KIT | Troubleshooting for electrical systems. |



# Electrical Component Location

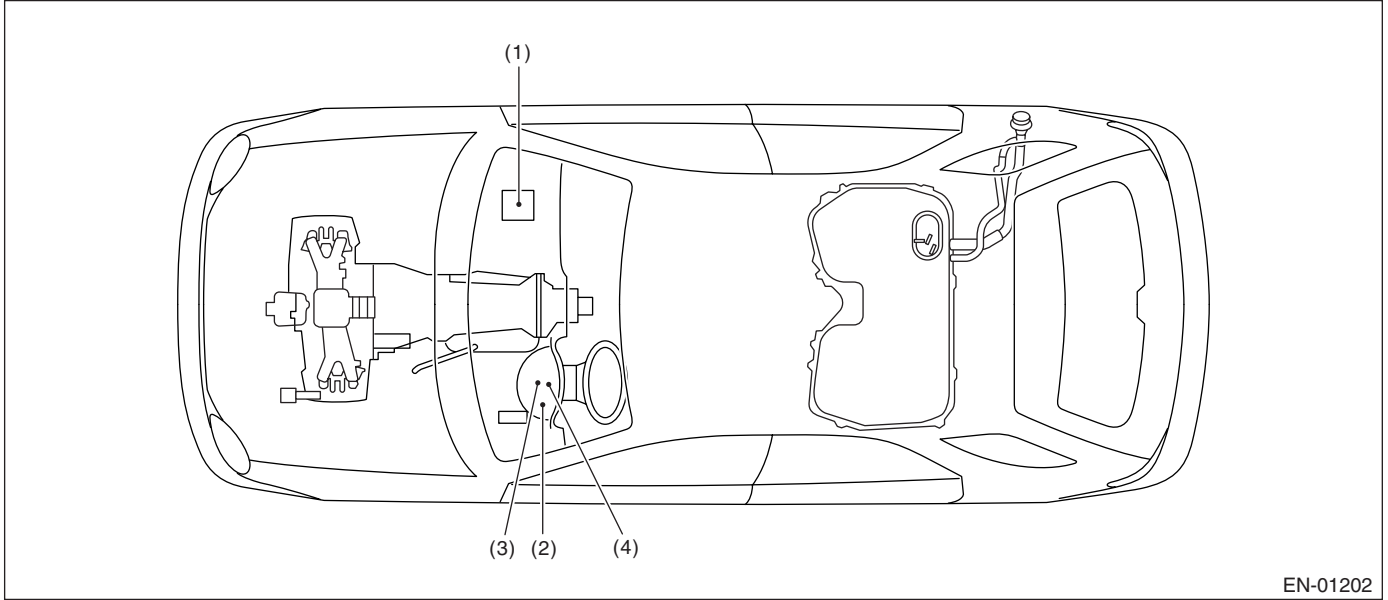
ENGINE (DIAGNOSTICS)

## 4. Electrical Component Location

### A: LOCATION

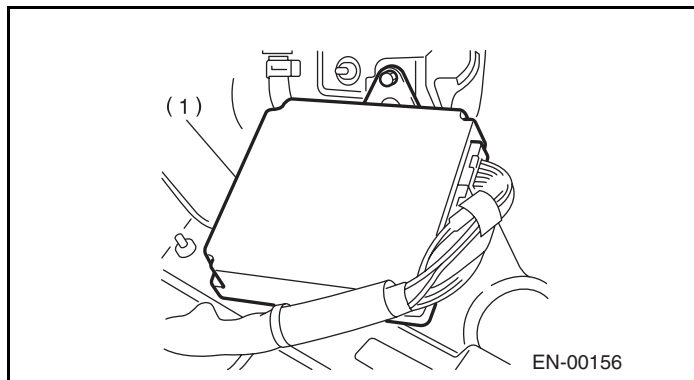
#### 1. ENGINE

##### • Module

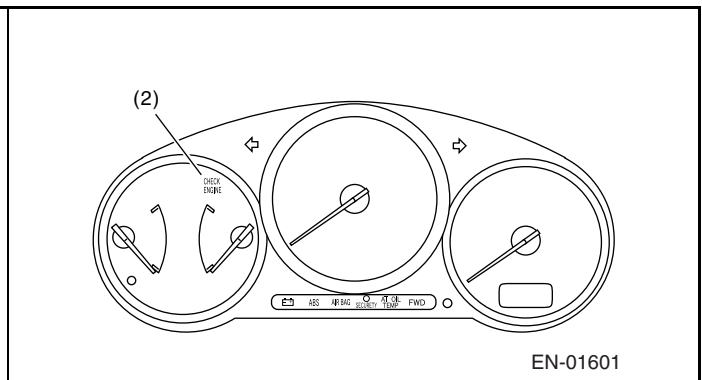


EN-01202

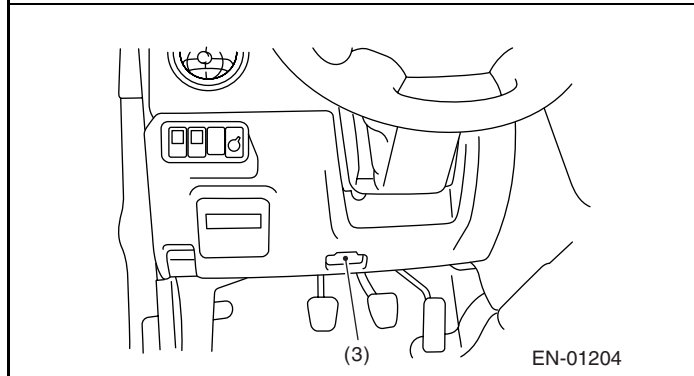
- (1) Engine control module (ECM)
- (2) Malfunction indicator light
- (3) Data link connector
- (4) Test mode connector



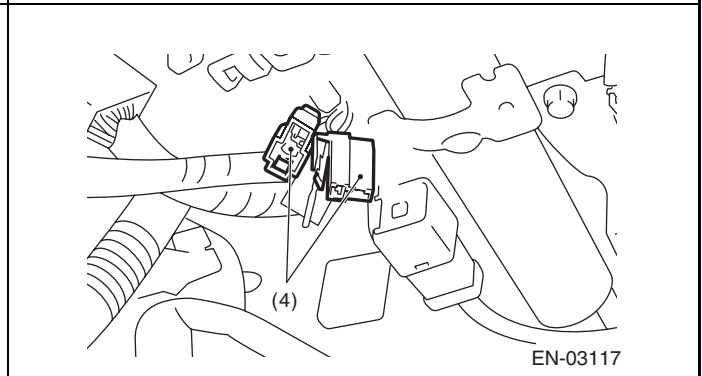
EN-00156



EN-01601

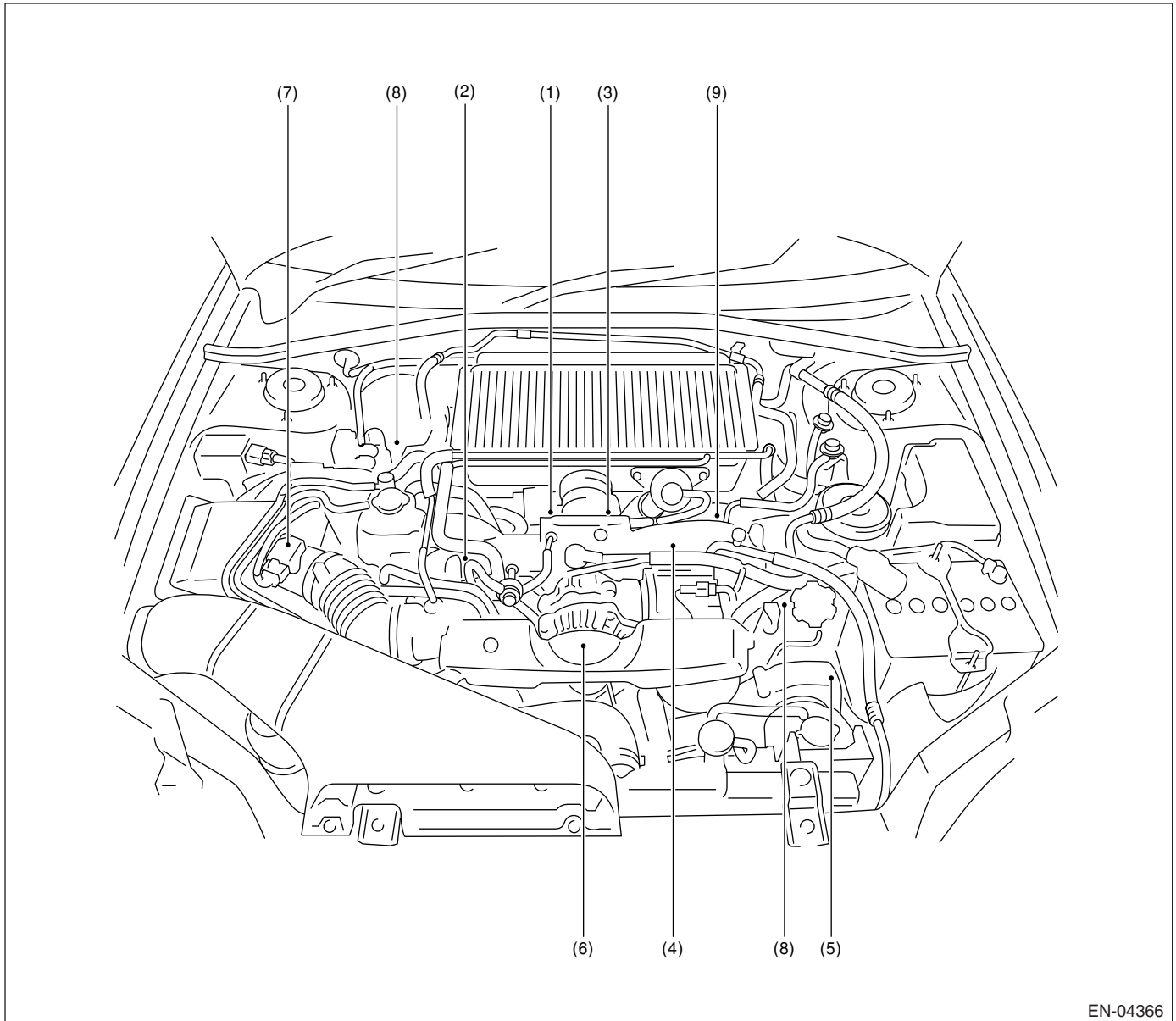


EN-01204



EN-03117

## • Sensor

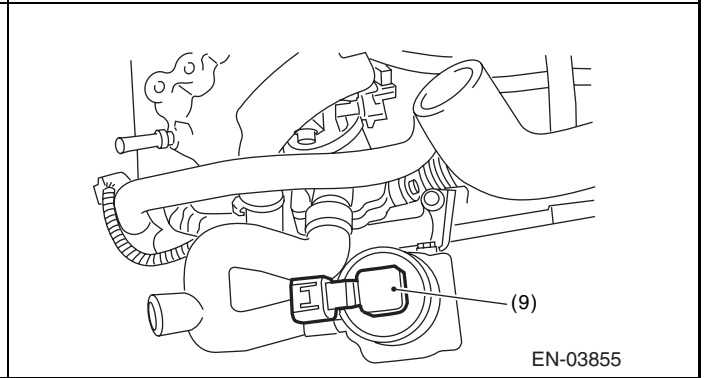
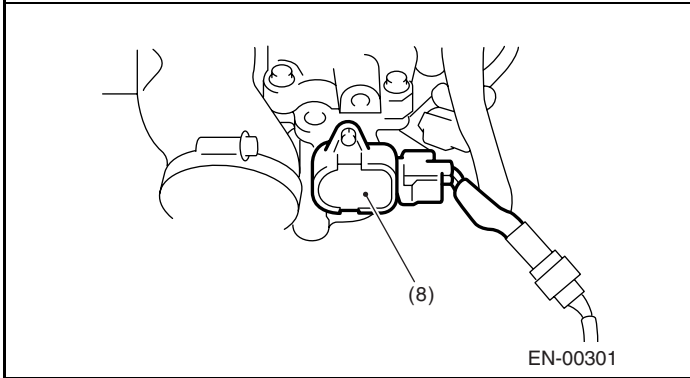
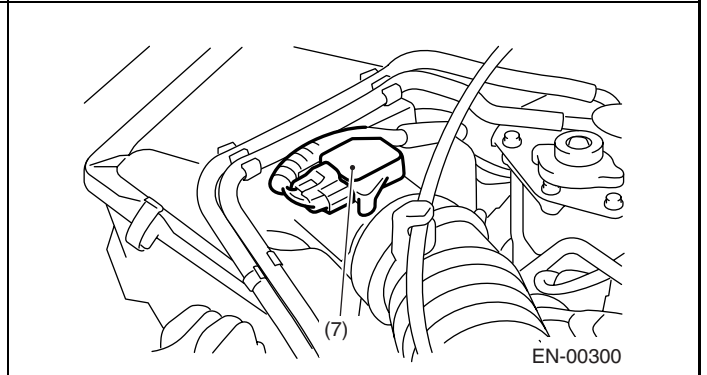
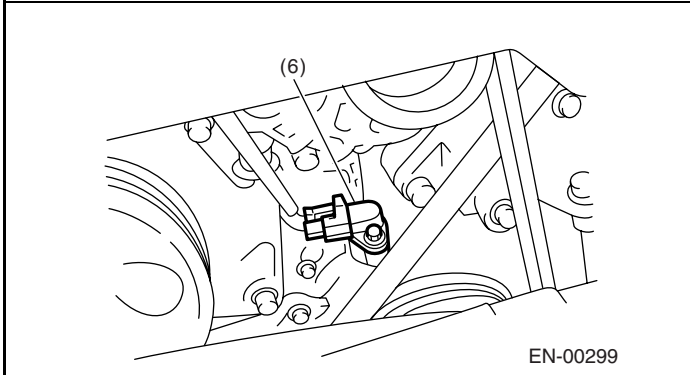
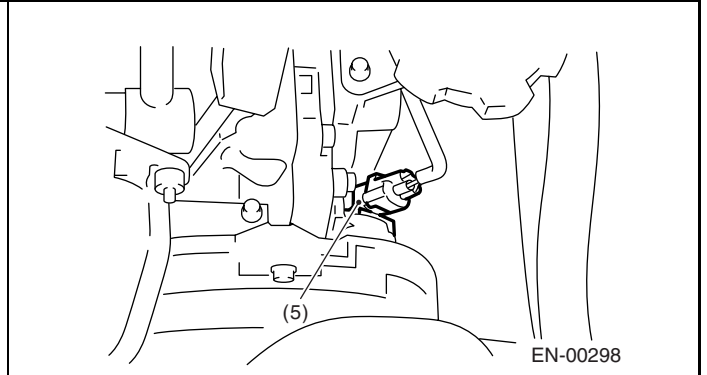
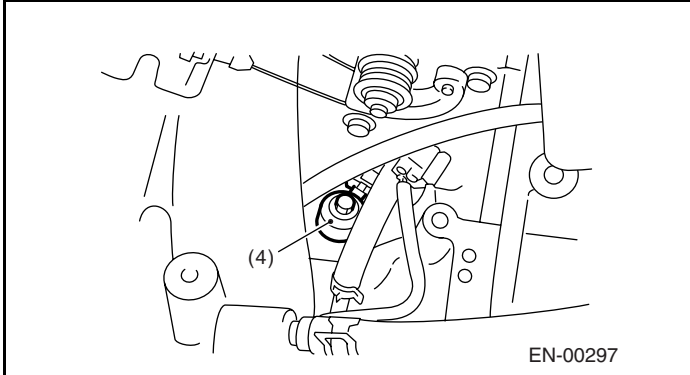
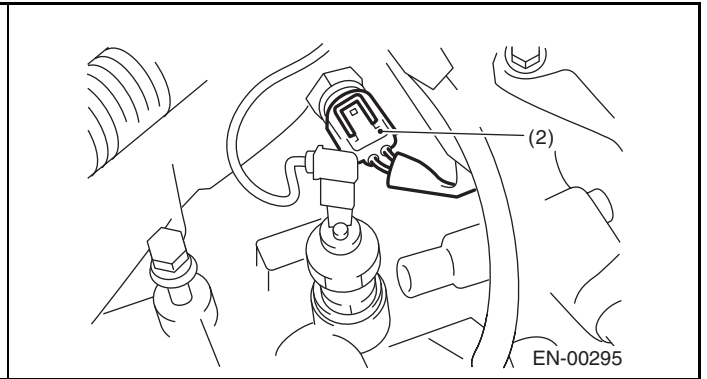
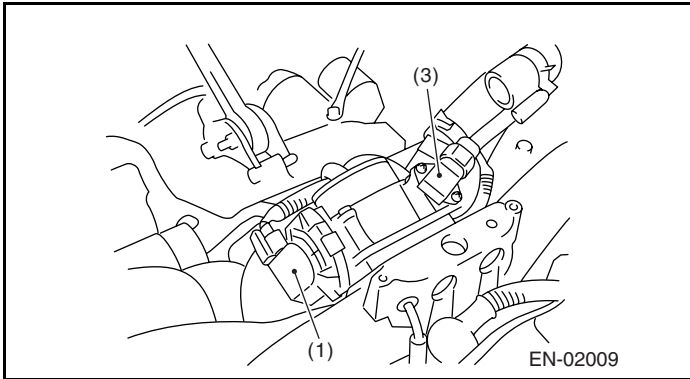


EN-04366

- |                                       |   |  |
|---------------------------------------|---|--|
| (1) Electronic throttle control       | (5) Camshaft position sensor                        | (8) Tumble generator valve position sensor |
| (2) Engine coolant temperature sensor | (6) Crankshaft position sensor                      | (9) Secondary air pressure sensor          |
| (3) Manifold absolute pressure sensor | (7) Mass air flow and intake air temperature sensor |  |
| (4) Knock sensor                      |   |  |

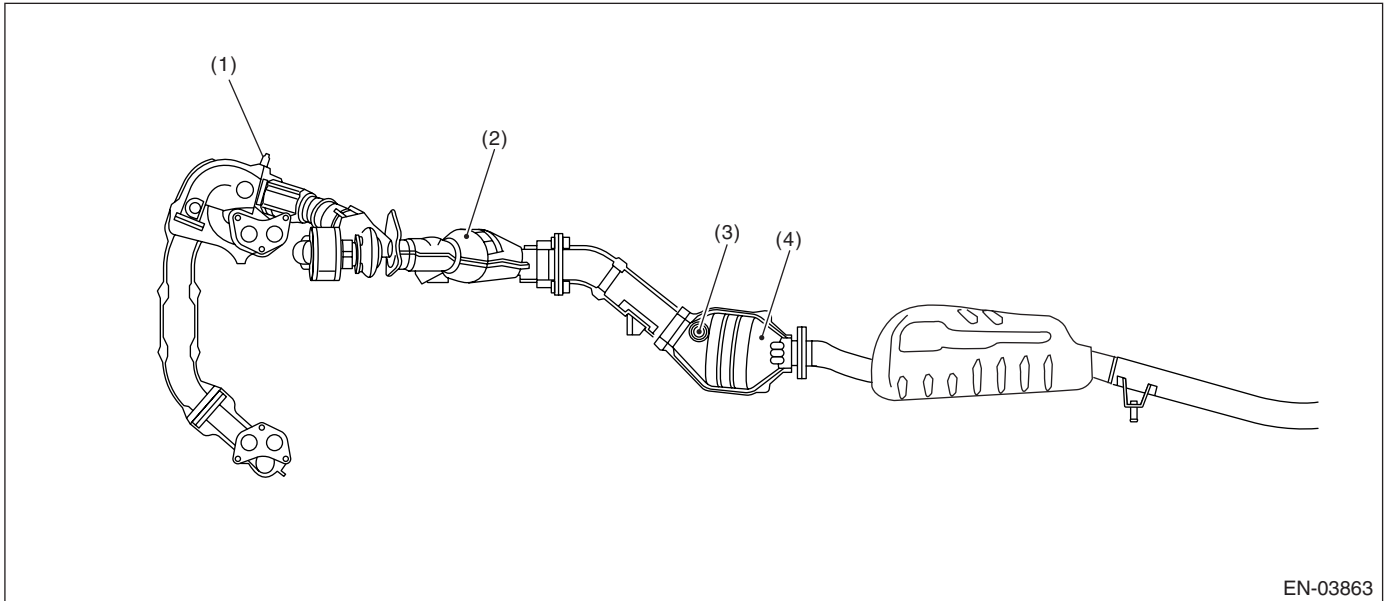
# Electrical Component Location

ENGINE (DIAGNOSTICS)



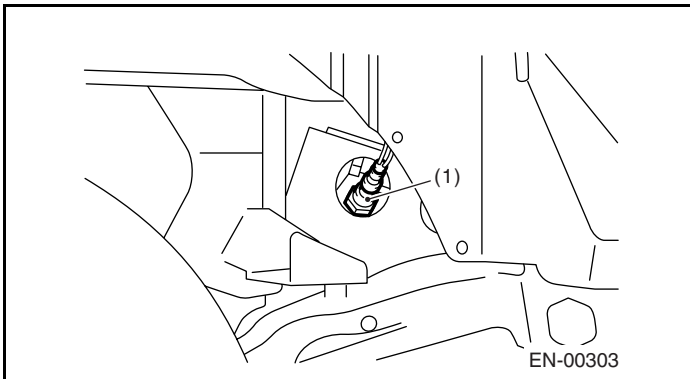
# Electrical Component Location

ENGINE (DIAGNOSTICS)

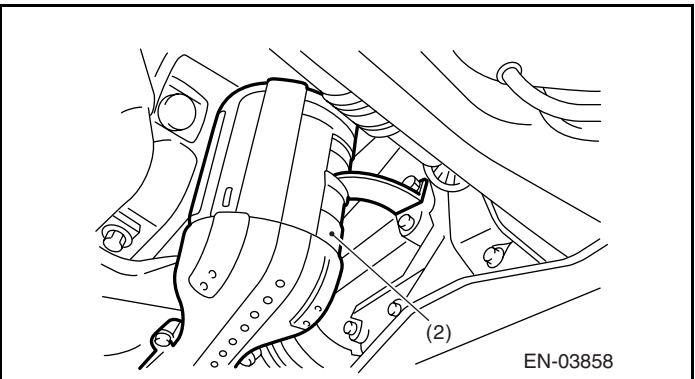


EN-03863

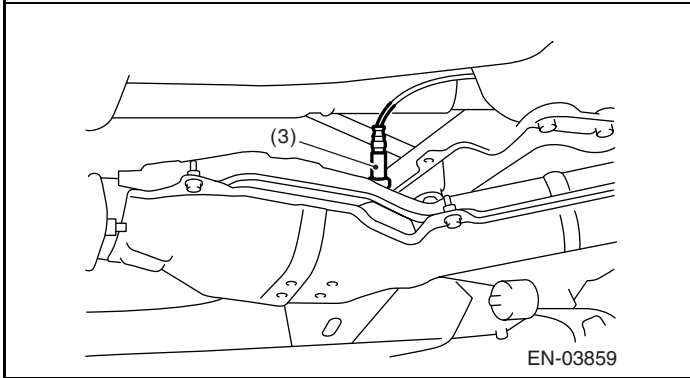
- |                               |                              |
|-------------------------------|------------------------------|
| (1) Front oxygen (A/F) sensor | (3) Rear oxygen sensor       |
| (2) Front catalytic converter | (4) Rear catalytic converter |



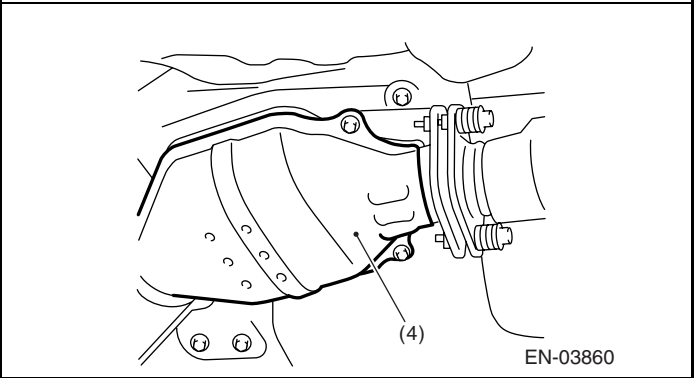
EN-00303



EN-03858



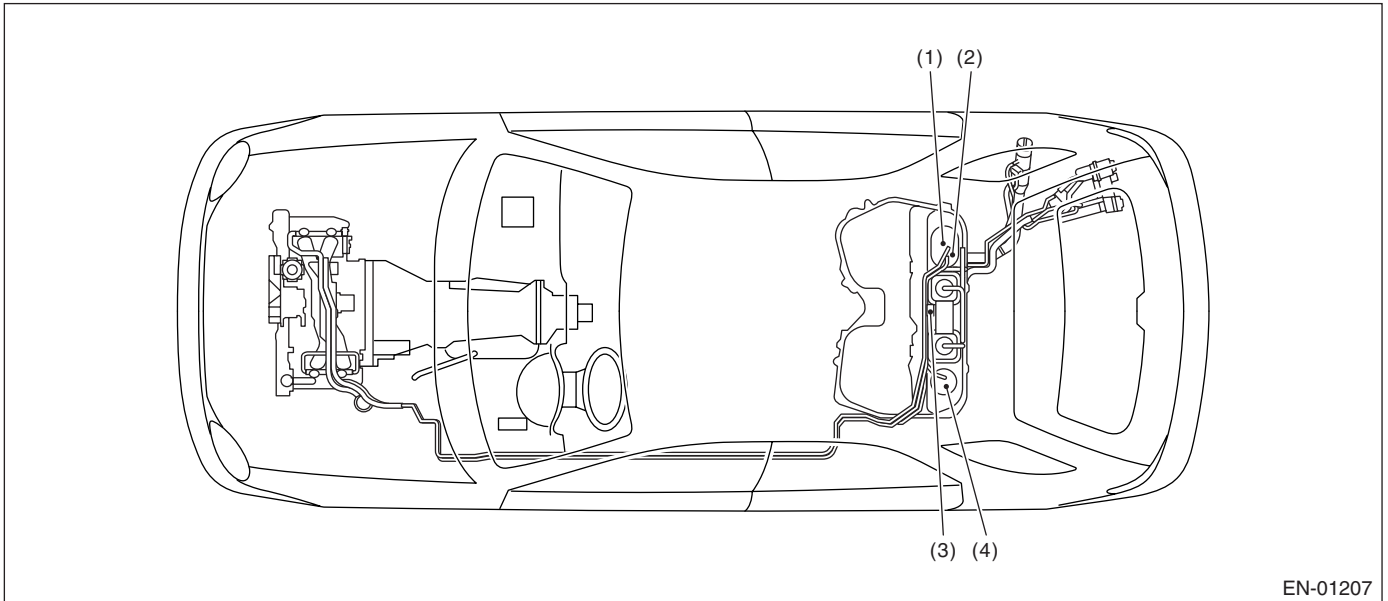
EN-03859



EN-03860

# Electrical Component Location

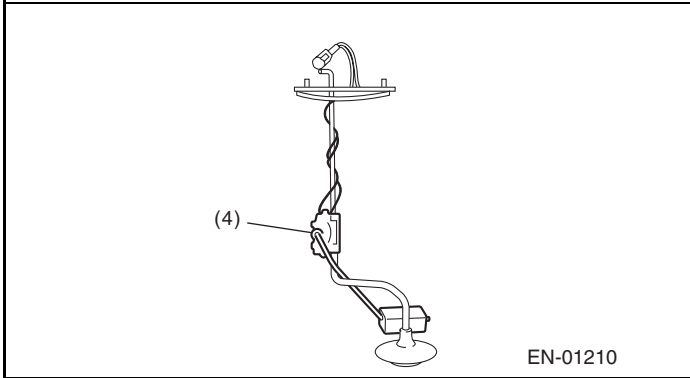
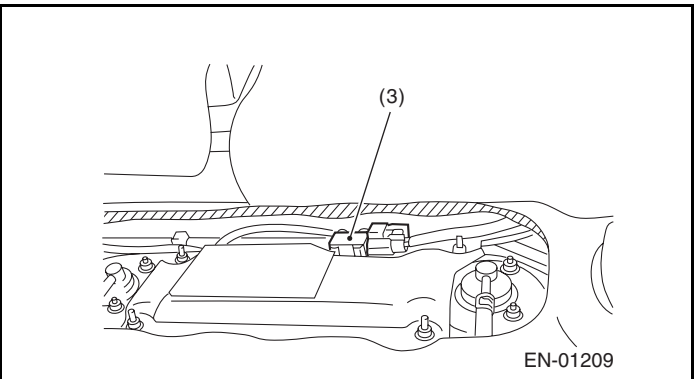
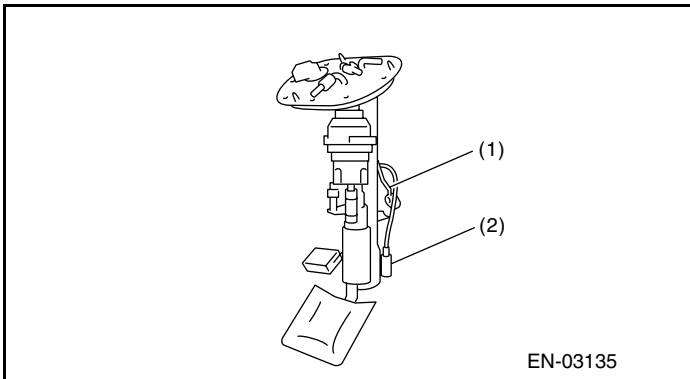
ENGINE (DIAGNOSTICS)



- (1) Fuel level sensor
- (2) Fuel temperature sensor

- (3) Fuel tank pressure sensor

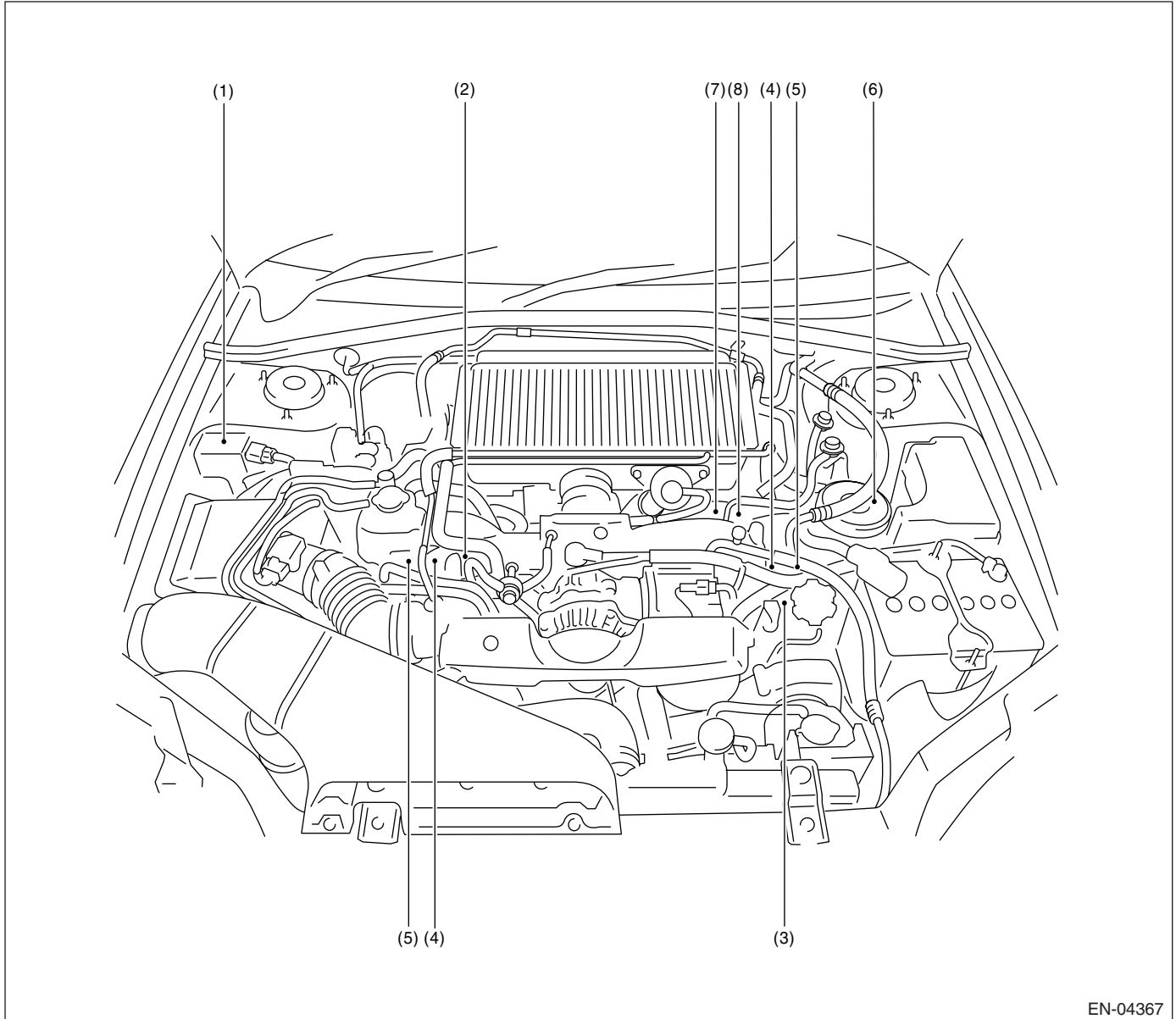
- (4) Fuel sub level sensor



# Electrical Component Location

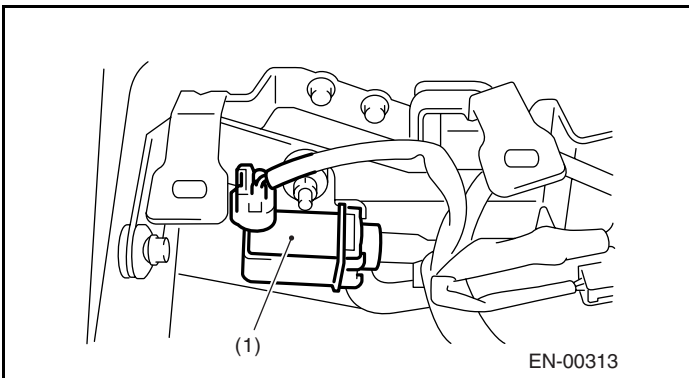
ENGINE (DIAGNOSTICS)

## • Solenoid Valve, Actuator, Emission Control System Parts and Ignition System Parts

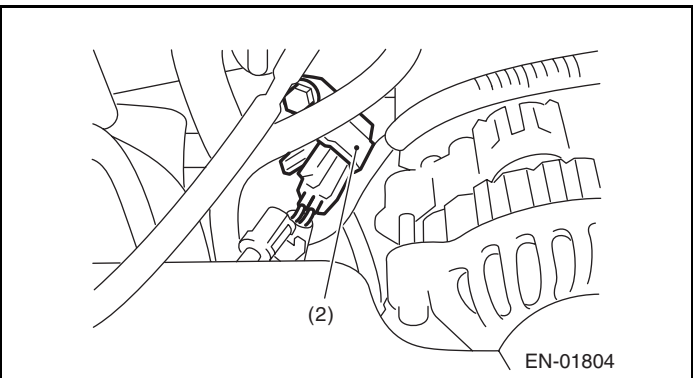


EN-04367

- |                                      |                                     |                                    |
|--------------------------------------|-------------------------------------|------------------------------------|
| (1) Wastegate control solenoid valve | (4) Tumble generator valve actuator | (7) Secondary air combi valve (RH) |
| (2) Purge control solenoid valve     | (5) Oil flow control solenoid valve | (8) Secondary air combi valve (LH) |
| (3) Ignition coil and ignitor ASSY   | (6) Secondary air pump              |                                    |



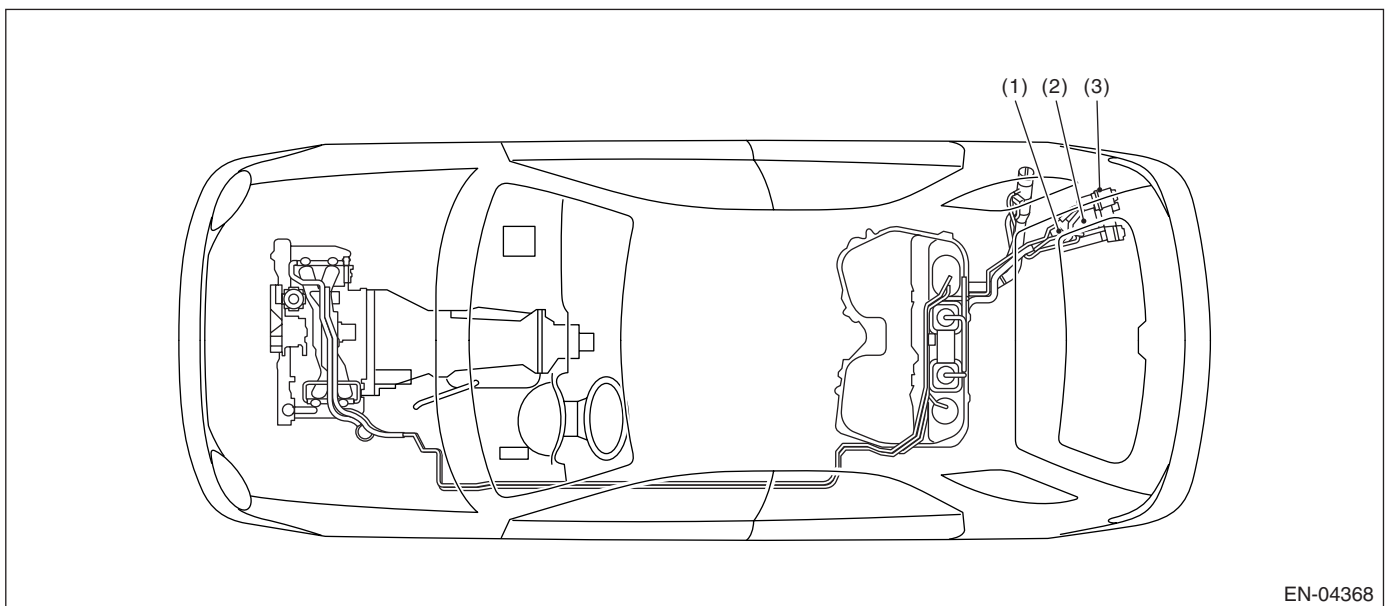
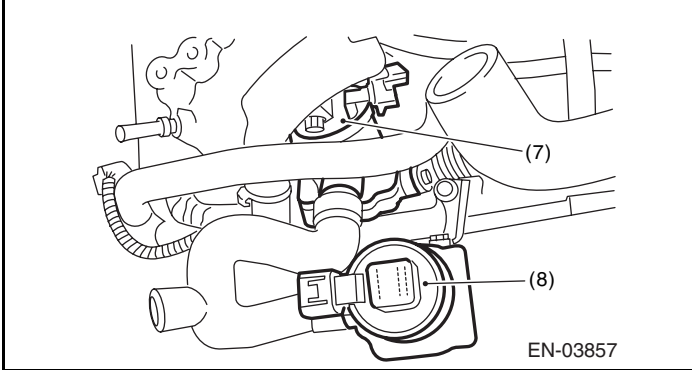
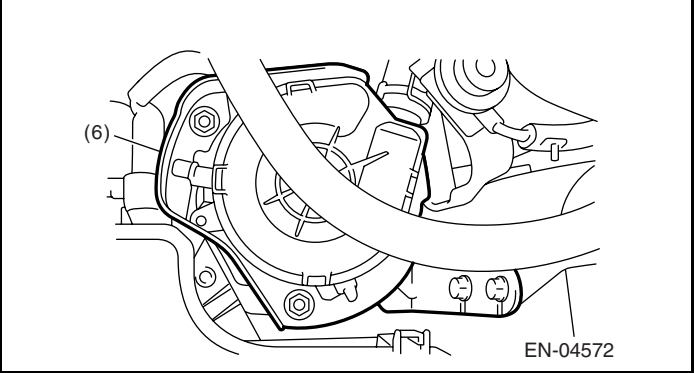
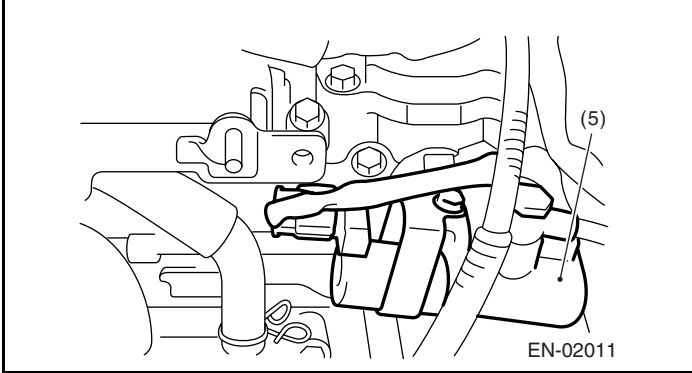
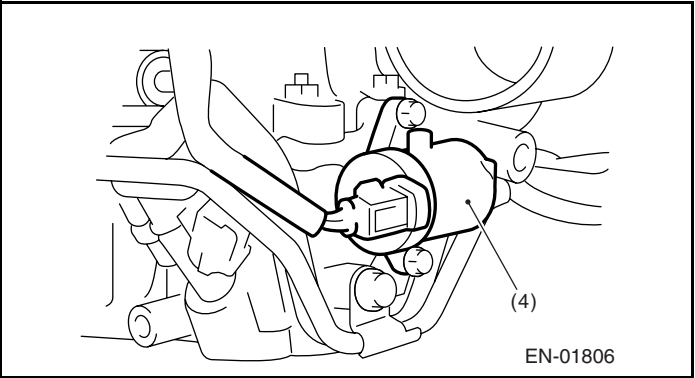
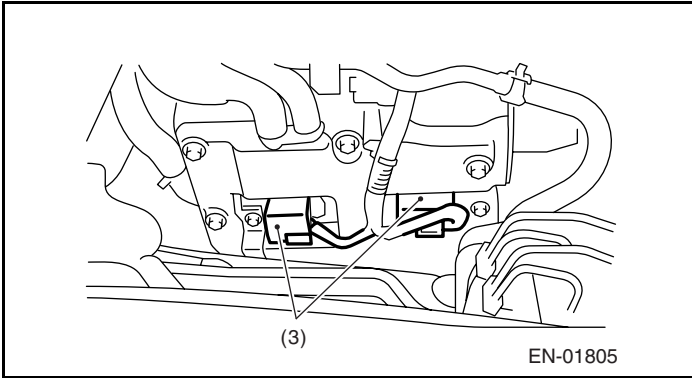
EN-00313



EN-01804

# Electrical Component Location

ENGINE (DIAGNOSTICS)



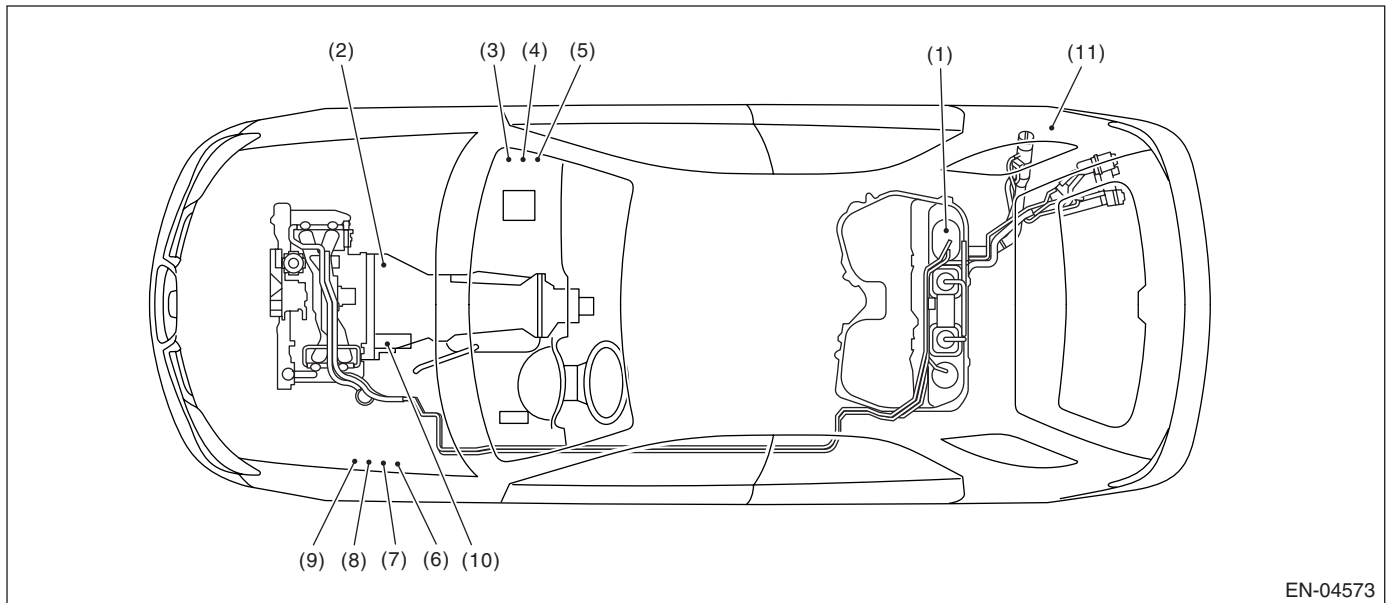
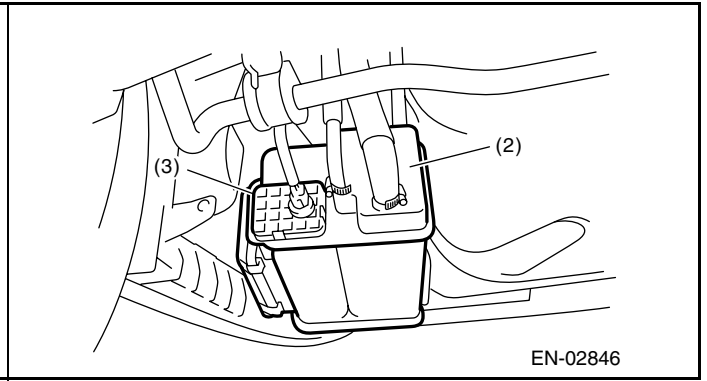
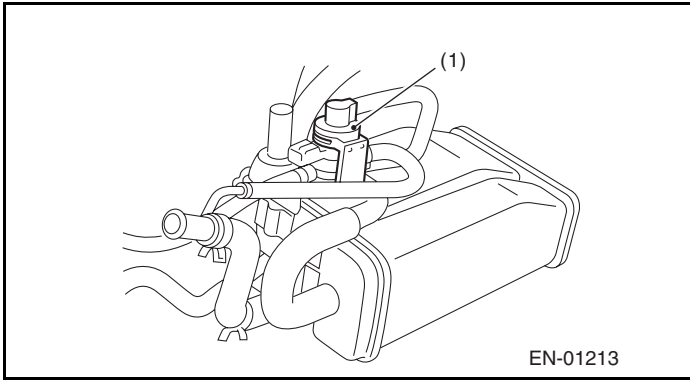
(1) Pressure control solenoid valve

(2) Canister

(3) Drain valve

# Electrical Component Location

ENGINE (DIAGNOSTICS)

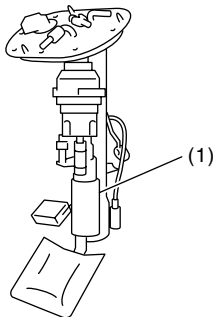
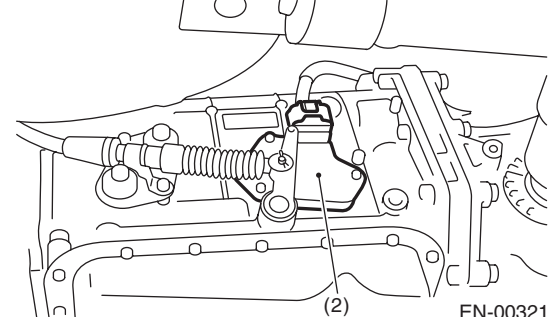
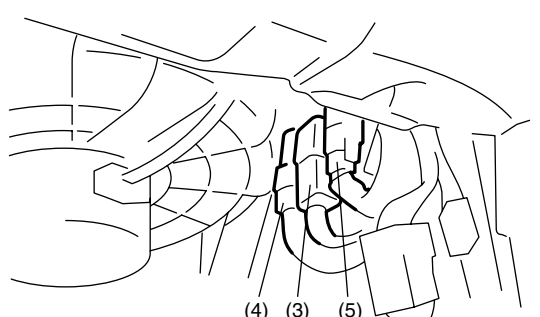
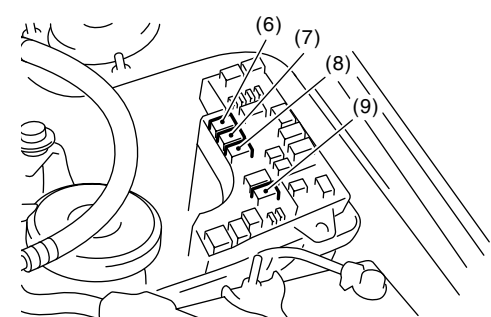
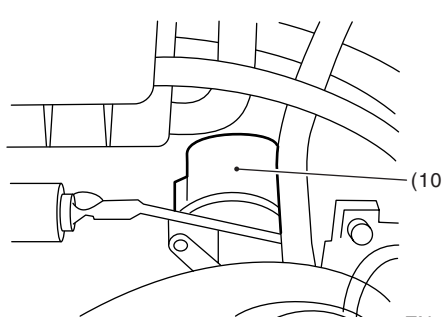
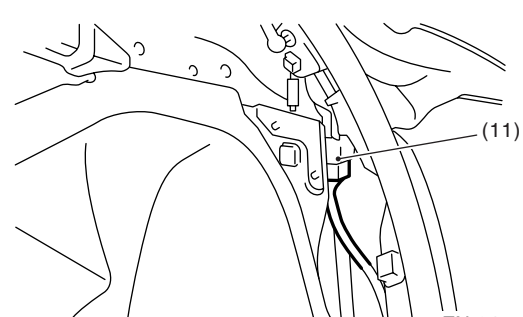


- |                      |                                       |                              |
|----------------------|---------------------------------------|------------------------------|
| (1) Fuel pump        | (5) Electronic throttle control relay | (9) Radiator sub fan relay 2 |
| (2) Inhibitor switch | (6) Radiator main fan relay 1         | (10) Starter                 |
| (3) Main relay       | (7) Radiator main fan relay 2         | (11) Fuel pump control unit  |
| (4) Fuel pump relay  | (8) Radiator sub fan relay 1          |                              |



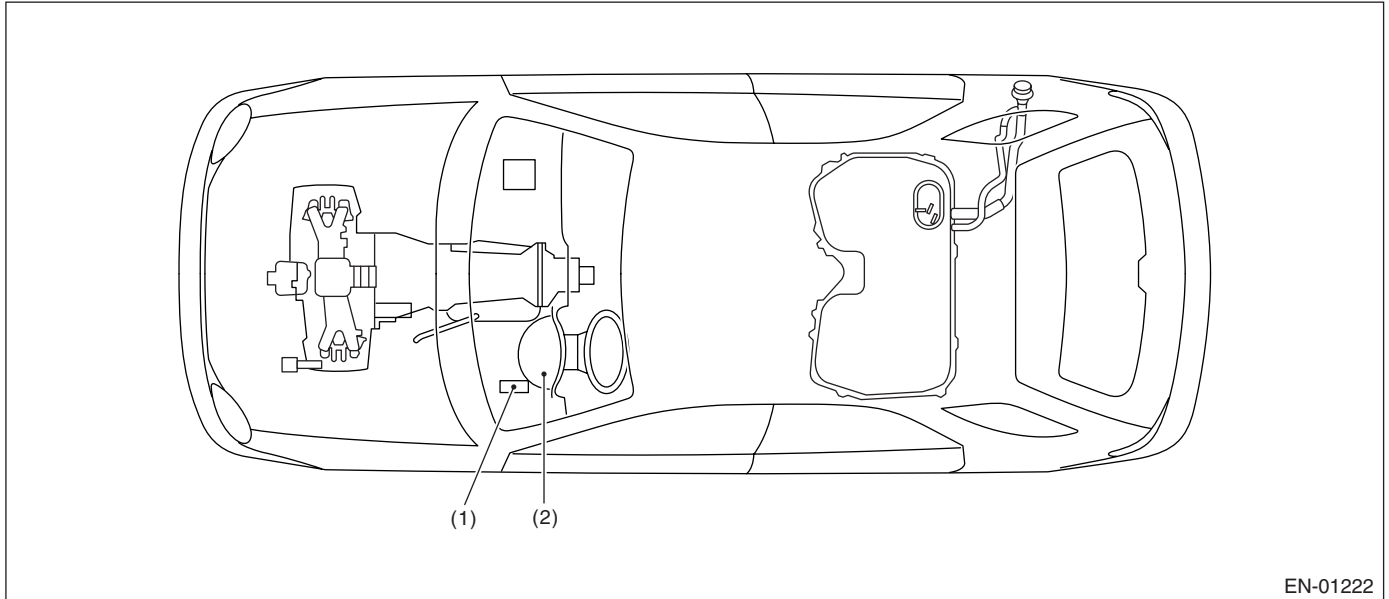
# Electrical Component Location

ENGINE (DIAGNOSTICS)

|  |   |
|--|---|
|  <p>(1)</p> <p>EN-03136</p>         |  <p>(2)</p> <p>EN-00321</p>             |
|  <p>(4) (3) (5)</p> <p>EN-03017</p> |  <p>(6) (7) (8) (9)</p> <p>EN-04369</p> |
|  <p>(10)</p> <p>EN-01328</p>       |  <p>(11)</p> <p>EN-04574</p>           |

## 2. TRANSMISSION

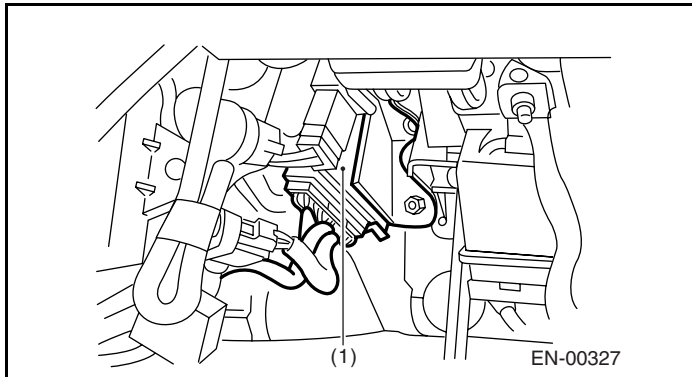
### • Module



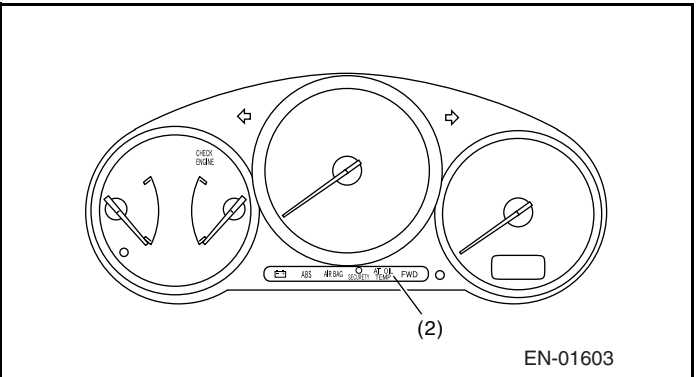
EN-01222

(1) Transmission control module (TCM) (AT model)

(2) AT diagnostic indicator light (AT model)



EN-00327

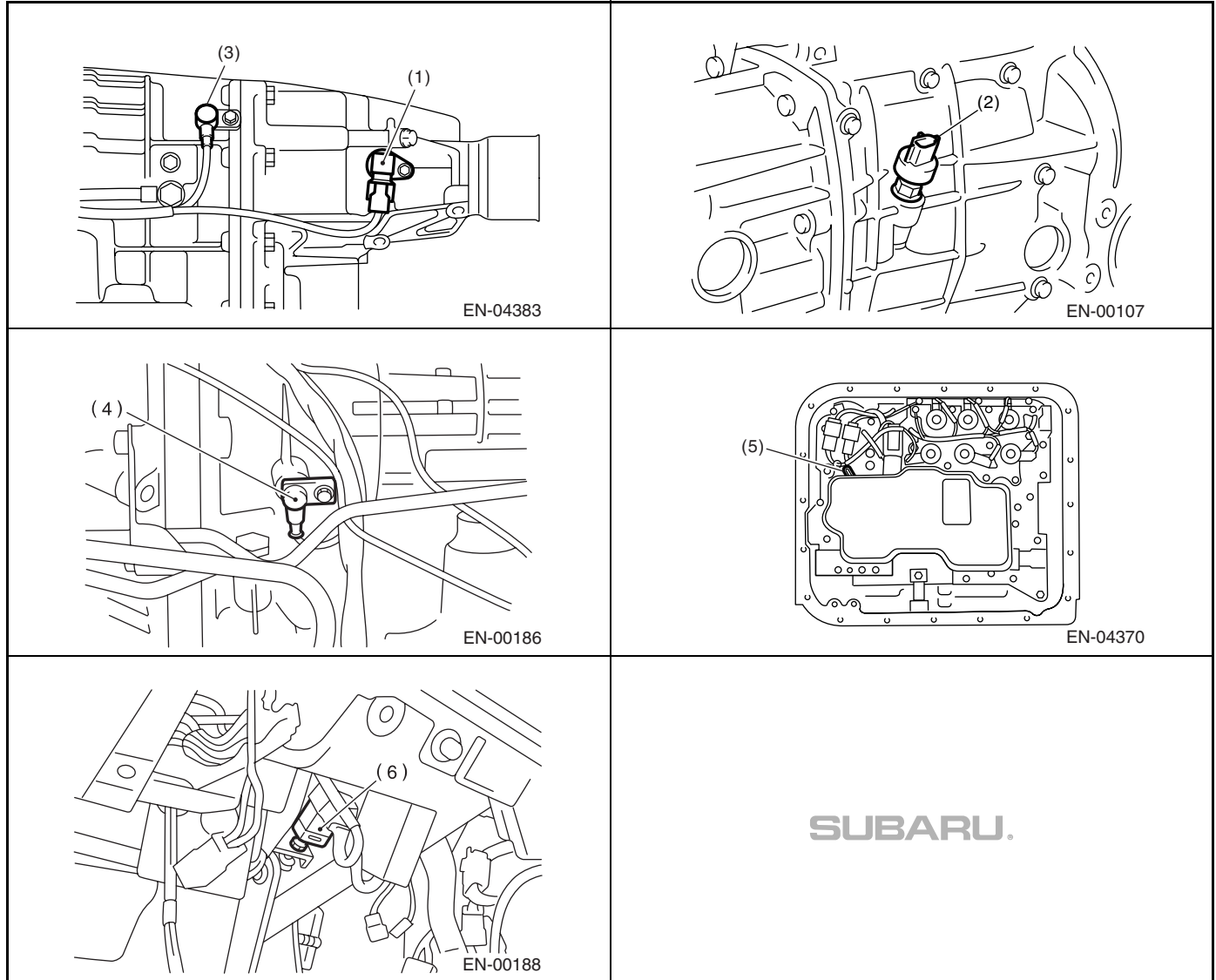


EN-01603

# Electrical Component Location

## ENGINE (DIAGNOSTICS)

### • Sensor



(1) Rear vehicle speed sensor (AT model)

(2) Front vehicle speed sensor (MT model)

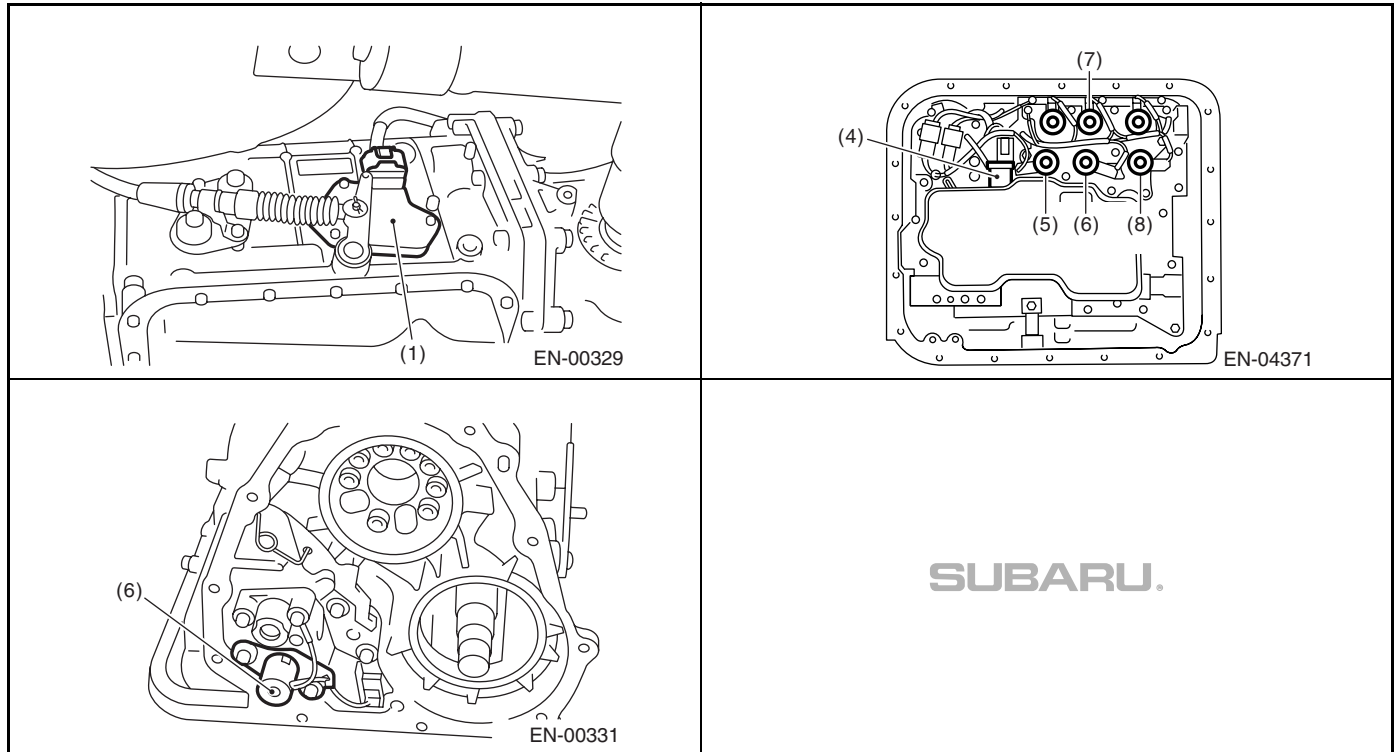
(3) Front vehicle speed sensor (AT model)

(4) Torque converter turbine speed sensor (AT model)

(5) ATF temperature sensor (AT model)

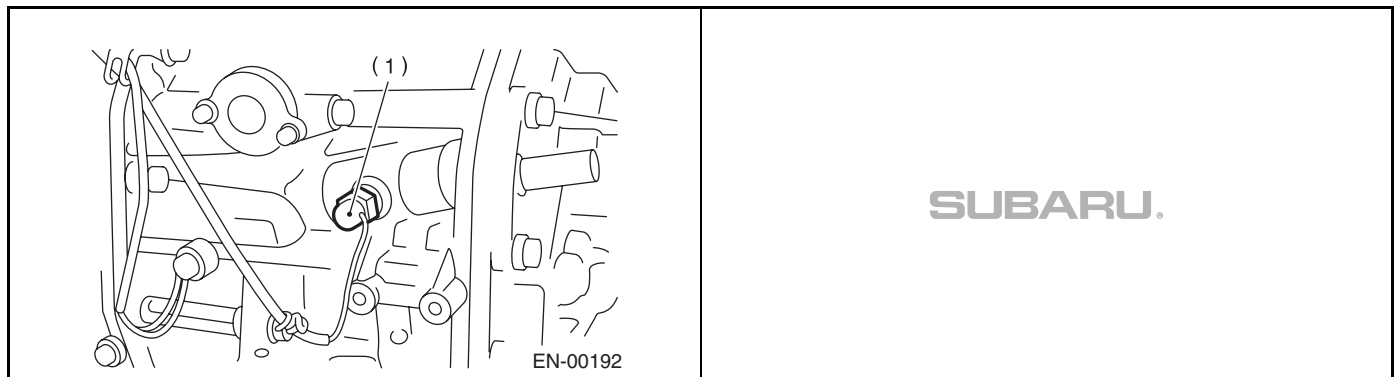
(6) Brake light switch

## • Solenoid Valve and Switch (AT model)



- |                            |                                   |                                      |
|----------------------------|-----------------------------------|--------------------------------------|
| (1) Inhibitor switch       | (4) Line pressure linear solenoid | (7) 2-4 brake duty solenoid          |
| (2) Shift solenoid valve 1 | (5) Lock-up duty solenoid         | (8) Low clutch timing solenoid valve |
| (3) Shift solenoid valve 2 | (6) Transfer duty solenoid        |                                      |

## • Solenoid Valve and Switch (MT model)



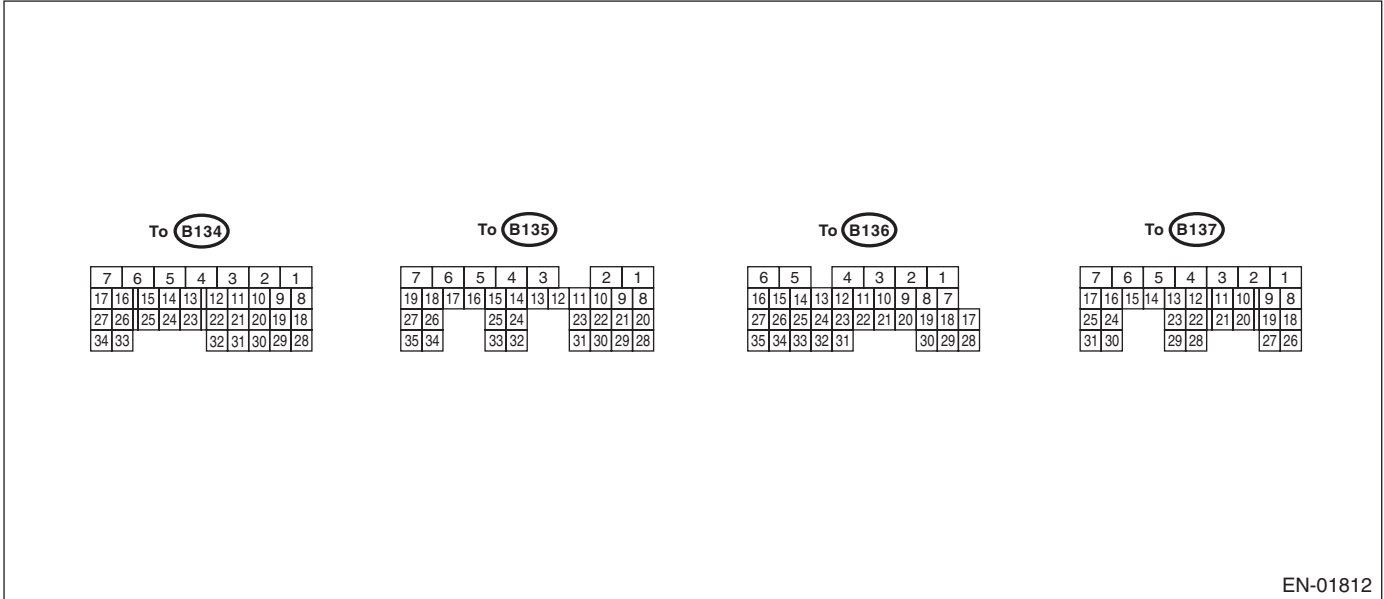
- (1) Neutral position switch

# Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

## 5. Engine Control Module (ECM) I/O Signal

### A: ELECTRICAL SPECIFICATION



EN-01812

| Content   |                   | Con-<br>nector<br>No. | Termi-<br>nal No. | Signal (V)   |                    | Note  |
|---|-------------------|-----------------------|-------------------|--|--------------------|---|
|   |                   |                       |                   | Ignition SW ON<br>(Engine OFF)                     | Engine ON (Idling) |   |
| Crank-<br>shaft posi-<br>tion sensor                    | Signal (+)        | B134                  | 13                | 0  | -7 — +7            | Sensor output waveform  |
|   | Signal (-)        | B134                  | 14                | 0  | 0                  | —   |
|   | Shield            | B134                  | 24                | 0  | 0                  | —   |
| Rear oxy-<br>gen sen-<br>sor                            | Signal            | B135                  | 4                 | 0  | 0 — 0.9            | —   |
|   | Shield            | B135                  | 1                 | 0  | 0                  | —   |
|   | GND (sen-<br>sor) | B135                  | 30                | 0  | 0                  | —   |
| Front oxy-<br>gen (A/F)<br>sensor<br>heater             | Signal 1          | B136                  | 3                 | 0 — 1.0  | —                  | Sensor output waveform  |
|   | Signal 2          | B136                  | 2                 | 0 — 1.0  | —                  | Sensor output waveform  |
| Rear oxygen sensor<br>heater signal                     |                   | B136                  | 4                 | 0 — 1.0  | —                  | Sensor output waveform  |
| Engine<br>coolant<br>tempera-<br>ture sen-<br>sor       | Signal            | B134                  | 34                | 1.0 — 1.4  | 1.0 — 1.4          | After warm-up the engine.   |
|   | GND (sen-<br>sor) | B134                  | 29                | 0  | 0                  | After warm-up the engine.   |
| Vehicle speed signal                                    |                   | B136                  | 13                | 0 or 5   | 0 or 5             | “5” and “0” are repeatedly dis-<br>played when vehicle is driven. |
| Mass air<br>flow sen-<br>sor                            | Signal            | B135                  | 26                | —  | 0.3 — 4.5          | —   |
|   | Shield            | B135                  | 35                | 0  | 0                  | —   |
|   | GND               | B135                  | 34                | 0  | 0                  | —   |
| Intake air temperature<br>sensor signal                 |                   | B135                  | 18                | 0.3 — 4.6  | 0.3 — 4.6          | —   |
| Tumble<br>generator<br>valve posi-<br>tion sensor<br>RH | Signal            | B134                  | 26                | Fully closed: 3.8 — 4.9<br>Fully opened: 0.2 — 0.9 |                    | —   |
|   | Power<br>supply   | B134                  | 19                | 5  | 5                  | —   |
|   | GND (sen-<br>sor) | B134                  | 29                | 0  | 0                  | —   |

# Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

| Content   |                   | Con-<br>nector<br>No. | Termi-<br>nal No. | Signal (V)   |                                 | Note  |
|---|-------------------|-----------------------|-------------------|--|---------------------------------|---|
|   |                   |                       |                   | Ignition SW ON<br>(Engine OFF)                     | Engine ON (Idling)              |   |
| Tumble<br>generator<br>valve posi-<br>tion sensor<br>LH | Signal            | B134                  | 16                | Fully closed: 3.8 — 4.9<br>Fully opened: 0.2 — 0.9 |                                 | —   |
|   | Power<br>supply   | B134                  | 19                | 5  | 5                               | —   |
|   | GND (sen-<br>sor) | B134                  | 29                | 0  | 0                               | —   |
| Tumble generator valve<br>RH (open)                     |                   | B137                  | 22                | 0 or 10 — 13                                       | 0 or 12 — 14                    | Sensor output waveform                        |
| Tumble generator valve<br>RH (close)                    |                   | B137                  | 23                | 0 or 10 — 13                                       | 0 or 12 — 14                    | Sensor output waveform                        |
| Tumble generator valve<br>LH (open)                     |                   | B137                  | 12                | 0 or 10 — 13                                       | 0 or 12 — 14                    | Sensor output waveform                        |
| Tumble generator valve<br>LH (close)                    |                   | B137                  | 13                | 0 or 10 — 13                                       | 0 or 12 — 14                    | Sensor output waveform                        |
| Wastegate control sole-<br>noid valve                   |                   | B137                  | 27                | 0 or 10 — 13                                       | 0 or 12 — 14                    | Sensor output waveform                        |
| Starter switch  |                   | B136                  | 32                | 0  | 0                               | Cranking: 8 — 14                              |
| A/C switch  |                   | B136                  | 24                | ON: 10 — 13<br>OFF: 0                              | ON: 12 — 14<br>OFF: 0           | —   |
| Ignition switch   |                   | B135                  | 19                | 10 — 13  | 12 — 14                         | —   |
| Neutral position switch                                 |                   | B136                  | 31                | ON: 10 — 13<br>OFF: 0                              | ON: 12 — 14<br>OFF: 0           | —   |
| Test mode connector                                     |                   | B135                  | 27                | 10 — 13  | 12 — 14                         | When connected: 0                             |
| Knock<br>sensor   | Signal            | B134                  | 15                | 2.8  | 2.8                             | —   |
|   | Shield            | B134                  | 25                | 0  | 0                               | —   |
| Back-up power supply                                    |                   | B135                  | 5                 | 10 — 13  | 12 — 14                         | Ignition switch "OFF": 10 — 13                |
| Control unit power sup-<br>ply                          |                   | B134                  | 7                 | 10 — 13  | 12 — 14                         | —   |
|   |                   | B135                  | 2                 | 10 — 13  | 12 — 14                         | —   |
| Sensor power supply                                     |                   | B134                  | 19                | 5  | 5                               | —   |
| Ignition<br>control                                     | #1                | B137                  | 18                | 0  | 12 — 14                         | Waveform                                      |
|   | #2                | B137                  | 19                | 0  | 12 — 14                         | Waveform                                      |
|   | #3                | B137                  | 20                | 0  | 12 — 14                         | Waveform                                      |
|   | #4                | B137                  | 21                | 0  | 12 — 14                         | Waveform                                      |
| Fuel injec-<br>tor                                      | #1                | B137                  | 8                 | 10 — 13  | 1 — 14                          | Waveform                                      |
|   | #2                | B137                  | 9                 | 10 — 13  | 1 — 14                          | Waveform                                      |
|   | #3                | B137                  | 10                | 10 — 13  | 1 — 14                          | Waveform                                      |
|   | #4                | B137                  | 11                | 10 — 13  | 1 — 14                          | Waveform                                      |
| Fuel pump<br>control unit                               |                   | B136                  | 12                | 0 or 5   | 0 or 5                          | —   |
|   |                   | B135                  | 33                | 10 — 13  | 12 — 14                         | —   |
| A/C relay control                                       |                   | B136                  | 9                 | ON: 0.5 or less<br>OFF: 10 — 13                    | ON: 0.5 or less<br>OFF: 12 — 14 | —   |
| Radiator fan relay 1<br>control                         |                   | B136                  | 18                | ON: 0.5 or less<br>OFF: 10 — 13                    | ON: 0.5 or less<br>OFF: 12 — 14 | —   |
| Radiator fan relay 2<br>control                         |                   | B136                  | 29                | ON: 0.5 or less<br>OFF: 10 — 13                    | ON: 0.5 or less<br>OFF: 12 — 14 | Model with A/C only                           |
| Malfunction indicator<br>light                          |                   | B136                  | 11                | —  | —                               | Light "ON": 1 or less<br>Light "OFF": 10 — 14 |
| Engine speed output                                     |                   | B136                  | 22                | —  | 0 — 13, or more                 | Waveform                                      |
| Purge control solenoid<br>valve                         |                   | B137                  | 29                | ON: 1 or less<br>OFF: 10 — 13                      | ON: 1 or less<br>OFF: 12 — 14   | Sensor output waveform                        |

## Engine Control Module (ECM) I/O Signal

### ENGINE (DIAGNOSTICS)

| Content                              |              | Connector No. | Terminal No. | Signal (V)                    |                               | Note  |
|--------------------------------------|--------------|---------------|--------------|-------------------------------|-------------------------------|---|
|                                      |              |               |              | Ignition SW ON (Engine OFF)   | Engine ON (Idling)            |   |
| Manifold absolute pressure sensor    | Signal       | B134          | 6            | 1.7 — 2.4                     | 1.1 — 1.6                     | —   |
|                                      | Power supply | B134          | 19           | 5                             | 5                             |   |
|                                      | GND (sensor) | B134          | 29           | 0                             | 0                             |   |
| Fuel tank pressure sensor            | Signal       | B135          | 32           | 2.3 — 2.7                     | 2.3 — 2.7                     | The valve operates when fuel filler cap is removed and reinstalled. |
|                                      | Power supply | B135          | 22           | 5                             | 5                             |   |
|                                      | GND (sensor) | B135          | 30           | 0                             | 0                             | —   |
| Pressure control solenoid valve      |              | B136          | 28           | ON: 1 or less<br>OFF: 10 — 13 | ON: 1 or less<br>OFF: 12 — 14 | —   |
| Drain valve                          |              | B136          | 17           | ON: 1 or less<br>OFF: 10 — 13 | ON: 1 or less<br>OFF: 12 — 14 | —   |
| Fuel level sensor                    |              | B135          | 10           | 0.12 — 4.75                   | 0.12 — 4.75                   | —   |
| Fuel temperature sensor signal       |              | B135          | 17           | 2.5 — 3.8                     | 2.5 — 3.8                     | Ambient temperature:<br>25°C (77°F)                                 |
| Blow-by leak diagnosis signal        |              | B134          | 30           | 0                             | 0                             | When disconnection (malfunction) = 5                                |
| Small light switch                   |              | B135          | 15           | ON: 0<br>OFF: 10 — 13         | ON: 0<br>OFF: 12 — 14         | —   |
| Blower fan switch                    |              | B135          | 16           | ON: 0<br>OFF: 10 — 13         | ON: 0<br>OFF: 12 — 14         | —   |
| Rear defogger switch                 |              | B135          | 14           | ON: 0<br>OFF: 10 — 13         | ON: 0<br>OFF: 12 — 14         | —   |
| Power steering oil pressure switch   |              | B134          | 33           | 10 — 13                       | ON: 0<br>OFF: 12 — 14         | —   |
| Front oxygen (A/F) sensor signal (+) |              | B135          | 9            | 2.8 — 3.2                     | 2.8 — 3.2                     | —   |
| Front oxygen (A/F) sensor signal (-) |              | B135          | 8            | 2.4 — 2.7                     | 2.4 — 2.7                     | —   |
| Front oxygen (A/F) sensor shield     |              | B135          | 1            | 0                             | 0                             | —   |
| SSM/GST communication line           |              | B136          | 16           | 1 ↔ 4                         | 1 ↔ 4                         | —   |
| Ground (engine 4)                    |              | B137          | 1            | 0                             | 0                             | —   |
| Ground                               | Ignition 1   | B137          | 26           | 0                             | 0                             | —   |
|                                      | Ignition 2   | B137          | 6            |                               |                               |   |
| Ground (engine 3)                    |              | B137          | 2            | 0                             | 0                             | —   |
| Ground (engine 5)                    |              | B137          | 3            | 0                             | 0                             | —   |
| Ground (body)                        |              | B136          | 6            | 0                             | 0                             | —   |
| Ground (engine 1)                    |              | B134          | 5            | 0                             | 0                             | —   |
| Ground (engine 2)                    |              | B137          | 7            | 0                             | 0                             | —   |
| Camshaft position sensor (LH)        |              | B134          | 21           | 0 — 0.9                       | ON: 0<br>OFF: 4.7 — 5.3       | Sensor output waveform  |
| Camshaft position sensor (RH)        |              | B134          | 11           | 0 — 0.9                       | ON: 0<br>OFF: 4.7 — 5.3       | Sensor output waveform  |

# Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

| Content   |                           | Con-<br>nector<br>No. | Termi-<br>nal No. | Signal (V)  |   | Note                                     |
|---|---------------------------|-----------------------|-------------------|---|---|--|
|   |                           |                       |                   | Ignition SW ON<br>(Engine OFF)  | Engine ON (Idling)  |  |
| Electronic<br>throttle<br>control                   | Main                      | B134                  | 18                | 0.64 — 0.72<br>Fully opened: 3.96   | 0.64 — 0.72 (After<br>warm-up)  | Fully closed: 0.6<br>Fully opened: 3.96  |
|   | Sub                       | B134                  | 28                | 1.51 — 1.58<br>Fully opened: 4.17   | 1.51 — 1.58 (After<br>warm-up)  | Fully closed: 1.48<br>Fully opened: 4.17 |
|   | Power<br>supply           | B134                  | 19                | 5   | 5   | —  |
|   | GND (sen-<br>sor)         | B134                  | 29                | 0   | 0   | —  |
| Electronic throttle con-<br>trol motor (+)          |                           | B137                  | 5                 | Duty waveform   | Duty waveform   | Driving frequency: 500 Hz                |
| Electronic throttle con-<br>trol motor (-)          |                           | B137                  | 4                 | Duty waveform   | Duty waveform   | Driving frequency: 500 Hz                |
| Electronic throttle con-<br>trol motor power supply |                           | B136                  | 1                 | 10 — 13   | 12 — 14   | —  |
| Electronic throttle con-<br>trol motor relay        |                           | B136                  | 21                | ON: 0<br>OFF: 10 — 13   | ON: 0<br>OFF: 12 — 14   | When ignition switch is ON: ON           |
| Oil flow<br>control<br>solenoid<br>(LH)             | Signal (+)                | B137                  | 15                | ON: 10 — 13<br>OFF: 0   | ON: 12 — 14<br>OFF: 0   | —  |
|   | Signal (-)                | B137                  | 14                | 0   | 0   | —  |
| Oil flow<br>control<br>solenoid<br>(RH)             | Signal (+)                | B137                  | 17                | ON: 10 — 13<br>OFF: 0   | ON: 12 — 14<br>OFF: 0   | —  |
|   | Signal (-)                | B137                  | 16                | 0   | 0   | —  |
| Accelera-<br>tor pedal<br>position<br>sensor        | Main cen-<br>sor signal   | B135                  | 23                | Fully closed: 1<br>Fully opened: 3.5  | Fully closed: 1<br>Fully opened: 3.5  | —  |
|   | Main<br>power<br>supply   | B135                  | 21                | 5   | 5   | —  |
|   | GND<br>(main sen-<br>sor) | B135                  | 29                | 0   | 0   | —  |
|   | Sub cen-<br>sor signal    | B135                  | 31                | Fully closed: 1<br>Fully opened: 3.5  | Fully closed: 1<br>Fully opened: 3.5  | —  |
|   | Sub power<br>supply       | B135                  | 22                | 5   | 5   | —  |
|   | GND (sub<br>sensor)       | B135                  | 30                | 0   | 0   | —  |
| Main light  |                           | B135                  | 6                 | ON: 0<br>OFF: 10 — 13   | ON: 0<br>OFF: 12 — 14   | —  |
| Cruise control set light                            |                           | B135                  | 3                 | ON: 0<br>OFF: 10 — 13   | ON: 0<br>OFF: 12 — 14   | —  |
| Clutch switch                                       |                           | B136                  | 25                | When clutch pedal is<br>depressed: 0<br>When clutch pedal is<br>released: 10 — 13 | When clutch pedal is<br>depressed: 0<br>When clutch pedal is<br>released: 12 — 14 | —  |
| SET/COAST switch                                    |                           | B135                  | 24                | ON: 10 — 13<br>OFF: 0   | ON: 12 — 14<br>OFF: 0   | —  |
| Brake switch 1                                      |                           | B135                  | 20                | When brake pedal is<br>depressed: 0<br>When brake pedal is<br>released: 10 — 13   | When brake pedal is<br>depressed: 0<br>When brake pedal is<br>released: 12 — 14   | —  |



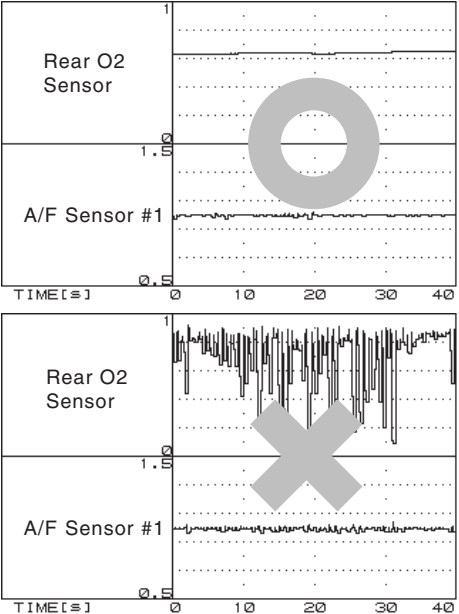
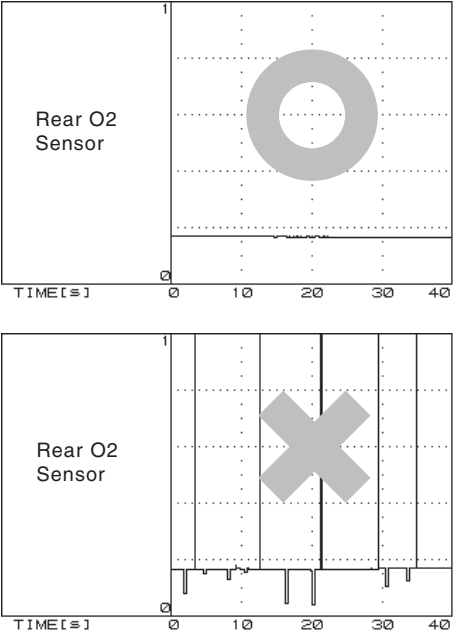
## Engine Control Module (ECM) I/O Signal

### ENGINE (DIAGNOSTICS)

| Content  | Con-<br>nector<br>No. | Termi-<br>nal No. | Signal (V)  |   | Note      |   |
|--|-----------------------|-------------------|---|---|-----------|---|
|  |                       |                   | Ignition SW ON<br>(Engine OFF)  | Engine ON (Idling)  |           |   |
| Brake switch 2                                       | B135                  | 28                | When brake pedal is<br>depressed: 10 — 13<br>When brake pedal is<br>released: 0 | When brake pedal is<br>depressed: 12 — 14<br>When brake pedal is<br>released: 0 | —         |   |
| Main switch  | B135                  | 12                | ON: 10 — 13<br>OFF: 0   | ON: 12 — 14<br>OFF: 0   | —         |   |
| CAN com-<br>munication                               | Signal (+)            | B136              | 27  | Pulse signal  |           | — |
|  | Signal (-)            | B136              | 35  | Pulse signal  |           | — |
| Second-<br>ary air<br>pipe pres-<br>sure sen-<br>sor | Signal                | B134              | 27  | 1.7 — 2.4   | 1.1 — 1.6 | — |
|  | Power<br>supply       | B134              | 19  | 5   | 5         | — |
|  | GND (sen-<br>sor)     | B134              | 29  | 0   | 0         | — |
| Secondary air combi<br>valve relay 1                 | B136                  | 30                | ON: 0<br>OFF: 10 — 13   | ON: 0<br>OFF: 12 — 14   | —         |   |
| Secondary air combi<br>valve relay 2                 | B136                  | 19                | ON: 0<br>OFF: 10 — 13   | ON: 0<br>OFF: 12 — 14   | —         |   |
| Secondary air pump<br>relay                          | B136                  | 8                 | ON: 0<br>OFF: 10 — 13   | ON: 0<br>OFF: 12 — 14   | —         |   |

# Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

| Input/Output          | Measuring condition  | Waveform   |
|-----------------------|--|--|
| 1. Rear oxygen sensor | 5 minutes after driving at a constant speed of 80 — 113 km/h (50 — 70 MPH) |  <p>The top graph shows a stable signal around 1.0V, marked with a circle. The bottom graph shows a noisy signal, marked with an X.</p> <p style="text-align: right;">EN-04680</p>               |
| 2. Rear oxygen sensor | While idling (Oxygen sensor in active status)                              |  <p>The top graph shows a stable signal around 1.0V, marked with a circle. The bottom graph shows a signal with sharp spikes, marked with an X.</p> <p style="text-align: right;">EN-04681</p> |

# Engine Condition Data

ENGINE (DIAGNOSTICS)

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## 6. Engine Condition Data

### A: ELECTRICAL SPECIFICATION

| Content     | Specified data                     |
|-------------|------------------------------------|
| Engine load | 17.6 — 35.64 (%): Idling           |
|             | 13.2 — 26.73 (%): 2,500 rpm racing |

Measuring condition:

- After warm-up the engine.
- Gear position is in neutral position.
- A/C is turned to OFF.
- All accessory switches are turned to OFF.

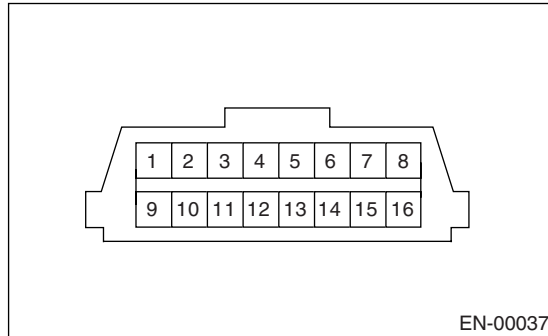
## 7. Data Link Connector

### A: NOTE

This connector is used both for the general scan tools and Subaru Select Monitor.

### CAUTION:

**Do not connect any scan tools other than the general scan tools and Subaru Select Monitor, because the circuit for Subaru Select Monitor may be damaged.**



| Terminal No. | Contents     | Terminal No. | Contents                                       |
|--------------|--------------|--------------|--|
| 1            | Power supply | 9            | Blank  |
| 2            | Blank        | 10           | Subaru Select Monitor/general scan tool signal |
| 3            | Blank        | 11           | Blank  |
| 4            | Blank        | 12           | Ground   |
| 5            | Blank        | 13           | Ground   |
| 6            | Blank        | 14           | Blank  |
| 7            | Blank        | 15           | Blank  |
| 8            | Blank        | 16           | Blank  |

# General Scan Tool

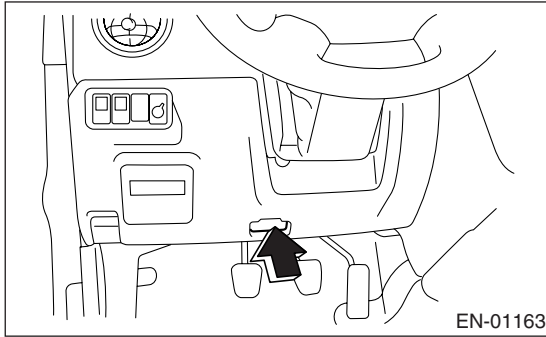
ENGINE (DIAGNOSTICS)

## 8. General Scan Tool

### A: OPERATION

#### 1. HOW TO USE GENERAL SCAN TOOL

- 1) Prepare a general scan tool required by SAE J1978.
- 2) Open the cover and connect the general scan tool to data link connector located in the lower portion of instrument panel (on the driver's side).



- 3) Using the general scan tool, call up DTC and freeze frame data.

#### 2. MODE \$01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.

A list of the support data and PID (Parameter Identification) codes are shown in the following table.

| PID | Data   | Unit of measure |
|-----|--|-----------------|
| 01  | Number of emission-related powertrain DTC and malfunction indicator light status and diagnosis support information | —               |
| 03  | Fuel system control status   | —               |
| 04  | Calculated engine load value   | %               |
| 05  | Engine coolant temperature   | °C              |
| 06  | Short term fuel trim   | %               |
| 07  | Long term fuel trim  | %               |
| 0B  | Intake manifold absolute pressure  | kPa             |
| 0C  | Engine revolution  | rpm             |
| 0D  | Vehicle speed  | km/h            |
| 0E  | Ignition timing advance  | °               |
| 0F  | Intake air temperature   | °C              |
| 10  | Air flow rate from mass air flow sensor  | g/sec           |
| 11  | Throttle valve absolute opening angle  | %               |
| 12  | Secondary air control condition  | —               |
| 13  | Check whether oxygen sensor is installed   | —               |
| 15  | Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor                                | V and %         |
| 1C  | Supporting OBD system  | —               |
| 24  | A/F value and A/F sensor output voltage  | — and V         |
| 34  | A/F value and A/F sensor current   | — and mA        |

NOTE:

Refer to general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE \$01).

General scan tool functions consist of:

- (1) MODE \$01: Current powertrain diagnostic data
- (2) MODE \$02: Powertrain freeze frame data
- (3) MODE \$03: Emission-related powertrain DTC
- (4) MODE \$04: Clear/Reset emission-related diagnostic information
- (5) MODE \$06: Request on-board monitoring test results for non-continuously monitored systems
- (6) MODE \$07: Request on-board monitoring test results for continuously monitored systems
- (7) MODE \$09: Request vehicle information

Read out the data according to repair procedures. (For detailed operation procedures, refer to the General Scan Tool Operation Manual.)

NOTE:

For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>

### 3. MODE \$02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

| PID | Data  | Unit of measure |
|-----|---|-----------------|
| 02  | DTC that caused CARB required freeze frame data storage                             | —               |
| 03  | Fuel system control status  | —               |
| 04  | Calculated engine load value  | %               |
| 05  | Engine coolant temperature  | °C              |
| 06  | Short term fuel trim  | %               |
| 07  | Long term fuel trim   | %               |
| 0B  | Intake manifold absolute pressure   | kPa             |
| 0C  | Engine revolution   | rpm             |
| 0D  | Vehicle speed   | km/h            |
| 0E  | Ignition timing advance   | °               |
| 0F  | Intake air temperature  | °C              |
| 10  | Air flow rate from mass air flow sensor   | g/sec           |
| 11  | Throttle valve opening angle  | %               |
| 15  | Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor | V and %         |
| 1C  | Supporting OBD system   | —               |

**NOTE:**

Refer to general scan tool manufacturer's instruction manual to access freeze frame data (MODE \$02).

### 4. MODE \$03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE (DTC))

Refer to Read Diagnostic Trouble Code (DTC) for information about data denoting emission-related powertrain DTC. <Ref. to EN(H4DOTC)(diag)-39, Read Diagnostic Trouble Code (DTC).>

### 5. MODE \$04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

**NOTE:**

Refer to general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE \$04).

# General Scan Tool

## ENGINE (DIAGNOSTICS)

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### 6. MODE \$06

Refer to test value of troubleshooting and data of test limit on support data bit sequence table. List of support data is shown in the following table.

| TID  | CID  | Test value & Test limit  |
|------|------|--|
| \$41 | \$81 | Rear O <sub>2</sub> sensor circuit (Bank 1 Sensor 2)                           |
|      | \$02 | Rear O <sub>2</sub> sensor circuit (Bank 1 Sensor 2)                           |
| \$81 | \$01 | Catalyst system efficiency   |
| \$83 | \$01 | Evaporative emission control system (0.04 inch leak)                           |
|      | \$02 | Evaporative emission control system (0.04 inch leak)                           |
|      | \$03 | Evaporative emission control system (0.04 inch leak)                           |
|      | \$04 | Evaporative emission control system (0.04 inch leak)                           |
|      | \$05 | Evaporative emission control system (0.02 inch leak)                           |
|      | \$86 | Evaporative emission control system (0.02 inch leak)                           |
| \$84 | \$01 | Front oxygen (A/F) sensor circuit slow response (Bank 1 Sensor 1)              |
| \$85 | \$01 | Rear O <sub>2</sub> sensor circuit slow response (Bank 1 Sensor 2) Rich → Lean |
|      | \$02 | Rear O <sub>2</sub> sensor circuit slow response (Bank 1 Sensor 2) Lean → Rich |
| \$89 | \$81 | Secondary air system   |
|      | \$82 |  |
|      | \$83 |  |
|      | \$04 |  |
|      | \$05 |  |

### 7. MODE \$07

Refer to data of DTC (pending code) for troubleshooting result about emission in first time.

### 8. MODE \$09

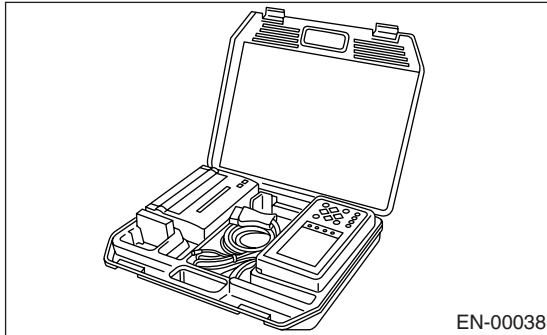
Refer to data of vehicle specification (VIN, calibration ID, etc.).

## 9. Subaru Select Monitor

### A: OPERATION

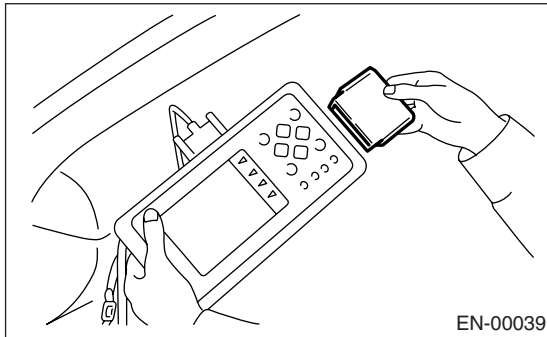
#### 1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



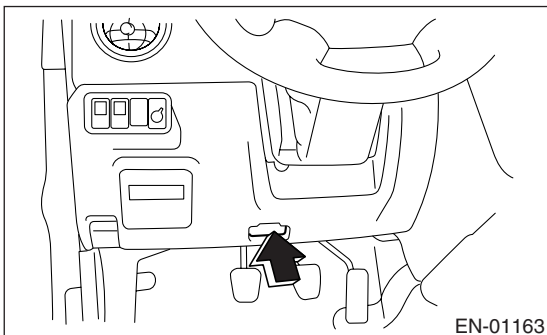
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



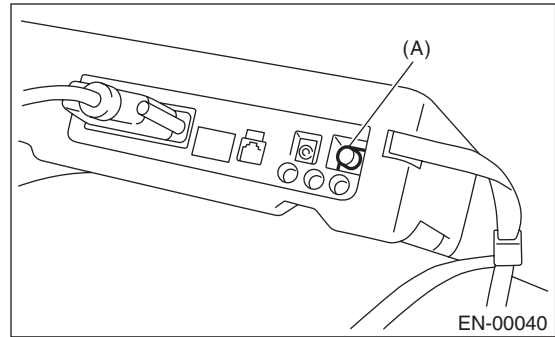
4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector is located in the lower portion of instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor power switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up the DTC and various data, and then record them.

#### 2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (NORMAL MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(H4DOTC)(diag)-39, Read Diagnostic Trouble Code (DTC).>

#### 3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (OBD MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(H4DOTC)(diag)-39, Read Diagnostic Trouble Code (DTC).>

### CAUTION:

Do not connect the scan tools except for Subaru Select Monitor and general scan tool.



# Subaru Select Monitor

## ENGINE (DIAGNOSTICS)

### 4. READ CURRENT DATA FOR ENGINE. (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
  - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
  - 3) Press the [YES] key after the information of engine type is displayed.
  - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
  - 5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
  - 6) Using the scroll key, move the display screen up or down until desired data is shown.
- A list of the support data is shown in the following table.

| Remarks  | Display                 | Unit of measure         | Note (at idling)   |
|--|-------------------------|-------------------------|--|
| Engine load                                    | Engine Load             | %                       | 21.0%  |
| Engine coolant temperature signal              | Coolant Temp.           | °C or °F                | 80 — 100°C or 176 — 212°F                                      |
| A/F correction 1                               | A/F Correction #1       | %                       | -10 — +10%   |
| A/F learning 1                                 | A/F Learning #1         | %                       | -15 — +15%   |
| Intake manifold absolute pressure              | Mani. Absolute Pressure | mmHg, kPa, inHg or psig | 220 — 275 mmHg, 29.5 — 37 kPa, 8.7 — 10 inHg or 4.2 — 5.3 psig |
| Engine speed signal                            | Engine Speed            | rpm                     | 700 rpm (Agree with the tachometer indication)                 |
| Vehicle speed signal                           | Vehicle Speed           | km/h or MPH             | 0 km/h or 0 MPH (at parking)                                   |
| Ignition timing signal                         | Ignition Timing         | deg                     | +17.0 deg  |
| Intake air temperature signal                  | Intake Air Temp.        | °C or °F                | 20 — 50°C or 68 — 122°F  |
| Amount of intake air                           | Mass Air Flow           | g/s or lb/m             | 3.6 g/s or 0.48 lb/m   |
| Throttle opening angle signal                  | Throttle Opening Angle  | %                       | 3.0 — 3.2%   |
| Rear oxygen sensor voltage                     | Rear O2 Sensor          | V                       | 0 — 1.0 V  |
| Battery voltage                                | Battery Voltage         | V                       | 12 — 15 V  |
| Mass air flow voltage                          | Air Flow Sensor Voltage | V                       | 1.0 — 1.7 V  |
| Injection 1 pulse width                        | Fuel Injection #1 Pulse | ms                      | 1.2 — 2.2 ms   |
| Knock sensor correction                        | Knocking Correction     | deg                     | 0.0 deg  |
| Atmospheric pressure signal                    | Atmosphere Pressure     | mmHg, kPa, inHg or psig | (Atmosphere pressure)  |
| Intake manifold relative pressure              | Mani. Relative Pressure | mmHg, kPa, inHg or psig | (Mani. Absolute Pressure – Atmosphere pressure)                |
| Fuel tank pressure signal                      | Fuel Tank Pressure      | mmHg, kPa, inHg or psig | +8.8 mmHg, +1.2 kPa, +0.4 inHg or +0.2 psig                    |
| Acceleration opening angle signal              | Accel. Opening Angle    | %                       | 0.0%   |
| Fuel temperature signal                        | Fuel Temp               | °C or °F                | +21°C or +70°F   |
| Fuel level signal                              | Fuel Level              | V                       | 0 — 5 V  |
| Primary supercharged pressure control signal   | Primary Control         | %                       | 0.0%   |
| Purge control solenoid duty ratio              | CPC Valve Duty Ratio    | %                       | 0 — 25%  |
| Tumble generator valve RH opening angle signal | TGV Position Sensor R   | V                       | 0.44 V   |
| Tumble generator valve LH opening angle signal | TGV Position Sensor L   | V                       | 0.48 V   |
| Fuel pump duty ratio                           | Fuel Pump Duty          | %                       | 33%  |
| AVCS advance angle amount RH                   | VVT Adv. Ang. Amount R  | deg                     | 0 deg  |
| AVCS advance angle amount LH                   | VVT Adv. Ang. Amount L  | deg                     | 0 deg  |
| Oil flow control solenoid valve duty RH        | OSV Duty R              | %                       | 9.4%   |
| Oil flow control solenoid valve duty LH        | OSV Duty L              | %                       | 9.4%   |
| Oil flow control solenoid valve current RH     | OSV Current R           | mA                      | 40 — 100 mA  |
| Oil flow control solenoid valve current LH     | OSV Current L           | mA                      | 40 — 100 mA  |

# Subaru Select Monitor

ENGINE (DIAGNOSTICS)

| Remarks  | Display                  | Unit of measure         | Note (at idling)                          |
|--|--------------------------|-------------------------|---|
| A/F sensor current value 1                     | A/F Sensor #1 Current    | mA                      | -20 — 20 mA                               |
| A/F sensor resistance value 1                  | A/F Sensor #1 Resistance | Ω                       | 27 — 35 Ω                                 |
| A/F sensor output lambda 1                     | A/F Sensor #1            | —                       | 1.00                                      |
| A/F correction 3                               | A/F Correction #3        | %                       | 0.00%                                     |
| A/F learning 3                                 | A/F Learning #3          | %                       | 0.00%                                     |
| Throttle motor duty                            | Throttle Motor Duty      | %                       | -10%                                      |
| Throttle power supply voltage                  | Throttle Motor Voltage   | V                       | 12 — 15 V                                 |
| Sub throttle sensor voltage                    | Sub-throttle Sensor      | V                       | 1.52 V                                    |
| Main throttle sensor voltage                   | Main-throttle Sensor     | V                       | 0.66 V                                    |
| Sub acceleration sensor voltage                | Sub-accelerator Sensor   | V                       | 0.68 V                                    |
| Main acceleration sensor voltage               | Main-accelerator Sensor  | V                       | 0.66 V                                    |
| Secondary air pipe pressure signal             | Sec. Air Piping Pressure | mmHg, kPa, inHg or psig | 765 mmHg, 102 kPa, 30.1 inHg or 14.8 psig |
| Secondary air flow signal                      | Sec. Air Flow            | g/s or lb/m             | 0.00 g/s or 0.00 lb/m                     |
| Memory vehicle speed                           | Memorized Cruise Speed   | km/h or MPH             | 0 km/h or 0 MPH                           |
| Estimated cumulative driving distance          | Odd Meter                | km                      | —   |
| #1 cylinder roughness monitor                  | Roughness Monitor #1     | —                       | 0   |
| #2 cylinder roughness monitor                  | Roughness Monitor #2     | —                       | 0   |
| #3 cylinder roughness monitor                  | Roughness Monitor #3     | —                       | 0   |
| #4 cylinder roughness monitor                  | Roughness Monitor #4     | —                       | 0   |
| AT/MT identification terminal                  | AT Vehicle ID Signal     | —                       | ON/OFF                                    |
| Test mode terminal                             | Test Mode Signal         | —                       | OFF                                       |
| Neutral position switch signal                 | Neutral Position Switch  | —                       | ON  |
| Soft idle switch signal                        | Idle Switch Signal       | —                       | ON  |
| Ignition switch signal                         | Ignition Switch          | —                       | ON  |
| Power steering switch input signal             | P/S Switch               | —                       | OFF (At OFF)                              |
| Air conditioning switch signal                 | A/C Switch               | —                       | OFF (At OFF)                              |
| Starter switch signal                          | Starter Switch           | —                       | OFF                                       |
| Rear O <sub>2</sub> monitor                    | Rear O2 Rich Signal      | —                       | ON/OFF                                    |
| Knocking signal                                | Knocking Signal          | —                       | OFF                                       |
| Crankshaft position sensor signal              | Crankshaft Position Sig. | —                       | OFF                                       |
| Camshaft position sensor signal                | Camshaft Position Sig.   | —                       | OFF                                       |
| Rear defogger switch signal                    | Rear Defogger SW         | —                       | OFF (At OFF)                              |
| Blower fan switch signal                       | Blower Fan SW            | —                       | OFF (At OFF)                              |
| Light switch signal                            | Light Switch             | —                       | OFF (At OFF)                              |
| Air conditioner compressor relay output signal | A/C Compressor Signal    | —                       | OFF (At OFF)                              |
| Radiator fan relay 1 signal                    | Radiator Fan Relay #1    | —                       | OFF (At OFF)                              |
| Radiator fan relay 2 signal                    | Radiator Fan Relay #2    | —                       | OFF (At OFF)                              |
| PCV hose ASSY diagnosis signal                 | Blow-by Leak Connector   | —                       | ON  |
| Pressure control solenoid valve signal         | PCV Solenoid             | —                       | OFF output (At OFF)                       |
| Tumble generator valve output signal           | TGV Output               | —                       | OFF                                       |
| Tumble generator valve drive signal            | TGV Drive                | —                       | Open                                      |
| Drain valve signal                             | Vent Control Solenoid    | —                       | OFF output (At OFF)                       |
| AT coordinate retard angle demand signal       | Retard Signal from AT    | —                       | OFF                                       |
| AT coordinate fuel cut demand signal           | Fuel Cut Signal from AT  | —                       | OFF                                       |
| AT coordinate permission demand                | Torque Permission Signal | —                       | ON  |
| Electronic throttle control motor relay signal | ETC Motor Relay          | —                       | ON  |
| Clutch switch signal                           | Clutch Switch            | —                       | OFF (At OFF)                              |

# Subaru Select Monitor

## ENGINE (DIAGNOSTICS)

| Remarks                                  | Display                  | Unit of measure | Note (at idling) |
|--|--------------------------|-----------------|------------------|
| Stop light switch signal                 | Stop Light Switch        | —               | OFF (At OFF)     |
| SET/COAST switch signal                  | SET/COAST Switch         | —               | OFF (At OFF)     |
| RES/ACC switch signal                    | RESUME/ACCEL Switch      | —               | OFF (At OFF)     |
| Brake switch signal                      | Brake Switch             | —               | OFF (At OFF)     |
| Main switch signal                       | Main Switch              | —               | OFF (At OFF)     |
| Secondary air combi valve relay 2 signal | Sec. Air Combi V Relay 2 | —               | OFF (At OFF)     |
| Secondary air pump relay signal          | Sec. Air Pump Relay      | —               | OFF (At OFF)     |
| Secondary air combi valve relay 1 signal | Sec. Air Combi V Relay 1 | —               | OFF (At OFF)     |

**NOTE:**

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

## 5. READ CURRENT DATA FOR ENGINE. (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
  - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
  - 3) Press the [YES] key after the information of engine type is displayed.
  - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
  - 5) On the «OBD Menu» display screen, select the {Current Data Display & Save} and press the [YES] key.
  - 6) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
  - 7) Using the scroll key, move the display screen up or down until desired data is shown.
- A list of the support data is shown in the following table.

| Contents  | Display                         | Unit of measure         | Note (at idling)                          |
|---|---------------------------------|-------------------------|---|
| Number of DTC                                     | Number of DTC                   | —                       | —   |
| Malfunction indicator light status                | MI (MIL)                        | —                       | ON or OFF                                 |
| Monitoring test of misfire                        | Misfire monitoring              | —                       | Complete or incomplete                    |
| Monitoring test of fuel system                    | Fuel system monitoring          | —                       | Complete or incomplete                    |
| Monitoring test of comprehensive component        | Component monitoring            | —                       | Complete or incomplete                    |
| Test of catalyst                                  | Catalyst Diagnosis              | —                       | Complete or incomplete                    |
| Test of heated catalyst                           | Heated catalyst                 | —                       | No support                                |
| Test of evaporative emission purge control system | Evaporative purge system        | —                       | Complete or incomplete                    |
| Test of secondary air system                      | Secondary air system            | —                       | Complete or incomplete                    |
| Test of air conditioning system refrigerant       | A/C system refrigerant          | —                       | No support                                |
| Test of oxygen sensor                             | Oxygen sensor                   | —                       | Complete or incomplete                    |
| Test of oxygen sensor heater                      | O <sub>2</sub> Heater Diagnosis | —                       | Complete or incomplete                    |
| Test of EGR system                                | EGR system                      | —                       | No support                                |
| Air fuel ratio control system for bank 1          | Fuel System for Bank 1          | —                       | Close normal                              |
| Engine load data                                  | Calculated load value           | %                       | 21.0%                                     |
| Engine coolant temperature signal                 | Coolant Temp.                   | °C                      | +91°C or 196°F                            |
| Short term fuel trim by front oxygen (A/F) sensor | Short term fuel trim B1         | %                       | +0.8%                                     |
| Long term fuel trim by front oxygen (A/F) sensor  | Long term fuel trim B1          | %                       | +3.9%                                     |
| Intake manifold absolute pressure signal          | Mani. Absolute Pressure         | mmHg, kPa, inHg or psig | 233 mmHg or 31 kPa or 9.2 inHg or 4.5 psi |
| Engine speed signal                               | Engine Speed                    | rpm                     | 700 rpm                                   |
| Vehicle speed signal                              | Vehicle Speed                   | km/h or MPH             | 0 km/h or 0 MPH                           |
| Ignition timing advance for #1 cylinder           | Ignition timing adv. #1         | °                       | +16.5°                                    |
| Intake air temperature signal                     | Intake Air Temp.                | °C or °F                | 54°C or 129°F                             |
| Intake air amount                                 | Mass Air Flow                   | g/s or lb/m             | 2.8 g/s or 0.37 lb/m                      |
| Throttle position signal                          | Throttle Opening Angle          | %                       | 13%                                       |
| Secondary air system                              | Sec. air system                 | —                       | Stop                                      |
| Oxygen sensor #12                                 | Oxygen Sensor #12               | V                       | 0.1 — 0.7 V                               |
| Air fuel ratio correction by rear oxygen sensor   | Short term fuel trim #12        | %                       | +0.0%                                     |
| On-board diagnostic system                        | OBD System                      | —                       | CARB-OBD2                                 |
| Oxygen sensor #11                                 | Oxygen Sensor #11               | —                       | Support                                   |
| Rear oxygen sensor output signal                  | Oxygen Sensor #12               | —                       | Support                                   |
| A/F lambda signal                                 | A/F sensor #11                  | —                       | 1.001                                     |
| A/F sensor output signal                          | A/F sensor #11                  | V                       | 2.805 V                                   |
| A/F lambda signal #11                             | A/F sensor #11                  | —                       | 0.999                                     |
| A/F sensor current #11                            | A/F sensor #11                  | mA                      | 0.02 mA                                   |

**NOTE:**

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

# Subaru Select Monitor

## ENGINE (DIAGNOSTICS)

### 6. READ FREEZE FRAME DATA FOR ENGINE. (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
  - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
  - 3) Press the [YES] key after the information of engine type has been displayed.
  - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
  - 5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.
- A list of support data is shown in the following table.

| Contents  | Display                  | Unit of measure         | Note (at idling)             |
|---|--------------------------|-------------------------|------------------------------|
| DTC for freeze frame data                         | Freeze frame data        | —                       | DTC                          |
| Air fuel ratio control system for bank 1          | Fuel system for Bank1    | —                       | CLOSE normal or OPEN initial |
| Oxygen sensor output voltage                      | Oxygen Sensor #12        | V                       | —                            |
| Air fuel ratio correction by rear oxygen sensor   | Short term fuel trim #12 | %                       | —                            |
| Engine load data                                  | Calculated load value    | %                       | —                            |
| Engine coolant temperature signal                 | Coolant Temp.            | °C or °F                | —                            |
| Short term fuel trim by front oxygen (A/F) sensor | Short term fuel trim B1  | %                       | —                            |
| Long term fuel trim by front oxygen (A/F) sensor  | Long term fuel trim B1   | %                       | —                            |
| Intake manifold absolute pressure signal          | Mani. Absolute Pressure  | mmHg, kPa, inHg or psig | —                            |
| Engine speed signal                               | Engine Speed             | rpm                     | —                            |
| Vehicle speed signal                              | Vehicle Speed            | km/h or MPH             | —                            |
| Ignition timing signal                            | Ignition Timing          | °                       | —                            |
| Intake air temperature signal                     | Intake Air Temp          | °C or °F                | —                            |
| Intake air volume                                 | Mass Air Flow            | g/s                     | —                            |
| Throttle position signal                          | Throttle Opening Angle   | %                       | —                            |
| Secondary air system                              | Sec. Air system          | —                       | —                            |
| Oxygen sensor #11                                 | Oxygen sensor #11        | —                       | Support                      |
| Oxygen sensor #12                                 | Oxygen sensor #12        | —                       | Support                      |

**NOTE:**

For detailed operation procedure, refer to SUBARU SELECT MONITOR OPERATION MANUAL.

## 7. LED OPERATION MODE FOR ENGINE

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
- 5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press the [YES] key.
- 6) Using the scroll key, move the display screen up or down until the desired data is shown.
  - A list of the support data is shown in the following table.

| Remarks  | Display                    | Message              | LED "ON" requirements  |
|--|----------------------------|----------------------|--|
| AT/MT identification signal                    | AT Vehicle ID Signal       | ON or OFF            | Illuminate (AT model)  |
| Test mode signal                               | Test Mode Signal           | ON or OFF            | D check  |
| Neutral position switch signal                 | Neutral Position Switch    | ON or OFF            | When neutral position signal is entered.                     |
| Idle switch signal                             | Idle Switch Signal         | ON or OFF            | When idle switch signal is entered.                          |
| Ignition switch signal                         | Ignition Switch            | ON or OFF            | When ignition switch is turned to ON.                        |
| Power steering switch signal                   | P/S Switch                 | ON or OFF            | When power steering switch is entered.                       |
| Air conditioning switch signal                 | A/C Switch                 | ON or OFF            | When air conditioning switch is input.                       |
| Starter switch signal                          | Starter Switch             | ON or OFF            | When starter switch is input.                                |
| Rear oxygen sensor rich signal                 | Rear O2 Rich Signal        | Lean or Rich         | When rear oxygen sensor mixture ratio is rich.               |
| Knocking signal                                | Knocking Signal            | Provided or None     | When knocking signal is input.                               |
| Crankshaft position sensor signal              | Crankshaft Position Signal | Provided or None     | When crankshaft position sensor signal is input.             |
| Camshaft position sensor signal                | Camshaft Position Signal   | Provided or None     | When camshaft position sensor signal is input.               |
| Rear defogger switch signal                    | Rear Defogger Switch       | ON or OFF            | When rear defogger switch is turned to ON.                   |
| Blower fan switch signal                       | Blower Fan Switch          | ON or OFF            | When blower fan switch is turned to ON.                      |
| Small light switch signal                      | Light Switch               | ON or OFF            | When small light switch is turned to ON.                     |
| Air conditioning relay signal                  | A/C Compressor Signal      | ON or OFF            | When air conditioning relay is in function.                  |
| Radiator fan relay 1 signal                    | Radiator Fan Relay #1      | ON or OFF            | When radiator fan relay 1 is in function.                    |
| Radiator fan relay 2 signal                    | Radiator Fan Relay #2      | ON or OFF            | When radiator fan relay 2 is in function.                    |
| PCV hose assembly diagnosis signal             | Blow-by leak Connector     | Connect or Unconnect | When PCV hose assembly is connected.                         |
| Pressure control solenoid valve signal         | PCV Solenoid               | ON or OFF            | When pressure control solenoid valve is ON.                  |
| Tumble generator valve signal                  | TGV Output                 | Provided or None     | When tumble generator valve signal is input.                 |
| Tumble generator valve drive signal            | TGV Drive                  | Open or Close        | When tumble generator valve is open.                         |
| Drain valve signal                             | Vent Control Solenoid      | ON or OFF            | When drain valve is ON.                                      |
| AT retard angle demand signal                  | Retard Signal              | Provided or None     | When AT retard angle demand signal is input.                 |
| AT fuel cut signal                             | Fuel Cut                   | Provided or None     | When AT fuel cut signal is input.                            |
| AT coordinate permission signal                | Torque Control Permission  | Provided or None     | When AT coordinate permission signal is input.               |
| Electronic throttle control motor relay signal | ETC Motor Relay            | ON or OFF            | When electronic throttle control motor relay is in function. |
| Clutch switch signal                           | Clutch Switch              | ON or OFF            | When clutch switch is turned to ON.                          |
| Stop light switch signal                       | Stop Light Switch          | ON or OFF            | When stop switch is turned to ON.                            |

# Subaru Select Monitor

## ENGINE (DIAGNOSTICS)

| Remarks                            | Display             | Message   | LED "ON" requirements                  |
|------------------------------------|---------------------|-----------|--|
| SET/COAST switch signal            | SET/COAST Switch    | ON or OFF | When SET/COAST switch is turned to ON. |
| RES/ACC switch signal              | RESUME/ACCEL Switch | ON or OFF | When RES/ACC switch is turned to ON.   |
| Brake switch signal                | Brake Switch        | ON or OFF | When brake switch is turned to ON.     |
| Main switch signal                 | Main Switch         | ON or OFF | When main switch is turned to ON.      |
| Secondary air combi valve 2 signal | Combi valve 2       | ON or OFF | Secondary air combi valve 2 is ON.     |
| Secondary air pump relay signal    | Air pump relay      | ON or OFF | Secondary air pump relay functions.    |
| Secondary air combi valve 1 signal | Combi valve 1       | ON or OFF | Secondary air combi valve 1 is ON.     |

**NOTE:**

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

### 8. VIN REGISTRATION

- 1) On «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On «Engine Diagnosis» display screen, select the {VIN Registration}, and then press the [YES] key.
- 5) Perform the procedure shown on the display.

**NOTE:**

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

## 10. Read Diagnostic Trouble Code (DTC)

### A: OPERATION

#### 1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On the «Engine Diagnosis» display screen, select the {DTC Display} and press the [YES] key.
- 5) On the «DTC Display» display screen, select the {Current DTC} or {History DTC} and press the [YES] key.

#### NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>

#### 2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
- 5) On the «OBD Menu» display screen, select the {DTC Display} and press the [YES] key.
- 6) Make sure that a DTC is shown on the display screen.

#### NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>

### 3. GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain DTC.

For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>

#### NOTE:

Refer to general scan tool manufacturer's instruction manual to access emission-related powertrain DTC (MODE \$03).



# Inspection Mode

ENGINE (DIAGNOSTICS)

## 11. Inspection Mode

### A: PROCEDURE

Carry out trouble diagnosis shown in the following DTC table.

When performing trouble diagnosis which is not shown in the DTC table, refer to the next item Drive cycle.

<Ref. to EN(H4DOTC)(diag)-46, Drive Cycle.>

| DTC   | Item   | Condition |
|-------|--|-----------|
| P0011 | Intake Camshaft Position - Timing Over-advanced or System Performance (Bank 1) | —         |
| P0016 | Crankshaft Position - Camshaft Position Correlation (Bank 1)                   | —         |
| P0018 | Crankshaft Position - Camshaft Position Correlation (Bank 2)                   | —         |
| P0021 | Intake Camshaft Position - Timing Over-advanced or System Performance (Bank 2) | —         |
| P0031 | HO2S Heater Control Circuit Low (Bank 1 Sensor 1)                              | —         |
| P0032 | HO2S Heater Control Circuit High (Bank 1 Sensor 1)                             | —         |
| P0037 | HO2S Heater Control Circuit Low (Bank 1 Sensor 2)                              | —         |
| P0038 | HO2S Heater Control Circuit High (Bank 1 Sensor 2)                             | —         |
| P0102 | Mass or Volume Air Flow Circuit Low Input                                      | —         |
| P0103 | Mass or Volume Air Flow Circuit High Input                                     | —         |
| P0107 | Manifold Absolute Pressure/Barometric Pressure Circuit Low Input               | —         |
| P0108 | Manifold Absolute Pressure/Barometric Pressure Circuit High Input              | —         |
| P0112 | Intake Air Temperature Circuit Low Input                                       | —         |
| P0113 | Intake Air Temperature Circuit High Input                                      | —         |
| P0117 | Engine Coolant Temperature Circuit Low Input                                   | —         |
| P0118 | Engine Coolant Temperature Circuit High Input                                  | —         |
| P0122 | Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input                    | —         |
| P0123 | Throttle/Pedal Position Sensor/Switch "A" Circuit High Input                   | —         |
| P0131 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 1)                    | —         |
| P0132 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 1)                   | —         |
| P0137 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 2)                    | —         |
| P0138 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 2)                   | —         |
| P0140 | O <sub>2</sub> Sensor Circuit No Activity Detected (Bank 1 Sensor 2)           | —         |
| P0182 | Fuel Temperature Sensor "A" Circuit Low Input                                  | —         |
| P0183 | Fuel Temperature Sensor "A" Circuit High Input                                 | —         |
| P0222 | Throttle/Pedal Position Sensor/Switch "B" Circuit Low                          | —         |
| P0223 | Throttle/Pedal Position Sensor/Switch "B" Circuit High                         | —         |
| P0230 | Fuel Pump Primary Circuit  | —         |
| P0245 | Turbo/Super Charger Wastegate Solenoid "A" Low                                 | —         |
| P0327 | Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)                     | —         |
| P0328 | Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)                    | —         |
| P0335 | Crankshaft Position Sensor "A" Circuit   | —         |
| P0336 | Crankshaft Position Sensor "A" Circuit Range/Performance                       | —         |
| P0340 | Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)                 | —         |
| P0345 | Camshaft Position Sensor "A" Circuit (Bank 2)                                  | —         |
| P0413 | Secondary Air Injection System Switching Valve "A" Circuit Open                | —         |
| P0416 | Secondary Air Injection System Switching Valve "B" Circuit Open                | —         |
| P0418 | Secondary Air Injection System Control "A" Circuit Open                        | —         |
| P0447 | Evaporative Emission Control System Vent Control Circuit Open                  | —         |
| P0448 | Evaporative Emission Control System Vent Control Circuit Shorted               | —         |
| P0452 | Evaporative Emission Control System Pressure Sensor Low Input                  | —         |
| P0453 | Evaporative Emission Control System Pressure Sensor High Input                 | —         |

# Inspection Mode

ENGINE (DIAGNOSTICS)

| DTC   | Item   | Condition |
|-------|--|-----------|
| P0458 | Evaporative Emission Control System Purge Control Valve Circuit Low      | —         |
| P0462 | Fuel Level Sensor Circuit Low Input                                      | —         |
| P0463 | Fuel Level Sensor Circuit High Input                                     | —         |
| P0502 | Vehicle Speed Sensor Circuit Low Input                                   | —         |
| P0503 | Vehicle Speed Sensor Intermittent/Erratic/High                           | —         |
| P0512 | Starter Request Circuit  | —         |
| P0513 | Incorrect Immobilizer Key  | —         |
| P0519 | Idle Control System Malfunction (Fail-Safe)                              | —         |
| P0600 | Serial Communication Link  | —         |
| P0604 | Internal Control Module Random Access Memory (RAM) Error                 | —         |
| P0605 | Internal Control Module Read Only Memory (ROM) Error                     | —         |
| P0607 | Control Module Performance   | —         |
| P0638 | Throttle Actuator Control Range/Performance (Bank 1)                     | —         |
| P0691 | Cooling Fan 1 Control Circuit Low  | —         |
| P0700 | Transmission Control System (MIL Request)                                | —         |
| P0851 | Neutral Switch Input Circuit Low   | —         |
| P0852 | Neutral Switch Input Circuit High  | —         |
| P1152 | O <sub>2</sub> Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)  | —         |
| P1153 | O <sub>2</sub> Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1) | —         |
| P1160 | Return Spring Failure  | —         |
| P1400 | Fuel Tank Pressure Control Solenoid Valve Circuit Low                    | —         |
| P1410 | Secondary Air Injection System Switching Valve Stuck Open                | —         |
| P1420 | Fuel Tank Pressure Control Sol. Valve Circuit High                       | —         |
| P1491 | Positive Crankcase Ventilation (Blow-by) Function Problem                | —         |
| P1518 | Starter Switch Circuit Low Input   | —         |
| P1560 | Back-up Voltage Circuit Malfunction                                      | —         |
| P1570 | Antenna  | —         |
| P1571 | Reference Code Incompatibility   | —         |
| P1572 | IMM Circuit Failure (Except Antenna Circuit)                             | —         |
| P1574 | Key Communication Failure  | —         |
| P1576 | EGI Control Module EEPROM  | —         |
| P1577 | IMM Control Module EEPROM  | —         |
| P2006 | Intake Manifold Runner Control Stuck Closed (Bank 1)                     | —         |
| P2007 | Intake Manifold Runner Control Stuck Closed (Bank 2)                     | —         |
| P2008 | Intake Manifold Runner Control Circuit / Open (Bank 1)                   | —         |
| P2009 | Intake Manifold Runner Control Circuit Low (Bank 1)                      | —         |
| P2011 | Intake Manifold Runner Control Circuit / Open (Bank 2)                   | —         |
| P2012 | Intake Manifold Runner Control Circuit Low (Bank 2)                      | —         |
| P2016 | Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 1)     | —         |
| P2017 | Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 1)    | —         |
| P2021 | Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 2)     | —         |
| P2022 | Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2)    | —         |
| P2088 | OCV Solenoid Valve Signal A Circuit Open (Bank 1)                        | —         |
| P2089 | OCV Solenoid Valve Signal A Circuit Short (Bank 1)                       | —         |
| P2092 | OCV Solenoid Valve Signal A Circuit Open (Bank 2)                        | —         |
| P2093 | Intake Camshaft Position Actuator Control Circuit High (Bank 2)          | —         |
| P2101 | Throttle Actuator Control Motor Circuit Range/Performance                | —         |

## Inspection Mode

### ENGINE (DIAGNOSTICS)

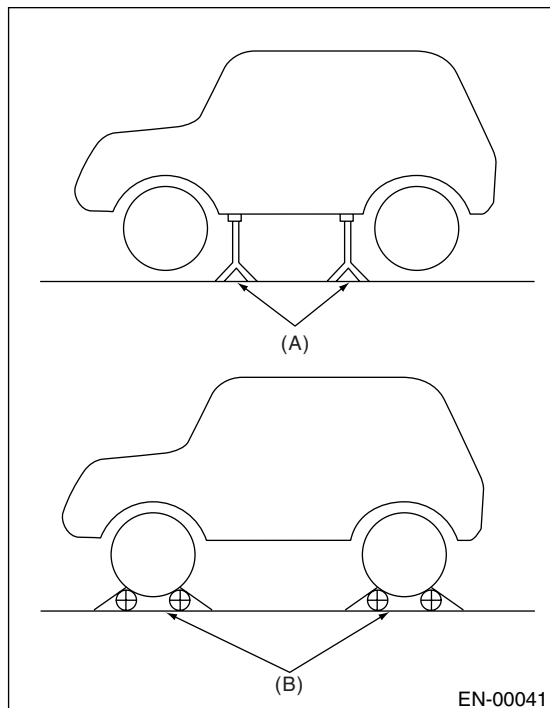
| DTC   | Item   | Condition |
|-------|--|-----------|
| P2102 | Throttle Actuator Control Motor Circuit Low  | —         |
| P2103 | Throttle Actuator Control Motor Circuit High                                       | —         |
| P2109 | Throttle/Pedal Position Sensor "A" Minimum Stop Performance                        | —         |
| P2122 | Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input                        | —         |
| P2123 | Throttle/Pedal Position Sensor/Switch "D" Circuit High Input                       | —         |
| P2127 | Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input                        | —         |
| P2128 | Throttle/Pedal Position Sensor/Switch "E" Circuit High Input                       | —         |
| P2135 | Throttle/Pedal Position Sensor/Switch "A" / "B" Voltage Correlation                | —         |
| P2138 | Throttle/Pedal Position Sensor/Switch "D" / "E" Voltage Correlation                | —         |
| P2227 | Barometric Pressure Circuit Range/Performance                                      | —         |
| P2228 | Barometric Pressure Circuit Low  | —         |
| P2229 | Barometric Pressure Circuit High   | —         |
| P2431 | Secondary Air Injection System Air Flow /Pressure Sensor Circuit Range/Performance | —         |
| P2432 | Secondary Air Injection System Air Flow /Pressure Sensor Circuit Low               | —         |
| P2433 | Secondary Air Injection System Air Flow /Pressure Sensor Circuit High              | —         |
| P2444 | Secondary Air Injection System Pump Stuck On                                       | —         |

## 1. PREPARATION FOR THE INSPECTION MODE

- 1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)] and the battery voltage is 12 V or more.
- 2) Raise the vehicle using a garage jack and place on rigid racks or drive the vehicle onto free rollers.

### WARNING:

- Before raising the vehicle, ensure the parking brake is applied.
- Do not use a pantograph jack in place of a rigid rack.
- Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
- Do not abruptly depress/release the clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
- In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the rigid racks and the vehicle.
- Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



- (A) Rigid rack  
(B) Free rollers

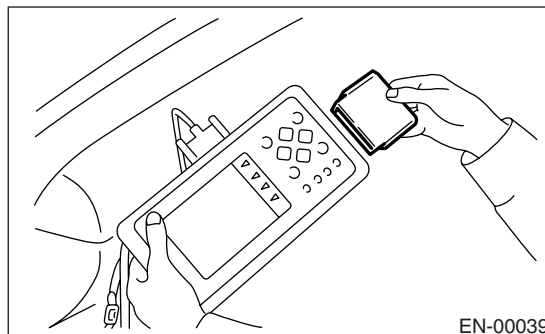
## 2. SUBARU SELECT MONITOR

- 1) Warm up the engine.
- 2) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



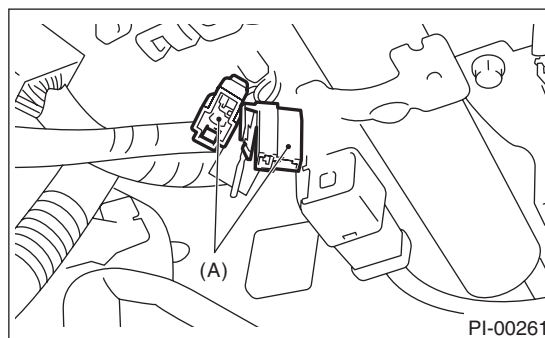
EN-00038

- 3) Connect the diagnosis cable to Subaru Select Monitor.
- 4) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



EN-00039

- 5) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



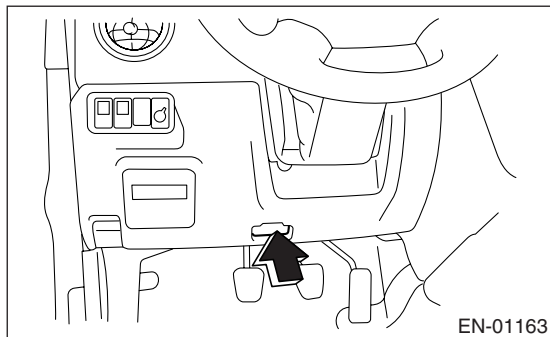
PI-00261

- (A) Test mode connector

# Inspection Mode

## ENGINE (DIAGNOSTICS)

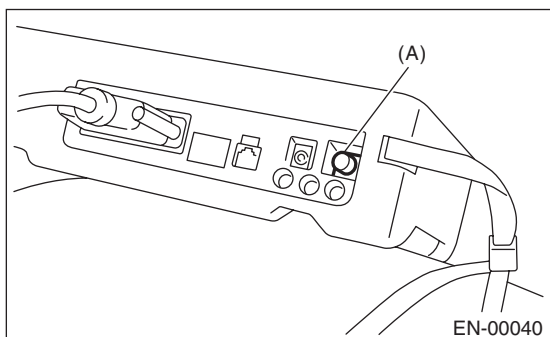
6) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



### CAUTION:

**Do not connect the scan tools except for Subaru Select Monitor and general scan tool.**

7) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor power switch to ON.



(A) Power switch

8) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.

9) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.

10) Press the [YES] key after the information of engine type is displayed.

11) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.

12) When the “Perform Inspection (Dealer Check Mode)?” is shown on the display screen, press the [YES] key.

13) Perform subsequent procedures as instructed on the display screen.

- If trouble still remains in the memory, the corresponding DTC appears on the display screen.

### NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

- For detailed concerning the DTC, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>

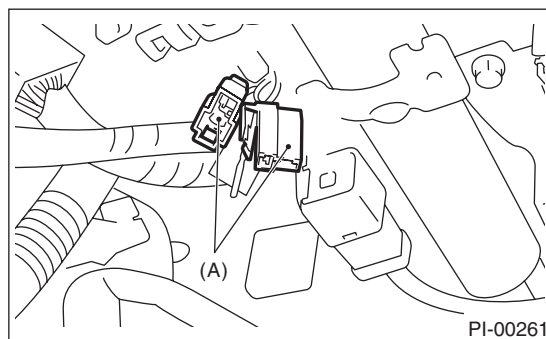
- Release the parking brake.

- The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

### 3. GENERAL SCAN TOOL

1) Warm up the engine.

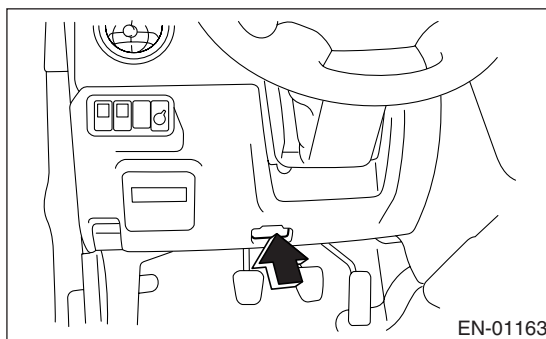
2) Connect the test mode connector (A) at the lower side of instrument panel (on the driver's side).



3) Connect the general scan tool to its data link connector in the lower portion of instrument panel (on the driver's side).

### CAUTION:

**Do not connect the scan tools except for Subaru Select Monitor and general scan tool.**



4) Start the engine.

### NOTE:

- Ensure the select lever is placed in “P” range before starting. (AT model)

- Depress the clutch pedal when starting engine. (MT model)

5) Using the select lever or shift lever, turn the “P” position switch and “N” position switch to ON.

6) Depress the brake pedal to turn brake switch ON. (AT model)

7) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.

8) Place the select lever or shift lever in “D” range (AT model) or “1st” gear (MT model) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

**NOTE:**

- On AWD model, release the parking brake.
- The speed difference between front and rear wheels may light ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

9) Using the general scan tool, check for DTC and record the result(s).

**NOTE:**

- For detailed operation procedures, refer to the General Scan Tool Instruction Manual.
- For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>

# Drive Cycle

## ENGINE (DIAGNOSTICS)

### 12. Drive Cycle

#### A: PROCEDURE

There are seven drive patterns of drive cycles A — G for the trouble diagnosis. Performing the specified drive pattern allows to diagnose malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check if they correctly resume their functions by performing the required drive pattern.

#### 1. PREPARATION FOR THE DRIVE CYCLE

- 1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12 V or more.
- 2) Disconnect the test mode connector.

#### NOTE:

- Except for the engine coolant temperature specified items at starting, the diagnosis is carried out after engine warm up.
- Carry out the diagnosis which is marked\* on DTC twice, then, after finishing first diagnosis, stop the engine and do second time at the same condition.

#### 2. DRIVE CYCLE A (AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE ENGINE FOR 1 MINUTE.)

| DTC    | Item   | Condition   |
|--------|--|---|
| *P0125 | Insufficient Coolant Temperature for Closed Loop Fuel Control          | Engine coolant temperature is less than 20°C (68°F) at engine start.  |
| *P0128 | Coolant Thermostat   | Engine coolant temperature is less than 55°C (131°F) at engine start. |
| *P0133 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 1)          | —   |
| *P0171 | System Too Lean (Bank 1)   | Diagnosis completes in drive cycle B or C as well.                    |
| *P0172 | System Too Rich (Bank 1)   | Diagnosis completes in drive cycle B or C as well.                    |
| P0301  | Cylinder 1 Misfire Detected  | Diagnosis completes in drive cycle B or C as well.                    |
| P0302  | Cylinder 2 Misfire Detected  | Diagnosis completes in drive cycle B or C as well.                    |
| P0303  | Cylinder 3 Misfire Detected  | Diagnosis completes in drive cycle B or C as well.                    |
| P0304  | Cylinder 4 Misfire Detected  | Diagnosis completes in drive cycle B or C as well.                    |
| *P0420 | Catalyst System Efficiency Below Threshold (Bank 1)                    | —   |
| *P0442 | Evaporative Emission Control System Leak Detected (small leak)         | Engine coolant temperature is less than 25°C (77°F) at engine start.  |
| *P0451 | Evaporative Emission Control System Pressure Sensor Range/Performance  | —   |
| *P0456 | Evaporative Emission Control System Leak Detected (very small leak)    | Engine coolant temperature is less than 25°C (77°F) at engine start.  |
| *P0457 | Evaporative Emission Control System Leak Detected (fuel cap loose/off) | Engine coolant temperature is less than 25°C (77°F) at engine start.  |
| *P0459 | Evaporative Emission Control System Purge Control Valve Circuit High   | —   |
| *P0692 | Cooling Fan 1 Control Circuit High                                     | —   |
| P1443  | Vent Control Solenoid Valve Function Problem                           | —   |
| *P2096 | Post Catalyst Fuel Trim System Too Lean Bank 1                         | Diagnosis completes in drive cycle B or C as well.                    |
| *P2097 | Post Catalyst Fuel Trim System Too Rich Bank 1                         | Diagnosis completes in drive cycle B or C as well.                    |

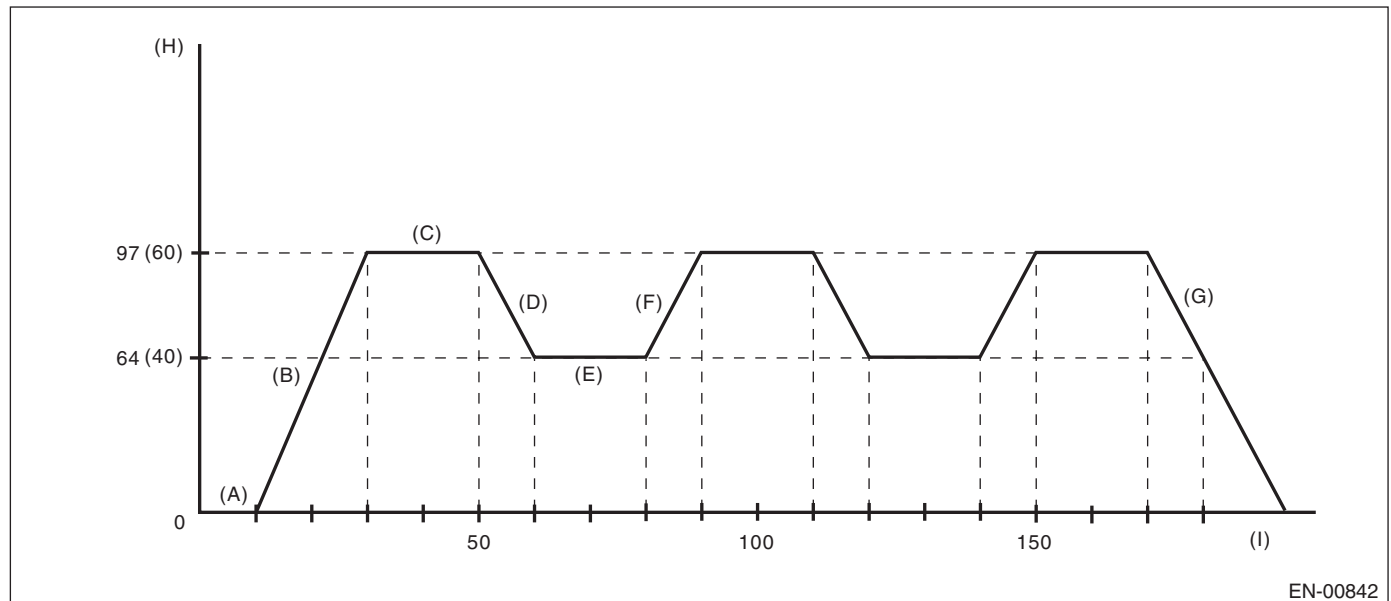
### 3. DRIVE CYCLE B (IDLE FOR 10 MINUTES)

**NOTE:**

Before the diagnosis, drive the vehicle at 10 km/h (6 MPH) or more.

| DTC    | Item   | Condition  |
|--------|--|--|
| *P0126 | Insufficient Engine Coolant Temperature for Stable Operation | —  |
| *P0171 | System too Lean (Bank 1)                                     | Diagnosis completes in drive cycle A or C as well. |
| *P0172 | System too Rich (Bank 1)                                     | Diagnosis completes in drive cycle A or C as well. |
| P0301  | Cylinder 1 Misfire Detected                                  | Diagnosis completes in drive cycle A or C as well. |
| P0302  | Cylinder 2 Misfire Detected                                  | Diagnosis completes in drive cycle A or C as well. |
| P0303  | Cylinder 3 Misfire Detected                                  | Diagnosis completes in drive cycle A or C as well. |
| P0304  | Cylinder 4 Misfire Detected                                  | Diagnosis completes in drive cycle A or C as well. |
| *P0464 | Fuel Level Sensor Circuit Intermittent                       | —  |
| *P0483 | Cooling Fan Rationality Check                                | —  |
| *P0506 | Idle Control System RPM Lower Than Expected                  | —  |
| *P0507 | Idle Control System RPM Higher Than Expected                 | —  |
| *P2096 | Post Catalyst Fuel Trim System Too Lean Bank 1               | Diagnosis completes in drive cycle A or C as well. |
| *P2097 | Post Catalyst Fuel Trim System Too Rich Bank 1               | Diagnosis completes in drive cycle A or C as well. |

### 4. DRIVE CYCLE C (DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN)



- |  |   |  |
|--|---|--|
| <p>(A) Idle engine for 10 seconds or more.</p> <p>(B) Accelerate to 97 km/h (60 MPH) within 20 seconds.</p> <p>(C) Drive vehicle at 97 km/h (60 MPH) for 20 seconds.</p> | <p>(D) Decelerate with fully closed throttle to 64 km/h (40 MPH).</p> <p>(E) Drive vehicle at 64 km/h (40 MPH) for 20 seconds.</p> <p>(F) Accelerate to 97 km/h (60 MPH) within 10 seconds.</p> | <p>(G) Stop vehicle with throttle fully closed.</p> <p>(H) Vehicle speed km/h (MPH)</p> <p>(I) Seconds</p> |
|--|---|--|



# Drive Cycle

## ENGINE (DIAGNOSTICS)

| DTC    | Item   | Condition  |
|--------|--|--|
| *P0030 | HO <sub>2</sub> S Heater Control Circuit (Bank 1 Sensor 1)               | —  |
| P0068  | Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance | —  |
| *P0101 | Mass or Volume Air Flow Circuit Range/Performance                        | —  |
| P0134  | O <sub>2</sub> Sensor Circuit No Activity Detected (Bank 1 Sensor 1)     | —  |
| *P0139 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 2)            | —  |
| *P0171 | System too Lean (Bank 1)   | Diagnosis completes in drive cycle A or B as well. |
| *P0172 | System too Rich (Bank 1)   | Diagnosis completes in drive cycle A or B as well. |
| *P0244 | Turbo/Supercharger Wastegate Solenoid "A" Range/Performance              | —  |
| P0246  | Turbo/Supercharger Wastegate Solenoid "A" High                           | —  |
| *P0301 | Cylinder 1 Misfire Detected  | Diagnosis completes in drive cycle A or B as well. |
| *P0302 | Cylinder 2 Misfire Detected  | Diagnosis completes in drive cycle A or B as well. |
| *P0303 | Cylinder 3 Misfire Detected  | Diagnosis completes in drive cycle A or B as well. |
| *P0304 | Cylinder 4 Misfire Detected  | Diagnosis completes in drive cycle A or B as well. |
| P2004  | Intake Manifold Runner Control Stuck Open (Bank 1)                       | —  |
| P2005  | Intake Manifold Runner Control Stuck Open (Bank 2)                       | —  |
| *P2096 | Post Catalyst Fuel Trim System Too Lean Bank 1                           | Diagnosis completes in drive cycle A or B as well. |
| *P2097 | Post Catalyst Fuel Trim System Too Rich Bank 1                           | Diagnosis completes in drive cycle A or B as well. |

## 5. DRIVE CYCLE D

### • DRIFT DIAGNOSIS

- 1) Make sure that the engine coolant temperature at engine starting is less than 30°C (86°F).
- 2) Make sure that fuel of more than 10 ℓ (2.6 US gal, 2.2 Imp gal) remains and the battery voltage is more than 10.9 V.
- 3) Make sure that the engine coolant temperature rises for more than 10°C (18°F) from the level of engine starting and is also more than 75°C (167°F).
- 4) Idle the engine for more than 120 seconds in the condition of step 3.

### • STUCK DIAGNOSIS

- 1) Make sure that the battery voltage is more than 10.9 V.
- 2) Perform the clear memory mode. <Ref. to EN(H4DOTC)(diag)-50, Clear Memory Mode.>
- 3) Drive the vehicle for the distance equal to fuel of 50 ℓ (13.2 US gal, 11 Imp gal).

#### NOTE:

- It is possible to drive intermittently.
- Do not disconnect the terminal of battery during diagnosis. (If disconnecting the terminal of battery, the data will be cleared.)

| DTC   | Item  | Condition |
|-------|---|-----------|
| P0181 | Fuel Temperature Sensor "A" Circuit Range/Performance | —         |

## 6. DRIVE CYCLE E

- 1) Make sure that the battery voltage is more than 10.9 V.
- 2) Perform the clear memory mode. <Ref. to EN(H4DOTC)(diag)-50, Clear Memory Mode.>
- 3) Drive the vehicle for the distance equal to fuel of 30 ℓ (7.9 US gal, 6.6 Imp gal).

**NOTE:**

- It is possible to drive intermittently.
- Do not disconnect the terminal of battery during diagnosis. (If disconnecting the terminal of battery, the data will be cleared.)

| DTC   | Item  | Condition |
|-------|---|-----------|
| P0461 | Fuel Level Sensor Circuit Range/Performance | —         |

## 7. DRIVE CYCLE F

- 1) Make sure that the engine coolant temperature at engine starting is less than 30°C (86°F).
- 2) Warm-up the engine until the engine coolant temperature is more than 95°C (203°F) from engine starting.
- 3) Idle the engine for more than 10 minutes in the condition of step 2).

**NOTE:**

Do not disconnect the terminal of battery during diagnosis. (If disconnecting the terminal of battery, the data will be cleared.)

| DTC   | Item   | Condition |
|-------|--|-----------|
| P0111 | Intake Air Temperature Circuit Range/Performance | —         |

## 8. DRIVE CYCLE G

- 1) Disconnect the ground cable from battery. Wait for 10 seconds and then reconnect it.
- 2) Start the engine and idle it until engine coolant temperature becomes 80°C (176°F).
- 3) Turn the engine OFF, and wait until coolant temperature goes down to 40°C (104°F).

**NOTE:**

Do not let the engine coolant temperature go down below 5°C (41°F).

- 4) Repeat the steps 2) and 3) again.

**NOTE:**

Do not let the engine coolant temperature go down below than 5°C (41°F).

- 5) Start and idle the engine.

| DTC    | Item   | Condition |
|--------|--|-----------|
| *P0410 | Secondary Air Injection System                                       | —         |
| *P0411 | Secondary Air Injection System Incorrect Flow Detected               | —         |
| P0414  | Secondary Air Injection System Switching Valve "A" Circuit Shorted   | —         |
| P0417  | Secondary Air Injection System Switching Valve "B" Circuit Shorted   | —         |
| P1418  | Secondary Air Injection System Control "A" Circuit Shorted           | —         |
| *P2440 | Secondary Air Injection System Switching Valve Stuck Open (Bank 1)   | —         |
| *P2441 | Secondary Air Injection System Switching Valve Stuck Closed (Bank 1) | —         |
| *P2442 | Secondary Air Injection System Switching Valve Stuck Open (Bank 2)   | —         |
| *P2443 | Secondary Air Injection System Switching Valve Stuck Closed (Bank 2) | —         |

## 13. Clear Memory Mode

### A: OPERATION

#### 1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
- 5) When the 'Done' and 'Turn Ignition Switch OFF' are shown on the display screen, turn the ignition switch to OFF, and then turn the Subaru Select Monitor power switch to OFF.

**NOTE:**

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

#### 2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
- 5) On the «OBD Menu» display screen, select the {4. Diagnosis Code(s) Cleared} and press the [YES] key.
- 6) When the 'Clear Diagnostic Code?' is shown on the display screen, press the [YES] key.
- 7) Turn the ignition switch to OFF, and then turn the Subaru Select Monitor power switch to OFF.

**NOTE:**

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

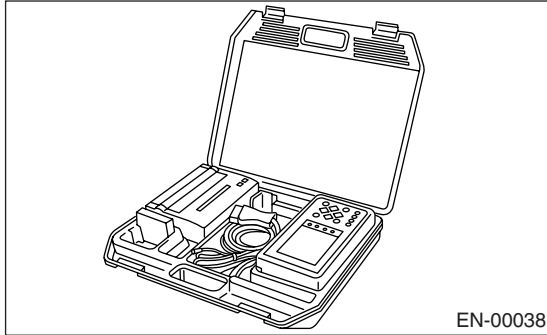
#### 3. GENERAL SCAN TOOL

For clear memory procedures using the general scan tool, refer to the General Scan Tool Instruction Manual.

## 14. Compulsory Valve Operation Check Mode

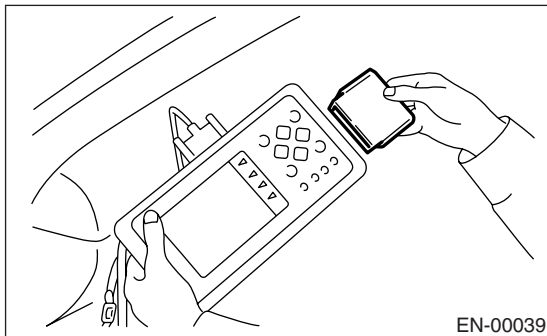
### A: OPERATION

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>

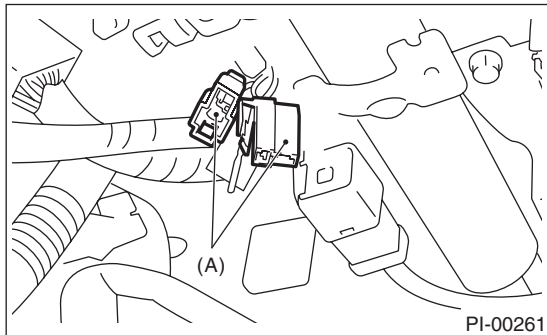


2) Connect the diagnosis cable to Subaru Select Monitor.

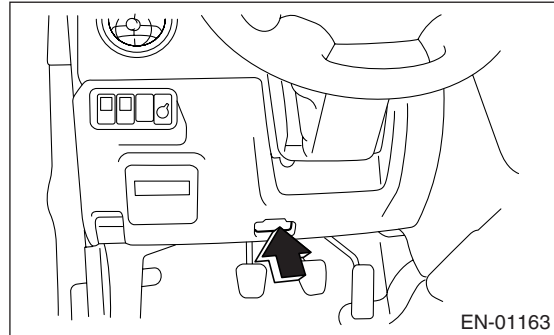
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



4) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



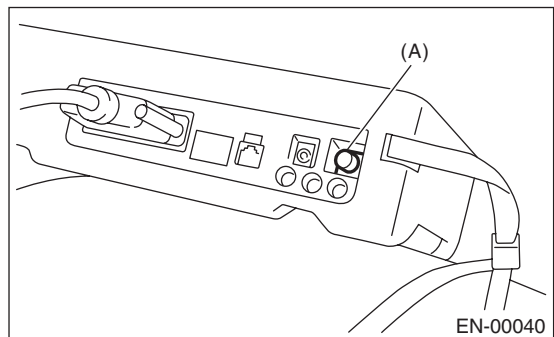
5) Connect the Subaru Select Monitor to data link connector located in the lower portion of instrument panel (on the driver's side).



### CAUTION:

**Do not connect scan tools except for the Subaru Select Monitor and general scan tool.**

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor power switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.

8) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.

9) Press the [YES] key after the information of engine type is displayed.

10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.

11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press the [YES] key.

12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.

13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

- A list of support data is shown in the following table.

# Compulsory Valve Operation Check Mode

## ENGINE (DIAGNOSTICS)

| Contents   | Display                         |
|--|---------------------------------|
| Compulsory fuel pump relay operation check                 | Fuel Pump Relay                 |
| Compulsory radiator fan relay operation check              | Radiator Fan Relay              |
| Compulsory air conditioning relay operation check          | A/C Compressor Relay            |
| Compulsory purge control solenoid valve operation check    | CPC Solenoid Valve              |
| Compulsory pressure control solenoid valve operation check | PCV Solenoid Valve              |
| Compulsory drain valve operation check                     | Vent. Solenoid Valve            |
| Compulsory turbocharger wastegate solenoid operation check | Turbocharger Wastegate Solenoid |
| Compulsory secondary air combi valve 1 operation check     | Secondary Air Combi Valve 1     |
| Compulsory secondary air combi valve 2 operation check     | Secondary Air Combi Valve 2     |
| Compulsory air pump relay operation check                  | Secondary Air Pump Relay        |

### NOTE:

- The following parts will be displayed but not functional because they are not installed on the vehicle.

| Display                               |
|---------------------------------------|
| EGR Solenoid Valve                    |
| ASV Solenoid Valve                    |
| FICD Solenoid                         |
| Pressure Switching Sol. 1             |
| Pressure Switching Sol. 2             |
| AAI Solenoid Valve                    |
| Tank Sensor Cntl Valve                |
| Emission-bypass valve permission flag |

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

## 15. Malfunction Indicator Light

### A: PROCEDURE

|  |
|--|
| 1. Activation of check malfunction indicator light. <Ref. to EN(H4DOTC)(diag)-53, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>   |
| ↓  |
| 2. Check that the malfunction indicator light does not come on. <Ref. to EN(H4DOTC)(diag)-55, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>  |
| ↓  |
| 3. Check that the malfunction indicator light does not go off. <Ref. to EN(H4DOTC)(diag)-57, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF., Malfunction Indicator Light.>   |
| ↓  |
| 4. Check that the malfunction indicator light does not blink at a cycle of 3 Hz. <Ref. to EN(H4DOTC)(diag)-58, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 HZ., Malfunction Indicator Light.>     |
| ↓  |
| 5. Check that the malfunction indicator light remains blinking at a cycle of 3 Hz. <Ref. to EN(H4DOTC)(diag)-60, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 HZ., Malfunction Indicator Light.> |

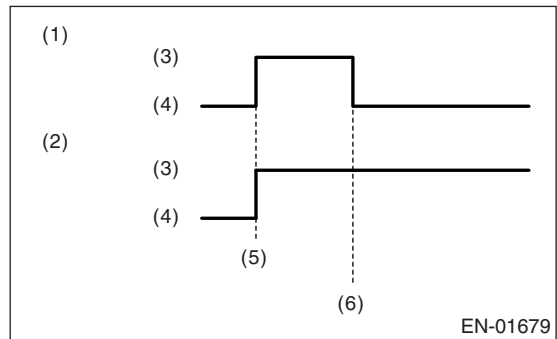
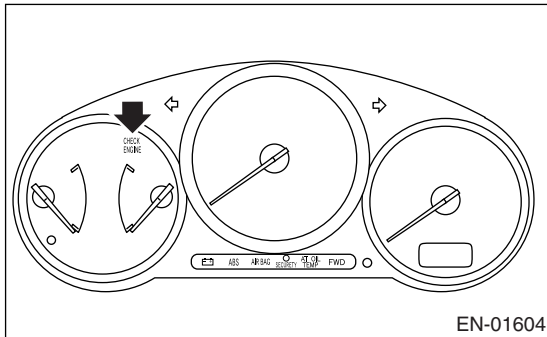
### B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

1) When the ignition switch is turned to ON (engine off), the malfunction indicator light in the combination meter illuminates.

**NOTE:**

If the malfunction indicator light does not illuminate, perform diagnostics of the malfunction indicator light circuit or the combination meter circuit. <Ref. to EN(H4DOTC)(diag)-55, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>

2) After starting the engine, the malfunction indicator light goes out. If it does not, either the engine or the emission control system is malfunctioning.



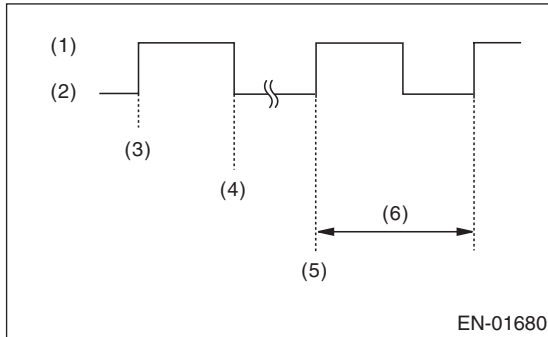
- (1) No trouble
- (2) Trouble occurs
- (3) ON
- (4) OFF
- (5) Ignition switch ON
- (6) Engine start

# Malfunction Indicator Light

## ENGINE (DIAGNOSTICS)

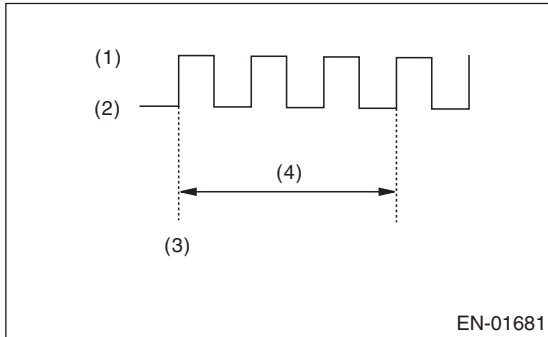
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3) If the diagnosis system senses a misfire which could damage the catalyzer, the malfunction indicator light will blink at a cycle of 1 Hz.



- (1) ON
- (2) OFF
- (3) Ignition switch ON
- (4) Engine start
- (5) Misfire start
- (6) 1 second

4) When the ignition switch is turned to ON (engine off) or to START with the test mode connector connected, the malfunction indicator light blinks at a cycle of 3 Hz.



- (1) ON
- (2) OFF
- (3) Ignition switch ON
- (4) 1 second

# Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

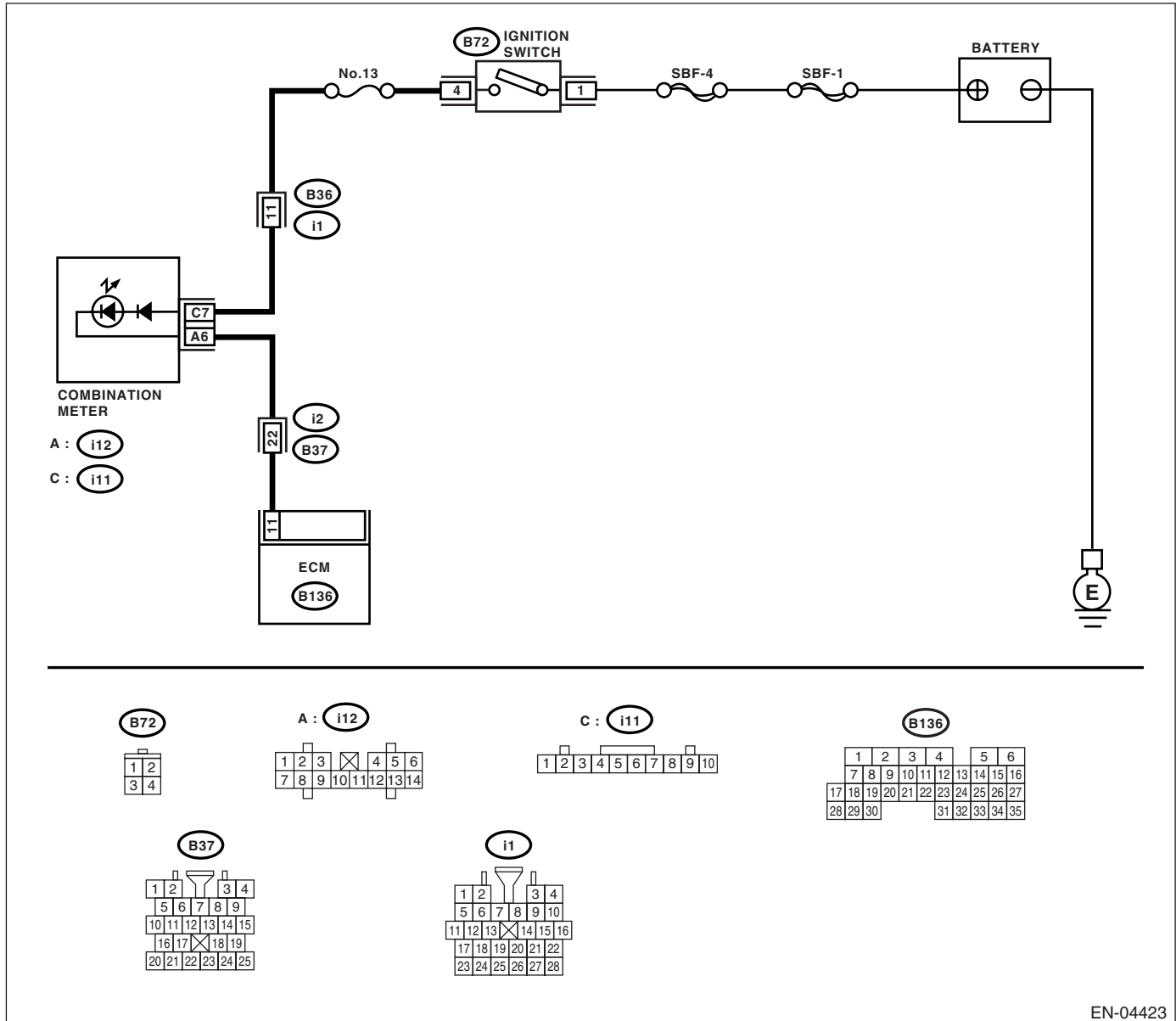
## C: MALFUNCTION INDICATOR LIGHT DOES NOT COME ON DIAGNOSIS:

The malfunction indicator light circuit is shorted.

### TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), malfunction indicator light does not come on.

### WIRING DIAGRAM:



EN-04423

| Step  | Check   | Yes                                       | No            |
|---|---|---|---------------|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 11 (+) — Chassis ground (-):</b> | Is the voltage less than 1 V?   | Go to step 4.                             | Go to step 2. |
| <b>2</b><br><b>CHECK POOR CONTACT.</b>  | Does the malfunction indicator light come on when shaking or pulling ECM connector and harness? | Repair the poor contact in ECM connector. | Go to step 3. |



## Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <b>3</b><br><b>CHECK ECM CONNECTOR.</b>   | Is the ECM connector correctly connected?             | Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>            | Repair the connection of ECM connector.   |
| <b>4</b><br><b>CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the combination meter. <Ref. to IDI-10, Combination Meter.><br>3) Disconnect the connector from ECM and combination meter.<br>4) Measure the resistance of harness between ECM and combination meter connector.<br><br><i>Connector &amp; terminal</i><br><i>(B136) No. 11 — (i12) No. 6:</i> | Is the resistance less than 1 $\Omega$ ?              | Go to step 5.   | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and combination meter connector</li> <li>• Poor contact in coupling connector</li> </ul>                       |
| <b>5</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in combination meter connector.  | Is there poor contact in combination meter connector? | Repair the poor contact in combination meter connector.                           | Go to step 6.   |
| <b>6</b><br><b>CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between combination meter connector and chassis ground.<br><br><i>Connector &amp; terminal</i><br><i>(i11) No. 7 (+) — Chassis ground (-):</i>  | Is the voltage more than 10 V?                        | Replace the combination meter circuit board. <Ref. to IDI-10, Combination Meter.> | Check the following and repair if necessary.<br><br>NOTE: <ul style="list-style-type: none"> <li>• Blown out fuse (No. 13)</li> <li>• Open or short circuit in harness between fuse (No. 13) and battery terminal</li> <li>• Poor contact in ignition switch connector</li> </ul> |

## D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF.

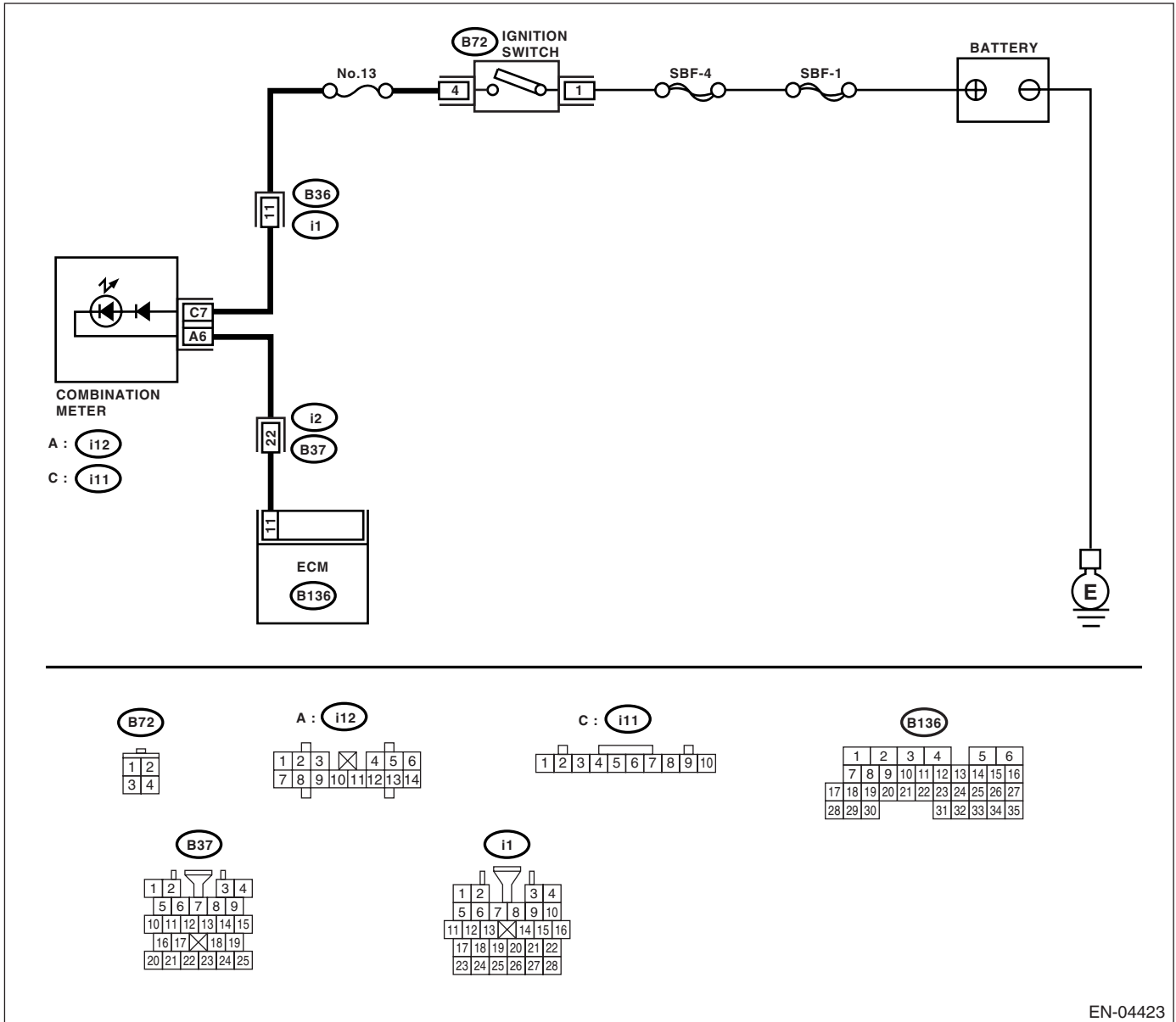
### DIAGNOSIS:

The malfunction indicator light circuit is shorted.

### TROUBLE SYMPTOM:

Although malfunction indicator light comes on when engine runs, but DTC is not shown on Subaru Select Monitor or general scan tool display.

### WIRING DIAGRAM:



| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <b>1</b><br><b>CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Turn the ignition switch to ON. | Does the malfunction indicator light come on? | Repair the short circuit in harness between combination meter and ECM connector. | Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |

# Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

## E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 Hz.

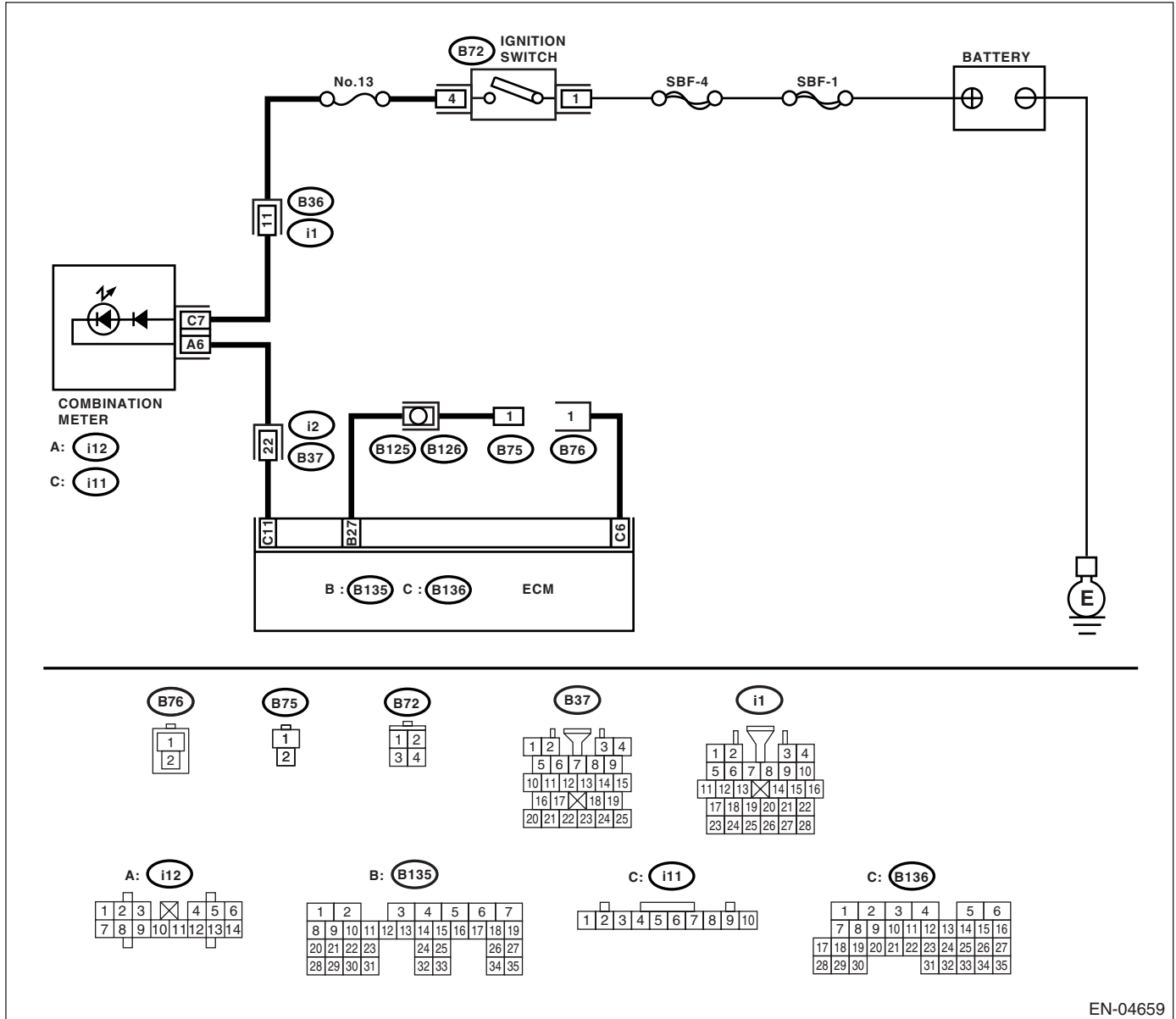
### DIAGNOSIS:

- The malfunction indicator light circuit is open or shorted.
- Test mode connector circuit is open.

### TROUBLE SYMPTOM:

During inspection mode, malfunction indicator light does not blink at a cycle of 3 Hz.

### WIRING DIAGRAM:



EN-04659

# Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <b>1 CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the test mode connector.<br>3) Turn the ignition switch to ON. (engine OFF)   | Does the malfunction indicator light come on? | Go to step 2.   | Repair the malfunction indicator light circuit. <Ref. to EN(H4DOTC)(diag)-55, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.> |
| <b>2 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Turn the ignition switch to ON.   | Does the malfunction indicator light come on? | Repair the ground short circuit in harness between combination meter and ECM connector. | Go to step 3.   |
| <b>3 CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between test mode connector and ECM.<br><b>Connector &amp; terminal</b><br><b>(B76) No. 1 — (B136) No. 6:</b> | Is the resistance less than 1 $\Omega$ ?      | Go to step 4.   | Repair the open circuit in harness between test mode connector and ECM.   |
| <b>4 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.  | Is there poor contact in ECM connector?       | Repair the poor contact in ECM connector.   | Go to step 5.   |
| <b>5 CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.</b><br>Measure the resistance of harness between ECM and test mode connector.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 27 — (B75) No. 1:</b>   | Is the resistance less than 1 $\Omega$ ?      | Go to step 6.   | Repair the open circuit in harness between ECM and test mode connector.   |
| <b>6 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.  | Is there poor contact in ECM connector?       | Repair the poor contact in ECM connector.   | Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>  |

# Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

## F: MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 Hz.

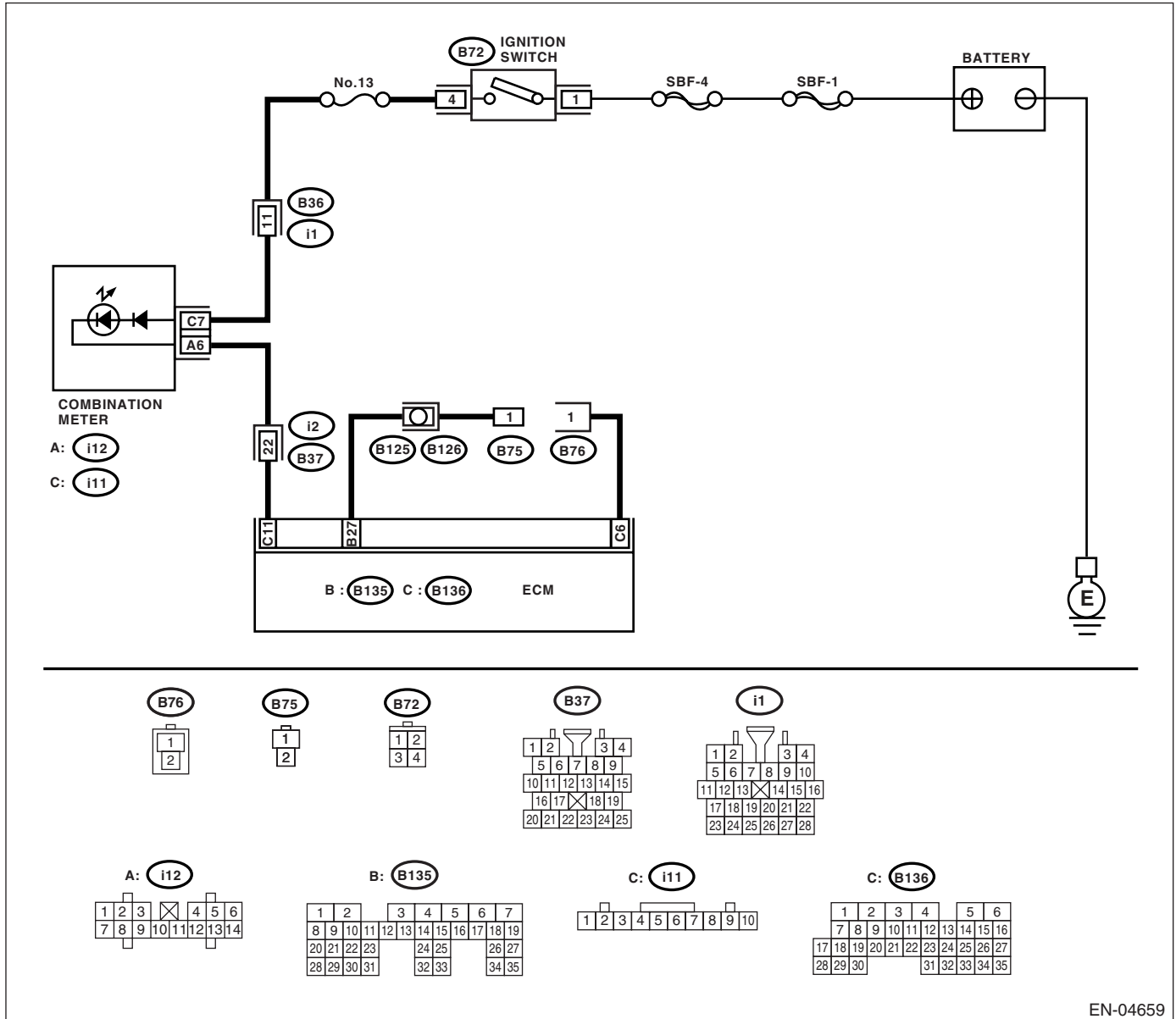
### DIAGNOSIS:

Test mode connector circuit is shorted.

### TROUBLE SYMPTOM:

Malfunction indicator light blinks at a cycle of 3 Hz when ignition switch is turned to ON.

### WIRING DIAGRAM:



| Step  | Check                                       | Yes           | No  |
|---|---|---------------|---|
| <b>1 CHECK TEST MODE CONNECTOR.</b><br>1) Disconnect the test mode connector.<br>2) Turn the ignition switch to ON. | Does the malfunction indicator light blink? | Go to step 2. | System is in good order.<br><br>NOTE:<br>Malfunction indicator light blinks at a cycle of 3 Hz when test mode connector is connected. |

# Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <p><b>2</b>    <b>CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL.</b><br/>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from ECM.<br/>3) Measure the resistance of harness between ECM connector and chassis ground.<br/><b>Connector &amp; terminal</b><br/><b>(B135) No. 27 — Chassis ground:</b></p> | <p>Is the resistance less than 5 <math>\Omega</math>?</p> | <p>Repair the short circuit in harness between ECM and test mode connector.</p> | <p>Replace the ECM.<br/>&lt;Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).&gt;</p> |

# Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

## 16. Diagnostics for Engine Starting Failure

### A: PROCEDURE

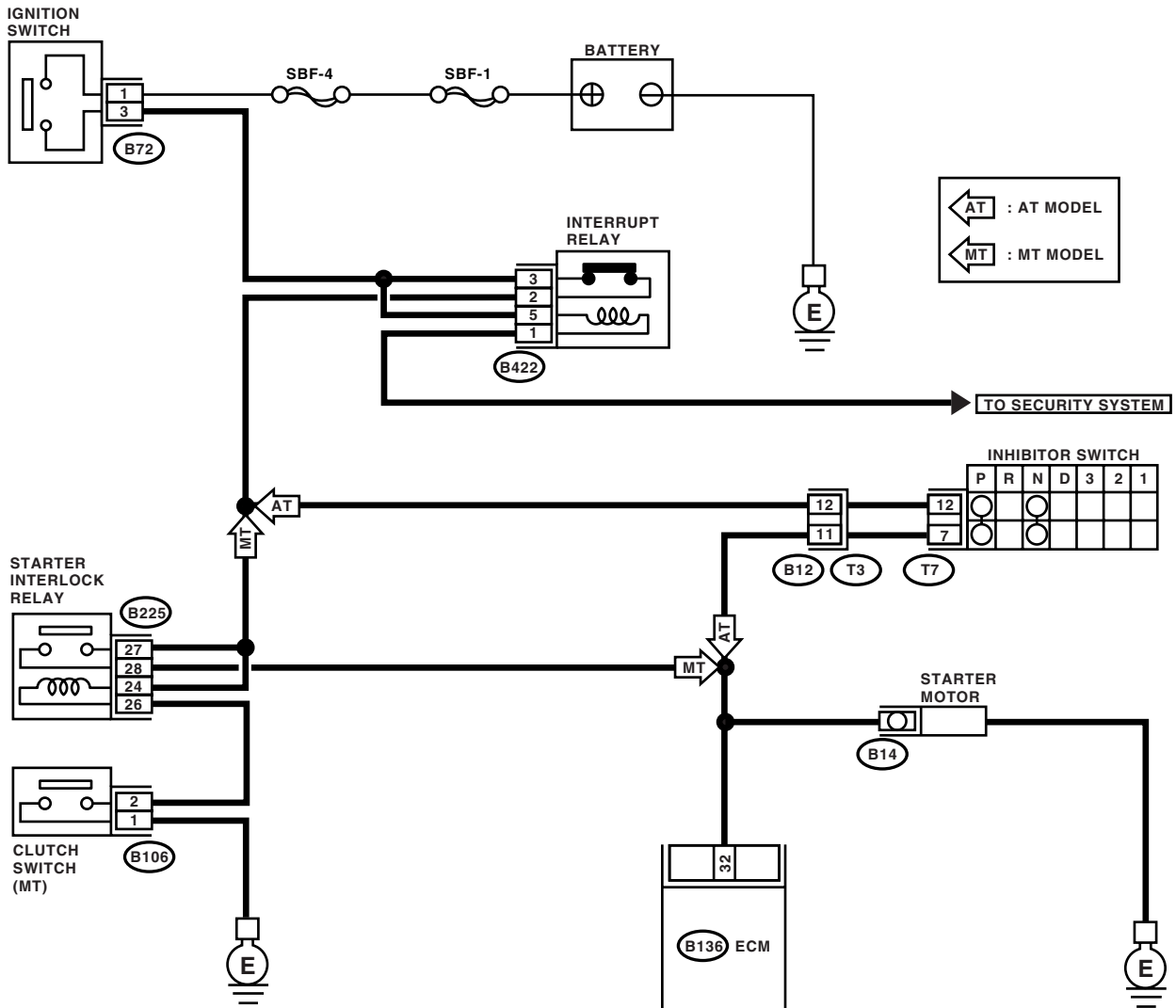
|   |
|---|
| 1. Check the fuel level.  |
| ↓   |
| 2. Inspection of starter motor circuit. <Ref. to EN(H4DOTC)(diag)-63, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>  |
| ↓   |
| 3. Inspection of ECM power supply and ground line. <Ref. to EN(H4DOTC)(diag)-66, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.> |
| ↓   |
| 4. Inspection of ignition control system. <Ref. to EN(H4DOTC)(diag)-68, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>  |
| ↓   |
| 5. Inspection of fuel pump circuit. <Ref. to EN(H4DOTC)(diag)-71, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>  |
| ↓   |
| 6. Inspection of fuel injector circuit. <Ref. to EN(H4DOTC)(diag)-72, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>  |

## B: STARTER MOTOR CIRCUIT

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:





# Diagnostics for Engine Starting Failure

## ENGINE (DIAGNOSTICS)

| Step | Check  | Yes   | No  |  |
|------|--|---|---|--|
| 1    | <b>CHECK BATTERY.</b><br>Check the battery voltage.  | Is the voltage more than 12 V?  | Go to step 2.   | Charge or replace the battery.   |
| 2    | <b>CHECK OPERATION OF STARTER MOTOR.</b>   | Does the starter motor operate?   | Go to step 3.   | Go to step 4.  |
| 3    | <b>CHECK DTC.</b>  | Is the DTC displayed? <Ref. to EN(H4DOTC)(diag)-39, OPERATION, Read Diagnostic Trouble Code (DTC).> | Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> | Repair the poor contact in ECM connector.  |
| 4    | <b>CHECK INPUT SIGNAL FOR STARTER MOTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from starter motor.<br>3) Turn the ignition switch to START.<br>4) Measure the power supply voltage between starter motor connector terminal and engine ground.<br><b>Connector &amp; terminal</b><br><b>(B14) No. 1 (+) — Engine ground (-):</b><br>NOTE:<br>• On AT model, move the select lever to “P” or “N” range.<br>• On MT model, depress the clutch pedal. | Is the voltage more than 10 V?  | Check the starter motor. <Ref. to SC(H4SO)-8, Starter.>   | Go to step 5.  |
| 5    | <b>CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.</b><br>1) Disconnect the connector from ignition switch.<br>2) Measure the power supply voltage between ignition switch connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B72) No. 1 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?  | Go to step 6.   | Check the following, repair if necessary.<br>• Blown out fuse<br>• Open circuit in harness between ignition switch and battery                                       |
| 6    | <b>CHECK IGNITION SWITCH.</b><br>1) Disconnect the connector from ignition switch.<br>2) Measure the resistance between ignition switch terminals while turning ignition switch to START.<br><b>Terminals</b><br><b>No. 1 — No. 3:</b>   | Is the resistance less than 5 Ω?  | Go to step 7.   | Replace the ignition switch.   |
| 7    | <b>CHECK TRANSMISSION TYPE.</b>  | Is the transmission AT?   | Go to step 8.   | Go to step 10.   |
| 8    | <b>CHECK INPUT VOLTAGE OF INHIBITOR SWITCH.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from inhibitor switch.<br>3) Connect the connector to ignition switch.<br>4) Measure the input voltage between inhibitor switch connector terminal and engine ground while turning ignition switch to START.<br><b>Connector &amp; terminal</b><br><b>(B12) No. 12 (+) — Engine ground (-):</b>  | Is the voltage more than 10 V?  | Go to step 9.   | Repair open or short circuit to ground in harness between inhibitor switch and ignition switch.<br>NOTE:<br>Check security system. <Ref. to SL-21, Security System.> |

# Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes   | No  |
|--|--|---|---|
| <b>9 CHECK INHIBITOR SWITCH.</b><br>1) Move the selector lever to "P" or "N" range.<br>2) Measure the resistance between inhibitor switch terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(T3) No. 11 — No. 12:</b></i>  | Is the resistance less than 1 $\Omega$ ? | Repair open or short circuit to ground in harness between inhibitor switch and starter motor. | Replace the inhibitor switch. <Ref. to 4AT-48, Inhibitor Switch.>   |
| <b>10 CHECK INPUT VOLTAGE OF STARTER INTERLOCK RELAY.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from starter interlock relay.<br>3) Connect the connector to ignition switch.<br>4) Measure the input voltage between starter interlock relay connector and chassis ground while turning ignition switch to START.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B225) No. 27 (+) — Chassis ground (-):</b></i><br><i><b>(B225) No. 24 (+) — Chassis ground (-):</b></i> | Is the voltage more than 10 V?           | Go to step 11.  | Repair open or short circuit to ground in harness between starter interlock relay and ignition switch.<br><br>NOTE:<br>Check security system. <Ref. to SL-21, Security System.> |
| <b>11 CHECK STARTER INTERLOCK RELAY.</b><br>1) Connect the battery to starter interlock relay terminals No. 26 and No. 24.<br>2) Measure the resistance between starter interlock relay terminals.<br><i><b>Terminals</b></i><br><i><b>No. 27 — No. 28:</b></i>  | Is the resistance less than 1 $\Omega$ ? | Go to step 12.  | Replace the starter interlock relay.  |
| <b>12 CHECK GROUND CIRCUIT OF CLUTCH SWITCH.</b><br>1) Disconnect the connector from clutch switch.<br>2) Measure the resistance between clutch switch connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B106) No. 1 — Chassis ground:</b></i>   | Is the resistance less than 5 $\Omega$ ? | Go to step 13.  | Repair open circuit of ground cable.  |
| <b>13 CHECK CLUTCH SWITCH.</b><br>Measure the resistance between clutch switch terminals while depressing the clutch pedal.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i>   | Is the resistance less than 1 $\Omega$ ? | Go to step 14.  | Replace the clutch switch. <Ref. to CL-36, Clutch Switch.>  |
| <b>14 CHECK CLUTCH SWITCH CIRCUIT.</b><br>1) Connect the connector to clutch switch.<br>2) Measure the resistance between starter interlock relay connector and chassis ground while depressing the clutch pedal.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B225) No. 26 — Chassis ground:</b></i>   | Is the resistance less than 1 $\Omega$ ? | Repair short circuit to ground in harness between starter interlock relay and starter motor.  | Repair open circuit in harness between starter interlock relay and clutch switch.   |

# Diagnostics for Engine Starting Failure

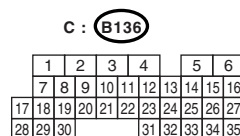
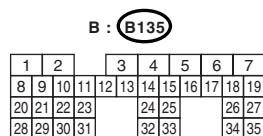
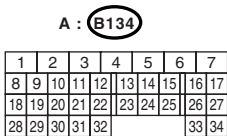
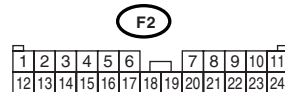
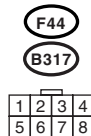
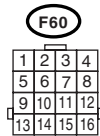
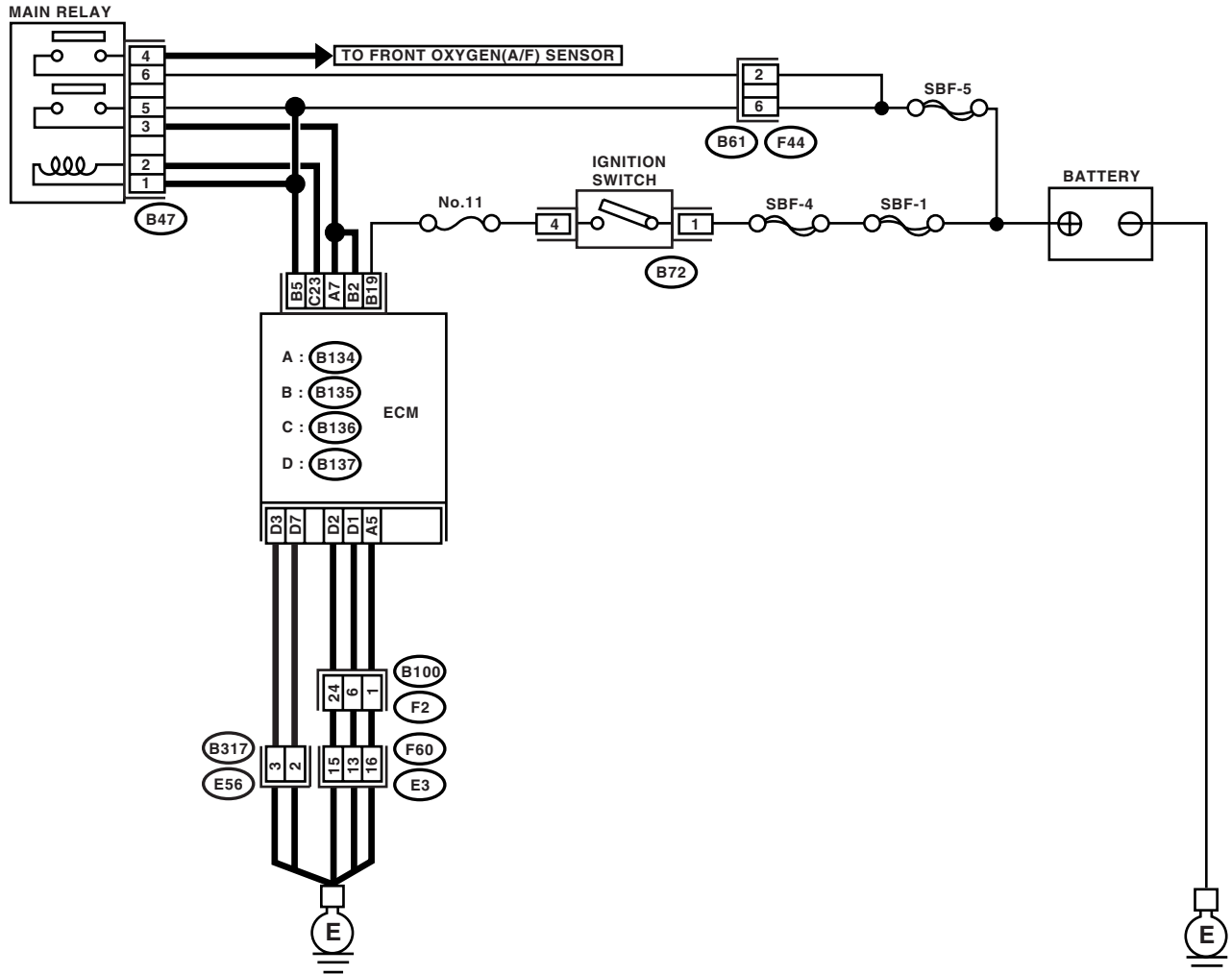
ENGINE (DIAGNOSTICS)

## C: CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM)

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04702

# Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

| Step   | Check                                     | Yes  | No   |
|--|---|--|--|
| <b>1 CHECK MAIN RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the main relay.<br>3) Using a lead wire, connect the positive terminal of battery to main relay terminal No. 1, and ground terminal of battery to terminal No. 2.<br>4) Measure the resistance between main relay terminals.<br><b>Terminals</b><br><b>No. 3 — No. 5:</b><br><b>No. 4 — No. 6:</b>                      | Is the resistance less than 10 $\Omega$ ? | Go to step 2.  | Replace the main relay.  |
| <b>2 CHECK GROUND CIRCUIT OF ECM.</b><br>1) Disconnect the connector from ECM.<br>2) Measure the resistance of harness between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 5 — Chassis ground:</b><br><b>(B137) No. 1 — Chassis ground:</b><br><b>(B137) No. 2 — Chassis ground:</b><br><b>(B137) No. 3 — Chassis ground:</b><br><b>(B137) No. 7 — Chassis ground:</b> | Is the resistance less than 5 $\Omega$ ?  | Go to step 3.  | Repair the open circuit in harness between ECM connector and engine grounding terminal.            |
| <b>3 CHECK INPUT VOLTAGE OF ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 5 (+) — Chassis ground (-):</b><br><b>(B135) No. 19 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?            | Go to step 4.  | Repair the open or ground short circuit of power supply circuit.                                   |
| <b>4 CHECK INPUT VOLTAGE OF MAIN RELAY.</b><br>Measure the voltage between main relay connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B47) No. 1 (+) — Chassis ground (-):</b><br><b>(B47) No. 5 (+) — Chassis ground (-):</b><br><b>(B47) No. 6 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?            | Go to step 5.  | Repair the open or ground short circuit in harness of power supply circuit.                        |
| <b>5 CHECK INPUT VOLTAGE OF ECM.</b><br>1) Connect the main relay connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 7 (+) — Chassis ground (-):</b><br><b>(B135) No. 2 (+) — Chassis ground (-):</b><br><b>(B136) No. 23 (+) — Chassis ground (-):</b>                          | Is the voltage more than 10 V?            | Check the ignition control system.<br><Ref. to EN(H4DOTC)(diag)-68, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.> | Repair the open or ground short circuit in harness between ECM connector and main relay connector. |

# Diagnostics for Engine Starting Failure

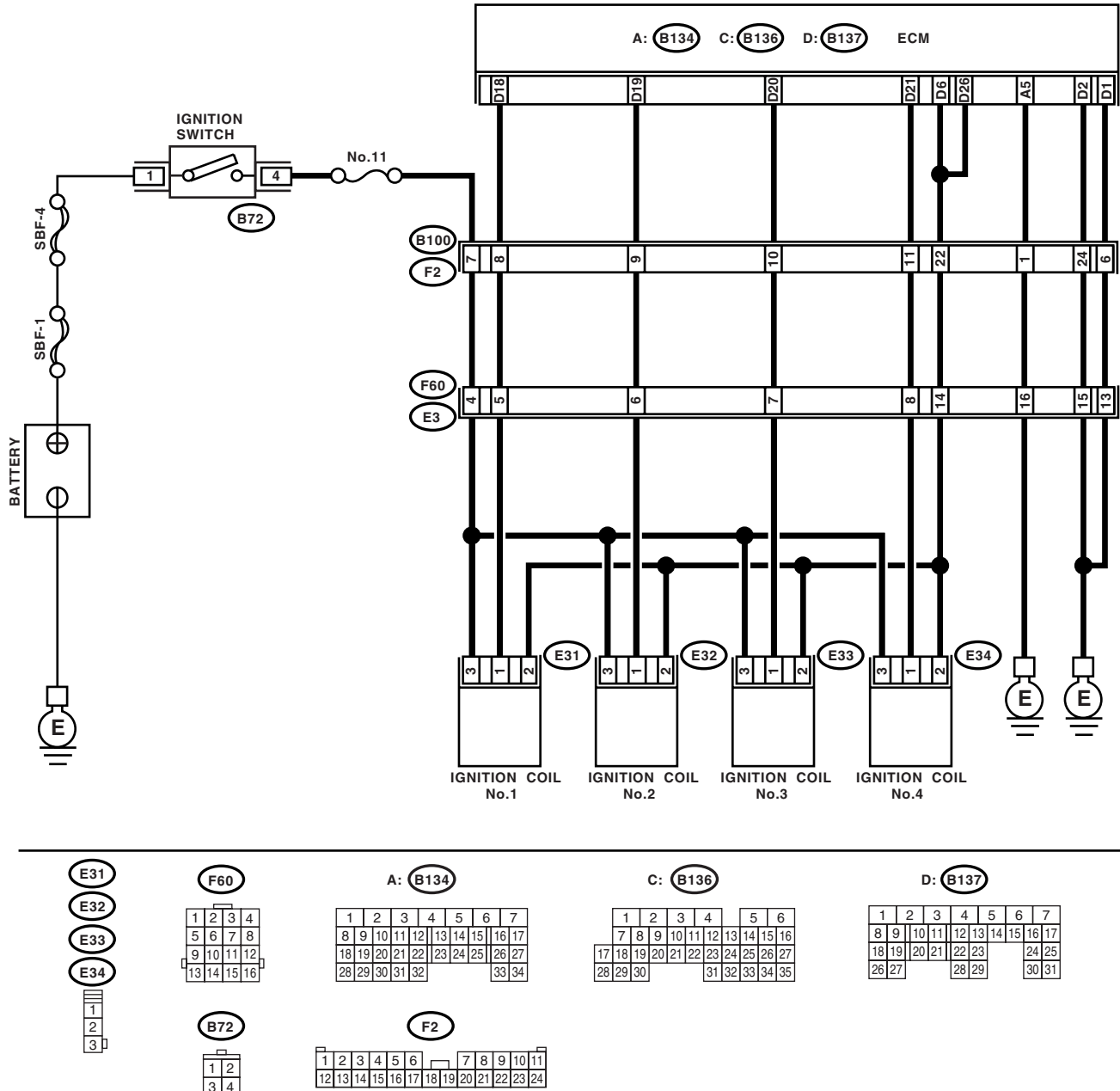
ENGINE (DIAGNOSTICS)

## D: IGNITION CONTROL SYSTEM

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04703

# Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes  | No   |
|--|--|--|--|
| <b>1 CHECK SPARK PLUG CONDITION.</b><br>1) Remove the spark plug. <Ref. to IG(H4DOTC)-4, INSTALLATION, Spark Plug.><br>2) Check the spark plug condition. <Ref. to IG(H4DOTC)-5, INSPECTION, Spark Plug.>  | Is the spark plug's status OK?           | Go to step 2.  | Replace the spark plug.  |
| <b>2 CHECK IGNITION SYSTEM FOR SPARKS.</b><br>1) Connect the spark plug to ignition coil and ignitor assembly.<br>2) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.><br>3) Contact the spark plug's thread portion on engine.<br>4) While opening the throttle valve fully, crank engine to check that spark occurs at each cylinder.   | Does spark occur at each cylinder?       | Check the fuel pump system. <Ref. to EN(H4DOTC)(diag)-71, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.> | Go to step 3.  |
| <b>3 CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL AND IGNITOR ASSEMBLY.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ignition coil and ignitor assembly.<br>3) Turn the ignition switch to ON.<br>4) Measure the power supply voltage between ignition coil and ignitor assembly connector and engine ground.<br><br><i>Connector &amp; terminal</i><br>(E31) No. 3 (+) — Engine ground (-):<br>(E32) No. 3 (+) — Engine ground (-):<br>(E33) No. 3 (+) — Engine ground (-):<br>(E34) No. 3 (+) — Engine ground (-): | Is the voltage more than 10 V?           | Go to step 4.  | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ignition coil and ignitor assembly, and ignition switch connector</li> <li>• Poor contact in coupling connectors</li> </ul> |
| <b>4 CHECK HARNESS OF IGNITION COIL AND IGNITOR ASSEMBLY GROUND CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between ignition coil and ignitor assembly connector and engine ground.<br><br><i>Connector &amp; terminal</i><br>(E31) No. 2 — Engine ground:<br>(E32) No. 2 — Engine ground:<br>(E33) No. 2 — Engine ground:<br>(E34) No. 2 — Engine ground:  | Is the resistance less than 5 $\Omega$ ? | Go to step 5.  | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ignition coil and ignitor assembly connector and engine grounding terminal</li> </ul>                                       |
| <b>5 CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from ignition coil and ignitor assembly.<br>4) Measure the resistance of harness between ECM and ignition coil and ignitor assembly connector.<br><br><i>Connector &amp; terminal</i><br>(B137) No. 18 — (E31) No. 1:<br>(B137) No. 19 — (E32) No. 1:<br>(B137) No. 20 — (E33) No. 1:<br>(B137) No. 21 — (E34) No. 1:                              | Is the resistance less than 1 $\Omega$ ? | Go to step 6.  | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and ignition coil and ignitor assembly connector</li> <li>• Poor contact in coupling connector</li> </ul>               |

## Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

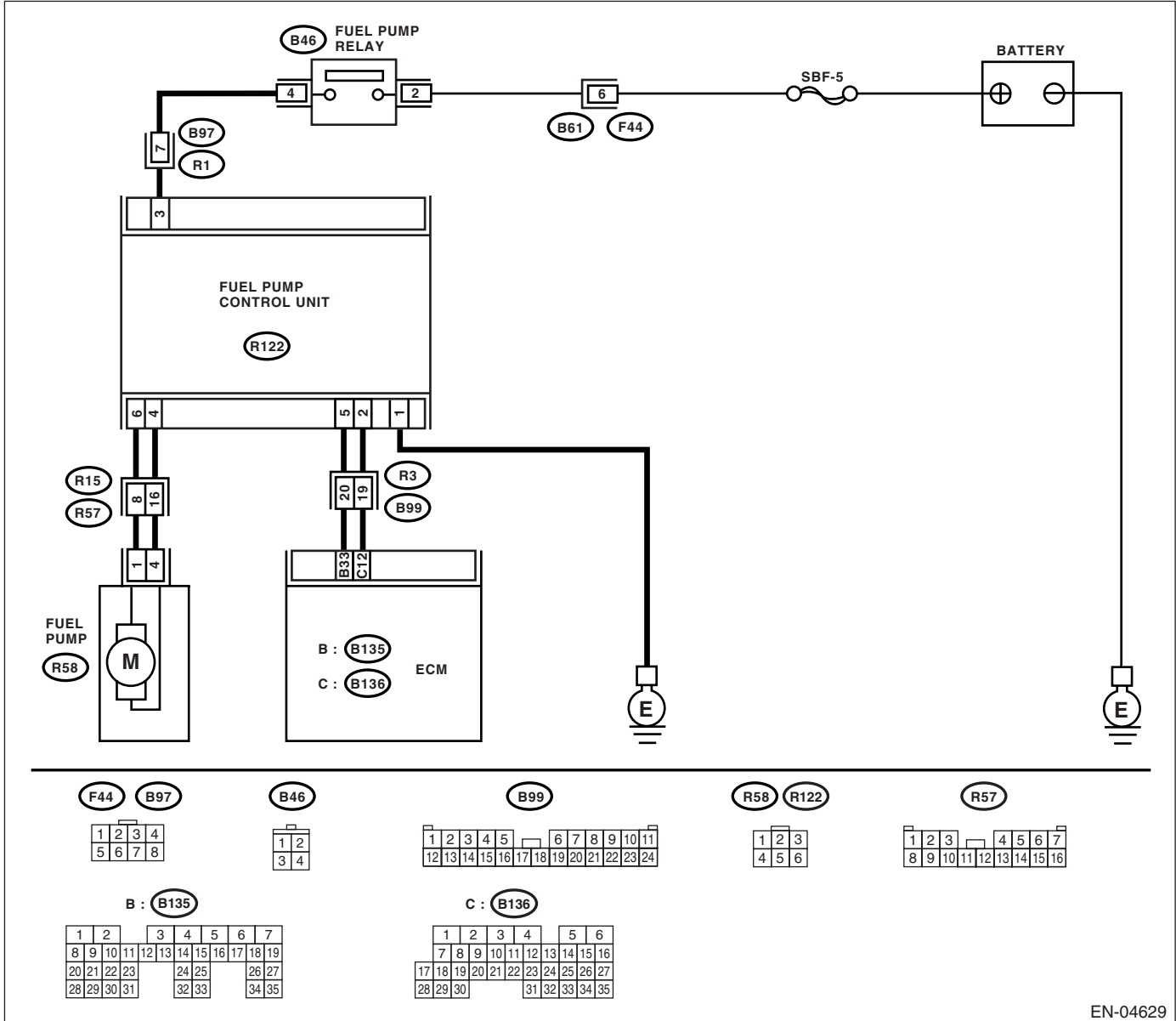
| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <p><b>6</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR.</b><br/>                     Measure the resistance of harness between ECM and engine ground.<br/> <i>Connector &amp; terminal:</i><br/>                     (B137) No. 18 — Engine ground:<br/>                     (B137) No. 19 — Engine ground:<br/>                     (B137) No. 20 — Engine ground:<br/>                     (B137) No. 21 — Engine ground:</p> | <p>Is the resistance more than 1 MΩ?</p>       | <p>Go to step 7.</p>                             | <p>Repair the ground short circuit in harness between ECM and ignition coil and ignitor assembly connector.</p> |
| <p><b>7</b></p> <p><b>CHECK POOR CONTACT.</b><br/>                     Check poor contact in ECM connector.</p>   | <p>Is there poor contact in ECM connector?</p> | <p>Repair the poor contact in ECM connector.</p> | <p>Replace the ignition coil and ignitor assembly.</p>  |

## E: FUEL PUMP CIRCUIT

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04629

| Step   | Check  | Yes  | No  |
|--|--|--|---|
| <p><b>1</b></p> <p><b>CHECK OPERATING SOUND OF FUEL PUMP.</b></p> <p>Make sure that the fuel pump is in operation for 2 seconds when turning ignition switch to ON.</p> <p>NOTE:<br/>Fuel pump operation check can be executed using the Subaru Select Monitor.<br/>For the procedure, refer to "Compulsory Valve Operation Check Mode". &lt;Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.&gt;</p> | <p>Does the fuel pump produce "operating" sound?</p> | <p>Check the fuel injector circuit.<br/>&lt;Ref. to EN(H4DOTC)(diag)-72, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.&gt;</p> | <p>Display the DTC.<br/>&lt;Ref. to EN(H4DOTC)(diag)-39, OPERATION, Read Diagnostic Trouble Code (DTC).&gt;</p> |



# Diagnostics for Engine Starting Failure

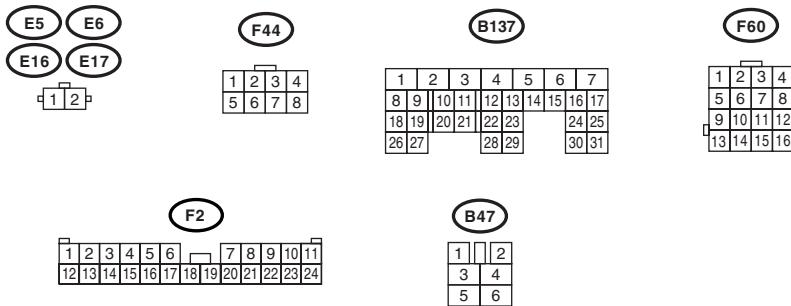
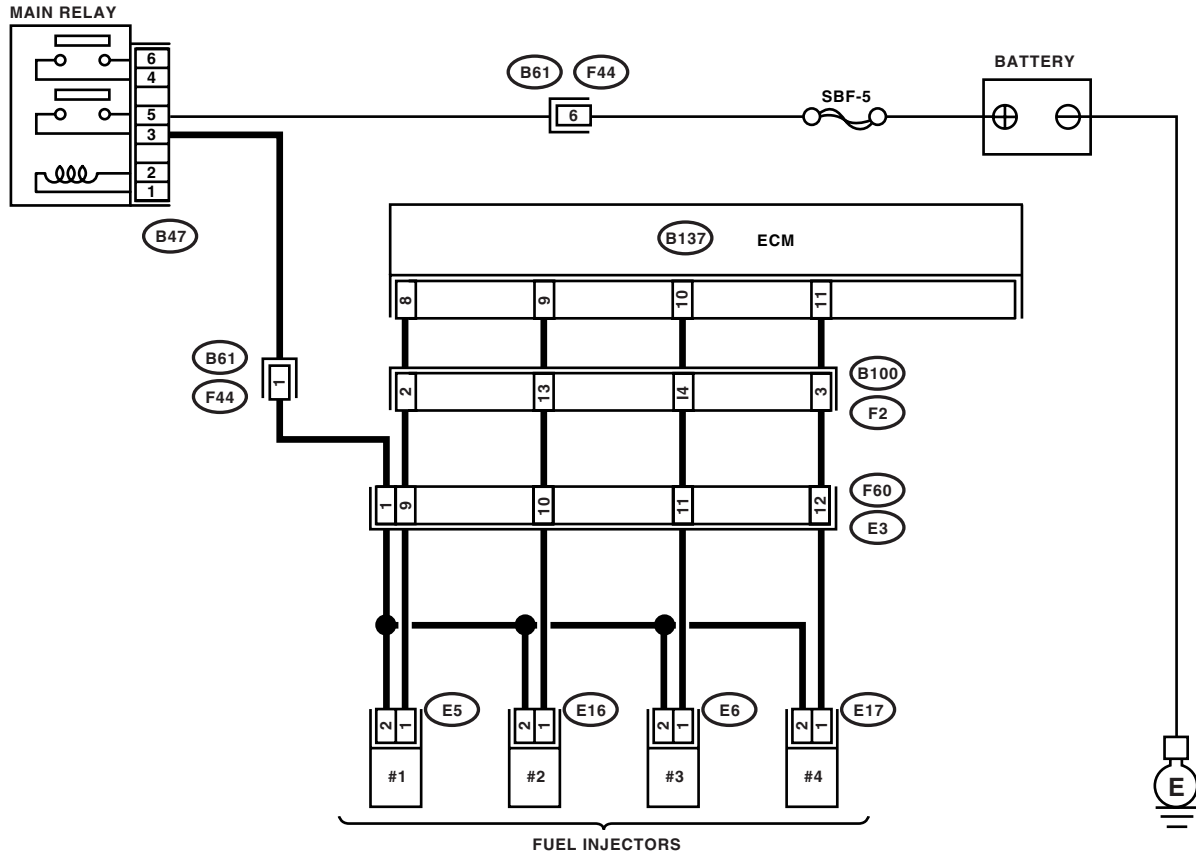
ENGINE (DIAGNOSTICS)

## F: FUEL INJECTOR CIRCUIT

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04209

# Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <p><b>1</b></p> <p><b>CHECK OPERATION OF EACH FUEL INJECTOR.</b><br/>While cranking the engine, check that each fuel injector emits “operating” sound. Use a sound scope or attach a screwdriver to injector for this check.</p>   | Does the fuel injector emit “operating” sound? | Check the fuel pressure. <Ref. to ME(H4DOTC)-28, INSPECTION, Fuel Pressure.>        | Go to step 2.   |
| <p><b>2</b></p> <p><b>CHECK POWER SUPPLY TO EACH FUEL INJECTOR.</b><br/>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from fuel injector.<br/>3) Turn the ignition switch to ON.<br/>4) Measure the power supply voltage between the fuel injector terminal and engine ground.<br/><b>Connector &amp; terminal</b><br/><b>#1 (E5) No. 2 (+) — Engine ground (-):</b><br/><b>#2 (E16) No. 2 (+) — Engine ground (-):</b><br/><b>#3 (E6) No. 2 (+) — Engine ground (-):</b><br/><b>#4 (E17) No. 2 (+) — Engine ground (-):</b></p> | Is the voltage more than 10 V?                 | Go to step 3.   | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and fuel injector connector</li> <li>• Poor contact in main relay connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in fuel injector connector</li> </ul> |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.</b><br/>1) Disconnect the connector from ECM.<br/>2) Measure the resistance of harness between ECM and fuel injector connector.<br/><b>Connector &amp; terminal</b><br/><b>(B137) No. 8 — (E5) No. 1:</b><br/><b>(B137) No. 9 — (E16) No. 1:</b><br/><b>(B137) No. 10 — (E6) No. 1:</b><br/><b>(B137) No. 11 — (E17) No. 1:</b></p>   | Is the resistance less than 1 $\Omega$ ?       | Go to step 4.   | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and fuel injector connector</li> <li>• Poor contact in coupling connector</li> </ul>   |
| <p><b>4</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.</b><br/>Measure the resistance of harness between ECM and fuel injector connector.<br/><b>Connector &amp; terminal</b><br/><b>(B137) No. 8 — Chassis ground:</b><br/><b>(B137) No. 9 — Chassis ground:</b><br/><b>(B137) No. 10 — Chassis ground:</b><br/><b>(B137) No. 11 — Chassis ground:</b></p>  | Is the resistance less than 1 $\Omega$ ?       | Repair the ground short circuit in harness between ECM and fuel injector connector. | Go to step 5.   |
| <p><b>5</b></p> <p><b>CHECK EACH FUEL INJECTOR.</b><br/>1) Turn the ignition switch to OFF.<br/>2) Measure the resistance between each fuel injector terminals.<br/><b>Terminals</b><br/><b>No. 1 — No. 2:</b></p>   | Is the resistance 5 — 20 $\Omega$ ?            | Go to step 6.   | Replace the faulty fuel injector.   |
| <p><b>6</b></p> <p><b>CHECK POOR CONTACT.</b><br/>Check poor contact in ECM connector.</p>   | Is there poor contact in ECM connector?        | Repair the poor contact in ECM connector.   | Inspection using “General Diagnostic Table”. <Ref. to EN(H4DOTC)(diag)-394, INSPECTION, General Diagnostic Table.>  |

## List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

### 17. List of Diagnostic Trouble Code (DTC)

#### A: LIST

| DTC   | Item   | Index   |
|-------|--|---|
| P0011 | Intake Camshaft Position - Timing Over-advanced or System Performance (Bank 1) | <Ref. to EN(H4DOTC)(diag)-82, DTC P0011 INTAKE CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0016 | Crankshaft Position - Camshaft Position Correlation (Bank 1)                   | <Ref. to EN(H4DOTC)(diag)-83, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                 |
| P0018 | Crankshaft Position - Camshaft Position Correlation (Bank 2)                   | <Ref. to EN(H4DOTC)(diag)-84, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                 |
| P0021 | Intake Camshaft Position - Timing Over-advanced or System Performance (Bank 2) | <Ref. to EN(H4DOTC)(diag)-85, DTC P0021 INTAKE CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0030 | HO2S Heater Control Circuit (Bank 1 Sensor 1)                                  | <Ref. to EN(H4DOTC)(diag)-86, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                |
| P0031 | HO2S Heater Control Circuit Low (Bank 1 Sensor 1)                              | <Ref. to EN(H4DOTC)(diag)-88, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0032 | HO2S Heater Control Circuit High (Bank 1 Sensor 1)                             | <Ref. to EN(H4DOTC)(diag)-91, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                           |
| P0037 | HO2S Heater Control Circuit Low (Bank 1 Sensor 2)                              | <Ref. to EN(H4DOTC)(diag)-93, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0038 | HO2S Heater Control Circuit High (Bank 1 Sensor 2)                             | <Ref. to EN(H4DOTC)(diag)-96, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                           |
| P0068 | Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance       | <Ref. to EN(H4DOTC)(diag)-98, DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                   |
| P0101 | Mass or Volume Air Flow Circuit Range/Performance                              | <Ref. to EN(H4DOTC)(diag)-100, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                           |
| P0102 | Mass or Volume Air Flow Circuit Low Input                                      | <Ref. to EN(H4DOTC)(diag)-102, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                   |
| P0103 | Mass or Volume Air Flow Circuit High Input                                     | <Ref. to EN(H4DOTC)(diag)-105, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                  |
| P0107 | Manifold Absolute Pressure/Barometric Pressure Circuit Low Input               | <Ref. to EN(H4DOTC)(diag)-107, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>            |
| P0108 | Manifold Absolute Pressure/Barometric Pressure Circuit High Input              | <Ref. to EN(H4DOTC)(diag)-109, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>           |
| P0111 | Intake Air Temperature Circuit Range/Performance                               | <Ref. to EN(H4DOTC)(diag)-111, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0112 | Intake Air Temperature Circuit Low Input                                       | <Ref. to EN(H4DOTC)(diag)-113, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                    |
| P0113 | Intake Air Temperature Circuit High Input                                      | <Ref. to EN(H4DOTC)(diag)-115, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                   |

# List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| DTC   | Item   | Index  |
|-------|--|--|
| P0117 | Engine Coolant Temperature Circuit Low Input                                     | <Ref. to EN(H4DOTC)(diag)-118, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                     |
| P0118 | Engine Coolant Temperature Circuit High Input                                    | <Ref. to EN(H4DOTC)(diag)-120, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                    |
| P0122 | Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input                      | <Ref. to EN(H4DOTC)(diag)-123, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P0123 | Throttle/Pedal Position Sensor/Switch "A" Circuit High Input                     | <Ref. to EN(H4DOTC)(diag)-126, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P0125 | Insufficient Coolant Temperature for Closed Loop Fuel Control                    | <Ref. to EN(H4DOTC)(diag)-129, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P0126 | Insufficient Coolant Temperature for Stable Operation                            | <Ref. to EN(H4DOTC)(diag)-131, DTC P0126 INSUFFICIENT COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0128 | Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature) | <Ref. to EN(H4DOTC)(diag)-133, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0131 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 1)                      | <Ref. to EN(H4DOTC)(diag)-134, DTC P0131 O <sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P0132 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 1)                     | <Ref. to EN(H4DOTC)(diag)-136, DTC P0132 O <sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P0133 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 1)                    | <Ref. to EN(H4DOTC)(diag)-138, DTC P0133 O <sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P0134 | O <sub>2</sub> Sensor Circuit No Activity Detected (Bank 1 Sensor 1)             | <Ref. to EN(H4DOTC)(diag)-140, DTC P0134 O <sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>             |
| P0137 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 2)                      | <Ref. to EN(H4DOTC)(diag)-142, DTC P0137 O <sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P0138 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 2)                     | <Ref. to EN(H4DOTC)(diag)-145, DTC P0138 O <sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P0139 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 2)                    | <Ref. to EN(H4DOTC)(diag)-148, DTC P0139 O <sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P0140 | O <sub>2</sub> Sensor Circuit No Activity Detected (Bank 1 Sensor 2)             | <Ref. to EN(H4DOTC)(diag)-150, DTC P0140 O <sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>             |
| P0171 | System Too Lean (Bank 1)   | <Ref. to EN(H4DOTC)(diag)-152, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0172 | System Too Rich (Bank 1)   | <Ref. to EN(H4DOTC)(diag)-153, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0181 | Fuel Temperature Sensor "A" Circuit Range/Performance                            | <Ref. to EN(H4DOTC)(diag)-155, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0182 | Fuel Temperature Sensor "A" Circuit Low Input                                    | <Ref. to EN(H4DOTC)(diag)-157, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                    |

## List of Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| DTC   | Item   | Index  |
|-------|--|--|
| P0183 | Fuel Temperature Sensor "A" Circuit High Input                     | <Ref. to EN(H4DOTC)(diag)-159, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P0222 | Throttle/Pedal Position Sensor/Switch "B" Circuit Low              | <Ref. to EN(H4DOTC)(diag)-162, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>              |
| P0223 | Throttle/Pedal Position Sensor/Switch "B" Circuit High             | <Ref. to EN(H4DOTC)(diag)-165, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>             |
| P0230 | Fuel Pump Primary Circuit  | <Ref. to EN(H4DOTC)(diag)-169, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0244 | Turbo/Super Charger Wastegate Solenoid "A" Range/Performance       | <Ref. to EN(H4DOTC)(diag)-172, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>       |
| P0245 | Turbo/Super Charger Wastegate Solenoid "A" Low                     | <Ref. to EN(H4DOTC)(diag)-174, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P0246 | Turbo/Super Charger Wastegate Solenoid "A" High                    | <Ref. to EN(H4DOTC)(diag)-176, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P0301 | Cylinder 1 Misfire Detected  | <Ref. to EN(H4DOTC)(diag)-178, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0302 | Cylinder 2 Misfire Detected  | <Ref. to EN(H4DOTC)(diag)-178, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0303 | Cylinder 3 Misfire Detected  | <Ref. to EN(H4DOTC)(diag)-178, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0304 | Cylinder 4 Misfire Detected  | <Ref. to EN(H4DOTC)(diag)-178, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0327 | Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)         | <Ref. to EN(H4DOTC)(diag)-183, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>         |
| P0328 | Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)        | <Ref. to EN(H4DOTC)(diag)-185, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>        |
| P0335 | Crankshaft Position Sensor "A" Circuit                             | <Ref. to EN(H4DOTC)(diag)-187, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                             |
| P0336 | Crankshaft Position Sensor "A" Circuit Range/Performance           | <Ref. to EN(H4DOTC)(diag)-189, DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>           |
| P0340 | Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)     | <Ref. to EN(H4DOTC)(diag)-191, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>     |
| P0345 | Camshaft Position Sensor "A" Circuit (Bank 2)                      | <Ref. to EN(H4DOTC)(diag)-193, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P0410 | Secondary Air Injection System                                     | <Ref. to EN(H4DOTC)(diag)-195, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                     |
| P0411 | Secondary Air Injection System Incorrect Flow Detected             | <Ref. to EN(H4DOTC)(diag)-198, DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>             |
| P0413 | Secondary Air Injection System Switching Valve "A" Circuit Open    | <Ref. to EN(H4DOTC)(diag)-200, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>    |
| P0414 | Secondary Air Injection System Switching Valve "A" Circuit Shorted | <Ref. to EN(H4DOTC)(diag)-202, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |

# List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| DTC   | Item   | Index  |
|-------|--|--|
| P0416 | Secondary Air Injection System Switching Valve "B" Circuit Open        | <Ref. to EN(H4DOTC)(diag)-204, DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "B" CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>        |
| P0417 | Secondary Air Injection System Switching Valve "B" Circuit Shorted     | <Ref. to EN(H4DOTC)(diag)-206, DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "B" CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>     |
| P0418 | Secondary Air Injection System Control "A" Circuit Open                | <Ref. to EN(H4DOTC)(diag)-208, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                |
| P0420 | Catalyst System Efficiency Below Threshold (Bank 1)                    | <Ref. to EN(H4DOTC)(diag)-211, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P0442 | Evaporative Emission Control System Leak Detected (small leak)         | <Ref. to EN(H4DOTC)(diag)-214, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>         |
| P0447 | Evaporative Emission Control System Vent Control Circuit Open          | <Ref. to EN(H4DOTC)(diag)-218, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>          |
| P0448 | Evaporative Emission Control System Vent Control Circuit Shorted       | <Ref. to EN(H4DOTC)(diag)-221, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>       |
| P0451 | Evaporative Emission Control System Pressure Sensor Range/Performance  | <Ref. to EN(H4DOTC)(diag)-222, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0452 | Evaporative Emission Control System Pressure Sensor Low Input          | <Ref. to EN(H4DOTC)(diag)-225, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>          |
| P0453 | Evaporative Emission Control System Pressure Sensor High Input         | <Ref. to EN(H4DOTC)(diag)-228, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>         |
| P0456 | Evaporative Emission Control System Leak Detected (very small leak)    | <Ref. to EN(H4DOTC)(diag)-231, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>    |
| P0457 | Evaporative Emission Control System Leak Detected (fuel cap loose/off) | <Ref. to EN(H4DOTC)(diag)-234, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0458 | Evaporative Emission Control System Purge Control Valve Circuit Low    | <Ref. to EN(H4DOTC)(diag)-238, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>    |
| P0459 | Evaporative Emission Control System Purge Control Valve Circuit High   | <Ref. to EN(H4DOTC)(diag)-240, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0461 | Fuel Level Sensor Circuit Range/Performance                            | <Ref. to EN(H4DOTC)(diag)-241, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0462 | Fuel Level Sensor Circuit Low Input                                    | <Ref. to EN(H4DOTC)(diag)-243, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                    |
| P0463 | Fuel Level Sensor Circuit High Input                                   | <Ref. to EN(H4DOTC)(diag)-247, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                   |
| P0464 | Fuel Level Sensor Circuit Intermittent                                 | <Ref. to EN(H4DOTC)(diag)-250, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                 |
| P0483 | Cooling Fan Rationality Check  | <Ref. to EN(H4DOTC)(diag)-252, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |

## List of Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| DTC   | Item   | Index  |
|-------|--|--|
| P0502 | Vehicle Speed Sensor Circuit Low Input                                   | <Ref. to EN(H4DOTC)(diag)-255, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0503 | Vehicle Speed Sensor Intermittent/Erratic/High                           | <Ref. to EN(H4DOTC)(diag)-257, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0506 | Idle Control System RPM Lower Than Expected                              | <Ref. to EN(H4DOTC)(diag)-258, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0507 | Idle Control System RPM Higher Than Expected                             | <Ref. to EN(H4DOTC)(diag)-260, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0512 | Starter Request Circuit  | <Ref. to EN(H4DOTC)(diag)-262, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0513 | Incorrect Immobilizer Key  | <Ref. to EN(H4DOTC)(diag)-264, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0519 | Idle Control System Malfunction (Fail-Safe)                              | <Ref. to EN(H4DOTC)(diag)-264, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0600 | Serial Communication Link  | <Ref. to EN(H4DOTC)(diag)-267, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0604 | Internal Control Module Random Access Memory (RAM) Error                 | <Ref. to EN(H4DOTC)(diag)-268, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0605 | Internal Control Module Read Only Memory (ROM) Error                     | <Ref. to EN(H4DOTC)(diag)-270, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0607 | Control Module Performance   | <Ref. to EN(H4DOTC)(diag)-271, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0638 | Throttle Actuator Control Range/Performance (Bank 1)                     | <Ref. to EN(H4DOTC)(diag)-272, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0691 | Cooling Fan 1 Control Circuit Low  | <Ref. to EN(H4DOTC)(diag)-272, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0692 | Cooling Fan 1 Control Circuit High                                       | <Ref. to EN(H4DOTC)(diag)-274, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0700 | Transmission Control System (MIL Request)                                | <Ref. to EN(H4DOTC)(diag)-276, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0851 | Neutral Switch Input Circuit Low   | <Ref. to EN(H4DOTC)(diag)-277, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4DOTC)(diag)-279, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0852 | Neutral Switch Input Circuit High  | <Ref. to EN(H4DOTC)(diag)-281, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4DOTC)(diag)-284, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P1152 | O <sub>2</sub> Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)  | <Ref. to EN(H4DOTC)(diag)-286, DTC P1152 O <sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1153 | O <sub>2</sub> Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1) | <Ref. to EN(H4DOTC)(diag)-288, DTC P1153 O <sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |

# List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| DTC   | Item   | Index  |
|-------|--|--|
| P1160 | Return Spring Failure                                      | <Ref. to EN(H4DOTC)(diag)-290, DTC P1160 RETURN SPRING FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                      |
| P1400 | Fuel Tank Pressure Control Solenoid Valve Circuit Low      | <Ref. to EN(H4DOTC)(diag)-291, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>      |
| P1410 | Secondary Air Injection System Switching Valve Stuck Open  | <Ref. to EN(H4DOTC)(diag)-293, DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1418 | Secondary Air Injection System Control "A" Circuit Shorted | <Ref. to EN(H4DOTC)(diag)-295, DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P1420 | Fuel Tank Pressure Control Sol. Valve Circuit High         | <Ref. to EN(H4DOTC)(diag)-298, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>         |
| P1443 | Vent Control Solenoid Valve Function Problem               | <Ref. to EN(H4DOTC)(diag)-300, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>               |
| P1491 | Positive Crankcase Ventilation (Blow-by) Function Problem  | <Ref. to EN(H4DOTC)(diag)-302, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1518 | Starter Switch Circuit Low Input                           | <Ref. to EN(H4DOTC)(diag)-303, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                           |
| P1560 | Back-Up Voltage Circuit Malfunction                        | <Ref. to EN(H4DOTC)(diag)-305, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                        |
| P1570 | Antenna  | <Ref. to EN(H4DOTC)(diag)-308, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1571 | Reference Code Incompatibility                             | <Ref. to EN(H4DOTC)(diag)-308, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                             |
| P1572 | IMM Circuit Failure (Except Antenna Circuit)               | <Ref. to EN(H4DOTC)(diag)-308, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>               |
| P1574 | Key Communication Failure                                  | <Ref. to EN(H4DOTC)(diag)-308, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                  |
| P1576 | EGI Control Module EEPROM                                  | <Ref. to EN(H4DOTC)(diag)-308, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                  |
| P1577 | IMM Control Module EEPROM                                  | <Ref. to EN(H4DOTC)(diag)-308, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                  |
| P2004 | Intake Manifold Runner Control Stuck Open (Bank 1)         | <Ref. to EN(H4DOTC)(diag)-309, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>         |
| P2005 | Intake Manifold Runner Control Stuck Open (Bank 2)         | <Ref. to EN(H4DOTC)(diag)-310, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>         |
| P2006 | Intake Manifold Runner Control Stuck Closed (Bank 1)       | <Ref. to EN(H4DOTC)(diag)-311, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>       |
| P2007 | Intake Manifold Runner Control Stuck Closed (Bank 2)       | <Ref. to EN(H4DOTC)(diag)-312, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>       |
| P2008 | Intake Manifold Runner Control Circuit / Open (Bank 1)     | <Ref. to EN(H4DOTC)(diag)-313, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>     |
| P2009 | Intake Manifold Runner Control Circuit Low (Bank 1)        | <Ref. to EN(H4DOTC)(diag)-315, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>        |



## List of Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| DTC   | Item  | Index   |
|-------|---|---|
| P2011 | Intake Manifold Runner Control Circuit / Open (Bank 2)                | <Ref. to EN(H4DOTC)(diag)-317, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                |
| P2012 | Intake Manifold Runner Control Circuit Low (Bank 2)                   | <Ref. to EN(H4DOTC)(diag)-319, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                   |
| P2016 | Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 1)  | <Ref. to EN(H4DOTC)(diag)-321, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P2017 | Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 1) | <Ref. to EN(H4DOTC)(diag)-324, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P2021 | Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 2)  | <Ref. to EN(H4DOTC)(diag)-326, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P2022 | Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2) | <Ref. to EN(H4DOTC)(diag)-329, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P2088 | OCV Solenoid Valve Signal A Circuit Open (Bank 1)                     | <Ref. to EN(H4DOTC)(diag)-331, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P2089 | OCV Solenoid Valve Signal A Circuit Short (Bank 1)                    | <Ref. to EN(H4DOTC)(diag)-333, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P2092 | OCV Solenoid Valve Signal A Circuit Open (Bank 2)                     | <Ref. to EN(H4DOTC)(diag)-335, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P2093 | Intake Camshaft Position Actuator Control Circuit High (Bank 2)       | <Ref. to EN(H4DOTC)(diag)-337, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>       |
| P2096 | Post Catalyst Fuel Trim System Too Lean Bank 1                        | <Ref. to EN(H4DOTC)(diag)-339, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                        |
| P2097 | Post Catalyst Fuel Trim System Too Rich Bank 1                        | <Ref. to EN(H4DOTC)(diag)-345, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                        |
| P2101 | Throttle Actuator Control Motor Circuit Range/Performance             | <Ref. to EN(H4DOTC)(diag)-350, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>             |
| P2102 | Throttle Actuator Control Motor Circuit Low                           | <Ref. to EN(H4DOTC)(diag)-356, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                           |
| P2103 | Throttle Actuator Control Motor Circuit High                          | <Ref. to EN(H4DOTC)(diag)-359, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                          |
| P2109 | Throttle/Pedal Position Sensor "A" Minimum Stop Performance           | <Ref. to EN(H4DOTC)(diag)-361, DTC P2109 THROTTLE/PEDAL POSITION SENSOR "A" MINIMUM STOP PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>           |
| P2122 | Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input           | <Ref. to EN(H4DOTC)(diag)-362, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>           |
| P2123 | Throttle/Pedal Position Sensor/Switch "D" Circuit High Input          | <Ref. to EN(H4DOTC)(diag)-364, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>          |
| P2127 | Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input           | <Ref. to EN(H4DOTC)(diag)-366, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>           |

# List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| DTC   | Item  | Index   |
|-------|---|---|
| P2128 | Throttle/Pedal Position Sensor/Switch "E" Circuit High Input                      | <Ref. to EN(H4DOTC)(diag)-368, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                          |
| P2135 | Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correlation                 | <Ref. to EN(H4DOTC)(diag)-370, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P2138 | Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation                 | <Ref. to EN(H4DOTC)(diag)-375, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P2227 | Barometric Pressure Circuit Range/performance                                     | <Ref. to EN(H4DOTC)(diag)-378, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P2228 | Barometric Pressure Circuit Low Input   | <Ref. to EN(H4DOTC)(diag)-378, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P2229 | Barometric Pressure Circuit High Input  | <Ref. to EN(H4DOTC)(diag)-379, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P2431 | Secondary Air Injection System Air Flow/Pressure Sensor Circuit Range/Performance | <Ref. to EN(H4DOTC)(diag)-379, DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT RANGE / PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P2432 | Secondary Air Injection System Air Flow/Pressure Sensor Circuit Low               | <Ref. to EN(H4DOTC)(diag)-381, DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                 |
| P2433 | Secondary Air Injection System Air Flow/Pressure Sensor Circuit High              | <Ref. to EN(H4DOTC)(diag)-383, DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                |
| P2440 | Secondary Air Injection System Switching Valve Stuck Open (Bank 1)                | <Ref. to EN(H4DOTC)(diag)-385, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P2441 | Secondary Air Injection System Switching Valve Stuck Closed (Bank 1)              | <Ref. to EN(H4DOTC)(diag)-388, DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                  |
| P2442 | Secondary Air Injection System Switching Valve Stuck Open (Bank 2)                | <Ref. to EN(H4DOTC)(diag)-388, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P2443 | Secondary Air Injection System Switching Valve Stuck Closed (Bank 2)              | <Ref. to EN(H4DOTC)(diag)-391, DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                  |
| P2444 | Secondary Air Injection System Pump Stuck On                                      | <Ref. to EN(H4DOTC)(diag)-391, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

### 18. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

#### A: DTC P0011 INTAKE CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

##### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

##### TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

##### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>   | Go to step 2.  |
| <b>2</b><br><b>CHECK CURRENT DATA.</b><br>1) Start the engine and let it idle.<br>2) Inspect the AVCS advance timing and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool.<br>NOTE:<br><ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE. <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.><br><ul style="list-style-type: none"> <li>• General scan tool</li> </ul> For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the AVCS advance timing more than approx. 0°C and the oil flow control solenoid valve duty output more than approx. 10%? | Inspect the following items and repair or replace if necessary. <ul style="list-style-type: none"> <li>• Oil pipe (clog)</li> <li>• Oil flow control solenoid valve (clog or contamination in oil passage, settling at spring, stuck at valve)</li> <li>• Intake camshaft (sludge, damage at camshaft)</li> <li>• Timing belt (timing mark aligning)</li> </ul> | A temporary malfunction. Conduct the following to clean the oil passage. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## B: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-12, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

| Step   | Check   | Yes  | No   |
|--|---|--|--|
| <b>1</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>  | Go to step 2.  |
| <b>2</b><br><b>CHECK CURRENT DATA.</b><br>1) Start the engine and let it idle.<br>2) Inspect the AVCS timing advance and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedure, refer to the General Scan Tool Instruction Manual. | Is the AVCS timing advance more than approx. 0 degree?<br>Also, is the oil flow control solenoid valve duty output more than approx. 10%? | Inspect the following items and repair or replace if necessary. <ul style="list-style-type: none"> <li>• Oil pipe (clog)</li> <li>• Oil flow control solenoid valve (clog or contamination in oil passage, setting of spring, stuck at valve)</li> <li>• Intake camshaft (sludge, damage at camshaft)</li> <li>• Timing belt (timing mark aligning)</li> </ul> | A temporary malfunction. Conduct the following to clean the oil passage. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

### C: DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2)

#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-12, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

#### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

| Step   | Check  | Yes  | No   |
|--|--|--|--|
| <b>1</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?  | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>  | Go to step 2.  |
| <b>2</b><br><b>CHECK CURRENT DATA.</b><br>1) Start the engine and let it idle.<br>2) Inspect the AVCS timing advance and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedure, refer to the General Scan Tool Instruction Manual. | Is the AVCS timing advance more than approx. 0 degree? Also, is the oil flow control solenoid valve duty output more than approx. 10%? | Inspect the following items and repair or replace if necessary. <ul style="list-style-type: none"> <li>• Oil pipe (clog)</li> <li>• Oil flow control solenoid valve (clog or contamination in oil passage, setting of spring, stuck at valve)</li> <li>• Intake camshaft (sludge, damage at camshaft)</li> <li>• Timing belt (timing mark aligning)</li> </ul> | A temporary malfunction. Conduct the following to clean the oil passage. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## D: DTC P0021 INTAKE CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-12, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>   | Go to step 2.  |
| <b>2</b><br><b>CHECK CURRENT DATA.</b><br>1) Start the engine and let it idle.<br>2) Inspect the AVCS advance timing and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE. <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the AVCS advance timing more than approx. 0°C and the oil flow control solenoid valve duty output more than approx. 10%? | Inspect the following items and repair or replace if necessary. <ul style="list-style-type: none"> <li>• Oil pipe (clog)</li> <li>• Oil flow control solenoid valve (clog or contamination in oil passage, settling at spring, stuck at valve)</li> <li>• Intake camshaft (sludge, damage at camshaft)</li> <li>• Timing belt (timing mark aligning)</li> </ul> | A temporary malfunction. Conduct the following to clean the oil passage. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## E: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

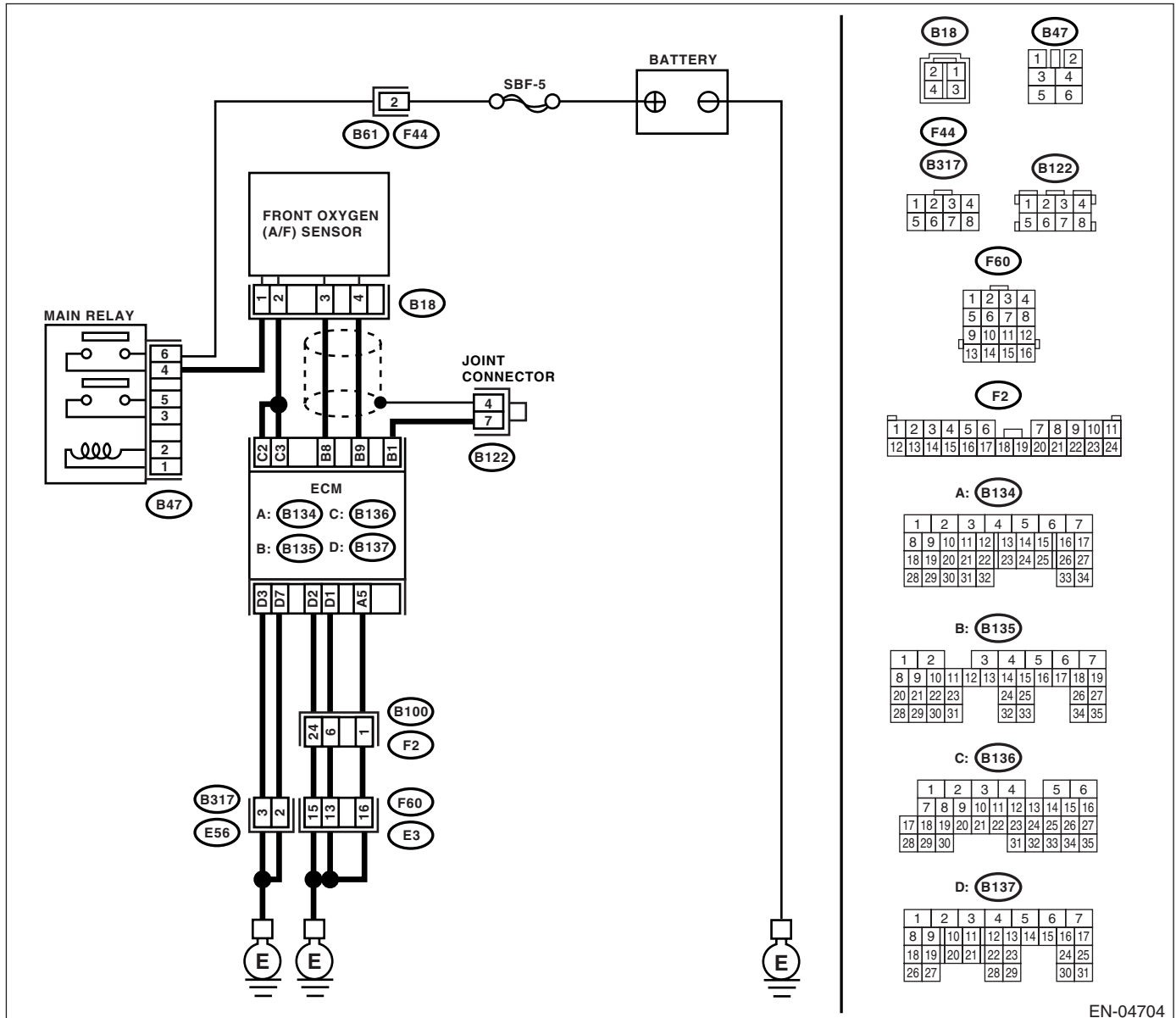
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-13, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04704

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No   |
|--|--|--|--|
| <p><b>1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>1) Start the engine and warm-up engine.<br/>                     2) Turn the ignition switch to OFF.<br/>                     3) Disconnect the connectors from ECM and front oxygen (A/F) sensor.<br/>                     4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p><b>Connector &amp; terminal</b><br/>                     (B136) No. 3 — (B18) No. 2:<br/>                     (B136) No. 2 — (B18) No. 2:</p> | Is the resistance less than 1 $\Omega$ ?                             | Go to step 2.  | Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.    |
| <p><b>2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p><b>Connector &amp; terminal</b><br/>                     (B135) No. 8 — (B18) No. 3:<br/>                     (B135) No. 9 — (B18) No. 4:</p>  | Is the resistance less than 1 $\Omega$ ?                             | Go to step 3.  | Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.    |
| <p><b>3 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>Measure the resistance of harness between main relay and front oxygen (A/F) sensor connector.</p> <p><b>Connector &amp; terminal</b><br/>                     (B47) No. 4 — (B18) No. 1:</p>   | Is the resistance less than 1 $\Omega$ ?                             | Go to step 4.  | Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.    |
| <p><b>4 CHECK FRONT OXYGEN (A/F) SENSOR.</b></p> <p>Measure the resistance between front oxygen (A/F) sensor connector terminals.</p> <p><b>Terminals</b><br/>                     No. 2 — No. 1:</p>  | Is the resistance less than 5 $\Omega$ ?                             | Go to step 5.  | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.> |
| <p><b>5 CHECK POOR CONTACT.</b></p> <p>Check the poor contact in ECM and front oxygen (A/F) sensor connector.</p>  | Is there poor contact in ECM or front oxygen (A/F) sensor connector? | Repair the poor contact in ECM or front oxygen (A/F) sensor connector. | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.> |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## F: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

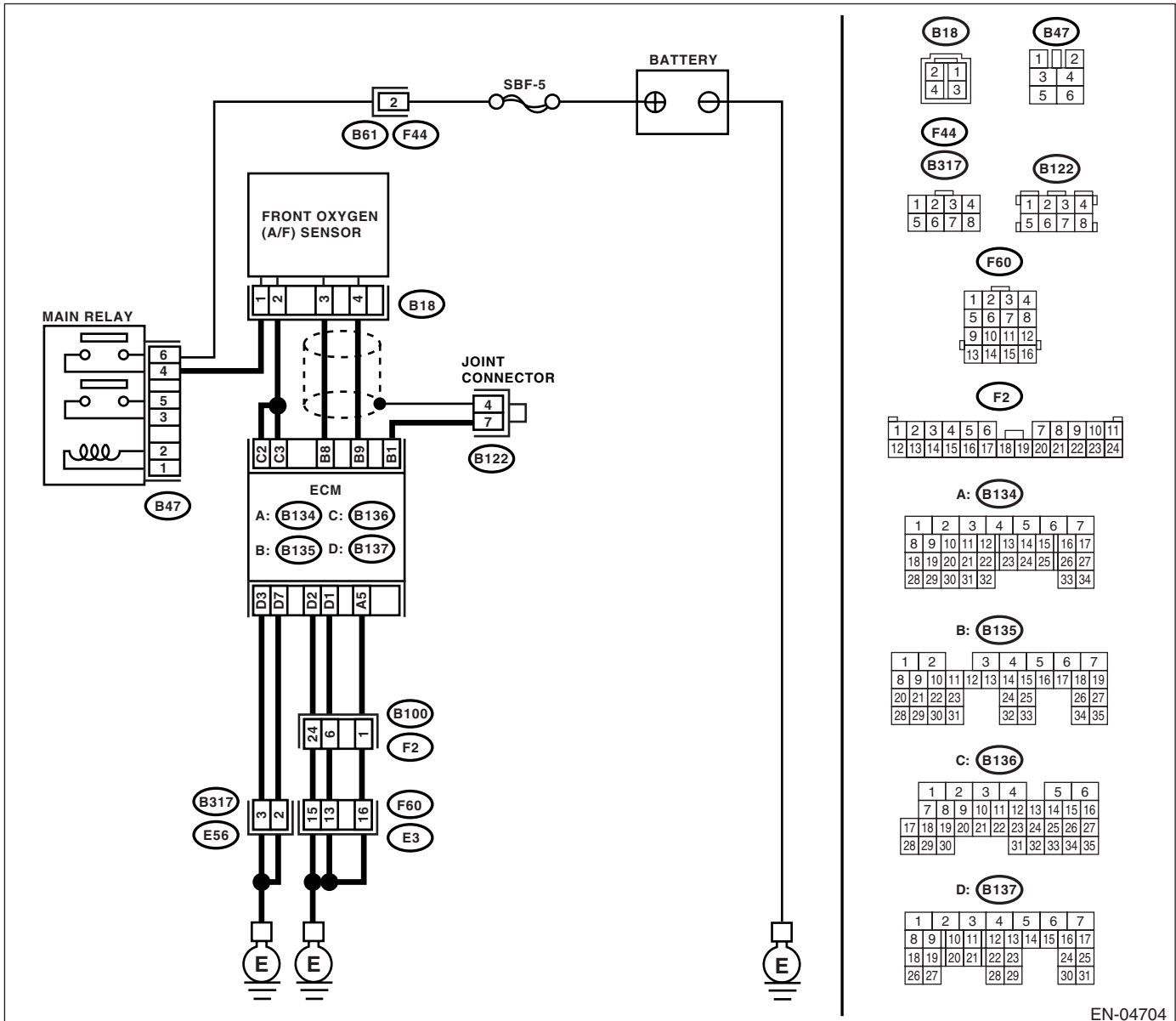
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-15, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04704

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <p><b>1</b></p> <p><b>CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from front oxygen (A/F) sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B18) No. 1 (+) — Engine ground (-):</b></p>   | Is the voltage more than 10 V?   | Go to step 2.  | Repair the power supply line.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and front oxygen (A/F) sensor connector</li> <li>• Poor contact in main relay connector</li> <li>• Malfunction in main relay</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK GROUND CIRCUIT OF ECM.</b><br/>                     Measure the resistance of harness between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B134) No. 5 — Chassis ground:</b><br/> <b>(B137) No. 1 — Chassis ground:</b><br/> <b>(B137) No. 2 — Chassis ground:</b><br/> <b>(B137) No. 7 — Chassis ground:</b><br/> <b>(B137) No. 3 — Chassis ground:</b></p>   | Is the resistance less than 5 Ω?   | Go to step 3.  | Repair the harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and engine ground cable</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul>                  |
| <p><b>3</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Start the engine.<br/>                     2) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or general scan tool.</p> <p>NOTE:<br/>                     • Subaru Select Monitor<br/>                     For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;<br/>                     • General scan tool<br/>                     For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | Is the current more than 0.2 A?  | Repair the poor contact in connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Poor contact in front oxygen (A/F) sensor connector</li> <li>• Poor contact in ECM connector</li> </ul> | Go to step 4.   |
| <p><b>4</b></p> <p><b>CHECK OUTPUT SIGNAL FROM ECM.</b></p> <p>1) Start and idle the engine.<br/>                     2) Measure the voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B136) No. 2 (+) — Chassis ground (-):</b><br/> <b>(B136) No. 3 (+) — Chassis ground (-):</b></p>   | Is the voltage less than 1 V?  | Go to step 6.  | Go to step 5.   |
| <p><b>5</b></p> <p><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br/>                     Measure the voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B136) No. 2 (+) — Chassis ground (-):</b><br/> <b>(B136) No. 3 (+) — Chassis ground (-):</b></p>   | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change? | Repair the poor contact in ECM connector.  | Go to step 6.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <p><b>6</b>      <b>CHECK FRONT OXYGEN (A/F) SENSOR.</b><br/>1) Turn the ignition switch to OFF.<br/>2) Measure the resistance between front oxygen (A/F) sensor connector terminals.<br/><b>Terminals</b><br/><b>No. 2 — No. 1:</b></p> | <p>Is the resistance less than 10 <math>\Omega</math>?</p> | <p>Repair the harness and connector.<br/><b>NOTE:</b><br/>In this case, repair the following:</p> <ul style="list-style-type: none"><li>• Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector</li><li>• Poor contact in front oxygen (A/F) sensor connector</li><li>• Poor contact in ECM connector</li></ul> | <p>Replace the front oxygen (A/F) sensor. &lt;Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.&gt;</p> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## G: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

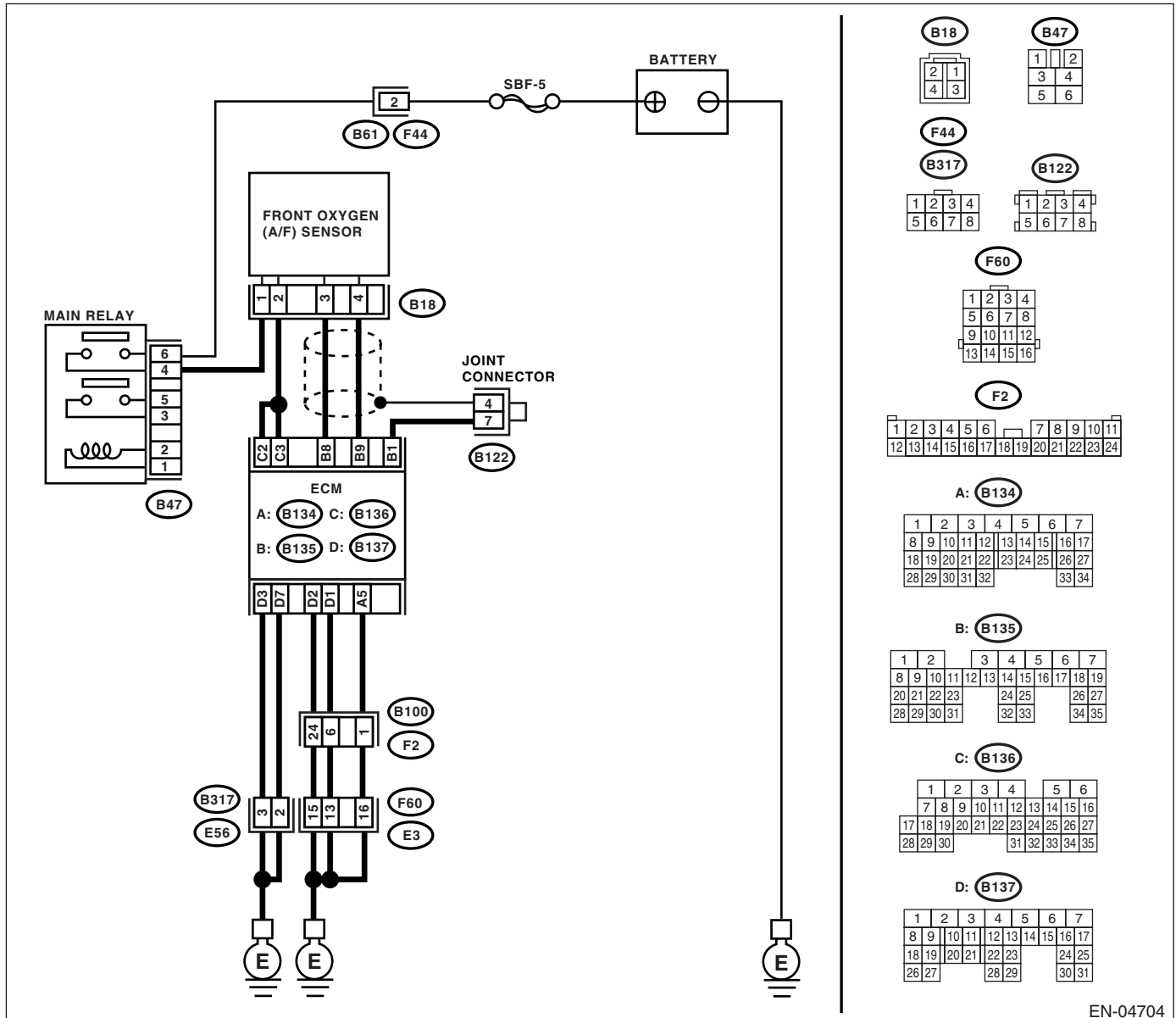
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-17, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04704

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No                    |
|--|--|--|-----------------------|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B136) No. 2 (+) — Chassis ground (-):</i><br><i>(B136) No. 3 (+) — Chassis ground (-):</i>  | Is the voltage more than 8 V?  | Go to step 3.  | Go to step 2.         |
| <b>2</b><br><b>CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.</b><br>1) Turn the ignition switch to OFF.<br>2) Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>3) Turn the ignition switch to ON.<br>4) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the general scan tool.<br><b>NOTE:</b><br><ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.><br><ul style="list-style-type: none"> <li>• General scan tool</li> </ul> For detailed operation procedure, refer to the General Scan Tool Instruction Manual. | Is the current more than 2.3 A?  | Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>                           | Finish the diagnosis. |
| <b>3</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B136) No. 2 (+) — Chassis ground (-):</i><br><i>(B136) No. 3 (+) — Chassis ground (-):</i>   | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change? | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. | Finish the diagnosis. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## H: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

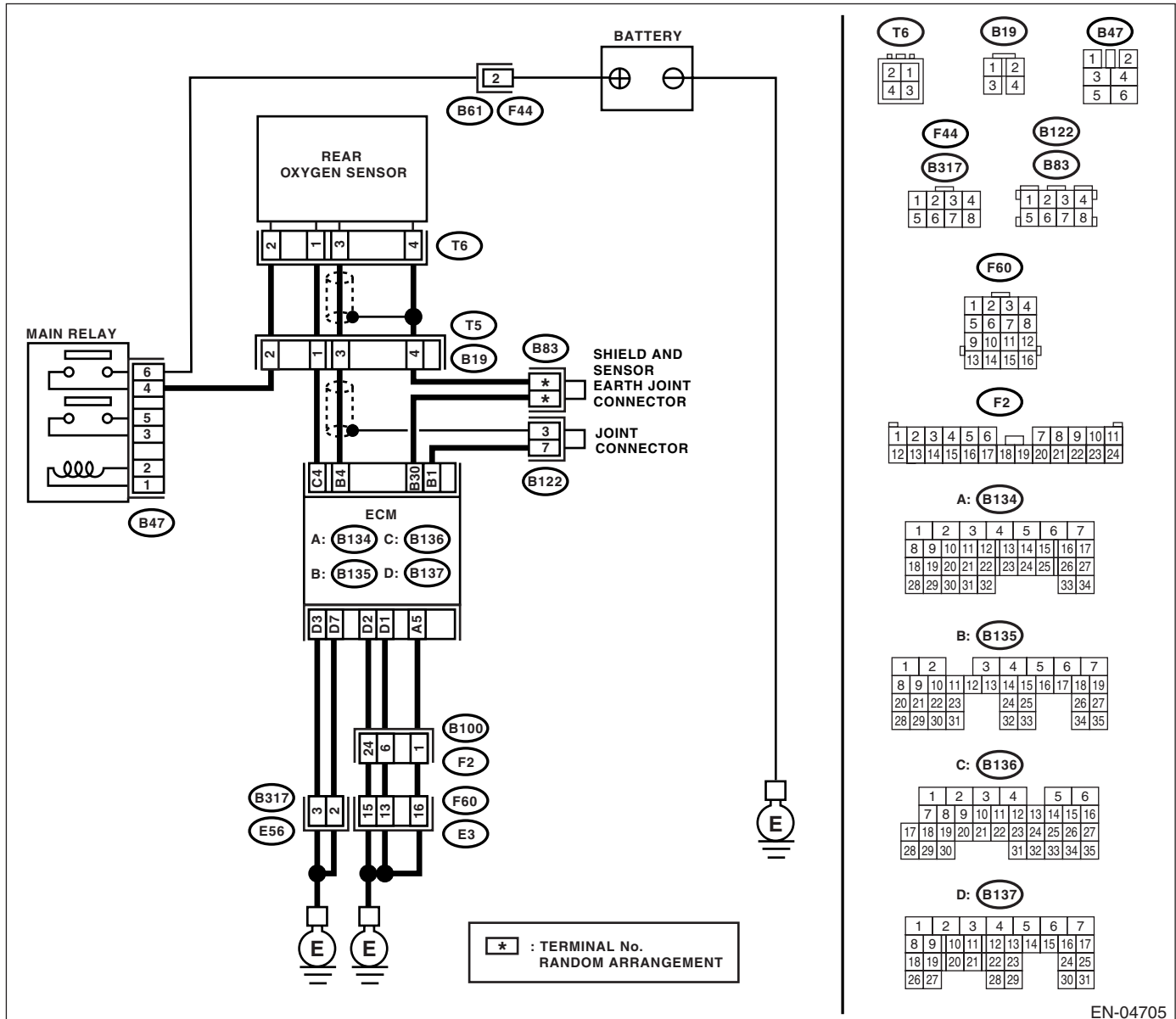
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-19, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04705

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <p><b>1 CHECK GROUND CIRCUIT OF ECM.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from ECM.<br/>3) Measure the resistance of harness between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B134) No. 5 — Chassis ground:</b><br/><b>(B137) No. 1 — Chassis ground:</b><br/><b>(B137) No. 2 — Chassis ground:</b><br/><b>(B137) No. 7 — Chassis ground:</b><br/><b>(B137) No. 3 — Chassis ground:</b></p>         | Is the resistance less than 5 Ω?   | Go to step 2.   | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ECM and engine ground cable<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector |
| <p><b>2 CHECK CURRENT DATA.</b></p> <p>1) Start the engine.<br/>2) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or general scan tool.</p> <p>NOTE:<br/>• Subaru Select Monitor<br/>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;<br/>• General scan tool<br/>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | Is the current more than 0.2 A?  | Repair the connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Poor contact in rear oxygen sensor connector<br>• Poor contact in rear oxygen sensor connecting harness connector<br>• Poor contact in ECM connector | Go to step 3.   |
| <p><b>3 CHECK OUTPUT SIGNAL FROM ECM.</b></p> <p>1) Start and idle the engine.<br/>2) Measure the voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B136) No. 4 (+) — Chassis ground (-):</b></p>  | Is the voltage less than 1 V?  | Go to step 6.   | Go to step 4.   |
| <p><b>4 CHECK OUTPUT SIGNAL FROM ECM.</b></p> <p>Measure the voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B136) No. 4 (+) — Chassis ground (-):</b></p>   | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change? | Repair the poor contact in ECM connector.   | Go to step 5.   |
| <p><b>5 CHECK OUTPUT SIGNAL FROM ECM.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from rear oxygen sensor.<br/>3) Measure the voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B136) No. 4 (+) — Chassis ground (-):</b></p>   | Is the voltage less than 1 V?  | Replace the ECM.<br><Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>   | Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No   |
|--|--|---|--|
| <p><b>6</b></p> <p><b>CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from rear oxygen sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between rear oxygen sensor connector and engine ground or chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T6) No. 2 (+) — Chassis ground (-):</b></p> | <p>Is the voltage more than 10 V?</p>                      | <p>Go to step 7.</p>  | <p>Repair the power supply line.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and rear oxygen sensor connector</li> <li>• Poor contact in main relay connector</li> <li>• Poor contact in coupling connector</li> <li>• Malfunction in main relay</li> </ul> |
| <p><b>7</b></p> <p><b>CHECK REAR OXYGEN SENSOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Measure the resistance between rear oxygen sensor connector terminals.</p> <p><b>Terminals</b><br/> <b>No. 1 — No. 2:</b></p>   | <p>Is the resistance less than 30 <math>\Omega</math>?</p> | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> | <p>Replace the rear oxygen sensor.</p> <p>&lt;Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.&gt;</p>   |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## I: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

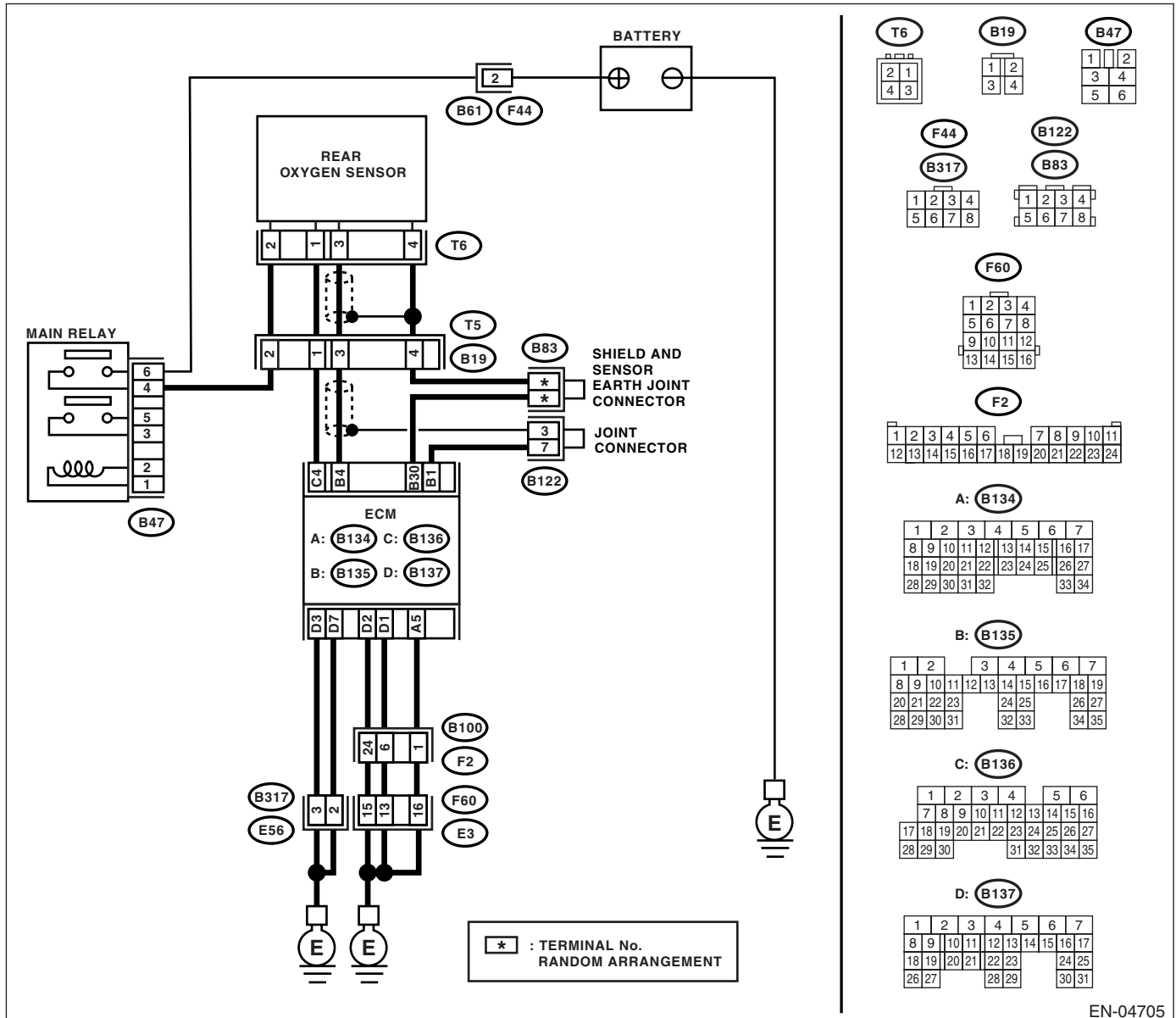
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-21, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04705

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                   | Yes   | No                    |
|---|---|---|-----------------------|
| <b>1</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 4 (+) — Chassis ground (-):</b>   | Is the voltage more than 8 V?           | Go to step 2.   | Go to step 3.         |
| <b>2</b><br><b>CHECK CURRENT DATA.</b><br>1) Repair the battery short circuit in harness between ECM and rear oxygen sensor connector.<br>2) Turn the ignition switch to ON.<br>3) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or the general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedure, refer to the General Scan Tool Instruction Manual. | Is the current more than 7 A?           | Replace the ECM.<br><Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Finish the diagnosis. |
| <b>3</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.  | Is there poor contact in ECM connector? | Repair the poor contact in ECM connector.                                 | Finish the diagnosis. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## J: DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-23, DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

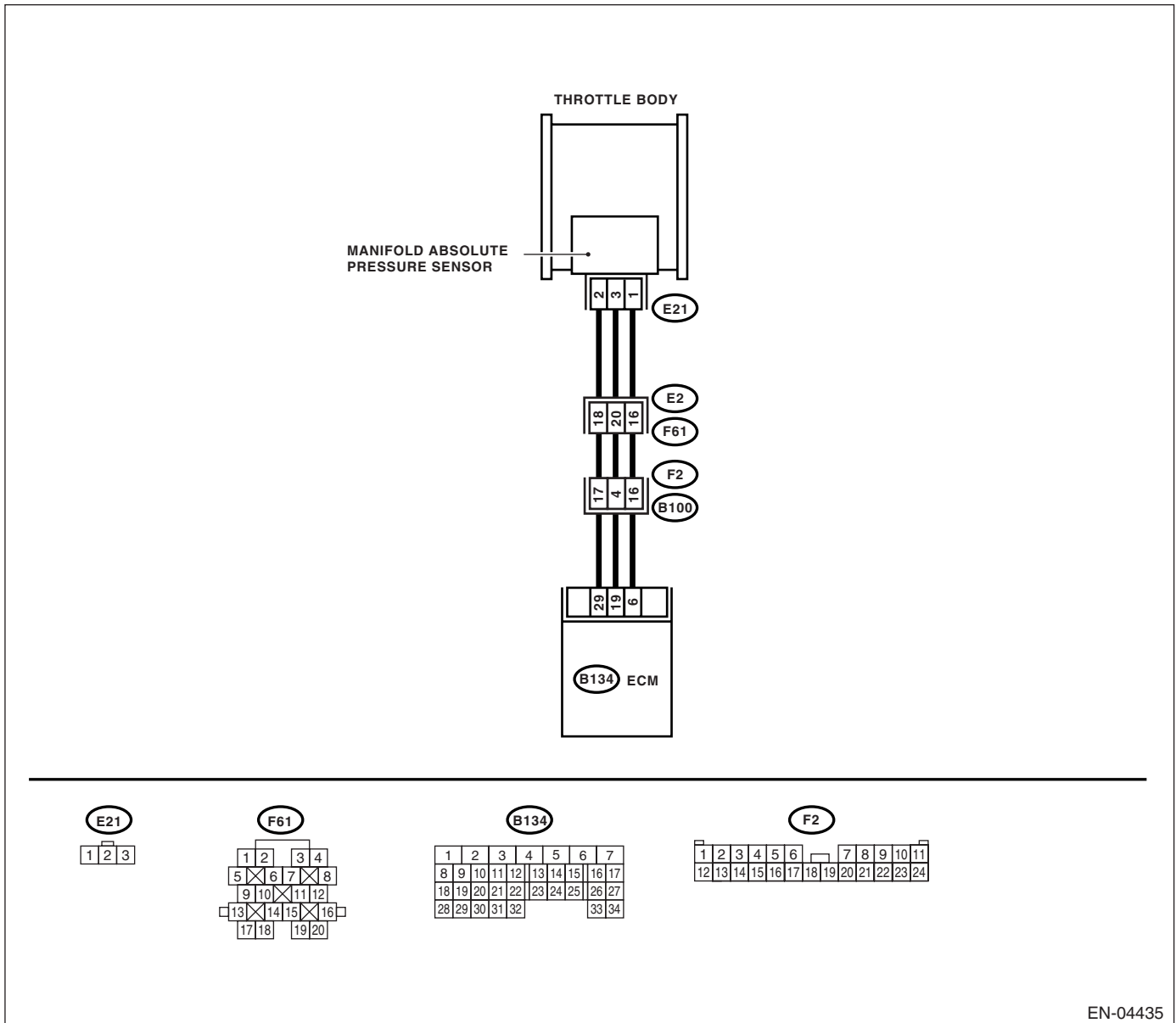
### TROUBLE SYMPTOM:

Failure of engine to start

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04435

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <b>1 CHECK IDLE SWITCH SIGNAL.</b><br>1) Turn the ignition switch to ON.<br>2) Operate the LED operation mode for engine using Subaru Select Monitor.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE".<br><Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> | Does the LED of {Idle Switch Signal} come on?                                  | Go to step 2.  | Check the throttle position sensor circuit. <Ref. to EN(H4DOTC)(diag)-370, DTC P2135 THROTTLE/ PEDAL POSITION SENSOR/ SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| <b>2 CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?  | Inspect the relevant DTC. "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> | Go to step 3.   |
| <b>3 CHECK CONDITION OF MANIFOLD ABSOLUTE PRESSURE SENSOR.</b>  | Is the manifold absolute pressure sensor installation bolt tightened securely? | Go to step 4.  | Tighten the manifold absolute pressure sensor installation bolt securely.   |
| <b>4 CHECK CONDITION OF THROTTLE BODY.</b>  | Is the throttle body installation bolt tightened securely?                     | Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.>                               | Tighten the throttle body installation bolt securely.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## K: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-25, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

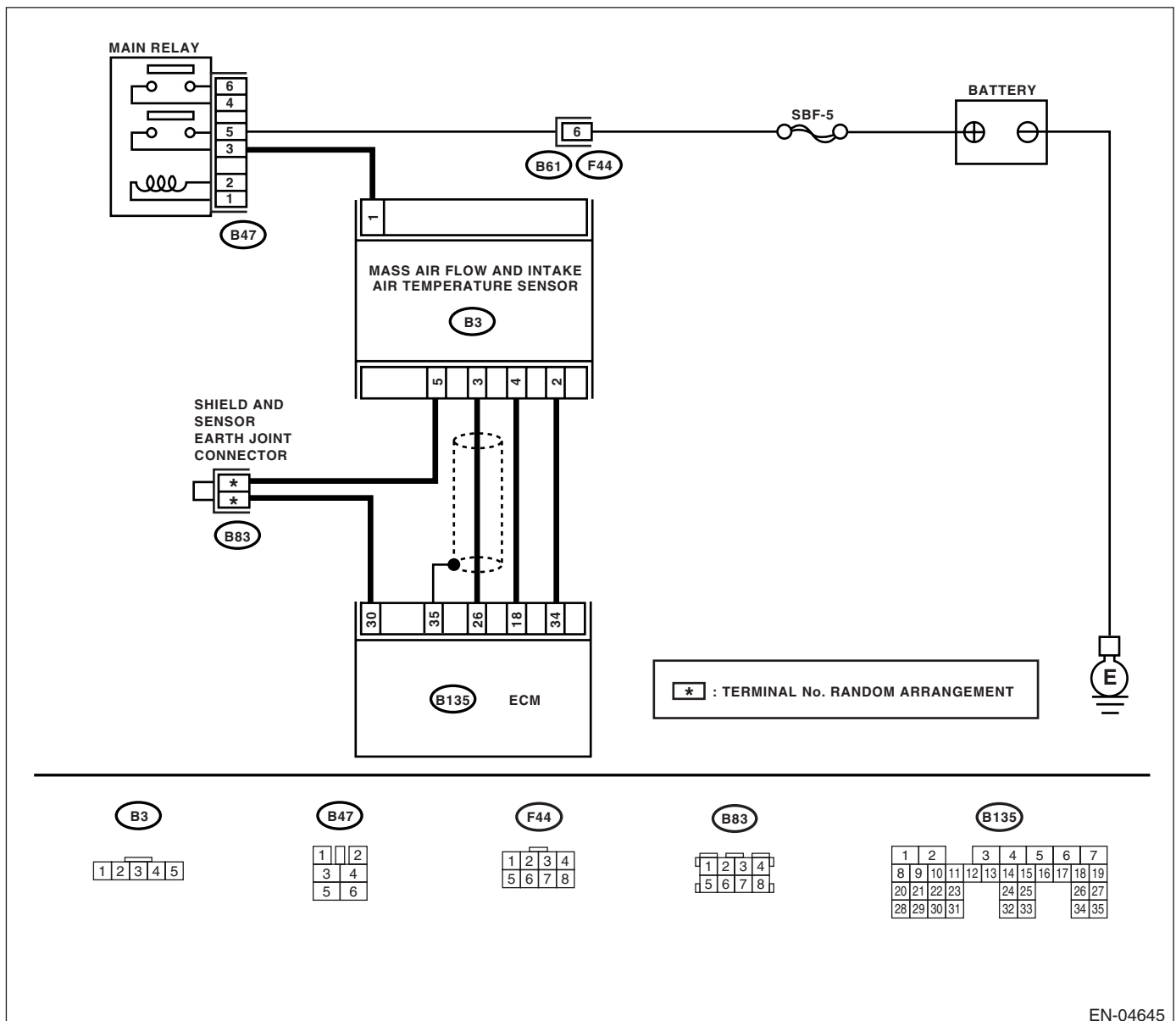
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04645

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                       | Yes   | No   |
|---|-----------------------------|---|--|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0101. | Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## L: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-28, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

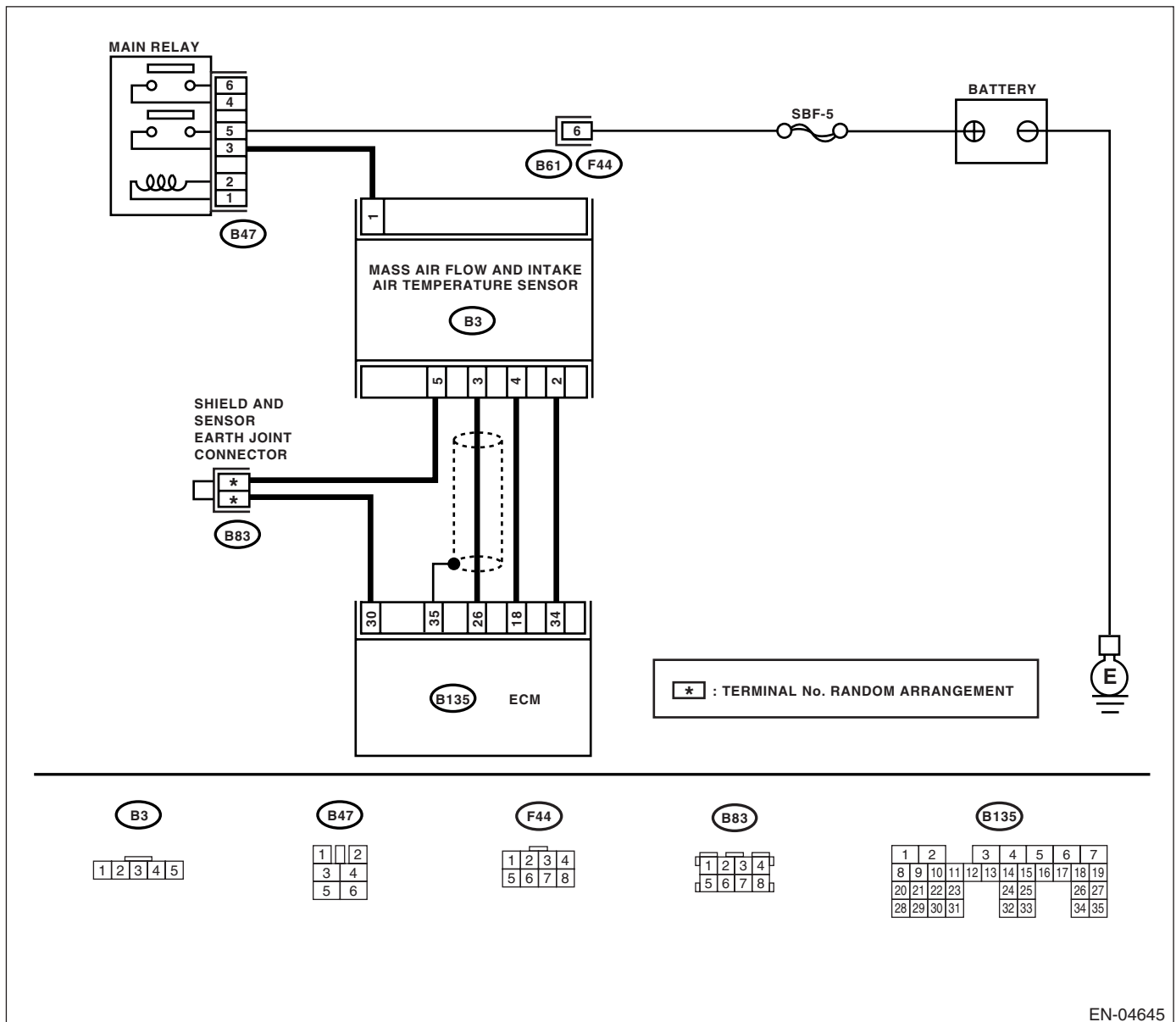
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04645

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <p><b>1 CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Connect the Subaru Select Monitor or general scan tool to data link connector.<br/>                     3) Turn the ignition switch to ON and Subaru Select Monitor or the general scan tool power switch to ON.<br/>                     4) Start the engine.<br/>                     5) Read the mass air flow sensor voltage using Subaru Select Monitor or general scan tool.</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the voltage 0.2 — 4.7 V?</p>  | <p>Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in the mass air flow sensor.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open or ground short circuit in harness between mass air flow sensor and ECM connector</li> <li>• Poor contact in mass air flow sensor or ECM connector</li> </ul> | <p>Go to step 2.</p>   |
| <p><b>2 CHECK INPUT SIGNAL FOR ECM.</b></p> <p>Measure the voltage between ECM connector and chassis ground while engine is idling.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B135) No. 26 (+) — Chassis ground (-):</b></p>  | <p>Is the voltage less than 0.2 V?</p>  | <p>Go to step 4.</p>  | <p>Go to step 3.</p>   |
| <p><b>3 CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).</b></p> <p>Measure the voltage between ECM connector and chassis ground while engine is idling.</p>   | <p>Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?</p> | <p>Repair the poor contact in ECM connector.</p>  | <p>Contact your SOA Service Center since deterioration of some parts may be the cause.</p> |
| <p><b>4 CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from mass air flow sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between mass air flow sensor connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B3) No. 1 (+) — Chassis ground (-):</b></p>   | <p>Is the voltage more than 5 V?</p>  | <p>Go to step 5.</p>  | <p>Repair the open circuit between mass air flow sensor and main relay.</p>                |
| <p><b>5 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM.<br/>                     3) Measure the resistance of harness between ECM and mass air flow sensor connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B135) No. 18 — (B3) No. 4:</b><br/> <b>(B135) No. 26 — (B3) No. 3:</b><br/> <b>(B135) No. 34 — (B3) No. 2:</b><br/> <b>(B135) No. 30 — (B3) No. 5:</b></p>  | <p>Is the resistance less than 1 <math>\Omega</math>?</p>   | <p>Go to step 6.</p>  | <p>Repair the open circuit between ECM and mass air flow sensor connector.</p>             |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <b>6</b><br><b>CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR</b><br>Measure the resistance of harness between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 18 — Chassis ground:</b><br><b>(B135) No. 26 — Chassis ground:</b><br><b>(B135) No. 34 — Chassis ground:</b><br><b>(B135) No. 30 — Chassis ground:</b> | Is the resistance more than 1 MΩ?                        | Go to step 7.  | Repair the ground short circuit between ECM and mass air flow sensor connector.  |
| <b>7</b><br><b>CHECK POOR CONTACT</b><br>Check poor contact in mass air flow sensor connector.  | Is there poor contact in mass air flow sensor connector? | Repair the poor contact in mass air flow sensor connector. | Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.> |

## M: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-30, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

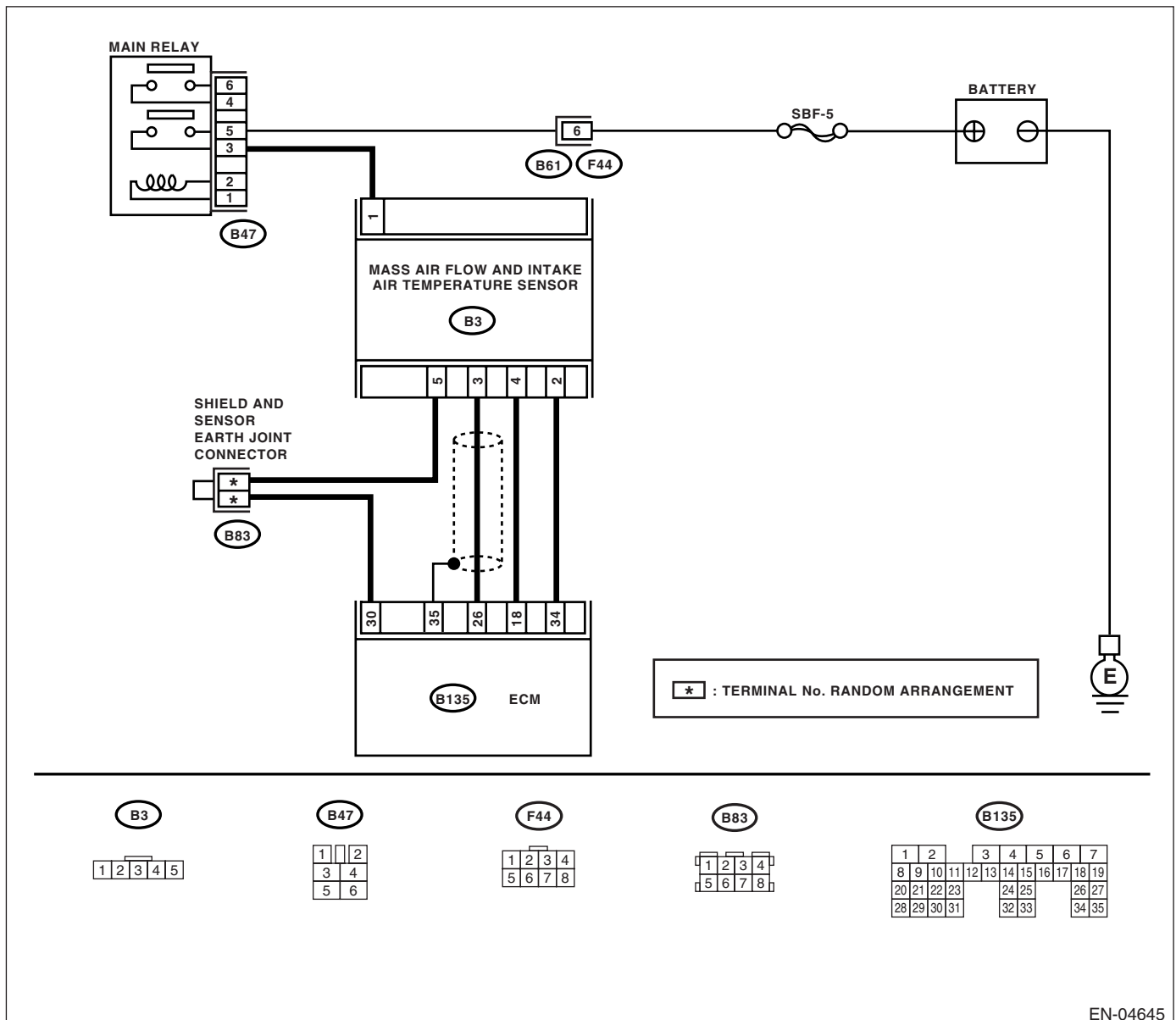
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04645

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <p><b>1</b></p> <p><b>CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Connect the Subaru Select Monitor or general scan tool to data link connector.<br/>                     3) Turn the ignition switch to ON and Subaru Select Monitor or general scan tool power switch to ON.<br/>                     4) Start the engine.<br/>                     5) Read the mass air flow sensor voltage using Subaru Select Monitor or general scan tool.</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the voltage 0.2 — 4.7 V?</p>                        | <p>Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.</p>                                  | <p>Go to step 2.</p>  |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from mass air flow sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between mass air flow and intake air temperature sensor connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B3) No. 3 (+) — Chassis ground (-):</b></p>  | <p>Is the voltage more than 5 V?</p>                      | <p>Repair the battery short of harness between mass air flow and intake air temperature sensor connector and ECM connector.</p>                     | <p>Go to step 3.</p>  |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM.<br/>                     3) Measure the resistance between ECM connector and mass air flow and intake air temperature sensor connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B3) No. 2 — (B135) No. 34:</b></p>  | <p>Is the resistance less than 1 <math>\Omega</math>?</p> | <p>Replace the mass air flow and intake air temperature sensor. &lt;Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p> | <p>Repair the open harness between mass air flow and intake air temperature sensor connector and ECM connector.</p> |

## N: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

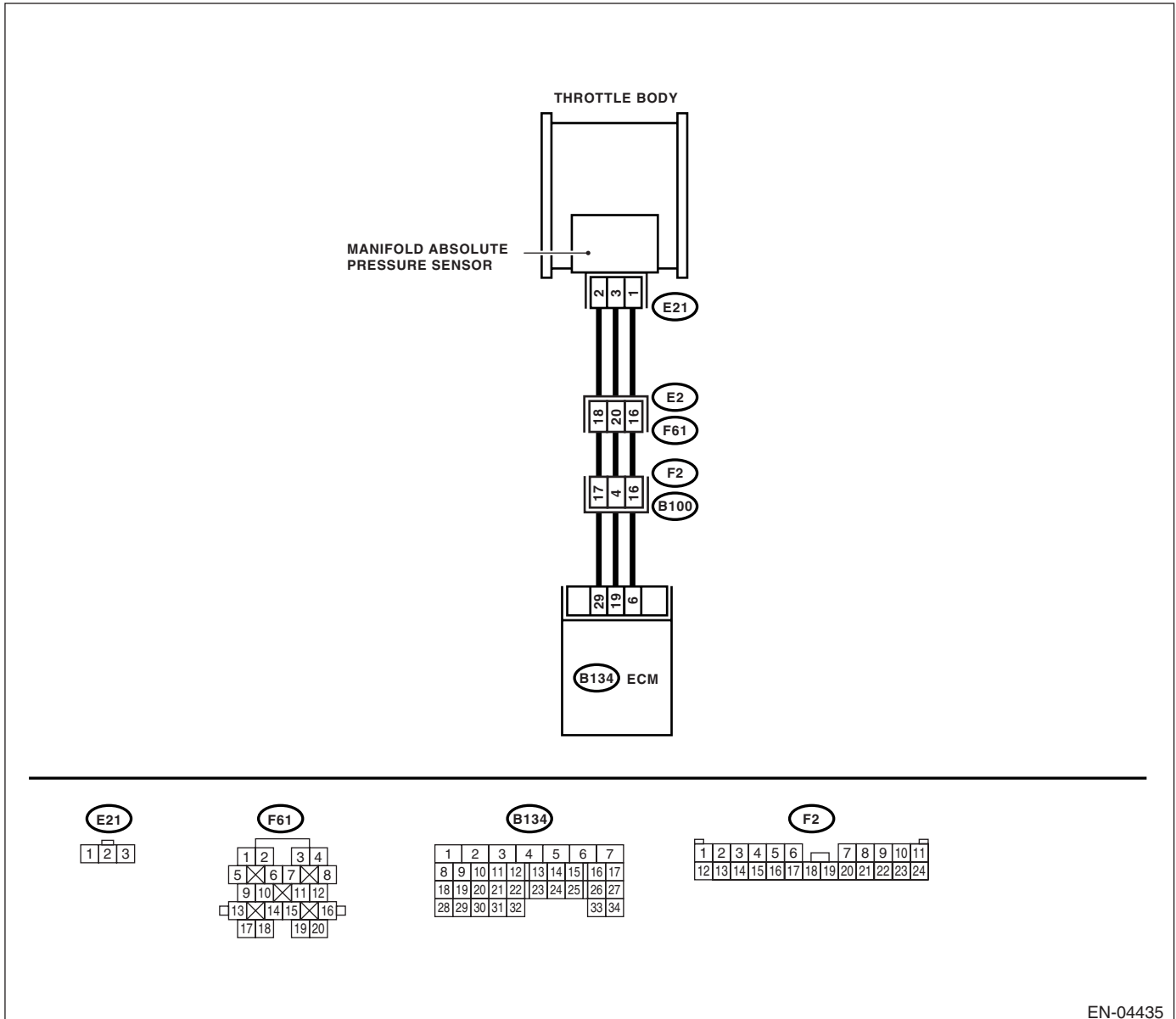
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-32, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04435

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No   |
|--|--|---|--|
| <b>1 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 19 (+) — Chassis ground (-):</i>   | Is the voltage more than 4.5 V?  | Go to step 3.   | Go to step 2.  |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 19 (+) — Chassis ground (-):</i>   | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change? | Repair the poor contact in ECM connector.                               | Contact your SOA Service Center since deterioration of some parts may be the cause.                        |
| <b>3 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 6 (+) — Chassis ground (-):</i>  | Is the voltage less than 0.7 V?  | Go to step 4.   | Contact your SOA Service Center since deterioration of some parts may be the cause.                        |
| <b>4 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from manifold absolute pressure sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between manifold absolute pressure sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E21) No. 3 (+) — Engine ground (-):</i> | Is the voltage more than 4.5 V?  | Go to step 5.   | Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.            |
| <b>5 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 29 — (E21) No. 2:</i>   | Is the resistance less than 1 $\Omega$ ?   | Go to step 6.   | Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.            |
| <b>6 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.</b><br>Measure the resistance of harness between manifold absolute pressure sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E21) No. 1 — Engine ground:</i>  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 7.   | Repair the ground short circuit in harness between ECM and manifold absolute pressure sensor connector.    |
| <b>7 CHECK POOR CONTACT.</b><br>Check poor contact in manifold absolute pressure sensor connector.   | Is there poor contact in manifold absolute pressure sensor connector?                                  | Repair the poor contact in manifold absolute pressure sensor connector. | Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.> |

## O: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

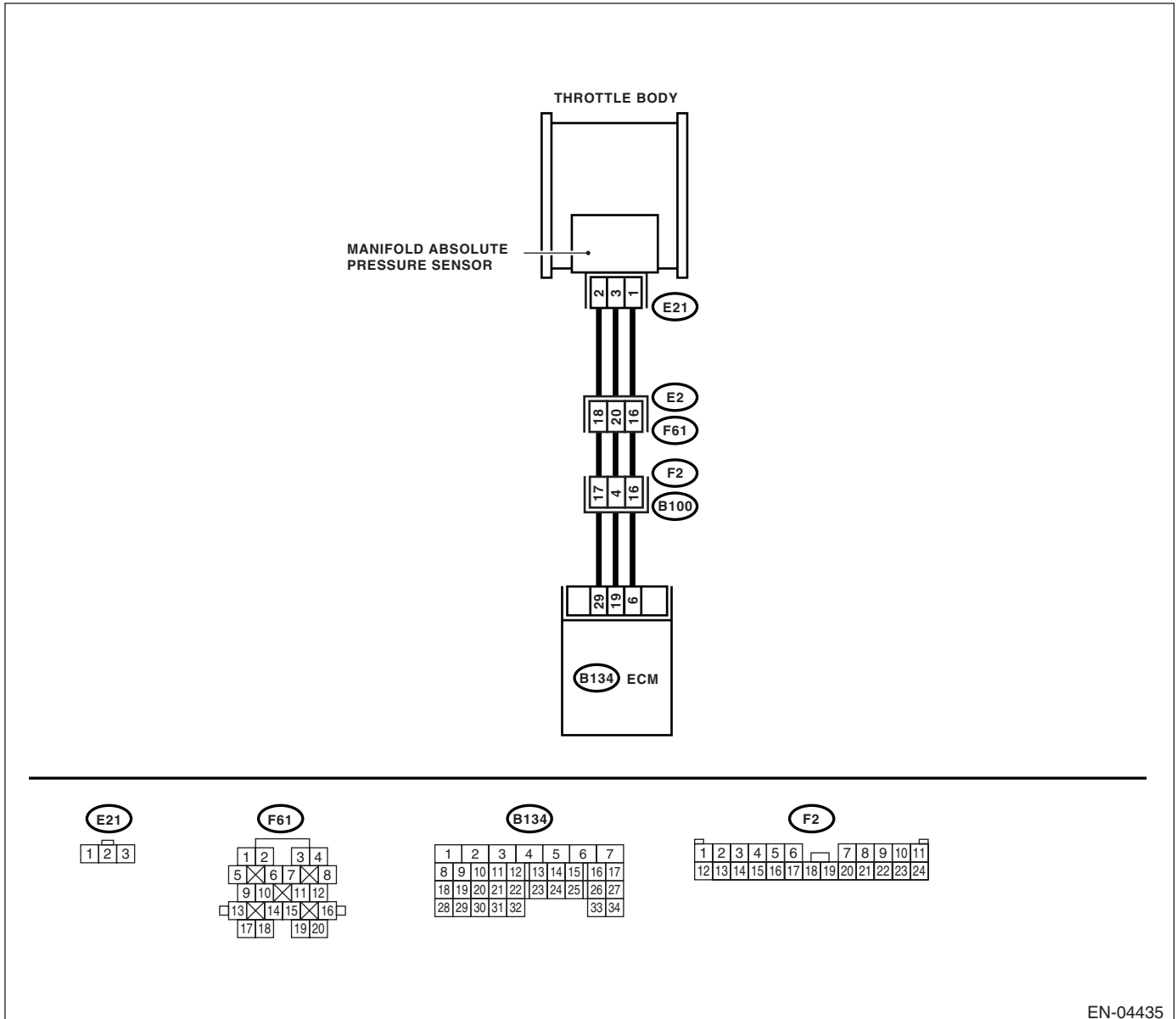
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-34, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No   |
|--|--|---|--|
| <b>1</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 19 (+) — Chassis ground (-):</i>   | Is the voltage more than 4.5 V?  | Go to step 3.   | Go to step 2.  |
| <b>2</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 19 (+) — Chassis ground (-):</i>   | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change? | Repair the poor contact in ECM connector.                               | Contact your SOA Service Center since deterioration of some parts may be the cause.                        |
| <b>3</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 6 (+) — Chassis ground (-):</i>  | Is the voltage more than 4.5 V?  | Go to step 4.   | Contact your SOA Service Center since deterioration of some parts may be the cause.                        |
| <b>4</b><br><b>CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from manifold absolute pressure sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between manifold absolute pressure sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E21) No. 3 (+) — Engine ground (-):</i> | Is the voltage more than 4.5 V?  | Go to step 5.   | Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.            |
| <b>5</b><br><b>CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 6 — (E21) No. 1:</i>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 6.   | Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.            |
| <b>6</b><br><b>CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.</b><br>Measure the resistance of harness between ECM and manifold absolute pressure sensor connector.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 29 — (E21) No. 2:</i>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 7.   | Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.            |
| <b>7</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in manifold absolute pressure sensor connector.   | Is there poor contact in manifold absolute pressure sensor connector?                                  | Repair the poor contact in manifold absolute pressure sensor connector. | Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.> |

## P: DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-36, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

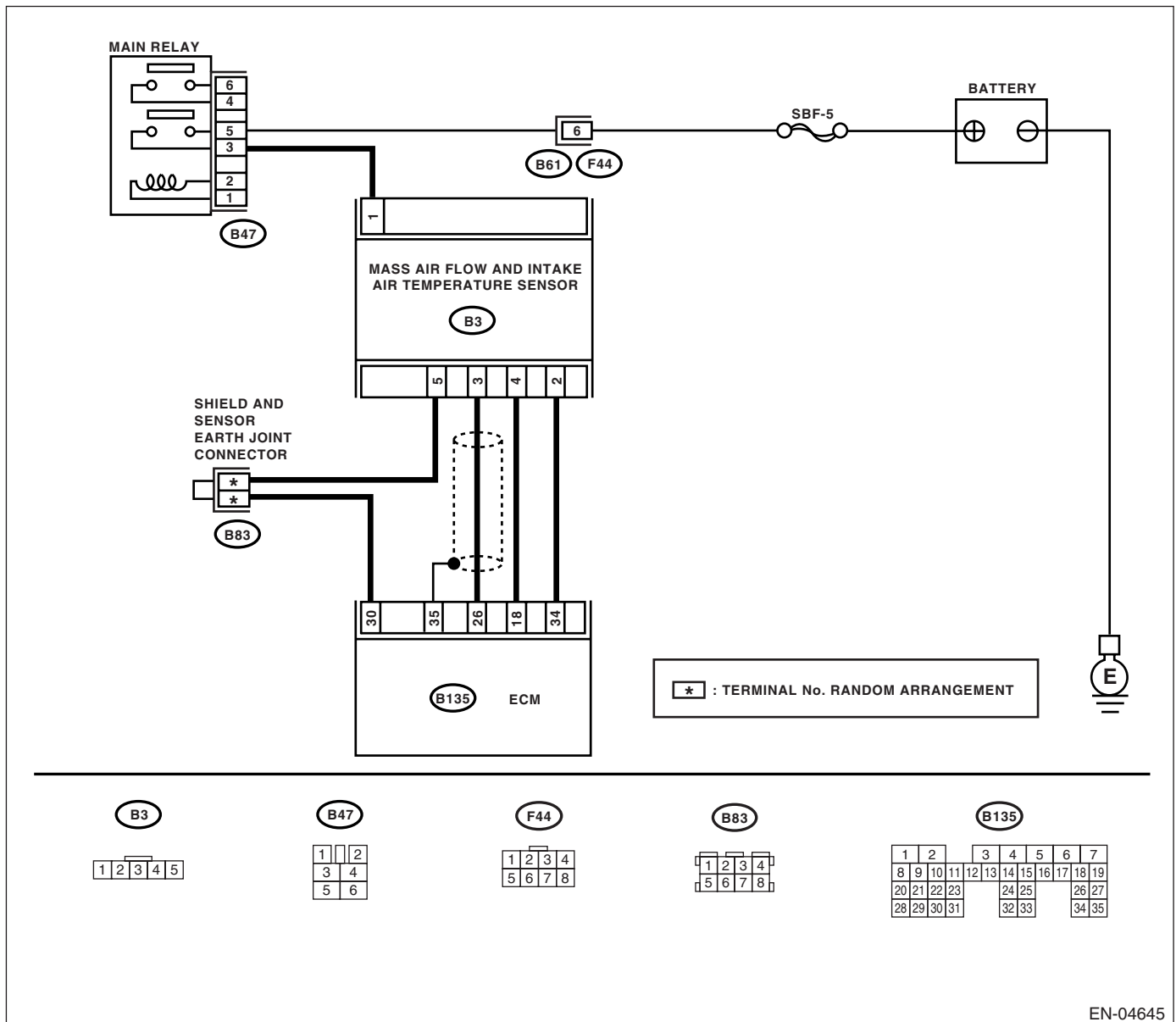
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04645



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?                                | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0111. | Go to step 2.  |
| <b>2</b><br><b>CHECK ENGINE COOLANT TEMPERATURE.</b><br>1) Start the engine and warm it up completely.<br>2) Measure the engine coolant temperature using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br><ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.><br><ul style="list-style-type: none"> <li>• General scan tool</li> </ul> For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the engine coolant temperature 75 — 95°C (167 — 203°F)? | Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>  | Inspect the DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## Q: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-38, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

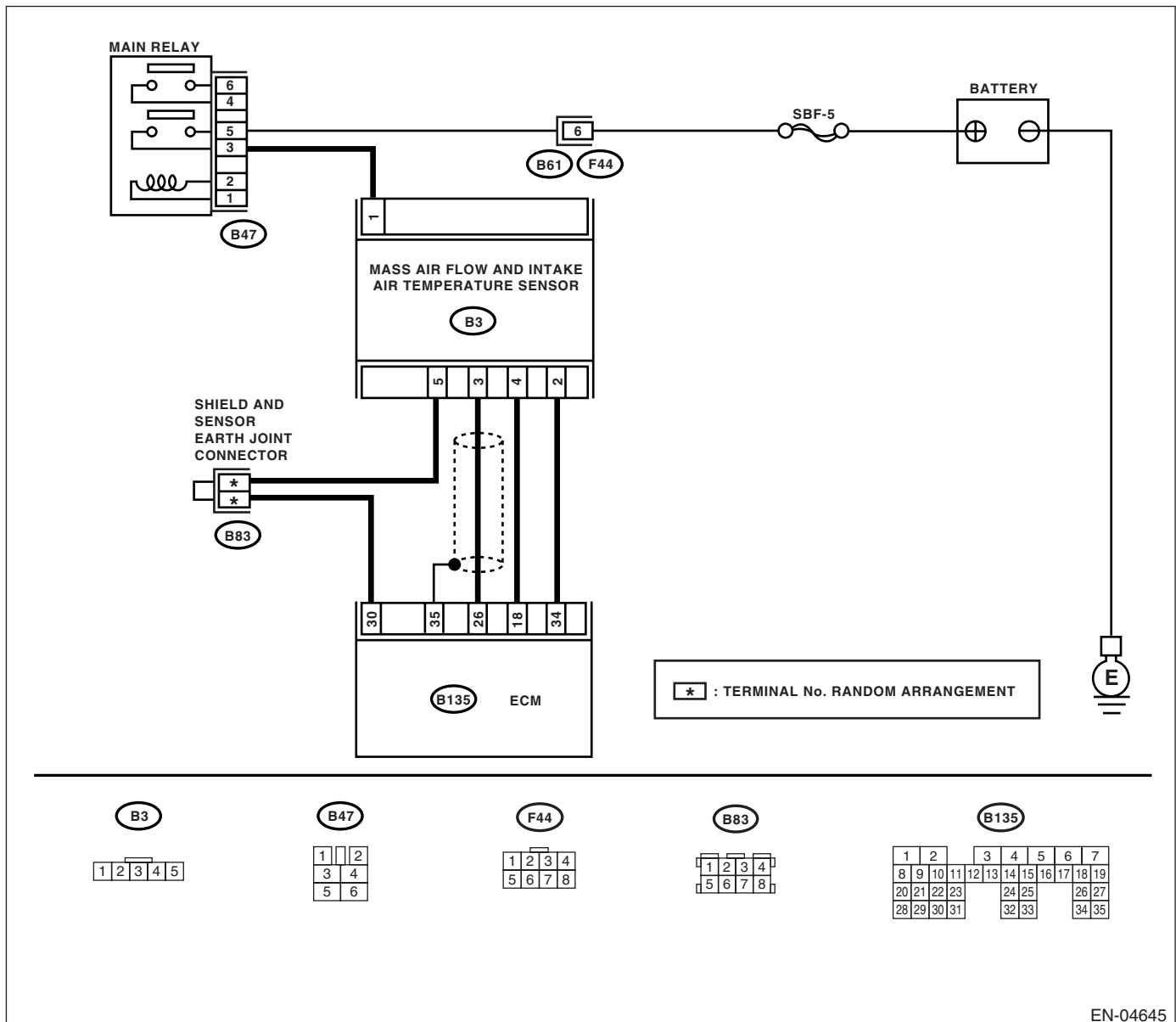
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04645

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <p><b>1</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Start the engine.</p> <p>2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the General Scan Tool Instruction Manual.</p>  | <p>Is the temperature more than 55°C (131°F)?</p>  | <p>Go to step 2.</p>  | <p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Poor contact mass air flow and intake air temperature sensor</li> <li>• Poor contact in ECM</li> <li>• Poor contact in joint connector</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from mass air flow and intake air temperature sensor.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the temperature less than –36°C (–33°F)?</p> | <p>Replace the mass air flow and intake air temperature sensor. &lt;Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p> | <p>Repair the ground short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.</p>   |

## R: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-40, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

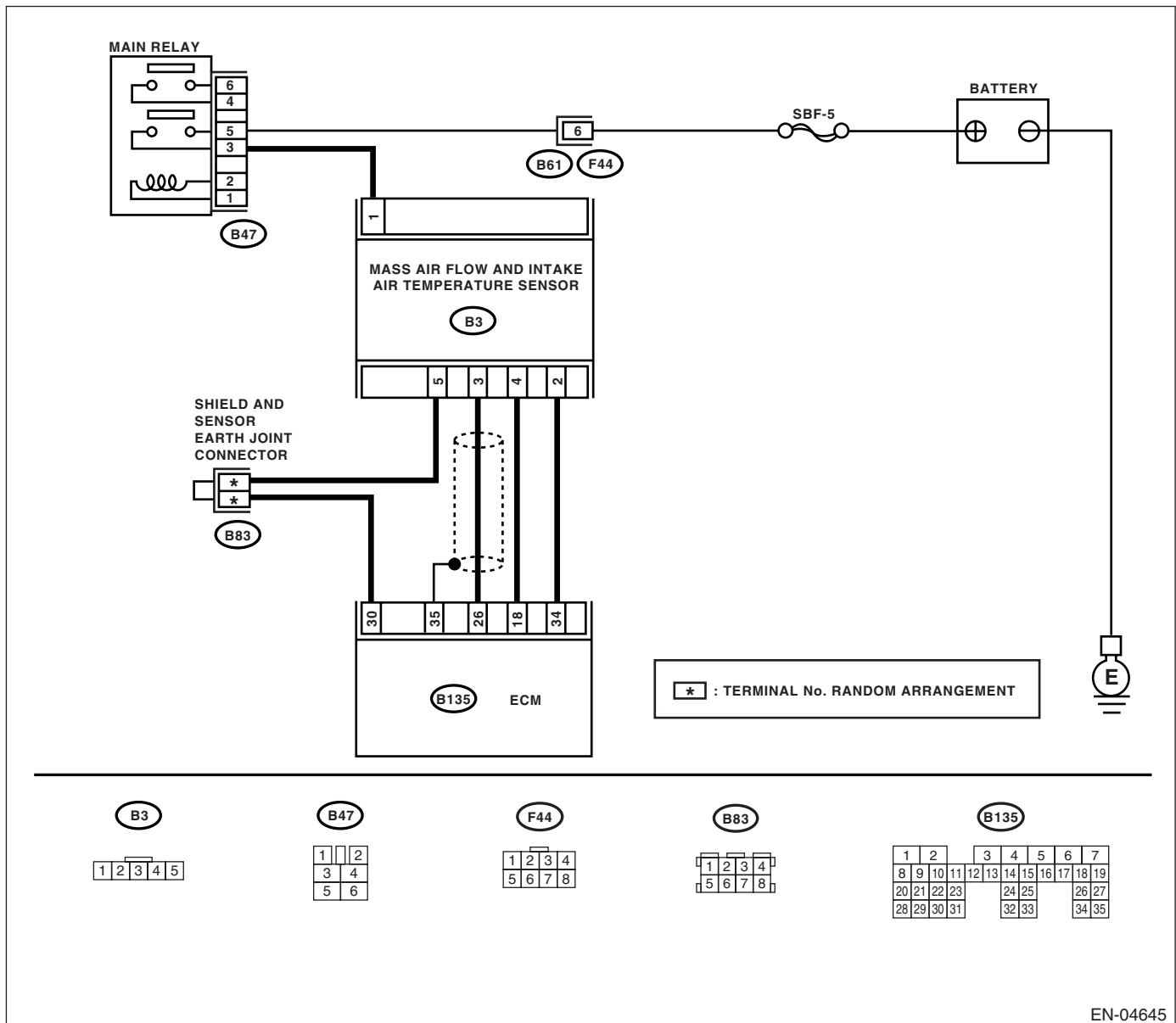
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04645

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <p><b>1 CHECK CURRENT DATA.</b></p> <p>1) Start the engine.</p> <p>2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the temperature less than –36°C (–33°F)?</p> | <p>Go to step 2.</p>  | <p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Poor contact in mass air flow and intake air temperature sensor</li> <li>• Poor contact in ECM</li> <li>• Poor contact in joint connector</li> </ul>   |
| <p><b>2 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from mass air flow and intake air temperature sensor.</p> <p>3) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B3) No. 4 (+) — Engine ground (-):</b></p>  | <p>Is the voltage more than 10 V?</p>              | <p>Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.</p> | <p>Go to step 3.</p>  |
| <p><b>3 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B3) No. 4 (+) — Engine ground (-):</b></p>  | <p>Is the voltage more than 10 V?</p>              | <p>Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.</p> | <p>Go to step 4.</p>  |
| <p><b>4 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>Measure the voltage between mass air flow and intake air temperature sensor and manifold absolute pressure sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B3) No. 4 (+) — Engine ground (-):</b></p>   | <p>Is the voltage more than 4 V?</p>               | <p>Go to step 5.</p>  | <p>Repair the harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector</li> <li>• Poor contact in mass air flow and intake air temperature sensor</li> <li>• Poor contact in ECM</li> <li>• Poor contact in joint connector</li> </ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <p><b>5</b></p> <p><b>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Measure the resistance of harness between mass air flow and intake air temperature sensor and engine ground.</p> <p><b><i>Connector &amp; terminal</i></b><br/><b><i>(B3) No. 5 — Engine ground:</i></b></p> | <p>Is the resistance less than 5 <math>\Omega</math>?</p> | <p>Replace the mass air flow and intake air temperature sensor. &lt;Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p> | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector</li> <li>• Poor contact in mass air flow and intake air temperature sensor</li> <li>• Poor contact in ECM</li> <li>• Poor contact in joint connector</li> </ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## S: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-42, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

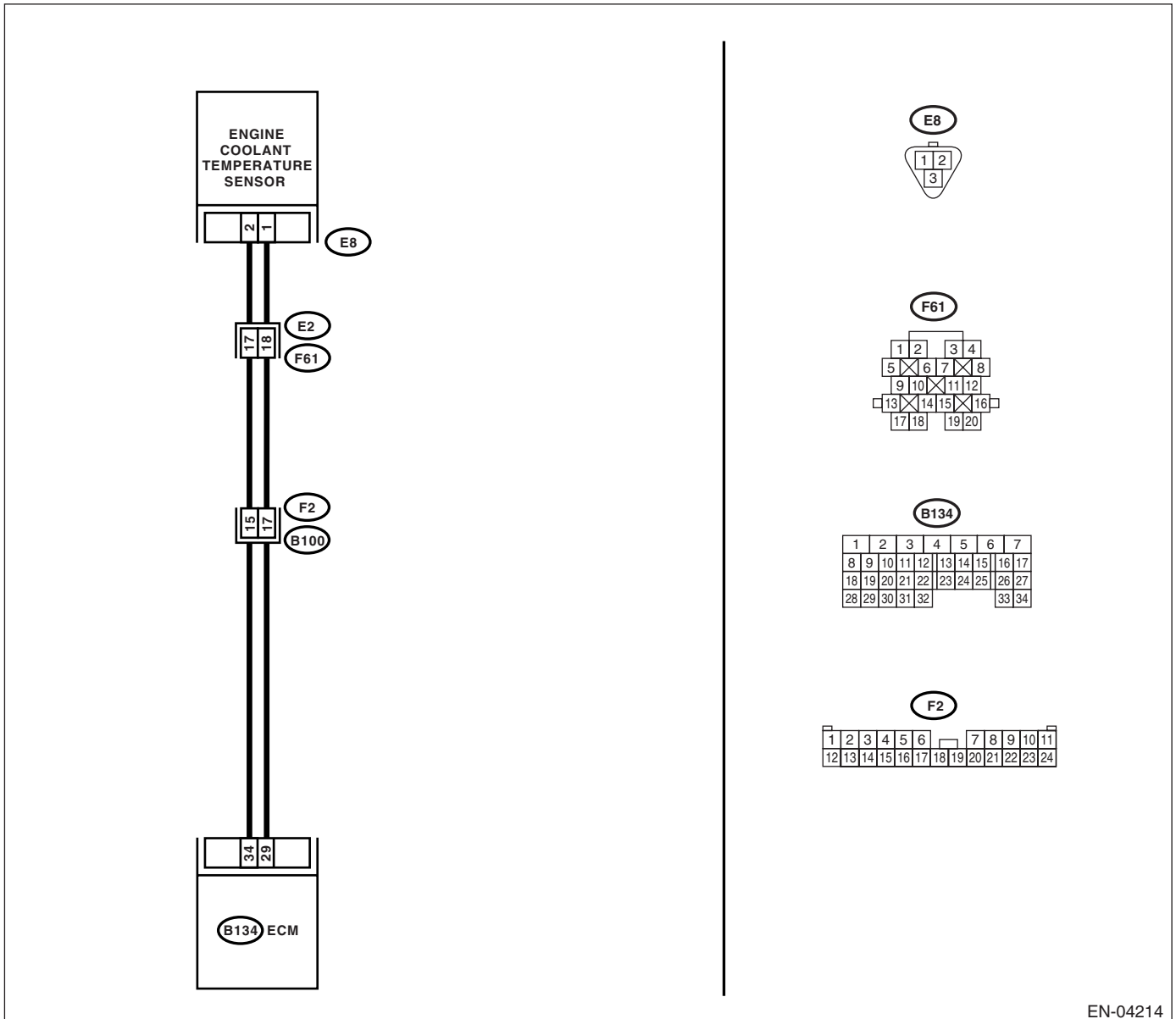
### TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04214

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <p><b>1</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Start the engine.</p> <p>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p>  | <p>Is the temperature more than 120°C (248°F)?</p> | <p>Go to step 2.</p>  | <p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Poor contact in engine coolant temperature sensor</li> <li>• Poor contact in ECM</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from engine coolant temperature sensor.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the temperature less than –40°C (–40°F)?</p> | <p>Replace the engine coolant temperature sensor. &lt;Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.&gt;</p> | <p>Repair the ground short circuit in harness between engine coolant temperature sensor and ECM connector.</p>  |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## T: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-44, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

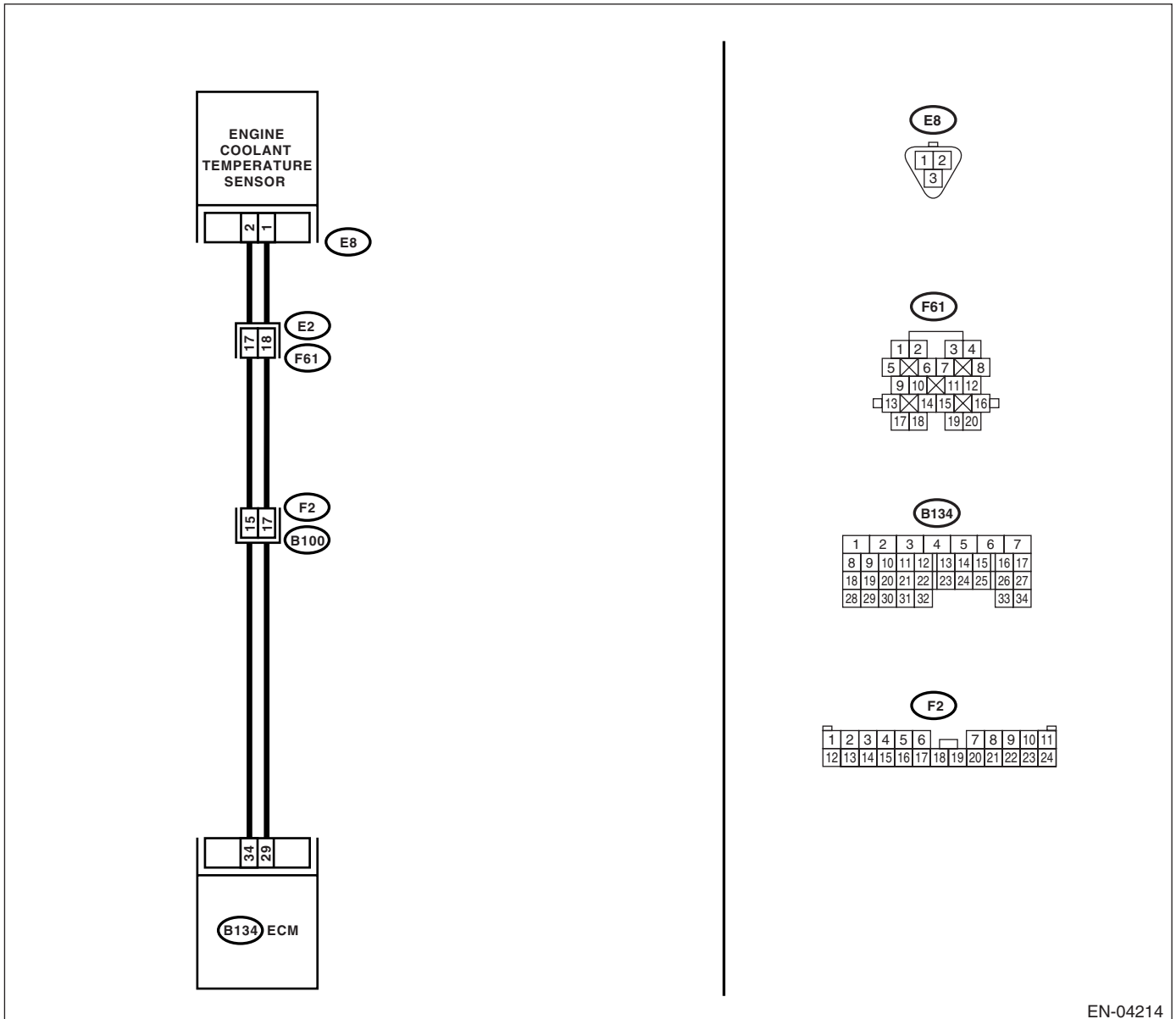
### TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04214

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <p><b>1</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Start the engine.</p> <p>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the temperature less than –40°C (–40°F)?</p> | <p>Go to step 2.</p>  | <p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Poor contact in engine coolant temperature sensor</li> <li>• Poor contact in ECM</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul>   |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from engine coolant temperature sensor.</p> <p>3) Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E8) No. 2 (+) — Engine ground (-):</b></p>   | <p>Is the voltage more than 10 V?</p>              | <p>Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.</p> | <p>Go to step 3.</p>  |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E8) No. 2 (+) — Engine ground (-):</b></p>   | <p>Is the voltage more than 10 V?</p>              | <p>Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.</p> | <p>Go to step 4.</p>  |
| <p><b>4</b></p> <p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E8) No. 2 (+) — Engine ground (-):</b></p>  | <p>Is the voltage more than 4 V?</p>               | <p>Go to step 5.</p>  | <p>Repair the harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and engine coolant temperature sensor connector</li> <li>• Poor contact in engine coolant temperature sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <p><b>5</b></p> <p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E8) No. 1 — Engine ground:</b></p> | <p>Is the resistance less than 5 <math>\Omega</math>?</p> | <p>Replace the engine coolant temperature sensor. &lt;Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.&gt;</p> | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and engine coolant temperature sensor connector</li> <li>• Poor contact in engine coolant temperature sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |

## **U: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT**

### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-46, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

- Erroneous idling
- Engine stalls.
- Poor driving performance

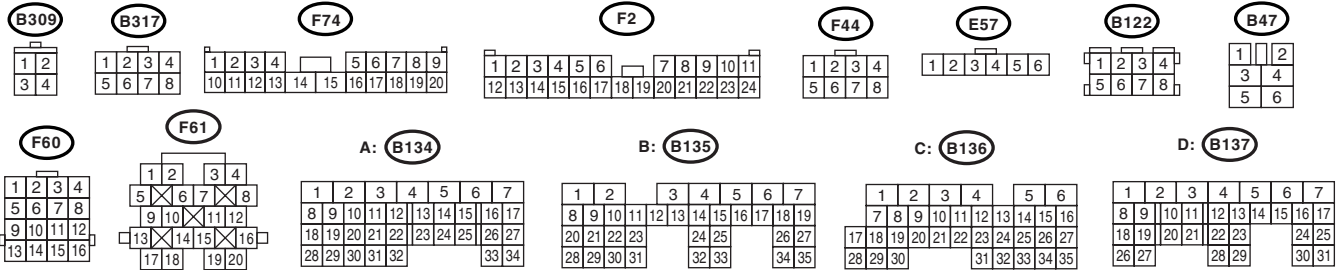
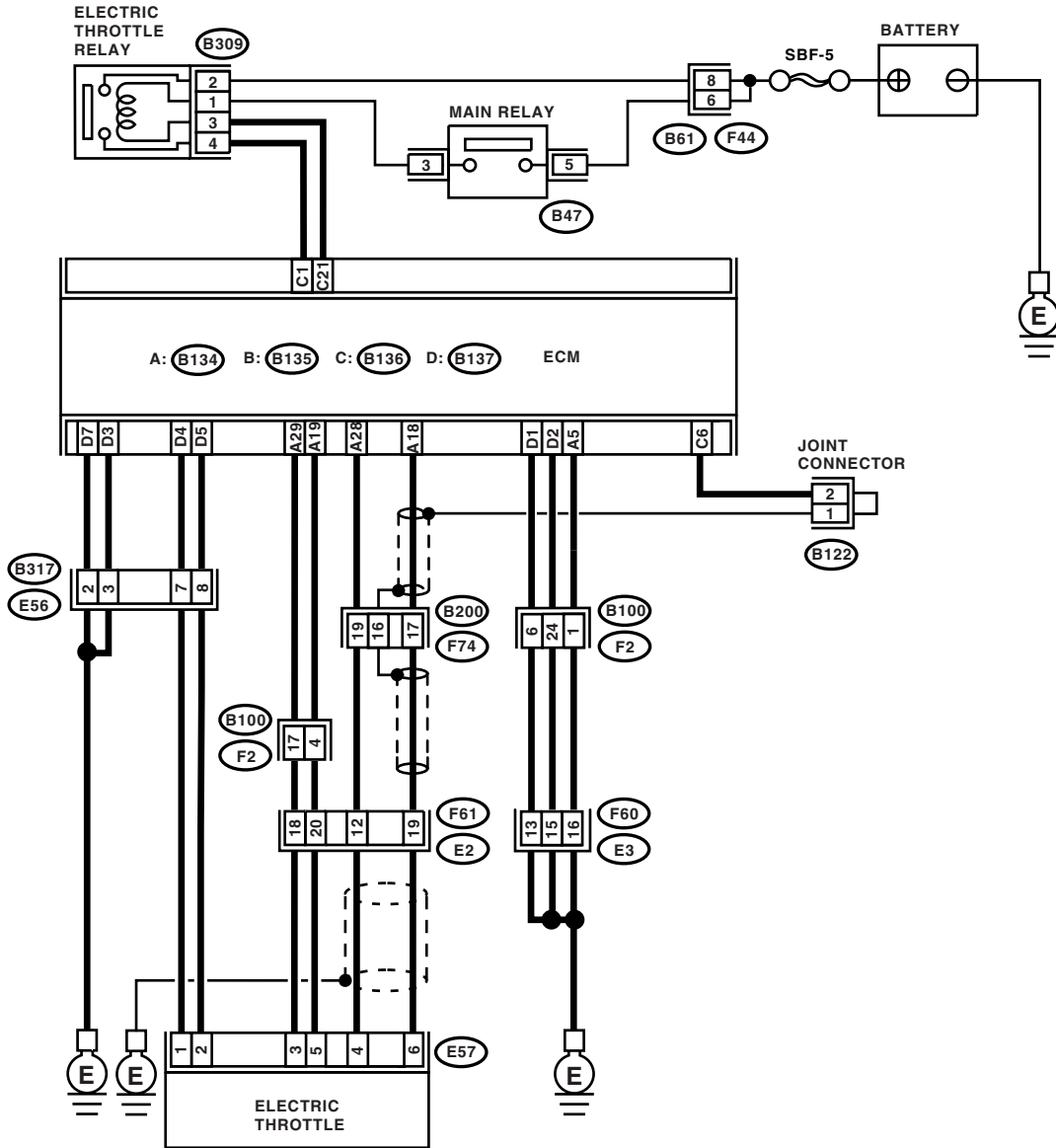
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04706

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <p><b>1</b></p> <p><b>CHECK SENSOR OUTPUT.</b><br/>                     1) Turn the ignition switch to ON.<br/>                     2) Measure the voltage between ECM connector and terminal.<br/> <i><b>Connector &amp; terminal</b></i><br/> <i><b>(B134) No. 28 (+) — (B134) No. 29 (-):</b></i><br/>                     3) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.</p>   | Is the voltage more than 0.4 V?   | Go to step 2.   | Go to step 3.  |
| <p><b>2</b></p> <p><b>CHECK POOR CONTACT.</b><br/>                     Check the poor contact in connector between ECM and electronic throttle control.</p>   | Is there poor contact in connector between ECM and electronic throttle control? | Repair the poor contact.  | Temporary poor contact occurred, but it is normal at present.  |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br/>                     1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM.<br/>                     3) Disconnect the connectors from the electronic throttle control control.<br/>                     4) Measure the resistance between ECM connector and electronic throttle control connector.<br/> <i><b>Connector &amp; terminal</b></i><br/> <i><b>(B134) No. 19 — (E57) No. 5:</b></i></p>                      | Is the resistance less than 1 $\Omega$ ?  | Go to step 4.   | Repair the open circuit of harness connector.  |
| <p><b>4</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br/>                     Measure the resistance between ECM connector and chassis ground.<br/> <i><b>Connector &amp; terminal</b></i><br/> <i><b>(B134) No. 18 — Chassis ground:</b></i><br/> <i><b>(B134) No. 19 — Chassis ground:</b></i></p>  | Is the resistance more than 1 M $\Omega$ ?                                      | Go to step 5.   | Repair the chassis short circuit of harness.   |
| <p><b>5</b></p> <p><b>CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL.</b><br/>                     1) Connect the ECM connector.<br/>                     2) Turn the ignition switch to ON.<br/>                     3) Measure the voltage between electronic throttle control connector and engine ground.<br/> <i><b>Connector &amp; terminal</b></i><br/> <i><b>(E57) No. 5 (+) — Engine ground (-):</b></i><br/>                     4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.</p> | Is the voltage 4.5 — 5.5 V?   | Go to step 6.   | Repair the poor contact in ECM connector.<br>Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |
| <p><b>6</b></p> <p><b>CHECK SHORT CIRCUIT INSIDE THE ECM.</b><br/>                     1) Turn the ignition switch to OFF.<br/>                     2) Measure the resistance between electronic throttle control control connector and engine ground.<br/> <i><b>Connector &amp; terminal</b></i><br/> <i><b>(E57) No. 6 — Engine ground:</b></i></p>  | Is the resistance more than 10 $\Omega$ ?                                       | Repair the poor contact of electronic throttle control connector. If problem persists, replace the electronic throttle control. <Ref. to FU(H4DOTC)-13, Throttle Body.> | Repair the poor contact in ECM connector.<br>Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **V: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT**

#### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-47, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Erroneous idling
- Engine stalls.
- Poor driving performance

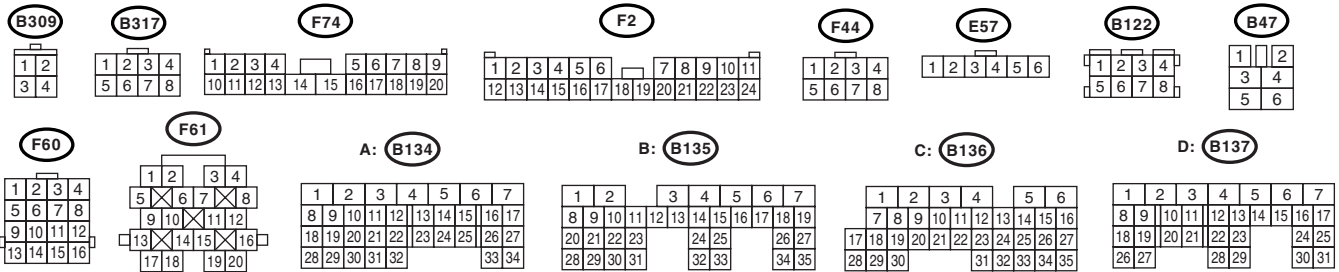
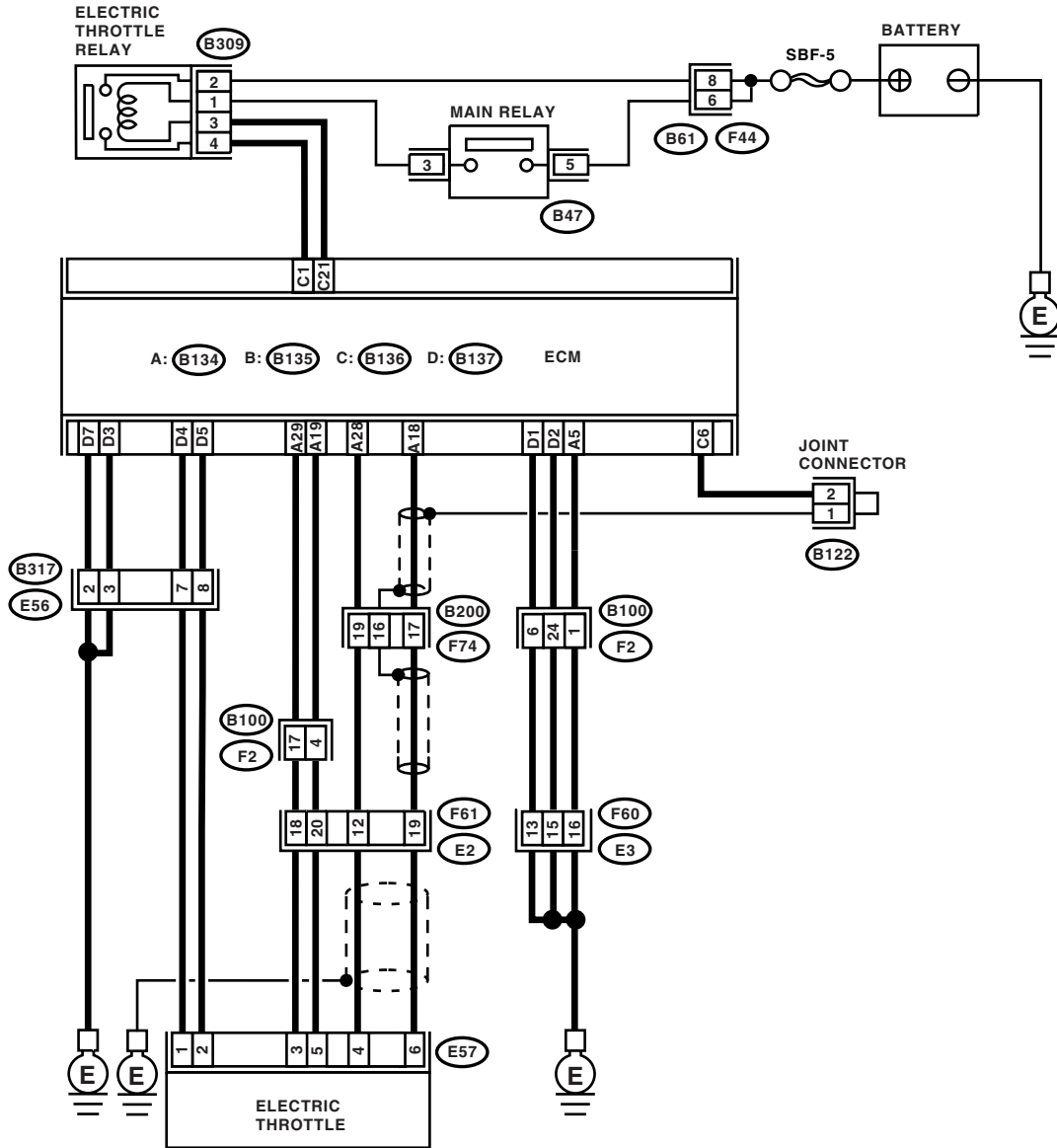
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04706



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No  |
|--|---|--|---|
| <b>1 CHECK SENSOR OUTPUT.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of main throttle sensor signal using Subaru Select Monitor.<br>3) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.   | Is the voltage less than 4.63 V?  | Go to step 2.  | Go to step 3.   |
| <b>2 CHECK POOR CONTACT.</b><br>Check the poor contact in connector between ECM and electronic throttle control.   | Is there poor contact in connector between ECM and electronic throttle control? | Repair the poor contact.   | Temporary poor contact occurred, but it is normal at present.   |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connectors from the electronic throttle control control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><b>Connector &amp; terminal</b><br>(B134) No. 18 — (E57) No. 6:<br>(B134) No. 29 — (E57) No. 3: | Is the resistance less than 1 $\Omega$ ?  | Go to step 4.  | Repair the open circuit of harness connector.   |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between electronic throttle control connector and engine ground.<br><b>Connector &amp; terminal</b><br>(E57) No. 3 — Engine ground:  | Is the resistance less than 5 $\Omega$ ?  | Go to step 5.  | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |
| <b>5 CHECK SENSOR OUTPUT POWER SUPPLY.</b><br>Measure the voltage between selectronic throttle control connector and engine ground.<br><b>Connector &amp; terminal</b><br>(E57) No. 6 (+) — Engine ground (-):   | Is the voltage more than 10 V?  | Replace the electronic throttle control. <Ref. to FU(H4DOTC)-13, Throttle Body.> | Repair battery short circuit in harness between ECM connector and electronic throttle control connector.                              |

## W: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-49, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

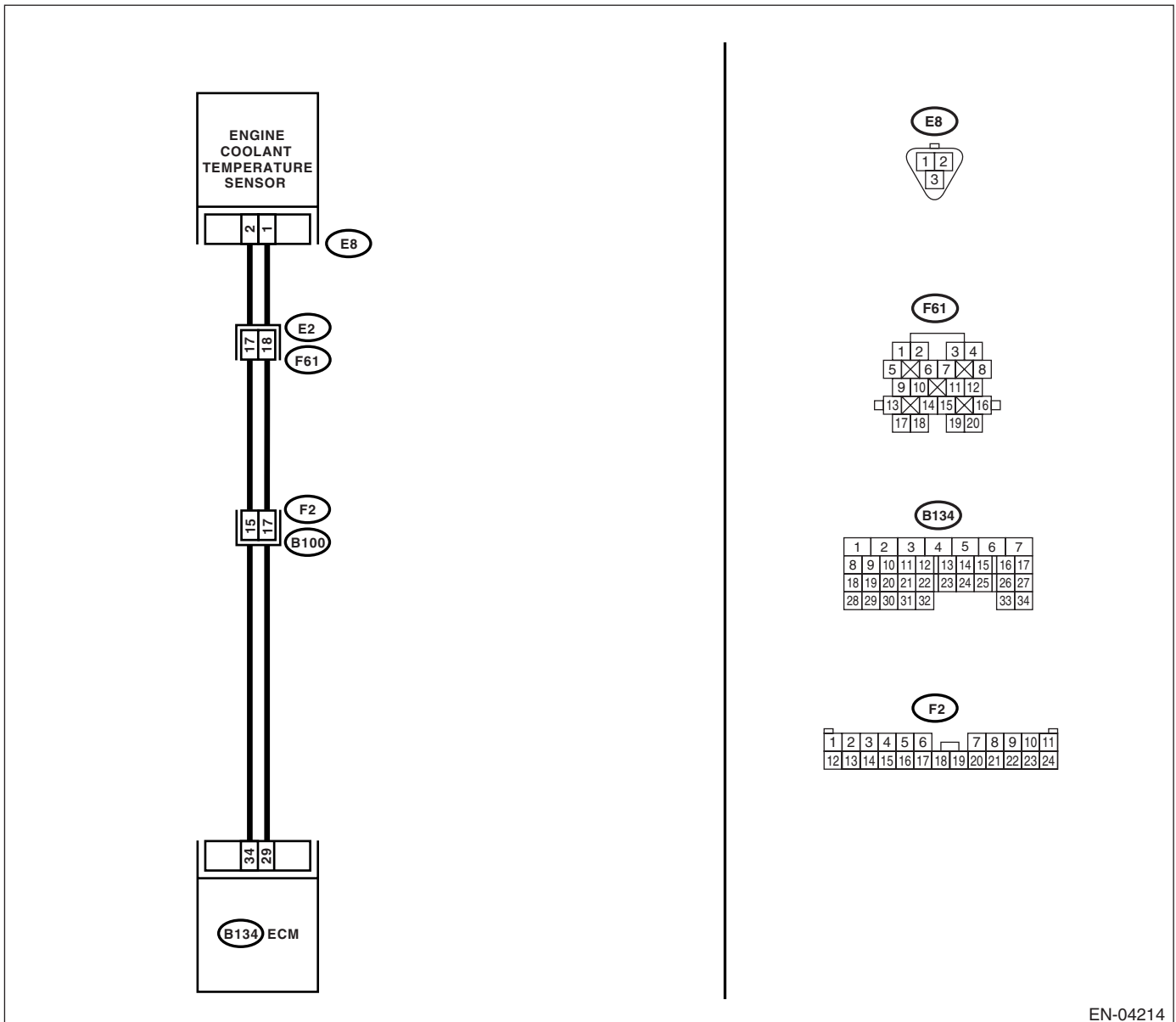
### TROUBLE SYMPTOM:

Engine will not return to idling.

### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

### WIRING DIAGRAM:



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check                                      | Yes   | No   |
|--|--|---|--|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?                | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0125. | Go to step 2.  |
| <b>2</b><br><b>CHECK ENGINE COOLING SYSTEM.</b><br><br>NOTE:<br>Check the following items. <ul style="list-style-type: none"> <li>• Thermostat open stuck</li> <li>• Coolant level</li> <li>• Coolant freeze</li> <li>• Tire diameter</li> </ul> | Is there a fault in engine cooling system? | Replace the thermostat. <Ref. to CO(H4DOTC)-21, Thermostat.>  | Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.> |

## X: DTC P0126 INSUFFICIENT COOLANT TEMPERATURE FOR STABLE OPERATION

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-51, DTC P0126 INSUFFICIENT COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

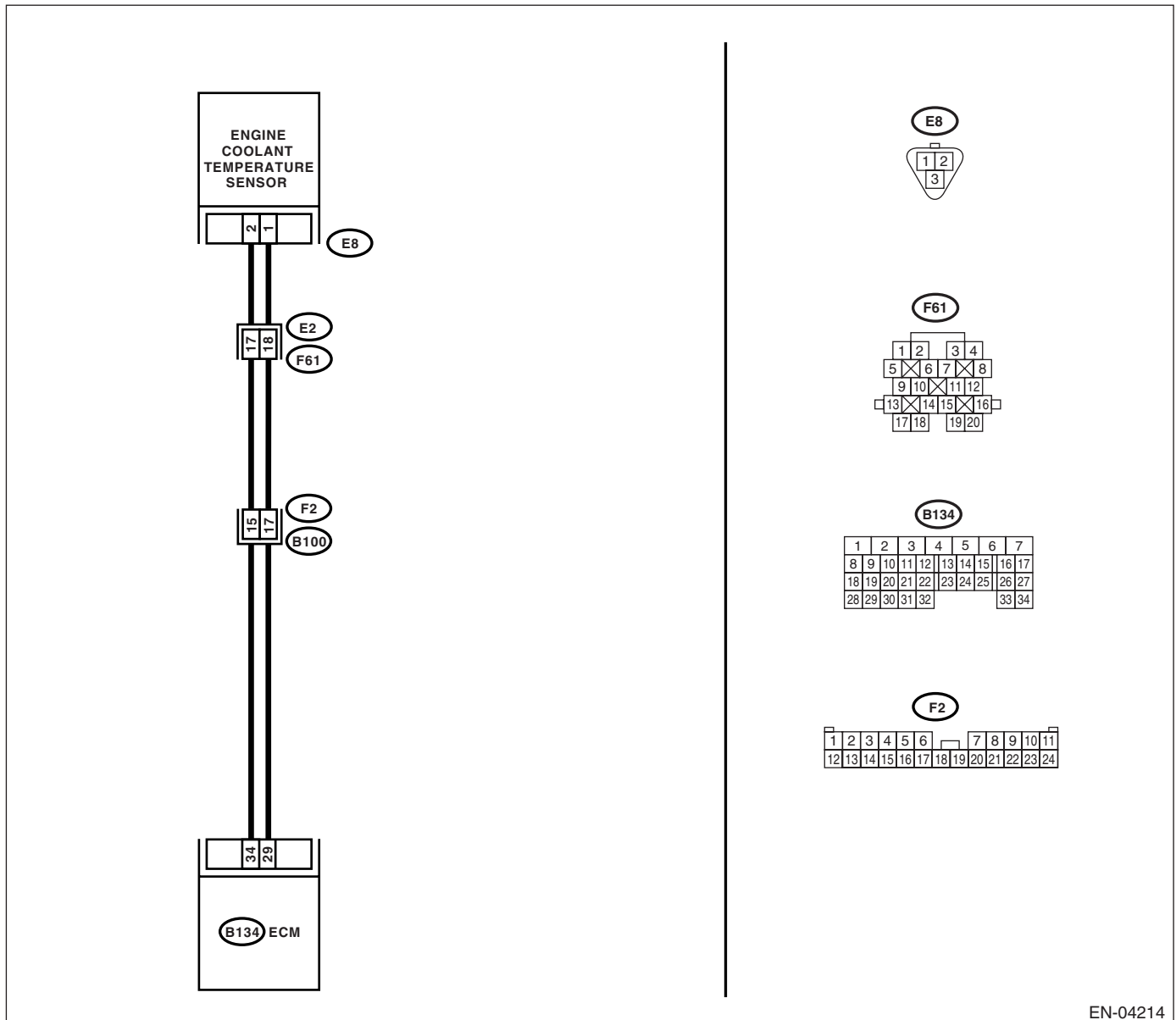
### TROUBLE SYMPTOM:

Engine would not return to idling.

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04214

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> | Go to step 2.  |
| <b>2</b><br><b>CHECK ENGINE COOLANT TEMPERATURE SENSOR.</b><br>Measure the resistance between engine coolant temperature sensor terminals when engine coolant is cold and after warmed-up.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b> | Is the resistance of engine coolant temperature sensor different between when engine coolant is cold and after warmed-up? | Contact your SOA Service Center since deterioration of some parts may be the cause.<br>NOTE:<br>Deterioration of some parts may be the cause. | Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## Y: DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-53, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

Thermostat remains open.

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

| Step | Check  | Yes   | No  |   |
|------|--|---|---|---|
| 1    | <b>CHECK VEHICLE CONDITION.</b>  | Was the vehicle driven or idled with the engine partially submerged under water?      | In this case, it is not necessary to inspect DTC P0128.   | Go to step 2.   |
| 2    | <b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Codes (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>      | Go to step 3.   |
| 3    | <b>CHECK ENGINE COOLANT.</b>   | Are coolant level and mixture ratio of cooling water to anti-freeze solution correct? | Go to step 4.   | Replace the engine coolant. <Ref. to CO(H4DOTC)-17, REPLACEMENT, Engine Coolant.> |
| 4    | <b>CHECK RADIATOR FAN.</b><br>1) Start the engine.<br>2) Check radiator fan operation. | Does the radiator fan continuously rotate for more than 3 minutes during idling?      | Repair radiator fan circuit. <Ref. to CO(H4DOTC)-28, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4DOTC)-30, Radiator Sub Fan and Fan Motor.> | Replace the thermostat. <Ref. to CO(H4DOTC)-21, Thermostat.>                      |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## Z: DTC P0131 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

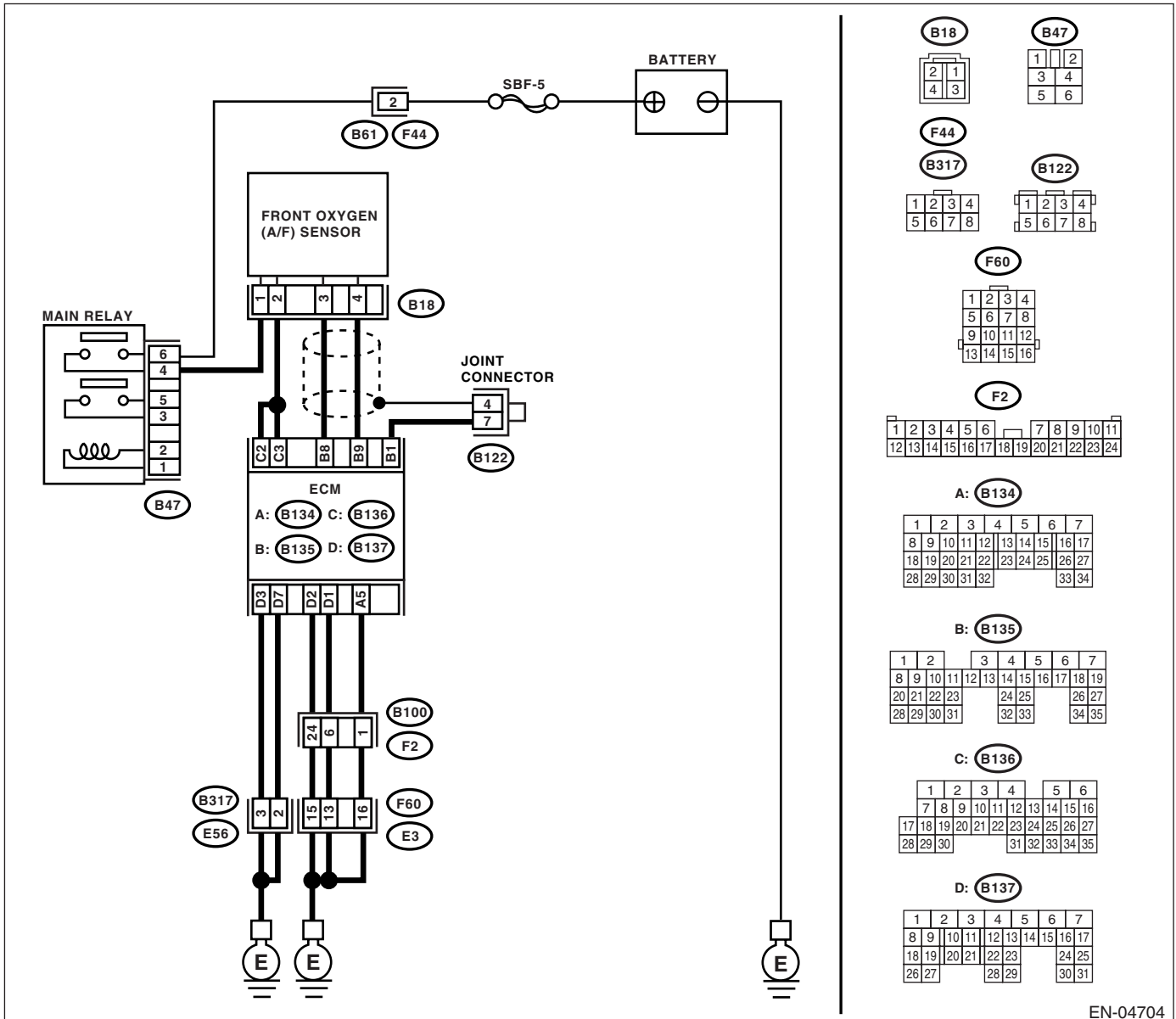
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-55, DTC P0131 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04704

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check  | Yes   | No  |
|------|--|---|---|
| 1    | <b>CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>   | Remove infiltrating water completely.   | Go to step 2.   |
| 2    | <b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Disconnect the connector from ECM and front oxygen (A/F) sensor connector.<br>2) Turn the ignition switch to OFF.<br>3) Measure the resistance of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 — Chassis ground:</b><br><b>(B135) No. 9 — Chassis ground:</b> | Is the resistance more than 1 MΩ?<br><br>Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.> | Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector. |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AA:DTC P0132 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

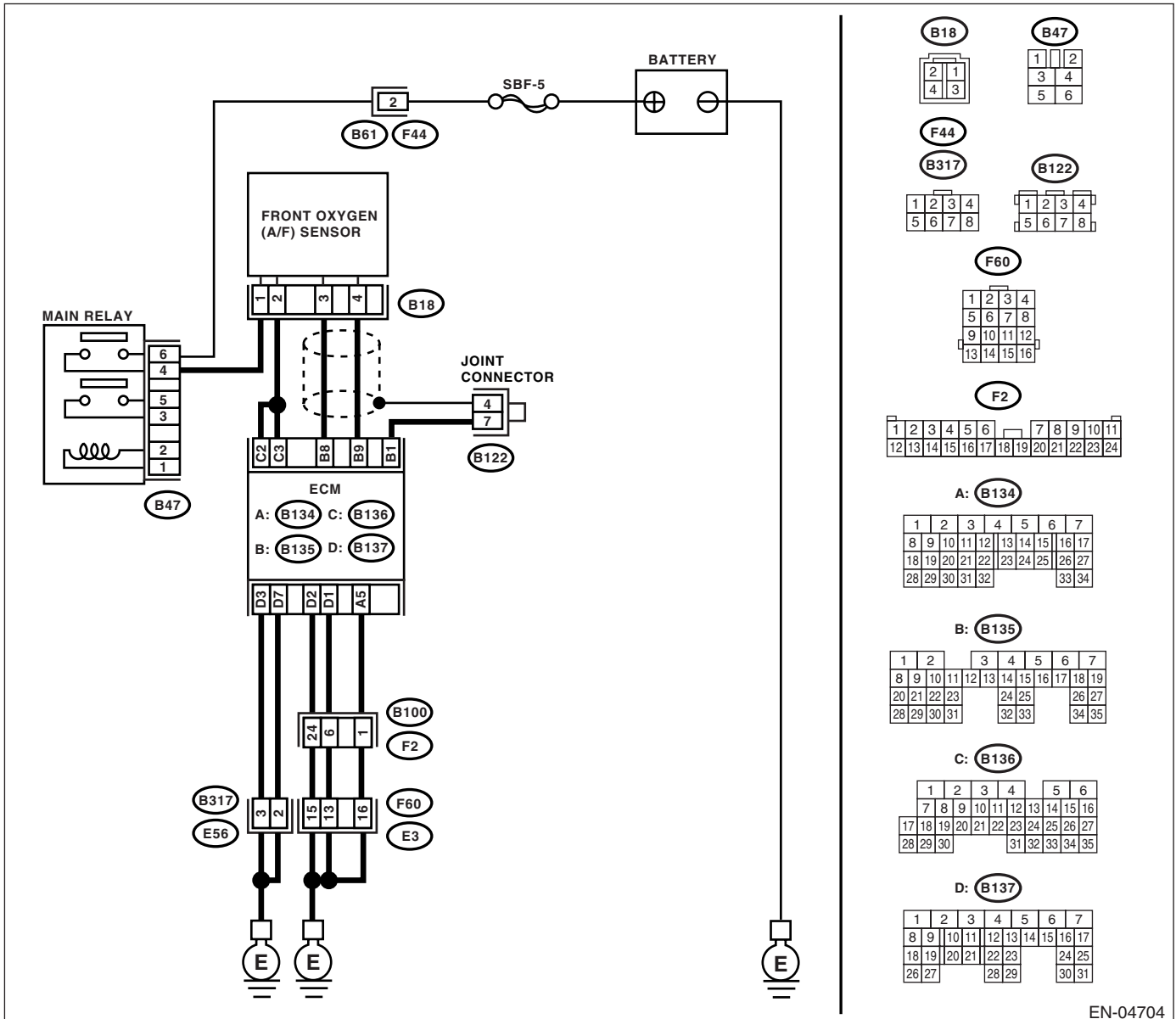
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-57, DTC P0132 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04704

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                         | Yes  | No   |
|--|-------------------------------|--|--|
| <b>1</b><br><b>CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>   | Is there water in connector?  | Remove infiltrating water completely.  | Go to step 2.  |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Disconnect the connector from front oxygen (A/F) sensor.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 (+) — Chassis ground (-):</b><br><b>(B135) No. 9 (+) — Chassis ground (-):</b> | Is the voltage more than 8 V? | Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AB:DTC P0133 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

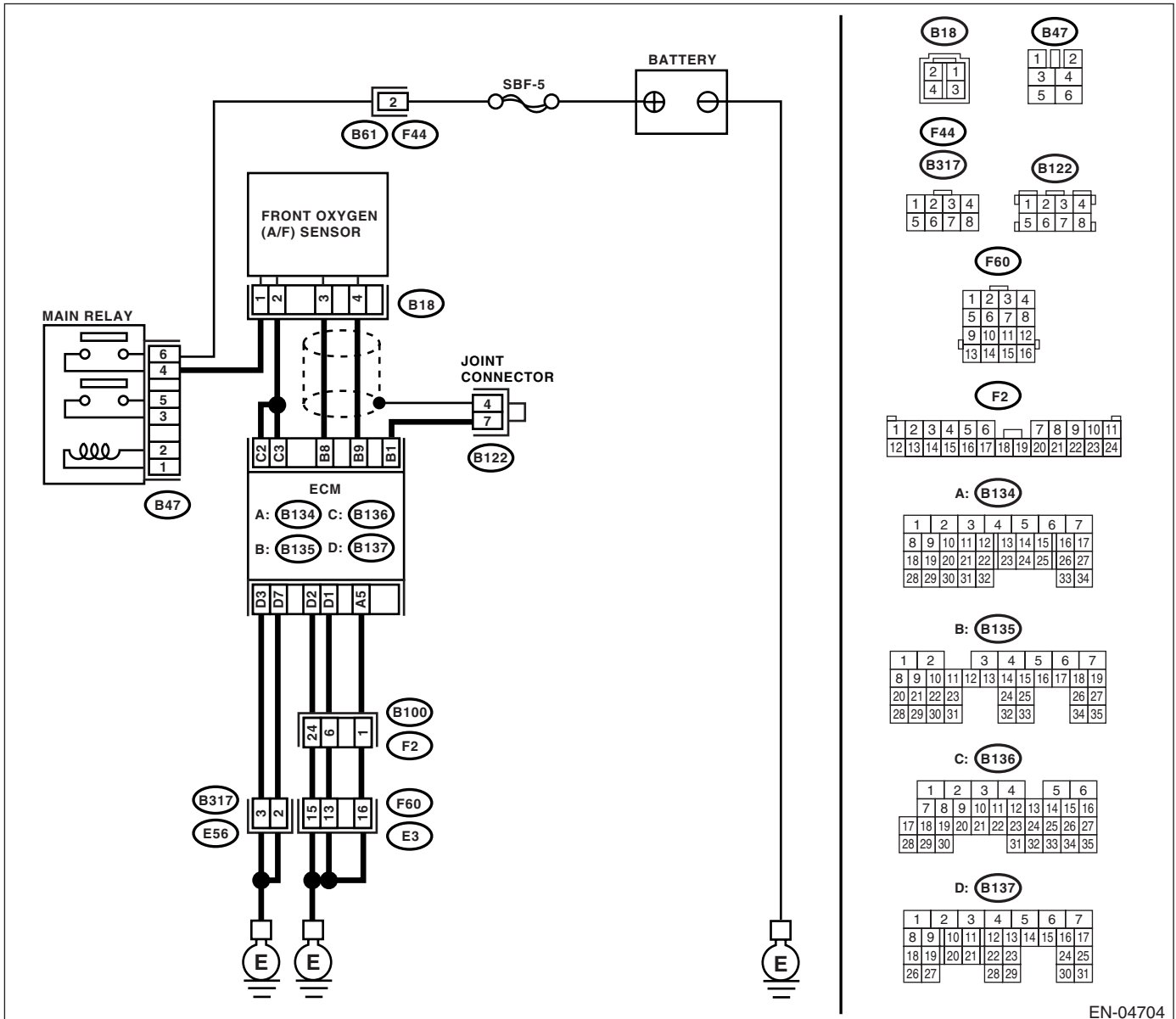
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-58, DTC P0133 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04704

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                               | Yes   | No   |
|--|-------------------------------------|---|--|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?         | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0133. | Go to step 2.  |
| <b>2</b><br><b>CHECK EXHAUST SYSTEM.</b><br><br>NOTE:<br>Check the following items. <ul style="list-style-type: none"><li>• Loose installation of front portion of exhaust pipe onto cylinder heads</li><li>• Loose connection between front exhaust pipe and front catalytic converter</li><li>• Damage of exhaust pipe resulting in a hole</li></ul> | Is there a fault in exhaust system? | Repair the exhaust system.  | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AC:DTC P0134 O<sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

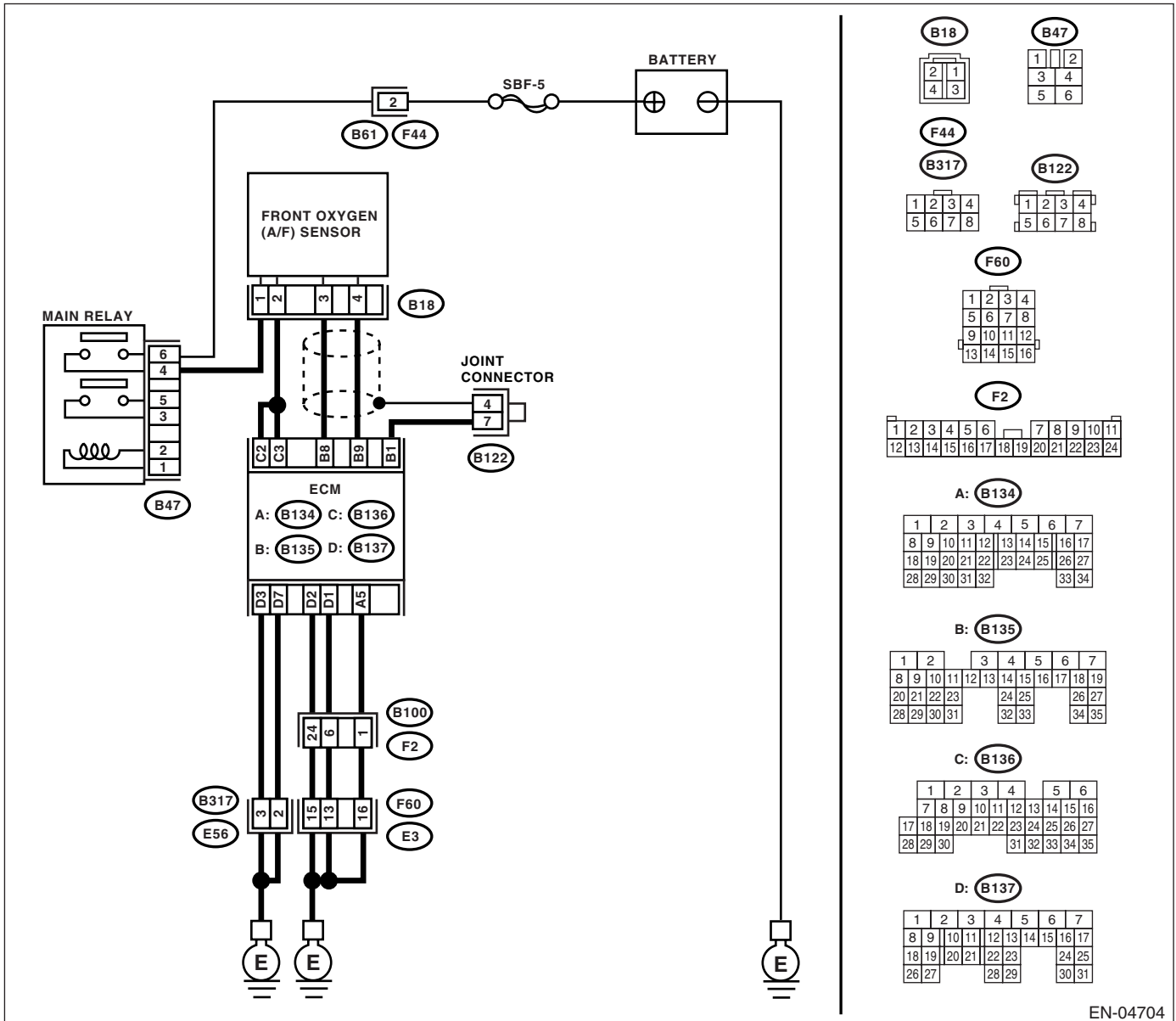
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-61, DTC P0134 O<sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04704

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br/>3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p><b>Connector &amp; terminal</b><br/><b>(B135) No. 8 — (B18) No. 3:</b><br/><b>(B135) No. 9 — (B18) No. 4:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p> | <p>Replace the front oxygen (A/F) sensor. &lt;Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.&gt;</p> | <p>Repair the open circuit in harness between ECM and front oxygen (A/F) sensor.</p> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AD:DTC P0137 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

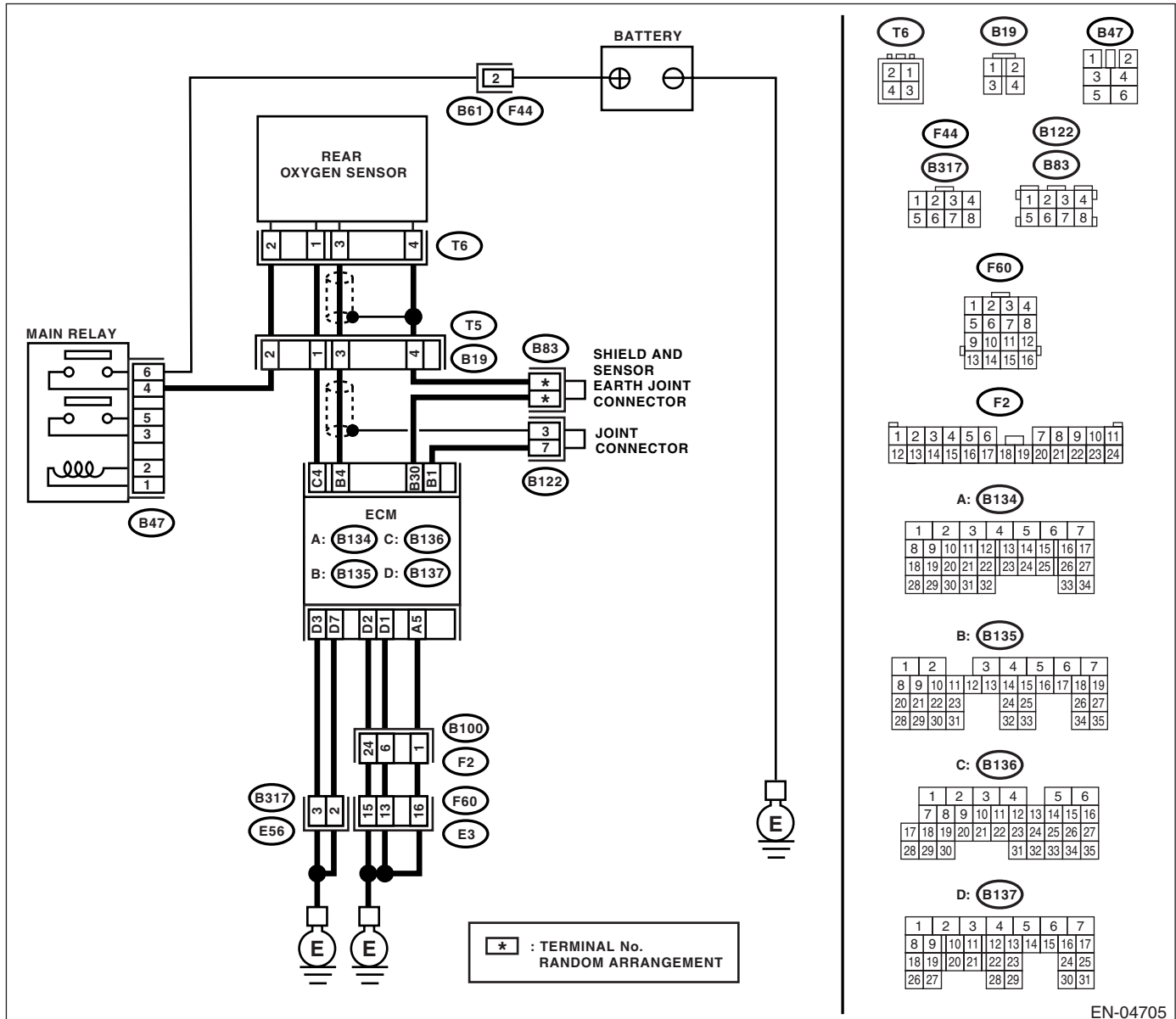
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-62, DTC P0137 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04705

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check  | Yes   | No            |
|------|--|---|---------------|
| 1    | <b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0137. | Go to step 2. |
| 2    | <b>CHECK REAR OXYGEN SENSOR DATA.</b><br>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest)<br>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• For MT model, depress the clutch pedal.<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Go to step 6.   | Go to step 3. |
| 3    | <b>CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>  | Remove infiltrating water completely.   | Go to step 4. |
| 4    | <b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and rear oxygen sensor.<br>3) Measure the resistance of harness between ECM and rear oxygen sensor connector.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 4 — (T6) No. 3:</b><br><b>(B135) No. 30 — (T6) No. 4:</b>   | Is the resistance more than 3 Ω?<br><br>Repair the open circuit in harness between ECM and rear oxygen sensor connector.  | Go to step 5. |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                      | Yes  | No  |
|--|--|--|---|
| <p><b>5</b></p> <p><b>CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from rear oxygen sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T6) No. 3 (+) — Chassis ground (-):</b></p> | <p>Is the voltage 0.2 — 0.5 V?</p>         | <p>Replace the rear oxygen sensor.<br/>                     &lt;Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.&gt;</p> | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in ECM connector</li> </ul> |
| <p><b>6</b></p> <p><b>CHECK EXHAUST SYSTEM.</b><br/>                     Check the exhaust system parts.</p> <p><b>NOTE:</b><br/>                     Check the following items.</p> <ul style="list-style-type: none"> <li>• Looseness and incomplete installation of exhaust system parts</li> <li>• Damage (crack, hole etc.) of parts</li> <li>• Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor</li> </ul>  | <p>Is there a fault in exhaust system?</p> | <p>Repair or replace the faulty parts.</p>   | <p>Replace the rear oxygen sensor.<br/>                     &lt;Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.&gt;</p>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AE:DTC P0138 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

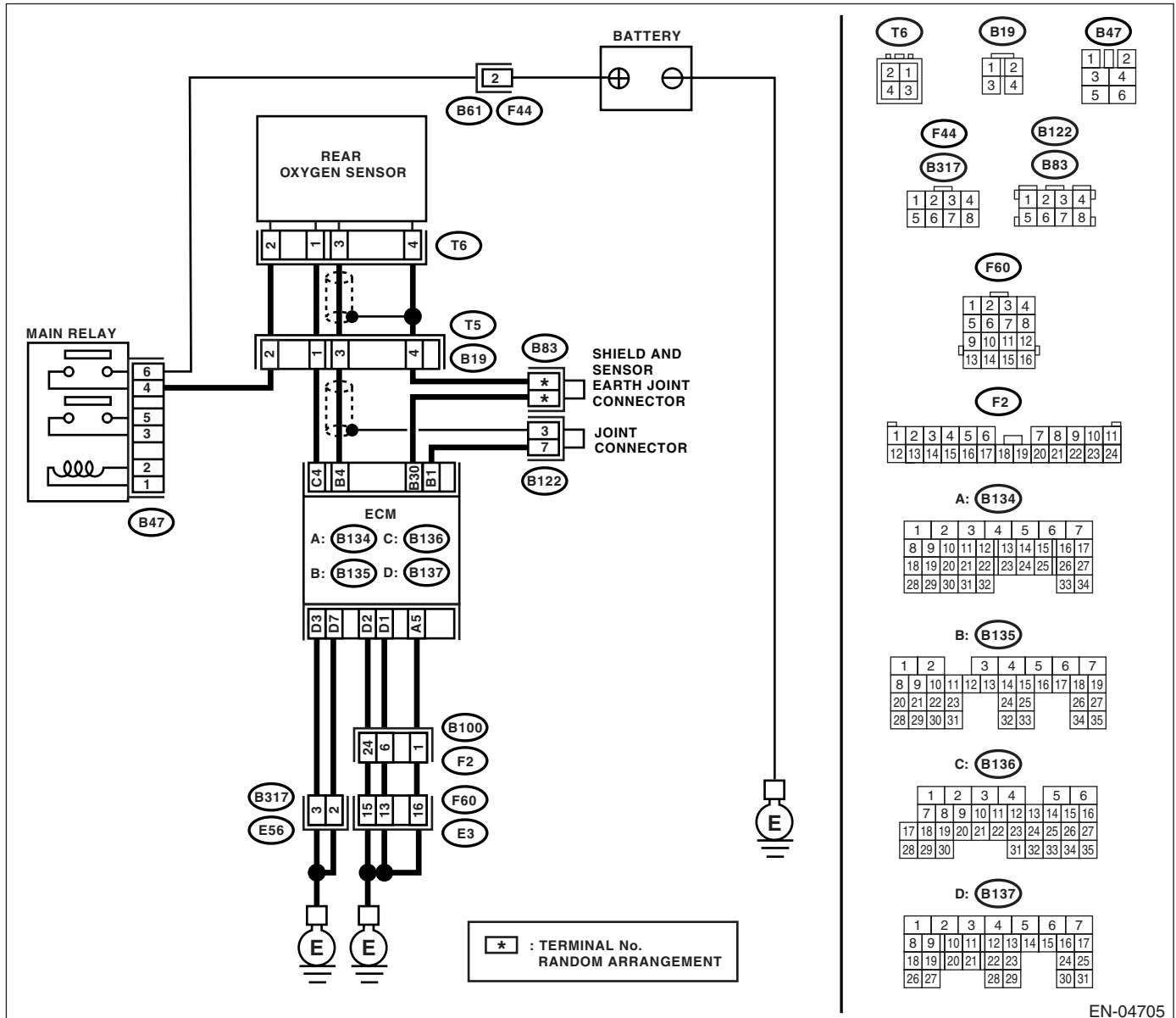
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-64, DTC P0138 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04705

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                            | Yes   | No            |
|--|----------------------------------|---|---------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?      | Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0138. | Go to step 2. |
| <b>2</b><br><b>CHECK REAR OXYGEN SENSOR DATA.</b><br>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and quickly lower the engine speed from 3,000 rpm.<br>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• For MT model, depress the clutch pedal.<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the voltage less than 250 mV? | Go to step 6.   | Go to step 3. |
| <b>3</b><br><b>CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>  | Is there water in connector?     | Remove infiltrating water completely.   | Go to step 4. |
| <b>4</b><br><b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and rear oxygen sensor.<br>3) Measure the resistance of harness between ECM and rear oxygen sensor connector.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 4 — (T6) No. 3:</b><br><b>(B135) No. 30 — (T6) No. 4:</b>   | Is the resistance more than 3 Ω? | Repair the open circuit in harness between ECM and rear oxygen sensor connector.  | Go to step 5. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                      | Yes  | No  |
|--|--|--|---|
| <p><b>5</b></p> <p><b>CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from rear oxygen sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T6) No. 3 (+) — Chassis ground (-):</b></p> | <p>Is the voltage 0.2 — 0.5 V?</p>         | <p>Replace the rear oxygen sensor.<br/>                     &lt;Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.&gt;</p> | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in ECM connector</li> </ul> |
| <p><b>6</b></p> <p><b>CHECK EXHAUST SYSTEM.</b></p> <p>Check the exhaust system parts.</p> <p><b>NOTE:</b><br/>                     Check the following items.</p> <ul style="list-style-type: none"> <li>• Looseness and incomplete installation of exhaust system parts</li> <li>• Damage (crack, hole etc.) of parts</li> <li>• Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor</li> </ul>  | <p>Is there a fault in exhaust system?</p> | <p>Repair or replace the faulty parts.</p>   | <p>Replace the rear oxygen sensor.<br/>                     &lt;Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.&gt;</p>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AF:DTC P0139 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

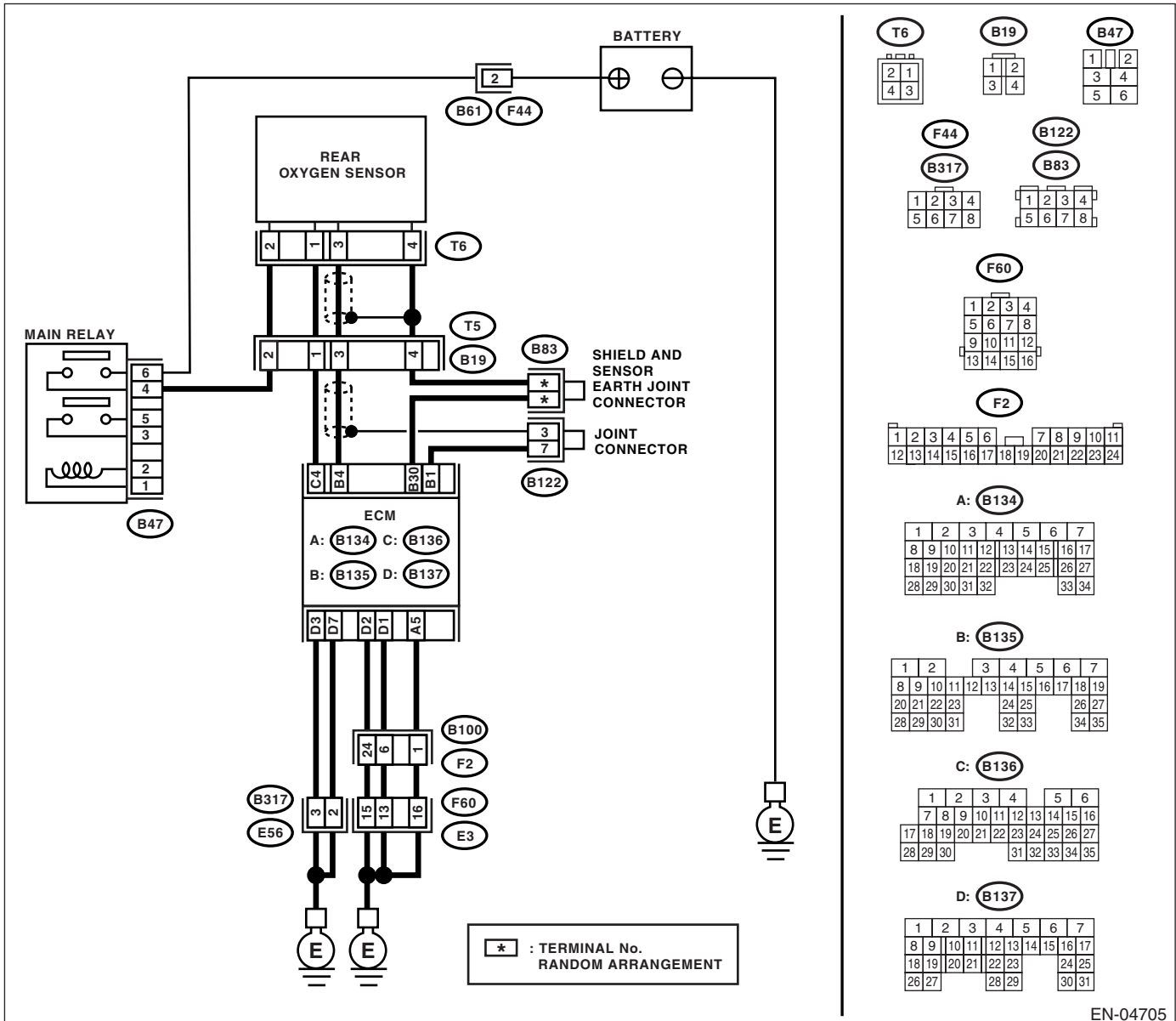
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-65, DTC P0139 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04705

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes   | No   |
|---|--|---|--|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?                | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0139. | Go to step 2.  |
| <b>2</b><br><b>CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and rear oxygen sensor.<br>3) Measure the resistance of harness between ECM and rear oxygen sensor.<br><br><i>Connector &amp; terminal</i><br><i>(T6) No. 3 — (B135) No. 4:</i> | Is the resistance less than 1 $\Omega$ ?   | Go to step 3.   | Repair open circuit in harness between rear oxygen sensor and ECM.         |
| <b>3</b><br><b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.</b><br>Measure the resistance between ECM connector and chassis ground.<br><br><i>Connector &amp; terminal</i><br><i>(T6) No. 3 — Chassis ground:</i>  | Is the resistance more than 1 M $\Omega$ ? | Go to step 4.   | Repair ground short circuit in harness between rear oxygen sensor and ECM. |
| <b>4</b><br><b>CHECK REAR OXYGEN SENSOR.</b><br>Measure the resistance between rear oxygen sensor terminals.<br><br><i>Terminals</i><br><i>No. 3 — No. 4:</i>   | Is the resistance less than 1 $\Omega$ ?   | Replace the rear oxygen sensor.<br><Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.>   | Temporary poor contact occurs.<br>Check poor contact in connector.         |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AG:DTC P0140 O<sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2)

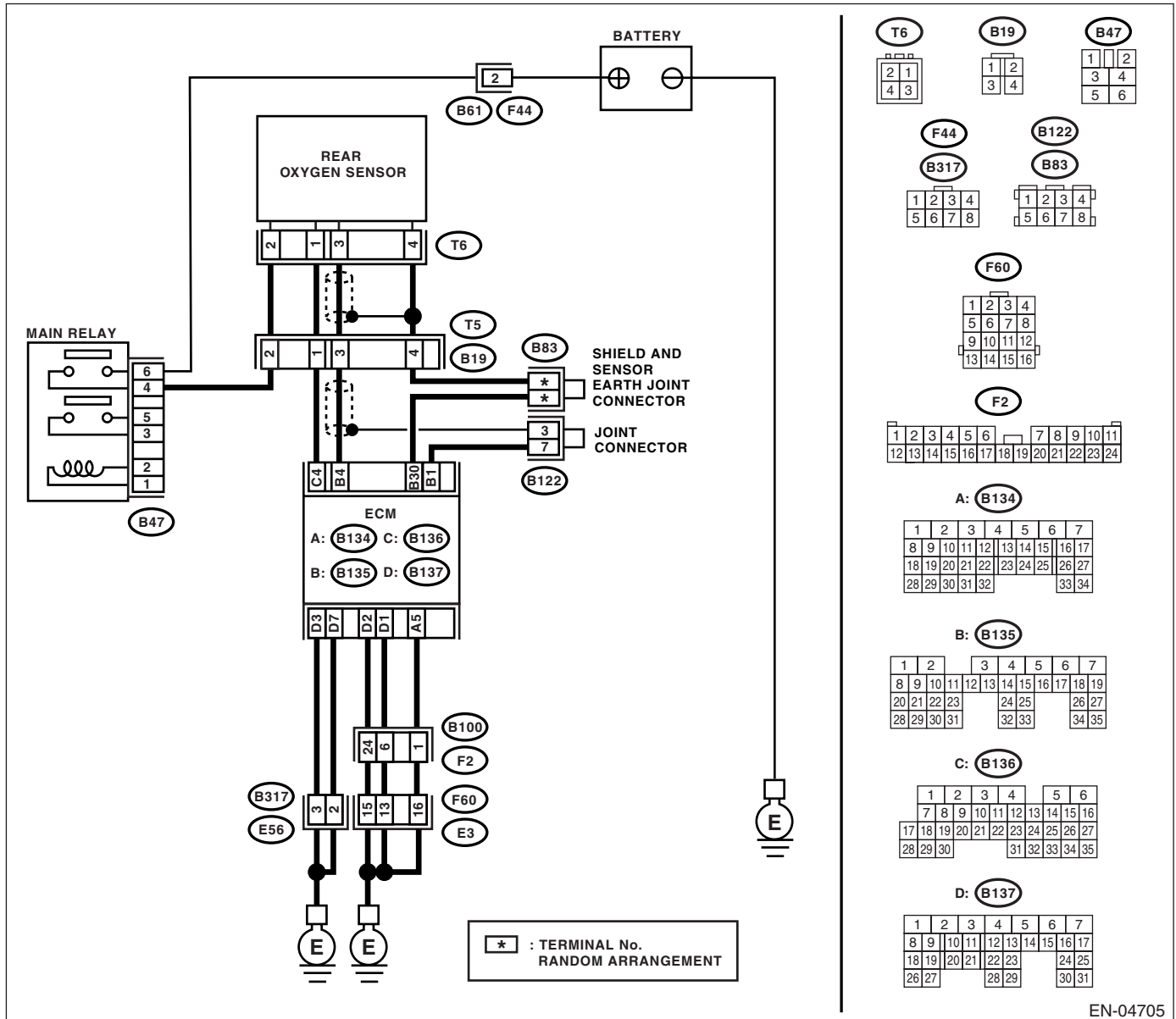
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-71, DTC P0140 O<sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04705

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                            | Yes   | No            |
|---|----------------------------------|---|---------------|
| <b>1</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?      | Using the List of "Diagnostic Trouble Code (DTC)", check the appropriate DTC. <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0140. | Go to step 2. |
| <b>2</b><br><b>CHECK REAR OXYGEN SENSOR DATA.</b><br>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest)<br>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• For MT model, depress the clutch pedal.<br>• Subaru Select Monitor<br>For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedure, refer to the General Scan Tool Instruction Manual. | Is the voltage more than 490 mV? | Go to step 7.   | Go to step 3. |
| <b>3</b><br><b>CHECK REAR OXYGEN SENSOR DATA.</b><br>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed from 3,000 rpm.<br>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• For MT model, depress the clutch pedal.<br>• Subaru Select Monitor<br>For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedure, refer to the General Scan Tool Instruction Manual.          | Is the voltage less than 250 mV? | Go to step 7.   | Go to step 4. |
| <b>4</b><br><b>CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>   | Is there water in connector?     | Remove infiltrating water completely.   | Go to step 5. |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <p><b>5 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connectors from ECM and rear oxygen sensor.<br/>                     3) Measure the resistance of harness between ECM and rear oxygen sensor connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B135) No. 4 — (T6) No. 3:</b><br/> <b>(B135) No. 30 — (T6) No. 4:</b></p>                               | <p>Is the resistance more than 3 Ω?</p>      | <p>Repair the open circuit in harness between ECM and rear oxygen sensor connector.</p>                            | <p>Go to step 6.</p>  |
| <p><b>6 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from the rear oxygen sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between rear oxygen sensor harness connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T6) No. 3 (+) — Chassis ground (-):</b></p> | <p>Is the voltage 0.2 — 0.5 V?</p>           | <p>Replace the rear oxygen sensor.<br/>                     &lt;Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.&gt;</p> | <p>Repair harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in ECM connector</li> </ul> |
| <p><b>7 CHECK EXHAUST SYSTEM.</b></p> <p>Check the exhaust system parts.</p> <p><b>NOTE:</b><br/>                     Check the following items:</p> <ul style="list-style-type: none"> <li>• Looseness and incomplete installation of exhaust system parts</li> <li>• Damage (crack, hole etc.) of parts</li> <li>• Looseness and incomplete installation of parts between front oxygen (A/F) sensor and rear oxygen sensor</li> </ul>                                       | <p>Is there any fault in exhaust system?</p> | <p>Repair or replace faulty parts.</p>   | <p>Replace the rear oxygen sensor.<br/>                     &lt;Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.&gt;</p>  |

## AH:DTC P0171 SYSTEM TOO LEAN (BANK 1)

**NOTE:**

For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(H4DOTC)(diag)-153, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AI: DTC P0172 SYSTEM TOO RICH (BANK 1)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-74, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

| Step | Check  | Yes  | No  |
|------|--|--|---|
| 1    | <b>CHECK EXHAUST SYSTEM.</b>   | Are there holes or loose bolts on exhaust system?                                    | Repair the exhaust system.<br>Go to step 2.   |
| 2    | <b>CHECK AIR INTAKE SYSTEM.</b>  | Are there holes, loose bolts or disconnection of hose on air intake system?          | Repair the air intake system.<br>Go to step 3.  |
| 3    | <b>CHECK FUEL PRESSURE.</b><br><b>Warning:</b><br><ul style="list-style-type: none"> <li>• Place “NO FIRE” signs near the working area.</li> <li>• Be careful not to spill fuel on the floor.</li> </ul> Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-28, INSPECTION, Fuel Pressure.><br><b>Warning:</b><br>Before removing the fuel pressure gauge, release fuel pressure.<br>NOTE:<br>If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. | Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm <sup>2</sup> , 41 — 46 psi)?   | Go to step 4.<br><br>Repair the following items.<br>Fuel pressure too high:<br><ul style="list-style-type: none"> <li>• Clogged fuel return line or bent hose</li> </ul> Fuel pressure too low:<br><ul style="list-style-type: none"> <li>• Improper fuel pump discharge</li> <li>• Clogged fuel supply line</li> </ul>   |
| 4    | <b>CHECK FUEL PRESSURE.</b><br>After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-28, INSPECTION, Fuel Pressure.><br><b>Warning:</b><br>Before removing the fuel pressure gauge, release fuel pressure.<br>NOTE:<br><ul style="list-style-type: none"> <li>• If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.</li> <li>• If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.</li> </ul>     | Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm <sup>2</sup> , 33 — 38 psi)? | Go to step 5.<br><br>Repair the following items.<br>Fuel pressure too high:<br><ul style="list-style-type: none"> <li>• Faulty pressure regulator</li> <li>• Clogged fuel return line or bent hose</li> </ul> Fuel pressure too low:<br><ul style="list-style-type: none"> <li>• Faulty pressure regulator</li> <li>• Improper fuel pump discharge</li> <li>• Clogged fuel supply line</li> </ul> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <p><b>5 CHECK ENGINE COOLANT TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up completely.<br/>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor<br/>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</li> <li>• General scan tool<br/>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</li> </ul>   | <p>Is the temperature more than 60°C (140°F)?</p>   | <p>Go to step 6.</p>  | <p>Replace the engine coolant temperature sensor. &lt;Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.&gt;</p>                             |
| <p><b>6 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).<br/>2) Place the shift lever in neutral position.<br/>3) Turn the A/C switch to OFF.<br/>4) Turn all accessory switches to OFF.<br/>5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor<br/>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</li> <li>• General scan tool<br/>For detailed operation procedure, refer to the General Scan Tool Instruction Manual.</li> </ul>  | <p>Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)?</p>  | <p>Go to step 7.</p>  | <p>Replace the mass air flow and intake air temperature sensor. &lt;Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p> |
| <p><b>7 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).<br/>2) Place the shift lever in neutral position.<br/>3) Turn the A/C switch to OFF.<br/>4) Turn all accessory switches to OFF.<br/>5) Open the front hood.<br/>6) Measure the ambient temperature.<br/>7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor<br/>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</li> <li>• General scan tool<br/>For detailed operation procedure, refer to the General Scan Tool Instruction Manual.</li> </ul> | <p>Subtract ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?</p> | <p>Replace the ECM. &lt;Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).&gt;</p> | <p>Check the mass air flow and intake air temperature sensor. &lt;Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p>   |

## AJ:DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE

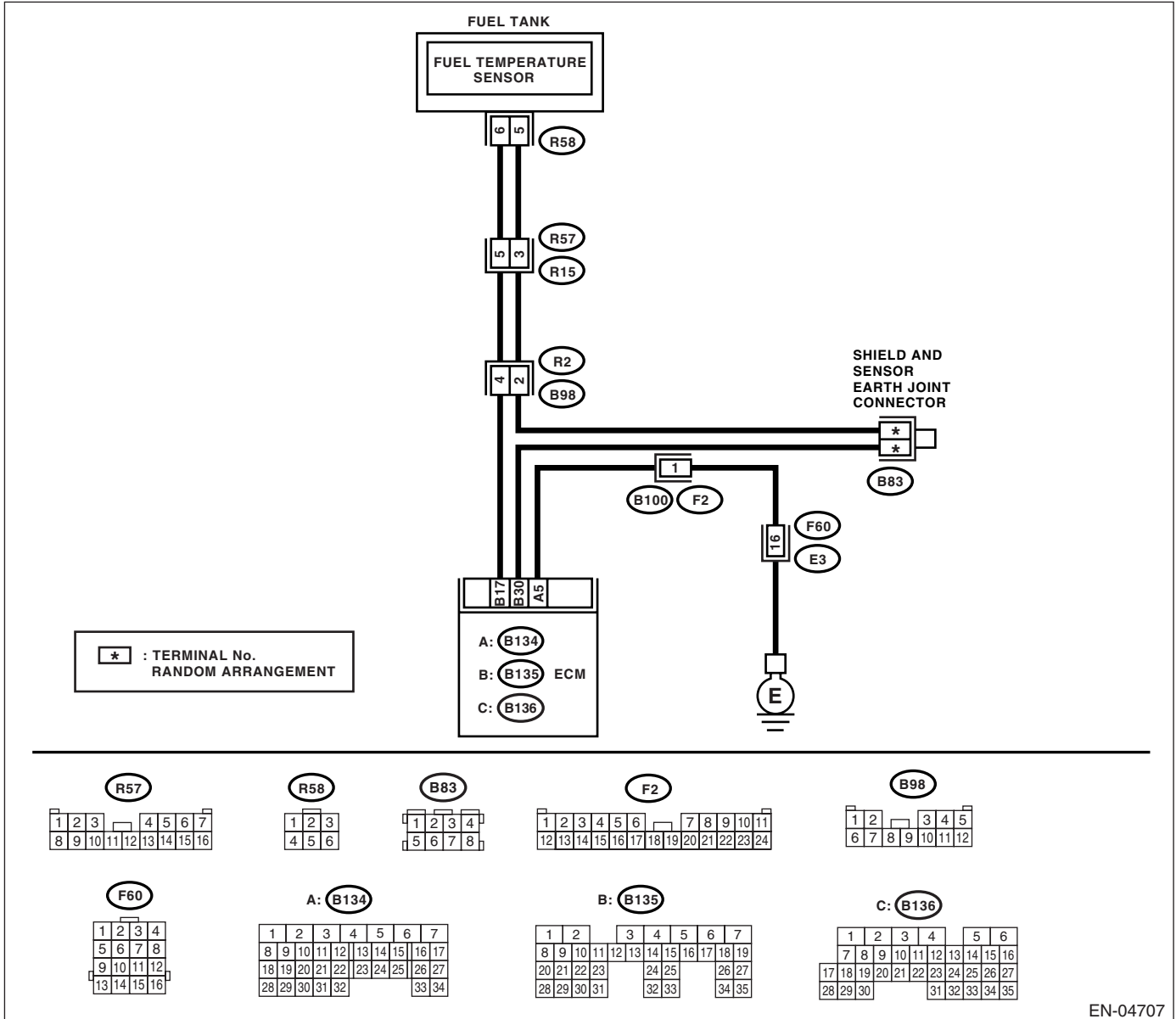
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-77, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                       | Yes  | No   |
|---|-----------------------------|--|--|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Codes (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0181. | Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-13, Fuel Temperature Sensor.> |

## AK:DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT

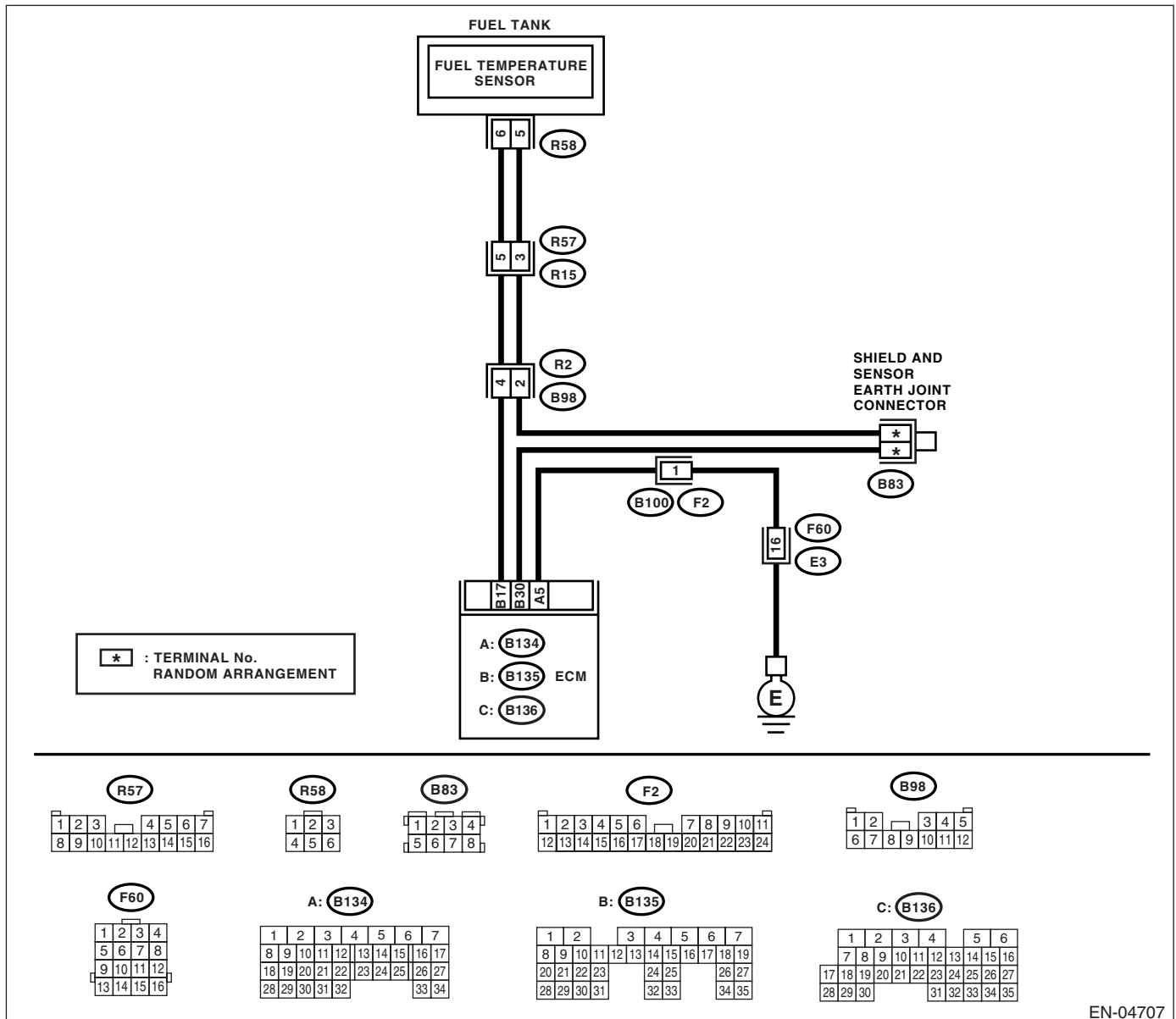
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-80, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04707

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <p><b>1</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Start the engine.<br/>2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p>  | <p>Is the temperature more than 150°C (302°F)?</p> | <p>Go to step 2.</p>  | <p>The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.</p> |
| <p><b>2</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Turn ignition switch to OFF.<br/>2) Remove the access hole lid.<br/>3) Disconnect the connector from fuel pump.<br/>4) Turn ignition switch to ON.<br/>5) Read the data of fuel temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the temperature less than -40°C (-40°F)?</p> | <p>Replace the fuel temperature sensor. &lt;Ref. to EC(H4DOTC)-13, Fuel Temperature Sensor.&gt;</p> | <p>Repair short circuit to ground in harness between fuel pump and ECM connector.</p>                                     |

## AL:DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT

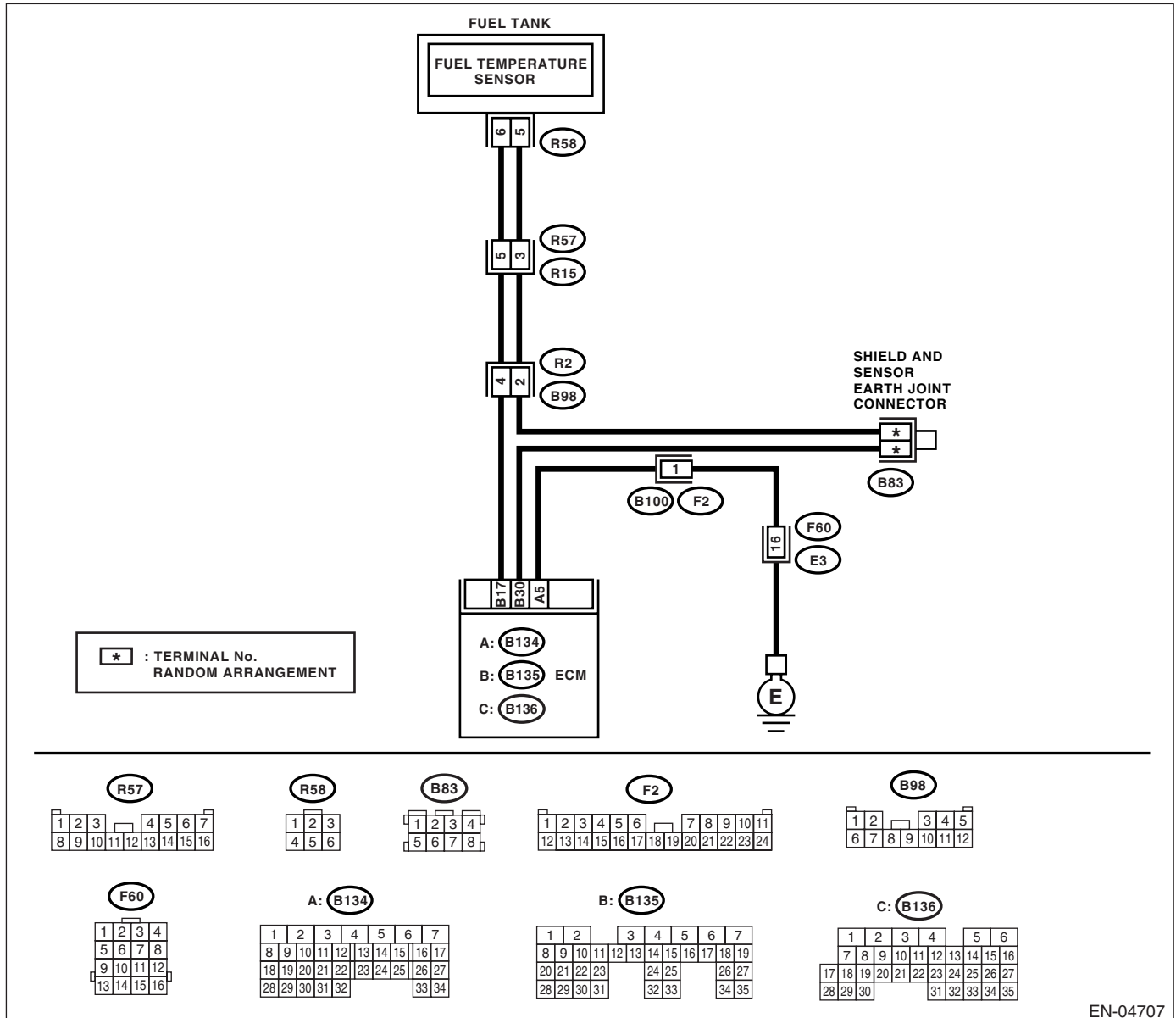
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-82, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04707



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check                                       | Yes   | No  |
|--|---|---|---|
| <b>1 CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the temperature less than –40°C (–40°F)? | Go to step 2.   | Repair poor contact.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Poor contact in fuel pump connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector<br>• Poor contact in joint connector                                      |
| <b>2 CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Remove the access hole lid.<br>3) Disconnect the connector from fuel pump.<br>4) Measure the voltage between fuel pump connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(R58) No. 6 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?              | Repair short circuit to battery in harness between ECM and fuel pump connector. | Go to step 3.   |
| <b>3 CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between fuel pump connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(R58) No. 6 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?              | Repair short circuit to battery in harness between ECM and fuel pump connector. | Go to step 4.   |
| <b>4 CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>Measure the voltage between fuel pump connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(R58) No. 6 (+) — Chassis ground (-):</b>  | Is the voltage more than 4 V?               | Go to step 5.   | Repair harness and connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM and fuel pump connector<br>• Poor contact in fuel pump connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <p><b>5</b></p> <p><b>CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM.<br/>                     3) Measure the resistance of harness between fuel pump connector and ECM.</p> <p><b>Connector &amp; terminal</b><br/> <b>(R58) No. 5 — (B135) No. 30:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p> | <p>Replace the fuel temperature sensor. &lt;Ref. to EC(H4DOTC)-13, Fuel Temperature Sensor.&gt;</p> | <p>Repair harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and fuel pump connector</li> <li>• Poor contact in fuel pump connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **AM:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW**

#### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-84, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance
- Engine stalls.

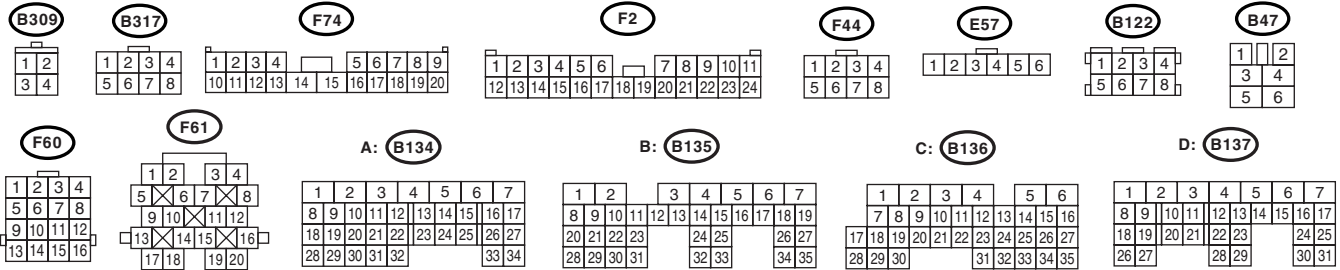
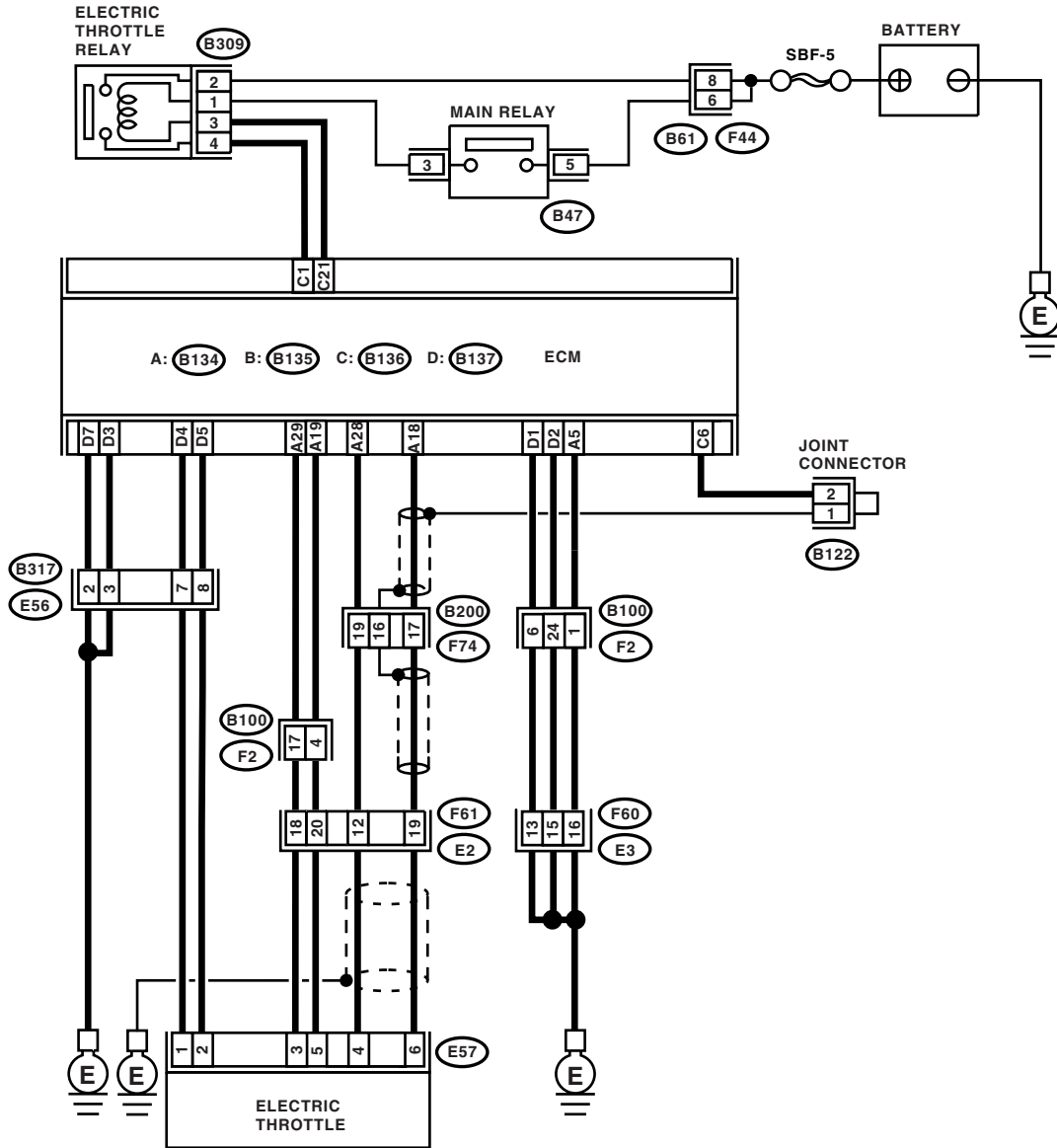
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04706

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <p><b>1</b></p> <p><b>CHECK OUTPUT VOLTAGE OF SENSOR.</b><br/>                     1) Turn the ignition switch to ON.<br/>                     2) Measure the voltage between ECM connector terminals.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B134) No. 28 (+) — (B134) No. 29 (-):</b></p> <p>3) Shake the ECM harness and connector, engine harness connectors (E84, E22), electronic throttle control connector harness while monitoring value of voltage meter.</p>                                    | Is the voltage more than 0.8 V?  | Go to step 2.   | Go to step 3.  |
| <p><b>2</b></p> <p><b>CHECK POOR CONTACT IN CONNECTORS.</b><br/>                     Check poor contact in the connectors between the ECM and electronic throttle control.</p>  | Is there poor contact in the connectors between ECM and electronic throttle control? | Repair the poor contact in connectors.  | Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.                 |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br/>                     1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM.<br/>                     3) Disconnect the connector from electronic throttle control.<br/>                     4) Measure the resistance between the ECM connector and electronic throttle control connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B134) No. 19 — (E57) No. 5:</b></p> | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.   | Repair the open circuit of harness connector.  |
| <p><b>4</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br/>                     Check the resistance between the ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B134) No. 19 — Chassis ground:</b><br/> <b>(B134) No. 28 — Chassis ground:</b></p>   | Is the resistance more than 1 M $\Omega$ ?   | Go to step 5.   | Repair the ground short of harness.  |
| <p><b>5</b></p> <p><b>CHECK POWER SUPPLY TO SENSOR.</b><br/>                     1) Connect the ECM connectors.<br/>                     2) Turn the ignition switch to ON.<br/>                     3) Measure the voltage between electronic throttle control connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(E57) No. 5 (+) — Engine ground (-):</b></p> <p>4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.</p>         | Is the voltage 4.5 — 5.5 V?  | Go to step 6.   | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>  |
| <p><b>6</b></p> <p><b>CHECK SHORT OF ECM.</b><br/>                     1) Turn the ignition switch to OFF.<br/>                     2) Measure the resistance between electronic throttle control connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(E57) No. 4 — Engine ground:</b></p>  | Is the resistance more than 10 $\Omega$ ?  | Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control. | Repair the poor contact in ECM connectors. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |

**AN:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH**

**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-85, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

**TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance
- Engine stalls.

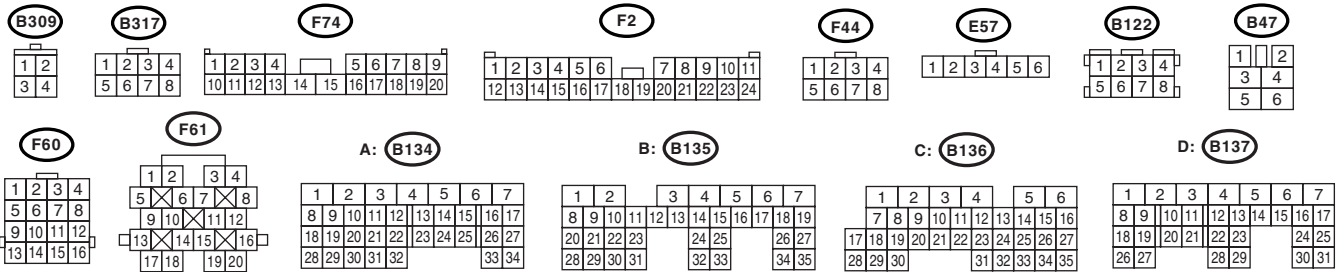
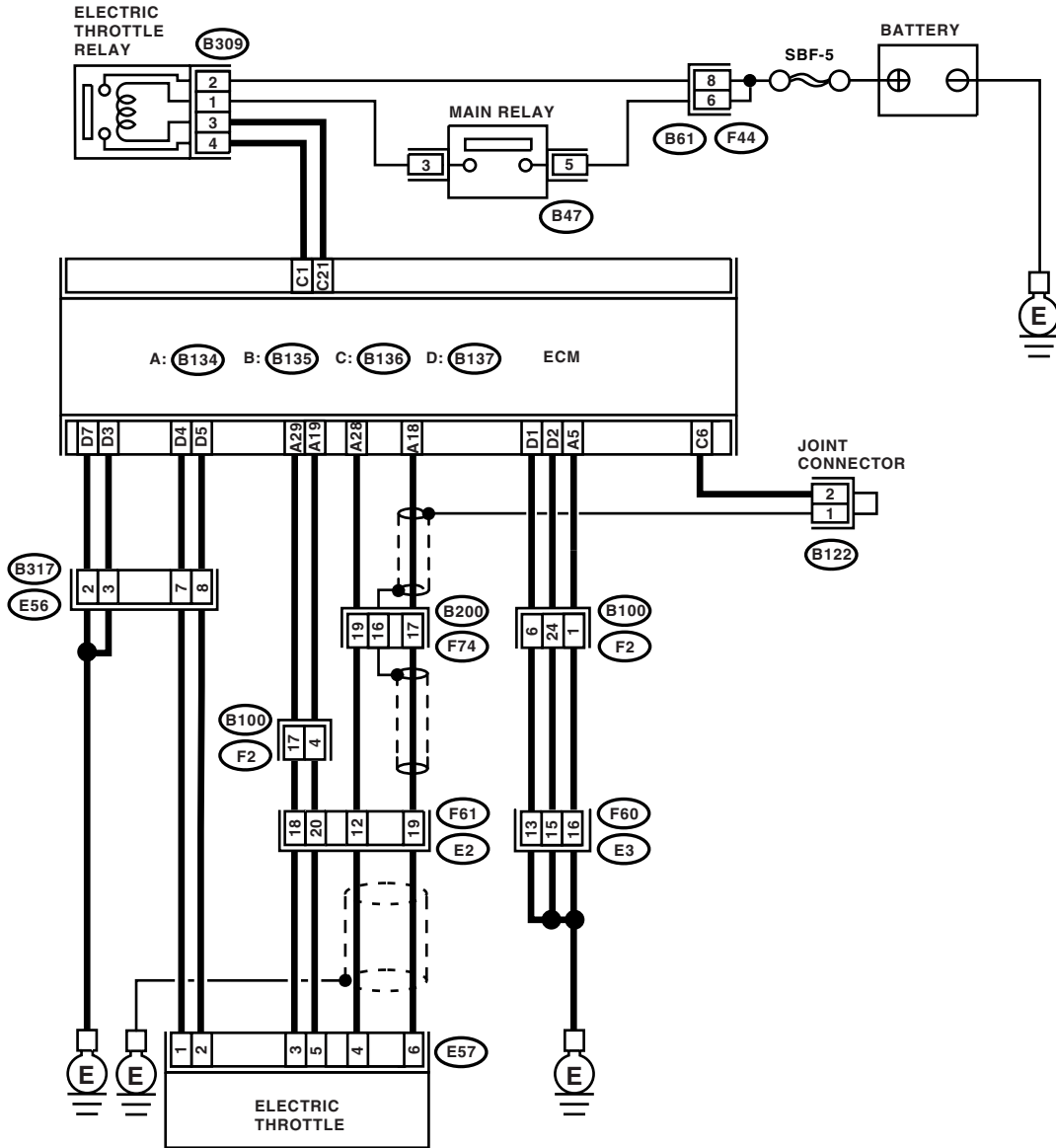
**CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04706

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes                                    | No  |
|--|--|--|---|
| <b>1 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of sub throttle sensor signals, using the Subaru Select Monitor.<br>3) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.   | Is the voltage less than 4.73 V?   | Go to step 2.                          | Go to step 3.   |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electronic throttle control.  | Is there poor contact in the connectors between ECM and electronic throttle control? | Repair the poor contact in connectors. | Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.                    |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM.<br>3) Disconnect the connectors from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 28 — (E57) No. 4:</i><br><i>(B134) No. 29 — (E57) No. 3:</i>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.                          | Repair the open circuit of harness connector.   |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between the electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 3 — Engine ground:</i>   | Is the resistance less than 5 $\Omega$ ?   | Go to step 5.                          | Repair the poor contact in ECM connector. If the problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |
| <b>5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 5 (+) — Engine ground (-):</i><br>4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter. | Is the voltage more than 10 V?   | Go to step 6.                          | Repair the battery short of harness between ECM connector and electronic throttle control connector.                                      |
| <b>6 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Measure the voltage between the electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 4 (+) — Engine ground (-):</i><br>2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.  | Is the voltage less than 10 V?   | Go to step 7.                          | Repair the short of harness between ECM connector and electronic throttle control connector.  |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

|   | Step  | Check                                      | Yes   | No   |
|---|---|--|---|--|
| 7 | <b>CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the voltage between connectors.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 28 — (B134) No. 19:</b> | Is the resistance more than 1 M $\Omega$ ? | Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control. | Short circuit of sensor power supply may be the cause. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AO:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

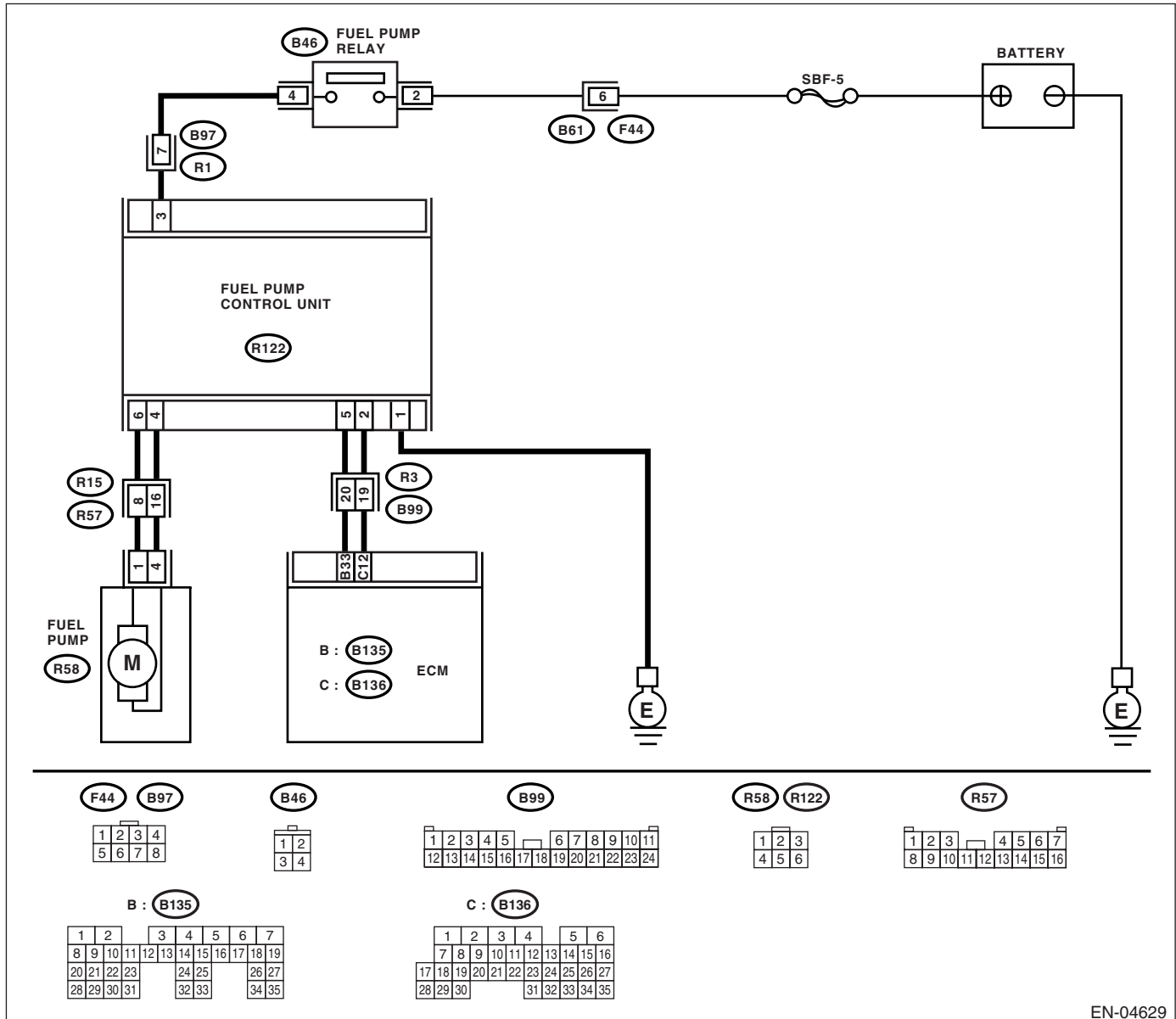
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-87, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04629

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes                  | No   |
|---|--|----------------------|--|
| <p><b>1</b></p> <p><b>CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROL UNIT.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from fuel pump control unit.<br/>3) Turn the ignition switch to ON.<br/>4) Measure the voltage between fuel pump control unit and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(R122) No. 3 (+) — Chassis ground (-):</b></p> | <p>Is the voltage more than 10 V?</p>                      | <p>Go to step 2.</p> | <p>Repair the power supply circuit.</p> <p><b>NOTE:</b><br/>In this case repair the following:</p> <ul style="list-style-type: none"> <li>• Open or ground short circuit in harness between fuel pump relay and fuel pump control unit</li> <li>• Poor contact in fuel pump control unit connector</li> <li>• Poor contact in fuel pump relay connector</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK GROUND CIRCUIT OF FUEL PUMP CONTROL UNIT.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Measure the resistance of harness between fuel pump control unit and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(R122) No. 1 — Chassis ground:</b></p>   | <p>Is the resistance less than 5 <math>\Omega</math>?</p>  | <p>Go to step 3.</p> | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit between fuel pump control unit and chassis ground</li> <li>• Poor contact in fuel pump control unit connector</li> </ul>  |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.</b></p> <p>1) Disconnect the connector from fuel pump.<br/>2) Measure the resistance of harness between fuel pump control unit and fuel pump connector.</p> <p><b>Connector &amp; terminal</b><br/><b>(R122) No. 4 — (R58) No. 4:</b><br/><b>(R122) No. 6 — (R58) No. 1:</b></p>                              | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | <p>Go to step 4.</p> | <p>Repair the open circuit between fuel pump control unit and fuel pump.</p>   |
| <p><b>4</b></p> <p><b>CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.</b></p> <p>Measure the resistance of harness between fuel pump control unit and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(R122) No. 4 — Chassis ground:</b><br/><b>(R122) No. 6 — Chassis ground:</b></p>  | <p>Is the resistance more than 1 <math>M\Omega</math>?</p> | <p>Go to step 5.</p> | <p>Repair the ground short circuit between fuel pump control unit and fuel pump.</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <b>5</b><br><b>CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between fuel pump control unit and ECM connector.<br><br><i>Connector &amp; terminal</i><br>(R122) No. 5 — (B135) No. 33:<br>(R122) No. 2 — (B136) No. 12: | Is the resistance less than 1 $\Omega$ ?                           | Go to step 6.  | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit between fuel pump control unit and ECM</li> <li>• Poor contact in fuel pump control unit and ECM connector</li> </ul> |
| <b>6</b><br><b>CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.</b><br>Measure the resistance of harness between fuel pump control unit and chassis ground.<br><br><i>Connector &amp; terminal</i><br>(R122) No. 5 — Chassis ground:<br>(R122) No. 2 — Chassis ground:   | Is the resistance more than 1 M $\Omega$ ?                         | Go to step 7.  | Repair the ground short circuit between fuel pump control unit and ECM.   |
| <b>7</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in ECM and fuel pump control unit connector.   | Is there poor contact in ECM and fuel pump control unit connector? | Repair the poor contact in ECM and fuel pump control unit.   | Go to step 8.   |
| <b>8</b><br><b>CHECK EXPERIENCE OF RUNNING OUT OF FUEL.</b>   | Has the vehicle run out of fuel before?                            | Finish the diagnosis.<br><br>NOTE:<br>DTC may be recorded due to the idle running of fuel pump when running out of fuel. | Replace the fuel pump control unit.<br><Ref. to FU(H4DOTC)-49, Fuel Pump Control Unit.>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AP:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-89, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

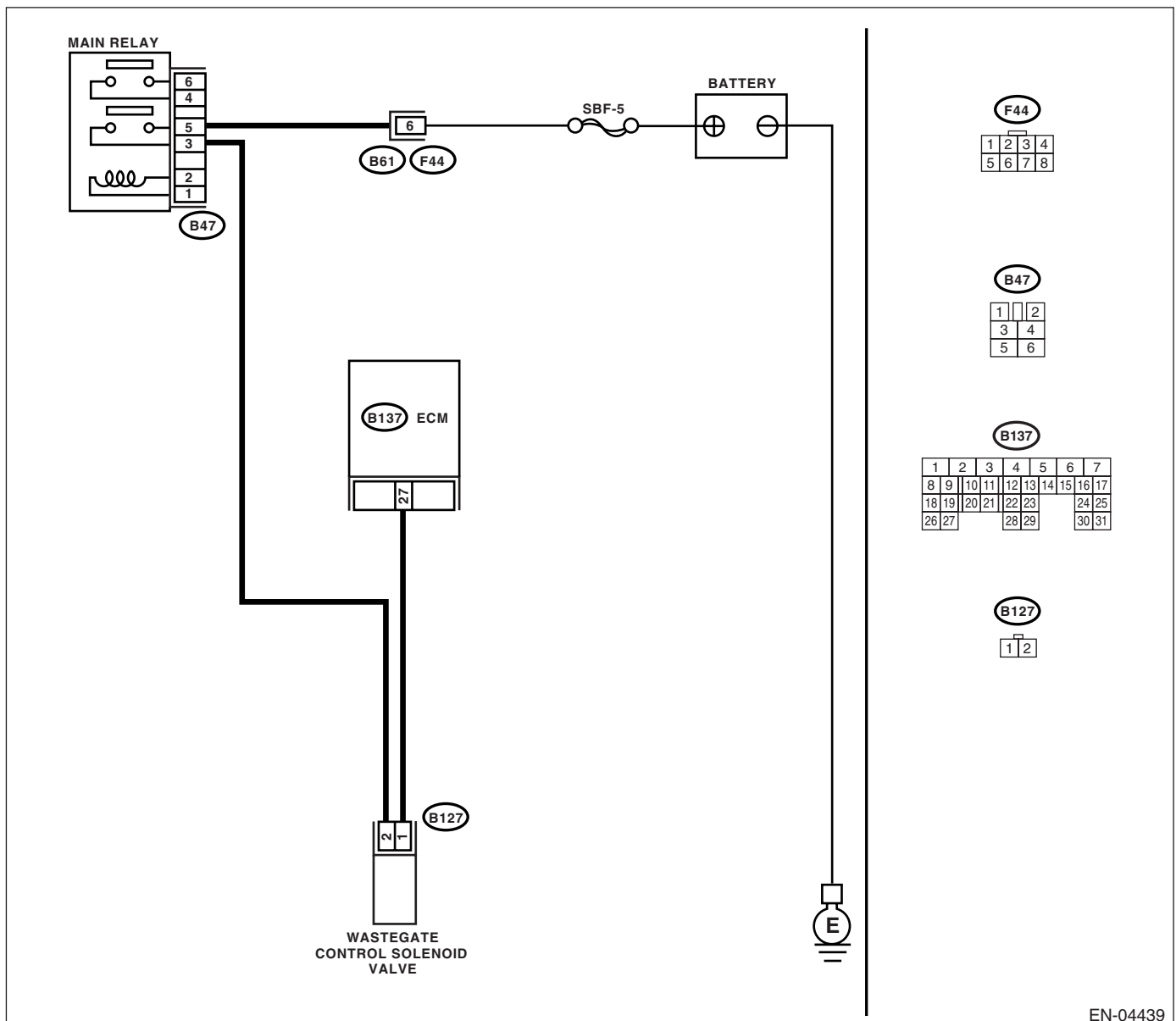
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04439

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                       | Yes   | No  |
|---|-----------------------------|---|---|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0244. | Replace the wastegate control solenoid valve.<br><Ref. to FU(H4DOTC)-40, Wastegate Control Solenoid Valve.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AQ:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-91, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

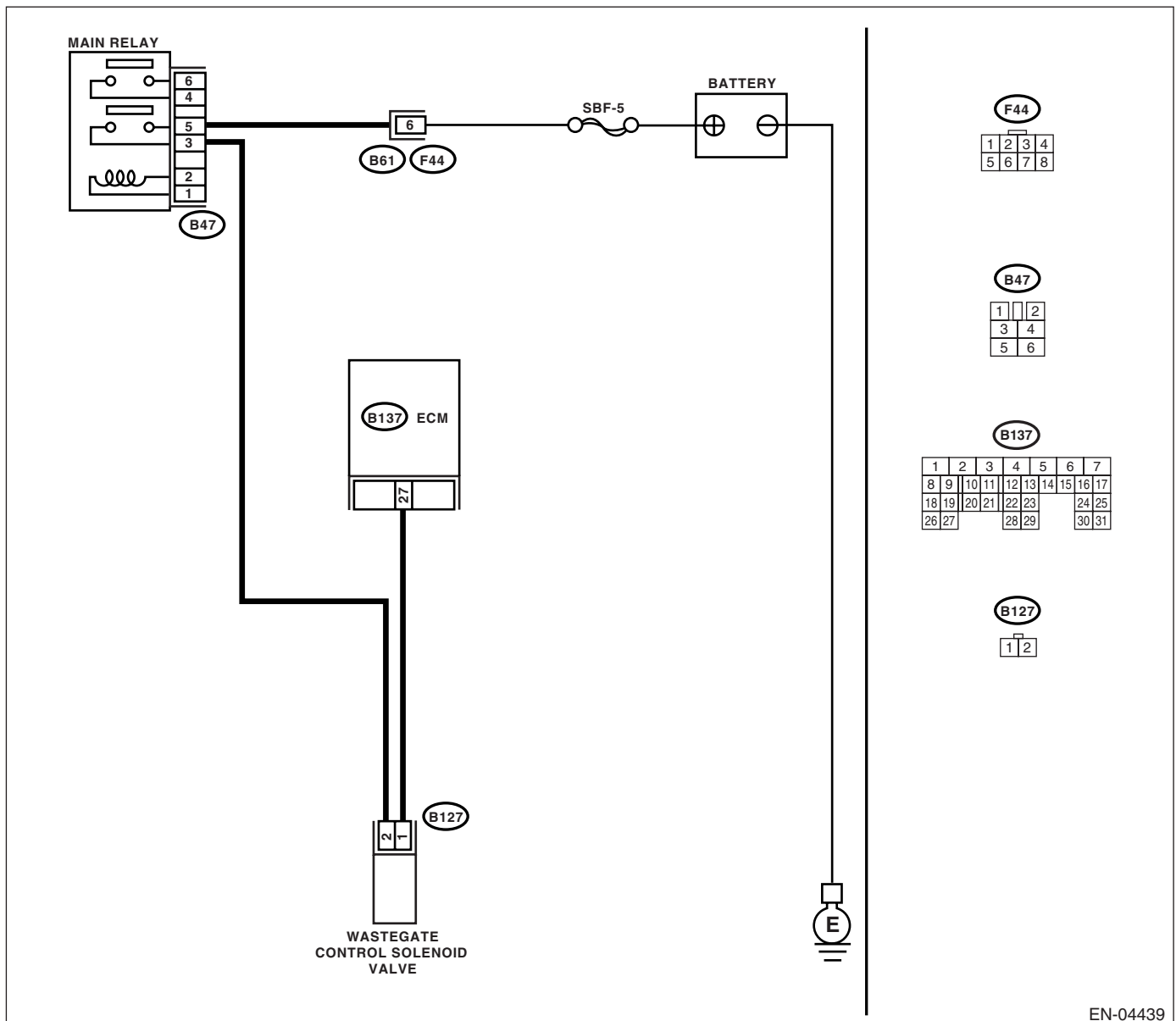
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B137) No. 27 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 10 V?                                       | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. | Go to step 2.  |
| <b>2</b><br><b>CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from wastegate control solenoid valve and ECM.<br>3) Measure the resistance of harness between wastegate control solenoid valve connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B127) No. 1 — Engine ground:</b></i> | Is the resistance less than 10 $\Omega$ ?                            | Repair the ground short circuit in harness between ECM and wastegate control solenoid valve connector.      | Go to step 3.  |
| <b>3</b><br><b>CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM and wastegate control solenoid valve of harness connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B137) No. 27 — (B127) No. 1:</b></i>   | Is the resistance less than 1 $\Omega$ ?                             | Go to step 4.   | Repair the open circuit in harness between ECM and wastegate control solenoid valve connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ECM and wastegate control solenoid valve connector |
| <b>4</b><br><b>CHECK WASTEGATE CONTROL SOLENOID VALVE.</b><br>1) Remove the wastegate control solenoid valve.<br>2) Measure the resistance between wastegate control solenoid valve terminals.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i>   | Is the resistance 30 — 34 $\Omega$ ?                                 | Go to step 5.   | Replace the wastegate control solenoid valve.<br><Ref. to FU(H4DOTC)-40, Wastegate Control Solenoid Valve.>  |
| <b>5</b><br><b>CHECK POWER SUPPLY TO WASTEGATE CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between wastegate control solenoid valve and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B127) No. 2 (+) — Engine ground (-):</b></i>   | Is the voltage more than 10 V?                                       | Go to step 6.   | Repair the open circuit in harness between main relay and wastegate control solenoid valve connector.  |
| <b>6</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in wastegate control solenoid valve connector.   | Is there poor contact in wastegate control solenoid valve connector? | Repair the poor contact in wastegate control solenoid valve connector.                                      | Contact your SOA Service Center since deterioration of some parts may be the cause.  |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AR:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-93, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

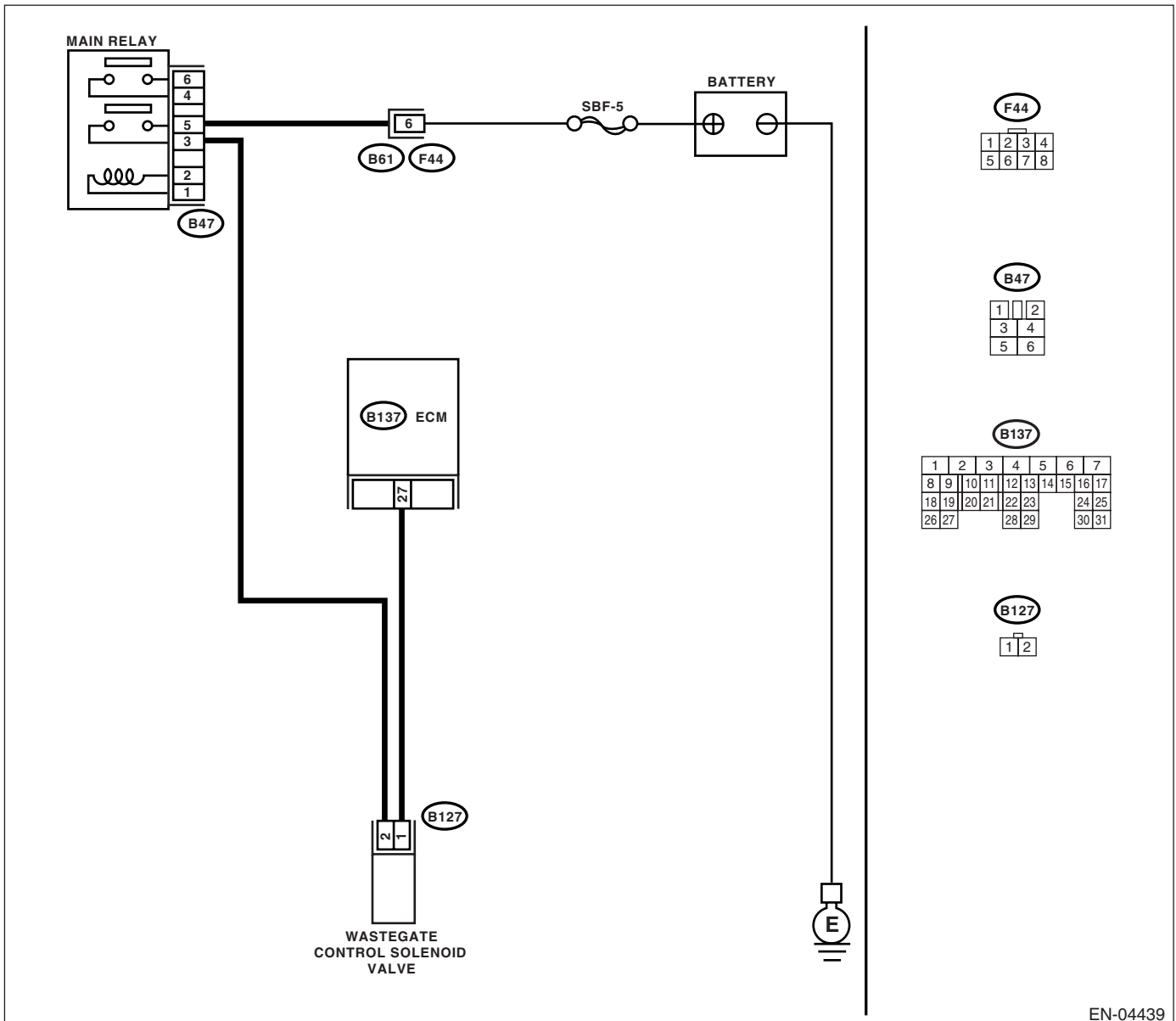
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04439

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes  | No   |
|--|--|--|--|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B137) No. 27 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10 V?           | Go to step 3.  | Go to step 2.  |
| <b>2</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.   | Is there poor contact in ECM connector?  | Repair the poor contact in ECM connector.  | Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |
| <b>3</b><br><b>CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from wastegate control solenoid valve.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B137) No. 27 (+) — Chassis ground (-):</b></i> | Is the voltage more than 10 V?           | Repair the battery short circuit in harness between ECM and wastegate control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Go to step 4.  |
| <b>4</b><br><b>CHECK WASTEGATE CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between wastegate control solenoid valve terminals.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i>  | Is the resistance less than 1 $\Omega$ ? | Replace the wastegate control solenoid valve <Ref. to FU(H4DOTC)-40, Wastegate Control Solenoid Valve.> and ECM <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>                        | Go to step 5.  |
| <b>5</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.   | Is there poor contact in ECM connector?  | Repair the poor contact in ECM connector.  | Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **AS:DTC P0301 CYLINDER 1 MISFIRE DETECTED**

**NOTE:**

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-178, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **AT:DTC P0302 CYLINDER 2 MISFIRE DETECTED**

**NOTE:**

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-178, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **AU:DTC P0303 CYLINDER 3 MISFIRE DETECTED**

**NOTE:**

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-178, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **AV:DTC P0304 CYLINDER 4 MISFIRE DETECTED**

**DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-100, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

**TROUBLE SYMPTOM:**

- Engine stalls.
- Erroneous idling
- Rough driving

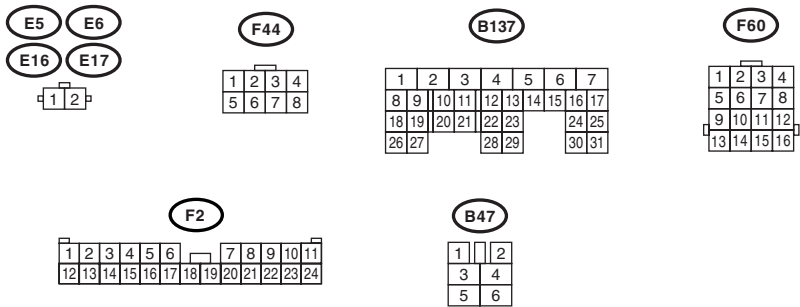
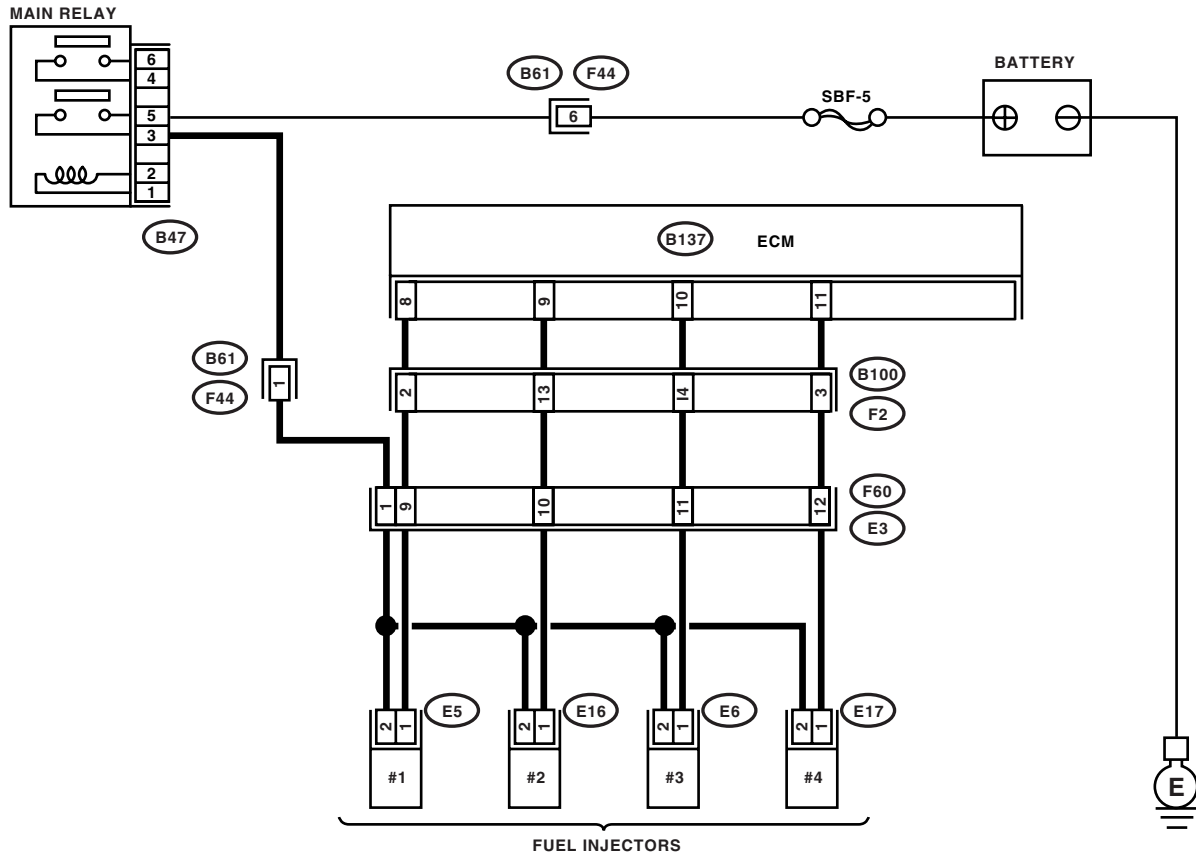
**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04209

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes   | No  |
|---|--|---|---|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?                | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> | Go to step 2.   |
| <b>2</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector and chassis ground on faulty cylinders.<br><b>Connector &amp; terminal</b><br><b>#1 (B137) No. 8 (+) — Chassis ground (-):</b><br><b>#2 (B137) No. 9 (+) — Chassis ground (-):</b><br><b>#3 (B137) No. 10 (+) — Chassis ground (-):</b><br><b>#4 (B137) No. 11 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?             | Go to step 7.   | Go to step 3.   |
| <b>3</b><br><b>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from fuel injector on faulty cylinders.<br>3) Disconnect the connector from ECM.<br>4) Measure the resistance between fuel injector connector and engine ground on faulty cylinders.<br><b>Connector &amp; terminal</b><br><b>#1 (E5) No. 1 — Engine ground:</b><br><b>#2 (E16) No. 1 — Engine ground:</b><br><b>#3 (E6) No. 1 — Engine ground:</b><br><b>#4 (E17) No. 1 — Engine ground:</b> | Is the resistance more than 1 M $\Omega$ ? | Go to step 4.   | Repair the ground short circuit in harness between fuel injector connector and ECM connector.   |
| <b>4</b><br><b>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</b><br>Measure the resistance of harness connector between ECM connector and fuel injector connector on faulty cylinders.<br><b>Connector &amp; terminal</b><br><b>#1 (B137) No. 8 — (E5) No. 1:</b><br><b>#2 (B137) No. 9 — (E16) No. 1:</b><br><b>#3 (B137) No. 10 — (E6) No. 1:</b><br><b>#4 (B137) No. 11 — (E17) No. 1:</b>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 5.   | Repair the harness and connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM connector and fuel injector connector<br>• Poor contact in coupling connector |
| <b>5</b><br><b>CHECK FUEL INJECTOR.</b><br>Measure the resistance between fuel injector terminals on faulty cylinder.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>  | Is the resistance 5 — 20 $\Omega$ ?        | Go to step 6.   | Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-33, Fuel Injector.>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No   |
|--|--|---|--|
| <p><b>6</b></p> <p><b>CHECK POWER SUPPLY LINE.</b><br/>                     1) Turn the ignition switch to ON.<br/>                     2) Measure the voltage between fuel injector connector and engine ground on faulty cylinders.</p> <p><b>Connector &amp; terminal</b><br/>                     #1 (E5) No. 2 (+) — Engine ground (-):<br/>                     #2 (E16) No. 2 (+) — Engine ground (-):<br/>                     #3 (E6) No. 2 (+) — Engine ground (-):<br/>                     #4 (E17) No. 2 (+) — Engine ground (-):</p>   | Is the voltage more than 10 V?   | Repair the poor contact in all connectors in fuel injector circuit.   | Repair the harness and connector.<br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and fuel injector connector on faulty cylinders</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in main relay connector</li> <li>• Poor contact in fuel injector connector on faulty cylinders</li> </ul> |
| <p><b>7</b></p> <p><b>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</b><br/>                     1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from fuel injector on faulty cylinder.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between ECM connector and chassis ground on faulty cylinders.</p> <p><b>Connector &amp; terminal</b><br/>                     #1 (B137) No. 8 (+) — Chassis ground (-):<br/>                     #2 (B137) No. 9 (+) — Chassis ground (-):<br/>                     #3 (B137) No. 10 (+) — Chassis ground (-):<br/>                     #4 (B137) No. 11 (+) — Chassis ground (-):</p> | Is the voltage more than 10 V?   | Repair the battery short circuit in harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Go to step 8.  |
| <p><b>8</b></p> <p><b>CHECK FUEL INJECTOR.</b><br/>                     1) Turn the ignition switch to OFF.<br/>                     2) Measure the resistance between fuel injector terminals on faulty cylinder.</p> <p><b>Terminals</b><br/>                     No. 1 — No. 2:</p>   | Is the resistance less than 1 $\Omega$ ?   | Replace the faulty fuel injector <Ref. to FU(H4DOTC)-33, Fuel Injector.> and ECM <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>                          | Go to step 9.  |
| <p><b>9</b></p> <p><b>CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.</b></p>   | Is the camshaft position sensor or crankshaft position sensor loosely installed? | Tighten the camshaft position sensor or crankshaft position sensor.   | Go to step 10.   |
| <p><b>10</b></p> <p><b>CHECK CRANK SPROCKET.</b><br/>                     Remove the timing belt cover.</p>  | Is the crank sprocket rusted or does it have broken teeth?                       | Replace the crank sprocket. <Ref. to ME(H4DOTC)-54, Crank Sprocket.>  | Go to step 11.   |
| <p><b>11</b></p> <p><b>CHECK INSTALLATION CONDITION OF TIMING BELT.</b><br/>                     Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block.</p>  | Is the timing belt dislocated from its proper position?                          | Repair the installation condition of timing belt. <Ref. to ME(H4DOTC)-45, Timing Belt.>   | Go to step 12.   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No   |
|--|--|--|--|
| <b>12</b> <b>CHECK FUEL LEVEL.</b>   | Is the fuel meter indication higher than the "Lower" level?    | Go to step <b>13</b> .   | Replenish the fuel so fuel meter indication is higher than the "Lower" level. After replenishing fuel; Go to step <b>13</b> .  |
| <b>13</b> <b>CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.</b><br>1) Clear the memory using Subaru Select Monitor.<br><Ref. to EN(H4DOTC)(diag)-50, Clear Memory Mode.><br>2) Start the engine, and drive the vehicle more than 10 minutes. | Is the malfunction indicator light coming on or blinking?      | Go to step <b>15</b> .   | Go to step <b>14</b> .   |
| <b>14</b> <b>CHECK CAUSE OF MISFIRE DIAGNOSED.</b>   | Was the cause of misfire diagnosed when the engine is running? | Finish the diagnostics operation, if the engine has no abnormality.  | Repair the poor contact.<br><b>NOTE:</b><br>In this case, repair the following:<br>• Poor contact in ignition coil connector<br>• Poor contact in fuel injector connector on faulty cylinders<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector |
| <b>15</b> <b>CHECK AIR INTAKE SYSTEM.</b>  | Is there a fault in air intake system?                         | Repair the air intake system.<br><b>NOTE:</b><br>Check the following items:<br>• Are there air leaks or air suction caused by loose or dislocated nuts and bolts?<br>• Are there cracks or any disconnection of hoses? | Go to step <b>16</b> .   |
| <b>16</b> <b>CHECK CYLINDER.</b>   | Is there a fault in that cylinder?                             | Repair or replace the faulty parts.<br><b>NOTE:</b><br>Check the following items.<br>• Spark plug<br>• Fuel injector<br>• Compression pressure   | Go to DTC P0171 and P0172. <Ref. to EN(H4DOTC)(diag)-152, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |

## AW:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-101, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

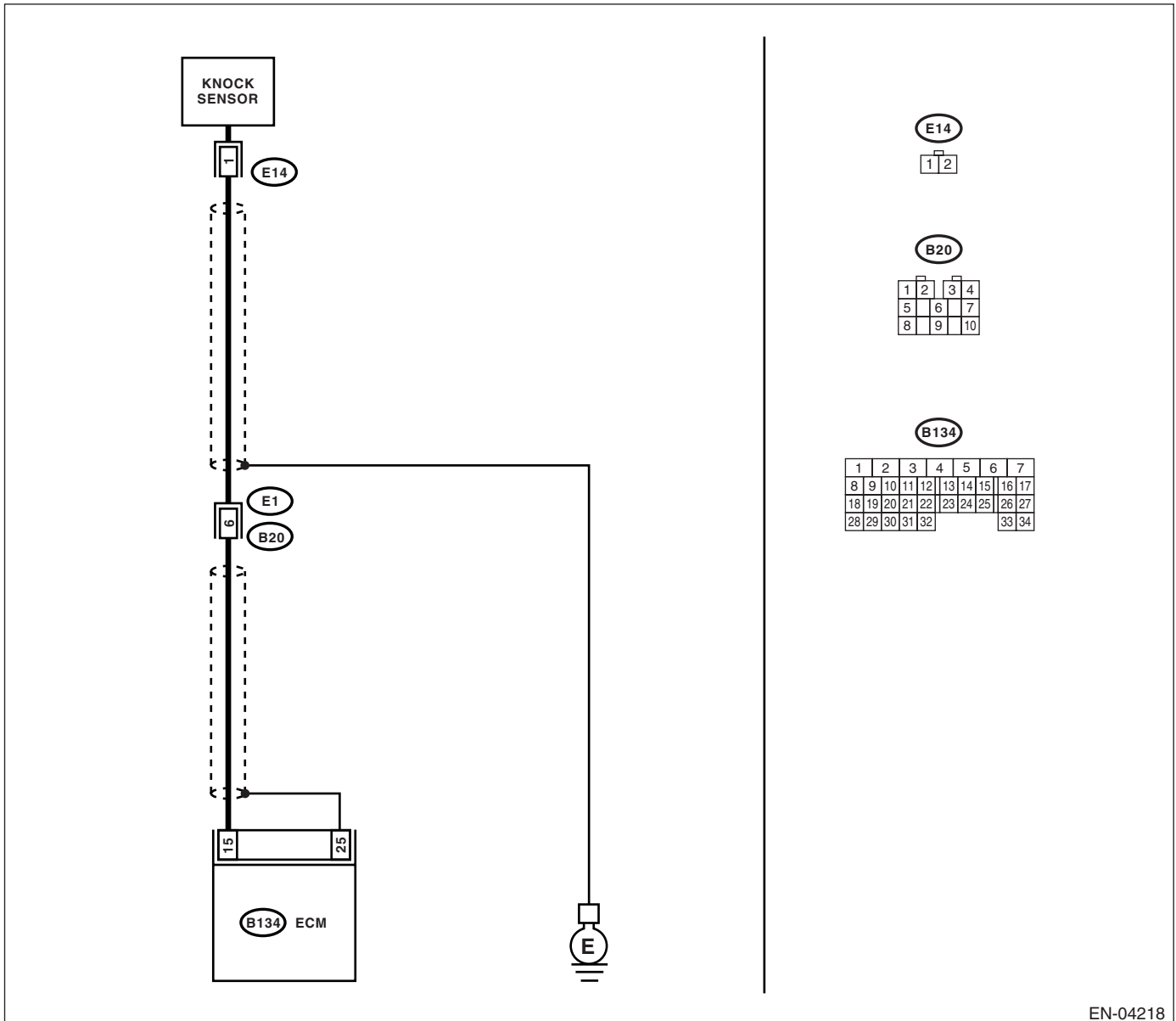
### TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

### WIRING DIAGRAM:



EN-04218



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No  |
|--|---|--|---|
| <b>1</b><br><b>CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance between ECM harness connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 15 — Chassis ground:</b> | Is the resistance more than 700 k $\Omega$ ?              | Go to step 2.  | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between knock sensor and ECM connector</li> <li>• Poor contact in knock sensor connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>2</b><br><b>CHECK KNOCK SENSOR.</b><br>1) Disconnect the connector from knock sensor.<br>2) Measure the resistance between knock sensor connector terminal and engine ground.<br><b>Terminals</b><br><b>No. 1 — Engine ground:</b>  | Is the resistance more than 700 k $\Omega$ ?              | Go to step 3.  | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Poor contact in knock sensor connector</li> <li>• Poor contact in coupling connector</li> </ul>   |
| <b>3</b><br><b>CHECK CONDITION OF KNOCK SENSOR INSTALLATION.</b>   | Is the knock sensor installation bolt tightened securely? | Replace the knock sensor. <Ref. to FU(H4DOTC)-30, Knock Sensor.> | Tighten the knock sensor installation bolt securely.  |

## AX:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-103, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

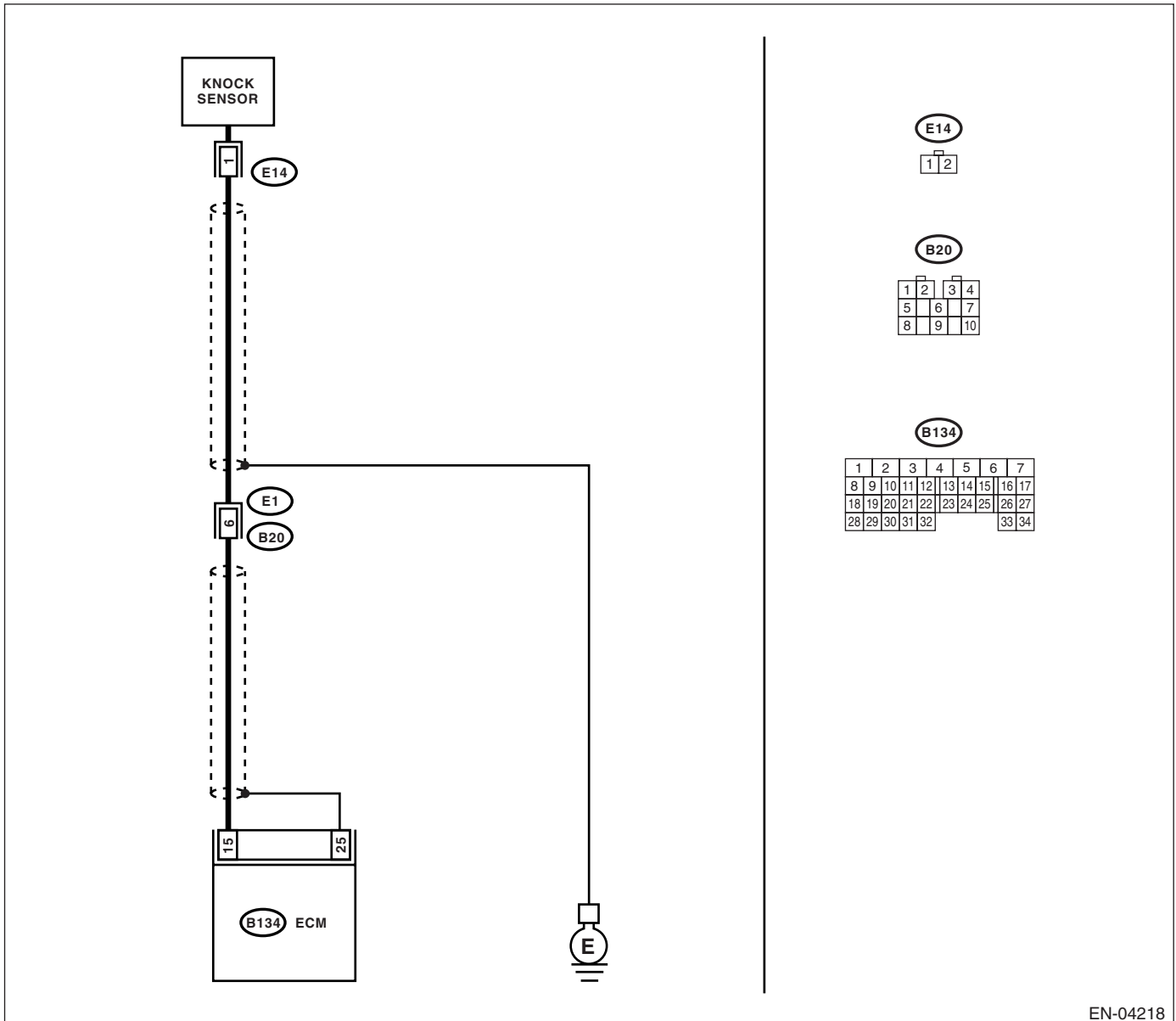
### TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

### WIRING DIAGRAM:



EN-04218

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <b>1</b><br><b>CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 15 — Chassis ground:</b></i>  | Is the resistance less than 400 k $\Omega$ ? | Go to step 2.  | Go to step 3.   |
| <b>2</b><br><b>CHECK KNOCK SENSOR.</b><br>1) Disconnect the connector from knock sensor.<br>2) Measure the resistance between knock sensor connector terminal and engine ground.<br><i><b>Terminals</b></i><br><i><b>No. 1 — Engine ground:</b></i>   | Is the resistance less than 400 k $\Omega$ ? | Replace the knock sensor. <Ref. to FU(H4DOTC)-30, Knock Sensor.>   | Repair the ground short circuit in harness between knock sensor connector and ECM connector.<br><br>NOTE:<br>The harness between both connectors is shielded. Repair the short circuit of harness together with shield. |
| <b>3</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Connect the connectors to ECM and knock sensor.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 15 (+) — Chassis ground (-):</b></i> | Is the voltage more than 2 V?                | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.)<br><br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Poor contact in knock sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> | Repair the poor contact in ECM connector.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AY:DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-105, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

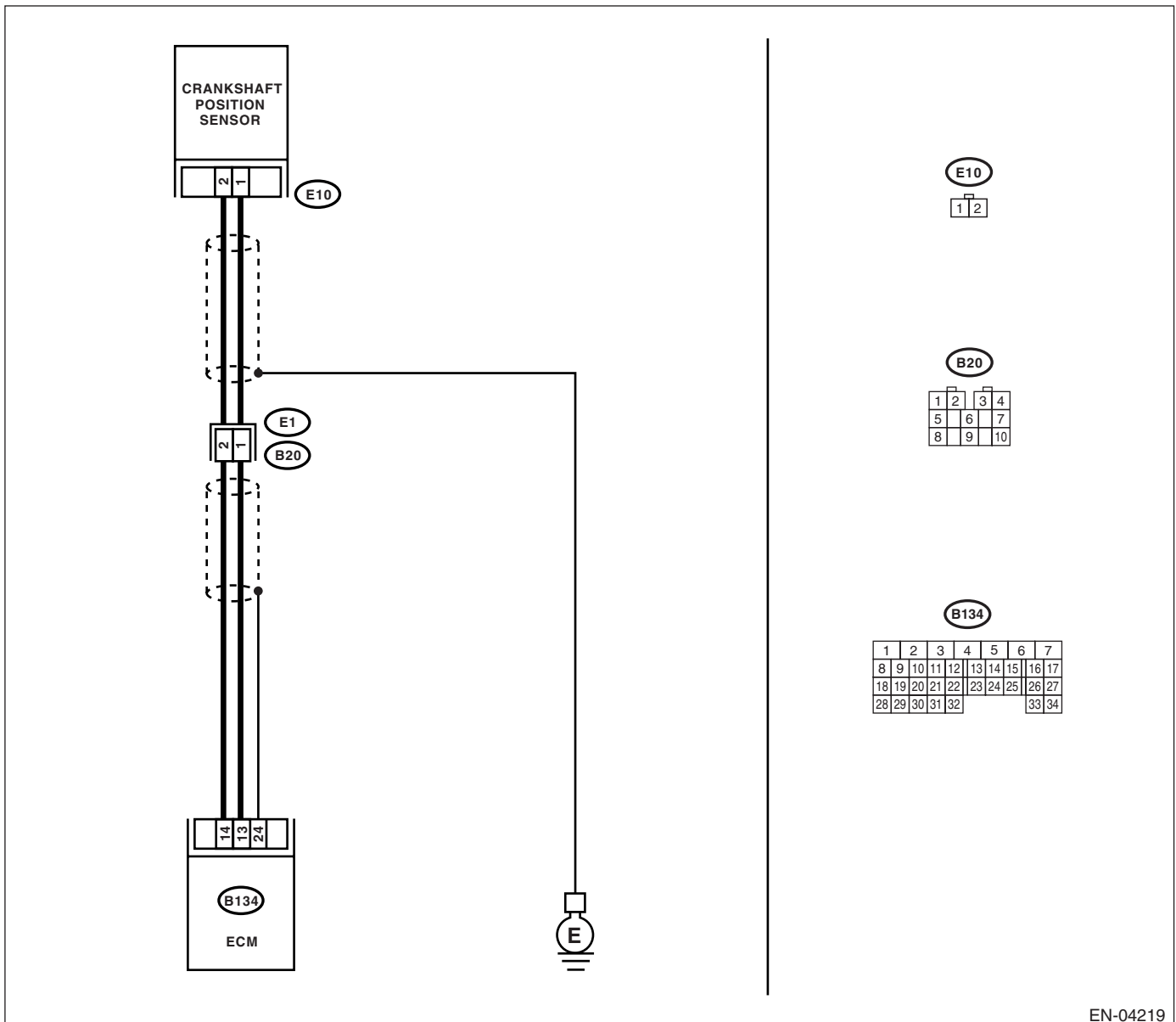
### TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04219

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <b>1</b><br><b>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from crankshaft position sensor.<br>3) Measure the resistance of harness between crankshaft position sensor connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E10) No. 1 — Engine ground:</b></i> | Is the resistance more than 100 k $\Omega$ ?                            | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between crankshaft position sensor and ECM connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> | Go to step 2.  |
| <b>2</b><br><b>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</b><br>Measure the resistance of harness between crankshaft position sensor connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E10) No. 1 — Engine ground:</b></i>   | Is the resistance more than 1 M $\Omega$ ?                              | Go to step 3.  | Repair the ground short circuit in harness between crankshaft position sensor and ECM connector.<br><br>NOTE:<br>The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.  |
| <b>3</b><br><b>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</b><br>Measure the resistance of harness between crankshaft position sensor connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E10) No. 2 — Engine ground:</b></i>   | Is the resistance less than 5 $\Omega$ ?                                | Go to step 4.  | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between crankshaft position sensor and ECM connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>4</b><br><b>CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.</b>   | Is the crankshaft position sensor installation bolt tightened securely? | Go to step 5.  | Tighten the crankshaft position sensor installation bolt securely.   |
| <b>5</b><br><b>CHECK CRANKSHAFT POSITION SENSOR.</b><br>1) Remove the crankshaft position sensor.<br>2) Measure the resistance between connector terminals of crankshaft position sensor.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i>  | Is the resistance 1 — 4 k $\Omega$ ?                                    | Repair the poor contact in crankshaft position sensor connector.   | Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-28, Crankshaft Position Sensor.>   |

## AZ:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-107, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

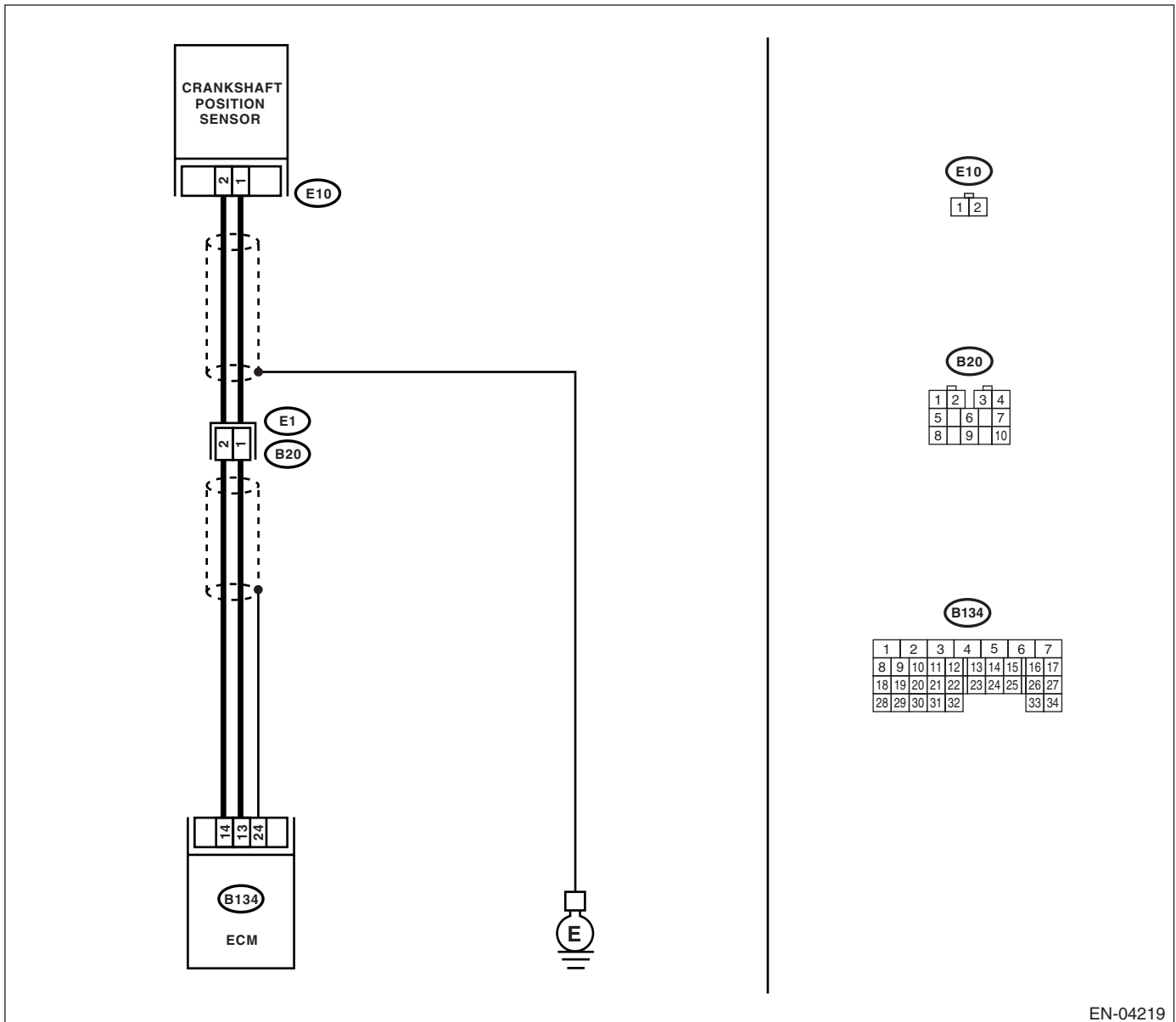
### TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04219

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> | Go to step 2.  |
| <b>2</b><br><b>CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.</b><br>Turn the ignition switch to OFF.   | Is the crankshaft position sensor installation bolt tightened securely? | Go to step 3.   | Tighten the crankshaft position sensor installation bolt securely.                           |
| <b>3</b><br><b>CHECK CRANK SPROCKET.</b><br>Remove the front belt cover.  | Are the crank sprocket teeth cracked or damaged?                        | Replace the crank sprocket. <Ref. to FU(H4DOTC)-28, Crankshaft Position Sensor.>  | Go to step 4.  |
| <b>4</b><br><b>CHECK INSTALLATION CONDITION OF TIMING BELT.</b><br>Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block. | Is the timing belt dislocated from its proper position?                 | Repair the installation condition of timing belt. <Ref. to ME(H4DOTC)-45, Timing Belt.>   | Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-28, Crankshaft Position Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BA:DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-109, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

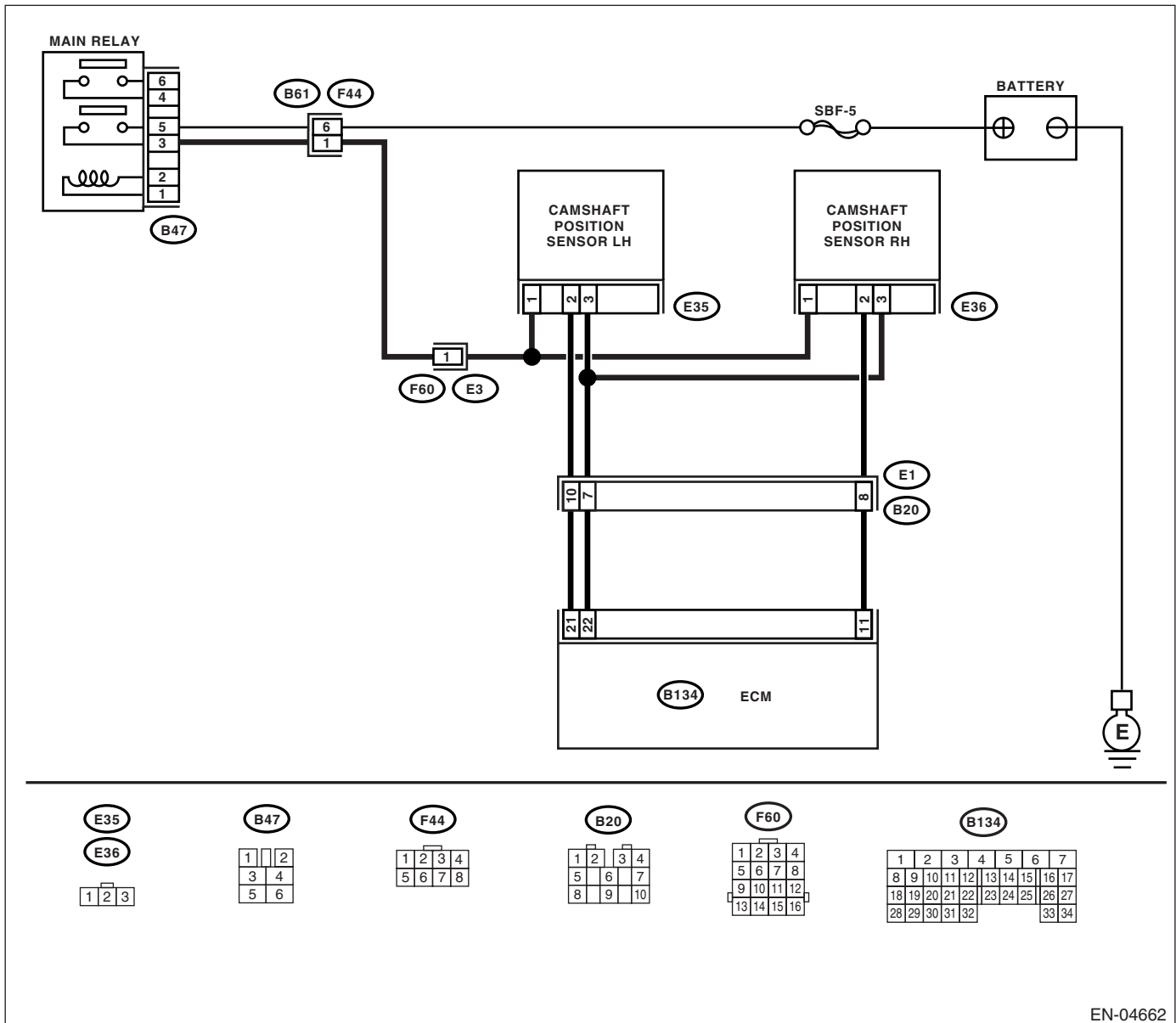
### TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04662



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>1 CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the from camshaft position sensor.<br>3) Measure the voltage between camshaft position sensor and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E36) No. 1 (+) — Engine ground (-):</b></i>                             | Is the voltage more than 10 V?  | Repair the battery short circuit between main relay connector and camshaft position sensor connector. | Go to step 2.  |
| <b>2 CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between camshaft position sensor and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E36) No. 1 (+) — Engine ground (-):</b></i>  | Is the voltage more than 10 V?  | Go to step 3.   | Repair the open or ground short circuit between main relay connector and camshaft position sensor connector. |
| <b>3 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance between camshaft position sensor and ECM.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E36) No. 2 — (B134) No. 11:</b></i><br><i><b>(E36) No. 3 — (B134) No. 22:</b></i> | Is the resistance less than 1 $\Omega$ ?                              | Go to step 4.   | Repair the open circuit between camshaft position sensor and ECM.  |
| <b>4 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.</b><br>Measure the resistance between camshaft position sensor and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E36) No. 2 — Engine ground:</b></i><br><i><b>(E36) No. 3 — Engine ground:</b></i>  | Is the resistance more than 1 M $\Omega$ ?                            | Go to step 5.   | Repair the ground short circuit between camshaft position sensor and ECM.                                    |
| <b>5 CHECK CONDITION OF CAMSHAFT POSITION SENSOR.</b>   | Is the camshaft position sensor installation bolt tightened securely? | Go to step 6.   | Tighten the camshaft position sensor installation bolt securely.   |
| <b>6 CHECK CAMSHAFT POSITION SENSOR.</b><br>Check waveform of camshaft position sensor. <Ref. to EN(H4DOTC)(diag)-20, Engine Control Module (ECM) I/O Signal.>  | Is there any abnormality in waveform?                                 | Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-29, Camshaft Position Sensor.>              | Go to step 7.  |
| <b>7 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.  | Is there poor contact in ECM connector?                               | Repair the poor contact in ECM connector.   | Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>                                       |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BB:DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-110, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

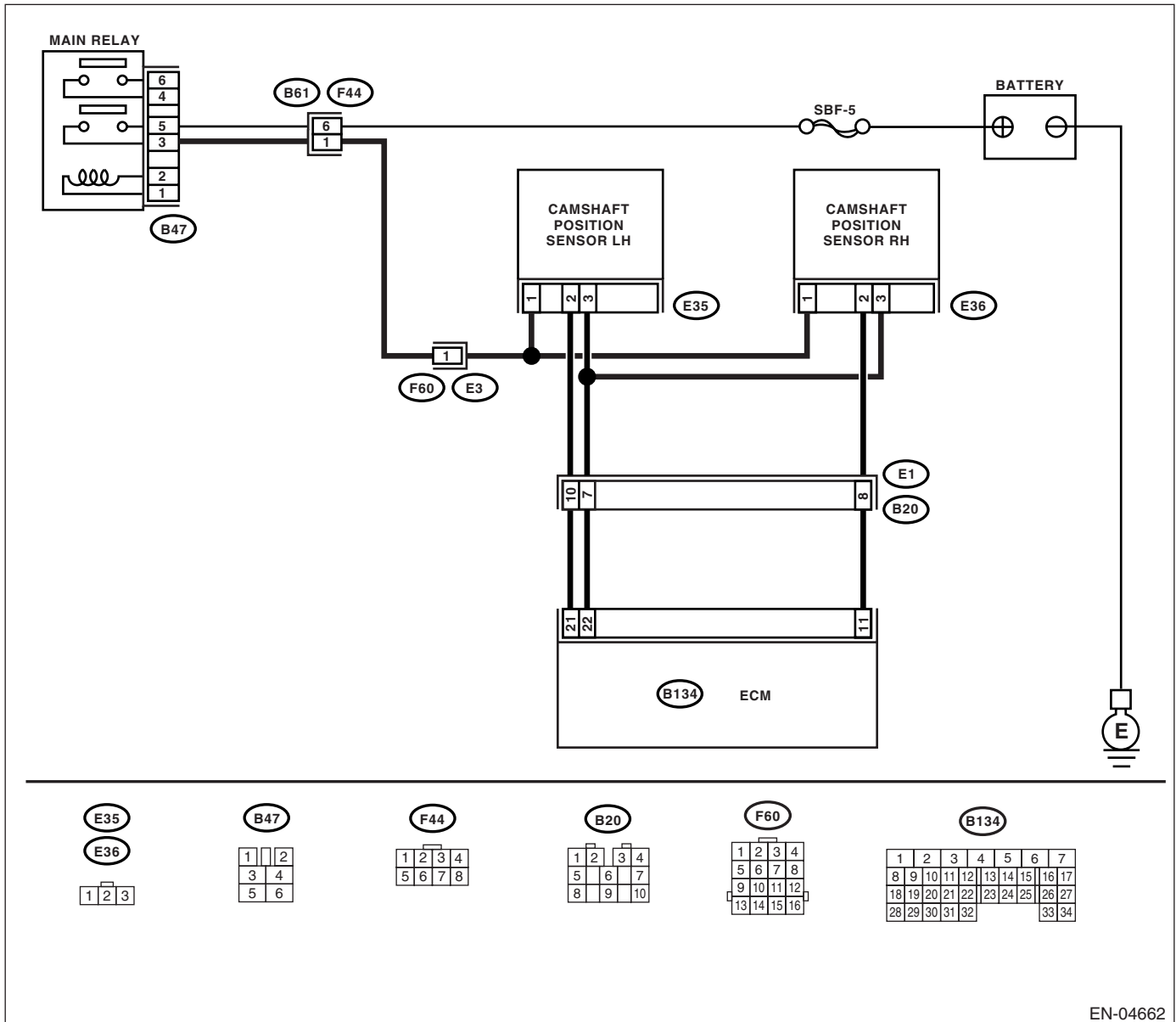
### TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04662

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>1 CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from camshaft position sensor.<br>3) Measure the voltage between camshaft position sensor and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E35) No. 1 (+) — Engine ground (-):</b></i>                   | Is the voltage more than 10 V?  | Repair the battery short circuit between main relay connector and camshaft position sensor connector. | Go to step 2.  |
| <b>2 CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between camshaft position sensor and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E35) No. 1 (+) — Engine ground (-):</b></i>  | Is the voltage more than 10 V?  | Go to step 3.   | Repair the open or ground short circuit between main relay connector and camshaft position sensor connector. |
| <b>3 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance between camshaft position sensor and ECM.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E35) No. 2 — (B134) No. 21:</b></i><br><i><b>(E35) No. 3 — (B134) No. 22:</b></i> | Is the resistance less than 1 $\Omega$ ?                              | Go to step 4.   | Repair the open circuit between camshaft position sensor and ECM.  |
| <b>4 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.</b><br>Measure the resistance between camshaft position sensor and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E35) No. 2 — Engine ground:</b></i><br><i><b>(E35) No. 3 — Engine ground:</b></i>  | Is the resistance more than 1 M $\Omega$ ?                            | Go to step 5.   | Repair the ground short circuit between camshaft position sensor and ECM.                                    |
| <b>5 CHECK CONDITION OF CAMSHAFT POSITION SENSOR.</b>   | Is the camshaft position sensor installation bolt tightened securely? | Go to step 6.   | Tighten the camshaft position sensor installation bolt securely.   |
| <b>6 CHECK CAMSHAFT POSITION SENSOR.</b><br>Check the camshaft position sensor waveform. <Ref. to EN(H4DOTC)(diag)-20, Engine Control Module (ECM) I/O Signal.>   | Is any abnormality found in waveform?                                 | Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-29, Camshaft Position Sensor.>              | Go to step 7.  |
| <b>7 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.  | Is there poor contact in ECM connector?                               | Repair the poor contact in ECM connector.   | Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>                                       |

## **BC:DTC P0410 SECONDARY AIR INJECTION SYSTEM**

### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-111, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

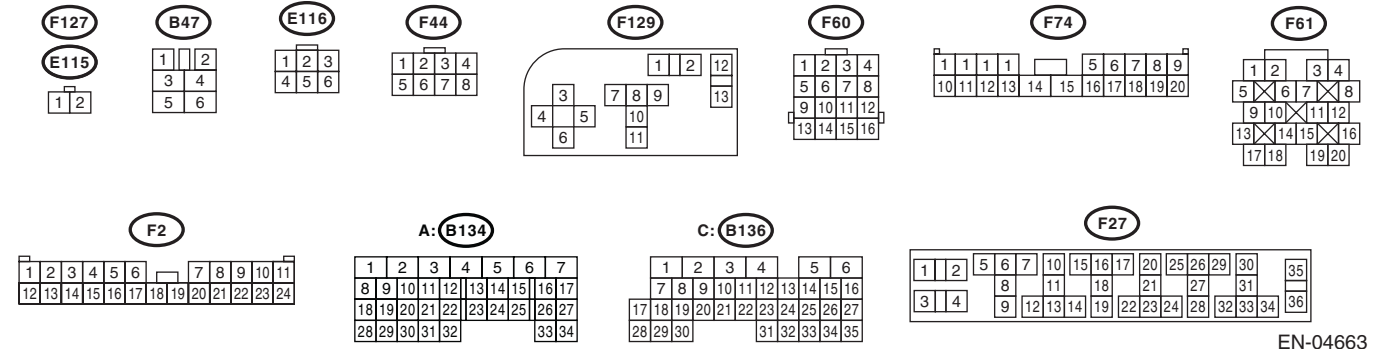
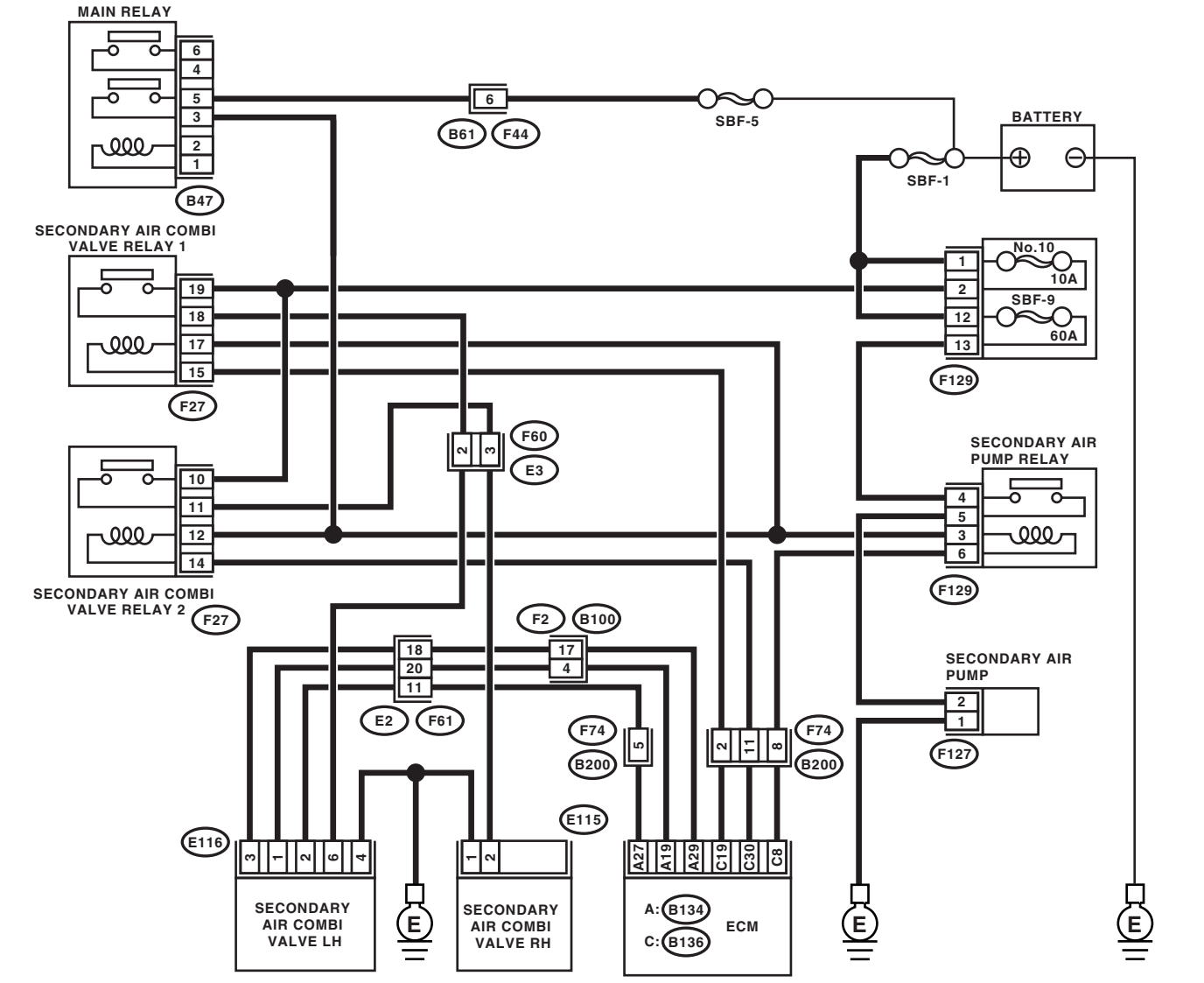
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04663

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes                             | No  |
|--|--|---------------------------------|---|
| <b>1 CHECK SECONDARY AIR PUMP OPERATION.</b><br>1) Connect the test mode connector.<br>2) Turn the ignition switch to ON.<br>3) Perform the operational check of secondary air pump using the Subaru Select Monitor.<br><br><b>NOTE:</b><br>Subaru Select Monitor<br>For detailed operation procedures, refer to "Compulsory Valve Operation Check Mode".<br><Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.> | Does the secondary air pump operate?     | Go to step 2.                   | Go to step 3.   |
| <b>2 CHECK DUCT BETWEEN SECONDARY AIR PUMP AND COMBI VALVE.</b><br>Check the duct between secondary air pump and combi valve.  | Is the duct damaged or disconnected?     | Replace or connect the duct.    | A temporary poor contact occurs.<br>Check poor contact in connector.  |
| <b>3 CHECK POWER SUPPLY TO SECONDARY AIR PUMP.</b><br>Measure the voltage between secondary air pump and chassis ground at the condition of Step 1.<br><br><b>Connector &amp; terminal</b><br><b>(F127) No. 2 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?           | Replace the secondary air pump. | Go to step 4.   |
| <b>4 CHECK HARNESS BETWEEN SECONDARY AIR PUMP RELAY AND SECONDARY AIR PUMP CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from secondary air pump relay and secondary air pump.<br>3) Measure the resistance of harness between secondary air pump relay and secondary air pump connector terminal.<br><br><b>Connector &amp; terminal</b><br><b>(F129) No. 5 — (F127) No. 2:</b>            | Is the resistance less than 1 $\Omega$ ? | Go to step 5.                   | Measure the resistance of harness between secondary air pump relay and secondary air pump connector terminal. |
| <b>5 CHECK SECONDARY AIR PUMP RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the secondary air pump relay from relay box.<br>3) Connect the battery to terminals No. 3 and No. 6 of secondary air pump relay.<br>4) Measure the resistance between secondary air pump relay terminals.<br><br><b>Terminals</b><br><b>No. 4 — No. 5:</b>  | Is the resistance less than 1 $\Omega$ ? | Go to step 6.                   | Replace the secondary air pump relay.   |
| <b>6 CHECK POWER SUPPLY OF SECONDARY AIR PUMP RELAY.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between secondary air pump relay connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(F129) No. 3 (+) — Chassis ground (-):</b><br><b>(F129) No. 4 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?           | Go to step 7.                   | Repair the open power supply circuit or ground short.   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                    | Yes   | No  |
|---|--|---|---|
| <b>7</b><br><b>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector of ECM.<br>3) Measure the resistance of harness between ECM and secondary air pump relay connector terminal.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 8 — (F129) No. 6:</i> | Is the resistance less than 1 $\Omega$ ? | Replace the ECM.<br><Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Repair the open circuit in harness between ECM and secondary air pump relay connector terminal. |

### BD:DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED

#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-115, DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

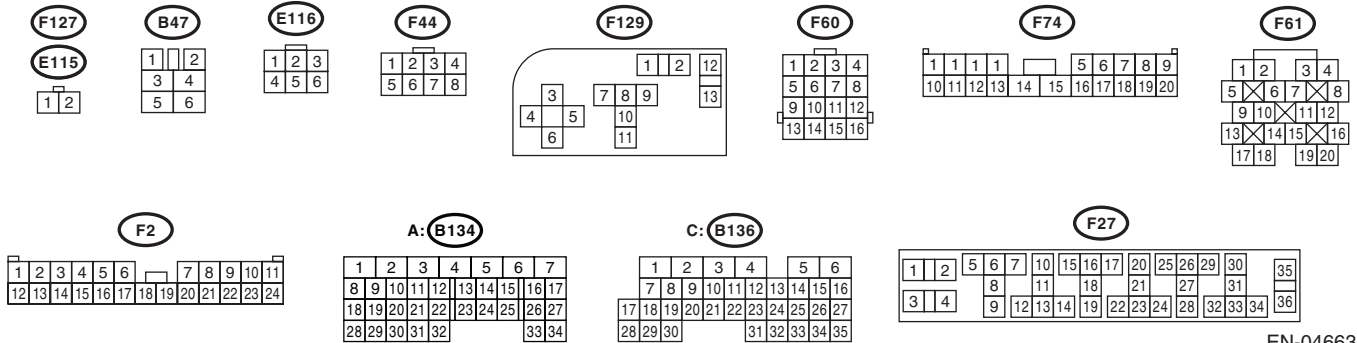
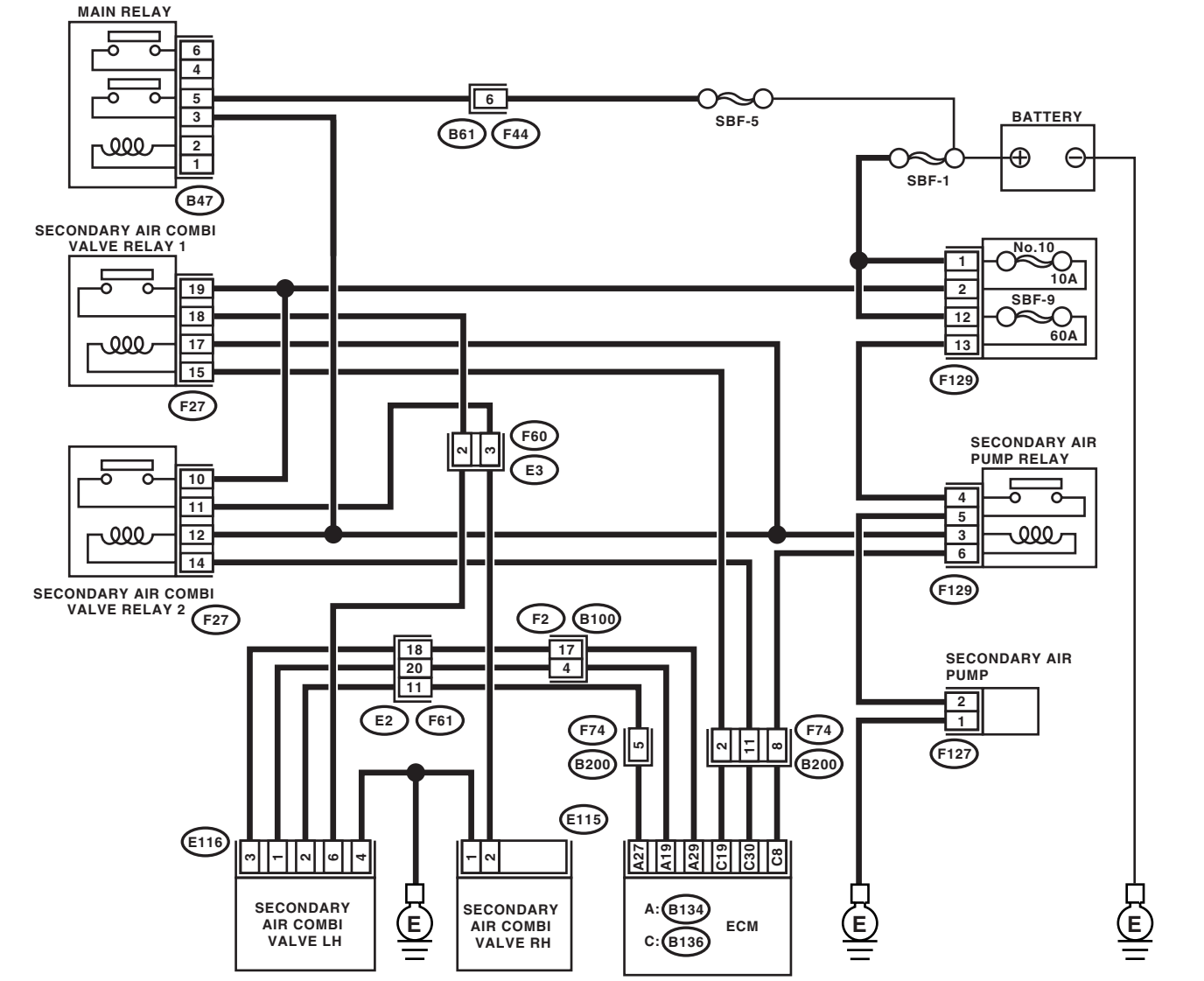
#### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04663



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                  | Yes   | No  |
|---|--|---|---|
| 1<br><b>CHECK SECONDARY AIR COMBI VALVE.</b><br>Check the pipe between secondary air combi valve and cylinder head. | Is the pipe damaged or disconnected?   | Replace the pipe between secondary air combi valve and cylinder head. | Go to step 2.   |
| 2<br><b>CHECK SECONDARY AIR COMBI VALVE.</b><br>Race at 2,000 rpm and check for sound of exhaust leakage.           | Is there the sound of exhaust leakage? | Replace the pipe between secondary air combi valve and cylinder head. | Contact your SOA Service Center since deterioration of some parts may be the cause.<br><br>NOTE:<br>Deterioration of some parts may be the cause. |

## BE:DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT OPEN

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-116, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

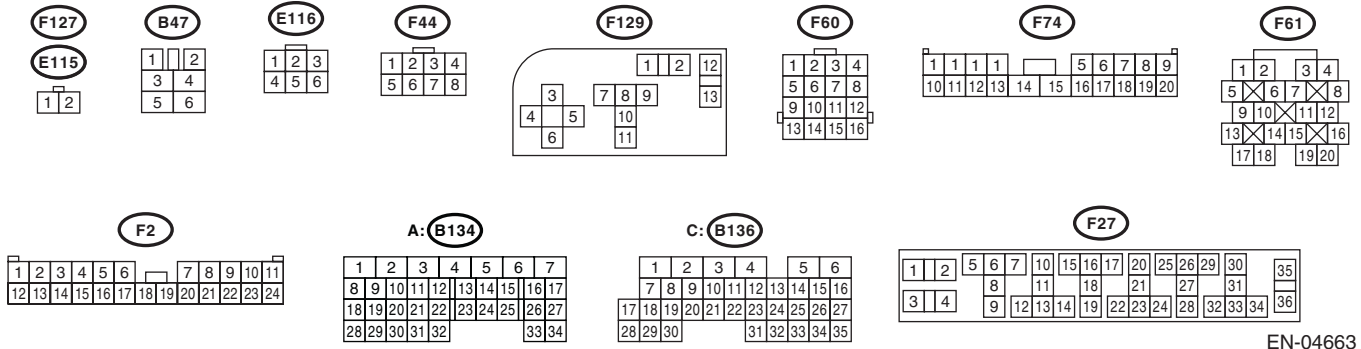
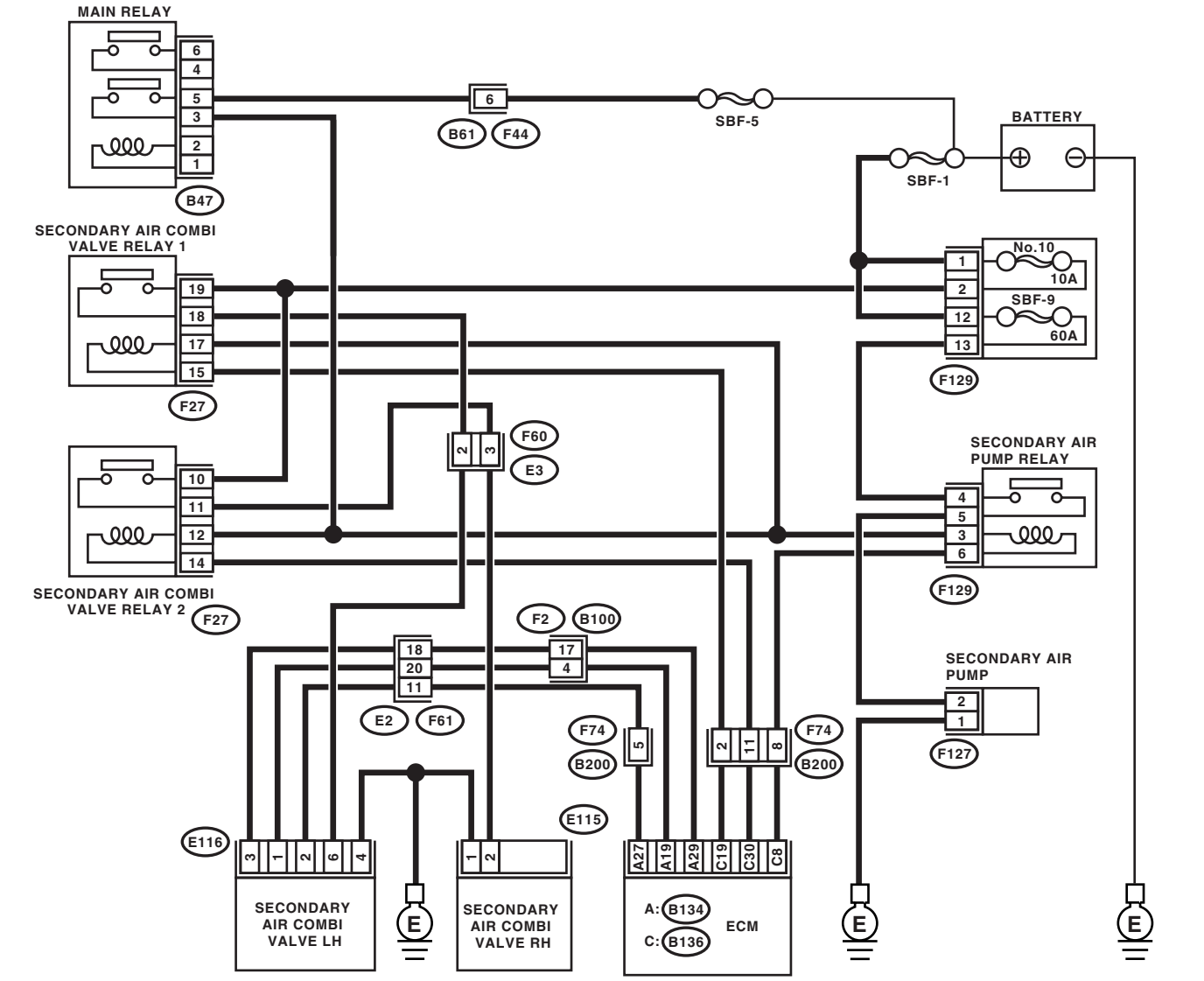
### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04663

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                      | Yes  | No   |
|--|--|--|--|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY 1.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and secondary air combi valve relay 1.<br>3) Measure the resistance of harness between ECM and secondary air combi valve relay 1 terminal.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 30 — (F27) No. 14:</i> | Is the resistance less than 1 $\Omega$ ?   | Go to step 2.  | Repair the open circuit in harness between ECM and secondary air combi valve relay 1 terminal.         |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY 1.</b><br>Measure the resistance of harness between ECM and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 30 — Chassis ground:</i>  | Is the resistance more than 1 M $\Omega$ ? | A temporary poor contact occurs.<br>Check poor contact in connector. | Repair the ground short circuit in harness between ECM and secondary air combi valve relay 1 terminal. |

## BF:DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-117, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

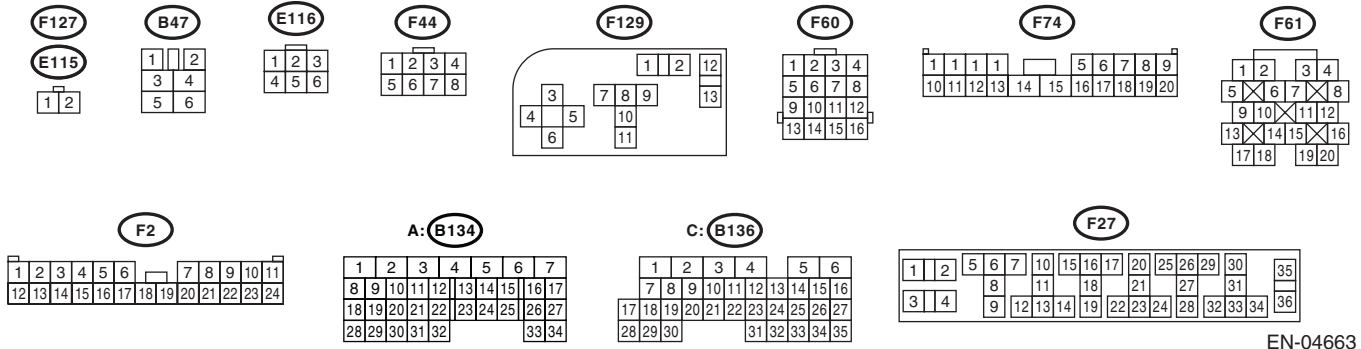
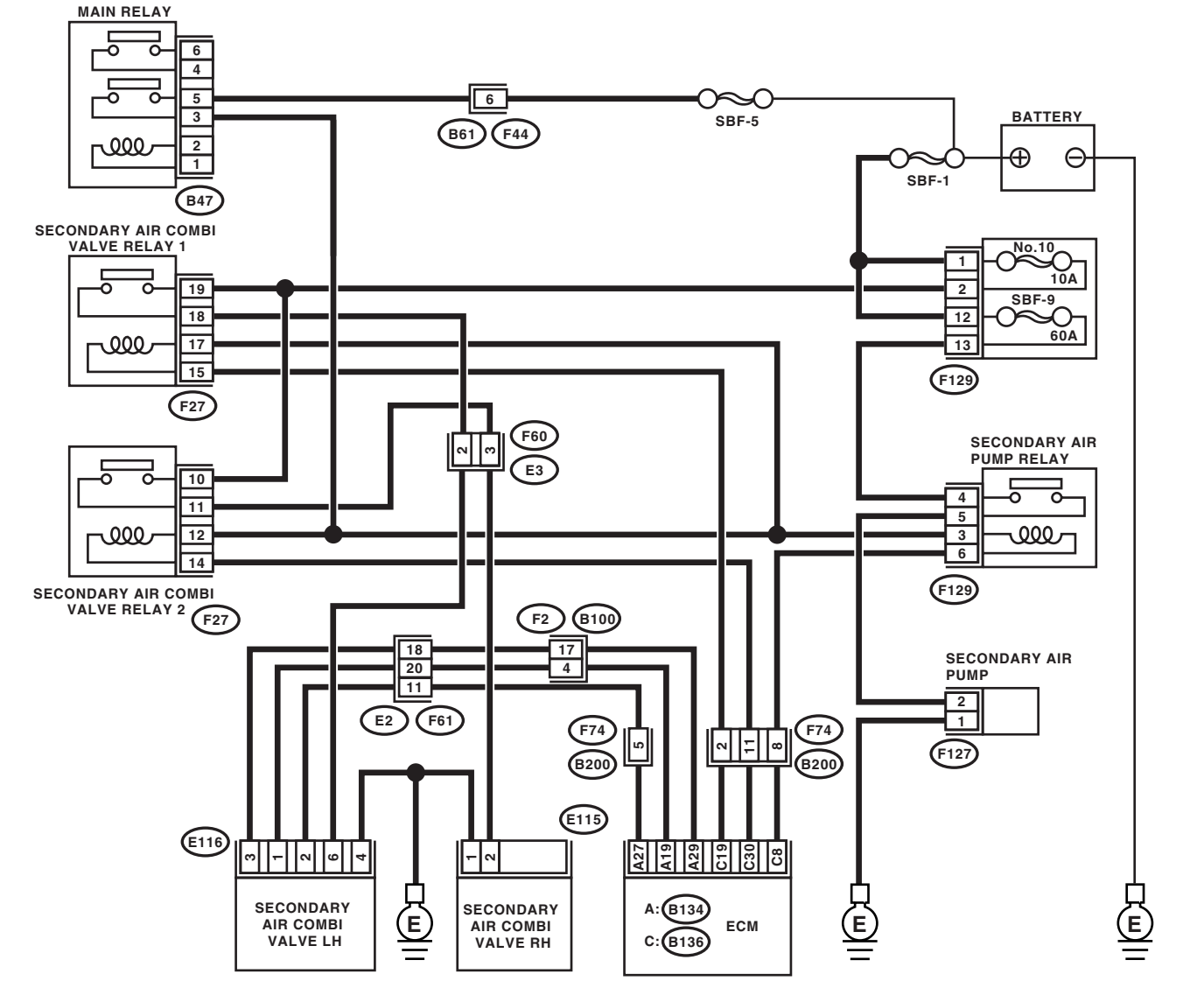
### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04663

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes   | No   |
|--|--|---|--|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY 1.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and secondary air combi valve relay 1.<br>3) Measure the resistance of harness between ECM and secondary air combi valve relay 1 terminal.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 30 — (F27) No. 14:</i> | Is the resistance less than 1 $\Omega$ ? | Go to step 2.   | Repair the open circuit in harness between ECM and secondary air combi valve relay 1 terminal. |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY 1.</b><br>Measure the voltage between ECM and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 30 (+) — Chassis ground (-):</i>  | Is the voltage more than 10 V?           | Repair the battery short circuit in harness between ECM and secondary air combi valve relay 1 terminal. | A temporary poor contact occurs. Check poor contact in connector.                              |

## BG:DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT OPEN

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-118, DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

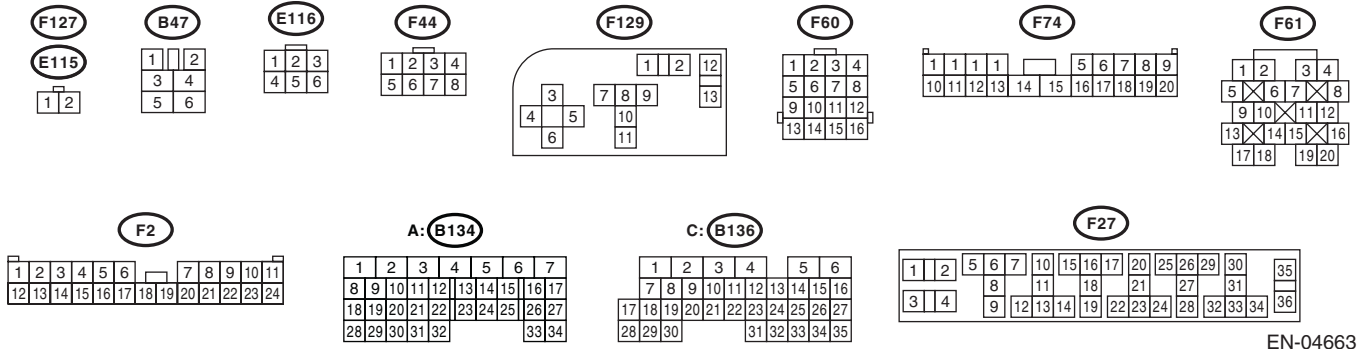
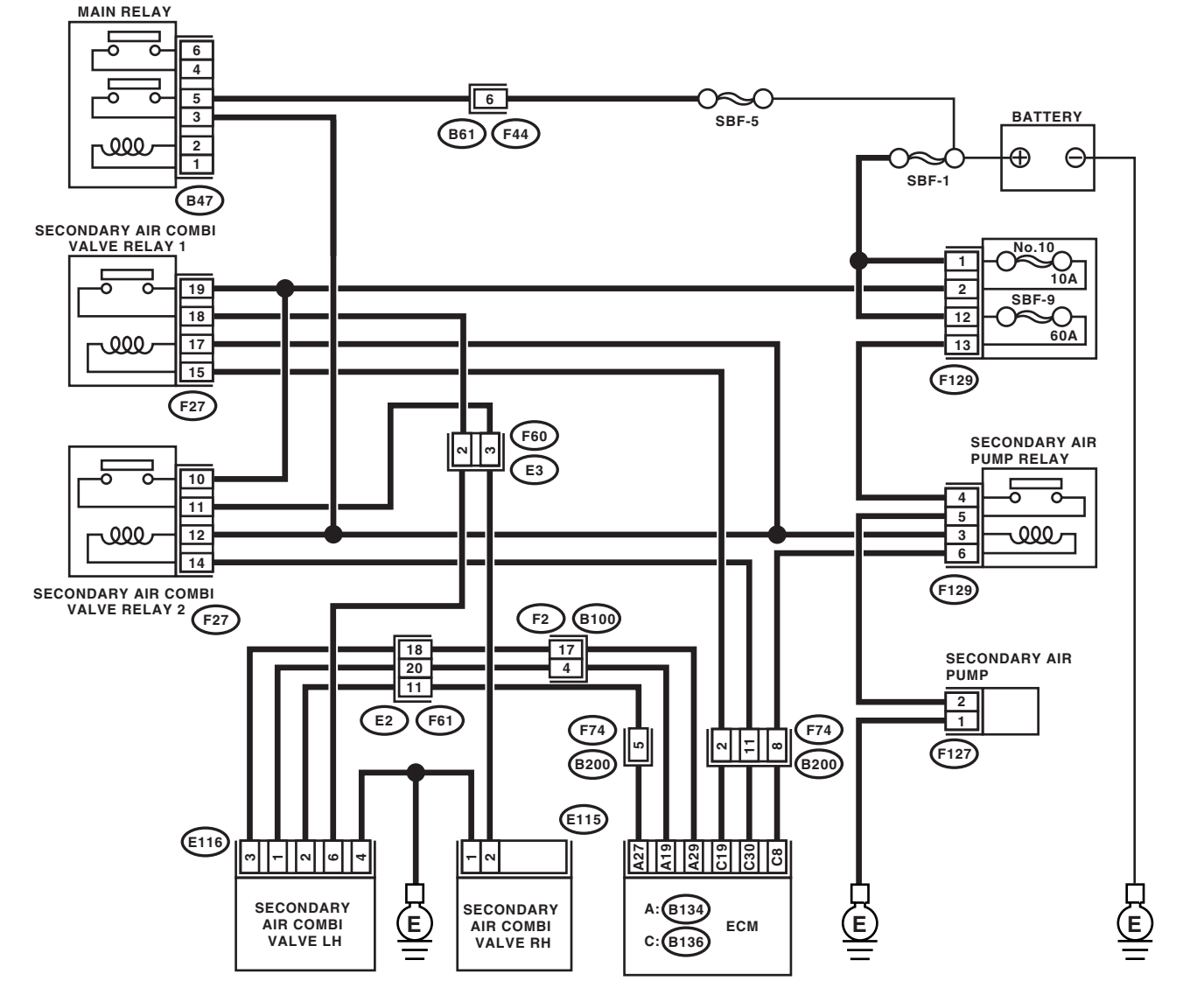
### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04663

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                      | Yes  | No   |
|--|--|--|--|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY 2.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and secondary air combi valve relay 2.<br>3) Measure the resistance of harness between ECM and secondary air combi valve relay 2 terminal.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 19 — (F27) No. 15:</i> | Is the resistance less than 1 $\Omega$ ?   | Go to step 2.  | Repair the open circuit in harness between ECM and secondary air combi valve relay 2 terminal.         |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY 2.</b><br>Measure the resistance of harness between ECM and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 19 — Chassis ground:</i>  | Is the resistance more than 1 M $\Omega$ ? | A temporary poor contact occurs.<br>Check poor contact in connector. | Repair the ground short circuit in harness between ECM and secondary air combi valve relay 2 terminal. |

### BH:DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED

#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-118, DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

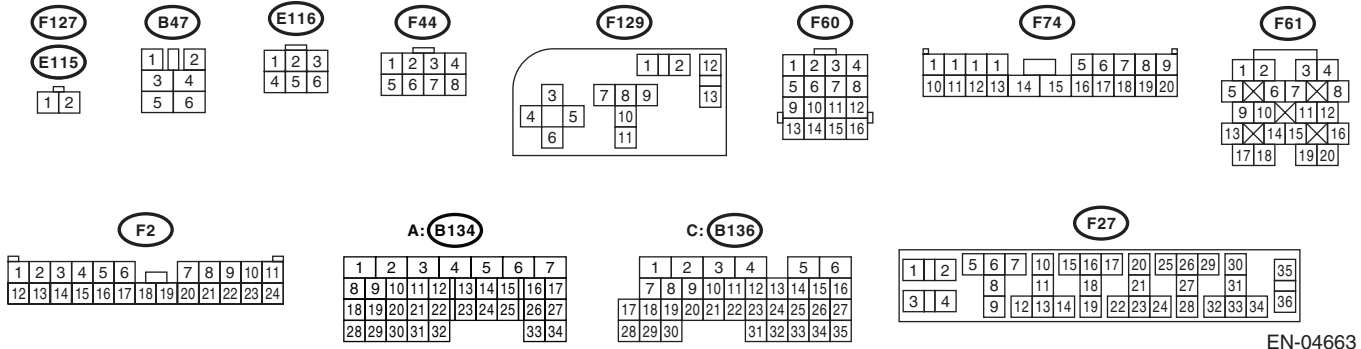
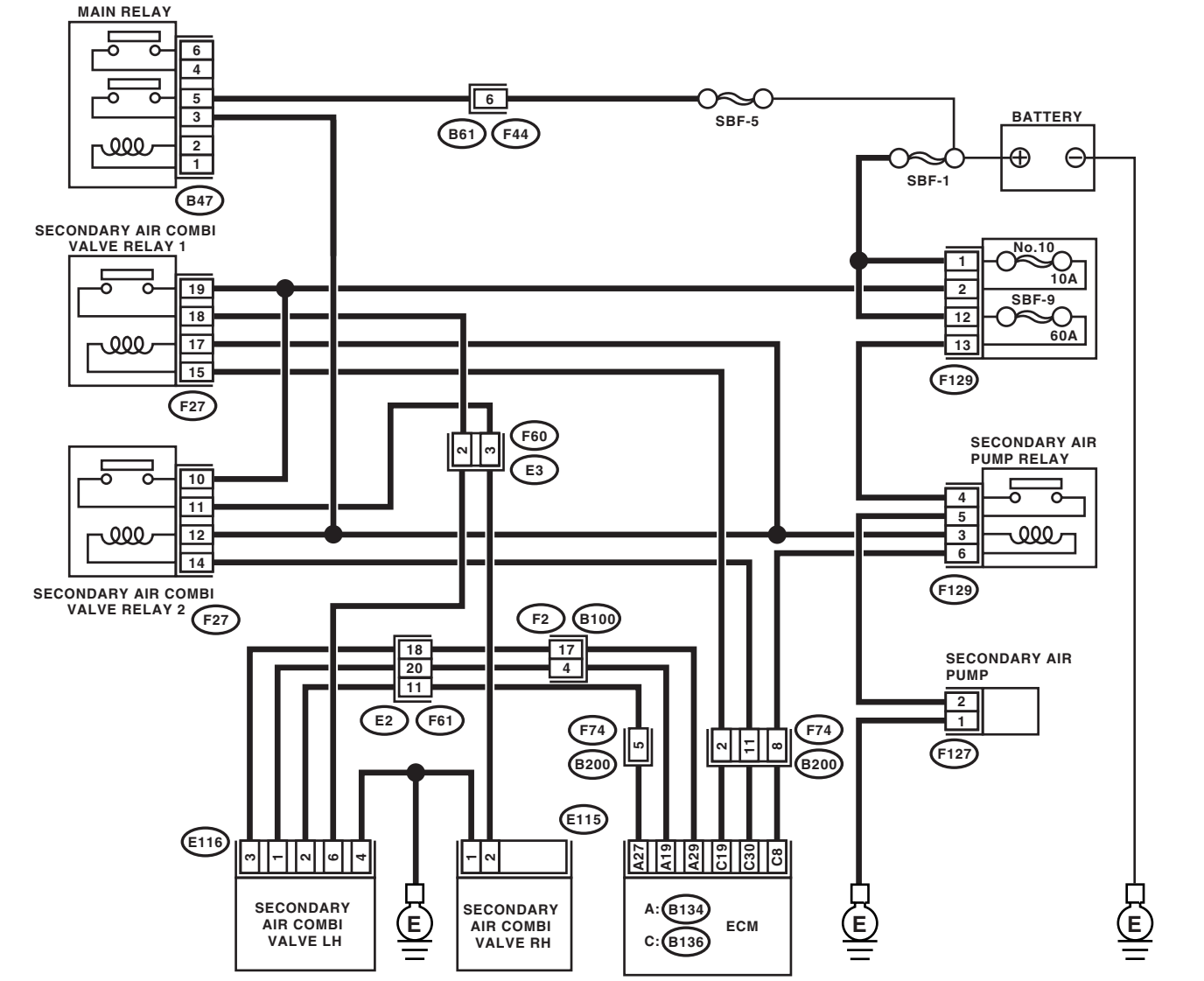
#### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04663



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes   | No   |
|--|--|---|--|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY 2.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and secondary air combi valve relay 2.<br>3) Measure the resistance of harness between ECM and secondary air combi valve relay 2 terminal.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 19 — (F27) No. 15:</i> | Is the resistance less than 1 $\Omega$ ? | Go to step 2.   | Repair the open circuit in harness between ECM and secondary air combi valve relay 2 terminal. |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY 2.</b><br>Measure the voltage between ECM and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 19 (+) — Chassis ground (-):</i>  | Is the voltage more than 10 V?           | Repair the battery short circuit in harness between ECM and secondary air combi valve relay 2 terminal. | A temporary poor contact occurs. Check poor contact in connector.                              |

### BI: DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT OPEN

#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-119, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

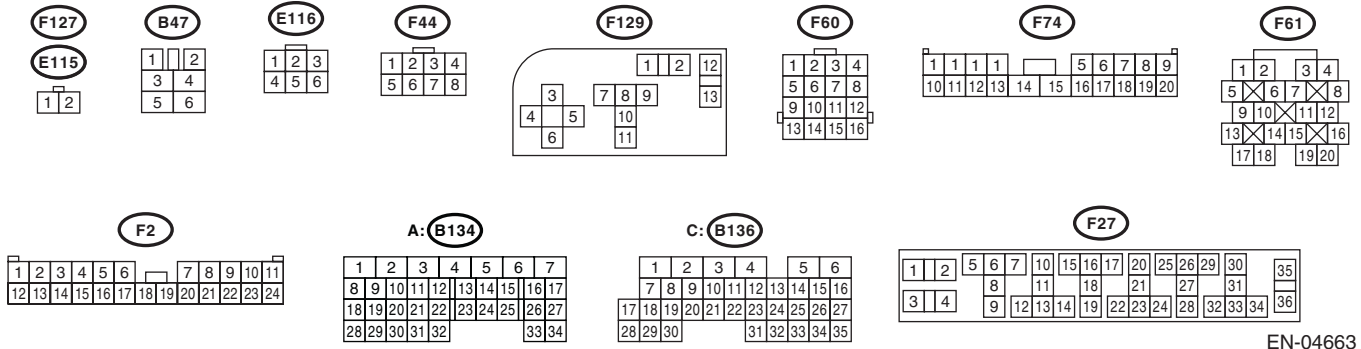
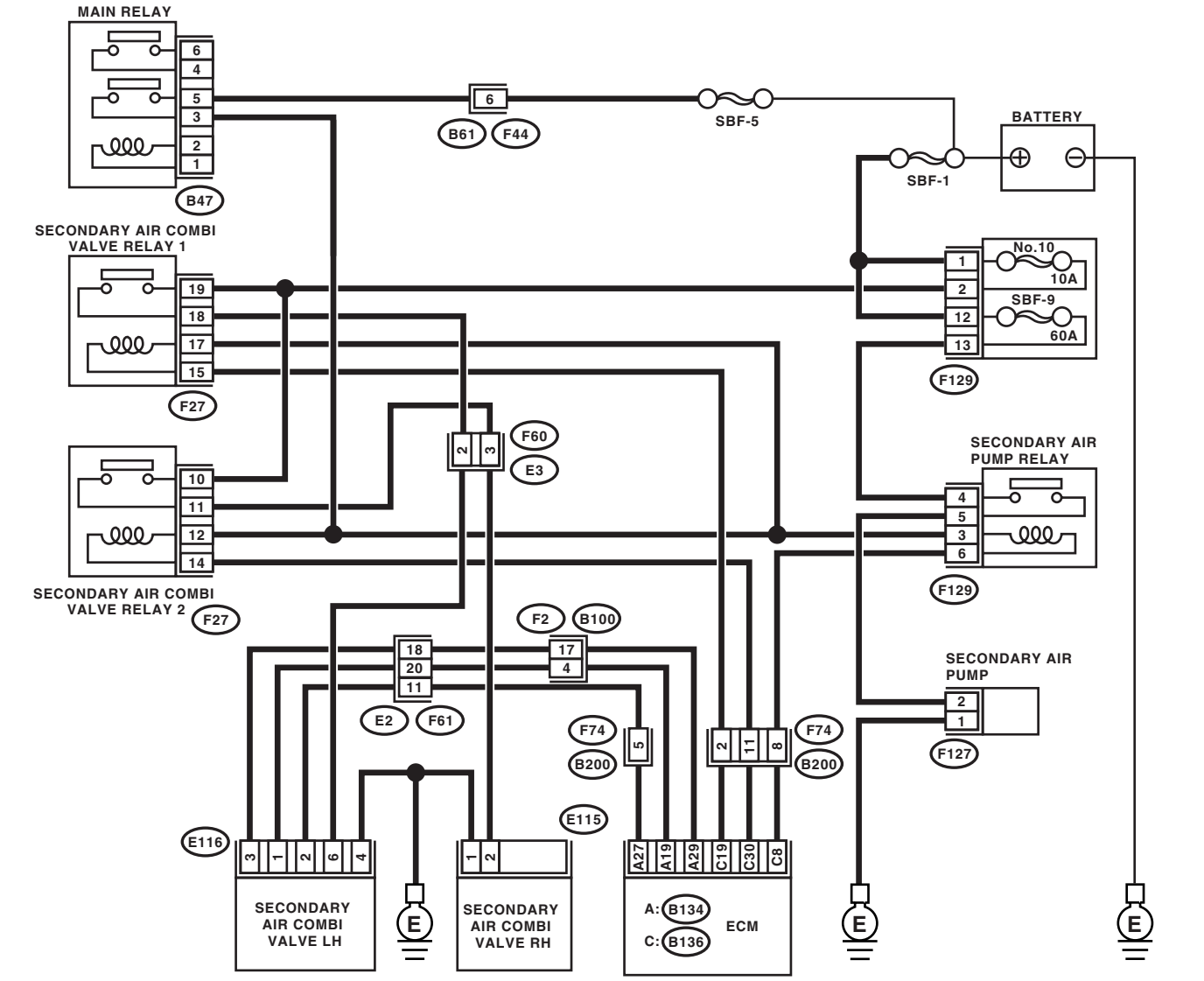
#### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04663

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                     | Yes  | No  |
|--|---|--|---|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and secondary air pump relay.<br>3) Measure the resistance of harness between ECM and secondary air pump relay terminal.<br><i>Connector &amp; terminal<br/>(B136) No. 8 — (F129) No. 6:</i> | Is the resistance less than 1 $\Omega$ ?  | Go to step 2.  | Repair the open circuit in harness between ECM and secondary air pump relay terminal.         |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY.</b><br>Measure the resistance of harness between ECM and chassis ground.<br><i>Connector &amp; terminal<br/>(B136) No. 8 — Chassis ground:</i>  | Is the resistance more than 1 $M\Omega$ ? | A temporary poor contact occurs.<br>Check poor contact in connector. | Repair the ground short circuit in harness between ECM and secondary air pump relay terminal. |

## BJ:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-120, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

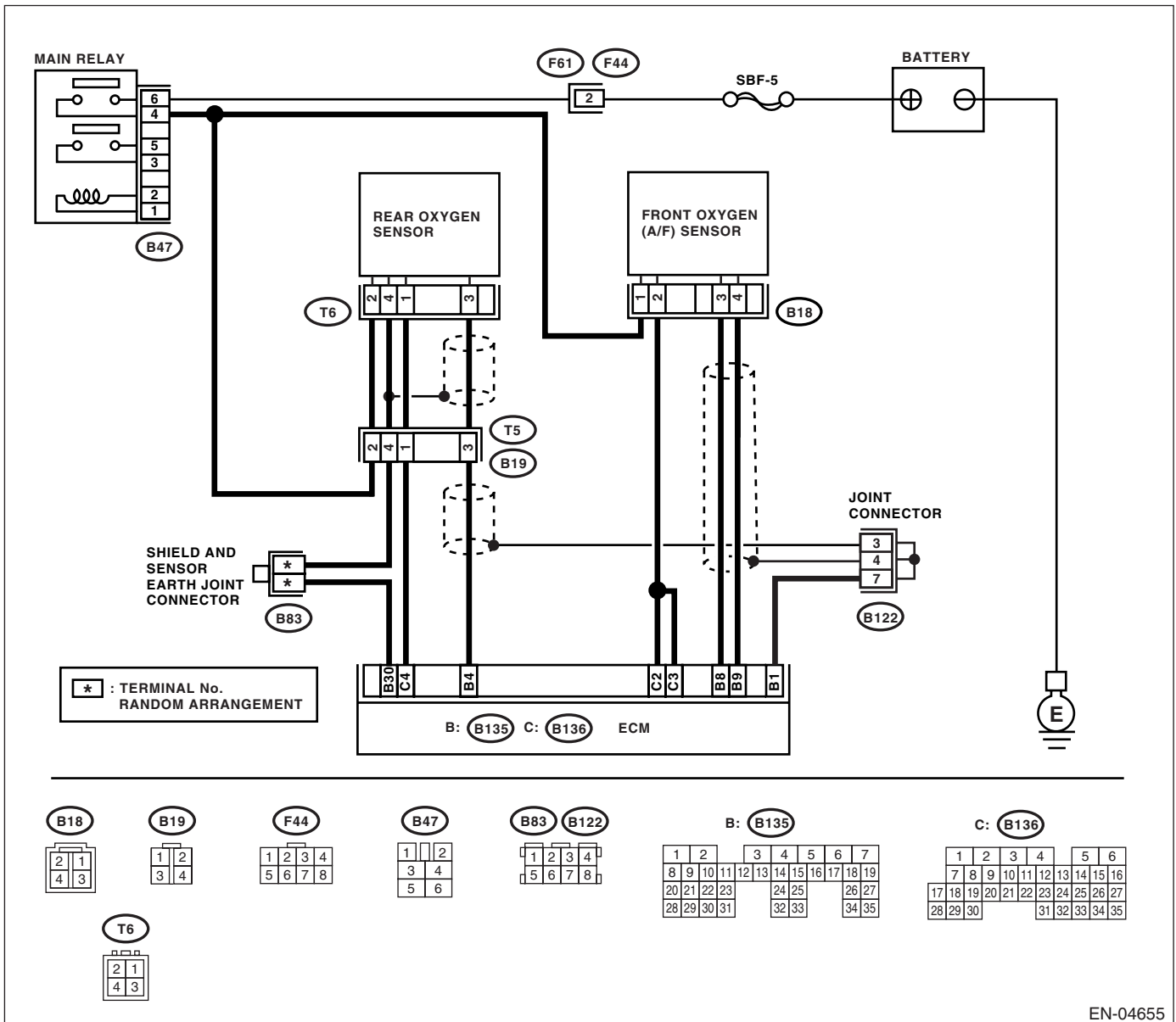
### TROUBLE SYMPTOM:

- Engine stalls.
- Idle mixture is out of specifications.

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check                               | Yes   | No            |
|---|-------------------------------------|---|---------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?         | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0420. | Go to step 2. |
| <b>2</b><br><b>CHECK EXHAUST SYSTEM.</b><br>Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes.<br><br>NOTE:<br>Check the following positions. <ul style="list-style-type: none"> <li>• Between cylinder head and front exhaust pipe</li> <li>• Between front exhaust pipe and front catalytic converter</li> <li>• Between front catalytic converter and rear catalytic converter</li> <li>• Looseness and incomplete installation of front oxygen (A/F) sensor and rear oxygen sensor</li> </ul> | Is there a fault in exhaust system? | Repair or replace the exhaust system. <Ref. to EX(H4DOTC)-2, General Description.>  | Go to step 3. |
| <b>3</b><br><b>CHECK WAVEFORM ON SUBARU SELECT MONITOR. (DURING DRIVING)</b><br>1) Drive at a constant speed of 80 — 113 km/h (50 — 70 MPH).<br>2) After leaving it in the condition of Step 1) for 5 minutes, read the waveform data using Subaru Select Monitor while driving. <Ref. to EN(H4DOTC)(diag)-20, ELECTRICAL SPECIFICATION, Engine Control Module (ECM) I/O Signal.>   | Is normal waveform displayed?       | Contact your SOA Service Center since deterioration of some parts may be the cause.   | Go to step 4. |
| <b>4</b><br><b>CHECK WAVEFORM ON SUBARU SELECT MONITOR. (DURING IDLING)</b><br>1) Run the vehicle at idle.<br>2) In the condition of Step 1), read the waveform data using Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-20, ELECTRICAL SPECIFICATION, Engine Control Module (ECM) I/O Signal.>  | Is normal waveform displayed?       | Go to step 10.  | Go to step 5. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                   | Yes   | No  |
|---|---|---|---|
| <p><b>5 CHECK VOLTAGE OF REAR OXYGEN SENSOR.</b></p> <p>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest)</p> <p>2) Read the rear oxygen sensor voltage using Subaru Select Monitor.</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• For MT model, depress the clutch pedal.</li> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</p> | <p>Is the voltage more than 490 mV?</p> | <p>Go to step <b>9</b>.</p>   | <p>Go to step <b>6</b>.</p>   |
| <p><b>6 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</b></p>  | <p>Is there water in connector?</p>     | <p>Remove infiltrating water completely.</p>  | <p>Go to step <b>7</b>.</p>   |
| <p><b>7 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connectors from ECM and rear oxygen sensor.</p> <p>3) Measure the resistance of harness between ECM and rear oxygen sensor connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B135) No. 4 — (T6) No. 3:</b><br/> <b>(B135) No. 30 — (T6) No. 4:</b></p>   | <p>Is the resistance more than 3 Ω?</p> | <p>Repair the open circuit in harness between ECM and rear oxygen sensor connector.</p> | <p>Go to step <b>8</b>.</p>   |
| <p><b>8 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between rear oxygen sensor connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T6) No. 3 (+) — Chassis ground (-):</b></p>  | <p>Is the voltage 0.2 — 0.5 V?</p>      | <p>Go to step <b>11</b>.</p>  | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>           Repair the following items.</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>• Poor contact of rear oxygen sensor and ECM connector</li> <li>• Poor contact in ECM connector</li> </ul> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check                               | Yes  | No  |
|---|-------------------------------------|--|---|
| <b>9 CHECK VOLTAGE OF REAR OXYGEN SENSOR.</b><br>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed from 3,000 rpm.<br>2) Read the rear oxygen sensor voltage using Subaru Select Monitor.<br>NOTE:<br>• For MT model, depress the clutch pedal.<br>• Subaru Select Monitor<br>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> | Is the voltage less than 250 mV?    | Contact your SOA Service Center since deterioration of some parts may be the cause.    | Go to step 6.   |
| <b>10 CHECK CATALYTIC CONVERTER.</b>  | Is the catalytic converter damaged? | Replace the catalytic converter.<br><Ref. to EC(H4DOTC)-5, Front Catalytic Converter.> | Contact your SOA Service Center since deterioration of some parts may be the cause. |
| <b>11 CHECK REAR OXYGEN SENSOR SHIELD.</b><br>1) Turn the ignition switch to OFF.<br>2) Bare the sensor shield of body side harness of rear oxygen sensor connector.<br>3) Measure the resistance between sensor shield and chassis ground.   | Is the resistance less than 1 Ω?    | Replace the rear oxygen sensor.<br><Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.>        | Repair the open circuit in rear oxygen sensor harness.                              |

### BK:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-123, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### TROUBLE SYMPTOM:

- Fuel odor
- There is a hole of more than 1.0 mm (0.04 in) dia. in evaporation system or fuel tank.

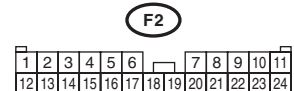
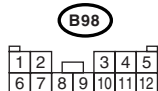
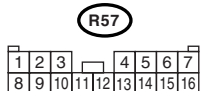
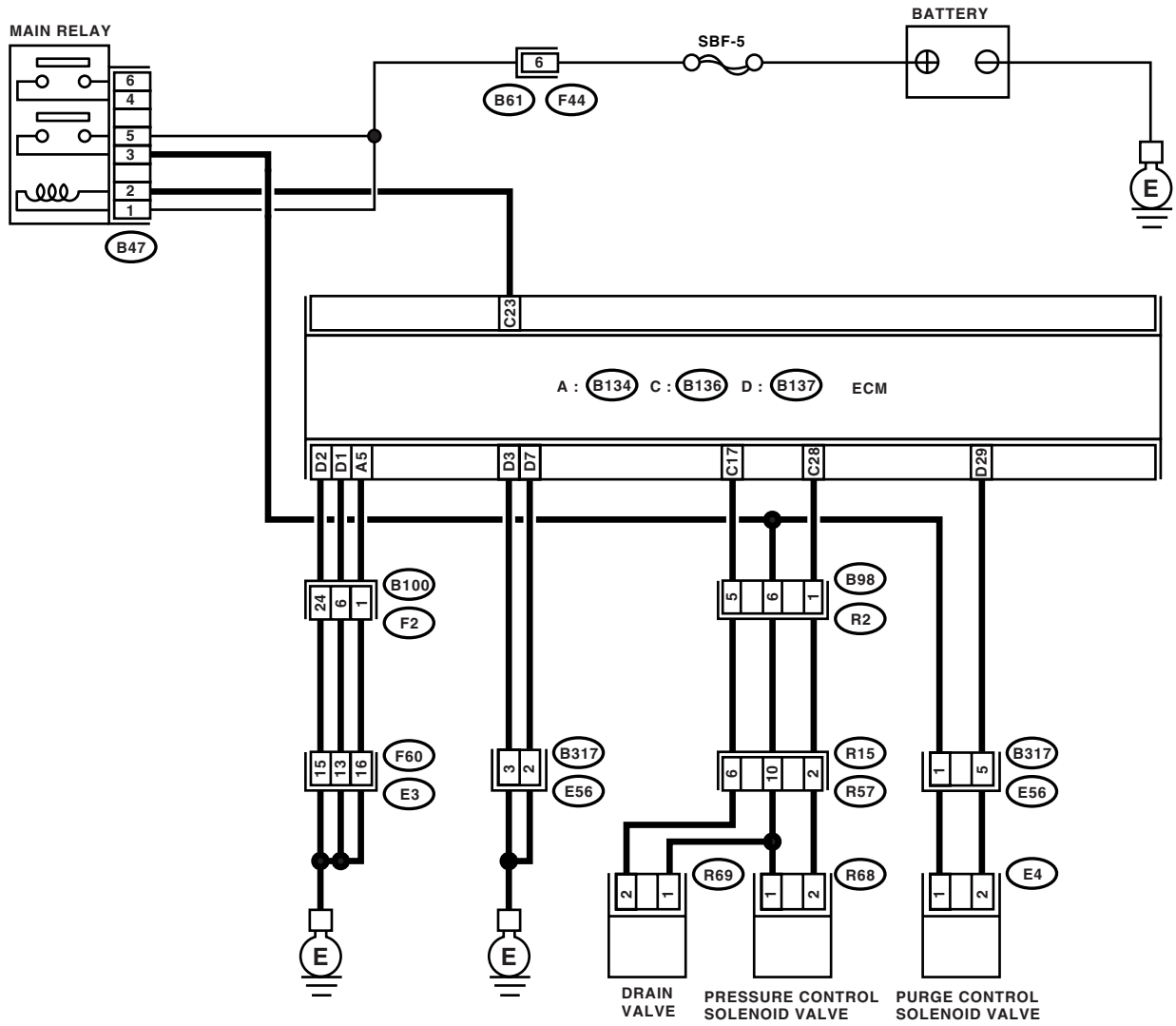
#### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

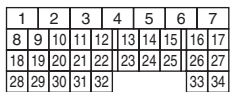
# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

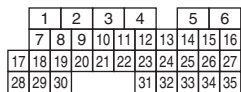
## WIRING DIAGRAM:



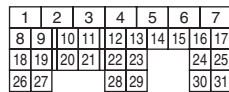
A : B134



C : B136



D : B137



F44



EN-04708



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step     | Check  | Yes   | No  |  |
|----------|--|---|---|--|
| <b>1</b> | <b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> | Go to step 2.  |
| <b>2</b> | <b>CHECK FUEL FILLER CAP.</b><br>1) Turn ignition switch to OFF.<br>2) Check the fuel filler cap.<br><br>NOTE:<br>The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.  | Is the fuel filler cap tightened securely?                                    | Go to step 3.   | Tighten fuel filler cap securely.  |
| <b>3</b> | <b>CHECK FUEL FILLER CAP.</b>  | Is the fuel filler cap SUBARU genuine?  | Go to step 4.   | Replace with a SUBARU genuine fuel filler cap.   |
| <b>4</b> | <b>CHECK FUEL FILLER PIPE SEAL.</b>  | Is there any damage to the seal between fuel filler cap and fuel filler pipe? | Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-54, Fuel Filler Pipe.>  | Go to step 5.  |
| <b>5</b> | <b>CHECK DRAIN VALVE.</b><br>1) Connect the test mode connector.<br>2) Turn ignition switch to ON.<br>3) Operate the drain valve.<br><br>NOTE:<br>Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.> | Does the drain valve operate?   | Go to step 6.   | Replace the drain valve. <Ref. to EC(H4DOTC)-20, Drain Valve.>   |
| <b>6</b> | <b>CHECK PURGE CONTROL SOLENOID VALVE.</b><br>Operate the purge control solenoid valve.<br><br>NOTE:<br>Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>                          | Does the purge control solenoid valve operate?                                | Go to step 7.   | Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>        |
| <b>7</b> | <b>CHECK PRESSURE CONTROL SOLENOID VALVE.</b><br>Operate the pressure control solenoid valve.<br><br>NOTE:<br>Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>                 | Does the pressure control solenoid valve operate?                             | Go to step 8.   | Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-16, Pressure Control Solenoid Valve.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step      | Check  | Yes  | No  |   |
|-----------|--|--|---|---|
| <b>8</b>  | <b>CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.</b><br>Turn ignition switch to OFF. | Is there a hole of more than 1.0 mm (0.04 in) dia. on evaporation line?  | Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-65, Fuel Delivery, Return and Evaporation lines.> | Go to step <b>9</b> .   |
| <b>9</b>  | <b>CHECK CANISTER.</b>   | Is the canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?   | Repair or replace the canister. <Ref. to EC(H4DOTC)-7, Canister.>   | Go to step <b>10</b> .  |
| <b>10</b> | <b>CHECK FUEL TANK.</b><br>Remove the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>   | Is the fuel tank damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?  | Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>  | Go to step <b>11</b> .  |
| <b>11</b> | <b>CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.</b>      | Are there holes of more than 1.0 mm (0.04 in) dia., cracks, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system? | Repair or replace the hoses or pipes.   | Contact your SOA Service Center since deterioration of some parts may be the cause. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BL:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

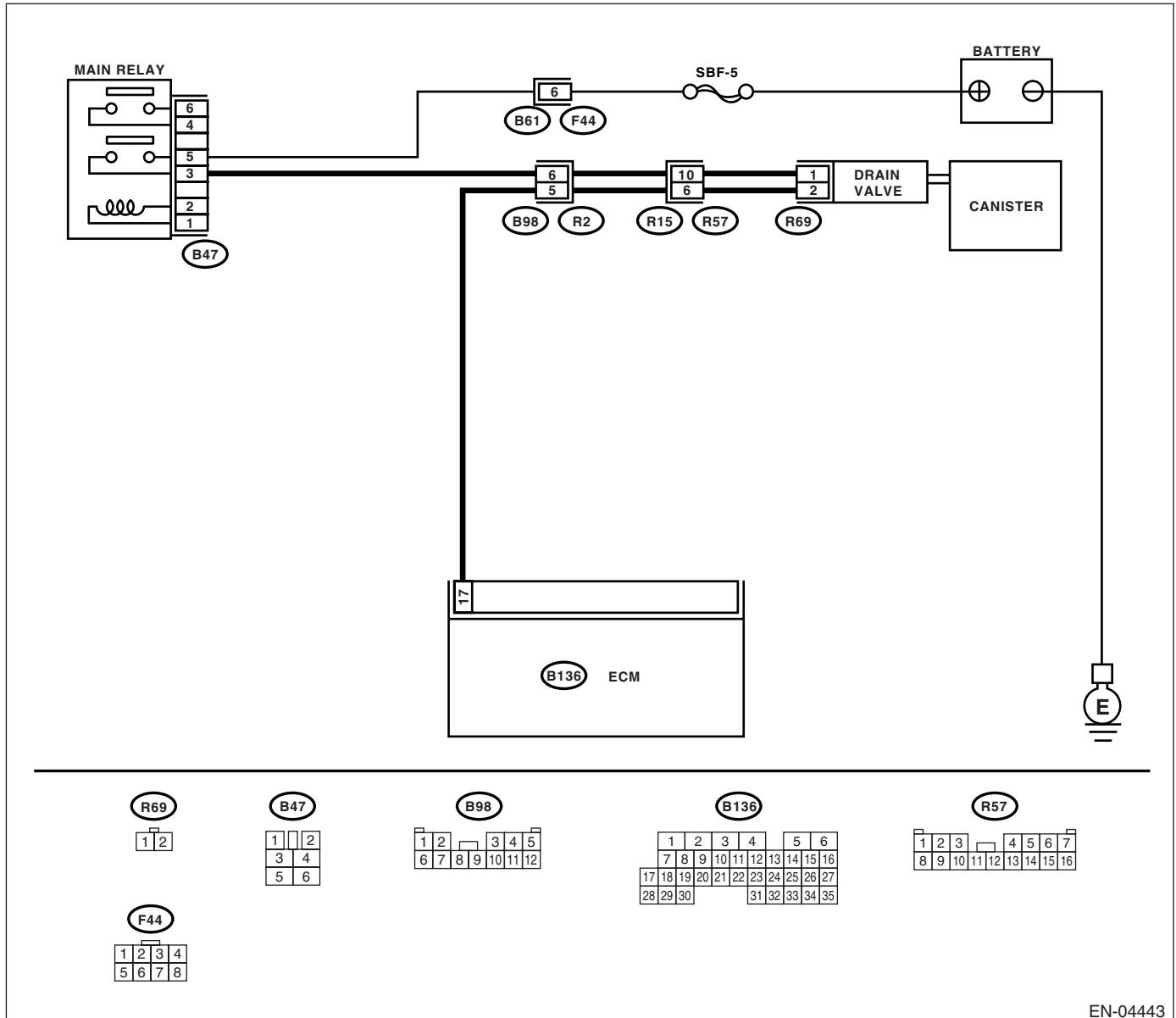
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-139, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes                                   | No   |
|---|--|---------------------------------------|--|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 17 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 10 V?             | Go to step 2.                         | Go to step 3.  |
| <b>2</b><br><b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.  | Is there poor contact in ECM connector?    | Repair poor contact in ECM connector. | The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.<br>(However, the possibility of poor contact still remains.)<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Poor contact in drain valve connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>3</b><br><b>CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connectors from drain valve and ECM.<br>3) Measure the resistance of harness between drain valve connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(R69) No. 2 — Chassis ground:</b></i> | Is the resistance more than 1 M $\Omega$ ? | Go to step 4.                         | Repair short circuit to ground in harness between ECM and drain valve connector.   |
| <b>4</b><br><b>CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM and drain valve connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 17 — (R69) No. 2:</b></i>   | Is the resistance less than 1 $\Omega$ ?   | Go to step 5.                         | Repair harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and drain valve connector</li> <li>• Poor contact in coupling connector</li> </ul>  |
| <b>5</b><br><b>CHECK DRAIN VALVE.</b><br>Measure the resistance between drain valve terminals.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i>   | Is the resistance 10 — 100 $\Omega$ ?      | Go to step 6.                         | Replace the drain valve. <Ref. to EC(H4DOTC)-20, Drain Valve.>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <b>6</b><br><b>CHECK POWER SUPPLY TO DRAIN VALVE.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between drain valve and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R69) No. 1 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?                  | Go to step 7.                                 | Repair harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"><li>• Open circuit in harness between main relay and drain valve</li><li>• Poor contact in coupling connector</li><li>• Poor contact in main relay connector</li></ul> |
| <b>7</b><br><b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in drain valve connector.   | Is there poor contact in drain valve connector? | Repair poor contact in drain valve connector. | Contact your SOA Service Center since deterioration of some parts may be the cause.   |

## BM:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

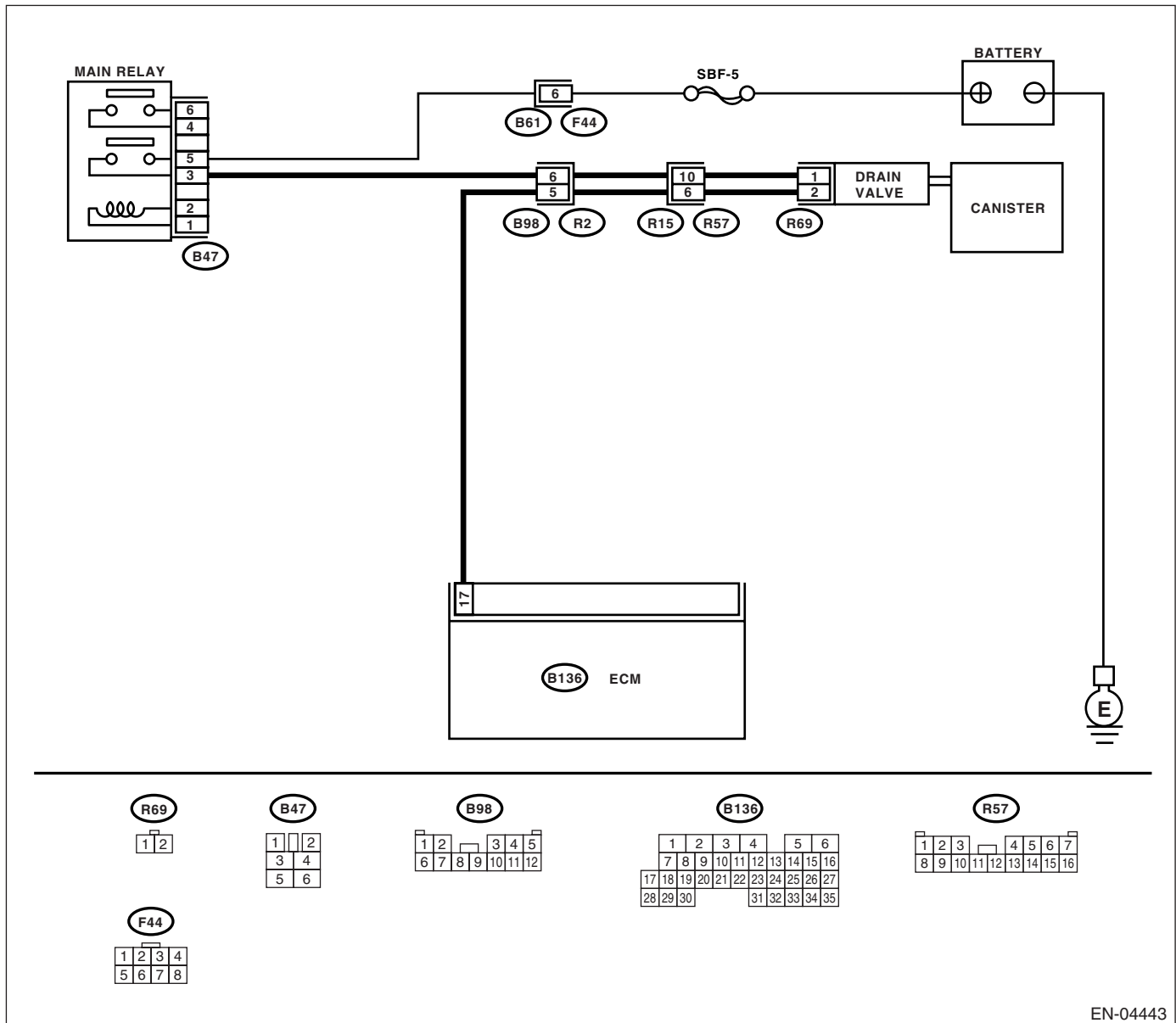
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-141, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

### WIRING DIAGRAM:



EN-04443

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check                                       | Yes   | No   |
|---|---|---|--|
| <b>1 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn ignition switch to OFF.<br>2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side).<br>3) Turn ignition switch to ON.<br>4) While operating the drain valve, measure voltage between ECM and chassis ground.<br>NOTE:<br>Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode".<br><Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.><br><b>Connector &amp; terminal</b><br><b>(B136) No. 17 (+) — Chassis ground (-):</b> | Does the resistance change within 0 — 10 V? | Go to step 2.   | The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector. |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 17 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?              | Go to step 4.   | Go to step 3.  |
| <b>3 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.  | Is there poor contact in ECM connector?     | Repair poor contact in ECM connector.   | Replace the ECM.<br><Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>  |
| <b>4 CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from drain valve.<br>3) Turn ignition switch to ON.<br>4) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 17 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?              | Repair short circuit to battery in harness between ECM and drain valve connector. After repair, replace the ECM.<br><Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Go to step 5.  |
| <b>5 CHECK DRAIN VALVE.</b><br>1) Turn ignition switch to OFF.<br>2) Measure the resistance between drain valve terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>   | Is the resistance less than 1 $\Omega$ ?    | Replace the drain valve and ECM.<br><Ref. to EC(H4DOTC)-20, Drain Valve.><br><Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>  | Go to step 6.  |
| <b>6 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.  | Is there poor contact in ECM connector?     | Repair poor contact in ECM connector.   | Replace the ECM.<br><Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>  |

### BN:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

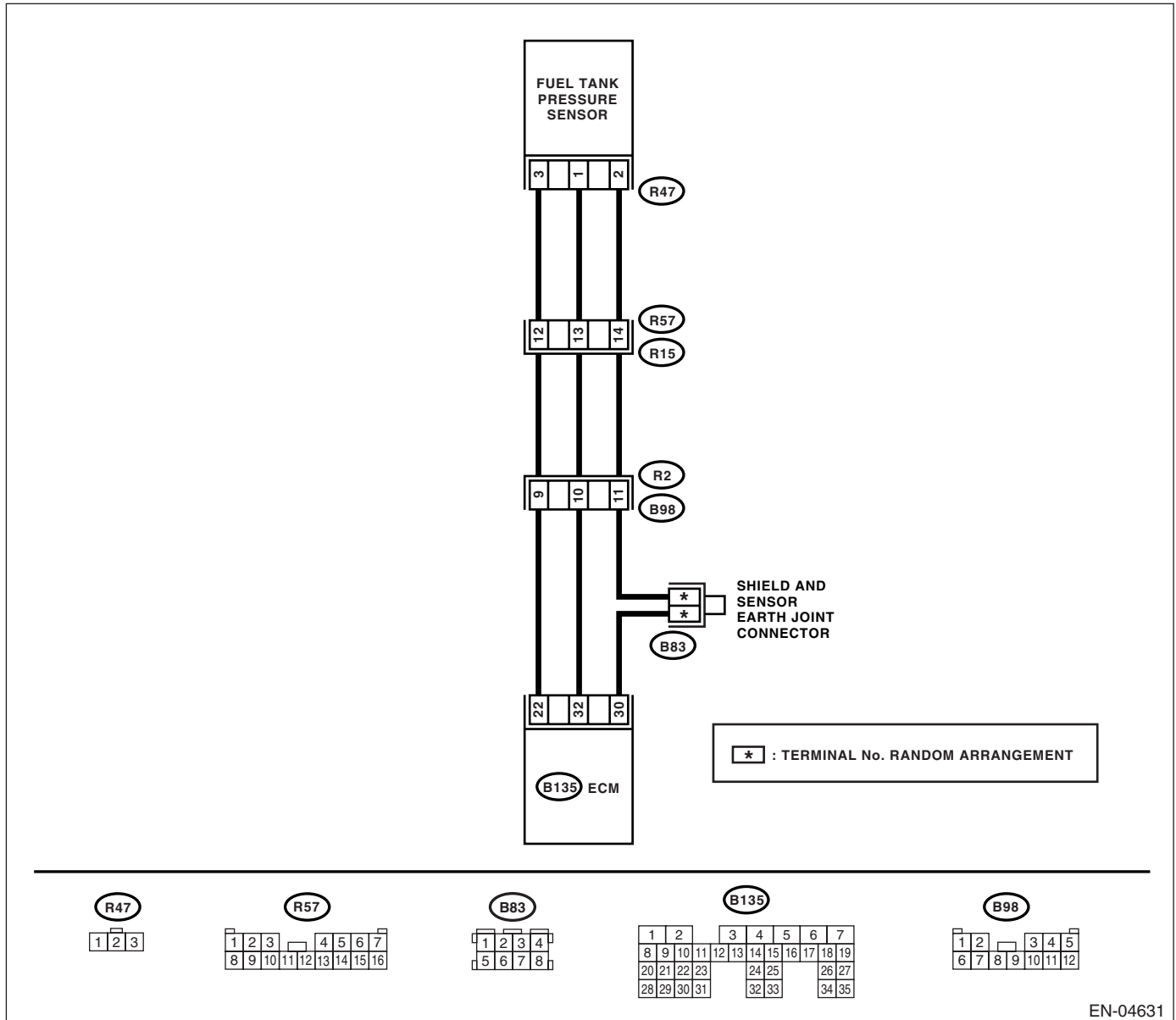
ENGINE (DIAGNOSTICS)

- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-143, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

## CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

## WIRING DIAGRAM:



EN-04631



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes   | No   |
|---|--|---|--|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?                | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> | Go to step <b>2</b> .  |
| <b>2</b><br><b>CHECK FUEL FILLER CAP.</b><br>1) Turn ignition switch to OFF.<br>2) Open the fuel filler flap lid.   | Is the fuel filler cap tightened securely? | Go to step <b>3</b> .   | Tighten fuel filler cap securely.  |
| <b>3</b><br><b>CHECK PRESSURE/VACUUM LINE.</b><br>NOTE:<br>Check the following items. <ul style="list-style-type: none"><li>• Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank</li><li>• Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank</li></ul> | Is there a fault in pressure/vacuum line?  | Repair or replace the hoses and pipes.  | Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-15, Fuel Tank Pressure Sensor.> |

## BO:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

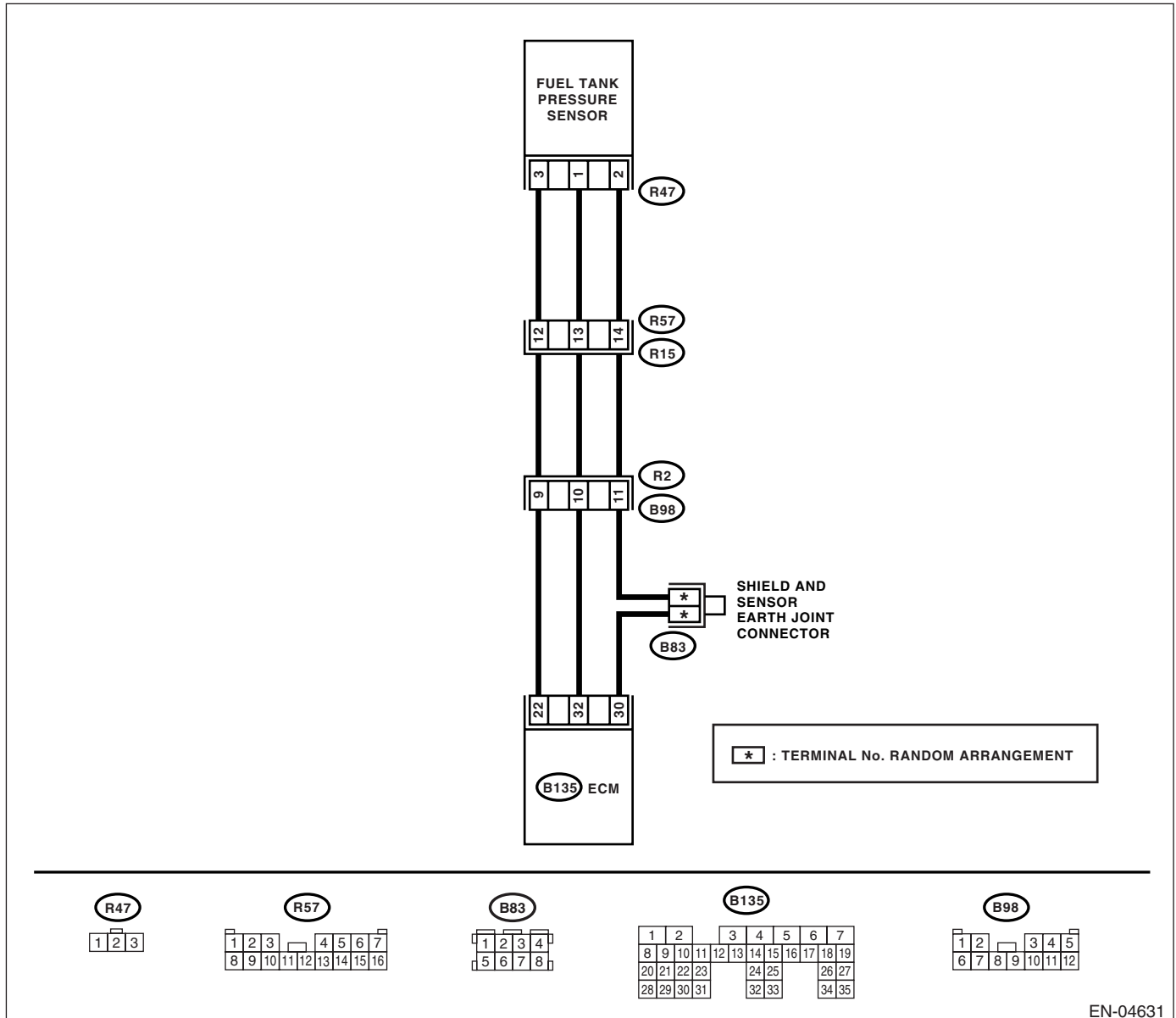
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-145, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

### WIRING DIAGRAM:



EN-04631

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes                                   | No   |
|--|--|---------------------------------------|--|
| <p><b>1 CHECK CURRENT DATA.</b></p> <p>1) Turn ignition switch to OFF.<br/>2) Remove the fuel filler cap.<br/>3) Install the fuel filler cap.<br/>4) Turn ignition switch to ON.<br/>5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the general scan tool.</p> <p>NOTE:<br/>• Subaru Select Monitor<br/>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;<br/>• General scan tool<br/>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | Is the measured value less than -2.8 kPa (-21.0 mmHg, -0.827 inHg)?                          | Go to step 2.                         | The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.   |
| <p><b>2 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b></p> <p>Measure the voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B135) No. 22 (+) — Chassis ground (-):</b></p>  | Is the voltage more than 4.5 V?  | Go to step 4.                         | Go to step 3.  |
| <p><b>3 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b></p> <p>Measure the voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B135) No. 22 (+) — Chassis ground (-):</b></p>  | Does the measured value exceed the specified value by shaking the ECM harness and connector? | Repair poor contact in ECM connector. | Contact your SOA Service Center since deterioration of some parts may be the cause.  |
| <p><b>4 CHECK INPUT SIGNAL FOR ECM.</b></p> <p>Measure the voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B135) No. 32 (+) — Chassis ground (-):</b></p>   | Is the voltage less than 0.2 V?  | Go to step 6.                         | Go to step 5.  |
| <p><b>5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)</b></p> <p>Read the data of fuel tank pressure sensor signal using Subaru Select Monitor.</p> <p>NOTE:<br/>• Subaru Select Monitor<br/>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</p>  | Does the measured value exceed the specified value by shaking the ECM harness and connector? | Repair poor contact in ECM connector. | Go to step 6.  |
| <p><b>6 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b></p> <p>1) Turn ignition switch to OFF.<br/>2) Remove the rear seat cushion.<br/>3) Separate rear wiring harness and fuel tank cord.<br/>4) Turn ignition switch to ON.<br/>5) Measure the voltage between rear wiring harness connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(R15) No. 12 (+) — Chassis ground (-):</b></p>  | Is the voltage more than 4.5 V?  | Go to step 7.                         | Repair harness and connector.<br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ECM and rear wiring harness connector<br>• Poor contact in coupling connector |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No   |
|--|--|--|--|
| <p><b>7</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b><br/>                     1) Turn ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM.<br/>                     3) Measure the resistance of harness between ECM and rear wiring harness connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B135) No. 30 — (R15) No. 14:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p>            | <p>Go to step <b>8</b>.</p>  | <p>Repair harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and rear wiring harness connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |
| <p><b>8</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b><br/>                     Measure the resistance of harness between rear wiring harness connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(R15) No. 14 — Chassis ground:</b></p>  | <p>Is the resistance more than 1 <math>M\Omega</math>?</p>           | <p>Go to step <b>9</b>.</p>  | <p>Repair short circuit to ground in harness between ECM and rear wiring harness connector.</p>  |
| <p><b>9</b></p> <p><b>CHECK FUEL TANK CORD.</b><br/>                     1) Disconnect the connector from fuel tank pressure sensor.<br/>                     2) Measure the resistance of fuel tank cord.</p> <p><b>Connector &amp; terminal</b><br/> <b>(R57) No. 12 — (R47) No. 3:</b></p>  | <p>Is the resistance less than 1 <math>\Omega</math>?</p>            | <p>Go to step <b>10</b>.</p>                                       | <p>Repair open circuit in fuel tank cord.</p>  |
| <p><b>10</b></p> <p><b>CHECK FUEL TANK CORD.</b><br/>                     Measure the resistance of fuel tank cord.</p> <p><b>Connector &amp; terminal</b><br/> <b>(R57) No. 14 — (R47) No. 2:</b></p>   | <p>Is the resistance less than 1 <math>\Omega</math>?</p>            | <p>Go to step <b>11</b>.</p>                                       | <p>Repair open circuit in fuel tank cord.</p>  |
| <p><b>11</b></p> <p><b>CHECK FUEL TANK CORD.</b><br/>                     Measure the resistance of harness between fuel tank pressure sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(R47) No. 1 — Chassis ground:</b></p>  | <p>Is the resistance more than 1 <math>M\Omega</math>?</p>           | <p>Go to step <b>12</b>.</p>                                       | <p>Repair short circuit to ground in fuel tank cord.</p>   |
| <p><b>12</b></p> <p><b>CHECK FOR POOR CONTACT.</b><br/>                     Check for poor contact in fuel tank pressure sensor connector.</p>   | <p>Is there poor contact in fuel tank pressure sensor connector?</p> | <p>Repair poor contact in fuel tank pressure sensor connector.</p> | <p>Replace the fuel tank pressure sensor. &lt;Ref. to EC(H4DOTC)-15, Fuel Tank Pressure Sensor.&gt;</p>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BP:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

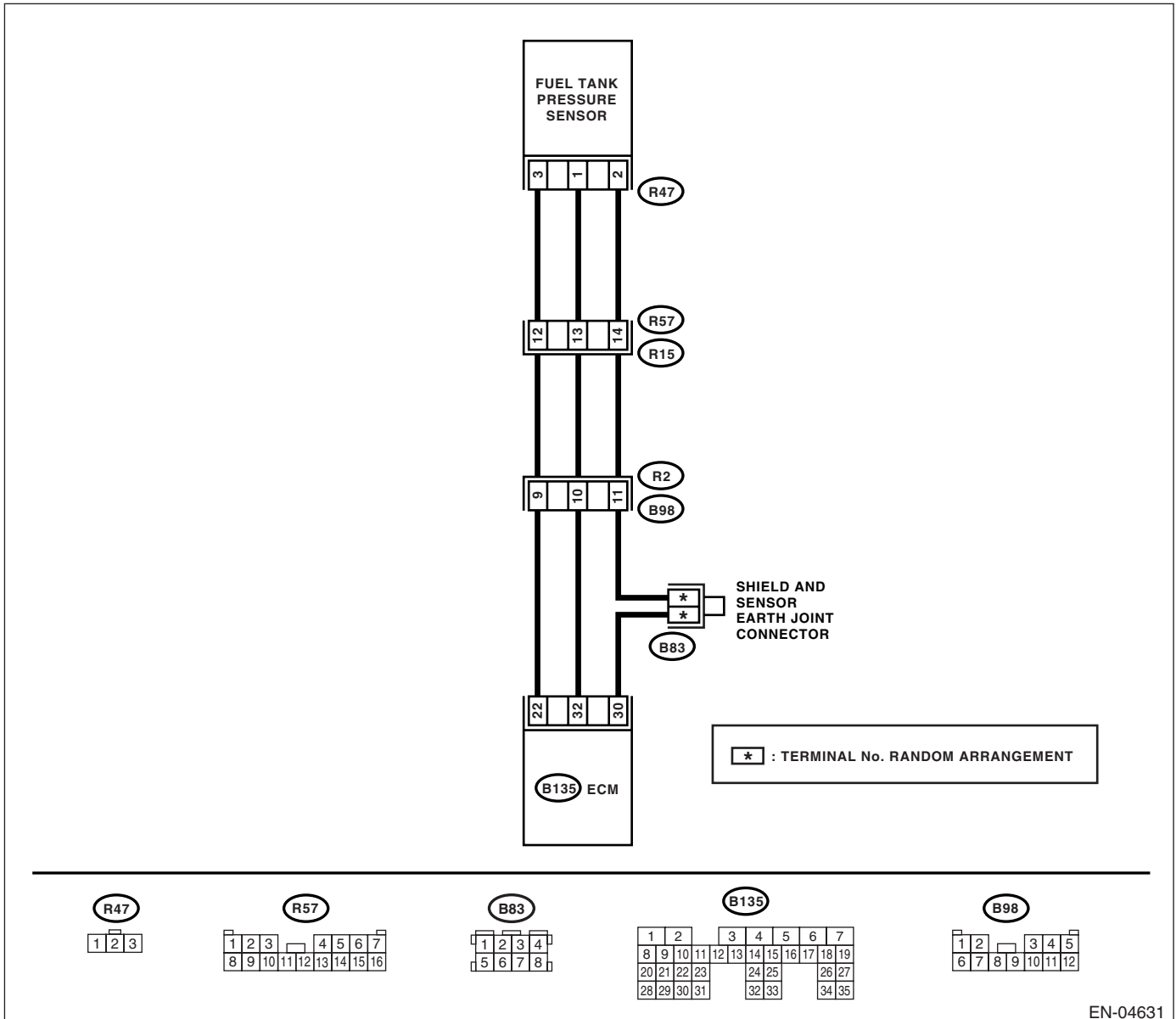
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-147, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04631

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes  | No  |
|---|---|--|---|
| <p><b>1</b></p> <p><b>CHECK CURRENT DATA.</b></p> <ol style="list-style-type: none"> <li>1) Turn ignition switch to OFF.</li> <li>2) Remove the fuel filler cap.</li> <li>3) Install the fuel filler cap.</li> <li>4) Turn ignition switch to ON.</li> <li>5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the general scan tool.</li> </ol> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)</p>          | <p>Go to step 11.</p>                        | <p>Go to step 2.</p>  |
| <p><b>2</b></p> <p><b>CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b></p> <p>Measure the voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B135) No. 22 (+) — Chassis ground (-):</b></p>   | <p>Is the voltage more than 4.5 V?</p>  | <p>Go to step 4.</p>                         | <p>Go to step 3.</p>  |
| <p><b>3</b></p> <p><b>CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b></p> <p>Measure the voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B135) No. 22 (+) — Chassis ground (-):</b></p>   | <p>Does the measured value change by shaking the ECM harness and connector?</p> | <p>Repair poor contact in ECM connector.</p> | <p>Replace the ECM. &lt;Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).&gt;</p>   |
| <p><b>4</b></p> <p><b>CHECK INPUT SIGNAL FOR ECM.</b></p> <p>Measure the voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B135) No. 32 (+) — Chassis ground (-):</b></p>  | <p>Is the voltage less than 0.2 V?</p>  | <p>Go to step 6.</p>                         | <p>Go to step 5.</p>  |
| <p><b>5</b></p> <p><b>CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)</b></p> <p>Read the data of fuel tank pressure sensor signal using Subaru Select Monitor.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</p>  | <p>Does the measured value change by shaking the ECM harness and connector?</p> | <p>Repair poor contact in ECM connector.</p> | <p>Go to step 6.</p>  |
| <p><b>6</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b></p> <ol style="list-style-type: none"> <li>1) Turn ignition switch to OFF.</li> <li>2) Remove the rear seat cushion.</li> <li>3) Separate rear wiring harness and fuel tank cord.</li> <li>4) Turn ignition switch to ON.</li> <li>5) Measure the voltage between rear wiring harness connector and chassis ground.</li> </ol> <p><b>Connector &amp; terminal</b><br/><b>(R15) No. 12 (+) — Chassis ground (-):</b></p>  | <p>Is the voltage more than 4.5 V?</p>  | <p>Go to step 7.</p>                         | <p>Repair harness and connector.</p> <p>NOTE:<br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and rear wiring harness connector</li> <li>• Poor contact in coupling connector</li> </ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <b>7 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM and rear wiring harness connector.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 30 — (R15) No. 14:</b><br><b>(B135) No. 32 — (R15) No. 13:</b>   | Is the resistance less than 1 $\Omega$ ?                         | Go to step <b>8</b> .   | Repair harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and rear wiring harness connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>8 CHECK FUEL TANK CORD.</b><br>1) Disconnect the connector from fuel tank pressure sensor.<br>2) Measure the resistance of fuel tank cord.<br><br><b>Connector &amp; terminal</b><br><b>(R57) No. 13 — (R47) No. 1:</b>  | Is the resistance less than 1 $\Omega$ ?                         | Go to step <b>9</b> .   | Repair open circuit in fuel tank cord.   |
| <b>9 CHECK FUEL TANK CORD.</b><br>Measure the resistance of fuel tank cord.<br><br><b>Connector &amp; terminal</b><br><b>(R57) No. 14 — (R47) No. 2:</b>  | Is the resistance less than 1 $\Omega$ ?                         | Go to step <b>10</b> .  | Repair open circuit in fuel tank cord.   |
| <b>10 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in fuel tank pressure sensor connector.   | Is there poor contact in fuel tank pressure sensor connector?    | Repair poor contact in fuel tank pressure sensor connector.                                     | Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-15, Fuel Tank Pressure Sensor.>   |
| <b>11 CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from fuel tank pressure sensor.<br>3) Turn ignition switch to ON.<br>4) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the general scan tool.<br><br>NOTE:<br><ul style="list-style-type: none"> <li>• Subaru Select Monitor<br/>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</li> <li>• General scan tool<br/>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</li> </ul> | Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)? | Repair short circuit to battery in harness between ECM and fuel tank pressure sensor connector. | Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-15, Fuel Tank Pressure Sensor.>   |

## **BQ:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)**

### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-148, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

- Fuel odor
- There is a hole of more than 0.5 mm (0.020 in) dia. in evaporation system or fuel tank.

### **CAUTION:**

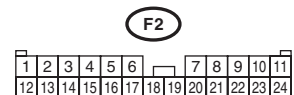
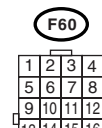
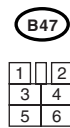
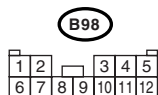
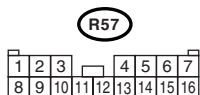
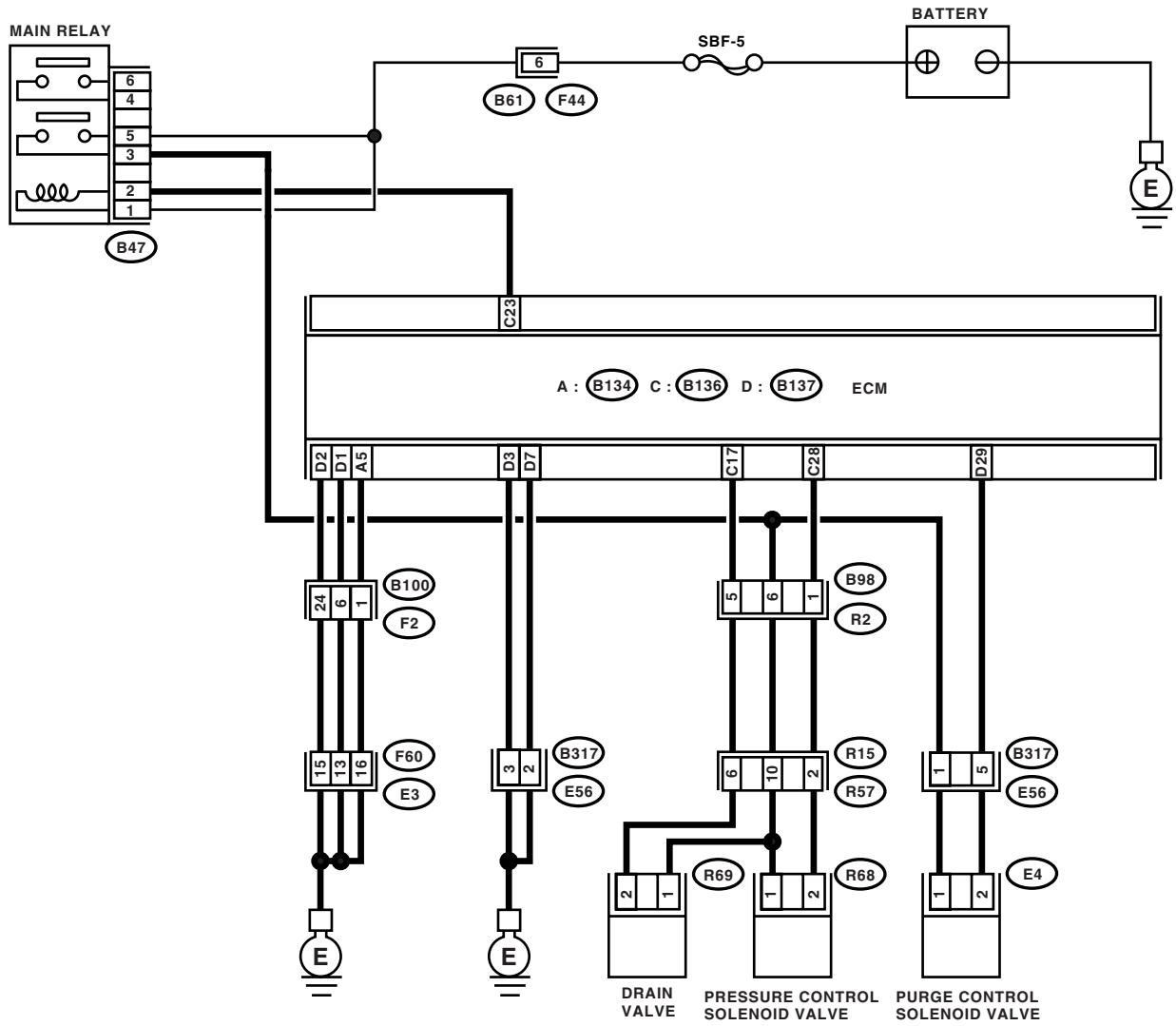
**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**



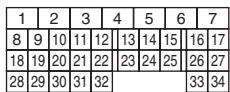
# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

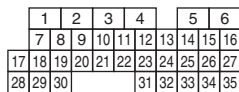
## WIRING DIAGRAM:



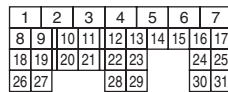
A : B134



C : B136



D : B137



F44



EN-04708

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step     | Check   | Yes   | No  |  |
|----------|---|---|---|--|
| <b>1</b> | <b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> | Go to step 2.  |
| <b>2</b> | <b>CHECK FUEL FILLER CAP.</b><br>1) Turn ignition switch to OFF.<br>2) Check the fuel filler cap.<br><br>NOTE:<br>The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.   | Is the fuel filler cap tightened securely?                                    | Go to step 3.   | Tighten fuel filler cap securely.  |
| <b>3</b> | <b>CHECK FUEL FILLER CAP.</b>   | Is the fuel filler cap SUBARU genuine?  | Go to step 4.   | Replace with a SUBARU genuine fuel filler cap.   |
| <b>4</b> | <b>CHECK FUEL FILLER PIPE SEAL.</b>   | Is there any damage to the seal between fuel filler cap and fuel filler pipe? | Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-54, Fuel Filler Pipe.>  | Go to step 5.  |
| <b>5</b> | <b>CHECK DRAIN VALVE.</b><br>1) Connect the test mode connector.<br>2) Turn ignition switch to ON.<br>3) Operate the drain valve.<br><br>NOTE:<br>Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.> | Does the drain valve operate?   | Go to step 6.   | Replace the drain valve. <Ref. to EC(H4DOTC)-20, Drain Valve.>                                     |
| <b>6</b> | <b>CHECK PURGE CONTROL SOLENOID VALVE.</b><br>Operate the purge control solenoid valve.<br><br>NOTE:<br>Purge control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>                          | Does the purge control solenoid valve operate?                                | Go to step 7.   | Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>    |
| <b>7</b> | <b>CHECK PRESSURE CONTROL SOLENOID VALVE.</b><br>Operate the pressure control solenoid valve.<br><br>NOTE:<br>Pressure control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>                 | Does the pressure control solenoid valve operate?                             | Go to step 8.   | Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step      | Check  | Yes   | No  |   |
|-----------|--|---|---|---|
| <b>8</b>  | <b>CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.</b><br>Turn ignition switch to OFF. | Is there a hole of more than 0.5 mm (0.020 in) dia. on evaporation line?  | Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-65, Fuel Delivery, Return and Evaporation lines.> | Go to step <b>9</b> .   |
| <b>9</b>  | <b>CHECK CANISTER.</b>   | Is the canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?   | Repair or replace the canister. <Ref. to EC(H4DOTC)-7, Canister.>   | Go to step <b>10</b> .  |
| <b>10</b> | <b>CHECK FUEL TANK.</b><br>Remove the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>   | Is the fuel tank damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?  | Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>  | Go to step <b>11</b> .  |
| <b>11</b> | <b>CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.</b>      | Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system? | Repair or replace the hoses or pipes.   | Contact your SOA Service Center since deterioration of some parts may be the cause. |

### **BR:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)**

#### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-148, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Fuel odor
- Fuel filler cap is loose or not installed.

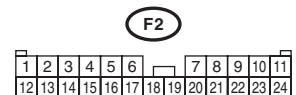
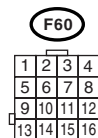
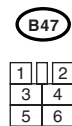
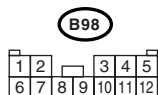
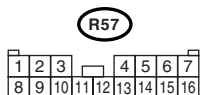
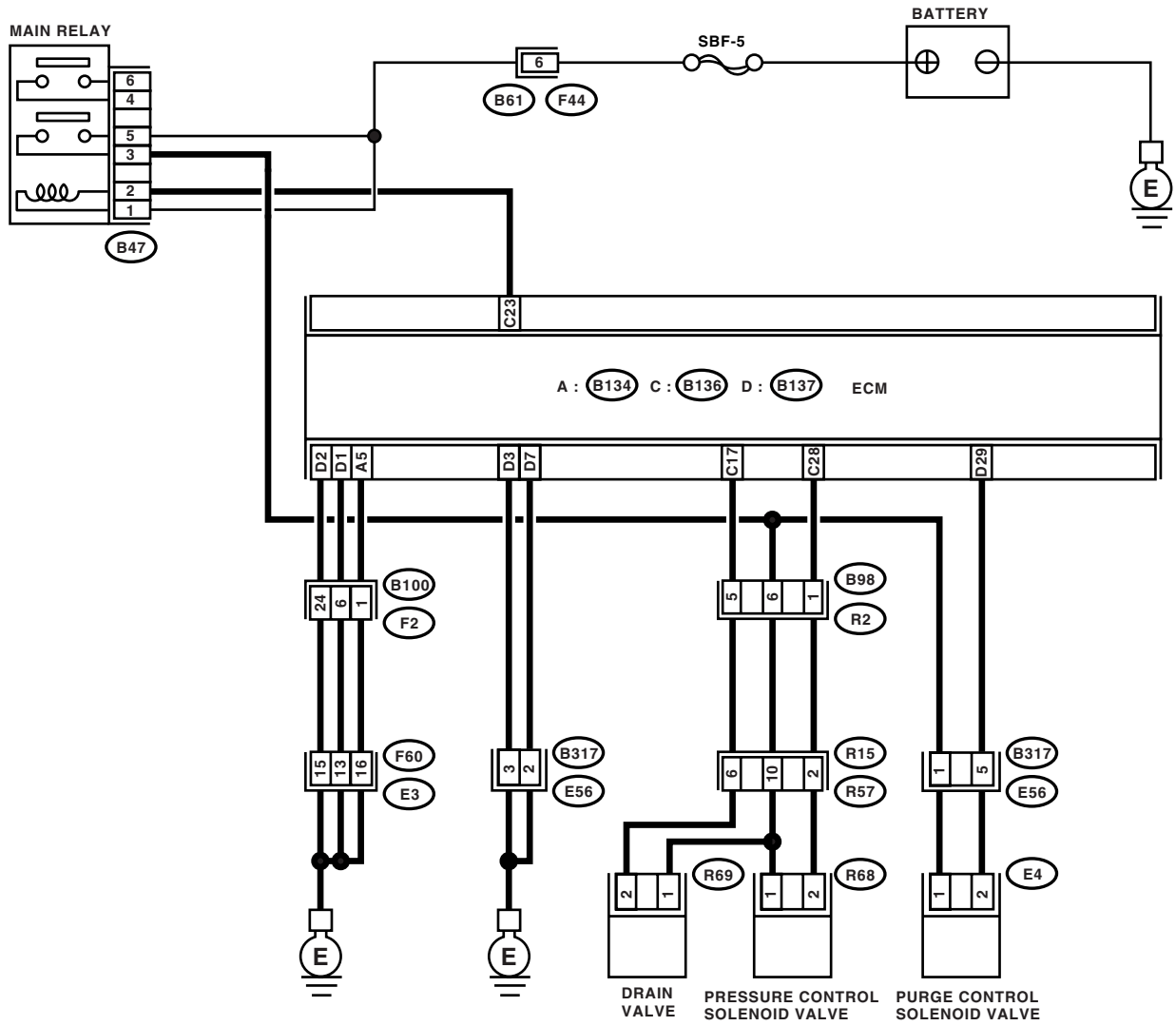
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

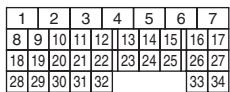
# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

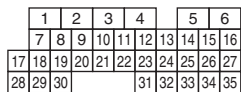
## WIRING DIAGRAM:



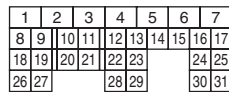
A: B134



C: B136



D: B137



F44



EN-04708

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step     | Check   | Yes   | No  |  |
|----------|---|---|---|--|
| <b>1</b> | <b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> | Go to step 2.  |
| <b>2</b> | <b>CHECK FUEL FILLER CAP.</b><br>1) Turn ignition switch to OFF.<br>2) Check the fuel filler cap.<br><br>NOTE:<br>The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.   | Is the fuel filler cap tightened securely?                                    | Go to step 3.   | Tighten fuel filler cap securely.  |
| <b>3</b> | <b>CHECK FUEL FILLER CAP.</b>   | Is the fuel filler cap SUBARU genuine?  | Go to step 4.   | Replace with a SUBARU genuine fuel filler cap.   |
| <b>4</b> | <b>CHECK FUEL FILLER PIPE SEAL.</b>   | Is there any damage to the seal between fuel filler cap and fuel filler pipe? | Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-54, Fuel Filler Pipe.>  | Go to step 5.  |
| <b>5</b> | <b>CHECK DRAIN VALVE.</b><br>1) Connect the test mode connector.<br>2) Turn ignition switch to ON.<br>3) Operate the drain valve.<br><br>NOTE:<br>Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.> | Does the drain valve operate?   | Go to step 6.   | Replace the drain valve. <Ref. to EC(H4DOTC)-20, Drain Valve.>                                     |
| <b>6</b> | <b>CHECK PURGE CONTROL SOLENOID VALVE.</b><br>Operate the purge control solenoid valve.<br><br>NOTE:<br>Purge control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>                          | Does the purge control solenoid valve operate?                                | Go to step 7.   | Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>    |
| <b>7</b> | <b>CHECK PRESSURE CONTROL SOLENOID VALVE.</b><br>Operate the pressure control solenoid valve.<br><br>NOTE:<br>Pressure control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>                 | Does the pressure control solenoid valve operate?                             | Go to step 8.   | Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.> |
| <b>8</b> | <b>CHECK CANISTER.</b>  | Is the canister damaged?  | Repair or replace the canister. <Ref. to EC(H4DOTC)-7, Canister.>   | Go to step 9.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No  |
|--|---|--|---|
| <b>9</b><br><b>CHECK FUEL TANK.</b><br>Remove the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.> | Is the fuel tank damaged?   | Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.> | Go to step <b>10</b> .  |
| <b>10</b><br><b>CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.</b>   | Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, or disconnections, misconnection of hoses or pipes in evaporative emission control system? | Repair or replace the hoses or pipes.                                | Contact your SOA Service Center since deterioration of some parts may be the cause. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BS:DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-149, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

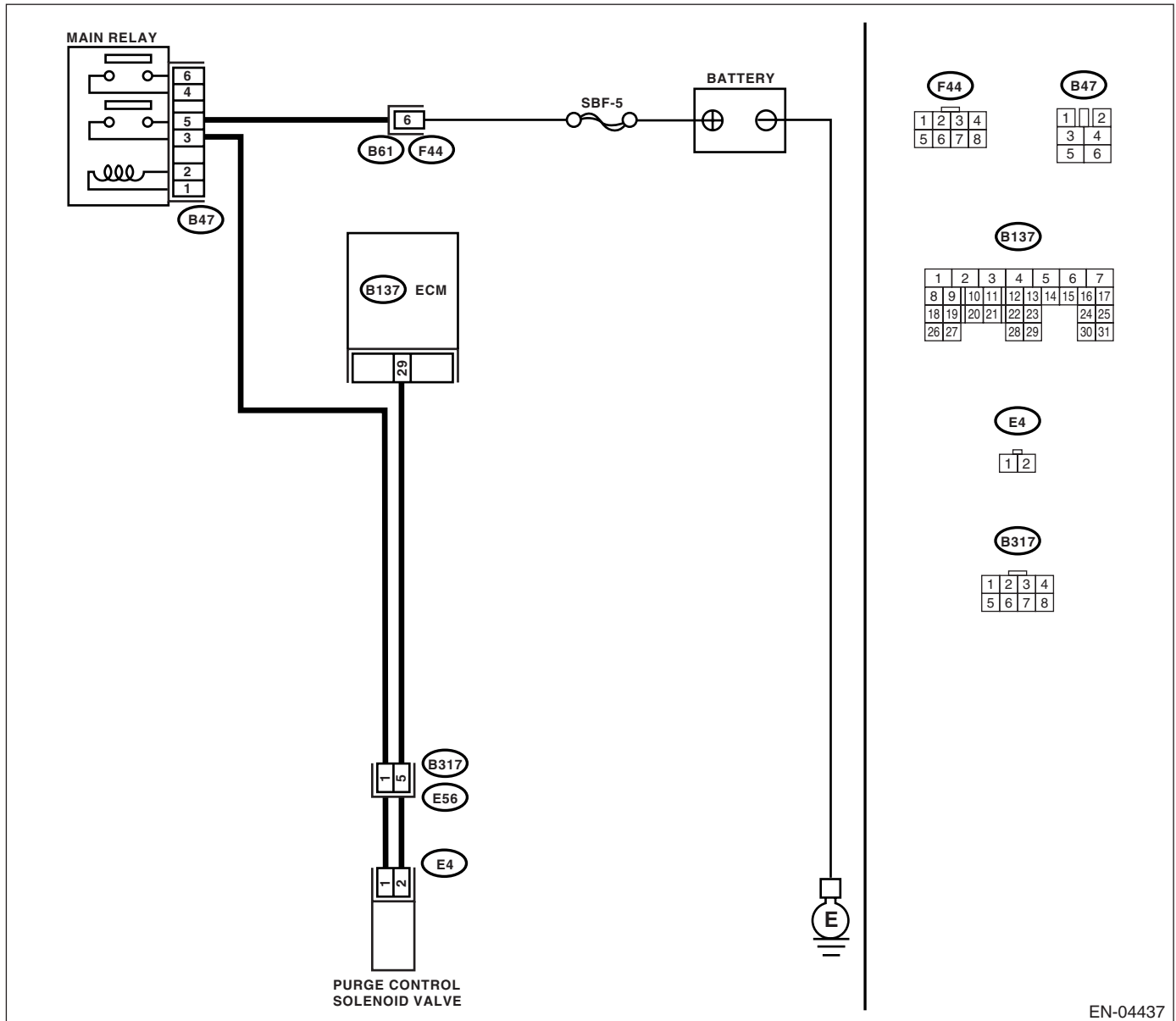
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04437

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B137) No. 29 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 10 V?                                   | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. | Go to step 2.   |
| <b>2</b><br><b>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from purge control solenoid valve and ECM.<br>3) Measure the resistance of harness between purge control solenoid valve connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E4) No. 2 — Engine ground:</b></i> | Is the resistance more than 1 M $\Omega$ ?                       | Go to step 3.   | Repair the ground short circuit in harness between ECM and purge control solenoid valve connector.  |
| <b>3</b><br><b>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM and purge control solenoid valve of harness connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B137) No. 29 — (E4) No. 2:</b></i>   | Is the resistance less than 1 $\Omega$ ?                         | Go to step 4.   | Repair the open circuit in harness between ECM and purge control solenoid valve connector.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and purge control solenoid valve connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>4</b><br><b>CHECK PURGE CONTROL SOLENOID VALVE.</b><br>1) Remove the purge control solenoid valve.<br>2) Measure the resistance between purge control solenoid valve terminals.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i>   | Is the resistance 10 — 100 $\Omega$ ?                            | Go to step 5.   | Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>   |
| <b>5</b><br><b>CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between purge control solenoid valve and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E4) No. 1 (+) — Engine ground (-):</b></i>   | Is the voltage more than 10 V?                                   | Go to step 6.   | Repair the open circuit in harness between main relay and purge control solenoid valve connector.   |
| <b>6</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in purge control solenoid valve connector.   | Is there poor contact in purge control solenoid valve connector? | Repair the poor contact in purge control solenoid valve connector.  | Contact your SOA Service Center since deterioration of some parts may be the cause.   |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BT:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-151, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

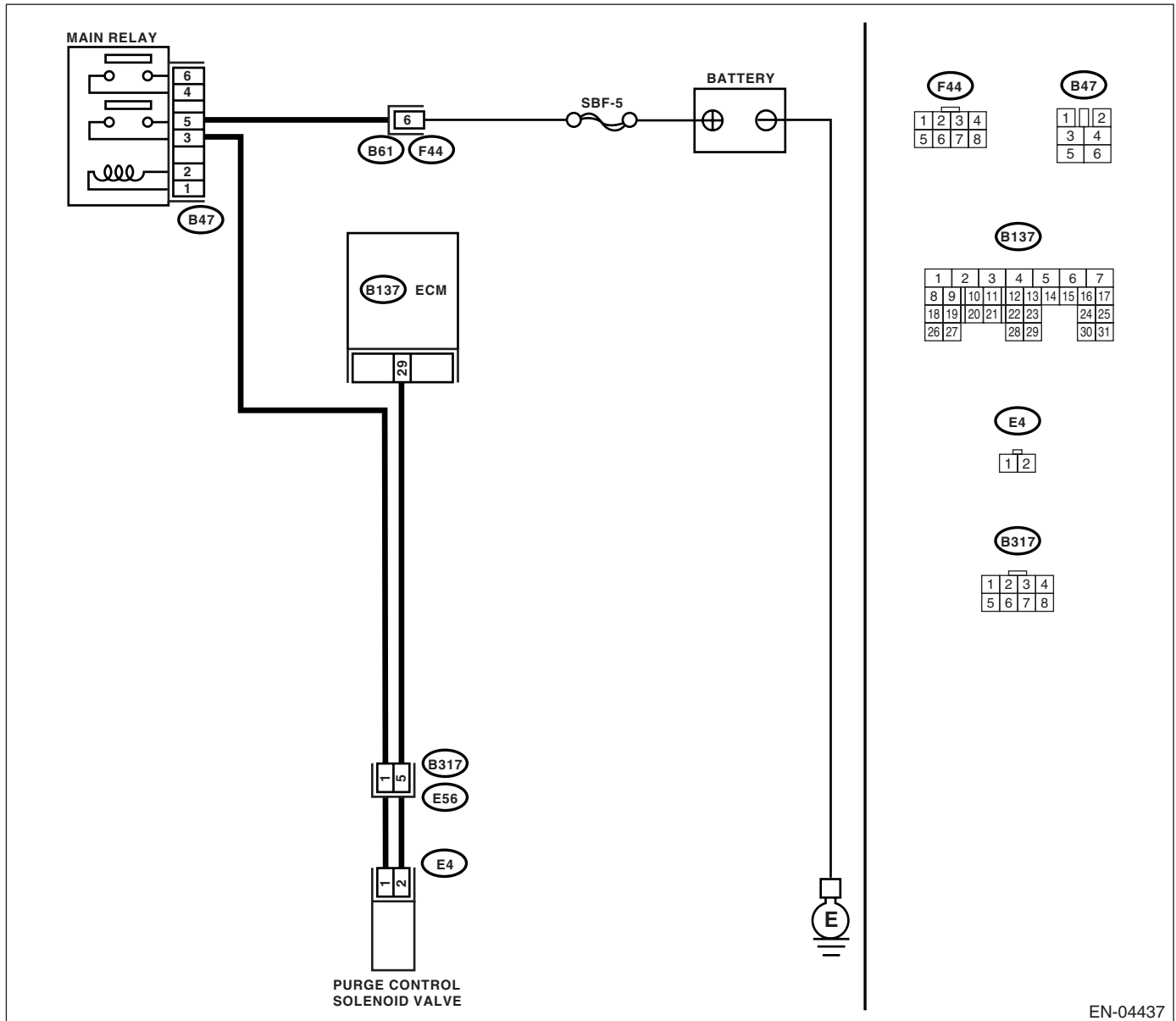
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                    | Yes  | No  |
|---|--|--|---|
| <p><b>1</b></p> <p><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br/>                     1) Turn the ignition switch to OFF.<br/>                     2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side).<br/>                     3) Turn the ignition switch to ON.<br/>                     4) While operating the purge control solenoid valve, measure the voltage between ECM and chassis ground.</p> <p>NOTE:<br/>                     Purge control solenoid valve operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". &lt;Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.&gt;</p> <p><b>Connector &amp; terminal</b><br/> <b>(B137) No. 29 (+) — Chassis ground (-):</b></p> | Is the voltage 0 — 13 V?                 | Go to step 2.  | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector. |
| <p><b>2</b></p> <p><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br/>                     1) Turn the ignition switch to ON.<br/>                     2) Measure the voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B137) No. 29 (+) — Chassis ground (-):</b></p>  | Is the voltage more than 10 V?           | Go to step 4.  | Go to step 3.   |
| <p><b>3</b></p> <p><b>CHECK POOR CONTACT.</b><br/>                     Check the poor contact in ECM connector.</p>   | Is there poor contact in ECM connector?  | Repair the poor contact in ECM connector.  | Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>  |
| <p><b>4</b></p> <p><b>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br/>                     1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from purge control solenoid valve.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B137) No. 29 (+) — Chassis ground (-):</b></p>   | Is the voltage more than 10 V?           | Repair the battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Go to step 5.   |
| <p><b>5</b></p> <p><b>CHECK PURGE CONTROL SOLENOID VALVE.</b><br/>                     1) Turn the ignition switch to OFF.<br/>                     2) Measure the resistance between purge control solenoid valve terminals.</p> <p><b>Terminals</b><br/> <b>No. 1 — No. 2:</b></p>  | Is the resistance less than 1 $\Omega$ ? | Replace the purge control solenoid valve <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.> and ECM <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>                             | Go to step 6.   |
| <p><b>6</b></p> <p><b>CHECK POOR CONTACT.</b><br/>                     Check poor contact in ECM connector.</p>   | Is there poor contact in ECM connector?  | Repair the poor contact in ECM connector.  | Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>  |

**BU:DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE**  
**DTC DETECTING CONDITION:**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

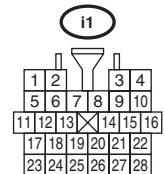
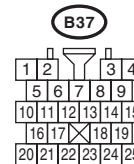
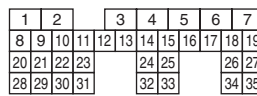
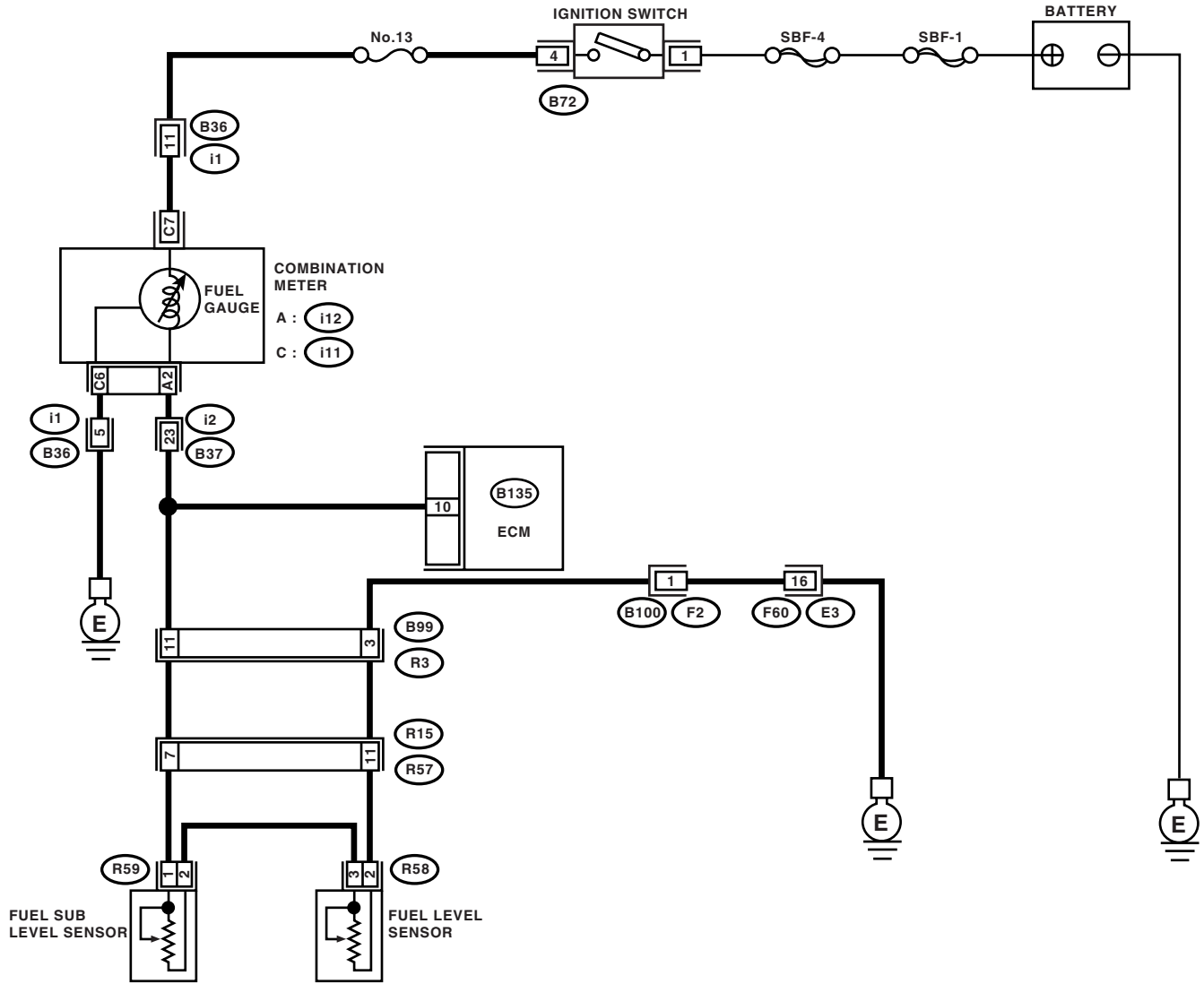
## ENGINE (DIAGNOSTICS)

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-153, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>

### WIRING DIAGRAM:



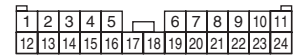
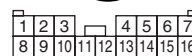
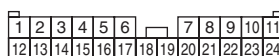
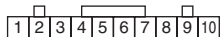
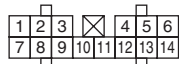
A : i12

C : i11

F2

R57

B99



EN-04665

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                       | Yes   | No   |
|---|-----------------------------|---|--|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0461. | Replace the fuel level sensor. <Ref. to FU(H4DOTC)-60, Fuel Level Sensor.> and fuel sub level sensor <Ref. to FU(H4DOTC)-61, Fuel Sub Level Sensor.> |

## **BV:DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT**

### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-155, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

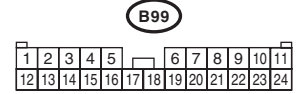
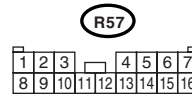
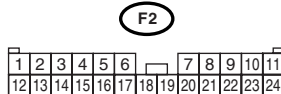
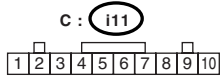
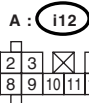
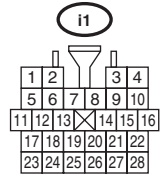
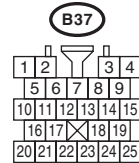
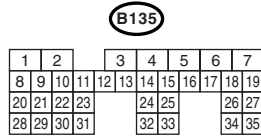
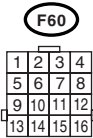
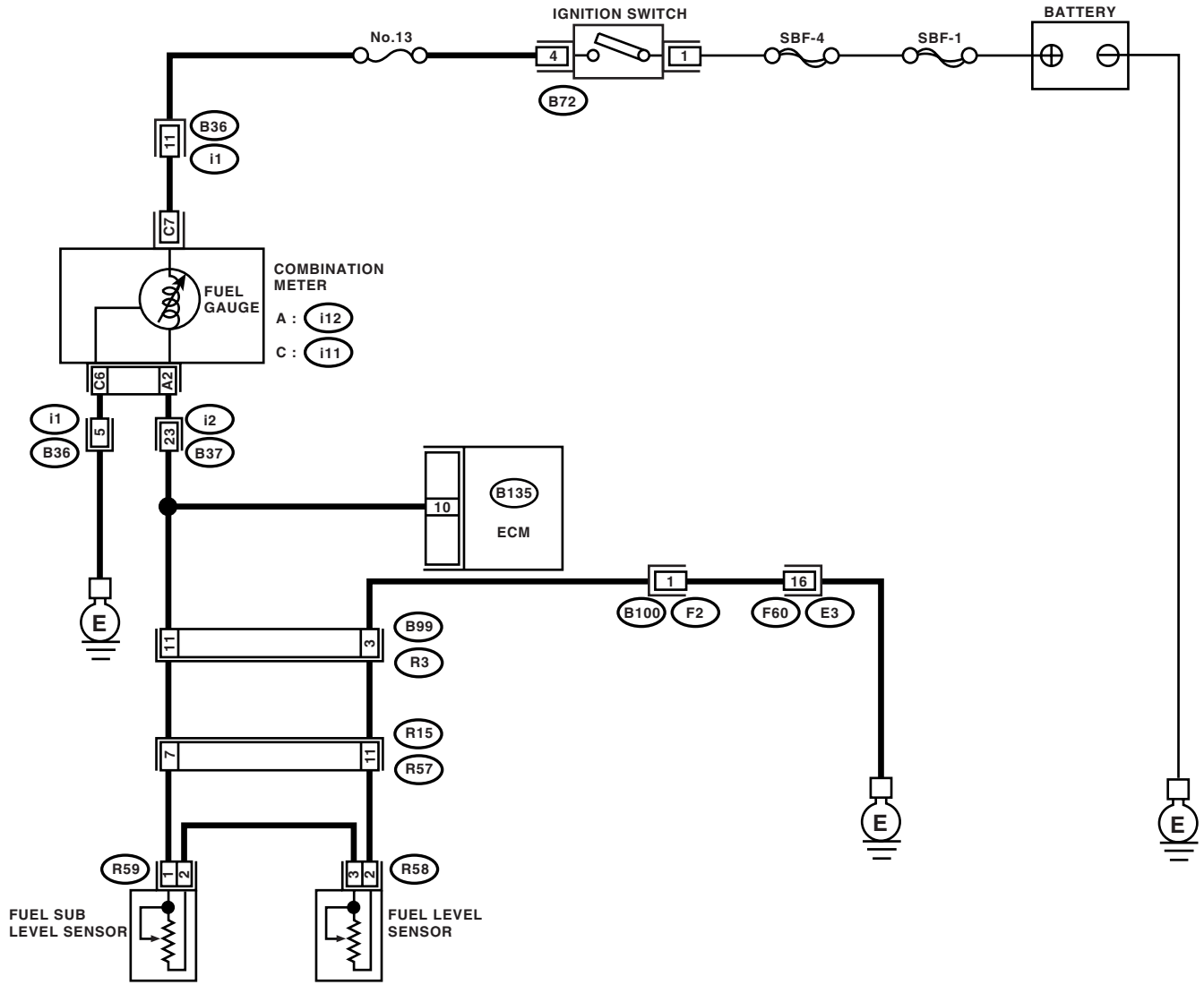
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04665

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check  | Yes                                       | No   |
|------|--|---|--|
| 1    | <b>CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.</b>  | Go to step 2.                             | Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>  |
| 2    | <b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to ON. (engine OFF)<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 10 (+) — Chassis ground (-):</b>   | Go to step 4.                             | Go to step 3.  |
| 3    | <b>CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)</b><br>Read the data of fuel level sensor signal using Subaru Select Monitor.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.>   | Repair the poor contact in ECM connector. | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.<br><br>NOTE:<br>In this case, repair the following:<br>• Poor contact in combination meter connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connectors |
| 4    | <b>CHECK INPUT VOLTAGE OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15).<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 10 (+) — Chassis ground (-):</b> | Go to step 5.                             | Go to step 6.  |
| 5    | <b>CHECK HARNESS BETWEEN ECM AND COMBINATION METER.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from connector (i11), (i12) and ECM connector.<br>3) Measure the resistance between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 10 — Chassis ground:</b>   | Go to step 7.                             | Repair the ground short circuit in harness between ECM and combination meter connector.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes   | No   |
|---|--|---|--|
| <b>6 CHECK HARNESS BETWEEN ECM AND COMBINATION METER.</b><br>Measure the resistance between ECM and combination meter connector.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 10 — (i12) No. 2:</b>  | Is the resistance less than 10 $\Omega$ ?  | Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.> | Repair the open circuit between ECM and combination meter connector.<br><br>NOTE:<br>In this case, repair the following:<br>Poor contact in coupling connector |
| <b>7 CHECK FUEL TANK CORD.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from fuel sub level sensor.<br>3) Measure the resistance between fuel sub level sensor and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R59) No. 1 — Chassis ground:</b>    | Is the resistance more than 1 M $\Omega$ ? | Go to step 8.   | Repair the ground short circuit in fuel tank cord.   |
| <b>8 CHECK FUEL TANK CORD.</b><br>1) Disconnect the connector from fuel pump assembly.<br>2) Measure the resistance between fuel pump assembly and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R59) No. 2 — Chassis ground:</b>   | Is the resistance more than 1 M $\Omega$ ? | Go to step 9.   | Repair the ground short circuit in fuel tank cord.   |
| <b>9 CHECK FUEL LEVEL SENSOR.</b><br>1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-58, Fuel Pump.><br>2) Measure the resistance between fuel level sensor and terminals with its float set to the full position.<br><b>Terminals</b><br><b>No. 2 — No. 3:</b>                         | Is the resistance 0.5 — 2.5 $\Omega$ ?     | Go to step 10.  | Replace the fuel level sensor.   |
| <b>10 CHECK FUEL SUB LEVEL SENSOR.</b><br>1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-61, Fuel Sub Level Sensor.><br>2) Measure the resistance between fuel sub level sensor and terminals with its float set to the full position.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b> | Is the resistance 0.5 — 2.5 $\Omega$ ?     | Repair the poor contact in harness between ECM and combination meter connector.     | Replace the fuel sub level sensor.   |

## **BW:DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT**

### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-157, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **CAUTION:**

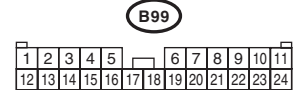
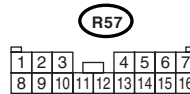
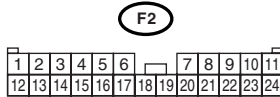
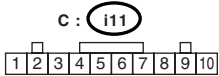
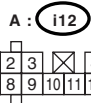
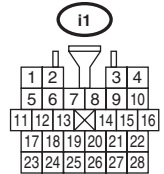
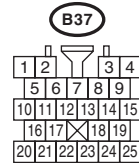
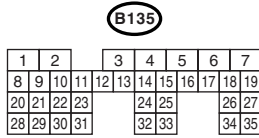
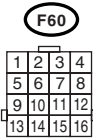
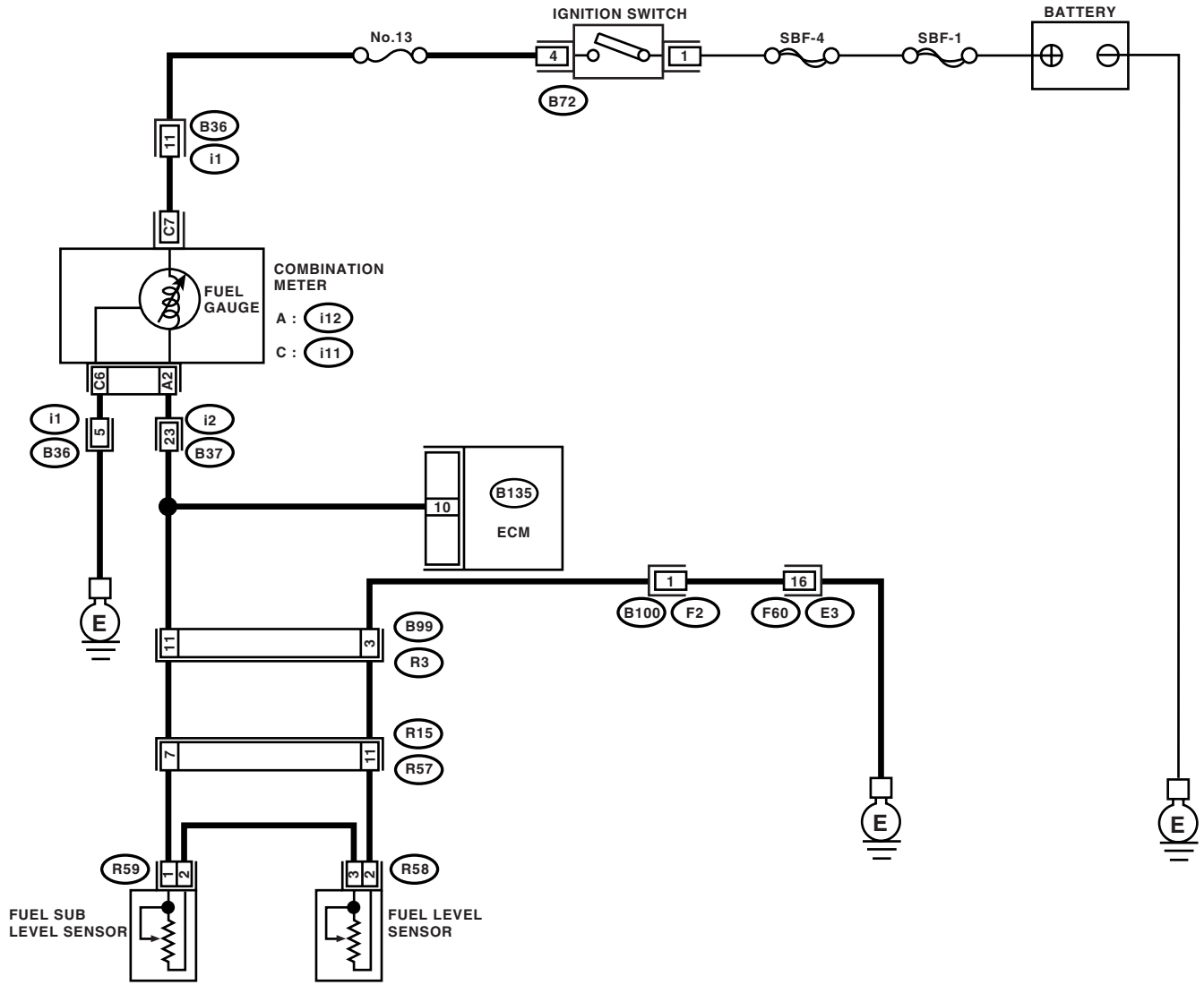
**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04665

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check   | Yes   | No  |
|------|---|---|---|
| 1    | <b>CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.</b>   | Go to step 2.   | Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>   |
| 2    | <b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to ON. (engine OFF)<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 10 (+) — Chassis ground (-):</b>  | Go to step 3.   | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Poor contact in fuel pump connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| 3    | <b>CHECK INPUT VOLTAGE OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the combination meter connector (i11) and ECM connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage of harness between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 10 (+) — Chassis ground (-):</b> | Repair the battery short circuit between ECM and combination meter connector. | Go to step 4.   |
| 4    | <b>CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.</b><br>1) Turn the ignition switch to OFF.<br>2) Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15).<br>3) Measure the resistance between ECM and fuel tank cord.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 10 — (R15) No. 7:</b>                       | Go to step 5.   | Repair the open circuit between ECM and fuel tank cord.   |
| 5    | <b>CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.</b><br>Measure the resistance between fuel tank cord and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R15) No. 11 — Chassis ground:</b>  | Go to step 6.   | Repair the open circuit between fuel tank cord and chassis ground.<br><br>NOTE:<br>In this case, repair the following:<br>Poor contact in coupling connectors   |
| 6    | <b>CHECK FUEL TANK CORD.</b><br>1) Disconnect the connector from fuel level sensor.<br>2) Measure the resistance between fuel level sensor and coupling connector.<br><b>Connector &amp; terminal</b><br><b>(R57) No. 11 — (R58) No. 2:</b>   | Go to step 7.   | Repair the open circuit between coupling connector and fuel level sensor.   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check                                     | Yes  | No  |
|---|---|--|---|
| <b>7 CHECK FUEL TANK CORD.</b><br>1) Disconnect the connector from fuel sub level sensor.<br>2) Measure the resistance between fuel level sensor and fuel sub level sensor.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(R58) No. 3 — (R59) No. 2:</b></i>   | Is the resistance less than 10 $\Omega$   | Go to step <b>8</b> .  | Repair the open circuit between fuel level sensor and fuel sub level sensor.  |
| <b>8 CHECK FUEL TANK CORD.</b><br>Measure the resistance between fuel sub level sensor and coupling connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(R57) No. 7 — (R59) No. 1:</b></i>  | Is the resistance less than 10 $\Omega$ ? | Go to step <b>9</b> .  | Repair the open circuit between coupling connector and fuel sub level sensor. |
| <b>9 CHECK FUEL LEVEL SENSOR.</b><br>1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-58, Fuel Pump.><br>2) While moving the fuel level sensor float up and down, measure the resistance between fuel level sensor terminals.<br><i><b>Terminals</b></i><br><i><b>No. 2 — No. 3:</b></i>                             | Is the resistance more than 53 $\Omega$ ? | Replace the fuel level sensor. <Ref. to FU(H4DOTC)-60, Fuel Level Sensor.>         | Go to step <b>10</b> .  |
| <b>10 CHECK FUEL SUB LEVEL SENSOR.</b><br>1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-61, Fuel Sub Level Sensor.><br>2) While moving the fuel sub level sensor float up and down, measure the resistance between fuel sub level sensor terminals.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i> | Is the resistance more than 45 $\Omega$ ? | Replace the fuel sub level sensor. <Ref. to FU(H4DOTC)-61, Fuel Sub Level Sensor.> | Replace the combination meter. <Ref. to IDI-10, Combination Meter.>           |

### **BX:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT**

#### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-158, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

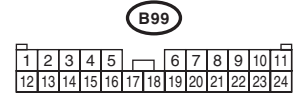
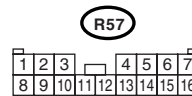
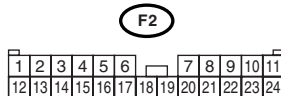
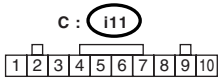
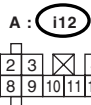
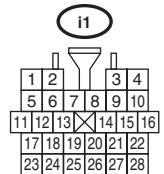
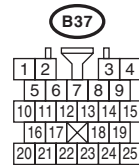
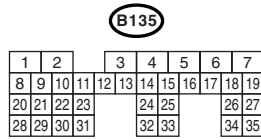
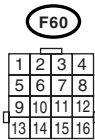
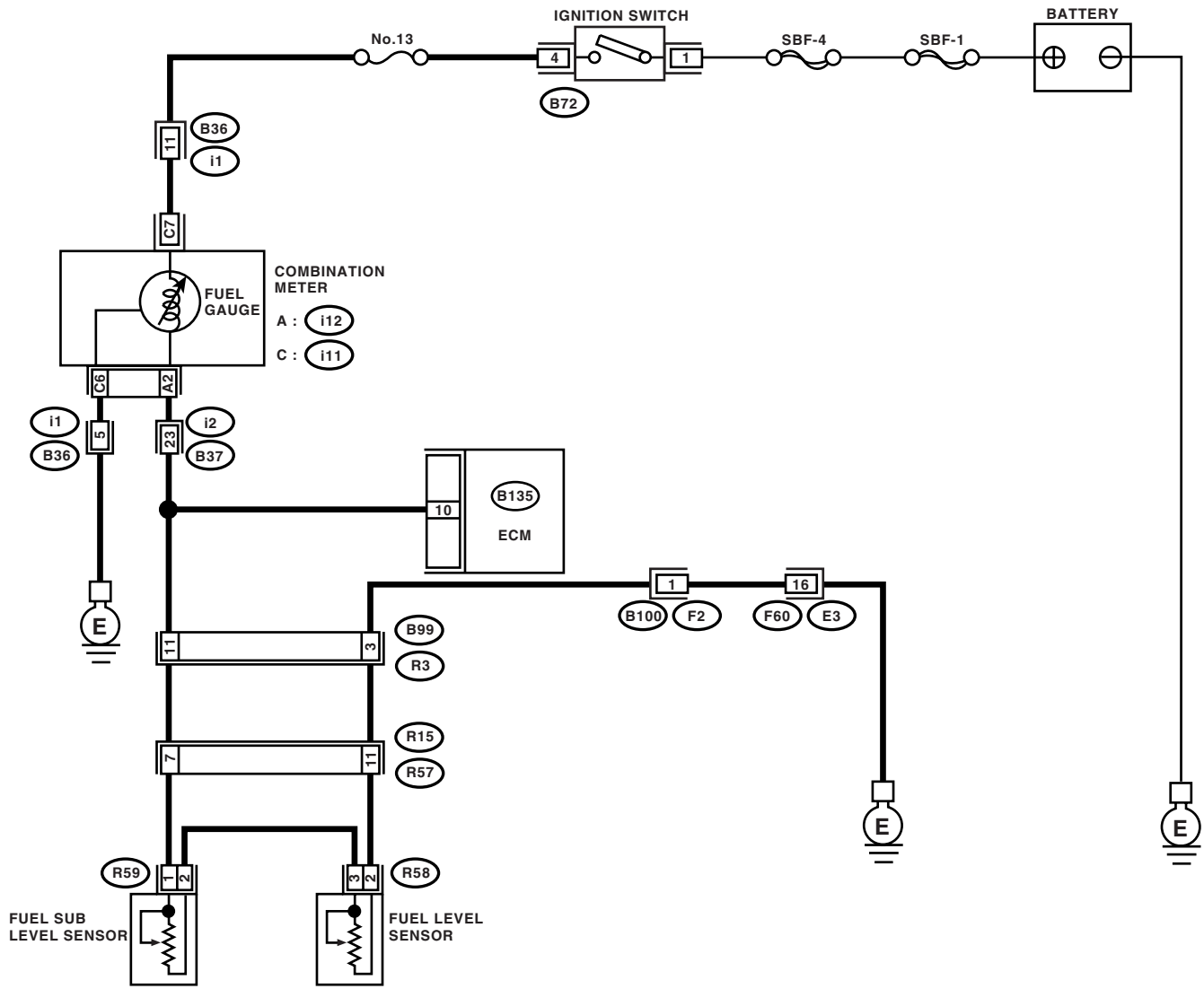
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04665

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                | Yes   | No   |
|---|--------------------------------------|---|--|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?          | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> | Go to step 2.  |
| 2<br><b>CHECK FUEL LEVEL SENSOR.</b><br>1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-58, Fuel Pump.><br>2) While moving the fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly.<br><b>Terminals</b><br><b>No. 3 — No. 2:</b>                        | Does the resistance change smoothly? | Go to step 3.   | Replace the fuel level sensor. <Ref. to FU(H4DOTC)-60, Fuel Level Sensor.>         |
| 3<br><b>CHECK FUEL SUB LEVEL SENSOR.</b><br>1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-61, Fuel Sub Level Sensor.><br>2) While moving the fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b> | Does the resistance change smoothly? | Repair the poor contact in ECM, combination meter and coupling connectors.  | Replace the fuel sub level sensor. <Ref. to FU(H4DOTC)-61, Fuel Sub Level Sensor.> |

## BY:DTC P0483 COOLING FAN RATIONALITY CHECK

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-161, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

- Occurrence of noise
- Overheating

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

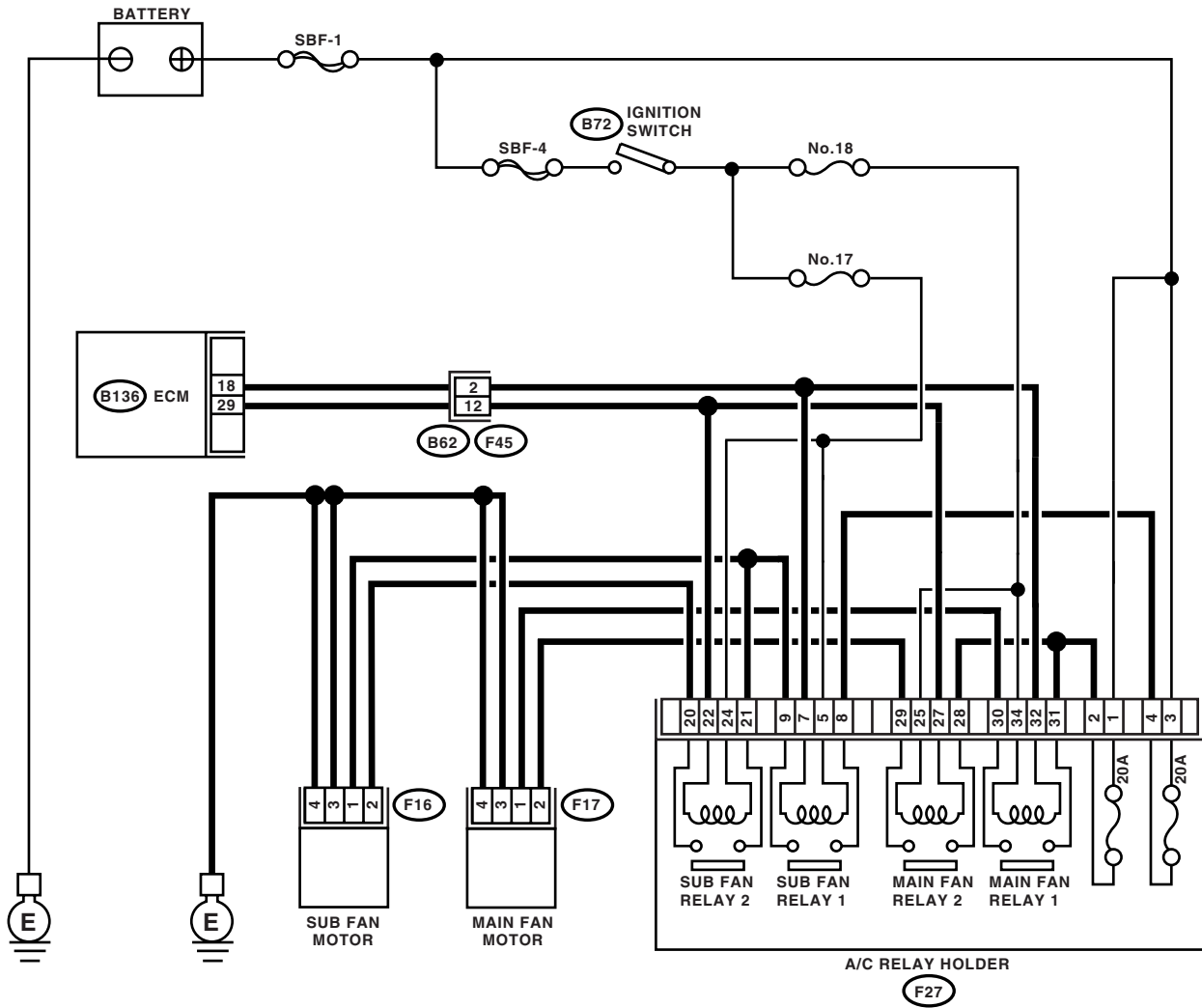
### NOTE:

If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

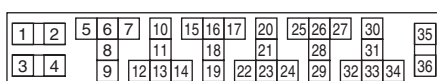
## WIRING DIAGRAM:



(B72)



(F27)



(B136)



(F45)



(F16)



EN-04379

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                       | Yes   | No   |
|---|-----------------------------|---|--|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> | Check the radiator fan, fan motor and thermostat. <Ref. to CO(H4DOTC)-28, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4DOTC)-30, Radiator Sub Fan and Fan Motor.> If thermostat is stuck, replace thermostat. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BZ:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT

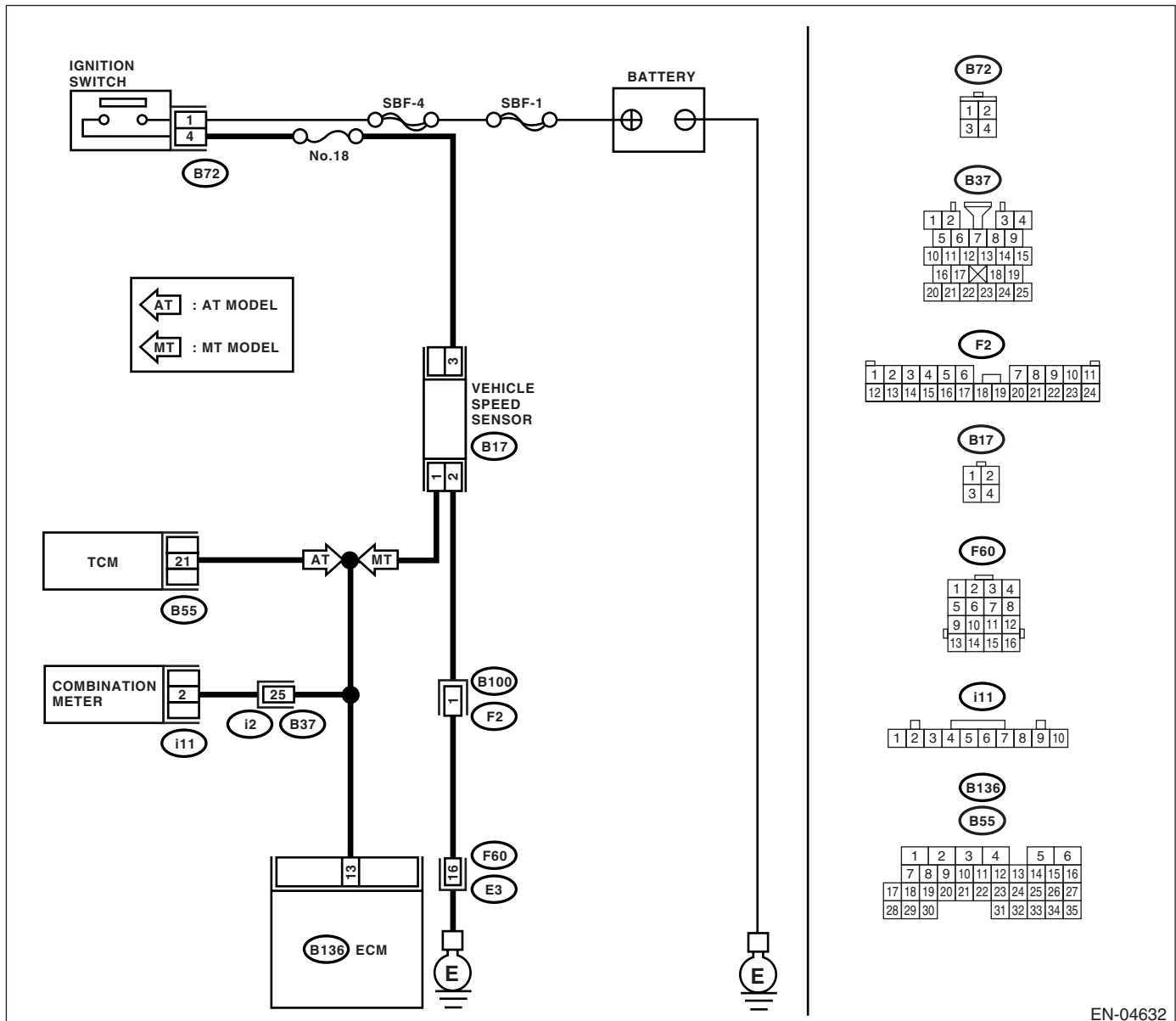
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-162, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04632



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step     | Check  | Yes  | No   |
|----------|--|--|--|
| <b>1</b> | <b>CHECK TRANSMISSION TYPE.</b>  | Go to step <b>2</b> .                                      | Go to step <b>4</b> .  |
| <b>2</b> | <b>CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and TCM.<br>3) Measure the resistance of harness between TCM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B55) No. 21 — Chassis ground:</b>   | Go to step <b>3</b> .                                      | Repair the ground short circuit in harness between ECM and TCM connector.                  |
| <b>3</b> | <b>CHECK POOR CONTACT.</b><br>Check poor contact in TCM connector.   | Repair poor contact in TCM connector.                      | Contact your SOA Service Center since deterioration of some parts may be the cause.        |
| <b>4</b> | <b>CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from vehicle speed sensor and ECM.<br>3) Measure the resistance of harness between vehicle speed sensor connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B17) No. 1 — Chassis ground:</b> | Go to step <b>5</b> .                                      | Repair the ground short circuit in harness between vehicle speed sensor and ECM connector. |
| <b>5</b> | <b>CHECK POOR CONTACT.</b><br>Check poor contact in the vehicle speed sensor connector.  | Repair poor contact in the vehicle speed sensor connector. | Replace the vehicle speed sensor.<br><Ref. to 5MT-38, Vehicle Speed Sensor.>               |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CA:DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH

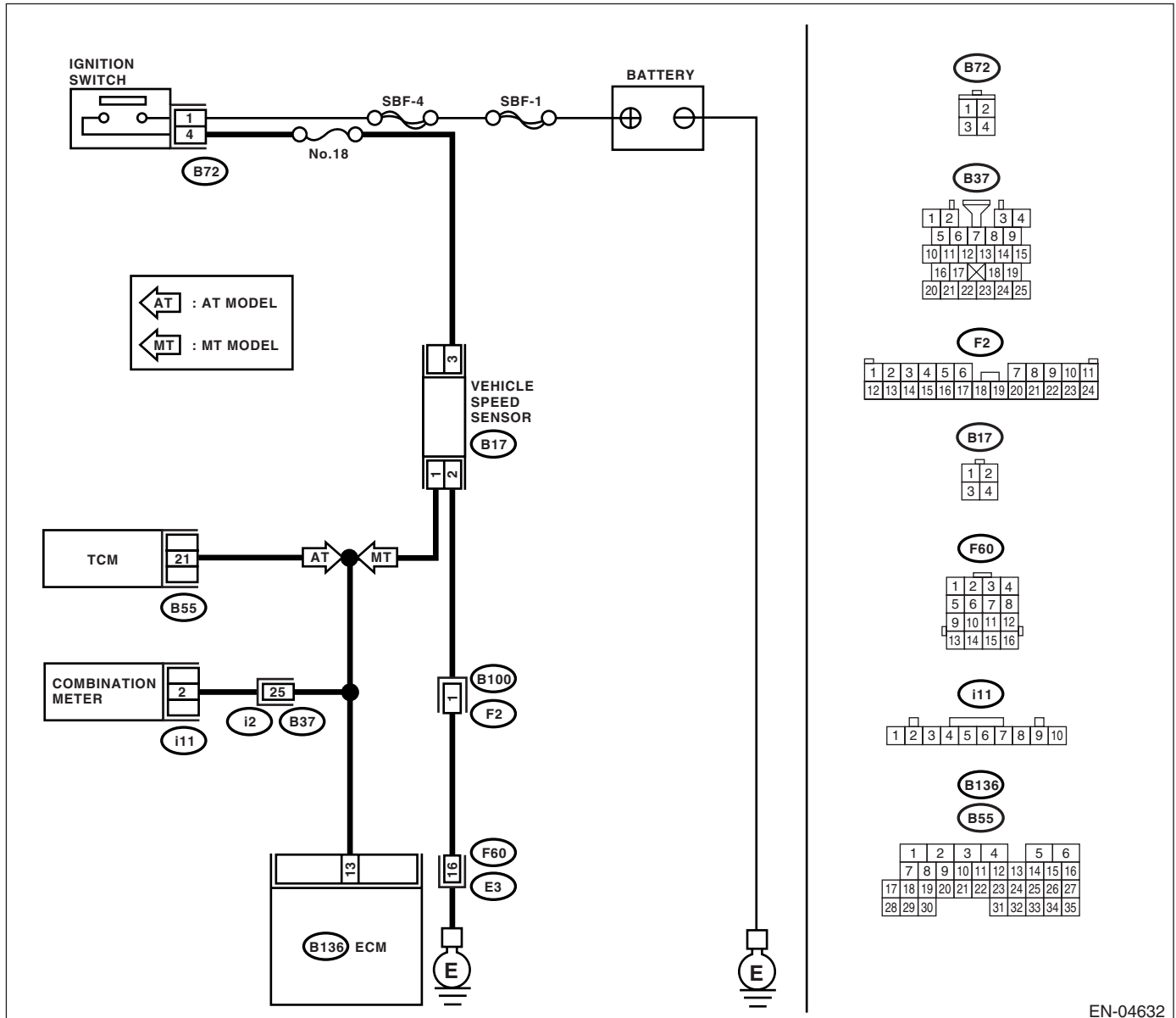
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-163, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04632

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step     | Check   | Yes   | No  |
|----------|---|---|---|
| <b>1</b> | <b>CHECK TRANSMISSION TYPE.</b>   | Is the transmission type AT?  | Go to step 2.   |
| <b>2</b> | <b>CHECK DTC P0720 ON DISPLAY.</b>  | Does the Subaru Select Monitor or general scan tool indicate DTC P0720? | Go to step 3.   |
| <b>3</b> | <b>CHECK SPEEDOMETER OPERATION IN COMBINATION METER.</b>  | Does the speedometer operate normally?                                  | Go to step 4.   |
| <b>4</b> | <b>CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from combination meter.<br>3) Measure the resistance between ECM and combination meter.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 13 — (i11) No. 2:</b> | Is the resistance less than 10 Ω?                                       | Repair the poor contact in ECM connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM and combination meter connector<br>• Poor contact in ECM connector<br>• Poor contact in combination meter connector<br>• Poor contact in coupling connector |

### CB:DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED

#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-165, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### TROUBLE SYMPTOM:

- Engine is difficult to start.
- Engine does not start.
- Erroneous idling
- Engine stalls.

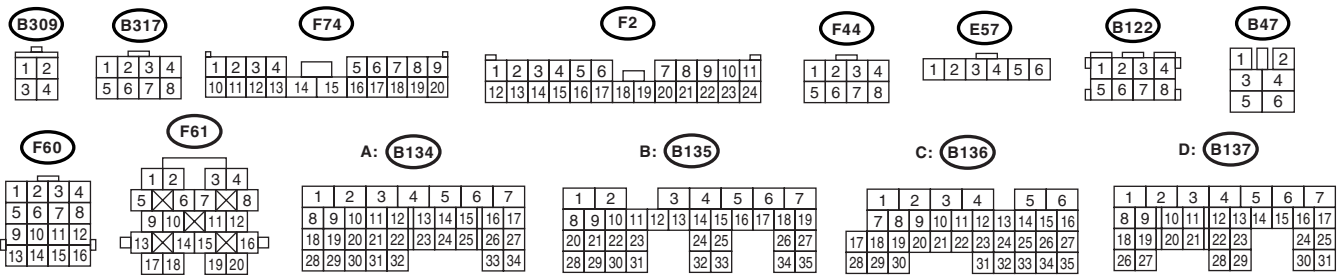
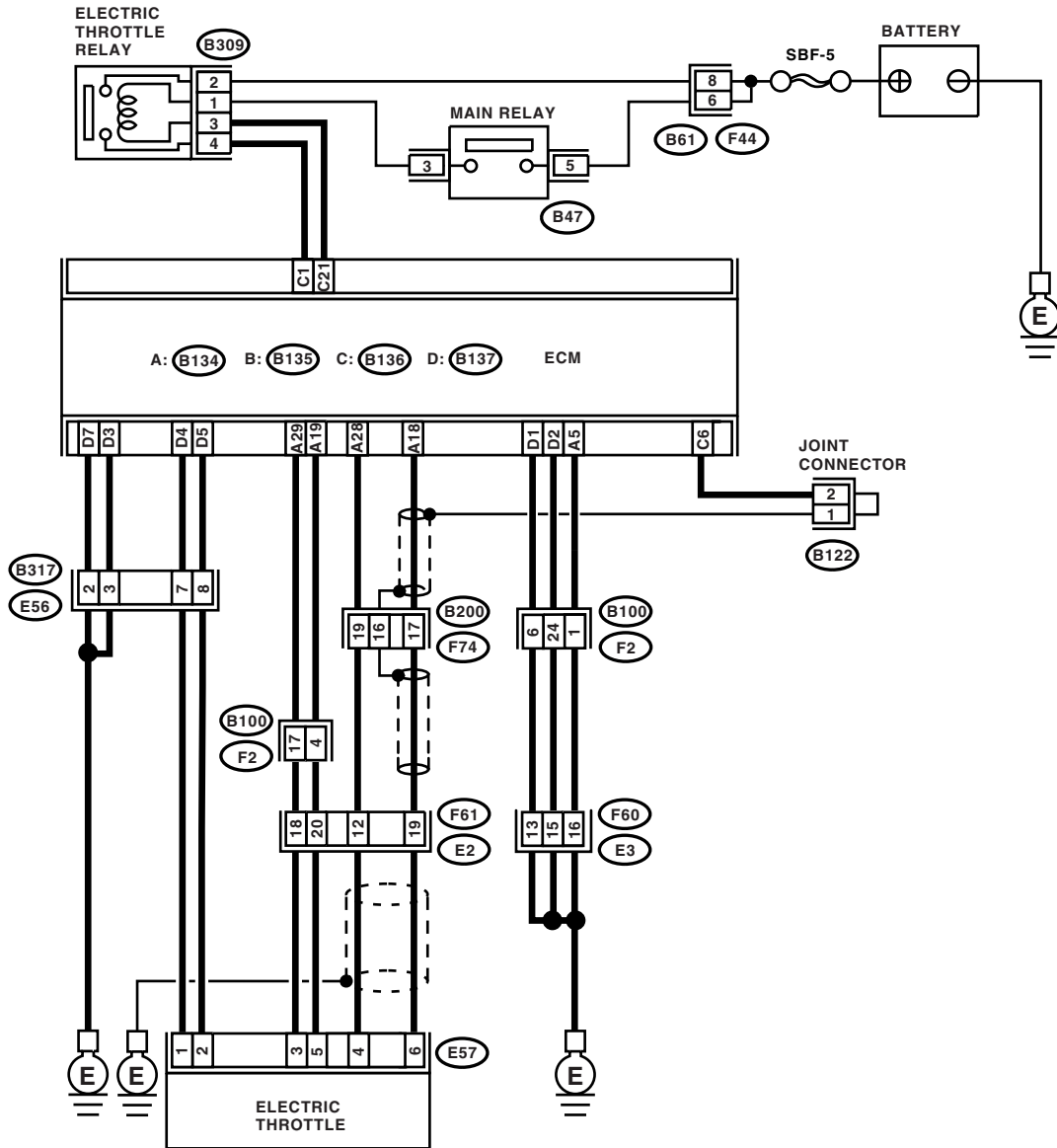
#### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04706

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No                                  |
|---|---|---|-------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?                                 | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0506. | Go to step 2.                       |
| <b>2</b><br><b>CHECK AIR CLEANER ELEMENT.</b><br>1) Turn the ignition switch to OFF.<br>2) Check air cleaner element.   | Is there excessive clogging on air cleaner element.         | Replace the air cleaner element.<br><Ref. to IN(H4DOTC)-7, Air Cleaner Element.>  | Go to step 3.                       |
| <b>3</b><br><b>CHECK ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electronic throttle control.<br>3) Check the electronic throttle control. | Are there foreign particles in electronic throttle control? | Remove the foreign particles from electronic throttle control.  | Perform the diagnosis of DTC P2101. |

### CC:DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED

#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-167, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### TROUBLE SYMPTOM:

Engine keeps running at higher revolution than specified idling revolution.

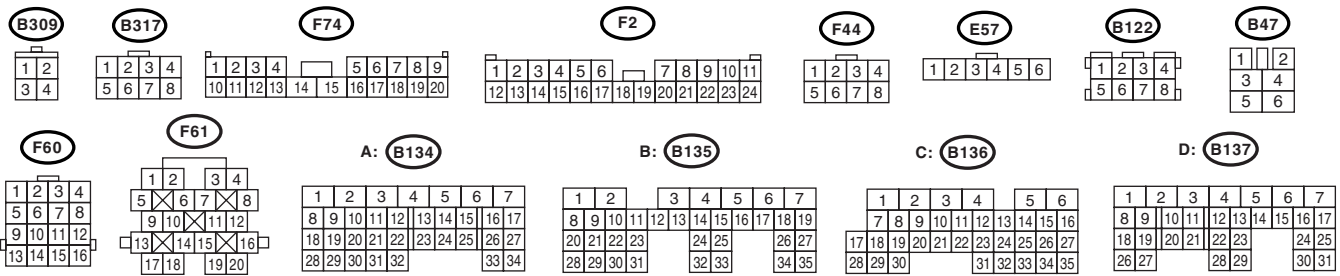
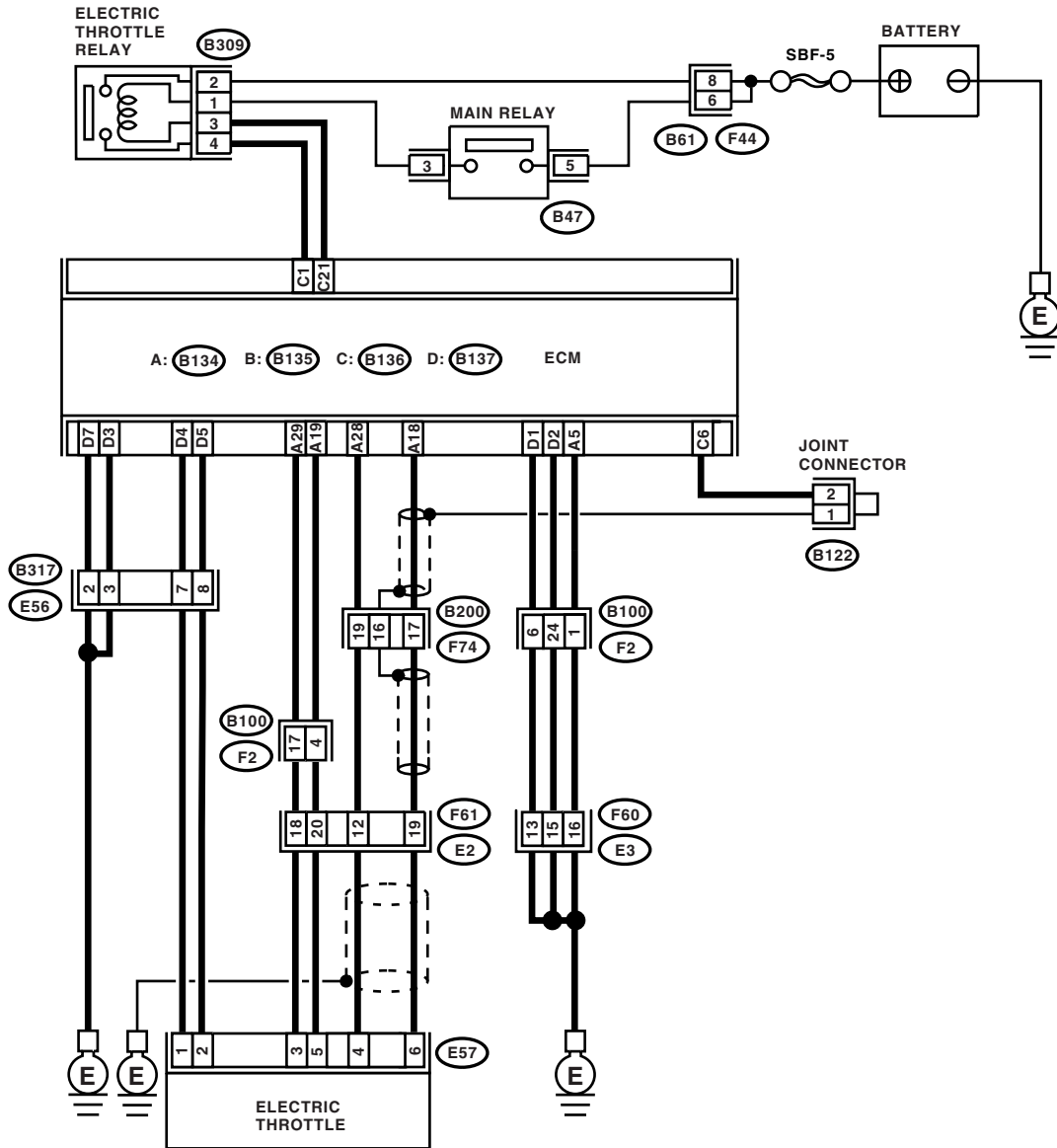
#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04706

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No                                  |
|--|---|---|-------------------------------------|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?                                 | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0507. | Go to step 2.                       |
| 2<br><b>CHECK AIR INTAKE SYSTEM.</b><br>1) Turn the ignition switch to ON.<br>2) Start the engine, and idle it.<br>3) Check the following items.<br>• Loose installation of intake manifold and throttle body<br>• Cracks of intake manifold gasket and throttle body gasket<br>• Disconnections of vacuum hoses | Is there a fault in air intake system?                      | Repair the air suction and leaks.   | Go to step 3.                       |
| 3<br><b>CHECK ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electronic throttle control.<br>3) Check the electronic throttle control.   | Are there foreign particles in electronic throttle control? | Remove the foreign particles from electronic throttle control.  | Perform the diagnosis of DTC P2101. |

### CD:DTC P0512 STARTER REQUEST CIRCUIT

#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-169, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### TROUBLE SYMPTOM:

Failure of engine to start

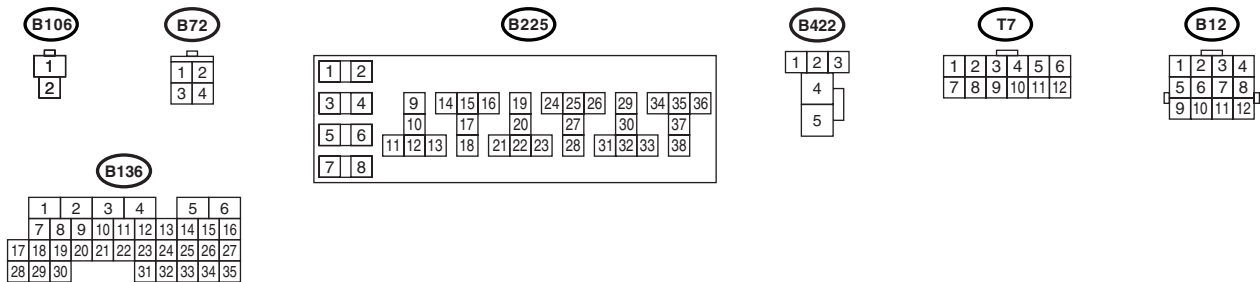
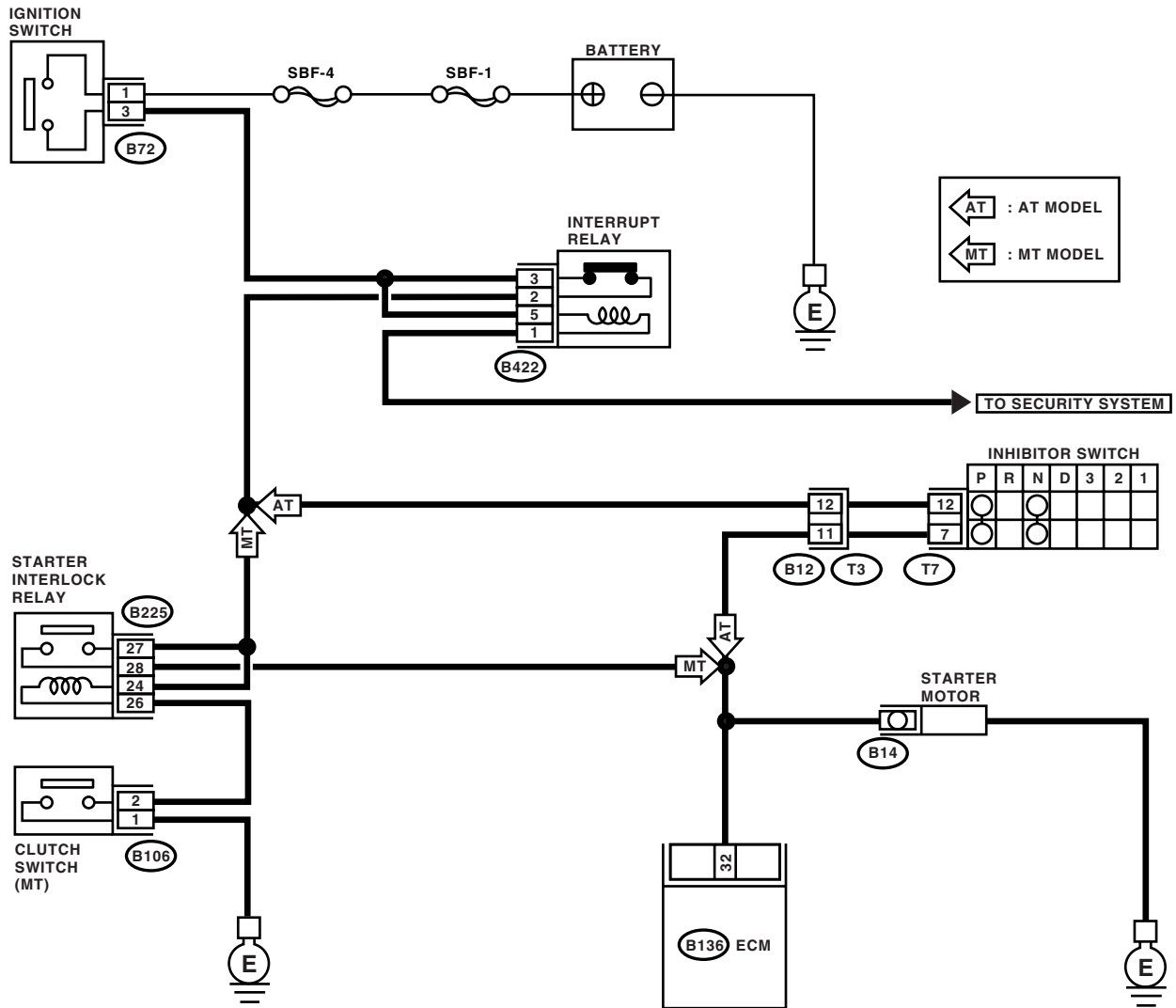
#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04633



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check                                    | Yes  | No  |   |
|------|--|--|---|---|
| 1    | <b>CHECK OPERATION OF STARTER MOTOR.</b> | Does the starter motor operate when ignition switch is turned to ON? | Repair the battery short circuit in starter motor circuit. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Check the starter motor circuit. <Ref. to EN(H4DOTC)(diag)-63, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.> |

## CE:DTC P0513 INCORRECT IMMOBILIZER KEY

NOTE:

For the diagnostic procedure, refer to DTC P0513. <Ref. to IM(diag)-21, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## CF:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)

**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-171, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

**TROUBLE SYMPTOM:**

- Engine keeps running at higher revolution than specified idling revolution.
- Fuel is cut according to fail-safe function.

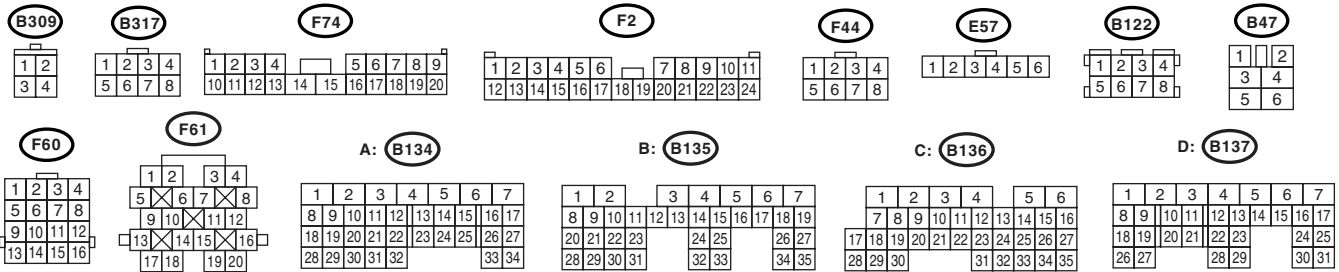
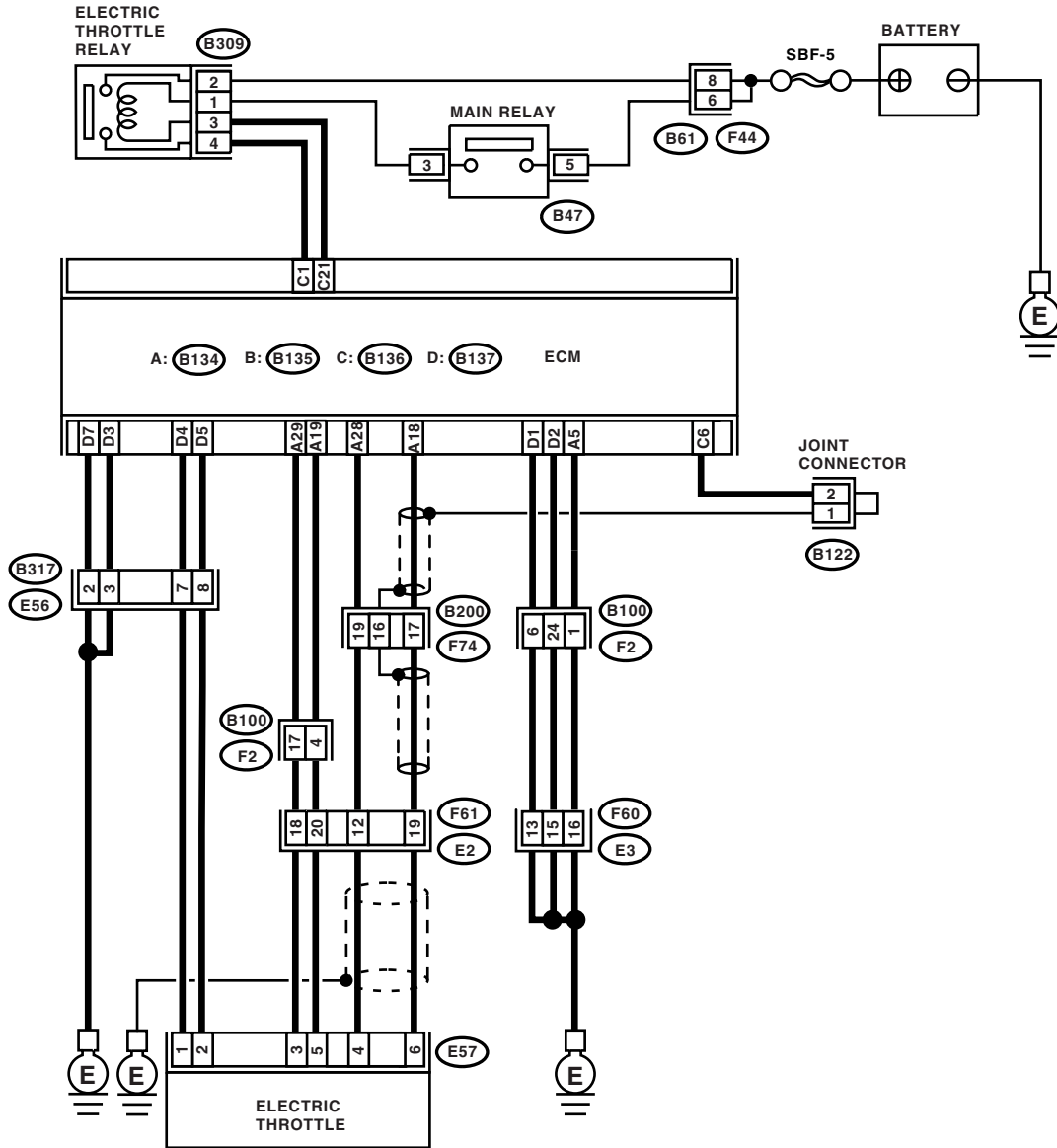
**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04706

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No                                  |
|---|---|---|-------------------------------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?                           | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0519. | Go to step 2.                       |
| <b>2</b><br><b>CHECK AIR INTAKE SYSTEM.</b><br>1) Turn the ignition switch to ON.<br>2) Start the engine, and idle it.<br>3) Check the following items. <ul style="list-style-type: none"> <li>• Loose installation of intake manifold, idle air control solenoid valve and throttle body</li> <li>• Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket</li> <li>• Disconnections of vacuum hoses</li> </ul> | Is there a fault in air intake system?                | Repair the air suction and leaks.   | Go to step 3.                       |
| <b>3</b><br><b>CHECK ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electronic throttle control.<br>3) Check the electronic throttle control.   | Are foreign particles in electronic throttle control? | Remove the foreign particles from electronic throttle control.  | Perform the diagnosis of DTC P2101. |

## CG:DTC P0600 SERIAL COMMUNICATION LINK

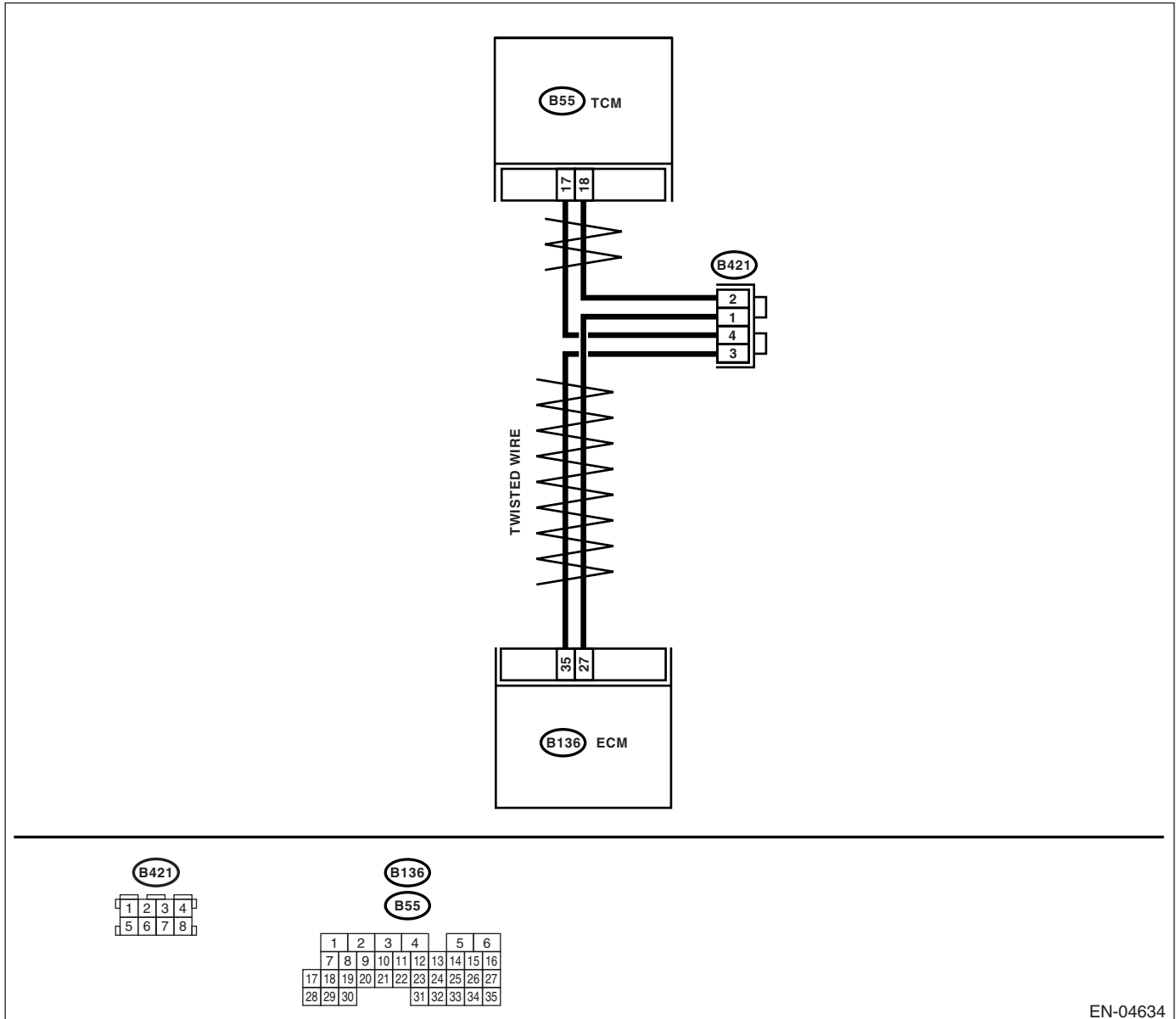
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-172, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04634

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes                    | No   |
|---|---|------------------------|--|
| <b>1 CHECK HARNESS BETWEEN ECM AND TCM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from TCM.<br>4) Measure the resistance between connectors of ECM and TCM.<br><i>Connector &amp; terminal</i><br>(B136) No. 27 — (B55) No. 18:<br>(B136) No. 35 — (B55) No. 17: | Is the resistance less than 1 $\Omega$ ?          | Go to step 2.          | Repair the harness connector.  |
| <b>2 CHECK HARNESS BETWEEN ECM AND TCM.</b><br>Measure the resistance between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br>(B136) No. 27 — Chassis ground:<br>(B136) No. 35 — Chassis ground:  | Is the resistance more than 1 M $\Omega$ ?        | Go to step 3.          | Repair the harness connector.  |
| <b>3 CHECK HARNESS BETWEEN ECM AND TCM.</b><br>Measure the resistance of ECM connectors.<br><i>Connector &amp; terminal</i><br>(B136) No. 27 — (B136) No. 35:   | Is the resistance more than 1 M $\Omega$ ?        | Go to step 4.          | Repair the harness connector.  |
| <b>4 CHECK AT SYSTEM STATUS.</b><br>Check the AT using Subaru Select Monitor.   | Does the Subaru Select Monitor display DTC P1718? | Inspect the AT system. | Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |

### CH:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-173, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### TROUBLE SYMPTOM:

- Engine does not start.
- Engine stalls.

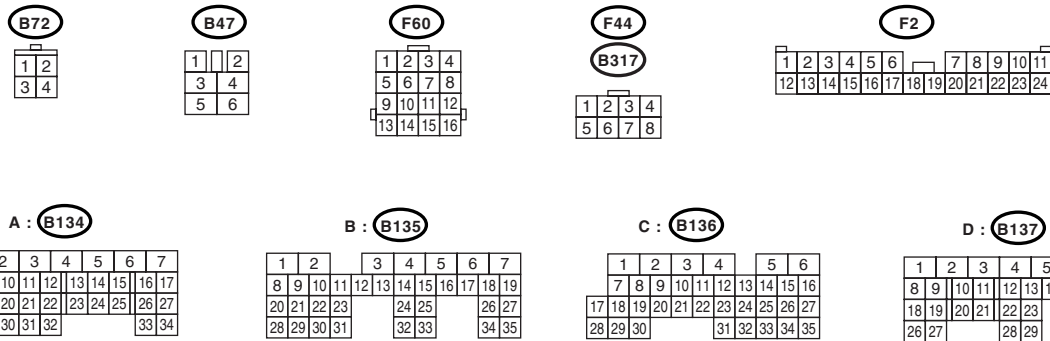
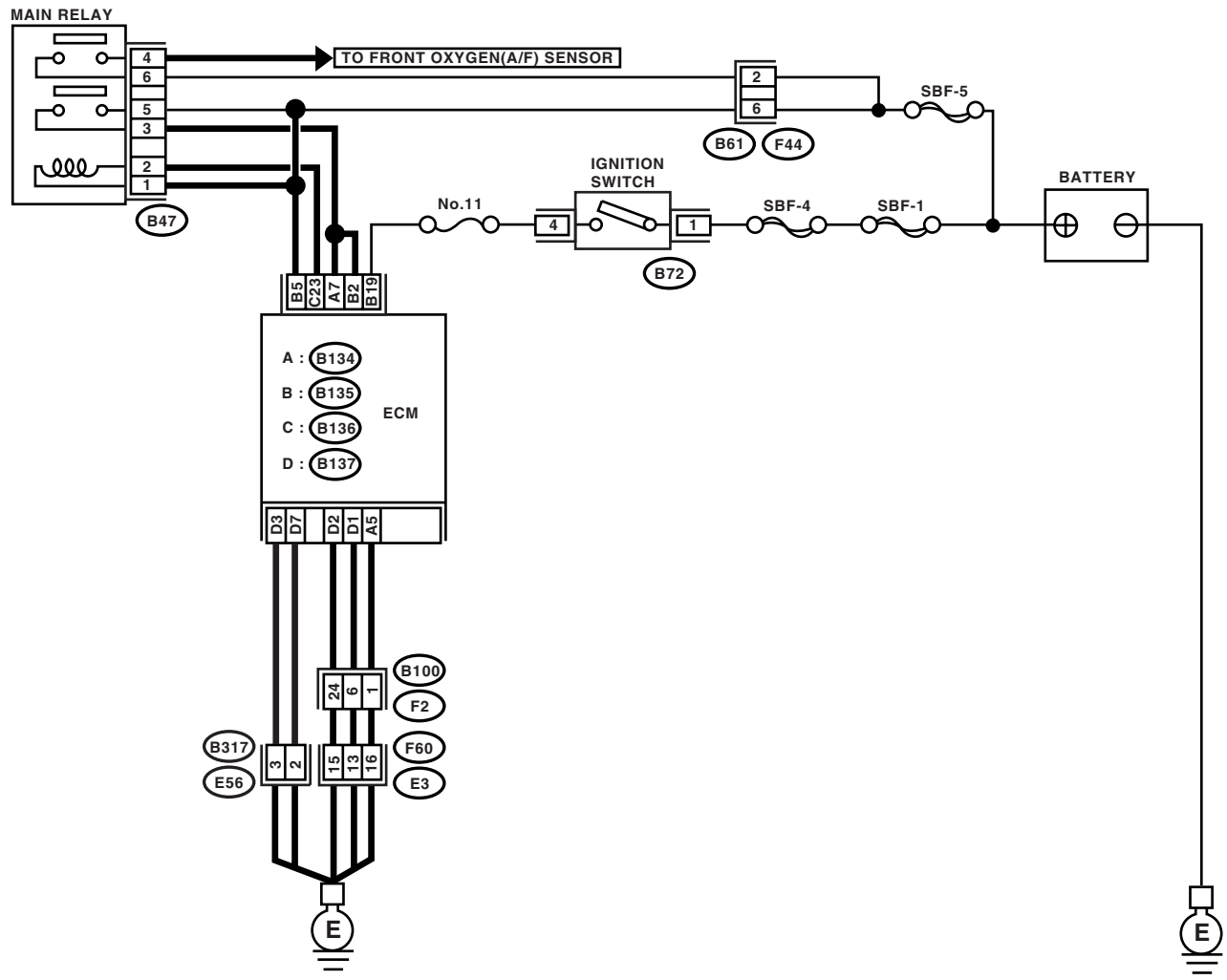
#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04702

| Step | Check   | Yes   | No                        |
|------|---|---|---------------------------|
| 1    | <b>CHECK ANY OTHER DTC ON DISPLAY.</b><br>Does the Subaru Select Monitor or general scan tool indicate DTC P0604? | Replace the ECM.<br><Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | A temporary poor contact. |

## **Diagnostic Procedure with Diagnostic Trouble Code (DTC)**

ENGINE (DIAGNOSTICS)

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### **CI: DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR**

NOTE:

For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H4DOTC)(diag)-271, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CJ:DTC P0607 CONTROL MODULE PERFORMANCE

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-175, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

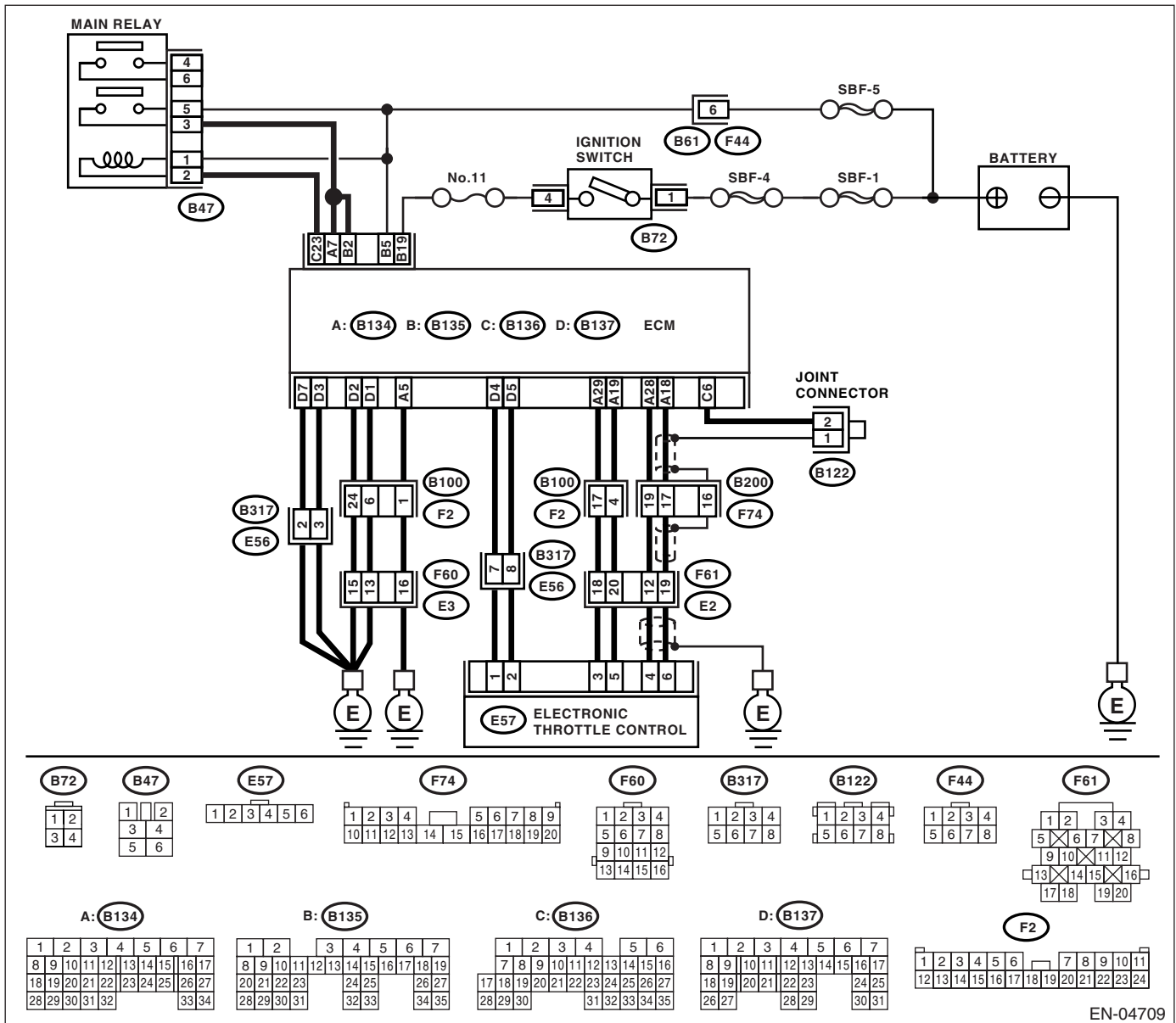
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:





# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes  | No   |
|--|--|--|--|
| <b>1 CHECK INPUT VOLTAGE OF ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector and ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 7 (+) — Chassis ground (-):</i><br><i>(B135) No. 2 (+) — Chassis ground (-):</i>  | Is the voltage 10 — 13 V?                | Go to step 2.  | Repair the open circuit or ground short of power supply circuit.   |
| <b>2 CHECK INPUT VOLTAGE OF ECM.</b><br>1) Start the engine.<br>2) Measure the voltage between ECM connector and ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 7 (+) — Chassis ground (-):</i><br><i>(B135) No. 2 (+) — Chassis ground (-):</i>  | Is the voltage 13 — 15 V?                | Go to step 3.  | Repair the open circuit or ground short of power supply circuit.   |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and electronic throttle control.<br>3) Measure the resistance of harness between ECM and electronic throttle control.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 5 — (B134) No. 19:</i><br><i>(E57) No. 3 — (B134) No. 29:</i> | Is the resistance less than 1 $\Omega$ ? | Go to step 4.  | Repair the open circuit in harness between ECM and electronic throttle control connector.  |
| <b>4 CHECK GROUND HARNESS OF ECM.</b><br>Measure the voltage between ECM connector and ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 5 (+) — Chassis ground (-):</i><br><i>(B137) No. 1 (+) — Chassis ground (-):</i><br><i>(B137) No. 2 (+) — Chassis ground (-):</i><br><i>(B137) No. 3 (+) — Chassis ground (-):</i><br><i>(B137) No. 7 (+) — Chassis ground (-):</i>     | Is the voltage less than 1 V?            | Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Repair the following: <ul style="list-style-type: none"> <li>• Retighten the engine ground terminal.</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |

### CK:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

#### NOTE:

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-350, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### CL:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW

#### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-179, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

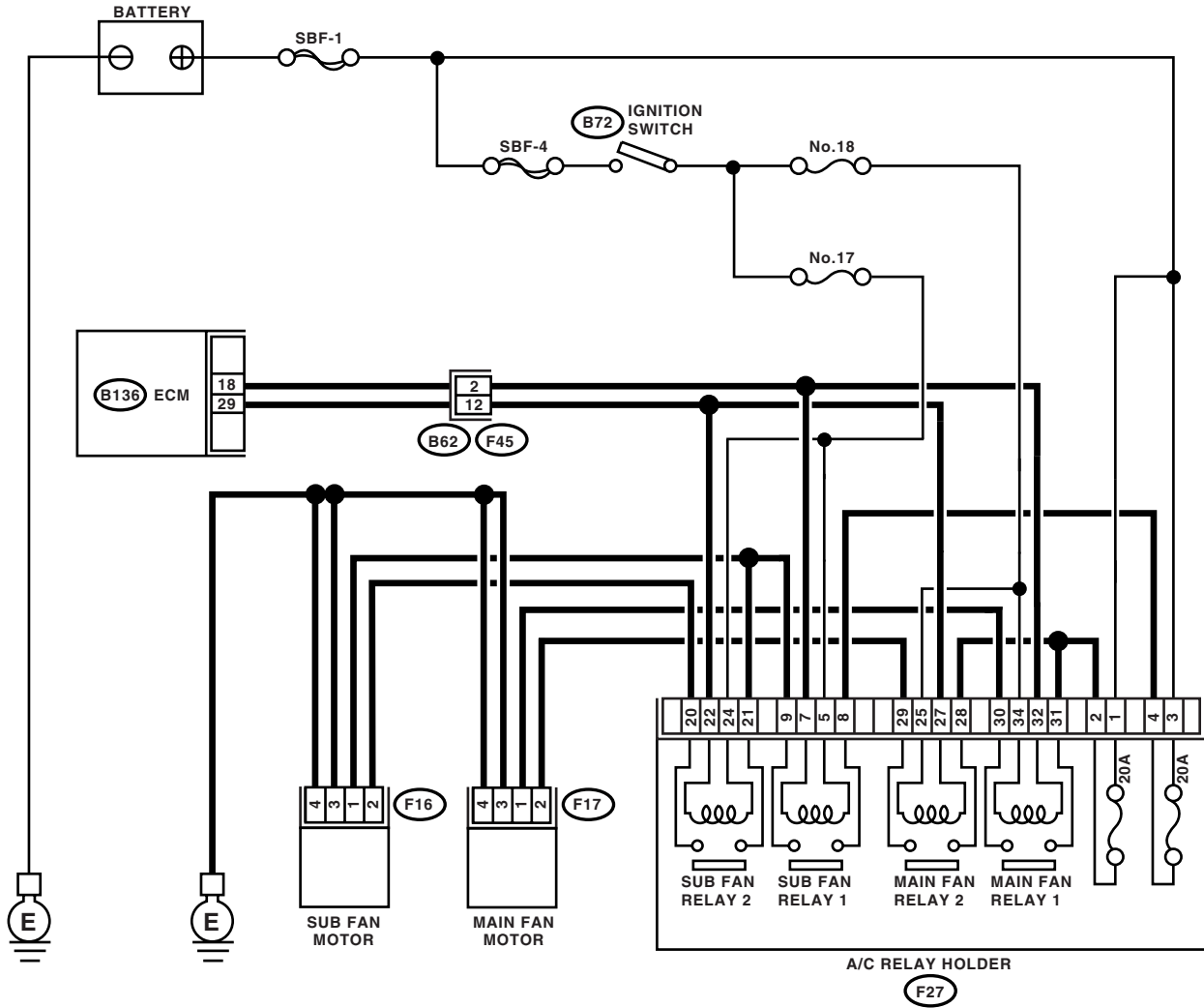
#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



(B72)

|   |   |
|---|---|
| 1 | 2 |
| 3 | 4 |

(F27)

|   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1 | 2  | 5  | 6  | 7  | 10 | 15 | 16 | 17 | 20 | 25 | 26 | 27 | 30 | 35 |
| 3 | 4  | 8  | 11 | 18 | 21 | 28 | 31 | 34 | 36 |    |    |    |    |    |
| 9 | 12 | 13 | 14 | 19 | 22 | 23 | 24 | 29 | 32 | 33 | 34 |    |    |    |

(B136)

|    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  |    |    |    |    |    |
| 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 |    |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |    |    |    |

(F45)

|    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 |    |    |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |

(F16)

(F17)

|   |   |
|---|---|
| 1 | 2 |
| 3 | 4 |

EN-04379

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No                               |
|---|--|---|----------------------------------|
| 1<br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b> | Is DTC P0691 displayed on the Subaru Select Monitor? | Check the radiator fan relay. <Ref. to CO(H4DOTC)-7, Radiator Main Fan System.> <Ref. to CO(H4DOTC)-12, Radiator Sub Fan System.> | A temporary poor contact occurs. |

## CM:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-180, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

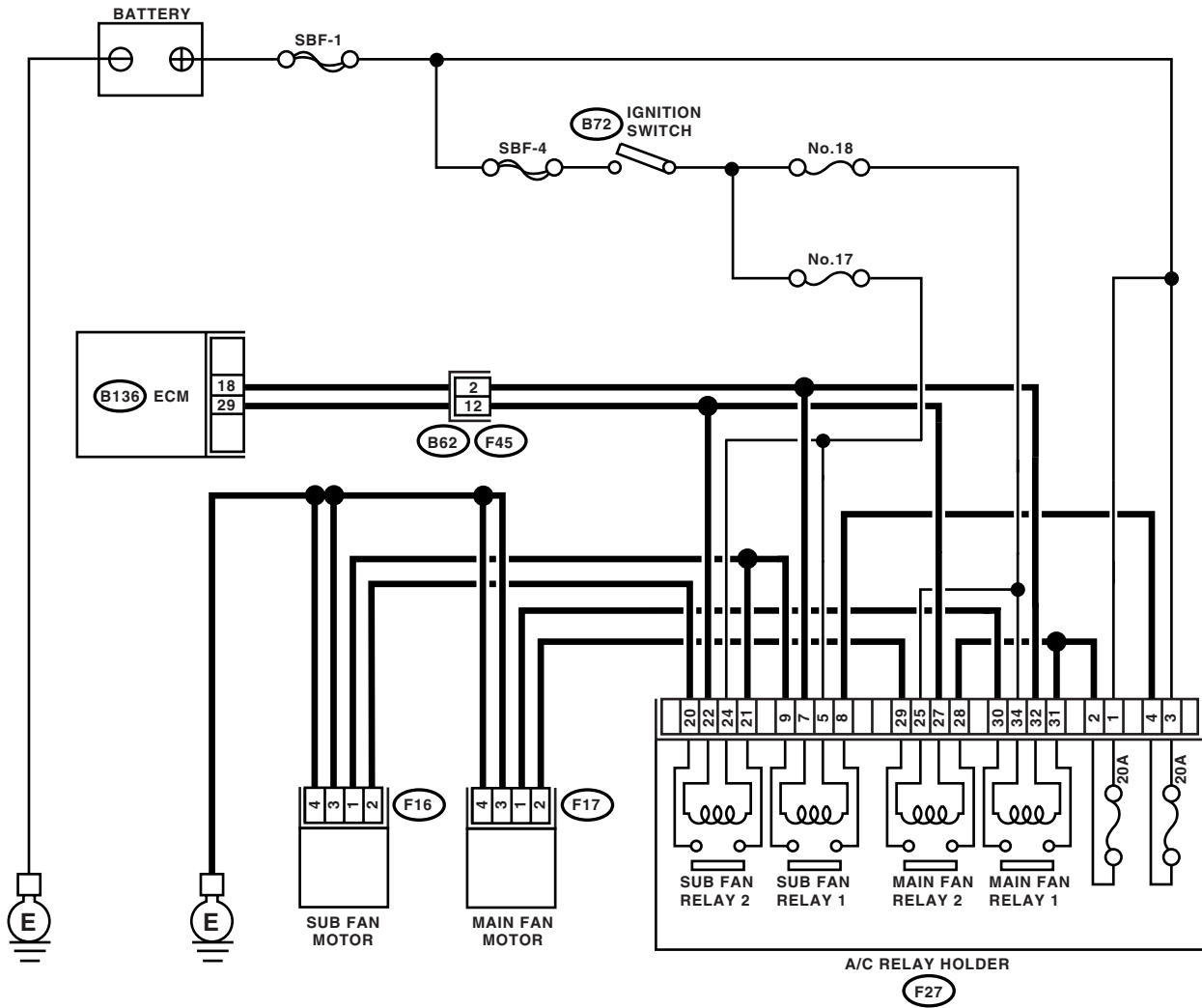
### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



(B72)



(F27)



(B136)



(F45)



(F16)



EN-04379

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No                               |
|---|--|---|----------------------------------|
| 1<br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b> | Is DTC P0692 displayed on the Subaru Select Monitor? | Check the radiator fan relay. <Ref. to CO(H4DOTC)-7, Radiator Main Fan System.> <Ref. to CO(H4DOTC)-12, Radiator Sub Fan System.> | A temporary poor contact occurs. |

### CN:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-181, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Trouble Code (DTC) Detecting Criteria.>

**NOTE:**

For the diagnostic procedure, refer to AT section. <Ref. to 4AT(D)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CO:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-182, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

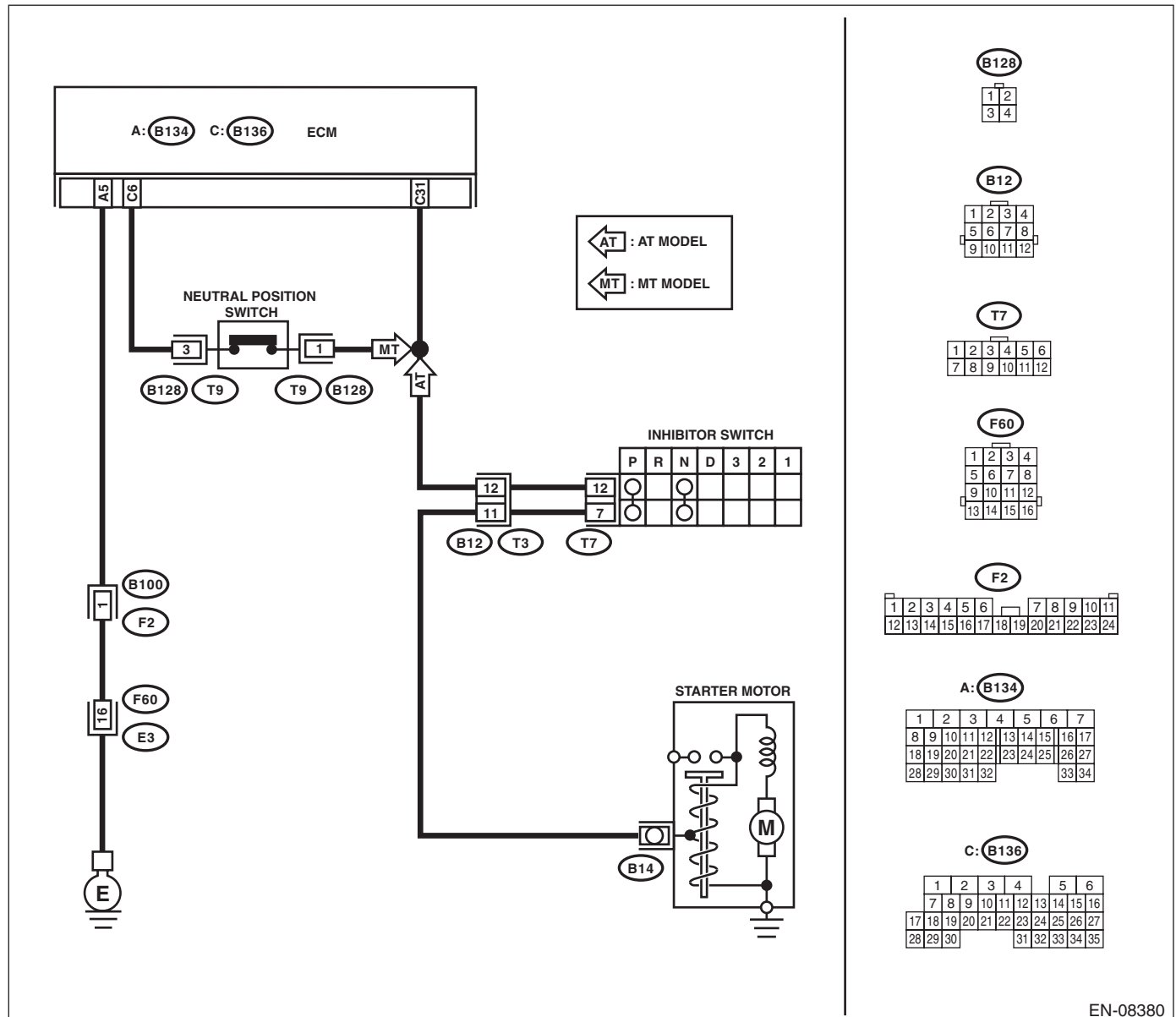
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-08380

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <b>1 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Place the select lever except for "N" and "P" positions.<br>3) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 31 (+) — Chassis ground (-):</b></i>   | Is the voltage 4.5 — 5.5 V?  | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. | Go to step 2.   |
| <b>2 CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and transmission harness connector (T3).<br>3) Measure the resistance of harness between ECM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 31 — Chassis ground:</b></i> | Is the resistance more than 1 MΩ?                                    | Go to step 3.   | Repair ground short circuit in harness between ECM and transmission harness connector.              |
| <b>3 CHECK TRANSMISSION HARNESS CONNECTOR.</b><br>1) Disconnect the connector from inhibitor switch.<br>2) Measure the resistance of harness between transmission harness connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(T3) No. 12 — Engine ground:</b></i>   | Is the resistance more than 1 MΩ?                                    | Go to step 4.   | Repair ground short circuit in harness between transmission harness and inhibitor switch connector. |
| <b>4 CHECK INHIBITOR SWITCH.</b><br>Measure the resistance between inhibitor switch connector the receptacle's terminals in selector lever except for "N" position.<br><i><b>Terminals</b></i><br><i><b>No. 7 — No. 12:</b></i>  | Is the resistance more than 1 MΩ?                                    | Go to step 5.   | Replace the inhibitor switch. <Ref. to 4AT-48, Inhibitor Switch.>                                   |
| <b>5 CHECK SELECTOR CABLE CONNECTION.</b>  | Is there any fault in selector cable connection to inhibitor switch? | Repair selector cable connection. <Ref. to CS-28, INSPECTION, Select Cable.>                                | Contact your SOA Service Center since deterioration of some parts may be the cause.                 |

## CP:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-183, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

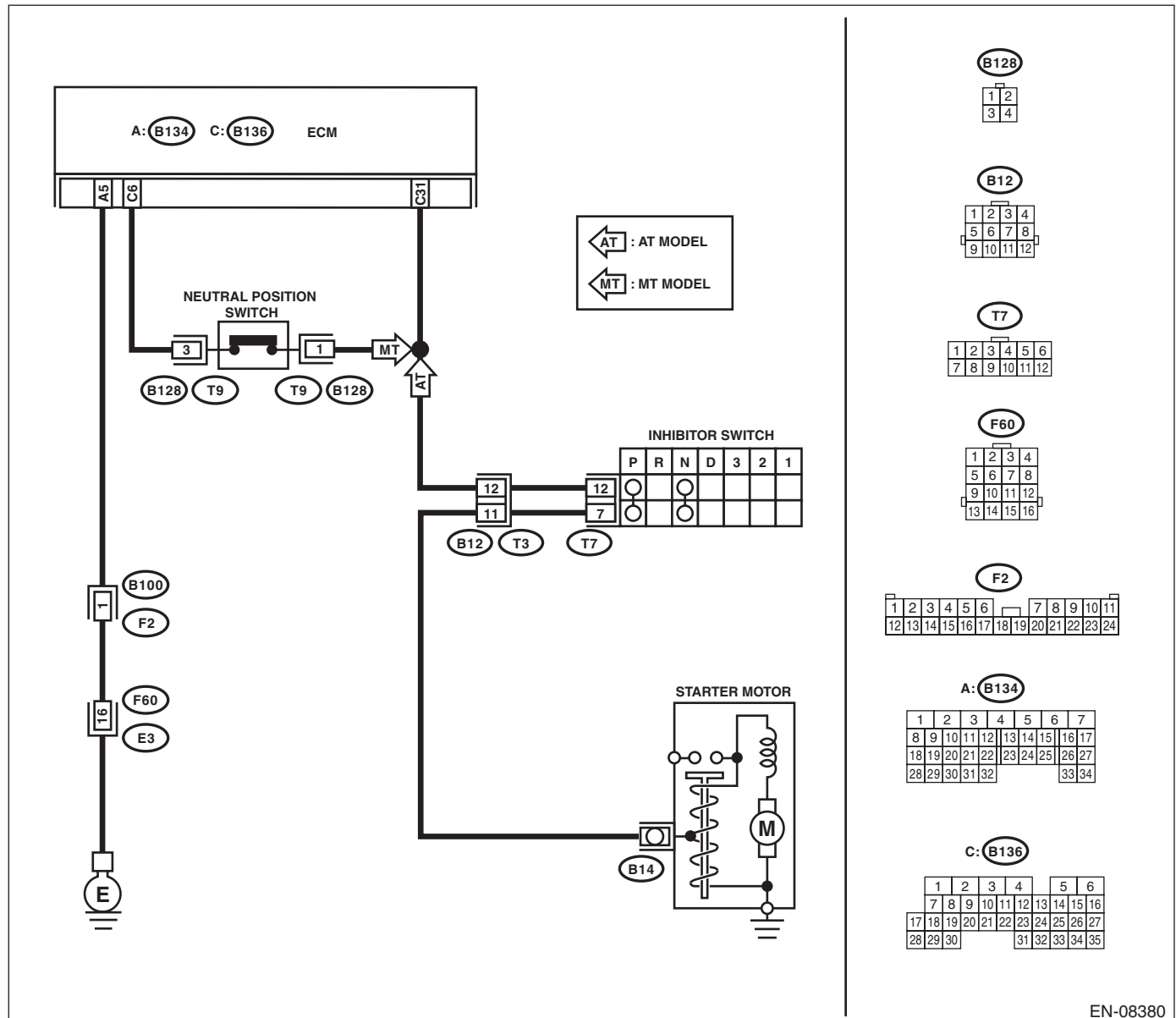
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:





## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No   |
|--|--|--|--|
| <b>1 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Place the shift lever in a position except for neutral.<br>3) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 31 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10 V?                           | Go to step 2.  | Go to step 4.  |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Place the shift lever in neutral.<br>2) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 31 (+) — Chassis ground (-):</b></i>  | Is the voltage less than 1 V?                            | Go to step 3.  | Go to step 4.  |
| <b>3 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.   | Is there poor contact in ECM connector?                  | Repair poor contact in ECM connector.                  | Contact your SOA Service Center since deterioration of some parts may be the cause.    |
| <b>4 CHECK NEUTRAL POSITION SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from transmission harness.<br>3) Place the shift lever in a position except for neutral.<br>4) Measure the resistance between transmission harness and connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(T9) No. 1 — No. 3:</b></i> | Is the resistance more than 1 M $\Omega$ ?               | Go to step 5.  | Repair short circuit in transmission harness or replace neutral position switch.       |
| <b>5 CHECK NEUTRAL POSITION SWITCH.</b><br>1) Place the shift lever in neutral.<br>2) Measure the resistance between transmission harness connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(T9) No. 1 — No. 3:</b></i>  | Is the resistance less than 1 $\Omega$ ?                 | Go to step 6.  | Repair short circuit in transmission harness or replace neutral position switch.       |
| <b>6 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.</b><br>Measure the resistance between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 31 — Chassis ground:</b></i>   | Is the resistance more than 1 M $\Omega$ ?               | Go to step 7.  | Repair ground short circuit in harness between ECM and transmission harness connector. |
| <b>7 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.</b><br>1) Disconnect the connector from ECM.<br>2) Measure the resistance of harness between ECM and transmission harness connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 31 — (B128) No. 1:</b></i><br><i><b>(B136) No. 6 — (B128) No. 3:</b></i>                        | Is the resistance less than 1 $\Omega$ ?                 | Go to step 8.  | Repair open circuit in harness between ECM and transmission harness connector.         |
| <b>8 CHECK POOR CONTACT.</b><br>Check poor contact in transmission harness connector.  | Is there poor contact in transmission harness connector? | Repair poor contact in transmission harness connector. | Contact your SOA Service Center since deterioration of some parts may be the cause.    |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CQ:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-184, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

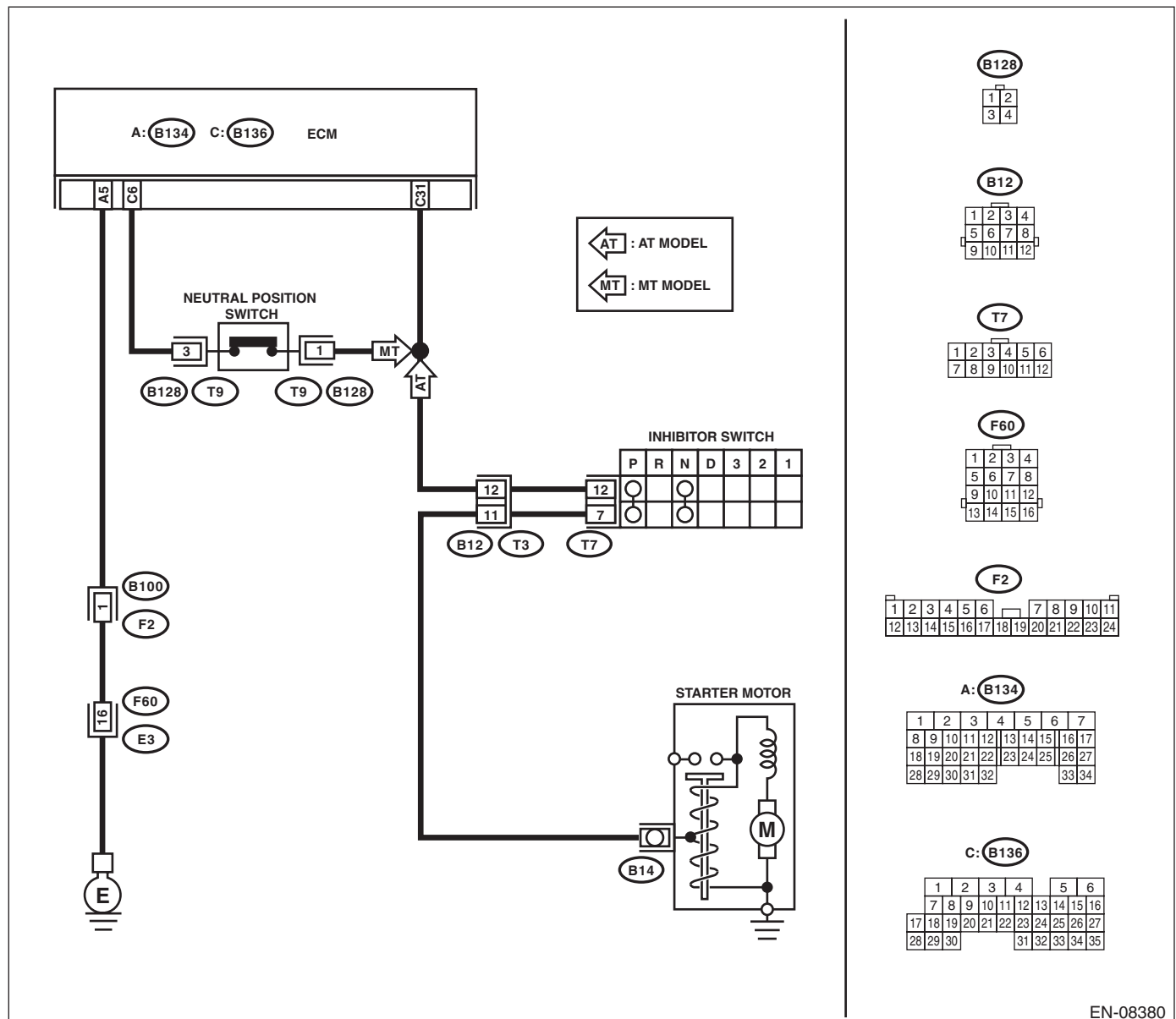
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-08380

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes   | No  |
|--|--|---|---|
| <b>1 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground in selector lever "N" and "P" positions.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 31 (+) — Chassis ground (-):</b></i>  | Is the voltage less than 1 V?            | Go to step 2.   | Go to step 4.   |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM and chassis ground in selector lever except for "N" and "P" positions.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 31 (+) — Chassis ground (-):</b></i>  | Is the voltage 4.5 — 5.5 V?              | Go to step 3.   | Go to step 4.   |
| <b>3 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.   | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.   | Contact your SOA Service Center since deterioration of some parts may be the cause.   |
| <b>4 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 31 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 10 V?           | Repair battery short circuit in harness between ECM and inhibitor switch connector. | Go to step 5.   |
| <b>5 CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and inhibitor switch.<br>3) Measure the resistance of harness between ECM and inhibitor switch connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 31 — (T7) No. 12:</b></i> | Is the resistance less than 1 $\Omega$ ? | Go to step 6.   | Repair harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and inhibitor switch connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in inhibitor switch connector</li> <li>• Poor contact in ECM connector</li> </ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <b>6</b><br><b>CHECK INHIBITOR SWITCH GROUND LINE.</b><br>Measure the resistance of harness between inhibitor switch connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(T7) No. 12 — Engine ground:</b></i> | Is the resistance less than 5 $\Omega$ ?                           | Go to step 7.   | Repair open circuit in harness between inhibitor switch connector and starter motor ground line.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between inhibitor switch connector and starter motor ground line</li> <li>• Poor contact in starter motor connector</li> <li>• Poor contact in starter motor ground</li> <li>• Starter motor</li> </ul> |
| <b>7</b><br><b>CHECK INHIBITOR SWITCH.</b><br>Measure the resistance between inhibitor switch connector receptacle's terminals in selector lever "N" and "P" positions.<br><i><b>Terminals</b></i><br><i><b>No. 7 — No. 12:</b></i>       | Is the resistance less than 1 $\Omega$ ?                           | Go to step 8.   | Replace the inhibitor switch. <Ref. to 4AT-48, Inhibitor Switch.>   |
| <b>8</b><br><b>CHECK SELECT CABLE CONNECTION.</b>   | Is there any fault in select cable connection to inhibitor switch? | Repair select cable connection.<br><Ref. to CS-28, INSPECTION, Select Cable.> | Contact your SOA Service Center since deterioration of some parts may be the cause.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CR:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-185, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

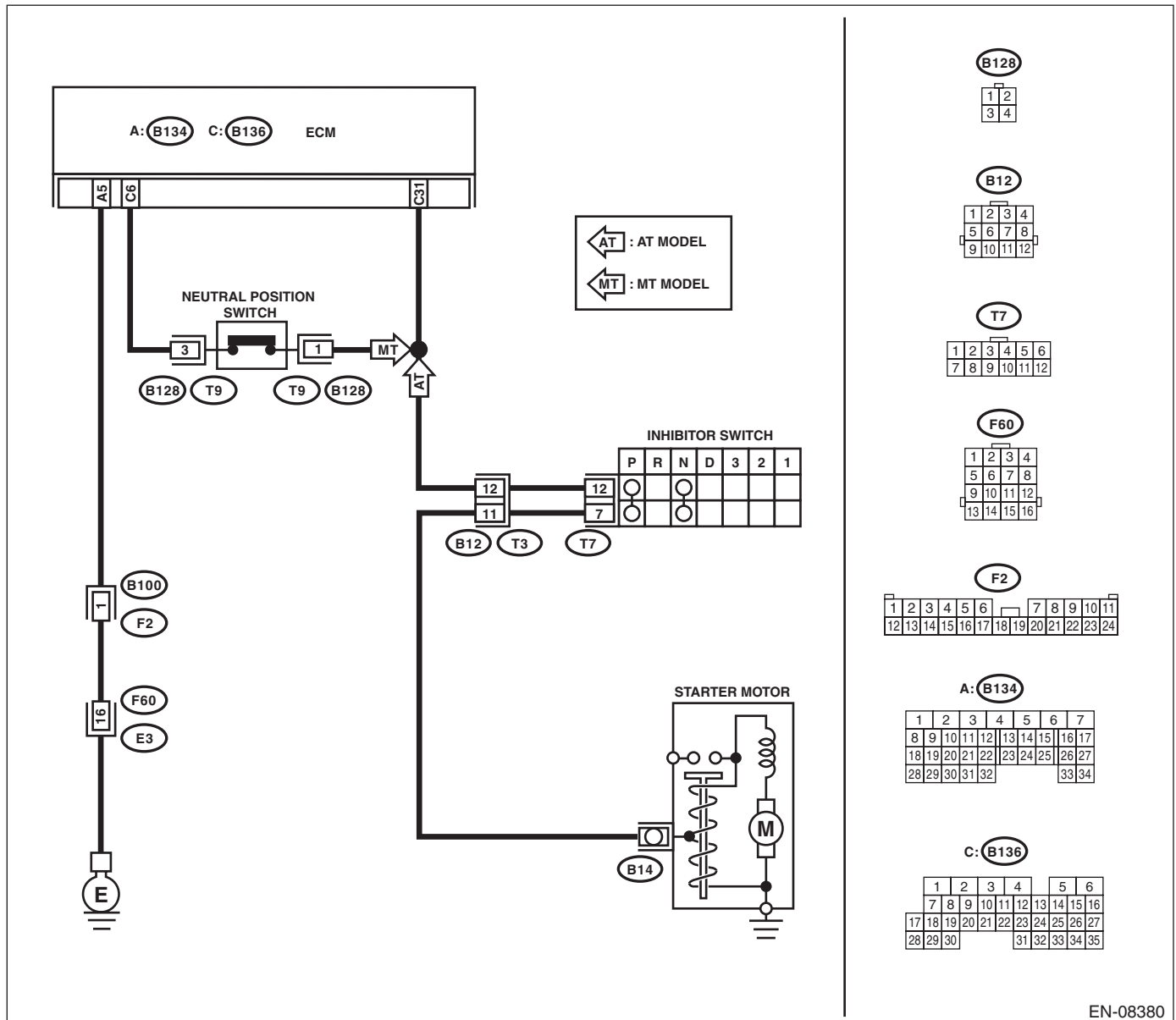
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-08380

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <b>1 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Place the shift lever in a position except for neutral.<br>3) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 31 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?                               | Go to step 2.   | Go to step 4.   |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Place the shift lever in neutral.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 31 (+) — Chassis ground (-):</b>   | Is the voltage less than 1 V?                                | Go to step 3.   | Go to step 4.   |
| <b>3 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.  | Is there poor contact in ECM connector?                      | Repair the poor contact in ECM connector.   | Contact your SOA Service Center since deterioration of some parts may be the cause. |
| <b>4 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Disconnect ECM connector from ECM.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 31 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?                               | Repair the battery short circuit in harness between ECM and transmission connector. | Go to step 5.   |
| <b>5 CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and transmission harness connector (T9).<br>3) Measure the resistance of harness between ECM and neutral switch connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 31 — (B128) No. 1:</b><br><b>(B136) No. 6 — (B128) No. 3:</b> | Is the resistance less than 1 $\Omega$ ?                     | Go to step 6.   | Repair the open circuit in harness between ECM and transmission harness connector.  |
| <b>6 CHECK NEUTRAL POSITION SWITCH.</b><br>1) Place the shift lever in neutral.<br>2) Measure the resistance between transmission harness connector receptacle's terminals.<br><b>Terminals</b><br><b>No. 1 — No. 3:</b>  | Is the resistance less than 1 $\Omega$ ?                     | Go to step 7.   | Replace the neutral position switch.  |
| <b>7 CHECK POOR CONTACT.</b><br>Check poor contact in the transmission harness connector.   | Is there poor contact in the transmission harness connector? | Repair poor contact in transmission harness connector.                              | Contact your SOA Service Center since deterioration of some parts may be the cause. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CS:DTC P1152 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1)

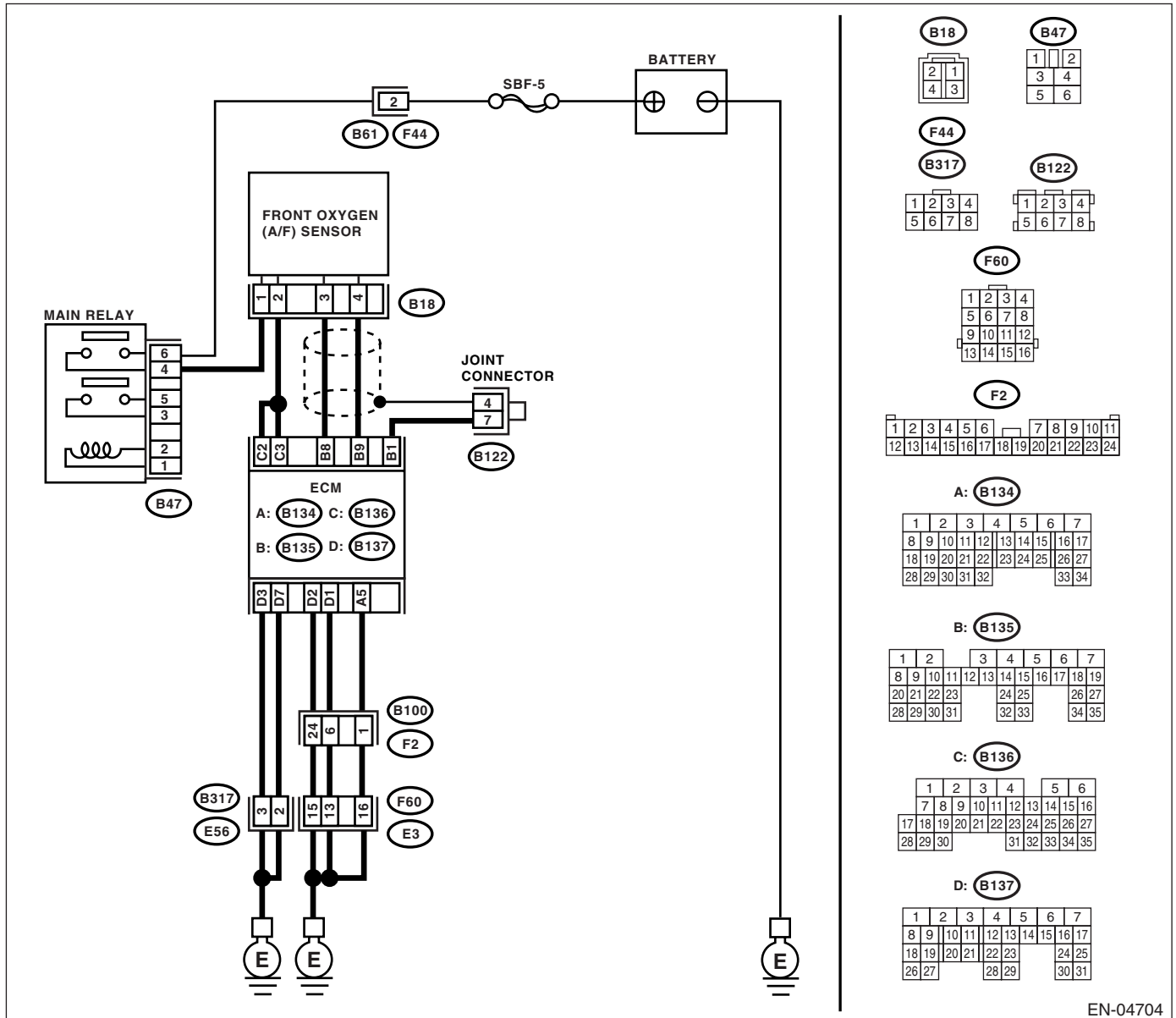
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-186, DTC P1152 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04704

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>1</b><br><b>CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>  | Is there water in connector?                                  | Remove infiltrating water completely.                           | Go to step 2.  |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br>3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><br><i><b>Connector &amp; terminal</b></i><br><i><b>(B135) No. 9 — (B18) No. 4:</b></i><br><i><b>(B135) No. 8 — (B18) No. 3:</b></i> | Is the resistance less than 1 $\Omega$ ?                      | Go to step 3.   | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ECM and front oxygen (A/F) sensor connector<br>• Poor contact in front oxygen (A/F) sensor connector<br>• Poor contact in ECM connector |
| <b>3</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in front oxygen (A/F) sensor connector.  | Is there poor contact in front oxygen (A/F) sensor connector? | Repair the poor contact in front oxygen (A/F) sensor connector. | Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>   |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CT:DTC P1153 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1)

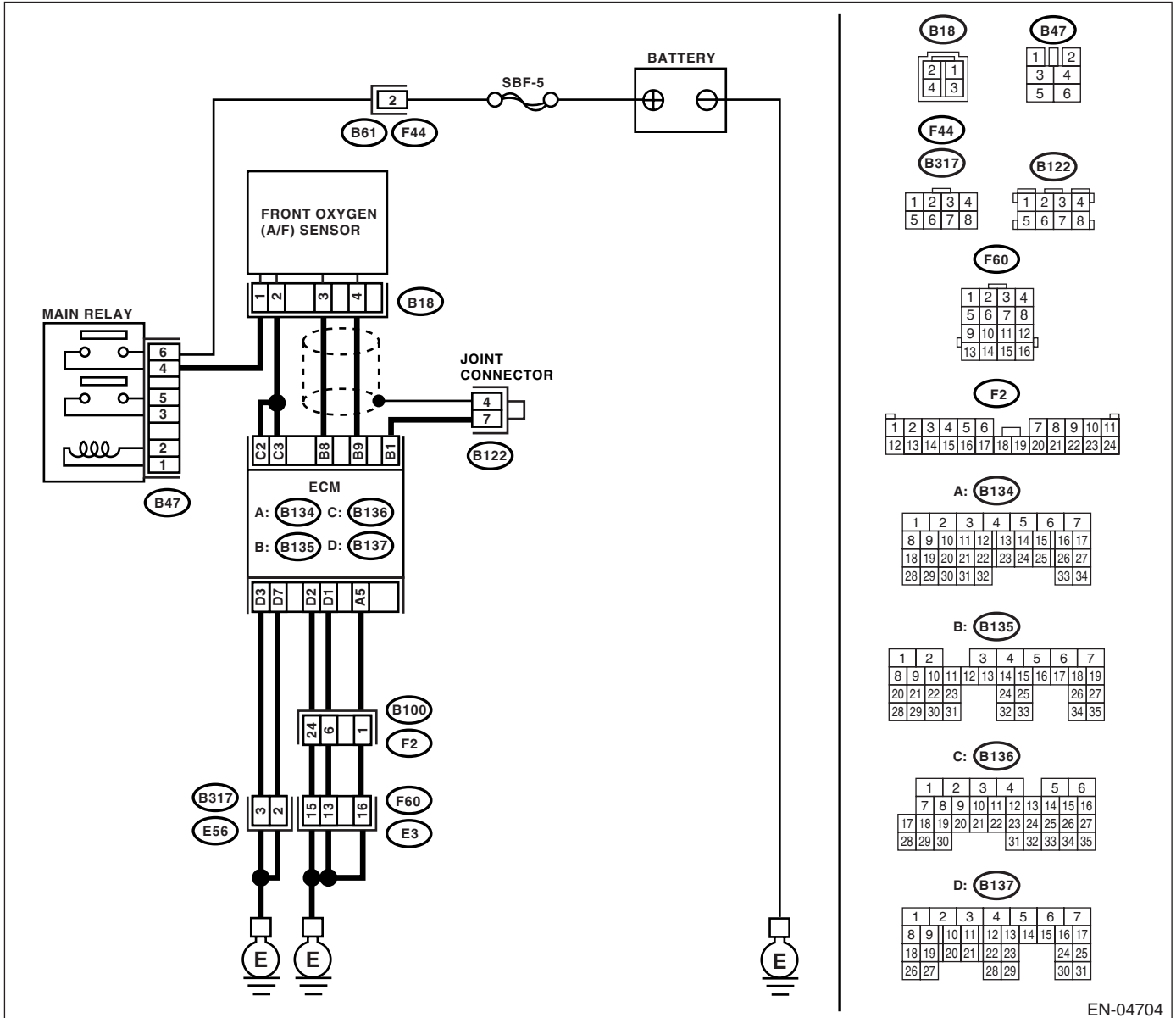
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-188, DTC P1153 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04704

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check   | Yes  | No   |
|------|---|--|--|
| 1    | <b>CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>  | Is there water in connector?               | Remove infiltrating water completely.  |
| 2    | <b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B135) No. 8 — Chassis ground:</i> | Is the resistance more than 1 M $\Omega$ ? | Go to step 3.<br><br>Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.   |
| 3    | <b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>Measure the resistance of harness between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B135) No. 9 — Chassis ground:</i>  | Is the resistance more than 1 M $\Omega$ ? | Go to step 4.<br><br>Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.   |
| 4    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>1) Connect the connector to ECM.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B135) No. 8 (+) — Chassis ground (-):</i>   | Is the voltage more than 4.5 V?            | Go to step 5.<br><br>Go to step 6.   |
| 5    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B135) No. 8 (+) — Chassis ground (-):</i>  | Is the voltage more than 10 V?             | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>After repair, replace the ECM.<br><Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).><br><br>Repair the poor contact in ECM connector. |
| 6    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B135) No. 9 (+) — Chassis ground (-):</i>  | Is the voltage more than 4.95 V?           | Go to step 7.<br><br>Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>  |
| 7    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B135) No. 9 (+) — Chassis ground (-):</i>  | Is the voltage more than 10 V?             | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>After repair, replace the ECM.<br><Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).><br><br>Repair the poor contact in ECM connector. |

## **Diagnostic Procedure with Diagnostic Trouble Code (DTC)**

ENGINE (DIAGNOSTICS)

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### **CU:DTC P1160 RETURN SPRING FAILURE**

**NOTE:**

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-350, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## CV:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

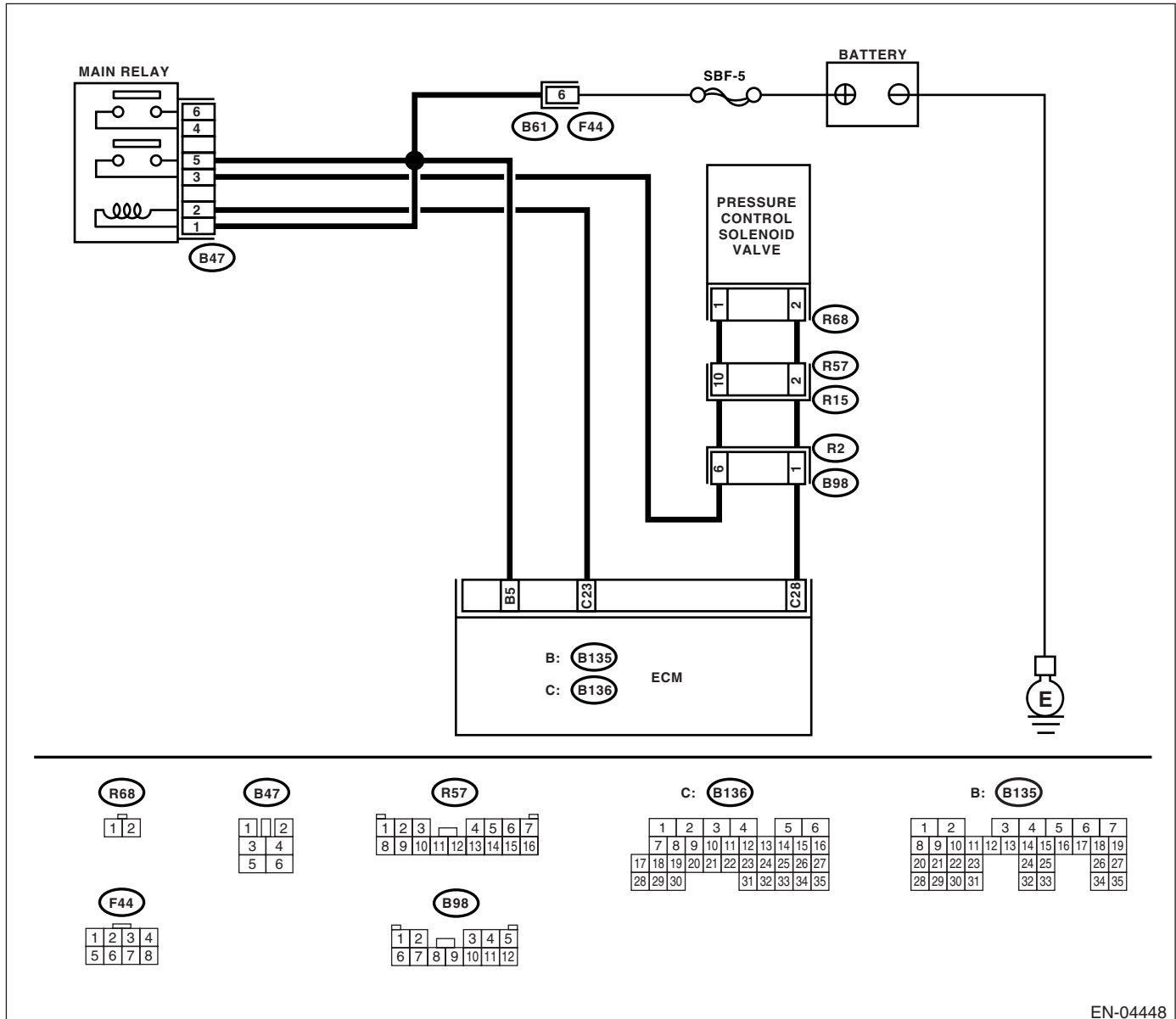
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-192, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes                                   | No   |
|---|--|---------------------------------------|--|
| <b>1 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 28 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?             | Go to step 2.                         | Go to step 3.  |
| <b>2 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.  | Is there poor contact in ECM connector?    | Repair poor contact in ECM connector. | Contact your SOA Service Center since deterioration of some parts may be the cause.  |
| <b>3 CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connectors from pressure control solenoid valve and ECM.<br>3) Measure the resistance of harness between pressure control solenoid valve connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R68) No. 2 — Chassis ground:</b> | Is the resistance more than 1 M $\Omega$ ? | Go to step 4.                         | Repair short circuit to ground in harness between ECM and pressure control solenoid valve connector.   |
| <b>4 CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM and pressure control solenoid valve connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 28 — (R68) No. 2:</b>   | Is the resistance less than 1 $\Omega$ ?   | Go to step 5.                         | Repair harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and pressure control solenoid valve connector</li> <li>• Poor contact in coupling connector</li> </ul>  |
| <b>5 CHECK PRESSURE CONTROL SOLENOID VALVE.</b><br>Measure the resistance between pressure control solenoid valve terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>   | Is the resistance 10 — 100 $\Omega$ ?      | Go to step 6.                         | Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-16, Pressure Control Solenoid Valve.>   |
| <b>6 CHECK POWER SUPPLY TO PRESSURE CONTROL SOLENOID VALVE.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between pressure control solenoid valve and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R68) No. 1 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?             | Go to step 7.                         | Repair harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and pressure control solenoid valve connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in main relay connector</li> </ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check  | Yes   | No  |   |
|------|--|---|---|---|
| 7    | <b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in pressure control solenoid valve connector. | Is there poor contact in pressure control solenoid valve connector? | Repair poor contact in pressure control solenoid valve connector. | Contact your SOA Service Center since deterioration of some parts may be the cause. |

## **CW:DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN**

### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-194, DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

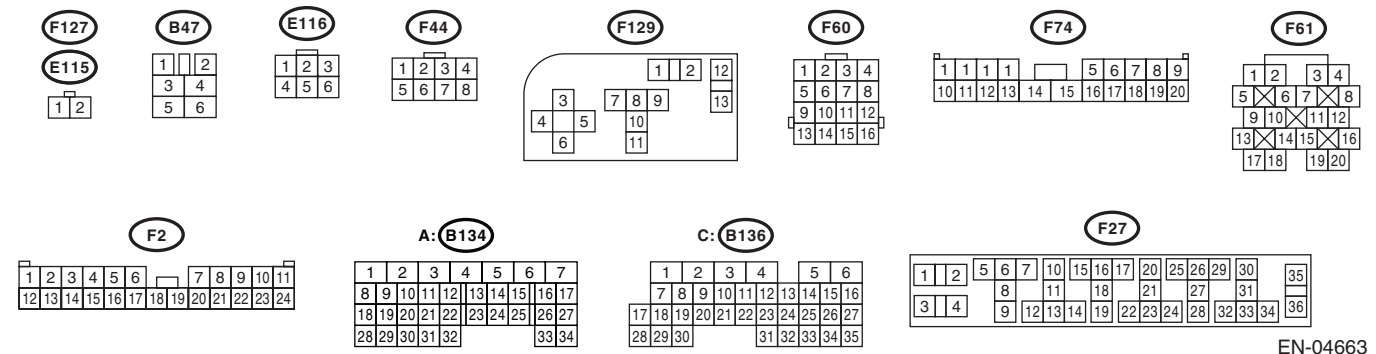
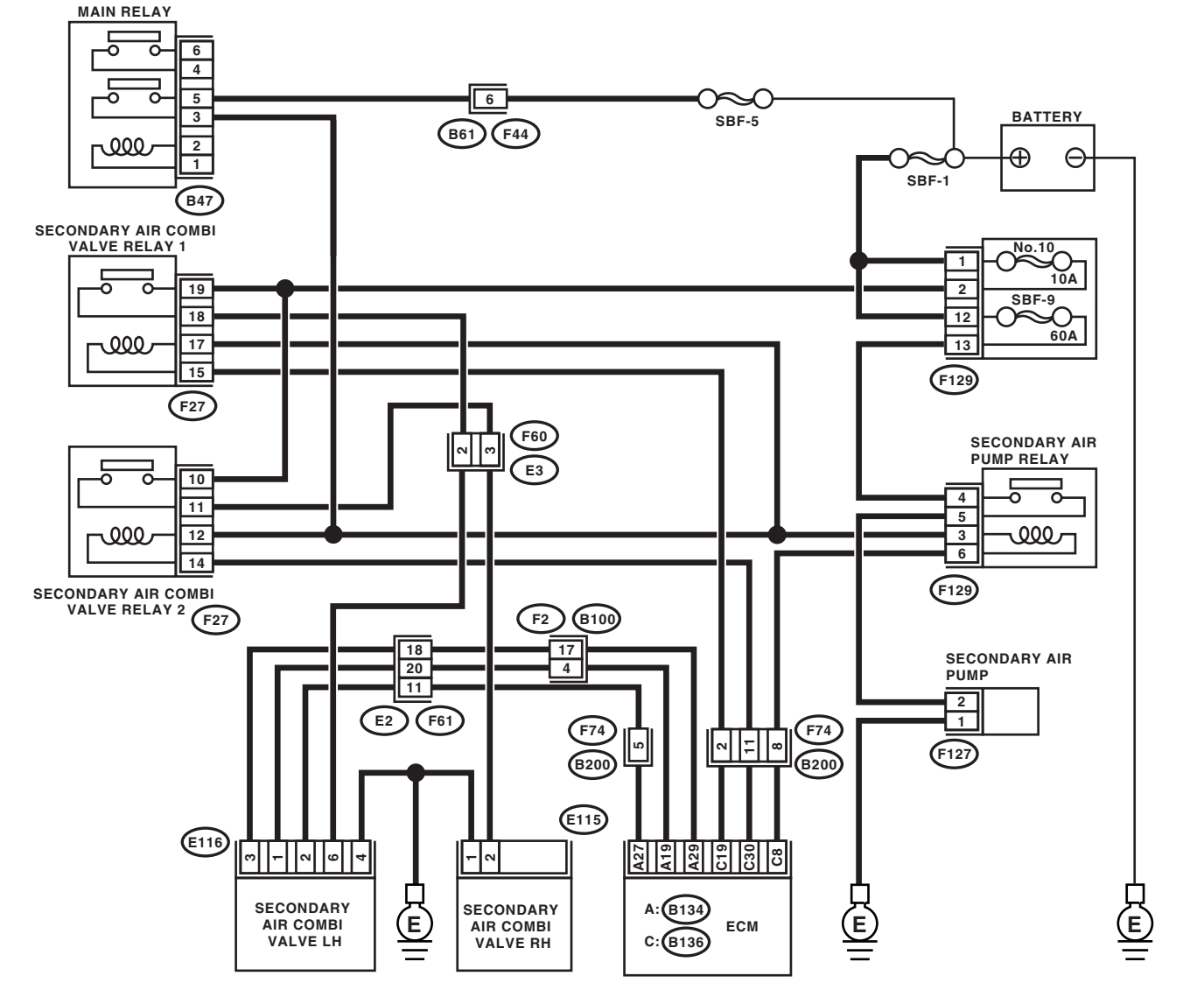
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04663

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                      | Yes  | No  |
|--|--|--|---|
| 1<br><b>CHECK SECONDARY AIR COMBI VALVE.</b><br>1) Remove the secondary air combi valve.<br>2) Blow air through inlet port of secondary air combi valve and check the pipe connection for air leakage. | Is there air leakage from pipe connection? | Replace the secondary air combi valve which has air leakage. <Ref. to EC(H4DOTC)-10, Secondary Air Combi Valve.> | A temporary poor contact occurs. Check for poor contact of connector. |

## CX:DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT SHORTED

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-195, DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

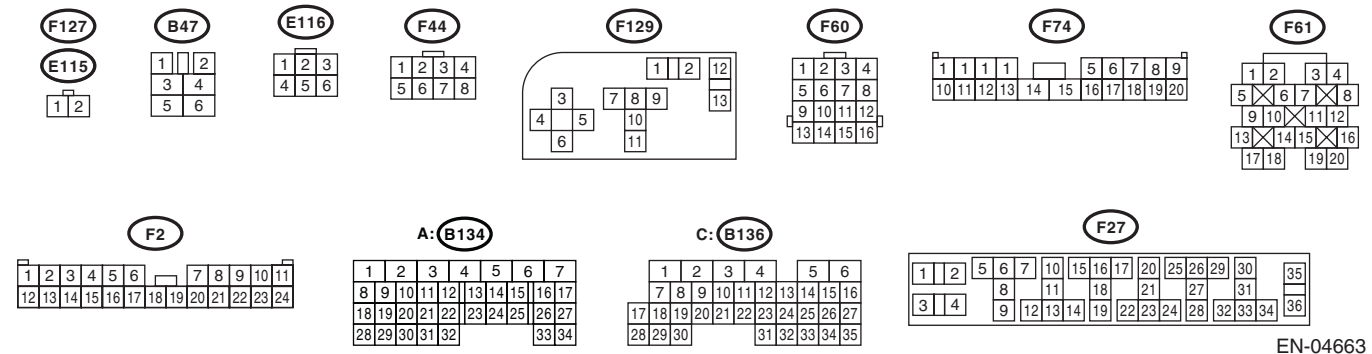
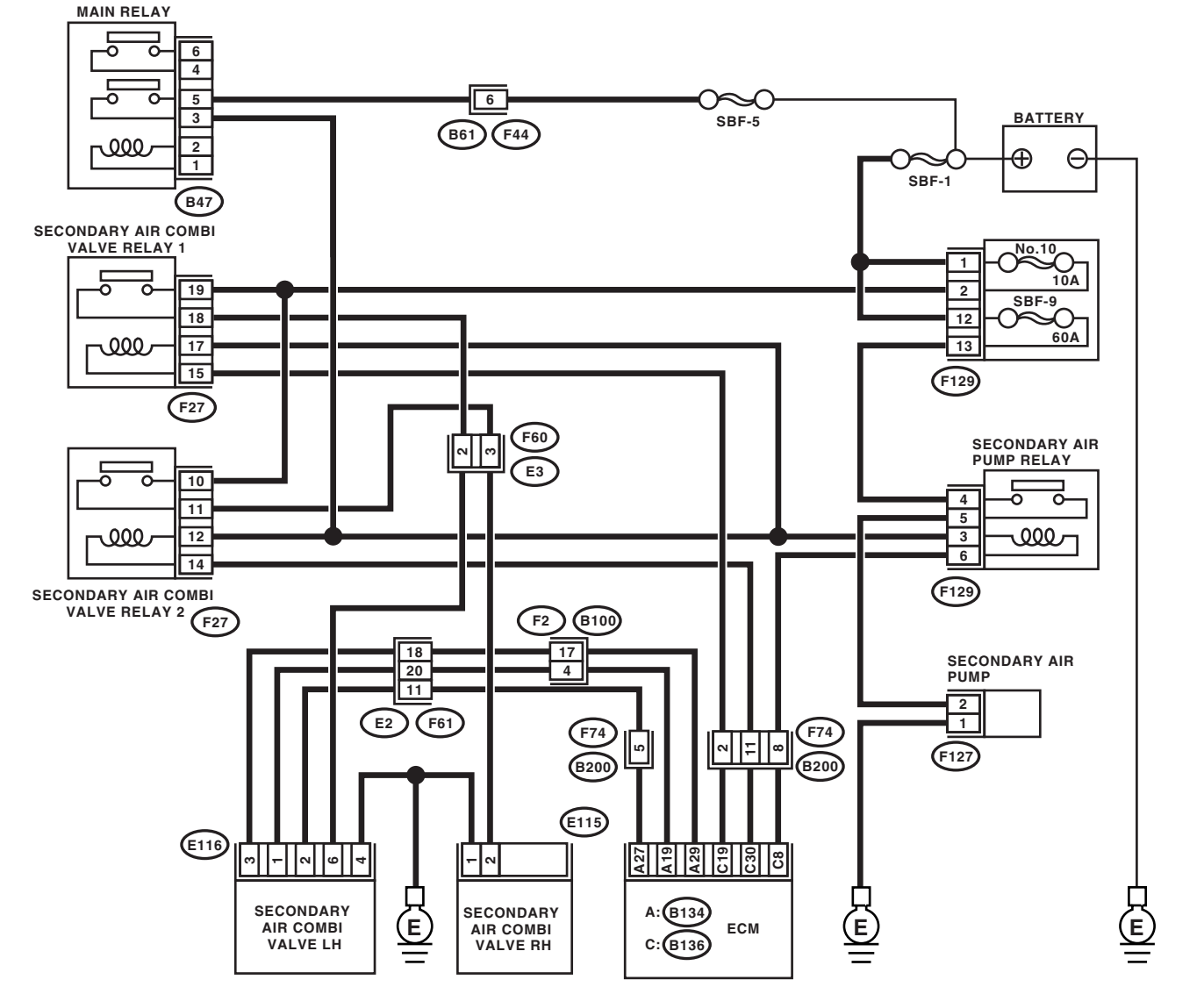
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04663

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes  | No  |
|--|--|--|---|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and secondary air pump relay.<br>3) Measure the resistance of harness between ECM and secondary air pump relay terminal.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 8 — (F129) No. 6:</i> | Is the resistance less than 1 $\Omega$ ? | Go to step 2.  | Repair the open circuit in harness between ECM and secondary air pump relay terminal. |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY.</b><br>Measure the voltage between ECM and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 8 (+) — Chassis ground (-):</i>  | Is the voltage more than 10 V?           | Repair the battery short circuit in harness between ECM and secondary air pump relay terminal. | A temporary poor contact occurs. Check for poor contact of connector.                 |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

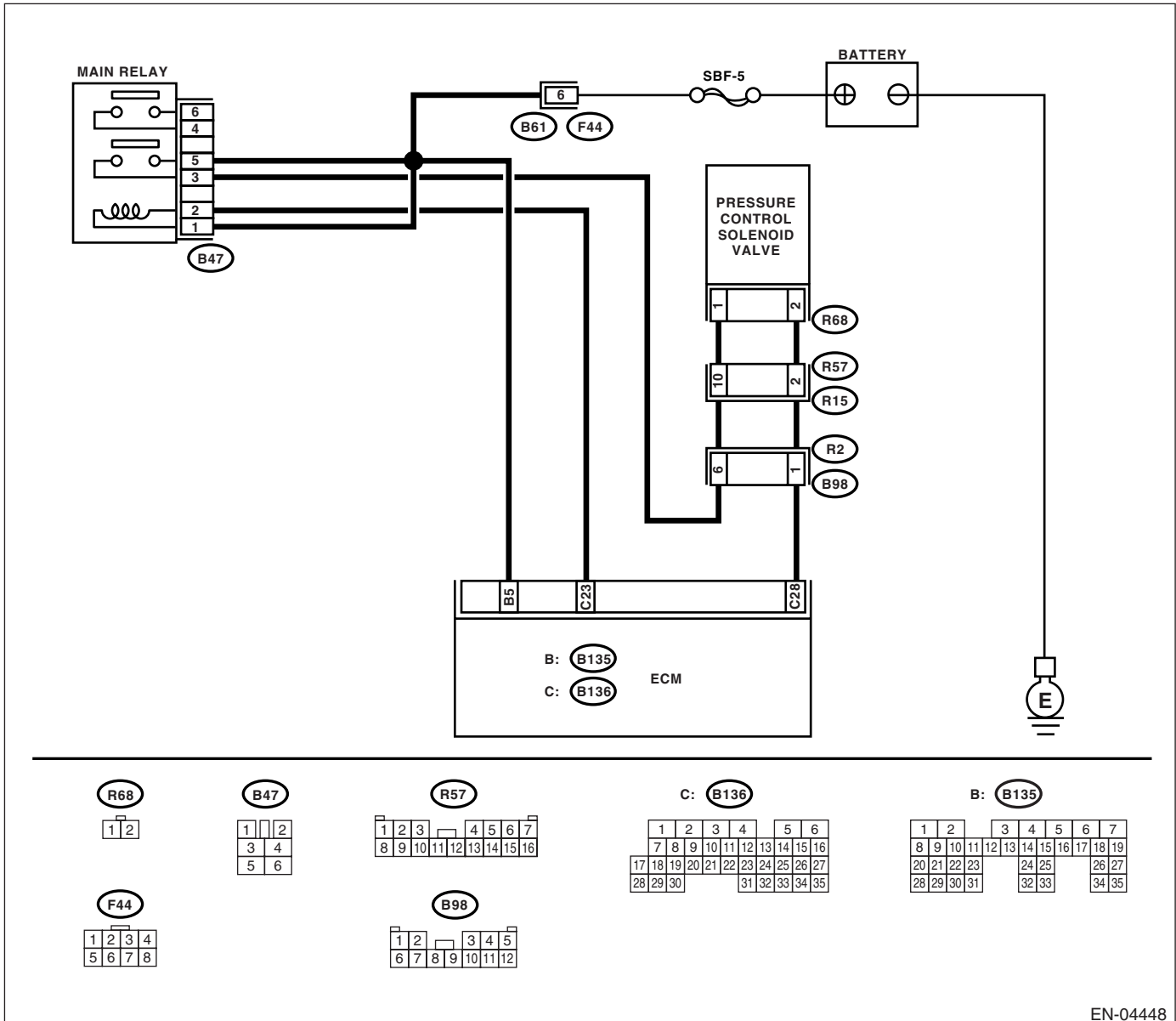
## CY:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-196, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04448

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes  | No   |
|--|--|--|--|
| <p><b>1</b></p> <p><b>CHECK INPUT SIGNAL FOR ECM.</b></p> <p>1) Turn ignition switch to OFF.<br/>2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side).<br/>3) Turn ignition switch to ON.<br/>4) While operating the pressure control solenoid valve, measure voltage between ECM and chassis ground.</p> <p>NOTE:<br/>Pressure control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". &lt;Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.&gt;</p> <p><b>Connector &amp; terminal</b><br/><b>(B136) No. 28 (+) — Chassis ground (-):</b></p> | Does the voltage value change 0 — 10 V?  | Go to step 2.  | The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector. |
| <p><b>2</b></p> <p><b>CHECK INPUT SIGNAL FOR ECM.</b></p> <p>1) Turn ignition switch to ON.<br/>2) Measure the voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B136) No. 28 (+) — Chassis ground (-):</b></p>   | Is the voltage more than 10 V?           | Go to step 4.  | Go to step 3.  |
| <p><b>3</b></p> <p><b>CHECK FOR POOR CONTACT.</b></p> <p>Check for poor contact in ECM connector.</p>  | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.  | Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>   |
| <p><b>4</b></p> <p><b>CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF.<br/>2) Disconnect the connector from pressure control solenoid valve.<br/>3) Turn ignition switch to ON.<br/>4) Measure the voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B136) No. 28 (+) — Chassis ground (-):</b></p>  | Is the voltage more than 10 V?           | Repair short circuit to battery in harness between ECM and pressure control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Go to step 5.  |
| <p><b>5</b></p> <p><b>CHECK PRESSURE CONTROL SOLENOID VALVE.</b></p> <p>1) Turn ignition switch to OFF.<br/>2) Measure the resistance between pressure control solenoid valve terminals.</p> <p><b>Terminals</b><br/><b>No. 1 — No. 2:</b></p>   | Is the resistance less than 1 $\Omega$ ? | Replace the pressure control solenoid valve <Ref. to EC(H4DOTC)-16, Pressure Control Solenoid Valve.> and the ECM <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>.                   | Go to step 6.  |
| <p><b>6</b></p> <p><b>CHECK FOR POOR CONTACT.</b></p> <p>Check for poor contact in ECM connector.</p>  | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.  | Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CZ:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-198, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

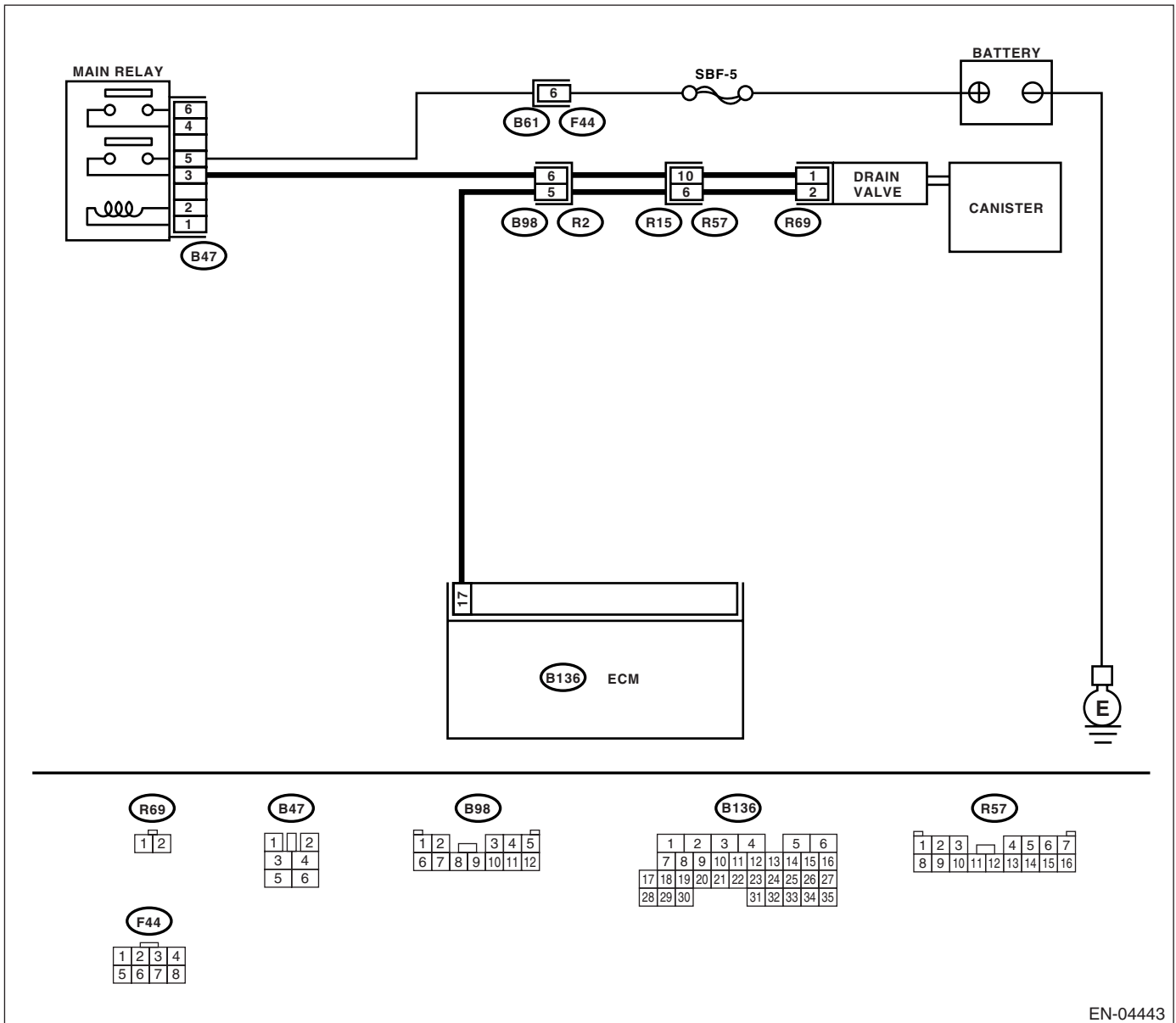
### TROUBLE SYMPTOM:

Improper fuel supply

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04443

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                 | Yes   | No   |
|---|---------------------------------------|---|--|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?           | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> | Go to step 2.  |
| <b>2</b><br><b>CHECK DRAIN HOSES.</b><br>Check the drain hoses for clogging.  | Is there clogging in the drain hoses? | Replace the drain hoses.  | Go to step 3.  |
| <b>3</b><br><b>CHECK DRAIN VALVE OPERATION.</b><br>1) Turn ignition switch to OFF.<br>2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side).<br>3) Turn ignition switch to ON.<br>4) Operate the drain valve.<br><b>NOTE:</b><br>Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.> | Does the drain valve operate?         | Contact your SOA Service Center since deterioration of some parts may be the cause.   | Replace the drain valve. <Ref. to EC(H4DOTC)-20, Drain Valve.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DA:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-200, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

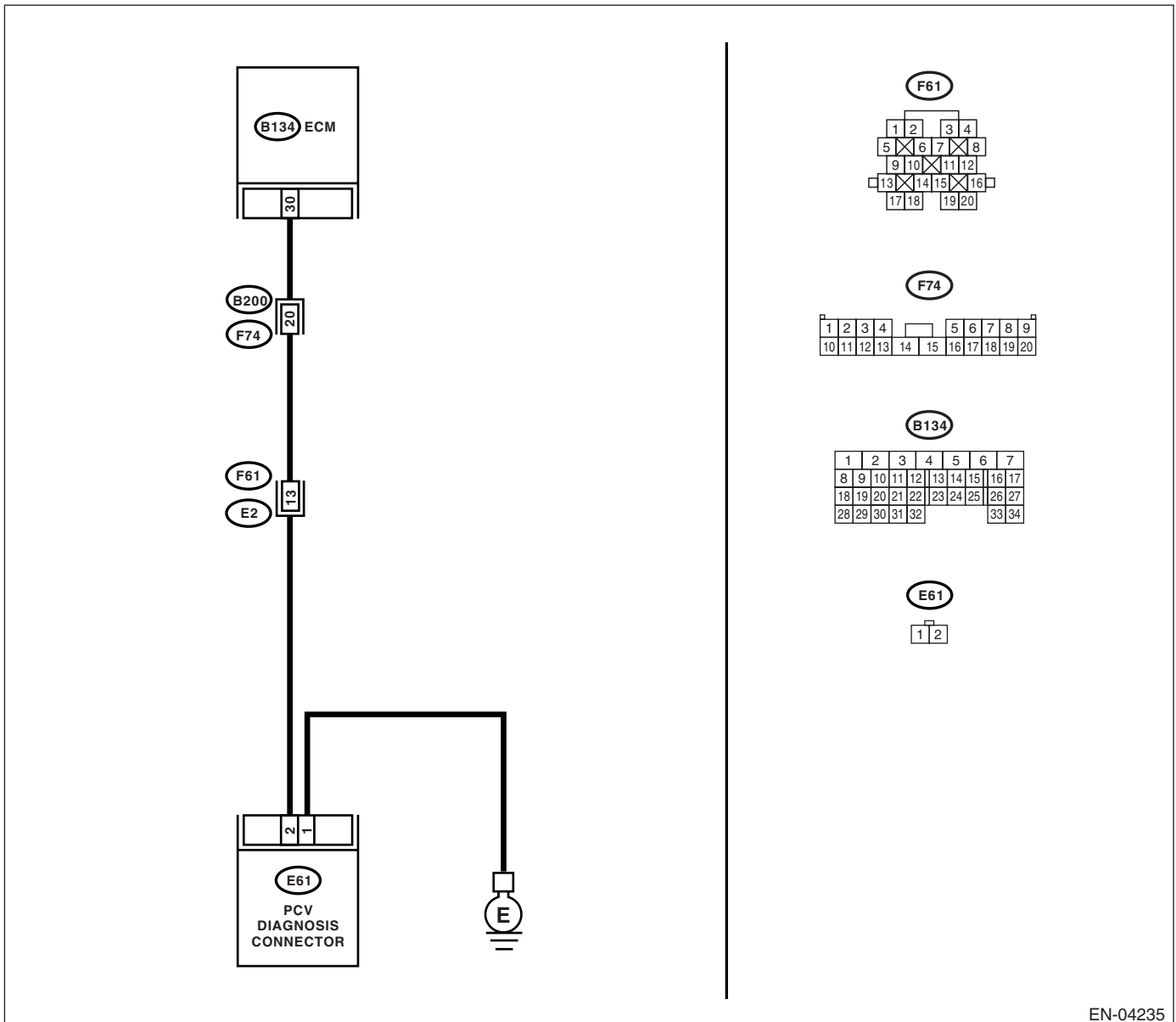
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04235

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No   |
|--|--|---|--|
| <b>1 CHECK BLOW-BY HOSE.</b><br>Check the blow-by hose.  | Is there disconnection or crack in blow-by hose? | Replace or repair blow-by hose.                         | Go to step 2.  |
| <b>2 INSPECT HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from PCV diagnosis connector and ECM.<br>3) Measure the resistance of harness between PCV diagnosis connector and ECM connector.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 30 — (E61) No. 2:</i> | Is the resistance less than 1 $\Omega$ ?         | Go to step 3.   | Repair open circuit in harness between PCV diagnosis connector and ECM.                    |
| <b>3 INSPECT HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR.</b><br>Measure the resistance of harness between PCV diagnosis connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 30 — Chassis ground:</i>  | Is the resistance more than 1 M $\Omega$ ?       | Go to step 4.   | Repair short circuit to chassis ground in harness between PCV diagnosis connector and ECM. |
| <b>4 INSPECT PCV DIAGNOSIS CONNECTOR GROUND CIRCUIT.</b><br>Measure the resistance between PCV diagnosis connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B61) No. 1 — Engine ground:</i>  | Is the resistance less than 5 $\Omega$ ?         | Go to step 5.   | Repair PCV diagnosis connector ground circuit.   |
| <b>5 INSPECT PCV DIAGNOSIS CONNECTOR.</b><br>Measure the resistance between PCV diagnosis connector and terminal.<br><i>Terminals</i><br><i>No. 1 — No. 2:</i>   | Is the resistance less than 1 $\Omega$ ?         | Repair poor contact in ECM and PCV diagnosis connector. | Replace PCV diagnosis connector.   |

## DB:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-202, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

Failure of engine to start

### CAUTION:

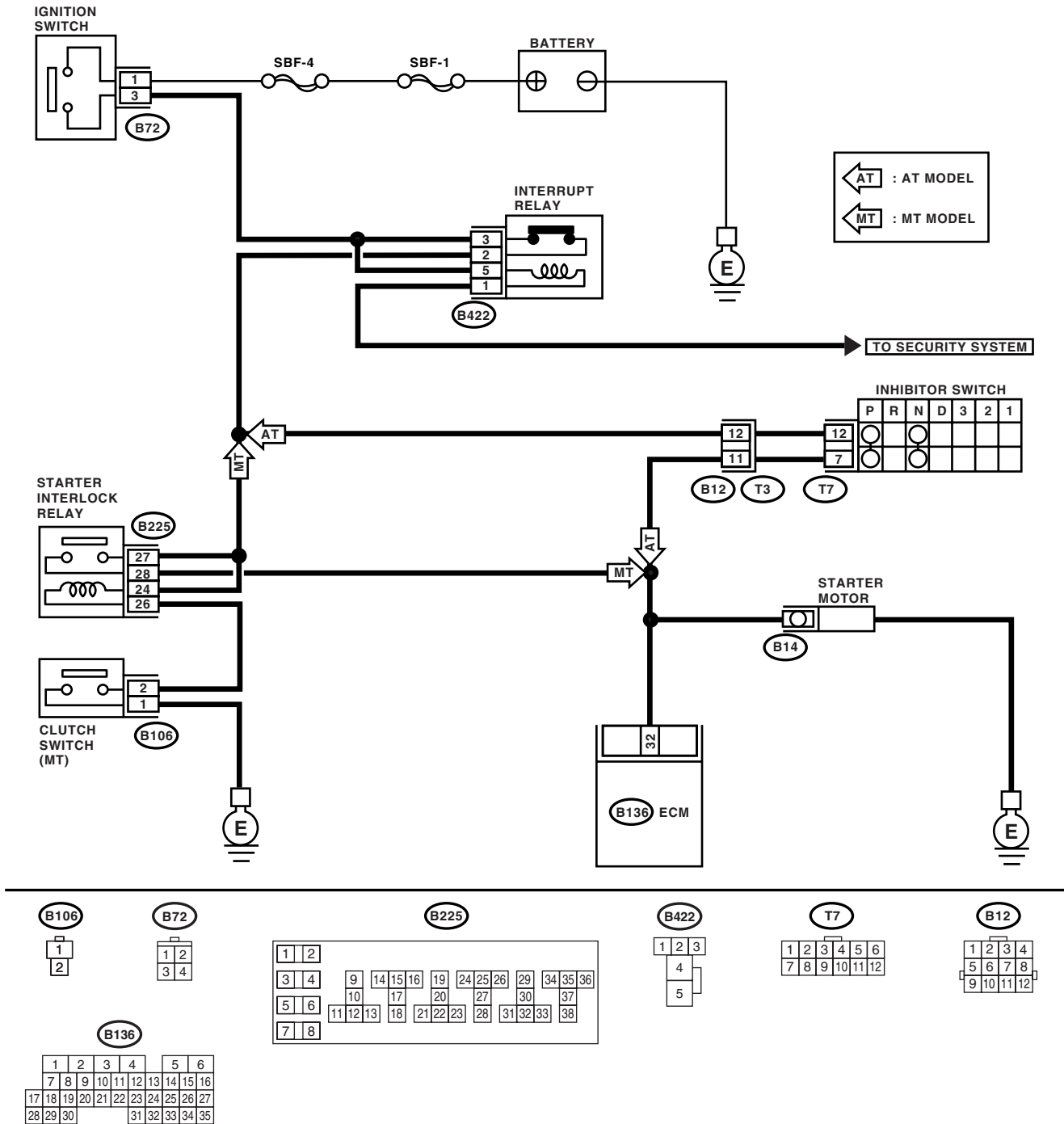
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04633

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| 1<br><b>CHECK OPERATION OF STARTER MOTOR.</b> | Does the starter motor operate when ignition switch is turned to START? | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"><li>• Open or ground short circuit in harness between ECM and starter motor connector</li><li>• Poor contact in ECM connector</li></ul> | Check the starter motor circuit. <Ref. to EN(H4DOTC)(diag)-63, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.> |

## DC:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-203, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

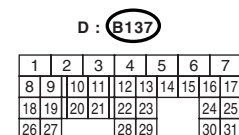
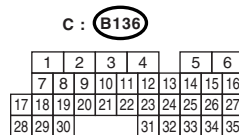
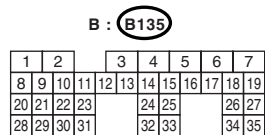
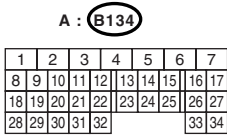
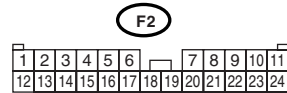
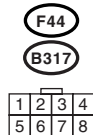
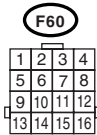
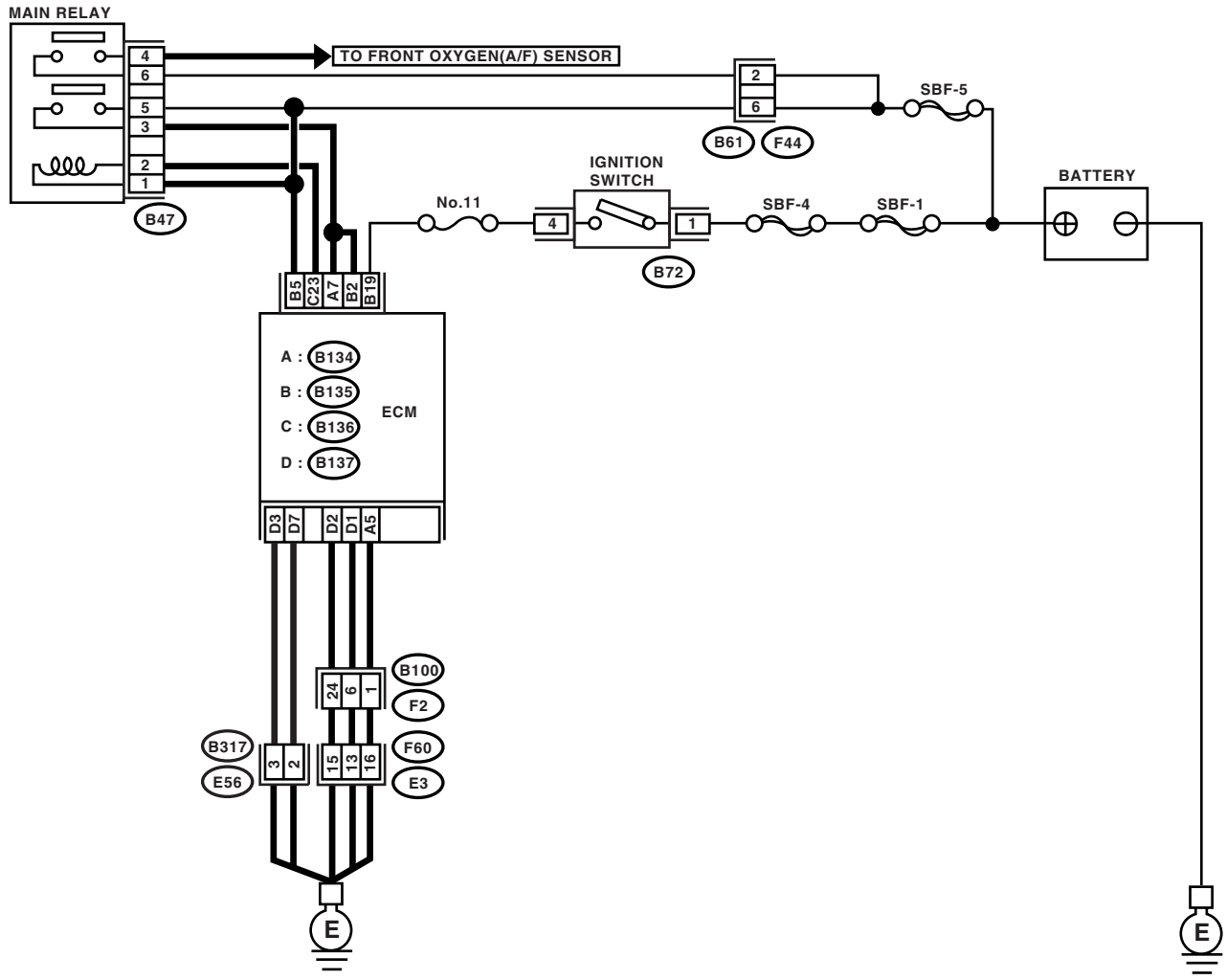
### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04702

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                     | Yes  | No   |
|--|---|--|--|
| <b>1</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B135) No. 5 (+) — Chassis ground (-):</b></i>                                    | Is the voltage more than 10 V?            | Repair the poor contact in ECM connector.  | Go to step 2.  |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.</b><br>1) Disconnect the connector from ECM.<br>2) Measure the resistance of harness between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B135) No. 5 — Chassis ground:</b></i> | Is the resistance less than 10 $\Omega$ ? | Repair the ground short circuit in harness between ECM connector and battery terminal. | Go to step 3.  |
| <b>3</b><br><b>CHECK FUSE SBF-5.</b>   | Is the fuse blown?                        | Replace the fuse.  | Repair the harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and battery</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in battery terminal</li> </ul> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **DD:DTC P1570 ANTENNA**

NOTE:

For the diagnostic procedure, refer to DTC P1570. <Ref. to IM(diag)-22, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **DE:DTC P1571 REFERENCE CODE INCOMPATIBILITY**

NOTE:

For the diagnostic procedure, refer to DTC P1571. <Ref. to IM(diag)-15, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **DF:DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)**

NOTE:

For the diagnostic procedure, refer to DTC P1572. <Ref. to IM(diag)-16, DTC P1572 EGI IMMOBILIZER COMMUNICATION (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **DG:DTC P1574 KEY COMMUNICATION FAILURE**

NOTE:

For the diagnostic procedure, refer to DTC P1574. <Ref. to IM(diag)-20, DTC P1574 KEY IMMOBILIZER COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **DH:DTC P1576 EGI CONTROL MODULE EEPROM**

NOTE:

For the diagnostic procedure, refer to DTC P1576. <Ref. to IM(diag)-21, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **DI: DTC P1577 IMM CONTROL MODULE EEPROM**

NOTE:

For the diagnostic procedure, refer to DTC P1577. <Ref. to IM(diag)-21, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DJ:DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-205, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

| Step  | Check   | Yes   | No                                |
|---|---|---|-----------------------------------|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                     |
| 2<br><b>CHECK TUMBLE GENERATOR VALVE RH.</b><br>1) Remove the tumble generator valve assembly.<br>2) Check the tumble generator valve body. | Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged) | Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Assembly.>  | Clean the tumble generator valve. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DK:DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-206, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

| Step  | Check   | Yes   | No                                |
|---|---|---|-----------------------------------|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                     |
| 2<br><b>CHECK TUMBLE GENERATOR VALVE LH.</b><br>1) Remove the tumble generator valve assembly.<br>2) Check the tumble generator valve body. | Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged) | Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Assembly.>  | Clean the tumble generator valve. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DL:DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-207, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

| Step  | Check   | Yes  | No                                |
|---|---|--|-----------------------------------|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                     |
| 2<br><b>CHECK TUMBLE GENERATOR VALVE RH.</b><br>1) Remove the tumble generator valve assembly.<br>2) Check the tumble generator valve body. | Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged) | Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Assembly.>                                       | Clean the tumble generator valve. |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DM:DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-208, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

| Step  | Check   | Yes   | No                                |
|---|---|---|-----------------------------------|
| 1<br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                     |
| 2<br><b>CHECK TUMBLE GENERATOR VALVE LH.</b><br>1) Remove the tumble generator valve assembly.<br>2) Check the tumble generator valve body. | Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged) | Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Assembly.>  | Clean the tumble generator valve. |

## DN:DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1)

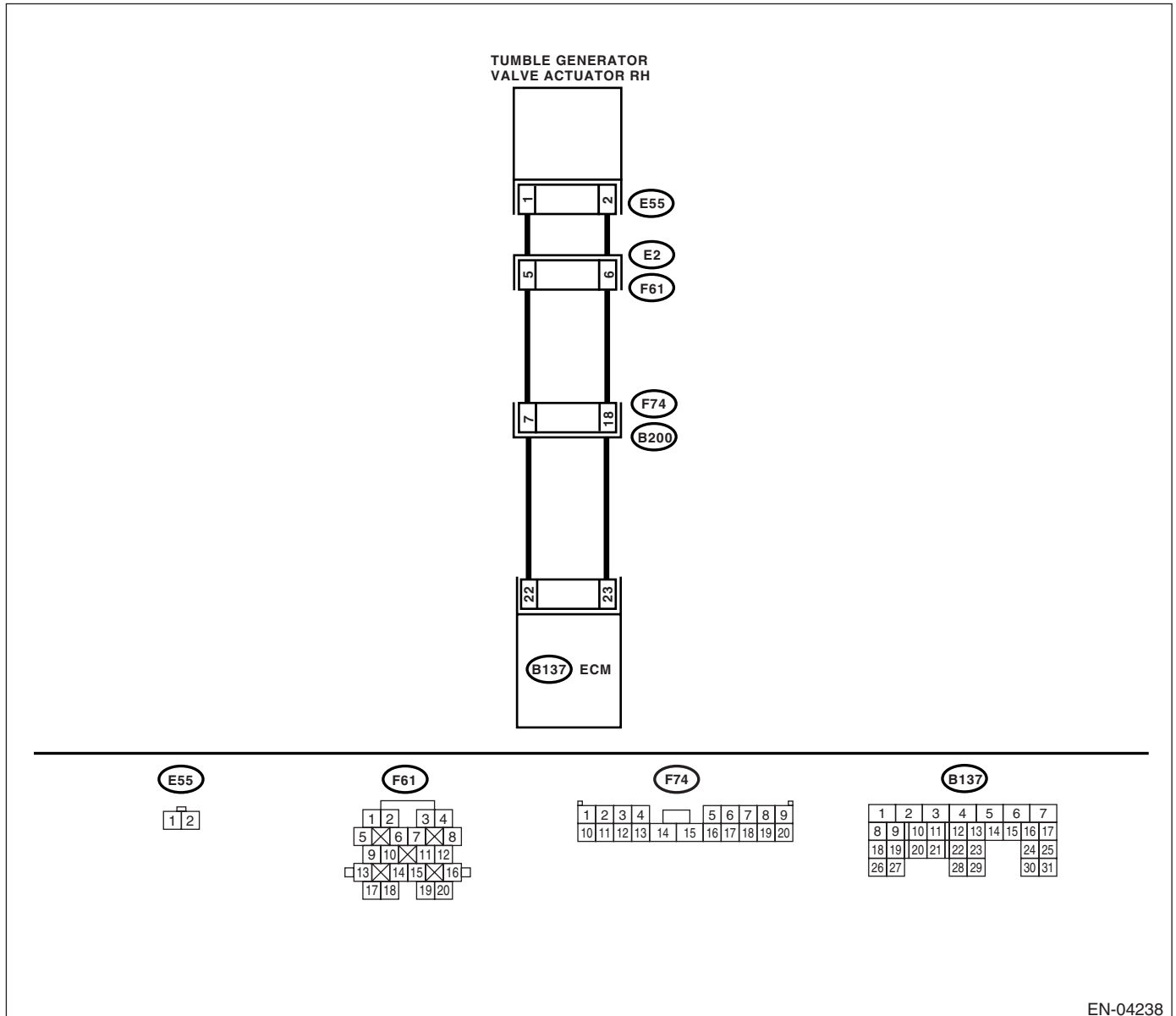
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-209, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No   |
|--|--|--|--|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from tumble generator valve and ECM connector.<br/>                     3) Measure the resistance between tumble generator valve actuator and ECM connector.</p> <p><b>Connector &amp; terminal</b><br/>                     (E55) No. 1 — (B137) No. 22:<br/>                     (E55) No. 2 — (B137) No. 23:</p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p>                  | <p>Go to step 2.</p>   | <p>Repair the open circuit between ECM and tumble generator valve connector.</p> <p>NOTE:<br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and tumble generator valve actuator connector.</li> <li>• Poor contact in coupling connector.</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in tumble generator valve actuator connector.</p>  | <p>Is there poor contact in tumble generator valve actuator connector?</p> | <p>Repair the poor contact in tumble generator valve actuator connector.</p> | <p>Replace the tumble generator valve actuator. &lt;Ref. to FU(H4DOTC)-39, Tumble Generator Valve Actuator.&gt;</p>  |

## DO:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)

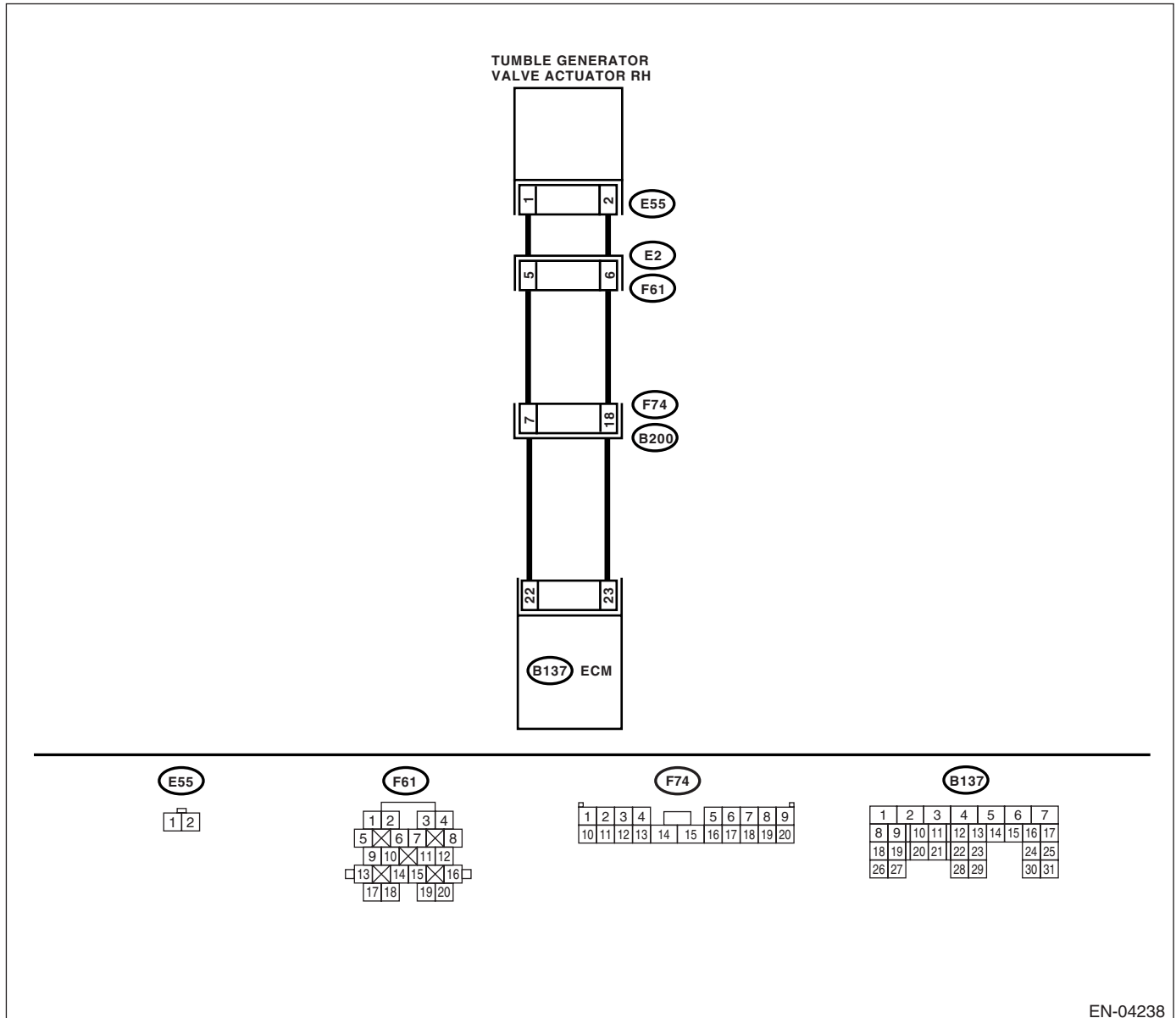
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-211, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                | Yes   | No   |
|--|--------------------------------------|---|--|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from tumble generator valve connector.</p> <p>3) Measure the voltage between tumble generator valve actuator and chassis ground.</p> <p><b>Connector &amp; terminal</b></p> <p><b>(E55) No. 1 (+) — Chassis ground (-):</b></p> <p><b>(E55) No. 2 (+) — Chassis ground (-):</b></p> | <p>Is the voltage less than 5 V?</p> | <p>Replace the tumble generator valve actuator. &lt;Ref. to FU(H4DOTC)-39, Tumble Generator Valve Actuator.&gt;</p> | <p>Repair the battery short circuit between ECM and tumble generator valve actuator.</p> |

**DP:DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN  
(BANK 2)**

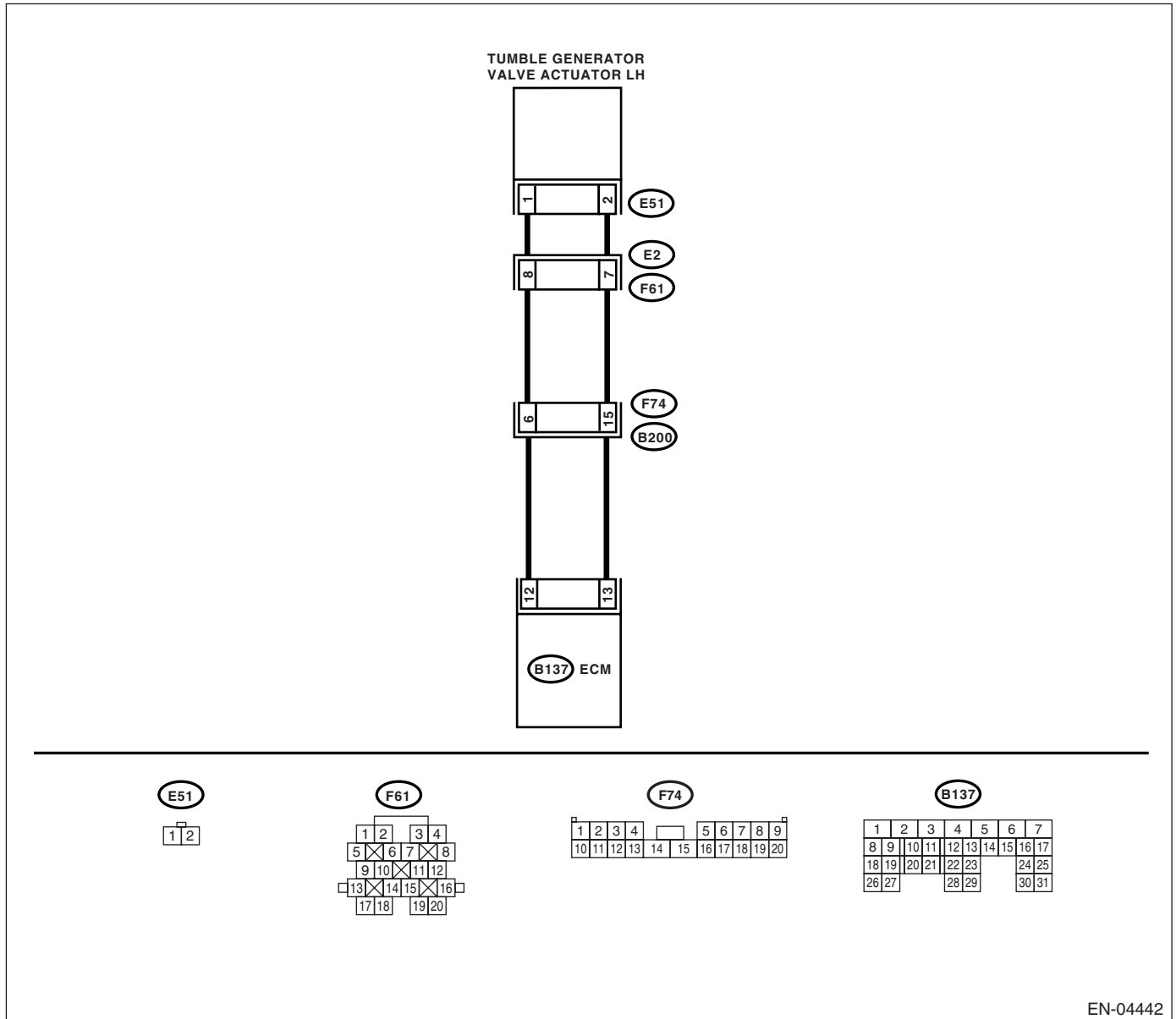
**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-213, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

**CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

**WIRING DIAGRAM:**



EN-04442

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No   |
|--|--|--|--|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from tumble generator valve and ECM connector.<br/>                     3) Measure the resistance between tumble generator valve actuator and ECM connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(E51) No. 1 — (B137) No. 12:</b><br/> <b>(E51) No. 2 — (B137) No. 13:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p>                  | <p>Go to step 2.</p>   | <p>Repair the open circuit between ECM and tumble generator valve connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and tumble generator valve actuator connector.</li> <li>• Poor contact in coupling connector</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in tumble generator valve actuator connector.</p>  | <p>Is there poor contact in tumble generator valve actuator connector?</p> | <p>Repair the poor contact in tumble generator valve actuator connector.</p> | <p>Replace the tumble generator valve actuator. &lt;Ref. to FU(H4DOTC)-39, Tumble Generator Valve Actuator.&gt;</p>  |

## DQ:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)

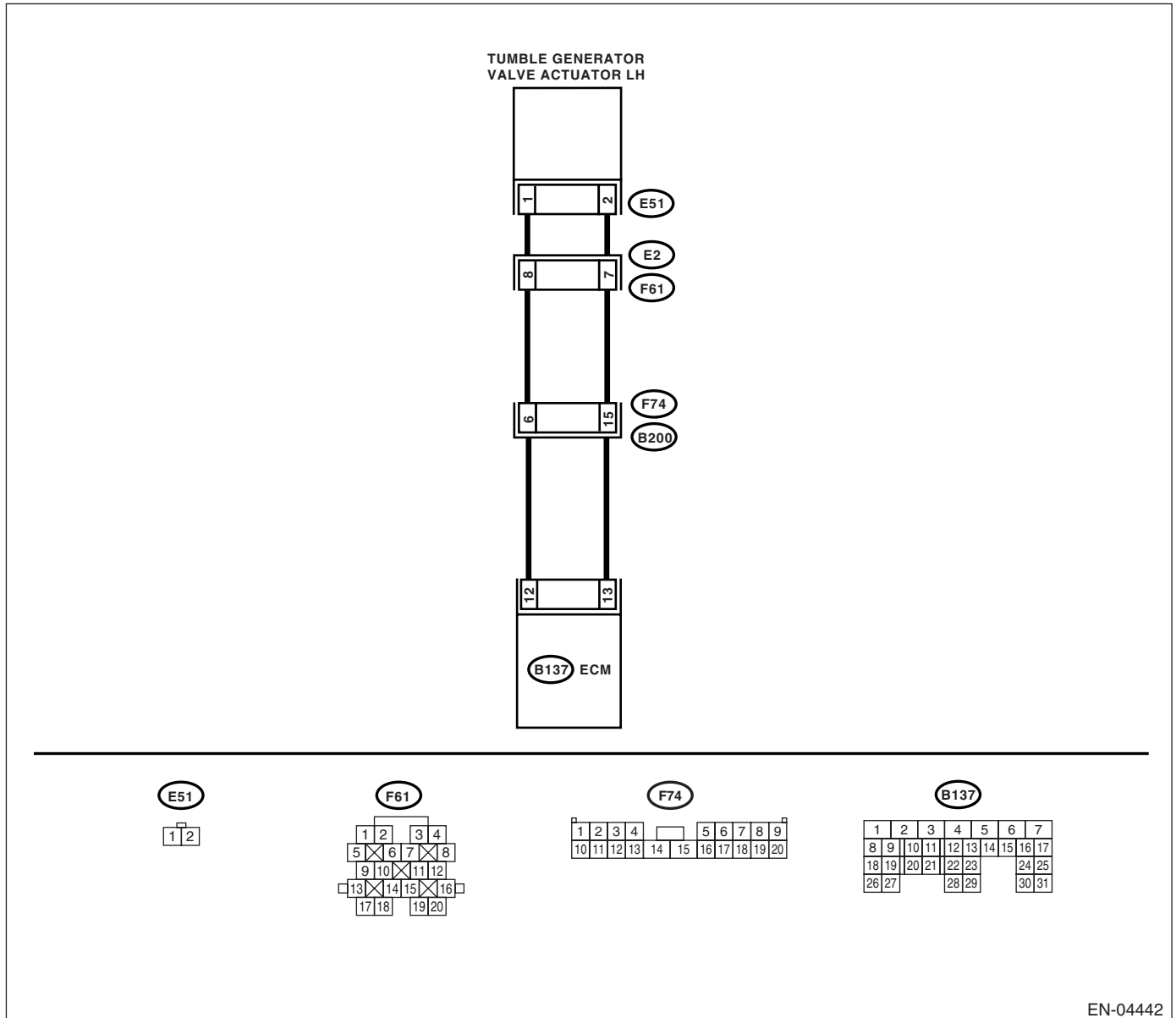
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-215, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:





# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                | Yes   | No   |
|--|--------------------------------------|---|--|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from tumble generator valve connector.<br/>3) Measure the voltage between tumble generator valve actuator and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E51) No. 1 (+) — Chassis ground (-):</b><br/><b>(E51) No. 2 (+) — Chassis ground (-):</b></p> | <p>Is the voltage less than 5 V?</p> | <p>Replace the tumble generator valve actuator. &lt;Ref. to FU(H4DOTC)-39, Tumble Generator Valve Actuator.&gt;</p> | <p>Repair the battery short circuit between ECM and tumble generator valve actuator.</p> |

## DR:DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-217, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

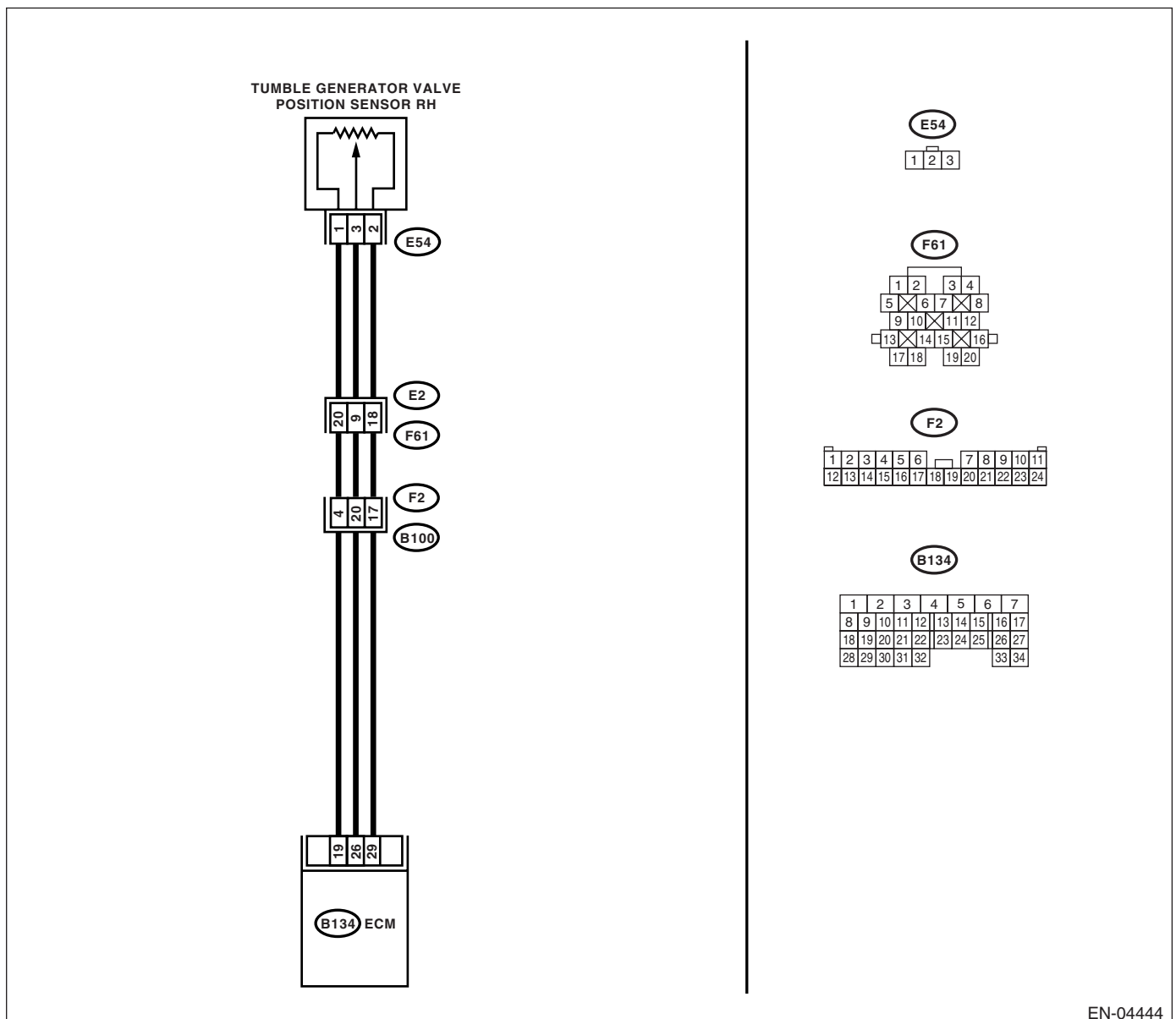
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

### WIRING DIAGRAM:



EN-04444

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes                                       | No   |
|---|--|---|--|
| <b>1 CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the voltage less than 0.1 V?  | Go to step 2.                             | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.<br><br>NOTE:<br>In this case, repair the following:<br>• Poor contact in tumble generator valve position sensor connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><i>Connector &amp; terminal</i><br><i>(B134) No. 19 (+) — Chassis ground (-):</i>  | Is the voltage more than 4.5 V?  | Go to step 4.                             | Go to step 3.  |
| <b>3 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><i>Connector &amp; terminal</i><br><i>(B134) No. 19 (+) — Chassis ground (-):</i>  | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?         | Repair the poor contact in ECM connector. | Contact your SOA Service Center since deterioration of some parts may be the cause.  |
| <b>4 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><i>Connector &amp; terminal</i><br><i>(B134) No. 26 (+) — Chassis ground (-):</i>  | Is the voltage less than 0.1 V?  | Go to step 6.                             | Go to step 5.  |
| <b>5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)</b><br>Measure the voltage between ECM connector and chassis ground.   | Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change? | Repair the poor contact in ECM connector. | Go to step 6.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <p><b>6</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connectors from tumble generator valve position sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between tumble generator valve position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(E54) No. 1 (+) — Engine ground (-):</b></p> | <p>Is the voltage more than 4.5 V?</p>  | <p>Go to step 7.</p>  | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between tumble generator valve position sensor and ECM connector</li> <li>• Poor contact in tumble generator valve position sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |
| <p><b>7</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B134) No. 26 — (E54) No. 3:</b></p>  | <p>Is the resistance less than 1 <math>\Omega</math>?</p>                         | <p>Go to step 8.</p>  | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between tumble generator valve position sensor and ECM connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in tumble generator valve position sensor connector</li> <li>• Poor contact in coupling connector</li> </ul>  |
| <p><b>8</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</b></p> <p>Measure the resistance of harness between tumble generator valve position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(E54) No. 3 — Engine ground:</b></p>  | <p>Is the resistance more than 1 M<math>\Omega</math>?</p>                        | <p>Go to step 9.</p>  | <p>Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.</p>  |
| <p><b>9</b></p> <p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in tumble generator valve position sensor connector.</p>  | <p>Is there poor contact in tumble generator valve position sensor connector?</p> | <p>Repair the poor contact in tumble generator valve position sensor connector.</p> | <p>Replace the tumble generator valve position sensor.<br/>                     &lt;Ref. to FU(H4DOTC)-38, Tumble Generator Valve Position Sensor.&gt;</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DS:DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-219, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

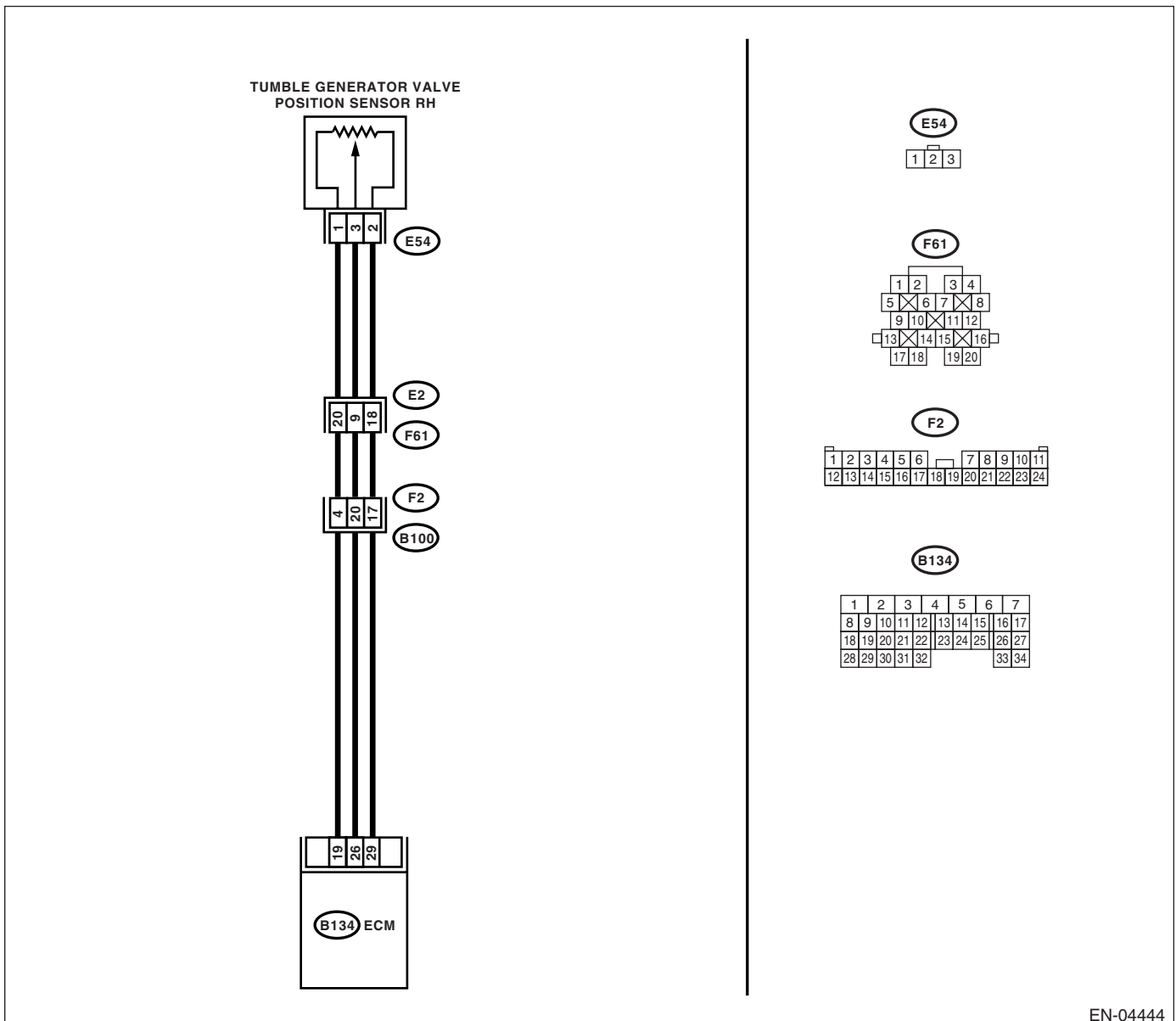
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04444

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No   |
|--|---|---|--|
| <p><b>1</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Start the engine.</p> <p>2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the voltage more than 4.9 V?</p>                    | <p>Go to step 2.</p>  | <p>Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Poor contact in tumble generator valve position sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from tumble generator valve position sensor.</p> <p>3) Measure the resistance of harness between tumble generator valve position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E54) No. 2 — Engine ground:</b></p>  | <p>Is the resistance less than 5 <math>\Omega</math>?</p> | <p>Go to step 3.</p>  | <p>Repair the harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between tumble generator valve position sensor and ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul>   |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between tumble generator valve position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E54) No. 3 (+) — Engine ground (-):</b></p>   | <p>Is the voltage more than 4.9 V?</p>                    | <p>Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. &lt;Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).&gt;</p> | <p>Replace the tumble generator valve position sensor. &lt;Ref. to FU(H4DOTC)-38, Tumble Generator Valve Position Sensor.&gt;</p>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DT:DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-221, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

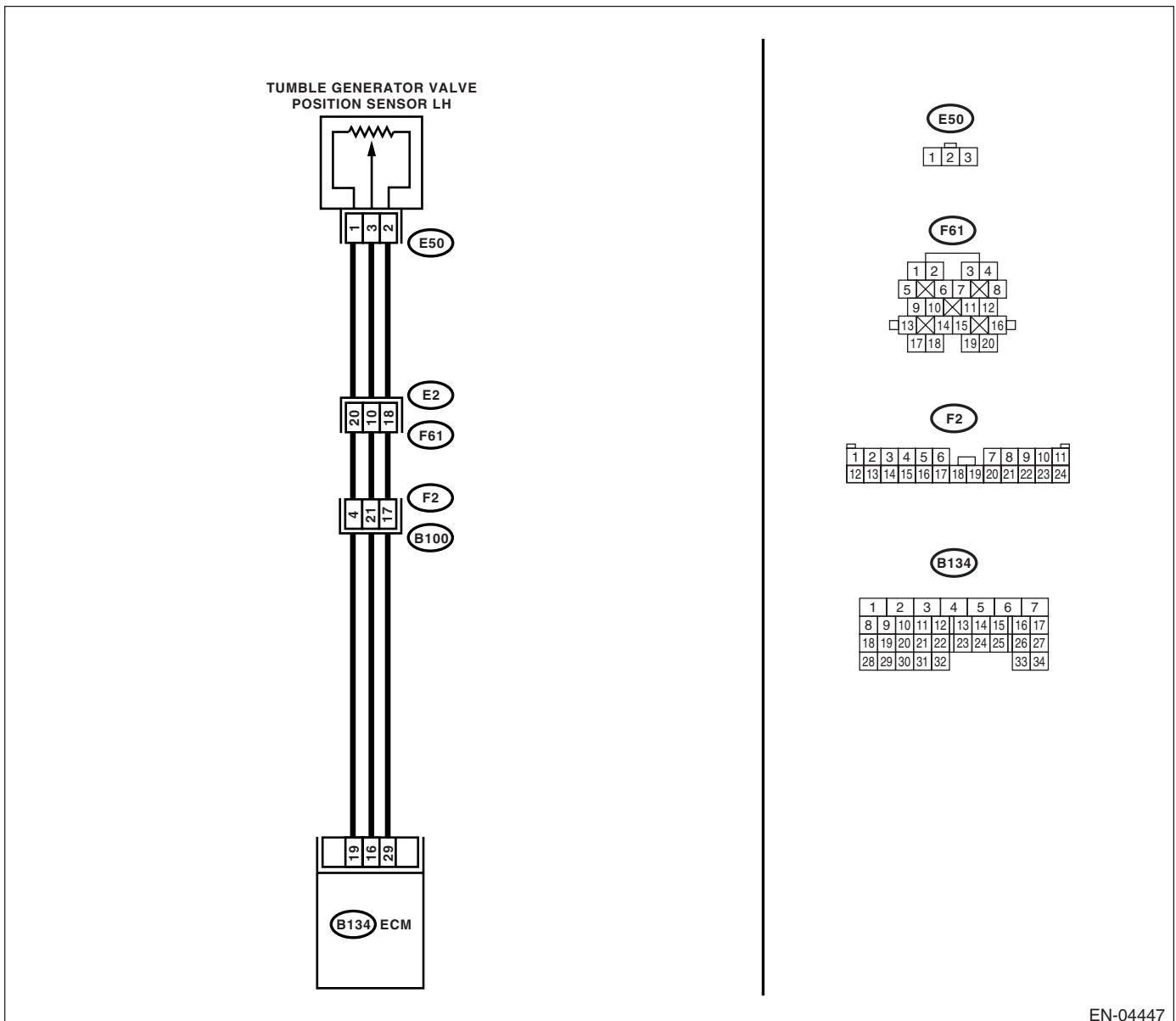
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04447

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes                                       | No   |
|---|--|---|--|
| <b>1 CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the voltage less than 0.1 V?  | Go to step 2.                             | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.<br><br>NOTE:<br>In this case, repair the following:<br>• Poor contact in tumble generator valve position sensor connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><i>Connector &amp; terminal</i><br><i>(B134) No. 19 (+) — Chassis ground (-):</i>  | Is the voltage more than 4.5 V?  | Go to step 4.                             | Go to step 3.  |
| <b>3 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><i>Connector &amp; terminal</i><br><i>(B135) No. 19 (+) — Chassis ground (-):</i>  | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?         | Repair the poor contact in ECM connector. | Contact your SOA Service Center since deterioration of some parts may be the cause.  |
| <b>4 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><i>Connector &amp; terminal</i><br><i>(B134) No. 16 (+) — Chassis ground (-):</i>  | Is the voltage less than 0.1 V?  | Go to step 6.                             | Go to step 5.  |
| <b>5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)</b><br>Measure the voltage between ECM connector and chassis ground.   | Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change? | Repair the poor contact in ECM connector. | Go to step 6.  |



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <p><b>6</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connectors from tumble generator valve position sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between tumble generator valve position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(E50) No. 1 (+) — Engine ground (-):</b></p> | <p>Is the voltage more than 4.5 V?</p>  | <p>Go to step 7.</p>  | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between tumble generator valve position sensor and ECM connector</li> <li>• Poor contact in tumble generator valve position sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |
| <p><b>7</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B134) No. 16 — (E50) No. 3:</b></p>  | <p>Is the resistance less than 1 <math>\Omega</math>?</p>                         | <p>Go to step 8.</p>  | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between tumble generator valve position sensor and ECM connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in tumble generator valve position sensor connector</li> <li>• Poor contact in coupling connector</li> </ul>  |
| <p><b>8</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</b></p> <p>Measure the resistance of harness between tumble generator valve position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(E50) No. 3 — Engine ground:</b></p>  | <p>Is the resistance more than 1 M<math>\Omega</math>?</p>                        | <p>Go to step 9.</p>  | <p>Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.</p>  |
| <p><b>9</b></p> <p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in tumble generator valve position sensor connector.</p>  | <p>Is there poor contact in tumble generator valve position sensor connector?</p> | <p>Repair the poor contact in tumble generator valve position sensor connector.</p> | <p>Replace the tumble generator valve position sensor.<br/>                     &lt;Ref. to FU(H4DOTC)-38, Tumble Generator Valve Position Sensor.&gt;</p>   |

## DU:DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-223, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

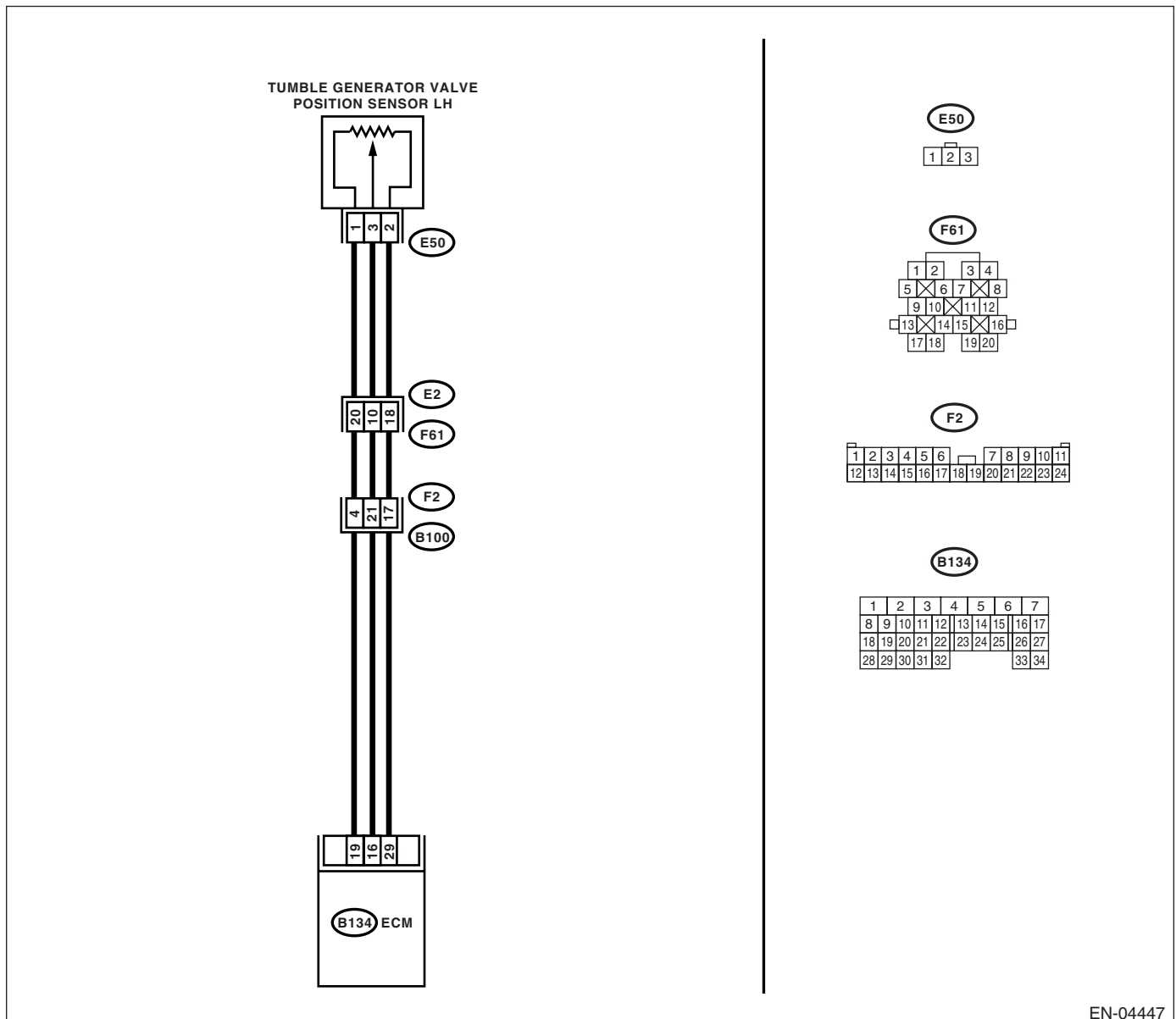
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

### WIRING DIAGRAM:



EN-04447

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No   |
|--|---|--|--|
| <p><b>1</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Start the engine.</p> <p>2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the voltage more than 4.9 V?</p>                    | <p>Go to step 2.</p>   | <p>Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Poor contact in tumble generator valve position sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from tumble generator valve position sensor.</p> <p>3) Measure the resistance of harness between tumble generator valve position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E50) No. 2 — Engine ground:</b></p>  | <p>Is the resistance less than 5 <math>\Omega</math>?</p> | <p>Go to step 3.</p>   | <p>Repair the harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between tumble generator valve position sensor and ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul>   |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between tumble generator valve position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E50) No. 3 (+) — Engine ground (-):</b></p>   | <p>Is the voltage more than 4.9 V?</p>                    | <p>Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM.</p> <p>&lt;Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).&gt;</p> | <p>Replace the tumble generator valve position sensor.</p> <p>&lt;Ref. to FU(H4DOTC)-38, Tumble Generator Valve Position Sensor.&gt;</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DV:DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-225, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

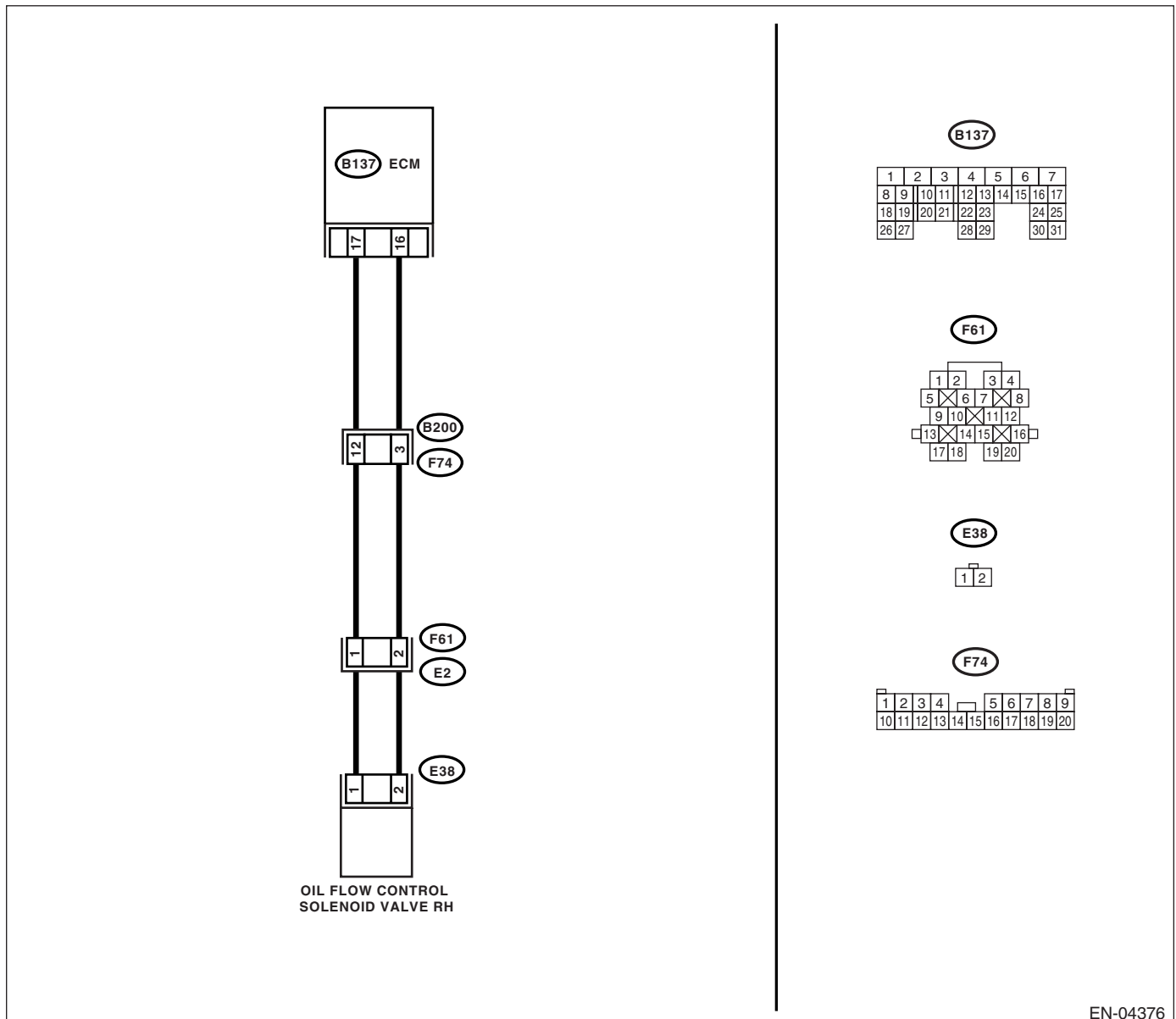
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04376

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from ECM and oil flow control solenoid valve.<br/>3) Measure the resistance between ECM and oil flow control solenoid valve.</p> <p><b>Connector &amp; terminal</b><br/><b>(B137) No. 17 — (E38) No. 1:</b><br/><b>(B137) No. 16 — (E38) No. 2:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | <p>Go to step <b>2</b>.</p>  | <p>Repair the open circuit in harness between ECM and oil flow control solenoid valve connector.</p> <p><b>NOTE:</b><br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and oil flow control solenoid valve connector</li> <li>• Poor contact in coupling connector.</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>Measure the resistance between ECM and oil flow control solenoid valve.</p> <p><b>Connector &amp; terminal</b><br/><b>(E38) No. 1 — Engine ground:</b><br/><b>(E38) No. 2 — Engine ground:</b></p>  | <p>Is the resistance more than 1 <math>M\Omega</math>?</p> | <p>Go to step <b>3</b>.</p>  | <p>Repair the short circuit between ECM and oil flow control solenoid valve connector.</p>  |
| <p><b>3</b></p> <p><b>CHECK OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>1) Remove the oil flow control solenoid valve.<br/>2) Measure the resistance between oil flow control solenoid valve terminal.</p> <p><b>Terminals</b><br/><b>No. 1 — No. 2:</b></p>  | <p>Is the resistance 6 — 12 <math>\Omega</math>?</p>       | <p>Repair the poor contact in ECM and oil flow control solenoid valve.</p> | <p>Replace the oil flow control solenoid valve. &lt;Ref. to ME(H4DOTC)-55, Camshaft.&gt;</p>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DW:DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-227, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

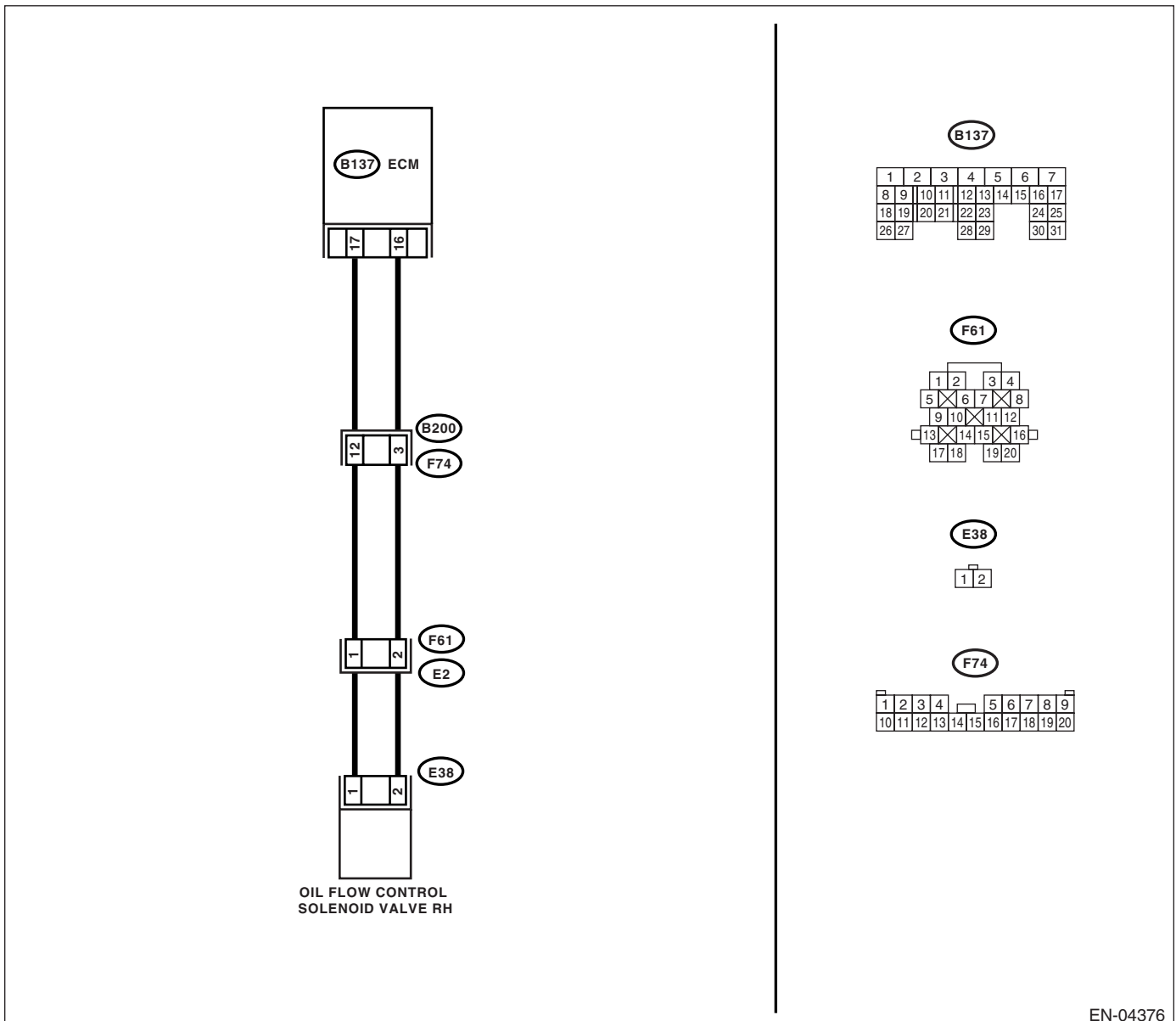
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04376

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM and oil flow control solenoid valve.<br/>                     3) Measure the resistance between ECM and oil flow control solenoid valve.</p> <p><b>Connector &amp; terminal</b><br/>                     (B137) No. 17 — (E38) No. 1:<br/>                     (B137) No. 16 — (E38) No. 2:</p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | <p>Go to step 2.</p>   | <p>Repair the open circuit in harness between ECM and oil flow control solenoid valve connector.</p> <p>NOTE:<br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and oil flow control solenoid valve connector</li> <li>• Poor contact in coupling connector.</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM and oil flow control solenoid valve.<br/>                     3) Measure the resistance between ECM and oil flow control solenoid valve.</p> <p><b>Connector &amp; terminal</b><br/>                     (E38) No. 1 — Engine ground:<br/>                     (E38) No. 2 — Engine ground:</p> | <p>Is the resistance more than 1 M<math>\Omega</math>?</p> | <p>Go to step 3.</p>   | <p>Repair the short circuit between ECM and oil flow control solenoid valve connector.</p>  |
| <p><b>3</b></p> <p><b>CHECK OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>1) Remove the oil flow control solenoid valve.<br/>                     2) Measure the resistance between oil flow control solenoid valve terminal.</p> <p><b>Terminals</b><br/>                     No. 1 — No. 2:</p>   | <p>Is the resistance 6 — 12 <math>\Omega</math>?</p>       | <p>Repair the poor contact in ECM and oil flow control solenoid valve.</p> | <p>Replace the oil flow control solenoid valve. &lt;Ref. to ME(H4DOTC)-55, Camshaft.&gt;</p>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DX:DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-229, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

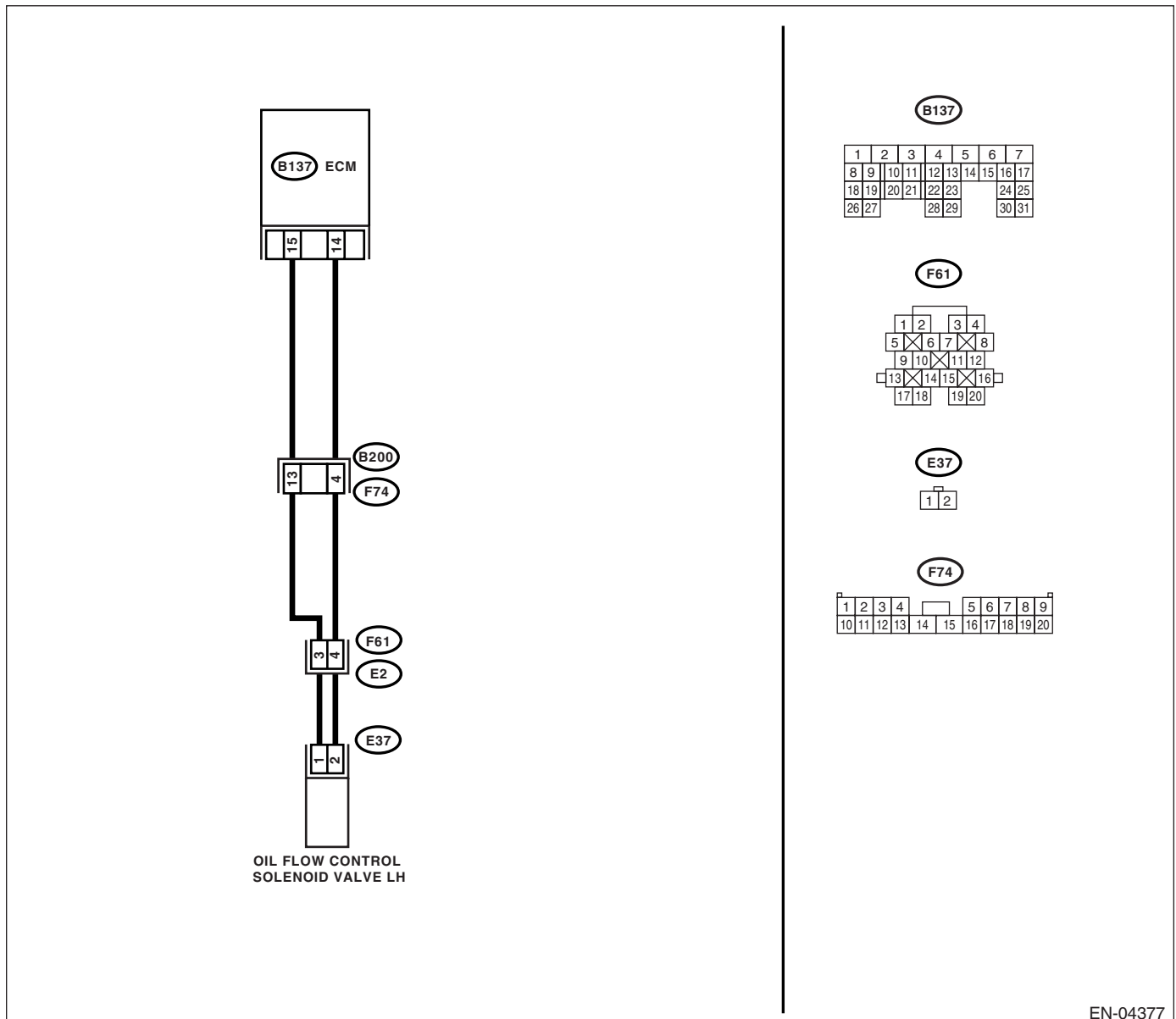
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04377



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from ECM and oil flow control solenoid valve.<br/>3) Measure the resistance between ECM and oil flow control solenoid valve.</p> <p><b>Connector &amp; terminal</b><br/><b>(B137) No. 15 — (E37) No. 1:</b><br/><b>(B137) No. 14 — (E37) No. 2:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | <p>Go to step <b>2</b>.</p>  | <p>Repair the open circuit in harness between ECM and oil flow control solenoid valve connector.</p> <p><b>NOTE:</b><br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and oil flow control solenoid valve connector</li> <li>• Poor contact in coupling connector.</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>Measure the resistance between ECM and oil flow control solenoid valve.</p> <p><b>Connector &amp; terminal</b><br/><b>(E37) No. 1 — Engine ground:</b><br/><b>(E37) No. 2 — Engine ground:</b></p>  | <p>Is the resistance more than 1 <math>M\Omega</math>?</p> | <p>Go to step <b>3</b>.</p>  | <p>Repair the short circuit between ECM and oil flow control solenoid valve connector.</p>  |
| <p><b>3</b></p> <p><b>CHECK OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>1) Remove the oil flow control solenoid valve.<br/>2) Measure the resistance between oil flow control solenoid valve terminal.</p> <p><b>Terminals</b><br/><b>No. 1 — No. 2:</b></p>  | <p>Is the resistance 6 — 12 <math>\Omega</math>?</p>       | <p>Repair the poor contact in ECM and oil flow control solenoid valve.</p> | <p>Replace the oil flow control solenoid valve. &lt;Ref. to ME(H4DOTC)-55, Camshaft.&gt;</p>  |

## DY:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-231, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

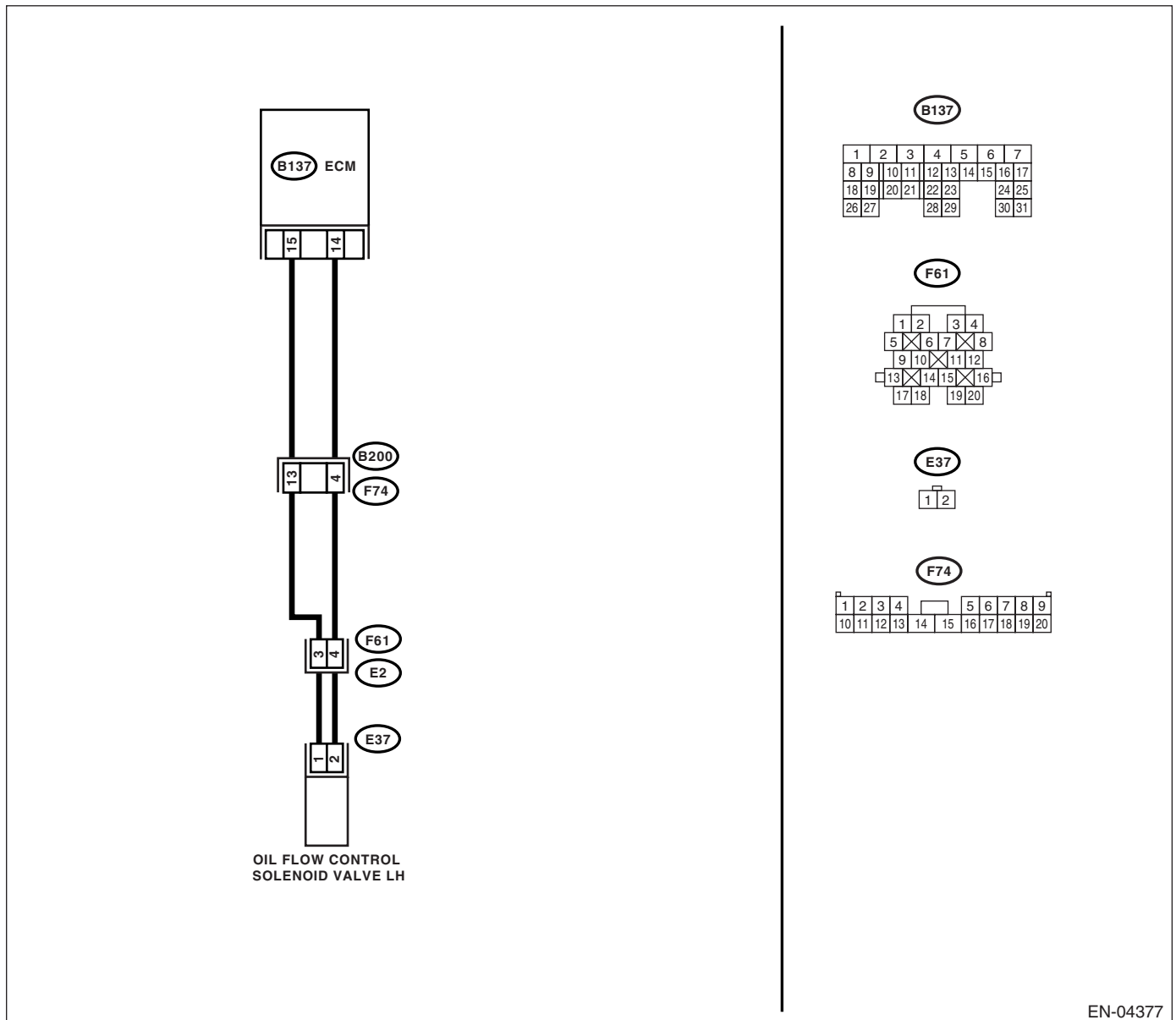
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04377

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from ECM and oil flow control solenoid valve.<br/>3) Measure the resistance between ECM and oil flow control solenoid valve.</p> <p><b>Connector &amp; terminal</b><br/><b>(B137) No. 15 — (E37) No. 1:</b><br/><b>(B137) No. 14 — (E37) No. 2:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | <p>Go to step 2.</p>   | <p>Repair the open circuit in harness between ECM and oil flow control solenoid valve connector.</p> <p>NOTE:<br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and oil flow control solenoid valve connector</li> <li>• Poor contact in coupling connector.</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from ECM and oil flow control solenoid valve.<br/>3) Measure the resistance between ECM and oil flow control solenoid valve.</p> <p><b>Connector &amp; terminal</b><br/><b>(E37) No. 1 — Engine ground:</b><br/><b>(E37) No. 2 — Engine ground:</b></p> | <p>Is the resistance more than 1 M<math>\Omega</math>?</p> | <p>Go to step 3.</p>   | <p>Repair the short circuit between ECM and oil flow control solenoid valve connector.</p>   |
| <p><b>3</b></p> <p><b>CHECK OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>1) Remove the oil flow control solenoid valve.<br/>2) Measure the resistance between oil flow control solenoid valve terminal.</p> <p><b>Terminals</b><br/><b>No. 1 — No. 2:</b></p>  | <p>Is the resistance 6 — 12 <math>\Omega</math>?</p>       | <p>Repair the poor contact in ECM and oil flow control solenoid valve.</p> | <p>Replace the oil flow control solenoid valve. &lt;Ref. to ME(H4DOTC)-55, Camshaft.&gt;</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DZ:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

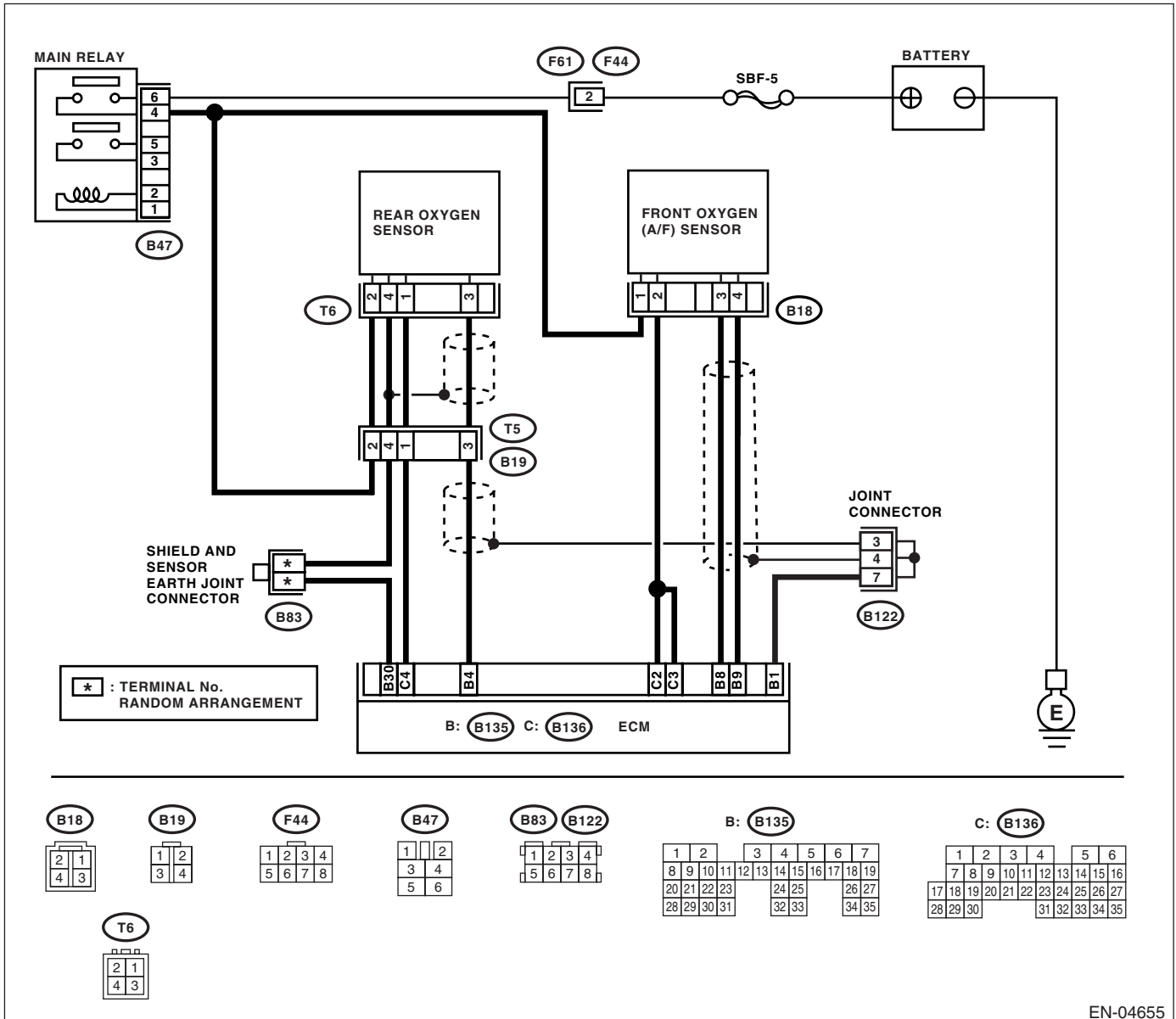
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-233, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04655

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check   | Yes                                    | No  |
|------|---|--|---|
| 1    | <b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?            | Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P2096.  |
| 2    | <b>CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>  | Is there water in connector?           | Remove infiltrating water completely.<br><br>Go to step 3.  |
| 3    | <b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br>3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 — (B18) No. 3:</b><br><b>(B135) No. 9 — (B18) No. 4:</b> | Is the measured value less than 1 Ω?   | Go to step 4.<br><br>Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ECM and front oxygen (A/F) sensor connector<br>• Poor contact in front oxygen (A/F) sensor connector<br>• Poor contact in ECM connector |
| 4    | <b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN (A/F) SENSOR CONNECTOR.</b><br>Measure the resistance of harness between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 — Chassis ground:</b><br><b>(B135) No. 9 — Chassis ground:</b>  | Is the measured value more than 1 MΩ?  | Go to step 5.<br><br>Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.  |
| 5    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>1) Connect the connector to ECM.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 (+) — Chassis ground (-):</b>   | Is the measured value more than 4.5 V? | Go to step 6.<br><br>Go to step 7.  |
| 6    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 (+) — Chassis ground (-):</b>  | Is the measured value more than 10 V?  | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>After repair, replace the ECM.<br><Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).><br><br>Repair the poor contact in ECM connector.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <b>7</b><br><b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 9 (+) — Chassis ground (-):</b>  | Is the measured value more than 4.95 V?  | Go to step <b>8</b> .   | Go to step <b>9</b> .  |
| <b>8</b><br><b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 9 (+) — Chassis ground (-):</b>  | Is the measured value more than 10 V?  | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>After repair, replace the ECM.<br><Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Repair the poor contact in ECM connector.  |
| <b>9</b><br><b>CHECK EXHAUST SYSTEM.</b>  | Are there holes or loose bolts on exhaust system?                                    | Repair the exhaust system.  | Go to step <b>10</b> .   |
| <b>10</b><br><b>CHECK AIR INTAKE SYSTEM.</b>  | Are there holes, loose bolts or disconnection of hose on air intake system?          | Repair the air intake system.   | Go to step <b>11</b> .   |
| <b>11</b><br><b>CHECK FUEL PRESSURE.</b><br><b>Warning:</b><br><ul style="list-style-type: none"> <li>• Place “NO FIRE” signs near the working area.</li> <li>• Be careful not to spill fuel on the floor.</li> </ul> Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.<br><Ref. to ME(H4DOTC)-28, INSPECTION, Fuel Pressure.><br><b>Warning:</b><br><b>Before removing the fuel pressure gauge, release fuel pressure.</b><br>NOTE:<br>If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. | Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm <sup>2</sup> , 41 — 46 psi)?   | Go to step <b>12</b> .  | Repair the following items.<br>Fuel pressure too high: <ul style="list-style-type: none"> <li>• Clogged fuel return line or bent hose</li> </ul> Fuel pressure too low: <ul style="list-style-type: none"> <li>• Improper fuel pump discharge</li> <li>• Clogged fuel supply line</li> </ul>   |
| <b>12</b><br><b>CHECK FUEL PRESSURE.</b><br>After connecting the pressure regulator vacuum hose, measure fuel pressure.<br><Ref. to ME(H4DOTC)-28, INSPECTION, Fuel Pressure.><br><b>Warning:</b><br><b>Before removing the fuel pressure gauge, release fuel pressure.</b><br>NOTE:<br><ul style="list-style-type: none"> <li>• If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.</li> <li>• If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.</li> </ul>     | Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm <sup>2</sup> , 33 — 38 psi)? | Go to step <b>13</b> .  | Repair the following items.<br>Fuel pressure too high: <ul style="list-style-type: none"> <li>• Faulty pressure regulator</li> <li>• Clogged fuel return line or bent hose</li> </ul> Fuel pressure too low: <ul style="list-style-type: none"> <li>• Faulty pressure regulator</li> <li>• Improper fuel pump discharge</li> <li>• Clogged fuel supply line</li> </ul> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes                   | No  |
|--|---|-----------------------|---|
| <p><b>13 CHECK ENGINE COOLANT TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up completely.<br/>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor<br/>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</li> <li>• General scan tool<br/>For detailed operation procedure, refer to the general scan tool instruction manual.</li> </ul>  | <p>Is the temperature more than 60°C (140°F)?</p>   | <p>Go to step 14.</p> | <p>Replace the engine coolant temperature sensor. &lt;Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.&gt;</p>                             |
| <p><b>14 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).<br/>2) Place the shift lever in neutral position.<br/>3) Turn the A/C switch to OFF.<br/>4) Turn all accessory switches to OFF.<br/>5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor<br/>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</li> <li>• General scan tool<br/>For detailed operation procedure, refer to the general scan tool instruction manual.</li> </ul>  | <p>Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)?</p>  | <p>Go to step 15.</p> | <p>Replace the mass air flow and intake air temperature sensor. &lt;Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p> |
| <p><b>15 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).<br/>2) Place the shift lever in neutral position.<br/>3) Turn the A/C switch to OFF.<br/>4) Turn all accessory switches to OFF.<br/>5) Open the front hood.<br/>6) Measure the ambient temperature.<br/>7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor<br/>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</li> <li>• General scan tool<br/>For detailed operation procedure, refer to the general scan tool instruction manual.</li> </ul> | <p>Subtract ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?</p> | <p>Go to step 16.</p> | <p>Check the mass air flow and intake air temperature sensor. &lt;Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No                    |
|---|---|---|-----------------------|
| <p><b>16 CHECK REAR OXYGEN SENSOR DATA.</b><br/>                     1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest)<br/>                     2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:<br/>                     • For MT model, depress the clutch pedal.<br/>                     • Subaru Select Monitor</p> <p>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;<br/>                     • General scan tool</p> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p> | <p>Is the measured value more than 490 mV?</p>              | <p>Go to step 17.</p>   | <p>Go to step 18.</p> |
| <p><b>17 CHECK REAR OXYGEN SENSOR DATA.</b><br/>                     1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed from 3,000 rpm.<br/>                     2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:<br/>                     • For MT model, depress the clutch pedal.<br/>                     • Subaru Select Monitor</p> <p>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;<br/>                     • General scan tool</p> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p>          | <p>Is the measured value less than 250 mV?</p>              | <p>Go to step 19.</p>   | <p>Go to step 18.</p> |
| <p><b>18 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</b></p>   | <p>Is there water in connector?</p>                         | <p>Remove infiltrating water completely.</p>  | <p>Go to step 20.</p> |
| <p><b>19 CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA.</b><br/>                     1) Warm-up the engine until the engine coolant temperature exceeds 70°C (158°F), and leave it at idle for more than 5 minutes.<br/>                     2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:<br/>                     • Subaru Select Monitor</p> <p>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;<br/>                     • General scan tool</p> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p>  | <p>Does the voltage keep 0.8 V for more than 5 minutes?</p> | <p>Replace the front oxygen (A/F) sensor. &lt;Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.&gt;</p> | <p>Go to step 20.</p> |



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <p><b>20</b>     <b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b><br/>           1) Turn the ignition switch to OFF.<br/>           2) Disconnect the connectors from ECM and rear oxygen sensor.<br/>           3) Measure the resistance of harness between ECM and rear oxygen sensor connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B135) No. 4 — (T6) No. 3:</b><br/> <b>(B135) No. 30 — (T6) No. 4:</b></p>                                 | <p>Is the measured value more than 3 Ω?</p>       | <p>Repair open circuit in harness between ECM and rear oxygen sensor connector.</p>                      | <p>Go to step 21.</p>  |
| <p><b>21</b>     <b>CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b><br/>           1) Turn the ignition switch to OFF.<br/>           2) Disconnect the connector from rear oxygen sensor.<br/>           3) Turn the ignition switch to ON.<br/>           4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T6) No. 3 (+) — Engine ground (-):</b></p> | <p>Is the measured value within 0.2 to 0.5 V?</p> | <p>Replace the rear oxygen sensor.<br/>           &lt;Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.&gt;</p> | <p>Repair harness and connector.</p> <p>NOTE:<br/>           In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in ECM connector</li> </ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## EA:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

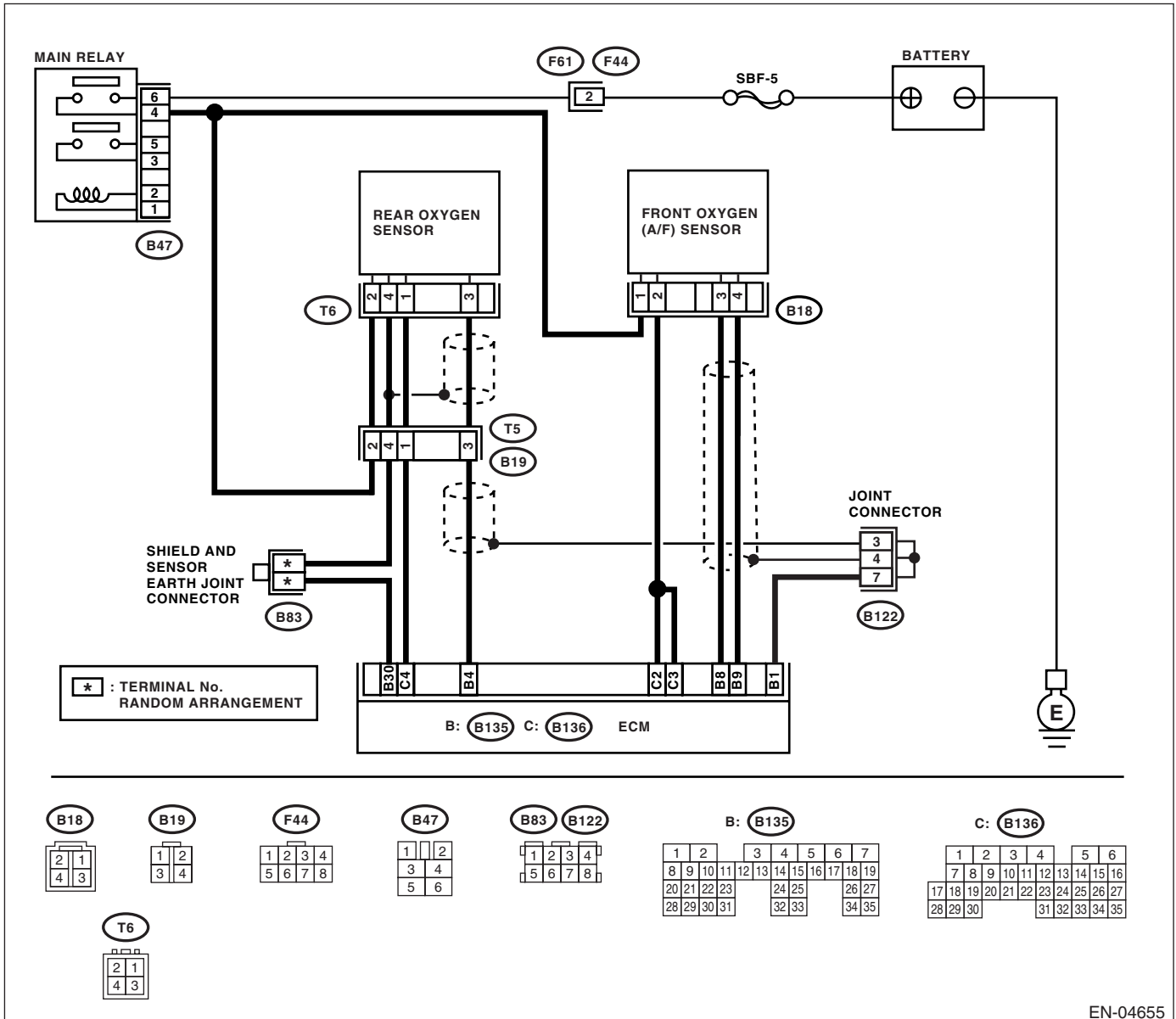
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-235, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04655

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check   | Yes                                    | No  |
|------|---|--|---|
| 1    | <b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?            | Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P2097.  |
| 2    | <b>CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>  | Is there water in connector?           | Remove infiltrating water completely.<br><br>Go to step 3.  |
| 3    | <b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br>3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 — (B18) No. 3:</b><br><b>(B135) No. 9 — (B18) No. 4:</b> | Is the measured value less than 1 Ω?   | Go to step 4.<br><br>Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ECM and front oxygen (A/F) sensor connector<br>• Poor contact in front oxygen (A/F) sensor connector<br>• Poor contact in ECM connector |
| 4    | <b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN (A/F) SENSOR CONNECTOR.</b><br>Measure the resistance of harness between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 — Chassis ground:</b><br><b>(B135) No. 9 — Chassis ground:</b>  | Is the measured value more than 1 MΩ?  | Go to step 5.<br><br>Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.  |
| 5    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>1) Connect the connector to ECM.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 (+) — Chassis ground (-):</b>   | Is the measured value more than 4.5 V? | Go to step 6.<br><br>Go to step 7.  |
| 6    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B135) No. 8 (+) — Chassis ground (-):</b>  | Is the measured value more than 10 V?  | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>After repair, replace the ECM.<br><Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).><br><br>Repair the poor contact in ECM connector.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <b>7</b><br><b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 9 (+) — Chassis ground (-):</b>  | Is the measured value more than 4.95 V?  | Go to step <b>8</b> .   | Go to step <b>9</b> .  |
| <b>8</b><br><b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 9 (+) — Chassis ground (-):</b>  | Is the measured value more than 10 V?  | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>After repair, replace the ECM.<br><Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Repair the poor contact in ECM connector.  |
| <b>9</b><br><b>CHECK EXHAUST SYSTEM.</b>  | Are there holes or loose bolts on exhaust system?                                    | Repair the exhaust system.  | Go to step <b>10</b> .   |
| <b>10</b><br><b>CHECK AIR INTAKE SYSTEM.</b>  | Are there holes, loose bolts or disconnection of hose on air intake system?          | Repair the air intake system.   | Go to step <b>11</b> .   |
| <b>11</b><br><b>CHECK FUEL PRESSURE.</b><br><b>Warning:</b><br><ul style="list-style-type: none"> <li>• Place “NO FIRE” signs near the working area.</li> <li>• Be careful not to spill fuel on the floor.</li> </ul> Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.<br><Ref. to ME(H4DOTC)-28, INSPECTION, Fuel Pressure.><br><b>Warning:</b><br><b>Before removing the fuel pressure gauge, release fuel pressure.</b><br>NOTE:<br>If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. | Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm <sup>2</sup> , 41 — 46 psi)?   | Go to step <b>12</b> .  | Repair the following items.<br>Fuel pressure too high: <ul style="list-style-type: none"> <li>• Clogged fuel return line or bent hose</li> </ul> Fuel pressure too low: <ul style="list-style-type: none"> <li>• Improper fuel pump discharge</li> <li>• Clogged fuel supply line</li> </ul>   |
| <b>12</b><br><b>CHECK FUEL PRESSURE.</b><br>After connecting the pressure regulator vacuum hose, measure fuel pressure.<br><Ref. to ME(H4DOTC)-28, INSPECTION, Fuel Pressure.><br><b>Warning:</b><br><b>Before removing the fuel pressure gauge, release fuel pressure.</b><br>NOTE:<br><ul style="list-style-type: none"> <li>• If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.</li> <li>• If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.</li> </ul>     | Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm <sup>2</sup> , 33 — 38 psi)? | Go to step <b>13</b> .  | Repair the following items.<br>Fuel pressure too high: <ul style="list-style-type: none"> <li>• Faulty pressure regulator</li> <li>• Clogged fuel return line or bent hose</li> </ul> Fuel pressure too low: <ul style="list-style-type: none"> <li>• Faulty pressure regulator</li> <li>• Improper fuel pump discharge</li> <li>• Clogged fuel supply line</li> </ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes                   | No  |
|--|---|-----------------------|---|
| <p><b>13 CHECK ENGINE COOLANT TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up completely.<br/>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor<br/>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</li> <li>• General scan tool<br/>For detailed operation procedure, refer to the general scan tool instruction manual.</li> </ul>  | <p>Is the temperature more than 60°C (140°F)?</p>   | <p>Go to step 14.</p> | <p>Replace the engine coolant temperature sensor. &lt;Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.&gt;</p>                             |
| <p><b>14 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).<br/>2) Place the shift lever in neutral position.<br/>3) Turn the A/C switch to OFF.<br/>4) Turn all accessory switches to OFF.<br/>5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor<br/>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</li> <li>• General scan tool<br/>For detailed operation procedure, refer to the general scan tool instruction manual.</li> </ul>  | <p>Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)?</p>  | <p>Go to step 15.</p> | <p>Replace the mass air flow and intake air temperature sensor. &lt;Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p> |
| <p><b>15 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).<br/>2) Place the shift lever in neutral position.<br/>3) Turn the A/C switch to OFF.<br/>4) Turn all accessory switches to OFF.<br/>5) Open the front hood.<br/>6) Measure the ambient temperature.<br/>7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor<br/>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;</li> <li>• General scan tool<br/>For detailed operation procedure, refer to the general scan tool instruction manual.</li> </ul> | <p>Subtract ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?</p> | <p>Go to step 16.</p> | <p>Check the mass air flow and intake air temperature sensor. &lt;Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No                    |
|---|---|---|-----------------------|
| <p><b>16 CHECK REAR OXYGEN SENSOR DATA.</b><br/>                     1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest)<br/>                     2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:<br/>                     • For MT model, depress the clutch pedal.<br/>                     • Subaru Select Monitor</p> <p>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;<br/>                     • General scan tool</p> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p> | <p>Is the measured value more than 490 mV?</p>              | <p>Go to step 17.</p>   | <p>Go to step 18.</p> |
| <p><b>17 CHECK REAR OXYGEN SENSOR DATA.</b><br/>                     1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed from 3,000 rpm.<br/>                     2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:<br/>                     • For MT model, depress the clutch pedal.<br/>                     • Subaru Select Monitor</p> <p>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;<br/>                     • General scan tool</p> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p>          | <p>Is the measured value less than 250 mV?</p>              | <p>Go to step 19.</p>   | <p>Go to step 18.</p> |
| <p><b>18 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</b></p>   | <p>Is there water in connector?</p>                         | <p>Remove infiltrating water completely.</p>  | <p>Go to step 20.</p> |
| <p><b>19 CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA.</b><br/>                     1) Warm-up the engine until the engine coolant temperature exceeds 70°C (158°F), and leave it at idle for more than 5 minutes.<br/>                     2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:<br/>                     • Subaru Select Monitor</p> <p>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". &lt;Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.&gt;<br/>                     • General scan tool</p> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p>  | <p>Does the voltage keep 0.8 V for more than 5 minutes?</p> | <p>Replace the front oxygen (A/F) sensor. &lt;Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.&gt;</p> | <p>Go to step 20.</p> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No  |
|--|---|--|---|
| <p><b>20 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connectors from ECM and rear oxygen sensor.<br/>                     3) Measure the resistance of harness between ECM and rear oxygen sensor connector.</p> <p><b>Connector &amp; terminal</b><br/> <i>(B135) No. 4 — (T6) No. 3:</i><br/> <i>(B135) No. 30 — (T6) No. 4:</i></p>   | <p>Is the measured value more than 3 Ω?</p>       | <p>Repair open circuit in harness between ECM and rear oxygen sensor connector.</p>                                | <p>Go to step 21.</p>   |
| <p><b>21 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from rear oxygen sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <i>(T6) No. 3 (+) — Engine ground (-):</i></p> | <p>Is the measured value within 0.2 to 0.5 V?</p> | <p>Replace the rear oxygen sensor.<br/>                     &lt;Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.&gt;</p> | <p>Repair harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in ECM connector</li> </ul> |

### EB:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-177, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4DOTC)-190, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4DOTC)-237, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

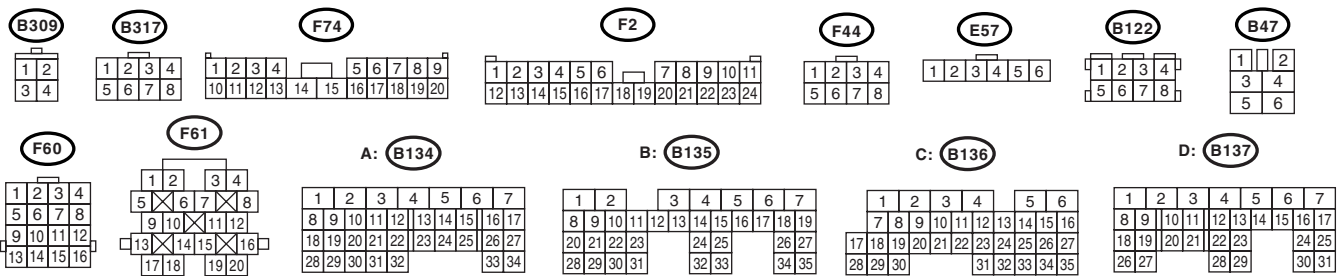
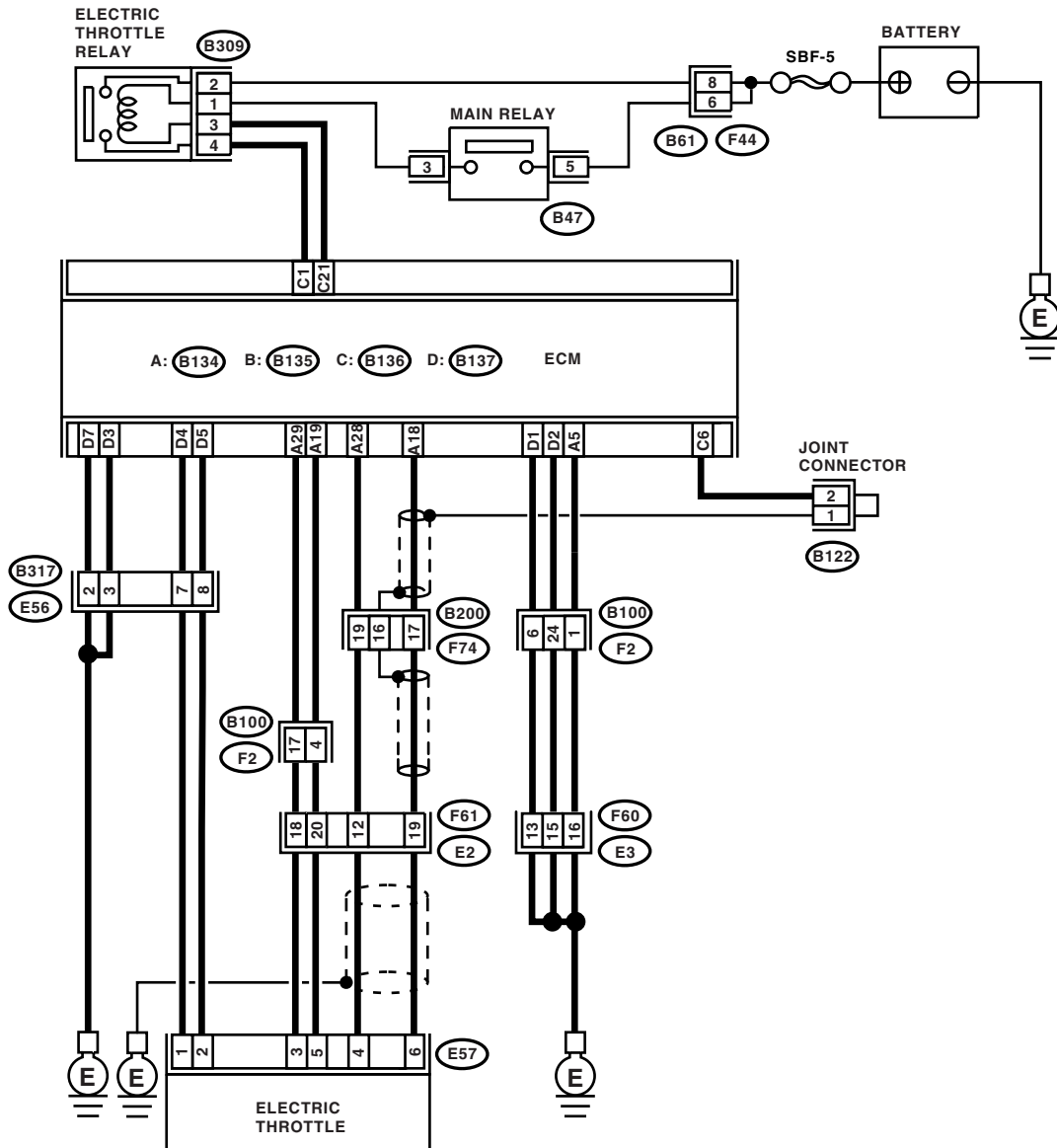
#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04706



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check                                     | Yes   | No  |
|--|---|---|---|
| <b>1 CHECK ELECTRONIC THROTTLE CONTROL RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electronic throttle control relay.<br>3) Connect the battery to electronic throttle control relay terminal No. 1 and No. 3.<br>4) Measure the resistance between electronic throttle control relay terminals.<br><i>Terminals</i><br><i>No. 2 — No. 4:</i>   | Is the resistance less than 1 $\Omega$ ?  | Go to step 2.   | Replace the electronic throttle control relay.  |
| <b>2 CHECK POWER SUPPLY TO ELECTRONIC THROTTLE CONTROL RELAY.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between electronic throttle control relay connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B309) No. 1 (+) — Engine ground (-):</i><br><i>(B309) No. 2 (+) — Engine ground (-):</i>  | Is the voltage more than 10 V?            | Go to step 3.   | Repair the open power supply circuit or ground short.                                 |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between electronic throttle control relay connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B309) No. 3 (+) — Engine ground (-):</i>  | Is the voltage less than 5 V?             | Repair the ground short of harness between ECM and electronic throttle control. | Go to step 4.   |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electronic throttle control relay connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B309) No. 3 — Engine ground:</i><br><i>(B309) No. 4 — Engine ground:</i>   | Is the resistance more than 1 $M\Omega$ ? | Go to step 5.   | Repair the ground short of harness between ECM and electronic throttle control relay. |
| <b>5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electronic throttle control connector and electronic throttle control relay connector.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 1 — (B309) No. 4:</i><br><i>(B136) No. 21 — (B309) No. 3:</i>   | Is the resistance less than 1 $\Omega$ ?  | Go to step 6.   | Repair the open circuit of harness between ECM and electronic throttle control relay. |
| <b>6 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Connect all the connectors.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM connector terminals.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 18 (+) — (B134) No. 29 (-):</i><br>4) Shake the ECM harness and connector, engine harness connectors (B134, F61), electronic throttle control connector harness while monitoring value of voltage meter. | Is the voltage more than 0.4 V?           | Go to step 7.   | Go to step 9.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes                      | No  |
|--|--|--------------------------|---|
| <b>7 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Connect all the connectors.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 28 (+) — (B134) No. 29 (-):</b></i><br>4) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter. | Is the voltage more than 0.8 V?  | Go to step 8.            | Go to step 9.   |
| <b>8 CHECK POOR CONTACT.</b><br>Check poor contact between ECM connector and electronic throttle control connector.  | Is there poor contact between ECM connector and electronic throttle control connector? | Repair the poor contact. | Go to step 13.  |
| <b>9 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 19 — (E57) No. 5:</b></i>                                 | Is the resistance less than 1 $\Omega$ ?   | Go to step 10.           | Repair the open harness connector.  |
| <b>10 CHECK THE HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>Measure the resistance between ECM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 19 — Chassis ground:</b></i><br><i><b>(B134) No. 18 — Chassis ground:</b></i><br><i><b>(B134) No. 28 — Chassis ground:</b></i>  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 11.           | Repair the ground short of harness.   |
| <b>11 CHECK POWER SUPPLY TO SENSOR.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the resistance between electronic throttle control connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E57) No. 5 (+) — Engine ground (-):</b></i><br>4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.                | Is the voltage 4.5 — 5.5 V?  | Go to step 12.           | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |
| <b>12 CHECK SHORT OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electronic throttle control connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E57) No. 4 — Engine ground:</b></i><br><i><b>(E57) No. 6 — Engine ground:</b></i>   | Is the resistance more than 10 $\Omega$ ?  | Go to step 13.           | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes                                    | No  |
|---|--|--|---|
| <b>13 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Connect all the connectors.<br>2) Turn the ignition switch to ON.<br>3) Read the data of main throttle sensor signal, using the Subaru Select Monitor.<br>4) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.   | Is the voltage 4.63 V?   | Go to step 14.                         | Go to step 16.  |
| <b>14 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Read the data of sub throttle sensor signal, using the Subaru Select Monitor.<br>2) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.  | Is the voltage 4.73 V?   | Go to step 15.                         | Go to step 16.  |
| <b>15 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electronic throttle control?  | Is there poor contact in connectors between ECM and electronic throttle control? | Repair the poor contact in connectors. | Go to step 21.  |
| <b>16 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 18 — (E57) No. 6:</b><br><b>(B134) No. 28 — (E57) No. 4:</b><br><b>(B134) No. 29 — (E57) No. 3:</b> | Is the resistance less than 1 $\Omega$ ?   | Go to step 17.                         | Repair the open harness connector.  |
| <b>17 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between electronic throttle control connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 3 — Engine ground:</b>   | Is the resistance less than 5 $\Omega$ ?   | Go to step 18.                         | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |
| <b>18 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between electronic throttle control connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 5 (+) — Engine ground (-):</b><br>3) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.  | Is the voltage less than 10 V?   | Go to step 19.                         | Repair the battery short of harness between ECM connector and electronic throttle control connector.                                  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes                    | No  |
|---|--|------------------------|---|
| <b>19 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Measure the voltage between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 6 (+) — Engine ground (-):</i><br><i>(E57) No. 4 (+) — Engine ground (-):</i><br>2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.                           | Is the voltage less than 10 V?             | Go to step <b>20</b> . | Repair the short of harness between ECM connector and electronic throttle control connector.                                    |
| <b>20 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the ECM.<br>3) Measure the voltage between ECM connectors.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 18 — (B134) No. 29:</i><br><i>(B134) No. 28 — (B134) No. 29:</i>  | Is the resistance more than 1 M $\Omega$ ? | Go to step <b>21</b> . | Repair the short of sensor power supply.  |
| <b>21 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect all the connectors except electronic throttle control replay.<br>3) Turn the ignition switch to ON.<br>4) Read the data of main throttle sensor signals, using Subaru Select Monitor.  | Is the voltage 0.81 — 0.87 V?              | Go to step <b>22</b> . | Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control. |
| <b>22 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>Read the data of sub throttle sensor signals, using Subaru Select Monitor.   | Is the voltage 1.64 — 1.70 V?              | Go to step <b>23</b> . | Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control. |
| <b>23 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connectors from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><i>Connector &amp; terminal</i><br><i>(B137) No. 4 — (E57) No. 1:</i><br><i>(B137) No. 5 — (E57) No. 2:</i> | Is the resistance less than 1 $\Omega$ ?   | Go to step <b>24</b> . | Repair the open harness connector.  |
| <b>24 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.</b><br>1) Connect the connectors to ECM.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 1 (+) — Engine ground (-):</i><br><i>(E57) No. 2 (+) — Engine ground (-):</i>   | Is the voltage less than 5 V?              | Go to step <b>25</b> . | Repair the short of harness to power supply circuit between ECM and electronic throttle control.                                |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes  | No                                       |
|---|---|--|--|
| <b>25 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 1 — Engine ground:</i><br><i>(E57) No. 2 — Engine ground:</i> | Is the resistance more than 1 M $\Omega$ ?  | Go to step 26.   | Repair the short of harness.             |
| <b>26 CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS.</b><br>Measure the resistance between electronic throttle control connector terminals.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 2 — (E57) No. 1:</i>   | Is the resistance more than 1 M $\Omega$ ?  | Go to step 27.   | Repair the short of harness.             |
| <b>27 CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT.</b><br>Measure the resistance between ECM connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 5 — Engine ground:</i><br><i>(B137) No. 1 — Engine ground:</i><br><i>(B137) No. 2 — Engine ground:</i><br><i>(B137) No. 3 — Engine ground:</i><br><i>(B137) No. 7 — Engine ground:</i> | Is the resistance less than 10 $\Omega$ ?   | Go to step 28.   | Repair the open circuit harness.         |
| <b>28 CHECK ELECTRONIC THROTTLE CONTROL.</b><br>Measure the resistance between electronic throttle control terminals.<br><i>Terminals</i><br><i>No. 1 — No. 2:</i>  | Is the resistance less than 50 $\Omega$ ?   | Go to step 29.   | Replace the electronic throttle control. |
| <b>29 CHECK ELECTRONIC THROTTLE CONTROL.</b><br>Move the throttle valve to the fully open and fully closed positions with fingers.<br>Check the valve returns to the specified position when releasing fingers.   | Does the valve return to the specified position?<br>Standard value: 3 mm (0.12 in) from fully closed position | Repair the poor contact in ECM connector. If problem persists, replace the ECM.<br><Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Replace the electronic throttle control. |

### EC:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

#### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-239, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

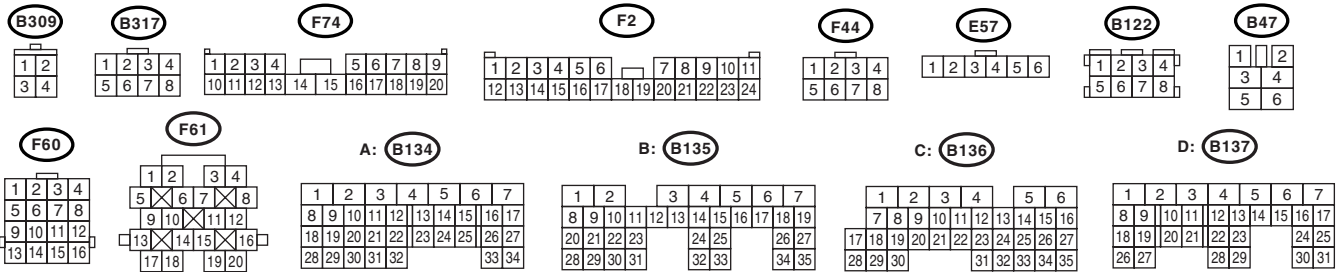
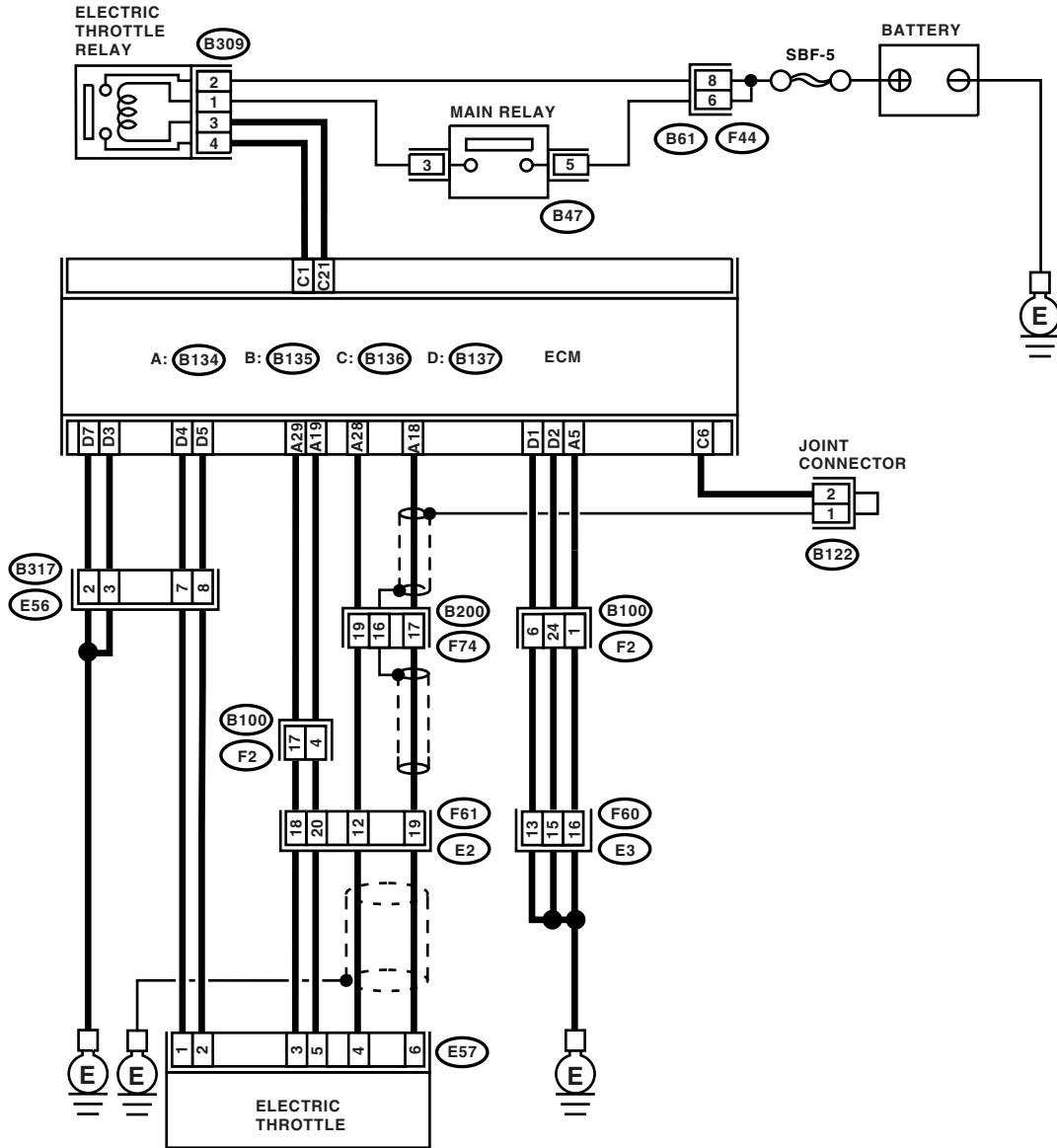
#### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04706

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check                                     | Yes  | No  |
|---|---|--|---|
| <b>1 CHECK ELECTRONIC THROTTLE CONTROL RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electronic throttle control relay.<br>3) Connect the battery to electronic throttle control relay terminal No. 1 and No. 3.<br>4) Measure the resistance between electronic throttle control relay terminals.<br><i>Connector &amp; terminal</i><br><i>No. 2 — No. 4:</i> | Is the resistance less than 1 $\Omega$ ?  | Go to step 2.  | Replace the electronic throttle control relay.  |
| <b>2 CHECK POWER TO ELECTRONIC THROTTLE CONTROL RELAY</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between electronic throttle control relay connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B309) No. 1 (+) — Engine ground (-):</i><br><i>(B309) No. 2 (+) — Engine ground (-):</i>   | Is the voltage more than 10 V?            | Go to step 3.  | Repair the open power supply circuit or ground short.                                 |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between electronic throttle control relay connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B309) No. 3 (+) — Engine ground (-):</i>       | Is the voltage less than 5 V?             | Repair the ground short of harness between ECM and electronic throttle control relay.  | Go to step 4.   |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electronic throttle control relay connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B309) No. 3 — Engine ground:</i><br><i>(B309) No. 4 — Engine ground:</i>  | Is the resistance more than 1 $M\Omega$ ? | Go to step 5.  | Repair the ground short of harness between ECM and electronic throttle control relay. |
| <b>5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</b><br>Measure the resistance between ECM connector and electronic throttle control relay connector.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 21 — (B309) No. 3:</i><br><i>(B136) No. 1 — (B309) No. 4:</i>  | Is the resistance less than 1 $\Omega$ ?  | Repair the poor contact in ECM connector. If problem persists, replace the ECM.<br><Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Repair the open harness between ECM and electronic throttle control relay.            |

## **ED:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH**

### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-241, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **CAUTION:**

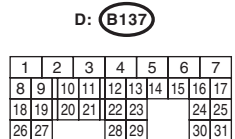
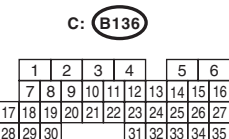
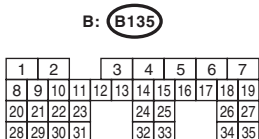
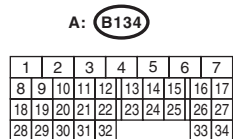
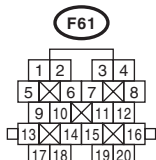
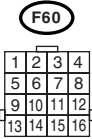
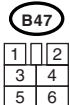
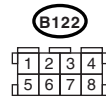
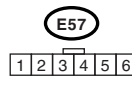
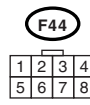
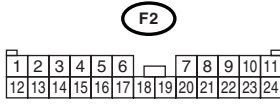
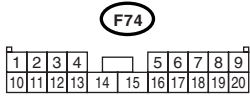
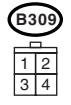
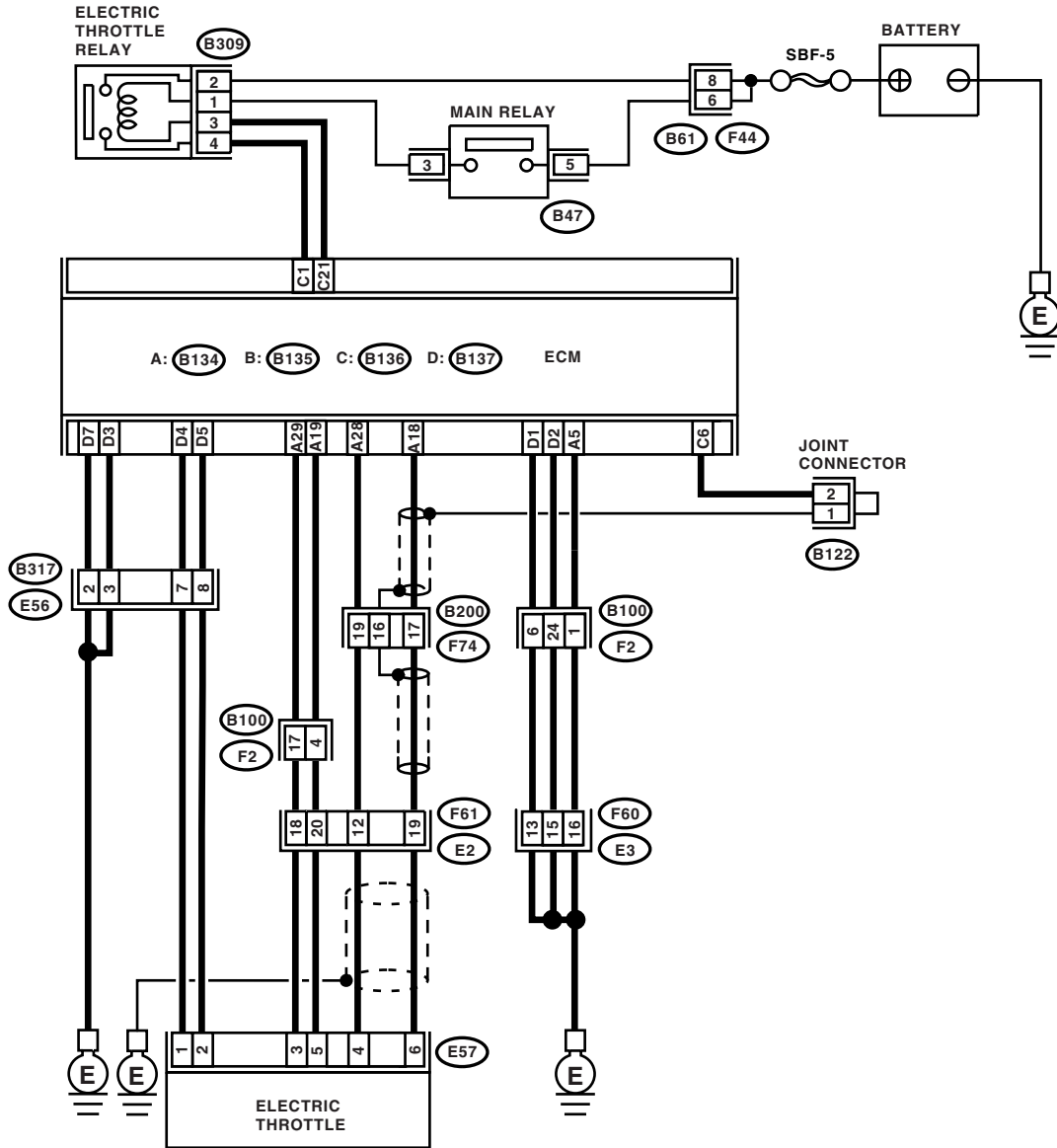
**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04706

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                      | Yes  | No  |
|--|--|--|---|
| <b>1 CHECK ELECTRONIC THROTTLE CONTROL RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electronic throttle control relay.<br>3) Measure the resistance between electronic throttle control relay terminals.<br><i>Terminals</i><br><i>No. 2 — No. 4:</i>                                  | Is the resistance more than 1 M $\Omega$ ? | Go to step 2.  | Replace the electronic throttle control relay.  |
| <b>2 CHECK SHORT OF ELECTRONIC THROTTLE CONTROL RELAY POWER SUPPLY CIRCUIT.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between electronic throttle control relay connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B309) No. 4 (+) — Engine ground (-):</i>    | Is the voltage more than 5 V?              | Repair the short of power supply to harness between ECM and electronic throttle control relay.   | Go to step 3.   |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM.<br>3) Measure the resistance between ECM connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 21 — Engine ground:</i> | Is the resistance more than 1 M $\Omega$ ? | Repair the poor contact in ECM connector. If problem persists, replace the ECM.<br><Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Repair the ground short of harness between ECM and electronic throttle control relay. |

## EE:DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE

**NOTE:**

For the diagnostic procedure, refer to DTC P2101. <Ref. to GD(H4DOTC)-237, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## EF:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-244, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

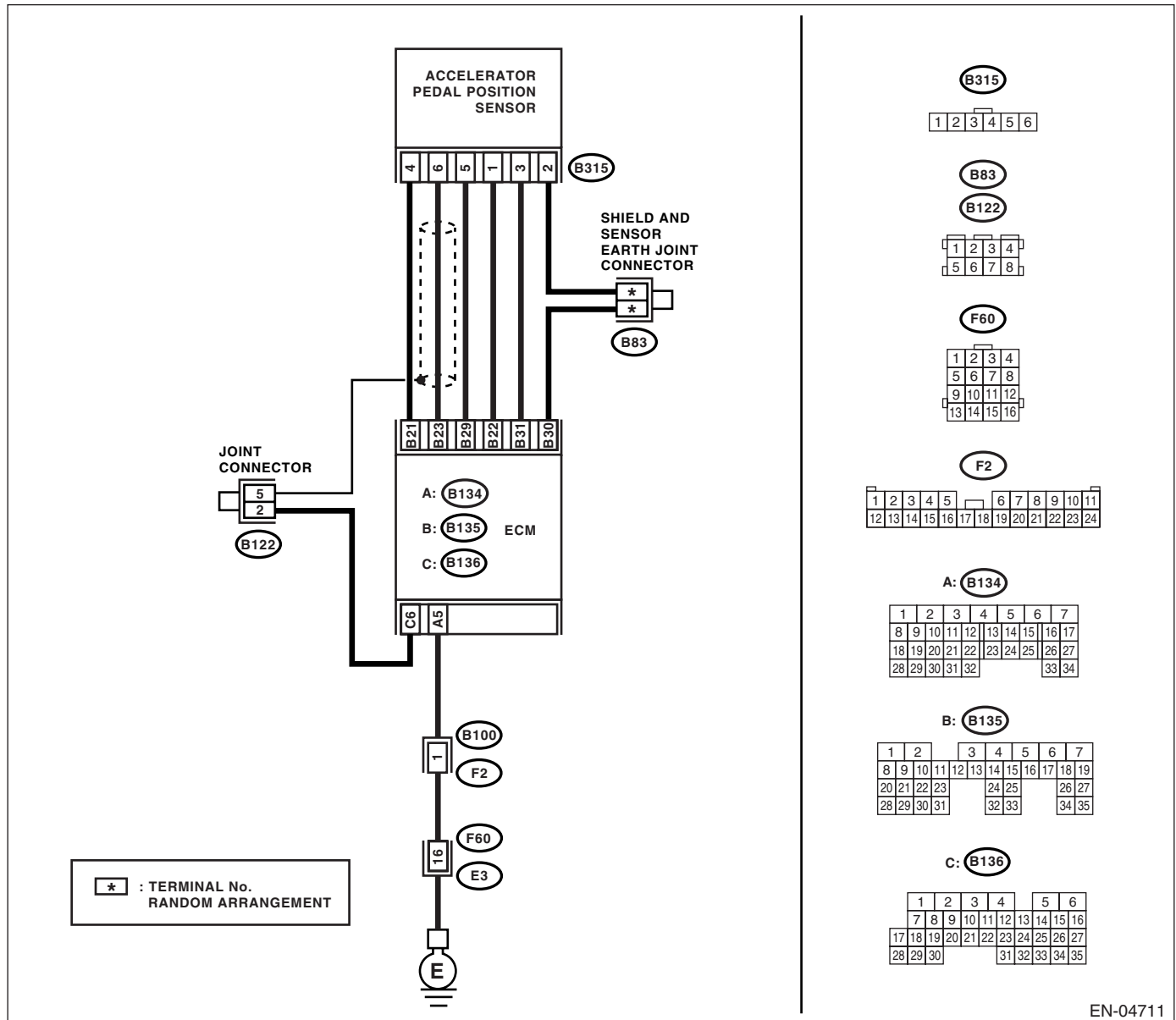
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04711

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <b>1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of main accelerator pedal position sensor signals using Subaru Select Monitor.  | Is the voltage more than 0.4 V?  | Go to step 2.   | Go to step 3.   |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and accelerator pedal position sensor.   | Is there poor contact in connectors between ECM and accelerator pedal position sensor? | Repair the poor contact in connectors.                                  | Connector has returned to its normal condition at this time. A temporary poor contact of the connector may be the cause.              |
| <b>3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator pedal position sensor.<br>4) Measure the resistance between ECM connector and accelerator pedal position sensor.<br><i>Connector &amp; terminal</i><br>(B135) No. 21 — (B315) No. 4:<br>(B135) No. 23 — (B315) No. 6: | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.   | Repair the open harness connector.  |
| <b>4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>Measure the resistance between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br>(B135) No. 21 — Chassis ground:<br>(B135) No. 23 — Chassis ground:  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 5.   | Repair the ground short circuit in harness.   |
| <b>5 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between accelerator position sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br>(B315) No. 5 — Engine ground:  | Is the resistance less than 5 $\Omega$ ?   | Go to step 6.   | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |
| <b>6 CHECK ACCELERATOR PEDAL POSITION SENSOR POWER SUPPLY</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between accelerator pedal position sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br>(B315) No. 4 (+) — Engine ground (-):  | Is the voltage 4.5 — 5.5 V?  | Replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.> | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## EG:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-246, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

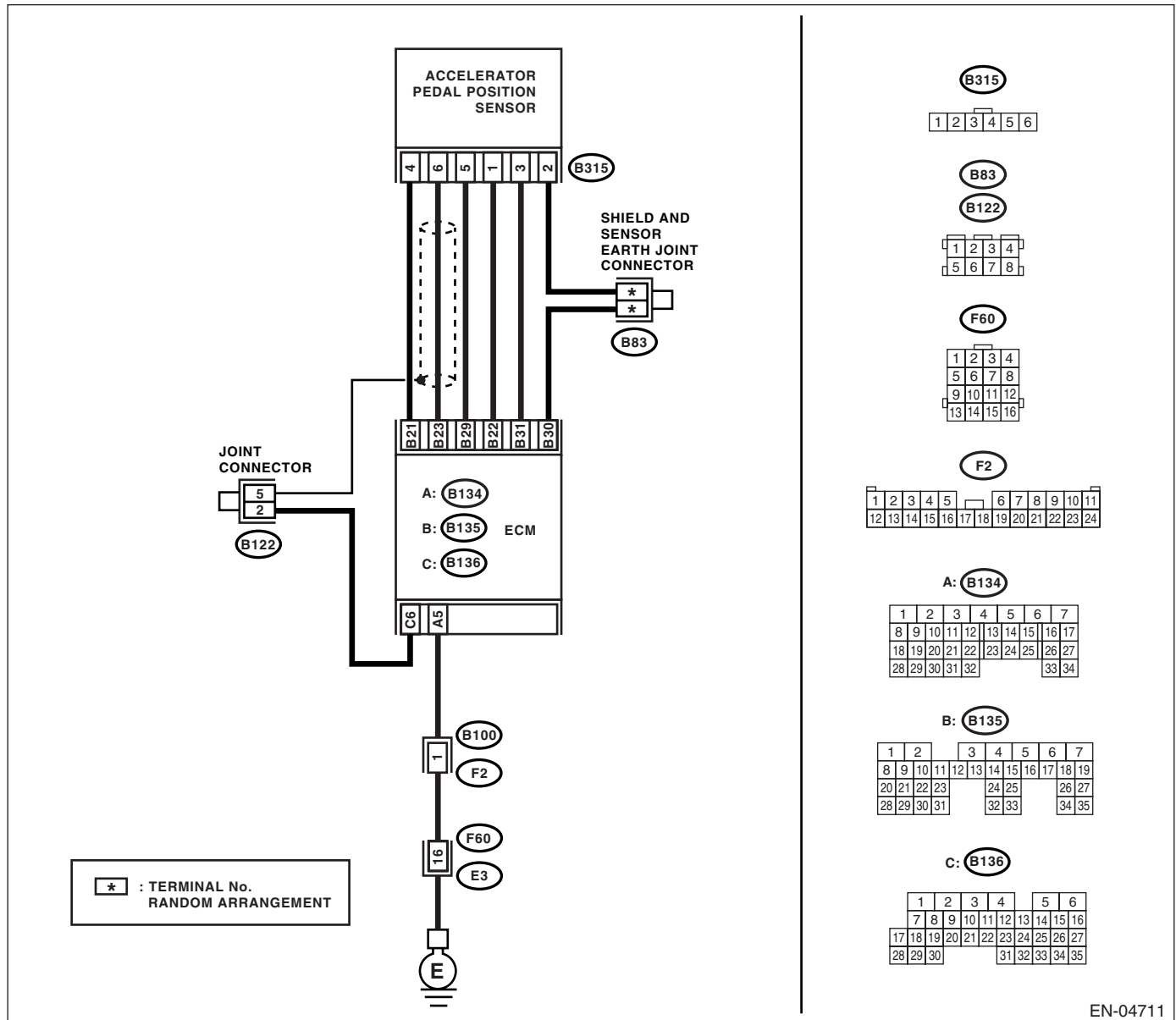
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04711

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <b>1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of main accelerator pedal position sensor signals, using Subaru Select Monitor.   | Is the voltage less than 4.8 V?  | Go to step 2.   | Go to step 3.   |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and accelerator pedal position sensor.   | Is there any poor contact in connectors between ECM and accelerator pedal position sensor? | Repair the poor contact in connectors.  | Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.   |
| <b>3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator pedal position sensor.<br>4) Measure the resistance between ECM connector and accelerator pedal position sensor.<br><i>Connector &amp; terminal</i><br><i>(B135) No. 21 — (B315) No. 4:</i><br><i>(B135) No. 23 — (B315) No. 6:</i><br><i>(B135) No. 29 — (B315) No. 5:</i> | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.   | Repair the open harness connector and trouble cause. Replace the ECM if faulty. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>   |
| <b>4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between accelerator pedal position sensor and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B315) No. 5 — Engine ground:</i>   | Is the resistance less than 5 $\Omega$ ?   | Go to step 5.   | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>   |
| <b>5 CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between accelerator pedal position sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B315) No. 4 (+) — Engine ground (-):</i><br>3) Shake the ECM harness and connector, while monitoring value of voltage meter. Check if the voltage is within specification.   | Is the voltage 4.5 — 5.5 V?  | Go to step 6.   | Repair the short circuit in harness between ECM connector and accelerator pedal position sensor connector. Replace the ECM if faulty. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |
| <b>6 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the accelerator pedal position sensor connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B135) No. 23 (+) — Chassis ground (-):</i>  | Is the voltage less than 4.8 V?  | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Repair the poor contact in accelerator pedal position sensor connector. If problem persists, replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.>                        |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## EH:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-247, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

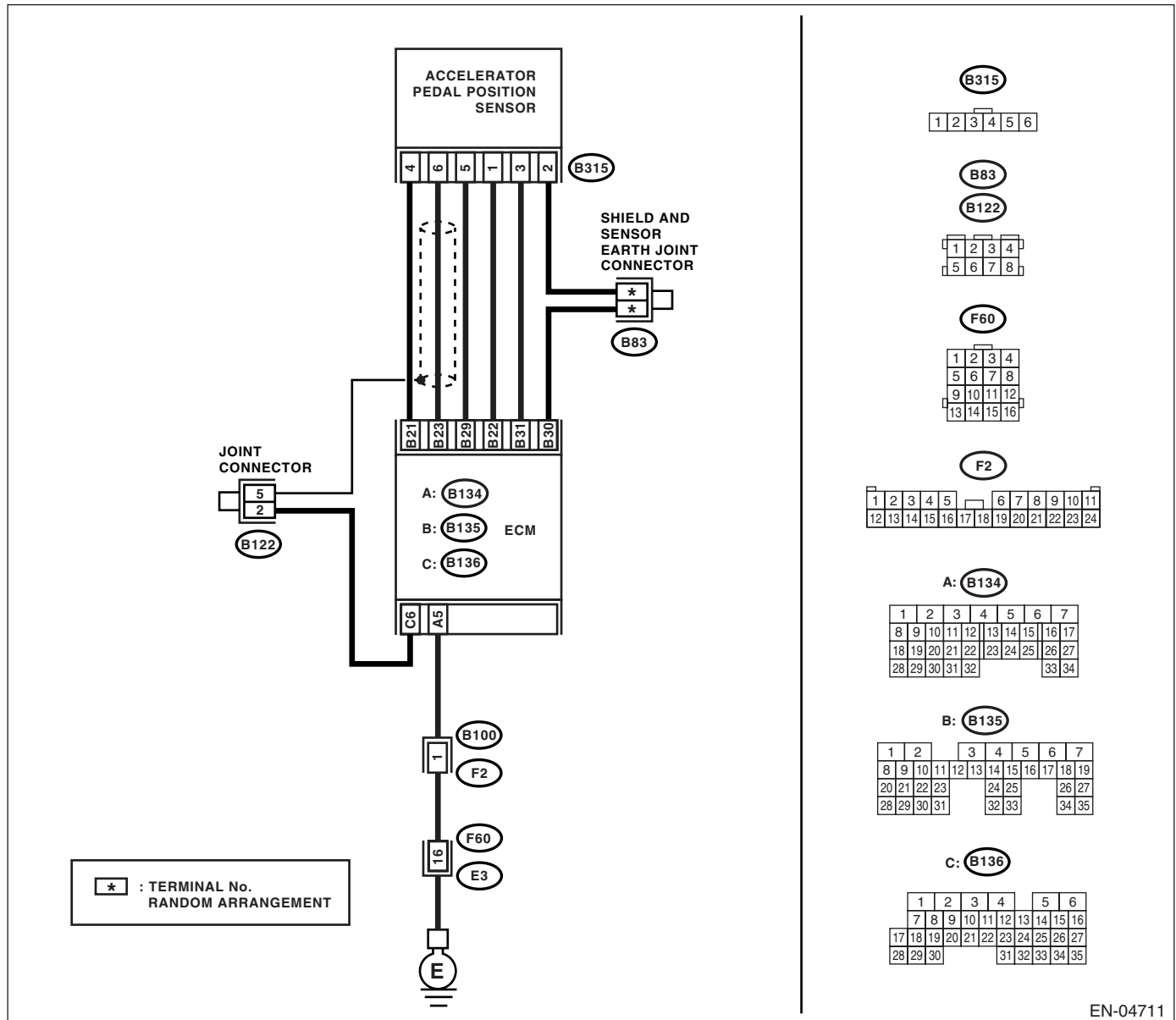
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04711

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <b>1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of sub accelerator pedal position sensor signals using Subaru Select Monitor   | Is the voltage more than 0.4 V?  | Go to step 2.   | Go to step 3.   |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and accelerator pedal position sensor.  | Is there any poor contact in connectors between ECM and accelerator pedal position sensor? | Repair the poor contact in connectors.                                  | Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.     |
| <b>3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator pedal position sensor.<br>4) Measure the resistance between ECM connector and accelerator pedal position sensor.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B135) No. 22 — (B315) No. 1:</b></i><br><i><b>(B135) No. 31 — (B315) No. 3:</b></i> | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.   | Repair the open harness connector.  |
| <b>4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>Measure the resistance between ECM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B135) No. 22 — Chassis ground:</b></i><br><i><b>(B135) No. 31 — Chassis ground:</b></i>  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 5.   | Repair the ground short of harness.   |
| <b>5 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between accelerator position sensor connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B315) No. 2 — Engine ground:</b></i>  | Is the resistance less than 5 $\Omega$ ?   | Go to step 6.   | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |
| <b>6 CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between accelerator pedal position sensor connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B315) No. 1 (+) — Engine ground (-):</b></i><br>4) Shake the ECM harness and connector, while monitoring value of voltage meter.                                     | Is the voltage 4.5 — 5.5 V?  | Replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.> | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## EI: DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-249, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

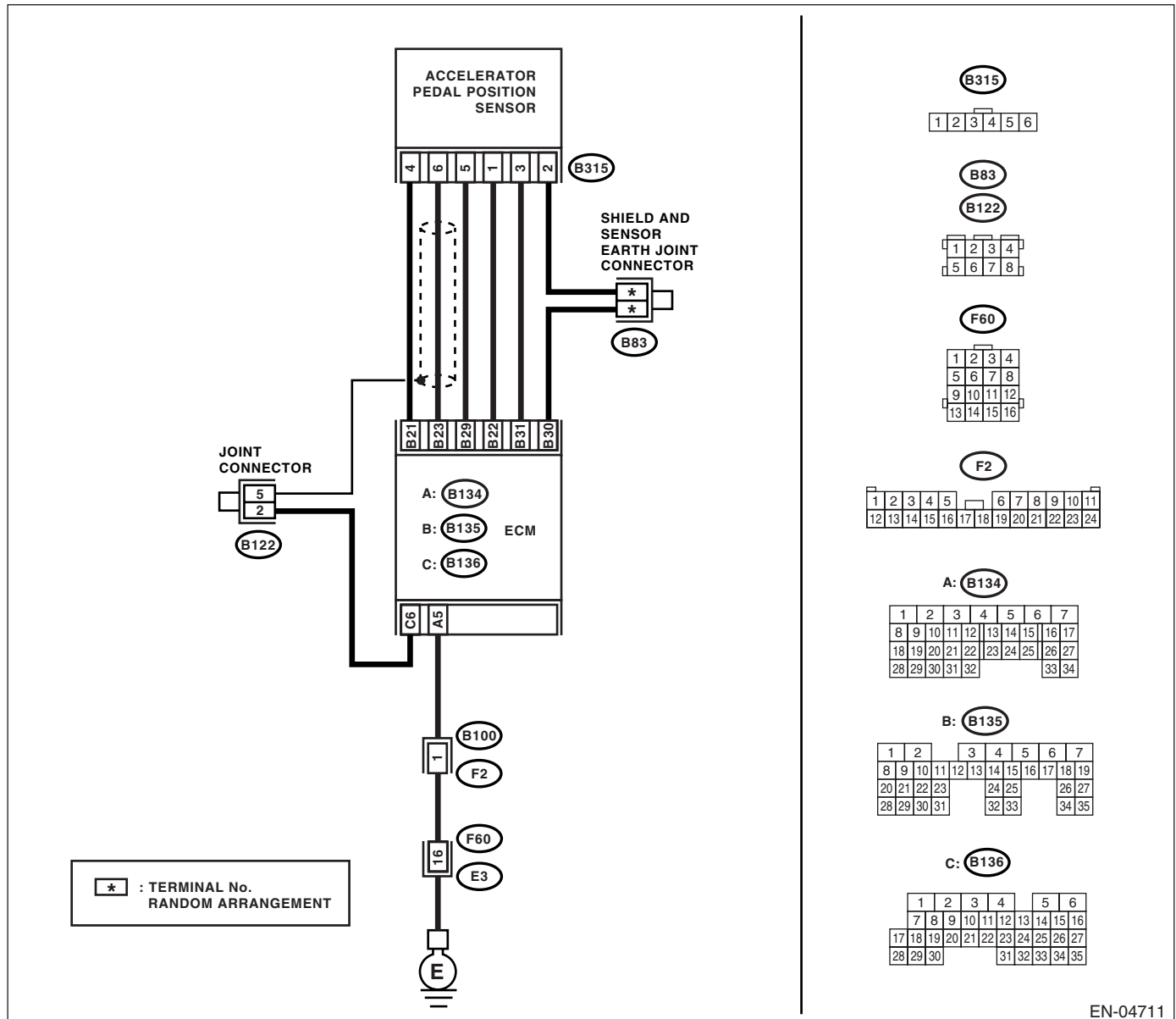
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04711

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <b>1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of sub accelerator pedal position sensor signals, using Subaru Select Monitor.  | Is the voltage less than 4.8 V?  | Go to step 2.   | Go to step 3.   |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and accelerator pedal position sensor.   | Is there any poor contact in connectors between ECM and accelerator pedal position sensor? | Repair the poor contact in connectors.  | Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.   |
| <b>3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator pedal position sensor.<br>4) Measure the resistance between ECM connector and accelerator pedal position sensor.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B135) No. 30 — (B315) No. 2:</b></i><br><i><b>(B135) No. 31 — (B315) No. 3:</b></i><br><i><b>(B135) No. 22 — (B315) No. 1:</b></i> | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.   | Repair the open harness connector and trouble cause. Replace the ECM if faulty. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>   |
| <b>4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between accelerator pedal position sensor connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B315) No. 2 — Engine ground:</b></i>   | Is the resistance less than 5 $\Omega$ ?   | Go to step 5.   | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>   |
| <b>5 CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between accelerator pedal position sensor connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B315) No. 1 (+) — Engine ground (-):</b></i>   | Is the voltage 4.5 — 5.5 V?  | Go to step 6.   | Repair the short of harness between ECM connector and accelerator pedal position sensor connector. Replace the ECM if faulty. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |
| <b>6 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the accelerator pedal position sensor connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between ECM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B135) No. 31 (+) — Chassis ground (-):</b></i>  | Is the voltage less than 4.8 V?  | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Repair the poor contact in accelerator pedal position sensor connector. If problem persists, replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.>                |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **EJ: DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION**

#### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-250, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance

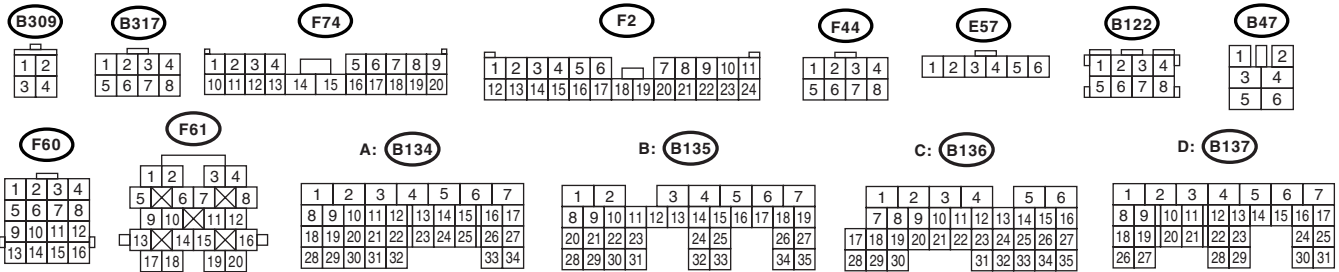
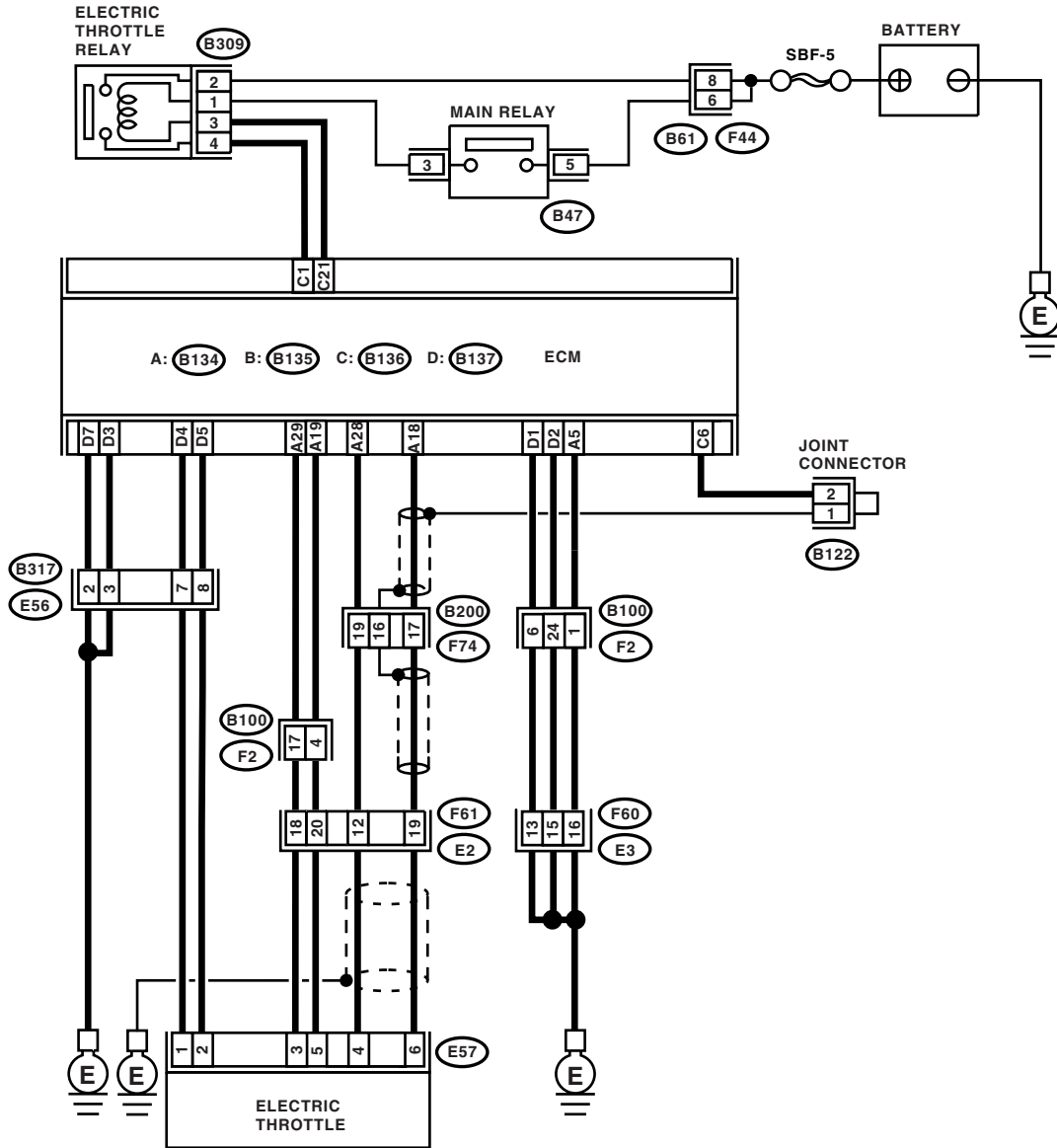
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04706

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes                                    | No   |
|--|--|--|--|
| <p><b>1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br/>                     1) Turn the ignition switch to ON.<br/>                     2) Measure the voltage between ECM connector terminals.<br/> <i>Connector &amp; terminal</i><br/> <i>(B134) No. 18 (+) — (B134) No. 29 (-):</i><br/>                     3) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.</p>           | Is the voltage more than 0.4 V?  | Go to step 2.                          | Go to step 4.  |
| <p><b>2 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br/>                     1) Measure the voltage between ECM connector terminals.<br/> <i>Connector &amp; terminal</i><br/> <i>(B134) No. 28 (+) — (B134) No. 29 (-):</i><br/>                     2) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.</p>   | Is the voltage more than 0.8 V?  | Go to step 3.                          | Go to step 4.  |
| <p><b>3 CHECK POOR CONTACT IN CONNECTORS.</b><br/>                     Check poor contact in connectors between ECM and electronic throttle control.</p>   | Is there any poor contact in connectors between ECM and electronic throttle control? | Repair the poor contact in connectors. | Go to step 14.   |
| <p><b>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br/>                     1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM.<br/>                     3) Disconnect the connector from electronic throttle control.<br/>                     4) Measure the resistance between ECM connector and electronic throttle control connector.<br/> <i>Connector &amp; terminal</i><br/> <i>(B134) No. 19 — (E57) No. 5:</i></p>              | Is the resistance less than 1 $\Omega$ ?   | Go to step 5.                          | Repair the open harness connector.   |
| <p><b>5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br/>                     Measure the resistance between ECM connector and chassis ground.<br/> <i>Connector &amp; terminal</i><br/> <i>(B134) No. 19 — Chassis ground:</i><br/> <i>(B134) No. 18 — Chassis ground:</i><br/> <i>(B134) No. 28 — Chassis ground:</i></p>  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 6.                          | Repair the ground short of harness.  |
| <p><b>6 CHECK POWER SUPPLY TO SENSOR.</b><br/>                     1) Connect the ECM connector.<br/>                     2) Turn the ignition switch to ON.<br/>                     3) Measure the voltage between electronic throttle control connector and engine ground.<br/> <i>Connector &amp; terminal</i><br/> <i>(E57) No. 5 (+) — Engine ground (-):</i><br/>                     4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.</p> | Is the voltage 4.5 — 5.5 V?  | Go to step 7.                          | Repair the poor contact in ECM connector. If problem persists, replace the ECM.<br><Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes                                    | No  |
|---|--|--|---|
| <b>7 CHECK SHORT OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electronic throttle control connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 4 — Engine ground:</b><br><b>(E57) No. 6 — Engine ground:</b>  | Is the resistance more than 10 $\Omega$ ?  | Go to step 8.                          | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |
| <b>8 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect all the connectors.<br>2) Turn the ignition switch to ON.<br>3) Read the data of main throttle sensor signals, using Subaru Select Monitors.<br>4) Shake the ECM harness and connector, engine harness connector, electronic throttle control connector harness while monitoring value of voltage meter.  | Is the voltage less than 4.63 V?   | Go to step 9.                          | Go to step 11.  |
| <b>9 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Read the data of sub throttle sensor signals, using Subaru Select Monitors.<br>2) Shake the ECM harness and connector, engine harness connector, electronic throttle control connector harness while monitoring value of voltage meter.   | Is the voltage less than 4.73 V?   | Go to step 10.                         | Go to step 11.  |
| <b>10 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electronic throttle control.  | Is there any poor contact in connectors between ECM and electronic throttle control? | Repair the poor contact in connectors. | Connector has returned to a normal condition at this time. A temporary poor contact in the connector might have been the cause.       |
| <b>11 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 18 — (E57) No. 6:</b><br><b>(B134) No. 28 — (E57) No. 4:</b><br><b>(B134) No. 29 — (E57) No. 3:</b> | Is the resistance less than 1 $\Omega$ ?   | Go to step 12.                         | Repair the open harness connector.  |
| <b>12 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between electronic throttle control connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 3 — Engine ground:</b>   | Is the resistance less than 5 $\Omega$ ?   | Go to step 13.                         | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes  | No   |
|---|--|--|--|
| <b>13 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electronic throttle control connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E57) No. 5 (+) — Engine ground (-):</b></i><br>4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter. | Is the voltage less than 10 V?             | Go to step 14.   | Repair the battery short of harness between ECM connector and electronic throttle control connector. |
| <b>14 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Measure the voltage between electronic throttle control connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E57) No. 4 (+) — Engine ground (-):</b></i><br><i><b>(E57) No. 6 (+) — Engine ground (-):</b></i><br>2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.                  | Is the voltage less than 10 V?             | Go to step 15.   | Repair the short of harness between ECM connector and electronic throttle control connector.         |
| <b>15 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the electronic throttle control connector.<br>3) Measure the resistance between ECM connectors.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 18 — (B134) No. 29:</b></i><br><i><b>(B134) No. 28 — (B134) No. 29:</b></i>  | Is the resistance more than 1 M $\Omega$ ? | Go to step 16.   | Repair the short of power supply sensor.   |
| <b>16 CHECK ELECTRONIC THROTTLE CONTROL HARNESS.</b><br>1) Disconnect the connector from ECM.<br>2) Disconnect the connector from electronic throttle control.<br>3) Measure the resistance between electronic throttle control connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E57) No. 6 — (E57) No. 4:</b></i>  | Is the resistance more than 1 M $\Omega$ ? | Repair the poor contact in ECM connector. If problem persists, replace the ECM.<br><Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Repair the short of harness.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## EK:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-252, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

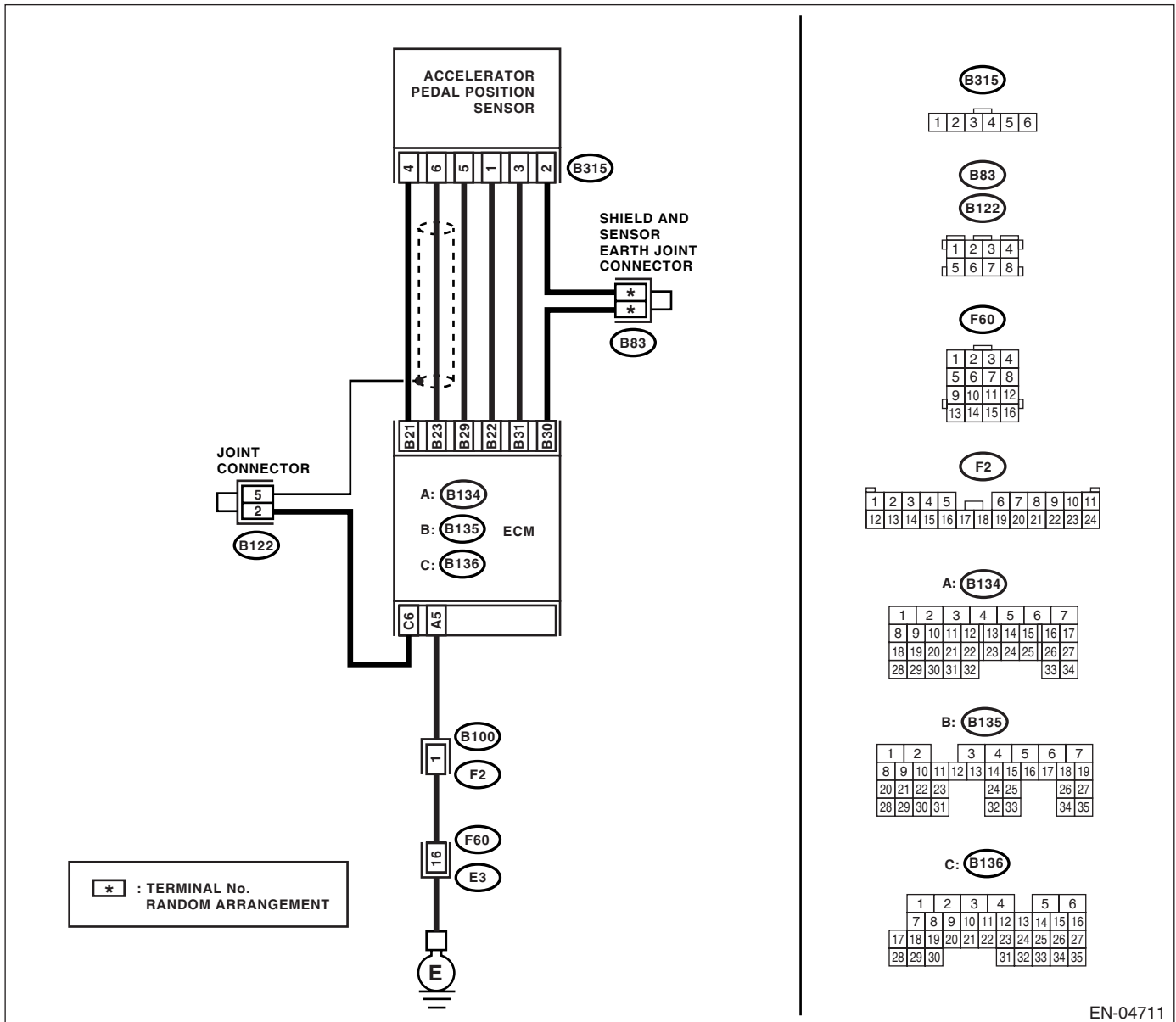
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04711



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes                                    | No  |
|---|--|--|---|
| <b>1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Using Subaru Select Monitor, read the data of main accelerator pedal position sensor signals and sub accelerator pedal position sensor signals.<br><br><b>NOTE:</b><br>Subaru Select Monitor<br>For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.>   | Is the voltage more than 0.4 V?  | Go to step 2.                          | Go to step 4.   |
| <b>2 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>Read the data of main accelerator pedal position sensor signals and sub accelerator pedal position sensor signals, using Subaru Select Monitor.<br><br><b>NOTE:</b><br>Subaru Select Monitor<br>For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.>  | Is the voltage less than 4.8 V?  | Go to step 3.                          | Go to step 4.   |
| <b>3 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electronic throttle control.   | Is there any poor contact in connectors between ECM and electronic throttle control? | Repair the poor contact in connectors. | Connector has returned to a normal condition at this time. A temporary poor contact in the connector might have been the cause. |
| <b>4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator pedal position sensor.<br>4) Measure the resistance between ECM connector and accelerator pedal position sensor connector.<br><br><b>Connector &amp; terminal</b><br>(B135) No. 21 — (B315) No. 4:<br>(B135) No. 22 — (B315) No. 1:<br>(B135) No. 23 — (B315) No. 6:<br>(B135) No. 29 — (B315) No. 5:<br>(B135) No. 30 — (B315) No. 2:<br>(B135) No. 31 — (B315) No. 3: | Is the resistance less than 1 $\Omega$ ?   | Go to step 5.                          | Repair the open harness connector.  |
| <b>5 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>Measure the resistance between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br>(B135) No. 21 — Chassis ground:<br>(B135) No. 22 — Chassis ground:<br>(B135) No. 23 — Chassis ground:<br>(B135) No. 31 — Chassis ground:  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 6.                          | Repair the ground short of harness.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                      | Yes   | No   |
|--|--|---|--|
| <b>6</b><br><b>CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between accelerator pedal position sensor and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B315) No. 5 — Chassis ground:</i><br><i>(B315) No. 2 — Chassis ground:</i>   | Is the resistance less than 5 $\Omega$ ?   | Go to step 7.   | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>                                |
| <b>7</b><br><b>CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between accelerator pedal position sensor connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B315) No. 1 (+) — Chassis ground (-):</i><br><i>(B315) No. 4 (+) — Chassis ground (-):</i>   | Is the voltage 4.5 — 5.5 V?                | Go to step 8.   | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>                                |
| <b>8</b><br><b>CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the accelerator pedal position sensor connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B135) No. 23 (+) — Chassis ground (-):</i><br><i>(B135) No. 31 (+) — Chassis ground (-):</i> | Is the voltage less than 4.8 V?            | Go to step 9.   | Repair the poor contact in accelerator pedal position sensor connector. If problem persists, replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.> |
| <b>9</b><br><b>CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator pedal position sensor.<br>4) Measure the resistance between terminals of accelerator pedal position sensor connector.<br><b>Connector &amp; terminal</b><br><i>(B315) No. 6 — (B315) No. 3:</i>                        | Is the resistance less than 1 M $\Omega$ ? | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Repair the short of harness between accelerator pedal position sensor connector and accelerator pedal position sensor connector.                                     |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## EL:DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-254, DTC P2227 BAROMETRIC PRESSURE TOO LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

| Step                                 | Check                       | Yes  | No  |
|--------------------------------------|-----------------------------|--|---|
| 1<br>CHECK ANY OTHER DTC ON DISPLAY. | Is any other DTC displayed? | Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> | Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).><br>NOTE:<br>Atmospheric pressure sensor is built into ECM. |

## EM:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-255, DTC P2228 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

| Step                                 | Check                       | Yes  | No  |
|--------------------------------------|-----------------------------|--|---|
| 1<br>CHECK ANY OTHER DTC ON DISPLAY. | Is any other DTC displayed? | Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> | Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).><br>NOTE:<br>Atmospheric pressure sensor is built into ECM. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## EN:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-256, DTC P2229 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

| Step                                 | Check                       | Yes  | No  |
|--------------------------------------|-----------------------------|--|---|
| 1<br>CHECK ANY OTHER DTC ON DISPLAY. | Is any other DTC displayed? | Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> | Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).><br>NOTE:<br>Atmospheric pressure sensor is built into ECM. |

## EO:DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT RANGE / PERFORMANCE

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-257, DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT RANGE / PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

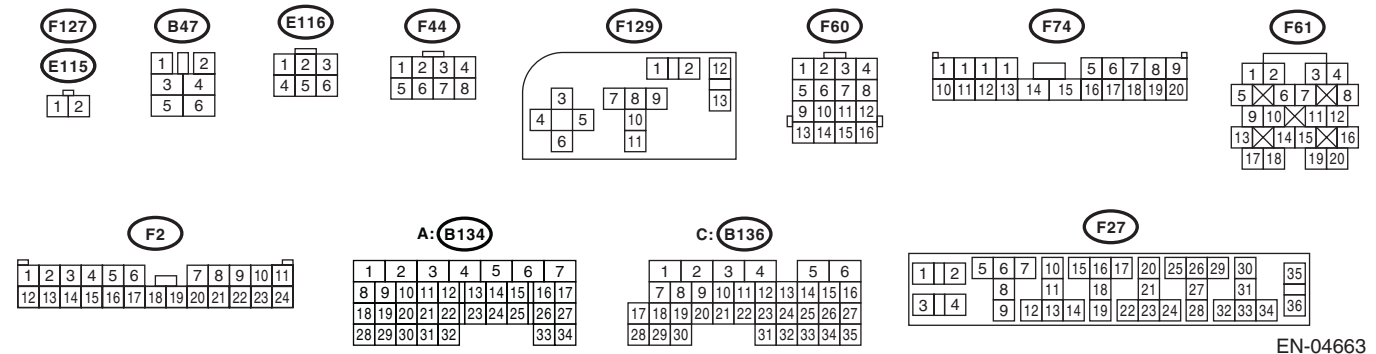
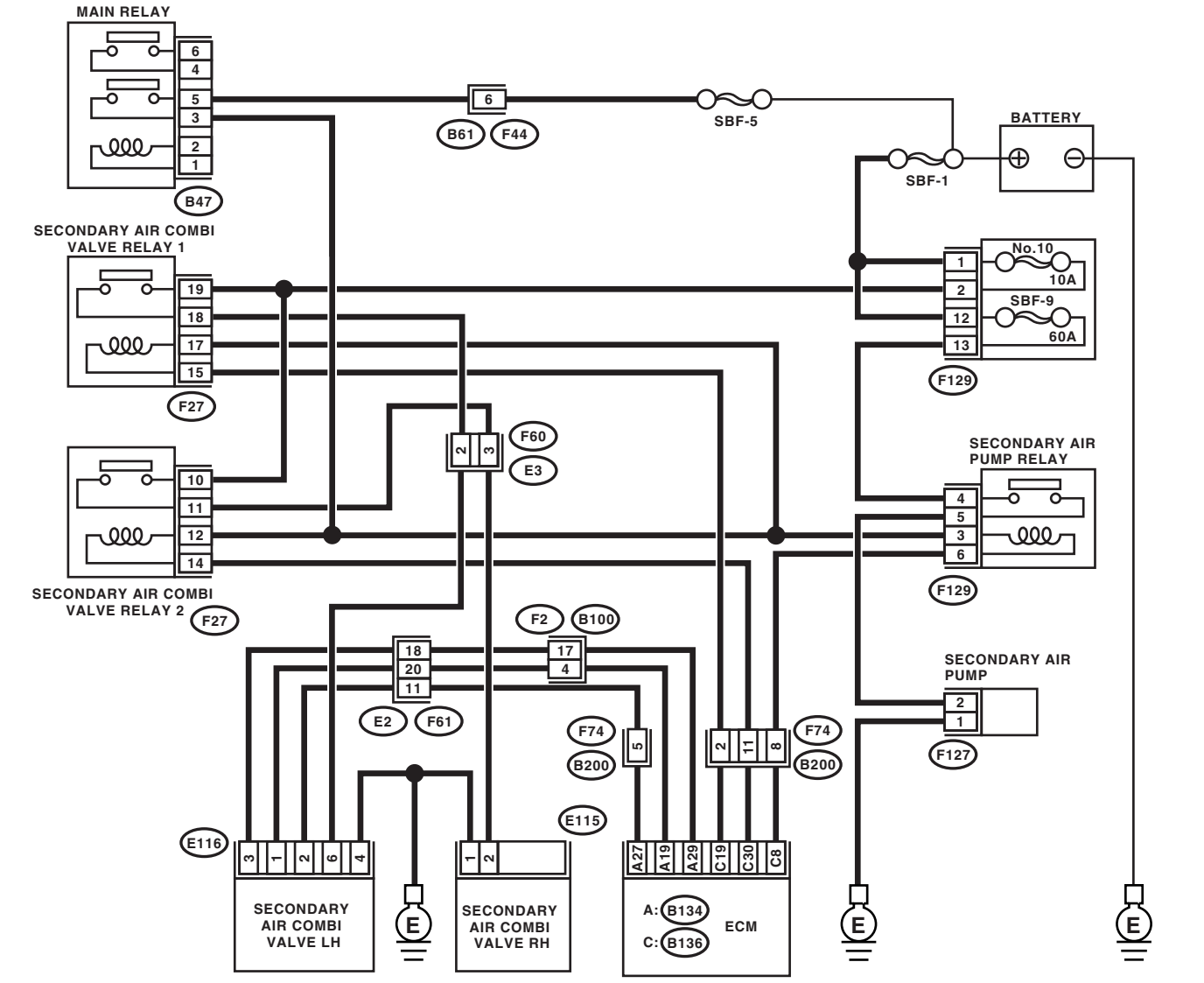
### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04663

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check   | Yes   | No  |   |
|------|---|---|---|---|
| 1    | <b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Inspect the relevant DTC.   | Go to step 2.   |
| 2    | <b>CHECK CURRENT DATA.</b><br>1) Turn the ignition switch to ON (engine OFF).<br>2) Using Subaru Select Monitor, read the data of secondary air pipe pressure, intake manifold absolute pressure and atmospheric pressure, and compare them with the actual atmospheric pressure.<br><b>NOTE:</b><br>Subaru Select Monitor<br>For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> | Is the difference between these pressure and actual atmospheric pressure more than 200 mmHg (27 kPa, 8 inHg or 3.9 psig)? | Replace the secondary air combi valve (LH). <Ref. to EC(H4DOTC)-10, Secondary Air Combi Valve.><br><b>NOTE:</b><br>The secondary air pressure sensor is integrated with secondary air combi valve (LH). | A temporary poor contact occurs. Check for poor contact of connector. |

## EP:DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT LOW

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-258, DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

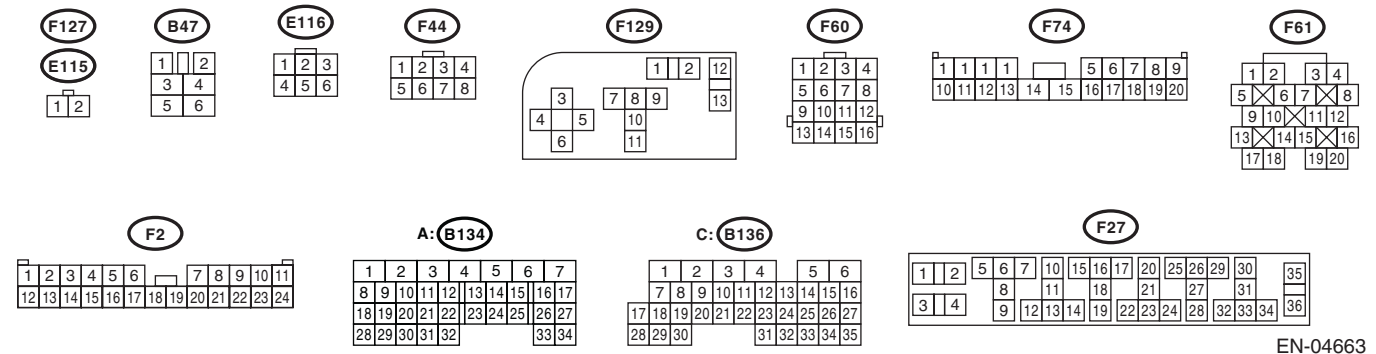
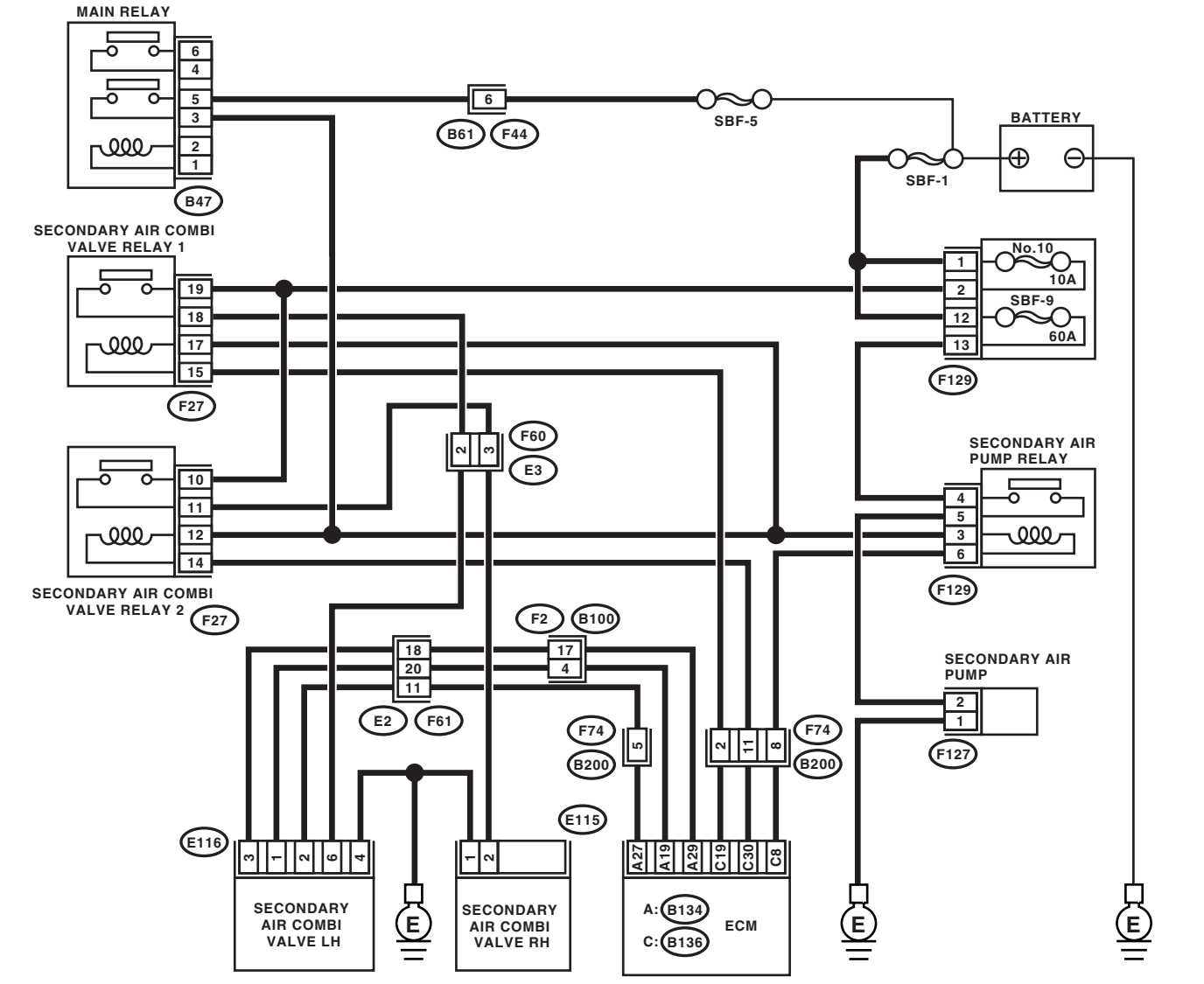
### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04663

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes  | No  |
|---|--|--|---|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE LH CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and secondary air combi valve LH.<br>3) Measure the resistance of harness between ECM and secondary air combi valve LH connector terminal.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 27 — (E116) No. 2:</i><br><i>(B134) No. 19 — (E116) No. 1:</i><br><i>(B134) No. 29 — (E116) No. 3:</i> | Is the resistance less than 1 $\Omega$ ?   | Go to step 2.  | Repair the open circuit in harness between ECM and secondary air combi valve LH connector terminal.         |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE LH CONNECTOR.</b><br>Measure the resistance of harness between ECM and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 27 — Chassis ground:</i>  | Is the resistance more than 1 M $\Omega$ ? | A temporary poor contact occurs.<br>Check poor contact in connector. | Repair the ground short circuit in harness between ECM and secondary air combi valve LH connector terminal. |

## EQ:DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT HIGH

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-259, DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

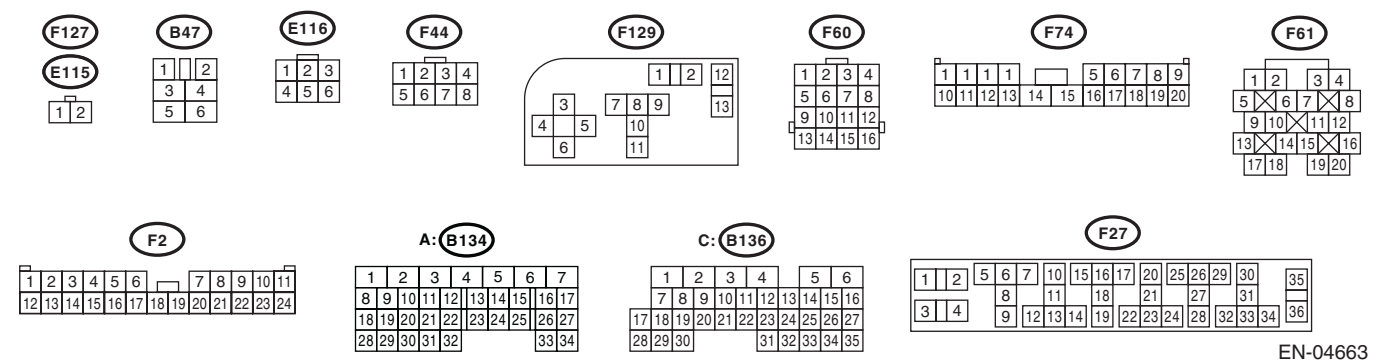
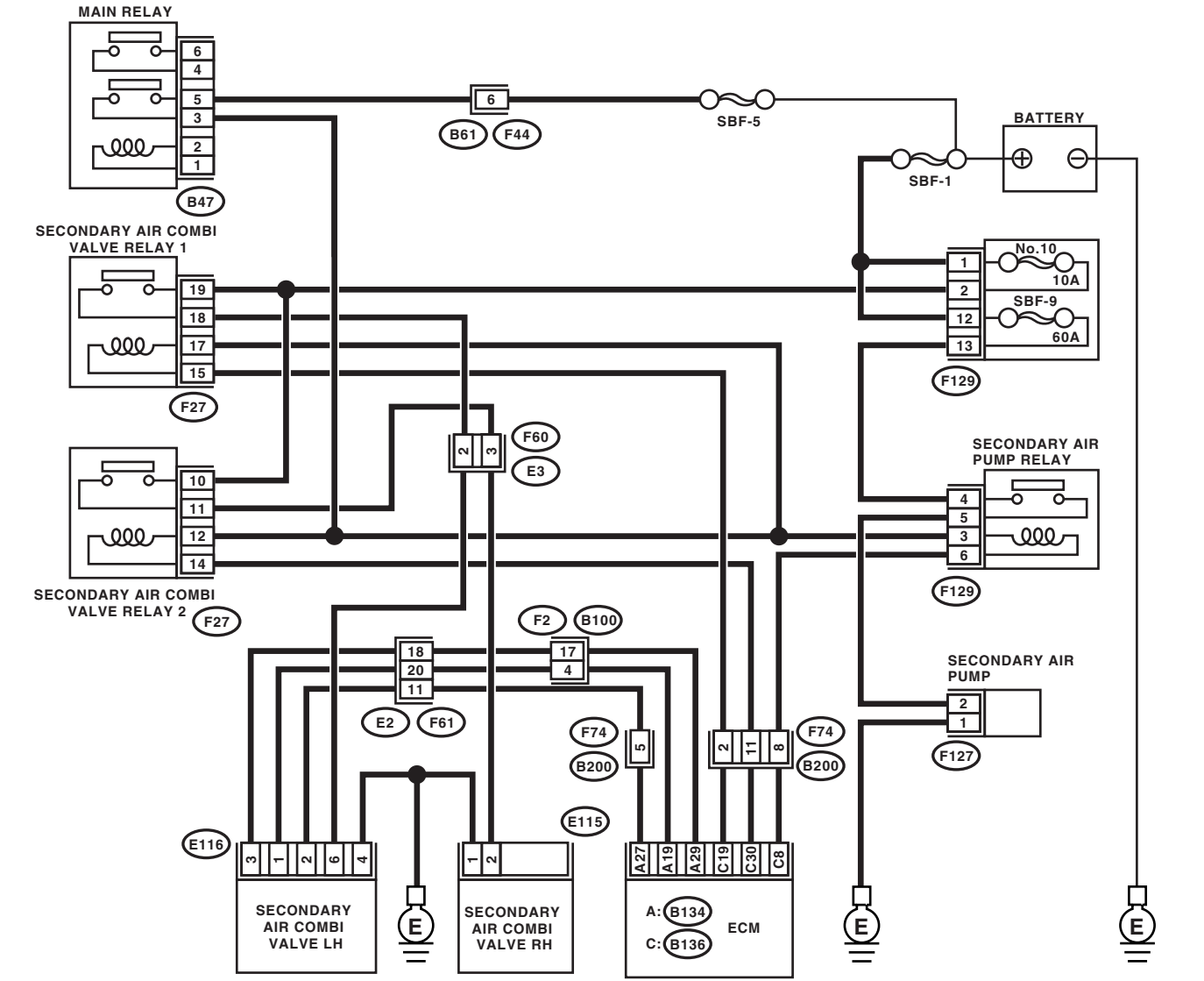
**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04663

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes  | No  |
|--|--|--|---|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE LH CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and secondary air combi valve LH.<br>3) Measure the resistance of harness between ECM and secondary air combi valve LH connector terminal.<br><i><b>Connector &amp; terminal</b></i><br><i>(B134) No. 27 — (E116) No. 2:</i><br><i>(B134) No. 19 — (E116) No. 1:</i><br><i>(B134) No. 29 — (E116) No. 3:</i> | Is the resistance less than 1 $\Omega$ ? | Go to step 2.  | Repair the open circuit in harness between ECM and secondary air combi valve LH connector terminal. |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE LH CONNECTOR.</b><br>Measure the resistance of harness between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i>(B134) No. 27 (+) — Chassis ground (-):</i>  | Is the voltage more than 5 V?            | Repair the battery short circuit in harness between ECM and secondary air combi valve LH connector terminal. | A temporary poor contact occurs. Check for poor contact of connector.                               |

## ER:DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-260, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

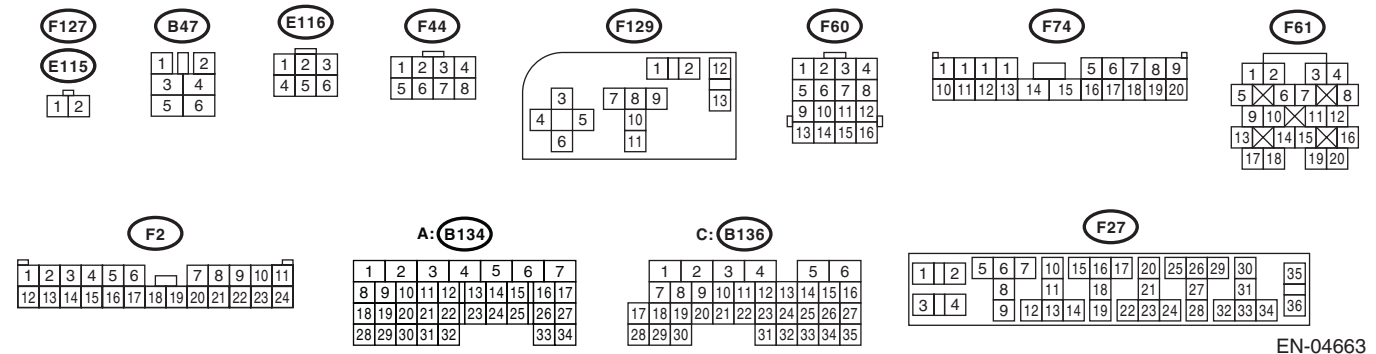
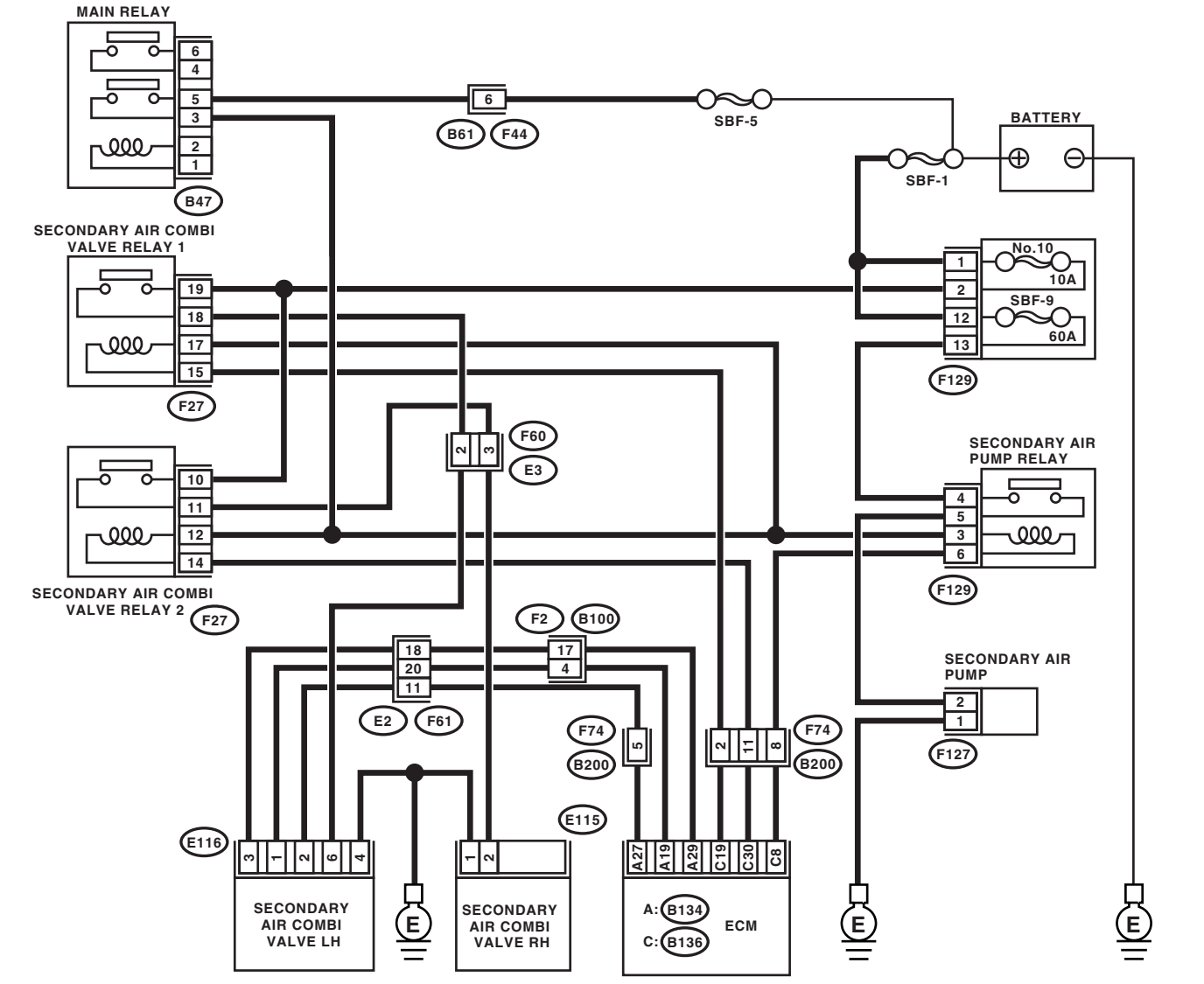
### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04663

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                       | Yes                                    | No   |
|---|---|--|--|
| <p><b>1 CHECK SECONDARY AIR COMBI VALVE OPERATION.</b></p> <p>1) Connect the test mode connector.<br/>2) Turn the ignition switch to ON.<br/>3) Perform the operational check of secondary air combi valve using the Subaru Select Monitor.</p> <p><b>NOTE:</b><br/>Subaru Select Monitor<br/>For detailed operation procedures, refer to "Compulsory Valve Operation Check Mode".<br/>&lt;Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.&gt;</p>          | Does the secondary air combi valve operate? | Go to step 2.                          | Go to step 4.  |
| <p><b>2 CHECK DUCT BETWEEN SECONDARY AIR COMBI VALVE AND SECONDARY AIR COMBI VALVE.</b></p> <p>Check the duct between secondary air combi and secondary air combi valve.</p>  | Is the duct damaged or disconnected?        | Replace or connect the duct.           | Go to step 3.  |
| <p><b>3 CHECK PIPE BETWEEN SECONDARY AIR COMBI VALVE AND CYLINDER HEAD.</b></p> <p>Check the pipe between secondary air combi valve and cylinder head.</p>  | Is the pipe damaged or disconnected?        | Replace or connect the pipe.           | A temporary poor contact occurs.<br>Check poor contact in connector.   |
| <p><b>4 CHECK POWER SUPPLY TO SECONDARY AIR COMBI VALVE.</b></p> <p>Measure the voltage between secondary air combi valve and chassis ground at the condition of Step 1.</p> <p><b>Connector &amp; terminal</b><br/><b>(E115) No. 2 (+) — Chassis ground (-):</b></p>   | Is the voltage more than 10 V?              | Replace the secondary air combi valve. | Go to step 5.  |
| <p><b>5 CHECK HARNESS BETWEEN SECONDARY AIR COMBI VALVE RELAY AND SECONDARY AIR COMBI VALVE CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from secondary air combi valve relay and secondary air combi valve.<br/>3) Measure the resistance of harness between secondary air combi valve relay and secondary air combi valve connector terminal.</p> <p><b>Connector &amp; terminal</b><br/><b>(F27) No. 11 — (E115) No. 2:</b></p> | Is the resistance less than 1 $\Omega$ ?    | Go to step 6.                          | Repair the open circuit in harness between secondary air combi valve relay and secondary air combi valve connector terminal. |
| <p><b>6 CHECK SECONDARY AIR COMBI VALVE RELAY.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Remove the secondary air combi valve relay from relay box.<br/>3) Connect the battery to terminals No. 12 and No. 14 of secondary air combi valve relay.<br/>4) Measure the resistance between secondary air combi valve relay terminals.</p> <p><b>Terminals</b><br/><b>No. 10 — No. 11:</b></p>  | Is the resistance less than 1 $\Omega$ ?    | Go to step 7.                          | Replace the secondary air combi valve relay.   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes  | No   |
|--|--|--|--|
| <b>7</b><br><b>CHECK POWER SUPPLY OF SECONDARY AIR COMBI VALVE RELAY.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between secondary air combi valve relay connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(F27) No. 10 (+) — Chassis ground (-):</i><br><i>(F27) No. 12 (+) — Chassis ground (-):</i>             | Is the voltage more than 10 V?           | Go to step 8.  | Repair the open power supply circuit or ground short.  |
| <b>8</b><br><b>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector of ECM.<br>3) Measure the resistance of harness between ECM and secondary air combi valve relay connector terminal.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 30 — (F27) No. 14:</i> | Is the resistance less than 1 $\Omega$ ? | Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Repair the open circuit in harness between ECM and secondary air combi valve relay connector terminal. |

### ES:DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 1)

NOTE:

For the diagnostic procedure, refer to DTC P2440. <Ref. to EN(H4DOTC)(diag)-385, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### ET:DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2)

**DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-260, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

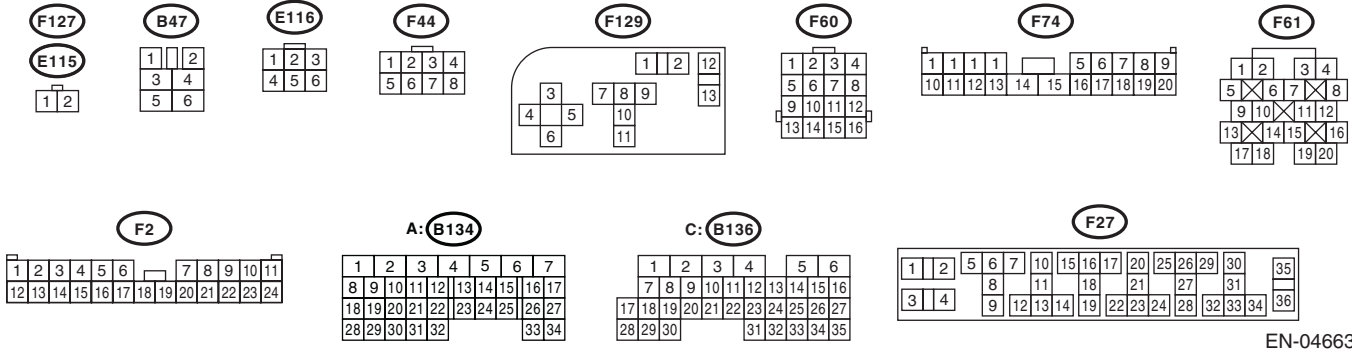
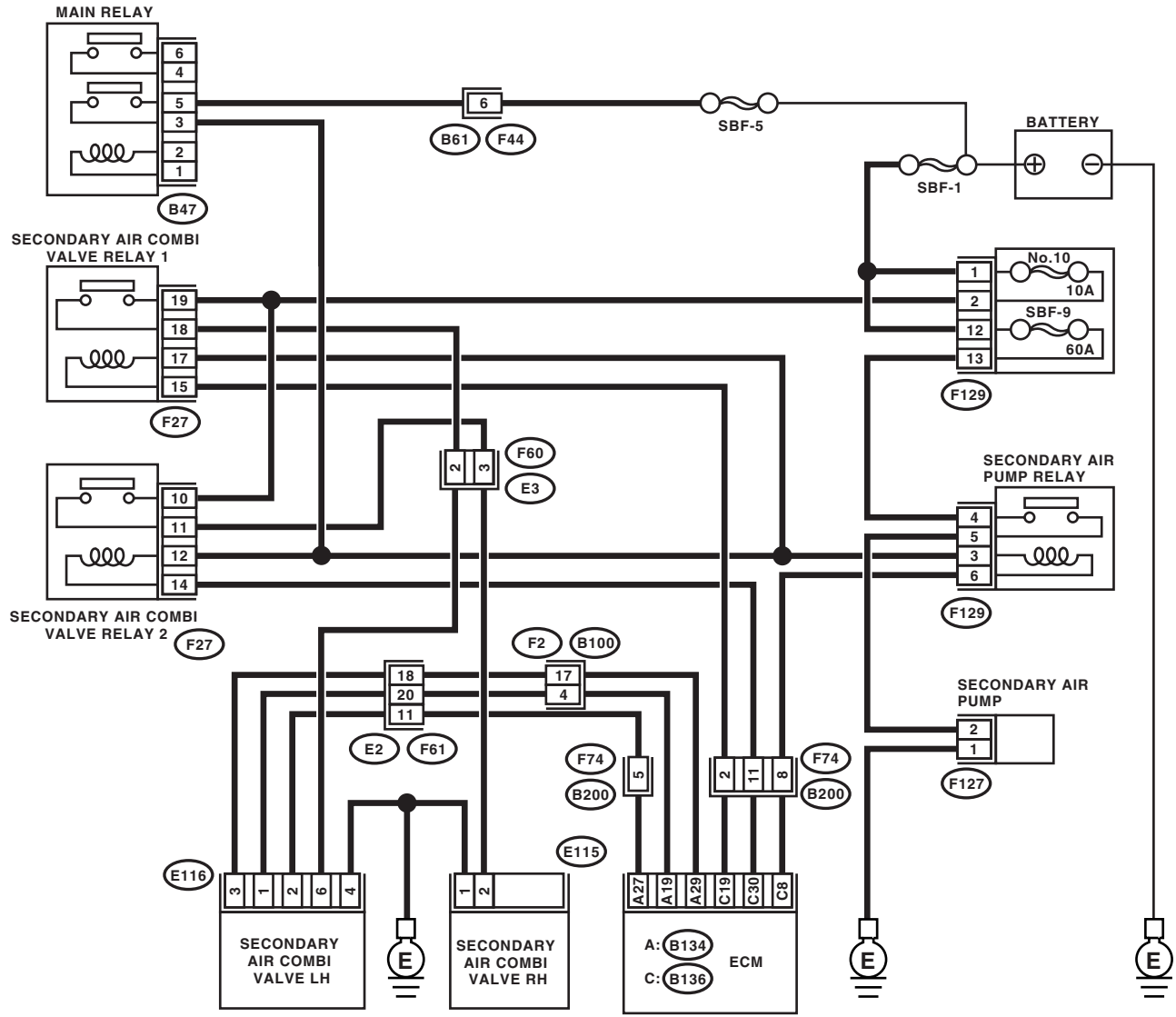
**CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04663

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                       | Yes                                    | No   |
|---|---|--|--|
| <b>1 CHECK SECONDARY AIR COMBI VALVE OPERATION.</b><br>1) Connect the test mode connector.<br>2) Turn the ignition switch to ON.<br>3) Perform the operational check of secondary air combi valve using the Subaru Select Monitor.<br><br><b>NOTE:</b><br>Subaru Select Monitor<br>For detailed operation procedures, refer to "Compulsory Valve Operation Check Mode".<br><Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>                  | Does the secondary air combi valve operate? | Go to step 2.                          | Go to step 4.  |
| <b>2 CHECK DUCT BETWEEN SECONDARY AIR COMBI VALVE AND SECONDARY AIR COMBI VALVE.</b><br>Check the duct between secondary air combi and secondary air combi valve.   | Is the duct damaged or disconnected?        | Replace or connect the duct.           | Go to step 3.  |
| <b>3 CHECK PIPE BETWEEN SECONDARY AIR COMBI VALVE AND CYLINDER HEAD.</b><br>Check the pipe between secondary air combi valve and cylinder head.   | Is the pipe damaged or disconnected?        | Replace or connect the pipe.           | A temporary poor contact occurs. Check poor contact in connector.  |
| <b>4 CHECK POWER SUPPLY TO SECONDARY AIR COMBI VALVE.</b><br>Measure the voltage between secondary air combi valve and chassis ground at the condition of Step 1.<br><br><b>Connector &amp; terminal</b><br><b>(E116) No. 6 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?              | Replace the secondary air combi valve. | Go to step 5.  |
| <b>5 CHECK HARNESS BETWEEN SECONDARY AIR COMBI VALVE RELAY AND SECONDARY AIR COMBI VALVE CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from secondary air combi valve relay and secondary air combi valve.<br>3) Measure the resistance of harness between secondary air combi valve relay and secondary air combi valve connector terminal.<br><br><b>Connector &amp; terminal</b><br><b>(F27) No. 18 — (E116) No. 6:</b> | Is the resistance less than 1 $\Omega$ ?    | Go to step 6.                          | Repair the open circuit in harness between secondary air combi valve relay and secondary air combi valve connector terminal. |
| <b>6 CHECK SECONDARY AIR COMBI VALVE RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the secondary air combi valve relay from relay box.<br>3) Connect the battery to terminals No. 17 and No. 15 of secondary air combi valve relay.<br>4) Measure the resistance between secondary air combi valve relay terminals.<br><br><b>Terminals</b><br><b>No. 19 — No. 18:</b>   | Is the resistance less than 1 $\Omega$ ?    | Go to step 7.                          | Replace the secondary air combi valve relay.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes  | No   |
|--|--|--|--|
| <b>7</b><br><b>CHECK POWER SUPPLY OF SECONDARY AIR COMBI VALVE RELAY.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between secondary air combi valve relay connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(F27) No. 19 (+) — Chassis ground (-):</i><br><i>(F27) No. 17 (+) — Chassis ground (-):</i>             | Is the voltage more than 10 V?           | Go to step <b>8</b> .  | Repair the open power supply circuit or ground short.  |
| <b>8</b><br><b>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector of ECM.<br>3) Measure the resistance of harness between ECM and secondary air combi valve relay connector terminal.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 19 — (F27) No. 15:</i> | Is the resistance less than 1 $\Omega$ ? | Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> | Repair the open circuit in harness between ECM and secondary air combi valve relay connector terminal. |

## EU:DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 2)

**NOTE:**

For the diagnostic procedure, refer to DTC P2442. <Ref. to EN(H4DOTC)(diag)-388, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## EV:DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-261, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Trouble Code (DTC) Detecting Criteria.>

**CAUTION:**

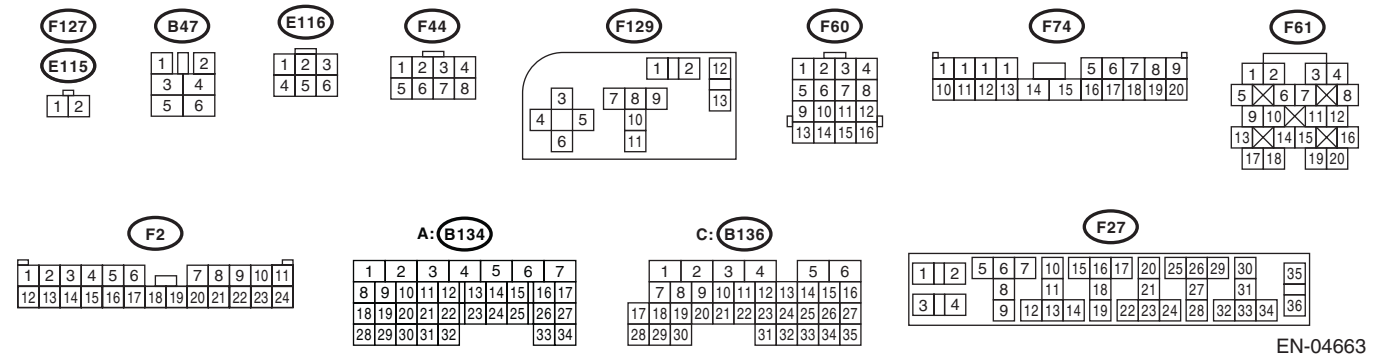
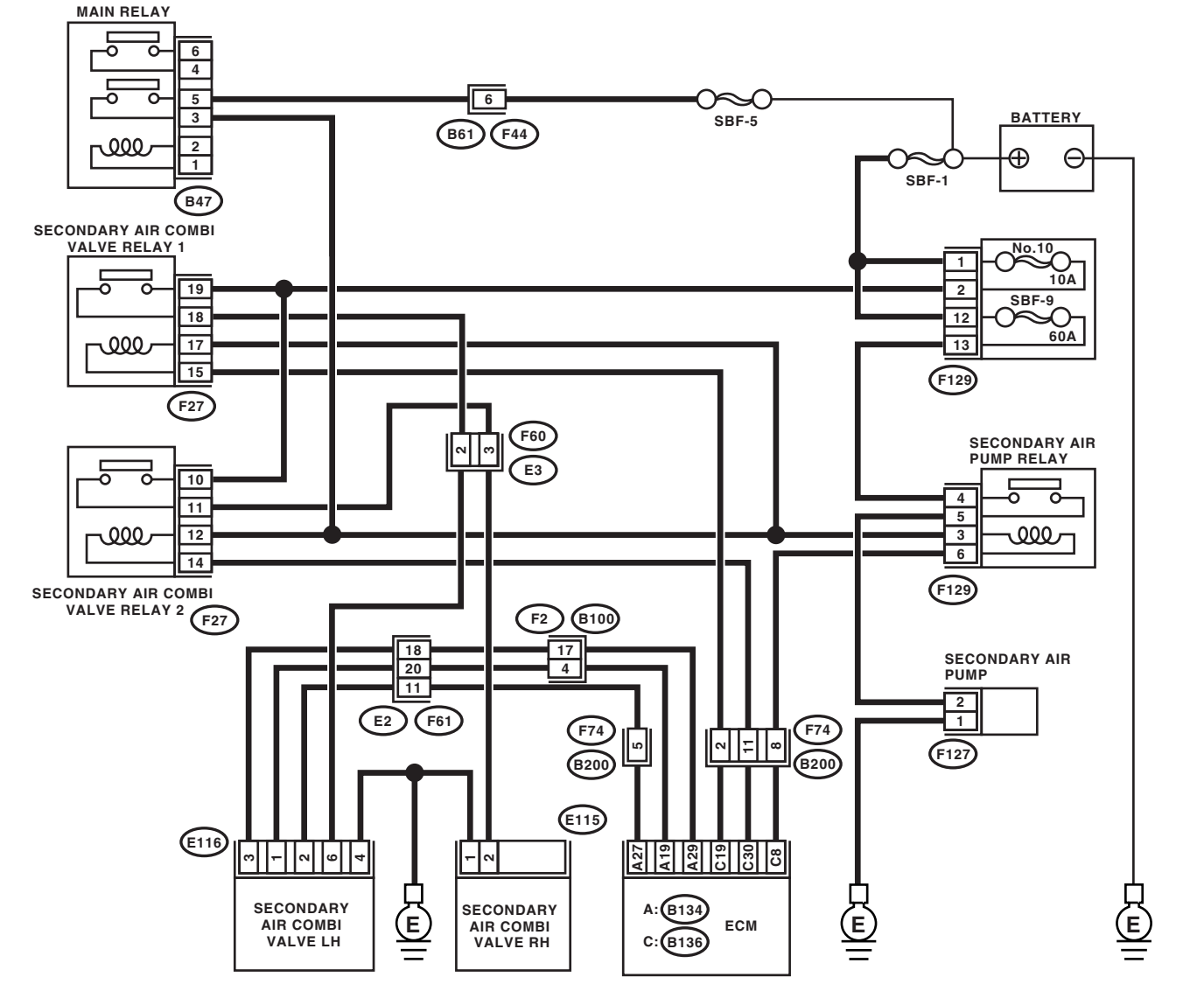
**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.**



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04663

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <b>1 CHECK SECONDARY AIR PIPE PRESSURE.</b><br>1) Turn the ignition switch to ON (engine OFF).<br>2) Using Subaru Select Monitor, read the data of secondary air pipe pressure, and compare it with atmospheric pressure.<br><br><b>NOTE:</b><br>Subaru Select Monitor<br>For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> | Is the difference between its pressure and actual atmospheric pressure more than 6.7 kPa (50 mmHg, 2.0 inHg or 0.97 psig)? | Replace the secondary air combi valve (LH). <Ref. to EC(H4DOTC)-10, Secondary Air Combi Valve.><br><br><b>NOTE:</b><br>The secondary air pressure sensor is integrated with secondary air combi valve (LH). | Go to step 2.   |
| <b>2 CHECK POWER SUPPLY TO SECONDARY AIR PUMP.</b><br>1) Turn the ignition switch to ON (engine OFF).<br>2) Measure the voltage between secondary air pump and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F127) No. 2 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?   | Go to step 3.   | A temporary poor contact occurs. Check for poor contact of connector. |
| <b>3 CHECK SECONDARY AIR PUMP RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the secondary air pump relay from relay box.<br>3) Measure the resistance between secondary air pump relay terminals.<br><b>Terminals</b><br><b>No. 4 — No. 5:</b>   | Is the resistance more than 1 MΩ?  | Repair the battery short circuit in harness between secondary air pump relay and secondary air pump connector terminal.   | Replace the secondary air pump relay.                                 |

# General Diagnostic Table

ENGINE (DIAGNOSTICS)

## 19. General Diagnostic Table

### A: INSPECTION

#### 1. ENGINE

NOTE:

Malfunction of parts other than those listed is also possible. <Ref. to ME(H4DOTC)-96, Engine Noise.>

| Symptom   | Problem parts  |
|---|--|
| 1. Engine stalls during idling.                               | 1) Electronic throttle control<br>2) Manifold absolute pressure sensor<br>3) Mass air flow and intake temperature sensor<br>4) Ignition parts (*1)<br>5) Engine coolant temperature sensor (*2)<br>6) Crankshaft position sensor (*3)<br>7) Camshaft position sensor (*3)<br>8) Fuel injection parts (*4)  |
| 2. Rough idling   | 1) Electronic throttle control<br>2) Manifold absolute pressure sensor<br>3) Mass air flow and intake temperature sensor<br>4) Engine coolant temperature sensor (*2)<br>5) Ignition parts (*1)<br>6) Air intake system (*5)<br>7) Fuel injection parts (*4)<br>8) Crankshaft position sensor (*3)<br>9) Camshaft position sensor (*3)<br>10) Oxygen sensor<br>11) Fuel pump and fuel pump relay |
| 3. Engine does not return to idle.                            | 1) Electronic throttle control<br>2) Engine coolant temperature sensor<br>3) Manifold absolute pressure sensor<br>4) Mass air flow sensor  |
| 4. Poor acceleration  | 1) Manifold absolute pressure sensor<br>2) Mass air flow and intake temperature sensor<br>3) Electronic throttle control<br>5) Fuel pump and fuel pump relay<br>6) Engine coolant temperature sensor (*2)<br>7) Crankshaft position sensor (*3)<br>8) Camshaft position sensor (*3)<br>9) A/C switch and A/C cut relay<br>10) Engine torque control signal circuit<br>11) Ignition parts (*1)    |
| 5. Engine stalls or engine sags or hesitates at acceleration. | 1) Manifold absolute pressure sensor<br>2) Mass air flow and intake temperature sensor<br>3) Engine coolant temperature sensor (*2)<br>4) Crankshaft position sensor (*3)<br>5) Camshaft position sensor (*3)<br>6) Purge control solenoid valve<br>7) Fuel injection parts (*4)<br>8) Fuel pump and fuel pump relay   |
| 6. Surge  | 1) Manifold absolute pressure sensor<br>2) Mass air flow and intake temperature sensor<br>3) Engine coolant temperature sensor (*2)<br>4) Crankshaft position sensor (*3)<br>5) Camshaft position sensor (*3)<br>6) Fuel injection parts (*4)<br>7) Throttle position sensor<br>8) Fuel pump and fuel pump relay   |

# General Diagnostic Table

ENGINE (DIAGNOSTICS)

| Symptom                            | Problem parts   |
|------------------------------------|---|
| 7. Spark knock                     | 1) Manifold absolute pressure sensor<br>2) Mass air flow and intake temperature sensor<br>3) Engine coolant temperature sensor<br>4) Knock sensor<br>5) Fuel injection parts (*4)<br>6) Fuel pump and fuel pump relay |
| 8. After-burning in exhaust system | 1) Manifold absolute pressure sensor<br>2) Mass air flow and intake temperature sensor<br>3) Engine coolant temperature sensor (*2)<br>4) Fuel injection parts (*4)<br>5) Fuel pump and fuel pump relay               |

\*1: Check ignition coil and ignitor assembly and spark plug.

\*2: Indicate the symptom occurring only in cold temperatures.

\*3: Ensure the secure installation.

\*4: Check fuel injector, fuel pressure regulator and fuel filter.

\*5: Inspect air leak in air intake system.

# General Diagnostic Table

ENGINE (DIAGNOSTICS)

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# GENERAL DESCRIPTION

# *GD(H4DOTC)*

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# List of Diagnostic Trouble Code (DTC)

## GENERAL DESCRIPTION

### 1. List of Diagnostic Trouble Code (DTC)

#### A: LIST

| DTC   | Description  | Index  |
|-------|--|--|
| P0011 | Intake Camshaft Position - Timing Over-advanced Or System Performance (Bank 1) | <Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P0016 | Crankshaft Position - Camshaft Position Correlation (Bank 1)                   | <Ref. to GD(H4DOTC)-12, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                   |
| P0018 | Crankshaft Position - Camshaft Position Correlation (Bank 2)                   | <Ref. to GD(H4DOTC)-12, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                   |
| P0021 | Intake Camshaft Position - Timing Over-advanced Or System Performance (Bank 2) | <Ref. to GD(H4DOTC)-12, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P0030 | HO2S Heater Control Circuit (Bank 1 Sensor 1)                                  | <Ref. to GD(H4DOTC)-13, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                                  |
| P0031 | HO2S Heater Control Circuit Low (Bank 1 Sensor 1)                              | <Ref. to GD(H4DOTC)-15, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                              |
| P0032 | HO2S Heater Control Circuit High (Bank 1 Sensor 1)                             | <Ref. to GD(H4DOTC)-17, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                             |
| P0037 | HO2S Heater Control Circuit Low (Bank 1 Sensor 2)                              | <Ref. to GD(H4DOTC)-19, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                              |
| P0038 | HO2S Heater Control Circuit High (Bank 1 Sensor 2)                             | <Ref. to GD(H4DOTC)-21, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                             |
| P0068 | Manifold Pressure Sensor Range/Performance                                     | <Ref. to GD(H4DOTC)-23, DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                     |
| P0101 | Mass or Volume Air Flow Circuit Range/Performance                              | <Ref. to GD(H4DOTC)-25, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                              |
| P0102 | Mass or Volume Air Flow Circuit Low Input                                      | <Ref. to GD(H4DOTC)-28, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                      |
| P0103 | Mass or Volume Air Flow Circuit High Input                                     | <Ref. to GD(H4DOTC)-30, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                     |
| P0107 | Manifold Absolute Pressure/Barometric Pressure Circuit Low Input               | <Ref. to GD(H4DOTC)-32, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>               |
| P0108 | Manifold Absolute Pressure/Barometric Pressure Circuit High Input              | <Ref. to GD(H4DOTC)-34, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>              |
| P0111 | Intake Air Temperature Circuit Range/Performance                               | <Ref. to GD(H4DOTC)-36, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                               |
| P0112 | Intake Air Temperature Circuit Low Input                                       | <Ref. to GD(H4DOTC)-38, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                       |
| P0113 | Intake Air Temperature Circuit High Input                                      | <Ref. to GD(H4DOTC)-40, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                      |
| P0117 | Engine Coolant Temperature Circuit Low Input                                   | <Ref. to GD(H4DOTC)-42, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                   |

# List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

| DTC   | Description  | Index  |
|-------|--|--|
| P0118 | Engine Coolant Temperature Circuit High Input                                    | <Ref. to GD(H4DOTC)-44, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                    |
| P0122 | Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input                      | <Ref. to GD(H4DOTC)-46, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P0123 | Throttle/Pedal Position Sensor/Switch "A" Circuit High Input                     | <Ref. to GD(H4DOTC)-47, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0125 | Insufficient Coolant Temperature For Closed Loop Fuel Control                    | <Ref. to GD(H4DOTC)-49, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>                    |
| P0126 | Insufficient Coolant Temperature For Stable Operation                            | <Ref. to GD(H4DOTC)-51, DTC P0126 INSUFFICIENT COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0128 | Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature) | <Ref. to GD(H4DOTC)-53, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P0131 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 1)                      | <Ref. to GD(H4DOTC)-55, DTC P0131 O <sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P0132 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 1)                     | <Ref. to GD(H4DOTC)-57, DTC P0132 O <sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0133 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 1)                    | <Ref. to GD(H4DOTC)-58, DTC P0133 O <sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                    |
| P0134 | O <sub>2</sub> Sensor Circuit No Activity Detected (Bank 1 Sensor 1)             | <Ref. to GD(H4DOTC)-61, DTC P0134 O <sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>             |
| P0137 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 2)                      | <Ref. to GD(H4DOTC)-62, DTC P0137 O <sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P0138 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 2)                     | <Ref. to GD(H4DOTC)-64, DTC P0138 O <sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0139 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 2)                    | <Ref. to GD(H4DOTC)-65, DTC P0139 O <sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                    |
| P0140 | O <sub>2</sub> Sensor Circuit No Activity Detected (Bank 1 Sensor 2)             | <Ref. to GD(H4DOTC)-71, DTC P0140 O <sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>             |
| P0171 | System Too Lean (Bank 1)   | <Ref. to GD(H4DOTC)-72, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P0172 | System Too Rich (Bank 1)   | <Ref. to GD(H4DOTC)-74, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P0181 | Fuel Temperature Sensor "A" Circuit Range/Performance                            | <Ref. to GD(H4DOTC)-77, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0182 | Fuel Temperature Sensor "A" Circuit Low Input                                    | <Ref. to GD(H4DOTC)-80, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                    |
| P0183 | Fuel Temperature Sensor "A" Circuit High Input                                   | <Ref. to GD(H4DOTC)-82, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                   |



## List of Diagnostic Trouble Code (DTC)

### GENERAL DESCRIPTION

| DTC   | Description  | Index   |
|-------|--|---|
| P0222 | Throttle/pedal Position Sensor/switch "B" Circuit Low              | <Ref. to GD(H4DOTC)-84, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>               |
| P0223 | Throttle/pedal Position Sensor/switch "B" Circuit High             | <Ref. to GD(H4DOTC)-85, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>              |
| P0230 | Fuel Pump Primary Circuit  | <Ref. to GD(H4DOTC)-87, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P0244 | Turbo/Super Charger Wastegate Solenoid "A" Range/Performance       | <Ref. to GD(H4DOTC)-89, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>        |
| P0245 | Turbo/Super Charger Wastegate Solenoid "A" Low                     | <Ref. to GD(H4DOTC)-91, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P0246 | Turbo/Super Charger Wastegate Solenoid "A" High                    | <Ref. to GD(H4DOTC)-93, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0301 | Cylinder 1 Misfire Detected  | <Ref. to GD(H4DOTC)-95, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P0302 | Cylinder 2 Misfire Detected  | <Ref. to GD(H4DOTC)-100, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0303 | Cylinder 3 Misfire Detected  | <Ref. to GD(H4DOTC)-100, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0304 | Cylinder 4 Misfire Detected  | <Ref. to GD(H4DOTC)-100, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0327 | Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)         | <Ref. to GD(H4DOTC)-101, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>         |
| P0328 | Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)        | <Ref. to GD(H4DOTC)-103, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>        |
| P0335 | Crankshaft Position Sensor "A" Circuit                             | <Ref. to GD(H4DOTC)-105, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                             |
| P0336 | Crankshaft Position Sensor "A" Circuit Range/Performance           | <Ref. to GD(H4DOTC)-107, DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>           |
| P0340 | Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)     | <Ref. to GD(H4DOTC)-109, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>     |
| P0345 | Camshaft Position Sensor "A" Circuit (Bank 2)                      | <Ref. to GD(H4DOTC)-110, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P0410 | Secondary Air Injection System                                     | <Ref. to GD(H4DOTC)-111, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                     |
| P0411 | Secondary Air Injection System Incorrect Flow Detected             | <Ref. to GD(H4DOTC)-115, DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>             |
| P0413 | Secondary Air Injection System Switching Valve "A" Circuit Open    | <Ref. to GD(H4DOTC)-116, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>    |
| P0414 | Secondary Air Injection System Switching Valve "A" Circuit Shorted | <Ref. to GD(H4DOTC)-117, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P0416 | Secondary Air Injection System Switching Valve "B" Circuit Open    | <Ref. to GD(H4DOTC)-118, DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "B" CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>    |

# List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

| DTC   | Description  | Index   |
|-------|--|---|
| P0417 | Secondary Air Injection System Switching Valve "B" Circuit Shorted     | <Ref. to GD(H4DOTC)-118, DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "B" CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>     |
| P0418 | Secondary Air Injection System Control "A" Circuit Open                | <Ref. to GD(H4DOTC)-119, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>                |
| P0420 | Catalyst System Efficiency Below Threshold (Bank 1)                    | <Ref. to GD(H4DOTC)-120, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                    |
| P0442 | Evaporative Emission Control System Leak Detected (Small Leak)         | <Ref. to GD(H4DOTC)-123, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>         |
| P0447 | Evaporative Emission Control System Vent Control Circuit Open          | <Ref. to GD(H4DOTC)-139, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>          |
| P0448 | Evaporative Emission Control System Vent Control Circuit Shorted       | <Ref. to GD(H4DOTC)-141, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>       |
| P0451 | Evaporative Emission Control System Pressure Sensor Range/Performance  | <Ref. to GD(H4DOTC)-143, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0452 | Evaporative Emission Control System Pressure Sensor Low Input          | <Ref. to GD(H4DOTC)-145, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>          |
| P0453 | Evaporative Emission Control System Pressure Sensor High Input         | <Ref. to GD(H4DOTC)-147, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>         |
| P0456 | Evaporative Emission Control System Leak Detected (Very Small Leak)    | <Ref. to GD(H4DOTC)-148, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>    |
| P0457 | Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off) | <Ref. to GD(H4DOTC)-148, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P0458 | Evaporative Emission Control System Purge Control Valve Circuit Low    | <Ref. to GD(H4DOTC)-149, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>    |
| P0459 | Evaporative Emission Control System Purge Control Valve Circuit High   | <Ref. to GD(H4DOTC)-151, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P0461 | Fuel Level Sensor Circuit Range/Performance                            | <Ref. to GD(H4DOTC)-153, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0462 | Fuel Level Sensor Circuit Low Input                                    | <Ref. to GD(H4DOTC)-155, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                    |
| P0463 | Fuel Level Sensor Circuit High Input                                   | <Ref. to GD(H4DOTC)-157, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                   |
| P0464 | Fuel Level Sensor Circuit Intermittent                                 | <Ref. to GD(H4DOTC)-158, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                 |
| P0483 | Cooling Fan Rationality Check  | <Ref. to GD(H4DOTC)-161, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0502 | Vehicle Speed Sensor Circuit Low Input                                 | <Ref. to GD(H4DOTC)-162, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                 |
| P0503 | Vehicle Speed Sensor Intermittent/Erratic/High                         | <Ref. to GD(H4DOTC)-163, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>                         |

## List of Diagnostic Trouble Code (DTC)

### GENERAL DESCRIPTION

| DTC   | Description  | Index   |
|-------|--|---|
| P0506 | Idle Control System RPM Lower Than Expected                              | <Ref. to GD(H4DOTC)-165, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>                        |
| P0507 | Idle Control System RPM Higher Than Expected                             | <Ref. to GD(H4DOTC)-167, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>                       |
| P0512 | Starter Request Circuit  | <Ref. to GD(H4DOTC)-169, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0513 | Incorrect Immobilizer Key  | <Ref. to GD(H4DOTC)-170, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0519 | Idle Control System Malfunction (Fail-Safe)                              | <Ref. to GD(H4DOTC)-171, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0600 | Serial Communication Link  | <Ref. to GD(H4DOTC)-172, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0604 | Internal Control Module Random Access Memory (RAM) Error                 | <Ref. to GD(H4DOTC)-173, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>               |
| P0605 | Internal Control Module Read Only Memory (ROM) Error                     | <Ref. to GD(H4DOTC)-174, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>                   |
| P0607 | Control Module Performance   | <Ref. to GD(H4DOTC)-175, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P0638 | Throttle Actuator Control Range/Performance (Bank 1)                     | <Ref. to GD(H4DOTC)-177, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                   |
| P0691 | Cooling Fan 1 Control Circuit Low  | <Ref. to GD(H4DOTC)-179, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                      |
| P0692 | Cooling Fan 1 Control Circuit High                                       | <Ref. to GD(H4DOTC)-180, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                     |
| P0700 | Transmission Control System (MIL Request)                                | <Ref. to GD(H4DOTC)-181, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Trouble Code (DTC) Detecting Criteria.>                              |
| P0851 | Neutral Switch Input Circuit Low (AT Model)                              | <Ref. to GD(H4DOTC)-182, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0851 | Neutral Switch Input Circuit Low (MT Model)                              | <Ref. to GD(H4DOTC)-183, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0852 | Neutral Switch Input Circuit High (AT Model)                             | <Ref. to GD(H4DOTC)-184, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>                           |
| P0852 | Neutral Switch Input Circuit High (MT Model)                             | <Ref. to GD(H4DOTC)-185, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>                           |
| P1152 | O <sub>2</sub> Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)  | <Ref. to GD(H4DOTC)-186, DTC P1152 O <sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P1153 | O <sub>2</sub> Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1) | <Ref. to GD(H4DOTC)-188, DTC P1153 O <sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P1160 | Return Spring Failure  | <Ref. to GD(H4DOTC)-190, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P1400 | Fuel Tank Pressure Control Solenoid Valve Circuit Low                    | <Ref. to GD(H4DOTC)-192, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>                  |

# List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

| DTC   | Description  | Index   |
|-------|--|---|
| P1410 | Secondary Air Injection System Switching Valve Stuck Open  | <Ref. to GD(H4DOTC)-194, DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P1418 | Secondary Air Injection System Control "A" Circuit Shorted | <Ref. to GD(H4DOTC)-195, DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P1420 | Fuel Tank Pressure Control Sol. Valve Circuit High         | <Ref. to GD(H4DOTC)-196, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>         |
| P1443 | Vent Control Solenoid Valve Function Problem               | <Ref. to GD(H4DOTC)-198, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>               |
| P1491 | Positive Crankcase Ventilation (Blow-By) Function Problem  | <Ref. to GD(H4DOTC)-200, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P1518 | Starter Switch Circuit Low Input                           | <Ref. to GD(H4DOTC)-202, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                           |
| P1560 | Back-Up Voltage Circuit Malfunction                        | <Ref. to GD(H4DOTC)-203, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>                        |
| P1570 | Antenna  | <Ref. to GD(H4DOTC)-204, DTC P1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P1571 | Reference Code Incompatibility                             | <Ref. to GD(H4DOTC)-204, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>                             |
| P1572 | IMM Circuit Failure (Except Antenna Circuit)               | <Ref. to GD(H4DOTC)-204, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Trouble Code (DTC) Detecting Criteria.>               |
| P1574 | Key Communication Failure                                  | <Ref. to GD(H4DOTC)-204, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                  |
| P1576 | EGI Control Module EEPROM                                  | <Ref. to GD(H4DOTC)-204, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                  |
| P1577 | IMM Control Module EEPROM                                  | <Ref. to GD(H4DOTC)-204, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                  |
| P2004 | Intake Manifold Runner Control Stuck Open (Bank 1)         | <Ref. to GD(H4DOTC)-205, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>         |
| P2005 | Intake Manifold Runner Control Stuck Open (Bank 2)         | <Ref. to GD(H4DOTC)-206, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>         |
| P2006 | Intake Manifold Runner Control Stuck Closed (Bank 1)       | <Ref. to GD(H4DOTC)-207, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>       |
| P2007 | Intake Manifold Runner Control Stuck Closed (Bank 2)       | <Ref. to GD(H4DOTC)-208, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>       |
| P2008 | Intake Manifold Runner Control Circuit / Open (Bank 1)     | <Ref. to GD(H4DOTC)-209, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>     |
| P2009 | Intake Manifold Runner Control Circuit Low (Bank 1)        | <Ref. to GD(H4DOTC)-211, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>        |
| P2011 | Intake Manifold Runner Control Circuit / Open (Bank 2)     | <Ref. to GD(H4DOTC)-213, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>     |
| P2012 | Intake Manifold Runner Control Circuit Low (Bank 2)        | <Ref. to GD(H4DOTC)-215, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>        |

## List of Diagnostic Trouble Code (DTC)

### GENERAL DESCRIPTION

| DTC   | Description   | Index  |
|-------|---|--|
| P2016 | Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 1)  | <Ref. to GD(H4DOTC)-217, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P2017 | Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 1) | <Ref. to GD(H4DOTC)-219, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P2021 | Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 2)  | <Ref. to GD(H4DOTC)-221, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P2022 | Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2) | <Ref. to GD(H4DOTC)-223, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P2088 | OCV Solenoid Valve Signal A Circuit Open (Bank 1)                     | <Ref. to GD(H4DOTC)-225, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P2089 | OCV Solenoid Valve Signal A Circuit Short (Bank 1)                    | <Ref. to GD(H4DOTC)-227, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                    |
| P2092 | OCV Solenoid Valve Signal A Circuit Open (Bank 2)                     | <Ref. to GD(H4DOTC)-229, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P2093 | Intake Camshaft Position Actuator Control Circuit High (Bank 2)       | <Ref. to GD(H4DOTC)-231, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>       |
| P2096 | Post Catalyst Fuel Trim System Too Lean Bank 1                        | <Ref. to GD(H4DOTC)-233, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>                        |
| P2097 | Post Catalyst Fuel Trim System Too Rich Bank 1                        | <Ref. to GD(H4DOTC)-235, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>                        |
| P2101 | Throttle Actuator Control Motor Circuit Range/Performance             | <Ref. to GD(H4DOTC)-237, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>             |
| P2102 | Throttle Actuator Control Motor Circuit Low                           | <Ref. to GD(H4DOTC)-239, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>                           |
| P2103 | Throttle Actuator Control Motor Circuit High                          | <Ref. to GD(H4DOTC)-241, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>                          |
| P2109 | Throttle/Pedal Position Sensor "A" Minimum Stop Performance           | <Ref. to GD(H4DOTC)-243, DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>             |
| P2122 | Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input           | <Ref. to GD(H4DOTC)-244, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>           |
| P2123 | Throttle/Pedal Position Sensor/Switch "D" Circuit High Input          | <Ref. to GD(H4DOTC)-246, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>          |
| P2127 | Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input           | <Ref. to GD(H4DOTC)-247, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>           |
| P2128 | Throttle/Pedal Position Sensor/Switch "E" Circuit High Input          | <Ref. to GD(H4DOTC)-249, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>          |
| P2135 | Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correlation     | <Ref. to GD(H4DOTC)-250, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>     |

# List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

| DTC   | Description  | Index  |
|-------|--|--|
| P2138 | Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation                  | <Ref. to GD(H4DOTC)-252, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P2227 | Barometric Pressure Too Low  | <Ref. to GD(H4DOTC)-254, DTC P2227 BAROMETRIC PRESSURE TOO LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P2228 | Atmospheric Pressure Sensor Circuit Malfunction (Low Input)                        | <Ref. to GD(H4DOTC)-255, DTC P2228 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>                           |
| P2229 | Atmospheric Pressure Sensor Circuit Malfunction (High Input)                       | <Ref. to GD(H4DOTC)-256, DTC P2229 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>                          |
| P2431 | Secondary Air Injection System Air Flow /Pressure Sensor Circuit Range/Performance | <Ref. to GD(H4DOTC)-257, DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT RANGE / PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P2432 | Secondary Air Injection System Air Flow /Pressure Sensor Circuit Low               | <Ref. to GD(H4DOTC)-258, DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>                 |
| P2433 | Secondary Air Injection System Air Flow /Pressure Sensor Circuit High              | <Ref. to GD(H4DOTC)-259, DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>                |
| P2440 | Secondary Air Injection System Switching Valve Stuck Open (Bank 1)                 | <Ref. to GD(H4DOTC)-260, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P2441 | Secondary Air Injection System Switching Valve Stuck Closed (Bank 1)               | <Ref. to GD(H4DOTC)-260, DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                   |
| P2442 | Secondary Air Injection System Switching Valve Stuck Open (Bank 2)                 | <Ref. to GD(H4DOTC)-260, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P2443 | Secondary Air Injection System Switching Valve Stuck Closed (Bank 2)               | <Ref. to GD(H4DOTC)-260, DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                   |
| P2444 | Secondary Air Injection System Pump Stuck On                                       | <Ref. to GD(H4DOTC)-261, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

## 2. Diagnostic Trouble Code (DTC) Detecting Criteria

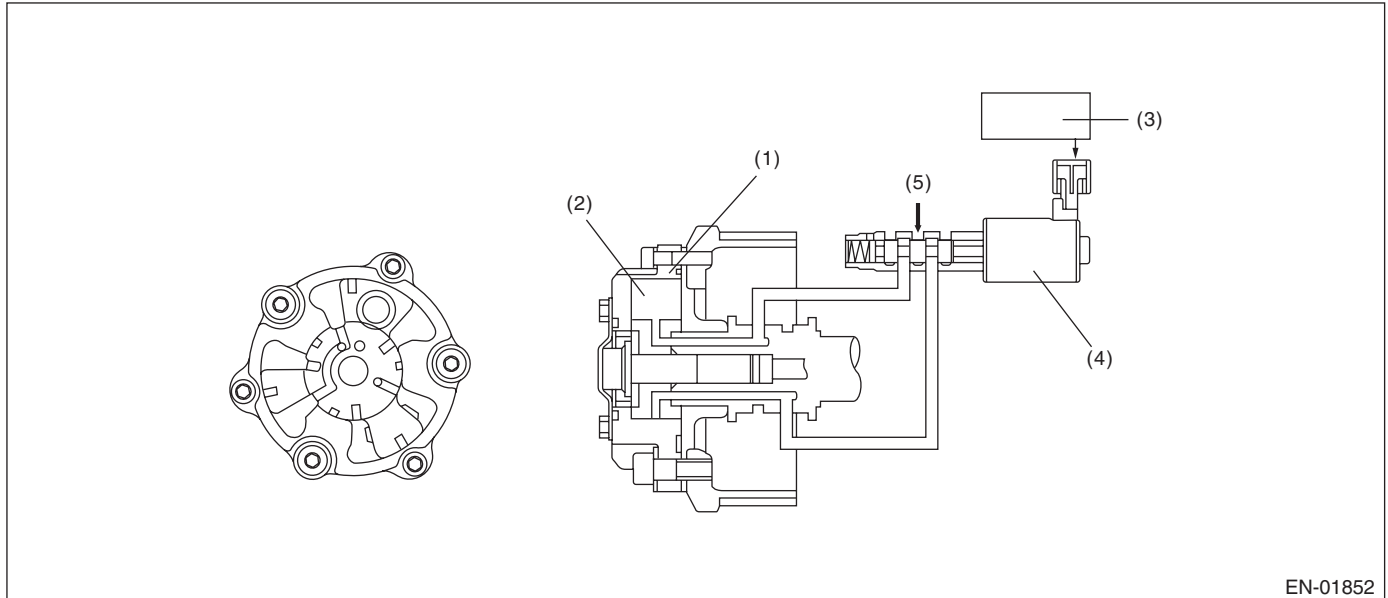
### A: DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of AVCS system.

There are two types of diagnosis; crankshaft and camshaft position diagnosis and slow response diagnosis. Perform one of two according to operation status.

#### 2. COMPONENT DESCRIPTION



EN-01852

- (1) AVCS timing controller
- (2) Vane
- (3) Engine control module (ECM)
- (4) Oil flow control solenoid valve
- (5) Oil pressure

#### 3. ENABLE CONDITION

##### (1) Crankshaft and camshaft position diagnosis

| Secondary Parameters            | Enable Conditions                                |
|---------------------------------|--|
| Battery voltage                 | $\geq 10.9$ V                                    |
| Engine coolant temperature      | $> 60^{\circ}\text{C}$ ( $140^{\circ}\text{F}$ ) |
| Amount of target timing advance | $= 0^{\circ}\text{CA}$                           |
| Engine speed                    | $\geq 500$ rpm                                   |
| AVCS                            | Not in operation                                 |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## (2) Slow response diagnosis

| Secondary Parameters                           | Enable Conditions                                |
|--|--|
| All the secondary parameters can be performed. | More than 1 second                               |
| Battery voltage                                | $\geq 10.9 \text{ V}$                            |
| Engine coolant temperature                     | $> 60^{\circ}\text{C}$ ( $140^{\circ}\text{F}$ ) |
| Amount of AVCS target timing advance           | $\neq 0^{\circ}\text{CA}$                        |
| Engine speed                                   | $\geq 1,300 \text{ rpm}$                         |
| AVCS   | In operation                                     |
| Variable amount of target timing advance       | $< 1.07^{\circ}\text{CA}$                        |

## 4. GENERAL DRIVING CYCLE

### (1) Crankshaft and camshaft position diagnosis

Always perform the diagnosis continuously after starting the engine while the AVCS is not operated.

### (2) Slow response diagnosis

Always perform the diagnosis continuously after starting the engine while the AVCS is operated.

## 5. DIAGNOSTIC METHOD

### (1) Crankshaft and camshaft position diagnosis

Judge NG when standard amount of timing advance is outside of normal range, and judge OK when it is within normal range.

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 20 seconds, and judge OK and clear the NG when the continuous time of not completing the malfunction criteria below becomes more than 1 second.

#### Judgment Value

| Malfunction Criteria              | Threshold Value   |
|-----------------------------------|---|
| Standard amount of timing advance | $< -13^{\circ}\text{CA}$<br>or<br>$> 25^{\circ}\text{CA}$ |

**Time Needed for Diagnosis:** 20 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### (2) Slow response diagnosis

Accumulate the AVCS deviation amount in positive and negative while AVCS is operated. Judge NG when cumulative value is large at interval of certain time (30 seconds).

#### • Abnormality Judgment

Judge OK when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                        | Threshold Value  |
|---|--|
| AVCS target position                        | $\geq 0^{\circ}\text{CA}$  |
| Cumulative value of AVCS positive deviation | $< 8000^{\circ}\text{CA}$ (R bank)<br>$< 8000^{\circ}\text{CA}$ (L bank)   |
| or  |  |
| Cumulative value of AVCS negative deviation | $< -8000^{\circ}\text{CA}$ (R bank)<br>$< -8000^{\circ}\text{CA}$ (L bank) |

**Time Needed for Diagnosis:** 30 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria                        | Threshold Value  |
|---|--|
| AVCS target position                        | $\geq 0^{\circ}\text{CA}$  |
| Cumulative value of AVCS positive deviation | $\leq 8000^{\circ}\text{CA}$ (R bank)<br>$\leq 8000^{\circ}\text{CA}$ (L bank)   |
| or  |  |
| Cumulative value of AVCS negative deviation | $\geq -8000^{\circ}\text{CA}$ (R bank)<br>$\geq -8000^{\circ}\text{CA}$ (L bank) |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

### **B: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1)**

NOTE:

For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **C: DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2)**

NOTE:

For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **D: DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)**

NOTE:

For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

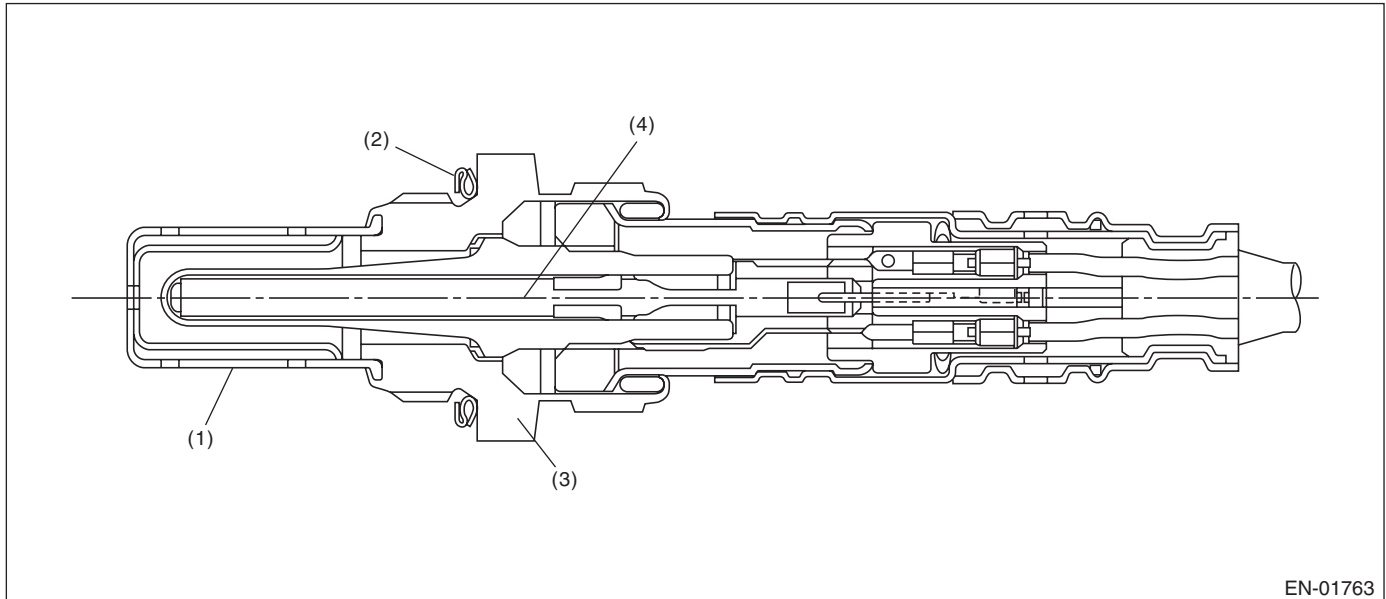
## E: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of front oxygen (A/F) sensor heater.

Judge NG when impedance of front oxygen (A/F) sensor is larger than the standard value by referring to the engine condition such as fuel shut-off in deceleration, etc.

### 2. COMPONENT DESCRIPTION



EN-01763

- (1) Protection tube
- (2) Gasket
- (3) Sensor housing
- (4) Ceramic heater

### 3. ENABLE CONDITION

| Secondary Parameters   | Enable Conditions  |
|--|--------------------|
| Continuous time which all the following conditions were filled | 30 seconds or more |
| Battery voltage  | > 10.9 V           |
| After fuel shut-off  | 10 seconds or more |
| Front oxygen (A/F) sensor heater control duty $\geq$ 35%       | Experienced        |
| Heater current   | Permit             |

### 4. GENERAL DRIVING CYCLE

Perform diagnosis continuously in 30 seconds after starting engine.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the continuous time of not completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

#### Judgment Value

| Malfunction Criteria                   | Threshold Value |
|--|-----------------|
| Impedance of front oxygen (A/F) sensor | > 50 $\Omega$   |

**Time Needed for Diagnosis:** 10 seconds

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## F: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

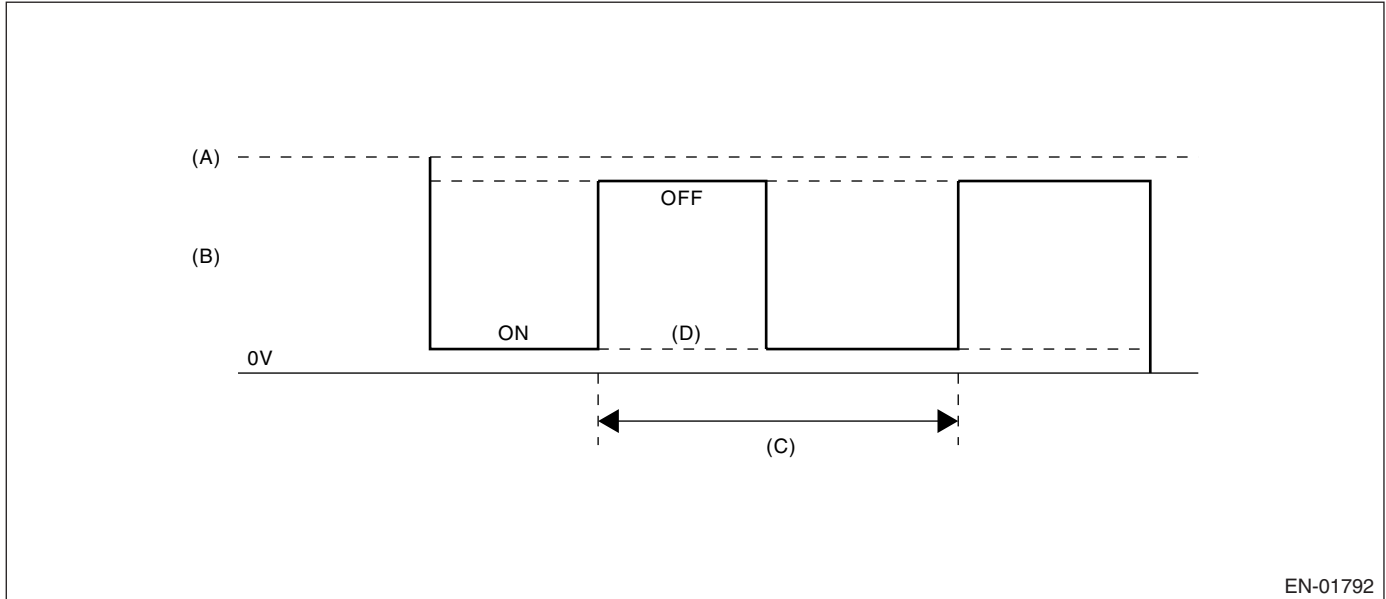
### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of front oxygen (A/F) sensor heater.

The front oxygen (A/F) sensor heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.

Judge NG when the terminal voltage remains to be Low.

### 2. COMPONENT DESCRIPTION



- |   |                                    |
|---|------------------------------------|
| (A) Battery voltage                                 | (C) 128 milliseconds               |
| (B) Front oxygen (A/F) sensor heater output voltage | (D) Low abnormality output voltage |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | ≥ 10.9 V          |

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second (8 cycles).

#### Judgment Value

| Malfunction Criteria                          | Threshold Value |
|---|-----------------|
| Output voltage level                          | Low             |
| Front oxygen (A/F) sensor heater control duty | < 87.5%         |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage level | High            |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- Front oxygen sensor main learning correction: Not allowed to calculate.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## G: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

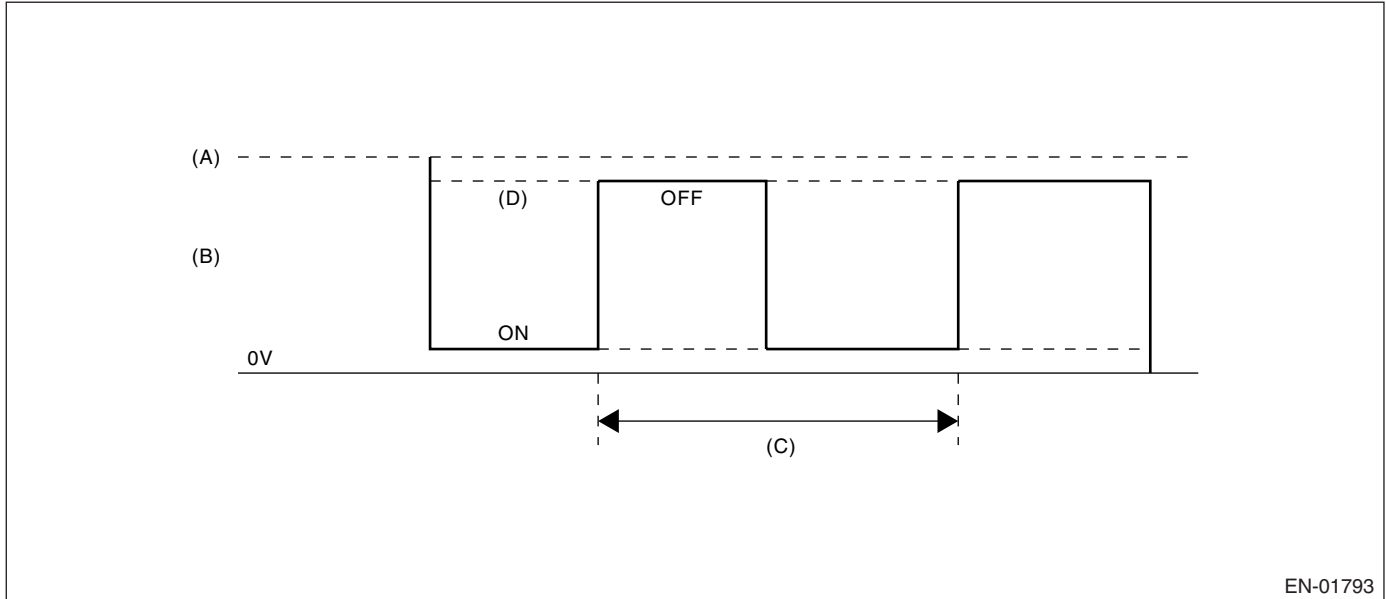
### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of front oxygen (A/F) sensor heater.

The front oxygen (A/F) sensor heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.

Judge NG when the terminal voltage remains to be High.

### 2. COMPONENT DESCRIPTION



EN-01793

- |   |                                     |
|---|-------------------------------------|
| (A) Battery voltage                                 | (C) 128 milliseconds                |
| (B) Front oxygen (A/F) sensor heater output voltage | (D) High abnormality output voltage |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions     |
|----------------------|-----------------------|
| Battery voltage      | $\geq 10.9 \text{ V}$ |

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes 1 second (8 cycles).

#### Judgment Value

| Malfunction Criteria                          | Threshold Value |
|---|-----------------|
| Output voltage level                          | High            |
| Front oxygen (A/F) sensor heater control duty | $\geq 12.5\%$   |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage level | Low             |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- Front oxygen sensor main learning correction: Not allowed to calculate.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## H: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

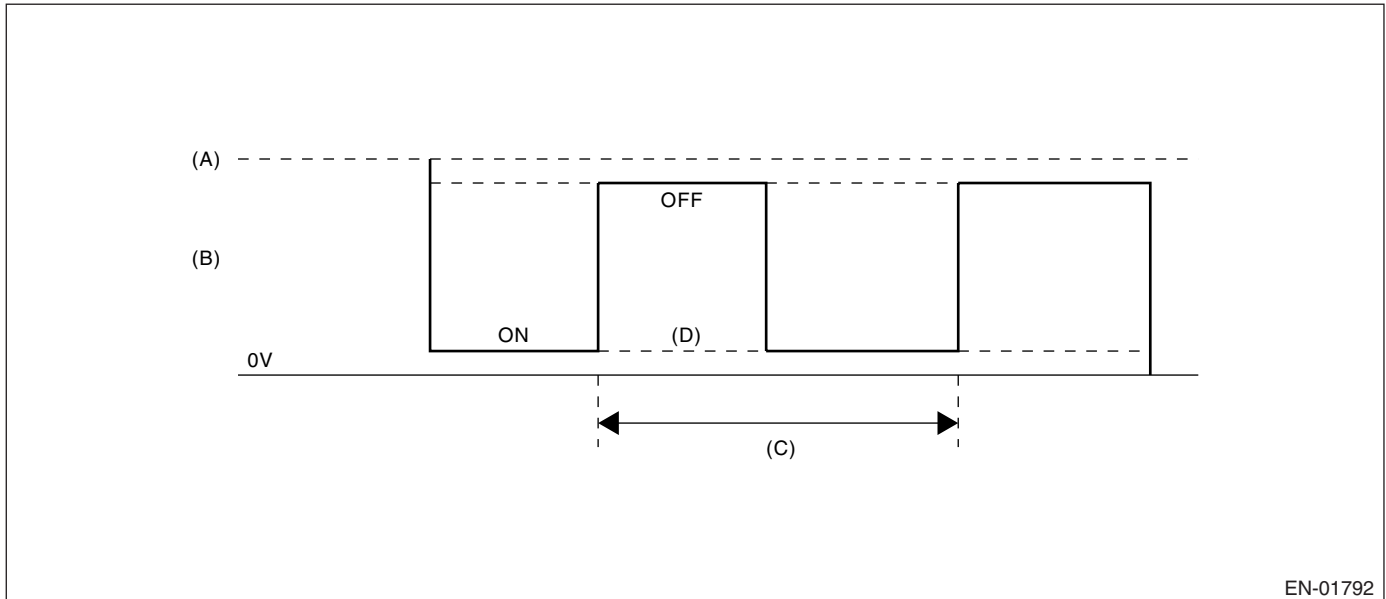
### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of rear oxygen sensor heater.

Rear oxygen sensor heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains to be Low.

### 2. COMPONENT DESCRIPTION



EN-01792

- |   |                               |
|---|-------------------------------|
| (A) Battery voltage                     | (C) 256 milliseconds (cycles) |
| (B) Oxygen sensor heater output voltage | (D) Low malfunction           |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | > 10.9 V          |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2,560 millisecond (10 cycles).

#### Judgment Value

| Malfunction Criteria                   | Threshold Value |
|--|-----------------|
| Output voltage level                   | Low             |
| Rear oxygen sensor heater control duty | < 75%           |

**Time Needed for Diagnosis:** 2.56 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage level | High            |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Sub feedback control: Not allowed

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## I: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

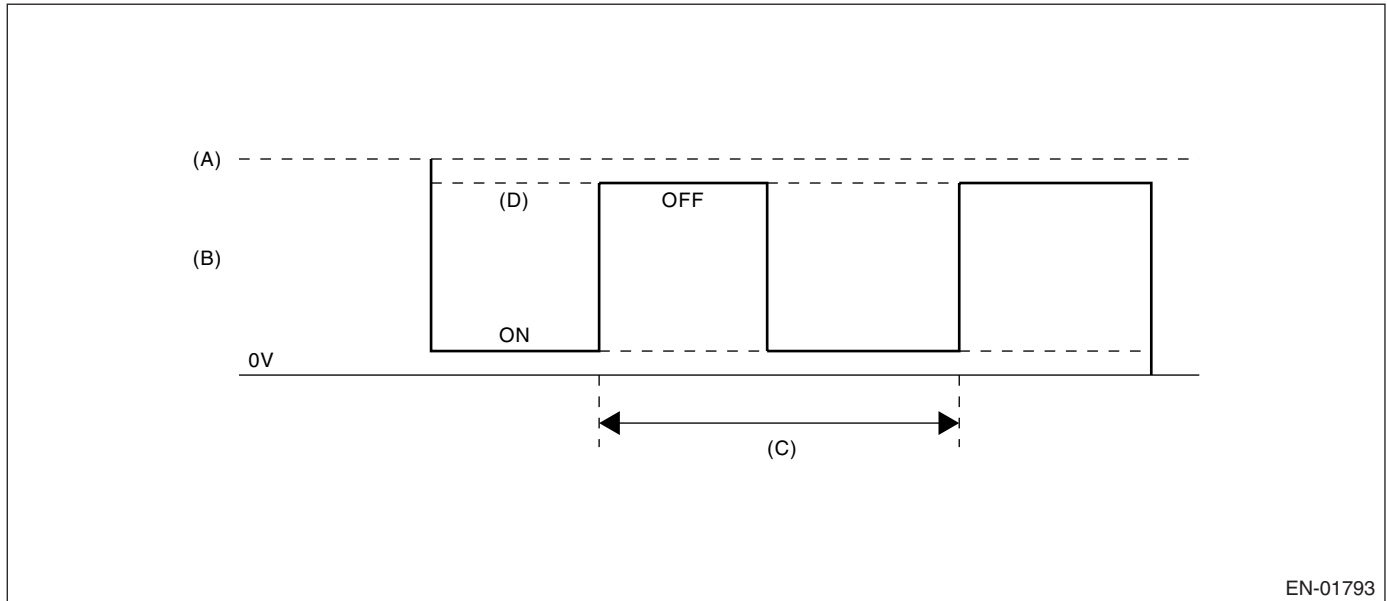
### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of rear oxygen heater.

Rear oxygen heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains to be High.

### 2. COMPONENT DESCRIPTION



EN-01793

- |   |                               |
|---|-------------------------------|
| (A) Battery voltage                     | (C) 256 milliseconds (cycles) |
| (B) Oxygen sensor heater output voltage | (D) High malfunction          |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | > 10.9 V          |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2,560 milliseconds (10 cycles).

#### Judgment Value

| Malfunction Criteria                   | Threshold Value |
|--|-----------------|
| Output voltage level                   | High            |
| Rear oxygen sensor heater control duty | ≥ 25%           |

**Time Needed for Diagnosis:** 2.56 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage level | Low             |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Sub feedback control: Not allowed

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

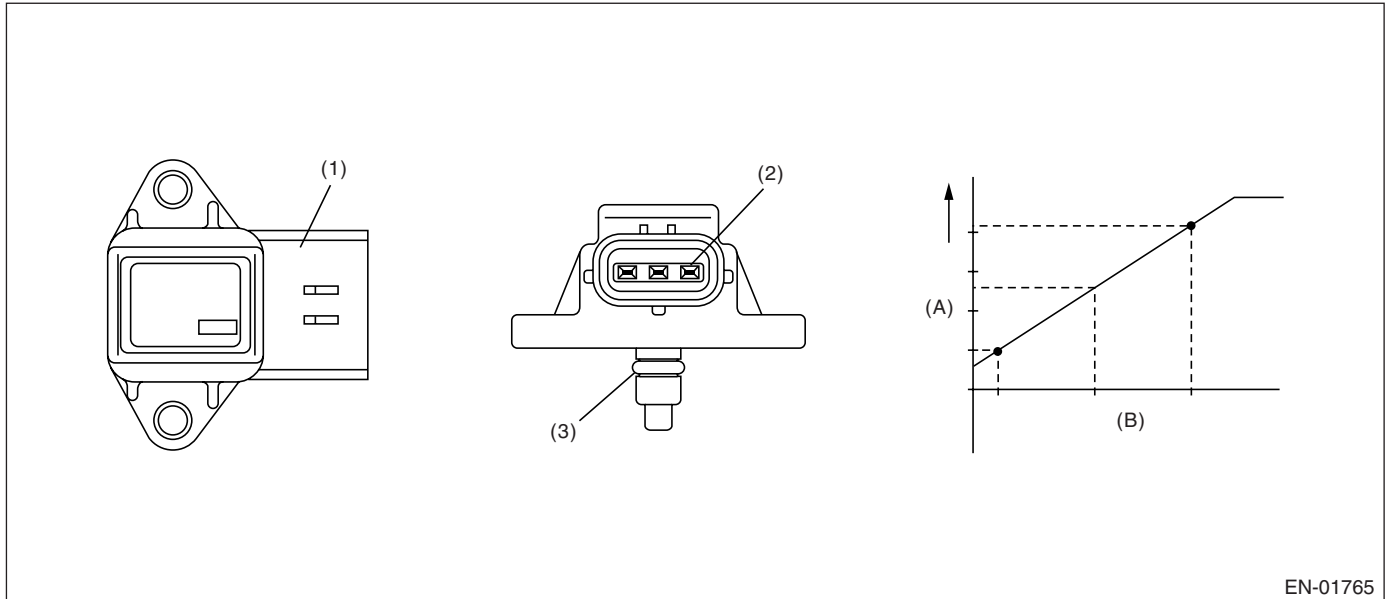
GENERAL DESCRIPTION

## J: DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake manifold pressure sensor output property. Judge NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

### 2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal
- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

### 3. ENABLE CONDITION

| Secondary Parameters       | Enable Conditions                 |
|----------------------------|-----------------------------------|
| Engine coolant temperature | $\geq 70^{\circ}\text{C}$ (158°F) |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when either Low side or High side becomes NG. Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### Judgment Value

| Malfunction Criteria                  | Threshold Value |
|---------------------------------------|-----------------|
| Low side                              |                 |
| Engine speed                          | < 2,500 rpm     |
| Throttle position                     | ≥ 10°           |
| Intake air amount per engine 0.5 rev. | > 1.356 g/rev   |
| Output voltage                        | < 1.0 V         |
| High side                             |                 |
| Engine speed                          | 600 ←→ 900 rpm  |
| Throttle position                     | < 1.3°          |
| Intake air amount per engine 0.5 rev. | > 0.4 g/rev     |
| Output voltage                        | ≥ 2.36 V        |

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear the NG when both Low side and High side become OK. Judge OK when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Low side             |                 |
| Engine speed         | < 2,500 rpm     |
| Throttle position    | ≥ 10°           |
| Output voltage       | ≥ 1.0 V         |
| High side            |                 |
| Engine speed         | 600 ←→ 900 rpm  |
| Throttle position    | < 1.3°          |
| Output voltage       | < 2.36 V        |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

### 9. ECM OPERATION AT DTC SETTING

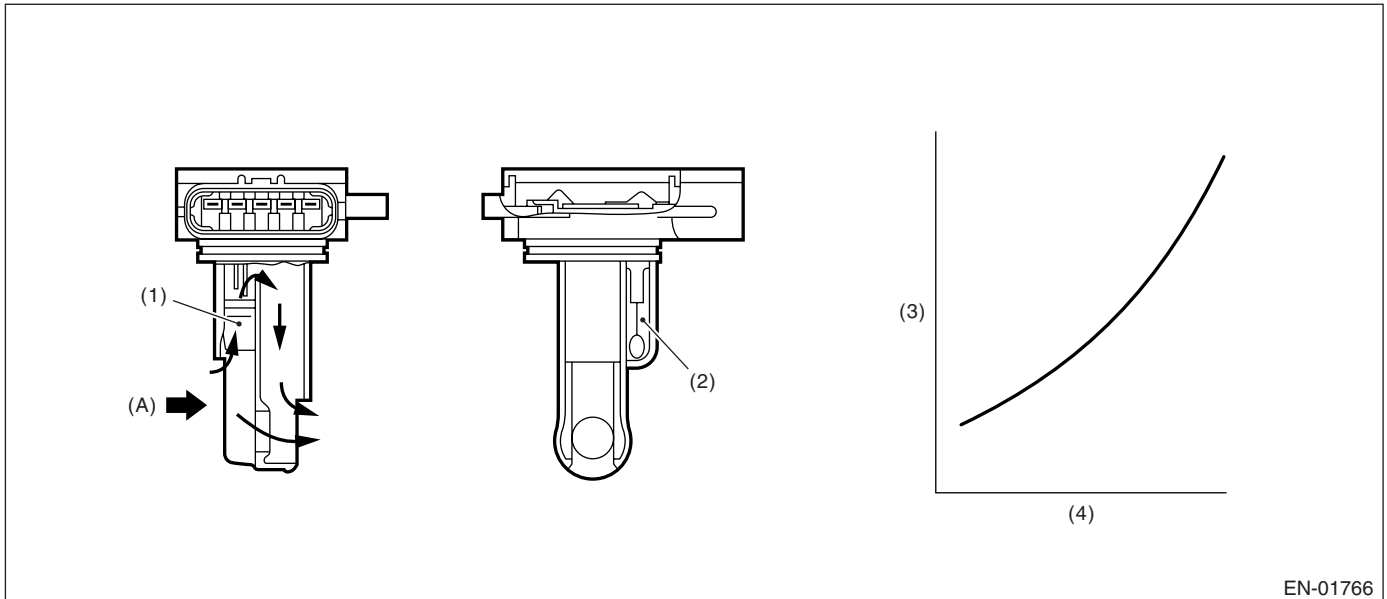
Memorize the freeze frame data. (For test mode \$02)

## K: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output property. Judge Low side NG when the air flow voltage indicates low value in spite of the driving condition that the air flow voltage might be high; otherwise, judge High side NG when the air flow voltage indicates high value in spite of the driving condition that the air flow voltage might be low. Judge air flow sensor property NG when the Low side or High side becomes NG.

### 2. COMPONENT DESCRIPTION



EN-01766

- (1) Air flow sensor
  - (2) Intake air temperature sensor
  - (3) Voltage (V)
  - (4) Intake air volume (kg/s)
- (A) Air

### 3. ENABLE CONDITION

| Secondary Parameters       | Enable Conditions                 |
|----------------------------|-----------------------------------|
| Engine coolant temperature | $\geq 70^{\circ}\text{C}$ (158°F) |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis.

#### Judgment Value

| Malfunction Criteria  | Threshold Value  |
|---|--|
| Low side NG<br>Output voltage<br>Engine speed<br>Throttle angle<br>Intake manifold pressure                                 | < 1.5 V<br>≥ 2,500 rpm<br>≥ 15°<br>≥ 53.3 kPa (400 mmHg, 15.7 inHg)                              |
| High side NG 1<br>Output voltage<br>Engine speed<br>Throttle angle<br>Intake manifold pressure                              | ≥ 1.95 V<br>600 ←→ 900 rpm<br>< 4.1°<br>< 52.7 kPa (395 mmHg, 15.6 inHg)                         |
| High side NG 2<br>Output voltage<br>Engine speed<br>Throttle angle<br>Intake manifold pressure<br>Diagnosis for fuel system | ≥ 1.7 V<br>600 ←→ 900 rpm<br>< 4.1°<br>< 52.7 kPa (395 mmHg, 15.6 inHg)<br>Rich side malfunction |

#### Time Needed for Diagnosis:

|           |            |
|-----------|------------|
| Low side  | 3 seconds  |
| High side | 10 seconds |

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK the when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value  |
|--|--|
| Low side NG<br>Output voltage<br>Engine speed<br>Throttle angle<br>Intake manifold pressure  | ≥ 1.5 V<br>≥ 2,500 rpm<br>≥ 15°<br>≥ 53.3 kPa (400 mmHg, 15.7 inHg)      |
| High side NG<br>Output voltage<br>Engine speed<br>Throttle angle<br>Intake manifold pressure | < 1.95 V<br>600 ←→ 900 rpm<br>< 4.1°<br>< 52.7 kPa (395 mmHg, 15.6 inHg) |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  - At normal: knock compensation = 0°CA is fixed.
  - At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
  - Not allowed to update the whole learning compensation factor.
  - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

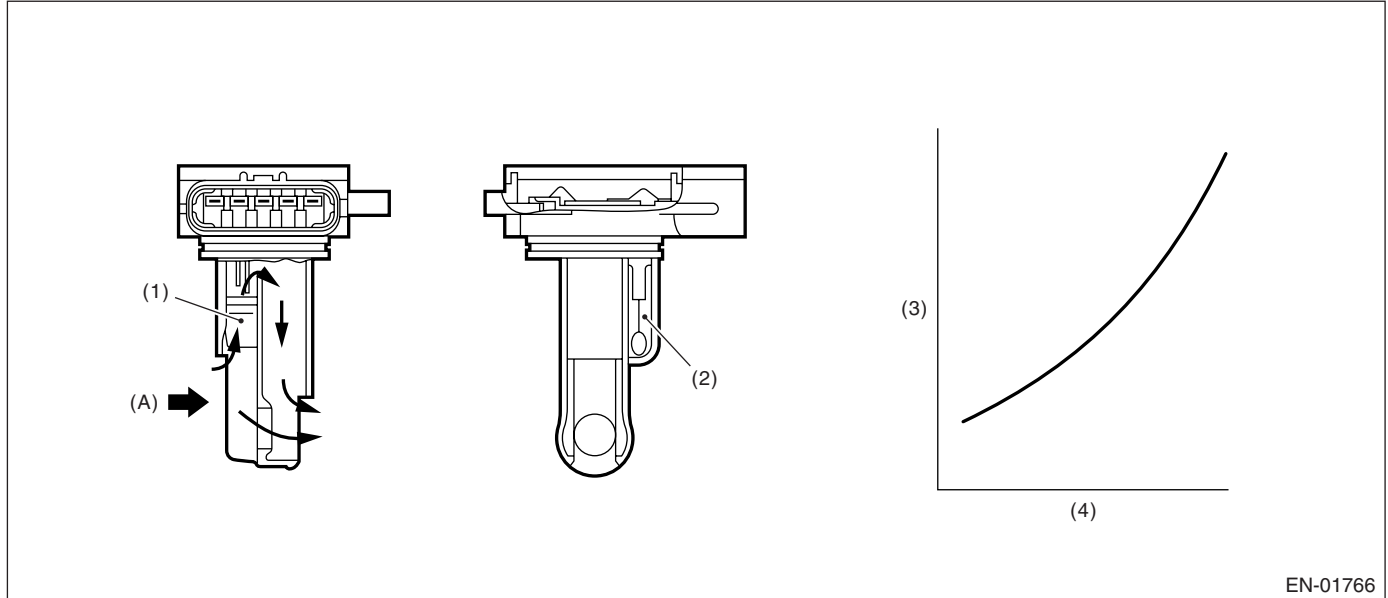
## GENERAL DESCRIPTION

### L: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Air flow sensor
  - (2) Intake air temperature sensor
  - (3) Voltage (V)
  - (4) Intake air volume (kg/s)
- (A) Air

EN-01766

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\leq 0.2$ V    |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  - At normal: knock compensation = 0°CA is fixed.
  - At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
  - Not allowed to update the whole learning compensation factor.
  - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

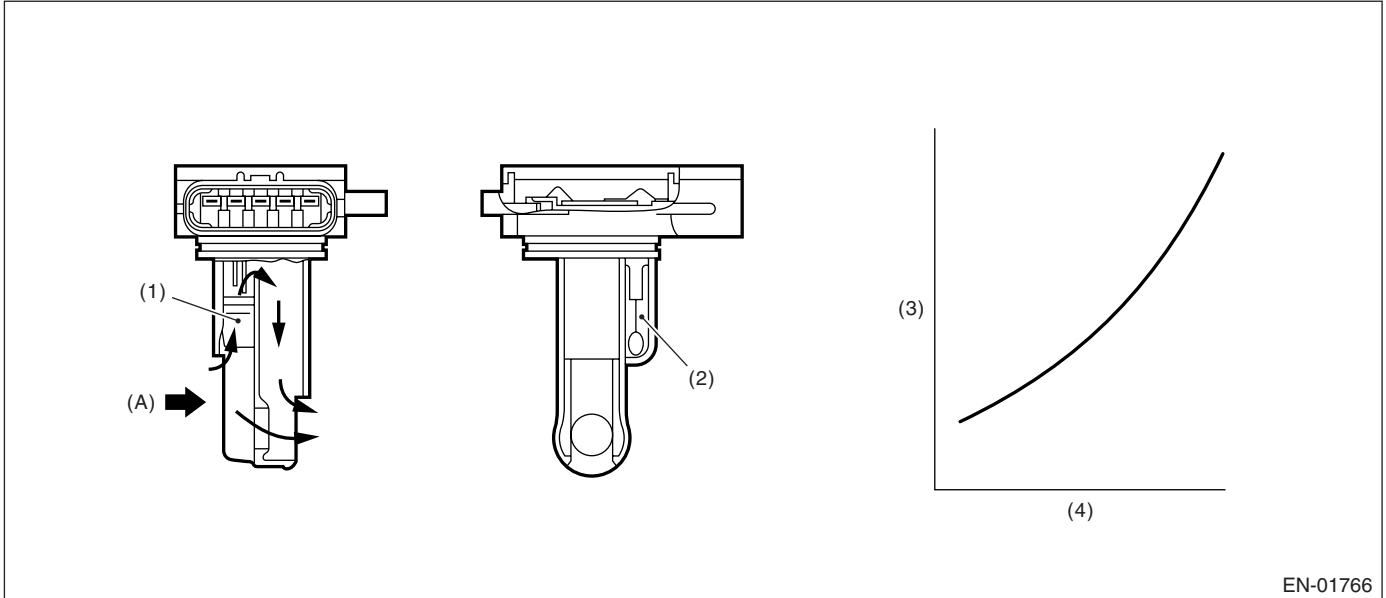
## GENERAL DESCRIPTION

### M: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Air flow sensor
- (2) Intake air temperature sensor
- (3) Voltage (V)
- (4) Intake air volume (kg/s)
- (A) Air

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.985$ V  |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  - At normal: knock compensation = 0°CA is fixed.
  - At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
  - Not allowed to update the whole learning compensation factor.
  - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g (0.04 oz)/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

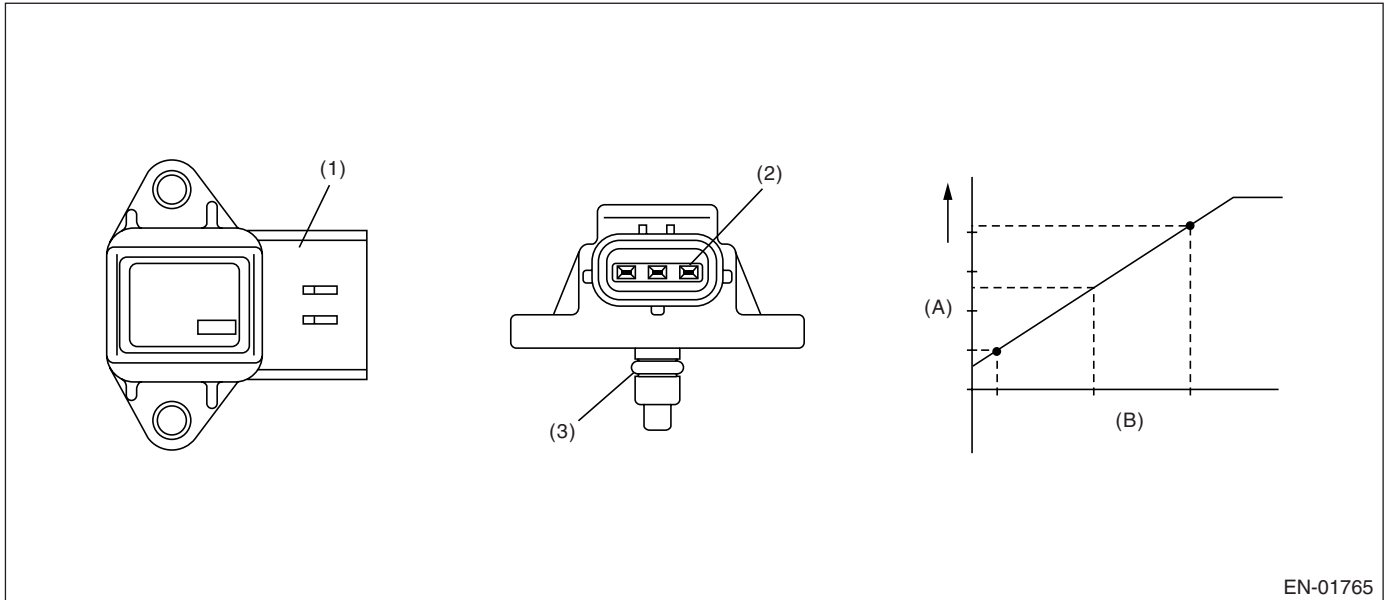
## GENERAL DESCRIPTION

### N: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal
- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

EN-01765

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions     |
|----------------------|-----------------------|
| Battery voltage      | $\geq 10.9 \text{ V}$ |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value     |
|----------------------|---------------------|
| Output voltage       | $< 0.568 \text{ V}$ |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

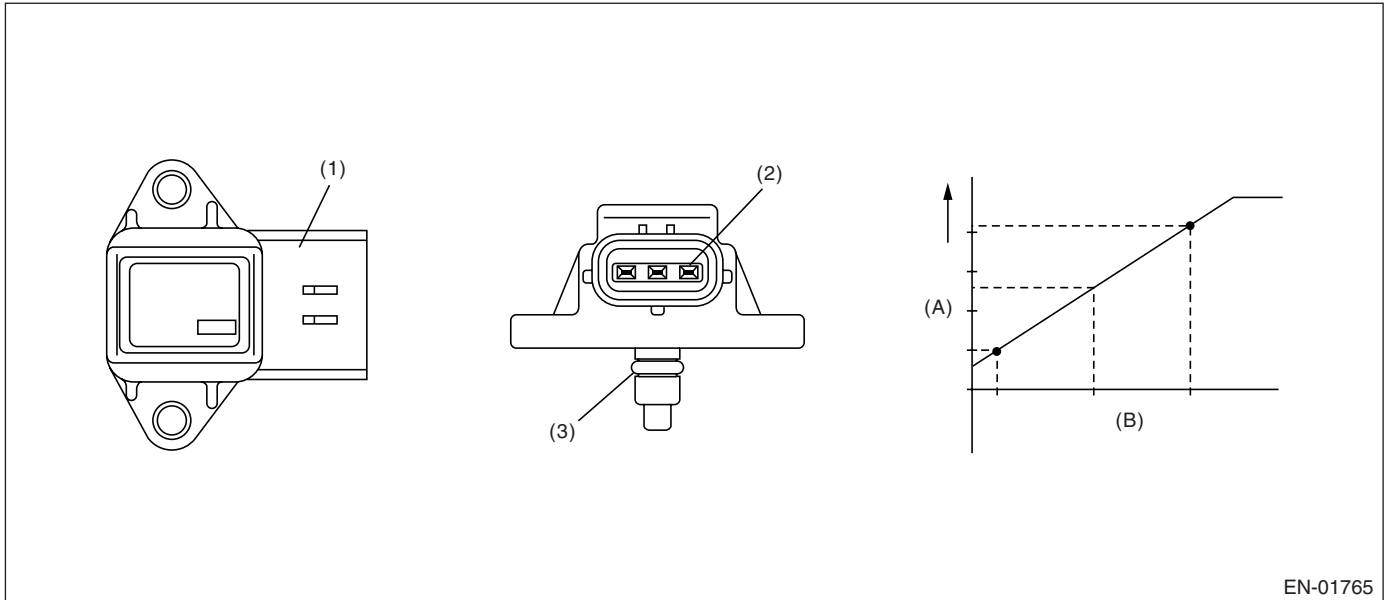
## GENERAL DESCRIPTION

### O: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal
- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

EN-01765

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions     |
|----------------------|-----------------------|
| Battery voltage      | $\geq 10.9 \text{ V}$ |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value       |
|----------------------|-----------------------|
| Output voltage       | $\geq 4.93 \text{ V}$ |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

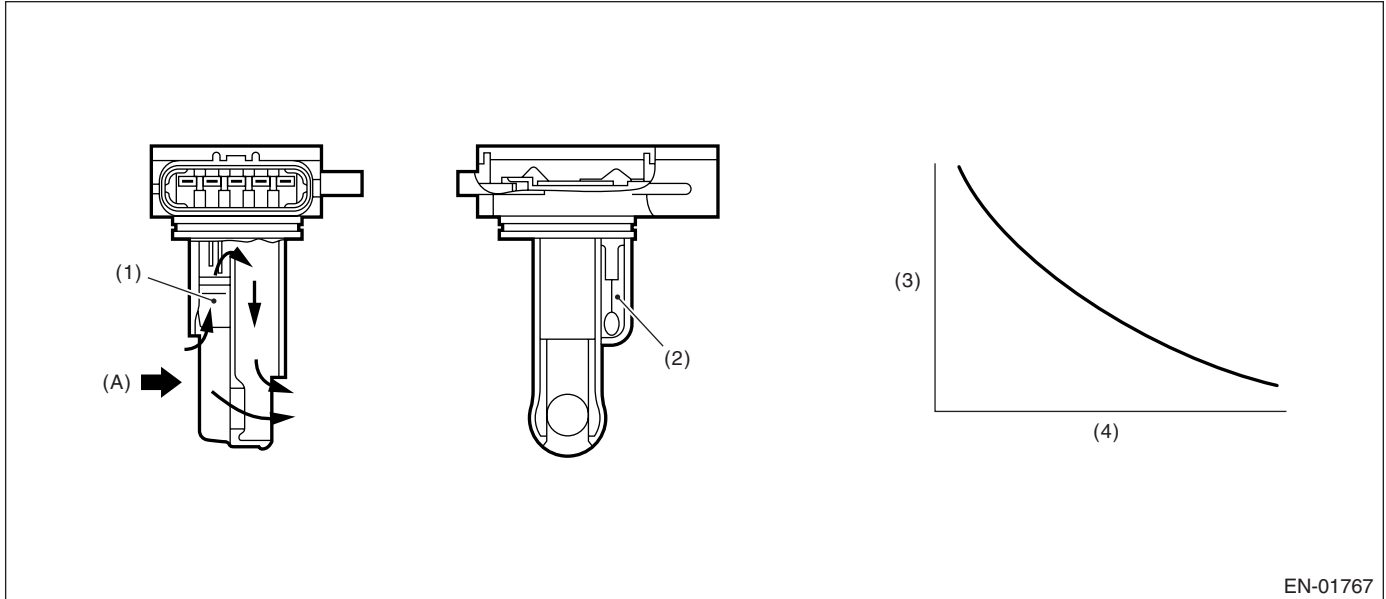
## GENERAL DESCRIPTION

### P: DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property. Judge NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

#### 2. COMPONENT DESCRIPTION



- (1) Air flow sensor
  - (2) Intake air temperature sensor
  - (3) Resistance value ( $\Omega$ )
  - (4) Intake air temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )
- (A) Air

#### 3. ENABLE CONDITION

| Secondary Parameters   | Enable Conditions   |
|--|---------------------|
| Coolant temp. before engine start                                    | < 30°C (86°F)       |
| Engine coolant temperature   | > 95°C (203°F)      |
| Battery voltage  | $\geq$ 10.9 V       |
| Continuous time when the vehicle speed is less than 50 km/h (31 MPH) | 600 seconds or more |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after idling from starting the cooled engine.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

##### Judgment Value

| Malfunction Criteria                            | Threshold Value   |
|---|---|
| Output voltage difference between Max. and Min. | < 20 mV (It is equal to approx. 0.5°C (0.9°F) around 25° (77°F).) |

**Time Needed for Diagnosis:** 1 second

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

## Judgment Value

| Malfunction Criteria                            | Threshold Value |
|---|-----------------|
| Output voltage difference between Max. and Min. | $\geq 20$ mV    |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

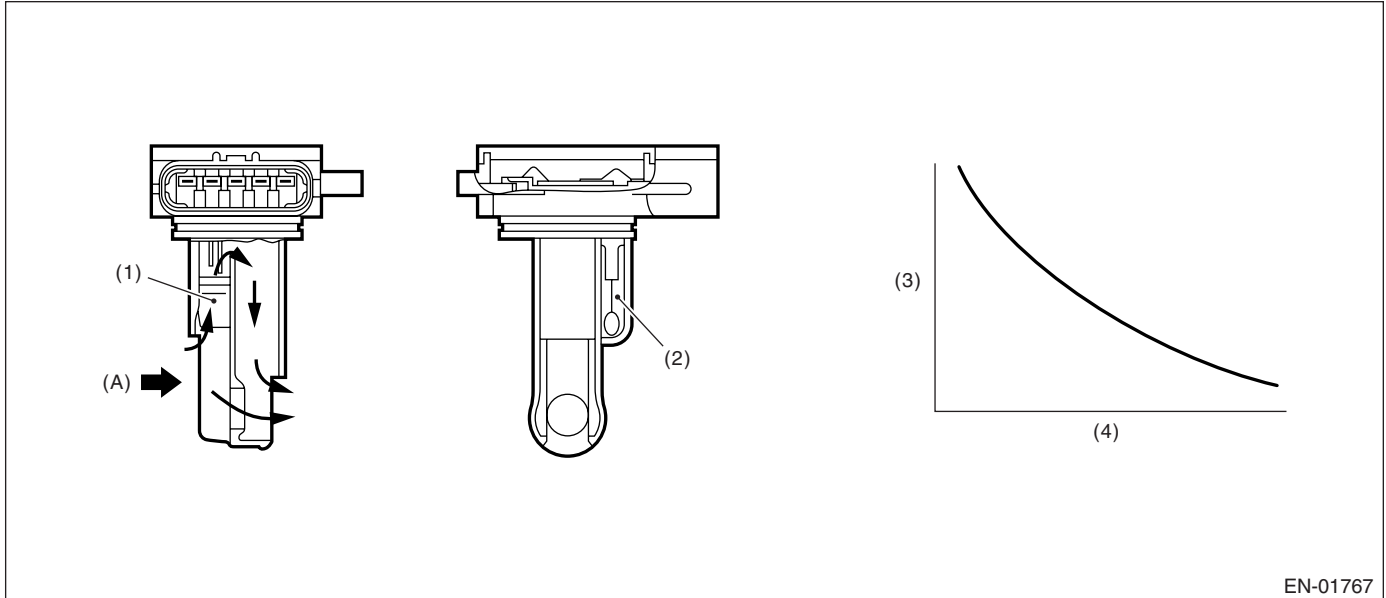
## GENERAL DESCRIPTION

### Q: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01767

- (1) Air flow sensor
  - (2) Intake air temperature sensor
  - (3) Resistance value ( $\Omega$ )
  - (4) Intake air temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )
- (A) Air

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.165 V       |
| Ignition switch      | ON              |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 0.165$ V  |
| Ignition switch      | ON              |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

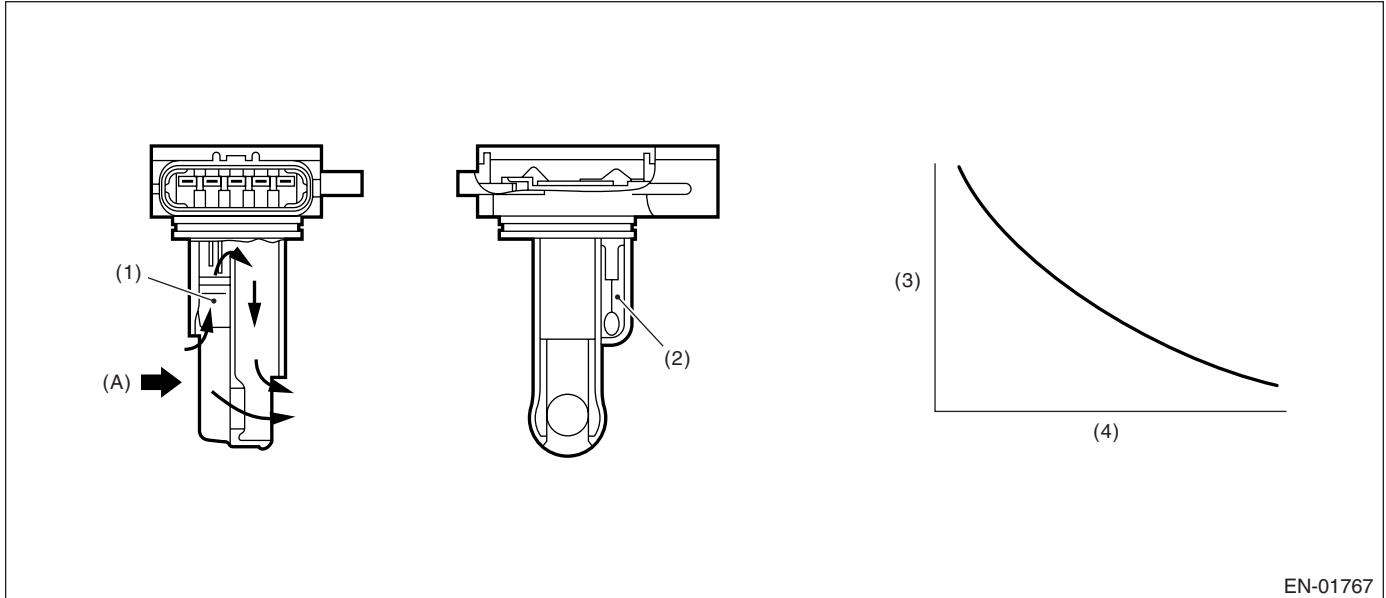
## GENERAL DESCRIPTION

### R: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01767

- (1) Air flow sensor
  - (2) Intake air temperature sensor
  - (3) Resistance value ( $\Omega$ )
  - (4) Intake air temperature °C (°F)
- (A) Air

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.72$ V   |
| Ignition switch      | ON              |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 0.23$ V   |
| Ignition switch      | ON              |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

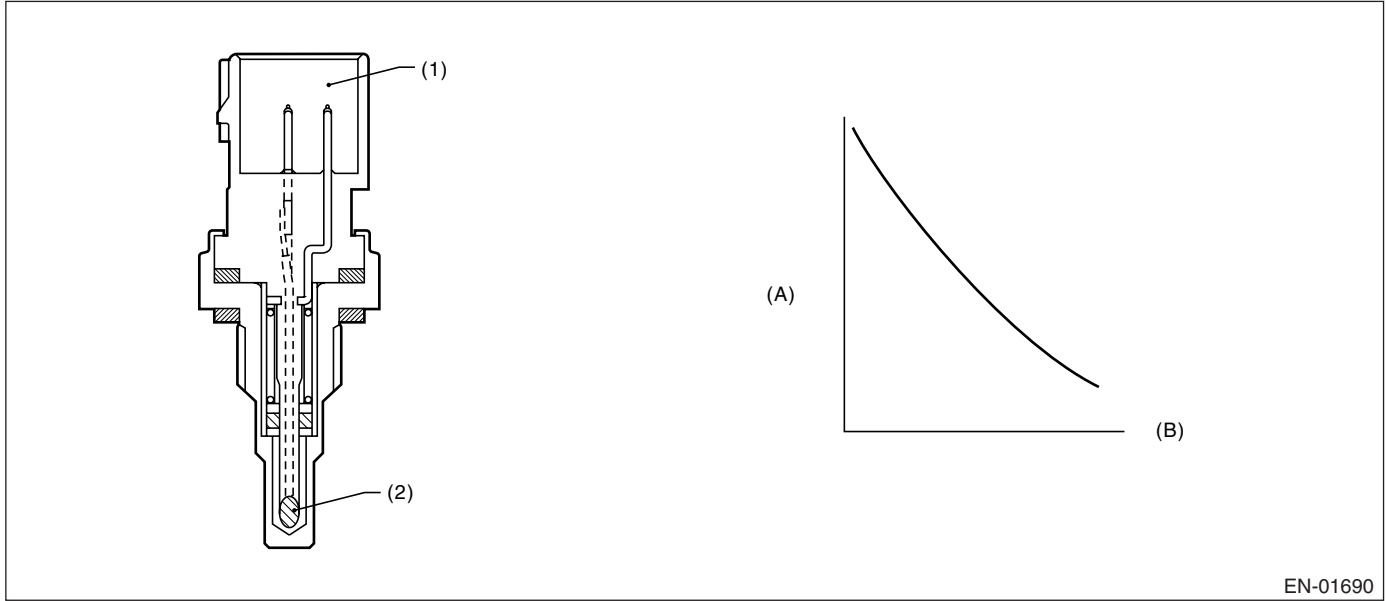
## GENERAL DESCRIPTION

### S: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Thermistor element

- (A) Resistance value (kΩ)
- (B) Temperature °C (°F)

EN-01690

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.165 V       |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high engine coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except engine coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

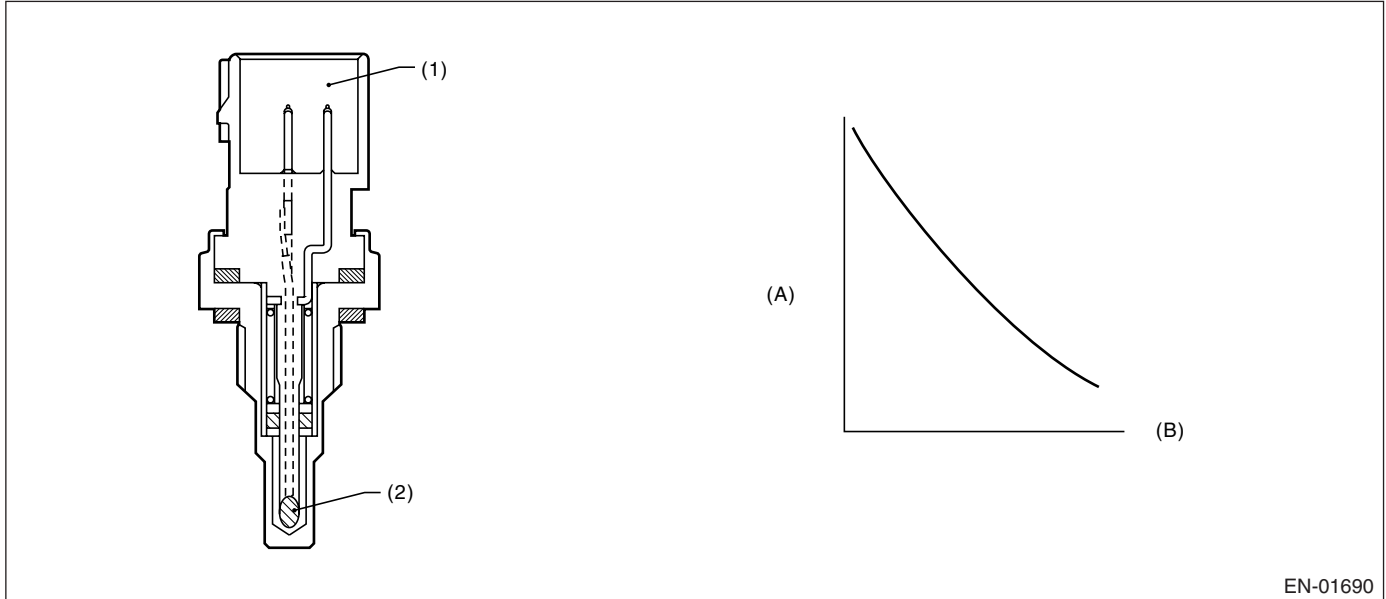
## GENERAL DESCRIPTION

### T: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Thermistor element

- (A) Resistance value (kΩ)
- (B) Temperature °C (°F)

EN-01690

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | ≥ 4.72 V        |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high engine coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except engine coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

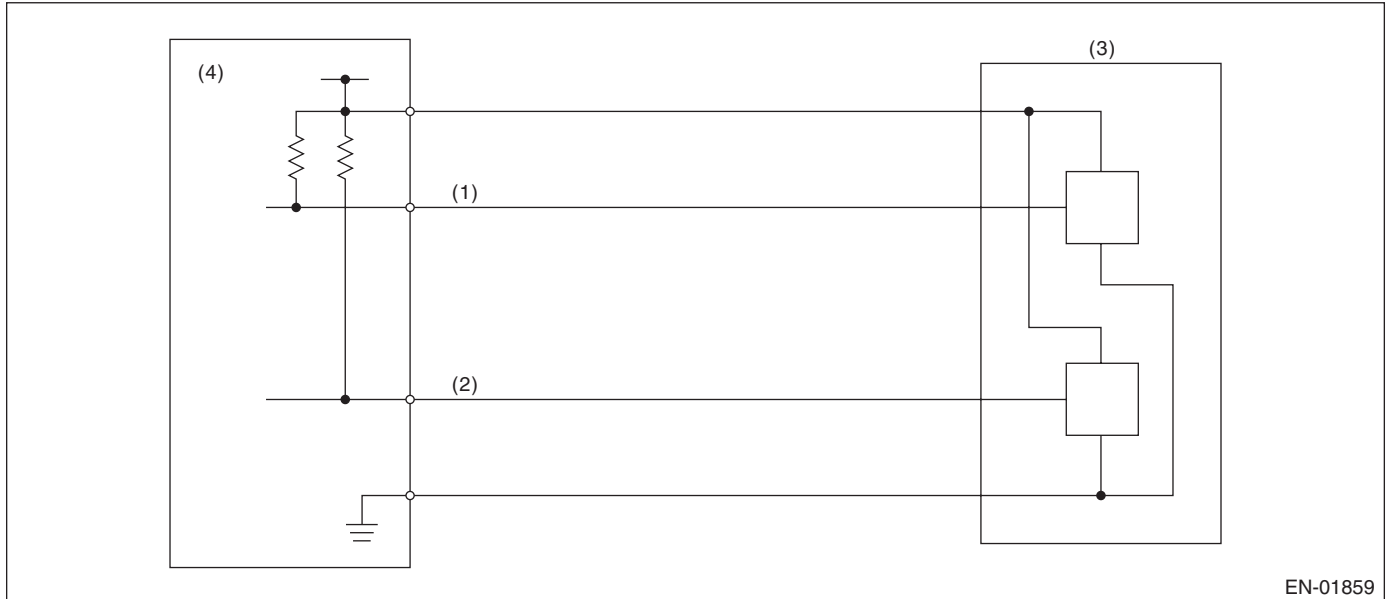
## GENERAL DESCRIPTION

### U: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01859

- |                                       |                                 |
|---------------------------------------|---------------------------------|
| (1) Throttle position sensor 1 signal | (3) Throttle position sensor    |
| (2) Throttle position sensor 2 signal | (4) Engine control module (ECM) |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\leq 0.224$ V  |

**Time Needed for Diagnosis:** 24 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

## 9. ECM OPERATION AT DTC SETTING

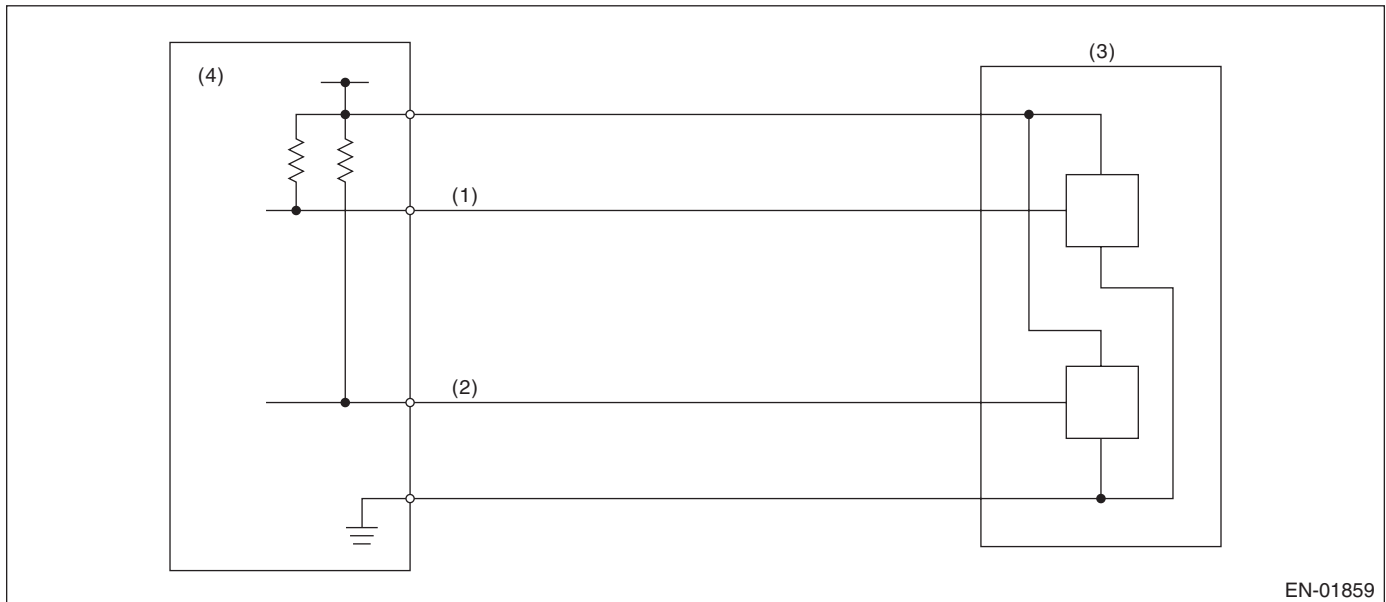
Memorize the freeze frame data. (For test mode \$02)

## V: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01859

- (1) Throttle position sensor 1 signal      (3) Throttle position sensor  
(2) Throttle position sensor 2 signal      (4) Engine control module (ECM)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\leq 4.851$ V  |

**Time Needed for Diagnosis:**24 milliseconds

**Malfunction Indicator Light Illumination:**Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

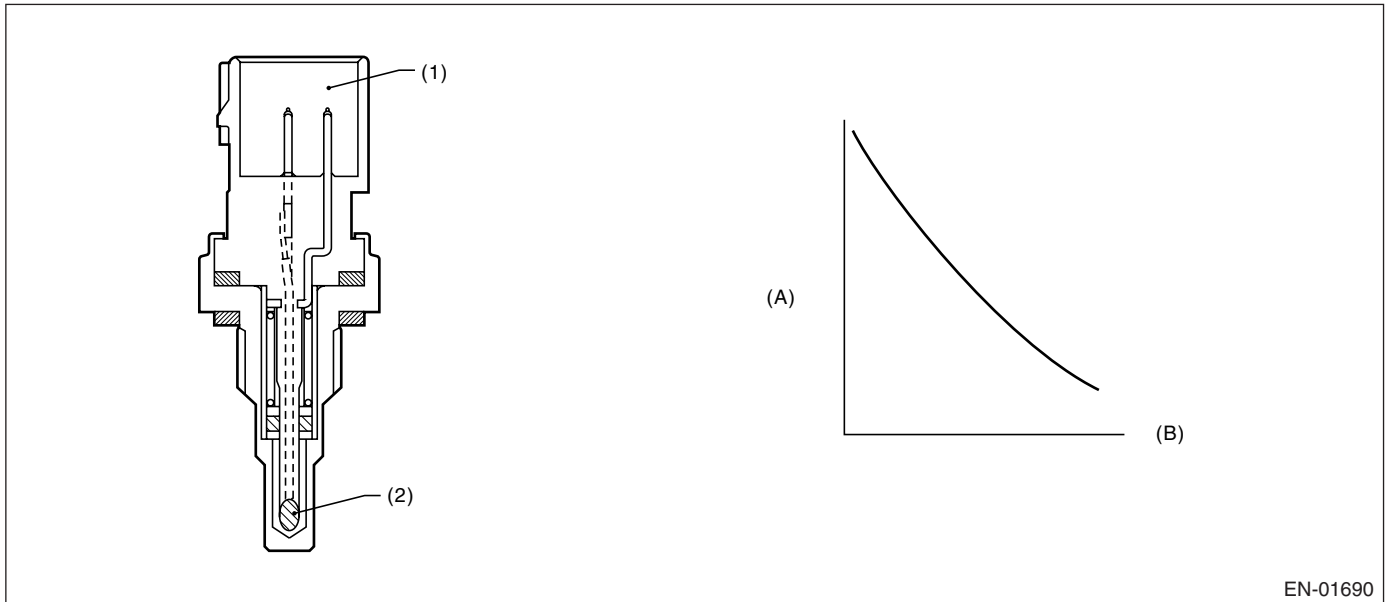
Memorize the freeze frame data. (For test mode \$02)

## W: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property. Judge NG when the engine coolant temperature does not rise whereas it seemed to rise from the viewpoint of the engine condition.

### 2. COMPONENT DESCRIPTION



EN-01690

- (1) Connector
- (2) Thermistor element

- (A) Resistance value (kΩ)
- (B) Temperature °C (°F)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Engine speed         | ≥ 500 rpm         |
| Battery voltage      | > 10.9 V          |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine starting.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                      | Threshold Value                              |
|---|--|
| Engine coolant temperature                | < 20°C (68°F)                                |
| Timer for diagnosis after engine starting | ≥ Timer judgment value after engine starting |

Timer for diagnosis after engine starting

- a) Timer stop at fuel cut mode.
- b) During the driving conditions (except a) above), timer count up by 64 milliseconds + TWCNT milliseconds at every 64 milliseconds.

Where, TWCNT is determined as follows,

TWCNT = 0 at idle switch ON,

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

TWCNT show on the following table at idle switch OFF.

| Temperature<br>°C (°F) | Vehicle speed km/h (MPH) |          |           |           |           |           |           |           |
|------------------------|--------------------------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                        | 0 (0)                    | 8 (4.97) | 16 (9.94) | 24 (14.9) | 32 (19.9) | 40 (24.9) | 48 (29.8) | 56 (34.8) |
| -20 (-4)               | 0 ms                     | 37.14 ms | 74.27 ms  | 111.41 ms | 126.66 ms | 141.91 ms | 163.59 ms | 185.26 ms |
| -10 (14)               | 0 ms                     | 27.39 ms | 54.78 ms  | 82.17 ms  | 99.65 ms  | 117.13 ms | 135.96 ms | 154.80 ms |
| 0 (32)                 | 0 ms                     | 17.65 ms | 35.29 ms  | 52.94 ms  | 72.64 ms  | 92.34 ms  | 108.34 ms | 124.33 ms |
| 10 (50)                | 0 ms                     | 7.90 ms  | 15.80 ms  | 23.70 ms  | 45.63 ms  | 67.56 ms  | 80.71 ms  | 93.87 ms  |
| 20 (68)                | 0 ms                     | 7.90 ms  | 15.80 ms  | 23.70 ms  | 45.63 ms  | 67.56 ms  | 80.71 ms  | 93.87 ms  |

Judgment value of timer after engine starting

$$t = 451.1 - 25.9 \times T_i$$

$T_i$  is the lowest engine coolant temperature after starting the engine.

**Time Needed for Diagnosis:** To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria       | Threshold Value                |
|----------------------------|--------------------------------|
| Engine coolant temperature | $\geq 20^\circ\text{C}$ (68°F) |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high engine coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except engine coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

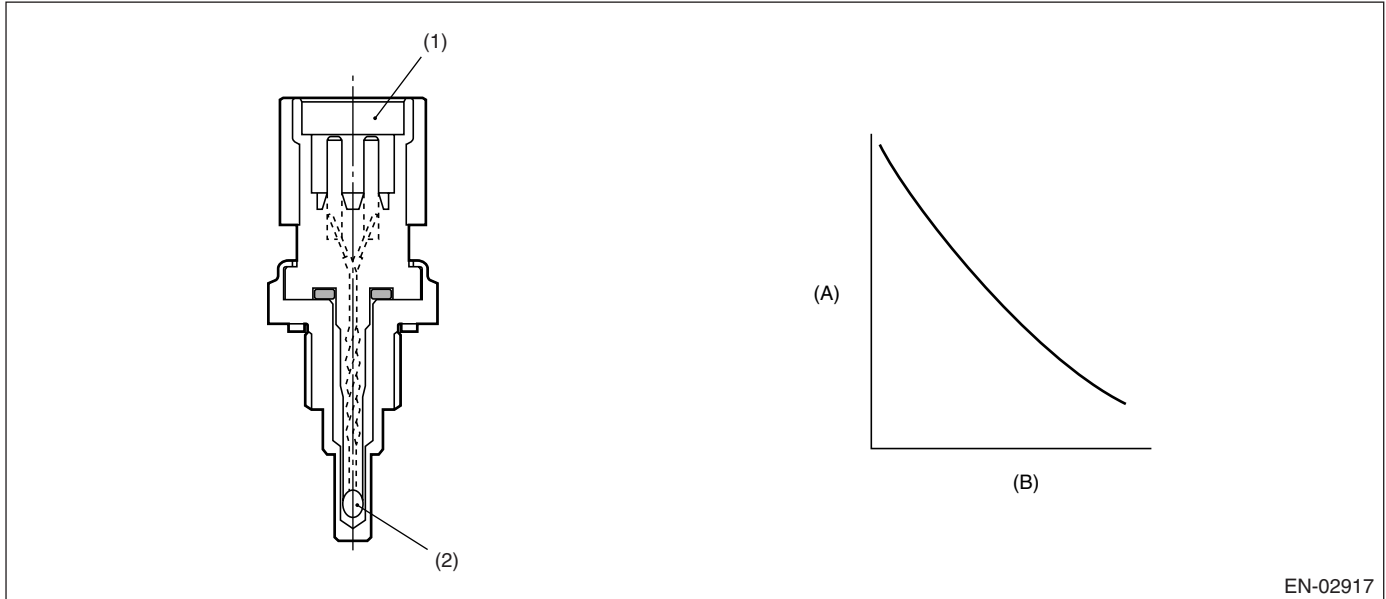
## X: DTC P0126 INSUFFICIENT COOLANT TEMPERATURE FOR STABLE OPERATION

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the engine coolant temperature sensor output does not change.

Judge NG when the engine coolant temperature sensor output does not change though the vehicle is operated in a manner which is expected to affect the engine coolant temperature.

### 2. COMPONENT DESCRIPTION



EN-02917

- (1) Connector
- (2) Thermistor element

- (A) Resistance value (k $\Omega$ )
- (B) Temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions  |
|---|--|
| Battery voltage   | $\geq 10.9 \text{ V}$  |
| Filling fuel from stopping engine at the previous time to starting it this time | No   |
| Fuel level  | $\geq 15 \text{ l}$ (3.96 US gal, 3.3 Imp gal)   |
| Engine coolant temperature when stopping engine at the previous time            | $\geq 70^{\circ}\text{C}$ ( $158^{\circ}\text{F}$ ) and $< 95^{\circ}\text{C}$ ( $203^{\circ}\text{F}$ ) |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria   | Threshold Value  |
|--|------------------|
| Engine coolant temperature when stopping engine at the previous time – The lowest engine coolant temperature after starting engine | < 2.5°C (36.5°F) |
| Fuel temperature when stopping engine at the previous time – Fuel temperature  | ≥ 5°C (41°F)     |
| Intake air temperature – Fuel temperature  | < 2.5°C (36.5°F) |
| Fuel temperature   | < 35°C (95°F)    |

#### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value  |
|--|------------------|
| Engine coolant temperature when stopping engine at the previous time – The lowest engine coolant temperature after starting engine | ≥ 2.5°C (36.5°F) |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illuminations:** Detect when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

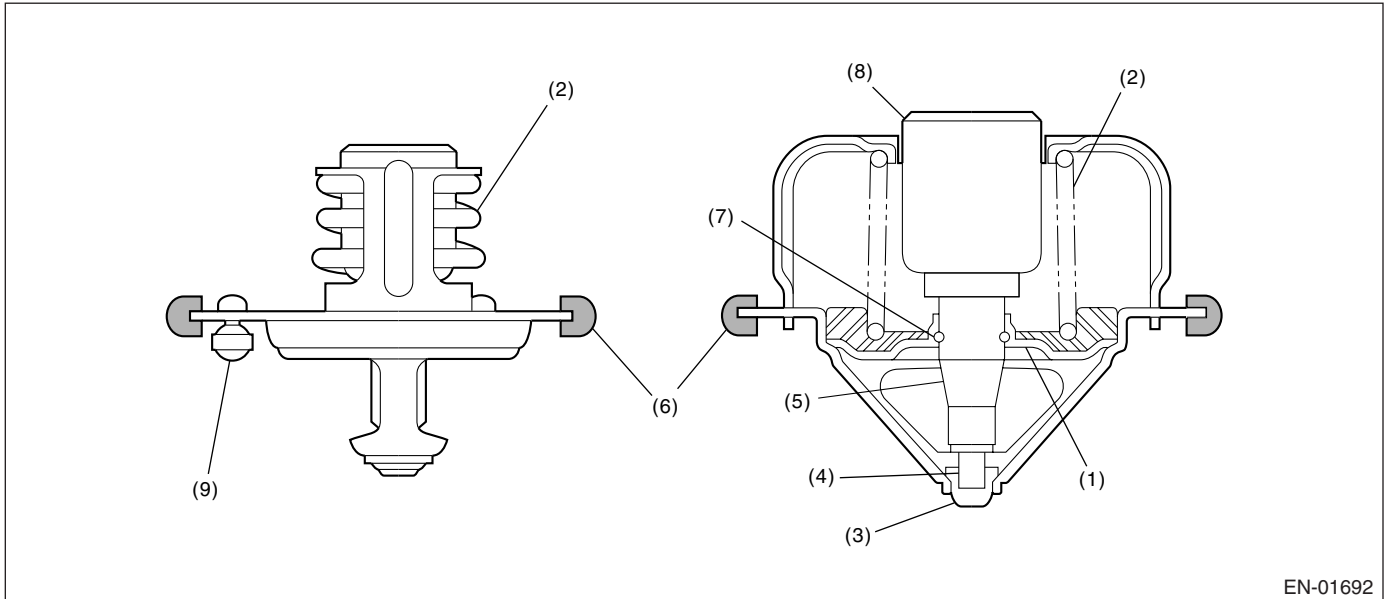
GENERAL DESCRIPTION

## Y: DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of thermostat function. Judge NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge OK when the engine coolant temperature becomes 75°C (167°F) and the difference is small before judging NG.

### 2. COMPONENT DESCRIPTION



- |             |                    |
|-------------|--------------------|
| (1) Valve   | (6) Rubber packing |
| (2) Spring  | (7) Stop ring      |
| (3) Stopper | (8) Wax element    |
| (4) Piston  | (9) Jiggle valve   |
| (5) Guide   |                    |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 30 seconds.

#### Judgment Value

| Malfunction Criteria                              | Threshold Value                   |
|---|-----------------------------------|
| Battery voltage                                   | $\geq 10.9$ V                     |
| Estimated ambient air temperature                 | $\geq -7^{\circ}\text{C}$ (19°F)  |
| Engine coolant temperature at engine starting     | $< 55^{\circ}\text{C}$ (131°F)    |
| Estimated engine coolant temperature              | $\geq 70^{\circ}\text{C}$ (158°F) |
| Engine coolant temperature                        | $< 70^{\circ}\text{C}$ (158°F)    |
| (Estimated – measured) engine coolant temperature | $> 30^{\circ}\text{C}$ (86°F)     |
| Vehicle speed                                     | $\geq 30$ km/h                    |

**Time Needed for Diagnosis:** 30 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                              | Threshold Value                   |
|---|-----------------------------------|
| Battery voltage                                   | $\geq 10.9$ V                     |
| Estimated ambient air temperature                 | $\geq -7^{\circ}\text{C}$ (19°F)  |
| Thermostat malfunction diagnosis                  | Not finished                      |
| Engine coolant temperature at engine starting     | $< 55^{\circ}\text{C}$ (131°F)    |
| Engine coolant temperature                        | $\geq 70^{\circ}\text{C}$ (158°F) |
| (Estimated – measured) engine coolant temperature | $\leq 30^{\circ}\text{C}$ (68°F)  |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

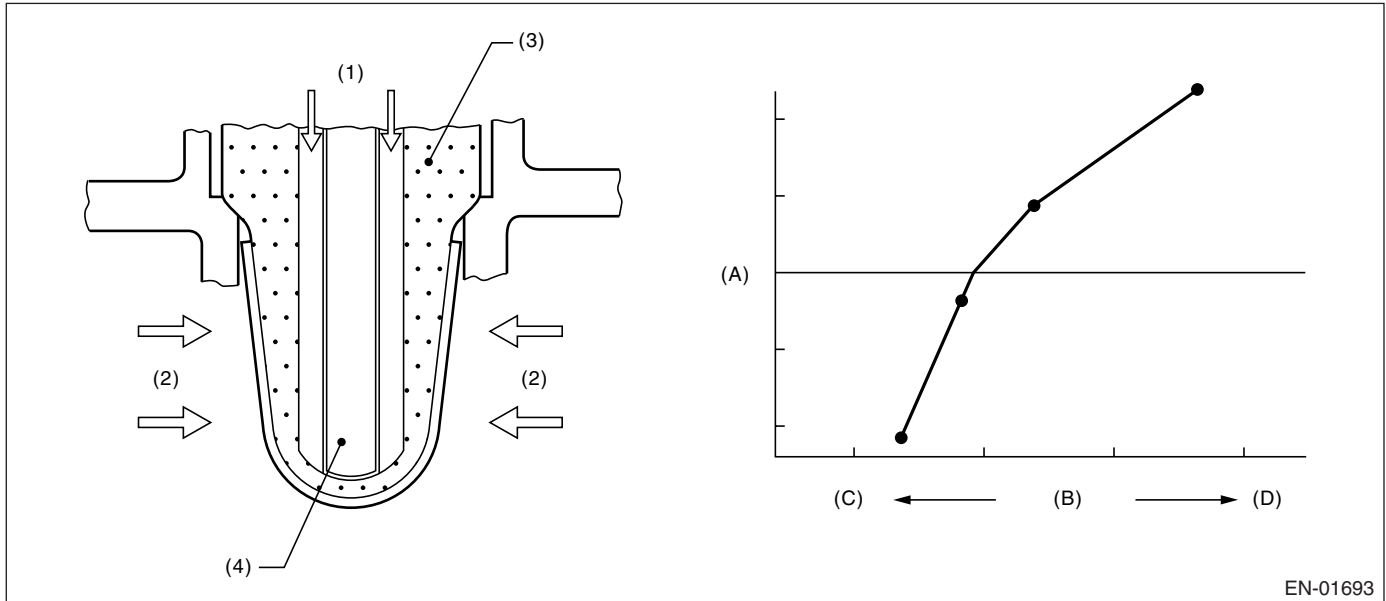
## Z: DTC P0131 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge NG when the element impressed voltage is out of range, or the element current is out of range.

### 2. COMPONENT DESCRIPTION



EN-01693

- |                      |                         |
|----------------------|-------------------------|
| (1) Atmosphere       | (A) Electromotive force |
| (2) Exhaust          | (B) Air fuel ratio      |
| (3) ZrO <sub>2</sub> | (C) Lean                |
| (4) Ceramic heater   | (D) Rich                |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Voltage              | ≥ 10.9 V          |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Input voltage        | < 1.8 V         |
| Input current        | < -0.01 A       |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

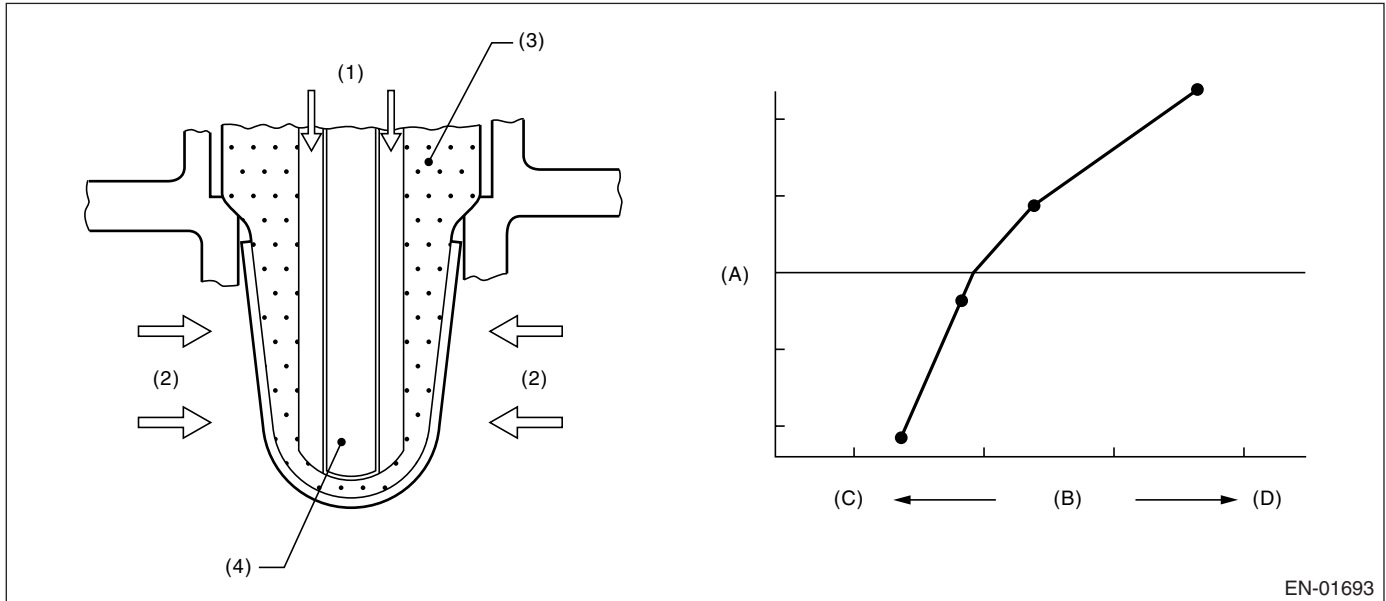
## AA:DTC P0132 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge NG when the element impressed voltage is out of range, or the element current is out of range.

### 2. COMPONENT DESCRIPTION



EN-01693

- |                      |                         |
|----------------------|-------------------------|
| (1) Atmosphere       | (A) Electromotive force |
| (2) Exhaust          | (B) Air fuel ratio      |
| (3) ZrO <sub>2</sub> | (C) Lean                |
| (4) Ceramic heater   | (D) Rich                |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Voltage              | ≥ 10.9 V          |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Input voltage        | ≥ 3.8 V         |
| Input current        | ≥ 0.01 A        |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

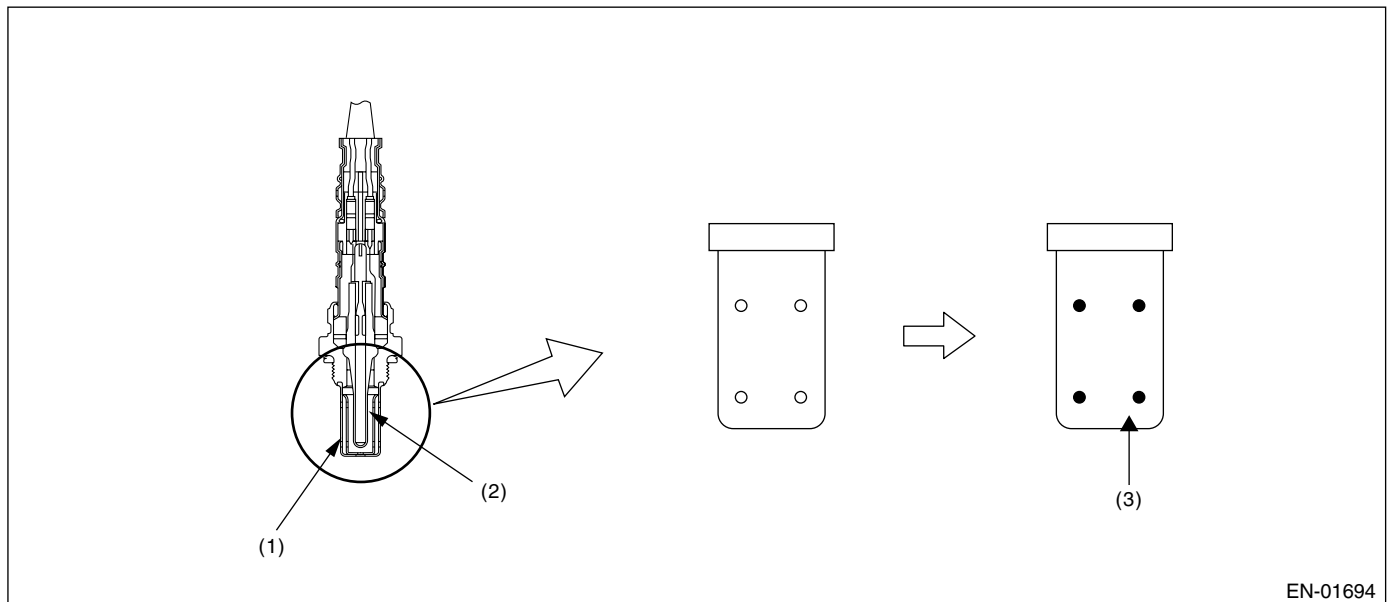
### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## AB:DTC P0133 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

### 1. OUTLINE OF DIAGNOSIS

Detect time-lag of front oxygen (A/F) sensor response. Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed. When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the cover has clogged holes, the rich to lean judgment in ECM is delayed when the change from rich to lean is caused. Judge NG when the actual A/F variation is slow comparing with the ECM control amount.

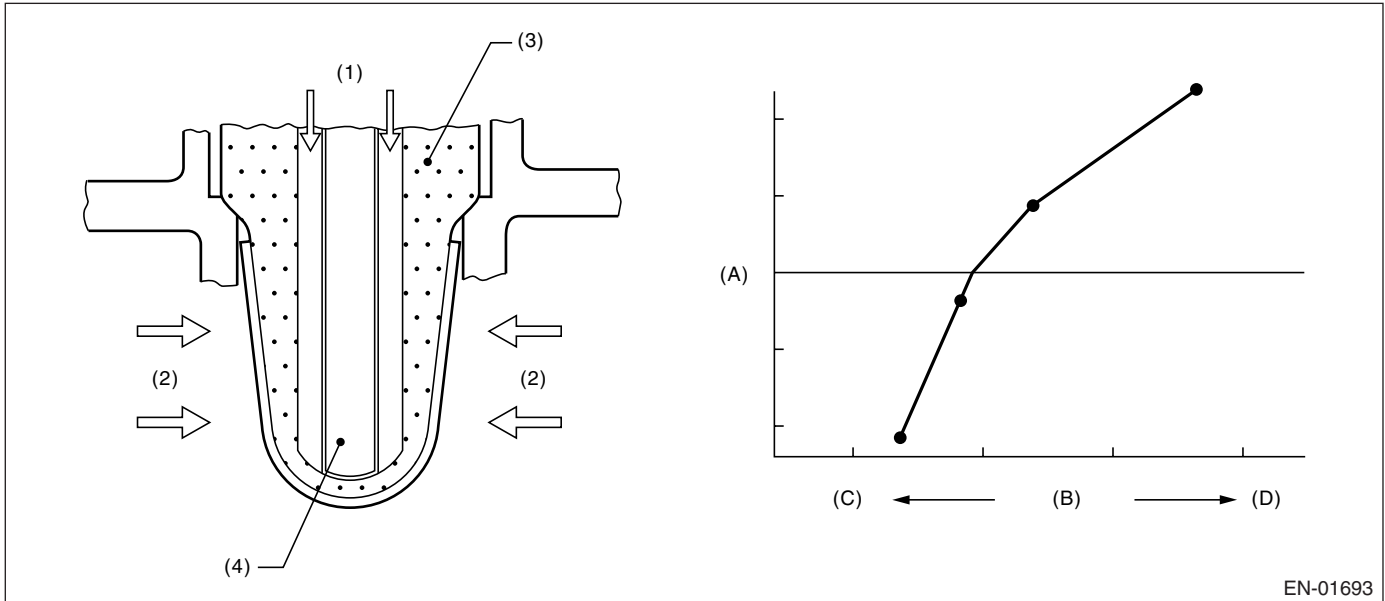


- (1) Cover
- (2) Zirconia
- (3) Clogging

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust
- (3) ZrO<sub>2</sub>
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

## 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions                |
|---|----------------------------------|
| Time needed for all secondary parameters in enable conditions | ≥ 1 second                       |
| Battery voltage   | > 10.9 V                         |
| Atmospheric pressure  | > 75.0 kPa (563 mmHg, 22.2 inHg) |
| Closed loop control with main feedback                        | operating                        |
| Impedance of front oxygen (A/F) sensor                        | 0 ↔ 50 Ω                         |
| After engine starting   | 120 seconds or more              |
| Engine coolant temperature                                    | ≥ 70°C (158°F)                   |
| Engine speed  | 1,000 ↔ 3,200 rpm                |
| Vehicle speed   | 10 ↔ 120 km/h (6 ↔ 75 MPH)       |
| Amount of intake air  | 10 ↔ 31 g/s                      |
| Engine load change during 0.5 engine rev.                     | ≤ 0.02 g/rev                     |
| Learning value of EVAP conc. during purge                     | ≤ 0.2                            |
| Accumulated time of operating canister purge                  | 20 seconds or more               |

## 4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 to 120 km/h (6 to 75 MPH) in 120 seconds after starting the engine.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 5. DIAGNOSTIC METHOD

Integrate the difference of  $faf$  in every 128 milliseconds and difference of  $\lambda$  value.

After integrate 1,640 times (210 seconds), calculate the diagnosis value.

Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| $para_{fca} = td2_{faf}/td2_{lmd}$<br>where,<br>$td2_{faf}(N) = td2_{faf}(n-1) +  d2_{faf}(n) $<br>$td2_{lmd}(N) = td2_{lmd}(n-1) +  d2_{lmd}(n) $<br>add up for a total of 210 seconds<br>$d2_{faf}(n) = (faf(n) - faf(n-1)) - (faf(n-1) - faf(n-2))$<br>$d2_{lmd}(n) = (lmd(n) - lmd(n-1)) - (lmd(n-1) - lmd(n-2))$<br>$faf$ = main feedback compensation coefficient every 128 milliseconds<br>$lmd$ = output lambda every 128 milliseconds | $\geq 0.392$    |

**Time Needed for Diagnosis:** 210 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3  $\rightarrow$  0.
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

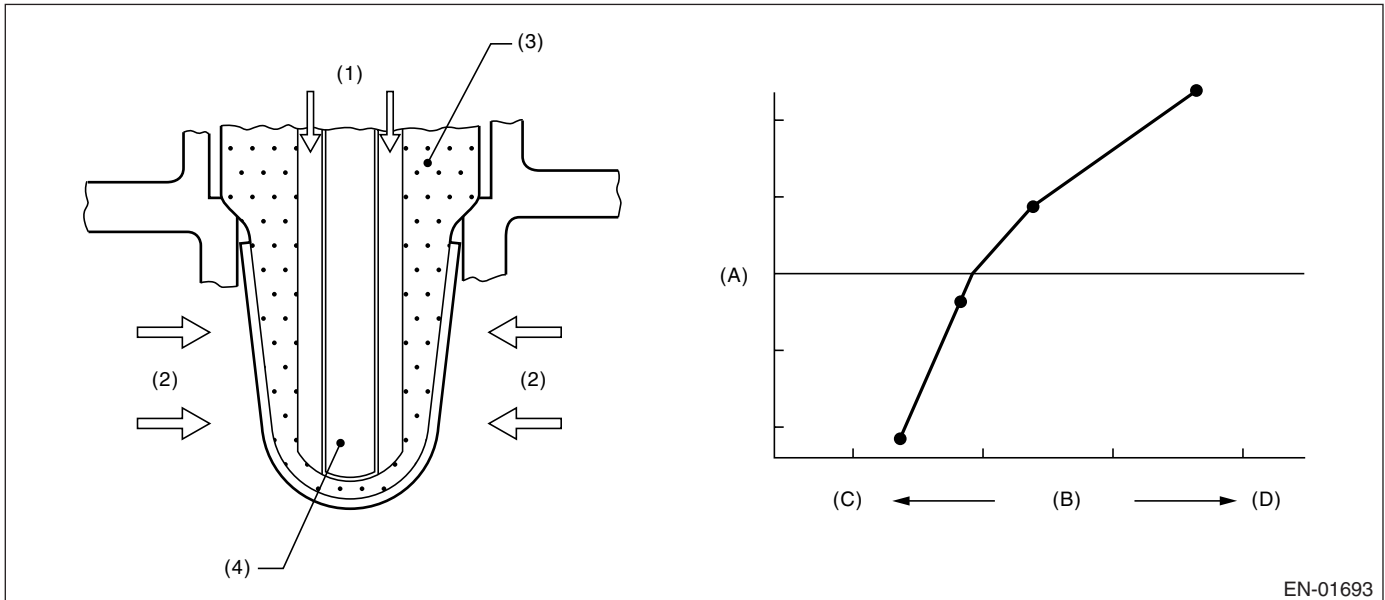
## AC:DTC P0134 O<sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the open circuit of sensor.

Judge NG when the element impedance is large.

### 2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust
- (3) ZrO<sub>2</sub>
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

#### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Voltage   | ≥ 10.9 V        |
| Time after engine starting  | ≥ 50 seconds    |
| Cumulative amount of Front oxygen (A/F) sensor heater control duty every 128 milliseconds | ≥ 28,000%       |
| Front lambda sensor impedance   | ≥ 500 Ω         |

**Time Needed for Diagnosis:** 5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- Front oxygen sensor main learning correction: Not allowed to calculate.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge

### 9. ECM OPERATION AT DTC SETTING

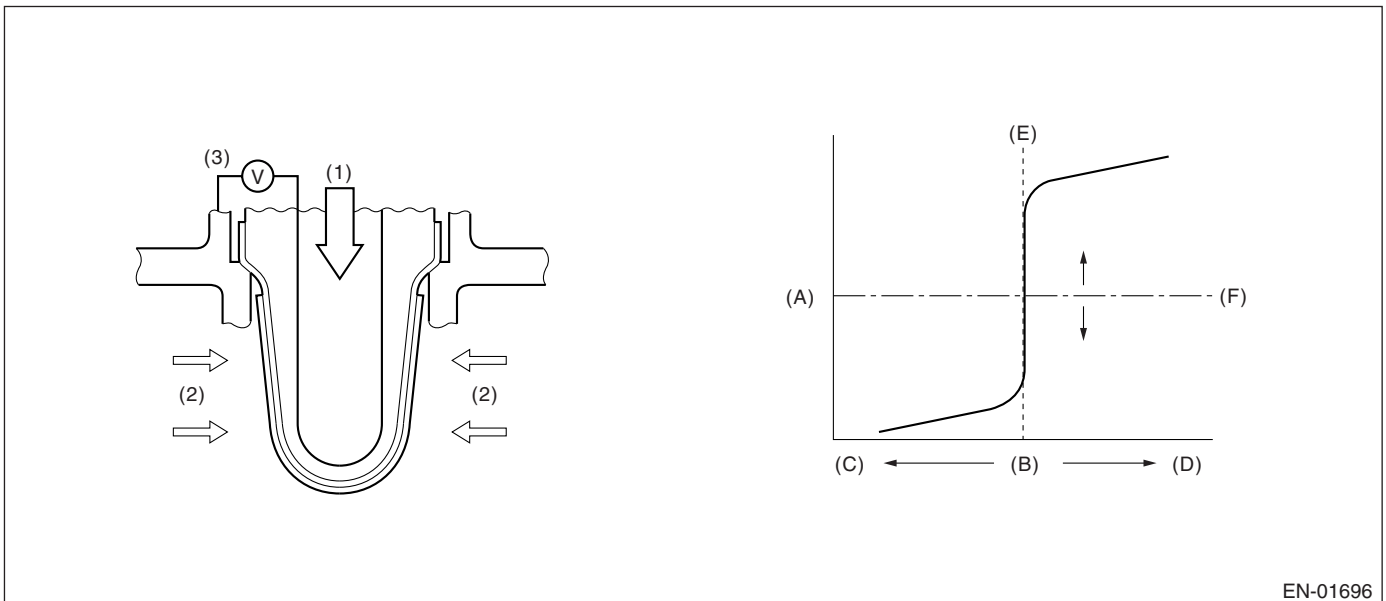
Memorize the freeze frame data. (For test mode \$02)

## AD:DTC P0137 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of oxygen sensor power distribution NG. Judge NG when the oxygen sensor voltage is abnormal with considering the operating conditions.

### 2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich
- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

### Abnormality Judgement

| Secondary Parameters                              | Enable Conditions  |
|---|--------------------|
| High side   |                    |
| Secondary air system                              | Not in operation   |
| Closed loop control of oxygen sensor              | In operation       |
| Misfire detection during 200 engine revs.         | < 5 times          |
| Compensation factor for front oxygen (A/F) sensor | Not in limit value |
| Battery voltage                                   | > 10.9 V           |
| Low side 1  |                    |
| Secondary air system                              | Not in operation   |
| Closed loop control of oxygen sensor              | In operation       |
| Misfire detection during 200 engine revs.         | < 5 times          |
| Compensation factor for front oxygen (A/F) sensor | Not in limit value |
| Battery voltage                                   | > 10.9 V           |
| Amount of intake air                              | ≥ 10 g (0.35 oz)/s |
| Low side 2  |                    |
| Secondary air system                              | Not in operation   |
| Closed loop control of oxygen sensor              | In operation       |
| Misfire detection during 200 engine revs.         | < 5 times          |
| Compensation factor for front oxygen (A/F) sensor | Not in limit value |
| Battery voltage                                   | > 10.9 V           |
| Amount of intake air                              | < 10 g (0.35 oz)/s |
| Continuous time of rear oxygen heater current     | 25 seconds or more |
| Low side 3  |                    |
| Secondary air system                              | Not in operation   |
| Closed loop control of oxygen sensor              | In operation       |
| Misfire detection during 200 engine revs.         | < 5 times          |
| Compensation factor for front oxygen (A/F) sensor | Not in limit value |
| Battery voltage                                   | > 10.9 V           |
| Amount of intake air                              | < 10 g (0.35 oz)/s |
| Continuous time of rear oxygen heater current     | 25 seconds or more |
| Fuel cut  | Experienced        |

### Normality Judgement

| Secondary Parameters                              | Enable conditions  |
|---|--------------------|
| Secondary air system                              | No operation       |
| Closed loop control of oxygen sensor              | In operation       |
| Misfire detection during 200 engine revs.         | < 5 times          |
| Compensation factor for front oxygen (A/F) sensor | Not in limit value |
| Battery voltage                                   | > 10.9 V           |

## 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine at engine steady operation condition.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis. Judge OK when the malfunction criteria below are not completed.

#### Judgment Value

| Malfunction Criteria                                | Threshold Value | DTC   |
|---|-----------------|-------|
| High side<br>Max. output voltage without continuity | ≥ 1,200 mV      | P0138 |
| Low side<br>Min. output voltage without continuity  | < 30 mV         | P0137 |

#### Time Needed for Diagnosis:

High side: 2.5 seconds

Low side 1: 20 seconds

Low side 2: 40 seconds

Low side 3: Value of Map

#### Map

| Fuel shut-off time (sec.) | Time Needed for Diagnosis (sec.) |
|---------------------------|----------------------------------|
| 0                         | 40                               |
| 2                         | 40                               |
| 10                        | 60                               |

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Sub feedback control: Not allowed

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## AE:DTC P0138 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

#### NOTE:

For the detecting criteria, refer to DTC P0137. <Ref. to GD(H4DOTC)-62, DTC P0137 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

## AF:DTC P0139 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

### 1. OUTLINE OF DIAGNOSIS

Detect the slow response of rear oxygen sensor.

Judge NG when the Rich → Lean response diagnosis or Lean → Rich response diagnosis is NG and judge OK when both response diagnoses are OK.

[Rich → Lean diagnosis response]

(1) When the measured response time is larger than a threshold, since the A/F ratio is rich, the response time of the output change of O<sub>2</sub> sensor when changing from Rich to Lean is measured, and it judges with NG, and when small, it judges with OK.

(2) When O<sub>2</sub> sensor voltage at the time of a fuel shut-off in deceleration return is large (rich), it judges with NG.

[Lean → Rich diagnosis response]

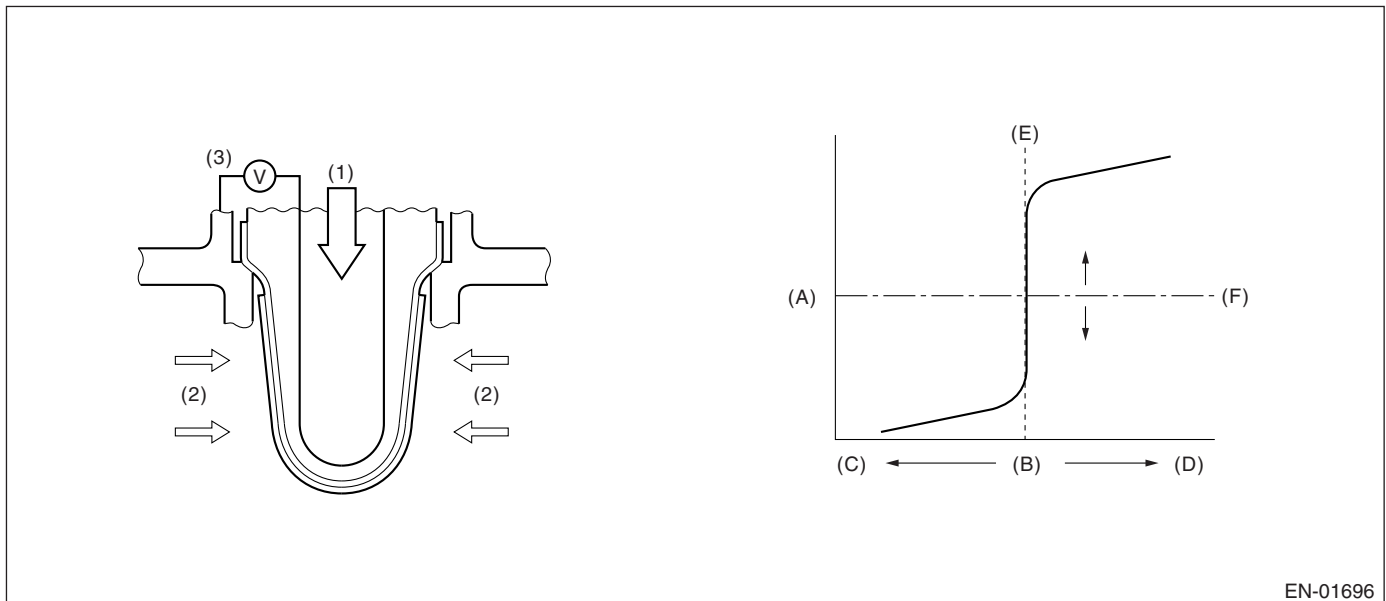
(1) The response time of output change of O<sub>2</sub> sensor when an A/F ratio changes from Lean to Rich is measured, and it is referred to as NG when the measured response time is larger than a threshold.

(2) It is referred to as NG when O<sub>2</sub> sensor voltage after recovery of fuel shut-off in deceleration is small and still small.

#### Diagnostic Method

Measure the response time of the output change of the oxygen sensor when the A/F ratio changes from rich to lean. And Judge NG when the measured response time is larger than the threshold value.

### 2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich
- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions |
|---|-------------------|
| Battery voltage   | > 10.9 V          |
| A/F sub feedback control condition                          | Completed         |
| 5 seconds or more fuel shut-off in deceleration             | Experienced       |
| After fuel cut  | ≥ 2 seconds       |
| Cumulative time for current conducted in rear oxygen sensor | ≥ 60 s            |
| Continuous time for current conducted in rear oxygen sensor | ≥ 30 s            |
| Catalyst warm-up counter                                    | ≥ 7,000 times     |

### 4. GENERAL DRIVING CYCLE

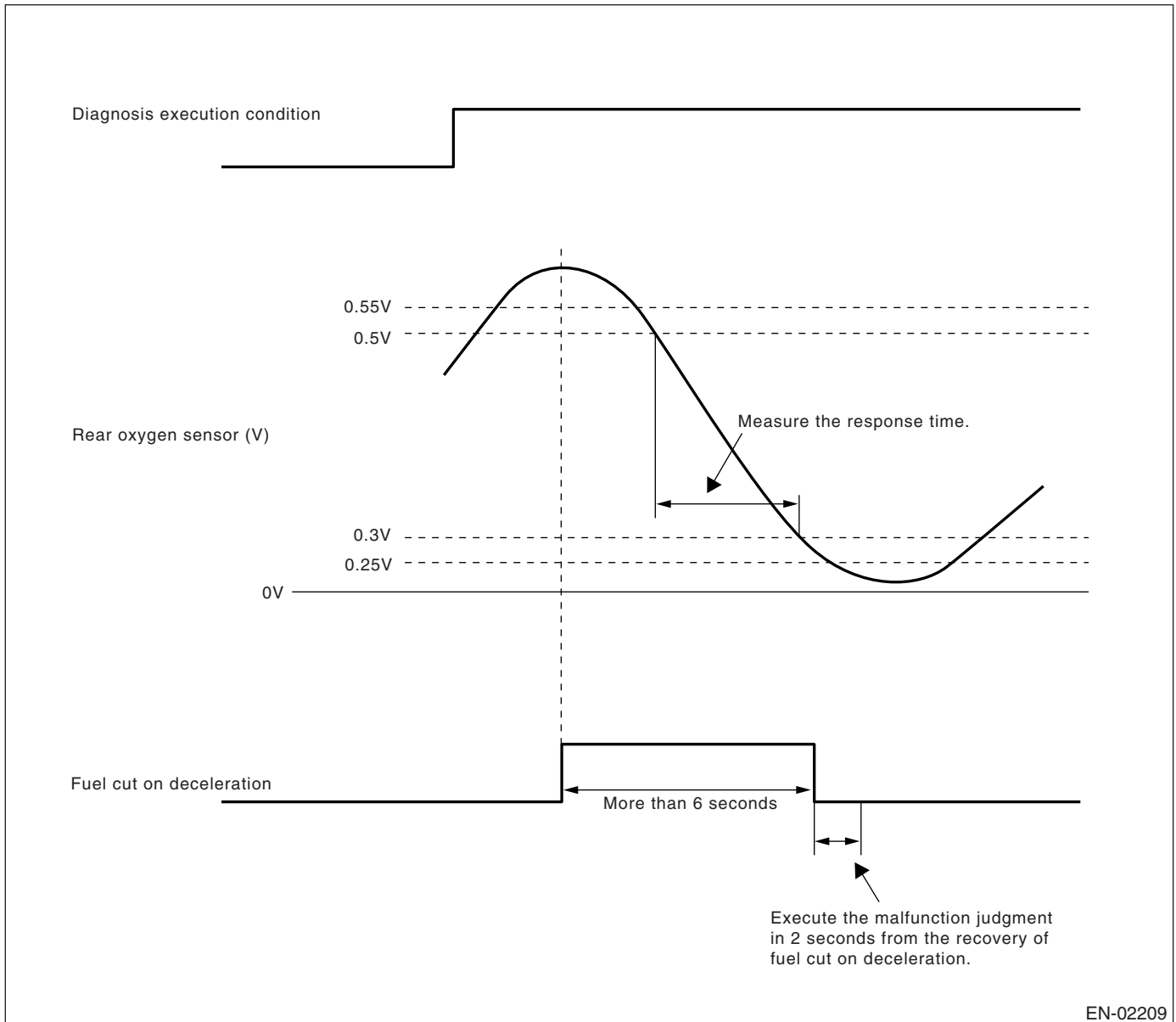
Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration in order to calculate the diagnostic value. (Pay attention to oxygen sensor voltage for the timing of deceleration.)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

When the rear oxygen sensor output voltage changes from 0.55 V (rich) to 0.25 V (lean), calculate the Min. value of response time regarded as judgment value while the output varies from 0.5 V to 0.3 V.



### • Abnormality Judgment

(1) Judge NG when the judgment value is larger than the threshold value after fuel shut-off in deceleration. Response time (Diagnosis value) > Threshold value → Abnormal

#### NOTE:

Variation time of rear oxygen sensor output voltage is short during fuel shut-off in deceleration. Carry out the NG judgment only after the fuel shut-off in deceleration. As for OK judgment, without the condition of fuel shut-off in deceleration, judge OK if the value is below the threshold value.

Judge NG when the malfunction criteria below are completed in 2 seconds after the recovery of fuel shut-off in deceleration which requires 6 seconds or more.

(2) Judge NG when the O<sub>2</sub> sensor voltage after recovery of fuel shut-off in deceleration is large. Judge NG when fuel shut-off in deceleration is also long (6 sec. or more), and although carried out the fuel shut-off in deceleration cut return, when O<sub>2</sub> sensor voltage is large (more than 0.55V).



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Shortest time change from rich (500 mV O <sub>2</sub> output) to lean (300 mV) if voltage reduces from 550 mV to 250 mV. | > 0.327 seconds |
| Time when more than 550 mV   | > 2 seconds     |

**Time Needed for Diagnosis:** Once

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgement

(1) Judge Normal when the response time (diagnostic value) is smaller than threshold (judgment value) when changing to lean since O<sub>2</sub> sensor voltage.

(2) A normal judging is not carried out.

Judge OK when the following standards value are completed.

### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Change of the shortest time from rich (500 mV O <sub>2</sub> output), when voltage decreases from 550 mV to 250 mV to lean (300 mV). | ≤ 0.327 seconds |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Sub feedback control: Not allowed

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## 10.ENABLE CONDITION

- Lean → Rich response diagnosis

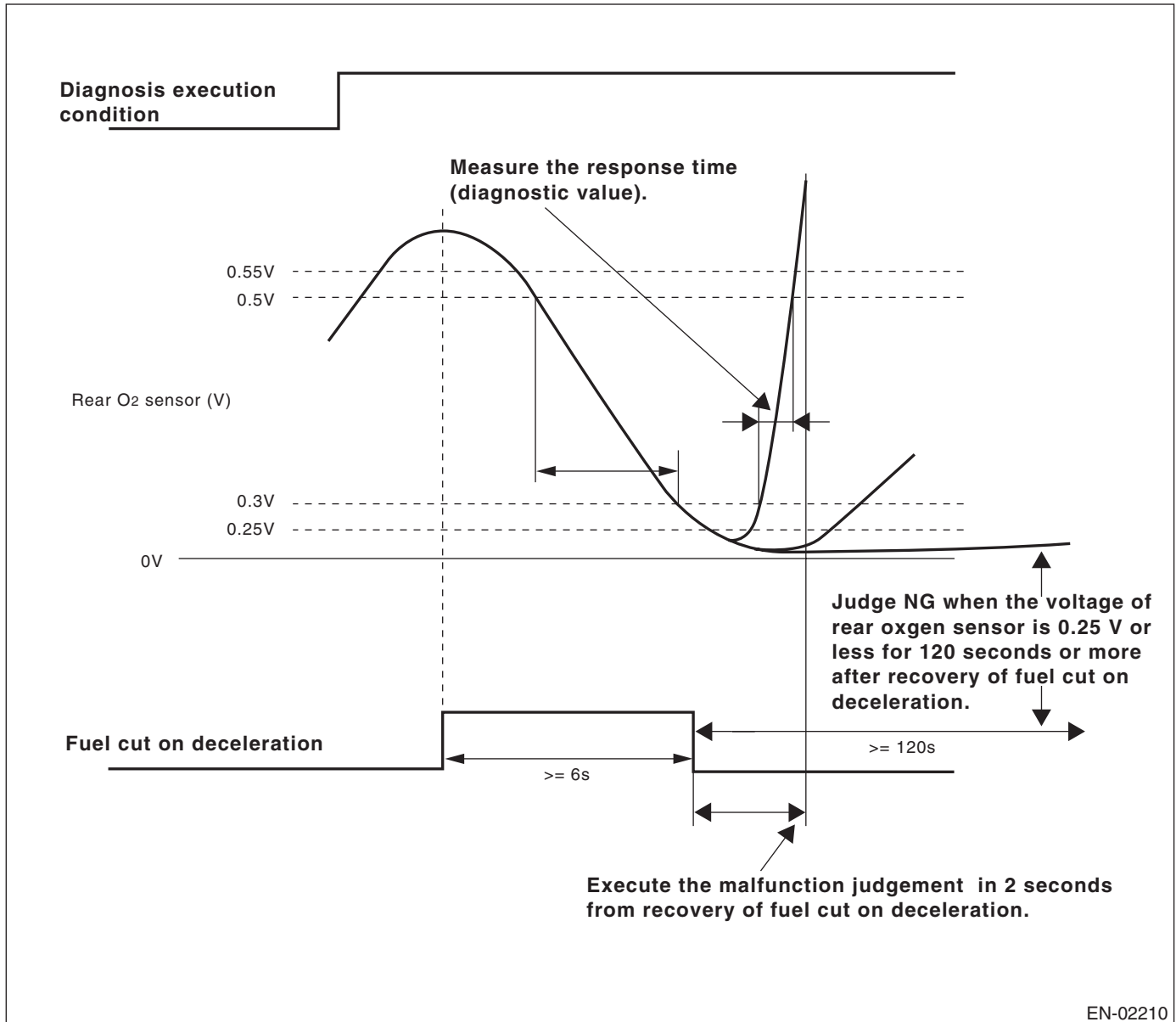
| Secondary Parameters  | Enable Conditions |
|---|-------------------|
| Battery voltage   | > 10.9 V          |
| A/F main feedback control condition                         | Completed         |
| Fuel cut on deceleration ≥ 5 seconds                        | Experienced       |
| After fuel cut  | ≥ 2 seconds       |
| Accumulative time of rear oxygen sensor heater energization | ≥ 60 seconds      |
| Continuous time of rear oxygen sensor heater energization   | ≥ 30 seconds      |

## 11.GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration. (Pay attention to oxygen sensor voltage for the timing of deceleration.)

## 12. DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich), calculate the Min. value of response time regarded as judgment value while the output varies from 0.3 V to 0.5 V.



### • Abnormality Judgment

(1) Judge NG when the judgment value is larger than the threshold value after recovery of fuel shut-off in deceleration.

Response time (Diagnosis value) > Threshold value → Abnormal

(2) Judge NG when the O<sub>2</sub> sensor voltage after recovery of fuel shut-off in deceleration is small.

### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Shortest time change from lean (300 mV O <sub>2</sub> output) to rich (500 mV) if voltage reduces from 500 mV to 250 mV. | > 2 seconds     |
| Or longest time to change to 250 mV  | > 120 seconds   |

**Time Needed for Diagnosis:** Once

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### • Normality Judgement

(1) Judge Normal when the response time (diagnostic value) is smaller than threshold (judgment value) when changing to lean since O<sub>2</sub> sensor voltage.

Response Time (diagnosis value) ≤ Threshold value → Normal

(2) A normal judging is not carried out.

### Judgment Value

Judge OK when the following standards value are completed.

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Change of the shortest time from rich (300 mV O <sub>2</sub> output), when voltage decreases from 550 mV to 250 mV to lean (500 mV). | ≤ 2 seconds     |

### 13.DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 14.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 15.FAIL SAFE

Sub feedback control: Not allowed

### 16.ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## AG:DTC P0140 O<sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2)

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor output property.

Judge Low side NG when the rear oxygen sensor voltage indicates low, otherwise, judge High side NG when the rear oxygen sensor voltage indicates high, in spite of the driving condition that the voltage might move, by referring to the driving condition such as amount of intake air, coolant temperature, main feedback control, fuel shut-off in deceleration, etc.

Judge rear oxygen sensor property NG when the Low side or High side becomes NG.

### 2. ENABLE CONDITION

| Secondary Parameters                              | Enable Conditions           |
|---|-----------------------------|
| Engine coolant temperature                        | ≥ 70°C (158°F)              |
| Target output voltage of rear oxygen sensor       | ≥ 0.6 V                     |
| Amount of intake air                              | 10 g (0.35 oz)/sec. or more |
| Battery voltage                                   | > 10.9 V                    |
| Closed loop with oxygen sensor                    | In operation                |
| Misfire detection during 200 engine revs.         | 5 times or less             |
| Compensation factor for front oxygen (A/F) sensor | Not in limit value          |
| 5 seconds or more fuel shut-off in decel.         | Experienced                 |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis once after warming-up the engine.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria             | Threshold Value |
|----------------------------------|-----------------|
| Low side of max. output voltage  | < 550 mV        |
| High side of min. output voltage | > 250 mV        |

**Time Needed for Diagnosis:** 200 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria             | Threshold Value |
|----------------------------------|-----------------|
| Low side of max. output voltage  | ≥ 550 mV        |
| High side of min. output voltage | ≤ 250 mV        |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 7. FAIL SAFE

None

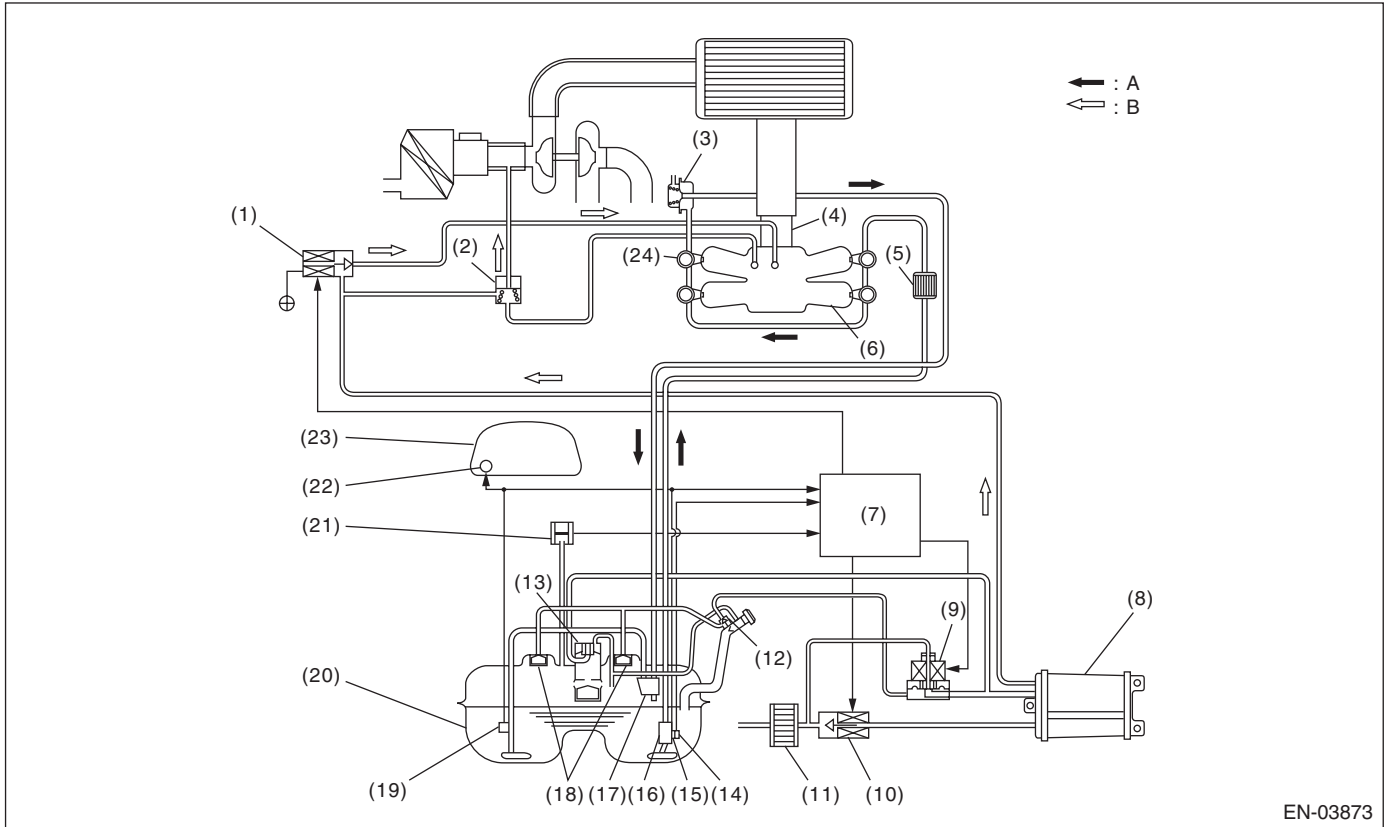
### 8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## AH:DTC P0171 SYSTEM TOO LEAN (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.



EN-03873

- |                                     |                              |                                |
|-------------------------------------|------------------------------|--------------------------------|
| (1) Purge control solenoid valve    | (10) Drain valve             | (19) Fuel sub level sensor     |
| (2) Purge valve                     | (11) Drain filter            | (20) Fuel tank                 |
| (3) Pressure regulator              | (12) Shut-off valve          | (21) Fuel tank pressure sensor |
| (4) Throttle body                   | (13) Vent valve              | (22) Fuel gauge                |
| (5) Fuel filter                     | (14) Fuel temperature sensor | (23) Combination meter         |
| (6) Intake manifold                 | (15) Fuel level sensor       | (24) Fuel injector             |
| (7) Engine control module (ECM)     | (16) Fuel pump               | (A) Fuel line                  |
| (8) Canister                        | (17) Jet pump                | (B) Evaporation fuel line      |
| (9) Pressure control solenoid valve | (18) Fuel cut valve          |                                |

### • Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 2. ENABLE CONDITION

| Secondary Parameters                     | Enable Conditions |
|--|-------------------|
| A/F main learning system                 | In operation      |
| Engine coolant temperature               | ≥ 70°C (158°F)    |
| Engine load                              | ≥ Value of Map 5  |
| Intake air change during 0.5 engine rev. | ≤ 0.02 g/rev      |

### Map 5

| Engine speed (rpm)          | Idle      | 800              | 1,200            | 1,600            | 2,000            | 2,400            | 2,800            | 3,200             | 3,600             | 4,000             | 4,400             |
|-----------------------------|-----------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|-------------------|-------------------|
| Measured value (g (oz)/rev) | Non-turbo | 0.228<br>(0.008) | 0.22<br>(0.0078) | 0.22<br>(0.0078) | 0.22<br>(0.0078) | 0.228<br>(0.008) | 0.23<br>(0.0081) | 0.234<br>(0.0083) | 0.242<br>(0.0085) | 0.250<br>(0.0088) | 0.250<br>(0.0088) |

## 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at engine idle or constant vehicle speed after warm-up.

## 4. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 50 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

### Judgment Value

| Malfunction Criteria   | Threshold Value  |
|--|--|
| $fsobd = (sglmd - tglmda) + faf + flaf$<br>where,<br>sglmd = measured lambda<br>tglmda = target lambda<br><br>faf = main feedback compensation coefficient every 64 milliseconds<br>flaf = main feedback learning compensation coefficient | ≥ fsobdL1<br>See Map 4<br><br>fsobdL1 = lean side threshold value of fsobd |

### Map 4 Threshold value for fuel system malfunction criteria

| Amount of air (g (oz)/s) | 0  | 2.4<br>(0.085) | 4.7<br>(0.166) | 7<br>(0.247) | 9.4<br>(0.332) | 11.7<br>(0.413) | 14.1<br>(0.497) |
|--------------------------|----|----------------|----------------|--------------|----------------|-----------------|-----------------|
| fsobdL1 (%)              | 40 | 40             | 36.9           | 32.0         | 27.0           | 26.5            | 26.5            |

**Time Needed for Diagnosis:** 10 seconds × 5 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

### Judgment Value

| Malfunction Criteria                    | Threshold Value |
|---|-----------------|
| $fsobd = (sglmd - tglmda) + faf + flaf$ | < 19%           |

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 driving cycles.
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 7. FAIL SAFE

Rich side malfunction

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

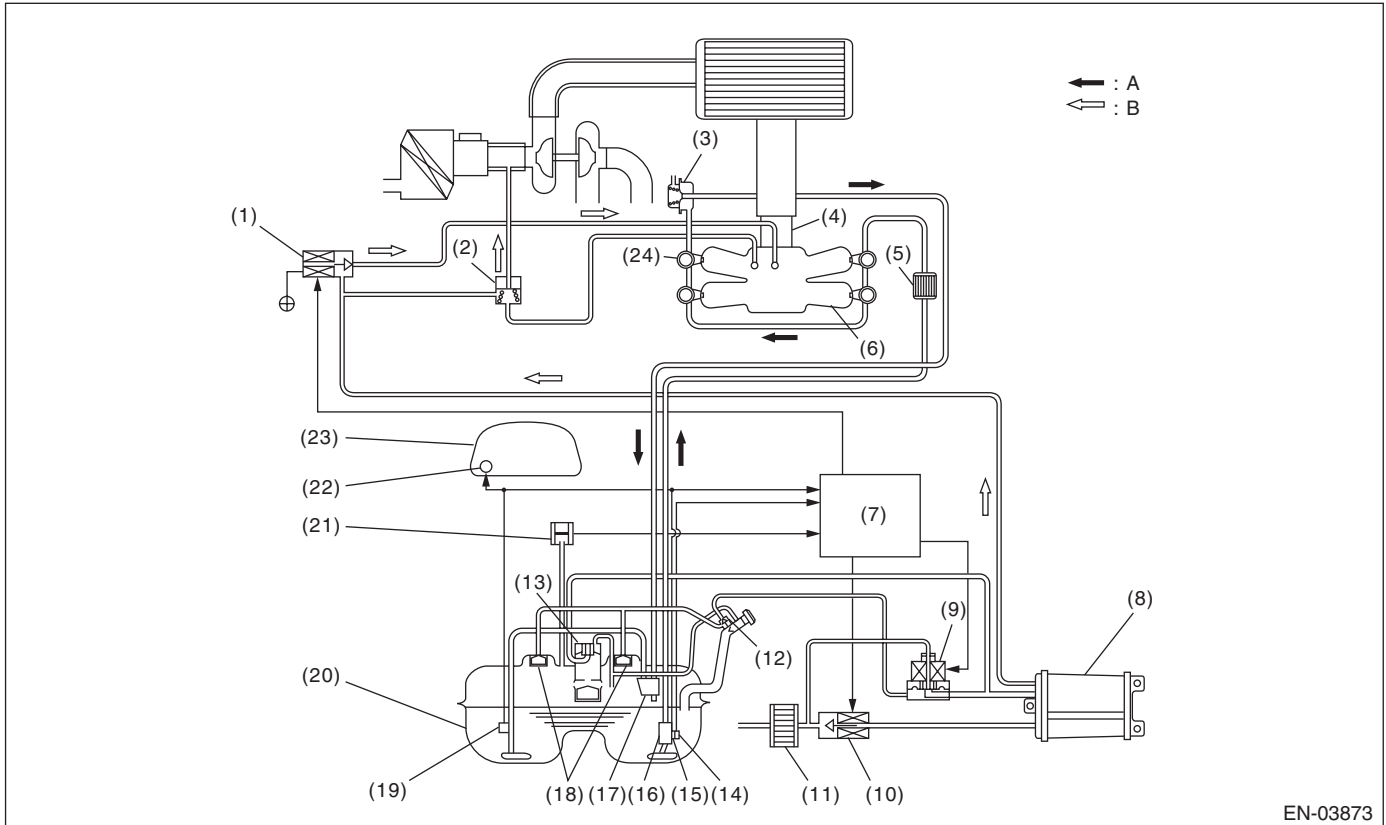
### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## AI: DTC P0172 SYSTEM TOO RICH (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.



EN-03873

- |                                     |                              |                                |
|-------------------------------------|------------------------------|--------------------------------|
| (1) Purge control solenoid valve    | (10) Drain valve             | (19) Fuel sub level sensor     |
| (2) Purge valve                     | (11) Drain filter            | (20) Fuel tank                 |
| (3) Pressure regulator              | (12) Shut-off valve          | (21) Fuel tank pressure sensor |
| (4) Throttle body                   | (13) Vent valve              | (22) Fuel gauge                |
| (5) Fuel filter                     | (14) Fuel temperature sensor | (23) Combination meter         |
| (6) Intake manifold                 | (15) Fuel level sensor       | (24) Fuel injector             |
| (7) Engine control module (ECM)     | (16) Fuel pump               | (A) Fuel line                  |
| (8) Canister                        | (17) Jet pump                | (B) Evaporation fuel line      |
| (9) Pressure control solenoid valve | (18) Fuel cut valve          |                                |

### • Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 2. ENABLE CONDITION

| Secondary Parameters                                 | Enable Conditions                 |
|--|-----------------------------------|
| A/F main learning system                             | In operation                      |
| Engine coolant temperature                           | $\geq 70^{\circ}\text{C}$ (158°F) |
| Engine load  | $\geq$ Value of Map 5             |
| Intake air change during 0.5 engine rev.             | $\leq 0.02$ g/rev                 |
| Learning value of EVAP conc. during purge            | $\leq 0.1$                        |
| Cumulative time of canister purge after engine start | 20 seconds or more                |
| Continuous period after canister purge starting      | 30 seconds or more                |

### Map 5

| Engine speed (rpm)          | Idle      | 800              | 1200             | 1600             | 2000             | 2400             | 2800             | 3200              | 3600              | 4000              | 4400              |
|-----------------------------|-----------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|-------------------|-------------------|
| Measured value (g (oz)/rev) | Non-turbo | 0.228<br>(0.008) | 0.22<br>(0.0078) | 0.22<br>(0.0078) | 0.22<br>(0.0078) | 0.228<br>(0.008) | 0.23<br>(0.0081) | 0.234<br>(0.0083) | 0.242<br>(0.0085) | 0.250<br>(0.0088) | 0.250<br>(0.0088) |

## 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at engine idle or constant vehicle speed after warm-up.

## 4. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 50 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

### Judgment Value

| Malfunction Criteria   | Threshold Value  |
|--|--|
| $\text{fsobd} = (\text{sglmd} - \text{tglm da}) + \text{faf} + \text{flaf}$ where,<br>sglmd = measured lambda<br><br>tglm da = target lambda<br>faf = main feedback compensation coefficient every 64 milliseconds<br>flaf = main feedback learning compensation coefficient | $\leq \text{fsobdR1}$<br>See Map 4<br>fsobdR1 = rich side threshold value of fsobd |

### Map 4 Threshold value for fuel system malfunction criteria

| Amount of air (g (oz)/s) | 0   | 2.4<br>(0.085) | 4.7<br>(0.166) | 7<br>(0.247) | 9.4<br>(0.332) | 11.7<br>(0.413) | 14.1<br>(0.497) |
|--------------------------|-----|----------------|----------------|--------------|----------------|-----------------|-----------------|
| fsobdR1 (%)              | -40 | -40            | -36.9          | -32.0        | -27.0          | -27.0           | -27.0           |

**Time Needed for Diagnosis:** 10 seconds  $\times$  5 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| $\text{fsobd} = (\text{sglmd} - \text{tglm da}) + \text{faf} + \text{flaf}$ | $\geq -20\%$    |



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When "Clear Memory" was performed

### 7. FAIL SAFE

Rich side malfunction

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## AJ:DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE

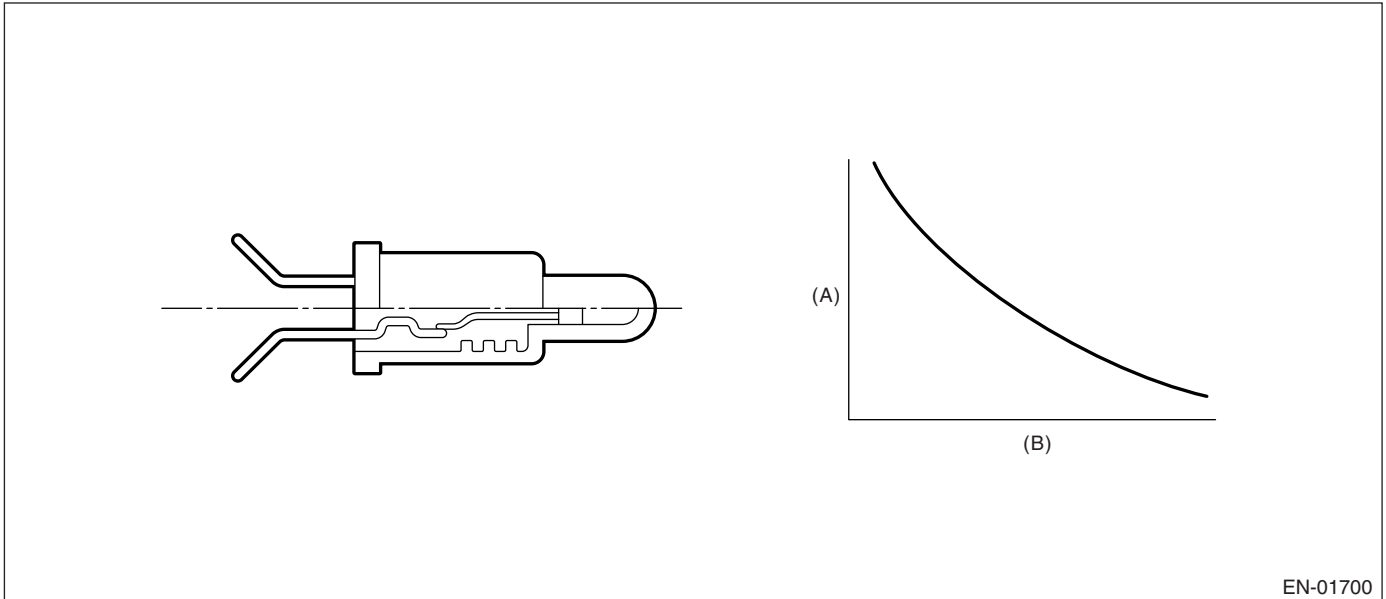
### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel temperature sensor output property. Perform the diagnosis in two methods; namely, drift diagnosis and stuck diagnosis. Judge NG when either of them results in NG, and judge OK when both of them result in OK.

#### • Drift Diagnosis

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and make an NG judgment.

### 2. COMPONENT DESCRIPTION



EN-01700

- (A) Resistance value (Ω)
- (B) Fuel temperature °C (°F)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 120 seconds.

#### Judgment Value

| Malfunction Criteria   | Threshold Value                                |
|--|--|
| Fuel level   | $\geq 9 \text{ l}$ (2.38 US gal, 1.98 Imp gal) |
| After engine starting  | 20 seconds or more                             |
| Engine coolant temperature – engine coolant temperature at engine starting | $\geq 10^{\circ}\text{C}$ (18°F)               |
| Fuel temperature – engine coolant temperature                              | $\geq 10^{\circ}\text{C}$ (18°F)               |
| Battery voltage  | $> 10.9 \text{ V}$                             |

**Time Needed for Diagnosis:** 120 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value                                |
|--|--|
| Fuel level   | $\geq 9 \text{ l}$ (2.38 US gal, 1.98 Imp gal) |
| After engine starting  | 20 seconds or more                             |
| Engine coolant temperature – engine coolant temperature at engine starting | $\geq 10^{\circ}\text{C}$ (18°F)               |
| Fuel temperature – engine coolant temperature                              | $< 10^{\circ}\text{C}$ (18°F)                  |
| Battery voltage  | $> 10.9 \text{ V}$                             |
| Engine coolant temperature   | $< 70^{\circ}\text{C}$ (158°F)                 |

#### • Stuck Diagnosis

If the fuel temperature which might rise along with the engine idling (the cumulative amount of intake air after engine starting is large) does not increase, the engine is considered to be stuck and make an NG judgment.

### 6. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions  |
|-----------------------|--------------------|
| After engine starting | 20 seconds or more |
| Battery voltage       | $> 10.9 \text{ V}$ |

### 7. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

### 8. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                              | Threshold Value                    |
|---|------------------------------------|
| Accumulated amount of intake air                  | $\geq 550 \text{ kg}$ (1,212.8 lb) |
| Fuel temperature difference between Max. and Min. | $< 3^{\circ}\text{C}$ (5.4°F)      |

**Time Needed for Diagnosis:** To be determined.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## • Normality Judgment

Judge OK when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria                              | Threshold Value                                    |
|---|--|
| Accumulated amount of intake air                  | $\geq 550$ kg (1,212.8 lb)                         |
| Fuel temperature difference between Max. and Min. | $\geq 3^{\circ}\text{C}$ (5.4 $^{\circ}\text{F}$ ) |

## 9. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 10.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 11.FAIL SAFE

None

## 12.ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

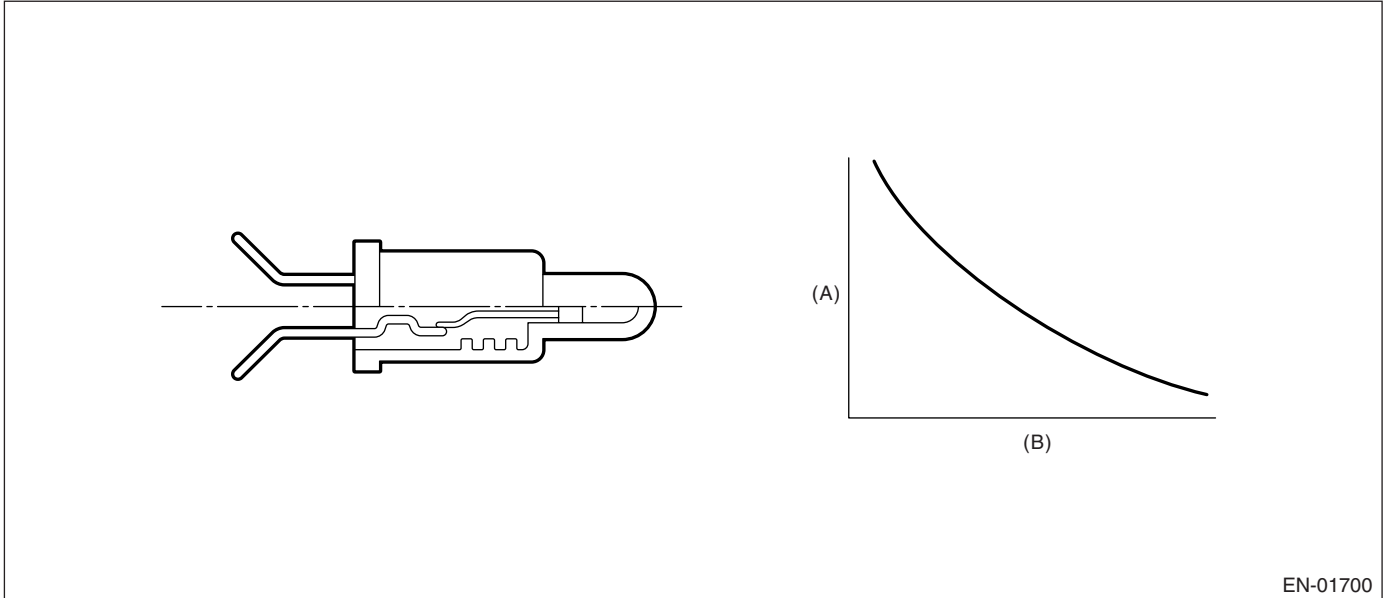
## GENERAL DESCRIPTION

### AK:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



(A) Resistance value ( $\Omega$ )

(B) Fuel temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value       |
|----------------------|-----------------------|
| Output voltage       | $< 0.1646 \text{ V}$  |
| Battery voltage      | $\geq 10.9 \text{ V}$ |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

##### • Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value         |
|----------------------|-------------------------|
| Output voltage       | $\geq 0.1646 \text{ V}$ |
| Battery voltage      | $\geq 10.9 \text{ V}$   |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

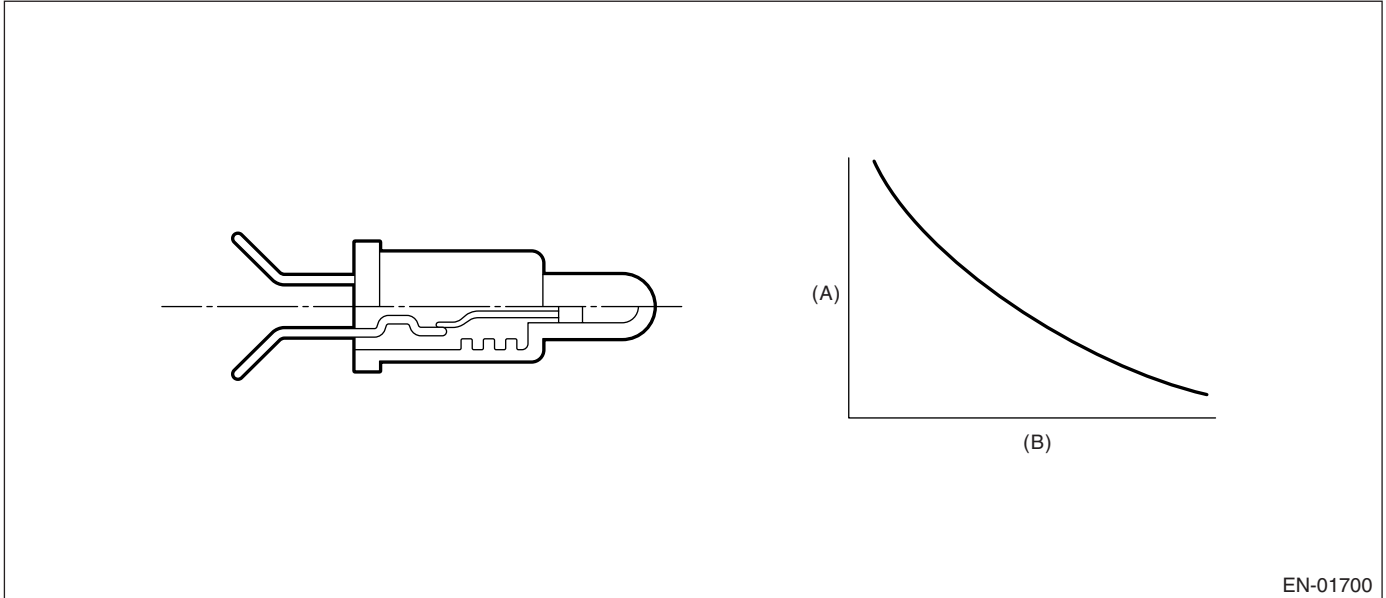
## GENERAL DESCRIPTION

### AL:DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



(A) Resistance value ( $\Omega$ )

(B) Fuel temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value       |
|----------------------|-----------------------|
| Output voltage       | $\geq 4.72 \text{ V}$ |
| Battery voltage      | $\geq 10.9 \text{ V}$ |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

##### • Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value       |
|----------------------|-----------------------|
| Output voltage       | $< 4.72 \text{ V}$    |
| Battery voltage      | $\geq 10.9 \text{ V}$ |

## Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

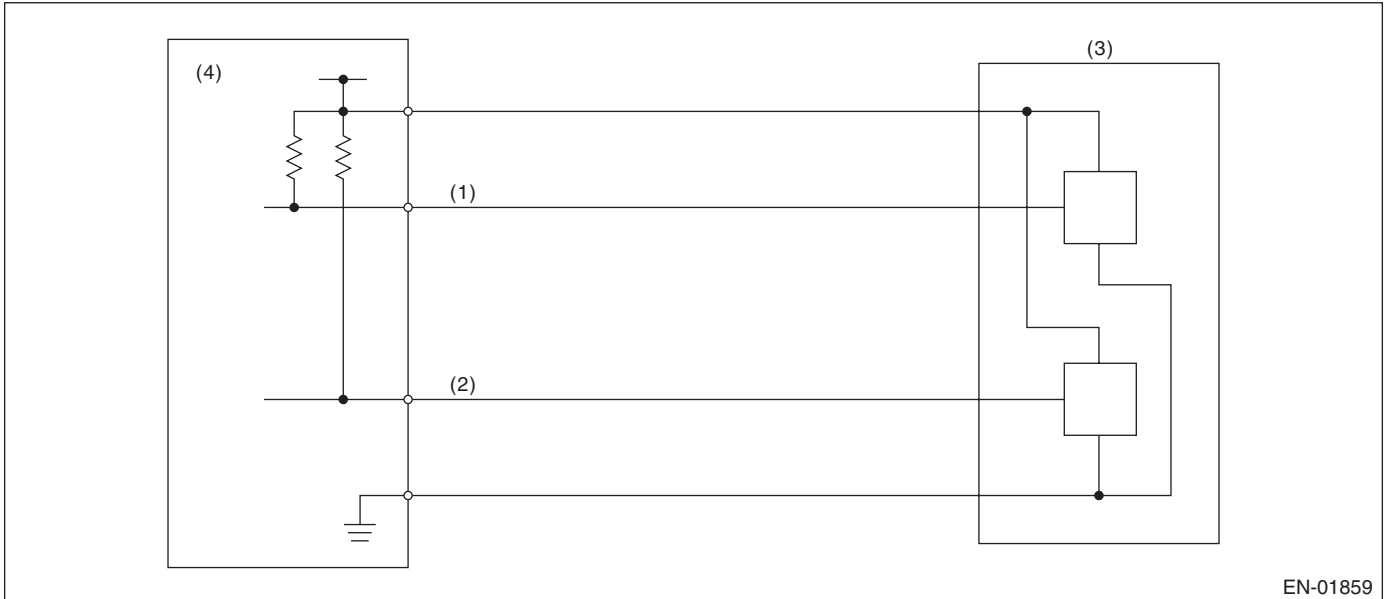
## GENERAL DESCRIPTION

### AM:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01859

- |                                       |                                 |
|---------------------------------------|---------------------------------|
| (1) Throttle position sensor 1 signal | (3) Throttle position sensor    |
| (2) Throttle position sensor 2 signal | (4) Engine control module (ECM) |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | > 0.224 V       |

**Time Needed for Diagnosis:** 24 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

## 8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

## 9. ECM OPERATION AT DTC SETTING

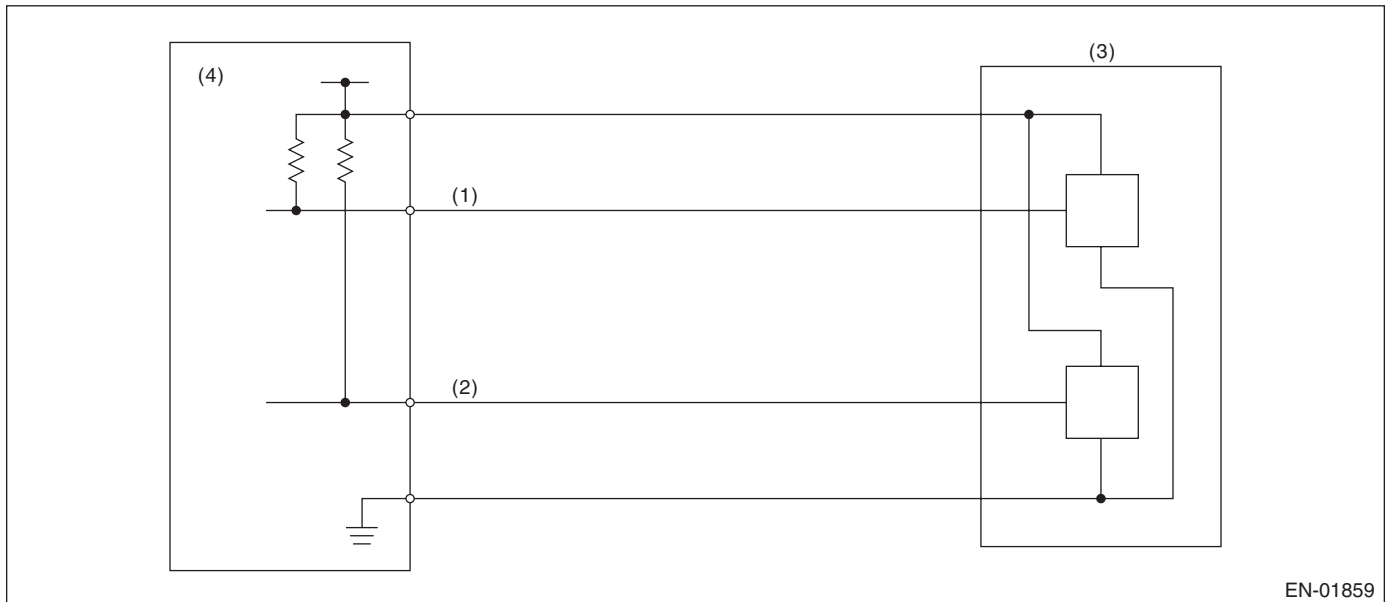
Memorize the freeze frame data. (For test mode \$02)

# AN:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01859

- |                                       |                                 |
|---------------------------------------|---------------------------------|
| (1) Throttle position sensor 1 signal | (3) Throttle position sensor    |
| (2) Throttle position sensor 2 signal | (4) Engine control module (ECM) |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | < 4.851 V       |

**Time Needed for Diagnosis:** 24 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

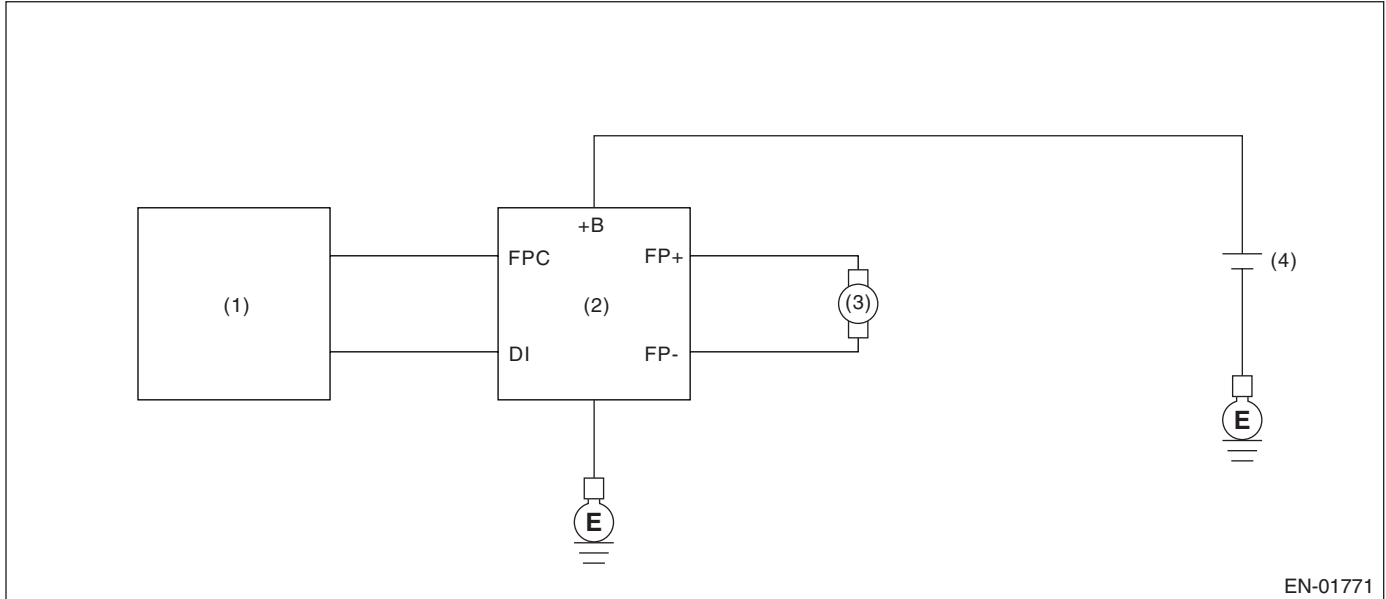
GENERAL DESCRIPTION

## AO:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel pump control unit. Judge NG when the NG signal is sent through a diagnostic line coming from the fuel pump control unit. Fuel pump control unit detects the open or short circuit malfunction for each line, and then sends NG signals if one of them is found NG.

### 2. COMPONENT DESCRIPTION



EN-01771

- (1) Engine control module (ECM)
- (2) Fuel pump control unit
- (3) Fuel pump
- (4) Battery

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria                           | Threshold Value                  |
|--|----------------------------------|
| Battery voltage                                | ≥ 8 V                            |
| After engine starting                          | 30 seconds or more               |
| Fuel pump control                              | ON                               |
| Fuel pump control unit output diagnosis signal | Low                              |
| Fuel level                                     | ≥ 10 ℓ (2.6 US gal, 2.2 Imp gal) |

**Time Needed for Diagnosis:** 2.5 seconds

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

• **Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria                           | Threshold Value    |
|--|--------------------|
| Battery voltage                                | $\geq 8$ V         |
| After engine starting                          | 30 seconds or more |
| Fuel pump control                              | ON                 |
| Fuel pump control unit output diagnosis signal | High               |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

OFF setting may be needed depending on the NG portion.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

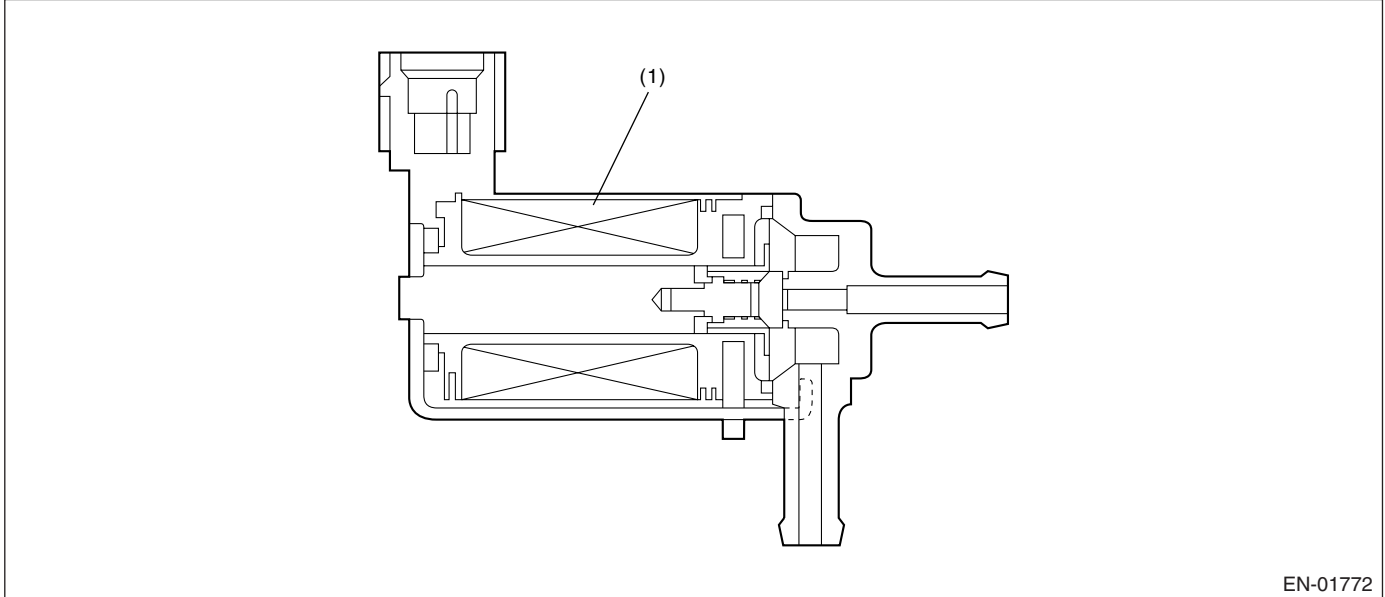
GENERAL DESCRIPTION

## AP:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of wastegate control solenoid valve function. Judge NG when becoming high wastegate pressure.

### 2. COMPONENT DESCRIPTION



EN-01772

(1) Coil

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

#### Judgment Value

| Malfunction Criteria     | Threshold Value |
|--------------------------|-----------------|
| Intake manifold pressure | ≥ Map 10        |

#### Map 10

|   |                     |                     |                     |                     |                     |                     |
|---|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Atmospheric pressure (kPa (mmHg, inHg)) | 58.7 (440, 17.3)    | 67.2 (504, 19.8)    | 75.7 (568, 22.4)    | 84.2 (632, 24.9)    | 92.8 (696, 27.4)    | 101.3 (760, 29.9)   |
| NG pressure (kPa (mmHg, inHg))          | 142.4 (1,068, 42.1) | 156.2 (1,172, 46.1) | 170.2 (1,277, 50.3) | 184.1 (1,381, 54.4) | 198.0 (1,485, 58.5) | 207.9 (1,560, 61.4) |
| OK pressure (kPa (mmHg, inHg))          | 120.0 (900, 35.4)   | 113.8 (1,004, 33.6) | 147.8 (1,109, 43.7) | 161.7 (1,213, 47.8) | 175.6 (1,317, 51.9) | 185.6 (1,392, 54.8) |

Time Needed for Diagnosis: 1 second

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

• **Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria     | Threshold Value |
|--------------------------|-----------------|
| Intake manifold pressure | < Map 10        |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

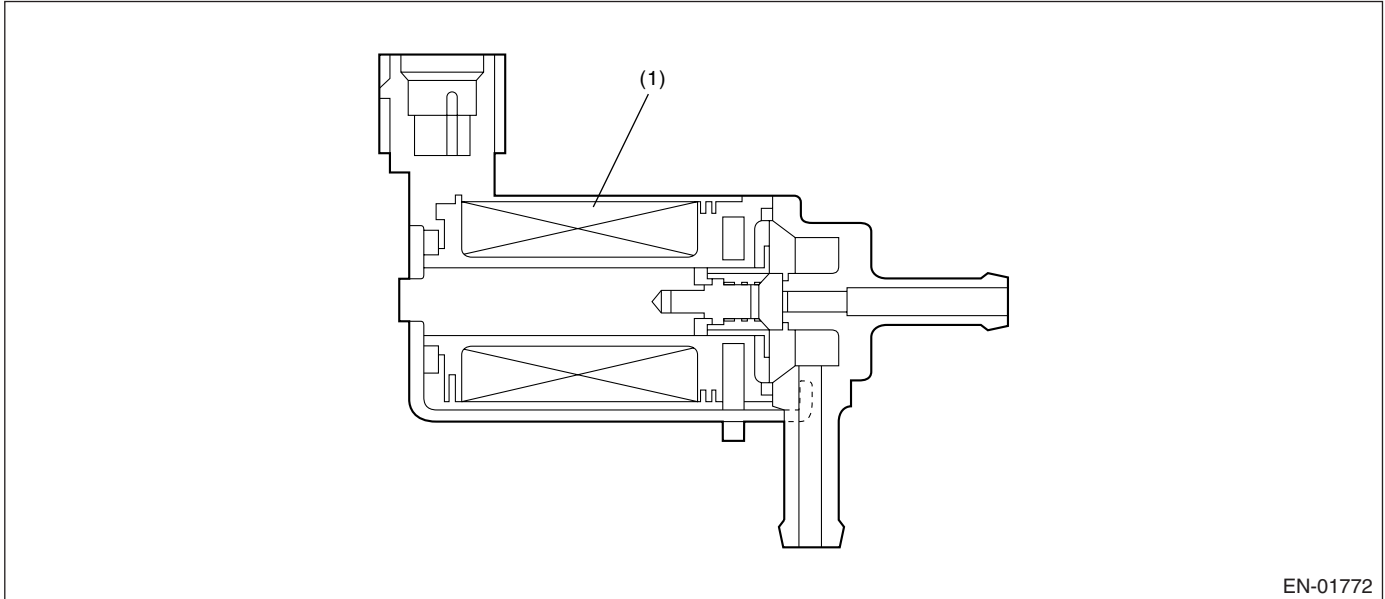
GENERAL DESCRIPTION

## AQ:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve. Judge NG when the terminal output voltage remains Low during outputting the duty signal.

### 2. COMPONENT DESCRIPTION



(1) Coil

### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions |
|-----------------------|-------------------|
| Battery voltage       | > 10.9 V          |
| After engine starting | 1 second or more  |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starts.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

#### Judgment Value

| Malfunction Criteria                         | Threshold Value |
|--|-----------------|
| Terminal output voltage                      | Low             |
| Duty ratio for turbocharged pressure control | < 75%           |

**Time Needed for Diagnosis:** 655 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria    | Threshold Value |
|-------------------------|-----------------|
| Terminal output voltage | High            |



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

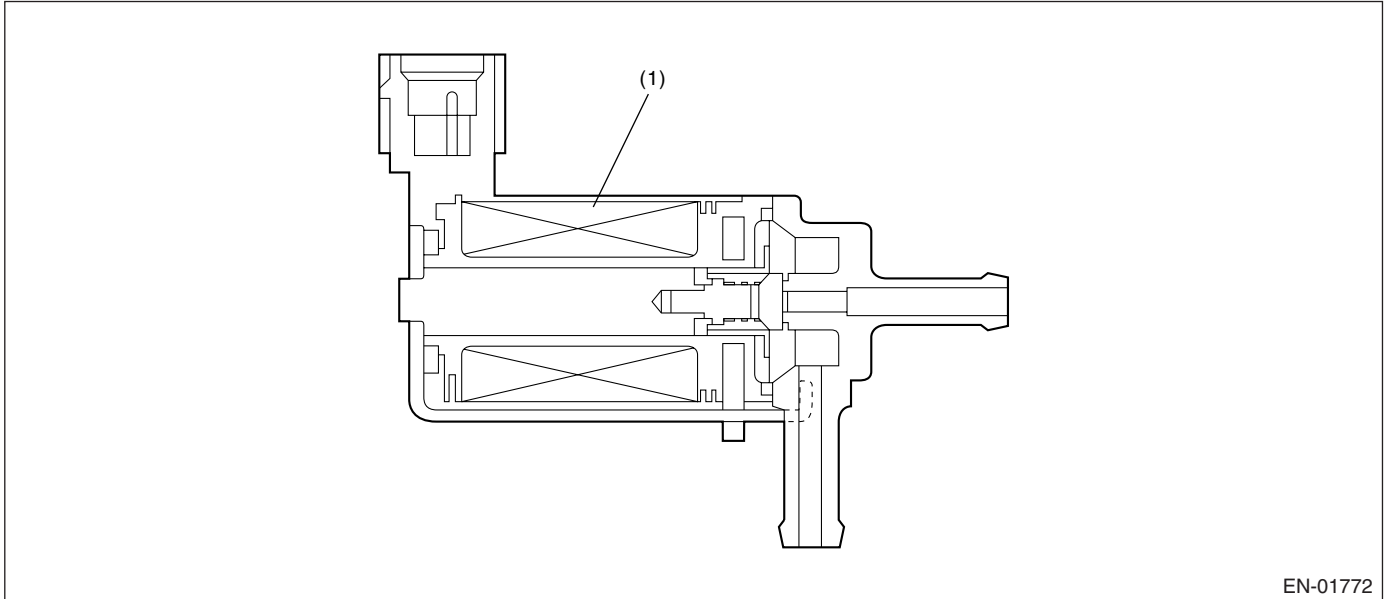
Memorize the freeze frame data. (For test mode \$02)

## AR:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve. Judge NG when the terminal output voltage remains Low or High during outputting the duty signal.

### 2. COMPONENT DESCRIPTION



EN-01772

(1) Coil

### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions |
|-----------------------|-------------------|
| Battery voltage       | > 10.9 V          |
| After engine starting | 1 second or more  |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starts.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

#### Judgment Value

| Malfunction Criteria                         | Threshold Value |
|--|-----------------|
| Terminal output voltage                      | High            |
| Duty ratio for turbocharged pressure control | > 25%           |

**Time Needed for Diagnosis:** 655 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### • Normality Judgment

Judge OK and clear NG when a malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria    | Threshold Value |
|-------------------------|-----------------|
| Terminal output voltage | Low             |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## AS:DTC P0301 CYLINDER 1 MISFIRE DETECTED

### 1. OUTLINE OF DIAGNOSIS

Detect whether the misfire occurred or not. (Revolution fluctuation method) Monitoring the misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has three patterns below.

- Intermittent misfire (The same cylinder misfires in random, or different cylinders misfire in random.): FTP 1.5 times misfire
- Every time misfire (The same cylinder misfires every time.): FTP 1.5 times misfire, Catalyst damage misfire

The following detecting methods are adopted for these detection.

1) Intermittent misfire: FTP 1.5 times misfire

- 180° Interval Difference Method (MT: 1,800 rpm or less; AT: None)
- 360° Interval Difference Method (whole range)
- 720° Interval Difference Method (3,000 rpm or less)

2) Every time misfire: FTP 1.5 times misfire, Catalyst damage misfire

- 360° Interval Difference Method

### 2. ENABLE CONDITION

| Secondary Parameters                                    | Enable Conditions   |
|---|---|
| Continuous time for completing all secondary parameters | ≥ 1 second  |
| Intake manifold pressure change during 0.5 engine rev.  | < 13.3 kPa (100 mmHg, 3.93 inHg)<br>(MT)<br>< 13.3 kPa (100 mmHg, 3.93 inHg) (AT) |
| Engine speed change                                     | < 1,000 rpm/32 milliseconds   |
| Throttle position change during 16 milliseconds         | < 14°   |
| Fuel shut-off function                                  | Not in operation  |
| Atmospheric pressure                                    | ≥ 75.0 kPa (563 mmHg, 22.2 inHg)  |
| Fuel level  | ≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)   |
| Evaporative system leak check                           | Not in operation  |
| Engine speed  | 500 — 6,500 rpm   |
| Intake manifold pressure                                | > Value of Map 3  |
| Battery voltage   | ≥ 8 V   |

#### Map3

#### MT model

#### Vehicle Speed < 64.4 km/h (40 MPH)

| rpm          | 700         | 1000        | 1500        | 2000        | 2500        | 3000        | 3500        | 4000        | 4500        | 5000        | 5500         | 6000        | 6500         | 6700        |
|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|-------------|--------------|-------------|
| kPa          | 25.1        | 24.8        | 23.3        | 24.7        | 24.0        | 25.6        | 28.8        | 30.0        | 31.6        | 32.5        | 37.1         | 41.9        | 36.9         | 51.1        |
| (mmHg, inHg) | (188, 7.40) | (186, 7.32) | (175, 6.89) | (185, 7.30) | (180, 7.09) | (192, 7.56) | (216, 8.51) | (225, 8.86) | (237, 9.33) | (244, 9.60) | (278, 10.96) | (314, 12.4) | (352, 10.90) | (383, 15.1) |

#### Vehicle Speed ≥ 64.4 km/h (40 MPH)

| rpm          | 700         | 1000        | 1500        | 2000        | 2500        | 3000        | 3500        | 4000        | 4500        | 5000        | 5500         | 6000        | 6500         | 6700        |
|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|-------------|--------------|-------------|
| kPa          | 25.1        | 24.8        | 23.3        | 24.7        | 24.0        | 25.6        | 28.8        | 30.0        | 31.6        | 32.5        | 37.1         | 41.9        | 36.9         | 51.1        |
| (mmHg, inHg) | (188, 7.40) | (186, 7.32) | (175, 6.89) | (185, 7.30) | (180, 7.09) | (192, 7.56) | (216, 8.51) | (225, 8.86) | (237, 9.33) | (244, 9.60) | (278, 10.96) | (314, 12.4) | (352, 10.90) | (383, 15.1) |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

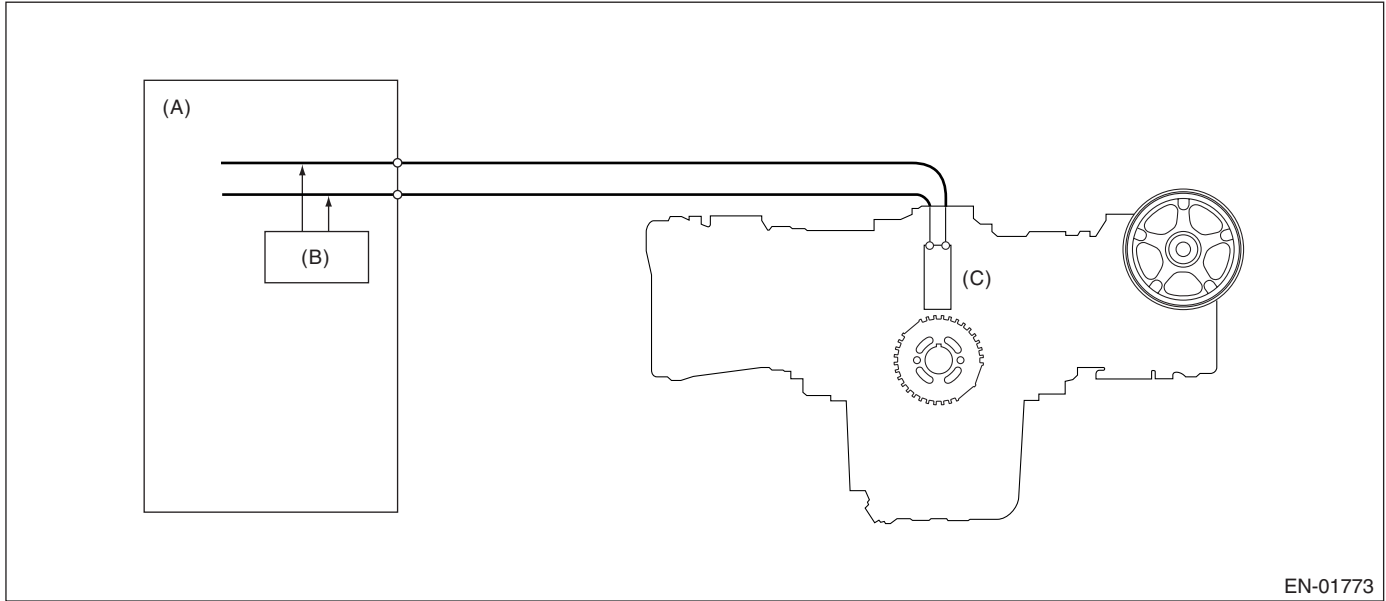
### AT model

| rpm             | 700            | 1000           | 1500           | 2000           | 2500           | 3000           | 3500             | 4000           | 4500             | 5000            | 5500              | 6000           | 6500              | 6700            |
|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|------------------|----------------|------------------|-----------------|-------------------|----------------|-------------------|-----------------|
| kPa             | 26.3           | 24.7           | 23.6           | 26.7           | 27.3           | 26.1           | 29.5             | 31.3           | 32.7             | 34.1            | 38.2              | 44.0           | 49.5              | 53.3            |
| (mmHg,<br>inHg) | (197,<br>7.76) | (185,<br>7.28) | (177,<br>6.97) | (200,<br>7.89) | (205,<br>8.07) | (196,<br>7.72) | (221.5,<br>8.72) | (235,<br>9.25) | (245.5,<br>9.67) | (256,<br>10.08) | (286.5,<br>11.28) | (330,<br>13.0) | (371.5,<br>14.63) | (400,<br>15.74) |

### 3. GENERAL DRIVING CYCLE

- Detecting misfire is able to be carried out in the condition between idling and high revolution.
- Perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD



- (A) Engine control module (ECM)
- (B) Diagnosis circuit
- (C) Crankshaft position sensor

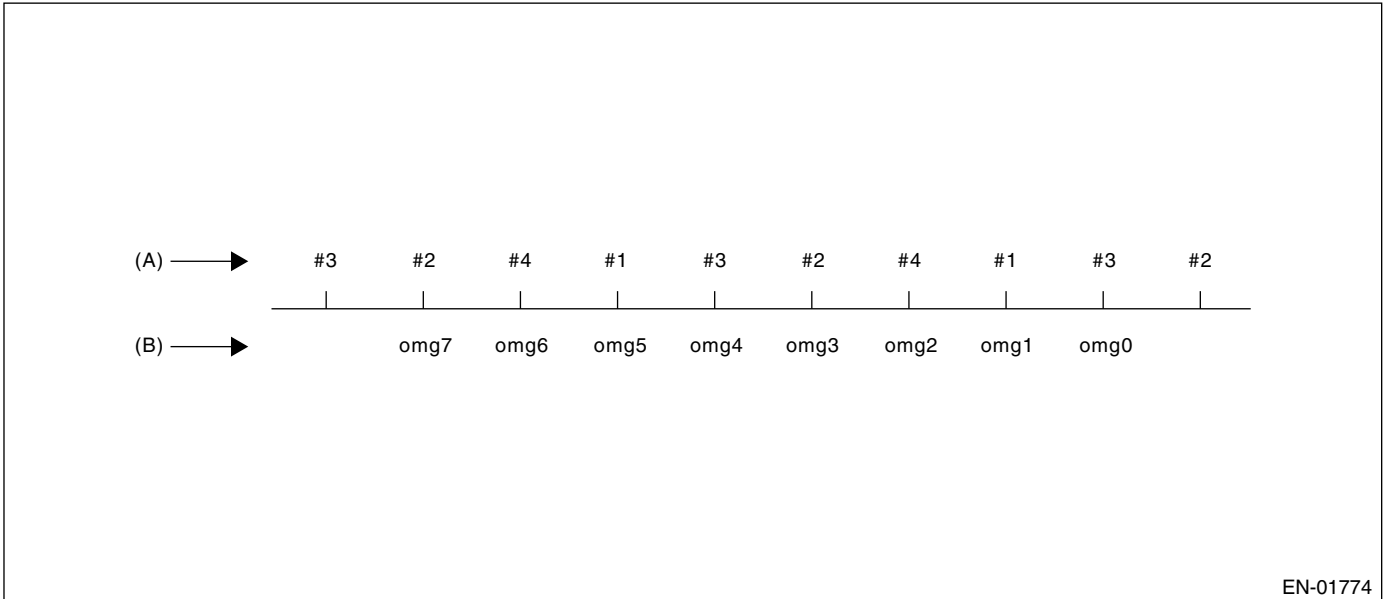
When the misfire occurred, the engine speed is decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether the misfire occurs or not comparing the calculated result with judgment value. Counting the number of misfire up, and if the misfire ratio is higher during 1,000 rev. or 200 rev., judge NG for the corresponding cylinder.

|   |   |   |
|---|---|---|
| Calculate the diagnostic value (from crankshaft position speed) | → Misfire detection every single ignition (Compare diagnostic value with judgment value)  | → NG judgment (Judge misfire occurrence required by the law) (Compare number of misfire with judgment)                              |
|   | <ul style="list-style-type: none"> <li>• 180° Interval Difference Method</li> <li>• 360° Interval Difference Method</li> <li>• 720° Interval Difference Method</li> </ul> | <ul style="list-style-type: none"> <li>• FTP1.5 times misfire NG judgment</li> <li>• Catalyst damage misfire NG judgment</li> </ul> |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

As the following figure, pick out a random cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, and the following is the same.



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- (A) Ignition order
- (B) Crankshaft position speed

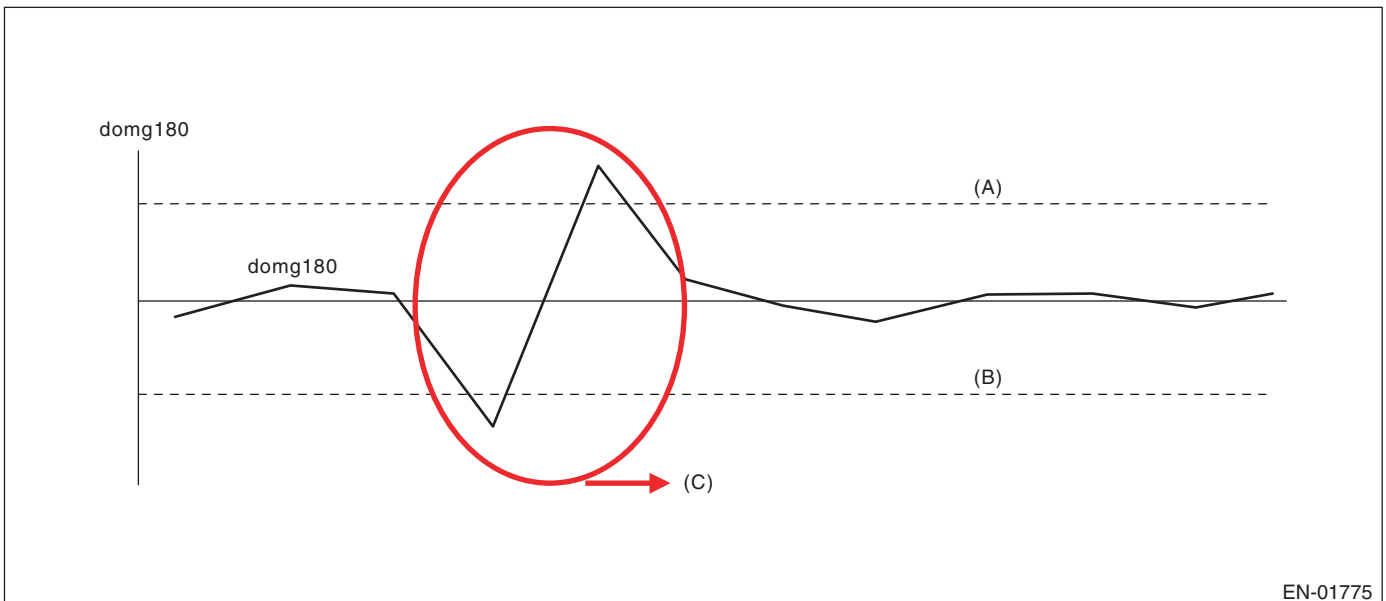
## • 180° Interval Difference Method

Diagnosis value  $domg180 = (omg_{-1} - omg_0) - (omg_7 - omg_1)/6$

Judge misfire occurs in the following cases.

- $domg180 >$  judgment value of positive side
- $domg180 \leq$  judgment value of negative side

(judgment value before 180°CA)



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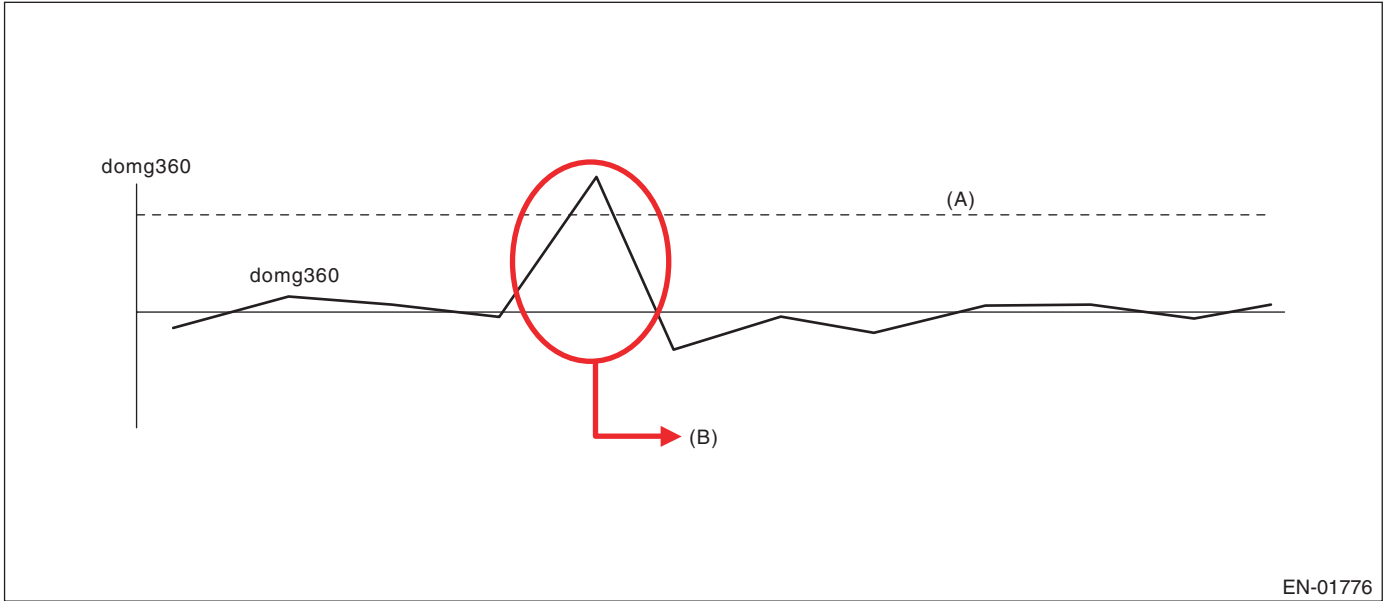
- (A) Threshold value (Judgment value of positive side)
- (B) Threshold value (Judgment value of negative side)
- (C) Judged as misfire

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • 360° Interval Difference Method

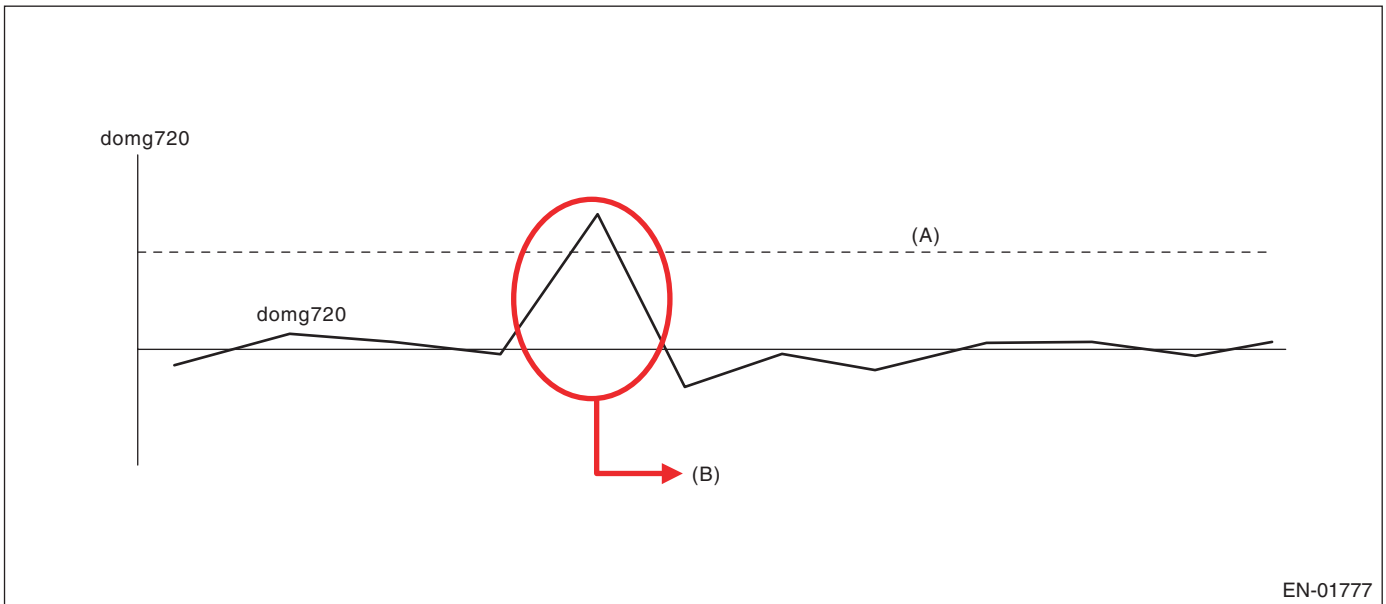
|                  |   |
|------------------|---|
| Diagnosis value  | $\text{domg 360} = (\text{omg 1} - \text{omg 0}) - (\text{omg 4} - \text{omg 3})$ |
| Misfire judgment | $\text{domg 360} > \text{judgment value} \rightarrow \text{Misfire occurs}$       |



- (A) Threshold value
- (B) Judged as misfire

### • 720° Interval Difference Method

|                  |   |
|------------------|---|
| Diagnosis value  | $\text{domg 720} = (\text{omg 1} - \text{omg 0}) - (\text{omg 7} - \text{omg 6})$ |
| Misfire judgment | $\text{domg 720} > \text{judgment value} \rightarrow \text{Misfire occurs}$       |



- (A) Threshold value
- (B) Judged as misfire

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

- FTP 1.5 times misfire (Misfire occurrence level affecting exhaust gas)

**Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1,000 engine revs.)**

| Malfunction Criteria        | Threshold Value       |
|-----------------------------|-----------------------|
| FTP emission judgment value | > 1.0% in 1,000 revs. |

**Time Needed for Diagnosis:** 1,000 engine revs.

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

- Catalyst damage misfire (Misfire occurrence level damaging catalyst)

**Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 200 engine revs. (400 ignitions))**

| Malfunction Criteria                   | Threshold Value |
|--|-----------------|
| Catalyst damage misfire judgment value | See Map 1       |

**Map 1 Fault criteria threshold for misfire which would result in catalyst damage**

| %                  | AIR INTAKE (g/rev.) |      |      |      |      |      |      |      |      |     |     |
|--------------------|---------------------|------|------|------|------|------|------|------|------|-----|-----|
|                    | 0.2                 | 0.4  | 0.6  | 0.8  | 1.0  | 1.2  | 1.4  | 1.6  | 1.8  | 2.0 |     |
| ENGINE SPEED (rpm) | 1000                | 37.0 | 32.0 | 28.5 | 26.0 | 23.0 | 21.3 | 21.3 | -    | -   | -   |
|                    | 1500                | 35.0 | 29.5 | 25.5 | 22.5 | 21.3 | 21.3 | 21.3 | 18.0 | -   | -   |
|                    | 2000                | 32.0 | 22.5 | 22.5 | 18.3 | 14.5 | 10.8 | 10.0 | 9.0  | 8.0 | 5.0 |
|                    | 2500                | 29.0 | 21.8 | 14.3 | 11.3 | 9.8  | 9.0  | 8.5  | 8.0  | 7.5 | 5.0 |
|                    | 3000                | 27.0 | 21.8 | 14.5 | 9.8  | 9.0  | 9.0  | 8.0  | 7.5  | 7.0 | 5.0 |
|                    | 3500                | 24.5 | 18.5 | 10.8 | 6.8  | 5.8  | 5.5  | 5.0  | 5.0  | 5.0 | 5.0 |
|                    | 4000                | -    | 15.3 | 10.0 | 6.8  | 5.5  | 5.0  | 5.0  | 5.0  | 5.0 | 5.0 |
|                    | 4500                | -    | 13.8 | 8.5  | 6.3  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0 | -   |
|                    | 5000                | -    | 13.8 | 8.5  | 5.8  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0 | -   |
|                    | 5500                | -    | 13.5 | 8.3  | 5.5  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0 | -   |
|                    | 6000                | -    | 13.0 | 8.0  | 5.3  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0 | -   |
|                    | 6500                | -    | 12.5 | 7.5  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | -   | -   |
| 6700               | -                   | 12.3 | 7.3  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | -    | -   |     |

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These figures mean the misfire ratio (%) in 400 ignitions; for example, 22.5 (%) means 400 (ignition) × 22.5 (%) = 90 (ignition) or more, so this case is judged misfire.

**Time Needed for Diagnosis:** 200 engine revs.

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 7. FAIL SAFE

None



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

#### **AT:DTC P0302 CYLINDER 2 MISFIRE DETECTED**

##### 1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-95, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **AU:DTC P0303 CYLINDER 3 MISFIRE DETECTED**

##### 1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-95, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **AV:DTC P0304 CYLINDER 4 MISFIRE DETECTED**

##### 1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-95, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

# Diagnostic Trouble Code (DTC) Detecting Criteria

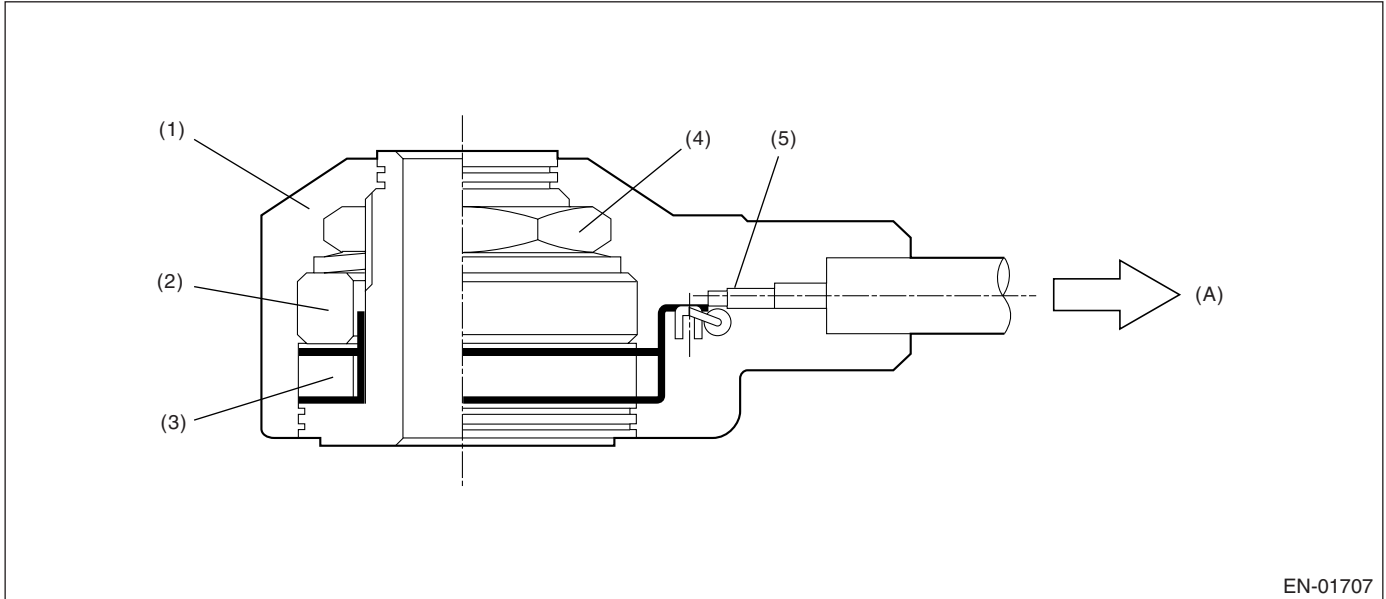
GENERAL DESCRIPTION

## AW:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



- (1) Case
- (2) Weight
- (3) Piezoelectric element
- (4) Nut
- (5) Resistance

(A) To knock sensor harness

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.238 V       |
| Ignition switch      | ON              |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 0.238$ V  |
| Ignition switch      | ON              |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Knock compensation:

- Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
- At normal: knock compensation =  $0^{\circ}\text{CA}$  is fixed.
- At trouble: knock compensation =  $-5^{\circ}\text{CA}$ . (Retard  $5^{\circ}\text{CA}$ .)
- Not allowed to update the whole learning compensation factor.
- Not allowed to calculate the partial learning zone compensation value.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

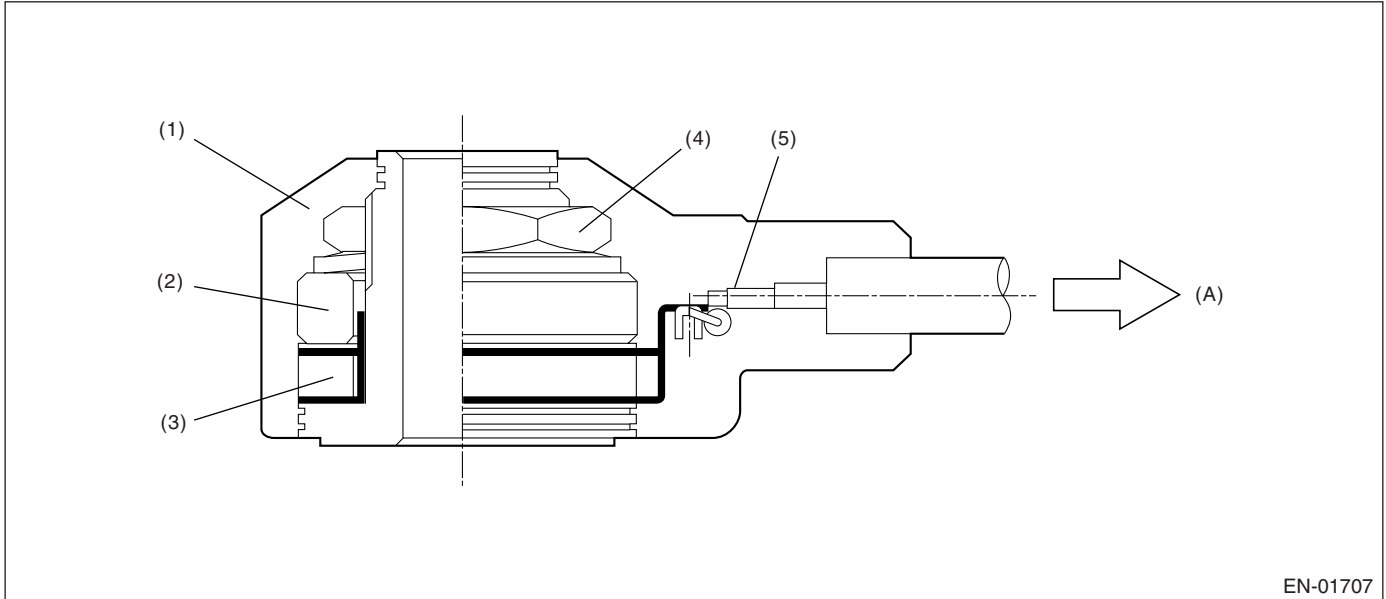
GENERAL DESCRIPTION

## AX:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



- (1) Case
- (2) Weight
- (3) Piezoelectric element
- (4) Nut
- (5) Resistance

(A) To knock sensor harness

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.714$ V  |
| Ignition switch      | ON              |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 4.714 V       |
| Ignition switch      | ON              |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Knock compensation:

- Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
- At normal: knock compensation = 0°CA is fixed.
- At trouble: knock compensation = -5°CA. (Retard 5°CA.)
- Not allowed to update the whole learning compensation factor.
- Not allowed to calculate the partial learning zone compensation value.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

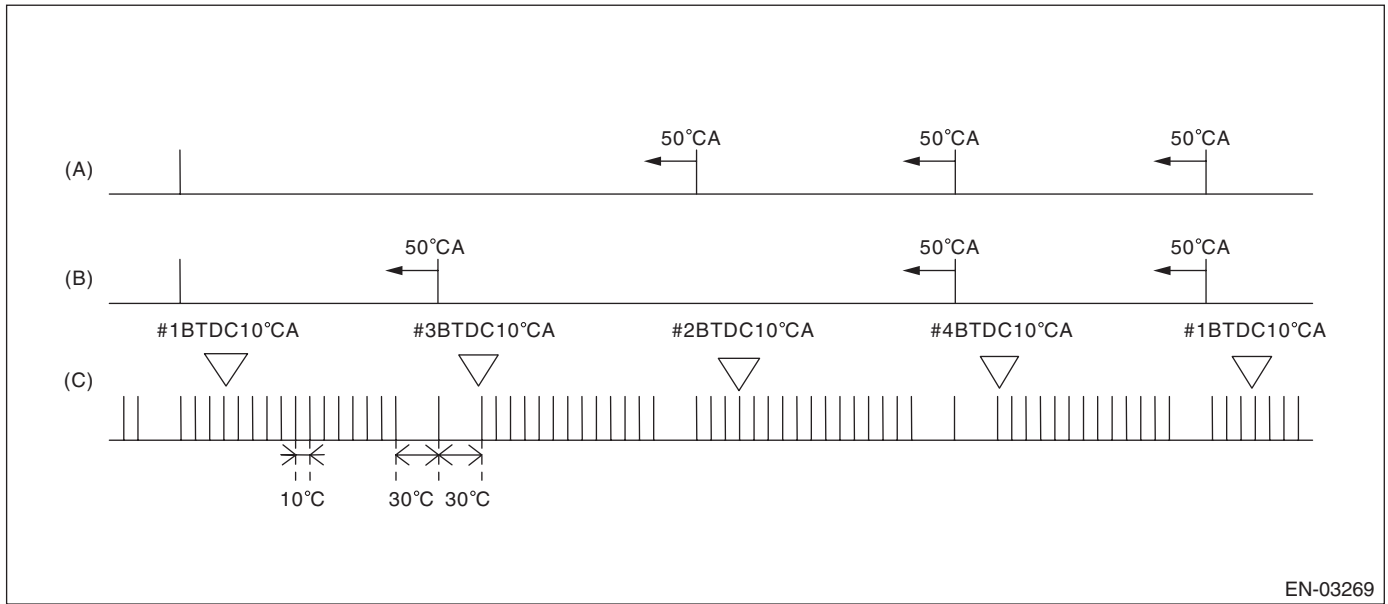
GENERAL DESCRIPTION

## AY:DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT

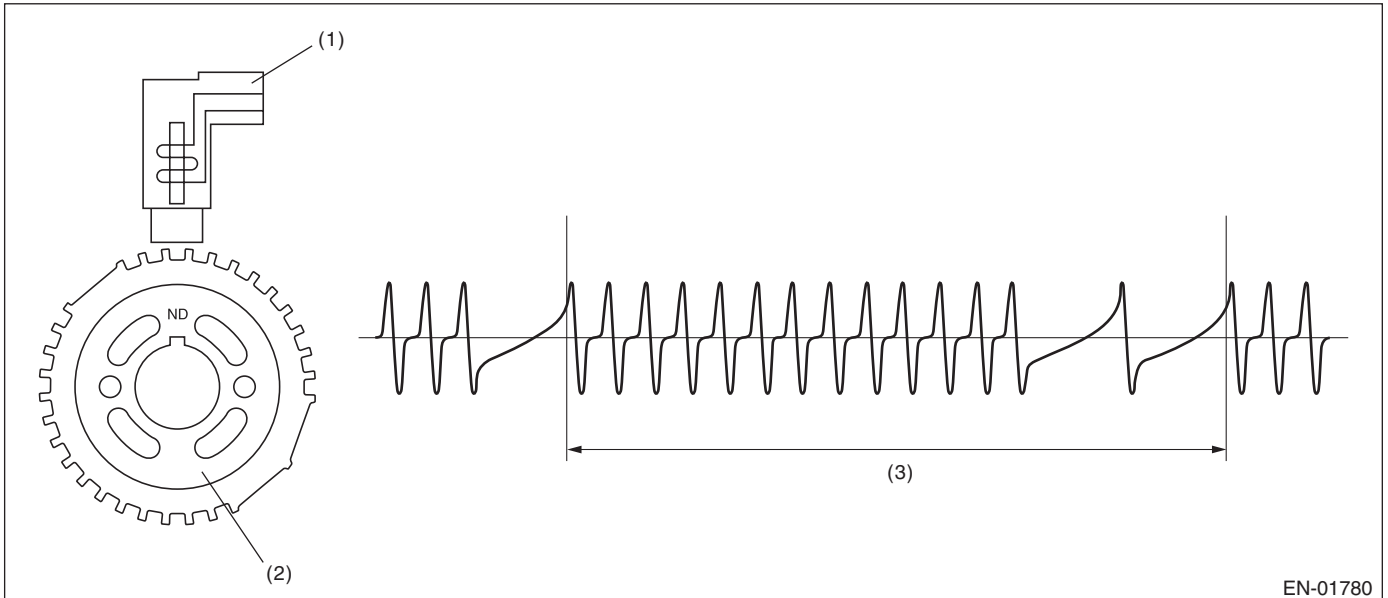
### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of crankshaft position sensor. Judge NG when the crankshaft signal does not input regardless of turning the starter.

### 2. COMPONENT DESCRIPTION



- (A) Camshaft signal RH
- (B) Camshaft signal LH
- (C) Crankshaft signal



- (1) Crankshaft position sensor
- (2) Crank sprocket
- (3) Crankshaft half-turn

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### Judgment Value

| Malfunction Criteria              | Threshold Value   |
|-----------------------------------|-------------------|
| Starter switch                    | ON                |
| Crankshaft position sensor signal | Not detected      |
| Battery voltage                   | $\geq 8\text{ V}$ |

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### • Normality Judgment

Judge OK when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### Judgment Value

| Malfunction Criteria              | Threshold Value   |
|-----------------------------------|-------------------|
| Crankshaft position sensor signal | Input exists      |
| Battery voltage                   | $\geq 8\text{ V}$ |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

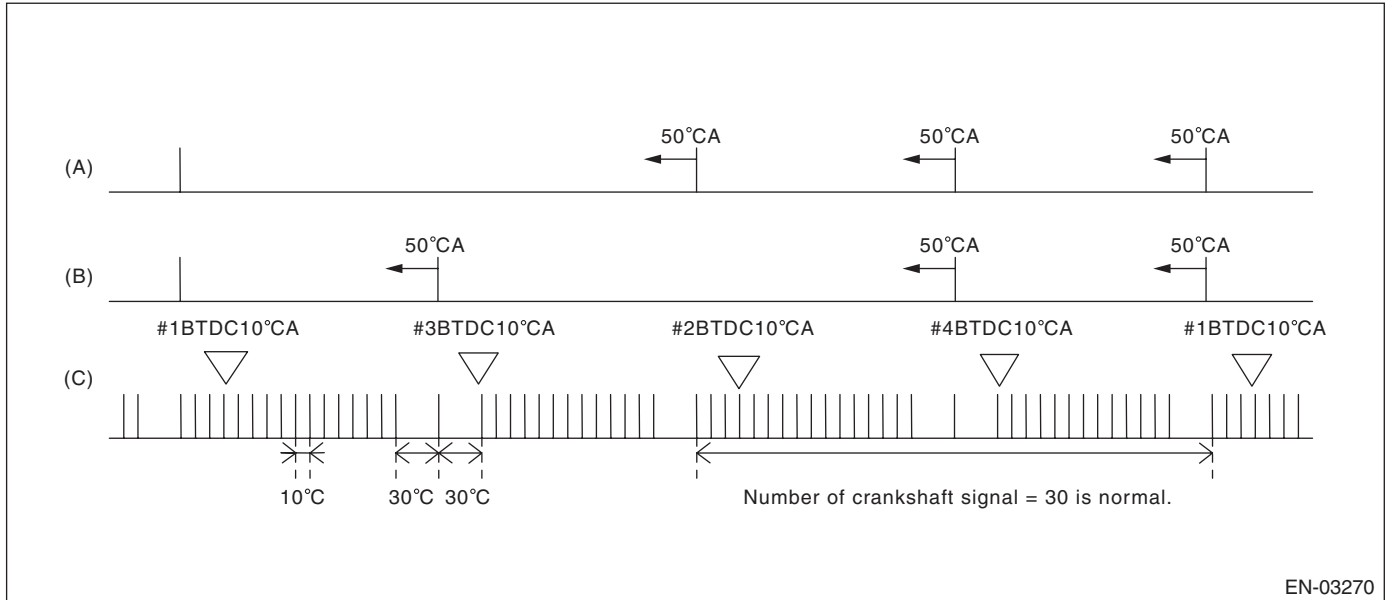
Memorize the freeze frame data. (For test mode \$02)

## AZ:DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE

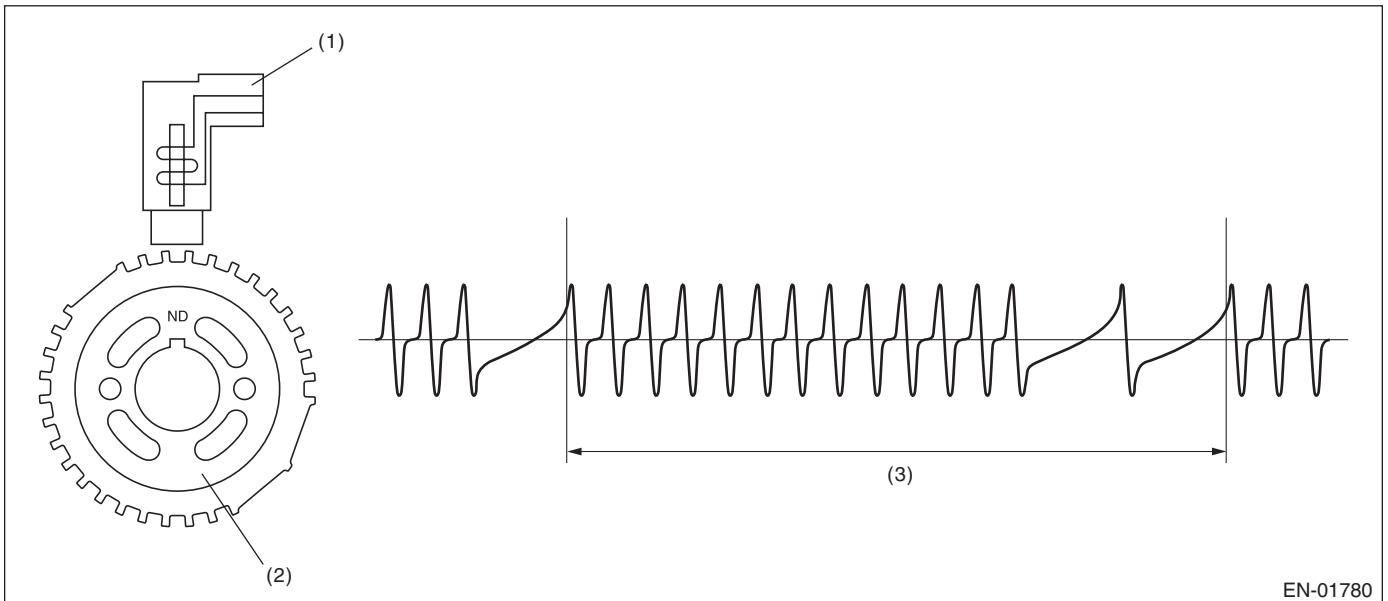
### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of crankshaft position sensor output property. Judge NG when the number of crankshaft signal every 1 revolution becomes abnormal.

### 2. COMPONENT DESCRIPTION



- (A) Camshaft signal RH
- (B) Camshaft signal LH
- (C) Crankshaft signal



- (1) Crankshaft position sensor
- (2) Crank sprocket
- (3) Crankshaft half-turn



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions     |
|----------------------|-----------------------|
| Battery voltage      | $\geq 8 \text{ V}$    |
| Engine speed         | $< 3,000 \text{ rpm}$ |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3,000 rpm engine speed.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when all the malfunction criteria below are completed more than 10 times in a row.

#### Judgment Value

| Malfunction Criteria                        | Threshold Value |
|---|-----------------|
| Cylinder number distinction                 | Completed       |
| Amount of crank sensor signal during 1 rev. | Not = 30        |

**Time Needed for Diagnosis:** 10 engine revs.

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                        | Threshold Value |
|---|-----------------|
| Cylinder number distinction                 | Completed       |
| Amount of crank sensor signal during 1 rev. | = 30            |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

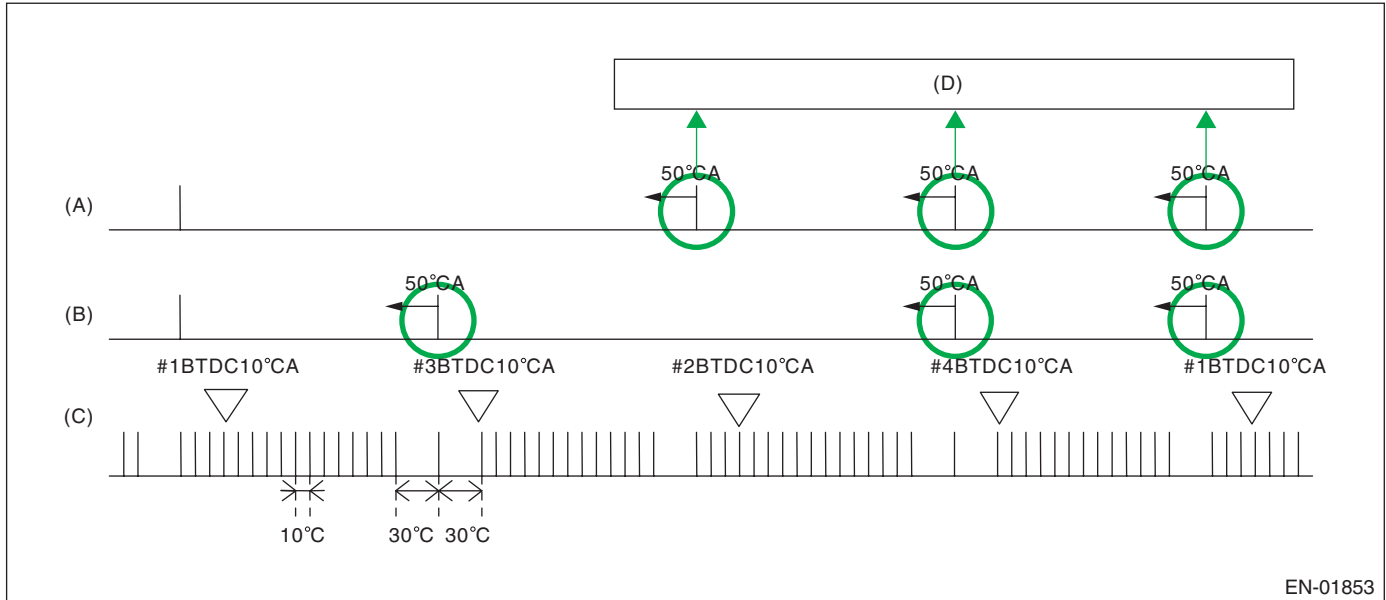
GENERAL DESCRIPTION

## BA:DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of camshaft position sensor. Judge NG when the number of camshaft signal remains to be abnormal.

### 2. COMPONENT DESCRIPTION



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- (A) Camshaft signal RH
- (B) Camshaft signal LH
- (C) Crankshaft signal

- (D) Number of camshaft position signals = Receive camshaft position signal 3 times per tow engine revolutions.

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Voltage              | ≥ 8 V             |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

The camshaft signal normally enters three times by two rev. of engine speed; however, judge NG when the camshaft signal does not enter three times continuously.

Judge NG when the malfunction criteria below are completed more than 100 rev. of engine speed. Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

| Malfunction Criteria                           | Threshold Value |
|--|-----------------|
| Number of camshaft sensor signal during 2 rev. | Except 3        |
| Engine speed                                   | ≥ 600 rpm       |

**Time Needed for Diagnosis:** 100 rev.

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                          | Threshold Value |
|---|-----------------|
| Number of camshaft angle signal during 2 rev. | 3               |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°C A) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°C A) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## **BB:DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2)**

#### NOTE:

For diagnostic procedure, refer to DTC P0340. <Ref. to GD(H4DOTC)-109, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

## BC:DTC P0410 SECONDARY AIR INJECTION SYSTEM

### 1. OUTLINE OF DIAGNOSIS

Detect leakage or blocking of secondary air injection system.

When the secondary air injection system is operated (pump is ON, right and left combi valves are open), close right and left combi valves, and detect NG by the secondary air supply pipe pressure and flow amount of secondary air pipe.

### 2. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions  |
|---|--|
| Presumed ambient temperature  | 4.4°C (40°F)   |
| Battery voltage   | 10.9 V   |
| After secondary air injection system is operated  | 0.6 seconds  |
| Battery voltage   | 7 V  |
| Atmospheric pressure  | 563 mmHg   |
| Engine  | In operation   |
| (Pressure measuring condition)  |  |
| Electric load change - after change<br>(Air conditioning, power steering, lights, rear defroster, heater fan, radiator fan, neutral switch) | More than 5 seconds  |
| Intake air amount   | 2 g (0.07 oz)/sec. or more<br>and<br>15 g (0.53 oz)/sec. or less |
| Engine speed  | ≥ 800 rpm<br>and<br>≤ 3,800 rpm                                  |
| Vehicle speed   | ≤ 0 km/h   |
| Canister purge duty   | ≥ 0%   |
| Variable amount of engine speed at every 128 milliseconds   | < 40rpm  |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis when the secondary air pump is operated.

### 4. DIAGNOSTIC METHOD

When the secondary air injection system is operated (pump is operated, right and left combi valves are open), close right and left combi valves respectively as following, and measure the secondary air supply pipe pressure and flow amount of secondary air pipe. Detect NG by 2 methods of pump supply pressure check and flow amount check.

#### Pump supply pressure check

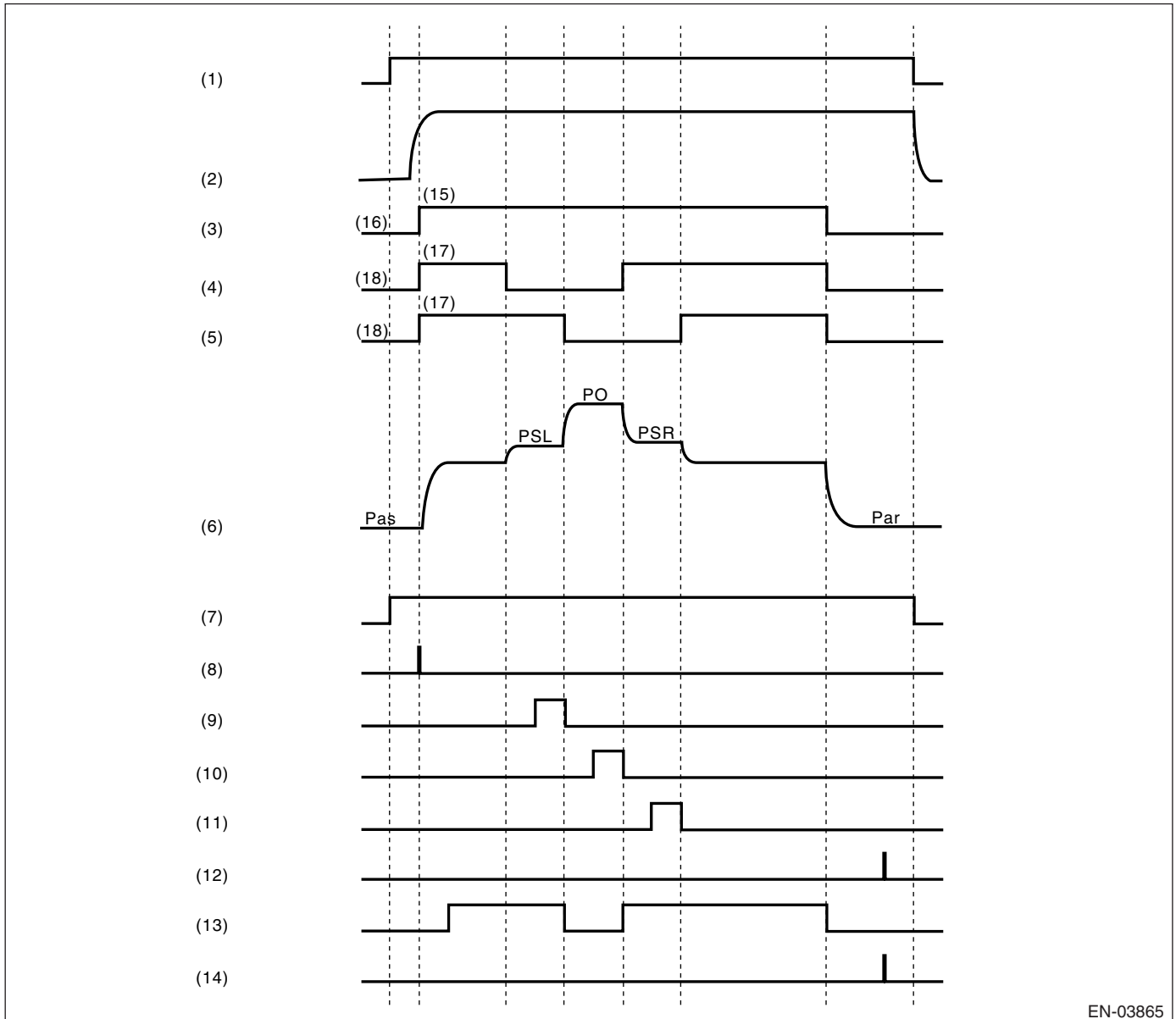
Judge NG for the pump supply pressure when secondary air supply pipe pressure is lower than ambient pressure and judge OK when it is higher, when the secondary air pump is ON.

#### Flow amount check

When the secondary air injection system is operated (pump is operated, right and left combi valves are open), close right combi valve → close left combi valve → open right combi valve → open left combi valve, measure each secondary air supply pipe pressure (PSL, P0, PSR) and calculate the flow amount of secondary air pipe by these measurements. Detect NG according to flow amount of secondary air pipe.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION



EN-03865

- |                                    |   |                                    |
|------------------------------------|---|------------------------------------|
| (1) IG                             | (9) Right bank closure pressure (PSL) measurement                     | (14) Flow amount check (judgement) |
| (2) Ne                             | (10) Both banks closure pressure (PO) measurement                     | (15) ON                            |
| (3) Secondary air pump is operated | (11) Left bank closure pressure (PSR) measurement                     | (16) OFF                           |
| (4) E-COMB valve (right) status    | (12) Ambient pressure after secondary air operation (Par) measurement | (17) Open                          |
| (5) E-COMB valve (left) status     | (13) Pump supply pressure check (judgement)                           | (18) Closed                        |

### Judgment Value

Judge NG when the malfunction criteria below are completed. Judge OK and clear the NG when the malfunction criteria below are not completed.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## Pump supply pressure check

| Malfunction Criteria                        | Threshold Value   | DTC   |
|---|-------------------|-------|
| Secondary air supply pipe relative pressure | < Value of Map 14 | P0410 |

## Map14

| Unit: kPa (mmHg, inHg) |      | Ambient pressure (kPa (mmHg, inHg)) |                   |                   |                   |                   |                   |                    |                    |
|------------------------|------|-------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|--------------------|--------------------|
|                        |      | 69.3 (520, 20.47)                   | 74.6 (560, 22.03) | 80.0 (600, 23.63) | 85.3 (640, 25.19) | 90.6 (680, 26.76) | 96.0 (720, 28.35) | 101.3 (760, 29.92) | 106.6 (800, 31.48) |
| Battery voltage (V)    | 10.5 | 0.93 (7, 0.275)                     | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)    | 0.93 (7, 0.275)    |
|                        | 11.5 | 0.93 (7, 0.275)                     | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)    | 0.93 (7, 0.275)    |
|                        | 12.5 | 0.93 (7, 0.275)                     | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)    | 0.93 (7, 0.275)    |
|                        | 13.5 | 0.93 (7, 0.275)                     | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)    | 0.93 (7, 0.275)    |
|                        | 14.5 | 0.93 (7, 0.275)                     | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)    | 0.93 (7, 0.275)    |
|                        | 15.5 | 0.93 (7, 0.275)                     | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)   | 0.93 (7, 0.275)    | 0.93 (7, 0.275)    |

## Flow amount check

| Malfunction Criteria  | Threshold Value                            | DTC   |
|---|--|-------|
| Incorrect flow<br>Presumed secondary air flow amount at bank 1 opened<br>or<br>Presumed secondary air flow amount at bank 2 opened<br>Map (P0 vs PSL) | > Value of Map 20<br><br>> Value of Map 19 | P0411 |
| Bank 1 is stuck open<br>Presumed secondary air flow amount at bank 1 opened<br>and<br>Both banks closure pressure                                     | < Value of Map 16<br><br>< Value of Map 18 | P2440 |
| Bank 1 is stuck closed<br>Presumed secondary air flow amount at bank 1 opened<br>and<br>Both banks closure pressure                                   | < Value of Map 16<br><br>≥ Value of Map 18 | P2441 |
| Bank 2 is stuck open<br>Presumed secondary air flow amount at bank 2 opened<br>and<br>Both banks closure pressure                                     | < Value of Map 15<br><br>< Value of Map 18 | P2442 |
| Bank 2 is stuck closed<br>Presumed secondary air flow amount at bank 2 opened<br>and<br>Both banks closure pressure                                   | < Value of Map 15<br><br>≥ Value of Map 18 | P2443 |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### Map 15, Map 16

| Unit: $\varnothing$ /min  |      | Intake air flow (g (oz)/s) |              |              |               |               |               |               |               |               |
|---------------------------|------|----------------------------|--------------|--------------|---------------|---------------|---------------|---------------|---------------|---------------|
|                           |      | 7<br>(0.247)               | 8<br>(0.282) | 9<br>(0.317) | 10<br>(0.353) | 11<br>(0.388) | 12<br>(0.423) | 13<br>(0.459) | 14<br>(0.494) | 15<br>(0.529) |
| Battery<br>voltage<br>(V) | 11.0 | 4.1                        | 1.0          | 1.0          | 1.0           | 1.0           | 1.0           | 1.0           | 1.0           | 1.0           |
|                           | 11.5 | 4.1                        | 4.1          | 1.0          | 1.0           | 1.0           | 1.0           | 1.0           | 1.0           | 1.0           |
|                           | 12.0 | 4.1                        | 4.1          | 4.1          | 1.0           | 1.0           | 1.0           | 1.0           | 1.0           | 1.0           |
|                           | 12.5 | 10.0                       | 10.0         | 10.0         | 4.1           | 4.1           | 4.1           | 1.0           | 1.0           | 1.0           |
|                           | 13.0 | 17.5                       | 17.5         | 17.5         | 10.0          | 10.0          | 10.0          | 4.1           | 1.0           | 1.0           |
|                           | 13.5 | 17.5                       | 17.5         | 17.5         | 17.5          | 17.5          | 17.5          | 17.5          | 4.1           | 4.1           |
|                           | 14.0 | 17.5                       | 17.5         | 17.5         | 17.5          | 17.5          | 17.5          | 17.5          | 10.0          | 10.0          |
|                           | 14.5 | 17.5                       | 17.5         | 17.5         | 17.5          | 17.5          | 17.5          | 17.5          | 10.0          | 10.0          |

### Map 18

| Unit: kPa (mmHg, inHg) |      | Ambient pressure (kPa (mmHg, inHg)) |                      |                      |                          |                          |                          |                          |                          |
|------------------------|------|-------------------------------------|----------------------|----------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
|                        |      | 69.3 (520,<br>20.47)                | 74.6 (560,<br>22.03) | 80.0 (600,<br>23.63) | 85.3 (640,<br>25.19)     | 90.6 (680,<br>26.76)     | 96.0 (720,<br>28.35)     | 101.3<br>(760,<br>29.92) | 106.6<br>(800,<br>31.48) |
| Battery<br>voltage (V) | 10.5 | 78.0 (585,<br>23.03)                | 84.0 (630,<br>24.80) | 90.0 (675,<br>26.58) | 96.0 (720,<br>28.35)     | 102.0<br>(765,<br>30.13) | 108.0<br>(810,<br>31.90) | 114.0<br>(855,<br>33.67) | 120.0<br>(900,<br>35.44) |
|                        | 11.5 | 79.3 (595,<br>23.42)                | 85.4 (641,<br>25.22) | 91.6 (687,<br>27.05) | 97.7 (733,<br>28.86)     | 103.7<br>(778,<br>30.63) | 109.8<br>(824,<br>32.43) | 116.0<br>(870,<br>34.26) | 122.1<br>(916,<br>36.06) |
|                        | 12.5 | 80.8 (606,<br>23.86)                | 86.9 (652,<br>25.67) | 93.2 (699,<br>27.53) | 99.3 (745,<br>29.33)     | 105.6<br>(792,<br>31.19) | 111.7<br>(838,<br>32.99) | 118.0<br>(885,<br>34.85) | 124.2<br>(932,<br>36.68) |
|                        | 13.5 | 82.1 (616,<br>24.25)                | 88.4 (663,<br>26.11) | 94.8 (711,<br>28.0)  | 101.0<br>(758,<br>29.83) | 107.3<br>(805,<br>31.69) | 113.7<br>(853,<br>33.58) | 120.0<br>(900,<br>35.44) | 126.2<br>(947,<br>37.27) |
|                        | 14.5 | 83.4 (626,<br>24.63)                | 89.8 (674,<br>26.52) | 96.2 (722,<br>28.41) | 102.8<br>(771,<br>30.36) | 109.2<br>(819,<br>32.25) | 115.6<br>(867,<br>34.14) | 122.0<br>(915,<br>36.03) | 128.4<br>(963,<br>37.92) |
|                        | 15.5 | 84.8 (636,<br>25.05)                | 89.8 (685,<br>26.52) | 97.8 (734,<br>28.89) | 104.4<br>(783,<br>30.83) | 110.9<br>(832,<br>32.75) | 117.4<br>(881,<br>34.67) | 124.0<br>(930,<br>36.62) | 130.5<br>(979,<br>38.54) |

### Map 19, Map 20

| Unit: $\varnothing$ /min  |      | Intake air flow (g (oz)/s) |                |                |                |                 |                 |                 |                 |                 |
|---------------------------|------|----------------------------|----------------|----------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                           |      | 2.0<br>(0.071)             | 4.0<br>(0.141) | 6.0<br>(0.212) | 8.0<br>(0.282) | 10.0<br>(0.353) | 12.0<br>(0.423) | 14.0<br>(0.494) | 16.0<br>(0.564) | 18.0<br>(0.635) |
| Battery<br>voltage<br>(V) | 10.5 | 290                        | 290            | 290            | 290            | 290             | 290             | 290             | 290             | 290             |
|                           | 11.5 | 330                        | 330            | 330            | 330            | 330             | 330             | 330             | 330             | 330             |
|                           | 12.5 | 370                        | 370            | 370            | 370            | 370             | 370             | 370             | 370             | 370             |
|                           | 13.5 | 420                        | 420            | 420            | 420            | 420             | 420             | 420             | 420             | 420             |
|                           | 14.5 | 470                        | 470            | 470            | 470            | 470             | 470             | 470             | 470             | 470             |
|                           | 15.5 | 520                        | 520            | 520            | 520            | 520             | 520             | 520             | 520             | 520             |

**Time Needed for Diagnosis:** 7 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## **BD:DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED**

#### NOTE:

For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-111, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### BE:DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT OPEN

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the ECM output level is different from the actual terminal level.

#### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| OFF                  |                   |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

##### Judgment Value

| Malfunction Criteria                           | Threshold Value |
|--|-----------------|
| Battery voltage                                | $\geq 10.9$ V   |
| Ignition                                       | ON              |
| Terminal voltage when ECM transmits OFF signal | Low             |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria                           | Threshold Value |
|--|-----------------|
| Battery voltage                                | $\geq 10.9$ V   |
| Ignition                                       | ON              |
| Terminal voltage when ECM transmits OFF signal | High            |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## BF:DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT SHORTED

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the ECM output level is different from the actual terminal level.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| OFF                  |                   |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria                          | Threshold Value |
|---|-----------------|
| Battery voltage                               | $\geq 10.9$ V   |
| Ignition                                      | ON              |
| Terminal voltage when ECM transmits ON signal | High            |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                          | Threshold Value |
|---|-----------------|
| Battery voltage                               | $\geq 10.9$ V   |
| Ignition                                      | ON              |
| Terminal voltage when ECM transmits ON signal | Low             |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## Diagnostic Trouble Code (DTC) Detecting Criteria

### GENERAL DESCRIPTION

---

#### **BG:DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT OPEN**

**NOTE:**

For the diagnostic procedure, refer to DTC P0413. <Ref. to GD(H4DOTC)-116, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **BH:DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED**

**NOTE:**

For the diagnostic procedure, refer to DTC P0414. <Ref. to GD(H4DOTC)-117, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## BI: DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT OPEN

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the ECM output level is different from the actual terminal level.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| OFF                  |                   |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria                           | Threshold Value |
|--|-----------------|
| Battery voltage                                | $\geq 10.9$ V   |
| Ignition                                       | ON              |
| Terminal voltage when ECM transmits OFF signal | Low             |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                           | Threshold Value |
|--|-----------------|
| Battery voltage                                | $\geq 10.9$ V   |
| Ignition                                       | ON              |
| Terminal voltage when ECM transmits OFF signal | High            |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

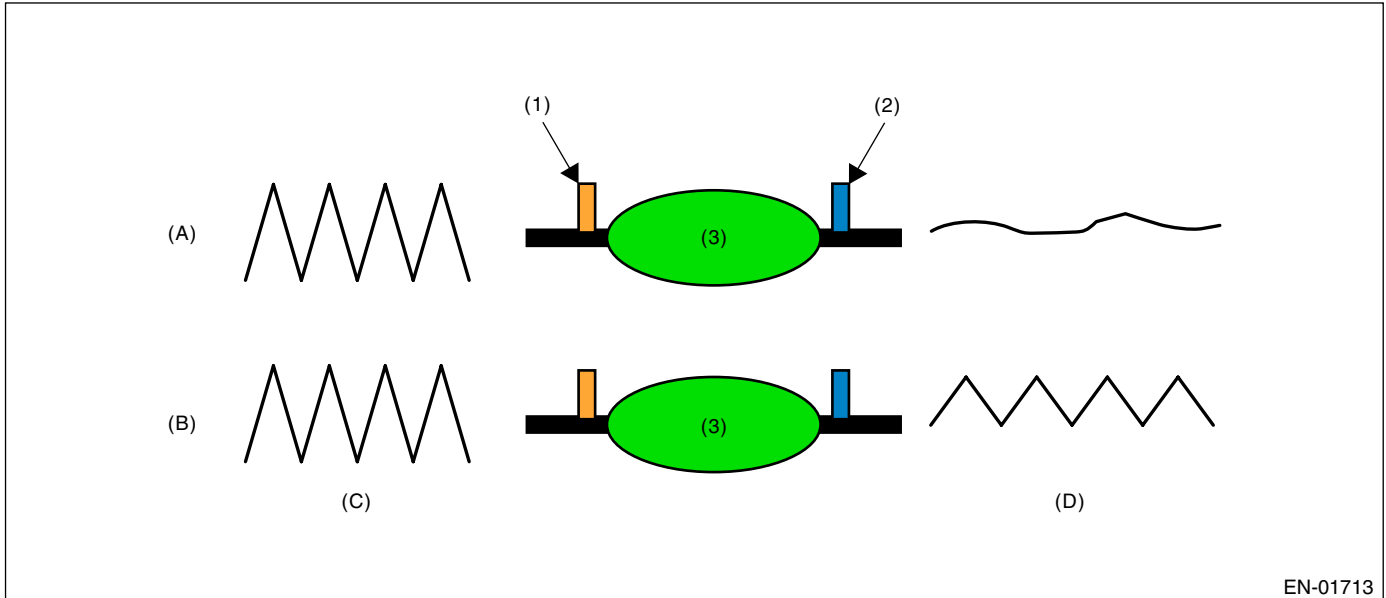
### BJ:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the deterioration of catalyst function.

Though the rear oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened. For this reason, the catalyst diagnosis is carried out by monitoring the rear oxygen sensor output and comparing it with the front A/F sensor output.

#### 2. COMPONENT DESCRIPTION



EN-01713

- (1) Front oxygen (A/F) sensor
- (2) Rear oxygen sensor
- (3) Catalyst

- (A) Normal
- (B) Deterioration
- (C) Front oxygen (A/F) sensor waveform
- (D) Rear oxygen sensor waveform

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions                |
|---|----------------------------------|
| Battery voltage   | > 10.9 V                         |
| Atmospheric pressure  | > 75.0 kPa (563 mmHg, 22.2 inHg) |
| Engine coolant temperature                                  | ≥ 70°C (158°F)                   |
| Catalyst warm-up counter on Map 2                           | ≥ 8,000                          |
| Misfire detection during 200 engine revs.                   | < 5 times                        |
| Learning value of evaporation gas density                   | < 0.20                           |
| Sub feedback  | Operating                        |
| Evaporative system diagnostic                               | Not in operation                 |
| Difference between actual and target time lambda < 0.10     | 1,000 milliseconds or more       |
| Vehicle speed   | ≥ 70 km/h (47 MPH)               |
| Amount of intake air  | 12 ←→ 40 g/s                     |
| Engine load change every 0.5 engine revs.                   | < 0.02 g/rev                     |
| Rear O <sub>2</sub> output change from below 660 mV to over | Experienced after fuel cut       |
| After engine starting                                       | ≥ 235 seconds                    |
| Purge execution cumulative time after engine starting       | ≥ 19.9 seconds                   |

### • Map 2

Add the following value every 512 milliseconds.

#### Catalyst warm-up counter ≤ 9,000

|                                      |    |    |     |    |    |    |    |    |    |     |     |     |
|--------------------------------------|----|----|-----|----|----|----|----|----|----|-----|-----|-----|
| Amount of intake air (g/s)           | 0  | 5  | 7.5 | 10 | 15 | 20 | 25 | 30 | 35 | 40  | 45  | 50  |
| Integrated value for warm-up counter | -5 | -5 | 1   | 11 | 25 | 40 | 57 | 72 | 87 | 100 | 100 | 100 |

#### Catalyst warm-up counter > 9,000

|                                      |     |    |     |    |    |    |    |    |    |    |    |    |
|--------------------------------------|-----|----|-----|----|----|----|----|----|----|----|----|----|
| Amount of intake air (g/s)           | 0   | 5  | 7.5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| Integrated value for warm-up counter | -16 | -8 | -1  | 3  | 6  | 8  | 9  | 11 | 13 | 14 | 14 | 14 |

## 4. GENERAL DRIVING CYCLE

Perform the diagnosis once at the constant vehicle speed of 75 km/h (47 MPH) or more after warming up the engine.

## 5. DIAGNOSTIC METHOD

After the malfunction criteria are completed, calculate the output fluctuation value of front oxygen (A/F) sensor and output fluctuation value of rear oxygen sensor.

Calculate the diagnosis value when the front oxygen (A/F) sensor output fluctuation value more than specified value.

Regard the A/F response properties and diagnosis value as parameters for judgment value.

Judge NG when the malfunction criteria below are completed, and judge OK when they are not completed.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Accumulated variation of output voltage of rear oxygen sensor per 32 milliseconds divided by accumulated variation of lambda of front oxygen (A/F) sensor per 32 milliseconds | $\geq 12.6$     |

**Time Needed for Diagnosis:** 33 — 55 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

None

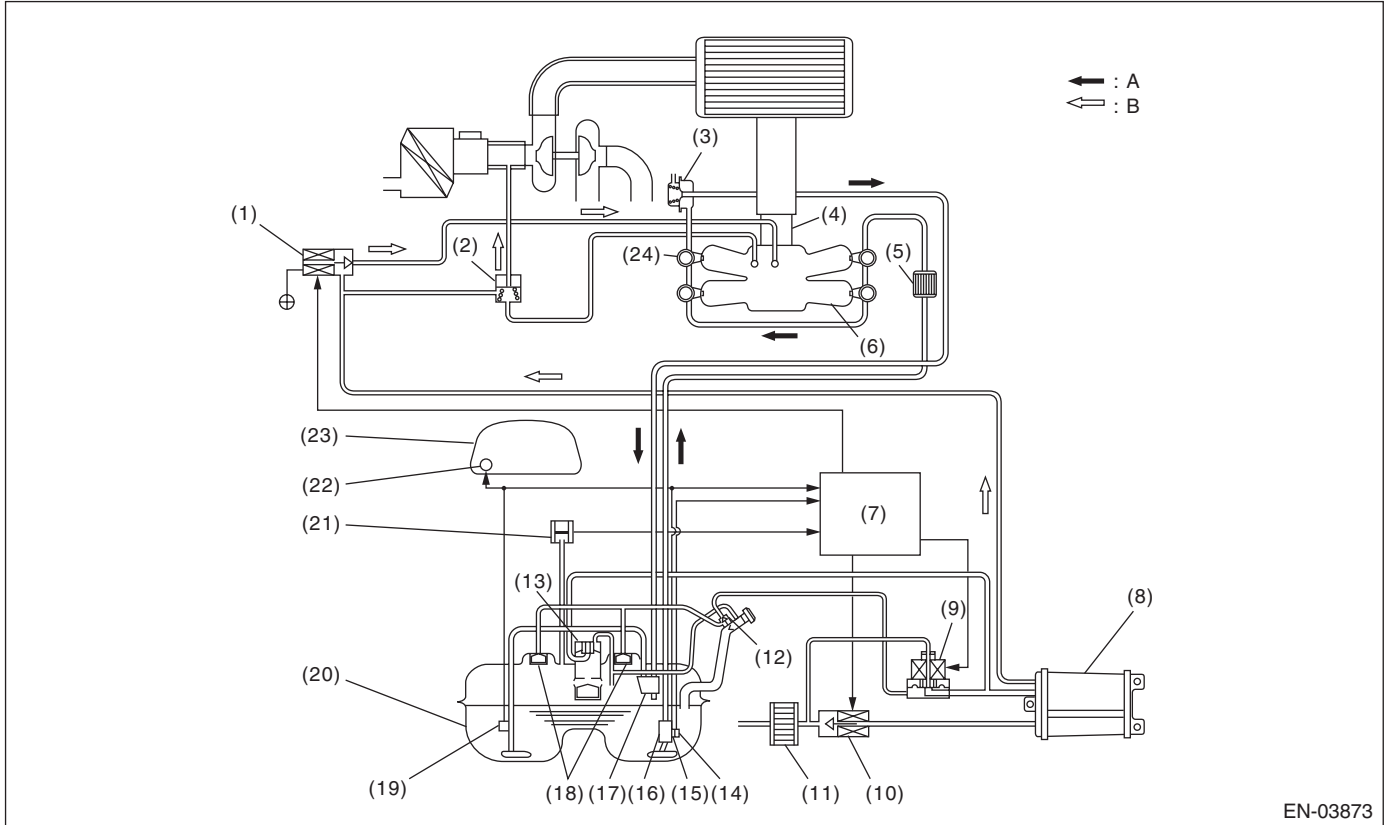
### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## BK:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

### 1. OUTLINE OF DIAGNOSIS

Perform the diagnosis of leakage of fuels system and valve functions.



EN-03873

- |                                     |                              |                                |
|-------------------------------------|------------------------------|--------------------------------|
| (1) Purge control solenoid valve    | (10) Drain valve             | (19) Fuel sub level sensor     |
| (2) Purge valve                     | (11) Drain filter            | (20) Fuel tank                 |
| (3) Pressure regulator              | (12) Shut-off valve          | (21) Fuel tank pressure sensor |
| (4) Throttle body                   | (13) Vent valve              | (22) Fuel gauge                |
| (5) Fuel filter                     | (14) Fuel temperature sensor | (23) Combination meter         |
| (6) Intake manifold                 | (15) Fuel level sensor       | (24) Fuel injector             |
| (7) Engine control module (ECM)     | (16) Fuel pump               | (A) Fuel line                  |
| (8) Canister                        | (17) Jet pump                | (B) Evaporation fuel line      |
| (9) Pressure control solenoid valve | (18) Fuel cut valve          |                                |

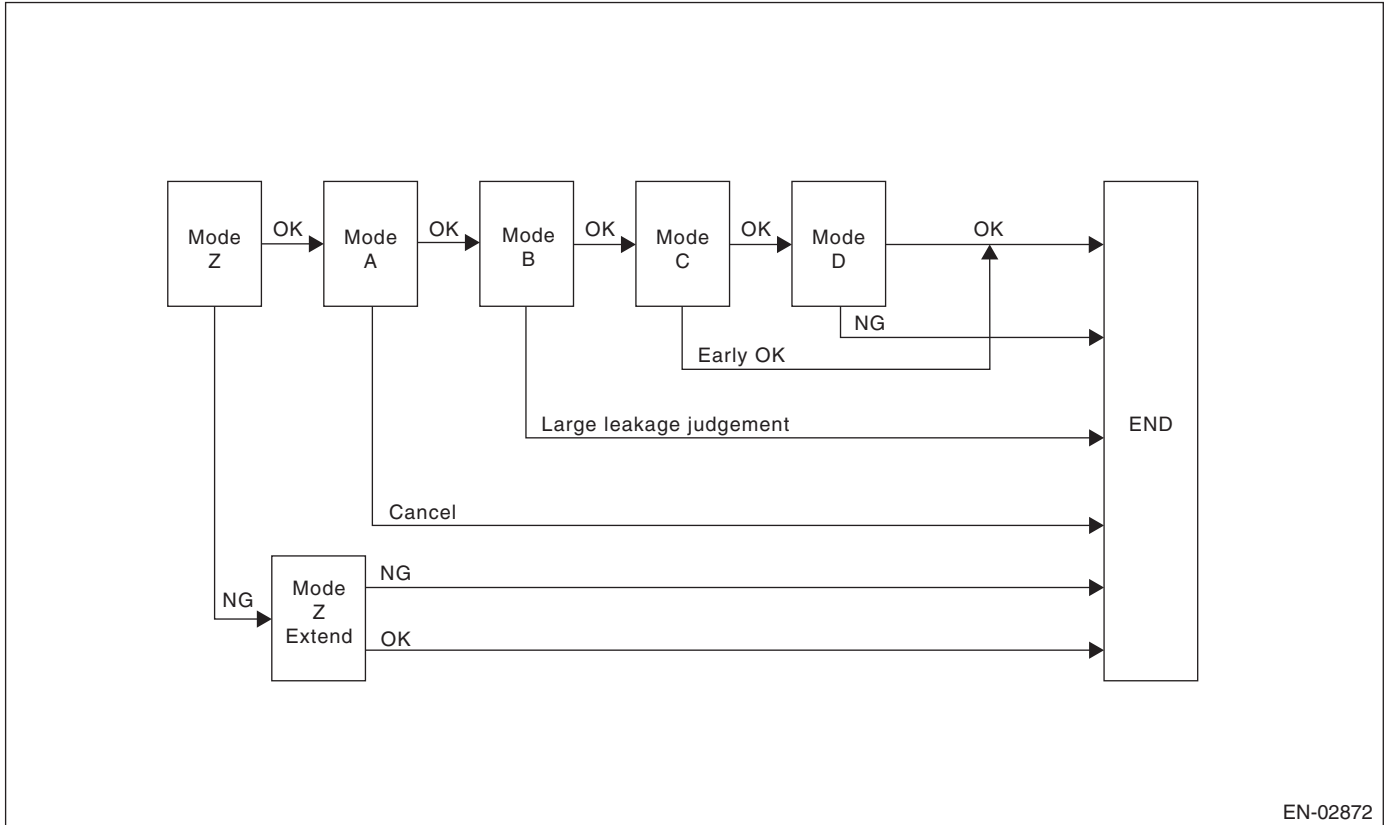
In this system diagnosis, filter tank pressure is changed. And leakage and normality & abnormality of valve operation are judged by monitoring the pressure change status using the fuel tank pressure sensor. The diagnosis is performed for 0.04-inch diagnosis in the order of Mode A, Mode B, Mode C and Mode D. For 0.02-inch diagnosis, perform in the order of Mode Y, Mode A, Mode B, Mode C and Mode D.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 0.04-inch Diagnosis



EN-02872

| Mode  | Mode Description  | Diagnosis Period |
|---|---|------------------|
| Mode Z<br>(Purge control solenoid valve open fail diagnosis)                    | Perform the diagnosis of purge control solenoid valve open fail depending on the magnitude of the tank pressure change after diagnosis started.                               | 3 — 16 seconds   |
| Mode A<br>(Evaluation of EVAP. generation amount)                               | Calculate the tank pressure change amount (P1).   | 10 seconds       |
| Mode B<br>(Negative pressure sealed/large leak judgment)                        | Introduce the intake manifold pressure into the fuel tank. If the tank pressure cannot be reduced, diagnose that there is large leakage.                                      | 5 — 25 seconds   |
| Mode C<br>(Pressure increase check/premature OK judgment)                       | Wait until the tank pressure returns to the target value (Tank pressure when P2 calculation started). If the pressure does not return, perform the premature OK judgment.     | 1 — 15 seconds   |
| Mode D<br>(Negative pressure change amount measurement/EVAP. leakage diagnosis) | Calculate the tank pressure change amount (P2), and measure the diagnosis value using P1 calculated in Mode A. Perform the EVAP. leakage diagnosis using the diagnosis value. | 10 seconds       |

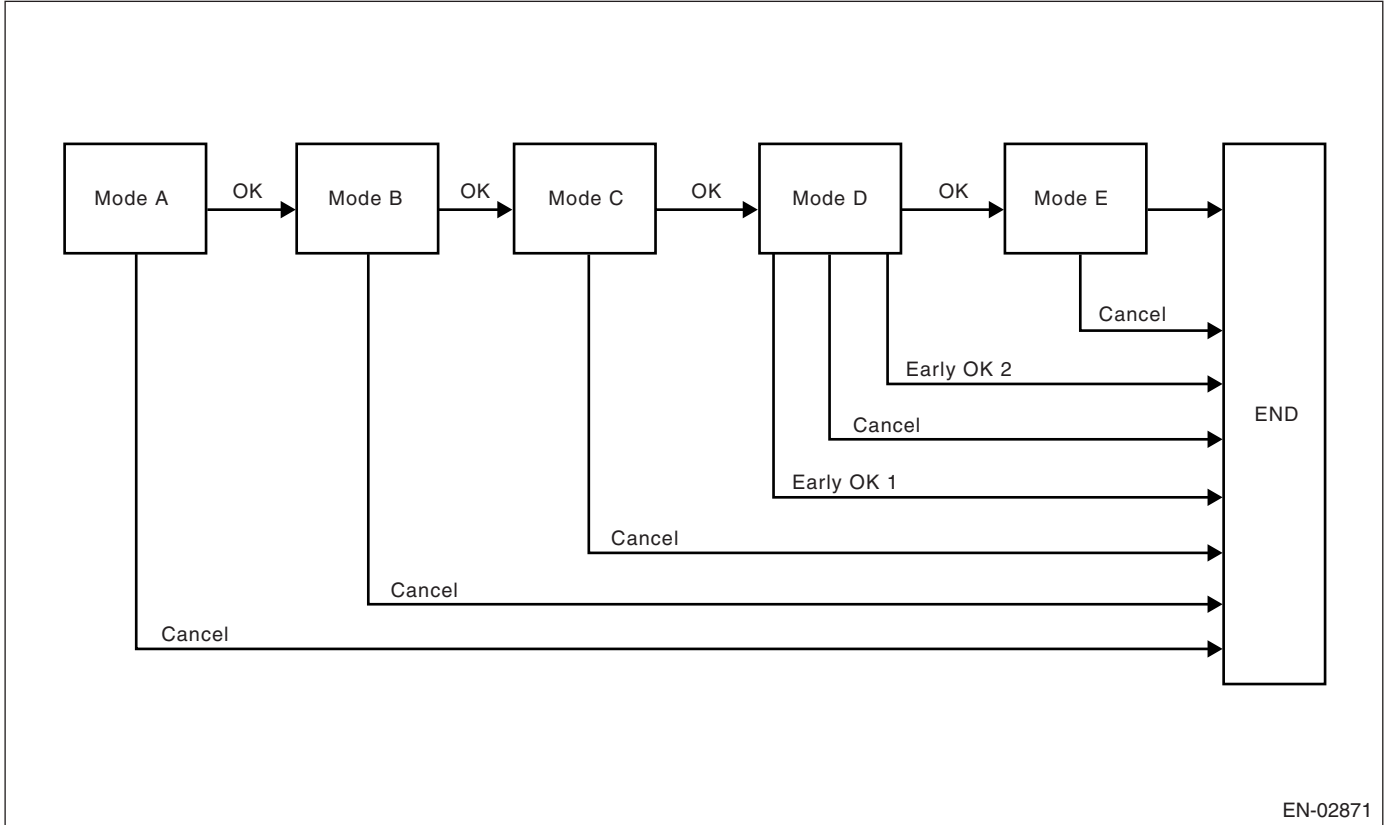
### Mode table for Evaporative Emission Control System diagnosis

| Mode   | Normal conditions   | Diagnostic item  | DTC   |
|--------|---|--|-------|
| Mode Z | Nearly same as atmospheric pressure (equivalent pressure of 0 kPa (0 mmHg, 0 inHg)) | Purge control solenoid valve is judged to be open.           | P0457 |
| Mode A | Pressure is in proportion to amount of evaporative emission.                        | —  | —     |
| Mode B | Negative pressure is formed due to intake manifold negative pressure                | Large leak   | P0457 |
| Mode C | Target pressure is reached.   | —  | —     |
| Mode D | Pressure change is small.   | EVAP system is judged to have large leak [1.0 mm (0.04 in)]. | P0442 |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 0.02-inch Diagnosis



EN-02871

| Mode   | Mode Description   | Diagnosis Period |
|--|--|------------------|
| Mode A<br>(0 point correction)                         | Wait until the tank pressure returns to 0 point (around 0 mmHg) when tank pressure is high.  | 0 — 12 seconds   |
| Mode B<br>(Introduce negative pressure)                | Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value.   | 0 — 27 seconds   |
| Mode C<br>(Maintain negative pressure)                 | Wait until the tank pressure returns to target pressure (start pressure of P2 calculation).  | 0 — 20 seconds   |
| Mode D<br>(Calculation of negative pressure variation) | Calculate the time until the tank pressure returns the end pressure of P2 calculation.<br>Make advanced OK judgment when the tank pressure does not return the end pressure of P2 calculation. | 0 — 200 seconds  |
| Mode E<br>(Calculation of Evaporative gas yield)       | Calculate the amount of evaporative gas yield (P1).  | 0 — 280 seconds  |

# Diagnostic Trouble Code (DTC) Detecting Criteria

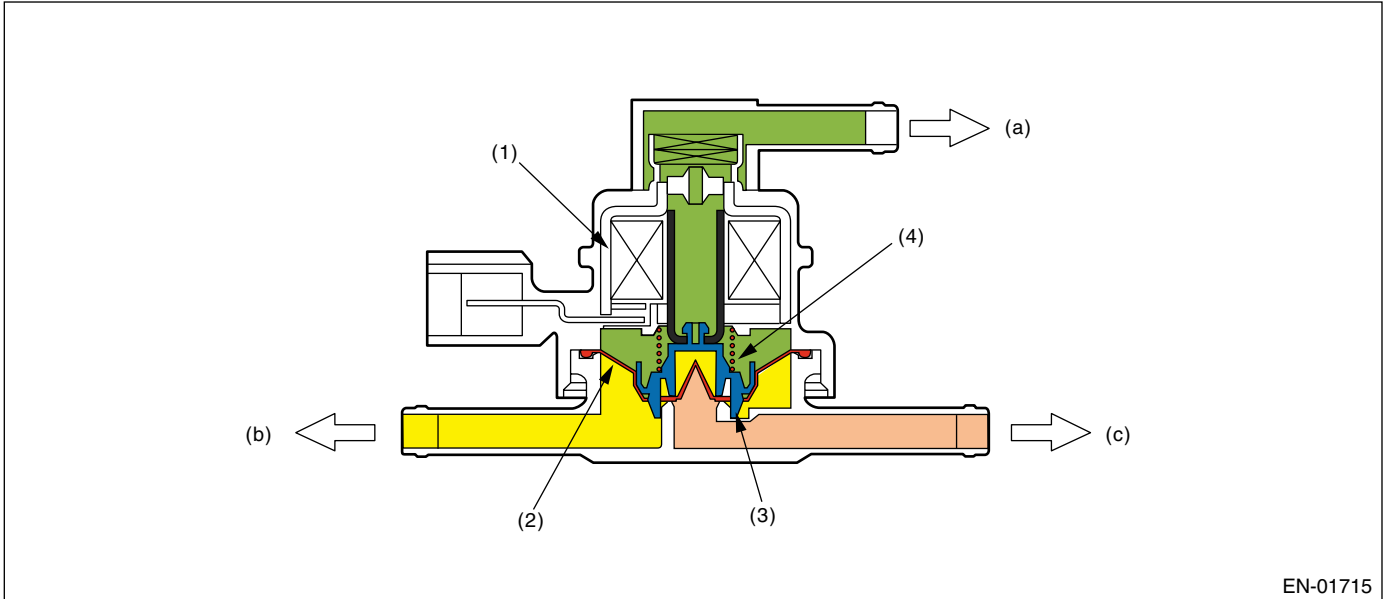
## GENERAL DESCRIPTION

### 2. COMPONENT DESCRIPTION

#### • Pressure Control Solenoid Valve

Pressure control solenoid valve maintains the fuel tank pressure equal to the atmospheric air pressure. Normally, the solenoid is set to OFF, and the valve mechanically opens and closes in accordance with the difference between the tank pressure and atmospheric air pressure, and the tank pressure and canister pressure.

The solenoid which is set to ON forces to open the valve.



EN-01715

- (1) Solenoid
- (2) Diaphragm
- (3) Valve
- (4) Spring

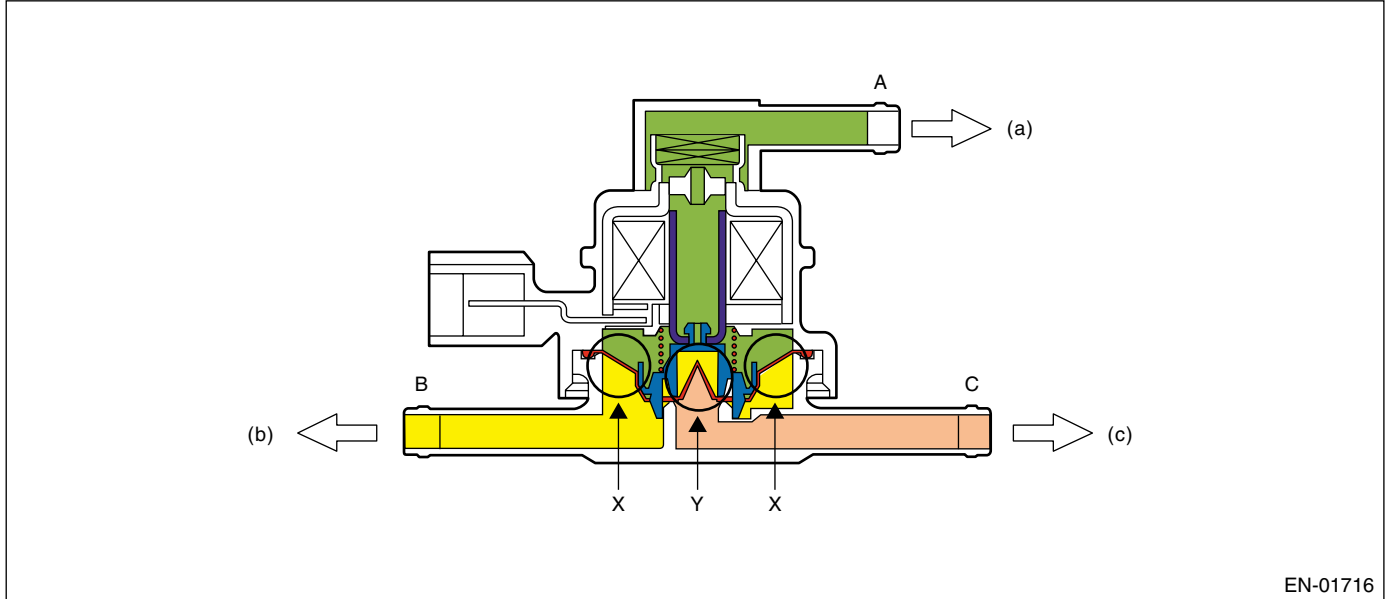
- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Valve Operation and Air Flow

As in the X parts below, there are the area with atmospheric air pressure above the diaphragm and the area with tank pressure below the diaphragm. Also, as in the Y parts below, there are the area with tank pressure above the diaphragm and the area with canister pressure below the diaphragm. In the table below the air flow from each port in accordance with pressure difference is shown with the atmospheric air pressure port A, tank pressure port B and canister pressure port C.



EN-01716

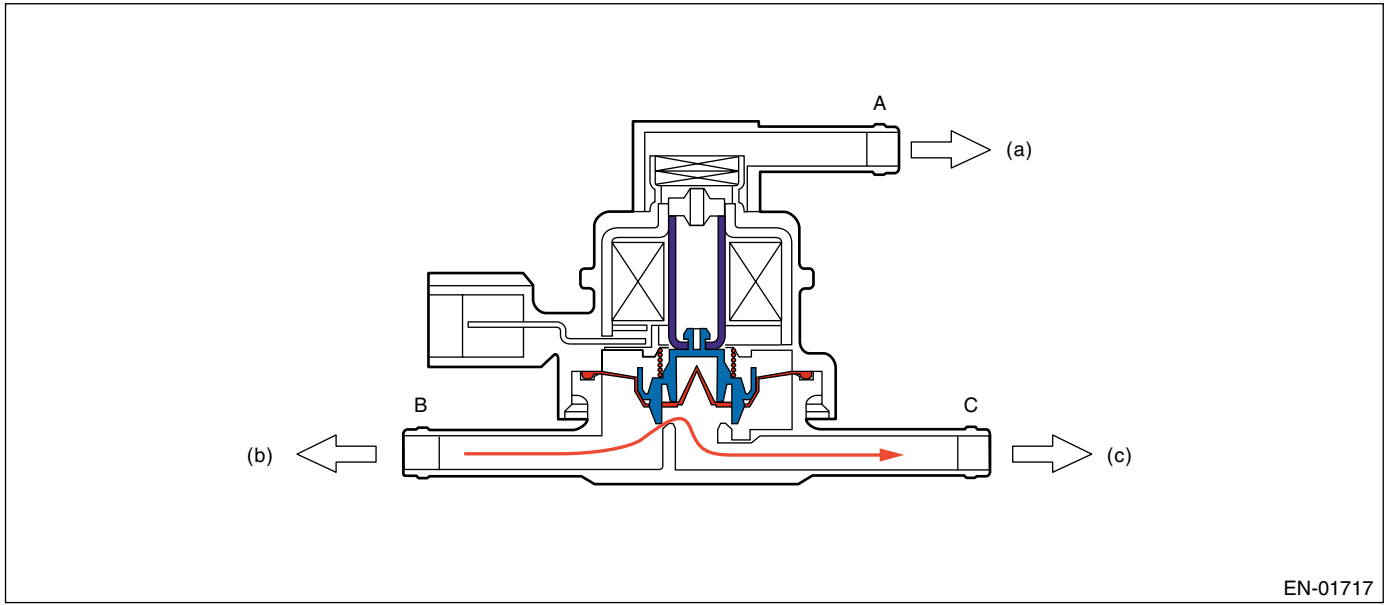
- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

| Pressure Status        | Flow                  |
|------------------------|-----------------------|
| $A < B$ (Solenoid OFF) | $B \rightarrow C$     |
| $B < C$ (Solenoid OFF) | $C \rightarrow B$     |
| Solenoid ON            | $B \leftrightarrow C$ |

# Diagnostic Trouble Code (DTC) Detecting Criteria

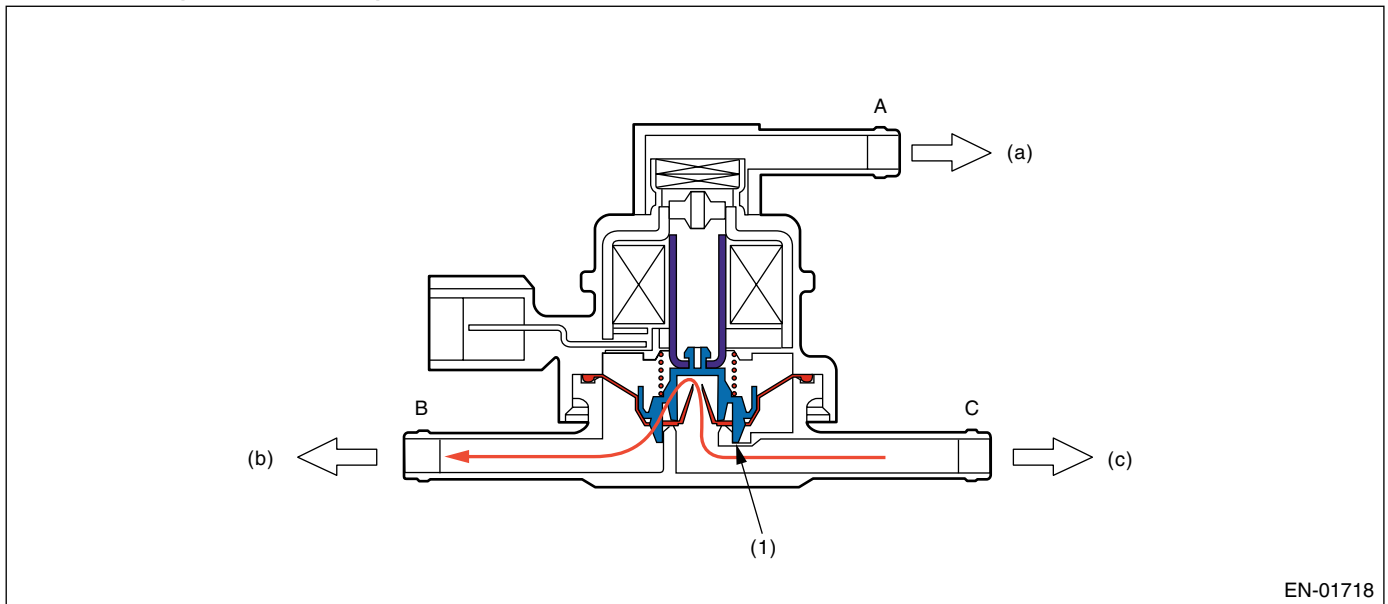
## GENERAL DESCRIPTION

### When $A < B$ (Solenoid OFF)



- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

### When $B < C$ (Solenoid OFF)

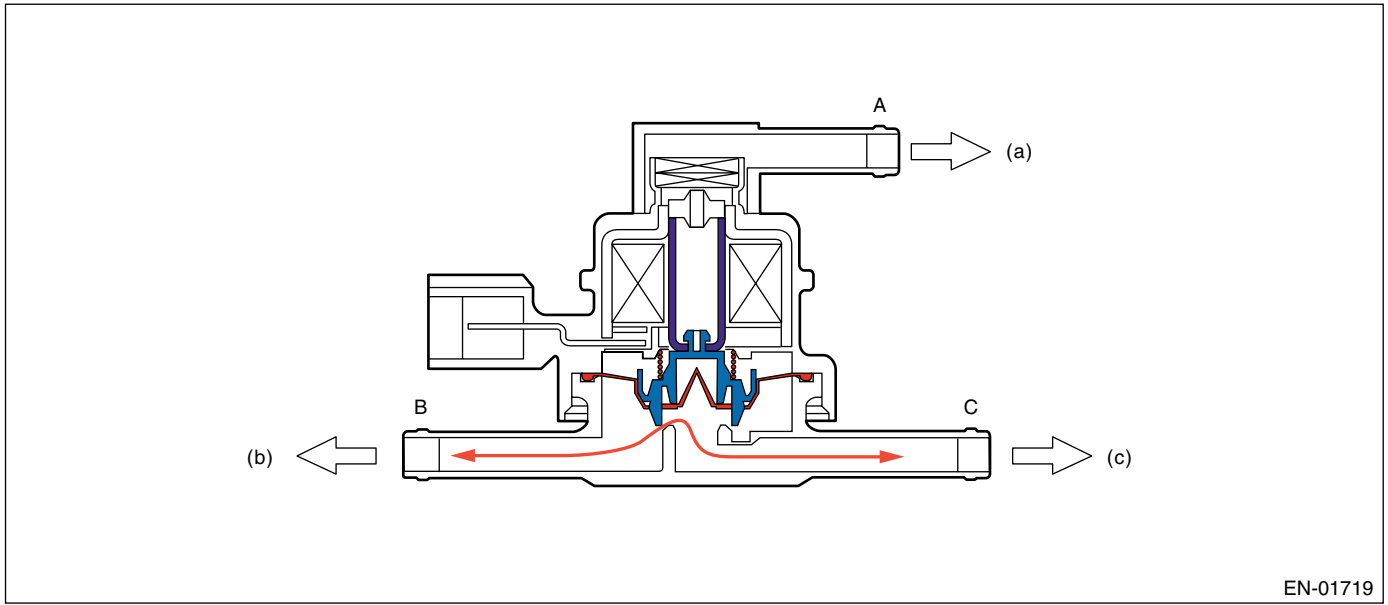


- (1) Valve
- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

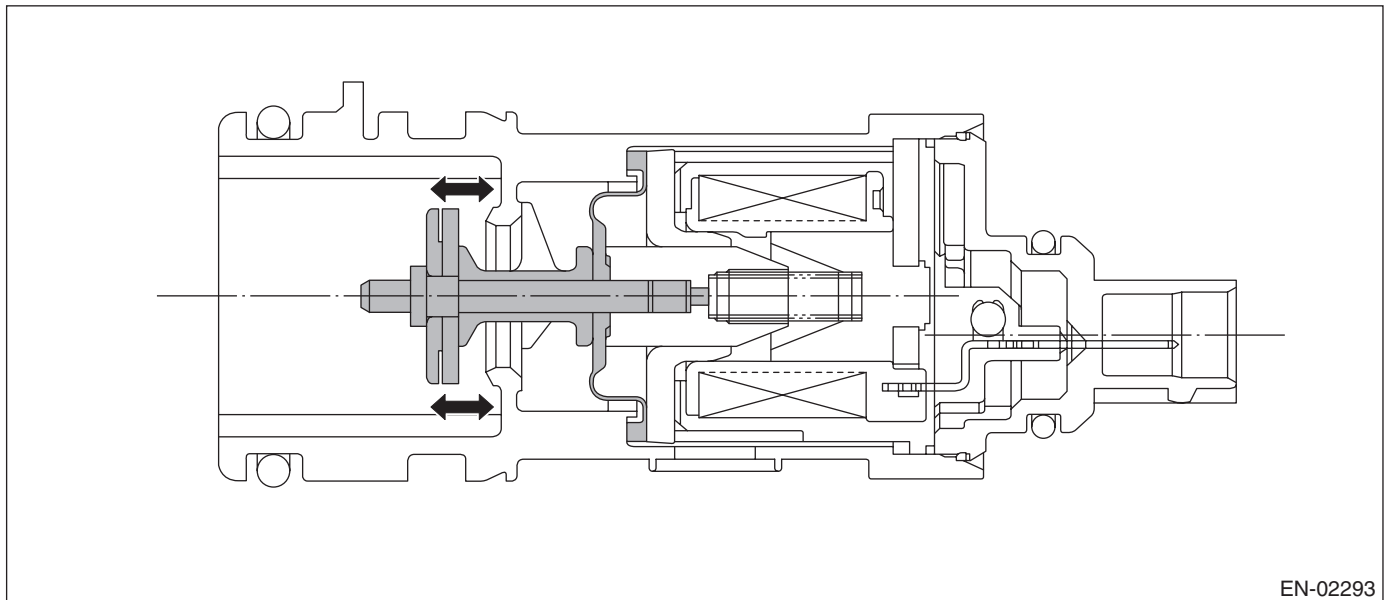
## When solenoid is ON



- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

### • Drain valve

Drain valve controls the ambient air to be introduced to the canister.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 3. ENABLE CONDITION

#### 0.04-inch Diagnosis

| Secondary Parameters  | Enable Conditions   |
|---|---|
| Battery voltage   | ≥ 10.9 V  |
| Barometric pressure   | ≥ 75.0 kPa (563 mmHg, 22.2 inHg)  |
| Cumulative time of canister purge                                 | 120 seconds or more   |
| After engine starting   | 856 seconds or more   |
| Learning value of evaporation gas density                         | ≤ 0.04  |
| Engine speed  | 1,050 ↔ 6,500 rpm   |
| Fuel tank pressure  | ≥ -1.4 kPa (-10.7 mmHg, -0.42 inHg)   |
| Intake manifold vacuum (relative pressure)                        | < -13.3 kPa (-100 mmHg, -3.94 inHg)   |
| Vehicle speed   | ≥ 32 km/h (19.9 MPH)  |
| Fuel level  | 9 ↔ 51 ℓ (2.38 ↔ 13.47 US gal, 1.98 ↔ 11.22 Imp gal)                                    |
| Closed air/fuel ratio control                                     | In operation  |
| Fuel temperature  | -10 ↔ 45°C (14 ↔ 113°F)   |
| Intake air temperature  | ≥ -10°C (14°F)  |
| Pressure change per second  | < 0.23 kPa (1.7 mmHg, 0.07 inHg)  |
| Min. pressure change per second – Max. pressure change per second | < 0.23 kPa (1.7 mmHg, 0.07 inHg)  |
| Fuel level change   | < 2.5 ℓ /128 milliseconds (0.66 US gal/128 milliseconds, 0.55 Imp gal/128 milliseconds) |
| Air fuel ratio  | 0.76 — 1.25   |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 0.02-inch Diagnosis

| Secondary Parameters  | Enable Conditions                                     |
|---|---|
| (At starting a diagnosis)   |   |
| Evaporation diagnosis   | Not completed   |
| Battery voltage   | ≥ 10.9 V  |
| Atmospheric pressure  | ≥ 75.0 kPa (563 mmHg, 22.2 inHg)                      |
| Since last incomplete diagnosis event of 0.02-inch leakage                  |   |
| Cancelled at mode A   | > 120 seconds   |
| Cancelled at other than mode A  | > 600 seconds   |
| Cumulative time of canister purge   | 120 seconds or more                                   |
| After engine starting   | 770 second or more                                    |
| Fuel temperature  | -10 — 70°C (14 — 158°F)                               |
| Fuel level  | 9 — 51 ℓ (2.38 — 13.47 US gal, 1.98 — 11.22 Imp gal)  |
| Intake manifold vacuum (relative pressure)                                  | < -13.3 kPa (-100 mmHg, -3.93 inHg)                   |
| Fuel tank pressure  | -0.67 — 1.43 kPa (-5 — 10.7 mmHg, -0.20 — 0.42 inHg)  |
| Vehicle speed   | ≥ 68 km/h (42 MPH)                                    |
| Closed air/fuel ratio control   | In operation  |
| Engine speed  | 550 ↔ 6,000 rpm                                       |
| (During diagnosis)  |   |
| Fuel level change   | ≤ Value of Map  |
| Pressure change per second  | < 0.06 kPa (0.44 mmHg, 0.02 inHg)                     |
| Min. tank pressure change per second – Max. tank pressure change per second | < 0.07 kPa (0.51 mmHg, 0.02 inHg)                     |
| ITank pressure change per secondI   | ≤ 0.1 kPa (0.75 mmHg, 0.03 inHg)                      |
| Pressure change (Mode D)  | -0.47 ↔ 0.32 kPa (-3.5 ↔ 2.4 mmHg, -0.14 ↔ 0.09 inHg) |
| Pressure change (Mode E)  | -0.32 ↔ 0.32 kPa (-2.4 ↔ 2.4 mmHg, -0.09 ↔ 0.09 inHg) |

## Map

|                                   |                 |                 |                |                 |                 |                |                 |
|-----------------------------------|-----------------|-----------------|----------------|-----------------|-----------------|----------------|-----------------|
| Fuel level ( ℓ , US gal, Imp gal) | 0               | 10, 2.64, 2.2   | 20, 5.28, 4.4  | 30, 7.93, 6.6   | 40, 10.57, 8.8  | 50, 13.21, 11  | 60, 15.85, 13.2 |
| Variation ( ℓ , US gal, Imp gal)  | 4.2, 1.11, 0.92 | 4.2, 1.11, 0.92 | 4.1, 1.08, 0.9 | 4.0, 1.06, 0.88 | 3.9, 1.03, 0.86 | 3.8, 1.0, 0.84 | 3.8, 1.0, 0.84  |



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 4. GENERAL DRIVING CYCLE

#### 0.04-inch Diagnosis

- Perform the diagnosis only once in more than 856 seconds after the engine start at the constant driving speed of 32 km/h (19.9 MPH) or more.
- Pay attention to the fuel temperature and fuel level.

#### 0.02-inch Diagnosis

- Perform diagnosis in more than 770 seconds after engine start at the constant speed of 68 km/h (42 MPH) or more, and judged OK or NG.
- If not judged OK or NG, repeat the diagnosis.
- Pay attention to the fuel level.

### 5. DIAGNOSTIC METHOD

#### • Diagnosing Function of Purge Control Solenoid Valve

#### DTC

P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

#### Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, purge control solenoid valve have to operate normally. Therefore, mode Z is used to diagnose the purge control solenoid valve open fixation.

If purge control solenoid valve open fixation trouble is detected, the evaporation system leakage diagnosis is cancelled.

#### • Diagnosing function of purge control solenoid valve [P0457]

Purge control solenoid valve functional diagnosis is performed by monitoring the tank pressure in Mode Z.

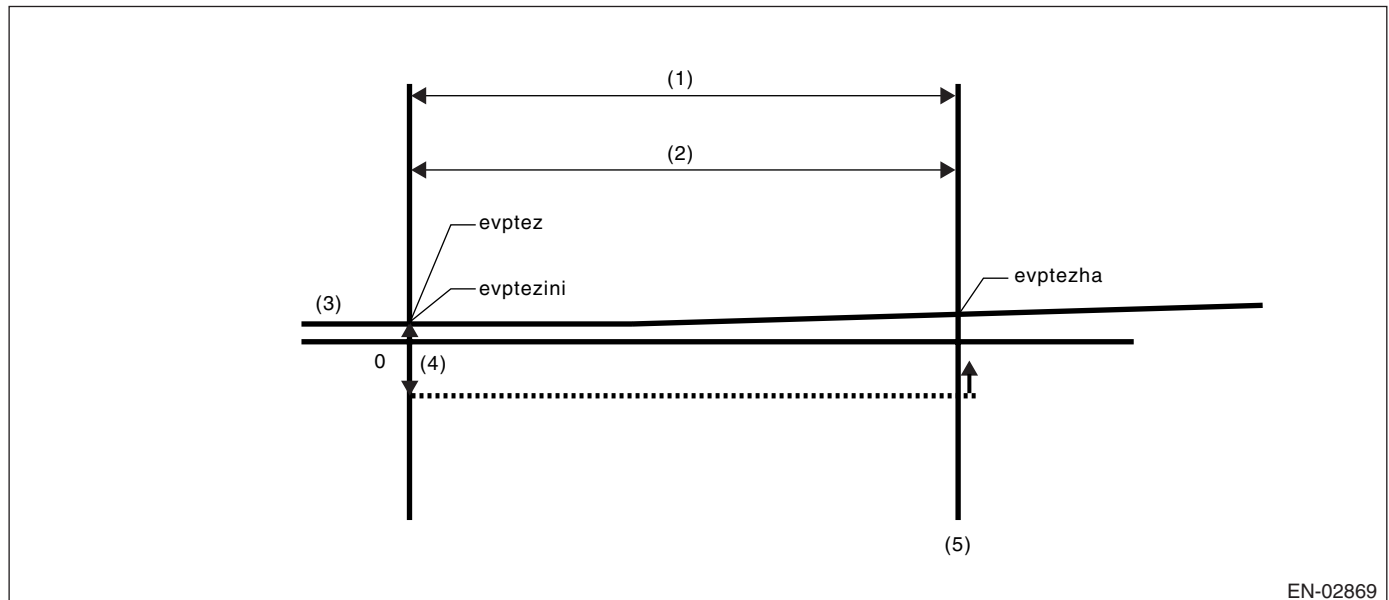
#### Normality Judgment

Judge OK when the following criteria are satisfied in 3 seconds after Mode Z started, and change to Mode A.

#### Judgment Value

| Malfunction Criteria  | Threshold Value                       | DTC   |
|---|---------------------------------------|-------|
| (Tank pressure when Mode Z started) —<br>(Tank pressure when Mode Z finished) | $\leq 0.4$ kPa (3 mmHg,<br>0.12 inHg) | P0457 |

#### • Normal



EN-02869

- |               |                                   |                  |
|---------------|-----------------------------------|------------------|
| (1) Mode Z    | (3) Fuel tank pressure            | (5) OK judgement |
| (2) 3 seconds | (4) 0.4 kPa (3.0 mmHg, 0.12 inHg) |                  |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Judge normal when the following conditions are completed at once.

- $evptez - evptezha \leq 0.4 \text{ kPa}$  (3.0 mmHg, 0.12 inHg)
- $evptezini - evptezha \leq 0.71 \text{ kPa}$  (5.3 mmHg, 0.21 inHg)

## Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge NG when all the criteria below are completed in 16 seconds.

## Judgment Value

| Malfunction Criteria   | Threshold Value                                | DTC   |
|--|--|-------|
| (Tank pressure 1 second after Mode Z started) – (Tank pressure when Mode Z finished) | $> 0.6 \text{ kPa}$ (4.5 mmHg, 0.18 inHg)      | P0457 |
| Tank pressure when Mode Z started  | $\leq 1.43 \text{ kPa}$ (10.7 mmHg, 0.42 inHg) |       |
| Time for no fuel rolling of 2 $\varnothing$ or more                                  | $\geq 40 \text{ seconds}$                      |       |

**Time Needed for Diagnosis:** 16 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

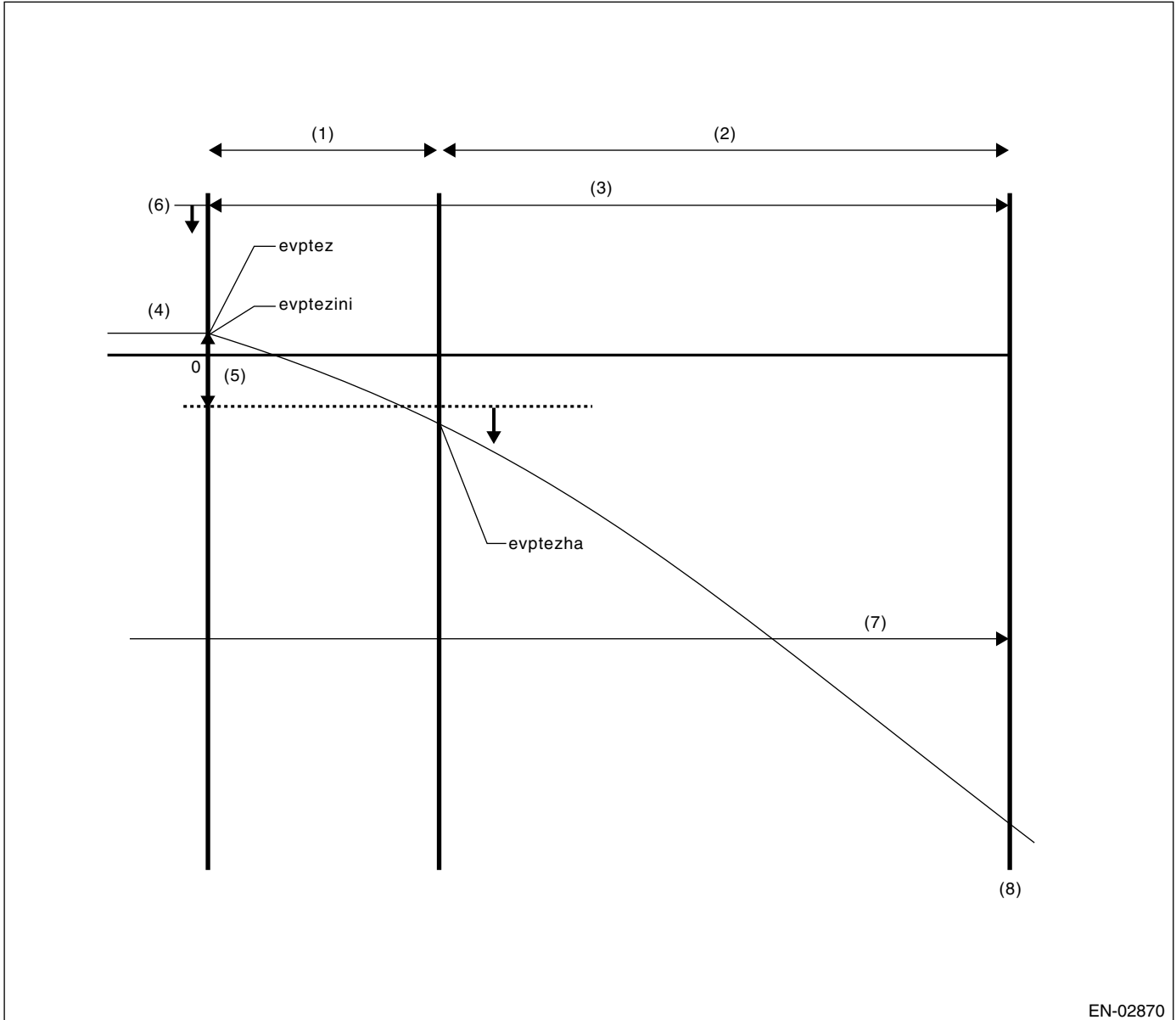
Finish the Evap. diagnosis when making NG judgment for purge control solenoid valve open fixation.

Cancel the Evap. diagnosis when the OK/NG judgment for purge control solenoid valve open fixation cannot be made in Mode Z.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • Purge control solenoid valve open fixation



EN-02870

- |                     |                                     |  |
|---------------------|-------------------------------------|--|
| (1) Mode Z          | (4) Fuel tank pressure              | (7) No fuel rolling for more than 40 seconds |
| (2) Extended mode Z | (5) 0.87 kPa (6.5 mmHg, 0.26 inHg)  | (8) NG judgement                             |
| (3) 16 seconds      | (6) 1.43 kPa (10.7 mmHg, 0.42 inHg) |  |

- $evptezini, evptez \leq 1.43 \text{ kPa (10.7 mmHg, 0.42 inHg)}$
  - $evptez - evptezha \leq 0.87 \text{ kPa (6.5 mmHg, 0.26 inHg)}$
  - $evptezini - evptezha \leq 0.87 \text{ kPa (6.5 mmHg, 0.26 inHg)}$
  - No fuel rolling of above 2  $\varnothing$  (0.53 US gal, 0.44 Imp gal) for more than 40 seconds.
- Judge normal when all the calculations are completed.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Leak Diagnosis

### DTC

P0442 Evaporative Emission Control System Leak Detected (small leak)

P0457 Evaporative Emission Control System Leak Detected (fuel cap loose/off)

### Diagnostic method

- The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
- This diagnostic method consists of 5 steps.

### Mode A: (Estimation of evaporation gas yield)

The amount of change of tank pressure (P1) in Mode A is calculated. After calculating P1, change to Mode B.

### Mode B: (Seal negative pressure)

Introduce the negative pressure in the intake manifold to the tank.

Approx. 0 → -1.4 kPa (0 → -10.5 mmHg, 0 → -0.41 inHg)

When the pressure above (desired negative pressure) is reached, Mode C is entered.

In this case, if the tank pressure does not become the desired negative pressure, judge that there is a large leakage in the system and judge as large leak (10 or 25 seconds).

### Abnormality Judgment

Judge NG (large leak) when the criteria below are completed in the specified time.

### Judgment Value

| Malfunction Criteria  | Threshold Value                  | DTC   |
|---|----------------------------------|-------|
| Time before reaching desired negative pressure                                    | ≥ 25 seconds                     | P0457 |
| Or time for Mode B  | ≥ 10 seconds                     |       |
| (Min. value of tank pressure during Mode B) – (Tank pressure when Mode B started) | < -0.5 kPa (-4 mmHg, -0.16 inHg) |       |

### Mode C: (Check increasing pressure)

Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)

Change to Mode D when the tank pressure returns to the start level of P2 calculation.

Judge immediate OK and change to Mode E when it does not return in spite of spending the specified time.

|   |                                |
|---|--------------------------------|
| Tank pressure when P2 calculation started | Time for immediate OK judgment |
| -1.3 kPa (-9.75 mmHg, -0.38 inHg)         | 15 seconds                     |

### Mode D: (Measurement of negative pressure changes)

Monitor the pressure variation in the tank in Mode Z. In this case, the tank pressure increases, that is, the pressure becomes as high as the atmospheric air pressure, because evaporator is generated. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.

After calculating P2, perform following small leak diagnosis.

### • After Mode D

Assigning P1 and P2, which are tank variations measured in Mode A and Mode B, to the formula below, judge the small leakage of the system. If the measured judgment value exceeds the threshold value, it is judged to be malfunction.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### Abnormality Judgment

Judge NG when the criteria below are completed and judge OK and clear the NG when not completed.

### Judgment Value

| Malfunction Criteria  | Threshold Value   | DTC   |
|---|---|-------|
| P2 – 1.5 × P1<br>P2: Change of tank pressure within 16 seconds on Mode D<br>P1: Change of tank pressure within 16 seconds on Mode A | > Value on Map 7.<br>* Threshold value: Figure (Fuel level vs Tank temperature) | P0442 |

\*1.5: Compensation value of the amount of evaporator occurrence. (Because evaporator increases more when becoming negative pressure.)

### Map 7 Limit of malfunction criteria as Evap. diagnosis.

| Fuel temperature & Fuel level     | 5°C (41°F)                              | 15°C (59°F)                             | 25°C (77°F)                             | 35°C (95°F)                           | 45°C (113°F)                          |
|-----------------------------------|---|---|---|---------------------------------------|---------------------------------------|
| 0 L (0 US gal, 0 Imp gal)         | 0.49 kPa<br>(3.68 mmHg,<br>0.14 inHg)   | 0.49 kPa<br>(3.68 mmHg,<br>0.14 inHg)   | 0.53 kPa<br>(3.95 mmHg,<br>0.16 inHg)   | 0.54 kPa<br>(4.07 mmHg,<br>0.16 inHg) | 0.56 kPa<br>(4.17 mmHg,<br>0.16 inHg) |
| 10 L (2.64 US gal, 2.2 Imp gal)   | 0.49 kPa<br>(3.68 mmHg,<br>0.14 inHg)   | 0.49 kPa<br>(3.68 mmHg,<br>0.14 inHg)   | 0.53 kPa<br>(3.95 mmHg,<br>0.16 inHg)   | 0.54 kPa<br>(4.07 mmHg,<br>0.16 inHg) | 0.56 kPa<br>(4.17 mmHg,<br>0.16 inHg) |
| 20 L (5.28 US gal, 4.4 Imp gal)   | 0.50 kPa<br>(3.77 mmHg,<br>0.15 inHg)   | 0.51 kPa<br>(3.79 mmHg,<br>0.15 inHg)   | 0.53 kPa<br>(4.01 mmHg,<br>0.16 inHg)   | 0.56 kPa<br>(4.17 mmHg,<br>0.16 inHg) | 0.57 kPa<br>(4.27 mmHg,<br>0.17 inHg) |
| 30 L (7.93 US gal, 6.6 Imp gal)   | 0.51 kPa<br>(3.85 mmHg,<br>0.15 inHg)   | 0.52 kPa<br>(3.9 mmHg,<br>0.15 inHg)    | 0.54 kPa<br>(4.06 mmHg,<br>0.16 inHg)   | 0.57 kPa<br>(4.27 mmHg,<br>0.17 inHg) | 0.60 kPa<br>(4.48 mmHg,<br>0.18 inHg) |
| 40 L (10.57 US gal, 8.8 Imp gal)  | 0.65 kPa<br>(4.88 mmHg,<br>0.19 inHg)   | 0.65 kPa<br>(4.9 mmHg,<br>0.19 inHg)    | 0.66 kPa<br>(4.98 mmHg,<br>0.20 inHg)   | 0.71 kPa<br>(5.32 mmHg,<br>0.21 inHg) | 0.76 kPa<br>(5.73 mmHg,<br>0.23 inHg) |
| 50 L (13.21 US gal, 11.0 Imp gal) | 0.794 kPa<br>(5.96 mmHg,<br>0.235 inHg) | 0.794 kPa<br>(5.96 mmHg,<br>0.235 inHg) | 0.794 kPa<br>(5.96 mmHg,<br>0.235 inHg) | 0.85 kPa<br>(6.38 mmHg,<br>0.25 inHg) | 0.88 kPa<br>(6.6 mmHg,<br>0.26 inHg)  |
| 60 L (15.85 US gal, 13.2 Imp gal) | 0.794 kPa<br>(5.96 mmHg,<br>0.235 inHg) | 0.794 kPa<br>(5.96 mmHg,<br>0.235 inHg) | 0.794 kPa<br>(5.96 mmHg,<br>0.235 inHg) | 0.85 kPa<br>(6.38 mmHg,<br>0.25 inHg) | 0.88 kPa<br>(6.6 mmHg,<br>0.26 inHg)  |

**Time Needed for Diagnosis:** 30 — 100 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous drive cycles.

### Leak diagnosis

#### DTC

P0456 Evaporative Emission Control System (Very Small Leak)

#### • Diagnostic method

- The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
- This diagnostic method consists of 5 steps.

#### Mode A: (0 point correction)

Wait until the tank pressure returns to 0 point (around 0 mmHg) when the tank pressure is high. Change to Mode B when the tank pressure becomes 0. Cancel the diagnosis when the tank pressure does not return to 0 point in spite of spending the specified time.

#### Mode B: (Introduce negative pressure)

Introduce the intake manifold negative pressure to fuel tank.

About 0 → -2.0 kPa (0 mmHg → -15 mmHg, 0 → -0.59 inHg)

Change to Mode C when the tank pressure becomes the pressure (desired negative pressure) above. Cancel the diagnosis when the tank pressure does not become the value above.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## Mode C: (Hold negative pressure)

Stop introducing the negative pressure and wait the tank pressure returns to the start level of P2 calculation. Change to Mode D when the tank pressure returns to the start level of P2 calculation or when spending the specified time.

## Mode D: (Calculation of negative pressure variation)

Monitor the tank pressure on Mode D, and calculate the tank pressure variation (P2) and time until it returns to the end level of P2 (evpdset). When it returns, change to Mode E. Make advanced OK judgment or cancel depending on the P2 level, when it doesn't return in spite of spending the specified time.

### Normality Judgment

Judge OK when the criteria below are completed.

### Judgment Value

| Malfunction Criteria    | Threshold Value                                  |
|-------------------------|--|
| Advanced OK judgment #1 |  |
| Mode D time             | ≥ 30 s   |
| Tank pressure           | ≤ -1.8 kPa (-13.4 mmHg, -0.53 inHg)              |
| Advanced OK judgment #2 |  |
| Mode D time             | ≥ 200 s  |
| P2                      | ≤ 0.9 — 1.3 kPa (7 — 9.6 mmHg, 0.28 — 0.38 inHg) |

## Mode E: (Calculation of evaporation gas yield)

Calculate the tank pressure variation P1 in time evpdset, judge NG/OK from P1 value. (Gray judgment possible)

### Abnormal judgment

Judge NG when the criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value  |
|----------------------|--|
| P1                   | < Map 7 value<br>* Threshold value:<br>map (fuel level vs evpdset) |

## Map 7 Limit of malfunction criteria as Evap. diagnosis

| Time (evpdset) & Fuel level       | 0 second               | 30 seconds                     | 80 seconds                     | 100 seconds                    | 150 seconds                    | 200 seconds                    |
|-----------------------------------|------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| 0 L (0 US gal, 0 Imp gal)         | 0 kPa (0 mmHg, 0 inHg) | 0.21 kPa (1.6 mmHg, 0.06 inHg) | 0.29 kPa (2.2 mmHg, 0.09 inHg) | 0.29 kPa (2.2 mmHg, 0.09 inHg) | 0.29 kPa (2.2 mmHg, 0.09 inHg) | 0.29 kPa (2.2 mmHg, 0.09 inHg) |
| 10 L (2.64 US gal, 2.2 Imp gal)   | 0 kPa (0 mmHg, 0 inHg) | 0.21 kPa (1.6 mmHg, 0.06 inHg) | 0.29 kPa (2.2 mmHg, 0.09 inHg) | 0.29 kPa (2.2 mmHg, 0.09 inHg) | 0.29 kPa (2.2 mmHg, 0.09 inHg) | 0.29 kPa (2.2 mmHg, 0.09 inHg) |
| 30 L (7.93 US gal, 6.6 Imp gal)   | 0 kPa (0 mmHg, 0 inHg) | 0.21 kPa (1.6 mmHg, 0.06 inHg) | 0.29 kPa (2.2 mmHg, 0.09 inHg) | 0.29 kPa (2.2 mmHg, 0.09 inHg) | 0.29 kPa (2.2 mmHg, 0.09 inHg) | 0 kPa (0 mmHg, 0 inHg)         |
| 50 L (13.21 US gal, 11.0 Imp gal) | 0 kPa (0 mmHg, 0 inHg) | 0.24 kPa (1.8 mmHg, 0.07 inHg) | 0.29 kPa (2.2 mmHg, 0.09 inHg) | 0.29 kPa (2.2 mmHg, 0.09 inHg) | 0 kPa (0 mmHg, 0 inHg)         | 0 kPa (0 mmHg, 0 inHg)         |
| 60 L (15.85 US gal, 13.2 Imp gal) | 0 kPa (0 mmHg, 0 inHg) | 0.24 kPa (1.8 mmHg, 0.07 inHg) | 0.29 kPa (2.2 mmHg, 0.09 inHg) | 0.29 kPa (2.2 mmHg, 0.09 inHg) | 0 kPa (0 mmHg, 0 inHg)         | 0 kPa (0 mmHg, 0 inHg)         |
| 70 L (18.49 US gal, 15.4 Imp gal) | 0 kPa (0 mmHg, 0 inHg) | 0.24 kPa (1.8 mmHg, 0.07 inHg) | 0.29 kPa (2.2 mmHg, 0.09 inHg) | 0.29 kPa (2.2 mmHg, 0.09 inHg) | 0 kPa (0 mmHg, 0 inHg)         | 0 kPa (0 mmHg, 0 inHg)         |
| 80 L (21.14 US gal, 17.6 Imp gal) | 0 kPa (0 mmHg, 0 inHg) | 0.24 kPa (1.8 mmHg, 0.07 inHg) | 0.29 kPa (2.2 mmHg, 0.09 inHg) | 0.29 kPa (2.2 mmHg, 0.09 inHg) | 0 kPa (0 mmHg, 0 inHg)         | 0 kPa (0 mmHg, 0 inHg)         |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### Normality Judgment

Judge OK when all the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value  |
|----------------------|--|
| P1                   | > Value of Map 8<br>* Threshold value:<br>Map (Fuel level vs evp-dset) |

### Map 8

| Time (evpdset) & Fuel level       | 0 second                             | 30 seconds                           | 80 seconds                           | 100 seconds                          | 150 seconds                          | 200 seconds                          |
|-----------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| 0 L (0 US gal, 0 Imp gal)         | 0.16 kPa<br>(1.2 mmHg,<br>0.05 inHg) | 0.37 kPa<br>(2.8 mmHg,<br>0.11 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) |
| 10 L (2.64 US gal, 2.2 Imp gal)   | 0.16 kPa<br>(1.2 mmHg,<br>0.05 inHg) | 0.37 kPa<br>(2.8 mmHg,<br>0.11 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) |
| 30 L (7.93 US gal, 6.6 Imp gal)   | 0.16 kPa<br>(1.2 mmHg,<br>0.05 inHg) | 0.37 kPa<br>(2.8 mmHg,<br>0.11 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) |
| 50 L (13.21 US gal, 11.0 Imp gal) | 0.16 kPa<br>(1.2 mmHg,<br>0.05 inHg) | 0.40 kPa<br>(3.0 mmHg,<br>0.12 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) |
| 60 L (15.85 US gal, 13.2 Imp gal) | 0.16 kPa<br>(1.2 mmHg,<br>0.05 inHg) | 0.40 kPa<br>(3.0 mmHg,<br>0.12 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) |
| 70 L (18.49 US gal, 15.4 Imp gal) | 0.16 kPa<br>(1.2 mmHg,<br>0.05 inHg) | 0.40 kPa<br>(3.0 mmHg,<br>0.12 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) |
| 80 L (21.14 US gal, 17.6 Imp gal) | 0.16 kPa<br>(1.2 mmHg,<br>0.05 inHg) | 0.40 kPa<br>(3.0 mmHg,<br>0.12 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) | 0.45 kPa<br>(3.4 mmHg,<br>0.13 inHg) |

Time Needed for Diagnosis: 65 — 516 seconds

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

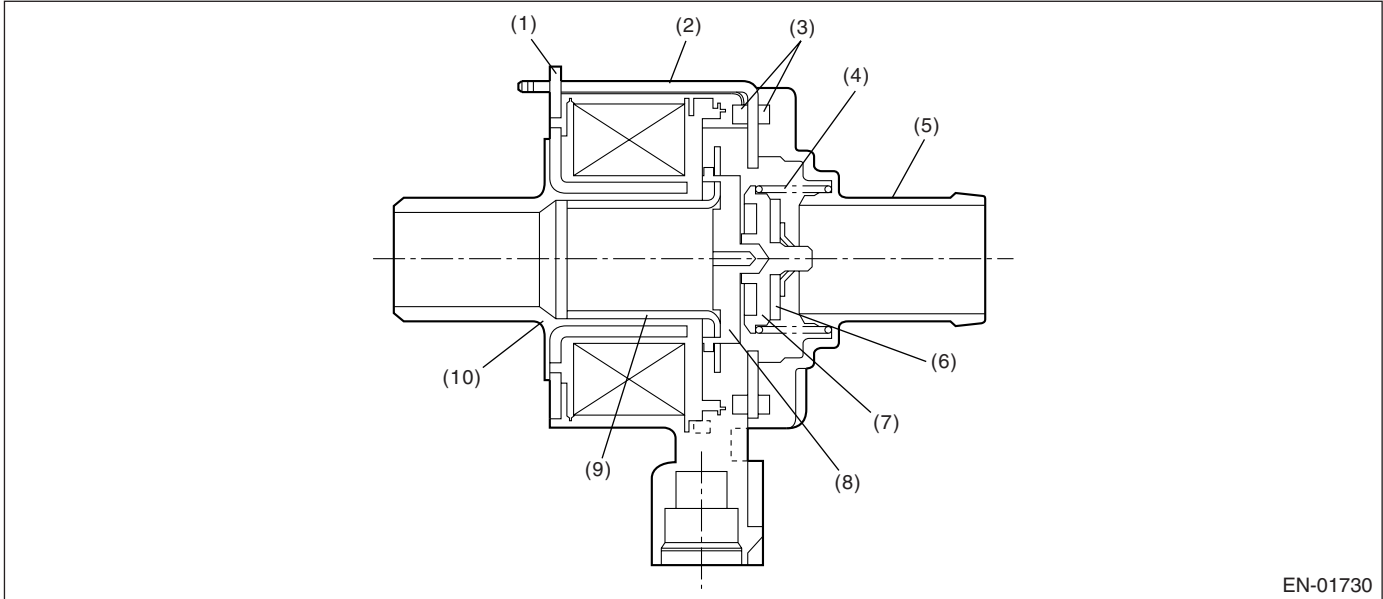
## BL:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.

Judge NG when the ECM output level is different from the actual terminal level.

### 2. COMPONENT DESCRIPTION



- |                    |                |                  |
|--------------------|----------------|------------------|
| (1) Magnetic plate | (5) Valve seat | (9) Movable core |
| (2) Yoke           | (6) Valve      | (10) Bobbin      |
| (3) Packing        | (7) Plate      |                  |
| (4) Spring         | (8) Retainer   |                  |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria                              | Threshold Value       |
|---|-----------------------|
| Ignition switch                                   | ON                    |
| Battery voltage                                   | $\geq 10.9 \text{ V}$ |
| After engine starting                             | 1 second or more      |
| Terminal output voltage when ECM sends OFF signal | Low                   |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria                              | Threshold Value  |
|---|------------------|
| Ignition switch                                   | ON               |
| Battery voltage                                   | $\geq 10.9$ V    |
| After engine starting                             | 1 second or more |
| Terminal output voltage when ECM sends OFF signal | High             |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve solenoid.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

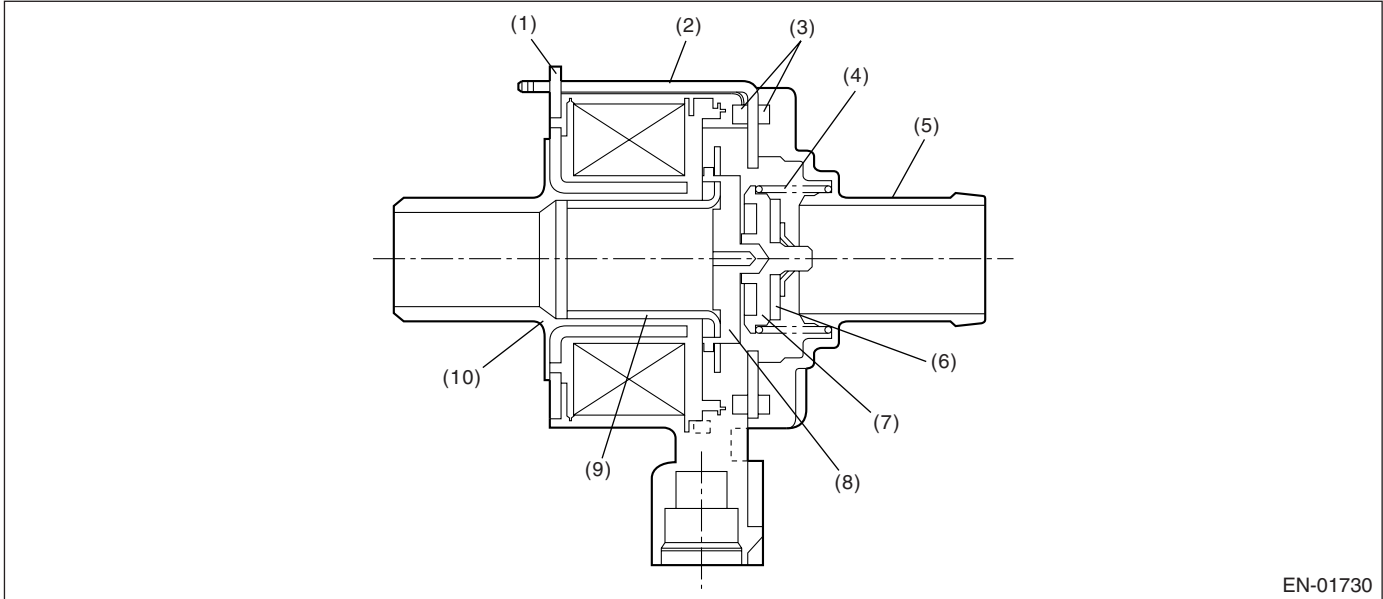
## BM:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.

Judge NG when the ECM output level is different from the actual terminal level.

### 2. COMPONENT DESCRIPTION



EN-01730

- |                    |                |                  |
|--------------------|----------------|------------------|
| (1) Magnetic plate | (5) Valve seat | (9) Movable core |
| (2) Yoke           | (6) Valve      | (10) Bobbin      |
| (3) Packing        | (7) Plate      |                  |
| (4) Spring         | (8) Retainer   |                  |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria                             | Threshold Value       |
|--|-----------------------|
| Ignition switch                                  | ON                    |
| Battery voltage                                  | $\geq 10.9 \text{ V}$ |
| After engine starting                            | 1 second or more      |
| Terminal output voltage when ECM sends ON signal | High                  |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria                             | Threshold Value  |
|--|------------------|
| Ignition switch                                  | ON               |
| Battery voltage                                  | $\geq 10.9$ V    |
| After engine starting                            | 1 second or more |
| Terminal output voltage when ECM sends ON signal | Low              |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

PCV control: Open the PCV solenoid.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

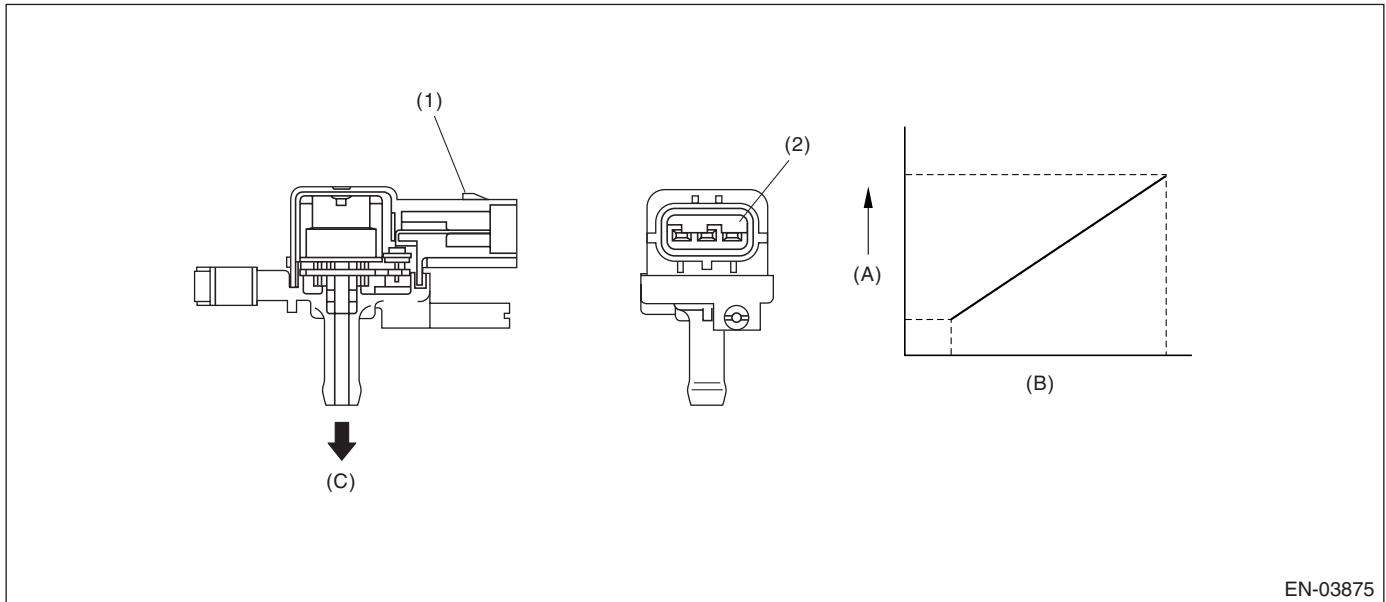
## BN:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.

Judge NG when there is no pressure variation, which should exist in the tank, considering the engine status.

### 2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal

- (A) Output voltage
- (B) Input voltage
- (C) To fuel tank

EN-03875

### 3. ENABLE CONDITION

| Secondary Parameters                | Enable Conditions                               |
|-------------------------------------|---|
| After starting the engine           | 60 second or more                               |
| Fuel level                          | $\geq 9 \ell$ (2.38 US gal, 1.98 Imp gal)       |
| Fuel temperature                    | $< 35^{\circ}\text{C}$ ( $95^{\circ}\text{F}$ ) |
| Battery voltage                     | $\geq 10.9 \text{ V}$                           |
| Atmospheric pressure                | $> 75.0 \text{ kPa}$ (563 mmHg, 22.2 inHg)      |
| Purge control solenoid valve ON/OFF | Experienced                                     |

### 4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in 60 seconds or more after starting the engine.
- Be sure to check the fuel level and fuel temperature.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below is completed.

#### Judgment Value

| Malfunction Criteria  | Threshold Value                    |
|---|------------------------------------|
| Number of times when the difference between the Max. fuel level and the Min. fuel level every 60 seconds is 2 ℓ (0.53 US gal, 0.44 Imp gal) or more (with enable condition completed) | ≥ 16 times                         |
| Max. – Min. tank pressure (with enable condition completed)   | < 0.05 kPa (0.375 mmHg, 0.02 inHg) |
| Max. – Min. fuel temperature (with enable condition completed)  | ≥ 7°C (13°F)                       |

If the fuel level (Max. – Min.) in every 60 seconds is less than 2 ℓ, extend 60 seconds more and make judgment with the Max. and Min. fuel level in 120 seconds.

If the difference did not appear though the time extended, extend the time (180, 240, 300 seconds) and continue the judgment.

Diagnosis counter will count up when the difference of fuel level (Max. – Min.) is more than 5 ℓ.

**Time Needed for Diagnosis:** 1 minute × 16 times or more

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

#### • Normality Judgment

Judge OK when the malfunction criteria below is completed.

#### Judgment Value

| Malfunction Criteria      | Threshold Value                    |
|---------------------------|------------------------------------|
| Max. – Min. tank pressure | ≥ 0.05 kPa (0.375 mmHg, 0.02 inHg) |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

### 9. ECM OPERATION AT DTC SETTING

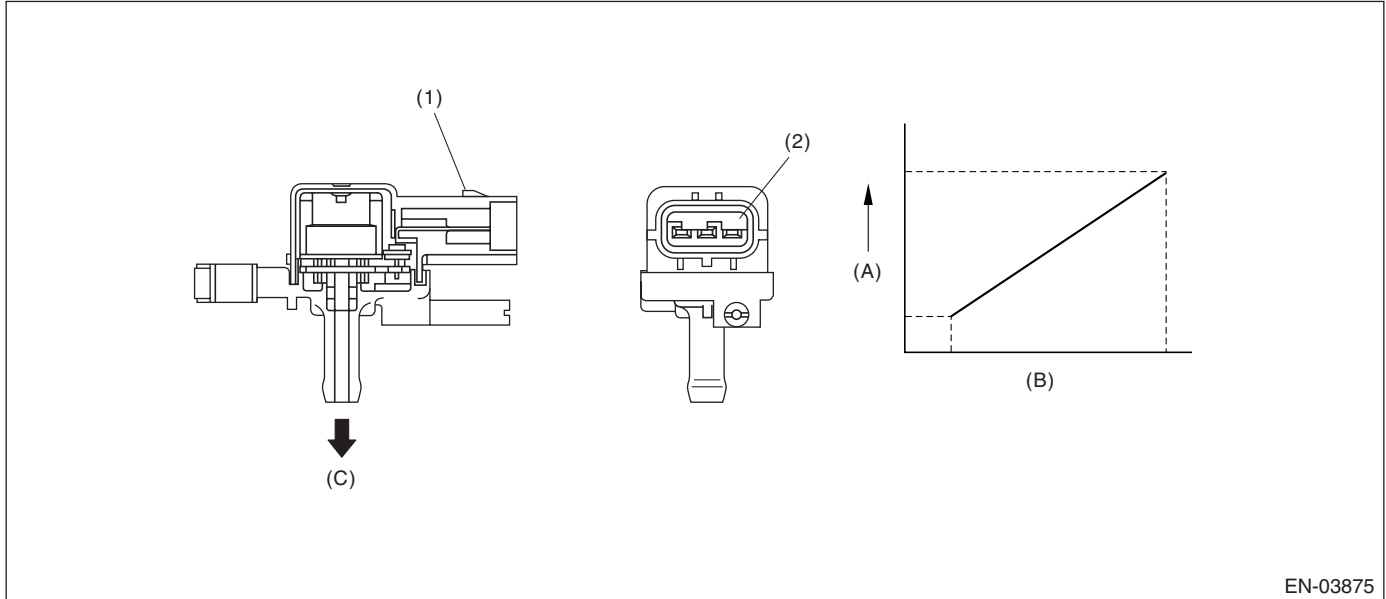
Memorize the freeze frame data. (For test mode \$02)

## BO:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal

- (A) Output voltage
- (B) Input voltage
- (C) To fuel tank

EN-03875

### 3. ENABLE CONDITION (USED WITH HIGH SIDE NORMAL/ABNORMAL JUDGMENT)

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | $\geq 10.9$       |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 15 seconds.

#### Judgment Value

| Malfunction Criteria | Threshold Value                              |
|----------------------|--|
| Fuel tank pressure   | $< -6.82$ kPa ( $-56.15$ mmHg, $-2.01$ inHg) |

**Time Needed for Diagnosis:** 15 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK when the malfunction criteria below is completed.

#### Judgment Value

| Malfunction Criteria        | Threshold Value                                 |
|-----------------------------|---|
| Fuel tank pressure          | $\geq -6.82$ kPa ( $-56.15$ mmHg, $-2.01$ inHg) |
| Feedback lambda coefficient | $\geq 0.9$                                      |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

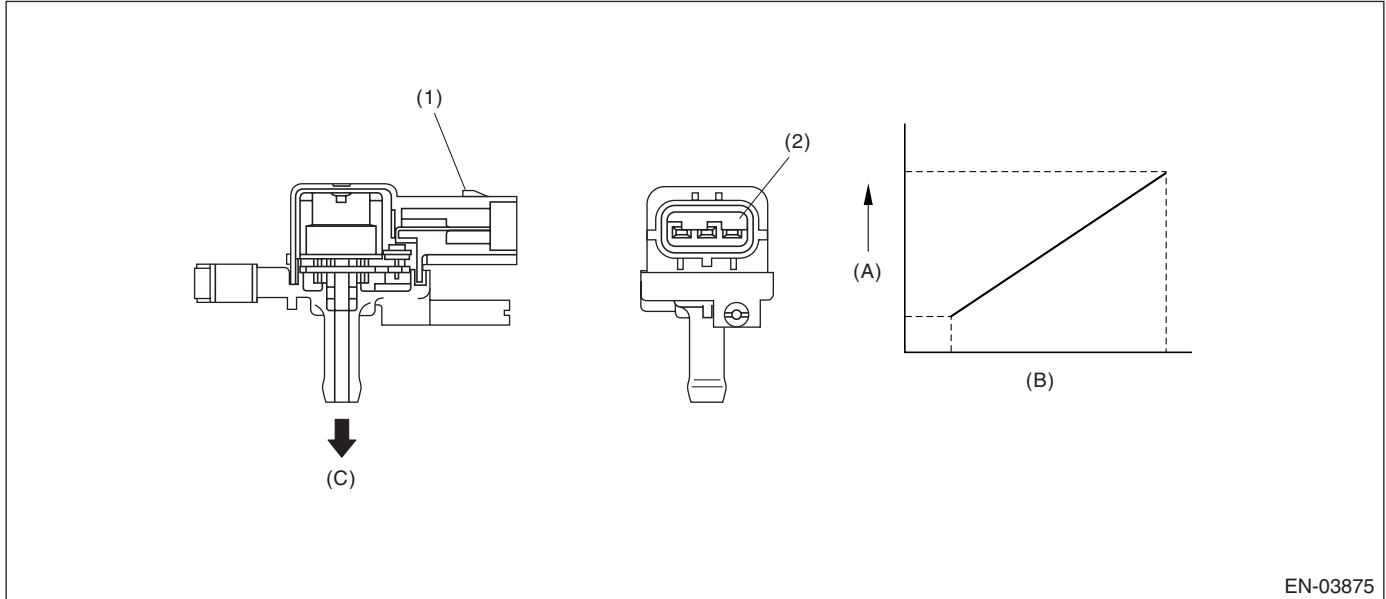
GENERAL DESCRIPTION

## BP:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the breaking/shortage of the fuel tank pressure sensor.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal

- (A) Output voltage
- (B) Input voltage
- (C) To fuel tank

### 3. ENABLE CONDITION

| Secondary Parameters                   | Enable Conditions        |
|--|--------------------------|
| Vehicle speed                          | $\geq 2$ km/h (1.24 MPH) |
| All conditions of EVAP canister purge  | Complete                 |
| Evaporation gas density learning value | $\leq 0.08$              |
| Main feedback compensation coefficient | $\geq 0.9$               |
| Battery voltage                        | $\geq 10.9$ V            |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when purging.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 15 seconds.

#### Judgment Value

| Malfunction Criteria | Threshold Value                         |
|----------------------|---|
| Fuel tank pressure   | $\geq 7.98$ kPa (59.85 mmHg, 2.36 inHg) |
| Fuel temperature     | $< 35^\circ\text{C}$ (95°F)             |
| Atmospheric pressure | $\geq 75.0$ kPa (563 mmHg, 22.2 inHg)   |



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

**Time Needed for Diagnosis:** 15 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

• **Normality Judgment**

Judge OK when the malfunction criteria below is completed.

**Judgment Value**

| Malfunction Criteria | Threshold Value                    |
|----------------------|------------------------------------|
| Fuel tank pressure   | < 7.98 kPa (59.85 mmHg, 2.36 inHg) |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## **BQ:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)**

### 1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4DOTC)-123, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

## **BR:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)**

### 1. OUTLINE OF DIAGNOSIS

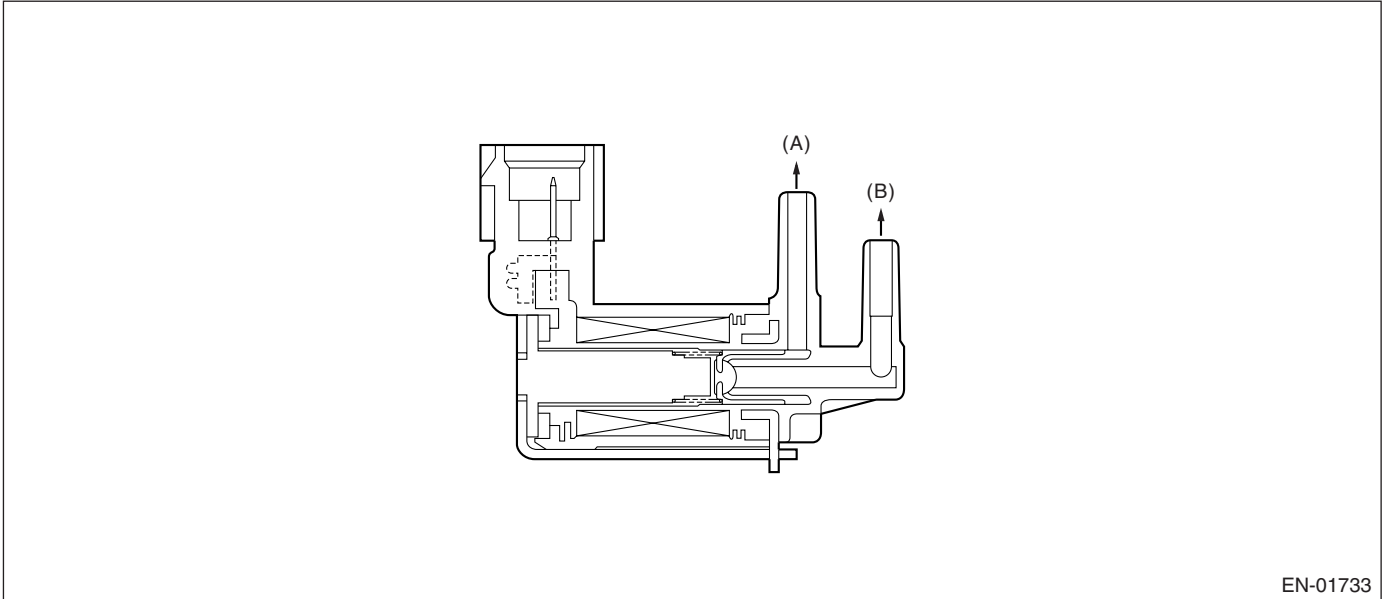
For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4DOTC)-123, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

## BS:DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.  
 Judge NG when ECM output level is different from actual terminal level.

### 2. COMPONENT DESCRIPTION



- (A) To intake manifold
- (B) To canister

### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions |
|-----------------------|-------------------|
| Ignition switch       | ON                |
| Battery voltage       | ≥ 10.9 V          |
| After engine starting | 1 second or more  |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

#### Judgment Value

| Malfunction Criteria    | Threshold Value |
|-------------------------|-----------------|
| Duty ratio of 'ON'      | < 75%           |
| Terminal output voltage | Low             |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

### Judgment Value

| Malfunction Criteria    | Threshold Value |
|-------------------------|-----------------|
| Terminal output voltage | High            |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

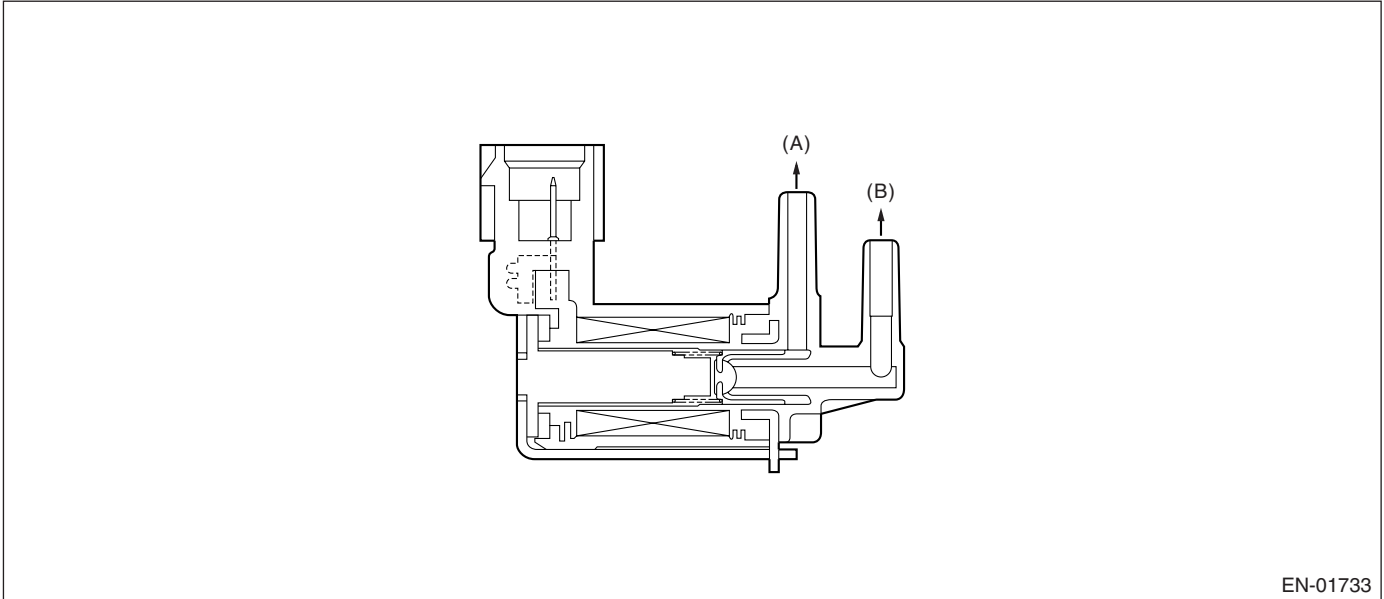
Memorize the freeze frame data. (For test mode \$02)

## BT:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.  
 Judge NG when ECM output level is different from actual terminal level.

### 2. COMPONENT DESCRIPTION



- (A) To intake manifold
- (B) To canister

### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions |
|-----------------------|-------------------|
| Ignition switch       | ON                |
| Battery voltage       | ≥ 10.9 V          |
| After engine starting | 1 second or more  |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

#### Judgment Value

| Malfunction Criteria    | Threshold Value |
|-------------------------|-----------------|
| Duty ratio of 'ON'      | ≥ 25%           |
| Terminal output voltage | High            |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

### Judgment Value

| Malfunction Criteria    | Threshold Value |
|-------------------------|-----------------|
| Terminal output voltage | Low             |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

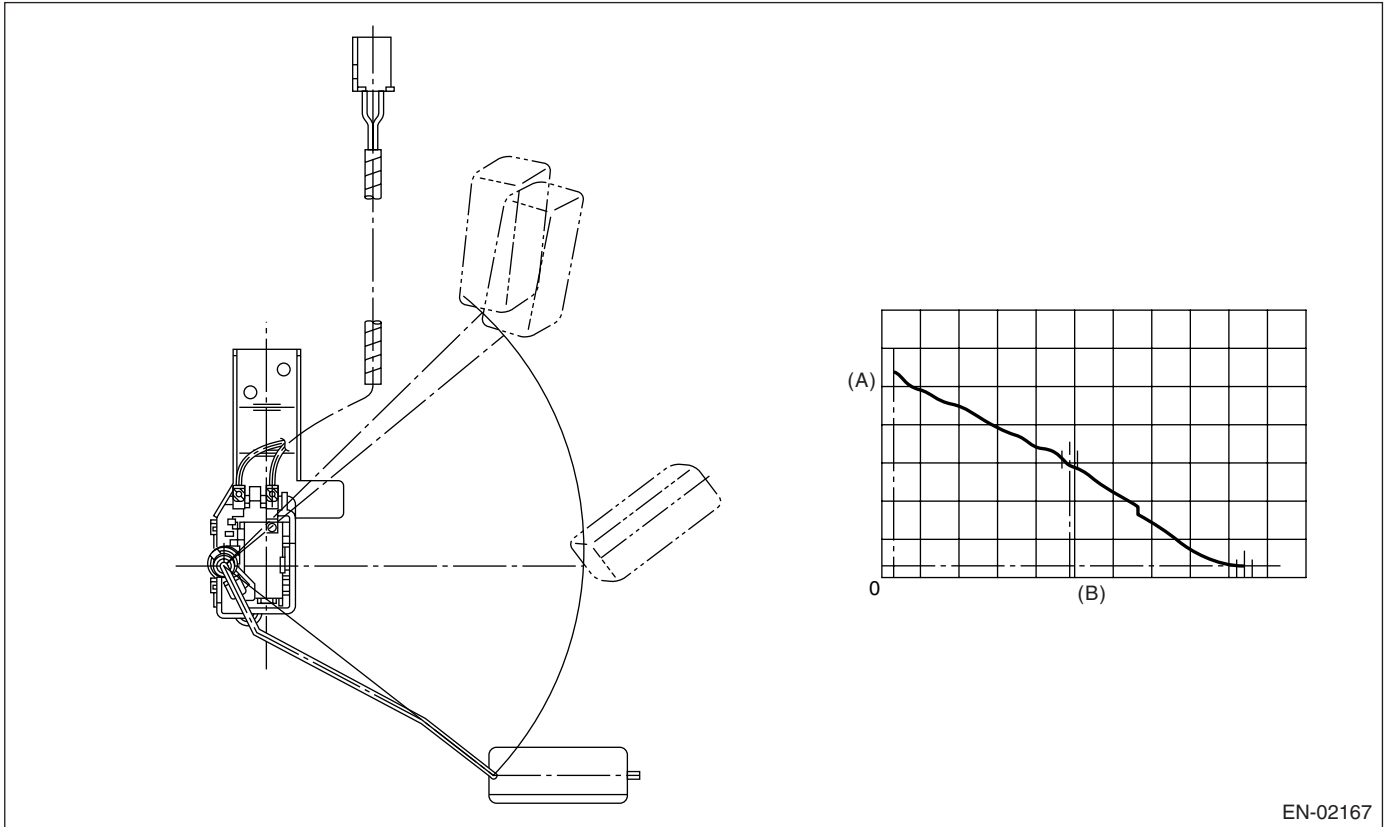
## BU:DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel level sensor output property.

Judge NG when the fuel level does not vary whereas it seemed to vary be in a usual driving speed.

### 2. COMPONENT DESCRIPTION



- (A) Fuel level (L)
- (B) Resistance ( $\Omega$ )

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria             | Threshold Value                             |
|----------------------------------|---|
| Accumulated amount of intake air | > 331 kg (729.7 lb)                         |
| Max. – Min. fuel level output    | < 2.6 $\ell$ (0.69 US gal,<br>0.57 Imp gal) |
| Battery voltage                  | $\geq$ 10.9 V                               |
| After engine starting            | 10 seconds or more                          |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

**Time Needed for Diagnosis:** To be determined.

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

• **Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria             | Threshold Value                        |
|----------------------------------|--|
| Accumulated amount of intake air | > 331 kg (729.7 lb)                    |
| Max. – Min. fuel level output    | ≥ 2.6 ℓ (0.69 US gal,<br>0.57 Imp gal) |
| Battery voltage                  | ≥ 10.9 V                               |
| After engine starting            | 10 seconds or more                     |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

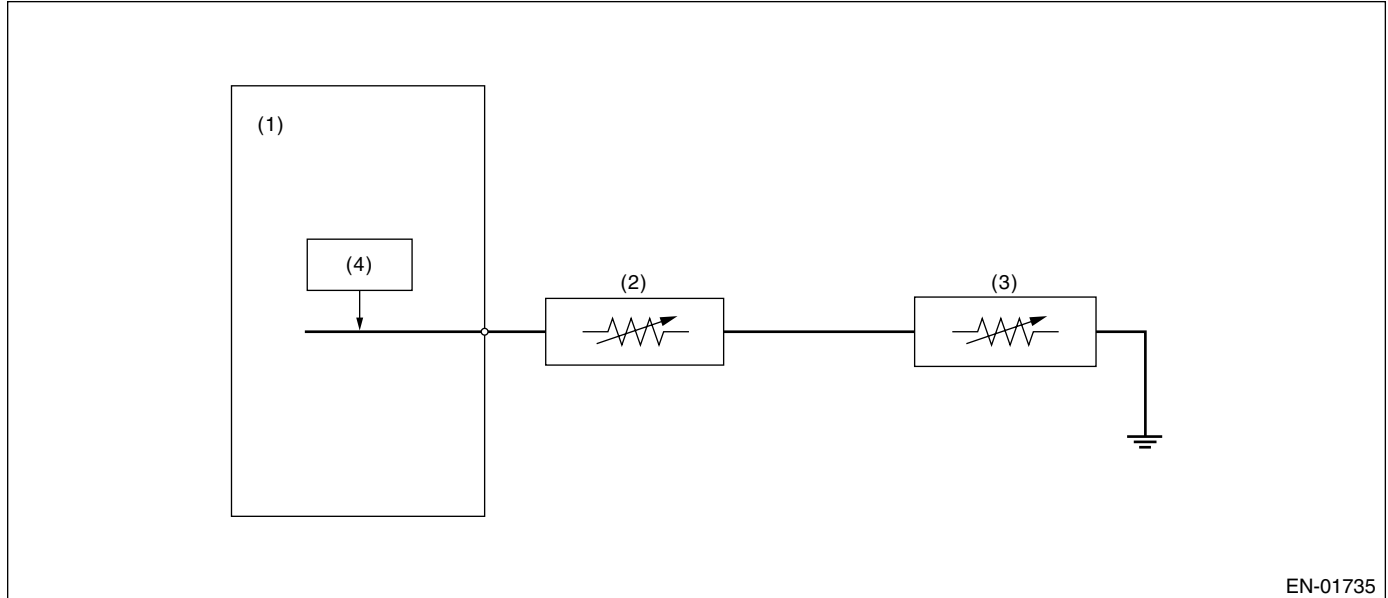
Memorize the freeze frame data. (For test mode \$02)

## BV:DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Fuel level sensor
- (3) Fuel sub level sensor
- (4) Detecting circuit

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### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

#### Judgment Value

| Malfunction Criteria  | Threshold Value       |
|-----------------------|-----------------------|
| Ignition switch       | ON                    |
| Battery voltage       | $\geq 10.9 \text{ V}$ |
| After engine starting | 3 seconds or more     |
| Output voltage        | $< 0.035 \text{ V}$   |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria  | Threshold Value   |
|-----------------------|-------------------|
| Ignition switch       | ON                |
| Battery voltage       | $\geq 10.9$ V     |
| After engine starting | 3 seconds or more |
| Output voltage        | $\geq 0.035$ V    |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

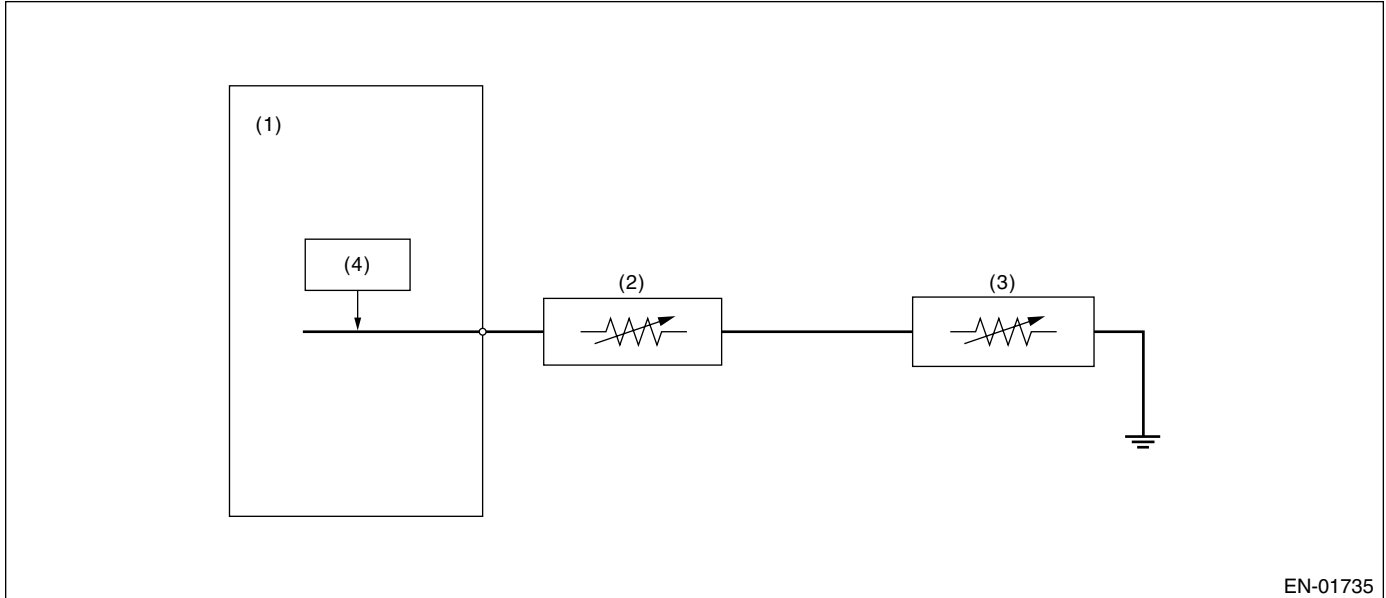
Memorize the freeze frame data. (For test mode \$02)

## BW:DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Fuel level sensor
- (3) Fuel sub level sensor
- (4) Detecting circuit

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

#### Judgment Value

| Malfunction Criteria  | Threshold Value        |
|-----------------------|------------------------|
| Ignition switch       | ON                     |
| Battery voltage       | $\geq 10.9 \text{ V}$  |
| After engine starting | 3 seconds or more      |
| Output voltage        | $\geq 4.911 \text{ V}$ |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria  | Threshold Value   |
|-----------------------|-------------------|
| Ignition switch       | ON                |
| Battery voltage       | $\geq 10.9$ V     |
| After engine starting | 3 seconds or more |
| Output voltage        | $< 4.911$ V       |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## **BX:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT**

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of unstable output from fuel level sensor caused by noise.

Judge NG when the max. value and cumulative value of output voltage variation of fuel level sensor is larger than the threshold value.

### 2. ENABLE CONDITION

| Secondary Parameters           | Enable Conditions   |
|--------------------------------|---|
| Engine speed                   | $\geq 500$ rpm  |
| After engine starting          | 1 second or more  |
| Ignition switch                | ON  |
| Battery voltage                | $> 10.9$ V  |
| Idle switch                    | ON  |
| Fuel level                     | 9 $\leftrightarrow$ 51 $\emptyset$ (2.4 $\leftrightarrow$ 13.4 US gal, 1.98 $\leftrightarrow$ 11.2 Imp gal) |
| Vehicle speed = 0 km/h (0 MPH) | 10 seconds or more  |

### 3. GENERAL DRIVING CYCLE

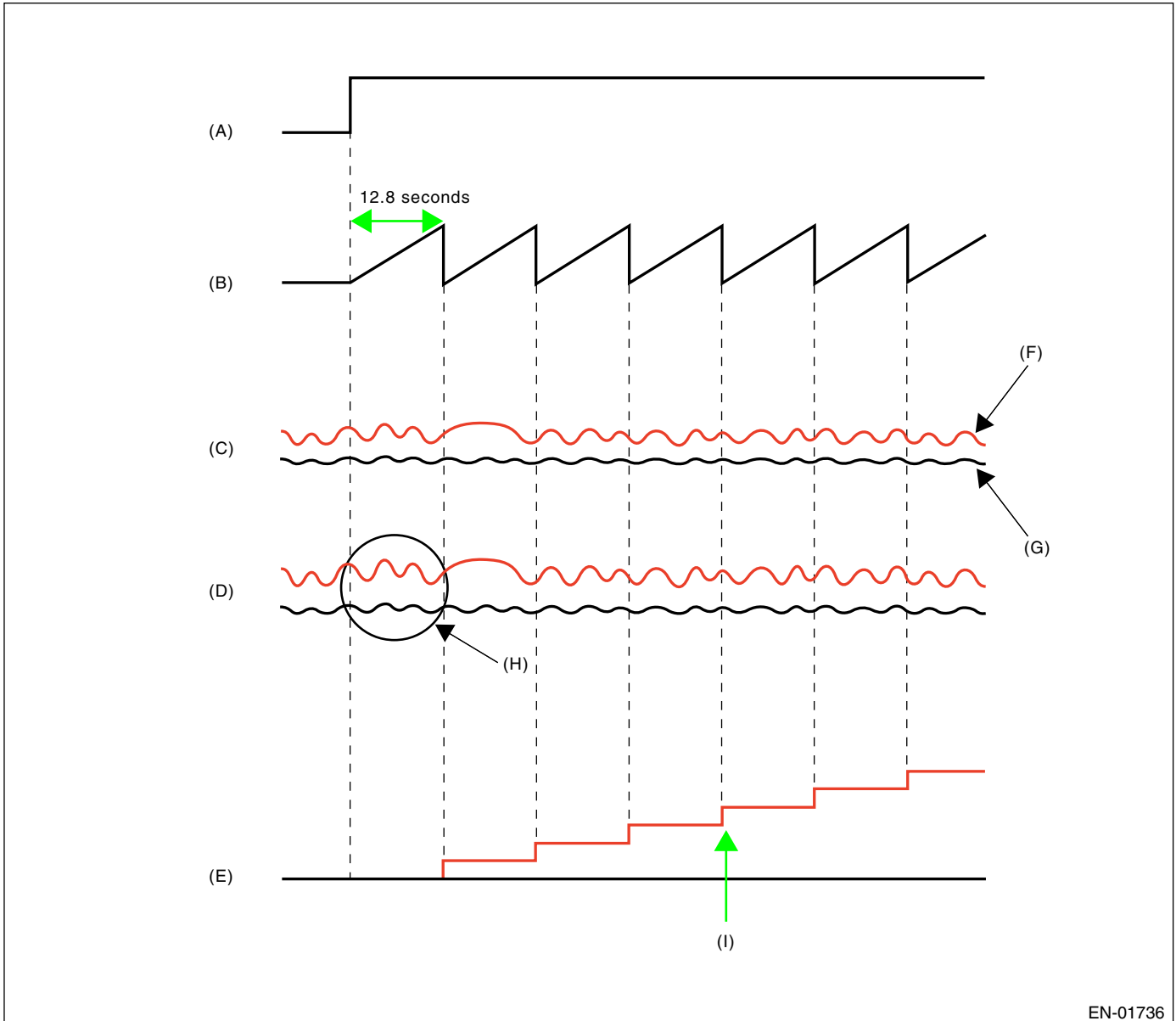
- Perform the diagnosis continuously in idling condition.
- Pay attention to the fuel level.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 4. DIAGNOSTIC METHOD

Calculate the Max. value (delflmax) and cumulative value (sumfl) of output voltage variation of fuel level sensor during 12.8 seconds. Judge it normal when both max. and cumulative values are not over the threshold value. Otherwise, when either of them is over the threshold value, count the diagnosis counter up. And judge NG if the counter indicated 4 counts.



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(A) Diagnosis condition

(B) Diagnosis time

(C) Fuel level sensor A/D value

(D) Fuel level output voltage

(E) Diagnosis counter

(F) Malfunction

(G) Normal

(H) Judge value of DVFLMAX and SUMVFL as maximum

(I) NG at 4 counts

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Integrated times of the condition reaching follows,<br>DELFLMAX $\geq$ 0.228 V or SUMVFL $\geq$ 21.8 V<br>where,<br>DELFLMAX is Max. deviation of sensor output during 12.8 seconds.<br>SUMVFL is integrated value of sensor output deviation during 12.8 seconds. | $\geq$ 4 times  |

Do not count the diagnosis counter up when the following conditions are completed during 12.8 seconds.

|  |   |
|--|---|
| Max – Min of tank pressure during 12.8 seconds   | $\geq$ 0.05 kPa (0.375 mmHg, 0.01 inHg) |
| Max – Min of battery voltage during 12.8 seconds | $\geq$ 0.465 V                          |

**Time Needed for Diagnosis:** 12.8 seconds  $\times$  4 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria  | Threshold Value       |
|---|-----------------------|
| DELFLMAX<br>SUMVFL<br>Where, DELFLMAX is Max. deviation of sensor output during 12.8 seconds.<br>SUMVFL is integrated value of sensor output deviation during 12.8 seconds. | < 0.228 V<br>< 21.8 V |

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## BY:DTC P0483 COOLING FAN RATIONALITY CHECK

### 1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the radiator fan.

Judge NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

### 2. ENABLE CONDITION

Diagnostic enable condition is completed if the radiator fan changes from OFF to ON when all of the conditions below are completed. When one of the conditions below is not completed, the diagnostic enable condition is not completed.

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Engine Speed         | 550 — 950 rpm     |
| Idle switch          | ON                |
| Vehicle speed        | 0 km/h (0 MPH)    |
| Battery voltage      | ≥ 10.9 V          |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when idling.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 minutes.

#### Judgment Value

| Malfunction Criteria       | Threshold Value |
|----------------------------|-----------------|
| Engine coolant temperature | ≥ 95°C (203°F)  |
| Radiator fan signal change | OFF to ON       |
| Engine coolant temperature | Not decrease    |

**Time Needed for Diagnosis:** 5 minutes

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria       | Threshold Value |
|----------------------------|-----------------|
| Radiator fan signal change | OFF to ON       |
| Engine coolant temperature | Decrease        |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### BZ:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.

Judge NG when low vehicle speed (0 km/h (0 MPH)) remains whereas it seemed to be in a usual driving speed.

#### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Engine speed         | < 4,000 rpm       |
| Fuel cut in decel.   | Operating         |
| Battery voltage      | ≥ 10.9 V          |

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration at less than 4,000 rpm in engine speed.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 4 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Vehicle speed        | < 1             |

**Time Needed for Diagnosis:** 4 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria               | Threshold Value |
|------------------------------------|-----------------|
| Vehicle speed                      | ≥ 1             |
| Starter switch                     | OFF             |
| Time after starter switch ON → OFF | ≥ 3 seconds     |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

- Accelerator sensor signal process: All closed points learning / Not allowed to increase.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6.21 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on "and" of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Hi driven both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

### CA:DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.

Judge NG when high vehicle speed (300 km/h (186.4 MPH) or more) remains whereas it seemed to be in a usual driving speed.

#### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Engine speed         | < 4,000 rpm       |
| Fuel cut in decel.   | Operating         |
| Battery voltage      | ≥ 10.9 V          |

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration at less than 4,000 rpm in engine speed.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 4 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Vehicle speed        | ≥ 300           |

**Time Needed for Diagnosis:** 4 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria               | Threshold Value        |
|------------------------------------|------------------------|
| Vehicle speed                      | < 300 km/h (186.4 MPH) |
| Starter switch                     | OFF                    |
| Time after starter switch ON → OFF | ≥ 3 seconds            |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 7. FAIL SAFE

- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6.21 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on “and” of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Hi driven both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## CB:DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.  
Judge NG when actual engine speed is not close to target engine speed during idling.

### 2. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions                 |
|---|-----------------------------------|
| Engine coolant temperature  | ≥ 70°C (158°F)                    |
| Battery voltage   | ≥ 10.9 V                          |
| Atmospheric pressure  | > 75.0 kPa (563 mmHg, 22.2 inHg)  |
| Fuel level  | ≥ 9 ℓ (2.38 US gal, 1.98 Imp gal) |
| After starting engine   | 10 seconds or more                |
| Feedback in ISC   | In operation                      |
| Measured lambda   | 0.90 ←→ 1.1                       |
| After air condition switching ON-OFF, OFF-ON                          | 5 seconds or more                 |
| After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg) | > 5 seconds                       |
| After neutral switch ON-OFF event                                     | > 5 seconds                       |
| Vehicle speed   | 0 km/h (0 MPH)                    |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during idling.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).

#### Judgment Value

| Malfunction Criteria                                    | Threshold Value |
|---|-----------------|
| Actual – target engine speed                            | < –100 rpm      |
| Feedback correction for idle air control solenoid valve | Max.            |

**Time Needed for Diagnosis:** 10 seconds × 3 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

#### Judgment Value

| Malfunction Criteria         | Threshold Value |
|------------------------------|-----------------|
| Actual – target engine speed | ≥ –100 rpm      |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 7. FAIL SAFE

- Heavy fuel judgment: Not allowed to carry out the heavy judgment
- Knock compensation:
  - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  - At normal: knock compensation = 0°CA is fixed.
  - At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
  - Not allowed to update the whole learning compensation factor.
  - Not allowed to calculate the partial learning zone compensation value.

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## CC:DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.  
Judge NG when actual engine speed is not close to target engine speed during idling.

### 2. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions                 |
|---|-----------------------------------|
| Engine coolant temperature  | ≥ 70°C (158°F)                    |
| Battery voltage   | ≥ 10.9 V                          |
| Atmospheric pressure  | > 75.0 kPa (563 mmHg, 22.2 inHg)  |
| Fuel level  | ≥ 9 ℓ (2.38 US gal, 1.98 Imp gal) |
| After starting engine   | 10 seconds or more                |
| Feedback in ISC   | In operation                      |
| Lambda  | 0.90 ←→ 1.1                       |
| After air condition switching ON-OFF, OFF-ON                          | 5 seconds or more                 |
| After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg) | > 5 seconds                       |
| After neutral switch ON-OFF event                                     | > 5 seconds                       |
| Vehicle speed   | 0 km/h (0 MPH)                    |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously 10 seconds after starting and at idling after warm-up.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).

#### Judgment Value

| Malfunction Criteria                                    | Threshold Value |
|---|-----------------|
| Actual – target eng. speed                              | ≥ 200 rpm       |
| Feedback correction for idle air control solenoid valve | Min.            |

**Time Needed for Diagnosis:** 10 seconds × 3 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

#### Judgment Value

| Malfunction Criteria       | Threshold Value |
|----------------------------|-----------------|
| Actual – target eng. speed | < 200 rpm       |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. FAIL SAFE

- Heavy fuel judgment: Not allowed to carry out the heavy judgment
- Knock compensation:
  - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  - At normal: knock compensation = 0°CA is fixed.
  - At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
  - Not allowed to update the whole learning compensation factor.
  - Not allowed to calculate the partial learning zone compensation value.

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## CD:DTC P0512 STARTER REQUEST CIRCUIT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge ON NG when the starter SW signal remains on.

Judge OFF NG when the engine starts without starter experience.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 minutes.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Engine speed         | > 500 rpm       |
| Starter OFF signal   | Not detected    |
| Battery voltage      | > 8 V           |

**Time Needed for Diagnosis:** 180 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge ON OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Starter SW           | OFF             |
| Battery voltage      | > 8 V           |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### CE:DTC P0513 INCORRECT IMMOBILIZER KEY

#### 1. OUTLINE OF DIAGNOSIS

| DTC   | ITEM   | OUTLINE OF DIAGNOSIS  |
|-------|--|---|
| P0513 | Incorrect Immobilizer Key                    | Incorrect immobilizer key (Use of key not registered in body integrated module)                   |
| P1570 | Antenna                                      | Improper antenna  |
| P1571 | Reference Code Incompatibility               | Unmatched reference code between body integrated module and ECM                                   |
| P1572 | IMM Circuit Failure (Except Antenna Circuit) | Communication malfunction between body integrated module and ECM                                  |
| P1574 | Key Communication Failure                    | Malfunction of body integrated module that check the key (transponder) ID or transponder failure. |
| P1576 | EGI Control Module EEPROM                    | Abnormality of ECM  |
| P1577 | IMM Control Module EEPROM                    | Malfunction of body integrated module.  |
| P1578 | Meter Failure                                | Unmatched reference code between body integrated module and combination meter.                    |

#### 2. ENABLE CONDITION

When the engine is started.

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis only when the engine is started.

#### 4. DIAGNOSTIC METHOD

Jude NG when the outline diagnosis above was completed.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## CF:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction that engine speed increases more than that in normal condition during idling.

### 2. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions   |
|-----------------------|---------------------|
| Battery voltage       | ≥ 10.9 V            |
| Feedback in ISC       | In operation        |
| Vehicle speed         | < 4 km/h (2.49 MPH) |
| After engine starting | 1 seconds or more   |

### 3. GENERAL DRIVING CYCLE

Always perform diagnosis at less than 4 km/h (2.49 MPH) of vehicle speed.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (2 seconds).

#### Judgment Value

| Malfunction Criteria                             | Threshold Value |
|--|-----------------|
| Engine speed – target eng. speed                 | ≥ 1,500 rpm     |
| Feedback value for ISC                           | ≤ 0%            |
| Engine speed change every 180 degree engine rev. | ≥ -5 rpm        |

**Time Needed for Diagnosis:** 2 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

#### Judgment Value

| Malfunction Criteria             | Threshold Value |
|----------------------------------|-----------------|
| Engine speed – target eng. speed | < 200 rpm       |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 7. FAIL SAFE

Fuel shut-off: Shut-off fuel for only #1 and #2 cylinder, or for all cylinder in accordance with vehicle speed, engine speed, throttle position

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### CG:DTC P0600 SERIAL COMMUNICATION LINK

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of CAN communication.

Judge NG when CAN communication becomes impossible, the CAN communication with AT becomes impossible, and the data from AT is not normal.

#### 2. COMPONENT DESCRIPTION

CAN connects between ECM and TCM with high speed.

*(Common Specification)*

*CAN PROTOCOL 2.0B (active)*

*Frame format: 11 bit ID Frame (Standard frame)*

*(High Speed CAN)*

*ISO 11898 compliance*

*Communication Speed: 500 kbps*

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery Voltages     | ≥ 10.9 V          |
| Starter switch       | OFF               |
| Engine               | Run               |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

#### 5. DIAGNOSTIC METHOD

##### • JUDGMENT OF MALFUNCTION

Judge NG when any of the malfunction criteria below are completed. Judge OK and clear the NG when the continuous time of not completing all the malfunction criteria below becomes more than the time needed for diagnosis (1 second).

##### Judgement Value

| Malfunction Criteria           | Threshold Value    |
|--------------------------------|--------------------|
| Buss off flag or warning flag  | Set                |
| ID cannot be received from TCM | = 500 milliseconds |

**Time needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates simultaneously when malfunction is detected.

#### 6. DTC CLEAR CONDITION

When the OK driving cycle was completed 40 consecutive times.

When "Clear Memory" was performed.

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 consecutive times.
- When "Clear Memory" was performed.

#### 8. FAIL-SAFE

The angle operation of accelerator position sensor demand target throttle opening calculation

#### 9. ECM OPERATION AT DTC SETTING

Store the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## CH:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

### 1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the micro-computer (RAM).

Normally, zero-clear all the RAM area in the initial routine. And judge NG when the total of all the RAM after the clear is not \$0000.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | OFF → ON          |

Perform the diagnosis in the initial routine.

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis immediately after IG key SW is turned ON.

### 4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

| Malfunction Criteria                                   | Threshold Value |
|--|-----------------|
| Result of RAM data addition, after zero initialization | Cannot read     |

**Time Needed for Diagnosis:** Undecided

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### CI: DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when SUM value of ROM is out of the standard value.

#### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| SUM value of ROM     | Standard value  |

**Time Needed for Diagnosis:** To be determined.

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only at engine stop)

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

Stop the current to electronic throttle control motor. (Fix the throttle opening angle to 6°.)

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

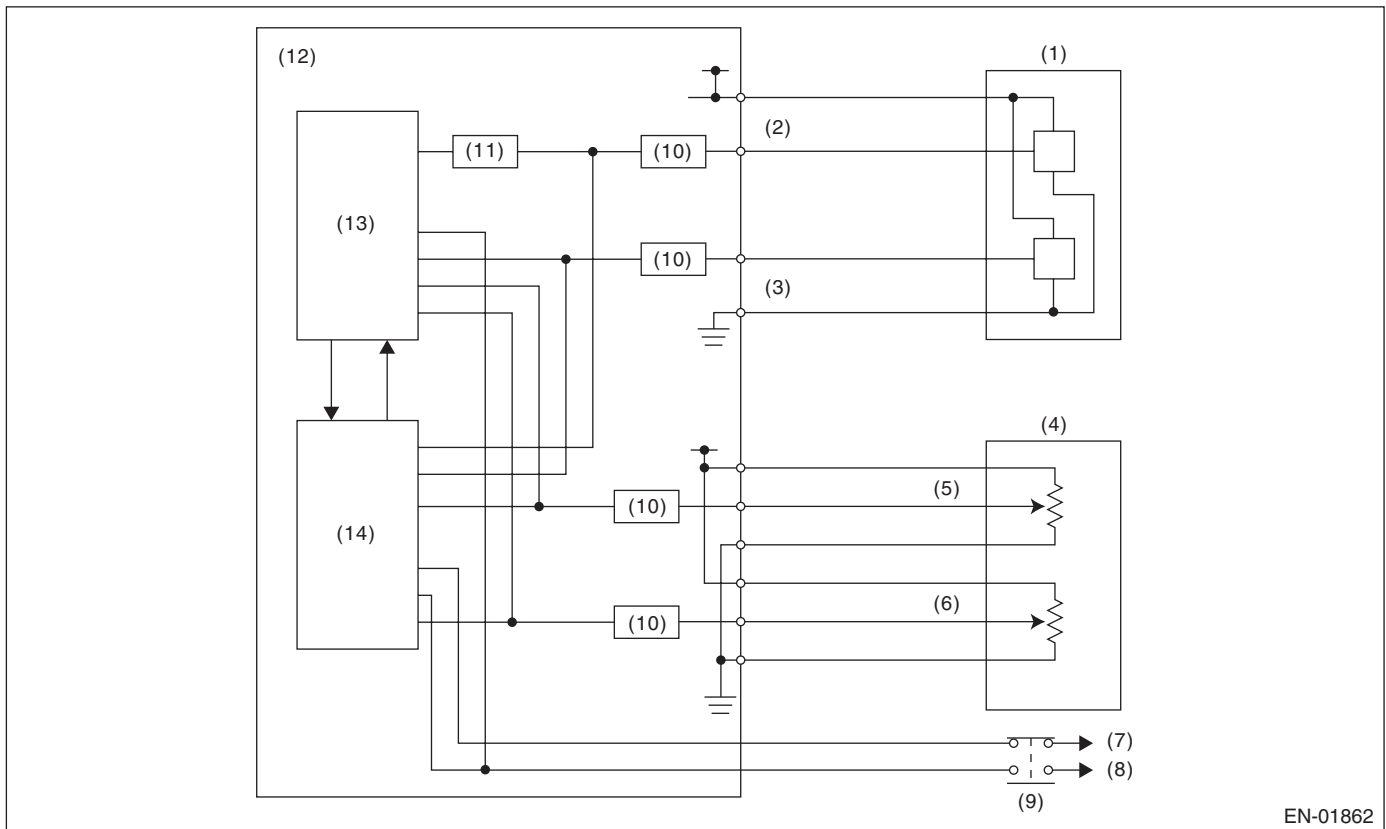
## CJ:DTC P0607 CONTROL MODULE PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Judge NG when either the following is completed.

- When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the read value of accelerator pedal position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU and sub CPU is abnormal.
- When the input amplifier circuit of throttle position sensor 1 is abnormal.
- When the cruise control cannot be canceled correctly.
- When the signal of brake SW1 and 2 is mismatched.
- When the directed angle from main CPU is abnormal.

### 2. COMPONENT DESCRIPTION



- |   |                                       |                                  |
|---|---------------------------------------|----------------------------------|
| (1) Throttle position sensor            | (6) Accelerator pedal position sensor | (11) Amplifier circuit           |
| (2) Throttle position sensor 1          | 2                                     | (12) Engine control module (ECM) |
| (3) Throttle position sensor 2          | (7) Battery                           | (13) Sub CPU                     |
| (4) Accelerator pedal position sensor   | (8) Stop light                        | (14) Main CPU                    |
| (5) Accelerator pedal position sensor 1 | (9) Brake switch                      |                                  |
|   | (10) I/F circuit                      |                                  |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 3. ENABLE CONDITION

| Secondary Parameters               | Enable Conditions |
|------------------------------------|-------------------|
| (1) Ignition switch                | ON                |
| (2) Ignition switch                | ON                |
| (3) None                           | —                 |
| (4) None                           | —                 |
| (5) Throttle opening angle         |                   |
| (6) Brake SW (with cruise control) | ON                |
| (7) None                           | —                 |

### 4. GENERAL DRIVING CYCLE

- (1) — (4): Always perform the diagnosis continuously.  
(5): Always perform the diagnosis continuously on idling.  
(6): Perform the diagnosis when the brake pedal is depressed.  
(7): Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value                 |
|--|---------------------------------|
| (1) Difference of CPU on reading value of throttle position sensor signal    | Within 0.858 V                  |
| (2) Difference of CPU on reading value of accelerator position sensor signal | Within 0.042 V                  |
| (3) WD pulse from sub CPU  | WD pulse occur                  |
| (4) Communication between CPU  | Possible to communicate         |
| (5) Difference of signal on connection of amplifier                          | Within $\times 4\pm 3^\circ$    |
| (6) Cruise control cancel signal at brake ON                                 | Cruise control cancel signal ON |
| (7) Brake switch 1, 2 signal   | SW 1 and 2 are matched          |

#### Time Needed for Diagnosis:

- (1) 250 milliseconds  
(2) 250 milliseconds  
(3) 200 milliseconds  
(4) 200 milliseconds  
(5) 24 milliseconds  
(6) 250 milliseconds  
(7) 200 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Stop the current to electronic throttle control motor. (Fix the throttle opening angle to  $6^\circ$ .)

## 9. ECM OPERATION AT DTC SETTING

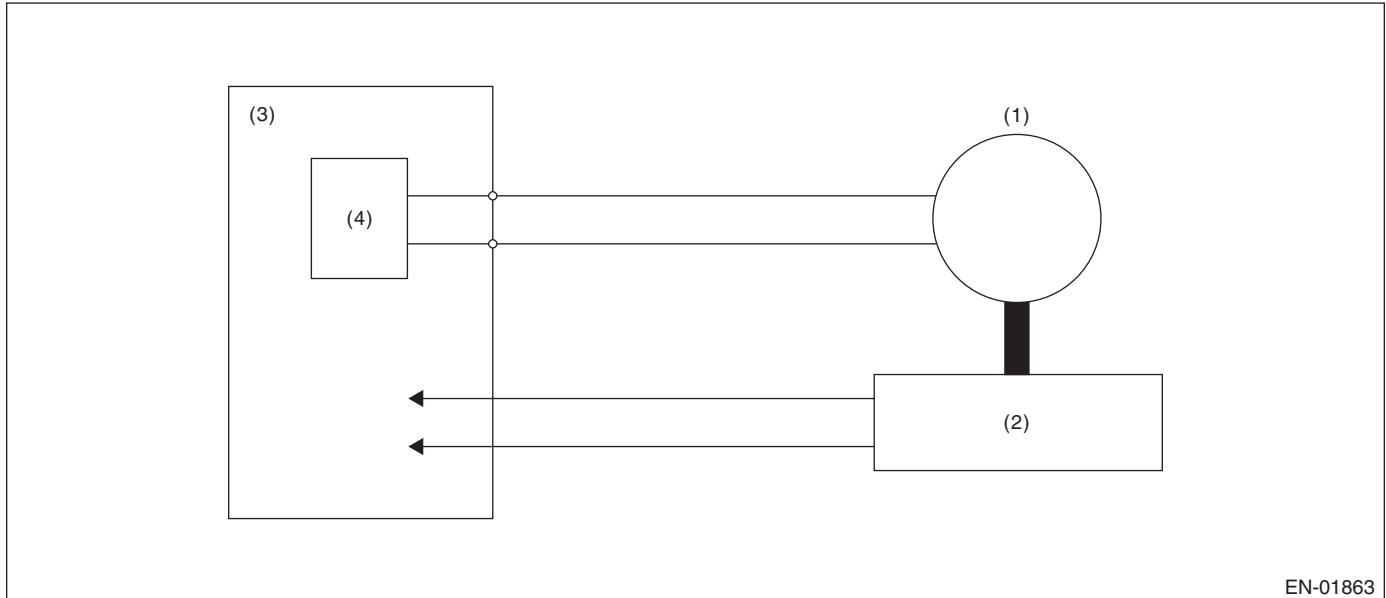
Memorize the freeze frame data. (For test mode \$02)

### CK:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the target opening angle and actual opening angle is mismatched or the current to motor is more than specified duty for specified time continuously.

#### 2. COMPONENT DESCRIPTION



- |                              |                                 |
|------------------------------|---------------------------------|
| (1) Motor                    | (3) Engine control module (ECM) |
| (2) Throttle position sensor | (4) Drive circuit               |

#### 3. ENABLE CONDITION

| Secondary Parameters                            | Enable Conditions |
|---|-------------------|
| Ignition switch                                 | ON                |
| Normal operation of electronic throttle control | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electronic throttle control is operating.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Difference between target opening angle and actual opening angle | Less than 3.5°  |
| Output duty to drive circuit                                     | Less than 95%   |

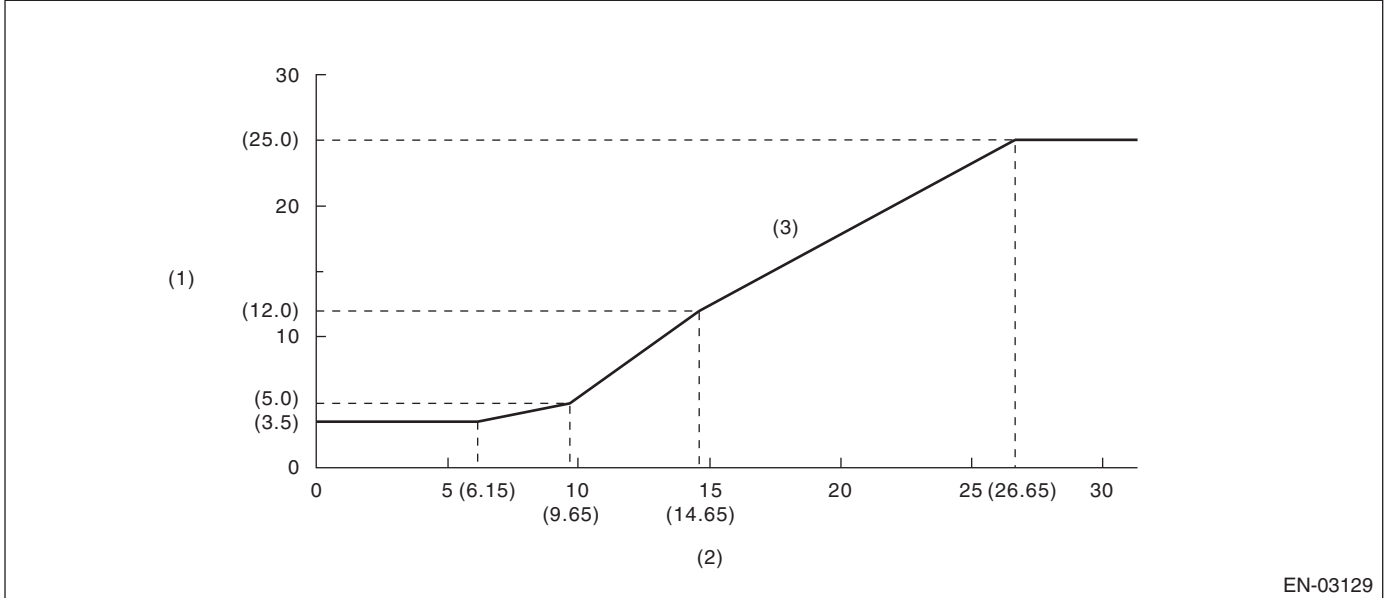
##### Time Needed for Diagnosis:

Target opening angle and actual opening angle: 250 milliseconds (For NG) 2,000 milliseconds (For OK)  
 Output duty to drive circuit: 2,000 milliseconds

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

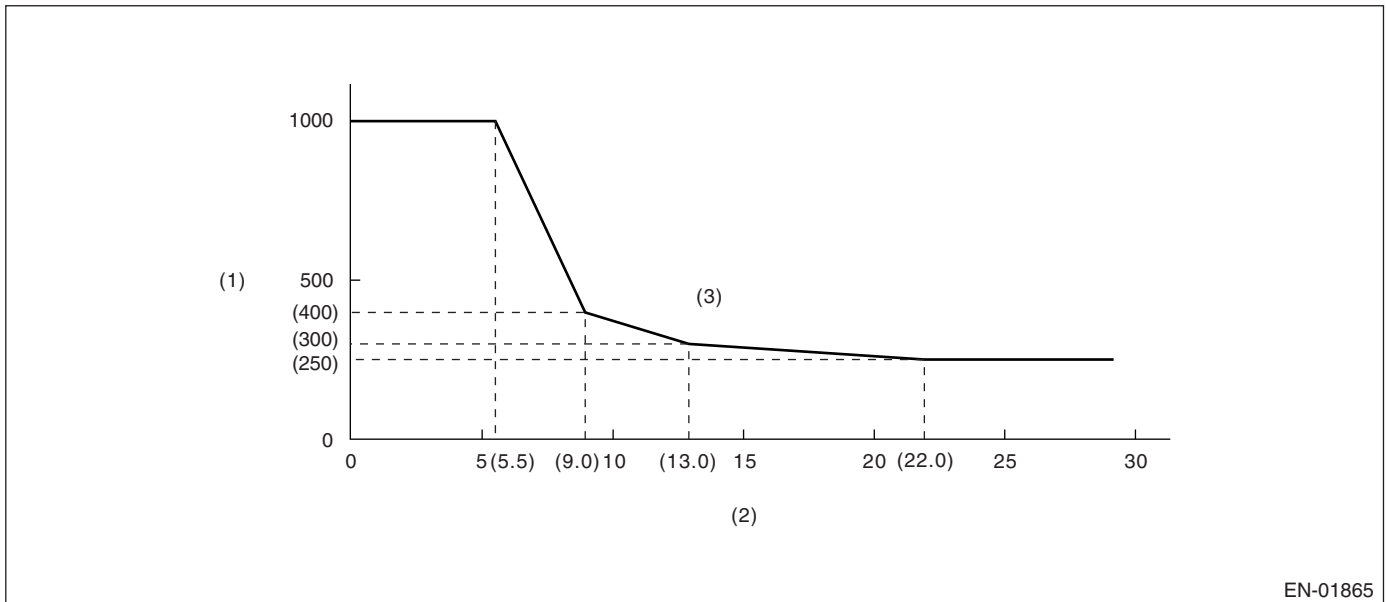
### Details of Judgment



EN-03129

- (1) Difference between target opening angle and actual opening angle (°)      (2) Target throttle opening angle (°)  
 (3) NG area

### Details of Judgment (Always 1,000 milliseconds when the actual opening angle ≤ target opening angle)



EN-01865

- (1) Judgment time (milliseconds)      (3) NG area  
 (2) Throttle position sensor 1 opening angle

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 8. FAIL SAFE

Stop the current to electronic throttle control motor. (Fix the throttle opening angle to 6°.)

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## CL:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.

Judge NG when the ECM output level differs from the actual terminal level.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria                                 | Threshold Value   |
|--|-------------------|
| After starting the engine                            | 1 seconds or more |
| Engine speed   | ≥ 500 rpm         |
| Ignition switch                                      | ON                |
| Battery voltage                                      | ≥ 10.9 V          |
| Terminal voltage level when ECM transmits OFF signal | Low level         |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                                 | Threshold Value   |
|--|-------------------|
| After starting the engine                            | 1 seconds or more |
| Engine speed   | ≥ 500 rpm         |
| Ignition switch                                      | ON                |
| Battery voltage                                      | ≥ 10.9 V          |
| Terminal voltage level when ECM transmits OFF signal | High level        |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## CM:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.

Judge NG when the ECM output level differs from the actual terminal level.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria                                | Threshold Value   |
|---|-------------------|
| After starting the engine                           | 1 seconds or more |
| Engine speed  | ≥ 500 rpm         |
| Ignition switch                                     | ON                |
| Battery voltage                                     | ≥ 10.9 V          |
| Terminal voltage level when ECM transmits ON signal | High level        |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                                | Threshold Value   |
|---|-------------------|
| After starting the engine                           | 1 seconds or more |
| Engine speed  | ≥ 500 rpm         |
| Ignition switch                                     | ON                |
| Battery voltage                                     | ≥ 10.9 V          |
| Terminal voltage level when ECM transmits ON signal | Low level         |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## CN:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

### 1. OUTLINE OF DIAGNOSIS

AT C/U performs CAN communication. It judges as NG if malfunction is detected.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery Voltage      | $\geq 10.9$ V     |

### 3. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

### 4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judge OK and clear the NG when the malfunction criteria below are not completed.

#### Judgement Value

| Malfunction Criteria          | Threshold Value |
|-------------------------------|-----------------|
| MIL light up request from TCM | Set             |

**Time needed for diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates simultaneously when malfunction is detected.

### 5. DTC CLEAR CONDITION

- When the OK driving cycle was completed 40 consecutive times.
- When "Clear Memory" was performed.

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 consecutive times.
- When "Clear Memory" was performed.

## 7. FAIL-SAFE

None

## 8. ECM OPERATION AT DTC SETTING

Store the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### CO:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.

Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

#### 2. ENABLE CONDITION

| Secondary Parameters      | Enable Conditions     |
|---------------------------|-----------------------|
| Ignition switch           | ON                    |
| Battery voltage           | $\geq 10.9 \text{ V}$ |
| After starting the engine | 2 seconds or more     |
| Starter switch            | OFF                   |

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

#### 4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 6.5 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Neutral switch signal when park/neutral = "OFF" & any other switches = "ON" on AT | Low (ON)        |

**Time Needed for Diagnosis:** 6.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## CP:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

### 1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

### 2. ENABLE CONDITION

| Secondary Parameters      | Enable Conditions |
|---------------------------|-------------------|
| Ignition switch           | ON                |
| Battery voltage           | $\geq 10.9$ V     |
| After starting the engine | 2 seconds or more |
| Starter switch            | OFF               |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

### 4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

#### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Neutral switch signal (while changing from a to b below)                  | Low continues   |
| Driving condition change  | a) to b)        |
| a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm            |                 |
| b) Vehicle speed $\geq 64$ km/h (40 MPH) & engine speed 1,600 — 2,550 rpm |                 |

**Time Needed for Diagnosis:** 3 monitoring

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 7. FAIL SAFE

Cruise control: Not allowed to command cruise control.

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### CQ:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.

Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

#### 2. ENABLE CONDITION

| Secondary Parameters      | Enable Conditions     |
|---------------------------|-----------------------|
| Ignition switch           | ON                    |
| Battery voltage           | $\geq 10.9 \text{ V}$ |
| After starting the engine | 2 seconds or more     |
| Starter switch            | OFF                   |

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

#### 4. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 6.5 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Neutral switch signal when park/neutral = "ON" & any other switches = "OFF" on AT | High (OFF)      |

**Time Needed for Diagnosis:** 6.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## CR:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

### 1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

### 2. ENABLE CONDITION

| Secondary Parameters      | Enable Conditions     |
|---------------------------|-----------------------|
| Ignition switch           | ON                    |
| Battery voltage           | $\geq 10.9 \text{ V}$ |
| After starting the engine | 2 seconds or more     |
| Starter switch            | OFF                   |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

### 4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

#### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Neutral switch signal (while changing from a to b below)                            | High continues  |
| Driving condition change  | a) to b)        |
| a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm                      |                 |
| b) Vehicle speed $\geq 64 \text{ km/h}$ (39.8 MPH) & engine speed 1,600 — 2,550 rpm |                 |

**Time Needed for Diagnosis:** 3 monitoring

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### CS:DTC P1152 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

#### 1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains Low.

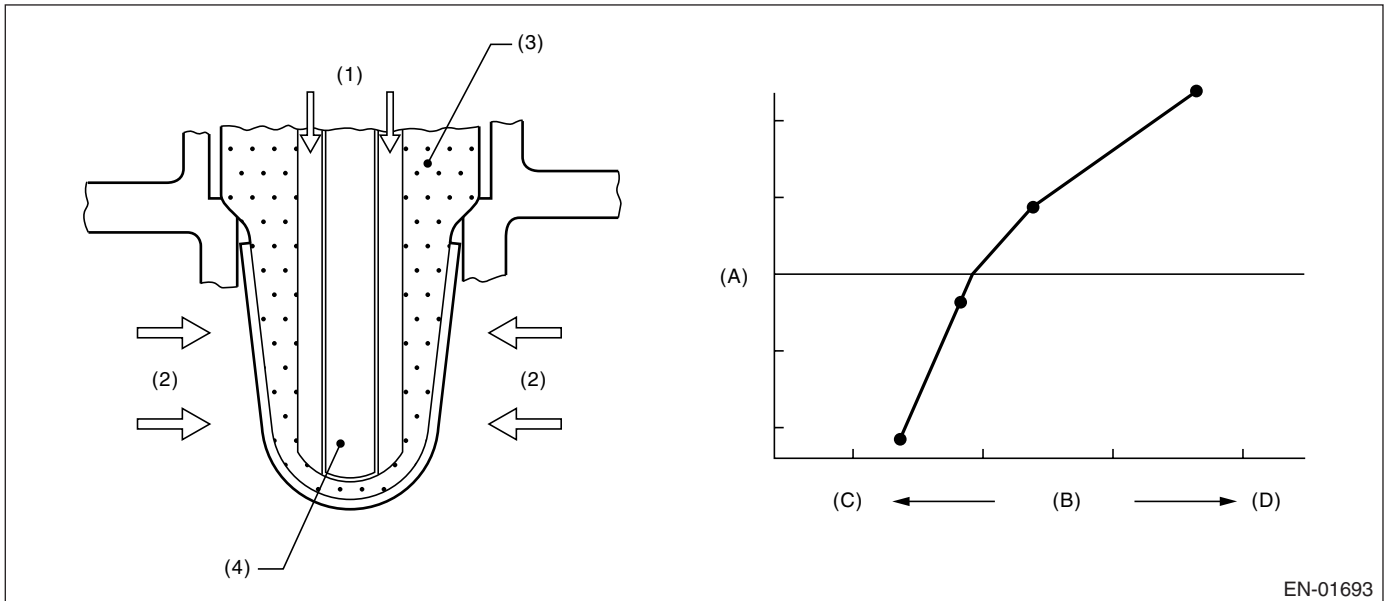
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.

***Lambda value = Actual air fuel ratio/Theoretical air fuel ratio***

Lambda > 1: Lean

Lambda < 1: Rich

#### 2. COMPONENT DESCRIPTION



EN-01693

- (1) Atmosphere
- (2) Exhaust
- (3) ZrO<sub>2</sub>
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions                |
|---|----------------------------------|
| All secondary parameters to be in enable conditions         | 4 seconds or more                |
| Battery voltage   | > 10.9 V                         |
| Atmospheric pressure  | > 75.0 kPa (563 mmHg, 22.2 inHg) |
| Rear oxygen sensor sub feedback                             | Operating                        |
| Rear oxygen sensor output voltage – feedback target voltage | –0.2 V ↔ 0.1 V                   |
| or rear oxygen sensor sub feedback compensation coefficient | On Min.                          |
| or rear oxygen sensor sub feedback compensation coefficient | On Max.                          |
| After engine starting                                       | 60 seconds or more               |
| Engine coolant temperature                                  | ≥ 70°C (158°F)                   |
| Vehicle speed   | ≥ 20 km/h (12 MPH)               |
| Amount of intake air  | ≥ 6 g/s                          |
| Load change during 0.5 engine rev.                          | ≤ 0.01 g/rev                     |
| Impedance of front oxygen (A/F) sensor                      | 0 ↔ 50 Ω                         |
| Learning value of evaporation gas density                   | ≤ 0.2                            |
| Accumulated time of operating canister purge                | 20 seconds or more               |

## 4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

## 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Output lambda when rear oxygen sensor sub feedback compensation coefficient being at not high limit | ≤ 0.85          |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

### CT:DTC P1153 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

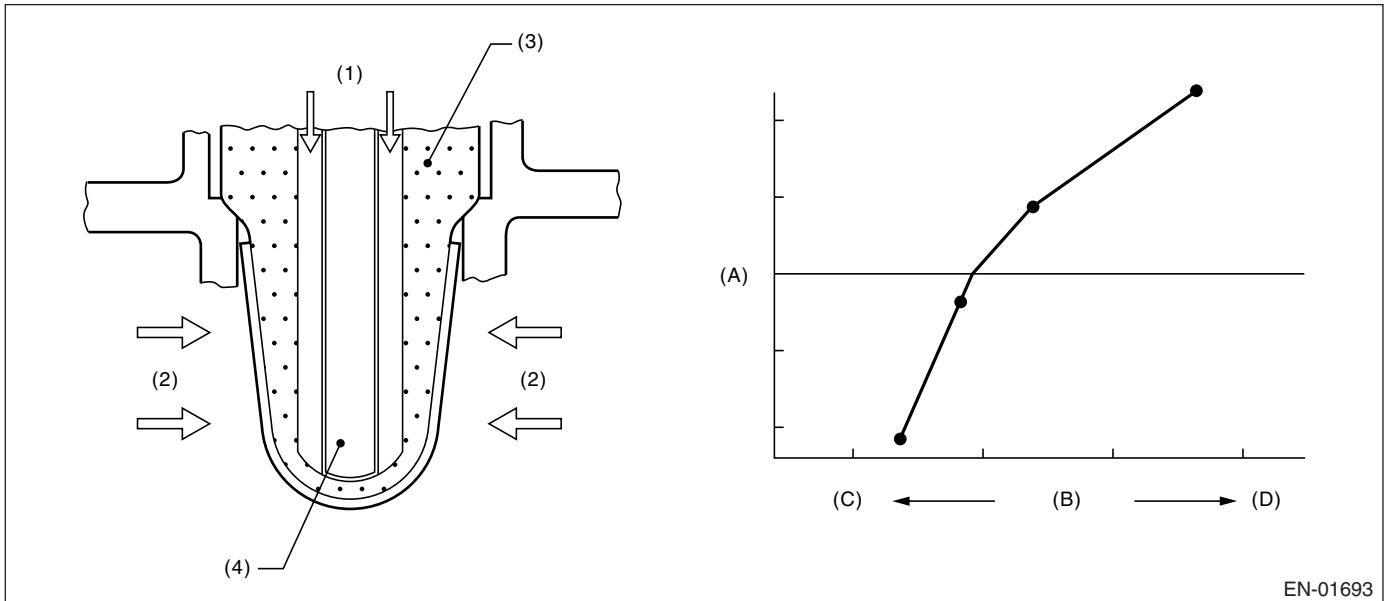
#### 1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains High.

Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.

**$\text{Lambda value} = \text{Actual air fuel ratio} / \text{Theoretical air fuel ratio}$**   
Lambda > 1: Lean  
Lambda < 1: Rich

#### 2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust
- (3) ZrO<sub>2</sub>
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

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# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions                |
|---|----------------------------------|
| All secondary parameters to be in enable conditions         | 4 seconds or more                |
| Battery voltage   | > 10.9 V                         |
| Atmospheric pressure  | > 75.0 kPa (563 mmHg, 22.2 inHg) |
| Rear oxygen sensor sub feedback                             | Operating                        |
| Rear oxygen sensor output voltage – feedback target voltage | –0.2 V ↔ 0.1 V                   |
| or rear oxygen sensor sub feedback compensation coefficient | On Min.                          |
| or rear oxygen sensor sub feedback compensation coefficient | On Max.                          |
| After engine starting                                       | 60 seconds or more               |
| Engine coolant temperature                                  | ≥ 70°C (158°F)                   |
| Vehicle speed   | ≥ 20 km/h (12 MPH)               |
| Amount of intake air  | ≥ 6 g/s                          |
| Load change during 0.5 engine rev.                          | ≤ 0.02 g/rev                     |
| Impedance of front oxygen (A/F) sensor                      | 0 ↔ 50 Ω                         |
| Learning value of evaporation gas density                   | ≤ 0.2                            |
| Accumulated time of operating canister purge                | 20 seconds or more               |

## 4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

## 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Output lambda when rear O <sub>2</sub> sensor sub feedback compensation coefficient value being at not low limit | ≥ 1.15          |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 9. ECM OPERATION AT DTC SETTING

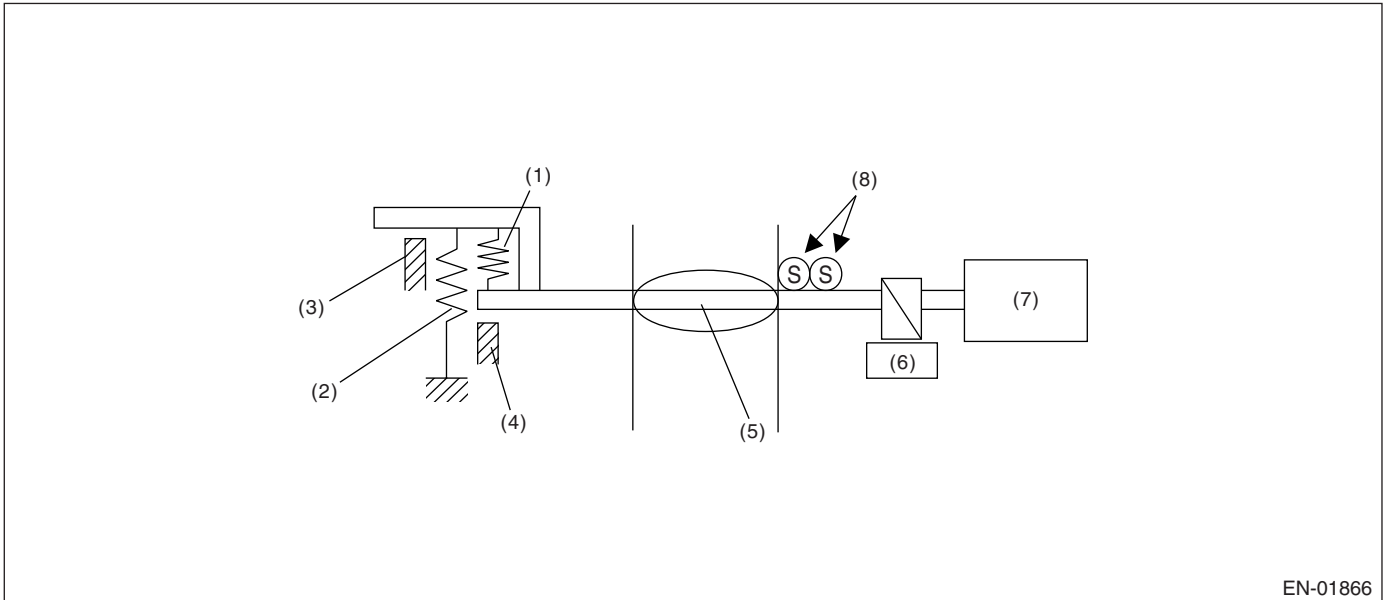
Memorize the freeze frame data. (For test mode \$02)

### CU:DTC P1160 RETURN SPRING FAILURE

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the valve does not move to the close direction with the motor power stopped and the valve open more than the default opening.

#### 2. COMPONENT DESCRIPTION



EN-01866

- |                          |                         |                                  |
|--------------------------|-------------------------|----------------------------------|
| (1) Opener spring        | (4) Full closed stopper | (7) DC motor                     |
| (2) Return spring        | (5) Throttle valve      | (8) Main and sub throttle sensor |
| (3) Intermediate stopper | (6) Gear                |                                  |

#### 3. ENABLE CONDITION

| Secondary Parameters   | Enable Conditions |
|------------------------|-------------------|
| Throttle opening angle | OFF               |
| Motor continuity       | OFF               |

#### 4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.6 seconds.

##### Judgment Value

| Malfunction Criteria                             | Threshold Value |
|--|-----------------|
| Opening variation after continuity is set to OFF | < 2°            |

**Time Needed for Diagnosis:** 600 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 8. FAIL SAFE

Fix the throttle opening to 6°.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

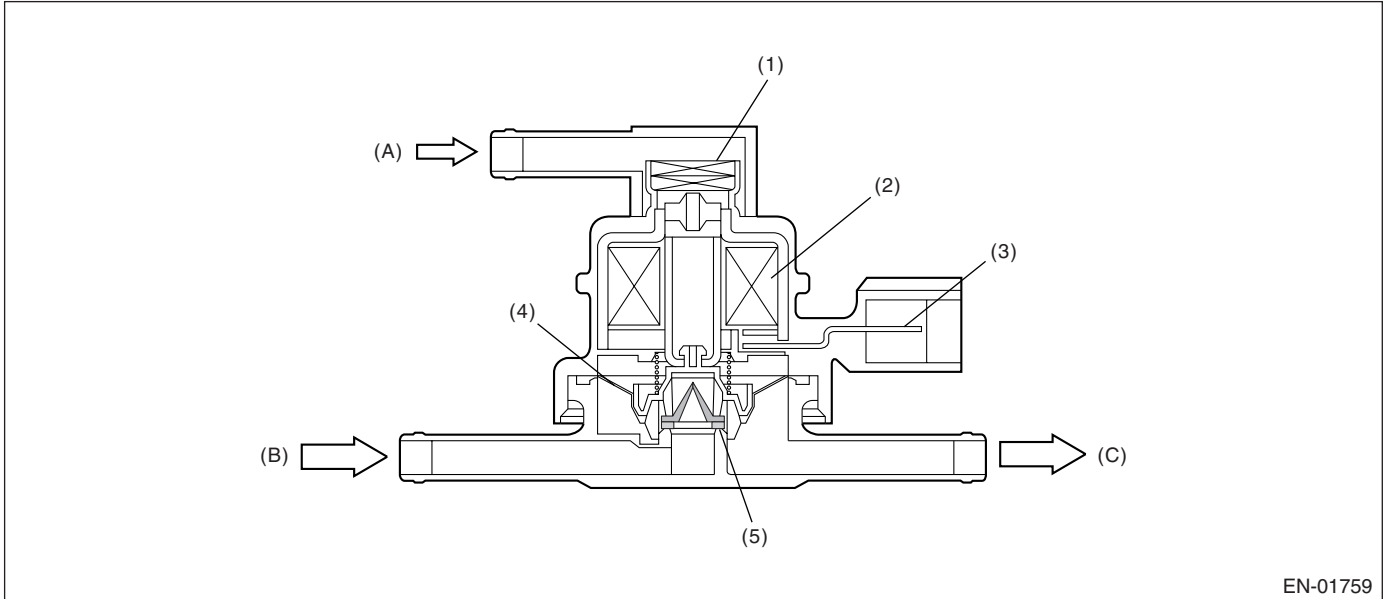
## GENERAL DESCRIPTION

### CV:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve. Judge NG when ECM output level is different from actual terminal level.

#### 2. COMPONENT DESCRIPTION



- |                        |                          |
|------------------------|--------------------------|
| (1) Filter             | (A) Atmospheric pressure |
| (2) Coil               | (B) Shut off valve       |
| (3) Connector terminal | (C) To fuel tank         |
| (4) Diaphragm          |                          |
| (5) Valve              |                          |

#### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions     |
|-----------------------|-----------------------|
| Ignition switch       | ON                    |
| Battery voltage       | $\geq 10.9 \text{ V}$ |
| After engine starting | 1 second or more      |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria                         | Threshold Value |
|--|-----------------|
| Terminal voltage when ECM outputs off signal | Low             |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### CW:DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN

#### 1. OUTLINE OF DIAGNOSIS

Always detect the open malfunction of both electromagnetic valve and reed valve of combi valve. Calculate maximum and minimum values of secondary air supply pipe pressure sensor output voltage during certain period of time after engine starting, and cumulative deviation of output voltage. Judge NG when the difference between max. and min. values, and cumulative deviation are large.

#### 2. ENABLE CONDITION

| Secondary Parameters                            | Enable Conditions  |
|---|--|
| Engine speed                                    | < 500 rpm  |
| After engine starting                           | 9 seconds or more  |
| After secondary air injection system is stopped | 9 seconds or more  |
| Intake air amount                               | 2 g (0.07 oz)/sec. or more and less than 400 g (14.11 oz)/sec. |
| Battery voltage                                 | ≥ 10.9 V   |

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when amount of air flow is large while secondary air pump is not operated after engine starting.

#### 4. DIAGNOSTIC METHOD

Pulsation occurs in secondary air supply pipe pressure sensor output when both electromagnetic valve and reed valve of combi valve have open malfunction. Find this pulsation in the following method, and detect the malfunction.

Calculate maximum (max) and minimum (min) values of secondary air supply pipe pressure sensor output voltage, and cumulative deviation (sum) of output voltage during kCOTIM sec. Compare the difference value between maximum and minimum values with threshold value, and also cumulative value with threshold value. Count up the number of times when both values exceed threshold value. Judge NG when the number of times becomes kCOCOT. Judge OK when both of values do not exceed threshold value or only one of them does.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Difference value between maximum and minimum values of internal pressure in pipe | ≥ 0.048 V       |
| Cumulative variation value of internal pressure in pipe at every 4 milliseconds  | ≥ 24 V          |
| Variation value in ambient pressure  | < 4 mmHg        |

**Time Needed for Diagnosis:** 10 seconds × 2 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs.

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

None

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

### CX:DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT SHORTED

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the ECM output level is different from the actual terminal level.

#### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| OFF                  |                   |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

##### Judgment Value

| Malfunction Criteria                          | Threshold Value |
|---|-----------------|
| Battery voltage                               | $\geq 10.9$ V   |
| Ignition                                      | ON              |
| Terminal voltage when ECM transmits ON signal | High            |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria                          | Threshold Value |
|---|-----------------|
| Battery voltage                               | $\geq 10.9$ V   |
| Ignition                                      | ON              |
| Terminal voltage when ECM transmits ON signal | Low             |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

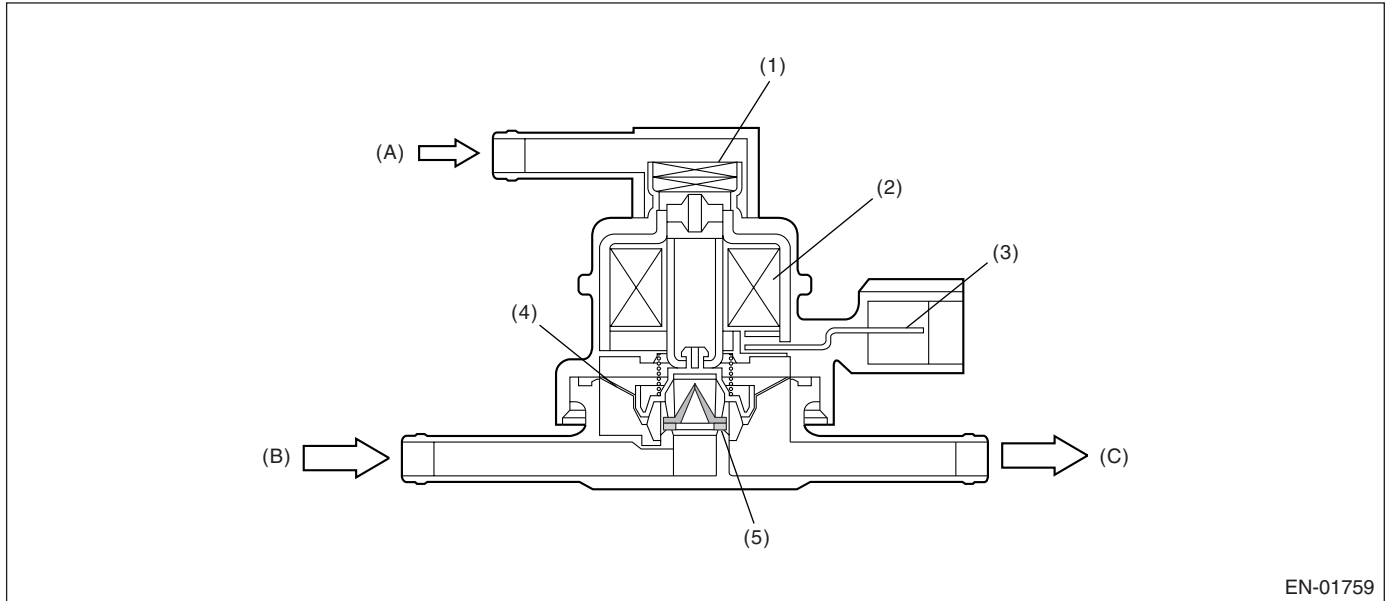
## GENERAL DESCRIPTION

### CY:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve.  
Judge NG when ECM output level is different from actual terminal level.

#### 2. COMPONENT DESCRIPTION



- |                        |                          |
|------------------------|--------------------------|
| (1) Filter             | (A) Atmospheric pressure |
| (2) Coil               | (B) Shut off valve       |
| (3) Connector terminal | (C) To fuel tank         |
| (4) Diaphragm          |                          |
| (5) Valve              |                          |

#### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions     |
|-----------------------|-----------------------|
| Ignition switch       | ON                    |
| Battery voltage       | $\geq 10.9 \text{ V}$ |
| After engine starting | 1 second or more      |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria                         | Threshold Value |
|--|-----------------|
| Terminal voltage when ECM outputs off signal | High            |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

## Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

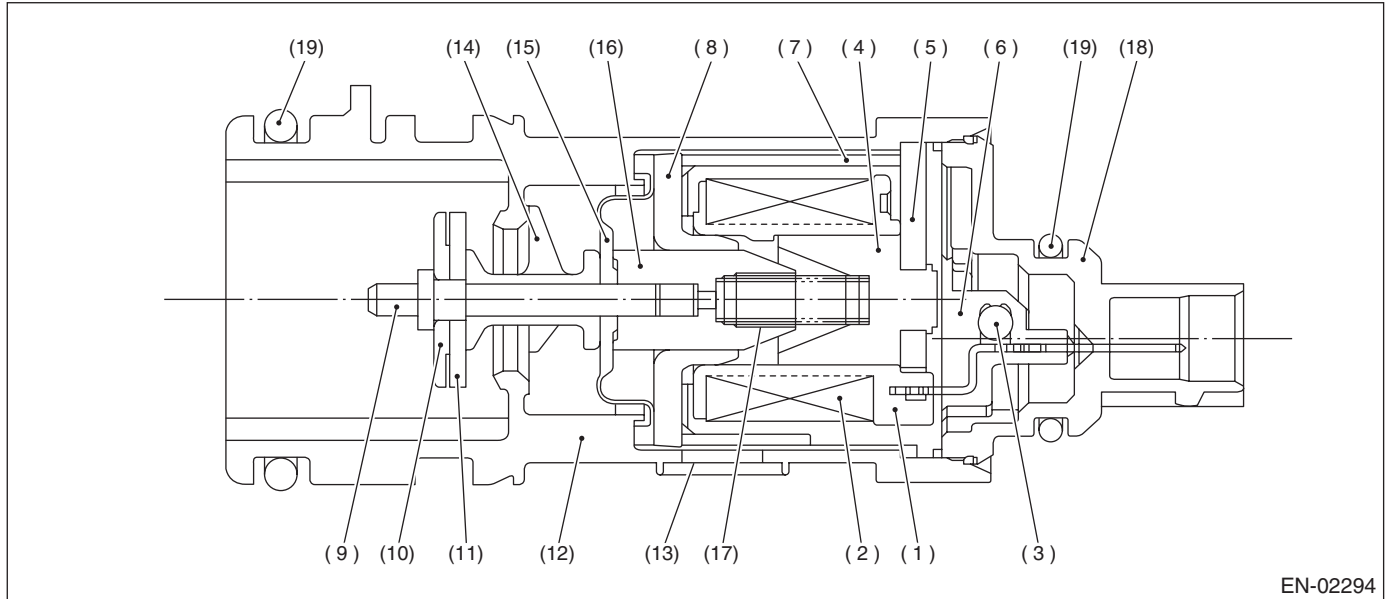
## GENERAL DESCRIPTION

### CZ:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

#### 1. OUTLINE OF DIAGNOSIS

Detect the drain valve function abnormality.  
Judge NG when the fuel tank pressure is small.

#### 2. COMPONENT DESCRIPTION



- |                    |                   |
|--------------------|-------------------|
| (1) Bobbin         | (11) Valve        |
| (2) Coil           | (12) Housing      |
| (3) Diode          | (13) Filter       |
| (4) Stator core    | (14) Retainer     |
| (5) End plate      | (15) Diaphragm    |
| (6) Body           | (16) Movable core |
| (7) Yoke           | (17) Spring       |
| (8) Magnetic plate | (18) Cover        |
| (9) Shaft          | (19) O-ring       |
| (10) Plate         |                   |

#### 3. ENABLE CONDITION

| Secondary Parameter                 | Enable Condition   |
|-------------------------------------|--|
| Drain valve                         | Open   |
| Battery voltage                     | $\geq 10.9$ V  |
| Atmospheric pressure                | $\geq 75.0$ kPa (563 mmHg, 22.17 inHg)   |
| Tank pressure when starter ON → OFF | $-0.67 \leftrightarrow 1.43$ kPa (-5 $\leftrightarrow$ 10.7 mmHg, -0.20 $\leftrightarrow$ 0.42 inHg) |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

### Judgment Value

| Malfunction Criteria | Threshold Value                             |
|----------------------|---|
| Tank pressure        | $\leq -4.0$ kPa ( $-30$ mmHg, $-1.18$ inHg) |

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria  | Threshold Value   |
|---|---|
| Tank pressure   | $> -4.0$ kPa ( $-30$ mmHg, $-1.18$ inHg)  |
| Cumulative time when the malfunction criteria below are completed | $\geq 30$ seconds   |
| Duty ratio of purge control solenoid valve                        | Except 0  |
| Fuel temperature  | $-10 \leftrightarrow 45^\circ\text{C}$ ( $14 \leftrightarrow 113^\circ\text{F}$ ) |
| Relative ratio of intake manifold                                 | $\leq -26.7$ kPa ( $-200$ mmHg, $-7.87$ inHg)                                     |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

PCV control: Open the PCV solenoid.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

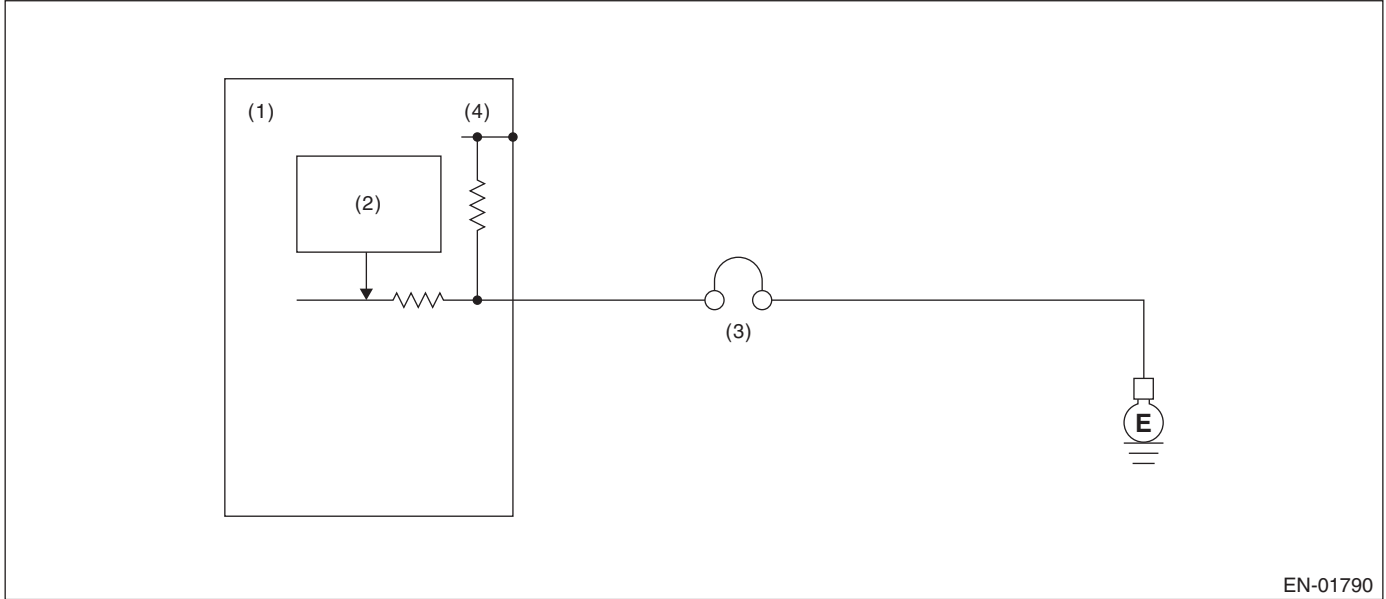
## GENERAL DESCRIPTION

### DA:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

#### 1. OUTLINE OF DIAGNOSIS

Detect the blow-by hose release abnormality.  
Judge NG when the diagnosis terminal voltage is high.

#### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Detecting circuit
- (3) PCV diagnosis connector
- (4) 5 V

#### 3. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---------------------|------------------|
| None                |                  |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSIS METHOD

##### • Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 2.5 second.

##### Judgment Value

| Malfunction Criteria                                      | Threshold Value |
|---|-----------------|
| Battery voltage   | > 10.9 V        |
| Positive crankcase ventilation diagnosis terminal voltage | High            |
| Engine speed  | ≥ 500 rpm       |

**Time Needed for Diagnosis:** 2.5 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

### Judgment Value

| Malfunction Criteria                                      | Threshold Value |
|---|-----------------|
| Battery voltage   | > 10.9 V        |
| Positive crankcase ventilation diagnosis terminal voltage | Low             |
| Engine speed  | ≥ 500 rpm       |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was performed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the diagnosis value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### DB:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge OFF NG when the engine starts without starter SW signal.

#### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge OFF NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria  | Threshold Value     |
|---|---------------------|
| Vehicle speed   | < 1 km/h (0.62 MPH) |
| Starter ON signal   | Not detected        |
| Engine speed after completing 0.8 seconds or more of engine speed less than 500 rpm | ≥ 500 rpm           |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

##### • Normality Judgment

Judge OFF OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Starter ON           | Experienced     |
| Starter ON diagnosis | Not experienced |
| Battery voltage      | > 8 V           |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## DC:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the back-up voltage circuit.

Judge NG when the back-up voltage becomes smaller than the battery voltage.

### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---------------------|------------------|
| None                |                  |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria     | Threshold Value                       |
|--------------------------|---------------------------------------|
| Voltage of back-up power | $< \text{Battery voltage} \times 0.7$ |
| Battery voltage          | $\geq 10.9 \text{ V}$                 |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

#### Judgment Value

| Malfunction Criteria            | Threshold Value                          |
|---------------------------------|--|
| Voltage of back-up power supply | $\geq \text{Battery voltage} \times 0.7$ |
| Battery voltage                 | $\geq 10.9 \text{ V}$                    |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### **DD:DTC P1570 ANTENNA**

#### **1. OUTLINE OF DIAGNOSIS**

For the detecting criteria, refer to P0513.

<Ref. to GD(H4DOTC)-170, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **DE:DTC P1571 REFERENCE CODE INCOMPATIBILITY**

#### **1. OUTLINE OF DIAGNOSIS**

For the detecting criteria, refer to P0513.

<Ref. to GD(H4DOTC)-170, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **DF:DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)**

#### **1. OUTLINE OF DIAGNOSIS**

For the detecting criteria, refer to P0513.

<Ref. to GD(H4DOTC)-170, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **DG:DTC P1574 KEY COMMUNICATION FAILURE**

#### **1. OUTLINE OF DIAGNOSIS**

For the detecting criteria, refer to P0513.

<Ref. to GD(H4DOTC)-170, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **DH:DTC P1576 EGI CONTROL MODULE EEPROM**

#### **1. OUTLINE OF DIAGNOSIS**

For the detecting criteria, refer to P0513.

<Ref. to GD(H4DOTC)-170, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **DI: DTC P1577 IMM CONTROL MODULE EEPROM**

#### **1. OUTLINE OF DIAGNOSIS**

For the detecting criteria, refer to P0513.

<Ref. to GD(H4DOTC)-170, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## DJ:DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge open fixing malfunction when the opening degree is large even after finishing the tumble generator valve open driving.

### 2. ENABLE CONDITION

| Secondary Parameters       | Enable Conditions                                 |
|----------------------------|---|
| Battery voltage            | $\geq 10.9$ V                                     |
| Engine coolant temperature | $\geq 0^{\circ}\text{C}$ ( $32^{\circ}\text{F}$ ) |
| Ambient temperature        | $\geq 0^{\circ}\text{C}$ ( $32^{\circ}\text{F}$ ) |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### Judgment Value

| Malfunction Criteria                         | Threshold Value     |
|--|---------------------|
| Tumble generator valve angle                 | $\geq 67.4^{\circ}$ |
| Tumble generator valve "close" signal output | 2.2 seconds or more |

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                         | Threshold Value     |
|--|---------------------|
| Tumble generator valve angle                 | $< 67.4^{\circ}$    |
| Tumble generator valve "close" signal output | 2.2 seconds or more |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the open signal.

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### DK:DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2)

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge open fixing malfunction when the opening degree is large even after finishing the tumble generator valve closing driving.

#### 2. ENABLE CONDITION

| Secondary Parameters       | Enable Conditions             |
|----------------------------|-------------------------------|
| Battery voltage            | $\geq 10.9 \text{ V}$         |
| Engine coolant temperature | $\geq 0^\circ\text{C}$ (32°F) |
| Ambient temperature        | $\geq 0^\circ\text{C}$ (32°F) |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

##### Judgment Value

| Malfunction Criteria                         | Threshold Value     |
|--|---------------------|
| Tumble generator valve angle                 | $\geq 67.4^\circ$   |
| Tumble generator valve "close" signal output | 2.2 seconds or more |

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria                         | Threshold Value     |
|--|---------------------|
| Tumble generator valve angle                 | $< 67.4^\circ$      |
| Tumble generator valve "close" signal output | 2.2 seconds or more |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the open signal.

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## DL:DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge close fixing malfunction when the opening degree is small even after finishing the tumble generator valve open driving.

### 2. ENABLE CONDITION

| Secondary Parameters       | Enable Conditions             |
|----------------------------|-------------------------------|
| Battery voltage            | $\geq 10.9 \text{ V}$         |
| Engine coolant temperature | $\geq 0^\circ\text{C}$ (32°F) |
| Ambient temperature        | $\geq 0^\circ\text{C}$ (32°F) |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### Judgment Value

| Malfunction Criteria                        | Threshold Value     |
|---|---------------------|
| Tumble generator valve angle                | $< 67.4^\circ$      |
| Tumble generator valve "open" signal output | 2.2 seconds or more |

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                        | Threshold Value     |
|---|---------------------|
| Tumble generator valve angle                | $\geq 67.4^\circ$   |
| Tumble generator valve "open" signal output | 2.2 seconds or more |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the close signal.

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### DM:DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2)

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge close fixing malfunction when the opening degree is small even after finishing the tumble generator valve open driving.

#### 2. ENABLE CONDITION

| Secondary Parameters       | Enable Conditions             |
|----------------------------|-------------------------------|
| Battery voltage            | $\geq 10.9 \text{ V}$         |
| Engine coolant temperature | $\geq 0^\circ\text{C}$ (32°F) |
| Ambient temperature        | $\geq 0^\circ\text{C}$ (32°F) |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

##### Judgment Value

| Malfunction Criteria                        | Threshold Value     |
|---|---------------------|
| Tumble generator valve angle                | $< 67.4^\circ$      |
| Tumble generator valve "open" signal output | 2.2 seconds or more |

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria                        | Threshold Value     |
|---|---------------------|
| Tumble generator valve angle                | $\geq 67.4^\circ$   |
| Tumble generator valve "open" signal output | 2.2 seconds or more |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the close signal.

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

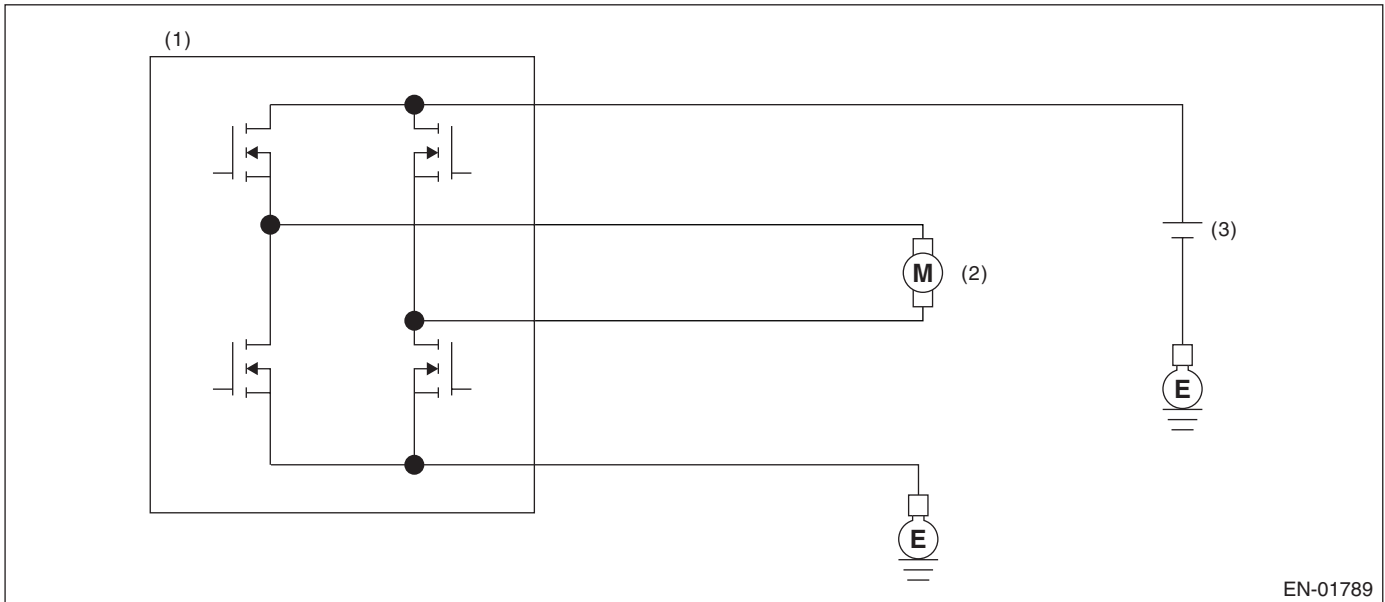
## DN:DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the open signal is sent from IC after tumble generator valve driving IC diagnosis.

### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

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### 3. ENABLE CONDITION

| Secondary Parameters                         | Enable Conditions       |
|--|-------------------------|
| Battery voltage                              | ≥ 10.9 V                |
| ECM output signal                            | before set ON → OFF     |
| Tumble generator valve ON signal output time | 20 milliseconds or more |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge open NG when the open NG signal is sent during 1 second in a row. Judge OK and clear the NG when the OK signal is sent.

#### Judgment Value

| Malfunction Criteria        | Threshold Value |
|-----------------------------|-----------------|
| Open NG signal input        | Low             |
| Overcurrent NG signal input | High            |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

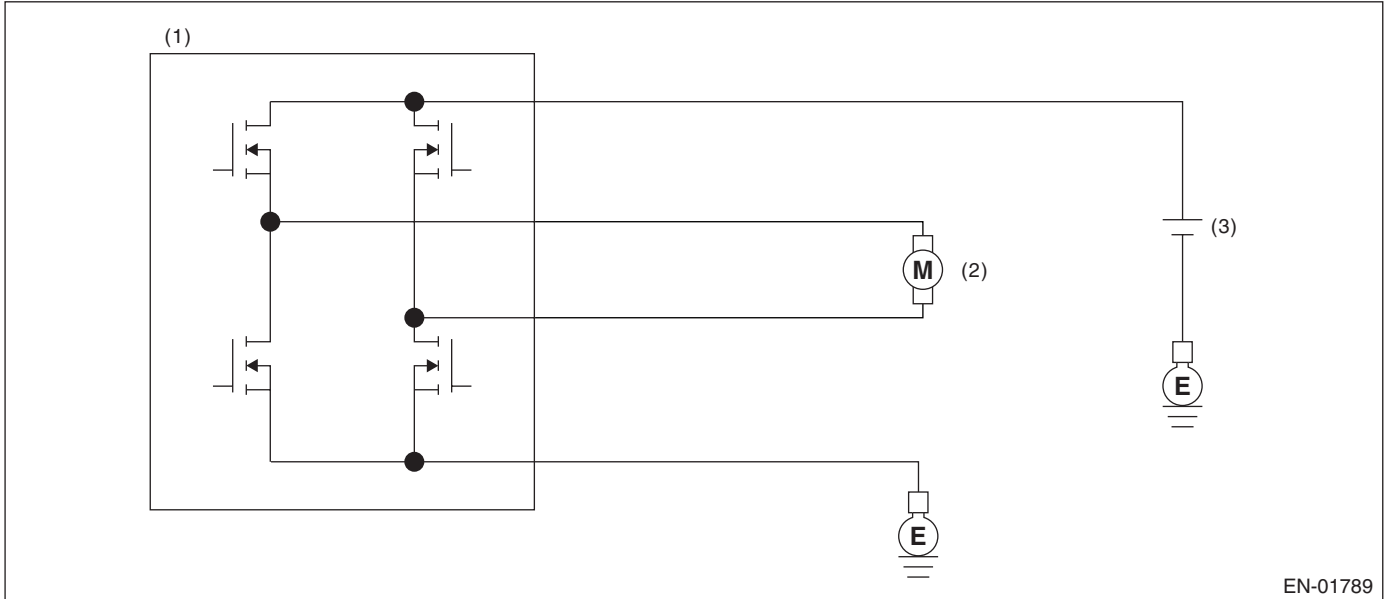
## DO:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

### 3. ENABLE CONDITION

| Secondary Parameters                         | Enable Conditions       |
|--|-------------------------|
| Battery voltage                              | $\geq 10.9$ V           |
| ECM output signal                            | Before set ON → OFF     |
| Tumble generator valve ON signal output time | 20 milliseconds or more |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge overcurrent NG when the overcurrent NG signal is sent during 1 second in a row. Judge OK and clear the NG when the OK signal is sent.

#### Judgment Value

| Malfunction Criteria        | Threshold Value |
|-----------------------------|-----------------|
| Open NG signal input        | High            |
| Overcurrent NG signal input | Low             |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

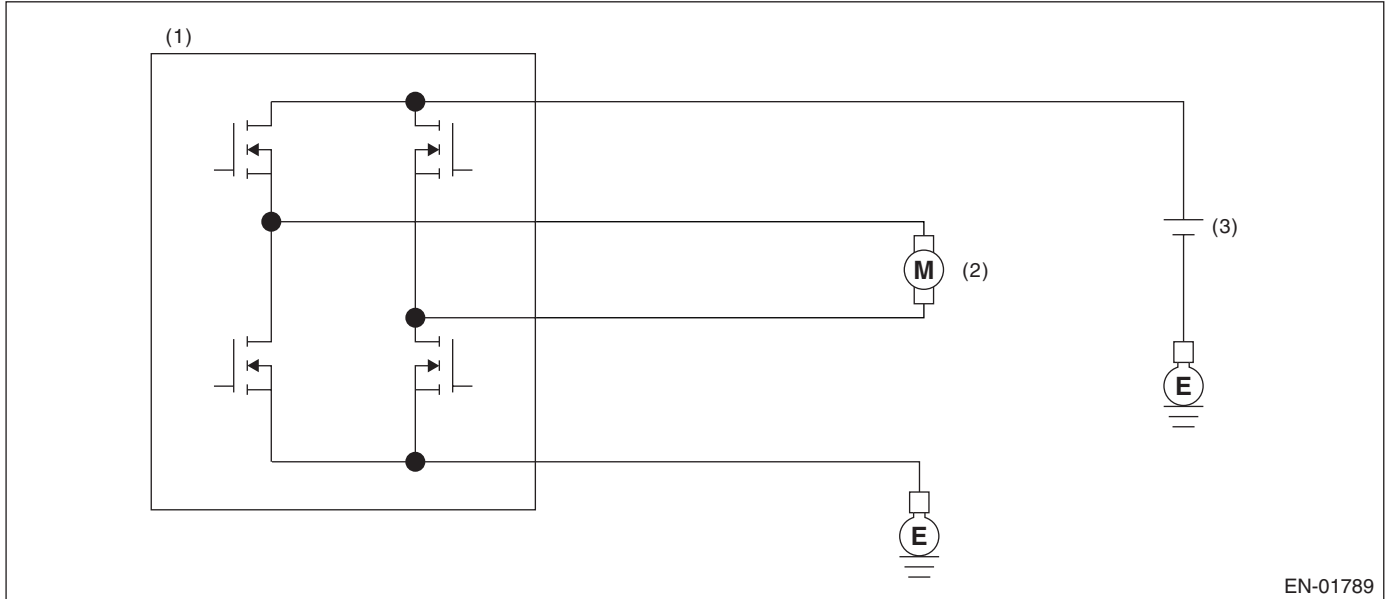
## DP:DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the open signal is sent from IC after tumble generator valve driving IC diagnosis.

### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

### 3. ENABLE CONDITION

| Secondary Parameters                         | Enable Conditions       |
|--|-------------------------|
| Battery voltage                              | ≥ 10.9 V                |
| ECM output signal                            | Before set ON → OFF     |
| Tumble generator valve ON signal output time | 20 milliseconds or more |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge open NG when the open NG signal is sent during 1 second in a row. Judge OK and clear the NG when the OK signal is sent.

#### Judgment Value

| Malfunction Criteria        | Threshold Value |
|-----------------------------|-----------------|
| Open NG signal input        | Low             |
| Overcurrent NG signal input | High            |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## Diagnostic Trouble Code (DTC) Detecting Criteria

### GENERAL DESCRIPTION

---

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

#### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

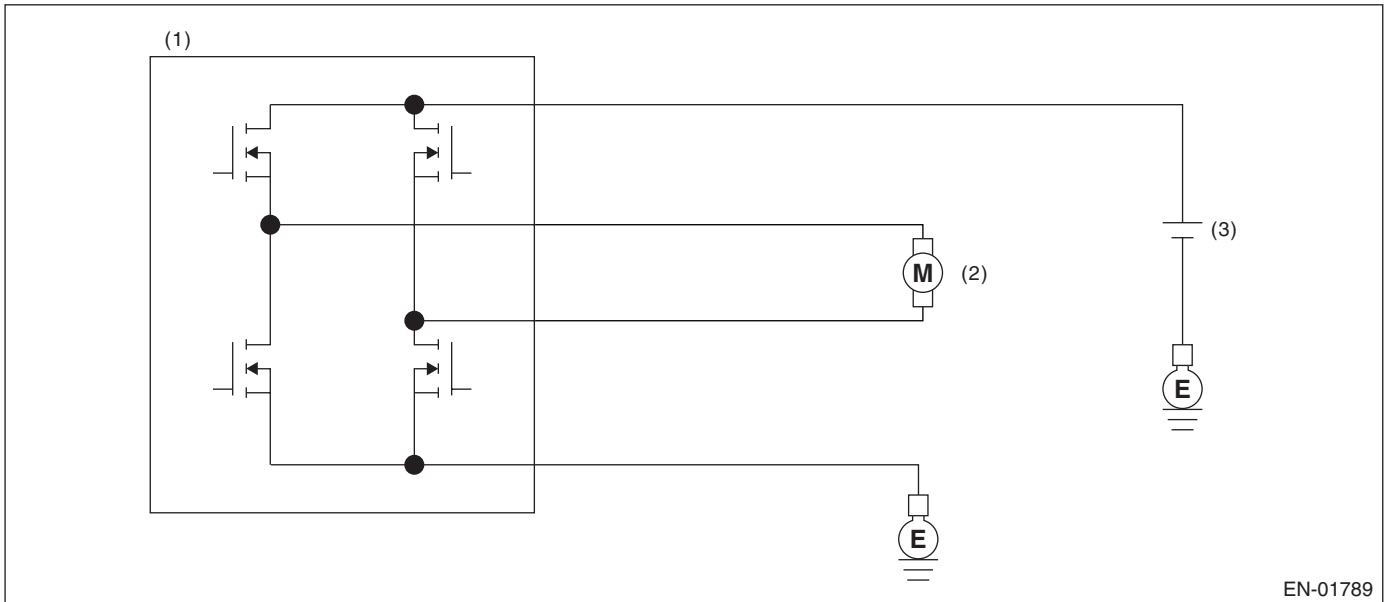
## DQ:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

### 3. ENABLE CONDITION

| Secondary Parameters                         | Enable Conditions       |
|--|-------------------------|
| Battery voltage                              | $\geq 10.9$ V           |
| ECM output signal                            | Before set ON → OFF     |
| Tumble generator valve ON signal output time | 20 milliseconds or more |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge overcurrent NG when the overcurrent NG signal is sent during 1 second in a row. Judge OK and clear the NG when the OK signal is sent.

#### Judgment Value

| Malfunction Criteria        | Threshold Value |
|-----------------------------|-----------------|
| Open NG signal input        | High            |
| Overcurrent NG signal input | Low             |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

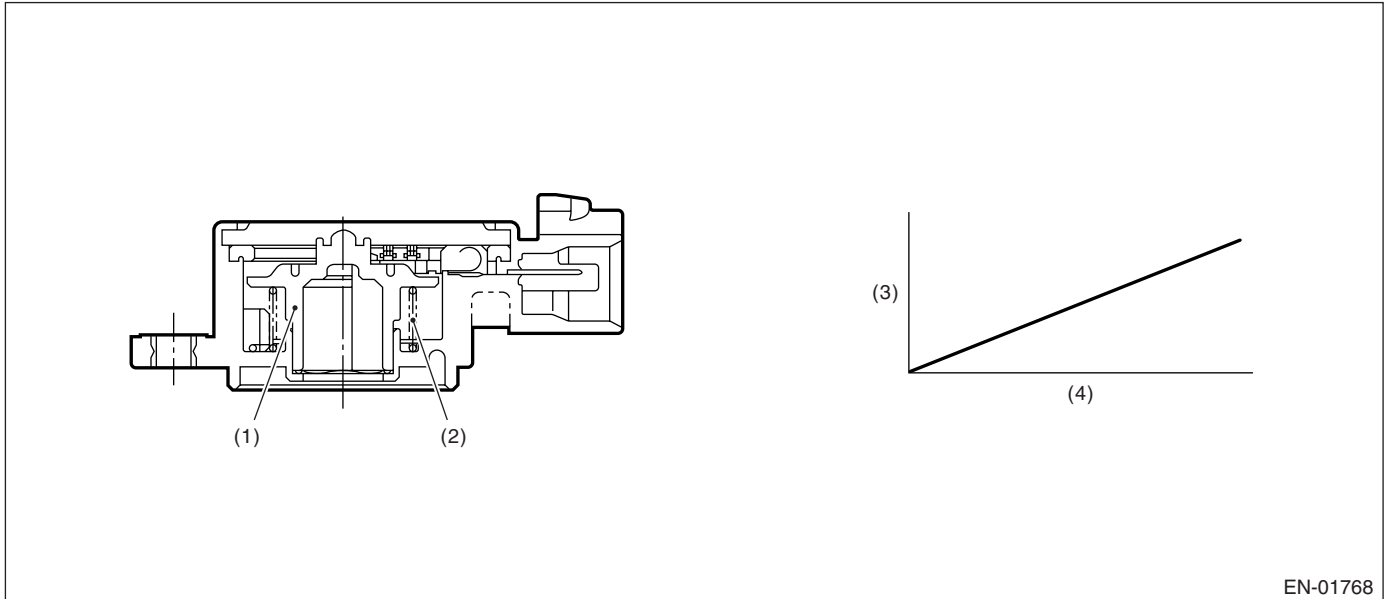
GENERAL DESCRIPTION

## DR:DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.  
Judge NG when the value is out of standard range.

### 2. COMPONENT DESCRIPTION



- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.167 V       |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### **7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION**

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### **8. FAIL SAFE**

Tumble generator valve position

- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

### **9. ECM OPERATION AT DTC SETTING**

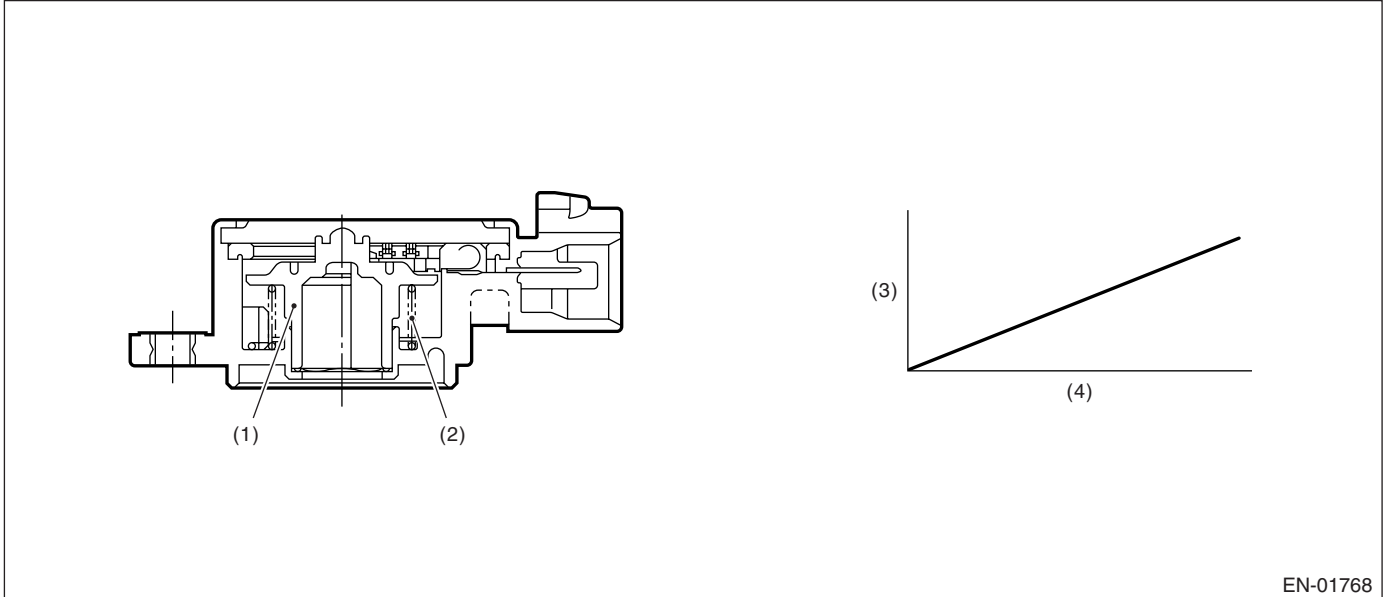
Memorize the freeze frame data. (For test mode \$02)

## DS:DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.  
Judge NG when the value is out of standard range.

### 2. COMPONENT DESCRIPTION



- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | ≥ 4.843 V       |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Tumble generator valve position

- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

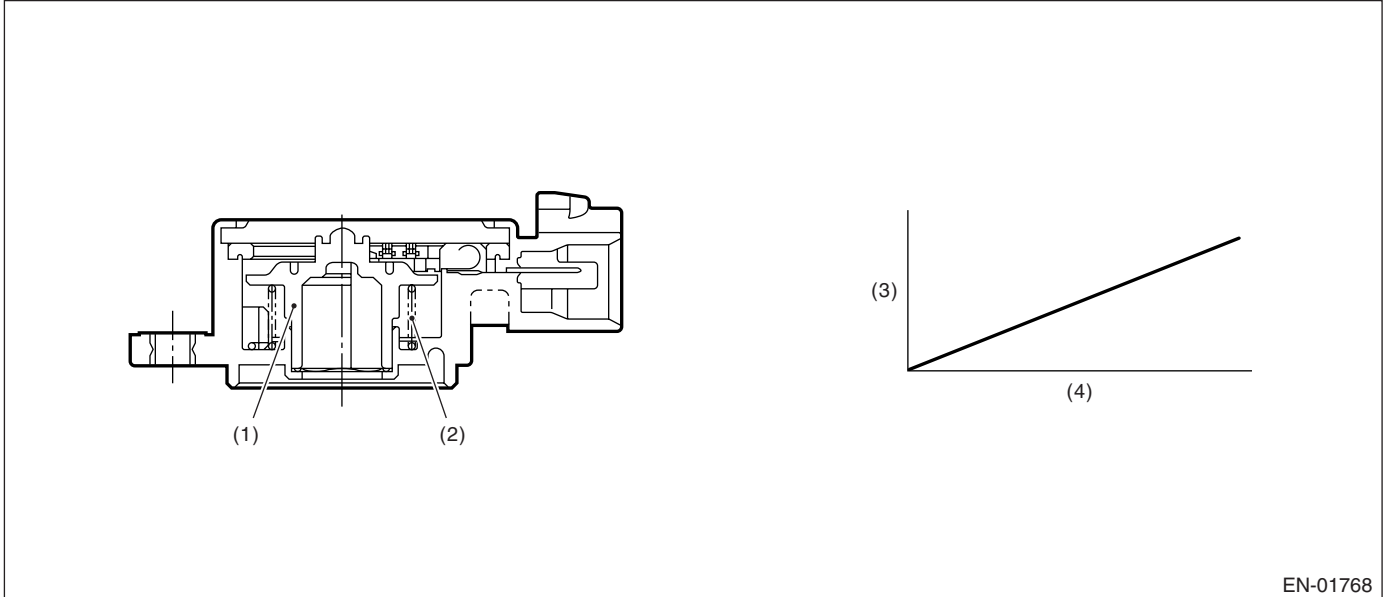
GENERAL DESCRIPTION

## DT:DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2)

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.  
Judge NG when the value is out of standard range.

### 2. COMPONENT DESCRIPTION



- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.167 V       |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### **7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION**

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### **8. FAIL SAFE**

Tumble generator valve position

- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

### **9. ECM OPERATION AT DTC SETTING**

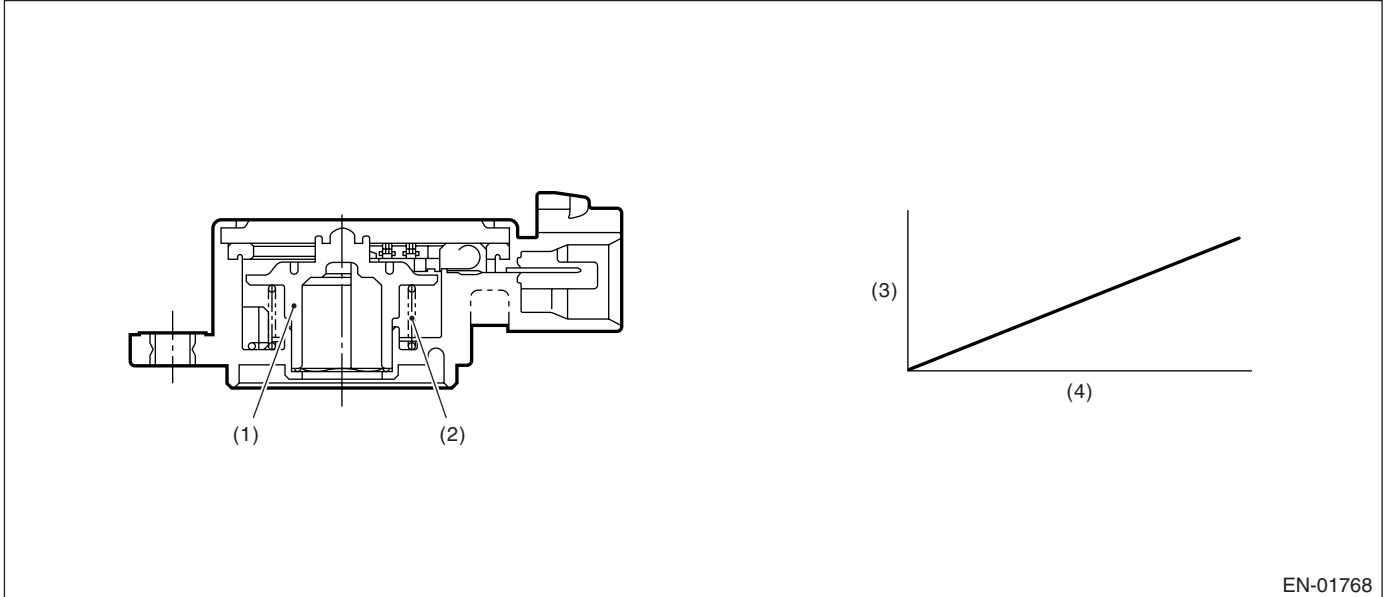
Memorize the freeze frame data. (For test mode \$02)

## DU:DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2)

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.  
Judge NG when the value is out of standard range.

### 2. COMPONENT DESCRIPTION



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- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | ≥ 4.843 V       |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### **7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION**

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### **8. FAIL SAFE**

Tumble generator valve position

- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

### **9. ECM OPERATION AT DTC SETTING**

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## DV:DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control solenoid valve.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---------------------|------------------|
| Battery voltage     | $\geq 10.9$ V    |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

#### Judgment Value

| Malfunction Criteria               | Threshold Value |
|------------------------------------|-----------------|
| OCV solenoid valve duty            | $\geq 99.61\%$  |
| OCV solenoid valve present current | $< 0.306$ A     |

**Time Needed for Diagnosis:** 2,000 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Target current value of OCV solenoid valve   | $\geq 0.14\%$   |
| Target current value of OCV solenoid valve – Control current value of OCV solenoid valve | $\geq 0.08$ A   |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## DW:DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control solenoid valve.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---------------------|------------------|
| Battery voltage     | $\geq 10.9$ V    |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

#### Judgment Value

| Malfunction Criteria               | Threshold Value |
|------------------------------------|-----------------|
| OCV solenoid valve duty            | $< 0.39\%$      |
| OCV solenoid valve present current | $\geq 0.306$ A  |

**Time Needed for Diagnosis:** 2,000 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Target current value of OCV solenoid valve – Control current value of OCV solenoid valve | $< 0.08$ A      |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## DX:DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2)

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---------------------|------------------|
| Battery voltage     | $\geq 10.9$ V    |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

#### Judgment Value

| Malfunction Criteria        | Threshold Value |
|-----------------------------|-----------------|
| OCV control duty            | $\geq 99.61\%$  |
| OCV control present current | $< 0.306$ A     |

**Time Needed for Diagnosis:** 2000 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

#### Judgment Value

| Malfunction Criteria                                       | Threshold Value |
|--|-----------------|
| Target current value of OCV                                | $\geq 0.14\%$   |
| Target current value of OCV – Control current value of OCV | $\geq 0.08$ A   |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## DY:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---------------------|------------------|
| Battery voltage     | $\geq 10.9$ V    |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

#### Judgment Value

| Malfunction Criteria        | Threshold Value |
|-----------------------------|-----------------|
| OCV control duty            | $< 0.39\%$      |
| OCV control present current | $\geq 0.306$ A  |

**Time Needed for Diagnosis:** 2000 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

#### Judgment Value

| Malfunction Criteria                                       | Threshold Value |
|--|-----------------|
| Target current value of OCV – Control current value of OCV | $< 0.08$ A      |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## DZ:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

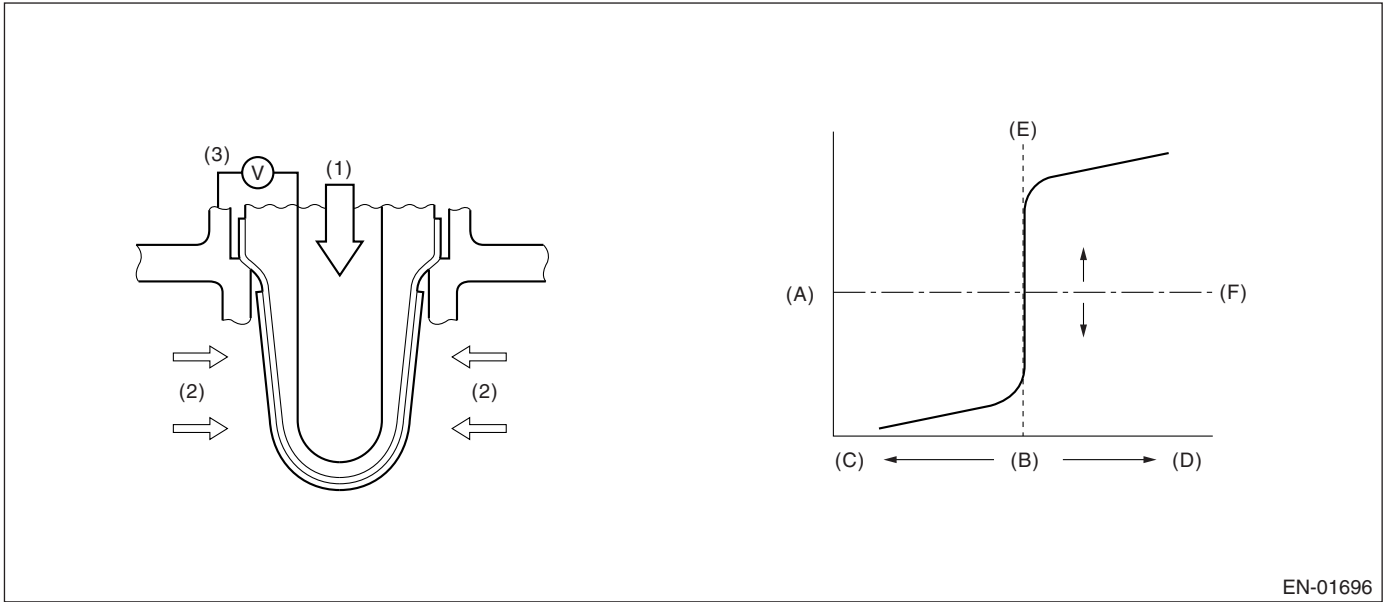
### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control, if it is shifted to rich or lean. If the sub feedback amount from the engine started till ignition switch OFF is shifted to rich or lean, judge as insufficient sub feedback amount.

If insufficient, change the sub feedback amount guard value and shift judge line, and increment the guard operation counter (tentative NG counter).

Judge NG when the guard operation counter (tentative NG counter) exceeds the specified value and sub feedback amount is shifted to rich or lean.

### 2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich
- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

### 3. ENABLE CONDITION

| Secondary Parameters                         | Enable Conditions |
|--|-------------------|
| Continuous time of completing all conditions | 1 second or more  |
| Sub feedback learning enable condition       | Completed         |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed at more than approx. 75 km/h (47 MPH).

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria becomes more than 5 seconds. Judge OK and clear NG when the continuous time of incompleting the malfunction criteria becomes more than 5 seconds.

#### Judgment Value

| Malfunction Criteria        | Threshold Value |
|-----------------------------|-----------------|
| Sub feedback learning value | < -0.018        |

**Time Needed for Diagnosis:** 5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## EA:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

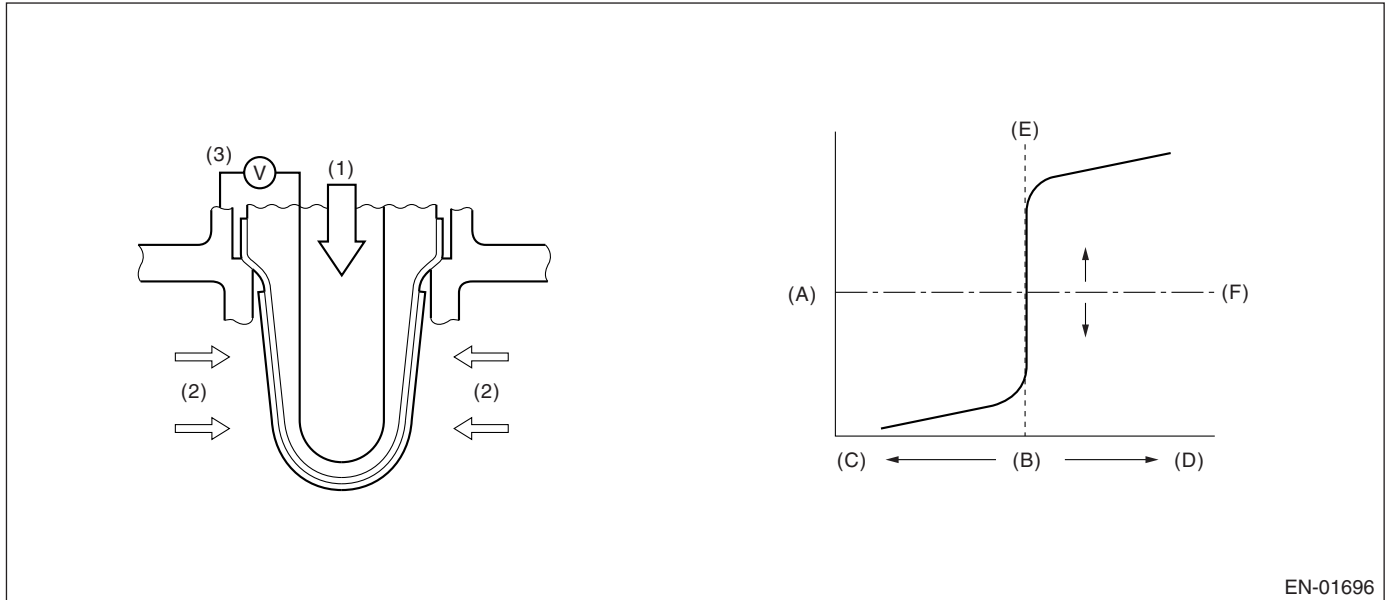
### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control, if it is shifted to rich or lean. If the sub feedback amount from the engine started till ignition switch OFF is shifted to rich or lean, judge as insufficient sub feedback amount.

If insufficient, change the sub feedback amount guard value and shift judge line, and increment the guard operation counter (tentative NG counter).

Judge NG when the guard operation counter (tentative NG counter) exceeds the specified value and sub feedback amount is shifted to rich or lean.

### 2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich
- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

### 3. ENABLE CONDITION

| Secondary Parameters                         | Enable Conditions |
|--|-------------------|
| Continuous time of completing all conditions | 1 second or more  |
| Sub feedback learning enable condition       | Completed         |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed at more than approx. 75 km/h (47 MPH).



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

#### Judgment Value

| Malfunction Criteria  | Threshold Value                              |
|---|--|
| Sub feedback learning value   | $\geq 0.018$                                 |
| Count of limits moving to lean  | $\geq 4$ count                               |
| Ratio of time for oxygen sensor upper or lower to time or rich time/lean time | $\leq 9$ (AT model)<br>$\leq 5.7$ (MT model) |

**Time Needed for Diagnosis:** 5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous drive cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

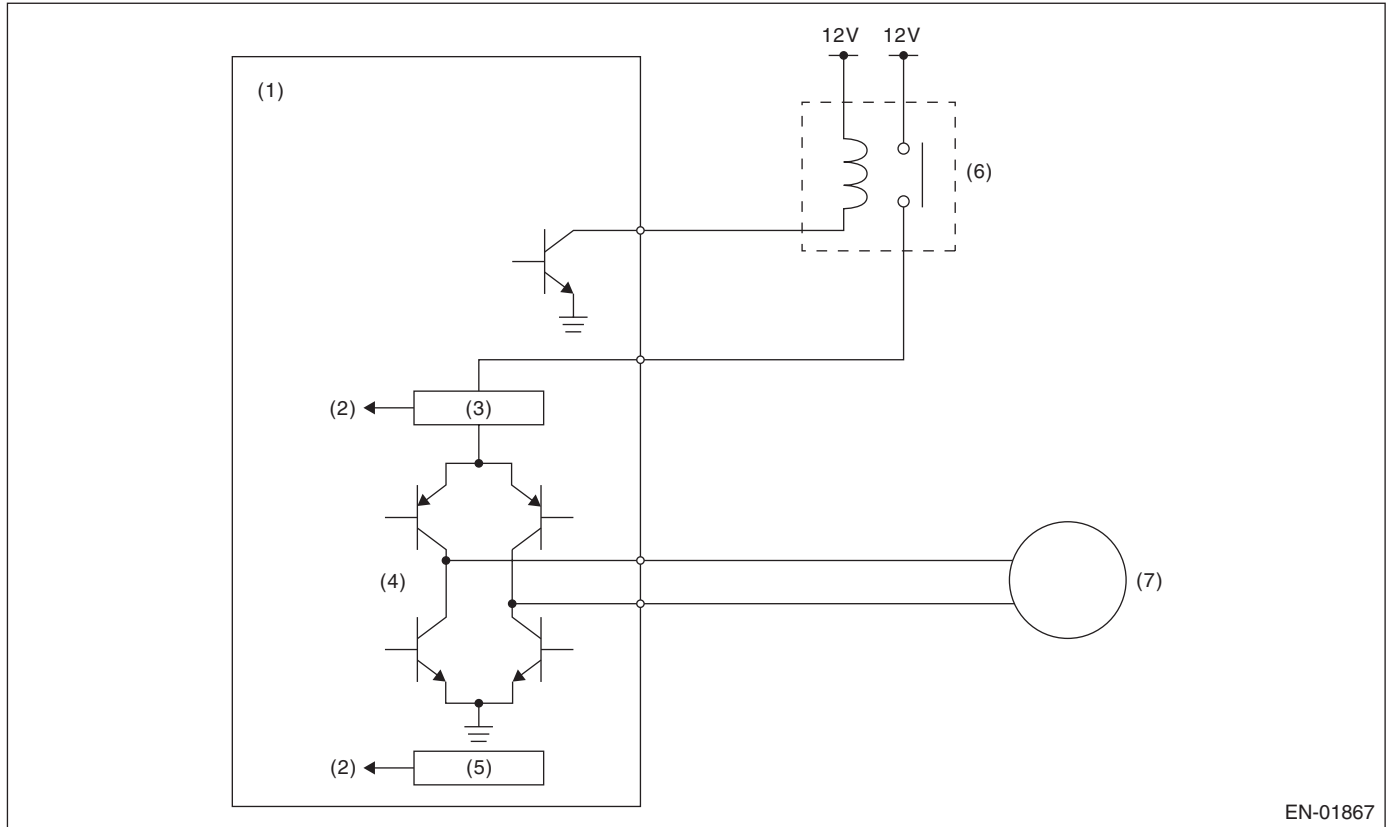
Memorize the freeze frame data. (For test mode \$02)

## EB:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the motor current becomes large or drive circuit is heated.

### 2. COMPONENT DESCRIPTION



- |                                   |                                       |           |
|-----------------------------------|---------------------------------------|-----------|
| (1) Engine control unit (ECM)     | (4) Drive circuit                     | (7) Motor |
| (2) Detection circuit             | (5) Temperature detection circuit     |           |
| (3) Overcurrent detection circuit | (6) Electronic control throttle relay |           |

### 3. ENABLE CONDITION

| Secondary Parameters                         | Enable Conditions |
|--|-------------------|
| Under control of electronic control throttle | ON                |
| Ignition switch                              | ON                |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria            | Threshold Value                  |
|---------------------------------|----------------------------------|
| Motor current                   | $\leq 8 \text{ A}$               |
| Drive circuit inner temperature | $\leq 175^\circ\text{C}$ (347°F) |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### Time Needed for Diagnosis:

- 500 milliseconds (NG judgment)
- 2,000 milliseconds (OK judgment)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

### 9. ECM OPERATION AT DTC SETTING

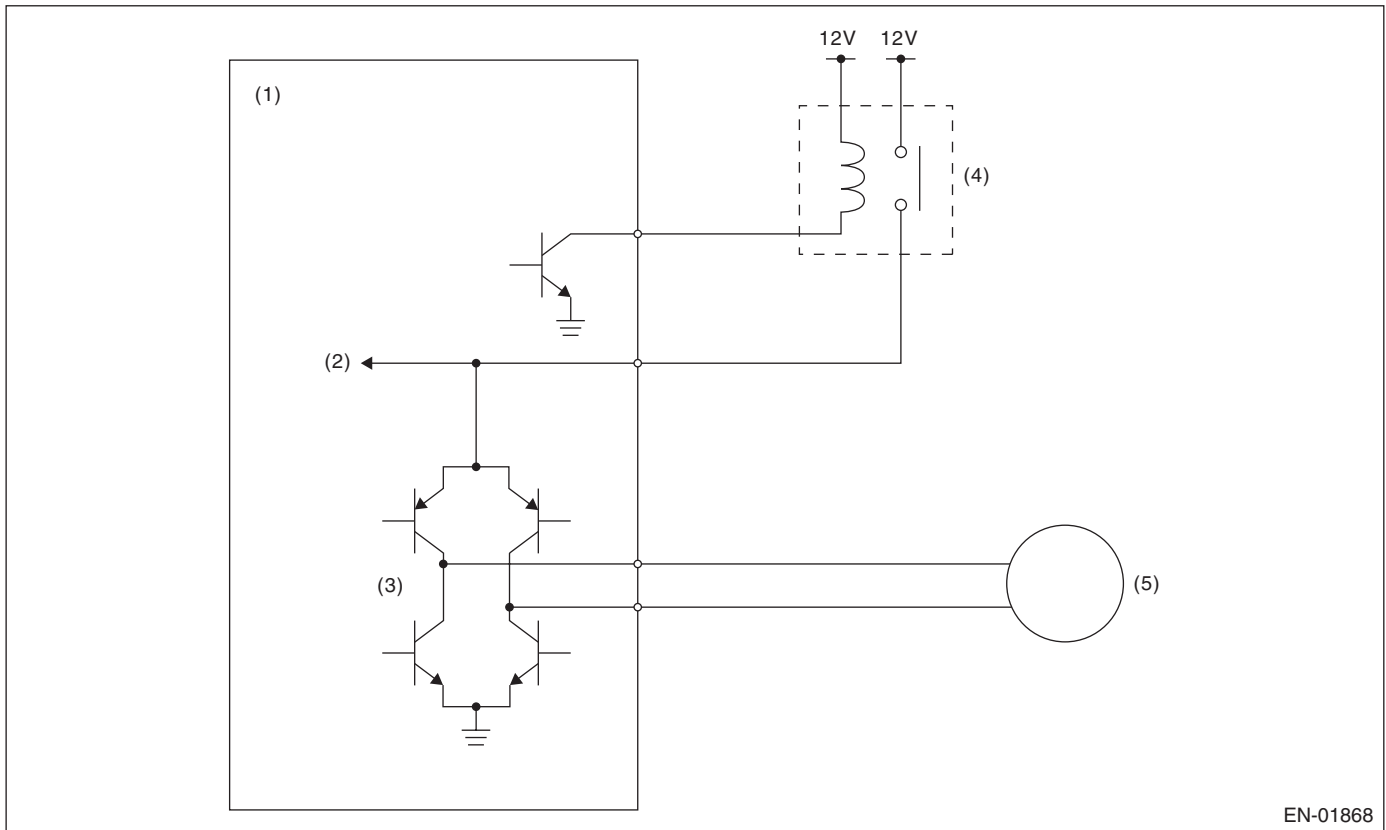
Memorize the freeze frame data. (For test mode \$02)

## EC:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electronic throttle control relay to ON.

### 2. COMPONENT DESCRIPTION



EN-01868

- |                                 |                                       |           |
|---------------------------------|---------------------------------------|-----------|
| (1) Engine control module (ECM) | (3) Drive circuit                     | (5) Motor |
| (2) Voltage detection circuit   | (4) Electronic control throttle relay |           |

### 3. ENABLE CONDITION

| Secondary Parameters                     | Enable Conditions |
|--|-------------------|
| Electronic control throttle relay output | ON                |
| Battery voltage                          | $\geq 6\text{ V}$ |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

#### Judgment Value

| Malfunction Criteria | Threshold Value   |
|----------------------|-------------------|
| Motor power voltage  | $\leq 5\text{ V}$ |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### Time Needed for Diagnosis:

- 400 milliseconds (For NG)
- 2,000 milliseconds (For OK)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

### 9. ECM OPERATION AT DTC SETTING

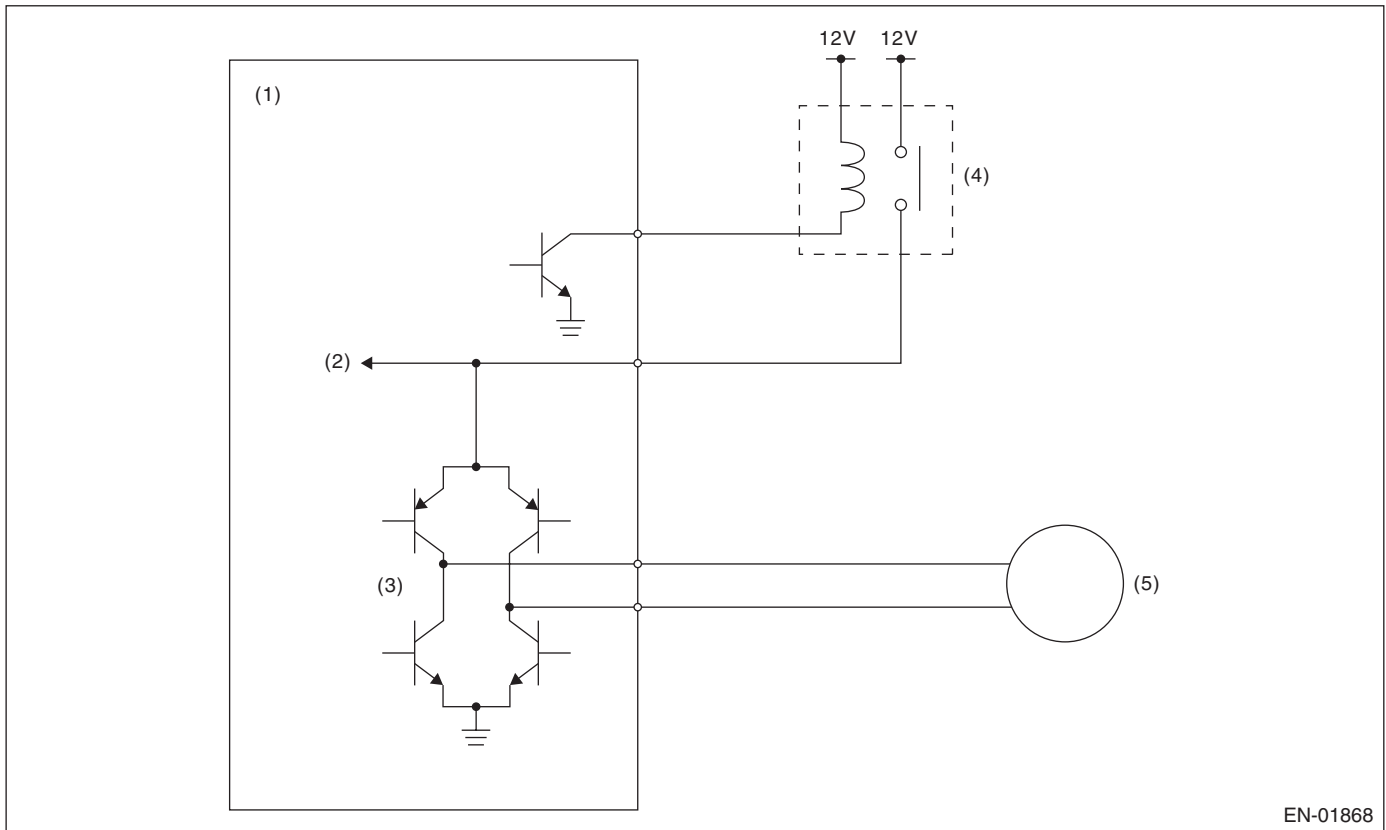
Memorize the freeze frame data. (For test mode \$02)

## ED:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electric throttle control relay to OFF.

### 2. COMPONENT DESCRIPTION



EN-01868

- |                                 |                                       |           |
|---------------------------------|---------------------------------------|-----------|
| (1) Engine control module (ECM) | (3) Drive circuit                     | (5) Motor |
| (2) Voltage detection circuit   | (4) Electronic throttle control relay |           |

### 3. ENABLE CONDITION

| Secondary Parameters                     | Enable Conditions |
|--|-------------------|
| Electronic throttle control relay output | OFF               |
| Battery voltage                          | $\geq 6\text{ V}$ |

### 4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value   |
|----------------------|-------------------|
| Motor power voltage  | $\leq 5\text{ V}$ |

#### Time Needed for Diagnosis:

- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

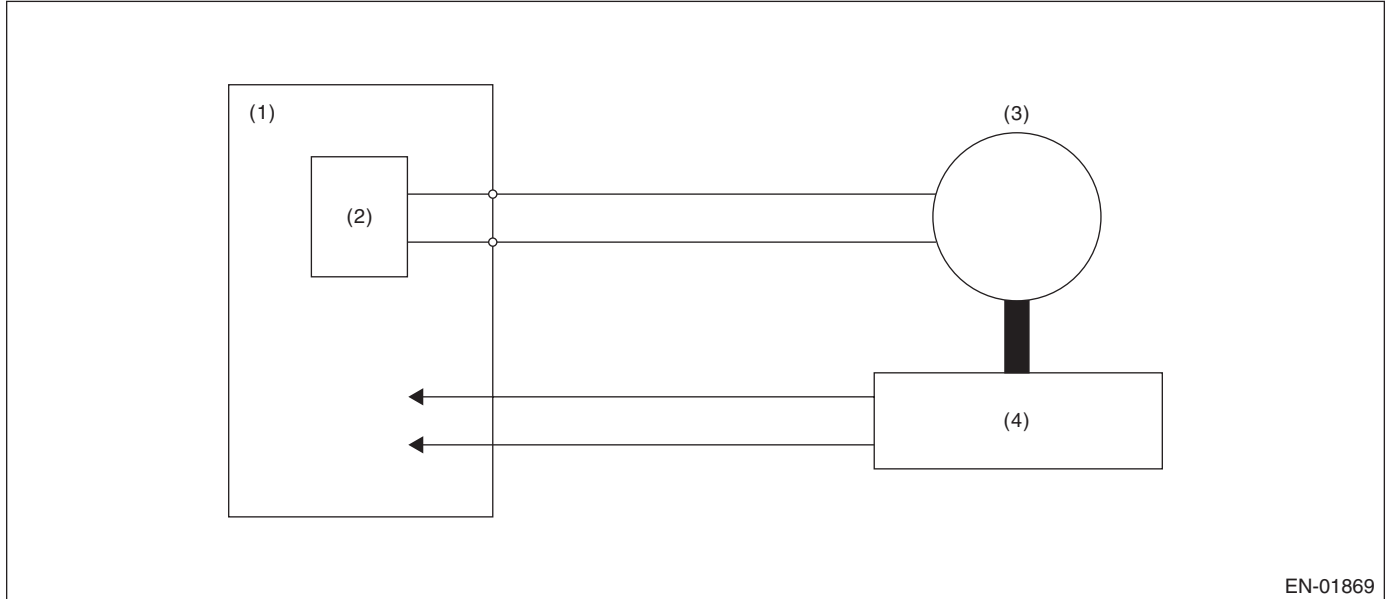
GENERAL DESCRIPTION

## EE:DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Judge NG when all close point learning cannot conducted or abnormal value is detected.

### 2. COMPONENT DESCRIPTION



- |                                 |                              |
|---------------------------------|------------------------------|
| (1) Engine control module (ECM) | (3) Motor                    |
| (2) Drive circuit               | (4) Throttle position sensor |

### 3. ENABLE CONDITION

| Secondary Parameters                      | Enable Conditions |
|---|-------------------|
| Ignition switch                           | ON → OFF          |
| Ignition switch (after clear memory only) | OFF → ON          |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis at all close point learning.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value   |
|--|-------------------|
| Throttle sensor opening angle at all close point learning                              | 10.127° — 19.872° |
| Throttle opening angle when ignition switch is ON — Minimum stop position for throttle | ≥ 1.683°          |

**Time Needed for Diagnosis:** 8 — 80 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

### 9. ECM OPERATION AT DTC SETTING

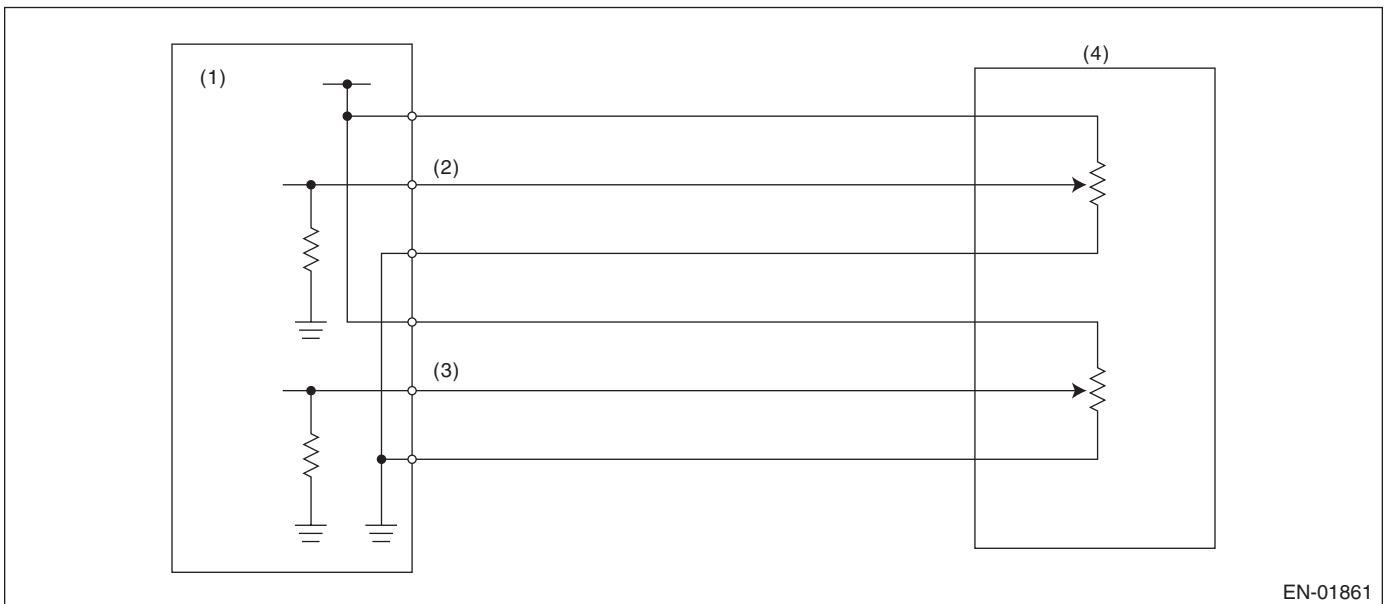
Memorize the freeze frame data. (For test mode \$02)

## EF:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01861

- |  |  |
|--|--|
| (1) Engine control module (ECM)                | (3) Accelerator pedal position sensor 2 signal |
| (2) Accelerator pedal position sensor 1 signal | (4) Accelerator pedal position sensor 2 signal |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | ≥ 0.219 V       |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

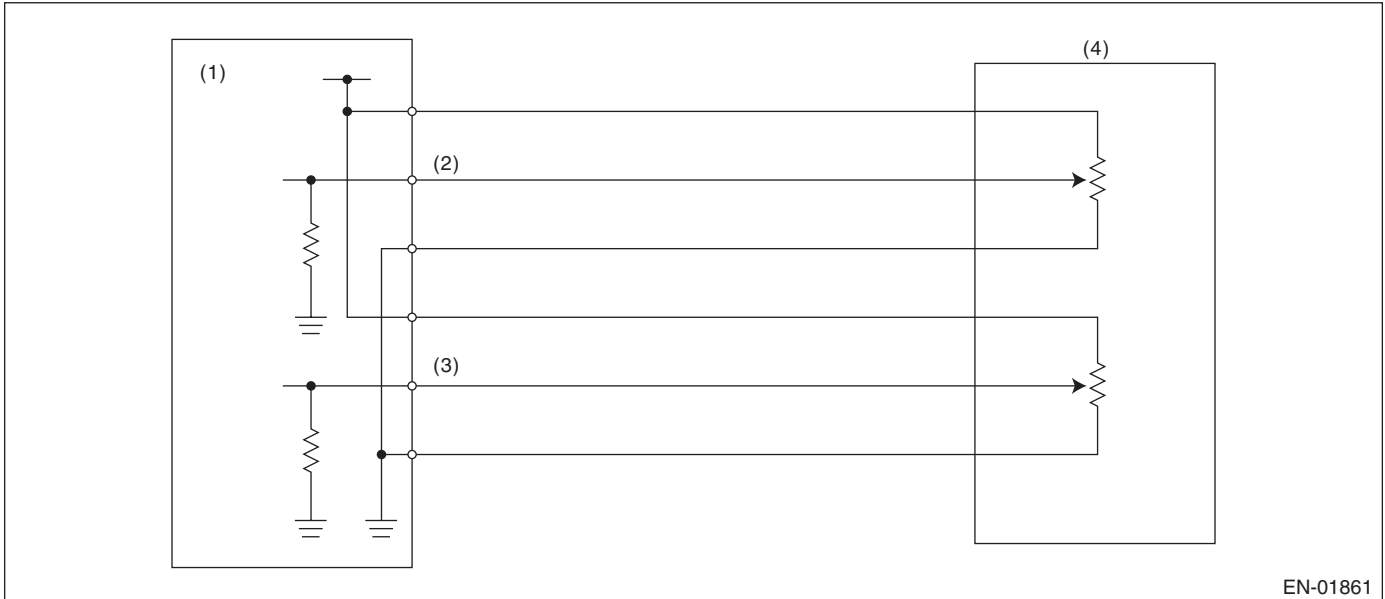
## GENERAL DESCRIPTION

### EG:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01861

- |  |  |
|--|--|
| (1) Engine control module (ECM)                | (3) Accelerator pedal position sensor 2 signal |
| (2) Accelerator pedal position sensor 1 signal | (4) Accelerator pedal position sensor          |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\leq 4.781$ V  |

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

## 9. ECM OPERATION AT DTC SETTING

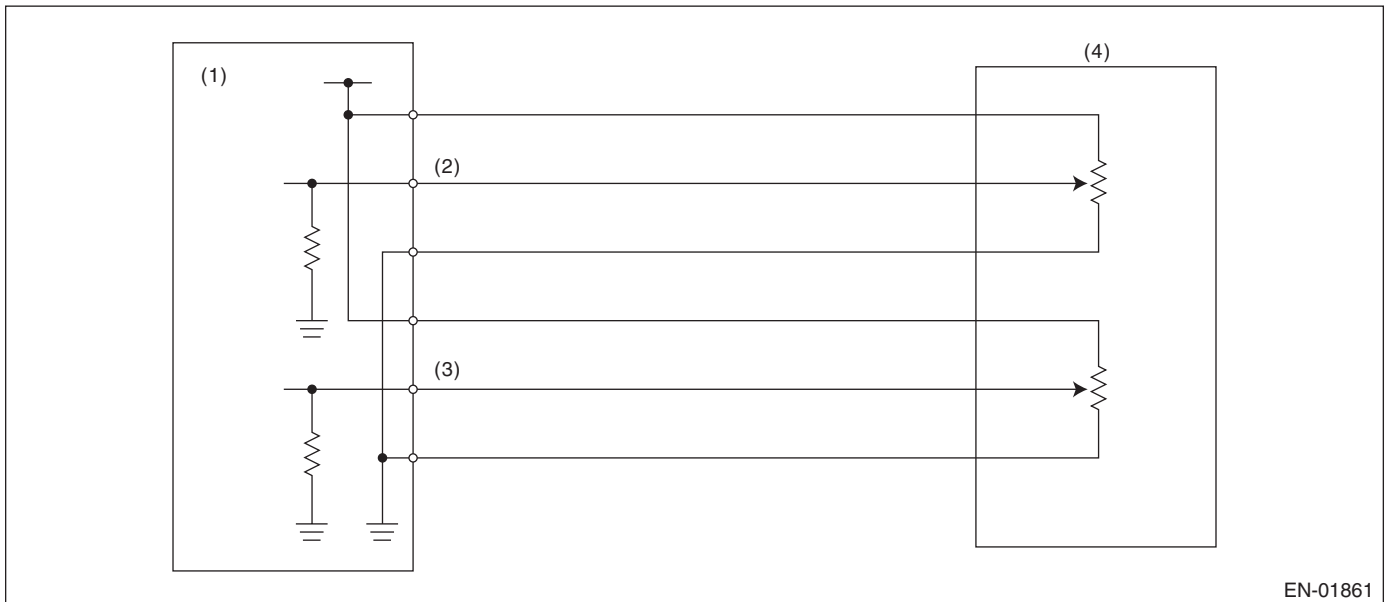
Memorize the freeze frame data. (For test mode \$02)

## EH:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01861

- |  |                                       |
|--|---------------------------------------|
| (1) Engine control module (ECM)                | (3) Accelerator pedal position sensor |
| (2) Accelerator pedal position sensor 1 signal | 2 signal                              |
|  | (4) Accelerator pedal position sensor |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\geq 0.219$ V  |

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

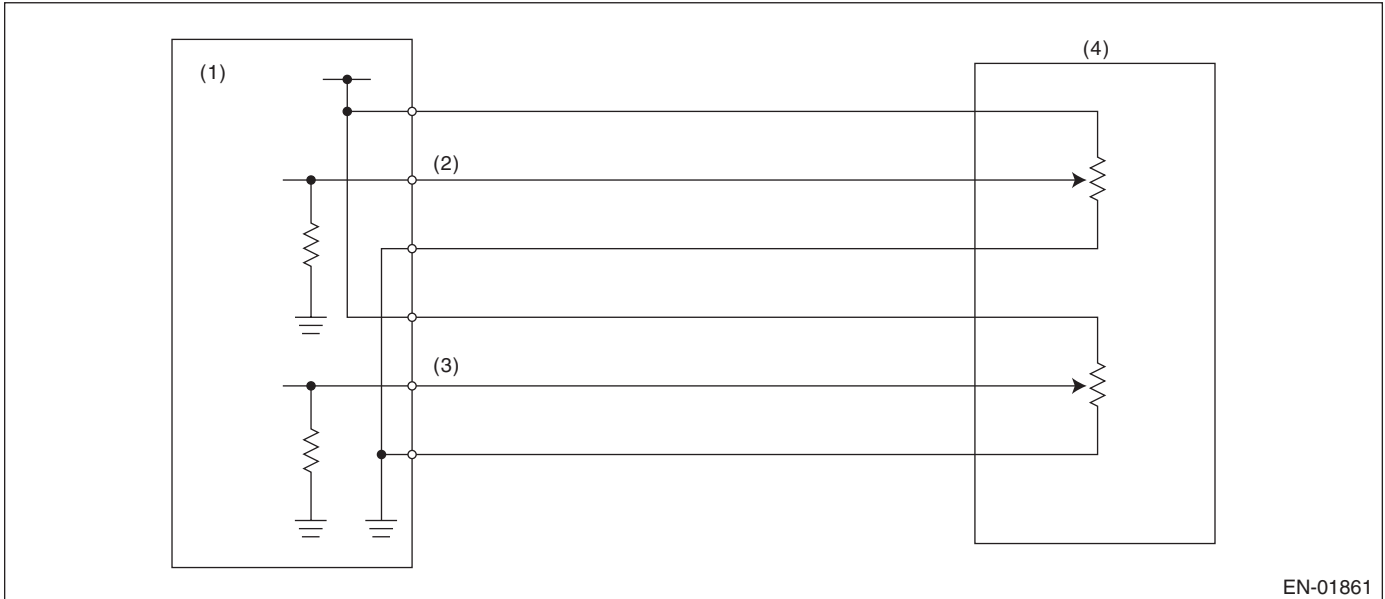
Memorize the freeze frame data. (For test mode \$02)

## EI: DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01861

- |  |  |
|--|--|
| (1) Engine control module (ECM)                | (3) Accelerator pedal position sensor 2 signal |
| (2) Accelerator pedal position sensor 1 signal | (4) Accelerator pedal position sensor          |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | ≤ 4.781 V       |

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

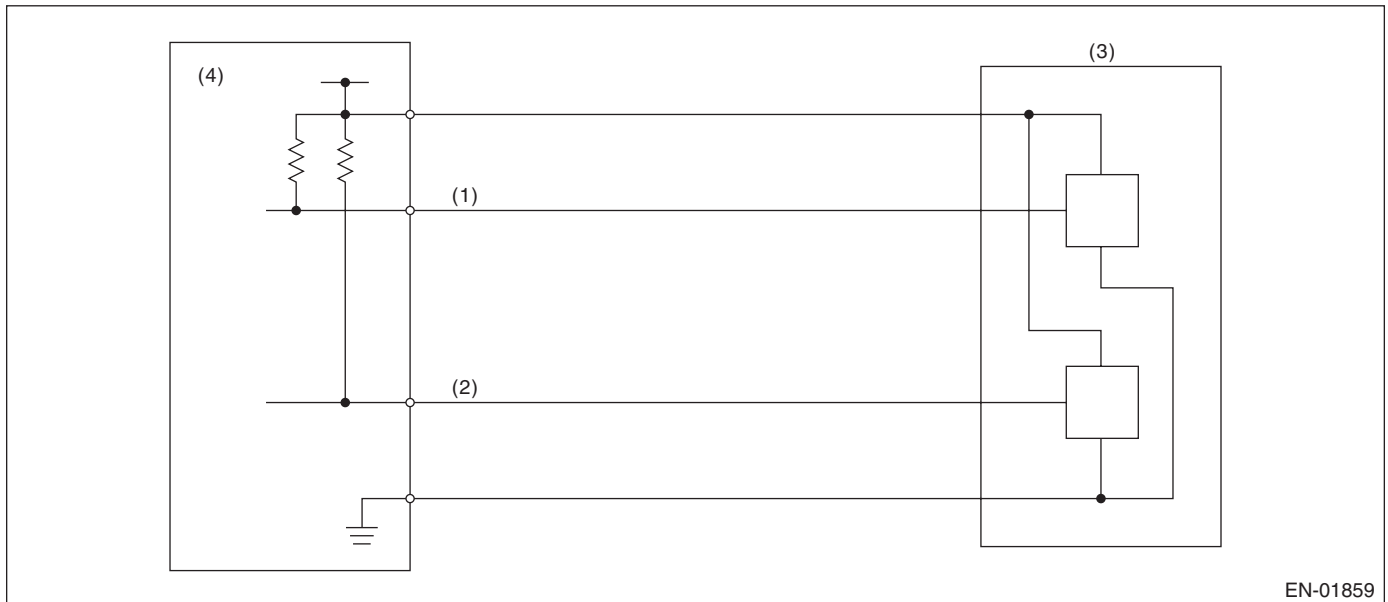
Memorize the freeze frame data. (For test mode \$02)

## EJ: DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

### 2. COMPONENT DESCRIPTION



EN-01859

- (1) Throttle position sensor 1 signal      (3) Throttle position sensor  
 (2) Throttle position sensor 2 signal      (4) Engine control module (ECM)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

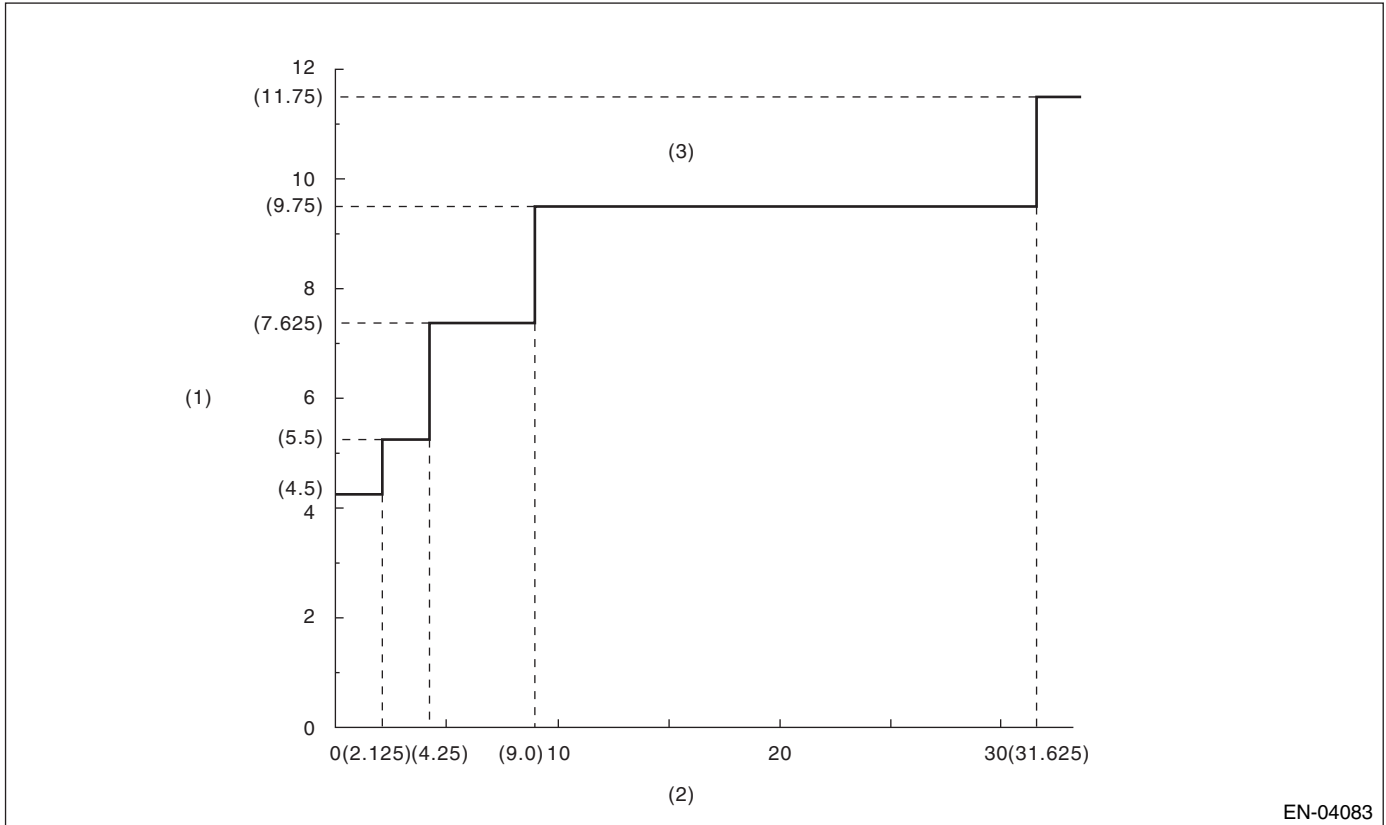
#### Judgment Value

| Malfunction Criteria                  | Threshold Value |
|---------------------------------------|-----------------|
| Signal difference between two sensors | $\leq 4.25$     |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## Details of Judgment Value



EN-04083

(1) Sensor output difference (°)

(2) Throttle position sensor 1 opening angle (°)

(3) NG area

**Time Needed for Diagnosis:** 212 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop the continuity to ETC motor. (Fix the throttle opening angle to 6°.)

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

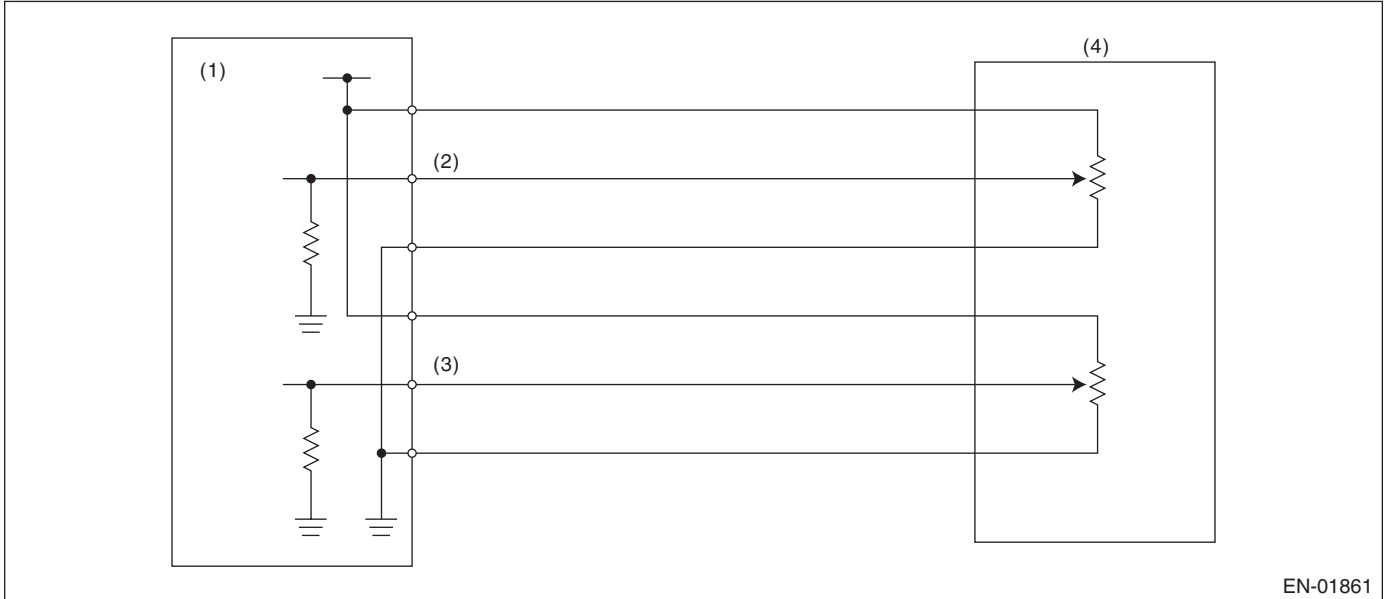
## GENERAL DESCRIPTION

### EK:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLT-AGE CORRELATION

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

#### 2. COMPONENT DESCRIPTION



EN-01861

- |  |  |
|--|--|
| (1) Engine control module (ECM)                | (3) Accelerator pedal position sensor 2 signal |
| (2) Accelerator pedal position sensor 1 signal | (4) Accelerator pedal position sensor          |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

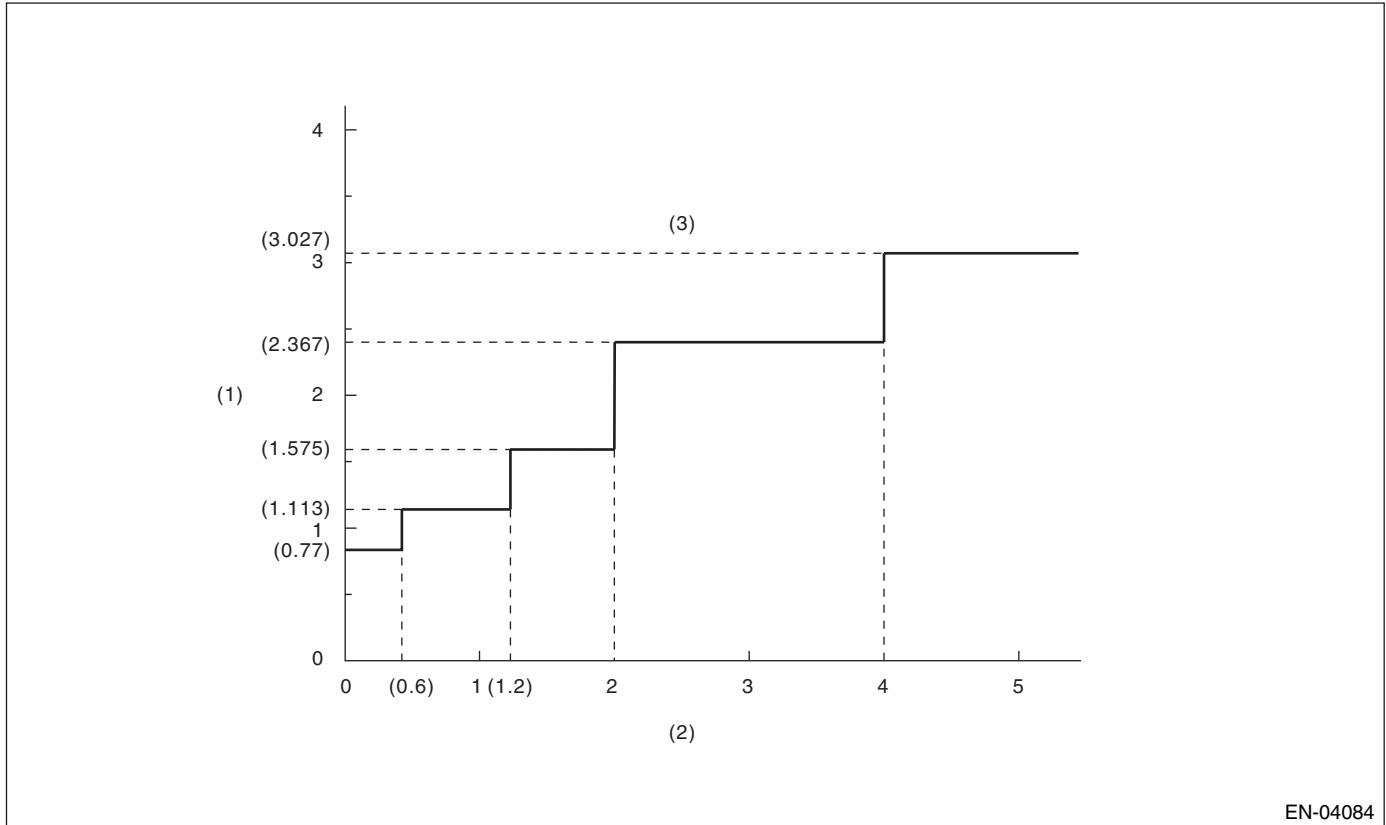
##### Judgment Value

| Malfunction Criteria                  | Threshold Value   |
|---------------------------------------|-------------------|
| Signal difference between two sensors | $\leq 0.77^\circ$ |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## Details of Judgment Value



EN-04084

- (1) Sensor output difference (°)      (2) Accelerator pedal position sensor 2 opening angle (°)      (3) NG area

### Time Needed for Diagnosis:

- 116 milliseconds (For NG)
- 1,000 milliseconds (For OK)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### EL:DTC P2227 BAROMETRIC PRESSURE TOO LOW

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of atmospheric pressure sensor output property. Judge NG when the atmospheric pressure sensor output is largely different from the intake manifold pressure at engine starting.

#### 2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

#### 3. ENABLE CONDITION

| Secondary Parameters            | Enable Conditions |
|---------------------------------|-------------------|
| Engine speed at engine starting | < 300 rpm         |
| Vehicle speed                   | < 1 km/h (1 MPH)  |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once before engine starting with the ignition switch ON.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.3 seconds.

##### Judgment Value

| Malfunction Criteria   | Threshold Value                       |
|--|---------------------------------------|
| Atmospheric – manifold absolute pressure                                 | $\geq 26.7$ kPa (200 mmHg, 7.88 inHg) |
| Intake manifold pressure at engine starting – manifold absolute pressure | $< 1.33$ kPa (10 mmHg, 2.95 inHg)     |

**Time Needed for Diagnosis:** 0.3 seconds

**Malfunction Indicator Light Illumination:** Detect when malfunction occurs in 2 continuous driving cycles.

##### • Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 0.26 seconds.

##### Judgment Value

| Malfunction Criteria                     | Threshold Value                    |
|--|------------------------------------|
| Atmospheric – manifold absolute pressure | $< 26.7$ kPa (200 mmHg, 7.88 inHg) |

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.8 inHg).

#### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## EM:DTC P2228 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | < 0.118 V       |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | $\geq 0.118$ V  |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### EN:DTC P2229 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | $\geq 4.936$ V  |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | $< 4.936$ V     |

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

#### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## EO:DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT RANGE / PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of secondary air pressure sensor output property.

Judge NG when the secondary air pressure sensor output is largely different from the intake manifold pressure at engine starting.

### 2. ENABLE CONDITION

| Secondary Parameters                            | Enable Conditions   |
|---|---------------------|
| Engine speed at starting                        | < 300 rpm           |
| Vehicle speed                                   | < 1 km/h            |
| After secondary air injection system is stopped | More than 3 seconds |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis with ignition switch ON.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.3 seconds.

#### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Secondary air pipe pressure - Intake manifold pressure          | ≥ 200 mmHg      |
| Intake manifold pressure at starting - Intake manifold pressure | < 10 mmHg       |

**Time Needed for Diagnosis:** 0.3 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 0.26 seconds.

#### Judgment Value

| Malfunction Criteria                                   | Threshold Value |
|--|-----------------|
| Secondary air pipe pressure - Intake manifold pressure | < 200 mmHg      |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### EP:DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT LOW

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when out of the standard value.

#### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| OFF                  |                   |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | < 0.568 V       |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | ≥ 0.568 V       |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## EQ:DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT HIGH

### 1. OUTLINE OF DIAGNOSIS

Judge NG when out of the standard value.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| OFF                  |                   |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | $\geq 4.921$ V  |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | $< 4.921$ V     |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



## Diagnostic Trouble Code (DTC) Detecting Criteria

### GENERAL DESCRIPTION

---

#### **ER:DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1)**

NOTE:

For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-111, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **ES:DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK1)**

NOTE:

For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-111, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **ET:DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2)**

NOTE:

For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-111, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **EU:DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK2)**

NOTE:

For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-111, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## EV:DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction (always ON) of secondary air pump.

Judge NG when the secondary air supply pipe pressure is higher than atmospheric pressure.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| OFF                  |                   |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

Judge NG when the secondary air supply pipe pressure is higher than atmospheric pressure though it should become atmospheric pressure with the secondary air pump OFF.

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

#### Judgment Value

| Malfunction Criteria                             | Threshold Value                                     |
|--|---|
| Presumed ambient temperature                     | $\geq 4.4^{\circ}\text{C}$ ( $40^{\circ}\text{F}$ ) |
| Battery voltage                                  | $\geq 10.9\text{ V}$                                |
| After secondary air injection system is operated | More than 0.6 seconds                               |
| Battery voltage                                  | $\geq 7\text{ V}$                                   |
| Atmospheric pressure                             | $\geq 75.0\text{ kPa}$ (563 mmHg, 22.15 inHg)       |
| Engine   | In operation  |
| After secondary air injection system is stopped  | More than 3 seconds                                 |
| Secondary air pipe pressure (absolute pressure)  | > Value of Map 22                                   |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### Map 22

| Unit: kPa (mmHg, inHg) |      | Ambient pressure (kPa (mmHg, inHg)) |                   |                   |                    |                    |                    |                    |                    |
|------------------------|------|-------------------------------------|-------------------|-------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
|                        |      | 69.3 (520, 20.47)                   | 74.6 (560, 22.03) | 80.0 (600, 23.63) | 85.3 (640, 25.19)  | 90.6 (680, 26.76)  | 96.0 (720, 28.35)  | 101.3 (760, 29.92) | 106.6 (800, 31.48) |
| Battery voltage (V)    | 10.5 | 78.0 (585, 23.03)                   | 84.0 (630, 24.80) | 90.0 (675, 26.58) | 96.0 (720, 28.35)  | 102.0 (765, 30.13) | 108.0 (810, 31.90) | 114.0 (855, 33.67) | 120.0 (900, 35.44) |
|                        | 11.5 | 79.3 (595, 23.42)                   | 85.4 (641, 25.22) | 91.6 (687, 27.05) | 97.7 (733, 28.86)  | 103.7 (778, 30.63) | 109.8 (824, 32.43) | 116.0 (870, 34.26) | 122.1 (916, 36.06) |
|                        | 12.5 | 80.8 (606, 23.86)                   | 86.9 (652, 25.67) | 93.2 (699, 27.53) | 99.3 (745, 29.33)  | 105.6 (792, 31.19) | 111.7 (838, 32.99) | 118.0 (885, 34.85) | 124.2 (932, 36.68) |
|                        | 13.5 | 82.1 (616, 24.25)                   | 88.4 (663, 26.11) | 94.8 (711, 28.0)  | 101.0 (758, 29.83) | 107.3 (805, 31.69) | 113.7 (853, 33.58) | 120.0 (900, 35.44) | 126.2 (947, 37.27) |
|                        | 14.5 | 83.4 (626, 24.63)                   | 89.8 (674, 26.52) | 96.2 (722, 28.41) | 102.8 (771, 30.36) | 109.2 (819, 32.25) | 115.6 (867, 34.14) | 122.0 (915, 36.03) | 128.4 (963, 37.92) |
|                        | 15.5 | 84.8 (636, 25.05)                   | 89.8 (685, 26.52) | 97.8 (734, 28.89) | 104.4 (783, 30.83) | 110.9 (832, 32.75) | 117.4 (881, 34.67) | 124.0 (930, 36.62) | 130.5 (979, 68.54) |

**Time Needed for Diagnosis:** 5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs.

**• Normality Judgment**

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

**Judgment Value**

| Malfunction Criteria                             | Threshold Value                   |
|--|-----------------------------------|
| Presumed ambient temperature                     | ≥ 4.4°C (40°F)                    |
| Battery voltage                                  | ≥ 10.9 V                          |
| After secondary air injection system is operated | More than 0.6 seconds             |
| Battery voltage                                  | ≥ 7 V                             |
| Atmospheric pressure                             | ≥ 75.0 kPa (563 mmHg, 22.15 inHg) |
| Engine   | In operation                      |
| After secondary air injection system is stopped  | More than 3 seconds               |
| Secondary air pipe pressure (absolute pressure)  | ≤ Value of Map 22                 |

**5. DTC CLEAR CONDITION**

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

**6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION**

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

**7. FAIL SAFE**

None

**8. ECM OPERATION AT DTC SETTING**

Memorize the freeze frame data. (For test mode \$02)

# FUEL INJECTION (FUEL SYSTEMS)

# *FU(STI)*

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# General Description

FUEL INJECTION (FUEL SYSTEMS)

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## 1. General Description

### A: SPECIFICATION

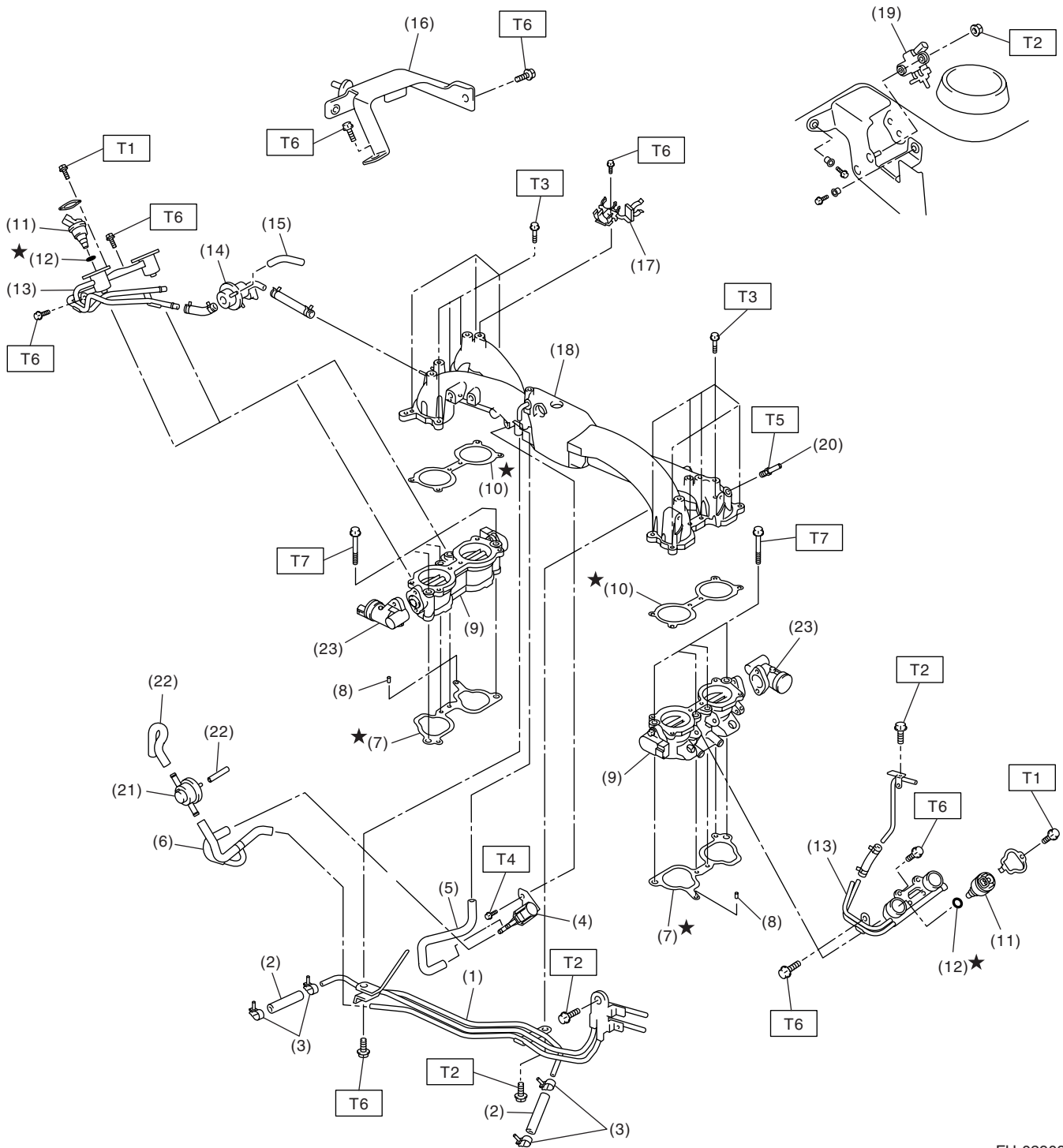
|             |                            |  |
|-------------|----------------------------|--|
| Fuel tank   | Capacity                   | 60 ℓ (15.9 US gal, 13.2 Imp gal)   |
|             | Location                   | Under rear seat  |
| Fuel pump   | Type                       | Impeller   |
|             | Shutoff discharge pressure | 450 — 677 kPa (4.59 — 6.9 kgf/cm <sup>2</sup> , 65.27 — 98.2 psi)  |
|             | Discharge flow             | More than 145 ℓ (38.3 US gal, 31.9 Imp gal)/h<br>[12 V at 300 kPa (3.06 kgf/cm <sup>2</sup> , 43.5 psi)] |
| Fuel filter |                            | Cartridge type   |

# General Description

FUEL INJECTION (FUEL SYSTEMS)

## B: COMPONENT

### 1. INTAKE MANIFOLD



FU-02909

FU(STI)-3

# General Description

## FUEL INJECTION (FUEL SYSTEMS)

|                                    |  |                                      |
|------------------------------------|--|--------------------------------------|
| (1) Fuel pipe ASSY                 | (12) O-ring                                | (22) Purge hose                      |
| (2) Fuel hose                      | (13) Fuel injector pipe                    | (23) Tumble generator valve actuator |
| (3) Clip                           | (14) Pressure regulator                    |                                      |
| (4) Purge control solenoid valve   | (15) Pressure regulator hose               |                                      |
| (5) Vacuum hose                    | (16) Fuel pipe protector RH                |                                      |
| (6) Vacuum control hose            | (17) Blow-by hose stay                     |                                      |
| (7) Intake manifold gasket         | (18) Intake manifold                       |                                      |
| (8) Guide pin                      | (19) Wastegate control solenoid valve ASSY |                                      |
| (9) Tumble generator valve ASSY    | (20) Nipple                                |                                      |
| (10) Tumble generator valve gasket | (21) Purge valve                           |                                      |
| (11) Fuel injector                 |  |                                      |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 3.5 (0.36, 2.6)**

**T2: 6.4 (0.65, 4.7)**

**T3: 8.25 (0.84, 6.1)**

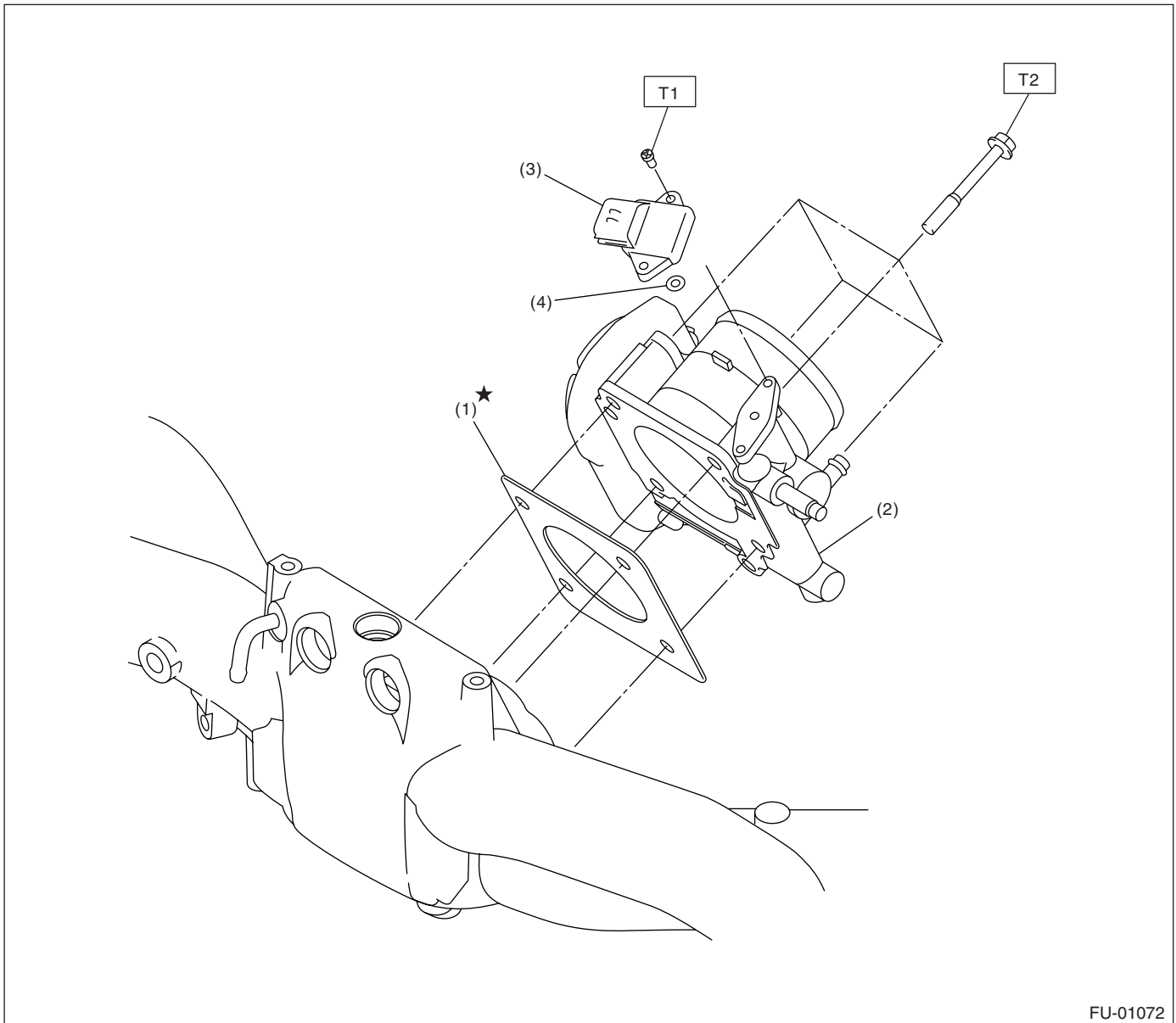
**T4: 16 (1.6, 11.8)**

**T5: 17 (1.73, 12.5)**

**T6: 19 (1.94, 13.7)**

**T7: 25 (2.5, 18.1)**

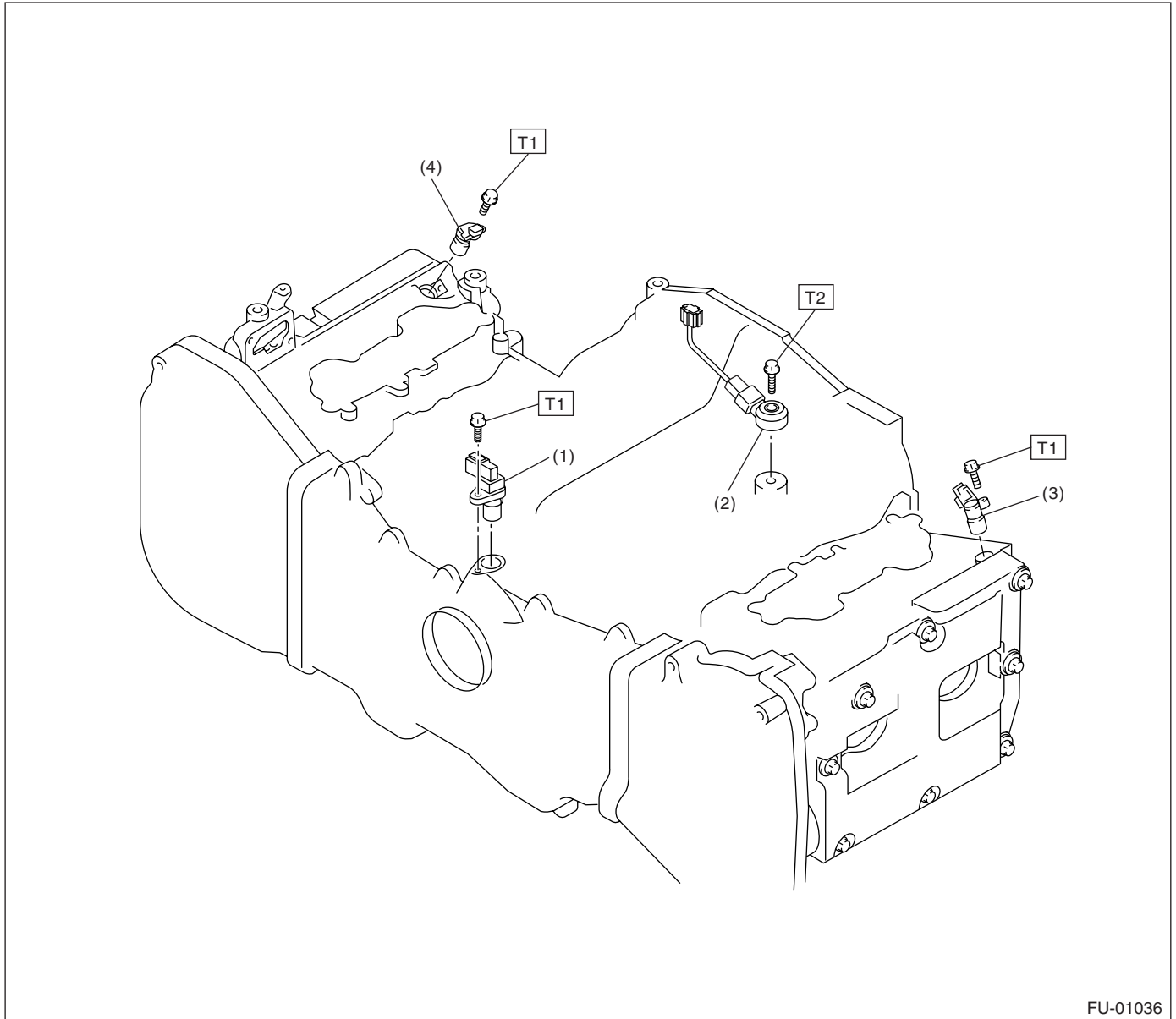
## 2. AIR INTAKE SYSTEM



FU-01072

|                   |                                       |  |
|-------------------|---------------------------------------|--|
| (1) Gasket        | (3) Manifold absolute pressure sensor | <b>Tightening torque: N·m (kgf·m, ft·lb)</b> |
| (2) Throttle body | (4) O-ring                            | <b>T1: 1.6 (0.16, 1.2)</b>                   |
|                   |                                       | <b>T2: 8 (0.8, 5.8)</b>                      |

## 3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



- (1) Crankshaft position sensor
- (2) Knock sensor

- (3) Camshaft position sensor LH
- (4) Camshaft position sensor RH

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 6.4 (0.65, 4.7)**

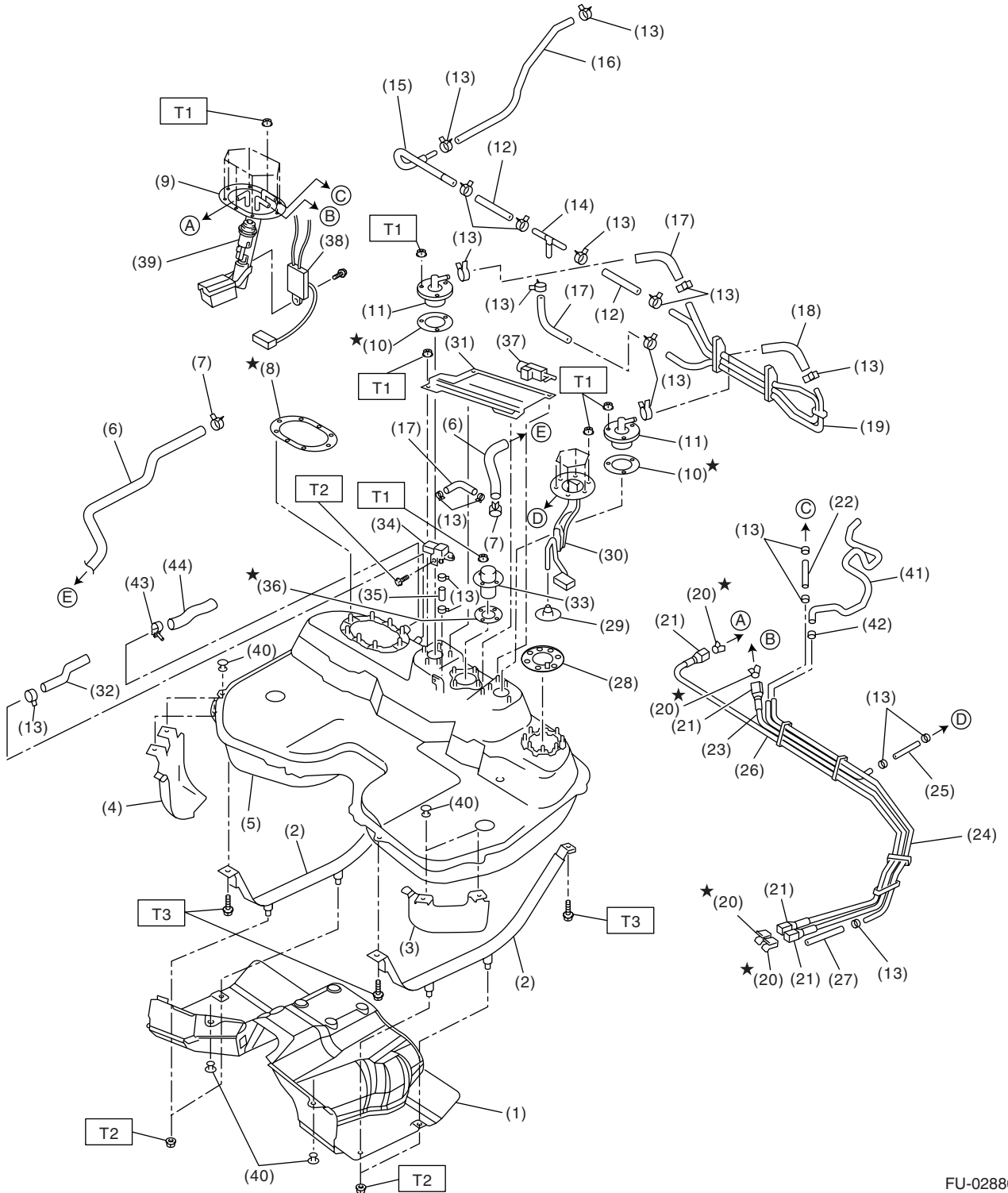
**T2: 24 (2.4, 17.4)**



# General Description

## FUEL INJECTION (FUEL SYSTEMS)

### 4. FUEL TANK



FU-02880

# General Description

## FUEL INJECTION (FUEL SYSTEMS)

|                            |                                   |                                     |
|----------------------------|-----------------------------------|-------------------------------------|
| (1) Heat shield cover      | (18) Evaporation hose D           | (35) Fuel tank pressure sensor hose |
| (2) Fuel tank band         | (19) Evaporation pipe ASSY        | (36) Vent valve gasket              |
| (3) Protector LH           | (20) Retainer                     | (37) Fuel tank sensor control valve |
| (4) Protector RH           | (21) Quick connector              | (38) Fuel level sensor              |
| (5) Fuel tank              | (22) Jet pump hose A              | (39) Fuel filter                    |
| (6) Canister hose A        | (23) Fuel return tube             | (40) Clip                           |
| (7) Clamp                  | (24) Fuel pipe ASSY               | (41) Evaporation hose G             |
| (8) Fuel pump gasket       | (25) Jet pump hose B              | (42) Clamp                          |
| (9) Fuel pump ASSY         | (26) Fuel delivery tube           | (43) Clamp                          |
| (10) Fuel cut valve gasket | (27) Evaporation hose E           | (44) Fuel filler hose               |
| (11) Fuel cut valve        | (28) Fuel sub level sensor gasket |                                     |
| (12) Evaporation hose A    | (29) Jet pump filter              |                                     |
| (13) Clip                  | (30) Fuel sub level sensor        |                                     |
| (14) Joint pipe            | (31) Protector cover              |                                     |
| (15) Evaporation pipe      | (32) Evaporation hose F           |                                     |
| (16) Evaporation hose B    | (33) Vent valve                   |                                     |
| (17) Evaporation hose C    | (34) Fuel tank pressure sensor    |                                     |

---

**Tightening torque: N·m (kgf-m, ft-lb)**

**T1: 4.4 (0.45, 3.3)**

**T2: 7.4 (0.75, 5.4)**

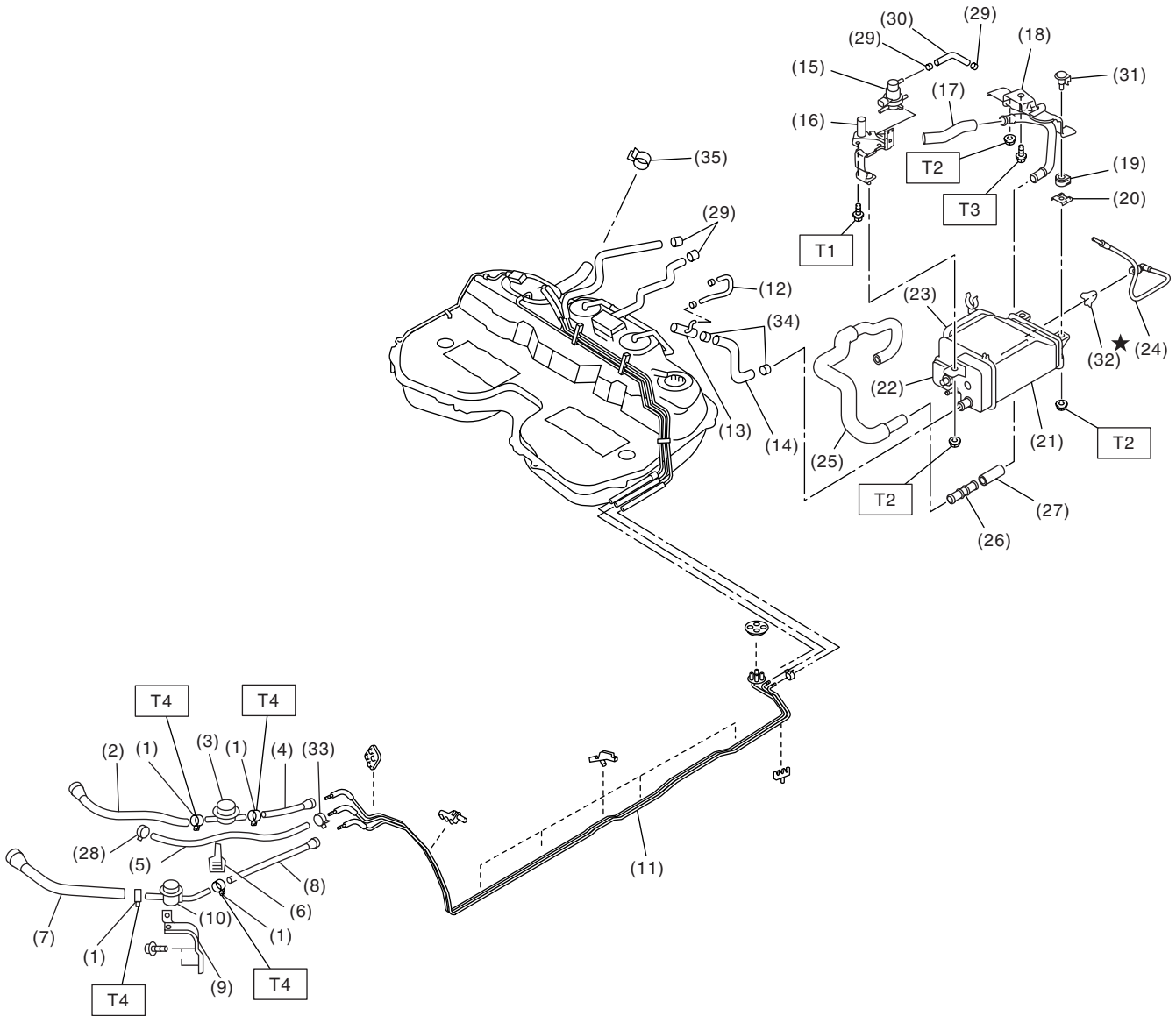
**T3: 33 (3.4, 25)**

---

# General Description

## FUEL INJECTION (FUEL SYSTEMS)

### 5. FUEL LINE



FU-02881

# General Description

## FUEL INJECTION (FUEL SYSTEMS)

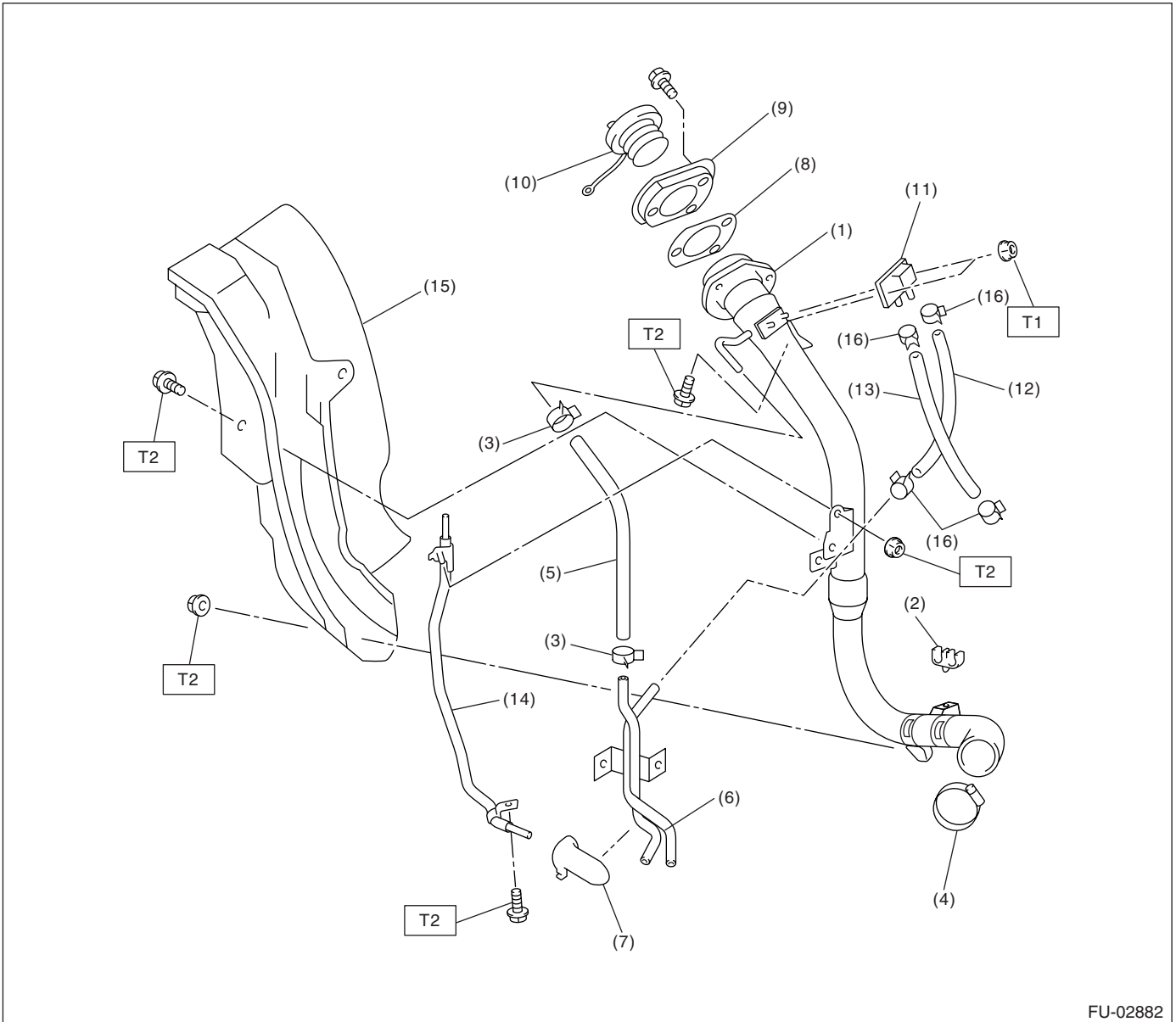
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|                                      |  |  |
|--------------------------------------|--|--|
| (1) Clamp                            | (16) Pressure control solenoid valve bracket | (29) Clamp   |
| (2) Fuel return hose A               | (17) Drain hose C                            | (30) Pressure control solenoid valve hose          |
| (3) Fuel damper valve (return)       | (18) Canister upper bracket                  | (31) Canister bracket spacer                       |
| (4) Fuel return hose B               | (19) Cushion rubber                          | (32) Retainer                                      |
| (5) Evaporation hose A               | (20) Canister lower bracket                  | (33) Clamp   |
| (6) Clip                             | (21) Canister                                | (34) Clamp   |
| (7) Fuel delivery hose A             | (22) Drain valve                             | (35) Clamp   |
| (8) Fuel delivery hose B             | (23) Drain filter                            |  |
| (9) Fuel damper valve bracket        | (24) Pressure control solenoid valve tube    |  |
| (10) Fuel damper valve (delivery)    | (25) Drain hose A                            | <hr/> <b>Tightening torque: N·m (kgf-m, ft-lb)</b> |
| (11) Fuel pipe ASSY                  | (26) Connector drain                         | <b>T1: 25 (2.5, 18.1)</b>                          |
| (12) Evaporation hose B              | (27) Drain hose B                            | <b>T2: 23 (2.3, 16.6)</b>                          |
| (13) Joint pipe                      | (28) Clamp                                   | <b>T3: 33 (3.4, 25)</b>                            |
| (14) Canister hose A                 |  | <b>T4: 1.25 (0.13, 0.94)</b>                       |
| (15) Pressure control solenoid valve |  | <hr/>  |

# General Description

## FUEL INJECTION (FUEL SYSTEMS)

### 6. FUEL FILLER PIPE



FU-02882

- |                             |                         |                                 |
|-----------------------------|-------------------------|---------------------------------|
| (1) Fuel filler pipe ASSY   | (8) Filler pipe packing | (15) Fuel filler pipe protector |
| (2) Evaporation hose holder | (9) Filler ring         | (16) Clamp                      |
| (3) Clamp                   | (10) Filler cap         |                                 |
| (4) Clamp                   | (11) Shut valve         |                                 |
| (5) Evaporation hose A      | (12) Evaporation hose B |                                 |
| (6) Evaporation pipe        | (13) Evaporation hose C |                                 |
| (7) Evaporation pipe holder | (14) Joint pipe         |                                 |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 4.4 (0.45, 3.3)**

**T2: 7.5 (0.76, 5.5)**

# General Description

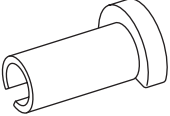
FUEL INJECTION (FUEL SYSTEMS)

## C: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.

- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.
- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

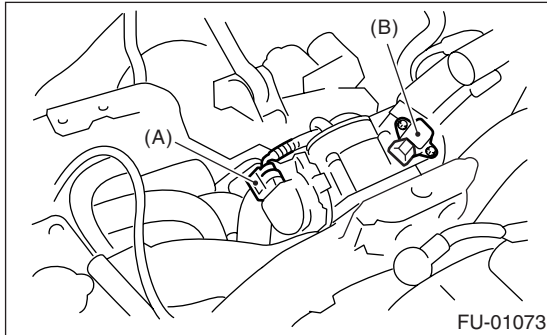
## D: PREPARATION TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION       | REMARKS  |
|---|-------------|-------------------|--|
| <br><br>ST42099AE000 | 42099AE000  | CONNECTOR REMOVER | Used for removing quick connector in engine compartment. |

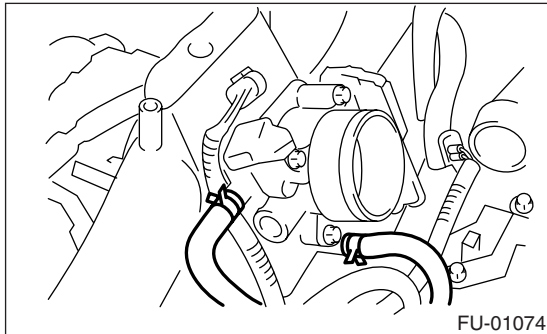
### 2. Throttle Body

#### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the intercooler. <Ref. to IN(STI)-11, REMOVAL, Intercooler.>
- 3) Disconnect the connector from the throttle position sensor (A) and manifold absolute pressure sensor (B).



- 4) Disconnect the engine coolant hoses from the throttle body.



- 5) Remove the bolts which secure the throttle body to intake manifold.

#### B: INSTALLATION

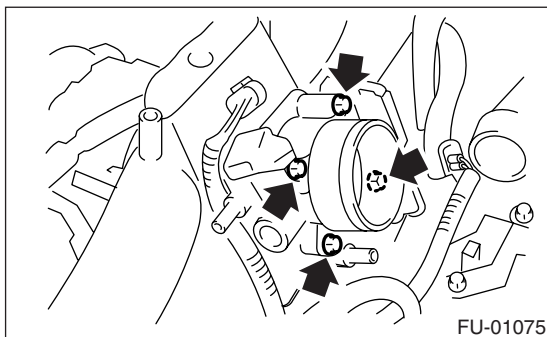
Install in the reverse order of removal.

NOTE:

Always use a new gasket.

**Tightening torque:**

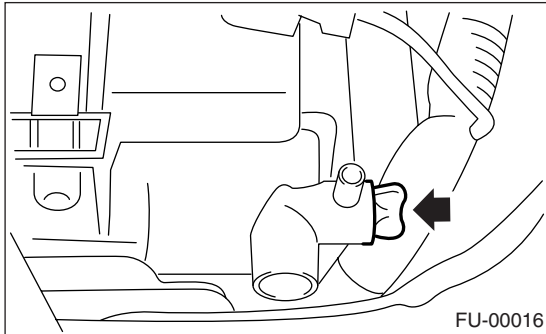
**8 N·m (0.8 kgf-m, 5.8 ft-lb)**



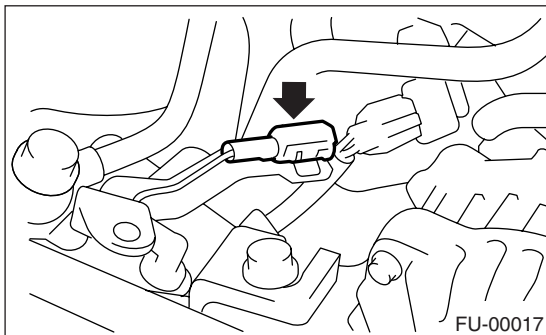
## 3. Intake Manifold

### A: REMOVAL

- 1) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Open the fuel filler flap lid and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.
- 4) Lift up the vehicle.
- 5) Remove the under cover.
- 6) Drain the engine coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).



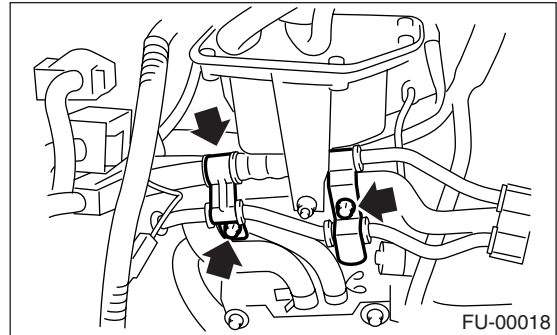
- 7) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(STI)-8, REMOVAL, Air Cleaner Case.>
- 8) Remove the air cleaner element.
- 9) Remove the intercooler. <Ref. to IN(STI)-11, REMOVAL, Intercooler.>
- 10) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-33, REMOVAL, Coolant Filler Tank.>
- 11) Remove the power steering pump.
  - (1) Remove the front side V-belt. <Ref. to ME(STI)-40, REMOVAL, V-belt.>
  - (2) Disconnect the power steering switch connector.



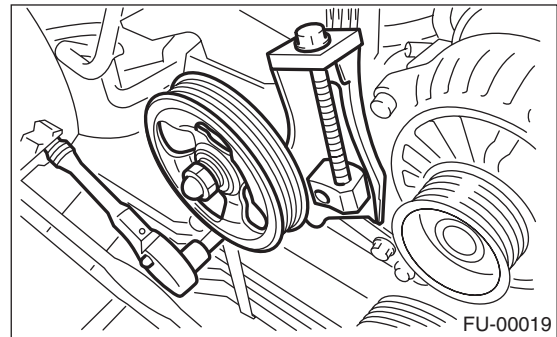
- (3) Remove the bolts which secure the power steering pipe brackets to the intake manifold.

### NOTE:

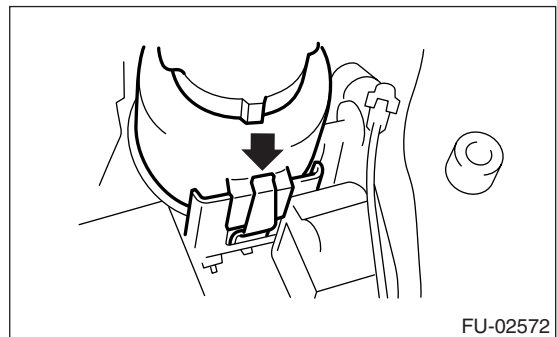
Do not disconnect the power steering hose.



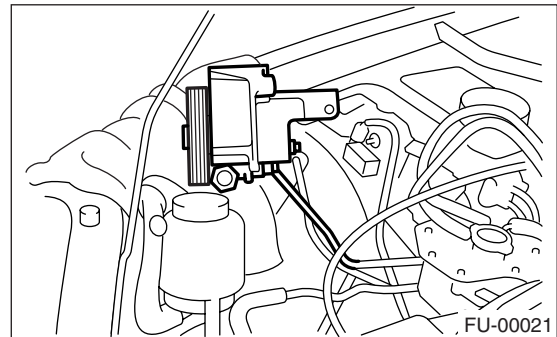
- (4) Remove the bolts which secure the power steering pump bracket.



- (5) Remove the power steering tank from the bracket by pulling it upward.



- (6) Place the power steering pump on the right side wheel apron.

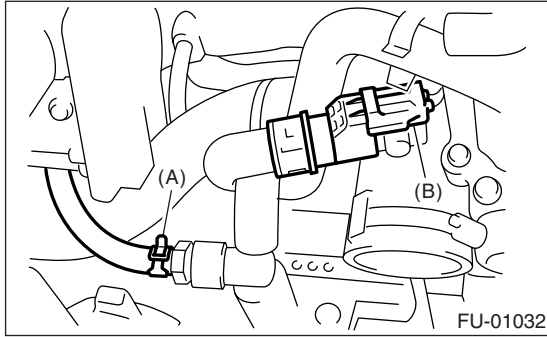




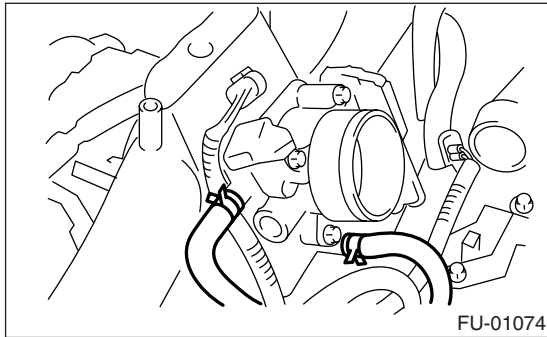
# Intake Manifold

## FUEL INJECTION (FUEL SYSTEMS)

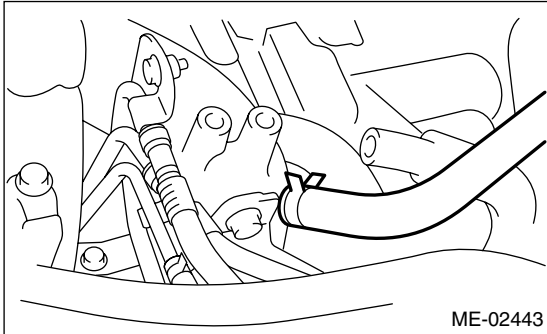
12) Disconnect the emission hose (A) and connector (B) from the PCV hose assembly.



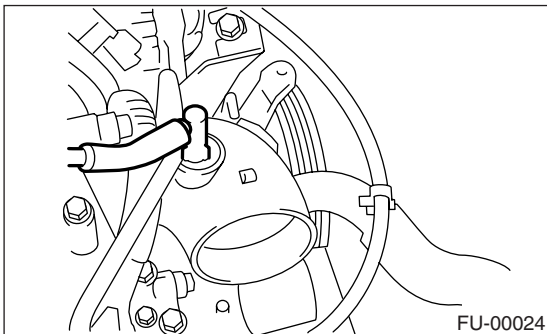
13) Disconnect the engine coolant hoses from the throttle body.



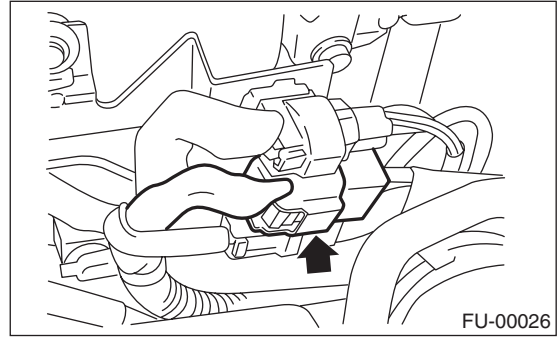
14) Disconnect the brake booster hose.



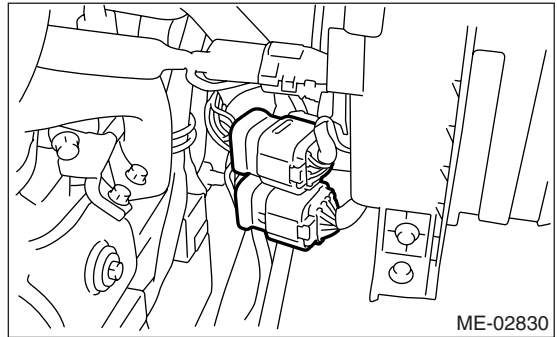
15) Disconnect the pressure hose from the intake duct.



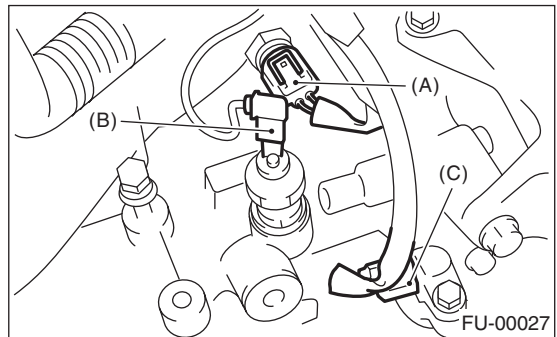
16) Disconnect the engine harness connectors from the bulkhead harness connectors.



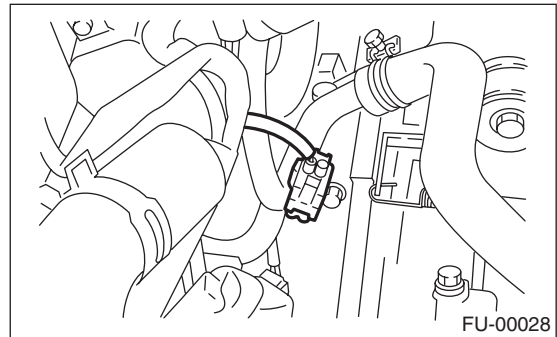
17) Disconnect the engine harness connector from front harness connector.



18) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



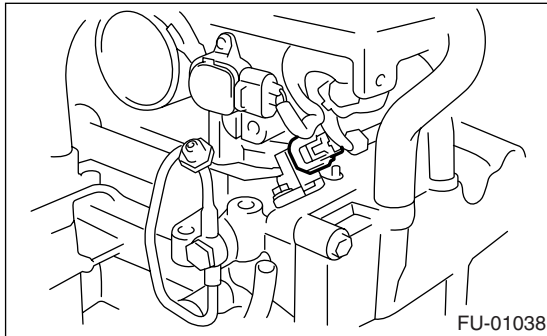
19) Disconnect the knock sensor connector.



# Intake Manifold

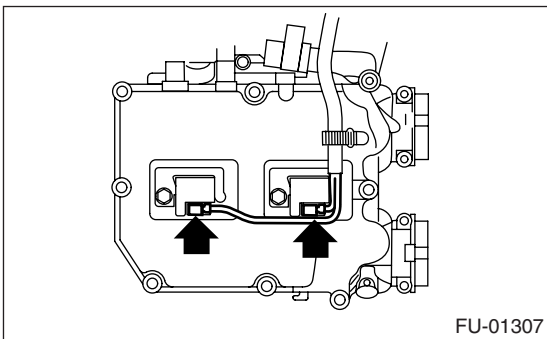
## FUEL INJECTION (FUEL SYSTEMS)

20) Disconnect the connector from the camshaft position sensor.

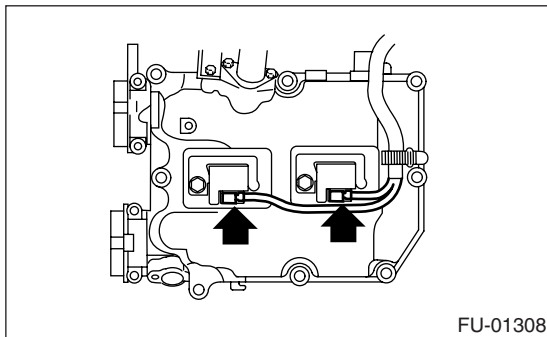


21) Disconnect the connector from the ignition coil and ignitor assembly.

- RH side

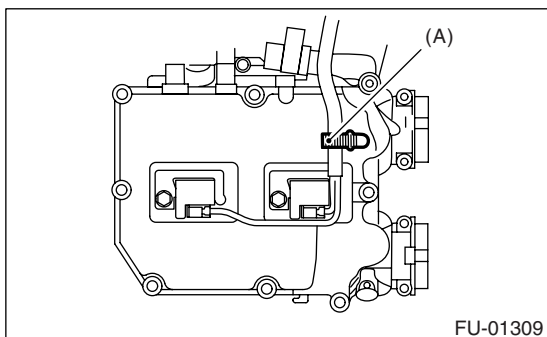


- LH side

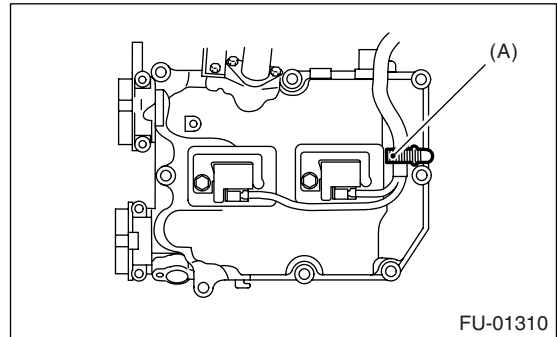


22) Disconnect the engine harness fixed by clip (A) from the rocker cover.

- RH side



- LH side

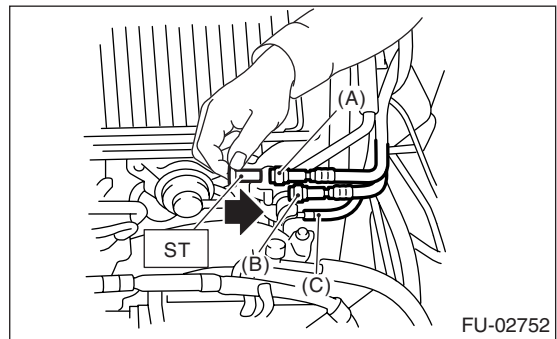


23) Using ST, disconnect fuel hoses from fuel pipes. <Ref. to FU(STI)-60, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

### CAUTION:

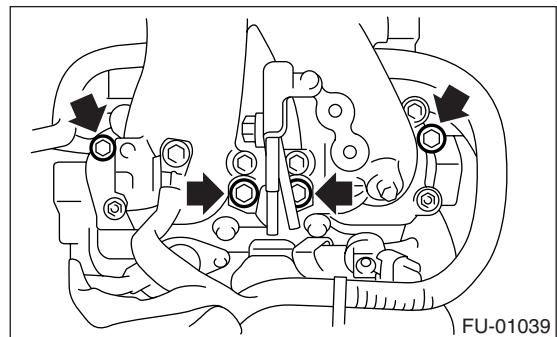
- Be careful not to spill fuel.
- Catch fuel from hoses using a container or cloth.

ST 42099AE000 CONNECTOR REMOVER



- (A) Fuel delivery hose
- (B) Return hose
- (C) Evaporation hose

24) Remove the bolts which secure the intake manifold to the cylinder heads.



25) Remove the intake manifold.

# Intake Manifold

## FUEL INJECTION (FUEL SYSTEMS)

### B: INSTALLATION

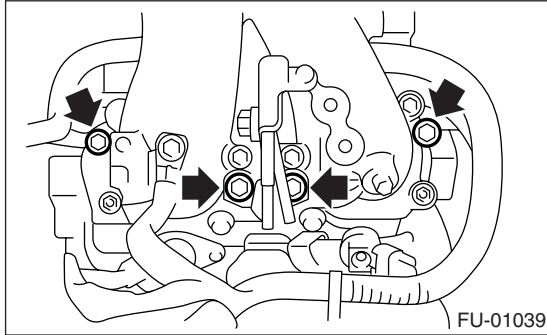
1) Install the intake manifold onto cylinder heads.

NOTE:

Always use new gaskets.

**Tightening torque:**

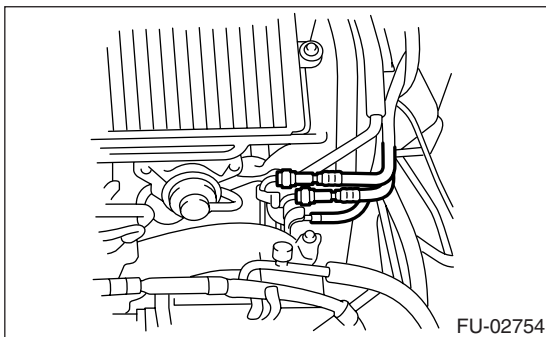
**25 N·m (2.5 kgf·m, 18.1 ft·lb)**



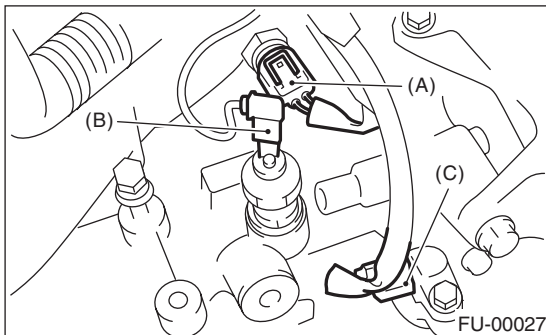
2) Connect the fuel delivery hose, return hose and evaporation hose.

NOTE:

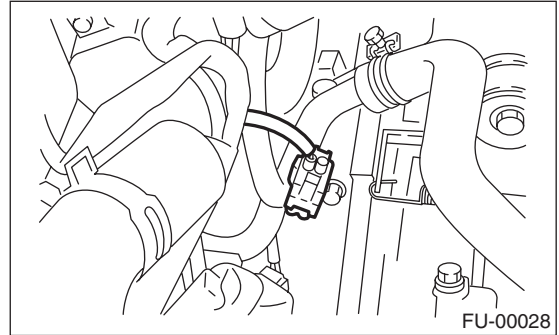
If fuel hoses or clamps are damaged, replace them with new ones.



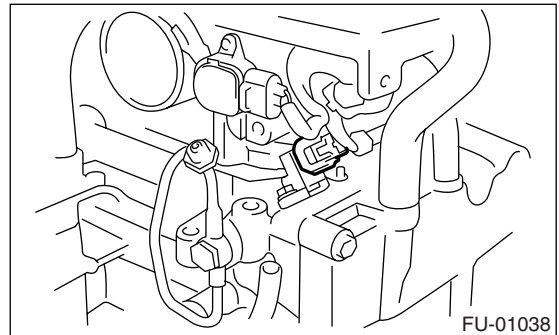
3) Connect the connector to the oil pressure switch (B), crankshaft position sensor (C) and engine coolant temperature sensor (A).



4) Connect the connector to the knock sensor.

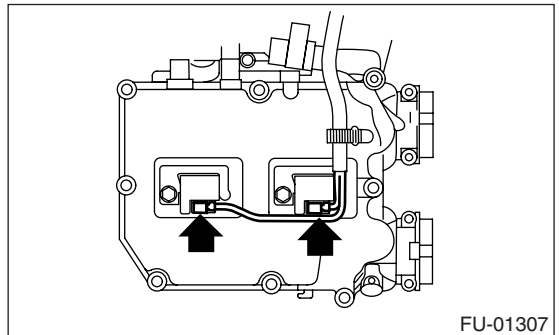


5) Connect the connector to the camshaft position sensor.

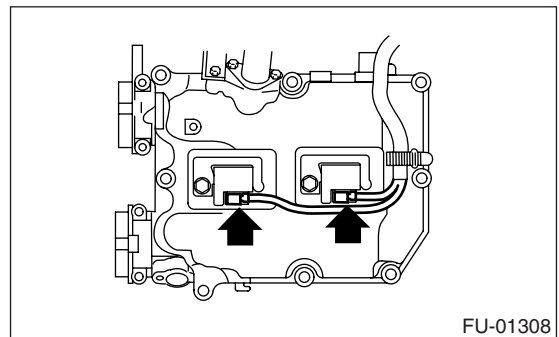


6) Connect the connector to the ignition coil and ignitor assembly.

- RH side



- LH side

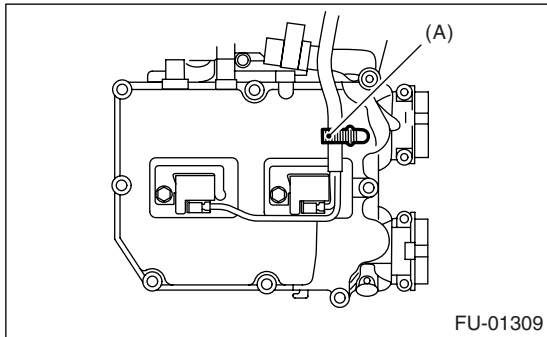


# Intake Manifold

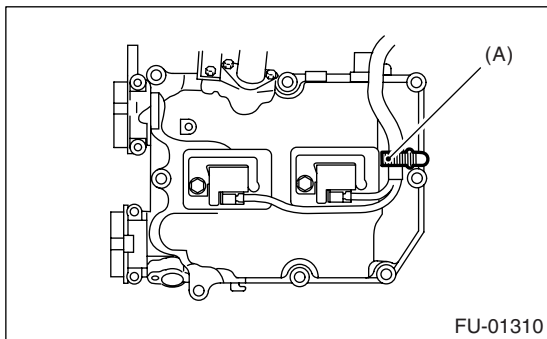
## FUEL INJECTION (FUEL SYSTEMS)

7) Connect the engine harness with clip (A) to the rocker cover.

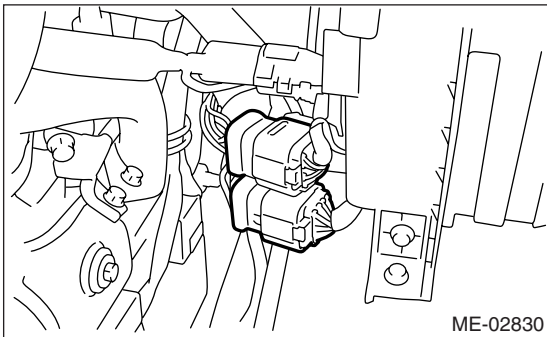
- RH side



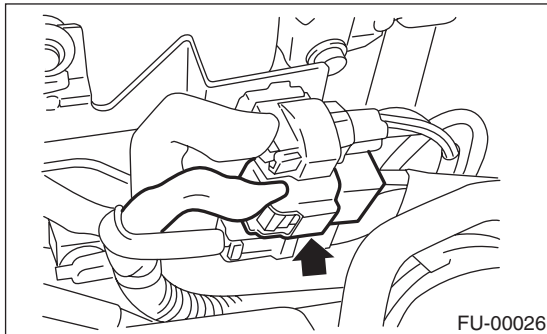
- LH side



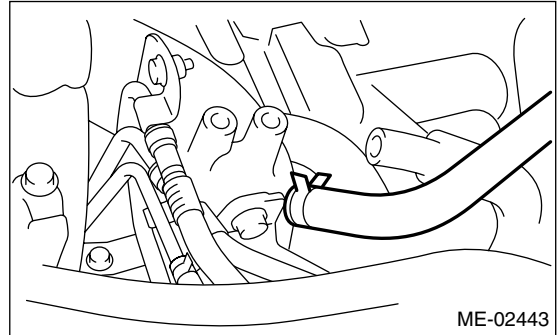
8) Connect the engine harness connector to the front harness connectors.



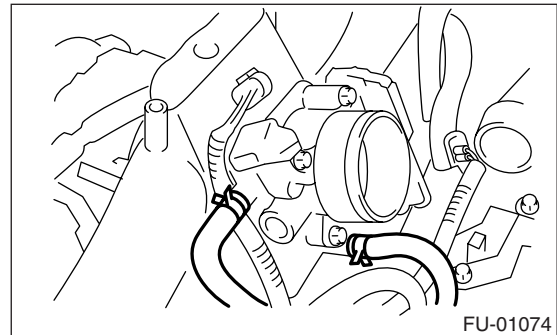
9) Connect the engine harness connector to the bulkhead harness connectors.



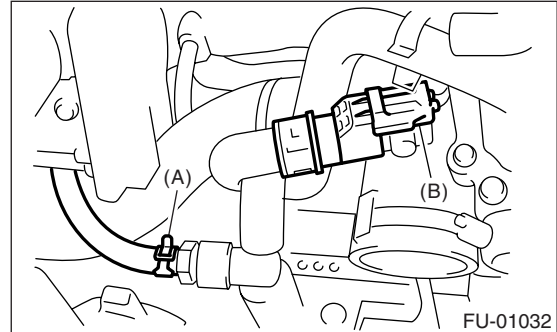
10) Connect the brake booster vacuum hose.



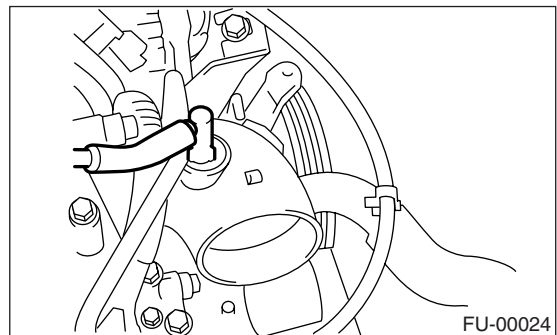
11) Connect the engine coolant hoses to the throttle body.



12) Connect the emission hose (A) and connector (B) to the PCV hose assembly.



13) Connect the pressure hose to the intake duct.

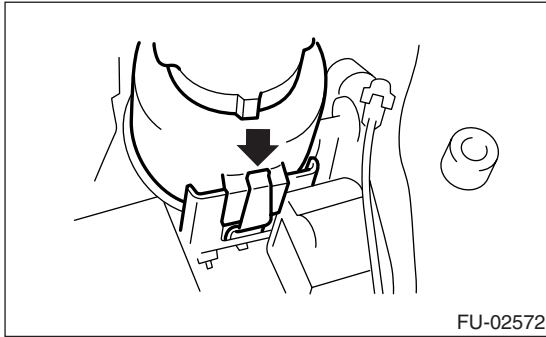


# Intake Manifold

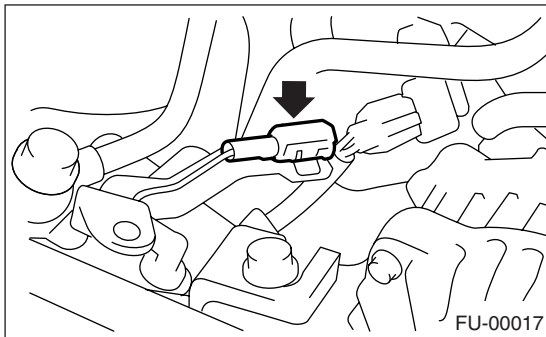
## FUEL INJECTION (FUEL SYSTEMS)

14) Install the power steering pump.

(1) Install the power steering tank on the bracket.



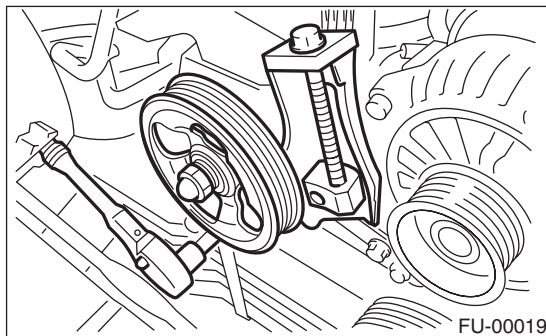
(2) Connect the connector to the power steering pump switch.



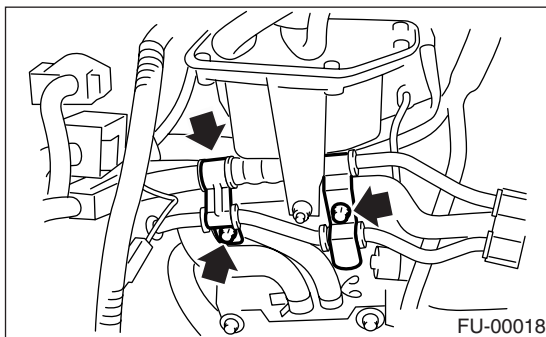
(3) Install the power steering pump, and tighten the bolts.

### Tightening torque:

**22 N·m (2.2 kgf-m, 15.9 ft-lb)**



(4) Install the power steering pipe brackets on the intake manifold RH.



(5) Install the front side V-belt. <Ref. to ME(STI)-40, INSTALLATION, V-belt.>

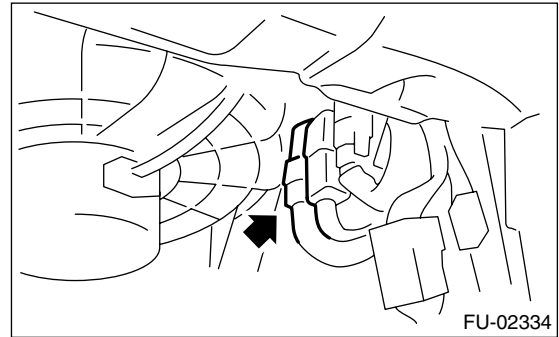
15) Install the coolant filler tank. <Ref. to CO(H4DOTC)-33, INSTALLATION, Coolant Filler Tank.>

16) Install the intercooler. <Ref. to IN(STI)-11, INSTALLATION, Intercooler.>

17) Install the air cleaner element.

18) Install the air cleaner upper cover and air intake duct as a unit. <Ref. to IN(STI)-8, INSTALLATION, Air Cleaner Case.>

19) Connect the connector to the fuel pump relay.



20) Connect the battery ground cable to battery.

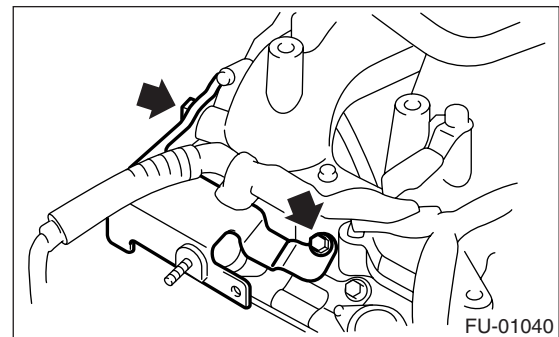
21) Lift up the vehicle.

22) Install the under cover.

23) Fill the engine coolant. <Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

## C: DISASSEMBLY

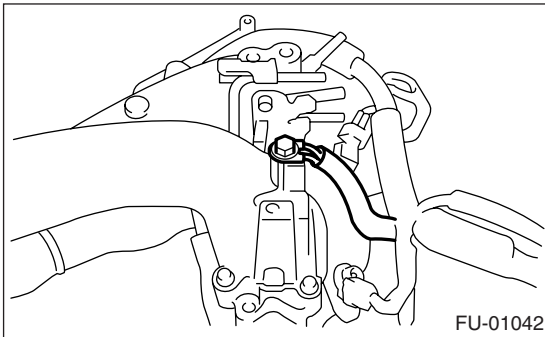
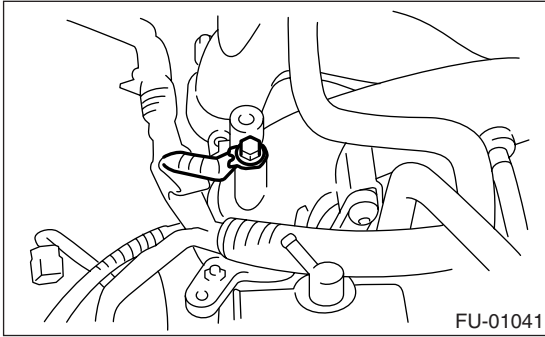
1) Remove the fuel pipe protector RH.



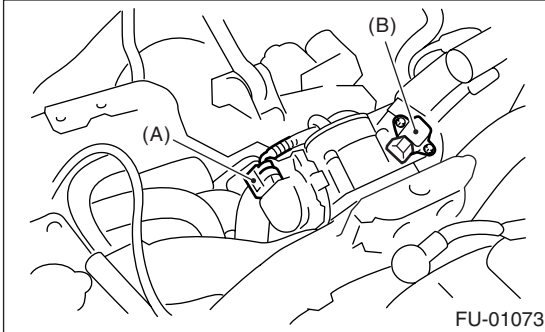
# Intake Manifold

## FUEL INJECTION (FUEL SYSTEMS)

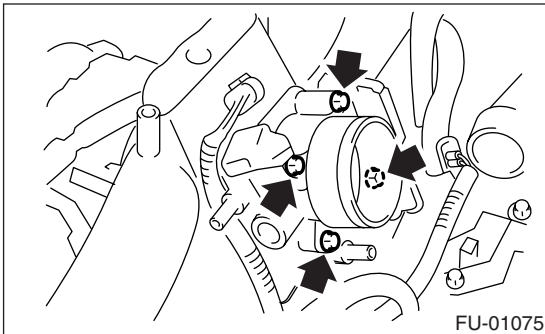
2) Remove the engine ground terminal from the intake manifold.



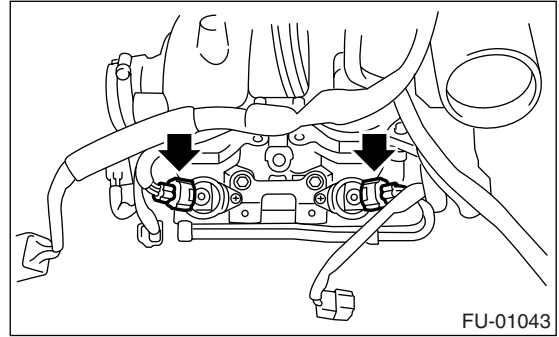
3) Disconnect the connector from the throttle position sensor (A) and manifold absolute pressure sensor (B).



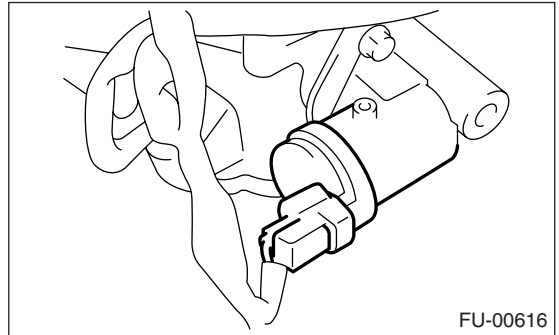
4) Remove the throttle body from the intake manifold.



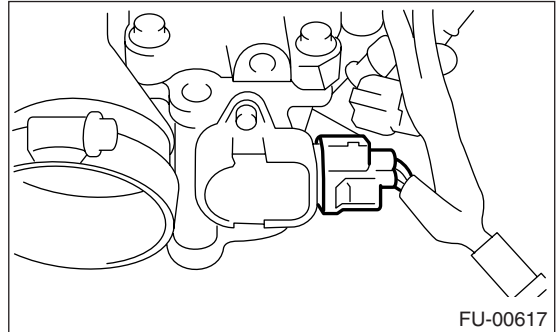
5) Disconnect the connector from the fuel injector.



6) Disconnect the connector from the tumble generator valve actuator.

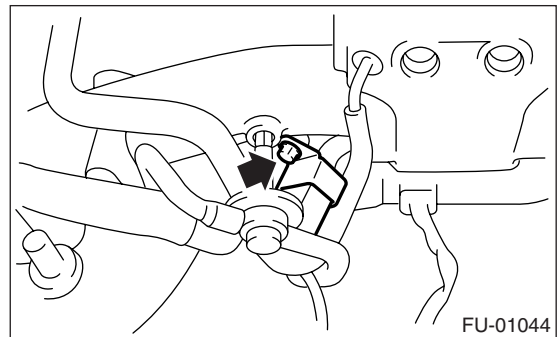


7) Disconnect the connector from the tumble generator valve sensor.



8) Disconnect the connector from the purge control solenoid valve.

9) Remove the purge control solenoid valve.

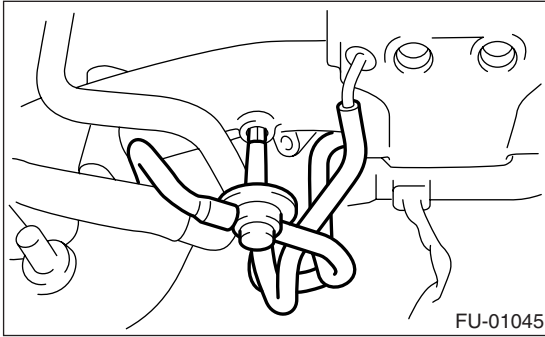




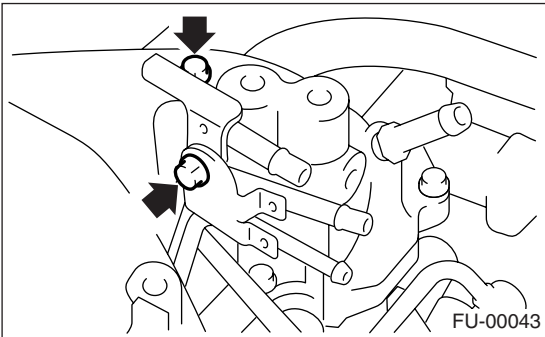
# Intake Manifold

## FUEL INJECTION (FUEL SYSTEMS)

10) Disconnect the evaporation hose and purge valve from the intake manifold.

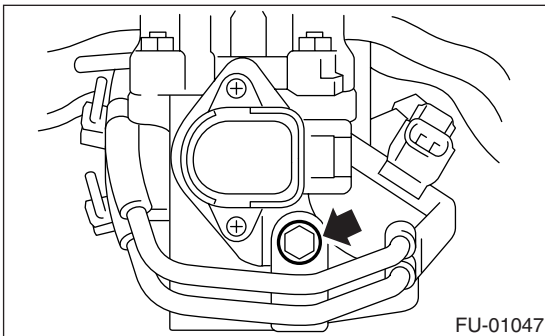
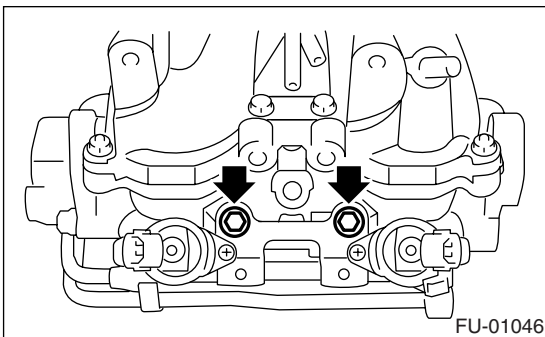


11) Remove the two bolts which hold the fuel pipes on the left side of intake manifold.

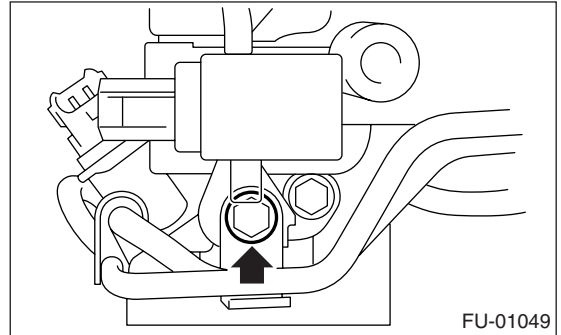
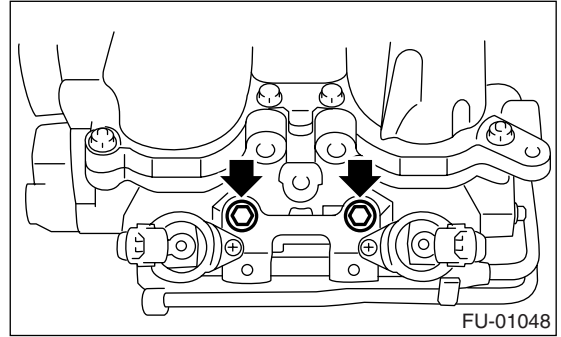


12) Remove the bolt which hold the fuel injector pipe onto intake manifold.

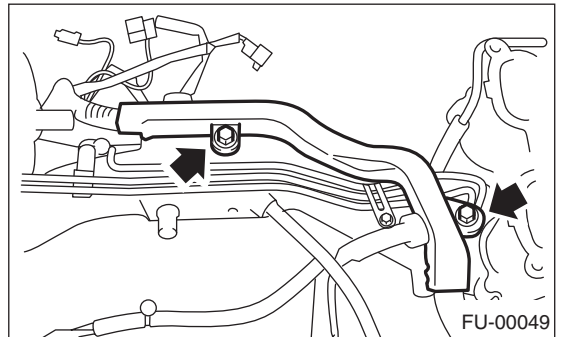
• LH SIDE



• RH SIDE

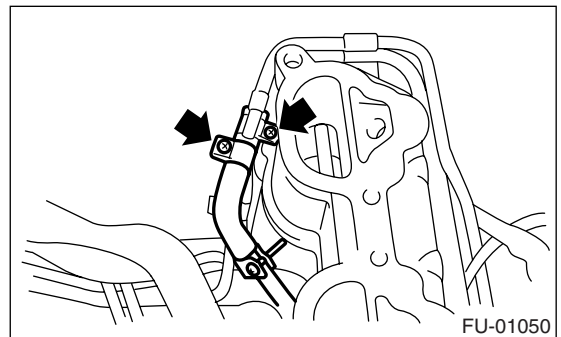


13) Remove the harness bracket which holds the engine harness onto intake manifold.



14) Remove the engine harness from the intake manifold.

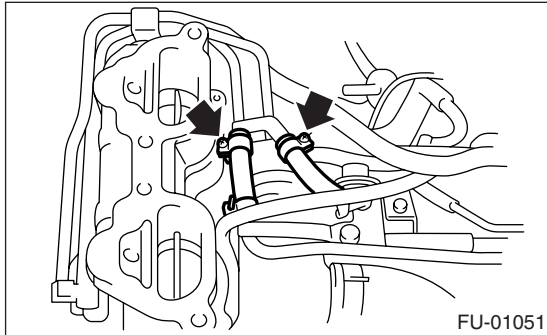
15) Loosen the clamp which holds the front left side fuel hose to injector pipe, and then remove the pipe from clamp.



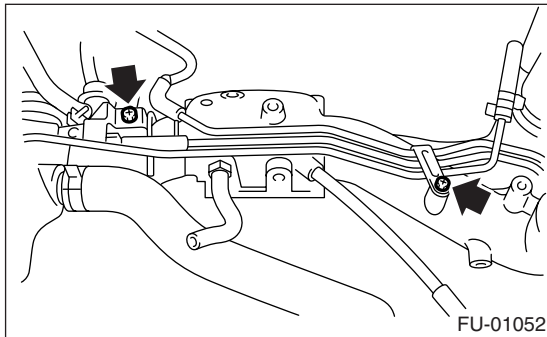
# Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

16) Loosen the clamp which holds the right side fuel hose to injector pipe, and then remove the pipe from clamp.

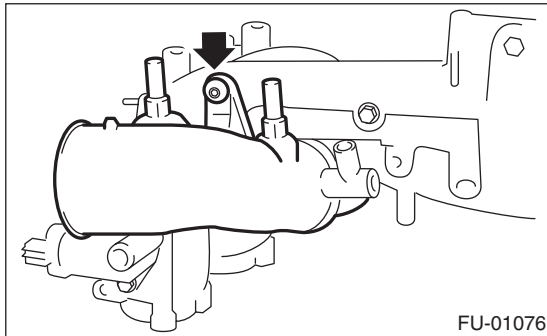


17) Remove the bolts which install the fuel pipe on intake manifold.

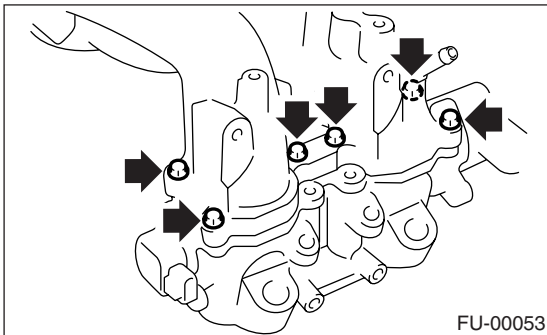


18) Remove the fuel pipe assembly and pressure regulator from the intake manifold.

19) Remove the intake duct from the intake manifold.



20) Remove the tumble generator valve assembly from the intake manifold.



## D: ASSEMBLY

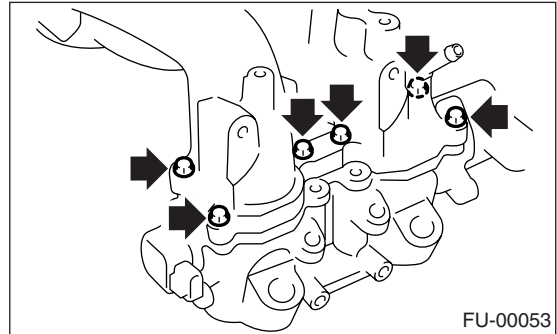
NOTE:

Replace the gasket with a new one.

1) Install the tumble generator valve assembly to the intake manifold.

**Tightening torque:**

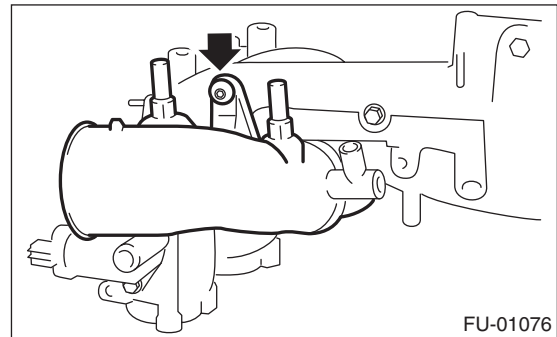
**8.25 N·m (0.84 kgf-m, 6.1 ft-lb)**



2) Install the air intake duct to the intake manifold.

**Tightening torque:**

**19 N·m (1.94 kgf-m, 13.7 ft-lb)**

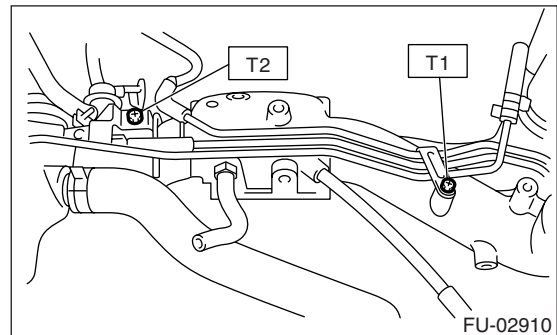


3) Install the fuel pipe assembly and pressure regulator to the intake manifold.

**Tightening torque:**

**T1: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**

**T2: 19 N·m (1.94 kgf-m, 13.7 ft-lb)**



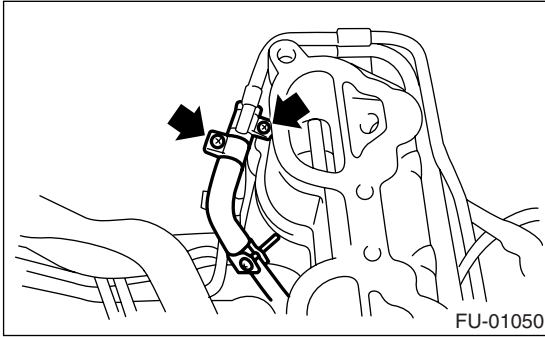
4) Install the fuel injector pipe LH.



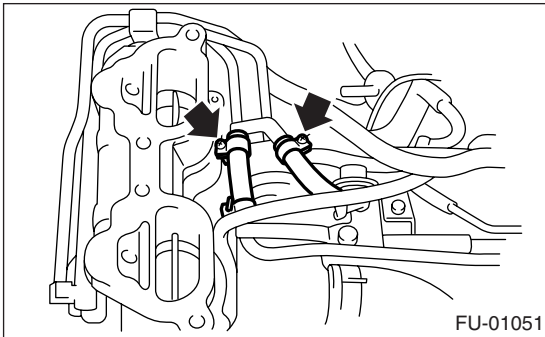
# Intake Manifold

## FUEL INJECTION (FUEL SYSTEMS)

5) Connect the left side fuel hose to injector pipe, and tighten the clamp screw.

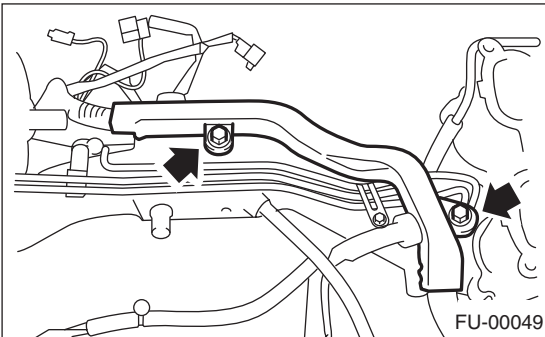


6) Install the fuel injector pipe RH.  
7) Connect the right side fuel hose to injector pipe, and tighten the clamp screw.



8) Install the engine harness to the intake manifold.  
9) Install the harness bracket which holds the engine harness onto intake manifold.

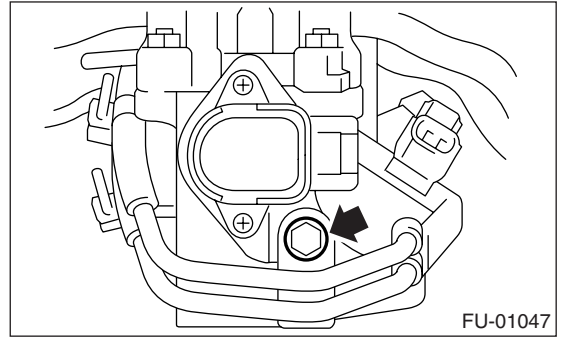
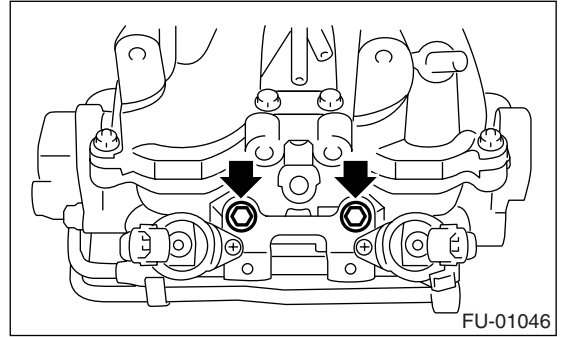
**Tightening torque:**  
**19 N·m (1.94 kgf-m, 13.7 ft-lb)**



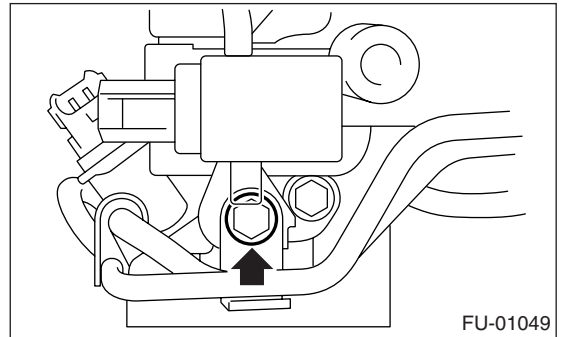
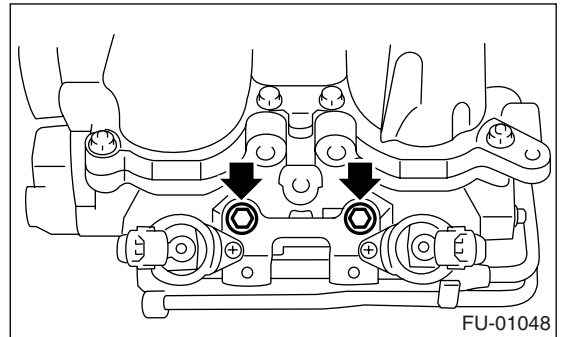
10) Tighten the bolts which install the fuel injector pipe onto intake manifold.

**Tightening torque:**  
**19 N·m (1.94 kgf-m, 13.7 ft-lb)**

### • LH SIDE



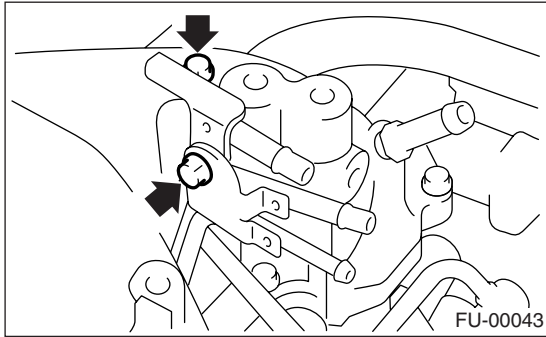
### • RH SIDE



11) Tighten the two bolts which install the fuel pipes on the left side of intake manifold.

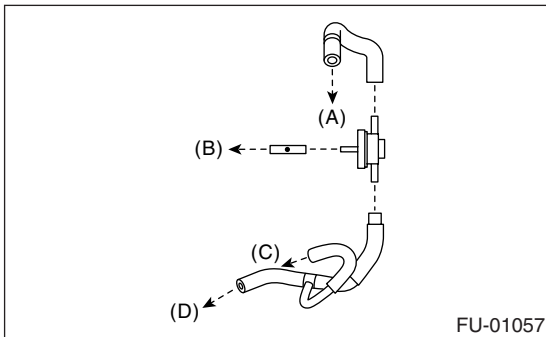
# Intake Manifold

**Tightening torque:**  
**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



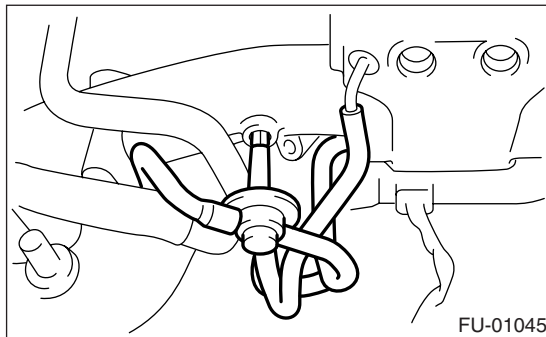
12) Connect the evaporation hoses to the purge valve.

**NOTE:**  
Connect the evaporation hoses as shown in the figure.



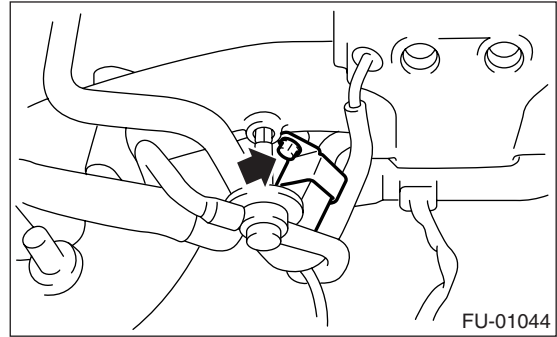
- (A) To intake duct
- (B) To intake manifold
- (C) To purge control solenoid valve
- (D) To fuel pipe ASSY

13) Connect the evaporation hose and purge valve to the intake manifold.



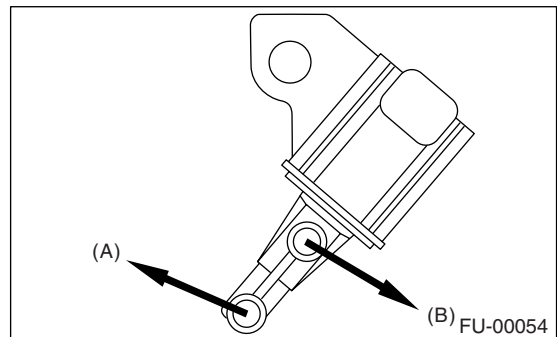
14) Install the purge control solenoid valve.

**Tightening torque:**  
**16 N·m (1.6 kgf-m, 11.8 ft-lb)**



15) Connect the hoses to the purge control solenoid valve.

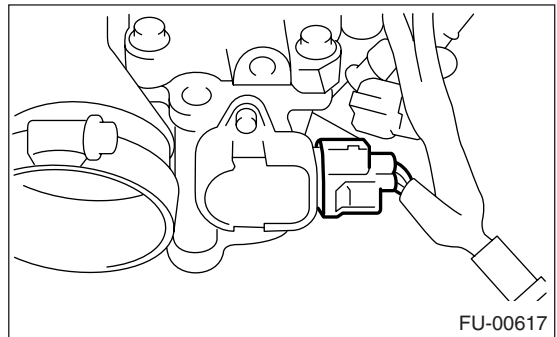
**NOTE:**  
Connect the evaporation hoses as shown in the figure.



- (A) To purge valve
- (B) To intake manifold

16) Connect the connector to the purge control solenoid valve.

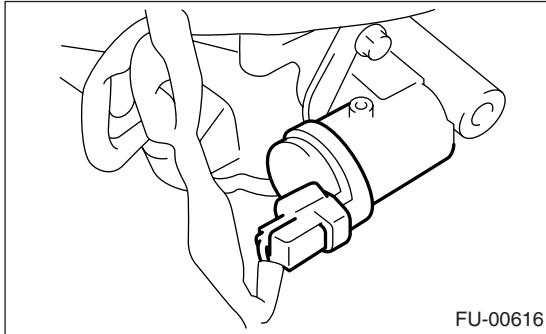
17) Connect the connector to the tumble generator valve sensor.



# Intake Manifold

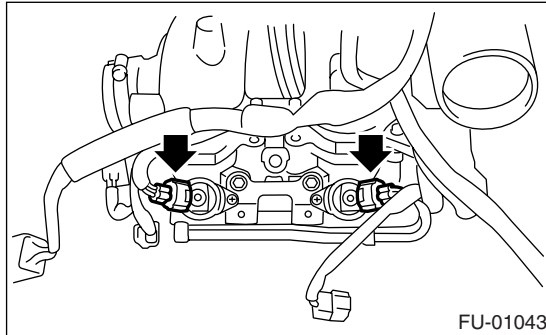
## FUEL INJECTION (FUEL SYSTEMS)

18) Connect the connector to the tumble generator valve actuator.



FU-00616

19) Connect the connector to the fuel injector.



FU-01043

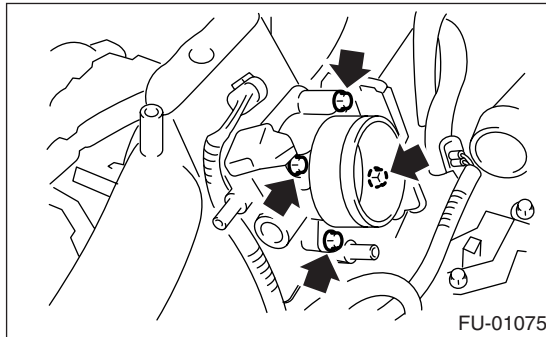
20) Install the throttle body to the intake manifold.

NOTE:

Replace the gasket with a new one.

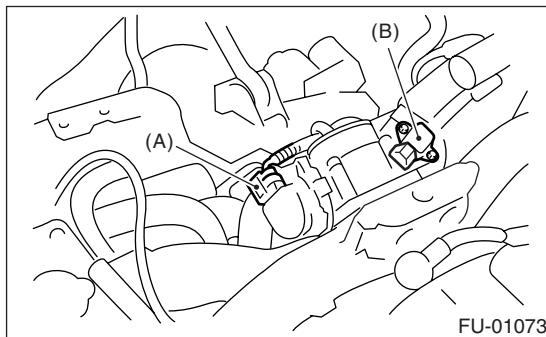
**Tightening torque:**

**8 N·m (0.8 kgf-m, 5.8 ft-lb)**



FU-01075

21) Connect the connector to the throttle position sensor (A) and manifold absolute pressure sensor (B).

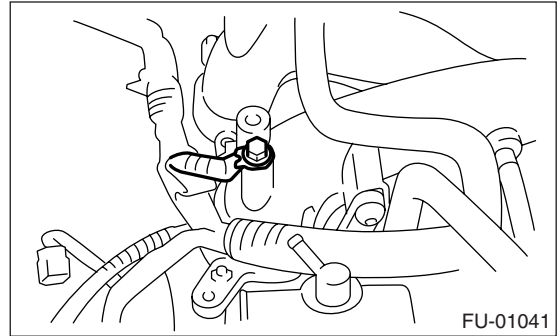


FU-01073

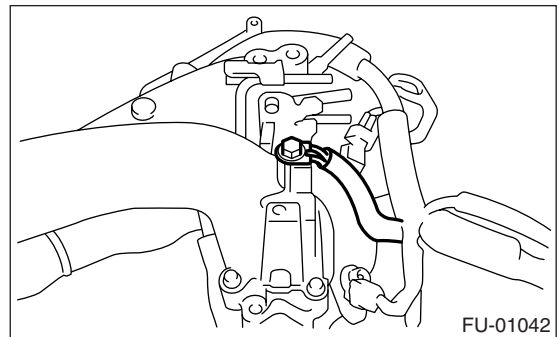
22) Install the engine ground terminal to the intake manifold.

**Tightening torque:**

**19 N·m (1.94 kgf-m, 13.7 ft-lb)**



FU-01041

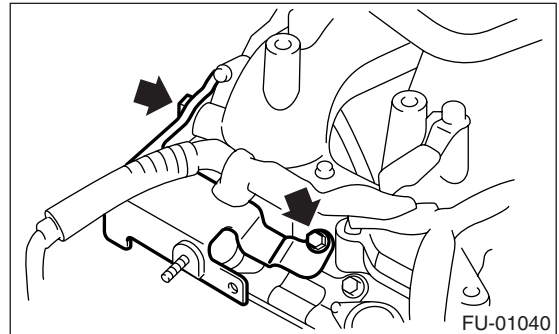


FU-01042

23) Install the fuel pipe protector RH.

**Tightening torque:**

**19 N·m (1.94 kgf-m, 13.7 ft-lb)**



FU-01040

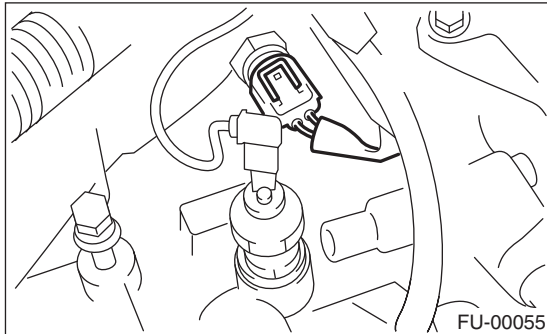
## **E: INSPECTION**

Make sure the fuel pipe and fuel hoses are not cracked and the connections are tightened securely.

## 4. Engine Coolant Temperature Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the generator. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
- 3) Drain the engine coolant. <Ref. to CO(H4DOTC)-17, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 4) Disconnect the connector from the engine coolant temperature sensor.



- 5) Remove the engine coolant temperature sensor.

### B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use a new gasket.

**Tightening torque:**

**18 N·m (1.8 kgf·m, 13.3 ft-lb)**

# Crankshaft Position Sensor

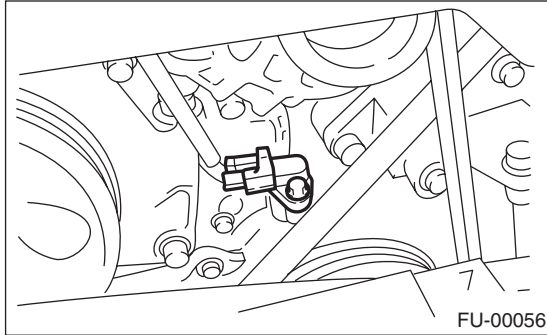
FUEL INJECTION (FUEL SYSTEMS)

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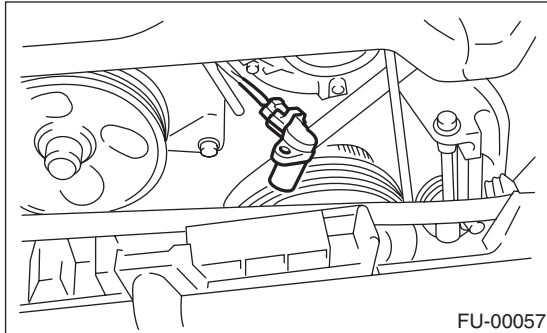
## 5. Crankshaft Position Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the bolt which installs the crankshaft position sensor to cylinder block.



- 3) Remove the crankshaft position sensor, and disconnect the connector from it.

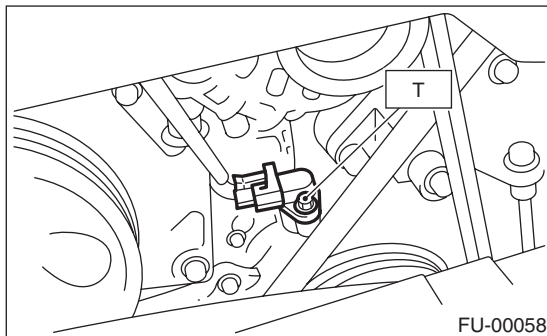


### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**

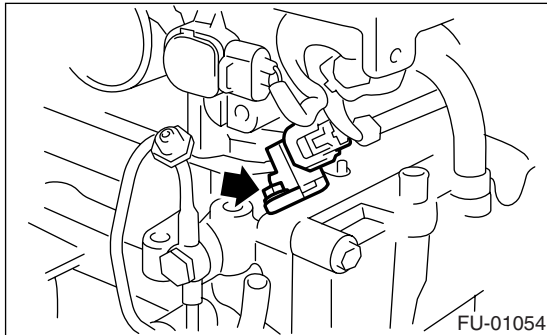
***T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)***



## 6. Camshaft Position Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from the camshaft position sensor RH.
- 3) Remove the camshaft position sensor RH from the backside of cylinder head.



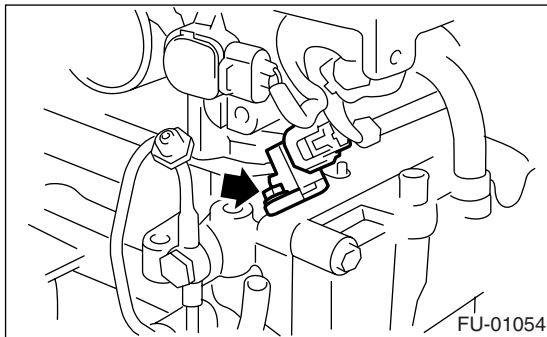
- 4) Remove the camshaft position sensor LH same as RH side.

### B: INSTALLATION

Install in the reverse order of removal.

#### ***Tightening torque:***

***6.4 N·m (0.65 kgf-m, 4.7 ft-lb)***



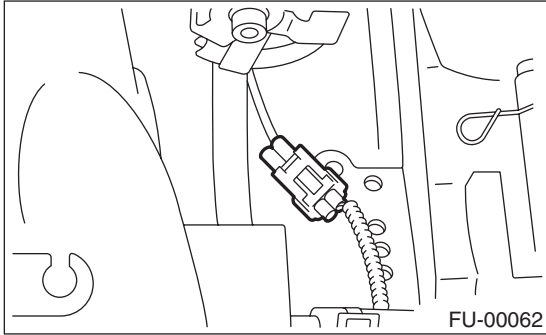
# Knock Sensor

FUEL INJECTION (FUEL SYSTEMS)

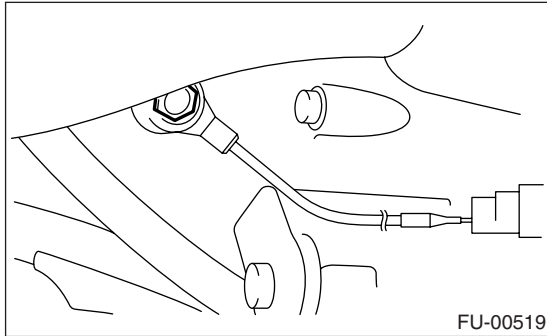
## 7. Knock Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the intercooler. <Ref. to IN(STI)-11, REMOVAL, Intercooler.>
- 3) Disconnect the knock sensor connector.



- 4) Remove the knock sensor from the cylinder block.



### B: INSTALLATION

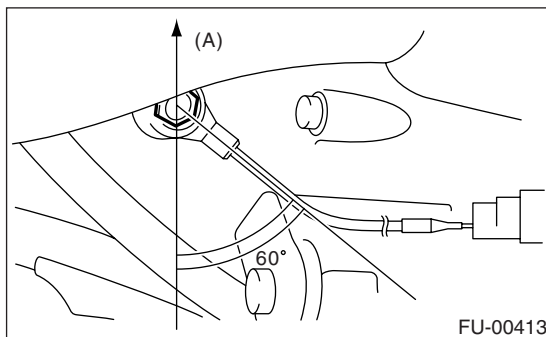
- 1) Install the knock sensor to the cylinder block.

#### **Tightening torque:**

**24 N·m (2.4 kgf·m, 17.4 ft·lb)**

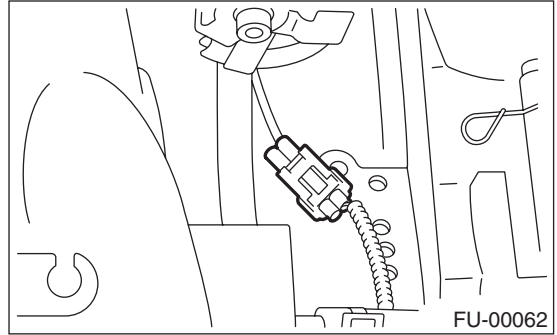
#### **NOTE:**

Extraction area of the knock sensor cord must be positioned at a 60° angle relative to the engine rear.



(A) Front side

- 2) Connect the knock sensor connector.

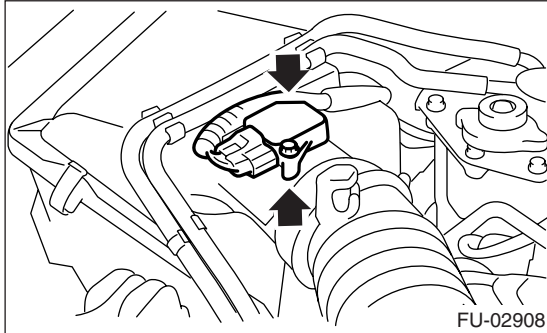


- 3) Install the intercooler. <Ref. to IN(STI)-11, INSTALLATION, Intercooler.>
- 4) Connect the battery ground cable to battery.

## 8. Mass Air Flow and Intake Air Temperature Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from mass air flow and intake air temperature sensor.
- 3) Remove the mass air flow and intake air temperature sensor.



### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**

**1.7 N·m (0.17 kgf-m, 1.3 ft-lb)**



# Manifold Absolute Pressure Sensor

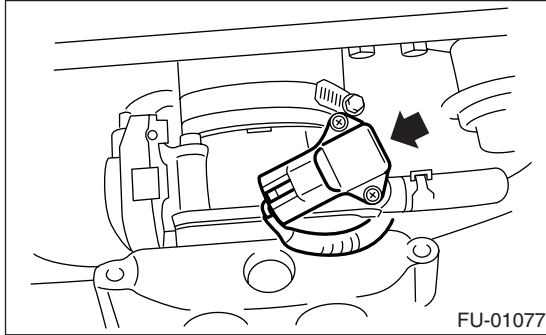
FUEL INJECTION (FUEL SYSTEMS)

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## 9. Manifold Absolute Pressure Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connectors from manifold absolute pressure sensor.



- 3) Remove the manifold absolute pressure sensor from the throttle body.

### B: INSTALLATION

Install in the reverse order of removal.

#### NOTE:

Replace the O-rings for the manifold absolute pressure sensor with new ones.

#### *Tightening torque:*

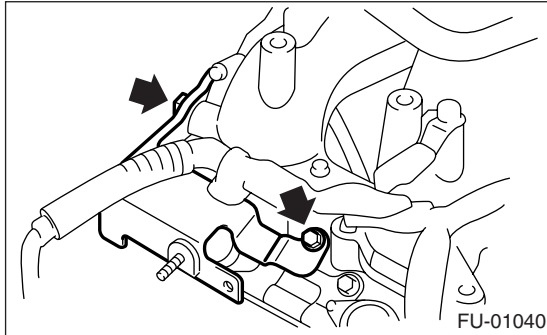
***1.6 N·m (0.16 kgf-m, 1.2 ft-lb)***

## 10. Fuel Injector

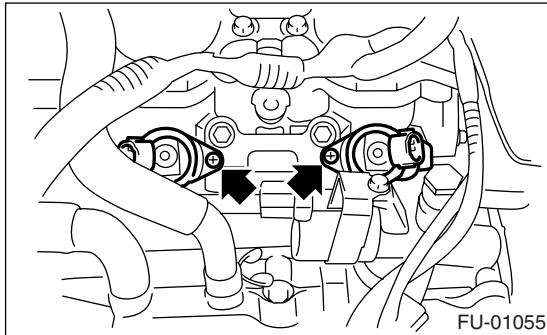
### A: REMOVAL

#### 1. RH SIDE

- 1) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Open the fuel filler flap lid and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.
- 4) Remove the fuel pipe protector RH.



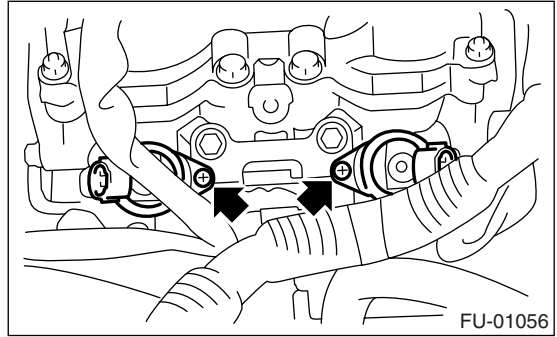
- 5) Disconnect the connector from the fuel injector.
- 6) Remove the screw and remove the fuel injector.



#### 2. LH SIDE

- 1) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Open the fuel filler flap lid and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.
- 4) Remove the intake manifold. <Ref. to FU(STI)-13, REMOVAL, Intake Manifold.>
- 5) Disconnect the connector from the fuel injector.

- 6) Remove the screw and remove the fuel injector.



### B: INSTALLATION

#### 1. RH SIDE

Install in the reverse order of removal.

NOTE:

Replace the O-rings with new ones.

#### 2. LH SIDE

Install in the reverse order of removal.

NOTE:

Replace the O-rings with new ones.

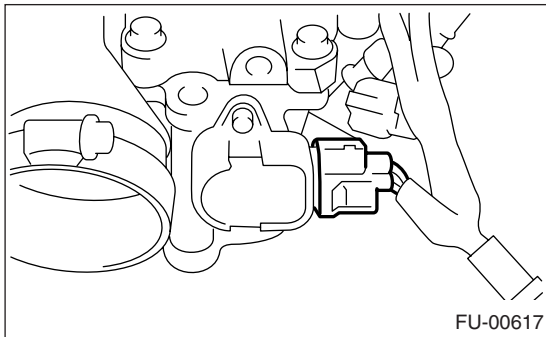
# Tumble Generator Valve Assembly

FUEL INJECTION (FUEL SYSTEMS)

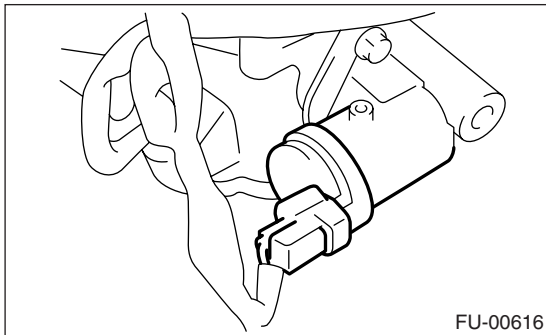
## 11. Tumble Generator Valve Assembly

### A: REMOVAL

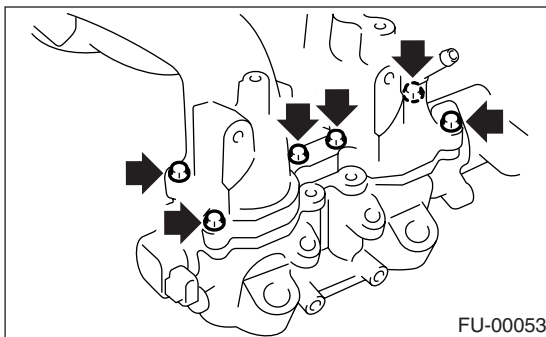
- 1) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Open the fuel filler flap lid and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.
- 4) Remove the intake manifold. <Ref. to FU(STI)-13, REMOVAL, Intake Manifold.>
- 5) Disconnect the connector from the tumble generator valve sensor.



- 6) Disconnect the connector from the tumble generator valve actuator.



- 7) Remove the fuel injector. <Ref. to FU(STI)-31, REMOVAL, Fuel Injector.>
- 8) Remove the tumble generator valve body from the intake manifold.



### B: INSTALLATION

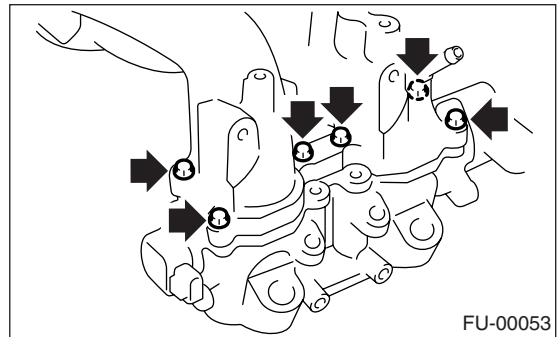
Install in the reverse order of removal.

NOTE:

Always use new gaskets.

**Tightening torque:**

**8.25 N·m (0.84 kgf-m, 6.1 ft-lb)**



### 12. Tumble Generator Valve Position Sensor

#### A: SPECIFICATION

Do not remove the tumble generator valve position sensor from tumble generator valve assembly, since it cannot be adjusted during installation.

Refer to "Tumble Generator Valve Assembly" for removal and installation procedures. <Ref. to FU(STI)-32, REMOVAL, Tumble Generator Valve Assembly.> <Ref. to FU(STI)-32, INSTALLATION, Tumble Generator Valve Assembly.>

# Tumble Generator Valve Actuator

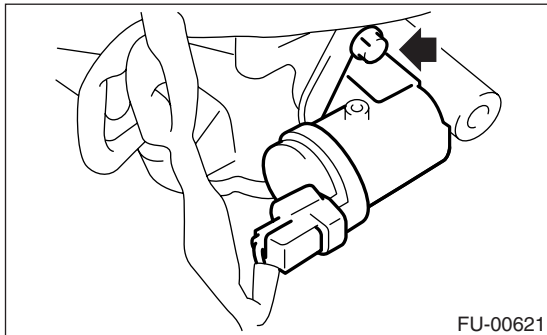
FUEL INJECTION (FUEL SYSTEMS)

## 13. Tumble Generator Valve Actuator

### A: REMOVAL

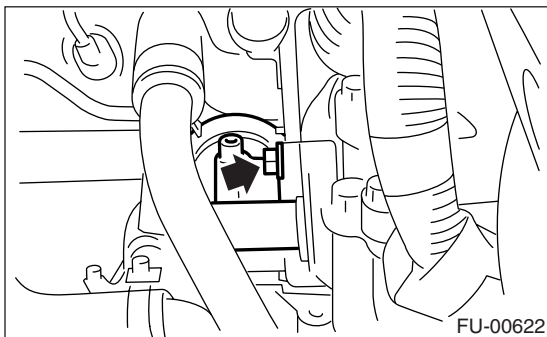
#### 1. RH SIDE

- 1) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Open the fuel filler flap lid and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.
- 4) Remove the intake manifold. <Ref. to FU(STI)-13, REMOVAL, Intake Manifold.>
- 5) Disconnect the connector from tumble generator valve actuator RH.
- 6) Remove the tumble generator valve actuator RH.



#### 2. LH SIDE

- 1) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Open the fuel filler flap lid and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.
- 4) Disconnect the connector from tumble generator valve actuator LH.
- 5) Remove the tumble generator valve actuator LH.



### B: INSTALLATION

#### 1. RH SIDE

Install in the reverse order of removal.

#### 2. LH SIDE

Install in the reverse order of removal.

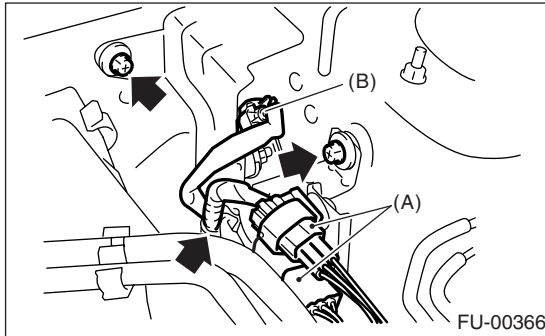
# Wastegate Control Solenoid Valve

FUEL INJECTION (FUEL SYSTEMS)

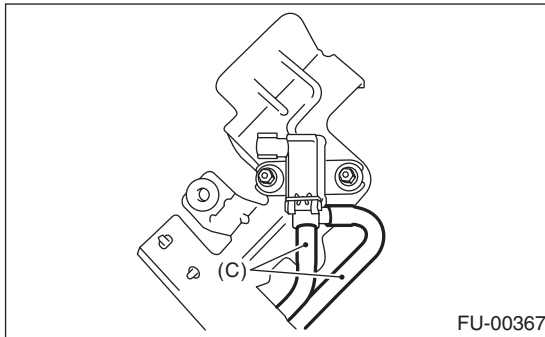
## 14. Wastegate Control Solenoid Valve

### A: REMOVAL

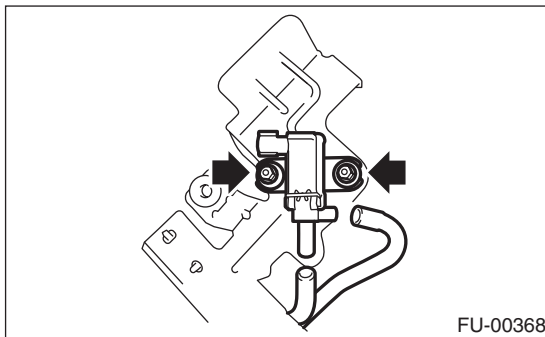
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the engine harness connector (A) from bracket.
- 3) Disconnect the connector (B) from wastegate control solenoid valve.
- 4) Remove the bracket from body.



- 5) Disconnect the pressure hoses (C) from wastegate control solenoid valve.



- 6) Remove the wastegate control solenoid valve from bracket.

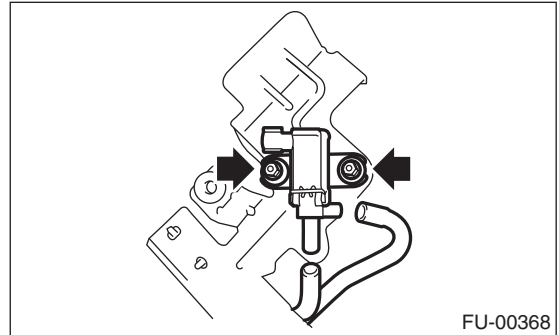


### B: INSTALLATION

Install in the reverse order of removal.

#### Tightening torque:

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



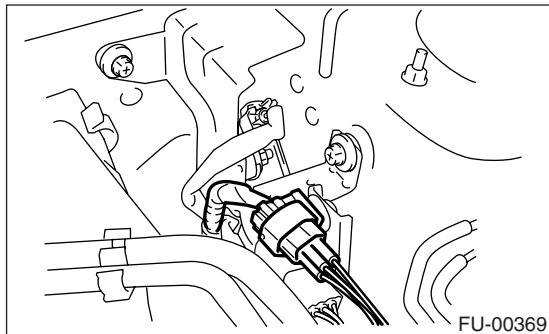
# Front Oxygen (A/F) Sensor

FUEL INJECTION (FUEL SYSTEMS)

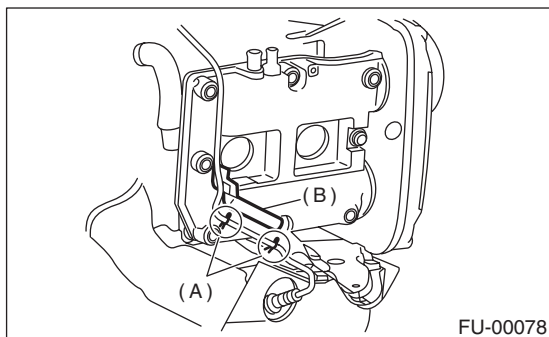
## 15. Front Oxygen (A/F) Sensor

### A: REMOVAL

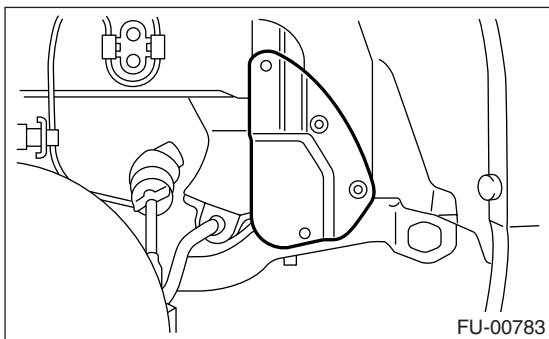
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from the front oxygen (A/F) sensor.



- 3) Disconnect the engine harness fixed by clip (A) from the bracket (B).



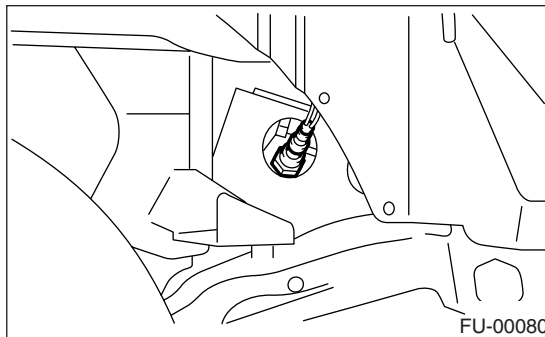
- 4) Remove the front right side wheel.
- 5) Lift-up the vehicle.
- 6) Remove the service hole cover.



- 7) Apply spray type lubricant to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.
- 8) Remove the front oxygen (A/F) sensor.

### CAUTION:

When removing the oxygen (A/F) sensor, wait until exhaust pipe cools; otherwise, it will damage exhaust pipe.



### B: INSTALLATION

- 1) Before installing front oxygen (A/F) sensor, apply anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make the next removal easier.

#### Anti-seize compound:

**NEVER-SEEZ NS-165 or equivalent**

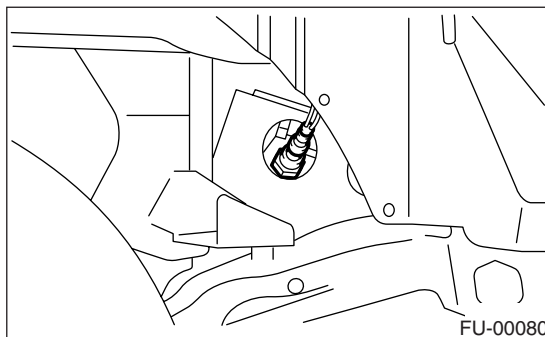
### CAUTION:

Never apply anti-seize compound to protector of front oxygen (A/F) sensor.

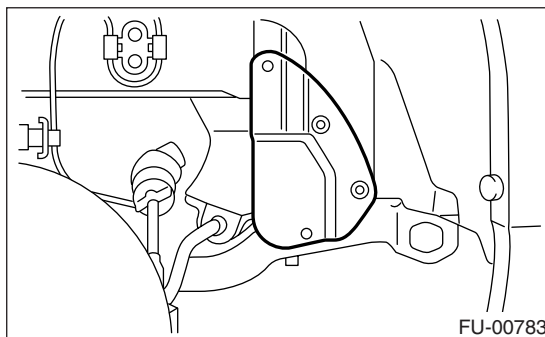
- 2) Install the front oxygen (A/F) sensor.

#### Tightening torque:

**30 N·m (3.1 kgf-m, 22.1 ft-lb)**



- 3) Install the service hole cover.

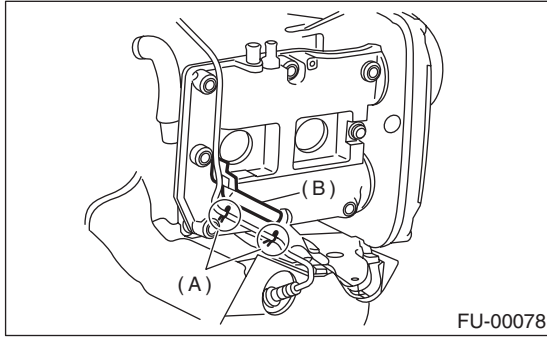


- 4) Lower the vehicle.
- 5) Install the front right side wheel.

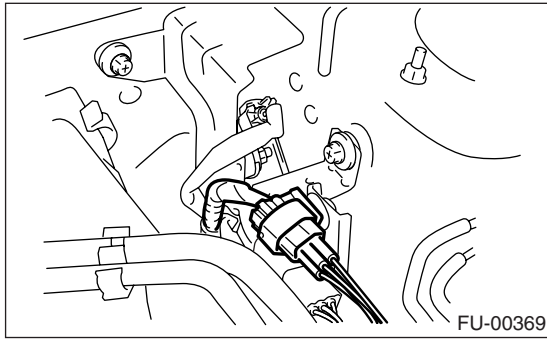
# Front Oxygen (A/F) Sensor

FUEL INJECTION (FUEL SYSTEMS)

6) Connect the engine harness to the bracket (B) using clips (A).



7) Connect the connector of front oxygen (A/F) sensor.



8) Connect the battery ground cable to battery.



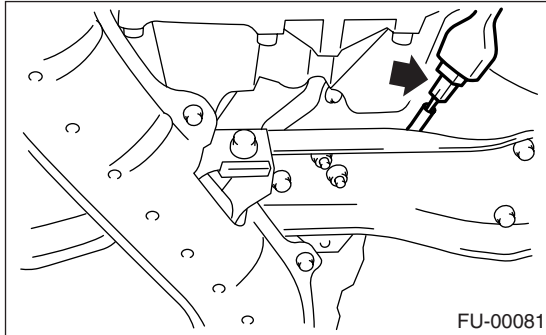
# Rear Oxygen Sensor

FUEL INJECTION (FUEL SYSTEMS)

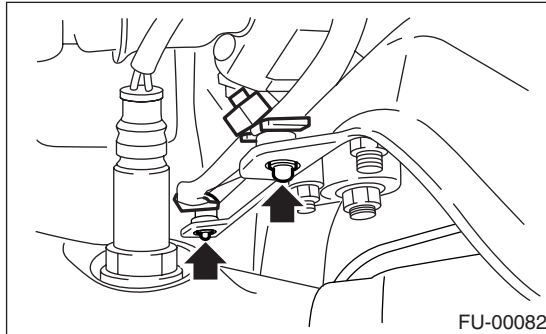
## 16. Rear Oxygen Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Disconnect the connector from the rear oxygen sensor.



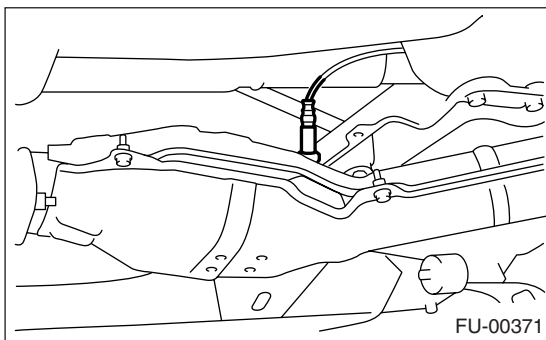
- 4) Remove the clip by pulling out from the upper side of crossmember.



- 5) Apply spray type lubricant to the threaded portion of rear oxygen sensor, and leave it for one minute or more.
- 6) Remove the rear oxygen sensor.

### CAUTION:

**When removing the rear oxygen sensor, wait until exhaust pipe cools; otherwise, it will damage exhaust pipe.**



### B: INSTALLATION

- 1) Before installing rear oxygen sensor, apply anti-seize compound only to the threaded portion of rear oxygen sensor to make the next removal easier.

### CAUTION:

**Never apply anti-seize compound to protector of rear oxygen sensor.**

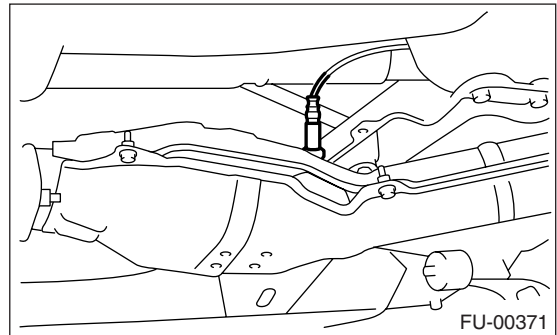
### Anti-seize compound:

**NEVER-SEEZ NS-165 or equivalent**

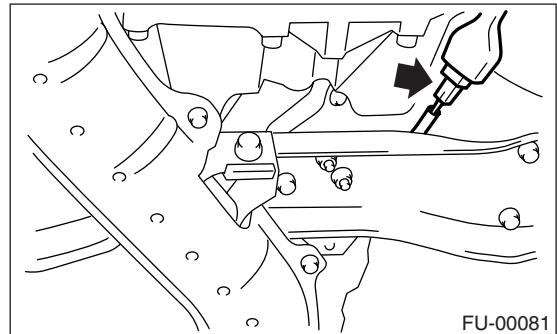
- 2) Install the rear oxygen sensor.

### Tightening torque:

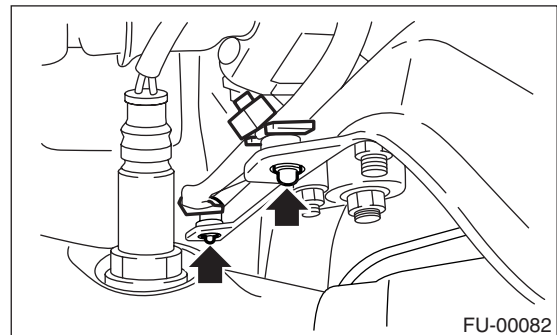
**21 N·m (2.1 kgf-m, 15.2 ft-lb)**



- 3) Connect the connector to the rear oxygen sensor.



- 4) Connect the clip to the crossmember.

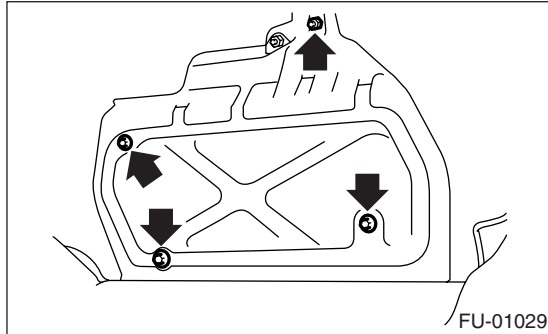


- 5) Lower the vehicle.
- 6) Connect the battery ground cable to battery.

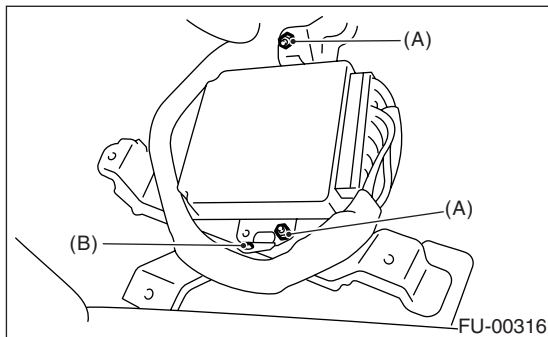
## 17.Engine Control Module (ECM)

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the lower inner trim of the passenger side.  
<Ref. to EI-51, REMOVAL, Lower Inner Trim.>
- 3) Detach the floor mat of the front passenger seat.
- 4) Remove the protect cover.



- 5) Remove the nuts (A) which hold ECM to the bracket.
- 6) Remove the clip (B) from the bracket.



- 7) Disconnect the ECM connectors and take out the ECM.

### B: INSTALLATION

Install in the reverse order of removal.

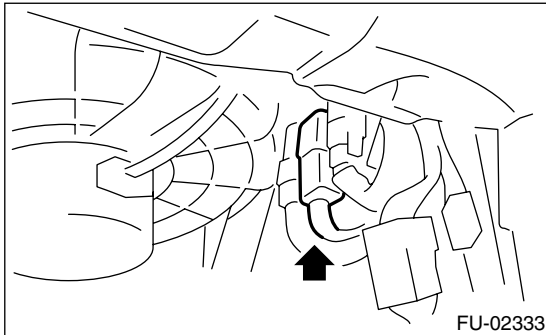
#### NOTE:

- When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage to the fuel injection system.
- When replacing ECM, be careful not to damage the harnesses and connectors.

## 18.Main Relay

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the passenger's side front side sill cover.
- 3) Remove the bolt which holds the relay bracket on the body.
- 4) Disconnect the connectors from the main relay.



- 5) Remove the main relay from the mounting bracket.

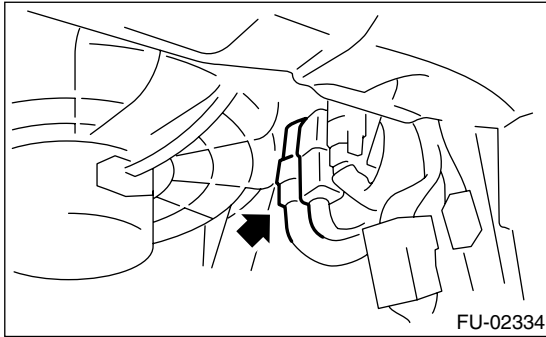
### B: INSTALLATION

Install in the reverse order of removal.

## 19. Fuel Pump Relay

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the passenger's side front side sill cover.
- 3) Remove the bolt which holds relay bracket on the body.
- 4) Disconnect the connector from the fuel pump relay.



- 5) Remove the fuel pump relay from the mounting bracket.

### B: INSTALLATION

Install in the reverse order of removal.

# Electronic Throttle Control Relay

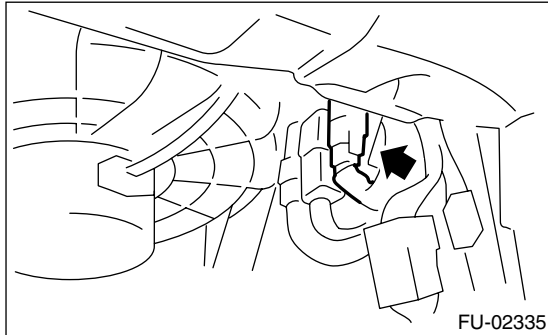
FUEL INJECTION (FUEL SYSTEMS)

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## 20. Electronic Throttle Control Relay

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the passenger's side front side sill cover.
- 3) Remove the bolt which holds relay bracket on the body.
- 4) Disconnect the connector from electronic throttle control relay.



- 5) Remove the electronic throttle control relay from the mounting bracket.

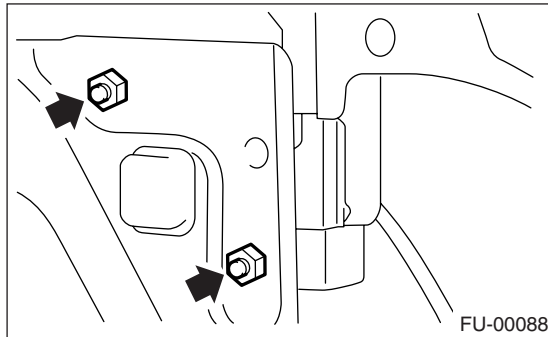
### B: INSTALLATION

Install in the reverse order of removal.

## 21. Fuel Pump Control Unit

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the rear quarter trim. <Ref. to EI-52, REMOVAL, Rear Quarter Trim.>
- 3) Disconnect the connector from the fuel pump control unit.
- 4) Remove the fuel pump control unit.



### B: INSTALLATION

Install in the reverse order of removal.

### 22. Fuel

#### A: PROCEDURE

##### 1. RELEASING OF FUEL PRESSURE

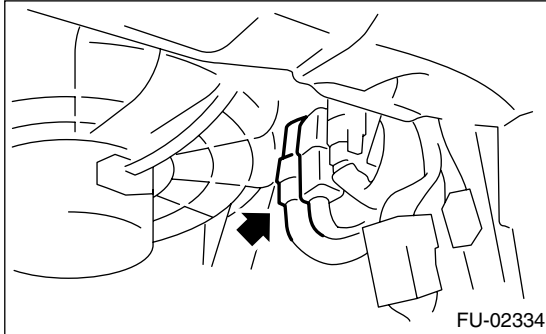
**WARNING:**

Place “NO FIRE” signs near the working area.

**CAUTION:**

Be careful not to spill the fuel.

- 1) Disconnect the connector from the fuel pump relay.



- 2) Start and run the engine until it stalls.
- 3) After the engine stalls, crank it for five more seconds.
- 4) Turn the ignition switch to OFF.

##### 2. DRAINING FUEL

• Model with fuel drain plug

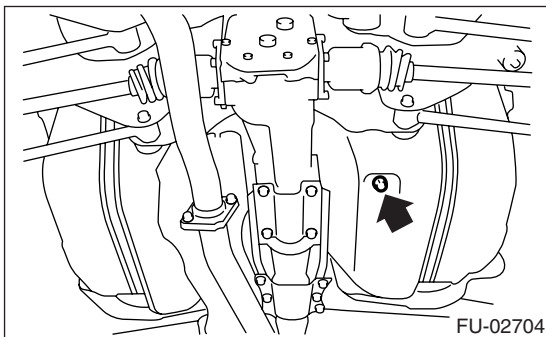
**WARNING:**

Place “NO FIRE” signs near the working area.

**CAUTION:**

Be careful not to spill the fuel.

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Open the fuel filler flap lid, and remove the fuel filler cap.
- 4) Lift-up the vehicle.
- 5) Set a container under the vehicle, and remove drain plug from the fuel tank to drain fuel.



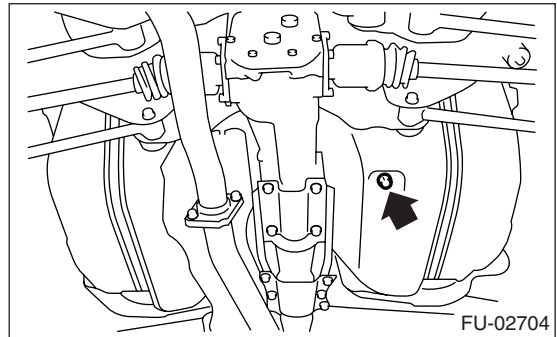
- 6) Tighten the fuel drain plug.

**NOTE:**

Use a new gasket.

**Tightening torque:**

26 N·m (2.65 kgf-m, 19.2 ft-lb)



• Model without fuel drain plug

**WARNING:**

Place “NO FIRE” signs near the working area.

**CAUTION:**

Be careful not to spill the fuel.

- 1) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from battery.
- 3) Remove the fuel pump. <Ref. to FU(STI)-52, REMOVAL, Fuel Pump.>
- 4) Drain fuel from the fuel pump installing part using a pump etc.

**CAUTION:**

Use a pump resistant to gasoline.

- 5) Install the fuel pump. <Ref. to FU(STI)-52, INSTALLATION, Fuel Pump.>

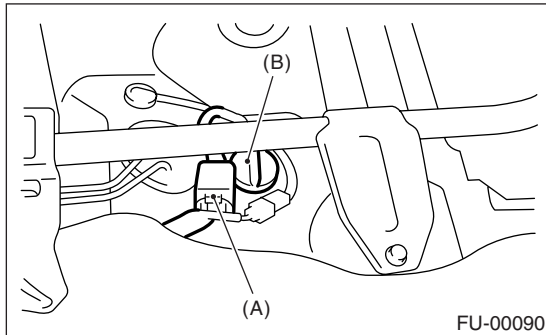
## 23. Fuel Tank

### A: REMOVAL

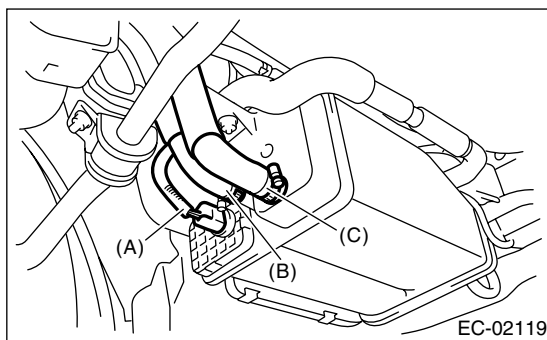
**WARNING:**

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 3) Drain the fuel from the fuel tank. <Ref. to FU(STI)-44, DRAINING FUEL, PROCEDURE, Fuel.>
- 4) Remove the rear seat.
- 5) Disconnect the connector (A) of rear harness from fuel tank cord.
- 6) Push the grommet (B) which holds the fuel tank cord on floor panel into the under side of body.

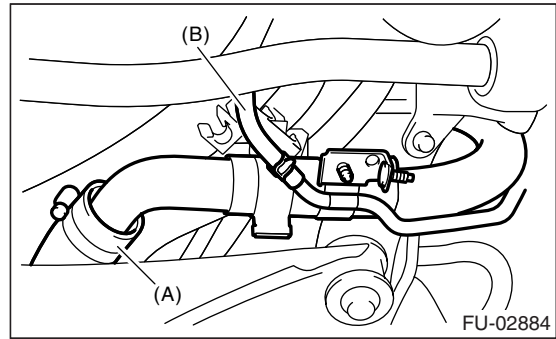


- 7) Remove the rear crossmember. <Ref. to RS-17, REMOVAL, Rear Crossmember.>
- 8) Disconnect connector (A) from drain valve.
- 9) Disconnect evaporation hoses (B) and (C) from canister.

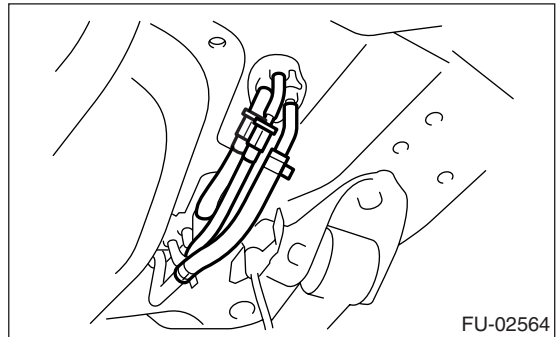


- 10) Disconnect the connector from the pressure control solenoid valve.
- 11) Loosen the clamp and disconnect the fuel filler hose (A) from fuel filler pipe.

- 12) Move the clip, and disconnect the evaporation hose (B).



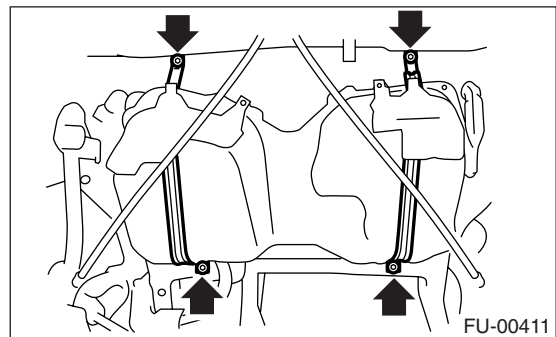
- 13) Move the clips, and disconnect the quick connector. <Ref. to FU(STI)-60, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
- 14) Disconnect the fuel hoses.



- 15) Support the fuel tank with transmission jack, remove the bolts from bands and dismount the fuel tank from vehicle.

**WARNING:**

- A helper is required to perform this work.
- Fuel may be left in the side, which has no drain plug, of the fuel tank. In this case, the tank is imbalanced between right and left sides. Be careful not to drop it when removing.



### B: INSTALLATION

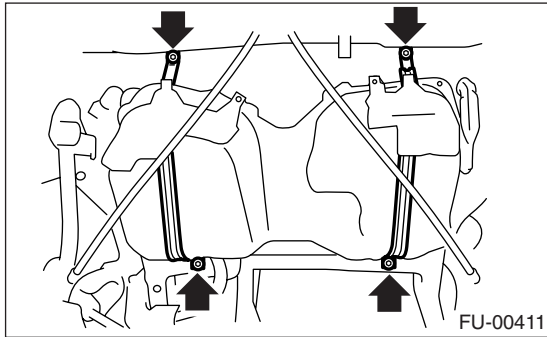
- 1) Support the fuel tank with transmission jack and push the fuel tank harness into the access hole with grommet.
- 2) Set the fuel tank and temporarily tighten the bolts of fuel tank bands.



# Fuel Tank

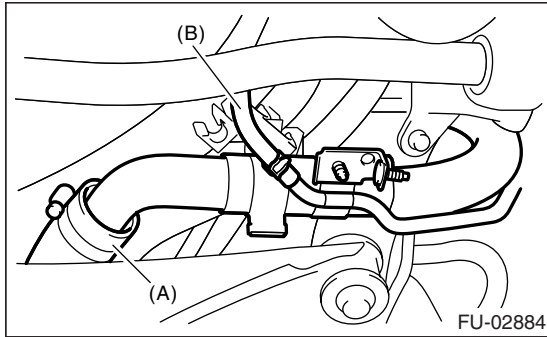
## FUEL INJECTION (FUEL SYSTEMS)

**WARNING:**  
A helper is required to perform this work.

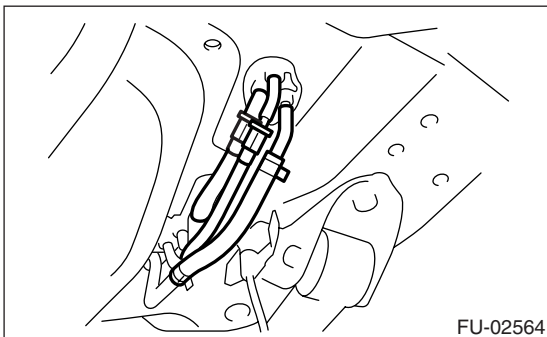


3) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

**CAUTION:**  
Do not allow clips to touch air vent hose (B) and rear suspension crossmember.

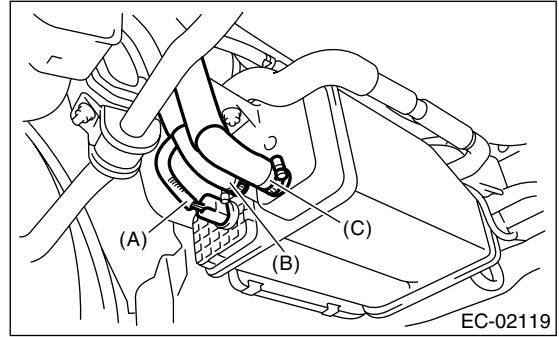


4) Connect the fuel hoses, and hold them with clips and quick connector. <Ref. to FU(STI)-61, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



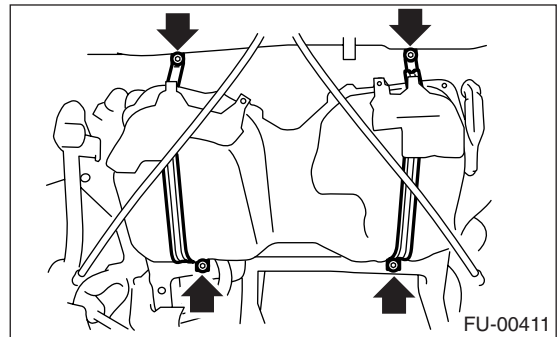
5) Connect the connector to the pressure control solenoid valve.  
6) Connect the evaporation hoses (B) and (C) to the canister, and hold them with clamps.

7) Connect the connector (A) to drain valve.



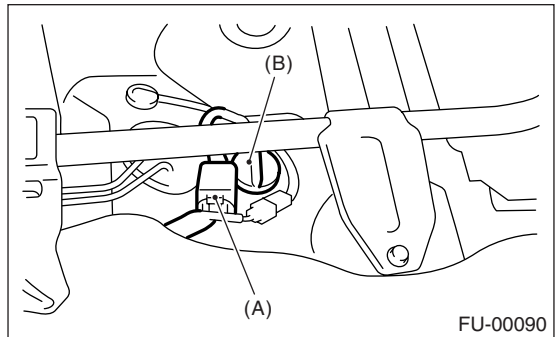
8) Tighten the band mounting bolts.

**Tightening torque:**  
**33 N·m (3.4 kgf-m, 25 ft-lb)**

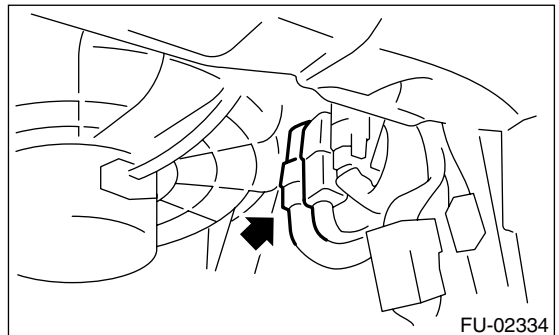


9) Install the rear crossmember. <Ref. to RS-17, INSTALLATION, Rear Crossmember.>

10) Connect the connector (A) to the fuel tank cord and plug the service hole with grommet (B).



11) Set the rear seat and floor mat.  
12) Connect the connector to the fuel pump relay.



## **C: INSPECTION**

- 1) Make sure there are no cracks, holes, or other damage on the fuel tank.
- 2) Make sure that the fuel hoses and fuel pipes are not cracked and the connections are tightened firmly.

# Fuel Filler Pipe

FUEL INJECTION (FUEL SYSTEMS)

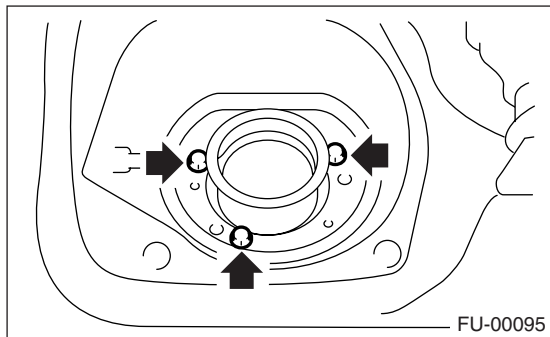
## 24. Fuel Filler Pipe

### A: REMOVAL

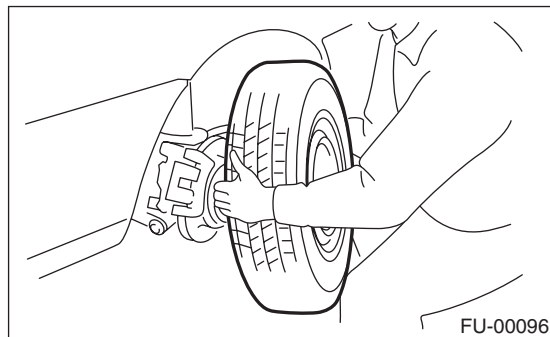
#### WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

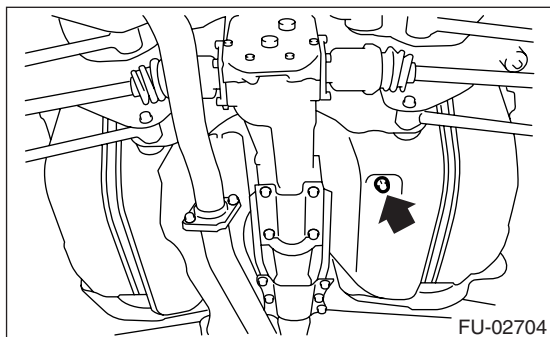
- 1) Set the vehicle on a lift.
- 2) Open the fuel filler flap lid and remove the filler cap.
- 3) Disconnect the ground cable from battery.
- 4) Remove the screws holding packing.



- 5) Loosen the rear right side wheel nuts.
- 6) Lift-up the vehicle.
- 7) Remove the rear right side wheel.



- 8) Set a container under the vehicle and remove the drain plug from fuel tank to drain fuel.



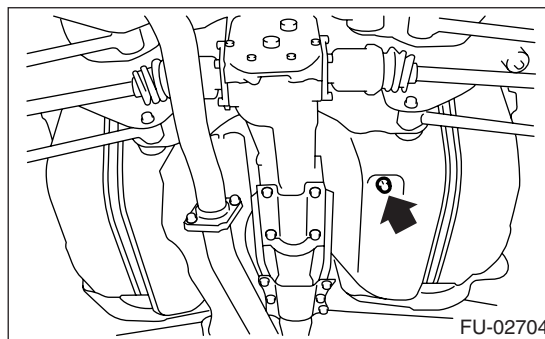
- 9) Tighten the fuel drain plug and then install the front right side tank cover.

#### NOTE:

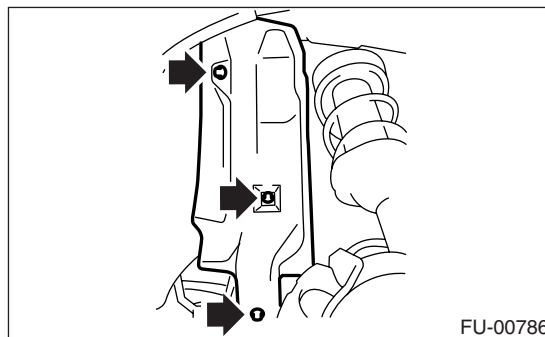
Use a new gasket.

#### Tightening torque:

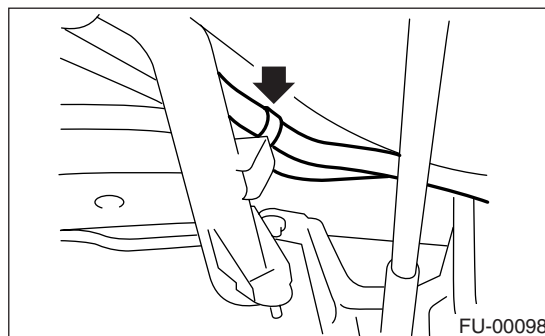
26 N·m (2.65 kgf·m, 19.2 ft·lb)



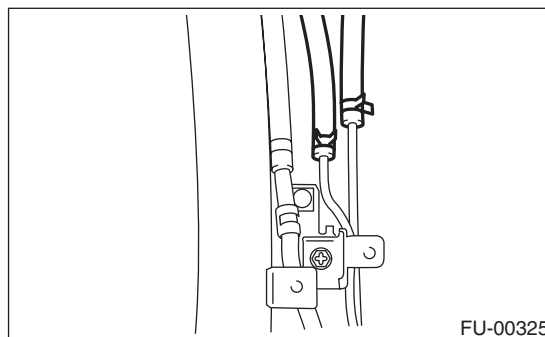
- 10) Remove the fuel filler pipe protector.



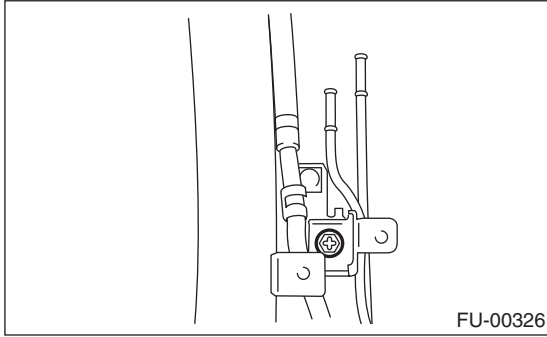
- 11) Separate the evaporation hoses from the clip of fuel filler pipe.



- 12) Disconnect the evaporation hoses from the pipes.

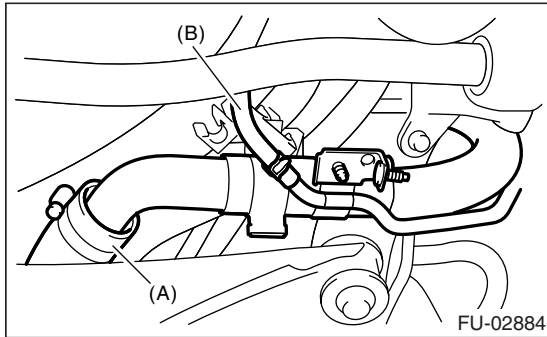


- 13) Remove the bolts which hold fuel filler pipe bracket on the body.



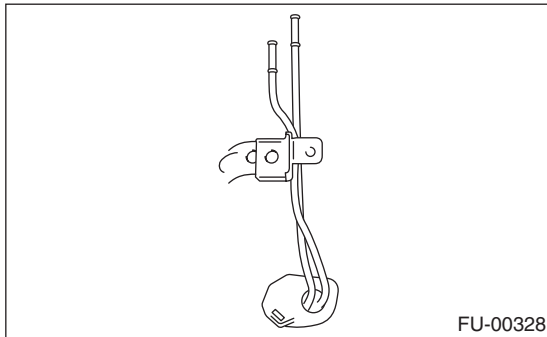
- 14) Loosen the clamp, and disconnect the fuel filler hose (A) from fuel filler pipe.

- 15) Move the clip, and disconnect the evaporation hose (B).



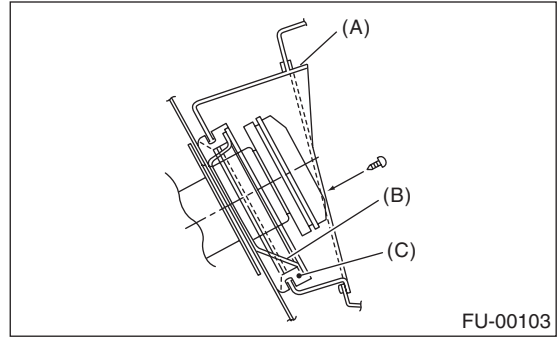
- 16) Remove the fuel filler pipe to the underside of vehicle.

- 17) Remove the air vent pipe together with clip from the body.



### B: INSTALLATION

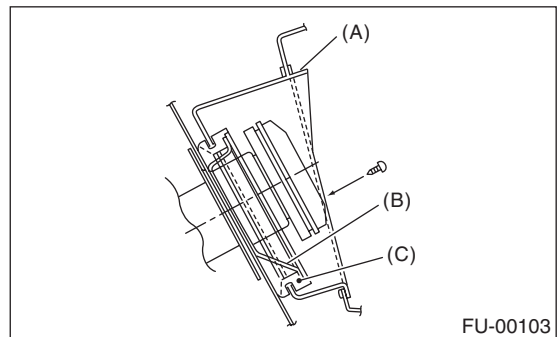
- 1) Open the fuel filler flap lid.  
2) Set the fuel saucer (A) with rubber packing (C), and then insert the fuel filler pipe into the hole from the inside of apron.



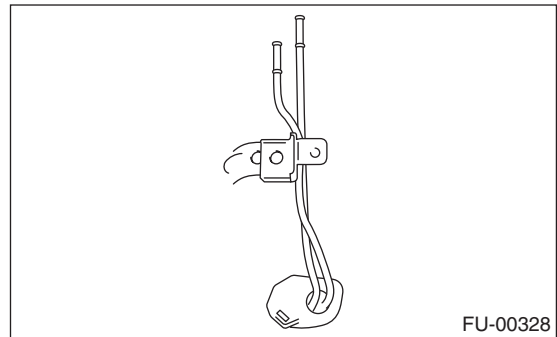
- 3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the screws.

#### NOTE:

If the edges of rubber packing are folded toward the inside, straighten them with a flat-tip screwdriver.



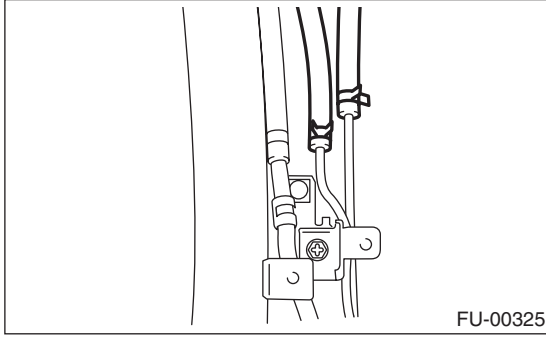
- 4) Install the evaporation pipes.



# Fuel Filler Pipe

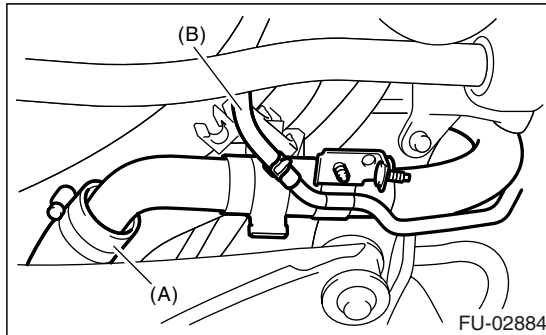
## FUEL INJECTION (FUEL SYSTEMS)

5) Connect the evaporation hose to pipes.



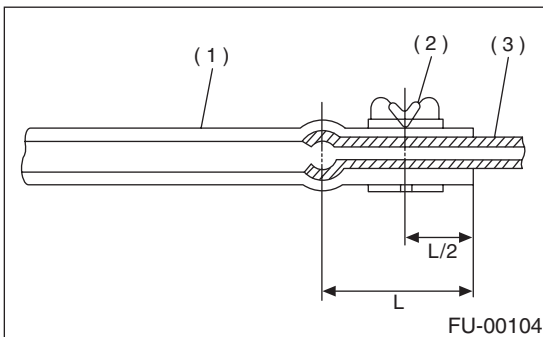
6) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe, and then tighten the clamp.

**CAUTION:**  
Do not allow clips to touch air vent hose (B) and rear suspension crossmember.



7) Insert the air vent hose approx. 25 to 30 mm (0.98 to 1.18 in) into the lower end of air vent pipe, and then hold the clip.

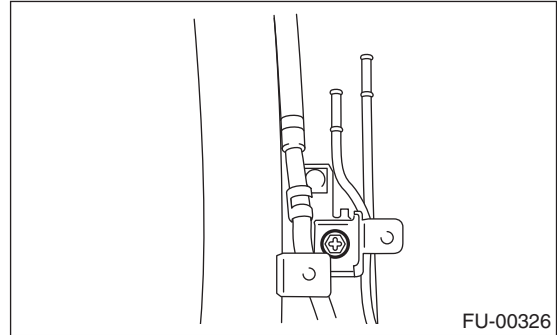
$L = 27.5 \pm 2.5 \text{ mm (1.083 \pm 0.098 in)}$



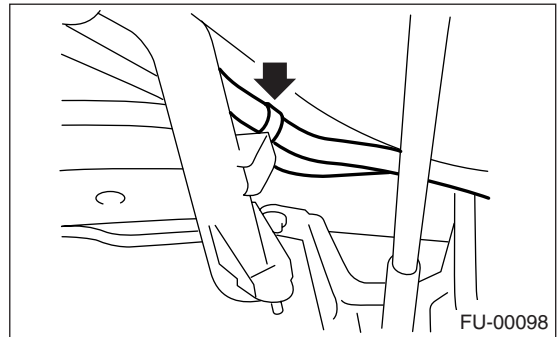
- (1) Hose
- (2) Clip or clamp
- (3) Pipe

8) Tighten the bolt which holds fuel filler pipe bracket on the body.

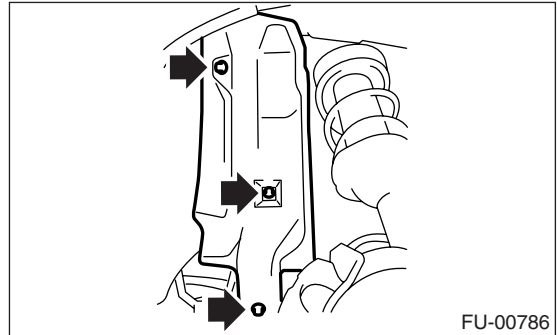
**Tightening torque:**  
 $7.5 \text{ N}\cdot\text{m (0.76 kgf}\cdot\text{m, 5.5 ft}\cdot\text{lb)}$



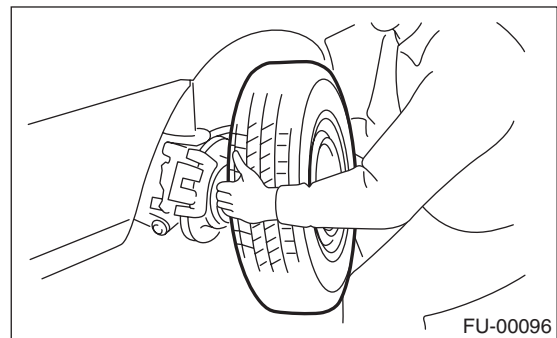
9) Tighten the bolts which hold evaporation hoses onto the clip of fuel filler pipe.



10) Install the fuel filler pipe protector.



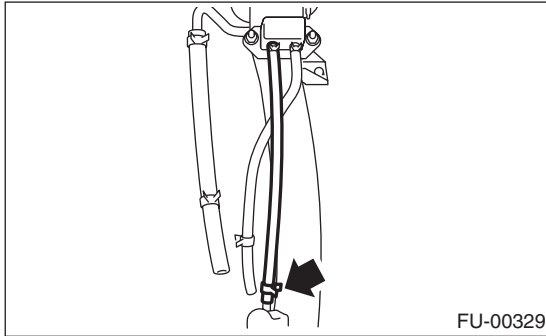
11) Install the rear right wheel.



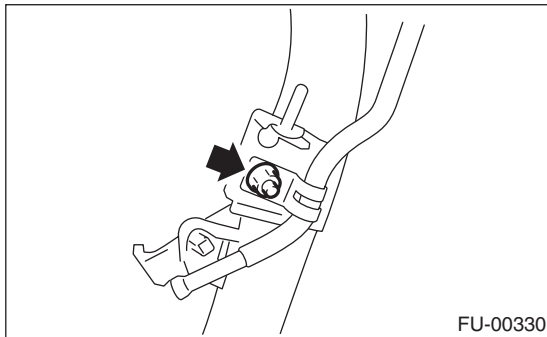
- 12) Lower the vehicle.
- 13) Tighten the wheel nuts.
- 14) Connect the battery ground cable to battery.

### C: DISASSEMBLY

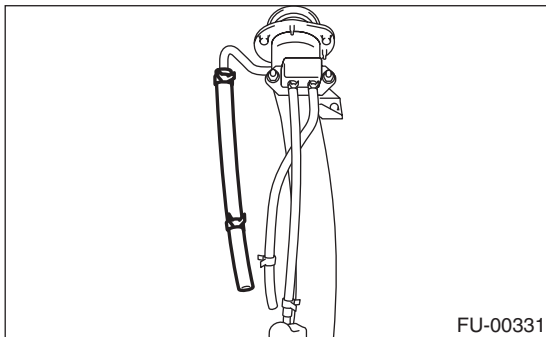
1) Move the clip, and disconnect the evaporation hose from joint pipe.



2) Remove the bolt which installs the joint pipe on fuel filler pipe.



3) Disconnect the evaporation hose from the fuel filler pipe.

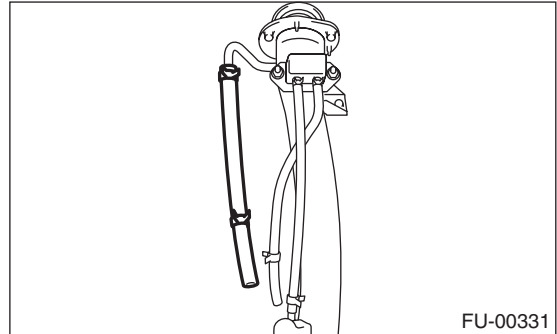


4) Remove the shut valve from the fuel filler pipe. <Ref. to EC(STI)-15, REMOVAL, Shut Valve.>

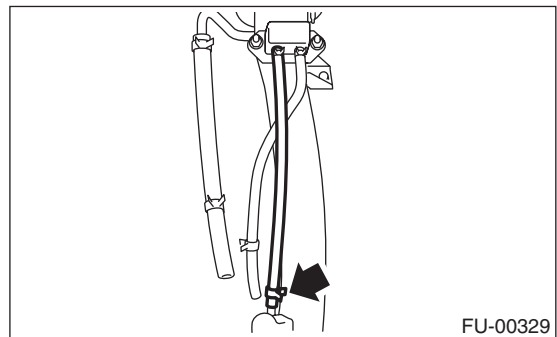
### D: ASSEMBLY

1) Install the shut valve on the fuel filler pipe. <Ref. to EC(STI)-15, INSPECTION, Shut Valve.>

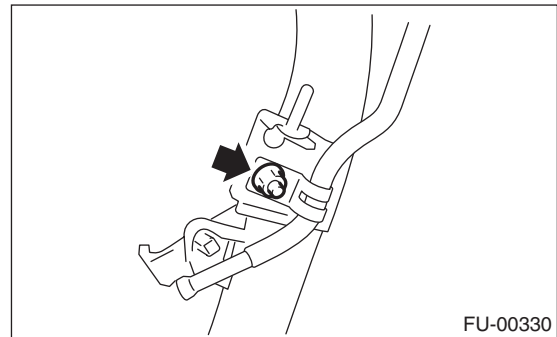
2) Connect the evaporation hose to the fuel filler pipe.



3) Connect the evaporation hose to the evaporation pipe.



4) Install the evaporation pipe to the fuel filler pipe.



# Fuel Pump

FUEL INJECTION (FUEL SYSTEMS)

## 25. Fuel Pump

### A: REMOVAL

#### WARNING:

Place "NO FIRE" signs near the working area.

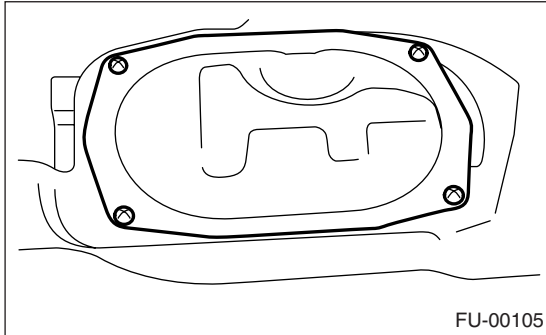
#### CAUTION:

Be careful not to spill the fuel.

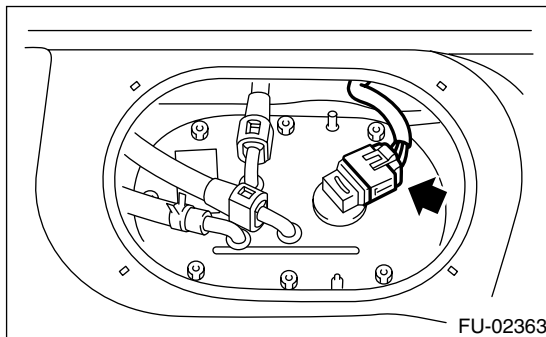
#### NOTE:

Fuel pump assembly consists of fuel pump and fuel level sensor.

- 1) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Open the fuel filler flap lid and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.
- 4) Remove the luggage floor mat. <Ref. to EI-61, REMOVAL, Luggage Floor Mat.>
- 5) Remove the service hole cover.

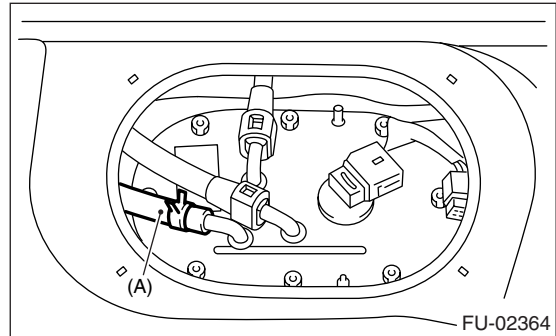


- 6) Disconnect the connector from the fuel pump.

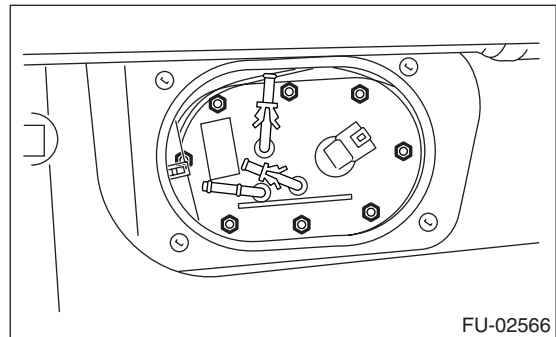


- 7) Disconnect the quick connector and then disconnect the fuel delivery hose and return hose. <Ref. to FU(STI)-60, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

- 8) Move the clips, and then disconnect the jet pump hose (A).



- 9) Remove the nuts which install the fuel pump assembly onto fuel tank.



- 10) Take off the fuel pump assembly from the fuel tank.

### B: INSTALLATION

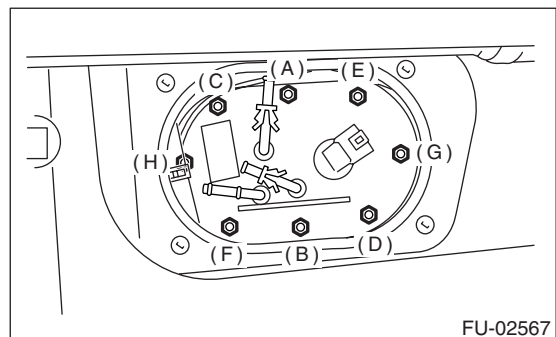
Carefully following the steps below, install in the reverse order of removal.

#### NOTE:

- Replace the gasket and retainer with new ones.
- Ensure the sealing portion is free from fuel or foreign particles before installation.
- Tighten the nuts to the specified torque in alphabetical sequence as shown in the figure.

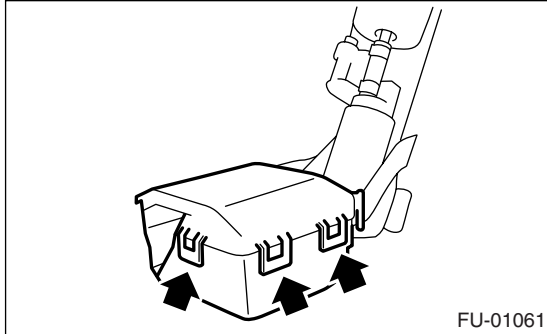
#### Tightening torque:

**4.4 N·m (0.45 kgf·m, 3.3 ft·lb)**

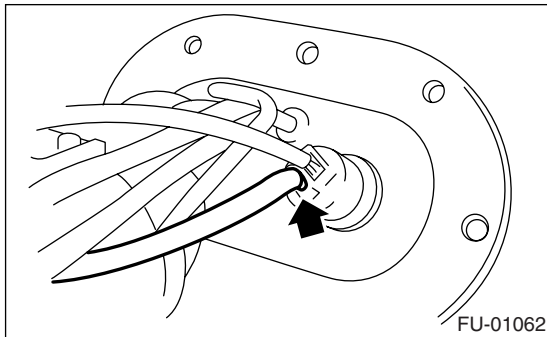


## C: DISASSEMBLY

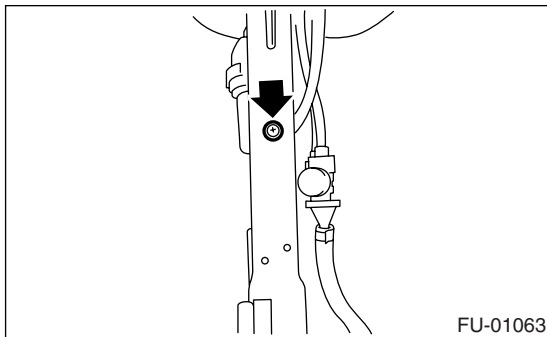
1) Separate the chamber into upper and lower parts, and then remove them.



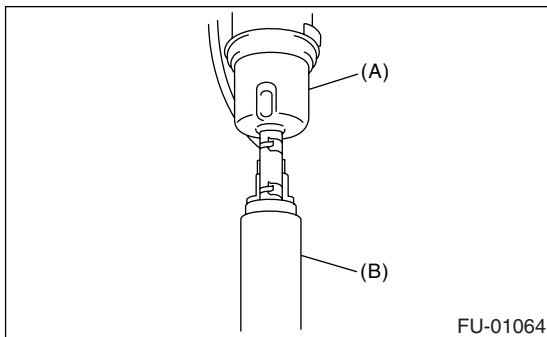
2) Disconnect the connector of fuel pump.



3) Remove the screw and remove the fuel pump and fuel filter.



4) Separate the fuel filter from fuel pump.



- (A) Fuel filter
- (B) Fuel pump

## D: ASSEMBLY

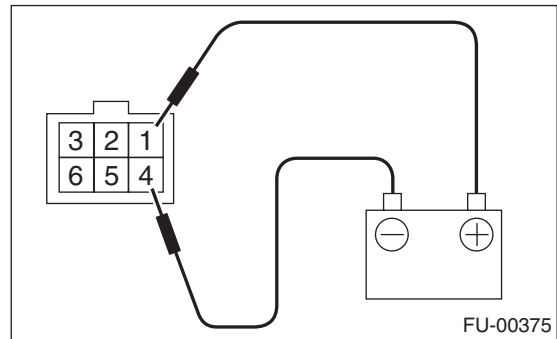
Assemble in the reverse order of disassembly.

## E: INSPECTION

Connect the lead harness to the connector terminal of fuel pump and apply battery power supply to check whether the pump operate.

### WARNING:

- Wipe off the fuel completely.
- Keep battery as far apart from fuel pump as possible.
- Be sure to turn the battery supply ON and OFF on the battery side.
- Do not run fuel pump for a long time under non-load condition.





### 26. Fuel Level Sensor

#### A: REMOVAL

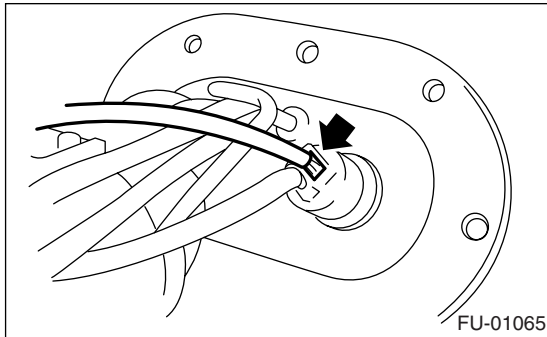
##### WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

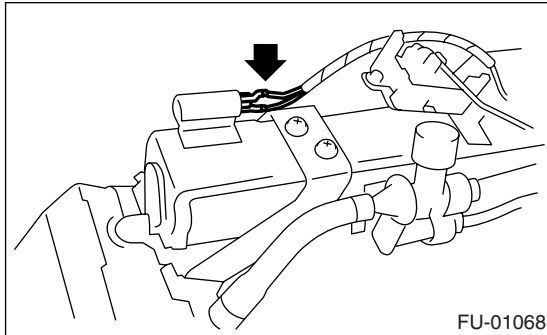
##### NOTE:

Fuel level sensor is built in fuel pump assembly.

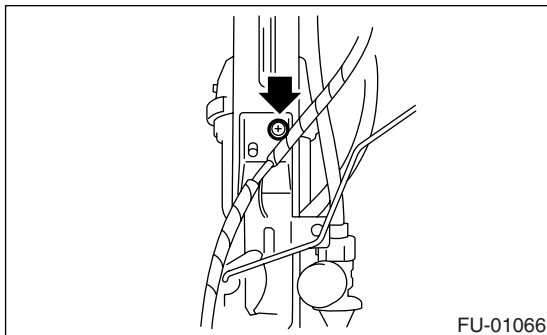
- 1) Remove the fuel pump assembly. <Ref. to FU(STI)-52, REMOVAL, Fuel Pump.>
- 2) Disconnect the connector from the fuel pump bracket.



- 3) Remove the fuel temperature sensor.



- 4) Remove the bolt which installs the fuel level sensor on mounting bracket.



#### B: INSTALLATION

Install in the reverse order of removal.

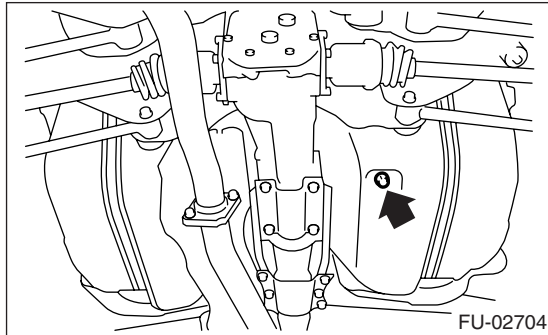
## 27. Fuel Sub Level Sensor

### A: REMOVAL

#### WARNING:

- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.
- Reduce the fuel on the fuel tank to less than 3/4 beforehand. Be careful that fuel may spill when the fuel is more than 3/4.

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Set a container under the vehicle and remove the drain plug from fuel tank to drain fuel.



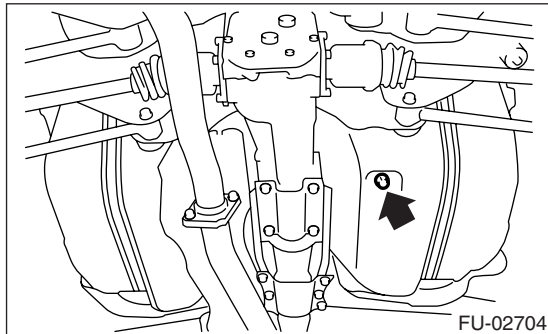
- 4) Tighten the fuel drain plug.

#### NOTE:

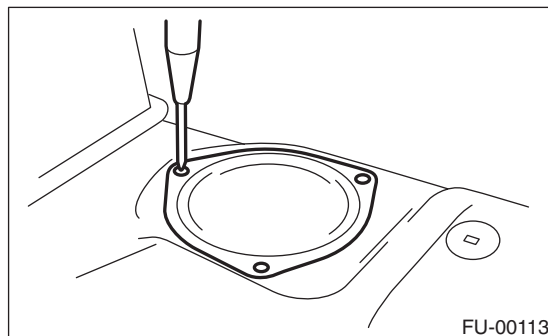
Use a new gasket.

#### Tightening torque:

**26 N·m (2.65 kgf·m, 19.2 ft·lb)**

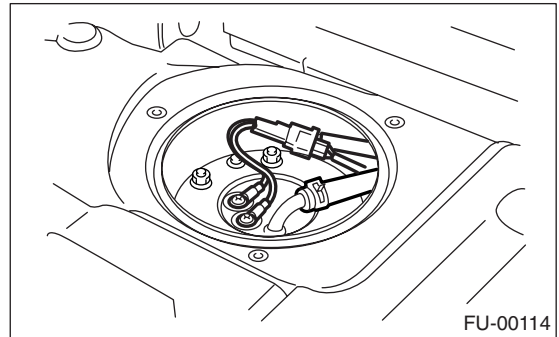


- 5) Remove the luggage floor mat. <Ref. to EI-61, REMOVAL, Luggage Floor Mat.>
- 6) Remove the service hole cover.

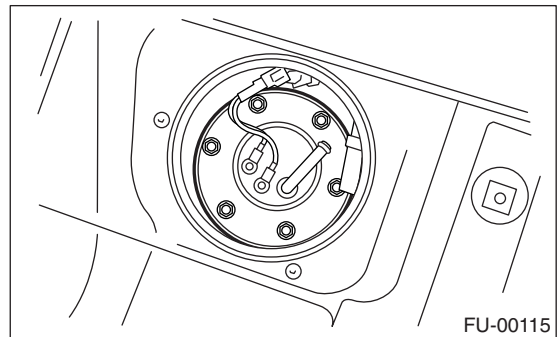


- 7) Disconnect the connector from the fuel sub level sensor.

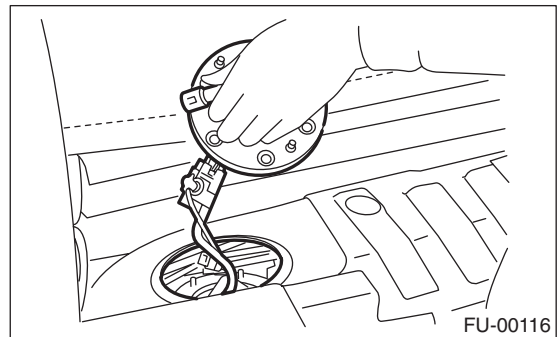
- 8) Disconnect the fuel jet pump hose.



- 9) Remove the bolts which install the fuel sub level sensor on fuel tank.



- 10) Remove the fuel sub level sensor.



## Fuel Sub Level Sensor

FUEL INJECTION (FUEL SYSTEMS)

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### **B: INSTALLATION**

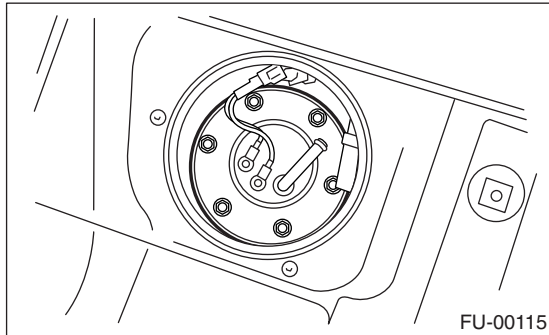
Install in the reverse order of removal.

NOTE:

- Use a new gasket.
- Ensure the sealing portion is free from fuel or foreign particles before installation.

***Tightening torque:***

***4.4 N·m (0.45 kgf-m, 3.3 ft-lb)***



## 28. Fuel Filter

### A: REMOVAL

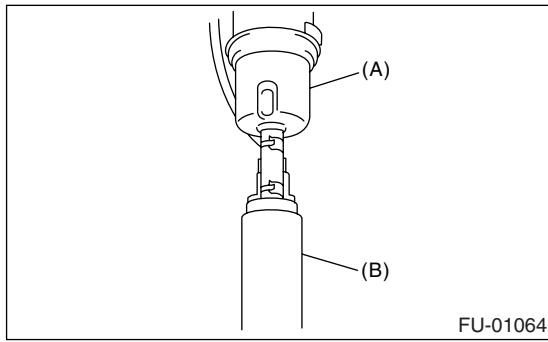
**WARNING:**

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

**NOTE:**

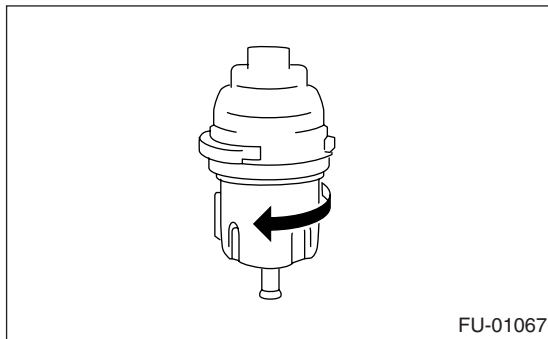
Fuel filter is built into the fuel pump assembly.

- 1) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Remove the fuel pump assembly. <Ref. to FU(STI)-52, REMOVAL, Fuel Pump.>
- 3) Remove the fuel pump. <Ref. to FU(STI)-53, DISASSEMBLY, Fuel Pump.>
- 4) Separate the fuel filter from fuel pump.



- (A) Fuel filter  
(B) Fuel pump

- 5) Turn the filter holder around to the arrow direction, and then remove the filter.



### B: INSTALLATION

**CAUTION:**

- If fuel hoses are damaged at the connecting portion, replace them with new ones.
- If clamps are badly damaged, replace them with new ones.

Install in the reverse order of removal.

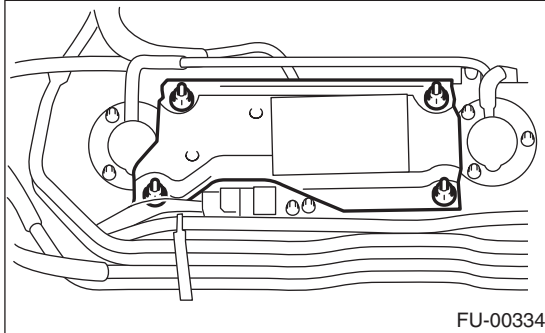
### C: INSPECTION

- 1) Check the inside of fuel filter for dirt and water sediment.
- 2) If it is clogged, or if replacement interval has been reached, replace it.

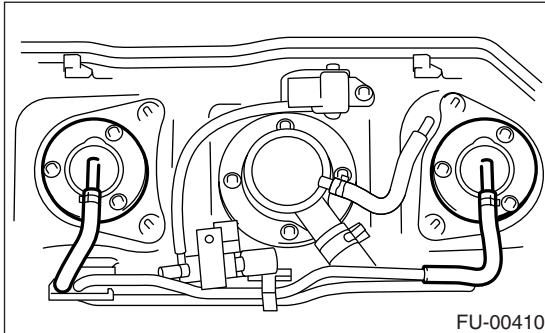
## 29. Fuel Cut Valve

### A: REMOVAL

- 1) Remove the fuel tank. <Ref. to FU(STI)-45, REMOVAL, Fuel Tank.>
- 2) Remove the protect cover.



- 3) Move the clip and disconnect the evaporation hose from fuel cut valve.



- 4) Remove the bolts which install the fuel cut valve.

### B: INSTALLATION

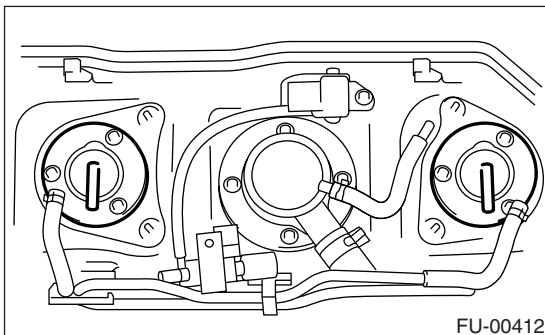
Install in the reverse order of removal.

NOTE:

Use a new gasket.

**Tightening torque:**

**4.4 N·m (0.45 kgf-m, 3.3 ft-lb)**



## 30. Fuel Damper Valve

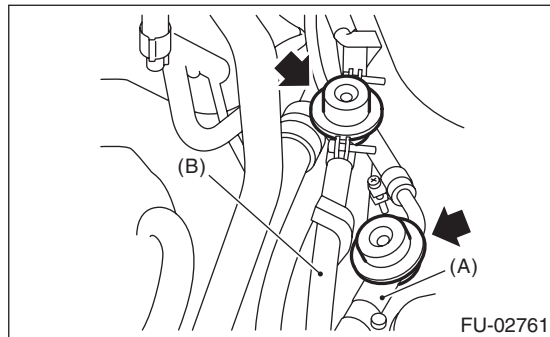
### A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Remove the fuel damper valve from the fuel delivery line (A) and fuel return line (B).

### WARNING:

- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.



### B: INSTALLATION

Install in the reverse order of removal.

### *Tightening torque:*

***1.25 N·m (0.13 kgf-m, 0.94 ft-lb)***

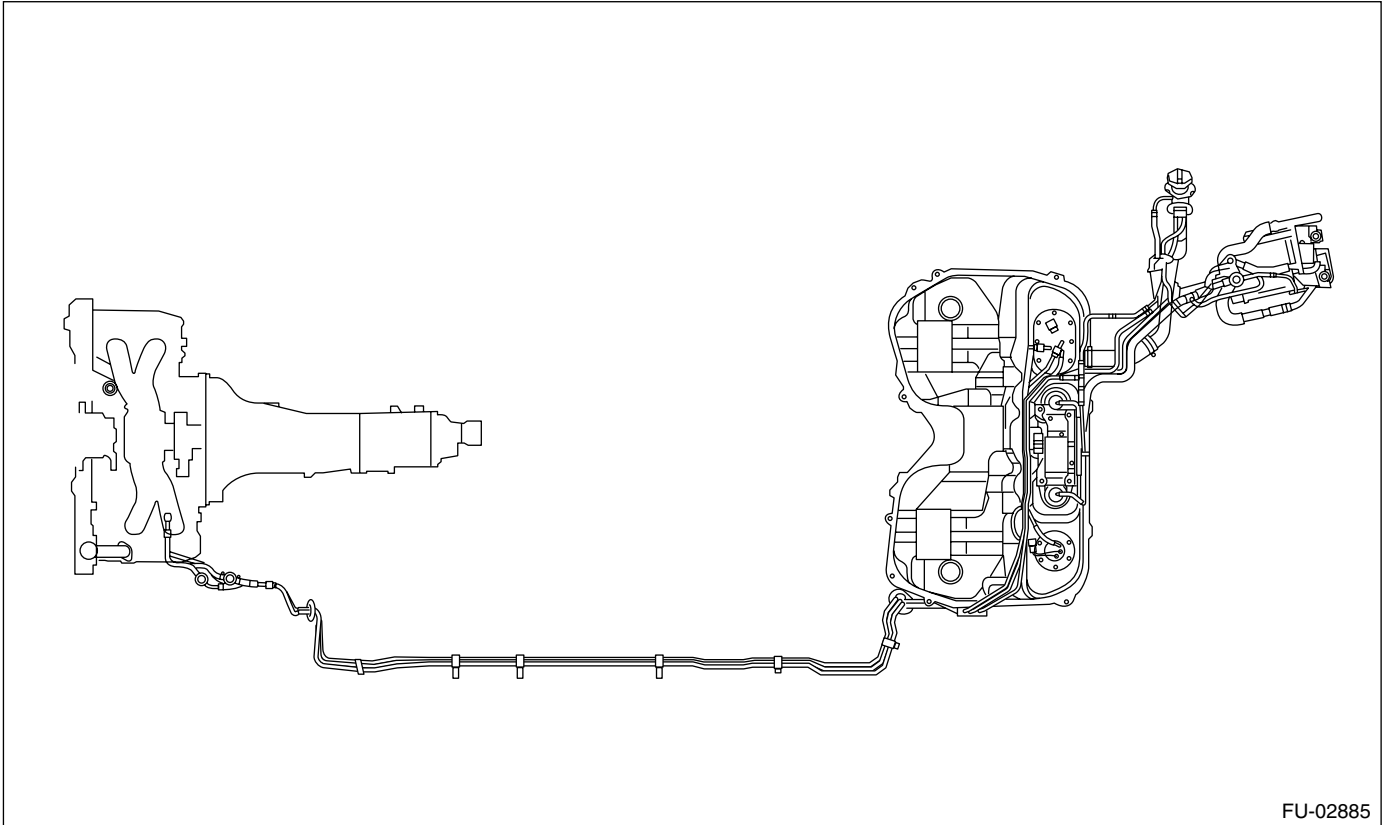
# Fuel Delivery, Return and Evaporation Lines

FUEL INJECTION (FUEL SYSTEMS)

## 31. Fuel Delivery, Return and Evaporation Lines

### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Remove the floor mat. <Ref. to EI-60, REMOVAL, Floor Mat.>
- 5) Disconnect the fuel delivery pipes and hoses, and disconnect the fuel return pipes and hoses, evaporation pipes and hoses.



FU-02885

6) In engine compartment, detach the fuel delivery hoses, return hoses and evaporation hose.

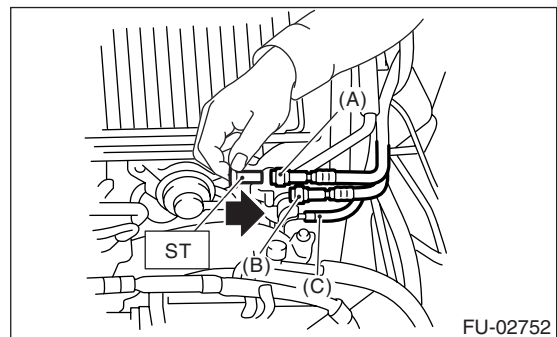
- (1) Separate the quick connectors of fuel delivery line and return line by pushing the ST to the direction of arrow.

ST 42099AE000 CONNECTOR REMOVER

- (2) Remove the clip, and separate the evaporation hose from pipe.

#### WARNING:

- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.



FU-02752

- (A) Fuel delivery hose
- (B) Return hose
- (C) Evaporation hose

7) Lift-up the vehicle.

FU(STI)-60

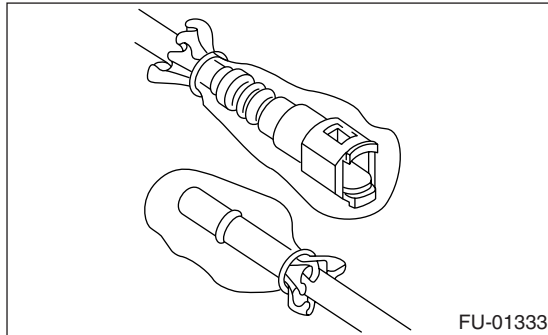
# Fuel Delivery, Return and Evaporation Lines

FUEL INJECTION (FUEL SYSTEMS)

8) Disconnect the quick connector on the fuel delivery line.

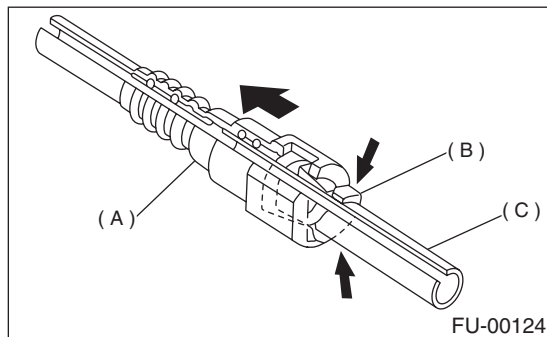
(1) Clean the pipe and connector, if they are covered with dust.

(2) To prevent from damaging or entering foreign matter, wrap the pipes and connectors with plastic bag, etc.



(3) Hold the connector (A) and push retainer (B) down.

(4) Pull out the connector (A) from retainer (B).



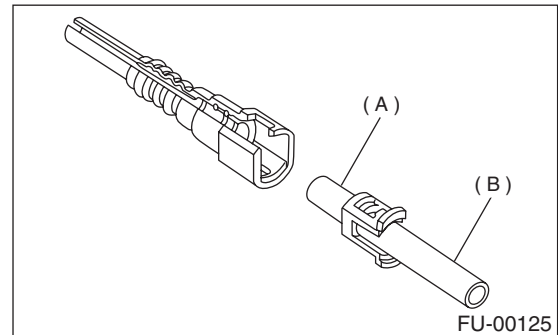
- (A) Connector
- (B) Retainer
- (C) Pipe

## B: INSTALLATION

1) Connect the quick connector on the fuel line.

### CAUTION:

- Always use a new retainer.
- Make sure that the connected portion is not damaged or has no dust. If necessary, clean seal surface of pipe.



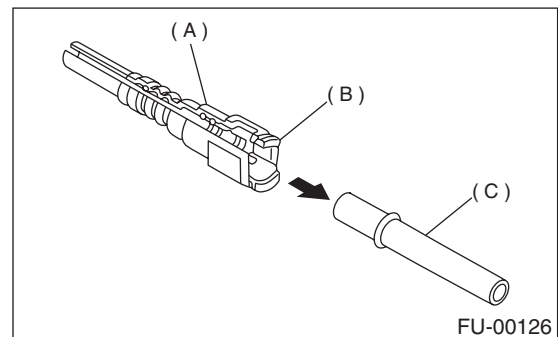
- (A) Seal surface
- (B) Pipe

(1) Set a new retainer (B) to connector (A).

(2) Push the pipe into the connector completely.

### NOTE:

At this time, two clicking sounds are heard.



- (A) Connector
- (B) Retainer
- (C) Pipe

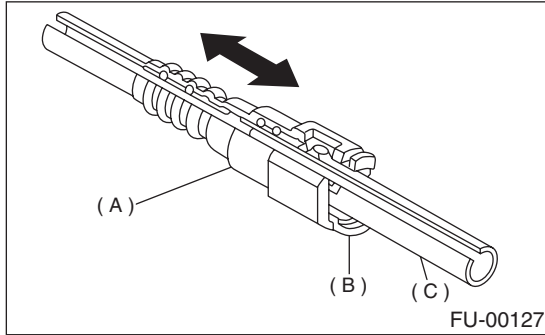


# Fuel Delivery, Return and Evaporation Lines

## FUEL INJECTION (FUEL SYSTEMS)

### CAUTION:

- Pull the connector to ensure it is connected securely.
- Ensure the two retainer pawls are engaged in their mating positions in the connector.
- Be sure to inspect hoses and their connections for any leakage of fuel.



- (A) Connector
- (B) Retainer
- (C) Pipe

2) Connect the fuel delivery hose and return hose by inserting them into the pipe for 20 to 25 mm (0.79 to 0.98 in) in length.

Type A: When the fitting length is specified.

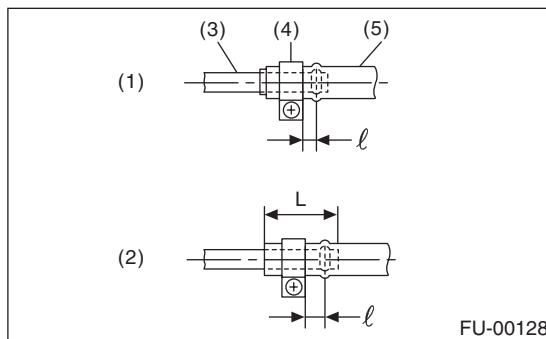
Type B: When the fitting length is not specified.

$$\varnothing : 2.5 \pm 1.5 \text{ mm } (0.098 \pm 0.059 \text{ in})$$

$$L : 22.5 \pm 2.5 \text{ mm } (0.886 \pm 0.098 \text{ in})$$

### CAUTION:

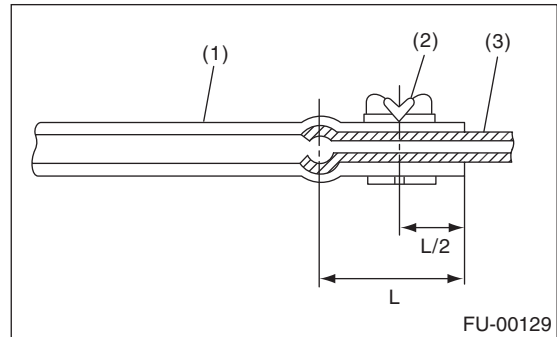
Be sure to inspect hoses and their connections for any leakage of fuel.



- (1) Type A
- (2) Type B
- (3) Pipe
- (4) Clamp
- (5) Hose

3) Connect the evaporation hose by inserting it into the pipe for 15 to 20 mm (0.59 to 0.79 in) in length.

$$L = 17.5 \pm 2.5 \text{ mm } (0.689 \pm 0.098 \text{ in})$$



- (1) Hose
- (2) Clip
- (3) Pipe

### C: INSPECTION

1) Make sure there are no cracks on the fuel pipes and fuel hoses.

2) Make sure the fuel pipe and fuel hose connections are tightened firmly.

# Fuel System Trouble in General

FUEL INJECTION (FUEL SYSTEMS)

## 32. Fuel System Trouble in General

### A: INSPECTION

| Trouble and possible cause                         |  | Corrective action   |
|--|--|---|
| <b>1. Insufficient fuel supply to the injector</b> |  |   |
| 1)   | Fuel pump will not operate.  |   |
|  | ○ Defective terminal contact.  | Inspect connections, especially ground, and tighten securely. |
|  | ○ Trouble in electromagnetic or electronic circuit parts.              | Replace faulty parts.   |
| 2)   | Lowering of fuel pump function.  | Replace fuel pump.  |
| 3)   | Clogged dust or water in the fuel filter.                              | Replace fuel filter, clean or replace fuel tank.              |
| 4)   | Clogged or bent fuel pipe or hose.                                     | Clean, correct or replace fuel pipe or hose.                  |
| 5)   | Air is mixed in the fuel system.                                       | Inspect or retighten each connection part.                    |
| 6)   | Clogged or bent breather tube or pipe.                                 | Clean, correct or replace air breather tube or pipe.          |
| 7)   | Damaged diaphragm of pressure regulator.                               | Replace.  |
| <b>2. Leakage or blow out fuel</b>                 |  |   |
| 1)   | Loosened joints of the fuel pipe.                                      | Retightening.   |
| 2)   | Cracked fuel pipe, hose and fuel tank.                                 | Replace.  |
| 3)   | Defective welding part on the fuel tank.                               | Replace.  |
| 4)   | Defective drain packing of the fuel tank.                              | Replace.  |
| 5)   | Clogged or bent air breather tube or air vent tube.                    | Clean, correct or replace air breather tube or air vent tube. |
| <b>3. Gasoline smell inside of compartment</b>     |  |   |
| 1)   | Loose joints at air breather tube, air vent tube and fuel filler pipe. | Retightening.   |
| 2)   | Defective packing air tightness on the fuel saucer.                    | Correct or replace packing.                                   |
| 3)   | Inoperative fuel pump modulator or circuit.                            | Replace.  |
| <b>4. Defective fuel meter indicator</b>           |  |   |
| 1)   | Defective operation of fuel level sensor.                              | Replace.  |
| 2)   | Defective operation of fuel meter.                                     | Replace.  |
| <b>5. Noise</b>                                    |  |   |
| 1)   | Large operation noise or vibration of fuel pump.                       | Replace.  |

#### NOTE:

- When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank. Fill fuel fully to prevent those problem. And also drain the water condensation from fuel filter.
- In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use water removing agent in the fuel system to prevent freezing fuel system and accumulating water. Fill the water removing agent at the time when the fuel reduced at half to maintain the advantage.
- When water condensation is noticed in the fuel filter, drain the water from both the fuel filter and fuel tank or use water removing agent in the fuel tank.
- Before using water removing agent, follow the cautions noted on the bottle.

# Fuel System Trouble in General

FUEL INJECTION (FUEL SYSTEMS)

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# EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

# *EC(STI)*

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| 3. Rear Catalytic Converter .....         | 4           |
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| 7. Fuel Temperature Sensor .....          | 8           |
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| 11. Pressure Control Solenoid Valve ..... | 12          |
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# General Description

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

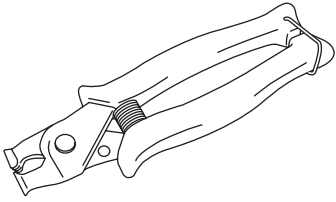
## 1. General Description

### A: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.

### B: PREPARATION TOOL

- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION  | REMARKS                                    |
|---|-------------|--------------|--|
| <br>ST18353AA000 | 18353AA000  | CLAMP PLIERS | Used for removing and installing PCV hose. |

# Front Catalytic Converter

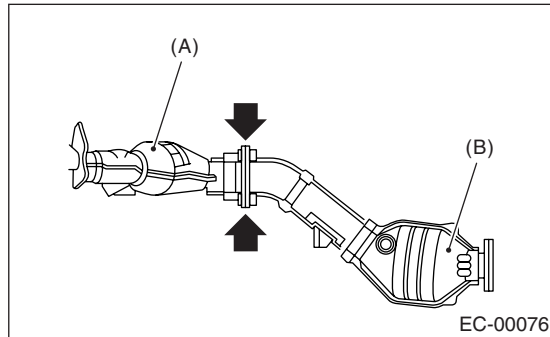
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

## 2. Front Catalytic Converter

### A: REMOVAL

1) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>

2) Separate the front catalytic converter (A) from rear catalytic converter (B).



### B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Replace the gaskets with new ones.

### C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.

2) Make sure there are no holes or rusting.

# Rear Catalytic Converter

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

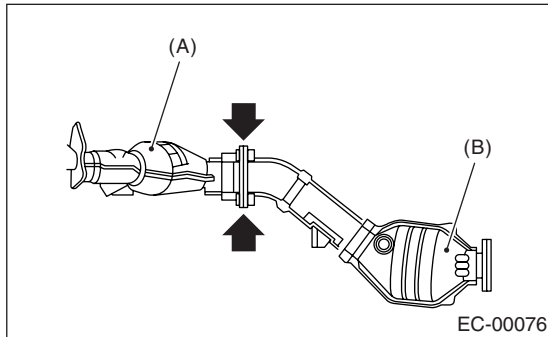
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## 3. Rear Catalytic Converter

### A: REMOVAL

1) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>

2) Separate the rear catalytic converter (B) from front catalytic converter (A).



### B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Replace the gaskets with new ones.

### C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.

2) Make sure there are no holes or rusting.

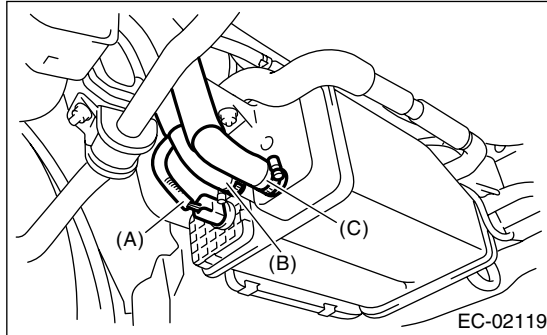
# Canister

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

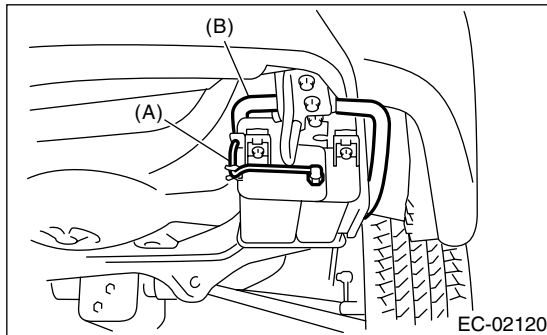
## 4. Canister

### A: REMOVAL

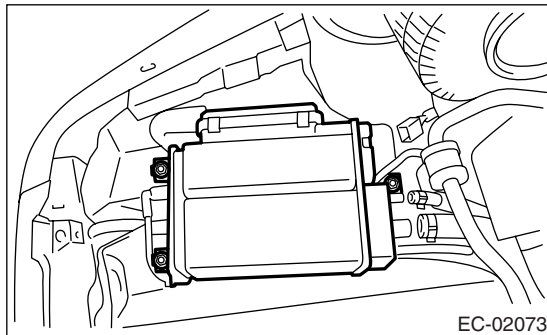
- 1) Disconnect the ground cable from battery.
- 2) Lift up the vehicle.
- 3) Disconnect connector (A) from drain valve.
- 4) Disconnect evaporation hoses (B) and (C) from canister.



- 5) Disconnect quick connector (A) from canister.
- 6) Disconnect drain hoses (B) from canister.



- 7) Remove the canister from vehicle.



### B: INSTALLATION

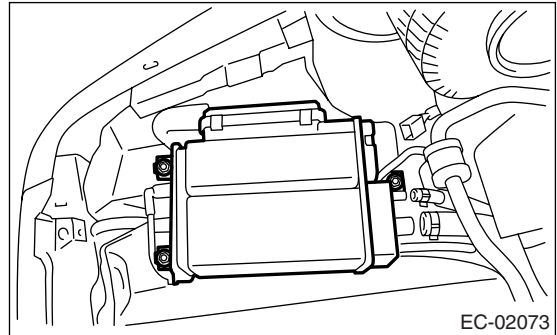
Install in the reverse order of removal.

#### NOTE:

Replace the retainer of quick connector with new one.

#### Tightening torque:

**23 N·m (2.3 kgf-m, 17 ft-lb)**



### C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.



# Purge Control Solenoid Valve

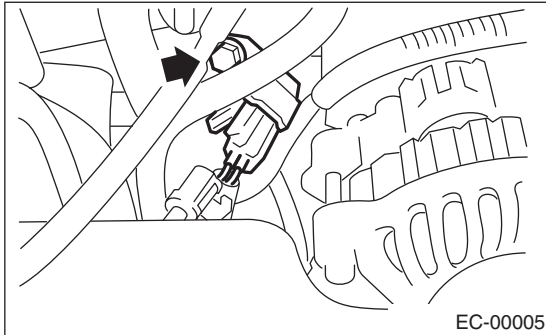
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

---

## 5. Purge Control Solenoid Valve

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector and hoses from purge control solenoid valve.
- 3) Remove the bolt which installs the purge control solenoid valve onto intake manifold.

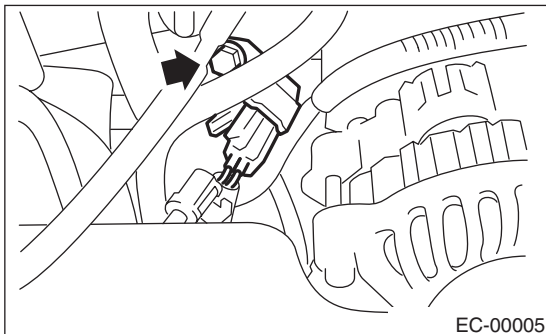


### B: INSTALLATION

Install in the reverse order of removal.

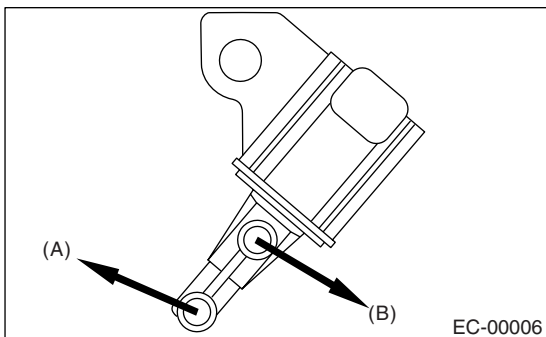
#### *Tightening torque:*

**16 N·m (1.6 kgf·m, 11.6 ft·lb)**



#### NOTE:

Connect the evaporation hoses as shown in the figure.



- (A) To purge valve
- (B) To intake manifold

### C: INSPECTION

Make sure the hoses are not cracked or loose.

## Fuel Level Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

---

### 6. Fuel Level Sensor

#### A: REMOVAL

For work procedures, refer to FU(STI) section.  
<Ref. to FU(STI)-54, REMOVAL, Fuel Level Sensor.>

#### B: INSTALLATION

For work procedures, refer to FU(STI) section.  
<Ref. to FU(STI)-54, INSTALLATION, Fuel Level Sensor.>

## Fuel Temperature Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

---

### 7. Fuel Temperature Sensor

#### A: REMOVAL

Fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, the removal procedure is the same as that for fuel level sensor. <Ref. to FU(STI)-54, REMOVAL, Fuel Level Sensor.>

#### B: INSTALLATION

Fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, the installation procedure is the same as that for fuel level sensor. <Ref. to FU(STI)-54, INSTALLATION, Fuel Level Sensor.>

## Fuel Sub Level Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

---

### 8. Fuel Sub Level Sensor

#### A: REMOVAL

For removal procedures, refer to FU(STI) section.  
<Ref. to FU(STI)-55, REMOVAL, Fuel Sub Level Sensor.>

#### B: INSTALLATION

For installation procedures, refer to FU(STI) section.  
<Ref. to FU(STI)-56, INSTALLATION, Fuel Sub Level Sensor.>

# Fuel Tank Pressure Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

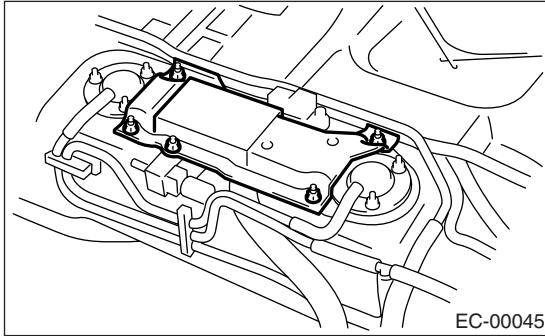
## 9. Fuel Tank Pressure Sensor

### A: REMOVAL

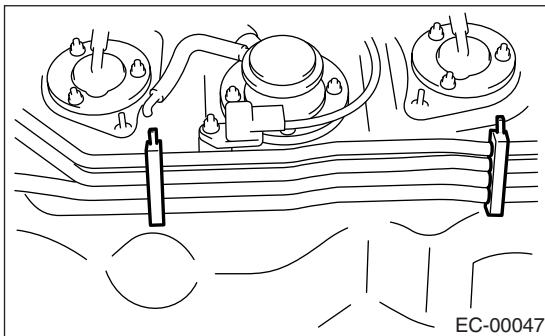
#### WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

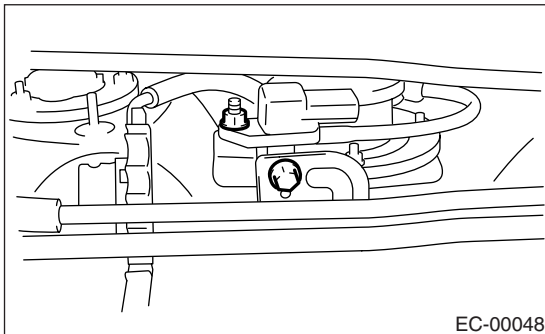
- 1) Remove the fuel tank. <Ref. to FU(STI)-45, REMOVAL, Fuel Tank.>
- 2) Remove the protector cover.



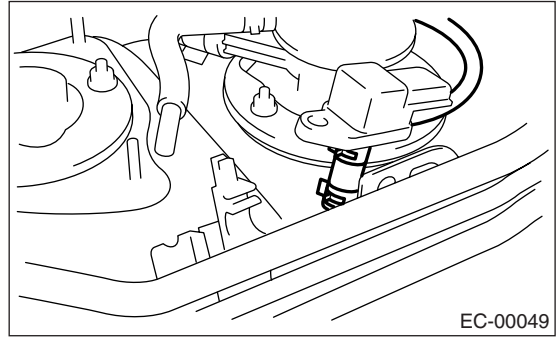
- 3) Disconnect the connector from fuel tank pressure sensor.
- 4) Release the clips which hold fuel pipes onto fuel tank.



- 5) Remove the bolt and nut which hold the fuel tank pressure sensor onto the bracket.



- 6) Disconnect the pressure hose from fuel tank pressure sensor.

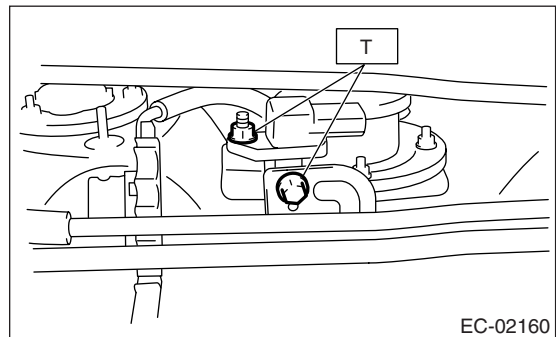


### B: INSTALLATION

Install in the reverse order of removal.

#### Tightening torque:

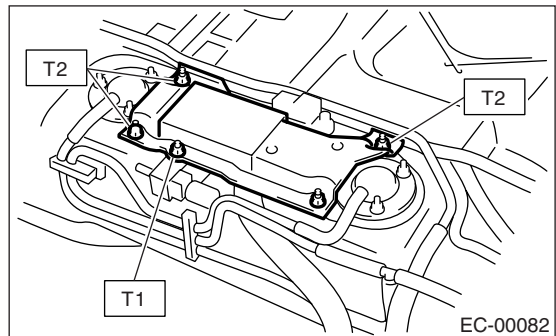
**7.4 N·m (0.75 kgf·m, 5.4 ft·lb)**



#### Tightening torque:

**T1: 7.4 N·m (0.75 kgf·m, 5.4 ft·lb)**

**T2: 4.4 N·m (0.45 kgf·m, 3.3 ft·lb)**



### C: INSPECTION

Make sure the hoses are not cracked or loose.

## 10. Fuel Tank Sensor Control Valve

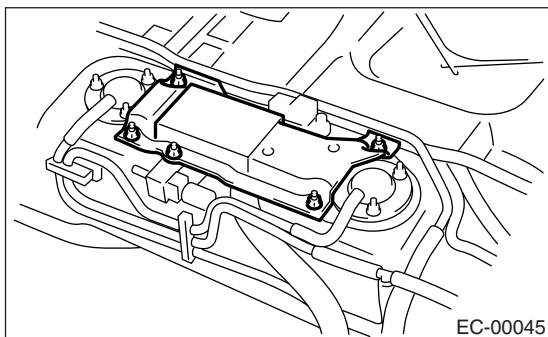
### A: REMOVAL

#### WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

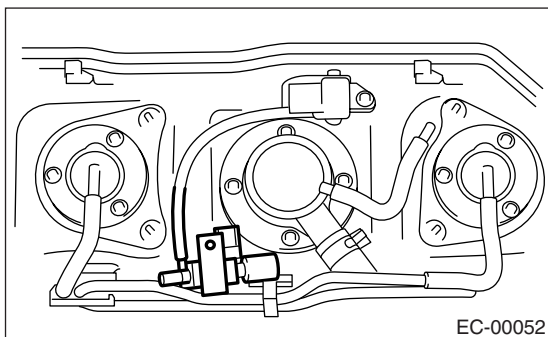
1) Remove the fuel tank. <Ref. to FU(STI)-45, REMOVAL, Fuel Tank.>

2) Remove the protector cover.



3) Disconnect the connector from fuel tank sensor control valve.

4) Disconnect hose and remove fuel tank sensor control valve.



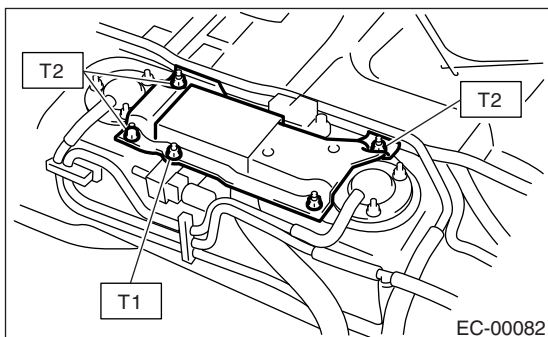
### B: INSTALLATION

Install in the reverse order of removal.

#### Tightening torque:

**T1: 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)**

**T2: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)**



### C: INSPECTION

Make sure the hoses are not cracked or loose.

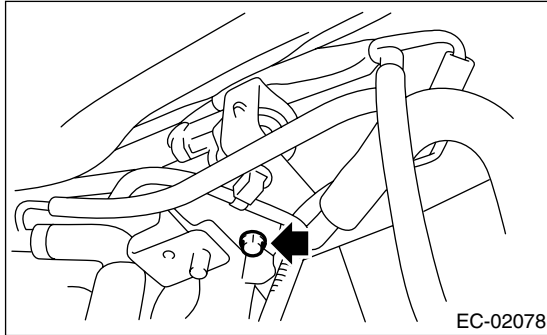
# Pressure Control Solenoid Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

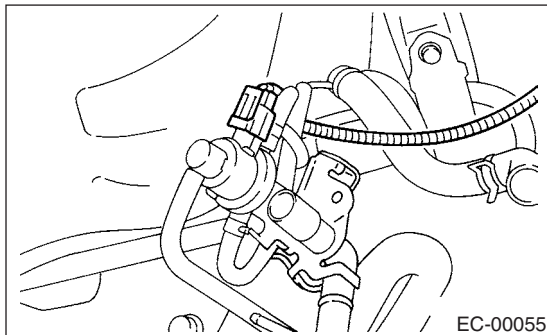
## 11. Pressure Control Solenoid Valve

### A: REMOVAL

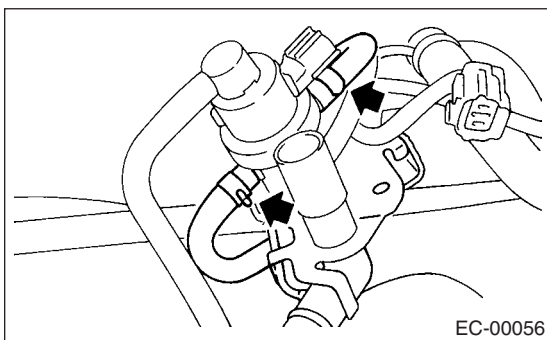
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Lift up the vehicle.
- 4) Remove the canister. <Ref. to EC(STI)-5, REMOVAL, Canister.>
- 5) Remove the bolt which installs the pressure control solenoid valve holding bracket on body.



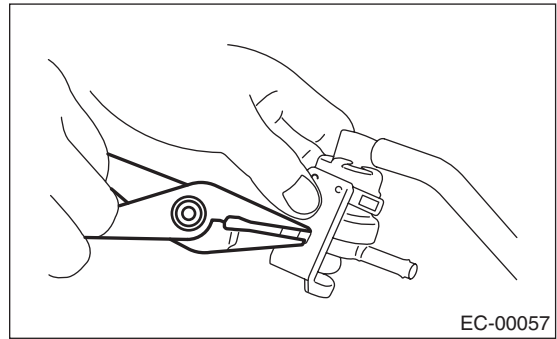
- 6) Remove the pressure control solenoid valve with bracket.
- 7) Disconnect the connector from pressure control solenoid valve.



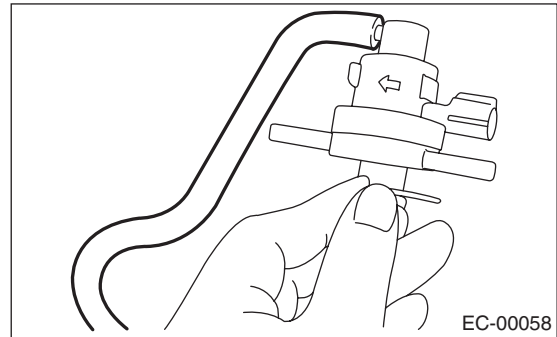
- 8) Disconnect the two evaporation hoses from pressure control solenoid valve.



- 9) Remove the pressure control solenoid valve from bracket.



- 10) Disconnect the pressure control valve hose from pressure control solenoid valve.

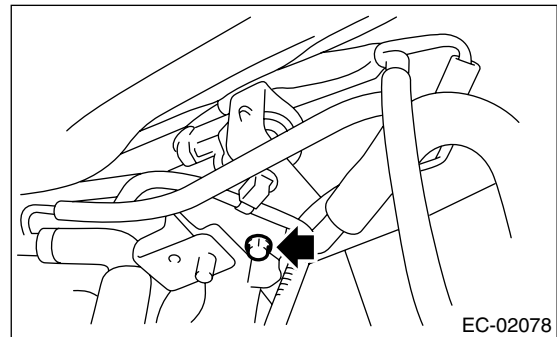


### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**

**25 N·m (2.6 kgf·m, 18.8 ft·lb)**



### C: INSPECTION

Make sure the hoses are not cracked or loose.

## **Drain Filter**

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

---

### **12.Drain Filter**

#### **A: SPECIFICATION**

Drain filter is built in the canister, and it is a part which cannot be disassembled.



# Vent Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

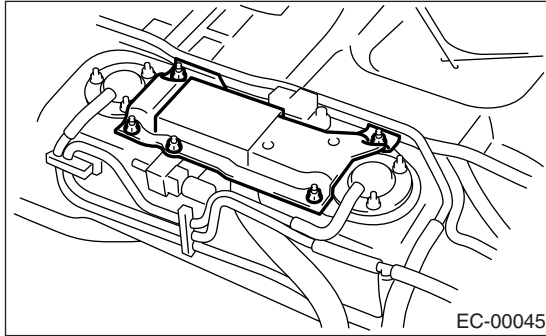
## 13. Vent Valve

### A: REMOVAL

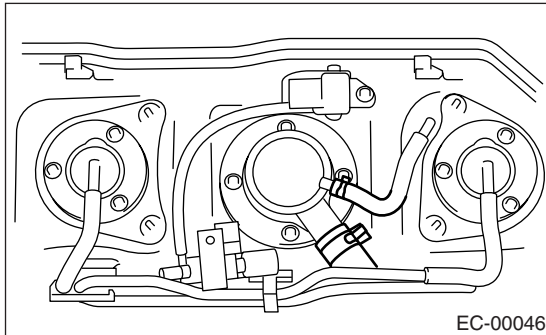
#### WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

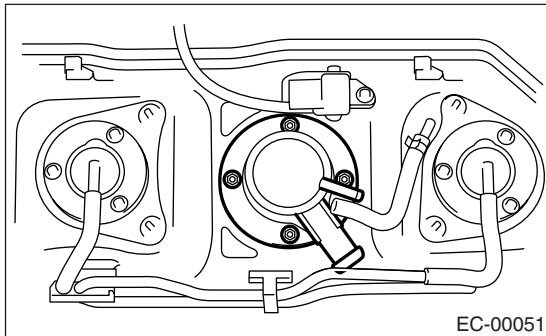
- 1) Remove the fuel tank. <Ref. to FU(STI)-45, REMOVAL, Fuel Tank.>
- 2) Remove the protector cover.



- 3) Remove the clips, and disconnect the hoses from vent valve.



- 4) Remove the nuts and then remove the vent valve.



### B: INSTALLATION

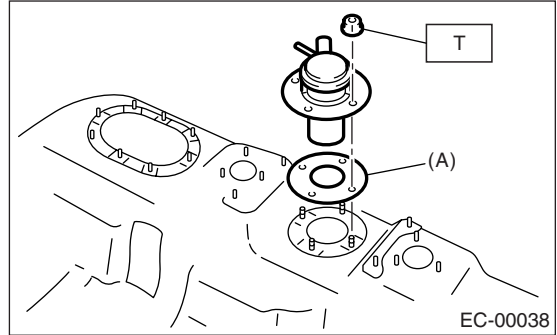
Install in the reverse order of removal.

#### NOTE:

Use a new gasket.

#### Tightening torque:

**T: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)**

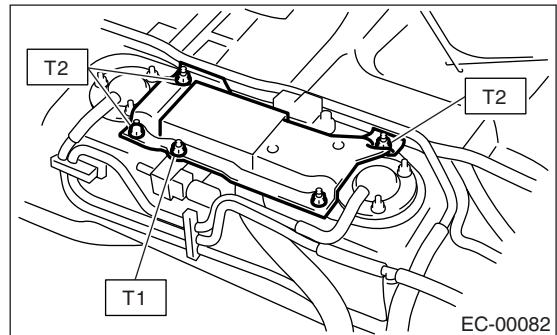


(A) Gasket

#### Tightening torque:

**T1: 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)**

**T2: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)**



### C: INSPECTION

Make sure the hoses are not cracked or loose.

# Shut Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

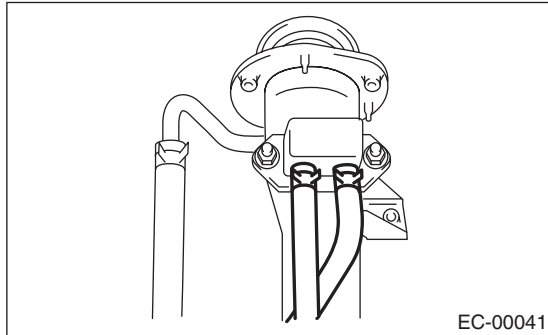
## 14. Shut Valve

### A: REMOVAL

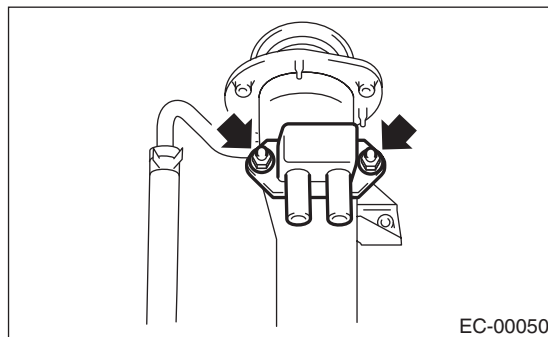
#### WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

- 1) Remove the fuel filler pipe. <Ref. to FU(STI)-48, REMOVAL, Fuel Filler Pipe.>
- 2) Disconnect the evaporation hoses from shut valve.



- 3) Remove the shut valve from fuel filler pipe.

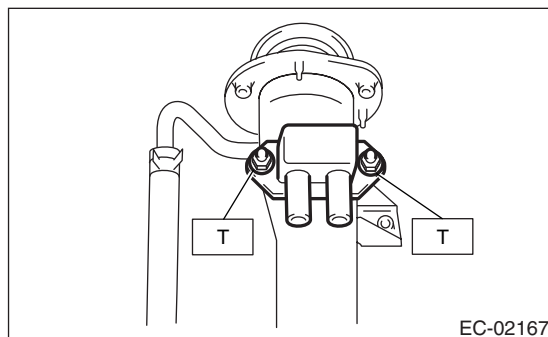


### B: INSTALLATION

Install in the reverse order of removal.

#### Tightening torque:

**4.5 N·m (0.46 kgf-m, 3.3 ft-lb)**



### C: INSPECTION

Make sure the hoses are not cracked or loose.

## Drain Valve

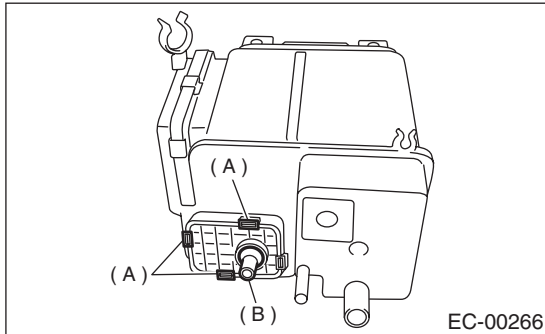
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

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### 15. Drain Valve

#### A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Disconnect the ground cable from battery.
- 3) Lift up the vehicle.
- 4) Remove the canister. <Ref. to EC(STI)-5, REMOVAL, Canister.>
- 5) Remove clip (A), and then remove drain valve (B) from canister.
- 6) Remove the filter from drain valve (B).



#### B: INSTALLATION

Install in the reverse order of removal.

#### CAUTION:

- Assemble the drain valve filter without any clearance.
- Make sure the packing in the groove before assembling drain valve to canister.
- Replace the clip with new one.

#### C: INSPECTION

- 1) Make sure that all hoses are installed securely.
- 2) Make sure that hoses are not cracked or loose.

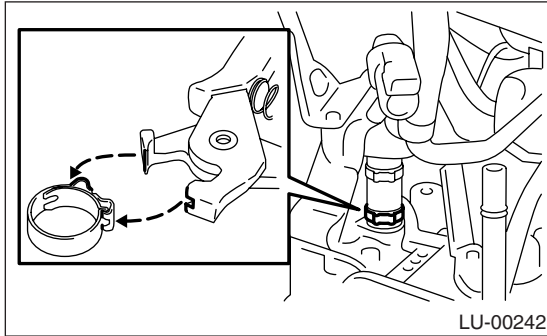
## 16.PCV Hose Assembly

### A: REMOVAL

#### CAUTION:

Removal is not allowed except for the damage of PCV hose, diagnosis connector and PCV valve.

- 1) Remove the intake manifold.  
<Ref. to FU(STI)-13, REMOVAL, Intake Manifold.>
- 2) Clip the protrusion of clamp after aligning the concave portion of ST with protrusion of clamp, and then unlock the lock.
- 3) Remove the PCV hose assembly.  
ST 18353AA000 CLAMP PLIERS

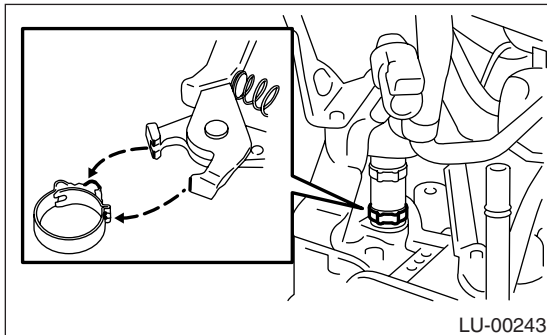


### B: INSTALLATION

#### NOTE:

Replace the clamp with a new one.

- 1) Install the PCV hose assembly, and then lock the clamp with protrusion of clamp clipped by pliers.  
ST 18353AA000 CLAMP PLIERS



- 2) Install the intake manifold.  
<Ref. to FU(STI)-16, INSTALLATION, Intake Manifold.>

# PCV Hose Assembly

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

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# INTAKE (INDUCTION)

# *IN(STI)*

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| 2. Air Cleaner Element .....             | 7           |
| 3. Air Cleaner Case .....                | 8           |
| 4. Air Intake Duct .....                 | 9           |
| 5. Intake Duct .....                     | 10          |
| 6. Intercooler .....                     | 11          |
| 7. Turbocharger .....                    | 13          |
| 8. Air By-pass Valve .....               | 15          |
| 9. Resonator Chamber .....               | 16          |
| 10. Intercooler Water Spray Tank .....   | 17          |
| 11. Intercooler Water Spray Nozzle ..... | 18          |

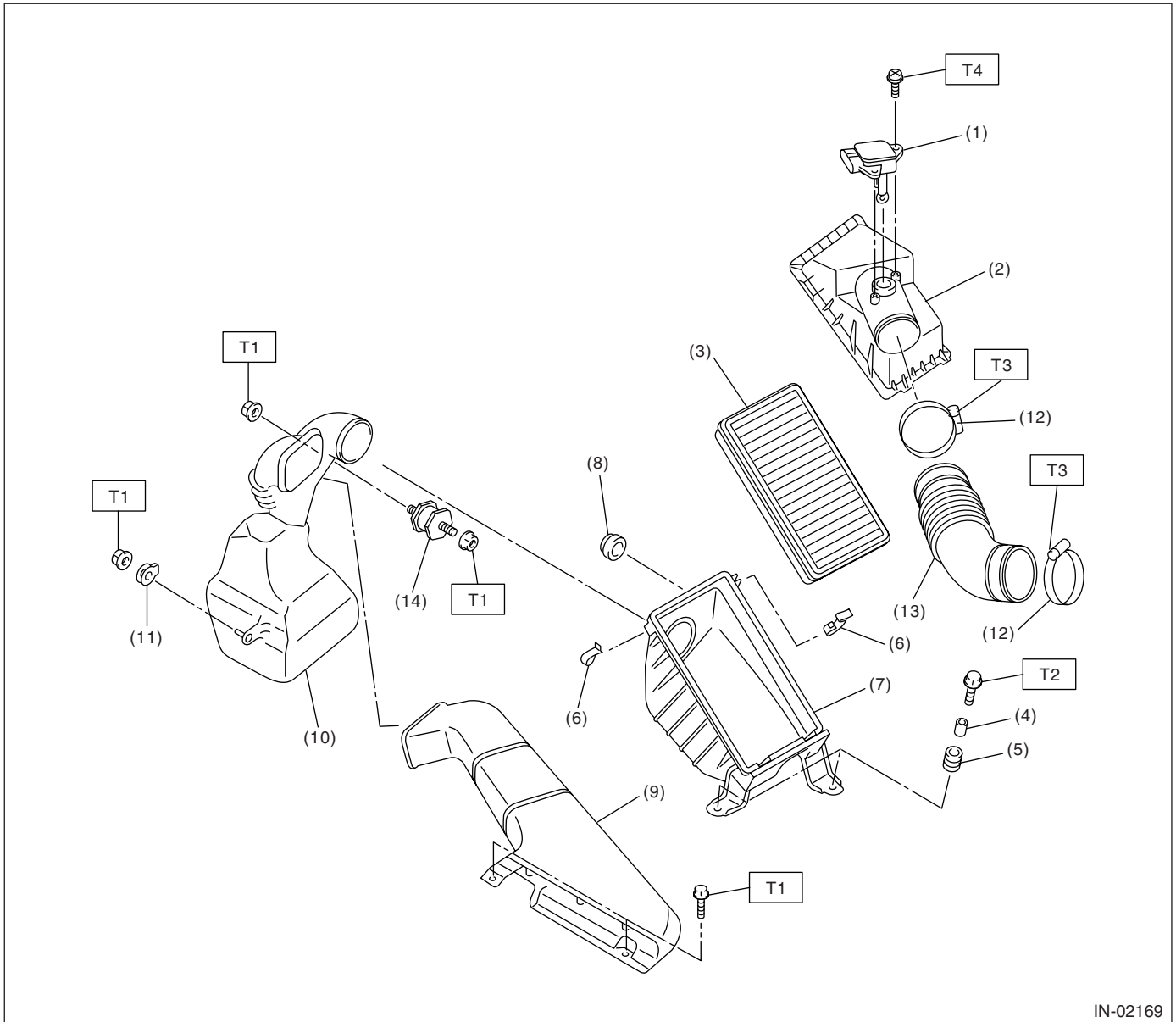
# General Description

INTAKE (INDUCTION)

## 1. General Description

### A: COMPONENT

#### 1. AIR CLEANER



IN-02169

- |   |                             |              |
|---|-----------------------------|--------------|
| (1) Mass air flow and intake air temperature sensor | (7) Air cleaner lower case  | (14) Cushion |
| (2) Air cleaner upper cover                         | (8) Cushion rubber          |              |
| (3) Air cleaner element                             | (9) Air intake duct         |              |
| (4) Spacer  | (10) Resonator chamber ASSY |              |
| (5) Bushing   | (11) Cushion rubber         |              |
| (6) Clip  | (12) Clamp                  |              |
|   | (13) Air intake boot        |              |

**Tightening torque: N·m (kgf·m, ft·lb)**

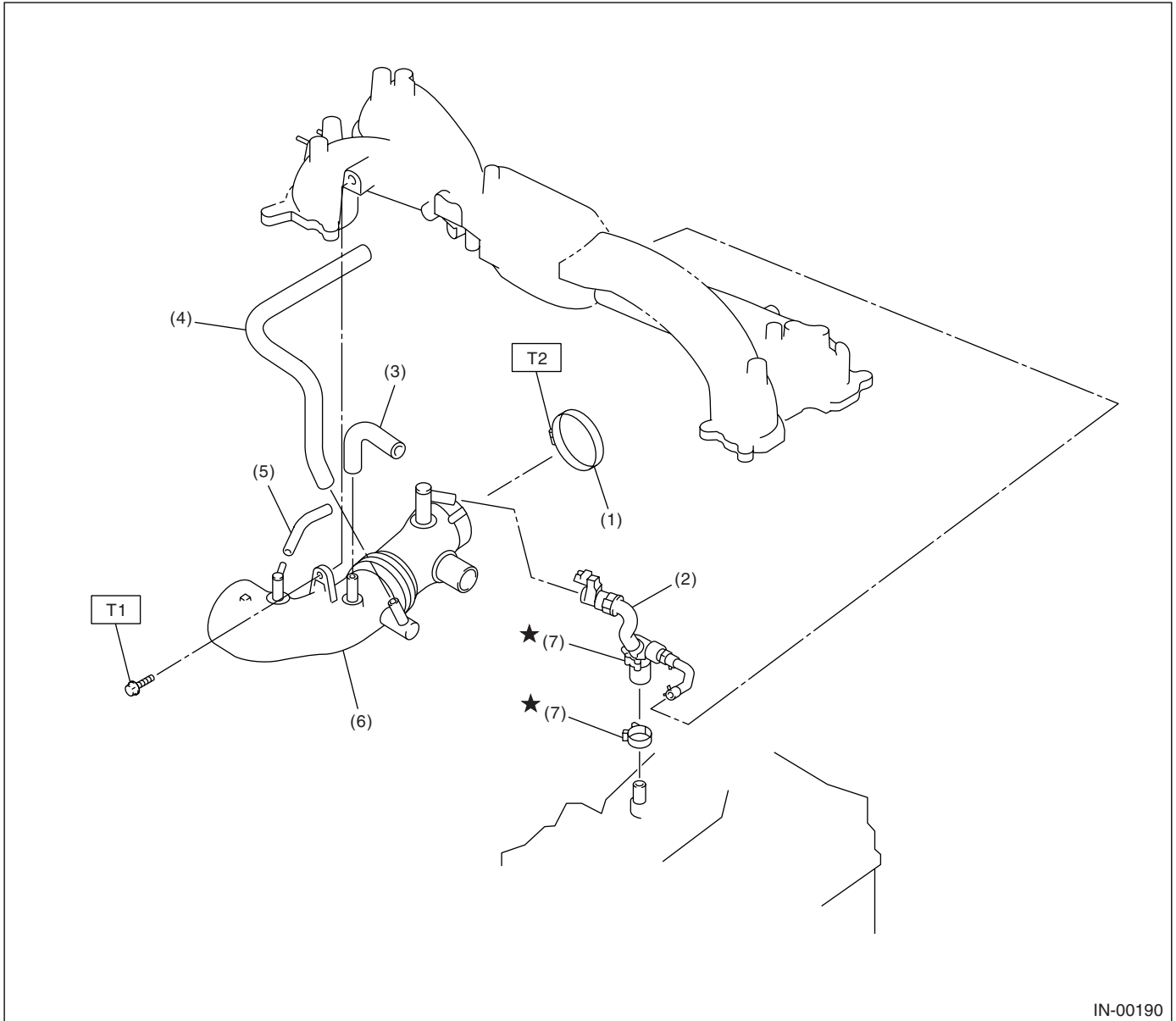
**T1: 7.5 (0.76, 5.5)**

**T2: 33 (3.4, 24.6)**

**T3: 2.5 (0.25, 1.8)**

**T4: 1.7 (0.17, 1.2)**

## 2. INTAKE DUCT



IN-00190

- |                        |                        |
|------------------------|------------------------|
| (1) Clamp              | (5) Air by-pass hose C |
| (2) PCV hose ASSY      | (6) Intake duct        |
| (3) Air by-pass hose A | (7) Clamp              |
| (4) Air by-pass hose B |                        |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 19 (1.9, 13.7)**

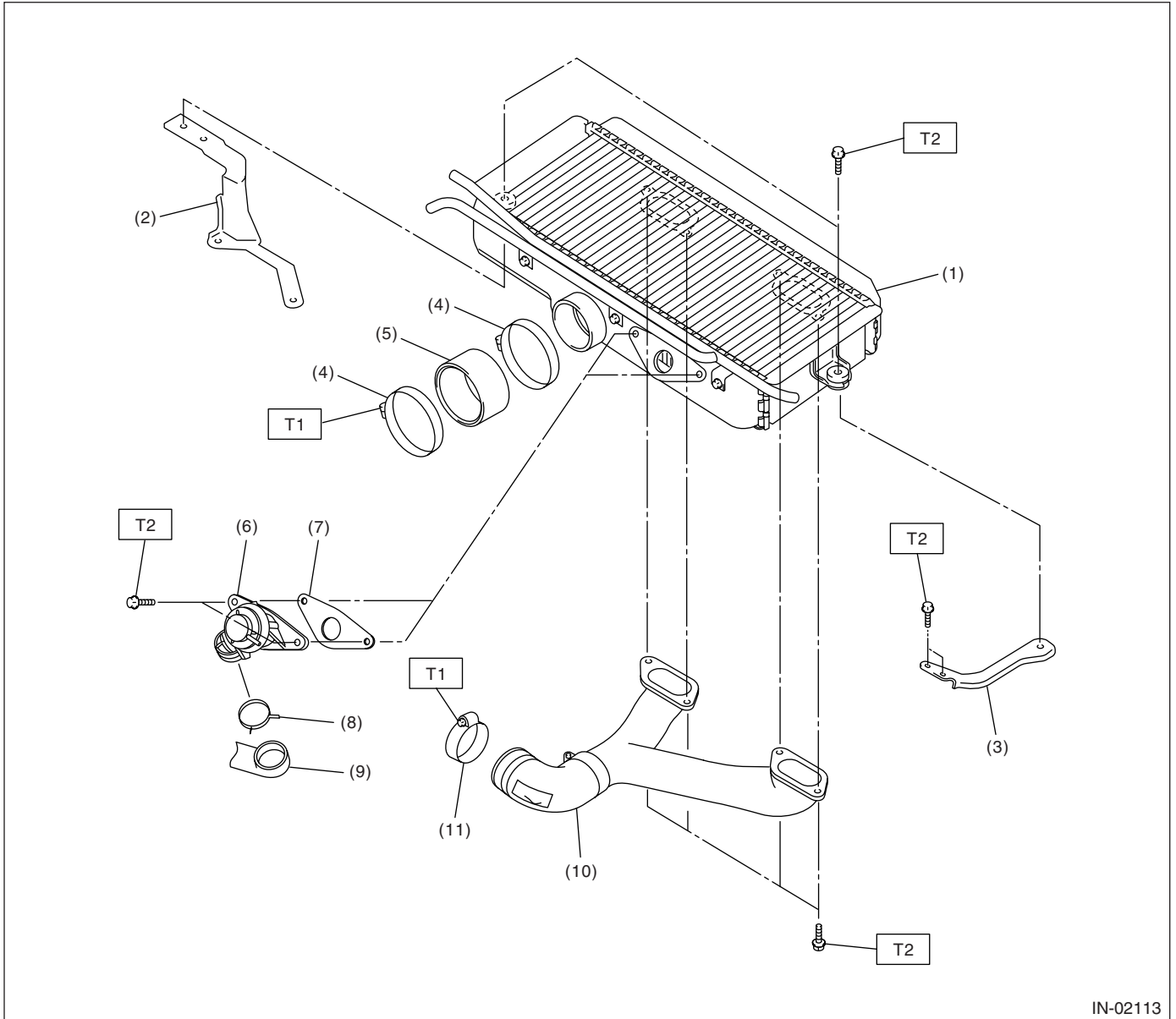
**T2: 3 (0.3, 2.2)**



# General Description

INTAKE (INDUCTION)

## 3. INTERCOOLER



IN-02113

- |                            |                        |
|----------------------------|------------------------|
| (1) Intercooler            | (6) Air by-pass valve  |
| (2) Intercooler bracket RH | (7) Gasket             |
| (3) Intercooler bracket LH | (8) Clamp              |
| (4) Clamp                  | (9) Air by-pass hose A |
| (5) Air intake duct        | (10) Intercooler duct  |

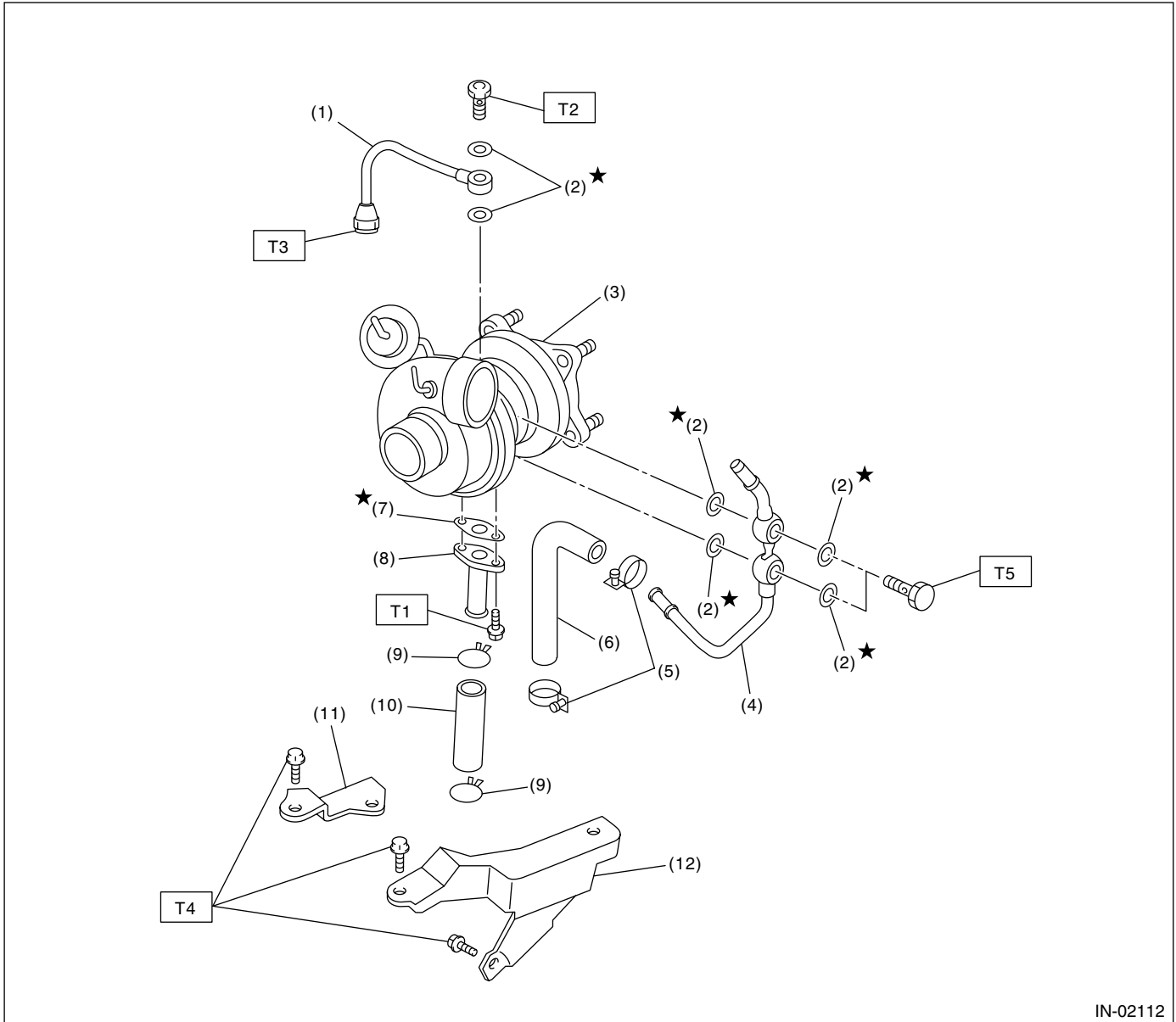
- (11) Clamp

**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 3 (0.3, 2.2)**

**T2: 16 (1.6, 11.8)**

## 4. TURBOCHARGER



IN-02112

- |                         |                              |
|-------------------------|------------------------------|
| (1) Oil inlet pipe      | (7) Gasket                   |
| (2) Metal gasket        | (8) Oil outlet pipe          |
| (3) Turbocharger        | (9) Clip                     |
| (4) Water pipe          | (10) Oil outlet hose         |
| (5) Clamp               | (11) Turbocharger bracket RH |
| (6) Engine coolant hose | (12) Turbocharger bracket LH |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 4.4 (0.45, 3.3)**

**T2: 16±1.5 (1.6±0.15, 11.8±1.1)**

**T3: 20±2.0 (2.0±0.2, 14.8±1.5)**

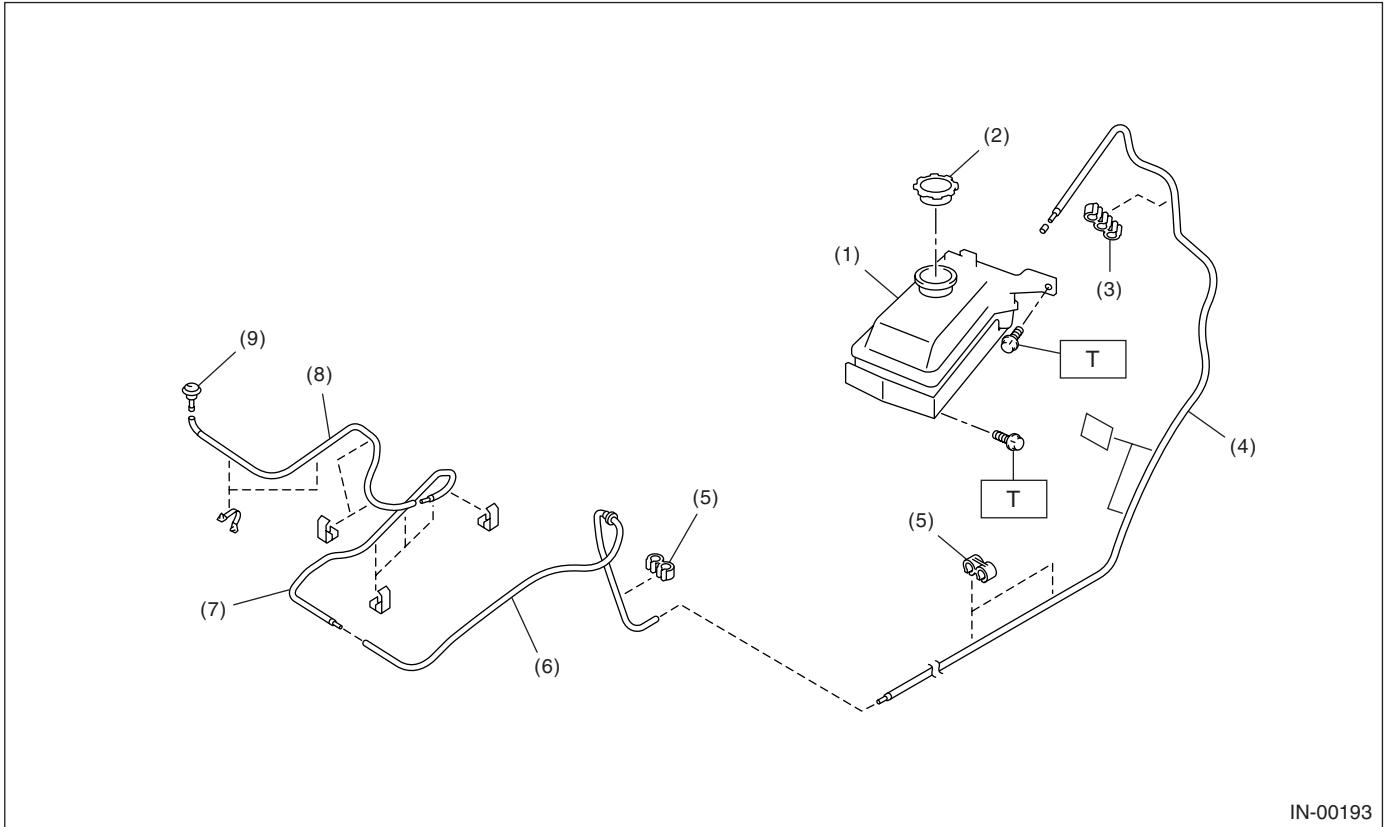
**T4: 33 (3.4, 24.6)**

**T5: 35 (3.6, 25.8)**

# General Description

INTAKE (INDUCTION)

## 5. INTERCOOLER WATER SPRAY



- (1) Water tank ASSY
- (2) Water tank cap
- (3) Clamp
- (4) Rear hose

- (5) Clamp
- (6) Center hose
- (7) Front hose
- (8) Intercooler hose

- (9) Nozzle

**Tightening torque: N·m (kgf·m, ft·lb)**

**T: 6.0 (0.61, 4.4)**

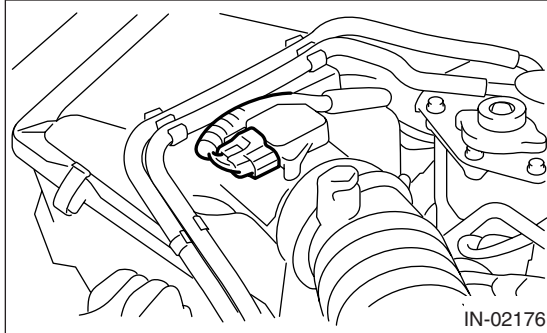
### B: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensor or units, be sure to disconnect the ground cable from battery.

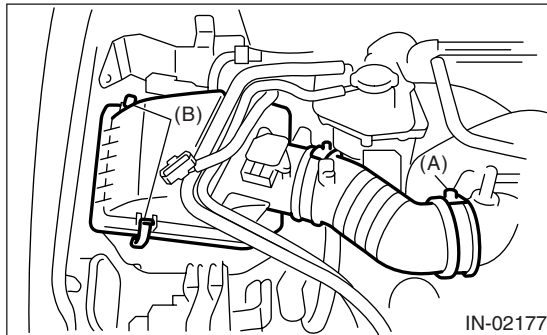
## 2. Air Cleaner Element

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from mass air flow and intake air temperature sensor.



- 3) Loosen the clamp (A) which connects the air intake boot and intake duct.
- 4) Remove the clip (B) from air cleaner upper cover.



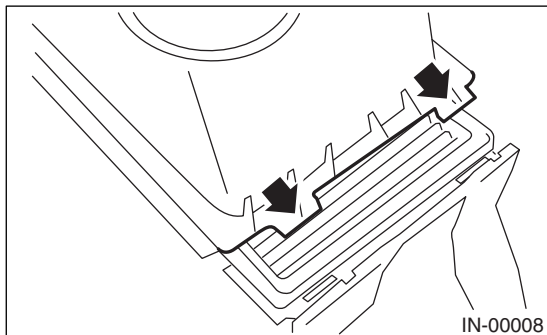
- 5) Remove the air cleaner upper cover.
- 6) Remove the air cleaner element.

### B: INSTALLATION

Install in the reverse order of removal.

#### NOTE:

Before installing the air cleaner upper cover, align the holes with protruding portions of air cleaner lower case, then secure the upper cover to the lower case.



### C: INSPECTION

Replace it if excessively damaged or dirty.

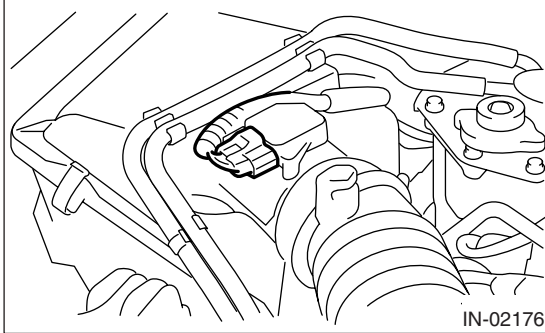
# Air Cleaner Case

INTAKE (INDUCTION)

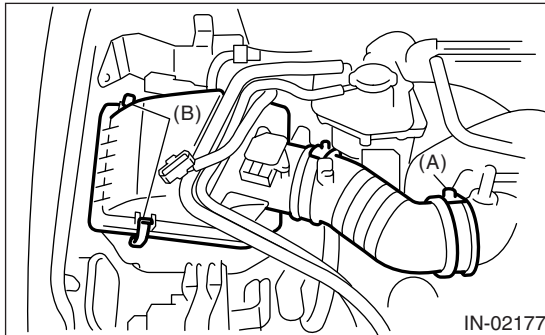
## 3. Air Cleaner Case

### A: REMOVAL

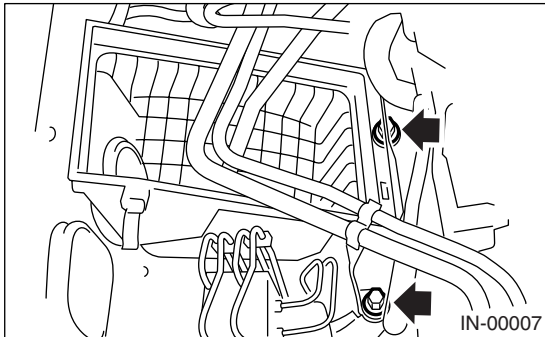
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from mass air flow and intake air temperature sensor.



- 3) Loosen the clamp (A) which connects the air intake boot and intake duct.
- 4) Remove the clip (B) from air cleaner upper cover.



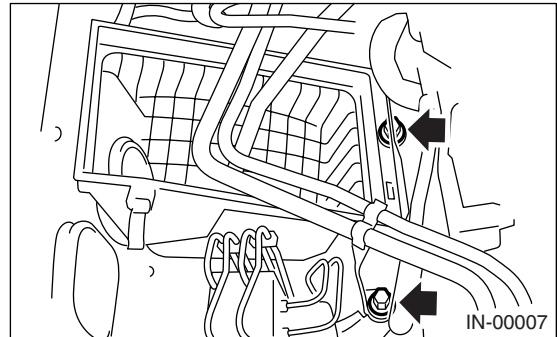
- 5) Remove the air cleaner upper cover.
- 6) Remove the air cleaner element.
- 7) Remove the air cleaner lower case.



### B: INSTALLATION

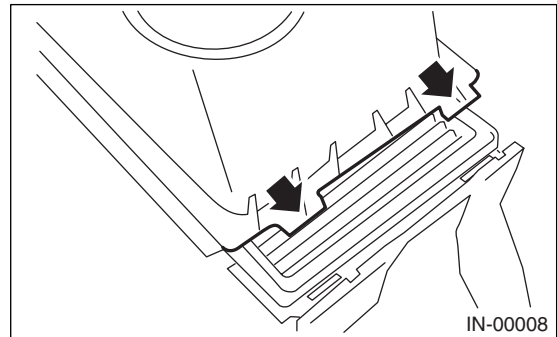
Install in the reverse order of removal.

**Tightening torque:**  
**33 N·m (3.4 kgf·m, 24.6 ft·lb)**



### NOTE:

Before installing the air cleaner upper cover, align the holes with protruding portions of air cleaner lower case, then secure the upper cover to the lower case.



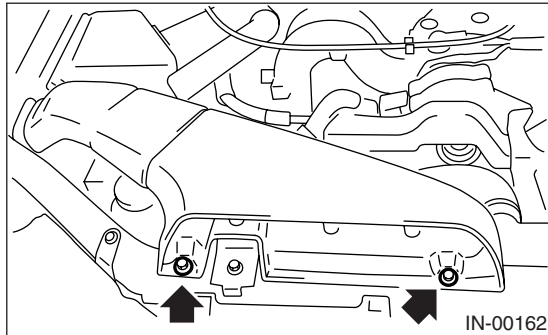
### C: INSPECTION

Inspect for cracks and loose connections.

## 4. Air Intake Duct

### A: REMOVAL

Remove the bolts which install the air intake duct on front side of body.

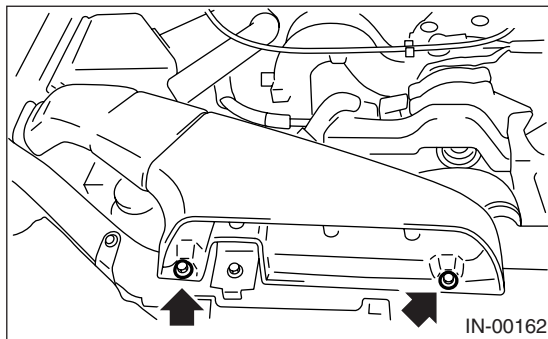


### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

**7.5 N·m (0.76 kgf-m, 5.5 ft-lb)**



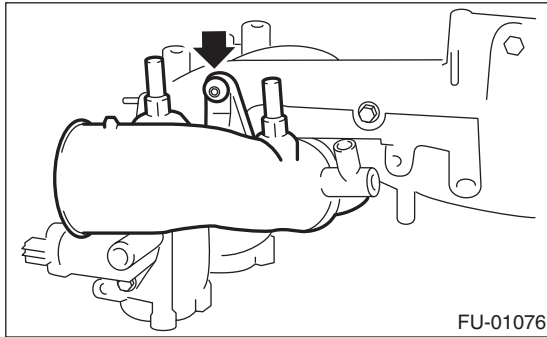
### C: INSPECTION

- 1) Inspect for cracks and loose connections.
- 2) Inspect that no foreign objects are mixed in air intake duct.

## 5. Intake Duct

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the intake manifold. <Ref. to FU(STI)-13, REMOVAL, Intake Manifold.>
- 3) Remove the sensor, engine harness and fuel pipe attached to intake manifold. <Ref. to FU(STI)-18, DISASSEMBLY, Intake Manifold.>
- 4) Remove the intake duct from intake manifold.

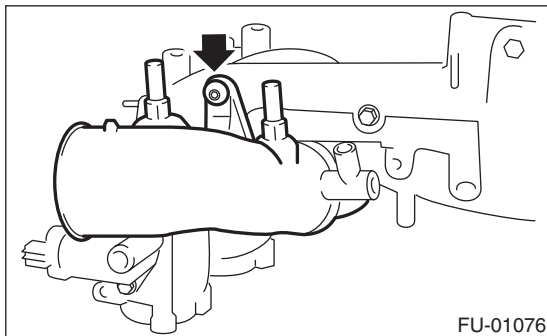


### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

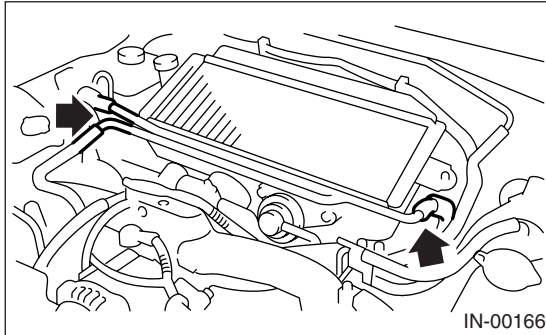
**19 N·m (1.9 kgf·m, 13.7 ft·lb)**



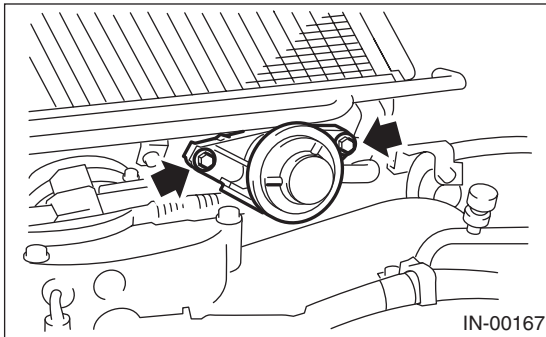
## 6. Intercooler

### A: REMOVAL

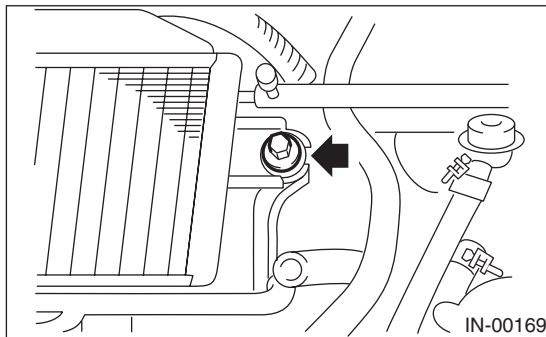
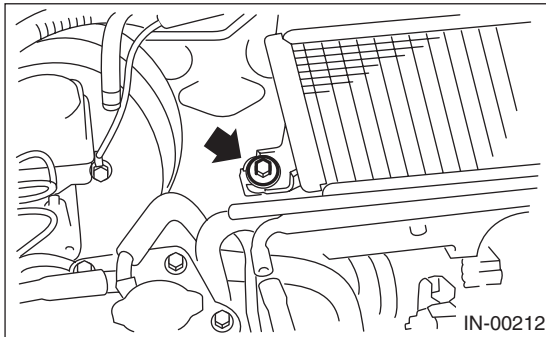
1) Disconnect the air by-pass hoses from intercooler.



2) Remove the air by-pass valve from intercooler.

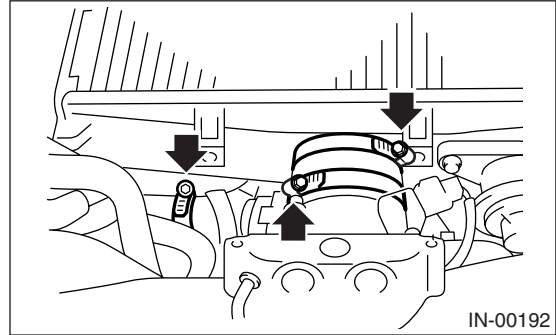


3) Remove the bolts which secure the intercooler to bracket.



4) Remove the intercooler air duct from turbocharger.

5) Remove the intercooler from throttle body.

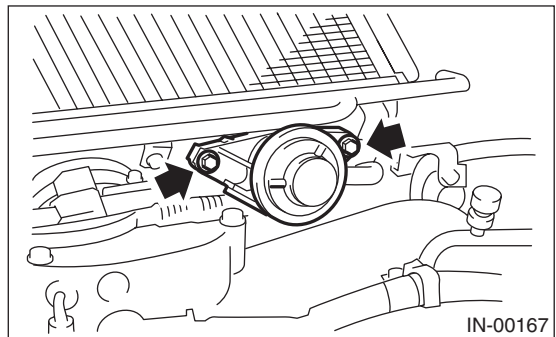
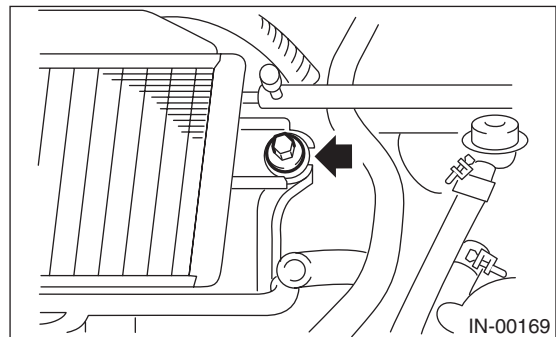
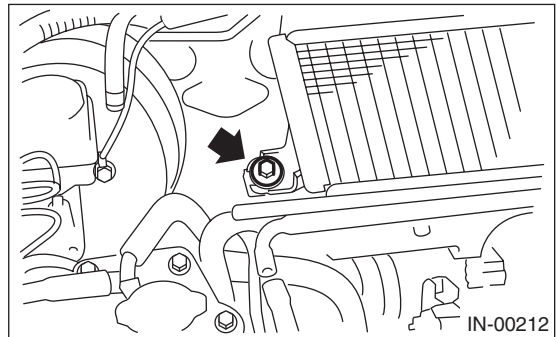


### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**

**16 N·m (1.6 kgf-m, 11.8 ft-lb)**





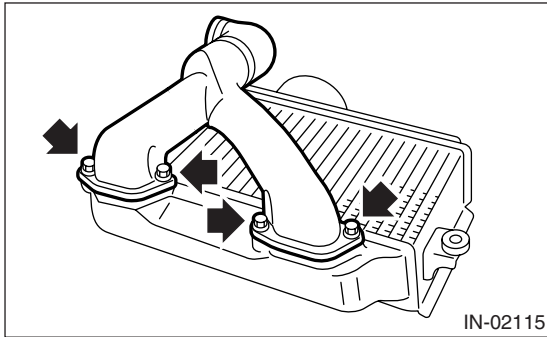
# Intercooler

INTAKE (INDUCTION)

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## C: DISASSEMBLY

Remove the intercooler ducts from intercooler.

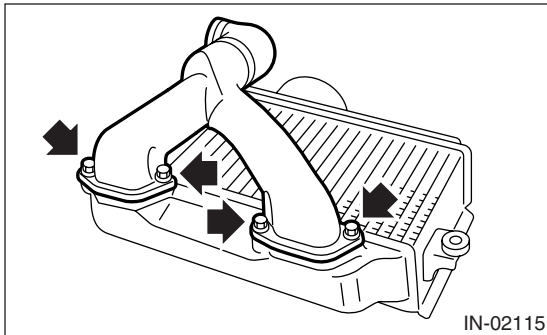


## D: ASSEMBLY

Assemble in the reverse order of disassembly.

**Tightening torque:**

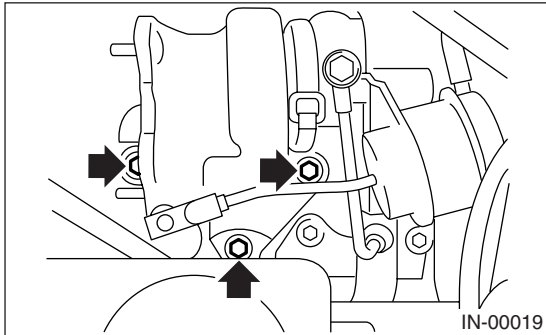
**16 N·m (1.6 kgf·m, 11.8 ft·lb)**



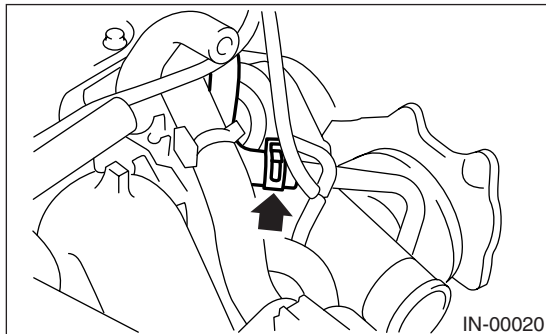
## 7. Turbocharger

### A: REMOVAL

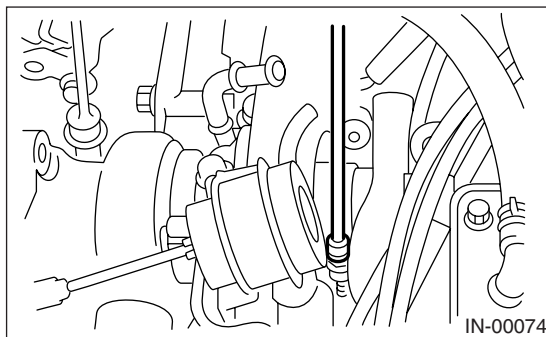
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>
- 4) Lower the vehicle.
- 5) Disconnect the turbocharger joint pipe from turbo-charger.



- 6) Disconnect the engine coolant hose which is connected to coolant filler tank.

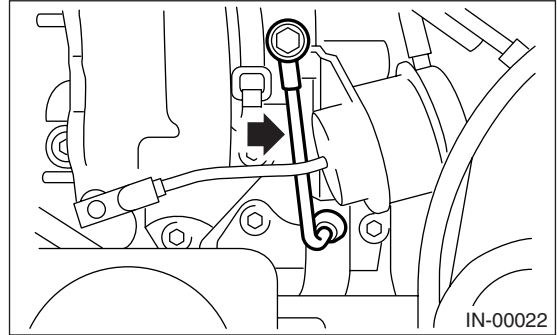


- 7) Loosen the clamp which secures the turbocharger to intake duct.

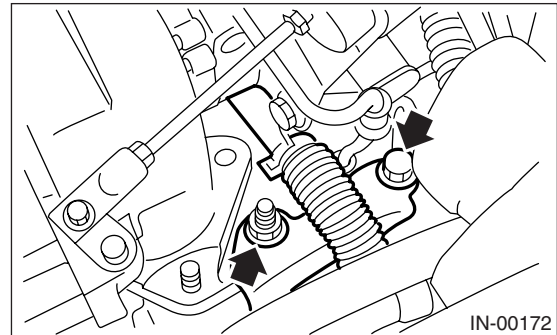


- 8) Loosen the flare joint of oil inlet pipe, and disconnect the flare joint.

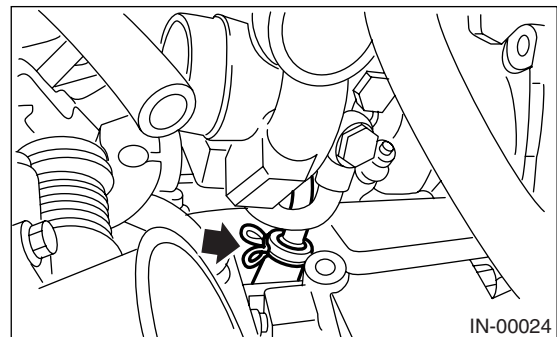
- 9) Remove the oil inlet pipe from turbocharger.



- 10) Disconnect the engine coolant hose.
- 11) Remove the turbocharger bracket.



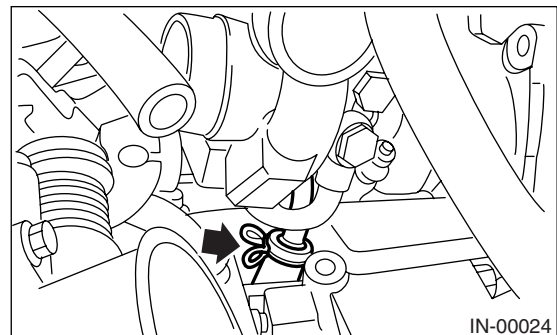
- 12) Disconnect the oil outlet hose from pipe.



- 13) Take out the turbocharger from engine compartment.

### B: INSTALLATION

- 1) Connect the oil outlet hose to outlet pipe.

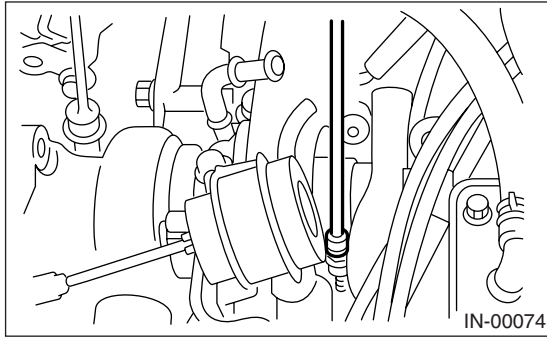


- 2) Install the turbocharger to intake duct.

# Turbocharger

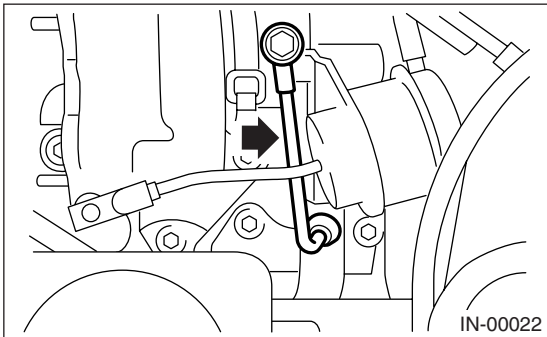
## INTAKE (INDUCTION)

**Tightening torque:**  
**3 N·m (0.3 kgf-m, 2.2 ft-lb)**



3) Install the oil inlet pipe to turbocharger, and connect the flare joint.

**Tightening torque:**  
**Union bolt**  
**16±1.5 N·m (1.6±0.15 kgf-m, 11.8±1.1 ft-lb)**  
**Flare joint**  
**20±2.0 N·m (2.0±0.2 kgf-m, 14.8±1.5 ft-lb)**

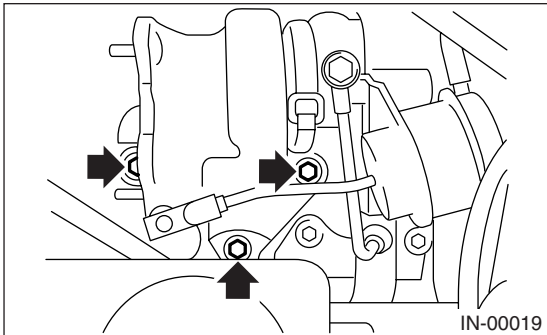


4) Install the turbocharger joint pipe to turbocharger.

NOTE:

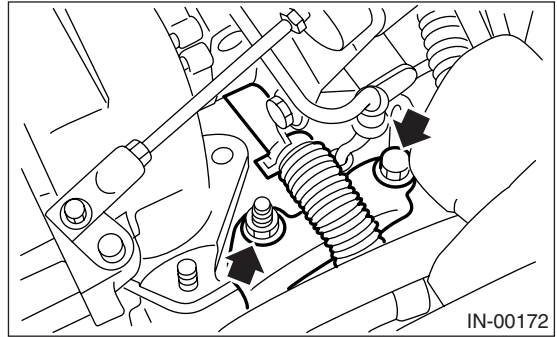
Replace the gasket with a new one.

**Tightening torque:**  
**35 N·m (3.6 kgf-m, 25.8 ft-lb)**

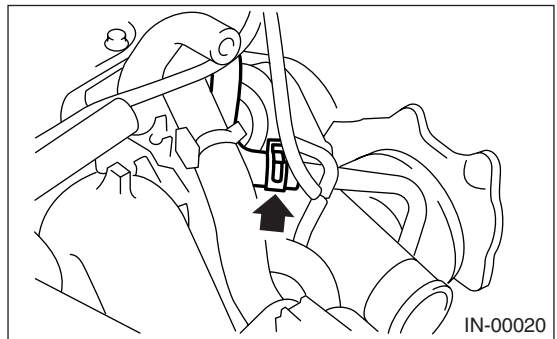


5) Connect the engine coolant hose.  
6) Install the turbocharger bracket.

**Tightening torque:**  
**33 N·m (3.4 kgf-m, 24.6 ft-lb)**



7) Connect the engine coolant hose which is connected to coolant filler tank.



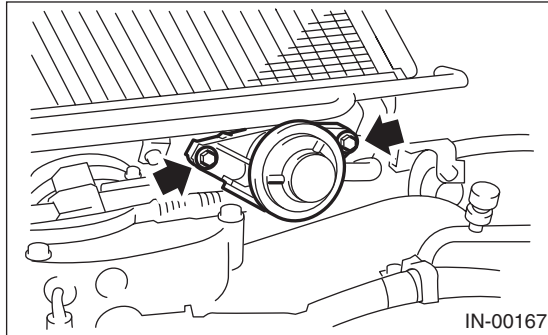
8) Lift-up the vehicle.

9) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-11, INSTALLATION, Center Exhaust Pipe.>

## 8. Air By-pass Valve

### A: REMOVAL

1) Remove the air by-pass valve from intercooler.



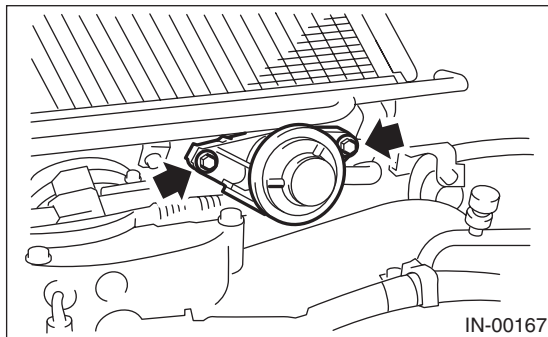
2) Disconnect the air by-pass hoses from air by-pass valve.

### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**

**16 N·m (1.6 kgf·m, 11.8 ft·lb)**



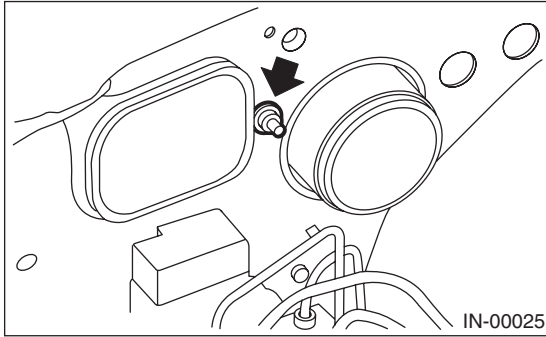
# Resonator Chamber

INTAKE (INDUCTION)

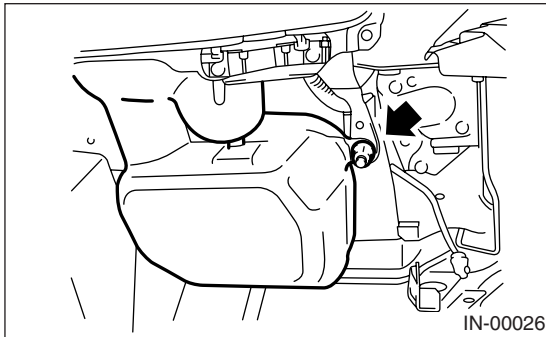
## 9. Resonator Chamber

### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Remove the air intake duct. <Ref. to IN(STI)-9, REMOVAL, Air Intake Duct.>
- 3) Remove the air cleaner lower case. <Ref. to IN(STI)-8, REMOVAL, Air Cleaner Case.>
- 4) Remove the resonator chamber mounting nut on right side of engine compartment.



- 5) Lift-up the vehicle, and then remove the front wheel RH.
- 6) Remove the front mud guard RH.
- 7) Remove the resonator chamber from the inside front fender.

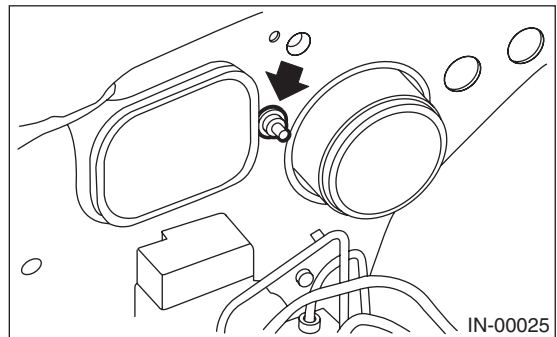
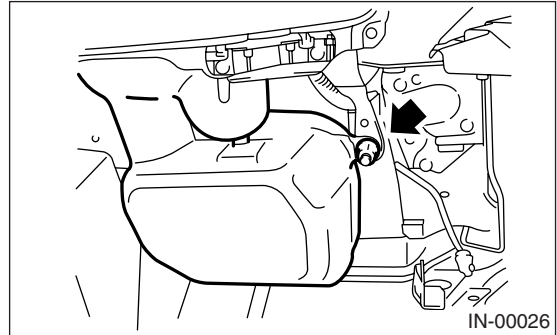


### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

**7.5 N·m (0.76 kgf-m, 5.5 ft-lb)**



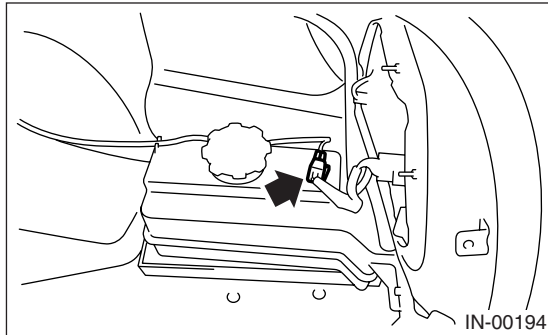
### C: INSPECTION

- 1) Inspect for cracks and loose connections.
- 2) Inspect that no foreign objects are mixed in resonator chamber.

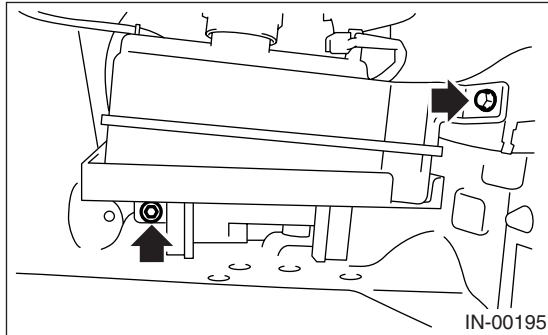
## 10. Intercooler Water Spray Tank

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the trunk room trim. <Ref. to EI-59, REMOVAL, Trunk Room Trim.>
- 3) Disconnect the water tank connector.



- 4) Remove the two water tank installation bolts.



- 5) Remove the hose between body and water tank, then remove the water tank.

### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

**6.0 N·m (0.61 kgf-m, 4.4 ft-lb)**

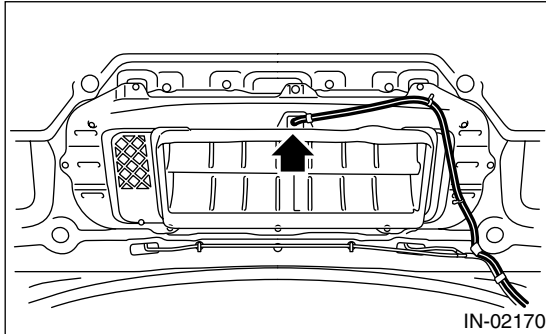
### C: INSPECTION

- 1) Make sure the hose is not deformed, damaged, cracked or clogged.
- 2) Make sure the water tank is not damaged or cracked.

## 11. Intercooler Water Spray Nozzle

### A: REMOVAL

- 1) Open the front hood.
- 2) Disconnect the connecting part of hose.
- 3) Push the clip of nozzle upward with the clip pressed by fingers from inside of front hood.



### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

Make sure the hose and nozzle are not deformed, damaged, cracked or clogged.

# MECHANICAL

# *ME(STI)*

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# General Description

MECHANICAL

## 1. General Description

### A: SPECIFICATION

|  |   |  |   |          |
|--|---|--|---|----------|
| Engine                                       | Cylinder arrangement  |  | Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine |          |
|  | Valve system mechanism  |  | Belt driven, double overhead camshaft, 4-valve/cylinder                   |          |
|  | Bore × Stroke mm (in)   |  | 99.5 × 79.0 (3.917 × 3.110)   |          |
|  | Piston displacement cm <sup>3</sup> (cu in)                             |  | 2,457 (150)   |          |
|  | Compression ratio   |  | 8.2   |          |
|  | Compression pressure (at 200 — 300 rpm) kPa (kgf/cm <sup>2</sup> , psi) |  | 981 — 1,177 (10 — 12, 142 — 171)  |          |
|  | Number of piston rings  |  | Pressure ring: 2, Oil ring: 1   |          |
|  | Intake valve timing   | Opening                                      | Max. retard   | ATDC 5°  |
|  |   |  | Min. advance  | BTDC 15° |
|  |   | Closing                                      | Max. retard   | ABDC 65° |
|  |   |  | Min. advance  | ABDC 45° |
|  | Exhaust valve timing  | Opening                                      | BBDC 55°  |          |
|  |   | Closing                                      | ATDC 5°   |          |
|  | Valve clearance   | Intake mm (in)                               | 0.20±0.02 (0.0079±0.0008)   |          |
|  |   | Exhaust mm (in)                              | 0.35±0.02 (0.0138±0.0008)   |          |
| Idling speed [At neutral position on MT] rpm |   | 700±100 (No load)<br>800±100 (A/C switch ON) |   |          |
| Firing order                                 |   | 1 → 3 → 2 → 4                                |   |          |
| Ignition timing BTDC/rpm                     |   | 17°±10°/700                                  |   |          |

**NOTE:**

STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter OS: Oversize US: Undersize

|                                  |  |                              |                                   |                                   |
|----------------------------------|--|------------------------------|-----------------------------------|-----------------------------------|
| Belt tension adjuster            | Protrusion of adjuster rod mm (in)           |                              | 5.2 — 6.2 (0.205 — 0.244)         |                                   |
| Belt tensioner                   | Spacer O.D. mm (in)                          |                              | 17.955 — 17.975 (0.7069 — 0.7077) |                                   |
|                                  | Tensioner bushing I.D. mm (in)               |                              | 18.0 — 18.08 (0.7087 — 0.7118)    |                                   |
|                                  | Clearance between spacer and bushing mm (in) | STD                          | 0.025 — 0.125 (0.0010 — 0.0049)   |                                   |
|                                  |  | Limit                        | 0.175 (0.0069)                    |                                   |
| Side clearance of spacer mm (in) | STD  | 0.2 — 0.55 (0.0079 — 0.0217) |                                   |                                   |
|                                  | Limit  | 0.81 (0.0319)                |                                   |                                   |
| Camshaft                         | Bend limit mm (in)                           |                              | 0.020 (0.00079)                   |                                   |
|                                  | Thrust clearance mm (in)                     | STD                          | 0.068 — 0.116 (0.0027 — 0.0046)   |                                   |
|                                  |  | Limit                        | 0.14 (0.0055)                     |                                   |
|                                  | Cam lobe height mm (in)                      | Intake                       | STD                               | 46.55 — 46.65 (1.833 — 1.837)     |
|                                  |  |                              | Limit                             | 46.45 (1.829)                     |
|                                  |  | Exhaust                      | STD                               | 46.75 — 46.85 (1.841 — 1.844)     |
|                                  |  |                              | Limit                             | 46.65 (1.837)                     |
|                                  | Journal O.D. mm (in)                         | STD                          | Front                             | 37.946 — 37.963 (1.4939 — 1.4946) |
|                                  |  |                              | Center rear                       | 29.946 — 29.963 (1.1790 — 1.1796) |
|                                  | Oil clearance at journal mm (in)             | STD                          | 0.037 — 0.072 (0.0015 — 0.0028)   |                                   |
| Limit                            |  | 0.10 (0.0039)                |                                   |                                   |
| Cylinder head                    | Surface warpage limit mm (in)                |                              | 0.035 (0.0014)                    |                                   |
|                                  | Surface grinding limit mm (in)               |                              | 0.3 (0.012)                       |                                   |
|                                  | Standard height mm (in)                      |                              | 127.5 (5.02)                      |                                   |

# General Description

MECHANICAL

|  |  |                      |   |  |
|--|--|----------------------|---|--|
| Valve seat                                       | Refacing angle   |                      |   | 90°  |
|  | Contacting width   | mm (in)              | Intake  | STD<br>0.6 — 1.4 (0.024 — 0.055)                                   |
|  |  |                      | Limit   | 1.7 (0.067)  |
|  | Exhaust  | STD                  | 1.2 — 1.8 (0.047 — 0.071)                         |  |
| Limit  |  | 2.2 (0.087)          |   |  |
| Valve guide                                      | Inner diameter mm (in)   |                      |   | 6.000 — 6.012 (0.2362 — 0.2367)                                    |
|  | Protrusion above head mm (in)                                    |                      |   | 15.8 — 16.2 (0.622 — 0.638)  |
| Valve  | Head edge thickness  | mm (in)              | Intake  | STD<br>1.0 — 1.4 (0.039 — 0.055)                                   |
|  |  |                      | Limit   | 0.8 (0.031)  |
|  | Exhaust  | STD                  | 1.3 — 1.7 (0.051 — 0.067)                         |  |
|  |  | Limit                | 0.8 (0.031)                                       |  |
|  | Stem diameter  | mm (in)              | Intake  | 5.955 — 5.970 (0.2344 — 0.2350)                                    |
|  |  |                      | Exhaust   | 5.945 — 5.960 (0.2341 — 0.2346)                                    |
|  | Stem oil clearance   | mm (in)              | STD   | Intake<br>0.030 — 0.057 (0.0012 — 0.0022)                          |
|  |  |                      | Limit   | Exhaust<br>0.040 — 0.067 (0.0016 — 0.0026)                         |
| Overall length                                   | mm (in)  | Intake               | 104.4 (4.110)                                     |  |
|  |  | Exhaust              | 104.65 (4.120)                                    |  |
| Valve spring                                     | Free length mm (in)  |                      |   | 47.32 (1.863)  |
|  | Squareness   |                      |   | 2.5°, 2.1 mm (0.083 in) or less                                    |
|  | Tension/spring height  | N (kgf, lbf)/mm (in) | Set   | 205 — 235 (20.9 — 24.0, 46.1 — 52.8)/36.0 (1.417)                  |
| Lift   |  |                      | 426 — 490 (43.4 — 50.0, 95.8 — 110)/26.50 (1.043) |  |
| Cylinder block                                   | Surface warpage limit (mating with cylinder head) mm (in)        |                      |   | 0.025 (0.00098)  |
|  | Surface grinding limit mm (in)                                   |                      |   | 0.1 (0.004)  |
|  | Standard height mm (in)  |                      |   | 201.0 (7.91)   |
|  | Cylinder bore  | mm (in)              | STD   | A<br>99.505 — 99.515 (3.9175 — 3.9179)                             |
|  |  |                      | B<br>99.495 — 99.505 (3.9171 — 3.9175)            |  |
|  | Taper  | mm (in)              | STD   | 0.015 (0.0006)   |
|  |  |                      | Limit   | 0.050 (0.0020)   |
|  | Out-of-roundness   | mm (in)              | STD   | 0.010 (0.0004)   |
|  |  |                      | Limit   | 0.050 (0.0020)   |
| Piston clearance                                 | mm (in)  | STD                  | -0.010 — 0.010 (-0.0004 — 0.0004)                 |  |
|  |  | Limit                | 0.030 (0.0012)                                    |  |
| Cylinder enlarging (boring) limit (dia.) mm (in) |  |                      | To 100.005 (3.937)                                |  |
| Piston   | Outer diameter   | mm (in)              | STD   | A<br>99.505 — 99.515 (3.9175 — 3.9179)                             |
|  |  |                      | B<br>99.495 — 99.505 (3.9171 — 3.9175)            |  |
|  |  | 0.25 (0.0098) OS     |   | 99.745 — 99.765 (3.9270 — 3.9278)                                  |
|  |  | 0.50 (0.0197) OS     |   | 99.995 — 100.015 (3.9368 — 3.9376)                                 |
| Piston pin                                       | Standard clearance between piston pin and hole in piston mm (in) |                      | STD   | 0.004 — 0.008 (0.0002 — 0.0003)                                    |
|  |  |                      | Limit   | 0.020 (0.0008)   |
|  | Degree of fit  |                      |   | Piston pin must be fitted into position with thumb at 20°C (68°F). |

## General Description

### MECHANICAL

|                        |   |                                 |                  |                                 |                               |
|------------------------|---|---------------------------------|------------------|---------------------------------|-------------------------------|
| Piston ring            | Piston ring gap                           | mm (in)                         | Top ring         | STD                             | 0.20 — 0.25 (0.0079 — 0.0098) |
|                        |   |                                 | Limit            |                                 | 1.0 (0.039)                   |
|                        |   | Second ring                     | STD              | 0.37 — 0.52 (0.015 — 0.020)     |                               |
|                        |   |                                 | Limit            | 1.0 (0.039)                     |                               |
|                        | Ring groove gap                           | mm (in)                         | Oil ring         | STD                             | 0.20 — 0.50 (0.0079 — 0.0197) |
|                        |   |                                 | Limit            | 1.5 (0.059)                     |                               |
|                        |   | Top ring                        | STD              | 0.040 — 0.080 (0.0016 — 0.0031) |                               |
|                        |   |                                 | Limit            | 0.15 (0.0059)                   |                               |
| Second ring            | STD                                       | 0.030 — 0.070 (0.0012 — 0.0028) |                  |                                 |                               |
|                        | Limit                                     | 0.15 (0.0059)                   |                  |                                 |                               |
| Connecting rod         | Bend twist per 100 mm (3.94 in) in length | mm (in)                         | Limit            |                                 | 0.10 (0.0039)                 |
|                        | Side clearance                            | mm (in)                         | STD              | 0.070 — 0.330 (0.0028 — 0.0130) |                               |
| Connecting rod bearing | Oil clearance                             | mm (in)                         | Limit            |                                 | 0.4 (0.016)                   |
|                        |   |                                 | STD              | 0.017 — 0.045 (0.0007 — 0.0018) |                               |
|                        | Thickness at center portion               | mm (in)                         | Limit            |                                 | 0.05 (0.0020)                 |
|                        |   |                                 | STD              | 1.490 — 1.502 (0.0587 — 0.0591) |                               |
|                        |   |                                 | 0.03 (0.0012) US | 1.504 — 1.512 (0.0592 — 0.0595) |                               |
|                        |   |                                 | 0.05 (0.0020) US | 1.514 — 1.522 (0.0596 — 0.0599) |                               |
| 0.25 (0.0098) US       | 1.614 — 1.622 (0.0635 — 0.0639)           |                                 |                  |                                 |                               |
|                        | Limit                                     |                                 | 0.030 (0.0012)   |                                 |                               |
| Connecting rod bushing | Clearance between piston pin and bushing  | mm (in)                         | STD              | 0 — 0.022 (0 — 0.0009)          |                               |
|                        |   |                                 | Limit            | 0.030 (0.0012)                  |                               |

# General Description

MECHANICAL

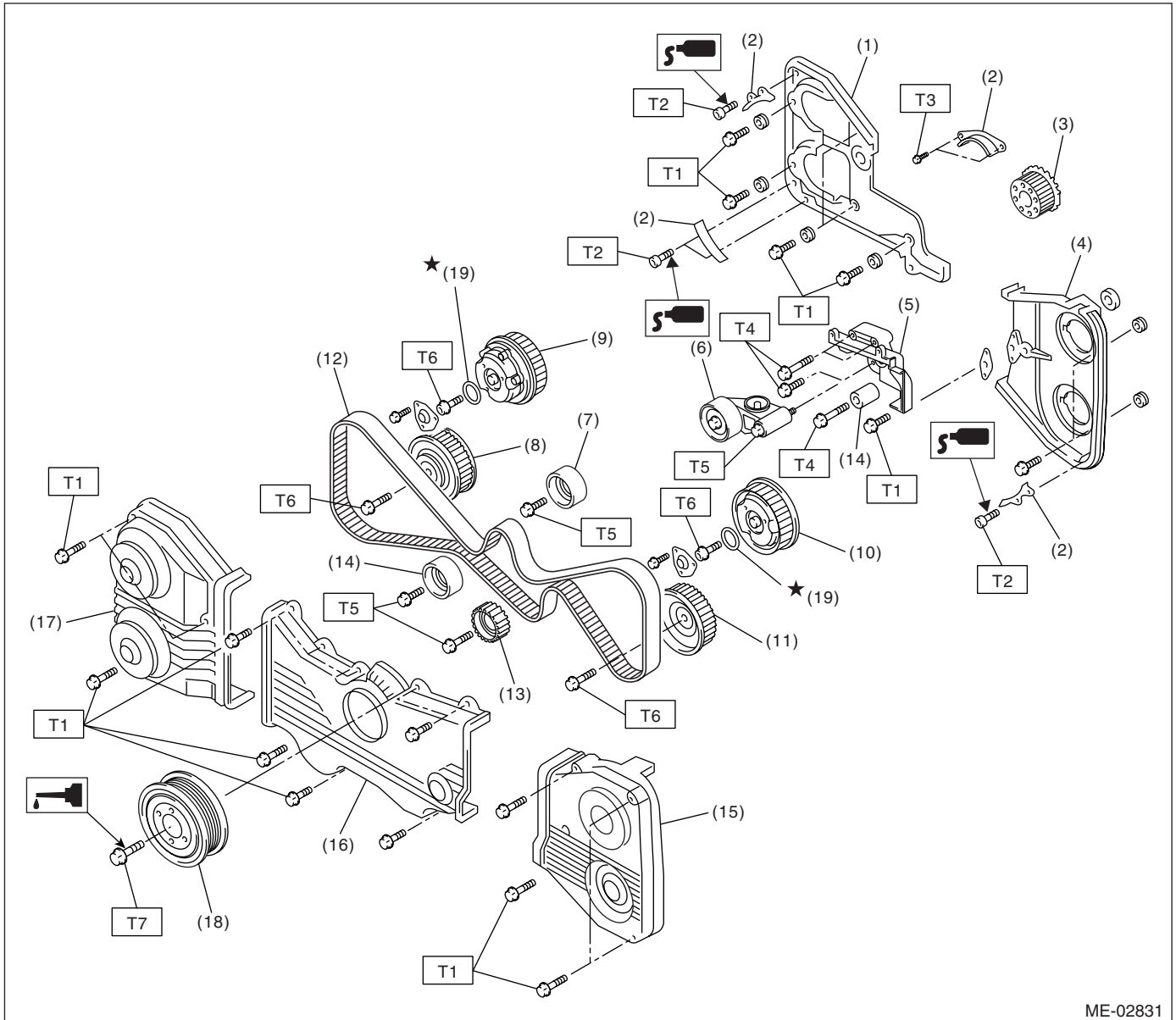
|              |                              |            |                        |                                   |                    |
|--------------|------------------------------|------------|------------------------|-----------------------------------|--------------------|
| Crankshaft   | Bend limit                   |            | mm (in)                | 0.035 (0.0014)                    |                    |
|              | Crank pin                    | mm (in)    | Out-of-roundness       |                                   | 0.003 (0.0001)     |
|              |                              |            | Cylindricity           |                                   | 0.004 (0.0002)     |
|              |                              |            | Grinding limit (dia.)  |                                   | To 51.750 (2.0374) |
|              | Crank journal                | mm (in)    | Out-of-roundness       |                                   | 0.005 (0.0002)     |
|              |                              |            | Cylindricity           |                                   | 0.006 (0.0002)     |
|              |                              |            | Grinding limit (dia.)  |                                   | To 59.750 (2.3524) |
|              | Crank pin outer diameter     | mm (in)    | STD                    | 51.984 — 52.000 (2.0466 — 2.0472) |                    |
|              |                              |            | 0.03<br>(0.0012)<br>US | 51.954 — 51.970 (2.0454 — 2.0461) |                    |
|              |                              |            | 0.05<br>(0.0020)<br>US | 51.934 — 51.950 (2.0447 — 2.0453) |                    |
|              |                              |            | 0.25<br>(0.0098)<br>US | 51.734 — 51.750 (2.0368 — 2.0374) |                    |
|              | Crank journal outer diameter | mm (in)    | STD                    | 59.992 — 60.008 (2.3619 — 2.3625) |                    |
|              |                              |            | 0.03<br>(0.0012)<br>US | 59.962 — 59.978 (2.3607 — 2.3613) |                    |
|              |                              |            | 0.05<br>(0.0020)<br>US | 59.942 — 59.958 (2.3599 — 2.3605) |                    |
|              |                              |            | 0.25<br>(0.0098)<br>US | 59.742 — 59.758 (2.3520 — 2.3527) |                    |
|              | Side clearance               | mm (in)    | STD                    | 0.030 — 0.115 (0.0012 — 0.0045)   |                    |
|              |                              |            | Limit                  | 0.25 (0.0098)                     |                    |
|              | Oil clearance                | mm (in)    | STD                    | 0.010 — 0.030 (0.0004 — 0.0012)   |                    |
| Limit        |                              |            | 0.040 (0.0016)         |                                   |                    |
| Main bearing | Main bearing thickness       | #1, #3     | STD                    | 1.998 — 2.011 (0.0787 — 0.0792)   |                    |
|              |                              |            | 0.03<br>(0.0012)<br>US | 2.017 — 2.020 (0.0794 — 0.0795)   |                    |
|              |                              |            | 0.05<br>(0.0020)<br>US | 2.027 — 2.030 (0.0798 — 0.0799)   |                    |
|              |                              |            | 0.25<br>(0.0098)<br>US | 2.127 — 2.130 (0.0837 — 0.0839)   |                    |
|              |                              | #2, #4, #5 | STD                    | 2.000 — 2.013 (0.0787 — 0.0793)   |                    |
|              |                              |            | 0.03<br>(0.0012)<br>US | 2.019 — 2.022 (0.0795 — 0.0796)   |                    |
|              |                              |            | 0.05<br>(0.0020)<br>US | 2.029 — 2.032 (0.0799 — 0.0800)   |                    |
|              |                              |            | 0.25<br>(0.0098)<br>US | 2.129 — 2.132 (0.0838 — 0.0839)   |                    |

# General Description

MECHANICAL

## B: COMPONENT

### 1. TIMING BELT



ME-02831

- |  |                                |
|--|--------------------------------|
| (1) Timing belt cover No. 2 (RH)         | (11) Exhaust cam sprocket (LH) |
| (2) Timing belt guide                    | (12) Timing belt               |
| (3) Crank sprocket                       | (13) Belt idler No. 2          |
| (4) Timing belt cover No. 2 (LH)         | (14) Belt idler                |
| (5) Tensioner bracket                    | (15) Timing belt cover (LH)    |
| (6) Automatic belt tension adjuster ASSY | (16) Front belt cover          |
| (7) Belt idler                           | (17) Timing belt cover (RH)    |
| (8) Exhaust cam sprocket (RH)            | (18) Crank pulley              |
| (9) Intake cam sprocket (RH)             | (19) O-ring                    |
| (10) Intake cam sprocket (LH)            |                                |

#### **Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 5 (0.5, 3.6)**

**T2: 6.4 (0.65, 4.7)**

**T3: 9.75 (1.0, 7)**

**T4: 24.5 (2.5, 18.1)**

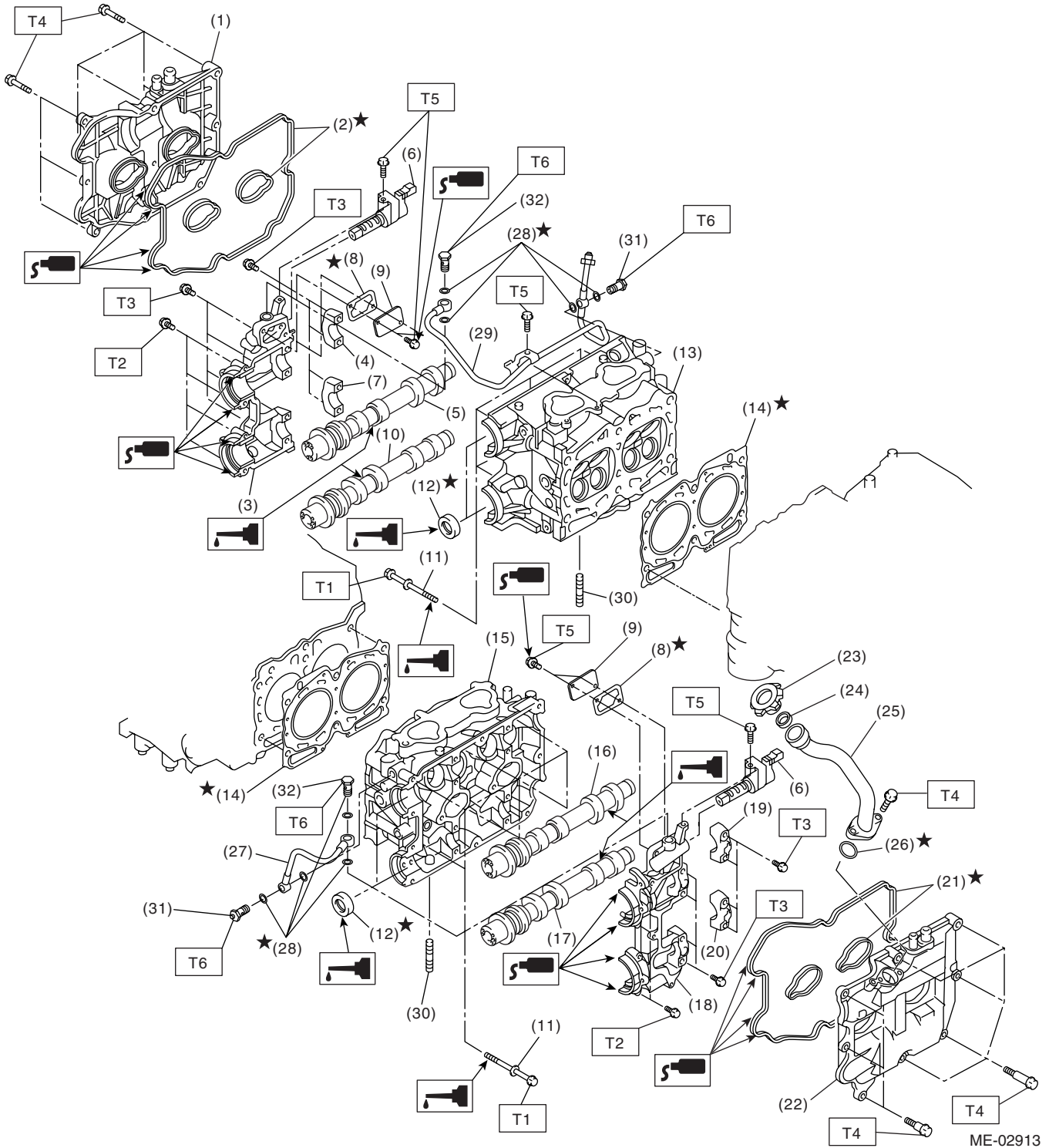
**T5: 39 (4.0, 28.9)**

**T6: <Ref. to ME(STI)-53, INSTALLATION, Crank Sprocket.>**

**T7: <Ref. to ME(STI)-42, INSTALLATION, Crank Pulley.>**

**ME(STI)-6**

## 2. CYLINDER HEAD AND CAMSHAFT



ME-02913

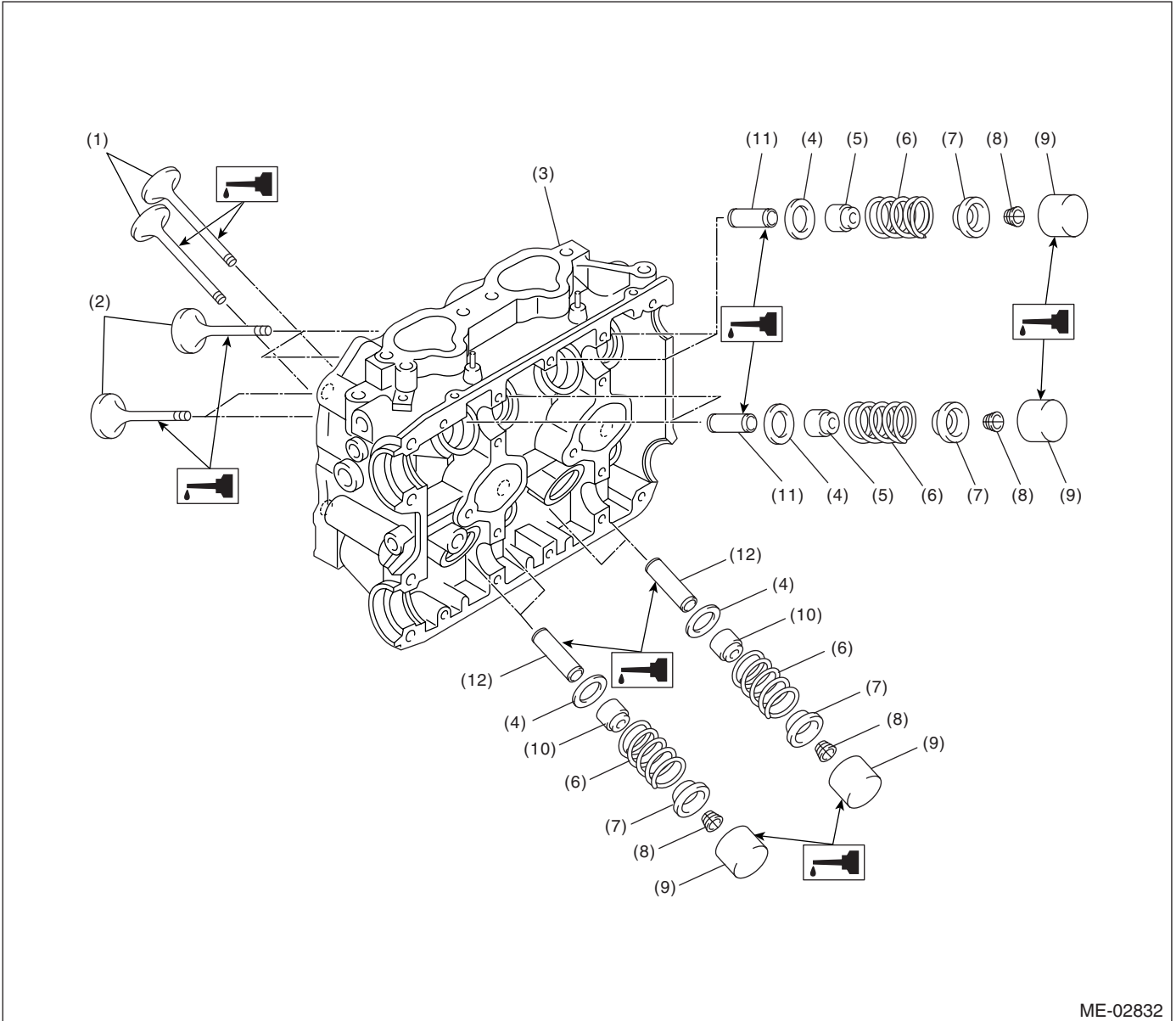
# General Description

## MECHANICAL

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|                                     |                                     |   |
|-------------------------------------|-------------------------------------|---|
| (1) Rocker cover (RH)               | (16) Intake camshaft (LH)           | (31) Union screw (with protrusion)  |
| (2) Rocker cover gasket (RH)        | (17) Exhaust camshaft (LH)          | (32) Union screw (without protrusion)                                       |
| (3) Camshaft cap (Front RH)         | (18) Camshaft cap (Front LH)        |   |
| (4) Intake camshaft cap (Rear RH)   | (19) Intake camshaft cap (Rear LH)  | <hr/>   |
| (5) Intake camshaft (RH)            | (20) Exhaust camshaft cap (Rear LH) | <b>Tightening torque: N·m (kgf·m, ft·lb)</b>                                |
| (6) Oil flow control solenoid valve | (21) Rocker cover gasket (LH)       | <b>T1: &lt;Ref. to ME(STI)-60,<br/>INSTALLATION, Cylinder<br/>Head.&gt;</b> |
| (7) Exhaust camshaft cap (Rear RH)  | (22) Rocker cover (LH)              |   |
| (8) Gasket                          | (23) Oil filler cap                 | <b>T2: &lt;Ref. to ME(STI)-55,<br/>INSTALLATION, Camshaft.&gt;</b>          |
| (9) Oil return cover                | (24) Gasket                         |   |
| (10) Exhaust camshaft (RH)          | (25) Oil filler duct                | <b>T3: &lt;Ref. to ME(STI)-55,<br/>INSTALLATION, Camshaft.&gt;</b>          |
| (11) Cylinder head bolt             | (26) O-ring                         |   |
| (12) Oil seal                       | (27) Oil pipe (LH)                  | <b>T4: 6.4 (0.65, 4.7)</b>  |
| (13) Cylinder head (RH)             | (28) Gasket                         | <b>T5: 8 (0.8, 5.9)</b>   |
| (14) Cylinder head gasket           | (29) Oil pipe (RH)                  | <b>T6: 29 (3.0, 21.4)</b>   |
| (15) Cylinder head (LH)             | (30) Stud bolt                      | <hr/>   |

## 3. CYLINDER HEAD AND VALVE ASSEMBLY



ME-02832

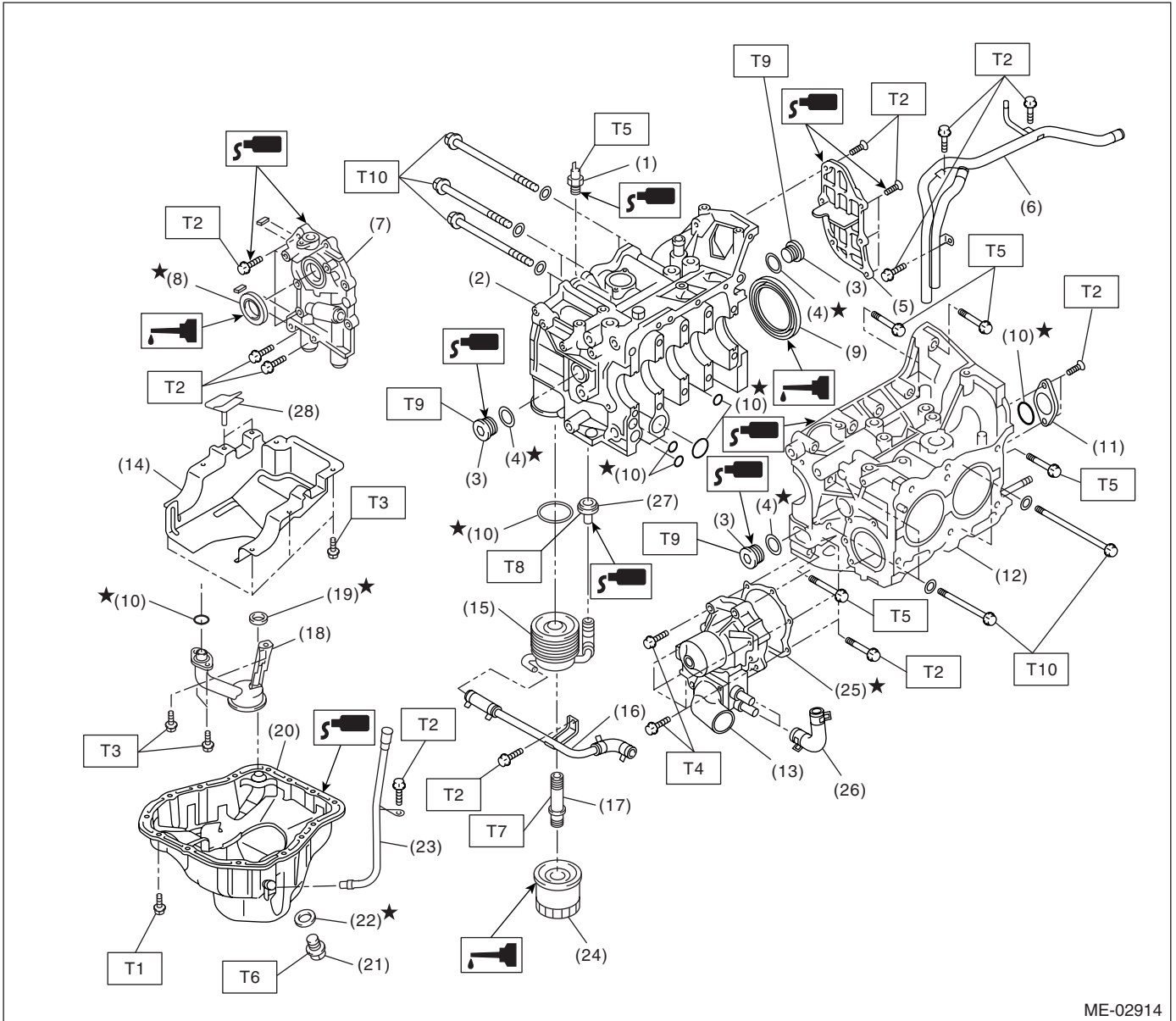
- |                       |                           |                             |
|-----------------------|---------------------------|-----------------------------|
| (1) Exhaust valve     | (5) Intake valve oil seal | (9) Valve lifter            |
| (2) Intake valve      | (6) Valve spring          | (10) Exhaust valve oil seal |
| (3) Cylinder head     | (7) Retainer              | (11) Intake valve guide     |
| (4) Valve spring seat | (8) Retainer key          | (12) Exhaust valve guide    |



# General Description

MECHANICAL

## 4. CYLINDER BLOCK



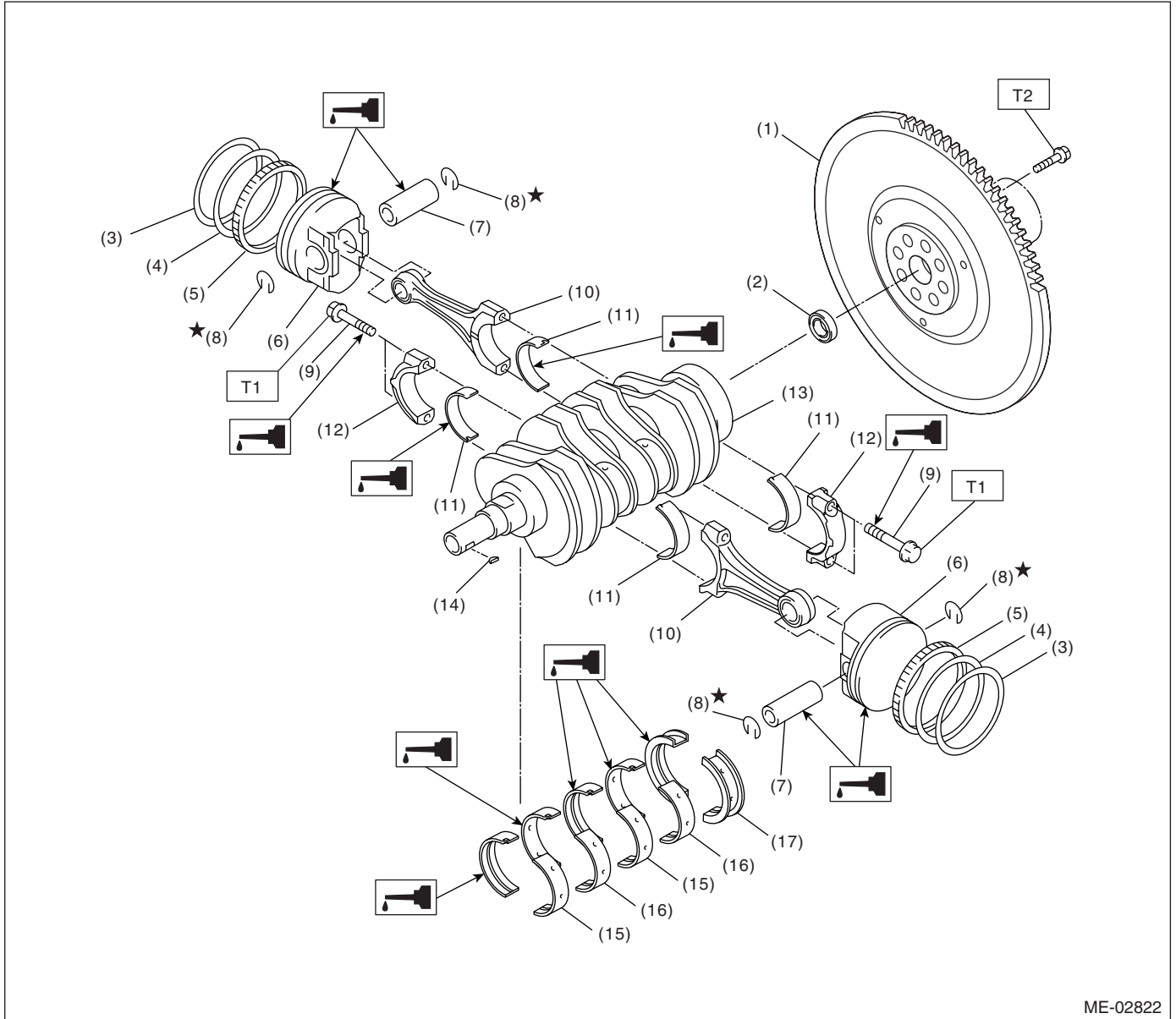
ME-02914

- |                          |                            |
|--------------------------|----------------------------|
| (1) Oil pressure switch  | (15) Oil cooler            |
| (2) Cylinder block (RH)  | (16) Water by-pass pipe    |
| (3) Service hole plug    | (17) Connector             |
| (4) Gasket               | (18) Oil strainer          |
| (5) Oil separator cover  | (19) Gasket                |
| (6) Water by-pass pipe   | (20) Oil pan               |
| (7) Oil pump             | (21) Drain plug            |
| (8) Front oil seal       | (22) Metal gasket          |
| (9) Rear oil seal        | (23) Oil level gauge guide |
| (10) O-ring              | (24) Oil filter            |
| (11) Service hole cover  | (25) Gasket                |
| (12) Cylinder block (LH) | (26) Water pump hose       |
| (13) Water pump          | (27) Plug                  |
| (14) Baffle plate        | (28) Seal                  |

### Tightening torque: N·m (kgf·m, ft·lb)

- T1: 5 (0.5, 3.6)**  
**T2: 6.4 (0.65, 4.7)**  
**T3: 10 (1.0, 7.4)**  
**T4: First 12 (1.2, 8.7)**  
**Second 12 (1.2, 8.7)**  
**T5: 25 (2.5, 18.4)**  
**T6: 44 (4.5, 33)**  
**T7: 54 (5.5, 40)**  
**T8: 69 (7.0, 50.9)**  
**T9: 70 (7.1, 51.6)**  
**T10: <Ref. to ME(STI)-70,**  
**INSTALLATION, Cylinder**  
**Block.>**

## 5. CRANKSHAFT AND PISTON



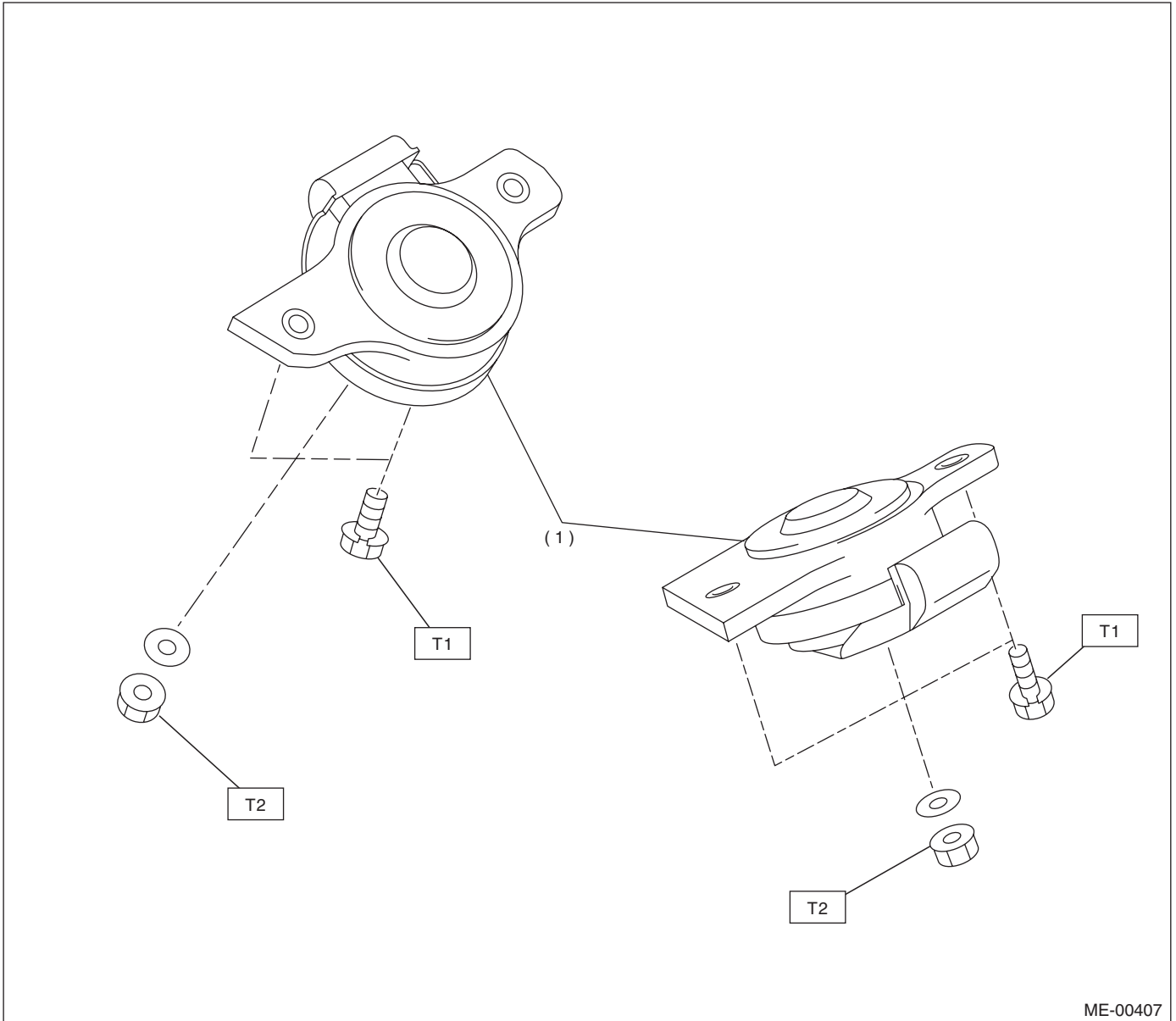
- |                  |                             |                                |
|------------------|-----------------------------|--------------------------------|
| (1) Flywheel     | (8) Snap ring               | (15) Crankshaft bearing #1, #3 |
| (2) Ball bearing | (9) Connecting rod bolt     | (16) Crankshaft bearing #2, #4 |
| (3) Top ring     | (10) Connecting rod         | (17) Crankshaft bearing #5     |
| (4) Second ring  | (11) Connecting rod bearing |                                |
| (5) Oil ring     | (12) Connecting rod cap     |                                |
| (6) Piston       | (13) Crankshaft             |                                |
| (7) Piston pin   | (14) Woodruff key           |                                |

**Tightening torque: N-m (kgf-m, ft-lb)**  
**T1: 52 (5.3, 38.4)**  
**T2: 75 (7.6, 55.3)**

# General Description

MECHANICAL

## 6. ENGINE MOUNTING



(1) Front cushion rubber

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 35 (3.6, 25.8)**

**T2: 85 (8.7, 62.7)**

## **C: CAUTION**

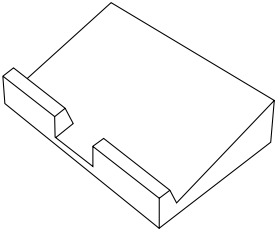
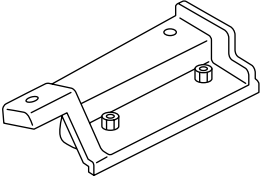
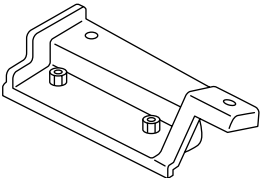
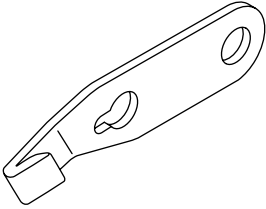
- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn yourself, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
- Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
- Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
- All removed parts, if to be reused, should be reinstalled in the original positions and directions.
- Bolts, nuts and washers should be replaced with new ones as required.
- Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
- Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
- Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
- Prior to starting work, prepare the following: Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
- Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

# General Description

MECHANICAL

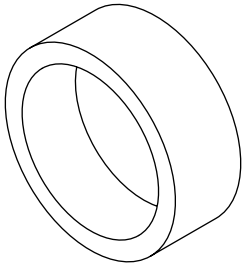
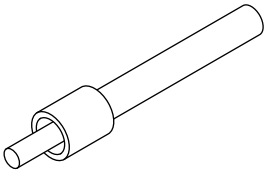
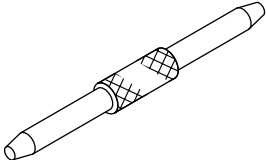
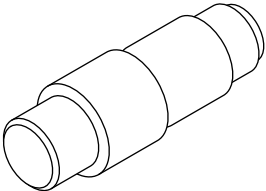
## D: PREPARATION TOOL

### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION             | REMARKS  |
|---|-------------|-------------------------|--|
| <br>ST-498267600   | 498267600   | CYLINDER HEAD TABLE     | <ul style="list-style-type: none"><li>• Used for replacing valve guides.</li><li>• Used for removing and installing valve springs.</li></ul> |
| <br>ST-498457000   | 498457000   | ENGINE STAND ADAPTER RH | Used with ENGINE STAND (499817000).  |
| <br>ST-498457100 | 498457100   | ENGINE STAND ADAPTER LH | Used with ENGINE STAND (499817000).  |
| <br>ST-498497100 | 498497100   | CRANKSHAFT STOPPER      | Used for stopping rotation of flywheel when loosening and tightening crank pulley bolt, etc.   |

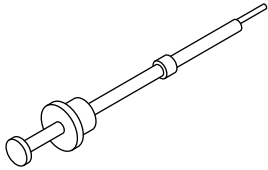
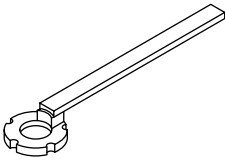
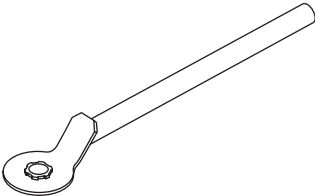
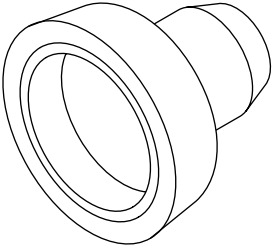
# General Description

MECHANICAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION                                  | REMARKS   |
|---|-------------|--|---|
|  <p style="text-align: center;">ST-498747300</p>   | 498747300   | PISTON GUIDE                                 | Used for installing piston in cylinder for 2.5 L engine.            |
|  <p style="text-align: center;">ST-498857100</p>   | 498857100   | VALVE OIL SEAL GUIDE                         | Used for press-fitting of intake and exhaust valve guide oil seals. |
|  <p style="text-align: center;">ST-499017100</p> | 499017100   | PISTON PIN GUIDE                             | Used for installing piston pin, piston and connecting rod.          |
|  <p style="text-align: center;">ST-499037100</p> | 499037100   | CONNECTING ROD BUSHING REMOVER AND INSTALLER | Used for removing and installing connecting rod bushing.            |

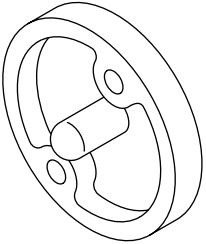
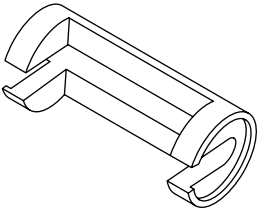
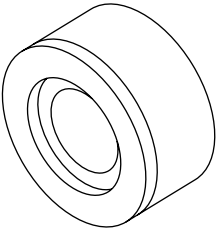
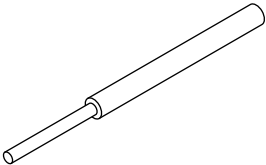
# General Description

## MECHANICAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION                      | REMARKS  |
|---|-------------|----------------------------------|--|
|  <p style="text-align: center;">ST-499097700</p>   | 499097700   | PISTON PIN<br>REMOVER ASSY       | Used for removing piston pin.  |
|  <p style="text-align: center;">ST-499207400</p>   | 499207400   | CAM SPROCKET<br>WRENCH           | Used for removing and installing exhaust cam sprocket.   |
|  <p style="text-align: center;">ST-499977500</p> | 499977500   | CAM SPROCKET<br>WRENCH           | Used for removing and installing intake cam sprocket.  |
|  <p style="text-align: center;">ST-499587200</p> | 499587200   | CRANKSHAFT OIL<br>SEAL INSTALLER | <ul style="list-style-type: none"> <li>• Used for installing crankshaft oil seal.</li> <li>• Used with CRANKSHAFT OIL SEAL GUIDE (499597100).</li> </ul> |

# General Description

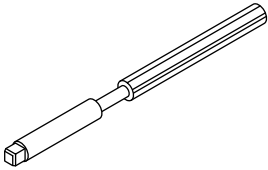
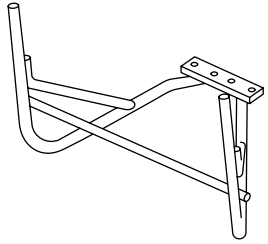
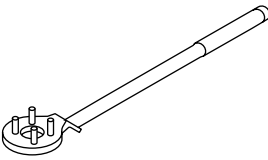
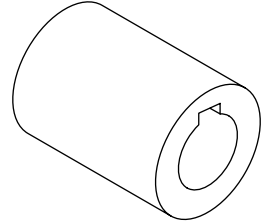
MECHANICAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION               | REMARKS  |
|---|-------------|---------------------------|--|
|  <p>ST-499597100</p>     | 499597100   | CRANKSHAFT OIL SEAL GUIDE | <ul style="list-style-type: none"> <li>• Used for installing crankshaft oil seal.</li> <li>• Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).</li> </ul> |
|  <p>ST-499718000</p>     | 499718000   | VALVE SPRING REMOVER      | Used for removing and installing valve spring.   |
|  <p>ST18251AA020</p> | 18251AA020  | VALVE GUIDE ADJUSTER      | Used for installing intake and exhaust valve guides.   |
|  <p>ST-499767200</p> | 499767200   | VALVE GUIDE REMOVER       | Used for removing valve guides.  |



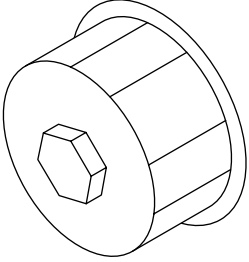
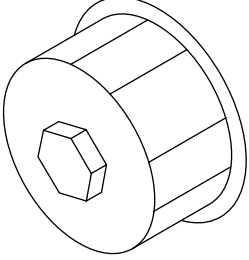
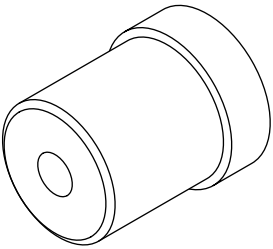
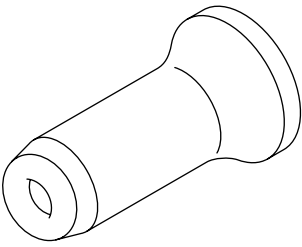
# General Description

## MECHANICAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION         | REMARKS  |
|---|-------------|---------------------|--|
|  <p style="text-align: center;">ST-499767400</p>   | 499767400   | VALVE GUIDE REAMER  | Used for reaming valve guides.   |
|  <p style="text-align: center;">ST-499817000</p>   | 499817000   | ENGINE STAND        | <ul style="list-style-type: none"> <li>• Stand used for engine disassembly and assembly.</li> <li>• Used with ENGINE STAND ADAPTER RH (498457000) and LH (498457100).</li> </ul> |
|  <p style="text-align: center;">ST-499977100</p> | 499977100   | CRANK PULLEY WRENCH | Used for stopping rotation of crank pulley when loosening and tightening crank pulley bolts.   |
|  <p style="text-align: center;">ST-499987500</p> | 499987500   | CRANKSHAFT SOCKET   | Used for rotating crankshaft.  |

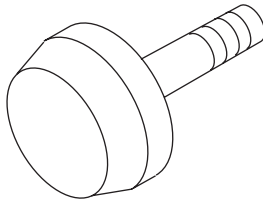
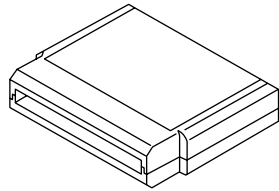

# General Description

MECHANICAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION        | REMARKS  |
|---|-------------|--------------------|--|
|  <p style="text-align: center;">ST18332AA000</p>   | 18332AA000  | OIL FILTER WRENCH  | Used for removing and installing the oil filter. (Outer diameter: 68 mm (2.68 in)) |
|  <p style="text-align: center;">ST18332AA010</p>   | 18332AA010  | OIL FILTER WRENCH  | Used for removing and installing the oil filter. (Outer diameter: 65 mm (2.56 in)) |
|  <p style="text-align: center;">ST-499587100</p> | 499587100   | OIL SEAL INSTALLER | Used for installing oil pump oil seal.   |
|  <p style="text-align: center;">ST-499587600</p> | 499587600   | OIL SEAL GUIDE     | Used for installing camshaft oil seal for DOHC engine.                             |

# General Description

## MECHANICAL

| ILLUSTRATION   | TOOL NUMBER                        | DESCRIPTION               | REMARKS   |
|--|------------------------------------|---------------------------|---|
| <br>ST-499597200  | 499597200                          | OIL SEAL GUIDE            | <ul style="list-style-type: none"> <li>• Used for installing camshaft oil seal for DOHC engine.</li> <li>• Used with OIL SEAL GUIDE (499587600).</li> </ul> |
| <br>ST18482AA010  | 18482AA010<br>(Newly adopted tool) | CARTRIDGE                 | Troubleshooting for electrical systems.   |
| <br>ST22771AA030 | 22771AA030                         | SUBARU SELECT MONITOR KIT | Troubleshooting for electrical systems.   |

## 2. GENERAL TOOL

| TOOL NAME         | REMARKS                         |
|-------------------|---------------------------------|
| Compression gauge | Used for measuring compression. |

## E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing Belt
- Camshaft
- Cylinder Head

## 2. Compression

### A: INSPECTION

**CAUTION:**

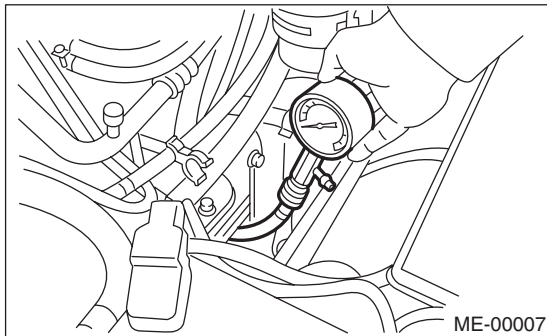
**After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.**

- 1) After warming-up the engine, turn the ignition switch to OFF.
- 2) Make sure that the battery is fully charged.
- 3) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 4) Remove all the spark plugs. <Ref. to IG(STI)-4, REMOVAL, Spark Plug.>
- 5) Fully open the throttle valve.
- 6) Check the starter motor for satisfactory performance and operation.
- 7) Fix the compression gauge securely against spark plug hole.

**NOTE:**

The screw of screw-in type compression gauge (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

- 8) Crank the engine by means of starter motor, and then read the maximum value on the gauge when the needle of gauge is steady.



- 9) Perform at least two measurements per cylinder, and make sure that the values are correct.

**Compression (at 200 — 300 rpm):**

**Standard:**

**981 — 1,177 kPa (10 — 12 kgf/cm<sup>2</sup>, 142 — 171 psi)**

**Limit:**

**882 kPa (9.0 kgf/cm<sup>2</sup>, 128 psi)**

**Difference between cylinders**

**Less than 49 kPa (0.5 kgf/cm<sup>2</sup>, 7 psi)**

## 3. Idle Speed

### A: INSPECTION

1) Before checking the idle speed, check the following:

(1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that the hoses are connected properly.

(2) Ensure the malfunction indicator light does not illuminate.

2) Warm-up the engine.

3) Stop the engine, and then turn the ignition switch to OFF.

4) Insert the cartridge to Subaru Select Monitor.

5) Connect the Subaru Select Monitor to data link connector.

6) Turn the ignition switch to ON, and Subaru Select Monitor power switch to ON.

7) Select the {2. Each System Check} in Main Menu.

8) Select the {Engine Control System} in Selection Menu.

9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.

10) Select the {1.12 Data Display} in Data Display Menu.

11) Start the engine, and then read the engine idle speed.

12) Check the idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

***Idle speed [No load and gears in neutral]:***

***700±100 rpm***

13) Check the idle speed when loaded. (Turn the air conditioning switch to “ON” and operate the compressor for at least 1 minute before measurement.)

***Idle speed [A/C “ON”, no load and gears in neutral]:***

***800±100 rpm***

NOTE:

As the idle speed is automatically controlled, it can not be adjusted manually. If the idle speed is out of specifications, refer to General On-board Diagnosis Table under “Engine Control System”. <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.>

## 4. Ignition Timing

### A: INSPECTION

**CAUTION:**

**After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.**

- 1) Before checking the ignition timing speed, check the following:
  - (1) Ensure the air cleaner element is free from clogging, spark plugs are in good condition, and that hoses are connected properly.
  - (2) Ensure the malfunction indicator light does not illuminate.
- 2) Warm-up the engine.
- 3) Stop the engine, and then turn the ignition switch to OFF.
- 4) Insert the cartridge to Subaru Select Monitor.
- 5) Connect the Subaru Select Monitor to data link connector.
- 6) Turn the ignition switch to ON, and Subaru Select Monitor power switch to ON.
- 7) Select the {2. Each System Check} in Main Menu.
- 8) Select the {Engine Control System} in Selection Menu.
- 9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
- 10) Select the {1.12 Data Display} in Data Display Menu.
- 11) Start the engine and check the ignition timing at idle speed.

**Ignition timing [BTDC/rpm]:** **$17^{\circ} \pm 10^{\circ} / 700$** 

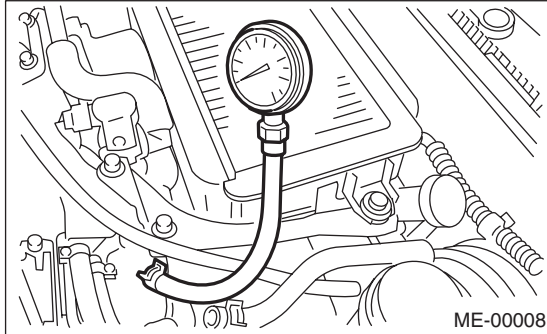
If the timing is not correct, check the ignition control system. Refer to Engine Control System. <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.>

## 5. Intake Manifold Vacuum

### A: INSPECTION

- 1) Warm-up the engine.
- 2) Disconnect the brake vacuum hose from intake manifold, and then install the vacuum gauge.
- 3) Keep the engine at the idle speed, and then read the vacuum gauge indication.

By observing the gauge needle movement, the internal condition of engine can be diagnosed as described below.



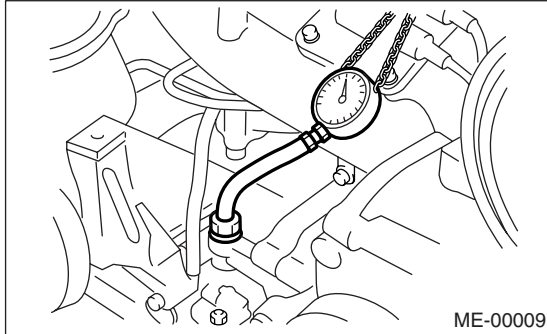
**Vacuum pressure (at idling, A/C "OFF"):**  
**Less than  $-60.0$  kPa ( $-450$  mmHg,  $-17.72$  in-Hg)**

| Diagnosis of engine condition by measurement of manifold vacuum   |   |
|---|---|
| Vacuum gauge indication   | Possible engine condition   |
| 1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.                                     | Leakage around intake manifold gasket or disconnection or damaged vacuum hose |
| 2. Needle intermittently drops to position lower than normal position.  | Leakage around cylinder   |
| 3. Needle drops suddenly and intermittently from normal position.   | Sticky valves   |
| 4. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases. | Weak or broken valve springs  |
| 5. Needle vibrates above and below normal position in narrow range.   | Defective ignition system or throttle chamber idle adjustment                 |

## 6. Engine Oil Pressure

### A: INSPECTION

- 1) Remove the oil pressure switch from engine cylinder block. <Ref. to LU(STI)-18, REMOVAL, Oil Pressure Switch.>
- 2) Connect the oil pressure gauge hose to cylinder block.
- 3) Connect the battery ground cable to battery.
- 4) Start the engine, and then measure the oil pressure.



#### **Oil pressure:**

**98 kPa (1.0 kgf/cm<sup>2</sup>, 14 psi) or more at 600 rpm**

**294 kPa (3.0 kgf/cm<sup>2</sup>, 43 psi) or more at 5,000 rpm**

#### **CAUTION:**

- If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU(STI)-25, INSPECTION, Engine Lubrication System Trouble in General.>
- If the oil pressure warning light is turned ON and oil pressure is in specification, replace the oil pressure switch. <Ref. to LU(STI)-25, INSPECTION, Engine Lubrication System Trouble in General.>

#### **NOTE:**

The specified data is based on an engine oil temperature of 80°C (176°F).

- 5) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(STI)-18, INSTALLATION, Oil Pressure Switch.>

#### **Tightening torque:**

**25 N·m (2.5 kgf·m, 18.4 ft·lb)**



## 7. Fuel Pressure

### A: INSPECTION

#### CAUTION:

Before removing the fuel pressure gauge, release the fuel pressure.

#### NOTE:

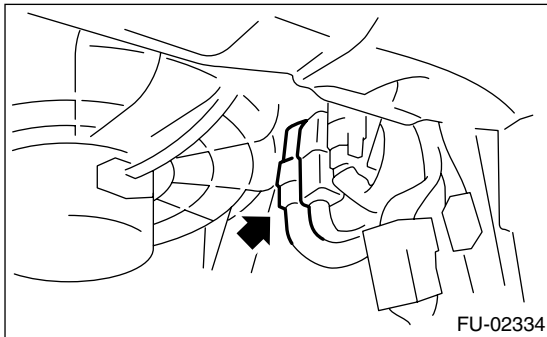
If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Open the fuel filler flap lid, and then remove the fuel filler cap.

3) Disconnect the fuel delivery hoses, and then connect the fuel pressure gauge.

4) Connect the connector of fuel pump relay.

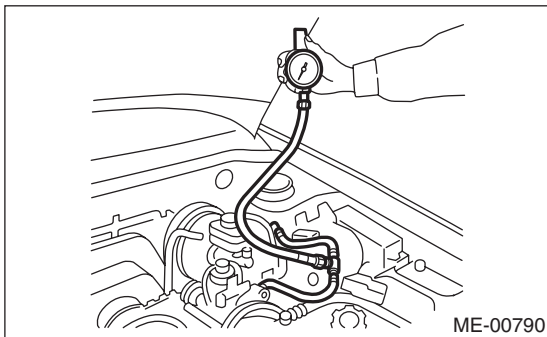


5) Start the engine.

6) Measure the fuel pressure while disconnecting the pressure regulator vacuum hose from intake manifold.

#### Fuel pressure:

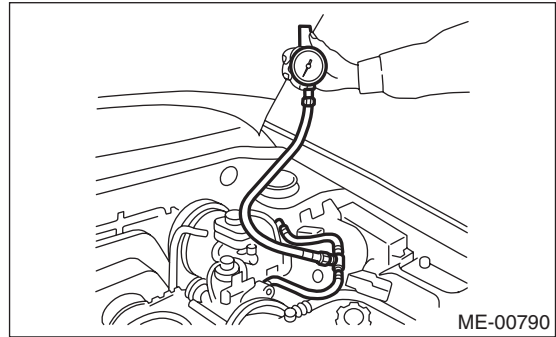
**Standard: 284 — 314 kPa (2.9 — 3.2 kgf/cm<sup>2</sup>, 41 — 46 psi)**



7) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

#### Fuel pressure:

**Standard: 230 — 260 kPa (2.35 — 2.65 kgf/cm<sup>2</sup>, 33 — 38 psi)**



#### NOTE:

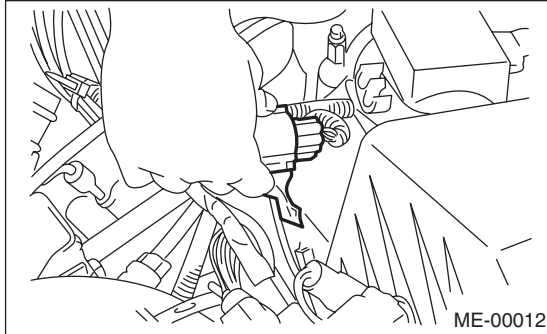
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm<sup>2</sup>, 1 to 3 psi) higher than standard values during high-altitude operations.

## 8. Valve Clearance

### A: INSPECTION

Inspection and adjustment of the valve clearance should be performed while engine is cold.

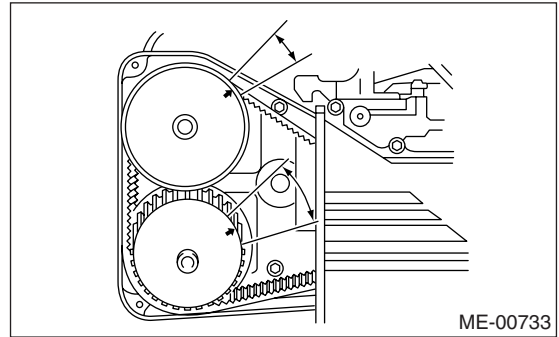
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
- 4) Remove the bolts which secure the timing belt cover (RH).
- 5) Lift-up the vehicle.
- 6) Remove the under cover.
- 7) Loosen the remaining bolts which secure the timing belt cover (RH), and then remove the timing belt cover.
- 8) Lower the vehicle.
- 9) When inspecting the #1 and #3 cylinders:
  - (1) Pull out the engine harness connector with bracket from air cleaner upper cover.



- (2) Remove the air cleaner case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
  - (3) Disconnect the ignition coil connector.
  - (4) Remove the ignition coil.
  - (5) Place a suitable container under the vehicle.
  - (6) Disconnect the PCV hose from rocker cover (RH).
  - (7) Remove the bolts, and then remove the rocker cover (RH).
- 10) When inspecting the #2 and #4 cylinders:
    - (1) Disconnect the battery cable, and then remove the battery and battery carrier.
    - (2) Disconnect the ignition coil connector.
    - (3) Remove the ignition coil.
    - (4) Place a suitable container under the vehicle.
    - (5) Disconnect the PCV hose from rocker cover (LH).
    - (6) Remove the bolts, and then remove the rocker cover (LH).
  - 11) Turn the crank pulley clockwise until arrow mark on the cam sprocket is set to position shown in the figure.

NOTE:

Turn the crankshaft using socket wrench.



- 12) Measure the #1 cylinder intake valve and #3 cylinder exhaust valve clearance by using thickness gauge (A).

NOTE:

- Insert the thickness gauge (A) as horizontally as possible with respect to the shim.
- Measure the exhaust valve clearances while lifting-up the vehicle.

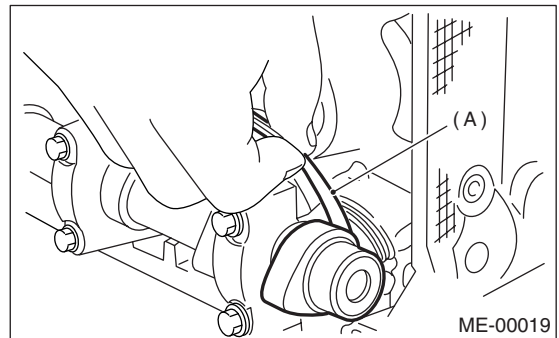
**Valve clearance:**

**Intake:  $0.20 \pm 0.02$  mm ( $0.0079 \pm 0.0008$  in)**

**Exhaust:  $0.35 \pm 0.02$  mm ( $0.0138 \pm 0.0008$  in)**

NOTE:

If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.

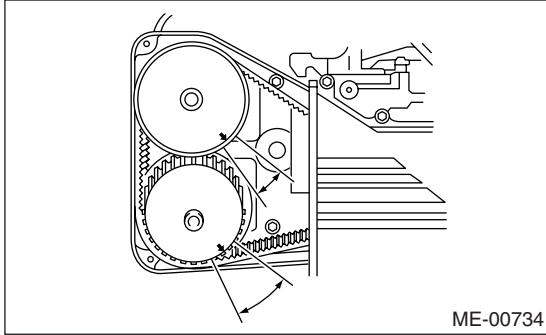


- 13) If necessary, adjust the valve clearance. <Ref. to ME(STI)-28, ADJUSTMENT, Valve Clearance.>
- 14) Further turn the crank pulley clockwise. Using the same procedures described previously, measure the valve clearances again.

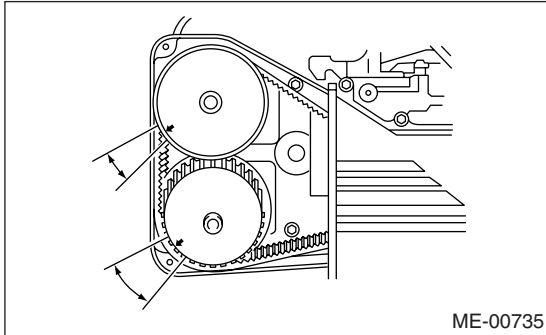
# Valve Clearance

## MECHANICAL

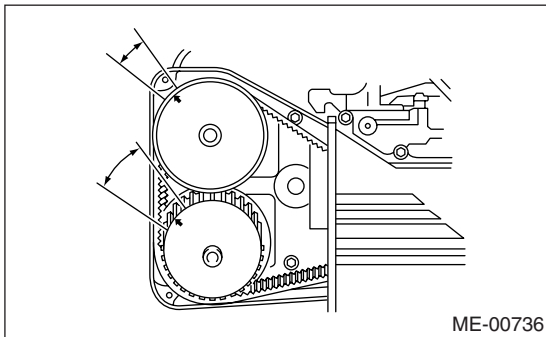
(1) Set the arrow mark on cam sprocket to position shown in the figure, and then measure the #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



(2) Set the arrow mark on cam sprocket to position shown in the figure, and then measure the #2 cylinder intake valve and #4 cylinder exhaust valve clearances.

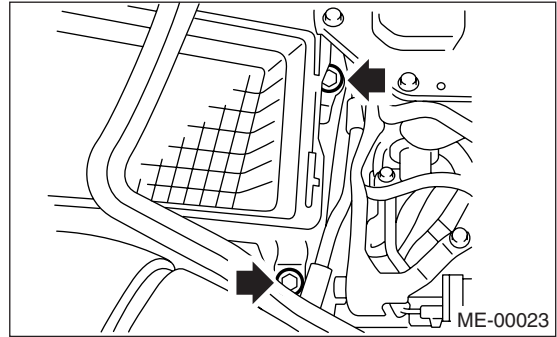


(3) Set the arrow mark on cam sprocket to position shown in the figure, and then measure the #1 cylinder exhaust valve and #4 cylinder intake valve clearances.



15) After inspection, install the related parts in the reverse order of removal.

**Tightening torque:**  
**33 N·m (3.4 kgf·m, 25 ft·lb)**



## B: ADJUSTMENT

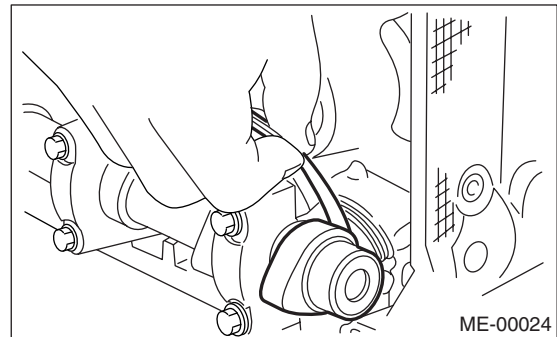
### CAUTION:

**Adjustment of the valve clearance should be performed while engine is cold.**

1) Measure all valve clearances. <Ref. to ME(STI)-27, INSPECTION, Valve Clearance.>

### NOTE:

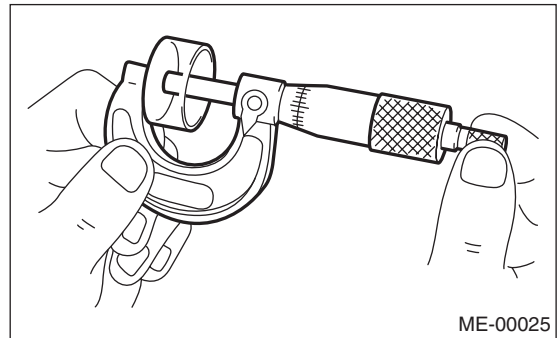
Record each valve clearance after it has been measured.



2) Remove the camshaft. <Ref. to ME(STI)-54, REMOVAL, Camshaft.>

3) Remove the valve lifter.

4) Measure the thickness of valve lifter with a micrometer.



5) Select a valve lifter of suitable thickness using measured valve clearance and valve lifter thickness, by referring to the following table.

# Valve Clearance

MECHANICAL

|                                       |
|---------------------------------------|
| Unit: mm                              |
| Intake valve: $S = (V + T) - 0.20$    |
| Exhaust valve: $S = (V + T) - 0.35$   |
| S: Required thickness of valve lifter |
| V: Measured valve clearance           |
| T: Used valve lifter thickness        |

| Part No.    | Thickness mm (in) |
|-------------|-------------------|
| 13228 AB102 | 4.68 (0.1843)     |
| 13228 AB112 | 4.69 (0.1846)     |
| 13228 AB122 | 4.70 (0.1850)     |
| 13228 AB132 | 4.71 (0.1854)     |
| 13228 AB142 | 4.72 (0.1858)     |
| 13228 AB152 | 4.73 (0.1862)     |
| 13228 AB162 | 4.74 (0.1866)     |
| 13228 AB172 | 4.75 (0.1870)     |
| 13228 AB182 | 4.76 (0.1874)     |
| 13228 AB192 | 4.77 (0.1878)     |
| 13228 AB202 | 4.78 (0.1882)     |
| 13228 AB212 | 4.79 (0.1886)     |
| 13228 AB222 | 4.80 (0.1890)     |
| 13228 AB232 | 4.81 (0.1894)     |
| 13228 AB242 | 4.82 (0.1898)     |
| 13228 AB252 | 4.83 (0.1902)     |
| 13228 AB262 | 4.84 (0.1906)     |
| 13228 AB272 | 4.85 (0.1909)     |
| 13228 AB282 | 4.86 (0.1913)     |
| 13228 AB292 | 4.87 (0.1917)     |
| 13228 AB302 | 4.88 (0.1921)     |
| 13228 AB312 | 4.89 (0.1925)     |
| 13228 AB322 | 4.90 (0.1929)     |
| 13228 AB332 | 4.91 (0.1933)     |
| 13228 AB342 | 4.92 (0.1937)     |
| 13228 AB352 | 4.93 (0.1941)     |
| 13228 AB362 | 4.94 (0.1945)     |
| 13228 AB372 | 4.95 (0.1949)     |
| 13228 AB382 | 4.96 (0.1953)     |
| 13228 AB392 | 4.97 (0.1957)     |
| 13228 AB402 | 4.98 (0.1961)     |
| 13228 AB412 | 4.99 (0.1965)     |
| 13228 AB422 | 5.00 (0.1969)     |
| 13228 AB432 | 5.01 (0.1972)     |
| 13228 AB442 | 5.02 (0.1976)     |
| 13228 AB452 | 5.03 (0.1980)     |
| 13228 AB462 | 5.04 (0.1984)     |
| 13228 AB472 | 5.05 (0.1988)     |
| 13228 AB482 | 5.06 (0.1992)     |
| 13228 AB492 | 5.07 (0.1996)     |
| 13228 AB502 | 5.08 (0.2000)     |
| 13228 AB512 | 5.09 (0.2004)     |
| 13228 AB522 | 5.10 (0.2008)     |
| 13228 AB532 | 5.11 (0.2012)     |

| Part No.    | Thickness mm (in) |
|-------------|-------------------|
| 13228 AB542 | 5.12 (0.2016)     |
| 13228 AB552 | 5.13 (0.2020)     |
| 13228 AB562 | 5.14 (0.2024)     |
| 13228 AB572 | 5.15 (0.2028)     |
| 13228 AB582 | 5.16 (0.2031)     |
| 13228 AB592 | 5.17 (0.2035)     |
| 13228 AB602 | 5.18 (0.2039)     |
| 13228 AB612 | 5.19 (0.2043)     |
| 13228 AB622 | 5.20 (0.2047)     |
| 13228 AB632 | 5.21 (0.2051)     |
| 13228 AB642 | 5.22 (0.2055)     |
| 13228 AB652 | 5.23 (0.2059)     |
| 13228 AB662 | 5.24 (0.2063)     |
| 13228 AB672 | 5.25 (0.2067)     |
| 13228 AB682 | 5.26 (0.2071)     |
| 13228 AB692 | 5.27 (0.2075)     |
| 13228 AB702 | 4.38 (0.1724)     |
| 13228 AB712 | 4.40 (0.1732)     |
| 13228 AB722 | 4.42 (0.1740)     |
| 13228 AB732 | 4.44 (0.1748)     |
| 13228 AB742 | 4.46 (0.1756)     |
| 13228 AB752 | 4.48 (0.1764)     |
| 13228 AB762 | 4.50 (0.1771)     |
| 13228 AB772 | 4.52 (0.1780)     |
| 13228 AB782 | 4.54 (0.1787)     |
| 13228 AB792 | 4.56 (0.1795)     |
| 13228 AB802 | 4.58 (0.1803)     |
| 13228 AB812 | 4.60 (0.1811)     |
| 13228 AB822 | 4.62 (0.1819)     |
| 13228 AB832 | 4.64 (0.1827)     |
| 13228 AB842 | 4.66 (0.1835)     |
| 13228 AB852 | 5.29 (0.2083)     |
| 13228 AB862 | 5.31 (0.2091)     |
| 13228 AB872 | 5.33 (0.2098)     |
| 13228 AB882 | 5.35 (0.2106)     |
| 13228 AB892 | 5.37 (0.2114)     |
| 13228 AB902 | 5.39 (0.2122)     |
| 13228 AB912 | 5.41 (0.2123)     |
| 13228 AB922 | 5.43 (0.2138)     |
| 13228 AB932 | 5.45 (0.2146)     |
| 13228 AB942 | 5.47 (0.2154)     |
| 13228 AB952 | 5.49 (0.2161)     |
| 13228 AB962 | 5.51 (0.2169)     |
| 13228 AB972 | 5.53 (0.2177)     |
| 13228 AB982 | 5.55 (0.2185)     |
| 13228 AB992 | 5.57 (0.2193)     |
| 13228 AC002 | 5.59 (0.2201)     |
| 13228 AC012 | 5.61 (0.2209)     |
| 13228 AC022 | 5.63 (0.2217)     |
| 13228 AC032 | 5.65 (0.2224)     |

## Valve Clearance

### MECHANICAL

---

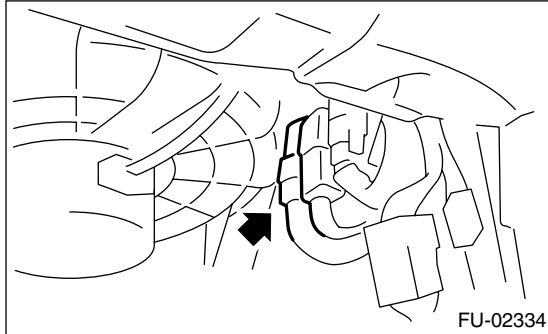
6) Inspect all valves for clearance again at this stage. If the valve clearance is not correct, repeat the procedure over again from the first step.

7) After inspection, install the related parts in the reverse order of removal.

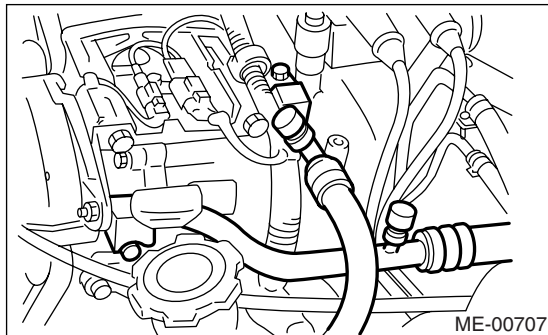
## 9. Engine Assembly

### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Open the front hood fully, and then support with the hood stay.
- 3) Collect the refrigerant from A/C system.
- 4) Release the fuel pressure.
  - (1) Disconnect the fuel pump relay connector.

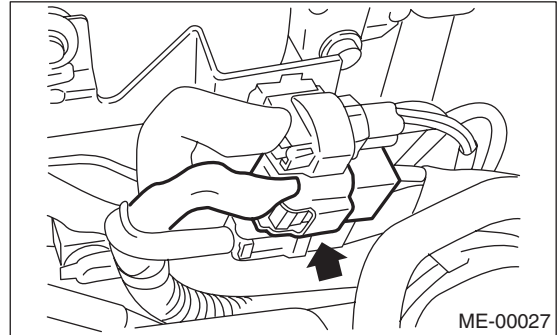


- (2) Start the engine, and run until it stalls.
  - (3) After the engine stalls, crank it for 5 seconds more.
  - (4) Turn the ignition switch to OFF.
- 5) Remove the fuel filler cap.
  - 6) Disconnect the ground cable from battery.
  - 7) Remove the radiator from vehicle. <Ref. to CO(H4DOTC)-23, REMOVAL, Radiator.>
  - 8) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-33, REMOVAL, Coolant Filler Tank.>
  - 9) Disconnect the A/C pressure hoses from A/C compressor.

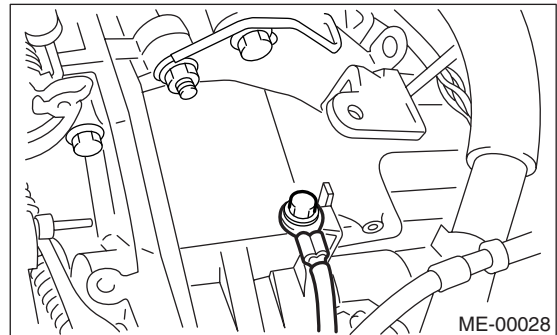


- 10) Remove the intercooler. <Ref. to IN(STI)-11, REMOVAL, Intercooler.>
- 11) Disconnect the following connectors and cable.

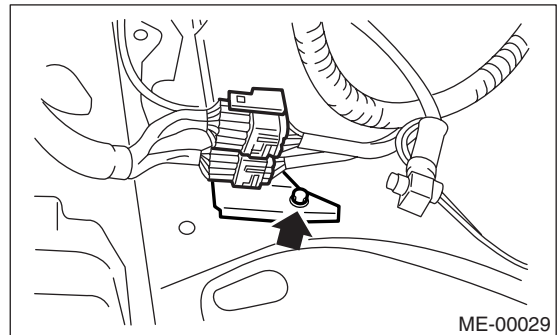
- (1) Engine harness connector



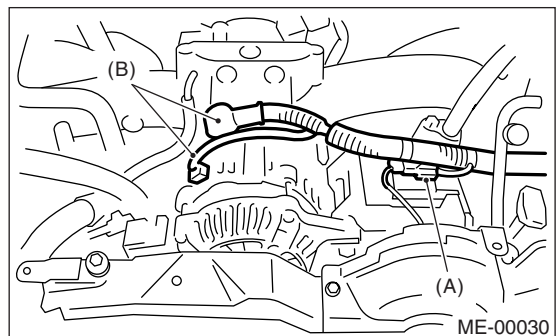
- (2) Engine ground terminal



- (3) Engine harness connector



- (4) Generator connector, terminal and A/C compressor connectors

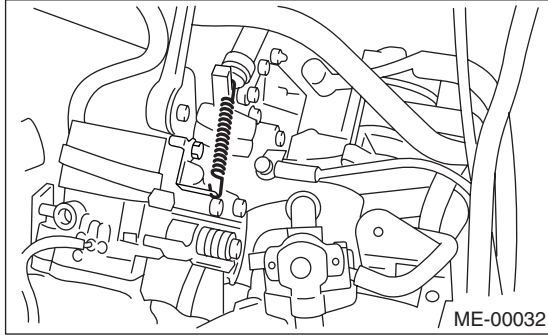


- (A) A/C compressor connector
- (B) Generator connector and terminal

# Engine Assembly

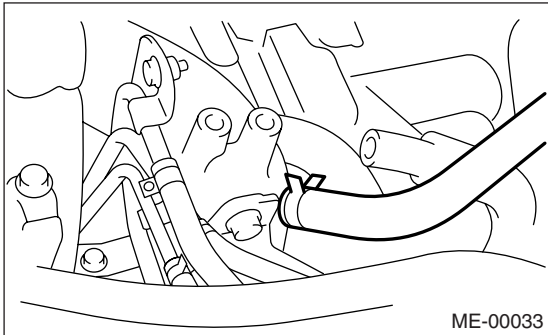
## MECHANICAL

### (5) Clutch release spring



### 12) Disconnect the following hoses.

#### (1) Brake booster vacuum hose

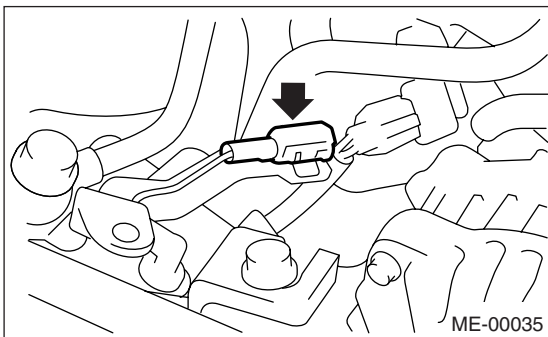


#### (2) Heater inlet outlet hose

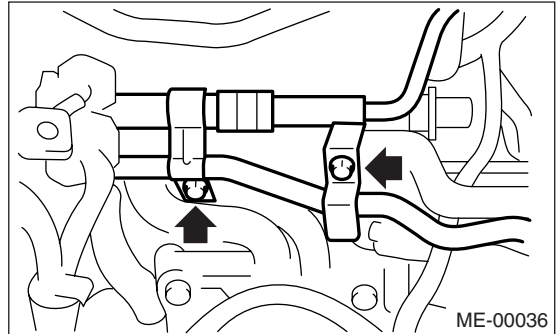
### 13) Remove the power steering pump from bracket.

(1) Loosen the lock bolt and slider bolt, and then remove the front side V-belt. <Ref. to ME(STI)-40, FRONT SIDE BELT, REMOVAL, V-belt.>

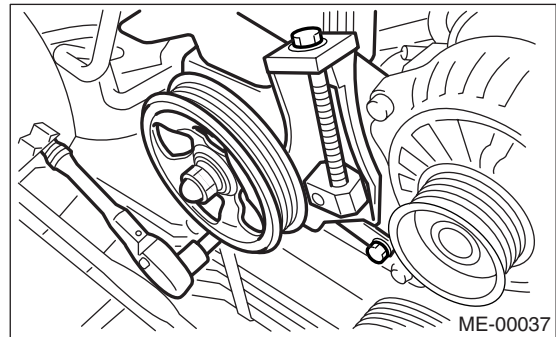
(2) Disconnect the power steering switch connector.



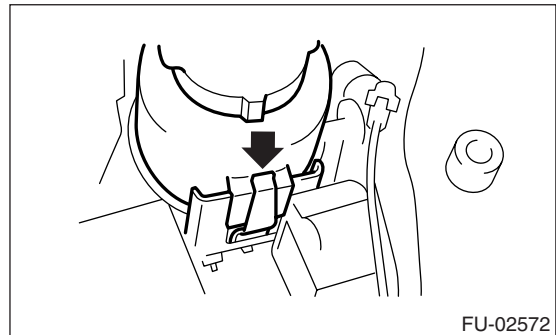
### (3) Remove the pipe with bracket from intake manifold.



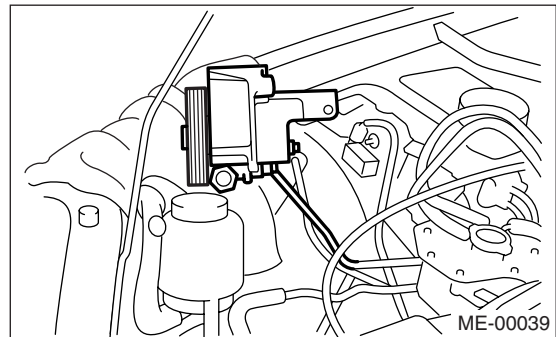
### (4) Remove the power steering pump from engine.



### (5) Remove the power steering tank from bracket by pulling it upward.



### (6) Place the power steering pump on right side wheel apron.

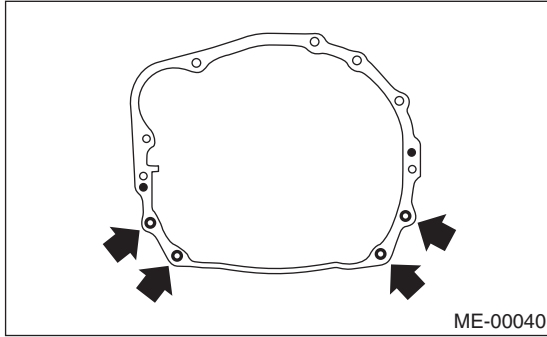


### 14) Lift-up the vehicle.

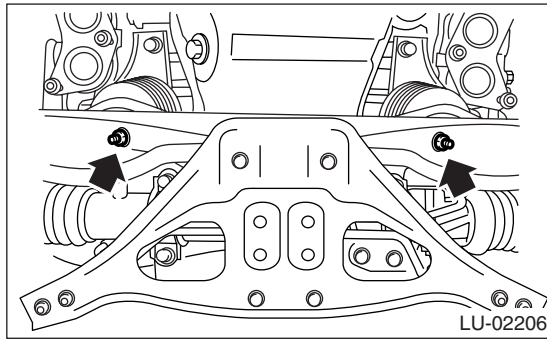
15) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>



16) Remove the nuts which hold the lower side of transmission to engine.



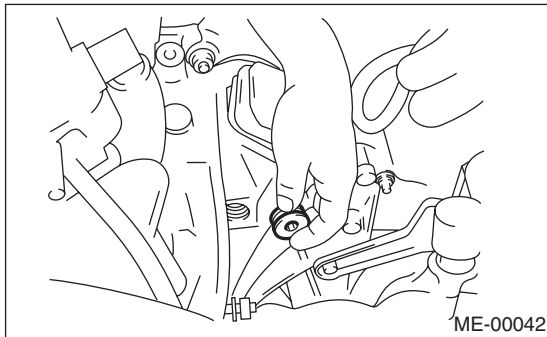
17) Remove the nuts which install the front cushion rubber onto front crossmember.



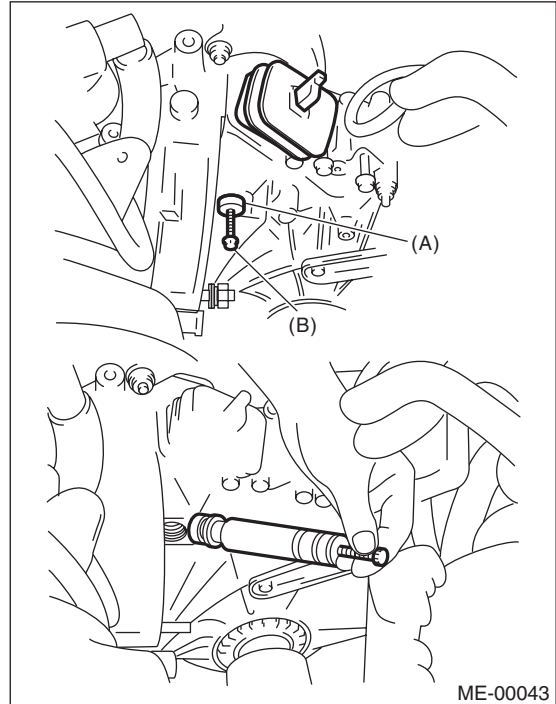
18) Lower the vehicle.

19) Separate the clutch release fork from release bearing.

- (1) Remove the clutch operating cylinder from transmission.
- (2) Remove the plug using a 10 mm hexagon wrench.



(3) Screw the 6 mm dia. bolt into release fork shaft, and remove it.



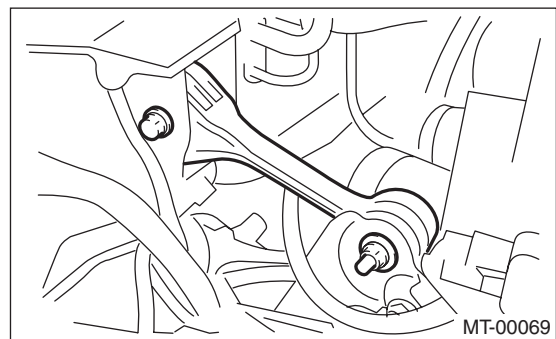
- (A) Shaft  
(B) Bolt

(4) Raise the release fork, and then unfasten the release bearing tabs to free release fork.

**NOTE:**

Step (4) is required to prevent interference with engine when removing the engine from transmission.

20) Remove the pitching stopper.



21) Disconnect the fuel delivery hose (A), return hose (B) and evaporation hose (C).

**NOTE:**

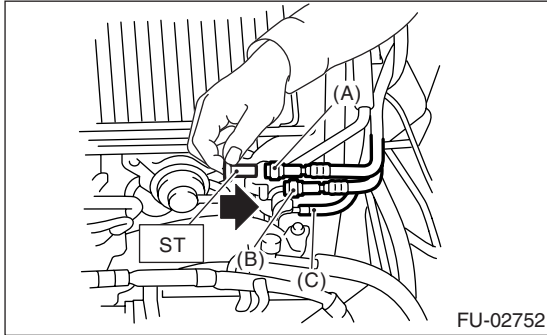
- Catch fuel from the hose into container.
- Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.



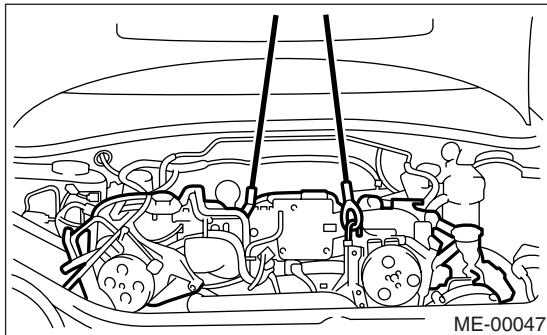
# Engine Assembly

MECHANICAL

## ST 42099AE000 CONNECTOR REMOVER



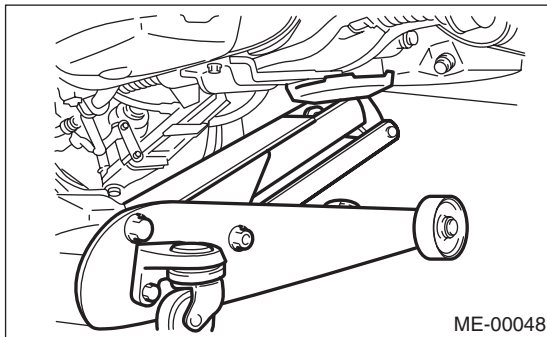
22) Support the engine with a lifting device and wire ropes.



23) Support the transmission with a garage jack.

### CAUTION:

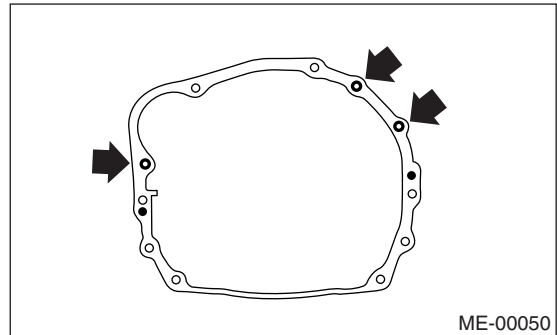
Doing this is very important in order to facilitate re-installation and because transmission lowers under its own weight.



### CAUTION:

Before removing the engine away from transmission, check to be sure no work has been overlooked.

- 24) Separation of the engine and transmission
- (1) Remove the starter. <Ref. to SC(H4SO)-8, REMOVAL, Starter.>
  - (2) Remove the bolts which hold the right upper side of transmission to engine.



- 25) Remove the engine from vehicle.
- (1) Slightly raise the engine.
  - (2) Raise the transmission with garage jack.
  - (3) Move the engine horizontally until the mainshaft is withdrawn from clutch cover.
  - (4) Slowly move the engine away from engine compartment.

### NOTE:

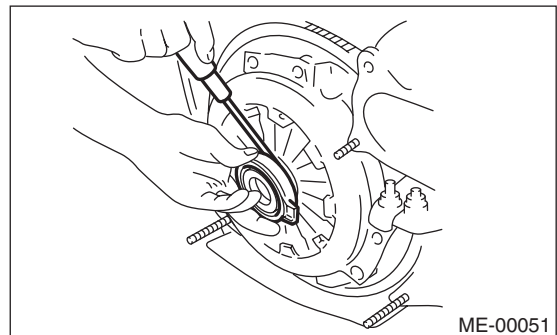
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

26) Remove the front cushion rubbers.

## B: INSTALLATION

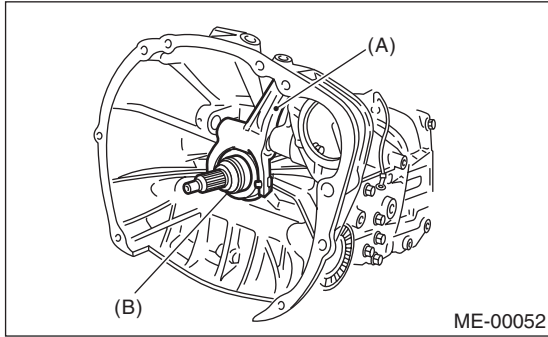
1) Install the clutch release fork and bearing onto transmission.

- (1) Remove the release bearing from clutch cover with flat-tip screwdriver.



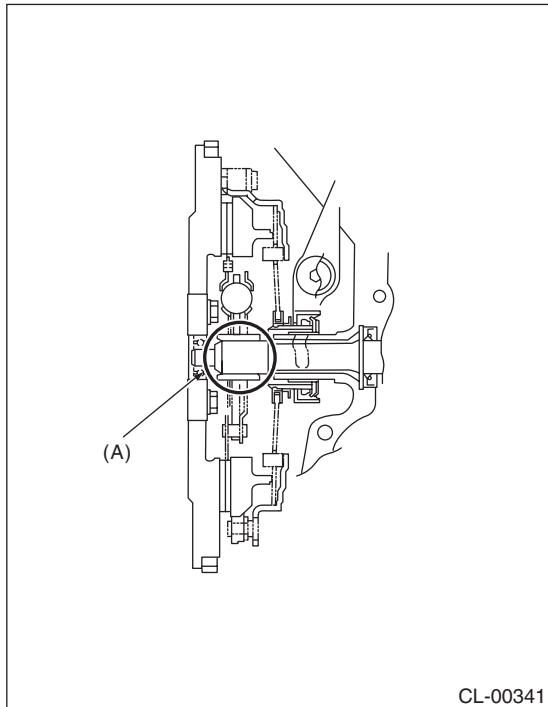
- (2) Install the release bearing on transmission.

(3) Install the release fork into release bearing tab.



- (A) Release fork
- (B) Release bearing

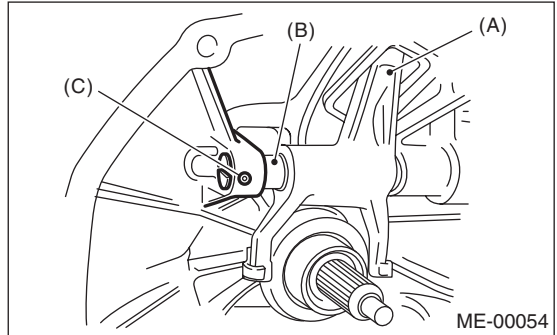
(4) Apply grease to the specified points.  
 • Spline NICHIMOLY 130



- (A) Spline

(5) Insert the release fork shaft into release fork.

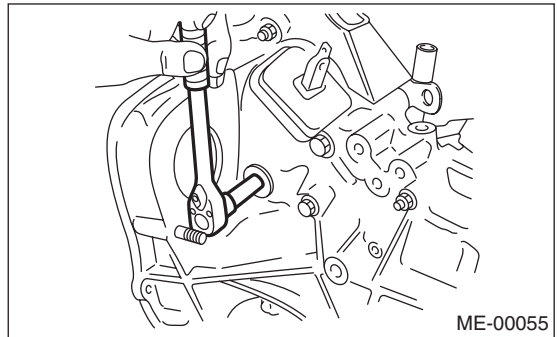
**CAUTION:**  
 Make sure the cutout portion of release fork shaft contacts spring pin.



- (A) Release fork
- (B) Release shaft
- (C) Spring pin

(6) Tighten the plug.

**Tightening torque:**  
**44 N·m (4.5 kgf-m, 33.5 ft-lb)**



2) Install the front cushion rubbers to engine.

**Tightening torque:**  
**35 N·m (3.6 kgf-m, 25.8 ft-lb)**

3) Install the engine onto transmission.

(1) Position the engine in engine compartment, and then align it with the transmission.

**NOTE:**

Be careful not to damage the adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

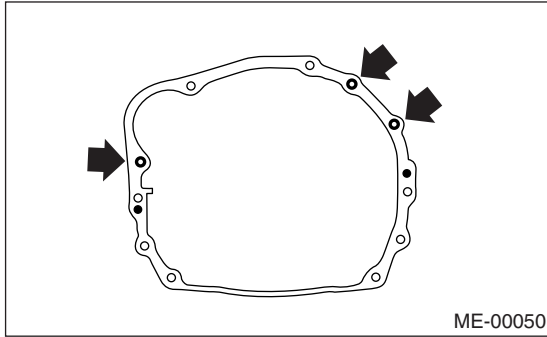
(2) Apply a small amount of grease to the splines of mainshaft.

4) Tighten the bolts which hold the upper side of transmission to engine.

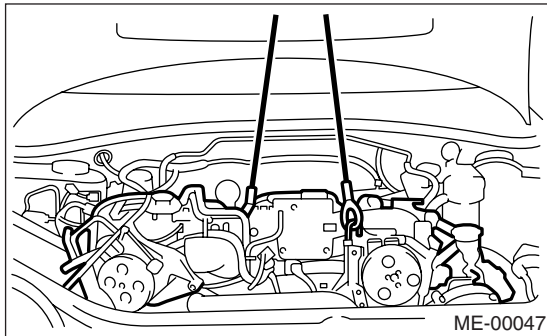
# Engine Assembly

MECHANICAL

**Tightening torque:**  
**50 N·m (5.1 kgf·m, 36.9 ft·lb)**

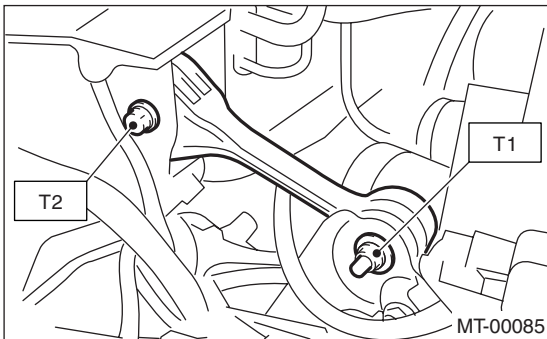


5) Remove the lifting device and wire ropes.

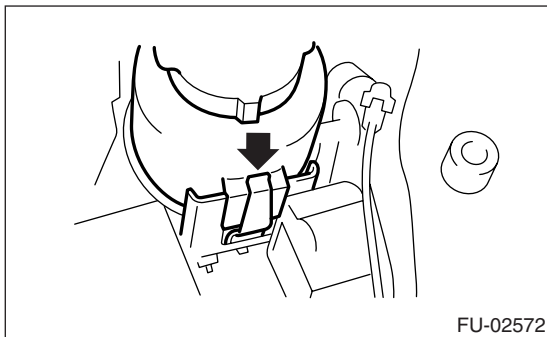


6) Remove the garage jack.  
7) Install the pitching stopper.

**Tightening torque:**  
**T1: 50 N·m (5.1 kgf·m, 36.9 ft·lb)**  
**T2: 58 N·m (5.9 kgf·m, 42.8 ft·lb)**

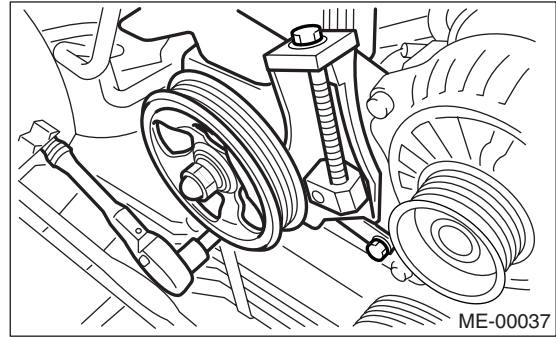


8) Install the power steering pump on bracket.  
(1) Install the power steering tank on bracket.

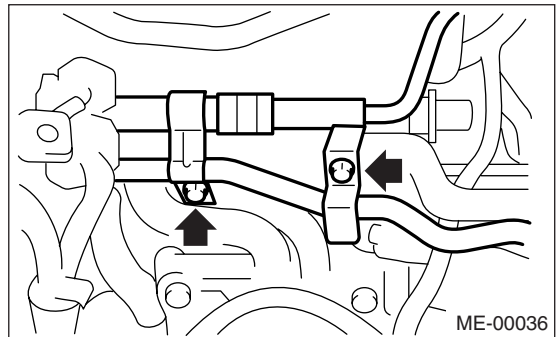


(2) Install the power steering pump.

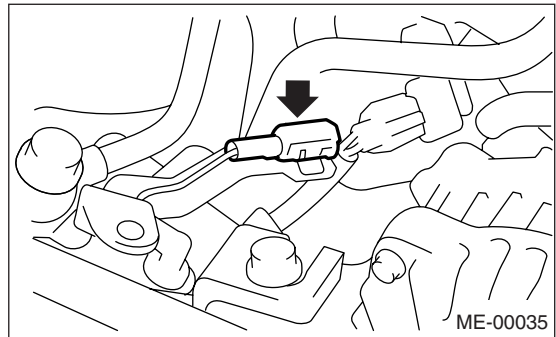
**Tightening torque:**  
**20 N·m (2.0 kgf·m, 14.5 ft·lb)**



(3) Install the power steering pipe bracket on intake manifold RH.



(4) Connect the power steering switch connector.

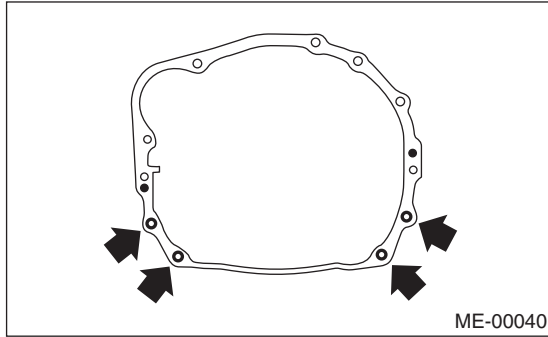


(5) Install the front side V-belt, and adjust it.  
<Ref. to ME(STI)-40, FRONT SIDE BELT, INSTALLATION, V-belt.>

9) Lift-up the vehicle.  
10) Tighten the nuts which hold the lower side of transmission to engine.

**Tightening torque:**

**50 N·m (5.1 kgf·m, 36.9 ft·lb)**



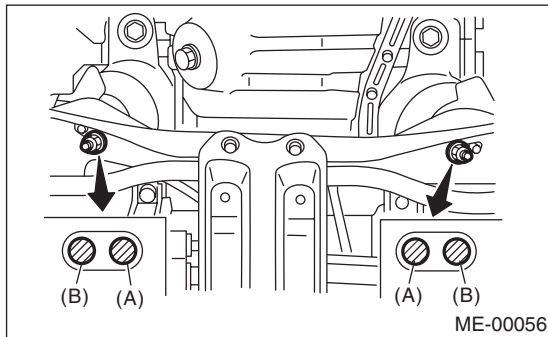
11) Tighten the nuts which install the front cushion rubber onto crossmember.

**Tightening torque:**

**85 N·m (8.7 kgf·m, 62.7 ft·lb)**

**NOTE:**

Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



12) Install the center exhaust pipe.  
<Ref. to EX(H4DOTC)-11, INSTALLATION, Center Exhaust Pipe.>

13) Lower the vehicle.

14) Connect the following hoses:

- (1) Fuel delivery hose, return hose and evaporation hose
- (2) Heater inlet and outlet hoses
- (3) Brake booster vacuum hose

15) Connect the following connectors and terminals:

- (1) Engine ground terminal
- (2) Engine harness connectors
- (3) Generator connector and terminal
- (4) A/C compressor connectors

16) Install the air intake system.

- (1) Install the intercooler. <Ref. to IN(STI)-11, INSTALLATION, Intercooler.>
- (2) Install the air cleaner element and air cleaner upper cover.
- (3) Install the engine harness connector bracket.
- (4) Install the filler hose to air cleaner case.

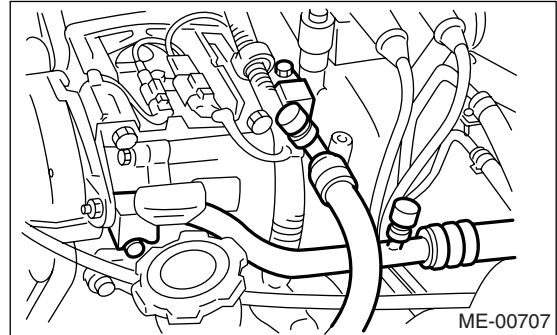
17) Install the A/C pressure hoses.

**NOTE:**

Use new O-rings.

**Tightening torque:**

**25 N·m (2.5 kgf·m, 18.4 ft·lb)**



18) Install the radiator. <Ref. to CO(H4DOTC)-24, INSTALLATION, Radiator.>

19) Install the coolant filler tank. <Ref. to CO(H4DOTC)-33, INSTALLATION, Coolant Filler Tank.>

20) Install the window washer tank.

21) Install the battery in the vehicle, and then connect the cables.

22) Fill coolant.

<Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

23) Charge the A/C system with refrigerant.

<Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>

24) Remove the front hood stay, and close the front hood.

25) Take off the vehicle from lift arms.

**C: INSPECTION**

1) Check that the pipes and hoses are installed firmly.

2) Check that the engine coolant is at specified level.

## 10.Engine Mounting

### A: REMOVAL

- 1) Remove the engine assembly. <Ref. to ME(STI)-31, REMOVAL, Engine Assembly.>
- 2) Remove the engine mounting from engine assembly.

### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

#### *Engine mounting;*

*35 N·m (3.6 kgf-m, 25.8 ft-lb)*

### C: INSPECTION

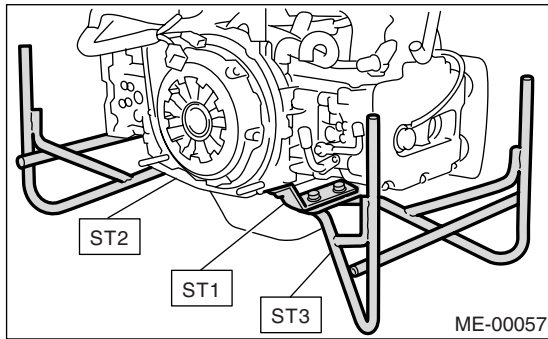
Make sure there are no cracks or other damage.

## 11. Preparation for Overhaul

### A: PROCEDURE

1) After removing the engine from body, secure it in the STs shown below.

|     |           |                            |
|-----|-----------|----------------------------|
| ST1 | 498457000 | ENGINE STAND ADAPTER<br>RH |
| ST2 | 498457100 | ENGINE STAND ADAPTER<br>LH |
| ST3 | 499817000 | ENGINE STAND               |



2) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for overhauling of the engine itself when you go through all steps in the process.

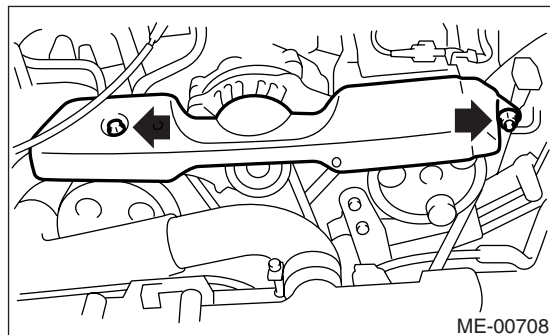
Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

## 12.V-belt

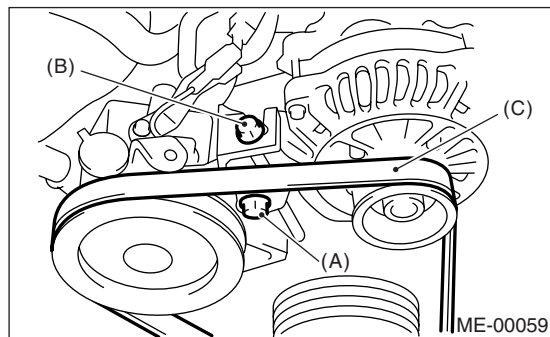
### A: REMOVAL

#### 1. FRONT SIDE BELT

- 1) Remove the V-belt cover.

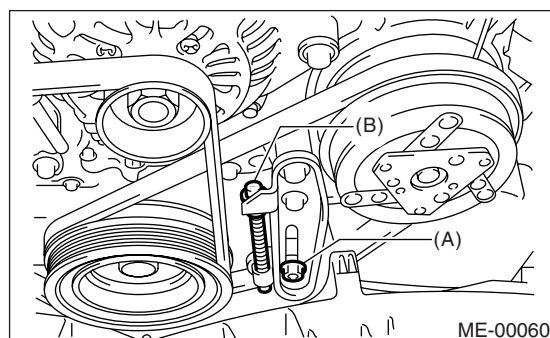


- 2) Loosen the lock bolt (A).
- 3) Loosen the slider bolt (B).
- 4) Remove the front side belt (C).



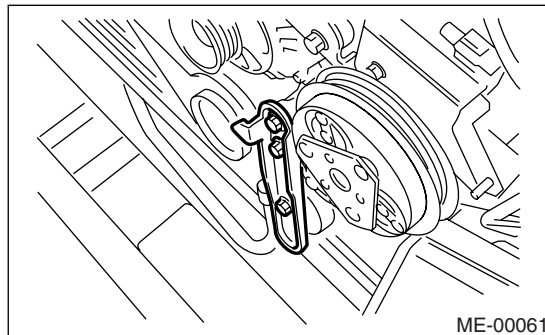
#### 2. REAR SIDE BELT

- 1) Loosen the lock nut (A).
- 2) Loosen the slider bolt (B).



- 3) Remove the A/C belt.

- 4) Remove the A/C belt tensioner.



### B: INSTALLATION

#### NOTE:

Wipe off any oil or water on the belt and pulley.

#### 1. FRONT SIDE BELT

- 1) Install the belt (C), and tighten the slider bolt so as to obtain the specified belt tension <Ref. to ME(STI)-41, INSPECTION, V-belt.>
- 2) Tighten the lock bolt (A).
- 3) Tighten the slider bolt (B).

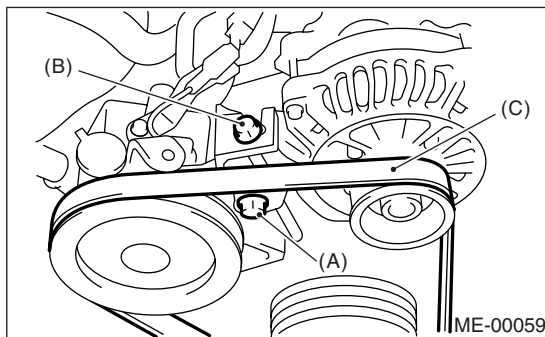
#### Tightening torque:

##### Lock bolt through bolt:

**25 N·m (2.5 kgf-m, 18.4 ft-lb)**

##### Slider bolt:

**8 N·m (0.8 kgf-m, 5.9 ft-lb)**



- 4) Idle the engine for approx. 5 min. to normalize the V-belt. (With using tension gauge)
- 5) Stop the engine, and then check the belt tension and adjust it. (With using tension gauge)
- 6) Idle the engine for approx. 1 min. to normalize the V-belt. (With using tension gauge)
- 7) Stop the engine, and then check that the belt tension is within specified value. (With using tension gauge)
- 8) Adjust the belt tension within the specification. (With using tension gauge)



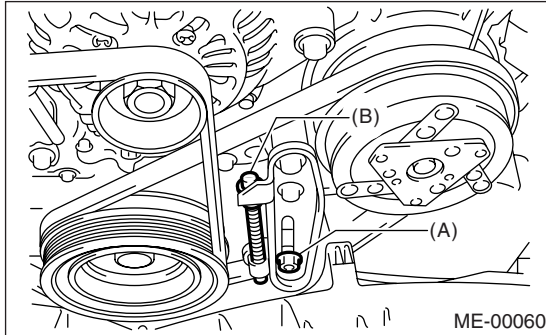
## 2. REAR SIDE BELT

- 1) Install the belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(STI)-41, INSPECTION, V-belt.>
- 2) Tighten the lock nut (A).

### Tightening torque:

**Lock nut (A):**

**23 N·m (2.3 kgf·m, 17.0 ft·lb)**



- 3) Idle the engine for approx. 5 min. to normalize the V-belt. (With using tension gauge)
- 4) Stop the engine, and then check the belt tension and adjust it. (With using tension gauge)
- 5) Idle the engine for approx. 1 min. to normalize the V-belt. (With using tension gauge)
- 6) Stop the engine, and then check the belt tension is within specified value. (With using tension gauge)
- 7) Adjust the belt tension within the specification. (With using tension gauge)

## C: INSPECTION

- 1) Replace the belts, if cracks, fraying or wear are found.
- 2) Check the V-belt tension and adjust it if necessary by changing generator installing position and/or idler pulley installing position.

### Belt tension (without using belt tension gauge)

**(A)**

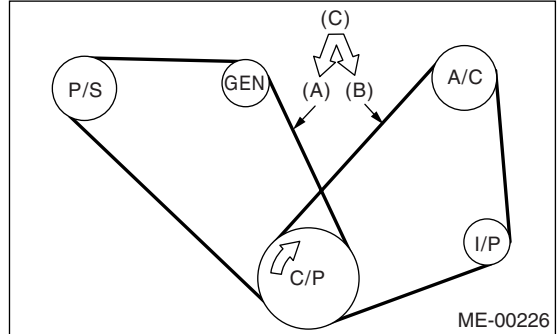
**replaced: 7 — 9 mm (0.276 — 0.354 in)**

**reused: 9 — 11 mm (0.354 — 0.433 in)**

**(B)**

**replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)**

**reused: 9.0 — 10.0 mm (0.354 — 0.394 in)**



(A) Front side belt

(B) Rear side belt

(C) 98 N (10 kgf, 22 lbf)

C/P Crank pulley

GEN Generator

P/S Power steering oil pump pulley

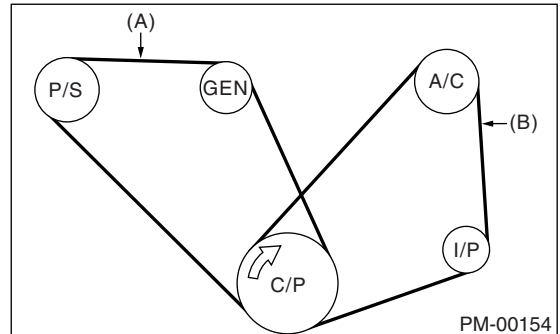
A/C Air conditioning compressor pulley

I/P Idler pulley

### Belt tension (with using belt tension gauge)

**(A) 490 — 640 N (50 — 65 kgf, 110 — 144 lbf)**

**(B) 350 — 450 N (36 — 46 kgf, 79 — 101 lbf)**



(A) Front side belt

(B) Rear side belt

C/P Crank pulley

GEN Generator

P/S Power steering oil pump pulley

A/C A/C compressor pulley

I/P Idler pulley



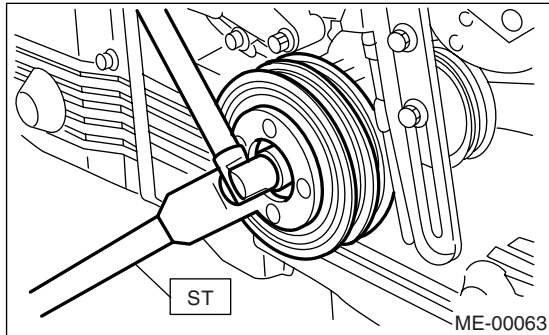
## 13. Crank Pulley

### A: REMOVAL

1) Remove the V-belt. <Ref. to ME(STI)-40, REMOVAL, V-belt.>

2) Remove the crank pulley bolt. To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH



3) Remove the crank pulley.

### B: INSTALLATION

1) Install the crank pulley.

2) Install the pulley bolt.

To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH

(1) Clean the crank pulley thread using an compressed air.

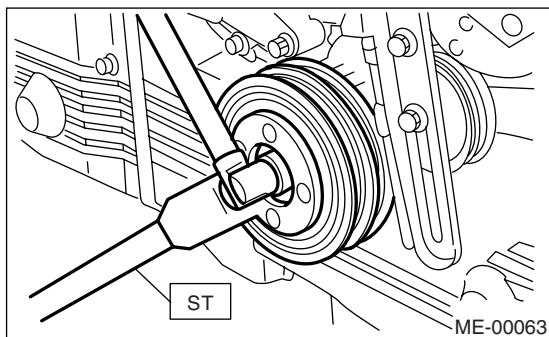
(2) Apply engine oil to the crank pulley bolt seat and thread.

(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf·m, 33 ft·lb).

(4) Tighten the crank pulley bolts.

#### Tightening torque:

**180 N·m (18.4 kgf·m, 132.8 ft·lb)**



3) Confirm that the tightening angle of crank pulley bolt is 65 degrees or more. If the tightening angle of crank pulley bolt is less than 65 degrees, conduct the following procedures.

#### CAUTION:

**If the tightening angle of crank pulley bolt is less than 65 degrees, the bolt should be damaged. In this case, the bolt must be replaced.**

(1) Replace the crank pulley bolts and clean them.

#### Crank pulley bolt:

**Part No. 12369AA011**

(2) Clean the crankshaft thread using an compressed air.

(3) Apply engine oil to the crank pulley bolt seat and thread.

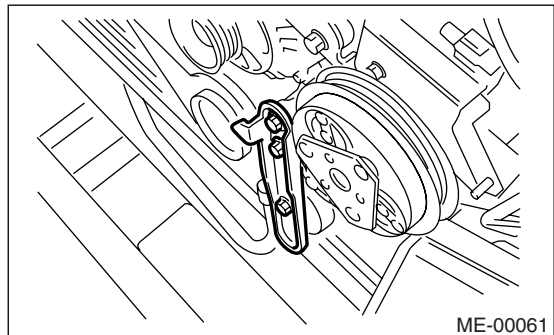
(4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf·m, 33 ft·lb).

(5) Tighten the crank pulley bolts keeping them in an angle between 65 degrees and 75 degrees.

#### NOTE:

Conduct the tightening procedures by confirming the turning angle of crank pulley bolt referring to the gauge indicated on timing belt cover.

4) Install the A/C belt tensioner.



5) Install the V-belt. <Ref. to ME(STI)-40, INSTALLATION, V-belt.>

### C: INSPECTION

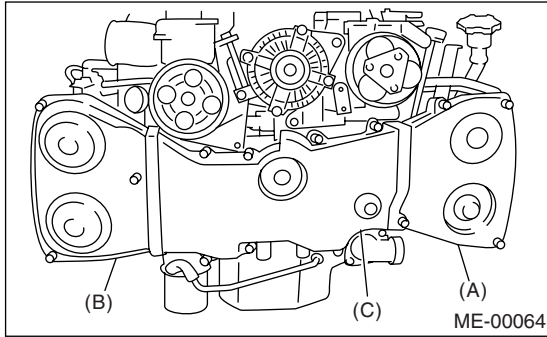
1) Make sure the V-belt is not worn or otherwise damaged.

2) Check the tension of the belt. <Ref. to ME(STI)-41, INSPECTION, V-belt.>

## 14. Timing Belt Cover

### A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(STI)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(STI)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover (LH) (A).
- 4) Remove the timing belt cover (RH) (B).
- 5) Remove the front timing belt cover (C).



### B: INSTALLATION

- 1) Install the front timing belt cover (C).

**Tightening torque:**

**5 N·m (0.5 kgf·m, 3.6 ft·lb)**

- 2) Install the timing belt cover (RH) (B).

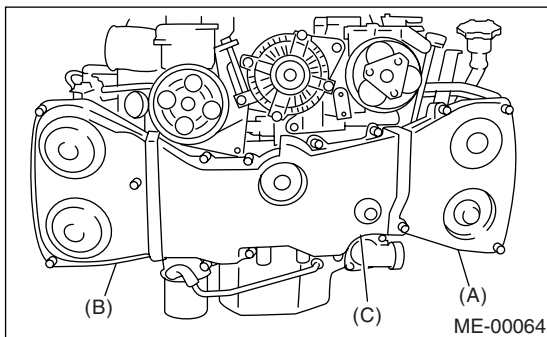
**Tightening torque:**

**5 N·m (0.5 kgf·m, 3.6 ft·lb)**

- 3) Install the timing belt cover (LH) (A).

**Tightening torque:**

**5 N·m (0.5 kgf·m, 3.6 ft·lb)**



- 4) Install the crank pulley. <Ref. to ME(STI)-42, INSTALLATION, Crank Pulley.>
- 5) Install the V-belt. <Ref. to ME(STI)-40, INSTALLATION, V-belt.>

### C: INSPECTION

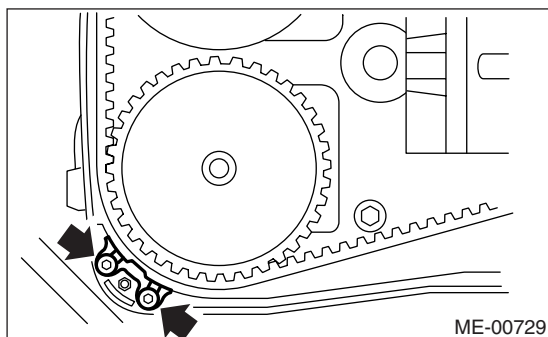
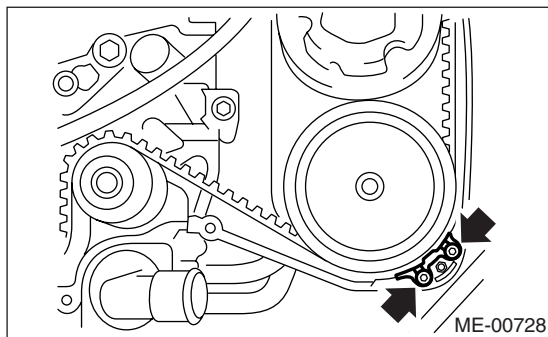
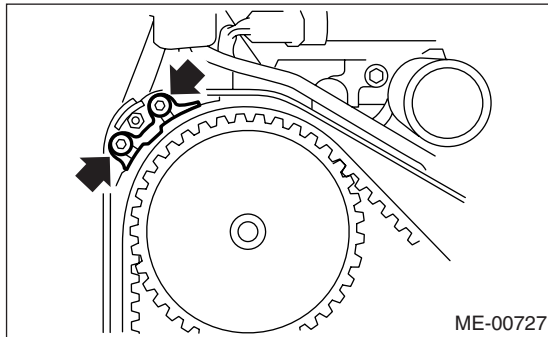
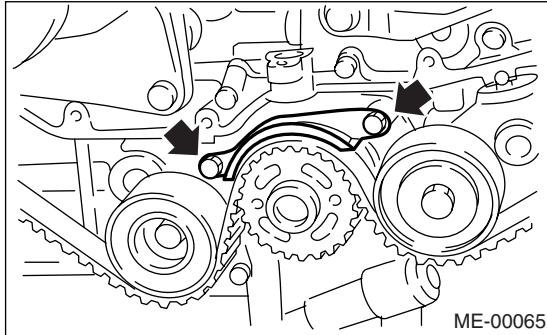
Make sure the cover is not damaged.

## 15. Timing Belt

### A: REMOVAL

#### 1. TIMING BELT

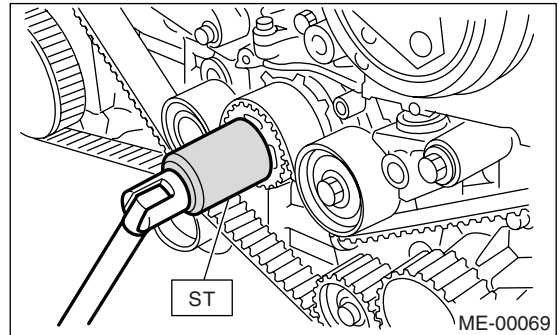
- 1) Remove the V-belt. <Ref. to ME(STI)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(STI)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(STI)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt guides.



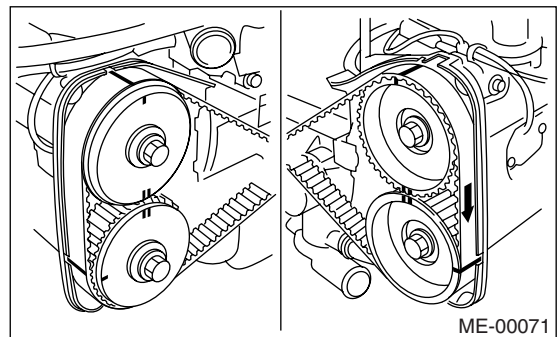
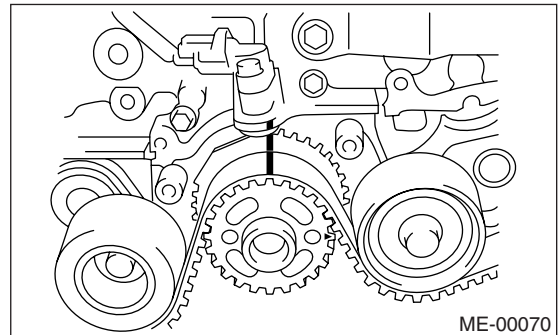
- 5) If the alignment mark and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as follows:

- (1) Turn the crankshaft using ST, and align the alignment marks on crank sprocket, intake cam sprocket (LH), exhaust cam sprocket (LH), intake cam sprocket (RH) and exhaust cam sprocket (RH) with notches of timing belt cover and cylinder block.

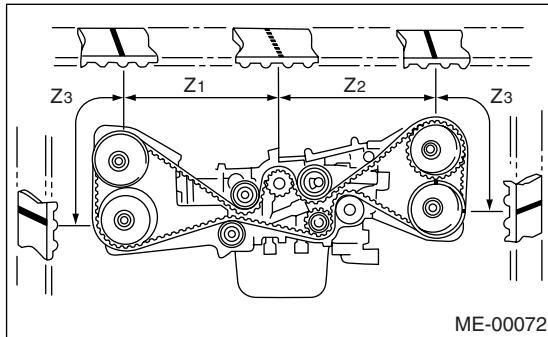
ST 499987500 CRANKSHAFT SOCKET



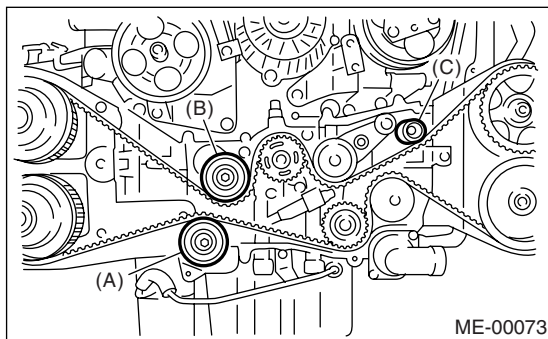
- (2) Using white paint, put alignment and/or arrow marks on the timing belts in relation to the sprockets.



**Z<sub>1</sub>: 54.5 tooth length**  
**Z<sub>2</sub>: 51 tooth length**  
**Z<sub>3</sub>: 28 tooth length**



6) Remove the belt idler (A).



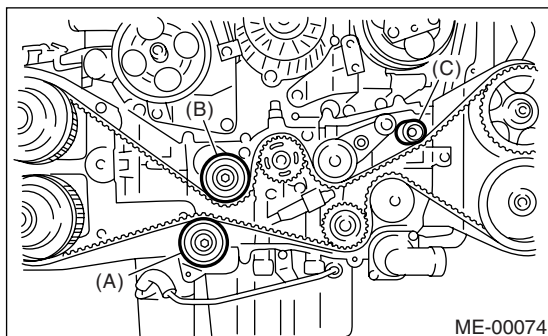
7) Remove the timing belt.

**CAUTION:**

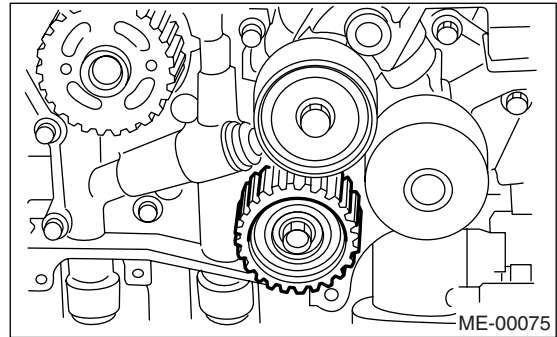
After the timing belt has been removed, never rotate the intake and exhaust cam sprocket. If the cam sprockets are rotated, the intake and exhaust valve heads strike together and valve stems are bent.

**2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY**

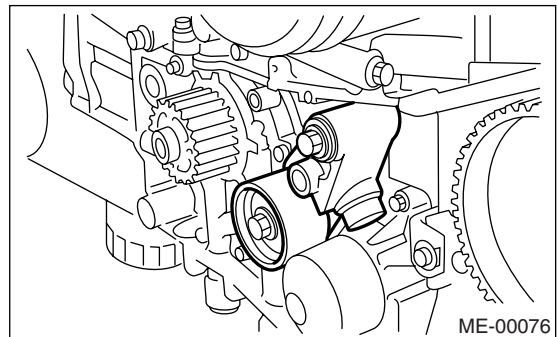
1) Remove the belt idler (B) and (C).



2) Remove the belt idler No. 2.



3) Remove the automatic belt tension adjuster assembly.



**B: INSTALLATION**

**1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER**

1) Preparation for installation of automatic belt tension adjuster assembly:

**CAUTION:**

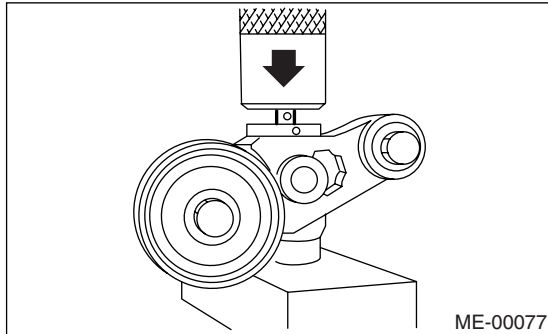
- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.
- Press-in the push adjuster rod gradually taking more than 3 minutes.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lbf).
- Press the adjuster rod as far as the end surface of cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
- Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.

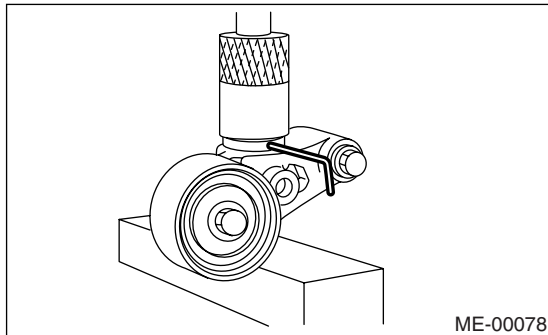
# Timing Belt

## MECHANICAL

(2) Slowly move the adjuster rod down with a pressure of more than 165 N (16.8 kgf, 37.1 lbf) until the adjuster rod is aligned with the stopper pin hole in the cylinder.



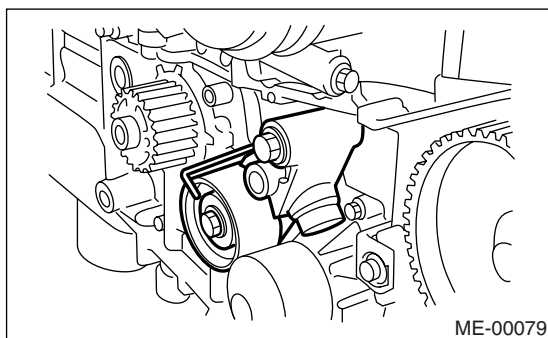
(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



2) Install the automatic belt tension adjuster assembly.

### **Tightening torque:**

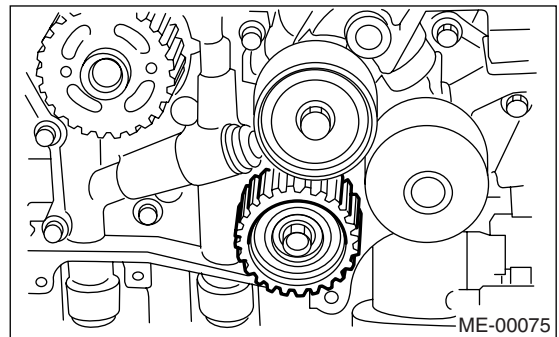
**39 N·m (4.0 kgf·m, 28.9 ft·lb)**



3) Install the belt idler No. 2.

### **Tightening torque:**

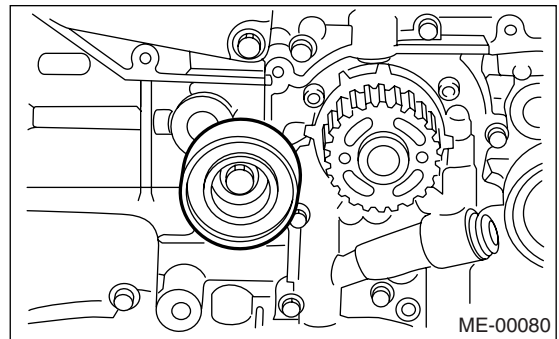
**39 N·m (4.0 kgf·m, 28.9 ft·lb)**



4) Install the belt idler.

### **Tightening torque:**

**39 N·m (4.0 kgf·m, 28.9 ft·lb)**

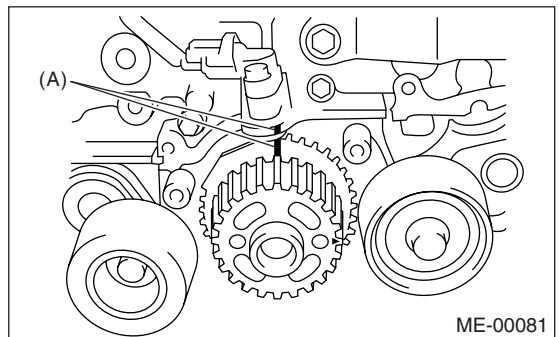


## 2. TIMING BELT

1) Preparation for installation of automatic belt tension adjuster assembly <Ref. to ME(STI)-51, AUTOMATIC BELT TENSION ADJUSTER, INSPECTION, Timing Belt.>

2) Crankshaft and cam sprocket alignment

(1) Align mark (A) on the crank sprocket with mark on the oil pump cover at cylinder block.

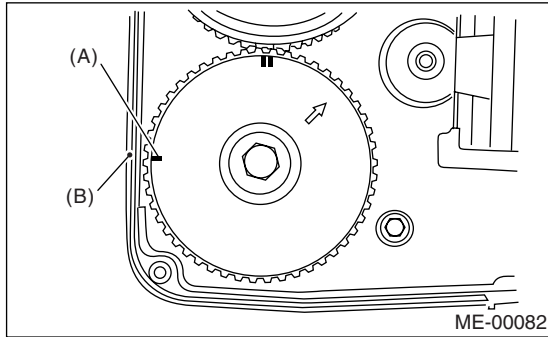




# Timing Belt

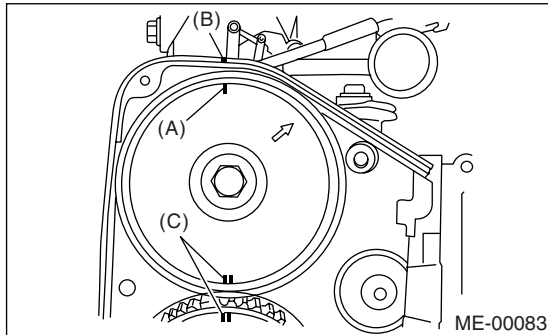
MECHANICAL

(2) Align single line mark (A) on the exhaust cam sprocket (RH) with notch (B) on timing belt cover.

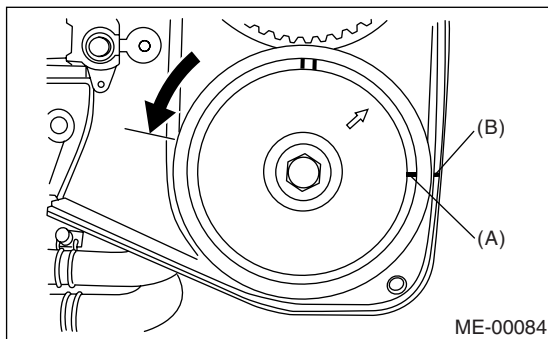


(3) Align single line mark (A) on the intake cam sprocket (RH) with notch (B) on timing belt cover.

(Make sure double lines (C) on intake camshaft and exhaust cam sprockets are aligned.)

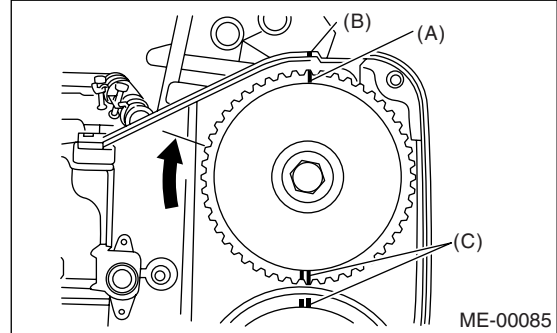


(4) Align single line mark (A) on exhaust cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket counterclockwise (as viewed from front of engine).



(5) Align the single line mark (A) on intake cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket clockwise (as viewed from front of engine).

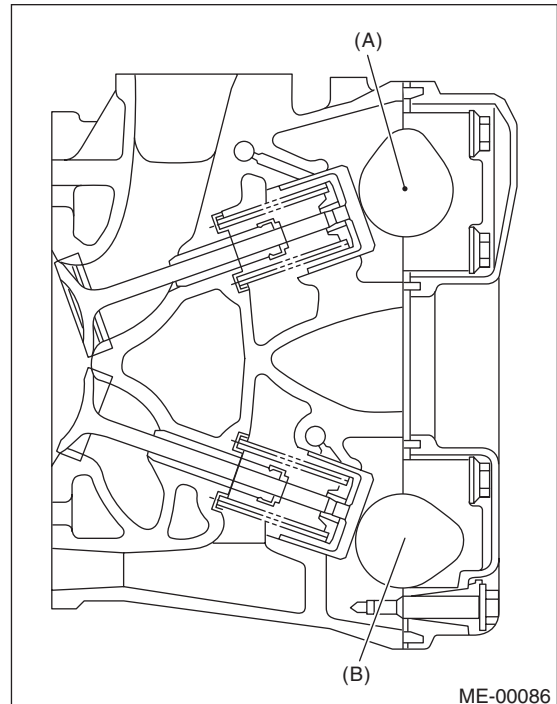
Ensure the double lines (C) on intake and exhaust cam sprockets are aligned.



(6) Ensure the camshaft and crank sprockets are positioned properly.

### CAUTION:

- Intake and exhaust camshafts for this DOHC engine can be independently rotated with the timing belts removed. As can be seen from the figure, if the intake and exhaust valves are lifted simultaneously, their heads will interfere with each other, resulting in bent valves.

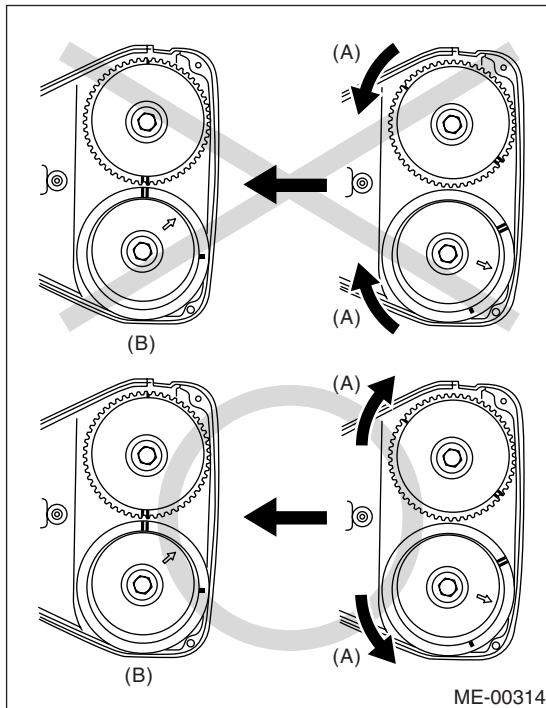


- (A) Intake camshaft
- (B) Exhaust camshaft

# Timing Belt

## MECHANICAL

- When the timing belts are not installed, four camshafts are held at the “zero-lift” position, where all cams on camshafts do not push the intake and exhaust valves down. (Under this condition, all valves remain unlifted.)
- When the camshafts are rotated to install the timing belts, #2 intake and #4 exhaust cam of camshafts (LH) are held to push their corresponding valves down. (Under this condition, these valves are held lifted.) Camshafts (RH) are held so that their cams do not push valves down.
- Camshafts (LH) must be rotated from the “zero-lift” position to the position where the timing belt is to be installed at as small an angle as possible, in order to prevent mutual interference of intake and exhaust valve heads.
- Do not allow the camshafts to rotate in the direction shown by the upper illustration in the figure as this causes both intake and exhaust valves to lift simultaneously, resulting in interference with their heads.



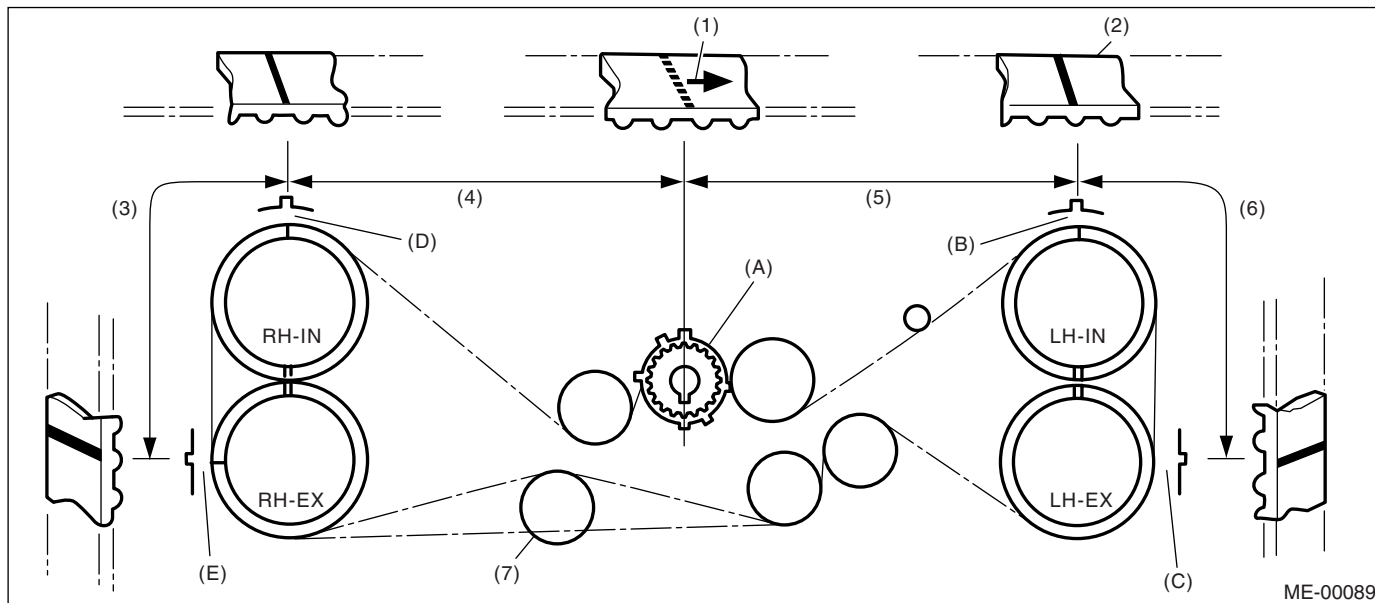
- (A) Rotating direction
- (B) Timing belt installation position

### 3) Installation of timing belt

Align the alignment mark on timing belt with marks on sprockets in alphabetical order shown in the figure. While aligning marks, position the timing belt properly.

#### CAUTION:

- Disengagement of more than three timing belt teeth may result in interference between the valve and piston.
- Ensure the belt's rotating direction is correct.



- |                     |                       |                           |
|---------------------|-----------------------|---------------------------|
| (1) Arrow mark      | (4) 54.5 tooth length | (7) Install it in the end |
| (2) Timing belt     | (5) 51 tooth length   |                           |
| (3) 28 tooth length | (6) 28 tooth length   |                           |

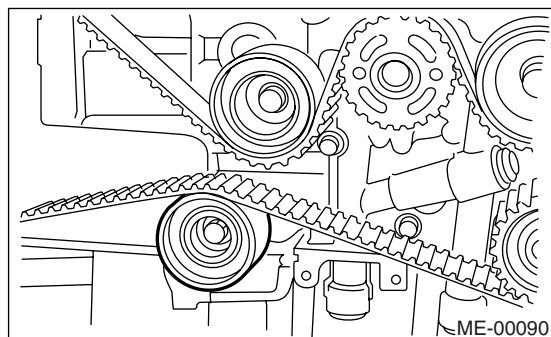
### 4) Install the belt idlers.

#### Tightening torque:

**39 N·m (4.0 kgf·m, 28.9 ft·lb)**

#### NOTE:

Make sure that the marks on the timing belt and sprockets are aligned.



5) After ensuring that the marks on the timing belt and sprockets are aligned, remove the stopper pin from tensioner adjuster.

6) Install the timing belt guide.

#### CAUTION:

- Before installing the bolts, clean the threaded portion of timing belt cover.

- Apply liquid gasket to the threaded portion of bolts. (Cam sprocket side only)

#### Liquid gasket:

**THREE BOND 1324 (Part No. 004403042) or equivalent**

- (1) Temporarily tighten the bolts.
- (2) Check and adjust the clearance between timing belt and timing belt guide.

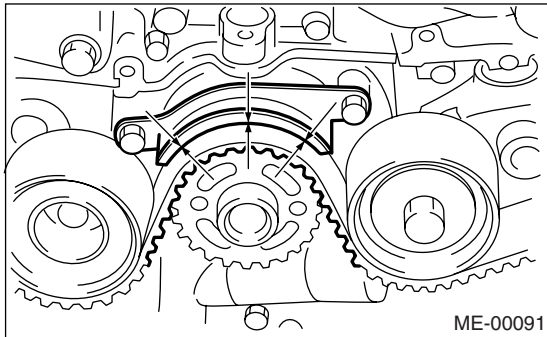


# Timing Belt

MECHANICAL

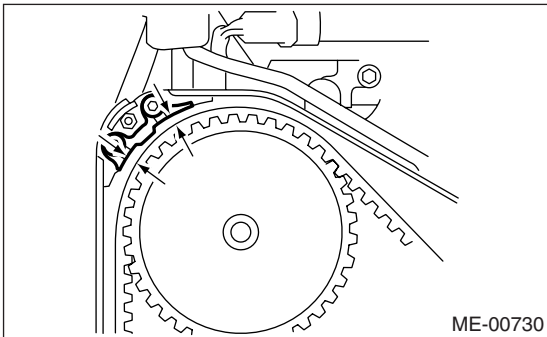
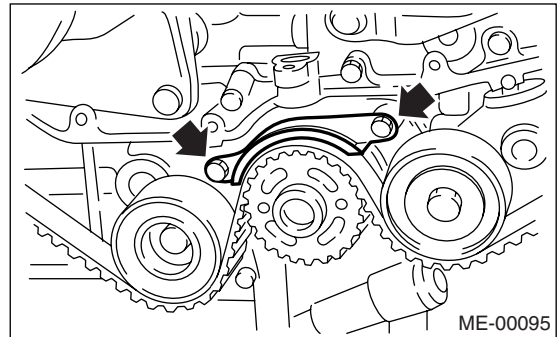
## Clearance:

$1.0 \pm 0.5 \text{ mm}$  ( $0.039 \pm 0.020 \text{ in}$ )



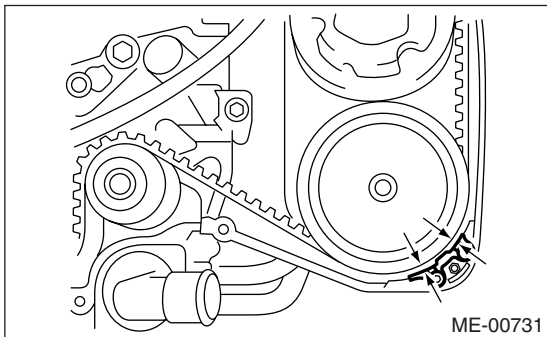
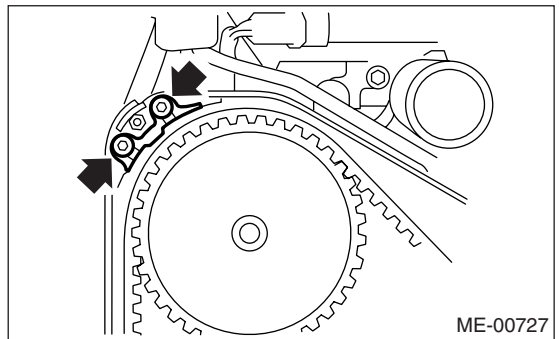
## Tightening torque:

$9.75 \text{ N}\cdot\text{m}$  ( $1.0 \text{ kgf}\cdot\text{m}$ ,  $7 \text{ ft}\cdot\text{lb}$ )



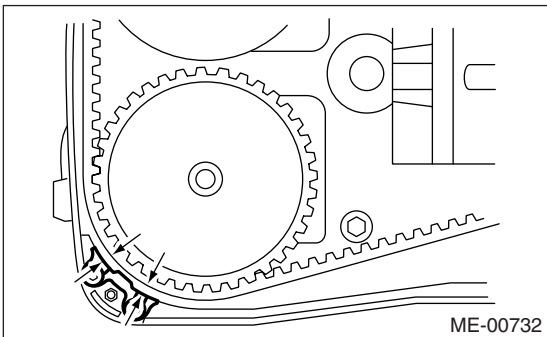
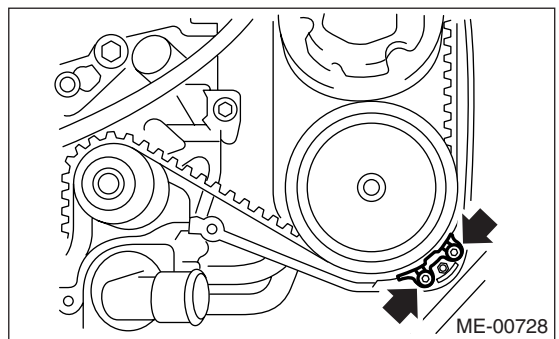
## Tightening torque:

$6.4 \text{ N}\cdot\text{m}$  ( $0.65 \text{ kgf}\cdot\text{m}$ ,  $4.7 \text{ ft}\cdot\text{lb}$ )



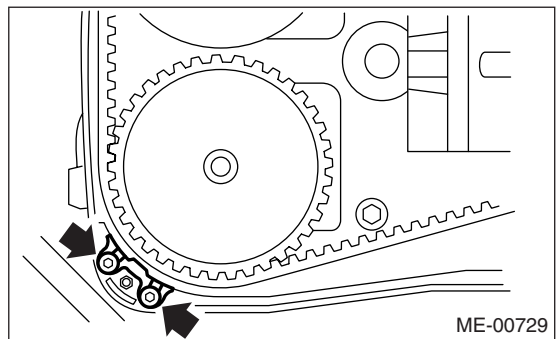
## Tightening torque:

$6.4 \text{ N}\cdot\text{m}$  ( $0.65 \text{ kgf}\cdot\text{m}$ ,  $4.7 \text{ ft}\cdot\text{lb}$ )



## Tightening torque:

$6.4 \text{ N}\cdot\text{m}$  ( $0.65 \text{ kgf}\cdot\text{m}$ ,  $4.7 \text{ ft}\cdot\text{lb}$ )



(3) Tighten the bolts.

7) Install the timing belt cover. <Ref. to ME(STI)-43, INSTALLATION, Timing Belt Cover.>

- 8) Install the crank pulley. <Ref. to ME(STI)-42, INSTALLATION, Crank Pulley.>
- 9) Install the V-belt. <Ref. to ME(STI)-40, INSTALLATION, V-belt.>

## C: INSPECTION

### 1. TIMING BELT

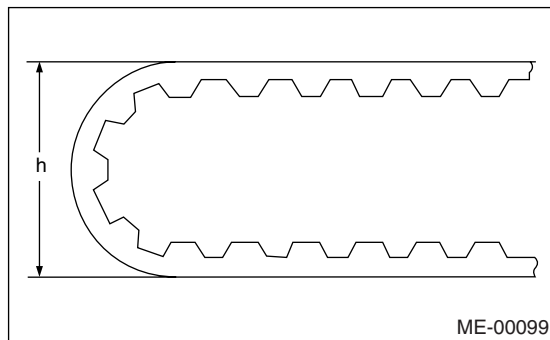
- 1) Check the timing belt teeth for breaks, cracks, and wear. If any fault is found, replace the belt.
- 2) Check the condition of back side of belt; if any crack is found, replace the belt.

#### CAUTION:

- Be careful not to let oil, grease or coolant contact the timing belt. Remove quickly and thoroughly if this happens.
- Do not bend the belt sharply.

#### Bending radius h:

60 mm (2.36 in) or more



### 2. AUTOMATIC BELT TENSION ADJUST-ER

- 1) Visually check the oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace the automatic belt tension adjuster assembly.

#### NOTE:

Slight traces of oil at rod's oil seal does not indicate a problem.

- 2) Check that the adjuster rod does not move when a pressure of 165 N (16.8 kgf, 37.1 lbf) is applied to it. This is to check adjuster rod stiffness.

- 3) If the adjuster rod is not stiff and moves freely when applying 165 N (16.8 kgf, 37.1 lbf), check it using the following procedures:

- (1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this motion 2 or 3 times.

- (2) With the adjuster rod moved all the way up, apply a pressure of 165 N (16.8 kgf, 37.1 lbf) to it. Check the adjuster rod stiffness.

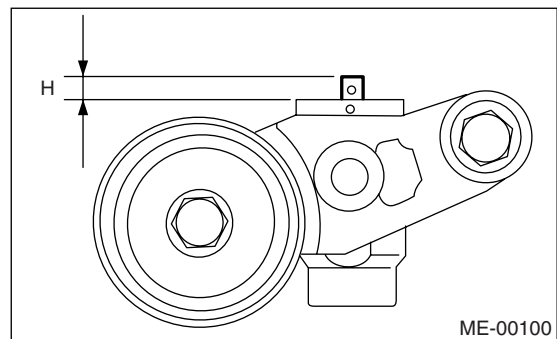
- (3) If the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new one.

#### CAUTION:

- Always use a vertical type pressing tool to move the adjuster rod down.
  - Do not use a lateral type vise.
  - Push the adjuster rod vertically.
  - Press-in the push adjuster rod gradually taking more than 3 minutes.
  - Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lbf).
  - Press the adjuster rod till the end of the surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
- 4) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

#### Rod extension H:

5.7±0.5 mm (0.224±0.020 in)



### 3. BELT TENSION PULLEY

- 1) Check the mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace the belt tension pulley if faulty.
- 2) Check the belt tension pulley for smooth rotation. Replace if noise or excessive play is noted.
- 3) Check the belt tension pulley for grease leakage.

### 4. BELT IDLER

- 1) Check the belt idler for smooth rotation. Replace if noise or excessive play is noted.
- 2) Check the outer contacting surfaces of idler pulley for abnormal wear and scratches.
- 3) Check the belt idler for grease leakage.

# Cam Sprocket

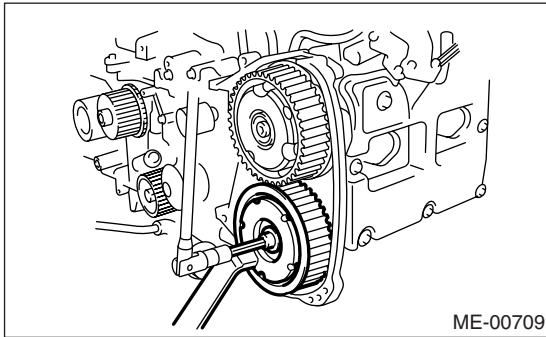
MECHANICAL

## 16. Cam Sprocket

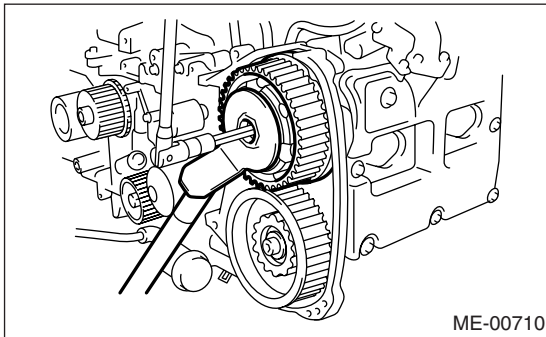
### A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(STI)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(STI)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(STI)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(STI)-44, REMOVAL, Timing Belt.>
- 5) Remove the cam sprockets. To lock the camshaft, use ST.

ST 499207400 CAM SPROCKET WRENCH



ST 499977500 CAM SPROCKET WRENCH



### B: INSTALLATION

- 1) Install the cam sprocket. To lock the camshaft, use ST.

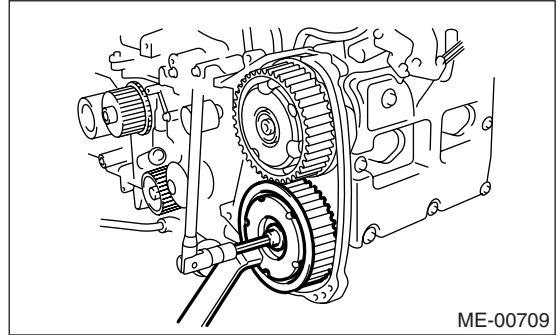
#### NOTE:

Do not confuse cam sprockets (RH) and (LH) during installation.

ST 499207400 CAM SPROCKET WRENCH

### Tightening torque:

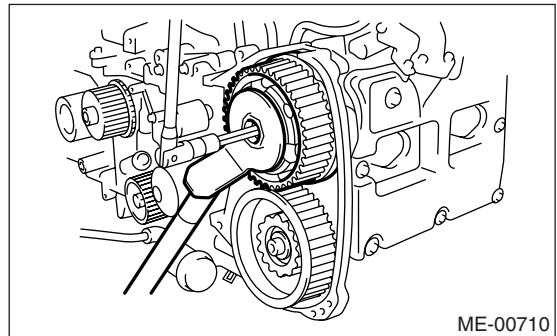
**30 N·m (3.0 kgf·m, 21.8 ft·lb), and then tighten 45° furthermore**



ST 499977500 CAM SPROCKET WRENCH

### Tightening torque:

**30 N·m (3.0 kgf·m, 21.8 ft·lb), and then tighten 45° furthermore**



- 2) Install the timing belt. <Ref. to ME(STI)-45, INSTALLATION, Timing Belt.>
- 3) Install the timing belt cover. <Ref. to ME(STI)-43, INSTALLATION, Timing Belt Cover.>
- 4) Install the crank pulley. <Ref. to ME(STI)-42, INSTALLATION, Crank Pulley.>
- 5) Install the V-belt. <Ref. to ME(STI)-40, INSTALLATION, V-belt.>

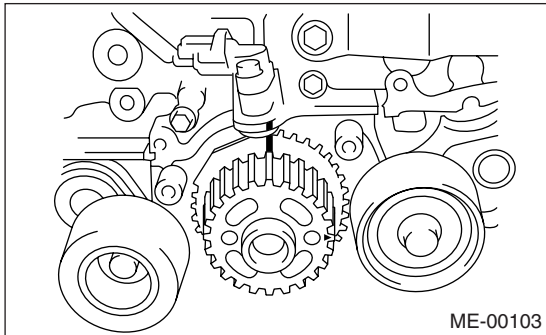
### C: INSPECTION

- 1) Check the sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.
- 3) Check the crank sprocket notch used for sensor for damage and contamination of foreign matter.

## 17.Crank Sprocket

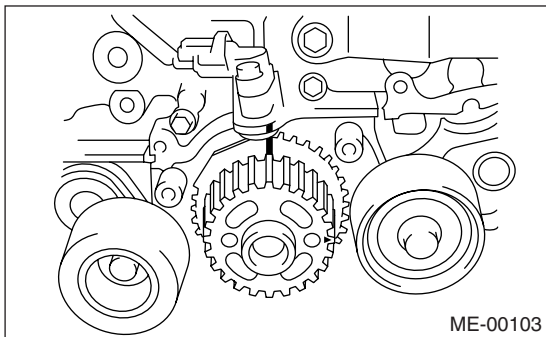
### A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(STI)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(STI)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(STI)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(STI)-44, REMOVAL, Timing Belt.>
- 5) Remove the cam sprocket. <Ref. to ME(STI)-52, REMOVAL, Cam Sprocket.>
- 6) Remove the crank sprocket.



### B: INSTALLATION

- 1) Install the crank sprocket.



- 2) Install the cam sprocket. <Ref. to ME(STI)-52, INSTALLATION, Cam Sprocket.>
- 3) Install the timing belt. <Ref. to ME(STI)-45, INSTALLATION, Timing Belt.>
- 4) Install the timing belt cover. <Ref. to ME(STI)-43, INSTALLATION, Timing Belt Cover.>
- 5) Install the crank pulley. <Ref. to ME(STI)-42, INSTALLATION, Crank Pulley.>
- 6) Install the V-belt. <Ref. to ME(STI)-40, INSTALLATION, V-belt.>

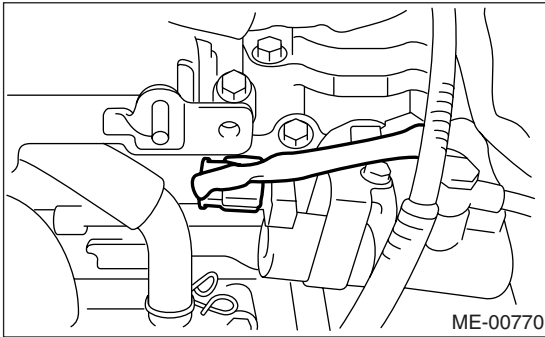
### C: INSPECTION

- 1) Check the sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.
- 3) Check the crank sprocket notch used for sensor for damage and contamination of foreign matter.

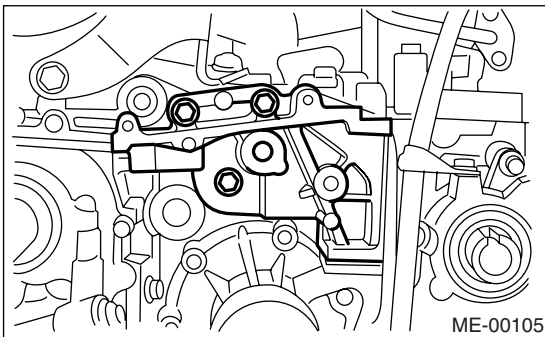
## 18. Camshaft

### A: REMOVAL

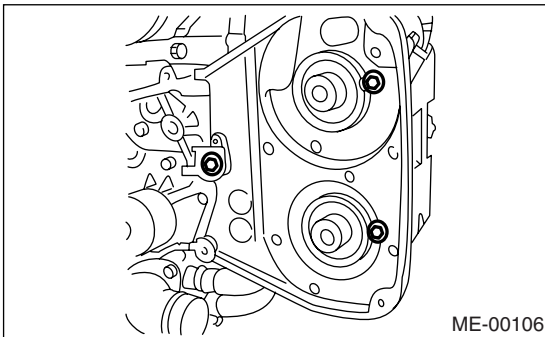
- 1) Remove the V-belt. <Ref. to ME(STI)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(STI)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(STI)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(STI)-44, REMOVAL, Timing Belt.>
- 5) Remove the cam sprocket. <Ref. to ME(STI)-42, REMOVAL, Crank Pulley.>
- 6) Remove the crank sprocket. <Ref. to ME(STI)-53, REMOVAL, Crank Sprocket.>
- 7) Disconnect the oil flow control solenoid valve assembly connector.



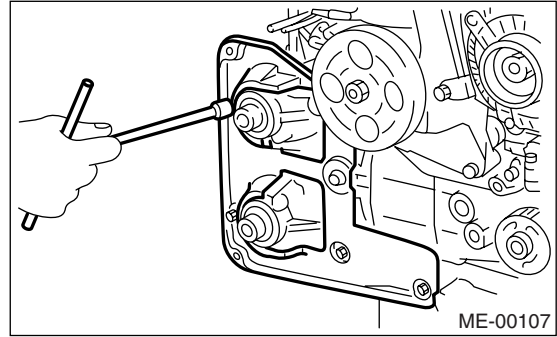
- 8) Remove the tensioner bracket.



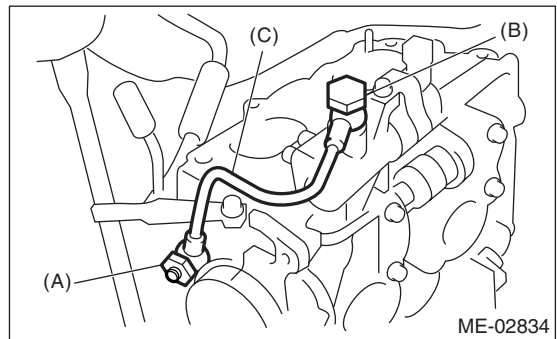
- 9) Remove the timing belt cover No. 2 (LH).



- 10) Remove the timing belt cover No. 2 (RH).

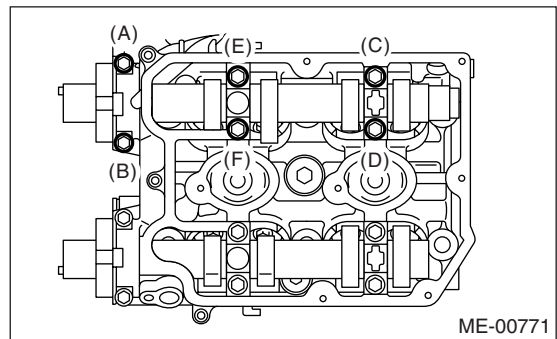


- 11) Remove the spark plug cord.
- 12) Remove the oil level gauge guide. (LH side)
- 13) Remove the rocker cover and gasket.
- 14) Remove the oil pipe.



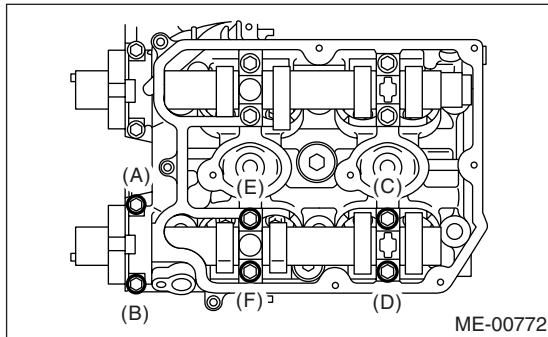
- (A) Union screw (with protrusion)
- (B) Union screw (without protrusion)
- (C) Oil pipe

- 15) Loosen the oil flow control solenoid valve assembly and intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.





16) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



17) Remove the oil flow control solenoid valve assembly, intake camshaft cap, and camshaft.  
18) Remove the exhaust camshaft cap and camshaft.

**NOTE:**

Arrange the camshaft caps in order so that they can be reinstalled in their original positions.

19) Similarly, remove the camshafts (RH) and related parts.

## B: INSTALLATION

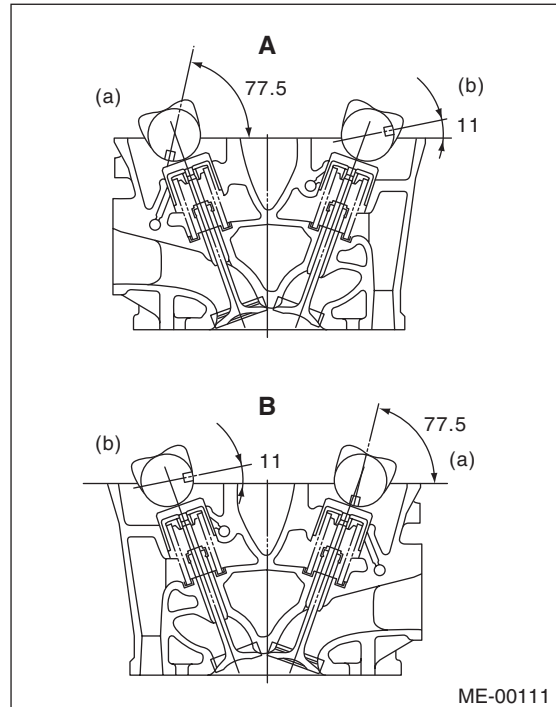
### 1) Camshaft installation

Apply engine oil to cylinder head at camshaft bearing location before installing the camshaft. Install the camshaft so that each valve is close to or in contact with “base circle” of cam lobe.

**NOTE:**

- When the camshafts are positioned as shown in the figure, camshafts need to be rotated at a minimum to align with the timing belt during installation.

- Camshaft (RH) need not be rotated when set at position shown in the figure. Intake camshaft (LH): Rotate 80° clockwise. Exhaust camshaft (LH): Rotate 45° counterclockwise.



- A Cylinder head (LH)
- B Cylinder head (RH)
- (a) Intake camshaft
- (b) Exhaust camshaft

### 2) Camshaft cap and oil flow control solenoid valve assembly installation

(1) Apply liquid gasket sparingly to cap mating surface.

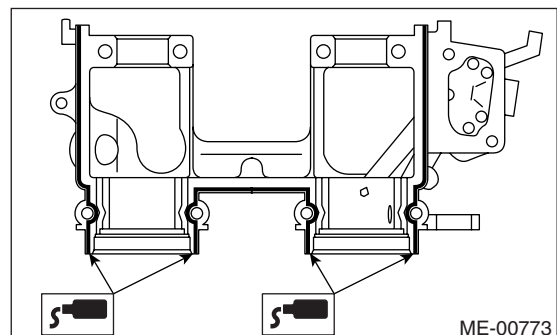
**NOTE:**

Do not apply liquid gasket excessively. Failure to do so may cause excess gasket to come out and flow toward the oil seal, resulting in oil leaks.

**Liquid gasket:**

**Part No. 004403007**

**THREE BOND 1215 or equivalent**



# Camshaft

MECHANICAL

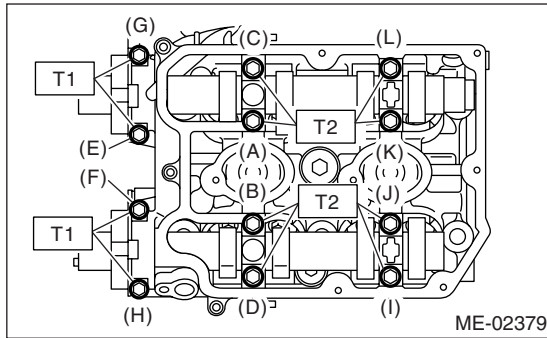
(2) Apply engine oil to cap bearing surface and install the cap on camshaft.

(3) Gradually tighten the camshaft cap and oil control valve assembly in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.

**Tightening torque:**

**T1: 9.75 N·m (1.0 kgf-m, 7 ft-lb)**

**T2: 20 N·m (2.0 kgf-m, 14.8 ft-lb)**



(4) After tightening camshaft cap, ensure the camshaft rotates only slightly while holding it at “base” circle.

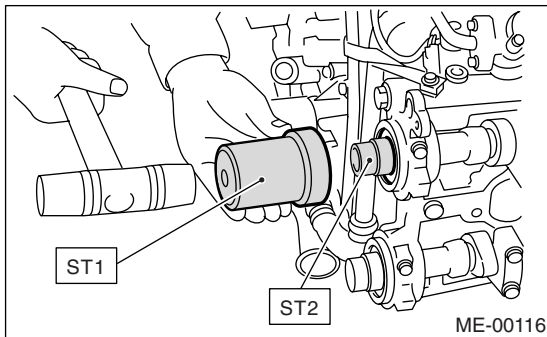
3) Apply engine oil to the outer perimeter and lips of oil seal, and install the oil seal on camshaft using ST1 and ST2.

**NOTE:**

Use a new oil seal.

ST1 499587600 OIL SEAL GUIDE

ST2 499597200 OIL SEAL GUIDE



**4) Rocker cover installation**

(1) Install the gasket on rocker cover. Install the nearby gaskets and ignition coil gasket.

**NOTE:**

Use a new gasket.

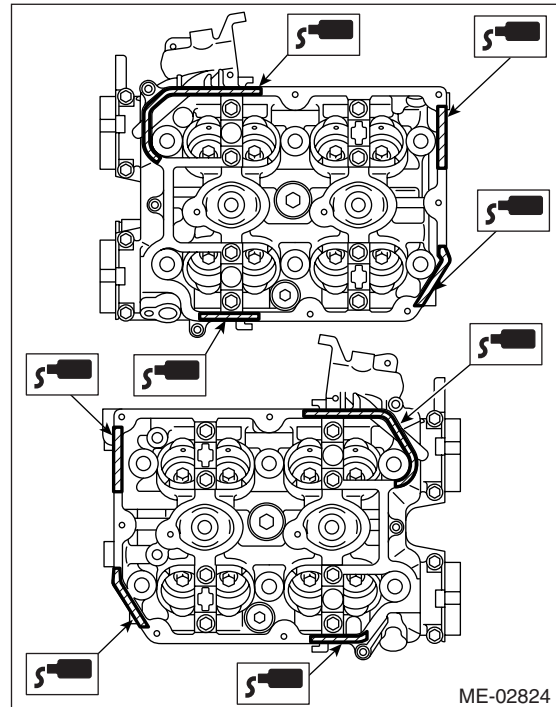
(2) Apply liquid gasket to the specified point of cylinder head.

**NOTE:**

Apply liquid gasket to the half moon plug portion with sticking out more than 5 mm (0.2 in).

**Liquid gasket:**

**THREE BOND 1215 (Part No. 004403007) or equivalent**

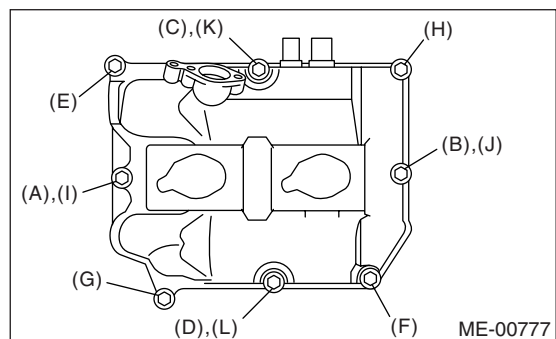


(3) Install the rocker cover on cylinder head. Ensure the gasket is properly positioned during installation.

(4) Tighten the rocker cover tightening bolt in alphabetical sequence shown in the figure, and then tighten to specified torque.

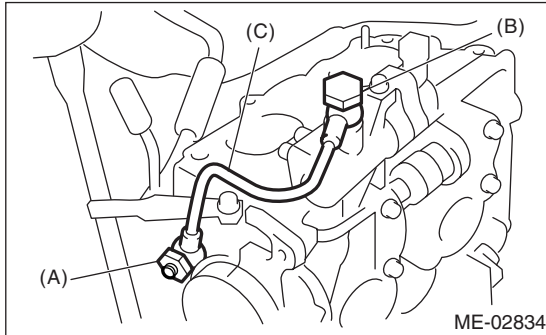
**Tightening torque:**

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



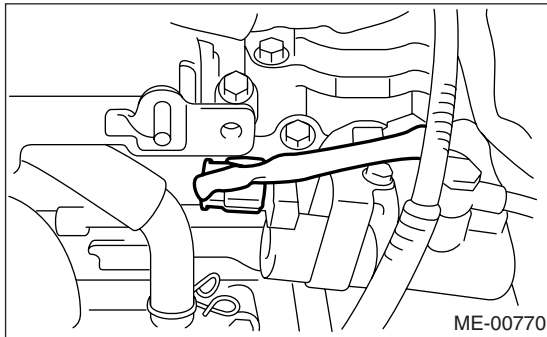
5) Install the oil pipe. Assemble the union screw to the location as shown in the figure during installation.

**Tightening torque:**  
**29 N·m (3.0 kgf·m, 21.4 ft·lb)**



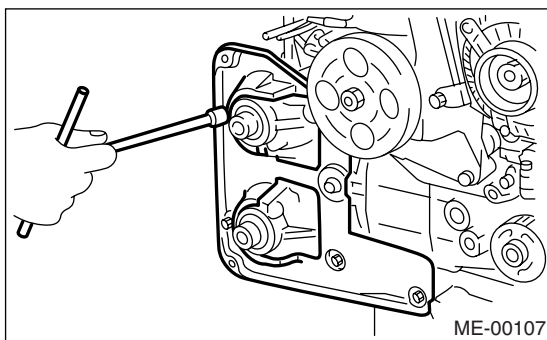
- (A) Union screw (with protrusion)
- (B) Union screw (without protrusion)
- (C) Oil pipe

6) Connect the oil flow control solenoid valve connector.



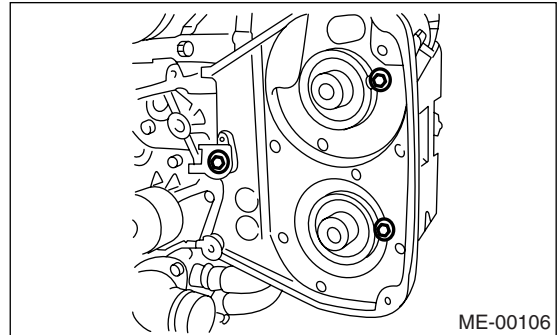
- 7) Install the spark plug cord.
- 8) Similarly, install the parts on right-hand side.
- 9) Install the timing belt cover No. 2 (RH).

**Tightening torque:**  
**5 N·m (0.5 kgf·m, 3.6 ft·lb)**



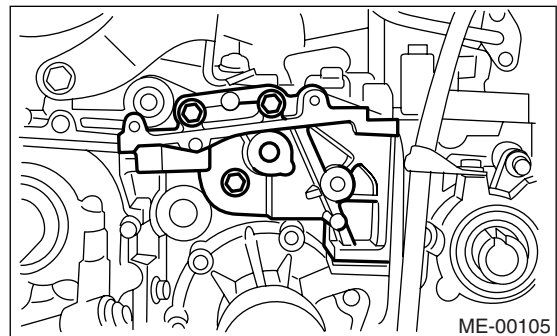
10) Install the timing belt cover No. 2 (LH).

**Tightening torque:**  
**5 N·m (0.5 kgf·m, 3.6 ft·lb)**



11) Install the tensioner bracket.

**Tightening torque:**  
**24.5 N·m (2.5 kgf·m, 18.1 ft·lb)**



12) Install the crank sprocket. <Ref. to ME(STI)-53, INSTALLATION, Crank Sprocket.>

13) Install the cam sprockets. <Ref. to ME(STI)-52, INSTALLATION, Cam Sprocket.>

14) Install the timing belt. <Ref. to ME(STI)-45, INSTALLATION, Timing Belt.>

15) Install the timing belt cover. <Ref. to ME(STI)-43, INSTALLATION, Timing Belt Cover.>

16) Install the crank pulley. <Ref. to ME(STI)-42, INSTALLATION, Crank Pulley.>

17) Install the V-belt. <Ref. to ME(STI)-40, INSTALLATION, V-belt.>



# Camshaft

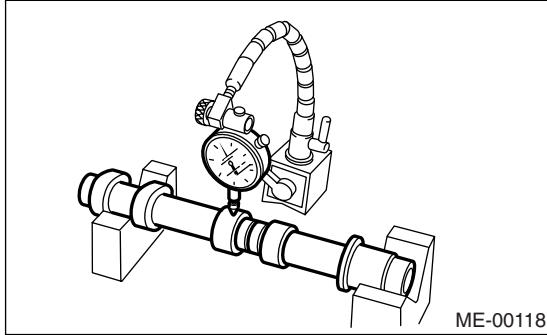
MECHANICAL

## C: INSPECTION

1) Measure the bend, and repair or replace if necessary.

**Limit:**

**0.020 mm (0.00079 in)**



2) Check the journal for damage and wear. Replace if faulty.

3) Measure the outside diameter of camshaft journal. If the journal diameter is not as specified, check the oil clearance.

|          | Camshaft journal                           |  |
|----------|--|--|
|          | Front                                      | Center, rear                               |
| Standard | 37.946 — 37.963 mm<br>(1.4939 — 1.4946 in) | 29.946 — 29.963 mm<br>(1.1790 — 1.1796 in) |

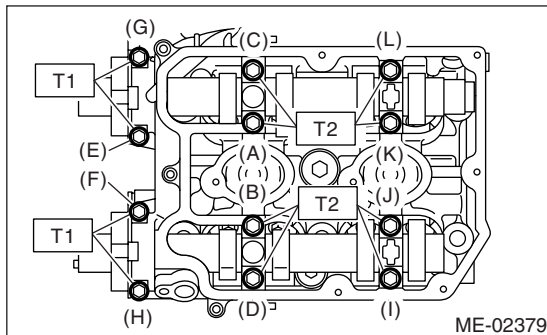
4) Measurement of the camshaft journal oil clearance

- (1) Clean the bearing caps and camshaft journals.
- (2) Place the camshafts on cylinder head.
- (3) Place a plastigauge across each of the camshaft journals.
- (4) Gradually tighten the cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque. Do not turn the camshaft.

**Tightening torque:**

**T1: 10 N·m (1.0 kgf·m, 7.4 ft·lb)**

**T2: 20 N·m (2.0 kgf·m, 14.8 ft·lb)**



(5) Remove the bearing caps.

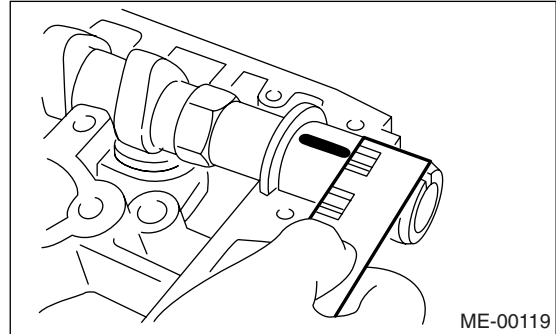
(6) Measure the widest point of plastigauge on each journal. If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

**Standard:**

**0.037 — 0.072 mm (0.0015 — 0.0028 in)**

**Limit:**

**0.10 mm (0.0039 in)**



(7) Completely remove the plastigauge.

5) Check the cam face condition, and remove the minor faults by grinding with oil stone. Measure the cam height H. If it exceeds the limit or offset wear occurs, replace the camshaft.

**Cam height H:**

**Standard:**

**Intake:**

**46.55 — 46.65 mm (1.833 — 1.837 in)**

**Exhaust:**

**46.75 — 46.85 mm (1.841 — 1.844 in)**

**Limit:**

**Intake:**

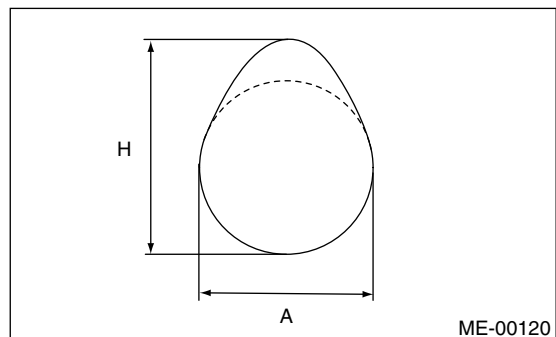
**46.45 mm (1.829 in)**

**Exhaust:**

**46.65 mm (1.837 in)**

**Cam base circle diameter A:**

**37.0 mm (1.457 in)**



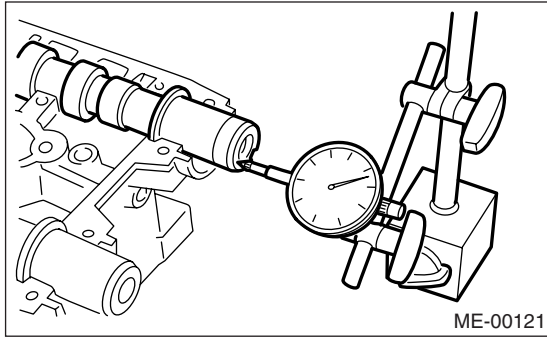
6) Measure the thrust clearance of camshaft with dial gauge. If the thrust clearance exceeds the limit, replace the caps and cylinder head as a set. If necessary, replace the camshaft.

**Standard:**

**0.068 — 0.116 mm (0.0027 — 0.0046 in)**

**Limit:**

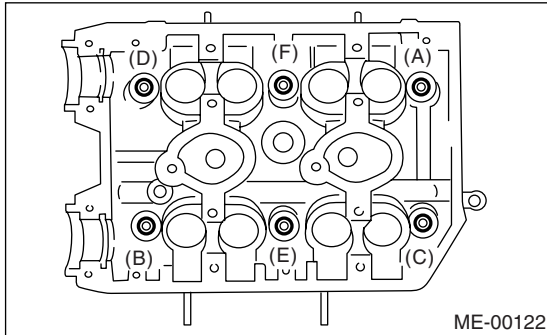
**0.14 mm (0.0055 in)**



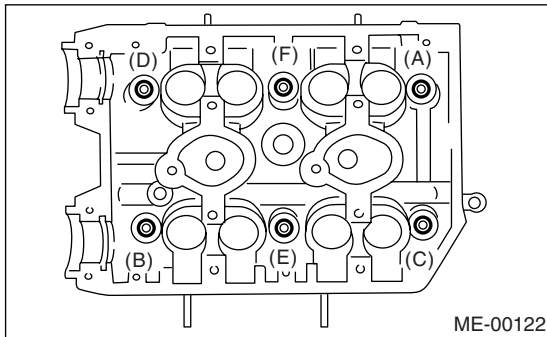
## 19. Cylinder Head

### A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(STI)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(STI)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(STI)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(STI)-44, REMOVAL, Timing Belt.>
- 5) Remove the cam sprocket. <Ref. to ME(STI)-52, REMOVAL, Cam Sprocket.>
- 6) Remove the intake manifold. <Ref. to FU(STI)-13, REMOVAL, Intake Manifold.>
- 7) Remove the bolt which installs the A/C compressor bracket on cylinder head.
- 8) Remove the camshaft. <Ref. to ME(STI)-54, REMOVAL, Camshaft.>
- 9) Remove the cylinder head bolts in alphabetical sequence shown in the figure.  
Leave bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.



- 10) While tapping the cylinder head with a plastic hammer, separate it from cylinder block. Remove the bolts (A) and (D) to remove cylinder head.



- 11) Remove the cylinder head gasket.

### CAUTION:

**Be careful not to scratch the mating surface of cylinder head and cylinder block.**

- 12) Similarly, remove the cylinder head (RH).

### B: INSTALLATION

- 1) Install the cylinder head and gaskets on cylinder block.

### CAUTION:

- Use new cylinder head gaskets.
  - Be careful not to scratch the mating surface of cylinder head and cylinder block.
- 2) Tighten the cylinder head bolts.
    - (1) Apply a coat of engine oil to the washers and bolt threads.
    - (2) Tighten all bolts to 29 N·m (3.0 kgf-m, 21.4 ft-lb) in alphabetical sequence.
    - (3) Tighten all bolts to 69 N·m (7.0 kgf-m, 50.9 ft-lb) in alphabetical sequence again.
    - (4) Back off all bolts by 180° first; back them off by 180° again in reverse order of installation.
    - (5) Tighten all bolts to 49 N·m (5.0 kgf-m, 36 ft-lb) in alphabetical sequence.
    - (6) Tighten all bolts 80 to 90° in alphabetical sequence.
    - (7) Tighten all bolts by 40 to 45° in alphabetical sequence again.

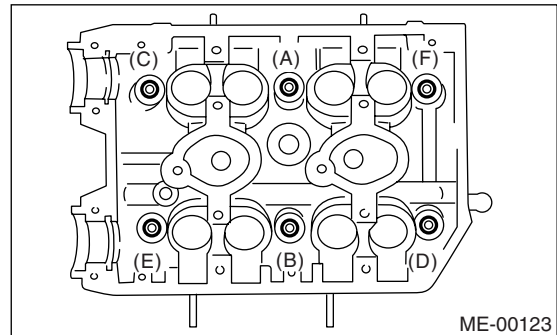
### CAUTION:

**Do not tighten the bolts by more than 45°.**

- (8) Further tighten all bolts (A) and (B) by 40 to 45°.

### CAUTION:

**Ensure that the total “re-tightening angle” in the previous two steps do not exceed 90°.**



- 3) Install the camshaft. <Ref. to ME(STI)-55, INSTALLATION, Camshaft.>
- 4) Install the A/C compressor bracket on cylinder head.
- 5) Install the intake manifold. <Ref. to FU(STI)-16, INSTALLATION, Intake Manifold.> <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 6) Install the cam sprocket. <Ref. to ME(STI)-52, INSTALLATION, Cam Sprocket.>
- 7) Install the timing belt. <Ref. to ME(STI)-45, INSTALLATION, Timing Belt.>
- 8) Install the timing belt cover. <Ref. to ME(STI)-43, INSTALLATION, Timing Belt Cover.>

9) Install the crank pulley. <Ref. to ME(STI)-42, INSTALLATION, Crank Pulley.>

10) Install the V-belt. <Ref. to ME(STI)-40, INSTALLATION, V-belt.>

## C: DISASSEMBLY

1) Remove the valve lifters.

2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

ST1 498267600 CYLINDER HEAD TABLE

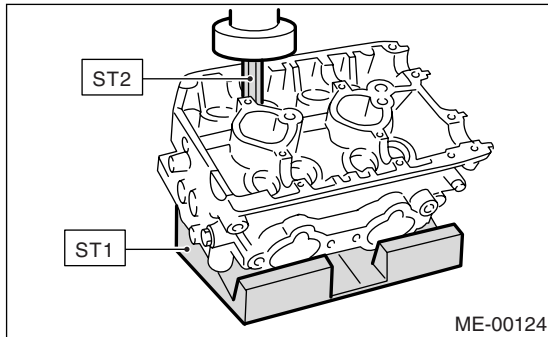
ST2 499718000 VALVE SPRING REMOVER

### NOTE:

Keep the removed parts in order for re-installing in their original positions.

### CAUTION:

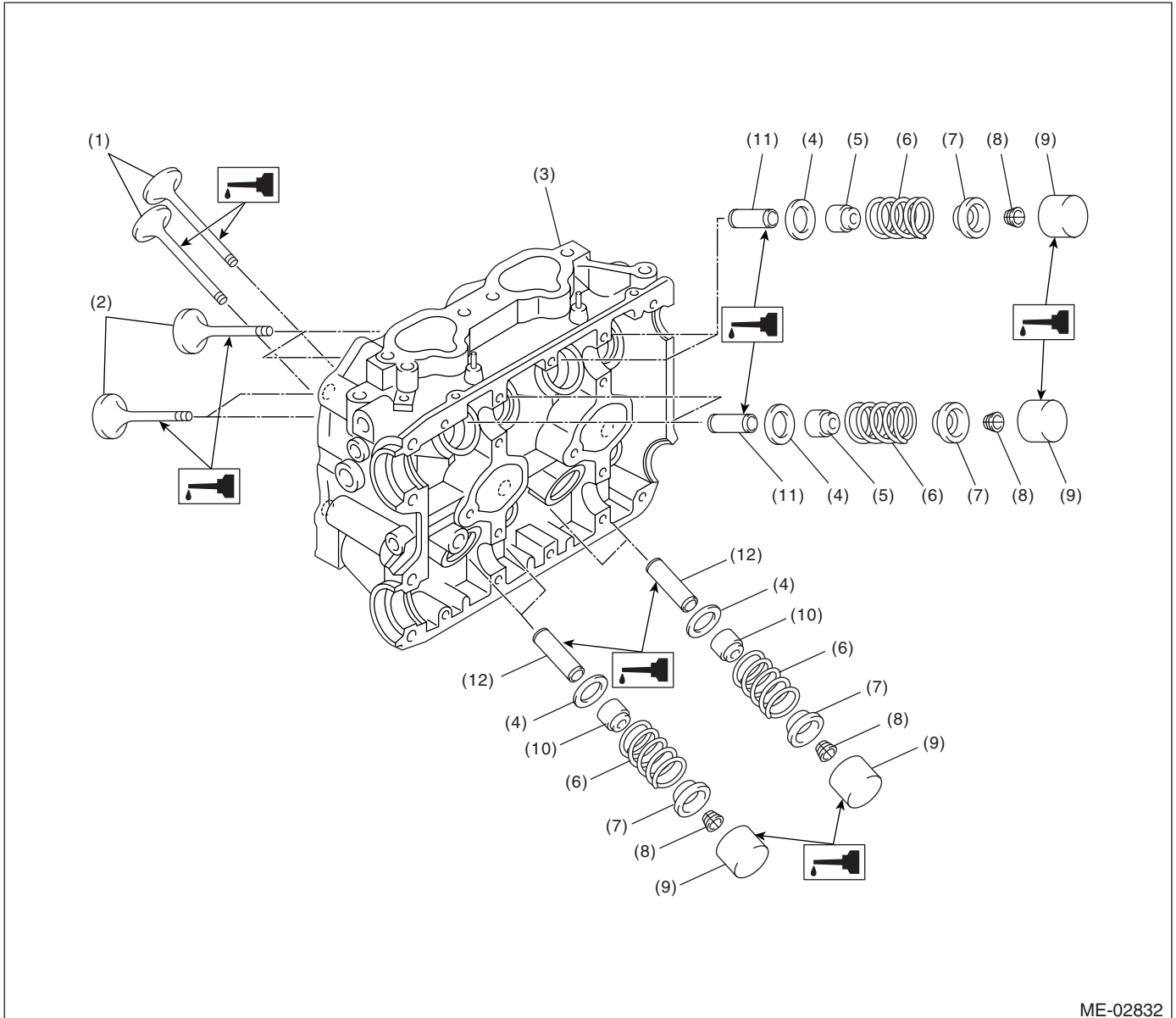
- Mark each valve to prevent confusion.
- Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve oil seals.



# Cylinder Head

MECHANICAL

## D: ASSEMBLY



ME-02832

- |                       |                           |                             |
|-----------------------|---------------------------|-----------------------------|
| (1) Exhaust valve     | (5) Intake valve oil seal | (9) Valve lifter            |
| (2) Intake valve      | (6) Valve spring          | (10) Exhaust valve oil seal |
| (3) Cylinder head     | (7) Retainer              | (11) Intake valve guide     |
| (4) Valve spring seat | (8) Retainer key          | (12) Exhaust valve guide    |

### 1) Installation of valve spring and valve:

- (1) Coat the stem of each valve with engine oil and insert the valve into valve guide.

#### NOTE:

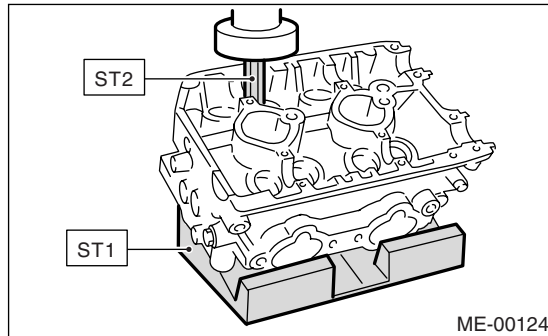
When inserting the valve into valve guide, use special care not to damage the oil seal lip.

- (2) Set the cylinder head on ST1.
- (3) Install the valve spring and retainer using ST2.

ST1 498267600 CYLINDER HEAD TABLE  
ST2 499718000 VALVE SPRING REMOVER

**NOTE:**

Be sure to install the valve springs with their close-coiled end facing the seat on cylinder head.



ME-00124

(4) Compress the valve spring, and then fit the valve spring retainer key.

(5) After installing, tap the valve spring retainers lightly with wooden hammer for better seating.

2) Apply oil to the surface of the valve lifter.

3) Install the valve lifter.

## E: INSPECTION

### 1. CYLINDER HEAD

1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect the important areas by means of liquid penetrant tester.

2) Measure the warping of the cylinder head surface that mates with crankcase by using a straight edge (A) and thickness gauge (B).

If the warping exceeds the limit, grind the surface with a surface grinder.

**Warping limit:**

**0.035 mm (0.0014 in)**

**Grinding limit:**

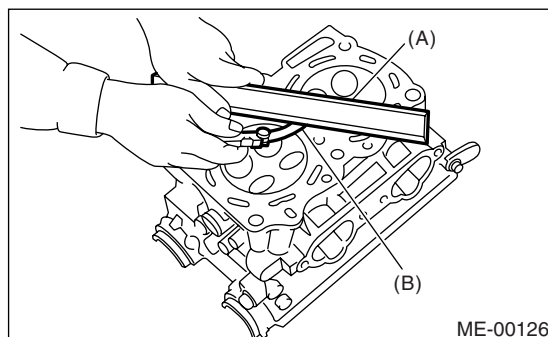
**0.3 mm (0.012 in)**

**Standard height of cylinder head:**

**127.5 mm (5.02 in)**

**NOTE:**

Uneven torque for the cylinder head nuts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.



ME-00126

### 2. VALVE SEAT

Inspect the intake and exhaust valve seats, and then correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

**Valve seat contact width W:**

**Intake**

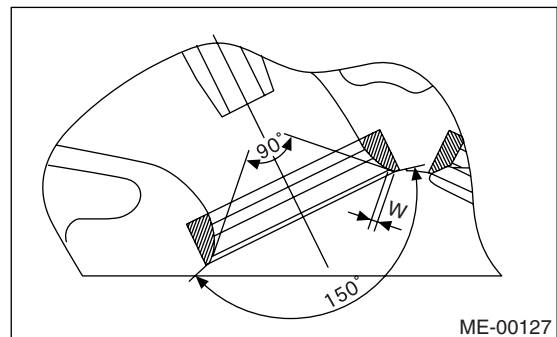
**Standard 0.6 — 1.6 mm (0.024 — 0.055 in)**

**Limit 1.7 mm (0.067 in)**

**Exhaust**

**Standard 1.2 — 1.8 mm (0.047 — 0.071 in)**

**Limit 2.2 mm (0.087 in)**



ME-00127

### 3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

**Clearance between the valve guide and valve stem:**

**Standard**

**Intake**

**0.030 — 0.057 mm (0.0012 — 0.0022 in)**

**Exhaust**

**0.040 — 0.067 mm (0.0016 — 0.0026 in)**

**Limit**

**0.15 mm (0.0059 in)**

2) If the clearance between valve guide and stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

**Valve guide inner diameter:**

**6.000 — 6.012 mm (0.2362 — 0.2367 in)**

**Valve stem outer diameters:**

**Intake**

**5.955 — 5.970 mm (0.2344 — 0.2350 in)**

**Exhaust**

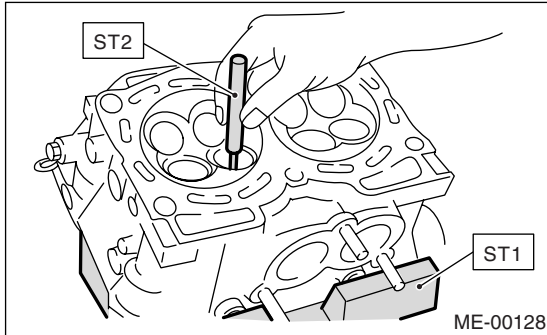
**5.945 — 5.960 mm (0.2341 — 0.2346 in)**

# Cylinder Head

## MECHANICAL

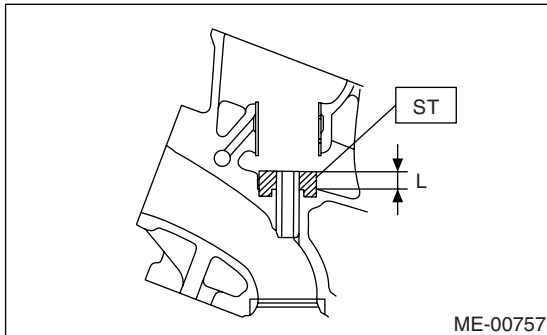
- (1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.
- (2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE  
ST2 499767200 VALVE GUIDE REMOVER



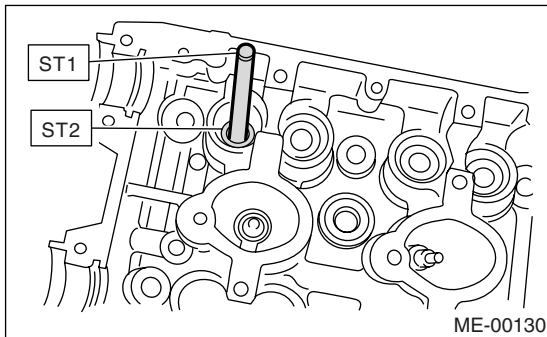
- (3) Turn the cylinder head upside down and place ST as shown in the figure.

ST 18251AA020 VALVE GUIDE ADJUSTER



- (4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.
- (5) Put a new valve guide, coated with sufficient oil, in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER  
ST2 18251AA020 VALVE GUIDE ADJUSTER



- (6) Check the valve guide protrusion.

### Valve guide protrusion L:

15.8 — 16.2 mm (0.622 — 0.638 in)

- (7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into the valve guide, and return it also rotating clockwise. After reaming, clean the valve guide to remove chips.

ST 499767400 VALVE GUIDE REAMER

### NOTE:

- Apply engine oil to the reamer when reaming.
  - If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
  - If the inner surface of the valve guide becomes lustrous and the reamer does not chip, use a new reamer or remedy the reamer.
- (8) Recheck the contact condition between valve and valve seat after replacing the valve guide.



## 4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if head edge thickness "H" is less than the specified limit.

### Head edge thickness H:

#### Intake (A)

**Standard 1.0 — 1.4 mm (0.039 — 0.055 in)**

**Limit 0.8 mm (0.031 in)**

#### Exhaust (B)

**Standard 1.3 — 1.7 mm (0.051 — 0.067 in)**

**Limit 0.8 mm (0.031 in)**

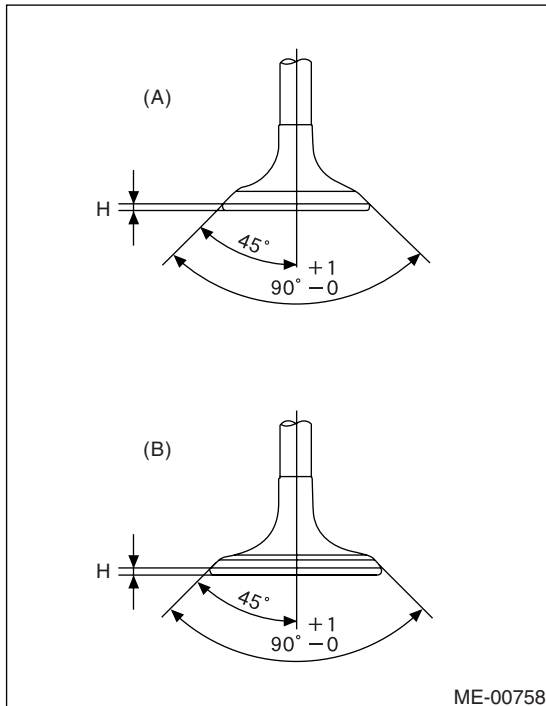
### Valve overall length:

#### Intake (A)

**104.4 mm (4.110 in)**

#### Exhaust (B)

**104.65 mm (4.120 in)**



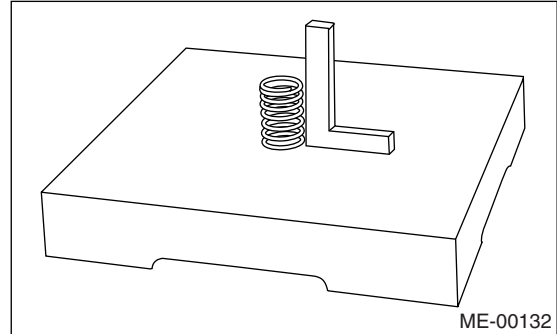
2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

## 5. VALVE SPRINGS

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within specifications presented in the table.

2) To measure the squareness of valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

|                       |      | Valve spring   |
|-----------------------|------|--|
| Free length           |      | 47.32 mm (1.863 in)  |
| Tension/spring height | Set  | 205 — 235 N<br>(20.9 — 24.0 kgf, 46.1 — 52.8 lbf)<br>/36.0 mm (1.417 in) |
|                       | Lift | 426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lbf) /26.50 mm (1.043 in)       |
| Squareness            |      | 2.5°, 2.1 mm (0.083 in) or less  |



## 6. INTAKE AND EXHAUST VALVE OIL SEAL

In the following case, pinch and remove the oil seal from valve using pliers, and then replace it with a new one.

- When the lip is damaged.
- When the spring is out of the specified position.
- When readjusting the surfaces of valve and valve seat.
- When replacing the intake valve guide.

- 1) Place the cylinder head on ST1.
- 2) Press in the oil seal to the specified dimension indicated in the figure by using ST2.

ST1 498267600 CYLINDER HEAD TABLE

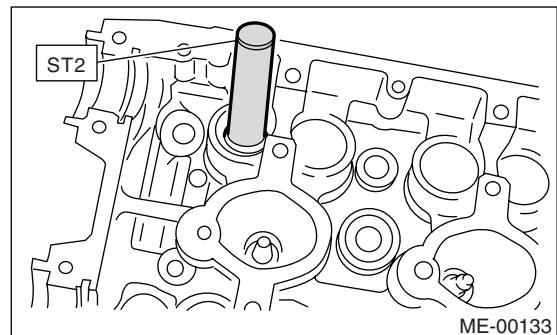
ST2 498857100 VALVE OIL SEAL GUIDE

### NOTE:

- Apply engine oil to oil seal before press-fit.
- Differentiate between the intake valve oil seal and exhaust valve oil seal by noting their difference in color.

### Color of rubber part:

**Intake [Gray] Exhaust [Green]**





# Cylinder Head

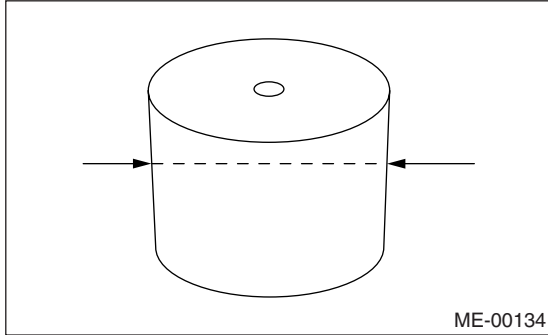
MECHANICAL

## 7. VALVE LIFTER

- 1) Visually check the valve lifter.
- 2) Measure the outer diameter of valve lifter.

### Outer diameter:

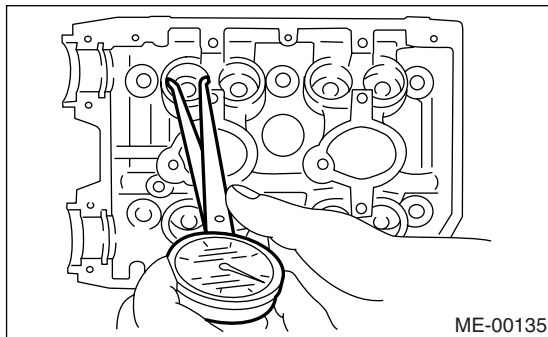
**34.959 — 34.975 mm (1.3763 — 1.3770 in)**



- 3) Measure the inner diameter of valve lifter mating part on cylinder head.

### Inner diameter:

**34.994 — 35.016 mm (1.3777 — 1.3786 in)**



### NOTE:

If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the limit, replace the cylinder head.

### Standard:

**0.019 — 0.057 mm (0.0007 — 0.0022 in)**

### Limit:

**0.100 mm (0.0039 in)**

## F: DISPOSAL

### CAUTION:

- Metallic sodium is enclosed in the exhaust valve. Metallic sodium is extremely alkaline and may produce severe chemical reactions. Full consideration must therefore be given to the following points when handling or disposing of the valve.
- Since metallic sodium may cause blindness if contacted with the eyes, burns if contacted with the skin, and fire, do not deliberately take the valve apart.

If the valve is damaged, remove the valve and neutralize it by immersing it in water, and dispose of it in the same way that general steel materials are disposed of. The disposal method is described in the following.

- 1) Wearing rubber gloves, remove the damaged valve from the cylinder head.
- 2) Prepare a large receptacle (bucket or other container) in a well ventilated location, and fill the receptacle with water (at least 10 ℓ (21.14 US qt, 17.6 Imp qt)).
- 3) Immerse the damaged valve in the receptacle.

### CAUTION:

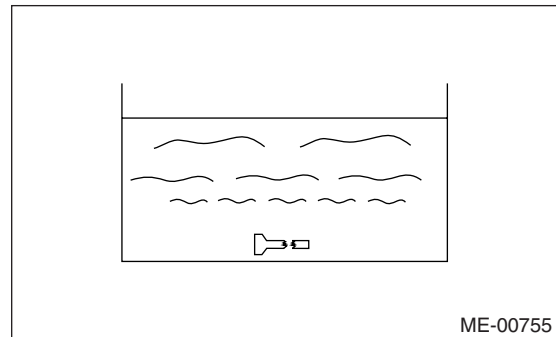
**A severe reaction may occur, so stand at least 2 — 3 m from the receptacle. Because the reaction will produce hydrogen gas, moreover, keep the receptacle away from sparks or flames.**

- 4) Once the reaction is completed (about 4 — 5 hours have elapsed), carefully remove the valve using large pincers so that the reaction liquid does not contact your skin, and dispose of it with other parts that are being disposed of.

- 5) The reaction liquid is a strong alkaline solution, so it must be disposed of in accordance with local regulations.

### CAUTION:

**Make sure the reaction liquid does not contact your skin. If contact with skin occurs, immediately wash the affected area with large quantities of water.**



## 20. Cylinder Block

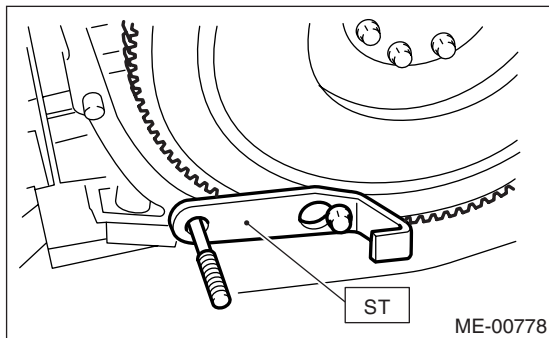
### A: REMOVAL

**NOTE:**

Before conducting this procedure, drain the engine oil completely if applicable.

- 1) Remove the intake manifold. <Ref. to FU(STI)-13, REMOVAL, Intake Manifold.>
- 2) Remove the V-belt. <Ref. to ME(STI)-40, REMOVAL, V-belt.>
- 3) Remove the crank pulley. <Ref. to ME(STI)-42, REMOVAL, Crank Pulley.>
- 4) Remove the timing belt cover. <Ref. to ME(STI)-43, REMOVAL, Timing Belt Cover.>
- 5) Remove the timing belt. <Ref. to ME(STI)-44, REMOVAL, Timing Belt.>
- 6) Remove the cam sprocket. <Ref. to ME(STI)-52, REMOVAL, Cam Sprocket.>
- 7) Remove the crank sprocket. <Ref. to ME(STI)-53, REMOVAL, Crank Sprocket.>
- 8) Remove the generator and A/C compressor with their brackets.
- 9) Remove the cylinder head. <Ref. to ME(STI)-60, REMOVAL, Cylinder Head.>
- 10) Remove the clutch disc and cover. <Ref. to CL-14, REMOVAL, Clutch Disc and Cover.>
- 11) Remove the flywheel. <Ref. to CL-17, REMOVAL, Flywheel.>

ST 498497100 CRANKSHAFT STOPPER

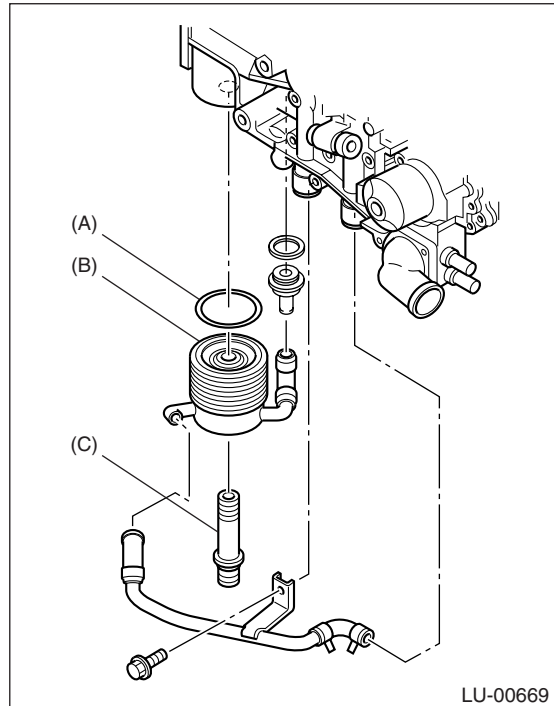


- 12) Remove the oil separator cover.
  - 13) Remove the water by-pass pipe for heater.
  - 14) Remove the oil filter using ST.
- ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))
- ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))

**NOTE:**

Standard oil filter is outer diameter of 65 mm (2.56 in). However, SUBARU genuine oil filter having outer diameter of 68 mm (2.68 in) can also be used.

- 15) Remove the oil cooler.

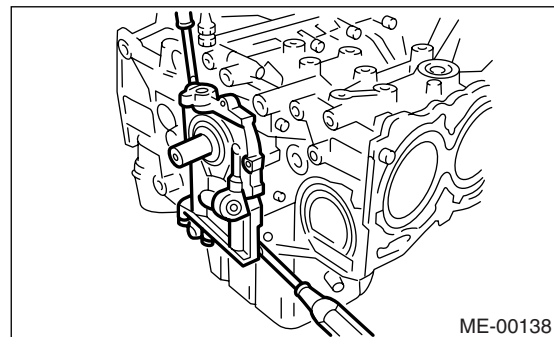


- (A) Gasket
- (B) Oil cooler
- (C) Oil cooler connector

- 16) Remove the water pump.
- 17) Remove the oil pump from cylinder block. Use a flat-bladed screwdriver as shown in the figure when removing the oil pump.

**NOTE:**

Be careful not to scratch the mating surface of cylinder block and oil pump.



- 18) Removal of oil pan:
  - (1) Turn the cylinder block with #2 and #4 piston sides facing upward.
  - (2) Remove the bolts which secure oil pan to cylinder block.
  - (3) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance, and then remove the oil pan.

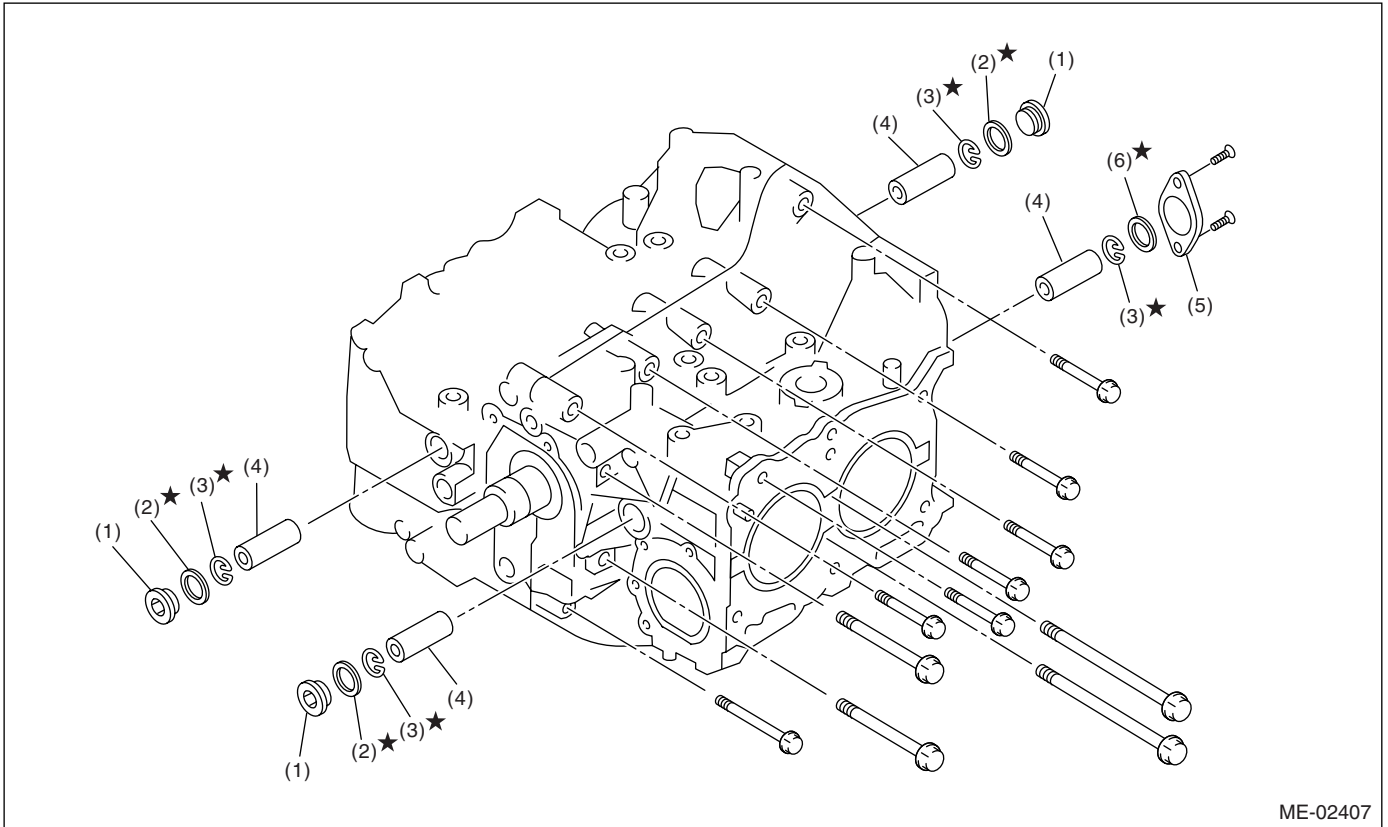
Do not use a screwdriver or similar tool in place of oil pan cutter.

# Cylinder Block

## MECHANICAL

- 19) Remove the oil strainer stay.
- 20) Remove the oil strainer.

- 21) Remove the baffle plate.
- 22) Remove the water pipes.

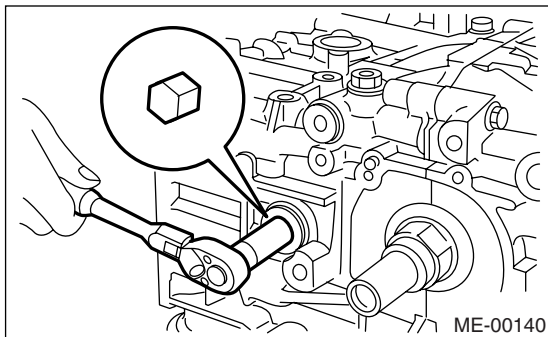


ME-02407

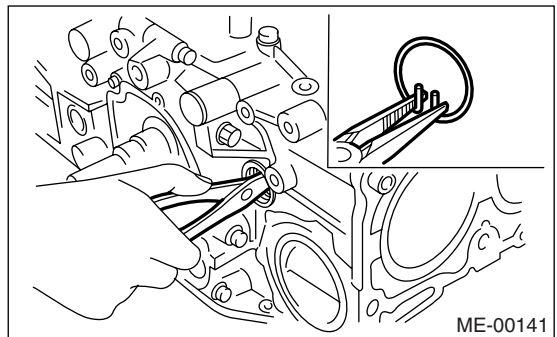
- |                       |                |                        |
|-----------------------|----------------|------------------------|
| (1) Service hole plug | (3) Snap ring  | (5) Service hole cover |
| (2) Gasket            | (4) Piston pin | (6) O-ring             |

- 23) Remove the service hole cover and service hole plugs using hexagon wrench (14 mm).

- 24) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, and then remove the piston snap ring through service hole of #1 and #2 cylinders.



ME-00140



ME-00141

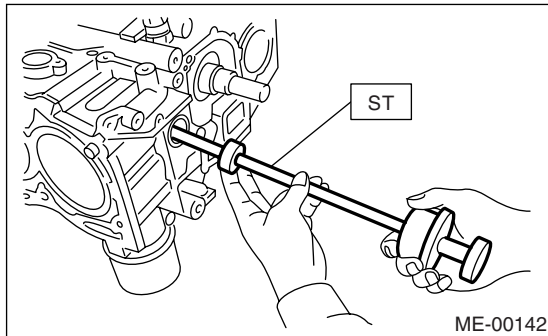
- 25) Draw out the piston pin from #1 and #2 pistons using ST.
- ST 499097700 PISTON PIN REMOVER ASSY

# Cylinder Block

MECHANICAL

**NOTE:**

Be careful not to confuse the original combination of piston, piston pin and cylinder.



26) Similarly remove the piston pins from #3 and #4 pistons.

27) Remove the bolts which connect the cylinder block on the side of #2 and #4 cylinders.

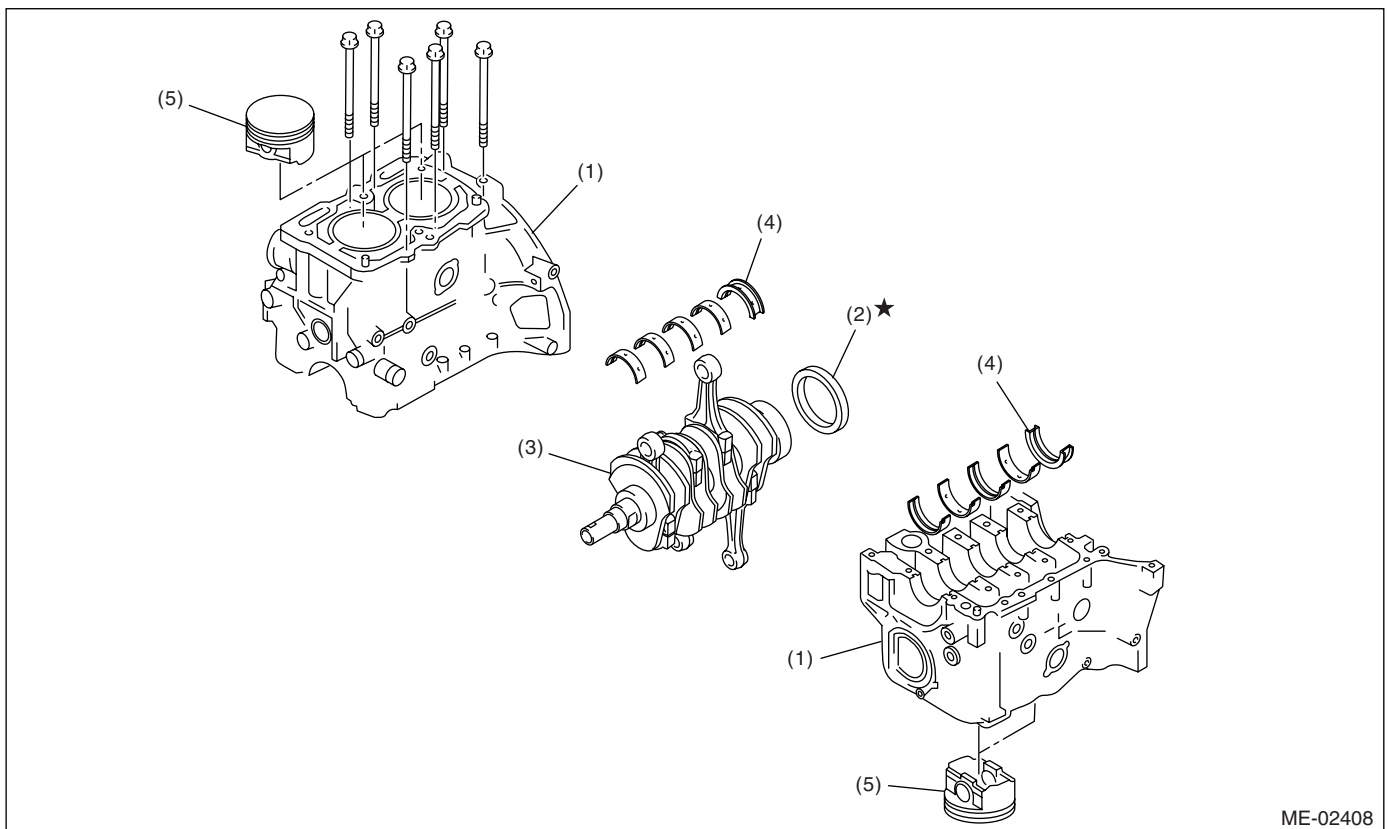
28) Back off the bolts which connect the cylinder block on the side of #1 and #3 cylinders two or three turns.

29) Set up the cylinder block so that #1 and #3 cylinders are on the upper side, then remove the cylinder block connecting bolts.

30) Separate the cylinder blocks (LH) and (RH).

**NOTE:**

When separating the cylinder block, do not allow the connecting rod to fall or damage the cylinder block.



(1) Cylinder block

(3) Crankshaft

(5) Piston

(2) Rear oil seal

(4) Crankshaft bearing

31) Remove the rear oil seal.

32) Remove the crankshaft together with connecting rod.

33) Remove the crankshaft bearings from cylinder block using a hammer handle.

**NOTE:**

Do not confuse the combination of crankshaft bearings. Press the bearing at the end opposite to locking lip.

34) Draw out each piston from cylinder block using a wooden bar or hammer handle.

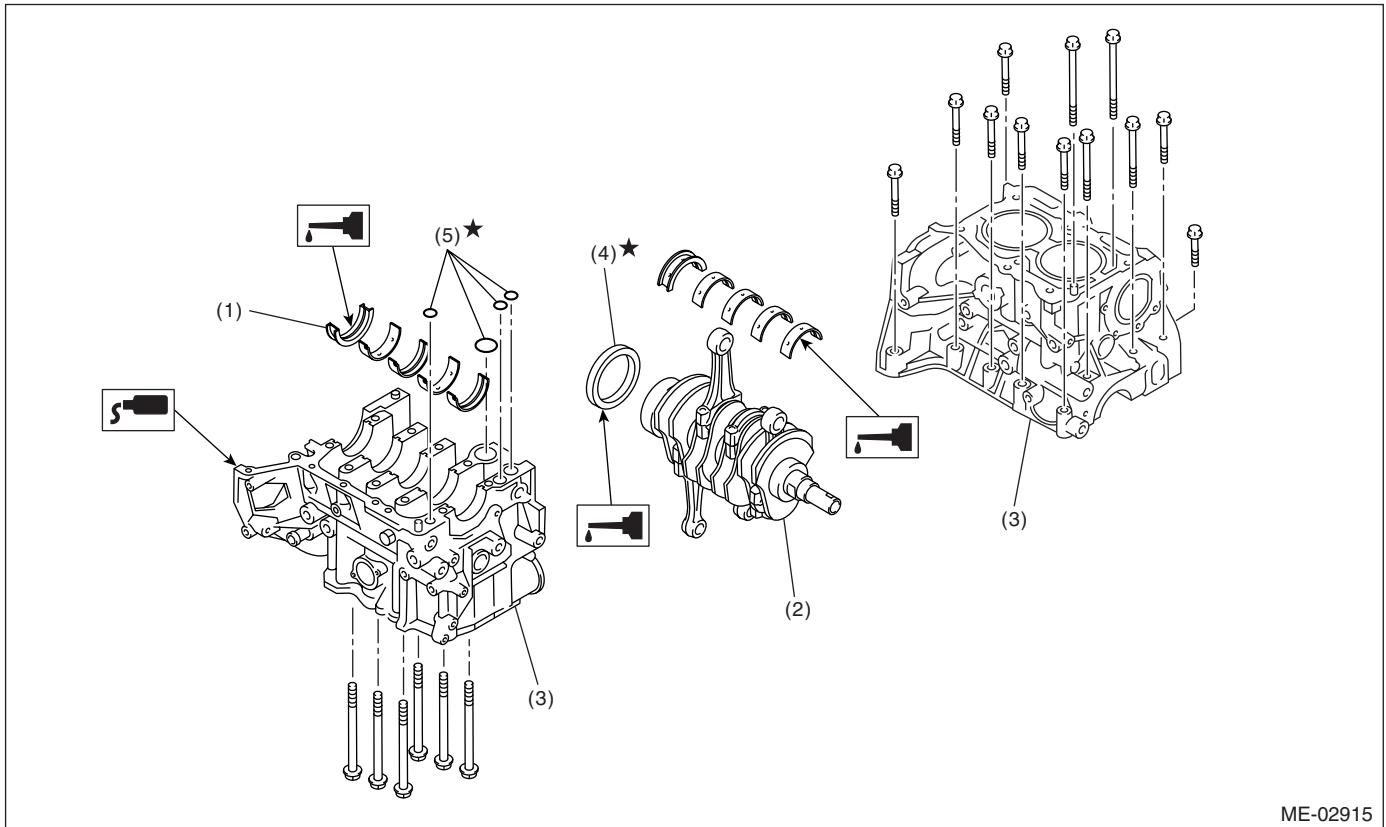
**NOTE:**

Be careful not to confuse the original combination of piston and cylinder.

# Cylinder Block

MECHANICAL

## B: INSTALLATION



- (1) Crankshaft bearing (2) Crankshaft (3) Cylinder block (4) Rear oil seal (5) O-ring

1) Remove oil in the mating surface of bearing and cylinder block before installation. Also apply engine oil to crankshaft pins.

2) Position the crankshaft and O-ring on #1 and #3 cylinder block.

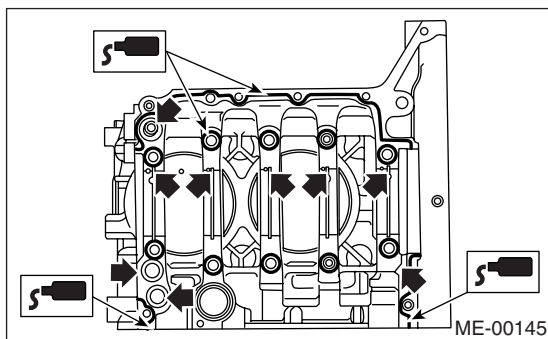
3) Apply liquid gasket to the mating surface of #1 and #3 cylinder block, and position #2 and #4 cylinder block.

### Liquid gasket:

**THREE BOND 1215 (Part No. 004403007) or equivalent**

### NOTE:

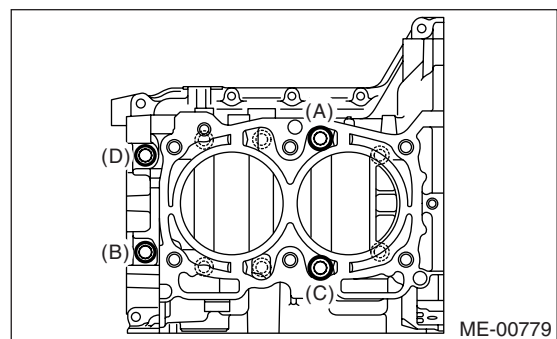
Do not allow liquid gasket to jut into O-ring grooves, oil passages, bearing grooves, etc.



- 4) Apply engine oil to washers and thread of bolts.  
5) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (LH side)

### Tightening torque:

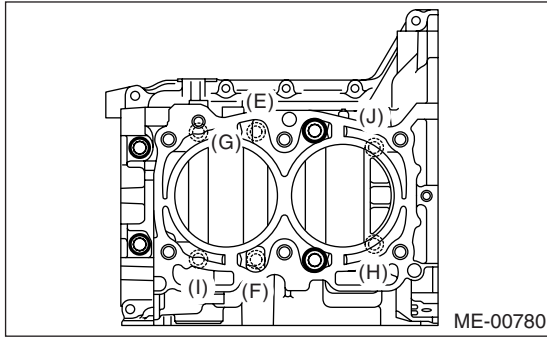
**10 N·m (1.0 kgf·m, 7.4 ft·lb)**



- 6) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (RH side)

**Tightening torque:**

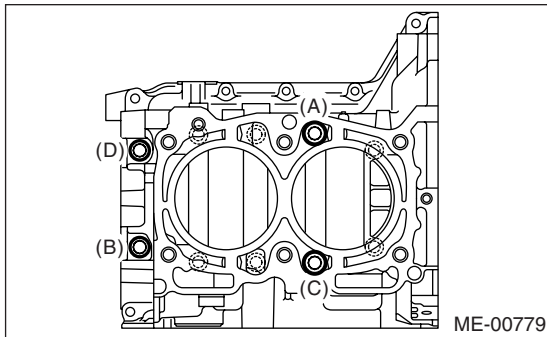
**10 N·m (1.0 kgf-m, 7.4 ft-lb)**



7) Further tighten the LH side bolts (A) — (D) in alphabetical sequence.

**Tightening torque:**

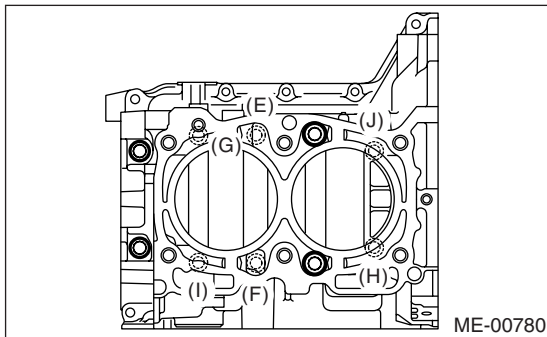
**18 N·m (1.8 kgf-m, 13.3 ft-lb)**



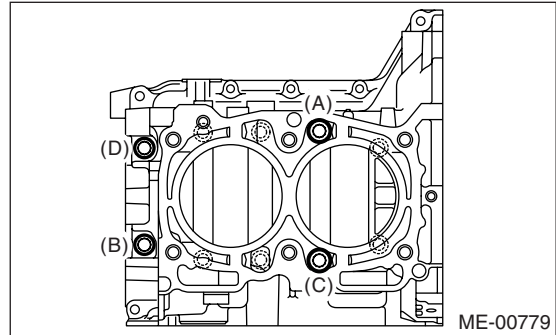
8) Further tighten the RH side bolts (E) — (J) in alphabetical sequence.

**Tightening torque:**

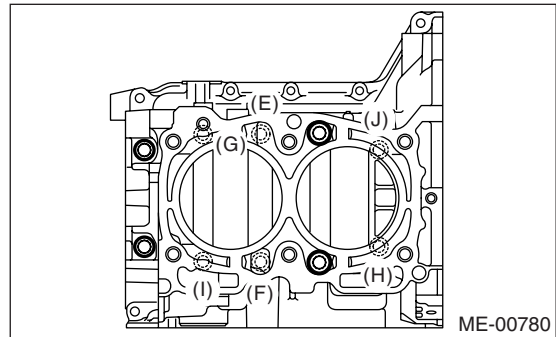
**18 N·m (1.8 kgf-m, 13.3 ft-lb)**



9) Further tighten the LH side bolts (A) — (D) in alphabetical sequence, by 90° for (A) and (C), and to 40 N·m (4.1 kgf-m, 29.5 ft-lb) for (B) and (D).



10) Further tighten the RH side bolts (E) — (J) by 90° in alphabetical sequence.

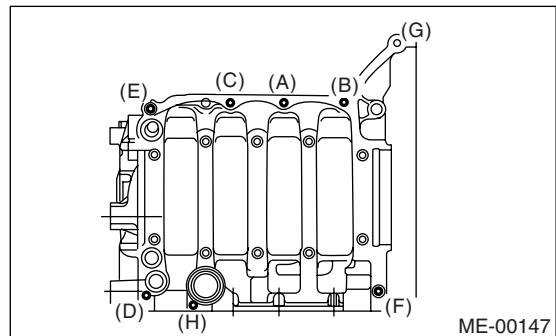


11) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

**Tightening torque:**

**(A) — (G): 25 N·m (2.5 kgf-m, 18.4 ft-lb)**

**(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



12) Apply engine oil to the outer perimeter of rear oil seal, and install the rear oil seal using ST1 and ST2.

**NOTE:**

Use a new rear oil seal.

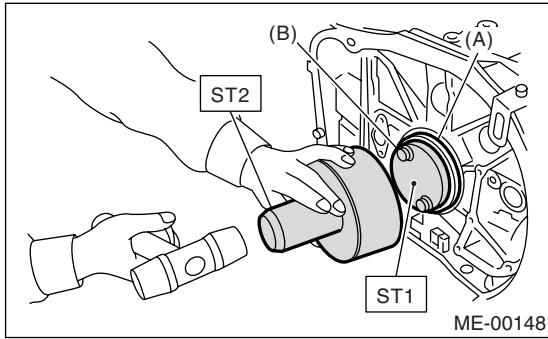
ST1 499597100 CRANKSHAFT OIL SEAL GUIDE



# Cylinder Block

MECHANICAL

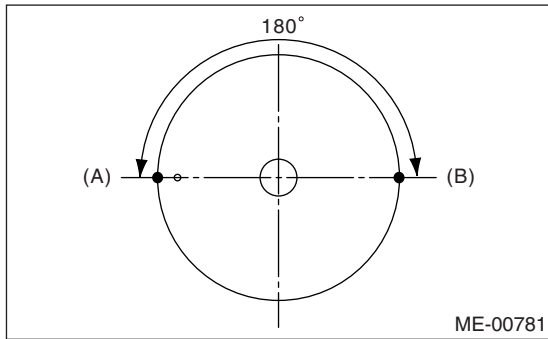
## ST2 499587200 CRANKSHAFT OIL SEAL INSTALLER



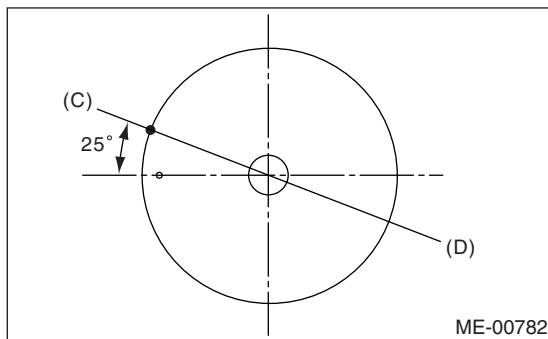
- (A) Rear oil seal
- (B) Flywheel attaching bolt

13) Position the top ring gap at (A) or (B) in the figure.

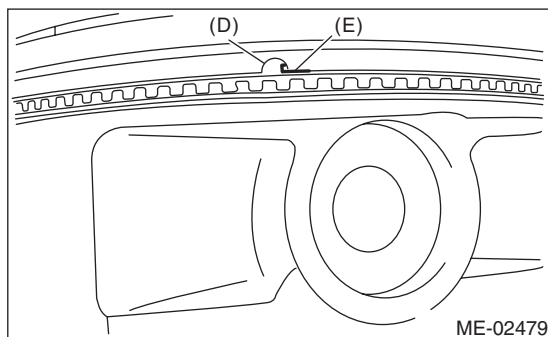
14) Position the second ring gap at 180° on the reverse side for the top ring gap.



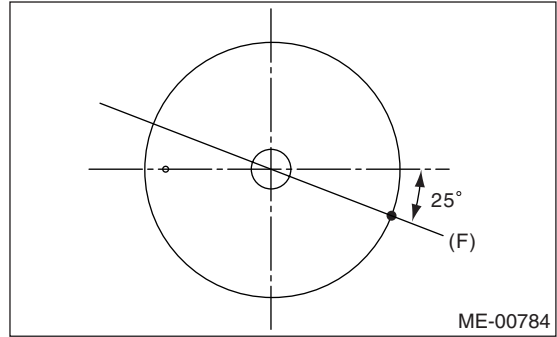
15) Position the upper rail gap at (C) in the figure.



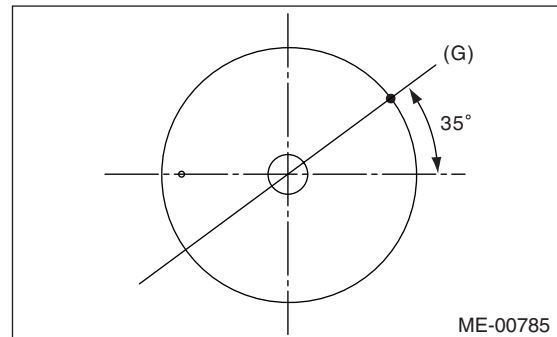
16) Align upper rail spin stopper (D) with piston side surface hole (E).



17) Position the expander gap at (F) in the figure.



18) Position the lower rail gap at (G) in the figure.



### CAUTION:

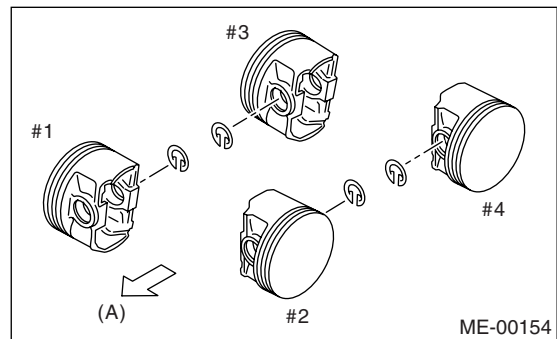
- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

19) Install the snap ring.

Install the snap rings in piston holes located opposite of service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

### NOTE:

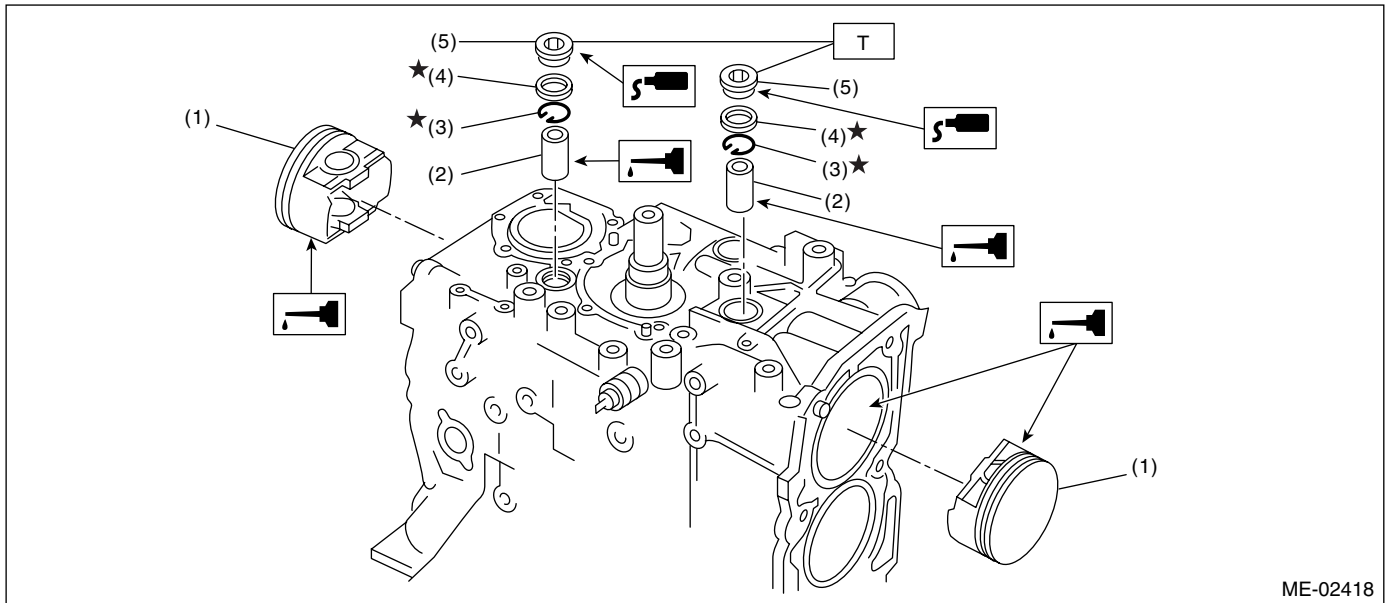
Use new snap rings.



(A) Front side

# Cylinder Block

MECHANICAL



ME-02418

- |                |                       |
|----------------|-----------------------|
| (1) Piston     | (4) Gasket            |
| (2) Piston pin | (5) Service hole plug |
| (3) Snap ring  |                       |

**Tightening torque: N-m (kgf-m, ft-lb)**  
**T: 70 (7.1, 51.6)**

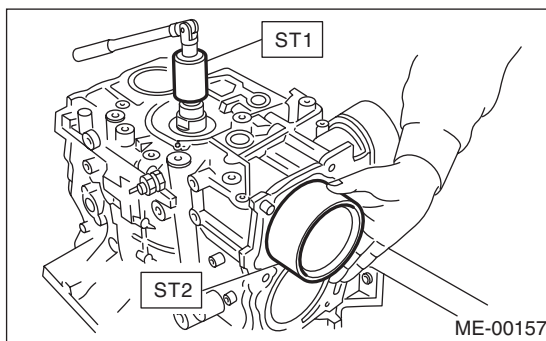
## 20) Piston installation:

- (1) Turn the cylinder block so that #1 and #2 cylinders face upward.
- (2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

### ST1 499987500 CRANKSHAFT SOCKET

- (3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

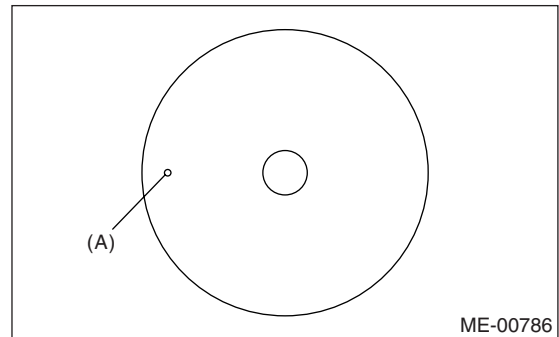
### ST2 498747300 PISTON GUIDE



ME-00157

## NOTE:

Piston front mark faces towards the front of the engine.



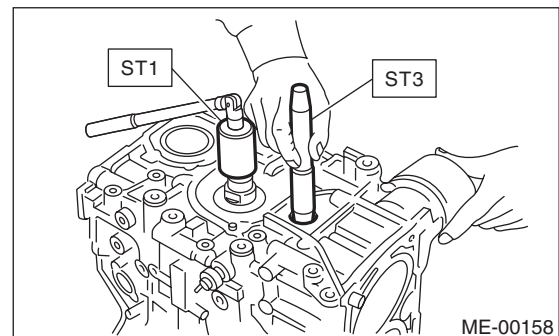
ME-00786

(A) Front mark

## 21) Piston pin installation:

- (1) Apply a coat of engine oil to ST3, and then insert the ST3 into service hole to align piston pin hole with connecting rod small end.

### ST3 499017100 PISTON PIN GUIDE



ME-00158



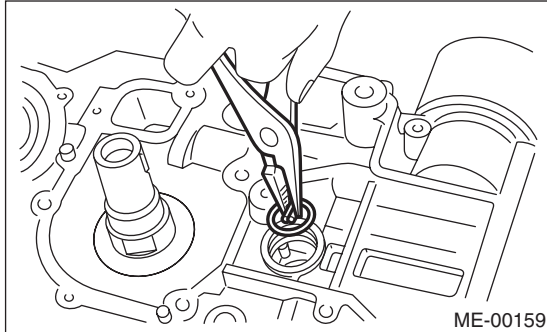
# Cylinder Block

## MECHANICAL

- (2) Apply a coat of engine oil to the piston pin and insert piston pin into piston and connecting rod through service hole.
- (3) Using the ST, install the snap ring.

**NOTE:**

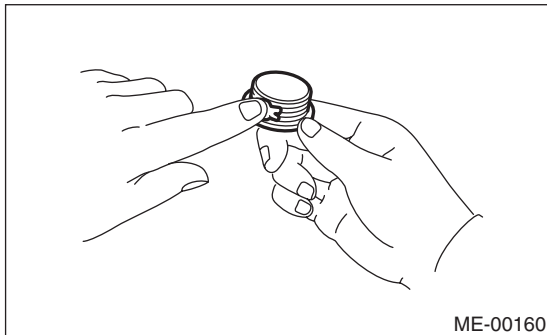
Use new snap rings.



- (4) Apply liquid gasket around the service hole plug.

**Liquid gasket:**

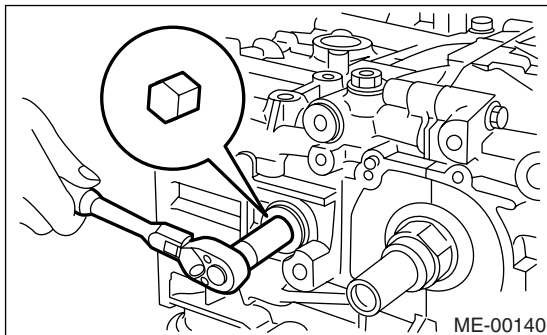
**THREE BOND 1105 (Part No. 004403010) or equivalent**

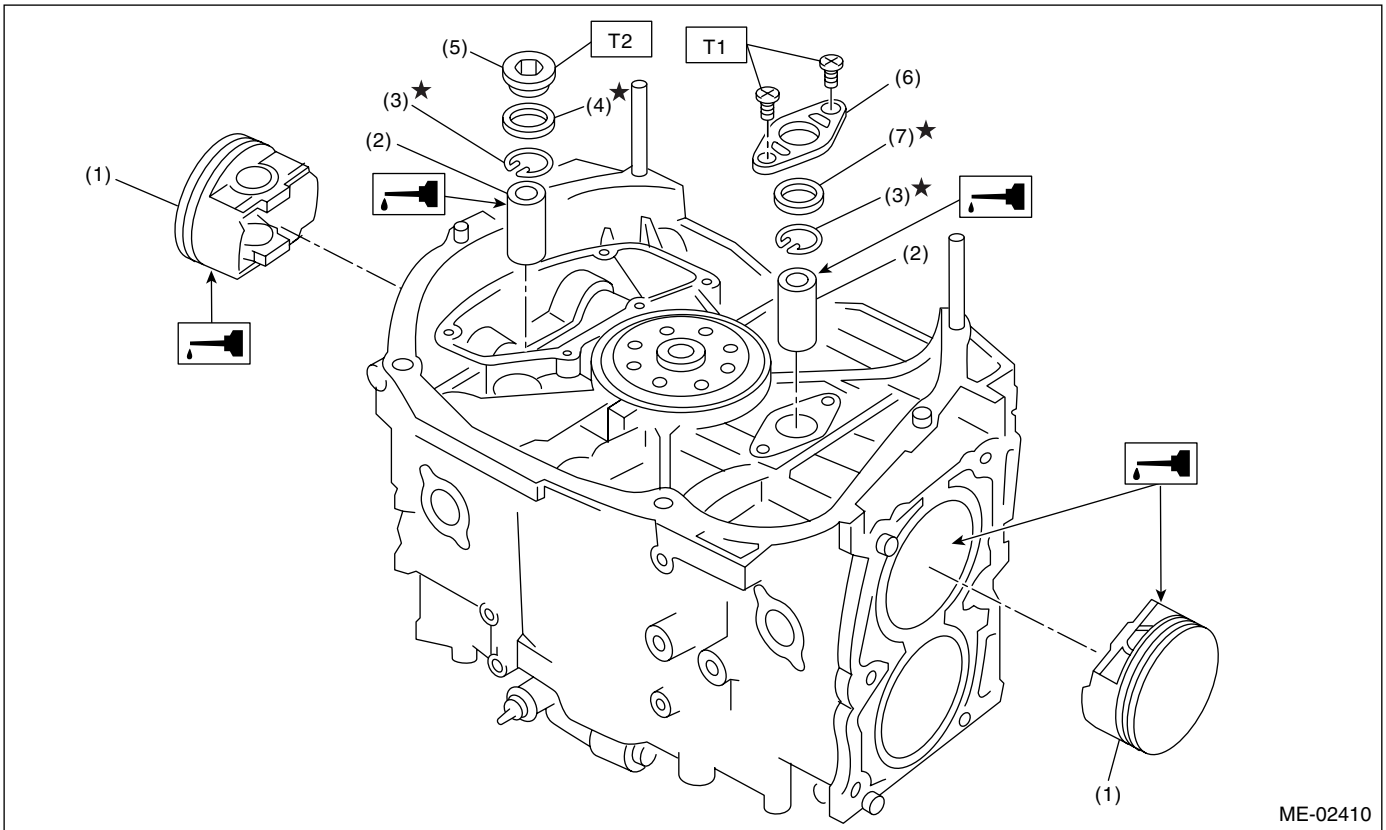


- (5) Install the service hole plug and gasket.

**NOTE:**

Use a new gasket.





ME-02410

- |                |                        |
|----------------|------------------------|
| (1) Piston     | (5) Service hole plug  |
| (2) Piston pin | (6) Service hole cover |
| (3) Snap ring  | (7) O-ring             |
| (4) Gasket     |                        |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 6.4 (0.65, 4.7)**

**T2: 70 (7.1, 51.6)**

(6) Turn the cylinder block so that #3 and #4 cylinders face upward. Using the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

- 22) Install the water pipe.
- 23) Install the baffle plate.

**Tightening torque:**

**6.4 N·m (0.65 kgf·m, 4.7 ft·lb)**

- 24) Install the oil strainer and O-ring

**Tightening torque:**

**10 N·m (1.0 kgf·m, 7.4 ft·lb)**

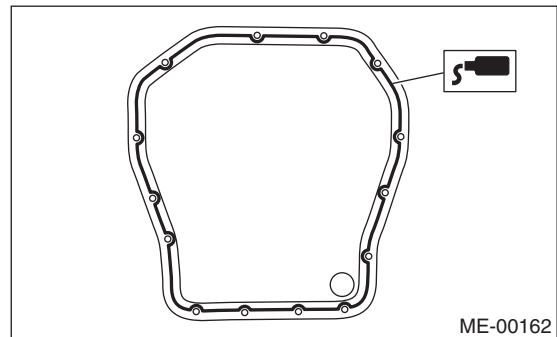
- 25) Install the oil strainer stay.
- 26) Apply liquid gasket to the matching surfaces, and then install the oil pan.

**Liquid gasket:**

**THREE BOND 1207C (Part No. 004403012) or equivalent**

**Tightening torque:**

**5 N·m (0.5 kgf·m, 3.6 ft·lb)**



ME-00162

- 27) Apply liquid gasket to the mating surfaces and threaded portion of bolt (A) as shown in the figure, and then install the oil separator cover.

**Liquid gasket:**

**Mating surface**

**THREE BOND 1207C (Part No. 004403012) or equivalent**

**Threaded portion of bolt (A)**

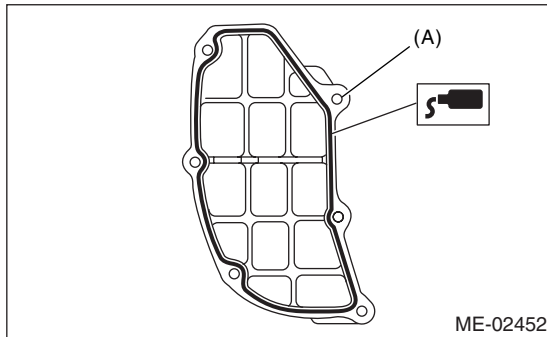
**THREE BOND 1324 (Part No. 004403042) or equivalent**

# Cylinder Block

MECHANICAL

## Tightening torque:

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



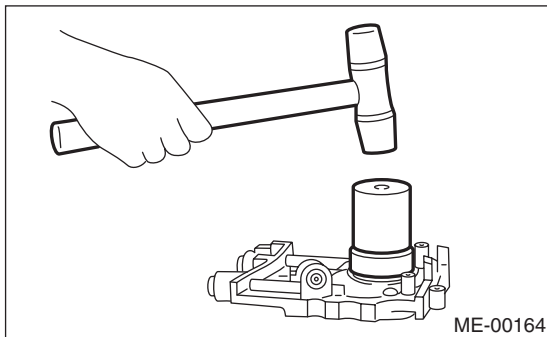
28) Install the flywheel. <Ref. to CL-17, INSTALLATION, Flywheel.>

29) Install the clutch disc and cover. <Ref. to CL-14, INSTALLATION, Clutch Disc and Cover.>

30) Installation of oil pump:

(1) Discard the front oil seal after removal. Replace with a new one using the ST.

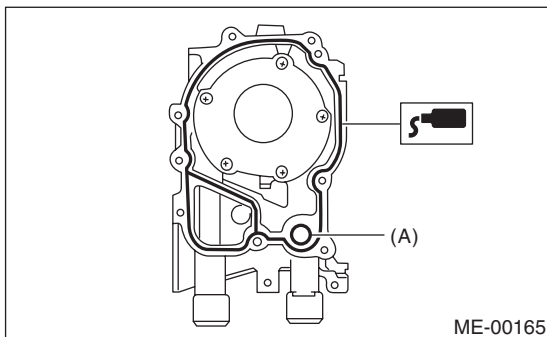
ST 499587100 OIL SEAL INSTALLER



(2) Apply liquid gasket to the matching surface of oil pump.

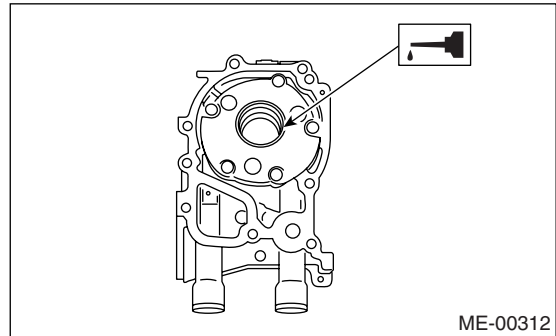
## Liquid gasket:

**THREE BOND 1215 (Part No. 004403007) or equivalent**



(A) O-ring

(3) Apply a coat of engine oil to the inside of the oil seal.



(4) Install the oil pump on cylinder block. Be careful not to damage the oil seal during installation.

(5) Position the oil pump, aligning the notched area with crankshaft, and push the oil pump straight.

## CAUTION:

**Make sure the oil seal lip is not folded.**

(6) Install the oil pump.

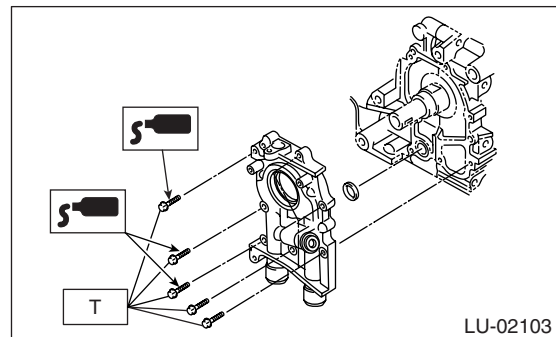
(7) Apply liquid gasket to the threaded portion of three bolts.

## Liquid gasket:

**THREE BOND 1324 (Part No. 004403042) or equivalent**

## Tightening torque:

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



## CAUTION:

- Use new O-ring and seal.
- Do not forget to install the O-ring and seal when installing the oil pump.

31) Install the water pump and gasket.

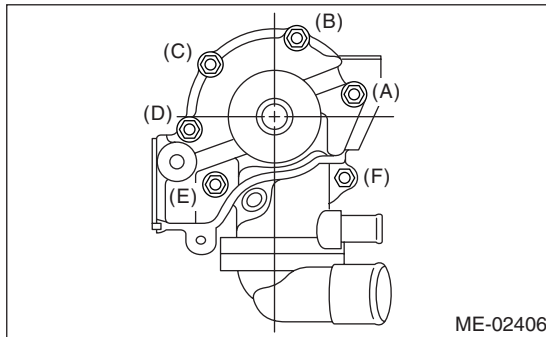
## Tightening torque:

**First; 12 N·m (1.2 kgf-m, 8.7 ft-lb)**

**Second; 12 N·m (1.2 kgf-m, 8.7 ft-lb)**

**CAUTION:**

- Be sure to use a new gasket.
- When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in the figure.



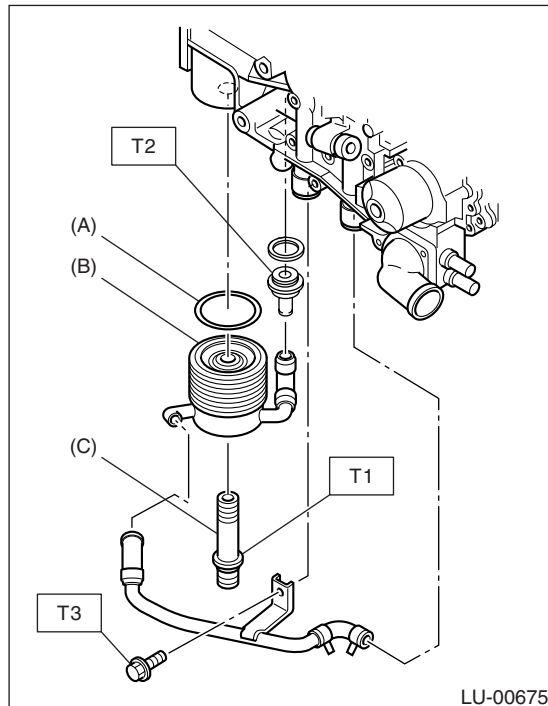
- 32) Install the water by-pass pipe for heater.  
 33) Install the oil cooler.

**CAUTION:**

Always use a new O-ring.

**Tightening torque:**

- T1: 54 N·m (5.5 kgf-m, 40 ft-lb)**  
**T2: 69 N·m (7.0 kgf-m, 50.9 ft-lb)**  
**T3: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



- (A) O-ring  
 (B) Oil cooler  
 (C) Oil cooler connector

- 34) Install the oil filter using ST.  
 ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))

ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))

**NOTE:**

- Standard oil filter is outer diameter of 68 mm (2.68 in). However, SUBARU genuine oil filter having outer diameter of 65 mm (2.56 in) can also be used.
- Install the oil filter by turning it by hand, being careful not to damage the seal rubber.
- Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with oil cooler. If using a torque wrench, tighten it to 14 N·m (1.4 kgf-m, 10.3 ft-lb).
- Tighten the oil filter 65 mm (2.56 in) in diameter by approx. 2/3 — 3/4 rotation more after the seal rubber of oil filter comes in contact with oil cooler. If using a torque wrench, tighten it to 12 N·m (1.2 kgf-m, 8.7 ft-lb).

**CAUTION:**

Do not tighten excessively, or oil may leak.

- 35) Install the water by-pass pipe between oil cooler and water pump.  
 36) Install the water pipe.

**NOTE:**

Always use a new O-ring.

- 37) Install the cylinder head. <Ref. to ME(STI)-60, INSTALLATION, Cylinder Head.>  
 38) Install the oil level gauge guide and tighten the attaching bolt (LH side).  
 39) Install the rocker cover.

**NOTE:**

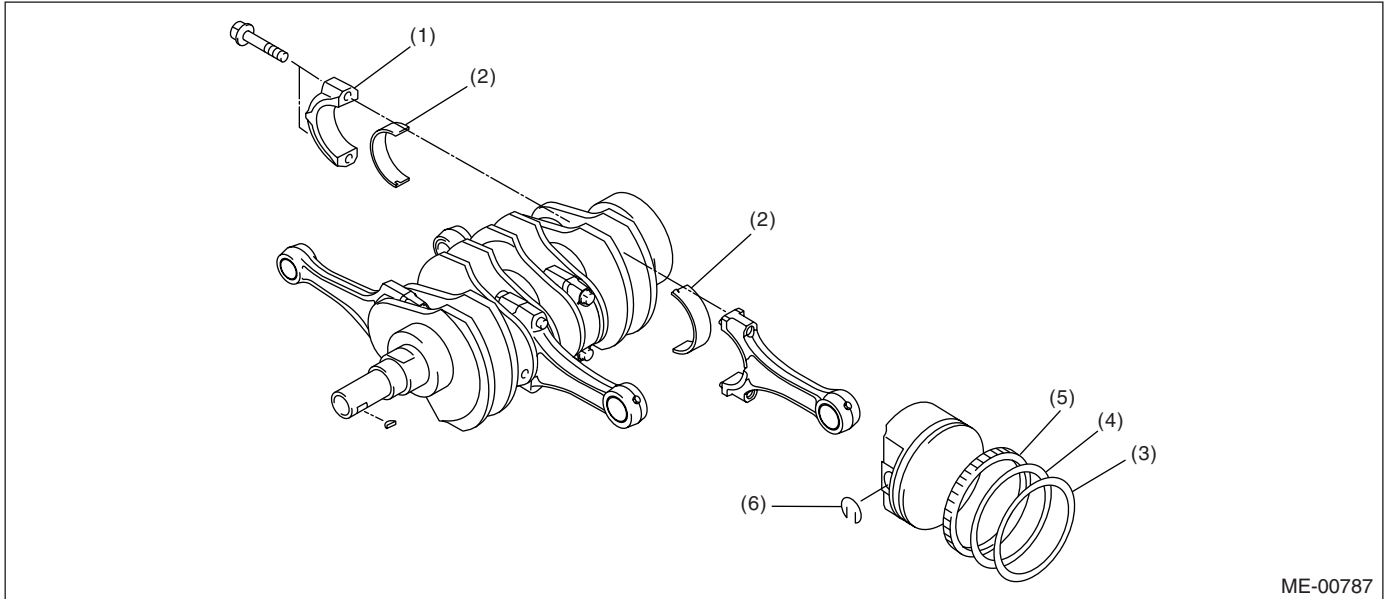
Be sure to use a new gasket of rocker cover.

- 40) Install the crank sprocket. <Ref. to ME(STI)-53, INSTALLATION, Crank Sprocket.>  
 41) Install the cam sprocket. <Ref. to ME(STI)-52, INSTALLATION, Cam Sprocket.>  
 42) Install the timing belt. <Ref. to ME(STI)-45, INSTALLATION, Timing Belt.>  
 43) Install the timing belt cover. <Ref. to ME(STI)-43, INSTALLATION, Timing Belt Cover.>  
 44) Install the crank pulley. <Ref. to ME(STI)-42, INSTALLATION, Crank Pulley.>  
 45) Install the generator and A/C compressor brackets on cylinder head.  
 46) Install the V-belt. <Ref. to ME(STI)-40, INSTALLATION, V-belt.>  
 47) Install the intake manifold. <Ref. to FU(STI)-13, REMOVAL, Intake Manifold.>

# Cylinder Block

MECHANICAL

## C: DISASSEMBLY



ME-00787

- |                            |                 |               |
|----------------------------|-----------------|---------------|
| (1) Connecting rod cap     | (3) Top ring    | (5) Oil ring  |
| (2) Connecting rod bearing | (4) Second ring | (6) Snap ring |

- 1) Remove the connecting rod cap.
- 2) Remove the connecting rod bearing.

### NOTE:

Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

3) Remove the piston rings using the piston ring expander.

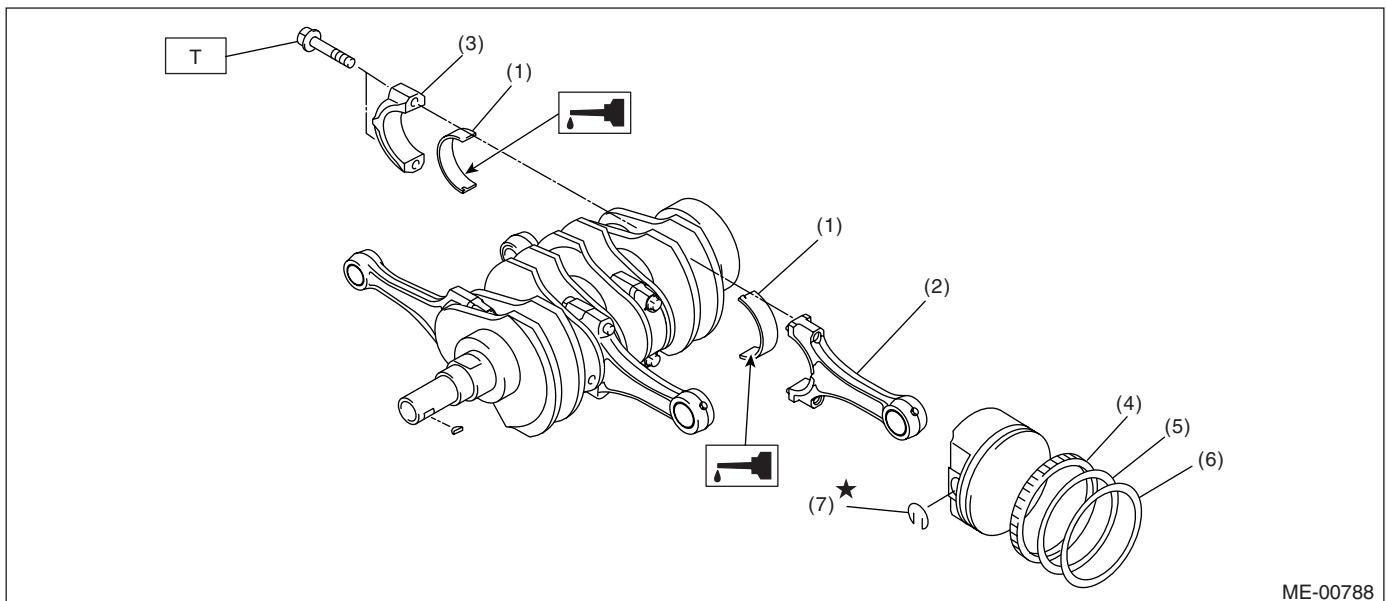
- 4) Remove the oil ring by hand.

### NOTE:

Arrange the removed piston rings in proper order to prevent confusion.

- 5) Remove the snap ring.

## D: ASSEMBLY



ME-00788

- |                            |                 |
|----------------------------|-----------------|
| (1) Connecting rod bearing | (5) Second ring |
| (2) Connecting rod         | (6) Top ring    |
| (3) Connecting rod cap     | (7) Snap ring   |
| (4) Oil ring               |                 |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T: 52 (5.3, 38.4)**

- 1) Apply oil to the surfaces of the connecting rod bearings. Install the connecting rod bearings on connecting rods and connecting rod caps.
- 2) Install the connecting rod on crankshaft.

**NOTE:**

Position each connecting rod with the side marked facing forward.

- 3) Install the connecting rod cap.

Ensure the arrow on connecting rod cap faces the front during installation.

**CAUTION:**

- Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
- When tightening the connecting rod nuts, apply oil on the threads.

- 4) Install the oil ring spacer, upper rail and lower rail in this order by hand. Then install the second ring and top ring with a piston ring expander.

## E: INSPECTION

### 1. CYLINDER BLOCK

- 1) Visually check for cracks and damage. Especially, inspect the important parts by means of liquid penetrant tester.
- 2) Check the oil passages for clogging.
- 3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

**Warping limit:**  
**0.025 mm (0.00098 in)**

**Grinding limit:**  
**0.1 mm (0.004 in)**

**Standard height of cylinder block:**  
**201.0 mm (7.91 in)**

### 2. CYLINDER AND PISTON

- 1) The cylinder bore size is stamped on cylinder block's front upper surface.

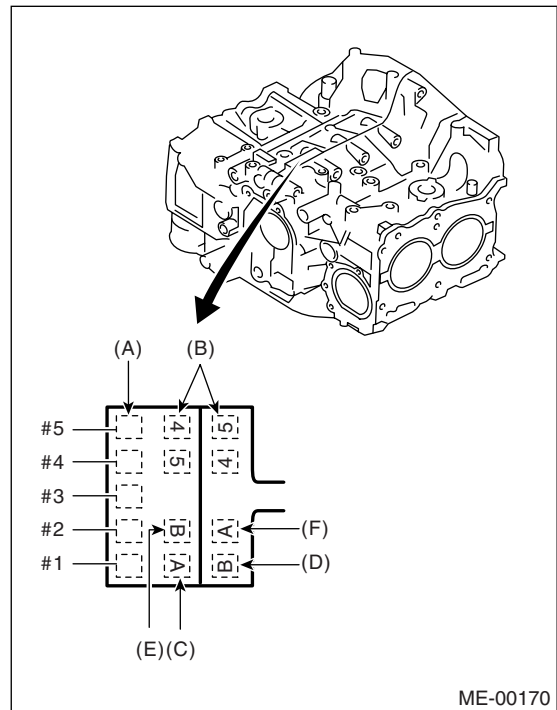
**NOTE:**

- Measurement should be performed at a temperature of 20°C (68°F).
- Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as a guide line in selecting a standard piston.

**Standard inner diameter:**

**A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)**

**B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)**



- (A) Main journal size mark
- (B) Cylinder block (RH)-(LH) combination mark
- (C) #1 cylinder bore size mark
- (D) #2 cylinder bore size mark
- (E) #3 cylinder bore size mark
- (F) #4 cylinder bore size mark

- 2) How to measure the inner diameter of each cylinder

Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

**NOTE:**

Measurement should be performed at a temperature of 20°C (68°F).

# Cylinder Block

MECHANICAL

## Taper:

### Standard

0.015 mm (0.0006 in)

### Limit

0.050 mm (0.0020 in)

## Out-of-roundness:

### Standard

0.010 mm (0.0004 in)

### Limit

0.050 mm (0.0020 in)

## Piston outer diameter:

### Standard

A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)

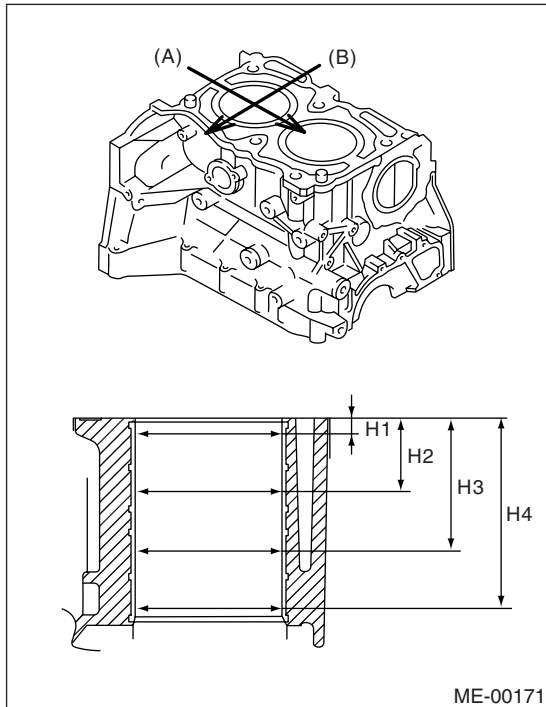
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)

### 0.25 mm (0.0098 in) oversize

99.745 — 99.765 mm (3.9270 — 3.9278 in)

### 0.50 mm (0.0197 in) oversize

99.995 — 100.015 mm (3.9368 — 3.9376 in)



(A) Piston pin direction

(B) Thrust direction

H1: 10 mm (0.39 in)

H2: 45 mm (1.77 in)

H3: 80 mm (3.15 in)

H4: 115 mm (4.53 in)

3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

4) How to measure the outer diameter of each piston:

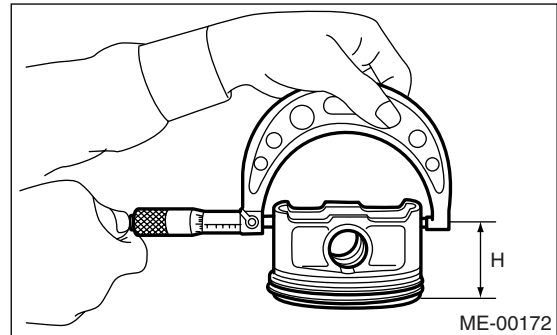
Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

## NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

## Piston grade point H:

38.2 mm (1.50 in)



5) Calculate the clearance between cylinder and piston.

## NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

## Cylinder to piston clearance at 20°C (68°F):

### Standard

-0.010 — 0.010 mm (-0.0004 — 0.0004 in)

### Limit

0.030 mm (0.0012 in)

6) Boring and honing

(1) If the measured value of either taper, out-of-roundness, or cylinder-to-piston clearance exceeds the specified limit, or if there is any damage on the cylinder wall, reboring it to use an oversize piston.

## CAUTION:

**When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only, nor use an oversize piston for one cylinder only.**

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the crankcase.

## NOTE:

Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

## Cylinder enlarging (boring) limit (dia.):

To 100.005 mm (3.937 in)



### 3. PISTON AND PISTON PIN

- 1) Check the pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.
- 2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(STI)-79, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not within specification, replace the piston or bore the cylinder to use an over-size piston.
- 3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

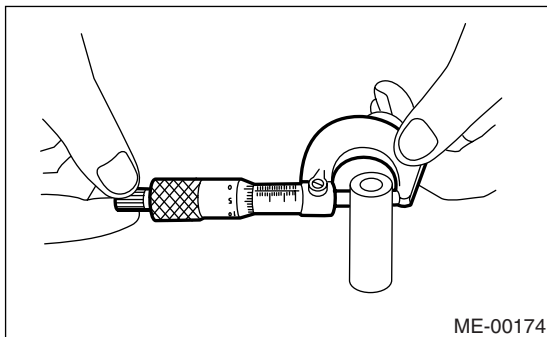
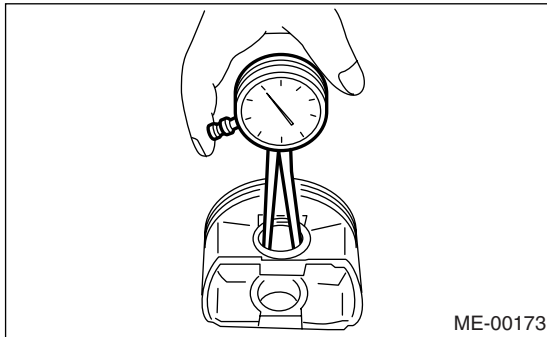
**Standard clearance between piston pin and hole in piston:**

**Standard**

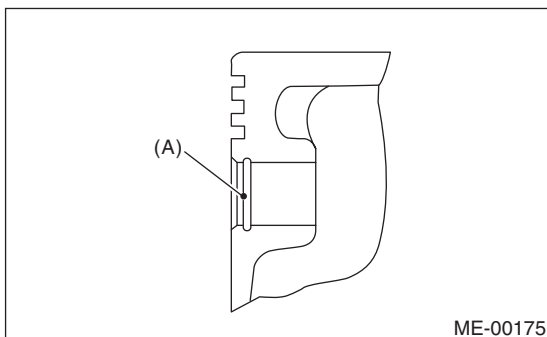
**0.004 — 0.008 mm (0.0002 — 0.0003 in)**

**Limit**

**0.020 mm (0.0008 in)**



- 4) Check the snap ring installation groove (A) on piston for burr. If necessary, remove the burr from groove so that the piston pin can lightly move.



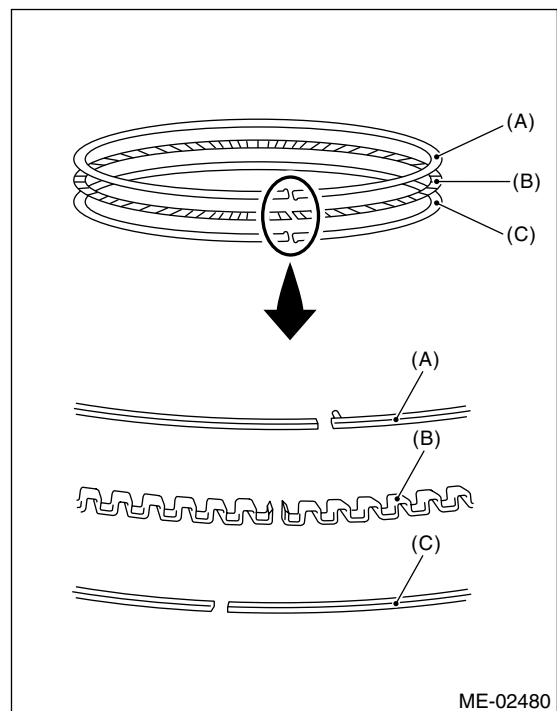
- 5) Check the piston pin snap ring for distortion, cracks and wear.

### 4. PISTON RING

- 1) If the piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

**NOTE:**

- Marks are shown on the end of top and second rings. When installing the rings to piston, face this mark upward.
- Oil ring consists of upper rail, expander and lower rail. When installing on piston, be careful of each rail's direction.



- (A) Upper rail
- (B) Expander
- (C) Lower rail

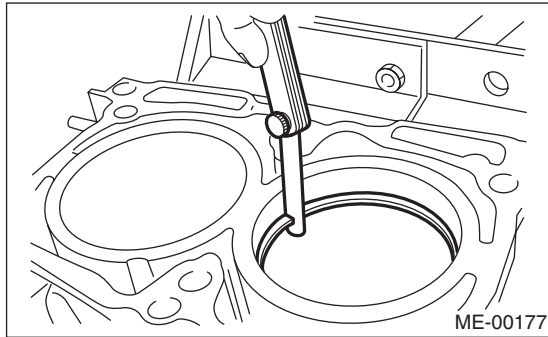


# Cylinder Block

## MECHANICAL

2) Squarely place the piston ring and oil ring in cylinder, and then measure the piston ring closed gap with a thickness gauge.

|                        |               | Unit: mm (in)                    |             |
|------------------------|---------------|----------------------------------|-------------|
|                        |               | Standard                         | Limit       |
| Piston ring closed gap | Top ring      | 0.20 — 0.25<br>(0.0079 — 0.0098) | 1.0 (0.039) |
|                        | Second ring   | 0.37 — 0.52<br>(0.015 — 0.020)   | 1.0 (0.039) |
|                        | Oil ring rail | 0.20 — 0.50<br>(0.0079 — 0.0197) | 1.5 (0.059) |

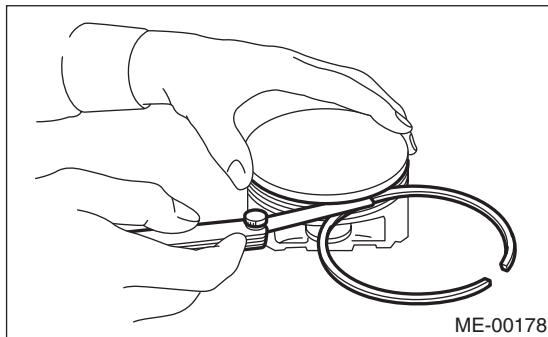


3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

### NOTE:

Before measuring the clearance, clean the piston ring groove and piston ring.

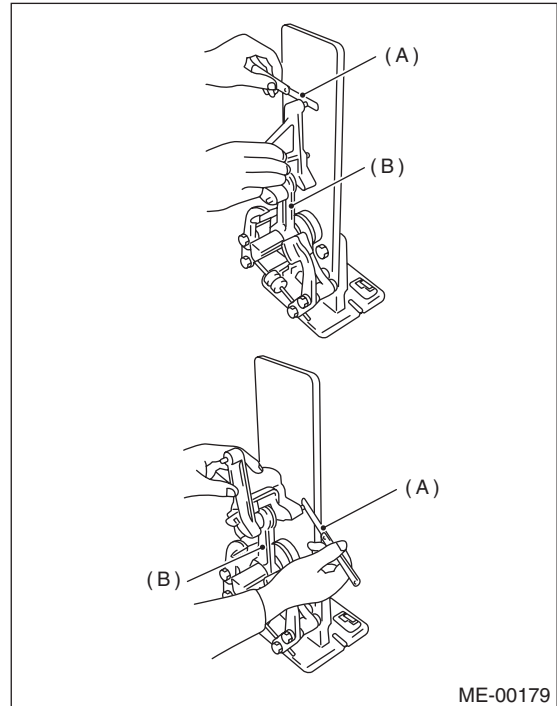
|  |             | Unit: mm (in)                      |               |
|--|-------------|------------------------------------|---------------|
|  |             | Standard                           | Limit         |
| Clearance between piston ring and piston ring groove | Top ring    | 0.040 — 0.080<br>(0.0016 — 0.0031) | 0.15 (0.0059) |
|  | Second ring | 0.030 — 0.070<br>(0.0012 — 0.0028) | 0.15 (0.0059) |



## 5. CONNECTING ROD

- 1) Replace the connecting rod, if the large or small end thrust surface is damaged.
- 2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

**Limit of bend or twist per 100 mm (3.94 in) in length:**  
**0.10 mm (0.0039 in)**



- (A) Thickness gauge  
 (B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft, and then measure the side clearance (thrust clearance). Replace the connecting rod if the side clearance exceeds the specified limit.

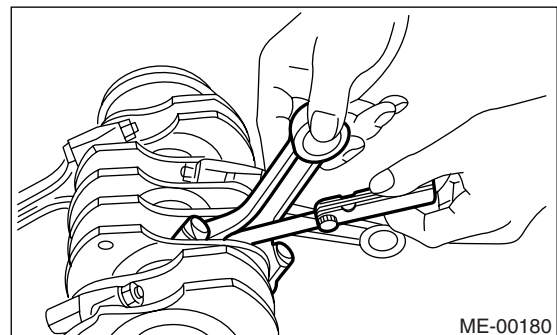
### Connecting rod side clearance:

#### Standard

**0.070 — 0.330 mm (0.0028 — 0.0130 in)**

#### Limit

**0.40 mm (0.016 in)**



- 4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.
- 5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

**Connecting rod oil clearance:**

**Standard**

**0.017 — 0.045 mm (0.0007 — 0.0018 in)**

**Limit**

**0.050 mm (0.0020 in)**

| Unit: mm (in)                 |                                       |                                      |
|-------------------------------|---------------------------------------|--------------------------------------|
| Bearing                       | Bearing size<br>(Thickness at center) | Outer diameter of<br>crank pin       |
| Standard                      | 1.490 — 1.502<br>(0.0587 — 0.0591)    | 51.984 — 52.000<br>(2.0466 — 2.0472) |
| 0.03<br>(0.0012)<br>undersize | 1.504 — 1.512<br>(0.0592 — 0.0595)    | 51.954 — 51.970<br>(2.0454 — 2.0461) |
| 0.05<br>(0.0020)<br>undersize | 1.514 — 1.522<br>(0.0596 — 0.0599)    | 51.934 — 51.950<br>(2.0447 — 2.0453) |
| 0.25<br>(0.0098)<br>undersize | 1.614 — 1.622<br>(0.0635 — 0.0639)    | 51.734 — 51.750<br>(2.0368 — 2.0374) |

- 6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at connecting rod small end.

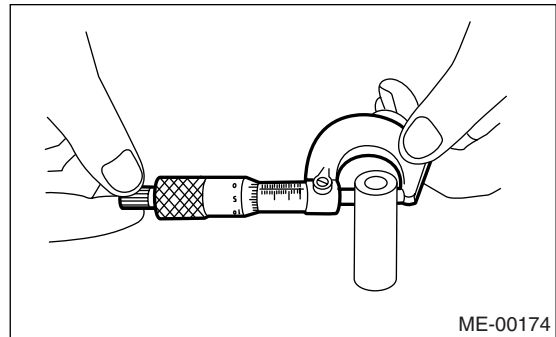
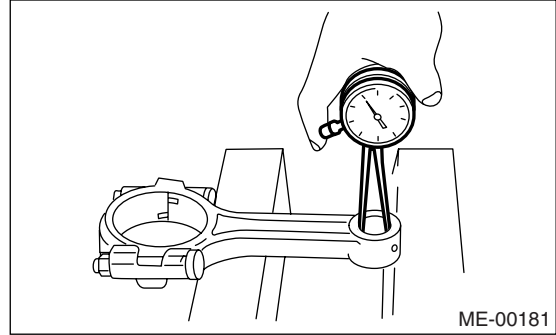
**Clearance between piston pin and bushing:**

**Standard**

**0 — 0.022 mm (0 — 0.0009 in)**

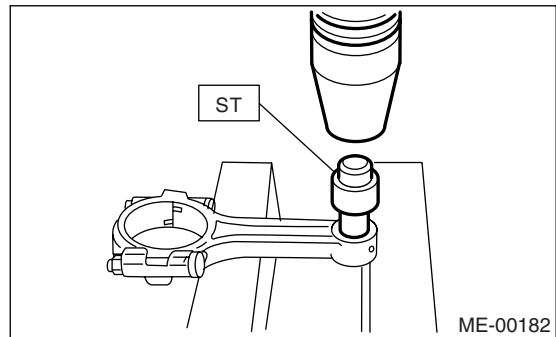
**Limit**

**0.030 mm (0.0012 in)**



- 7) Replacement procedure is as follows:
  - (1) Remove the bushing from connecting rod with ST and press.
  - (2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



- (3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
- (4) After the completion of reaming, clean the bushing to remove chips.

# Cylinder Block

MECHANICAL

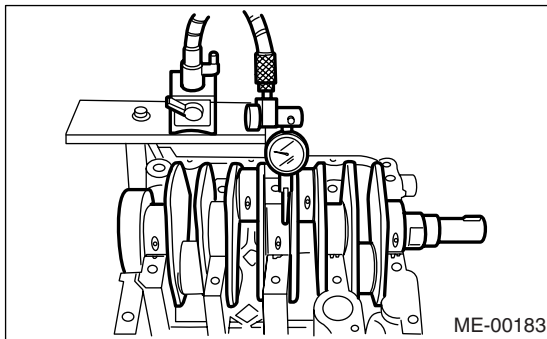
## 6. CRANKSHAFT AND CRANKSHAFT BEARING

- 1) Clean the crankshaft completely and check for cracks by means of liquid penetrant tester etc., and replace if defective.
- 2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

### NOTE:

If a suitable V-block is not available, install the #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

**Crankshaft bend limit:**  
**0.035 mm (0.0014 in)**



- 3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and then replace or recondition the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to specified dimensions according to the undersize bearing to be used.

### Crank pin:

**Out-of-roundness**

**0.003 mm (0.0001 in)**

**Cylindricality**

**0.004 mm (0.0002 in)**

**Grinding limit**

**To 51.750 mm (2.0374 in) dia.**

### Crank journal:

**Out-of-roundness**

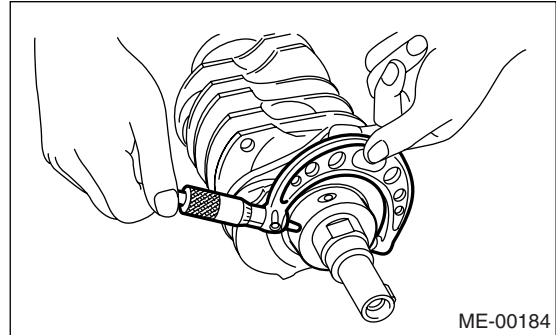
**0.005 mm (0.0002 in)**

**Cylindricality**

**0.006 mm (0.0002 in)**

**Grinding limit**

**To 59.750 mm (2.3524 in) dia.**



# Cylinder Block

MECHANICAL

|                            |                                       | Crank journal diameter               |                                      | Unit: mm (in)                        |
|----------------------------|---------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
|                            |                                       | #1, #3                               | #2, #4, #5                           | Crank pin outer diameter             |
| Standard                   | Journal O.D.                          | 59.992 — 60.008<br>(2.3619 — 2.3625) | 59.992 — 60.008<br>(2.3619 — 2.3625) | 51.984 — 52.000<br>(2.0466 — 2.0472) |
|                            | Bearing size<br>(Thickness at center) | 1.998 — 2.011<br>(0.0787 — 0.0792)   | 2.000 — 2.013<br>(0.0787 — 0.0793)   | 1.490 — 1.502<br>(0.0587 — 0.0591)   |
| 0.03 (0.0012)<br>undersize | Journal O.D.                          | 59.962 — 59.978<br>(2.3607 — 2.3613) | 59.962 — 59.978<br>(2.3607 — 2.3613) | 51.954 — 51.970<br>(2.0454 — 2.0461) |
|                            | Bearing size<br>(Thickness at center) | 2.017 — 2.020<br>(0.0794 — 0.0795)   | 2.019 — 2.022<br>(0.0795 — 0.0796)   | 1.504 — 1.512<br>(0.0592 — 0.0595)   |
| 0.05 (0.0020)<br>undersize | Journal O.D.                          | 59.942 — 59.958<br>(2.3599 — 2.3605) | 59.942 — 59.958<br>(2.3599 — 2.3605) | 51.934 — 51.950<br>(2.0447 — 2.0453) |
|                            | Bearing size<br>(Thickness at center) | 2.027 — 2.030<br>(0.0798 — 0.0799)   | 2.029 — 2.032<br>(0.0799 — 0.0800)   | 1.514 — 1.522<br>(0.0596 — 0.0599)   |
| 0.25 (0.0098)<br>undersize | Journal O.D.                          | 59.742 — 59.758<br>(2.3520 — 2.3527) | 59.742 — 59.758<br>(2.3520 — 2.3527) | 51.734 — 51.750<br>(2.0368 — 2.0374) |
|                            | Bearing size<br>(Thickness at center) | 2.127 — 2.130<br>(0.0837 — 0.0839)   | 2.129 — 2.132<br>(0.0838 — 0.0839)   | 1.614 — 1.622<br>(0.0635 — 0.0639)   |

O.D.: Outer Diameter

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace the bearing.

**Crankshaft side clearance:**

**Standard**

**0.030 — 0.115 mm (0.0012 — 0.0045 in)**

**Limit**

**0.25 mm (0.0098 in)**

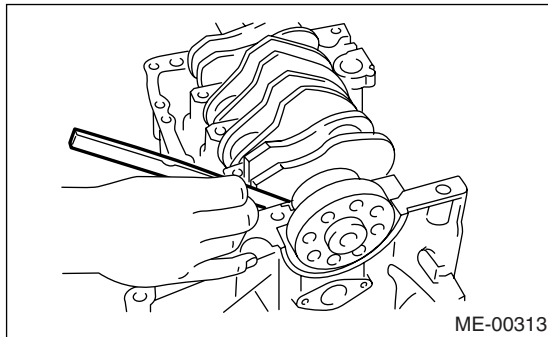
**Crankshaft oil clearance:**

**Standard**

**0.010 — 0.030 mm (0.0004 — 0.0012 in)**

**Limit**

**0.040 mm (0.0016 in)**



5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.

6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace the defective bearing with an undersize one, and replace or recondition the crankshaft as necessary.

## 21. Intake and Exhaust Valve

### A: SPECIFICATION

For the removal and installation procedure of intake and exhaust valve, refer to "Cylinder Head". <Ref. to ME(STI)-60, REMOVAL, Cylinder Head.> and <Ref. to ME(STI)-60, INSTALLATION, Cylinder Head.>

## 22.Piston

### A: SPECIFICATION

For the removal and installation procedure of piston, refer to "Cylinder Block". <Ref. to ME(STI)-67, REMOVAL, Cylinder Block.> and <Ref. to ME(STI)-70, INSTALLATION, Cylinder Block.>

## 23. Connecting Rod

### A: SPECIFICATION

For the removal and installation procedure of connecting rod, refer to "Cylinder Block". <Ref. to ME(STI)-67, REMOVAL, Cylinder Block.> and <Ref. to ME(STI)-70, INSTALLATION, Cylinder Block.>

## 24.Crankshaft

### A: SPECIFICATION

For the removal and installation procedure of crankshaft, refer to "Cylinder Block". <Ref. to ME(STI)-67, REMOVAL, Cylinder Block.> and <Ref. to ME(STI)-70, INSTALLATION, Cylinder Block.>



# Engine Trouble in General

MECHANICAL

## 25.Engine Trouble in General

### A: INSPECTION

NOTE:

“RANK” shown in the chart refers to the possibility of reason for the trouble in order (“Very often” to “Rarely”)

A — Very often

B — Sometimes

C — Rarely

| TROUBLE                               | PROBLEM PARTS, ETC.  | POSSIBLE CAUSE                                   | RANK |
|---------------------------------------|--|--|------|
| 1. Engine does not start.             |  |  |      |
| 1) Starter does not turn.             | Starter  | Defective battery-to-starter harness             | B    |
|                                       |  | Defective starter switch                         | C    |
|                                       |  | Defective inhibitor switch or neutral switch     | C    |
|                                       |  | Defective starter                                | B    |
|                                       | Battery  | Poor terminal connection                         | A    |
|                                       |  | Run-down battery                                 | A    |
|                                       |  | Defective charging system                        | B    |
|                                       | Friction   | Seizure of crankshaft and connecting rod bearing | C    |
|                                       |  | Seized camshaft                                  | C    |
| Seized or stuck piston and cylinder   |  | C  |      |
| 2) Initial combustion does not occur. | Starter  | Defective starter                                | C    |
|                                       | Engine control system <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|                                       | Fuel line  | Defective fuel pump and relay                    | A    |
|                                       |  | Lack of or insufficient fuel                     | B    |
|                                       | Belt   | Defective  | B    |
|                                       |  | Defective timing                                 | B    |
|                                       | Compression  | Incorrect valve clearance                        | C    |
|                                       |  | Loosened spark plugs or defective gasket         | C    |
|                                       |  | Loosened cylinder head bolts or defective gasket | C    |
|                                       |  | Improper valve sealing                           | C    |
|                                       |  | Defective valve stem                             | C    |
|                                       |  | Worn or broken valve spring                      | B    |
|                                       |  | Worn or stuck piston rings, cylinder and piston  | C    |
|                                       |  | Incorrect valve timing                           | B    |
|                                       | Improper engine oil (low viscosity)  | B  |      |
| 3) Initial combustion occurs.         | Engine control system <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|                                       | Intake system  | Defective intake manifold gasket                 | B    |
|                                       |  | Defective throttle body gasket                   | B    |
|                                       | Fuel line  | Defective fuel pump and relay                    | C    |
|                                       |  | Clogged fuel line                                | C    |
|                                       |  | Lack of or insufficient fuel                     | B    |
|                                       | Belt   | Defective  | B    |
|                                       |  | Defective timing                                 | B    |
|                                       | Compression  | Incorrect valve clearance                        | C    |
|                                       |  | Loosened spark plugs or defective gasket         | C    |
|                                       |  | Loosened cylinder head bolts or defective gasket | C    |
|                                       |  | Improper valve sealing                           | C    |
|                                       |  | Defective valve stem                             | C    |
|                                       |  | Worn or broken valve spring                      | B    |
|                                       |  | Worn or stuck piston rings, cylinder and piston  | C    |
| Incorrect valve timing                |  | B  |      |
| Improper engine oil (low viscosity)   | B  |  |      |

# Engine Trouble in General

MECHANICAL

| TROUBLE                                    | PROBLEM PARTS, ETC.  | POSSIBLE CAUSE                                     | RANK |
|--|--|--|------|
| 4) Engine stalls after initial combustion. | Engine control system <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|  | Intake system  | Loosened or cracked intake duct                    | B    |
|  |  | Loosened or cracked PCV hose                       | C    |
|  |  | Loosened or cracked vacuum hose                    | C    |
|  |  | Defective intake manifold gasket                   | B    |
|  |  | Defective throttle body gasket                     | B    |
|  |  | Dirty air cleaner element                          | C    |
|  | Fuel line  | Clogged fuel line                                  | C    |
|  |  | Lack of or insufficient fuel                       | B    |
|  | Belt   | Defective  | B    |
|  |  | Defective timing                                   | B    |
|  | Compression  | Incorrect valve clearance                          | C    |
|  |  | Loosened spark plugs or defective gasket           | C    |
|  |  | Loosened cylinder head bolts or defective gasket   | C    |
|  |  | Improper valve sealing                             | C    |
|  |  | Defective valve stem                               | C    |
|  |  | Worn or broken valve spring                        | B    |
|  |  | Worn or stuck piston rings, cylinder and piston    | C    |
| Incorrect valve timing                     |  | B  |      |
| Improper engine oil (low viscosity)        |  | B  |      |
| 2. Rough idle and engine stall             | Engine control system <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|  | Intake system  | Loosened or cracked intake duct                    | A    |
|  |  | Loosened or cracked PCV hose                       | A    |
|  |  | Loosened or cracked vacuum hose                    | A    |
|  |  | Defective intake manifold gasket                   | B    |
|  |  | Defective throttle body gasket                     | B    |
|  |  | Defective PCV valve                                | C    |
|  |  | Loosened oil filler cap                            | B    |
|  |  | Dirty air cleaner element                          | C    |
|  | Fuel line  | Defective fuel pump and relay                      | C    |
|  |  | Clogged fuel line                                  | C    |
|  |  | Lack of or insufficient fuel                       | B    |
|  | Belt   | Defective timing                                   | C    |
|  | Compression  | Incorrect valve clearance                          | B    |
|  |  | Loosened spark plugs or defective gasket           | B    |
|  |  | Loosened cylinder head bolts or defective gasket   | B    |
|  |  | Improper valve sealing                             | B    |
|  |  | Defective valve stem                               | C    |
|  |  | Worn or broken valve spring                        | B    |
|  |  | Worn or stuck piston rings, cylinder and piston    | B    |
|  |  | Incorrect valve timing                             | A    |
|  |  | Improper engine oil (low viscosity)                | B    |
|  | Lubrication system   | Incorrect oil pressure                             | B    |
|  |  | Defective rocker cover gasket                      | C    |
|  | Cooling system   | Overheating  | C    |
|  | Others   | Malfunction of evaporative emission control system | A    |
|  |  | Stuck or damaged throttle valve                    | B    |

## Engine Trouble in General

MECHANICAL

| TROUBLE   | PROBLEM PARTS, ETC.  | POSSIBLE CAUSE   | RANK |
|---|--|--|------|
| 3. Low output, hesitation and poor acceleration | Engine control system <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|   | Intake system  | Loosened or cracked intake duct  | A    |
|   |  | Loosened or cracked PCV hose   | A    |
|   |  | Loosened or cracked vacuum hose  | B    |
|   |  | Defective intake manifold gasket   | B    |
|   |  | Defective throttle body gasket   | B    |
|   |  | Defective PCV valve  | B    |
|   |  | Loosened oil filler cap  | B    |
|   |  | Dirty air cleaner element  | A    |
|   | Fuel line  | Defective fuel pump and relay  | B    |
|   |  | Clogged fuel line  | B    |
|   |  | Lack of or insufficient fuel   | C    |
|   | Belt   | Defective timing   | B    |
|   | Compression  | Incorrect valve clearance  | B    |
|   |  | Loosened spark plugs or defective gasket                                     | B    |
|   |  | Loosened cylinder head bolts or defective gasket                             | B    |
|   |  | Improper valve sealing   | B    |
|   |  | Defective valve stem   | C    |
|   |  | Worn or broken valve spring  | B    |
|   |  | Worn or stuck piston rings, cylinder and piston                              | C    |
|   |  | Incorrect valve timing   | A    |
|   | Improper engine oil (low viscosity)  | B  |      |
|   | Lubrication system   | Incorrect oil pressure   | B    |
|   | Cooling system   | Overheating  | C    |
|   |  | Over cooling   | C    |
|   | Others   | Malfunction of evaporative emission control system                           | A    |
|   | 4. Surging   | Engine control system <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.> |      |
| Intake system                                   |  | Loosened or cracked intake duct  | A    |
|   |  | Loosened or cracked PCV hose   | A    |
|   |  | Loosened or cracked vacuum hose  | A    |
|   |  | Defective intake manifold gasket   | B    |
|   |  | Defective throttle body gasket   | B    |
|   |  | Defective PCV valve  | B    |
|   |  | Loosened oil filler cap  | B    |
|   |  | Dirty air cleaner element  | B    |
| Fuel line                                       |  | Defective fuel pump and relay  | B    |
|   |  | Clogged fuel line  | B    |
|   |  | Lack of or insufficient fuel   | C    |
| Belt  |  | Defective timing   | B    |
| Compression                                     |  | Incorrect valve clearance  | B    |
|   |  | Loosened spark plugs or defective gasket                                     | C    |
|   |  | Loosened cylinder head bolts or defective gasket                             | C    |
|   |  | Improper valve sealing   | C    |
|   |  | Defective valve stem   | C    |
|   |  | Worn or broken valve spring  | C    |
|   |  | Worn or stuck piston rings, cylinder and piston                              | C    |
|   |  | Incorrect valve timing   | A    |
| Improper engine oil (low viscosity)             |  | B  |      |
| Cooling system                                  |  | Overheating  | B    |
| Others  |  | Malfunction of evaporative emission control system                           | C    |

# Engine Trouble in General

MECHANICAL

| TROUBLE                             | PROBLEM PARTS, ETC.  | POSSIBLE CAUSE   | RANK |
|-------------------------------------|--|--|------|
| 5. Engine does not return to idle.  | Engine control system <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|                                     | Intake system  | Loosened or cracked vacuum hose                        | A    |
|                                     | Others   | Stuck or damaged throttle valve                        | A    |
| 6. Dieseling (Run-on)               | Engine control system <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|                                     | Cooling system   | Overheating  | B    |
|                                     | Others   | Malfunction of evaporative emission control system     | B    |
| 7. Afterburning in exhaust system   | Engine control system <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|                                     | Intake system  | Loosened or cracked intake duct                        | C    |
|                                     |  | Loosened or cracked PCV hose                           | C    |
|                                     |  | Loosened or cracked vacuum hose                        | B    |
|                                     |  | Defective PCV valve                                    | B    |
|                                     |  | Loosened oil filler cap                                | C    |
|                                     | Belt   | Defective timing                                       | B    |
|                                     | Compression  | Incorrect valve clearance                              | B    |
|                                     |  | Loosened spark plugs or defective gasket               | C    |
|                                     |  | Loosened cylinder head bolts or defective gasket       | C    |
|                                     |  | Improper valve sealing                                 | B    |
|                                     |  | Defective valve stem                                   | C    |
|                                     |  | Worn or broken valve spring                            | C    |
|                                     |  | Worn or stuck piston rings, cylinder and piston        | C    |
|                                     |  | Incorrect valve timing                                 | A    |
| Lubrication system                  | Incorrect oil pressure   | C  |      |
| Cooling system                      | Over cooling   | C  |      |
| Others                              | Malfunction of evaporative emission control system                           | C  |      |
| 8. Knocking                         | Engine control system <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.> |  | A    |
|                                     | Intake system  | Loosened oil filler cap                                | B    |
|                                     | Belt   | Defective timing                                       | B    |
|                                     | Compression  | Incorrect valve clearance                              | C    |
|                                     |  | Incorrect valve timing                                 | B    |
|                                     | Cooling system   | Overheating  | A    |
| 9. Excessive engine oil consumption | Intake system  | Loosened or cracked PCV hose                           | A    |
|                                     |  | Defective PCV valve                                    | B    |
|                                     |  | Loosened oil filler cap                                | C    |
|                                     | Compression  | Defective valve stem                                   | A    |
|                                     |  | Worn or stuck piston rings, cylinder and piston        | A    |
|                                     | Lubrication system   | Loosened oil pump attaching bolts and defective gasket | B    |
|                                     |  | Defective oil filter o-ring                            | B    |
|                                     |  | Defective crankshaft oil seal                          | B    |
|                                     |  | Defective rocker cover gasket                          | B    |
|                                     |  | Loosened oil drain plug or defective gasket            | B    |
|                                     | Loosened oil pan fitting bolts or defective oil pan                          | B  |      |

## Engine Trouble in General

### MECHANICAL

| TROUBLE                        | PROBLEM PARTS, ETC.  | POSSIBLE CAUSE                                   | RANK |   |
|--------------------------------|--|--|------|---|
| 10. Excessive fuel consumption | Engine control system <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.> |  | A    |   |
|                                | Intake system  | Dirty air cleaner element                        | A    |   |
|                                | Belt   | Defective timing                                 | B    |   |
|                                | Compression  | Incorrect valve clearance                        |      | B |
|                                |  | Loosened spark plugs or defective gasket         |      | C |
|                                |  | Loosened cylinder head bolts or defective gasket |      | C |
|                                |  | Improper valve sealing                           |      | B |
|                                |  | Defective valve stem                             |      | C |
|                                |  | Worn or broken valve spring                      |      | C |
|                                |  | Worn or stuck piston rings, cylinder and piston  |      | B |
|                                |  | Incorrect valve timing                           |      | B |
|                                | Lubrication system   | Incorrect oil pressure                           | C    |   |
|                                | Cooling system   | Over cooling                                     | C    |   |

## 26.Engine Noise

### A: INSPECTION

| Type of sound   | Condition  | Possible cause   |
|---|--|--|
| Regular clicking sound  | Sound increases as engine speed increases.   | <ul style="list-style-type: none"> <li>• Valve mechanism is defective.</li> <li>• Incorrect valve clearance</li> <li>• Worn camshaft</li> <li>• Broken valve spring</li> </ul>                     |
| Heavy and dull clank  | Oil pressure is low.   | <ul style="list-style-type: none"> <li>• Worn crankshaft main bearing</li> <li>• Worn connecting rod bearing (large end)</li> </ul>  |
|   | Oil pressure is normal.  | <ul style="list-style-type: none"> <li>• Loose flywheel mounting bolts</li> <li>• Damaged engine mounting</li> </ul>   |
| High-pitched clank (Spark knock)  | Sound is noticeable when accelerating with an overload.                                  | <ul style="list-style-type: none"> <li>• Ignition timing advanced</li> <li>• Accumulation of carbon inside combustion chamber</li> <li>• Wrong spark plug</li> <li>• Improper gasoline</li> </ul>  |
| Clank when engine speed is medium (1,000 to 2,000 rpm).                       | Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*) | <ul style="list-style-type: none"> <li>• Worn crankshaft main bearing</li> <li>• Worn bearing at crankshaft end of connecting rod</li> </ul>   |
| Knocking sound when engine is operating under idling speed and engine is warm | Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*) | <ul style="list-style-type: none"> <li>• Worn cylinder liner and piston ring</li> <li>• Broken or stuck piston ring</li> <li>• Worn piston pin and hole at piston end of connecting rod</li> </ul> |
|   | Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)    | <ul style="list-style-type: none"> <li>• Unusually worn valve lifter</li> <li>• Worn cam sprocket</li> <li>• Worn camshaft journal bore in cylinder head assembly</li> </ul>                       |
| Squeaky sound   | —  | <ul style="list-style-type: none"> <li>• Insufficient generator lubrication</li> </ul>   |
| Rubbing sound   | —  | <ul style="list-style-type: none"> <li>• Defective generator brush and rotor contact</li> </ul>  |
| Gear scream when starting engine  | —  | <ul style="list-style-type: none"> <li>• Defective ignition starter switch</li> <li>• Worn gear and starter pinion</li> </ul>  |
| Sound like polishing glass with a dry cloth                                   | —  | <ul style="list-style-type: none"> <li>• Loose drive belt</li> <li>• Defective water pump shaft</li> </ul>   |
| Hissing sound   | —  | <ul style="list-style-type: none"> <li>• Loss of compression</li> <li>• Air leakage in air intake system, hoses, connections or manifolds</li> </ul>   |
| Timing belt noise   | —  | <ul style="list-style-type: none"> <li>• Loose timing belt</li> <li>• Belt contacting case/adjacent part</li> </ul>  |
| Valve noise   | —  | <ul style="list-style-type: none"> <li>• Incorrect valve clearance</li> </ul>  |

**NOTE\*:**

When disconnecting the fuel injector connector, Malfunction Indicator Light illuminates and DTC is stored in ECM memory. Therefore, carry out the CLEAR MEMORY MODE <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.> after connecting the fuel injector connector.

# Engine Noise

MECHANICAL

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# EXHAUST

# *EX(STI)*

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|                              | Page |
|------------------------------|------|
| 1. General Description ..... | 2    |





## 1. General Description

### A: SPECIFICATION

Specifications for STI model is as same as turbo model. <Ref. to EX(H4DOTC)-2, General Description.>

# COOLING

# *CO(STI)*

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|                              | Page |
|------------------------------|------|
| 1. General Description ..... | 2    |

## 1. General Description

### A: SPECIFICATION

Specifications for STI model are same as turbo model. <Ref. to CO(H4DOTC)-2, General Description.>

# LUBRICATION

# *LU(STI)*

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|   | <b>Page</b> |
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# General Description

LUBRICATION

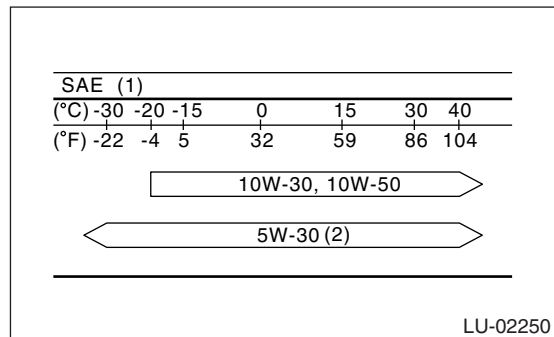
## 1. General Description

### A: SPECIFICATION

| Lubrication method               |  |                          | Forced lubrication                                   |
|----------------------------------|--|--------------------------|--|
| Oil pump                         | Pump type  |                          | Trochoid type  |
|                                  | Number of teeth                                  | Inner rotor              | 9  |
|                                  |  | Outer rotor              | 10   |
|                                  | Outer rotor diameter × thickness                 |                          | 78 × 10 mm (3.07 × 0.39 in)                          |
|                                  | Tip clearance between inner and outer rotor      | STANDARD                 | 0.04 — 0.14 mm (0.0016 — 0.0055 in)                  |
|                                  |  | LIMIT                    | 0.18 mm (0.0071 in)                                  |
|                                  | Side clearance between inner rotor and pump case | STANDARD                 | 0.02 — 0.07 mm (0.0008 — 0.0028 in)                  |
|                                  |  | LIMIT                    | 0.12 mm (0.0047 in)                                  |
|                                  | Case clearance between outer rotor and pump case | STANDARD                 | 0.10 — 0.175 mm (0.0039 — 0.0069 in)                 |
|                                  |  | LIMIT                    | 0.20 mm (0.0079 in)                                  |
|                                  | Capacity at 80°C (176°F)                         | 600 rpm                  | Discharge pressure                                   |
| Discharge quantity               |  |                          | 4.6 ℓ (4.9 US qt, 4.0 Imp qt)/min.                   |
| 5,000 rpm                        |  | Discharge pressure       | 294 kPa (3.0 kgf/cm <sup>2</sup> , 43 psi)           |
|                                  |  | Discharge quantity       | 47.0 ℓ (49.7 US qt, 41.4 Imp qt)/min.                |
| Relief valve operation pressure  |  |                          | 588 kPa (6.0 kgf/cm <sup>2</sup> , 85 psi)           |
| Oil filter                       | Type   |                          | Full-flow filter type                                |
|                                  | Filtration area                                  | Diameter 65 mm (2.56 in) | 470 cm <sup>2</sup> (73 sq in)                       |
|                                  |  | Diameter 68 mm (2.68 in) | 800 cm <sup>2</sup> (124 sq in)                      |
|                                  | By-pass valve opening pressure                   |                          | 160 kPa (1.63 kgf/cm <sup>2</sup> , 23.2 psi)        |
|                                  | Outer diameter × width                           | Diameter 68 mm (2.68 in) | 68 × 65 mm (2.68 × 2.56 in)                          |
|                                  |  | Diameter 65 mm (2.56 in) | 65 × 74.4 mm (2.56 × 2.93 in)                        |
| Oil filter to engine thread size |  | M 20 × 1.5               |  |
| Oil pressure switch              | Type   |                          | Immersed contact point type                          |
|                                  | Working voltage — wattage                        |                          | 12 V — 3.4 W or less                                 |
|                                  | Warning light activation pressure                |                          | 14.7 kPa (0.15 kgf/cm <sup>2</sup> , 2.1 psi)        |
|                                  | Proof pressure                                   |                          | More than 981 kPa (10 kgf/cm <sup>2</sup> , 142 psi) |
| Oil capacity (at replacement)    |  |                          | 4.0 ℓ (4.2 US qt, 3.5 Imp qt)                        |

**Recommended oil:**

**API standard SM with the “Energy Conserving” logo is printed.**  
**ILSAC standard, GF4 “Star burst mark” label is on the container.**



- (1) SAE viscosity No. and applicable temperature
- (2) Recommended

The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

**CAUTION:**

**When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API standard and SAE viscosity No. designated by SUBARU.**

**NOTE:**

If the vehicle is used in areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API standard:

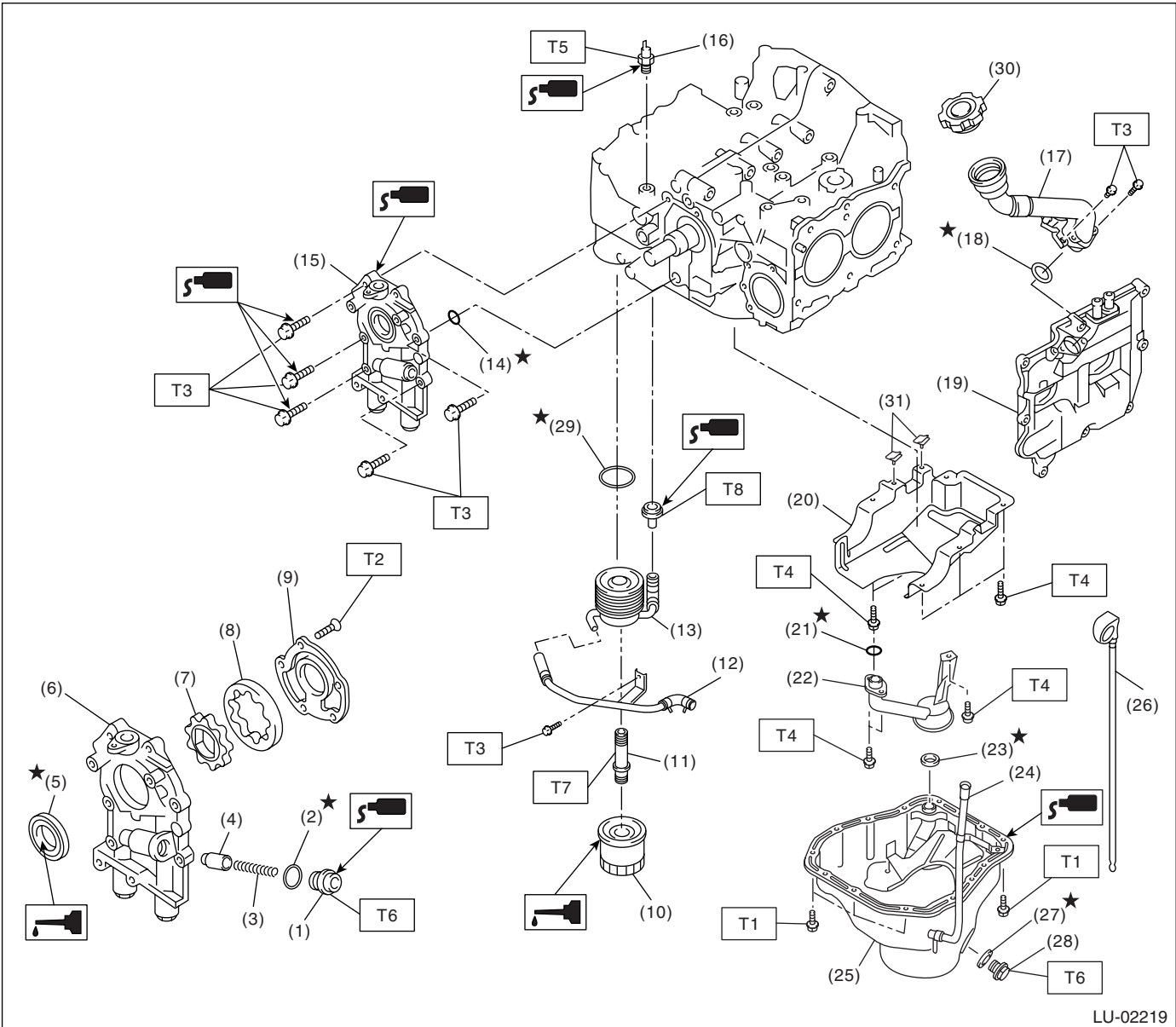
SM or SL

SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.

# General Description

## LUBRICATION

### B: COMPONENT



LU-02219

- (1) Plug
- (2) Gasket
- (3) Relief valve spring
- (4) Relief valve
- (5) Oil seal
- (6) Oil pump case
- (7) Inner rotor
- (8) Outer rotor
- (9) Oil pump cover
- (10) Oil filter
- (11) Oil cooler connector
- (12) Water by-pass pipe
- (13) Oil cooler
- (14) O-ring
- (15) Oil pump ASSY
- (16) Oil pressure switch
- (17) Oil filler duct
- (18) O-ring
- (19) Rocker cover
- (20) Baffle plate
- (21) O-ring
- (22) Oil strainer
- (23) Gasket
- (24) Oil level gauge guide
- (25) Oil pan
- (26) Oil level gauge
- (27) Metal gasket
- (28) Drain plug
- (29) O-ring

**Tightening torque: N-m (kgf-m, ft-lb)**

- T1: 5 (0.5, 3.6)**
- T2: 5.4 (0.55, 4.0)**
- T3: 6.4 (0.65, 4.7)**
- T4: 10 (1.0, 7.2)**
- T5: 25 (2.5, 18.1)**
- T6: 44 (4.5, 32.5)**
- T7: 54 (5.5, 40)**
- T8: 69 (7.0, 50.9)**

### **C: CAUTION**

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

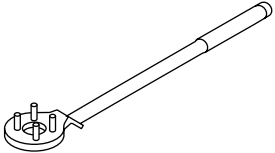
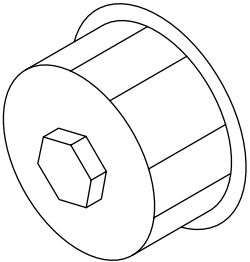
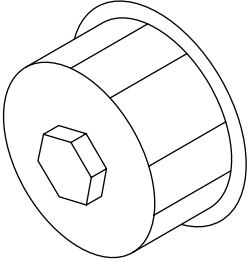
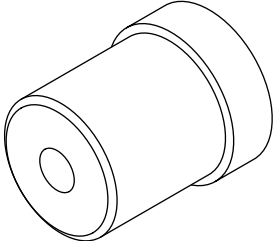


# General Description

LUBRICATION

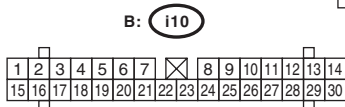
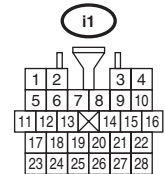
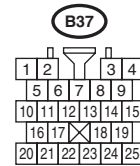
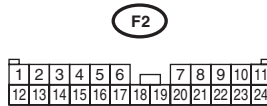
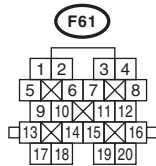
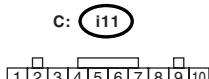
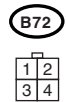
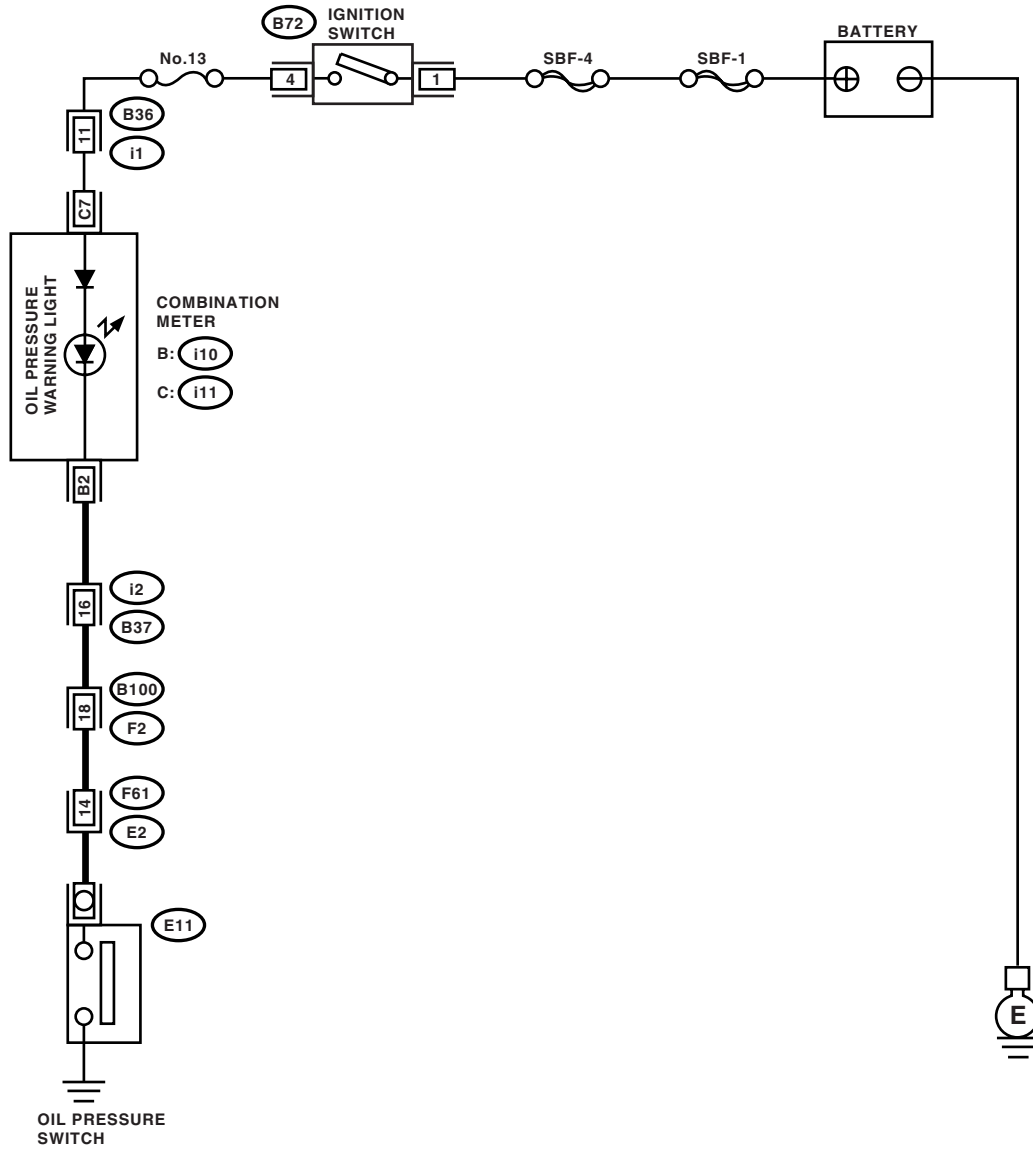
## D: PREPARATION TOOL

### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION         | REMARKS   |
|---|-------------|---------------------|---|
|  <p style="text-align: center;">ST-499977100</p>   | 499977100   | CRANK PULLEY WRENCH | Used for stopping rotation of crank pulley when loosening and tightening crank pulley bolt. |
|  <p style="text-align: center;">ST18332AA000</p>  | 18332AA000  | OIL FILTER WRENCH   | Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))              |
|  <p style="text-align: center;">ST18332AA010</p> | 18332AA010  | OIL FILTER WRENCH   | Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))              |
|  <p style="text-align: center;">ST-499587100</p> | 499587100   | OIL SEAL INSTALLER  | Used for installing oil seal to oil pump.   |

## 2. Oil Pressure System

### A: WIRING DIAGRAM



LU-02125

# Oil Pressure System

LUBRICATION

## B: INSPECTION

| Step   | Check                                     | Yes  | No  |
|--|---|--|---|
| <b>1</b><br><b>CHECK COMBINATION METER.</b><br>1) Turn the ignition switch to ON. (engine OFF)<br>2) Check warning lights in the combination meter.  | Do the warning lights illuminate?         | Go to step 2.  | Repair or replace the combination meter. <Ref. to IDI-3, INSPECTION, Combination Meter System.> |
| <b>2</b><br><b>CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from oil pressure switch.<br>3) Turn the ignition switch ON.<br>4) Measure the voltage of harness between the combination meter connector and chassis ground.<br><i>Connector &amp; terminal<br/>(E11) No. 1 (+) — Chassis ground (-):</i> | Is the voltage more than 10 V?            | Replace the oil pressure switch.   | Go to step 3.   |
| <b>3</b><br><b>CHECK COMBINATION METER.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the combination meter.<br>3) Measure the resistance of combination meter.<br><i>Terminals<br/>No. C7 — No. B2:</i>   | Is the resistance less than 10 $\Omega$ ? | Replace the harness connector between combination meter and oil pressure switch. | Repair or replace the combination meter. <Ref. to IDI-3, INSPECTION, Combination Meter System.> |

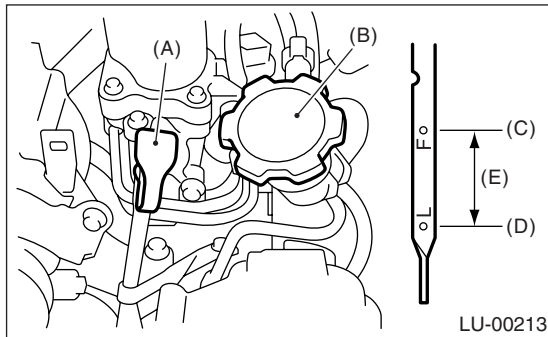
## 3. Engine Oil

### A: INSPECTION

- 1) Park the vehicle on a level surface.
- 2) After turning off the engine, wait a few minutes for oil to drain back into the oil pan before checking the level.
- 3) Just after driving or while the engine is warm, engine oil level may show in the range between the "F" line and notch mark. This is caused by thermal expansion of engine oil.
- 4) Remove the oil level gauge and wipe it clean.
- 5) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in proper orientation.
- 6) Remove it again and check the engine oil level. If the engine oil level is below the "L" line, add oil to bring the level up to "F" line.

**NOTE:**

To prevent overfilling the engine oil, do not add oil above "F" line when the engine is cold.



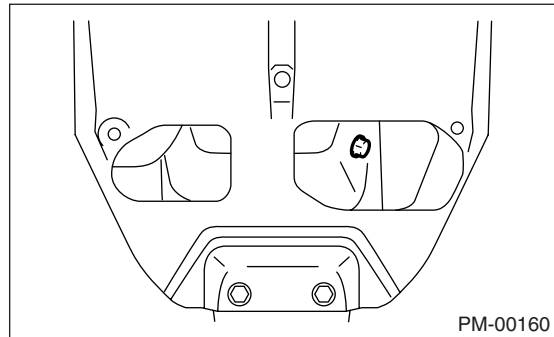
- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

### B: REPLACEMENT

- 1) Open the engine oil filler cap for quick draining of engine oil.
- 2) Lift-up the vehicle.
- 3) Drain the engine oil by loosening the engine oil drain plug.

**NOTE:**

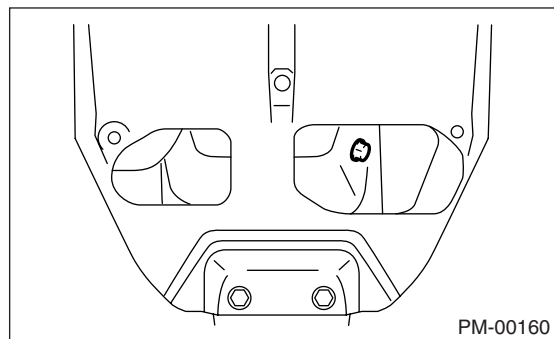
Prepare the container for draining of engine oil.



- 4) Replace the drain plug gasket.
- 5) Tighten the engine oil drain plug after draining engine oil.

**Tightening torque:**

**44 N·m (4.5 kgf-m, 32.5 ft-lb)**



- 6) Install the service hole cover.
- 7) Use the engine oil of proper quality and viscosity, fill engine oil through the oil filler duct up to upper level on level gauge. Make sure that the vehicle is placed level when checking oil level.

**Recommended oil:**

**API standard SM with the "Energy Conserving" logo is printed.**

**ILSAC standard, GF4 "Star burst mark" label is on the container.**

# Engine Oil

## LUBRICATION

### Engine oil capacity:

#### Upper level

4.0 ℓ (4.2 US qt, 3.5 Imp qt)

#### Lower level

3.0 ℓ (3.2 US qt, 2.6 Imp qt)

| SAE (1)        |     |     |     |    |    |    |     |
|----------------|-----|-----|-----|----|----|----|-----|
| (°C)           | -30 | -20 | -15 | 0  | 15 | 30 | 40  |
| (°F)           | -22 | -4  | 5   | 32 | 59 | 86 | 104 |
| 10W-30, 10W-50 |     |     |     |    |    |    |     |
| 5W-30 (2)      |     |     |     |    |    |    |     |

LU-02250

(1) SAE viscosity No. and applicable temperature

(2) Recommended

The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

### CAUTION:

**When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API standard and SAE viscosity No. designated by SUBARU.**

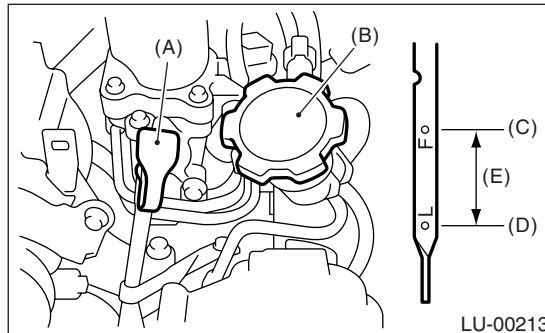
### NOTE:

If the vehicle is used in areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API standard: SM or SL  
SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.

8) Close the engine oil filler cap.

9) Start the engine and warm it up for a time.

10) After the engine stops, recheck the oil level. If necessary, add engine oil up to the upper level on level gauge.



(A) Oil level gauge

(B) Engine oil filler cap

(C) Upper level

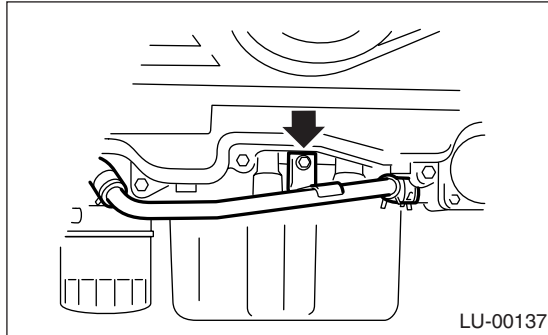
(D) Lower level

(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

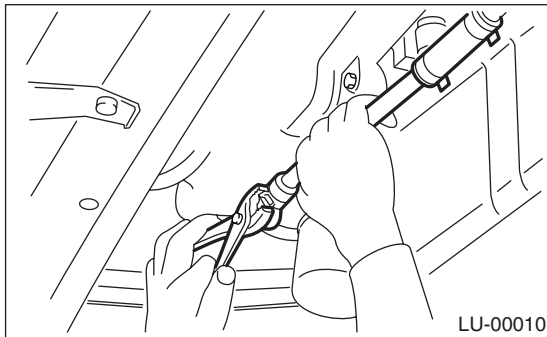
## 4. Oil Pump

### A: REMOVAL

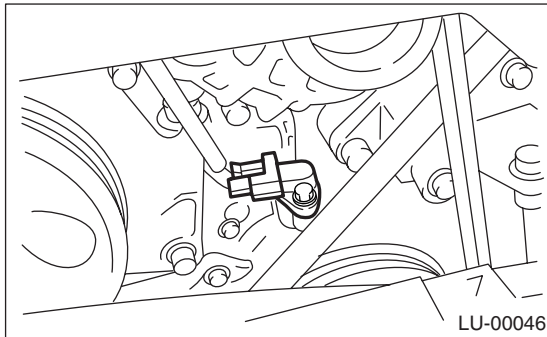
- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Remove the bolts which install the water pipe of oil cooler to oil pump.



- 5) Remove the water pipe and hoses between oil cooler and water pump.

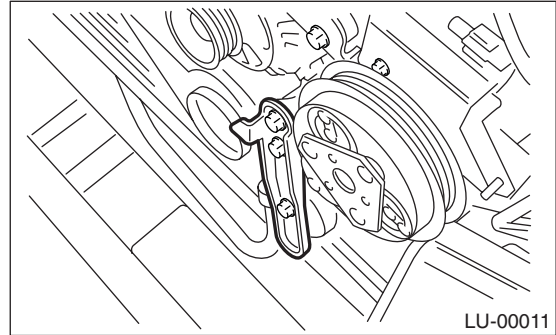


- 6) Remove the radiator. <Ref. to CO(H4DOTC)-23, REMOVAL, Radiator.>
- 7) Remove the crankshaft position sensor.

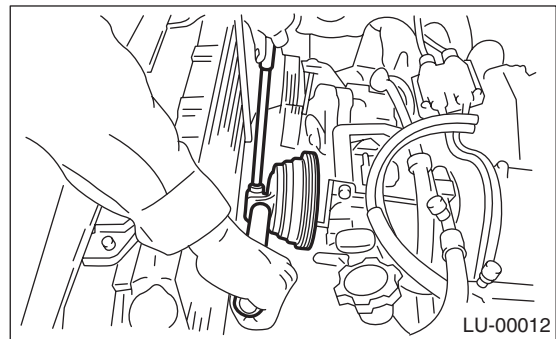


- 8) Remove the V-belts. <Ref. to ME(STI)-40, REMOVAL, V-belt.>

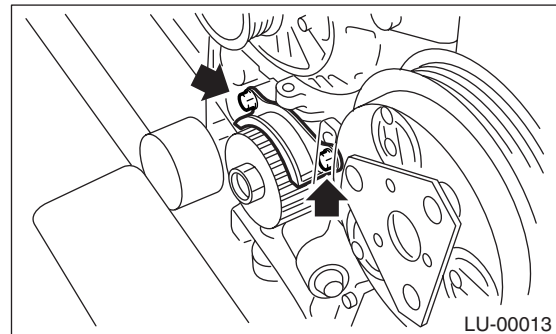
- 9) Remove the rear side V-belt tensioner.



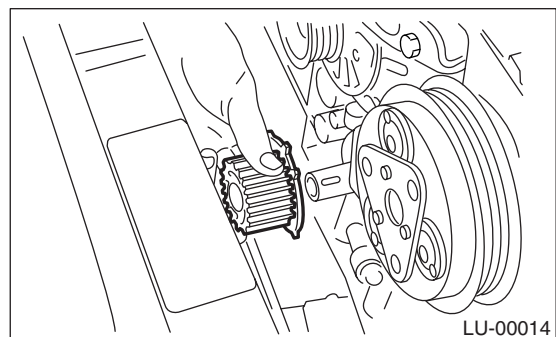
- 10) Remove the crank pulley by using ST. <Ref. to ME(STI)-42, REMOVAL, Crank Pulley.>  
ST 499977100 CRANK PULLEY WRENCH



- 11) Remove the timing belt. <Ref. to ME(STI)-44, REMOVAL, Timing Belt.>
- 12) Remove the timing belt guide. (MT model)



- 13) Remove the water pump. <Ref. to CO(H4DOTC)-19, REMOVAL, Water Pump.>
- 14) Remove the crank sprocket.



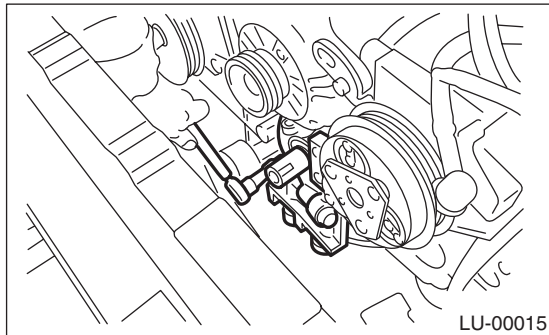
# Oil Pump

## LUBRICATION

15) Remove the bolts which install the oil pump onto cylinder block.

### NOTE:

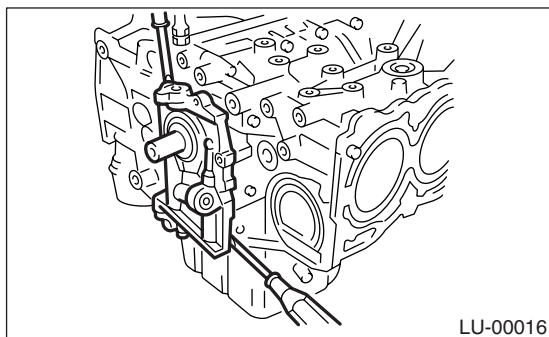
If disassembling or inspecting the oil pump, loosen the plug of relief valve before removing the oil pump.



16) Remove the oil pump using flat tip screwdriver.

### CAUTION:

Be careful not to scratch the mating surfaces of cylinder block and oil pump.



## B: INSTALLATION

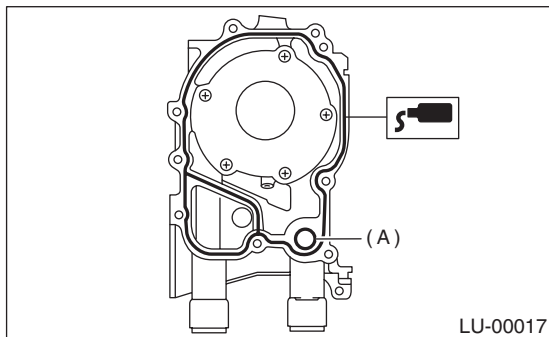
Install in the reverse order of removal.

Do the following:

1) Apply liquid gasket to the matching surfaces of oil pump.

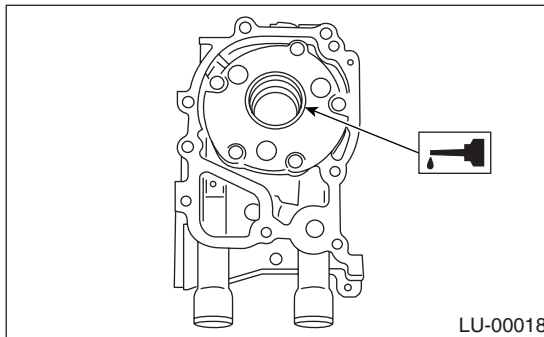
### Liquid gasket:

**THREE BOND 1215 (Part No. 004403007) or equivalent**



2) Replace the O-ring (A) with a new one.

3) Apply a coat of engine oil to the inside of oil seal.



4) Be careful not to scratch the oil seal when installing the oil pump on cylinder block.

5) Position the oil pump, aligning the notched area with crankshaft, and push the oil pump straight.

### CAUTION:

- Make sure the oil seal lip is not folded.
- Be careful not to scratch the oil seal when installing oil pump on cylinder block.

6) Install the oil pump.

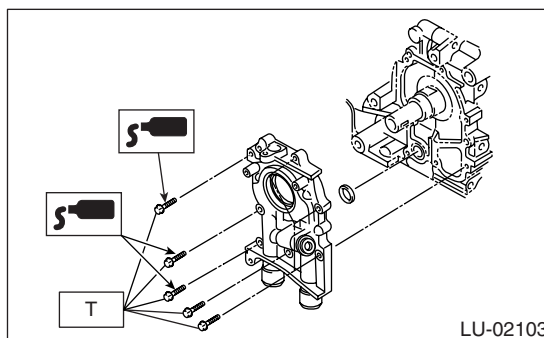
7) Apply liquid gasket to the threaded portion of three bolts. (If to be reuse the bolts.)

### Liquid gasket:

**THREE BOND 1324 (Part No. 004403042) or equivalent**

### Tightening torque:

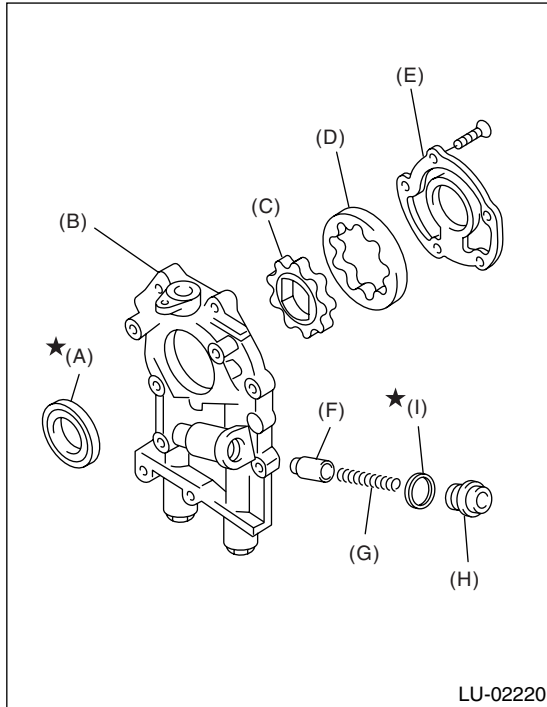
**6.4 N-m (0.65 kgf-m, 4.7 ft-lb)**



## C: DISASSEMBLY

Remove the screws which secure the oil pump cover and disassemble oil pump. Inscribe alignment marks on the inner and outer rotors so that they can be replaced in their original positions during reassembly.

**CAUTION:**  
Before disassembling the oil pump, remove the relief valve.

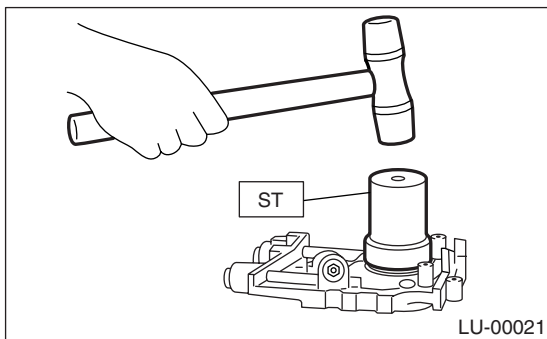


- (A) Oil seal
- (B) Pump case
- (C) Inner rotor
- (D) Outer rotor
- (E) Pump cover
- (F) Relief valve
- (G) Relief valve spring
- (H) Plug
- (I) Gasket

## D: ASSEMBLY

1) Install the front oil seal by using ST.  
ST 499587100 OIL SEAL INSTALLER

**NOTE:**  
Use a new oil seal.

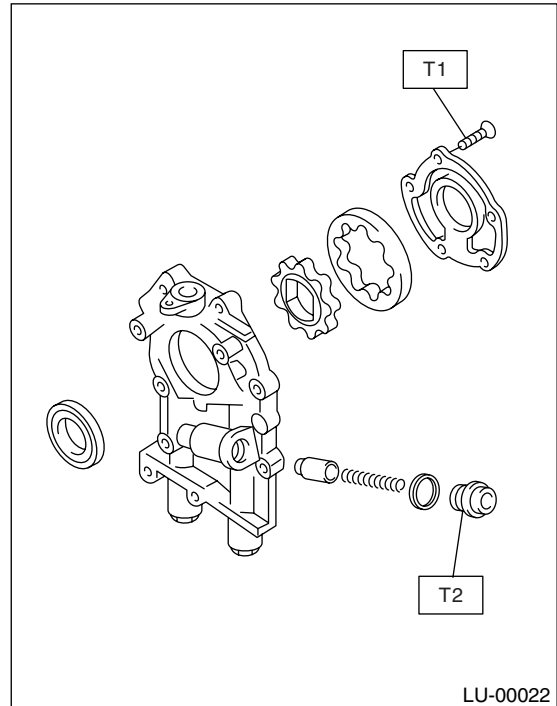


2) Apply a coat of engine oil to the inner and outer rotors.

3) Install the inner and outer rotors in their original positions.  
4) Install the oil relief valve, relief valve spring and plug.

**NOTE:**  
Use a new gasket.  
5) Install the oil pump cover.

**Tightening torque:**  
T1: 5.4 N·m (0.55 kgf-m, 4.0 ft-lb)  
T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)

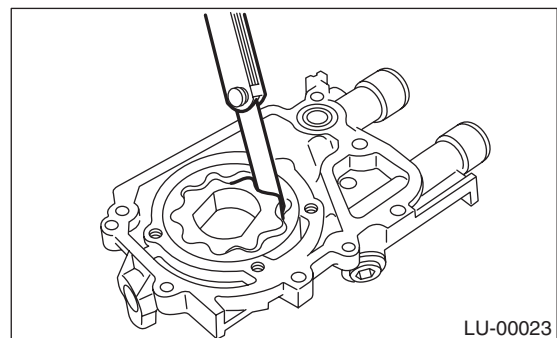


## E: INSPECTION

### 1. TIP CLEARANCE

Measure the tip clearance of rotors. If clearance exceeds the limit, replace the rotors as a matched set.

**Tip clearance:**  
**Standard**  
0.04 — 0.14 mm (0.0016 — 0.0055 in)  
**Limit**  
0.18 mm (0.0071 in)





# Oil Pump

## LUBRICATION

### 2. CASE CLEARANCE

Measure the clearance between outer rotor and oil pump rotor housing. If clearance exceeds the limit, replace the rotor.

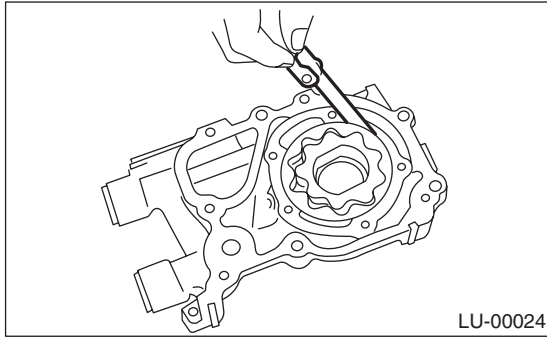
**Case clearance:**

**Standard**

**0.10 — 0.175 mm (0.0039 — 0.0069 in)**

**Limit**

**0.20 mm (0.0079 in)**



### 3. SIDE CLEARANCE

Measure the clearance between the oil pump inner rotor and pump cover. If clearance exceeds the limit, replace the rotor or pump body.

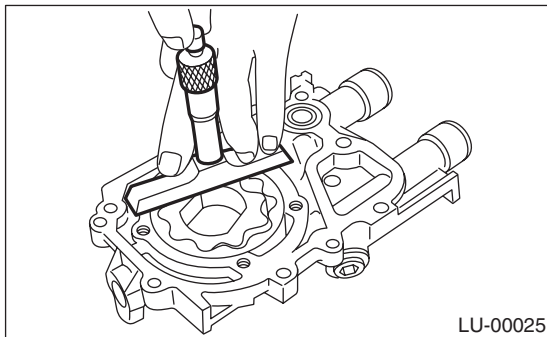
**Side clearance:**

**Standard**

**0.02 — 0.07 mm (0.0008 — 0.0028 in)**

**Limit**

**0.12 mm (0.0047 in)**



### 4. OIL RELIEF VALVE

Check the valve for fitting condition and damage, and the relief valve spring for damage and deterioration. Replace the parts if defective.

**Relief valve spring:**

**Free length**

**73.7 mm (2.902 in)**

**Installed length**

**54.7 mm (2.154 in)**

**Load when installed**

**93.1 N (9.49 kgf, 20.88 lbf)**

### 5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks, and other faults.

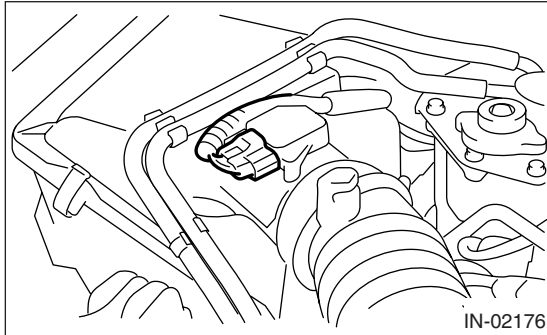
### 6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

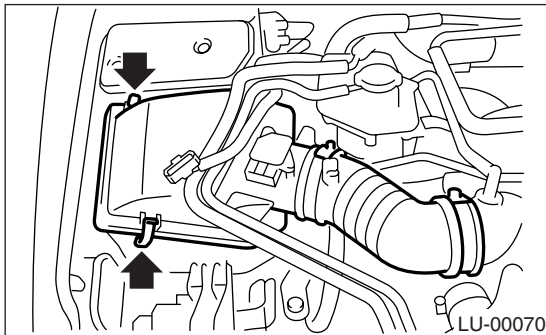
## 5. Oil Pan and Strainer

### A: REMOVAL

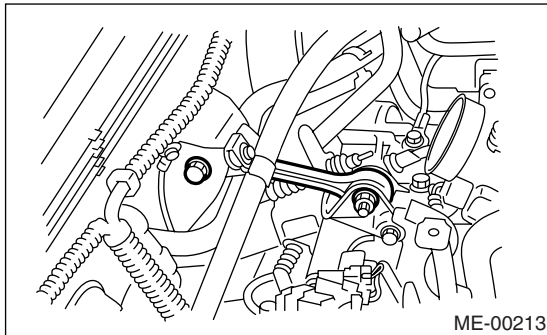
- 1) Set the vehicle on a lift.
- 2) Remove the front wheels.
- 3) Disconnect the ground cable from battery.
- 4) Disconnect the connector from mass air flow and intake air temperature sensor.



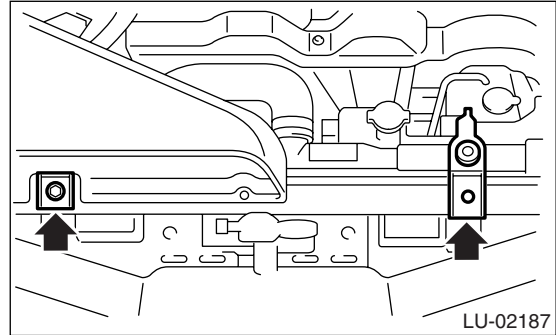
- 5) Remove the air intake boot and air cleaner upper cover.



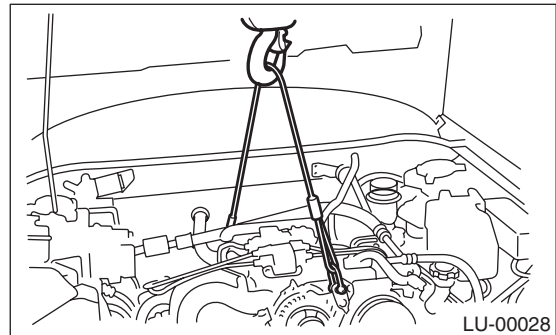
- 6) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 7) Remove the pitching stopper.



- 8) Remove the radiator upper brackets.



- 9) Support the engine with a lifting device and wire ropes.

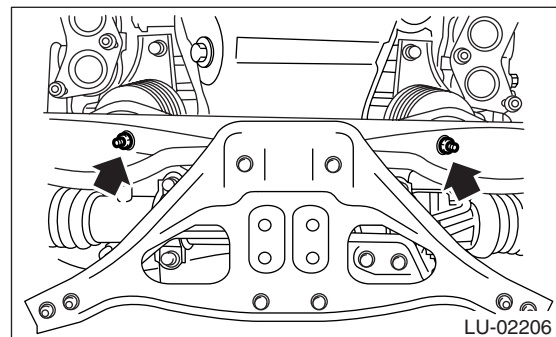


- 10) Lift-up the vehicle.

### CAUTION:

**When lifting up the vehicle, rise up the wire rope together.**

- 11) Remove the under cover.
- 12) Drain the engine oil.
- 13) Remove the front exhaust pipe assembly. <Ref. to EX(H4DOTC)-8, REMOVAL, Front Exhaust Pipe.>
- 14) Remove the nuts which install the front cushion rubber onto front crossmember.



- 15) Remove the bolts which install the oil pan on cylinder block while raising up engine.
- 16) Insert the oil pan cutter blade between cylinder block-to-oil pan clearance.

### CAUTION:

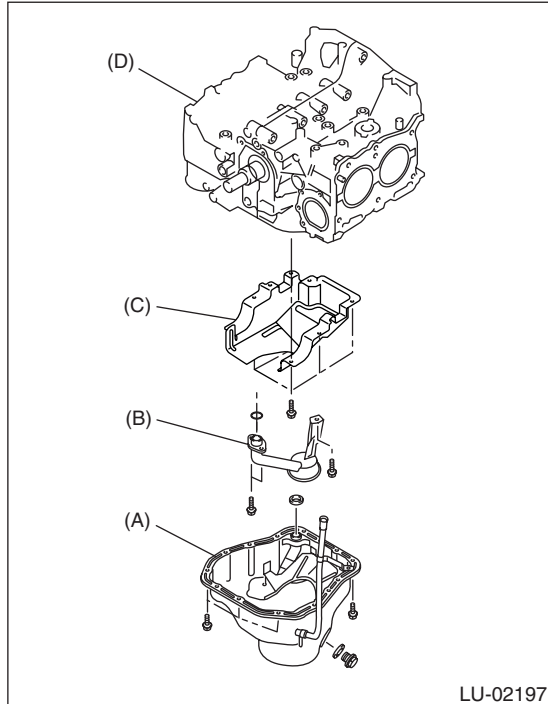
**Do not use a screwdriver or similar tool in place of oil pan cutter.**

- 17) Remove the oil strainer.

# Oil Pan and Strainer

## LUBRICATION

18) Remove the baffle plate.



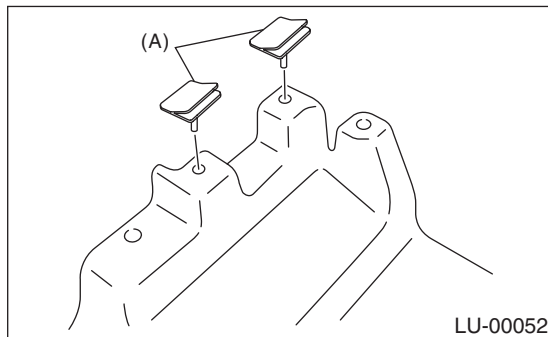
- (A) Oil pan
- (B) Oil strainer
- (C) Baffle plate
- (D) Cylinder block

## B: INSTALLATION

### CAUTION:

**Before installing the oil pan, clean sealant from oil pan and engine block.**

1) Check the seal (A) is securely installed in baffle plate in the direction as shown in the figure.



2) Install the baffle plate.

### Tightening torque:

**6.4 N-m (0.65 kgf-m, 4.7 ft-lb)**

3) Install the oil strainer onto baffle plate.

### NOTE:

Replace the O-ring with a new one.

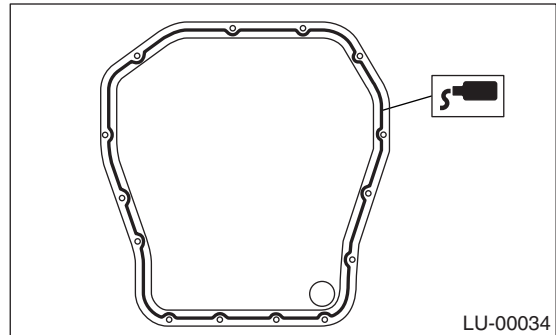
### Tightening torque:

**10 N-m (1.0 kgf-m, 7.2 ft-lb)**

4) Apply liquid gasket to the mating surfaces, and then install the oil pan.

### Liquid gasket:

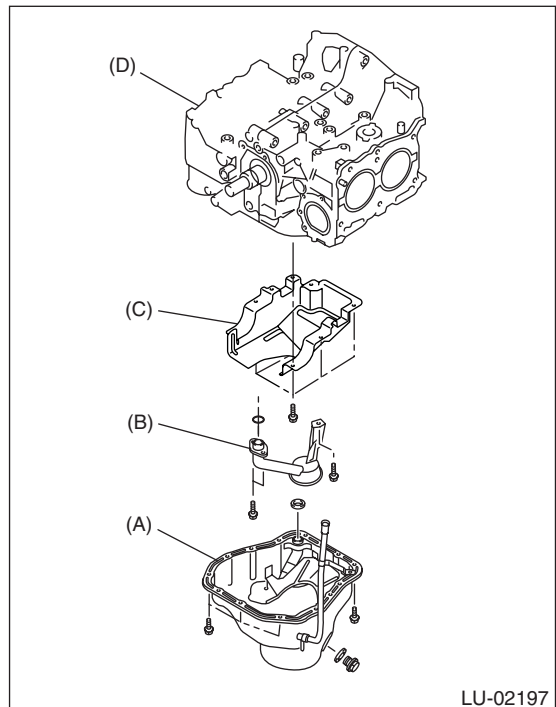
**THREE BOND 1207C (Part No. 004403012) or equivalent**



5) Tighten the bolts which install the oil pan onto engine block.

### Tightening torque:

**5 N-m (0.5 kgf-m, 3.6 ft-lb)**



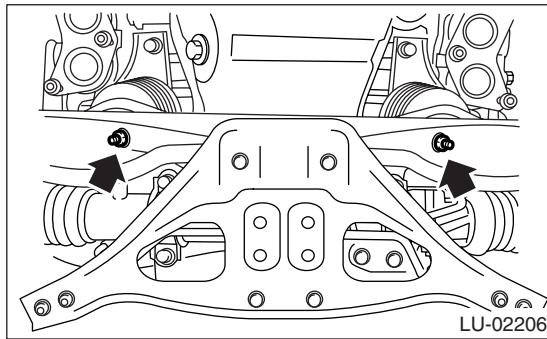
- (A) Oil pan
- (B) Oil strainer
- (C) Baffle plate
- (D) Cylinder block

6) Lower the engine onto front crossmember.

7) Tighten the nuts which install the front cushion rubber onto front crossmember.

**Tightening torque:**

**85 N·m (8.7 kgf-m, 62.7 ft-lb)**



8) Install the front exhaust pipe assembly. <Ref. to EX(H4DOTC)-8, INSTALLATION, Front Exhaust Pipe.>

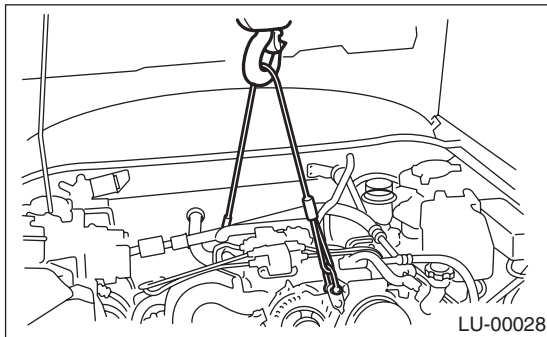
9) Install the under cover.

10) Lower the vehicle.

**CAUTION:**

**When lowering the vehicle, lower the lifting device and wire rope together.**

11) Remove the lifting device and wire ropes.

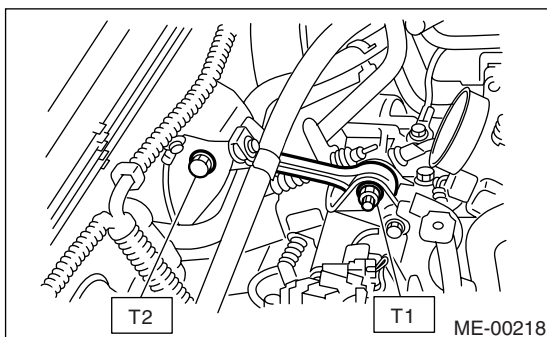


12) Install the pitching stopper.

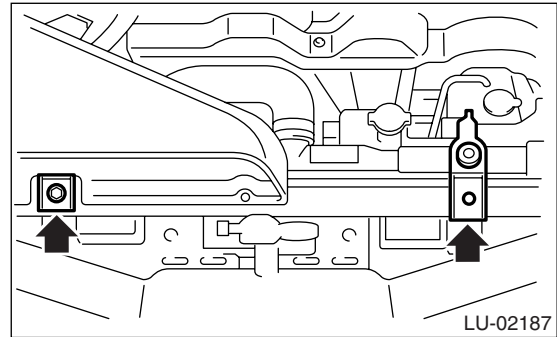
**Tightening torque:**

**T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)**

**T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)**

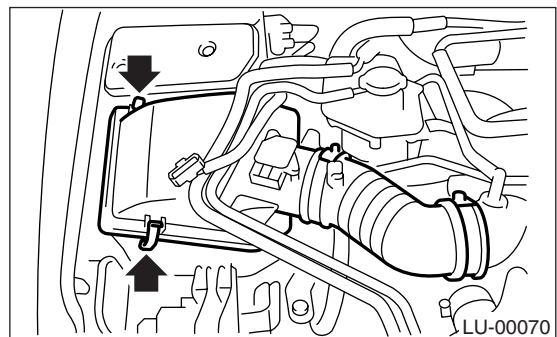


13) Install the radiator upper brackets.

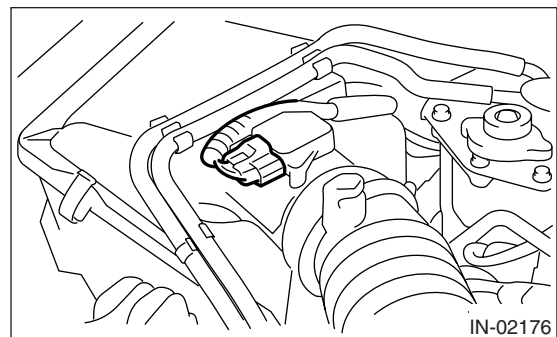


14) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

15) Install the air intake boot and air cleaner upper cover.



16) Connect the connector to mass air flow and intake air temperature sensor.



17) Install the front wheels.

18) Connect the battery ground cable to battery.

19) Fill engine oil. <Ref. to LU(STI)-9, INSPECTION, Engine Oil.>

**C: INSPECTION**

By visual check, make sure the oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

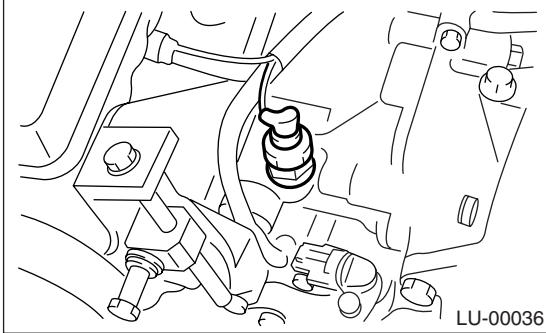
# Oil Pressure Switch

LUBRICATION

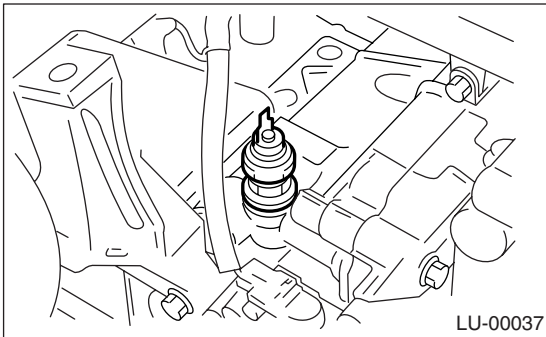
## 6. Oil Pressure Switch

### A: REMOVAL

- 1) Remove the generator from bracket. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
- 2) Disconnect the terminal from oil pressure switch.



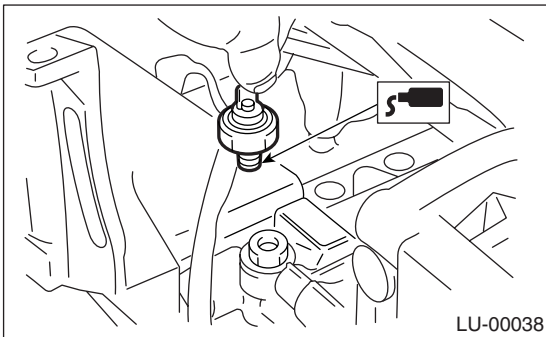
- 3) Remove the oil pressure switch.



### B: INSTALLATION

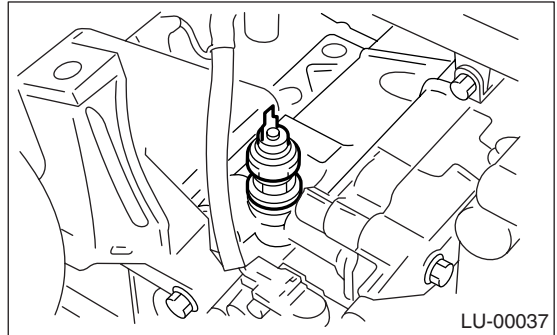
- 1) Apply liquid gasket to the oil pressure switch threads.

**Liquid gasket:**  
**THREE BOND 1324 (Part No. 004403042) or equivalent**

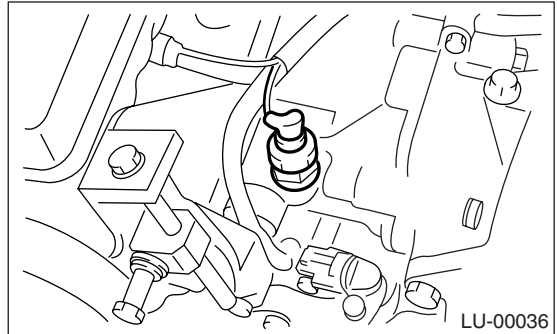


- 2) Install the oil pressure switch onto engine block.

**Tightening torque:**  
**25 N·m (2.5 kgf·m, 18.1 ft·lb)**



- 3) Connect the terminal of oil pressure switch.



- 4) Install the generator on bracket. <Ref. to SC(H4SO)-14, INSTALLATION, Generator.>

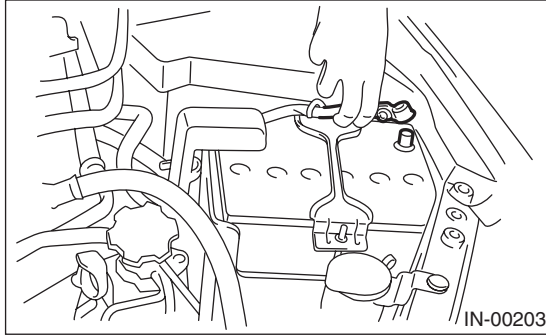
### C: INSPECTION

Make sure oil does not leak or seep from where the oil pressure switch is installed.

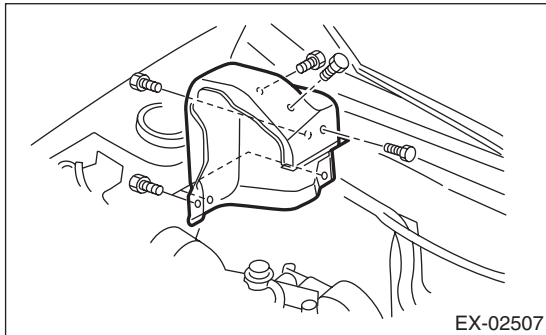
## 7. Oil Pipe

### A: REMOVAL

- 1) Disconnect the ground cable from battery.



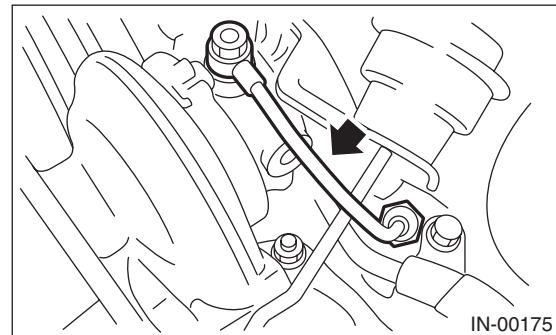
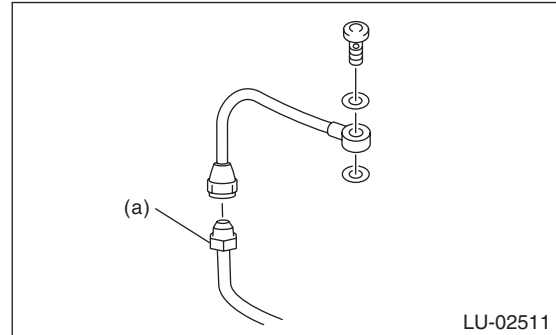
- 2) Remove the intercooler. <Ref. to IN(STI)-11, REMOVAL, Intercooler.>  
 3) Remove the intercooler bracket RH.  
 4) Remove the turbocharger upper cover.



- 5) Remove the oil inlet pipe from the turbocharger.

#### CAUTION:

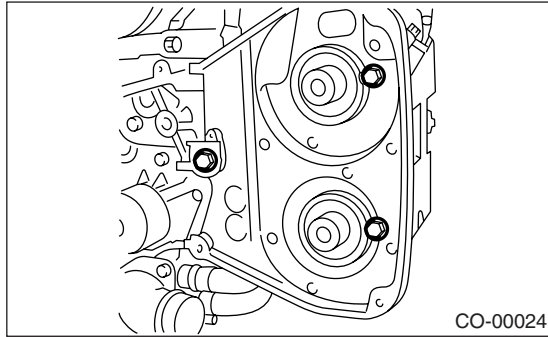
In order to prevent damaging the oil pipe on the cylinder head side, fix the section (a) shown in the figure when loosening the oil inlet pipe flare nut, and avoid the part from rotating together while loosening the nut.



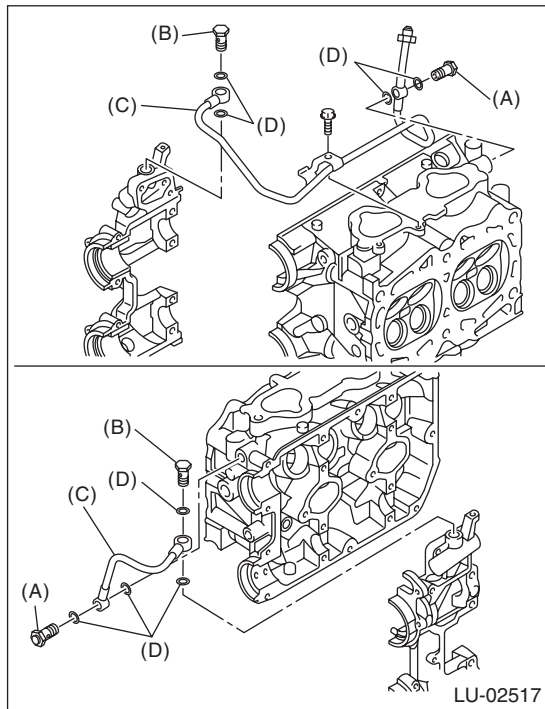
- 6) Remove the intake manifold. <Ref. to FU(STI)-13, REMOVAL, Intake Manifold.>  
 7) Remove the radiator main fan and radiator sub fan. <Ref. to CO(H4DOTC)-28, REMOVAL, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4DOTC)-30, REMOVAL, Radiator Sub Fan and Fan Motor.>  
 8) Remove the V-belts. <Ref. to ME(STI)-40, REMOVAL, V-belt.>  
 9) Remove the crank pulley. <Ref. to ME(STI)-42, REMOVAL, Crank Pulley.>  
 10) Remove the timing belt cover. <Ref. to ME(STI)-43, REMOVAL, Timing Belt Cover.>  
 11) Remove the timing belt. <Ref. to ME(STI)-44, TIMING BELT, REMOVAL, Timing Belt.>  
 12) Remove the cam sprocket LH. <Ref. to ME(STI)-52, REMOVAL, Cam Sprocket.>



13) Remove the belt cover No. 2 LH.



14) Remove the oil pipe.



- (A) Union screw with filter (with protrusion)
- (B) Union screw without filter (without protrusion)
- (C) Oil pipe
- (D) Gasket

## B: INSTALLATION

1) Inspect the union screw with filter. <Ref. to LU(STI)-22, INSPECTING UNION SCREW WITH FILTER, INSPECTION, Oil Pipe.>

2) Install the oil pipe.

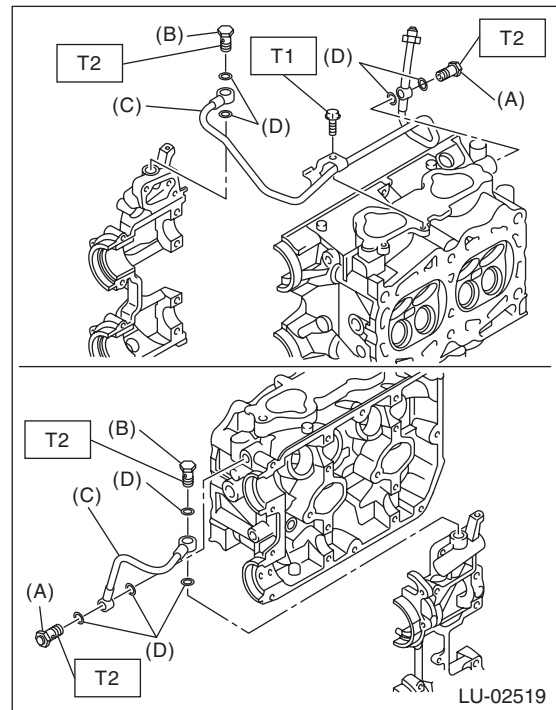
### NOTE:

- Make sure not to mix up the union screws with filter and without filter as their installation positions are different.
- Use a new gasket.

### Tightening torque:

**T1: 8 N·m (0.8 kgf-m, 5.9 ft-lb)**

**T2: 29 N·m (3.0 kgf-m, 21.4 ft-lb)**

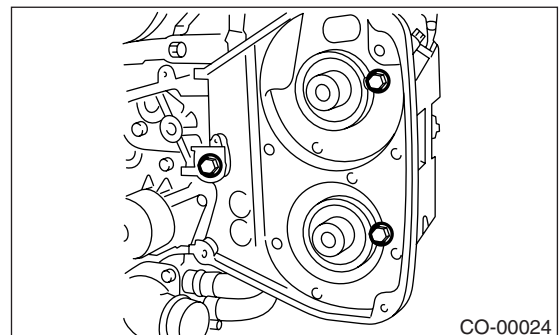


- (A) Union screw with filter (with protrusion)
- (B) Union screw without filter (without protrusion)
- (C) Oil pipe
- (D) Gasket

3) Install the belt cover No. 2 LH.

### Tightening torque:

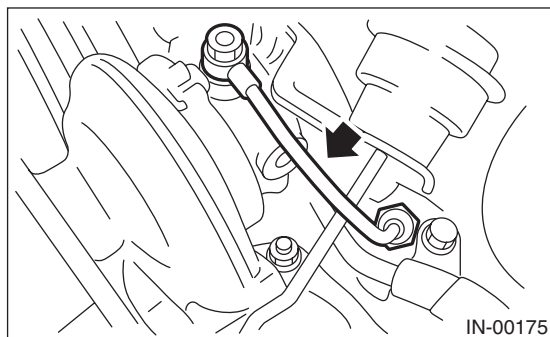
**5 N·m (0.5 kgf-m, 3.7 ft-lb)**



- 4) Install the cam sprocket LH. <Ref. to ME(STI)-52, INSTALLATION, Cam Sprocket.>
- 5) Install the timing belt. <Ref. to ME(STI)-46, TIMING BELT, INSTALLATION, Timing Belt.>
- 6) Install the timing belt cover. <Ref. to ME(STI)-43, INSTALLATION, Timing Belt Cover.>
- 7) Install the crank pulley. <Ref. to ME(STI)-42, INSTALLATION, Crank Pulley.>
- 8) Install the V-belts. <Ref. to ME(STI)-40, INSTALLATION, V-belt.>
- 9) Install the radiator main fan and the radiator sub fan. <Ref. to CO(H4DOTC)-28, INSTALLATION, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4DOTC)-30, INSTALLATION, Radiator Sub Fan and Fan Motor.>
- 10) Install the intake manifold. <Ref. to FU(STI)-16, INSTALLATION, Intake Manifold.>
- 11) Temporarily tighten the oil inlet pipe of turbocharger.

**NOTE:**

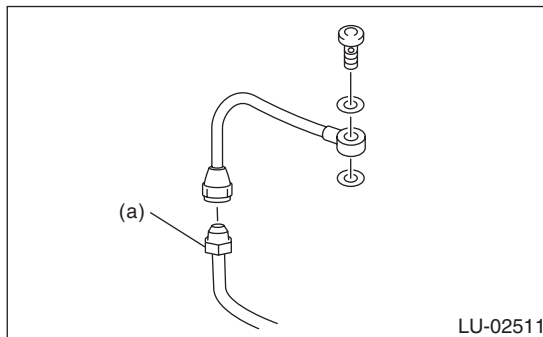
Use a new gasket.



- 12) Tighten the oil inlet pipe of turbocharger.

**CAUTION:**

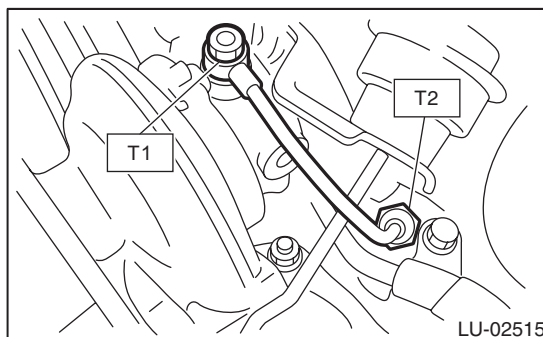
In order to prevent damaging the oil pipe on the cylinder head side, fix the section (a) shown in the figure when tightening the oil inlet pipe flare nut, and avoid the part from rotating together while tightening the nut.



**Tightening torque:**

**T1: 16 N·m (1.6 kgf·m, 11.8 ft·lb)**

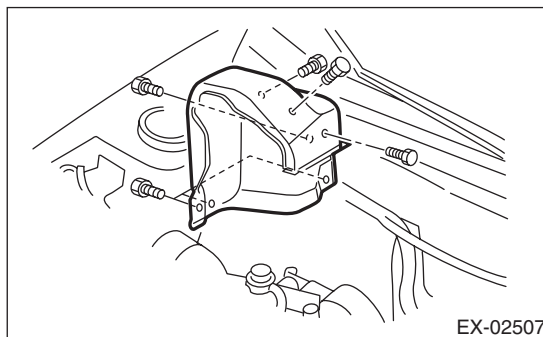
**T2: 20 N·m (2.0 kgf·m, 14.8 ft·lb)**



- 13) Install the turbocharger upper cover.

**Tightening torque:**

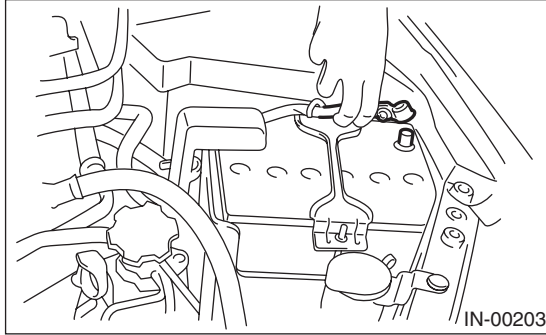
**7.5 N·m (0.8 kgf·m, 5.5 ft·lb)**



- 14) Install the intercooler bracket RH.
- 15) Install the intercooler. <Ref. to IN(STI)-11, INSTALLATION, Intercooler.>



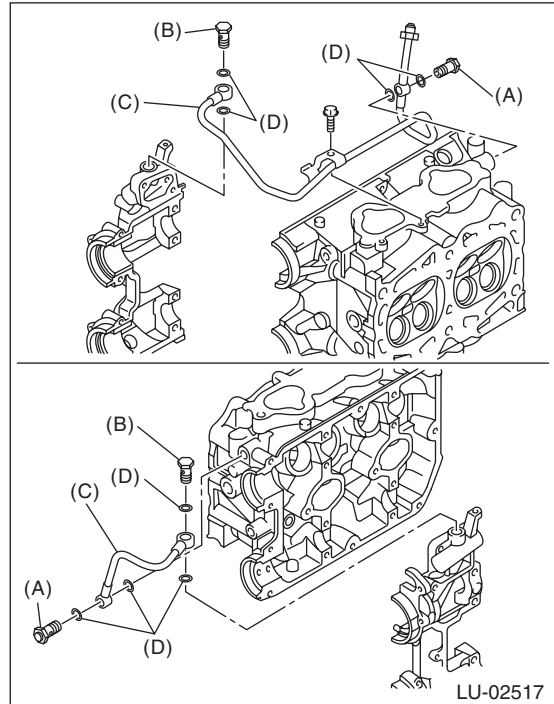
16) Connect the ground cable to battery.



## C: INSPECTION

### 1. INSPECTING UNION SCREW WITH FILTER

Check the filter part of union screw for clogging or damage, and if defective, replace the union screw with filter with a new part.



- (A) Union screw with filter (with protrusion)
- (B) Union screw without filter (without protrusion)
- (C) Oil pipe
- (D) Gasket

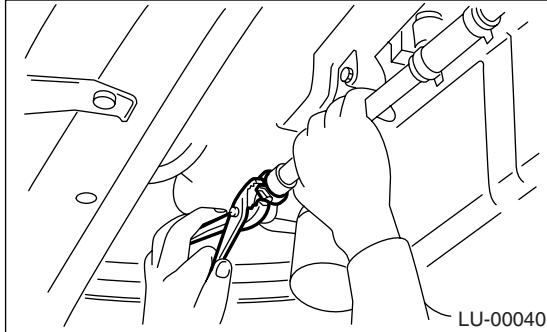
### 2. OTHER INSPECTIONS

- 1) Check that the oil pipe and union screw have no deformation, cracks and other damages.
- 2) Check that there are no oil leaks or oil oozing from the oil pipe attachment section.

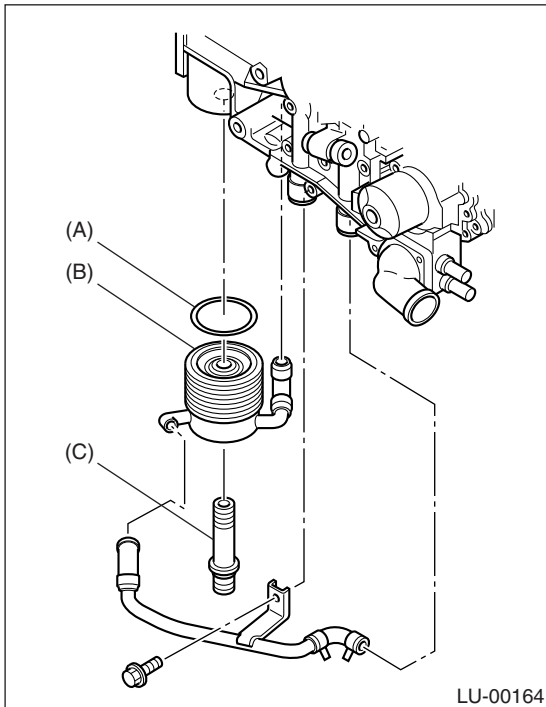
## 8. Engine Oil Cooler

### A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Drain the engine oil.
- 4) Drain the engine coolant.
- 5) Remove the water by-pass pipe between oil cooler and water pump.



- 6) Remove the engine oil filter. <Ref. to LU(STI)-24, REMOVAL, Engine Oil Filter.>
- 7) Remove the connector, and then remove the oil cooler.



- (A) O-ring
- (B) Oil cooler
- (C) Oil cooler connector

### B: INSTALLATION

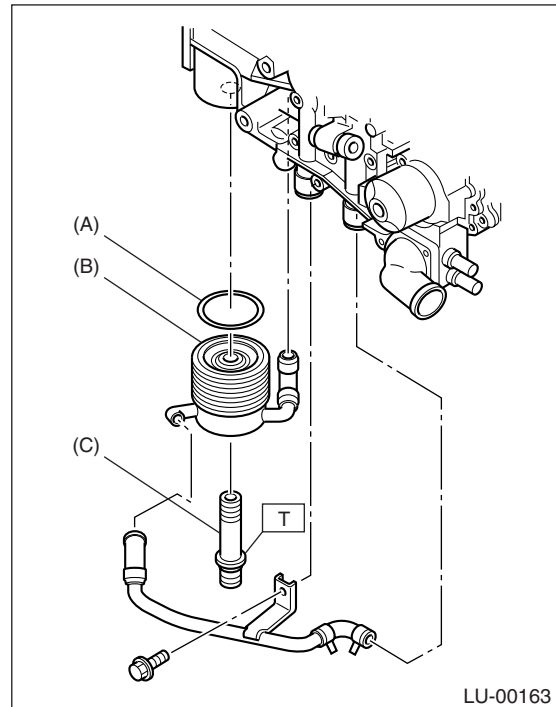
Install in the reverse order of removal.

#### Tightening torque:

**T: 54 N·m (5.5 kgf-m, 40 ft-lb)**

#### NOTE:

Always use a new O-ring.



- (A) O-ring
- (B) Oil cooler
- (C) Oil cooler connector

### C: INSPECTION

- 1) Check the coolant passages are not clogged by blowing compressed air.
- 2) Check the mating surfaces of cylinder block, O-ring groove and oil filter for damage.

## 9. Engine Oil Filter

### A: REMOVAL

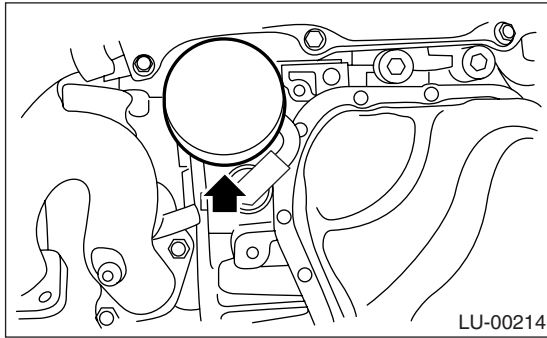
- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Remove the oil filter with ST.

ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))

ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))

#### NOTE:

Standard oil filter is outer diameter of 68 mm (2.68 in). However, SUBARU genuine oil filter having outer diameter of 65 mm (2.56 in) can also be used.



### B: INSTALLATION

- 1) Get a new oil filter and apply a thin coat of engine oil to seal rubber.
- 2) Install the oil filter by turning it by hand, being careful not to damage seal rubber.
  - Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler. If using a torque wrench, tighten it to 14 N·m (1.4 kgf·m, 10.3 ft·lb).
  - Tighten the oil filter 65 mm (2.56 in) in diameter by approx. 2/3 — 3/4 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler. If using a torque wrench, tighten it to 12 N·m (1.2 kgf·m, 8.7 ft·lb).

#### CAUTION:

**Do not tighten excessively, or oil may leak.**

- 3) Install the under cover.
- 4) Lower the vehicle.

### C: INSPECTION

- 1) After installing the oil filter, run the engine and make sure that no oil is leaking around seal rubber.

#### NOTE:

The filter element and filter case are permanently jointed; therefore, interior cleaning is not necessary.

- 2) Check the engine oil level. <Ref. to LU(STI)-9, INSPECTION, Engine Oil.>

## 10. Engine Lubrication System Trouble in General

### A: INSPECTION

Before performing diagnostics, make sure that the engine oil level is correct and no oil leakage exists.

| Symptom                                | Possible cause                           |   | Corrective action  |
|--|--|---|--|
| 1. Warning light remains on.           | 1) Oil pressure switch failure           | Cracked diaphragm or oil leakage within switch                        | Replace.   |
|  |  | Broken spring or seized contacts                                      | Replace.   |
|  | 2) Low oil pressure                      | Clogged oil filter  | Replace.   |
|  |  | Malfunition of oil by-pass valve of oil filter                        | Clean or replace.  |
|  |  | Malfunition of oil relief valve of oil pump                           | Clean or replace.  |
|  |  | Clogged oil passage   | Clean.   |
|  |  | Excessive tip clearance and side clearance of oil pump rotor and gear | Replace.   |
|  |  | Clogged oil strainer or broken pipe                                   | Clean or replace.  |
|  | 3) No oil pressure                       | Insufficient engine oil   | Replenish.   |
|  |  | Broken pipe of oil strainer   | Replace.   |
| Stuck oil pump rotor                   |  | Replace.  |  |
| 2. Warning light does not turn on.     | 1) Malfunition of combination meter      |   | Replace.   |
|  | 2) Poor contact of switch contact points |   | Replace.   |
|  | 3) Disconnection of wiring               |   | Repair.  |
| 3. Warning light flickers momentarily. | 1) Poor contact at terminals             |   | Repair.  |
|  | 2) Defective wiring harness              |   | Repair.  |
|  | 3) Low oil pressure                      |   | Check for the same possible causes as listed in 1. — 2). |



# SPEED CONTROL SYSTEMS

# *SP(STI)*

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|                              | <b>Page</b> |
|------------------------------|-------------|
| 1. General Description ..... | 2           |
| 2. Accelerator Pedal.....    | 3           |

# General Description

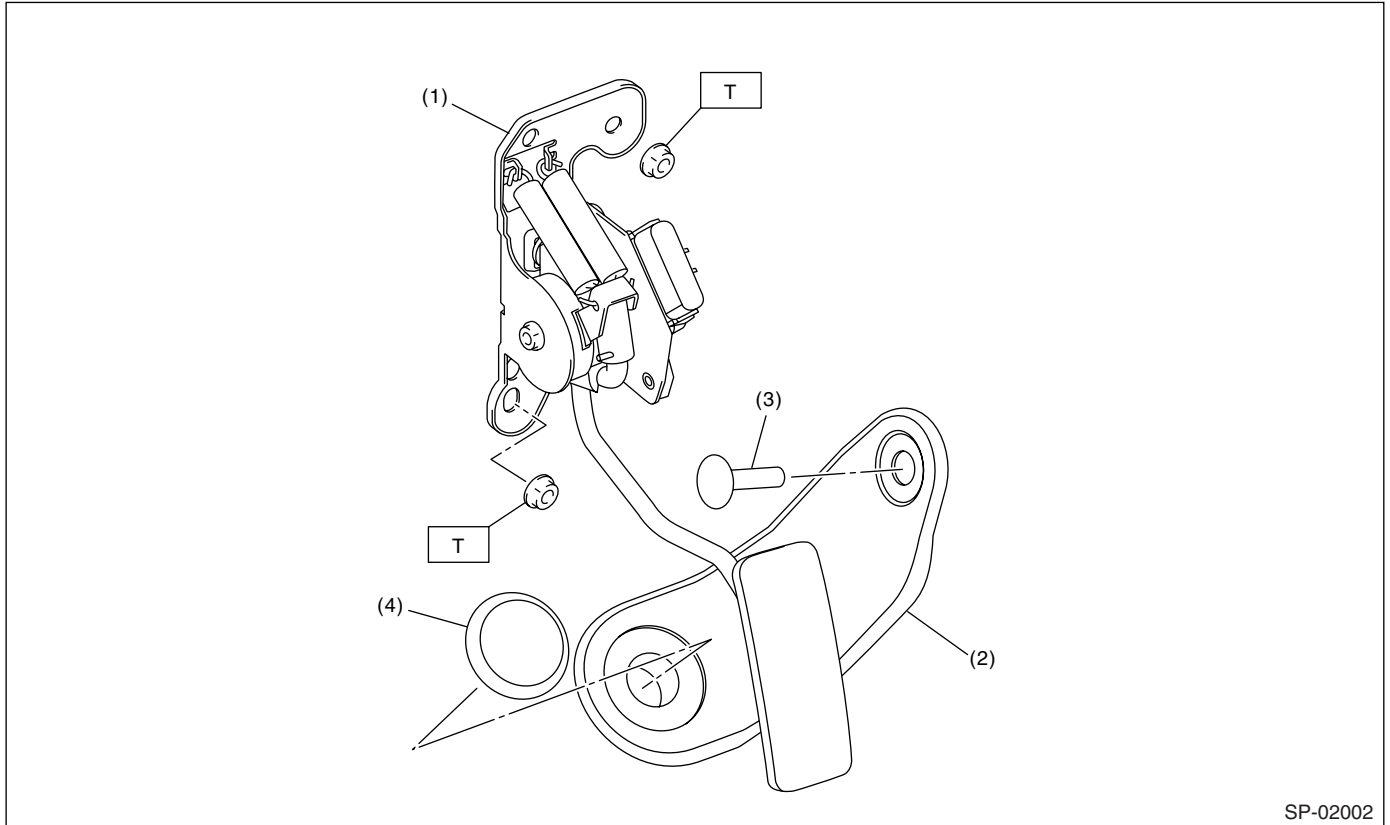
SPEED CONTROL SYSTEMS

## 1. General Description

### A: SPECIFICATION

|                   |        |              |                             |
|-------------------|--------|--------------|-----------------------------|
| Accelerator pedal | Stroke | At pedal pad | 52 — 57 mm (2.05 — 2.24 in) |
|-------------------|--------|--------------|-----------------------------|

### B: COMPONENT



SP-02002

- |                            |             |
|----------------------------|-------------|
| (1) Accelerator pedal ASSY | (3) Clip    |
| (2) Accelerator plate      | (4) Stopper |

**Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 18 (1.8, 13.0)**

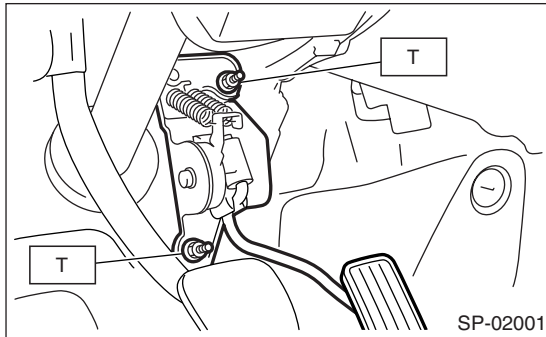
### C: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

## 2. Accelerator Pedal

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector.
- 3) Remove the nut securing accelerator pedal assembly.



### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

*18 N·m (1.8 kgf-m, 13.0 ft-lb)*

### C: DISASSEMBLY

NOTE:

Accelerator pedal cannot be disassembled.





# IGNITION

# *IG(STI)*

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|  | <b>Page</b> |
|--|-------------|
| 1. General Description .....               | 2           |
| 2. Spark Plug.....                         | 4           |
| 3. Ignition Coil and Ignitor Assembly..... | 7           |

# General Description

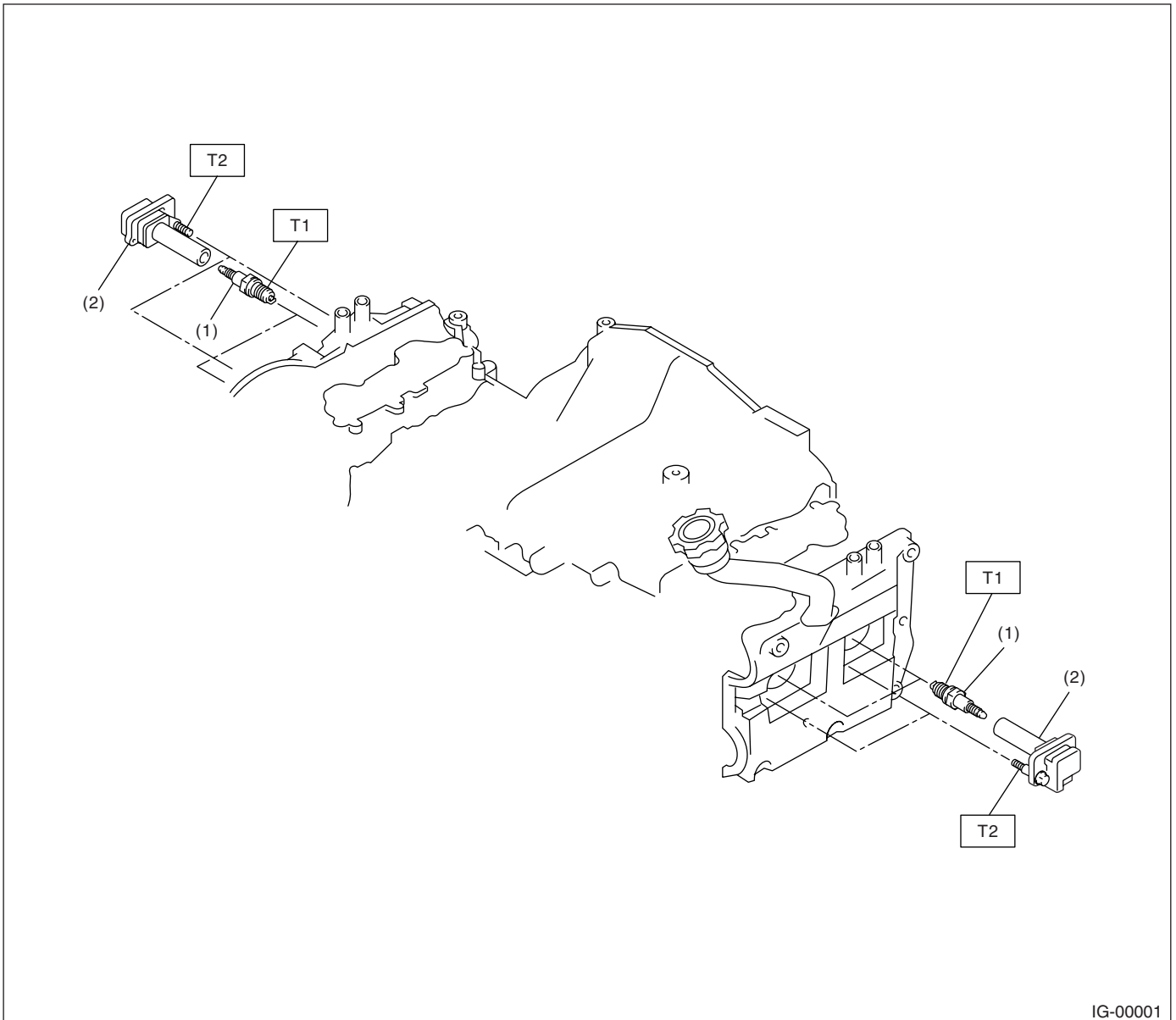
## IGNITION

### 1. General Description

#### A: SPECIFICATION

| Item                               |                                   | Designation               |
|------------------------------------|-----------------------------------|---------------------------|
| Ignition coil and ignitor assembly | Model                             | FK0186                    |
|                                    | Ignition type                     | Direct ignition           |
|                                    | Manufacturer                      | DIAMOND                   |
| Spark plug                         | Type and manufacturer             | NGK: ILFR6B               |
|                                    | Thread diameter, pitch, length mm | 14, 1.25, 26.5            |
|                                    | Spark plug gap mm (in)            | 0.7 — 0.8 (0.028 — 0.031) |
|                                    | Electrode                         | Iridium                   |

#### B: COMPONENT



IG-00001

- (1) Spark plug
- (2) Ignition coil and ignitor ASSY

**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 21 (2.1, 15.2)**

**T2: 16 (1.6, 11.7)**

### **C: CAUTION**

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

# Spark Plug

## IGNITION

### 2. Spark Plug

#### A: REMOVAL

##### CAUTION:

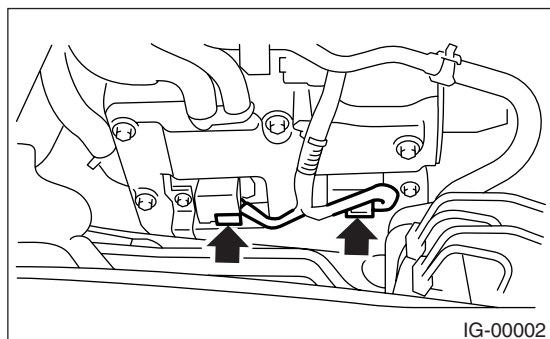
All spark plugs installed on an engine, must be of the same heat range.

**Spark plug:**

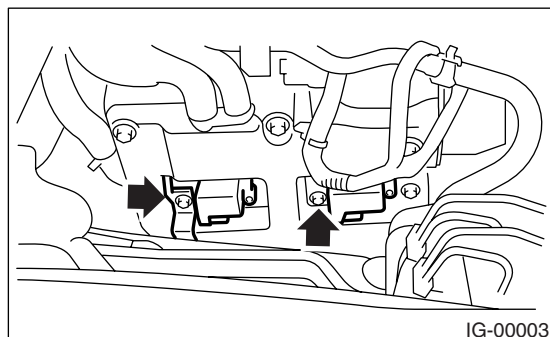
**NGK: ILFR6B**

#### 1. RH SIDE

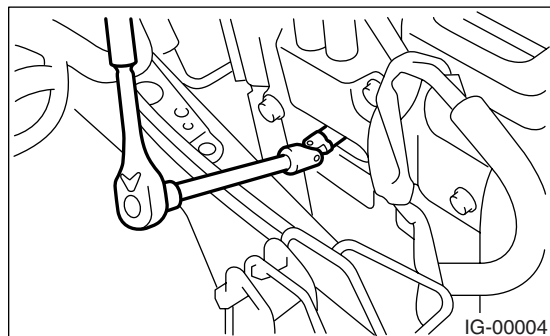
- 1) Disconnect the ground cable from battery.
- 2) Remove the air cleaner lower case. <Ref. to IN(STI)-8, REMOVAL, Air Cleaner Case.>
- 3) Disconnect the connector from ignition coil and ignitor assembly.



- 4) Remove the ignition coil and ignitor assembly.

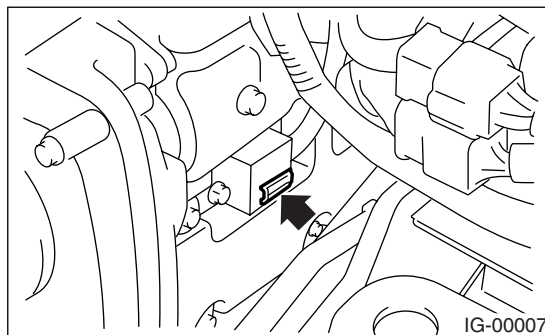


- 5) Remove the spark plugs with the spark plug sockets.

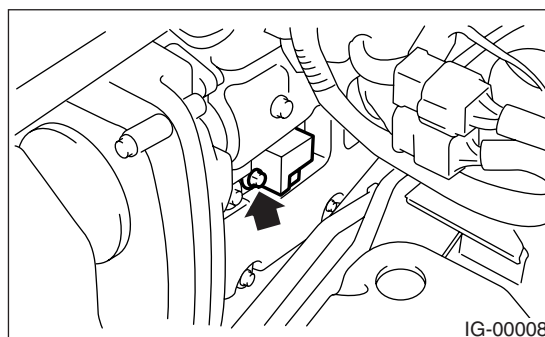


#### 2. LH SIDE

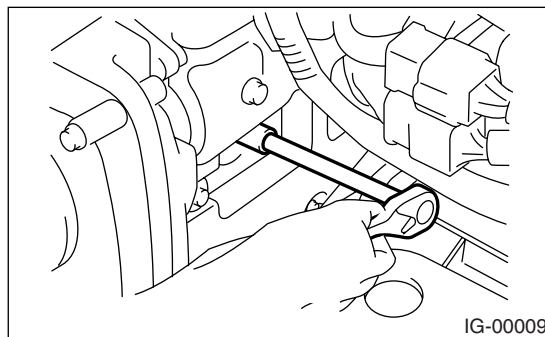
- 1) Disconnect the battery cables, and then remove the battery and battery carrier.
- 2) Disconnect the connector from ignition coil and ignitor assembly.



- 3) Remove the ignition coil and ignitor assembly.



- 4) Remove the spark plugs with the spark plug sockets.



#### B: INSTALLATION

##### 1. RH SIDE

Install in the reverse order of removal.

**Tightening torque (Spark plug):**

**21 N·m (2.1 kgf-m, 15.2 ft-lb)**

**Tightening torque (Ignition coil and ignitor assembly):**

**16 N·m (1.6 kgf-m, 11.7 ft-lb)**

**NOTE:**

The above torque should be only applied to new spark plugs without oil on their threads.

In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

**2. LH SIDE**

Install in the reverse order of removal.

**Tightening torque (Spark plug):**

**21 N·m (2.1 kgf·m, 15.2 ft·lb)**

**Tightening torque (Ignition coil and ignitor assembly):**

**16 N·m (1.6 kgf·m, 11.7 ft·lb)**

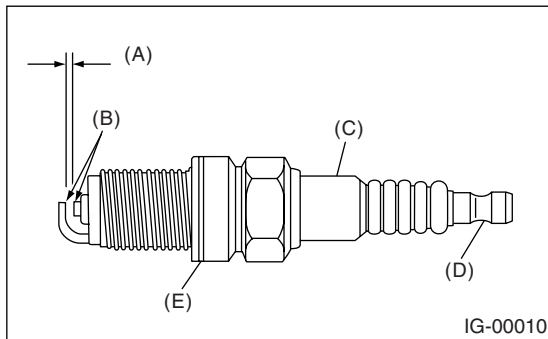
**NOTE:**

The above torque should be only applied to new spark plugs without oil on their threads.

In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

**C: INSPECTION**

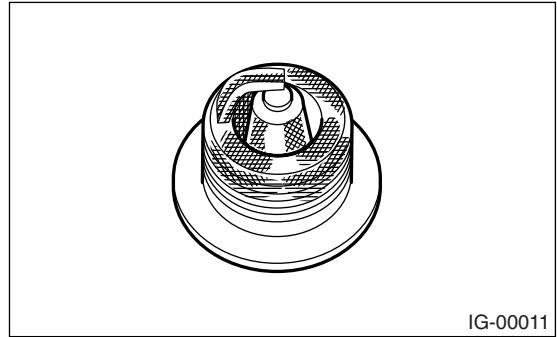
Check the electrodes and inner and ceramic insulator of plugs, noting the type of deposits and the degree of electrode erosion.



- (A) Spark plug gap
- (B) Carbon accumulation or wear
- (C) Cracks
- (D) Damage
- (E) Damaged gasket

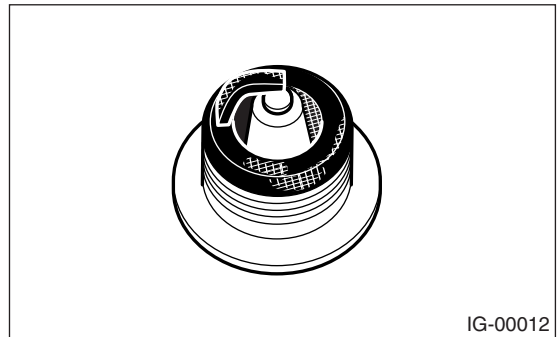
**1) Normal:**

Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.



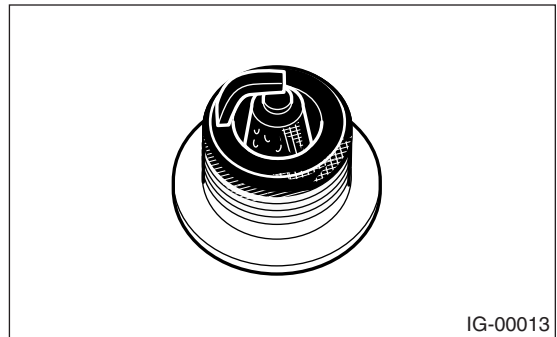
**2) Carbon fouled:**

Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture and dirty air cleaner.



**3) Oil fouled:**

Wet black deposits show oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems.



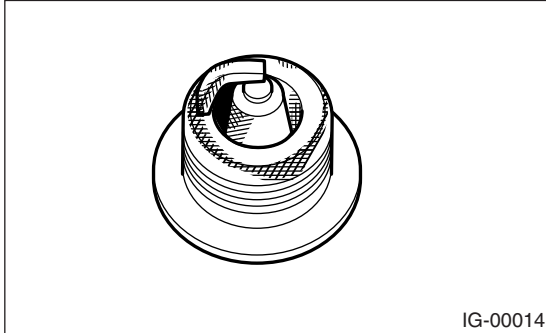
# Spark Plug

## IGNITION

---

### 4) Overheating:

White or light gray insulator with black or brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc.



## D: ADJUSTMENT

Clean the spark plugs with a wire brush. Clean and remove the carbon or oxide deposits, but do not wear away ceramic insulator.

If deposits are too stubborn, replace the plugs.

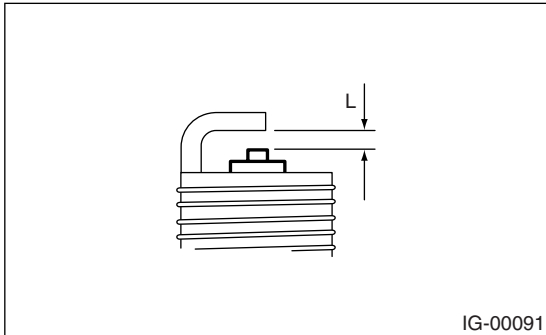
After cleaning the spark plugs, correct the spark plug gap using a gap gauge.

### NOTE:

Do not use spark plug cleaners, because the spark plugs are applied with iridium tips.

### **Spark plug gap L:**

**0.7 — 0.8 mm (0.028 — 0.031 in)**



## 3. Ignition Coil and Ignitor Assembly

### A: REMOVAL

Direct ignition type has been adopted. Refer to the "Spark Plug Removal" for removal procedure.  
<Ref. to IG(STI)-4, REMOVAL, Spark Plug.>

### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

***16 N·m (1.6 kgf-m, 11.7 ft-lb)***

### C: INSPECTION

For inspection, refer to "Ignition Control System".  
<Ref. to EN(STI)(diag)-63, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>



# Ignition Coil and Ignitor Assembly

IGNITION

---

# STARTING/CHARGING SYSTEMS

# *SC(STI)*

---

|                              |             |
|------------------------------|-------------|
|                              | <b>Page</b> |
| 1. General Description ..... | 2           |



### 1. General Description

#### A: SPECIFICATION

Specifications for STI model are included in SC(H4SO) section. <Ref. to SC(H4SO)-2, General Description.>

# ENGINE (DIAGNOSTICS)

# *EN(STI)(diag)*

---

|   | <b>Page</b> |
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# Basic Diagnostic Procedure

ENGINE (DIAGNOSTICS)

## 1. Basic Diagnostic Procedure

### A: PROCEDURE

#### 1. ENGINE

| Step   | Check   | Yes  | No   |
|--|---|--|--|
| <b>1 CHECK ENGINE START FAILURE.</b><br>1) Ask the customer when and how trouble occurred using the interview check list. <Ref. to EN(STI)(diag)-3, CHECK, Check List for Interview.><br>2) Start the engine.  | Does the engine start?  | Go to step 2.  | Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(STI)(diag)-57, Diagnostics for Engine Starting Failure.>  |
| <b>2 CHECK ILLUMINATION OF MALFUNCTION INDICATOR LIGHT.</b>  | Does the malfunction indicator light illuminate?                  | Go to step 3.  | Inspection using "General Diagnostics Table". <Ref. to EN(STI)(diag)-371, General Diagnostic Table.>   |
| <b>3 CHECK INDICATION OF DTC ON DISPLAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the Subaru Select Monitor or general scan tool to data link connector.<br>3) Turn the ignition switch to ON and the Subaru Select Monitor or general scan tool power switch to ON.<br>4) Read the DTC on Subaru Select Monitor or general scan tool. | Does the Subaru Select Monitor or general scan tool indicate DTC? | Record the DTC code. Repair the trouble cause. <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> Go to step 4.                                | Repair the related parts.<br>NOTE:<br>If a DTC is not shown on display although malfunction indicator light illuminates, perform diagnostics of malfunction indicator light circuit or combination meter. <Ref. to EN(STI)(diag)-48, Malfunction Indicator Light.> |
| <b>4 PERFORM THE DIAGNOSIS.</b><br>1) Perform the clear memory mode. <Ref. to EN(STI)(diag)-45, Clear Memory Mode.><br>2) Perform the inspection mode. <Ref. to EN(STI)(diag)-36, Inspection Mode.>  | Does the Subaru Select Monitor or general scan tool indicate DTC? | Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-76, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> | Complete the diagnosis.  |

# Check List for Interview

ENGINE (DIAGNOSTICS)

## 2. Check List for Interview

### A: CHECK

#### 1. CHECK LIST No. 1

Check the following items when problem has occurred.

NOTE:

Use copies of this page for interviewing customers.

|                     |   |                  |  |
|---------------------|---|------------------|--|
| Customer's name     |   | Engine No.       |  |
| Date of sale        |   | Fuel brand       |  |
| Date of repair      |   | Odometer reading | km   |
| VIN                 |   |                  | miles  |
| Weather             | <input type="checkbox"/> Fine<br><input type="checkbox"/> Cloudy<br><input type="checkbox"/> Rainy<br><input type="checkbox"/> Snowy<br><input type="checkbox"/> Various/Others:  |                  |  |
| Outdoor temperature | °C (°F)   |                  |  |
|                     | <input type="checkbox"/> Hot<br><input type="checkbox"/> Warm<br><input type="checkbox"/> Cool<br><input type="checkbox"/> Cold   |                  |  |
| Place               | <input type="checkbox"/> Highway<br><input type="checkbox"/> Suburbs<br><input type="checkbox"/> Inner city<br><input type="checkbox"/> Uphill<br><input type="checkbox"/> Downhill<br><input type="checkbox"/> Rough road<br><input type="checkbox"/> Others:  |                  |  |
| Engine temperature  | <input type="checkbox"/> Cold<br><input type="checkbox"/> Warming-up<br><input type="checkbox"/> After warming-up<br><input type="checkbox"/> Any temperature<br><input type="checkbox"/> Others:   |                  |  |
| Engine speed        | rpm   |                  |  |
| Vehicle speed       | MPH   |                  |  |
| Driving conditions  | <input type="checkbox"/> Not affected<br><input type="checkbox"/> At starting<br><input type="checkbox"/> While idling<br><input type="checkbox"/> At racing<br><input type="checkbox"/> While accelerating<br><input type="checkbox"/> While cruising<br><input type="checkbox"/> While decelerating<br><input type="checkbox"/> While turning (RH/LH) |                  |  |
| Headlight           | <input type="checkbox"/> ON / <input type="checkbox"/> OFF  | Rear defogger    | <input type="checkbox"/> ON / <input type="checkbox"/> OFF |
| Blower              | <input type="checkbox"/> ON / <input type="checkbox"/> OFF  | Radio            | <input type="checkbox"/> ON / <input type="checkbox"/> OFF |
| A/C compressor      | <input type="checkbox"/> ON / <input type="checkbox"/> OFF  | CD/Cassette      | <input type="checkbox"/> ON / <input type="checkbox"/> OFF |
| Cooling fan         | <input type="checkbox"/> ON / <input type="checkbox"/> OFF  | Car phone        | <input type="checkbox"/> ON / <input type="checkbox"/> OFF |
| Front wiper         | <input type="checkbox"/> ON / <input type="checkbox"/> OFF  | CB               | <input type="checkbox"/> ON / <input type="checkbox"/> OFF |
| Rear wiper          | <input type="checkbox"/> ON / <input type="checkbox"/> OFF  |                  |  |

# Check List for Interview

## ENGINE (DIAGNOSTICS)

---

### 2. CHECK LIST No. 2

Check the following items about the vehicle's state when malfunction indicator light turns on.

**NOTE:**

Use copies of this page for interviewing customers.

|  |
|--|
| a) Other warning lights or indicators turn on. <input type="checkbox"/> Yes / <input type="checkbox"/> No  |
| <input type="checkbox"/> Low fuel warning light<br><input type="checkbox"/> Charge indicator light<br><input type="checkbox"/> AT diagnostics indicator light<br><input type="checkbox"/> ABS warning light<br><input type="checkbox"/> Engine oil pressure warning light  |
| b) Fuel level  |
| <ul style="list-style-type: none"><li>• Lack of gasoline: <input type="checkbox"/> Yes / <input type="checkbox"/> No</li><li>• Indicator position of fuel gauge:</li><li>• Had run out of gas before: <input type="checkbox"/> Yes / <input type="checkbox"/> No</li></ul>   |
| c) Intentional connecting or disconnecting of harness connectors or spark plug cords: <input type="checkbox"/> Yes / <input type="checkbox"/> No   |
| <ul style="list-style-type: none"><li>• What:</li></ul>  |
| d) Intentional connecting or disconnecting of hoses: <input type="checkbox"/> Yes / <input type="checkbox"/> No  |
| <ul style="list-style-type: none"><li>• What:</li></ul>  |
| e) Installing of parts other than genuine parts: <input type="checkbox"/> Yes / <input type="checkbox"/> No  |
| <ul style="list-style-type: none"><li>• What:</li><li>• Where:</li></ul>   |
| f) Occurrence of noise: <input type="checkbox"/> Yes / <input type="checkbox"/> No   |
| <ul style="list-style-type: none"><li>• From where:</li><li>• What kind:</li></ul>   |
| g) Occurrence of smell: <input type="checkbox"/> Yes / <input type="checkbox"/> No   |
| <ul style="list-style-type: none"><li>• From where:</li><li>• What kind:</li></ul>   |
| h) Intrusion of water into engine compartment or passenger compartment: <input type="checkbox"/> Yes / <input type="checkbox"/> No   |
| i) Troubles occurred   |
| <input type="checkbox"/> Engine does not start.<br><input type="checkbox"/> Engine stalls during idling.<br><input type="checkbox"/> Engine stalls while driving.<br><input type="checkbox"/> Engine speed decreases.<br><input type="checkbox"/> Engine speed does not decrease.<br><input type="checkbox"/> Rough idling<br><input type="checkbox"/> Poor acceleration<br><input type="checkbox"/> Back fire<br><input type="checkbox"/> After fire<br><input type="checkbox"/> No shift<br><input type="checkbox"/> Excessive shift shock |

## 3. General Description

### A: CAUTION

1) Airbag system wiring harness is routed near the ECM, main relay and fuel pump relay.

#### CAUTION:

- All airbag system connectors are colored yellow. Do not use the electrical test equipment on these circuit.
- Be careful not to damage the airbag system wiring harness when servicing the ECM, TCM, main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.

- The ECM will be destroyed instantly.
- The fuel injector and other part will be damaged in just a few minutes more.

3) Do not disconnect the battery cables while the engine is running.

- A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn the ignition switch to OFF.

5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Before removing the ECM from located position, disconnect two cables on battery.

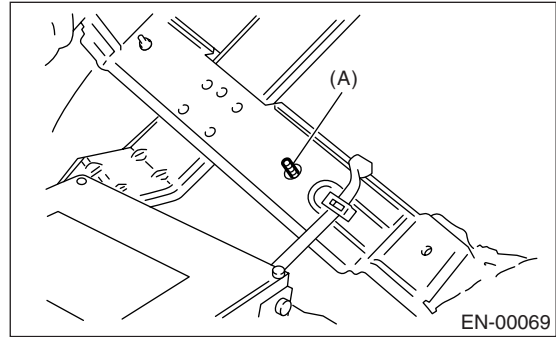
- Otherwise, the ECM may be damaged.

#### CAUTION:

**When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on the fuel injection system.**

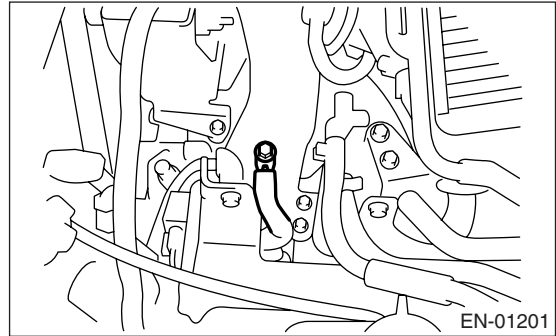
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use the ECM mounting stud bolt at the body head grounding points when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

9) Use the engine grounding terminal or engine proper as the grounding point to the body, when measuring voltage and resistance in the engine compartment.



10) Every MFI-related part is a precision part. Do not drop them.

11) Observe the following cautions when installing a radio in MFI equipped models.

#### CAUTION:

- The antenna must be kept as far apart as possible from the control unit.

(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)

- The antenna feeder must be placed as far as possible from ECM and MFI harness.
- Carefully adjust the antenna for correct matching.
- When mounting a large power type radio, pay special attention to the three items above mentioned.
- Incorrect installation of the radio may affect the operation of ECM.

12) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than 5 seconds to release pressure in the fuel system. If the engine starts during this operation, run it until it stops.



# General Description

## ENGINE (DIAGNOSTICS)

13) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.

14) On model with ABS, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis function.

### B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

#### 1. BATTERY

1) Measure the battery voltage and specific gravity of electrolyte.

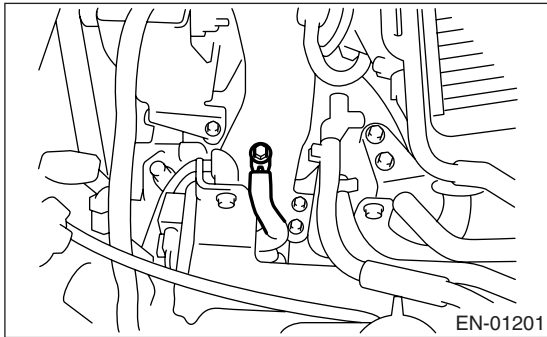
**Standard voltage: 12 V**

**Specific gravity: Above 1.260**

2) Check the condition of main and other fuses, and harnesses and connectors. Also check for proper grounding.

#### 2. ENGINE GROUND

Make sure the engine grounding terminal is properly connected to engine.



### C: NOTE

#### 1. DESCRIPTION

- The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. Malfunction indicator light in the combination meter indicates occurrence of a fault or trouble.
- Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.

- The OBD system incorporated with the vehicles within this engine family complies with OBD-II Regulations. The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.
- When the system decides that a malfunction occurs, malfunction indicator light illuminates. At the same time of the malfunction indicator light illumination or blinking, a DTC and a freeze frame engine conditions are stored into on-board computer.
- The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
- If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
- When the malfunction does not occur again for three consecutive driving cycles, malfunction indicator light is turned off, but DTC remains at on-board computer.
- When troubleshooting the vehicle which complies with OBD-II Regulations, connect the Subaru Select Monitor or general scan tool to the vehicle.

#### 2. ENGINE AND EMISSION CONTROL SYSTEM

- The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.

With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.

- Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.

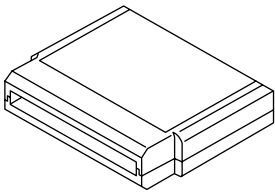

# General Description

ENGINE (DIAGNOSTICS)

The MFI system also has the following features:

- Reduced emission of harmful exhaust gases.
- Reduced in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

## D: PREPARATION TOOL

| ILLUSTRATION   | TOOL NUMBER                        | DESCRIPTION                  | REMARKS                                 |
|--|------------------------------------|------------------------------|---|
| <br>ST18482AA010  | 18482AA010<br>(Newly adopted tool) | CARTRIDGE                    | Troubleshooting for electrical systems. |
| <br>ST22771AA030 | 22771AA030                         | SUBARU SELECT<br>MONITOR KIT | Troubleshooting for electrical systems. |

# Electrical Component Location

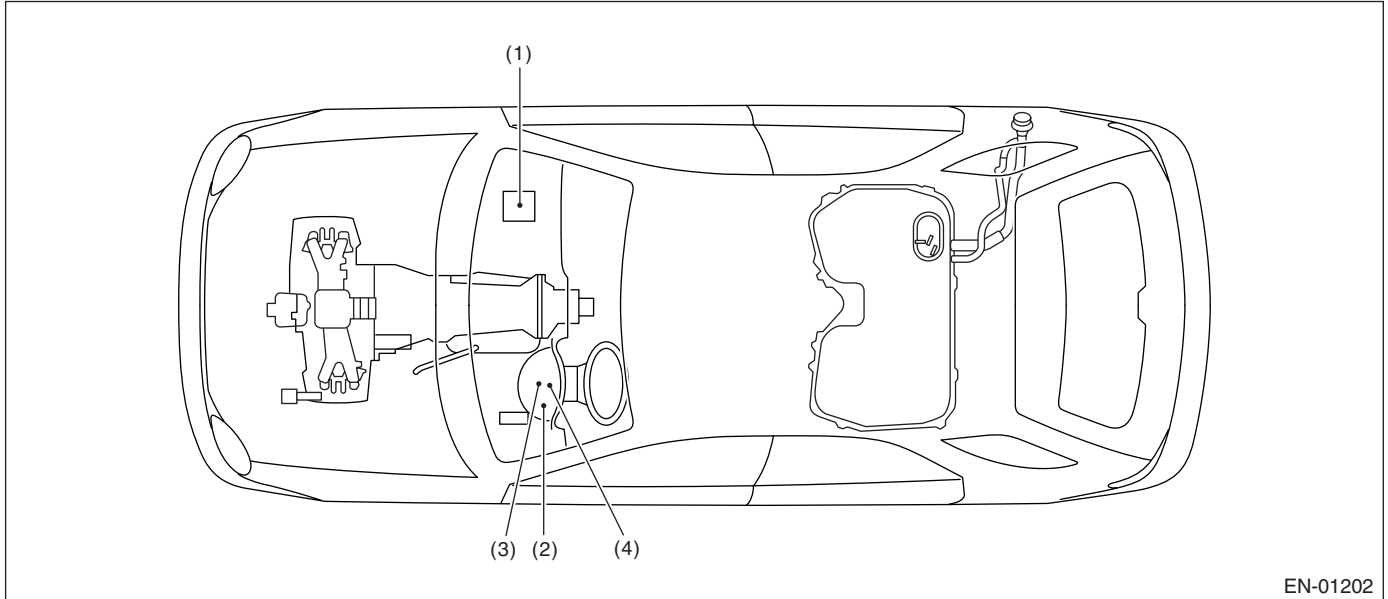
ENGINE (DIAGNOSTICS)

## 4. Electrical Component Location

### A: LOCATION

#### 1. ENGINE

##### • Control module



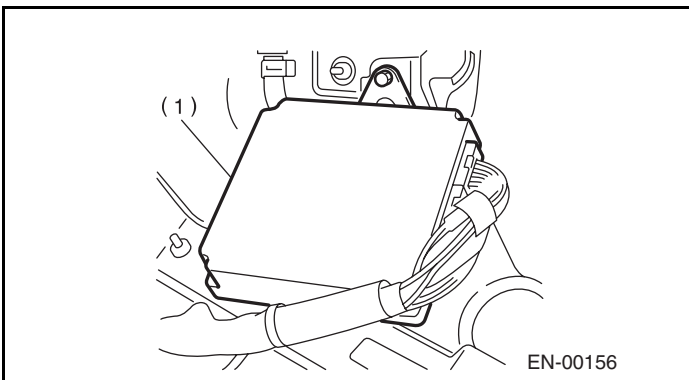
EN-01202

(1) Engine control module (ECM)

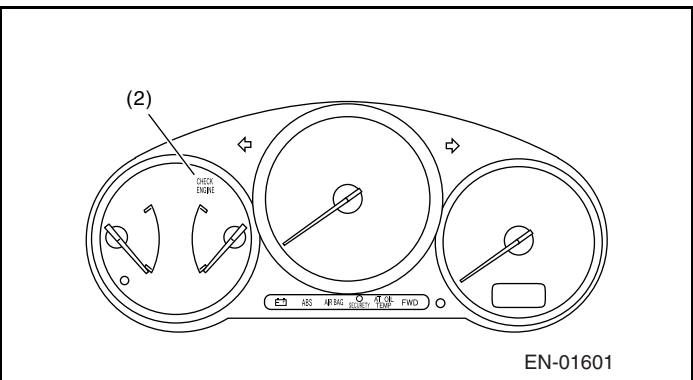
(3) Data link connector

(4) Test mode connector

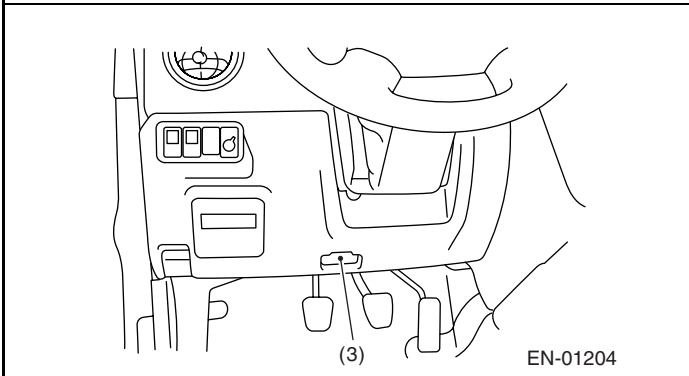
(2) Malfunction indicator light



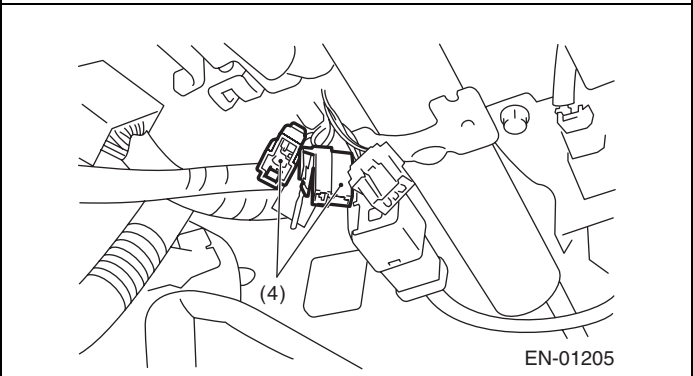
EN-00156



EN-01601



EN-01204

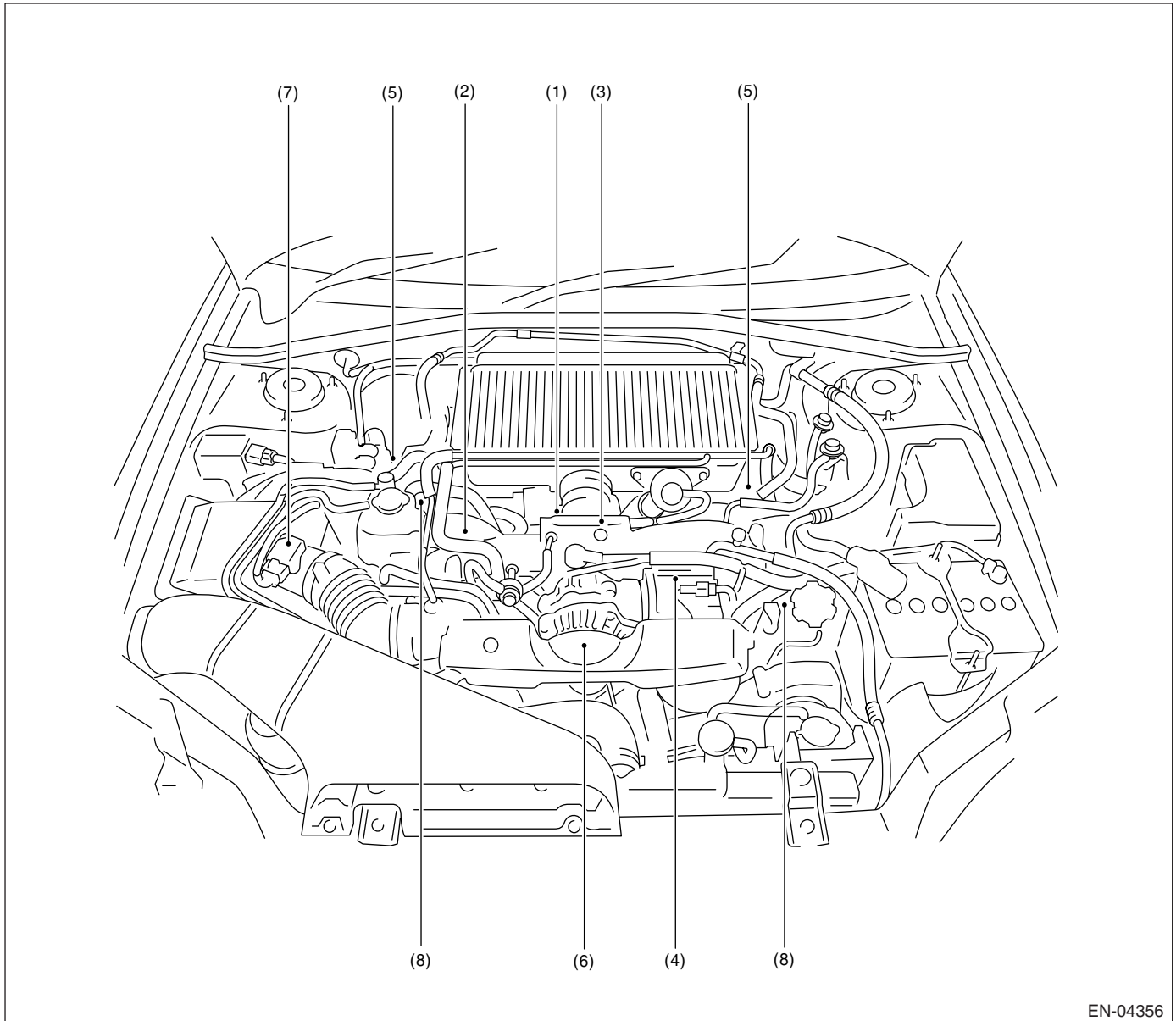


EN-01205

# Electrical Component Location

ENGINE (DIAGNOSTICS)

## • Sensor



EN-04356

- |                                       |   |  |
|---------------------------------------|---|--|
| (1) Manifold absolute pressure sensor | (5) Camshaft position sensor                        | (8) Tumble generator valve position sensor |
| (2) Engine coolant temperature sensor | (6) Crankshaft position sensor                      |  |
| (3) Electronic throttle control       | (7) Mass air flow and intake air temperature sensor |  |
| (4) Knock sensor                      |   |  |

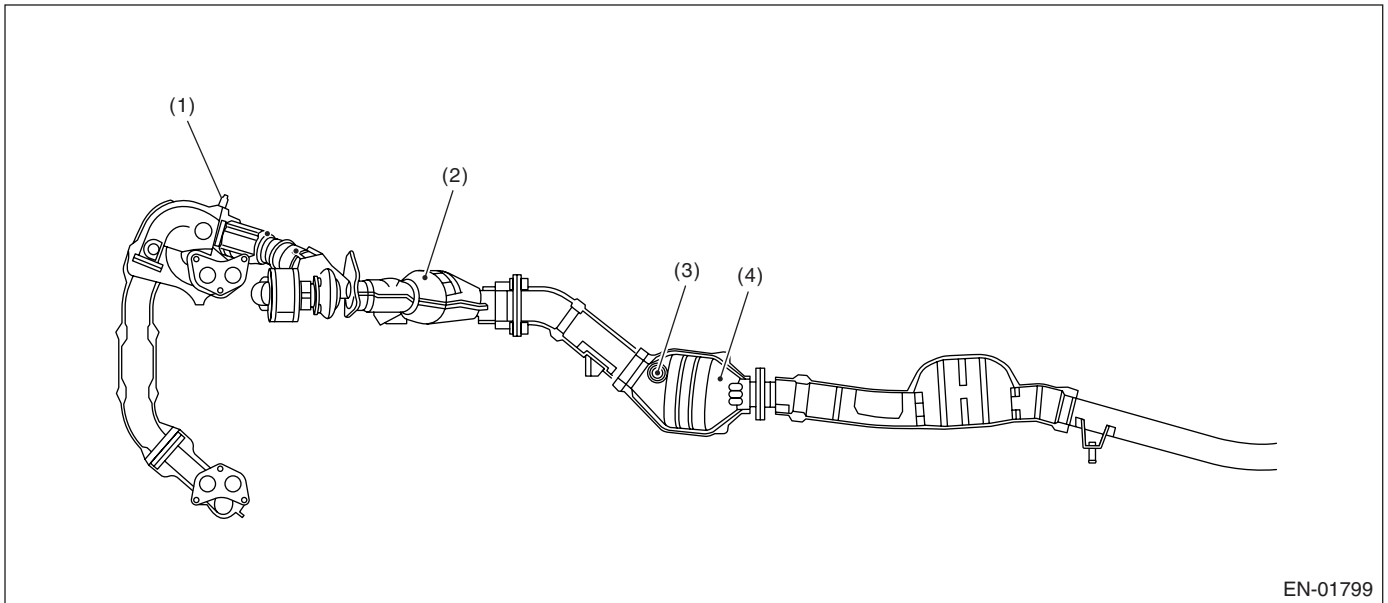
# Electrical Component Location

ENGINE (DIAGNOSTICS)

|                 |                       |
|-----------------|-----------------------|
| <p>EN-01797</p> | <p>EN-00295</p>       |
| <p>EN-00297</p> | <p>EN-01798</p>       |
| <p>EN-00299</p> | <p>EN-00300</p>       |
| <p>EN-00301</p> | <p><b>SUBARU.</b></p> |

# Electrical Component Location

ENGINE (DIAGNOSTICS)

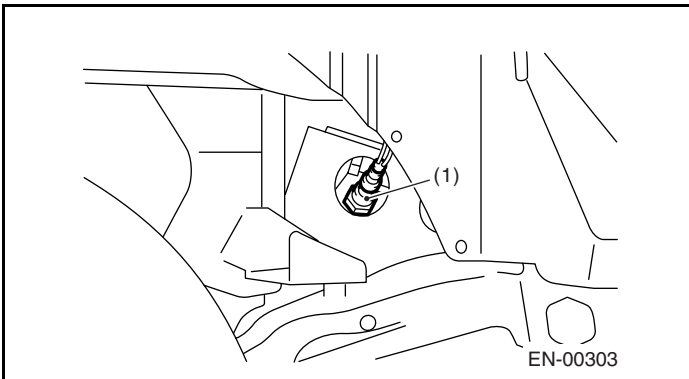


EN-01799

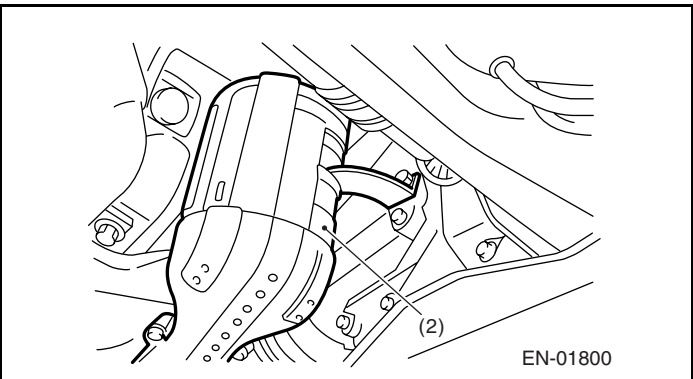
- (1) Front oxygen (A/F) sensor
- (2) Front catalytic converter

- (3) Rear oxygen sensor

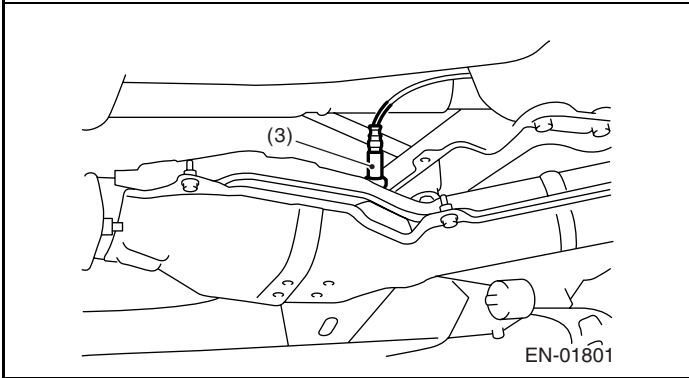
- (4) Rear catalytic converter



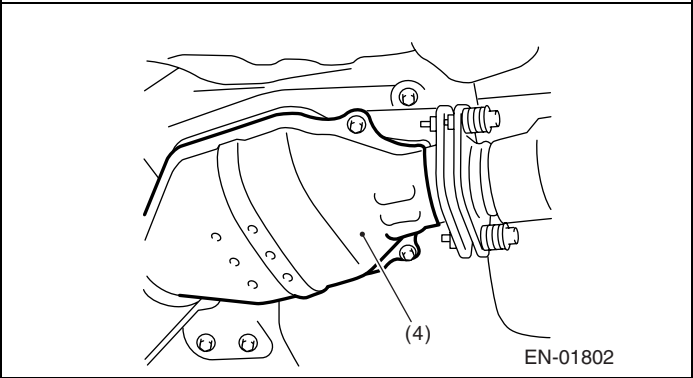
EN-00303



EN-01800



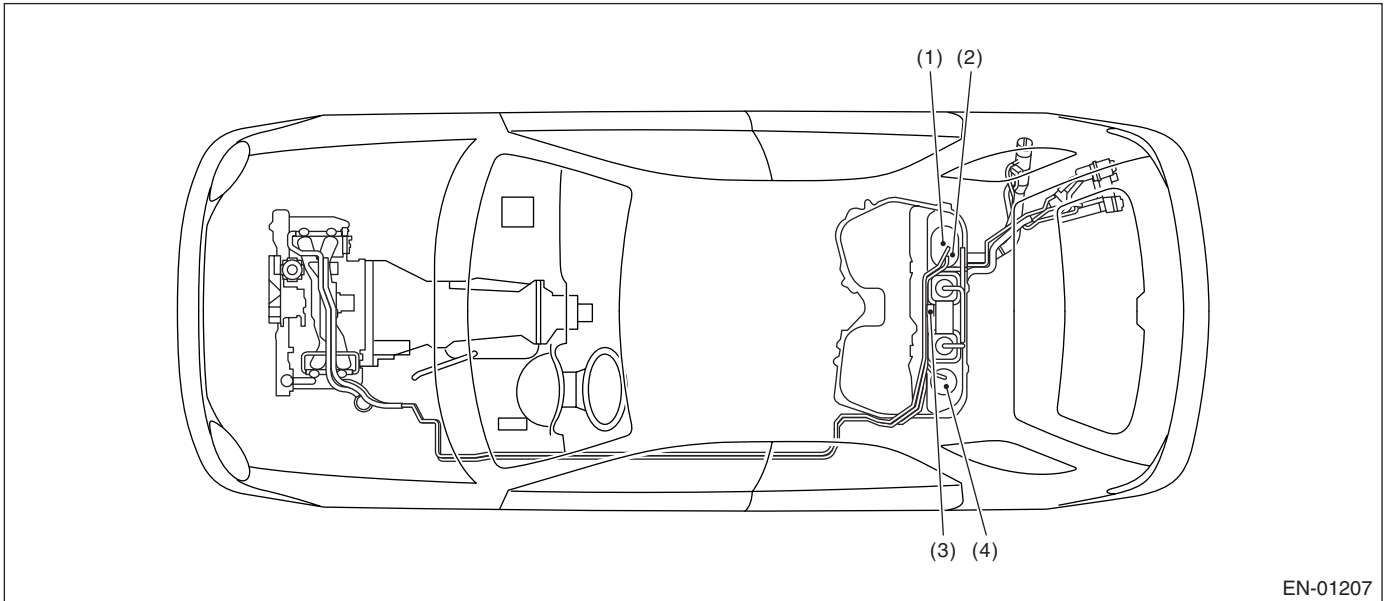
EN-01801



EN-01802

# Electrical Component Location

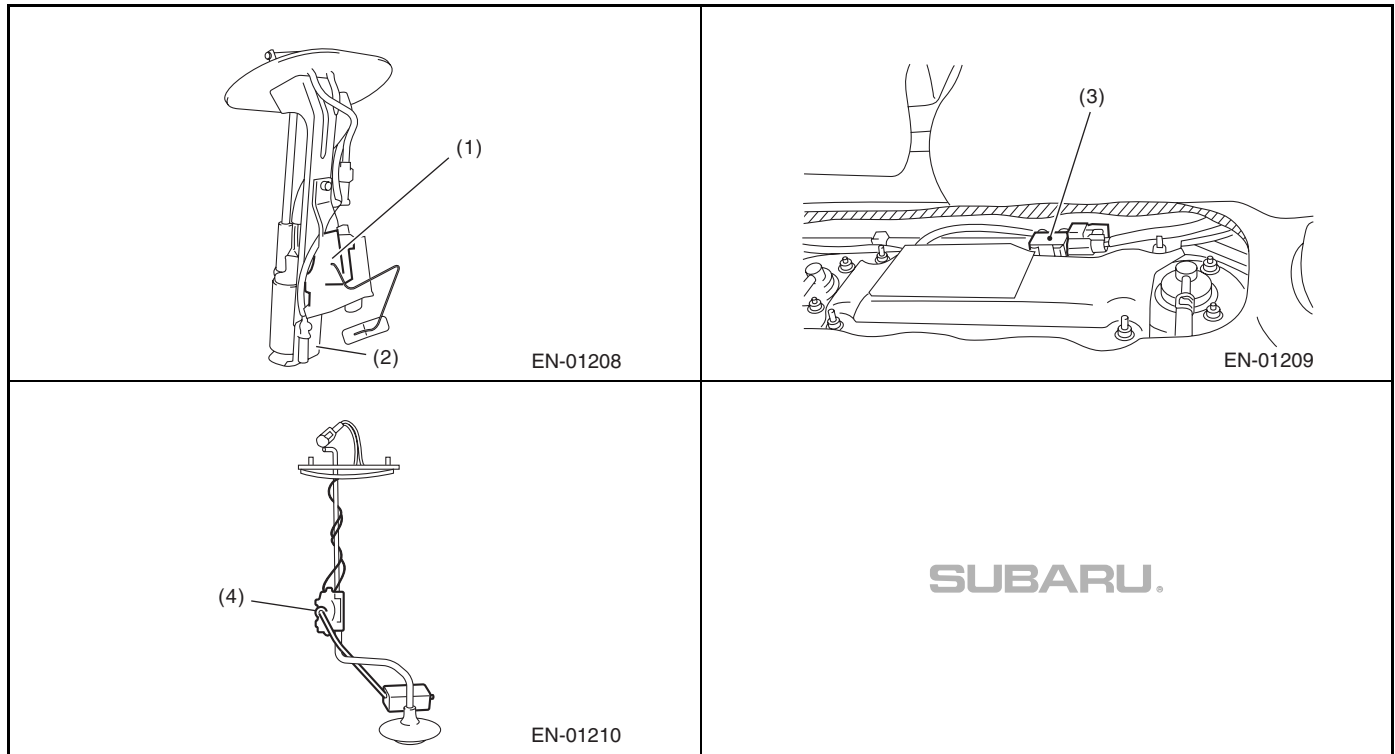
## ENGINE (DIAGNOSTICS)



- (1) Fuel level sensor
- (2) Fuel temperature sensor

- (3) Fuel tank pressure sensor

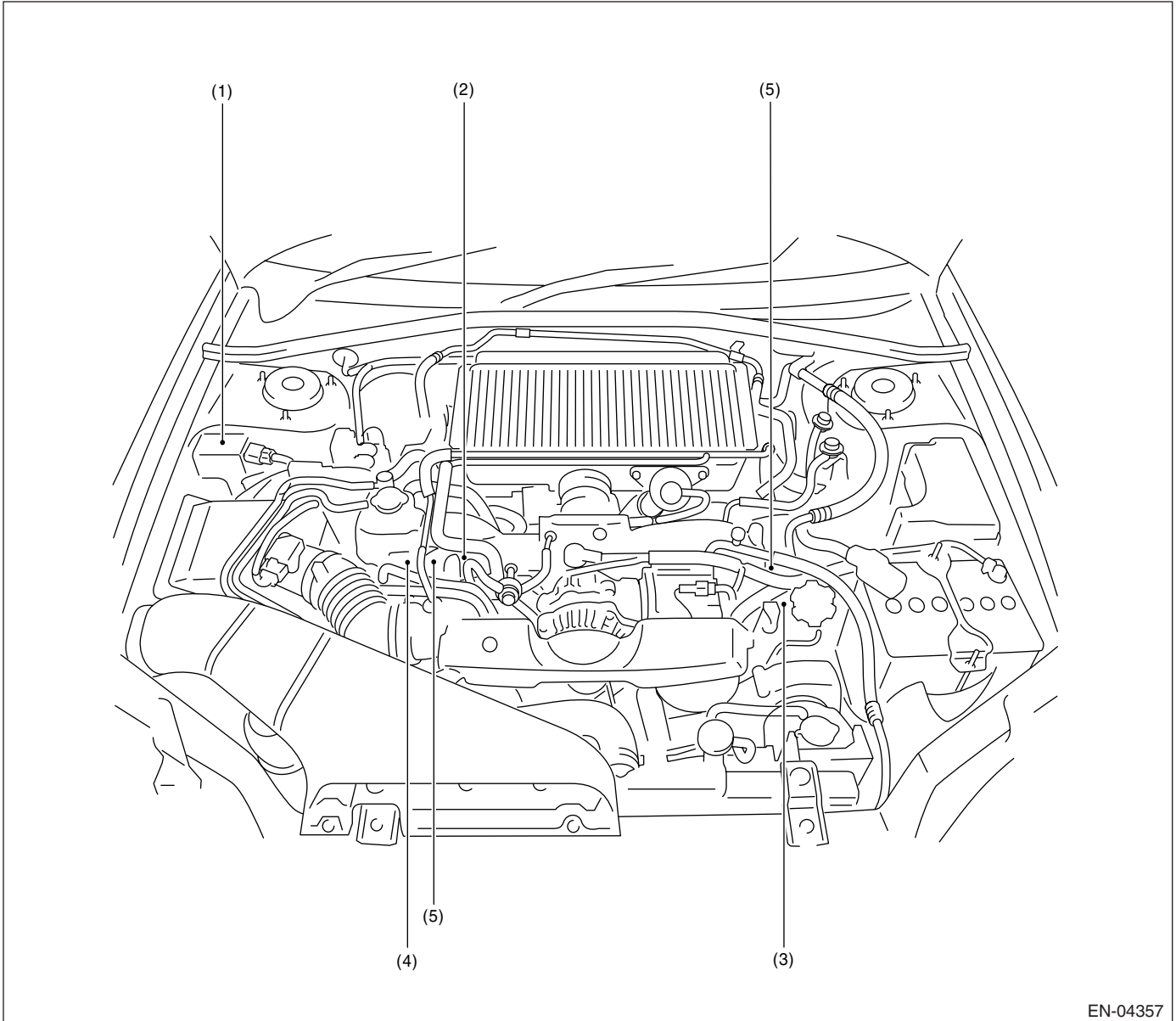
- (4) Fuel sub level sensor



# Electrical Component Location

ENGINE (DIAGNOSTICS)

## • Solenoid Valve, Actuator, Emission Control System Parts and Ignition System Parts



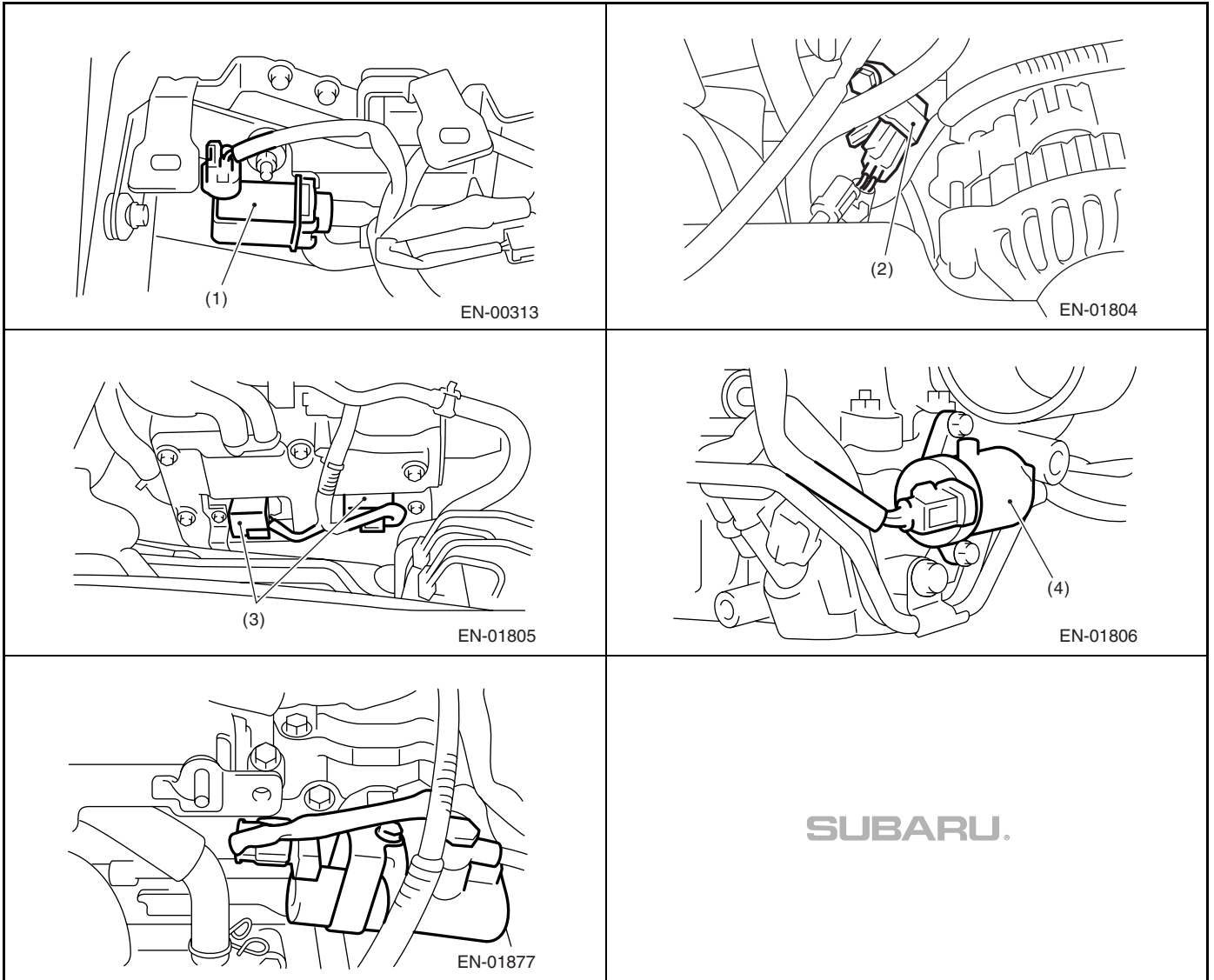
EN-04357

- |                                      |                                     |                                     |
|--------------------------------------|-------------------------------------|-------------------------------------|
| (1) Wastegate control solenoid valve | (3) Ignition coil and ignitor ASSY  | (5) Oil flow control solenoid valve |
| (2) Purge control solenoid valve     | (4) Tumble generator valve actuator |                                     |



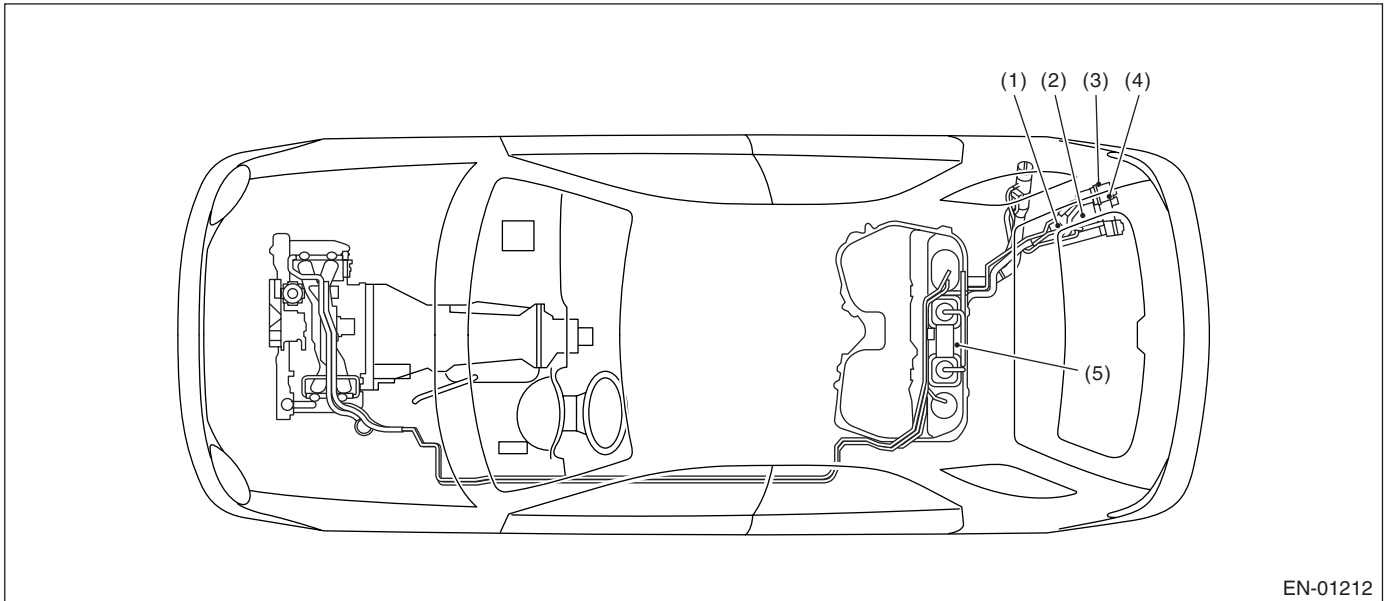
# Electrical Component Location

## ENGINE (DIAGNOSTICS)



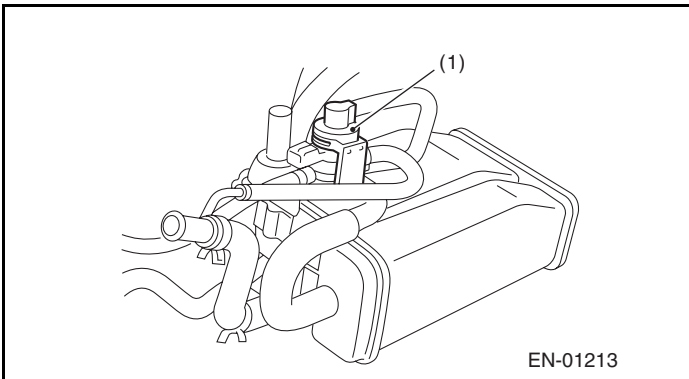
# Electrical Component Location

ENGINE (DIAGNOSTICS)

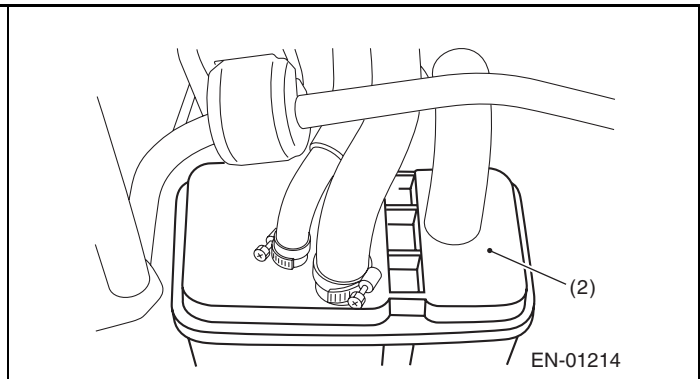


EN-01212

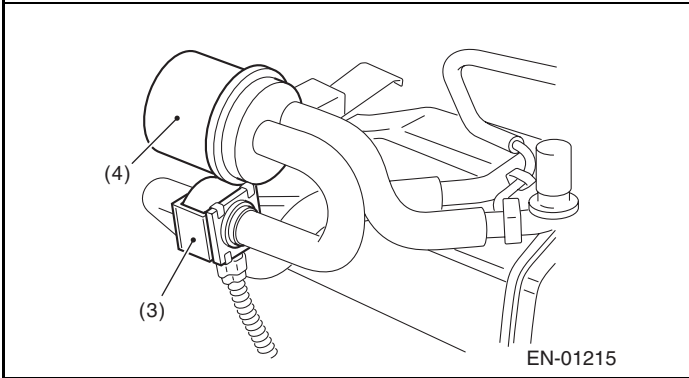
- |                                     |                  |                                    |
|-------------------------------------|------------------|------------------------------------|
| (1) Pressure control solenoid valve | (3) Drain valve  | (5) Fuel tank sensor control valve |
| (2) Canister                        | (4) Drain filter |                                    |



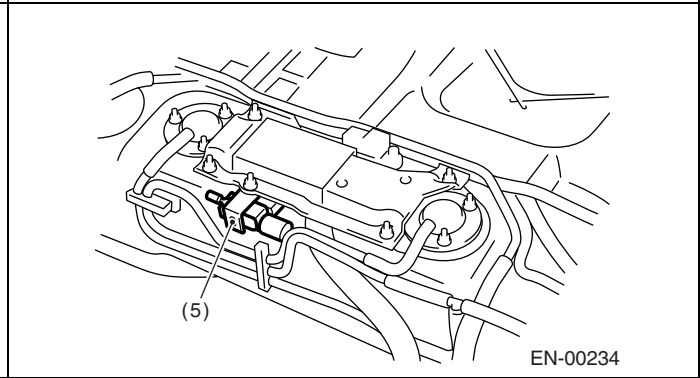
EN-01213



EN-01214



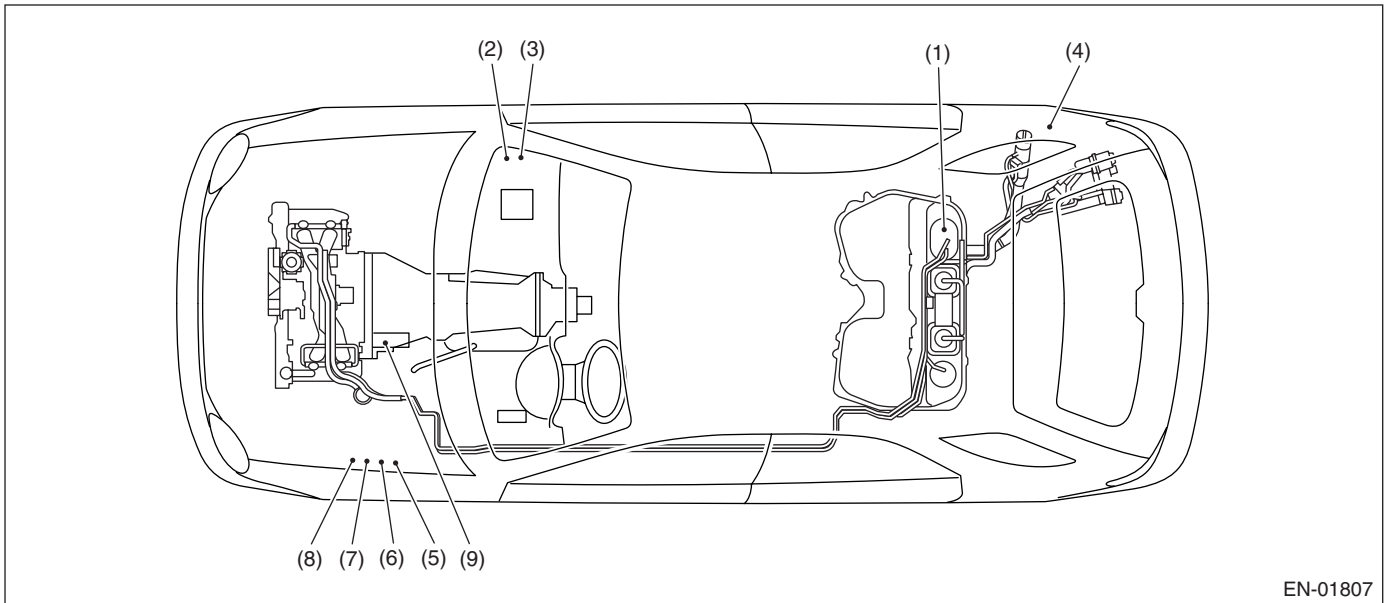
EN-01215



EN-00234

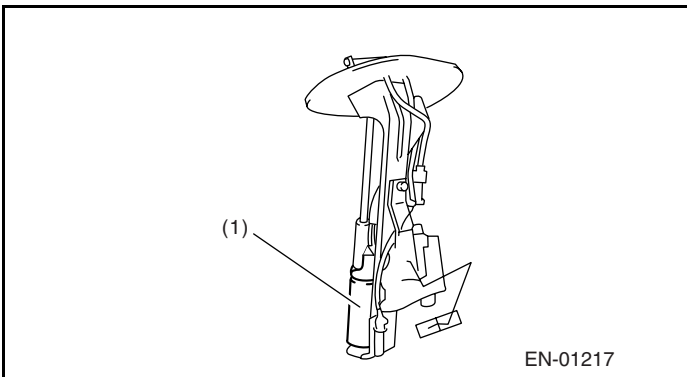
# Electrical Component Location

ENGINE (DIAGNOSTICS)

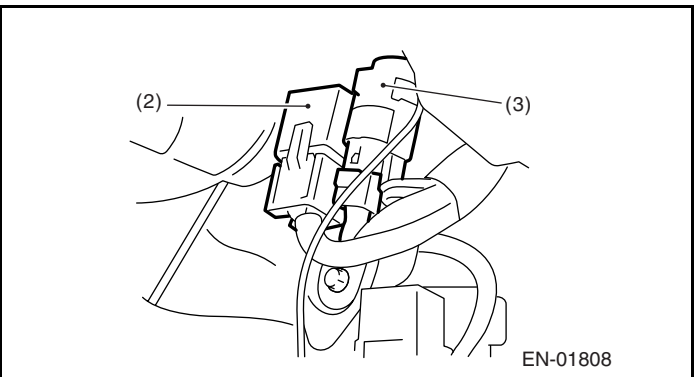


EN-01807

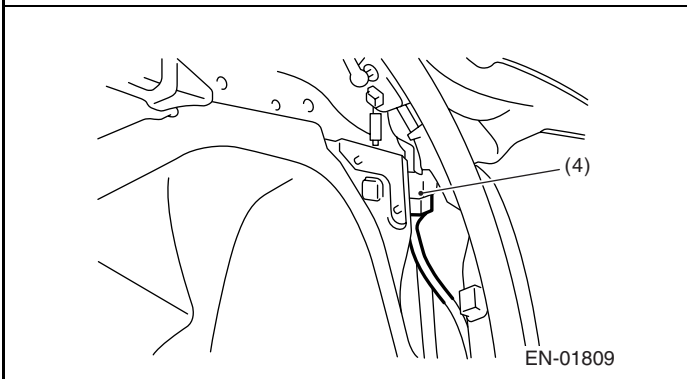
- |                     |                               |                              |
|---------------------|-------------------------------|------------------------------|
| (1) Fuel pump       | (4) Fuel pump control unit    | (7) Radiator sub fan relay 1 |
| (2) Main relay      | (5) Radiator main fan relay 1 | (8) Radiator sub fan relay 2 |
| (3) Fuel pump relay | (6) Radiator main fan relay 2 | (9) Starter                  |



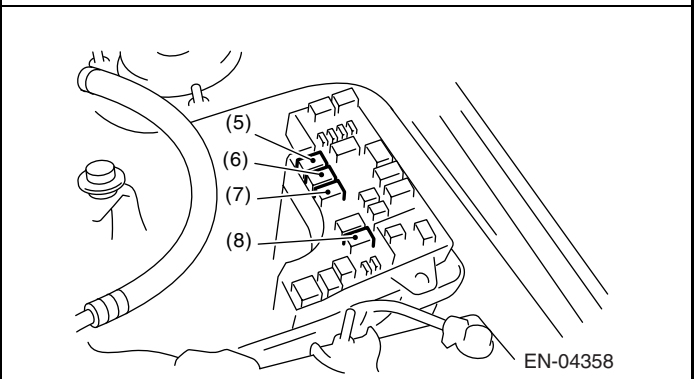
EN-01217



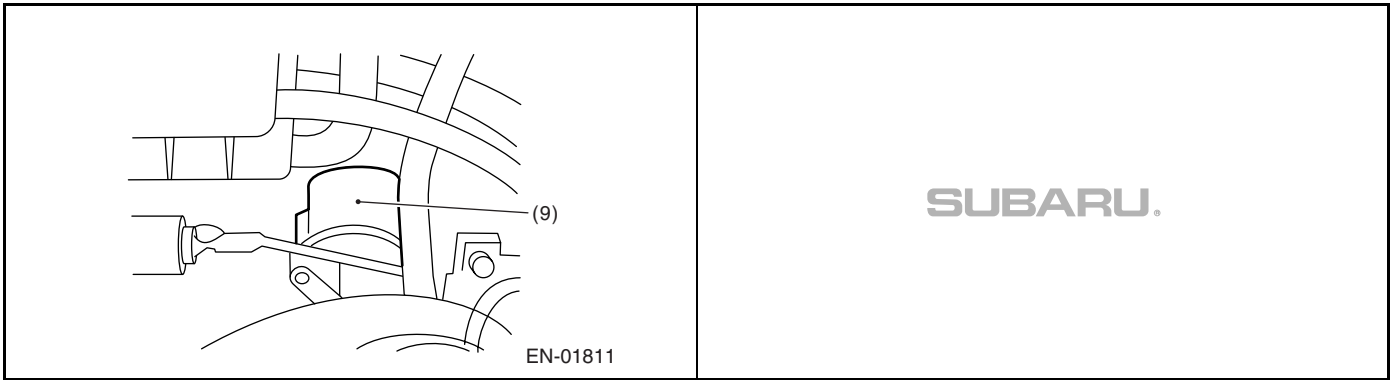
EN-01808



EN-01809



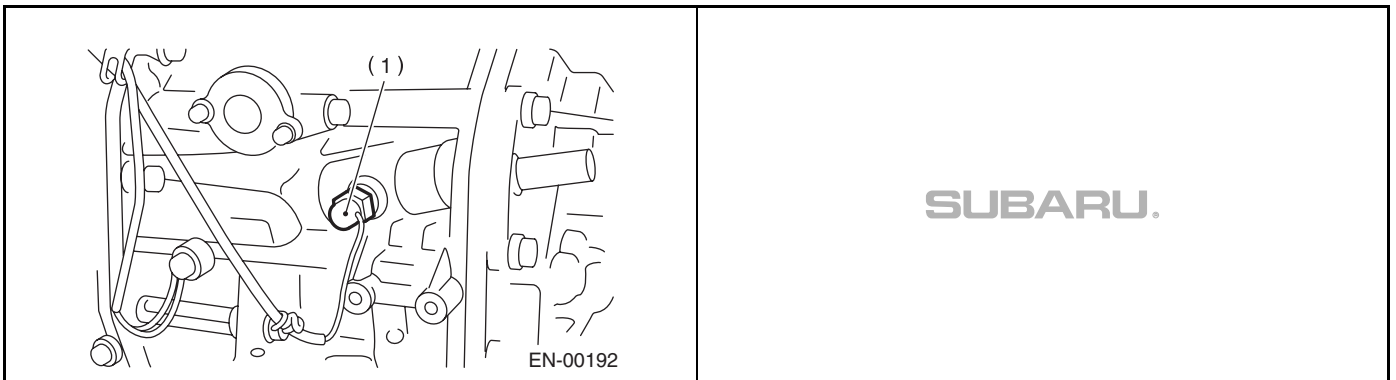
EN-04358



SUBARU.

## 2. TRANSMISSION

### • Solenoid Valve and Switch



SUBARU.

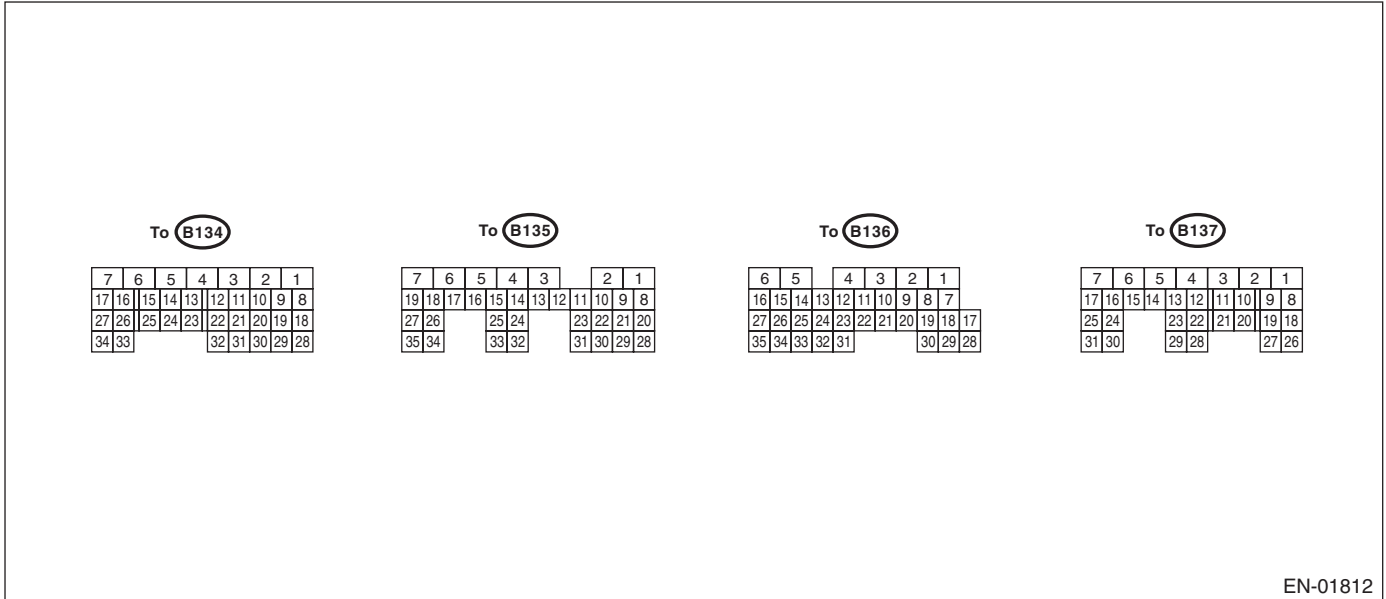
(1) Neutral position switch

# Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

## 5. Engine Control Module (ECM) I/O Signal

### A: ELECTRICAL SPECIFICATION



EN-01812

| Content                                   |              | Connector No. | Terminal No. | Signal (V)   |                    | Note   |
|---|--------------|---------------|--------------|--|--------------------|--|
|   |              |               |              | Ignition SW ON (Engine OFF)                        | Engine ON (Idling) |  |
| Crankshaft position sensor                | Signal (+)   | B135          | 10           | 0  | -7 — +7            | Sensor output waveform                                       |
|   | Signal (-)   | B135          | 22           | 0  | 0                  | —  |
|   | Shield       | B135          | 31           | 0  | 0                  | —  |
| Rear oxygen sensor                        | Signal       | B137          | 25           | 0  | 0 — 0.9            | —  |
|   | Shield       | B137          | 31           | 0  | 0                  | —  |
|   | GND (sensor) | B136          | 35           | 0  | 0                  | —  |
| Front oxygen (A/F) sensor heater          | Signal 1     | B134          | 3            | 0 — 1.0  | —                  | Sensor output waveform                                       |
|   | Signal 2     | B134          | 2            | 0 — 1.0  | —                  | Sensor output waveform                                       |
| Rear oxygen sensor heater signal          |              | B135          | 2            | 0 — 1.0  | —                  | Sensor output waveform                                       |
| Engine coolant temperature sensor         | Signal       | B136          | 14           | 1.0 — 1.4  | 1.0 — 1.4          | After warm-up the engine.                                    |
|   | GND (sensor) | B136          | 35           | 0  | 0                  | After warm-up the engine.                                    |
| Vehicle speed signal                      |              | B135          | 26           | 0 or 5   | 0 or 5             | "5" and "0" are repeatedly displayed when vehicle is driven. |
| Mass air flow sensor                      | Signal       | B136          | 23           | —  | 0.3 — 4.5          | —  |
|   | Shield       | B136          | 32           | 0  | 0                  | —  |
|   | GND          | B136          | 31           | 0  | 0                  | —  |
| Intake air temperature sensor signal      |              | B136          | 13           | 0.3 — 4.6  | 0.3 — 4.6          | —  |
| Tumble generator valve position sensor RH | Signal       | B136          | 27           | Fully closed: 3.8 — 4.9<br>Fully opened: 0.2 — 0.9 |                    | —  |
|   | Power supply | B136          | 16           | 5  | 5                  | —  |
|   | GND (sensor) | B136          | 35           | 0  | 0                  | —  |

# Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

| Content                                   |              | Connector No. | Terminal No. | Signal (V)   |                                 | Note  |
|---|--------------|---------------|--------------|--|---------------------------------|---|
|   |              |               |              | Ignition SW ON (Engine OFF)                        | Engine ON (Idling)              |   |
| Tumble generator valve position sensor LH | Signal       | B136          | 26           | Fully closed: 3.8 — 4.9<br>Fully opened: 0.2 — 0.9 |                                 | —   |
|   | Power supply | B136          | 16           | 5  | 5                               | —   |
|   | GND (sensor) | B136          | 35           | 0  | 0                               | —   |
| Tumble generator valve RH (open)          |              | B134          | 9            | 0 or 10 — 13                                       | 0 or 12 — 14                    | Sensor output waveform                        |
| Tumble generator valve RH (close)         |              | B134          | 8            | 0 or 10 — 13                                       | 0 or 12 — 14                    | Sensor output waveform                        |
| Tumble generator valve LH (open)          |              | B134          | 11           | 0 or 10 — 13                                       | 0 or 12 — 14                    | Sensor output waveform                        |
| Tumble generator valve LH (close)         |              | B134          | 10           | 0 or 10 — 13                                       | 0 or 12 — 14                    | Sensor output waveform                        |
| Wastegate control solenoid valve          |              | B134          | 32           | 0 or 10 — 13                                       | 0 or 12 — 14                    | Sensor output waveform                        |
| Starter switch                            |              | B137          | 8            | 0  | 0                               | Cranking: 8 — 14                              |
| A/C switch                                |              | B137          | 17           | ON: 10 — 13<br>OFF: 0                              | ON: 12 — 14<br>OFF: 0           | —   |
| Ignition switch                           |              | B137          | 14           | 10 — 13  | 12 — 14                         | —   |
| Neutral position switch                   |              | B137          | 9            | ON: 10 — 13<br>OFF: 0                              | ON: 12 — 14<br>OFF: 0           | —   |
| Test mode connector                       |              | B137          | 15           | 10 — 13  | 12 — 14                         | When connected: 0                             |
| Knock sensor                              | Signal       | B136          | 25           | 2.8  | 2.8                             | —   |
|   | Shield       | B136          | 33           | 0  | 0                               | —   |
| Back-up power supply                      |              | B135          | 19           | 10 — 13  | 12 — 14                         | Ignition switch "OFF":<br>10 — 13             |
| Control unit power supply                 |              | B135          | 5            | 10 — 13  | 12 — 14                         | —   |
|   |              | B135          | 6            | 10 — 13  | 12 — 14                         | —   |
| Sensor power supply                       |              | B136          | 16           | 5  | 5                               | —   |
| Ignition control                          | #1           | B135          | 18           | 0  | 12 — 14                         | Waveform                                      |
|   | #2           | B135          | 17           | 0  | 12 — 14                         | Waveform                                      |
|   | #3           | B135          | 16           | 0  | 12 — 14                         | Waveform                                      |
|   | #4           | B135          | 15           | 0  | 12 — 14                         | Waveform                                      |
| Fuel injector                             | #1           | B136          | 6            | 10 — 13  | 1 — 14                          | Waveform                                      |
|   | #2           | B136          | 5            | 10 — 13  | 1 — 14                          | Waveform                                      |
|   | #3           | B136          | 4            | 10 — 13  | 1 — 14                          | Waveform                                      |
|   | #4           | B136          | 3            | 10 — 13  | 1 — 14                          | Waveform                                      |
| Fuel pump control unit                    | Signal 1     | B135          | 27           | 0 or 5   | 0 or 5                          | Sensor output waveform                        |
|   | Signal 2     | B137          | 28           | 10 — 13  | 12 — 14                         | —   |
| A/C relay control                         |              | B135          | 33           | ON: 0.5 or less<br>OFF: 10 — 13                    | ON: 0.5 or less<br>OFF: 12 — 14 | —   |
| Radiator fan relay 1 control              |              | B135          | 25           | ON: 0.5 or less<br>OFF: 10 — 13                    | ON: 0.5 or less<br>OFF: 12 — 14 | —   |
| Radiator fan relay 2 control              |              | B135          | 24           | ON: 0.5 or less<br>OFF: 10 — 13                    | ON: 0.5 or less<br>OFF: 12 — 14 | —   |
| Malfunction indicator lamp                |              | B134          | 17           | —  | —                               | Light "ON": 1 or less<br>Light "OFF": 10 — 14 |
| Engine speed output                       |              | B134          | 23           | —  | 0 — 13, or more                 | Waveform                                      |
| Purge control solenoid valve              |              | B134          | 14           | ON: 1 or less<br>OFF: 10 — 13                      | ON: 1 or less<br>OFF: 12 — 14   | Sensor output waveform                        |

# Engine Control Module (ECM) I/O Signal

## ENGINE (DIAGNOSTICS)

| Content                                  |              | Connector No. | Terminal No. | Signal (V)                    |                               | Note  |
|--|--------------|---------------|--------------|-------------------------------|-------------------------------|---|
|  |              |               |              | Ignition SW ON (Engine OFF)   | Engine ON (Idling)            |   |
| Manifold absolute pressure sensor        | Signal       | B136          | 22           | 1.7 — 2.4                     | 1.1 — 1.6                     | —   |
|  | Power supply | B136          | 16           | 5                             | 5                             |   |
|  | GND (sensor) | B136          | 35           | 0                             | 0                             |   |
| Fuel tank pressure sensor                | Signal       | B136          | 21           | 2.3 — 2.7                     | 2.3 — 2.7                     | The valve operates when fuel filler cap is removed and reinstalled. |
|  | GND (sensor) | B136          | 35           | 0                             | 0                             | —   |
| Pressure control solenoid valve          |              | B134          | 12           | ON: 1 or less<br>OFF: 10 — 13 | ON: 1 or less<br>OFF: 12 — 14 | —   |
| Drain valve                              |              | B134          | 13           | ON: 1 or less<br>OFF: 10 — 13 | ON: 1 or less<br>OFF: 12 — 14 | —   |
| Fuel tank sensor control valve           |              | B134          | 24           | ON: 1 or less<br>OFF: 10 — 13 | ON: 1 or less<br>OFF: 12 — 14 | —   |
| Fuel level sensor                        |              | B136          | 20           | 0.12 — 4.75                   | 0.12 — 4.75                   | —   |
| Fuel temperature sensor signal           |              | B136          | 12           | 2.5 — 3.8                     | 2.5 — 3.8                     | Ambient temperature:<br>25°C (77°F)                                 |
| Blow-by leak diagnosis signal            |              | B137          | 24           | 0                             | 0                             | When disconnection (malfunction): 5                                 |
| Small light switch                       |              | B137          | 12           | ON: 0<br>OFF: 10 — 13         | ON: 0<br>OFF: 12 — 14         | —   |
| Blower fan switch                        |              | B137          | 13           | ON: 0<br>OFF: 10 — 13         | ON: 0<br>OFF: 12 — 14         | —   |
| Rear defogger switch                     |              | B137          | 11           | ON: 0<br>OFF: 10 — 13         | ON: 0<br>OFF: 12 — 14         | —   |
| Power steering oil pressure switch       |              | B137          | 10           | 10 — 13                       | ON: 0<br>OFF: 12 — 14         | —   |
| Front oxygen (A/F) sensor signal (+)     |              | B134          | 33           | 2.8 — 3.2                     | 2.8 — 3.2                     | —   |
| Front oxygen (A/F) sensor signal (-)     |              | B134          | 26           | 2.4 — 2.7                     | 2.4 — 2.7                     | —   |
| Front oxygen (A/F) sensor shield         |              | B134          | 25           | 0                             | 0                             | —   |
| SSM/GST communication line               |              | B137          | 20           | Less than 1 ←→ More than 4    | Less than 1 ←→ More than 4    | —   |
| GND (injectors)                          |              | B137          | 7            | 0                             | 0                             | —   |
| GND (ignition system)                    |              | B135          | 12           | 0                             | 0                             | —   |
| GND (power supply)                       |              | B135          | 4            | 0                             | 0                             | —   |
|  |              | B135          | 1            | 0                             | 0                             | —   |
| GND (control systems)                    |              | B137          | 1            | 0                             | 0                             | —   |
|  |              | B137          | 2            | 0                             | 0                             | —   |
| GND (front oxygen (A/F) sensor heater 1) |              | B134          | 7            | 0                             | 0                             | —   |
| GND (front oxygen (A/F) sensor heater 2) |              | B134          | 6            | 0                             | 0                             | —   |
| Camshaft position sensor (LH)            |              | B135          | 8            | 0 — 0.9                       | ON: 0<br>OFF: 4.7 — 5.3       | Sensor output waveform  |
| Camshaft position sensor (RH)            |              | B135          | 9            | 0 — 0.9                       | ON: 0<br>OFF: 4.7 — 5.3       | Sensor output waveform  |

# Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

| Content  |                    | Connector No. | Terminal No. | Signal (V)  |   | Note                                     |
|--|--------------------|---------------|--------------|---|---|--|
|  |                    |               |              | Ignition SW ON (Engine OFF)   | Engine ON (Idling)  |  |
| Electronic throttle control                    | Main               | B136          | 18           | 0.64 — 0.72<br>Fully opened: 3.96   | 0.64 — 0.72<br>(After engine warm-up)                                       | Fully closed: 0.6<br>Fully opened: 3.96  |
|  | Sub                | B136          | 29           | 1.51 — 1.58<br>Fully opened: 4.17   | 1.51 — 1.58<br>(After engine warm-up)                                       | Fully closed: 1.48<br>Fully opened: 4.17 |
|  | Power supply       | B136          | 16           | 5   | 5   | —  |
|  | GND (sensor)       | B137          | 3            | 0   | 0   | —  |
| Electronic throttle control motor (+)          |                    | B137          | 5            | Duty waveform   | Duty waveform   | Driving frequency: 500 Hz                |
| Electronic throttle control motor (-)          |                    | B137          | 4            | Duty waveform   | Duty waveform   | Driving frequency: 500 Hz                |
| Electronic throttle control motor power supply |                    | B137          | 6            | 10 — 13   | 12 — 14   | —  |
| Electronic throttle control motor relay        |                    | B135          | 35           | ON: 010<br>OFF: — 13  | ON: 0<br>OFF: 12 — 14   | When ignition switch is ON:<br>ON        |
| Oil flow control solenoid valve (LH)           | Signal (+)         | B134          | 19           | ON: 10 — 13<br>OFF: 0   | ON: 12 — 14<br>OFF: 0   | —  |
|  | Signal (-)         | B134          | 29           | 0   | 0   | —  |
| Oil flow control solenoid valve (RH)           | Signal (+)         | B134          | 18           | ON: 10 — 13<br>OFF: 0   | ON: 12 — 14<br>OFF: 0   | —  |
|  | Signal (-)         | B134          | 28           | 0   | 0   | —  |
| Accelerator pedal position sensor              | Main sensor signal | B136          | 17           | Fully closed: 1<br>Fully opened: 3.5  | Fully closed: 1<br>Fully opened: 3.5  | —  |
|  | Main power supply  | B136          | 15           | 5   | 5   | —  |
|  | GND (main sensor)  | B136          | 34           | 0   | 0   | —  |
|  | Sub sensor signal  | B136          | 28           | Fully closed: 1<br>Fully opened: 3.5  | Fully closed: 1<br>Fully opened: 3.5  | —  |
|  | Sub power supply   | B136          | 16           | 5   | 5   | —  |
|  | GND (sub sensor)   | B136          | 35           | 0   | 0   | —  |
| Cruise control set light                       |                    | B134          | 16           | ON: 0<br>OFF: 10 — 13   | ON: 0<br>OFF: 12 — 14   | —  |
| Main light                                     |                    | B134          | 15           | ON: 0<br>OFF: 10 — 13   | ON: 0<br>OFF: 12 — 14   | —  |
| Clutch switch                                  |                    | B134          | 1            | When clutch pedal is depressed: 0<br>When clutch pedal is released: 10 — 13 | When clutch pedal is depressed: 0<br>When clutch pedal is released: 12 — 14 | —  |
| SET/COAST switch                               |                    | B136          | 11           | ON: 10 — 13<br>OFF: 0   | ON: 12 — 14<br>OFF: 0   | —  |
| Brake switch 1                                 |                    | B136          | 9            | When brake pedal is depressed: 0<br>When brake pedal is released: 10 — 13   | When brake pedal is depressed: 0<br>When brake pedal is released: 12 — 14   | —  |
| Brake switch 2                                 |                    | B136          | 8            | When brake pedal is depressed: 10 — 13<br>When brake pedal is released: 0   | When brake pedal is depressed: 12 — 14<br>When brake pedal is released: 0   | —  |



# Engine Control Module (ECM) I/O Signal

## ENGINE (DIAGNOSTICS)

| Content             | Con-<br>nector<br>No. | Termi-<br>nal No. | Signal (V)                     |                       | Note |
|---------------------|-----------------------|-------------------|--------------------------------|-----------------------|------|
|                     |                       |                   | Ignition SW ON<br>(Engine OFF) | Engine ON (Idling)    |      |
| RESUME/ACCEL switch | B136                  | 10                | ON: 10 — 13<br>OFF: 0          | ON: 12 — 14<br>OFF: 0 | —    |
| Main switch         | B136                  | 7                 | ON: 10 — 13<br>OFF: 0          | ON: 12 — 14<br>OFF: 0 | —    |

| Input/Output          | Measuring condition  | Waveform  |
|-----------------------|--|---|
| 1. Rear oxygen sensor | 5 minutes after driving at a constant speed of 80 — 113 km/h (50 — 70 MPH) | <p>The top graph shows a stable signal around 1.0V, marked with a large circle. The bottom graph shows a highly oscillatory signal, marked with a large X.</p>          |
| 2. Rear oxygen sensor | While idling (Oxygen sensor in active status)                              | <p>The top graph shows a stable signal around 1.0V, marked with a large circle. The bottom graph shows a signal with sharp, periodic spikes, marked with a large X.</p> |

EN-04680

EN-04681

## 6. Engine Condition Data

### A: ELECTRICAL SPECIFICATION

| Content     | Specified data                    |
|-------------|-----------------------------------|
| Engine load | 19.2 — 38.88 (%): Idling          |
|             | 23.7 — 50.0 (%): 2,500 rpm racing |

Measuring condition:

- After warm-up the engine.
- Gear position is in neutral position.
- A/C is turned to OFF.
- All accessory switches are turned to OFF.

# Data Link Connector

ENGINE (DIAGNOSTICS)

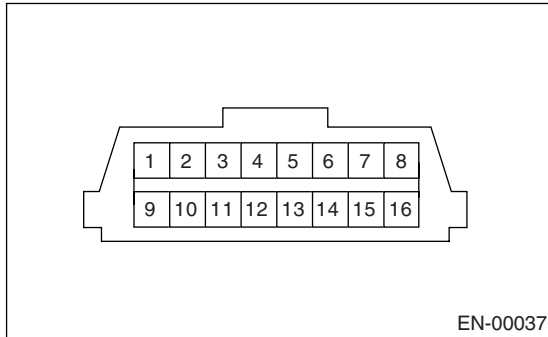
## 7. Data Link Connector

### A: NOTE

This connector is used both for the general scan tools and Subaru Select Monitor.

### CAUTION:

Do not connect any scan tools other than the general scan tools and Subaru Select Monitor, because the circuit for Subaru Select Monitor may be damaged.



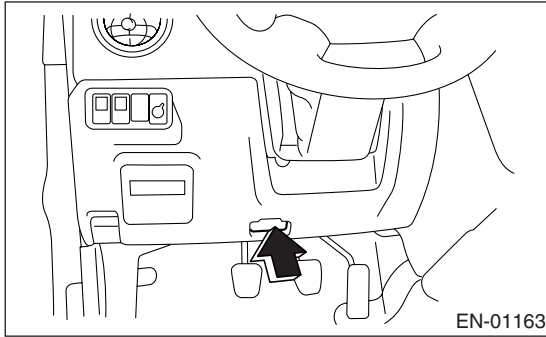
| Terminal No. | Contents     | Terminal No. | Contents                                       |
|--------------|--------------|--------------|--|
| 1            | Power supply | 9            | Blank  |
| 2            | Blank        | 10           | Subaru Select Monitor/general scan tool signal |
| 3            | Blank        | 11           | Blank  |
| 4            | Blank        | 12           | Ground   |
| 5            | Blank        | 13           | Ground   |
| 6            | Blank        | 14           | Blank  |
| 7            | Blank        | 15           | Blank  |
| 8            | Blank        | 16           | Blank  |

## 8. General Scan Tool

### A: OPERATION

#### 1. HOW TO USE GENERAL SCAN TOOL

- 1) Prepare a general scan tool required by SAE J1978.
- 2) Open the cover and connect the general scan tool to data link connector located in the lower portion of instrument panel (on the driver's side).



- 3) Using the general scan tool, call up DTC and freeze frame data.

#### 2. MODE \$01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.

A list of the support data and PID (Parameter Identification) codes are shown in the following table.

| PID | Data   | Unit of measure |
|-----|--|-----------------|
| 01  | Number of emission-related powertrain DTC and malfunction indicator light status and diagnosis support information | —               |
| 03  | Fuel system control status   | —               |
| 04  | Calculated engine load value   | %               |
| 05  | Engine coolant temperature   | °C              |
| 06  | Short term fuel trim   | %               |
| 07  | Long term fuel trim  | %               |
| 0B  | Intake manifold absolute pressure  | kPa             |
| 0C  | Engine revolution  | rpm             |
| 0D  | Vehicle speed  | km/h            |
| 0E  | Ignition timing advance  | °               |
| 0F  | Intake air temperature   | °C              |
| 10  | Air flow rate from mass air flow sensor  | g/sec           |
| 11  | Throttle valve absolute opening angle  | %               |
| 13  | Check whether oxygen sensor is installed.  | —               |
| 15  | Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor                                | V and %         |
| 1C  | Supporting OBD system  | —               |
| 24  | A/F value and A/F sensor output voltage  | — and V         |
| 34  | A/F value and A/F sensor current   | — and mA        |

**NOTE:**

Refer to general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE \$01).

General scan tool functions consist of:

- (1) MODE \$01: Current powertrain diagnostic data
- (2) MODE \$02: Powertrain freeze frame data
- (3) MODE \$03: Emission-related powertrain DTC
- (4) MODE \$04: Clear/Reset emission-related diagnostic information
- (5) MODE \$06: Request on-board monitoring test results for non-continuously monitored systems
- (6) MODE \$07: Request on-board monitoring test results for continuously monitored systems
- (7) MODE \$09: Request vehicle information

Read out the data according to repair procedures. (For detailed operation procedures, refer to the General Scan Tool Operation Manual.)

**NOTE:**

For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>

# General Scan Tool

## ENGINE (DIAGNOSTICS)

### 3. MODE \$02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

| PID | Data  | Unit of measure |
|-----|---|-----------------|
| 02  | DTC that caused CARB required freeze frame data storage                             | —               |
| 03  | Fuel system control status  | —               |
| 04  | Calculated engine load value  | %               |
| 05  | Engine coolant temperature  | °C              |
| 06  | Short term fuel trim  | %               |
| 07  | Long term fuel trim   | %               |
| 0B  | Intake manifold absolute pressure   | mmHg            |
| 0C  | Engine revolution   | rpm             |
| 0D  | Vehicle speed   | km/h            |
| 0E  | Ignition timing advance   | °               |
| 0F  | Intake air temperature  | °C              |
| 10  | Air flow rate from mass air flow sensor   | g/sec           |
| 11  | Throttle valve opening angle  | %               |
| 15  | O <sub>2</sub> sensor output voltage and O <sub>2</sub> sensor short term fuel trim | V and %         |

**NOTE:**

Refer to general scan tool manufacturer's instruction manual to access freeze frame data (MODE \$02).

### 4. MODE \$03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE (DTC))

Refer to Read Diagnostic Trouble Code (DTC) for information about data denoting emission-related powertrain DTC. <Ref. to EN(STI)(diag)-35, Read Diagnostic Trouble Code (DTC).>

### 5. MODE \$04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

**NOTE:**

Refer to general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE \$04).

### 6. MODE \$06

Refer to test value of troubleshooting and data of test limit on support data bit sequence table. List of support data is shown in the following table.

| TID  | CID  | Test value & Test limit  |
|------|------|--|
| \$01 | \$01 | Catalyst system efficiency below threshold                                       |
| \$03 | \$01 | Evaporative emission control system large leak                                   |
|      | \$02 | Evaporative emission control system small leak                                   |
|      | \$03 | Evaporative emission control system very small leak                              |
| \$05 | \$01 | O <sub>2</sub> sensor circuit slow response (Bank 1 Sensor 1)                    |
| \$06 | \$01 | O <sub>2</sub> sensor circuit (Bank 1 Sensor 2)                                  |
|      | \$02 |  |
| \$07 | \$01 | O <sub>2</sub> sensor circuit slow response (Bank 1 Sensor 2)                    |
| \$0C | \$01 | Coolant thermostat (Coolant temperature below thermostat regulating temperature) |
| \$0F | \$01 | Drain valve range/performance  |
|      | \$02 |  |

### 7. MODE \$07

Refer to data of DTC (pending code) for troubleshooting result about emission in first time.

## 8. MODE \$09

Refer to data of vehicle specification (VIN, calibration ID, etc.).

# Subaru Select Monitor

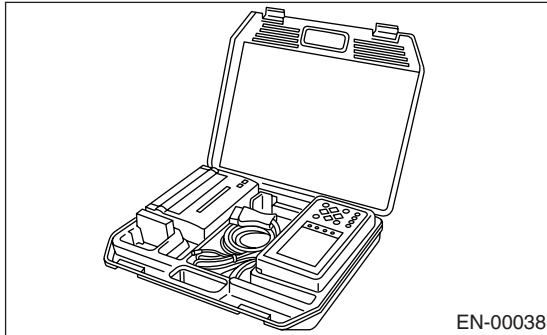
ENGINE (DIAGNOSTICS)

## 9. Subaru Select Monitor

### A: OPERATION

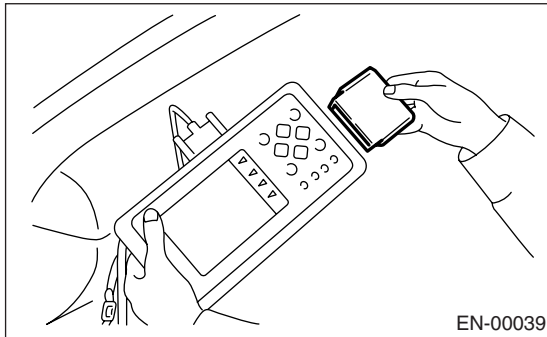
#### 1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(STI)(diag)-7, PREPARATION TOOL, General Description.>



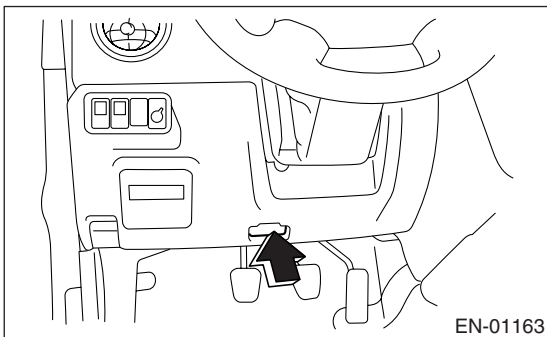
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(STI)(diag)-7, PREPARATION TOOL, General Description.>



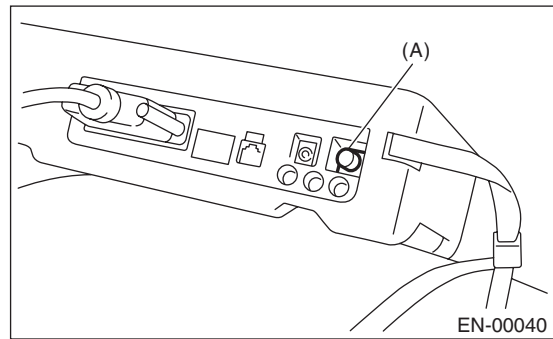
4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector is located in the lower portion of instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor power switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up the DTC and various data, and then record them.

#### 2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (NORMAL MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(STI)(diag)-35, Read Diagnostic Trouble Code (DTC).>

#### 3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (OBD MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(STI)(diag)-35, Read Diagnostic Trouble Code (DTC).>

### CAUTION:

Do not connect the scan tools except for Subaru Select Monitor and general scan tool.

## 4. READ CURRENT DATA FOR ENGINE. (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
  - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
  - 3) Press the [YES] key after the information of engine type is displayed.
  - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
  - 5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
  - 6) Using the scroll key, move the display screen up or down until desired data is shown.
- A list of the support data is shown in the following table.

| Contents  | Display                    | Unit of measure            |
|---|----------------------------|----------------------------|
| Battery voltage   | Battery Voltage            | V                          |
| Vehicle speed signal  | Vehicle Speed              | km/h or MPH                |
| Engine speed signal   | Engine Speed               | rpm                        |
| Engine coolant temperature signal                           | Coolant Temp.              | °C or °F                   |
| Ignition timing signal                                      | Ignition Timing            | deg                        |
| Throttle position signal                                    | Throttle Opening Angle     | %                          |
| Injection pulse width                                       | Fuel Injection #1 Pulse    | ms                         |
| Fuel pump duty control signal                               | Fuel Pump Duty             | %                          |
| A/F sensor current  | A/F Sensor #1 Current      | mA                         |
| A/F sensor resistance                                       | A/F Sensor #1 Resistance   | ohm                        |
| Front oxygen (A/F) sensor lambda value                      | A/F Sensor #1              | —                          |
| Rear oxygen sensor output signal                            | Rear O <sub>2</sub> Sensor | V                          |
| Short term fuel trim  | A/F Correction #1          | %                          |
| Knock sensor correction                                     | Knocking Correction        | deg                        |
| Atmospheric absolute pressure signal                        | Atmosphere Pressure        | mmHg or kPa or inHg or psi |
| Intake manifold relative pressure signal                    | Mani. Relative Pressure    | mmHg or kPa or inHg or psi |
| Intake manifold absolute pressure signal                    | Mani. Absolute Pressure    | mmHg or kPa or inHg or psi |
| A/F correction (short term fuel trim) by rear oxygen sensor | A/F Correction #3          | %                          |
| Long term whole fuel trim                                   | A/F Learning #1            | %                          |
| Canister purge control solenoid valve duty ratio            | CPC Valve Duty Ratio       | %                          |
| Primary supercharged pressure control signal                | Primary Control            | %                          |
| Tumble generator valve position sensor signal (right side)  | TGV Position Sensor R      | V                          |
| Tumble generator valve position sensor signal (left side)   | TGV Position Sensor L      | V                          |
| Accelerator position  | Accel. Opening Angle       | %                          |
| VVT advanced timing (R)                                     | VVTAdv.Amount R            | deg                        |
| VVT advanced timing (L)                                     | VVTAdv.Amount L            | deg                        |
| OCV duty ratio (R)  | OCV Duty R                 | %                          |
| OCV duty ratio (L)  | OCV Duty L                 | %                          |
| OCV duty current (R)  | OCV Current R              | mA                         |
| OCV duty current (L)  | OCV Current L              | mA                         |
| Throttle motor duty   | Throttle Motor Duty        | %                          |
| Throttle power supply voltage                               | Throttle Motor Voltage     | V                          |
| Sub-throttle sensor voltage                                 | Sub-Throttle Sensor        | V                          |
| Main-throttle sensor voltage                                | Main-Throttle Sensor       | V                          |
| Sub-accelerator sensor voltage                              | Sub-Accelerator Sensor     | V                          |
| Main-accelerator sensor voltage                             | Main-Accelerator Sensor    | V                          |
| Memorized cruise speed                                      | Memorized Cruise Speed     | km/h                       |
| Roughness Monitor for #1 cylinder                           | Roughness Monitor #1       | —                          |



# Subaru Select Monitor

## ENGINE (DIAGNOSTICS)

| Contents                                  | Display                         | Unit of measure            |
|---|---------------------------------|----------------------------|
| Roughness Monitor for #2 cylinder         | Roughness Monitor #2            | —                          |
| Roughness Monitor for #3 cylinder         | Roughness Monitor #3            | —                          |
| Roughness Monitor for #4 cylinder         | Roughness Monitor #4            | —                          |
| Fuel level signal                         | Fuel Level                      | V                          |
| Intake air temperature signal             | Intake Air Temp.                | °C or °F                   |
| Mass air flow sensor signal               | Mass Air Flow                   | g/s                        |
| Mass air flow sensor signal               | Air Flow Sensor Voltage         | V                          |
| Fuel tank pressure signal                 | Fuel Tank Pressure              | mmHg or kPa or inHg or psi |
| Fuel temperature signal                   | Fuel Temp.                      | °C or °F                   |
| AT/MT identification signal               | AT Vehicle ID Signal            | ON or OFF                  |
| Fuel pressure control signal              | PCV Solenoid Valve              | ON or OFF                  |
| Drain valve signal                        | Vent. Solenoid Valve            | ON or OFF                  |
| Tank sensor control solenoid valve signal | Tank Sensor Cntl Valve          | ON or OFF                  |
| ETC Motor Relay                           | ETC Motor Relay                 | ON or OFF                  |
| Clutch SW                                 | Clutch Switch                   | ON or OFF                  |
| Stop light SW                             | Stop Light Switch               | ON or OFF                  |
| SET/COAST SW                              | SET/COAST Switch                | ON or OFF                  |
| RESUME/ACCEL SW                           | RESUME/ACCEL Switch             | ON or OFF                  |
| Brake SW                                  | Brake Switch                    | ON or OFF                  |
| Main SW                                   | Main Switch                     | ON or OFF                  |
| Ignition switch signal                    | Ignition Switch                 | ON or OFF                  |
| Test mode signal                          | Test Mode Signal                | ON or OFF                  |
| Neutral position switch signal            | Neutral Position Switch         | ON or OFF                  |
| Air conditioning switch signal            | A/C Switch                      | ON or OFF                  |
| Air conditioning signal                   | A/C Compressor Signal           | ON or OFF                  |
| Radiator main fan relay signal            | Radiator Fan Relay #1           | ON or OFF                  |
| Blow-by leak diagnosis SW                 | Blow-by Leak Connector          | ON or OFF                  |
| Knocking signal                           | Knocking Signal                 | ON or OFF                  |
| Radiator sub fan relay signal             | Radiator Fan Relay #2           | ON or OFF                  |
| Power steering switch signal              | P/S Switch                      | ON or OFF                  |
| Rear oxygen sensor rich signal            | Rear O <sub>2</sub> Rich Signal | ON or OFF                  |
| Starter switch signal                     | Starter Switch                  | ON or OFF                  |
| Idle switch signal                        | Idle Switch                     | ON or OFF                  |
| Crankshaft position sensor signal         | Crankshaft Position Sig.        | ON or OFF                  |
| Camshaft position sensor signal           | Camshaft Position Sig.          | ON or OFF                  |
| Rear defogger switch signal               | Rear Defogger SW                | ON or OFF                  |
| Blower fan switch signal                  | Blower Fan SW                   | ON or OFF                  |
| Small light switch signal                 | Light Switch                    | ON or OFF                  |
| Tumble generator valve output signal      | TGV Output                      | ON or OFF                  |
| Tumble generator valve drive signal       | TGV Drive                       | OPEN or CLOSE              |

**NOTE:**

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

## 5. READ CURRENT DATA FOR ENGINE. (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
  - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
  - 3) Press the [YES] key after the information of engine type is displayed.
  - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
  - 5) On the «OBD Menu» display screen, select the {Current Data Display & Save} and press the [YES] key.
  - 6) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
  - 7) Using the scroll key, move the display screen up or down until desired data is shown.
- A list of the support data is shown in the following table.

| Contents  | Display                         | Unit of measure            |
|---|---------------------------------|----------------------------|
| Number of DTC                                     | Number of DTC                   | —                          |
| Malfunction indicator light status                | MI (MIL)                        | ON or OFF                  |
| Monitoring test of misfire                        | Misfire monitoring              | Complete or incomplete     |
| Monitoring test of fuel system                    | Fuel system monitoring          | Complete or incomplete     |
| Monitoring test of comprehensive component        | Component monitoring            | Complete or incomplete     |
| Test of catalyst                                  | Catalyst Diagnosis              | Complete or incomplete     |
| Test of heated catalyst                           | Heated catalyst                 | No support                 |
| Test of evaporative emission purge control system | Evaporative purge system        | Complete or incomplete     |
| Test of secondary air system                      | Secondary air system            | No support                 |
| Test of air conditioning system refrigerant       | A/C system refrigerant          | No support                 |
| Test of oxygen sensor                             | Oxygen sensor                   | Complete or incomplete     |
| Test of oxygen sensor heater                      | O <sub>2</sub> Heater Diagnosis | Complete or incomplete     |
| Test of EGR system                                | EGR system                      | No support                 |
| Air fuel ratio control system for bank 1          | Fuel System for Bank 1          | —                          |
| Engine load data                                  | Calculated load value           | %                          |
| Engine coolant temperature signal                 | Coolant Temp.                   | °C or °F                   |
| Short term fuel trim by front oxygen (A/F) sensor | Short term fuel trim B1         | %                          |
| Long term fuel trim by front oxygen (A/F) sensor  | Long term fuel trim B1          | %                          |
| Intake manifold absolute pressure signal          | Mani. Absolute Pressure         | mmHg or kPa or inHg or psi |
| Engine speed signal                               | Engine Speed                    | rpm                        |
| Vehicle speed signal                              | Vehicle Speed                   | km/h or MPH                |
| Ignition timing advance for #1 cylinder           | Ignition timing adv. #1         | °                          |
| Intake air temperature signal                     | Intake Air Temp.                | °C or °F                   |
| Intake air amount                                 | Mass Air Flow                   | g/s                        |
| Throttle position signal                          | Throttle Opening Angle          | %                          |
| Oxygen sensor #11                                 | Oxygen Sensor #11               | —                          |
| Oxygen sensor #12                                 | Oxygen Sensor #12               | —                          |
| Rear oxygen sensor output signal                  | Oxygen Sensor #12               | V                          |
| Air fuel ratio correction by rear oxygen sensor   | Short term fuel trim #12        | %                          |
| On-board diagnostic system                        | OBD System                      | CARB-OBD2                  |
| A/F sensor output signal                          | A/F sensor #11                  | V                          |
| A/F lambda signal                                 | A/F sensor #11                  | —                          |
| A/F lambda signal #11                             | A/F sensor #11                  | —                          |
| A/F sensor current #11                            | A/F sensor #11                  | mA                         |

**NOTE:**

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

# Subaru Select Monitor

## ENGINE (DIAGNOSTICS)

### 6. READ FREEZE FRAME DATA FOR ENGINE. (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
  - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
  - 3) Press the [YES] key after the information of engine type is displayed.
  - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
  - 5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.
- A list of the support data is shown in the following table.

| Contents  | Display                  | Unit of measure          |
|---|--------------------------|--------------------------|
| DTC for freeze frame data                         | Freeze frame data        | DTC                      |
| Air fuel ratio control system for bank 1          | Fuel system for Bank1    | Closed loop or Open loop |
| Air fuel ratio control system for bank 2          | Fuel system for Bank2    | Open loop                |
| O <sub>2</sub> sensor output voltage              | Oxygen Sensor #12        | V                        |
| Short term fuel trim by O <sub>2</sub> sensor     | Short term fuel trim #12 | %                        |
| Engine load data                                  | Calculated load value    | %                        |
| Engine coolant temperature signal                 | Coolant Temp.            | °C or °F                 |
| Short term fuel trim by front oxygen (A/F) sensor | Short term fuel trim B1  | %                        |
| Long term fuel trim by front oxygen (A/F) sensor  | Long term fuel trim B1   | %                        |
| Intake manifold absolute pressure signal          | Mani. Absolute Pressure  | mmHg, kPa, inHg or psi   |
| Engine speed signal                               | Engine Speed             | rpm                      |
| Vehicle speed signal                              | Vehicle Speed            | km/h or MPH              |
| Ignition timing advance for #1 cylinder           | Ignition timing adv. #1  | °                        |
| Intake air temperature signal                     | Intake Air Temp.         | °C or °F                 |
| Intake air amount                                 | Mass Air Flow            | g/s                      |
| Throttle position signal                          | Throttle Opening Angle   | %                        |

#### NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

## 7. LED OPERATION MODE FOR ENGINE

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
  - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
  - 3) Press the [YES] key after the information of engine type is displayed.
  - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
  - 5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press the [YES] key.
  - 6) Using the scroll key, move the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

| Contents                                       | Display                         | Message       | LED "ON" requirements                                     |
|--|---------------------------------|---------------|---|
| Ignition switch signal                         | Ignition Switch                 | ON or OFF     | When ignition switch is turned to ON.                     |
| Test mode signal                               | Test Mode Signal                | ON or OFF     | When test mode connector is connected.                    |
| Neutral position switch signal                 | Neutral Position Switch         | ON or OFF     | When neutral position signal is entered.                  |
| Air conditioning switch signal                 | A/C Switch                      | ON or OFF     | When air conditioning switch is turned ON.                |
| Air conditioning relay signal                  | A/C Compressor Signal           | ON or OFF     | When air conditioning relay is in function.               |
| Radiator main fan relay signal                 | Radiator Fan Relay #1           | ON or OFF     | When radiator main fan relay is in function.              |
| Knocking signal                                | Knocking Signal                 | ON or OFF     | When knocking signal is entered.                          |
| Radiator sub fan relay signal                  | Radiator Fan Relay #2           | ON or OFF     | When radiator sub fan relay is in function.               |
| Rear oxygen sensor rich signal                 | Rear O <sub>2</sub> Rich Signal | ON or OFF     | When rear oxygen sensor mixture ratio is rich.            |
| Starter switch signal                          | Starter Switch Signal           | ON or OFF     | When starter switch signal is entered.                    |
| Idle switch signal                             | Idle Switch Signal              | ON or OFF     | When idle switch signal is entered.                       |
| Crankshaft position sensor signal              | Crankshaft Position Signal      | ON or OFF     | When crankshaft position sensor signal is entered.        |
| Camshaft position sensor signal                | Camshaft Position Signal        | ON or OFF     | When camshaft position sensor signal is entered.          |
| Power steering switch signal                   | P/S Switch                      | ON or OFF     | When power steering switch is entered.                    |
| Rear defogger switch signal                    | Rear Defogger Switch            | ON or OFF     | When rear defogger switch is turned ON.                   |
| Blower fan switch signal                       | Blower Fan Switch               | ON or OFF     | When blower fan switch is turned ON.                      |
| Small light switch signal                      | Light Switch                    | ON or OFF     | When small light switch is turned ON.                     |
| Tumble generator valve actuator signal         | TGV Output                      | ON or OFF     | When TGV actuator signal is entered.                      |
| Tumble generator valve drive signal            | TGV Drive                       | Close or Open | When TGV moves and valve opens.                           |
| Fuel pressure control solenoid                 | PCV Solenoid Valve              | ON or OFF     | When fuel pressure control solenoid valve is in function. |
| Drain valve signal                             | Vent. Solenoid Valve            | ON or OFF     | When drain valve is in function.                          |
| Fuel tank sensor control solenoid valve signal | Fuel Tank Sensor Ctrl Valve     | ON or OFF     | When tank sensor control solenoid valve is in function.   |
| Blow-by leak diagnosis SW                      | Blow-by Leak Connector          | ON or OFF     | When connected.   |
| Handle SW                                      | Handle SW                       | RHD/LHD       | When the vehicle is LHD model.                            |
| ETC motor relay                                | ETC Motor Relay                 | ON or OFF     | When electronic throttle control is in function.          |
| Clutch SW                                      | Clutch SW                       | ON or OFF     | When clutch switch is turned ON.                          |
| Stop SW  | Stop Light Switch               | ON or OFF     | When stop light switch is turned ON.                      |
| SET/CST SW                                     | SET/COAST Switch                | ON or OFF     | When SET/COAST switch is turned ON.                       |
| RES/ACC SW                                     | RESUME/ACCEL Switch             | ON or OFF     | When RESUME/ACCEL switch is turned ON.                    |
| Brake SW                                       | Brake Switch                    | ON or OFF     | When brake switch is turned ON.                           |
| Main SW  | Main Switch                     | ON or OFF     | When main switch is turned ON.                            |

**NOTE:**

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

# Subaru Select Monitor

ENGINE (DIAGNOSTICS)

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## 8. VIN REGISTRATION

- 1) On «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On «Engine Diagnosis» display screen, select the {VIN Registration}, and then press the [YES] key.
- 5) Perform the procedure shown on the display.

### NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

## 10. Read Diagnostic Trouble Code (DTC)

### A: OPERATION

#### 1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On the «Engine Diagnosis» display screen, select the {DTC Display} and press the [YES] key.
- 5) On the «DTC Display» display screen, select the {Current DTC} or {History DTC} and press the [YES] key.

#### NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>

#### 2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
- 5) On the «OBD Menu» display screen, select the {DTC Display} and press the [YES] key.
- 6) Make sure that a DTC is shown on the display screen.

#### NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>

### 3. GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain DTC.

For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>

#### NOTE:

Refer to general scan tool manufacturer's instruction manual to access emission-related powertrain DTC (MODE \$03).

## Inspection Mode

ENGINE (DIAGNOSTICS)

### 11. Inspection Mode

#### A: PROCEDURE

Carry out trouble diagnosis shown in the following DTC table.

When performing trouble diagnosis which is not shown in the DTC table, refer to the next item Drive cycle.

<Ref. to EN(STI)(diag)-41, Drive Cycle.>

| DTC   | Item  | Condition |
|-------|---|-----------|
| P0011 | "A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 1) | —         |
| P0021 | "A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 2) | —         |
| P0031 | HO2S Heater Control Circuit Low (Bank 1 Sensor 1)                         | —         |
| P0032 | HO2S Heater Control Circuit High (Bank 1 Sensor 1)                        | —         |
| P0037 | HO2S Heater Control Circuit Low (Bank 1 Sensor 2)                         | —         |
| P0038 | HO2S Heater Control Circuit High (Bank 1 Sensor 2)                        | —         |
| P0102 | Mass or Volume Air Flow Circuit Low Input                                 | —         |
| P0103 | Mass or Volume Air Flow Circuit High Input                                | —         |
| P0107 | Manifold Absolute Pressure/Barometric Pressure Circuit Low Input          | —         |
| P0108 | Manifold Absolute Pressure/Barometric Pressure Circuit High Input         | —         |
| P0112 | Intake Air Temperature Circuit Low Input                                  | —         |
| P0113 | Intake Air Temperature Circuit High Input                                 | —         |
| P0117 | Engine Coolant Temperature Circuit Low Input                              | —         |
| P0118 | Engine Coolant Temperature Circuit High Input                             | —         |
| P0122 | Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input               | —         |
| P0123 | Throttle/Pedal Position Sensor/Switch "A" Circuit High Input              | —         |
| P0131 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 1)               | —         |
| P0132 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 1)              | —         |
| P0137 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 2)               | —         |
| P0138 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 2)              | —         |
| P0182 | Fuel Temperature Sensor "A" Circuit Low Input                             | —         |
| P0183 | Fuel Temperature Sensor "A" Circuit High Input                            | —         |
| P0222 | Throttle/Pedal Position Sensor/Switch "B" Circuit Low Input               | —         |
| P0223 | Throttle/Pedal Position Sensor/Switch "B" Circuit High Input              | —         |
| P0230 | Fuel Pump Primary Circuit   | —         |
| P0245 | Turbo/Super Charger Wastegate Solenoid "A" Low                            | —         |
| P0327 | Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)                | —         |
| P0328 | Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)               | —         |
| P0335 | Crankshaft Position Sensor "A" Circuit                                    | —         |
| P0336 | Crankshaft Position Sensor "A" Circuit Range/Performance                  | —         |
| P0340 | Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)            | —         |
| P0345 | Camshaft Position Sensor "A" Circuit (Bank 2)                             | —         |
| P0447 | Evaporative Emission Control System Vent Control Circuit Open             | —         |
| P0448 | Evaporative Emission Control System Vent Control Circuit Shorted          | —         |
| P0452 | Evaporative Emission Control System Pressure Sensor Low Input             | —         |
| P0453 | Evaporative Emission Control System Pressure Sensor High Input            | —         |
| P0458 | Evaporative Emission Control System Purge Control Valve Circuit Low       | —         |
| P0462 | Fuel Level Sensor Circuit Low Input                                       | —         |
| P0463 | Fuel Level Sensor Circuit High Input                                      | —         |
| P0502 | Vehicle Speed Sensor Circuit Low Input                                    | —         |
| P0503 | Vehicle Speed Sensor Intermittent/Erratic/High                            | —         |
| P0512 | Starter Request Circuit   | —         |

# Inspection Mode

ENGINE (DIAGNOSTICS)

| DTC   | Item   | Condition |
|-------|--|-----------|
| P0519 | Idle Control System Malfunction (Fail-Safe)                            | —         |
| P0604 | Internal Control Module Random Access Memory (RAM) Error               | —         |
| P0605 | Internal Control Module Read Only Memory (ROM) Error                   | —         |
| P0607 | Control Module Performance   | —         |
| P0638 | Throttle Actuator Control Range/Performance (Bank 1)                   | —         |
| P0691 | Cooling Fan 1 Control Circuit Low                                      | —         |
| P0851 | Neutral Switch Input Circuit Low                                       | —         |
| P0852 | Neutral Switch Input Circuit High                                      | —         |
| P1152 | O <sub>2</sub> Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)  | —         |
| P1153 | O <sub>2</sub> Sensor Circuit Range/Performance (High) (Bank1 Sensor1) | —         |
| P1160 | Return Spring Failure  | —         |
| P1400 | Fuel Tank Pressure Control Solenoid Valve Circuit Low                  | —         |
| P1420 | Fuel Tank Pressure Control Sol. Valve Circuit High                     | —         |
| P1446 | Fuel Tank Sensor Control Valve Circuit Low                             | —         |
| P1447 | Fuel Tank Sensor Control Valve Circuit High                            | —         |
| P1491 | Positive Crankcase Ventilation (Blow-by) Function Problem              | —         |
| P1518 | Starter Switch Circuit Low Input                                       | —         |
| P1560 | Back-up Voltage Circuit Malfunction                                    | —         |
| P2006 | Intake Manifold Runner Control Stuck Closed (Bank 1)                   | —         |
| P2007 | Intake Manifold Runner Control Stuck Closed (Bank 2)                   | —         |
| P2008 | Intake Manifold Runner Control Circuit / Open (Bank 1)                 | —         |
| P2009 | Intake Manifold Runner Control Circuit Low (Bank 1)                    | —         |
| P2011 | Intake Manifold Runner Control Circuit / Open (Bank 2)                 | —         |
| P2012 | Intake Manifold Runner Control Circuit Low (Bank 2)                    | —         |
| P2016 | Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank1)    | —         |
| P2017 | Intake Manifold Runner Position Sensor / Switch Circuit High (Bank1)   | —         |
| P2021 | Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 2)   | —         |
| P2022 | Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2)  | —         |
| P2088 | OCV Solenoid Valve Signal A Circuit Open (Bank 1)                      | —         |
| P2089 | OCV Solenoid Valve Signal A Circuit Short (Bank 1)                     | —         |
| P2092 | OCV Solenoid Valve Signal A Circuit Open (Bank 2)                      | —         |
| P2093 | OCV Solenoid Valve Signal A Circuit Short (Bank 2)                     | —         |
| P2101 | Throttle Actuator Control Motor Circuit Range/Performance              | —         |
| P2102 | Throttle Actuator Control Motor Circuit Low                            | —         |
| P2103 | Throttle Actuator Control Motor Circuit High                           | —         |
| P2109 | Throttle/Pedal Position Sensor A Minimum Stop Performance              | —         |
| P2122 | Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input            | —         |
| P2123 | Throttle/Pedal Position Sensor/Switch "D" Circuit High Input           | —         |
| P2127 | Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input            | —         |
| P2128 | Throttle/Pedal Position Sensor/Switch "E" Circuit High Input           | —         |
| P2135 | Throttle/Pedal Position Sensor/Switch "A" / "B" Voltage Rationality    | —         |
| P2138 | Throttle/Pedal Position Sensor/Switch "D" / "E" Voltage Rationality    | —         |
| P2227 | Barometric Pressure Circuit Range/Performance                          | —         |
| P2228 | Barometric Pressure Circuit Low Input                                  | —         |
| P2229 | Barometric Pressure Circuit High Input                                 | —         |



# Inspection Mode

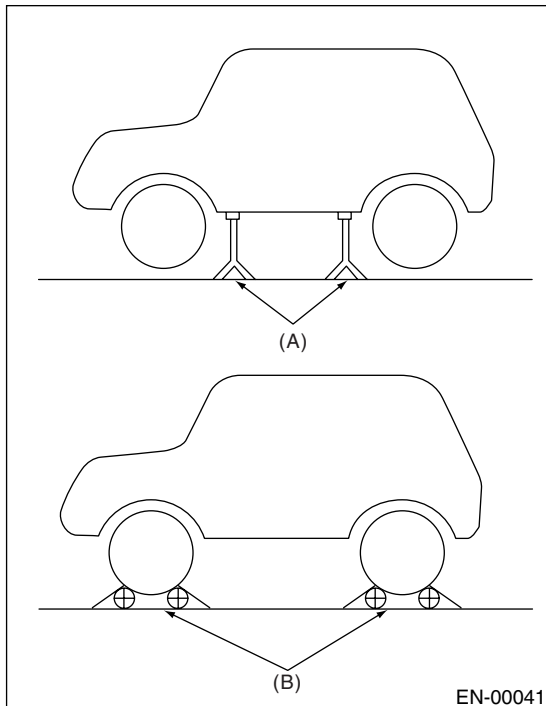
## ENGINE (DIAGNOSTICS)

### 1. PREPARATION FOR THE INSPECTION MODE

- 1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)] and the battery voltage is 12 V or more.
- 2) Raise the vehicle using a garage jack and place on rigid racks or drive the vehicle onto free rollers.

#### WARNING:

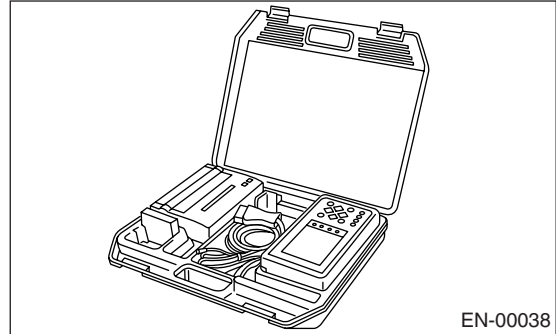
- Before raising the vehicle, ensure the parking brake is applied.
- Do not use a pantograph jack in place of a rigid rack.
- Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
- Do not abruptly depress/release the clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
- In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the rigid racks and the vehicle.
- Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



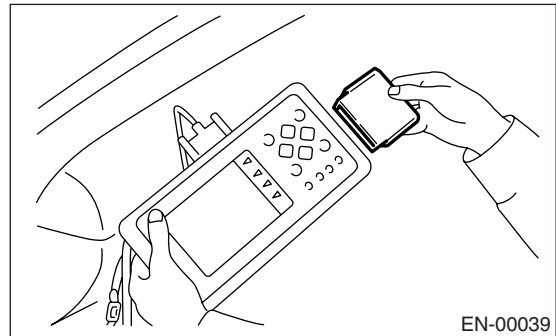
- (A) Rigid rack  
(B) Free rollers

### 2. SUBARU SELECT MONITOR

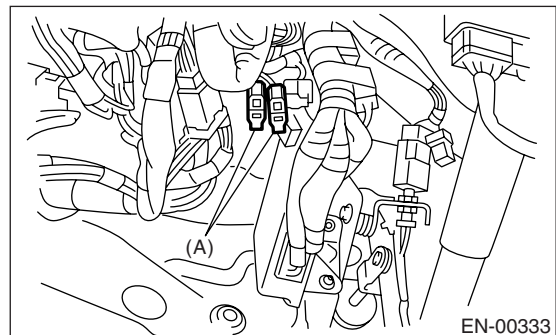
- 1) After cleaning the memory, check for any remaining unsolved trouble data. <Ref. to EN(STI)(diag)-45, Clear Memory Mode.>
- 2) Warm up the engine.
- 3) Prepare the Subaru Select Monitor kit. <Ref. to EN(STI)(diag)-7, PREPARATION TOOL, General Description.>



- 4) Connect the diagnosis cable to Subaru Select Monitor.
- 5) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(STI)(diag)-7, PREPARATION TOOL, General Description.>

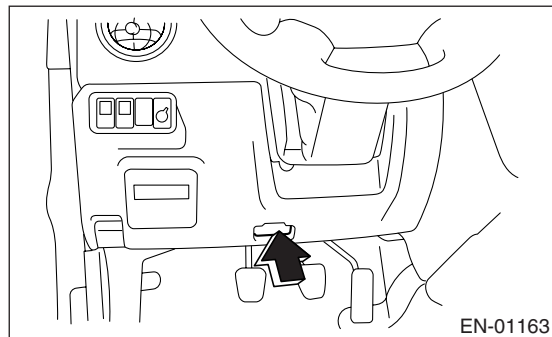


- 6) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



- (A) Test mode connector

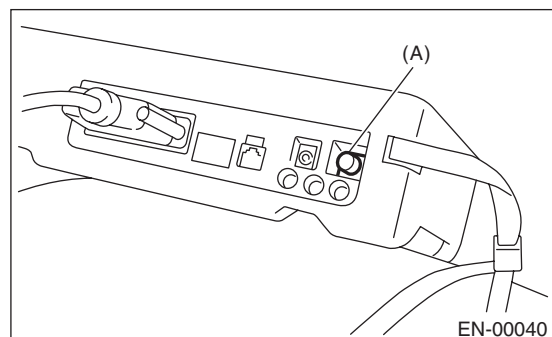
7) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



### CAUTION:

**Do not connect the scan tools except for Subaru Select Monitor and general scan tool.**

8) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor power switch to ON.



(A) Power switch

9) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.

10) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.

11) Press the [YES] key after the information of engine type is displayed.

12) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.

13) When the “Perform Inspection (Dealer Check Mode)?” is shown on the display screen, press the [YES] key.

14) Perform subsequent procedures as instructed on the display screen.

- If trouble still remains in the memory, the corresponding DTC appears on the display screen.

### NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

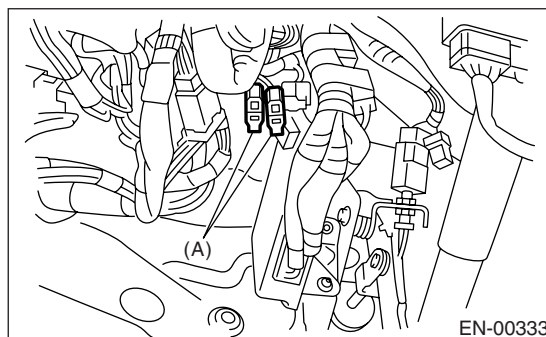
- For detailed concerning the DTC, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>

- Release the parking brake.
- The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis function.

### 3. GENERAL SCAN TOOL

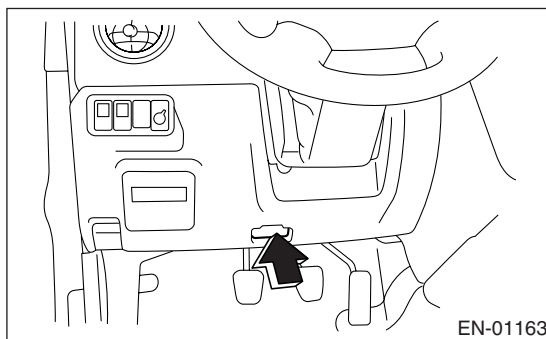
- 1) Warm up the engine.
- 2) Connect the test mode connector (A) at the lower side of instrument panel (on the driver's side).



- 3) Connect the general scan tool to its data link connector in the lower portion of instrument panel (on the driver's side).

### CAUTION:

**Do not connect the scan tools except for Subaru Select Monitor and general scan tool.**



- 4) Start the engine.

### NOTE:

Depress the clutch pedal when starting engine.

- 5) Using the shift lever, turn the “N” position switch to ON.

- 6) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.

- 7) Place the shift lever in “1st” gear and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

### NOTE:

- On AWD model, release the parking brake.

- The speed difference between front and rear wheels may light ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis function.

8) Using the general scan tool, check for DTC and record the result(s).

**NOTE:**

- For detailed operation procedures, refer to the General Scan Tool Instruction Manual.
- For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>

## 12. Drive Cycle

### A: PROCEDURE

There are six drive patterns of drive cycles A — F for the trouble diagnosis. Performing the specified drive pattern allows to diagnose malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check if they correctly resume their functions by performing the required drive pattern.

#### 1. PREPARATION FOR THE DRIVE CYCLE

- 1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12 V or more.
- 2) Disconnect the test mode connector.

**NOTE:**

- Except for the engine coolant temperature specified items at starting, the diagnosis is carried out after engine warm up.
- Carry out the diagnosis which is marked \* on DTC twice, then, after finishing first diagnosis, stop the engine and do second time at the same condition.

#### 2. DRIVE CYCLE A (AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE ENGINE FOR 1 MINUTE).

| DTC    | Item   | Condition   |
|--------|--|---|
| *P0125 | Insufficient Coolant Temperature for Closed Loop Fuel Control          | Engine coolant temperature is less than 20°C (68°F) at engine start.  |
| *P0126 | Insufficient Coolant Temperature for Stable Operation                  | —   |
| *P0128 | Coolant Thermostat   | Engine coolant temperature is less than 55°C (131°F) at engine start. |
| *P0133 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 1)          | —   |
| *P0171 | System Too Lean (Bank 1)   | Diagnosis completes in drive cycle B or C as well.                    |
| *P0172 | System Too Rich (Bank 1)   | Diagnosis completes in drive cycle B or C as well.                    |
| *P0301 | Cylinder 1 Misfire Detected  | Diagnosis completes in drive cycle B or C as well.                    |
| *P0302 | Cylinder 2 Misfire Detected  | Diagnosis completes in drive cycle B or C as well.                    |
| *P0303 | Cylinder 3 Misfire Detected  | Diagnosis completes in drive cycle B or C as well.                    |
| *P0304 | Cylinder 4 Misfire Detected  | Diagnosis completes in drive cycle B or C as well.                    |
| *P0420 | Catalyst System Efficiency Below Threshold (Bank 1)                    | —   |
| *P0442 | Evaporative Emission Control System Leak Detected (small leak)         | Engine coolant temperature is less than 25°C (77°F) at engine start.  |
| *P0451 | Evaporative Emission Control System Pressure Sensor Range/Performance  | —   |
| *P0456 | Evaporative Emission Control System Leak Detected (very small leak)    | Engine coolant temperature is less than 25°C (77°F) at engine start.  |
| *P0457 | Evaporative Emission Control System Leak Detected (fuel cap loose/off) | Engine coolant temperature is less than 25°C (77°F) at engine start.  |
| *P0459 | Evaporative Emission Control System Purge Control Valve Circuit High   | —   |
| *P0692 | Cooling Fan 1 Control Circuit High                                     | —   |
| P1443  | Vent Control Solenoid Valve Function Problem                           | —   |
| *P2096 | Post Catalyst Fuel Trim System Too Lean Bank 1                         | Diagnosis completes in drive cycle B or C as well.                    |
| *P2097 | Post Catalyst Fuel Trim System Too Rich Bank 1                         | Diagnosis completes in drive cycle B or C as well.                    |

# Drive Cycle

## ENGINE (DIAGNOSTICS)

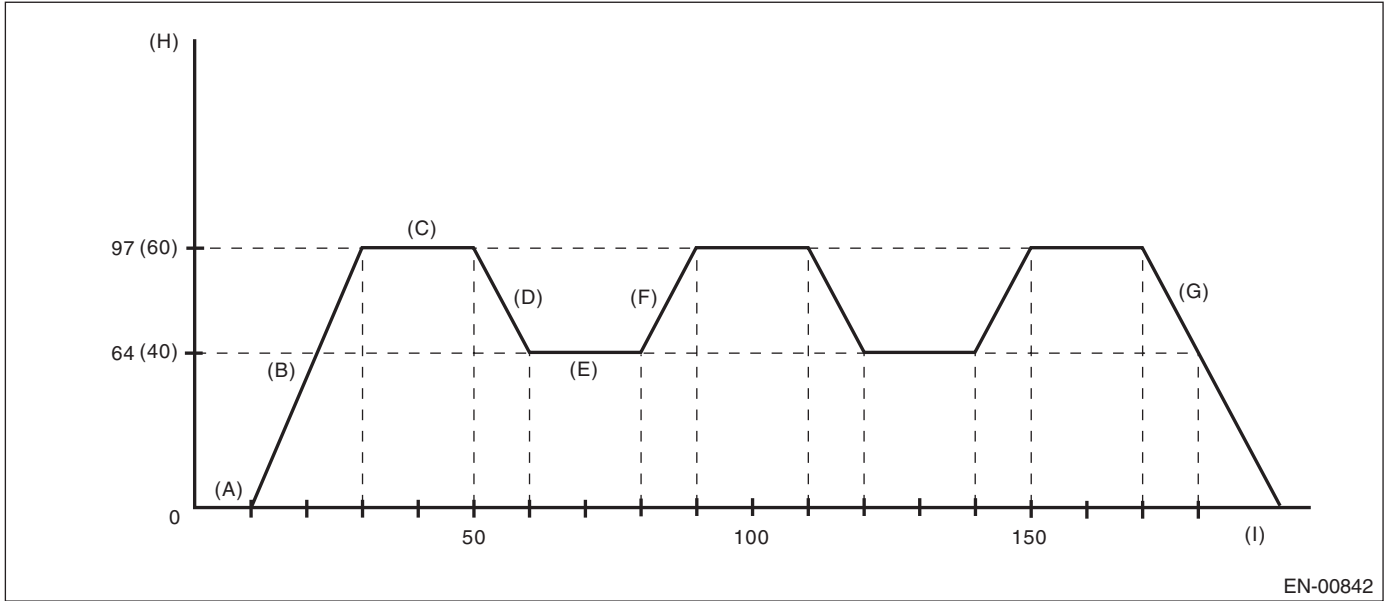
### 3. DRIVE CYCLE B (IDLE FOR 10 MINUTES)

**NOTE:**

Before the diagnosis, drive the vehicle at 10 km/h (6 MPH) or more.

| DTC    | Item  | Condition  |
|--------|---|--|
| *P0111 | Intake Air Temperature Sensor Range/Performance Problem | Engine coolant temperature is less than 30°C (86°F) at engine start. |
| *P0171 | System too Lean (Bank 1)                                | Diagnosis completes in drive cycle A or C as well.                   |
| *P0172 | System too Rich (Bank 1)                                | Diagnosis completes in drive cycle A or C as well.                   |
| *P0301 | Cylinder 1 Misfire Detected                             | Diagnosis completes in drive cycle A or C as well.                   |
| *P0302 | Cylinder 2 Misfire Detected                             | Diagnosis completes in drive cycle A or C as well.                   |
| *P0303 | Cylinder 3 Misfire Detected                             | Diagnosis completes in drive cycle A or C as well.                   |
| *P0304 | Cylinder 4 Misfire Detected                             | Diagnosis completes in drive cycle A or C as well.                   |
| *P0464 | Fuel Level Sensor Circuit Intermittent                  | —  |
| *P0483 | Cooling Fan Rationality Check                           | —  |
| *P0506 | Idle Control System RPM Lower Than Expected             | —  |
| *P0507 | Idle Control System RPM Higher Than Expected            | —  |
| *P2096 | Post Catalyst Fuel Trim System Too Lean Bank 1          | Diagnosis completes in drive cycle A or C as well.                   |
| *P2097 | Post Catalyst Fuel Trim System Too Rich Bank 1          | Diagnosis completes in drive cycle A or C as well.                   |

## 4. DRIVE CYCLE C (DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN)



EN-00842

- |   |  |  |
|---|--|--|
| (A) Idle engine for 10 seconds or more.               | (D) Decelerate with fully closed throttle to 64 km/h (40 MPH). | (G) Stop vehicle with throttle fully closed. |
| (B) Accelerate to 97 km/h (60 MPH) within 20 seconds. | (E) Drive vehicle at 64 km/h (40 MPH) for 20 seconds.          | (H) km/h (MPH)                               |
| (C) Drive vehicle at 97 km/h (60 MPH) for 20 seconds. | (F) Accelerate to 97 km/h (60 MPH) within 10 seconds.          | (I) second                                   |

| DTC    | Item   | Condition  |
|--------|--|--|
| *P0030 | HO2S Heater Control Circuit (Bank 1 Sensor 1)                            | —  |
| *P0068 | Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance | —  |
| *P0101 | Mass or Volume Air Flow Circuit Range/Performance                        | —  |
| P0134  | O <sub>2</sub> Sensor Circuit No Activity Detected (Bank 1 Sensor 1)     | —  |
| *P0139 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 2)            | —  |
| *P0171 | System too Lean (Bank 1)   | Diagnosis completes in drive cycle A or B as well. |
| *P0172 | System too Rich (Bank 1)   | Diagnosis completes in drive cycle A or B as well. |
| P0244  | Turbo/Supercharger Wastegate Solenoid "A" Range/Performance              | —  |
| P0246  | Turbo/Supercharger Wastegate Solenoid "A" High                           | —  |
| P0301  | Cylinder 1 Misfire Detected  | Diagnosis completes in drive cycle A or B as well. |
| P0302  | Cylinder 2 Misfire Detected  | Diagnosis completes in drive cycle A or B as well. |
| P0303  | Cylinder 3 Misfire Detected  | Diagnosis completes in drive cycle A or B as well. |
| P0304  | Cylinder 4 Misfire Detected  | Diagnosis completes in drive cycle A or B as well. |
| P2004  | Intake Manifold Runner Control Stuck Open (Bank 1)                       | —  |
| P2005  | Intake Manifold Runner Control Stuck Open (Bank 2)                       | —  |
| *P2096 | Post Catalyst Fuel Trim System Too Lean Bank 1                           | Diagnosis completes in drive cycle A or B as well. |
| *P2097 | Post Catalyst Fuel Trim System Too Rich Bank 1                           | Diagnosis completes in drive cycle A or B as well. |

# Drive Cycle

## ENGINE (DIAGNOSTICS)

### 5. DRIVE CYCLE D

#### • DRIFT DIAGNOSIS

- 1) Make sure that the engine coolant temperature at engine starting is less than 30°C (86°F).
- 2) Make sure that fuel of more than 10 ℓ (2.6 US gal, 2.2 Imp gal) remains and the battery voltage is more than 10.9 V.
- 3) Make sure that the engine coolant temperature rises for more than 10°C (50°F) from the level of engine starting and is also more than 75°C (167°F).
- 4) Idle the engine for more than 120 seconds in the condition of step 3.

#### • STUCK DIAGNOSIS

- 1) Make sure that the battery voltage is more than 10.9 V.
- 2) Perform the clear memory mode. <Ref. to EN(STI)(diag)-45, Clear Memory Mode.>
- 3) Drive the vehicle for the distance equal to fuel of 50 ℓ (13.2 US gal, 11 Imp gal).

#### NOTE:

- It is possible to drive intermittently.
- Do not disconnect the terminal of battery during diagnosis. (If disconnecting the terminal of battery, the data will be cleared.)

| DTC   | Item  | Condition |
|-------|---|-----------|
| P0181 | Fuel Temperature Sensor "A" Circuit Range/Performance | —         |

### 6. DRIVE CYCLE E

- 1) Make sure that the battery voltage is more than 10.9 V.
- 2) Perform the clear memory mode. <Ref. to EN(STI)(diag)-45, Clear Memory Mode.>
- 3) Drive the vehicle for the distance equal to fuel of 30 ℓ (7.9 US gal, 6.6 Imp gal).

#### NOTE:

- It is possible to drive intermittently.
- Do not disconnect the terminal of battery during diagnosis. (If disconnecting the terminal of battery, the data will be cleared.)

| DTC   | Item  | Condition |
|-------|---|-----------|
| P0461 | Fuel Level Sensor Circuit Range/Performance | —         |

### 7. DRIVE CYCLE F

- 1) Make sure that the battery voltage is more than 10.9 V.
- 2) Drive the vehicle at 80 km/h (50 MPH) for 20 minutes, and then idle the engine for a minute.
- 3) Read the current data of engine using Subaru Select Monitor. Make sure that the item of evaporative emission purge control system is displayed as "Completed". <Ref. to EN(STI)(diag)-31, READ CURRENT DATA FOR ENGINE. (OBD MODE), OPERATION, Subaru Select Monitor.>
- 4) Drive down for difference of elevation of 52 m (164 ft) within 80 seconds. (Ex: Drive down a incline with grade of 6% at 40 km/h (25 MPH).)
- 5) Repeat the step 4 for five times.

#### NOTE:

- Do not drive at than 68 km/h (42 MPH) in step 4 and 5.
- Do not disconnect the terminal of battery during diagnosis. (If disconnecting the terminal of battery, the data will be cleared.)
- Do not perform the Clear Memory in diagnosis. (If the Clear Memory is performed, the data will be cleared.)

| DTC   | Item   | Condition |
|-------|--|-----------|
| P1448 | Fuel Tank Sensor Control Valve Range/Performance | —         |

## 13. Clear Memory Mode

### A: OPERATION

#### 1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
- 5) When the 'Done' and 'Turn Ignition Switch OFF' are shown on the display screen, turn the ignition switch to OFF, and then turn the Subaru Select Monitor to OFF.

**NOTE:**

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

#### 2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
- 5) On the «OBD Menu» display screen, select the {Diagnosis Code(s) Cleared} and press the [YES] key.
- 6) When the 'Clear Diagnostic Code?' is shown on the display screen, press the [YES] key.
- 7) Turn the ignition switch to OFF, and then turn the Subaru Select Monitor power switch to OFF.

**NOTE:**

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

#### 3. GENERAL SCAN TOOL

For clear memory procedures using the general scan tool, refer to the General Scan Tool Instruction Manual.



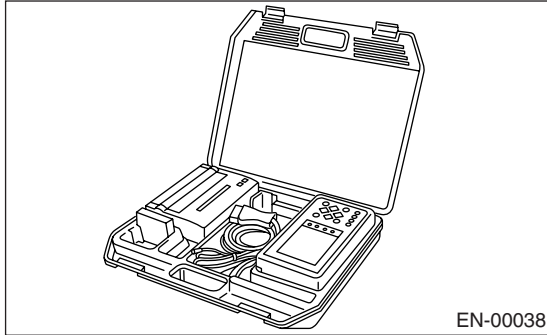
# Compulsory Valve Operation Check Mode

ENGINE (DIAGNOSTICS)

## 14. Compulsory Valve Operation Check Mode

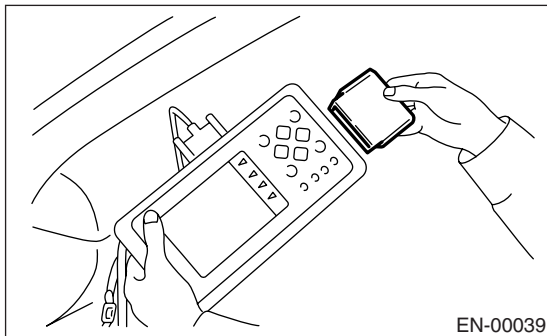
### A: OPERATION

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(STI)(diag)-7, PREPARATION TOOL, General Description.>

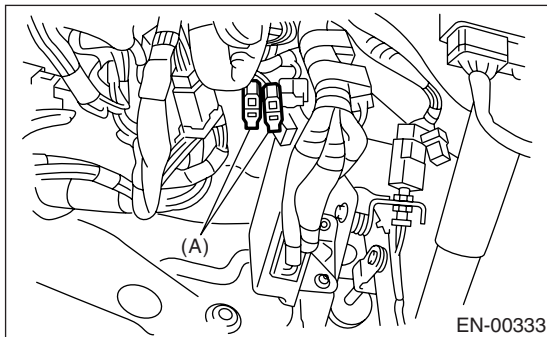


2) Connect the diagnosis cable to Subaru Select Monitor.

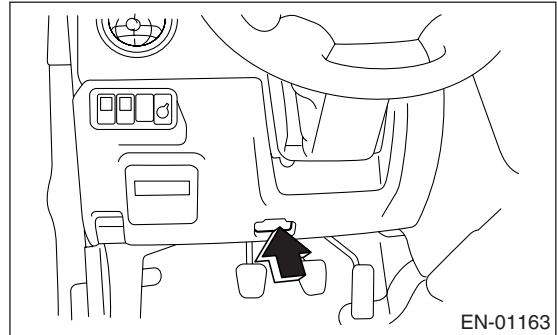
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(STI)(diag)-7, PREPARATION TOOL, General Description.>



4) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



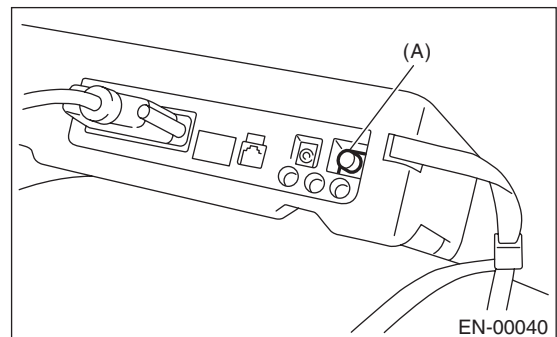
5) Connect the Subaru Select Monitor to data link connector located in the lower portion of instrument panel (on the driver's side).



### CAUTION:

**Do not connect scan tools except for the Subaru Select Monitor and general scan tool.**

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor power switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.

8) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.

9) Press the [YES] key after the information of engine type is displayed.

10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.

11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press the [YES] key.

12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.

13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

• A list of support data is shown in the following table.

# Compulsory Valve Operation Check Mode

ENGINE (DIAGNOSTICS)

| Contents   | Display                        |
|--|--------------------------------|
| Compulsory fuel pump relay operation check                 | Fuel Pump Relay                |
| Compulsory radiator fan relay operation check              | Radiator Fan Relay             |
| Compulsory air conditioning relay operation check          | A/C Compressor Relay           |
| Compulsory purge control solenoid valve operation check    | CPC Solenoid Valve             |
| Compulsory pressure control solenoid valve operation check | PCV Solenoid Valve             |
| Compulsory drain valve operation check                     | Vent. Control Solenoid Valve   |
| Compulsory fuel tank sensor control valve operation check  | Fuel Tank Sensor Control Valve |

## NOTE:

- The following parts will be displayed but not functional because they are not installed on the vehicle.

| Display                         |
|---------------------------------|
| EGR Solenoid Valve              |
| ASV Solenoid Valve              |
| FICD Solenoid                   |
| Pressure Switching Sol. 1       |
| Pressure Switching Sol. 2       |
| AAI Solenoid Valve              |
| Turbocharger Wastegate Solenoid |

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

# Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

## 15. Malfunction Indicator Light

### A: PROCEDURE

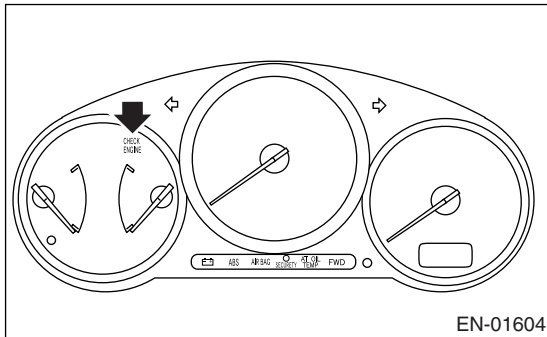
|   |
|---|
| 1. Activation of check malfunction indicator light. <Ref. to EN(STI)(diag)-49, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>   |
| ↓   |
| 2. Check that the malfunction indicator light does not come on. <Ref. to EN(STI)(diag)-50, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>                                       |
| ↓   |
| 3. Check that the malfunction indicator light does not go off. <Ref. to EN(STI)(diag)-52, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF., Malfunction Indicator Light.>   |
| ↓   |
| 4. Check that the malfunction indicator light does not blink at a cycle of 3 Hz. <Ref. to EN(STI)(diag)-53, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 HZ., Malfunction Indicator Light.>     |
| ↓   |
| 5. Check that the malfunction indicator light remains blinking at a cycle of 3 Hz. <Ref. to EN(STI)(diag)-55, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 HZ., Malfunction Indicator Light.> |

## B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

1) When the ignition switch is turned to ON (engine off), the malfunction indicator light in the combination meter illuminates.

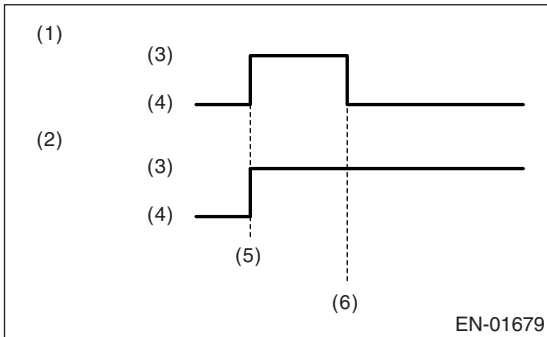
**NOTE:**

If the malfunction indicator light does not illuminate, perform diagnostics of the malfunction indicator light circuit or the combination meter circuit. <Ref. to EN(STI)(diag)-50, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>



EN-01604

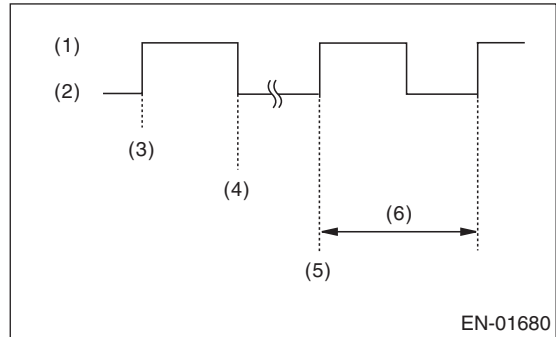
2) After starting the engine, the malfunction indicator light goes out. If it does not, either the engine or the emission control system is malfunctioning.



EN-01679

- (1) No trouble
- (2) Trouble occurs
- (3) ON
- (4) OFF
- (5) Ignition switch ON
- (6) Engine start

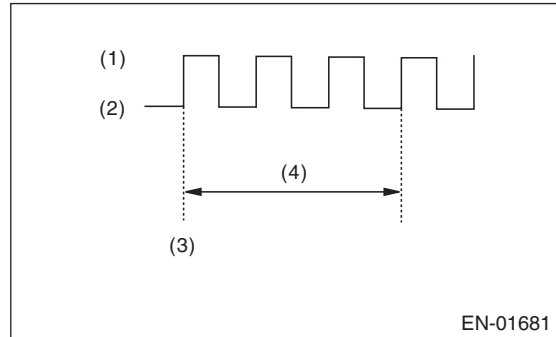
3) If the diagnosis system senses a misfire which could damage the catalyzer, the malfunction indicator light will blink at a cycle of 1 Hz.



EN-01680

- (1) ON
- (2) OFF
- (3) Ignition switch ON
- (4) Engine start
- (5) Misfire start
- (6) 1 second

4) When the ignition switch is turned to ON (engine off) or to START with the test mode connector connected, the malfunction indicator light blinks at a cycle of 3 Hz.



EN-01681

- (1) ON
- (2) OFF
- (3) Ignition switch ON
- (4) 1 second

# Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

## C: MALFUNCTION INDICATOR LIGHT DOES NOT COME ON.

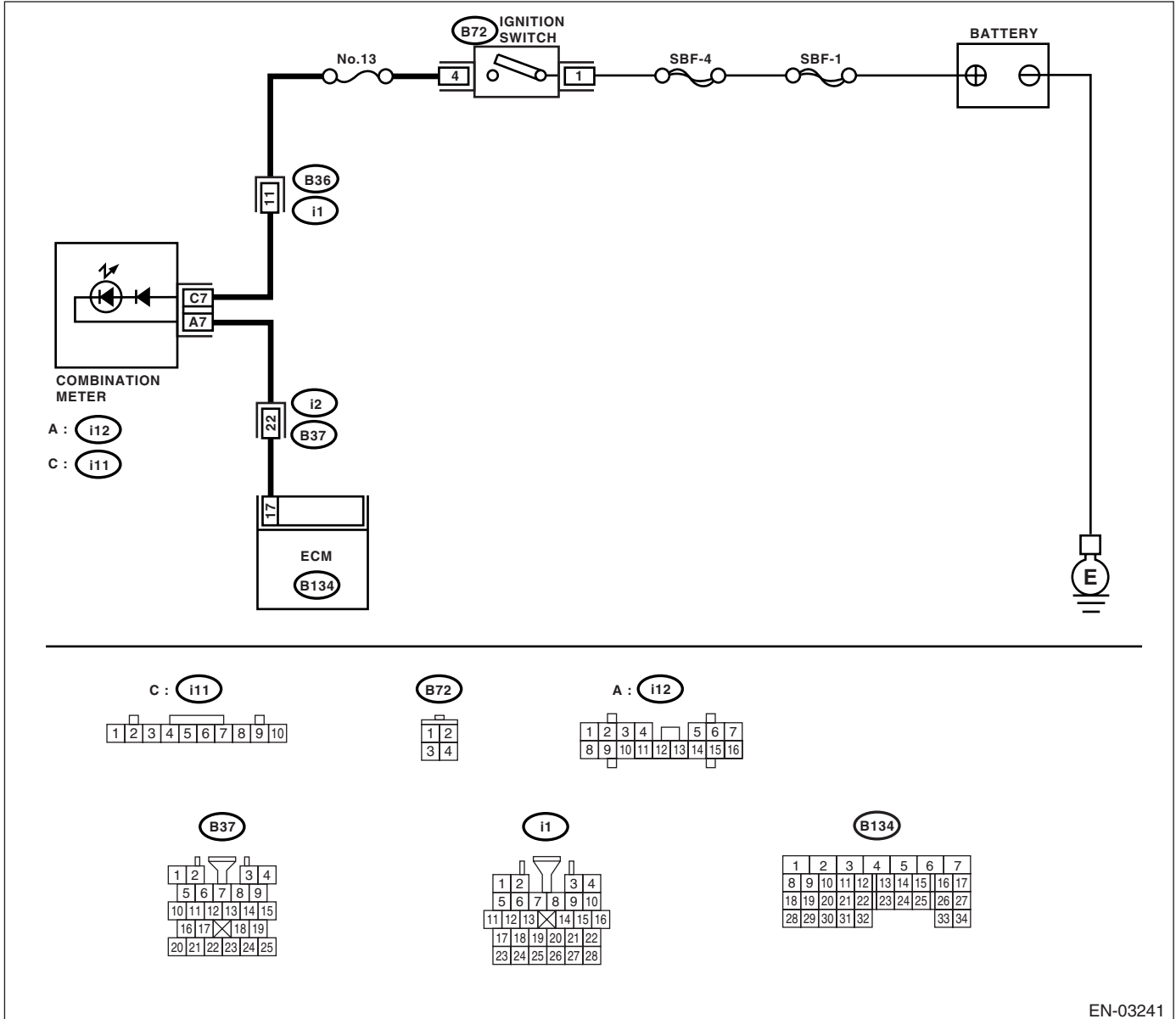
### DIAGNOSIS:

The malfunction indicator light circuit is shorted.

### TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), malfunction indicator light does not come on.

### WIRING DIAGRAM:



| Step | Check   | Yes  | No            |
|------|---|--|---------------|
| 1    | <b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 17 (+) — Chassis ground (-):</b> | Is the voltage less than 1 V?<br><br>Go to step 4.   | Go to step 2. |
| 2    | <b>CHECK POOR CONTACT.</b>  | Does the malfunction indicator light come on when shaking or pulling ECM connector and harness?<br><br>Repair the poor contact in ECM connector. | Go to step 3. |

# Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <b>3 CHECK ECM CONNECTOR.</b>   | Is the ECM connector correctly connected?             | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>               | Repair the connection of ECM connector.   |
| <b>4 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the combination meter. <Ref. to IDI-10, Combination Meter.><br>3) Disconnect the connector from ECM and combination meter.<br>4) Measure the resistance of harness between ECM and combination meter connector.<br><br><b>Connector &amp; terminal</b><br><b>(B134) No. 17 — (i12) No. 7:</b> | Is the resistance less than 1 $\Omega$ ?              | Go to step 5.   | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and combination meter connector</li> <li>• Poor contact in coupling connector</li> </ul>                       |
| <b>5 CHECK POOR CONTACT.</b><br>Check poor contact in combination meter connector.  | Is there poor contact in combination meter connector? | Repair the poor contact in combination meter connector.                           | Go to step 6.   |
| <b>6 CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between combination meter connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(i11) No. 7 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?                        | Replace the combination meter circuit board. <Ref. to IDI-10, Combination Meter.> | Check the following and repair if necessary.<br><br>NOTE: <ul style="list-style-type: none"> <li>• Blown out fuse (No. 13)</li> <li>• Open or short circuit in harness between fuse (No. 13) and battery terminal</li> <li>• Poor contact in ignition switch connector</li> </ul> |

# Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

## D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF.

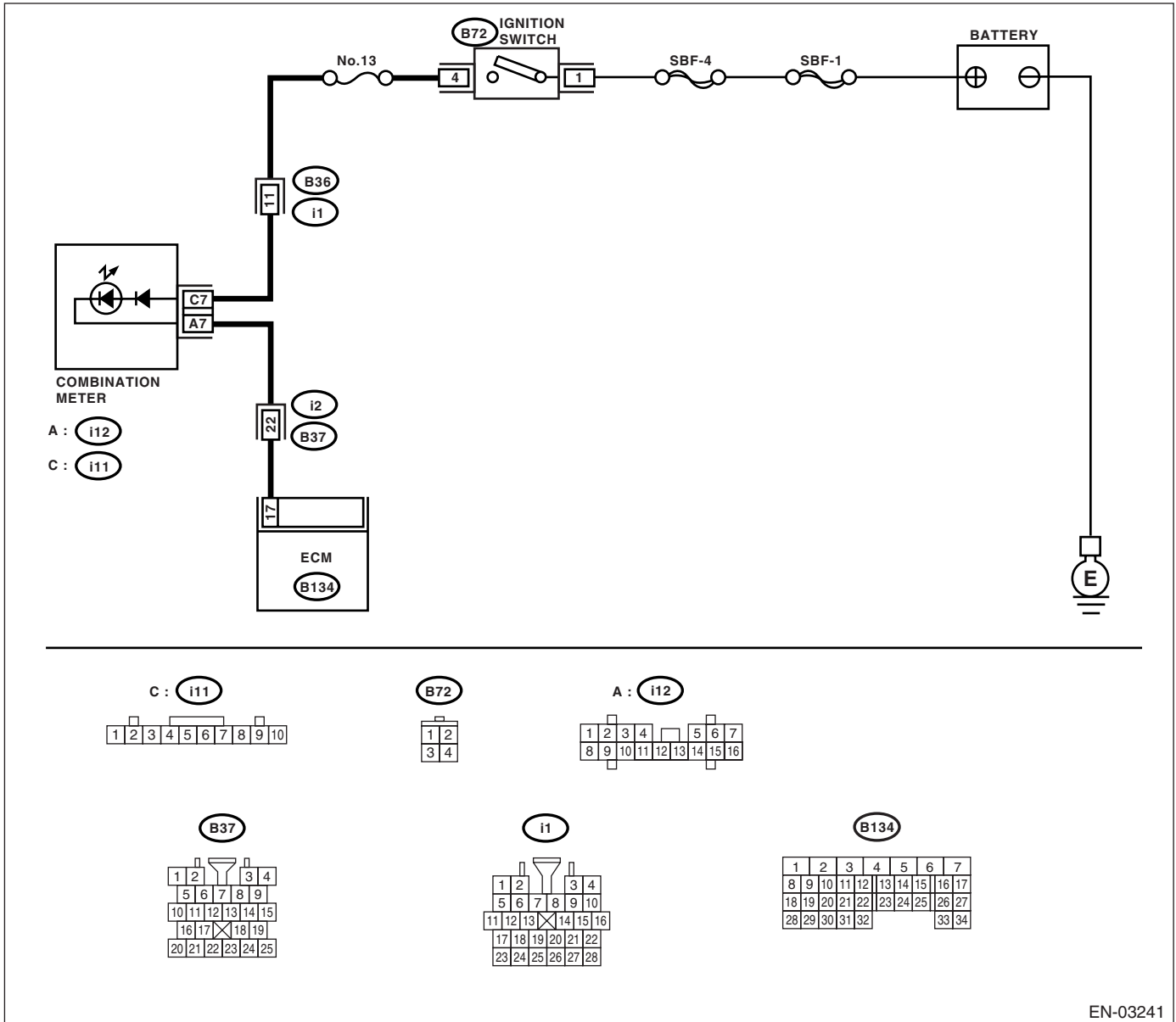
### DIAGNOSIS:

The malfunction indicator light circuit is shorted.

### TROUBLE SYMPTOM:

Although malfunction indicator light comes on when engine runs, but DTC is not shown on Subaru Select Monitor or general scan tool display.

### WIRING DIAGRAM:



| Step | Check   | Yes   | No   |   |
|------|---|---|--|---|
| 1    | <b>CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Turn the ignition switch to ON. | Does the malfunction indicator light come on? | Repair the short circuit in harness between combination meter and ECM connector. | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> |

# Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

## E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 Hz.

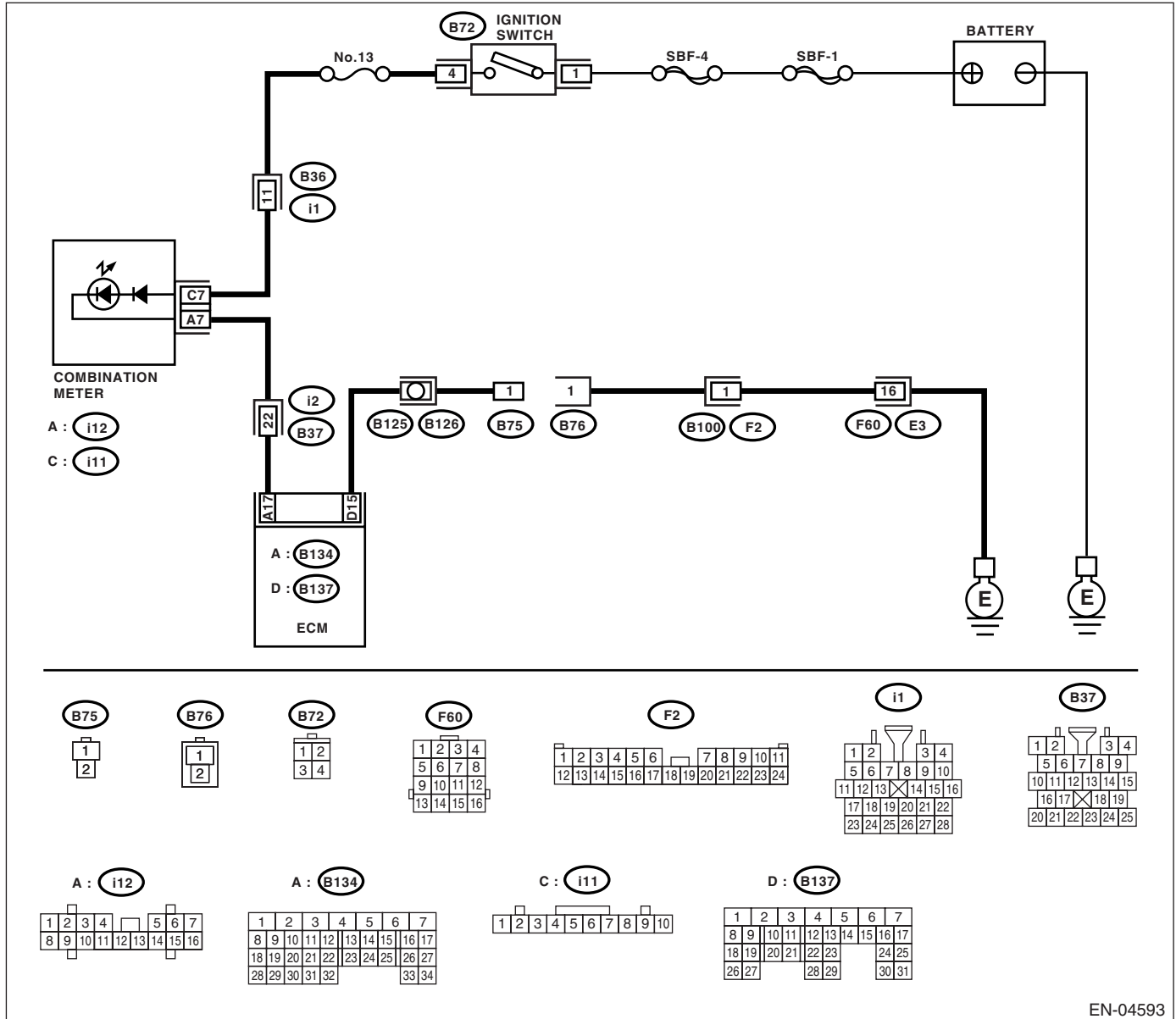
### DIAGNOSIS:

- The malfunction indicator light circuit is open or shorted.
- Test mode connector circuit is open.

### TROUBLE SYMPTOM:

During inspection mode, malfunction indicator light does not blink at a cycle of 3 Hz.

### WIRING DIAGRAM:



EN-04593



# Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <b>1 CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the test mode connector.<br>3) Turn the ignition switch to ON. (engine OFF)   | Does the malfunction indicator light come on? | Go to step 2.   | Repair the malfunction indicator light circuit. <Ref. to EN(STI)(diag)-50, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>           |
| <b>2 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Turn the ignition switch to ON.   | Does the malfunction indicator light come on? | Repair the ground short circuit in harness between combination meter and ECM connector. | Go to step 3.   |
| <b>3 CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between test mode connector and chassis ground.<br><br><i>Connector &amp; terminal<br/>(B76) No. 1 — Chassis ground:</i> | Is the resistance less than 1 $\Omega$ ?      | Go to step 4.   | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between test mode connector and chassis ground |
| <b>4 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.  | Is there poor contact in ECM connector?       | Repair the poor contact in ECM connector.   | Go to step 5.   |
| <b>5 CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.</b><br>1) Connect the test mode connector.<br>2) Measure the resistance of harness between ECM and chassis ground.<br><br><i>Connector &amp; terminal<br/>(B137) No. 15 — Chassis ground:</i>   | Is the resistance less than 1 $\Omega$ ?      | Go to step 6.   | Repair the open circuit in harness between ECM and test mode connector.   |
| <b>6 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.  | Is there poor contact in ECM connector?       | Repair the poor contact in ECM connector.   | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>   |

# Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

## F: MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 Hz.

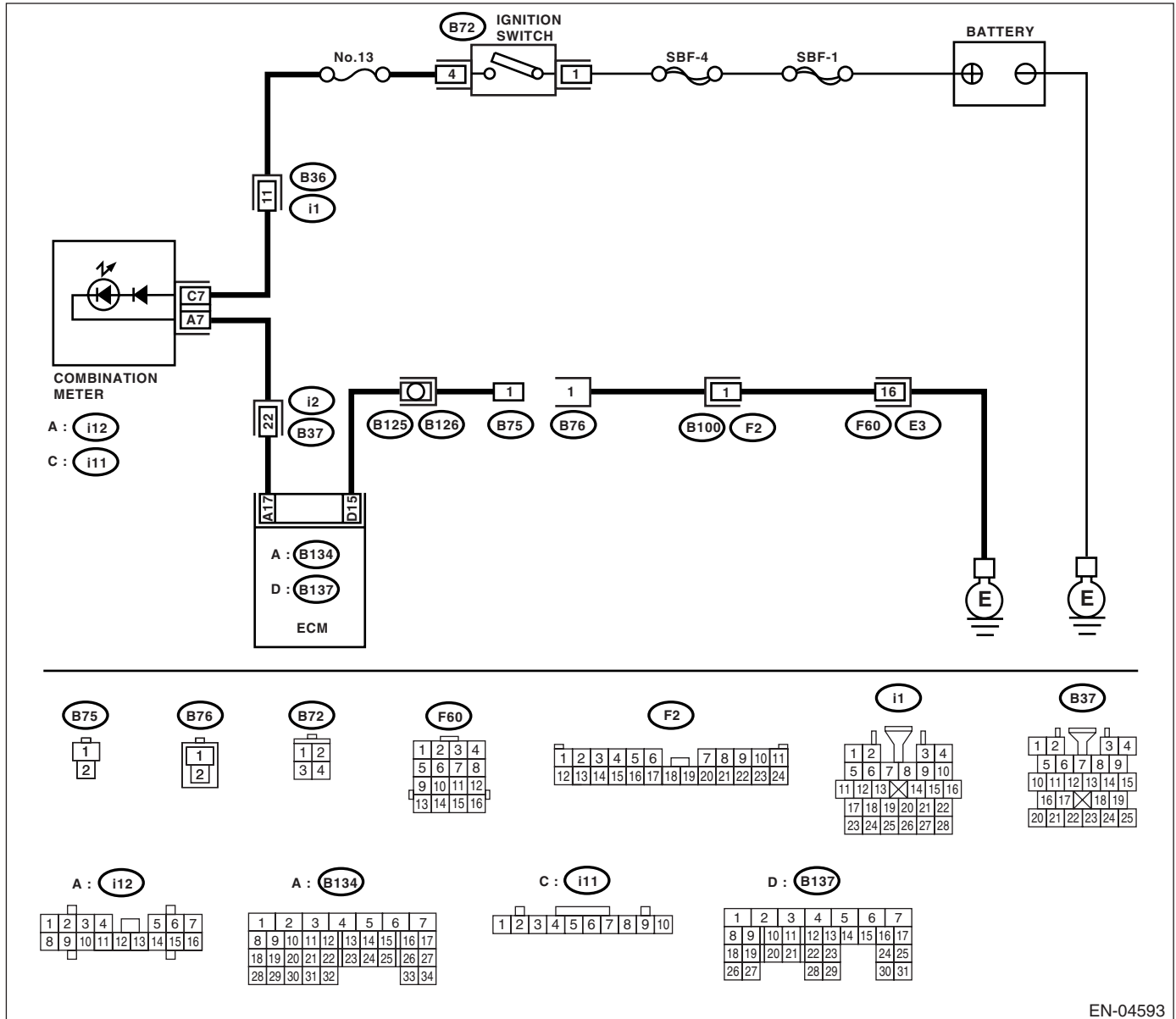
### DIAGNOSIS:

Test mode connector circuit is shorted.

### TROUBLE SYMPTOM:

Malfunction indicator light blinks at a cycle of 3 Hz when ignition switch is turned to ON.

### WIRING DIAGRAM:



EN-04593

| Step | Check   | Yes   | No            |   |
|------|---|---|---------------|---|
| 1    | <p><b>CHECK TEST MODE CONNECTOR.</b></p> <p>1) Disconnect the test mode connector.<br/>2) Turn the ignition switch to ON.</p> | Does the malfunction indicator light blink? | Go to step 2. | <p>System is in good order.</p> <p>NOTE:<br/>Malfunction indicator light blinks at a cycle of 3 Hz when test mode connector is connected.</p> |

# Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes  | No  |
|--|--|--|---|
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B137) No. 15 — Chassis ground:</b></i> | Is the resistance less than 5 $\Omega$ ? | Repair the short circuit in harness between ECM and test mode connector. | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> |

## 16. Diagnostics for Engine Starting Failure

### A: PROCEDURE

|  |
|--|
| 1. Check the fuel level.   |
| ↓  |
| 2. Inspection of starter motor circuit. <Ref. to EN(STI)(diag)-58, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>                                  |
| ↓  |
| 3. Inspection of ECM power supply and ground line. <Ref. to EN(STI)(diag)-61, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.> |
| ↓  |
| 4. Inspection of ignition control system. <Ref. to EN(STI)(diag)-63, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>                              |
| ↓  |
| 5. Inspection of fuel pump circuit. <Ref. to EN(STI)(diag)-66, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>  |
| ↓  |
| 6. Inspection of fuel injector circuit. <Ref. to EN(STI)(diag)-67, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>                                  |

# Diagnostics for Engine Starting Failure

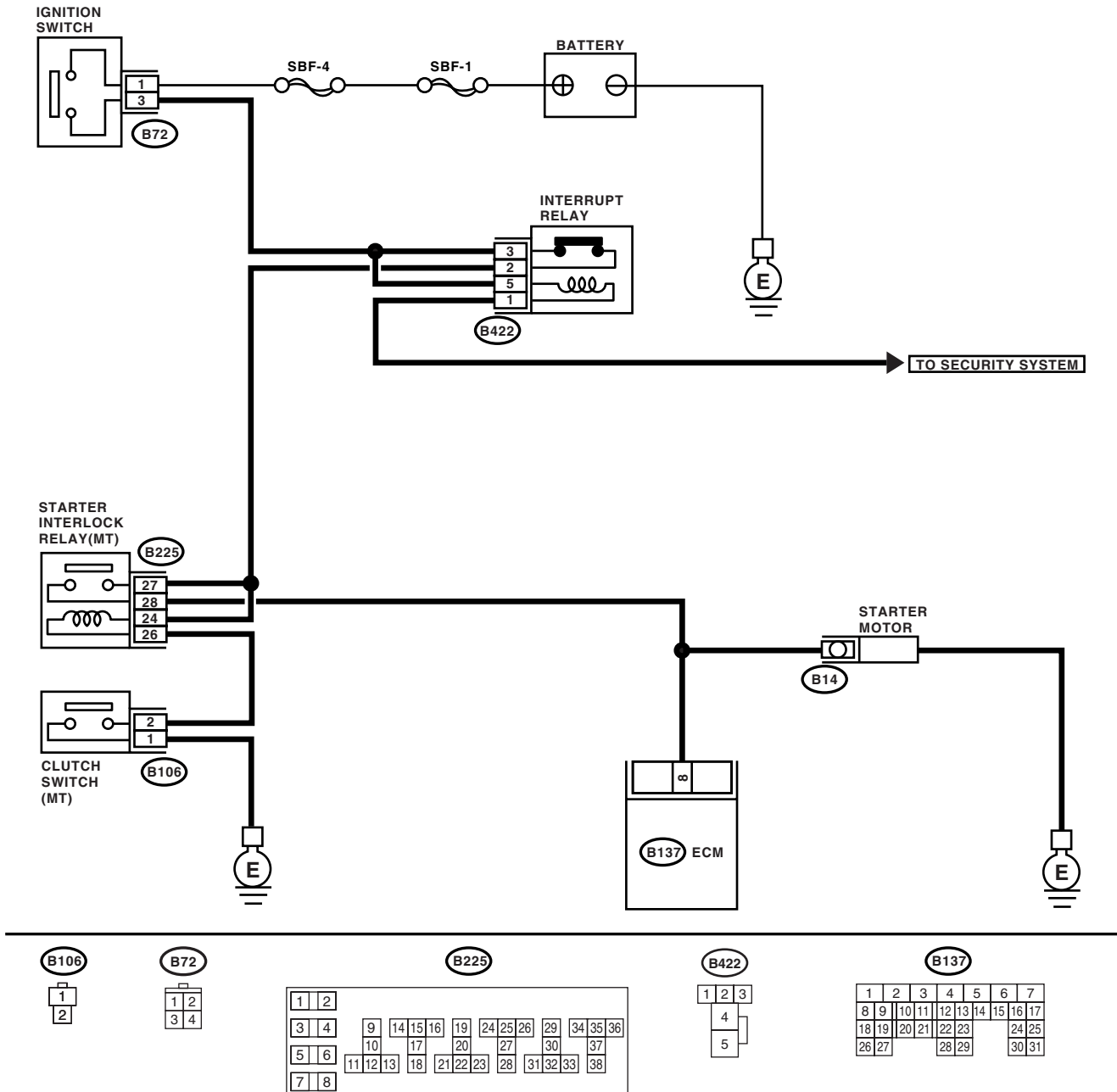
ENGINE (DIAGNOSTICS)

## B: STARTER MOTOR CIRCUIT

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04153

# Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No  |
|--|--|--|---|
| <b>1 CHECK BATTERY</b><br>Check the battery voltage.   | Is the voltage more than 12 V?   | Go to step 2.  | Charge or replace the battery.  |
| <b>2 CHECK OPERATION OF STARTER MOTOR.</b>   | Does the starter motor operate?  | Go to step 3.  | Go to step 4.   |
| <b>3 CHECK DTC.</b>  | Is the DTC displayed? <Ref. to EN(STI)(diag)-35, OPERATION, Read Diagnostic Trouble Code (DTC).> | Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> | Repair the poor contact in ECM connector.   |
| <b>4 CHECK INPUT SIGNAL FOR STARTER MOTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from starter motor.<br>3) Turn the ignition switch to START.<br>4) Measure the power supply voltage between starter motor connector terminal and engine ground.<br><b>Connector &amp; terminal</b><br><b>(B14) No. 1 (+) — Engine ground (-):</b><br>NOTE:<br>Depress the clutch pedal.   | Is the voltage more than 10 V?   | Check the starter motor. <Ref. to SC(H4SO)-8, Starter.>  | Go to step 5.   |
| <b>5 CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.</b><br>1) Disconnect the connector from ignition switch.<br>2) Measure the power supply voltage between ignition switch connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B72) No. 1 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?   | Go to step 6.  | Check the following, repair if necessary. <ul style="list-style-type: none"> <li>• Blown out fuse</li> <li>• Open circuit in harness between ignition switch and battery</li> </ul> |
| <b>6 CHECK IGNITION SWITCH.</b><br>1) Disconnect the connector from ignition switch.<br>2) Measure the resistance between ignition switch terminals while turning ignition switch to START.<br><b>Terminals</b><br><b>No. 1 — No. 3:</b>   | Is the resistance less than 5 Ω?   | Go to step 7.  | Replace the ignition switch.  |
| <b>7 CHECK INPUT VOLTAGE OF STARTER INTERLOCK RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from starter interlock relay.<br>3) Connect the connector to ignition switch.<br>4) Measure the input voltage between starter interlock relay connector and chassis ground while turning ignition switch to START.<br><b>Connector &amp; terminal</b><br><b>(B225) No. 27 (+) — Chassis ground (-):</b><br><b>(B225) No. 24 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?   | Go to step 8.  | Repair open or short circuit to ground in harness between starter interlock relay and ignition switch.<br>NOTE:<br>Check security system. <Ref. to SL-21, Security System.>         |

## Diagnostics for Engine Starting Failure

### ENGINE (DIAGNOSTICS)

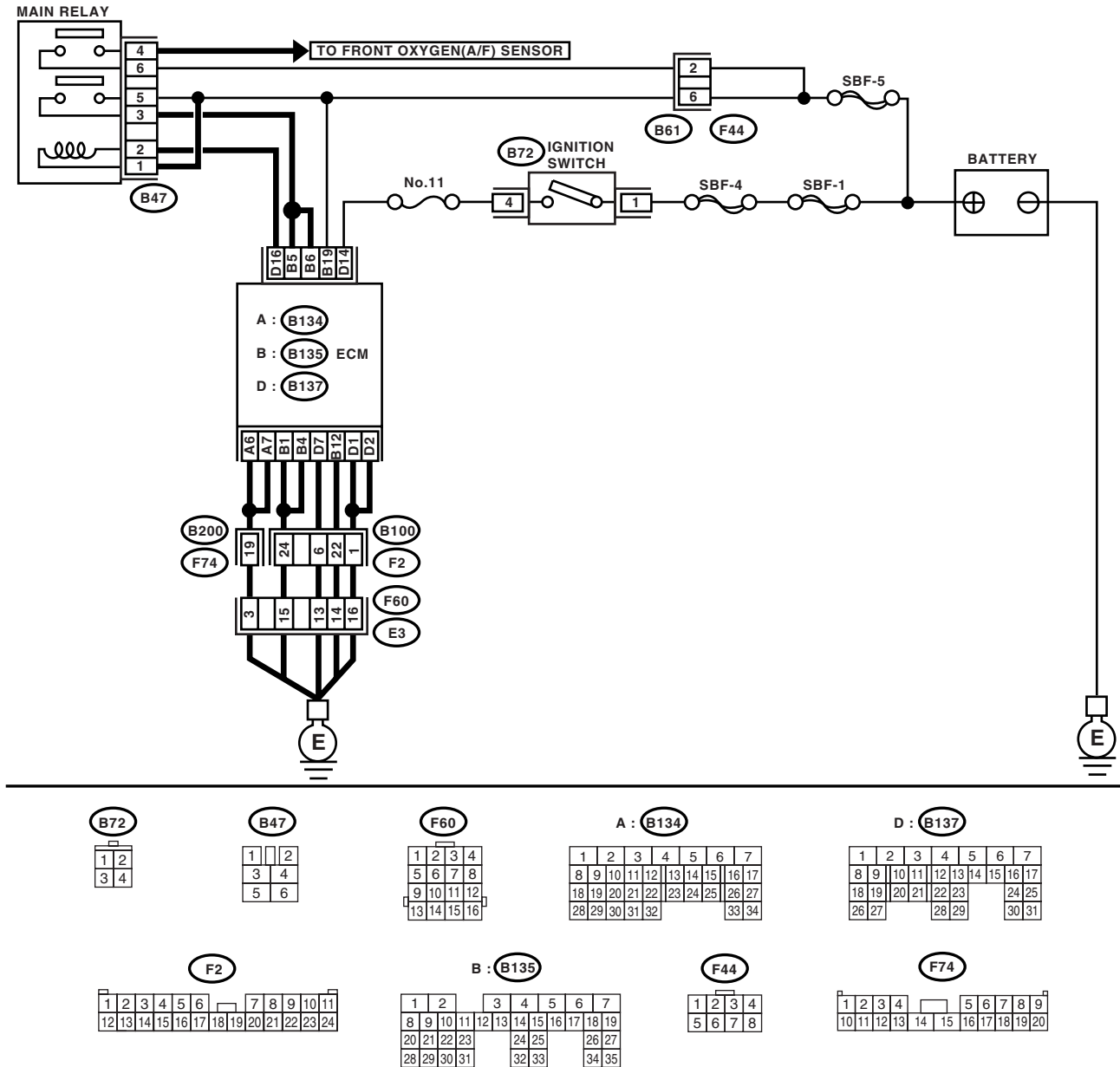
| Step   | Check                                    | Yes  | No  |
|--|--|--|---|
| <b>8 CHECK STARTER INTERLOCK RELAY.</b><br>1) Connect the battery to starter interlock relay terminals No. 26 and No. 24.<br>2) Measure the resistance between starter interlock relay terminals.<br><i><b>Terminals</b></i><br><i><b>No. 27 — No. 28:</b></i>   | Is the resistance less than 1 $\Omega$ ? | Go to step <b>9</b> .  | Replace the starter interlock relay.  |
| <b>9 CHECK GROUND CIRCUIT OF CLUTCH SWITCH.</b><br>1) Disconnect the connector from clutch switch.<br>2) Measure the resistance between clutch switch connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B106) No. 1 — Chassis ground:</b></i>                                | Is the resistance less than 5 $\Omega$ ? | Go to step <b>10</b> .   | Repair open circuit of ground cable.  |
| <b>10 CHECK CLUTCH SWITCH.</b><br>Measure the resistance between clutch switch terminals while depressing the clutch pedal.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i>   | Is the resistance less than 1 $\Omega$ ? | Go to step <b>11</b> .   | Replace the clutch switch. <Ref. to CL-36, Clutch Switch.>                        |
| <b>11 CHECK CLUTCH SWITCH CIRCUIT.</b><br>1) Connect the connector to clutch switch.<br>2) Measure the resistance between starter interlock relay connector and chassis ground while depressing the clutch pedal.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B225) No. 26 — Chassis ground:</b></i> | Is the resistance less than 1 $\Omega$ ? | Repair short circuit to ground in harness between starter interlock relay and starter motor. | Repair open circuit in harness between starter interlock relay and clutch switch. |

## C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

**WIRING DIAGRAM:**





# Diagnostics for Engine Starting Failure

## ENGINE (DIAGNOSTICS)

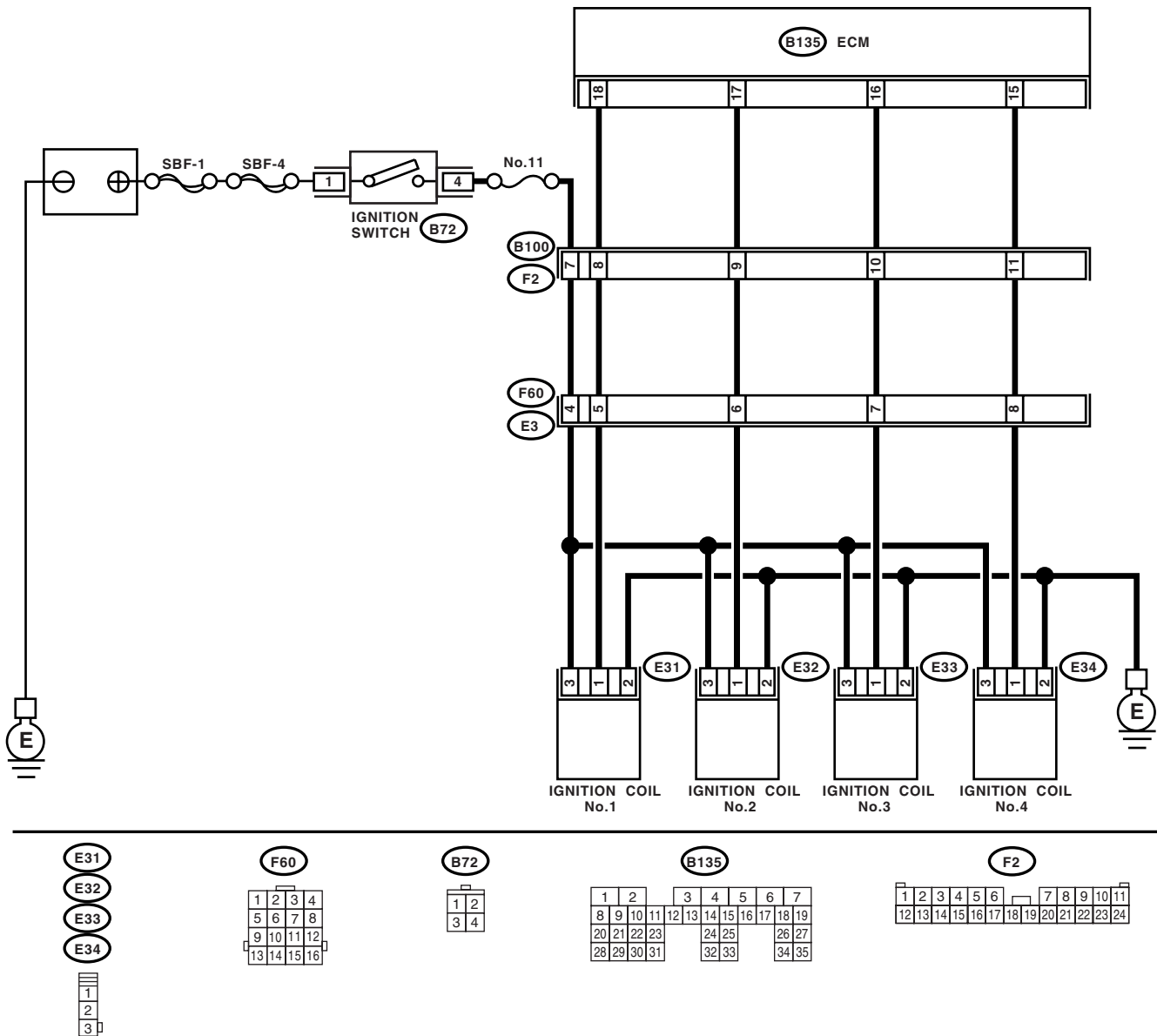
| Step  | Check                                     | Yes   | No  |
|---|---|---|---|
| <b>1 CHECK MAIN RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the main relay.<br>3) Connect the battery to main relay terminals No. 1 and No. 2.<br>4) Measure the resistance between main relay terminals.<br><i><b>Terminals</b></i><br><i><b>No. 3 — No. 5:</b></i><br><i><b>No. 4 — No. 6:</b></i>   | Is the resistance less than 10 $\Omega$ ? | Go to step 2.   | Replace the main relay.   |
| <b>2 CHECK GROUND CIRCUIT OF ECM.</b><br>1) Disconnect the connector from ECM.<br>2) Measure the resistance of harness between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 6 — Chassis ground:</b></i><br><i><b>(B134) No. 7 — Chassis ground:</b></i><br><i><b>(B135) No. 1 — Chassis ground:</b></i><br><i><b>(B135) No. 4 — Chassis ground:</b></i><br><i><b>(B135) No. 12 — Chassis ground:</b></i><br><i><b>(B137) No. 1 — Chassis ground:</b></i><br><i><b>(B137) No. 2 — Chassis ground:</b></i><br><i><b>(B137) No. 7 — Chassis ground:</b></i> | Is the resistance less than 5 $\Omega$ ?  | Go to step 3.   | Repair the open circuit in harness between ECM connector and engine grounding terminal.     |
| <b>3 CHECK INPUT VOLTAGE OF ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B135) No. 19 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10 V?            | Go to step 4.   | Repair the open or ground short circuit of power supply circuit.                            |
| <b>4 CHECK INPUT VOLTAGE OF MAIN RELAY.</b><br>Measure the voltage between main relay connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B47) No. 1 (+) — Chassis ground (-):</b></i><br><i><b>(B47) No. 5 (+) — Chassis ground (-):</b></i><br><i><b>(B47) No. 6 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10 V?            | Go to step 5.   | Repair the open or short circuit in harness of power supply circuit.                        |
| <b>5 CHECK INPUT VOLTAGE OF ECM.</b><br>1) Connect the main relay connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B135) No. 5 (+) — Chassis ground (-):</b></i><br><i><b>(B135) No. 6 (+) — Chassis ground (-):</b></i><br><i><b>(B137) No. 16 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 10 V?            | Check the ignition control system.<br><Ref. to EN(STI)(diag)-63, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.> | Repair the open or short circuit in harness between ECM connector and main relay connector. |

## D: IGNITION CONTROL SYSTEM

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

**WIRING DIAGRAM:**



## Diagnostics for Engine Starting Failure

### ENGINE (DIAGNOSTICS)

| Step  | Check                                    | Yes   | No   |
|---|--|---|--|
| <b>1 CHECK SPARK PLUG CONDITION.</b><br>1) Remove the spark plug. <Ref. to IG(STI)-4, INSTALLATION, Spark Plug.><br>2) Check the spark plug condition. <Ref. to IG(STI)-5, INSPECTION, Spark Plug.>   | Is the spark plug's status OK?           | Go to step 2.   | Replace the spark plug.  |
| <b>2 CHECK IGNITION SYSTEM FOR SPARKS.</b><br>1) Connect the spark plug to ignition coil.<br>2) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.><br>3) Contact the spark plug's thread portion on engine.<br>4) While opening the throttle valve fully, crank engine to check that spark occurs at each cylinder.  | Does spark occur at each cylinder?       | Check the fuel pump system. <Ref. to EN(STI)(diag)-66, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.> | Go to step 3.  |
| <b>3 CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL AND IGNITOR ASSEMBLY.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ignition coil and ignitor assembly.<br>3) Turn the ignition switch to ON.<br>4) Measure the power supply voltage between ignition coil and ignitor assembly connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i>(E31) No. 3 (+) — Engine ground (-):</i><br><i>(E32) No. 3 (+) — Engine ground (-):</i><br><i>(E33) No. 3 (+) — Engine ground (-):</i><br><i>(E34) No. 3 (+) — Engine ground (-):</i> | Is the voltage more than 10 V?           | Go to step 4.   | Repair the harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ignition coil and ignitor assembly, and ignition switch connector</li> <li>• Poor contact in coupling connectors</li> </ul> |
| <b>4 CHECK HARNESS OF IGNITION COIL AND IGNITOR ASSEMBLY GROUND CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between ignition coil and ignitor assembly connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i>(E31) No. 2 — Engine ground:</i><br><i>(E32) No. 2 — Engine ground:</i><br><i>(E33) No. 2 — Engine ground:</i><br><i>(E34) No. 2 — Engine ground:</i>  | Is the resistance less than 5 $\Omega$ ? | Go to step 5.   | Repair the harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ignition coil and ignitor assembly connector and engine grounding terminal</li> </ul>                                       |
| <b>5 CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from ignition coil and ignitor assembly.<br>4) Measure the resistance of harness between ECM and ignition coil and ignitor assembly connector.<br><i><b>Connector &amp; terminal</b></i><br><i>(B135) No. 15 — (E34) No. 1:</i><br><i>(B135) No. 16 — (E33) No. 1:</i><br><i>(B135) No. 17 — (E32) No. 1:</i><br><i>(B135) No. 18 — (E31) No. 1:</i>                              | Is the resistance less than 1 $\Omega$ ? | Go to step 6.   | Repair the harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and ignition coil and ignitor assembly connector</li> <li>• Poor contact in coupling connector</li> </ul>               |

# Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <p><b>6</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR.</b><br/>                     Measure the resistance of harness between ECM and engine ground.<br/> <i>Connector &amp; terminal:</i><br/>                     (B135) No. 15 — Engine ground:<br/>                     (B135) No. 16 — Engine ground:<br/>                     (B135) No. 17 — Engine ground:<br/>                     (B135) No. 18 — Engine ground:</p> | <p>Is the resistance more than 1 MΩ?</p>       | <p>Go to step 7.</p>                             | <p>Repair the ground short circuit in harness between ECM and ignition coil and ignitor assembly connector.</p> |
| <p><b>7</b></p> <p><b>CHECK POOR CONTACT.</b><br/>                     Check poor contact in ECM connector.</p>   | <p>Is there poor contact in ECM connector?</p> | <p>Repair the poor contact in ECM connector.</p> | <p>Replace the ignition coil and ignitor assembly.</p>  |

# Diagnostics for Engine Starting Failure

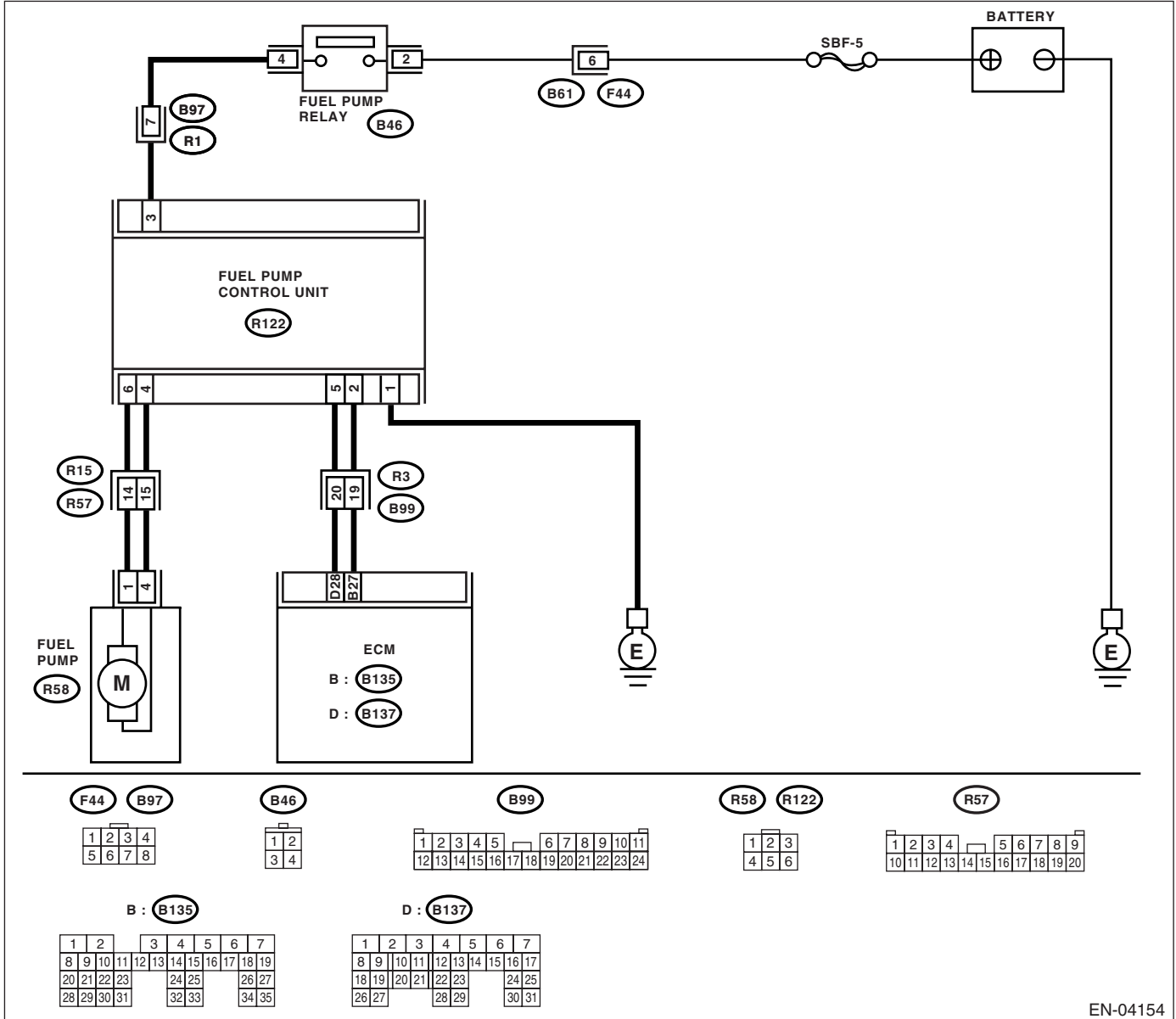
ENGINE (DIAGNOSTICS)

## E: FUEL PUMP CIRCUIT

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04154

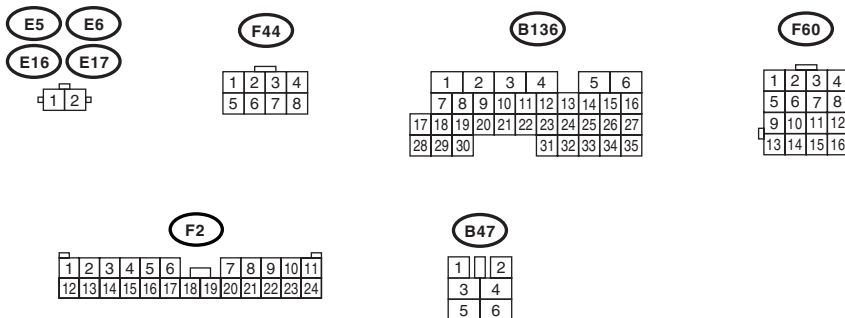
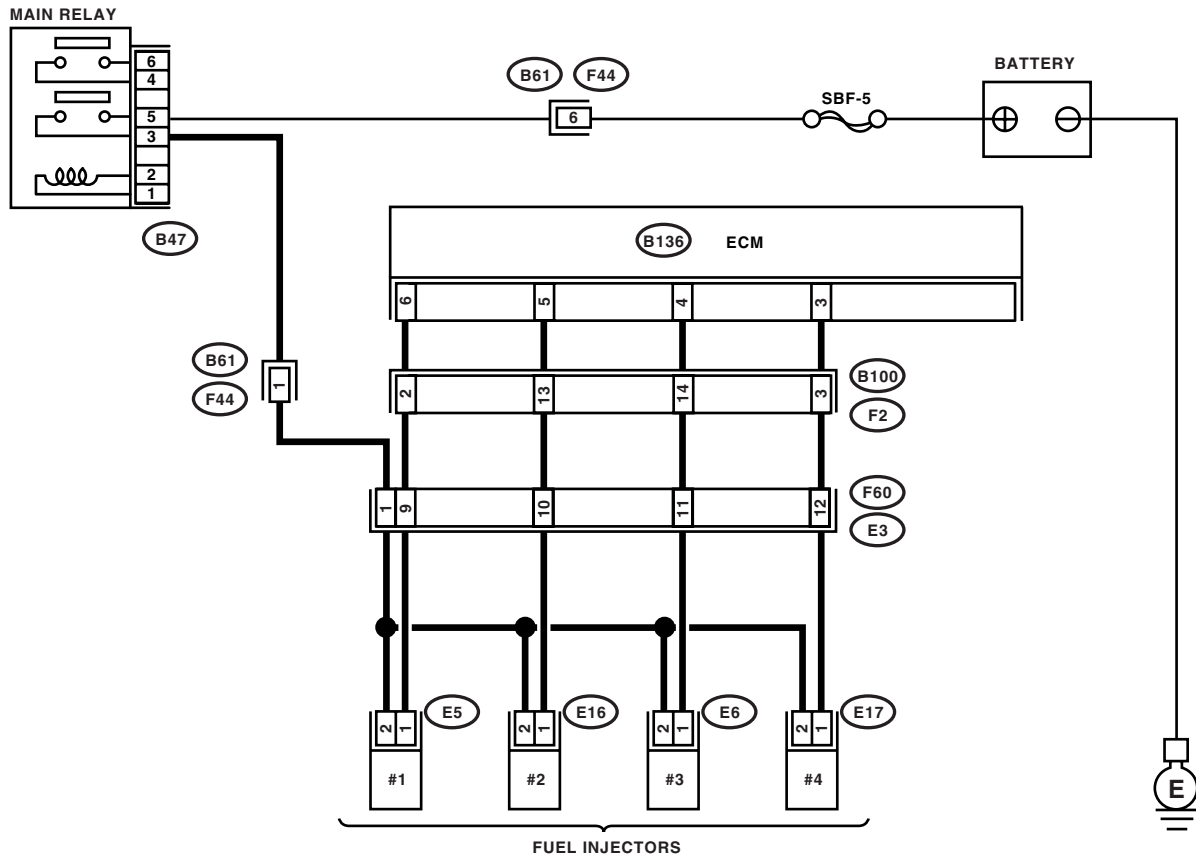
| Step   | Check  | Yes   | No   |
|--|--|---|--|
| <p><b>1</b></p> <p><b>CHECK OPERATING SOUND OF FUEL PUMP.</b></p> <p>Make sure that the fuel pump is in operation for 2 seconds when turning ignition switch to ON.</p> <p>NOTE:<br/>Fuel pump operation check can also be executed using the Subaru Select Monitor.<br/>For the procedure, refer to "Compulsory Valve Operation Check Mode". &lt;Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.&gt;</p> | <p>Does the fuel pump produce "operating" sound?</p> | <p>Check the fuel injector circuit.<br/>&lt;Ref. to EN(STI)(diag)-67, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.&gt;</p> | <p>Display the DTC.<br/>&lt;Ref. to EN(STI)(diag)-35, OPERATION, Read Diagnostic Trouble Code (DTC).&gt;</p> |

## F: FUEL INJECTOR CIRCUIT

### CAUTION:

- Inspect or repair the faulty parts only.
- After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostics for Engine Starting Failure

## ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <p><b>1</b></p> <p><b>CHECK OPERATION OF EACH FUEL INJECTOR.</b><br/>While cranking the engine, check that each fuel injector emits “operating” sound. Use a sound scope or attach a screwdriver to injector for this check.</p>   | Does the fuel injector emit “operating” sound? | Check the fuel pressure. <Ref. to ME(STI)-26, INSPECTION, Fuel Pressure.>           | Go to step 2.   |
| <p><b>2</b></p> <p><b>CHECK POWER SUPPLY TO EACH FUEL INJECTOR.</b><br/>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from fuel injector.<br/>3) Turn the ignition switch to ON.<br/>4) Measure the power supply voltage between the fuel injector terminal and engine ground.<br/><b>Connector &amp; terminal</b><br/><b>#1 (E5) No. 2 (+) — Engine ground (-):</b><br/><b>#2 (E16) No. 2 (+) — Engine ground (-):</b><br/><b>#3 (E6) No. 2 (+) — Engine ground (-):</b><br/><b>#4 (E17) No. 2 (+) — Engine ground (-):</b></p> | Is the voltage more than 10 V?                 | Go to step 3.   | <p>Repair the harness and connector.</p> <p>NOTE:<br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and fuel injector connector</li> <li>• Poor contact in main relay connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in fuel injector connector</li> </ul> |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.</b><br/>1) Disconnect the connector from ECM.<br/>2) Measure the resistance of harness between ECM and fuel injector connector.<br/><b>Connector &amp; terminal</b><br/><b>(B136) No. 6 — (E5) No. 1:</b><br/><b>(B136) No. 5 — (E16) No. 1:</b><br/><b>(B136) No. 4 — (E6) No. 1:</b><br/><b>(B136) No. 3 — (E6) No. 1:</b></p>  | Is the resistance less than 1 $\Omega$ ?       | Go to step 4.   | <p>Repair the harness and connector.</p> <p>NOTE:<br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and fuel injector connector</li> <li>• Poor contact in coupling connector</li> </ul>   |
| <p><b>4</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.</b><br/>Measure the resistance of harness between ECM and fuel injector connector.<br/><b>Connector &amp; terminal</b><br/><b>(B136) No. 6 — Chassis ground:</b><br/><b>(B136) No. 5 — Chassis ground:</b><br/><b>(B136) No. 4 — Chassis ground:</b><br/><b>(B136) No. 3 — Chassis ground:</b></p>  | Is the resistance less than 1 $\Omega$ ?       | Repair the ground short circuit in harness between ECM and fuel injector connector. | Go to step 5.   |
| <p><b>5</b></p> <p><b>CHECK EACH FUEL INJECTOR.</b><br/>1) Turn the ignition switch to OFF.<br/>2) Measure the resistance between each fuel injector terminals.<br/><b>Terminals</b><br/><b>No. 1 — No. 2:</b></p>   | Is the resistance 5 — 20 $\Omega$ ?            | Go to step 6.   | Replace the faulty fuel injector.   |
| <p><b>6</b></p> <p><b>CHECK POOR CONTACT.</b><br/>Check poor contact in ECM connector.</p>   | Is there poor contact in ECM connector?        | Repair the poor contact in ECM connector.   | Inspection using “General Diagnostic Table”. <Ref. to EN(STI)(diag)-371, INSPECTION, General Diagnostic Table.>   |

## List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

### 17. List of Diagnostic Trouble Code (DTC)

#### A: LIST

| DTC   | Item  | Index   |
|-------|---|---|
| P0011 | "A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 1) | <Ref. to EN(STI)(diag)-76, DTC P0011 "A" CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0021 | "A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 2) | <Ref. to EN(STI)(diag)-77, DTC P0021 "A" CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0030 | HO2S Heater Control Circuit (Bank 1 Sensor 1)                             | <Ref. to EN(STI)(diag)-78, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                             |
| P0031 | HO2S Heater Control Circuit Low (Bank 1 Sensor 1)                         | <Ref. to EN(STI)(diag)-80, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                         |
| P0032 | HO2S Heater Control Circuit High (Bank 1 Sensor 1)                        | <Ref. to EN(STI)(diag)-83, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                        |
| P0037 | HO2S Heater Control Circuit Low (Bank 1 Sensor 2)                         | <Ref. to EN(STI)(diag)-85, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                         |
| P0038 | HO2S Heater Control Circuit High (Bank 1 Sensor 2)                        | <Ref. to EN(STI)(diag)-88, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                        |
| P0068 | Map/Maf – Throttle Position Correlation                                   | <Ref. to EN(STI)(diag)-90, DTC P0068 MAP/MAF – THROTTLE POSITION CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                   |
| P0101 | Mass or Volume Air Flow Circuit Range/Performance                         | <Ref. to EN(STI)(diag)-92, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                         |
| P0102 | Mass or Volume Air Flow Circuit Low Input                                 | <Ref. to EN(STI)(diag)-94, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                 |
| P0103 | Mass or Volume Air Flow Circuit High Input                                | <Ref. to EN(STI)(diag)-97, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                |
| P0107 | Manifold Absolute Pressure/Barometric Pressure Circuit Low Input          | <Ref. to EN(STI)(diag)-99, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>          |
| P0108 | Manifold Absolute Pressure/Barometric Pressure Circuit High Input         | <Ref. to EN(STI)(diag)-101, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>        |
| P0111 | Intake Air Temperature Circuit Range/Performance                          | <Ref. to EN(STI)(diag)-103, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                         |
| P0112 | Intake Air Temperature Circuit Low Input                                  | <Ref. to EN(STI)(diag)-105, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                 |
| P0113 | Intake Air Temperature Circuit High Input                                 | <Ref. to EN(STI)(diag)-107, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                |
| P0117 | Engine Coolant Temperature Circuit Low Input                              | <Ref. to EN(STI)(diag)-110, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                             |
| P0118 | Engine Coolant Temperature Circuit High Input                             | <Ref. to EN(STI)(diag)-112, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |



## List of Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| DTC   | Item   | Index   |
|-------|--|---|
| P0122 | Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input                      | <Ref. to EN(STI)(diag)-115, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P0123 | Throttle/Pedal Position Sensor/Switch "A" Circuit High Input                     | <Ref. to EN(STI)(diag)-118, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P0125 | Insufficient Coolant Temperature for Closed Loop Fuel Control                    | <Ref. to EN(STI)(diag)-121, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P0126 | Insufficient Coolant Temperature for Stable Operation                            | <Ref. to EN(STI)(diag)-123, DTC P0126 INSUFFICIENT COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0128 | Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature) | <Ref. to EN(STI)(diag)-125, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0131 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 1)                      | <Ref. to EN(STI)(diag)-126, DTC P0131 O <sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P0132 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 1)                     | <Ref. to EN(STI)(diag)-128, DTC P0132 O <sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P0133 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 1)                    | <Ref. to EN(STI)(diag)-130, DTC P0133 O <sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P0134 | O <sub>2</sub> Sensor Circuit No Activity Detected (Bank 1 Sensor 1)             | <Ref. to EN(STI)(diag)-132, DTC P0134 O <sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>             |
| P0137 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 2)                      | <Ref. to EN(STI)(diag)-134, DTC P0137 O <sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P0138 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 2)                     | <Ref. to EN(STI)(diag)-137, DTC P0138 O <sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P0139 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 2)                    | <Ref. to EN(STI)(diag)-140, DTC P0139 O <sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P0171 | System too Lean (Bank 1)   | <Ref. to EN(STI)(diag)-142, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0172 | System too Rich (Bank 1)   | <Ref. to EN(STI)(diag)-142, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0181 | Fuel Temperature Sensor "A" Circuit Range/Performance                            | <Ref. to EN(STI)(diag)-145, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0182 | Fuel Temperature Sensor "A" Circuit Low Input                                    | <Ref. to EN(STI)(diag)-147, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                    |
| P0183 | Fuel Temperature Sensor "A" Circuit High Input                                   | <Ref. to EN(STI)(diag)-149, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                   |
| P0222 | Throttle/Pedal Position Sensor/Switch "B" Circuit Low Input                      | <Ref. to EN(STI)(diag)-152, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P0223 | Throttle/Pedal Position Sensor/Switch "B" Circuit High Input                     | <Ref. to EN(STI)(diag)-155, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |

# List of Diagnostic Trouble Code (DTC)

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| DTC   | Item  | Index  |
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| P0230 | Fuel Pump Primary Circuit   | <Ref. to EN(STI)(diag)-159, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0244 | Turbo/Super Charger Wastegate Solenoid "A" Range/Performance          | <Ref. to EN(STI)(diag)-162, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>          |
| P0245 | Turbo/Super Charger Wastegate Solenoid "A" Low                        | <Ref. to EN(STI)(diag)-164, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                        |
| P0246 | Turbo/Super Charger Wastegate Solenoid "A" High                       | <Ref. to EN(STI)(diag)-166, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                       |
| P0301 | Cylinder 1 misfire detected   | <Ref. to EN(STI)(diag)-168, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0302 | Cylinder 2 misfire detected   | <Ref. to EN(STI)(diag)-168, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0303 | Cylinder 3 misfire detected   | <Ref. to EN(STI)(diag)-168, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0304 | Cylinder 4 misfire detected   | <Ref. to EN(STI)(diag)-168, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0327 | Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)            | <Ref. to EN(STI)(diag)-173, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>            |
| P0328 | Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)           | <Ref. to EN(STI)(diag)-175, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>           |
| P0335 | Crankshaft Position Sensor "A" Circuit                                | <Ref. to EN(STI)(diag)-177, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                |
| P0336 | Crankshaft Position Sensor "A" Circuit Range/Performance              | <Ref. to EN(STI)(diag)-179, DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>              |
| P0340 | Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)        | <Ref. to EN(STI)(diag)-181, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>        |
| P0345 | Camshaft Position Sensor "A" Circuit (Bank 2)                         | <Ref. to EN(STI)(diag)-183, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                         |
| P0420 | Catalyst System Efficiency Below Threshold (Bank 1)                   | <Ref. to EN(STI)(diag)-185, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                   |
| P0442 | Evaporative Emission Control System Leak Detected (small leak)        | <Ref. to EN(STI)(diag)-189, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>        |
| P0447 | Evaporative Emission Control System Vent Control Circuit Open         | <Ref. to EN(STI)(diag)-193, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>         |
| P0448 | Evaporative Emission Control System Vent Control Circuit Shorted      | <Ref. to EN(STI)(diag)-196, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>      |
| P0451 | Evaporative Emission Control System Pressure Sensor Range/Performance | <Ref. to EN(STI)(diag)-198, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0452 | Evaporative Emission Control System Pressure Sensor Low Input         | <Ref. to EN(STI)(diag)-200, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>         |

## List of Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| DTC   | Item   | Index   |
|-------|--|---|
| P0453 | Evaporative Emission Control System Pressure Sensor High Input         | <Ref. to EN(STI)(diag)-203, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>         |
| P0456 | Evaporative Emission Control System Leak Detected (very small leak)    | <Ref. to EN(STI)(diag)-206, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>    |
| P0457 | Evaporative Emission Control System Leak Detected (fuel cap loose/off) | <Ref. to EN(STI)(diag)-210, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0458 | Evaporative Emission Control System Purge Control Valve Circuit Low    | <Ref. to EN(STI)(diag)-214, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>    |
| P0459 | Evaporative Emission Control System Purge Control Valve Circuit High   | <Ref. to EN(STI)(diag)-216, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0461 | Fuel Level Sensor Circuit Range/Performance                            | <Ref. to EN(STI)(diag)-218, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0462 | Fuel Level Sensor Circuit Low Input                                    | <Ref. to EN(STI)(diag)-221, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                    |
| P0463 | Fuel Level Sensor Circuit High Input                                   | <Ref. to EN(STI)(diag)-225, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                   |
| P0464 | Fuel Level Sensor Circuit Intermittent                                 | <Ref. to EN(STI)(diag)-229, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                 |
| P0483 | Cooling Fan Rationality Check  | <Ref. to EN(STI)(diag)-232, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0502 | Vehicle Speed Sensor Circuit Low Input                                 | <Ref. to EN(STI)(diag)-235, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                 |
| P0503 | Vehicle Speed Sensor Intermittent/Erratic/High                         | <Ref. to EN(STI)(diag)-237, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                         |
| P0506 | Idle Control System RPM Lower Than Expected                            | <Ref. to EN(STI)(diag)-239, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0507 | Idle Control System RPM Higher Than Expected                           | <Ref. to EN(STI)(diag)-242, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                           |
| P0512 | Starter Request Circuit  | <Ref. to EN(STI)(diag)-245, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0513 | Incorrect Immobilizer Key  | <Ref. to IM(diag)-21, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0519 | Idle Control System Malfunction (Fail-Safe)                            | <Ref. to EN(STI)(diag)-248, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0604 | Internal Control Module Random Access Memory (RAM) Error               | <Ref. to EN(STI)(diag)-251, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>               |
| P0605 | Internal Control Module Read Only Memory (ROM) Error                   | <Ref. to EN(STI)(diag)-253, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                   |
| P0607 | Control Module Performance   | <Ref. to EN(STI)(diag)-254, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P0638 | Throttle Actuator Control Range/Performance (Bank 1)                   | <Ref. to EN(STI)(diag)-257, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                   |

# List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| DTC   | Item   | Index   |
|-------|--|---|
| P0691 | Cooling Fan 1 Control Circuit Low                                      | <Ref. to EN(STI)(diag)-258, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                      |
| P0692 | Cooling Fan 1 Control Circuit High                                     | <Ref. to EN(STI)(diag)-261, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                     |
| P0851 | Neutral Switch Input Circuit Low                                       | <Ref. to EN(STI)(diag)-264, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                       |
| P0852 | Neutral Switch Input Circuit High                                      | <Ref. to EN(STI)(diag)-266, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                      |
| P1152 | O <sub>2</sub> Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)  | <Ref. to EN(STI)(diag)-268, DTC P1152 O <sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1153 | O <sub>2</sub> Sensor Circuit Range/Performance (High) (Bank1 Sensor1) | <Ref. to EN(STI)(diag)-270, DTC P1153 O <sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P1160 | Return Spring Failure  | <Ref. to EN(STI)(diag)-272, DTC P1160 RETURN SPRING FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1400 | Fuel Tank Pressure Control Solenoid Valve Circuit Low                  | <Ref. to EN(STI)(diag)-273, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                  |
| P1420 | Fuel Tank Pressure Control Sol. Valve Circuit High                     | <Ref. to EN(STI)(diag)-276, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P1443 | Vent Control Solenoid Valve Function Problem                           | <Ref. to EN(STI)(diag)-277, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                           |
| P1446 | Fuel Tank Sensor Control Valve Circuit Low                             | <Ref. to EN(STI)(diag)-280, DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                             |
| P1447 | Fuel Tank Sensor Control Valve Circuit High                            | <Ref. to EN(STI)(diag)-283, DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P1448 | Fuel Tank Sensor Control Valve Range/Performance                       | <Ref. to EN(STI)(diag)-285, DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                       |
| P1491 | Positive Crankcase Ventilation (Blow-by) Function Problem              | <Ref. to EN(STI)(diag)-287, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>              |
| P1518 | Starter Switch Circuit Low Input                                       | <Ref. to EN(STI)(diag)-289, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                       |
| P1560 | Back-Up Voltage Circuit Malfunction                                    | <Ref. to EN(STI)(diag)-292, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                    |
| P1570 | ANTENNA  | <Ref. to IM(diag)-22, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1571 | Reference Code Incompatibility   | <Ref. to IM(diag)-15, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| P1572 | EGI Immobilizer Communication (Except Antenna Circuit)                 | <Ref. to IM(diag)-16, DTC P1572 EGI IMMOBILIZER COMMUNICATION (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                       |
| P1574 | Key Immobilizer Communication  | <Ref. to IM(diag)-20, DTC P1574 KEY IMMOBILIZER COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1576 | EGI Control Module EEPROM  | <Ref. to IM(diag)-21, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1577 | IMM Control Module EEPROM  | <Ref. to IM(diag)-21, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |

## List of Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| DTC   | Item  | Index  |
|-------|---|--|
| P2004 | Intake Manifold Runner Control Stuck Open (Bank 1)                    | <Ref. to EN(STI)(diag)-295, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P2005 | Intake Manifold Runner Control Stuck Open (Bank 2)                    | <Ref. to EN(STI)(diag)-295, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P2006 | Intake Manifold Runner Control Stuck Closed (Bank 1)                  | <Ref. to EN(STI)(diag)-296, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                  |
| P2007 | Intake Manifold Runner Control Stuck Closed (Bank 2)                  | <Ref. to EN(STI)(diag)-296, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                   |
| P2008 | Intake Manifold Runner Control Circuit / Open (Bank 1)                | <Ref. to EN(STI)(diag)-297, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                |
| P2009 | Intake Manifold Runner Control Circuit Low (Bank 1)                   | <Ref. to EN(STI)(diag)-299, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                   |
| P2011 | Intake Manifold Runner Control Circuit / Open (Bank 2)                | <Ref. to EN(STI)(diag)-301, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                |
| P2012 | Intake Manifold Runner Control Circuit Low (Bank 2)                   | <Ref. to EN(STI)(diag)-303, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                   |
| P2016 | Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank1)   | <Ref. to EN(STI)(diag)-305, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P2017 | Intake Manifold Runner Position Sensor / Switch Circuit High (Bank1)  | <Ref. to EN(STI)(diag)-308, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P2021 | Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 2)  | <Ref. to EN(STI)(diag)-310, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P2022 | Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2) | <Ref. to EN(STI)(diag)-313, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P2088 | OCV Solenoid Valve Signal A Circuit Open (Bank 1)                     | <Ref. to EN(STI)(diag)-315, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P2089 | OCV Solenoid Valve Signal A Circuit Short (Bank 1)                    | <Ref. to EN(STI)(diag)-317, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P2092 | OCV Solenoid Valve Signal A Circuit Open (Bank 2)                     | <Ref. to EN(STI)(diag)-319, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P2093 | OCV Solenoid Valve Signal A Circuit Short (Bank 2)                    | <Ref. to EN(STI)(diag)-321, DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| P2096 | Post Catalyst Fuel Trim System Too Lean Bank 1                        | <Ref. to EN(STI)(diag)-323, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                        |
| P2097 | Post Catalyst Fuel Trim System Too Rich Bank 1                        | <Ref. to EN(STI)(diag)-329, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                        |
| P2101 | Throttle Actuator Control Motor Circuit Range/Performance             | <Ref. to EN(STI)(diag)-335, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>             |

# List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| DTC   | Item  | Index  |
|-------|---|--|
| P2102 | Throttle Actuator Control Motor Circuit Low                       | <Ref. to EN(STI)(diag)-342, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                       |
| P2103 | Throttle Actuator Control Motor Circuit High                      | <Ref. to EN(STI)(diag)-345, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P2109 | Throttle/Pedal Position Sensor A Minimum Stop Performance         | <Ref. to EN(STI)(diag)-347, DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>         |
| P2122 | Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input       | <Ref. to EN(STI)(diag)-348, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>       |
| P2123 | Throttle/Pedal Position Sensor/Switch "D" Circuit High Input      | <Ref. to EN(STI)(diag)-351, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>      |
| P2127 | Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input       | <Ref. to EN(STI)(diag)-354, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>       |
| P2128 | Throttle/Pedal Position Sensor/Switch "E" Circuit High Input      | <Ref. to EN(STI)(diag)-357, DTC P2128 THROTTLE/PEDAL POSITION SENSOR / SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>    |
| P2135 | Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Rationality | <Ref. to EN(STI)(diag)-360, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE RATIONALITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P2138 | Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Rationality | <Ref. to EN(STI)(diag)-365, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE RATIONALITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P2227 | Barometric Pressure Circuit Range/Performance                     | <Ref. to EN(STI)(diag)-369, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                     |
| P2228 | Barometric Pressure Circuit Low Input                             | <Ref. to EN(STI)(diag)-369, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                             |
| P2229 | Barometric Pressure Circuit High Input                            | <Ref. to EN(STI)(diag)-370, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

### 18. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

#### A: DTC P0011 “A” CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

**DTC DETECTING CONDITION:**

Immediately at fault recognition

**TROUBLE SYMPTOM:**

- Engine stalls.
- Erroneous idling

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, Inspection Mode.>.

| Step   | Check   | Yes  | No   |
|--|---|--|--|
| <p><b>1</b></p> <p><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b></p>  | <p>Is any other DTC displayed?</p>  | <p>Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. &lt;Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).&gt;</p>  | <p>Go to step 2.</p>   |
| <p><b>2</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Start the engine and let it idle.<br/>2) Inspect the AVCS operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor and general scan tool.</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the AVCS operating angle more than approx. 0°C and the oil flow control solenoid valve duty output more than approx. 10%?</p> | <p>Inspect the following items and repair or replace if necessary.</p> <ul style="list-style-type: none"> <li>• Oil pipe (clog)</li> <li>• Oil flow control solenoid valve (clog or contamination in oil passage, settling at spring, stuck at valve)</li> <li>• Intake camshaft (sludge, damage at camshaft)</li> <li>• Timing belt (timing mark aligning)</li> </ul> | <p>A temporary malfunction. Conduct the following to clean the oil passage.</p> <p>Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil.</p> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## **B: DTC P0021 “A” CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)**

### **DTC DETECTING CONDITION:**

Immediately at fault recognition

### **TROUBLE SYMPTOM:**

- Engine stalls.
- Erroneous idling

### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <b>1</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?  | Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>  | Go to step 2.   |
| <b>2</b><br><b>CHECK CURRENT DATA.</b><br>1) Start the engine and let it idle.<br>2) Inspect the AVCS operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor and general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the AVCS operating angle more than approx. 0°C and the oil flow control solenoid valve duty output more than approx. 10%? | Inspect the following items and repair or replace if necessary. <ul style="list-style-type: none"> <li>• Engine oil (amount, contamination)</li> <li>• Oil pipe (clog)</li> <li>• Oil flow control solenoid valve (clog or contamination in oil passage, settling at spring, stuck at valve)</li> <li>• Intake camshaft (sludge, damage at camshaft)</li> <li>• Timing belt (timing mark aligning)</li> </ul> | A temporary malfunction. Conduct the following to clean the oil passage.<br>Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## C: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

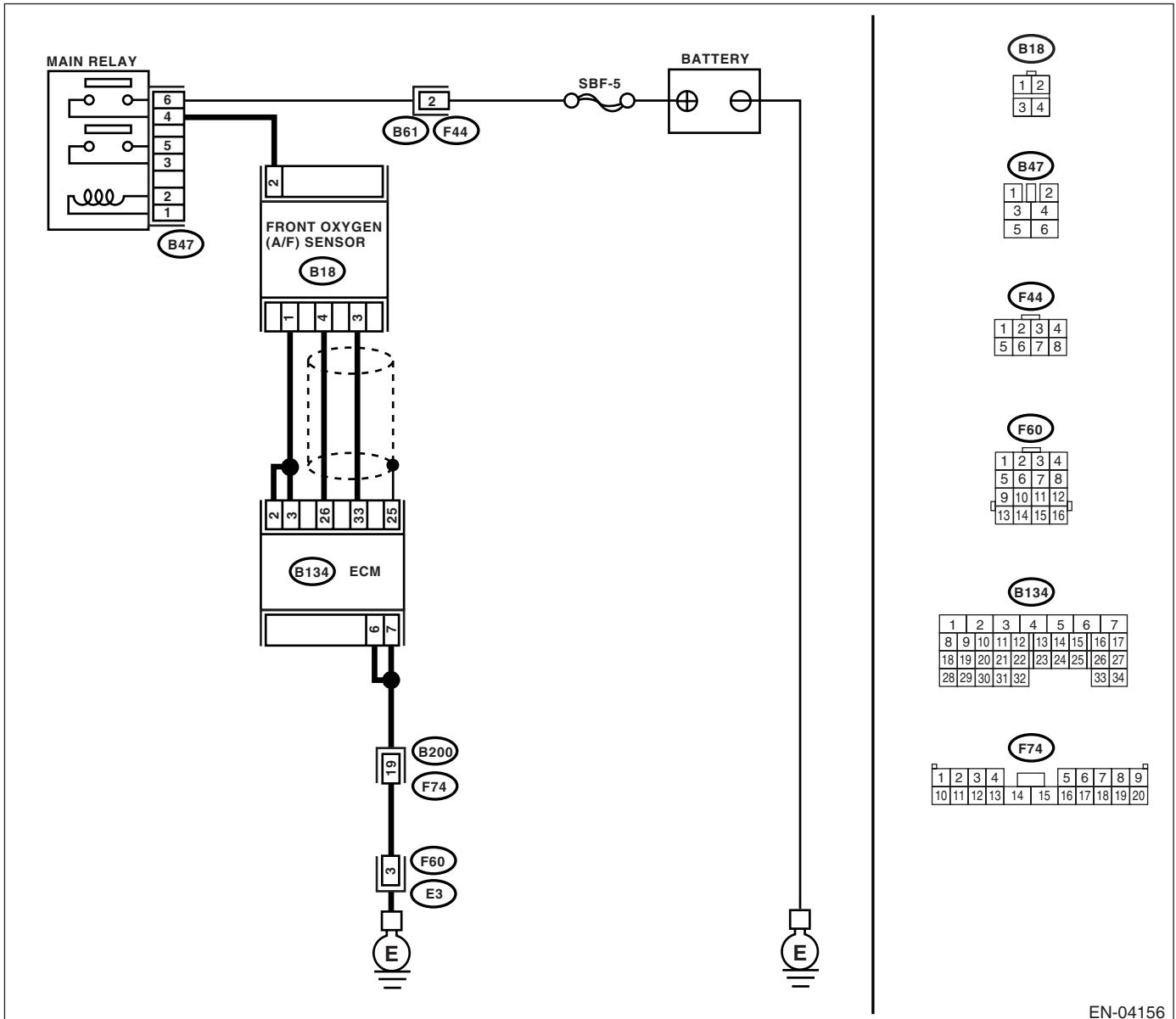
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-11, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04156

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <b>1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Start the engine and warm-up engine.<br>2) Turn the ignition switch to OFF.<br>3) Disconnect the connectors from ECM and front oxygen (A/F) sensor.<br>4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><br><i>Connector &amp; terminal</i><br>(B134) No. 2 — (B18) No. 1:<br>(B134) No. 3 — (B18) No. 1: | Is the resistance less than 1 $\Omega$ ?                             | Go to step 2.  | Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector. |
| <b>2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><br><i>Connector &amp; terminal</i><br>(B134) No. 26 — (B18) No. 4:<br>(B134) No. 33 — (B18) No. 3:  | Is the resistance less than 1 $\Omega$ ?                             | Go to step 3.  | Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector. |
| <b>3 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>Measure the resistance of harness between main relay and front oxygen (A/F) sensor connector.<br><br><i>Connector &amp; terminal</i><br>(B47) No. 4 — (B18) No. 2:   | Is the resistance less than 1 $\Omega$ ?                             | Go to step 4.  | Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector. |
| <b>4 CHECK FRONT OXYGEN (A/F) SENSOR.</b><br>Measure the resistance between front oxygen (A/F) sensor connector terminals.<br><br><i>Terminals</i><br>No. 2 — No. 1:  | Is the resistance less than 5 $\Omega$ ?                             | Go to step 5.  | Replace the front oxygen (A/F) sensor. <Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.> |
| <b>5 CHECK POOR CONTACT.</b><br>Check the poor contact in ECM or front oxygen (A/F) sensor connector.   | Is there poor contact in ECM or front oxygen (A/F) sensor connector? | Repair the poor contact in ECM or front oxygen (A/F) sensor connector. | Replace the front oxygen (A/F) sensor. <Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## D: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

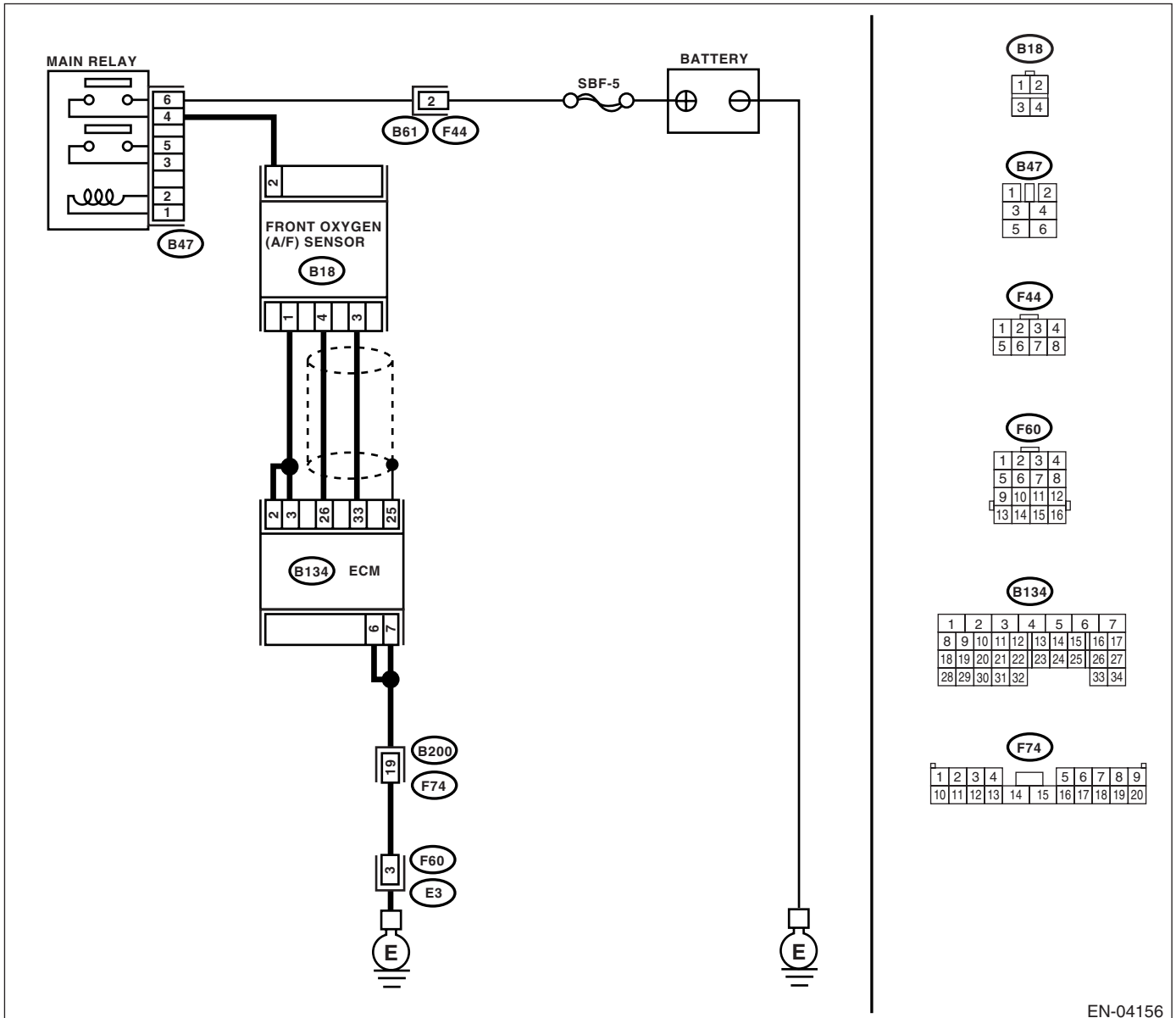
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-13, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04156

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No   |
|--|--|---|--|
| <p><b>1</b></p> <p><b>CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.</b><br/>                     1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from front oxygen (A/F) sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground.<br/> <b>Connector &amp; terminal</b><br/> <b>(B18) No. 2 (+) — Engine ground (-):</b></p>  | Is the voltage more than 10 V?   | Go to step 2.   | Repair the power supply line.<br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between main relay and front oxygen (A/F) sensor connector<br>• Poor contact in main relay connector<br>• Malfunction in main relay |
| <p><b>2</b></p> <p><b>CHECK GROUND CIRCUIT OF ECM.</b><br/>                     Measure the resistance of harness between ECM connector and chassis ground.<br/> <b>Connector &amp; terminal</b><br/> <b>(B134) No. 6 — Chassis ground:</b><br/> <b>(B134) No. 7 — Chassis ground:</b></p>   | Is the resistance less than 5 $\Omega$ ?   | Go to step 3.   | Repair the harness and connector.<br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ECM and engine ground cable<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector                  |
| <p><b>3</b></p> <p><b>CHECK CURRENT DATA.</b><br/>                     1) Start the engine.<br/>                     2) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or general scan tool.<br/>                     NOTE:<br/>                     • Subaru Select Monitor<br/>                     For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;<br/>                     • General scan tool<br/>                     For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | Is the current more than 0.2 A?  | Repair the poor contact in connector.<br>NOTE:<br>In this case, repair the following:<br>• Poor contact in front oxygen (A/F) sensor connector<br>• Poor contact in ECM connector | Go to step 4.  |
| <p><b>4</b></p> <p><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br/>                     1) Start and idle the engine.<br/>                     2) Measure the voltage between ECM connector and chassis ground.<br/> <b>Connector &amp; terminal</b><br/> <b>(B134) No. 2 (+) — Chassis ground (-):</b><br/> <b>(B134) No. 3 (+) — Chassis ground (-):</b></p>  | Is the voltage less than 1 V?  | Go to step 6.   | Go to step 5.  |
| <p><b>5</b></p> <p><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br/>                     Measure the voltage between ECM connector and chassis ground.<br/> <b>Connector &amp; terminal</b><br/> <b>(B134) No. 2 (+) — Chassis ground (-):</b><br/> <b>(B134) No. 3 (+) — Chassis ground (-):</b></p>  | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change? | Repair the poor contact in ECM connector.   | Go to step 6.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No   |
|--|--|---|--|
| <p><b>6</b>      <b>CHECK FRONT OXYGEN (A/F) SENSOR.</b><br/>           1) Turn the ignition switch to OFF.<br/>           2) Measure the resistance between front oxygen (A/F) sensor connector terminals.<br/> <b>Terminals</b><br/> <b>No. 2 — No. 1:</b></p> | <p>Is the resistance less than 10 <math>\Omega</math>?</p> | <p>Repair the harness and connector.<br/> <b>NOTE:</b><br/>           In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector</li> <li>• Poor contact in front oxygen (A/F) sensor connector</li> <li>• Poor contact in ECM connector</li> </ul> | <p>Replace the front oxygen (A/F) sensor. &lt;Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.&gt;</p> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## E: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

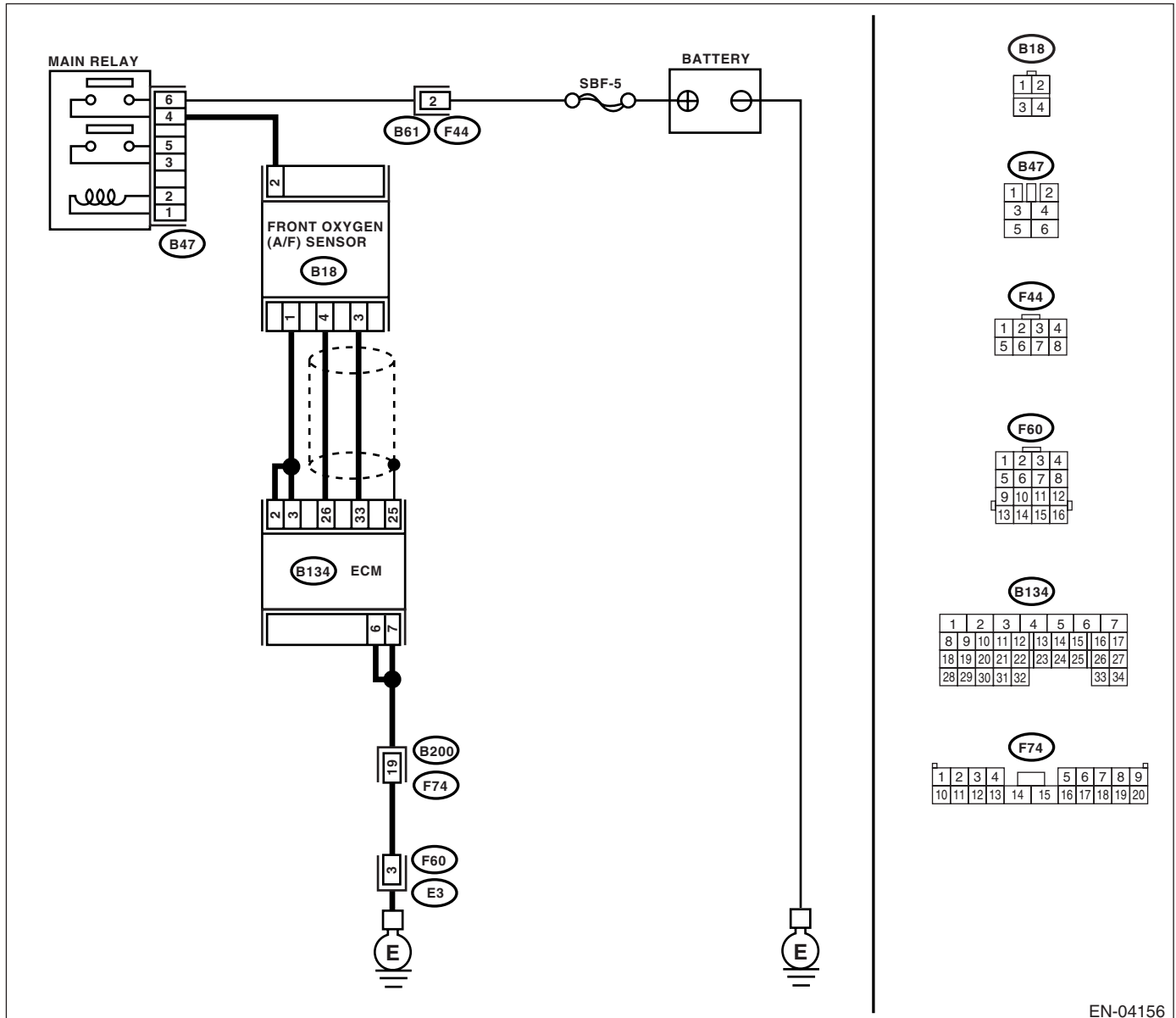
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-15, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04156

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No                    |
|---|--|--|-----------------------|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B134) No. 2 (+) — Chassis ground (-):</i><br><i>(B134) No. 3 (+) — Chassis ground (-):</i>   | Is the voltage more than 8 V?  | Go to step 3.  | Go to step 2.         |
| <b>2</b><br><b>CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.</b><br>1) Turn the ignition switch to OFF.<br>2) Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>3) Turn the ignition switch to ON.<br>4) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the general scan tool.<br><b>NOTE:</b><br><ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.><br><ul style="list-style-type: none"> <li>• General scan tool</li> </ul> For detailed operation procedure, refer to the General Scan Tool Instruction Manual. | Is the current more than 2.3 A?  | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>                              | Finish the diagnosis. |
| <b>3</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B134) No. 2 (+) — Chassis ground (-):</i><br><i>(B134) No. 3 (+) — Chassis ground (-):</i>  | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change? | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. | Finish the diagnosis. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## F: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

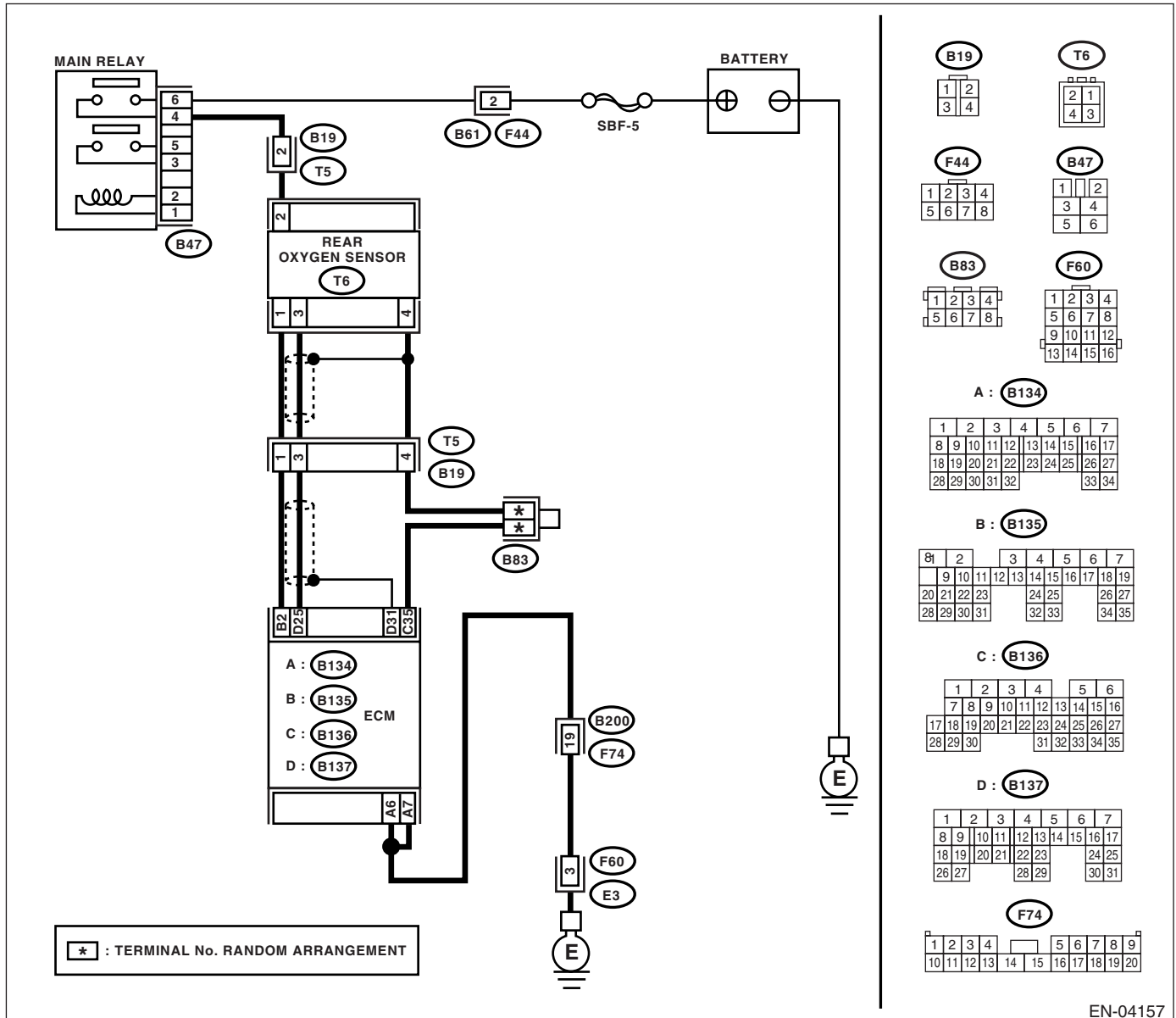
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-17, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04157



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <b>1 CHECK GROUND CIRCUIT OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 6 — Chassis ground:</b><br><b>(B134) No. 7 — Chassis ground:</b>   | Is the resistance less than 5 $\Omega$ ?   | Go to step 2.   | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and engine ground cable</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>2 CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br><ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.><br><ul style="list-style-type: none"> <li>• General scan tool</li> </ul> For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the current more than 0.2 A?  | Repair the connector.<br><br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in rear oxygen sensor connecting harness connector</li> <li>• Poor contact in ECM connector</li> </ul> | Go to step 3.   |
| <b>3 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Start and idle the engine.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 2 (+) — Chassis ground (-):</b>  | Is the voltage less than 1 V?  | Go to step 6.   | Go to step 4.   |
| <b>4 CHECK OUTPUT SIGNAL FROM ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 2 (+) — Chassis ground (-):</b>  | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change? | Repair the poor contact in ECM connector.   | Go to step 5.   |
| <b>5 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from rear oxygen sensor.<br>3) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 2 (+) — Chassis ground (-):</b>  | Is the voltage less than 1 V?  | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>   | Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No   |
|--|--|---|--|
| <p><b>6</b></p> <p><b>CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from rear oxygen sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between rear oxygen sensor connector and engine ground or chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T6) No. 2 (+) — Chassis ground (-):</b></p> | <p>Is the voltage more than 10 V?</p>                      | <p>Go to step 7.</p>  | <p>Repair the power supply line.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and rear oxygen sensor connector</li> <li>• Poor contact in main relay connector</li> <li>• Poor contact in coupling connector</li> <li>• Malfunction in main relay</li> </ul> |
| <p><b>7</b></p> <p><b>CHECK REAR OXYGEN SENSOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Measure the resistance between rear oxygen sensor connector terminals.</p> <p><b>Terminals</b><br/> <b>No. 1 — No. 2:</b></p>   | <p>Is the resistance less than 30 <math>\Omega</math>?</p> | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> | <p>Replace the rear oxygen sensor.<br/>                     &lt;Ref. to FU(STI)-38, Rear Oxygen Sensor.&gt;</p>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## G: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

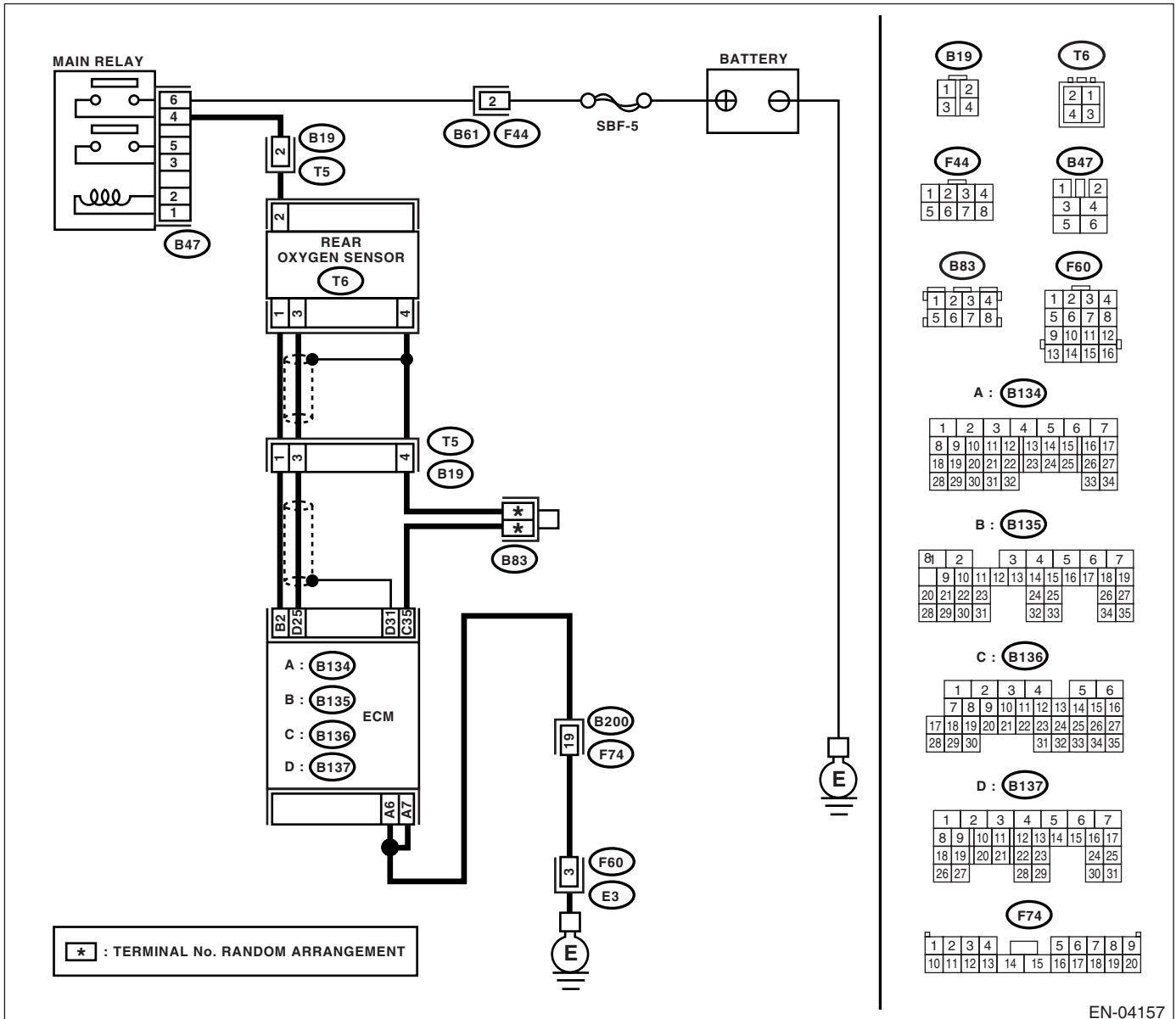
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-19, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04157

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                   | Yes  | No                    |
|--|---|--|-----------------------|
| <b>1</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 2 (+) — Chassis ground (-):</b>  | Is the voltage more than 8 V?           | Go to step 2.  | Go to step 3.         |
| <b>2</b><br><b>CHECK CURRENT DATA.</b><br>1) Repair the battery short circuit in harness between ECM and rear oxygen sensor connector.<br>2) Turn the ignition switch to ON.<br>3) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or the general scan tool.<br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedure, refer to the General Scan Tool Instruction Manual. | Is the current more than 7 A?           | Replace the ECM.<br><Ref. to FU(STI)-39, Engine Control Module (ECM).> | Finish the diagnosis. |
| <b>3</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.   | Is there poor contact in ECM connector? | Repair the poor contact in ECM connector.                              | Finish the diagnosis. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## H: DTC P0068 MAP/MAF – THROTTLE POSITION CORRELATION

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-21, DTC P0068 MAP/MAF – THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

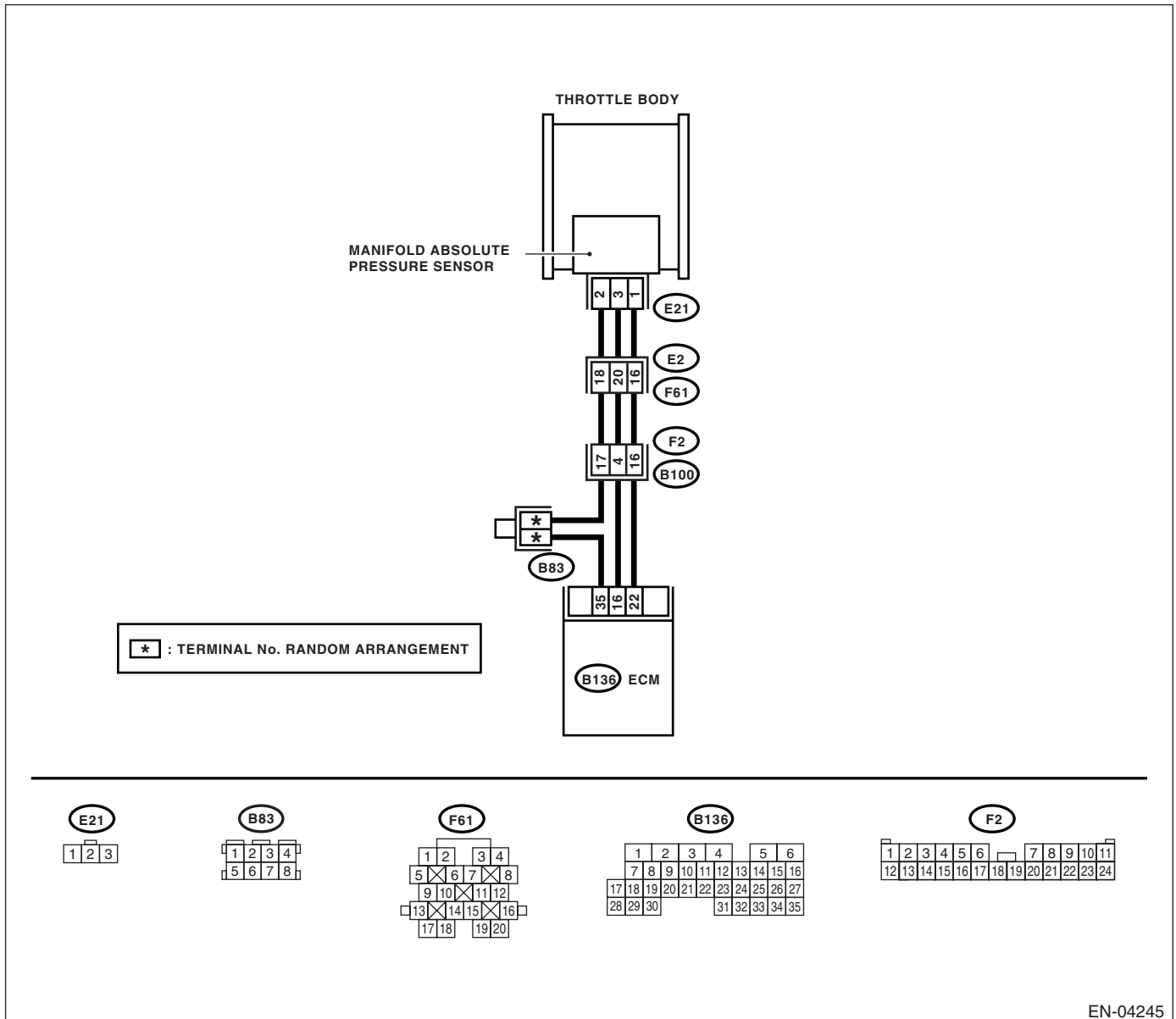
### TROUBLE SYMPTOM:

Failure of engine to start

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04245

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <b>1</b><br><b>CHECK IDLE SWITCH SIGNAL.</b><br>1) Turn the ignition switch to ON.<br>2) Operate the LED operation mode for engine using Subaru Select Monitor.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE".<br><Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> | Does the LED of {Idle Switch Signal} come on?                                   | Go to step 2.   | Check the throttle position sensor circuit. <Ref. to EN(STI)(diag)-360, DTC P2135 THROTTLE/ PEDAL POSITION SENSOR/ SWITCH "A"/"B" VOLTAGE RATIO-NALITY, Diagnos-tic Procedure with Diagnostic Trou-ble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0068. |
| <b>2</b><br><b>CHECK FOR ANY OTHER DTC ON DIS-PLAY.</b>  | Is any other DTC displayed?   | Inspect the rele-vant DTC. "List of Diagnostic Trou-ble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0068. | Go to step 3.   |
| <b>3</b><br><b>CHECK CONDITION OF MANIFOLD ABSO-LUTE PRESSURE SENSOR.</b>  | Is the manifold absolute pres-sure sensor installation bolt tightened securely? | Go to step 4.   | Tighten the mani-fold absolute pres-sure sensor installation bolt securely.   |
| <b>4</b><br><b>CHECK CONDITION OF THROTTLE BODY.</b>   | Is the throttle body installation bolt tightened securely?                      | Replace the mani-fold absolute pres-sure sensor. <Ref. to FU(STI)-30, Manifold Absolute Pressure Sensor.>   | Tighten the throttle body installation bolt securely.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## I: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-23, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

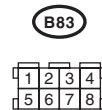
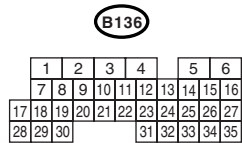
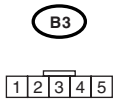
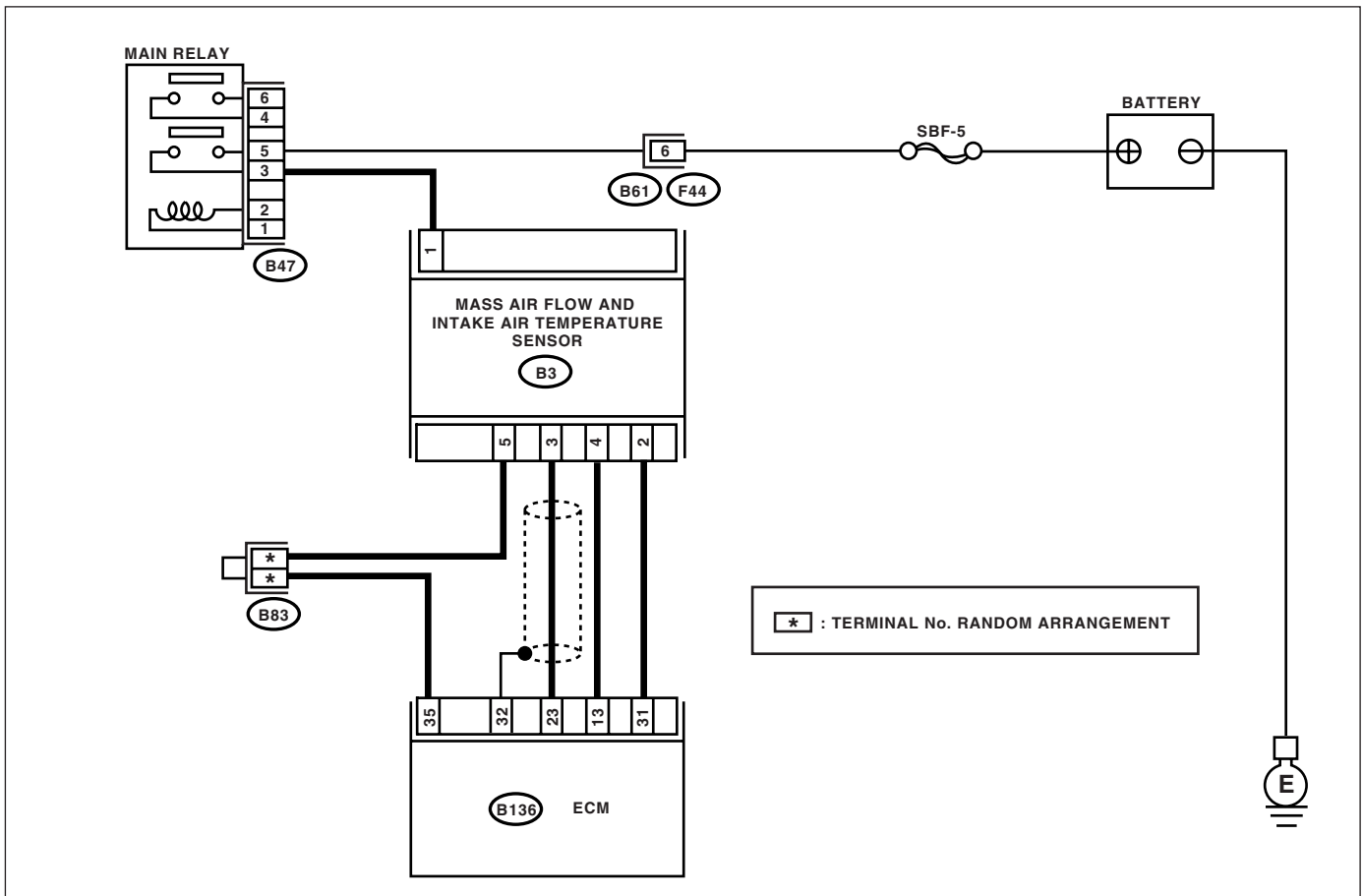
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04158

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

|   | Step                                       | Check                       | Yes  | No  |
|---|--|-----------------------------|--|---|
| 1 | <b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0101. | Replace the mass air flow and intake air temperature sensor. <Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.> |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## J: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-26, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

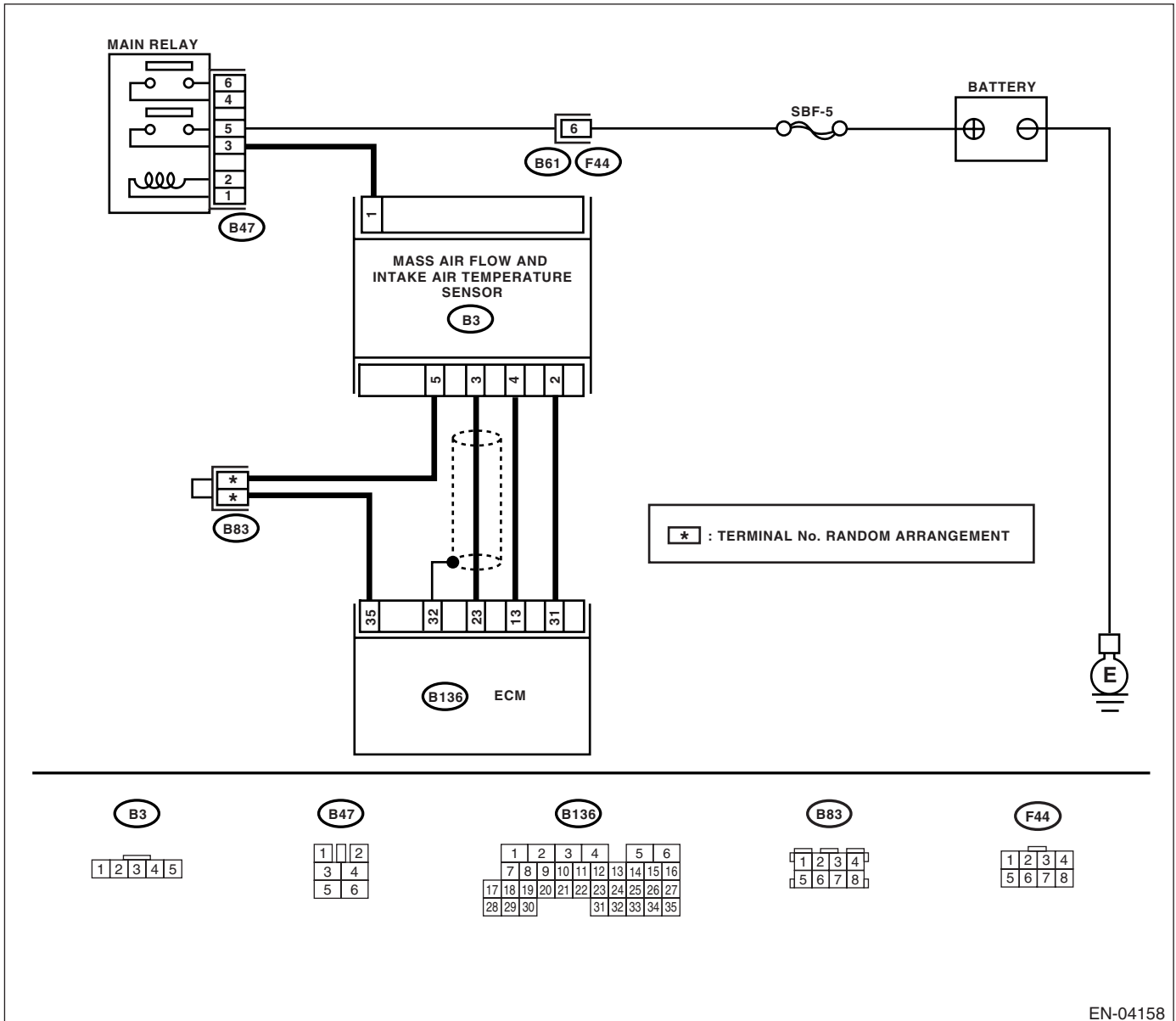
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04158

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No  |
|--|---|--|---|
| <p><b>1 CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Connect the Subaru Select Monitor or general scan tool to data link connector.<br/>                     3) Turn the ignition switch to ON and Subaru Select Monitor or the general scan tool power switch to ON.<br/>                     4) Start the engine.<br/>                     5) Read the mass air flow sensor voltage using Subaru Select Monitor or general scan tool.</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the voltage 0.2 — 4.7 V?</p>  | <p>Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in the mass air flow and intake air temperature sensor.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open or ground short circuit in harness between mass air flow and intake air temperature sensor and ECM connector</li> <li>• Poor contact in mass air flow and intake air temperature sensor or ECM connector</li> </ul> | <p>Go to step 2.</p>  |
| <p><b>2 CHECK INPUT SIGNAL FOR ECM.</b><br/>                     Measure the voltage between ECM connector and chassis ground while engine is idling.</p> <p><b>Connector &amp; terminal</b><br/> <i>(B136) No. 23 (+) — Chassis ground (-):</i></p>   | <p>Is the voltage less than 0.2 V?</p>  | <p>Go to step 4.</p>   | <p>Go to step 3.</p>  |
| <p><b>3 CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).</b><br/>                     Measure the voltage between ECM connector and chassis ground while engine is idling.</p>  | <p>Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?</p> | <p>Repair the poor contact in ECM connector.</p>   | <p>Contact your SOA Service Center since deterioration of some parts may be the cause.</p>                        |
| <p><b>4 CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from mass air flow sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between mass air flow and intake air temperature sensor connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <i>(B3) No. 1 (+) — Chassis ground (-):</i></p>   | <p>Is the voltage more than 5 V?</p>  | <p>Go to step 5.</p>   | <p>Repair the open circuit in harness between mass air flow and intake air temperature sensor and main relay.</p> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <p><b>5</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM.<br/>                     3) Measure the resistance of harness between ECM and mass air flow and intake air temperature sensor connector.</p> <p><b>Connector &amp; terminal</b><br/>                     (B136) No. 23 — (B3) No. 3:<br/>                     (B136) No. 31 — (B3) No. 2:<br/>                     (B136) No. 35 — (B3) No. 5:</p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p>                                  | <p>Go to step 6.</p>   | <p>Repair the open circuit in harness between ECM and mass air flow and intake air temperature sensor connector.</p>                             |
| <p><b>6</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR</b></p> <p>Measure the resistance of harness between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/>                     (B136) No. 23 — Chassis ground:<br/>                     (B136) No. 31 — Chassis ground:<br/>                     (B136) No. 35 — Chassis ground:</p>  | <p>Is the resistance more than 1 M<math>\Omega</math>?</p>                                 | <p>Go to step 7.</p>   | <p>Repair the ground short circuit in harness between ECM and mass air flow and intake air temperature sensor connector.</p>                     |
| <p><b>7</b></p> <p><b>CHECK POOR CONTACT</b></p> <p>Check poor contact in mass air flow and intake air temperature sensor connector.</p>  | <p>Is there poor contact in mass air flow and intake air temperature sensor connector?</p> | <p>Repair the poor contact in mass air flow and intake air temperature sensor connector.</p> | <p>Replace the mass air flow and intake air temperature sensor. &lt;Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p> |

## K: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-28, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

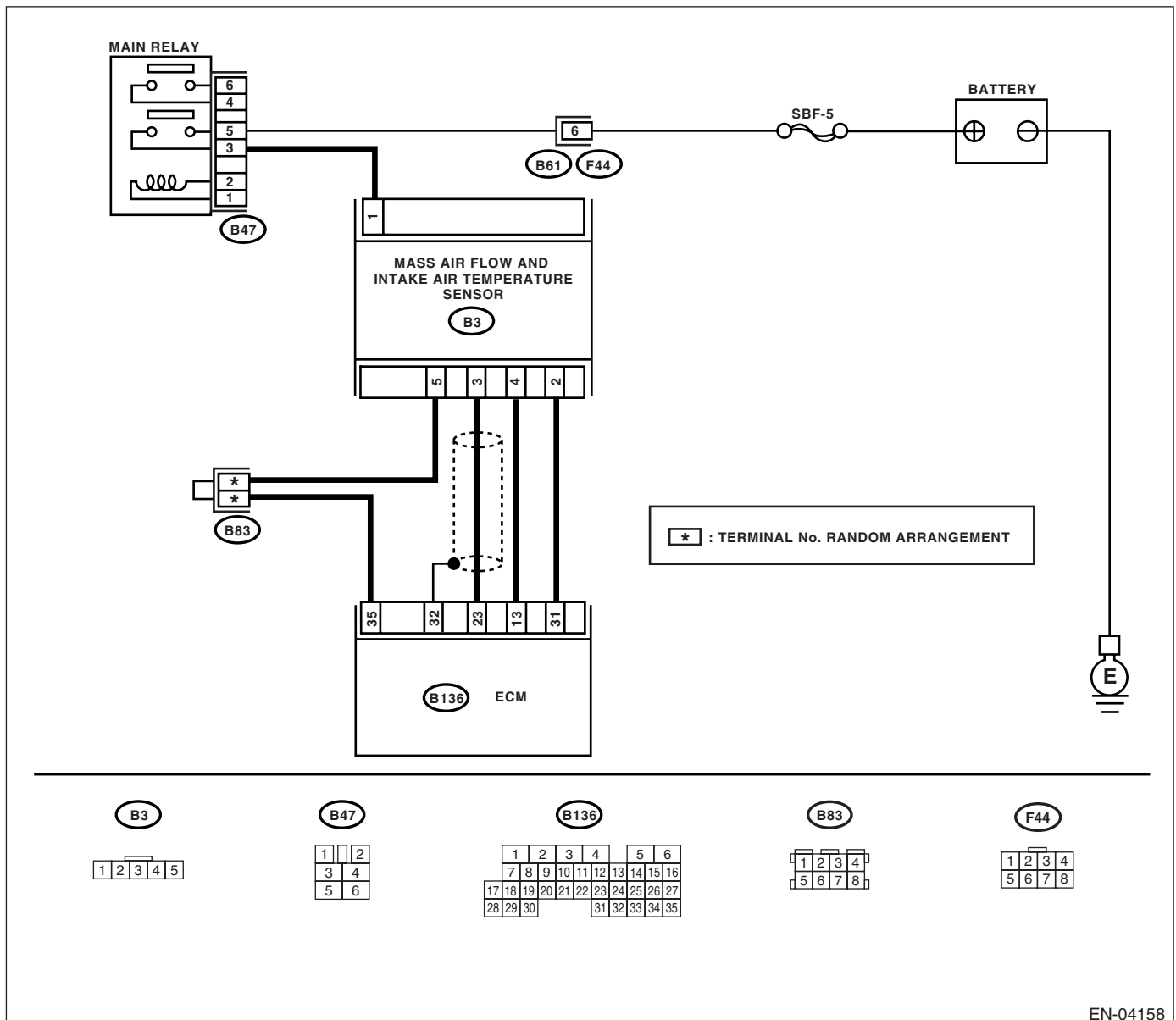
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04158

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No  |
|--|---|--|---|
| <p><b>1</b></p> <p><b>CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Connect the Subaru Select Monitor or general scan tool to data link connector.<br/>                     3) Turn the ignition switch to ON and Subaru Select Monitor or general scan tool power switch to ON.<br/>                     4) Start the engine.<br/>                     5) Read the mass air flow and intake air temperature sensor voltage using Subaru Select Monitor or general scan tool.</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor<br/>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</li> <li>• General scan tool<br/>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</li> </ul> | <p>Is the voltage 0.2 — 4.7 V?</p>                        | <p>Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.</p>                               | <p>Go to step 2.</p>  |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from mass air flow and intake air temperature sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between mass air flow and intake air temperature sensor connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B3) No. 3 (+) — Chassis ground (-):</b></p>   | <p>Is the voltage more than 5 V?</p>                      | <p>Repair the battery short of harness between mass air flow and intake air temperature sensor connector and ECM connector.</p>                  | <p>Go to step 3.</p>  |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM.<br/>                     3) Measure the resistance between ECM connector and mass air flow and intake air temperature sensor connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B3) No. 2 — (B136) No. 31:</b></p>  | <p>Is the resistance less than 1 <math>\Omega</math>?</p> | <p>Replace the mass air flow and intake air temperature sensor. &lt;Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p> | <p>Repair the open harness between mass air flow and intake air temperature sensor connector and ECM connector.</p> |

## L: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

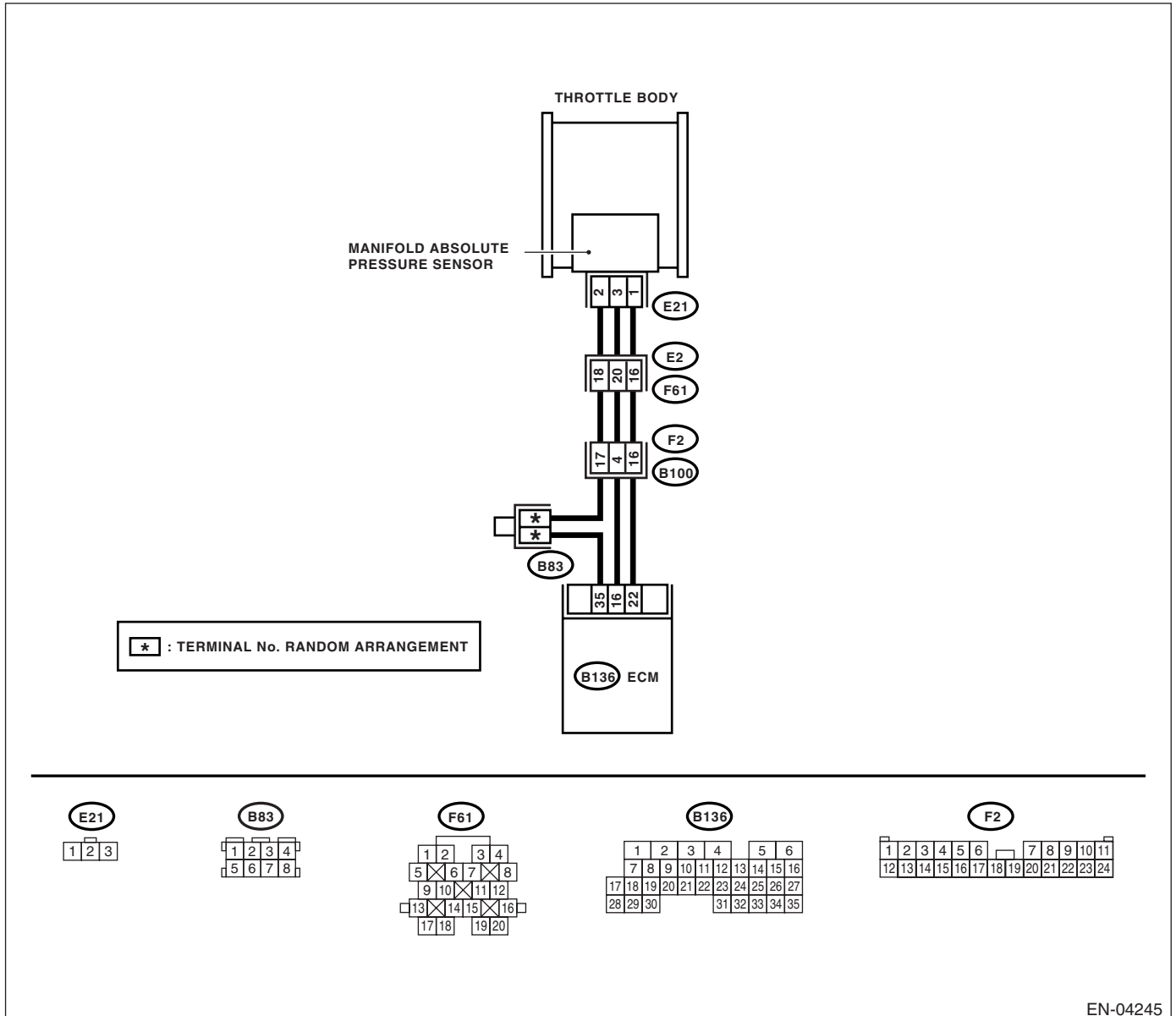
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-30, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <b>1 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 16 (+) — Chassis ground (-):</i>   | Is the voltage more than 4.5 V?  | Go to step 3.   | Go to step 2.   |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 16 (+) — Chassis ground (-):</i>   | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change? | Repair the poor contact in ECM connector.                               | Contact your SOA Service Center since deterioration of some parts may be the cause.                     |
| <b>3 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 22 (+) — Chassis ground (-):</i>   | Is the voltage less than 0.7 V?  | Go to step 4.   | Contact your SOA Service Center since deterioration of some parts may be the cause.                     |
| <b>4 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from manifold absolute pressure sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between manifold absolute pressure sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E21) No. 3 (+) — Engine ground (-):</i> | Is the voltage more than 4.5 V?  | Go to step 5.   | Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.         |
| <b>5 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 35 — (E21) No. 2:</i>   | Is the resistance less than 1 $\Omega$ ?   | Go to step 6.   | Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.         |
| <b>6 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.</b><br>Measure the resistance of harness between manifold absolute pressure sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E21) No. 1 — Engine ground:</i>  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 7.   | Repair the ground short circuit in harness between ECM and manifold absolute pressure sensor connector. |
| <b>7 CHECK POOR CONTACT.</b><br>Check poor contact in manifold absolute pressure sensor connector.   | Is there poor contact in manifold absolute pressure sensor connector?                                  | Repair the poor contact in manifold absolute pressure sensor connector. | Replace the manifold absolute pressure sensor. <Ref. to FU(STI)-30, Manifold Absolute Pressure Sensor.> |

## M: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

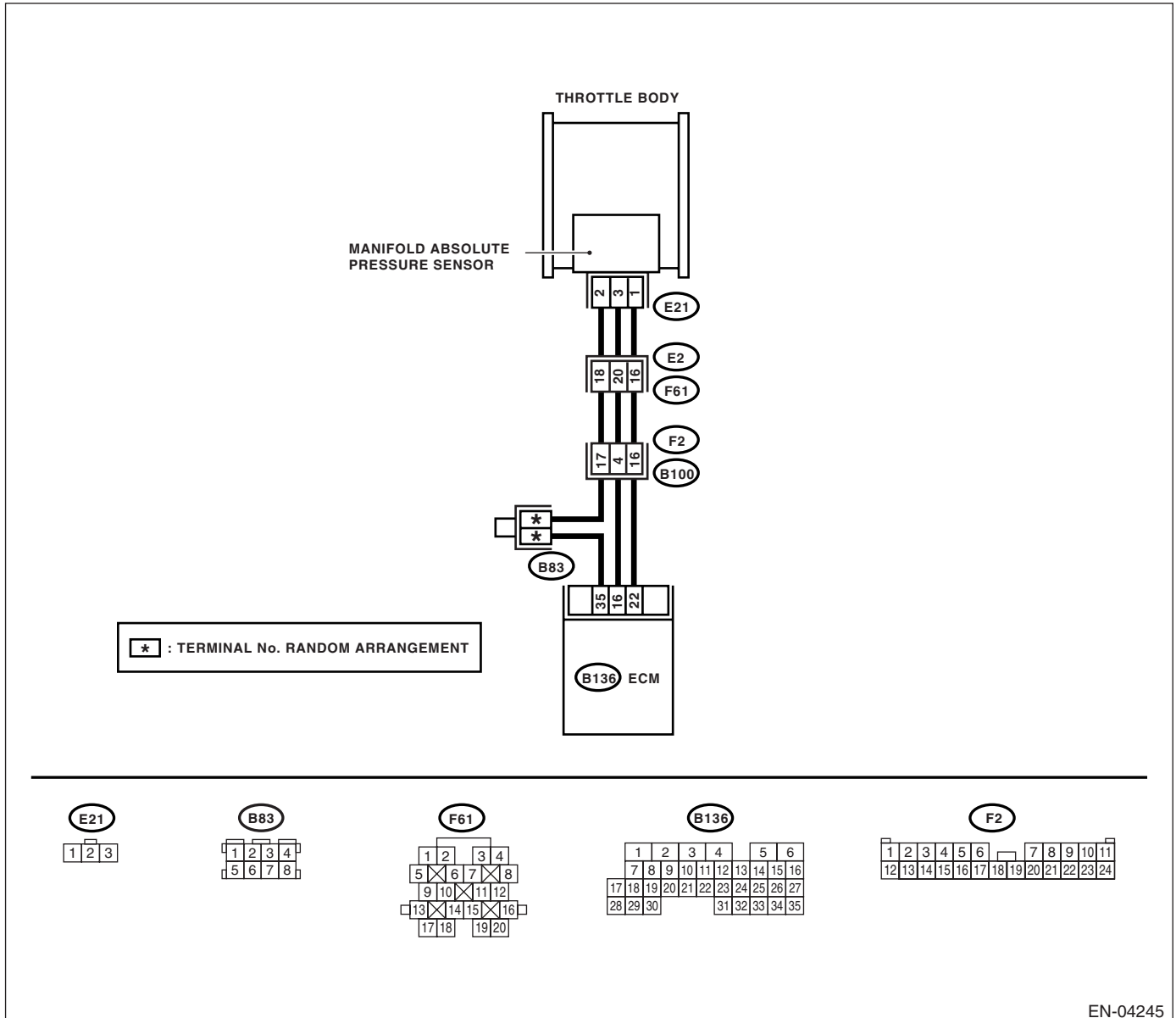
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-32, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:





## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <b>1 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 16 (+) — Chassis ground (-):</i>   | Is the voltage more than 4.5 V?  | Go to step 3.   | Go to step 2.   |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 16 (+) — Chassis ground (-):</i>   | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change? | Repair the poor contact in ECM connector.                               | Contact your SOA Service Center since deterioration of some parts may be the cause.                     |
| <b>3 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 22 (+) — Chassis ground (-):</i>   | Is the voltage more than 4.5 V?  | Go to step 4.   | Contact your SOA Service Center since deterioration of some parts may be the cause.                     |
| <b>4 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from manifold absolute pressure sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between manifold absolute pressure sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E21) No. 3 (+) — Engine ground (-):</i> | Is the voltage more than 4.5 V?  | Go to step 5.   | Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.         |
| <b>5 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 22 — (E21) No. 1:</i>   | Is the resistance less than 1 $\Omega$ ?   | Go to step 6.   | Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.         |
| <b>6 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.</b><br>Measure the resistance of harness between ECM and manifold absolute pressure sensor connector.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 35 — (E21) No. 2:</i>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 7.   | Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.         |
| <b>7 CHECK POOR CONTACT.</b><br>Check poor contact in manifold absolute pressure sensor connector.   | Is there poor contact in manifold absolute pressure sensor connector?                                  | Repair the poor contact in manifold absolute pressure sensor connector. | Replace the manifold absolute pressure sensor. <Ref. to FU(STI)-30, Manifold Absolute Pressure Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## N: DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-34, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

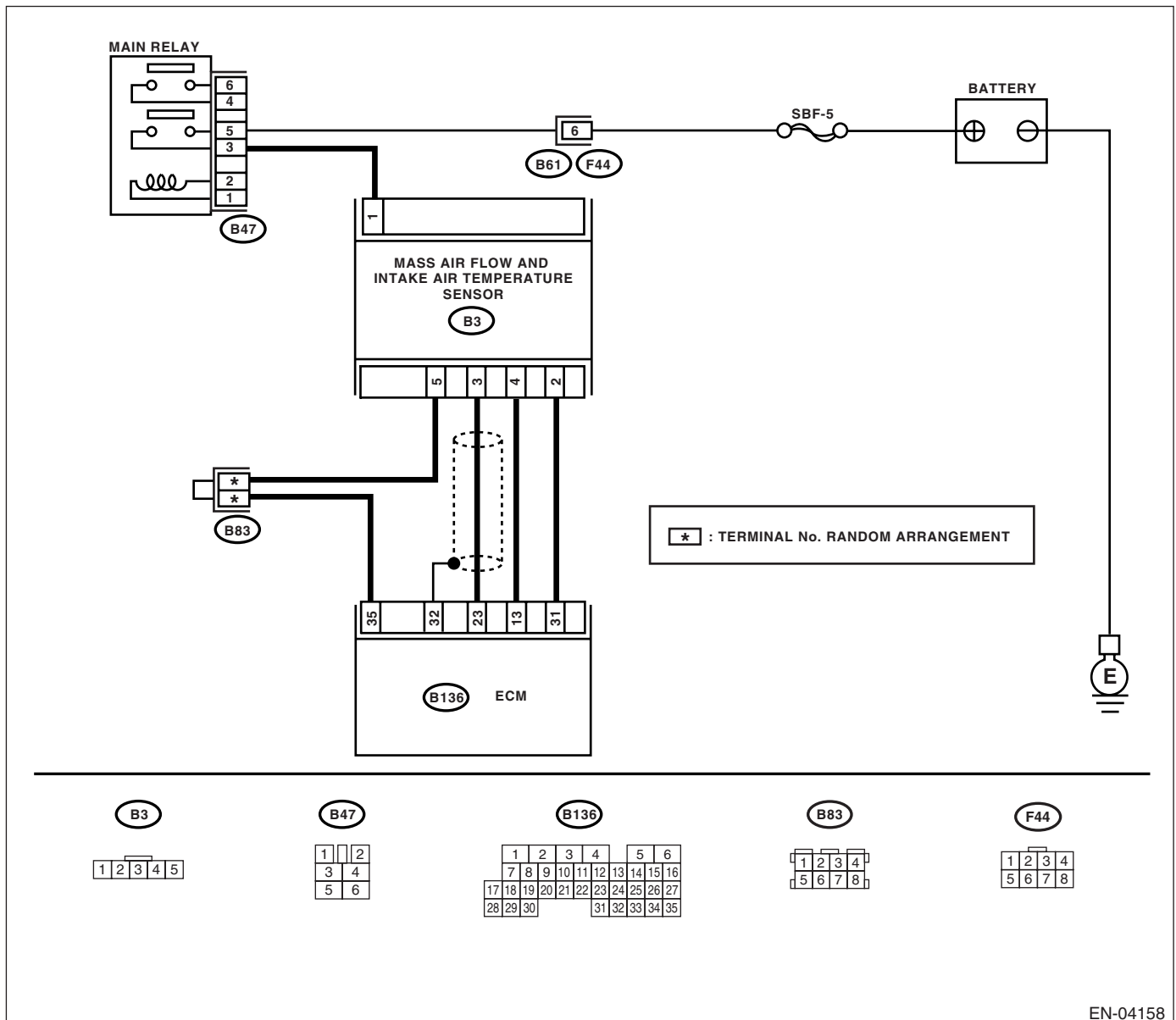
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04158

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No  |
|--|--|--|---|
| <b>1</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?                                    | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0111. | Go to step 2.   |
| <b>2</b><br><b>CHECK ENGINE COOLANT TEMPERATURE.</b><br>1) Start the engine and warm it up completely.<br>2) Measure the engine coolant temperature using Subaru Select Monitor or general scan tool.<br>NOTE:<br><ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.><br><ul style="list-style-type: none"> <li>• General scan tool</li> </ul> For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the engine coolant temperature 75°C (167°F) — 95°C (203°F)? | Replace the mass air flow and intake air temperature sensor. <Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.>  | Inspect the DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## O: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-36, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

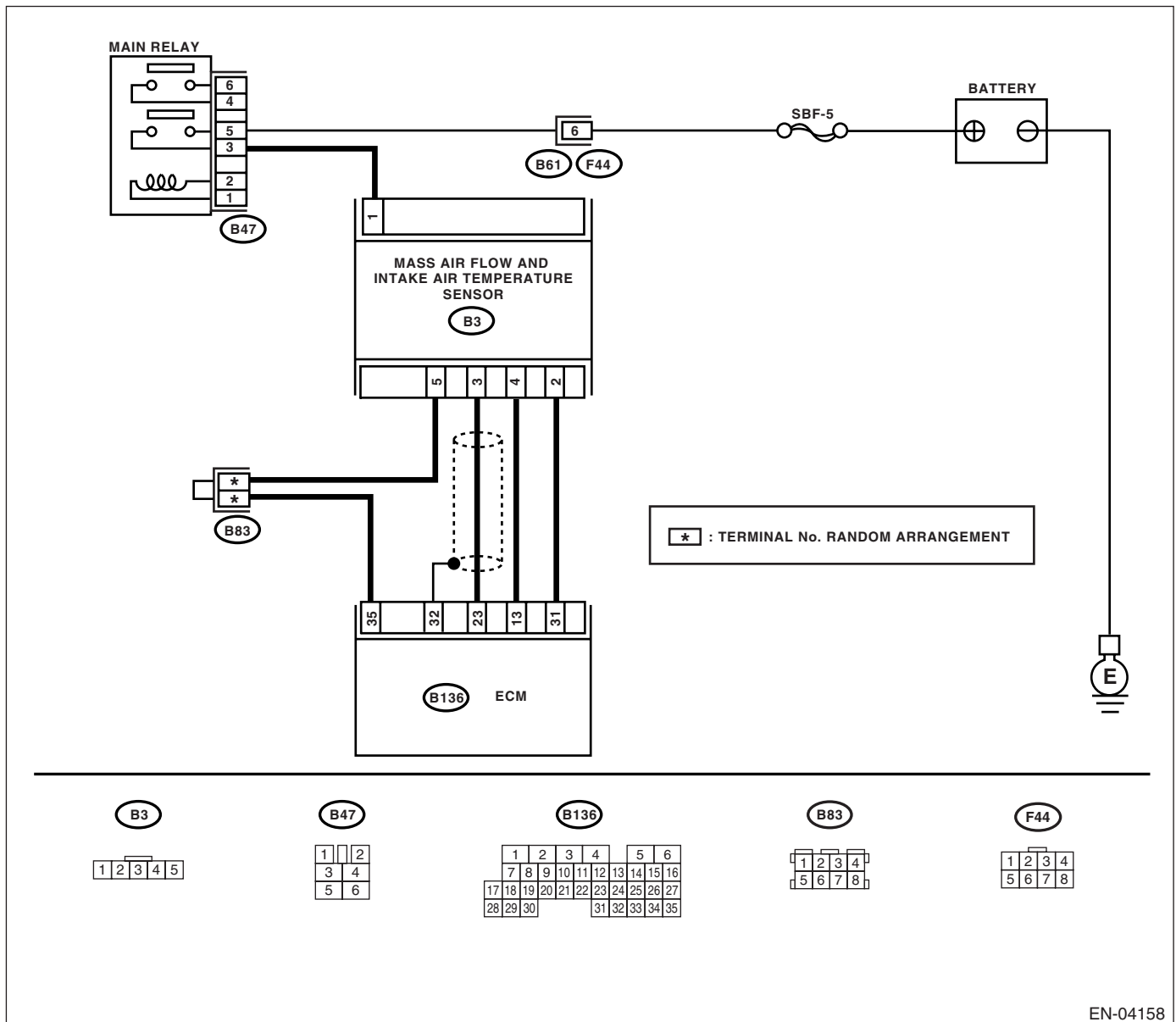
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04158

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No   |
|--|--|--|--|
| <p><b>1</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Start the engine.</p> <p>2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the General Scan Tool Instruction Manual.</p>  | <p>Is the temperature more than 55°C (131°F)?</p>  | <p>Go to step 2.</p>   | <p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Poor contact mass air flow and intake air temperature sensor</li> <li>• Poor contact in ECM</li> <li>• Poor contact in joint connector</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from mass air flow and intake air temperature sensor.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the temperature less than -36°C (-33°F)?</p> | <p>Replace the mass air flow and intake air temperature sensor. &lt;Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p> | <p>Repair the ground short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.</p>   |

## P: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-38, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

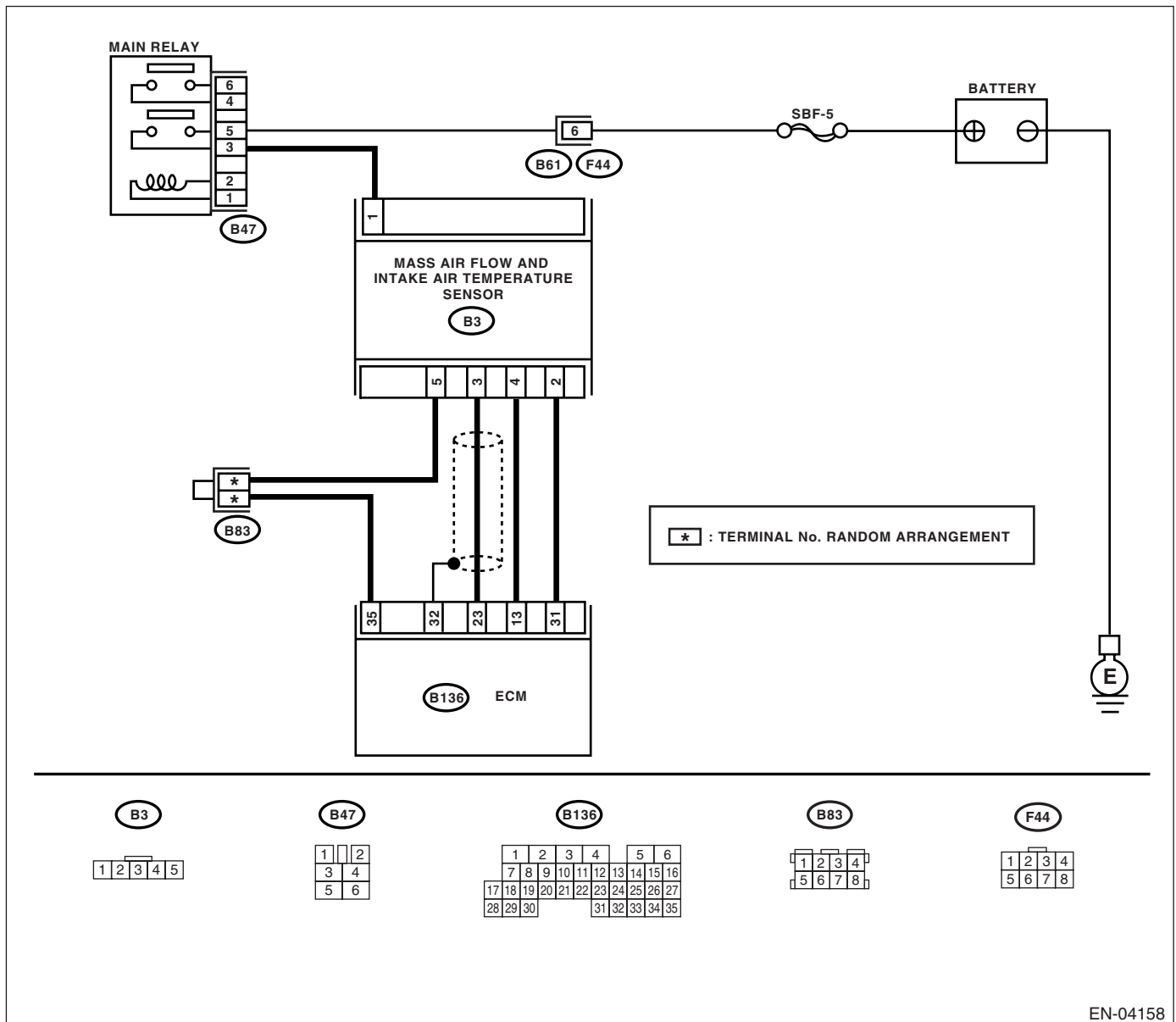
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04158

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check                                       | Yes  | No  |
|--|---|--|---|
| <b>1 CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedure, refer to the General Scan Tool Instruction Manual. | Is the temperature less than -36°C (-33°F)? | Go to step 2.  | Repair the poor contact.<br><br>NOTE:<br>In this case, repair the following:<br>• Poor contact in mass air flow and intake air temperature sensor<br>• Poor contact in ECM<br>• Poor contact in joint connector   |
| <b>2 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from mass air flow and intake air temperature sensor.<br>3) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground.<br><br><i>Connector &amp; terminal</i><br><i>(B3) No. 4 (+) — Engine ground (-):</i>                                  | Is the voltage more than 10 V?              | Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector. | Go to step 3.   |
| <b>3 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground.<br><br><i>Connector &amp; terminal</i><br><i>(B3) No. 4 (+) — Engine ground (-):</i>  | Is the voltage more than 10 V?              | Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector. | Go to step 4.   |
| <b>4 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>Measure the voltage between mass air flow and intake air temperature sensor and manifold absolute pressure sensor connector and engine ground.<br><br><i>Connector &amp; terminal</i><br><i>(B3) No. 4 (+) — Engine ground (-):</i>   | Is the voltage more than 4 V?               | Go to step 5.  | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector<br>• Poor contact in mass air flow and intake air temperature sensor<br>• Poor contact in ECM<br>• Poor contact in joint connector |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No  |
|--|---|--|---|
| <p><b>5</b></p> <p><b>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Measure the resistance of harness between mass air flow and intake air temperature sensor and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B3) No. 5 — Engine ground:</b></p> | <p>Is the resistance less than 5 <math>\Omega</math>?</p> | <p>Replace the mass air flow and intake air temperature sensor. &lt;Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p> | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector</li> <li>• Poor contact in mass air flow and intake air temperature sensor</li> <li>• Poor contact in ECM</li> <li>• Poor contact in joint connector</li> </ul> |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## Q: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-40, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

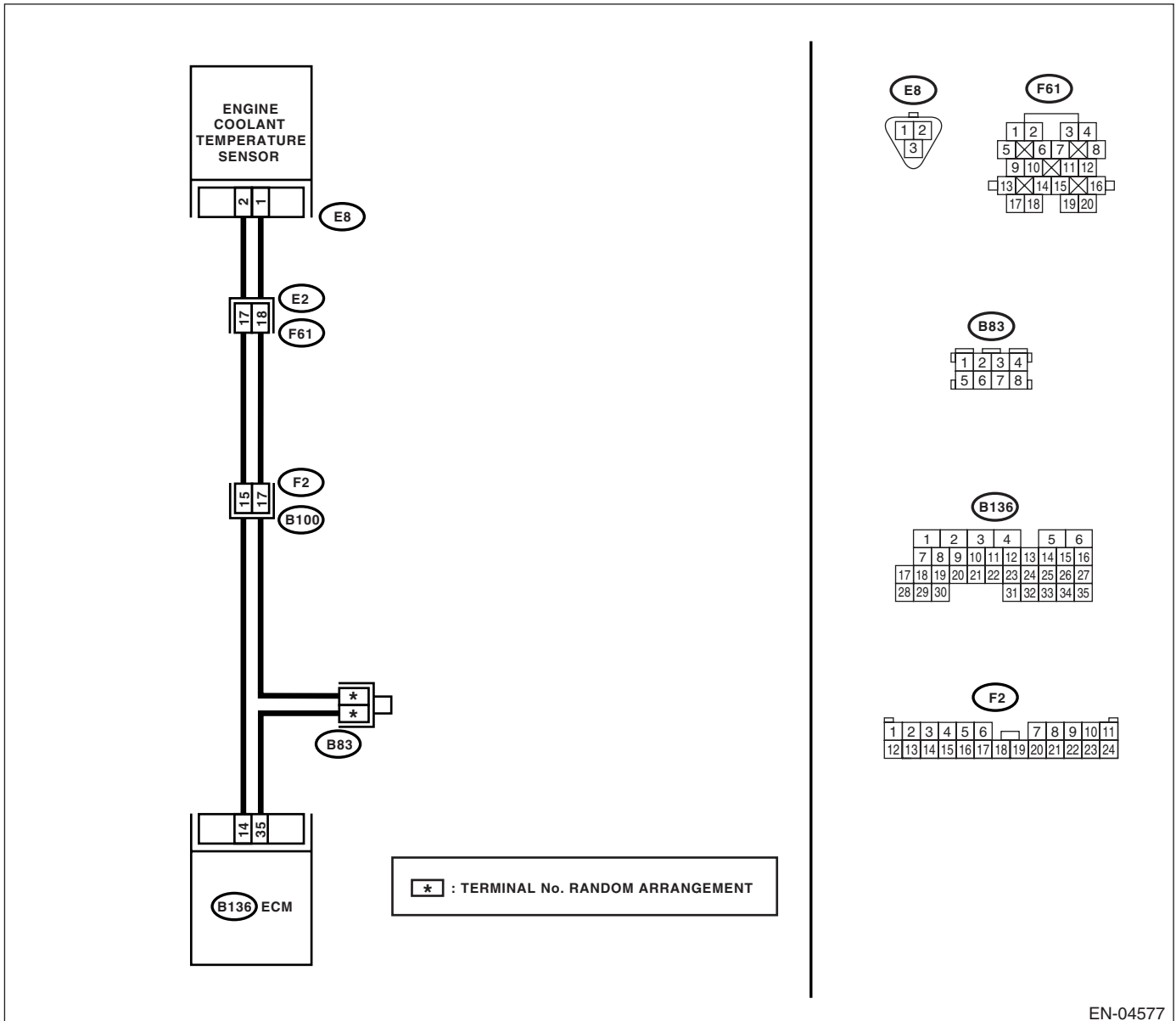
### TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04577

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <p><b>1</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Start the engine.</p> <p>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p>  | <p>Is the temperature more than 120°C (248°F)?</p> | <p>Go to step 2.</p>   | <p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Poor contact in engine coolant temperature sensor</li> <li>• Poor contact in ECM</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from engine coolant temperature sensor.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the temperature less than -40°C (-40°F)?</p> | <p>Replace the engine coolant temperature sensor. &lt;Ref. to FU(STI)-25, Engine Coolant Temperature Sensor.&gt;</p> | <p>Repair the ground short circuit in harness between engine coolant temperature sensor and ECM connector.</p>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## R: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-42, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

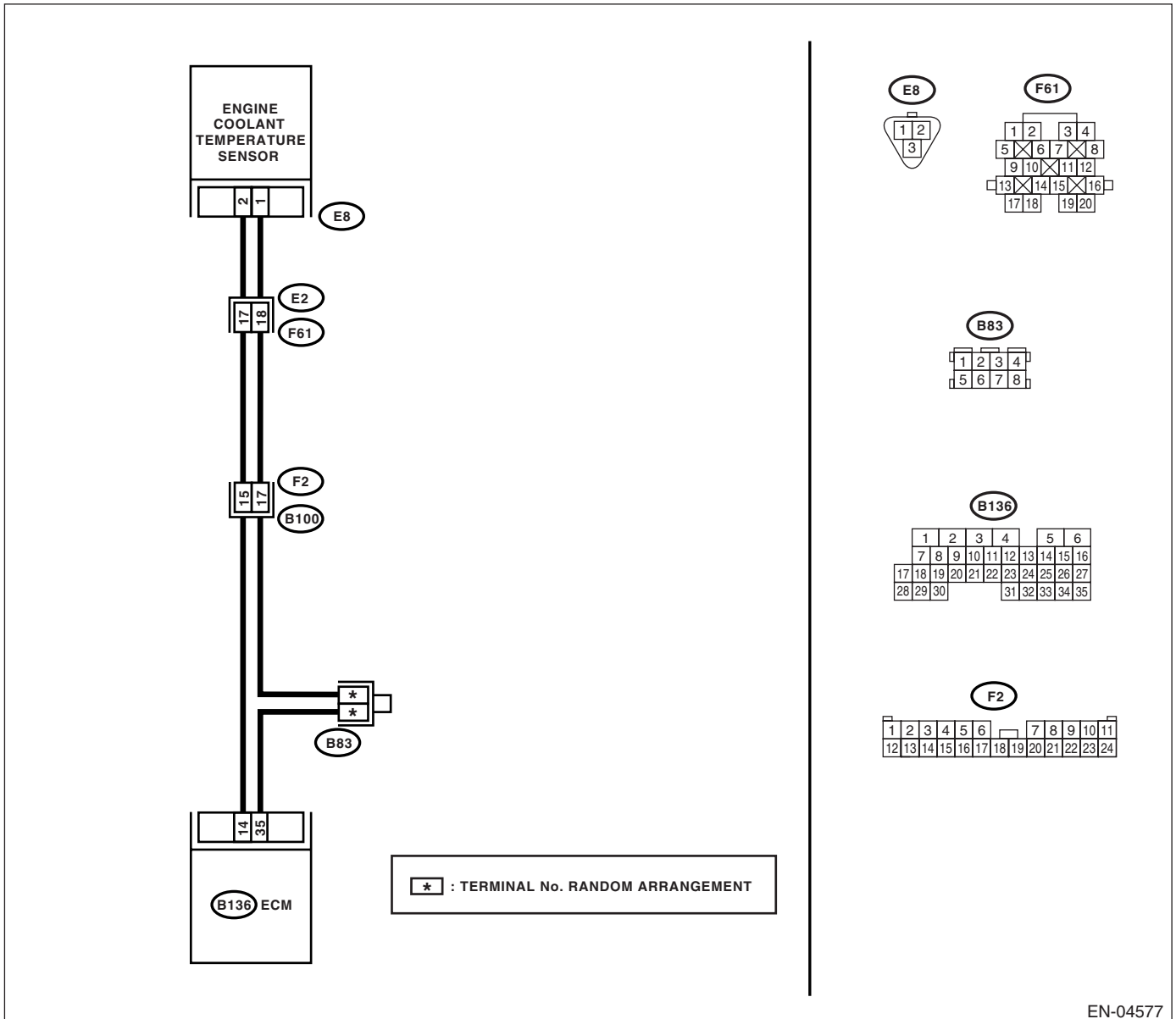
### TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04577

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <p><b>1</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Start the engine.</p> <p>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the temperature less than –40°C (–40°F)?</p> | <p>Go to step 2.</p>  | <p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Poor contact in engine coolant temperature sensor</li> <li>• Poor contact in ECM</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul>   |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from engine coolant temperature sensor.</p> <p>3) Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E8) No. 2 (+) — Engine ground (-):</b></p>  | <p>Is the voltage more than 10 V?</p>              | <p>Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.</p> | <p>Go to step 3.</p>  |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E8) No. 2 (+) — Engine ground (-):</b></p>  | <p>Is the voltage more than 10 V?</p>              | <p>Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.</p> | <p>Go to step 4.</p>  |
| <p><b>4</b></p> <p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E8) No. 2 (+) — Engine ground (-):</b></p>   | <p>Is the voltage more than 4 V?</p>               | <p>Go to step 5.</p>  | <p>Repair the harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and engine coolant temperature sensor connector</li> <li>• Poor contact in engine coolant temperature sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes  | No  |
|---|---|--|---|
| <p><b>5</b></p> <p><b>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground.</p> <p><b><i>Connector &amp; terminal (E8) No. 1 — Engine ground:</i></b></p> | <p>Is the resistance less than 5 <math>\Omega</math>?</p> | <p>Replace the engine coolant temperature sensor. &lt;Ref. to FU(STI)-25, Engine Coolant Temperature Sensor.&gt;</p> | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and engine coolant temperature sensor connector</li> <li>• Poor contact in engine coolant temperature sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |

## **S: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT**

### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-44, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

- Erroneous idling
- Engine stalls.
- Poor driving performance

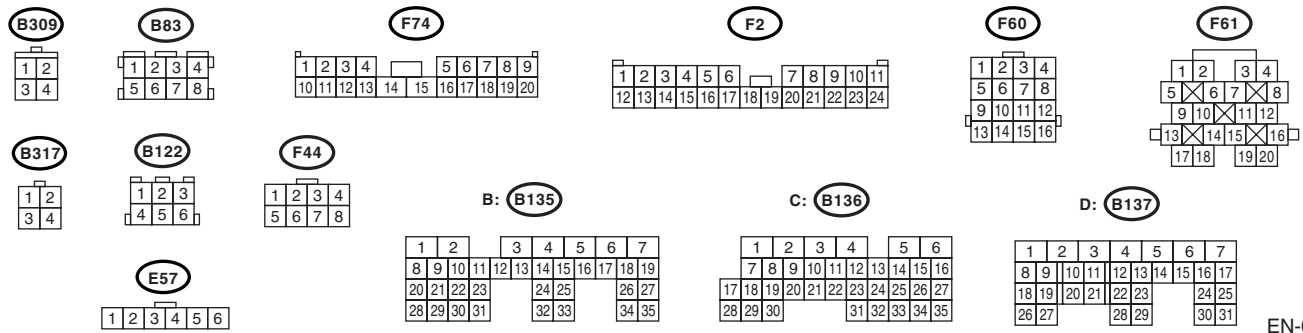
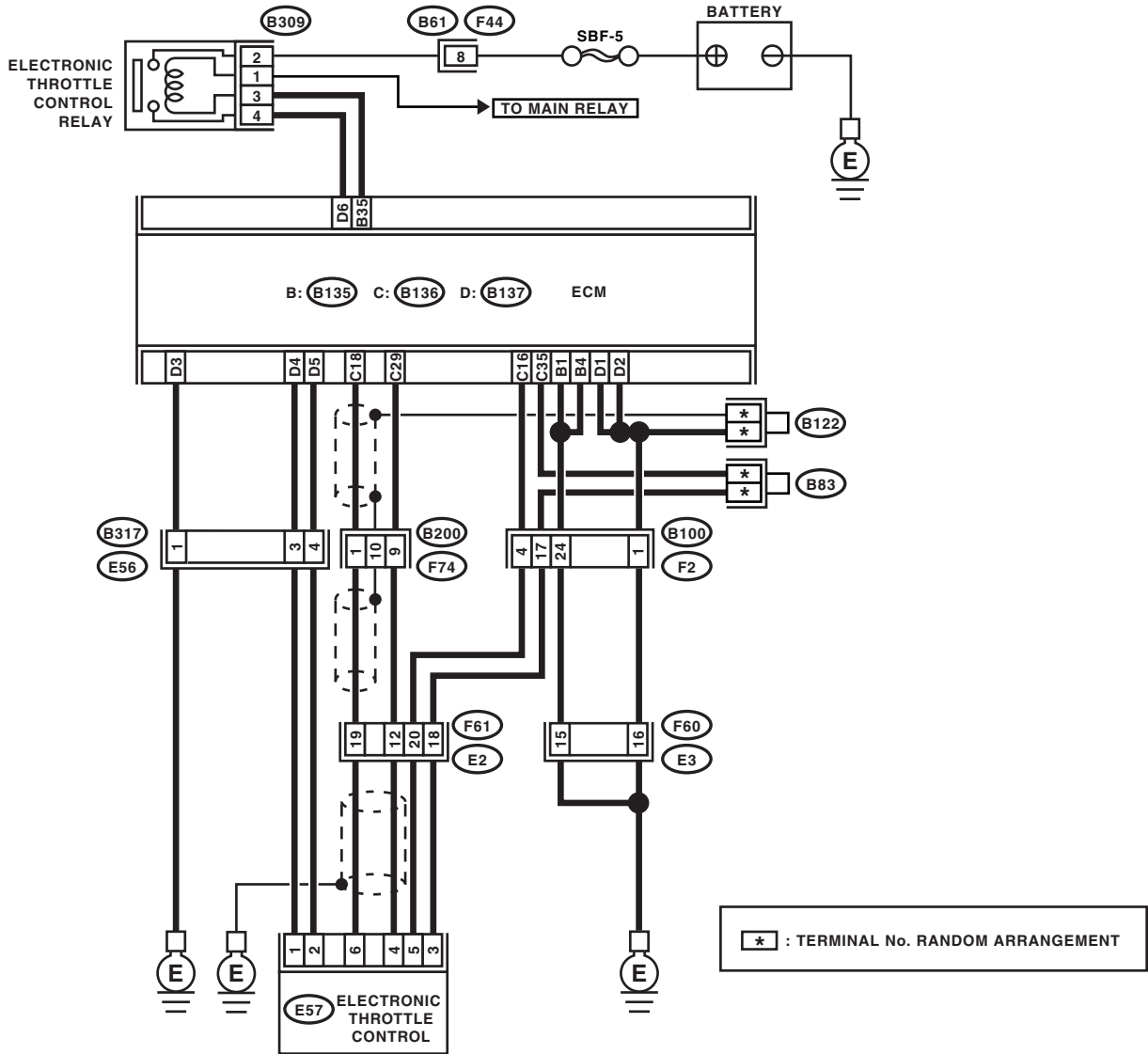
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04159

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <b>1 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 29 (+) — (B136) No. 35 (-):</b></i><br>3) Shake the ECM harness and connector, engine harness connectors and electronic throttle control.   | Is the voltage more than 0.4 V?  | Go to step 2.  | Go to step 3.  |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electronic throttle control.   | Is there poor contact in the connectors between ECM and electronic throttle control? | Repair the poor contact in connectors.   | Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.                 |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 16 — (E57) No. 5:</b></i>              | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.  | Repair open of harness connector.  |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>Measure the resistance between ECM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 18 — Chassis ground:</b></i><br><i><b>(B136) No. 16 — Chassis ground:</b></i>   | Is the resistance more than 1 M $\Omega$ ?   | Go to step 5.  | Repair the ground short of harness.  |
| <b>5 CHECK POWER SUPPLY TO SENSOR.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electronic throttle control connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E57) No. 5 (+) — Engine ground (-):</b></i><br>4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter. | Is the voltage 4.5 — 5.5 V?  | Go to step 6.  | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>     |
| <b>6 CHECK SHORT OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electronic throttle control connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E57) No. 6 — Engine ground:</b></i>   | Is the resistance more than 10 $\Omega$ ?  | Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control. <Ref. to FU(STI)-12, Throttle Body.> | Repair the poor the contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> |



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **T: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT**

#### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-46, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Erroneous idling
- Engine stalls.
- Poor driving performance

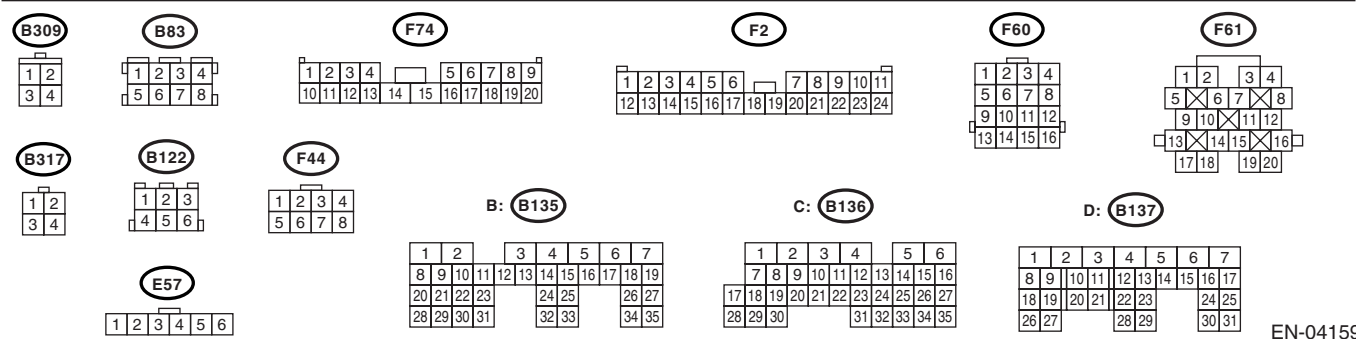
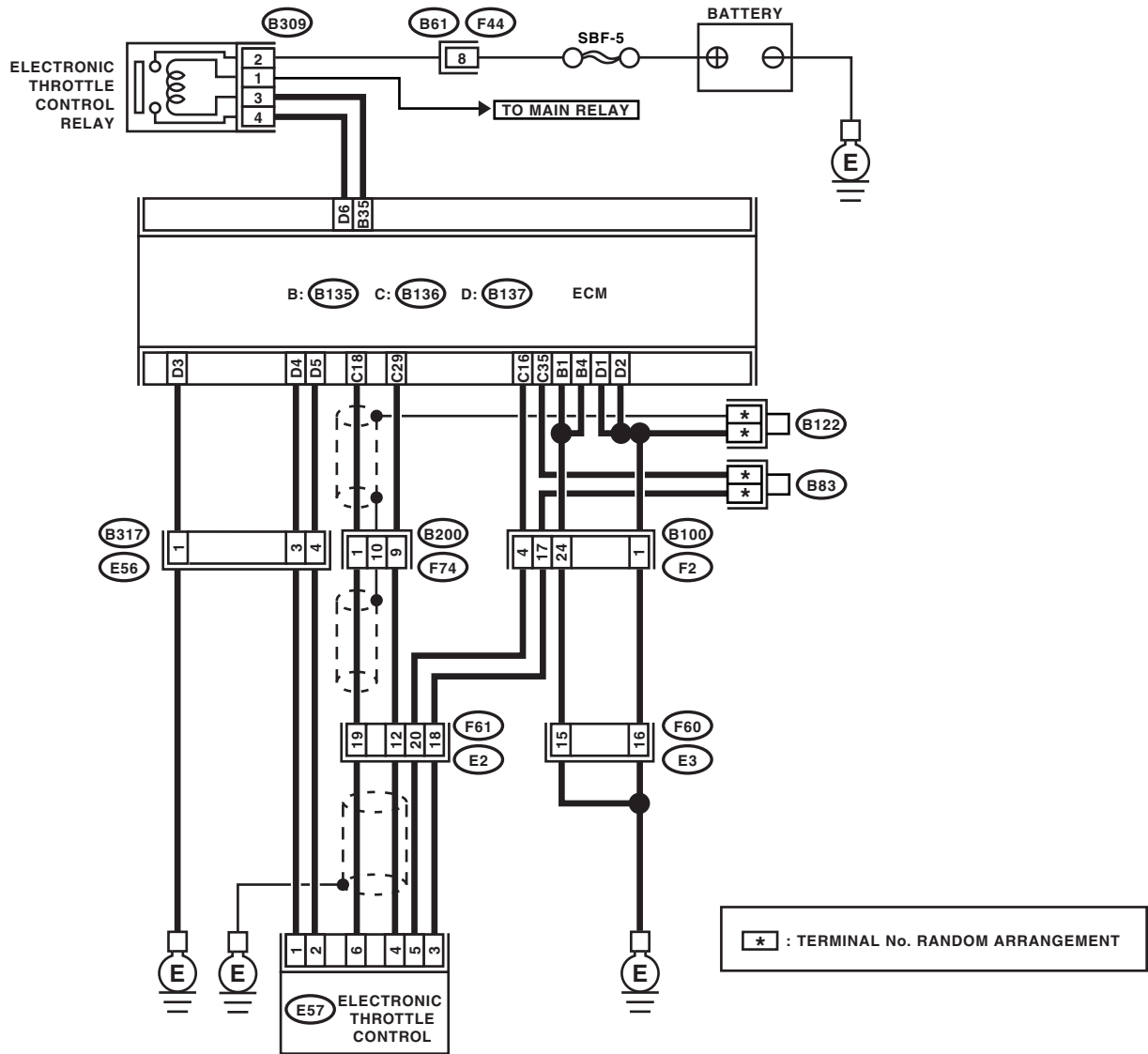
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04159

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <b>1 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of main throttle sensor signals, using the Subaru Select Monitor.<br>3) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.   | Is the voltage less than 4.63 V?   | Go to step 2.   | Go to step 3.  |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electronic throttle control.   | Is there poor contact in the connectors between ECM and electronic throttle control? | Repair the poor contact in connectors.  | Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.                 |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM.<br>3) Disconnect the connectors from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 18 — (E57) No. 6:</i><br><i>(B136) No. 35 — (E57) No. 3:</i> | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.   | Repair the open of harness connector.  |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between the electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 3 — Engine ground:</i>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 5.   | Repair the poor contact in ECM connector. If the problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> |
| <b>5 CHECK POWER SUPPLY TO SENSOR.</b><br>1) Measure the voltage between the electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 6 (+) — Engine ground (-):</i><br>2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.  | Is the voltage less than 10 V?   | Replace the electronic throttle control. <Ref. to FU(STI)-12, Throttle Body.> | Repair the short of harness between ECM connector and electronic throttle control connector.   |

## U: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-48, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

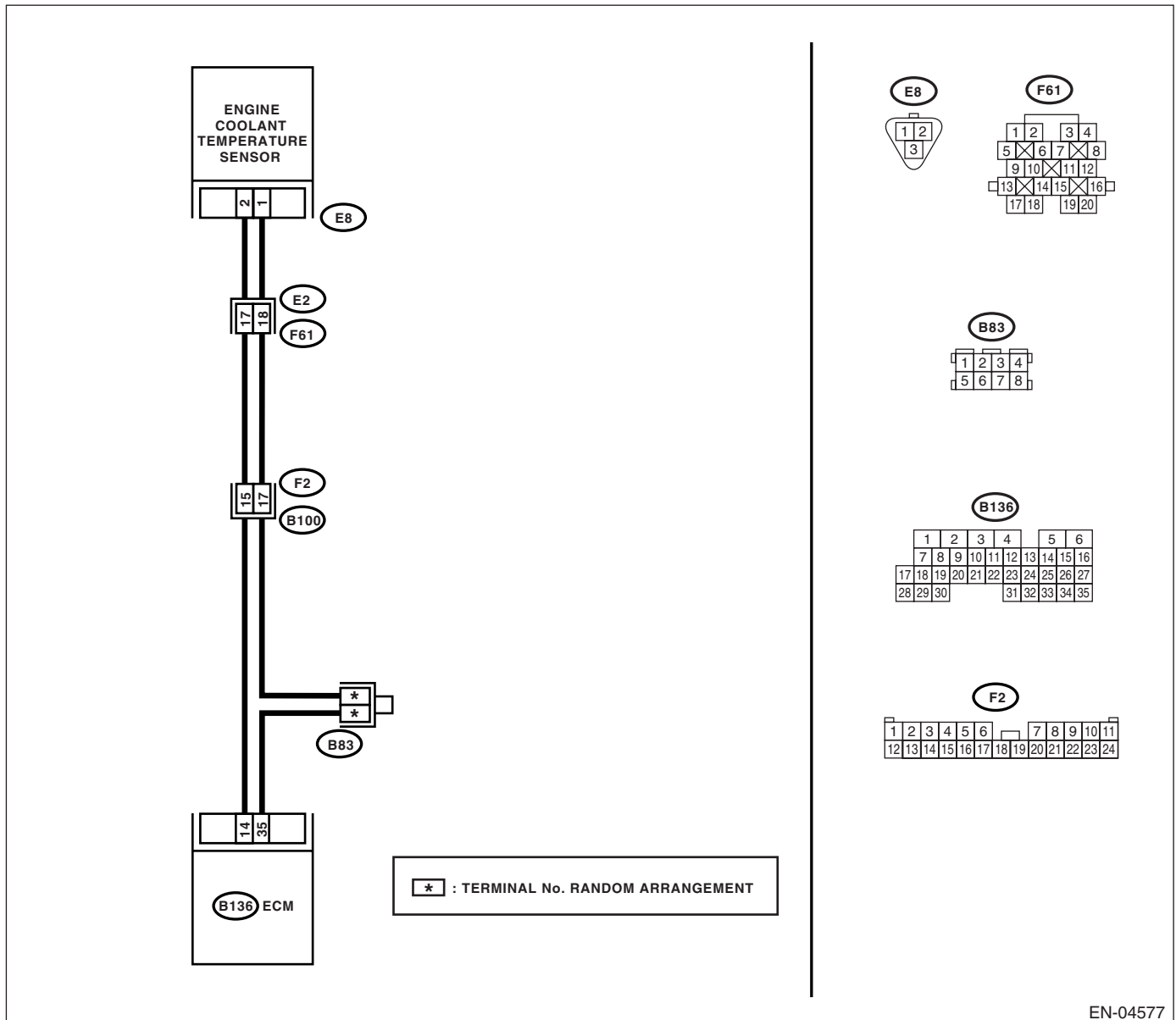
### TROUBLE SYMPTOM:

Engine will not return to idling.

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04577

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No  |
|--|--|--|---|
| <b>1</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?                  | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0125. | Go to step 2.   |
| <b>2</b><br><b>CHECK ENGINE COOLING SYSTEM.</b><br>NOTE:<br>Check the following items. <ul style="list-style-type: none"> <li>• Thermostat open stuck</li> <li>• Coolant level</li> <li>• Coolant freeze</li> <li>• Tire diameter</li> </ul> | Is there any fault in engine cooling system? | Replace the thermostat. <Ref. to CO(H4SO)-21, Thermostat.>   | Replace the engine coolant temperature sensor. <Ref. to FU(STI)-25, Engine Coolant Temperature Sensor.> |

## V: DTC P0126 INSUFFICIENT COOLANT TEMPERATURE FOR STABLE OPERATION

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-50, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

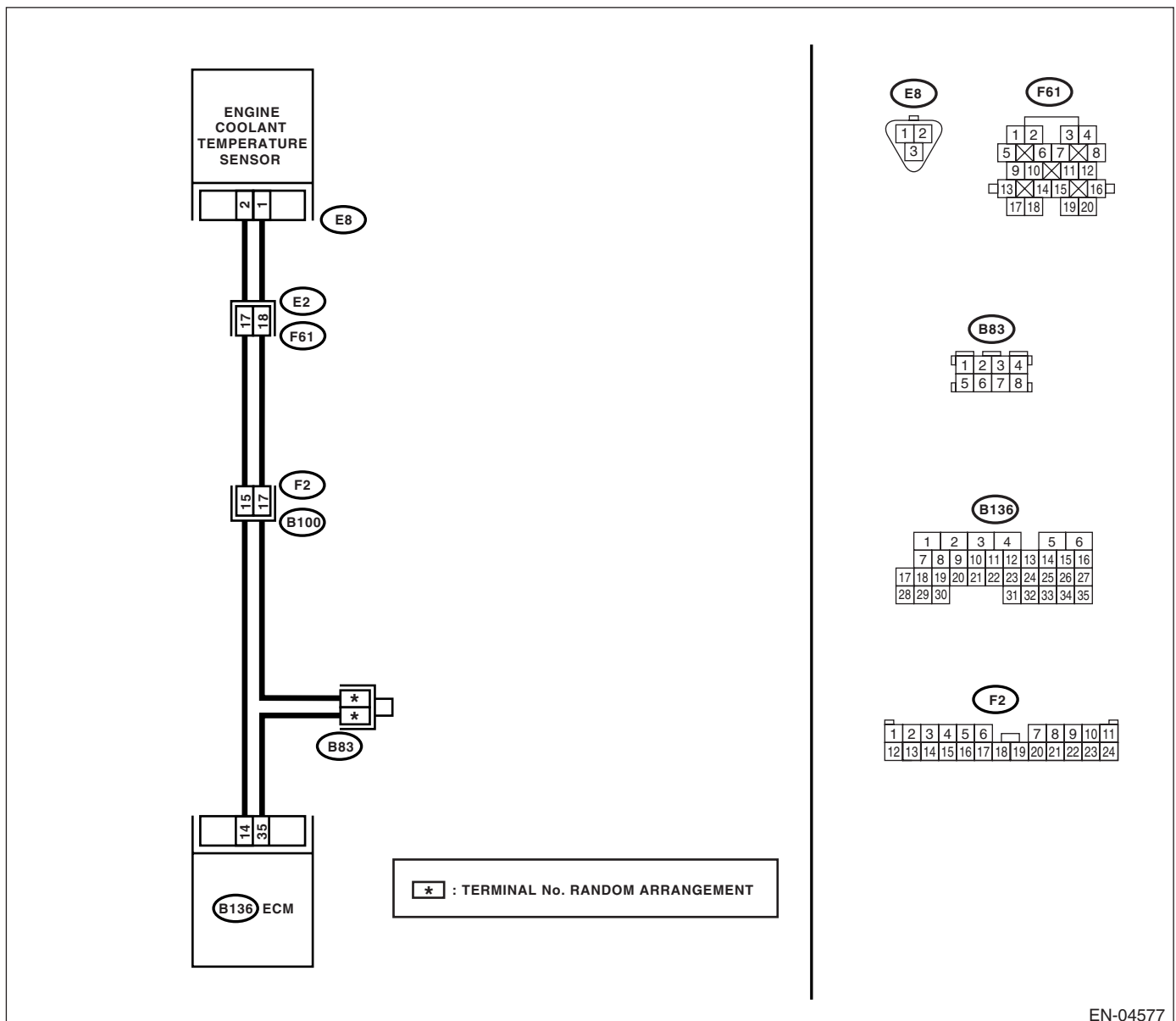
### TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04577

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes  | No  |
|---|---|--|---|
| <b>1</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> | Go to step 2.   |
| <b>2</b><br><b>CHECK ENGINE COOLANT TEMPERATURE SENSOR.</b><br>Measure the resistance between engine coolant temperature sensor terminals when engine coolant is cold and after warmed-up.<br><i>Terminals</i><br><i>No. 1 — No. 2:</i> | Is the resistance of engine coolant temperature sensor different between when engine coolant is cold and after warmed-up? | Contact your SOA Service Center since deterioration of some parts may be the cause.  | Replace the engine coolant temperature sensor. <Ref. to FU(STI)-25, Engine Coolant Temperature Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## W: DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-52, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

Thermostat remains open.

### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

| Step | Check  | Yes   | No  |
|------|--|---|---|
| 1    | <b>CHECK VEHICLE CONDITION.</b>  | Was the vehicle driven or idled with the engine partially submerged under water?      | In this case, it is not necessary to inspect DTC P0128.<br>Go to step 2.  |
| 2    | <b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Codes (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).><br>Go to step 3.  |
| 3    | <b>CHECK ENGINE COOLANT.</b>   | Are coolant level and mixture ratio of cooling water to anti-freeze solution correct? | Go to step 4.<br>Replace the engine coolant. <Ref. to CO(H4SO)-16, REPLACEMENT, Engine Coolant.>  |
| 4    | <b>CHECK RADIATOR FAN.</b><br>1) Start the engine.<br>2) Check radiator fan operation. | Does the radiator fan continuously rotate for more than 3 minutes during idling?      | Repair radiator fan circuit. <Ref. to CO(H4SO)-27, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-28, Radiator Sub Fan and Fan Motor.><br>Replace the thermostat. <Ref. to CO(H4SO)-21, Thermostat.> |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## X: DTC P0131 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

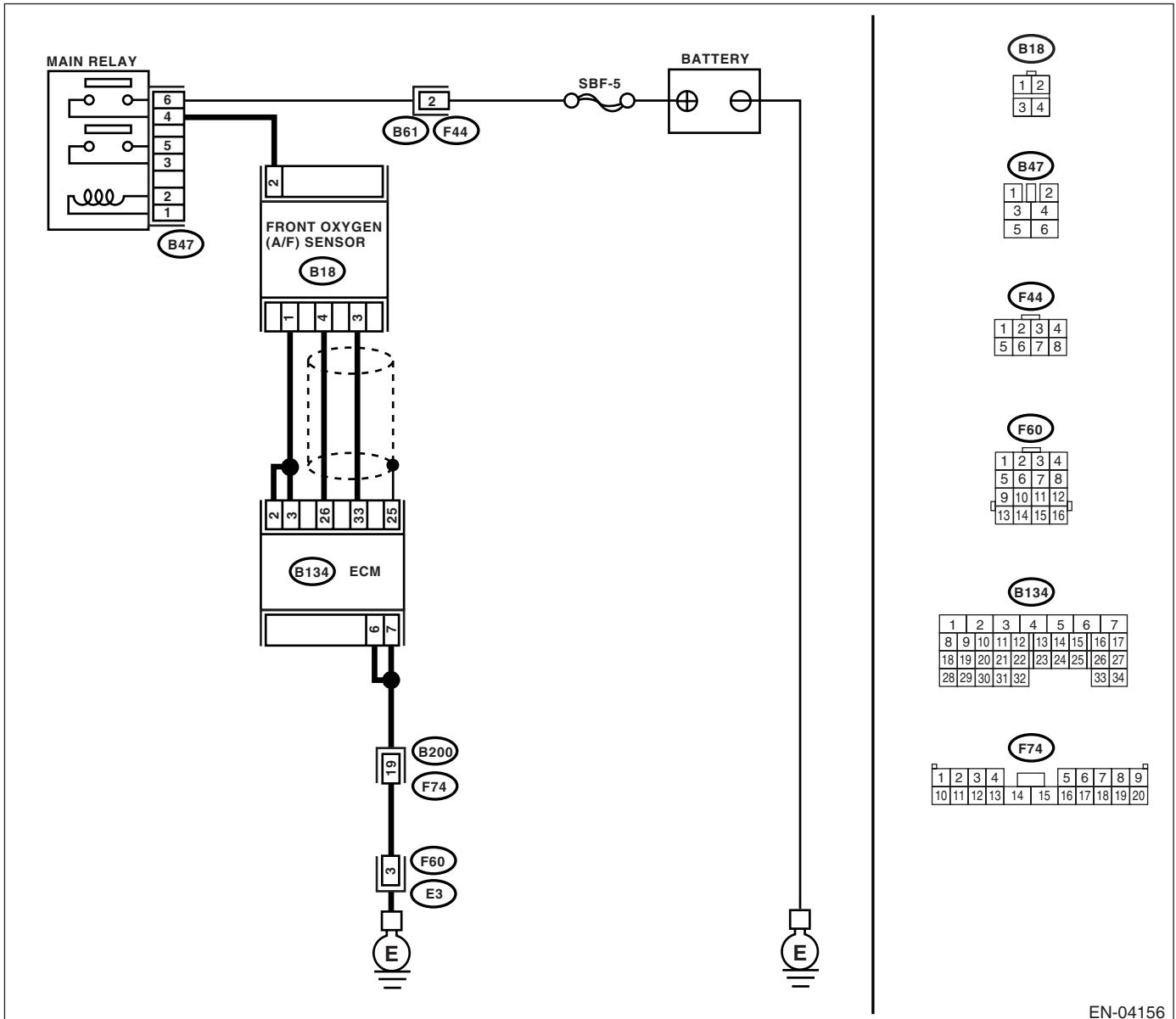
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-54, DTC P0131 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04156

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                             | Yes   | No  |
|--|-----------------------------------|---|---|
| <b>1</b><br><b>CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>   | Is there water in connector?      | Remove infiltrating water completely.   | Go to step 2.   |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br>3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><br><i>Connector &amp; terminal</i><br><i>(B134) No. 26 — Chassis ground:</i><br><i>(B134) No. 33 — Chassis ground:</i> | Is the resistance more than 1 MΩ? | Replace the front oxygen (A/F) sensor. <Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.> | Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## Y: DTC P0132 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

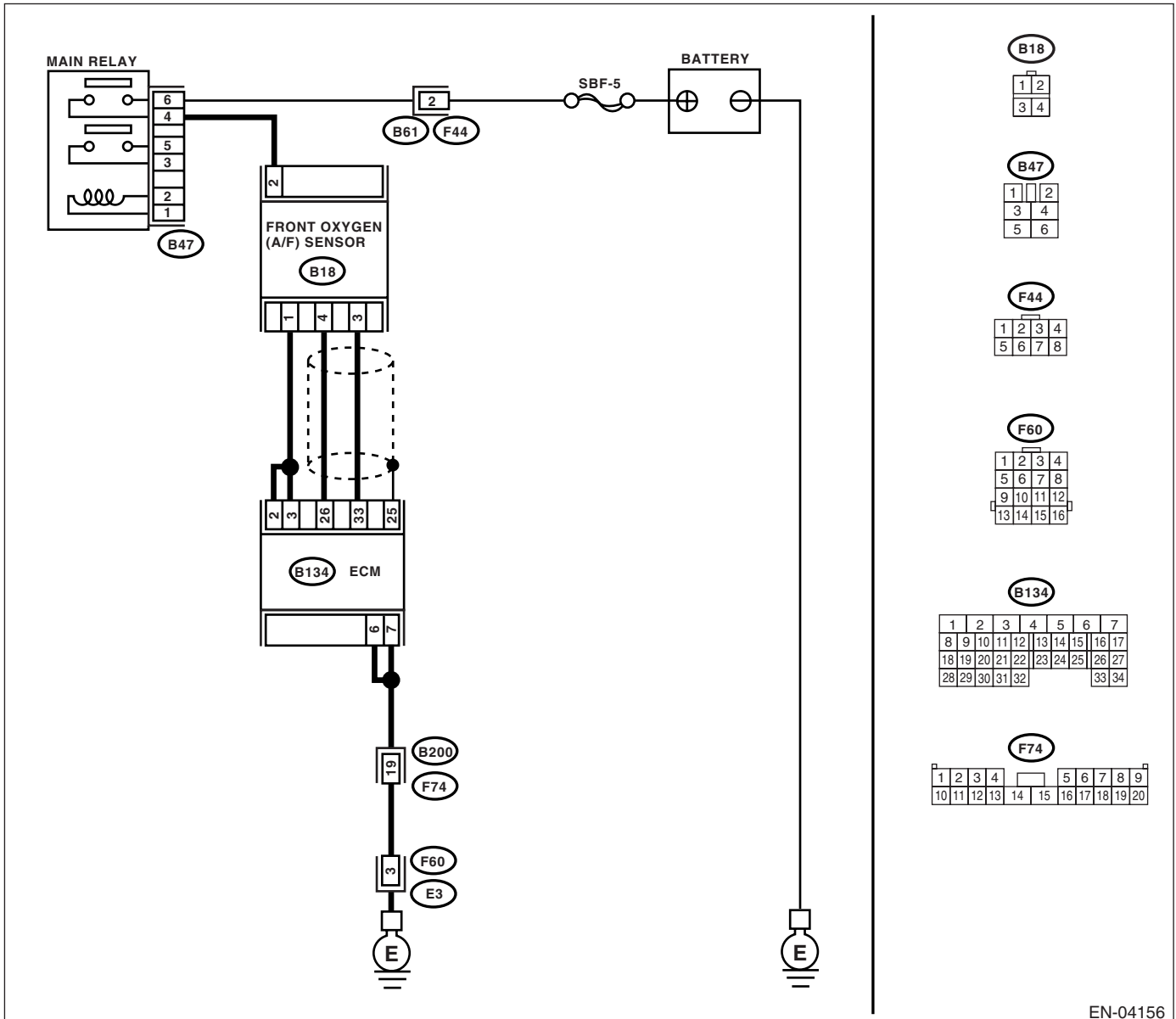
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-56, DTC P0132 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04156

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check  | Yes   | No  |
|------|--|---|---|
| 1    | <b>CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>   | Remove infiltrating water completely.   | Go to step 2.   |
| 2    | <b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from front oxygen (A/F) sensor.<br>3) Measure the voltage of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 26 (+) — Chassis ground (-):</b><br><b>(B134) No. 33 (+) — Chassis ground (-):</b> | Is the voltage more than 8 V?<br><br>Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. | Replace the front oxygen (A/F) sensor. <Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## Z: DTC P0133 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

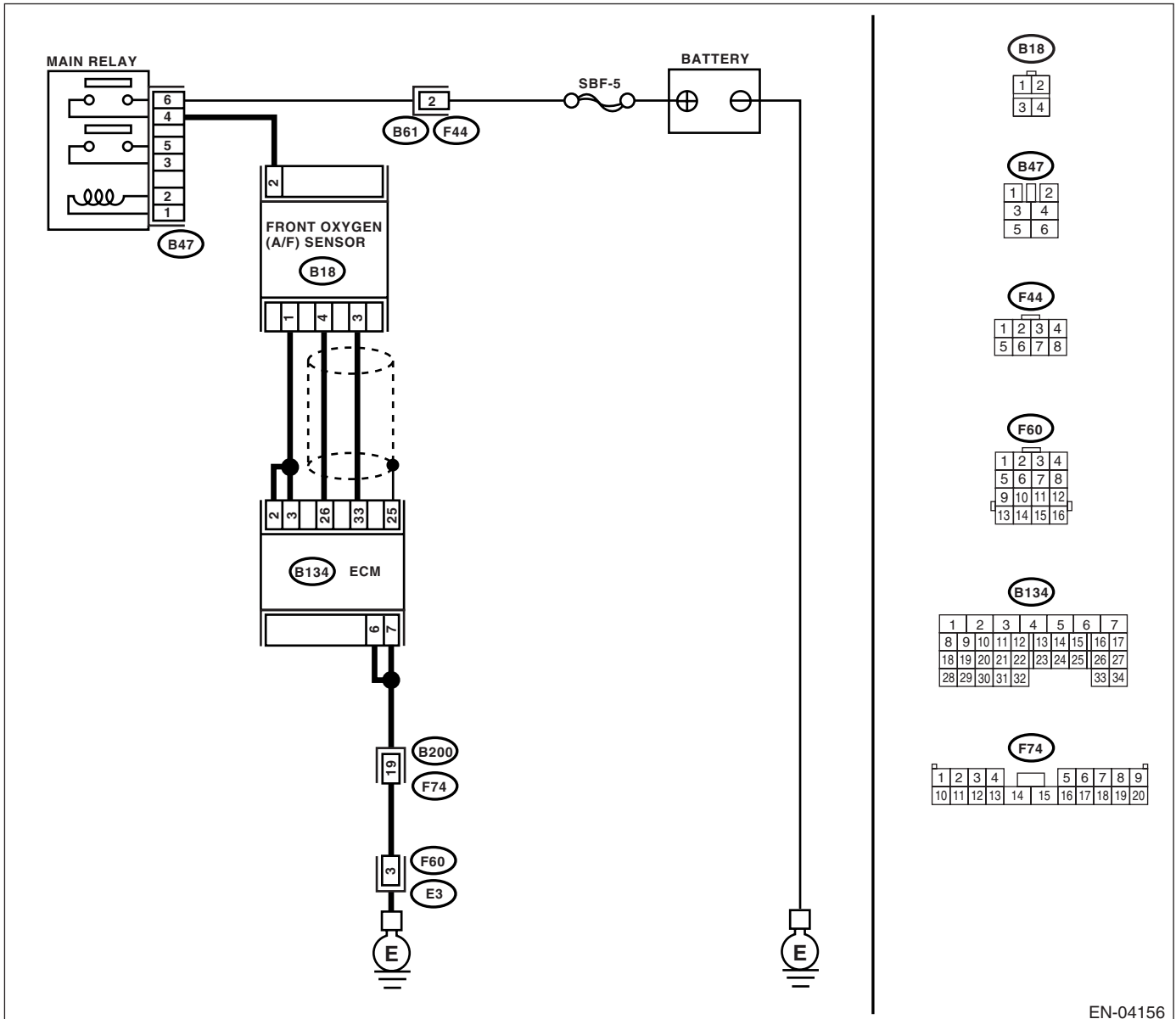
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-58, DTC P0133 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04156

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                 | Yes  | No  |
|--|---------------------------------------|--|---|
| <b>1</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?           | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0133. | Go to step 2.   |
| <b>2</b><br><b>CHECK EXHAUST SYSTEM.</b><br>NOTE:<br>Check the following items. <ul style="list-style-type: none"><li>• Loose installation of front portion of exhaust pipe onto cylinder heads</li><li>• Loose connection between front exhaust pipe and front catalytic converter</li><li>• Damage of exhaust pipe resulting in a hole</li></ul> | Is there any fault in exhaust system? | Repair the exhaust system.   | Replace the front oxygen (A/F) sensor. <Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AA:DTC P0134 O<sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

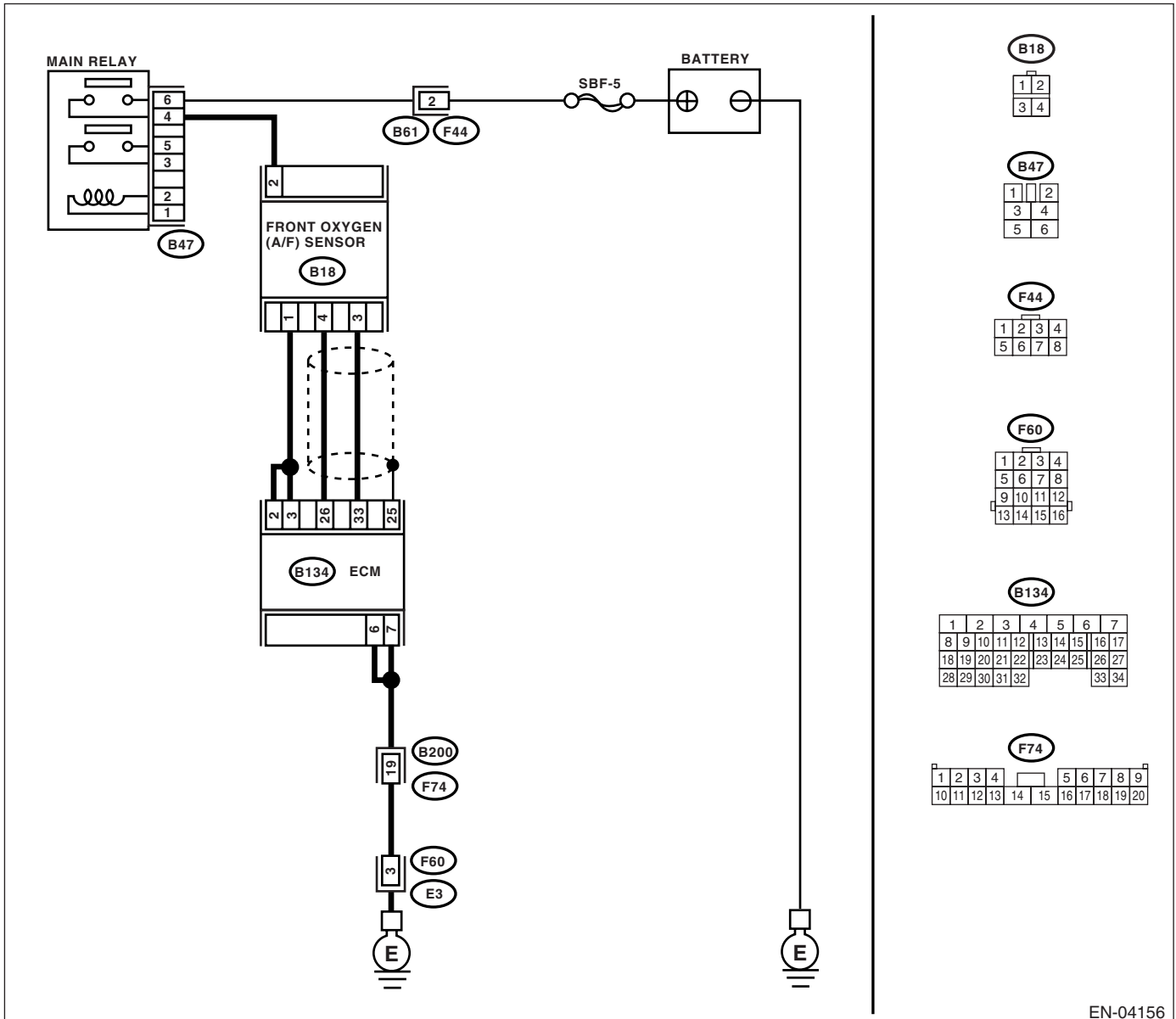
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-61, DTC P0134 O<sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04156

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br/>3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p><b>Connector &amp; terminal</b><br/><b>(B134) No. 26 — (B18) No. 4:</b><br/><b>(B134) No. 33 — (B18) No. 3:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p> | <p>Replace the front oxygen (A/F) sensor. &lt;Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.&gt;</p> | <p>Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.</p> |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AB:DTC P0137 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

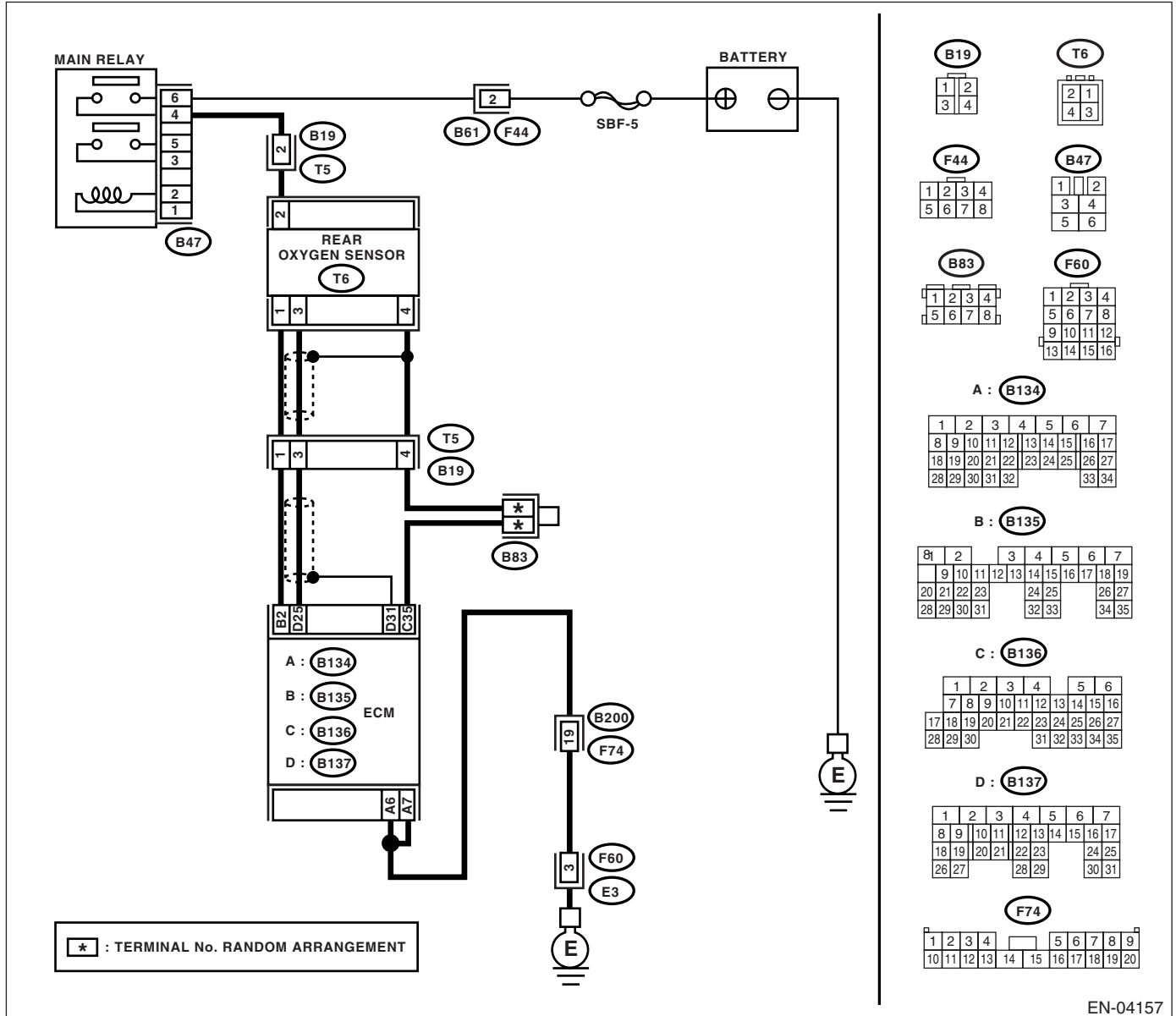
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-63, DTC P0137 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>

### WIRING DIAGRAM:



EN-04157

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                            | Yes  | No            |
|---|----------------------------------|--|---------------|
| <b>1</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?      | Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0137. | Go to step 2. |
| <b>2</b><br><b>CHECK REAR OXYGEN SENSOR DATA.</b><br>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest)<br>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br><ul style="list-style-type: none"> <li>• Depress the clutch pedal.</li> <li>• Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.><br><ul style="list-style-type: none"> <li>• General scan tool</li> </ul> For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the voltage more than 490 mV? | Go to step 6.  | Go to step 3. |
| <b>3</b><br><b>CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>   | Is there water in connector?     | Remove infiltrating water completely.  | Go to step 4. |
| <b>4</b><br><b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and rear oxygen sensor.<br>3) Measure the resistance of harness between ECM and rear oxygen sensor connector.<br><br><i>Connector &amp; terminal</i><br><i>(B136) No. 35 — (T6) No. 4:</i><br><i>(B137) No. 25 — (T6) No. 3:</i>   | Is the resistance more than 3 Ω? | Repair the open circuit in harness between ECM and rear oxygen sensor connector.   | Go to step 5. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <p><b>5</b></p> <p><b>CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from rear oxygen sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T6) No. 3 (+) — Engine ground (-):</b></p> | <p>Is the voltage 0.2 — 0.5 V?</p>           | <p>Replace the rear oxygen sensor.<br/>                     &lt;Ref. to FU(STI)-38, Rear Oxygen Sensor.&gt;</p> | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in ECM connector</li> </ul> |
| <p><b>6</b></p> <p><b>CHECK EXHAUST SYSTEM.</b></p> <p>Check the exhaust system parts.</p> <p><b>NOTE:</b><br/>                     Check the following items.</p> <ul style="list-style-type: none"> <li>• Loose installation of portions</li> <li>• Damage (crack, hole etc.) of parts</li> <li>• Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor</li> </ul>  | <p>Is there any fault in exhaust system?</p> | <p>Repair or replace the faulty parts.</p>  | <p>Replace the rear oxygen sensor.<br/>                     &lt;Ref. to FU(STI)-38, Rear Oxygen Sensor.&gt;</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AC:DTC P0138 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

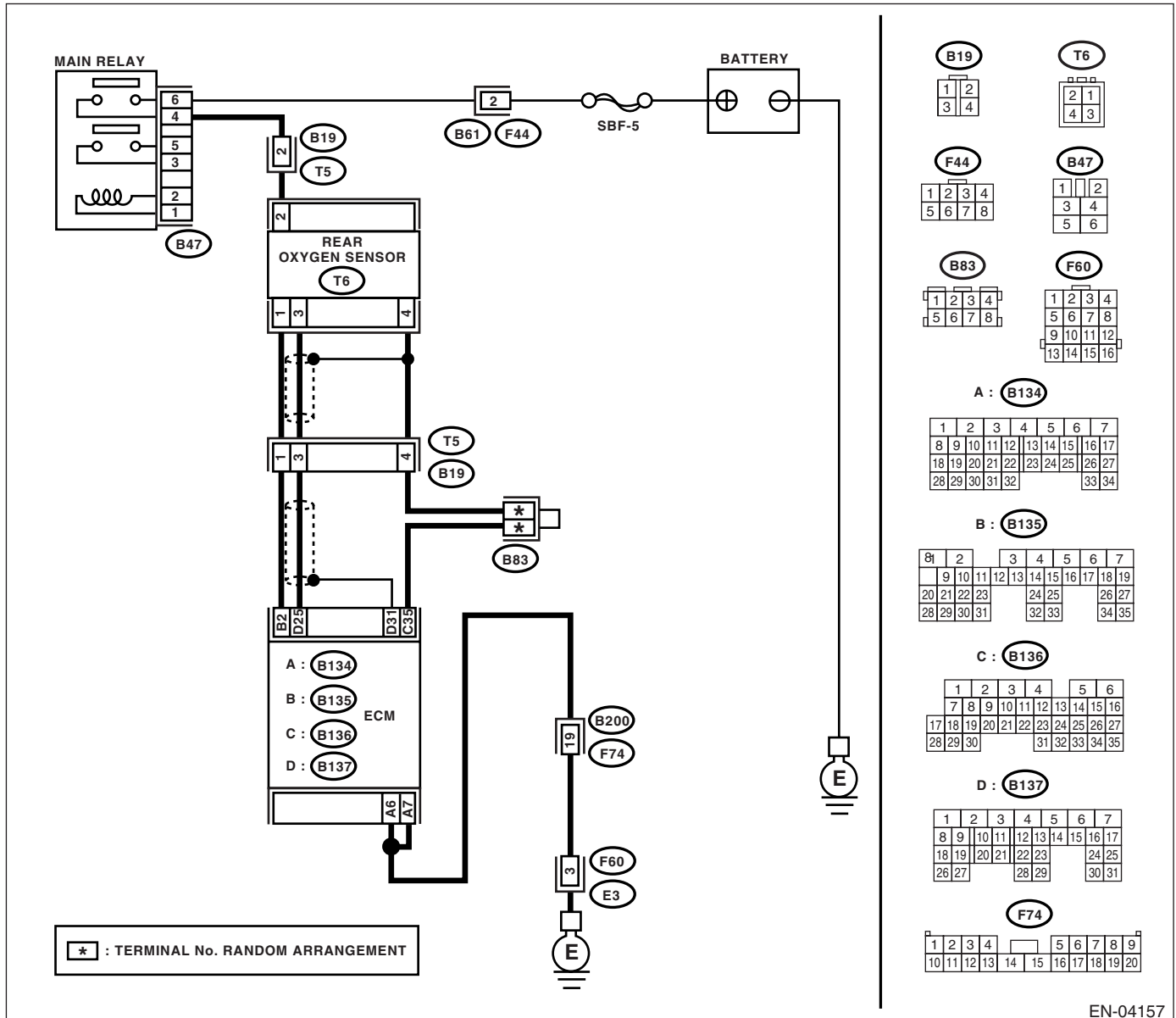
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-65, DTC P0138 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04157

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check                            | Yes  | No            |
|--|----------------------------------|--|---------------|
| <b>1</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?      | Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0138. | Go to step 2. |
| <b>2</b><br><b>CHECK REAR OXYGEN SENSOR DATA.</b><br>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed from 3,000 rpm.<br>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.<br><br>NOTE:<br>• Depress the clutch pedal.<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the voltage less than 250 mV? | Go to step 6.  | Go to step 3. |
| <b>3</b><br><b>CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>  | Is there water in connector?     | Remove infiltrating water completely.  | Go to step 4. |
| <b>4</b><br><b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and rear oxygen sensor.<br>3) Measure the resistance of harness between ECM and rear oxygen sensor connector.<br><br><i>Connector &amp; terminal</i><br><i>(B137) No. 25 — (T6) No. 3:</i><br><i>(B136) No. 35 — (T6) No. 4:</i>  | Is the resistance more than 3 Ω? | Repair the open circuit in harness between ECM and rear oxygen sensor connector.   | Go to step 5. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <p><b>5</b></p> <p><b>CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from rear oxygen sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T6) No. 3 (+) — Engine ground (-):</b></p> | <p>Is the voltage 0.2 — 0.5 V?</p>           | <p>Replace the rear oxygen sensor.<br/>                     &lt;Ref. to FU(STI)-38, Rear Oxygen Sensor.&gt;</p> | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in ECM connector</li> </ul> |
| <p><b>6</b></p> <p><b>CHECK EXHAUST SYSTEM.</b></p> <p>Check the exhaust system parts.</p> <p><b>NOTE:</b><br/>                     Check the following items.</p> <ul style="list-style-type: none"> <li>• Loose installation of portions</li> <li>• Damage (crack, hole etc.) of parts</li> <li>• Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor</li> </ul>  | <p>Is there any fault in exhaust system?</p> | <p>Repair or replace the faulty parts.</p>  | <p>Replace the rear oxygen sensor.<br/>                     &lt;Ref. to FU(STI)-38, Rear Oxygen Sensor.&gt;</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AD:DTC P0139 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

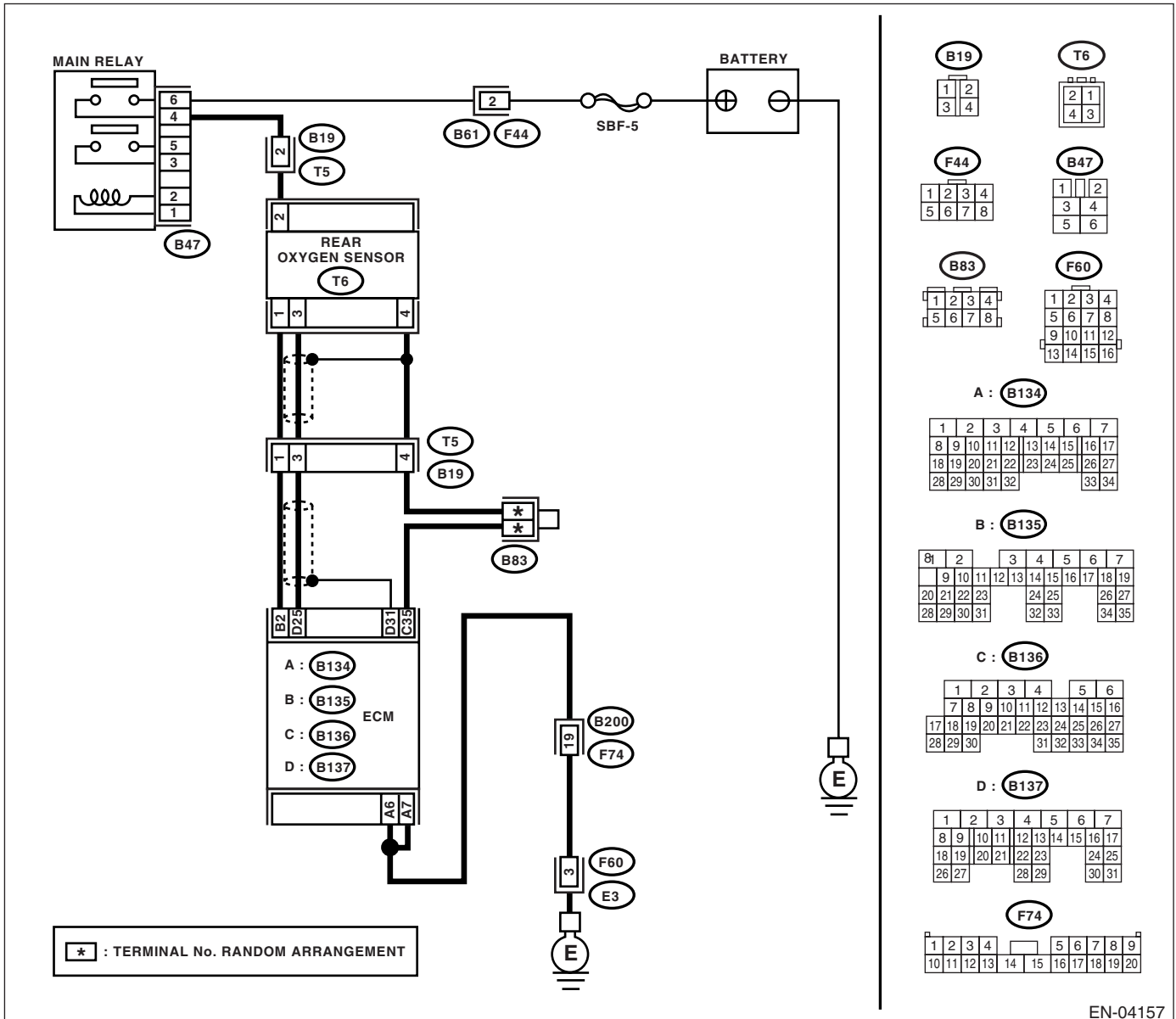
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-67, DTC P0139 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04157

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

|   | Step                                       | Check                       | Yes  | No   |
|---|--|-----------------------------|--|--|
| 1 | <b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0139. | Replace the rear oxygen sensor.<br><Ref. to FU(STI)-38, Rear Oxygen Sensor.> |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AE:DTC P0171 SYSTEM TOO LEAN (BANK 1)

NOTE:

For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(STI)(diag)-142, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## AF:DTC P0172 SYSTEM TOO RICH (BANK 1)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-72, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(STI)-75, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

| Step | Check  | Yes  | No  |
|------|--|--|---|
| 1    | <b>CHECK EXHAUST SYSTEM.</b>   | Are there holes or loose bolts on exhaust system?                                  | Repair the exhaust system.<br>Go to step 2.   |
| 2    | <b>CHECK AIR INTAKE SYSTEM.</b>  | Are there holes, loose bolts or disconnection of hose on air intake system?        | Repair the air intake system.<br>Go to step 3.  |
| 3    | <b>CHECK FUEL PRESSURE.</b><br><b>Warning:</b> <ul style="list-style-type: none"> <li>• Place “NO FIRE” signs near the working area.</li> <li>• Be careful not to spill fuel on the floor.</li> </ul> Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(STI)-26, INSPECTION, Fuel Pressure.><br><b>Warning:</b><br>Before removing the fuel pressure gauge, release fuel pressure.<br>NOTE:<br>If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. | Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm <sup>2</sup> , 41 — 46 psi)? | Go to step 4.<br><br>Repair the following items.<br>Fuel pressure too high: <ul style="list-style-type: none"> <li>• Clogged fuel return line or bent hose</li> </ul> Fuel pressure too low: <ul style="list-style-type: none"> <li>• Improper fuel pump discharge</li> <li>• Clogged fuel supply line</li> </ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes                  | No   |
|--|---|----------------------|--|
| <p><b>4</b>      <b>CHECK FUEL PRESSURE.</b><br/>After connecting the pressure regulator vacuum hose, measure fuel pressure. &lt;Ref. to ME(STI)-26, INSPECTION, Fuel Pressure.&gt;</p> <p><b>Warning:</b><br/><b>Before removing the fuel pressure gauge, release fuel pressure.</b></p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.</li> <li>• If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.</li> </ul>  | <p>Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm<sup>2</sup>, 33 — 38 psi)?</p> | <p>Go to step 5.</p> | <p>Repair the following items.</p> <p>Fuel pressure too high:</p> <ul style="list-style-type: none"> <li>• Faulty pressure regulator</li> <li>• Clogged fuel return line or bent hose</li> </ul> <p>Fuel pressure too low:</p> <ul style="list-style-type: none"> <li>• Faulty pressure regulator</li> <li>• Improper fuel pump discharge</li> <li>• Clogged fuel supply line</li> </ul> |
| <p><b>5</b>      <b>CHECK ENGINE COOLANT TEMPERATURE SENSOR.</b></p> <ol style="list-style-type: none"> <li>1) Start the engine and warm-up completely.</li> <li>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</li> </ol> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p>   | <p>Is the temperature more than 60°C (140°F)?</p>   | <p>Go to step 6.</p> | <p>Replace the engine coolant temperature sensor. &lt;Ref. to FU(STI)-25, Engine Coolant Temperature Sensor.&gt;</p>   |
| <p><b>6</b>      <b>CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.</b></p> <ol style="list-style-type: none"> <li>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</li> <li>2) Place the shift lever in neutral position.</li> <li>3) Turn the A/C switch to OFF.</li> <li>4) Turn all accessory switches to OFF.</li> <li>5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</li> </ol> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)?</p>                            | <p>Go to step 7.</p> | <p>Replace the mass air flow and intake air temperature sensor. &lt;Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p>   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <p><b>7</b></p> <p><b>CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2) Place the shift lever in neutral position.</p> <p>3) Turn the A/C switch to OFF.</p> <p>4) Turn all accessory switches to OFF.</p> <p>5) Open the front hood.</p> <p>6) Measure the ambient temperature.</p> <p>7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the General Scan Tool Instruction Manual.</p> | <p>Subtract ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?</p> | <p>Replace the ECM. &lt;Ref. to FU(STI)-39, Engine Control Module (ECM).&gt;</p> | <p>Check the mass air flow and intake air temperature sensor. &lt;Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p> |

## AG:DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE

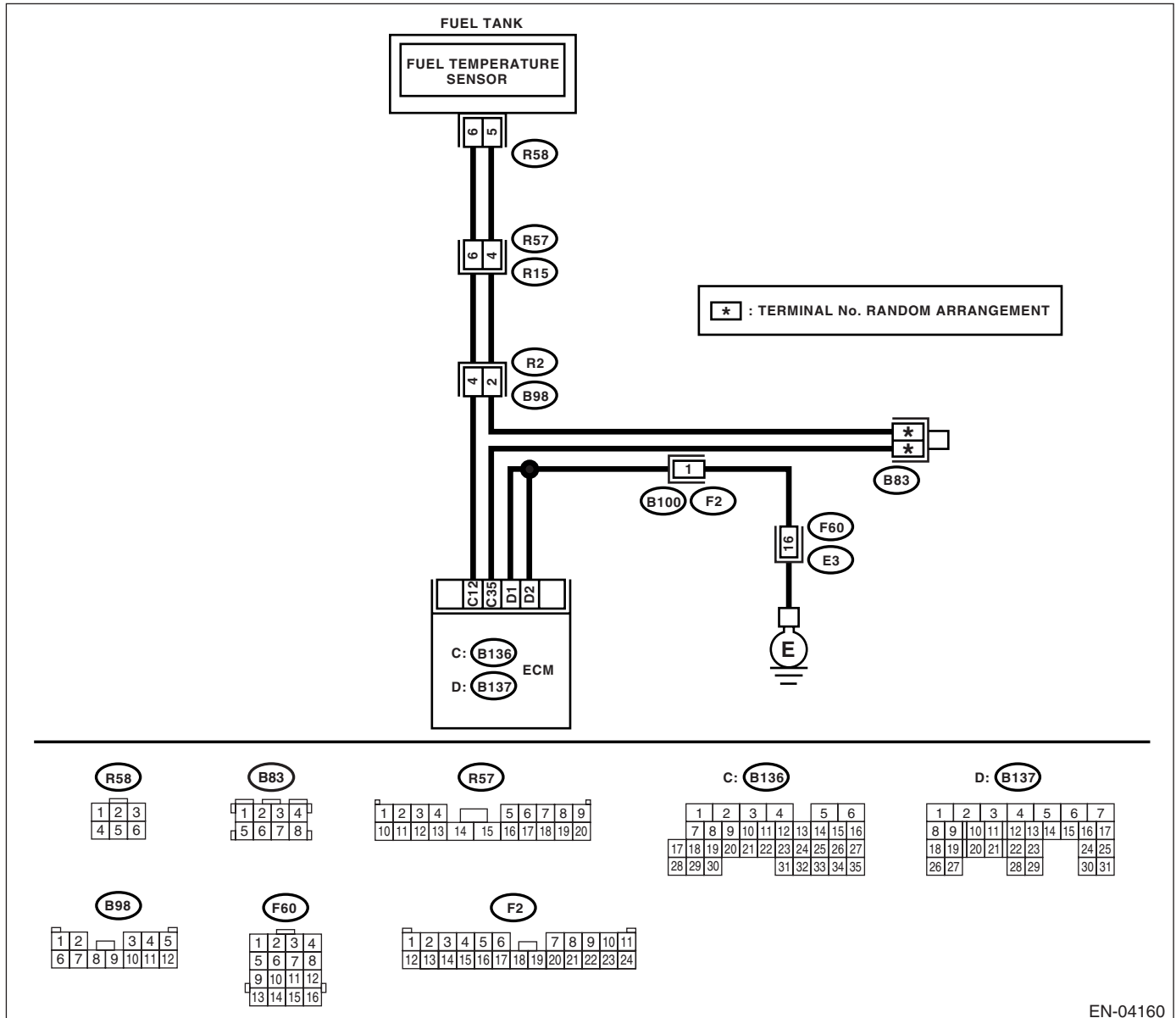
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-78, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                       | Yes   | No   |
|---|-----------------------------|---|--|
| 1<br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Codes (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0181. | Replace the fuel temperature sensor. <Ref. to EC(STI)-8, Fuel Temperature Sensor.> |

## AH:DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT

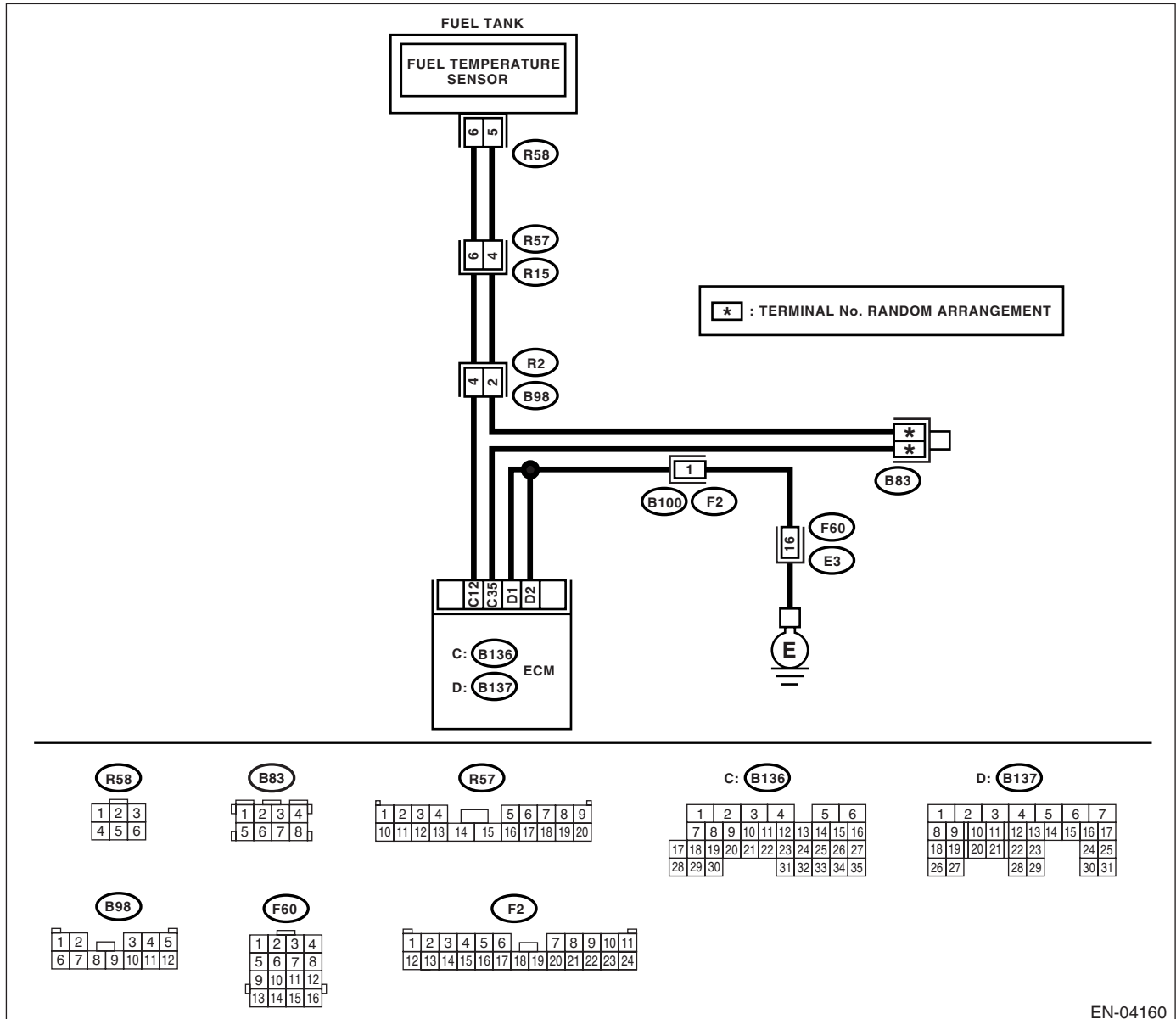
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-81, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <p><b>1</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Start the engine.<br/>2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p>  | <p>Is the temperature more than 150°C (302°F)?</p> | <p>Go to step 2.</p>  | <p>The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.</p> |
| <p><b>2</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Turn ignition switch to OFF.<br/>2) Remove the access hole lid.<br/>3) Disconnect the connector from fuel pump.<br/>4) Turn ignition switch to ON.<br/>5) Read the data of fuel temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the temperature less than -40°C (-40°F)?</p> | <p>Replace the fuel temperature sensor. &lt;Ref. to EC(STI)-8, Fuel Temperature Sensor.&gt;</p> | <p>Repair short circuit to ground in harness between fuel pump and ECM connector.</p>                                     |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AI: DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT

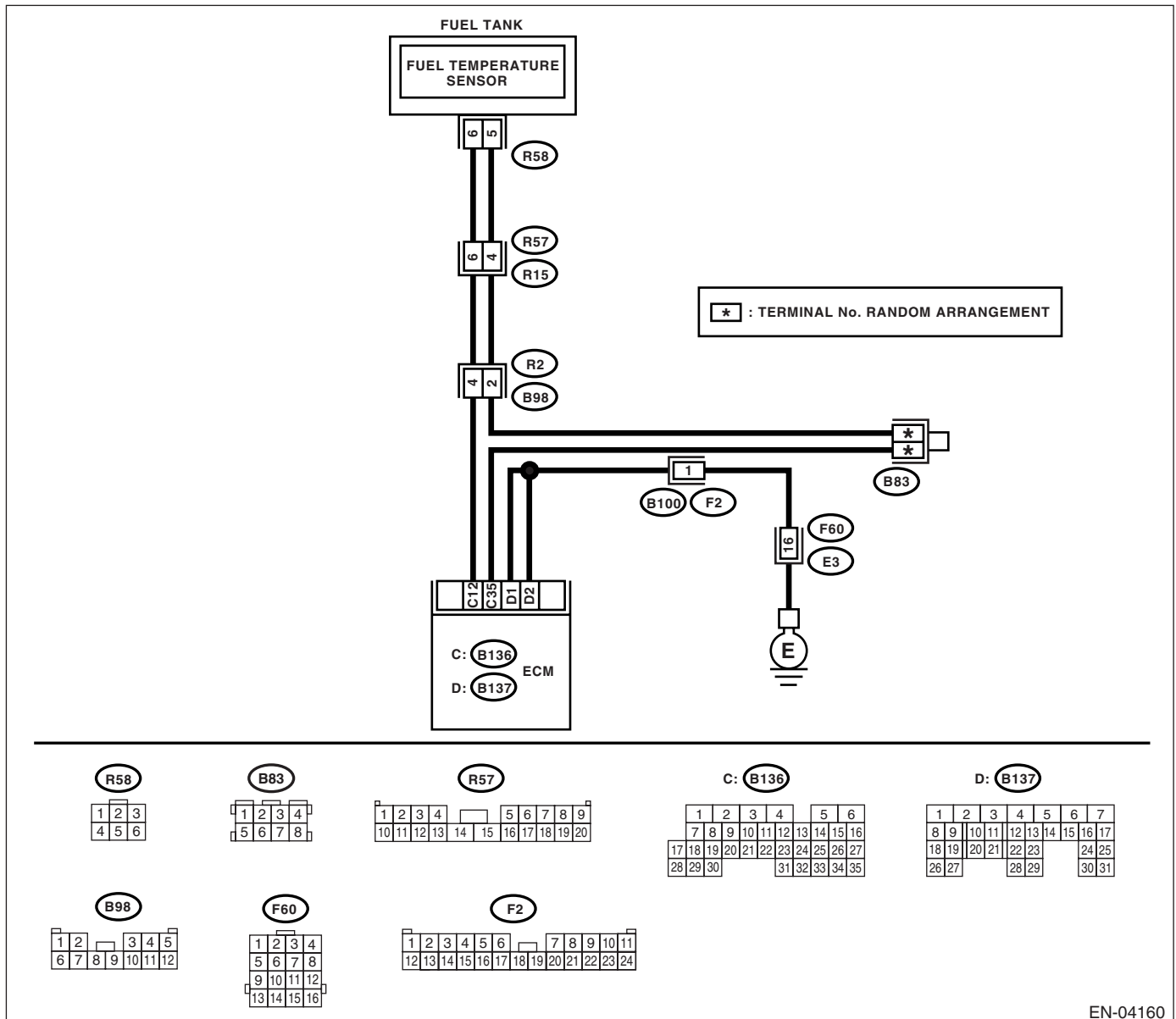
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-83, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04160



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check                                       | Yes   | No  |
|---|---|---|---|
| <b>1 CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the temperature less than -40°C (-40°F)? | Go to step 2.   | Repair poor contact.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Poor contact in fuel pump connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector<br>• Poor contact in joint connector                                      |
| <b>2 CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Remove the access hole lid.<br>3) Disconnect the connector from fuel pump.<br>4) Measure the voltage between fuel pump connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(R58) No. 6 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?              | Repair short circuit to battery in harness between ECM and fuel pump connector. | Go to step 3.   |
| <b>3 CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between fuel pump connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(R58) No. 6 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?              | Repair short circuit to battery in harness between ECM and fuel pump connector. | Go to step 4.   |
| <b>4 CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b><br>Measure the voltage between fuel pump connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(R58) No. 6 (+) — Chassis ground (-):</b>   | Is the voltage more than 4 V?               | Go to step 5.   | Repair harness and connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM and fuel pump connector<br>• Poor contact in fuel pump connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <p><b>5</b></p> <p><b>CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM.<br/>                     3) Measure the resistance of harness between fuel pump connector and ECM.</p> <p><b>Connector &amp; terminal</b><br/> <b>(R58) No. 5 — (B136) No. 35:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p> | <p>Replace the fuel temperature sensor. &lt;Ref. to EC(STI)-8, Fuel Temperature Sensor.&gt;</p> | <p>Repair harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and fuel pump connector</li> <li>• Poor contact in fuel pump connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **AJ:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT**

#### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-85, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance
- Engine stalls.

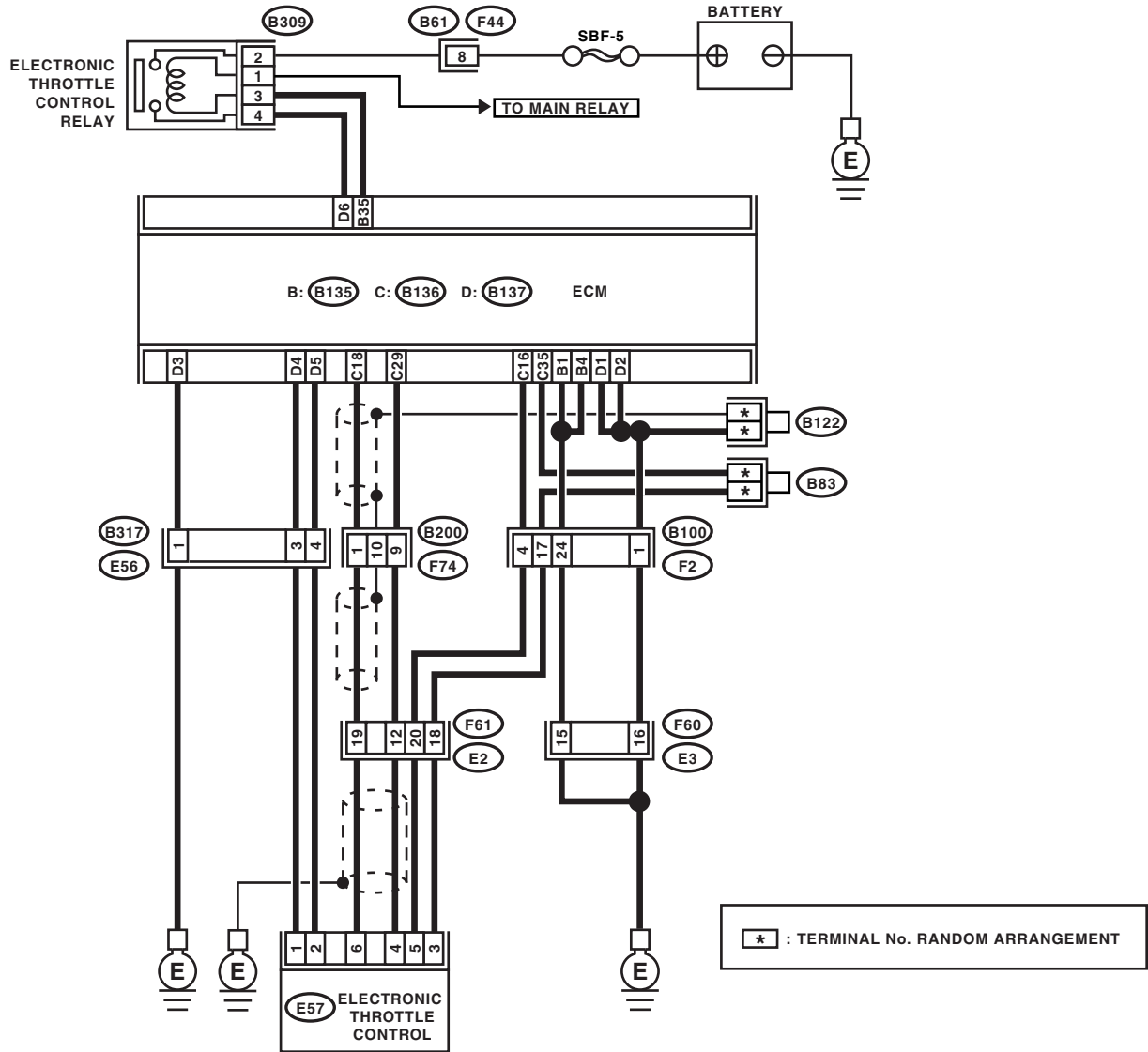
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

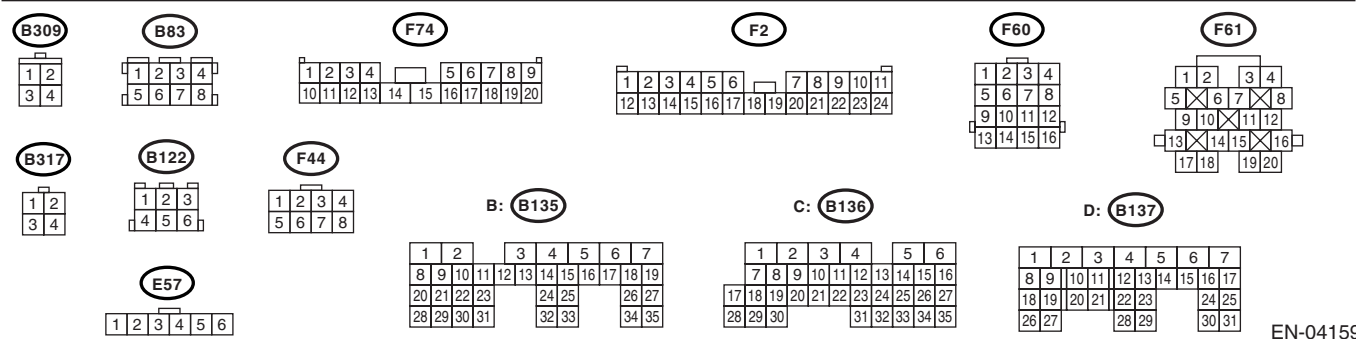
# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



\* : TERMINAL No. RANDOM ARRANGEMENT



EN-04159

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No   |
|--|--|---|--|
| <b>1 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 29 (+) — (B136) No. 35 (-):</b></i><br>3) Shake the ECM harness and connector, engine harness connectors (E84, E22), electronic throttle control connector harness while monitoring value of voltage meter.      | Is the voltage more than 0.8 V?  | Go to step 2.   | Go to step 3.  |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in the connectors between the ECM and electronic throttle control.  | Is there poor contact in the connectors between ECM and electronic throttle control? | Repair the poor contact in connectors.  | Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.             |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from electronic throttle control.<br>4) Measure the resistance between the ECM connector and electronic throttle control connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 16 — (E57) No. 5:</b></i>           | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.   | Repair the open harness connector.   |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>Check the resistance between the ECM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 29 — Chassis ground:</b></i><br><i><b>(B136) No. 16 — Chassis ground:</b></i>  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 5.   | Repair the ground short of harness.  |
| <b>5 CHECK POWER SUPPLY TO SENSOR.</b><br>1) Connect the ECM connectors.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electronic throttle control connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E57) No. 5 (+) — Engine ground (-):</b></i><br>4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter. | Is the voltage 4.5 — 5.5 V?  | Go to step 6.   | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> |
| <b>6 CHECK SHORT OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electronic throttle control connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E57) No. 4 — Engine ground:</b></i>  | Is the resistance more than 10 $\Omega$ ?  | Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control. | Repair the poor contact in ECM connectors. If problem persists, replace the ECM.   |

## **AK:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT**

### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-87, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance
- Engine stalls.

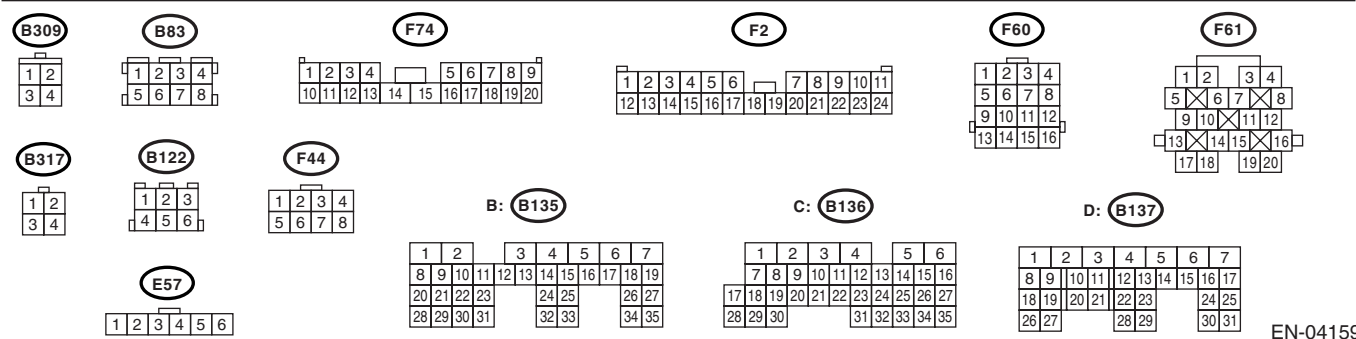
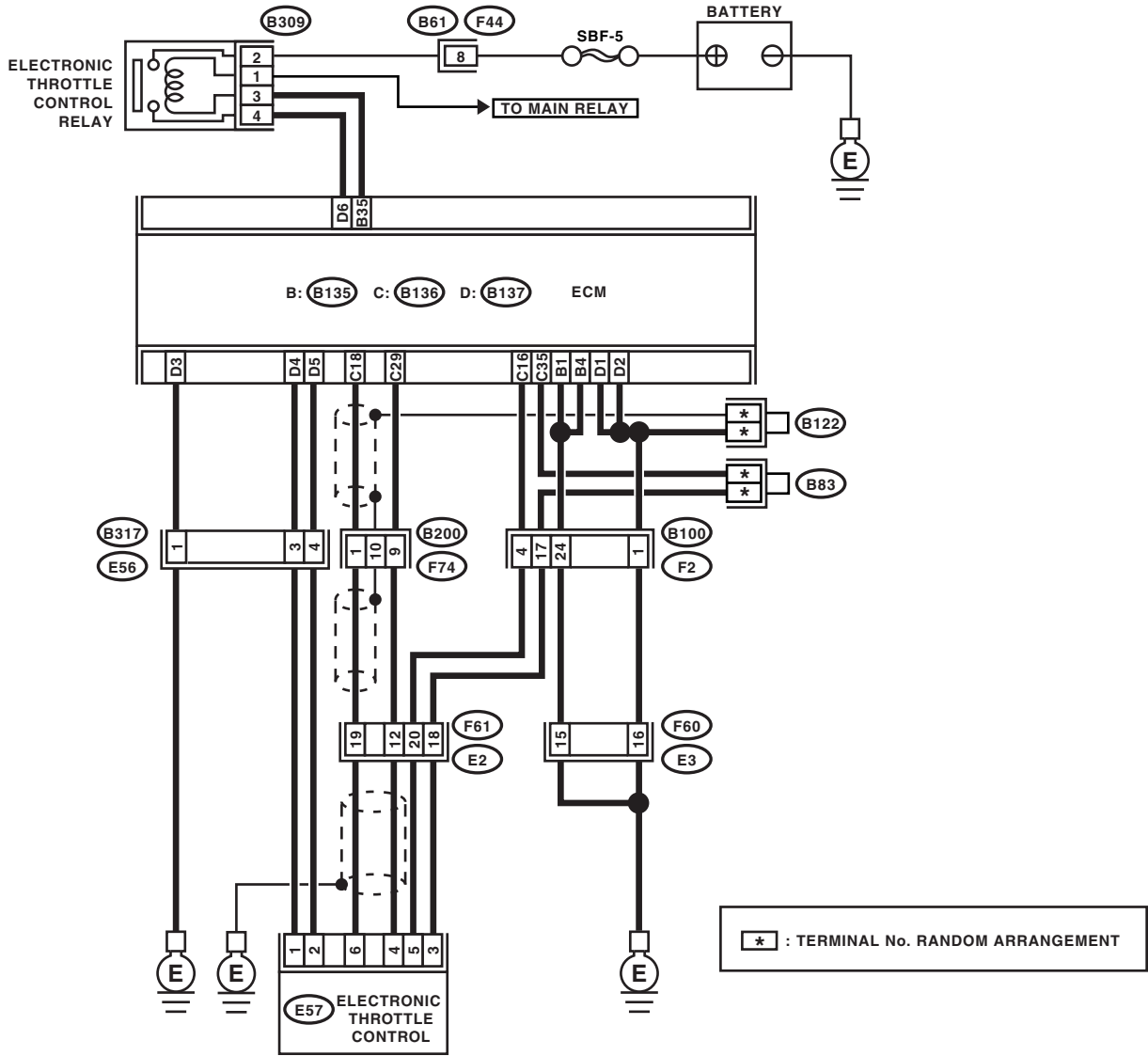
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04159

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes                                    | No   |
|---|--|--|--|
| <b>1 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of sub throttle sensor signals, using the Subaru Select Monitor.<br>3) Shake the ECM harness and connector, engine harness connectors (E84, E22), electronic throttle control connector harness while monitoring value of voltage meter.   | Is the voltage less than 4.73 V?   | Go to step 2.                          | Go to step 3.  |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electronic throttle control.   | Is there poor contact in the connectors between ECM and electronic throttle control? | Repair the poor contact in connectors. | Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM.<br>3) Disconnect the connectors from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 35 — (E57) No. 3:</i><br><i>(B136) No. 29 — (E57) No. 4:</i> | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.                          | Repair the open circuit of harness connector.  |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between the electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 3 — Engine ground:</i>  | Is the resistance less than 5 $\Omega$ ?   | Go to step 5.                          | Repair the poor contact in ECM connector. If the problem persists, replace the ECM.                                    |
| <b>5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 5 — Engine ground:</i><br>4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.        | Is the voltage more than 10 V?   | Go to step 6.                          | Repair the battery short of harness between ECM connector and electronic throttle control connector.                   |
| <b>6 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Measure the voltage between the electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 4 (+) — Engine ground (-):</i><br>2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.   | Is the voltage less than 10 V?   | Go to step 7.                          | Repair the short of harness between ECM connector and electronic throttle control connector.                           |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                             | Yes   | No   |
|---|-----------------------------------|---|--|
| <b>7</b><br><b>CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the voltage between connectors.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 29 — (B136) No. 16:</b> | Is the resistance more than 1 MΩ? | Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control. | Short circuit of sensor power supply may be the cause. |

## AL:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

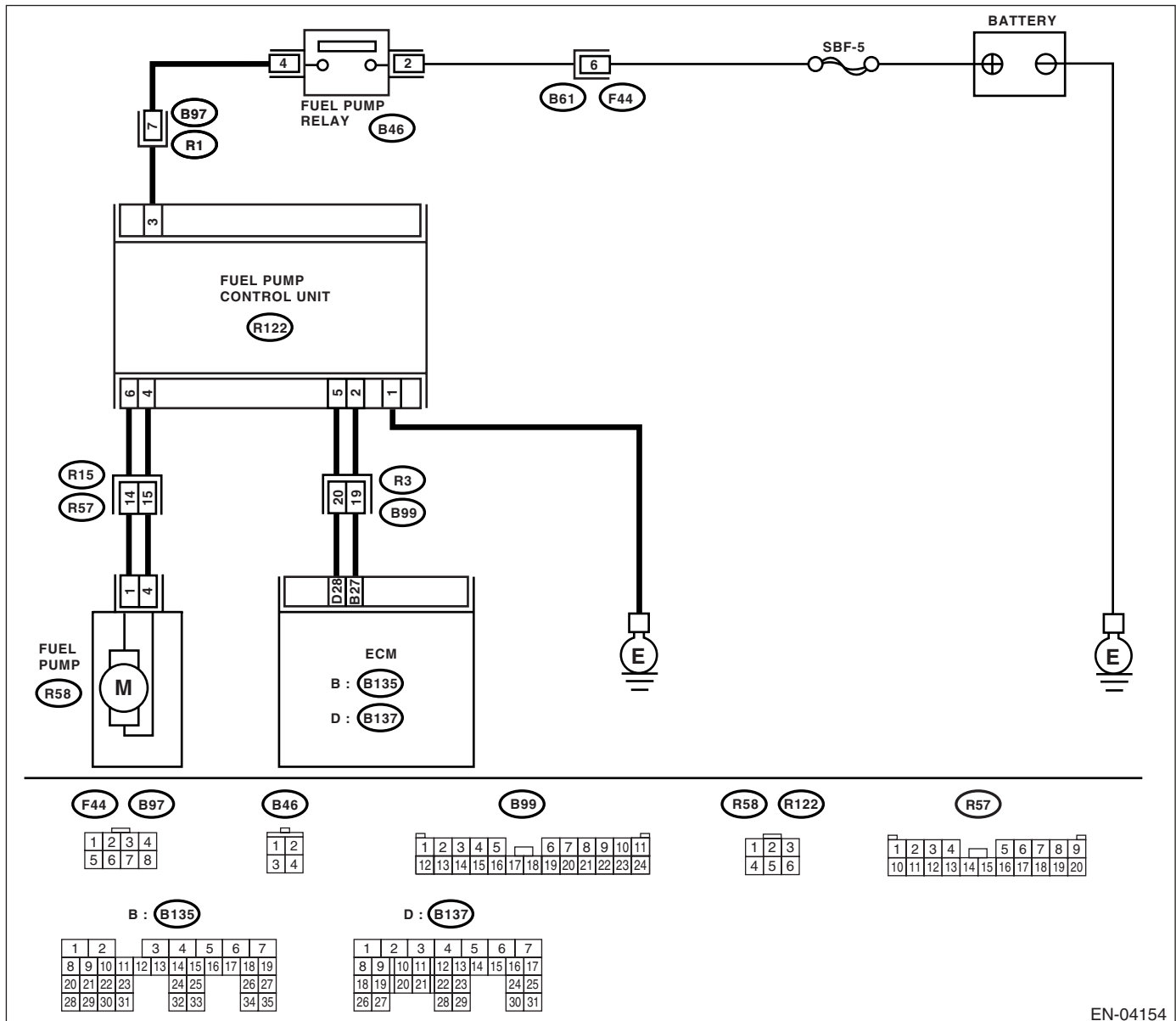
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-89, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04154

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes                  | No  |
|---|--|----------------------|---|
| <p><b>1</b></p> <p><b>CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROL UNIT.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from fuel pump control unit.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between fuel pump control unit and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(R122) No. 3 (+) — Chassis ground (-):</b></p> | <p>Is the voltage more than 10 V?</p>                      | <p>Go to step 2.</p> | <p>Repair the power supply circuit.</p> <p><b>NOTE:</b><br/>                     In this case repair the following:</p> <ul style="list-style-type: none"> <li>• Open or ground short circuit in harness between fuel pump relay and fuel pump control unit</li> <li>• Poor contact in fuel pump control unit connector</li> <li>• Poor contact in fuel pump relay connector</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK GROUND CIRCUIT OF FUEL PUMP CONTROL UNIT.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Measure the resistance of harness between fuel pump control unit and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(R122) No. 1 — Chassis ground:</b></p>   | <p>Is the resistance less than 5 <math>\Omega</math>?</p>  | <p>Go to step 3.</p> | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit between fuel pump control unit and chassis ground</li> <li>• Poor contact in fuel pump control unit connector</li> </ul>  |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.</b></p> <p>1) Disconnect the connector from fuel pump.<br/>                     2) Measure the resistance of harness between fuel pump control unit and fuel pump connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(R122) No. 4 — (R58) No. 4:</b><br/> <b>(R122) No. 6 — (R58) No. 1:</b></p>   | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | <p>Go to step 4.</p> | <p>Repair the open circuit in harness between fuel pump control unit and fuel pump.</p>   |
| <p><b>4</b></p> <p><b>CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.</b></p> <p>Measure the resistance of harness between fuel pump control unit and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(R122) No. 4 — Chassis ground:</b><br/> <b>(R122) No. 6 — Chassis ground:</b></p>  | <p>Is the resistance more than 1 <math>M\Omega</math>?</p> | <p>Go to step 5.</p> | <p>Repair the ground short circuit in harness between fuel pump control unit and fuel pump.</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <b>5 CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between fuel pump control unit and ECM connector.<br><br><i>Connector &amp; terminal</i><br>(R122) No. 5 — (B137) No. 28:<br>(R122) No. 2 — (B135) No. 27: | Is the resistance less than 1 $\Omega$ ?                           | Go to step 6.   | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit between fuel pump control unit and ECM</li> <li>• Poor contact in fuel pump control unit and ECM connector</li> </ul> |
| <b>6 CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.</b><br>Measure the resistance of harness between fuel pump control unit and chassis ground.<br><br><i>Connector &amp; terminal</i><br>(R122) No. 5 — Chassis ground:<br>(R122) No. 2 — Chassis ground:   | Is the resistance more than 1 M $\Omega$ ?                         | Go to step 7.   | Repair the ground short circuit in harness between fuel pump control unit and ECM.  |
| <b>7 CHECK POOR CONTACT.</b><br>Check poor contact in ECM and fuel pump control unit connector.   | Is there poor contact in ECM and fuel pump control unit connector? | Repair the poor contact in ECM and fuel pump control unit.  | Go to step 8.   |
| <b>8 CHECK EXPERIENCE OF OUT OF GAS.</b>  | Have the vehicle been out of gas before?                           | Complete the diagnosis.<br><br>NOTE:<br>DTC may be recorded due to the idle running of fuel pump at out of gas. | Replace the fuel pump control unit. <Ref. to FU(STI)-43, Fuel Pump Control Unit.>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AM:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-91, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

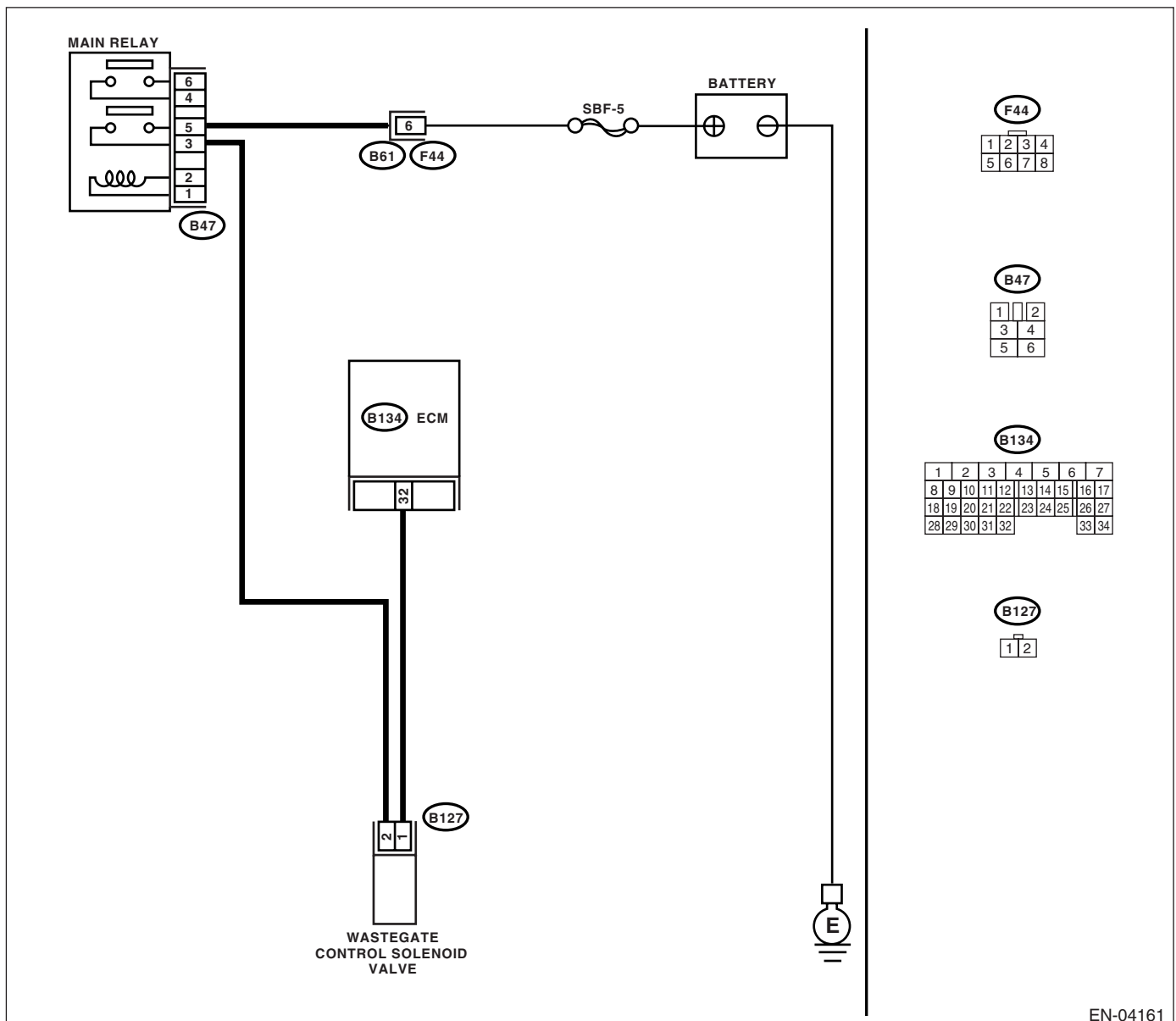
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04161

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                       | Yes  | No   |
|---|-----------------------------|--|--|
| 1<br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0244. | Replace the wastegate control solenoid valve.<br><Ref. to FU(STI)-35, Wastegate Control Solenoid Valve.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AN:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-93, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

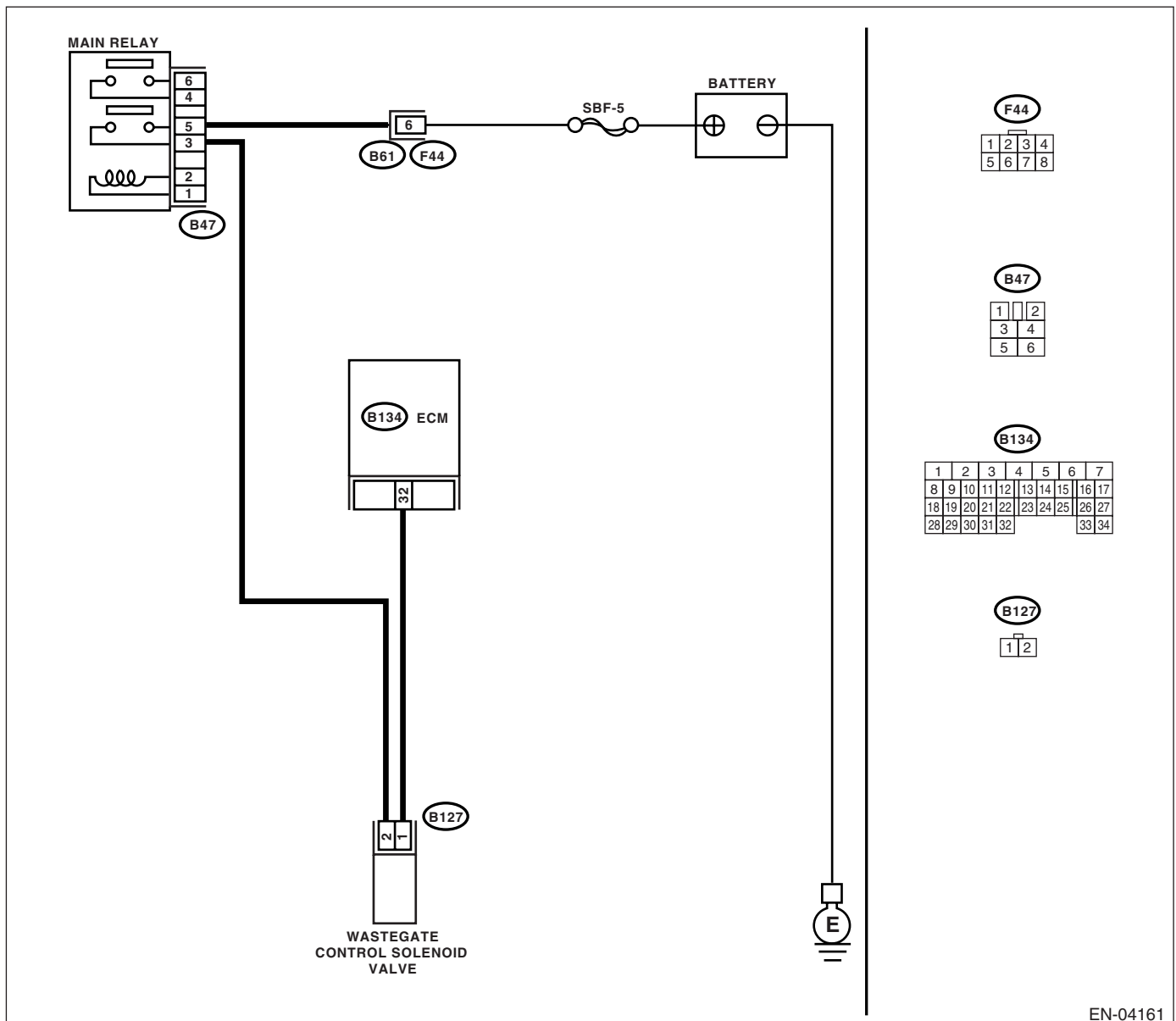
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04161

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <b>1 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 32 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 10 V?                                       | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. | Go to step 2.  |
| <b>2 CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from wastegate control solenoid valve and ECM.<br>3) Measure the resistance of harness between wastegate control solenoid valve connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B127) No. 1 — Engine ground:</b></i> | Is the resistance less than 10 $\Omega$ ?                            | Repair the ground short circuit in harness between ECM and wastegate control solenoid valve connector.      | Go to step 3.  |
| <b>3 CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM and wastegate control solenoid valve of harness connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 32 — (B127) No. 1:</b></i>   | Is the resistance less than 1 $\Omega$ ?                             | Go to step 4.   | Repair the open circuit in harness between ECM and wastegate control solenoid valve connector.<br><br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ECM and wastegate control solenoid valve connector |
| <b>4 CHECK WASTEGATE CONTROL SOLENOID VALVE.</b><br>1) Remove the wastegate control solenoid valve.<br>2) Measure the resistance between wastegate control solenoid valve terminals.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i>   | Is the resistance 30 — 40 $\Omega$ ?                                 | Go to step 5.   | Replace the wastegate control solenoid valve.<br><Ref. to FU(STI)-35, Wastegate Control Solenoid Valve.>   |
| <b>5 CHECK POWER SUPPLY TO WASTEGATE CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between wastegate control solenoid valve and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B127) No. 2 (+) — Engine ground (-):</b></i>   | Is the voltage more than 10 V?                                       | Go to step 6.   | Repair the open circuit in harness between main relay and wastegate control solenoid valve connector.  |
| <b>6 CHECK POOR CONTACT.</b><br>Check poor contact in wastegate control solenoid valve connector.   | Is there poor contact in wastegate control solenoid valve connector? | Repair the poor contact in wastegate control solenoid valve connector.                                      | Contact your SOA Service Center since deterioration of some parts may be the cause.  |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AO:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-95, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

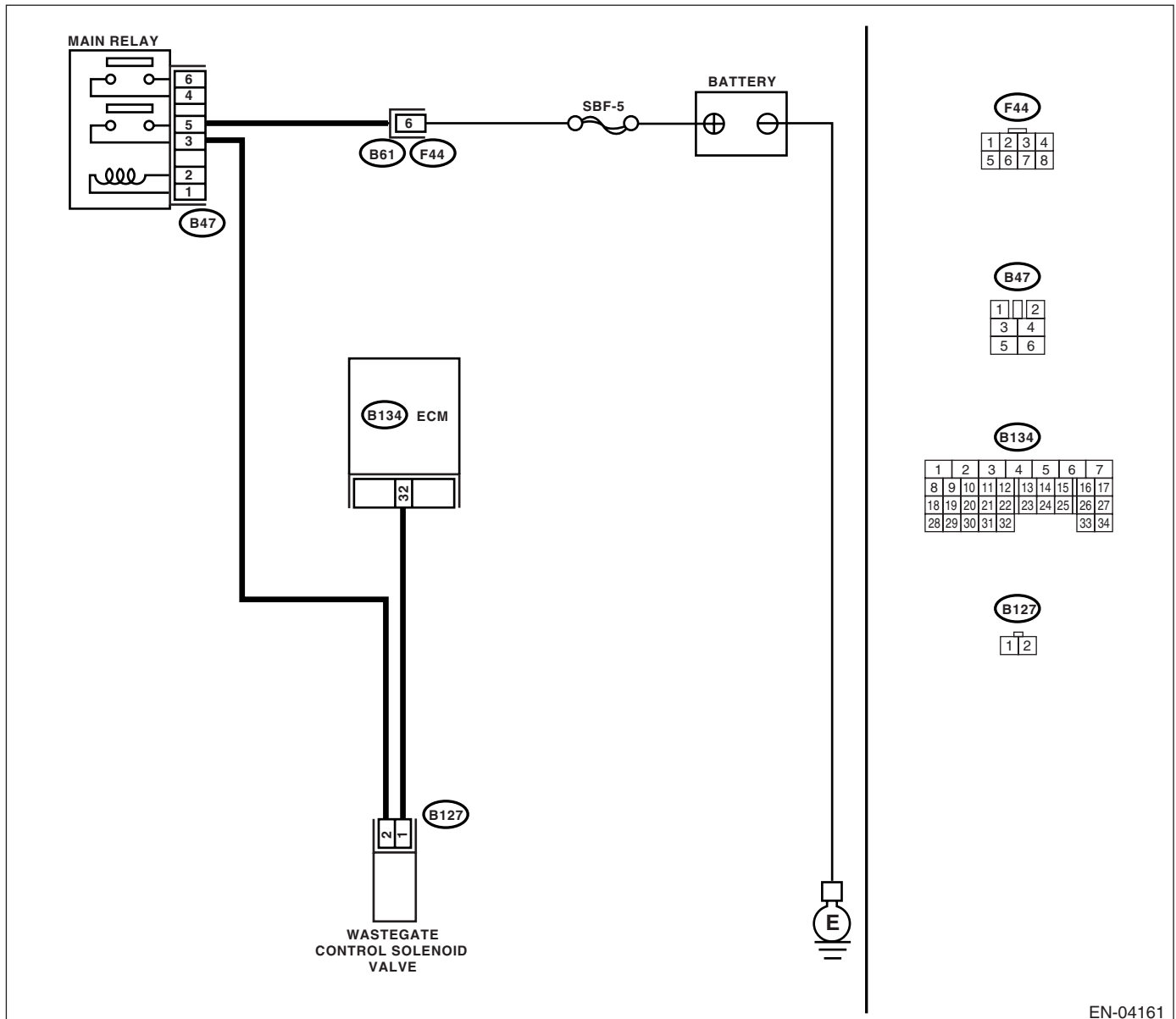
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes   | No  |
|--|--|---|---|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 32 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10 V?           | Go to step 3.   | Go to step 2.   |
| <b>2</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.   | Is there poor contact in ECM connector?  | Repair the poor contact in ECM connector.   | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> |
| <b>3</b><br><b>CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from wastegate control solenoid valve.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 32 (+) — Chassis ground (-):</b></i> | Is the voltage more than 10 V?           | Repair the battery short circuit in harness between ECM and wastegate control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> | Go to step 4.   |
| <b>4</b><br><b>CHECK WASTEGATE CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between wastegate control solenoid valve terminals.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i>  | Is the resistance less than 1 $\Omega$ ? | Replace the wastegate control solenoid valve <Ref. to FU(STI)-35, Wastegate Control Solenoid Valve.> and ECM <Ref. to FU(STI)-39, Engine Control Module (ECM).>                           | Go to step 5.   |
| <b>5</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.   | Is there poor contact in ECM connector?  | Repair the poor contact in ECM connector.   | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **AP:DTC P0301 CYLINDER 1 MISFIRE DETECTED**

**NOTE:**

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(STI)(diag)-168, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **AQ:DTC P0302 CYLINDER 2 MISFIRE DETECTED**

**NOTE:**

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(STI)(diag)-168, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **AR:DTC P0303 CYLINDER 3 MISFIRE DETECTED**

**NOTE:**

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(STI)(diag)-168, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **AS:DTC P0304 CYLINDER 4 MISFIRE DETECTED**

**DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- GENERAL DESCRIPTION <Ref. to GD(STI)-97, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

**TROUBLE SYMPTOM:**

- Engine stalls.
- Erroneous idling
- Rough driving

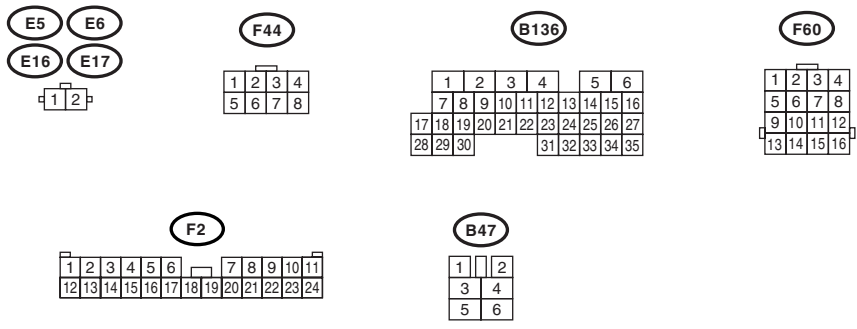
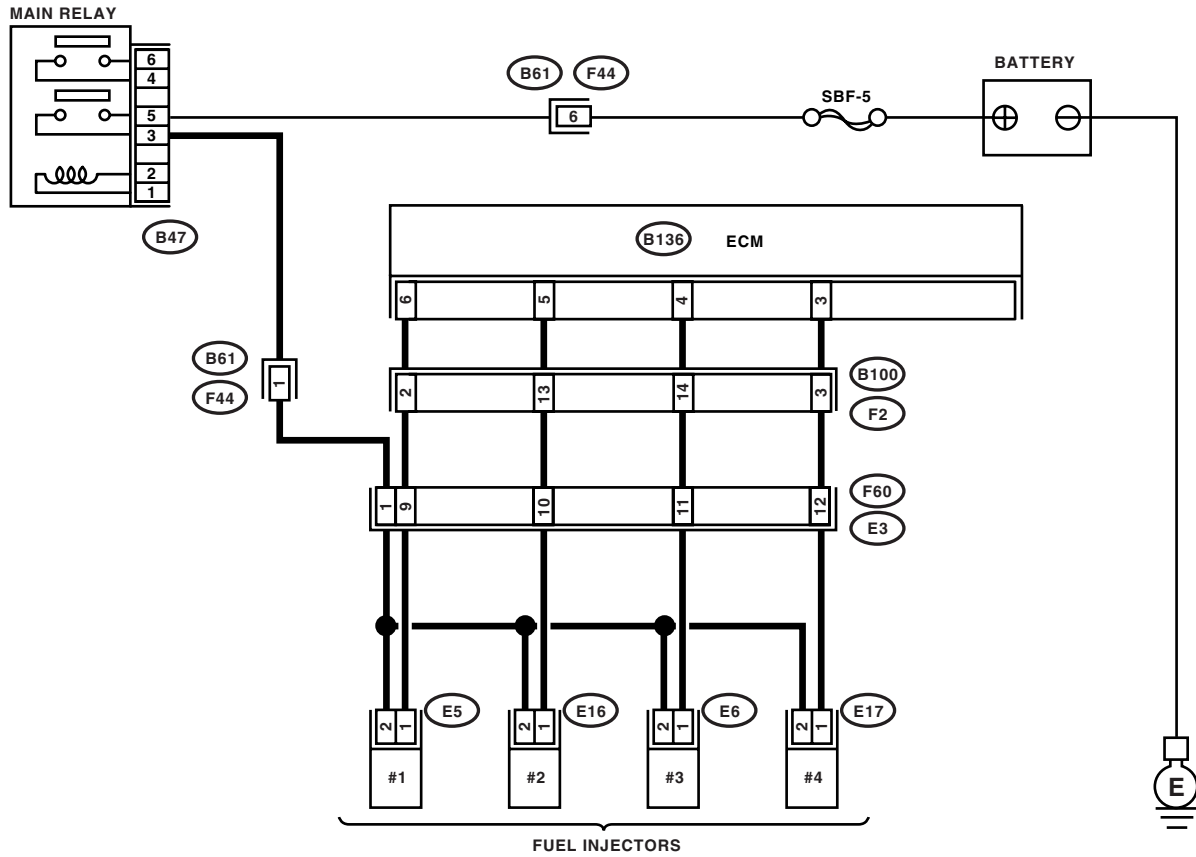
**CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04155

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes  | No   |
|---|--|--|--|
| <b>1</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?                | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> | Go to step 2.  |
| <b>2</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector and chassis ground on faulty cylinders.<br><b>Connector &amp; terminal</b><br><i>#1 (B136) No. 6 (+) — Chassis ground (-):</i><br><i>#2 (B136) No. 5 (+) — Chassis ground (-):</i><br><i>#3 (B136) No. 4 (+) — Chassis ground (-):</i><br><i>#4 (B136) No. 3 (+) — Chassis ground (-):</i>   | Is the voltage more than 10 V?             | Go to step 7.  | Go to step 3.  |
| <b>3</b><br><b>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from fuel injector on faulty cylinders.<br>3) Disconnect the connector from ECM.<br>4) Measure the resistance between fuel injector connector and engine ground on faulty cylinders.<br><b>Connector &amp; terminal</b><br><i>#1 (E5) No. 1 — Engine ground:</i><br><i>#2 (E16) No. 1 — Engine ground:</i><br><i>#3 (E6) No. 1 — Engine ground:</i><br><i>#4 (E17) No. 1 — Engine ground:</i> | Is the resistance more than 1 M $\Omega$ ? | Go to step 4.  | Repair the ground short circuit in harness between fuel injector and ECM connector.  |
| <b>4</b><br><b>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</b><br>Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders.<br><b>Connector &amp; terminal</b><br><i>#1 (B136) No. 6 — (E5) No. 1:</i><br><i>#2 (B136) No. 5 — (E16) No. 1:</i><br><i>#3 (B136) No. 4 — (E6) No. 1:</i><br><i>#4 (B136) No. 3 — (E17) No. 1:</i>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 5.  | Repair the harness and connector.<br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ECM and fuel injector connector<br>• Poor contact in coupling connector |
| <b>5</b><br><b>CHECK FUEL INJECTOR.</b><br>Measure the resistance between fuel injector terminals on faulty cylinder.<br><b>Terminals</b><br><i>No. 1 — No. 2:</i>  | Is the resistance 5 — 20 $\Omega$ ?        | Go to step 6.  | Replace the faulty fuel injector. <Ref. to FU(STI)-31, Fuel Injector.>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No   |
|--|--|--|--|
| <p><b>6</b></p> <p><b>CHECK POWER SUPPLY LINE.</b><br/>                     1) Turn the ignition switch to ON.<br/>                     2) Measure the voltage between fuel injector and engine ground on faulty cylinders.<br/> <b>Connector &amp; terminal</b><br/> <b>#1 (E5) No. 2 (+) — Engine ground (-):</b><br/> <b>#2 (E16) No. 2 (+) — Engine ground (-):</b><br/> <b>#3 (E6) No. 2 (+) — Engine ground (-):</b><br/> <b>#4 (E17) No. 2 (+) — Engine ground (-):</b></p>   | Is the voltage more than 10 V?   | Repair the poor contact in all connectors in fuel injector circuit.  | Repair the harness and connector.<br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and fuel injector connector on faulty cylinders</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in main relay connector</li> <li>• Poor contact in fuel injector connector on faulty cylinders</li> </ul> |
| <p><b>7</b></p> <p><b>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</b><br/>                     1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from fuel injector on faulty cylinder.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between ECM connector and chassis ground on faulty cylinders.<br/> <b>Connector &amp; terminal</b><br/> <b>#1 (B136) No. 6 (+) — Chassis ground (-):</b><br/> <b>#2 (B136) No. 5 (+) — Chassis ground (-):</b><br/> <b>#3 (B136) No. 4 (+) — Chassis ground (-):</b><br/> <b>#4 (B136) No. 3 (+) — Chassis ground (-):</b></p> | Is the voltage more than 10 V?   | Repair the battery short circuit in harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> | Go to step 8.  |
| <p><b>8</b></p> <p><b>CHECK FUEL INJECTOR.</b><br/>                     1) Turn the ignition switch to OFF.<br/>                     2) Measure the resistance between fuel injector terminals on faulty cylinder.<br/> <b>Terminals</b><br/> <b>No. 1 — No. 2:</b></p>  | Is the resistance less than 1 $\Omega$ ?   | Replace the faulty fuel injector <Ref. to FU(STI)-31, Fuel Injector.> and ECM <Ref. to FU(STI)-39, Engine Control Module (ECM).>                             | Go to step 9.  |
| <p><b>9</b></p> <p><b>CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.</b></p>   | Is the camshaft position sensor or crankshaft position sensor installing bolt loose? | Tighten the camshaft position sensor or crankshaft position sensor.  | Go to step 10.   |
| <p><b>10</b></p> <p><b>CHECK CRANK SPROCKET.</b><br/>                     Remove the timing belt cover.</p>  | Is the crank sprocket rusted or its teeth damaged?                                   | Replace the crank sprocket. <Ref. to ME(STI)-53, Crank Sprocket.>  | Go to step 11.   |
| <p><b>11</b></p> <p><b>CHECK INSTALLATION CONDITION OF TIMING BELT.</b><br/>                     Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block.</p>  | Is the timing belt dislocated from its proper position?                              | Repair the installation condition of timing belt. <Ref. to ME(STI)-44, Timing Belt.>   | Go to step 12.   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <b>12</b> <b>CHECK FUEL LEVEL.</b>  | Is the fuel meter indication higher than the "Lower" level?    | Go to step <b>13</b> .   | Replenish the fuel so fuel meter indication is higher than the "Lower" level. After replenishing fuel; Go to step <b>13</b> .  |
| <b>13</b> <b>CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.</b><br>1) Clear the memory using Subaru Select Monitor.<br><Ref. to EN(STI)(diag)-28, Subaru Select Monitor.><br>2) Start the engine, and drive the vehicle more than 10 minutes. | Is the malfunction indicator light coming on or blinking?      | Go to step <b>15</b> .   | Go to step <b>14</b> .   |
| <b>14</b> <b>CHECK CAUSE OF MISFIRE DIAGNOSED.</b>  | Was the cause of misfire diagnosed when the engine is running? | Finish the diagnostics operation, if the engine has no abnormality.  | Repair the poor contact.<br><b>NOTE:</b><br>In this case, repair the following:<br>• Poor contact in ignition coil connector<br>• Poor contact in fuel injector connector on faulty cylinders<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector |
| <b>15</b> <b>CHECK AIR INTAKE SYSTEM.</b>   | Is there any fault in air intake system?                       | Repair the air intake system.<br><b>NOTE:</b><br>Check the following items:<br>• Are there air leaks or air suction caused by loose or dislocated nuts and bolts?<br>• Are there cracks or any disconnection of hoses? | Go to step <b>16</b> .   |
| <b>16</b> <b>CHECK CYLINDER.</b>  | Is there any fault in that cylinder?                           | Repair or replace the faulty parts.<br><b>NOTE:</b><br>Check the following items.<br>• Spark plug<br>• Fuel injector<br>• Compression pressure   | Go to DTC P0171 and P0172. <Ref. to EN(STI)(diag)-142, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |

## AT:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-103, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

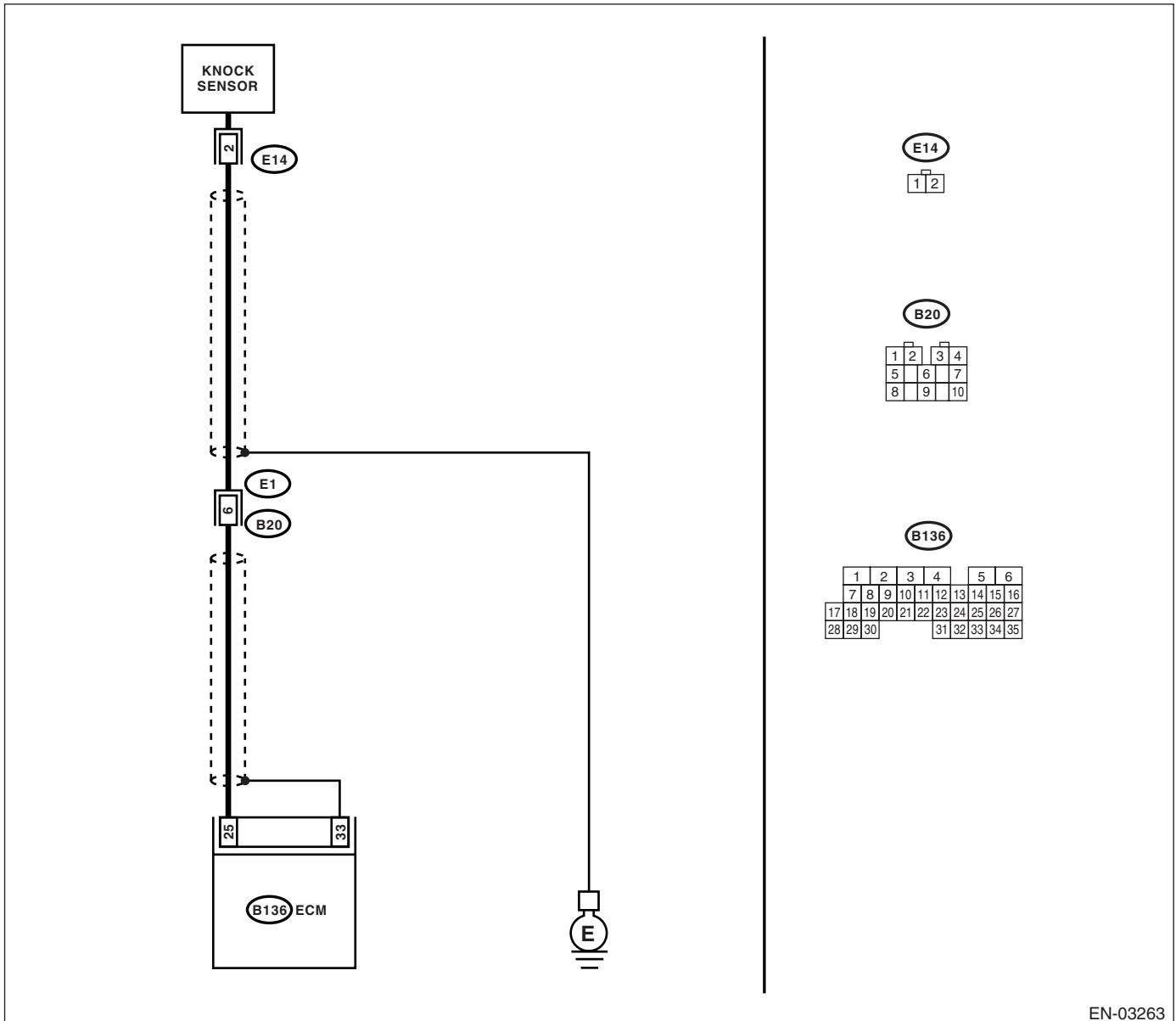
### TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

### WIRING DIAGRAM:



EN-03263



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No   |
|--|---|---|--|
| <b>1</b><br><b>CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance between ECM harness connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 25 — Chassis ground:</b> | Is the resistance more than 700 kΩ?                       | Go to step 2.   | Repair the harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between knock sensor and ECM connector</li> <li>• Poor contact in knock sensor connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>2</b><br><b>CHECK KNOCK SENSOR.</b><br>1) Disconnect the connector from knock sensor.<br>2) Measure the resistance between knock sensor connector terminal and engine ground.<br><b>Terminals</b><br><b>No. 2 — Engine ground:</b>  | Is the resistance more than 700 kΩ?                       | Go to step 3.   | Repair the harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Poor contact in knock sensor connector</li> <li>• Poor contact in coupling connector</li> </ul>   |
| <b>3</b><br><b>CHECK CONDITION OF KNOCK SENSOR INSTALLATION.</b>   | Is the knock sensor installation bolt tightened securely? | Replace the knock sensor. <Ref. to FU(STI)-28, Knock Sensor.> | Tighten the knock sensor installation bolt securely.   |

## AU:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-105, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

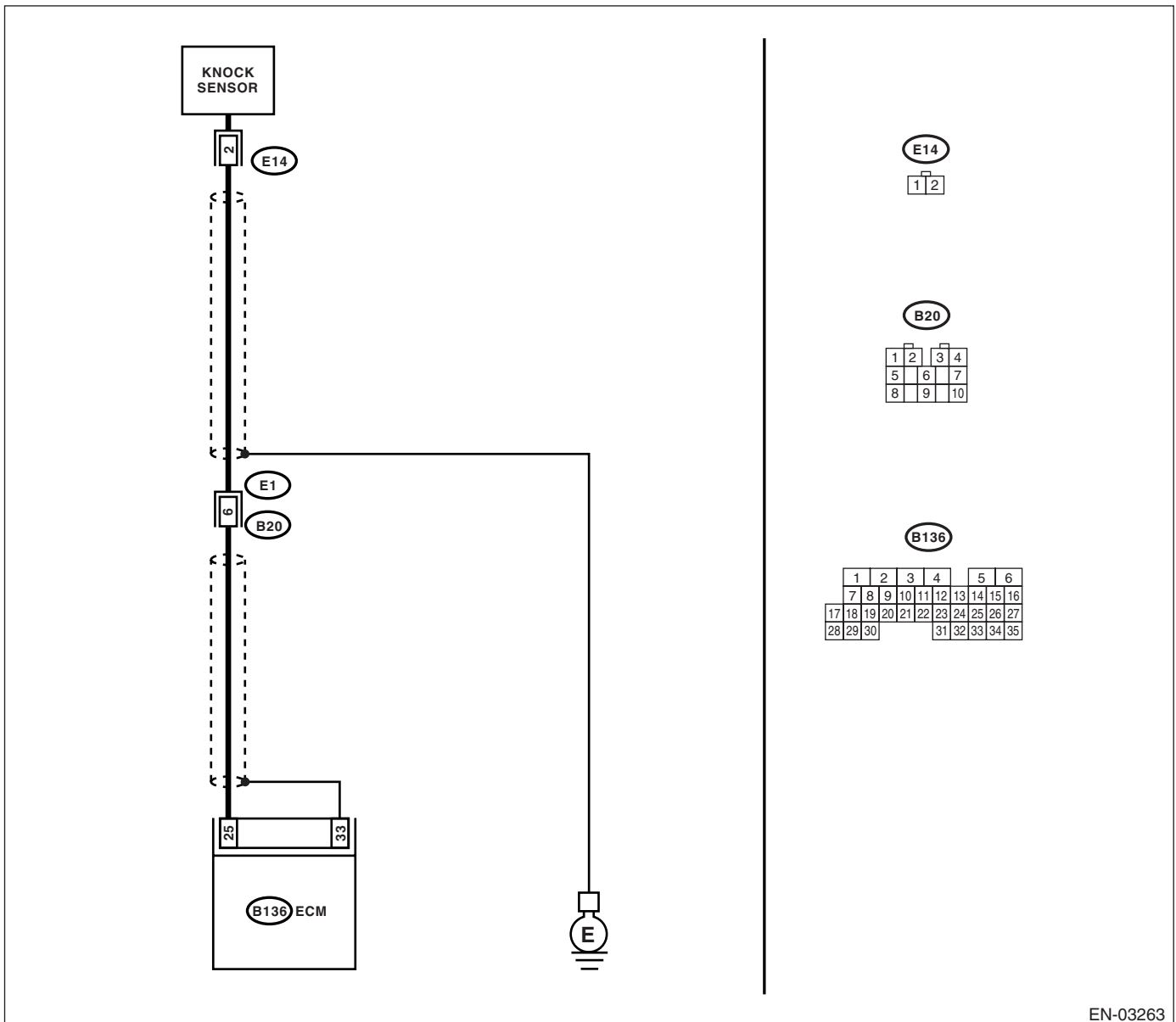
### TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-03263

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <b>1</b><br><b>CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 25 — Chassis ground:</b></i>  | Is the resistance less than 400 k $\Omega$ ? | Go to step 2.   | Go to step 3.   |
| <b>2</b><br><b>CHECK KNOCK SENSOR.</b><br>1) Disconnect the connector from knock sensor.<br>2) Measure the resistance between knock sensor connector terminal and engine ground.<br><i><b>Terminals</b></i><br><i><b>No. 2 — Engine ground:</b></i>   | Is the resistance less than 400 k $\Omega$ ? | Replace the knock sensor. <Ref. to FU(STI)-28, Knock Sensor.>   | Repair the ground short circuit in harness between knock sensor connector and ECM connector.<br><br>NOTE:<br>The harness between both connectors is shielded. Repair the short circuit of harness together with shield. |
| <b>3</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Connect the connectors to ECM and knock sensor.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 25 (+) — Chassis ground (-):</b></i> | Is the voltage more than 2 V?                | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.)<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Poor contact in knock sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> | Repair the poor contact in ECM connector.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AV:DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-107, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

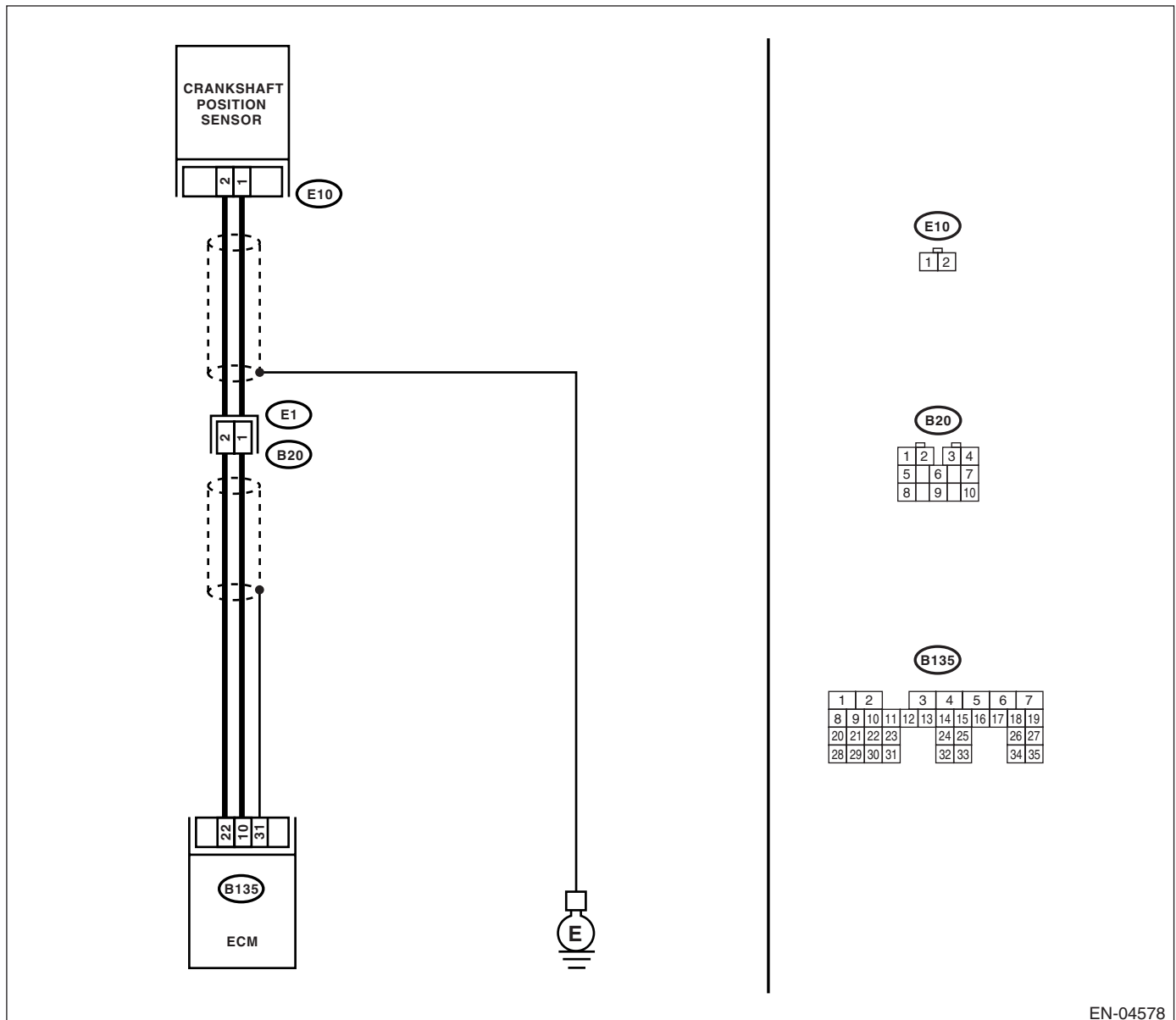
### TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from crankshaft position sensor.<br/>3) Measure the resistance of harness between crankshaft position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E10) No. 1 — Engine ground:</b></p> | <p>Is the resistance more than 100 k<math>\Omega</math>?</p>                   | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between crankshaft position sensor and ECM connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> | <p>Go to step 2.</p>   |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</b></p> <p>Measure the resistance of harness between crankshaft position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E10) No. 1 — Engine ground:</b></p>   | <p>Is the resistance more than 1 M<math>\Omega</math>?</p>                     | <p>Go to step 3.</p>   | <p>Repair the ground short circuit in harness between crankshaft position sensor and ECM connector.</p> <p><b>NOTE:</b><br/>The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.</p>   |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</b></p> <p>Measure the resistance of harness between crankshaft position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E10) No. 2 — Engine ground:</b></p>   | <p>Is the resistance less than 5 <math>\Omega</math>?</p>                      | <p>Go to step 4.</p>   | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between crankshaft position sensor and ECM connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <p><b>4</b></p> <p><b>CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.</b></p>  | <p>Is the crankshaft position sensor installation bolt tightened securely?</p> | <p>Go to step 5.</p>   | <p>Tighten the crankshaft position sensor installation bolt securely.</p>  |
| <p><b>5</b></p> <p><b>CHECK CRANKSHAFT POSITION SENSOR.</b></p> <p>1) Remove the crankshaft position sensor.<br/>2) Measure the resistance between connector terminals of crankshaft position sensor.</p> <p><b>Terminals</b><br/><b>No. 1 — No. 2:</b></p>   | <p>Is the resistance 1 — 4 k<math>\Omega</math>?</p>                           | <p>Repair the poor contact in crankshaft position sensor connector.</p>  | <p>Replace the crankshaft position sensor. &lt;Ref. to FU(STI)-26, Crankshaft Position Sensor.&gt;</p>   |

## AW:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-109, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

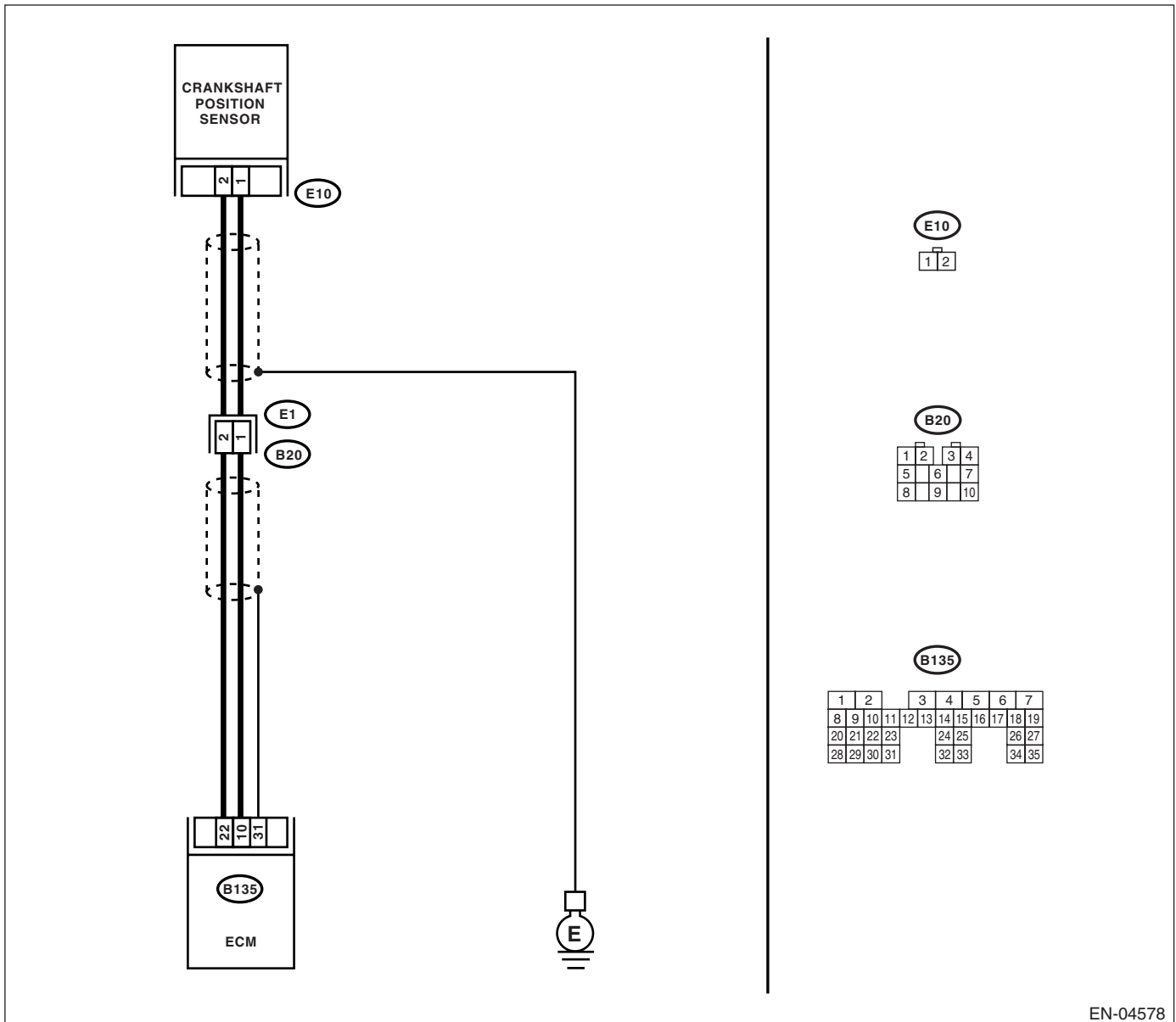
### TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

### WIRING DIAGRAM:



EN-04578

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes  | No  |
|---|---|--|---|
| <b>1</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> | Go to step 2.   |
| <b>2</b><br><b>CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.</b><br>Turn the ignition switch to OFF.   | Is the crankshaft position sensor installation bolt tightened securely? | Go to step 3.  | Tighten the crankshaft position sensor installation bolt securely.                        |
| <b>3</b><br><b>CHECK CRANK SPROCKET.</b><br>Remove the front belt cover.  | Are the crank sprocket teeth cracked or damaged?                        | Replace the crank sprocket. <Ref. to FU(STI)-26, Crankshaft Position Sensor.>  | Go to step 4.   |
| <b>4</b><br><b>CHECK INSTALLATION CONDITION OF TIMING BELT.</b><br>Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block. | Is the timing belt dislocated from its proper position?                 | Repair the installation condition of timing belt. <Ref. to ME(STI)-44, Timing Belt.>   | Replace the crankshaft position sensor. <Ref. to FU(STI)-26, Crankshaft Position Sensor.> |

## AX:DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-111, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

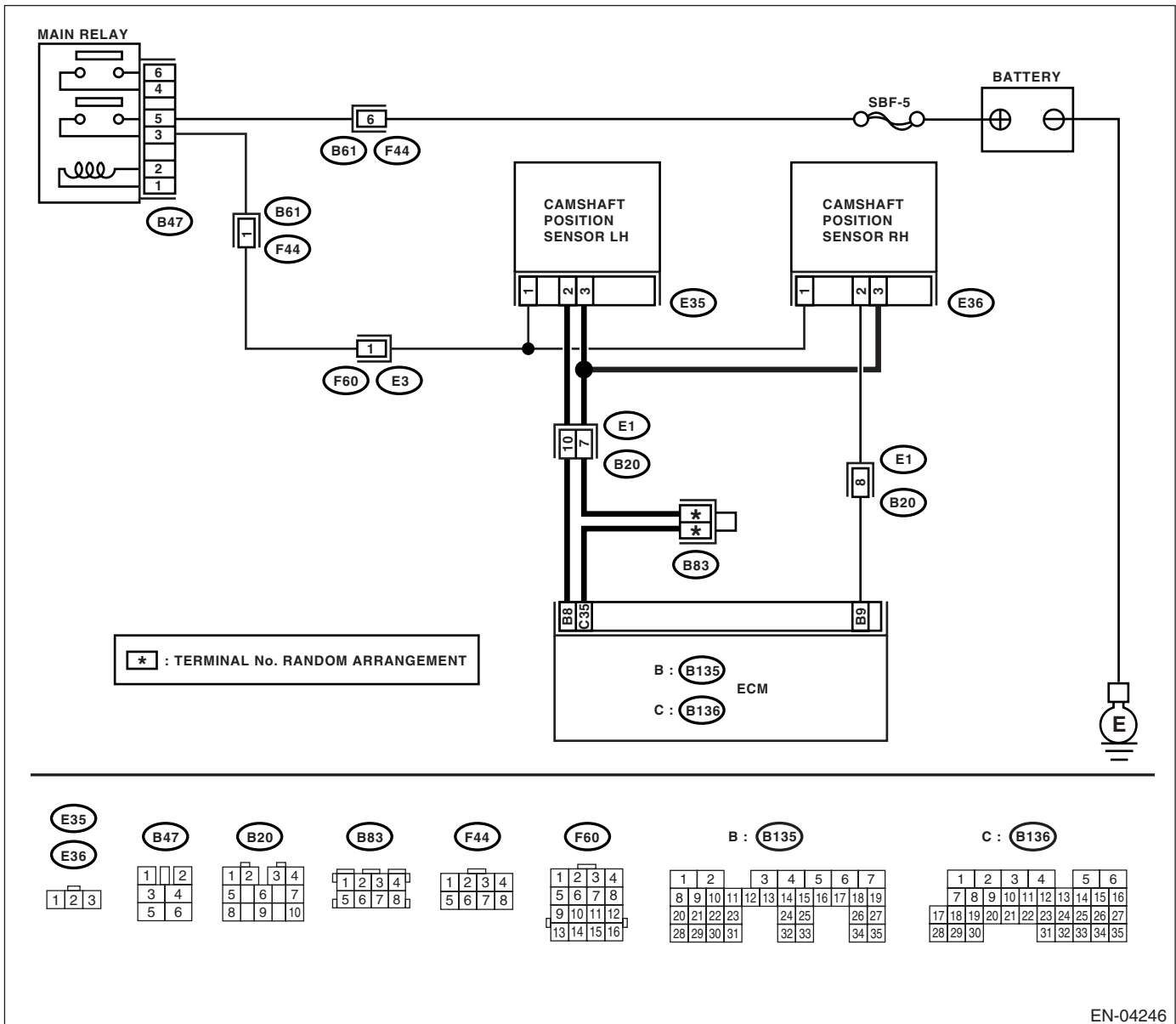
### TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:





# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes  | No  |
|---|---|--|---|
| <b>1 CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from camshaft position sensor.<br>3) Measure the voltage between camshaft position sensor and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E36) No. 1 (+) — Engine ground (-):</b></i>                             | Is the voltage more than 10 V?  | Repair the battery short circuit in harness between main relay connector and camshaft position sensor connector. | Go to step 2.   |
| <b>2 CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between camshaft position sensor and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E36) No. 1 (+) — Engine ground (-):</b></i>  | Is the voltage more than 10 V?  | Go to step 3.  | Repair the open or ground short circuit in harness between main relay connector and camshaft position sensor connector. |
| <b>3 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between camshaft position sensor and ECM.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E36) No. 2 — (E135) No. 9:</b></i><br><i><b>(E36) No. 3 — (E136) No. 35:</b></i> | Is the resistance less than 1 $\Omega$ ?                              | Go to step 4.  | Repair the open circuit in harness between camshaft position sensor and ECM.  |
| <b>4 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.</b><br>Measure the resistance of harness between camshaft position sensor and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E36) No. 2 — Engine ground:</b></i><br><i><b>(E36) No. 3 — Engine ground:</b></i>   | Is the resistance more than 1 M $\Omega$ ?                            | Go to step 5.  | Repair the ground short circuit in harness between camshaft position sensor and ECM.                                    |
| <b>5 CHECK CONDITION OF CAMSHAFT POSITION SENSOR.</b>   | Is the camshaft position sensor installation bolt tightened securely? | Go to step 6.  | Tighten the camshaft position sensor installation bolt securely.  |
| <b>6 CHECK CAMSHAFT POSITION SENSOR.</b><br>Check the camshaft position sensor waveform. <Ref. to EN(STI)(diag)-18, Engine Control Module (ECM) I/O Signal.>  | Is any abnormality found in waveform?                                 | Replace the camshaft position sensor. <Ref. to FU(STI)-27, Camshaft Position Sensor.>                            | Go to step 7.   |
| <b>7 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.  | Is there poor contact in ECM connector?                               | Repair the poor contact in ECM connector.  | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## AY:DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-112, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

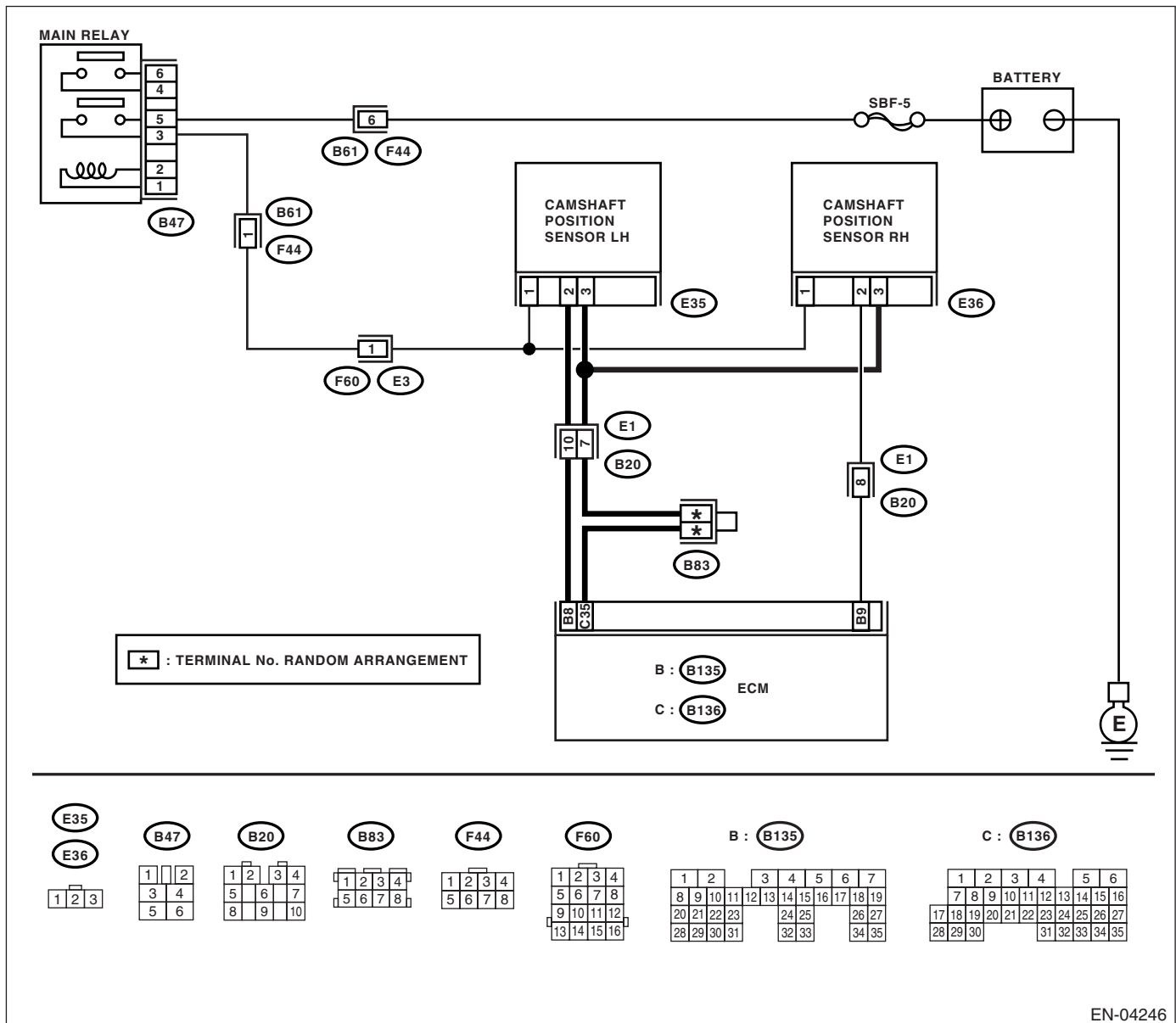
### TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04246

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No  |
|--|---|--|---|
| <b>1 CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from camshaft position sensor.<br>3) Measure the voltage between camshaft position sensor and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E35) No. 1 (+) — Engine ground (-):</i>                      | Is the voltage more than 10 V?  | Repair the battery short circuit in harness between main relay connector and camshaft position sensor connector. | Go to step 2.   |
| <b>2 CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between camshaft position sensor and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E35) No. 1 (+) — Engine ground (-):</i>   | Is the voltage more than 10 V?  | Go to step 3.  | Repair the open or ground short circuit in harness between main relay connector and camshaft position sensor connector. |
| <b>3 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between camshaft position sensor and ECM.<br><i>Connector &amp; terminal</i><br><i>(E35) No. 2 — (B135) No. 8:</i><br><i>(E35) No. 3 — (B136) No. 35:</i> | Is the resistance less than 1 $\Omega$ ?                              | Go to step 4.  | Repair the open circuit in harness between camshaft position sensor and ECM.  |
| <b>4 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.</b><br>Measure the resistance of harness between camshaft position sensor and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E35) No. 2 — Engine ground:</i><br><i>(E35) No. 3 — Engine ground:</i>   | Is the resistance more than 1 M $\Omega$ ?                            | Go to step 5.  | Repair the ground short circuit in harness between camshaft position sensor and ECM.                                    |
| <b>5 CHECK CONDITION OF CAMSHAFT POSITION SENSOR.</b>  | Is the camshaft position sensor installation bolt tightened securely? | Go to step 6.  | Tighten the camshaft position sensor installation bolt securely.  |
| <b>6 CHECK CAMSHAFT POSITION SENSOR.</b><br>Check the camshaft position sensor waveform. <Ref. to EN(STI)(diag)-18, Engine Control Module (ECM) I/O Signal.>   | Is any abnormality found in waveform?                                 | Replace the camshaft position sensor. <Ref. to FU(STI)-27, Camshaft Position Sensor.>                            | Go to step 7.   |
| <b>7 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.   | Is there poor contact in ECM connector?                               | Repair the poor contact in ECM connector.  | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>   |

## AZ:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-113, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

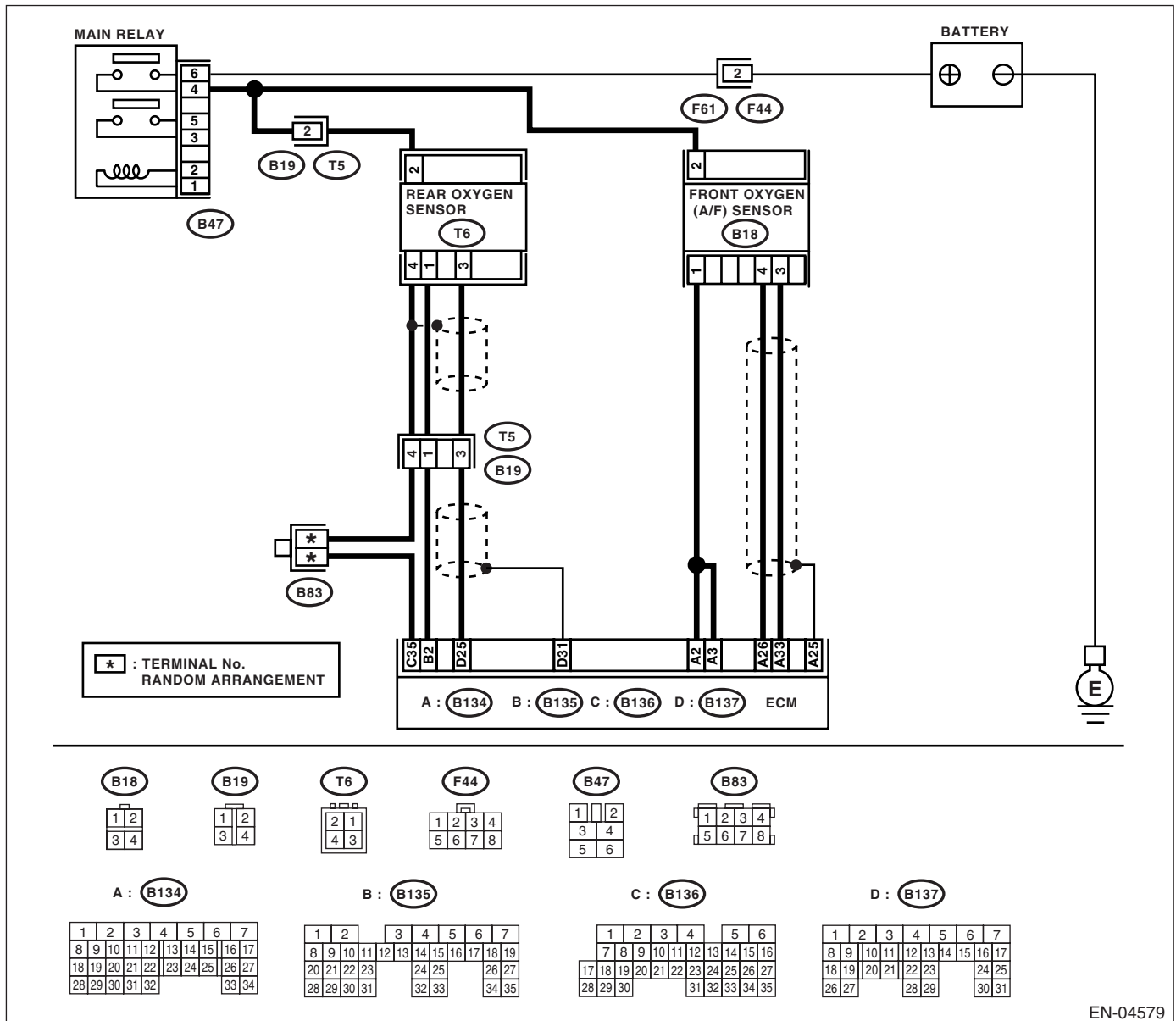
### TROUBLE SYMPTOM:

- Engine stalls.
- Idle mixture is out of specifications.

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04579

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check                               | Yes  | No            |
|---|-------------------------------------|--|---------------|
| <b>1</b><br><b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?         | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0420. | Go to step 2. |
| <b>2</b><br><b>CHECK EXHAUST SYSTEM.</b><br>Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes.<br>NOTE:<br>Check the following positions. <ul style="list-style-type: none"> <li>• Between cylinder head and front exhaust pipe</li> <li>• Between front exhaust pipe and front catalytic converter</li> <li>• Between front catalytic converter and rear catalytic converter</li> <li>• Looseness and incomplete installation of front oxygen (A/F) sensor and rear oxygen sensor</li> </ul> | Is there a fault in exhaust system? | Repair or replace the exhaust system. <Ref. to EX(STI)-2, General Description.>  | Go to step 3. |
| <b>3</b><br><b>CHECK WAVEFORM ON SUBARU SELECT MONITOR. (DURING DRIVING)</b><br>1) Drive at a constant speed of 80 — 113 km/h (50 — 70 MPH).<br>2) After leaving it in the condition of Step 1) for 5 minutes, read the waveform data using Subaru Select Monitor while driving. <Ref. to EN(STI)(diag)-18, ELECTRICAL SPECIFICATION, Engine Control Module (ECM) I/O Signal.>  | Is normal waveform displayed?       | Contact your SOA Service Center since deterioration of some parts may be the cause.  | Go to step 4. |
| <b>4</b><br><b>CHECK WAVEFORM ON SUBARU SELECT MONITOR. (DURING IDLING)</b><br>1) Run the vehicle at idle.<br>2) In the condition of Step 1), read the waveform data using Subaru Select Monitor. <Ref. to EN(STI)(diag)-18, ELECTRICAL SPECIFICATION, Engine Control Module (ECM) I/O Signal.>   | Is normal waveform displayed?       | Go to step 10.   | Go to step 5. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                   | Yes   | No  |
|---|---|---|---|
| <p><b>5 CHECK VOLTAGE OF REAR OXYGEN SENSOR.</b></p> <p>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest)</p> <p>2) Read the rear oxygen sensor voltage using Subaru Select Monitor.</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• Depress the clutch pedal.</li> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the voltage more than 490 mV?</p> | <p>Go to step 9.</p>  | <p>Go to step 6.</p>  |
| <p><b>6 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</b></p>  | <p>Is there water in connector?</p>     | <p>Remove infiltrating water completely.</p>  | <p>Go to step 7.</p>  |
| <p><b>7 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connectors from ECM and rear oxygen sensor.</p> <p>3) Measure the resistance of harness between ECM and rear oxygen sensor connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B137) No. 25 — (T6) No. 3:</b><br/> <b>(B136) No. 35 — (T6) No. 4:</b></p>  | <p>Is the resistance more than 3 Ω?</p> | <p>Repair the open circuit in harness between ECM and rear oxygen sensor connector.</p> | <p>Go to step 8.</p>  |
| <p><b>8 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between rear oxygen sensor connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T6) No. 3 (+) — Chassis ground (-):</b></p>  | <p>Is the voltage 0.2 — 0.5 V?</p>      | <p>Go to step 11.</p>   | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>           Repair the following items.</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>• Poor contact of rear oxygen sensor and ECM connector</li> <li>• Poor contact in ECM connector</li> </ul> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check                               | Yes   | No  |
|---|-------------------------------------|---|---|
| <b>9 CHECK VOLTAGE OF REAR OXYGEN SENSOR.</b><br>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed from 3,000 rpm.<br>2) Read the rear oxygen sensor voltage using Subaru Select Monitor.<br><b>NOTE:</b> <ul style="list-style-type: none"> <li>• Depress the clutch pedal.</li> <li>• Subaru Select Monitor</li> </ul> For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the voltage less than 250 mV?    | Contact your SOA Service Center since deterioration of some parts may be the cause. | Go to step 6.   |
| <b>10 CHECK CATALYTIC CONVERTER.</b>  | Is the catalytic converter damaged? | Replace the catalytic converter.<br><Ref. to EC(STI)-3, Front Catalytic Converter.> | Contact your SOA Service Center since deterioration of some parts may be the cause. |
| <b>11 CHECK REAR OXYGEN SENSOR SHIELD.</b><br>1) Turn the ignition switch to OFF.<br>2) Bare the sensor shield of body side harness of rear oxygen sensor connector.<br>3) Measure the resistance between sensor shield and chassis ground.   | Is the resistance less than 1 Ω?    | Replace the rear oxygen sensor.<br><Ref. to FU(STI)-38, Rear Oxygen Sensor.>        | Repair the open circuit in rear oxygen sensor harness.                              |

## **BA:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)**

### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-116, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

- Fuel odor
- There is a hole of more than 1.0 mm (0.04 in) dia. in evaporation system or fuel tank.

### **CAUTION:**

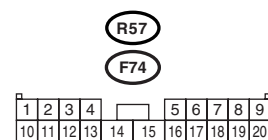
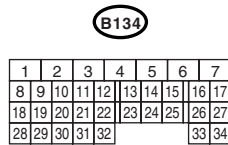
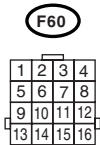
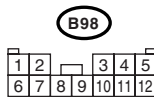
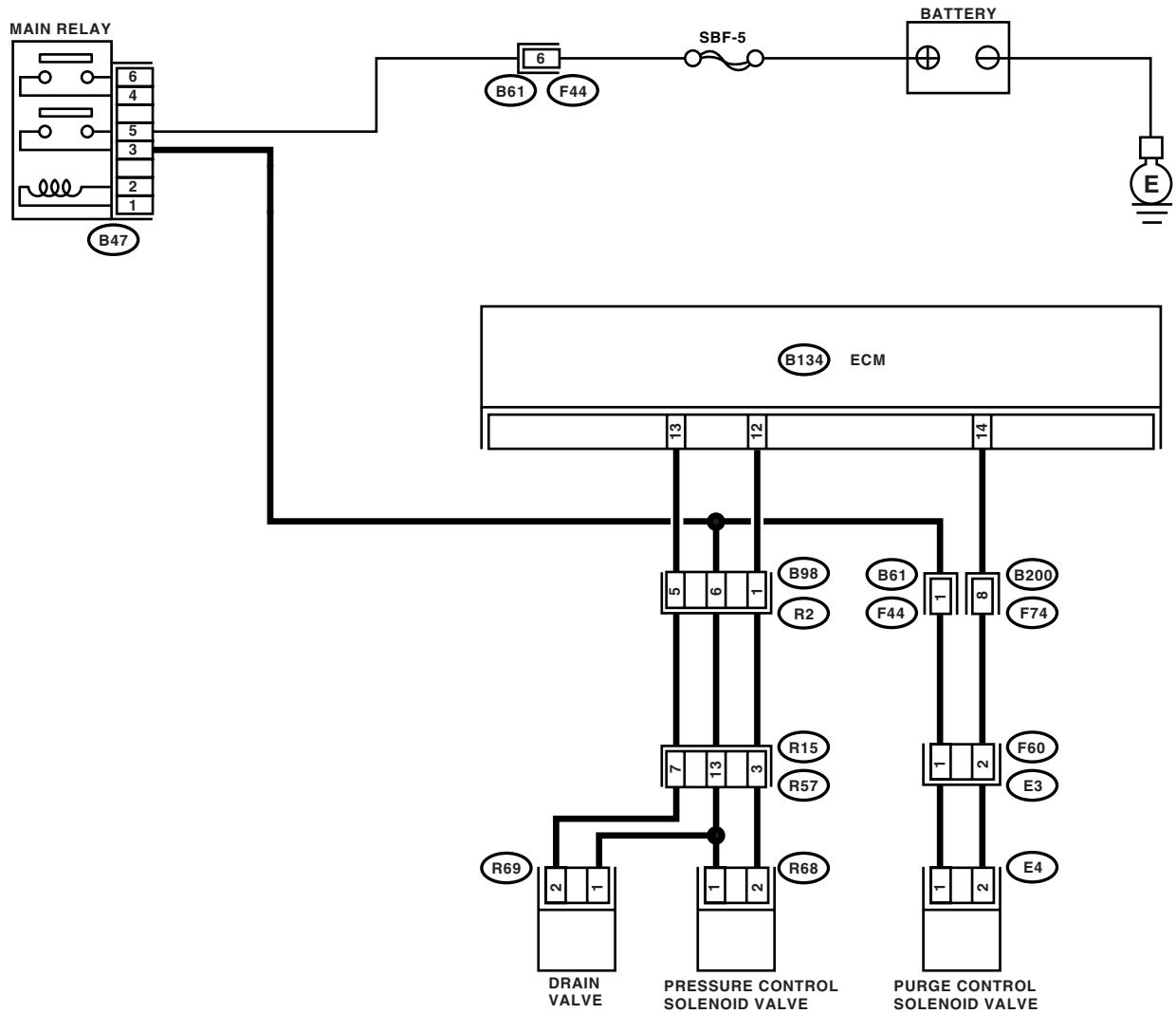
**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04162

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check   | Yes   | No   |
|------|---|---|--|
| 1    | <b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> |
| 2    | <b>CHECK FUEL FILLER CAP.</b><br>1) Turn ignition switch to OFF.<br>2) Check the fuel filler cap.<br><br>NOTE:<br>The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.   | Is the fuel filler cap tightened securely?                                    | Go to step 3.<br><br>Tighten fuel filler cap securely.   |
| 3    | <b>CHECK FUEL FILLER CAP.</b>   | Is the fuel filler cap SUBARU genuine?  | Go to step 4.<br><br>Replace with a SUBARU genuine fuel filler cap.  |
| 4    | <b>CHECK FUEL FILLER PIPE PACKING.</b>  | Is there any damage to the seal between fuel filler cap and fuel filler pipe? | Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(STI)-48, Fuel Filler Pipe.>  |
| 5    | <b>CHECK DRAIN VALVE.</b><br>1) Connect the test mode connector.<br>2) Turn ignition switch to ON.<br>3) Operate the drain valve.<br><br>NOTE:<br>Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.> | Does the drain valve operate?   | Go to step 6.<br><br>Replace the drain valve. <Ref. to EC(STI)-16, Drain Valve.>   |
| 6    | <b>CHECK PURGE CONTROL SOLENOID VALVE.</b><br>Operate the purge control solenoid valve.<br><br>NOTE:<br>Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.>                          | Does the purge control solenoid valve operate?                                | Go to step 7.<br><br>Replace the purge control solenoid valve. <Ref. to EC(STI)-6, Purge Control Solenoid Valve.>                          |
| 7    | <b>CHECK PRESSURE CONTROL SOLENOID VALVE.</b><br>Operate the pressure control solenoid valve.<br><br>NOTE:<br>Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.>                 | Does the pressure control solenoid valve operate?                             | Go to step 8.<br><br>Replace the pressure control solenoid valve. <Ref. to EC(STI)-12, Pressure Control Solenoid Valve.>                   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No  |
|--|--|--|---|
| <b>8</b><br><b>CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.</b><br>Turn ignition switch to OFF. | Is there a hole of more than 1.0 mm (0.04 in) dia. on evaporation line?  | Repair or replace the evaporation line. <Ref. to FU(STI)-60, Fuel Delivery, Return and Evaporation Lines.> | Go to step <b>9</b> .   |
| <b>9</b><br><b>CHECK CANISTER.</b>   | Is the canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?   | Repair or replace the canister. <Ref. to EC(STI)-5, Canister.>   | Go to step <b>10</b> .  |
| <b>10</b><br><b>CHECK FUEL TANK.</b><br>Remove the fuel tank. <Ref. to FU(STI)-45, Fuel Tank.>     | Is the fuel tank damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?  | Repair or replace the fuel tank. <Ref. to FU(STI)-45, Fuel Tank.>  | Go to step <b>11</b> .  |
| <b>11</b><br><b>CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.</b>     | Are there holes of more than 1.0 mm (0.04 in) dia., cracks, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system? | Repair or replace the hoses or pipes.  | Contact your SOA Service Center since deterioration of some parts may be the cause. |

## BB:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

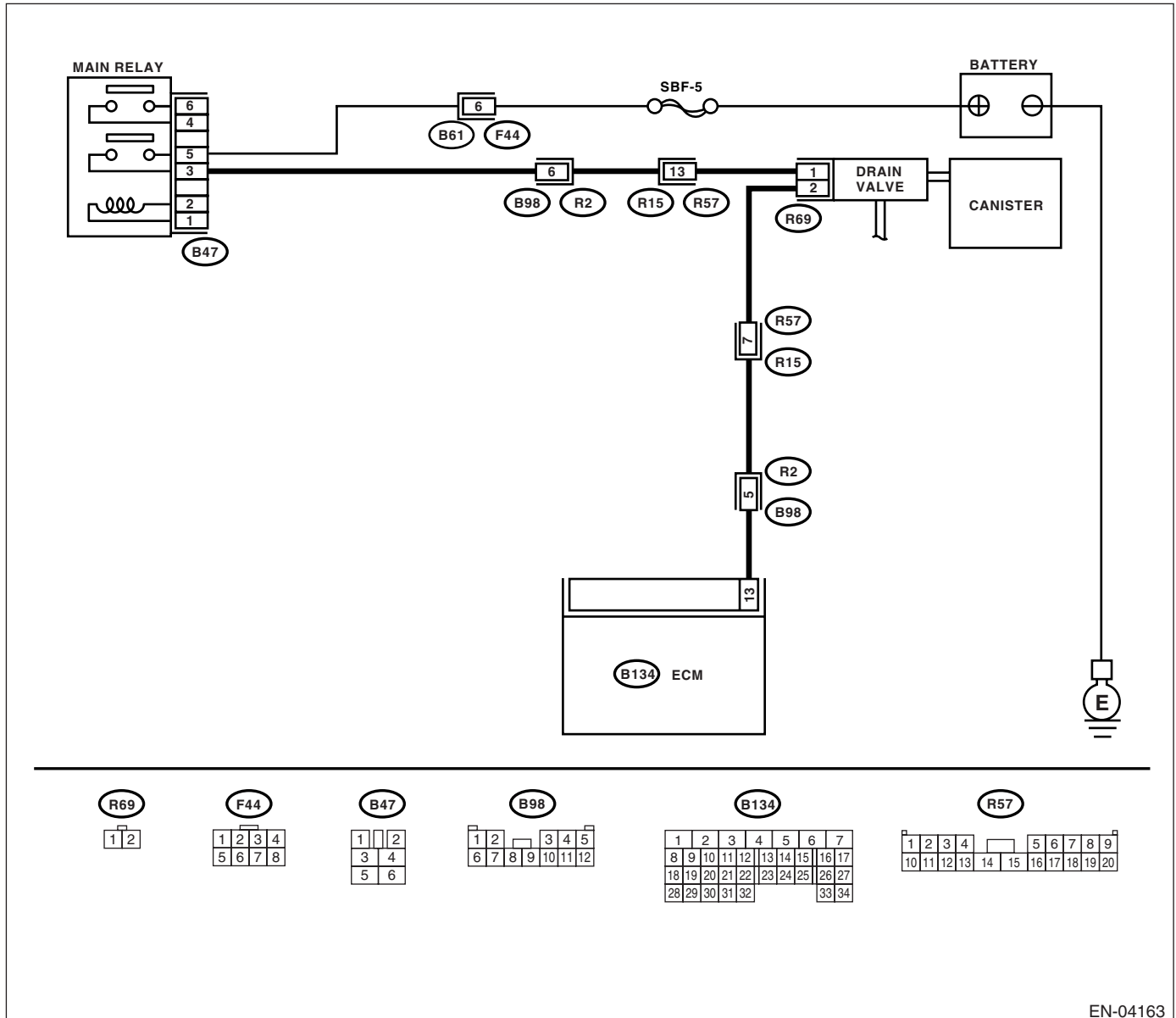
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-139, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04163

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes                                   | No   |
|---|--|---------------------------------------|--|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 13 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 10 V?             | Go to step 2.                         | Go to step 3.  |
| <b>2</b><br><b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.  | Is there poor contact in ECM connector?    | Repair poor contact in ECM connector. | The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.<br>(However, the possibility of poor contact still remains.)<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Poor contact in drain valve connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>3</b><br><b>CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connectors from drain valve and ECM.<br>3) Measure the resistance of harness between drain valve connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(R69) No. 2 — Chassis ground:</b></i> | Is the resistance more than 1 M $\Omega$ ? | Go to step 4.                         | Repair short circuit to ground in harness between ECM and drain valve connector.   |
| <b>4</b><br><b>CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM and drain valve connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 13 — (R69) No. 2:</b></i>   | Is the resistance less than 1 $\Omega$ ?   | Go to step 5.                         | Repair harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and drain valve connector</li> <li>• Poor contact in coupling connector</li> </ul>  |
| <b>5</b><br><b>CHECK DRAIN VALVE.</b><br>Measure the resistance between drain valve terminals.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i>   | Is the resistance 10 — 100 $\Omega$ ?      | Go to step 6.                         | Replace the drain valve. <Ref. to EC(STI)-16, Drain Valve.>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <b>6</b><br><b>CHECK POWER SUPPLY TO DRAIN VALVE.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between drain valve and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R69) No. 1 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?                  | Go to step 7.                                 | Repair harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and drain valve</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in main relay connector</li> </ul> |
| <b>7</b><br><b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in drain valve connector.   | Is there poor contact in drain valve connector? | Repair poor contact in drain valve connector. | Contact your SOA Service Center since deterioration of some parts may be the cause.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BC:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

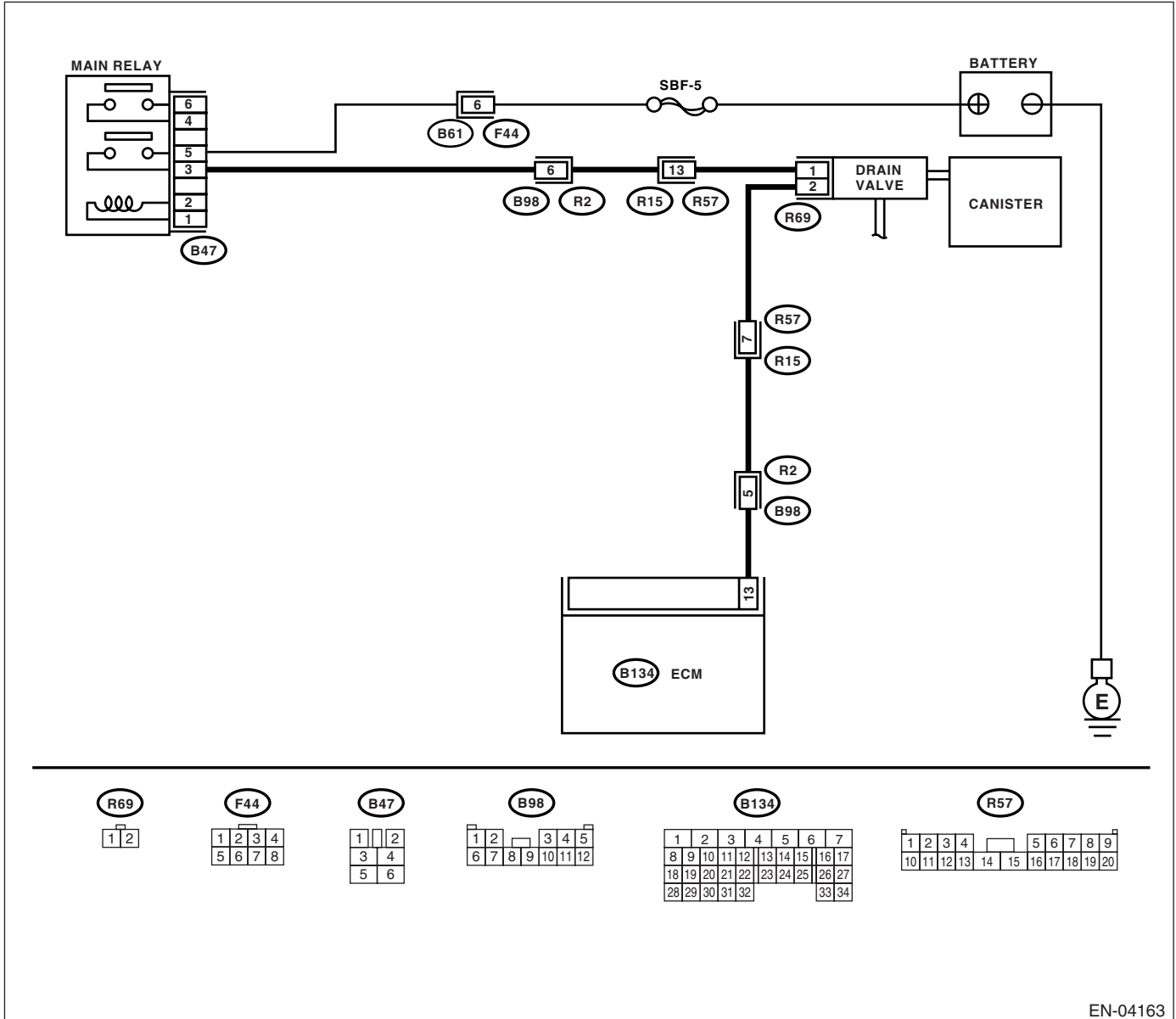
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-141, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04163

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                       | Yes   | No   |
|--|---|---|--|
| <b>1 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn ignition switch to OFF.<br>2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side).<br>3) Turn ignition switch to ON.<br>4) While operating the drain valve, measure voltage between ECM and chassis ground.<br>NOTE:<br>Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode".<br><Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.><br><b>Connector &amp; terminal</b><br><b>(B134) No. 13 (+) — Chassis ground (-):</b> | Does the resistance change within 0 — 10 V? | Go to step 2.   | The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector. |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 13 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?              | Go to step 4.   | Go to step 3.  |
| <b>3 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.   | Is there poor contact in ECM connector?     | Repair poor contact in ECM connector.   | Replace the ECM.<br><Ref. to FU(STI)-39, Engine Control Module (ECM).>   |
| <b>4 CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from drain valve.<br>3) Turn ignition switch to ON.<br>4) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 13 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?              | Repair short circuit to battery in harness between ECM and drain valve connector.<br>After repair, replace the ECM.<br><Ref. to FU(STI)-39, Engine Control Module (ECM).> | Go to step 5.  |
| <b>5 CHECK DRAIN VALVE.</b><br>1) Turn ignition switch to OFF.<br>2) Measure the resistance between drain valve terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>  | Is the resistance less than 1 $\Omega$ ?    | Replace the drain valve <Ref. to EC(STI)-16, Drain Valve.> and ECM <Ref. to FU(STI)-39, Engine Control Module (ECM).>.  | Go to step 6.  |
| <b>6 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.   | Is there poor contact in ECM connector?     | Repair poor contact in ECM connector.   | Replace the ECM.<br><Ref. to FU(STI)-39, Engine Control Module (ECM).>   |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BD:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

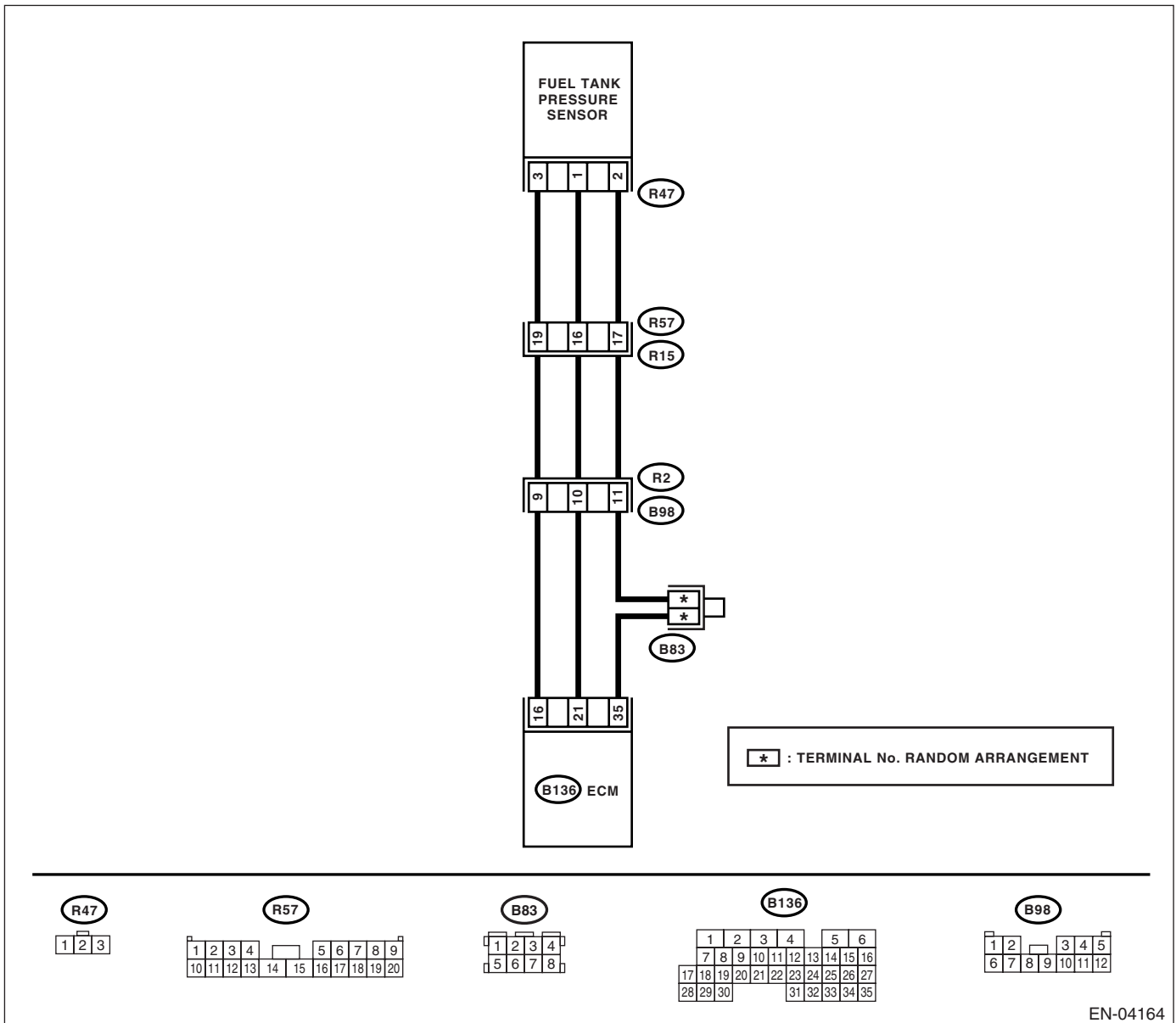
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-143, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04164

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check   | Yes   | No   |   |
|------|---|---|--|---|
| 1    | <b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?                 | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> | Go to step 2.   |
| 2    | <b>CHECK FUEL FILLER CAP.</b><br>1) Turn ignition switch to OFF.<br>2) Open the fuel filler flap lid.   | Is the fuel filler cap tightened securely?  | Go to step 3.  | Tighten fuel filler cap securely.   |
| 3    | <b>CHECK PRESSURE/VACUUM LINE.</b><br>NOTE:<br>Check the following items. <ul style="list-style-type: none"><li>• Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank</li><li>• Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank</li></ul> | Is there any fault in pressure/vacuum line? | Repair or replace the hoses and pipes.   | Replace the fuel tank pressure sensor. <Ref. to EC(STI)-10, Fuel Tank Pressure Sensor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BE:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

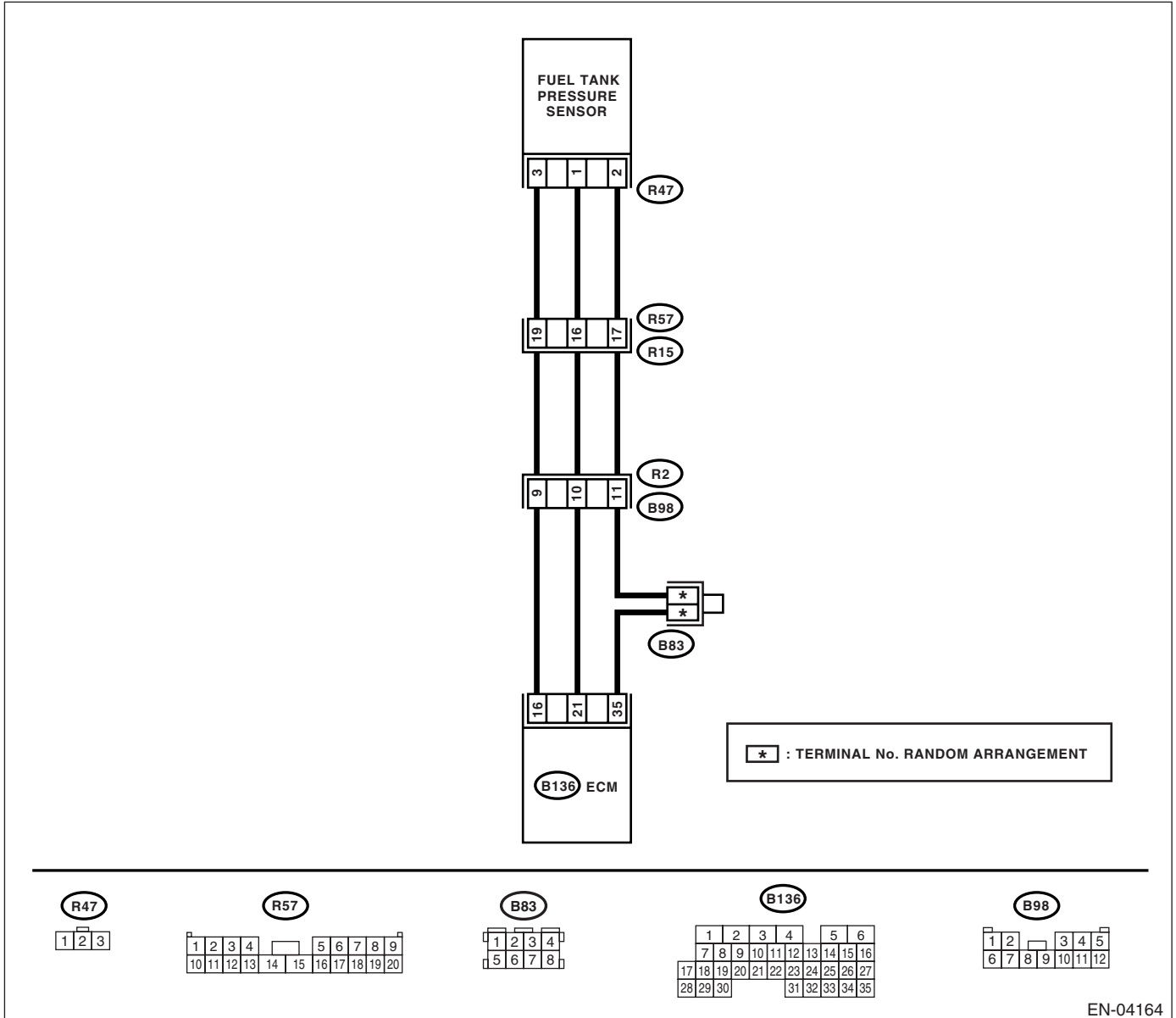
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-145, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04164

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <p><b>1 CHECK CURRENT DATA.</b></p> <p>1) Turn ignition switch to OFF.<br/>                     2) Remove the fuel filler cap.<br/>                     3) Install the fuel filler cap.<br/>                     4) Turn ignition switch to ON.<br/>                     5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the measured value less than -2.8 kPa (-21.0 mmHg, -0.827 inHg)?</p>                          | <p>Go to step 2.</p>                         | <p>The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.</p>  |
| <p><b>2 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b></p> <p>Measure the voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B136) No. 16 (+) — Chassis ground (-):</b></p>  | <p>Is the voltage more than 4.5 V?</p>  | <p>Go to step 4.</p>                         | <p>Go to step 3.</p>   |
| <p><b>3 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b></p> <p>Measure the voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B136) No. 16 (+) — Chassis ground (-):</b></p>  | <p>Does the measured value exceed the specified value by shaking the ECM harness and connector?</p> | <p>Repair poor contact in ECM connector.</p> | <p>Contact your SOA Service Center since deterioration of some parts may be the cause.</p>   |
| <p><b>4 CHECK INPUT SIGNAL FOR ECM.</b></p> <p>Measure the voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B136) No. 21 (+) — Chassis ground (-):</b></p>   | <p>Is the voltage less than 0.2 V?</p>  | <p>Go to step 6.</p>                         | <p>Go to step 5.</p>   |
| <p><b>5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)</b></p> <p>Read the data of fuel tank pressure sensor signal using Subaru Select Monitor.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p>   | <p>Does the measured value exceed the specified value by shaking the ECM harness and connector?</p> | <p>Repair poor contact in ECM connector.</p> | <p>Go to step 6.</p>   |
| <p><b>6 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b></p> <p>1) Turn ignition switch to OFF.<br/>                     2) Remove the rear seat cushion.<br/>                     3) Separate rear wiring harness and fuel tank cord.<br/>                     4) Turn ignition switch to ON.<br/>                     5) Measure the voltage between rear wiring harness connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(R15) No. 19 (+) — Chassis ground (-):</b></p>  | <p>Is the voltage more than 4.5 V?</p>  | <p>Go to step 7.</p>                         | <p>Repair harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and rear wiring harness connector</li> <li>• Poor contact in coupling connector</li> </ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>7 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM and rear wiring harness connector.<br><br><b>Connector &amp; terminal</b><br><b>(B136) No. 35 — (R15) No. 17:</b> | Is the resistance less than 1 $\Omega$ ?                      | Go to step <b>8</b> .                                       | Repair harness and connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM and rear wiring harness connector<br>• Poor contact in coupling connector<br>• Poor contact in joint connector |
| <b>8 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b><br>Measure the resistance of harness between rear wiring harness connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(R15) No. 17 — Chassis ground:</b>  | Is the resistance more than 1 $M\Omega$ ?                     | Go to step <b>9</b> .                                       | Repair short circuit to ground in harness between ECM and rear wiring harness connector.   |
| <b>9 CHECK FUEL TANK CORD.</b><br>1) Disconnect the connector from fuel tank pressure sensor.<br>2) Measure the resistance of fuel tank cord.<br><br><b>Connector &amp; terminal</b><br><b>(R57) No. 19 — (R47) No. 3:</b>  | Is the resistance less than 1 $\Omega$ ?                      | Go to step <b>10</b> .                                      | Repair open circuit in fuel tank cord.   |
| <b>10 CHECK FUEL TANK CORD.</b><br>Measure the resistance of fuel tank cord.<br><br><b>Connector &amp; terminal</b><br><b>(R57) No. 17 — (R47) No. 2:</b>   | Is the resistance less than 1 $\Omega$ ?                      | Go to step <b>11</b> .                                      | Repair open circuit in fuel tank cord.   |
| <b>11 CHECK FUEL TANK CORD.</b><br>Measure the resistance of harness between fuel tank pressure sensor connector and engine ground.<br><br><b>Connector &amp; terminal</b><br><b>(R47) No. 1 — Chassis ground:</b>  | Is the resistance more than 1 $M\Omega$ ?                     | Go to step <b>12</b> .                                      | Repair short circuit to ground in fuel tank cord.  |
| <b>12 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in fuel tank pressure sensor connector.   | Is there poor contact in fuel tank pressure sensor connector? | Repair poor contact in fuel tank pressure sensor connector. | Replace the fuel tank pressure sensor. <Ref. to EC(STI)-10, Fuel Tank Pressure Sensor.>  |

## BF:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

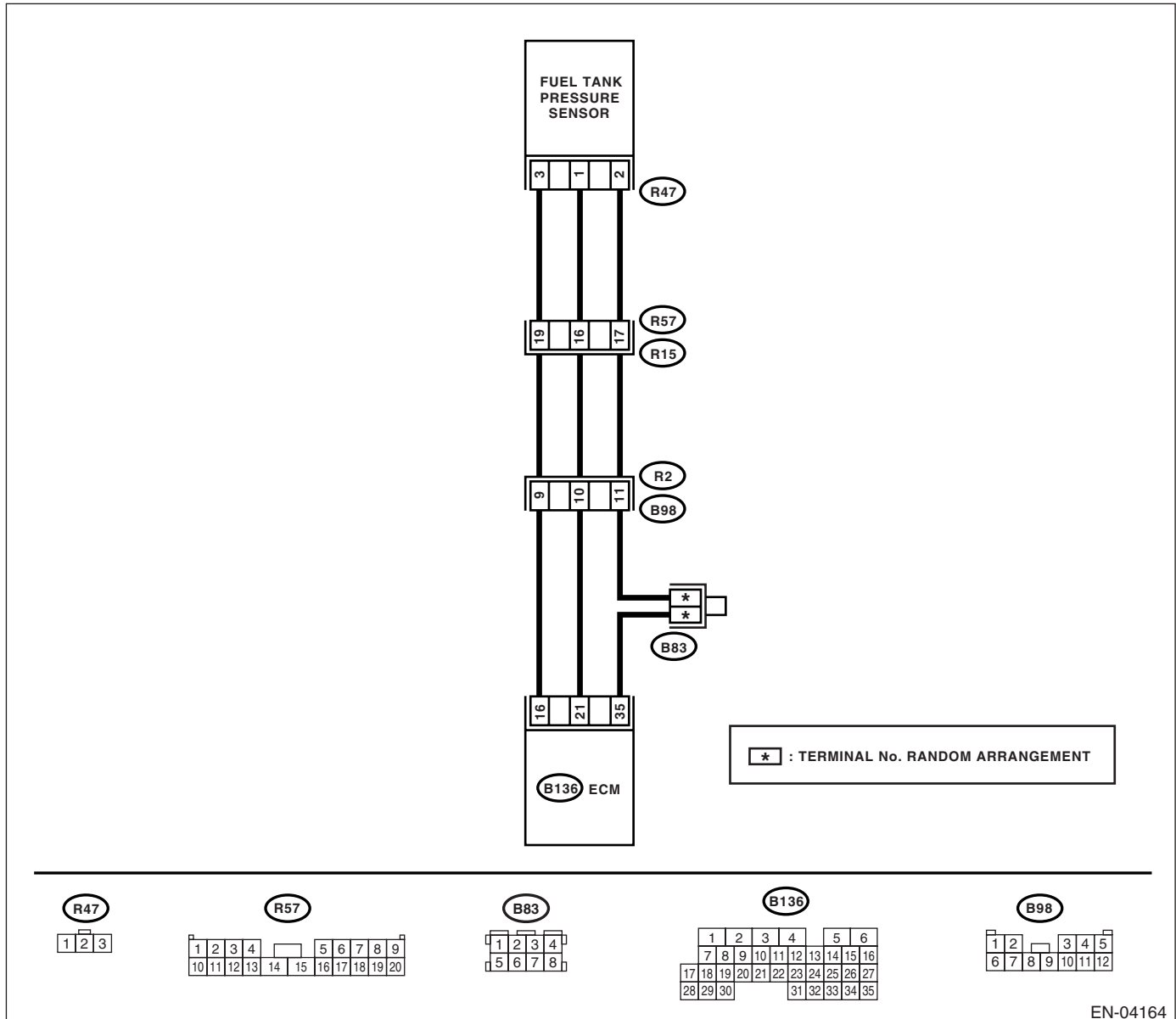
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-147, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04164

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes                                   | No  |
|---|---|---------------------------------------|---|
| <b>1 CHECK CURRENT DATA.</b><br>1) Turn ignition switch to OFF.<br>2) Remove the fuel filler cap.<br>3) Install the fuel filler cap.<br>4) Turn ignition switch to ON.<br>5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)   | Go to step 11.                        | Go to step 2.   |
| <b>2 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 (+) — Chassis ground (-):</b>   | Is the voltage more than 4.5 V?   | Go to step 4.                         | Go to step 3.   |
| <b>3 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 (+) — Chassis ground (-):</b>   | Does the measured value exceed the specified value by shaking the ECM harness and connector?                | Repair poor contact in ECM connector. | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>   |
| <b>4 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B136) No. 21 (+) — Chassis ground (-):</b>  | Is the voltage less than 0.2 V?   | Go to step 6.                         | Go to step 5.   |
| <b>5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)</b><br>Read the data of fuel tank pressure sensor signal using Subaru Select Monitor.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.>  | Does the measured value exceed -2.8 kPa (-21.0 mmHg, -0.827 inHg) by shaking the ECM harness and connector? | Repair poor contact in ECM connector. | Go to step 6.   |
| <b>6 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b><br>1) Turn ignition switch to OFF.<br>2) Remove the rear seat cushion.<br>3) Separate rear wiring harness and fuel tank cord.<br>4) Turn ignition switch to ON.<br>5) Measure the voltage between rear wiring harness connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(R15) No. 19 (+) — Chassis ground (-):</b>   | Is the voltage more than 4.5 V?   | Go to step 7.                         | Repair harness and connector.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM and rear wiring harness connector<br>• Poor contact in coupling connector |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No   |
|--|--|---|--|
| <b>7 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM and rear wiring harness connector.<br><br><b>Connector &amp; terminal</b><br><b>(B136) No. 21 — (R15) No. 16:</b><br><b>(B136) No. 35 — (R15) No. 17:</b>  | Is the resistance less than 1 $\Omega$ ?                         | Go to step <b>8</b> .   | Repair harness and connector.<br><br>NOTE:<br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and rear wiring harness connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>8 CHECK FUEL TANK CORD.</b><br>1) Disconnect the connector from fuel tank pressure sensor.<br>2) Measure the resistance of fuel tank cord.<br><br><b>Connector &amp; terminal</b><br><b>(R57) No. 16 — (R47) No. 1:</b>   | Is the resistance less than 1 $\Omega$ ?                         | Go to step <b>9</b> .   | Repair open circuit in fuel tank cord.   |
| <b>9 CHECK FUEL TANK CORD.</b><br>Measure the resistance of fuel tank cord.<br><br><b>Connector &amp; terminal</b><br><b>(R57) No. 17 — (R47) No. 2:</b>   | Is the resistance less than 1 $\Omega$ ?                         | Go to step <b>10</b> .  | Repair open circuit in fuel tank cord.   |
| <b>10 CHECK FOR POOR CONTACT.</b><br>Check for poor contact in fuel tank pressure sensor connector.  | Is there poor contact in fuel tank pressure sensor connector?    | Repair poor contact in fuel tank pressure sensor connector.                                     | Replace the fuel tank pressure sensor. <Ref. to EC(STI)-10, Fuel Tank Pressure Sensor.>  |
| <b>11 CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from fuel tank pressure sensor.<br>3) Turn ignition switch to ON.<br>4) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the general scan tool.<br><br>NOTE:<br><ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.><br><ul style="list-style-type: none"> <li>• General scan tool</li> </ul> For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)? | Repair short circuit to battery in harness between ECM and fuel tank pressure sensor connector. | Replace the fuel tank pressure sensor. <Ref. to EC(STI)-10, Fuel Tank Pressure Sensor.>  |



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **BG:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)**

#### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-148, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Fuel odor
- There is a hole of more than 0.5 mm (0.020 in) dia. in evaporation system or fuel tank.

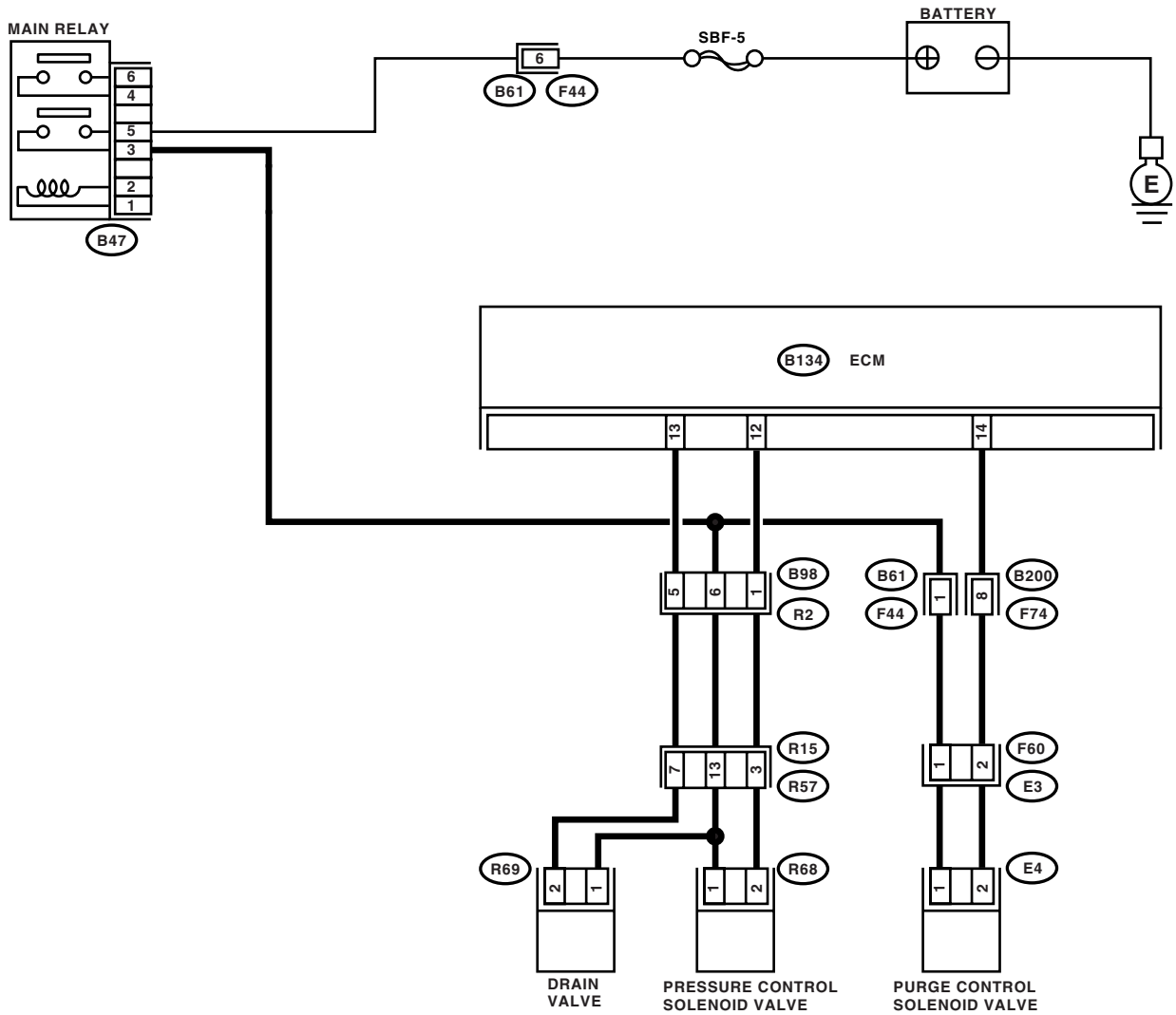
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

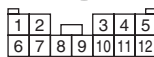
## WIRING DIAGRAM:



(B47)



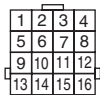
(B98)



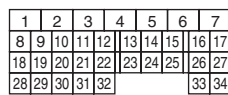
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(F60)



(B134)



(E4)

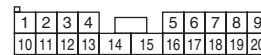
(R68)

(R69)



(R57)

(F74)



EN-04162

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step     | Check   | Yes   | No   |   |
|----------|---|---|--|---|
| <b>1</b> | <b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> | Go to step 2.   |
| <b>2</b> | <b>CHECK FUEL FILLER CAP.</b><br>1) Turn ignition switch to OFF.<br>2) Check the fuel filler cap.<br><br>NOTE:<br>The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.   | Is the fuel filler cap tightened securely?                                    | Go to step 3.  | Tighten fuel filler cap securely.   |
| <b>3</b> | <b>CHECK FUEL FILLER CAP.</b>   | Is the fuel filler cap SUBARU genuine?  | Go to step 4.  | Replace with a SUBARU genuine fuel filler cap.  |
| <b>4</b> | <b>CHECK FUEL FILLER PIPE PACKING.</b>  | Is there any damage to the seal between fuel filler cap and fuel filler pipe? | Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(STI)-48, Fuel Filler Pipe.>  | Go to step 5.   |
| <b>5</b> | <b>CHECK DRAIN VALVE.</b><br>1) Connect the test mode connector.<br>2) Turn ignition switch to ON.<br>3) Operate the drain valve.<br><br>NOTE:<br>Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.> | Does the drain valve operate?   | Go to step 6.  | Replace the drain valve. <Ref. to EC(STI)-16, Drain Valve.>                                     |
| <b>6</b> | <b>CHECK PURGE CONTROL SOLENOID VALVE.</b><br>Operate the purge control solenoid valve.<br><br>NOTE:<br>Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.>                          | Does the purge control solenoid valve operate?                                | Go to step 7.  | Replace the purge control solenoid valve. <Ref. to EC(STI)-6, Purge Control Solenoid Valve.>    |
| <b>7</b> | <b>CHECK PRESSURE CONTROL SOLENOID VALVE.</b><br>Operate the pressure control solenoid valve.<br><br>NOTE:<br>Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.>                 | Does the pressure control solenoid valve operate?                             | Go to step 8.  | Replace the pressure control solenoid valve. <Ref. to EC(STI)-6, Purge Control Solenoid Valve.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step      | Check  | Yes   | No   |   |
|-----------|--|---|--|---|
| <b>8</b>  | <b>CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.</b><br>Turn ignition switch to OFF. | Is there a hole of more than 0.5 mm (0.020 in) dia. on evaporation line?  | Repair or replace the evaporation line. <Ref. to FU(STI)-60, Fuel Delivery, Return and Evaporation Lines.> | Go to step <b>9</b> .   |
| <b>9</b>  | <b>CHECK CANISTER.</b>   | Is the canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?   | Repair or replace the canister. <Ref. to EC(STI)-5, Canister.>   | Go to step <b>10</b> .  |
| <b>10</b> | <b>CHECK FUEL TANK.</b><br>Remove the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>   | Is the fuel tank damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?  | Repair or replace the fuel tank. <Ref. to FU(STI)-45, Fuel Tank.>  | Go to step <b>11</b> .  |
| <b>11</b> | <b>CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.</b>      | Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system? | Repair or replace the hoses or pipes.  | Contact your SOA Service Center since deterioration of some parts may be the cause. |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **BH:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)**

#### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-148, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Fuel odor
- Fuel filler cap is loose or not installed.

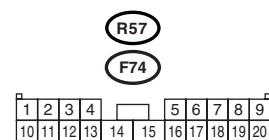
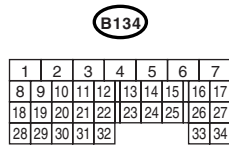
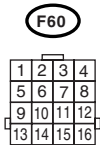
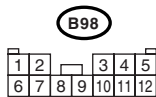
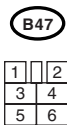
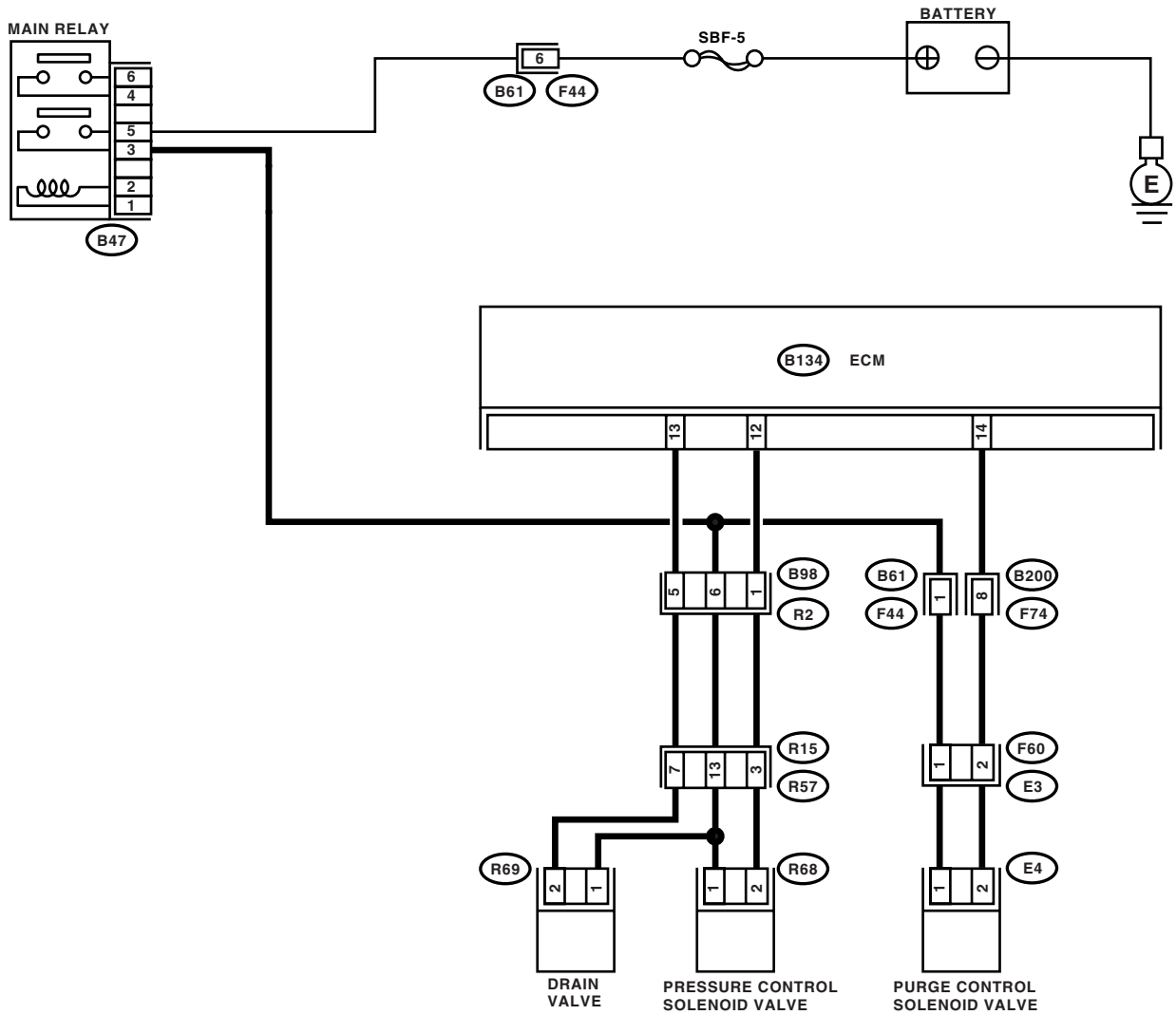
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04162

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step     | Check   | Yes   | No   |   |
|----------|---|---|--|---|
| <b>1</b> | <b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> | Go to step 2.   |
| <b>2</b> | <b>CHECK FUEL FILLER CAP.</b><br>1) Turn ignition switch to OFF.<br>2) Check the fuel filler cap.<br><br>NOTE:<br>The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.   | Is the fuel filler cap tightened securely?                                    | Go to step 3.  | Tighten fuel filler cap securely.   |
| <b>3</b> | <b>CHECK FUEL FILLER CAP.</b>   | Is the fuel filler cap SUBARU genuine?  | Go to step 4.  | Replace with a SUBARU genuine fuel filler cap.  |
| <b>4</b> | <b>CHECK FUEL FILLER PIPE PACKING.</b>  | Is there any damage to the seal between fuel filler cap and fuel filler pipe? | Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(STI)-48, Fuel Filler Pipe.>  | Go to step 5.   |
| <b>5</b> | <b>CHECK DRAIN VALVE.</b><br>1) Connect the test mode connector.<br>2) Turn ignition switch to ON.<br>3) Operate the drain valve.<br><br>NOTE:<br>Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.> | Does the drain valve operate?   | Go to step 6.  | Replace the drain valve. <Ref. to EC(STI)-16, Drain Valve.>                                     |
| <b>6</b> | <b>CHECK PURGE CONTROL SOLENOID VALVE.</b><br>Operate the purge control solenoid valve.<br><br>NOTE:<br>Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>                          | Does the purge control solenoid valve operate?                                | Go to step 7.  | Replace the purge control solenoid valve. <Ref. to EC(STI)-6, Purge Control Solenoid Valve.>    |
| <b>7</b> | <b>CHECK PRESSURE CONTROL SOLENOID VALVE.</b><br>Operate the pressure control solenoid valve.<br><br>NOTE:<br>Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.>                 | Does the pressure control solenoid valve operate?                             | Go to step 8.  | Replace the pressure control solenoid valve. <Ref. to EC(STI)-6, Purge Control Solenoid Valve.> |
| <b>8</b> | <b>CHECK CANISTER.</b>  | Is the canister damaged?  | Repair or replace the canister. <Ref. to EC(STI)-5, Canister.>   | Go to step 9.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <b>9</b><br><b>CHECK FUEL TANK.</b><br>Remove the fuel tank. <Ref. to FU(STI)-45, Fuel Tank.>  | Is the fuel tank damaged?   | Repair or replace the fuel tank. <Ref. to FU(STI)-45, Fuel Tank.> | Go to step <b>10</b> .  |
| <b>10</b><br><b>CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.</b> | Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, or disconnections, misconnection of hoses or pipes in evaporative emission control system? | Repair or replace the hoses or pipes.                             | Contact your SOA Service Center since deterioration of some parts may be the cause. |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BI: DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-149, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

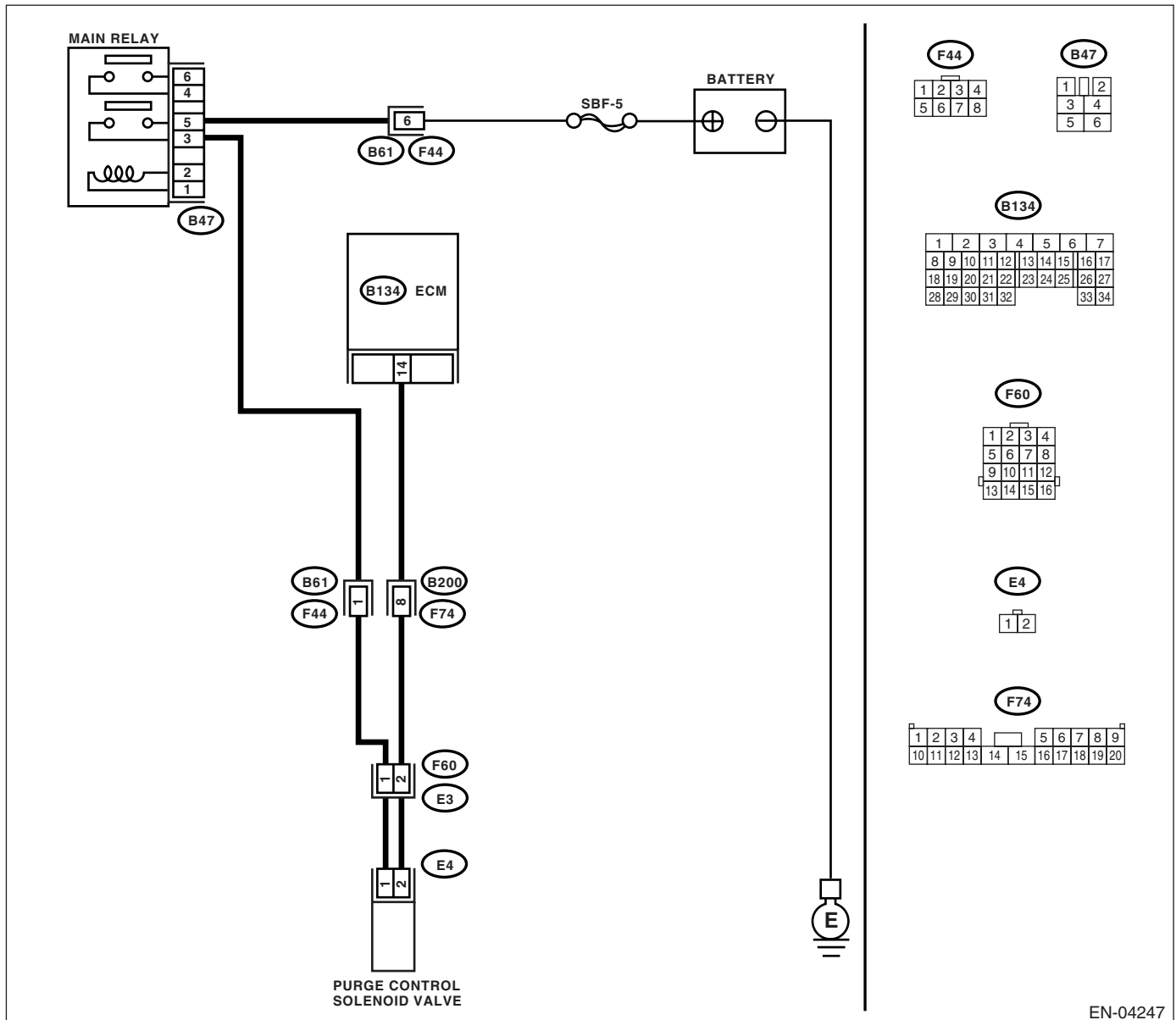
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 14 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 10 V?                                   | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. | Go to step 2.   |
| <b>2</b><br><b>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from purge control solenoid valve and ECM.<br>3) Measure the resistance of harness between purge control solenoid valve connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E4) No. 2 — Engine ground:</b></i> | Is the resistance more than 1 M $\Omega$ ?                       | Go to step 3.   | Repair the ground short circuit in harness between ECM and purge control solenoid valve connector.  |
| <b>3</b><br><b>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM and purge control solenoid valve of harness connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 14 — (E4) No. 2:</b></i>   | Is the resistance less than 1 $\Omega$ ?                         | Go to step 4.   | Repair the open circuit in harness between ECM and purge control solenoid valve connector.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and purge control solenoid valve connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>4</b><br><b>CHECK PURGE CONTROL SOLENOID VALVE.</b><br>1) Remove the purge control solenoid valve.<br>2) Measure the resistance between purge control solenoid valve terminals.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i>   | Is the resistance 10 — 100 $\Omega$ ?                            | Go to step 5.   | Replace the purge control solenoid valve. <Ref. to EC(STI)-6, Purge Control Solenoid Valve.>  |
| <b>5</b><br><b>CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between purge control solenoid valve and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E4) No. 1 (+) — Engine ground (-):</b></i>   | Is the voltage more than 10 V?                                   | Go to step 6.   | Repair the open circuit in harness between main relay and purge control solenoid valve connector.   |
| <b>6</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in purge control solenoid valve connector.   | Is there poor contact in purge control solenoid valve connector? | Repair the poor contact in purge control solenoid valve connector.  | Contact your SOA Service Center since deterioration of some parts may be the cause.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BJ:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-151, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

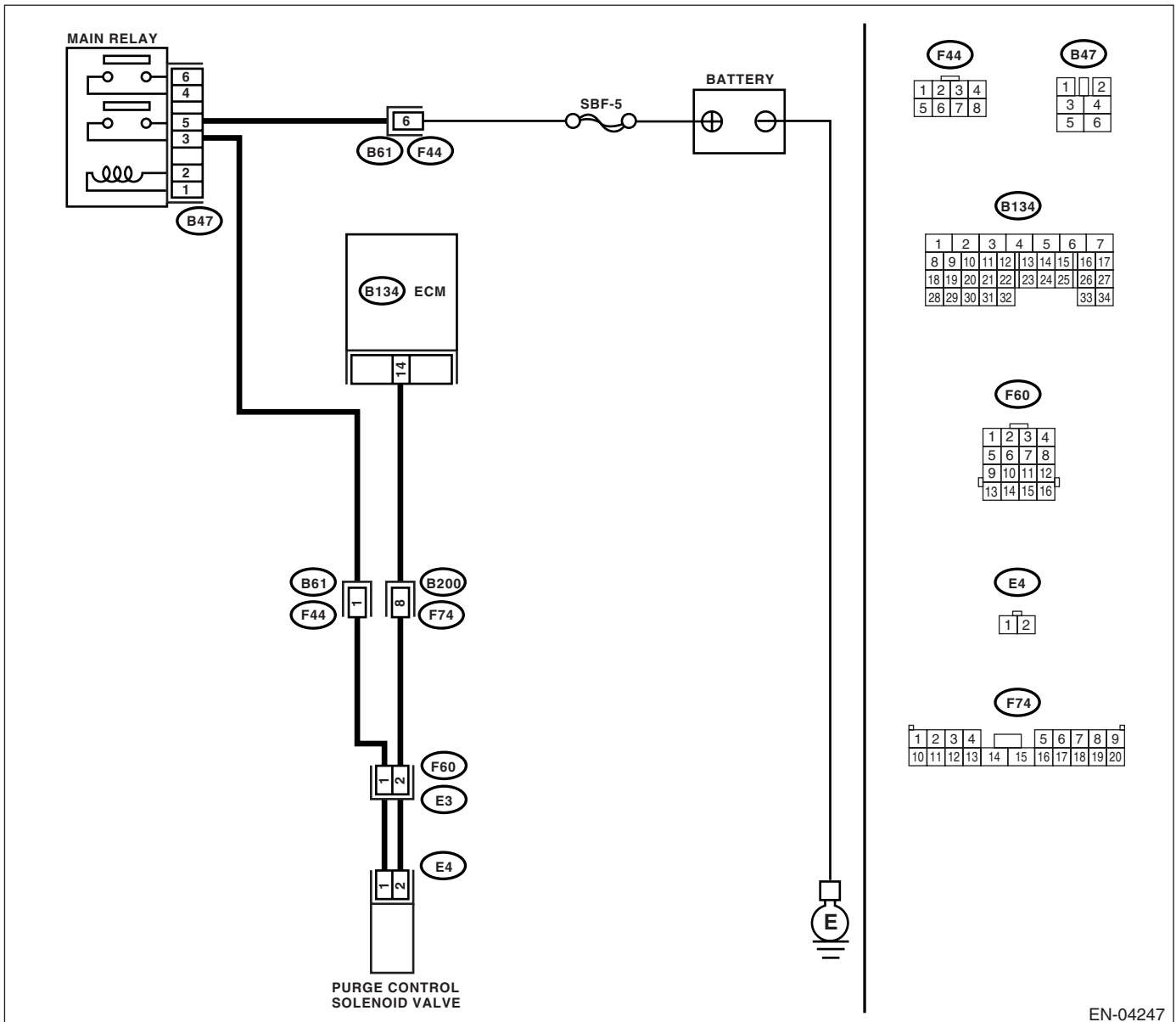
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04247

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes   | No  |
|--|--|---|---|
| <b>1 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side).<br>3) Turn the ignition switch to ON.<br>4) While operating the purge control solenoid valve, measure the voltage between ECM and chassis ground.<br><br><b>NOTE:</b><br>Purge control solenoid valve operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.><br><br><b>Connector &amp; terminal</b><br><b>(B134) No. 14 (+) — Chassis ground (-):</b> | Is the voltage 0 — 13 V?                 | Go to step 2.   | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector. |
| <b>2 CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B134) No. 14 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?           | Go to step 4.   | Go to step 3.   |
| <b>3 CHECK POOR CONTACT.</b><br>Check the poor contact in ECM connector.   | Is there poor contact in ECM connector?  | Repair the poor contact in ECM connector.   | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>   |
| <b>4 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from purge control solenoid valve.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between ECM and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B134) No. 14 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?           | Repair the battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> | Go to step 5.   |
| <b>5 CHECK PURGE CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between purge control solenoid valve terminals.<br><br><b>Terminals</b><br><b>No. 1 — No. 2:</b>  | Is the resistance less than 1 $\Omega$ ? | Replace the purge control solenoid valve and ECM <Ref. to EC(STI)-6, Purge Control Solenoid Valve.> ECM <Ref. to FU(STI)-39, Engine Control Module (ECM).>                            | Go to step 6.   |
| <b>6 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.   | Is there poor contact in ECM connector?  | Repair the poor contact in ECM connector.   | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

---

### **BK:DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE**

#### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-153, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

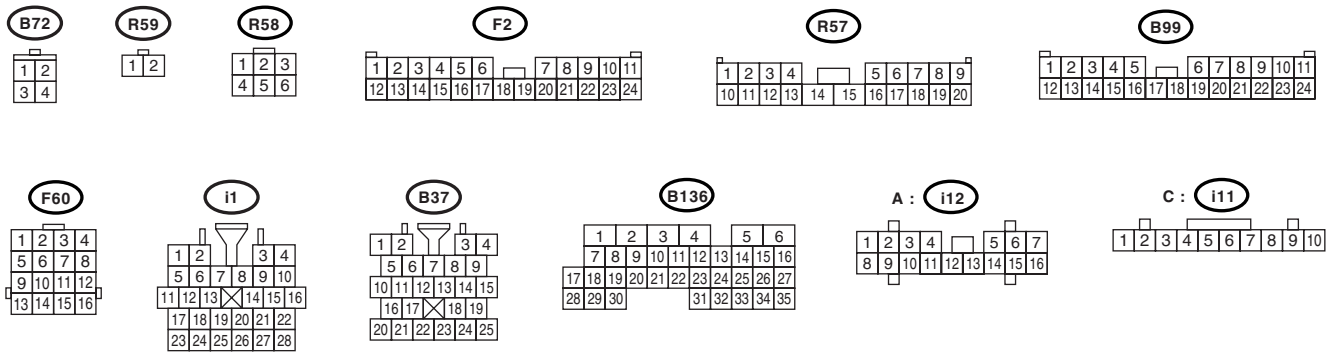
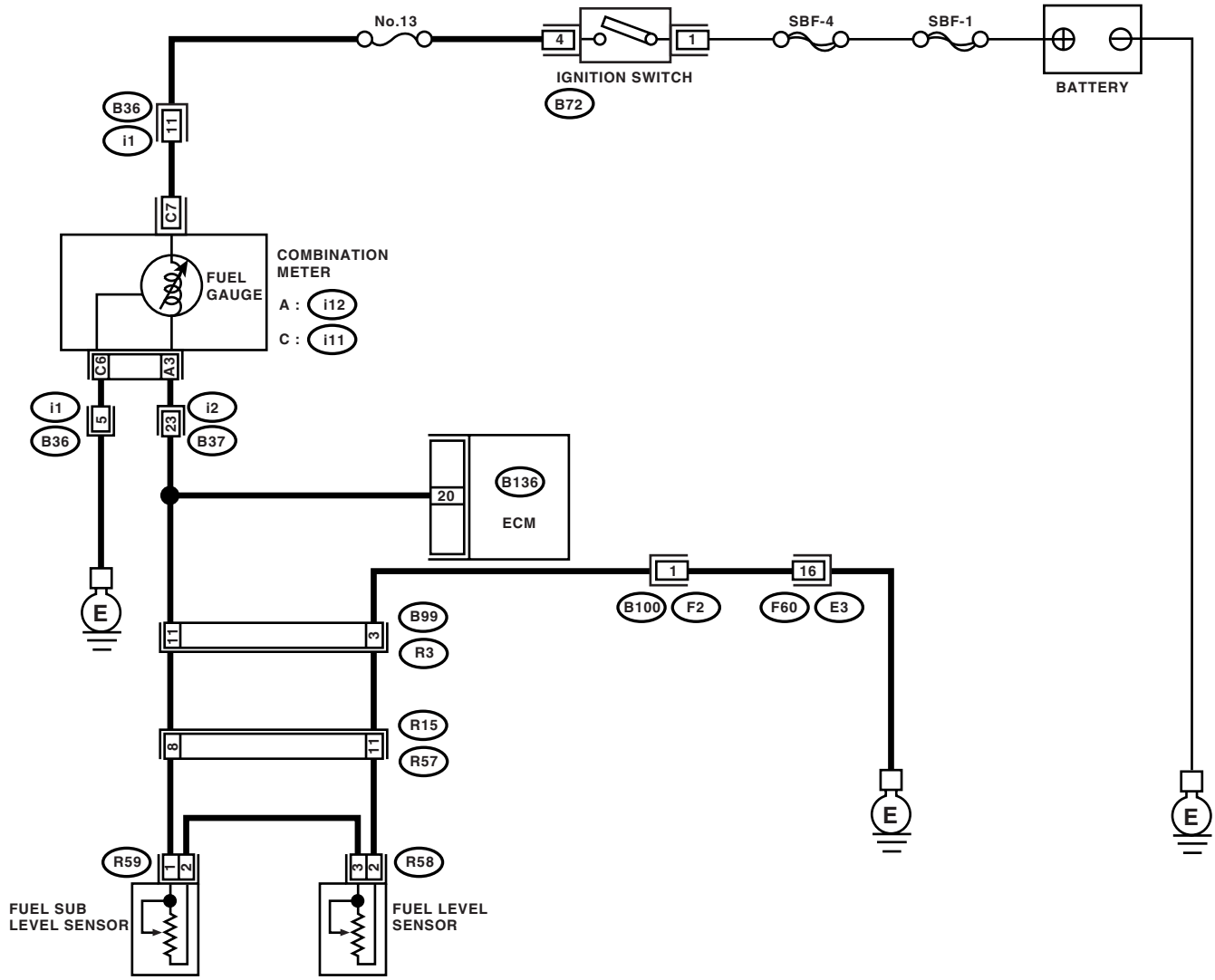
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04712

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                       | Yes  | No   |
|---|-----------------------------|--|--|
| 1<br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).><br><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0461. | Replace the fuel level sensor. <Ref. to FU(STI)-54, Fuel Level Sensor.> and fuel sub level sensor <Ref. to FU(STI)-55, Fuel Sub Level Sensor.> |

## **BL:DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT**

### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-155, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **CAUTION:**

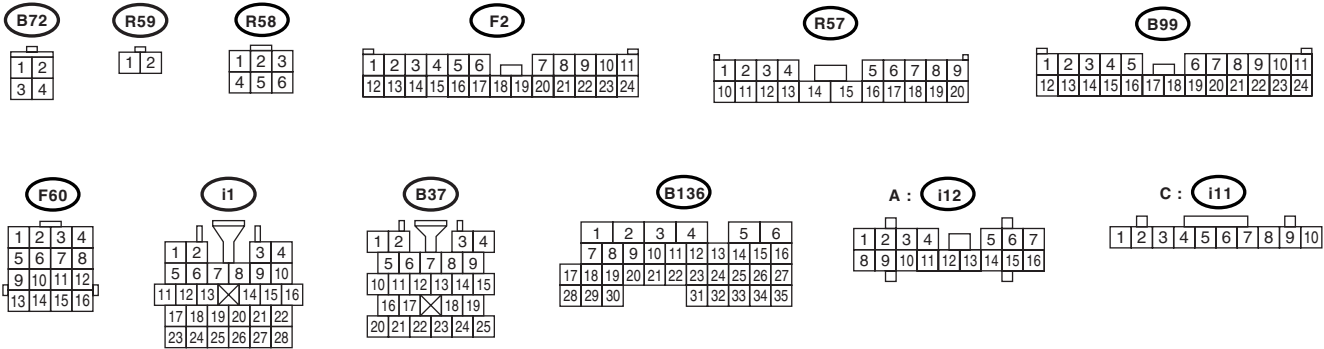
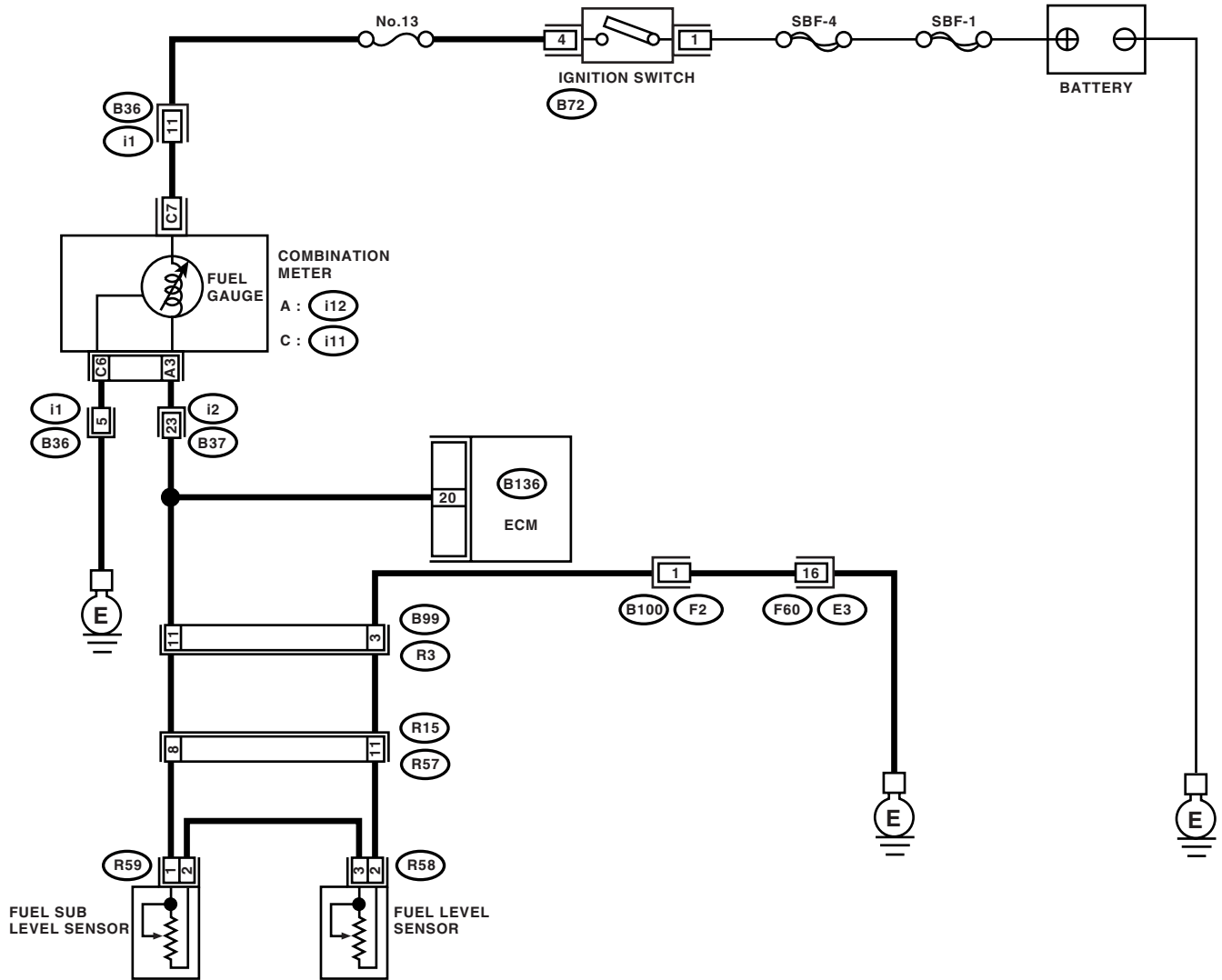
**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04712

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check  | Yes                                       | No   |
|------|--|---|--|
| 1    | <b>CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.</b>  | Go to step 2.                             | Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>  |
| 2    | <b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to ON. (engine OFF)<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 20 (+) — Chassis ground (-):</b>   | Go to step 4.                             | Go to step 3.  |
| 3    | <b>CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)</b><br>Read the data of fuel level sensor signal using Subaru Select Monitor.<br><br>NOTE:<br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.>  | Repair the poor contact in ECM connector. | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.<br><br>NOTE:<br>In this case, repair the following:<br>• Poor contact in combination meter connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connectors |
| 4    | <b>CHECK INPUT VOLTAGE OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15).<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 20 (+) — Chassis ground (-):</b> | Go to step 5.                             | Go to step 6.  |
| 5    | <b>CHECK HARNESS BETWEEN ECM AND COMBINATION METER.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from connector (i11), (i12) and ECM connector.<br>3) Measure the resistance between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 20 — Chassis ground:</b>   | Go to step 7.                             | Repair the ground short circuit in harness between ECM and combination meter connector.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                      | Yes   | No   |
|--|--|---|--|
| <b>6 CHECK HARNESS BETWEEN ECM AND COMBINATION METER.</b><br>Measure the resistance between ECM and combination meter connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 20 — (i12) No. 3:</b></i>   | Is the resistance less than 10 $\Omega$ ?  | Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.> | Repair the open circuit between ECM and combination meter connector.<br><br>NOTE:<br>In this case, repair the following:<br>Poor contact in coupling connector |
| <b>7 CHECK FUEL TANK CORD.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from fuel sub level sensor.<br>3) Measure the resistance between fuel sub level sensor and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(R59) No. 1 — Chassis ground:</b></i> | Is the resistance more than 1 M $\Omega$ ? | Go to step <b>8</b> .   | Repair the ground short circuit in fuel tank cord.   |
| <b>8 CHECK FUEL TANK CORD.</b><br>1) Disconnect the connector from fuel pump assembly.<br>2) Measure the resistance between fuel pump assembly and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(R59) No. 2 — Chassis ground:</b></i>  | Is the resistance more than 1 M $\Omega$ ? | Go to step <b>9</b> .   | Repair the ground short circuit in fuel tank cord.   |
| <b>9 CHECK FUEL LEVEL SENSOR.</b><br>1) Remove the fuel pump assembly. <Ref. to FU(STI)-52, Fuel Pump.><br>2) Measure the resistance between fuel level sensor and terminals with its float set to the full position.<br><i><b>Terminals</b></i><br><i><b>No. 2 — No. 3:</b></i>                         | Is the resistance 0.5 — 2.5 $\Omega$ ?     | Go to step <b>10</b> .  | Replace the fuel level sensor.   |
| <b>10 CHECK FUEL SUB LEVEL SENSOR.</b><br>1) Remove the fuel sub level sensor. <Ref. to FU(STI)-55, Fuel Sub Level Sensor.><br>2) Measure the resistance between fuel sub level sensor and terminals with its float set to the full position.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i> | Is the resistance 0.5 — 2.5 $\Omega$ ?     | Repair the poor contact in harness between ECM and combination meter connector.     | Replace the fuel sub level sensor.   |

## **BM:DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT**

### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-157, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

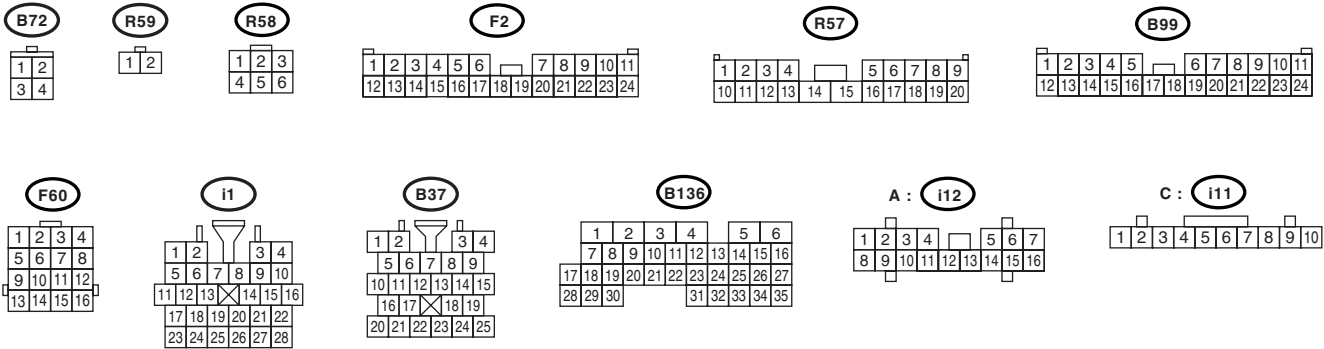
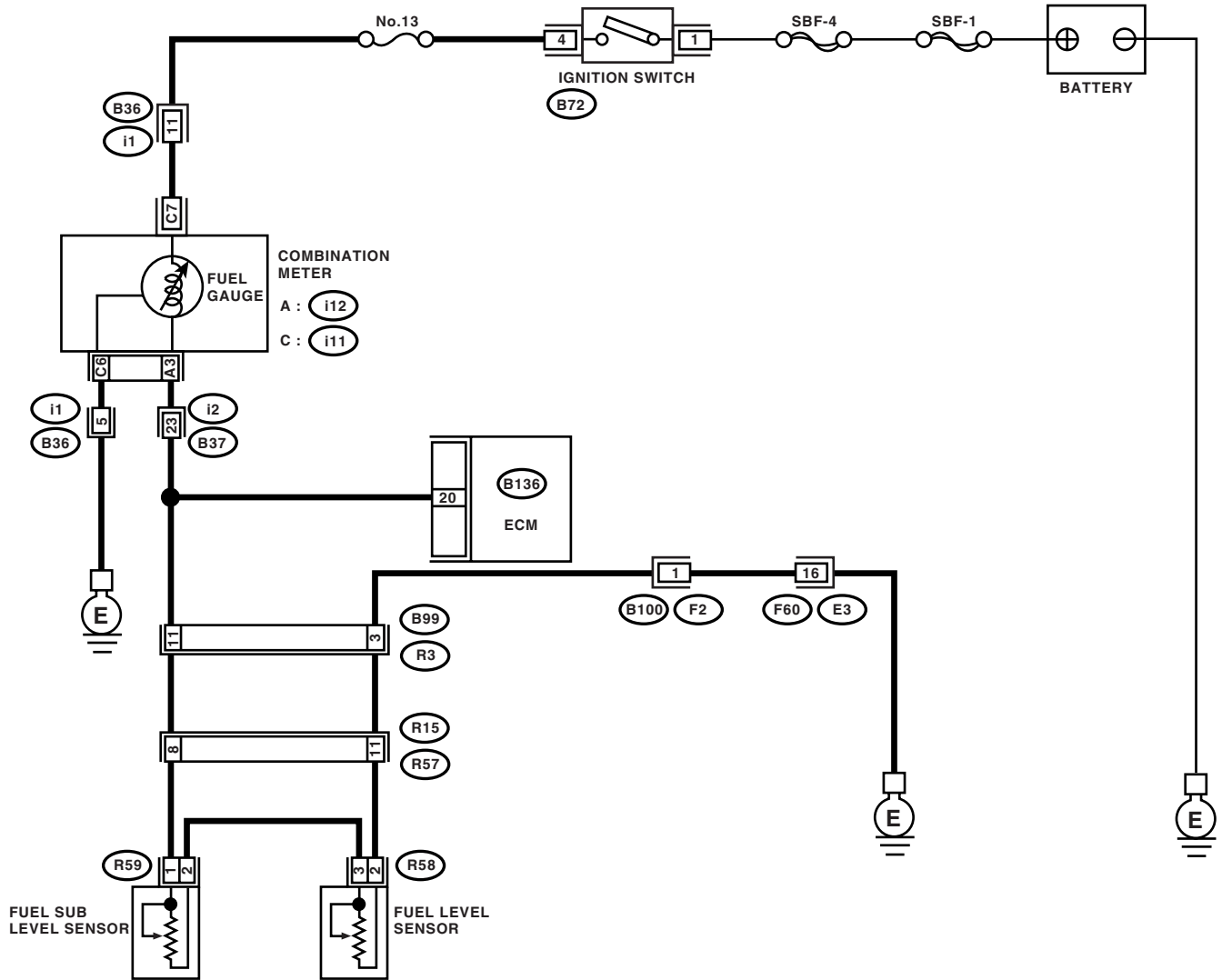
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04712

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check   | Yes           | No  |
|------|---|---------------|---|
| 1    | <b>CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.</b>   | Go to step 2. | Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>   |
| 2    | <b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to ON. (engine OFF)<br>2) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 20 (+) — Chassis ground (-):</b>  | Go to step 3. | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Poor contact in fuel pump connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| 3    | <b>CHECK INPUT VOLTAGE OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the combination meter connector (i11) and ECM connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage of harness between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 20 (+) — Chassis ground (-):</b> | Go to step 4. | Repair the battery short circuit between ECM and combination meter connector.   |
| 4    | <b>CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.</b><br>1) Turn the ignition switch to OFF.<br>2) Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15).<br>3) Measure the resistance between ECM and fuel tank cord.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 20 — (R15) No. 8:</b>                       | Go to step 5. | Repair the open circuit between ECM and fuel tank cord.   |
| 5    | <b>CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.</b><br>Measure the resistance between fuel tank cord and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R15) No. 11 — Chassis ground:</b>  | Go to step 6. | Repair the open circuit between fuel tank cord and chassis ground.<br><br>NOTE:<br>In this case, repair the following:<br>Poor contact in coupling connectors   |
| 6    | <b>CHECK FUEL TANK CORD.</b><br>1) Disconnect the connector from fuel level sensor.<br>2) Measure the resistance between fuel level sensor and coupling connector.<br><b>Connector &amp; terminal</b><br><b>(R57) No. 11 — (R58) No. 2:</b>   | Go to step 7. | Repair the open circuit between coupling connector and fuel level sensor.   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check                                     | Yes   | No  |
|--|---|---|---|
| <b>7</b><br><b>CHECK FUEL TANK CORD.</b><br>1) Disconnect the connector from fuel sub level sensor.<br>2) Measure the resistance between fuel level sensor and fuel sub level sensor.<br><b>Connector &amp; terminal</b><br><b>(R58) No. 3 — (R59) No. 2:</b>  | Is the resistance less than 10 $\Omega$ ? | Go to step <b>8</b> .   | Repair the open circuit between fuel level sensor and fuel sub level sensor.  |
| <b>8</b><br><b>CHECK FUEL TANK CORD.</b><br>Measure the resistance between fuel sub level sensor and coupling connector.<br><b>Connector &amp; terminal</b><br><b>(R57) No. 8 — (R59) No. 1:</b>   | Is the resistance less than 10 $\Omega$ ? | Go to step <b>9</b> .   | Repair the open circuit between coupling connector and fuel sub level sensor. |
| <b>9</b><br><b>CHECK FUEL LEVEL SENSOR.</b><br>1) Remove the fuel pump assembly. <Ref. to FU(STI)-52, Fuel Pump.><br>2) While moving the fuel level sensor float up and down, measure the resistance between fuel level sensor terminals.<br><b>Terminals</b><br><b>No. 2 — No. 3:</b>                             | Is the resistance more than 53 $\Omega$ ? | Replace the fuel level sensor. <Ref. to FU(STI)-54, Fuel Level Sensor.>         | Go to step <b>10</b> .  |
| <b>10</b><br><b>CHECK FUEL SUB LEVEL SENSOR.</b><br>1) Remove the fuel sub level sensor. <Ref. to FU(STI)-55, Fuel Sub Level Sensor.><br>2) While moving the fuel sub level sensor float up and down, measure the resistance between fuel sub level sensor terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b> | Is the resistance more than 45 $\Omega$ ? | Replace the fuel sub level sensor. <Ref. to FU(STI)-55, Fuel Sub Level Sensor.> | Replace the combination meter. <Ref. to IDI-10, Combination Meter.>           |

## **BN:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT**

### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-159, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **CAUTION:**

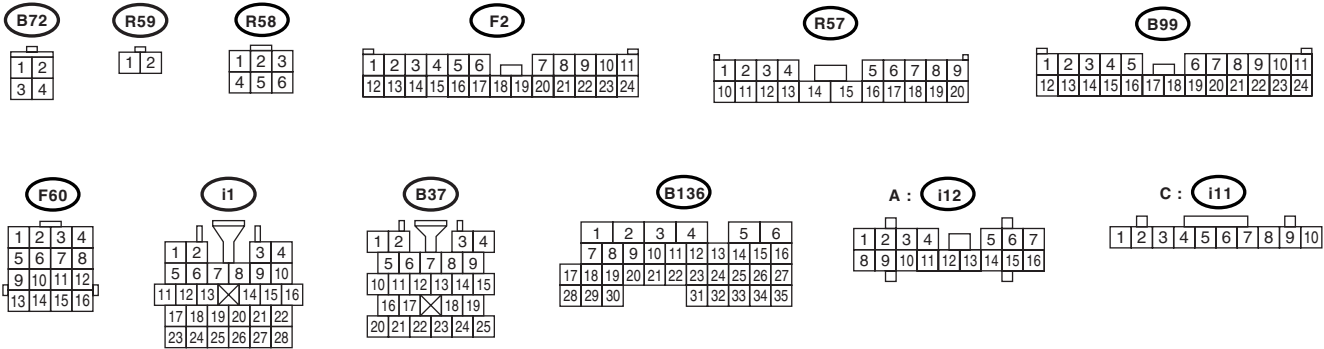
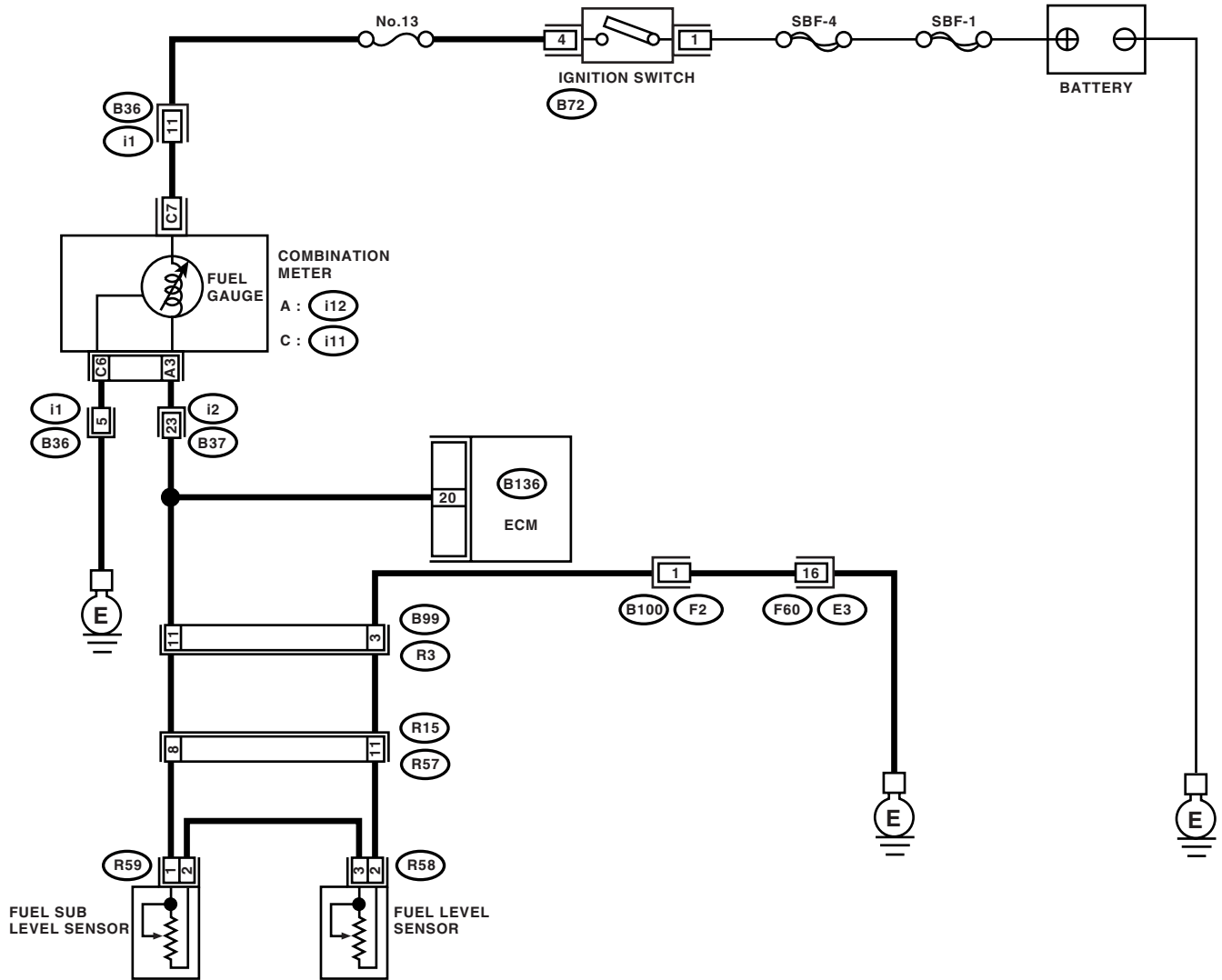
**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04712

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                | Yes  | No  |
|---|--------------------------------------|--|---|
| <b>1</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?          | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> | Go to step 2.   |
| <b>2</b><br><b>CHECK FUEL LEVEL SENSOR.</b><br>1) Remove the fuel pump assembly. <Ref. to FU(STI)-52, Fuel Pump.><br>2) While moving the fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly.<br><i>Terminals</i><br><b>No. 3 — No. 2:</b>                        | Does the resistance change smoothly? | Go to step 3.  | Replace the fuel level sensor. <Ref. to FU(STI)-54, Fuel Level Sensor.>         |
| <b>3</b><br><b>CHECK FUEL SUB LEVEL SENSOR.</b><br>1) Remove the fuel sub level sensor. <Ref. to FU(STI)-55, Fuel Sub Level Sensor.><br>2) While moving the fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly.<br><i>Terminals</i><br><b>No. 1 — No. 2:</b> | Does the resistance change smoothly? | Repair the poor contact in ECM, combination meter and coupling connectors.   | Replace the fuel sub level sensor. <Ref. to FU(STI)-55, Fuel Sub Level Sensor.> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **BO:DTC P0483 COOLING FAN RATIONALITY CHECK**

#### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-162, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Occurrence of noise
- Overheating

#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

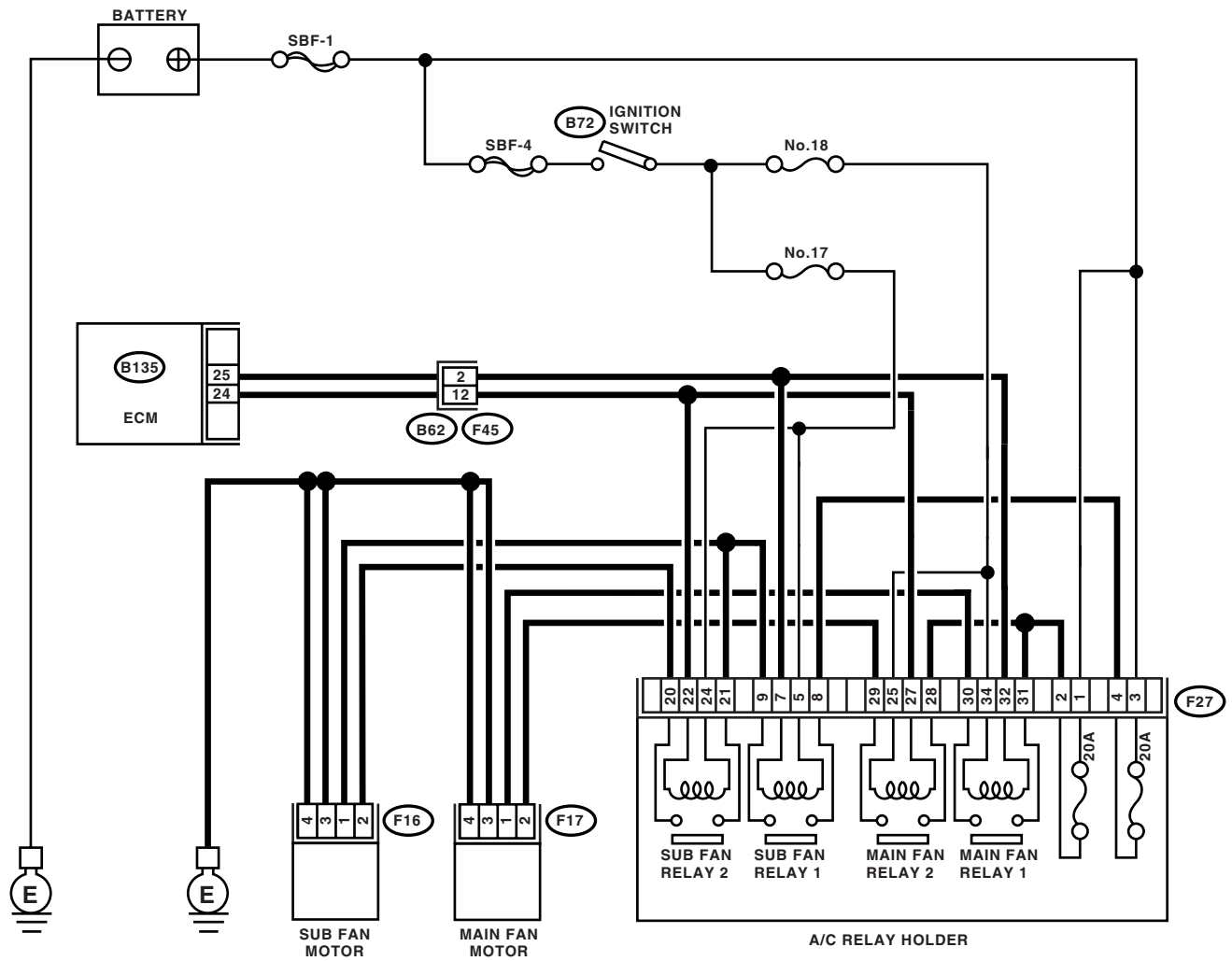
#### **NOTE:**

If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



(B72)

|   |   |
|---|---|
| 1 | 2 |
| 3 | 4 |

(F27)

|   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1 | 2  | 5  | 6  | 7  | 10 | 15 | 16 | 17 | 20 | 25 | 26 | 27 | 30 | 35 |
| 3 | 4  | 8  | 11 | 18 | 21 | 28 | 31 | 34 | 36 |    |    |    |    |    |
| 9 | 12 | 13 | 14 | 19 | 22 | 23 | 24 | 29 | 32 | 33 | 34 |    |    |    |

(B135)

|    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |    |    |    |    |    |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |    |    |    |    |
| 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |    |    |    |    |

(F45)

|    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 |    |    |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |

(F16)

(F17)

|   |   |
|---|---|
| 1 | 2 |
| 3 | 4 |

EN-04604

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                       | Yes  | No  |
|---|-----------------------------|--|---|
| 1<br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> | Check the radiator fan, fan motor and thermostat. If thermostat is stuck, replace thermostat. <Ref. to CO(H4SO)-27, Radiator Main Fan and Fan Motor.><br><Ref. to CO(H4SO)-28, Radiator Sub Fan and Fan Motor.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BP:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT

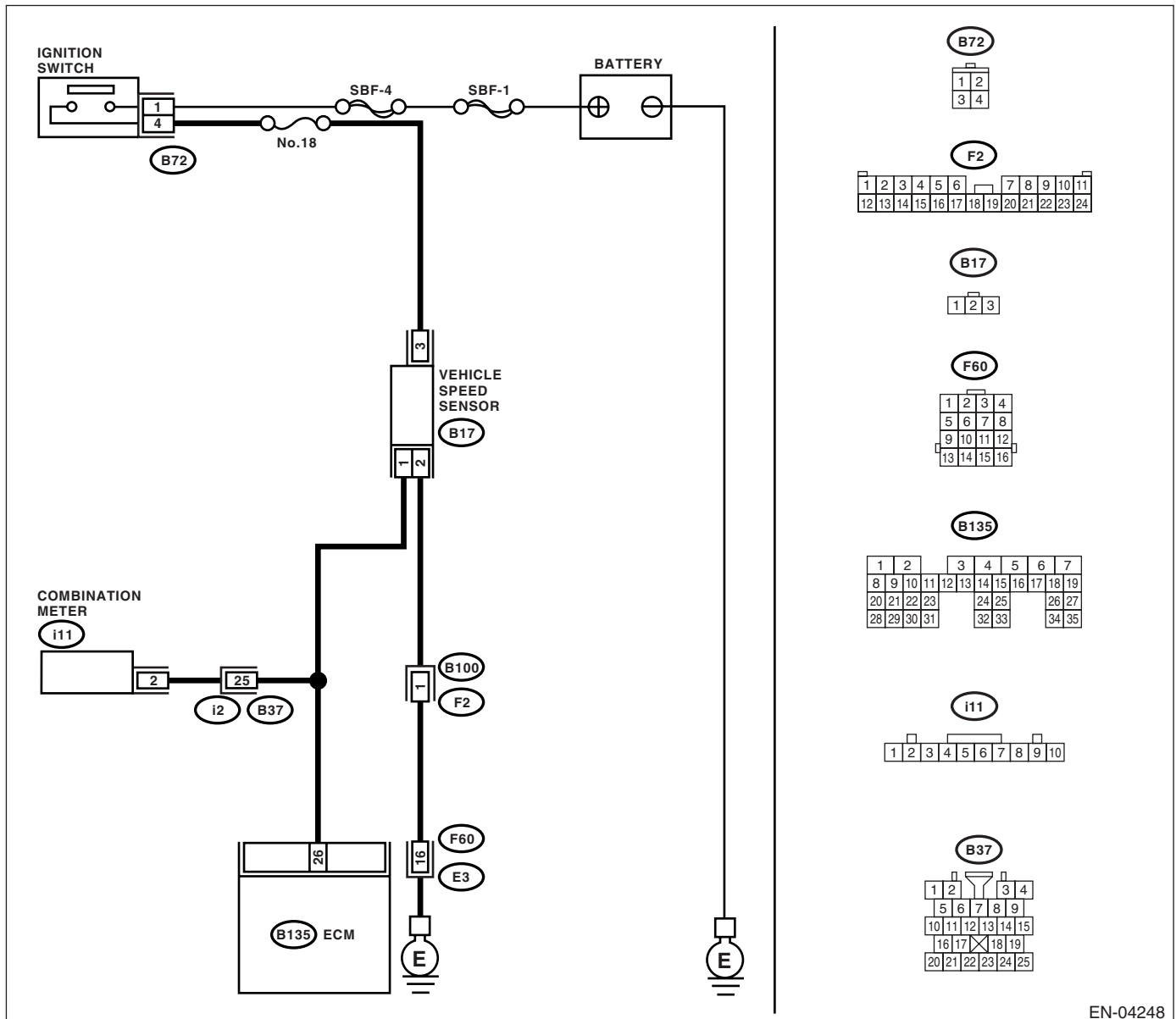
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-164, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04248

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No   |
|--|--|--|--|
| <b>1</b><br><b>CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from vehicle speed sensor and ECM.<br>3) Measure the resistance of harness between vehicle speed sensor connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B17) No. 1 — Chassis ground:</b> | Is the resistance more than 1 MΩ?                            | Go to step 2.  | Repair the ground short circuit in harness between vehicle speed sensor and ECM connector. |
| <b>2</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in the vehicle speed sensor connector.  | Is there poor contact in the vehicle speed sensor connector? | Repair poor contact in the vehicle speed sensor connector. | Replace the vehicle speed sensor.<br><Ref. to 5MT-38, Vehicle Speed Sensor.>               |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## BQ:DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH

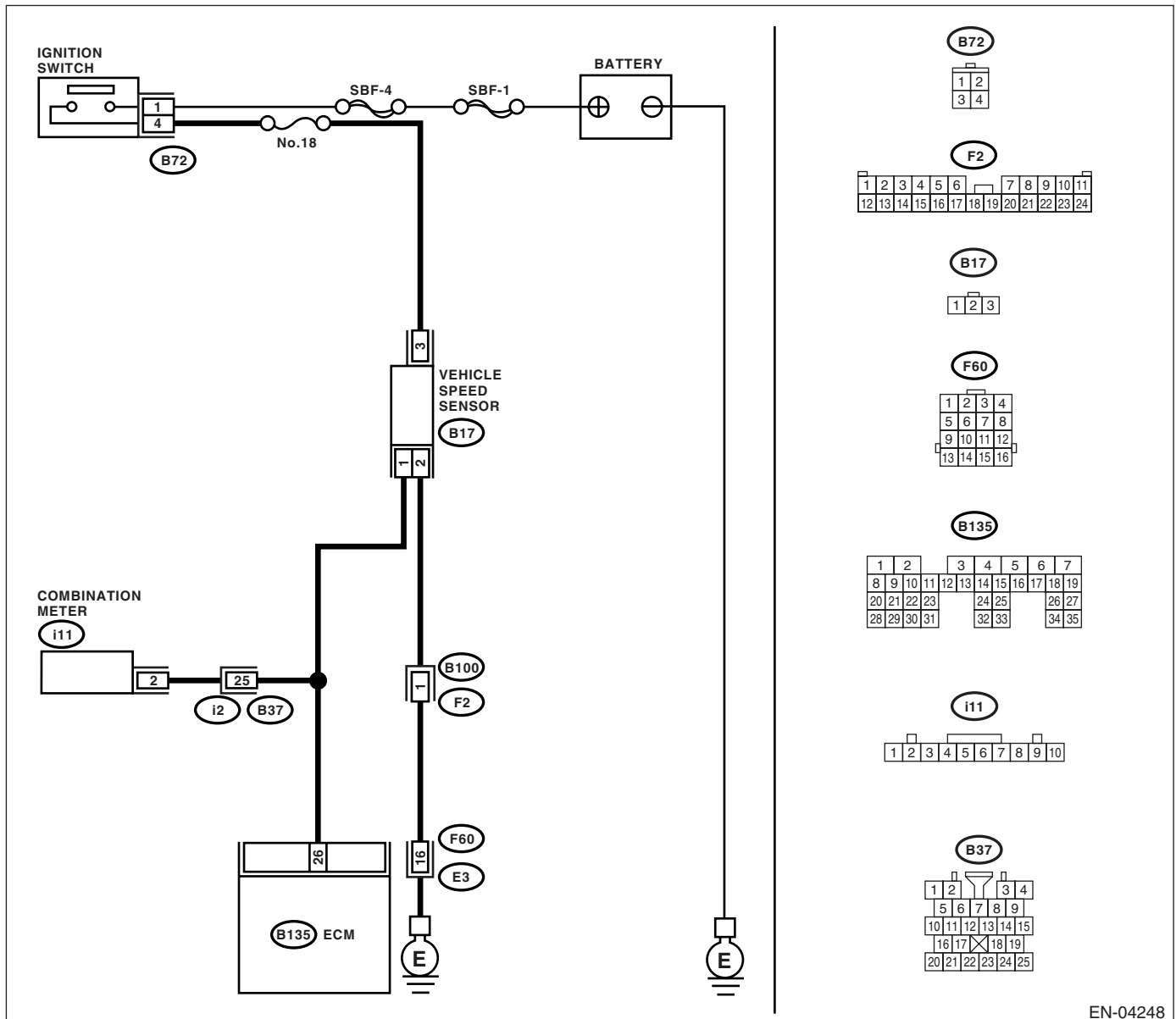
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-165, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04248



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                     | Yes                                       | No  |
|--|---|---|---|
| 1<br><b>CHECK SPEEDOMETER OPERATION IN COMBINATION METER.</b>  | Does the speedometer operate normally?    | Go to step 2.                             | Check the speedometer. <Ref. to IDI-13, Speedometer.>   |
| 2<br><b>CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from combination meter.<br>3) Measure the resistance between ECM and combination meter.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 26 — (i11) No. 2:</b> | Is the resistance less than 10 $\Omega$ ? | Repair the poor contact in ECM connector. | Repair the harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"><li>• Open circuit in harness between ECM and combination meter connector</li><li>• Poor contact in ECM connector</li><li>• Poor contact in combination meter connector</li><li>• Poor contact in coupling connector</li></ul> |

## **BR:DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED**

### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-167, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

- Engine is difficult to start.
- Engine does not start.
- Erroneous idling
- Engine stalls.

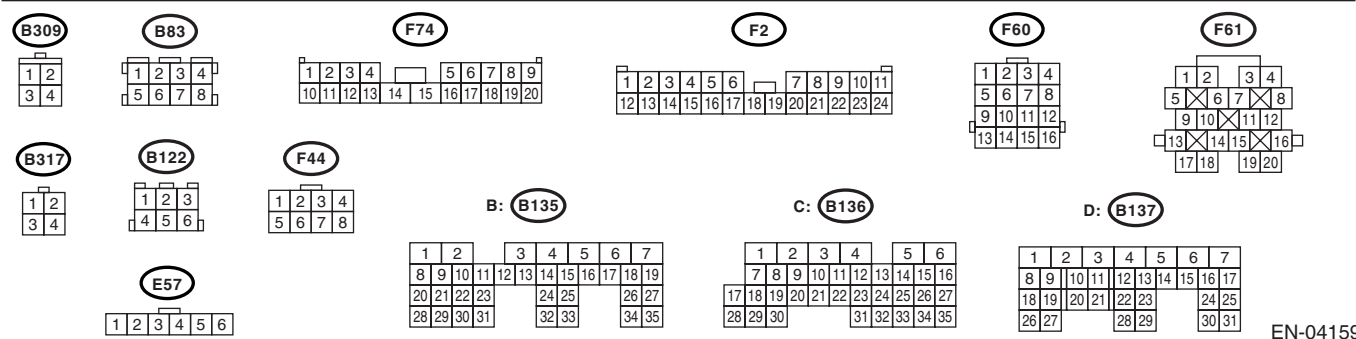
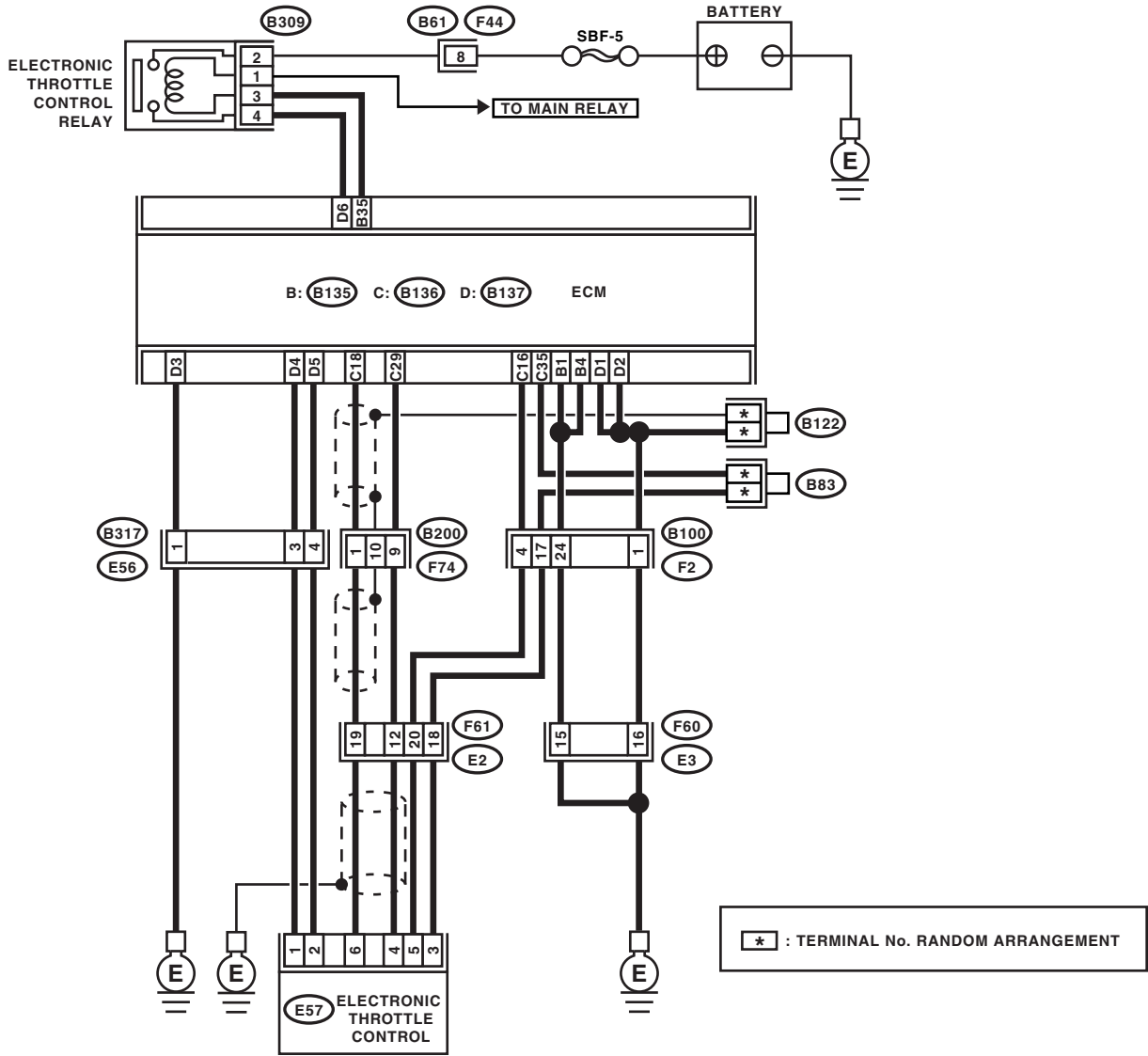
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04159

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check   | Yes   | No   |
|------|---|---|--|
| 1    | <b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?                                 | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0506. |
| 2    | <b>CHECK AIR CLEANER ELEMENT.</b><br>1) Turn the ignition switch to OFF.<br>2) Check air cleaner element.   | Is there excessive clogging on air cleaner element.         | Go to step 2.<br><br>Replace the air cleaner element.<br><Ref. to IN(STI)-8, Air Cleaner Case.>  |
| 3    | <b>CHECK ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electronic throttle control.<br>3) Check the electronic throttle control. | Are there foreign particles in electronic throttle control? | Go to step 3.<br><br>Remove the foreign particles from electronic throttle control.<br><br>Perform the diagnosis of DTC P2101.   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

---

### **BS:DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED**

#### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-169, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

Engine keeps running at higher revolution than specified idling revolution.

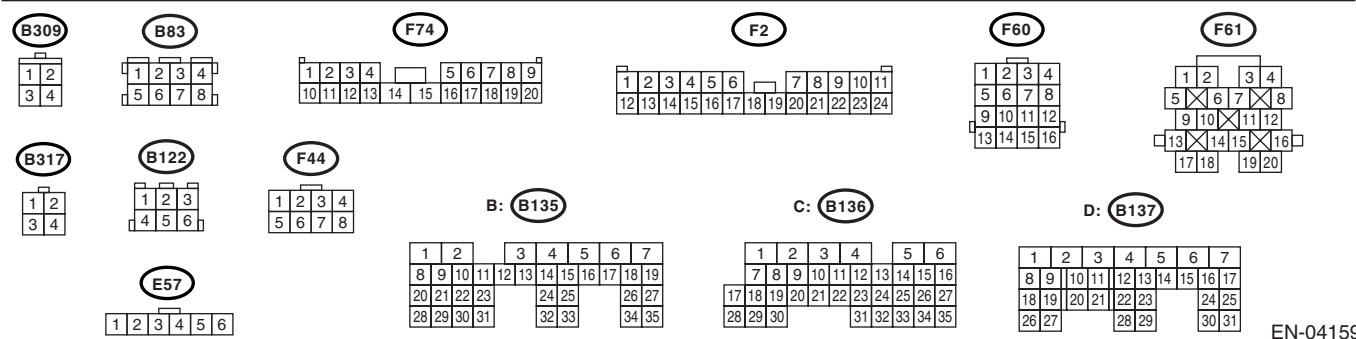
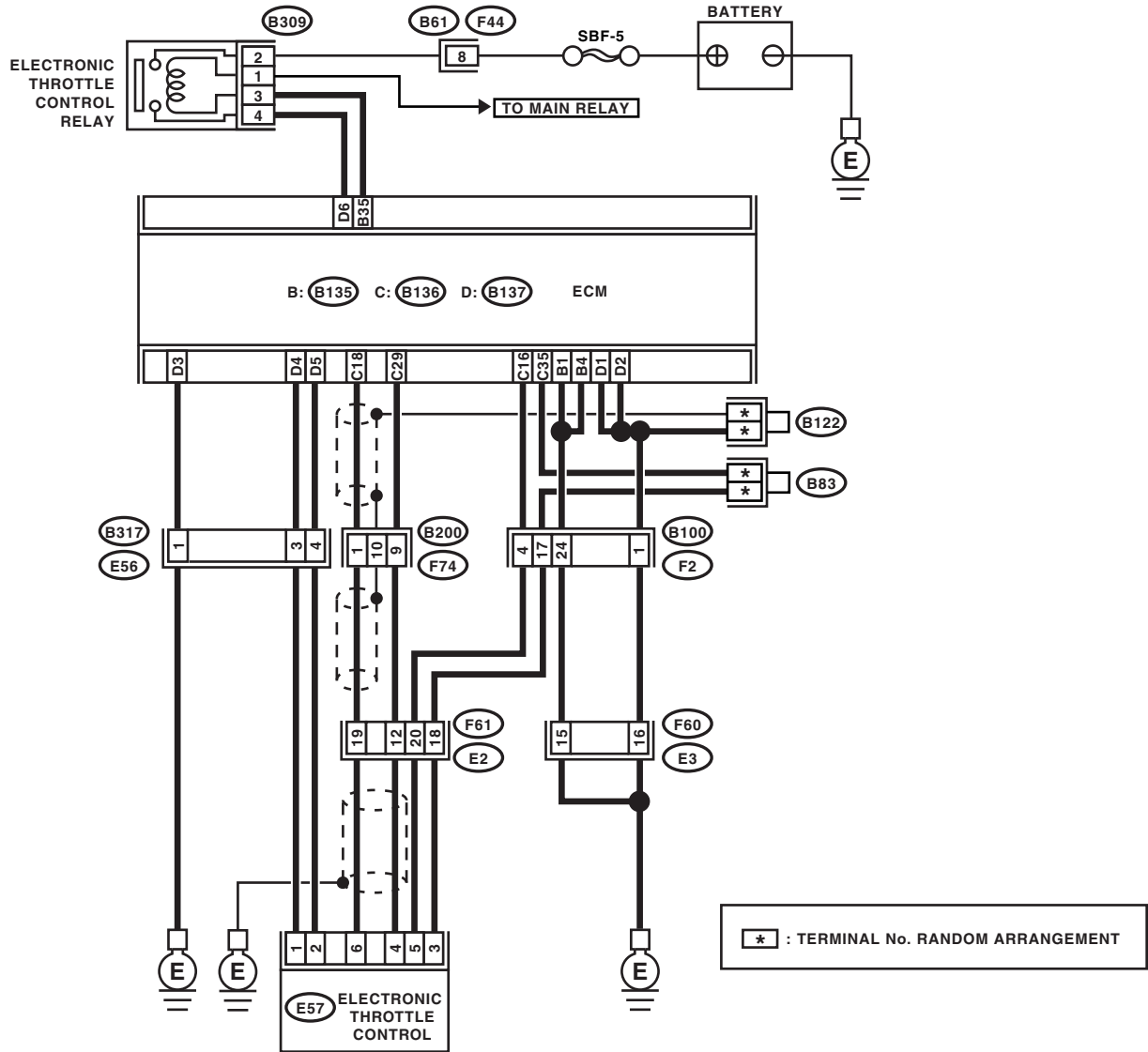
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04159

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No                                  |
|--|---|--|-------------------------------------|
| <b>1</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?                                 | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0507. | Go to step 2.                       |
| <b>2</b><br><b>CHECK AIR INTAKE SYSTEM.</b><br>1) Turn the ignition switch to ON.<br>2) Start the engine, and idle it.<br>3) Check the following items. <ul style="list-style-type: none"> <li>• Loose installation of intake manifold and throttle body</li> <li>• Cracks of intake manifold gasket and throttle body gasket</li> <li>• Disconnections of vacuum hoses</li> </ul> | Is there any fault in air intake system?                    | Repair the air suction and leaks.  | Go to step 3.                       |
| <b>3</b><br><b>CHECK ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electronic throttle control.<br>3) Check the electronic throttle control.  | Are there foreign particles in electronic throttle control? | Remove the foreign particles from electronic throttle control.   | Perform the diagnosis of DTC P2101. |

## **BT:DTC P0512 STARTER REQUEST CIRCUIT**

### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-171, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

Failure of engine to start

### **CAUTION:**

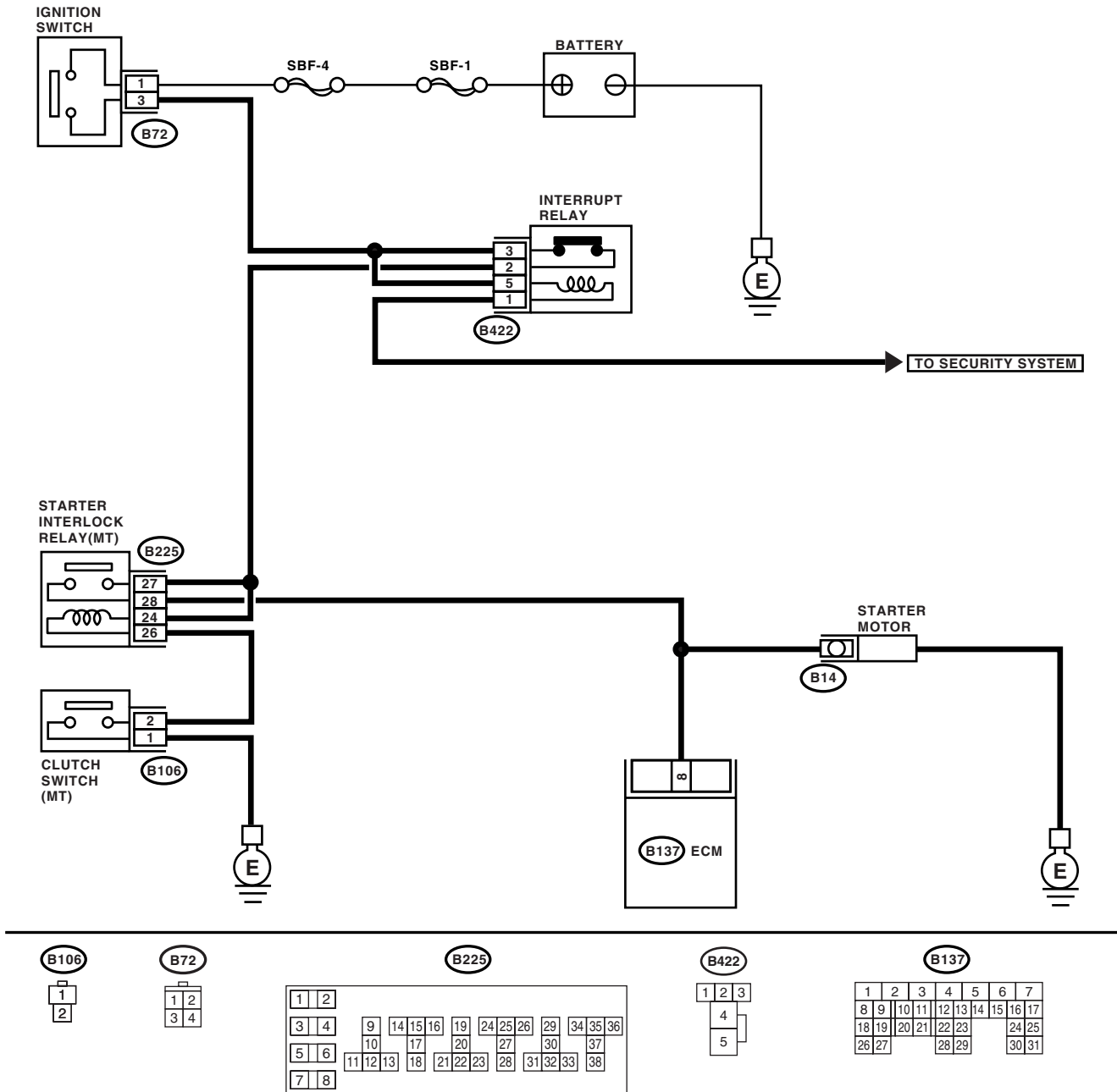
**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04153

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| 1<br><b>CHECK OPERATION OF STARTER MOTOR.</b> | Does the starter motor operate when ignition switch is turned to ON? | Repair the battery short circuit in starter motor circuit. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> | Check the starter motor circuit. <Ref. to EN(STI)(diag)-58, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **BU:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)**

#### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-173, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Engine keeps running at higher revolution than specified idling revolution.
- Fuel is cut according to fail-safe function.

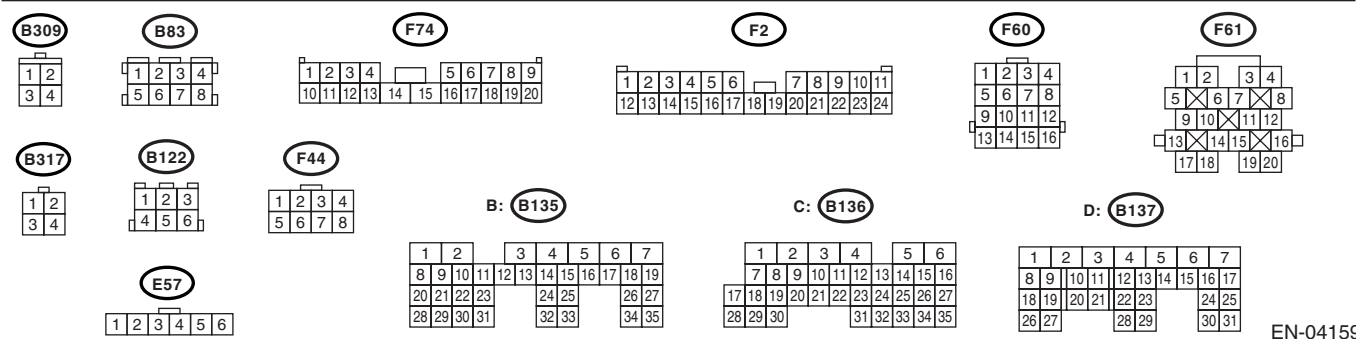
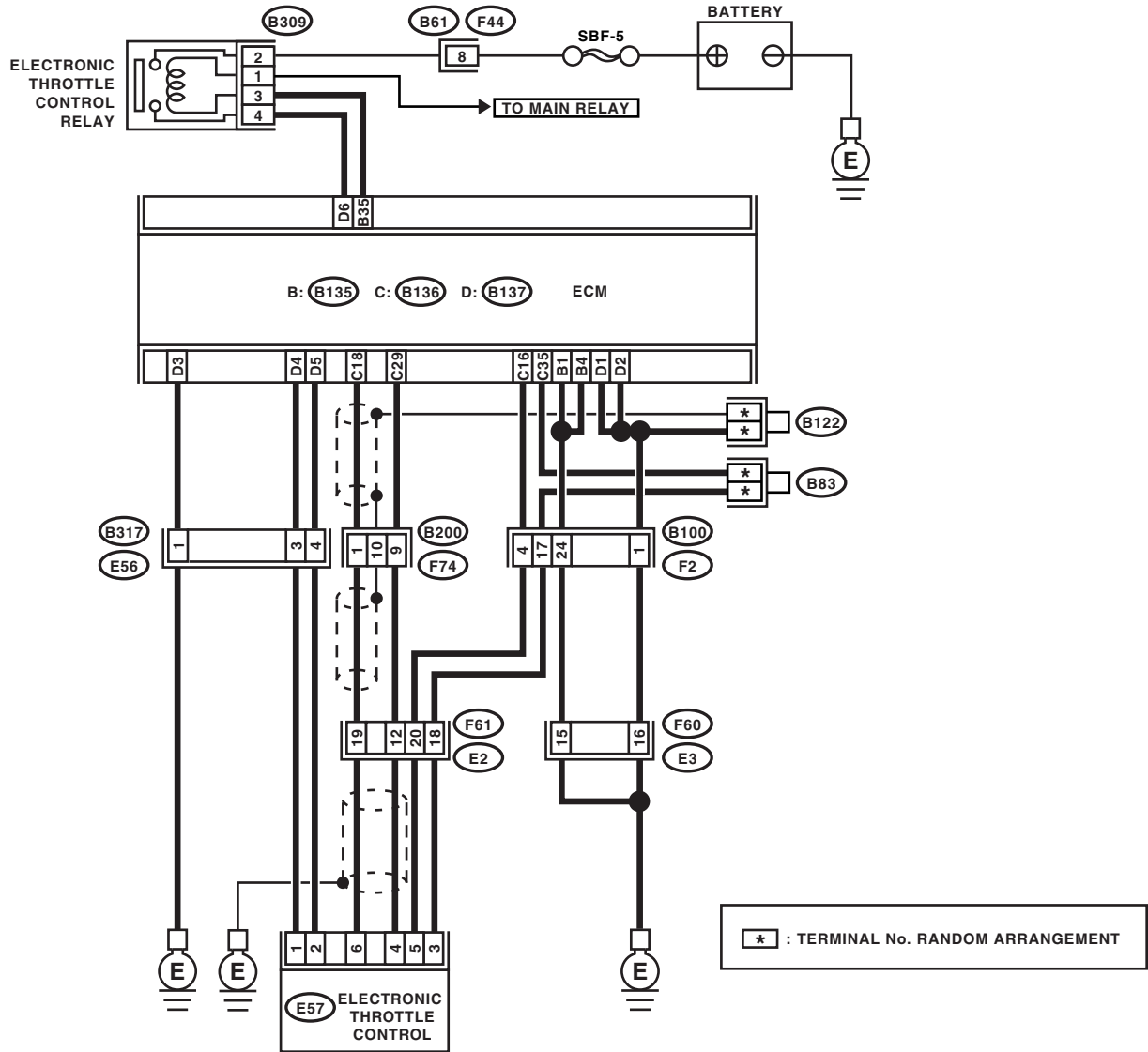
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04159

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes  | No                                  |
|--|---|--|-------------------------------------|
| <b>1</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?                                 | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).><br>NOTE:<br>In this case, it is not necessary to inspect DTC P0519. | Go to step 2.                       |
| <b>2</b><br><b>CHECK AIR INTAKE SYSTEM.</b><br>1) Turn the ignition switch to ON.<br>2) Start the engine, and idle it.<br>3) Check the following items. <ul style="list-style-type: none"> <li>• Loose installation of intake manifold and throttle body</li> <li>• Cracks of intake manifold gasket and throttle body gasket</li> <li>• Disconnections of vacuum hoses</li> </ul> | Is there any fault in air intake system?                    | Repair the air suction and leaks.  | Go to step 3.                       |
| <b>3</b><br><b>CHECK ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electronic throttle control.<br>3) Check the electronic throttle control.  | Are there foreign particles in electronic throttle control? | Remove the foreign particles from electronic throttle control.   | Perform the diagnosis of DTC P2101. |

## **BV:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR**

### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-174, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

- Engine does not start.
- Engine stalls.

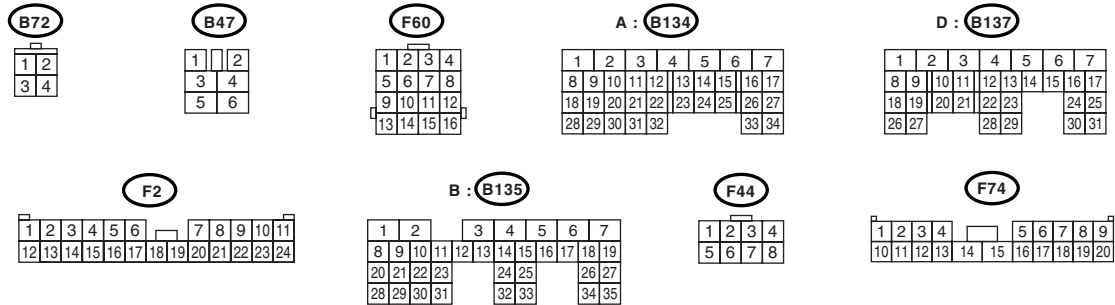
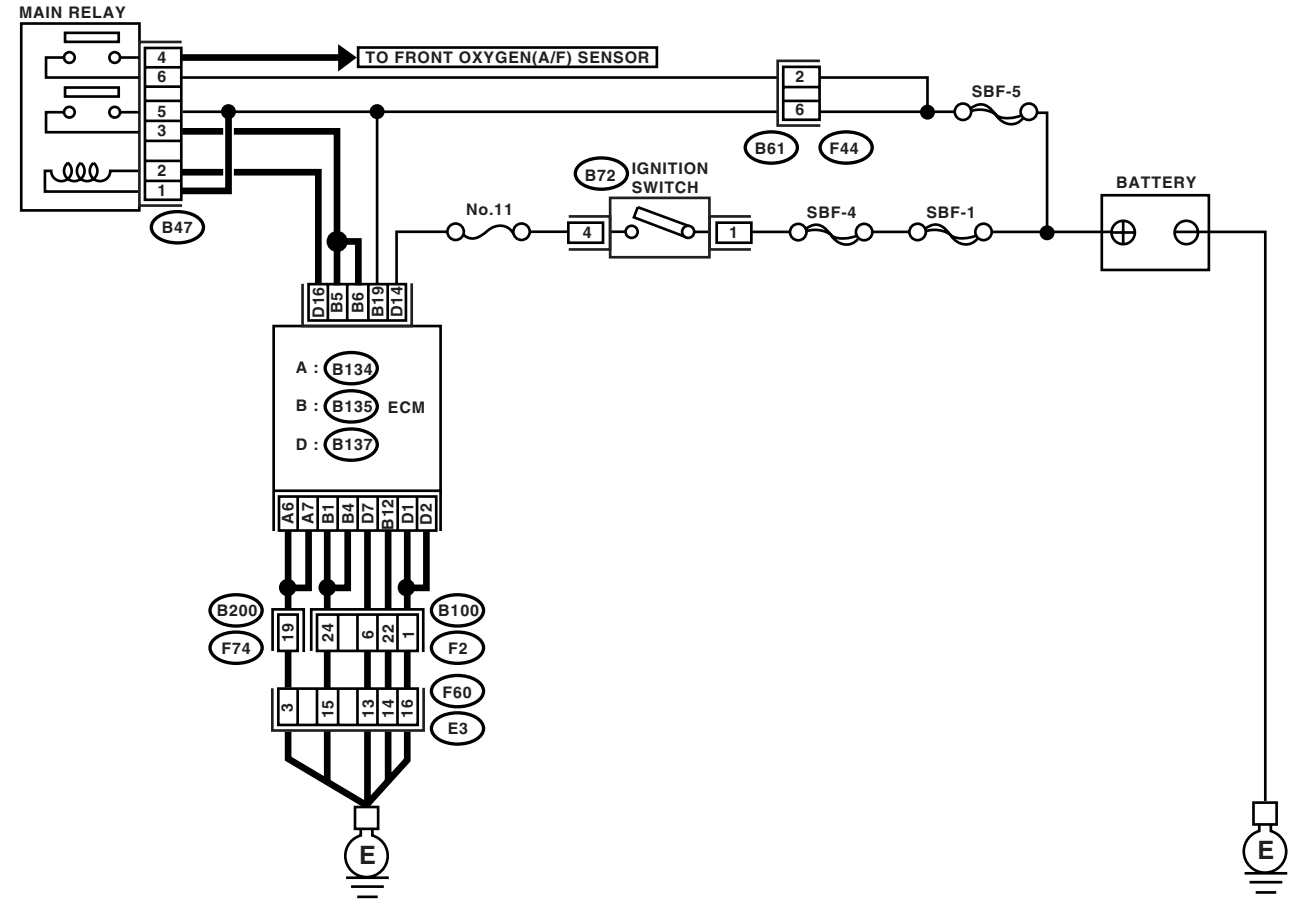
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04249

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

|   | Step                                       | Check   | Yes  | No                        |
|---|--|---|--|---------------------------|
| 1 | <b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b> | Does the Subaru Select Monitor or general scan tool indicate DTC P0604? | Replace the ECM.<br><Ref. to FU(STI)-39, Engine Control Module (ECM).> | A temporary poor contact. |

## **BW:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR**

**NOTE:**

For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(STI)(diag)-254, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **BX:DTC P0607 CONTROL MODULE PERFORMANCE**

#### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-175, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(STI)-176, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance

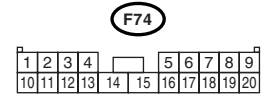
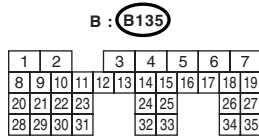
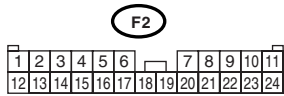
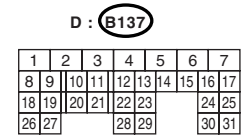
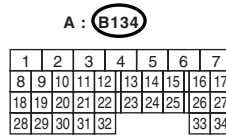
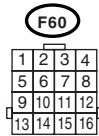
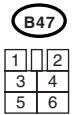
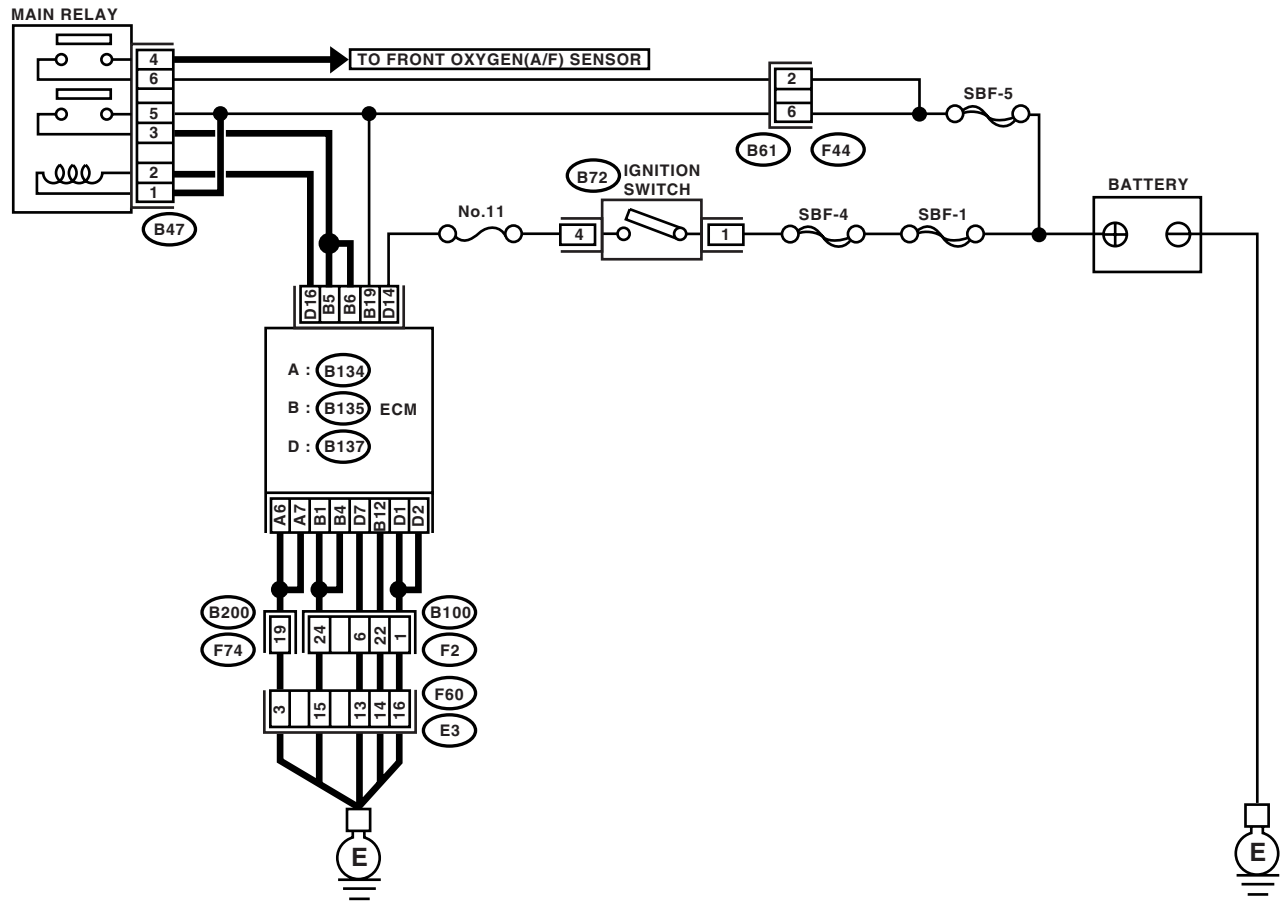
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04249

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check                         | Yes  | No   |
|--|-------------------------------|--|--|
| <b>1</b><br><b>CHECK INPUT VOLTAGE OF ECM</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector and ground.<br><b>Connector &amp; terminal</b><br><i>(B135) No. 5 (+) — Chassis ground (-):</i><br><i>(B135) No. 6 (+) — Chassis ground (-):</i> | Is the voltage 10 — 13 V?     | Go to step 2.  | Repair the open circuit or ground short of power supply circuit.   |
| <b>2</b><br><b>CHECK INPUT VOLTAGE OF ECM</b><br>1) Start the engine.<br>2) Measure the voltage between ECM connector and ground.<br><b>Connector &amp; terminal</b><br><i>(B135) No. 5 (+) — Chassis ground (-):</i><br><i>(B135) No. 6 (+) — Chassis ground (-):</i>               | Is the voltage 13 — 15 V?     | Go to step 3.  | Repair the open circuit or ground short of power supply circuit.   |
| <b>3</b><br><b>CHECK GROUND HARNESS OF ECM</b><br>Measure the voltage between ECM connector and ground.<br><b>Connector &amp; terminal</b><br><i>(B137) No. 1 (+) — Chassis ground (-):</i><br><i>(B137) No. 2 (+) — Chassis ground (-):</i>   | Is the voltage less than 1 V? | Replace the ECM.<br><Ref. to FU(STI)-39, Engine Control Module (ECM).> | Repair the following: <ul style="list-style-type: none"> <li>• Retighten the engine ground terminal.</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |

**BY:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE  
(BANK 1)**

**NOTE:**

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(STI)(diag)-335, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **BZ:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW**

#### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-182, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Radiator fan does not operate properly.
- Overheating

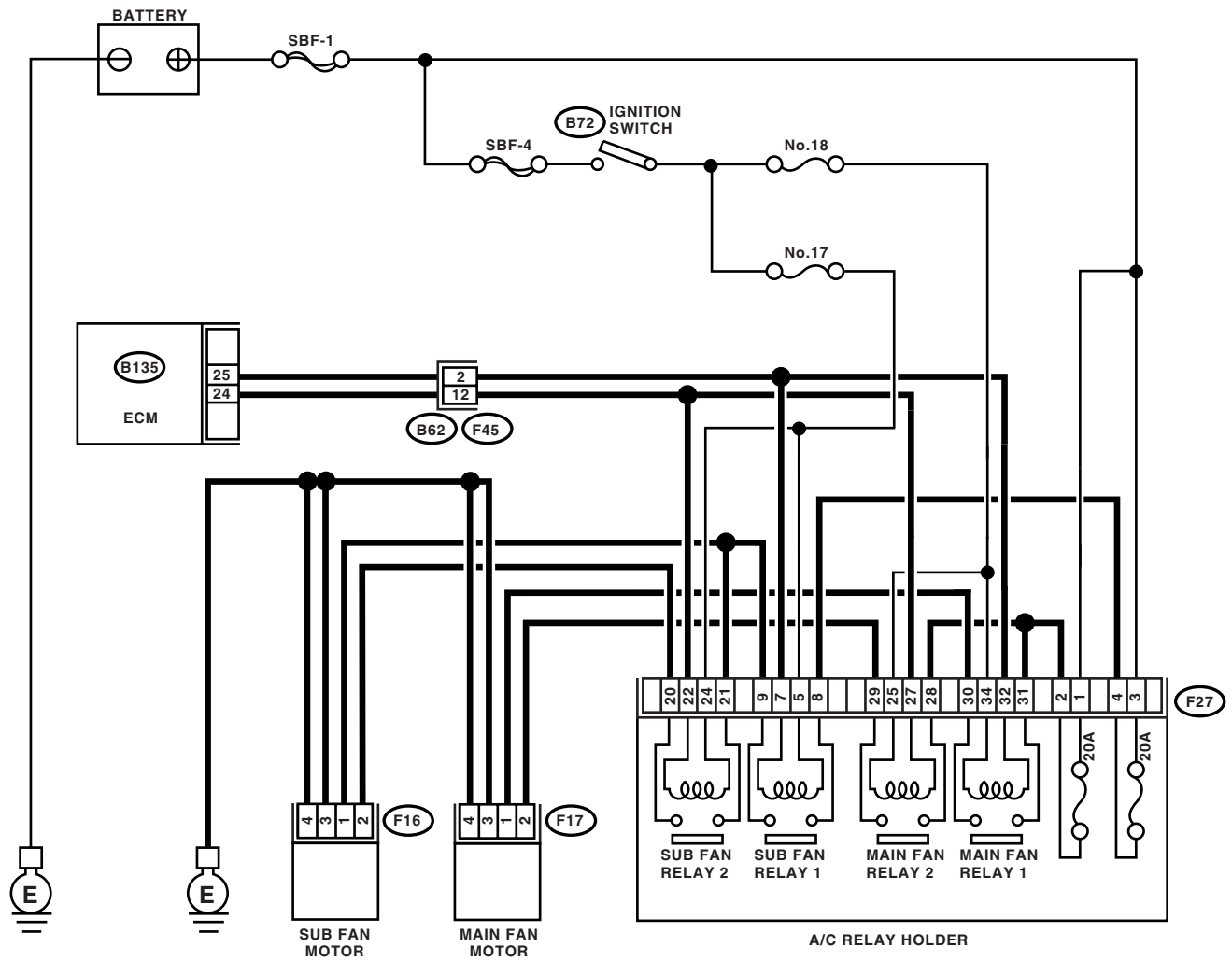
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



(B72)

|   |   |
|---|---|
| 1 | 2 |
| 3 | 4 |

(F27)

|   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1 | 2  | 5  | 6  | 7  | 10 | 15 | 16 | 17 | 20 | 25 | 26 | 27 | 30 | 35 |
| 3 | 4  | 8  | 11 | 18 | 21 | 28 | 31 | 34 | 36 |    |    |    |    |    |
| 9 | 12 | 13 | 14 | 19 | 22 | 23 | 24 | 29 | 32 | 33 | 34 |    |    |    |

(B135)

|    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |    |    |    |    |    |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |    |    |    |    |
| 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |    |    |    |    |

(F45)

|    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 |    |    |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |

(F16)

(F17)

|   |   |
|---|---|
| 1 | 2 |
| 3 | 4 |

EN-04604

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No  |
|--|--|--|---|
| <p><b>1 CHECK OUTPUT SIGNAL FROM ECM.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Connect the test mode connector.<br/>3) Turn the ignition switch to ON.<br/>4) While operating the radiator fan relay, measure voltage between ECM terminal and ground.</p> <p><b>NOTE:</b><br/>Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <p><b>Connector &amp; terminal</b><br/><b>(B135) No. 25 (+) — Chassis ground (-):</b><br/><b>(B135) No. 24 (+) — Chassis ground (-):</b></p> | Does the voltage change 0 — 10 V?                    | Repair poor contact in ECM connector.              | Go to step 2.   |
| <p><b>2 CHECK GROUND SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connectors from ECM.<br/>3) Measure the resistance of harness between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B135) No. 25 — Chassis ground:</b><br/><b>(B135) No. 24 — Chassis ground:</b></p>  | Is the resistance more than 1 M $\Omega$ ?           | Go to step 3.                                      | Repair ground short circuit in radiator fan relay control circuit.  |
| <p><b>3 CHECK POWER SUPPLY FOR RELAY.</b></p> <p>1) Remove the main fan relay 1 and main fan relay 2 from A/C relay holder.<br/>2) Turn the ignition switch to ON.<br/>3) Measure the voltage between fuse and relay box (F/B) connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(F27) No. 27 (+) — Chassis ground (-):</b><br/><b>(F27) No. 32 (+) — Chassis ground (-):</b></p>  | Is the voltage more than 10 V?                       | Go to step 4.                                      | Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.  |
| <p><b>4 CHECK MAIN FAN RELAY.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Measure the resistance between main fan relay terminals.</p> <p><b>Terminals</b><br/><b>No. 32 — No. 34: (Main fan relay 1)</b><br/><b>No. 25 — No. 27: (Main fan relay 2)</b></p>   | Is the resistance 87 — 107 $\Omega$ ?                | Go to step 5.                                      | Replace the main fan relay.   |
| <p><b>5 CHECK OPEN CIRCUIT IN MAIN FAN RELAY CONTROL CIRCUIT.</b></p> <p>Measure the resistance of harness between ECM and fan relay connector.</p> <p><b>Connector &amp; terminal</b><br/><b>(B135) No. 25 — (F27) No. 32:</b><br/><b>(B135) No. 24 — (F27) No. 27:</b></p>   | Is the resistance less than 1 $\Omega$ ?             | Go to step 6.                                      | Repair harness and connector.<br><b>NOTE:</b><br>In this case, repair the following:<br>• Open circuit in harness between ECM and fan relay connector<br>• Poor contact in coupling connector |
| <p><b>6 CHECK POOR CONTACT.</b></p> <p>Check poor contact in ECM or fan relay connector.</p>   | Is there poor contact in ECM or fan relay connector? | Repair poor contact in ECM or fan relay connector. | Contact your SOA Service Center since deterioration of some parts may be the cause.   |

## **CA:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH**

### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-183, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

- Radiator fan does not operate properly.
- Overheating

### **CAUTION:**

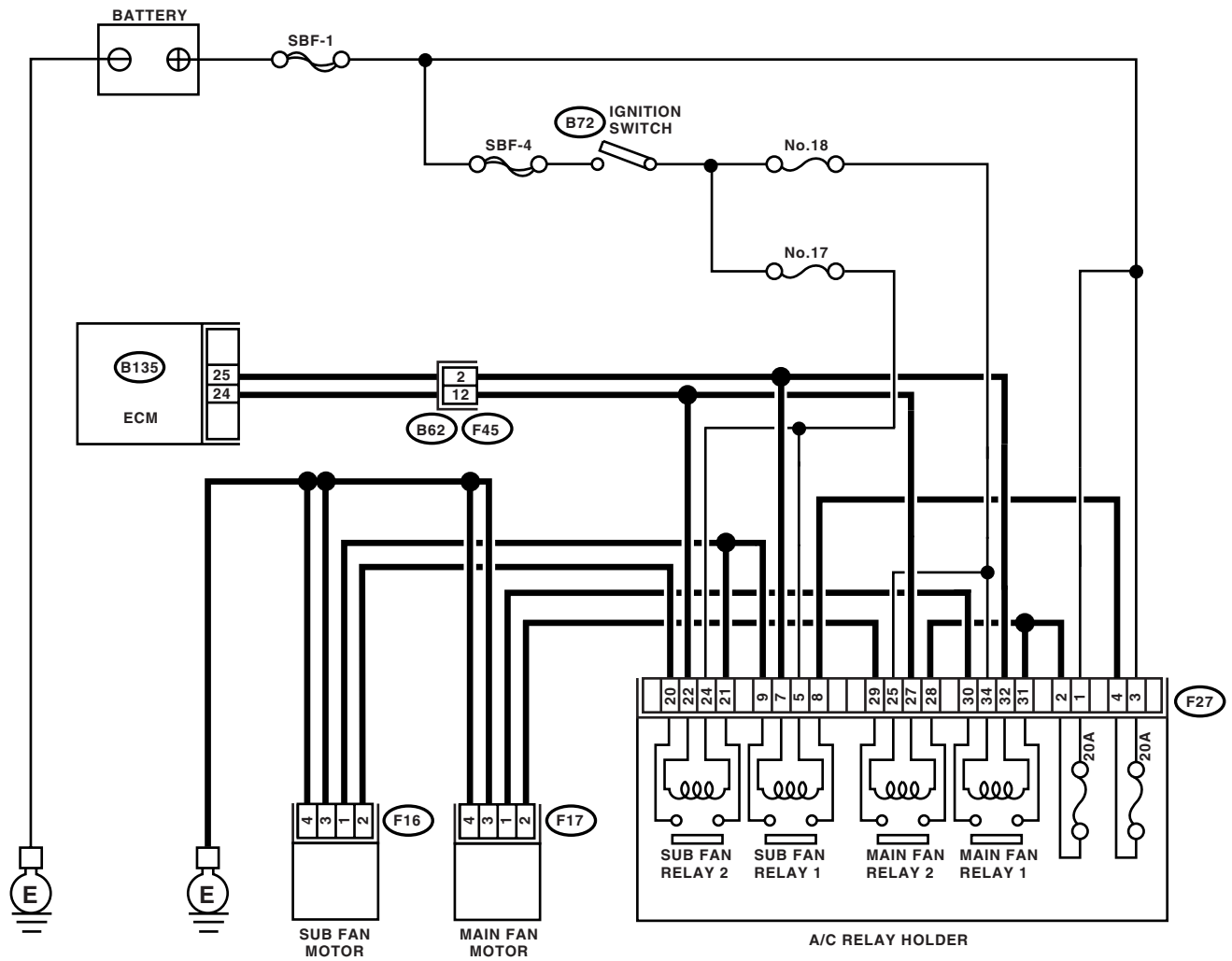
**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



(B72)

|   |   |
|---|---|
| 1 | 2 |
| 3 | 4 |

(F27)

|   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1 | 2  | 5  | 6  | 7  | 10 | 15 | 16 | 17 | 20 | 25 | 26 | 27 | 30 | 35 |
| 3 | 4  | 8  | 11 | 18 | 21 | 28 | 31 | 34 | 36 |    |    |    |    |    |
| 9 | 12 | 13 | 14 | 19 | 22 | 23 | 24 | 29 | 32 | 33 | 34 |    |    |    |

(B135)

|    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |    |    |    |    |    |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |    |    |    |    |
| 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |    |    |    |    |

(F45)

|    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 |    |    |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |

(F16)

(F17)

|   |   |
|---|---|
| 1 | 2 |
| 3 | 4 |

EN-04604

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                    | Yes   | No  |
|---|--|---|---|
| <p><b>1 CHECK OUTPUT SIGNAL FROM ECM.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Connect the test mode connector.<br/>3) Turn the ignition switch to ON.<br/>4) While operating the radiator fan relay, measure the voltage between ECM and chassis ground.</p> <p><b>NOTE:</b><br/>Radiator fan relay operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". &lt;Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.&gt;</p> <p><b>Connector &amp; terminal</b><br/><b>(B135) No. 25 (+) — Chassis ground (-):</b><br/><b>(B135) No. 24 (+) — Chassis ground (-):</b></p> | Does the voltage change 0 — 10 V?        | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector. | Go to step 2.   |
| <p><b>2 CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Remove the fan relay 1, fan relay 2 and fan mode relay.<br/>3) Disconnect the test mode connector.<br/>4) Turn the ignition switch to ON.<br/>5) Measure the voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B135) No. 25 (+) — Chassis ground (-):</b><br/><b>(B135) No. 24 (+) — Chassis ground (-):</b></p>  | Is the voltage more than 10 V?           | Repair the battery short circuit in radiator fan relay control circuit. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>           | Go to step 3.   |
| <p><b>3 CHECK MAIN FAN RELAY.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Remove the main fan relay.<br/>3) Measure the resistance between main fan relay terminals.</p> <p><b>Terminals</b><br/><b>No. 30 — No. 31: (Main fan relay 1)</b><br/><b>No. 28 — No. 29: (Main fan relay 2)</b></p>  | Is the resistance less than 1 $\Omega$ ? | Replace the main fan relay and ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>  | Go to step 4.   |
| <p><b>4 CHECK SUB FAN RELAY.</b></p> <p>1) Remove the sub fan relay.<br/>2) Measure the resistance between sub fan relay terminals.</p> <p><b>Terminals</b><br/><b>No. 8 — No. 9: (Sub fan relay 1)</b><br/><b>No. 20 — No. 21: (Sub fan relay 2)</b></p>   | Is the resistance less than 1 $\Omega$ ? | Replace the sub fan relay and ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>   | Go to step 5.   |
| <p><b>5 CHECK POOR CONTACT.</b></p> <p>Check poor contact in ECM connector.</p>   | Is there poor contact in ECM connector?  | Repair the poor contact in ECM connector.   | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CB:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-184, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

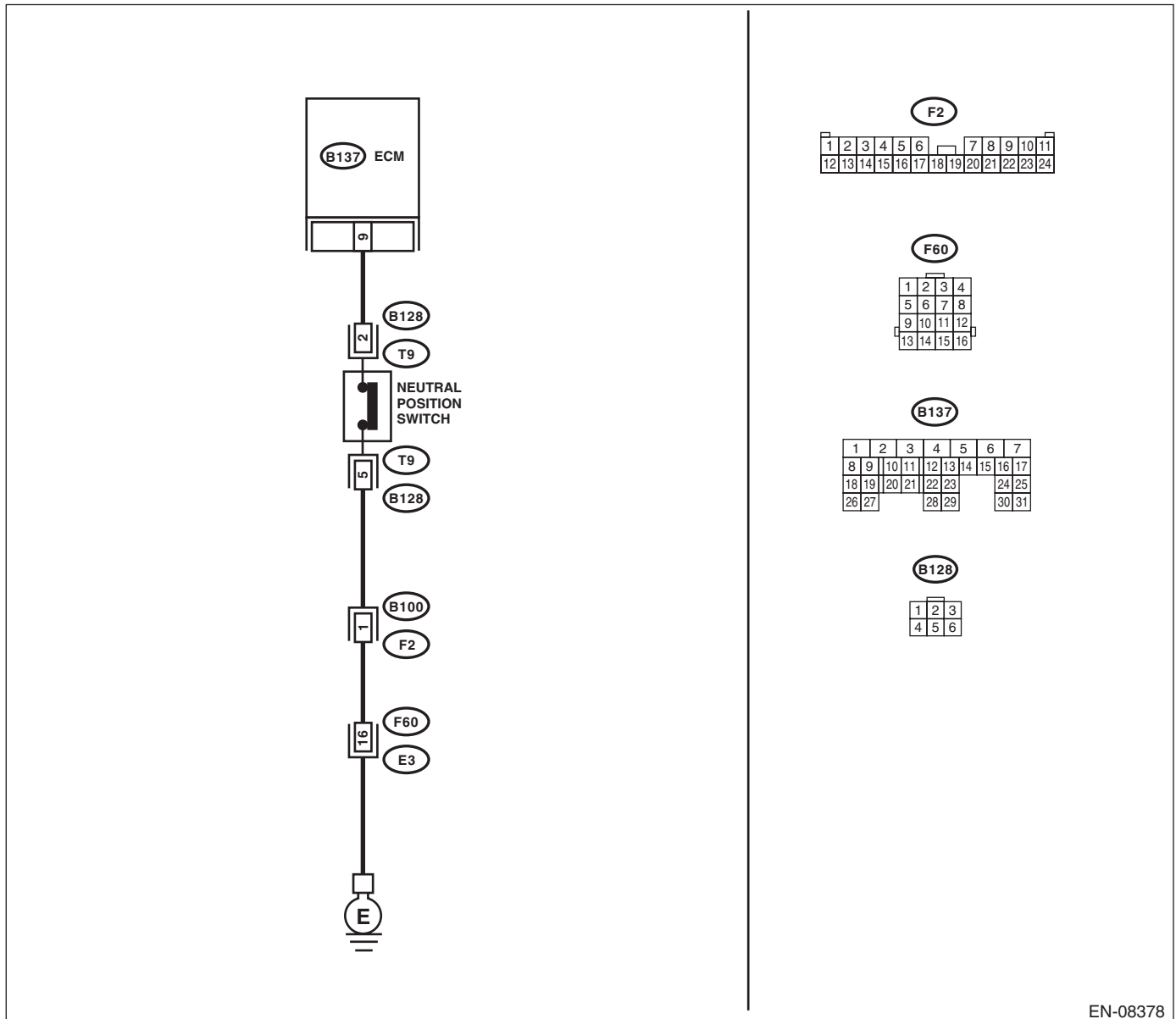
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-08378

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No   |
|--|--|--|--|
| <b>1 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Place the shift lever in a position except for neutral.<br>3) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B137) No. 9 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 10 V?                           | Go to step 2.  | Go to step 4.  |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Place the shift lever in neutral.<br>2) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B137) No. 9 (+) — Chassis ground (-):</b></i>   | Is the voltage less than 1 V?                            | Go to step 3.  | Go to step 4.  |
| <b>3 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.   | Is there poor contact in ECM connector?                  | Repair poor contact in ECM connector.                  | Contact your SOA Service Center since deterioration of some parts may be the cause.    |
| <b>4 CHECK NEUTRAL POSITION SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from transmission harness.<br>3) Place the shift lever in a position except for neutral.<br>4) Measure the resistance between transmission harness and connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(T9) No. 2 — No. 5:</b></i> | Is the resistance more than 1 M $\Omega$ ?               | Go to step 5.  | Repair short circuit in transmission harness or replace neutral position switch.       |
| <b>5 CHECK NEUTRAL POSITION SWITCH.</b><br>1) Place the shift lever in neutral.<br>2) Measure the resistance between transmission harness connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(T9) No. 2 — No. 5:</b></i>  | Is the resistance less than 1 $\Omega$ ?                 | Go to step 6.  | Repair short circuit in transmission harness or replace neutral position switch.       |
| <b>6 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.</b><br>Measure the resistance between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B137) No. 9 — Chassis ground:</b></i>  | Is the resistance more than 1 M $\Omega$ ?               | Go to step 7.  | Repair ground short circuit in harness between ECM and transmission harness connector. |
| <b>7 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.</b><br>1) Disconnect the connector from ECM.<br>2) Measure the resistance of harness between ECM and transmission harness connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B137) No. 9 — (B128) No. 2:</b></i>   | Is the resistance less than 1 $\Omega$ ?                 | Go to step 8.  | Repair open circuit in harness between ECM and transmission harness connector.         |
| <b>8 CHECK POOR CONTACT.</b><br>Check poor contact in transmission harness connector.  | Is there poor contact in transmission harness connector? | Repair poor contact in transmission harness connector. | Contact your SOA Service Center since deterioration of some parts may be the cause.    |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CC:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-185, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

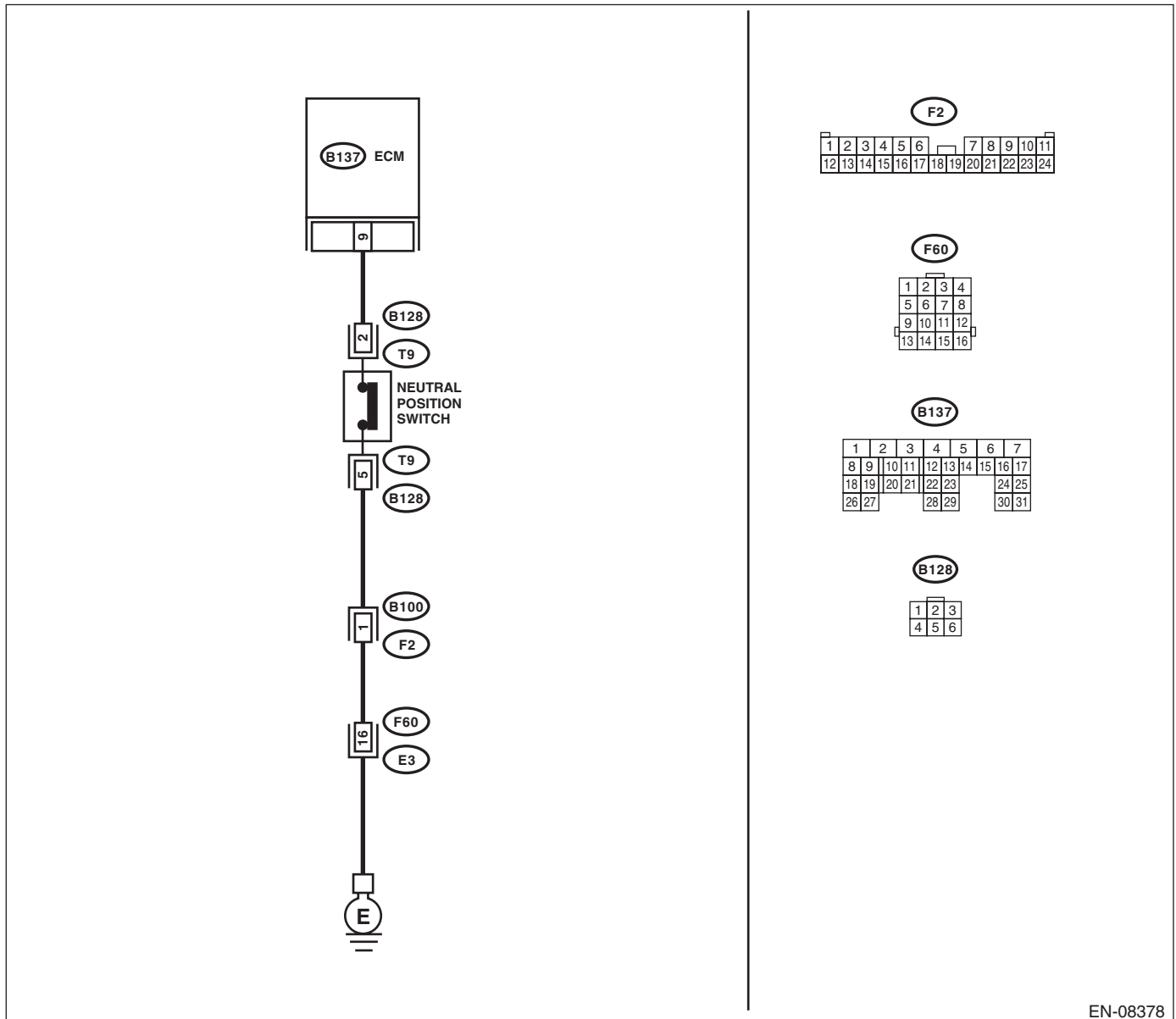
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-08378

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <b>1 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Place the shift lever in neutral.<br>3) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B137) No. 9 (+) — Chassis ground (-):</b></i>  | Is the voltage less than 1 V?                                | Go to step 2.   | Go to step 4.   |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Place the shift lever in a position except for neutral.<br>2) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B137) No. 9 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10 V?                               | Go to step 3.   | Go to step 4.   |
| <b>3 CHECK POOR CONTACT.</b><br>Check poor contact in ECM connector.  | Is there poor contact in ECM connector?                      | Repair the poor contact in ECM connector.   | Contact your SOA Service Center since deterioration of some parts may be the cause.   |
| <b>4 CHECK INPUT SIGNAL FOR ECM.</b><br>1) Disconnect ECM connector from ECM.<br>2) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B137) No. 9 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 10 V?                               | Repair the battery short circuit in harness between ECM and transmission connector. | Go to step 5.   |
| <b>5 CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and transmission harness connector (T9).<br>3) Measure the resistance of harness between ECM and neutral switch connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B137) No. 9 — (B128) No. 2:</b></i> | Is the resistance less than 1 $\Omega$ ?                     | Go to step 6.   | Repair the harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and transmission harness</li> <li>• Poor contact in transmission harness connector</li> <li>• Poor contact in ECM connector</li> </ul> |
| <b>6 CHECK NEUTRAL POSITION SWITCH GROUND LINE.</b><br>Measure the resistance of harness between transmission harness connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B128) No. 5 — Engine ground:</b></i>   | Is the resistance less than 5 $\Omega$ ?                     | Go to step 7.   | Repair the open circuit in harness of neutral position switch ground line.  |
| <b>7 CHECK NEUTRAL POSITION SWITCH.</b><br>1) Place the shift lever in neutral.<br>2) Measure the resistance between transmission harness connector receptacle's terminals.<br><i><b>Terminals</b></i><br><i><b>No. 2 — No. 5:</b></i>  | Is the resistance less than 1 $\Omega$ ?                     | Go to step 8.   | Replace the neutral position switch.  |
| <b>8 CHECK POOR CONTACT.</b><br>Check poor contact in the transmission harness connector.   | Is there poor contact in the transmission harness connector? | Repair poor contact in transmission harness connector.                              | Contact your SOA Service Center since deterioration of some parts may be the cause.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CD:DTC P1152 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

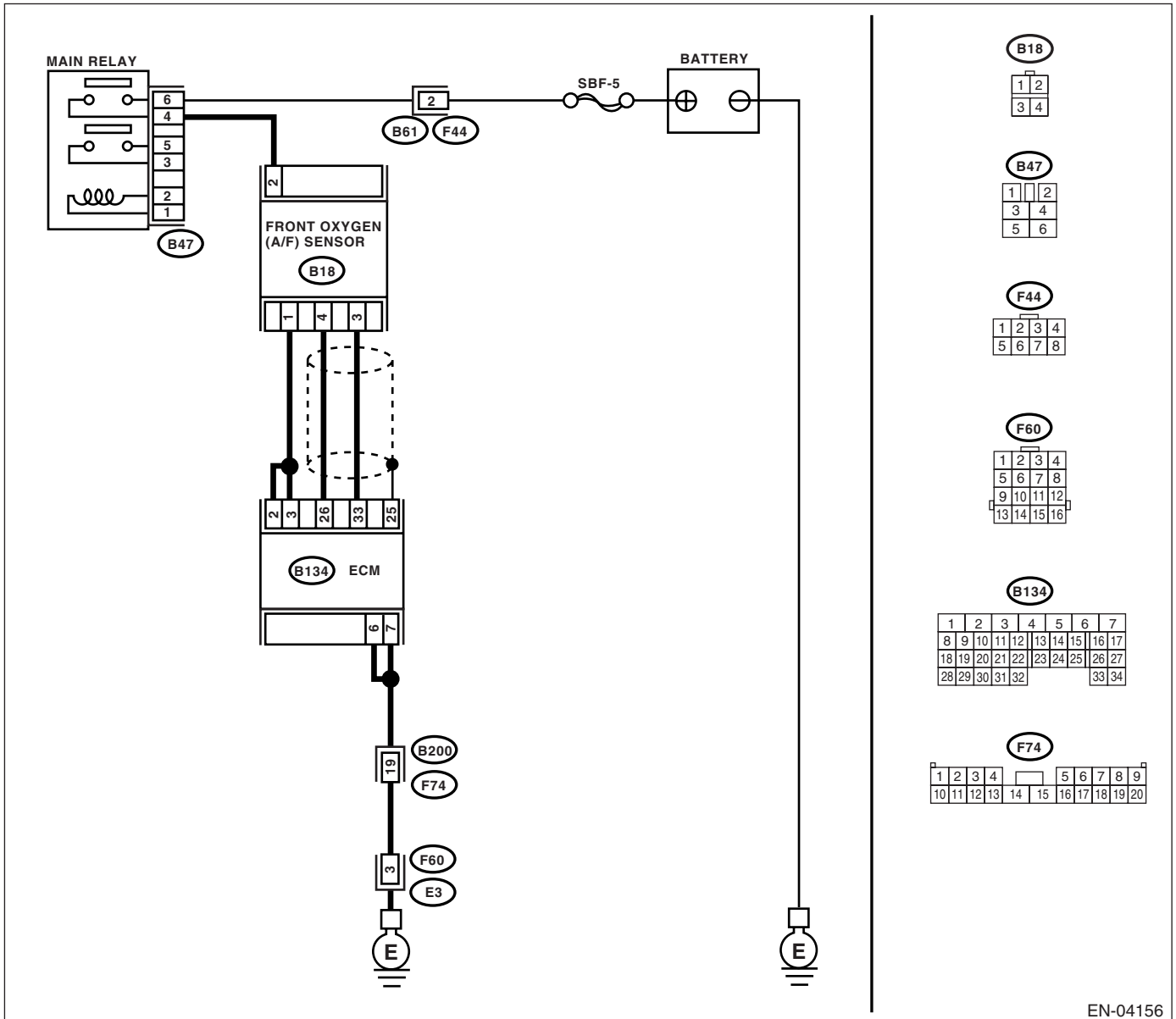
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-186, DTC P1152 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04156

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <b>1</b><br><b>CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>  | Is there water in connector?                                  | Remove infiltrating water completely.                           | Go to step 2.   |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br>3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 33 — (B18) No. 3:</b></i><br><i><b>(B134) No. 26 — (B18) No. 4:</b></i> | Is the resistance less than 1 $\Omega$ ?                      | Go to step 3.   | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and front oxygen (A/F) sensor connector</li> <li>• Poor contact in front oxygen (A/F) sensor connector</li> <li>• Poor contact in ECM connector</li> </ul> |
| <b>3</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in front oxygen (A/F) sensor connector.  | Is there poor contact in front oxygen (A/F) sensor connector? | Repair the poor contact in front oxygen (A/F) sensor connector. | Replace the front oxygen (A/F) sensor. <Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.>   |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CE:DTC P1153 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

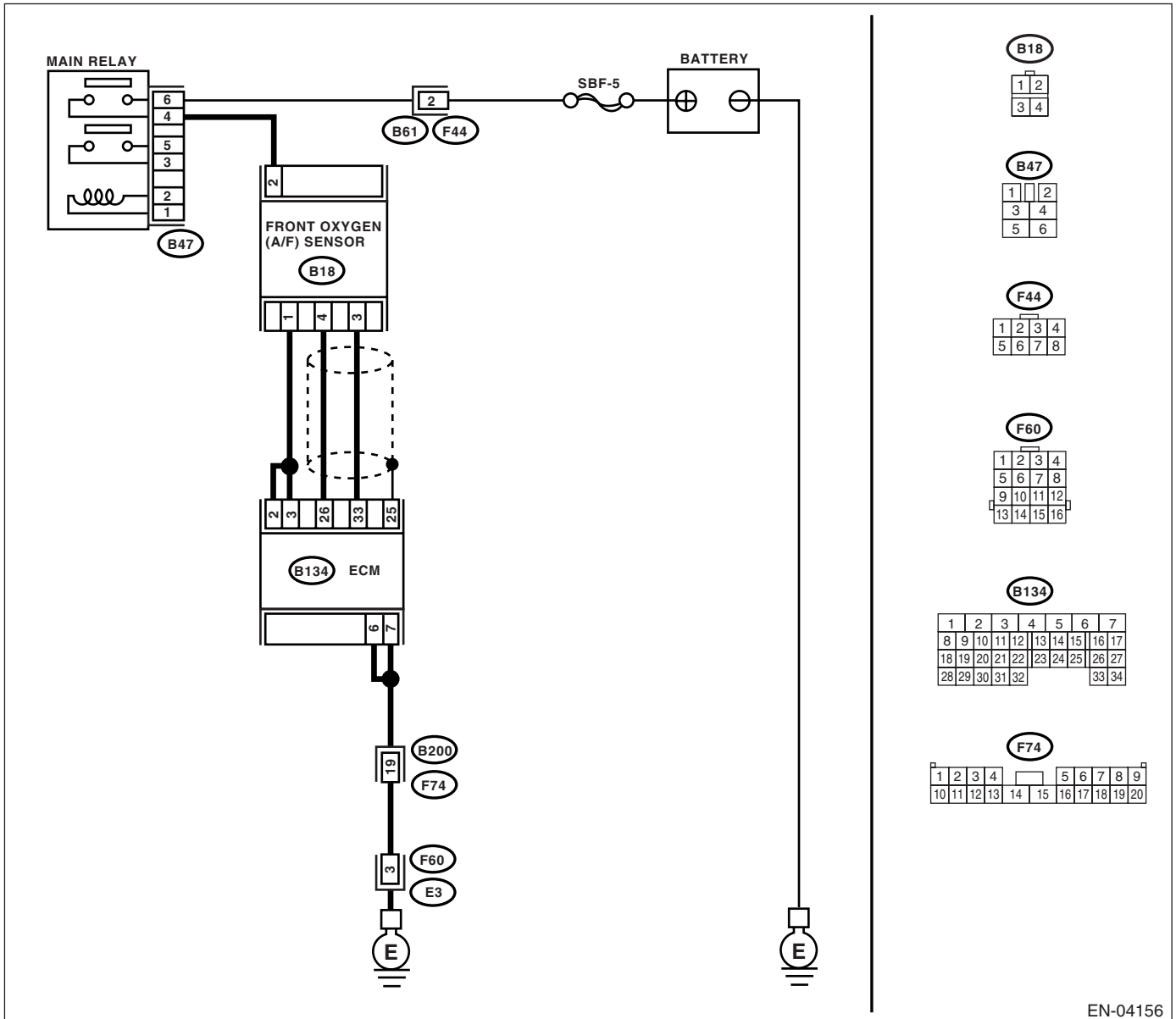
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-188, DTC P1153 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04156

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check  | Yes                               | No   |
|------|--|-----------------------------------|--|
| 1    | <b>CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>   | Is there water in connector?      | Remove infiltrating water completely.  |
| 2    | <b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance of harness between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 26 — Chassis ground:</i> | Is the resistance more than 1 MΩ? | Go to step 3.<br><br>Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.   |
| 3    | <b>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</b><br>Measure the resistance of harness between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 33 — Chassis ground:</i>  | Is the resistance more than 1 MΩ? | Go to step 4.<br><br>Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.   |
| 4    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>1) Connect the connector to ECM.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 26 (+) — Chassis ground (-):</i>   | Is the voltage more than 4.5 V?   | Go to step 5.<br><br>Go to step 6.   |
| 5    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 26 (+) — Chassis ground (-):</i>  | Is the voltage more than 10 V?    | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).><br><br>Repair the poor contact in ECM connector. |
| 6    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 33 (+) — Chassis ground (-):</i>  | Is the voltage more than 4.95 V?  | Go to step 7.<br><br>Replace the front oxygen (A/F) sensor. <Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.>   |
| 7    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B134) No. 33 (+) — Chassis ground (-):</i>  | Is the voltage more than 10 V?    | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).><br><br>Repair the poor contact in ECM connector. |

## **Diagnostic Procedure with Diagnostic Trouble Code (DTC)**

ENGINE (DIAGNOSTICS)

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### **CF:DTC P1160 RETURN SPRING FAILURE**

**NOTE:**

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(STI)(diag)-335, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## CG:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

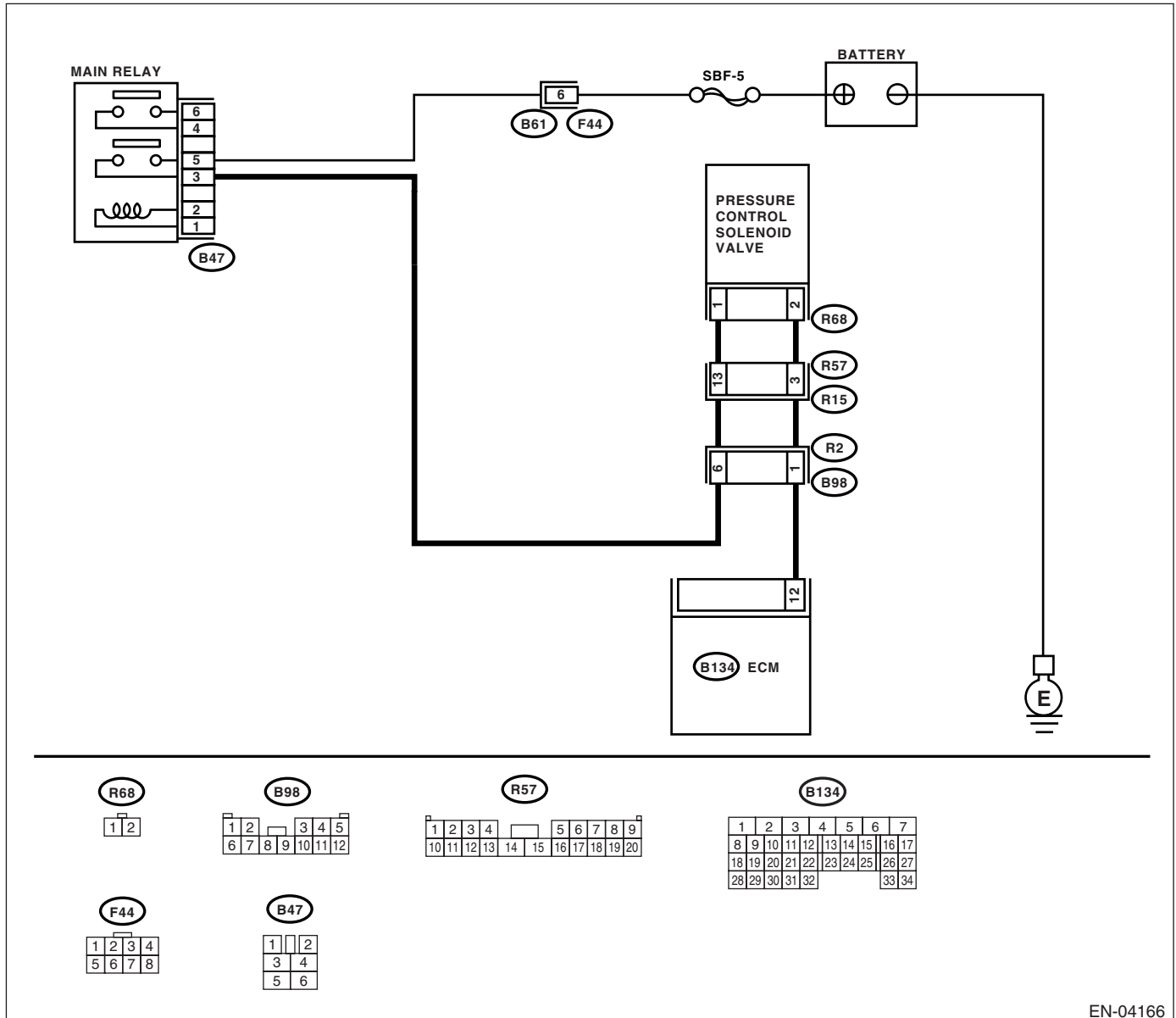
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-192, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

### WIRING DIAGRAM:



EN-04166

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes                                   | No   |
|---|--|---------------------------------------|--|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 12 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?             | Go to step 2.                         | Go to step 3.  |
| <b>2</b><br><b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.  | Is there poor contact in ECM connector?    | Repair poor contact in ECM connector. | Contact your SOA Service Center since deterioration of some parts may be the cause.  |
| <b>3</b><br><b>CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connectors from pressure control solenoid valve and ECM.<br>3) Measure the resistance of harness between pressure control solenoid valve connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R68) No. 2 — Chassis ground:</b> | Is the resistance more than 1 M $\Omega$ ? | Go to step 4.                         | Repair short circuit to ground in harness between ECM and pressure control solenoid valve connector.   |
| <b>4</b><br><b>CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM and pressure control solenoid valve connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 12 — (R68) No. 2:</b>   | Is the resistance less than 1 $\Omega$ ?   | Go to step 5.                         | Repair harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and pressure control solenoid valve connector</li> <li>• Poor contact in coupling connector</li> </ul>  |
| <b>5</b><br><b>CHECK PRESSURE CONTROL SOLENOID VALVE.</b><br>Measure the resistance between pressure control solenoid valve terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>   | Is the resistance 10 — 100 $\Omega$ ?      | Go to step 6.                         | Replace the pressure control solenoid valve. <Ref. to EC(STI)-12, Pressure Control Solenoid Valve.>  |
| <b>6</b><br><b>CHECK POWER SUPPLY TO PRESSURE CONTROL SOLENOID VALVE.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between pressure control solenoid valve and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R68) No. 1 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?             | Go to step 7.                         | Repair harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and pressure control solenoid valve connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in main relay connector</li> </ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

|   | Step   | Check   | Yes   | No  |
|---|--|---|---|---|
| 7 | <b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in pressure control solenoid valve connector. | Is there poor contact in pressure control solenoid valve connector? | Repair poor contact in pressure control solenoid valve connector. | Contact your SOA Service Center since deterioration of some parts may be the cause. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

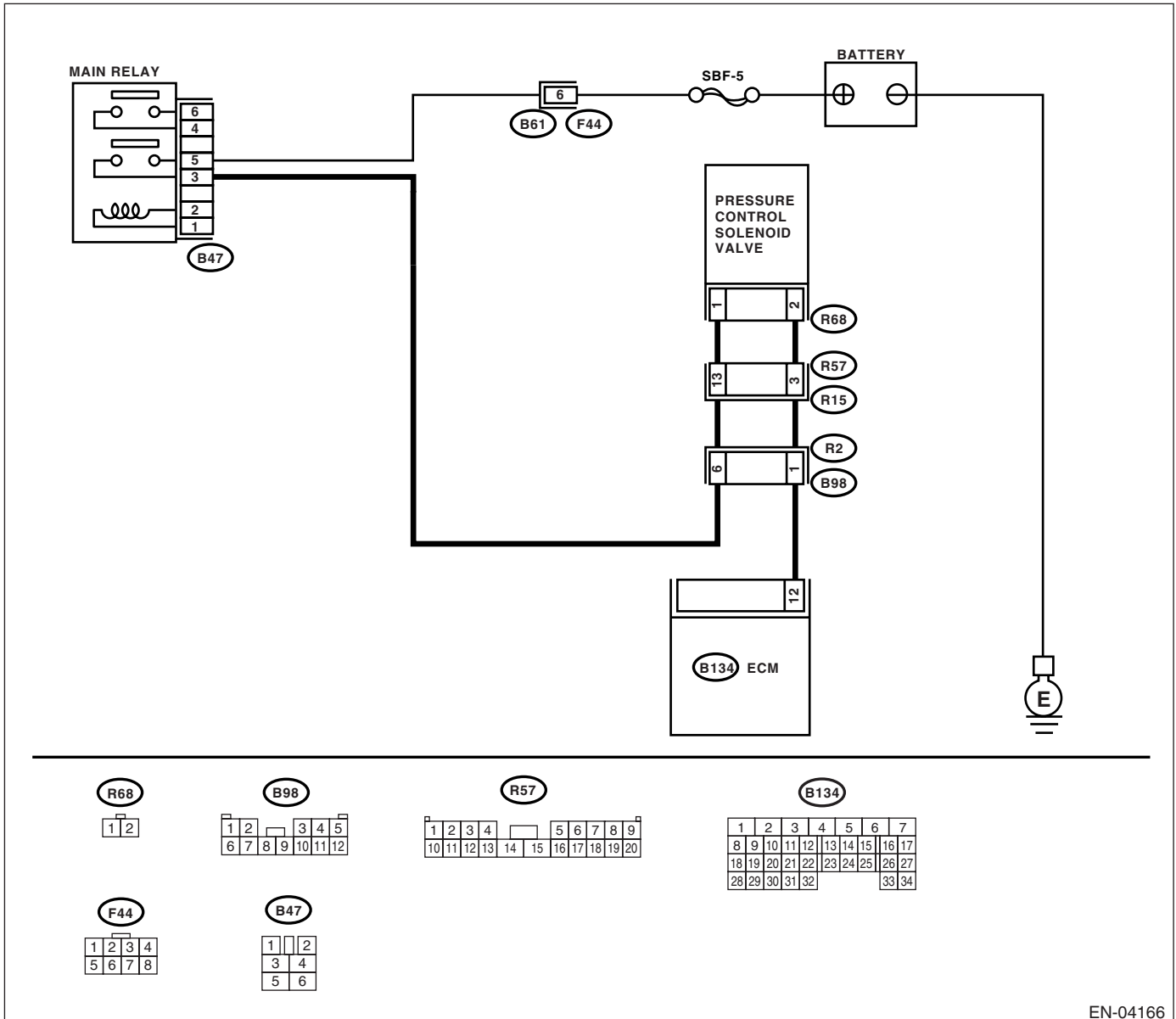
## CH:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-194, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04166

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes   | No   |
|--|--|---|--|
| <p><b>1 CHECK INPUT SIGNAL FOR ECM.</b></p> <p>1) Turn ignition switch to OFF.<br/>2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side).<br/>3) Turn ignition switch to ON.<br/>4) While operating the pressure control solenoid valve, measure voltage between ECM and chassis ground.</p> <p><b>NOTE:</b><br/>Pressure control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". &lt;Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.&gt;</p> <p><b>Connector &amp; terminal</b><br/><b>(B134) No. 12 (+) — Chassis ground (-):</b></p> | Does the voltage value change 0 — 10 V?  | Go to step 2.   | The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector. |
| <p><b>2 CHECK INPUT SIGNAL FOR ECM.</b></p> <p>1) Turn ignition switch to ON.<br/>2) Measure the voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B134) No. 12 (+) — Chassis ground (-):</b></p>   | Is the voltage more than 10 V?           | Go to step 4.   | Go to step 3.  |
| <p><b>3 CHECK FOR POOR CONTACT.</b></p> <p>Check for poor contact in ECM connector.</p>  | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.   | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>  |
| <p><b>4 CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</b></p> <p>1) Turn ignition switch to OFF.<br/>2) Disconnect the connector from pressure control solenoid valve.<br/>3) Turn ignition switch to ON.<br/>4) Measure the voltage between ECM and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B134) No. 12 (+) — Chassis ground (-):</b></p>  | Is the voltage more than 10 V?           | Repair short circuit to battery in harness between ECM and pressure control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> | Go to step 5.  |
| <p><b>5 CHECK PRESSURE CONTROL SOLENOID VALVE.</b></p> <p>1) Turn ignition switch to OFF.<br/>2) Measure the resistance between pressure control solenoid valve terminals.</p> <p><b>Terminals</b><br/><b>No. 1 — No. 2:</b></p>   | Is the resistance less than 1 $\Omega$ ? | Replace the pressure control solenoid valve <Ref. to EC(STI)-12, Pressure Control Solenoid Valve.> and the ECM <Ref. to FU(STI)-39, Engine Control Module (ECM).>.                      | Go to step 6.  |
| <p><b>6 CHECK FOR POOR CONTACT.</b></p> <p>Check for poor contact in ECM connector.</p>  | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.   | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>  |

**CI: DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM**  
DTC DETECTING CONDITION:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-196, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

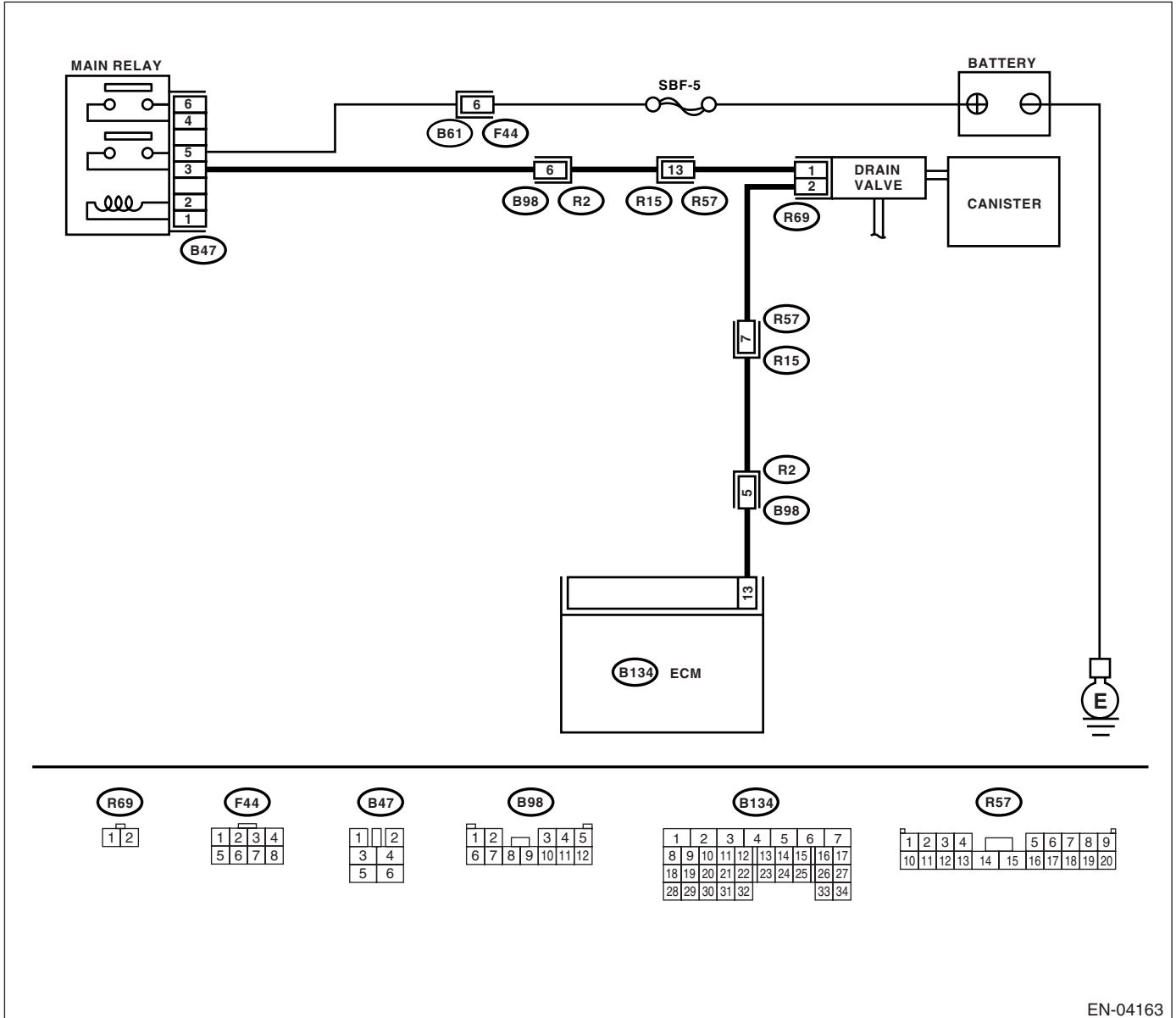
### TROUBLE SYMPTOM:

Improper fuel supply

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04163

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                 | Yes  | No  |
|--|---------------------------------------|--|---|
| <b>1</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?           | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> | Go to step <b>2</b> .                                       |
| <b>2</b><br><b>CHECK DRAIN HOSES.</b><br>Check the drain hoses for clogging.   | Is there clogging in the drain hoses? | Replace the drain hoses.   | Go to step <b>3</b> .                                       |
| <b>3</b><br><b>CHECK DRAIN VALVE OPERATION.</b><br>1) Turn ignition switch to OFF.<br>2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side).<br>3) Turn ignition switch to ON.<br>4) Operate the drain valve.<br><br>NOTE:<br>Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.> | Does the drain valve operate?         | Contact your SOA Service Center since deterioration of some parts may be the cause.  | Replace the drain valve. <Ref. to EC(STI)-16, Drain Valve.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CJ:DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW

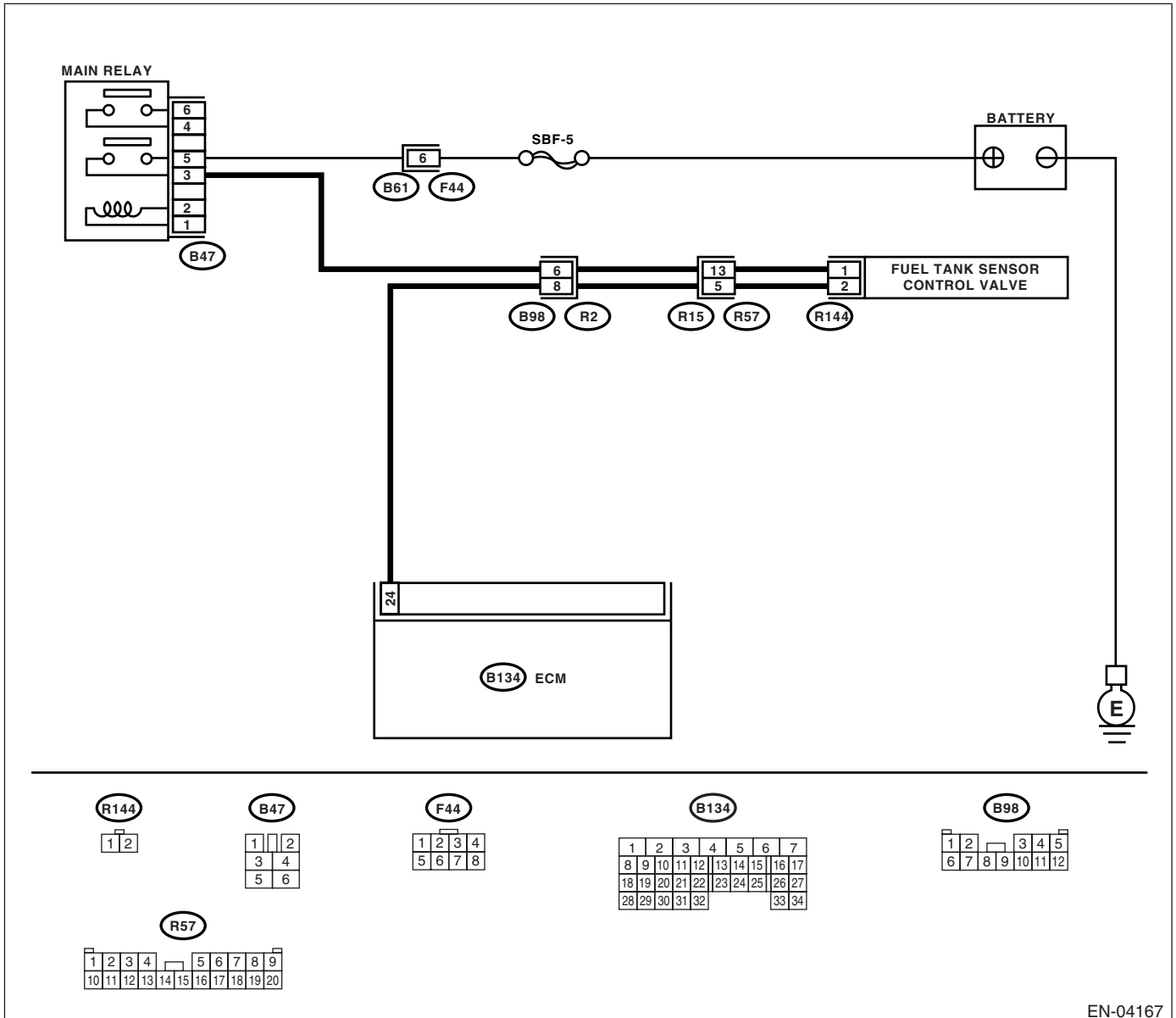
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-198, DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04167

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes                                   | No  |
|---|--|---------------------------------------|---|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 24 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 10 V?             | Go to step 2.                         | Go to step 3.   |
| <b>2</b><br><b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.  | Is there poor contact in ECM connector?    | Repair poor contact in ECM connector. | The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.<br>(However, the possibility of poor contact still remains.)<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Poor contact in fuel tank sensor control valve connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>3</b><br><b>CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connectors from fuel tank sensor control valve and ECM.<br>3) Measure the resistance of harness between fuel tank sensor control valve connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(R144) No. 2 — Chassis ground:</b></i> | Is the resistance more than 1 M $\Omega$ ? | Go to step 4.                         | Repair short circuit to ground in harness between ECM and fuel tank sensor control valve connector.   |
| <b>4</b><br><b>CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.</b><br>Measure the resistance of harness between ECM and fuel tank sensor control valve connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 24 — (R144) No. 2:</b></i>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 5.                         | Repair harness and connector.<br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and fuel tank sensor control valve connector</li> <li>• Poor contact in coupling connector</li> </ul>  |
| <b>5</b><br><b>CHECK FUEL TANK SENSOR CONTROL VALVE.</b><br>Measure the resistance between fuel tank sensor control valve terminals.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i>   | Is the resistance 10 — 100 $\Omega$ ?      | Go to step 6.                         | Replace the fuel tank sensor control valve. <Ref. to EC(STI)-16, Drain Valve.>  |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <b>6</b><br><b>CHECK POWER SUPPLY TO FUEL TANK SENSOR CONTROL VALVE.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between fuel tank sensor control valve and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R144) No. 1 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?                                     | Go to step 7.  | Repair harness and connector.<br><b>NOTE:</b><br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between main relay and fuel tank sensor control valve</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in main relay connector</li> </ul> |
| <b>7</b><br><b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in fuel tank sensor control valve connector.   | Is there poor contact in fuel tank sensor control valve connector? | Repair poor contact in fuel tank sensor control valve connector. | Contact your SOA Service Center since deterioration of some parts may be the cause.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CK:DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH

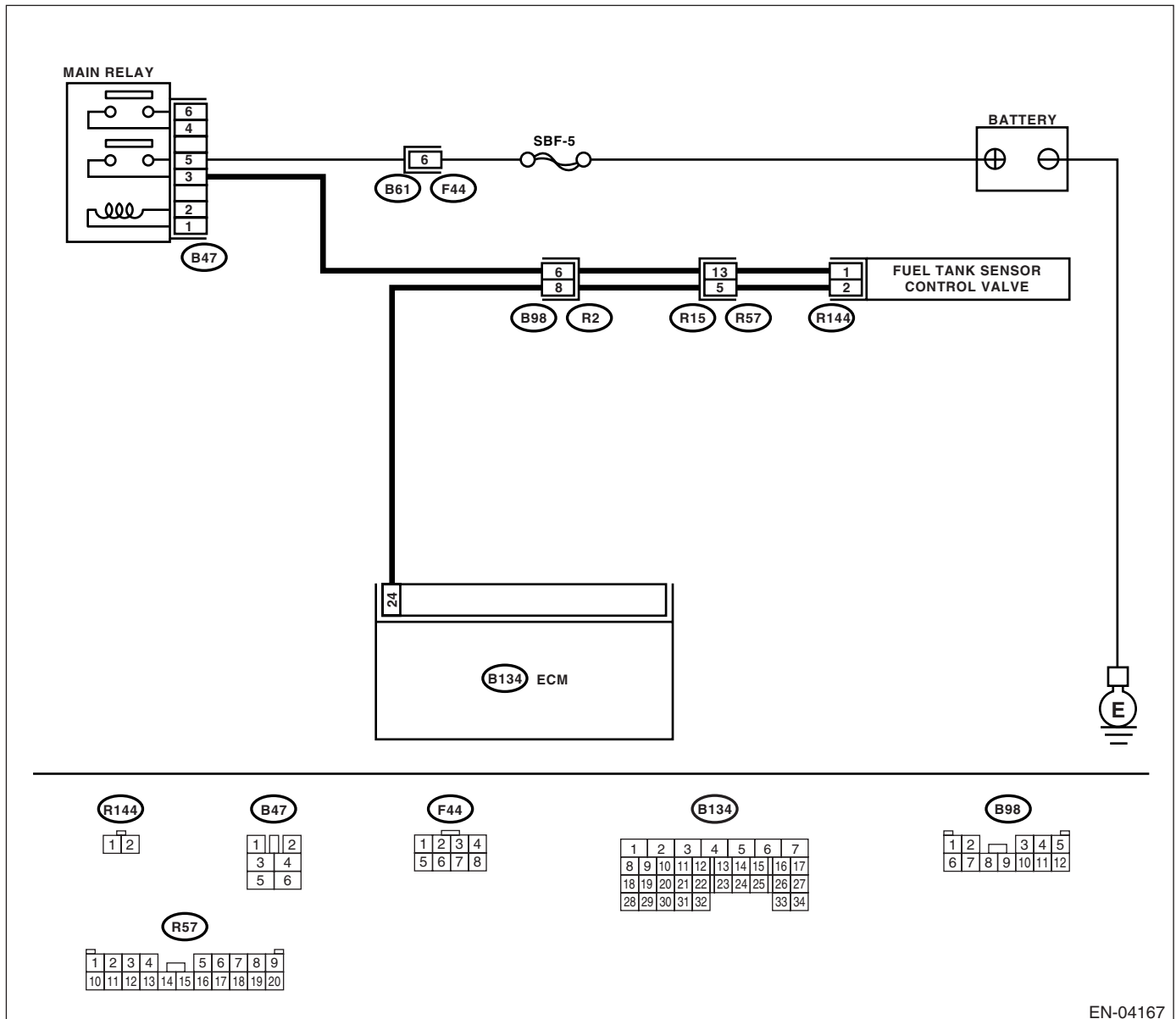
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-200, DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04167

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check                                    | Yes  | No  |
|--|--|--|---|
| <b>1</b><br><b>CHECK OUTPUT SIGNAL FROM ECM.</b><br>1) Turn ignition switch to ON.<br>2) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 24 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10 V?           | Go to step 3.  | Go to step 2.   |
| <b>2</b><br><b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.   | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.  | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> |
| <b>3</b><br><b>CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.</b><br>1) Turn ignition switch to OFF.<br>2) Disconnect the connector from fuel tank sensor control valve.<br>3) Turn ignition switch to ON.<br>4) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B134) No. 24 (+) — Chassis ground (-):</b></i> | Is the voltage more than 10 V?           | Repair short circuit to battery in harness between ECM and fuel tank sensor control valve connector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> | Go to step 4.   |
| <b>4</b><br><b>CHECK FUEL TANK SENSOR CONTROL VALVE.</b><br>1) Turn ignition switch to OFF.<br>2) Measure the resistance between fuel tank sensor control valve terminals.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i>  | Is the resistance less than 1 $\Omega$ ? | Replace the fuel tank sensor control valve <Ref. to EC(STI)-11, Fuel Tank Sensor Control Valve.> and the ECM <Ref. to FU(STI)-39, Engine Control Module (ECM).>.                       | Go to step 5.   |
| <b>5</b><br><b>CHECK FOR POOR CONTACT.</b><br>Check for poor contact in ECM connector.   | Is there poor contact in ECM connector?  | Repair poor contact in ECM connector.  | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> |

## CL:DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE

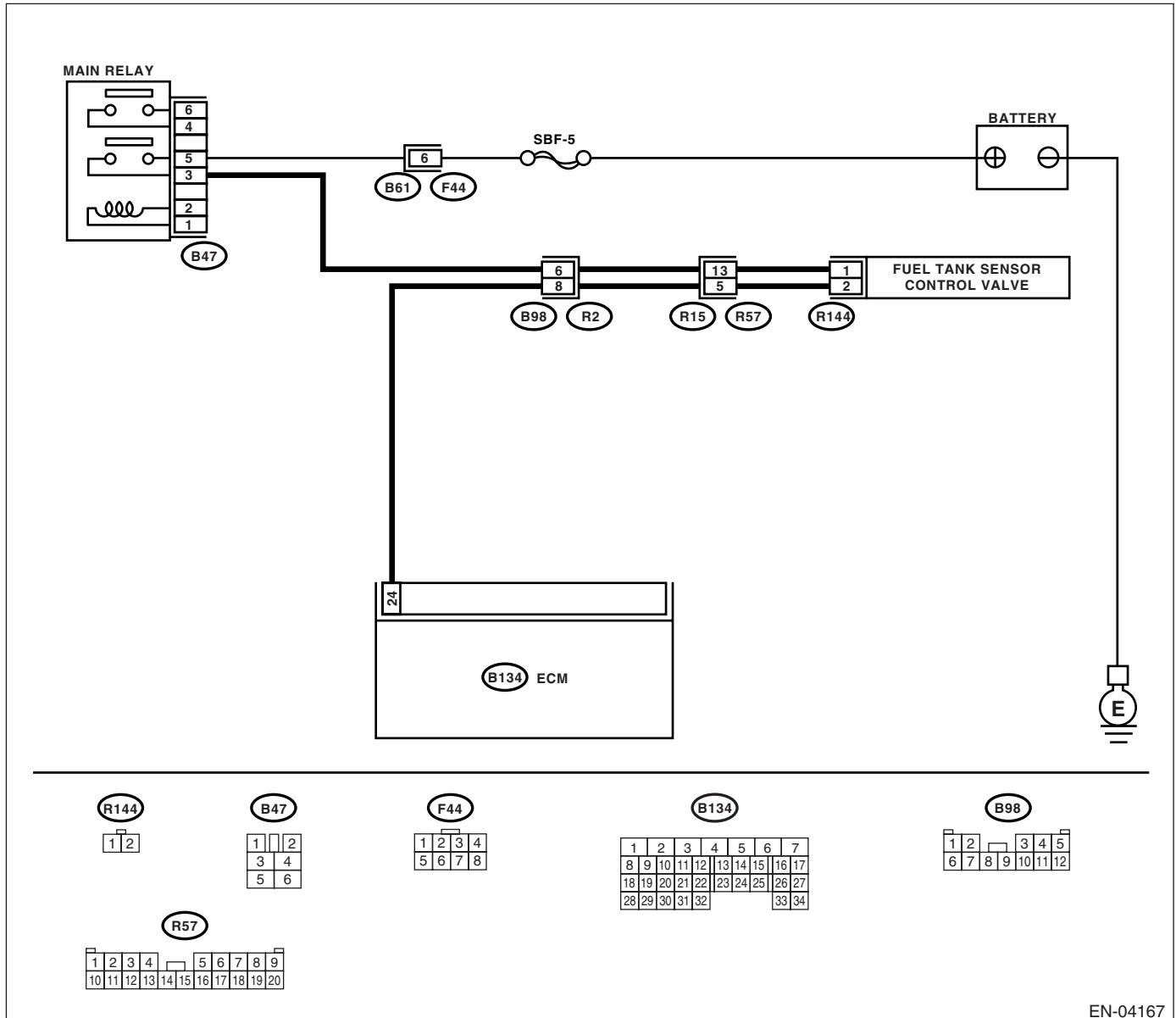
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-202, DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04167



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

|   | Step  | Check  | Yes  | No                                     |
|---|---|--|--|--|
| 1 | <b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?                        | Inspect the relevant DTC using the "List of Diagnostic Trouble Codes (DTC)".<br><Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                          |
| 2 | <b>CHECK FUEL FILLER CAP.</b><br>1) Turn ignition switch to OFF.<br>2) Open the fuel filler flap lid.   | Is the fuel filler cap tightened securely?         | Go to step 3.  | Tighten fuel filler cap securely.      |
| 3 | <b>CHECK EVAPORATIVE EMISSION LINE.</b><br>NOTE:<br>Check the following items. <ul style="list-style-type: none"><li>• Disconnection, leakage and clogging of hoses between fuel tank pressure sensor and fuel tank</li><li>• Disconnection, leakage and clogging of hoses and pipes between fuel filler pipe and fuel tank</li></ul> | Is there any trouble in evaporative emission line? | Repair the hoses and pipes.  | Replace the fuel tank pressure sensor. |

## CM:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-205, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

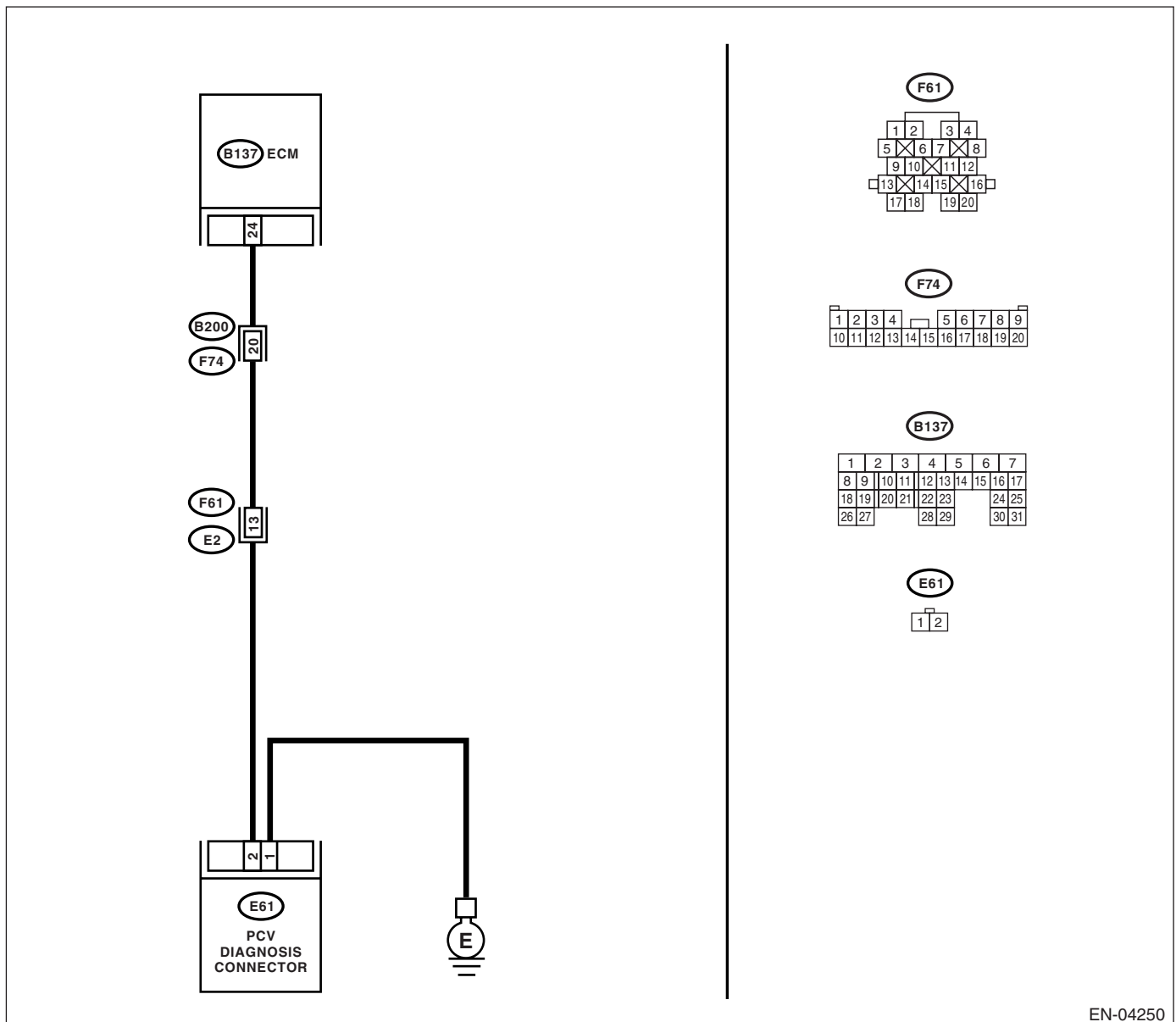
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04250

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No   |
|--|--|---|--|
| <b>1 CHECK BLOW-BY HOSE.</b><br>Check the blow-by hose.  | Is there disconnection or crack in blow-by hose? | Replace or repair blow-by hose.                         | Go to step 2.  |
| <b>2 INSPECT HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from PCV diagnosis connector and ECM.<br>3) Measure the resistance of harness between PCV diagnosis connector and ECM connector.<br><i>Connector &amp; terminal</i><br><i>(B137) No. 24 — (E61) No. 2:</i> | Is the resistance less than 1 $\Omega$ ?         | Go to step 3.   | Repair open circuit in harness between PCV diagnosis connector and ECM.                    |
| <b>3 INSPECT HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR.</b><br>Measure the resistance of harness between PCV diagnosis connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B137) No. 24 — Chassis ground:</i>  | Is the resistance more than 1 M $\Omega$ ?       | Go to step 4.   | Repair short circuit to chassis ground in harness between PCV diagnosis connector and ECM. |
| <b>4 INSPECT PCV DIAGNOSIS CONNECTOR GROUND CIRCUIT.</b><br>Measure the resistance between PCV diagnosis connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B61) No. 1 — Engine ground:</i>  | Is the resistance less than 5 $\Omega$ ?         | Go to step 5.   | Repair PCV diagnosis connector ground circuit.   |
| <b>5 INSPECT PCV DIAGNOSIS CONNECTOR.</b><br>Measure the resistance between PCV diagnosis connector and terminal.<br><i>Terminals</i><br><i>No. 1 — No. 2:</i>   | Is the resistance less than 1 $\Omega$ ?         | Repair poor contact in ECM and PCV diagnosis connector. | Replace PCV diagnosis connector.   |

## **CN:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT**

### **DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-207, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

Failure of engine to start

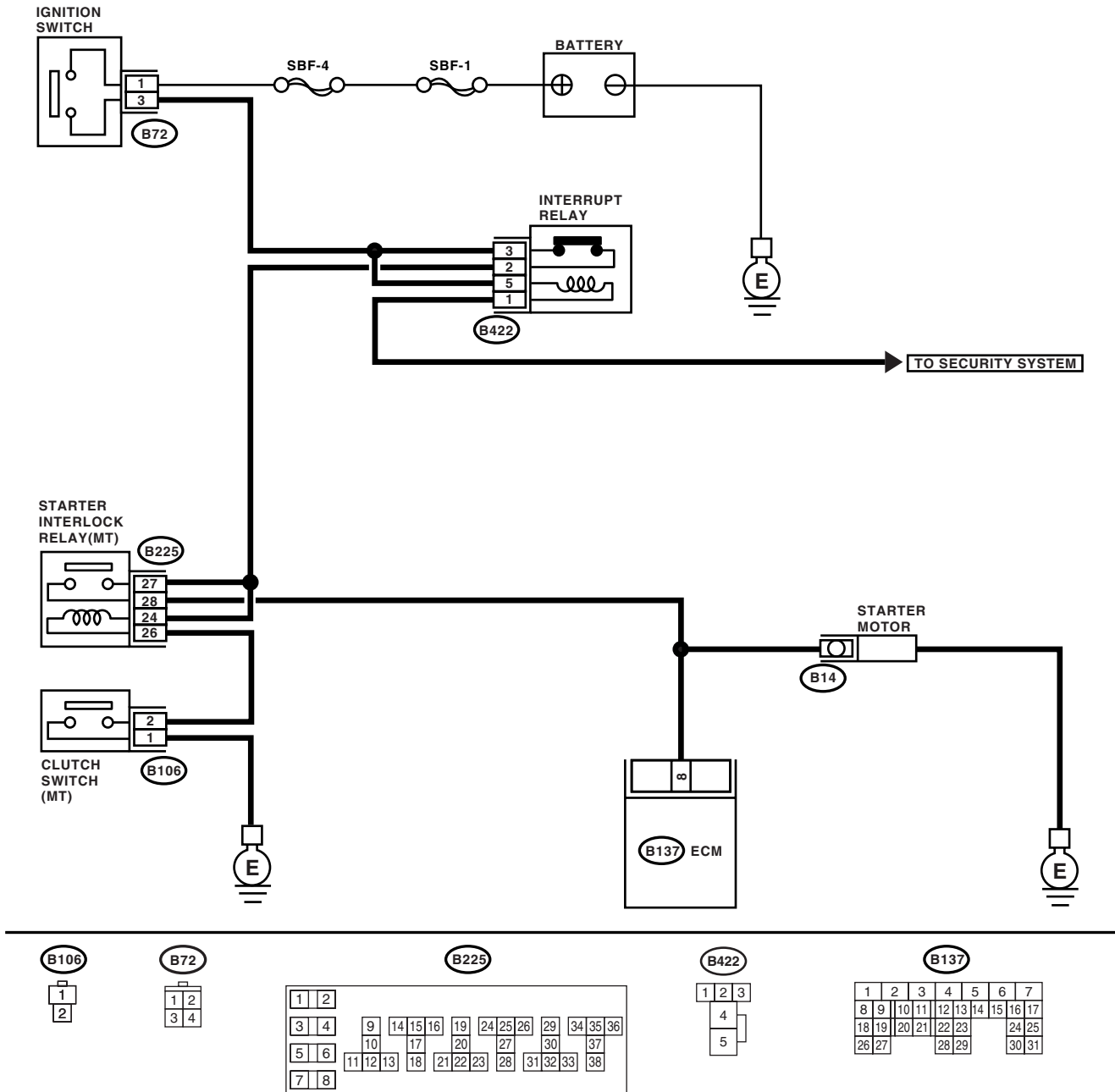
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04153

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| 1<br><b>CHECK OPERATION OF STARTER MOTOR.</b> | Does the starter motor operate when ignition switch is turned to START? | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"><li>• Open or ground short circuit in harness between ECM and starter motor connector</li><li>• Poor contact in ECM connector</li></ul> | Check the starter motor circuit. <Ref. to EN(STI)(diag)-58, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **CO:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION**

#### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-208, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

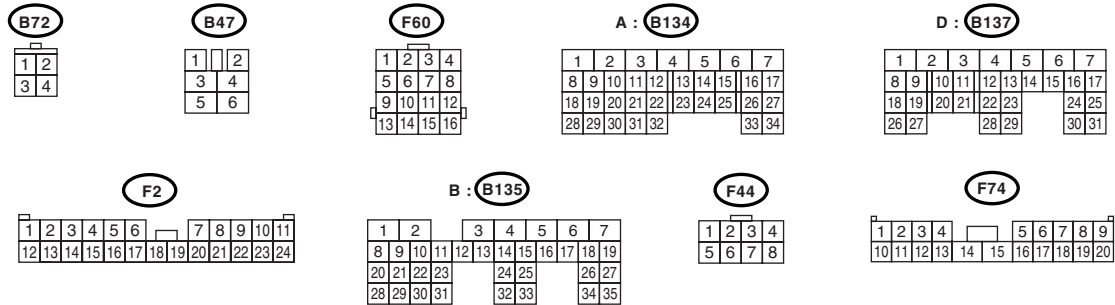
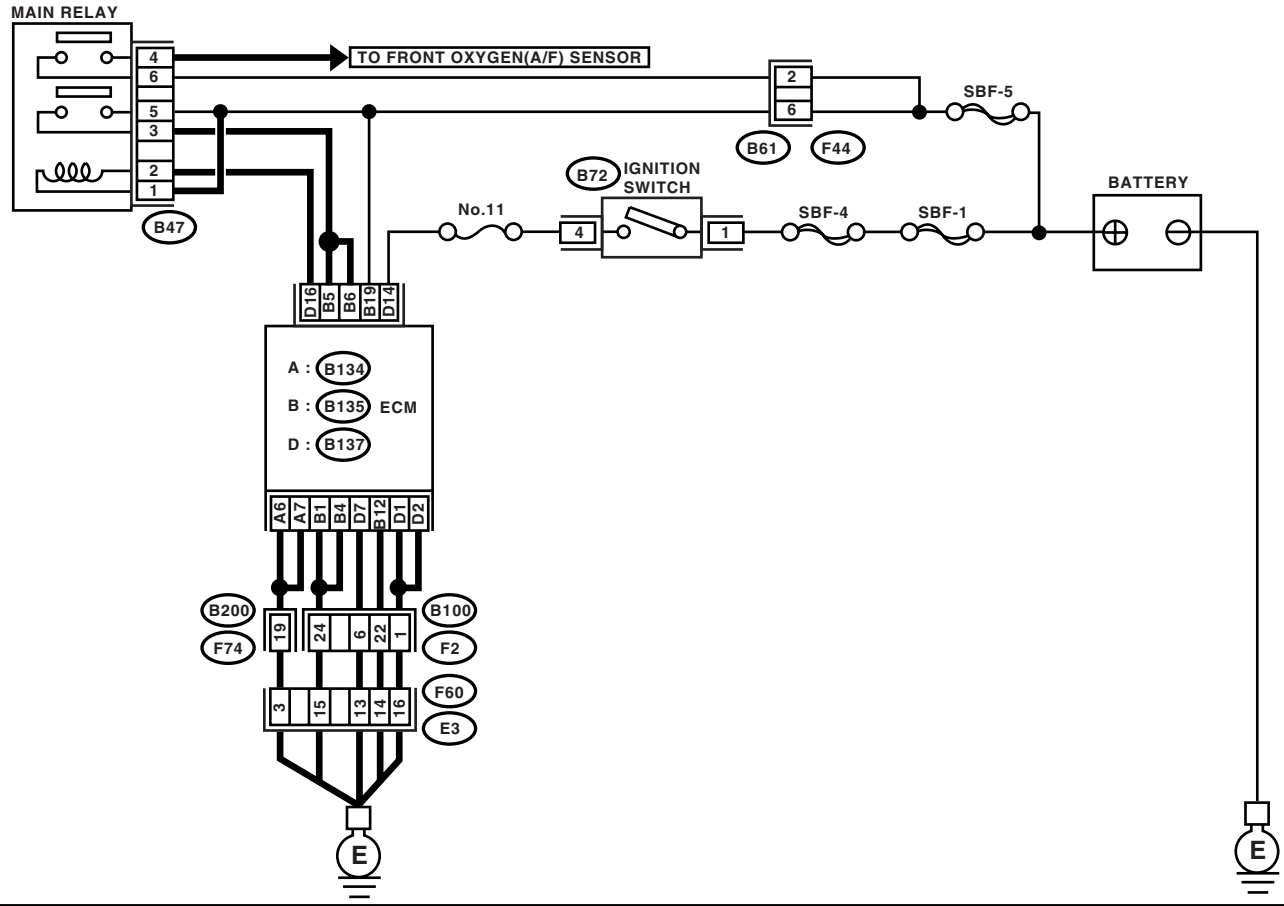
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04249



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                     | Yes  | No   |
|---|---|--|--|
| <b>1</b><br><b>CHECK INPUT SIGNAL FOR ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the voltage between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B135) No. 19 (+) — Chassis ground (-):</b></i>                                    | Is the voltage more than 10 V?            | Repair the poor contact in ECM connector.  | Go to step 2.  |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.</b><br>1) Disconnect the connector from ECM.<br>2) Measure the resistance of harness between ECM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B135) No. 19 — Chassis ground:</b></i> | Is the resistance less than 10 $\Omega$ ? | Repair the ground short circuit in harness between ECM connector and battery terminal. | Go to step 3.  |
| <b>3</b><br><b>CHECK FUSE SBF-5.</b>  | Is the fuse blown?                        | Replace the fuse.  | Repair the harness and connector.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and battery</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in battery terminal</li> </ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CP:DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-210, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

| Step  | Check   | Yes  | No                                |
|---|---|--|-----------------------------------|
| 1<br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                     |
| 2<br><b>CHECK TUMBLE GENERATOR VALVE RH.</b><br>1) Remove the tumble generator valve assembly.<br>2) Check the tumble generator valve body. | Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged) | Replace the tumble generator valve assembly. <Ref. to FU(STI)-32, Tumble Generator Valve Assembly.>  | Clean the tumble generator valve. |

## CQ:DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-211, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

| Step  | Check   | Yes  | No                                |
|---|---|--|-----------------------------------|
| 1<br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                     |
| 2<br><b>CHECK TUMBLE GENERATOR VALVE LH.</b><br>1) Remove the tumble generator valve assembly.<br>2) Check the tumble generator valve body. | Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged) | Replace the tumble generator valve assembly. <Ref. to FU(STI)-32, Tumble Generator Valve Assembly.>  | Clean the tumble generator valve. |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

### CR:DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1)

**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-212, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

**CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

| Step  | Check   | Yes   | No                                |
|---|---|---|-----------------------------------|
| 1<br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                     |
| 2<br><b>CHECK TUMBLE GENERATOR VALVE RH.</b><br>1) Remove the tumble generator valve assembly.<br>2) Check the tumble generator valve body. | Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged) | Replace the tumble generator valve assembly. <Ref. to FU(STI)-32, Tumble Generator Valve Assembly.>                                       | Clean the tumble generator valve. |

### CS:DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK2)

**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-213, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

**CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

| Step  | Check   | Yes  | No                                |
|---|---|--|-----------------------------------|
| 1<br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> | Go to step 2.                     |
| 2<br><b>CHECK TUMBLE GENERATOR VALVE LH.</b><br>1) Remove the tumble generator valve assembly.<br>2) Check the tumble generator valve body. | Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged) | Replace the tumble generator valve assembly. <Ref. to FU(STI)-32, Tumble Generator Valve Assembly.>  | Clean the tumble generator valve. |

**CT:DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN  
(BANK 1)**

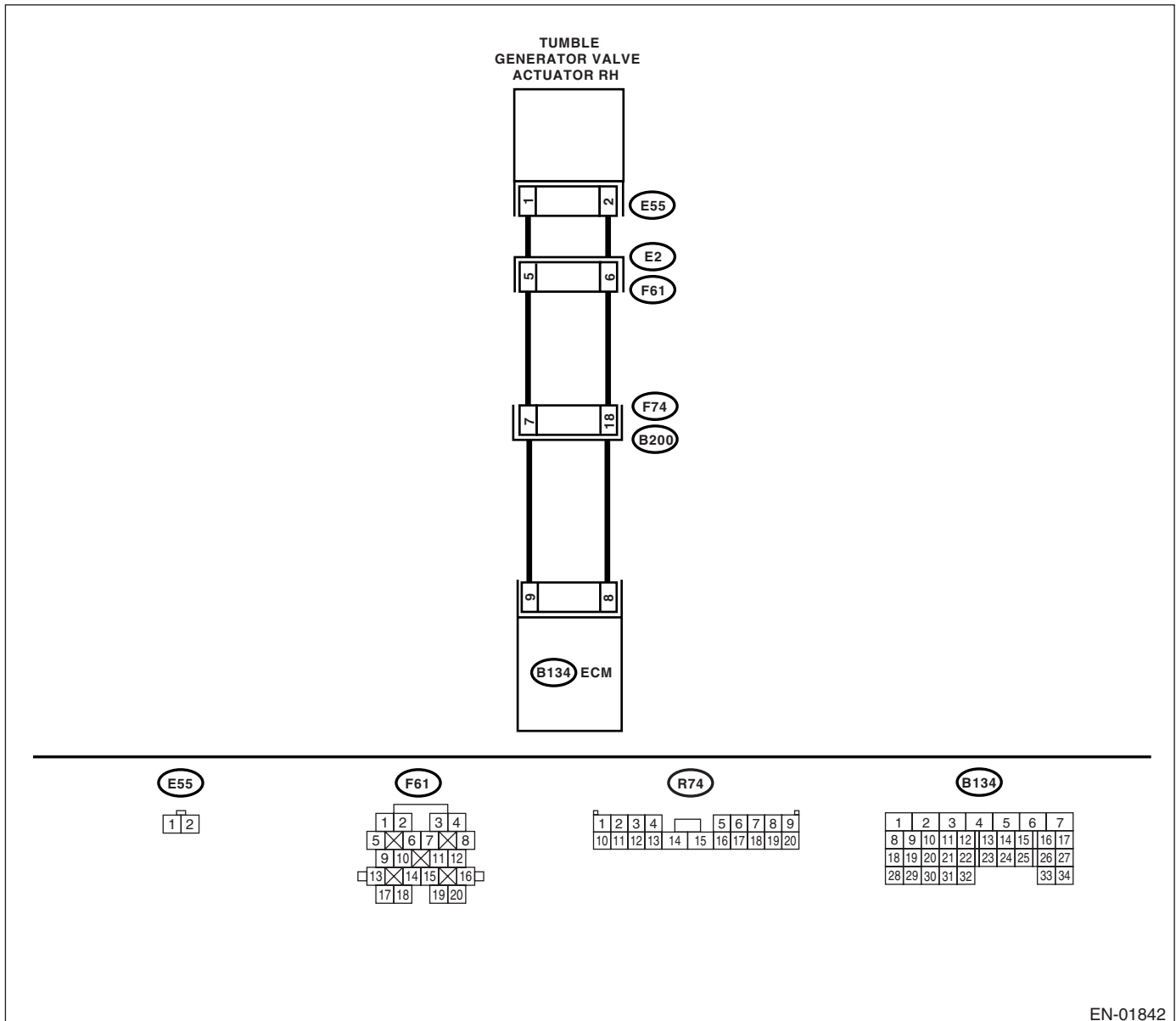
**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-214, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

**CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

**WIRING DIAGRAM:**



EN-01842

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No  |
|--|--|--|---|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from tumble generator valve and ECM connector.<br/>                     3) Measure the resistance between tumble generator valve actuator and ECM connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(E55) No. 1 — (B134) No. 9:</b><br/> <b>(E55) No. 2 — (B134) No. 8:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p>                  | <p>Go to step 2.</p>   | <p>Repair the open circuit between ECM and tumble generator valve connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and tumble generator valve actuator connector.</li> <li>• Poor contact in coupling connector.</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK POOR CONTACT.</b><br/>                     Check poor contact in tumble generator valve actuator connector.</p>  | <p>Is there poor contact in tumble generator valve actuator connector?</p> | <p>Repair the poor contact in tumble generator valve actuator connector.</p> | <p>Replace the tumble generator valve actuator. &lt;Ref. to FU(STI)-34, Tumble Generator Valve Actuator.&gt;</p>  |

## CU:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)

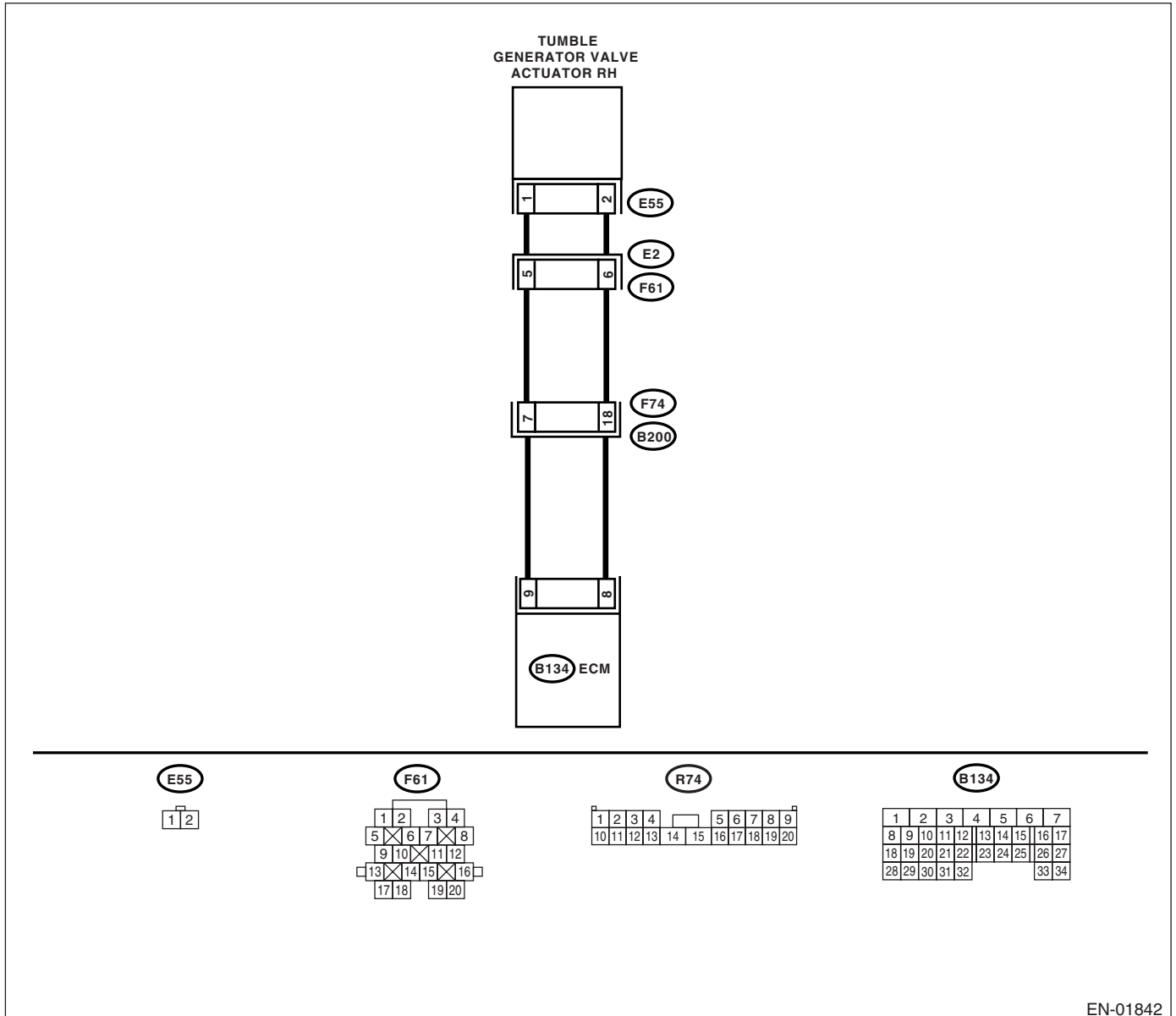
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-216, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-01842

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                | Yes  | No  |
|--|--------------------------------------|--|---|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from tumble generator valve connector.<br/>3) Measure the voltage between tumble generator valve actuator and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E55) No. 1 (+) — Chassis ground (-):</b><br/><b>(E55) No. 2 (+) — Chassis ground (-):</b></p> | <p>Is the voltage less than 5 V?</p> | <p>Replace the tumble generator valve actuator. &lt;Ref. to FU(STI)-34, Tumble Generator Valve Actuator.&gt;</p> | <p>Repair the battery short circuit in harness between ECM and tumble generator valve actuator.</p> |

## CV:DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2)

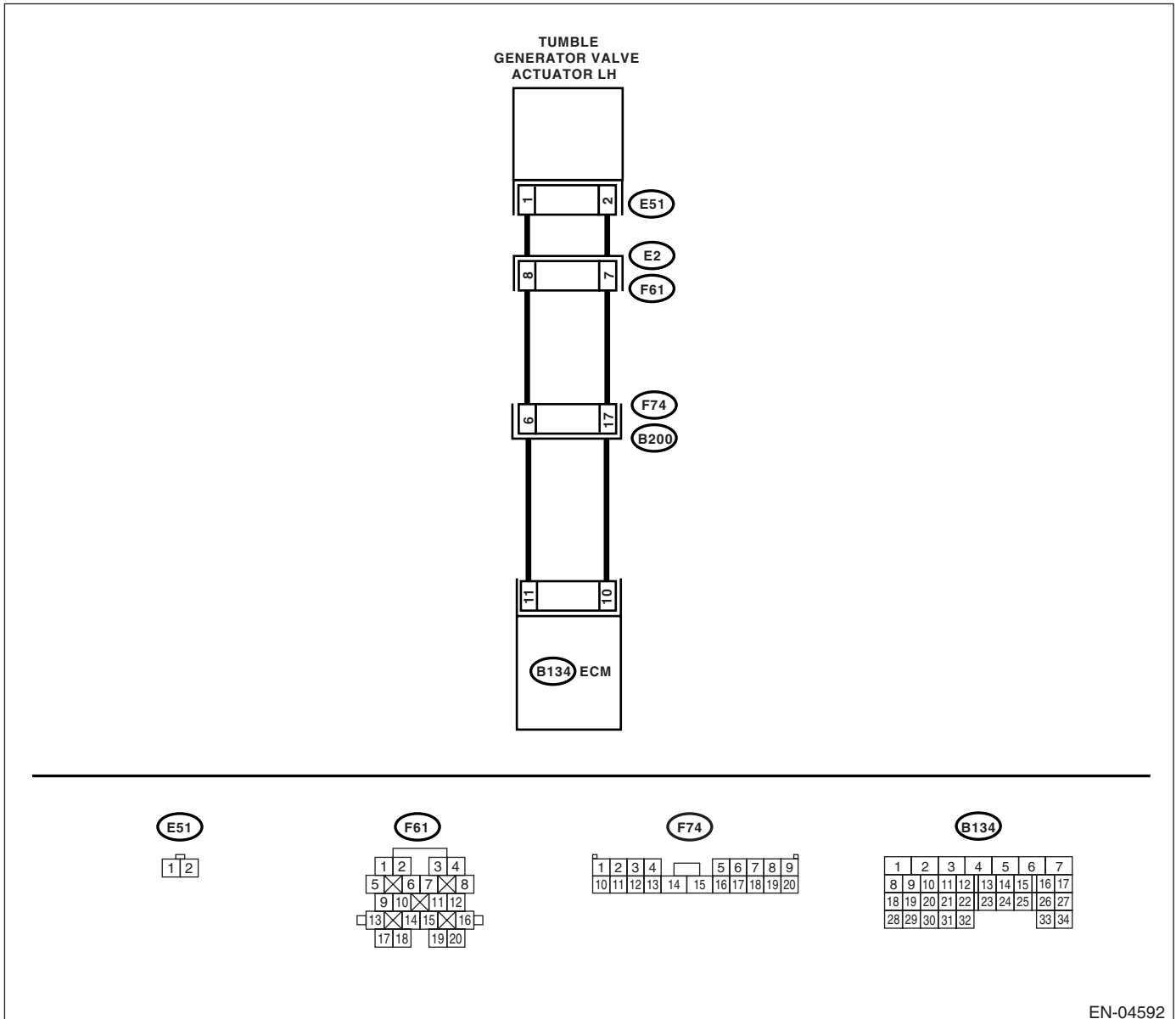
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-218, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:





# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No   |
|--|--|--|--|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from tumble generator valve and ECM connector.<br/>                     3) Measure the resistance between tumble generator valve actuator and ECM connector.</p> <p><b>Connector &amp; terminal</b><br/>                     (E51) No. 1 — (B134) No. 11:<br/>                     (E51) No. 2 — (B134) No. 10:</p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p>                  | <p>Go to step 2.</p>   | <p>Repair the open circuit between ECM and tumble generator valve connector.</p> <p>NOTE:<br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and tumble generator valve actuator connector.</li> <li>• Poor contact in coupling connector.</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in tumble generator valve actuator connector.</p>  | <p>Is there poor contact in tumble generator valve actuator connector?</p> | <p>Repair the poor contact in tumble generator valve actuator connector.</p> | <p>Replace the tumble generator valve actuator. &lt;Ref. to FU(STI)-34, Tumble Generator Valve Actuator.&gt;</p>   |

## CW:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)

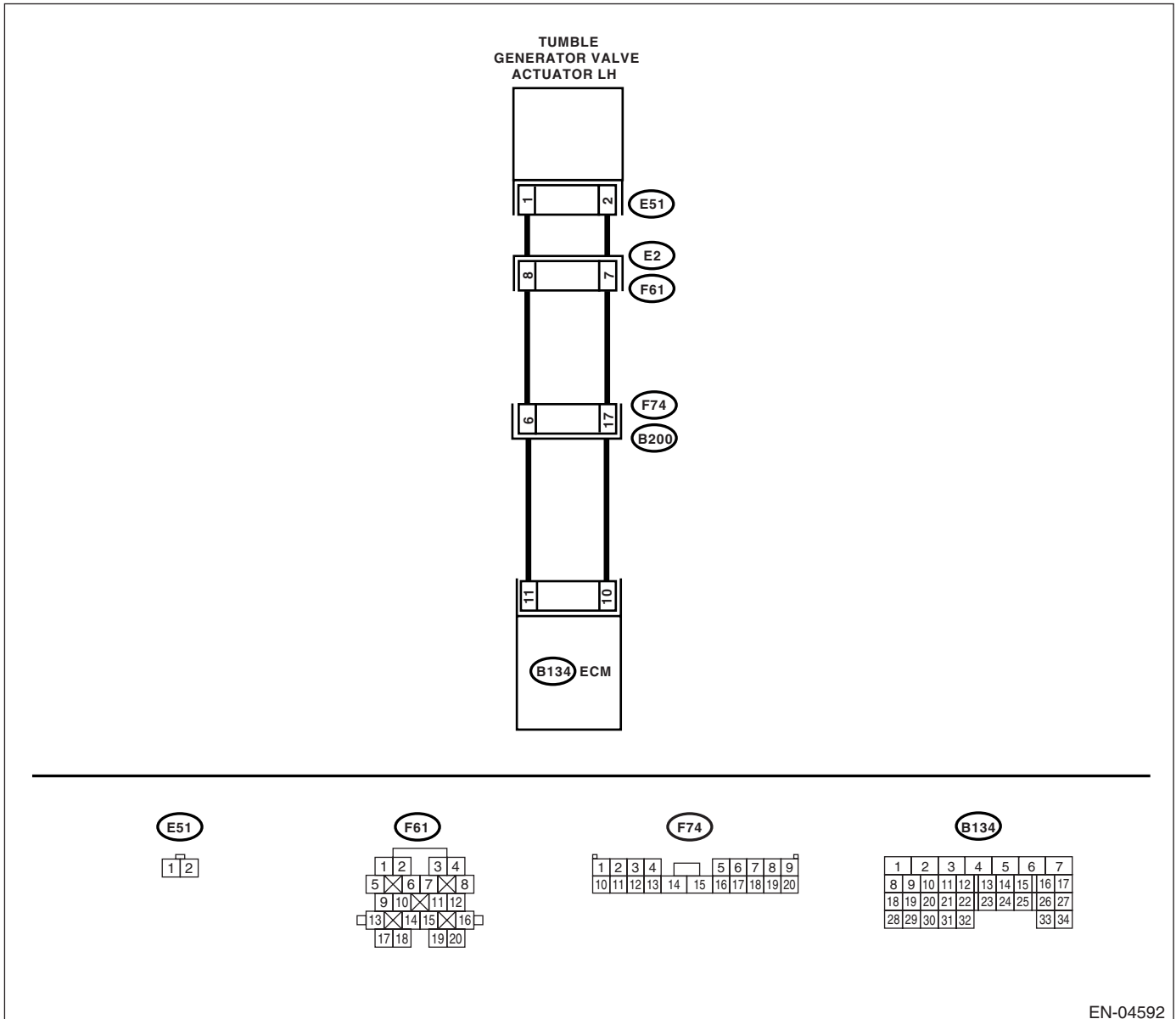
### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-220, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                | Yes  | No  |
|--|--------------------------------------|--|---|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from tumble generator valve connector.<br/>3) Measure the voltage between tumble generator valve actuator and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E51) No. 1 (+) — Chassis ground (-):</b><br/><b>(E51) No. 2 (+) — Chassis ground (-):</b></p> | <p>Is the voltage less than 5 V?</p> | <p>Replace the tumble generator valve actuator. &lt;Ref. to FU(STI)-34, Tumble Generator Valve Actuator.&gt;</p> | <p>Repair the battery short circuit in harness between ECM and tumble generator valve actuator.</p> |

## CX:DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1)

**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-222, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

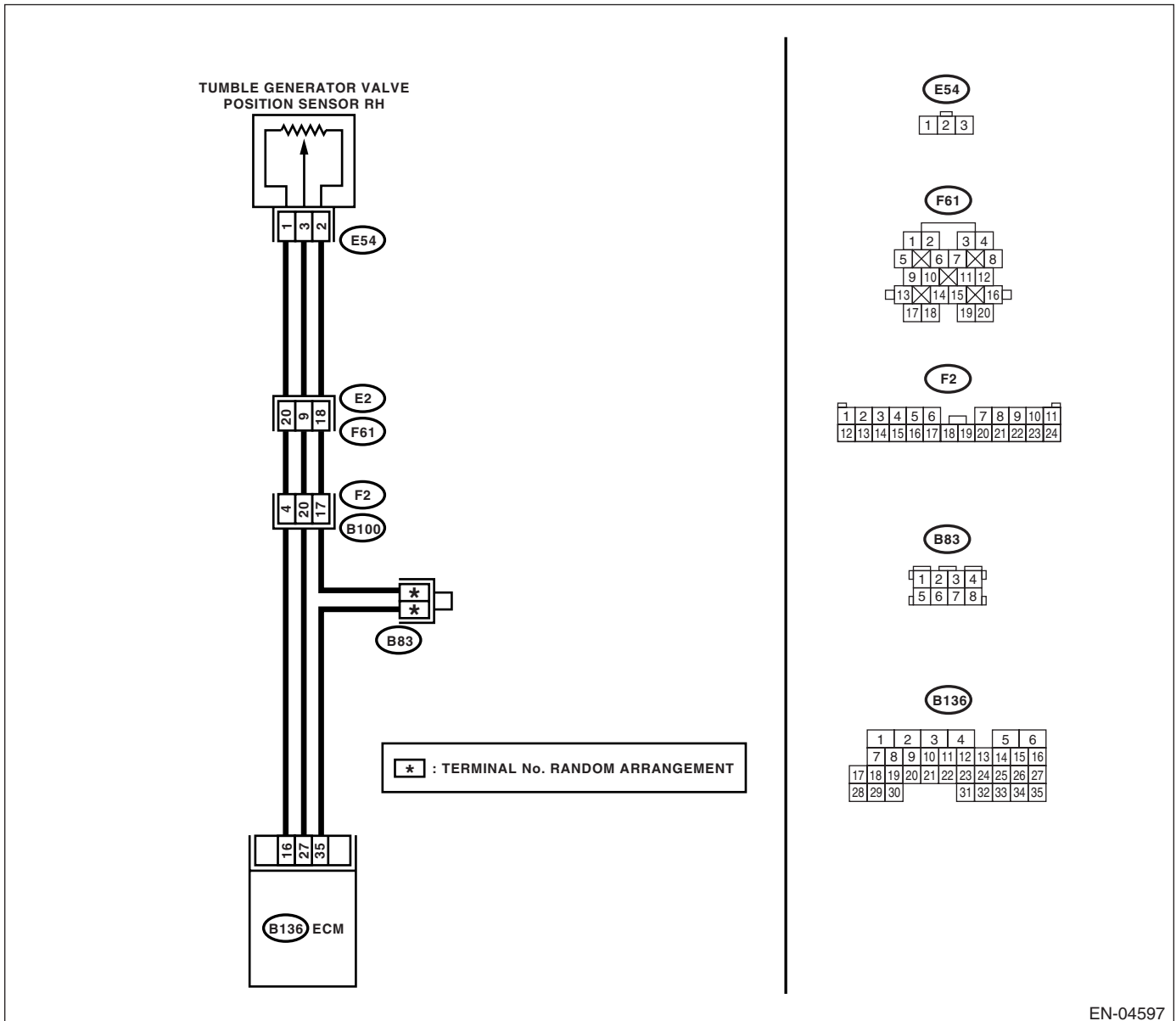
**TROUBLE SYMPTOM:**

- Erroneous idling
- Engine stalls.
- Poor driving performance

**CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

**WIRING DIAGRAM:**



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes                                       | No  |
|---|--|---|---|
| <b>1 CHECK CURRENT DATA.</b><br>1) Start the engine.<br>2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool.<br><br><b>NOTE:</b><br>• Subaru Select Monitor<br>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.><br>• General scan tool<br>For detailed operation procedures, refer to the General Scan Tool Instruction Manual. | Is the voltage less than 0.1 V?  | Go to step 2.                             | Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.<br><br><b>NOTE:</b><br>In this case, repair the following:<br>• Poor contact in tumble generator valve position sensor connector<br>• Poor contact in ECM connector<br>• Poor contact in coupling connector |
| <b>2 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 (+) — Chassis ground (-):</b>  | Is the voltage more than 4.5 V?  | Go to step 4.                             | Go to step 3.   |
| <b>3 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B136) No. 16 (+) — Chassis ground (-):</b>  | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?         | Repair the poor contact in ECM connector. | Contact your SOA Service Center since deterioration of some parts may be the cause.   |
| <b>4 CHECK INPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B136) No. 27 (+) — Chassis ground (-):</b>  | Is the voltage less than 0.1 V?  | Go to step 6.                             | Go to step 5.   |
| <b>5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)</b><br>Measure the voltage between ECM connector and chassis ground.   | Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change? | Repair the poor contact in ECM connector. | Go to step 6.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <p><b>6</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connectors from tumble generator valve position sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between tumble generator valve position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(E54) No. 1 (+) — Engine ground (-):</b></p> | <p>Is the voltage more than 4.5 V?</p>  | <p>Go to step 7.</p>  | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between tumble generator valve position sensor and ECM connector</li> <li>• Poor contact in tumble generator valve position sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |
| <p><b>7</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B136) No. 27 — (E54) No. 3:</b></p>  | <p>Is the resistance less than 1 <math>\Omega</math>?</p>                         | <p>Go to step 8.</p>  | <p>Repair the harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between tumble generator valve position sensor and ECM connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in tumble generator valve position sensor connector</li> <li>• Poor contact in coupling connector</li> </ul>  |
| <p><b>8</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</b></p> <p>Measure the resistance of harness between tumble generator valve position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(E54) No. 3 — Engine ground:</b></p>  | <p>Is the resistance more than 1 M<math>\Omega</math>?</p>                        | <p>Go to step 9.</p>  | <p>Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.</p>  |
| <p><b>9</b></p> <p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in tumble generator valve position sensor connector.</p>  | <p>Is there poor contact in tumble generator valve position sensor connector?</p> | <p>Repair the poor contact in tumble generator valve position sensor connector.</p> | <p>Replace the tumble generator valve position sensor.<br/>                     &lt;Ref. to FU(STI)-33, Tumble Generator Valve Position Sensor.&gt;</p>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CY:DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-224, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

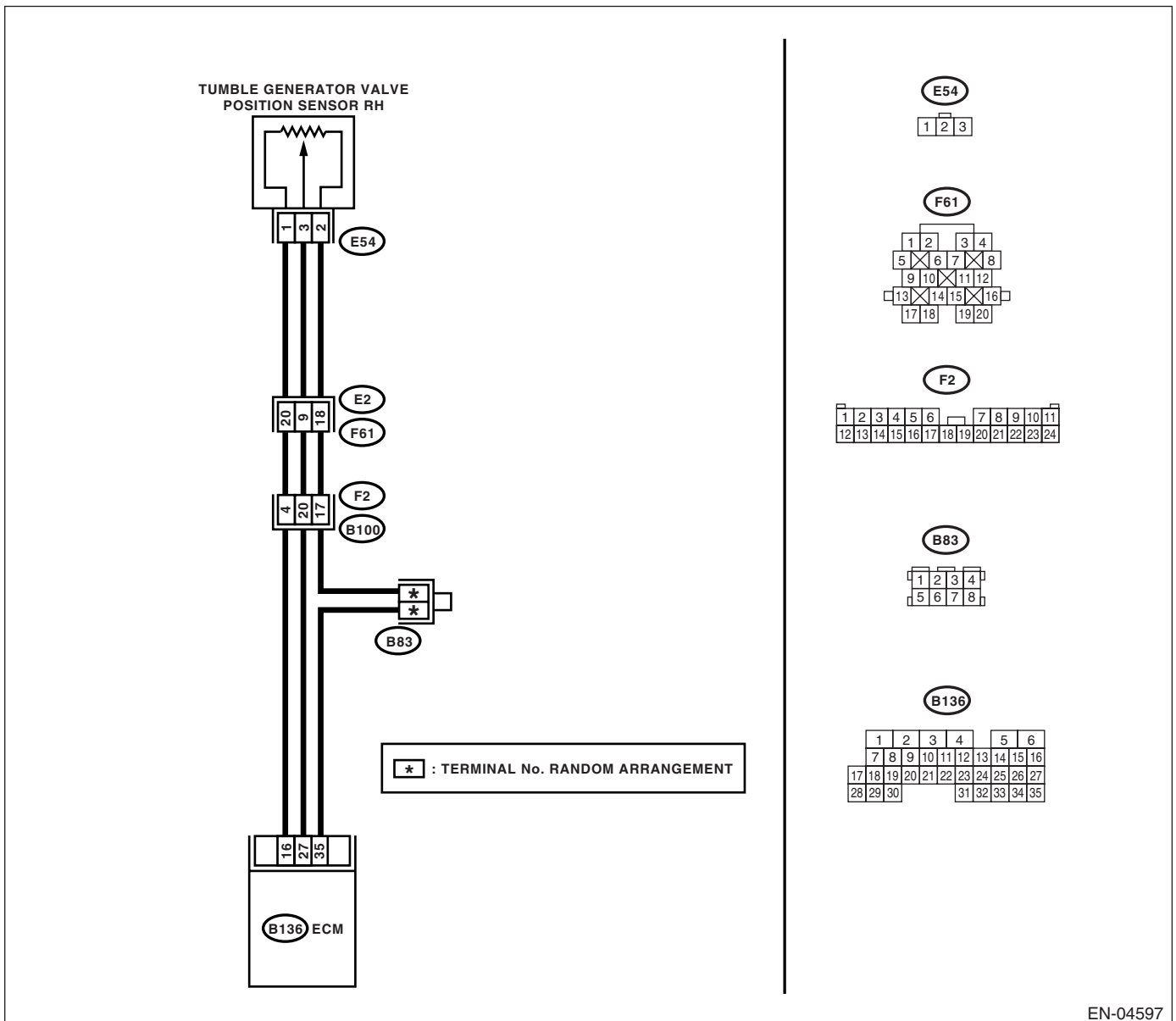
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04597

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <p><b>1</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Start the engine.</p> <p>2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the voltage more than 4.9 V?</p>                    | <p>Go to step 2.</p>   | <p>Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Poor contact in tumble generator valve position sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from tumble generator valve position sensor.</p> <p>3) Measure the resistance of harness between tumble generator valve position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E54) No. 2 — Engine ground:</b></p>   | <p>Is the resistance less than 5 <math>\Omega</math>?</p> | <p>Go to step 3.</p>   | <p>Repair the harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between tumble generator valve position sensor and ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul>   |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between tumble generator valve position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(E54) No. 3 (+) — Engine ground (-):</b></p>  | <p>Is the voltage more than 4.9 V?</p>                    | <p>Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. &lt;Ref. to FU(STI)-39, Engine Control Module (ECM).&gt;</p> | <p>Replace the tumble generator valve position sensor. &lt;Ref. to FU(STI)-33, Tumble Generator Valve Position Sensor.&gt;</p>   |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## CZ:DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-226, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

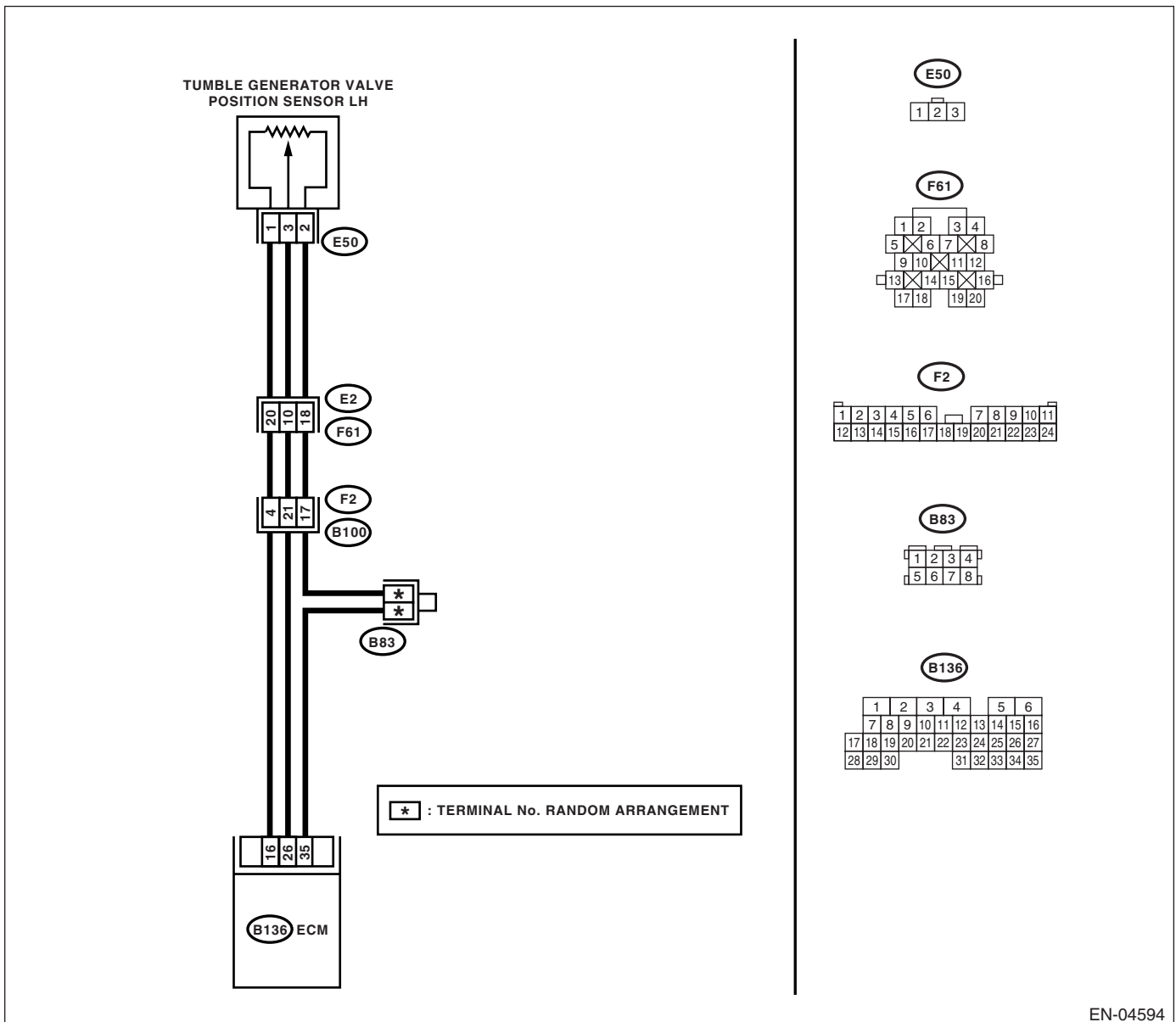
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04594

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes                                       | No  |
|---|--|---|---|
| <p><b>1</b></p> <p><b>CHECK CURRENT DATA.</b><br/>                     1) Start the engine.<br/>                     2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:<br/>                     • Subaru Select Monitor<br/>                     For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;<br/>                     • General scan tool<br/>                     For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | Is the voltage less than 0.1 V?  | Go to step 2.                             | <p>Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.</p> <p>NOTE:<br/>                     In this case, repair the following:<br/>                     • Poor contact in tumble generator valve position sensor connector<br/>                     • Poor contact in ECM connector<br/>                     • Poor contact in coupling connector</p> |
| <p><b>2</b></p> <p><b>CHECK INPUT SIGNAL FOR ECM.</b><br/>                     Measure the voltage between ECM connector and chassis ground.<br/> <i>Connector &amp; terminal</i><br/> <i>(B136) No. 16 (+) — Chassis ground (-):</i></p>   | Is the voltage more than 4.5 V?  | Go to step 4.                             | Go to step 3.   |
| <p><b>3</b></p> <p><b>CHECK INPUT SIGNAL FOR ECM.</b><br/>                     Measure the voltage between ECM connector and chassis ground.<br/> <i>Connector &amp; terminal</i><br/> <i>(B136) No. 16 (+) — Chassis ground (-):</i></p>   | Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?         | Repair the poor contact in ECM connector. | Contact your SOA Service Center since deterioration of some parts may be the cause.   |
| <p><b>4</b></p> <p><b>CHECK INPUT SIGNAL FOR ECM.</b><br/>                     Measure the voltage between ECM connector and chassis ground.<br/> <i>Connector &amp; terminal</i><br/> <i>(B136) No. 26 (+) — Chassis ground (-):</i></p>   | Is the voltage less than 0.1 V?  | Go to step 6.                             | Go to step 5.   |
| <p><b>5</b></p> <p><b>CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)</b><br/>                     Measure the voltage between ECM connector and chassis ground.</p>  | Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change? | Repair the poor contact in ECM connector. | Go to step 6.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <p><b>6</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connectors from tumble generator valve position sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between tumble generator valve position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(E50) No. 1 (+) — Engine ground (-):</b></p> | <p>Is the voltage more than 4.5 V?</p>  | <p>Go to step 7.</p>  | <p>Repair the harness and connector.</p> <p>NOTE:<br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between tumble generator valve position sensor and ECM connector</li> <li>• Poor contact in tumble generator valve position sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul> |
| <p><b>7</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B136) No. 26 — (E50) No. 3:</b></p>  | <p>Is the resistance less than 1 <math>\Omega</math>?</p>                         | <p>Go to step 8.</p>  | <p>Repair the harness and connector.</p> <p>NOTE:<br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between tumble generator valve position sensor and ECM connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in tumble generator valve position sensor connector</li> <li>• Poor contact in coupling connector</li> </ul>  |
| <p><b>8</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</b></p> <p>Measure the resistance of harness between tumble generator valve position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(E50) No. 3 — Engine ground:</b></p>  | <p>Is the resistance more than 1 M<math>\Omega</math>?</p>                        | <p>Go to step 9.</p>  | <p>Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.</p>   |
| <p><b>9</b></p> <p><b>CHECK POOR CONTACT.</b></p> <p>Check poor contact in tumble generator valve position sensor connector.</p>  | <p>Is there poor contact in tumble generator valve position sensor connector?</p> | <p>Repair the poor contact in tumble generator valve position sensor connector.</p> | <p>Replace the tumble generator valve position sensor.<br/>                     &lt;Ref. to FU(STI)-33, Tumble Generator Valve Position Sensor.&gt;</p>   |

## DA:DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2)

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-228, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR/ SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

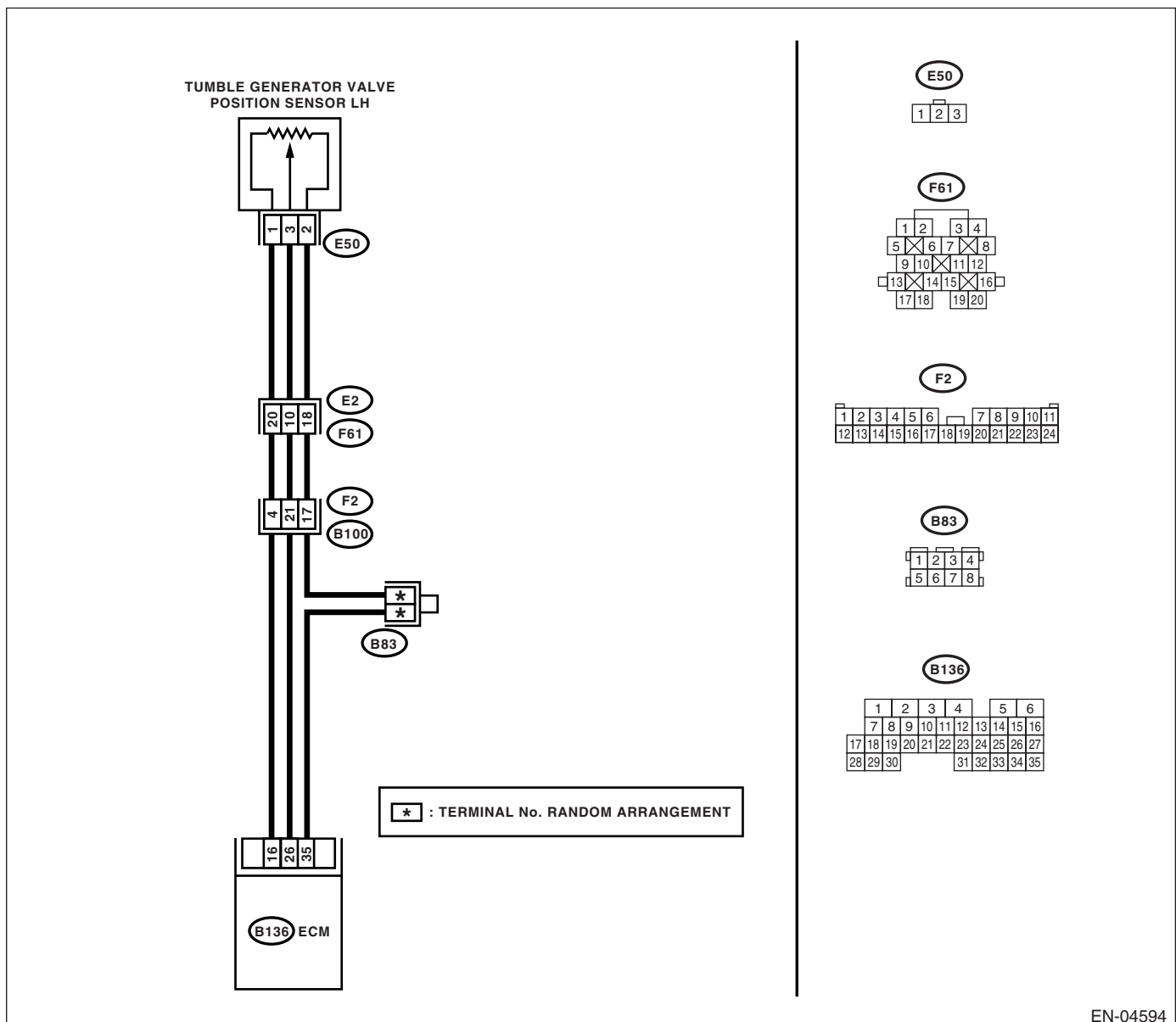
### TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04594

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <p><b>1</b></p> <p><b>CHECK CURRENT DATA.</b></p> <p>1) Start the engine.</p> <p>2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedures, refer to the General Scan Tool Instruction Manual.</p> | <p>Is the voltage more than 4.9 V?</p>                    | <p>Go to step 2.</p>   | <p>Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Poor contact in tumble generator valve position sensor connector</li> <li>• Poor contact in ECM connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from tumble generator valve position sensor.</p> <p>3) Measure the resistance of harness between tumble generator valve position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b></p> <p><b>(E50) No. 2 — Engine ground:</b></p>  | <p>Is the resistance less than 5 <math>\Omega</math>?</p> | <p>Go to step 3.</p>   | <p>Repair the harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between tumble generator valve position sensor and ECM connector</li> <li>• Poor contact in coupling connector</li> <li>• Poor contact in joint connector</li> </ul>   |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.</b></p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between tumble generator valve position sensor connector and engine ground.</p> <p><b>Connector &amp; terminal</b></p> <p><b>(E50) No. 3 (+) — Engine ground (-):</b></p>   | <p>Is the voltage more than 4.9 V?</p>                    | <p>Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. &lt;Ref. to FU(STI)-39, Engine Control Module (ECM).&gt;</p> | <p>Replace the tumble generator valve position sensor. &lt;Ref. to FU(STI)-33, Tumble Generator Valve Position Sensor.&gt;</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DB:DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-230, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

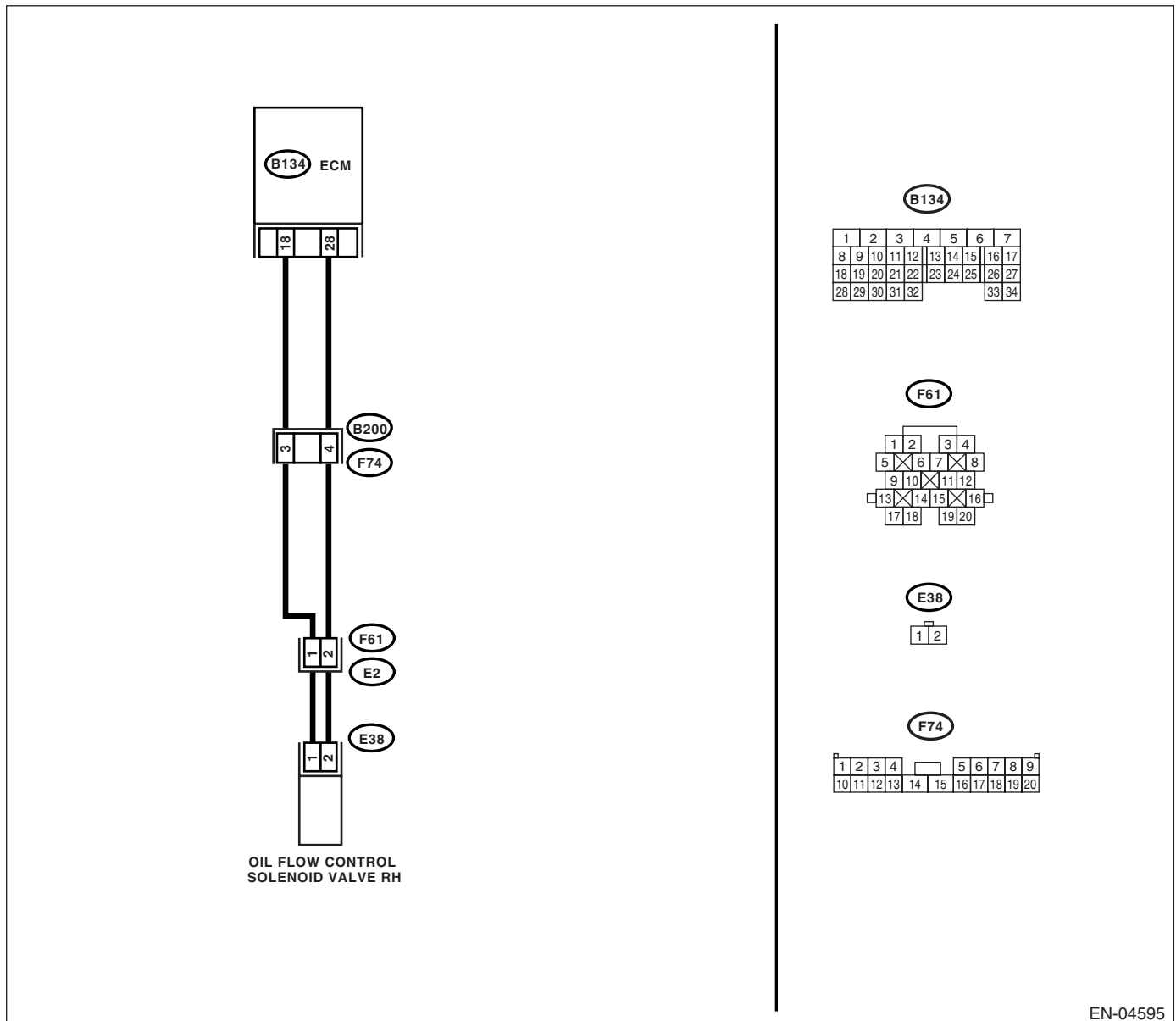
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check                                      | Yes   | No  |
|--|--|---|---|
| <b>1</b><br><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and oil flow control solenoid valve.<br>3) Measure the resistance between ECM and oil flow control solenoid valve.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 18 — (E38) No. 1:</b><br><b>(B134) No. 28 — (E38) No. 2:</b> | Is the resistance less than 1 $\Omega$ ?   | Go to step 2.   | Repair the open circuit in harness between ECM and oil flow control solenoid valve connector.<br><br>NOTE:<br>In this case, repair the following: <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and oil flow control solenoid valve connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <b>2</b><br><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b><br>Measure the resistance between ECM and oil flow control solenoid valve.<br><b>Connector &amp; terminal</b><br><b>(E38) No. 1 — Engine ground:</b><br><b>(E38) No. 2 — Engine ground:</b>  | Is the resistance more than 1 M $\Omega$ ? | Go to step 3.   | Repair the ground short circuit in harness between ECM and oil flow control solenoid valve connector.   |
| <b>3</b><br><b>CHECK OIL FLOW CONTROL SOLENOID VALVE.</b><br>1) Remove the oil flow control solenoid valve.<br>2) Measure the resistance between oil flow control solenoid valve terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>   | Is the resistance 6 — 12 $\Omega$ ?        | Repair the poor contact in ECM and oil flow control solenoid valve. | Replace the oil flow control solenoid valve. <Ref. to ME(STI)-54, Camshaft.>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DC:DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-232, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

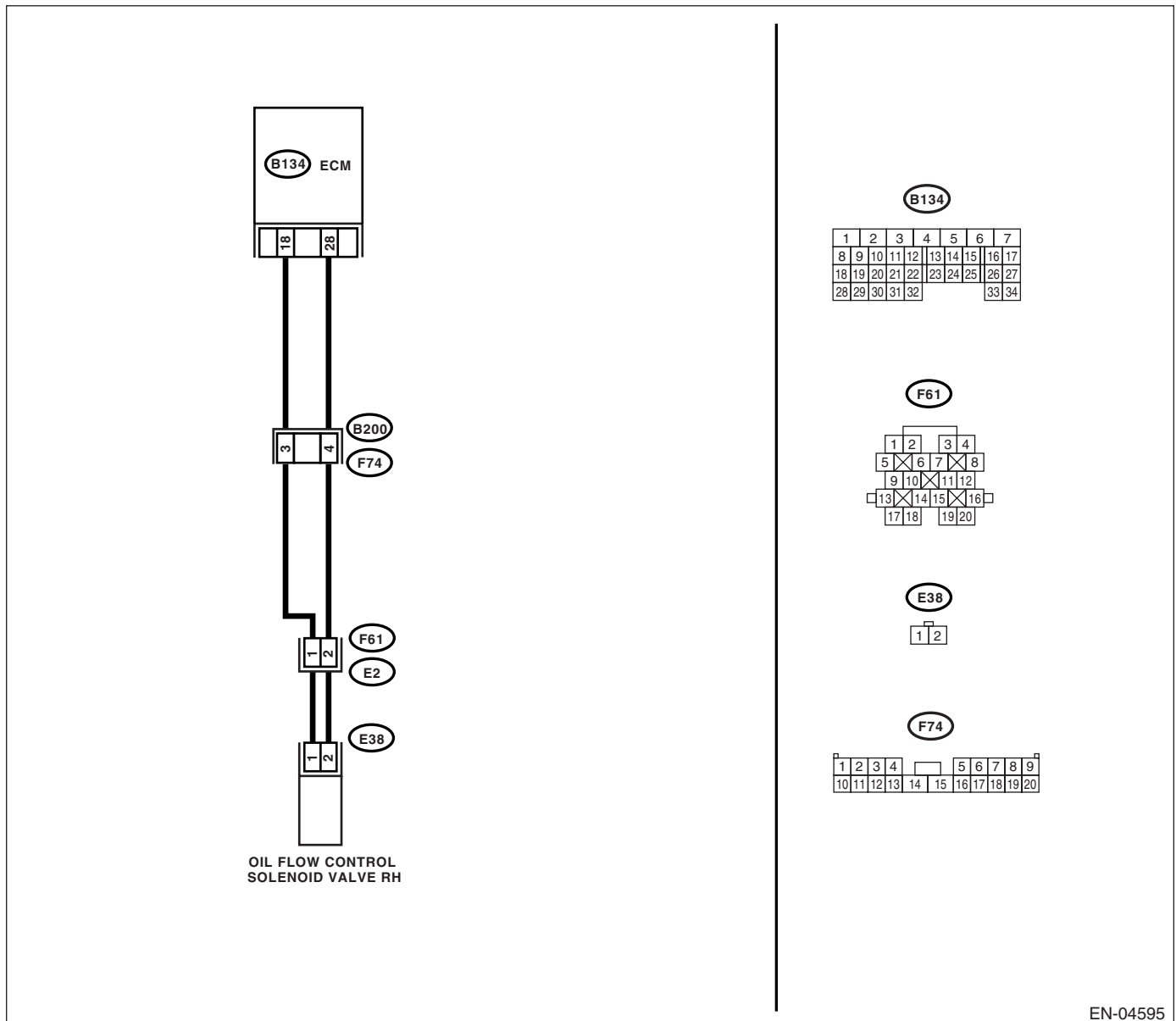
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04595



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from ECM and oil flow control solenoid valve.<br/>3) Measure the resistance between ECM and oil flow control solenoid valve.</p> <p><b>Connector &amp; terminal</b><br/><b>(B134) No. 18 — (E38) No. 1:</b><br/><b>(B134) No. 28 — (E38) No. 2:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | <p>Go to step 2.</p>   | <p>Repair the open circuit in harness between ECM and oil flow control solenoid valve connector.</p> <p>NOTE:<br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and oil flow control solenoid valve connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from ECM and oil flow control solenoid valve.<br/>3) Measure the resistance between ECM and oil flow control solenoid valve.</p> <p><b>Connector &amp; terminal</b><br/><b>(E38) No. 1 — Engine ground:</b><br/><b>(E38) No. 2 — Engine ground:</b></p> | <p>Is the resistance more than 1 <math>M\Omega</math>?</p> | <p>Go to step 3.</p>   | <p>Repair the ground short circuit in harness between ECM and oil flow control solenoid valve connector.</p>  |
| <p><b>3</b></p> <p><b>CHECK OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>1) Remove the oil flow control solenoid valve.<br/>2) Measure the resistance between oil flow control solenoid valve terminals.</p> <p><b>Terminals</b><br/><b>No. 1 — No. 2:</b></p>   | <p>Is the resistance 6 — 12 <math>\Omega</math>?</p>       | <p>Repair the poor contact in ECM and oil flow control solenoid valve.</p> | <p>Replace the oil flow control solenoid valve. &lt;Ref. to ME(STI)-54, Camshaft.&gt;</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DD:DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-234, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

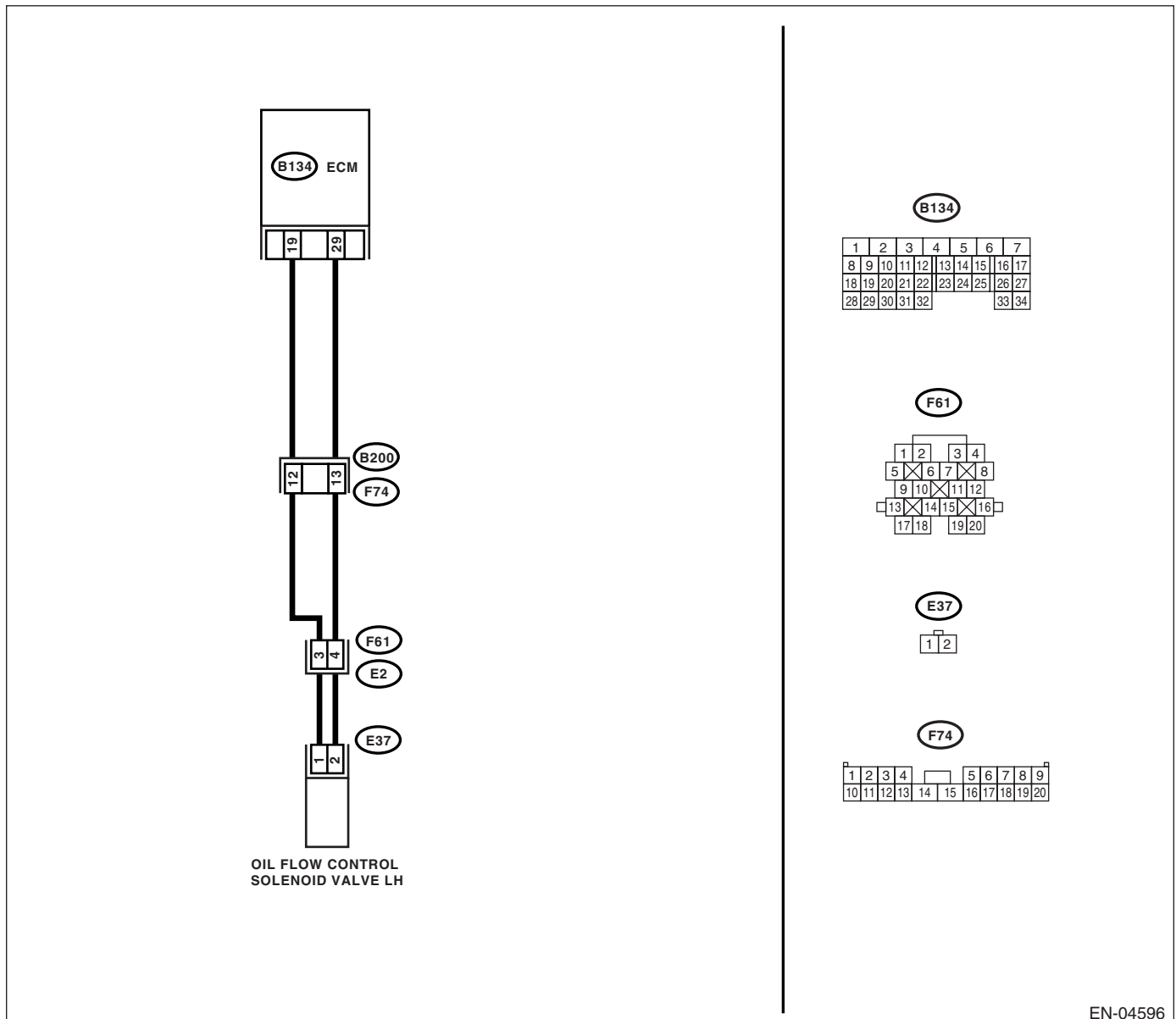
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04596

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from ECM and oil flow control solenoid valve.<br/>3) Measure the resistance between ECM and oil flow control solenoid valve.</p> <p><b>Connector &amp; terminal</b><br/><b>(B134) No. 19 — (E37) No. 1:</b><br/><b>(B134) No. 29 — (E37) No. 2:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | <p>Go to step 2.</p>   | <p>Repair the open circuit in harness between ECM and oil flow control solenoid valve connector.</p> <p><b>NOTE:</b><br/>In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and oil flow control solenoid valve connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>Measure the resistance between ECM and oil flow control solenoid valve.</p> <p><b>Connector &amp; terminal</b><br/><b>(E37) No. 1 — Engine ground:</b><br/><b>(E37) No. 2 — Engine ground:</b></p>  | <p>Is the resistance more than 1 <math>M\Omega</math>?</p> | <p>Go to step 3.</p>   | <p>Repair the ground short circuit in harness between ECM and oil flow control solenoid valve connector.</p>   |
| <p><b>3</b></p> <p><b>CHECK OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>1) Remove the oil flow control solenoid valve.<br/>2) Measure the resistance between oil flow control solenoid valve terminals.</p> <p><b>Terminals</b><br/><b>No. 1 — No. 2:</b></p>   | <p>Is the resistance 6 — 12 <math>\Omega</math>?</p>       | <p>Repair the poor contact in ECM and oil flow control solenoid valve.</p> | <p>Replace the oil flow control solenoid valve. &lt;Ref. to ME(STI)-54, Camshaft.&gt;</p>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DE:DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2)

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-236, DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

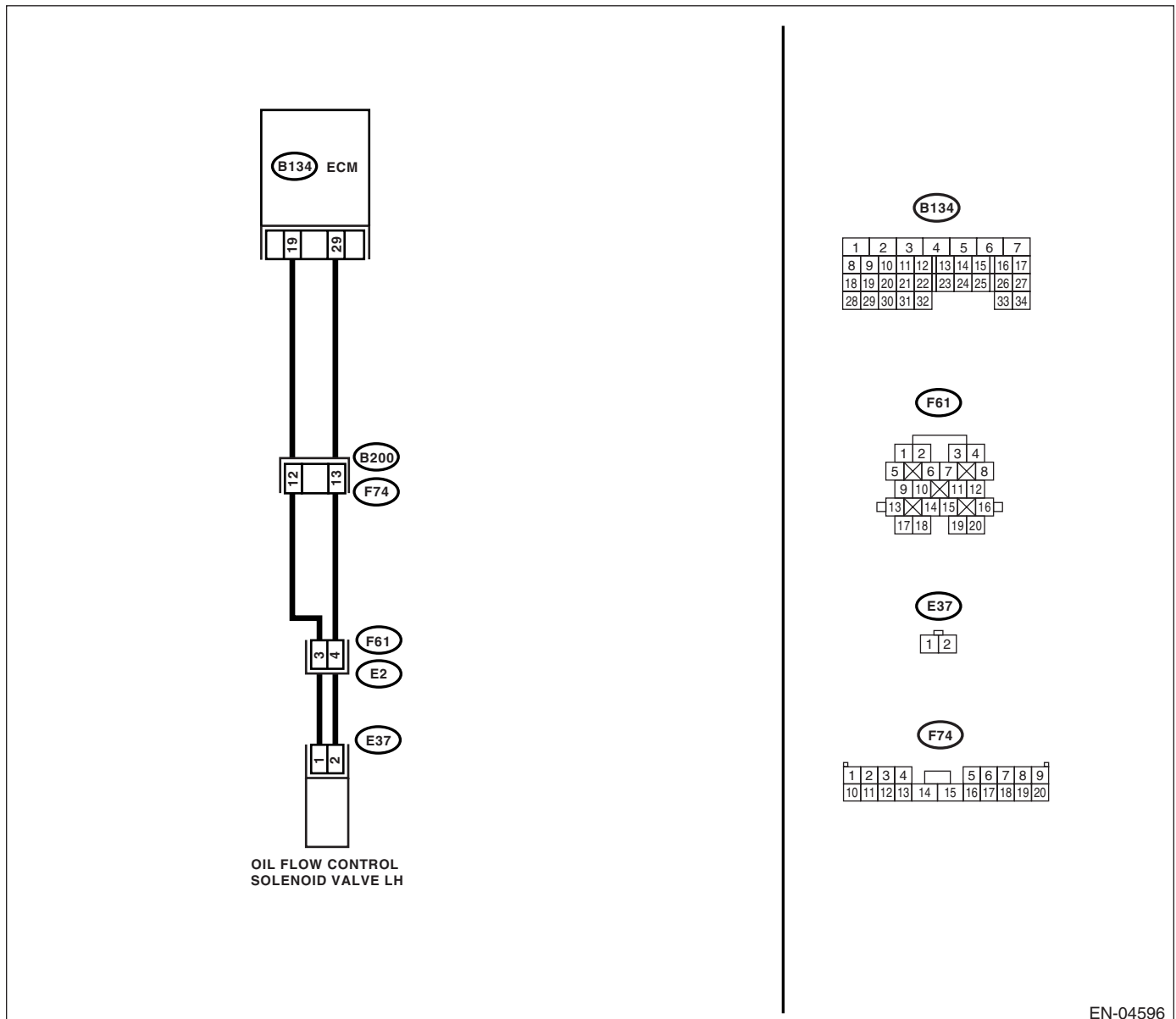
### TROUBLE SYMPTOM:

Erroneous idling

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04596

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM and oil flow control solenoid valve.<br/>                     3) Measure the resistance between ECM and oil flow control solenoid valve.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B134) No. 19 — (E37) No. 1:</b><br/> <b>(B134) No. 29 — (E37) No. 2:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | <p>Go to step 2.</p>   | <p>Repair the open circuit in harness between ECM and oil flow control solenoid valve connector.</p> <p>NOTE:<br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between ECM and oil flow control solenoid valve connector</li> <li>• Poor contact in coupling connector</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM and oil flow control solenoid valve.<br/>                     3) Measure the resistance between ECM and oil flow control solenoid valve.</p> <p><b>Connector &amp; terminal</b><br/> <b>(E37) No. 1 — Engine ground:</b><br/> <b>(E37) No. 2 — Engine ground:</b></p> | <p>Is the resistance more than 1 <math>M\Omega</math>?</p> | <p>Go to step 3.</p>   | <p>Repair the ground short circuit in harness between ECM and oil flow control solenoid valve connector.</p>   |
| <p><b>3</b></p> <p><b>CHECK OIL FLOW CONTROL SOLENOID VALVE.</b></p> <p>1) Remove the oil flow control solenoid valve.<br/>                     2) Measure the resistance between oil flow control solenoid valve terminal.</p> <p><b>Terminals</b><br/> <b>No. 1 — No. 2:</b></p>  | <p>Is the resistance 6 — 12 <math>\Omega</math>?</p>       | <p>Repair the poor contact in ECM and oil flow control solenoid valve.</p> | <p>Replace the oil flow control solenoid valve. &lt;Ref. to ME(STI)-54, Camshaft.&gt;</p>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DF:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

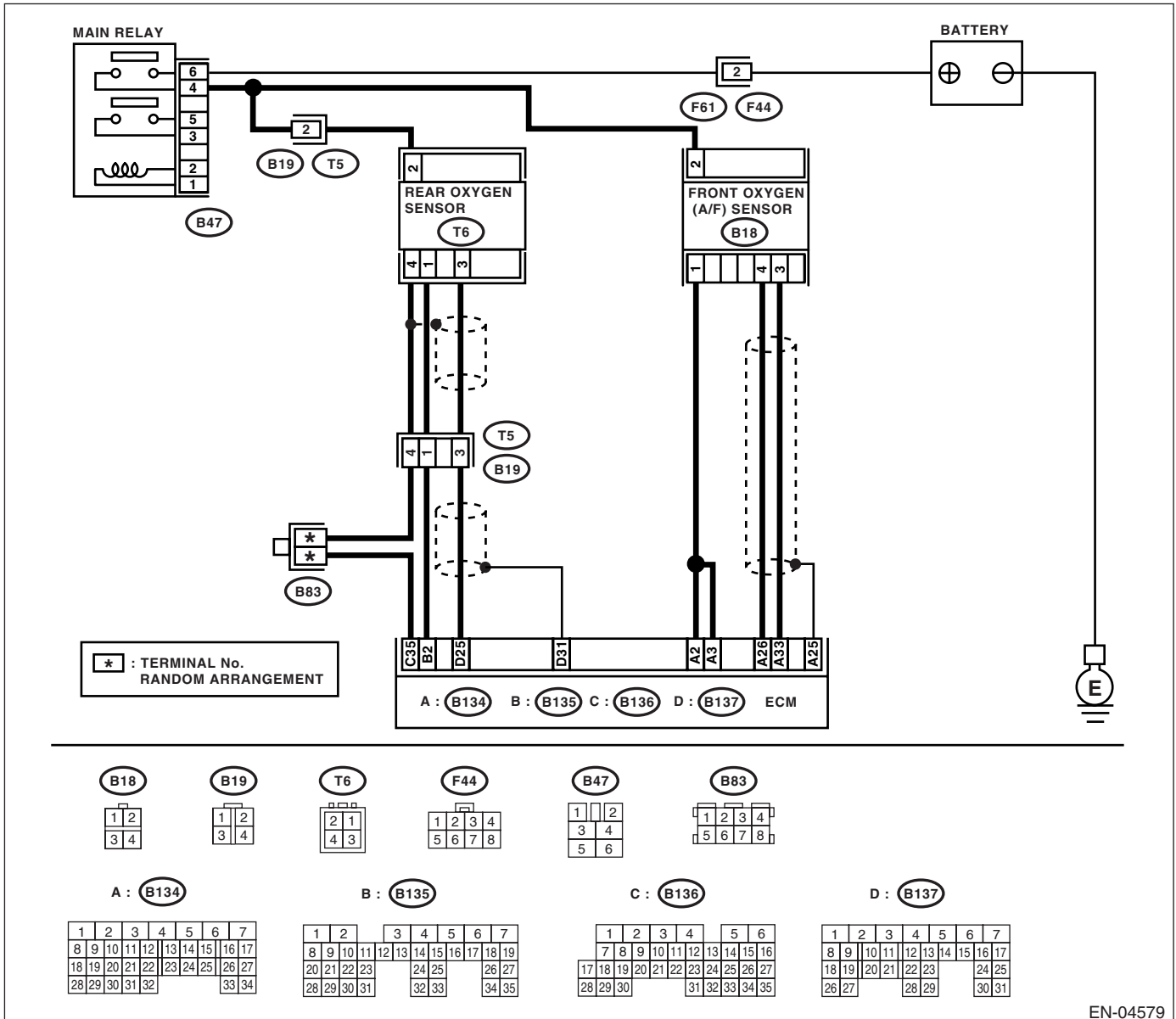
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-238, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04579

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check   | Yes                                       | No  |  |
|------|---|---|---|--|
| 1    | <b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?               | Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).><br>NOTE:<br>In this case, it is not necessary to inspect DTC P2096. | Go to step 2.  |
| 2    | <b>CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>  | Is there water in connector?              | Remove infiltrating water completely.   | Go to step 3.  |
| 3    | <b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br>3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 26 — (B18) No. 4:</b><br><b>(B134) No. 33 — (B18) No. 3:</b> | Is the resistance less than 1 $\Omega$ ?  | Go to step 4.   | Repair the harness and connector.<br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ECM and front oxygen (A/F) sensor connector<br>• Poor contact in front oxygen (A/F) sensor connector<br>• Poor contact in ECM connector |
| 4    | <b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN (A/F) SENSOR CONNECTOR.</b><br>Measure the resistance of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 26 — Chassis ground:</b><br><b>(B134) No. 33 — Chassis ground:</b>  | Is the resistance more than 1 $M\Omega$ ? | Go to step 5.   | Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.  |
| 5    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>1) Connect the connector to ECM.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 26 (+) — Chassis ground (-):</b>  | Is the voltage more than 4.5 V?           | Go to step 6.   | Go to step 7.  |
| 6    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 26 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?            | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>After repair, replace the ECM.<br><Ref. to FU(STI)-39, Engine Control Module (ECM).>        | Repair the poor contact in ECM connector.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <b>7</b><br><b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 33 (+) — Chassis ground (-):</b>   | Is the voltage more than 4.95 V?   | Go to step <b>8</b> .  | Go to step <b>9</b> .  |
| <b>8</b><br><b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 33 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?   | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>After repair, replace the ECM.<br><Ref. to FU(STI)-39, Engine Control Module (ECM).> | Repair the poor contact in ECM connector.  |
| <b>9</b><br><b>CHECK EXHAUST SYSTEM.</b>  | Are there holes or loose bolts on exhaust system?                                    | Repair the exhaust system.   | Go to step <b>10</b> .   |
| <b>10</b><br><b>CHECK AIR INTAKE SYSTEM.</b>  | Are there holes, loose bolts or disconnection of hose on air intake system?          | Repair the air intake system.  | Go to step <b>11</b> .   |
| <b>11</b><br><b>CHECK FUEL PRESSURE.</b><br><b>Warning:</b><br><ul style="list-style-type: none"> <li>• Place “NO FIRE” signs near the working area.</li> <li>• Be careful not to spill fuel on the floor.</li> </ul> Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(STI)-26, INSPECTION, Fuel Pressure.><br><b>Warning:</b><br><b>Before removing the fuel pressure gauge, release fuel pressure.</b><br>NOTE:<br>If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.       | Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm <sup>2</sup> , 41 — 46 psi)?   | Go to step <b>12</b> .   | Repair the following items.<br>Fuel pressure too high: <ul style="list-style-type: none"> <li>• Clogged fuel return line or bent hose</li> </ul> Fuel pressure too low: <ul style="list-style-type: none"> <li>• Improper fuel pump discharge</li> <li>• Clogged fuel supply line</li> </ul>   |
| <b>12</b><br><b>CHECK FUEL PRESSURE.</b><br>After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(STI)-26, INSPECTION, Fuel Pressure.><br><b>Warning:</b><br><b>Before removing the fuel pressure gauge, release fuel pressure.</b><br>NOTE:<br><ul style="list-style-type: none"> <li>• If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.</li> <li>• If the measured value at this step is out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.</li> </ul> | Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm <sup>2</sup> , 33 — 38 psi)? | Go to step <b>13</b> .   | Repair the following items.<br>Fuel pressure too high: <ul style="list-style-type: none"> <li>• Faulty pressure regulator</li> <li>• Clogged fuel return line or bent hose</li> </ul> Fuel pressure too low: <ul style="list-style-type: none"> <li>• Faulty pressure regulator</li> <li>• Improper fuel pump discharge</li> <li>• Clogged fuel supply line</li> </ul> |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes                   | No   |
|--|---|-----------------------|--|
| <p><b>13 CHECK ENGINE COOLANT TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up completely.<br/>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:<br/>• Subaru Select Monitor<br/>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;<br/>• General scan tool<br/>For detailed operation procedure, refer to the general scan tool instruction manual.</p>  | <p>Is the temperature above 60°C (140°F)?</p>   | <p>Go to step 14.</p> | <p>Replace the engine coolant temperature sensor. &lt;Ref. to FU(STI)-25, Engine Coolant Temperature Sensor.&gt;</p>                             |
| <p><b>14 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).<br/>2) Place the shift lever in neutral position.<br/>3) Turn the A/C switch to OFF.<br/>4) Turn all accessory switches to OFF.<br/>5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:<br/>• Subaru Select Monitor<br/>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;<br/>• General scan tool<br/>For detailed operation procedure, refer to the general scan tool instruction manual.</p>  | <p>Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)?</p>  | <p>Go to step 15.</p> | <p>Replace the mass air flow and intake air temperature sensor. &lt;Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p> |
| <p><b>15 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).<br/>2) Place the shift lever in neutral position.<br/>3) Turn the A/C switch to OFF.<br/>4) Turn all accessory switches to OFF.<br/>5) Open the front hood.<br/>6) Measure the ambient temperature.<br/>7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:<br/>• Subaru Select Monitor<br/>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;<br/>• General scan tool<br/>For detailed operation procedure, refer to the general scan tool instruction manual.</p> | <p>Subtract ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?</p> | <p>Go to step 16.</p> | <p>Check the mass air flow and intake air temperature sensor. &lt;Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                            | Yes  | No  |
|--|----------------------------------|--|---|
| <b>16 CHECK REAR OXYGEN SENSOR DATA.</b><br>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest)<br>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.<br><br><b>NOTE:</b><br><ul style="list-style-type: none"> <li>• Depress the clutch pedal.</li> <li>• Subaru Select Monitor</li> </ul> For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.><br><ul style="list-style-type: none"> <li>• General scan tool</li> </ul> For detailed operation procedure, refer to the general scan tool instruction manual. | Is the voltage more than 490 mV? | Go to step 20.   | Go to step 17.  |
| <b>17 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>   | Is there water in connector?     | Remove infiltrating water completely.  | Go to step 18.  |
| <b>18 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and rear oxygen sensor.<br>3) Measure the resistance of harness between ECM and rear oxygen sensor connector.<br><br><b>Connector &amp; terminal</b><br><b>(B137) No. 25 — (T6) No. 3:</b><br><b>(B136) No. 35 — (T6) No. 4:</b>   | Is the resistance more than 3 Ω? | Repair open circuit in harness between ECM and rear oxygen sensor connector. | Go to step 19.  |
| <b>19 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from rear oxygen sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(T6) No. 3 (+) — Engine ground (-):</b>  | Is the voltage 0.2 — 0.5 V?      | Replace the rear oxygen sensor.<br><Ref. to FU(STI)-38, Rear Oxygen Sensor.> | Repair harness and connector.<br><b>NOTE:</b><br>In this case, repair the following:<br><ul style="list-style-type: none"> <li>• Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in ECM connector</li> </ul> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No                           |
|---|--|--|------------------------------|
| <p><b>20 CHECK REAR OXYGEN SENSOR DATA.</b></p> <p>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm.</p> <p>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Depress the clutch pedal.</li> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p> | <p>Is the voltage less than 250 mV?</p>                                      | <p>Go to step <b>21</b>.</p>   | <p>Go to step <b>17</b>.</p> |
| <p><b>21 CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA.</b></p> <p>1) Warm-up the engine until engine coolant temperature exceeds 70°C (158°F), and leave it for 5 minutes or more with idling.</p> <p>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p>             | <p>Is the voltage more than 0.8 V for more than 5 minutes during idling?</p> | <p>Replace the front oxygen (A/F) sensor. &lt;Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.&gt;</p> | <p>Go to step <b>18</b>.</p> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DG:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

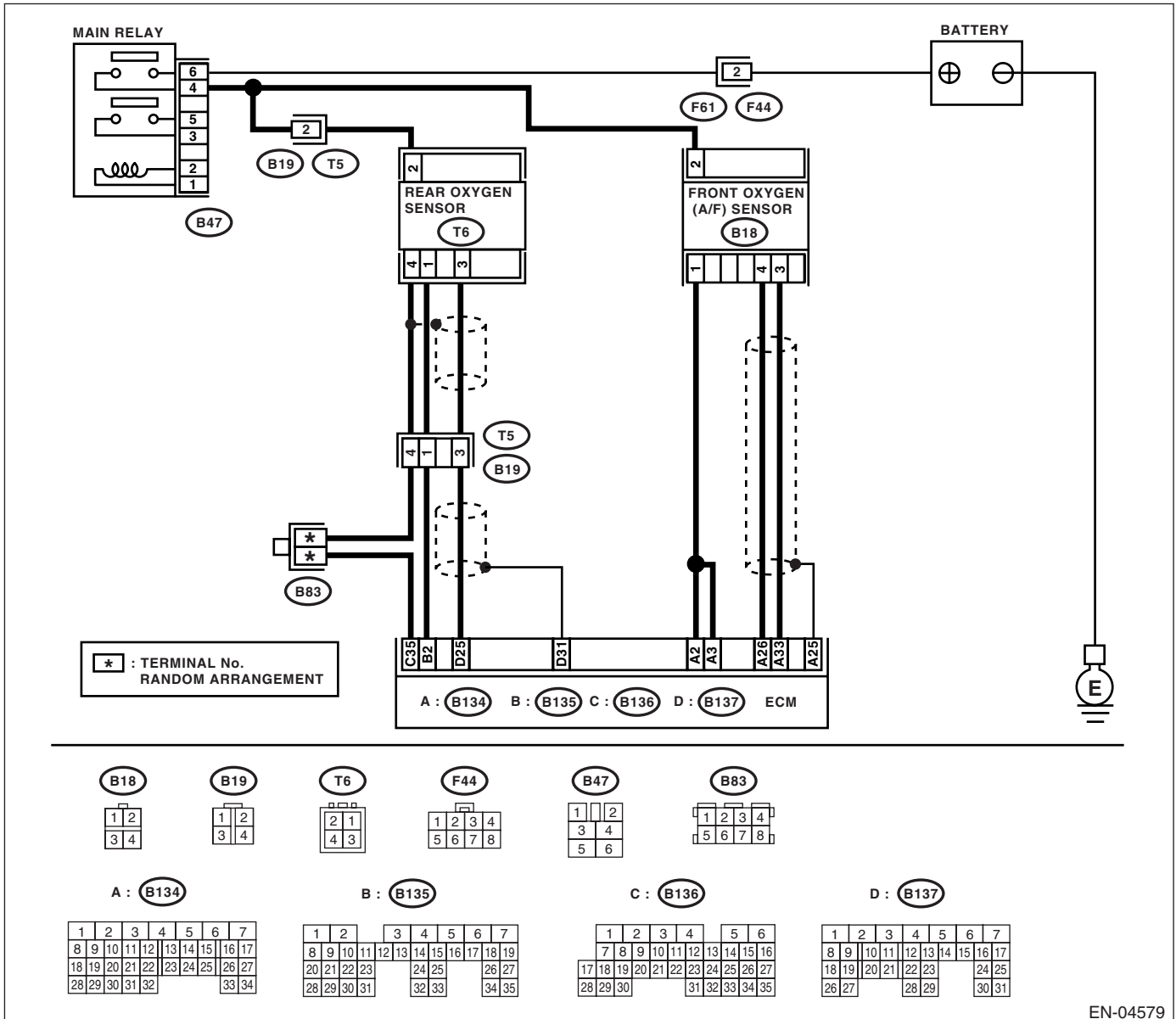
### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-240, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04579

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step | Check   | Yes                                       | No  |  |
|------|---|---|---|--|
| 1    | <b>CHECK ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?               | Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).><br>NOTE:<br>In this case, it is not necessary to inspect DTC P2097. | Go to step 2.  |
| 2    | <b>CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.</b>  | Is there water in connector?              | Remove infiltrating water completely.   | Go to step 3.  |
| 3    | <b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN (A/F) SENSOR CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector.<br>3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 26 — (B18) No. 4:</b><br><b>(B134) No. 33 — (B18) No. 3:</b> | Is the resistance less than 1 $\Omega$ ?  | Go to step 4.   | Repair the harness and connector.<br>NOTE:<br>In this case, repair the following:<br>• Open circuit in harness between ECM and front oxygen (A/F) sensor connector<br>• Poor contact in front oxygen (A/F) sensor connector<br>• Poor contact in ECM connector |
| 4    | <b>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN (A/F) SENSOR CONNECTOR.</b><br>Measure the resistance of harness between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 26 — Chassis ground:</b><br><b>(B134) No. 33 — Chassis ground:</b>  | Is the resistance more than 1 $M\Omega$ ? | Go to step 5.   | Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.  |
| 5    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>1) Connect the connector to ECM.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 26 (+) — Chassis ground (-):</b>  | Is the voltage more than 4.5 V?           | Go to step 6.   | Go to step 7.  |
| 6    | <b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 26 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?            | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>After repair, replace the ECM.<br><Ref. to FU(STI)-39, Engine Control Module (ECM).>        | Repair the poor contact in ECM connector.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <b>7</b><br><b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 33 (+) — Chassis ground (-):</b>   | Is the voltage more than 4.95 V?   | Go to step <b>8</b> .  | Go to step <b>9</b> .  |
| <b>8</b><br><b>CHECK OUTPUT SIGNAL FOR ECM.</b><br>Measure the voltage between ECM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B134) No. 33 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?   | Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.<br>After repair, replace the ECM.<br><Ref. to FU(STI)-39, Engine Control Module (ECM).> | Repair the poor contact in ECM connector.  |
| <b>9</b><br><b>CHECK EXHAUST SYSTEM.</b>  | Are there holes or loose bolts on exhaust system?                                    | Repair the exhaust system.   | Go to step <b>10</b> .   |
| <b>10</b><br><b>CHECK AIR INTAKE SYSTEM.</b>  | Are there holes, loose bolts or disconnection of hose on air intake system?          | Repair the air intake system.  | Go to step <b>11</b> .   |
| <b>11</b><br><b>CHECK FUEL PRESSURE.</b><br><b>Warning:</b><br><ul style="list-style-type: none"> <li>• Place “NO FIRE” signs near the working area.</li> <li>• Be careful not to spill fuel on the floor.</li> </ul> Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(STI)-26, INSPECTION, Fuel Pressure.><br><b>Warning:</b><br><b>Before removing the fuel pressure gauge, release fuel pressure.</b><br>NOTE:<br>If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.       | Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm <sup>2</sup> , 41 — 46 psi)?   | Go to step <b>12</b> .   | Repair the following items.<br>Fuel pressure too high: <ul style="list-style-type: none"> <li>• Clogged fuel return line or bent hose</li> </ul> Fuel pressure too low: <ul style="list-style-type: none"> <li>• Improper fuel pump discharge</li> <li>• Clogged fuel supply line</li> </ul>   |
| <b>12</b><br><b>CHECK FUEL PRESSURE.</b><br>After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(STI)-26, INSPECTION, Fuel Pressure.><br><b>Warning:</b><br><b>Before removing the fuel pressure gauge, release fuel pressure.</b><br>NOTE:<br><ul style="list-style-type: none"> <li>• If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.</li> <li>• If the measured value at this step is out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.</li> </ul> | Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm <sup>2</sup> , 33 — 38 psi)? | Go to step <b>13</b> .   | Repair the following items.<br>Fuel pressure too high: <ul style="list-style-type: none"> <li>• Faulty pressure regulator</li> <li>• Clogged fuel return line or bent hose</li> </ul> Fuel pressure too low: <ul style="list-style-type: none"> <li>• Faulty pressure regulator</li> <li>• Improper fuel pump discharge</li> <li>• Clogged fuel supply line</li> </ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check   | Yes                   | No   |
|--|---|-----------------------|--|
| <p><b>13 CHECK ENGINE COOLANT TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up completely.<br/>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:<br/>• Subaru Select Monitor<br/>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;<br/>• General scan tool<br/>For detailed operation procedure, refer to the general scan tool instruction manual.</p>  | <p>Is the temperature above 60°C (140°F)?</p>   | <p>Go to step 14.</p> | <p>Replace the engine coolant temperature sensor. &lt;Ref. to FU(STI)-25, Engine Coolant Temperature Sensor.&gt;</p>                             |
| <p><b>14 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).<br/>2) Place the shift lever in neutral position.<br/>3) Turn the A/C switch to OFF.<br/>4) Turn all accessory switches to OFF.<br/>5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:<br/>• Subaru Select Monitor<br/>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;<br/>• General scan tool<br/>For detailed operation procedure, refer to the general scan tool instruction manual.</p>  | <p>Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)?</p>  | <p>Go to step 15.</p> | <p>Replace the mass air flow and intake air temperature sensor. &lt;Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p> |
| <p><b>15 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</b></p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).<br/>2) Place the shift lever in neutral position.<br/>3) Turn the A/C switch to OFF.<br/>4) Turn all accessory switches to OFF.<br/>5) Open the front hood.<br/>6) Measure the ambient temperature.<br/>7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:<br/>• Subaru Select Monitor<br/>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;<br/>• General scan tool<br/>For detailed operation procedure, refer to the general scan tool instruction manual.</p> | <p>Subtract ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?</p> | <p>Go to step 16.</p> | <p>Check the mass air flow and intake air temperature sensor. &lt;Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.&gt;</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                   | Yes   | No  |
|---|---|---|---|
| <p><b>16 CHECK REAR OXYGEN SENSOR DATA.</b><br/>                     1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest)<br/>                     2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• Depress the clutch pedal.</li> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p> | <p>Is the voltage more than 490 mV?</p> | <p>Go to step 20.</p>   | <p>Go to step 17.</p>   |
| <p><b>17 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</b></p>   | <p>Is there water in connector?</p>     | <p>Remove infiltrating water completely.</p>  | <p>Go to step 18.</p>   |
| <p><b>18 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</b><br/>                     1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connectors from ECM and rear oxygen sensor.<br/>                     3) Measure the resistance of harness between ECM and rear oxygen sensor connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B137) No. 25 — (T6) No. 3:</b><br/> <b>(B136) No. 35 — (T6) No. 4:</b></p>   | <p>Is the resistance more than 3 Ω?</p> | <p>Repair open circuit in harness between ECM and rear oxygen sensor connector.</p>                             | <p>Go to step 19.</p>   |
| <p><b>19 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</b><br/>                     1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from rear oxygen sensor.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T6) No. 3 (+) — Engine ground (-):</b></p>  | <p>Is the voltage 0.2 — 0.5 V?</p>      | <p>Replace the rear oxygen sensor.<br/>                     &lt;Ref. to FU(STI)-38, Rear Oxygen Sensor.&gt;</p> | <p>Repair harness and connector.</p> <p><b>NOTE:</b><br/>                     In this case, repair the following:</p> <ul style="list-style-type: none"> <li>• Open circuit in harness between rear oxygen sensor and ECM connector</li> <li>• Poor contact in rear oxygen sensor connector</li> <li>• Poor contact in ECM connector</li> </ul> |



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes  | No                           |
|--|--|--|------------------------------|
| <p><b>20 CHECK REAR OXYGEN SENSOR DATA.</b></p> <p>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm.</p> <p>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• Depress the clutch pedal.</li> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p> | <p>Is the voltage less than 250 mV?</p>                                      | <p>Go to step <b>21</b>.</p>   | <p>Go to step <b>17</b>.</p> |
| <p><b>21 CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA.</b></p> <p>1) Warm-up the engine until engine coolant temperature exceeds 70°C (158°F), and leave it for 5 minutes or more with idling.</p> <p>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• Subaru Select Monitor</li> </ul> <p>For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". &lt;Ref. to EN(STI)(diag)-28, Subaru Select Monitor.&gt;</p> <ul style="list-style-type: none"> <li>• General scan tool</li> </ul> <p>For detailed operation procedure, refer to the general scan tool instruction manual.</p>             | <p>Is the voltage more than 0.8 V for more than 5 minutes during idling?</p> | <p>Replace the front oxygen (A/F) sensor. &lt;Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.&gt;</p> | <p>Go to step <b>18</b>.</p> |

## **DH:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE**

### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-179, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>, <Ref. to GD(STI)-190, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(STI)-242, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### **TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance
- Engine stalls.

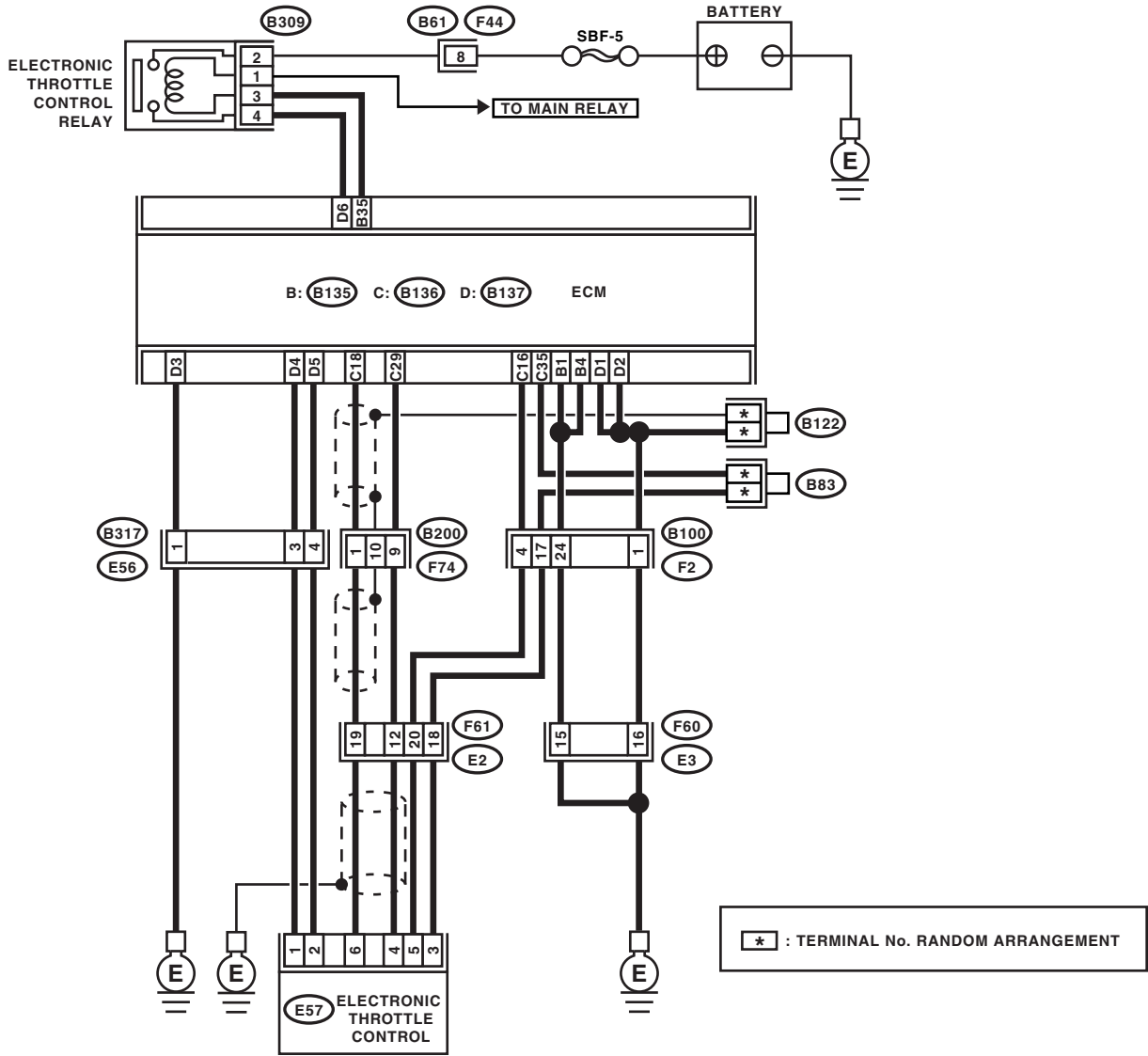
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

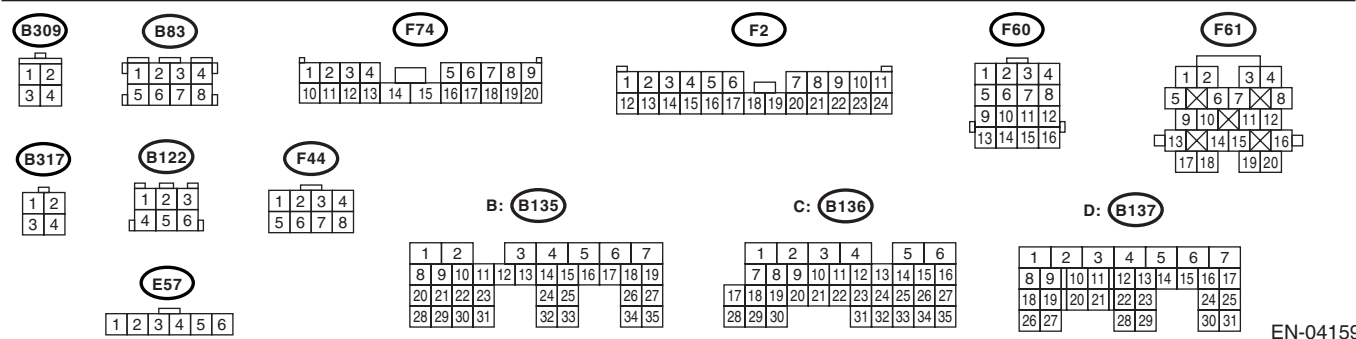
# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



\* : TERMINAL No. RANDOM ARRANGEMENT



EN-04159

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes   | No  |
|---|--|---|---|
| <p><b>1 CHECK ELECTRONIC THROTTLE CONTROL RELAY.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Remove the electronic throttle control relay.<br/>                     3) Using a lead wire, connect the positive terminal of battery to electronic throttle control relay terminal No. 1, and ground terminal of battery to electronic throttle control relay terminal No. 3.<br/>                     4) Measure the resistance between electronic throttle control relay terminals.</p> <p><b>Terminals</b><br/> <b>No. 2 — No. 4:</b></p> | Is the resistance less than 1 $\Omega$ ?   | Go to step 2.   | Replace the electronic throttle control relay.  |
| <p><b>2 CHECK POWER SUPPLY TO ELECTRONIC THROTTLE CONTROL RELAY.</b></p> <p>1) Turn the ignition switch to ON.<br/>                     2) Measure the voltage between electronic throttle control relay connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B309) No. 1 (+) — Engine ground (-):</b><br/> <b>(B309) No. 2 (+) — Engine ground (-):</b></p>  | Is the voltage more than 10 V?             | Go to step 3.   | Repair the open power supply circuit or ground short.                                 |
| <p><b>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between electronic throttle control relay connector and engine ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B309) No. 3 (+) — Engine ground (-):</b></p>  | Is the voltage more than 10 V?             | Repair the power supply short circuit of harness between ECM and electronic throttle control relay. | Go to step 4.   |
| <p><b>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Measure the resistance between electronic throttle control relay connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B309) No. 3 — Engine ground:</b><br/> <b>(B309) No. 4 — Engine ground:</b></p>   | Is the resistance more than 1 M $\Omega$ ? | Go to step 5.   | Repair the ground short of harness between ECM and electronic throttle control relay. |
| <p><b>5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Measure the resistance between electronic throttle control connector and electronic throttle control relay connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B135) No. 35 — (B309) No. 3:</b><br/> <b>(B137) No. 6 — (B309) No. 4:</b></p>   | Is the resistance less than 1 $\Omega$ ?   | Go to step 6.   | Repair the open circuit of harness between ECM and electronic throttle control relay. |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes                      | No   |
|--|--|--------------------------|--|
| <b>6 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Connect all the connectors.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 18 (+) — (B136) No. 35 (-):</b></i><br>4) Shake the ECM harness and connector, engine harness connectors (B136, F61), electronic throttle control connector harness while monitoring value of voltage meter. | Is the voltage more than 0.4 V?  | Go to step 7.            | Go to step 9.  |
| <b>7 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Connect all the connectors.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between ECM connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 29 (+) — (B136) No. 35 (-):</b></i><br>4) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.             | Is the voltage more than 0.8 V?  | Go to step 8.            | Go to step 9.  |
| <b>8 CHECK POOR CONTACT.</b><br>Check poor contact between ECM connector and electronic throttle control connector.  | Is there poor contact between ECM connector and electronic throttle control connector? | Repair the poor contact. | Go to step 13.   |
| <b>9 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 16 — (E57) No. 5:</b></i>   | Is the resistance less than 1 $\Omega$ ?   | Go to step 10.           | Repair the open harness connector.   |
| <b>10 CHECK THE HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>Measure the resistance between ECM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 16 — Chassis ground:</b></i><br><i><b>(B136) No. 18 — Chassis ground:</b></i><br><i><b>(B136) No. 29 — Chassis ground:</b></i>  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 11.           | Repair the ground short of harness.  |
| <b>11 CHECK POWER SUPPLY TO SENSOR.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the resistance between electronic throttle control connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E57) No. 5 (+) — Engine ground (-):</b></i><br>4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.                            | Is the voltage 4.5 — 5.5 V?  | Go to step 12.           | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes                                    | No   |
|---|--|--|--|
| <b>12 CHECK SHORT OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electronic throttle control connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 6 — Engine ground:</b><br><b>(E57) No. 4 — Engine ground:</b>   | Is the resistance more than 10 $\Omega$ ?  | Go to step 13.                         | Repair the poor contact in ECM connector. If problem persists, replace the ECM.                      |
| <b>13 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Connect all the connectors.<br>2) Turn the ignition switch to ON.<br>3) Read the data of main throttle sensor signal, using the Subaru Select Monitor.<br>4) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.   | Is the voltage 4.63 V?   | Go to step 14.                         | Go to step 16.   |
| <b>14 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Read the data of sub throttle sensor signal, using the Subaru Select Monitor.<br>2) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.  | Is the voltage 4.73 V?   | Go to step 15.                         | Go to step 16.   |
| <b>15 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electronic throttle control?  | Is there poor contact in connectors between ECM and electronic throttle control? | Repair the poor contact in connectors. | Go to step 21.   |
| <b>16 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><b>Connector &amp; terminal</b><br><b>(B136) No. 35 — (E57) No. 3:</b><br><b>(B136) No. 18 — (E57) No. 6:</b><br><b>(B136) No. 29 — (E57) No. 4:</b> | Is the resistance less than 1 $\Omega$ ?   | Go to step 17.                         | Repair the open harness connector.   |
| <b>17 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between electronic throttle control connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 3 — Engine ground:</b>   | Is the resistance less than 5 $\Omega$ ?   | Go to step 18.                         | Repair the poor contact in ECM connector. If problem persists, replace the ECM.                      |
| <b>18 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between electronic throttle control connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(E57) No. 5 (+) — Engine ground (-):</b><br>3) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.  | Is the voltage less than 10 V?   | Go to step 19.                         | Repair the battery short of harness between ECM connector and electronic throttle control connector. |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check                                      | Yes                    | No  |
|---|--|------------------------|---|
| <b>19 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Measure the voltage between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 6 (+) — Engine ground (-):</i><br><i>(E57) No. 4 (+) — Engine ground (-):</i><br>2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.                           | Is the voltage less than 10 V?             | Go to step <b>20</b> . | Repair the short of harness between ECM connector and electronic throttle control connector.                                    |
| <b>20 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the ECM.<br>3) Measure the voltage between ECM connectors.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 18 — (B136) No. 35:</i><br><i>(B136) No. 29 — (B136) No. 35:</i>  | Is the resistance more than 1 M $\Omega$ ? | Go to step <b>21</b> . | Repair the short of sensor power supply.  |
| <b>21 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect all the connectors except electronic throttle control replay.<br>3) Turn the ignition switch to ON.<br>4) Read the data of main throttle sensor signals, using Subaru Select Monitor.  | Is the voltage 0.81 — 0.87 V?              | Go to step <b>22</b> . | Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control. |
| <b>22 CHECK OUTPUT VOLTAGE OF SENSOR.</b><br>Read the data of sub throttle sensor signals, using Subaru Select Monitor.   | Is the voltage 1.64 — 1.70 V?              | Go to step <b>23</b> . | Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control. |
| <b>23 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connectors from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><i>Connector &amp; terminal</i><br><i>(B137) No. 5 — (E57) No. 2:</i><br><i>(B137) No. 4 — (E57) No. 1:</i> | Is the resistance less than 1 $\Omega$ ?   | Go to step <b>24</b> . | Repair the open harness connector.  |
| <b>24 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.</b><br>1) Connect the connectors to ECM.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 2 (+) — Engine ground (-):</i><br><i>(E57) No. 1 (+) — Engine ground (-):</i>   | Is the voltage less than 5 V?              | Go to step <b>25</b> . | Repair the short of harness to power supply circuit between ECM and electronic throttle control.                                |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check   | Yes   | No                                       |
|---|---|---|--|
| <b>25 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Measure the resistance between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 2 — Engine ground:</i><br><i>(E57) No. 1 — Engine ground:</i> | Is the resistance more than 1 M $\Omega$ ?  | Go to step <b>26</b> .  | Repair the short of harness.             |
| <b>26 CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS.</b><br>Measure the resistance between electronic throttle control connector terminals.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 2 — (E57) No. 1:</i>   | Is the resistance more than 1 M $\Omega$ ?  | Go to step <b>27</b> .  | Repair the short of harness.             |
| <b>27 CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT.</b><br>Measure the resistance between ECM connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B137) No. 3 — Engine ground:</i>   | Is the resistance less than 10 $\Omega$ ?   | Go to step <b>28</b> .  | Repair the open circuit harness.         |
| <b>28 CHECK ELECTRONIC THROTTLE CONTROL.</b><br>Measure the resistance between electronic throttle control terminals.<br><i>Terminals</i><br><i>No. 1 — No. 2:</i>  | Is the resistance less than 5 $\Omega$ ?  | Go to step <b>29</b> .  | Replace the electronic throttle control. |
| <b>29 CHECK ELECTRONIC THROTTLE CONTROL.</b><br>Open and close the throttle valve to its full width with finger.  | Does it return to specified position (3 mm (0.12 in) open from fully closed position.) when finger is released? | Repair the poor contact in ECM connector. If problem persists, replace the ECM.<br><Ref. to FU(STI)-39, Engine Control Module (ECM).> | Replace the electronic throttle control. |



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **DI: DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW**

#### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-244, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance
- Engine stalls.

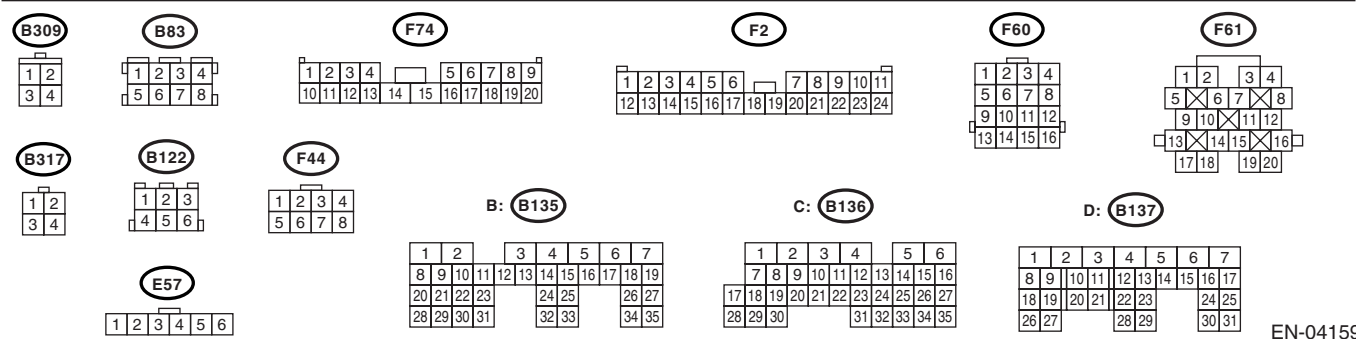
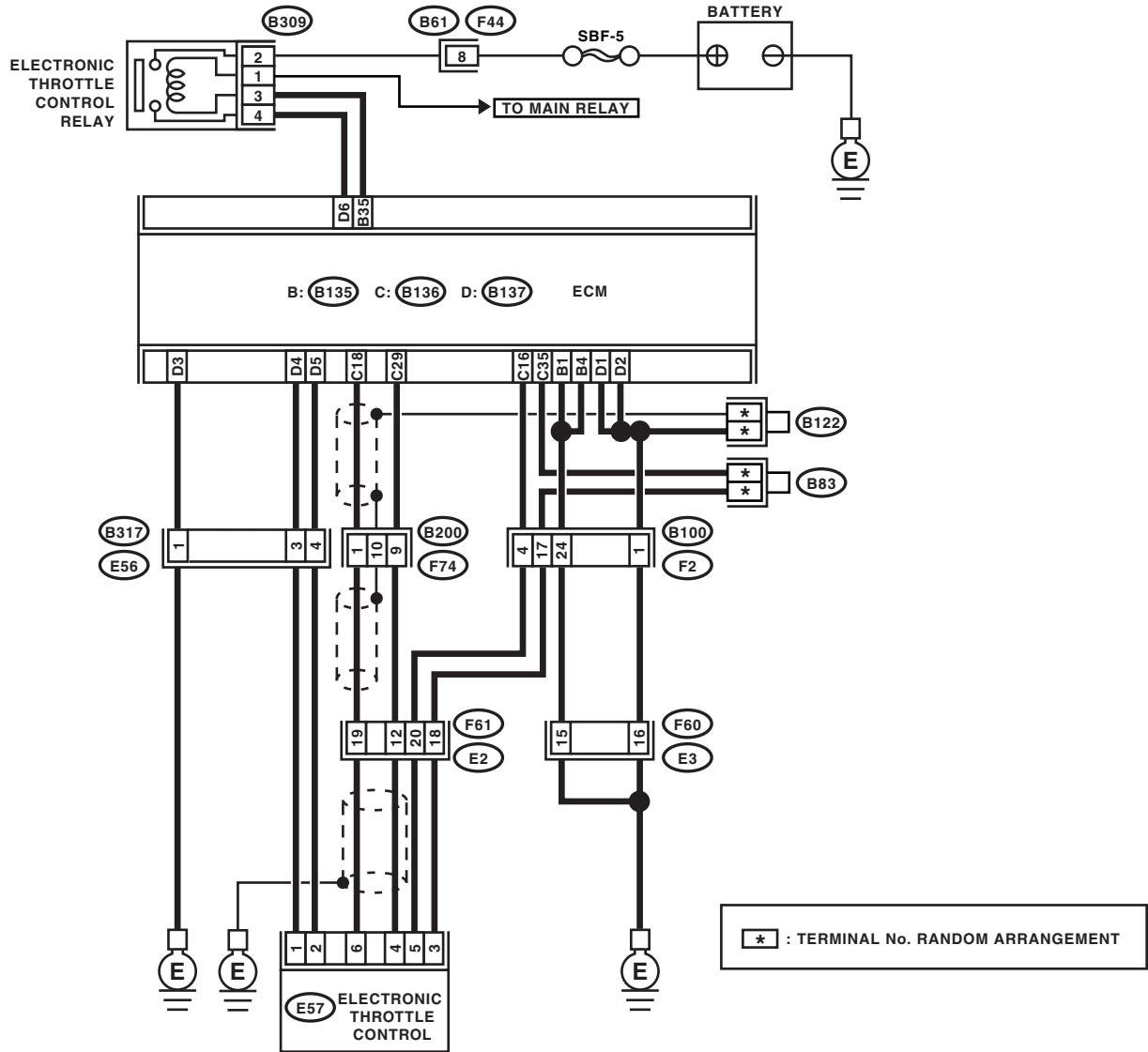
#### **CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04159

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check                                     | Yes  | No  |
|---|---|--|---|
| <b>1 CHECK ELECTRONIC THROTTLE CONTROL RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electronic throttle control relay.<br>3) Using a lead wire, connect the positive terminal of battery to electronic throttle control terminal No. 1, and ground terminal of battery to electronic throttle control terminal No. 3.<br>4) Measure the resistance between electronic throttle control terminals.<br><i>Connector &amp; terminal</i><br><i>(B309) No. 2 — (B309) No. 4:</i> | Is the resistance less than 1 $\Omega$ ?  | Go to step 2.  | Replace the electronic throttle control relay.  |
| <b>2 CHECK POWER TO ELECTRONIC THROTTLE CONTROL RELAY</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between electronic throttle control relay connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B309) No. 1 (+) — Engine ground (-):</i><br><i>(B309) No. 2 (+) — Engine ground (-):</i>   | Is the voltage more than 10 V?            | Go to step 3.  | Repair the open power supply circuit or ground short.                                 |
| <b>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between electronic throttle control relay connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B309) No. 3 (+) — Engine ground (-):</i>   | Is the voltage more than 10 V?            | Repair the power supply short circuit of harness between ECM and electronic throttle control relay.                                | Go to step 4.   |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electronic throttle control relay connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B309) No. 3 — Engine ground:</i><br><i>(B309) No. 4 — Engine ground:</i>  | Is the resistance more than 1 $M\Omega$ ? | Go to step 5.  | Repair the ground short of harness between ECM and electronic throttle control relay. |
| <b>5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</b><br>Measure the resistance between ECM connector and electronic throttle control relay connector.<br><i>Connector &amp; terminal</i><br><i>(B135) No. 35 — (B309) No. 3:</i><br><i>(B137) No. 6 — (B309) No. 4:</i>  | Is the resistance less than 1 $\Omega$ ?  | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> | Repair the open harness between ECM and electronic throttle control relay.            |

## **DJ:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH**

### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-246, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

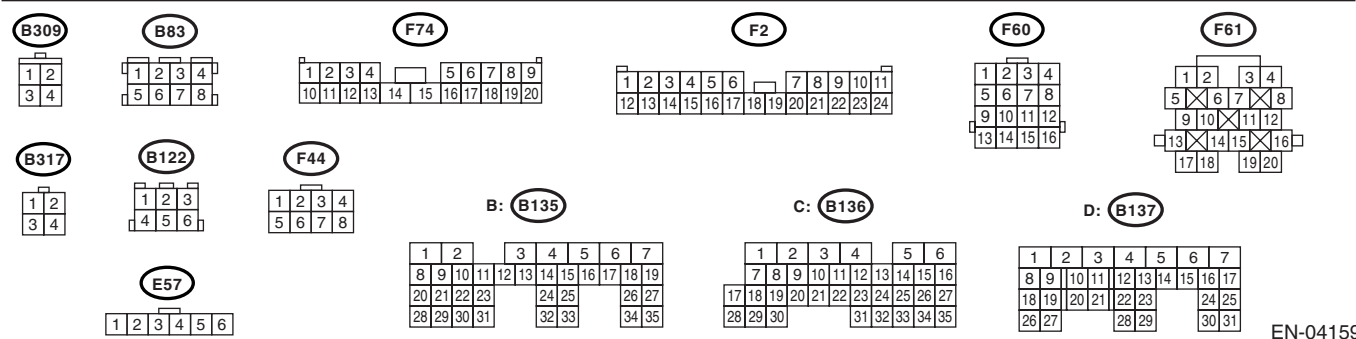
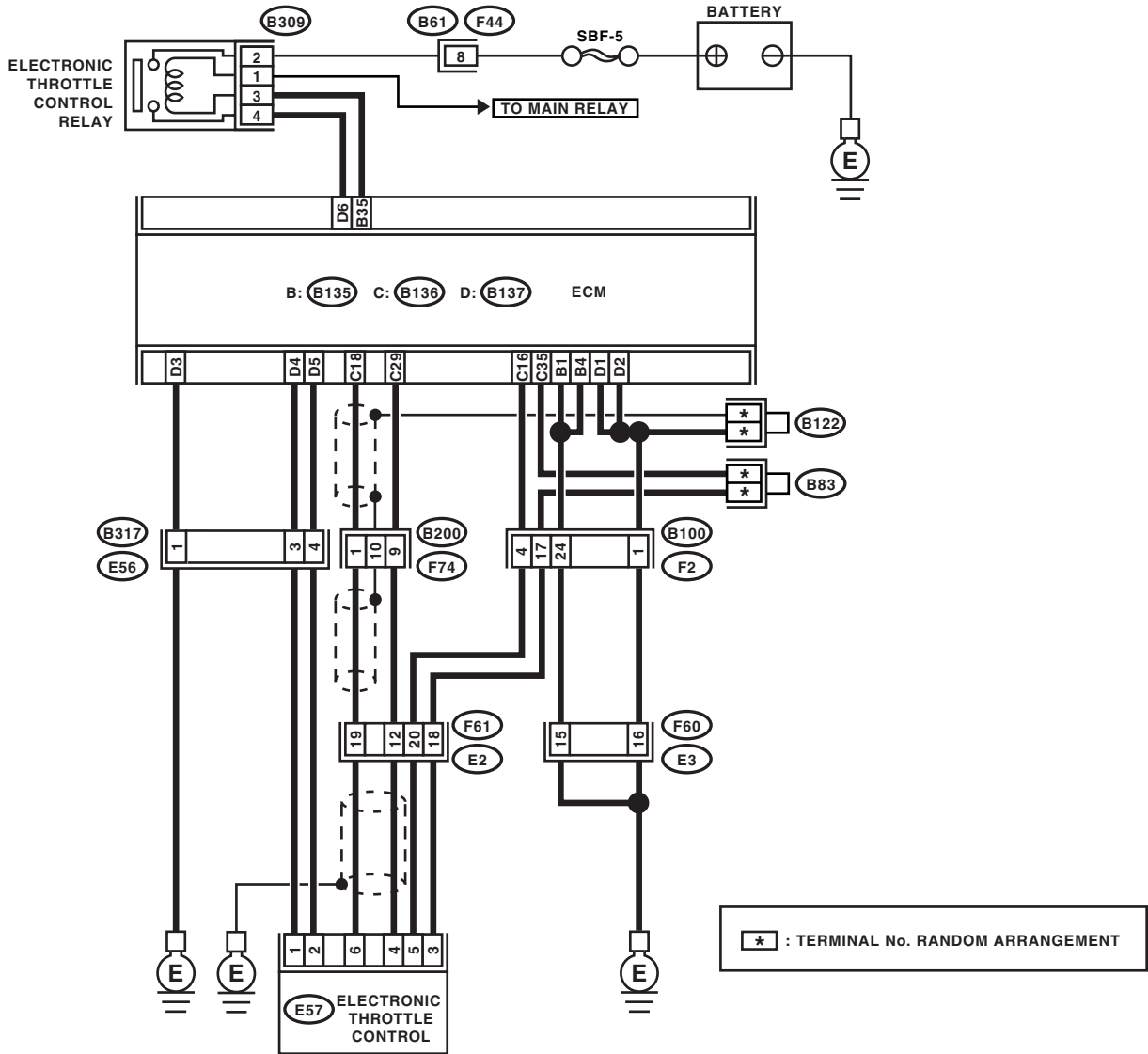
### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04159

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                                      | Yes   | No   |
|--|--|---|--|
| <b>1</b><br><b>CHECK ELECTRONIC THROTTLE CONTROL RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the electronic throttle control relay.<br>3) Measure the resistance between electronic throttle control relay terminals.<br><i>Terminals</i><br><i>No. 2 — No. 4:</i>                                  | Is the resistance more than 1 M $\Omega$ ? | Go to step 2.   | Replace the electronic throttle control relay.   |
| <b>2</b><br><b>CHECK SHORT OF ELECTRONIC THROTTLE CONTROL RELAY POWER SUPPLY CIRCUIT.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between electronic throttle control relay connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B309) No. 4 (+) — Engine ground (-):</i>    | Is the voltage more than 5 V?              | Go to step 3.   | Repair the short of power supply to harness between ECM and electronic throttle control relay. |
| <b>3</b><br><b>CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from ECM.<br>3) Measure the resistance between ECM connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B135) No. 35 — Engine ground:</i> | Is the resistance more than 1 M $\Omega$ ? | Repair the poor contact in ECM connector. If problem persists, replace the ECM. | Repair the ground short of harness between ECM and electronic throttle control relay.          |

## DK:DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE

**NOTE:**

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(STI)(diag)-335, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DL:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-250, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

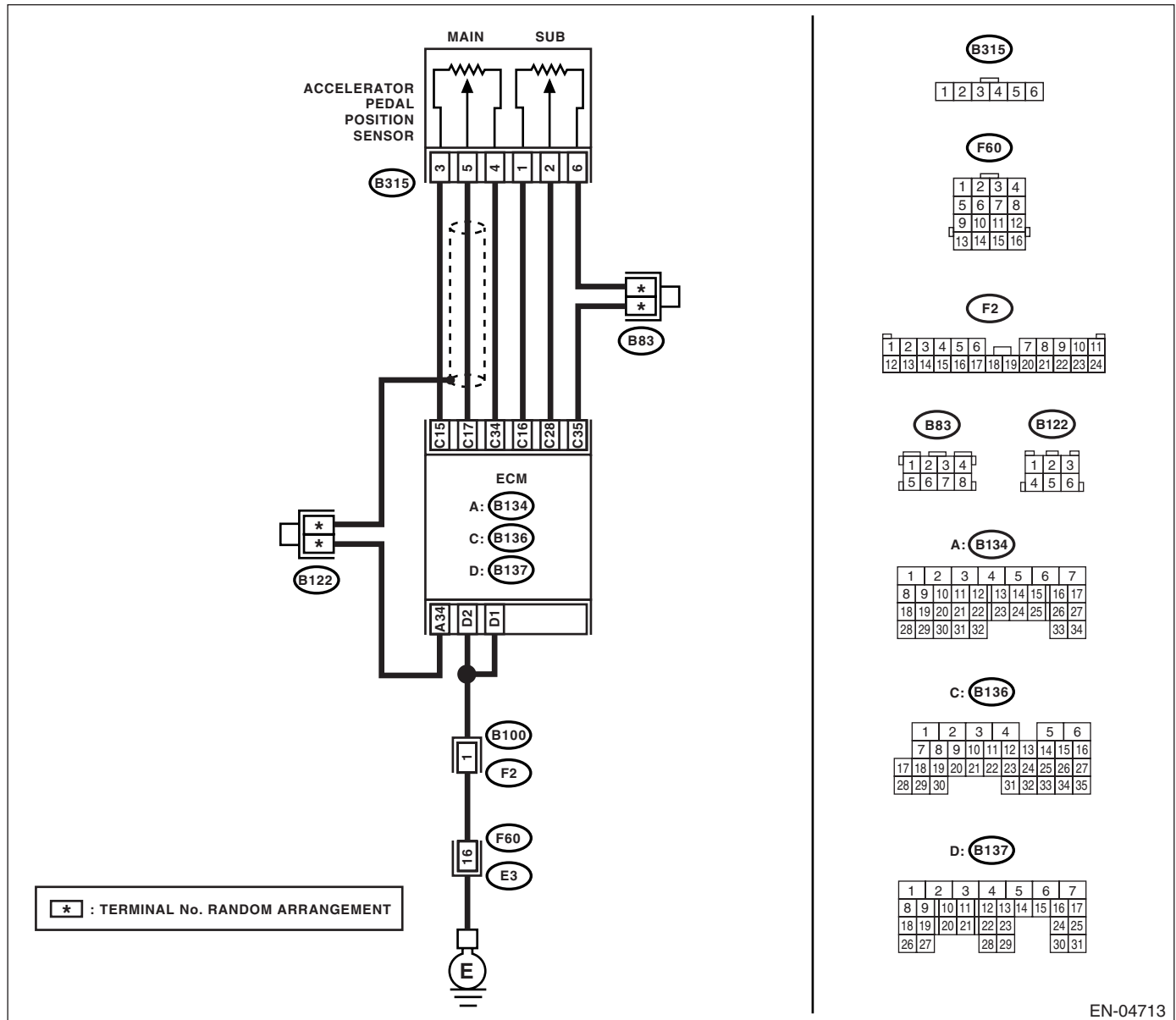
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04713

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes                                    | No   |
|---|--|--|--|
| <p><b>1</b></p> <p><b>CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br/>                     1) Turn the ignition switch to ON.<br/>                     2) Measure the voltage between ECM connector terminals.<br/> <i><b>Connector &amp; terminal</b></i><br/> <i><b>(B136) No. 17 (+) — (B136) No. 34 (-):</b></i><br/>                     3) Shake the ECM harness and connector, accelerator pedal position sensor.</p>   | Is the voltage more than 0.4 V?  | Go to step 2.                          | Go to step 3.  |
| <p><b>2</b></p> <p><b>CHECK POOR CONTACT IN CONNECTORS.</b><br/>                     Check poor contact in connectors between ECM and accelerator pedal position sensor.</p>  | Is there poor contact in connectors between ECM and accelerator pedal position sensor? | Repair the poor contact in connectors. | Connector has returned to its normal condition at this time. A temporary poor contact of the connector may be the cause.           |
| <p><b>3</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br/>                     1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from ECM.<br/>                     3) Disconnect the connector from accelerator pedal position sensor.<br/>                     4) Measure the resistance between ECM connector and accelerator pedal position sensor.<br/> <i><b>Connector &amp; terminal</b></i><br/> <i><b>(B136) No. 17 — (B315) No. 5:</b></i><br/> <i><b>(B136) No. 15 — (B315) No. 3:</b></i></p> | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.                          | Repair the open harness connector.   |
| <p><b>4</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br/>                     Measure the resistance between ECM connector and chassis ground.<br/> <i><b>Connector &amp; terminal</b></i><br/> <i><b>(B136) No. 17 — Chassis ground:</b></i><br/> <i><b>(B136) No. 15 — Chassis ground:</b></i></p>  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 5.                          | Repair the ground short of harness.  |
| <p><b>5</b></p> <p><b>CHECK ACCELERATOR PEDAL POSITION SENSOR POWER SUPPLY</b><br/>                     1) Connect the ECM connector.<br/>                     2) Turn the ignition switch to ON.<br/>                     3) Measure the voltage between accelerator pedal position sensor connector and engine ground.<br/> <i><b>Connector &amp; terminal</b></i><br/> <i><b>(B315) No. 3 (+) — Engine ground (-):</b></i><br/>                     4) Shake the ECM harness and connector, while monitoring value of voltage meter.</p>   | Is the voltage 4.5 — 5.5 V?  | Go to step 6.                          | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> |
| <p><b>6</b></p> <p><b>CHECK ACCELERATOR PEDAL POSITION SENSOR.</b><br/>                     Measure the resistance of accelerator pedal position sensor.<br/> <i><b>Terminals</b></i><br/> <i><b>No. 3 — No. 4:</b></i></p>   | Is the resistance 1.2 — 4.8 k $\Omega$ ?   | Go to step 7.                          | Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.>   |
| <p><b>7</b></p> <p><b>CHECK ACCELERATOR PEDAL POSITION SENSOR.</b><br/>                     Measure the resistance of accelerator pedal position sensor when accelerator pedal is released.<br/> <i><b>Terminals</b></i><br/> <i><b>No. 5 — No. 4:</b></i></p>  | Is the resistance 0.2 — 1.0 k $\Omega$ ?   | Go to step 8.                          | Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.>   |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <p><b>8</b>    <b>CHECK ACCELERATOR PEDAL POSITION SENSOR.</b><br/>Measure the resistance of accelerator pedal position sensor when accelerator pedal is depressed.<br/><b>Terminals</b><br/><b>No. 5 — No. 4:</b></p> | <p>Is the resistance 0.5 — 2.5 k<math>\Omega</math>?</p> | <p>Repair the poor contact in ECM connector. If problem persists, replace the ECM. &lt;Ref. to FU(STI)-39, Engine Control Module (ECM).&gt;</p> | <p>Replace the accelerator pedal. &lt;Ref. to SP(STI)-3, Accelerator Pedal.&gt;</p> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DM:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-252, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

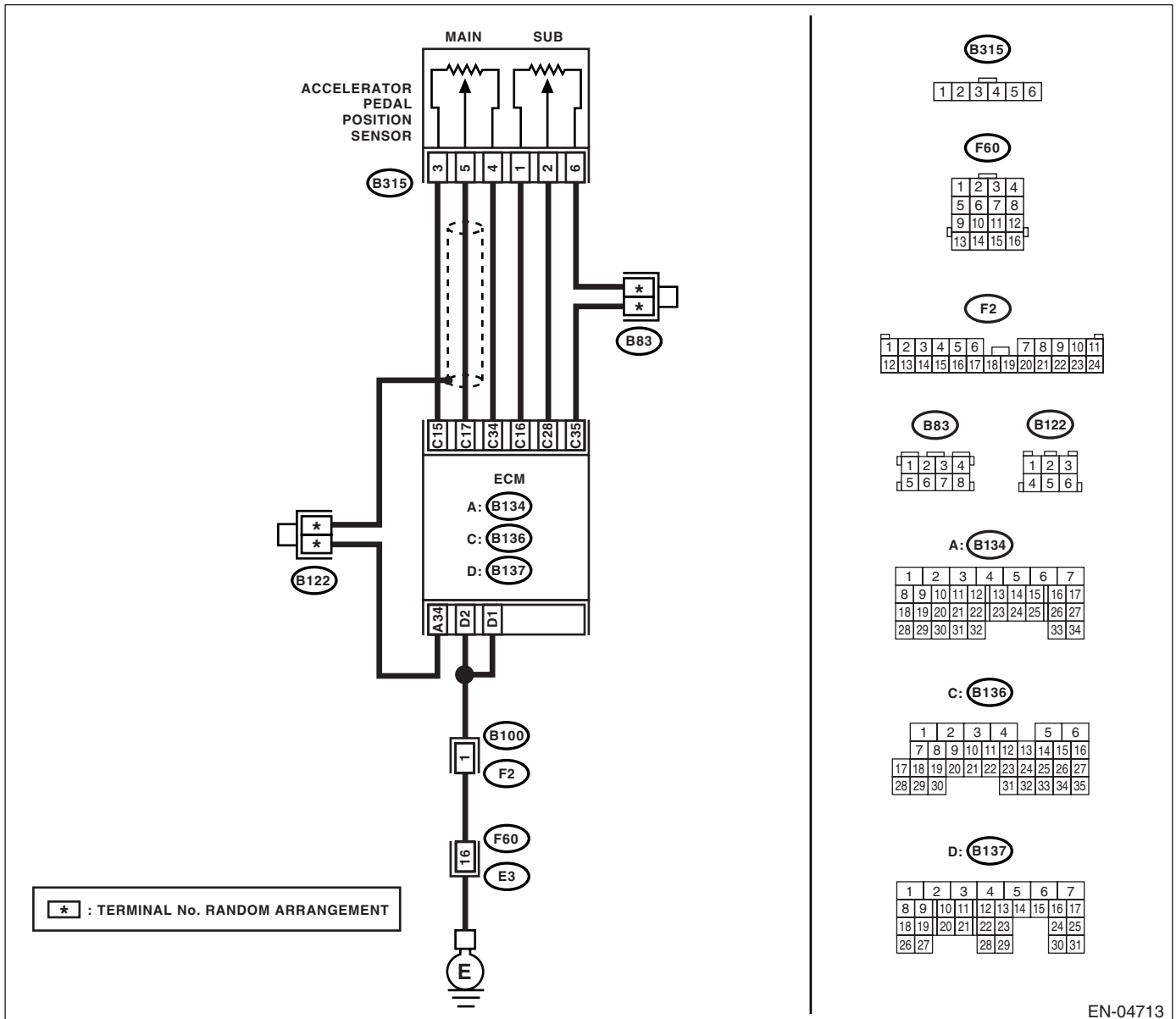
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04713

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes                                    | No   |
|--|--|--|--|
| <b>1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of main accelerator pedal position sensor signals, using Subaru Select Monitor.<br>3) Shake the ECM harness and connector, engine harness connector, accelerator pedal position sensor connector harness while monitoring value of voltage meter.  | Is the voltage less than 4.8 V?  | Go to step 2.                          | Go to step 3.  |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and accelerator pedal position sensor.  | Is there any poor contact in connectors between ECM and accelerator pedal position sensor? | Repair the poor contact in connectors. | Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.  |
| <b>3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator pedal position sensor.<br>4) Measure the resistance between ECM connector and accelerator pedal position sensor connector.<br><br><i>Connector &amp; terminal<br/>(B136) No. 34 — (B315) No. 4:</i>          | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.                          | Repair the open harness connector.   |
| <b>4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between accelerator pedal position sensor and engine ground.<br><br><i>Connector &amp; terminal<br/>(B315) No. 4 — Engine ground:</i>  | Is the resistance less than 5 $\Omega$ ?   | Go to step 5.                          | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> |
| <b>5 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between accelerator pedal position sensor connector and engine ground.<br><br><i>Connector &amp; terminal<br/>(B315) No. 3 (+) — Engine ground (-):</i><br>4) Shake the ECM harness and connector, while monitoring value of voltage meter. | Is the voltage more than 6 V?  | Go to step 6.                          | Repair the battery short of harness between ECM connector and accelerator pedal position sensor connector.                         |
| <b>6 CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Measure the voltage between accelerator pedal position sensor connector and engine ground.<br><br><i>Connector &amp; terminal<br/>(B315) No. 5 (+) — Engine ground (-):</i><br>2) Shake the ECM harness and connector, while monitoring value of voltage meter.  | Is the voltage less than 4.8 V?  | Go to step 7.                          | Repair the short of harness between ECM connector and accelerator pedal position sensor connector.                                 |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                        | Yes   | No   |
|---|------------------------------|---|--|
| <p><b>7</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Connect the accelerator pedal position sensor connector.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B136) No. 17 (+) — Chassis ground (-):</b></p> | <p>Is the voltage 4.8 V?</p> | <p>Repair the poor contact in ECM connector. If problem persists, replace the ECM. &lt;Ref. to FU(STI)-39, Engine Control Module (ECM).&gt;</p> | <p>Repair the poor contact in accelerator pedal position sensor connector. If problem persists, replace the accelerator pedal. &lt;Ref. to SP(STI)-3, Accelerator Pedal.&gt;</p> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DN:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-254, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

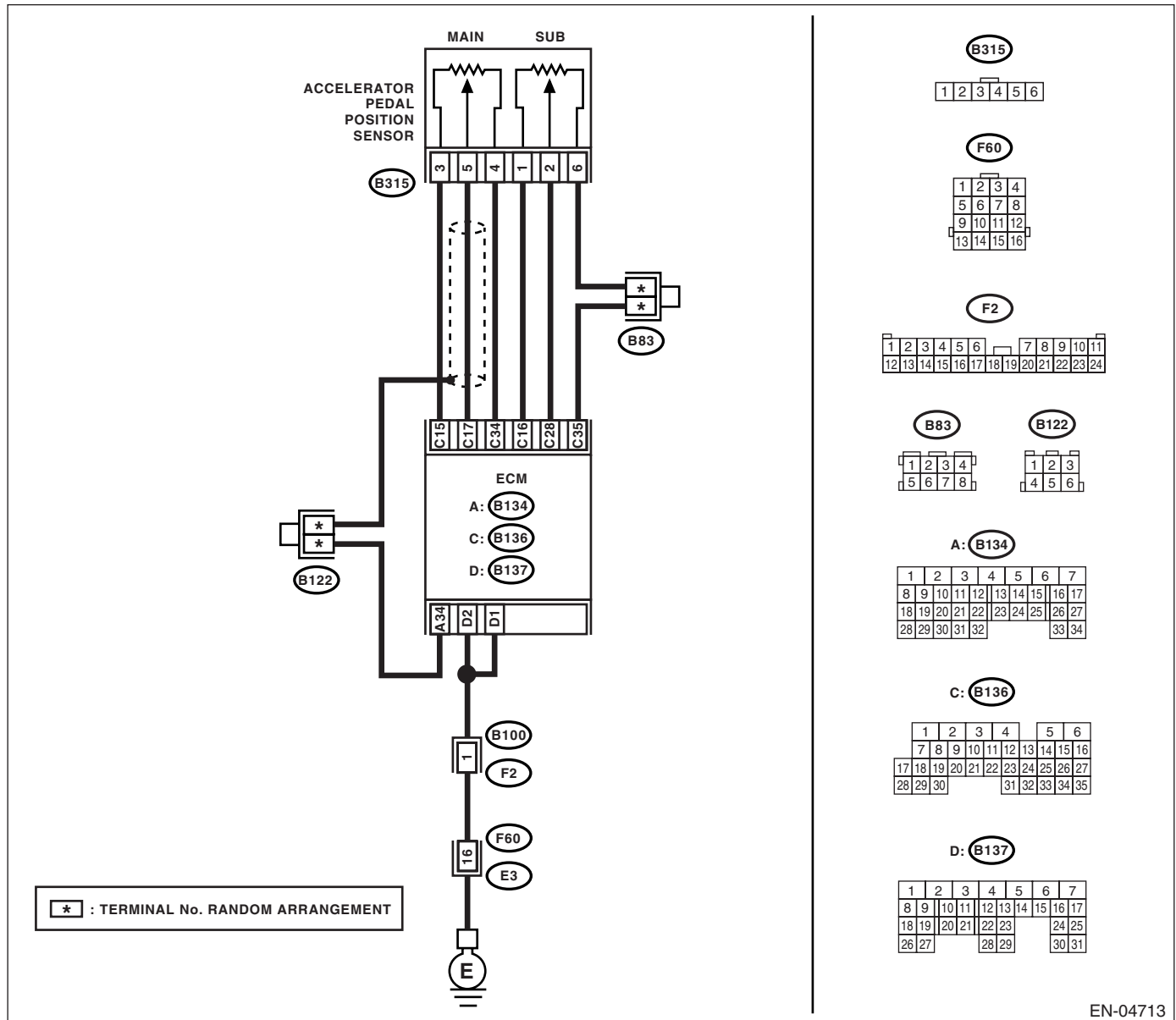
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04713

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes                                    | No   |
|--|--|--|--|
| <b>1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 28 (+) — (B136) No. 35 (-):</b></i><br>3) Shake the ECM harness and connector, accelerator pedal position sensor connector.   | Is the voltage more than 0.4 V?  | Go to step 2.                          | Go to step 3.  |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and accelerator pedal position sensor.  | Is there any poor contact in connectors between ECM and accelerator pedal position sensor? | Repair the poor contact in connectors. | Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.  |
| <b>3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator pedal position sensor.<br>4) Measure the resistance between ECM connector and accelerator pedal position sensor connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 28 — (B315) No. 2:</b></i><br><i><b>(B136) No. 16 — (B315) No. 1:</b></i> | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.                          | Repair the open harness connector.   |
| <b>4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>Measure the resistance between ECM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 28 — Chassis ground:</b></i><br><i><b>(B136) No. 16 — Chassis ground:</b></i>  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 5.                          | Repair the ground short of harness.  |
| <b>5 CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between accelerator pedal position sensor connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B315) No. 1 (+) — Engine ground (-):</b></i><br>4) Shake the ECM harness and connector, while monitoring value of voltage meter.   | Is the voltage 4.5 — 5.5 V?  | Go to step 6.                          | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> |
| <b>6 CHECK ACCELERATOR PEDAL POSITION SENSOR.</b><br>Measure the resistance of accelerator pedal position sensor.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 6:</b></i>   | Is the resistance 0.75 — 3.15 k $\Omega$ ?   | Go to step 7.                          | Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check                                      | Yes  | No   |
|--|--|--|--|
| <b>7</b><br><b>CHECK ACCELERATOR PEDAL POSITION SENSOR.</b><br>Measure the resistance of accelerator pedal position sensor when accelerator pedal is released.<br><i>Terminals</i><br><i>No. 2 — No. 6:</i>  | Is the resistance 0.15 — 0.63 k $\Omega$ ? | Go to step <b>8</b> .  | Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.> |
| <b>8</b><br><b>CHECK ACCELERATOR PEDAL POSITION SENSOR.</b><br>Measure the resistance of accelerator pedal position sensor when accelerator pedal is depressed.<br><i>Terminals</i><br><i>No. 2 — No. 6:</i> | Is the resistance 0.28 — 1.68 k $\Omega$ ? | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> | Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.> |

## DO:DTC P2128 THROTTLE/PEDAL POSITION SENSOR / SWITCH “E” CIRCUIT HIGH INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-256, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/ SWITCH “E” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

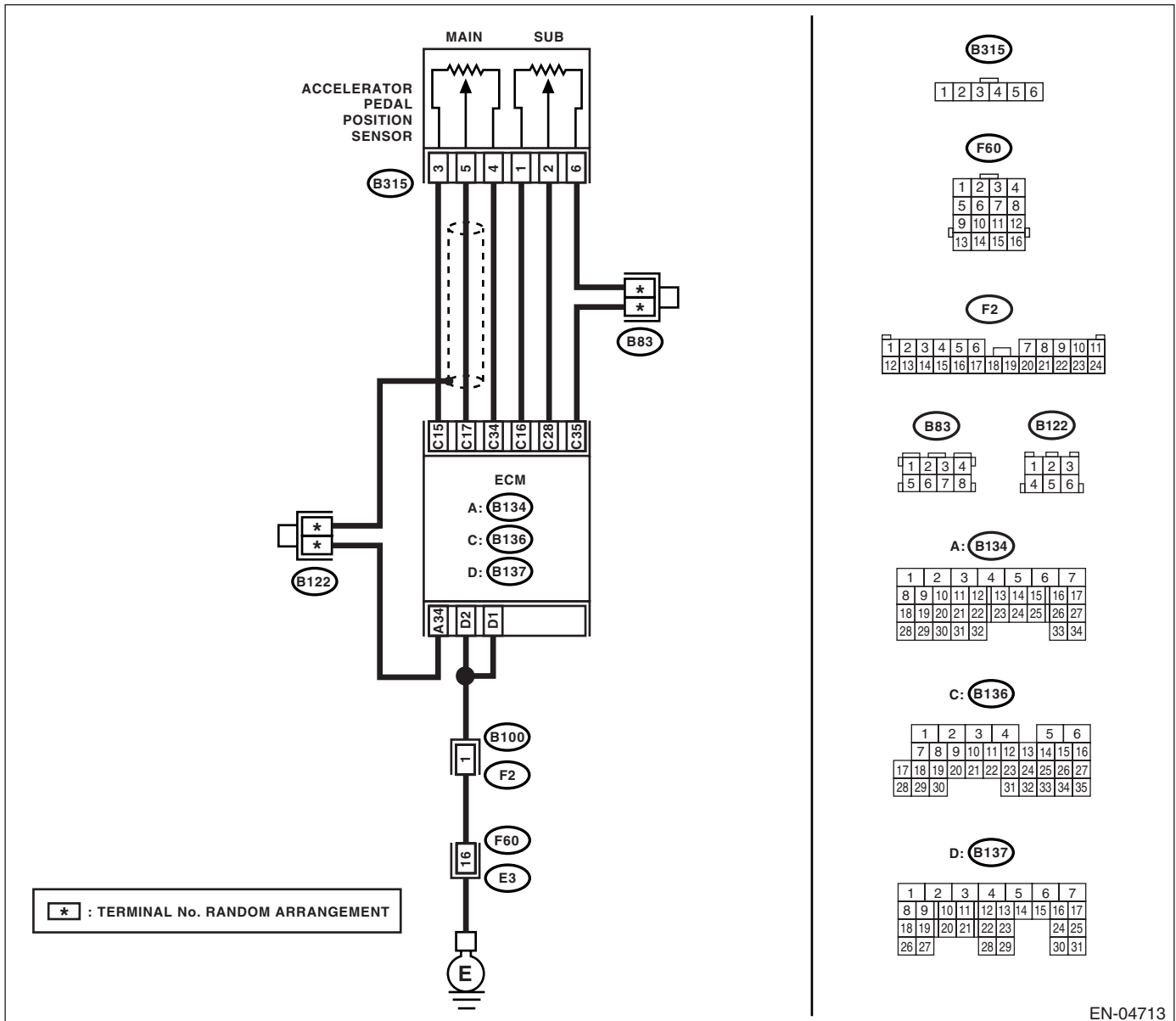
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:





# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step   | Check  | Yes                                    | No   |
|--|--|--|--|
| <b>1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Read the data of sub accelerator pedal position sensor signals, using Subaru Select Monitor.<br>3) Shake the ECM harness and connector, engine harness connector, accelerator pedal position sensor connector harness while monitoring value of voltage meter.   | Is the voltage less than 4.8 V?  | Go to step 2.                          | Go to step 3.  |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and accelerator pedal position sensor.  | Is there any poor contact in connectors between ECM and accelerator pedal position sensor? | Repair the poor contact in connectors. | Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.  |
| <b>3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator pedal position sensor.<br>4) Measure the resistance between ECM connector and accelerator pedal position sensor.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 35 — (B315) No. 6:</i>                    | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.                          | Repair the open harness connector.   |
| <b>4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between accelerator pedal position sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B315) No. 6 — Engine ground:</i>  | Is the resistance less than 5 $\Omega$ ?   | Go to step 5.                          | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> |
| <b>5 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between accelerator pedal position sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B315) No. 1 (+) — Engine ground (-):</i><br>4) Shake the ECM harness and connector, while monitoring value of voltage meter. | Is the voltage less than 6 V?  | Go to step 6.                          | Repair the battery short of harness between ECM connector and accelerator pedal position sensor connector.                         |
| <b>6 CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Measure the voltage between accelerator pedal position sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B315) No. 2 (+) — Engine ground (-):</i><br>2) Shake the ECM harness and connector, while monitoring value of voltage meter.  | Is the voltage less than 4.8 V?  | Go to step 7.                          | Repair the short of harness between ECM connector and accelerator pedal position sensor connector.                                 |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check                        | Yes   | No   |
|---|------------------------------|---|--|
| <p><b>7</b></p> <p><b>CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Connect the accelerator pedal position sensor connector.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between ECM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B136) No. 16 (+) — Chassis ground (-):</b></p> | <p>Is the voltage 4.8 V?</p> | <p>Repair the poor contact in ECM connector. If problem persists, replace the ECM. &lt;Ref. to FU(STI)-39, Engine Control Module (ECM).&gt;</p> | <p>Repair the poor contact in accelerator pedal position sensor connector. If problem persists, replace the accelerator pedal. &lt;Ref. to SP(STI)-3, Accelerator Pedal.&gt;</p> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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### **DP:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE RATIONALITY**

#### **DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-258, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **TROUBLE SYMPTOM:**

- Erroneous idling
- Poor driving performance

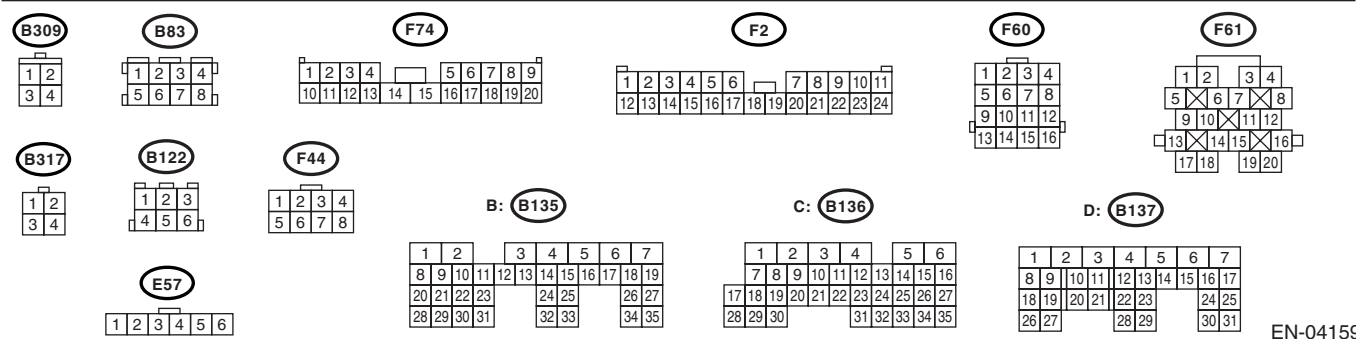
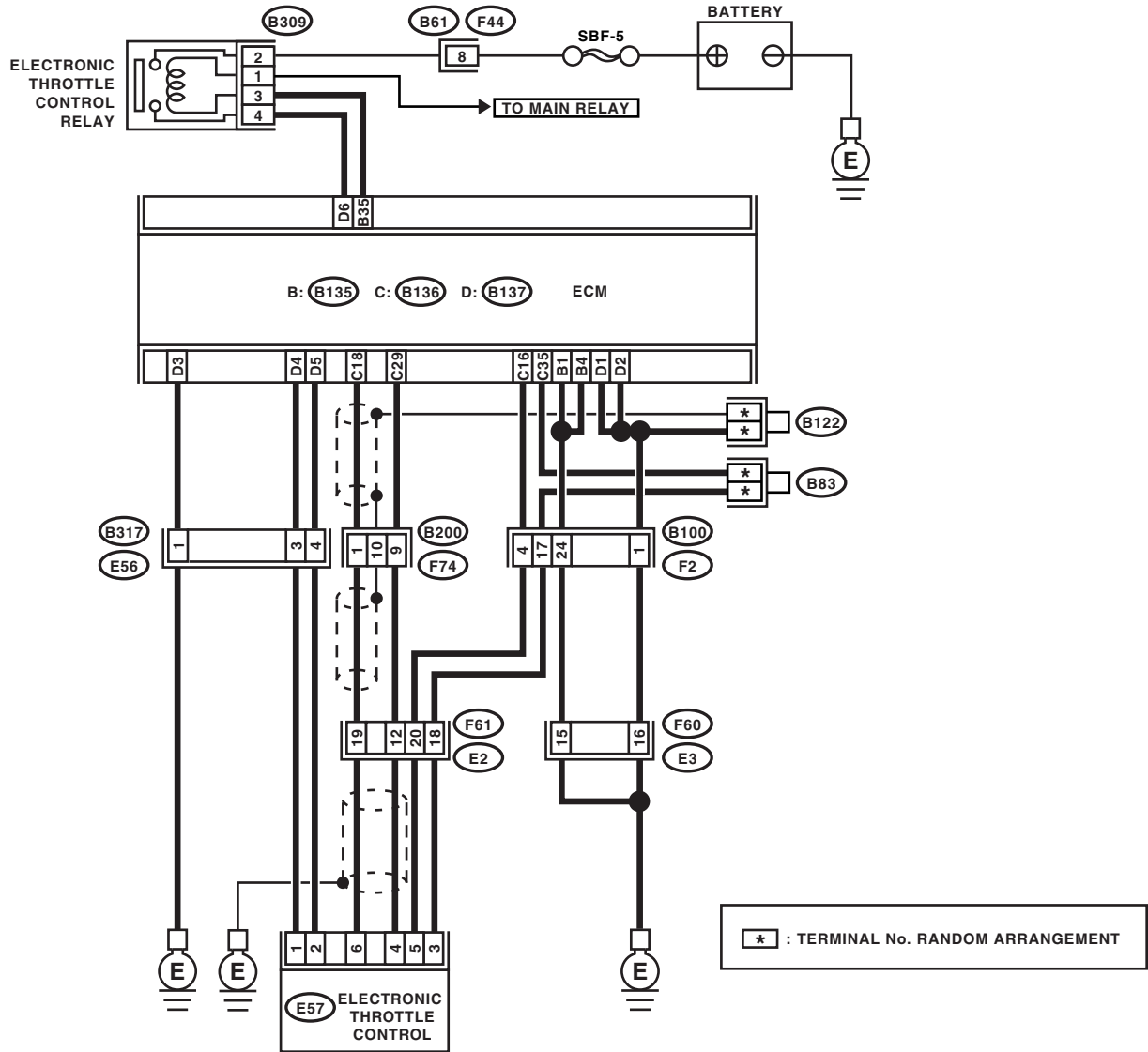
#### **CAUTION:**

**After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.**

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## WIRING DIAGRAM:



EN-04159

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes                                    | No  |
|---|--|--|---|
| <b>1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector terminals.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 18 (+) — (B136) No. 35 (-):</i><br>3) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter. | Is the voltage more than 0.4 V?  | Go to step 2.                          | Go to step 4.   |
| <b>2 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Measure the voltage between ECM connector terminals.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 29 (+) — (B136) No. 35 (-):</i><br>2) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.                                       | Is the voltage more than 0.8 V?  | Go to step 3.                          | Go to step 4.   |
| <b>3 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electronic throttle control.   | Is there any poor contact in connectors between ECM and electronic throttle control? | Repair the poor contact in connectors. | Go to step 14.  |
| <b>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 16 — (E57) No. 5:</i>                          | Is the resistance less than 1 $\Omega$ ?   | Go to step 5.                          | Repair the open harness connector.  |
| <b>5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>Measure the resistance between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 18 — Chassis ground:</i><br><i>(B136) No. 29 — Chassis ground:</i><br><i>(B136) No. 16 — Chassis ground:</i>  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 6.                          | Repair the ground short of harness.   |
| <b>6 CHECK POWER SUPPLY TO SENSOR.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 5 (+) — Engine ground (-):</i><br>4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.             | Is the voltage 4.5 — 5.5 V?  | Go to step 7.                          | Repair the poor contact in ECM connector. If problem persists, replace the ECM. |
| <b>7 CHECK SHORT OF ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between electronic throttle control connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(E57) No. 6 — Engine ground:</i><br><i>(E57) No. 4 — Engine ground:</i>  | Is the resistance more than 10 $\Omega$ ?  | Go to step 8.                          | Repair the poor contact in ECM connector. If problem persists, replace the ECM. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes                                    | No  |
|---|--|--|---|
| <b>8 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect all the connectors.<br>2) Turn the ignition switch to ON.<br>3) Read the data of main throttle sensor signals, using Subaru Select Monitors.<br>4) Shake the ECM harness and connector, engine harness connector, electronic throttle control connector harness while monitoring value of voltage meter.  | Is the voltage less than 4.63 V?   | Go to step 9.                          | Go to step 11.  |
| <b>9 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Read the data of sub throttle sensor signals, using Subaru Select Monitors.<br>2) Shake the ECM harness and connector, engine harness connector, electronic throttle control connector harness while monitoring value of voltage meter.   | Is the voltage less than 4.73 V?   | Go to step 10.                         | Go to step 11.  |
| <b>10 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electronic throttle control.  | Is there any poor contact in connectors between ECM and electronic throttle control? | Repair the poor contact in connectors. | Connector has returned to a normal condition at this time. A temporary poor contact in the connector might have been the cause. |
| <b>11 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from electronic throttle control.<br>4) Measure the resistance between ECM connector and electronic throttle control connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 35 — (E57) No. 3:</b></i><br><i><b>(B136) No. 18 — (E57) No. 6:</b></i><br><i><b>(B136) No. 29 — (E57) No. 4:</b></i> | Is the resistance less than 1 $\Omega$ ?   | Go to step 12.                         | Repair the open harness connector.  |
| <b>12 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between electronic throttle control connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E57) No. 3 — Engine ground:</b></i>   | Is the resistance less than 5 $\Omega$ ?   | Go to step 13.                         | Repair the poor contact in ECM connector. If problem persists, replace the ECM.   |
| <b>13 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between electronic throttle control connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E57) No. 5 (+) — Engine ground (-):</b></i><br>4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.   | Is the voltage less than 10 V?   | Go to step 14.                         | Repair the battery short of harness between ECM connector and electronic throttle control connector.                            |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step   | Check                                      | Yes   | No   |
|--|--|---|--|
| <b>14</b><br><b>CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Measure the voltage between electronic throttle control connector and engine ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E57) No. 6 (+) — Engine ground (-):</b></i><br><i><b>(E57) No. 4 (+) — Engine ground (-):</b></i><br>2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter. | Is the voltage less than 10 V?             | Go to step <b>15</b> .  | Repair the short of harness between ECM connector and electronic throttle control connector. |
| <b>15</b><br><b>CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the electronic throttle control connector.<br>3) Measure the resistance between ECM connectors.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B136) No. 18 (+) — (B136) No. 35 (-):</b></i><br><i><b>(B136) No. 29 (+) — (B136) No. 35 (-):</b></i>   | Is the resistance more than 1 M $\Omega$ ? | Go to step <b>16</b> .  | Repair the short of power supply sensor.   |
| <b>16</b><br><b>CHECK ELECTRONIC THROTTLE CONTROL HARNESS.</b><br>1) Disconnect the connector from ECM.<br>2) Disconnect the connector from electronic throttle control.<br>3) Measure the resistance between electronic throttle control connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(E57) No. 6 — (E57) No. 4:</b></i>   | Is the resistance more than 1 M $\Omega$ ? | Repair the poor contact in ECM connector. If problem persists, replace the ECM. | Repair the short of harness.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DQ:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE RATIONALITY

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-260, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

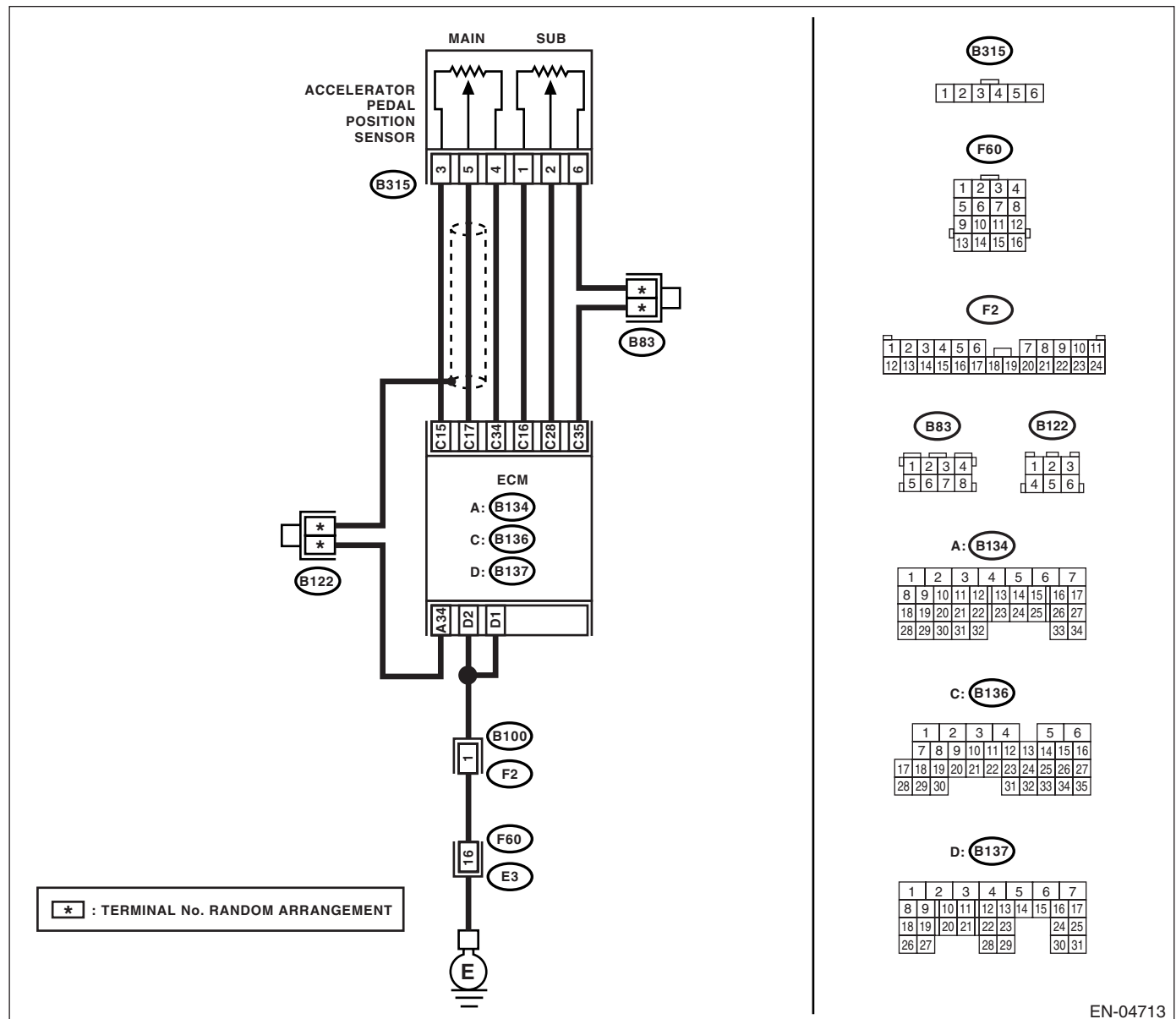
### TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

### WIRING DIAGRAM:



EN-04713



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes                                    | No   |
|---|--|--|--|
| <b>1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ECM connector terminals.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 17 (+) — (B136) No. 34 (-):</i><br><i>(B136) No. 28 (+) — (B136) No. 35 (-):</i><br>3) Shake the ECM harness and connector, accelerator pedal position sensor connector and harness.   | Is the voltage more than 0.4 V?  | Go to step 2.                          | Go to step 3.  |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and accelerator pedal position sensor.   | Is there any poor contact in connectors between ECM and electronic throttle control? | Repair the poor contact in connectors. | Go to step 12.   |
| <b>3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator pedal position sensor.<br>4) Measure the resistance between ECM connector and accelerator pedal position sensor connector.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 17 — (B315) No. 5:</i><br><i>(B136) No. 15 — (B315) No. 3:</i><br><i>(B136) No. 28 — (B315) No. 2:</i><br><i>(B136) No. 16 — (B315) No. 1:</i> | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.                          | Repair the open harness connector.   |
| <b>4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>Measure the resistance between ECM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B136) No. 17 — Chassis ground:</i><br><i>(B136) No. 15 — Chassis ground:</i><br><i>(B136) No. 28 — Chassis ground:</i><br><i>(B136) No. 16 — Chassis ground:</i>  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 5.                          | Repair the ground short of harness.  |
| <b>5 CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between accelerator pedal position sensor connector and engine ground.<br><i>Connector &amp; terminal</i><br><i>(B315) No. 3 (+) — Engine ground (-):</i><br><i>(B315) No. 1 (+) — Engine ground (-):</i><br>4) Shake the ECM harness and connector, while monitoring value of voltage meter.  | Is the voltage 4.5 — 5.5 V?  | Go to step 6.                          | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> |
| <b>6 CHECK ACCELERATOR PEDAL POSITION SENSOR.</b><br>Measure the resistance of accelerator pedal position sensor.<br><i>Terminals</i><br><i>No. 3 — No. 4:</i>  | Is the resistance 1.2 — 4.8 k $\Omega$ ?   | Go to step 7.                          | Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step  | Check  | Yes                                    | No   |
|---|--|--|--|
| <b>7 CHECK ACCELERATOR PEDAL POSITION SENSOR.</b><br>Measure the resistance of accelerator pedal position sensor.<br><i>Terminals</i><br><i>No. 1 — No. 6:</i>  | Is the resistance 0.75 — 3.15 k $\Omega$ ?   | Go to step 8.                          | Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.> |
| <b>8 CHECK ACCELERATOR PEDAL POSITION SENSOR.</b><br>Measure the resistance of accelerator pedal position sensor when the acceleration pedal is released.<br><i>Terminals</i><br><i>No. 5 — No. 4:</i>  | Is the resistance 0.2 — 0.8 k $\Omega$ ?   | Go to step 9.                          | Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.> |
| <b>9 CHECK ACCELERATOR PEDAL POSITION SENSOR.</b><br>Measure the resistance of accelerator pedal position sensor when the acceleration pedal is released.<br><i>Connector &amp; terminal</i><br><i>No. 2 — No. 6:</i>   | Is the resistance 0.15 — 0.63 k $\Omega$ ?   | Go to step 10.                         | Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.> |
| <b>10 CHECK ACCELERATOR PEDAL POSITION SENSOR.</b><br>Measure the resistance of accelerator pedal position sensor when the acceleration pedal is depressed.<br><i>Terminals</i><br><i>No. 5 — No. 4:</i>  | Is the resistance 0.5 — 2.5 k $\Omega$ ?   | Go to step 11.                         | Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.> |
| <b>11 CHECK ACCELERATOR PEDAL POSITION SENSOR.</b><br>Measure the resistance of accelerator pedal position sensor when the acceleration pedal is depressed.<br><i>Terminals</i><br><i>No. 2 — No. 6:</i>  | Is the resistance 0.28 — 1.68 k $\Omega$ ?   | Go to step 12.                         | Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.> |
| <b>12 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect all the connectors.<br>3) Turn the ignition switch to ON.<br>4) Read the data of main accelerator pedal position sensor signals and sub accelerator pedal position sensor signals, using Subaru Select Monitor.<br>5) Shake the ECM harness and connector, engine harness connector, accelerator pedal position sensor connector harness while monitoring value of voltage meter. | Is the voltage less than 4.8 V?  | Go to step 13.                         | Go to step 14.   |
| <b>13 CHECK POOR CONTACT IN CONNECTORS.</b><br>Check poor contact in connectors between ECM and electronic throttle control.  | Is there any poor contact in connectors between ECM and electronic throttle control? | Repair the poor contact in connectors. | Go to step 19.   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ENGINE (DIAGNOSTICS)

| Step  | Check                                    | Yes            | No  |
|---|--|----------------|---|
| <b>14 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator pedal position sensor.<br>4) Measure the resistance between ECM connector and accelerator pedal position sensor connector.<br><br><b>Connector &amp; terminal</b><br><b>(B136) No. 34 — (B315) No. 4:</b><br><b>(B136) No. 35 — (B315) No. 6:</b>            | Is the resistance less than 1 $\Omega$ ? | Go to step 15. | Repair the open harness connector.  |
| <b>15 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Measure the resistance between accelerator pedal position sensor and engine ground.<br><br><b>Connector &amp; terminal</b><br><b>(B315) No. 4 — Engine ground:</b><br><b>(B315) No. 6 — Engine ground:</b>  | Is the resistance less than 5 $\Omega$ ? | Go to step 16. | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>                                  |
| <b>16 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the ECM connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between accelerator pedal position sensor and engine ground.<br><br><b>Connector &amp; terminal</b><br><b>(B315) No. 3 (+) — Engine ground (-):</b><br><b>(B315) No. 1 (+) — Engine ground (-):</b><br><br>4) Shake the ECM harness and connector, while monitoring value of voltage meter. | Is the voltage less than 6 V?            | Go to step 17. | Repair the battery short of harness between ECM connector and accelerator pedal position sensor.  |
| <b>17 CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Measure the voltage between accelerator pedal position sensor connector and engine ground.<br><br><b>Connector &amp; terminal</b><br><b>(B315) No. 5 (+) — Engine ground (-):</b><br><b>(B315) No. 2 (+) — Engine ground (-):</b><br><br>2) Shake the ECM harness and connector, while monitoring value of voltage meter.  | Is the voltage less than 4.8 V?          | Go to step 18. | Repair the short of harness between ECM connector and accelerator pedal position sensor connector.  |
| <b>18 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the accelerator pedal position sensor connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between ECM connector and chassis ground.<br><br><b>Connector &amp; terminal</b><br><b>(B136) No. 17 (+) — Chassis ground (-):</b><br><b>(B136) No. 28 (+) — Chassis ground (-):</b>                                   | Is the voltage less than 4.8 V?          | Go to step 19. | Repair the poor contact in accelerator pedal position sensor connector. If problem persists, replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

| Step   | Check                             | Yes  | No   |
|--|-----------------------------------|--|--|
| <b>19 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM.<br>3) Disconnect the connector from accelerator pedal position sensor.<br>4) Measure the resistance between terminals of accelerator pedal position sensor connector.<br><i>Connector &amp; terminal<br/>(B315) No. 5 — (B315) No. 2:</i> | Is the resistance less than 1 MΩ? | Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> | Repair the short of harness between accelerator pedal position sensor connector and accelerator pedal position sensor connector. |

## DR:DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

### DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-262, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct **Clear Memory Mode** <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and **Inspection Mode** <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

| Step   | Check                       | Yes   | No   |
|--|-----------------------------|---|--|
| <b>1 CHECK FOR ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).><br><br>NOTE:<br>Atmospheric pressure sensor is built into ECM. |

## DS:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-263, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct **Clear Memory Mode** <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and **Inspection Mode** <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

| Step   | Check                       | Yes   | No   |
|--|-----------------------------|---|--|
| <b>1 CHECK FOR ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).><br><br>NOTE:<br>Atmospheric pressure sensor is built into ECM. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

## DT:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

### DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-264, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

### CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

| Step                                     | Check                       | Yes   | No   |
|--|-----------------------------|---|--|
| 1<br>CHECK FOR ANY OTHER DTC ON DISPLAY. | Is any other DTC displayed? | Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> | Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).><br>NOTE:<br>Atmospheric pressure sensor is built into ECM. |

## 19. General Diagnostic Table

### A: INSPECTION

#### 1. ENGINE

**NOTE:**

Malfunction of parts other than those listed is also possible. <Ref. to ME(STI)-90, Engine Trouble in General.>

| Symptom   | Problem parts   |
|---|---|
| 1. Engine stalls during idling.                               | 1) Electronic throttle control<br>2) Manifold absolute pressure sensor<br>3) Mass air flow and intake temperature sensor<br>4) Ignition parts (*1)<br>5) Engine coolant temperature sensor (*2)<br>6) Crankshaft position sensor (*3)<br>7) Camshaft position sensor (*3)<br>8) Fuel injection parts (*4)   |
| 2. Rough idling   | 1) Electronic throttle control<br>2) Manifold absolute pressure sensor<br>3) Mass air flow and intake temperature sensor<br>4) Engine coolant temperature sensor (*2)<br>5) Ignition parts (*1)<br>6) Air intake system (*5)<br>7) Fuel injection parts (*4)<br>8) Crankshaft position sensor (*3)<br>9) Camshaft position sensor (*3)<br>10) Oxygen sensor<br>11) Fuel pump and fuel pump relay                              |
| 3. Engine does not return to idle.                            | 1) Electronic throttle control<br>2) Engine coolant temperature sensor<br>3) Manifold absolute pressure sensor<br>4) Mass air flow sensor   |
| 4. Poor acceleration  | 1) Manifold absolute pressure sensor<br>2) Mass air flow and intake temperature sensor<br>3) Electronic throttle control<br>4) Fuel injection parts (*4)<br>5) Fuel pump and fuel pump relay<br>6) Engine coolant temperature sensor (*2)<br>7) Crankshaft position sensor (*3)<br>8) Camshaft position sensor (*3)<br>9) A/C switch and A/C cut relay<br>10) Engine torque control signal circuit<br>11) Ignition parts (*1) |
| 5. Engine stalls or engine sags or hesitates at acceleration. | 1) Manifold absolute pressure sensor<br>2) Mass air flow and intake temperature sensor<br>3) Engine coolant temperature sensor (*2)<br>4) Crankshaft position sensor (*3)<br>5) Camshaft position sensor (*3)<br>6) Purge control solenoid valve<br>7) Fuel injection parts (*4)<br>8) Fuel pump and fuel pump relay  |
| 6. Surge  | 1) Manifold absolute pressure sensor<br>2) Mass air flow and intake temperature sensor<br>3) Engine coolant temperature sensor (*2)<br>4) Crankshaft position sensor (*3)<br>5) Camshaft position sensor (*3)<br>6) Fuel injection parts (*4)<br>7) Throttle position sensor<br>8) Fuel pump and fuel pump relay  |

# General Diagnostic Table

## ENGINE (DIAGNOSTICS)

| Symptom                            | Problem parts   |
|------------------------------------|---|
| 7. Spark knock                     | 1) Manifold absolute pressure sensor<br>2) Mass air flow and intake temperature sensor<br>3) Engine coolant temperature sensor<br>4) Knock sensor<br>5) Fuel injection parts (*4)<br>6) Fuel pump and fuel pump relay |
| 8. After-burning in exhaust system | 1) Manifold absolute pressure sensor<br>2) Mass air flow and intake temperature sensor<br>3) Engine coolant temperature sensor (*2)<br>4) Fuel injection parts (*4)<br>5) Fuel pump and fuel pump relay               |

\*1: Check ignition coil and ignitor assembly and spark plug.

\*2: Indicate the symptom occurring only in cold temperatures.

\*3: Ensure the secure installation.

\*4: Check fuel injector, fuel pressure regulator and fuel filter.

\*5: Inspect air leak in air intake system.

# GENERAL DESCRIPTION

# *GD(STI)*

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| 2. Diagnostic Trouble Code (DTC) Detecting Criteria ..... | 9           |



## List of Diagnostic Trouble Code (DTC)

### GENERAL DESCRIPTION

## 1. List of Diagnostic Trouble Code (DTC)

### A: LIST

| DTC   | Item  | Index  |
|-------|---|--|
| P0011 | "A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 1) | <Ref. to GD(STI)-9, DTC P0011 "A" CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0021 | "A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 2) | <Ref. to GD(STI)-11, DTC P0021 "A" CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P0030 | HO2S Heater Control Circuit (Bank 1 Sensor 1)                             | <Ref. to GD(STI)-11, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                               |
| P0031 | HO2S Heater Control Circuit Low (Bank 1 Sensor 1)                         | <Ref. to GD(STI)-13, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                           |
| P0032 | HO2S Heater Control Circuit High (Bank 1 Sensor 1)                        | <Ref. to GD(STI)-15, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                          |
| P0037 | HO2S Heater Control Circuit Low (Bank 1 Sensor 2)                         | <Ref. to GD(STI)-17, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                           |
| P0038 | HO2S Heater Control Circuit High (Bank 1 Sensor 2)                        | <Ref. to GD(STI)-19, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                          |
| P0068 | MAP/MAF – Throttle Position Correlation                                   | <Ref. to GD(STI)-21, DTC P0068 MAP/MAF – THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                     |
| P0101 | Mass or Volume Air Flow Circuit Range/Performance                         | <Ref. to GD(STI)-23, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                           |
| P0102 | Mass or Volume Air Flow Circuit Low Input                                 | <Ref. to GD(STI)-26, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                   |
| P0103 | Mass or Volume Air Flow Circuit High Input                                | <Ref. to GD(STI)-28, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                  |
| P0107 | Manifold Absolute Pressure/Barometric Pressure Circuit Low Input          | <Ref. to GD(STI)-30, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>            |
| P0108 | Manifold Absolute Pressure/Barometric Pressure Circuit High Input         | <Ref. to GD(STI)-32, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>           |
| P0111 | Intake Air Temperature Circuit Range/Performance                          | <Ref. to GD(STI)-34, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0112 | Intake Air Temperature Circuit Low Input                                  | <Ref. to GD(STI)-36, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                    |
| P0113 | Intake Air Temperature Circuit High Input                                 | <Ref. to GD(STI)-38, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                   |
| P0117 | Engine Coolant Temperature Circuit Low Input                              | <Ref. to GD(STI)-40, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                |
| P0118 | Engine Coolant Temperature Circuit High Input                             | <Ref. to GD(STI)-42, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                               |
| P0122 | Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input               | <Ref. to GD(STI)-44, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                 |
| P0123 | Throttle/Pedal Position Sensor/Switch "A" Circuit High Input              | <Ref. to GD(STI)-46, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                |

# List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

| DTC   | Item   | Index   |
|-------|--|---|
| P0125 | Insufficient Coolant Temperature for Closed Loop Fuel Control                    | <Ref. to GD(STI)-48, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>                    |
| P0126 | Insufficient Engine Coolant Temperature for Stable Operation                     | <Ref. to GD(STI)-50, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0128 | Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature) | <Ref. to GD(STI)-52, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P0131 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 1)                      | <Ref. to GD(STI)-54, DTC P0131 O <sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P0132 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 1)                     | <Ref. to GD(STI)-56, DTC P0132 O <sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0133 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 1)                    | <Ref. to GD(STI)-58, DTC P0133 O <sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                    |
| P0134 | O <sub>2</sub> Sensor Circuit No Activity Detected (Bank 1 Sensor 1)             | <Ref. to GD(STI)-61, DTC P0134 O <sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>             |
| P0137 | O <sub>2</sub> Sensor Circuit Low Voltage (Bank 1 Sensor 2)                      | <Ref. to GD(STI)-63, DTC P0137 O <sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P0138 | O <sub>2</sub> Sensor Circuit High Voltage (Bank 1 Sensor 2)                     | <Ref. to GD(STI)-65, DTC P0138 O <sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0139 | O <sub>2</sub> Sensor Circuit Slow Response (Bank 1 Sensor 2)                    | <Ref. to GD(STI)-67, DTC P0139 O <sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                    |
| P0171 | System too Lean (Bank 1)   | <Ref. to GD(STI)-72, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P0172 | System too Rich (Bank 1)   | <Ref. to GD(STI)-75, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P0181 | Fuel Temperature Sensor "A" Circuit Range/Performance                            | <Ref. to GD(STI)-78, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0182 | Fuel Temperature Sensor "A" Circuit Low Input                                    | <Ref. to GD(STI)-81, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                    |
| P0183 | Fuel Temperature Sensor "A" Circuit High Input                                   | <Ref. to GD(STI)-83, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                   |
| P0222 | Throttle/Pedal Position Sensor/Switch "B" Circuit Low Input                      | <Ref. to GD(STI)-85, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P0223 | Throttle/Pedal Position Sensor/Switch "B" Circuit High Input                     | <Ref. to GD(STI)-87, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0230 | Fuel Pump Primary Circuit  | <Ref. to GD(STI)-89, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0244 | Turbo/Super Charger Wastegate Solenoid "A" Range/Performance                     | <Ref. to GD(STI)-91, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                     |
| P0245 | Turbo/Super Charger Wastegate Solenoid "A" Low                                   | <Ref. to GD(STI)-93, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                   |
| P0246 | Turbo/Super Charger Wastegate Solenoid "A" High                                  | <Ref. to GD(STI)-95, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                  |
| P0301 | Cylinder 1 misfire detected  | <Ref. to GD(STI)-97, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |

## List of Diagnostic Trouble Code (DTC)

### GENERAL DESCRIPTION

| DTC   | Item   | Index  |
|-------|--|--|
| P0302 | Cylinder 2 misfire detected  | <Ref. to GD(STI)-102, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0303 | Cylinder 3 misfire detected  | <Ref. to GD(STI)-102, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0304 | Cylinder 4 misfire detected  | <Ref. to GD(STI)-102, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0327 | Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)             | <Ref. to GD(STI)-103, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>             |
| P0328 | Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)            | <Ref. to GD(STI)-105, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>            |
| P0335 | Crankshaft Position Sensor "A" Circuit                                 | <Ref. to GD(STI)-107, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                 |
| P0336 | Crankshaft Position Sensor "A" Circuit Range/Performance               | <Ref. to GD(STI)-109, DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>               |
| P0340 | Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)         | <Ref. to GD(STI)-111, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>         |
| P0345 | Camshaft Position Sensor "A" Circuit (Bank 2)                          | <Ref. to GD(STI)-112, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                          |
| P0420 | Catalyst System Efficiency Below Threshold (Bank 1)                    | <Ref. to GD(STI)-113, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                    |
| P0442 | Evaporative Emission Control System Leak Detected (small leak)         | <Ref. to GD(STI)-116, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>         |
| P0447 | Evaporative Emission Control System Vent Control Circuit Open          | <Ref. to GD(STI)-139, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>          |
| P0448 | Evaporative Emission Control System Vent Control Circuit Shorted       | <Ref. to GD(STI)-141, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>       |
| P0451 | Evaporative Emission Control System Pressure Sensor Range/Performance  | <Ref. to GD(STI)-143, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0452 | Evaporative Emission Control System Pressure Sensor Low Input          | <Ref. to GD(STI)-145, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>          |
| P0453 | Evaporative Emission Control System Pressure Sensor High Input         | <Ref. to GD(STI)-147, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>         |
| P0456 | Evaporative Emission Control System Leak Detected (very small leak)    | <Ref. to GD(STI)-148, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>    |
| P0457 | Evaporative Emission Control System Leak Detected (fuel cap loose/off) | <Ref. to GD(STI)-148, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P0458 | Evaporative Emission Control System Purge Control Valve Circuit Low    | <Ref. to GD(STI)-149, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>    |
| P0459 | Evaporative Emission Control System Purge Control Valve Circuit High   | <Ref. to GD(STI)-151, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>   |

# List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

| DTC   | Item   | Index  |
|-------|--|--|
| P0461 | Fuel Level Sensor Circuit Range/Performance                            | <Ref. to GD(STI)-153, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0462 | Fuel Level Sensor Circuit Low Input                                    | <Ref. to GD(STI)-155, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                    |
| P0463 | Fuel Level Sensor Circuit High Input                                   | <Ref. to GD(STI)-157, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                   |
| P0464 | Fuel Level Sensor Circuit Intermittent                                 | <Ref. to GD(STI)-159, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                 |
| P0483 | Cooling Fan Rationality Check  | <Ref. to GD(STI)-162, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0502 | Vehicle Speed Sensor Circuit Low Input                                 | <Ref. to GD(STI)-164, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                 |
| P0503 | Vehicle Speed Sensor Intermittent/Erratic/High                         | <Ref. to GD(STI)-165, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>                         |
| P0506 | Idle Control System RPM Lower Than Expected                            | <Ref. to GD(STI)-167, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0507 | Idle Control System RPM Higher Than Expected                           | <Ref. to GD(STI)-169, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>                           |
| P0512 | Starter Request Circuit  | <Ref. to GD(STI)-171, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0513 | Incorrect Immobilizer Key  | <Ref. to GD(STI)-172, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P0519 | Idle Control System Malfunction (Fail-Safe)                            | <Ref. to GD(STI)-173, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P0604 | Internal Control Module Random Access Memory (RAM) Error               | <Ref. to GD(STI)-174, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>               |
| P0605 | Internal Control Module Read Only Memory (ROM) Error                   | <Ref. to GD(STI)-175, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>                   |
| P0607 | Control Module Performance   | <Ref. to GD(STI)-176, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P0638 | Throttle Actuator Control Range/Performance (Bank 1)                   | <Ref. to GD(STI)-179, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                   |
| P0691 | Cooling Fan 1 Control Circuit Low                                      | <Ref. to GD(STI)-182, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                      |
| P0692 | Cooling Fan 1 Control Circuit High                                     | <Ref. to GD(STI)-183, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                     |
| P0851 | Neutral Switch Input Circuit Low                                       | <Ref. to GD(STI)-184, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                       |
| P0852 | Neutral Switch Input Circuit High                                      | <Ref. to GD(STI)-185, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                      |
| P1152 | O <sub>2</sub> Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)  | <Ref. to GD(STI)-186, DTC P1152 O <sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P1153 | O <sub>2</sub> Sensor Circuit Range/Performance (High) (Bank1 Sensor1) | <Ref. to GD(STI)-188, DTC P1153 O <sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P1160 | Return Spring Failure  | <Ref. to GD(STI)-190, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P1400 | Fuel Tank Pressure Control Solenoid Valve Circuit Low                  | <Ref. to GD(STI)-192, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>                  |

## List of Diagnostic Trouble Code (DTC)

### GENERAL DESCRIPTION

| DTC   | Item  | Index   |
|-------|---|---|
| P1420 | Fuel Tank Pressure Control Sol. Valve Circuit High        | <Ref. to GD(STI)-194, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>        |
| P1443 | Vent Control Solenoid Valve Function Problem              | <Ref. to GD(STI)-196, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>              |
| P1446 | Fuel Tank Sensor Control Valve Circuit Low                | <Ref. to GD(STI)-198, DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>                |
| P1447 | Fuel Tank Sensor Control Valve Circuit High               | <Ref. to GD(STI)-200, DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>               |
| P1448 | Fuel Tank Sensor Control Valve Range/Performance          | <Ref. to GD(STI)-202, DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>          |
| P1491 | Positive Crankcase Ventilation (Blow-by) Function Problem | <Ref. to GD(STI)-205, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P1518 | Starter Switch Circuit Low Input                          | <Ref. to GD(STI)-207, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>                          |
| P1560 | Back-Up Voltage Circuit Malfunction                       | <Ref. to GD(STI)-208, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>                       |
| P1570 | Antenna   | <Ref. to GD(STI)-209, DTC P1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>   |
| P1571 | Reference Code Incompatibility                            | <Ref. to GD(STI)-209, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>                            |
| P1572 | IMM Circuit Failure (Except Antenna Circuit)              | <Ref. to GD(STI)-209, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Trouble Code (DTC) Detecting Criteria.>              |
| P1574 | Key Communication Failure                                 | <Ref. to GD(STI)-209, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                 |
| P1576 | EGI Control Module EEPROM                                 | <Ref. to GD(STI)-209, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                 |
| P1577 | IMM Control Module EEPROM                                 | <Ref. to GD(STI)-209, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>                                 |
| P2004 | Intake Manifold Runner Control Stuck Open (Bank 1)        | <Ref. to GD(STI)-210, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>        |
| P2005 | Intake Manifold Runner Control Stuck Open (Bank 2)        | <Ref. to GD(STI)-211, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>        |
| P2006 | Intake Manifold Runner Control Stuck Closed (Bank 1)      | <Ref. to GD(STI)-212, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>      |
| P2007 | Intake Manifold Runner Control Stuck Closed (Bank 2)      | <Ref. to GD(STI)-213, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>      |
| P2008 | Intake Manifold Runner Control Circuit / Open (Bank 1)    | <Ref. to GD(STI)-214, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>    |
| P2009 | Intake Manifold Runner Control Circuit Low (Bank 1)       | <Ref. to GD(STI)-216, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>       |
| P2011 | Intake Manifold Runner Control Circuit / Open (Bank 2)    | <Ref. to GD(STI)-218, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>    |
| P2012 | Intake Manifold Runner Control Circuit Low (Bank 2)       | <Ref. to GD(STI)-220, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>       |

# List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

| DTC   | Item  | Index   |
|-------|---|---|
| P2016 | Intake Manifold Runner Position Sensor/Switch Circuit Low (Bank 1)  | <Ref. to GD(STI)-222, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P2017 | Intake Manifold Runner Position Sensor/Switch Circuit High (Bank 1) | <Ref. to GD(STI)-224, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P2021 | Intake Manifold Runner Position Sensor/Switch Circuit Low (Bank 2)  | <Ref. to GD(STI)-226, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P2022 | Intake Manifold Runner Position Sensor/Switch Circuit High (Bank 2) | <Ref. to GD(STI)-228, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P2088 | OCV Solenoid Valve Signal A Circuit Open (Bank 1)                   | <Ref. to GD(STI)-230, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                   |
| P2089 | OCV Solenoid Valve Signal A Circuit Short (Bank 1)                  | <Ref. to GD(STI)-232, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>                  |
| P2092 | OCV Solenoid Valve Signal A Circuit Open (Bank 2)                   | <Ref. to GD(STI)-234, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                   |
| P2093 | OCV Solenoid Valve Signal A Circuit Short (Bank 2)                  | <Ref. to GD(STI)-236, DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>                  |
| P2096 | Post Catalyst Fuel Trim System Too Lean Bank 1                      | <Ref. to GD(STI)-238, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P2097 | Post Catalyst Fuel Trim System Too Rich Bank 1                      | <Ref. to GD(STI)-240, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>                      |
| P2101 | Throttle Actuator Control Motor Circuit Range/Performance           | <Ref. to GD(STI)-242, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>           |
| P2102 | Throttle Actuator Control Motor Circuit Low                         | <Ref. to GD(STI)-244, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>                         |
| P2103 | Throttle Actuator Control Motor Circuit High                        | <Ref. to GD(STI)-246, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>                        |
| P2109 | Throttle/Pedal Position Sensor A Minimum Stop Performance           | <Ref. to GD(STI)-248, DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>           |
| P2122 | Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input         | <Ref. to GD(STI)-250, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>         |
| P2123 | Throttle/Pedal Position Sensor/Switch "D" Circuit High Input        | <Ref. to GD(STI)-252, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>        |
| P2127 | Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input         | <Ref. to GD(STI)-254, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>         |
| P2128 | Throttle/Pedal Position Sensor/Switch "E" Circuit High Input        | <Ref. to GD(STI)-256, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>        |
| P2135 | Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Rationality   | <Ref. to GD(STI)-258, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" / "B" VOLTAGE RATIONALITY, Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P2138 | Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Rationality   | <Ref. to GD(STI)-260, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" / "E" VOLTAGE RATIONALITY, Diagnostic Trouble Code (DTC) Detecting Criteria.> |
| P2227 | Barometric Pressure Circuit Range/Performance                       | <Ref. to GD(STI)-262, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>                       |

## List of Diagnostic Trouble Code (DTC)

### GENERAL DESCRIPTION

| DTC   | Item                                   | Index  |
|-------|--|--|
| P2228 | Barometric Pressure Circuit Low Input  | <Ref. to GD(STI)-263, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>  |
| P2229 | Barometric Pressure Circuit High Input | <Ref. to GD(STI)-264, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.> |

## 2. Diagnostic Trouble Code (DTC) Detecting Criteria

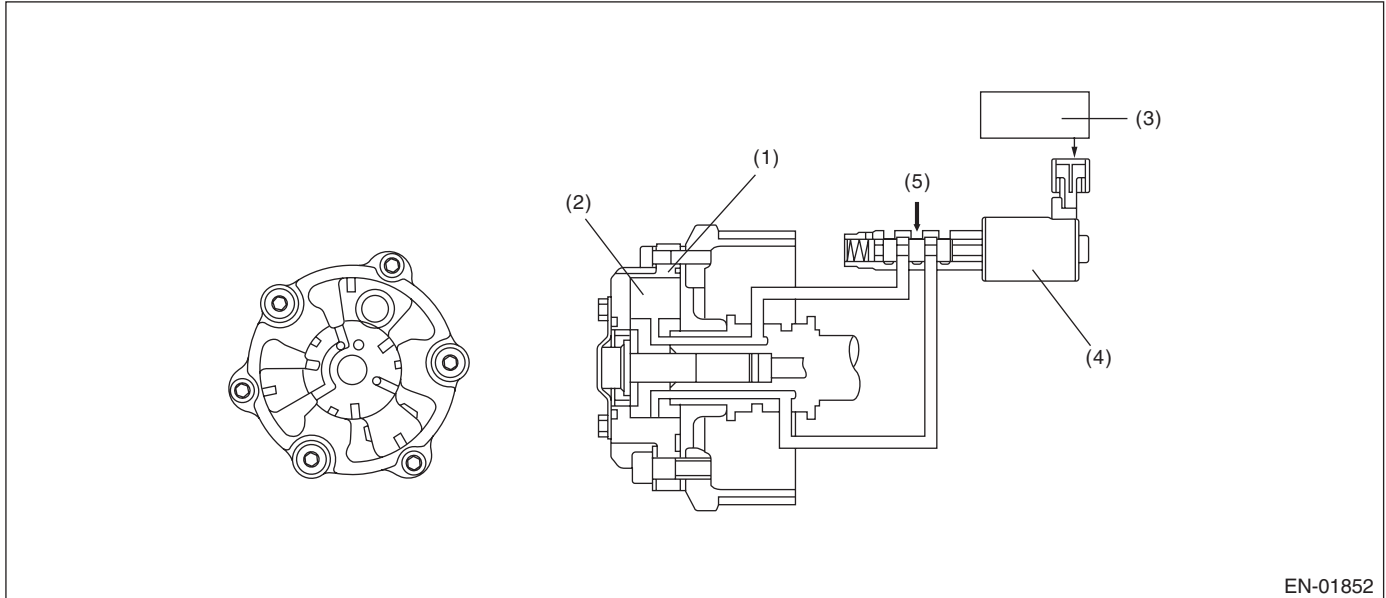
### A: DTC P0011 “A” CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of AVCS system.

Judge NG when the amount of AVCS actual timing advance does not approach to the amount of AVCS target timing advance.

#### 2. COMPONENT DESCRIPTION



EN-01852

- (1) AVCS timing controller
- (2) Vane
- (3) Engine control module (ECM)
- (4) Oil flow control valve
- (5) Oil pressure

#### 3. ENABLE CONDITION (FOR ABNORMALITY JUDGMENT ONLY)

| Secondary Parameters                 | Enable Conditions |
|--------------------------------------|-------------------|
| Battery voltage                      | ≥ 10.9 V          |
| Engine speed                         | ≥ 600 rpm         |
| Engine coolant temperature           | ≥ 60°C            |
| Amount of AVCS target timing advance | = 0°CA            |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after idling when the amount of AVCS target timing advance is equal to 0.

#### 5. DIAGNOSTIC METHOD

Judge NG when the difference of the amount of AVCS target timing advance and the amount of AVCS actual timing advance becomes large, and judge OK when the difference becomes small.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 10 seconds.

#### Judgment Value

| Malfunction Criteria                        | Threshold Value |
|---|-----------------|
| AVCS target position – AVCS actual position | $\geq 20^\circ$ |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### Judgment Value

| Malfunction Criteria                        | Threshold Value |
|---|-----------------|
| AVCS control                                | During feedback |
| Amount of AVCS target timing advance        | 5 — 30°CA       |
| AVCS target position – AVCS actual position | $< 10^\circ$    |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control: Most timing retard learning is not complete or most timing retard learning completion is not experienced.
- ISC feedback compensation: Do not perform the AVCS actual timing advance compensation. Make the OCV driving Duty to be the given value (9.36%).

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## B: DTC P0021 “A” CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

### 1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(STI)-9, DTC P0011 “A” CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

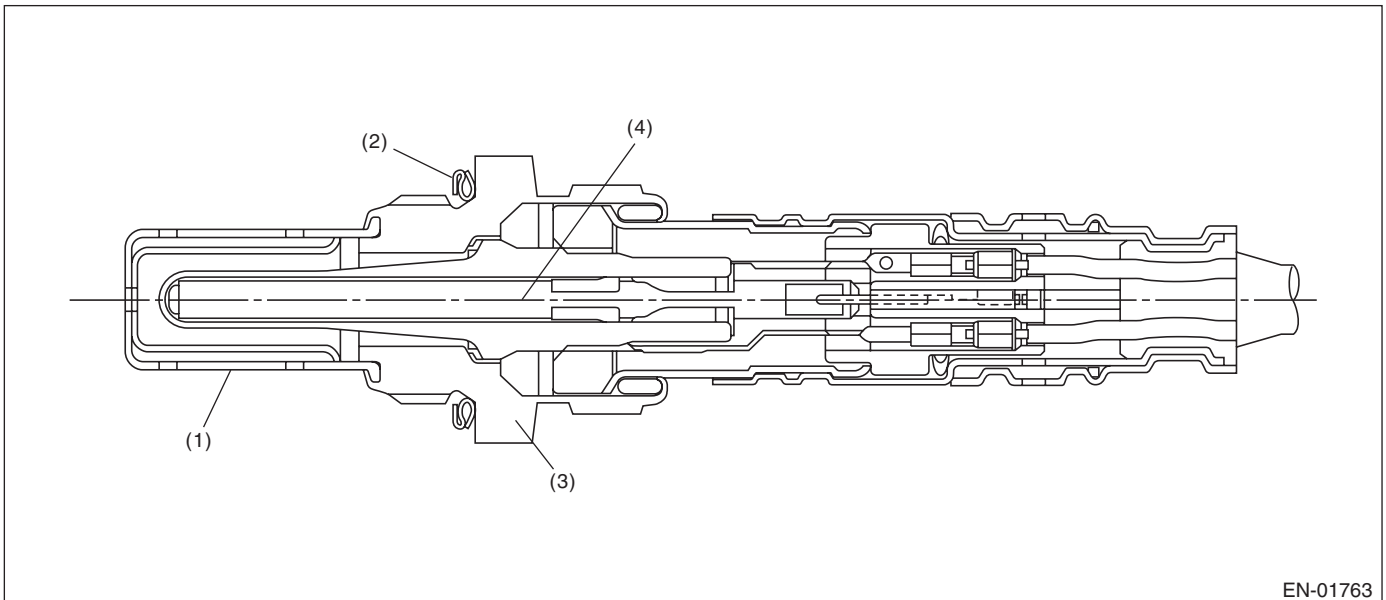
## C: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of front oxygen (A/F) sensor heater.

Judge NG when impedance of front oxygen (A/F) sensor is larger than the standard value by referring to the engine condition such as fuel shut-off in deceleration, etc.

### 2. COMPONENT DESCRIPTION



- (1) Protection tube
- (2) Gasket
- (3) Sensor housing
- (4) Ceramic heater

### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions  |
|---|--------------------|
| Time needed for all secondary parameters to be in enable conditions | 60 seconds or more |
| Battery voltage   | > 10.9 V           |
| After fuel shut-off   | 20 seconds or more |
| Front oxygen (A/F) sensor heater control duty $\geq$ 70%            | Experienced        |

### 4. GENERAL DRIVING CYCLE

Perform diagnosis continuously in 60 seconds after starting engine.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the continuous time of not completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

#### Judgment Value

| Malfunction Criteria                   | Threshold Value |
|--|-----------------|
| Impedance of front oxygen (A/F) sensor | > 50 $\Omega$   |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## D: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

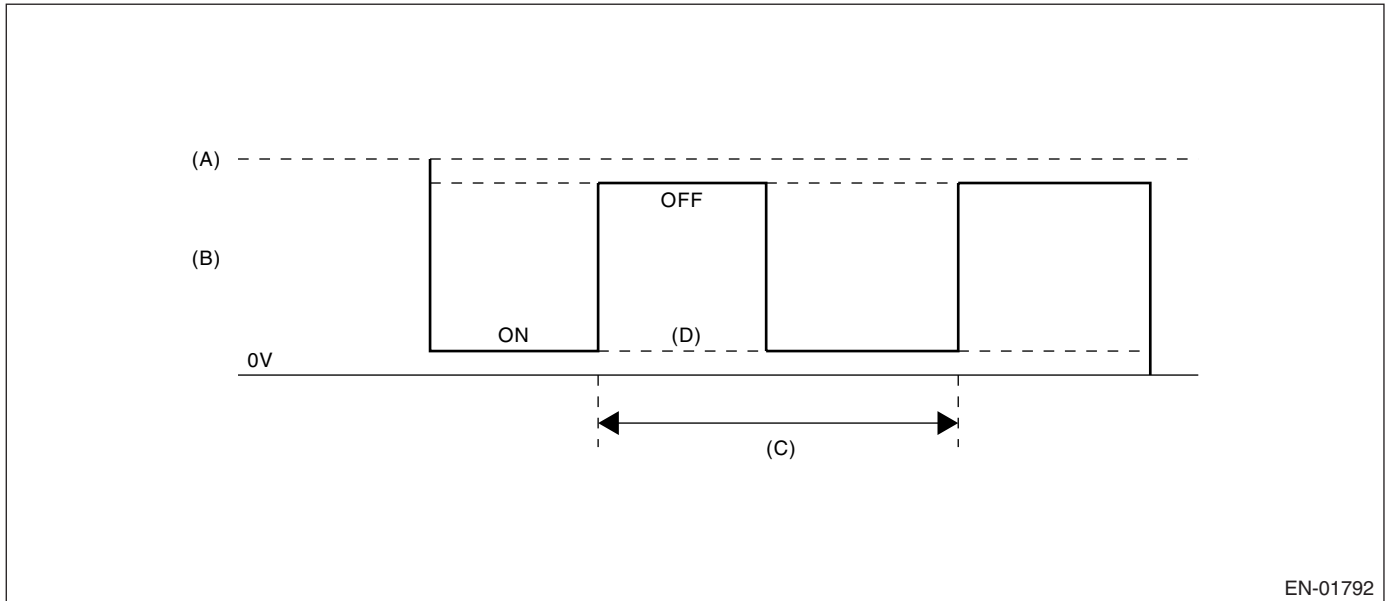
### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.

The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.

Judge NG when the terminal voltage remains to be Low.

### 2. COMPONENT DESCRIPTION



EN-01792

- (A) Battery voltage
- (B) Front oxygen (A/F) sensor heater output voltage
- (C) 128 milliseconds
- (D) Low abnormality

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions     |
|----------------------|-----------------------|
| Battery voltage      | $\geq 10.9 \text{ V}$ |

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second (8 cycles).

#### Judgment Value

| Malfunction Criteria                          | Threshold Value |
|---|-----------------|
| Output voltage level                          | Low             |
| Front oxygen (A/F) sensor heater control duty | $< 87.5\%$      |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage level | High            |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## E: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

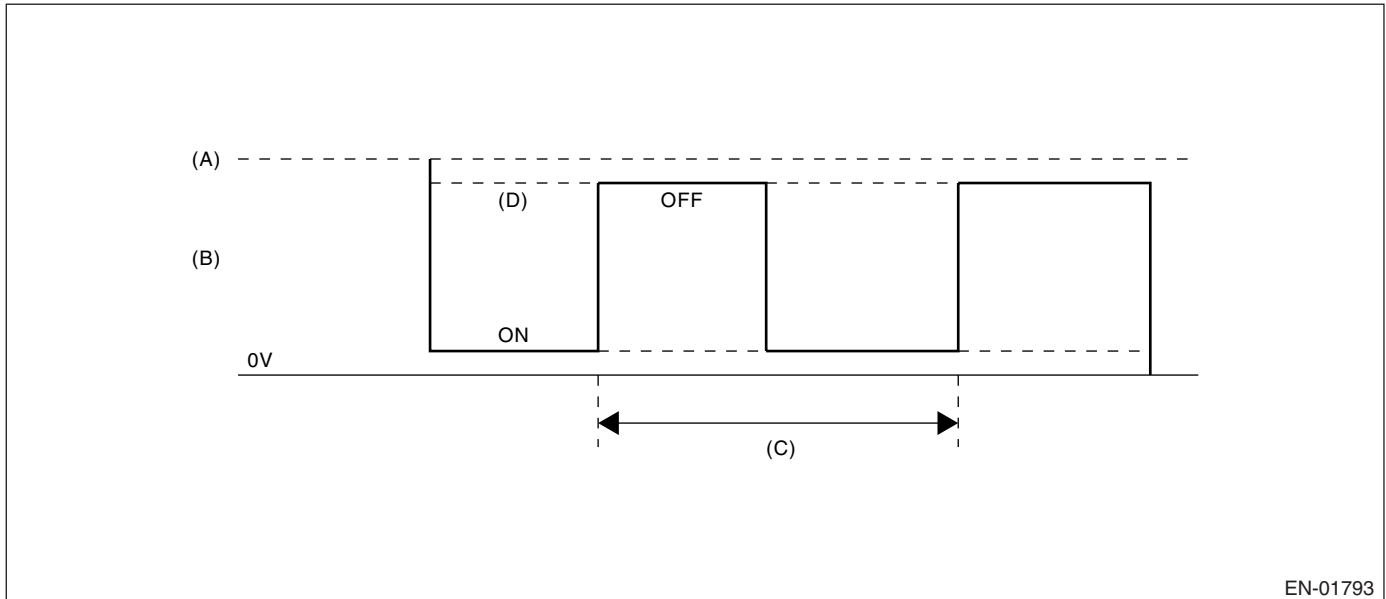
### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.

The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.

Judge NG when the terminal voltage remains to be High.

### 2. COMPONENT DESCRIPTION



- (A) Battery voltage
- (B) Front oxygen (A/F) sensor heater output voltage
- (C) 128 milliseconds
- (D) High abnormality

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions     |
|----------------------|-----------------------|
| Battery voltage      | $\geq 10.9 \text{ V}$ |

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes 1 second (8 cycles).

#### Judgment Value

| Malfunction Criteria                          | Threshold Value |
|---|-----------------|
| Output voltage level                          | High            |
| Front oxygen (A/F) sensor heater control duty | $\geq 12.5\%$   |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage level | Low             |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## F: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

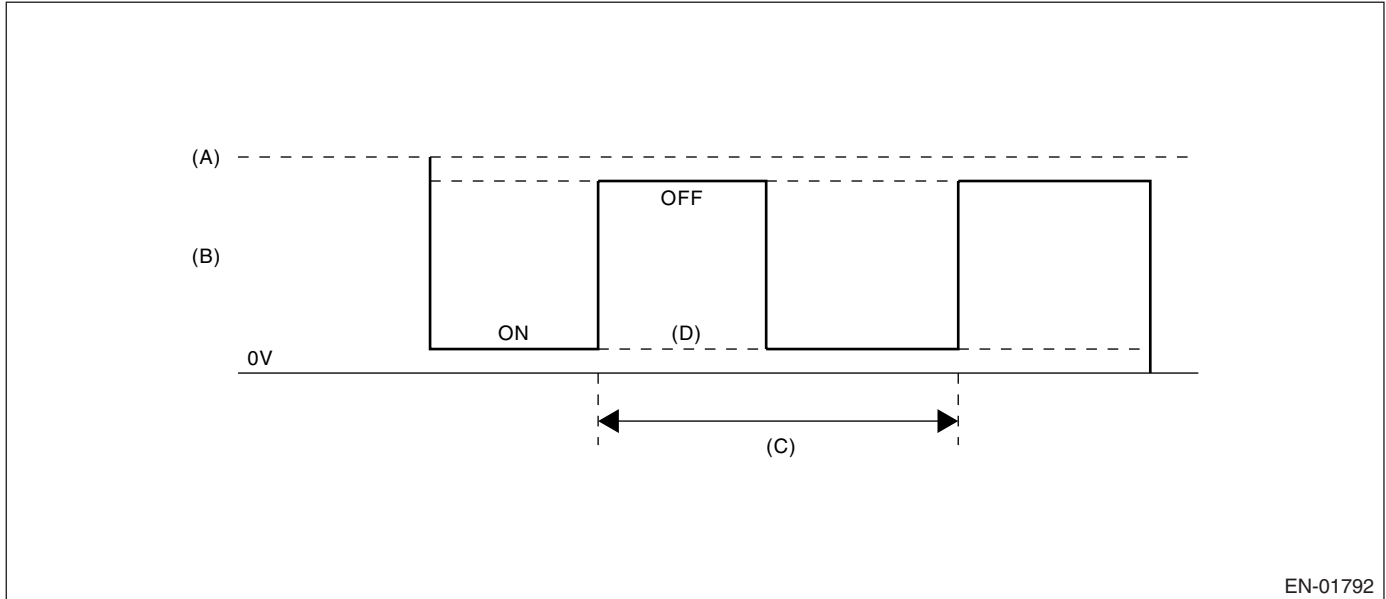
### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of rear oxygen sensor heater.

Rear oxygen sensor heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains to be Low.

### 2. COMPONENT DESCRIPTION



- (A) Battery voltage
- (B) Rear oxygen sensor heater output voltage
- (C) 256 milliseconds (cycles)
- (D) Low malfunction

### 3. ENABLE CONDITION

| Secondary Parameters               | Enable Conditions |
|------------------------------------|-------------------|
| Battery voltage                    | > 10.9 V          |
| Elapsed time after engine starting | ≥ 1 second        |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 1 second after engine starting.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2,560 millisecond (10 cycles).

#### Judgment Value

| Malfunction Criteria                   | Threshold Value |
|--|-----------------|
| Output voltage level                   | Low             |
| Rear oxygen sensor heater control duty | < 75%           |

**Time Needed for Diagnosis:** 2.56 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage level | High            |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Sub feedback control: Not allowed

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## G: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

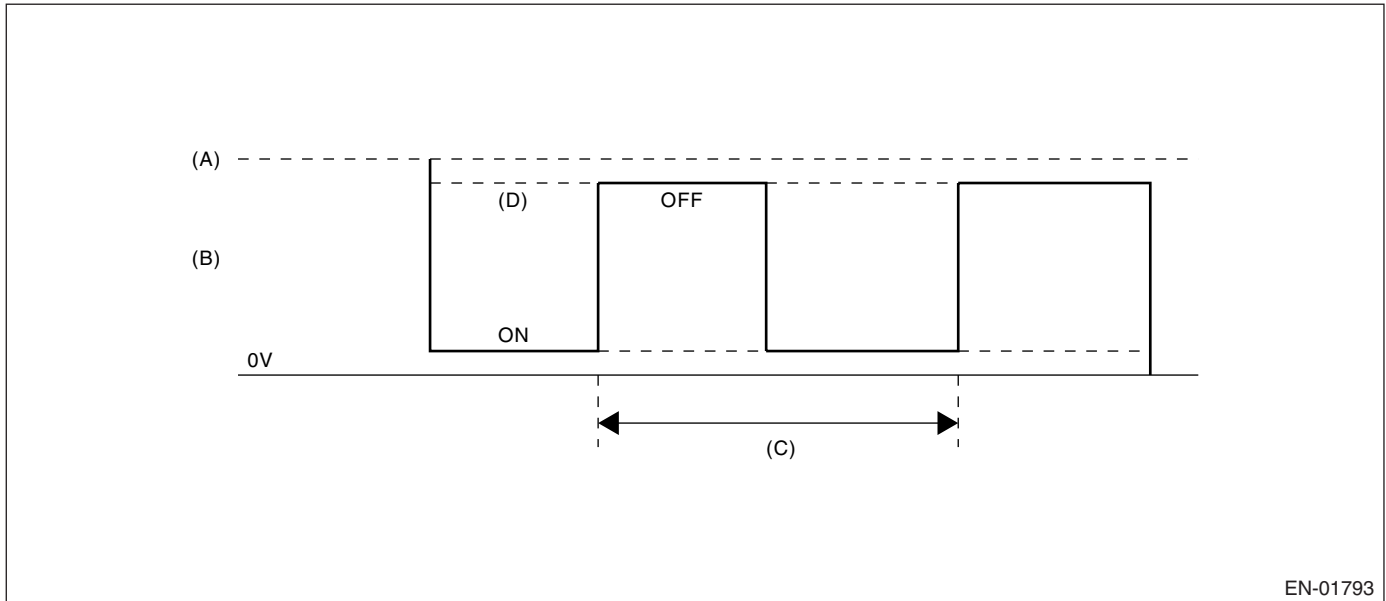
### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of rear oxygen heater.

Rear oxygen heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains to be High.

### 2. COMPONENT DESCRIPTION



- (A) Battery voltage
- (B) Rear oxygen sensor heater output voltage
- (C) 256 milliseconds (cycle)
- (D) High malfunction

### 3. ENABLE CONDITION

| Secondary Parameters               | Enable Conditions |
|------------------------------------|-------------------|
| Battery voltage                    | > 10.9 V          |
| Elapsed time after engine starting | ≥ 21 second       |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 1 second after engine starting.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2,560 milliseconds (10 cycles).

#### Judgment Value

| Malfunction Criteria                   | Threshold Value |
|--|-----------------|
| Output voltage level                   | High            |
| Rear oxygen sensor heater control duty | ≥ 25%           |

**Time Needed for Diagnosis:** 2.56 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage level | Low             |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Sub feedback control: Not allowed

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

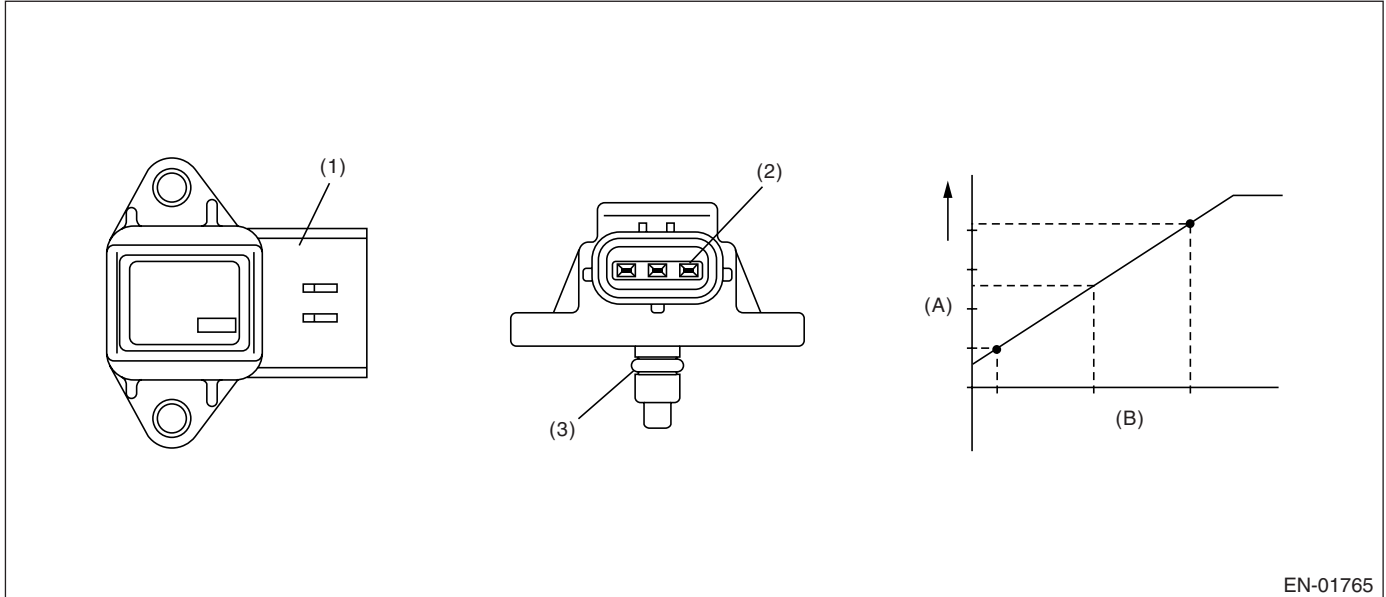
GENERAL DESCRIPTION

## H: DTC P0068 MAP/MAF – THROTTLE POSITION CORRELATION

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake manifold pressure sensor output property. Judge NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

### 2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal
- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

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### 3. ENABLE CONDITION

| Secondary Parameters       | Enable Conditions                 |
|----------------------------|-----------------------------------|
| Engine coolant temperature | $\geq 75^{\circ}\text{C}$ (167°F) |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when either Low side or High side becomes NG. Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### Judgment Value

| Malfunction Criteria | Threshold Value                   |
|----------------------|-----------------------------------|
| Low side             |                                   |
| Engine speed         | $< 2,500$ rpm                     |
| Throttle position    | $\geq 10^{\circ}$                 |
| Output voltage       | $< 1.0$ V                         |
| High side            |                                   |
| Engine speed         | $600 \longleftrightarrow 900$ rpm |
| Throttle position    | $< 1.3^{\circ}$                   |
| Output voltage       | $\geq 2.6$ V                      |

**Time Needed for Diagnosis:** 3 seconds

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when both Low side and High side become OK. Judge OK when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Low side             |                 |
| Engine speed         | < 2,500 rpm     |
| Throttle position    | ≥ 10°           |
| Output voltage       | ≥ 1.0 V         |
| High side            |                 |
| Engine speed         | 600 ←→ 900 rpm  |
| Throttle position    | < 1.3°          |
| Output voltage       | < 2.6 V         |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

## 9. ECM OPERATION AT DTC SETTING

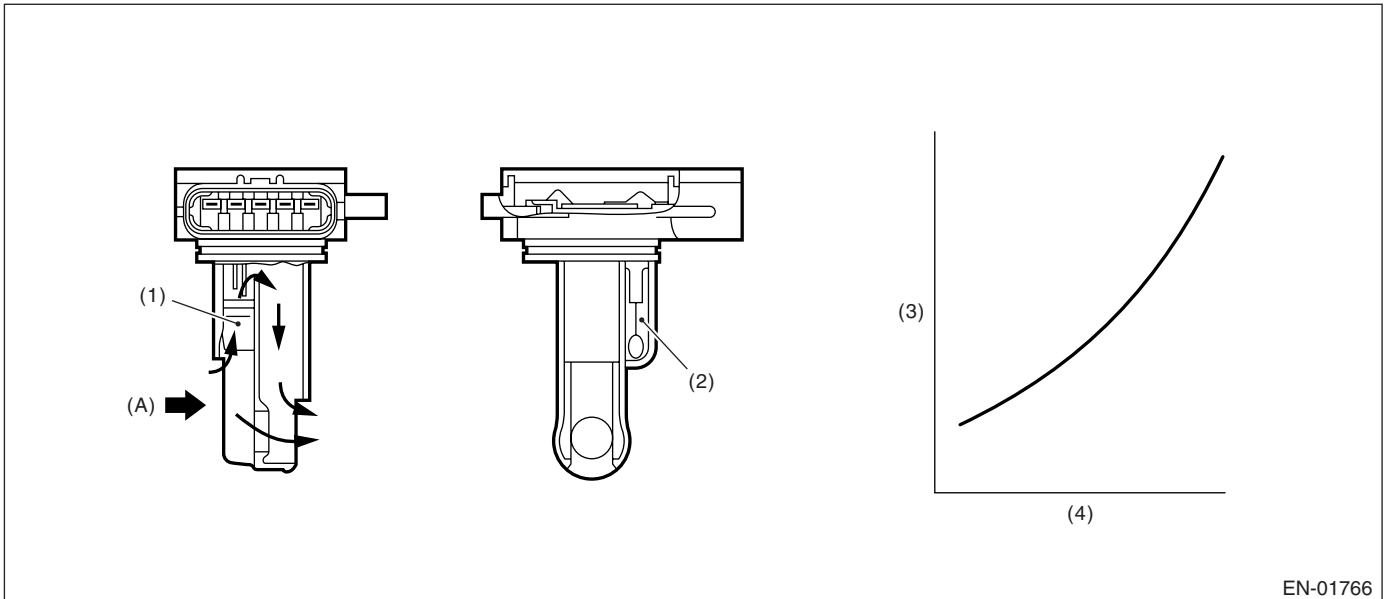
Memorize the freeze frame data. (For test mode \$02)

## I: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output property. Judge Low side NG when the air flow voltage indicates low value in spite of the driving condition that the air flow voltage might be high; otherwise, judge High side NG when the air flow voltage indicates high value in spite of the driving condition that the air flow voltage might be low. Judge air flow sensor property NG when the Low side or High side becomes NG.

### 2. COMPONENT DESCRIPTION



EN-01766

- (1) Air flow sensor
  - (2) Intake air temperature sensor
  - (3) Voltage (V)
  - (4) Intake air volume (kg/s)
- (A) Air

### 3. ENABLE CONDITION

| Secondary Parameters       | Enable Conditions                 |
|----------------------------|-----------------------------------|
| Engine coolant temperature | $\geq 70^{\circ}\text{C}$ (167°F) |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis.

#### Judgment Value

| Malfunction Criteria  | Threshold Value  |
|---|--|
| Low side NG<br>Output voltage<br>Engine speed<br>Throttle angle<br>Intake manifold pressure                                 | < 1.5 V<br>≥ 2,500 rpm<br>≥ 15°<br>≥ 53.3 kPa (400 mmHg, 15.7 inHg)                                |
| High side NG 1<br>Output voltage<br>Engine speed<br>Throttle angle<br>Intake manifold pressure                              | ≥ 1.95 V<br>600 ↔ 1,200 rpm<br>< 2.75°<br>< 46.7 kPa (350 mmHg, 13.8 inHg)                         |
| High side NG 2<br>Output voltage<br>Engine speed<br>Throttle angle<br>Intake manifold pressure<br>Diagnosis for fuel system | ≥ 1.7 V<br>600 ↔ 1,200 rpm<br>< 2.75°<br>< 46.7 kPa (350 mmHg, 13.8 inHg)<br>Rich side malfunction |

#### Time Needed for Diagnosis:

|           |            |
|-----------|------------|
| Low side  | 3 seconds  |
| High side | 10 seconds |

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK the when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value   |
|--|---|
| Low side NG<br>Output voltage<br>Engine speed<br>Throttle angle<br>Intake manifold pressure  | ≥ 1.5 V<br>≥ 2,500 rpm<br>≥ 15°<br>≥ 53.3 kPa (400 mmHg, 15.7 inHg)     |
| High side NG<br>Output voltage<br>Engine speed<br>Throttle angle<br>Intake manifold pressure | < 2.5 V<br>550 ↔ 900 rpm<br>< 1.92°<br>< 46.7 kPa (350 mmHg, 13.8 inHg) |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  - At normal: knock compensation = 0°CA is fixed.
  - At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
  - Not allowed to update the whole learning compensation factor.
  - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

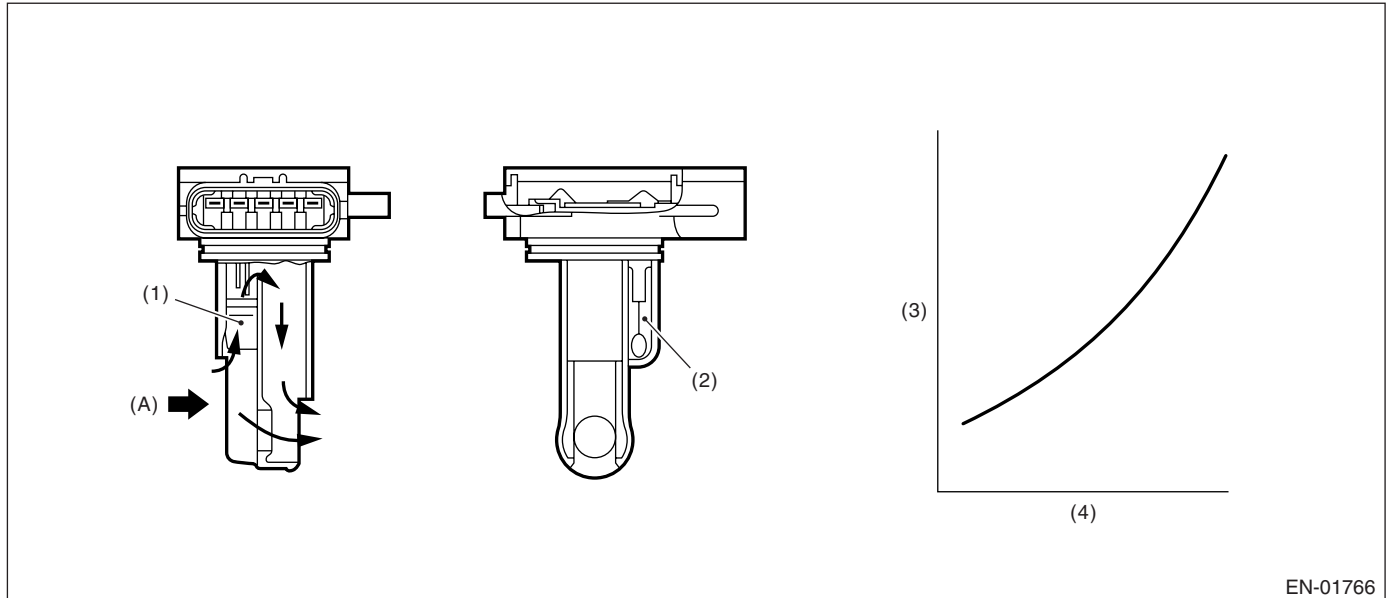
## GENERAL DESCRIPTION

### J: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01766

- |     |                               |     |     |
|-----|-------------------------------|-----|-----|
| (1) | Air flow sensor               | (A) | Air |
| (2) | Intake air temperature sensor |     |     |
| (3) | Voltage (V)                   |     |     |
| (4) | Intake air volume (kg/s)      |     |     |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions     |
|----------------------|-----------------------|
| Battery voltage      | $\geq 10.9 \text{ V}$ |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value      |
|----------------------|----------------------|
| Output voltage       | $\leq 0.2 \text{ V}$ |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  - At normal: knock compensation = 0°CA is fixed.
  - At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
  - Not allowed to update the whole learning compensation factor.
  - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

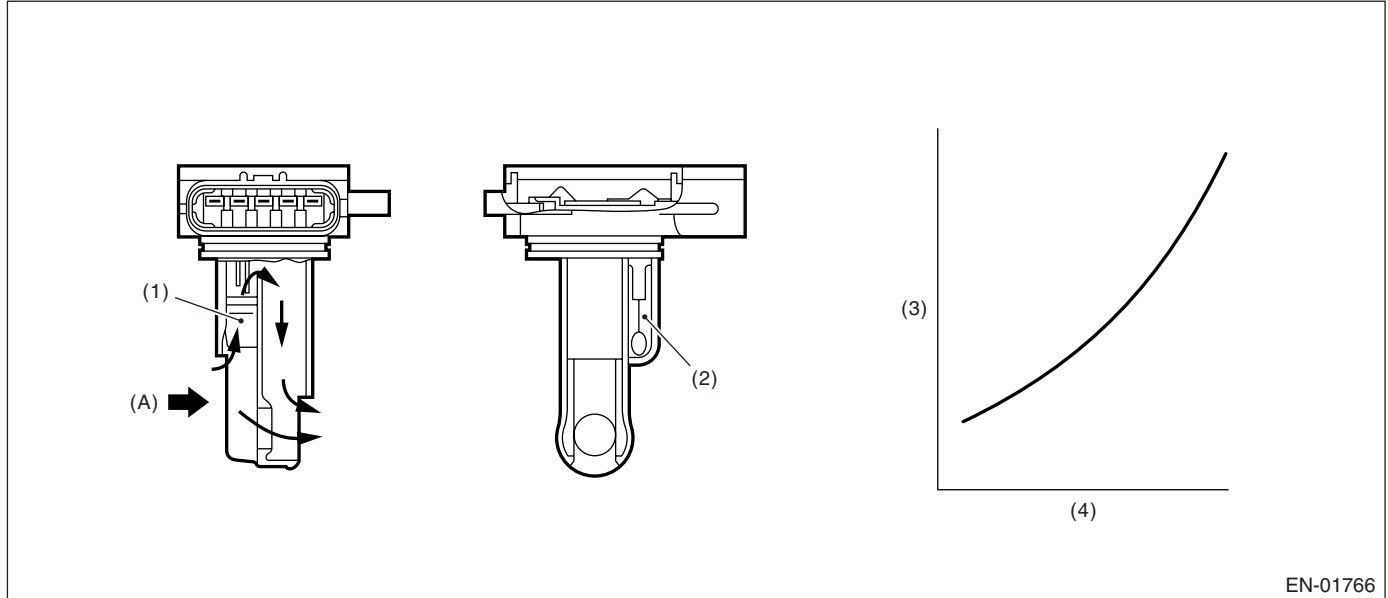
## GENERAL DESCRIPTION

### K: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Air flow sensor
- (2) Intake air temperature sensor
- (3) Voltage (V)
- (4) Intake air volume (kg/s)
- (A) Air

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions     |
|----------------------|-----------------------|
| Battery voltage      | $\geq 10.9 \text{ V}$ |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value        |
|----------------------|------------------------|
| Output voltage       | $\geq 4.985 \text{ V}$ |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  - At normal: knock compensation = 0°CA is fixed.
  - At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
  - Not allowed to update the whole learning compensation factor.
  - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

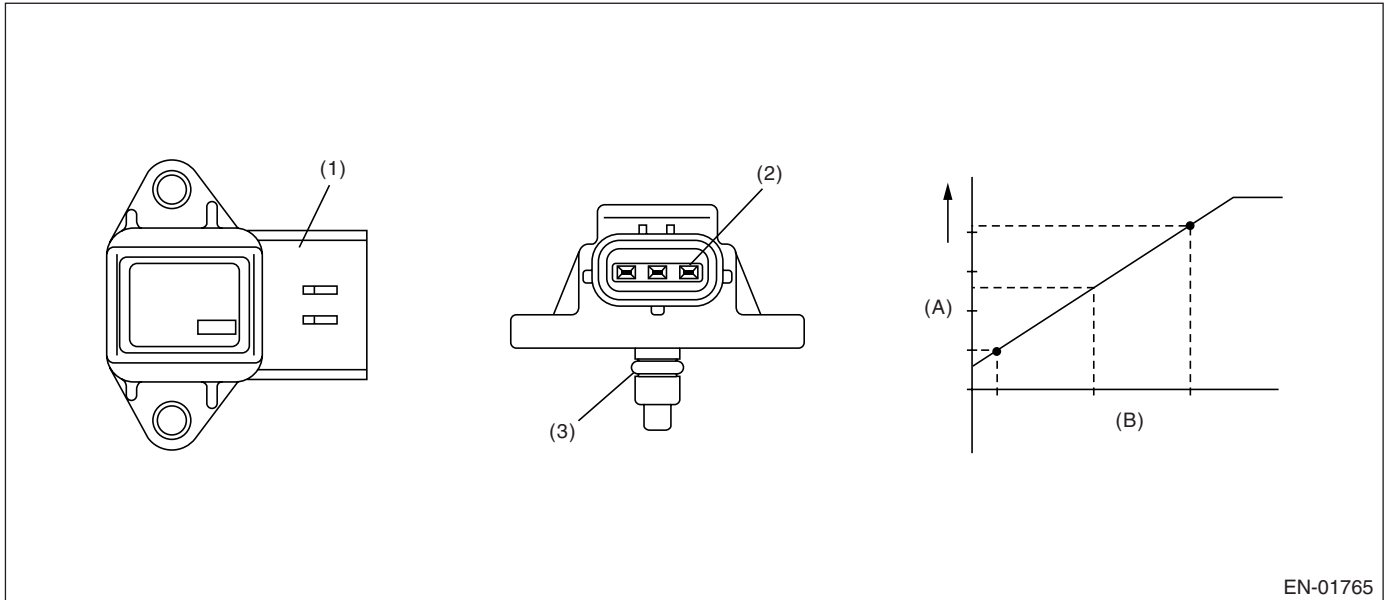
## GENERAL DESCRIPTION

### L: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal
- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.568 V       |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

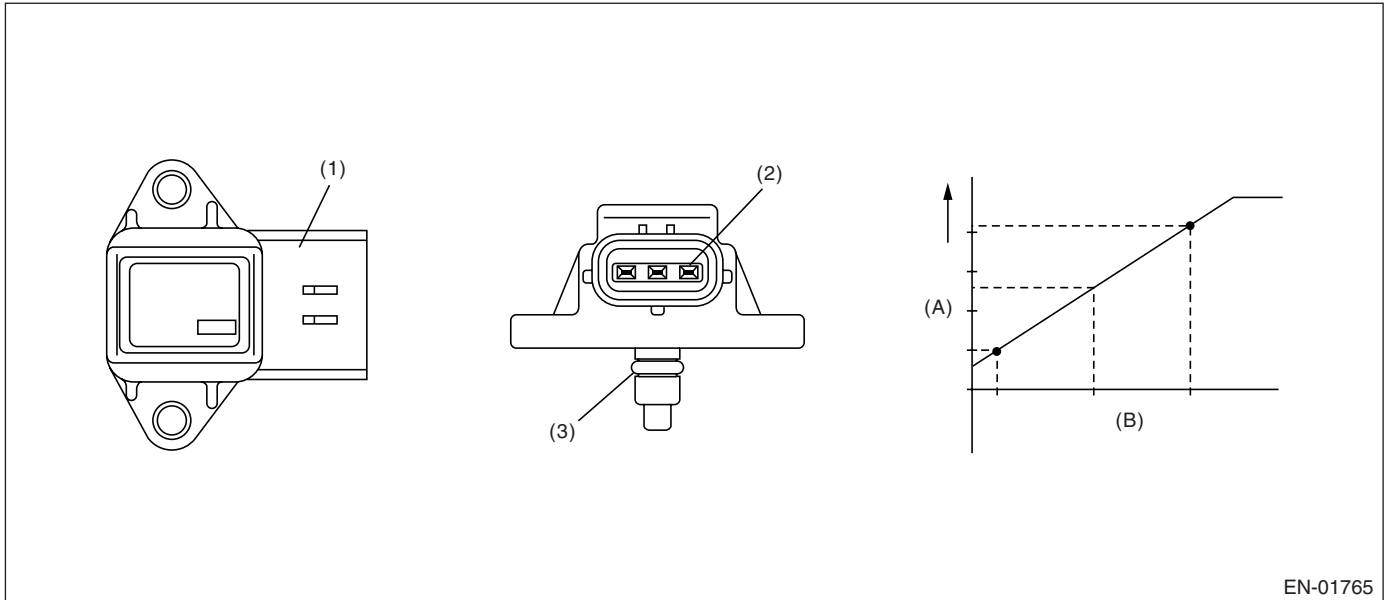
## GENERAL DESCRIPTION

### M: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal
- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.921$ V  |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

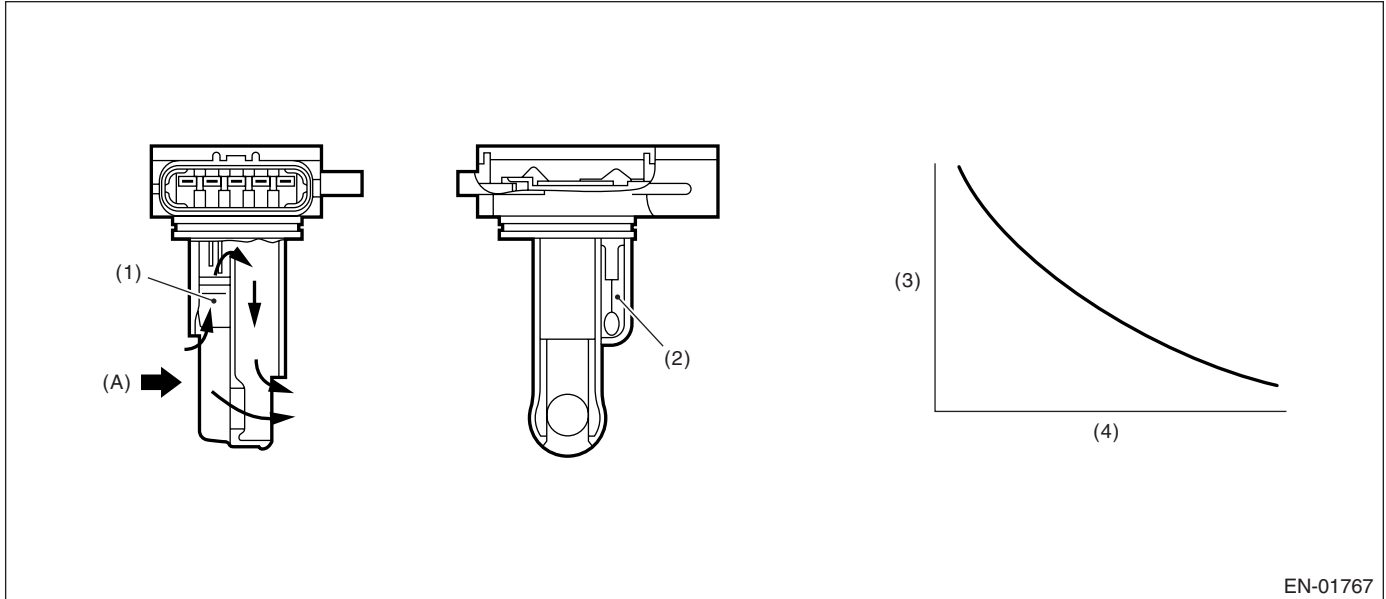
## GENERAL DESCRIPTION

### N: DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property. Judge NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

#### 2. COMPONENT DESCRIPTION



- (1) Air flow sensor
  - (2) Intake air temperature sensor
  - (3) Resistance value ( $\Omega$ )
  - (4) Intake air temperature °C (°F)
- (A) Air

#### 3. ENABLE CONDITION

| Secondary Parameters   | Enable Conditions   |
|--|---------------------|
| Coolant temp. before engine start                                    | < 30°C (86°F)       |
| Engine coolant temperature   | > 75°C (167°F)      |
| Battery voltage  | ≥ 10.9 V            |
| Continuous time when the vehicle speed is less than 50 km/h (31 MPH) | 600 seconds or more |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after idling from starting the cooled engine.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

### Judgment Value

| Malfunction Criteria                            | Threshold Value   |
|---|---|
| Output voltage difference between Max. and Min. | < 20 mV (It is equal to approx. 0.5°C (33°F) around 25°.) |
| Exhaust temperature above 500°C (932°F)         | 60 seconds or more  |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria                            | Threshold Value |
|---|-----------------|
| Output voltage difference between Max. and Min. | ≥ 20 mV         |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

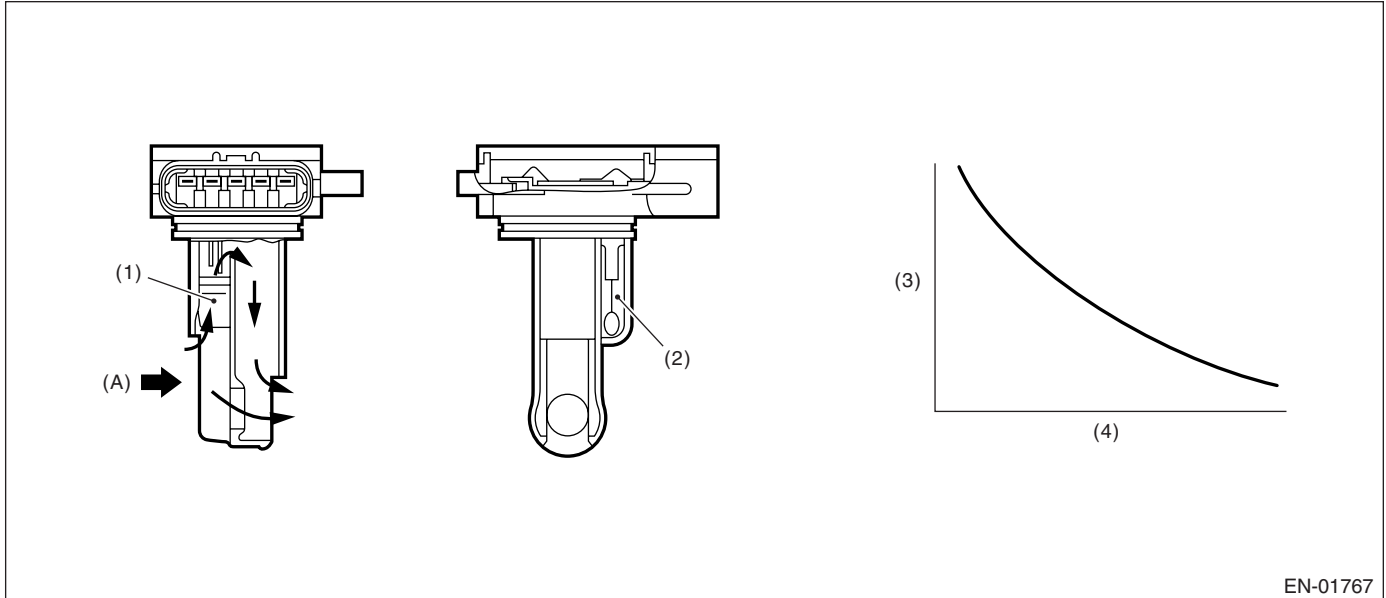
## GENERAL DESCRIPTION

### O: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01767

- (1) Air flow sensor
- (2) Intake air temperature sensor
- (3) Resistance value ( $\Omega$ )
- (4) Intake air temperature °C (°F)
- (A) Air

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.165 V       |
| Ignition switch      | ON              |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 0.165$ V  |
| Ignition switch      | ON              |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

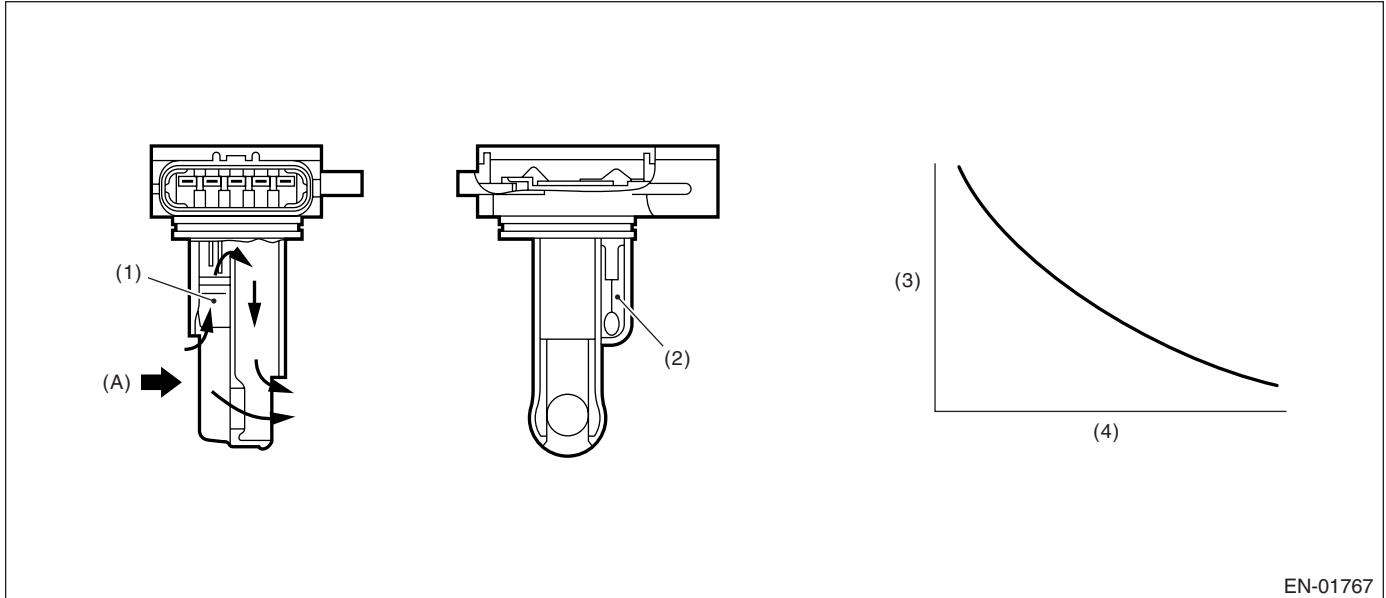
## GENERAL DESCRIPTION

### P: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01767

- (1) Air flow sensor
  - (2) Intake air temperature sensor
  - (3) Resistance value ( $\Omega$ )
  - (4) Intake air temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )
- (A) Air

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value       |
|----------------------|-----------------------|
| Output voltage       | $\geq 4.72 \text{ V}$ |
| Ignition switch      | ON                    |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 0.23$ V   |
| Ignition switch      | ON              |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

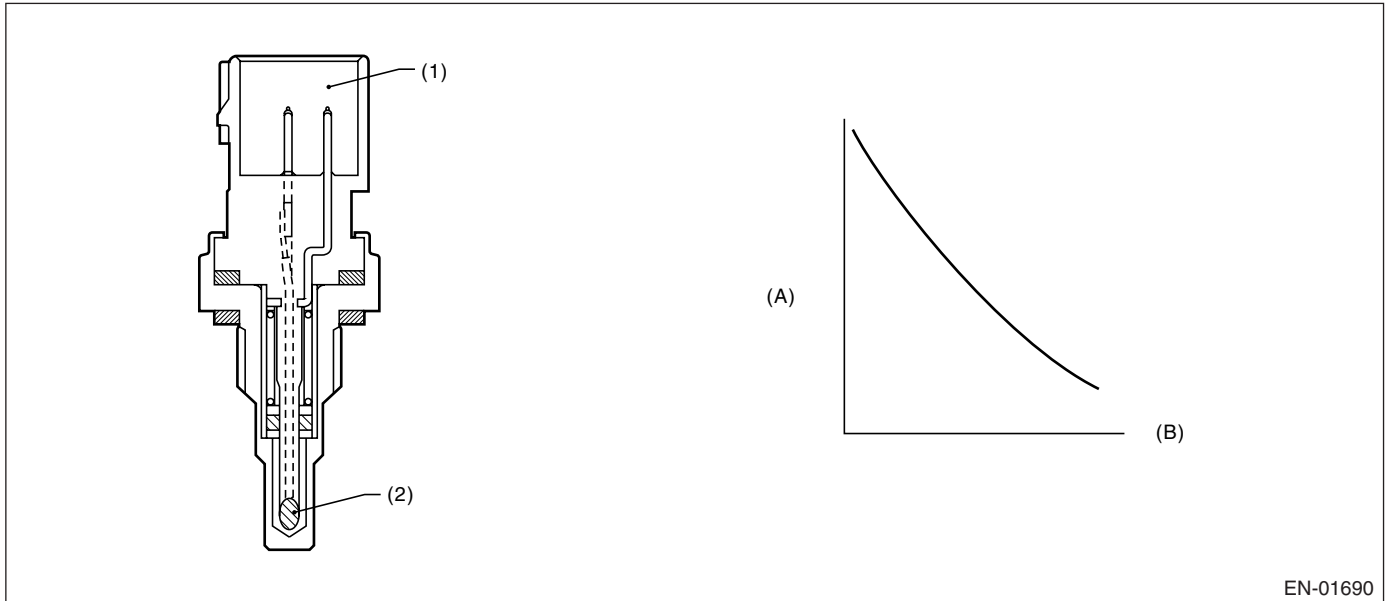
## GENERAL DESCRIPTION

### Q: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Thermistor element

- (A) Resistance value (k $\Omega$ )
- (B) Temperature °C (°F)

EN-01690

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.165 V       |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high engine coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except engine coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

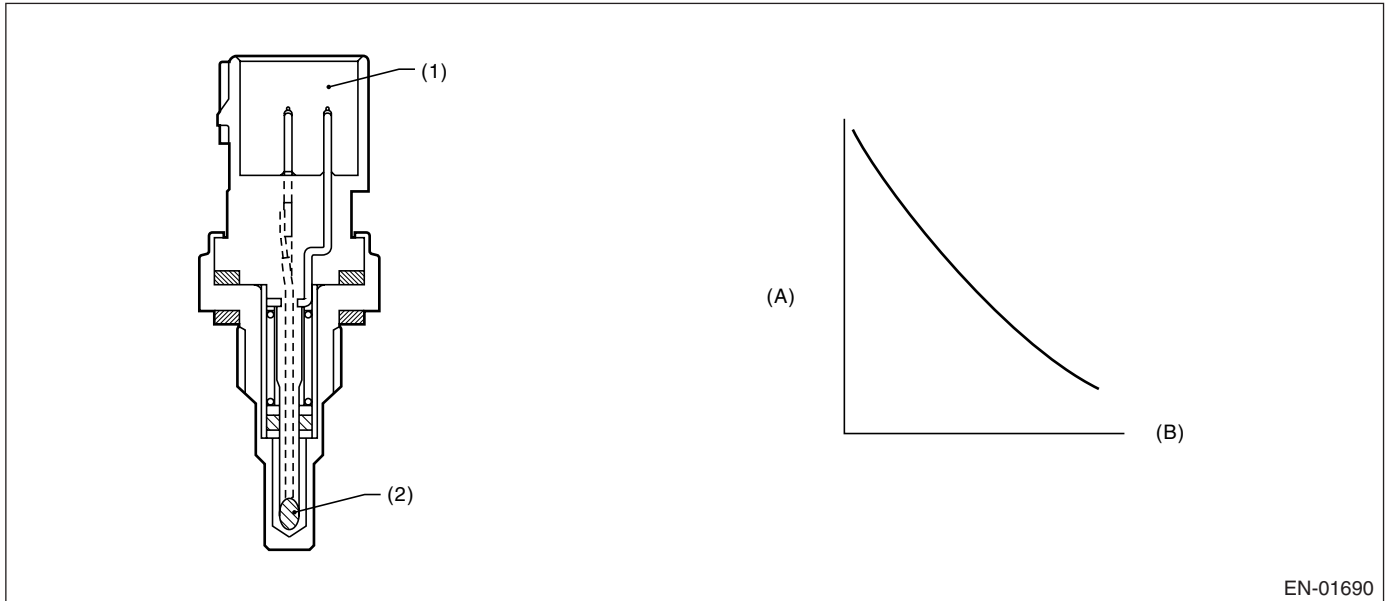
## GENERAL DESCRIPTION

### R: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Thermistor element

- (A) Resistance value (kΩ)
- (B) Temperature °C (°F)

EN-01690

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | ≥ 4.716 V       |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high engine coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except engine coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

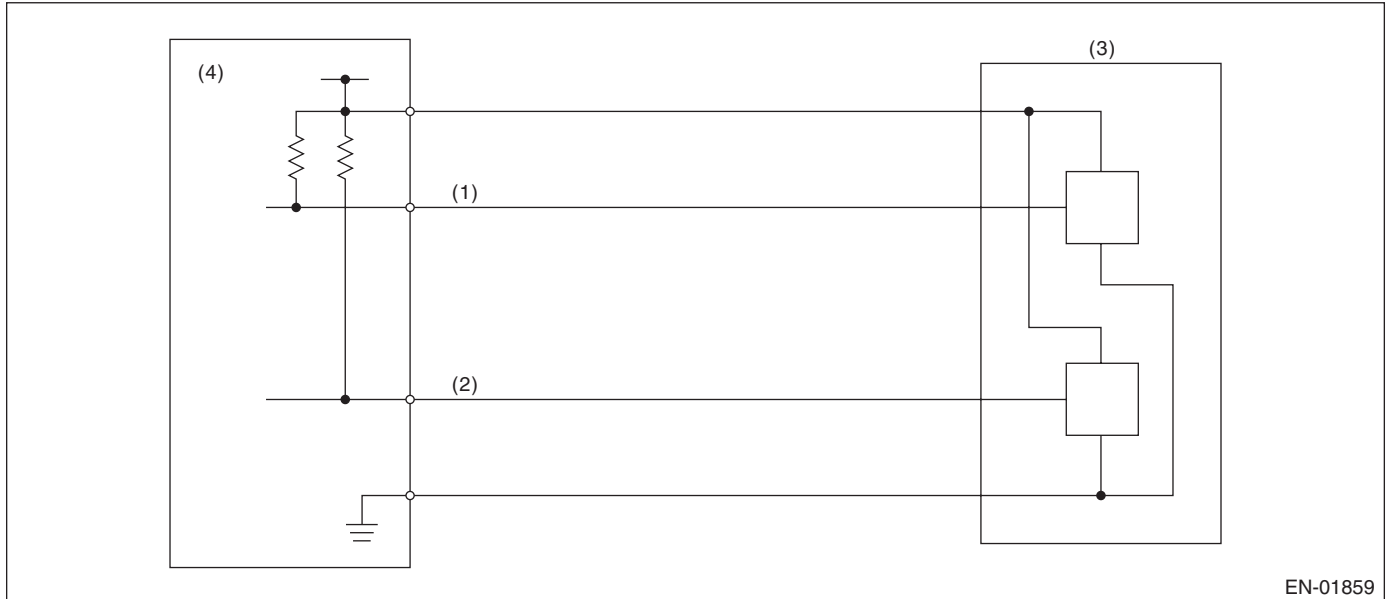
## GENERAL DESCRIPTION

### S: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal
- (2) Throttle position sensor 2 signal
- (3) Throttle position sensor
- (4) Engine control module (ECM)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\leq 0.309$ V  |

**Time Needed for Diagnosis:** 24 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

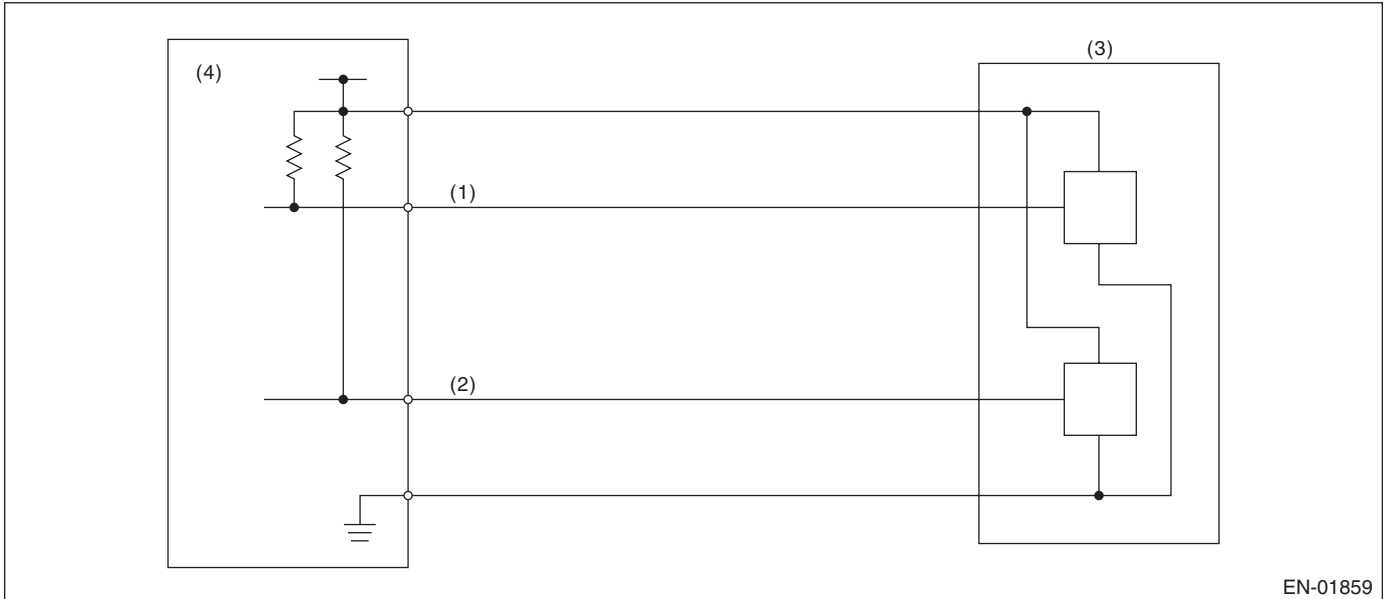
## GENERAL DESCRIPTION

### T: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal
- (2) Throttle position sensor 2 signal
- (3) Throttle position sensor
- (4) Engine control module (ECM)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\geq 4.646$ V  |

**Time Needed for Diagnosis:** 24 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

## Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

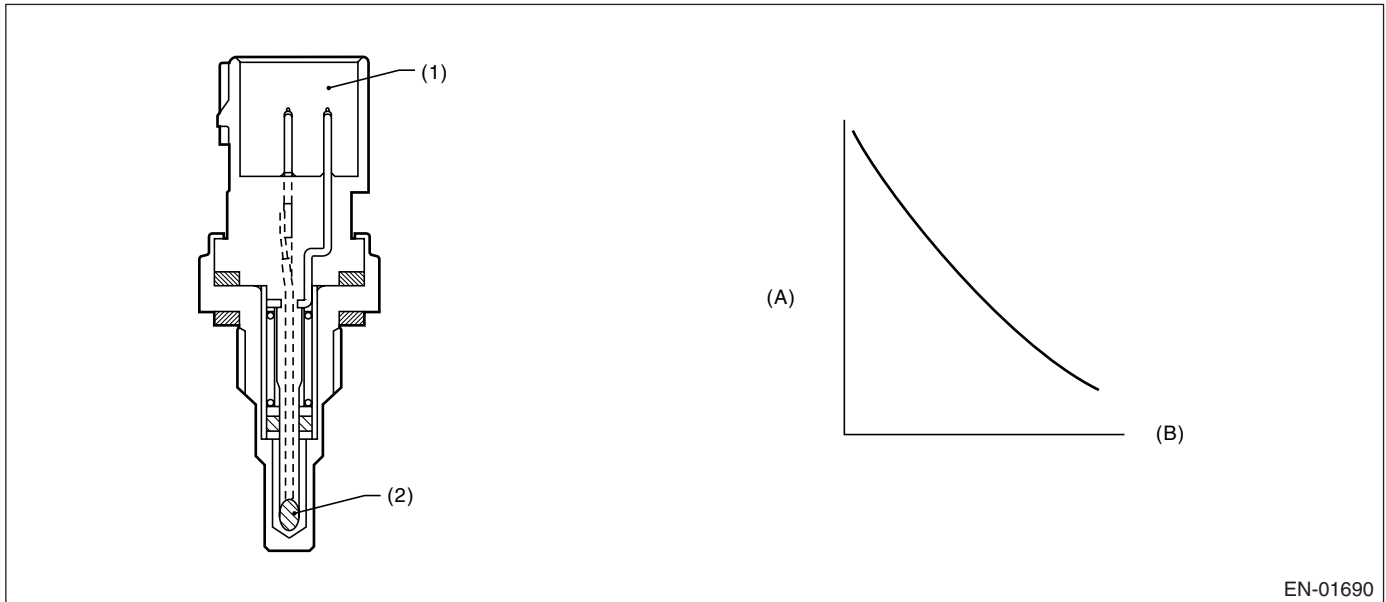
## GENERAL DESCRIPTION

### U: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property. Judge NG when the engine coolant temperature does not rise whereas it seemed to rise from the viewpoint of the engine condition.

#### 2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Thermistor element

- (A) Resistance value (kΩ)
- (B) Temperature °C (°F)

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#### 3. ENABLE CONDITION

| Secondary Parameters                                    | Enable Conditions |
|---|-------------------|
| Diagnosis of engine coolant temperature sensor property | Not finished      |
| Engine speed  | ≥ 500 rpm         |
| Battery voltage   | > 10.9 V          |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine starting.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria                      | Threshold Value                              |
|---|--|
| Engine coolant temperature                | < 20°C (68°F)                                |
| Timer for diagnosis after engine starting | ≥ Timer judgment value after engine starting |

Timer for diagnosis after engine starting

- a) Timer stop at fuel cut mode.
- b) During the driving conditions (except a) above), timer count up by 64 milliseconds + TWCNT milliseconds at every 64 milliseconds.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Where, TWCNT is determined as follows,  
TWCNT = 0 at idle switch ON,  
TWCNT show on the following table at idle switch OFF.

| Temperature<br>°C (°F) | Vehicle speed km/h (MPH) |          |           |           |           |           |           |           |
|------------------------|--------------------------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                        | 0 (0)                    | 8 (4.97) | 16 (9.94) | 24 (14.9) | 32 (19.9) | 40 (24.9) | 48 (29.8) | 56 (34.8) |
| -20 (-4)               | 0 ms                     | 37.14 ms | 74.27 ms  | 111.41 ms | 126.66 ms | 141.91 ms | 163.59 ms | 185.26 ms |
| -10 (14)               | 0 ms                     | 27.39 ms | 54.78 ms  | 82.17 ms  | 99.65 ms  | 117.13 ms | 135.96 ms | 154.80 ms |
| 0 (32)                 | 0 ms                     | 17.65 ms | 35.29 ms  | 52.94 ms  | 72.64 ms  | 92.34 ms  | 108.34 ms | 124.33 ms |
| 10 (50)                | 0 ms                     | 7.90 ms  | 15.80 ms  | 23.70 ms  | 45.63 ms  | 67.56 ms  | 80.71 ms  | 93.87 ms  |
| 20 (68)                | 0 ms                     | 7.90 ms  | 15.80 ms  | 23.70 ms  | 45.63 ms  | 67.56 ms  | 80.71 ms  | 93.87 ms  |

Judgment value of timer after engine starting

$$t = 451.1 - 25.9 \times T_i$$

$T_i$  is the lowest engine coolant temperature after starting the engine.

**Time Needed for Diagnosis:** To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria       | Threshold Value                |
|----------------------------|--------------------------------|
| Engine coolant temperature | $\geq 20^\circ\text{C}$ (68°F) |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high engine coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except engine coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

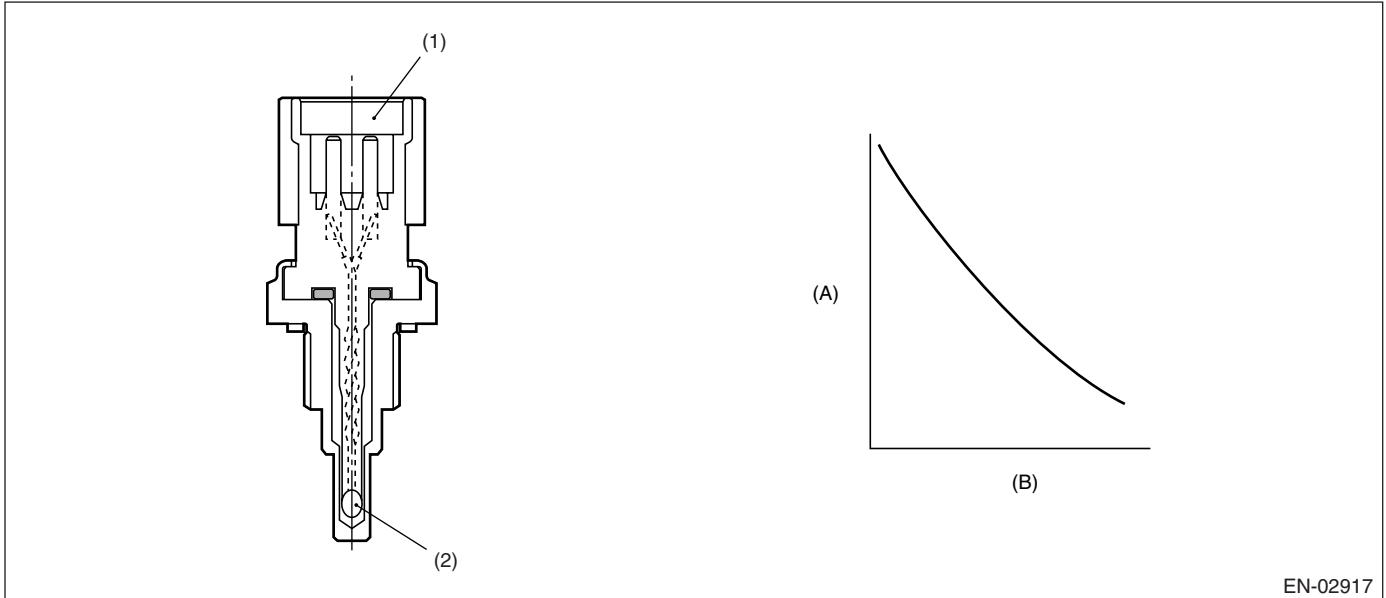
### V: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature sensor property.

The engine coolant temperature and fuel temperature are memorized when stopping the engine at the previous time. Judge NG when the engine coolant temperature does not decrease in the case the engine coolant temperature seems to decrease after starting the engine this time.

#### 2. COMPONENT DESCRIPTION



EN-02917

- (1) Connector
- (2) Thermistor element

- (A) Resistance value (k $\Omega$ )
- (B) Temperature °C (°F)

#### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions  |
|---|--|
| Battery voltage   | $\geq 10.9$ V  |
| Filling fuel from stopping engine at the previous time to starting it this time | No   |
| Fuel level  | $\geq 15$ $\varnothing$  |
| Engine coolant temperature when stopping engine at the previous time            | $\geq 70^{\circ}\text{C}$ (158°F) and $< 95^{\circ}\text{C}$ (203°F) |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Engine coolant temperature when stopping engine at the previous time – The lowest engine coolant temperature after starting engine | < 2.5°C (4.5°F) |
| Fuel temperature when stopping engine at the previous time – Fuel temperature  | ≥ 5°C (9°F)     |
| Intake air temperature – Fuel temperature  | < 2.5°C (4.5°F) |
| Fuel temperature   | < 35°C (95°F)   |

### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Engine coolant temperature when stopping engine at the previous time – The lowest engine coolant temperature after starting engine | ≥ 2.5°C (4.5°F) |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illuminations:** Detect when malfunction occurs in 2 continuous driving cycles.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

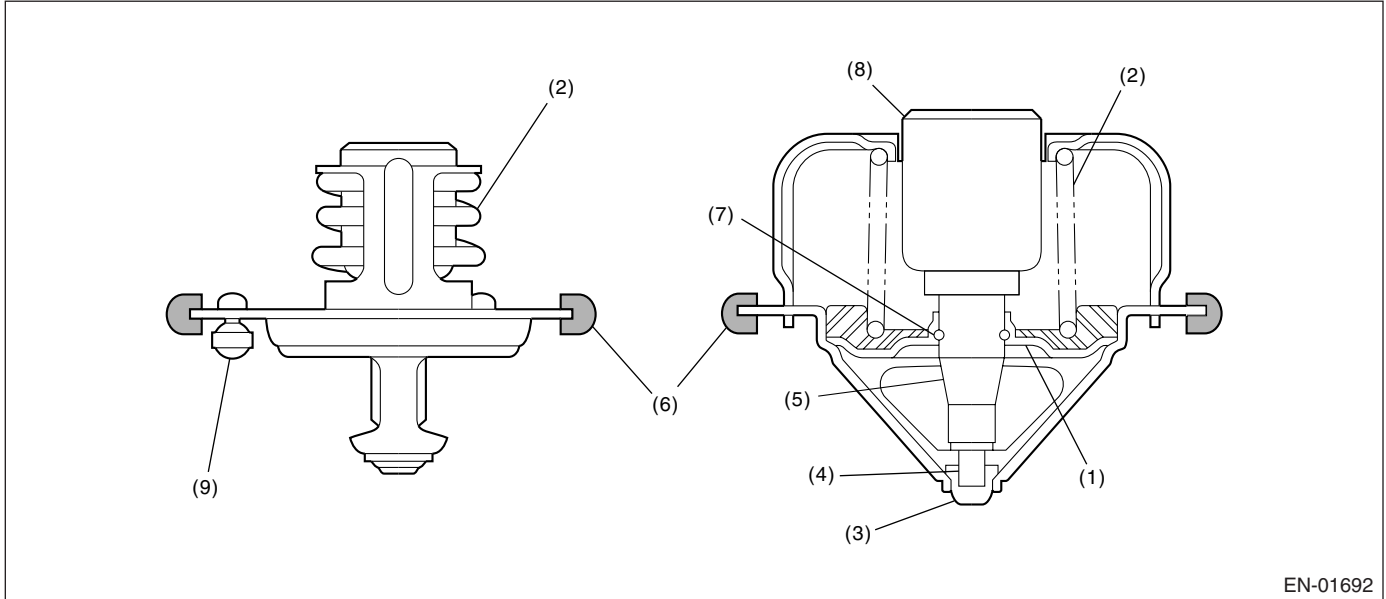
## GENERAL DESCRIPTION

### W: DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of thermostat function. Judge NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge OK when the engine coolant temperature becomes 75°C (167°F) and the difference is small before judging NG.

#### 2. COMPONENT DESCRIPTION



- |             |                    |
|-------------|--------------------|
| (1) Valve   | (6) Rubber packing |
| (2) Spring  | (7) Stop ring      |
| (3) Stopper | (8) Wax element    |
| (4) Piston  | (9) Jiggle valve   |
| (5) Guide   |                    |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 30 seconds.

### Judgment Value

| Malfunction Criteria                              | Threshold Value                    |
|---|------------------------------------|
| Battery voltage                                   | $\geq 10.9$ V                      |
| Estimated ambient air temperature                 | $\geq -7^{\circ}\text{C}$ (19.4°F) |
| Thermostat malfunction diagnosis                  | Not finished                       |
| Engine coolant temperature at engine starting     | $< 55^{\circ}\text{C}$ (131°F)     |
| Estimated engine coolant temperature              | $\geq 75^{\circ}\text{C}$ (167°F)  |
| Engine coolant temperature                        | $< 75^{\circ}\text{C}$ (167°F)     |
| (Estimated – measured) engine coolant temperature | $> 20^{\circ}\text{C}$ (68°F)      |

**Time Needed for Diagnosis:** 30 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria                              | Threshold Value                    |
|---|------------------------------------|
| Battery voltage                                   | $\geq 10.9$ V                      |
| Estimated ambient air temperature                 | $\geq -7^{\circ}\text{C}$ (19.4°F) |
| Thermostat malfunction diagnosis                  | Not finished                       |
| Engine coolant temperature at engine starting     | $< 55^{\circ}\text{C}$ (131°F)     |
| Engine coolant temperature                        | $\geq 75^{\circ}\text{C}$ (167°F)  |
| (Estimated – measured) engine coolant temperature | $\leq 30^{\circ}\text{C}$ (86°F)   |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

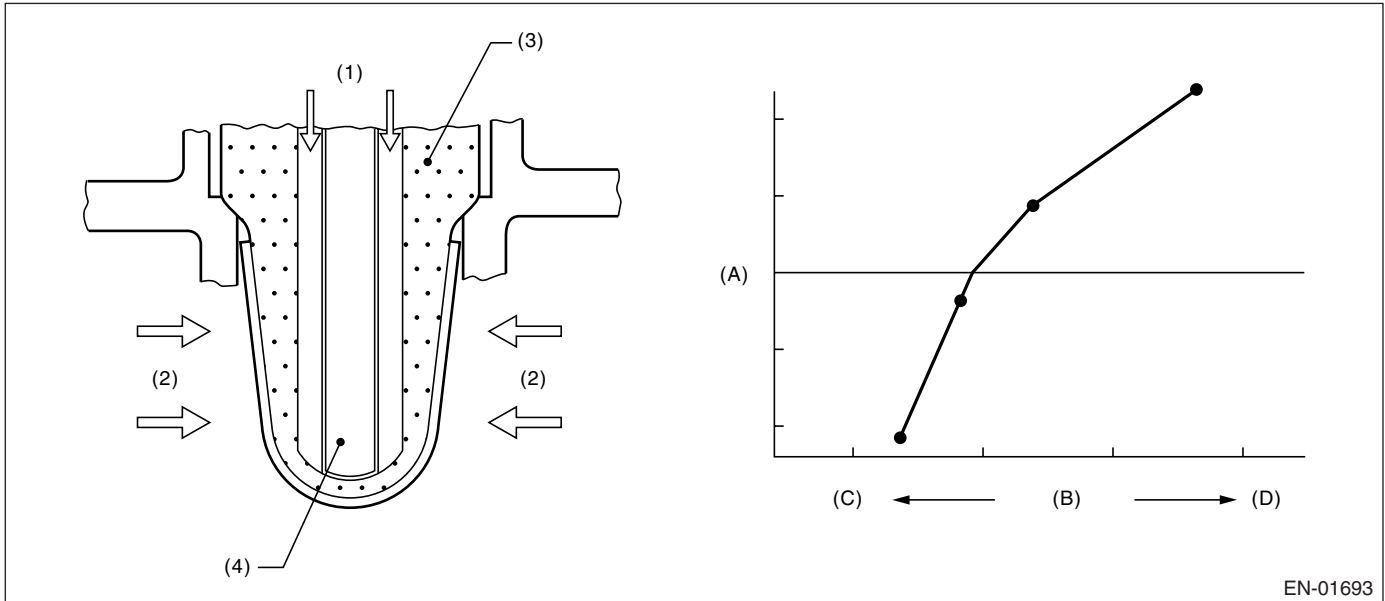
### X: DTC P0131 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge NG when the element impressed voltage is out of range, or the element current is out of range.

#### 2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust
- (3) ZrO<sub>2</sub>
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

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#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Voltage              | ≥ 10.9 V          |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Input voltage        | < 1.8 V         |
| Input current        | < -0.01 A       |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

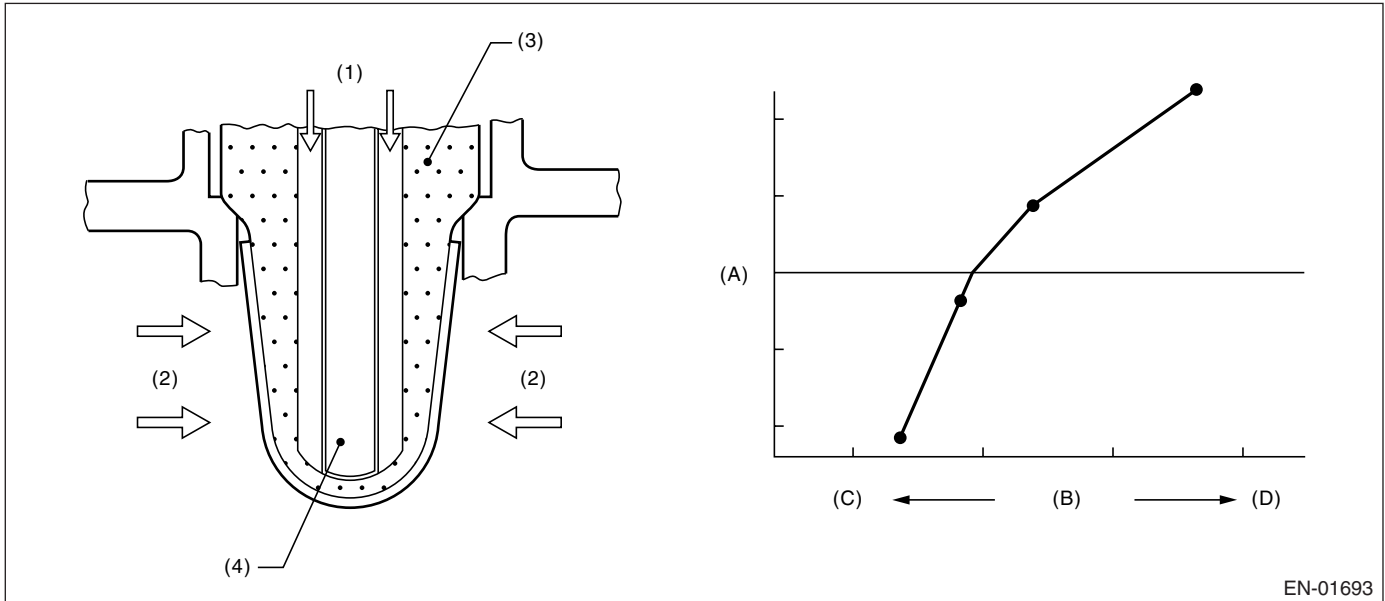
### Y: DTC P0132 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge NG when the element impressed voltage is out of range, or the element current is out of range.

#### 2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust
- (3) ZrO<sub>2</sub>
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

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#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Voltage              | ≥ 10.9 V          |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Input voltage        | ≥ 3.8 V         |
| Input current        | ≥ 0.01 A        |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



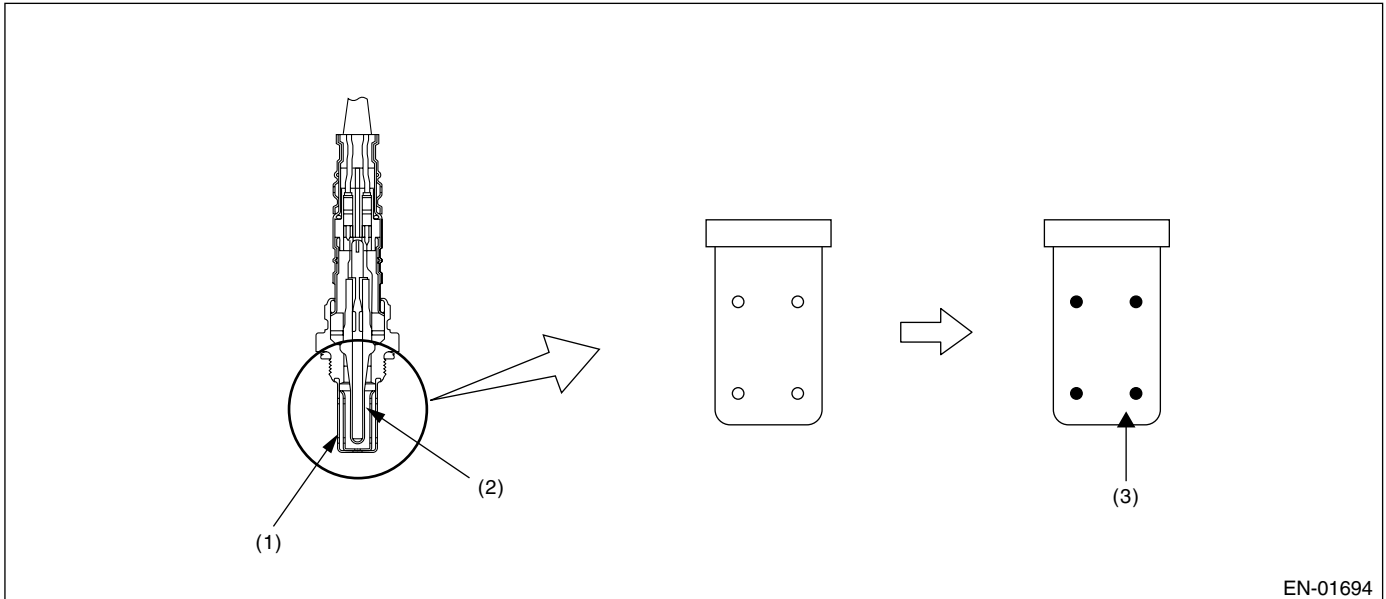
# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### Z: DTC P0133 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect time-lag of front oxygen (A/F) sensor response. Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed. When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the cover has clogged holes, the rich to lean judgment in ECM is delayed when the change from rich to lean is caused.

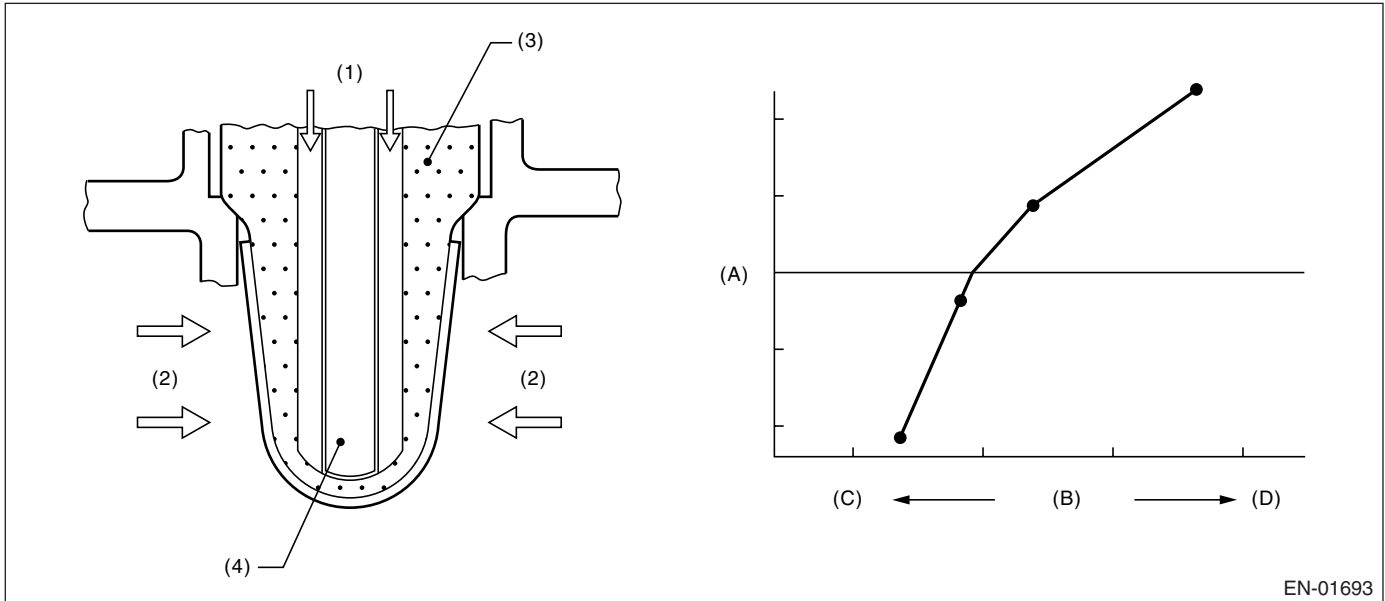


- (1) Cover
- (2) Zirconia
- (3) Clogging

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 2. COMPONENT DESCRIPTION



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- (1) Atmosphere
- (2) Exhaust
- (3) ZrO<sub>2</sub>
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

## 3. ENABLE CONDITION

| Secondary Parameters                         | Enable Conditions                  |
|--|------------------------------------|
| All secondary parameter enable conditions    | more than 1 second                 |
| Diagnosis of A/F response                    | Not done                           |
| Battery voltage                              | > 10.9 V                           |
| Atmospheric pressure                         | > 75.1 kPa (563 mmHg, 22.2 inHg)   |
| Closed loop control with main feedback       | operating                          |
| Impedance of front oxygen (A/F) sensor       | 0 ↔ 50 Ω                           |
| After engine starting                        | 120 seconds or more                |
| Engine coolant temperature                   | ≥ 75°C (167°F)                     |
| Engine speed                                 | 1,000 ↔ 3,200 rpm                  |
| Vehicle speed                                | 10 ↔ 120 km/h<br>(6.21 ↔ 74.6 MPH) |
| Amount of intake air                         | 10 ↔ 31 g/s                        |
| Engine load change during 0.5 engine rev.    | ≤ 0.01 g/rev                       |
| All conditions for EVAP canister purge       | to be in enable                    |
| Learning value of EVAP conc. during purge    | ≤ 0.2                              |
| Accumulated time of operating canister purge | 20 seconds or more                 |

## 4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 to 120 km/h (6.21 to 74.6 MPH) in 120 seconds after starting the engine.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 5. DIAGNOSTIC METHOD

Integrate the difference of  $faf$  in every 128 milliseconds and difference of  $\lambda$  value.

After integrate 1,640 times (210 seconds), calculate the diagnosis value.

Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| $para_{fca} = td2_{faf}/td2_{lmd}$<br>where,<br>$td2_{faf}(N) = td2_{faf}(n-1) +  d2_{faf}(n) $<br>$td2_{lmd}(N) = td2_{lmd}(n-1) +  d2_{lmd}(n) $<br>add up for a total of 210 seconds<br>$d2_{faf}(n) = (faf(n) - faf(n-1)) - (faf(n-1) - faf(n-2))$<br>$d2_{lmd}(n) = (lmd(n) - lmd(n-1)) - (lmd(n-1) - lmd(n-2))$<br>$faf$ = main feedback compensation coefficient every 128 milliseconds<br>$lmd$ = output lambda every 128 milliseconds | $\geq 0.30$     |

**Time Needed for Diagnosis:** 210 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value  $0.3 \rightarrow 0$ .
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

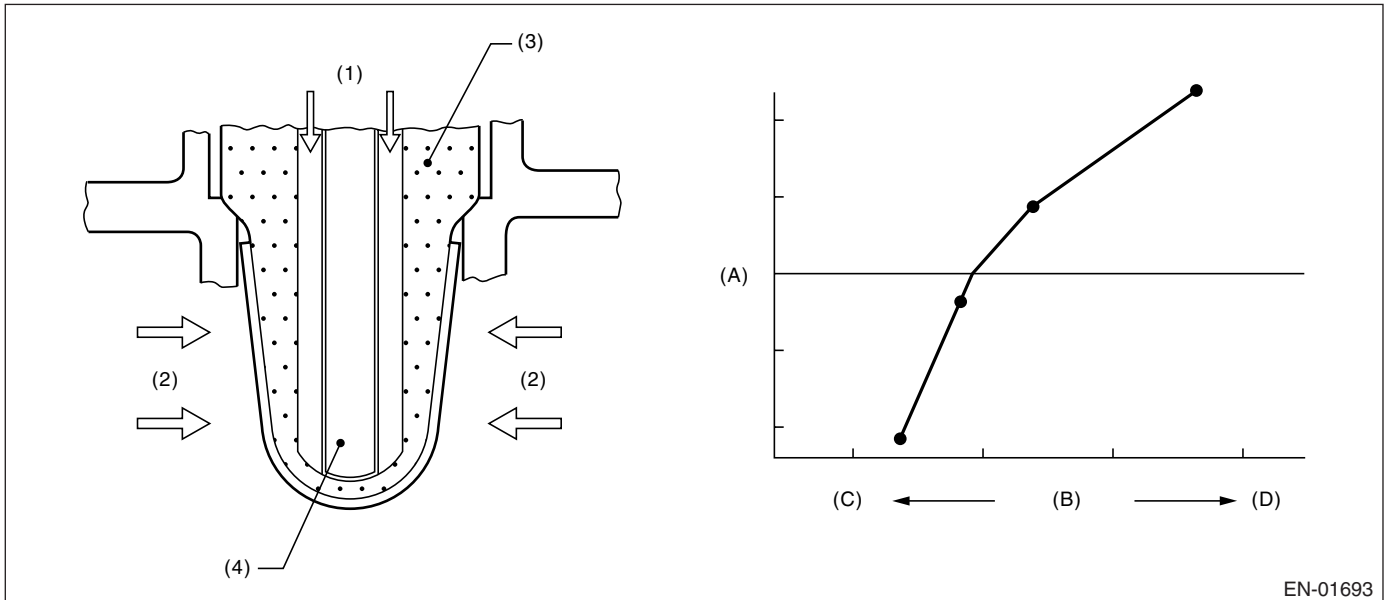
## AA:DTC P0134 O<sub>2</sub> SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the open circuit of sensor.

Judge NG when the element impedance is large.

### 2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust
- (3) ZrO<sub>2</sub>
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

#### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Voltage   | ≥ 10.9 V        |
| Time after engine starting  | ≥ 50 seconds    |
| Variable amount of Front O <sub>2</sub> (A/F) sensor heater control duty every 128 milliseconds | ≥ 28,000%       |
| Front lambda sensor impedance   | ≥ 500 Ω         |

**Time Needed for Diagnosis:** 2 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

### 9. ECM OPERATION AT DTC SETTING

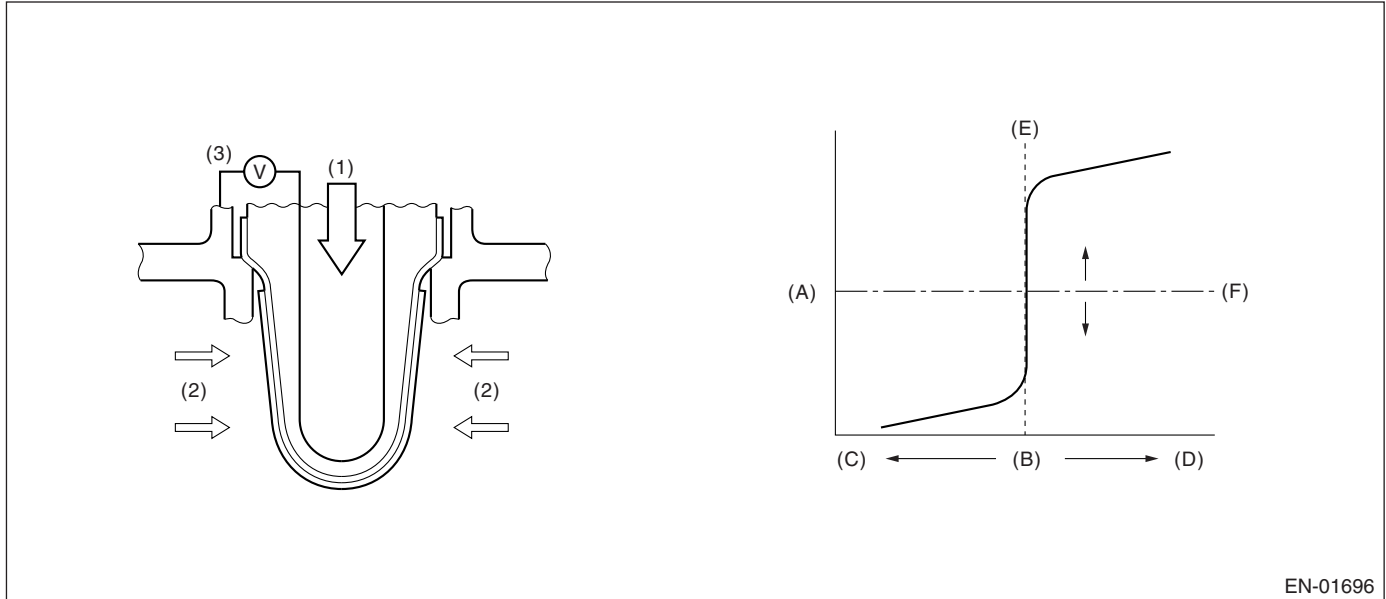
Memorize the freeze frame data. (For test mode \$02)

## AB:DTC P0137 O<sub>2</sub> SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor open or short circuit. Judge NG when the rear oxygen sensor voltage may be abnormal from rear oxygen sensor voltage value with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

### 2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich
- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

### 3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

| Secondary Parameters   | Enable Conditions  |
|--|--------------------|
| Low side diagnosis of rear oxygen sensor voltage with main feedback control  | Incomplete         |
| Closed loop control with main feedback control                               | In operation       |
| Target output voltage of rear oxygen sensor with main feedback control       | ≥ 0.54 V           |
| Amount of intake air with main feedback control                              | ≥ 10 g/s           |
| Engine coolant temperature with main feedback control                        | ≥ 75°C (167°F)     |
| Misfire detection during 200 engine revs.                                    | < 5 times          |
| Compensation factor for front oxygen (A/F) sensor with main feedback control | Not in limit value |
| Battery voltage with main feedback control                                   | > 10.9 V           |
| Cumulative time for completing the conditions with main feedback control     | ≥ 200 seconds      |
| 5 seconds or more fuel shut-off in decel.                                    | Experienced        |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Max. output voltage  | < 490 mV        |

**Time Needed for Diagnosis:** 200 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                             | Threshold Value |
|--|-----------------|
| Low side diagnosis of rear oxygen sensor voltage | Incomplete      |
| Max. output voltage                              | $\geq 490$ mV   |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Sub feedback control: Not allowed

### 9. ECM OPERATION AT DTC SETTING

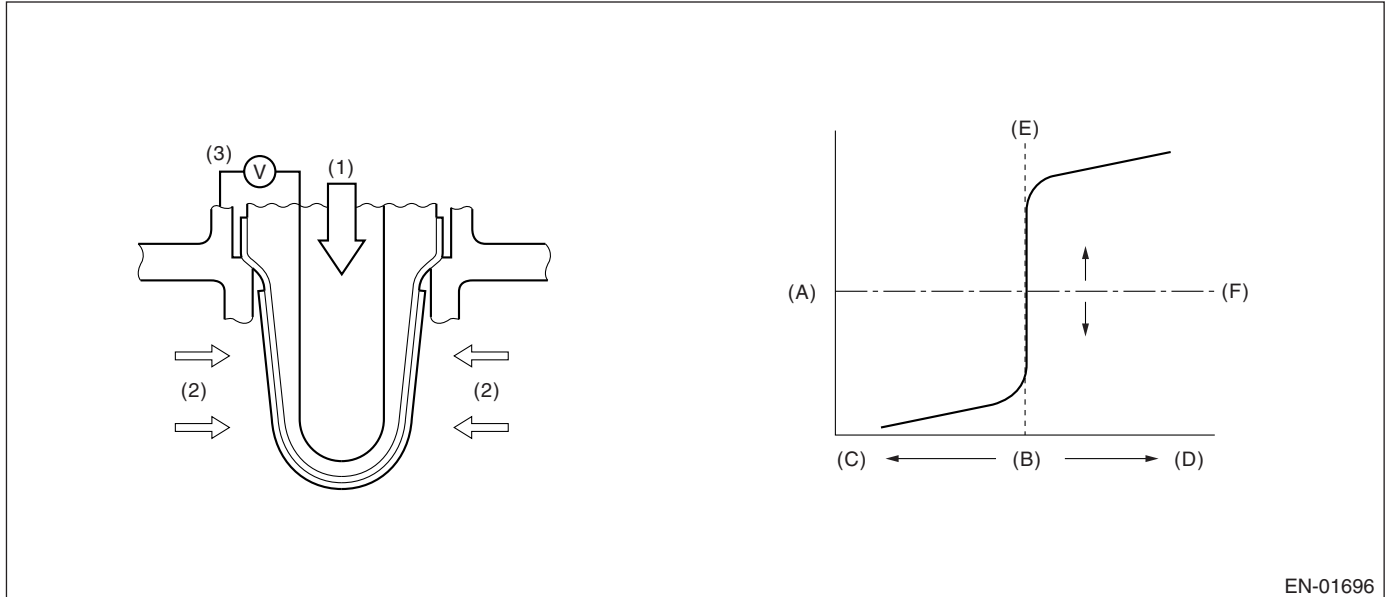
Memorize the freeze frame data. (For test mode \$02)

## AC:DTC P0138 O<sub>2</sub> SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor open or short circuit. Judge NG when the rear oxygen sensor voltage may be abnormal with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

### 2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich
- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

### 3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

| Secondary Parameters   | Enable Conditions  |
|--|--------------------|
| High side diagnosis of rear oxygen sensor voltage with main feedback control | Incomplete         |
| Closed loop control with main feedback control                               | In operation       |
| Target output voltage of rear oxygen sensor with main feedback control       | ≥ 0.54 V           |
| Amount of intake air with main feedback control                              | ≥ 10 g/s           |
| Engine coolant temperature with main feedback control                        | ≥ 75°C (167°F)     |
| Misfire detection during 200 engine revs.                                    | < 5 times          |
| Compensation factor for front oxygen (A/F) sensor with main feedback control | Not in limit value |
| Battery voltage with main feedback control                                   | > 10.9 V           |
| Cumulative time for completing the conditions with main feedback control     | ≥ 200 seconds      |
| 5 seconds or more fuel shut-off in decel.                                    | Experienced        |



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Min. output voltage  | > 250 mV        |

**Time Needed for Diagnosis:** 200 seconds

**Malfunction Indicator Light Illumination:** Detect when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                              | Threshold Value |
|---|-----------------|
| High side diagnosis of rear oxygen sensor voltage | Incomplete      |
| Min. output voltage                               | $\leq 250$ mV   |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Sub feedback control: Not allowed

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## AD:DTC P0139 O<sub>2</sub> SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

### 1. OUTLINE OF DIAGNOSIS

Detect the slow response of rear oxygen sensor.

Judge NG when the Rich → Lean response diagnosis or Lean → Rich response diagnosis is NG and judge OK when both response diagnoses are OK.

[Rich → Lean diagnosis response]

(1) When the measured response time is larger than a threshold, since the A/F ratio is rich, the response time of the output change of O<sub>2</sub> sensor when changing from Rich to Lean is measured, and it judges with NG, and when small, it judges with OK.

(2) When O<sub>2</sub> sensor voltage at the time of a fuel shut-off in deceleration return is large (rich), it judges with NG.

[Lean → Rich diagnosis response]

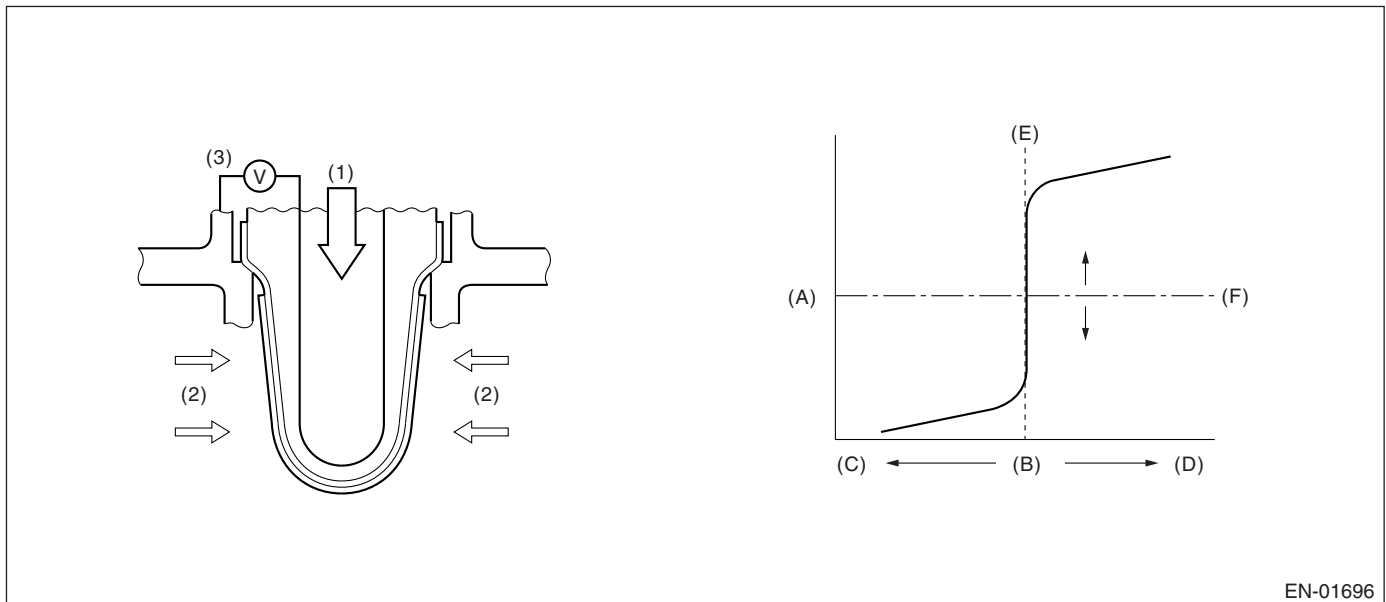
(1) The response time of output change of O<sub>2</sub> sensor when an A/F ratio changes from Lean to Rich is measured, and it is referred to as NG when the measured response time is larger than a threshold.

(2) It is referred to as NG when O<sub>2</sub> sensor voltage after recovery of fuel shut-off in deceleration is small and still small.

#### • Diagnostic Method

Measure the response time of the output change of the oxygen sensor when the A/F ratio changes from rich to lean. And Judge NG when the measured response time is larger than the threshold value.

### 2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

### 3. ENABLE CONDITION

- Rich → Lean response diagnosis

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

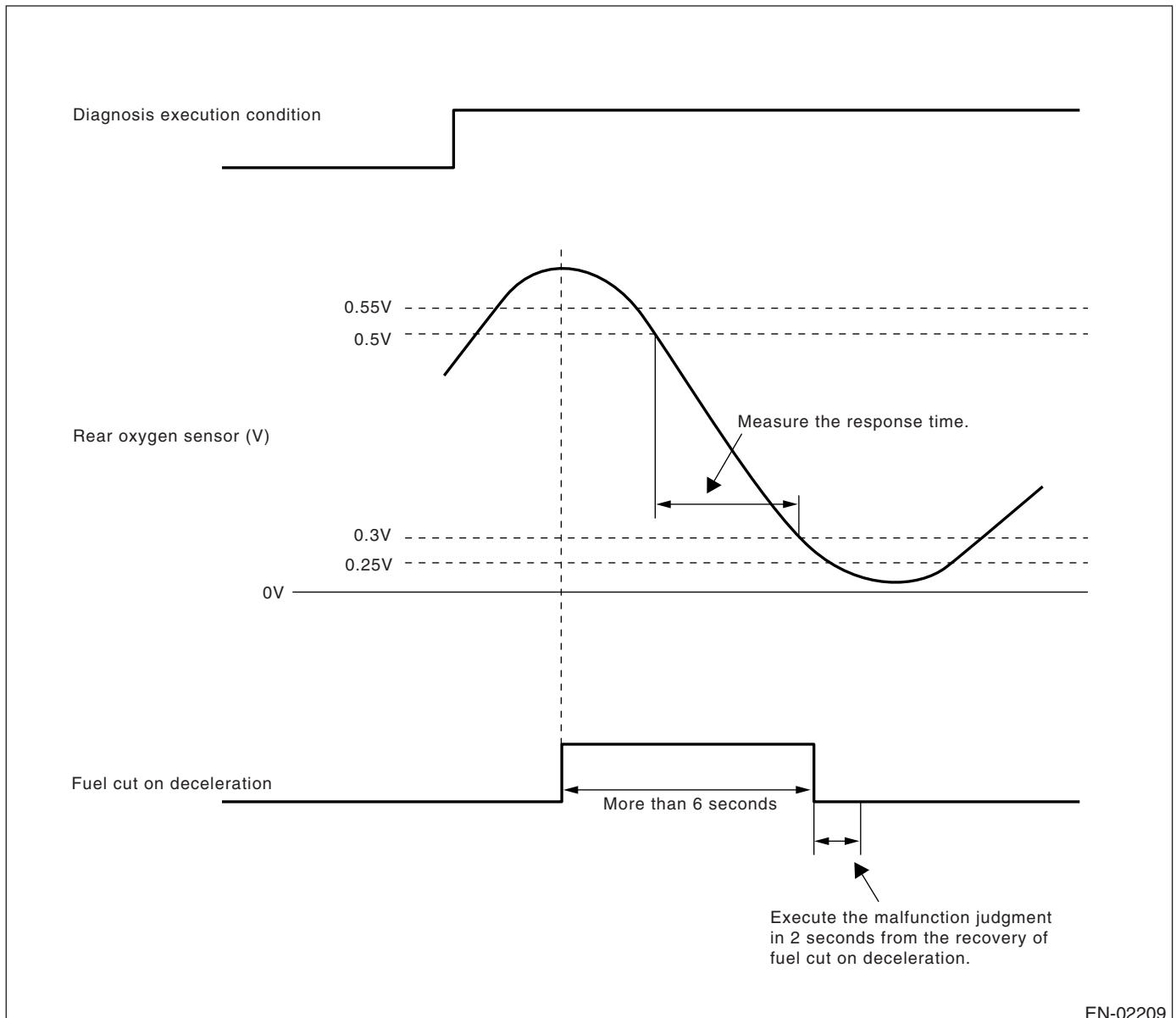
| Secondary Parameters                                    | Enable Conditions          |
|---|----------------------------|
| Battery voltage   | > 10.9 V                   |
| A/F sub feedback control condition                      | Completed                  |
| 6 seconds or more fuel shut-off indecel. After fuel cut | Experienced<br>≥ 2 seconds |
| Accumulated time with rear oxygen sensor heater ON      | ≥ 60 seconds               |
| Continuous time with rear oxygen sensor heater ON       | ≥ 30 seconds               |
| Catalyst warm-up counter                                | ≥ 11,000 times             |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration. (Pay attention to oxygen sensor voltage for the timing of deceleration.)

### 5. DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.55 V (rich) to 0.25 V (lean), calculate the Min. value of response time regarded as judgment value while the output varies from 0.5 V to 0.3 V.



EN-02209

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Abnormality Judgment

(1) Judge NG when the judgment value is larger than the threshold value after fuel shut-off in deceleration. Response time (Diagnosis value) > Threshold value → Abnormal

NOTE:

Variation time of rear oxygen sensor output voltage is short during fuel shut-off in deceleration. Carry out the NG judgment only after the fuel shut-off in deceleration. As for OK judgment, without the condition of fuel shut-off in deceleration, judge OK if the value is below the threshold value.

Judge NG when the malfunction criteria below are completed in 2 seconds after the recovery of fuel shut-off in deceleration which requires 6 seconds or more.

(2) Judge NG when the O<sub>2</sub> sensor voltage after recovery of fuel shut-off in deceleration is large. Judge NG when fuel shut-off in deceleration is also long (6 sec. or more), and although carried out the fuel shut-off in deceleration cut return, when O<sub>2</sub> sensor voltage is large (more than 0.55 V).

### Judgment Value

| Malfunction Criteria   | Threshold Value                         |
|--|---|
| Shortest time change from rich (500 mV O <sub>2</sub> output) to lean (300 mV) if voltage reduces from 550 mV to 250 mV.<br>or<br>Time when more than 550 mV | > 0.698 milliseconds<br><br>> 2 seconds |

**Time Needed for Diagnosis:** Once

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## • Normality Judgement

(1) Judge Normal when the response time (diagnostic value) is smaller than threshold (judgment value) when changing to lean since O<sub>2</sub> sensor voltage.

(2) A normal judging is not carried out.

### Judgment Value

Judge OK when the following standards value are completed.

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Change of the shortest time from rich (500 mV O <sub>2</sub> output) to lean (300 mV), when voltage decreases from 550 mV to 250 mV. | ≤ 0.698 seconds |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Sub feedback control: Not allowed

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## 10. ENABLE CONDITION

- Lean → Rich response diagnosis

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

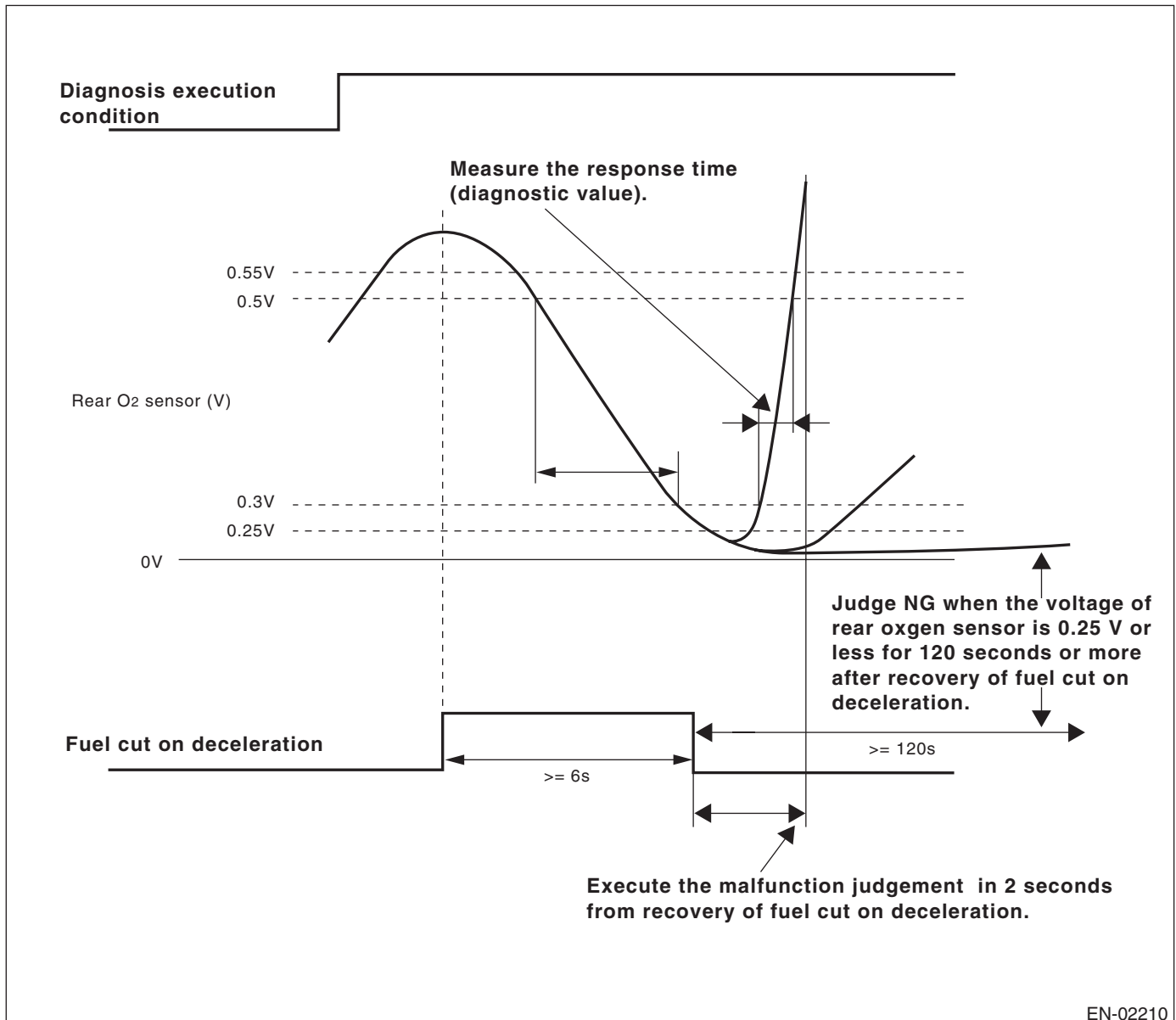
| Secondary Parameters                      | Enable Conditions |
|---|-------------------|
| Battery voltage                           | > 10.9 V          |
| A/F main feedback control condition       | Completed         |
| Fuel cut on deceleration $\geq 6$ seconds | Experienced       |
| After fuel cut                            | $\geq 2$ seconds  |

## 11.GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration. (Pay attention to oxygen sensor voltage for the timing of deceleration.)

## 12.DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich), calculate the Min. value of response time regarded as judgment value while the output varies from 0.3 V to 0.5 V.



### • Abnormality Judgment

(1) Judge NG when the judgment value is larger than the threshold value after recovery of fuel shut-off in deceleration.

Response time (Diagnosis value) > Threshold value → Abnormal

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

(2) Judge NG when the O<sub>2</sub> sensor voltage after recovery of fuel shut-off in deceleration is small.

## Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Shortest time change from lean (300 mV O <sub>2</sub> output) to rich (500 mV) if voltage reduces from 500 mV to 250 mV. | > 2 seconds     |
| Or longest time to change to 250 mV  | > 120 seconds   |

**Time Needed for Diagnosis:** Once

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## • Normality Judgement

(1) Judge Normal when the response time (diagnostic value) is smaller than threshold (judgment value) when changing to lean since O<sub>2</sub> sensor voltage.

Response Time (diagnosis value) ≤ Threshold value → Normal

(2) A normal judging is not carried out.

## Judgment Value

Judge OK when the following standards value are completed.

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Change of the shortest time from rich (300 mV O <sub>2</sub> output) to lean (500 mV), when voltage decreases from 550 mV to 250 mV. | ≤ 2 seconds     |

## 13.DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 14.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 15.FAIL SAFE

Sub feedback control: Not allowed

## 16.ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

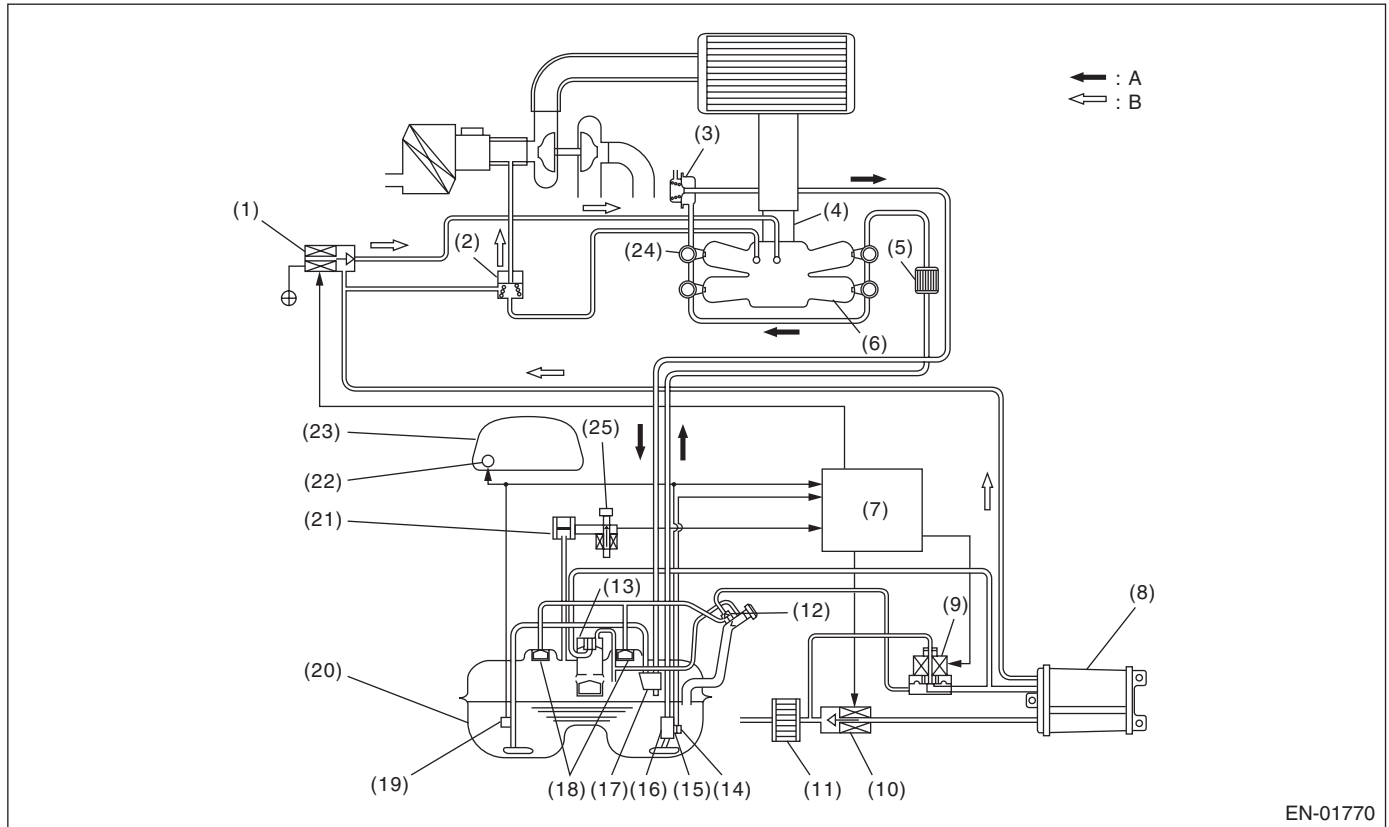
## GENERAL DESCRIPTION

### AE:DTC P0171 SYSTEM TOO LEAN (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

##### • Fuel System Diagnosis



EN-01770

- |      |                                 |      |  |
|------|---------------------------------|------|--|
| (1)  | Purge control solenoid valve    | (14) | Fuel temperature sensor                |
| (2)  | Purge valve                     | (15) | Fuel level sensor                      |
| (3)  | Pressure regulator              | (16) | Fuel pump                              |
| (4)  | Throttle body                   | (17) | Jet pump                               |
| (5)  | Fuel filter                     | (18) | Fuel cut valve                         |
| (6)  | Intake manifold                 | (19) | Fuel sub level sensor                  |
| (7)  | Engine control module (ECM)     | (20) | Fuel tank                              |
| (8)  | Canister                        | (21) | Fuel tank pressure sensor              |
| (9)  | Pressure control solenoid valve | (22) | Fuel meter                             |
| (10) | Drain valve                     | (23) | Combination meter                      |
| (11) | Drain filter                    | (24) | Fuel injector                          |
| (12) | Shut-off valve                  | (25) | Tank pressure switching solenoid valve |
| (13) | Vent valve                      |      |  |

##### • Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 2. ENABLE CONDITION

| Secondary Parameters                                 | Enable Conditions          |
|--|----------------------------|
| A/F main learning system                             | In operation               |
| Engine coolant temperature                           | 75 ←→ 119°C (167 ←→ 246°F) |
| Engine load  | ≥ Map 5                    |
| Intake air change during 0.5 engine rev.             | ≤ 0.02 g/rev               |
| Learning value of EVAP conc. during purge            | ≤ 0.1                      |
| Cumulative time of canister purge after engine start | 20 seconds or more         |
| Continuous period after canister purge starting      | 30 seconds or more         |

### Map 5

|                        |      |       |       |       |       |       |       |       |       |       |       |
|------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Engine speed (rpm)     | idle | 800   | 1,200 | 1,600 | 2,000 | 2,400 | 2,800 | 3,200 | 3,600 | 4,000 | 4,400 |
| Measured value (g/rev) | NA   | 0.237 | 0.224 | 0.221 | 0.238 | 0.255 | 0.267 | 0.242 | 0.243 | 0.258 | 0.263 |

## 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 60 km/h (37.3 MPH).

## 4. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

### Judgment Value

| Malfunction Criteria   | Threshold Value  |
|--|--|
| $fsobd = (sglmd - tglmda) + faf + flaf$<br>where,<br>sglmd = measured lambda<br>tglmda = target lambda<br><br>faf = main feedback compensation coefficient every 64 milliseconds<br>flaf = main feedback learning compensation coefficient | ≥ fsobdL1<br>See Map 4<br><br>fsobdL1 = lean side threshold value of fsobd |

### Map 4 Threshold value for fuel system malfunction criteria

|                     |    |     |      |      |      |      |
|---------------------|----|-----|------|------|------|------|
| Amount of air (g/s) | 0  | 2.4 | 4.7  | 7    | 9.4  | 11.7 |
| fsobdL1 (%)         | 40 | 40  | 36.9 | 32.0 | 27.0 | 26.5 |

**Time Needed for Diagnosis:** 10 seconds × 3 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

### Judgment Value

| Malfunction Criteria                    | Threshold Value |
|---|-----------------|
| $fsobd = (sglmd - tglmda) + faf + flaf$ | < 19%           |

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed



## Diagnostic Trouble Code (DTC) Detecting Criteria

### GENERAL DESCRIPTION

---

#### **6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION**

- When OK with similar drive in 3 driving cycles.
- When “Clear Memory” was performed

#### **7. FAIL SAFE**

Rich side malfunction

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

#### **8. ECM OPERATION AT DTC SETTING**

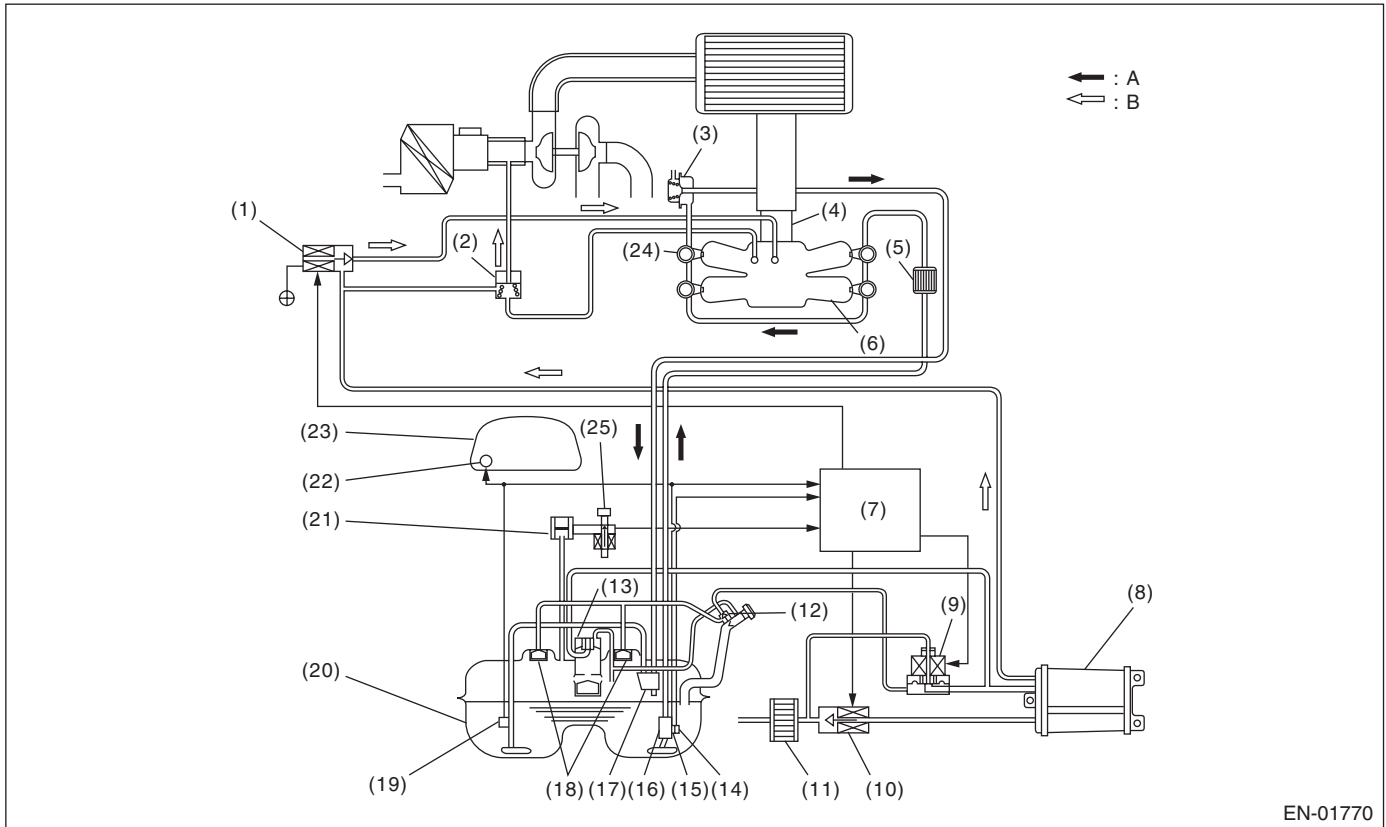
Memorize the freeze frame data. (For test mode \$02)

## AF:DTC P0172 SYSTEM TOO RICH (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

#### • Fuel System Diagnosis



- |                                     |   |
|-------------------------------------|---|
| (1) Purge control solenoid valve    | (14) Fuel temperature sensor                |
| (2) Purge valve                     | (15) Fuel level sensor                      |
| (3) Pressure regulator              | (16) Fuel pump                              |
| (4) Throttle body                   | (17) Jet pump                               |
| (5) Fuel filter                     | (18) Fuel cut valve                         |
| (6) Intake manifold                 | (19) Fuel sub level sensor                  |
| (7) Engine control module (ECM)     | (20) Fuel tank                              |
| (8) Canister                        | (21) Fuel tank pressure sensor              |
| (9) Pressure control solenoid valve | (22) Fuel meter                             |
| (10) Drain valve                    | (23) Combination meter                      |
| (11) Drain filter                   | (24) Fuel injector                          |
| (12) Shut-off valve                 | (25) Tank pressure switching solenoid valve |
| (13) Vent valve                     |   |

#### • Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 2. ENABLE CONDITION

| Secondary Parameters                                 | Enable Conditions          |
|--|----------------------------|
| A/F main learning system                             | In operation               |
| Engine coolant temperature                           | 75 ←→ 119°C (167 ←→ 246°F) |
| Engine load  | ≥ Map 5                    |
| Intake air change during 0.5 engine rev.             | ≤ 0.02 g/rev               |
| Learning value of EVAP conc. during purge            | ≤ 0.1                      |
| Cumulative time of canister purge after engine start | 20 seconds or more         |
| Continuous period after canister purge starting      | 30 seconds or more         |

#### Map 5

|                        |      |       |       |       |       |       |       |       |       |       |       |
|------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Engine speed (rpm)     | idle | 800   | 1,200 | 1,600 | 2,000 | 2,400 | 2,800 | 3,200 | 3,600 | 4,000 | 4,400 |
| Measured value (g/rev) | NA   | 0.237 | 0.224 | 0.221 | 0.238 | 0.255 | 0.267 | 0.242 | 0.243 | 0.258 | 0.263 |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 60 km/h (37.3 MPH).

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

#### Judgment Value

| Malfunction Criteria   | Threshold Value   |
|--|---|
| $fsobd = (sglmd - tglmda) + faf + flaf$<br>where,<br>sglmd = measured lambda<br><br>tglmda = target lambda<br>faf = main feedback compensation coefficient every 64 milliseconds<br>flaf = main feedback learning compensation coefficient | $\leq fsobdR1$<br>See Map 4<br>fsobdR1 = rich side threshold value of fsobd |

#### Map 4 Threshold value for fuel system malfunction criteria for System E

|                     |     |     |       |       |       |       |
|---------------------|-----|-----|-------|-------|-------|-------|
| Amount of air (g/s) | 0   | 2.4 | 4.7   | 7     | 9.4   | 11.7  |
| fsobdR1 (%)         | -40 | -40 | -36.9 | -32.0 | -27.0 | -27.0 |

**Time Needed for Diagnosis:** 10 seconds × 3 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

#### Judgment Value

| Malfunction Criteria                    | Threshold Value |
|---|-----------------|
| $fsobd = (sglmd - tglmda) + faf + flaf$ | $\geq -20\%$    |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When "Clear Memory" was performed

### 7. FAIL SAFE

Rich side malfunction

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### AG:DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE

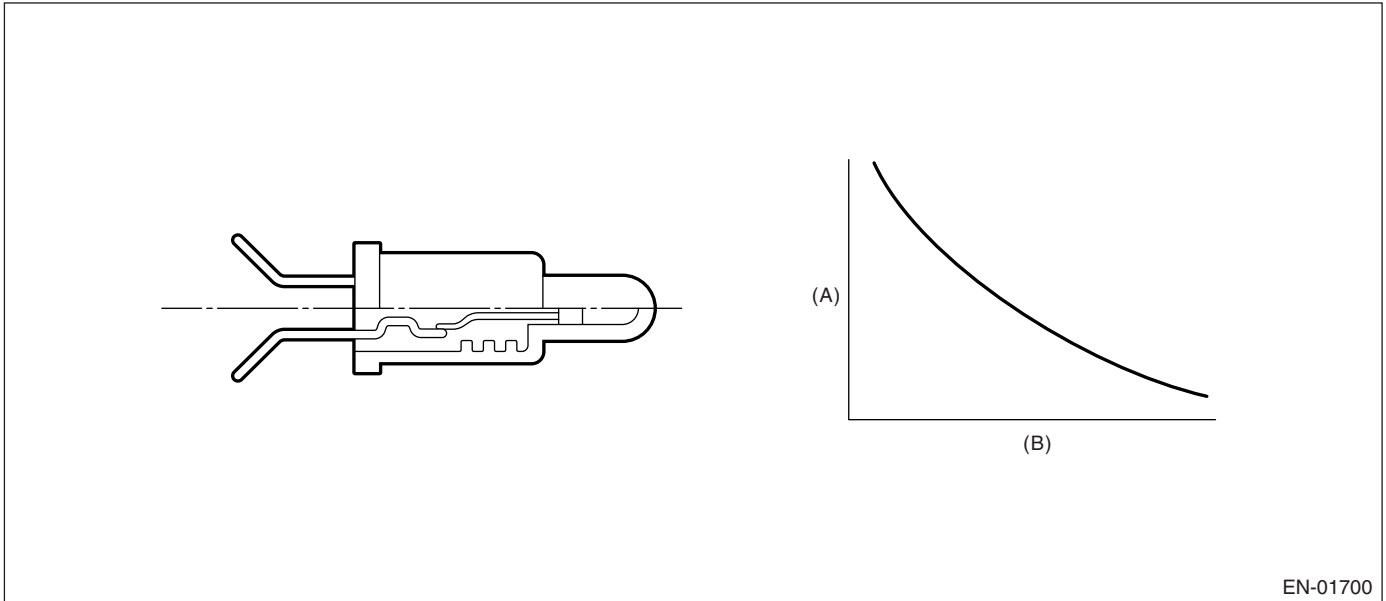
#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel temperature sensor output property. Perform the diagnosis in two methods; namely, drift diagnosis and stuck diagnosis. Judge NG when either of them results in NG, and judge OK when both of them result in OK.

##### • Drift Diagnosis

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and make an NG judgment.

#### 2. COMPONENT DESCRIPTION



(A) Resistance value ( $\Omega$ )

(B) Fuel temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 120 seconds.

### Judgment Value

| Malfunction Criteria   | Threshold Value  |
|--|--|
| Fuel level   | $\geq 10 \text{ } \varnothing$ (2.64 US gal, 2.20 Imp gal) |
| After engine starting  | 20 seconds or more   |
| Engine coolant temperature – engine coolant temperature at engine starting | $> 10^{\circ}\text{C}$ (50°F)                              |
| Fuel temperature – engine coolant temperature                              | $\geq 10^{\circ}\text{C}$ (50°F)                           |
| Battery voltage  | $> 10.9 \text{ V}$   |

**Time Needed for Diagnosis:** 120 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria   | Threshold Value  |
|--|--|
| Fuel level   | $\geq 10 \text{ } \varnothing$ (2.64 US gal, 2.20 Imp gal) |
| After engine starting  | 20 seconds or more   |
| Engine coolant temperature – engine coolant temperature at engine starting | $> 10^{\circ}\text{C}$ (50°F)                              |
| Fuel temperature – engine coolant temperature                              | $< 10^{\circ}\text{C}$ (50°F)                              |
| Battery voltage  | $> 10.9 \text{ V}$   |

### • Stuck Diagnosis

If the fuel temperature which might rise along with the engine idling (the cumulative amount of intake air after engine starting is large) does not increase, the engine is considered to be stuck and make an NG judgment.

## 6. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions  |
|-----------------------|--------------------|
| After engine starting | 20 seconds or more |
| Battery voltage       | $> 10.9 \text{ V}$ |

## 7. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 20 seconds or more after starting the engine.

## 8. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria                              | Threshold Value                    |
|---|------------------------------------|
| Accumulated amount of intake air                  | $\geq 550 \text{ kg}$ (1,212.5 lb) |
| Fuel temperature difference between Max. and Min. | $< 3^{\circ}\text{C}$ (37.4°F)     |

**Time Needed for Diagnosis:** To be determined.

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                              | Threshold Value                                     |
|---|---|
| Accumulated amount of intake air                  | $\geq 550$ kg (1,212.5 lb)                          |
| Fuel temperature difference between Max. and Min. | $\geq 3^{\circ}\text{C}$ (37.4 $^{\circ}\text{F}$ ) |

### 9. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 10.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 11.FAIL SAFE

None

### 12.ECM OPERATION AT DTC SETTING

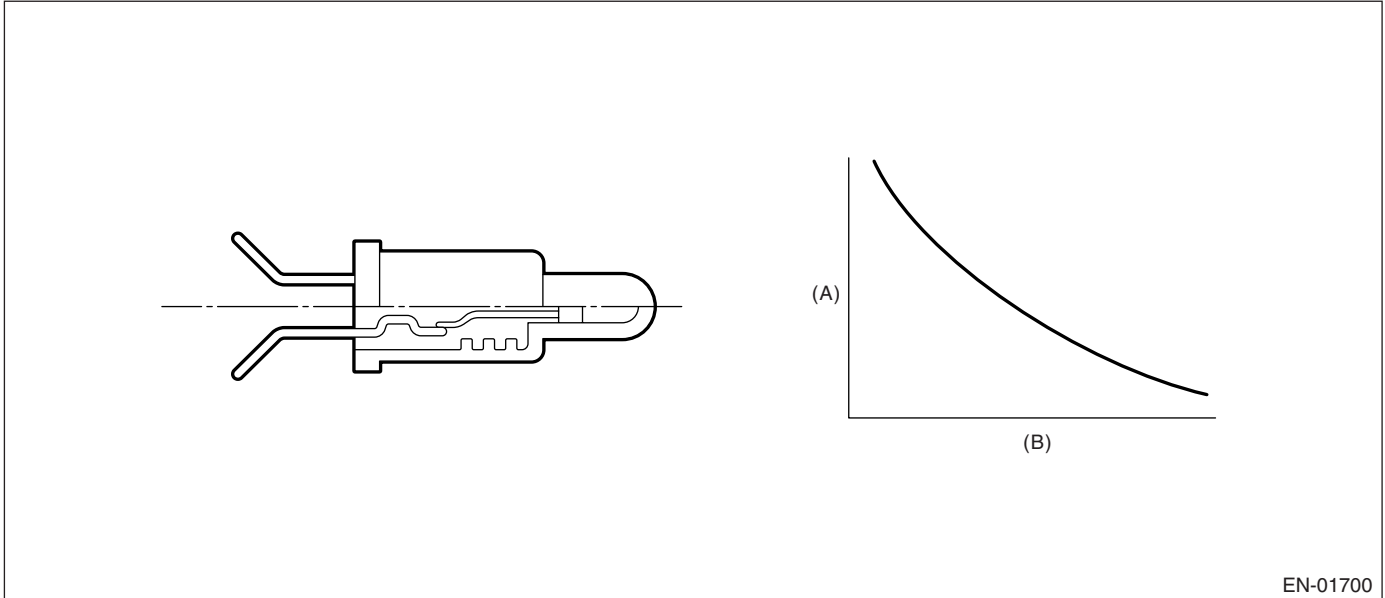
Memorize the freeze frame data. (For test mode \$02)

## AH:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01700

- (A) Resistance value ( $\Omega$ )
- (B) Fuel temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria | Threshold Value       |
|----------------------|-----------------------|
| Output voltage       | $< 0.1646 \text{ V}$  |
| Battery voltage      | $\geq 10.9 \text{ V}$ |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value         |
|----------------------|-------------------------|
| Output voltage       | $\geq 0.1646 \text{ V}$ |
| Battery voltage      | $\geq 10.9 \text{ V}$   |



## Diagnostic Trouble Code (DTC) Detecting Criteria

### GENERAL DESCRIPTION

---

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 8. FAIL SAFE

None

#### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

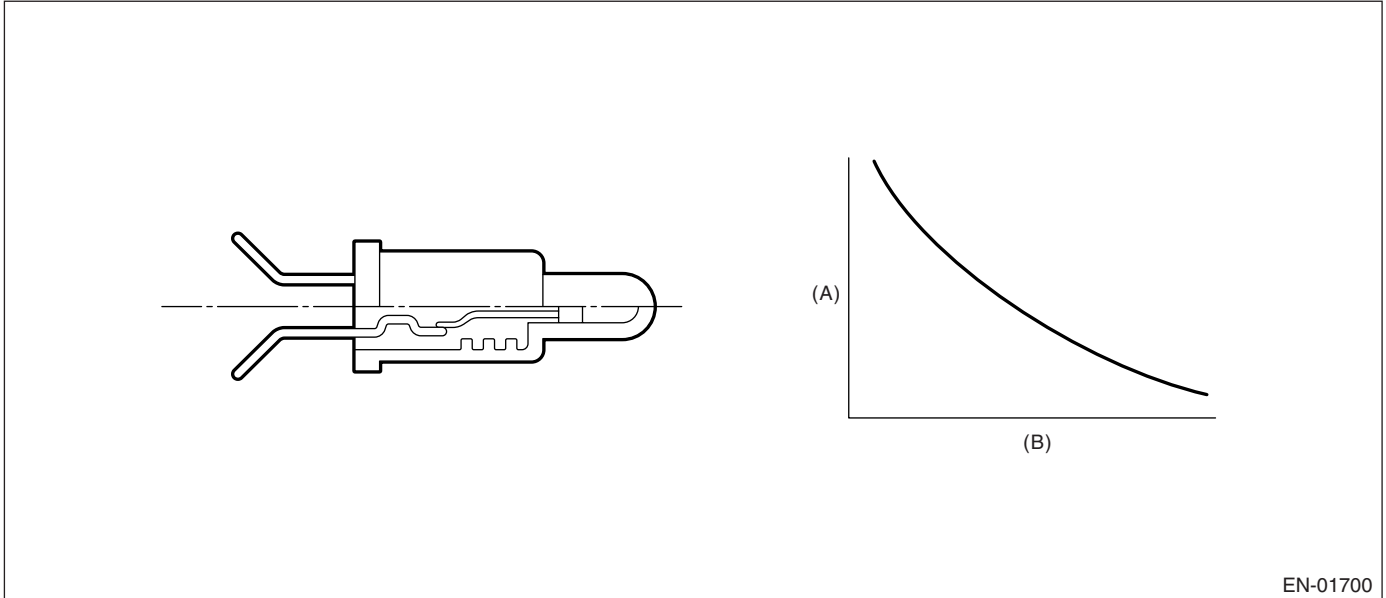
GENERAL DESCRIPTION

## AI: DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



(A) Resistance value ( $\Omega$ )

(B) Fuel temperature  $^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

EN-01700

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria | Threshold Value       |
|----------------------|-----------------------|
| Output voltage       | $\geq 4.72 \text{ V}$ |
| Battery voltage      | $\geq 10.9 \text{ V}$ |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value       |
|----------------------|-----------------------|
| Output voltage       | $< 4.72 \text{ V}$    |
| Battery voltage      | $\geq 10.9 \text{ V}$ |

## Diagnostic Trouble Code (DTC) Detecting Criteria

### GENERAL DESCRIPTION

---

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 8. FAIL SAFE

None

#### 9. ECM OPERATION AT DTC SETTING

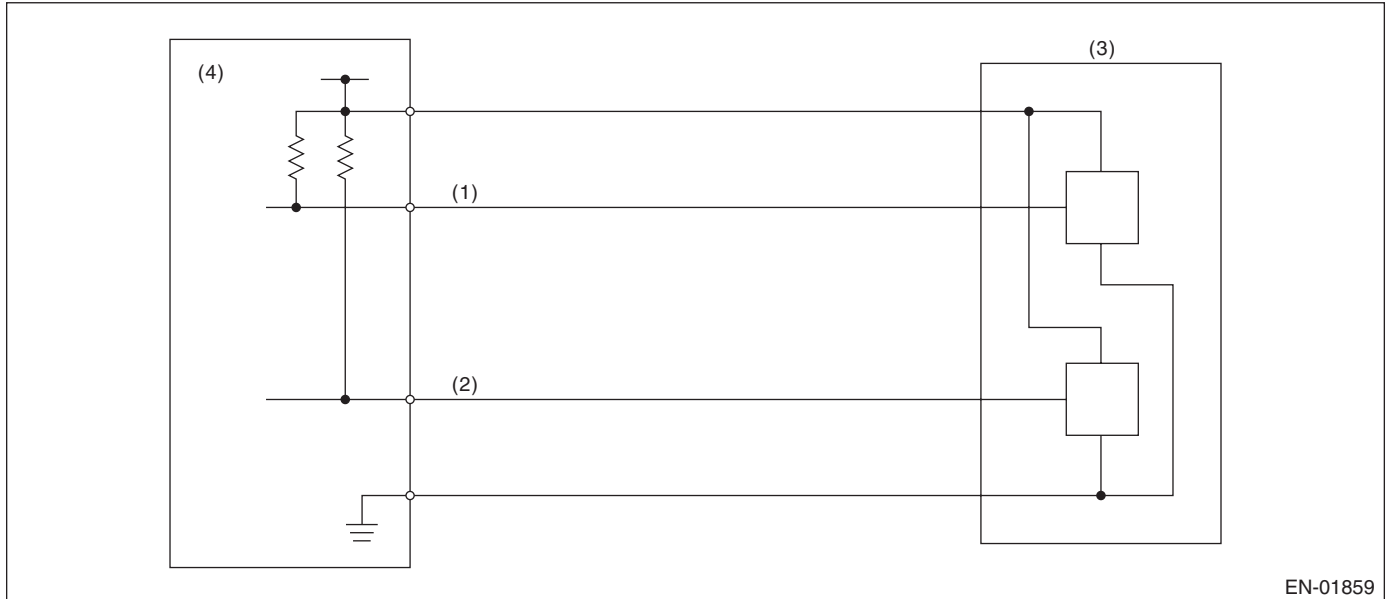
Memorize the freeze frame data. (For test mode \$02)

## AJ:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal
- (2) Throttle position sensor 2 signal
- (3) Throttle position sensor
- (4) Engine control module (ECM)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | ≤ 0.749 V       |

**Time Needed for Diagnosis:** 24 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### **7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION**

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### **8. FAIL SAFE**

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

### **9. ECM OPERATION AT DTC SETTING**

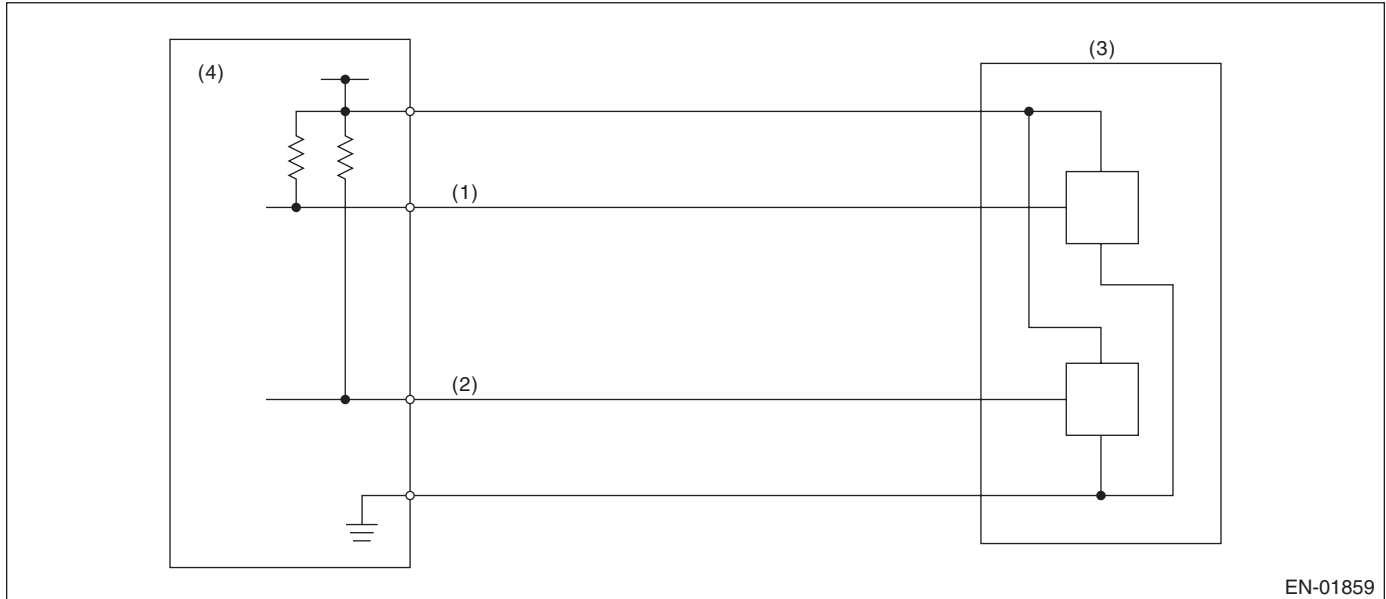
- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

## AK:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01859

- (1) Throttle position sensor 1 signal
- (2) Throttle position sensor 2 signal
- (3) Throttle position sensor
- (4) Engine control module (ECM)

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\geq 4.747$ V  |

**Time Needed for Diagnosis:** 24 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

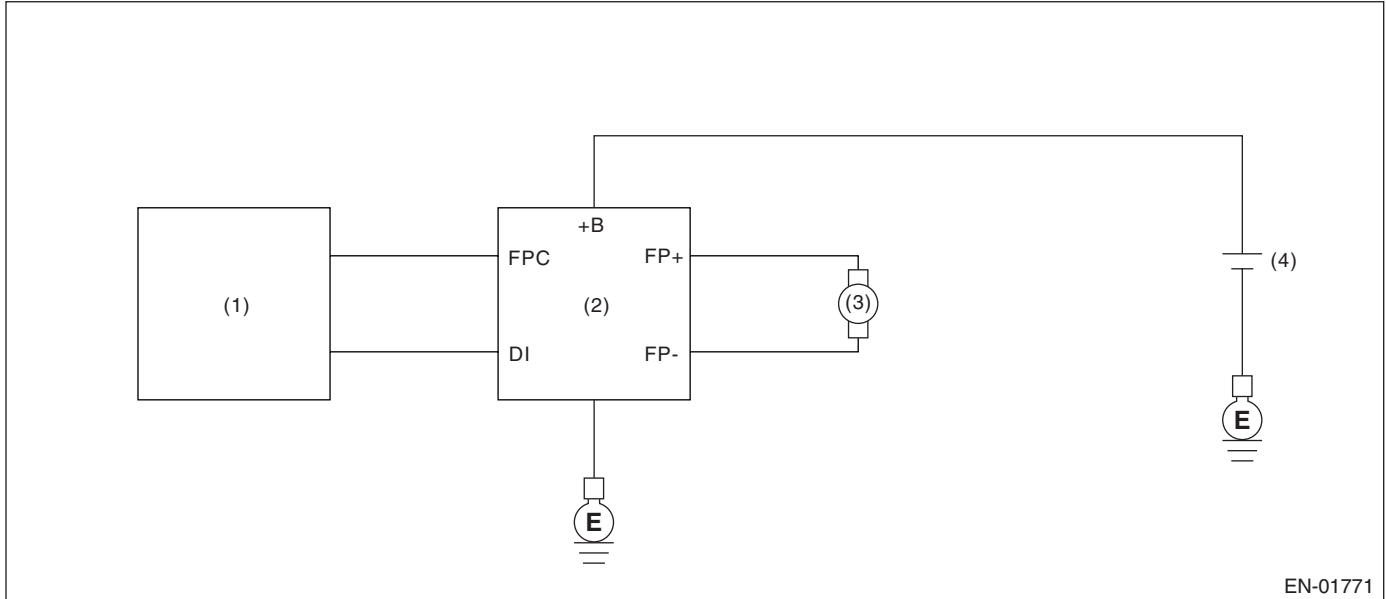
GENERAL DESCRIPTION

## AL:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel pump control unit. Judge NG when the NG signal is sent through a diagnostic line coming from the fuel pump control unit. Fuel pump control unit detects the open or short circuit malfunction for each line, and then sends NG signals if one of them is found NG.

### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Fuel pump control unit
- (3) Fuel pump
- (4) Battery

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria                           | Threshold Value                  |
|--|----------------------------------|
| Battery voltage                                | ≥ 8 V                            |
| After engine starting                          | 180 seconds or more              |
| Fuel pump control                              | ON                               |
| Fuel pump control unit output diagnosis signal | Low                              |
| Fuel level                                     | ≥ 10 ℓ (2.6 US gal, 2.2 Imp gal) |

**Time Needed for Diagnosis:** 2.5 seconds



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

• **Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria                           | Threshold Value    |
|--|--------------------|
| Battery voltage                                | $\geq 8$ V         |
| After engine starting                          | 30 seconds or more |
| Fuel pump control                              | ON                 |
| Fuel pump control unit output diagnosis signal | High               |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

OFF setting may be needed depending on the NG portion.

### 9. ECM OPERATION AT DTC SETTING

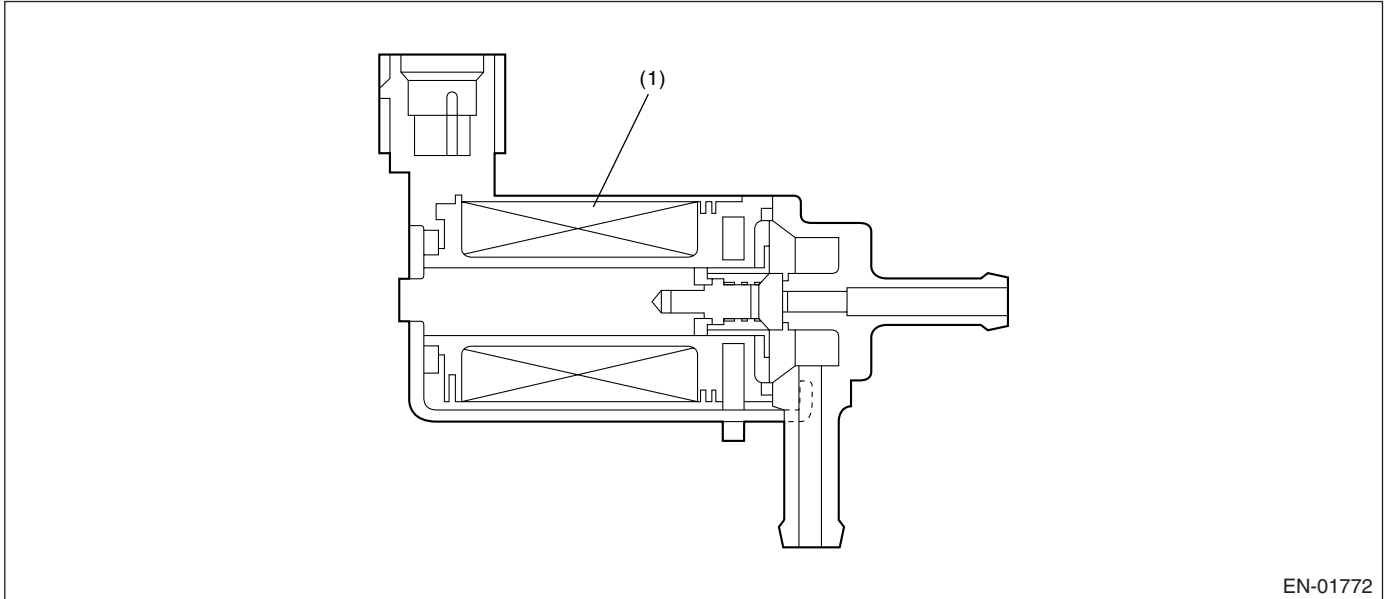
Memorize the freeze frame data. (For test mode \$02)

## AM:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of wastegate control solenoid valve function. Judge NG when becoming high wastegate pressure.

### 2. COMPONENT DESCRIPTION



EN-01772

(1) Coil

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

#### Judgment Value

| Malfunction Criteria     | Threshold Value |
|--------------------------|-----------------|
| Ignition switch          | ON              |
| Intake manifold pressure | ≥ Map 10        |

#### Map 10

|  |                           |                           |                           |                           |                           |                           |
|--|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Pa (kPa (mmHg, inHg))                    | 56.7<br>(440,17.3)        | 67.2 (504,<br>19.8)       | 75.7 (568,<br>22.4)       | 84.3 (632,<br>24.9)       | 92.8 (696,<br>27.4)       | 101.3<br>(760, 29.9)      |
| Abnormal threshold<br>(kPa (mmHg, inHg)) | 170.0<br>(1,275,<br>50.2) | 184.4<br>(1,383,<br>54.4) | 199.1<br>(1,493,<br>58.8) | 213.3<br>(1,600,<br>63.0) | 228.0<br>(1,710,<br>67.3) | 228.0<br>(1,710,<br>67.3) |
| Normal threshold (kPa<br>(mmHg, inHg))   | 147.6<br>(1,107,<br>43.6) | 162.0<br>(1,215,<br>47.8) | 176.7<br>(1,325,<br>52.2) | 190.9<br>(1,432,<br>56.4) | 205.6<br>(1,542,<br>60.7) | 205.6<br>(1,542,<br>60.7) |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria     | Threshold Value |
|--------------------------|-----------------|
| Ignition switch          | ON              |
| Intake manifold pressure | < Map 10        |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

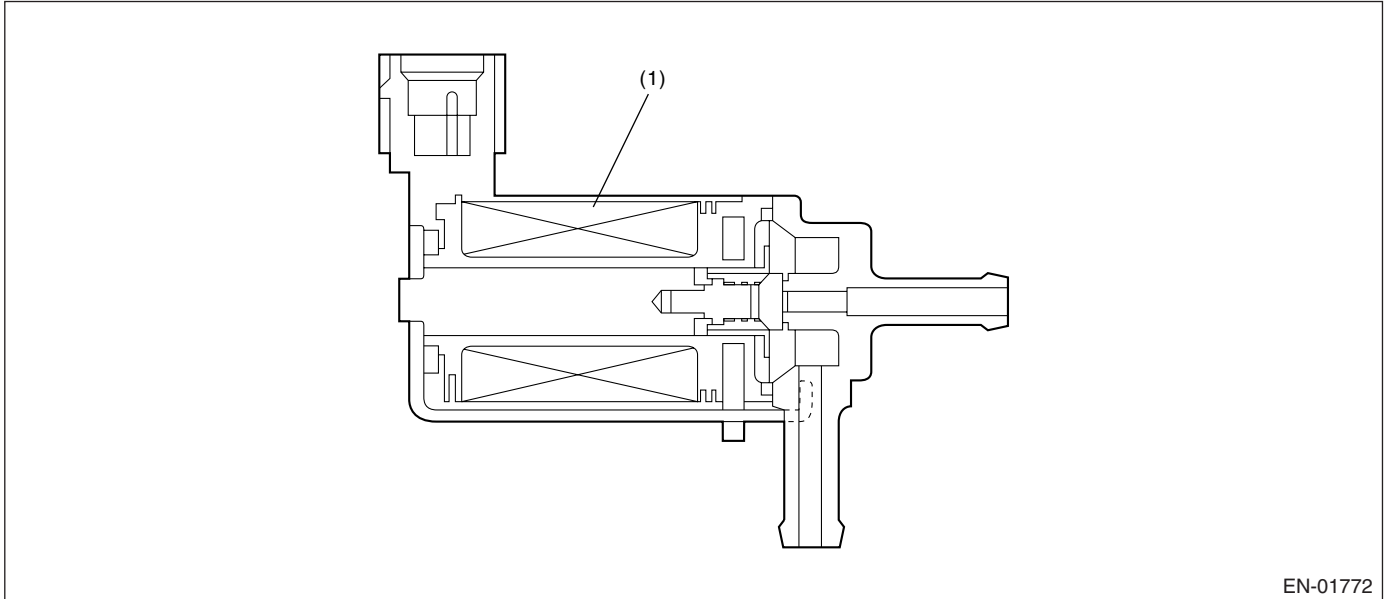
GENERAL DESCRIPTION

## AN:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve. Judge NG when the terminal output voltage remains Low during outputting the duty signal.

### 2. COMPONENT DESCRIPTION



(1) Coil

### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions |
|-----------------------|-------------------|
| Battery voltage       | > 10.9 V          |
| After engine starting | 1 second or more  |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starts.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Duty ratio for turbocharged pressure control when terminal output voltage is Low | < 75%           |

**Time Needed for Diagnosis:** 655 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria    | Threshold Value |
|-------------------------|-----------------|
| Terminal output voltage | High            |

## Diagnostic Trouble Code (DTC) Detecting Criteria

### GENERAL DESCRIPTION

---

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 8. FAIL SAFE

None

#### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

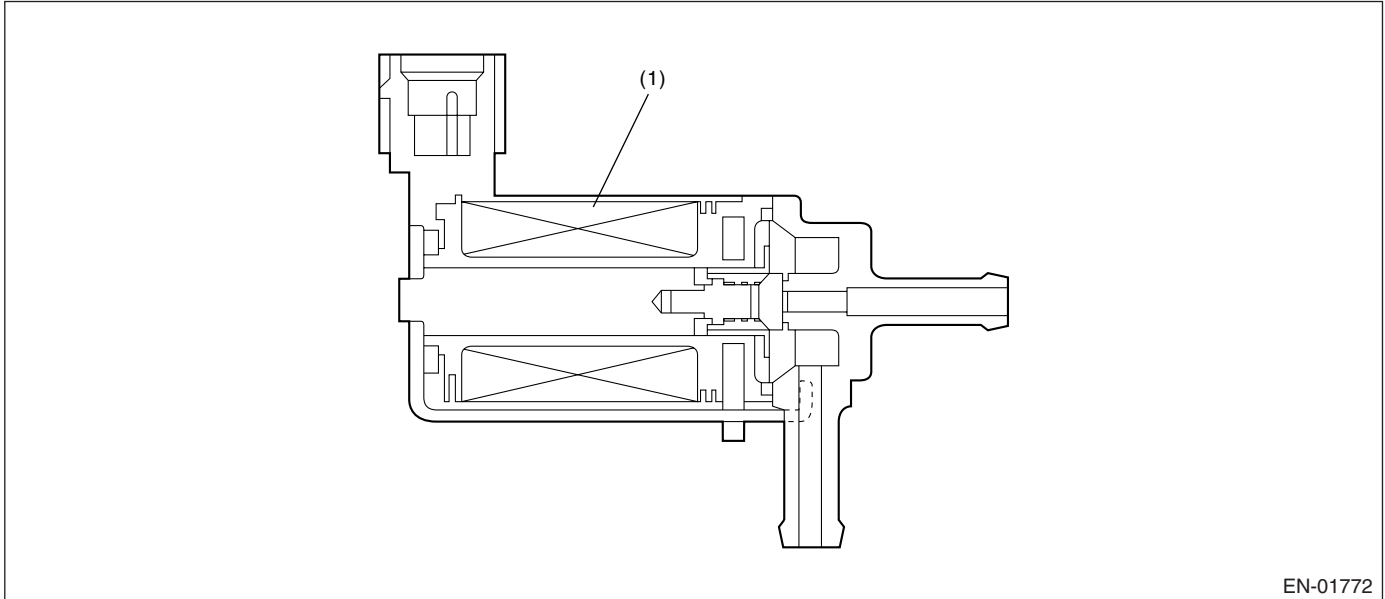
GENERAL DESCRIPTION

## AO:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve. Judge NG when the terminal output voltage remains Low or High during outputting the duty signal.

### 2. COMPONENT DESCRIPTION



EN-01772

(1) Coil

### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions |
|-----------------------|-------------------|
| Battery voltage       | > 10.9 V          |
| After engine starting | 1 second or more  |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starts.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

#### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Duty ratio for turbocharged pressure control when output terminal voltage is High | > 25%           |

**Time Needed for Diagnosis:** 655 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria    | Threshold Value |
|-------------------------|-----------------|
| Terminal output voltage | Low             |

## Diagnostic Trouble Code (DTC) Detecting Criteria

### GENERAL DESCRIPTION

---

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 8. FAIL SAFE

None

#### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## AP:DTC P0301 CYLINDER 1 MISFIRE DETECTED

### 1. OUTLINE OF DIAGNOSIS

Detect whether the misfire occurred or not. (Revolution fluctuation method) Monitoring the misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has three patterns below.

- Intermittent misfire (The same cylinder misfires in random, or different cylinders misfire in random.): FTP 1.5 times misfire
- Every time misfire (The same cylinder misfires every time.): FTP 1.5 times misfire, Catalyst damage misfire

The following detecting methods are adopted for these detection.

1) Intermittent misfire: FTP 1.5 times misfire

- 180° Interval Difference Method (MT: 1,800 rpm or less; AT: None)
- 360° Interval Difference Method (whole range)
- 720° Interval Difference Method (3,000 rpm or less)

2) Every time misfire: FTP 1.5 times misfire, Catalyst damage misfire

- 360° Interval Difference Method

### 2. ENABLE CONDITION

| Secondary Parameters                                   | Enable Conditions                 |
|--|-----------------------------------|
| Intake manifold pressure change during 0.5 engine rev. | < 16.0 kPa (120 mmHg, 4.72 inHg)  |
| Engine speed change                                    | < 500 rpm/32 milliseconds         |
| Throttle position change during 16 milliseconds        | < 10°                             |
| Fuel shut-off function                                 | Not operating                     |
| Atmospheric pressure                                   | ≥ 75.1 kPa (563 mmHg, 22.2 inHg)  |
| Fuel level   | ≥ 9 ℓ (2.38 US gal, 1.98 Imp gal) |
| Evaporative system leak check                          | Not in operation                  |
| Engine speed   | 500 — 7,000 rpm                   |
| Intake manifold pressure                               | > Map 3                           |
| Battery voltage  | ≥ 8 V                             |
| All secondary parameters approval                      | ≥ 1 second                        |

#### Map3

#### Vehicle Speed < 64.4 km/h (40 MPH)

| rpm          | 700         | 1,000       | 1,500       | 2,000       | 2,500       | 3,000       | 3,500         | 4,000       | 4,500         | 5,000       | 5,500         | 6,000       | 6,500         | 6,700       |
|--------------|-------------|-------------|-------------|-------------|-------------|-------------|---------------|-------------|---------------|-------------|---------------|-------------|---------------|-------------|
| kPa          | 25.1        | 24.8        | 25.6        | 23.3        | 26.3        | 25.9        | 28.9          | 30.0        | 31.7          | 33.0        | 37.1          | 41.9        | 47.0          | 51.1        |
| (mmHg, inHg) | (188, 7.40) | (186, 7.32) | (192, 7.56) | (175, 6.89) | (197, 7.76) | (194, 7.64) | (216.5, 8.52) | (225, 8.86) | (237.5, 9.35) | (248, 9.76) | (278.5, 11.0) | (314, 12.4) | (352.5, 13.9) | (383, 15.1) |

#### Vehicle Speed ≥ 64.4 km/h (40 MPH)

| rpm          | 700         | 1,000       | 1,500         | 2,000         | 2,500         | 3,000         | 3,500         | 4,000       | 4,500         | 5,000         | 5,500         | 6,000         | 6,500       | 6,700       |
|--------------|-------------|-------------|---------------|---------------|---------------|---------------|---------------|-------------|---------------|---------------|---------------|---------------|-------------|-------------|
| kPa          | 25.5        | 25.1        | 30.4          | 35.6          | 38.5          | 40.4          | 41.1          | 40.8        | 44.8          | 47.3          | 49.1          | 50.9          | 52.8        | 52.8        |
| (mmHg, inHg) | (191, 7.52) | (188, 7.40) | (227.7, 8.96) | (267.4, 10.5) | (288.9, 11.4) | (302.9, 11.9) | (308.6, 12.1) | (306, 12.0) | (335.8, 13.2) | (354.5, 14.0) | (368.2, 14.5) | (381.9, 15.0) | (396, 15.6) | (396, 15.6) |

### 3. GENERAL DRIVING CYCLE

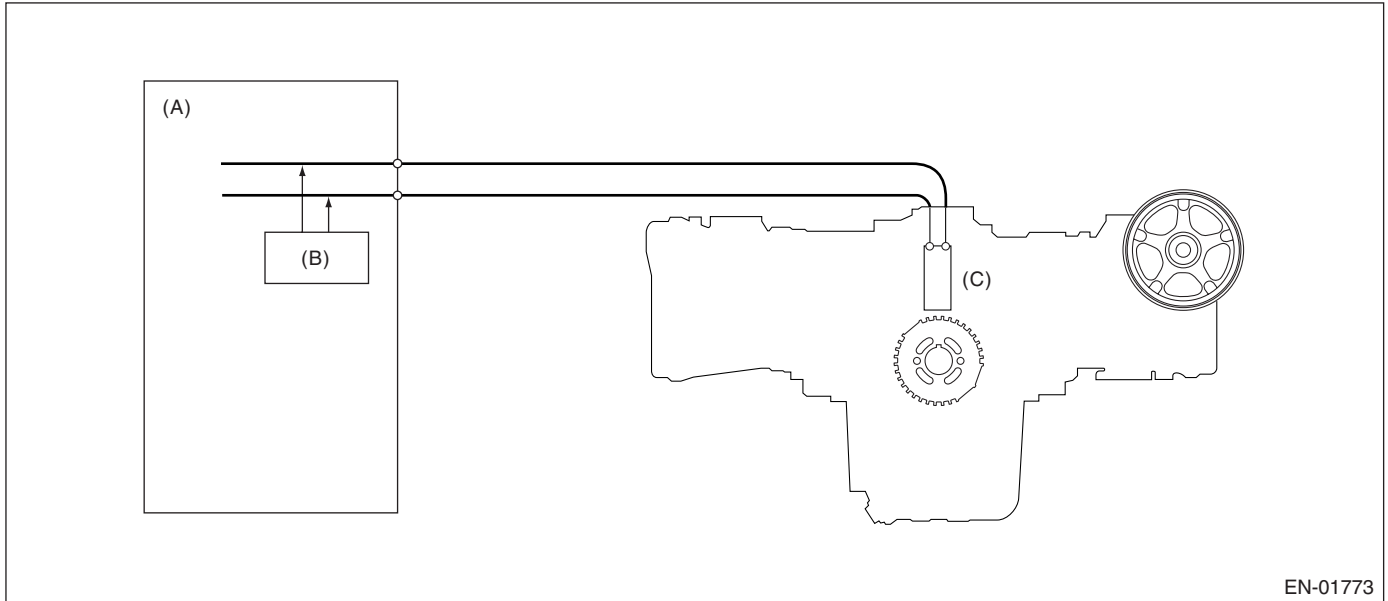
- Detecting misfire is able to be carried out in the condition between idling and high revolution; however, idling condition is better for detecting misfire from the viewpoint of engine load and damage.
- Perform the diagnosis continuously.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 4. DIAGNOSTIC METHOD



- (A) Engine control module (ECM)
- (B) Diagnosis circuit
- (C) Crankshaft position sensor

When the misfire occurred, the engine speed is decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether the misfire occurs or not comparing the calculated result with judgment value. Counting the number of misfire up, and if the misfire ratio is higher during 1,000 rev. or 200 rev., judge NG for the corresponding cylinder.

Calculate the diagnostic value (from crankshaft position speed)

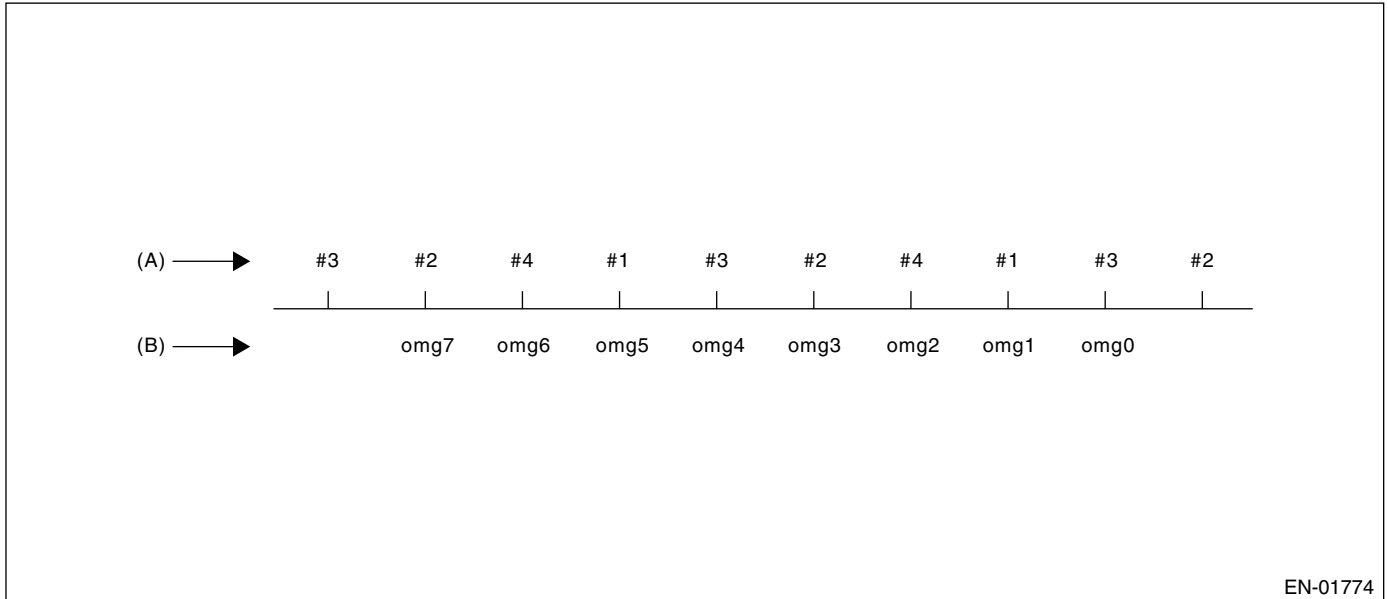
- Misfire detection every single ignition (Compare diagnostic value with judgment value)
  - 180° Interval Difference Method
  - 360° Interval Difference Method
  - 720° Interval Difference Method

- NG judgment (Judge misfire occurrence required by the law) (Compare number of misfire with judgment)
  - FTP1.5 times misfire NG judgment
  - Catalyst damage misfire NG judgment

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

As the following figure, pick out a random cylinder as the standard and name it  $\omega_0$ . And the former crankshaft position speed is named  $\omega_1$ , the second former crankshaft position speed is named  $\omega_2$ , the third is named  $\omega_3$ , and the following is the same.



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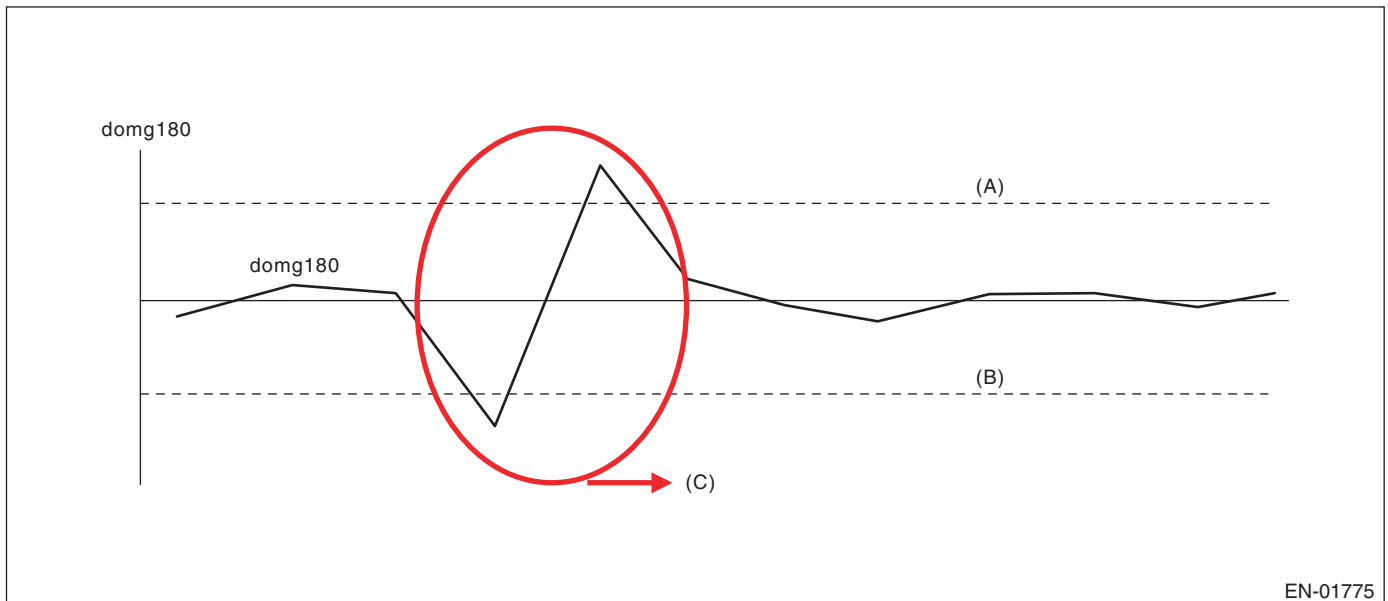
- (A) Ignition order
- (B) Crankshaft position speed

## • 180° Interval Difference Method

$$\text{Diagnosis value } \text{domg } 180 = (\omega_{-1} \omega_0) - (\omega_7 - \omega_1)/6$$

Judge misfire occurs in the following cases.

- $\text{domg } 180 > \text{judgment value of positive side}$
- $\text{domg } 180 \leq \text{judgment value of negative side}$   
(judgment value before 180°CA)



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- (A) Threshold value (Judgment value of positive side)
- (B) Threshold value (Judgment value of negative side)
- (C) Judged as misfire

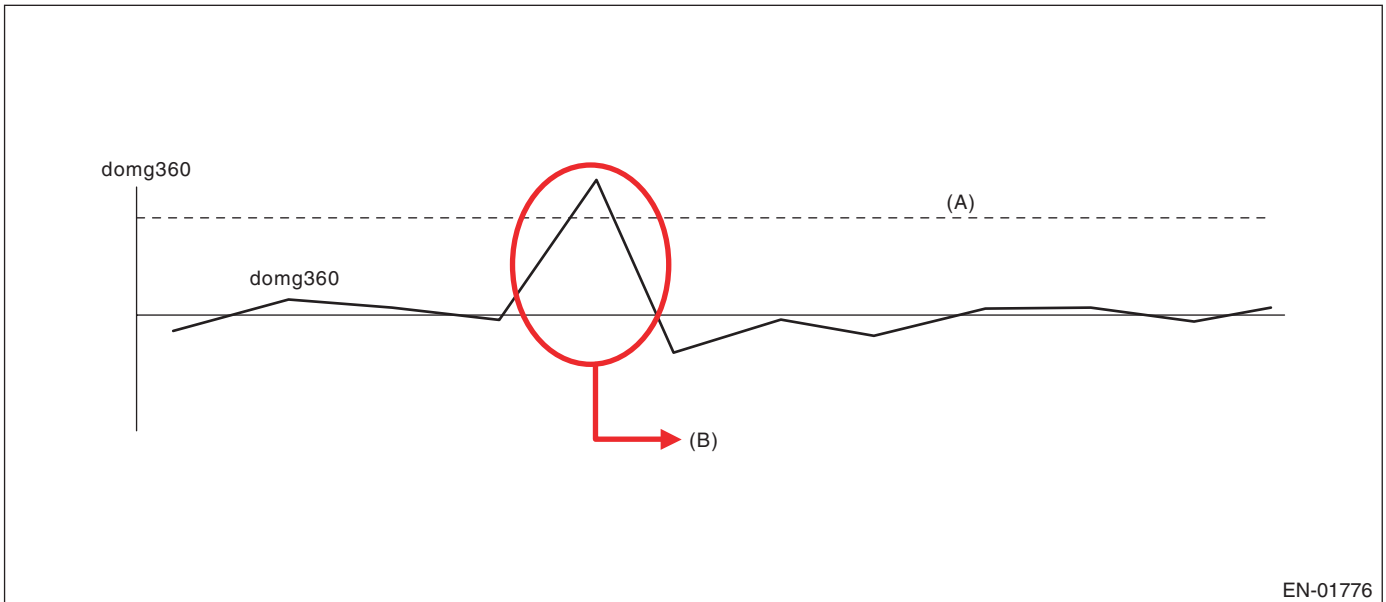
# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • 360° Interval Difference Method

Diagnosis value  $\text{domg } 360 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 4 - \text{omg } 3)$

Misfire judgment  $\text{domg } 360 > \text{judgment value} \rightarrow \text{Misfire occurs}$

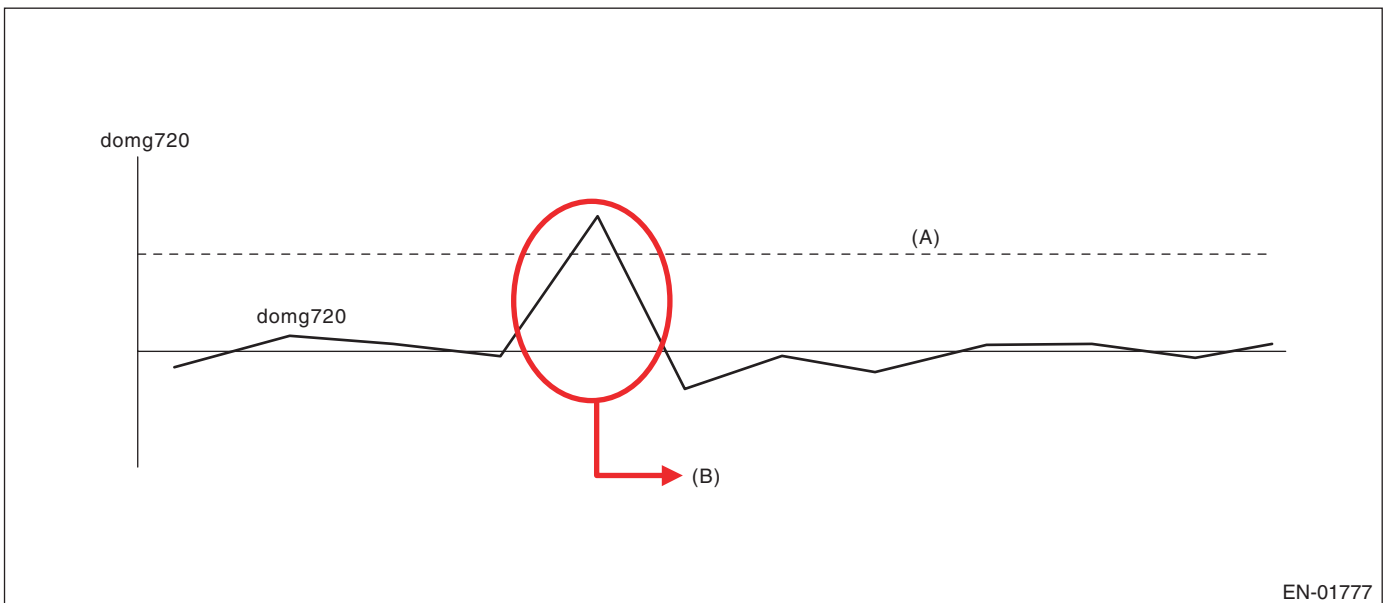


- (A) Threshold value
- (B) Judged as misfire

### • 720° Interval Difference Method

Diagnosis value  $\text{domg } 720 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 7 - \text{omg } 6)$

Misfire judgment  $\text{domg } 720 > \text{judgment value} \rightarrow \text{Misfire occurs}$



- (A) Threshold value
- (B) Judged as misfire

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

- FTP 1.5 times misfire (Misfire occurrence level affecting exhaust gas)

**Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1,000 engine revs.)**

| Malfunction Criteria        | Threshold Value       |
|-----------------------------|-----------------------|
| FTP emission judgment value | > 1.0% in 1,000 revs. |

**Time Needed for Diagnosis:** 1,000 engine revs.

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

- Catalyst damage misfire (Misfire occurrence level damaging catalyst)

**Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 200 engine revs. (400 ignitions))**

| Malfunction Criteria                   | Threshold Value |
|--|-----------------|
| Catalyst damage misfire judgment value | See Map 1       |

**Map 1 Fault criteria threshold for misfire which would result in catalyst damage**

| Percentage         | Intake air (g/rev.) |      |      |      |      |      |      |      |      |      |     |     |     |
|--------------------|---------------------|------|------|------|------|------|------|------|------|------|-----|-----|-----|
|                    | 0.2                 | 0.4  | 0.6  | 0.8  | 1.0  | 1.2  | 1.4  | 1.6  | 1.8  | 2.0  | 2.2 | 2.4 |     |
| Engine speed (rpm) | 1000                | 45.8 | 45.8 | 37.5 | 33.3 | 25.0 | 23.8 | —    | —    | —    | —   | —   | —   |
|                    | 1500                | 43.7 | 38.5 | 31.3 | 27.3 | 21.3 | 20.1 | —    | —    | —    | —   | —   | —   |
|                    | 2000                | 41.7 | 31.3 | 25.0 | 21.3 | 17.5 | 16.5 | 15.5 | 14.3 | 12.0 | 6.8 | 5.0 | —   |
|                    | 2500                | 38.5 | 27.5 | 21.3 | 17.8 | 14.3 | 12.4 | 10.6 | 9.7  | 9.2  | 7.5 | 6.3 | 5.0 |
|                    | 3000                | 35.4 | 23.8 | 17.5 | 14.3 | 11.1 | 8.4  | 5.6  | 5.0  | 5.0  | 6.4 | 6.0 | 5.0 |
|                    | 3500                | 25.0 | 22.5 | 14.3 | 12.2 | 10.1 | 8.4  | 6.7  | 6.2  | 5.8  | 5.8 | 5.6 | 5.0 |
|                    | 4000                | —    | 21.3 | 11.1 | 10.1 | 9.1  | 8.4  | 7.7  | 7.4  | 7.1  | 5.0 | 5.0 | 5.0 |
|                    | 4500                | —    | 19.0 | 12.3 | 10.9 | 9.6  | 9.2  | 8.9  | 7.7  | 6.5  | 5.0 | 5.0 | 5.0 |
|                    | 5000                | —    | 16.7 | 13.4 | 11.7 | 10.0 | 10.0 | 10.0 | 8.0  | 5.9  | 5.1 | 5.0 | 5.0 |
|                    | 5500                | —    | 16.1 | 12.0 | 10.6 | 9.2  | 8.8  | 8.4  | 6.3  | 5.0  | 5.0 | 5.0 | 5.0 |
|                    | 6000                | —    | 15.5 | 10.6 | 9.5  | 8.3  | 7.5  | 6.7  | 5.0  | 5.0  | 5.0 | 5.0 | 5.0 |
|                    | 6500                | —    | 15.5 | 10.0 | 9.2  | 8.2  | 7.3  | 5.9  | 5.0  | 5.0  | 5.0 | 5.0 | —   |
| 7000               | —                   | 15.0 | 9.5  | 9.0  | 7.5  | 6.5  | 5.0  | 5.0  | 5.0  | 5.0  | —   | —   |     |

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These figures mean the misfire ratio (%) in 400 ignitions; for example, 22.5 (%) means 400 (ignition) × 22.5 (%) = 90 (ignition) or more, so this case is judged misfire.

**Time Needed for Diagnosis:** 200 engine revs.

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 7. FAIL SAFE

None

## Diagnostic Trouble Code (DTC) Detecting Criteria

### GENERAL DESCRIPTION

---

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

#### **AQ:DTC P0302 CYLINDER 2 MISFIRE DETECTED**

##### 1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(STI)-97, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **AR:DTC P0303 CYLINDER 3 MISFIRE DETECTED**

##### 1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(STI)-97, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

#### **AS:DTC P0304 CYLINDER 4 MISFIRE DETECTED**

##### 1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(STI)-97, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

# Diagnostic Trouble Code (DTC) Detecting Criteria

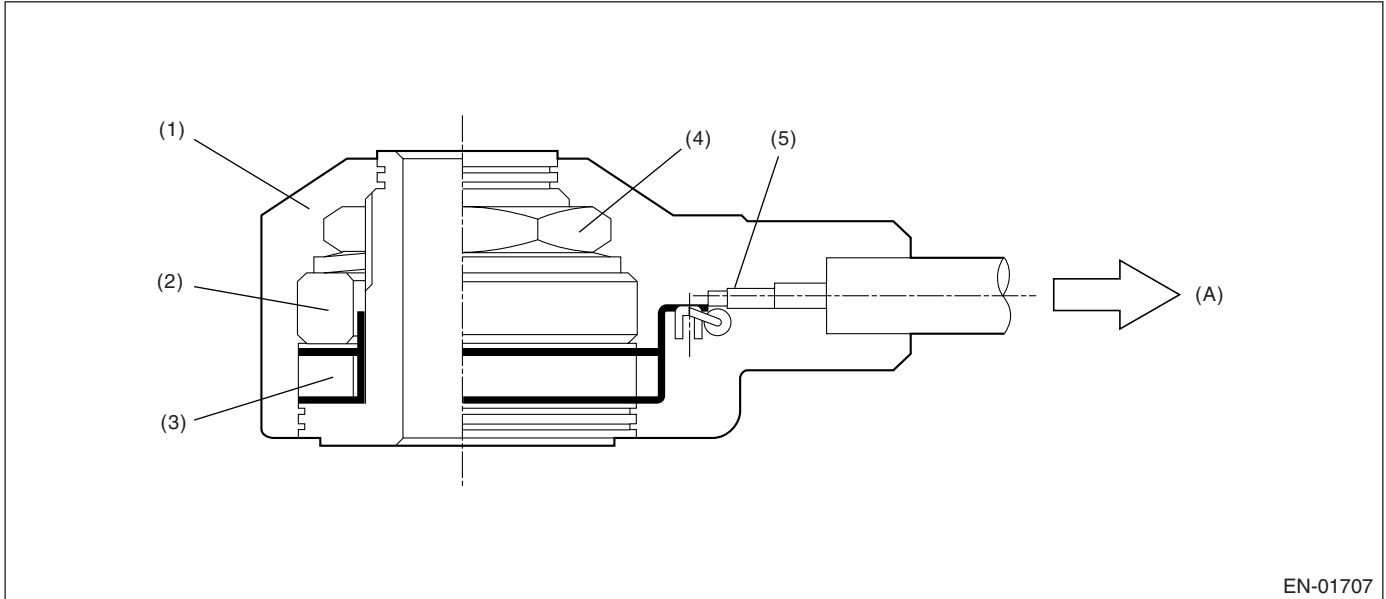
GENERAL DESCRIPTION

## AT:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



- (1) Case
- (2) Weight
- (3) Piezoelectric element
- (4) Nut
- (5) Resistance

(A) To knock sensor harness

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.238 V       |
| Ignition switch      | ON              |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 0.238$ V  |
| Ignition switch      | ON              |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Knock compensation:

- Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
- At normal: knock compensation =  $0^{\circ}\text{CA}$  is fixed.
- At trouble: knock compensation =  $-5^{\circ}\text{CA}$ . (Retard  $5^{\circ}\text{CA}$ .)
- Not allowed to update the whole learning compensation factor.
- Not allowed to calculate the partial learning zone compensation value.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

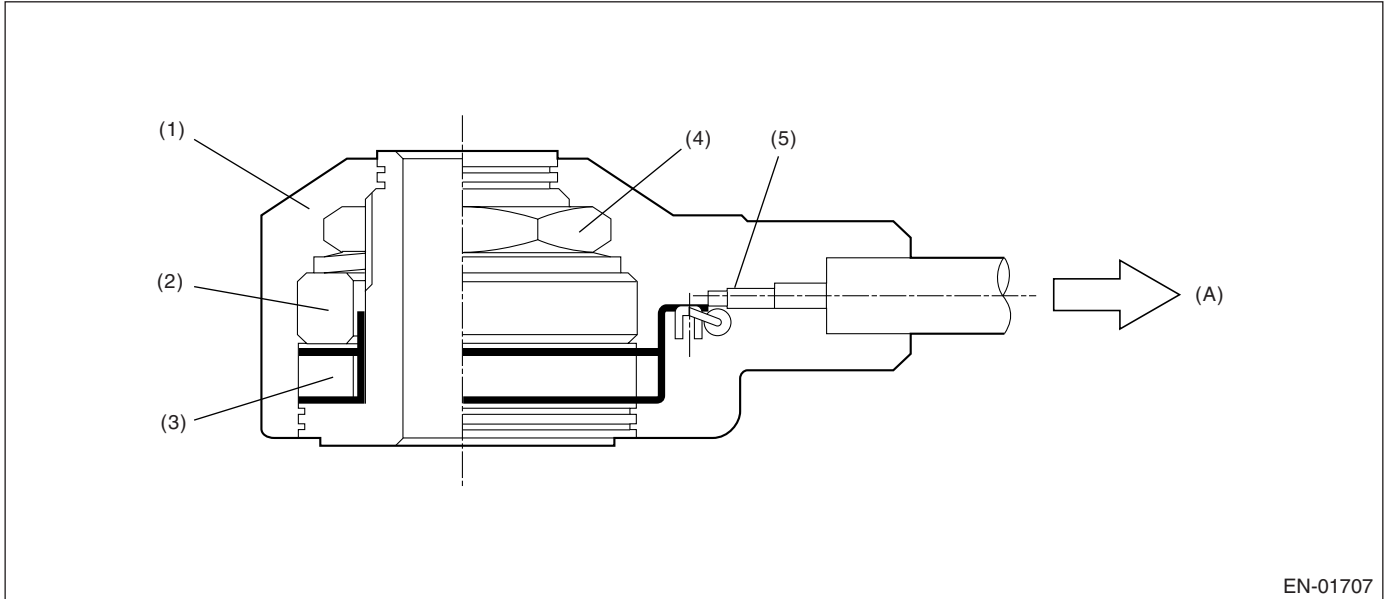
GENERAL DESCRIPTION

## AU:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



- (1) Case
- (2) Weight
- (3) Piezoelectric element
- (4) Nut
- (5) Resistance

(A) To knock sensor harness

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.714$ V  |
| Ignition switch      | ON              |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 4.714 V       |
| Ignition switch      | ON              |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Knock compensation:

- Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
- At normal: knock compensation = 0°CA is fixed.
- At trouble: knock compensation = -5°CA. (Retard 5°CA.)
- Not allowed to update the whole learning compensation factor.
- Not allowed to calculate the partial learning zone compensation value.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

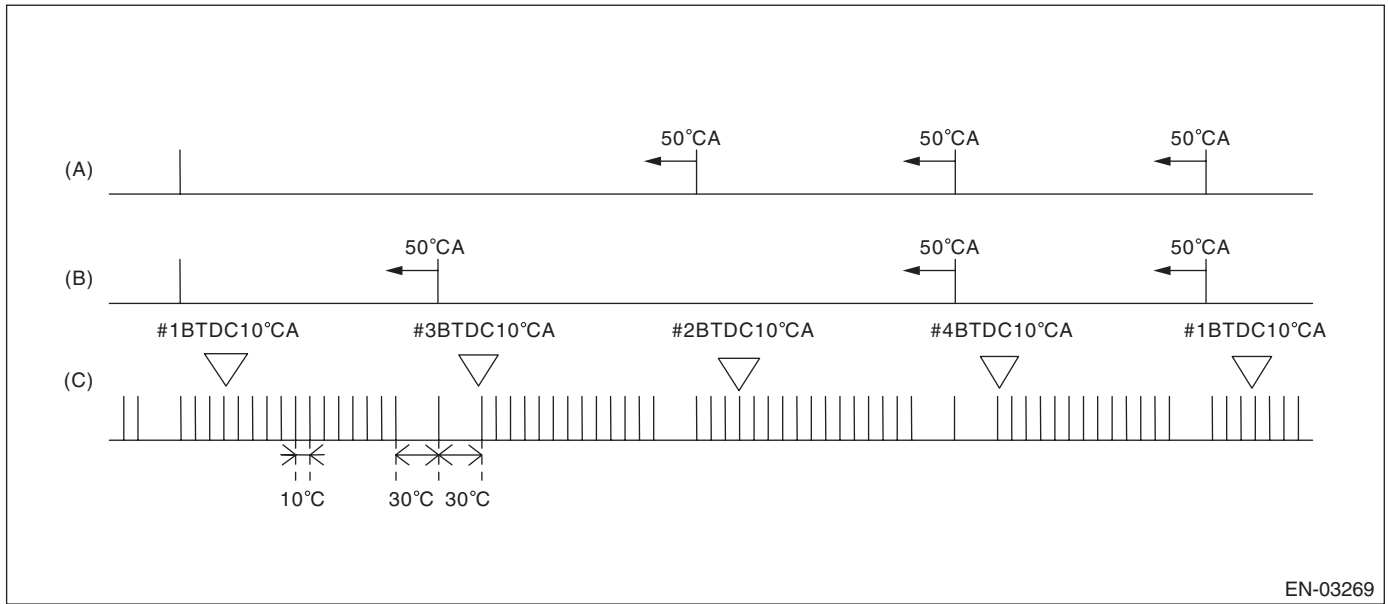
GENERAL DESCRIPTION

## AV:DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT

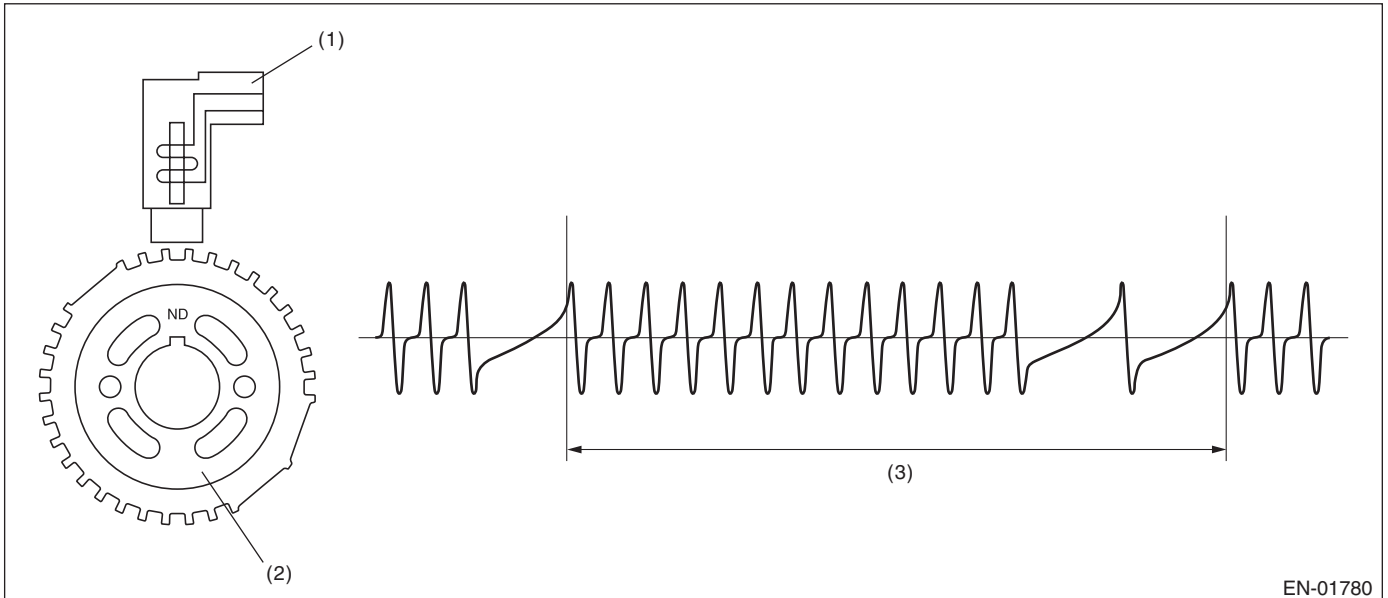
### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of crankshaft position sensor. Judge NG when the crankshaft signal does not input regardless of turning the starter.

### 2. COMPONENT DESCRIPTION



- (A) Camshaft signal RH
- (B) Camshaft signal LH
- (C) Crankshaft signal



- (1) Crankshaft position sensor
- (2) Crank sprocket
- (3) Crankshaft half-turn

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### Judgment Value

| Malfunction Criteria              | Threshold Value   |
|-----------------------------------|-------------------|
| Starter switch                    | ON                |
| Crankshaft position sensor signal | Not detected      |
| Battery voltage                   | $\geq 8\text{ V}$ |

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### • Normality Judgment

Judge OK when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### Judgment Value

| Malfunction Criteria              | Threshold Value   |
|-----------------------------------|-------------------|
| Crankshaft position sensor signal | Input exists      |
| Battery voltage                   | $\geq 8\text{ V}$ |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

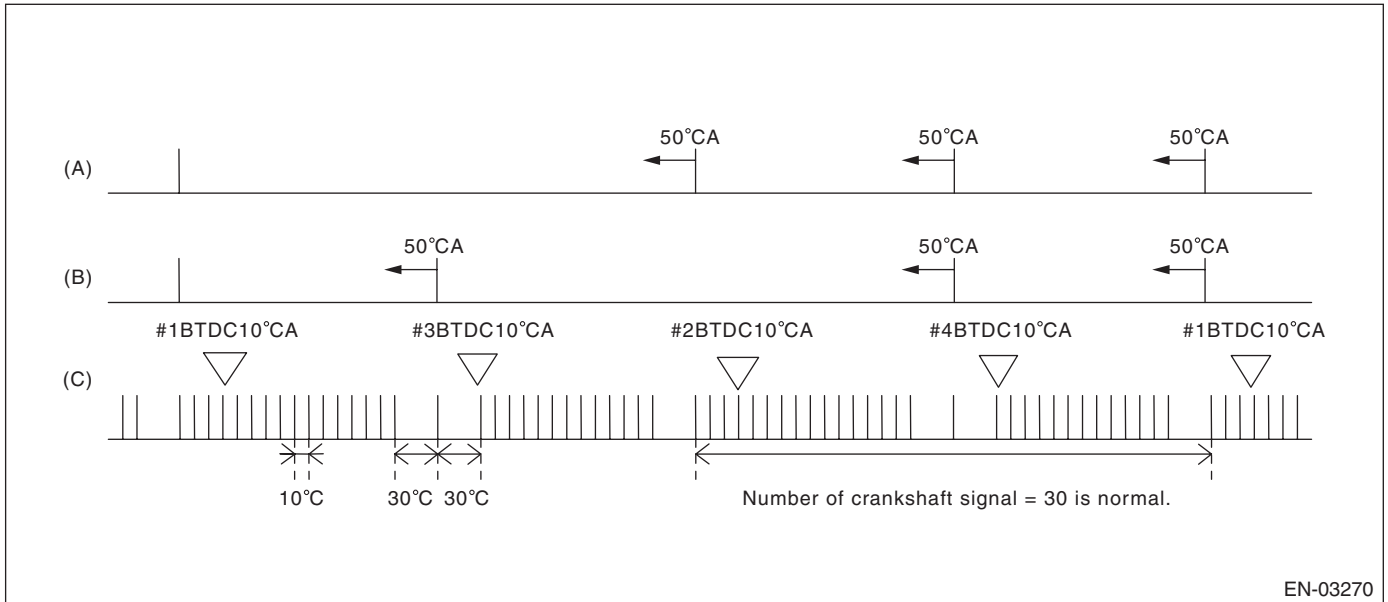
Memorize the freeze frame data. (For test mode \$02)

## AW:DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE

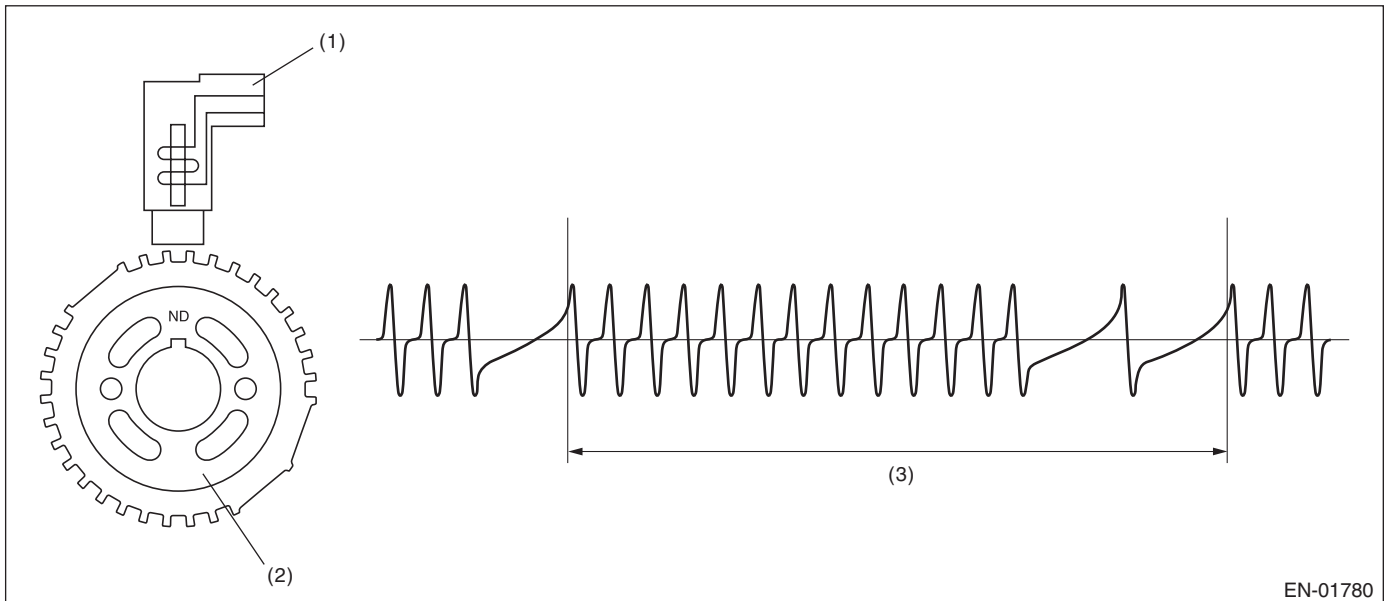
### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of crankshaft position sensor output property. Judge NG when the number of crankshaft signal every 1 revolution becomes abnormal.

### 2. COMPONENT DESCRIPTION



- (A) Camshaft signal RH
- (B) Camshaft signal LH
- (C) Crankshaft signal



- (1) Crankshaft position sensor
- (2) Crank sprocket
- (3) Crankshaft half-turn

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions     |
|----------------------|-----------------------|
| Battery voltage      | $\geq 8 \text{ V}$    |
| Engine speed         | $< 3,000 \text{ rpm}$ |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3,000 rpm engine speed.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when all the malfunction criteria below are completed more than 10 times in a row.

#### Judgment Value

| Malfunction Criteria                        | Threshold Value |
|---|-----------------|
| Cylinder number distinction                 | Completed       |
| Amount of crank sensor signal during 1 rev. | Not = 30        |

**Time Needed for Diagnosis:** 10 engine revs.

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                        | Threshold Value |
|---|-----------------|
| Cylinder number distinction                 | Completed       |
| Amount of crank sensor signal during 1 rev. | = 30            |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

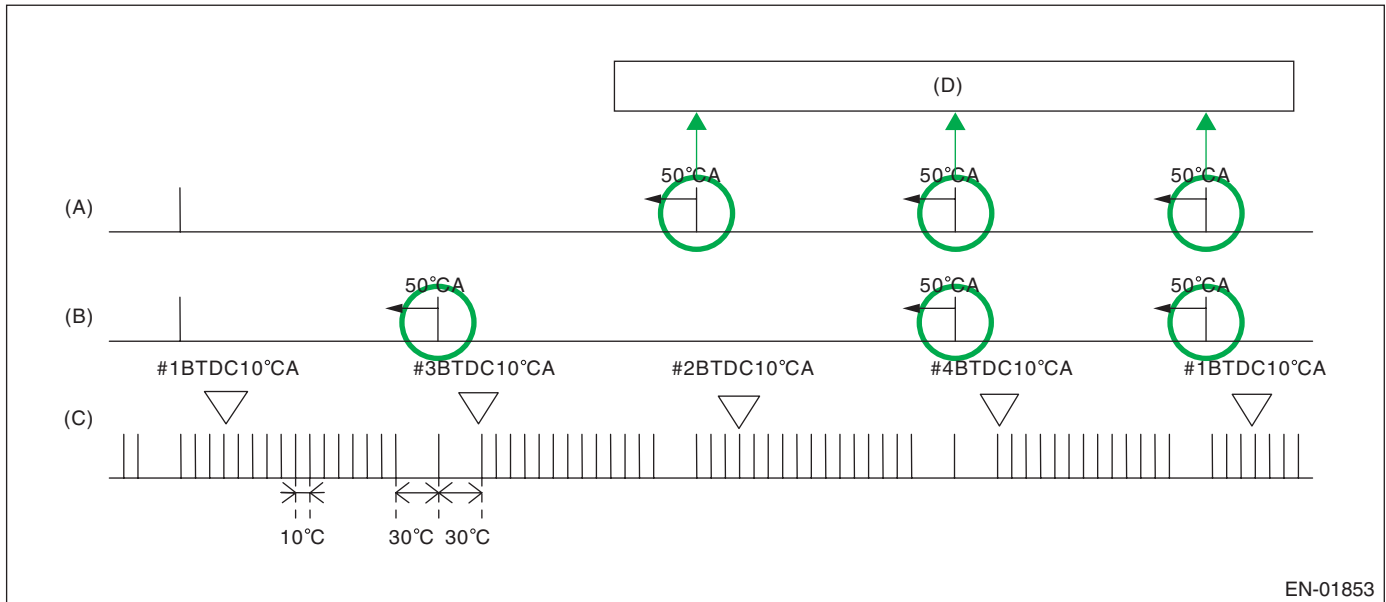
GENERAL DESCRIPTION

## AX:DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of camshaft position sensor. Judge NG when the number of camshaft signal remains to be abnormal.

### 2. COMPONENT DESCRIPTION



- (A) Camshaft signal RH
- (B) Camshaft signal LH
- (C) Crankshaft signal

- (D) Number of camshaft signal = 3 is normal at two engine revolution.

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Voltage              | ≥ 8 V             |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment 1

The camshaft signal normally enters three times by two rev. of engine speed; however, judge NG when the camshaft signal does not enter three times continuously.

Judge NG when the malfunction criteria below are completed more than 100 rev. of engine speed. Judge OK and clear NG when the malfunction criteria below are not completed.

#### Judgment Value

| Malfunction Criteria                                    | Threshold Value |
|---|-----------------|
| Number of camshaft position sensor signal during 2 rev. | Except 3        |

**Time Needed for Diagnosis:** 100 rev.

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • Abnormality Judgment 2

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### Judgment Value

| Malfunction Criteria  | Threshold Value |
|-----------------------|-----------------|
| Starter switch        | ON              |
| Camshaft angle signal | None            |

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria  | Threshold Value |
|-----------------------|-----------------|
| Camshaft angle signal | Exists          |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control: Most timing retard learning is not complete or most timing retard learning completion is not experienced.
- ISC feedback compensation: Do not perform the AVCS actual timing advance compensation. Make the OCV driving Duty to be the given value (9.36%).

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## AY:DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2)

### 1. OUTLINE OF DIAGNOSIS

For diagnostic procedure, refer to DTC P0340. <Ref. to GD(STI)-111, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

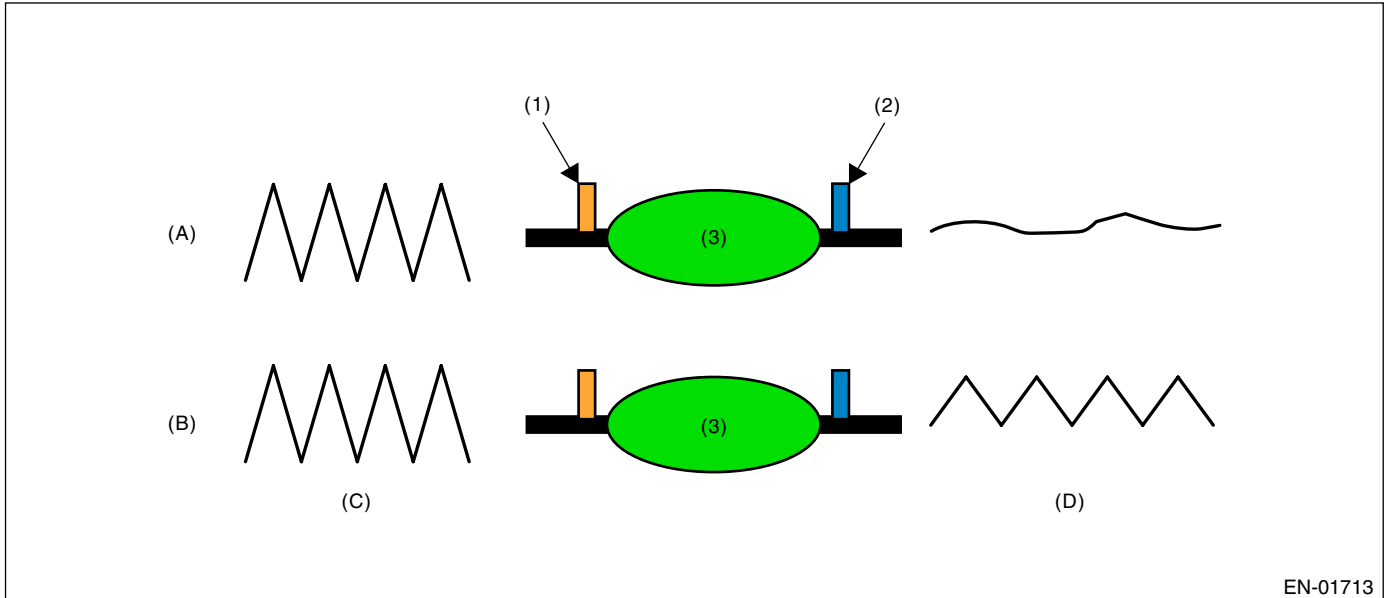
## AZ:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Detect the deterioration of catalyst function.

Though the rear oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened. For this reason, the catalyst diagnosis is carried out by monitoring the rear oxygen sensor output and comparing it with the front A/F sensor output.

### 2. COMPONENT DESCRIPTION



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- (1) Front oxygen (A/F) sensor
- (2) Rear oxygen sensor
- (3) Catalyst

- (A) Normal
- (B) Deterioration
- (C) Front oxygen (A/F) sensor waveform
- (D) Rear oxygen sensor waveform



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions                |
|---|----------------------------------|
| Time for keep completing all secondary parameters           | 1.2 seconds or more              |
| Catalyst deterioration diagnosis                            | Not finished                     |
| Battery voltage   | > 10.9 V                         |
| Atmospheric pressure  | > 75.1 kPa (563 mmHg, 22.2 inHg) |
| Engine coolant temperature                                  | ≥ 65°C (149°F)                   |
| Catalyst warm-up counter on Map 2                           | ≥ 7,600                          |
| Misfire detection during 200 engine revs.                   | < 5 times                        |
| Learning value of evaporation gas density                   | < 0.20                           |
| Sub feedback  | Operating                        |
| Evaporative system diagnostic                               | Not in operation                 |
| Difference between actual and target time lambda < 0.10     | 1,000 milliseconds or more       |
| Vehicle speed   | ≥ 75 km/h (46.6 MPH)             |
| Amount of intake air  | 10 ↔ 40 g/s                      |
| Engine load change every 0.5 engine revs.                   | < 0.03 g/rev                     |
| Rear O <sub>2</sub> output change from below 600 mV to over | Experienced after fuel cut       |
| After engine starting                                       | ≥ 150 seconds                    |

#### • Map 2

Add the following value every 512 milliseconds.

#### **Catalyst warm-up counter ≤ 8,000**

|                                      |     |    |    |    |    |    |     |     |     |     |     |     |
|--------------------------------------|-----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|
| Amount of intake air (g/s)           | 0   | 5  | 10 | 15 | 20 | 25 | 30  | 35  | 40  | 45  | 50  | 55  |
| Integrated value for warm-up counter | -20 | -8 | 15 | 36 | 57 | 79 | 100 | 121 | 127 | 127 | 127 | 127 |

#### **Catalyst warm-up counter > 8,000**

|                                      |    |    |    |    |    |    |    |    |    |    |    |    |
|--------------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|
| Amount of intake air (g/s)           | 0  | 5  | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
| Integrated value for warm-up counter | -2 | -1 | 5  | 7  | 8  | 9  | 11 | 12 | 13 | 13 | 13 | 13 |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once at the constant vehicle speed from 80 to 100 km/h (49.7 to 62.1 MPH).

### 5. DIAGNOSTIC METHOD

After the malfunction criteria are completed, calculate the output fluctuation value of front oxygen (A/F) sensor and output fluctuation value of rear oxygen sensor.

Calculate the diagnosis value when the front oxygen (A/F) sensor output fluctuation value more than specified value.

Regard the A/F response properties and diagnosis value as parameters for judgment value.

Judge NG when the malfunction criteria below are completed, and judge OK when they are not completed.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Accumulated variation of output voltage of rear oxygen sensor per 32 milliseconds $\times$ 4 divided by accumulated variation of lambda of front oxygen (A/F) sensor per 32 milliseconds $\times$ 4 | $\geq$ Map 3    |

## Map 3

|                 |      |       |       |       |       |
|-----------------|------|-------|-------|-------|-------|
| Diagnosis value | 0.1  | 0.162 | 0.214 | 0.266 | 0.318 |
| Judgment value  | 4.51 | 4.51  | 10.45 | 16.39 | 22.34 |

**Time Needed for Diagnosis:** 55 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

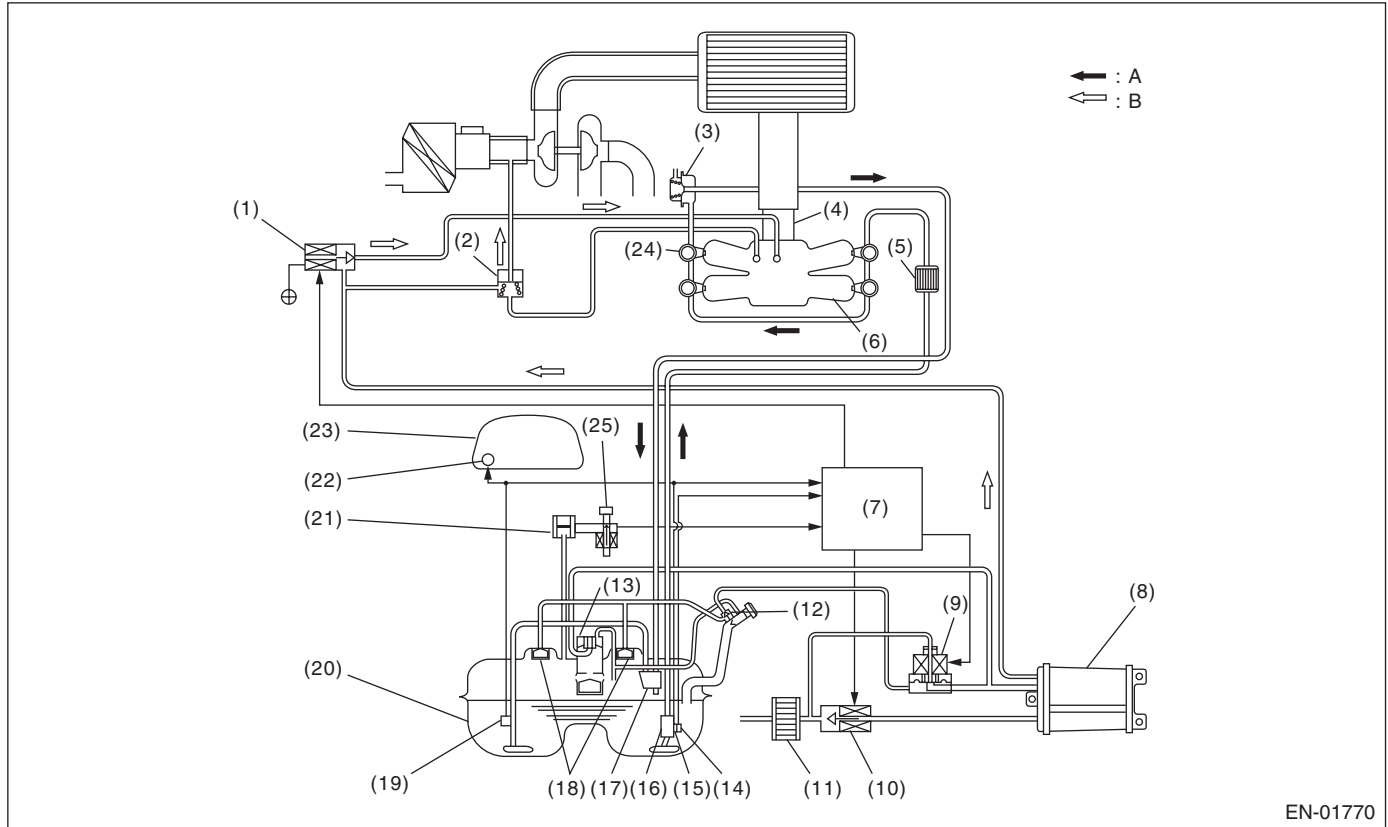
# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### BA:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

#### 1. OUTLINE OF DIAGNOSIS

Perform the diagnosis of leakage of fuels system and valve functions.



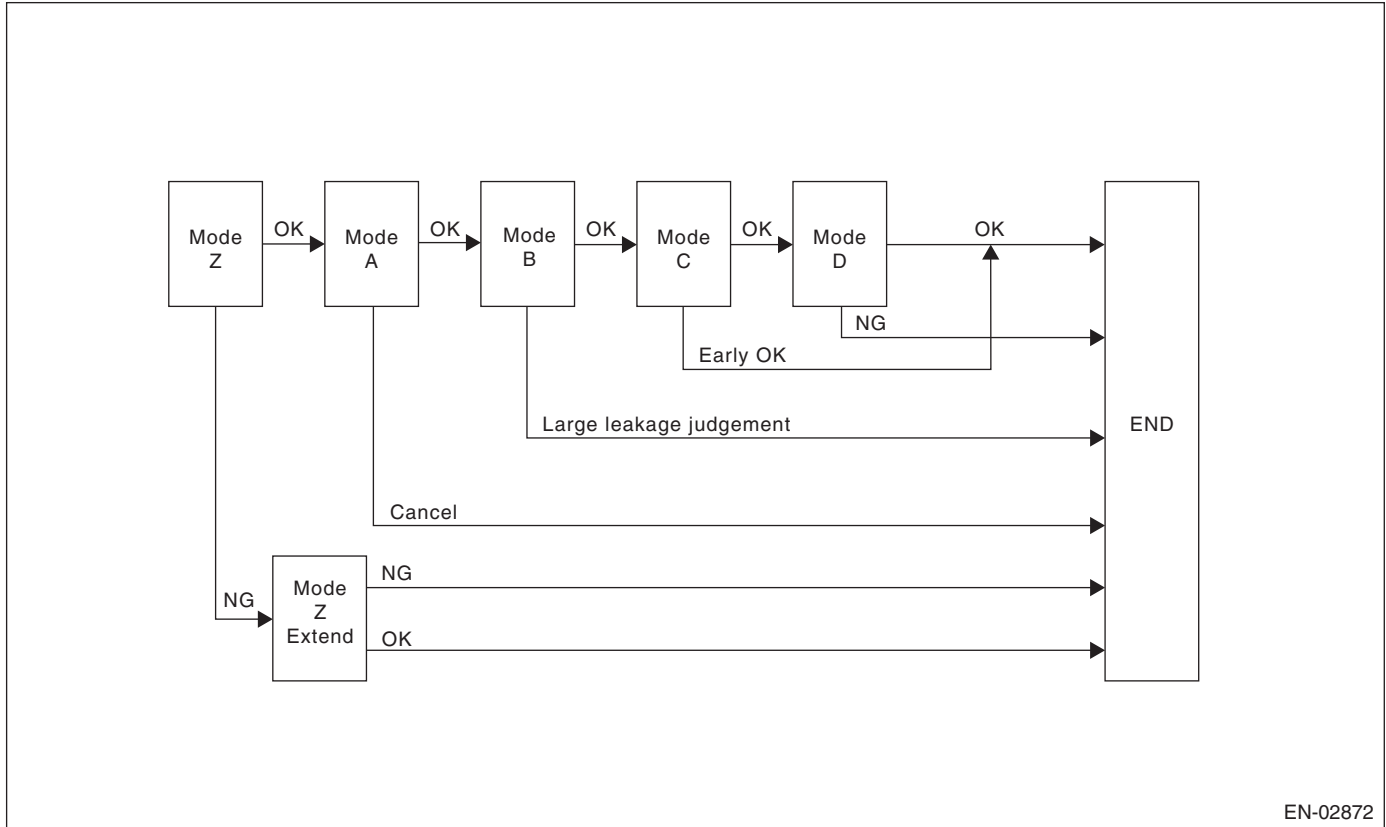
- |      |                                 |      |  |
|------|---------------------------------|------|--|
| (1)  | Purge control solenoid valve    | (14) | Fuel temperature sensor                |
| (2)  | Purge valve                     | (15) | Fuel level sensor                      |
| (3)  | Pressure regulator              | (16) | Fuel pump                              |
| (4)  | Throttle body                   | (17) | Jet pump                               |
| (5)  | Fuel filter                     | (18) | Fuel cut valve                         |
| (6)  | Intake manifold                 | (19) | Fuel sub level sensor                  |
| (7)  | Engine control module (ECM)     | (20) | Fuel tank                              |
| (8)  | Canister                        | (21) | Fuel tank pressure sensor              |
| (9)  | Pressure control solenoid valve | (22) | Fuel meter                             |
| (10) | Drain valve                     | (23) | Combination meter                      |
| (11) | Drain filter                    | (24) | Fuel injector                          |
| (12) | Shut-off valve                  | (25) | Tank pressure switching solenoid valve |
| (13) | Vent valve                      |      |  |

In this system diagnosis, checking for leakage and valve function is conducted by changing the fuel tank pressure and monitoring the pressure change using the fuel tank pressure sensor. 0.04 inch diagnosis is performed in the order of mode Z, mode A, mode B, mode C, mode D and mode E, and 0.02 inch diagnosis is performed in the order of mode Y, mode A, mode B, mode C, mode D and mode E.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • 0.04-inch Diagnosis



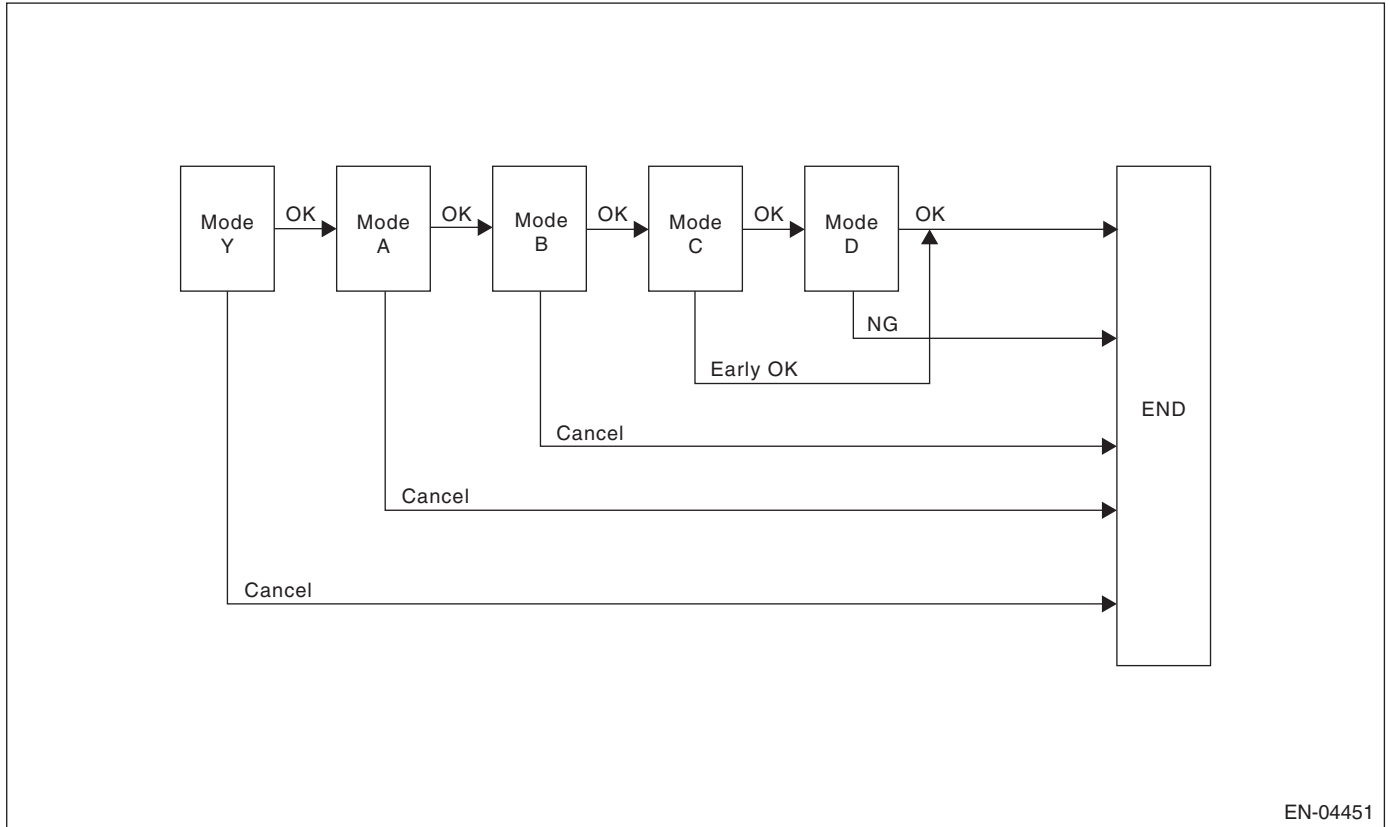
EN-02872

| Mode  | Mode Description   | Diagnosis Period |
|---|--|------------------|
| Mode Z<br>(CPC abnormal open diagnosis)   | Carry out CPC open trouble and CCV close trouble diagnosis according to tank pressure change amount after diagnosis started.   | 3 — 16 seconds   |
| Mode A<br>(Estimated evaporation amount)  | Calculate the tank pressure change amount (P1).  | 16 seconds       |
| Mode B<br>(Sealed negative pressure, large leakage judgment)                      | Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value.<br>If the tank pressure cannot be reduced, it is diagnosed as large leak. | 4 — 35 seconds   |
| Mode C<br>(Pressure increase check advanced OK judgment)                          | Wait until the tank pressure becomes the desired value. If the tank pressure does not become the value, make advanced OK judgment.   | 4 — 15 seconds   |
| Mode D<br>(Negative pressure variation measurement evaporation leakage diagnosis) | Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value.                | 12 — 16 seconds  |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • 0.02-inch Diagnosis



EN-04451

| Mode  | Mode Description  | Diagnosis Period |
|---|---|------------------|
| Mode Y<br>(Tank pressure stabilization)   | Return the tank pressure to atmosphere.   | 15 seconds       |
| Mode A<br>(Estimated evaporation amount)  | Calculate the tank pressure change amount (P1).   | 29 seconds       |
| Mode B<br>(Negative pressure sealed)  | Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value.  | 10 — 20 seconds  |
| Mode C<br>(Pressure increase check advanced OK judgment)                          | Wait until the tank pressure becomes the desired value. If the tank pressure does not become the value, make advanced OK judgment.                                    | 5 — 20 seconds   |
| Mode D<br>(Negative pressure variation measurement evaporation leakage diagnosis) | Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value. | 20 — 25 seconds  |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Mode Table for Evaporative Emission Control System Diagnosis

### 0.04-inch Diagnosis

| Mode   | Behavior of tank internal pressure under normal conditions                          | Diagnostic item  | DTC   |
|--------|---|--|-------|
| Mode Z | Nearly same as atmospheric pressure (equivalent pressure of 0 kPa (0 mmHg, 0 inHg)) | CPC is judged to be stuck open.  | P0457 |
| Mode A | Pressure is in proportion to amount of evaporative emission.                        | —  | —     |
| Mode B | Negative pressure is formed due to intake manifold negative pressure                | Large leakage  | P0457 |
| Mode C | Target pressure is reached.   | —  | —     |
| Mode D | Pressure change is small.   | EVAP system is judged to have large leak [1.0 mm (0.04 in)].   | P0442 |
|        |   | P2 measurement of small leak in system. EVAP. system is judged to have small leak [0.5 mm (0.02 in.)]. | P0456 |

### 0.02-inch Diagnosis

| Mode   | Behavior of tank internal pressure under normal conditions           | Diagnostic item  | DTC   |
|--------|--|--|-------|
| Mode Y | Return to atmosphere   | —  | —     |
| Mode A | Pressure is in proportion to amount of evaporation gas occurrence.   | —  | —     |
| Mode B | Negative pressure is formed due to intake manifold negative pressure | —  | —     |
| Mode C | Target pressure is reached.  | —  | —     |
| Mode D | Pressure change is small.  | P2 measurement of small leak in system. Evaporation system is judged to have small leak [0.5 mm (0.02 in.)]. | P0456 |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

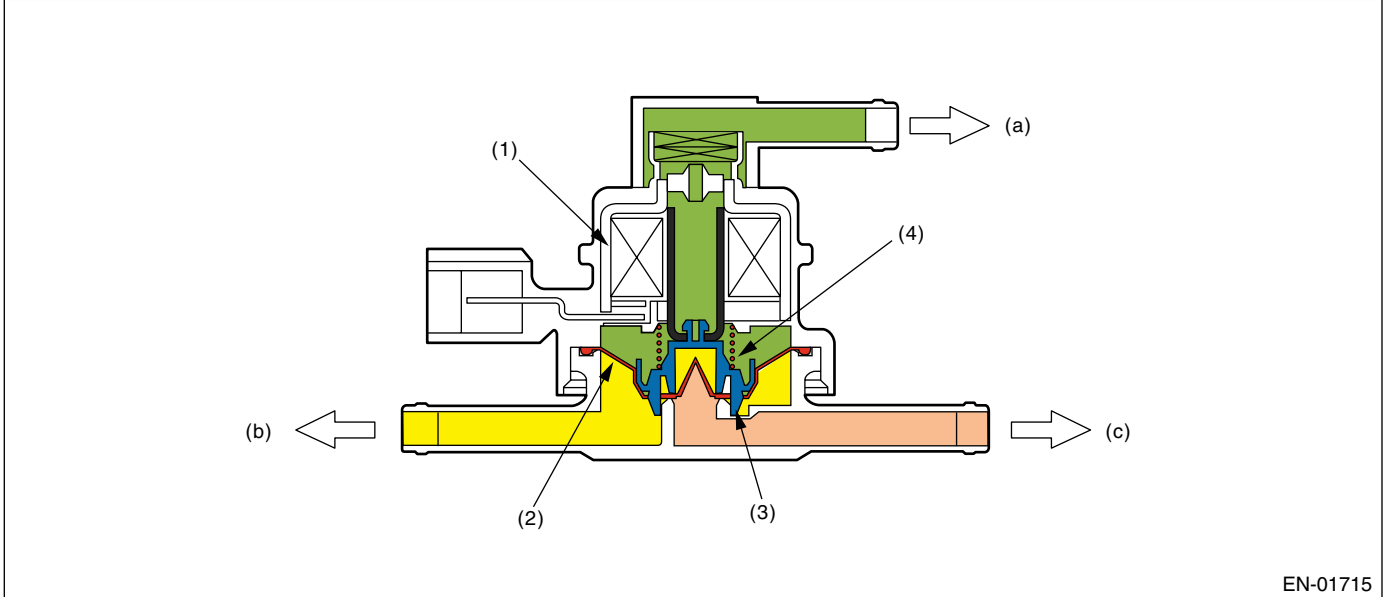
### 2. COMPONENT DESCRIPTION

#### • Pressure Control Solenoid Valve

PCV controls the fuel tank pressure to be equal to the atmospheric air pressure.

Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.

The solenoid which is set to ON forces to open the valve.



EN-01715

- (1) Solenoid
- (2) Diaphragm
- (3) Valve
- (4) Spring

- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

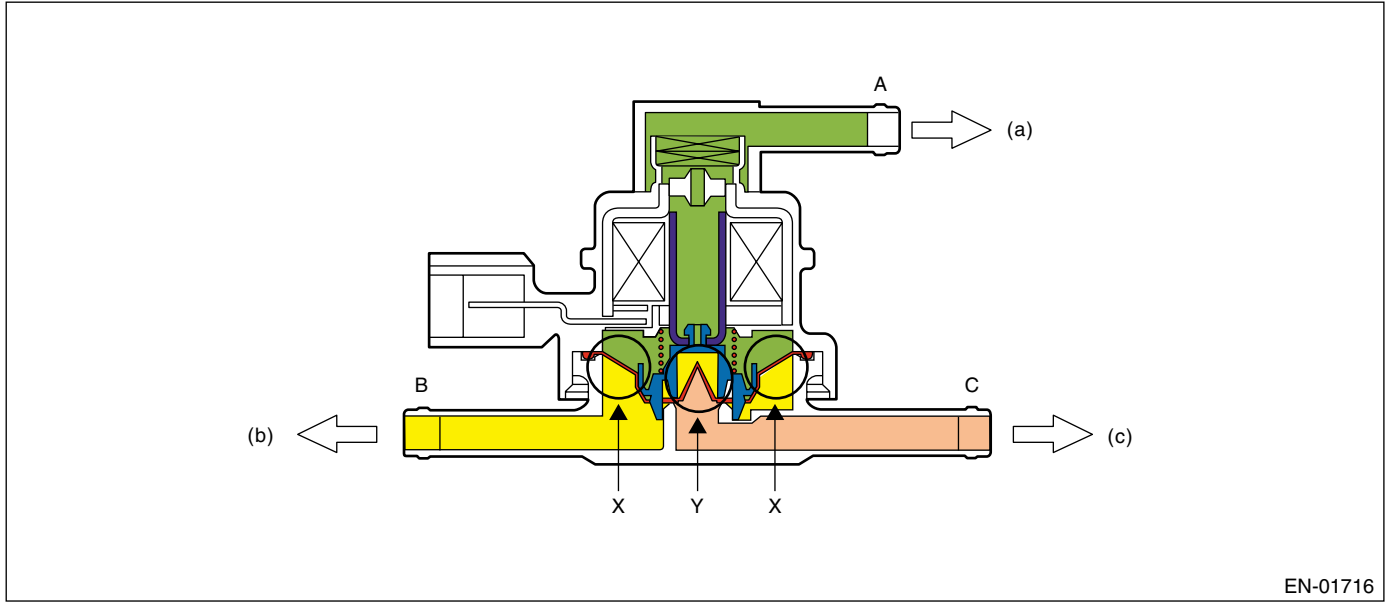
# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Valve Operation and Air Flow

In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.

If the atmospheric air pressure port is A, tank pressure port is B, and canister pressure port is C, the air flows according to pressure difference from each port as shown in the table below.



- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

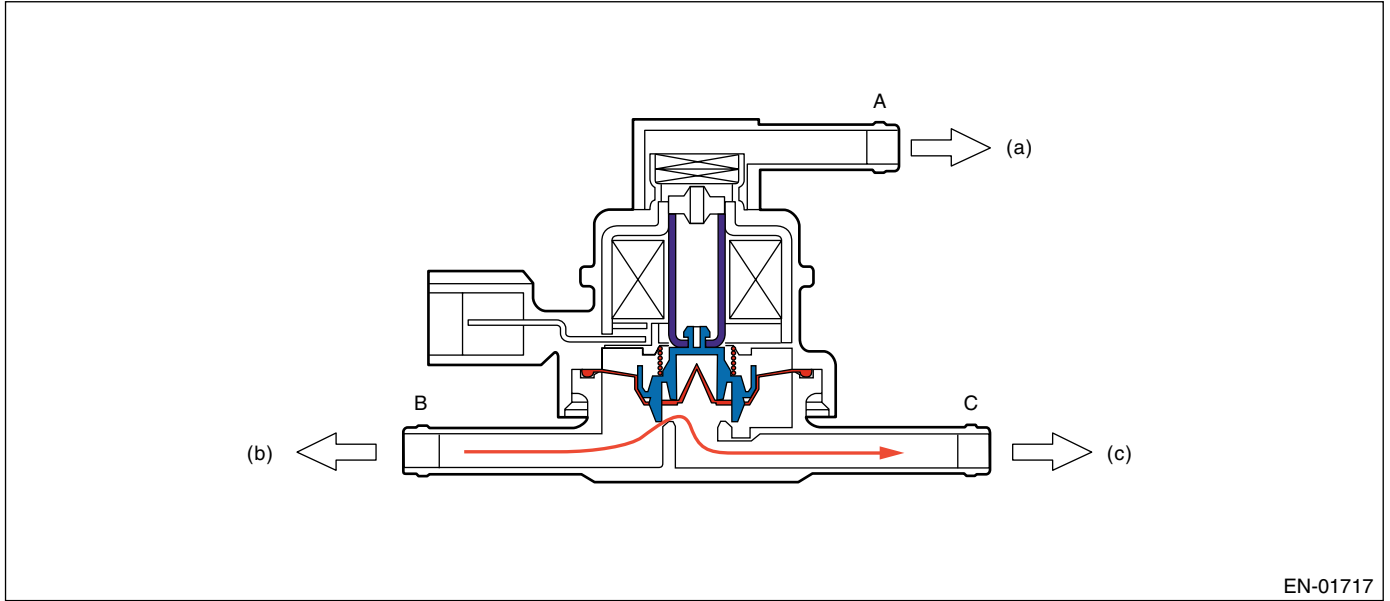
| Condition of pressure  | Flow                  |
|------------------------|-----------------------|
| $A < B$ (solenoid OFF) | $B \rightarrow C$     |
| $B < C$ (solenoid OFF) | $C \rightarrow B$     |
| Solenoid ON            | $B \leftrightarrow C$ |



# Diagnostic Trouble Code (DTC) Detecting Criteria

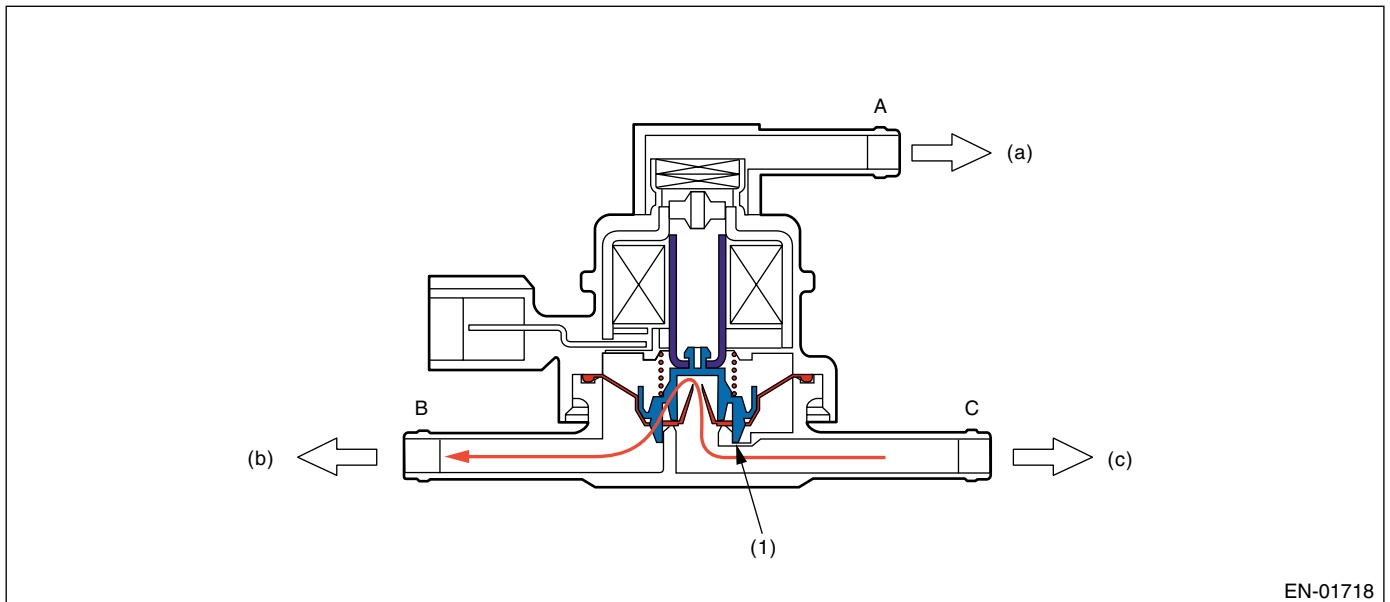
## GENERAL DESCRIPTION

### • When $A < B$ (Solenoid OFF)



- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

### • When $B < C$ (Solenoid OFF)

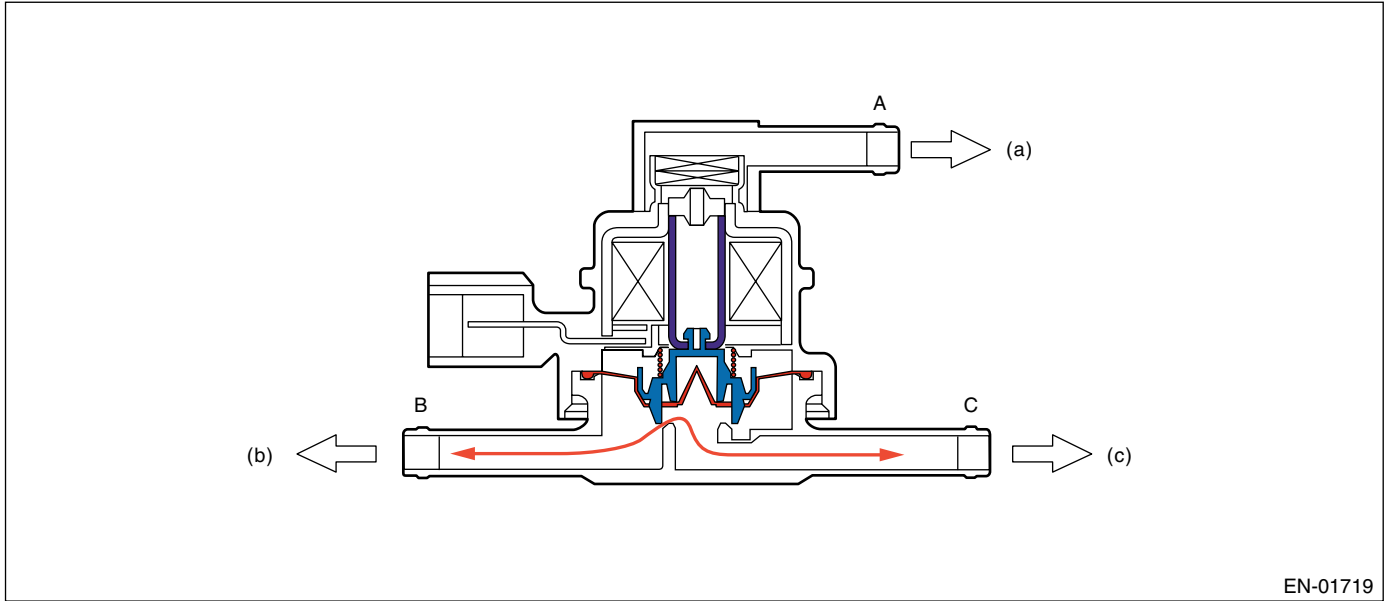


- (1) Valve
- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • When Solenoid is ON



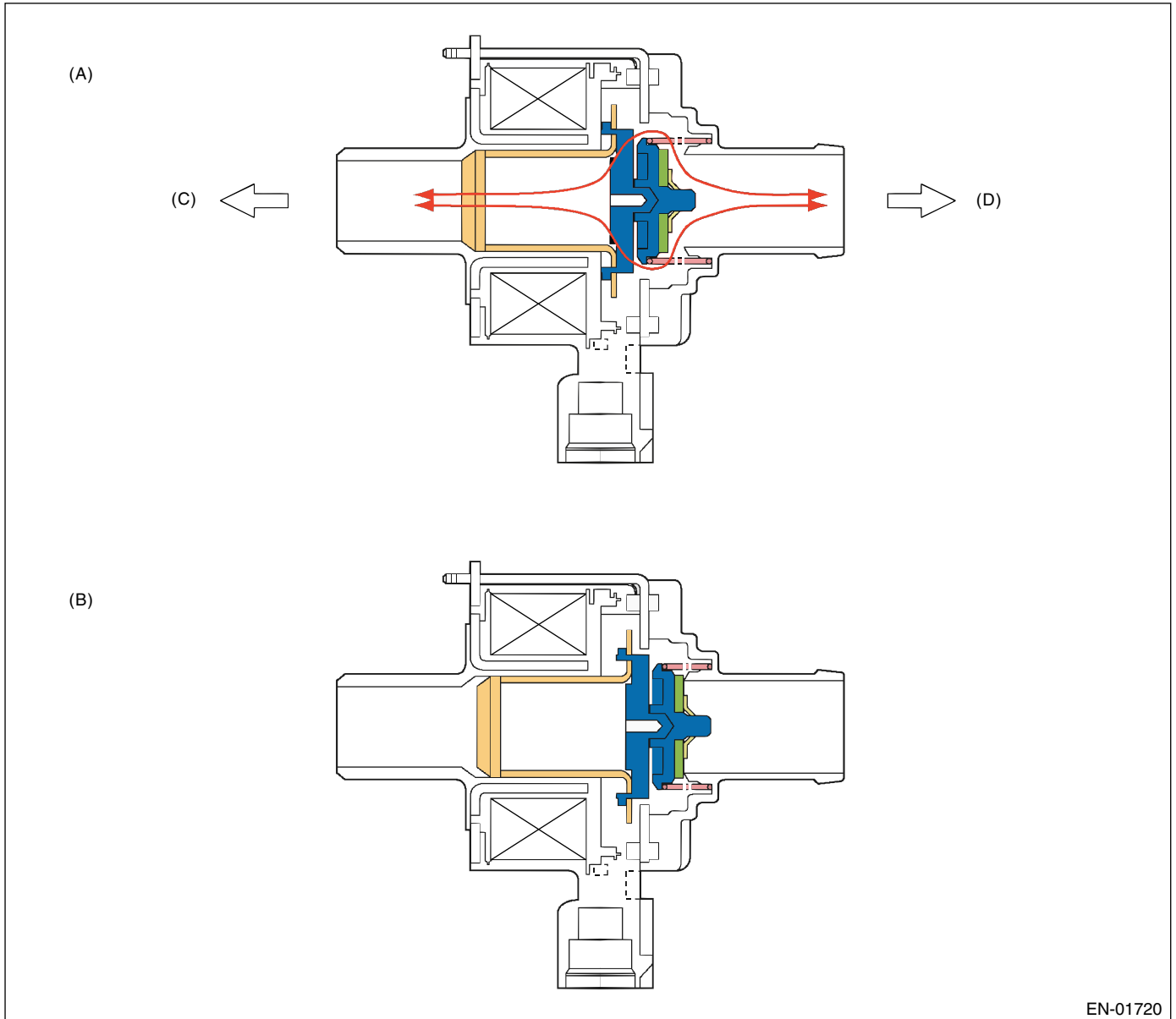
- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • CCV

CCV controls the ambient air to be introduced to the canister.



EN-01720

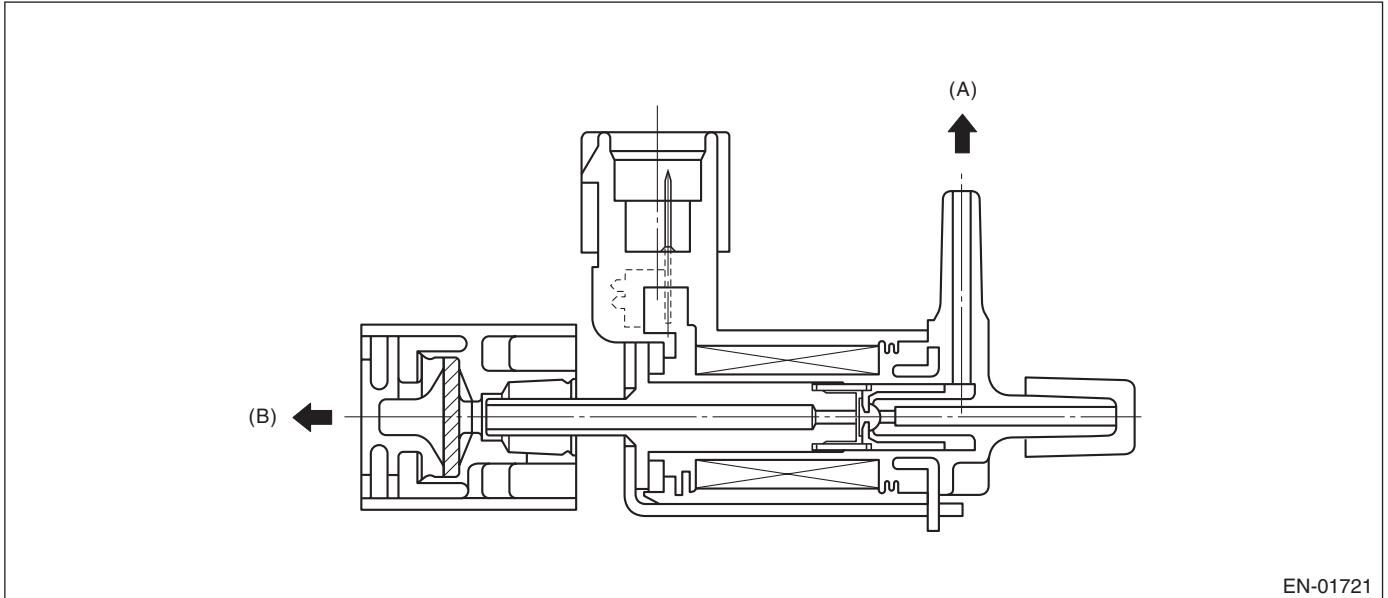
- (A) Open (Solenoid OFF)
- (B) Close (Solenoid ON)
- (C) Filter
- (D) Canister

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Tank Pressure Switching Solenoid

One of the atmospheric pressure switching solenoid valves is connected to fuel tank pressure sensor and the other is released to atmosphere. The passage to fuel tank pressure sensor is usually released to atmosphere because the solenoid is set to OFF, but the solenoid which is set to ON closes the passage open to atmosphere.



- (A) Fuel tank pressure sensor
- (B) Atmosphere

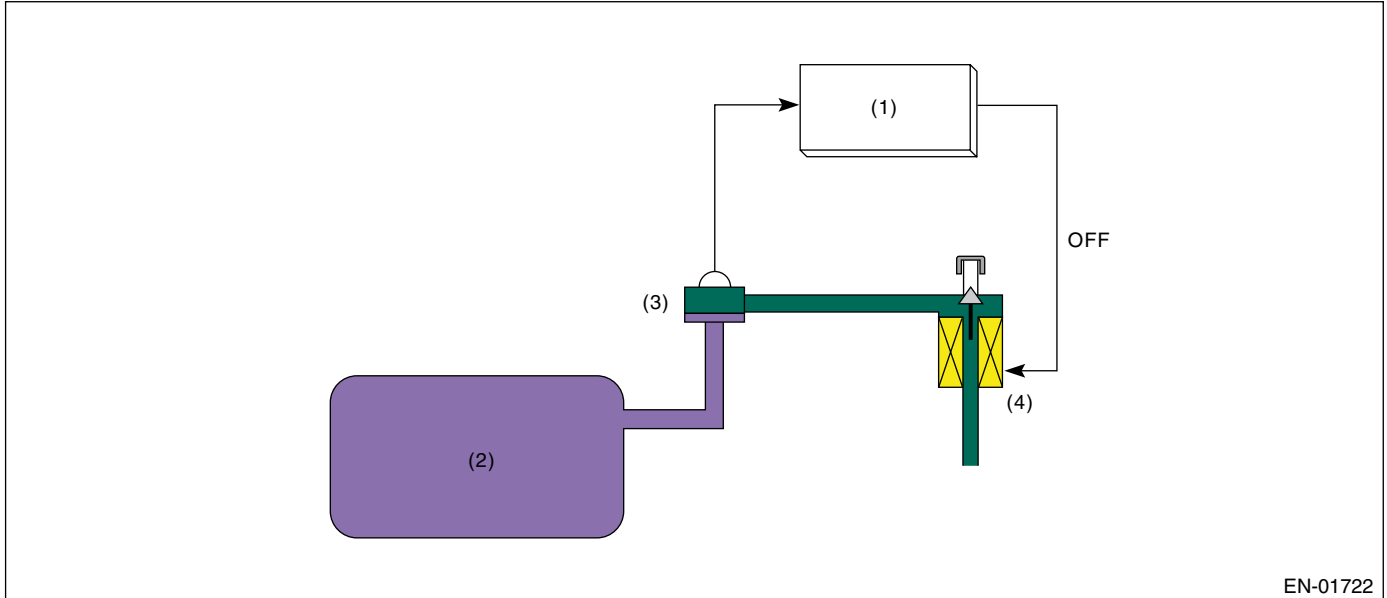
# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • Purpose of this solenoid

Fuel tank pressure sensor detects the difference between the atmospheric air pressure and the tank pressure and the ECM monitors the pressure difference.

Even if the tank pressure is constant, the atmospheric air pressure varies depending on the driving height, and the pressure signal transmitted to ECM will change.



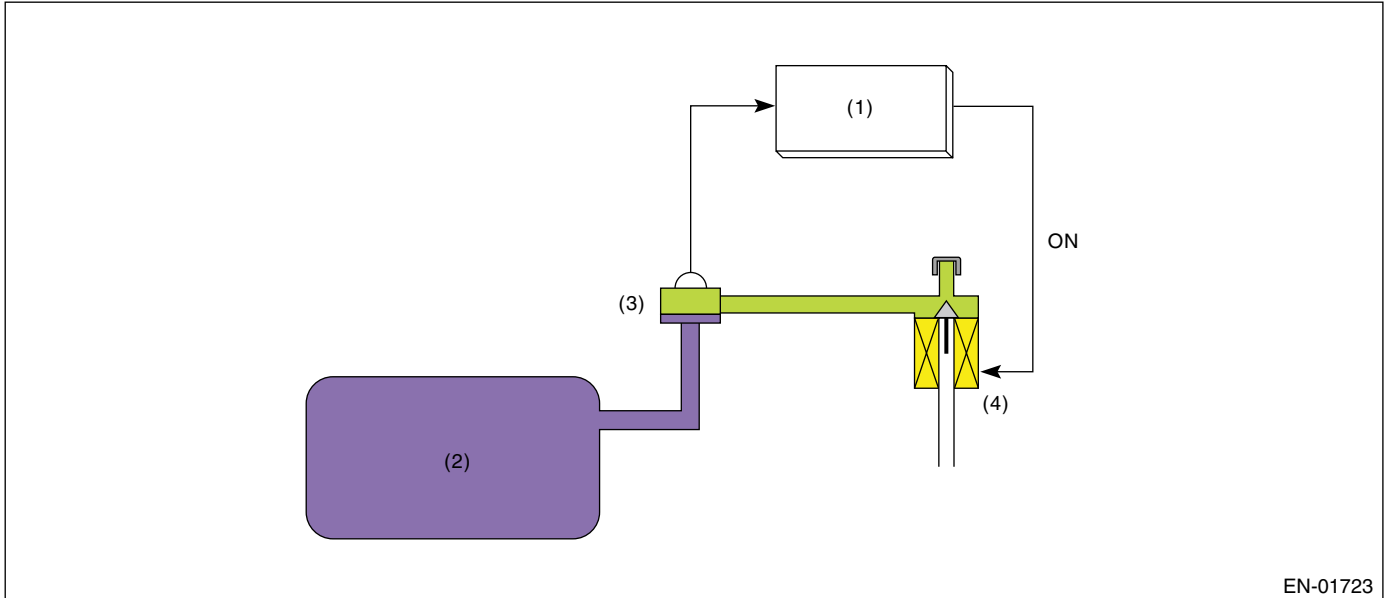
- (1) Engine control module (ECM)
- (2) Fuel tank
- (3) Fuel tank pressure sensor
- (4) Atmospheric pressure switching solenoid

EN-01722

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Especially, in the small leakage [0.5 mm (0.02 in)], minute change in the tank pressure has to be detected. This diagnosis period is long (approx. 29 seconds). And if the driving height changes during the diagnosis, the atmospheric air pressure changes. In this case, it becomes difficult to precisely detect the tank pressure variation, causing erroneous diagnosis. Therefore, using the atmospheric pressure switching solenoid, atmospheric air is sealed between the fuel tank pressure sensor and atmospheric pressure switching solenoid, maintaining the air pressure constant and enabling the detection of minute variation of tank pressure.



- (1) Engine control module (ECM)
- (2) Fuel tank
- (3) Fuel tank pressure sensor
- (4) Atmospheric pressure switching solenoid

## NOTE:

ECM also has the atmospheric air pressure sensor, and always monitors atmospheric air. However, as the monitoring range is large, that is, 53 to 107 kPa (400 to 800 mmHg, 16 to 32 inHg) it is not suitable for detection of minute pressure variation.

In the case of small leakage diagnosis, the tank pressure variation is very small, that is, 0.13 to 0.27 kPa (1 to 2 mmHg, 0.04 to 0.08 inHg) and the fuel tank pressure sensor is equipped.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 3. ENABLE CONDITION

#### 0.04-inch Diagnosis

| Secondary Parameters  | Enable Conditions   |
|---|---|
| Evaporation diagnosis   | Incomplete  |
| Battery voltage   | $\geq 10.9$ V   |
| Barometric pressure   | $\geq 75.1$ kPa (563 mmHg, 22.2 inHg)   |
| Accumulated time of canister purge operation                      | 120 seconds or more   |
| After engine starting   | 856 seconds or more   |
| Learning value of evaporation gas density                         | $\leq 0.04$   |
| Engine speed  | 1,050 $\leftrightarrow$ 6,500 rpm   |
| Fuel tank pressure  | $< 1.03$ kPa (7.72 mmHg, 0.30 inHg)   |
| Intake manifold vacuum (relative pressure)                        | $< -13.3$ kPa (-100 mmHg, -3.92 inHg)   |
| Vehicle speed   | $\geq 32$ km/h (20 MPH)   |
| Fuel level  | 9 $\leftrightarrow$ 51 $\ell$ (2.38 $\leftrightarrow$ 13.5 US gal, 1.98 $\leftrightarrow$ 11.2 Imp gal) |
| Closed air/fuel ratio control                                     | In operation  |
| Fuel temperature  | -10 $\leftrightarrow$ 45°C (14 $\leftrightarrow$ 113°F)   |
| Intake air temperature  | $\geq -10$ °C (14°F)  |
| Pressure change per second  | $< 0.13$ kPa (0.95 mmHg, 0.04 inHg)   |
| Min. pressure change per second – Max. pressure change per second | $< 0.23$ kPa (1.75 mmHg, 0.07 inHg)   |
| Fuel level change   | $< 2.5$ $\ell$ (0.66 US gal, 0.55 Imp gal)/128 milliseconds   |
| Air fuel ratio  | 0.76 — 1.25   |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 0.02-inch Diagnosis

| Secondary Parameters  | Enable Conditions  |
|---|--|
| (At starting a diagnosis)   |  |
| EVAP. diagnosis   | Incomplete   |
| Battery voltage   | $\geq 10.9 \text{ V}$  |
| Atmospheric pressure  | $\geq 75.1 \text{ kPa (563 mmHg, 22.2 inHg)}$  |
| Since last incomplete diagnosis event of 0.02-inch leakage  | $\geq 120 \text{ seconds}$   |
| Accumulated time of canister purge operation  | 120 second or more   |
| After engine starting   | 335 second or more   |
| Fuel temperature  | $-10 \leftrightarrow 35^\circ\text{C (14} \leftrightarrow 95^\circ\text{F)}$   |
| Or engine coolant temperature at engine start   | $< 40^\circ\text{C (104}^\circ\text{F)}$   |
| And time after engine start   | $< 2,400 \text{ seconds}$  |
| Fuel level  | $9 \leftrightarrow 51 \text{ } \ell \text{ (2.38} \leftrightarrow 13.5 \text{ US gal, 1.98} \leftrightarrow 11.2 \text{ Imp gal)}$ |
| (Ambient – fuel) temperature  | $< 1^\circ\text{C (1.8}^\circ\text{F)}$  |
| Fuel tank pressure below $-3.01 \text{ kPa (-22.8 mmHg, -0.88 inHg)}$ (during same driving cycle) | Up to 2 times  |
| Intake manifold vacuum (relative pressure)  | $< -13.3 \text{ kPa (-100 mmHg, -3.92 inHg)}$  |
| Fuel tank pressure  | $-0.67 \text{ — } 1 \text{ kPa (-5 — 7.72 mmHg, -0.2 — 0.3 inHg)}$   |
| Vehicle speed   | $\geq 68 \text{ km/h (42 MPH)}$  |
| Closed air/fuel ratio control   | In operation   |
| Engine speed  | $1,500 \leftrightarrow 6,500 \text{ rpm}$  |
| (During diagnosis)  |  |
| P1  | $-0.13 \leftrightarrow 0.13 \text{ kPa (-1} \leftrightarrow 1 \text{ mmHg, -0.04} \leftrightarrow 0.04 \text{ inHg)}$              |
| Pressure change per second  | $< 0.13 \text{ kPa (0.95 mmHg, 0.04 inHg)}$  |
| Fuel level change   | $< 2.5 \text{ } \ell \text{ (0.66 US gal, 0.55 Imp gal)}$  |
| Tank pressure   | $< 1.03 \text{ kPa (7.72 mmHg, 0.30 inHg)}$  |
| Min. tank pressure change per second – Max. tank pressure change per second                       | $< 0.23 \text{ kPa (1.75 mmHg, 0.07 inHg)}$  |
| Change of atmospheric pressure during P1 calculation  | $-0.04 \leftrightarrow 0.17 \text{ kPa (-0.3} \leftrightarrow 1.2 \text{ mmHg, -0.01} \leftrightarrow 0.05 \text{ inHg)}$          |
| Change of atmospheric pressure during P2 calculation  | $-0.08 \leftrightarrow 0.12 \text{ kPa (-0.6} \leftrightarrow 0.9 \text{ mmHg, 0.02} \leftrightarrow 0.04 \text{ inHg)}$           |



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 4. GENERAL DRIVING CYCLE

#### • 0.04-inch Diagnosis

- Perform the diagnosis only once in more than 856 seconds after the engine start at the constant driving speed of 32 km/h (20 MPH) or more.
- Pay attention to the fuel temperature and fuel level.

#### • 0.02-inch Diagnosis

- Perform diagnosis in more than 335 seconds after engine start at the constant speed of 68 km/h (42 MPH) or more, and then terminate the diagnosis when judged OK or NG.
- If not judged OK or NG, repeat the diagnosis until judged OK or NG.
- Pay attention to the fuel temperature and fuel level.

### 5. DIAGNOSTIC METHOD

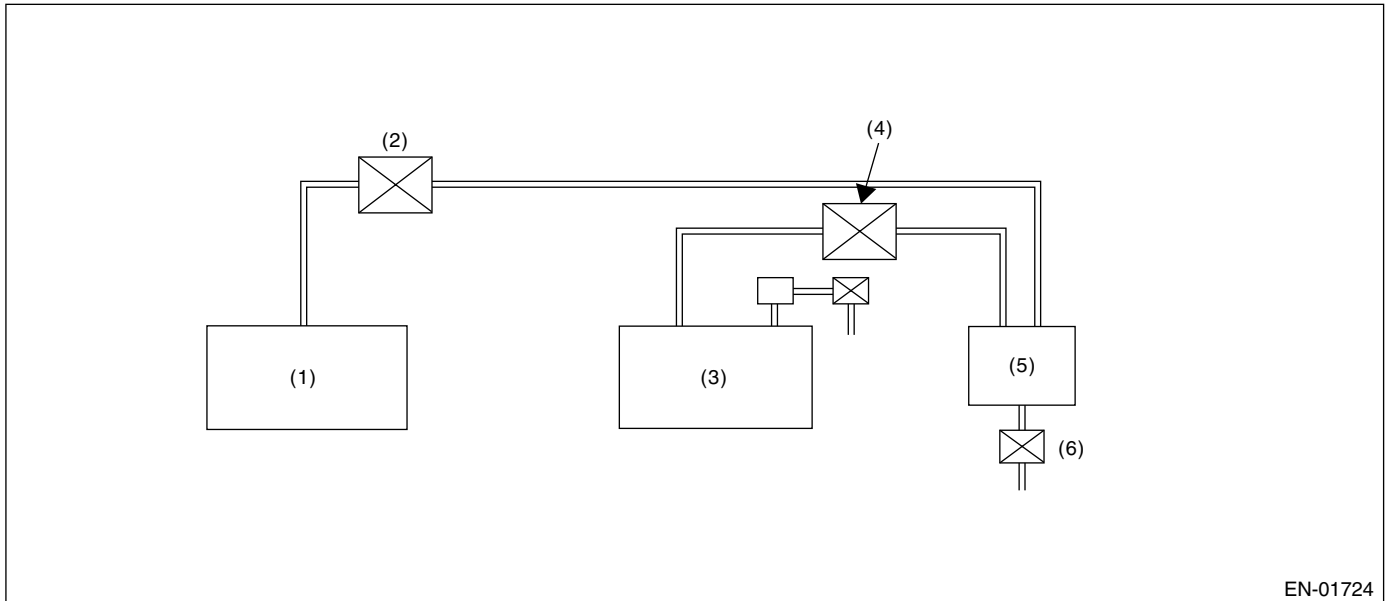
#### • MODE Z (Purge control solenoid valve open malfunction diagnosis)

DTC P0457

#### • Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, CPC has to operate normally. Therefore, mode Z is used to diagnose the CPC open fixation.

If the CPC open fixation trouble is detected, the EVAP system leakage diagnosis is cancelled.

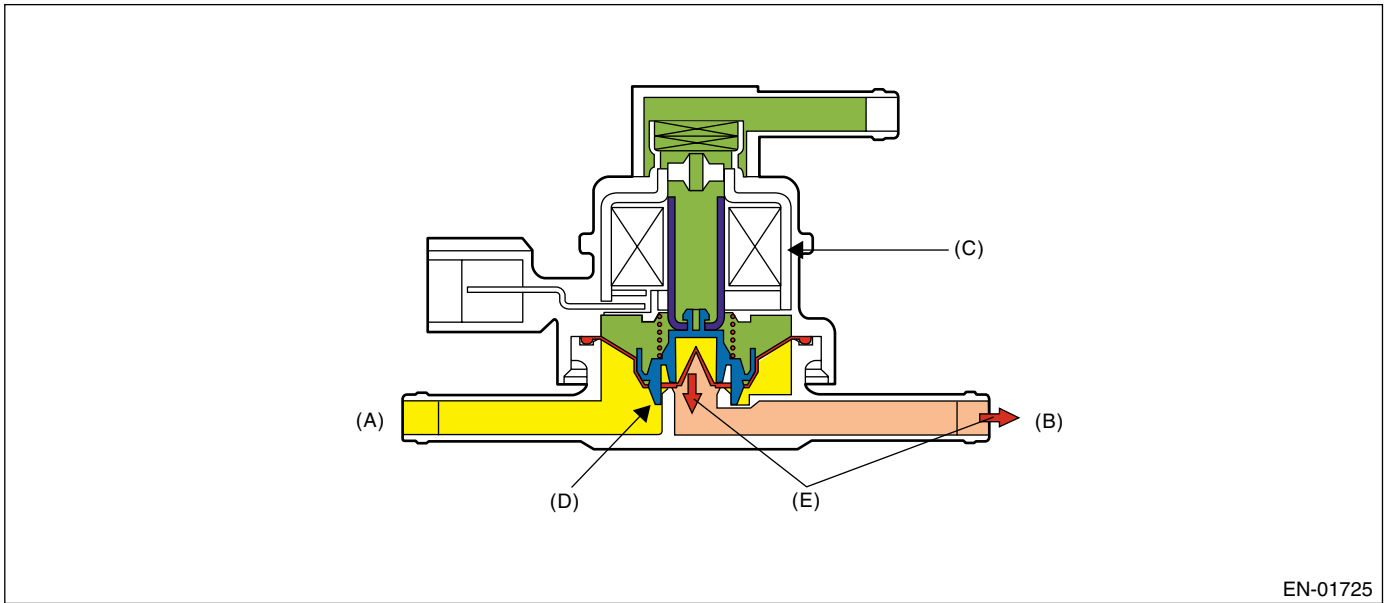


- (1) Engine
- (2) Purge control solenoid valve open
- (3) Fuel tank

- (4) Pressure control solenoid valve close
- (5) Canister
- (6) CCV stuck close

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

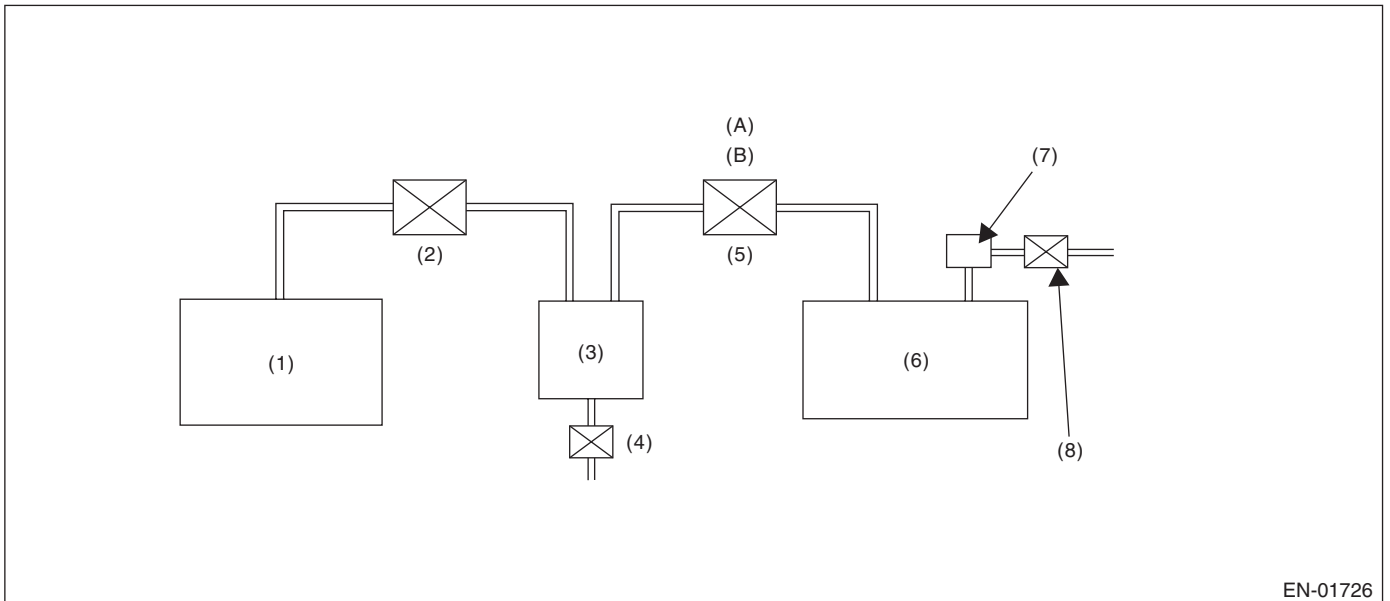


EN-01725

- (A) To fuel tank
- (B) To canister (Negative pressure)
- (C) Solenoid ON
- (D) Valve cannot be open.
- (E) Negative pressure

## • Diagnostic method

CPC open fixation diagnosis is performed in mode Z as shown in the figure below.



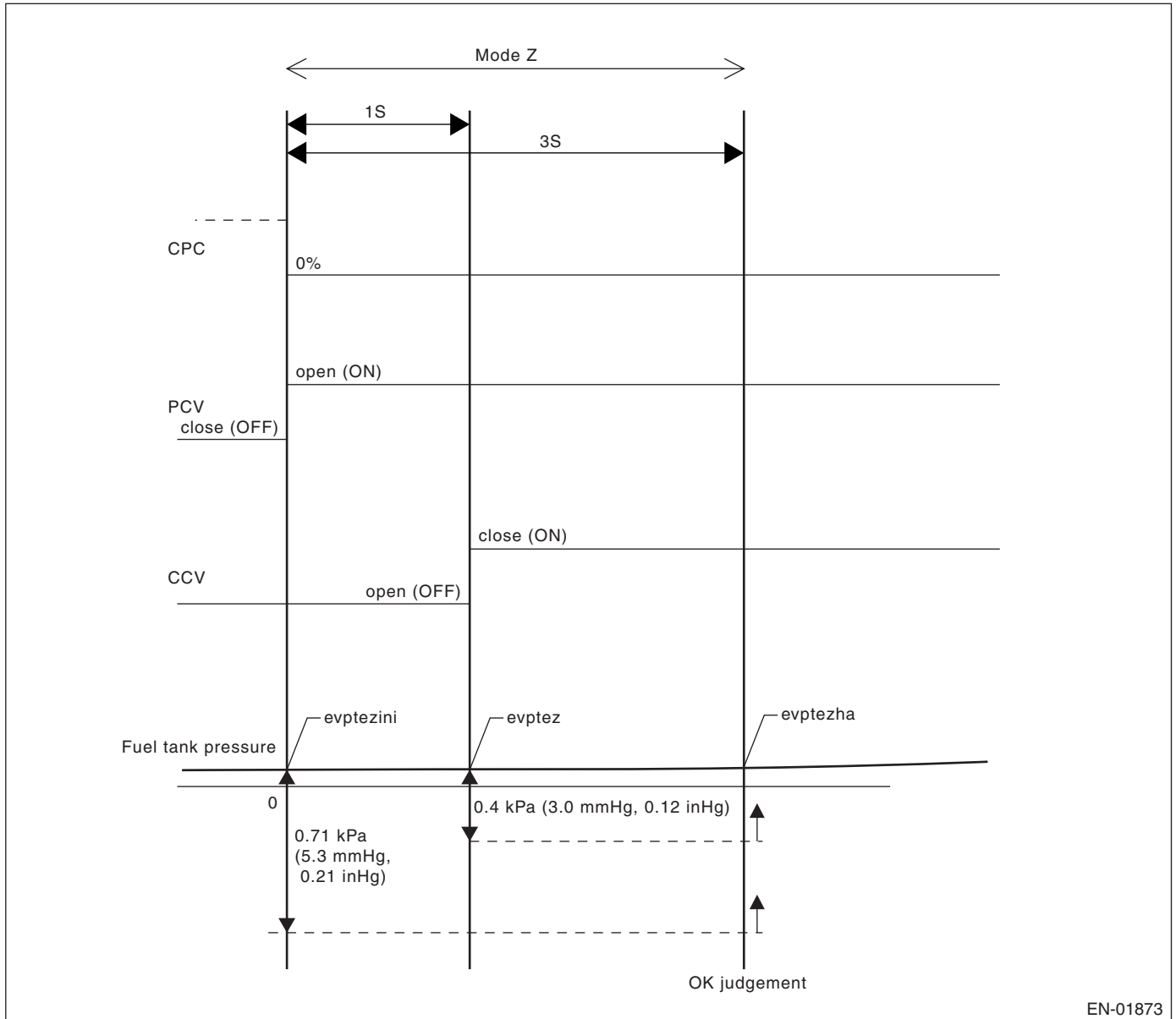
EN-01726

- |                                  |  |
|----------------------------------|--|
| (1) Engine                       | (5) Pressure control solenoid valve        |
| (2) Purge control solenoid valve | (6) Fuel tank                              |
| (3) Canister                     | (7) Fuel tank pressure sensor              |
| (4) Drain valve                  | (8) Tank pressure switching solenoid valve |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### • Normal Operation



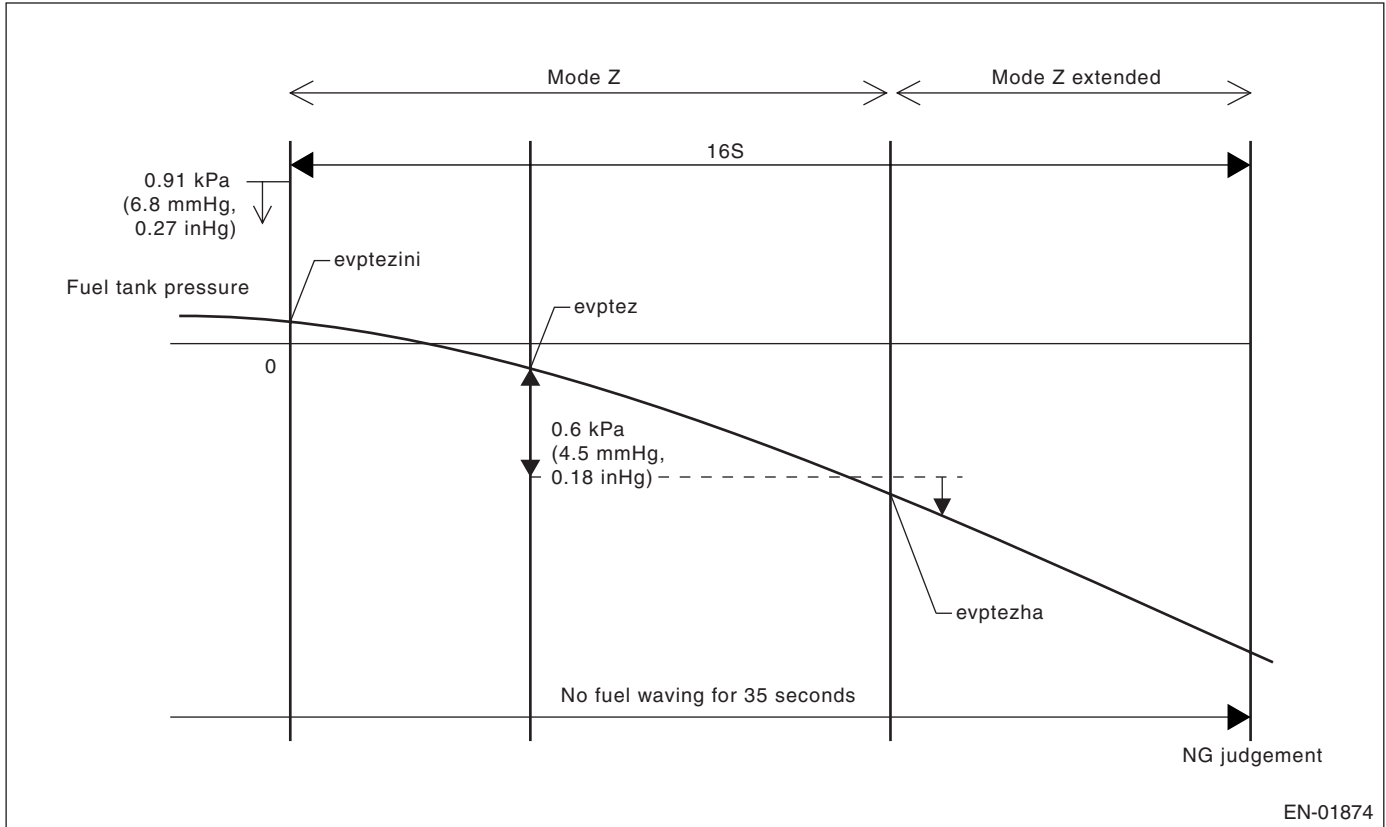
EN-01873

- $evptez - evptezha \leq 0.4 \text{ kPa (3.0 mmHg, 0.12 inHg)}$
  - $evptezini - evptezha \leq 0.71 \text{ kPa (5.3 mmHg, 0.21 inHg)}$
- Judge normal when both of above calculations are completed.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Purge Control Solenoid Valve Open Fixation



- $evptez - evptezha > 0.6 \text{ kPa (4.5 mmHg, 0.18 inHg)}$
- $evptezini \leq 0.91 \text{ kPa (6.8 mmHg, 0.27 inHg)}$
- No fuel rolling of above 32(0.79 US gal, 0.67 Imp gal) for more than 35 seconds.

Judge normal when both of above calculations are completed.

### Normality Judgment

Judge OK and change to Mode A when the criteria below are completed in 3 seconds after Mode Z started.

### Judgment Value

| Malfunction Criteria   | Threshold Value                              | DTC   |
|--|--|-------|
| (Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished) | $\leq 0.7 \text{ kPa (5.3 mmHg, 0.21 inHg)}$ | P0457 |

## • Diagnosing function of CPC [P0457]

CPC functional diagnosis is performed by monitoring the tank pressure in Mode Z.

### Normality Judgment

Make OK judgment in 3 seconds after Mode Z started, and change to Mode A if OK.

Both diagnostic method and judgment value are the same as PCV normality judgment.

### Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge NG when all the criteria below are completed in 16 seconds.

### Judgment Value

| Malfunction Criteria  | Threshold Value                               | DTC   |
|---|---|-------|
| (Tank pressure in 1 second after Mode Z started) – (Tank pressure when Mode Z finished) | $> 0.6 \text{ kPa (4.5 mmHg, 0.18 inHg)}$     | P0457 |
| Tank pressure when Mode Z started   | $\leq 0.91 \text{ kPa (6.8 mmHg, 0.27 inHg)}$ |       |
| No fuel locking time  | $\geq 35 \text{ seconds}$                     |       |

**Time Needed for Diagnosis:** 16 seconds

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

Finish the Evap. diagnosis when making NG judgment for purge control solenoid valve open fixation.

Cancel the Evap. diagnosis when the OK/NG judgment for purge control solenoid valve open fixation cannot be made in Mode Z.

### • Leak Diagnosis

DTC P0442

DTC P0456

DTC P0457

### • Diagnostic method

- The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.

- The diagnosis is divided into the following five phases.

#### Mode A; (Estimation of evaporation gas yield)

Calculate the tank pressure variation amount (P1). After calculating P1, change to Mode B.

#### Mode B; (Seal negative pressure)

Introduce the negative pressure in the intake manifold to the tank.

Approx. 0 → -1.4 kPa (0 → -10.5 mmHg, 0 → -0.41 inHg) (0.04-in diagnosis)

Approx. 0 → -3.05 kPa (0 → -22.9 mmHg, 0 → -0.9 inHg) (0.02-in diagnosis)

When the pressure above (desired negative pressure) is reached, Mode C is entered.

In this case, if the tank pressure does not become the desired negative pressure, judge that there is a large leakage in the system.

Judge NG when the malfunction criteria below is completed.

Finish the Evap. diagnosis when judging large leak (10 seconds or 25 seconds) in 0.04-inch diagnosis. Cancel the diagnosis (10 to 20 seconds) in 0.02-inch diagnosis.

#### Abnormality Judgment

Judge NG (large leak) when the criteria below are completed in the specified time.

#### Judgment Value

| Malfunction Criteria  | Threshold Value  | DTC   |
|---|--|-------|
| (0.04-inch diagnosis)<br>Time for reaching desired negative pressure<br>Or time for Mode B<br>(Min. value of tank pressure during Mode B) – (Tank pressure when Mode B started) | ≥ 25 seconds<br><br>≥ 10 seconds<br><br>< -0.5 kPa (-4 mmHg, -0.16 inHg) | P0457 |

#### Mode C; (Check increasing pressure)

Stop the introduction of negative pressure. (Wait until returning target pressure.)

When returning to target pressure, move to Mode D.

Judge immediate OK and change to Mode E when it does not return in spite of spending the specified time.

|                     | Target pressure                   | Time for immediate OK judgment |
|---------------------|-----------------------------------|--------------------------------|
| 0.04-inch diagnosis | -1.3 kPa (-9.75 mmHg, -0.38 inHg) | 15 seconds                     |
| 0.02-inch diagnosis | -3 kPa (-22.5 mmHg, -0.89 inHg)   | 20 seconds                     |

#### Mode D; (Measurement of negative pressure changes)

Monitor the tank pressure variation in Mode D. In this case, the tank pressure increases, that is, the pressure becomes as high as the atmospheric air pressure, because evaporator is generated. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.

After calculating P2, perform small leak diagnosis and change to Mode E if normal. Complete Evap. diagnosis if abnormal.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • After Mode D

Assigning P1 and P2, which are tank variations measured in Mode A and Mode B, to the formula below, judge the small leakage of the system. If the measured judgment value exceeds the threshold value, it is judged to be malfunction.

## • 0.04-inch Diagnosis

### Abnormality Judgment

Judge NG when the criteria below are completed and judge OK when not completed.

### Judgment Value

| Malfunction Criteria  | Threshold Value  | DTC   |
|---|--|-------|
| P2 – 1.5 × P1<br>P2: Change of tank pressure within 16 seconds on Mode D<br>P1: Change of tank pressure within 16 seconds on Mode A | > Value on map 7.<br>*Threshold value: Figure (Fuel level vs Tank temperature) | P0442 |

\*1.5: Compensation value of the amount of evaporator occurrence. (Because evaporator increases more when becoming negative pressure.)

### Map 7 Limit of malfunction criteria for 0.04-inch leak as Evap. diagnosis.

| Fuel temperature & Fuel level    | 5°C (41°F)                            | 15°C (59°F)                           | 25°C (77°F)                           | 35°C (95°F)                           | 45°C (113°F)                          |
|----------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 10 L (2.6 US gal, 2.2 Imp gal)   | 0.49 kPa<br>(3.68 mmHg,<br>0.14 inHg) | 0.49 kPa<br>(3.68 mmHg,<br>0.14 inHg) | 0.53 kPa<br>(3.95 mmHg,<br>0.16 inHg) | 0.54 kPa<br>(4.07 mmHg,<br>0.16 inHg) | 0.56 kPa<br>(4.17 mmHg,<br>0.16 inHg) |
| 20 L (5.3 US gal, 4.4 Imp gal)   | 0.50 kPa<br>(3.77 mmHg,<br>0.15 inHg) | 0.51 kPa<br>(3.79 mmHg,<br>0.15 inHg) | 0.53 kPa<br>(4.01 mmHg,<br>0.16 inHg) | 0.56 kPa<br>(4.17 mmHg,<br>0.16 inHg) | 0.57 kPa<br>(4.27 mmHg,<br>0.17 inHg) |
| 30 L (7.9 US gal, 6.6 Imp gal)   | 0.51 kPa<br>(3.85 mmHg,<br>0.15 inHg) | 0.52 kPa<br>(3.90 mmHg,<br>0.15 inHg) | 0.54 kPa<br>(4.06 mmHg,<br>0.16 inHg) | 0.57 kPa<br>(4.27 mmHg,<br>0.17 inHg) | 0.60 kPa<br>(4.48 mmHg,<br>0.18 inHg) |
| 40 L (10.6 US gal, 8.8 Imp gal)  | 0.65 kPa<br>(4.88 mmHg,<br>0.19 inHg) | 0.65 kPa<br>(4.90 mmHg,<br>0.19 inHg) | 0.66 kPa<br>(4.98 mmHg,<br>0.20 inHg) | 0.71 kPa<br>(5.32 mmHg,<br>0.21 inHg) | 0.76 kPa<br>(5.73 mmHg,<br>0.23 inHg) |
| 50 L (13.2 US gal, 11.0 Imp gal) | 0.79 kPa<br>(5.96 mmHg,<br>0.23 inHg) | 0.79 kPa<br>(5.96 mmHg,<br>0.23 inHg) | 0.79 kPa<br>(5.96 mmHg,<br>0.23 inHg) | 0.85 kPa<br>(6.38 mmHg,<br>0.25 inHg) | 0.88 kPa<br>(6.60 mmHg,<br>0.26 inHg) |

## • 0.02-inch Diagnosis

### Abnormality Judgment

Judge NG when the criteria below are completed.

### Judgment Value

| Malfunction Criteria  | Threshold Value  | DTC   |
|---|--|-------|
| P2 – 1.5 × P1<br>P2: Change of tank pressure within 16 seconds on Mode D<br>P1: Change of tank pressure within 16 seconds on Mode A | > Value on map 8.<br>*Threshold value: Figure (Fuel level vs Tank temperature) | P0456 |

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### Map 8 Limit of malfunction criteria for 0.02-inch leak as Evap. diagnosis.

| Fuel temperature & Fuel level    | 15°C (59°F)                           | 25°C (77°F)                           | 35°C (95°F)                           | 40°C (104°F)                              |
|----------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---|
| 10 L (2.6 US gal, 2.2 Imp gal)   | 0.48 kPa<br>(3.60 mmHg,<br>0.14 inHg) | 0.53 kPa<br>(4.00 mmHg,<br>0.16 inHg) | 0.59 kPa<br>(4.40 mmHg,<br>0.17 inHg) | 0.92 kPa<br>(6.90 mmHg,<br>0.27 inHg)     |
| 20 L (5.3 US gal, 4.4 Imp gal)   | 0.55 kPa<br>(4.15 mmHg,<br>0.16 inHg) | 0.60 kPa<br>(4.50 mmHg,<br>0.18 inHg) | 0.65 kPa<br>(4.90 mmHg,<br>0.19 inHg) | 1.00 kPa<br>(7.50 mmHg,<br>0.30 inHg)     |
| 30 L (7.9 US gal, 6.6 Imp gal)   | 0.61 kPa<br>(4.60 mmHg,<br>0.18 inHg) | 0.65 kPa<br>(4.90 mmHg,<br>0.19 inHg) | 0.70 kPa<br>(5.30 mmHg,<br>0.21 inHg) | 1.08 kPa<br>(8.10 mmHg,<br>0.32 inHg)     |
| 40 L (10.6 US gal, 8.8 Imp gal)  | 0.69 kPa<br>(5.15 mmHg,<br>0.20 inHg) | 0.73 kPa<br>(5.50 mmHg,<br>0.22 inHg) | 0.77 kPa<br>(5.80 mmHg,<br>0.23 inHg) | 1.21 kPa<br>(9.10 mmHg,<br>0.36 inHg)     |
| 50 L (13.2 US gal, 11.0 Imp gal) | 0.77 kPa<br>(5.80 mmHg,<br>0.23 inHg) | 0.83 kPa<br>(6.20 mmHg,<br>0.24 inHg) | 0.90 kPa<br>(6.70 mmHg,<br>0.26 inHg) | 1.35 kPa<br>(10.10<br>mmHg, 0.40<br>inHg) |

### Normality Judgment

Judge OK when the criteria below are completed.

### Judgment Value

| Malfunction Criteria | Threshold Value   | DTC   |
|----------------------|-------------------|-------|
| P2 – 1.5 × P1        | > Valve on map 9. | P0456 |

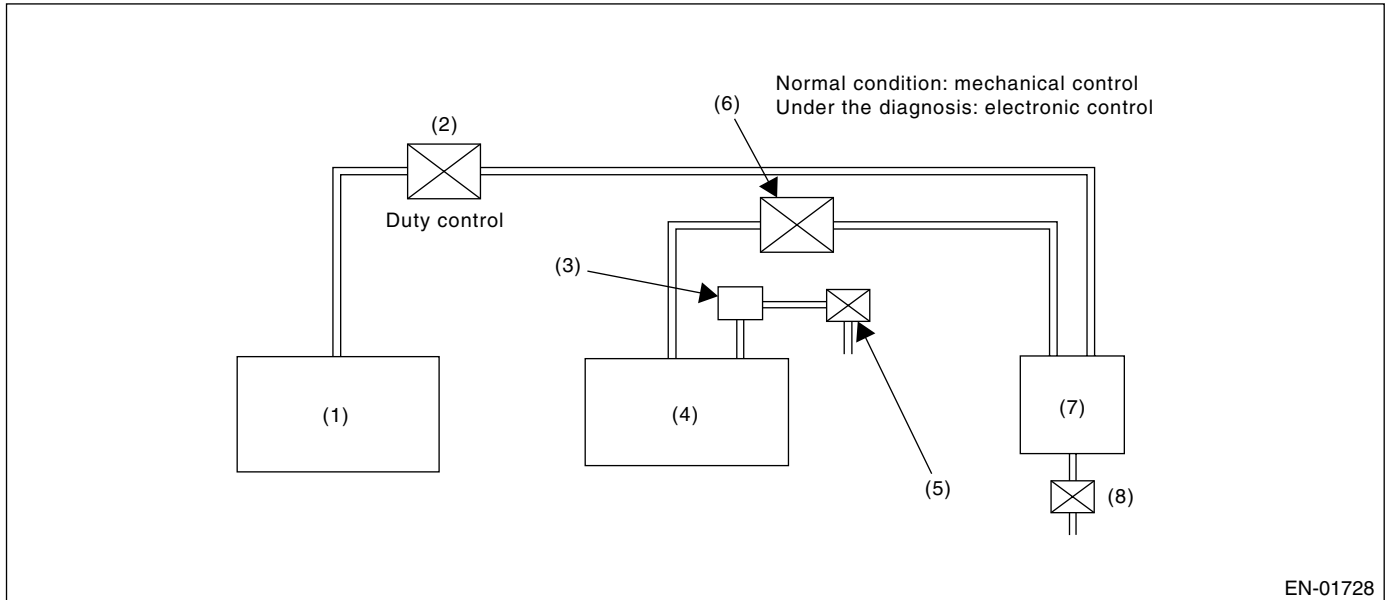
### Map 9

| Fuel temperature & Fuel level    | 15°C (59°F)                               | 25°C (77°F)                              | 35°C (95°F)                              | 40°C (104°F)                             |
|----------------------------------|---|--|--|--|
| 10 L (2.6 US gal, 2.2 Imp gal)   | 2.1 kPa<br>(15.75<br>mmHg, 0.62<br>inHg)  | 2.5 kPa<br>(18.75<br>mmHg, 0.74<br>inHg) | 2.9 kPa<br>(21.75<br>mmHg, 0.86<br>inHg) | 2.9 kPa<br>(21.75<br>mmHg, 0.86<br>inHg) |
| 20 L (5.3 US gal, 4.4 Imp gal)   | 2.65 kPa<br>(19.88<br>mmHg, 0.78<br>inHg) | 3 kPa (22.5<br>mmHg, 0.89<br>inHg)       | 3.4 kPa<br>(25.5 mmHg,<br>1.0 inHg)      | 3.4 kPa<br>(25.5 mmHg,<br>1.0 inHg)      |
| 30 L (7.9 US gal, 6.6 Imp gal)   | 3.1 kPa<br>(23.25<br>mmHg, 0.92<br>inHg)  | 3.4 kPa<br>(25.5 mmHg,<br>1.0 inHg)      | 3.8 kPa<br>(28.5 mmHg,<br>1.12 inHg)     | 3.8 kPa<br>(28.5 mmHg,<br>1.12 inHg)     |
| 40 L (10.6 US gal, 8.8 Imp gal)  | 3.65 kPa<br>(27.38<br>mmHg, 1.08<br>inHg) | 4 kPa (30.0<br>mmHg, 1.18<br>inHg)       | 4.3 kPa<br>(32.25<br>mmHg, 1.27<br>inHg) | 4.3 kPa<br>(32.25<br>mmHg, 1.27<br>inHg) |
| 50 L (13.2 US gal, 11.0 Imp gal) | 4.3 kPa<br>(32.25<br>mmHg, 1.27<br>inHg)  | 4.7 kPa<br>(35.25<br>mmHg, 1.39<br>inHg) | 5.2 kPa<br>(39.0 mmHg,<br>1.54 inHg)     | 5.2 kPa<br>(39.0 mmHg,<br>1.54 inHg)     |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

If not judged OK or NG, repeat the diagnosis until judged OK or NG.



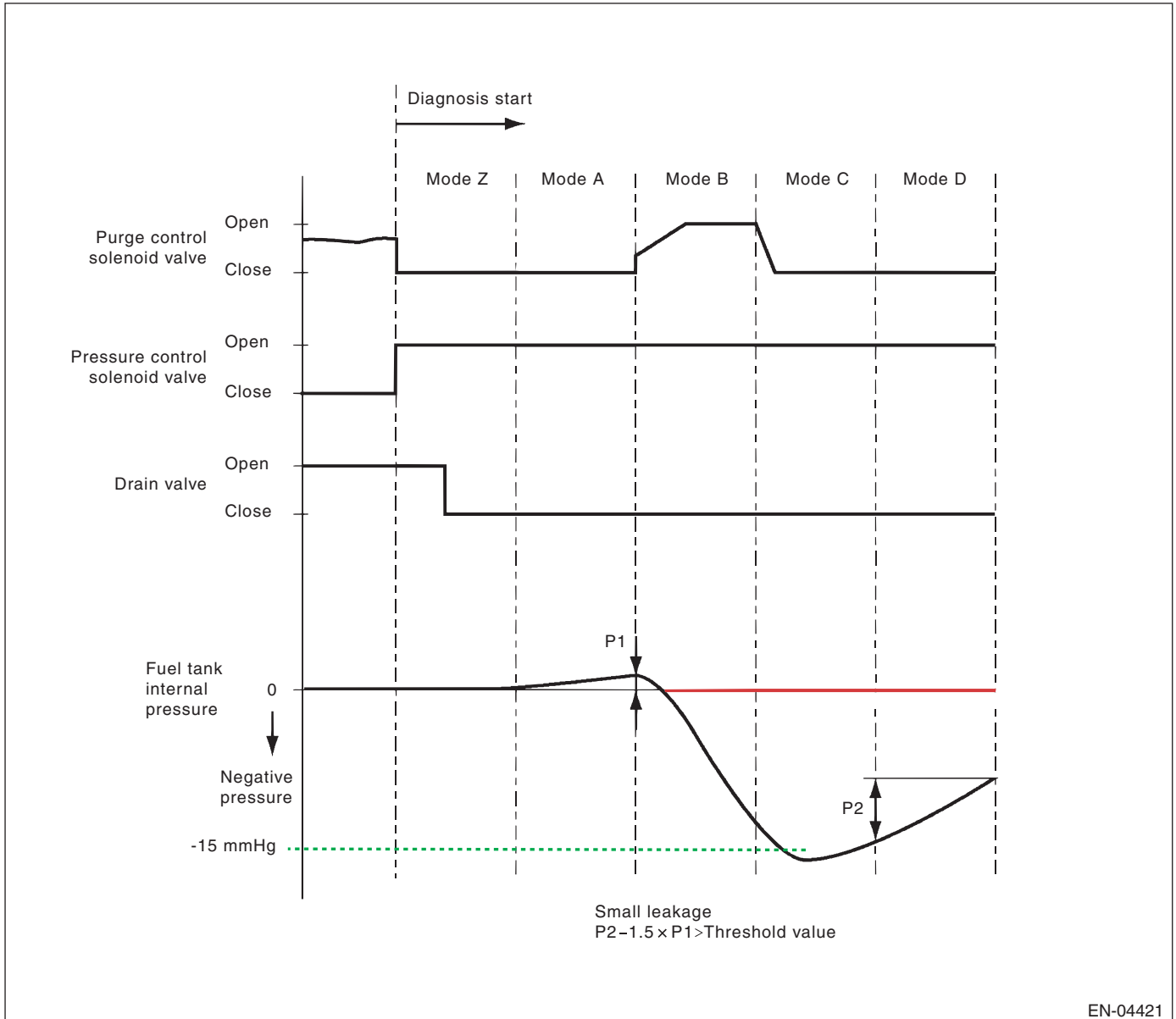
EN-01728

- |     |                              |     |   |
|-----|------------------------------|-----|---|
| (1) | Engine                       | (5) | Atmospheric pressure switching solenoid |
| (2) | Purge control solenoid valve | (6) | Pressure control solenoid valve         |
| (3) | Fuel tank pressure sensor    | (7) | Canister                                |
| (4) | Fuel tank                    | (8) | Drain valve                             |



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION



### Time Needed for Diagnosis:

- 0.04-inch: 50 — 70 seconds
- 0.02-inch: 90 — 105 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous drive cycles.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Atmospheric purge solenoid function malfunction; Open the pressure control solenoid valve.

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

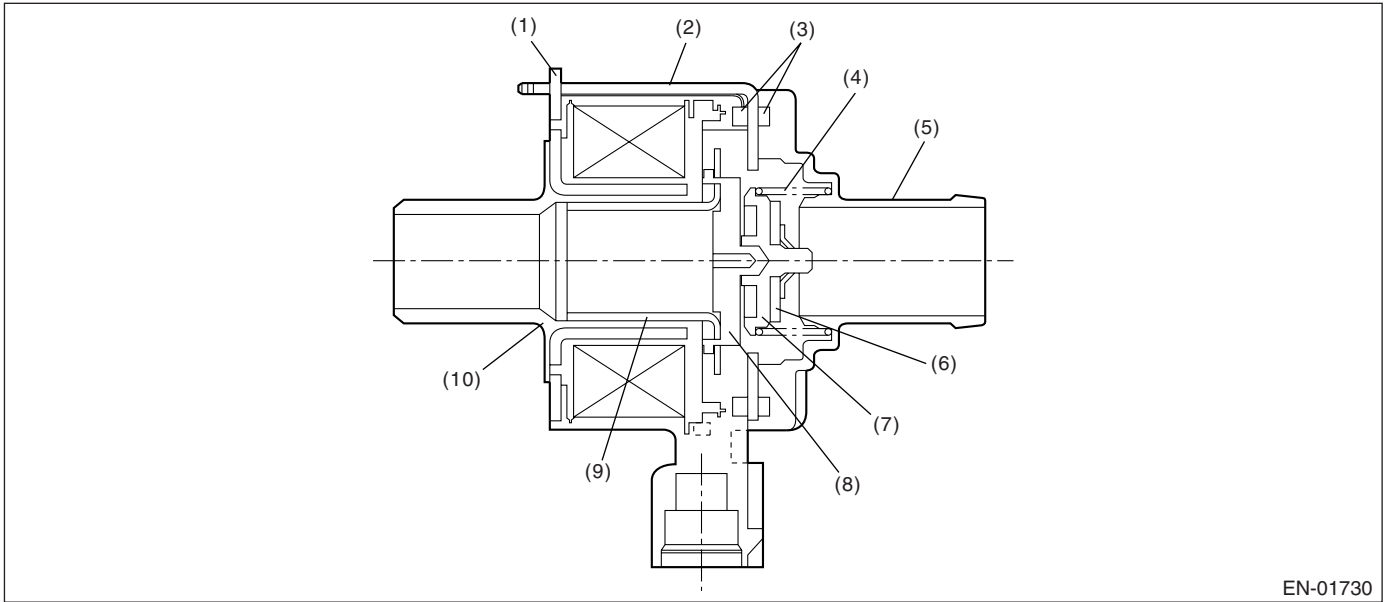
## BB:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.

Judge NG when the ECM output level is different from the actual terminal level.

### 2. COMPONENT DESCRIPTION



- |                    |                  |
|--------------------|------------------|
| (1) Magnetic plate | (6) Valve        |
| (2) Yoke           | (7) Plate        |
| (3) Packing        | (8) Retainer     |
| (4) Spring         | (9) Movable core |
| (5) Valve seat     | (10) Bobbin      |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria                              | Threshold Value  |
|---|------------------|
| Ignition switch                                   | ON               |
| Battery voltage                                   | $\geq 10.9$ V    |
| After engine starting                             | 1 second or more |
| Terminal output voltage when ECM sends OFF signal | Low              |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                              | Threshold Value  |
|---|------------------|
| Ignition switch                                   | ON               |
| Battery voltage                                   | $\geq 10.9$ V    |
| After engine starting                             | 1 second or more |
| Terminal output voltage when ECM sends OFF signal | High             |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

PCV control: Open the PCV solenoid.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

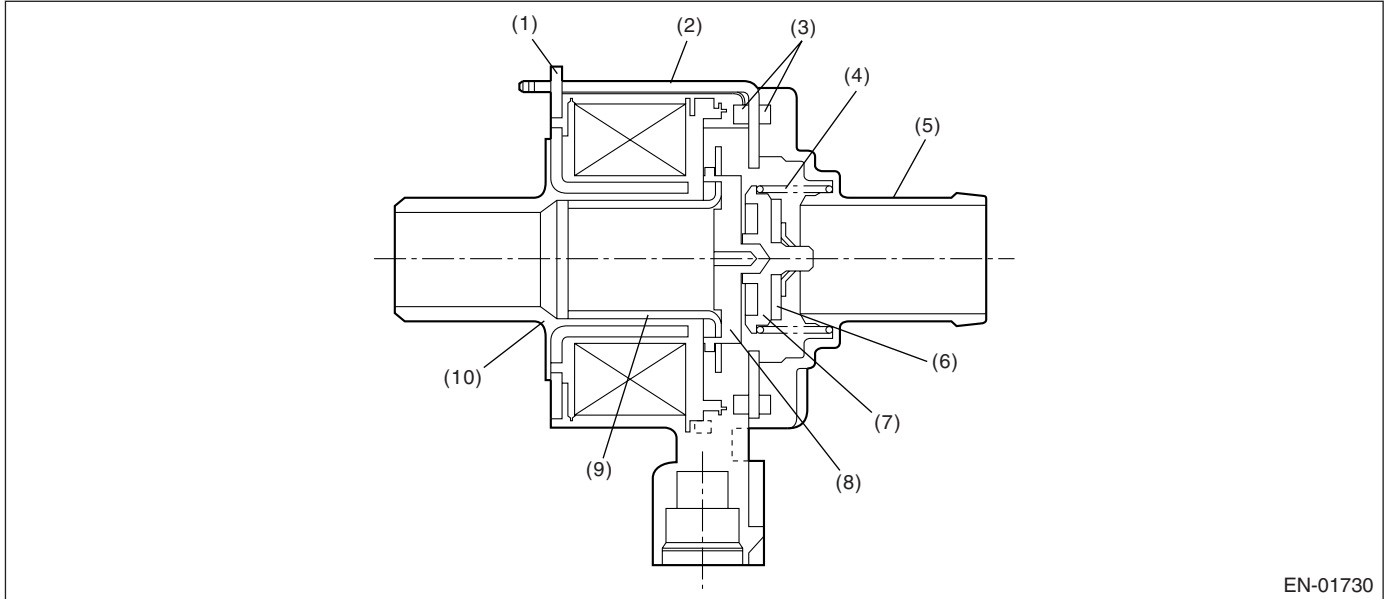
## BC:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.

Judge NG when the ECM output level is different from the actual terminal level.

### 2. COMPONENT DESCRIPTION



- |                    |                  |
|--------------------|------------------|
| (1) Magnetic plate | (6) Valve        |
| (2) Yoke           | (7) Plate        |
| (3) Packing        | (8) Retainer     |
| (4) Spring         | (9) Movable core |
| (5) Valve seat     | (10) Bobbin      |

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria                             | Threshold Value  |
|--|------------------|
| Ignition switch                                  | ON               |
| Battery voltage                                  | $\geq 10.9$ V    |
| After engine starting                            | 1 second or more |
| Terminal output voltage when ECM sends ON signal | High             |

**Time Needed for Diagnosis:** 2.5 seconds

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

• **Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

**Judgment Value**

| Malfunction Criteria                             | Threshold Value  |
|--|------------------|
| Ignition switch                                  | ON               |
| Battery voltage                                  | $\geq 10.9$ V    |
| After engine starting                            | 1 second or more |
| Terminal output voltage when ECM sends ON signal | Low              |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

PCV control: Open the PCV solenoid.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

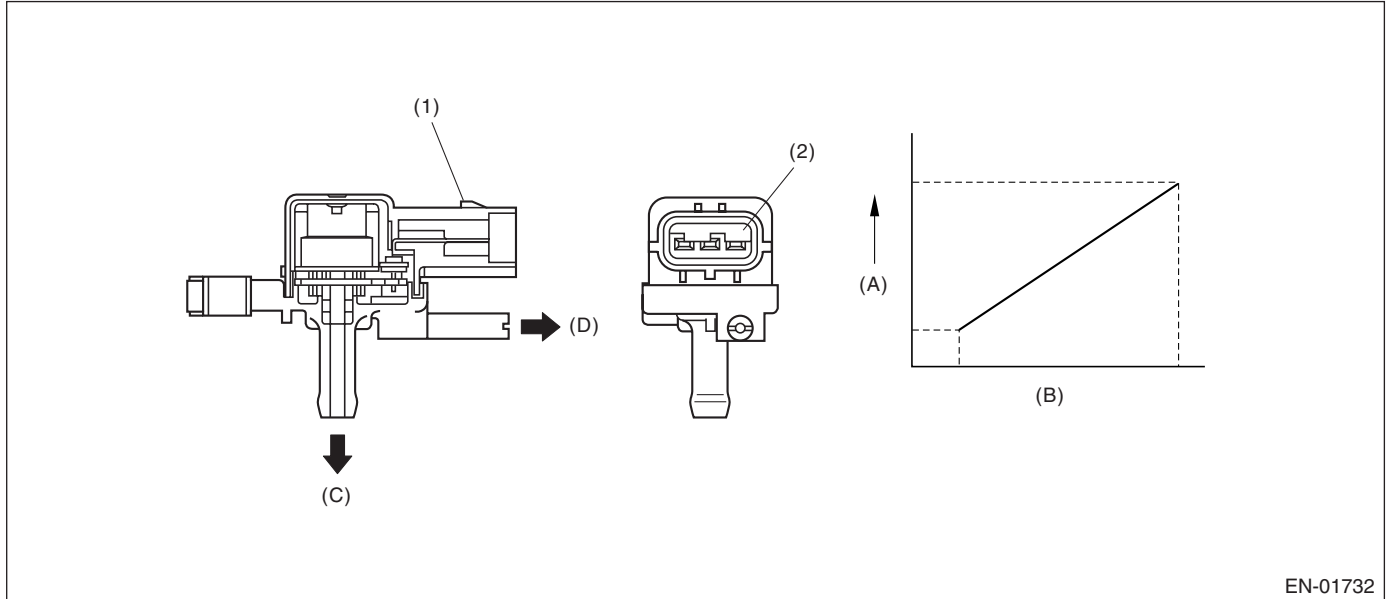
## BD:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.

Judge NG when there is no pressure variation, which should exist in the tank, considering the engine status.

### 2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal

- (A) Output voltage
- (B) Input voltage
- (C) To fuel tank
- (D) To atmospheric pressure switching solenoid

### 3. ENABLE CONDITION

| Secondary Parameters      | Enable Conditions                               |
|---------------------------|---|
| After starting the engine | 60 second or more                               |
| Fuel level                | $\geq 18 \text{ l}$ (4.76 US gal, 3.96 Imp gal) |
| Fuel temperature          | $< 35^{\circ}\text{C}$ ( $95^{\circ}\text{F}$ ) |
| Battery voltage           | $\geq 10.9 \text{ V}$                           |
| Atmospheric pressure      | $> 75.1 \text{ kPa}$ (563 mmHg, 22.2 inHg)      |
| Engine speed              | $< 6,500 \text{ rpm}$                           |

### 4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in 60 seconds or more after starting the engine.
- Be sure to check the fuel level and fuel temperature.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below is completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value                    |
|--|------------------------------------|
| Number of times when the difference between the Max. fuel level and the Min. fuel level every 60 seconds is 2 ℓ (0.53 US gal, 0.44Imp gal) or more (with enable condition completed) | ≥ 16 times                         |
| Max. – Min. tank pressure (with enable condition completed)  | < 0.05 kPa (0.375 mmHg, 0.02 inHg) |
| Max. – Min. fuel temperature (with enable condition completed)   | ≥ 7°C (44.6 °F)                    |

If the fuel level (Max. – Min.) in every 60 seconds is less than 2 ℓ, extend 60 seconds more and make judgment with the Max. and Min. fuel level in 120 seconds.

If the difference did not appear though the time extended, extend the time (180, 240, 300 seconds) and continue the judgment.

Diagnosis counter will count up when the difference of fuel level (Max. – Min.) is more than 2 ℓ.

**Time Needed for Diagnosis:** 1 second × 16 times or more

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

#### • Normality Judgment

Judge OK when the malfunction criteria below is completed.

#### Judgment Value

| Malfunction Criteria      | Threshold Value                    |
|---------------------------|------------------------------------|
| Max. – Min. tank pressure | ≥ 0.05 kPa (0.375 mmHg, 0.02 inHg) |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

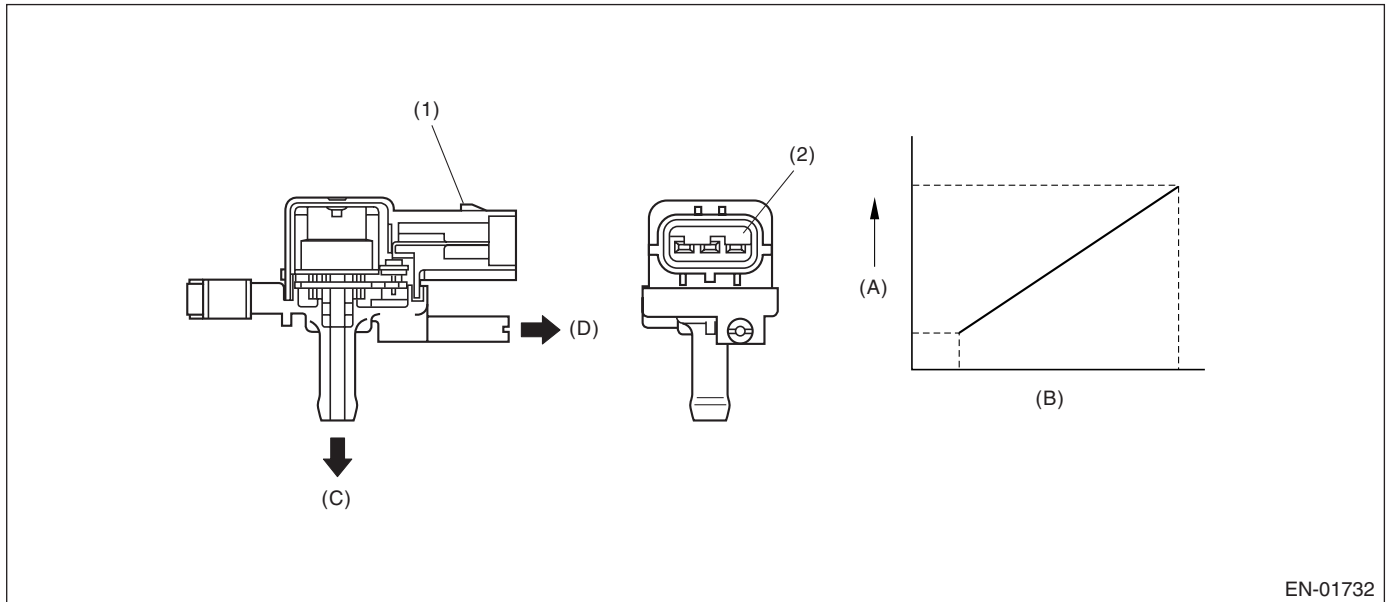
GENERAL DESCRIPTION

## BE:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01732

- (1) Connector
- (2) Terminal

- (A) Output voltage
- (B) Input voltage
- (C) To fuel tank
- (D) To atmospheric pressure switching solenoid

### 3. ENABLE CONDITION (USED WITH HIGH SIDE NORMAL/ABNORMAL JUDGMENT)

| Secondary Parameters                        | Enable Conditions     |
|---|-----------------------|
| Continuous time of completing all condition | $\geq 5$ seconds      |
| Vehicle speed                               | $\geq 2$ km/h (1 MPH) |
| All conditions of EVAP canister purge       | Possible              |
| Learning value of EVAP conc. during purge   | $\leq 0.08$           |
| Feedback lambda coefficient                 | $\geq 0.9$            |
| Battery voltage                             | $\geq 10.9$ V         |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 15 seconds.

#### Judgment Value

| Malfunction Criteria        | Threshold Value                       |
|-----------------------------|---------------------------------------|
| Fuel tank pressure          | < -7.45 kPa (-55.85 mmHg, -2.20 inHg) |
| Feedback lambda coefficient | ≥ 0.9                                 |

**Time Needed for Diagnosis:** 15 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK when the malfunction criteria below is completed.

#### Judgment Value

| Malfunction Criteria        | Threshold Value                    |
|-----------------------------|------------------------------------|
| Fuel tank pressure          | ≥ -7.33 kPa (-55 mmHg, -2.17 inHg) |
| Feedback lambda coefficient | ≥ 0.9                              |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

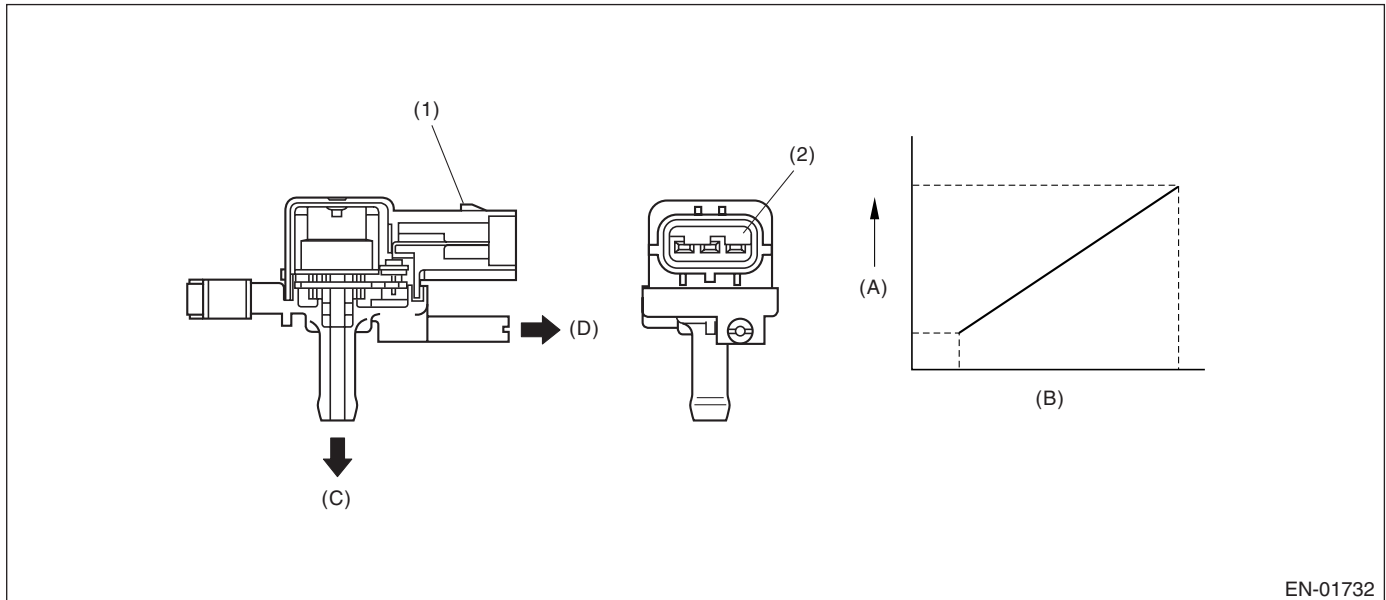
GENERAL DESCRIPTION

## BF:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the breaking/shortage of the fuel tank pressure sensor.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



EN-01732

- (1) Connector
- (2) Terminal

- (A) Output voltage
- (B) Input voltage
- (C) To fuel tank
- (D) To atmospheric pressure switching solenoid

### 3. ENABLE CONDITION

| Secondary Parameters                               | Enable Conditions        |
|--|--------------------------|
| Continuous time when all conditions are completed. | $\geq 5$ seconds         |
| Vehicle speed                                      | $\geq 2$ km/h (1.24 MPH) |
| All conditions of EVAP canister purge              | Complete                 |
| Evaporation gas density learning value             | $\leq 0.08$              |
| Main feedback compensation coefficient             | $\geq 0.9$               |
| Battery voltage                                    | $\geq 10.9$ V            |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis when purging.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 15 seconds.

#### Judgment Value

| Malfunction Criteria | Threshold Value                    |
|----------------------|------------------------------------|
| Fuel tank pressure   | ≥ 7.98 kPa (59.85 mmHg, 2.36 inHg) |
| Fuel temperature     | < 35°C (95°F)                      |
| Atmospheric pressure | ≥ 75.1 kPa (563 mmHg, 22.2 inHg)   |

**Time Needed for Diagnosis:** 15 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK when the malfunction criteria below is completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value                 |
|----------------------|---------------------------------|
| Fuel tank pressure   | < 7.33 kPa (55 mmHg, 2.17 inHg) |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## **BG:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)**

### 1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(STI)-116, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

## **BH:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)**

### 1. OUTLINE OF DIAGNOSIS

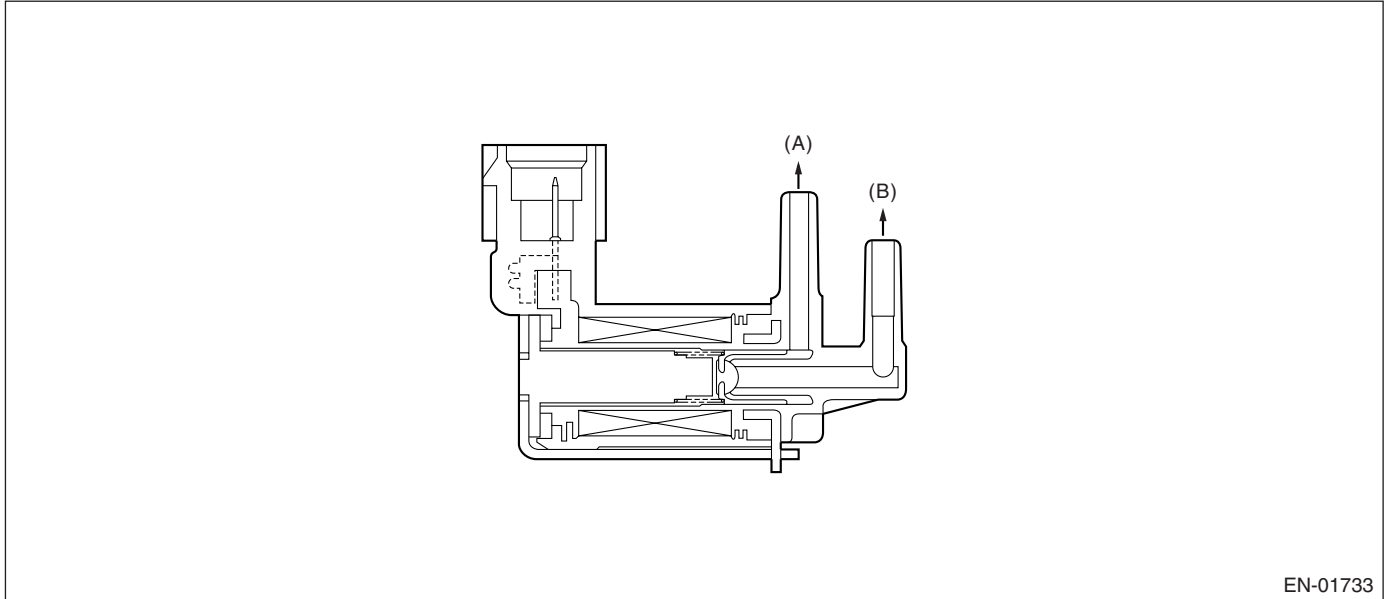
For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(STI)-116, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

## BI: DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.  
 Judge NG when ECM output level is different from actual terminal level.

### 2. COMPONENT DESCRIPTION



EN-01733

- (A) To intake manifold
- (B) To canister

### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions |
|-----------------------|-------------------|
| Ignition switch       | ON                |
| Battery voltage       | ≥ 10.9 V          |
| After engine starting | 1 second or more  |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                          | Threshold Value |
|---|-----------------|
| Continuous time of completing criteria below. | ≥ 2.5 seconds   |
| Duty ratio of 'ON'                            | < 75%           |
| Terminal output voltage                       | Low             |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

#### Judgment Value

| Malfunction Criteria    | Threshold Value |
|-------------------------|-----------------|
| Terminal output voltage | High            |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

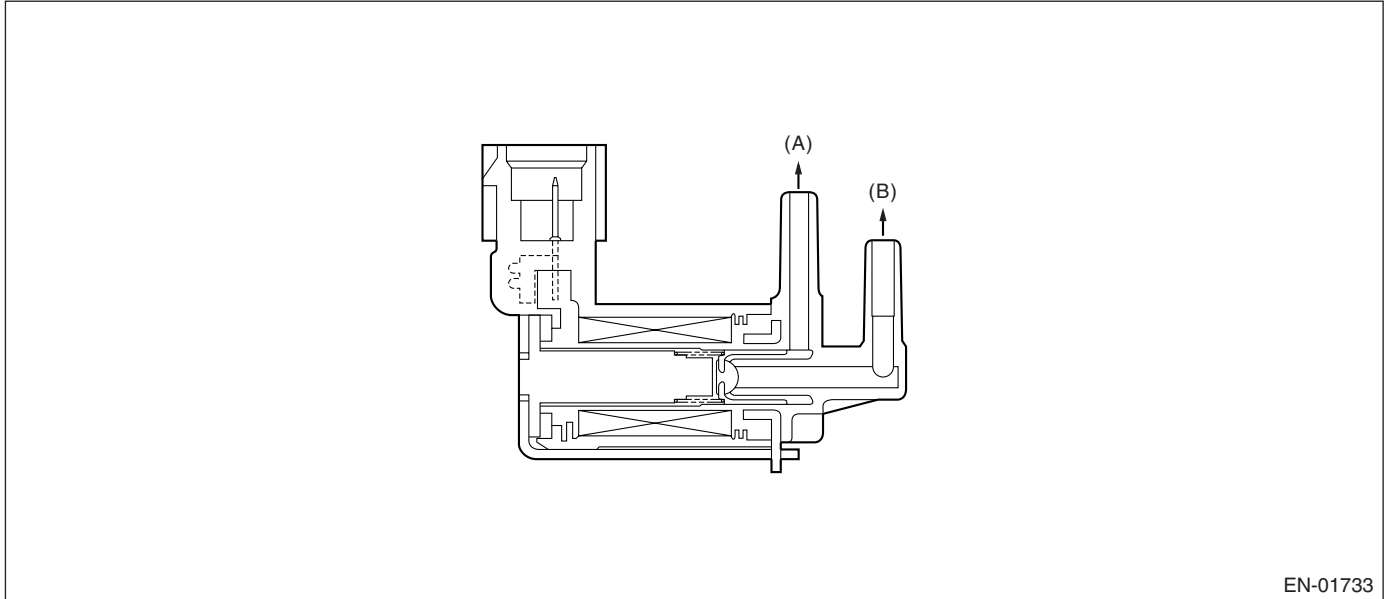
Memorize the freeze frame data. (For test mode \$02)

## BJ:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.  
 Judge NG when ECM output level is different from actual terminal level.

### 2. COMPONENT DESCRIPTION



EN-01733

- (A) To intake manifold
- (B) To canister

### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions |
|-----------------------|-------------------|
| Ignition switch       | ON                |
| Battery voltage       | ≥ 10.9 V          |
| After engine starting | 1 second or more  |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                          | Threshold Value |
|---|-----------------|
| Continuous time of completing criteria below. | ≥ 2.5 seconds   |
| Duty ratio of 'ON'                            | ≥ 25%           |
| Terminal output voltage                       | High            |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

### Judgment Value

| Malfunction Criteria    | Threshold Value |
|-------------------------|-----------------|
| Terminal output voltage | Low             |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

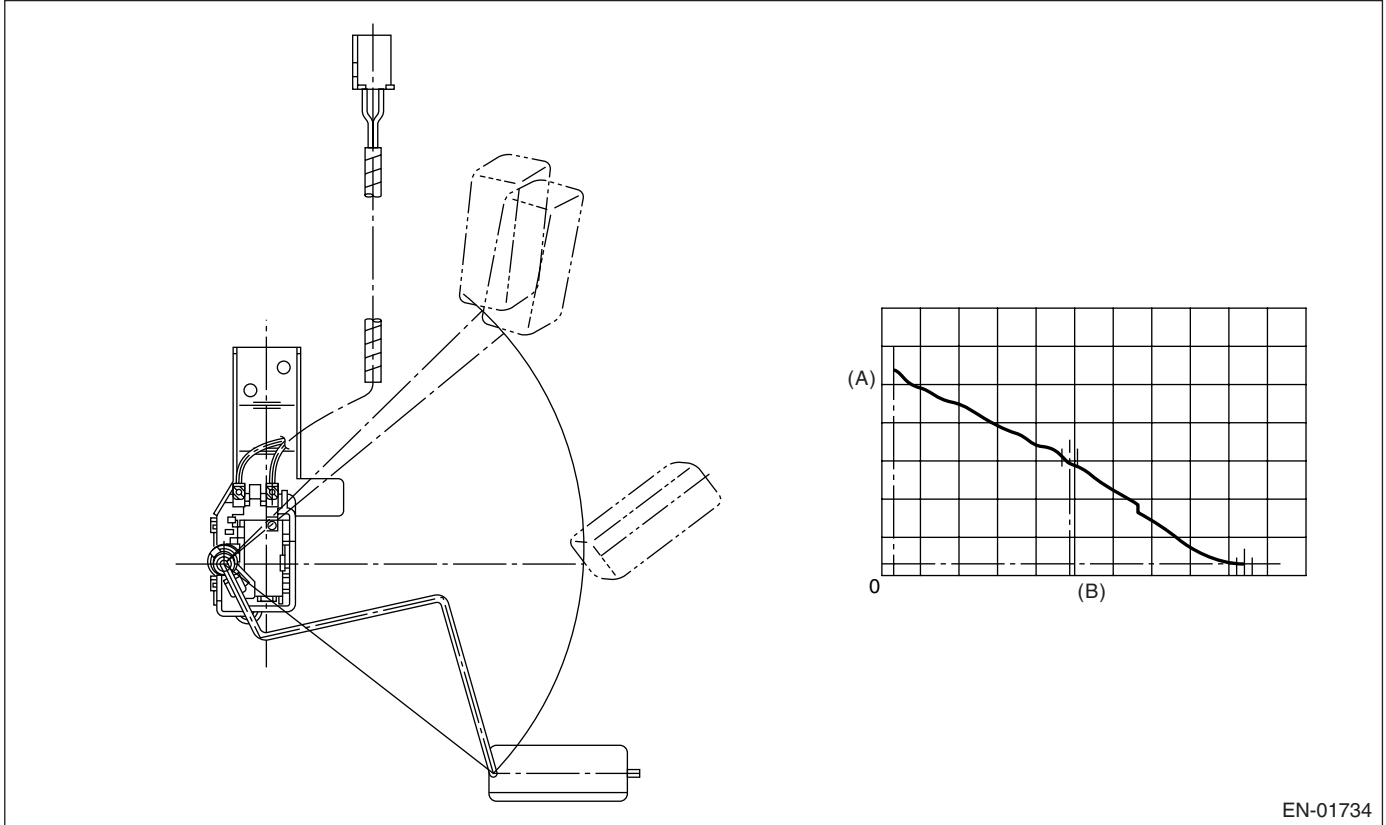
## BK:DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel level sensor output property.

Judge NG when the fuel level does not vary whereas it seemed to vary be in a usual driving speed.

### 2. COMPONENT DESCRIPTION



EN-01734

- (A) Fuel level
- (B) Resistance

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria             | Threshold Value                        |
|----------------------------------|--|
| Accumulated amount of intake air | > 331 kg (729.7 lb)                    |
| Max.– Min. fuel level output     | < 2.6 ℓ (0.69 US gal,<br>0.57 Imp gal) |
| Battery voltage                  | ≥ 10.9 V                               |
| Engine speed                     | < 6,500 rpm                            |
| After engine start               | More than 5 seconds                    |

**Time Needed for Diagnosis:** To be determined.

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria             | Threshold Value                        |
|----------------------------------|--|
| Accumulated amount of intake air | > 331 kg (729.7 lb)                    |
| Max. – Min. fuel level output    | ≥ 2.6 ℓ (0.69 US gal,<br>0.57 Imp gal) |
| Battery voltage                  | ≥ 10.9 V                               |
| Engine speed                     | < 6,500 rpm                            |
| After engine start               | More than 5 seconds                    |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

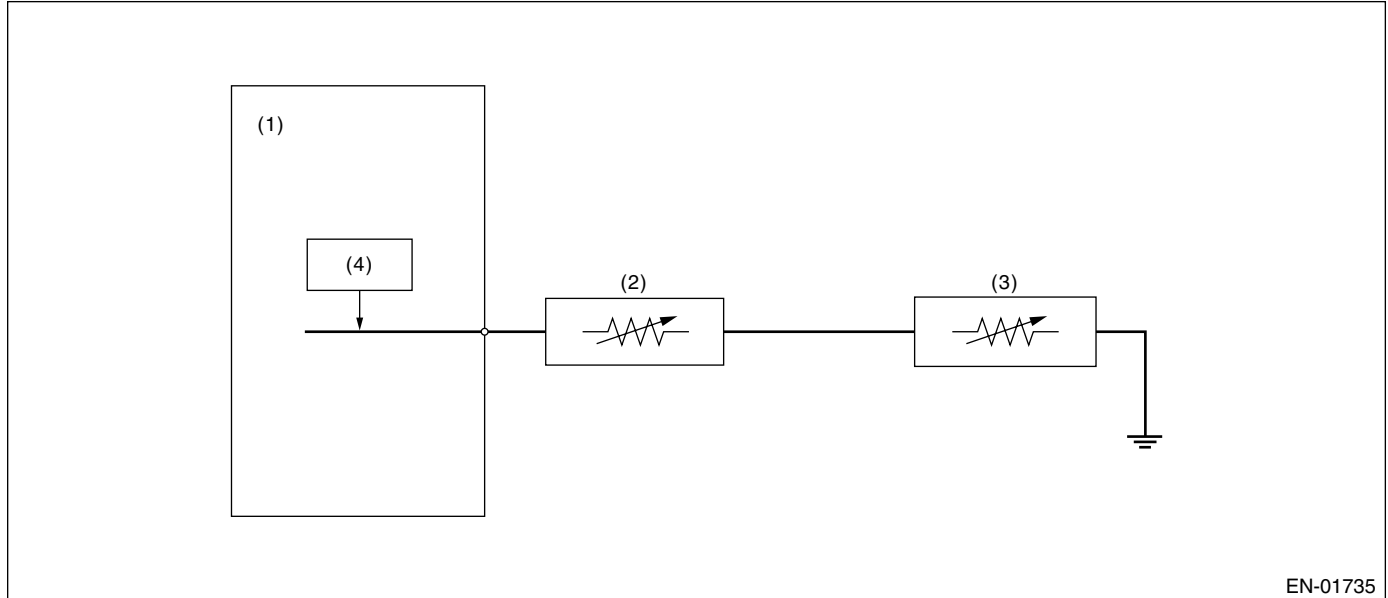
Memorize the freeze frame data. (For test mode \$02)

## BL:DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Fuel level sensor
- (3) Fuel sub level sensor
- (4) Detecting circuit

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

#### Judgment Value

| Malfunction Criteria  | Threshold Value       |
|-----------------------|-----------------------|
| Ignition switch       | ON                    |
| Battery voltage       | $\geq 10.9 \text{ V}$ |
| After engine starting | 3 seconds or more     |
| Output voltage        | $< 0.015 \text{ V}$   |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria  | Threshold Value   |
|-----------------------|-------------------|
| Ignition switch       | ON                |
| Battery voltage       | $\geq 10.9$ V     |
| After engine starting | 3 seconds or more |
| Output voltage        | $\geq 0.015$ V    |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

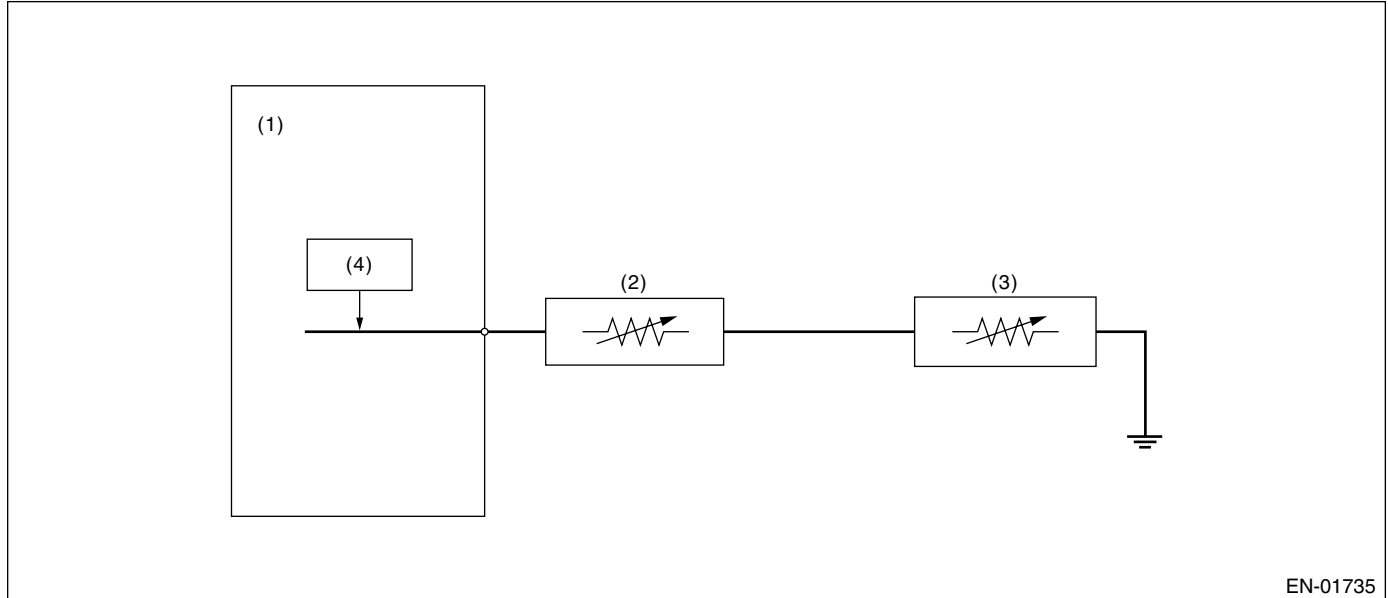
Memorize the freeze frame data. (For test mode \$02)

## BM:DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Fuel level sensor
- (3) Fuel sub level sensor
- (4) Detecting circuit

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (one second).

#### Judgment Value

| Malfunction Criteria  | Threshold Value        |
|-----------------------|------------------------|
| Ignition switch       | ON                     |
| Battery voltage       | $\geq 10.9 \text{ V}$  |
| After engine starting | 3 seconds or more      |
| Output voltage        | $\geq 4.958 \text{ V}$ |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria  | Threshold Value   |
|-----------------------|-------------------|
| Ignition switch       | ON                |
| Battery voltage       | $\geq 10.9$ V     |
| After engine starting | 3 seconds or more |
| Output voltage        | $< 4.958$ V       |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## BN:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of unstable output from fuel level sensor caused by noise.

Judge NG when the max. value and cumulative value of output voltage variation of fuel level sensor is larger than the threshold value.

### 2. ENABLE CONDITION

| Secondary Parameters           | Enable Conditions                                       |
|--------------------------------|---|
| Engine speed                   | ≥ 500 rpm   |
| After engine starting          | 1 second or more  |
| Ignition switch                | ON  |
| Battery voltage                | > 10.9 V  |
| Idle switch                    | ON  |
| Fuel level                     | 9 ↔ 51 ℓ (2.4 ↔<br>13.4 US gal, 1.98 ↔<br>11.2 Imp gal) |
| Vehicle speed = 0 km/h (0 MPH) | 10 seconds or more                                      |

### 3. GENERAL DRIVING CYCLE

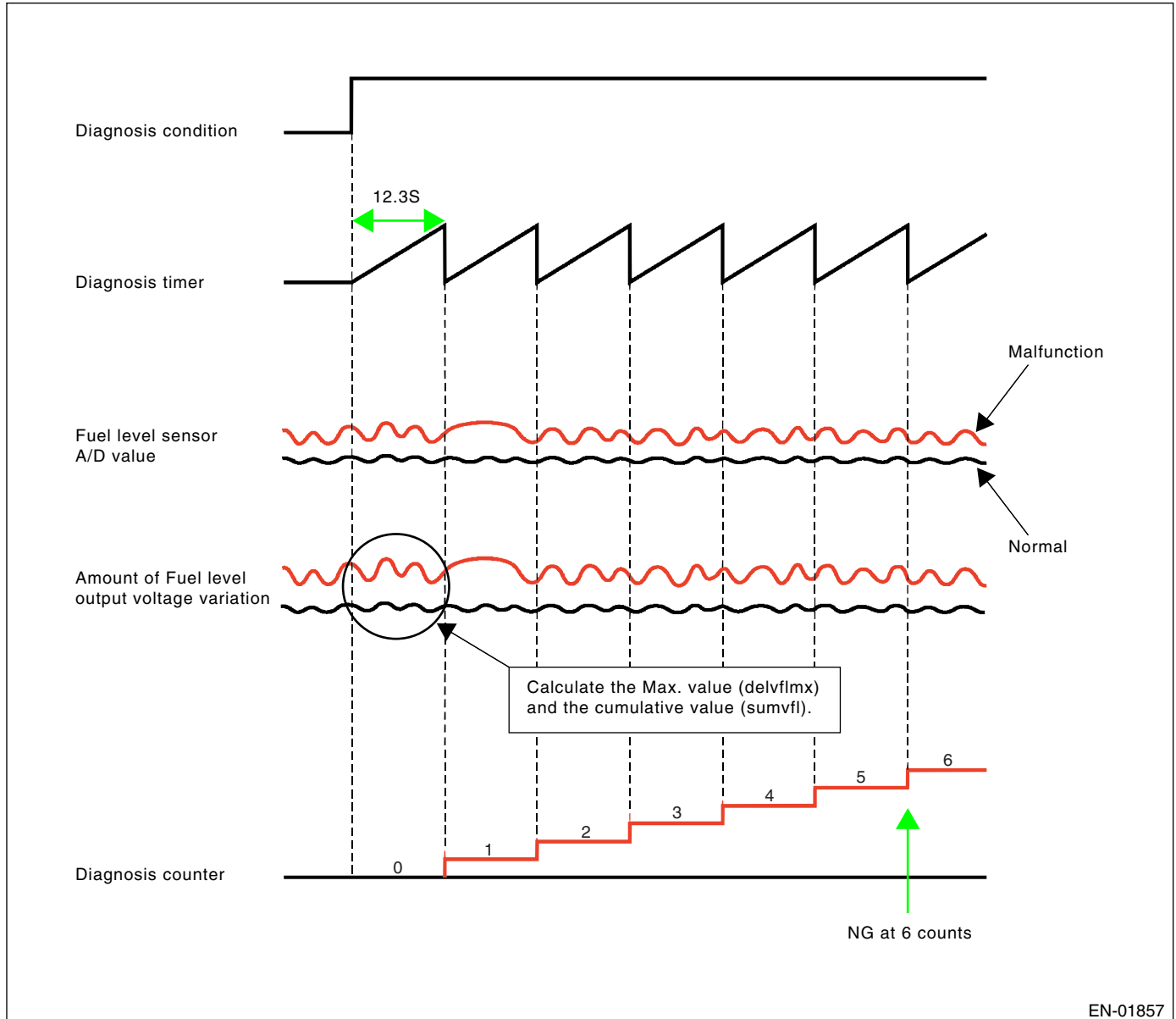
- Perform the diagnosis continuously in idling condition.
- Pay attention to the fuel level.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 4. DIAGNOSTIC METHOD

Calculate the Max. value (delflmax) and cumulative value (sumfl) of output voltage variation of fuel level sensor during 12.3 seconds. Judge it normal when both max. and cumulative values are not over the threshold value. Otherwise, when either of them is over the threshold value, count the diagnosis counter up. And judge NG if the counter indicated 6 counts.



EN-01857

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Integrated times of the condition reaching follows,<br>$DELFLMAX \geq 0.2 \text{ V}$ or $SUMFL \geq 15 \text{ V}$<br>where,<br>DELFLMAX is Max. deviation of sensor output during 12.3 seconds.<br>SUMFL is integrated value of sensor output deviation during 12.3 seconds. | $\geq 4$ times  |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Do not count the diagnosis counter up when the following conditions are completed during 12.3 seconds.

|  |                                    |
|--|------------------------------------|
| Max – Min of tank pressure during 12.3 seconds   | ≥ 0.05 kPa (0.375 mmHg, 0.02 inHg) |
| Max – Min of battery voltage during 12.3 seconds | ≥ 0.4 V                            |

**Time Needed for Diagnosis:** 12.3 seconds × 4 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

## Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| DELFLMAX   | < 0.2 V         |
| SUMFL  | < 15 V          |
| Where, DELFLMAX is Max. deviation of sensor output during 12.3 seconds.<br>SUMFL is integrated value of sensor output deviation during 12.3 seconds. |                 |

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### BO:DTC P0483 COOLING FAN RATIONALITY CHECK

#### 1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the radiator fan.

Judge NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

#### 2. ENABLE CONDITION

Diagnostic enable condition is completed if the radiator fan changes from OFF to ON when all of the conditions below are completed. When one of the conditions below is not completed, the diagnostic enable condition is not completed.

| Secondary Parameters | Enable Conditions  |
|----------------------|--------------------|
| Engine Speed         | 600 — 900 rpm      |
| Idle switch          | ON                 |
| Vehicle speed        | < 2 km/h (1.2 MPH) |
| Battery voltage      | ≥ 10.9 V           |

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the radiator fan changes from OFF to ON when idling.

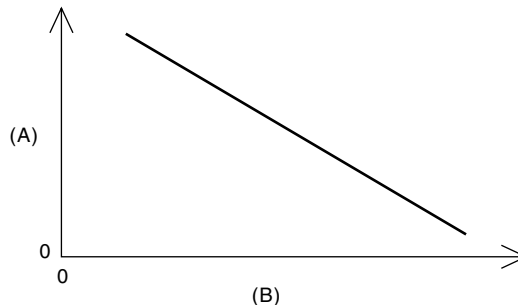
#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 minutes.

##### Judgment Value

| Malfunction Criteria   | Threshold Value                  |
|--|----------------------------------|
| Engine coolant temperature   | ≥ 96°C (204.8°F)                 |
| Engine coolant temperature sensor A/D value – Engine coolant temperature sensor A/D value Min. value (Min. value with radiator fan OFF → ON) | < 15 mV<br>(Approx. 1°C (1.8°F)) |



EN-01737

(A) Engine coolant temperature °C (°F)

(B) A/D value (V)

**Time Needed for Diagnosis:** 5 minutes

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

## Judgment Value

| Malfunction Criteria   | Threshold Value                  |
|--|----------------------------------|
| Engine coolant temperature sensor A/D value – Engine coolant temperature sensor A/D value Min. value (Min. value with radiator fan OFF → ON) | ≥ 15 mV<br>(Approx. 1°C (1.8°F)) |

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### BP:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.

Judge NG when low vehicle speed (0 km/h (0 MPH)) remains whereas it seemed to be in a usual driving speed.

#### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Engine speed         | < 4,000 rpm       |
| Fuel cut in decel.   | Operating         |
| Battery voltage      | ≥ 10.9 V          |

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 4 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Vehicle speed        | < 1             |

**Time Needed for Diagnosis:** 4 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria               | Threshold Value |
|------------------------------------|-----------------|
| Vehicle speed                      | ≥ 1             |
| Starter switch                     | OFF             |
| Time after starter switch ON → OFF | ≥ 3 seconds     |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

- Accelerator sensor signal process: Not allowed all closed points learning.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on "and" of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Hi drive both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

### BQ:DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.

Judge NG when high vehicle speed (240 km/h (149.1 MPH) or more) remains whereas it seemed to be in a usual driving speed.

#### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Engine speed         | < 4,000 rpm       |
| Fuel cut in decel.   | Operating         |
| Battery voltage      | ≥ 10.9 V          |

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 4 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Vehicle speed        | ≥ 240           |

**Time Needed for Diagnosis:** 4 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria               | Threshold Value |
|------------------------------------|-----------------|
| Vehicle speed                      | ≥ 300           |
| Starter switch                     | OFF             |
| Time after starter switch ON → OFF | ≥ 3 seconds     |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. FAIL SAFE

- Accelerator sensor signal process: Not allowed all closed points learning.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on “and” of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Hi drive both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## BR:DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.  
Judge NG when actual engine speed is not close to target engine speed during idling.

### 2. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions                 |
|---|-----------------------------------|
| Engine coolant temperature  | ≥ 75°C (167°F)                    |
| Battery voltage   | ≥ 10.9 V                          |
| Atmospheric pressure  | > 75.1 kPa (563 mmHg, 22.2 inHg)  |
| Fuel level  | ≥ 9 ℓ (2.38 US gal, 1.98 Imp gal) |
| After engine starting   | 10 seconds or more                |
| Feedback in ISC   | In operation                      |
| Measured lambda   | 0.90 ←→ 1.1                       |
| After air condition switching ON-OFF, OFF-ON                          | 5 seconds or more                 |
| After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg) | > 5 seconds                       |
| After neutral switch ON-OFF event                                     | > 5 seconds                       |
| Vehicle speed   | 0 km/h (0 MPH)                    |

### 3. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after engine warmed.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).

#### Judgment Value

| Malfunction Criteria                                    | Threshold Value |
|---|-----------------|
| Actual – target engine speed                            | < –100 rpm      |
| Feedback correction for idle air control solenoid valve | Max.            |

**Time Needed for Diagnosis:** 10 seconds × 3 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

#### Judgment Value

| Malfunction Criteria         | Threshold Value |
|------------------------------|-----------------|
| Actual – target engine speed | ≥ –100 rpm      |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. FAIL SAFE

- Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.
- Knock compensation:
  - Knock compensation final retard/advance value: Knock compensation value + Total learning compensation value + Partial learning compensation value
  - AT normal: Knock compensation value = Fixed on 0°CA
  - AT abnormal: Knock compensation value ≠ Fixed on 0°CA (Maximum 12°CA retard on knocking)
  - Not allowed to refresh learning compensation coefficient
  - Not allowed to calculate partial learning zone compensation value

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## BS:DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.  
Judge NG when actual engine speed is not close to target engine speed during idling.

### 2. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions                             |
|---|---|
| Engine coolant temperature  | $\geq 75^{\circ}\text{C}$ (167°F)             |
| Battery voltage   | $\geq 10.9\text{ V}$                          |
| Atmospheric pressure  | $> 75.1\text{ kPa}$ (563 mmHg, 22.2 inHg)     |
| Fuel level  | $\geq 9\text{ ℓ}$ (2.38 US gal, 1.98 Imp gal) |
| After engine starting   | 10 seconds or more                            |
| Feedback in ISC   | In operation                                  |
| Lambda  | $0.90 \leftrightarrow 1.1$                    |
| After air condition switching ON-OFF, OFF-ON                          | 5 seconds or more                             |
| After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg) | $> 5$ seconds                                 |
| After neutral switch ON-OFF event                                     | $> 5$ seconds                                 |
| Vehicle speed   | 0 km/h (0 MPH)                                |

### 3. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after engine warmed.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds  $\times$  3 times).

#### Judgment Value

| Malfunction Criteria                                    | Threshold Value       |
|---|-----------------------|
| Actual – target eng. speed                              | $\geq 200\text{ rpm}$ |
| Feedback correction for idle air control solenoid valve | Min.                  |

**Time Needed for Diagnosis:** 10 seconds  $\times$  3 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

#### Judgment Value

| Malfunction Criteria       | Threshold Value    |
|----------------------------|--------------------|
| Actual – target eng. speed | $< 200\text{ rpm}$ |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### 7. FAIL SAFE

- Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.
- Knock compensation:
  - Knock compensation final retard/advance value: Knock compensation value + Total learning compensation value + Partial learning compensation value
  - AT normal: Knock compensation value = Fixed on 0°CA
  - AT abnormal: Knock compensation value ≠ Fixed on 0°CA (Maximum 12°CA retard on knocking)
  - Not allowed to refresh learning compensation coefficient
  - Not allowed to calculate partial learning zone compensation value

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## BT:DTC P0512 STARTER REQUEST CIRCUIT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge ON NG when the starter SW signal remains on.

Judge OFF NG when the engine starts without starter experience.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 minutes.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Engine speed         | > 500 rpm       |
| Starter SW           | ON              |
| Battery voltage      | > 8 V           |

**Time Needed for Diagnosis:** 180 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge ON OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Starter SW           | OFF             |
| Battery voltage      | > 8 V           |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### BU:DTC P0513 INCORRECT IMMOBILIZER KEY

#### 1. OUTLINE OF DIAGNOSIS

| DTC   | ITEM   | OUTLINE OF DIAGNOSIS   |
|-------|--|--|
| P0513 | Incorrect Immobilizer Key                    | Incorrect immobilizer key (Use of key not registered in body integrated module)                          |
| P1570 | Antenna                                      | Improper antenna   |
| P1571 | Reference Code Incompatibility               | Unmatched reference code between body integrated module and ECM  |
| P1572 | IMM Circuit Failure (Except Antenna Circuit) | Communication malfunction between body integrated module and ECM   |
| P1574 | Key Communication Failure                    | Malfunction of body integrated module that check the key (transponder) ID or abnormality of transponder. |
| P1576 | EGI Control Module EEPROM                    | Abnormality of ECM   |
| P1577 | IMM Control Module EEPROM                    | Malfunction of body integrated module.   |

#### 2. ENABLE CONDITION

When the engine starting

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis only once engine starting.

#### 4. DIAGNOSTIC METHOD

Judge NG, when the outline of diagnosis consists.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## BV:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction that engine speed increases more than that in normal condition during idling.

### 2. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions   |
|-----------------------|---------------------|
| Battery voltage       | ≥ 10.9 V            |
| Feedback in ISC       | In operation        |
| Vehicle speed         | < 4 km/h (2.49 MPH) |
| After engine starting | 1 seconds or more   |

### 3. GENERAL DRIVING CYCLE

Always perform diagnosis at less than 4 km/h (2.49 MPH) of vehicle speed.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment 1

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (2 seconds).

#### Judgment Value

| Malfunction Criteria                             | Threshold Value |
|--|-----------------|
| Engine speed – target eng. speed                 | ≥ 1,000 rpm     |
| Feedback value for ISC                           | ≤ 0             |
| Engine speed change every 180 degree engine rev. | ≥ -5 rpm        |

#### • Abnormality Judgment 2

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

#### Judgment Value

| Malfunction Criteria             | Threshold Value |
|----------------------------------|-----------------|
| Engine speed – target eng. speed | ≥ 1,000 rpm     |
| Feedback value for ISC           | ≤ 0             |

**Time Needed for Diagnosis:** 2 seconds or 5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

#### Judgment Value

| Malfunction Criteria             | Threshold Value |
|----------------------------------|-----------------|
| Engine speed – target eng. speed | < 200 rpm       |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 7. FAIL SAFE

Fuel shut-off: Shut-off fuel for only #1 and #2 cylinder, or for all cylinder in accordance with vehicle speed, engine speed, throttle position

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## **BW:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR**

### 1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the micro-computer (RAM).

Judge NG when either the main CPU normal RAM or sub CPU normal RAM is abnormal. Judge OK when both of them are normal.

At initial routine, write the data to all area of RAM. Judge OK when same data can be read out, and judge NG when same data cannot be read out.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

Perform the diagnosis in the initial routine.

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis immediately after IG key SW is turned ON.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value  |
|--|--|
| Main CPU normal RAM abnormality<br>Write 5AA5A55A, and read out. (All area of RAM)<br>Or write A55A5AA5, and read out. (All area of RAM) | Cannot be read out<br>5AA5A55A.<br>Cannot be read out<br>A55A5AA5. |
| Sub CPU normal RAM abnormality.<br>Write 5AA5, and read out. (All area of RAM)<br>Or write A55A, and read out. (All area of RAM)         | Cannot be read out<br>5AA5.<br>Cannot be read out<br>A55A.         |

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value  |
|--|--|
| Main CPU normal RAM abnormality<br>Write 5AA5A55A, and read out. (All area of RAM)<br>Or write A55A5AA5, and read out. (All area of RAM) | Can be read out<br>5AA5A55A.<br>Can be read out<br>A55A5AA5. |
| Sub CPU normal RAM abnormality.<br>Write 5AA5, and read out. (All area of RAM)<br>Or write A55A, and read out. (All area of RAM)         | Can be read out 5AA5.<br>Can be read out A55A.               |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 7. FAIL SAFE

None

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## BX:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

### 1. OUTLINE OF DIAGNOSIS

Judge NG when SUM value of ROM is out of the standard value.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| SUM value of ROM     | Standard value  |

**Time Needed for Diagnosis:** To be determined

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only at engine stop)

## 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 7. FAIL SAFE

Stop the current to electronic throttle control motor. (Fix the throttle opening angle to 6°.)

## 8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnosis value and malfunction criteria value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

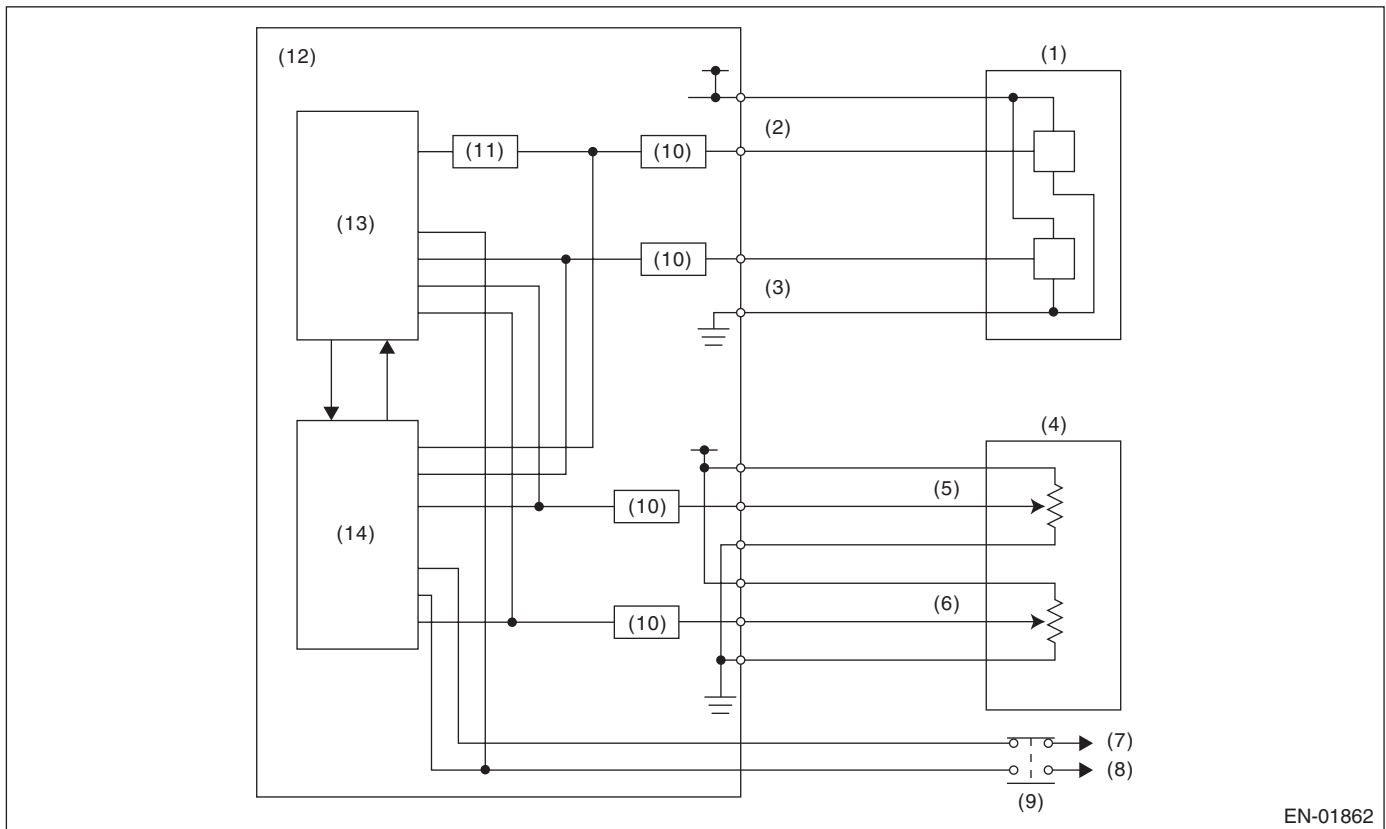
### BY:DTC P0607 CONTROL MODULE PERFORMANCE

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when either the following is completed.

- When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the read value of accelerator position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU and sub CPU is abnormal.
- When the input amplifier circuit of throttle position sensor 1 is abnormal.
- When the cruise control cannot be canceled correctly.
- When the signal of brake SW1 and 2 is mismatched.
- When the directed angle from main CPU is abnormal.

#### 2. COMPONENT DESCRIPTION



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- |     |                                     |      |                             |
|-----|-------------------------------------|------|-----------------------------|
| (1) | Throttle position sensor            | (8)  | Stop light                  |
| (2) | Throttle position sensor 1          | (9)  | Brake switch                |
| (3) | Throttle position sensor 2          | (10) | I/F circuit                 |
| (4) | Accelerator pedal position sensor   | (11) | Amplifier circuit           |
| (5) | Accelerator pedal position sensor 1 | (12) | Engine control module (ECM) |
| (6) | Accelerator pedal position sensor 2 | (13) | Sub CPU                     |
| (7) | Battery                             | (14) | Main CPU                    |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 3. ENABLE CONDITION

| Secondary Parameters               | Enable Conditions |
|------------------------------------|-------------------|
| (1) Ignition switch                | ON                |
| (2) Ignition switch                | ON                |
| (3) None                           | —                 |
| (4) None                           | —                 |
| (5) Throttle opening angle         |                   |
| (6) Brake SW (with cruise control) | ON                |
| (7) None                           | —                 |
| (8) Cruise control                 | OFF               |

## 4. GENERAL DRIVING CYCLE

- (1) — (4): Always perform the diagnosis continuously.  
(5): Always perform the diagnosis continuously on idling.  
(6): Perform the diagnosis when the brake pedal is depressed.  
(7): Always perform the diagnosis continuously.  
(8): Always perform the diagnosis continuously when the cruise control pedal is not operating.

## 5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria   | Threshold Value  |
|--|--|
| (1) Difference of CPU on reading value of throttle position sensor signal    | Within 0.12 V  |
| (2) Difference of CPU on reading value of accelerator position sensor signal | Within 0.07 V  |
| (3) WD pulse from sub CPU  | WD pulse occur   |
| (4) Communication between CPU  | Possible to communicate  |
| (5) Difference of signal on connection of amplifier                          | Within $\times 4 \pm 0.6$ V  |
| (6) Cruise control cancel signal at brake ON                                 | Cruise control cancel signal ON  |
| (7) Brake switch 1, 2 signal   | SW 1 and 2 are matched   |
| (8) Throttle opening angle directing value                                   | Within the opening angle $+3.4^\circ$ which calculated from accelerator opening angle coefficient. |

### Time Needed for Diagnosis:

- (1) 250 milliseconds  
(2) 250 milliseconds  
(3) 200 milliseconds  
(4) 200 milliseconds  
(5) 24 milliseconds  
(6) 250 milliseconds  
(7) 200 milliseconds  
(8) 250 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### **7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION**

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### **8. FAIL SAFE**

Stop the current to electronic throttle control motor. (Fix the throttle opening angle to 6°.)

### **9. ECM OPERATION AT DTC SETTING**

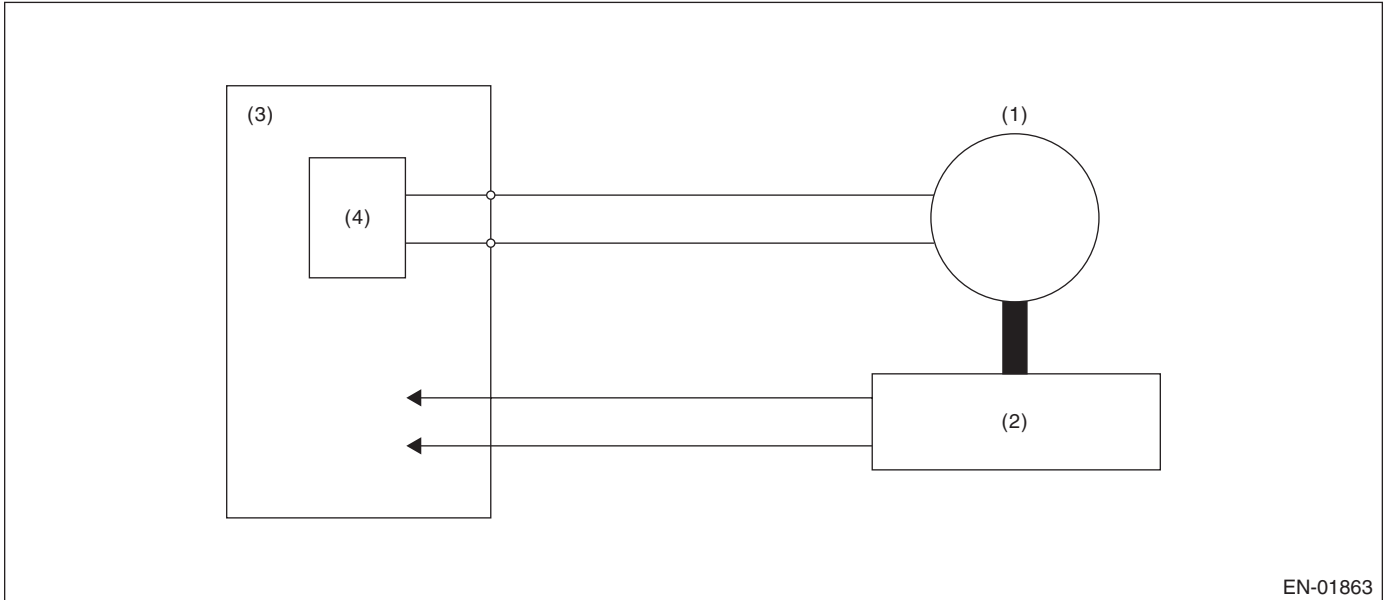
- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnosis value and malfunction criteria value. (For test mode \$06)

## BZ:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

### 1. OUTLINE OF DIAGNOSIS

Judge NG when the target opening angle and actual opening angle is mismatched or the current to motor is more than specified duty for specified time continuously.

### 2. COMPONENT DESCRIPTION



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- (1) Motor
- (2) Throttle position sensor
- (3) Engine control module (ECM)
- (4) Drive circuit

### 3. ENABLE CONDITION

| Secondary Parameters                            | Enable Conditions |
|---|-------------------|
| Ignition switch                                 | ON                |
| Normal operation of electronic throttle control | ON                |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electronic throttle control is operating.

### 5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Difference between target opening angle and actual opening angle | Less than 3.5°  |
| Output duty to drive circuit                                     | Less than 95%   |

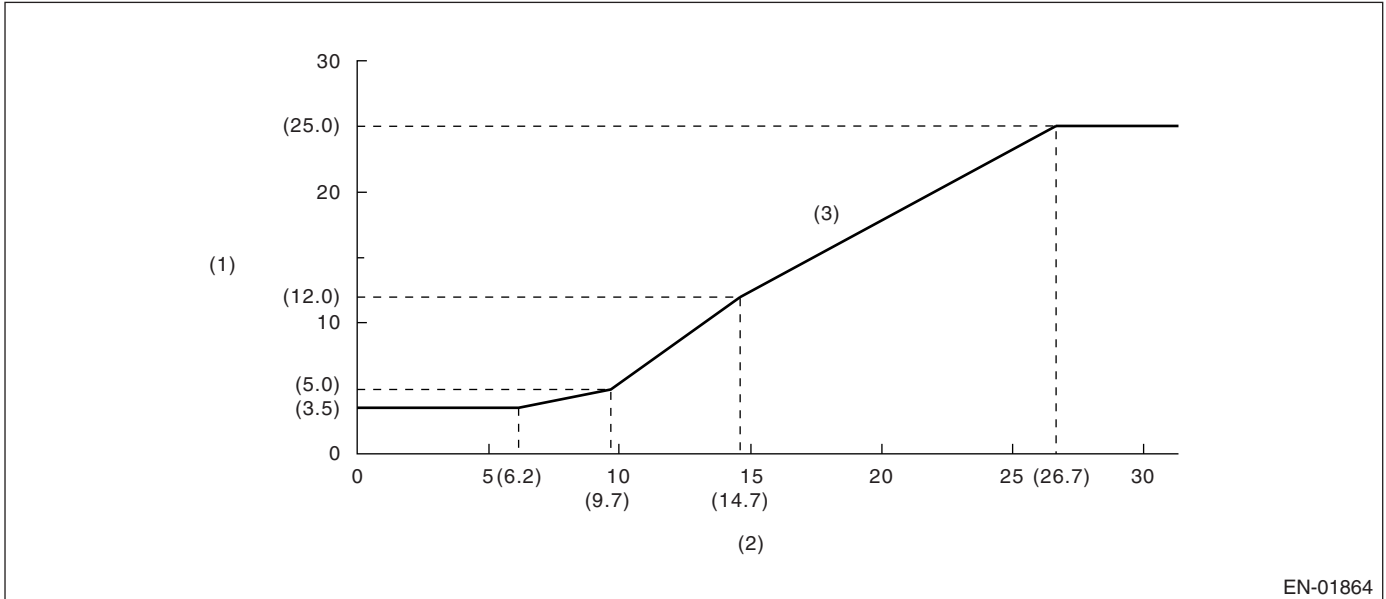
#### Time Needed for Diagnosis:

Target opening angle and actual opening angle: 250 milliseconds (For NG) 2,000 milliseconds (For OK)  
 Output duty to drive circuit: 2,000 milliseconds

# Diagnostic Trouble Code (DTC) Detecting Criteria

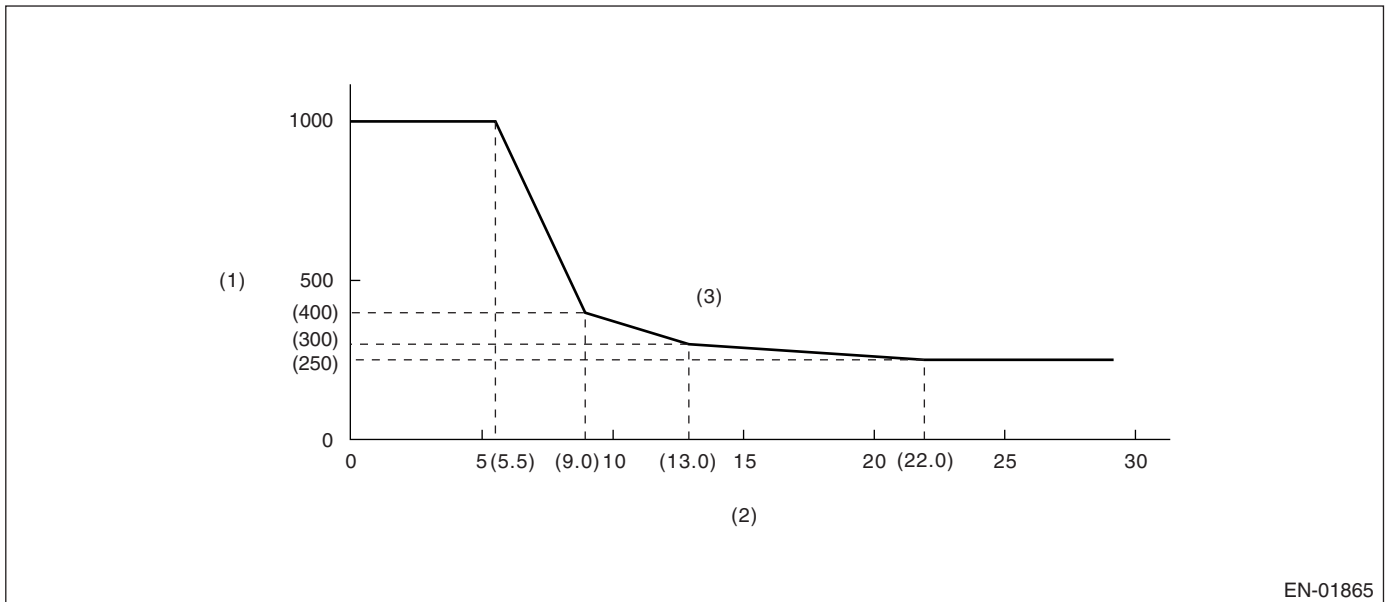
## GENERAL DESCRIPTION

### Details of Judgment



- (1) Difference between target opening angle and actual opening angle (°)
- (2) Target throttle opening angle (°)
- (3) NG area

### Details of Judgment (Always 1,000 milliseconds when the actual opening angle ≤ target opening angle)



- (1) Judgment time (milliseconds)
- (2) Throttle position sensor 1 opening angle
- (3) NG area

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

## Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop the current to electronic throttle control motor. (Fix the throttle opening angle to 6°.)

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnosis value and malfunction criteria value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### CA:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.

Judge NG when the ECM output level differs from the actual terminal level.

#### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

##### Judgment Value

| Malfunction Criteria                                 | Threshold Value   |
|--|-------------------|
| After starting the engine                            | 1 seconds or more |
| Engine speed   | ≥ 500 rpm         |
| Ignition switch                                      | ON                |
| Battery voltage                                      | ≥ 10.9 V          |
| Terminal voltage level when ECM transmits OFF signal | Low level         |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

##### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria                                 | Threshold Value   |
|--|-------------------|
| After starting the engine                            | 1 seconds or more |
| Engine speed   | ≥ 500 rpm         |
| Ignition switch                                      | ON                |
| Battery voltage                                      | ≥ 10.9 V          |
| Terminal voltage level when ECM transmits OFF signal | High level        |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## CB:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.

Judge NG when the ECM output level differs from the actual terminal level.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

#### Judgment Value

| Malfunction Criteria                                | Threshold Value   |
|---|-------------------|
| After starting the engine                           | 1 seconds or more |
| Engine speed  | ≥ 500 rpm         |
| Ignition switch                                     | ON                |
| Battery voltage                                     | ≥ 10.9 V          |
| Terminal voltage level when ECM transmits ON signal | High level        |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                                | Threshold Value   |
|---|-------------------|
| After starting the engine                           | 1 seconds or more |
| Engine speed  | ≥ 500 rpm         |
| Ignition switch                                     | ON                |
| Battery voltage                                     | ≥ 10.9 V          |
| Terminal voltage level when ECM transmits ON signal | Low level         |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### CC:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW

#### 1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

#### 2. ENABLE CONDITION

| Secondary Parameters      | Enable Conditions      |
|---------------------------|------------------------|
| Ignition switch           | ON                     |
| Battery voltage           | $\geq 10.9 \text{ V}$  |
| After starting the engine | 2 seconds or more      |
| Starter switch            | OFF                    |
| Engine speed              | $\geq 500 \text{ rpm}$ |

#### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

#### 4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Neutral switch signal (while changing from a to b below)             | ON continues    |
| Driving condition change   | a) to b)        |
| a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm       |                 |
| b) Vehicle speed = 64 km/h (40 MPH) & engine speed 1,600 — 2,550 rpm |                 |

**Time Needed for Diagnosis:** 3 monitoring

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

Cruise control command: Not allowed to command cruise control

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## CD:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH

### 1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

### 2. ENABLE CONDITION

| Secondary Parameters      | Enable Conditions |
|---------------------------|-------------------|
| Ignition switch           | ON                |
| Battery voltage           | $\geq 10.9$ V     |
| After starting the engine | 2 seconds or more |
| Starter switch            | OFF               |
| Engine speed              | $\geq 500$ rpm    |

### 3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

### 4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

#### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Neutral switch signal (while changing from a to b below)             | OFF continues   |
| Driving condition change   | a) to b)        |
| a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm       |                 |
| b) Vehicle speed = 64 km/h (40 MPH) & engine speed 1,600 — 2,550 rpm |                 |

**Time Needed for Diagnosis:** 3 monitoring

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### CE:DTC P1152 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

#### 1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains Low.

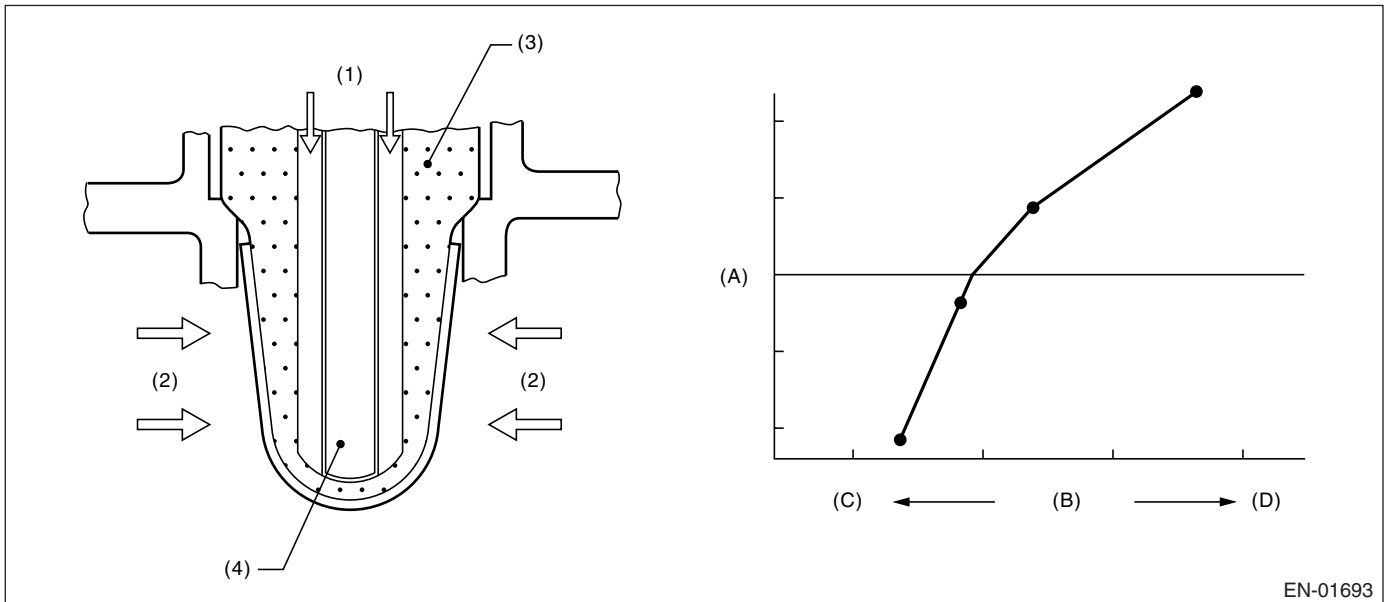
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.

**Lambda value = Actual air fuel ratio/Theoretical air fuel ratio**

Lambda > 1: Lean

Lambda < 1: Rich

#### 2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust
- (3) ZrO<sub>2</sub>
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

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# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions                |
|---|----------------------------------|
| All secondary parameters to be in enable conditions         | 4 seconds or more                |
| Battery voltage   | > 10.9 V                         |
| Atmospheric pressure  | > 75.1 kPa (563 mmHg, 22.2 inHg) |
| Rear oxygen sensor sub feedback                             | Operating                        |
| Rear oxygen sensor output voltage – feedback target voltage | –0.2 V ↔ 0.1 V                   |
| or rear oxygen sensor sub feedback compensation coefficient | On Min.                          |
| or rear oxygen sensor sub feedback compensation coefficient | On Max.                          |
| After engine starting                                       | 60 seconds or more               |
| Engine coolant temperature                                  | ≥ 75°C (167°F)                   |
| Vehicle speed   | ≥ 20 km/h (12 MPH)               |
| Amount of intake air  | ≥ 6 g/s                          |
| Load change during 0.5 engine rev.                          | ≤ 0.01 g/rev                     |
| Impedance of front oxygen (A/F) sensor                      | 0 ↔ 50 Ω                         |
| Learning value of evaporation gas density                   | ≤ 0.2                            |
| Accumulated time of operating canister purge                | 20 seconds or more               |

## 4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

## 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Output lambda when rear oxygen sensor sub feedback compensation coefficient being at not high limit | ≤ 0.85          |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

### CF:DTC P1153 O<sub>2</sub> SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

#### 1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains High.

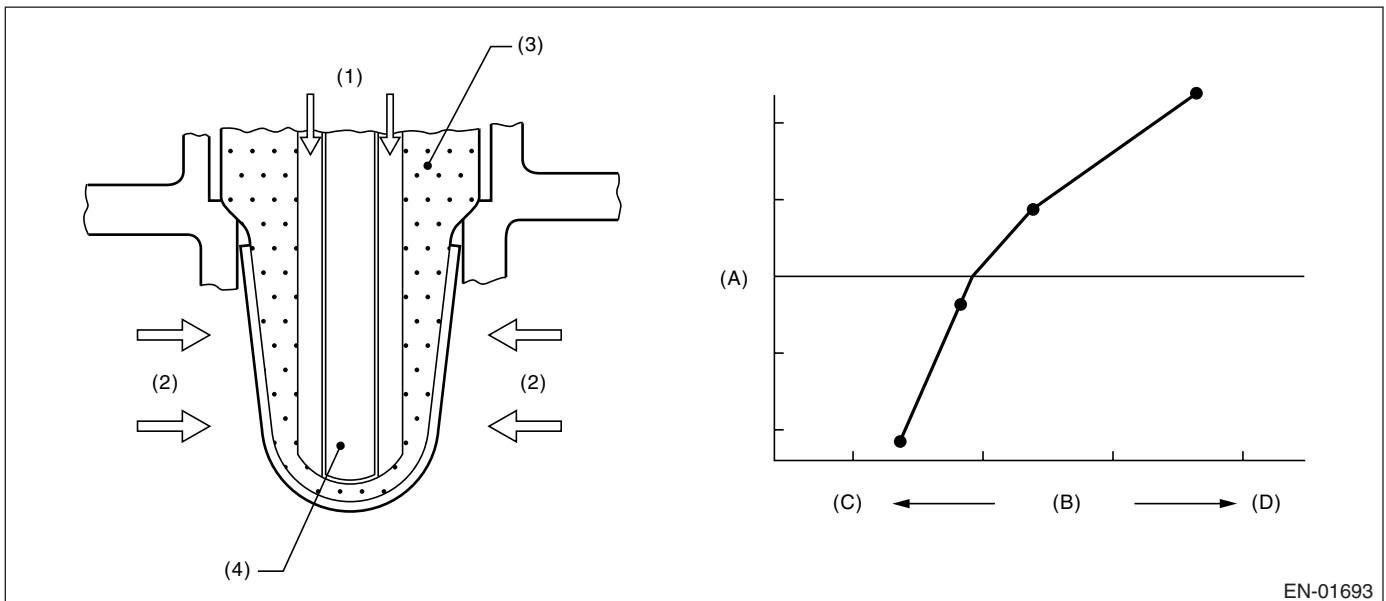
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.

**Lambda value = Actual air fuel ratio/Theoretical air fuel ratio**

Lambda > 1: Lean

Lambda < 1: Rich

#### 2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust
- (3) ZrO<sub>2</sub>
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

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# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions                |
|---|----------------------------------|
| All secondary parameters to be in enable conditions         | 4 seconds or more                |
| Battery voltage   | > 10.9 V                         |
| Atmospheric pressure  | > 75.1 kPa (563 mmHg, 22.2 inHg) |
| Rear oxygen sensor sub feedback                             | Operating                        |
| Rear oxygen sensor output voltage – feedback target voltage | –0.2 V ↔ 0.1 V                   |
| or rear oxygen sensor sub feedback compensation coefficient | On Min.                          |
| or rear oxygen sensor sub feedback compensation coefficient | On Max.                          |
| After engine starting                                       | 60 seconds or more               |
| Engine coolant temperature                                  | ≥ 75°C (167°F)                   |
| Vehicle speed   | ≥ 20 km/h (12 MPH)               |
| Amount of intake air  | ≥ 6 g/s                          |
| Load change during 0.5 engine rev.                          | ≤ 0.01 g/rev                     |
| Impedance of front oxygen (A/F) sensor                      | 0 ↔ 50 Ω                         |
| Learning value of evaporation gas density                   | ≤ 0.2                            |
| Accumulated time of operating canister purge                | 20 seconds or more               |

## 4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

## 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| Output lambda when rear O <sub>2</sub> sensor sub feedback compensation coefficient value being at not low limit | ≥ 1.15          |

**Time Needed for Diagnosis:** 10 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

## 8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 9. ECM OPERATION AT DTC SETTING

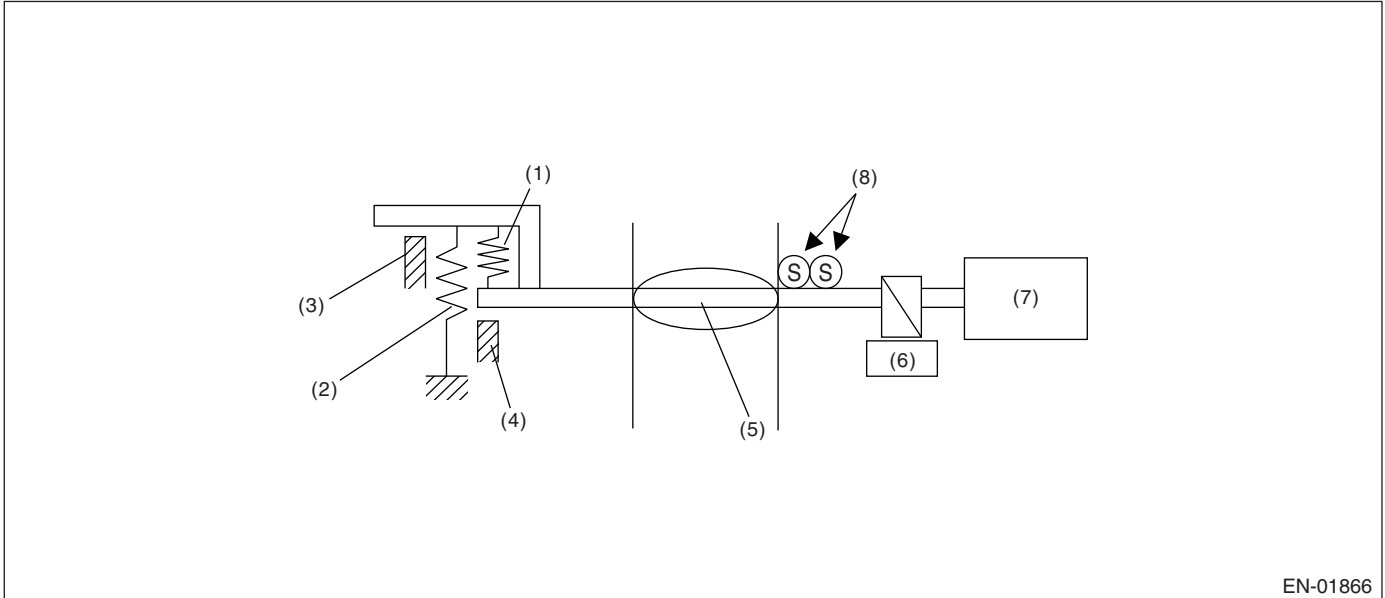
Memorize the freeze frame data. (For test mode \$02)

### CG:DTC P1160 RETURN SPRING FAILURE

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the valve does not move to the close direction with the motor power stopped and the valve open more than the default opening.

#### 2. COMPONENT DESCRIPTION



- |                          |                                  |
|--------------------------|----------------------------------|
| (1) Opener spring        | (5) Throttle valve               |
| (2) Return spring        | (6) Gear                         |
| (3) Intermediate stopper | (7) DC motor                     |
| (4) Full closed stopper  | (8) Main and sub throttle sensor |

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Throttle opening     | OFF               |
| Motor continuity     | OFF               |

#### 4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

##### Judgment Value

| Malfunction Criteria                             | Threshold Value |
|--|-----------------|
| Opening variation after continuity is set to OFF | $\geq 2^\circ$  |

**Time Needed for Diagnosis:** 600 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 8. FAIL SAFE

Fix the throttle opening to 6°.

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

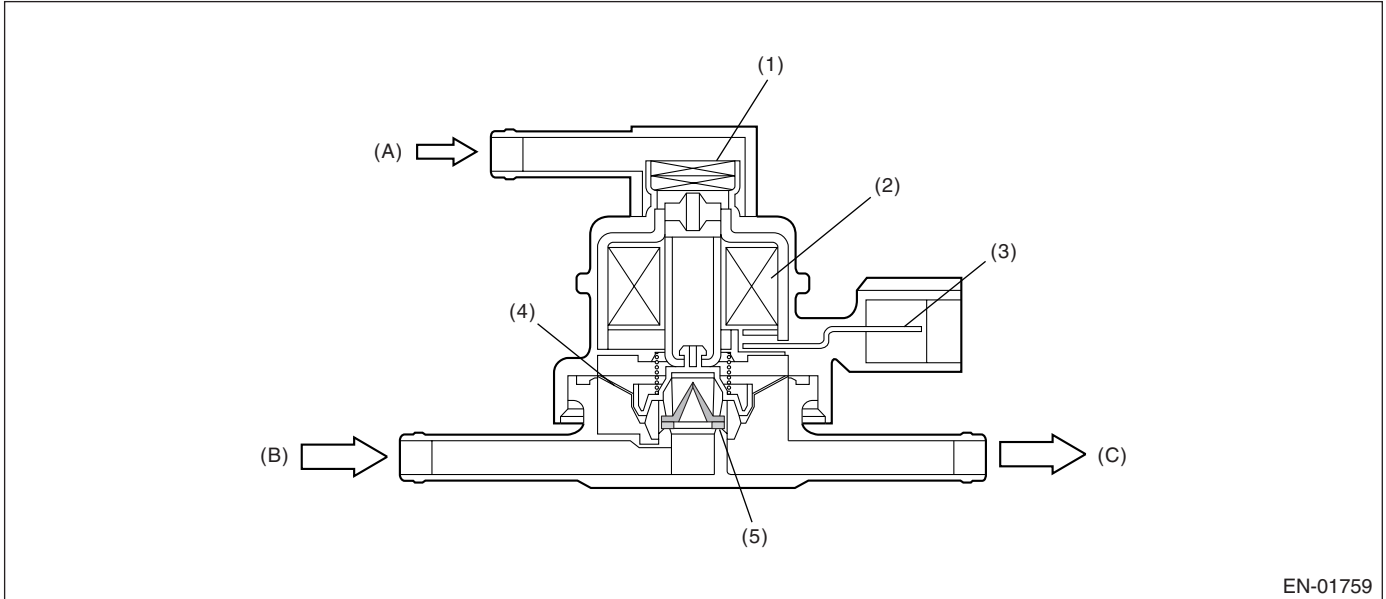
## GENERAL DESCRIPTION

### CH:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve. Judge NG when ECM output level is different from actual terminal level.

#### 2. COMPONENT DESCRIPTION



- |                        |                          |
|------------------------|--------------------------|
| (1) Filter             | (A) Atmospheric pressure |
| (2) Coil               | (B) Shut off valve       |
| (3) Connector terminal | (C) To fuel tank         |
| (4) Diaphragm          |                          |
| (5) Valve              |                          |

#### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions     |
|-----------------------|-----------------------|
| Ignition switch       | ON                    |
| Battery voltage       | $\geq 10.9 \text{ V}$ |
| After engine starting | 1 second or more      |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria                         | Threshold Value |
|--|-----------------|
| Terminal voltage when ECM outputs off signal | Low             |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

## Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

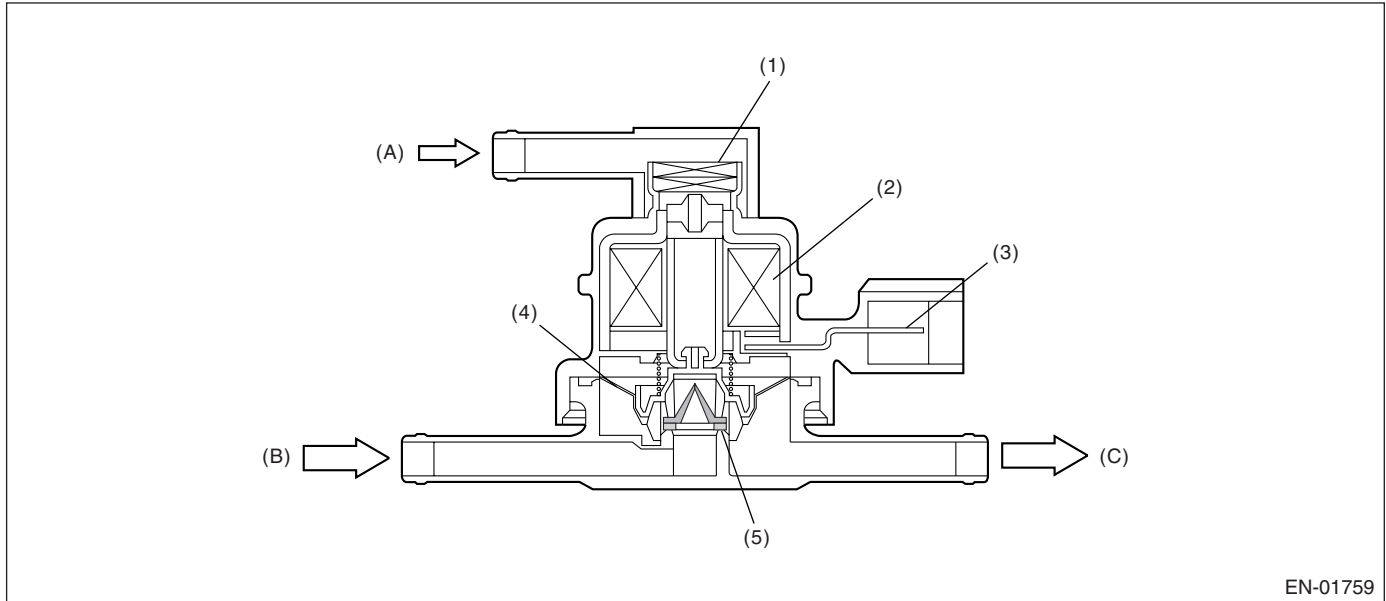
## GENERAL DESCRIPTION

### CI: DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve.  
Judge NG when ECM output level is different from actual terminal level.

#### 2. COMPONENT DESCRIPTION



- |                        |                          |
|------------------------|--------------------------|
| (1) Filter             | (A) Atmospheric pressure |
| (2) Coil               | (B) Shut off valve       |
| (3) Connector terminal | (C) To fuel tank         |
| (4) Diaphragm          |                          |
| (5) Valve              |                          |

#### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions     |
|-----------------------|-----------------------|
| Ignition switch       | ON                    |
| Battery voltage       | $\geq 10.9 \text{ V}$ |
| After engine starting | 1 second or more      |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria                         | Threshold Value |
|--|-----------------|
| Terminal voltage when ECM outputs off signal | High            |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

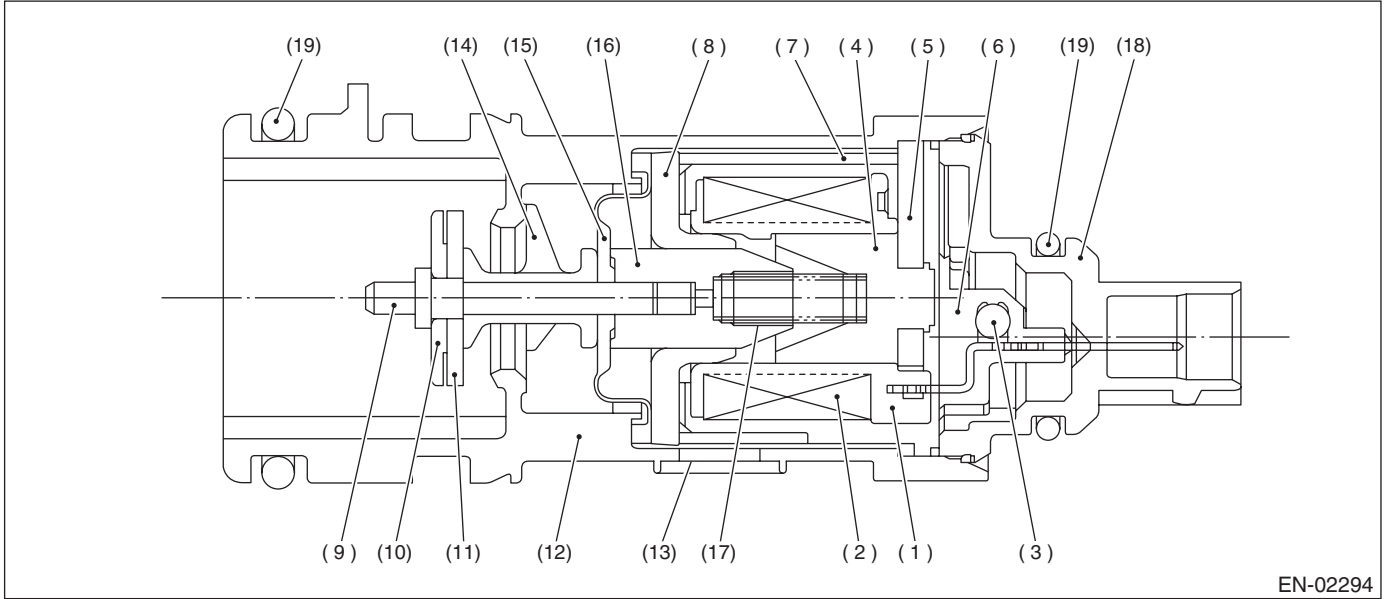
## GENERAL DESCRIPTION

### CJ:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

#### 1. OUTLINE OF DIAGNOSIS

Detect the drain valve function abnormality.  
Judge NG when the fuel tank pressure is small.

#### 2. COMPONENT DESCRIPTION



- |                    |                   |
|--------------------|-------------------|
| (1) Bobbin         | (11) Valve        |
| (2) Coil           | (12) Housing      |
| (3) Diode          | (13) Filter       |
| (4) Stator core    | (14) Retainer     |
| (5) End plate      | (15) Diaphragm    |
| (6) Body           | (16) Movable core |
| (7) Yoke           | (17) Spring       |
| (8) Magnetic plate | (18) Cover        |
| (9) Shaft          | (19) O-ring       |
| (10) Plate         |                   |

#### 3. ENABLE CONDITION

| Secondary Parameter                 | Enable Condition   |
|-------------------------------------|--|
| Drain valve                         | Open   |
| Battery voltage                     | $\geq 10.9$ V  |
| Atmospheric pressure                | $\geq 75.0$ kPa (563 mmHg, 22.17 inHg)   |
| Tank pressure when starter ON → OFF | $-0.67 \leftrightarrow 1.43$ kPa (-5 $\leftrightarrow$ 10.7 mmHg, -0.20 $\leftrightarrow$ 0.42 inHg) |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

### Judgment Value

| Malfunction Criteria | Threshold Value                             |
|----------------------|---|
| Tank pressure        | $\leq -4.0$ kPa ( $-30$ mmHg, $-1.18$ inHg) |

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as the malfunction occurs.

### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria  | Threshold Value   |
|---|---|
| Tank pressure   | $> -4.0$ kPa ( $-30$ mmHg, $-1.18$ inHg)  |
| Cumulative time when the malfunction criteria below are completed | $\geq 30$ seconds   |
| Duty ratio of purge control solenoid valve                        | Except 0  |
| Fuel temperature  | $-10 \leftrightarrow 45^\circ\text{C}$ ( $14 \leftrightarrow 113^\circ\text{F}$ ) |
| Relative ratio of intake manifold                                 | $-26.7$ kPa ( $-200$ mmHg, $-7.87$ inHg)  |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

PCV control: Open the PCV solenoid.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

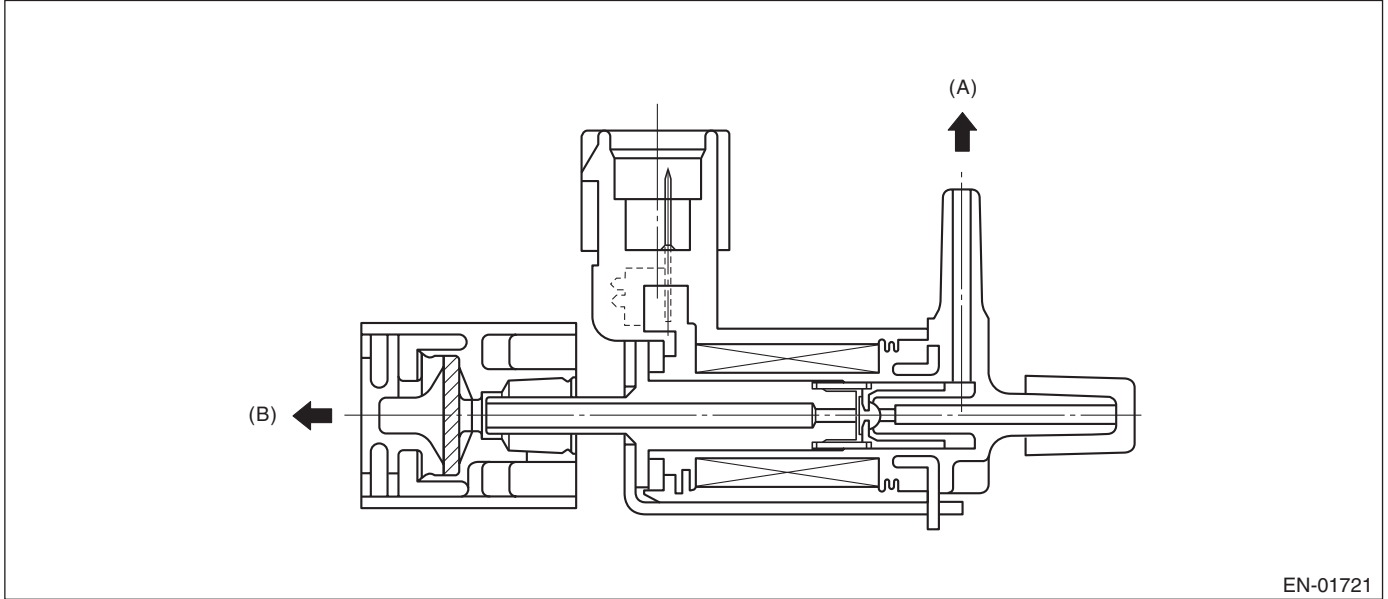
## GENERAL DESCRIPTION

### CK:DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.  
Judge NG when the ECM output level is different from actual terminal level.

#### 2. COMPONENT DESCRIPTION



- (A) Fuel tank pressure sensor
- (B) Ambient air

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

##### Judgment Value

| Malfunction Criteria                              | Threshold Value       |
|---|-----------------------|
| Battery voltage                                   | $\geq 10.9 \text{ V}$ |
| After engine starting                             | 1 second or more      |
| Terminal output voltage when ECM sent OFF signals | Low                   |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria                              | Threshold Value  |
|---|------------------|
| Battery voltage                                   | $\geq 10.9$ V    |
| After engine starting                             | 1 second or more |
| Terminal output voltage when ECM sent OFF signals | High             |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

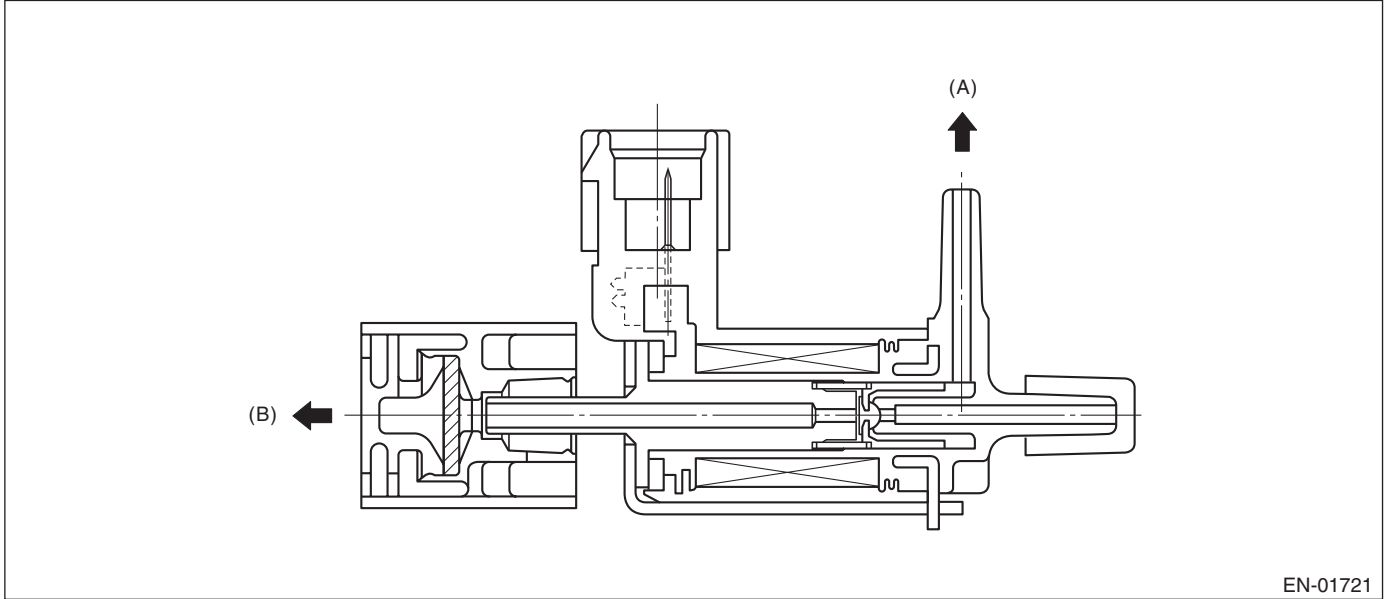
## GENERAL DESCRIPTION

### CL:DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.  
Judge NG when the ECM output level is different from actual terminal level.

#### 2. COMPONENT DESCRIPTION



- (A) Fuel tank pressure sensor
- (B) Ambient air

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

##### Judgment Value

| Malfunction Criteria                             | Threshold Value       |
|--|-----------------------|
| Battery voltage                                  | $\geq 10.9 \text{ V}$ |
| After engine starting                            | 1 second or more      |
| Terminal output voltage when ECM sent ON signals | High                  |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in two continuous drive cycles.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

### Judgment Value

| Malfunction Criteria                              | Threshold Value  |
|---|------------------|
| Battery voltage                                   | $\geq 10.9$ V    |
| After engine starting                             | 1 second or more |
| Terminal output voltage when ECM sent OFF signals | Low              |

## 6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### CM:DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE

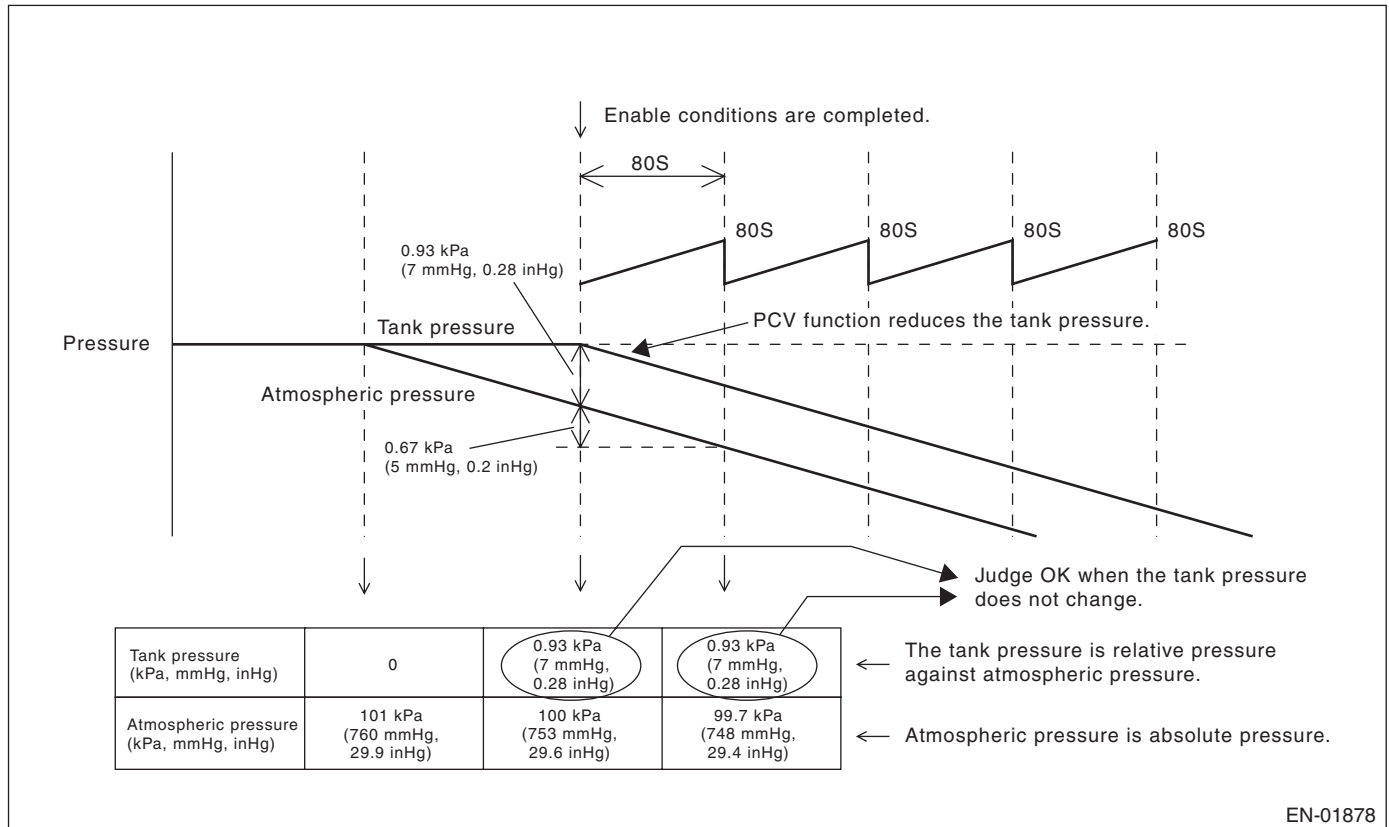
#### 1. OUTLINE OF DIAGNOSIS

Detect the tank pressure switching solenoid function abnormality.

The tank pressure sensor is a relative pressure sensor, which normally compares the pressure with the atmospheric pressure. The tank pressure switching solenoid is a solenoid, which shifts the compare space from opening to closed during the EVAP diagnosis. Detect the malfunction that the compare space remains closed. (Not judge NG after enable condition completed but assume NG before enable condition completed.)

#### • Normality Judgment

Judge OK when the fuel tank pressure does not change (or changes by less than 0.67 kPa (5 mmHg, 0.2 inHg) at atmospheric pressure changing by 0.67 kPa (5 mmHg, 0.2 inHg) or more per 80 seconds.

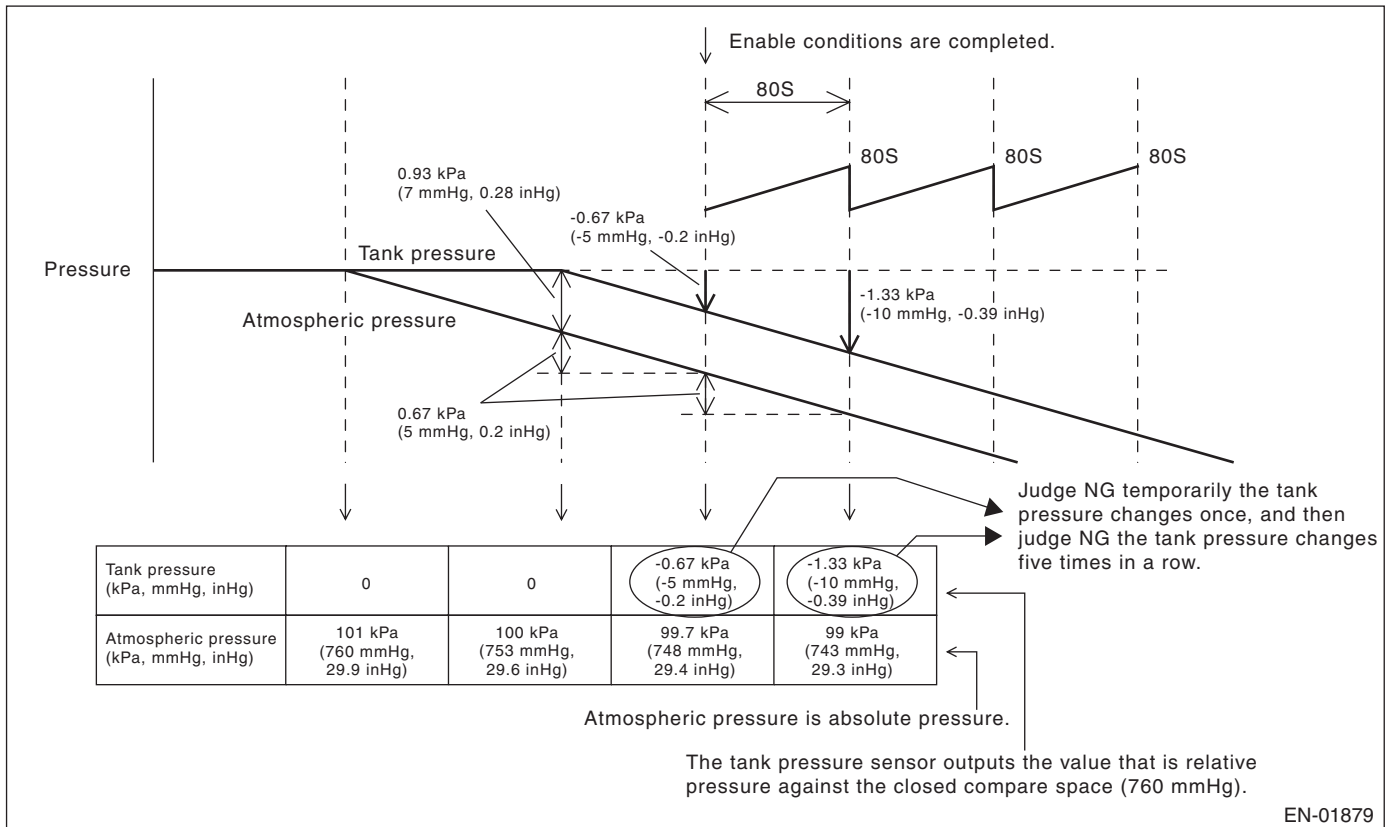


# Diagnostic Trouble Code (DTC) Detecting Criteria

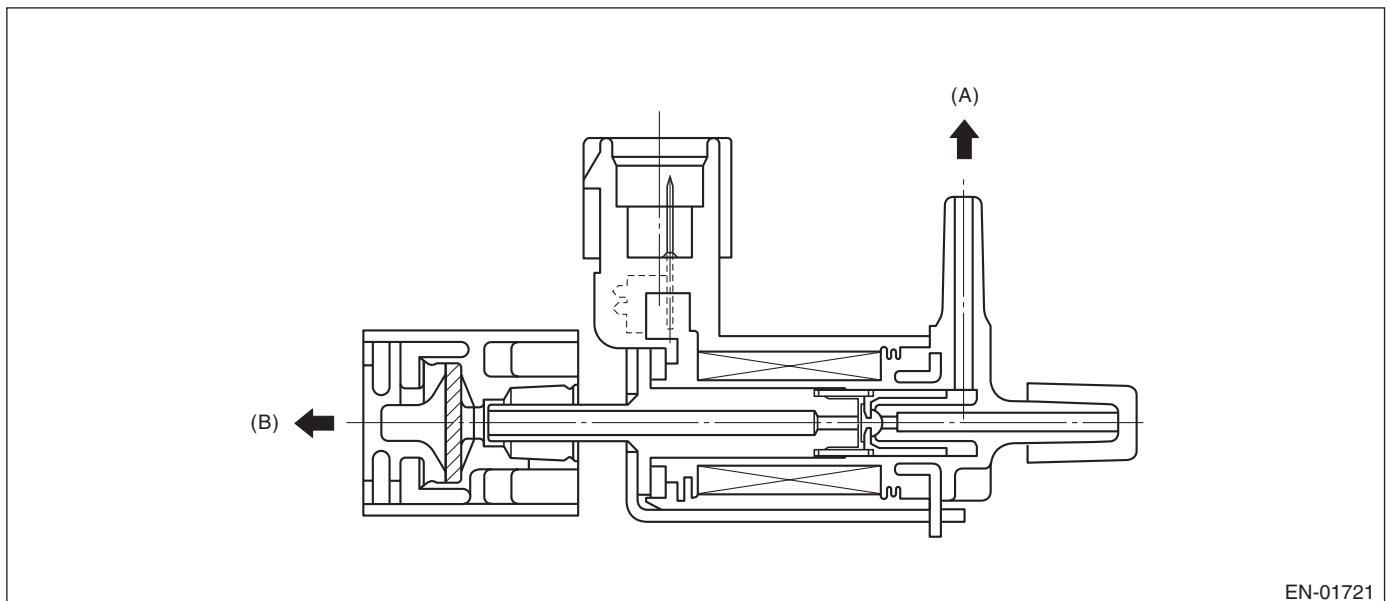
GENERAL DESCRIPTION

## • Abnormality Judgment

Judge NG temporarily when the fuel tank pressure changes by 0.67 kPa (5 mmHg, 0.2 inHg) or more at atmospheric pressure changing by 0.67 kPa (5 mmHg, 0.2 inHg) or more per 80 seconds, and then judge NG when the previous condition is completed 5 times in a row.



## 2. COMPONENT DESCRIPTION



- (A) Fuel tank pressure sensor
- (B) Ambient air

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### 3. ENABLE CONDITION

| Secondary Parameter          | Enable Condition   |
|------------------------------|--|
| Battery voltage              | $\geq 10.9$ V  |
| Fuel level                   | $9 \leftrightarrow 51$ ℓ (2.38 $\leftrightarrow$ 13.3 US gal, 1.98 $\leftrightarrow$ 11.2 Imp gal) |
| Evaporation system diagnosis | Not in operation   |
| After starting the engine    | 80 seconds or more   |
| Fuel tank pressure           | $< -0.67$ kPa ( $-5$ mmHg, $-0.2$ inHg) or $> -0.93$ kPa (7 mmHg, 0.28 inHg)                       |

### 4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the fuel tank pressure is large or small in 80 seconds or more after starting the engine.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the malfunction criteria below is completed 5 times.

#### Judgment Value

| Malfunction Criteria                    | Threshold Value                        |
|---|--|
| Atmospheric air change in 80 seconds    | $\geq 0.67$ kPa (4.5 mmHg, 0.2 inHg)   |
| Fuel tank pressure change in 80 seconds | $\geq 0.67$ kPa (4.5 mmHg, 0.2 inHg)   |
| Fuel level change                       | $< 2.25$ ℓ (0.59 US gal, 0.49 Imp gal) |

**Time Needed for Diagnosis:** 80 seconds  $\times$  5 times

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

#### Judgment Value

| Malfunction Criteria                    | Threshold Value                      |
|---|--------------------------------------|
| Atmospheric air change in 80 seconds    | $\geq 0.67$ kPa (4.5 mmHg, 0.2 inHg) |
| Fuel tank pressure change in 80 seconds | $< 0.67$ kPa (4.5 mmHg, 0.2 inHg)    |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

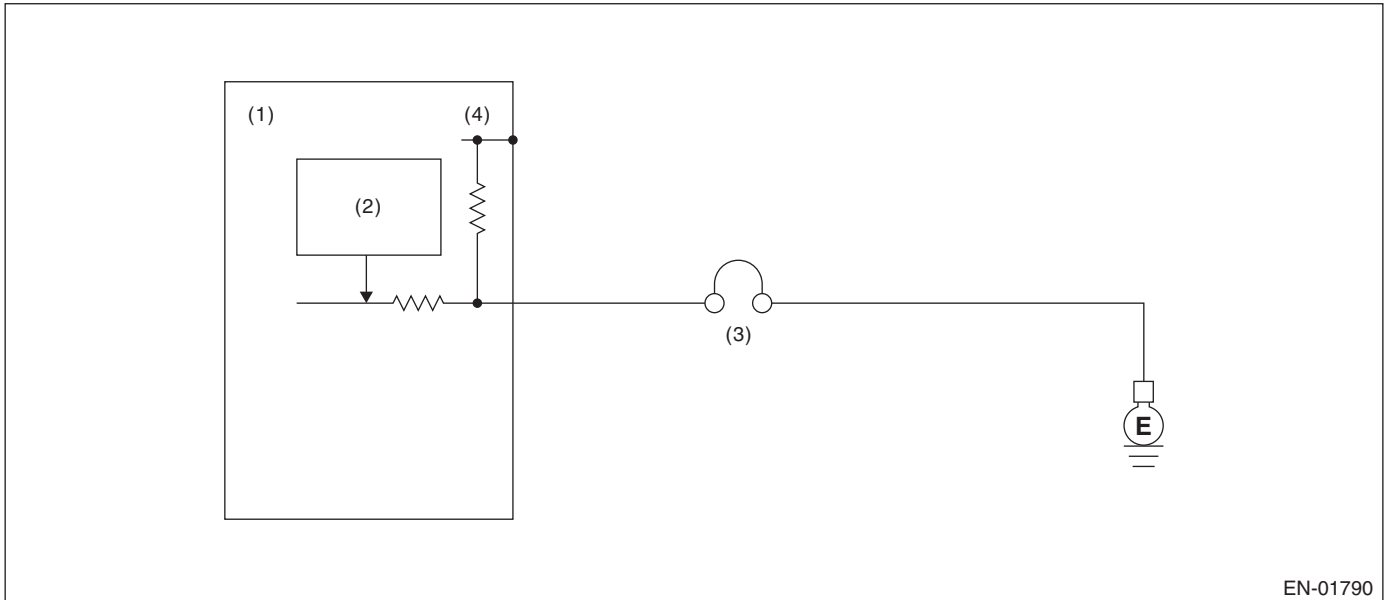
GENERAL DESCRIPTION

## CN:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

### 1. OUTLINE OF DIAGNOSIS

Detect the blow-by hose release abnormality.  
Judge NG when the diagnosis terminal voltage is high.

### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Detecting circuit
- (3) PCV diagnosis connector
- (4) 5 V

### 3. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---------------------|------------------|
| None                |                  |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSIS METHOD

#### • Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 1 second.

#### Judgment Value

| Malfunction Criteria                             | Threshold Value           |
|--|---------------------------|
| Battery voltage                                  | > 10.9 V                  |
| Before and after starting the engine             | After starting the engine |
| Positive crankcase ventilation diagnosis voltage | High                      |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

### Judgment Value

| Malfunction Criteria                             | Threshold Value           |
|--|---------------------------|
| Battery voltage                                  | > 10.9 V                  |
| Before and after starting the engine             | After starting the engine |
| Positive crankcase ventilation diagnosis voltage | Low                       |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was performed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

None

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnosis value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## CO:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge OFF NG when it turns to “after engine starting” while the starter has never been set to ON.

### 2. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge OFF NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### Judgment Value

| Malfunction Criteria   | Threshold Value     |
|--|---------------------|
| Vehicle speed<br>It took more than 0.8 seconds at engine starting, and then it turned after engine starting. | < 1 km/h (0.62 MPH) |
| Starter ON   | Not experienced     |
| Starter ON diagnosis   | Not diagnosed       |
| Battery voltage  | > 8 V               |

#### Time Needed for Diagnosis:

Not determined.

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

#### • Normality Judgment

Judge OFF OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Starter ON           | Experienced     |
| Starter ON diagnosis | Diagnosed       |
| Battery voltage      | > 8 V           |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

### 7. FAIL SAFE

None

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### CP:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the back-up voltage circuit.

Judge NG when the back-up voltage becomes smaller than the battery voltage.

#### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---------------------|------------------|
| None                |                  |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

##### Judgment Value

| Malfunction Criteria                 | Threshold Value           |
|--------------------------------------|---------------------------|
| Voltage of back-up power             | Low                       |
| Battery voltage                      | $\geq 10.9$ V             |
| Before and after starting the engine | After starting the engine |

**Time Needed for Diagnosis:** 2.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

##### Judgment Value

| Malfunction Criteria                 | Threshold Value           |
|--------------------------------------|---------------------------|
| Voltage of back-up power supply      | High                      |
| Battery voltage                      | $\geq 10.9$ V             |
| Before and after starting the engine | After starting the engine |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

None

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## **CQ:DTC P1570 ANTENNA**

### **1. OUTLINE OF DIAGNOSIS**

For the detection standard, refer to P0513.

<Ref. to GD(STI)-172, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

## **CR:DTC P1571 REFERENCE CODE INCOMPATIBILITY**

### **1. OUTLINE OF DIAGNOSIS**

For the detection standard, refer to P0513.

<Ref. to GD(STI)-172, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

## **CS:DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)**

### **1. OUTLINE OF DIAGNOSIS**

For the detection standard, refer to P0513.

<Ref. to GD(STI)-172, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

## **CT:DTC P1574 KEY COMMUNICATION FAILURE**

### **1. OUTLINE OF DIAGNOSIS**

For the detection standard, refer to P0513.

<Ref. to GD(STI)-172, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

## **CU:DTC P1576 EGI CONTROL MODULE EEPROM**

### **1. OUTLINE OF DIAGNOSIS**

For the detection standard, refer to P0513.

<Ref. to GD(STI)-172, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

## **CV:DTC P1577 IMM CONTROL MODULE EEPROM**

### **1. OUTLINE OF DIAGNOSIS**

For the detection standard, refer to P0513.

<Ref. to GD(STI)-172, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### CW:DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge open fixing malfunction when the opening degree is large even after finishing the tumble generator valve open driving.

#### 2. ENABLE CONDITION

| Secondary Parameters       | Enable Conditions             |
|----------------------------|-------------------------------|
| Battery voltage            | $\geq 10.9 \text{ V}$         |
| Engine coolant temperature | $\geq 0^\circ\text{C}$ (32°F) |
| Ambient temperature        | $\geq 0^\circ\text{C}$ (32°F) |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

##### Judgment Value

| Malfunction Criteria                         | Threshold Value     |
|--|---------------------|
| Tumble generator valve angle                 | $\geq 67.4^\circ$   |
| Tumble generator valve "close" signal output | 2.2 seconds or more |

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria                         | Threshold Value     |
|--|---------------------|
| Tumble generator valve angle                 | $< 67.4^\circ$      |
| Tumble generator valve "close" signal output | 2.2 seconds or more |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the open signal.

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## CX:DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2)

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge open fixing malfunction when the opening degree is large even after finishing the tumble generator valve closing driving.

### 2. ENABLE CONDITION

| Secondary Parameters       | Enable Conditions                                 |
|----------------------------|---|
| Battery voltage            | $\geq 10.9 \text{ V}$                             |
| Engine coolant temperature | $\geq 0^{\circ}\text{C}$ ( $32^{\circ}\text{F}$ ) |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### Judgment Value

| Malfunction Criteria                         | Threshold Value     |
|--|---------------------|
| Tumble generator valve angle                 | $\geq 67.4^{\circ}$ |
| Tumble generator valve "close" signal output | 2.2 seconds or more |

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                         | Threshold Value     |
|--|---------------------|
| Tumble generator valve angle                 | $< 67.4^{\circ}$    |
| Tumble generator valve "close" signal output | 2.2 seconds or more |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the open signal.

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### CY:DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge close fixing malfunction when the opening degree is small even after finishing the tumble generator valve open driving.

#### 2. ENABLE CONDITION

| Secondary Parameters       | Enable Conditions                                 |
|----------------------------|---|
| Battery voltage            | $\geq 10.9 \text{ V}$                             |
| Engine coolant temperature | $\geq 0^{\circ}\text{C}$ ( $32^{\circ}\text{F}$ ) |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

##### Judgment Value

| Malfunction Criteria                        | Threshold Value     |
|---|---------------------|
| Tumble generator valve angle                | $< 67.4^{\circ}$    |
| Tumble generator valve "open" signal output | 1.4 seconds or more |

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria                        | Threshold Value     |
|---|---------------------|
| Tumble generator valve angle                | $\geq 67.4^{\circ}$ |
| Tumble generator valve "open" signal output | 1.4 seconds or more |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the close signal.

#### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## CZ:DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2)

### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge close fixing malfunction when the opening degree is small even after finishing the tumble generator valve open driving.

### 2. ENABLE CONDITION

| Secondary Parameters       | Enable Conditions |
|----------------------------|-------------------|
| Battery voltage            | ≥ 10.9 V          |
| Engine coolant temperature | ≥ 0°C (32°F)      |

### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 4. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

#### Judgment Value

| Malfunction Criteria                        | Threshold Value     |
|---|---------------------|
| Tumble generator valve angle                | < 67.4°             |
| Tumble generator valve "open" signal output | 1.4 seconds or more |

**Time Needed for Diagnosis:** 3 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria                        | Threshold Value     |
|---|---------------------|
| Tumble generator valve angle                | ≥ 67.4°             |
| Tumble generator valve "open" signal output | 1.4 seconds or more |

### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the close signal.

### 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

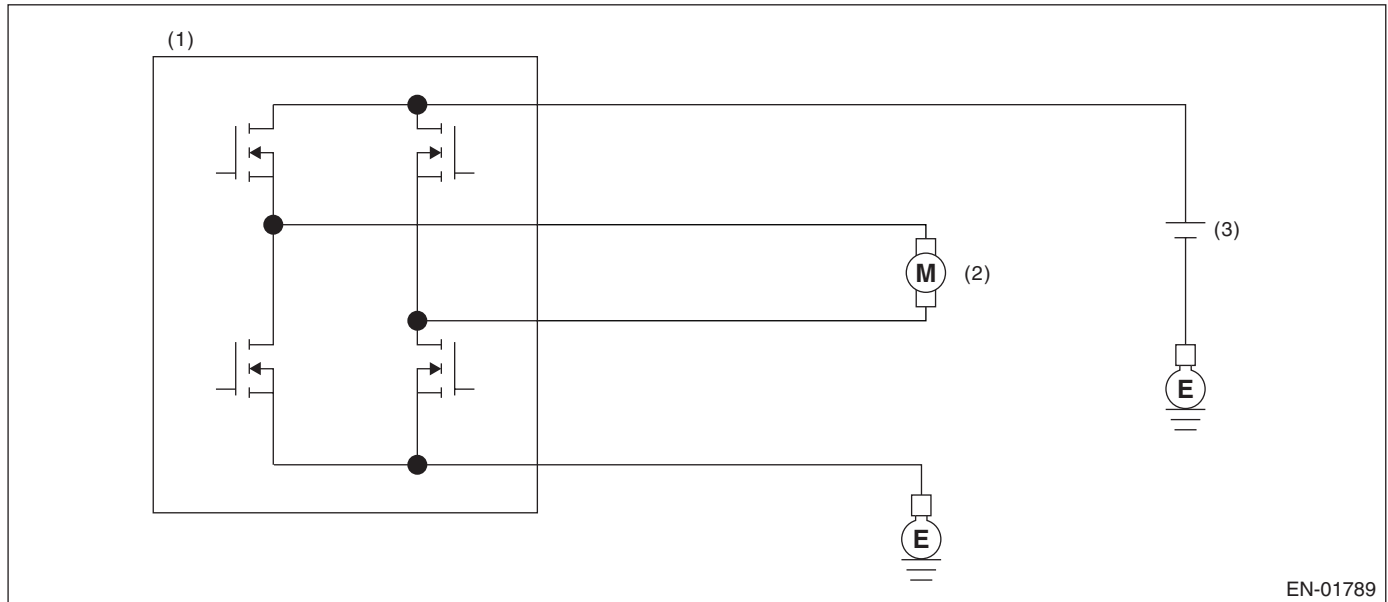
### DA:DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the open signal is sent from IC after tumble generator valve driving IC diagnosis.

#### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

EN-01789

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | $\geq 10.9$ V     |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generator valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge open NG when the open NG signal is sent 20 times in a row. Judge OK and clear the NG when the OK signal is sent.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Current              | $< 5$ mA        |

**Time Needed for Diagnosis:** 2 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

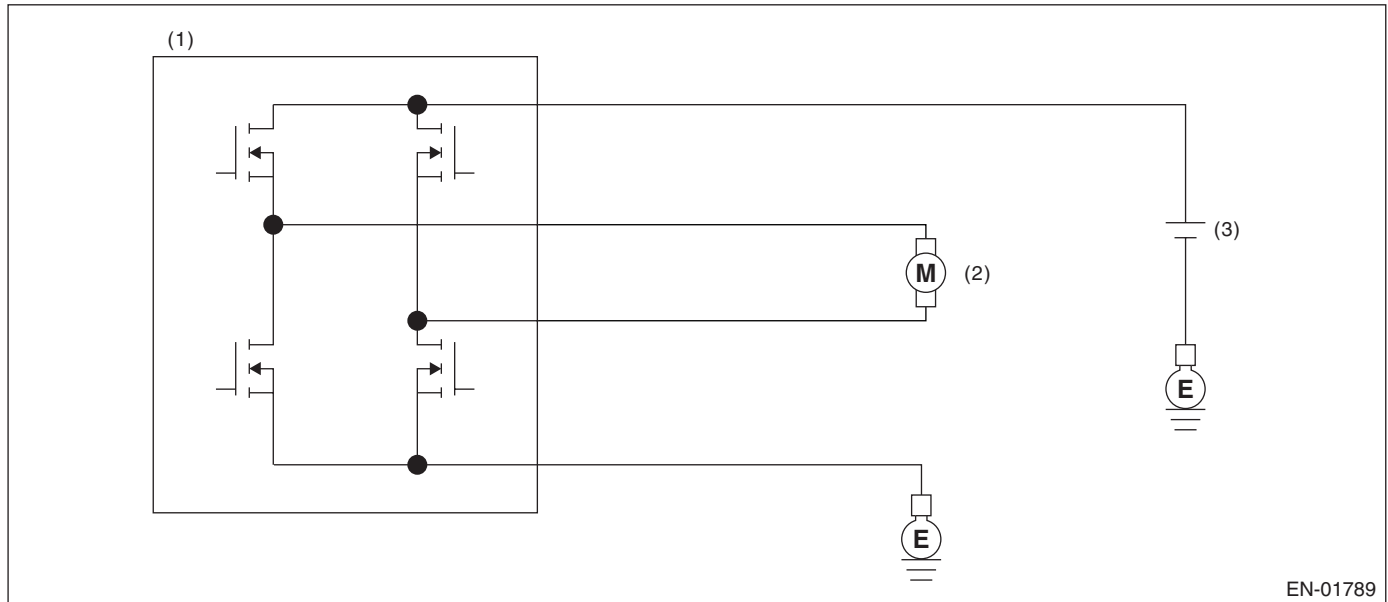
### DB:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

#### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

EN-01789

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | $\geq 10.9$ V     |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generator valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge overcurrent NG when the overcurrent NG signal is sent 10 times in a row. Judge OK and clear the NG when the OK signal is sent.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Current              | $> 3$ A         |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

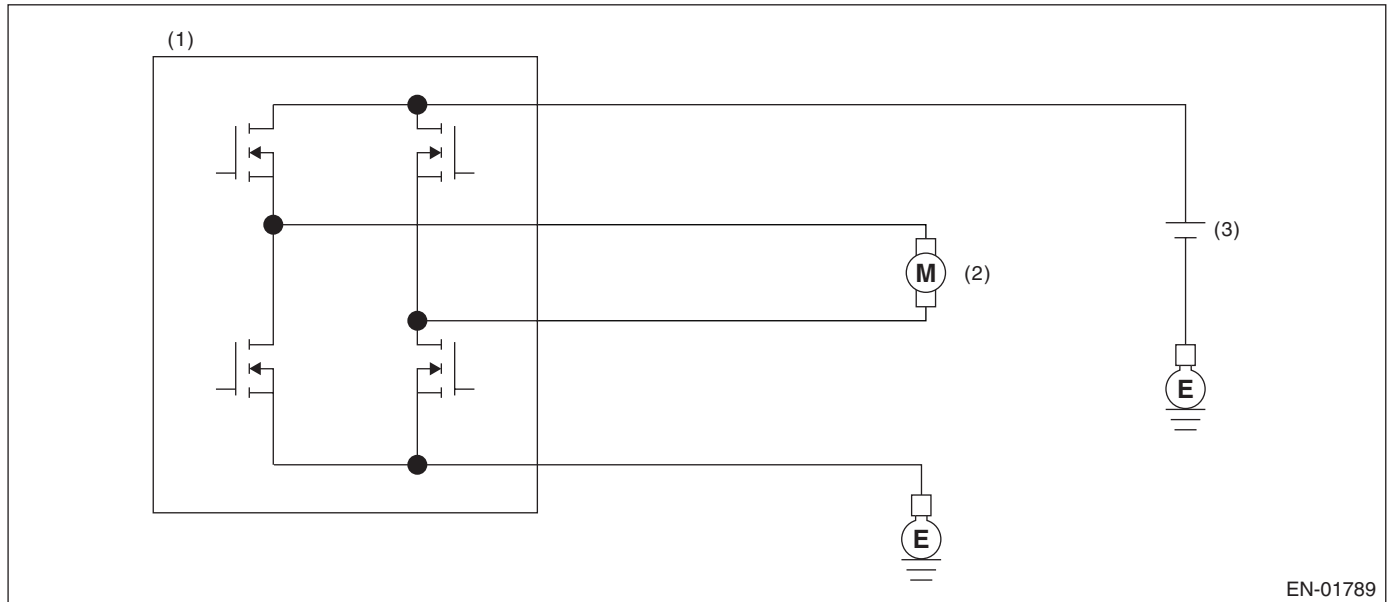
### DC:DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the open signal is sent from IC after tumble generator valve driving IC diagnosis.

#### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | $\geq 10.9$ V     |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generator valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge open NG when the open NG signal is sent 20 times in a row. Judge OK and clear the NG when the OK signal is sent.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Current              | $< 5$ mA        |

**Time Needed for Diagnosis:** 2 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

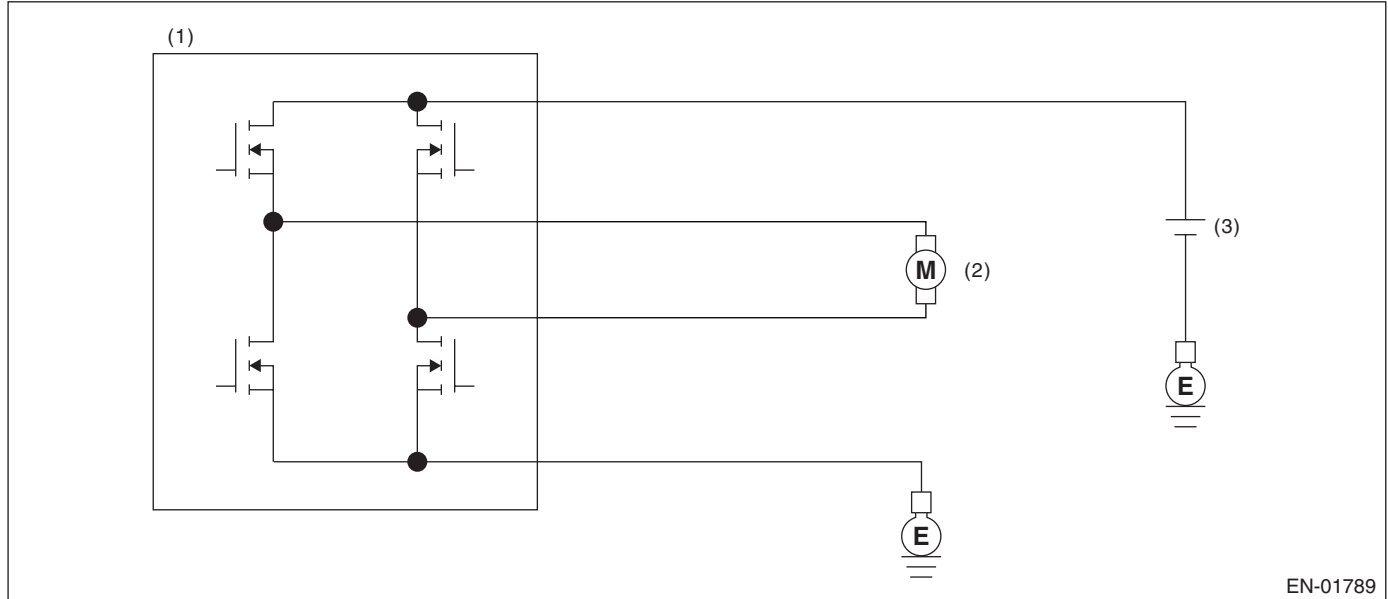
### DD:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

#### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Battery voltage      | $\geq 10.9$ V     |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generator valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge overcurrent NG when the overcurrent NG signal is sent 10 times in a row.

Judge OK and clear the NG when the OK signal is sent.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Current              | $> 3$ A         |

**Time Needed for Diagnosis:** 1 second

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

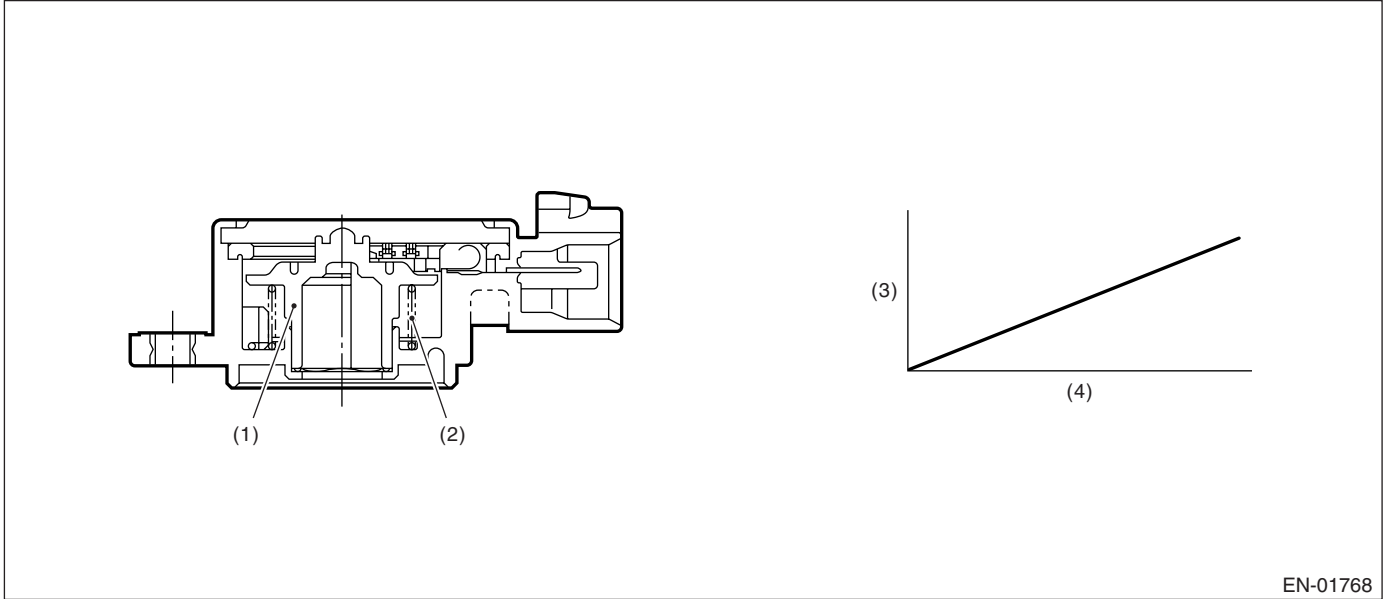
## GENERAL DESCRIPTION

### DE:DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT LOW (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.  
Judge NG when the value is out of standard range.

#### 2. COMPONENT DESCRIPTION



- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform diagnosis.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.167 V       |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Tumble generator valve position

- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

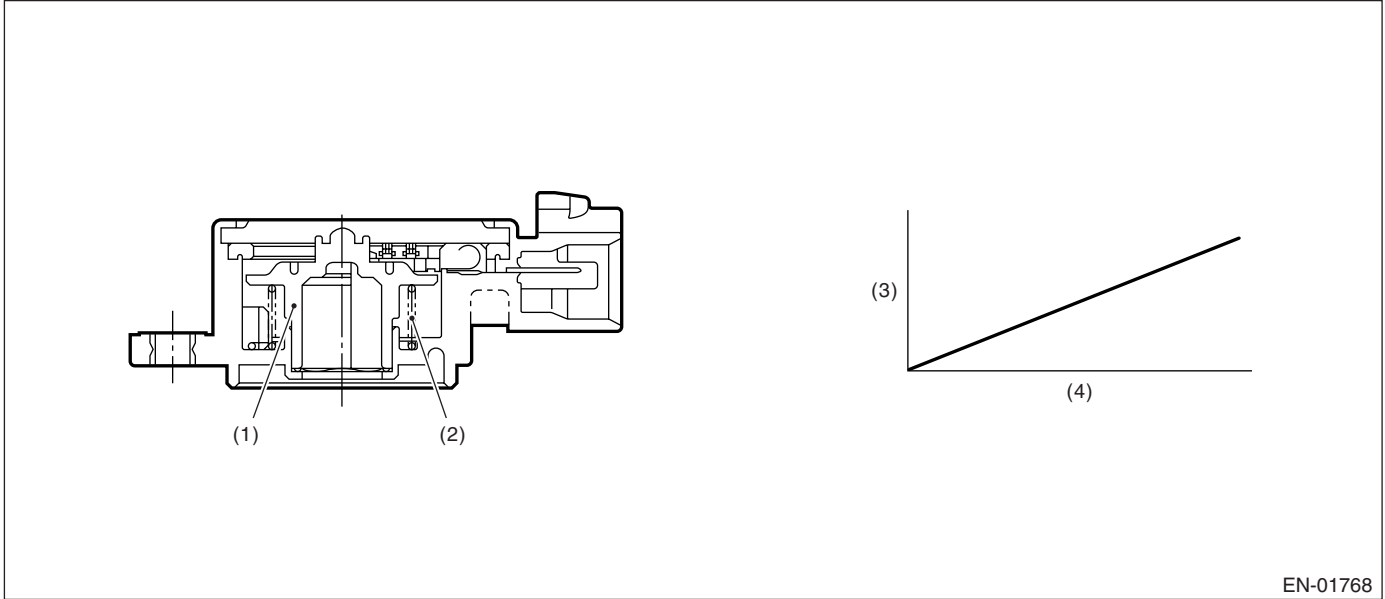
## GENERAL DESCRIPTION

### DF:DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT HIGH (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.  
Judge NG when the value is out of standard range.

#### 2. COMPONENT DESCRIPTION



- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform diagnosis.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.843$ V  |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Tumble generator valve position

- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

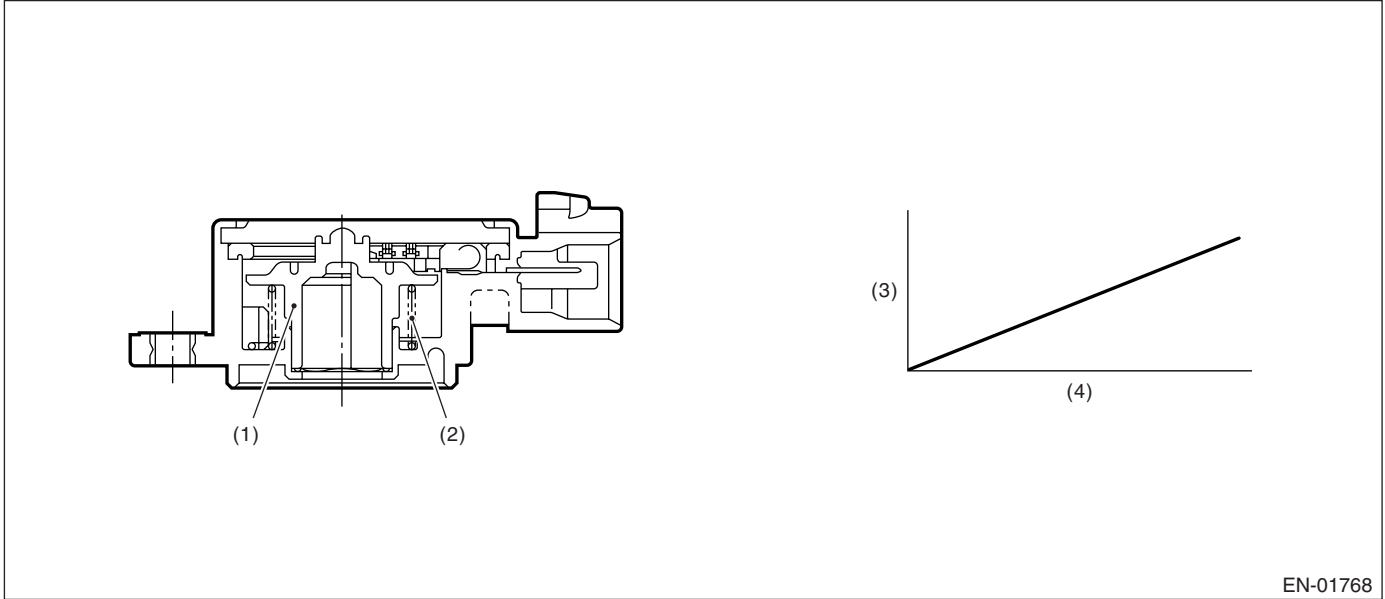
## GENERAL DESCRIPTION

### DG:DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT LOW (BANK 2)

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.  
Judge NG when the value is out of standard range.

#### 2. COMPONENT DESCRIPTION



- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform diagnosis.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | < 0.167 V       |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Tumble generator valve position

- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

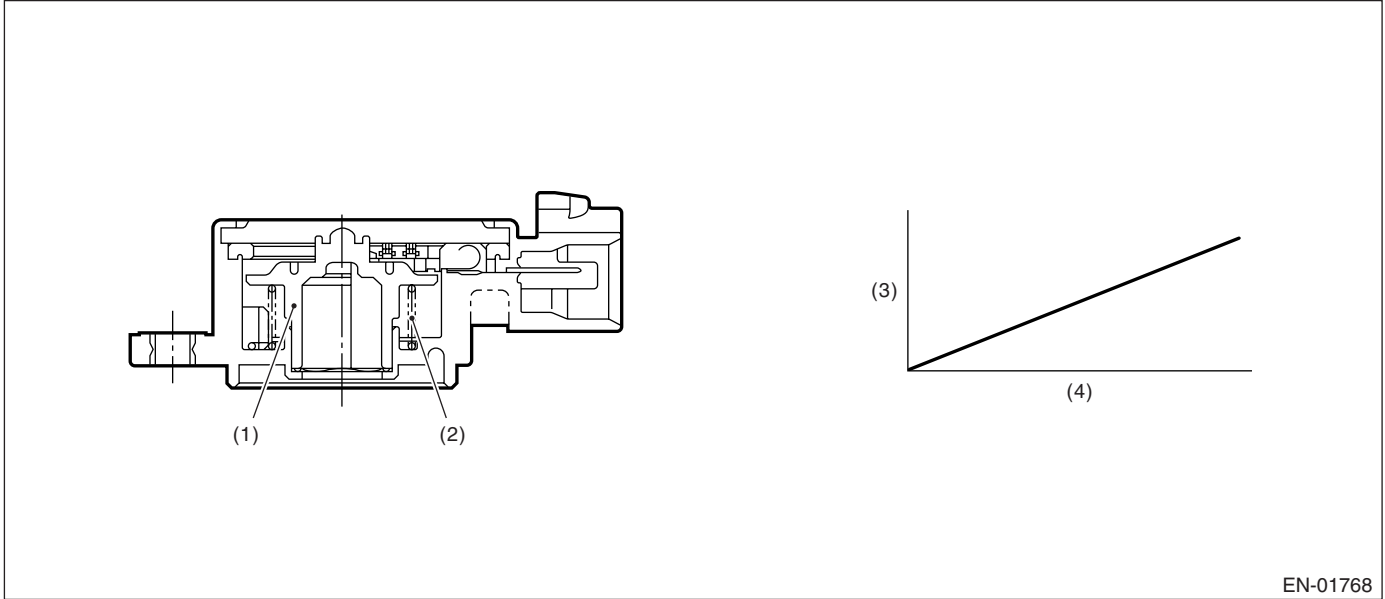
## GENERAL DESCRIPTION

### DH:DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT HIGH (BANK 2)

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.  
Judge NG when the value is out of standard range.

#### 2. COMPONENT DESCRIPTION



- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform diagnosis.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Output voltage       | $\geq 4.843$ V  |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

## 8. FAIL SAFE

Tumble generator valve position

- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

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### DI: DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

#### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---------------------|------------------|
| Battery voltage     | $\geq 10.9$ V    |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### Judgment Value

| Malfunction Criteria        | Threshold Value |
|-----------------------------|-----------------|
| OCV control duty            | $\geq 99.61\%$  |
| OCV control present current | $< 0.306$ A     |

**Time Needed for Diagnosis:** 2,000 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### Judgment Value

| Malfunction Criteria                                       | Threshold Value |
|--|-----------------|
| Target current value of OCV                                | $\geq 0.14\%$   |
| Target current value of OCV – Control current value of OCV | $\geq 0.08$ A   |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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## 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### DJ:DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1)

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

#### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---------------------|------------------|
| Battery voltage     | $\geq 10.9$ V    |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### Judgment Value

| Malfunction Criteria        | Threshold Value |
|-----------------------------|-----------------|
| OCV control duty            | $< 0.39\%$      |
| OCV control present current | $\geq 0.306$ A  |

**Time Needed for Diagnosis:** 2,000 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### Judgment Value

| Malfunction Criteria                                       | Threshold Value |
|--|-----------------|
| Target current value of OCV – Control current value of OCV | $< 0.08$ A      |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### DK:DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2)

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

#### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---------------------|------------------|
| Battery voltage     | $\geq 10.9$ V    |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### Judgment Value

| Malfunction Criteria        | Threshold Value |
|-----------------------------|-----------------|
| OCV control duty            | $\geq 99.61\%$  |
| OCV control present current | $< 0.306$ A     |

**Time Needed for Diagnosis:** 2,000 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### Judgment Value

| Malfunction Criteria                                       | Threshold Value |
|--|-----------------|
| Target current value of OCV                                | $\geq 0.14\%$   |
| Target current value of OCV – Control current value of OCV | $\geq 0.08$ A   |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### DL:DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2)

#### 1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

#### 2. ENABLE CONDITION

| Secondary Parameter | Enable Condition |
|---------------------|------------------|
| Battery voltage     | $\geq 10.9$ V    |

#### 3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 4. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### Judgment Value

| Malfunction Criteria        | Threshold Value |
|-----------------------------|-----------------|
| OCV control duty            | $< 0.39\%$      |
| OCV control present current | $\geq 0.306$ A  |

**Time Needed for Diagnosis:** 2,000 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|--|-----------------|
| $ $ Target current value of OCV – Control current value of OCV $ $ | $< 0.08$ A      |

#### 5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 7. FAIL SAFE

- Ignition timing whole learning compensation:
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  - Make the OCV driving Duty to be the given value (9.36%).

## 8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### DM:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

#### 1. OUTLINE OF DIAGNOSIS

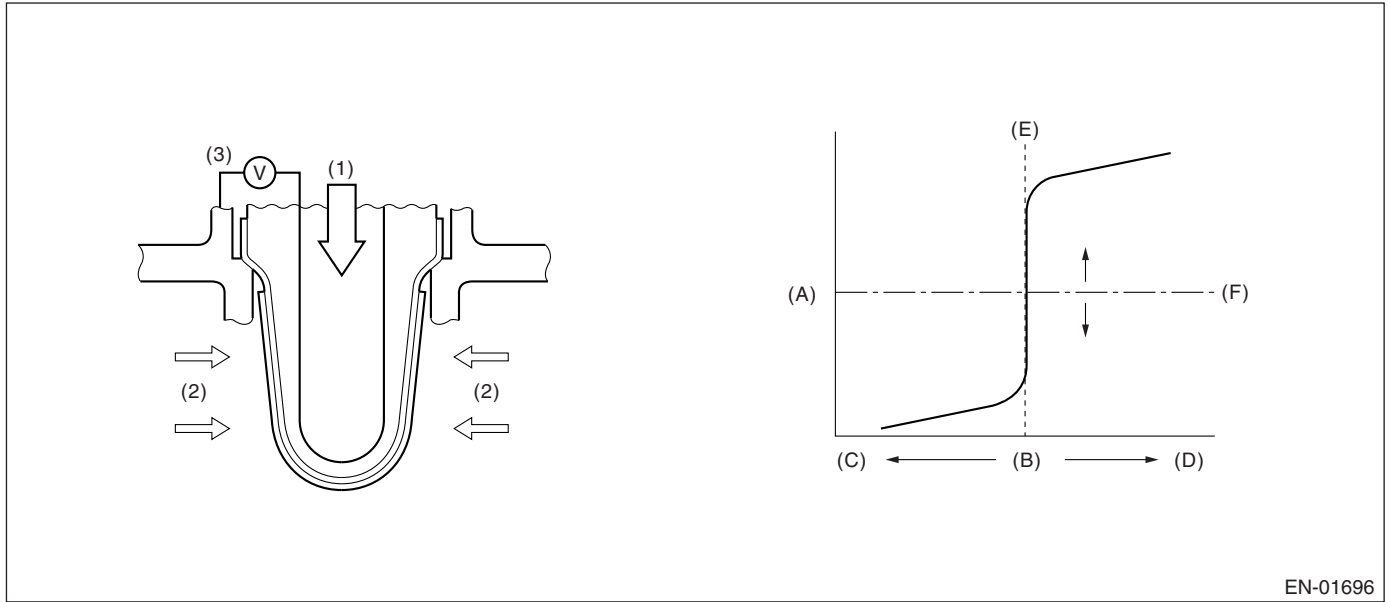
Detect the malfunction of fuel system from the amount of sub feedback control, if it is shifted to lean.

If the sub feedback amount from the engine started till ignition switch OFF is shifted to rich or lean, judge as insufficient sub feedback amount.

If insufficient, change the sub feedback amount guard value and shift judge line, and increment the guard operation counter (tentative NG counter).

Judge NG when the guard operation counter (tentative NG counter) exceeds the specified value and sub feedback amount is shifted to lean.

#### 2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich
- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

#### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions        |
|---|--------------------------|
| Engine coolant temperature  | ≥ 40 degC and < 105 degC |
| Accumulative time of closed loop control with secondary oxygen sensor | 130 secs.                |
| Closed loop control with secondary oxygen sensor                      | In operation             |
| Idling SW   | Off                      |
| Accumulative time of vehicle speed above 75 km/h (rich side only)     | 55 secs.                 |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis at a speed of more than 75 km/h (47 MPH).

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Average of fuel trim parameter based on a secondary oxygen sensor             | < -0.03         |
| Count of limits moving to rich  | ≥ 4 count       |
| Ratio of time for oxygen sensor upper or lower to time or rich time/lean time | ≥ 1.5           |

**Time Needed for Diagnosis:** 600 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous driving cycles.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### DN:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

#### 1. OUTLINE OF DIAGNOSIS

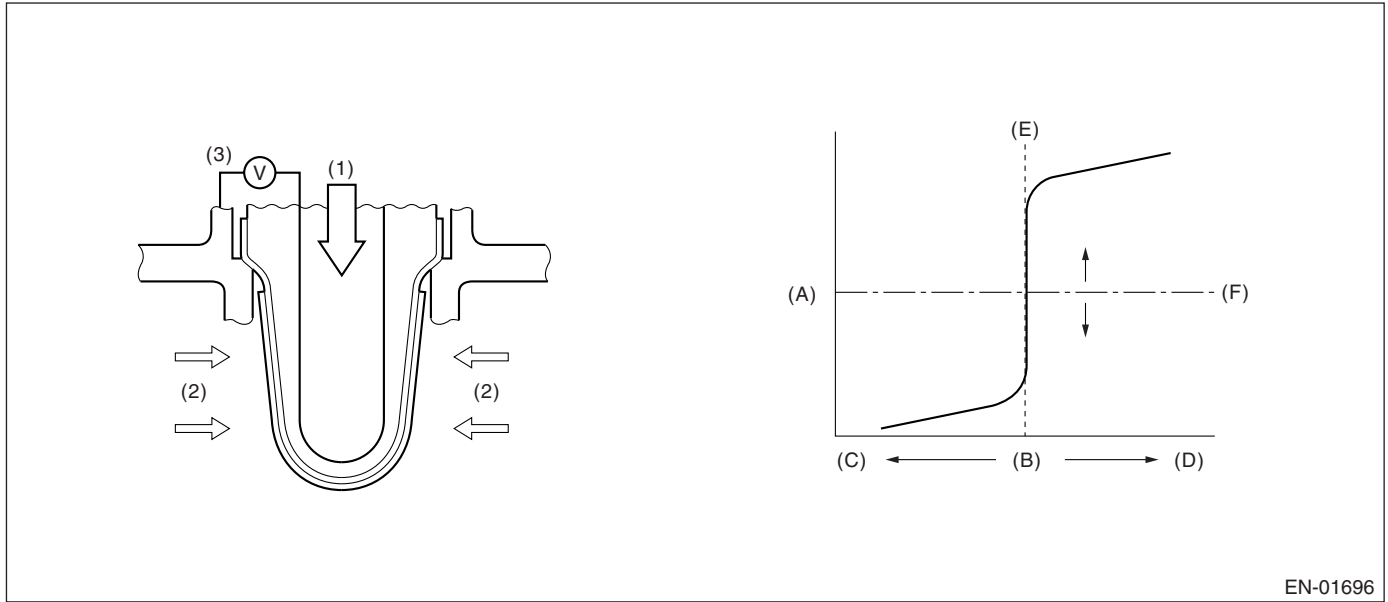
Detect the malfunction of fuel system from the amount of sub feedback control, if it is shifted to lean.

If the sub feedback amount from the engine started till ignition switch OFF is shifted to rich or lean, judge as insufficient sub feedback amount.

If insufficient, change the sub feedback amount guard value and shift judge line, and increment the guard operation counter (tentative NG counter).

Judge NG when the guard operation counter (tentative NG counter) exceeds the specified value and sub feedback amount is shifted to lean.

#### 2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich
- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

#### 3. ENABLE CONDITION

| Secondary Parameters  | Enable Conditions               |
|---|---------------------------------|
| Engine coolant temperature  | $\geq 40$ degC and $< 105$ degC |
| Accumulative time of closed loop control with secondary oxygen sensor | 130 secs.                       |
| Closed loop control with secondary oxygen sensor                      | In operation                    |
| Idling SW   | Off                             |
| Accumulative time of vehicle speed above 75 km/h (rich side only)     | 55 secs.                        |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis at a speed of more than 75 km/h (47 MPH).

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

### Judgment Value

| Malfunction Criteria  | Threshold Value |
|---|-----------------|
| Average of fuel trim parameter based on a secondary oxygen sensor             | $\geq 0.025$    |
| Count of limits moving to lean  | $\geq 4$ count  |
| Ratio of time for oxygen sensor upper or lower to time or rich time/lean time | $\leq 5.6$      |

**Time Needed for Diagnosis:** 600 seconds

**Malfunction Indicator Light Illumination:** Illuminates when malfunction occurs in 2 continuous drive cycles.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When "Clear Memory" was performed

## 8. FAIL SAFE

None

## 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)



# Diagnostic Trouble Code (DTC) Detecting Criteria

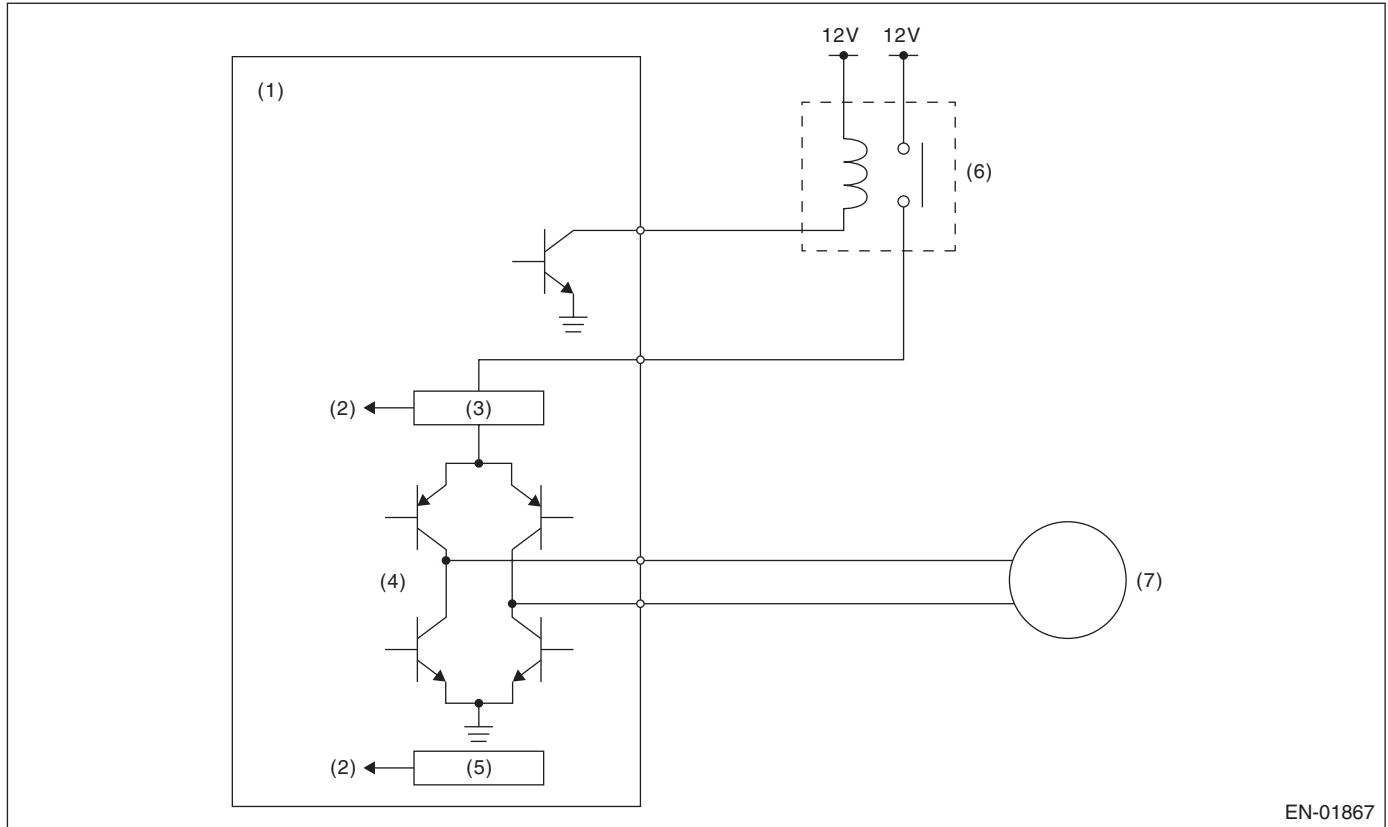
## GENERAL DESCRIPTION

### DO:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the motor current becomes large or drive circuit is heated.

#### 2. COMPONENT DESCRIPTION



EN-01867

- |                                   |                                       |
|-----------------------------------|---------------------------------------|
| (1) Engine control unit (ECM)     | (5) Temperature detection circuit     |
| (2) Detection circuit             | (6) Electronic control throttle relay |
| (3) Overcurrent detection circuit | (7) Motor                             |
| (4) Drive circuit                 |                                       |

#### 3. ENABLE CONDITION

| Secondary Parameters                         | Enable Conditions |
|--|-------------------|
| Under control of electronic control throttle | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria            | Threshold Value                  |
|---------------------------------|----------------------------------|
| Motor current                   | $\leq 8 \text{ A}$               |
| Drive circuit inner temperature | $\leq 175^\circ\text{C}$ (347°F) |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## Time Needed for Diagnosis:

- 500 milliseconds (NG judgment)
- 2,000 milliseconds (OK judgment)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

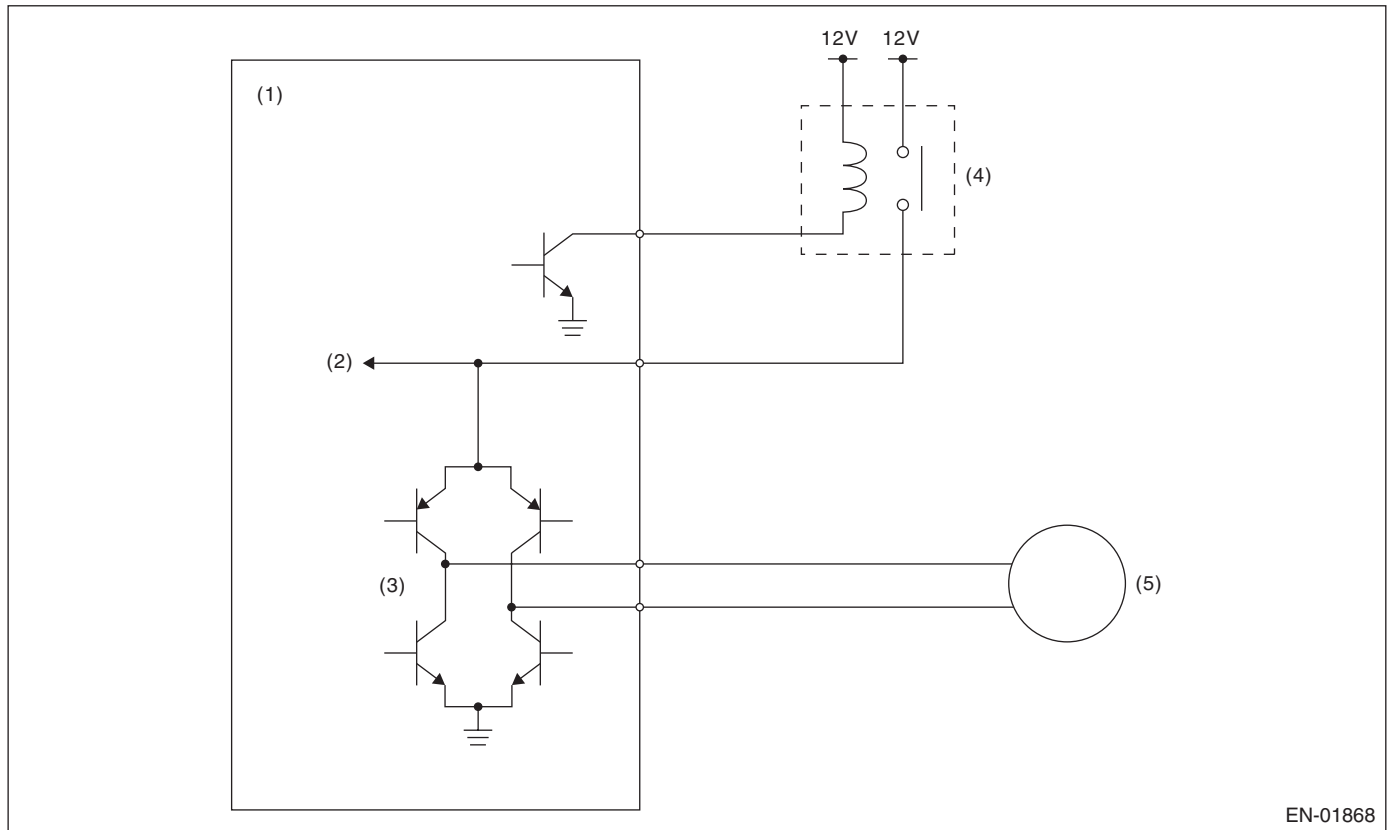
## GENERAL DESCRIPTION

### DP:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electronic throttle control relay to ON.

#### 2. COMPONENT DESCRIPTION



EN-01868

- (1) Engine control module (ECM)
- (2) Voltage detection circuit
- (3) Drive circuit
- (4) Electronic control throttle relay
- (5) Motor

#### 3. ENABLE CONDITION

| Secondary Parameters                     | Enable Conditions |
|--|-------------------|
| Electronic control throttle relay output | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Motor power voltage  | $\geq 5$ V      |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## Time Needed for Diagnosis:

- 400 milliseconds (For NG)
- 2,000 milliseconds (For OK)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

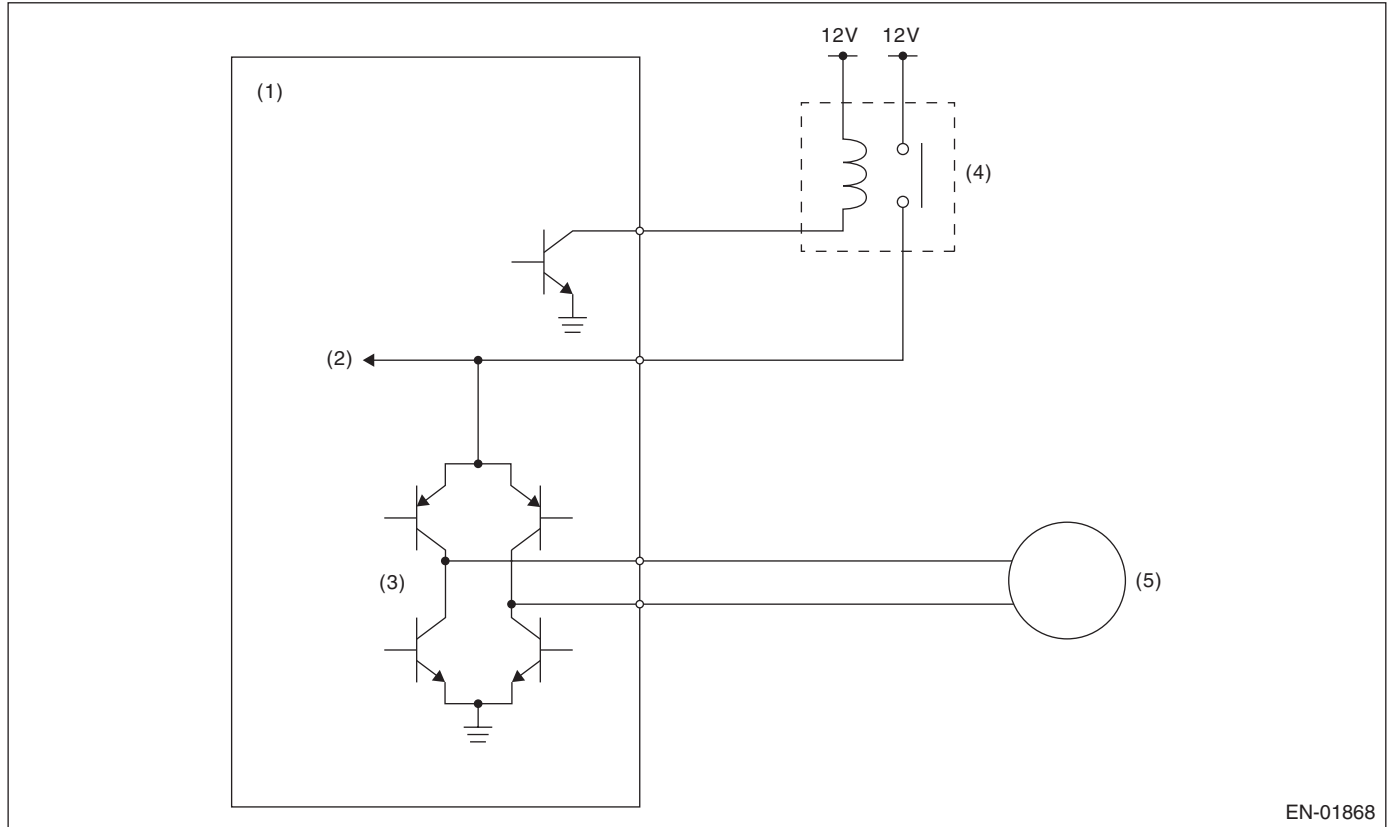
## GENERAL DESCRIPTION

### DQ:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electronic throttle control relay to OFF.

#### 2. COMPONENT DESCRIPTION



EN-01868

- (1) Engine control module (ECM)
- (2) Voltage detection circuit
- (3) Drive circuit
- (4) Electronic control throttle relay
- (5) Motor

#### 3. ENABLE CONDITION

| Secondary Parameters                     | Enable Conditions |
|--|-------------------|
| Electronic control throttle relay output | OFF               |

#### 4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Motor power voltage  | ≤ 5 V           |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## Time Needed for Diagnosis:

- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

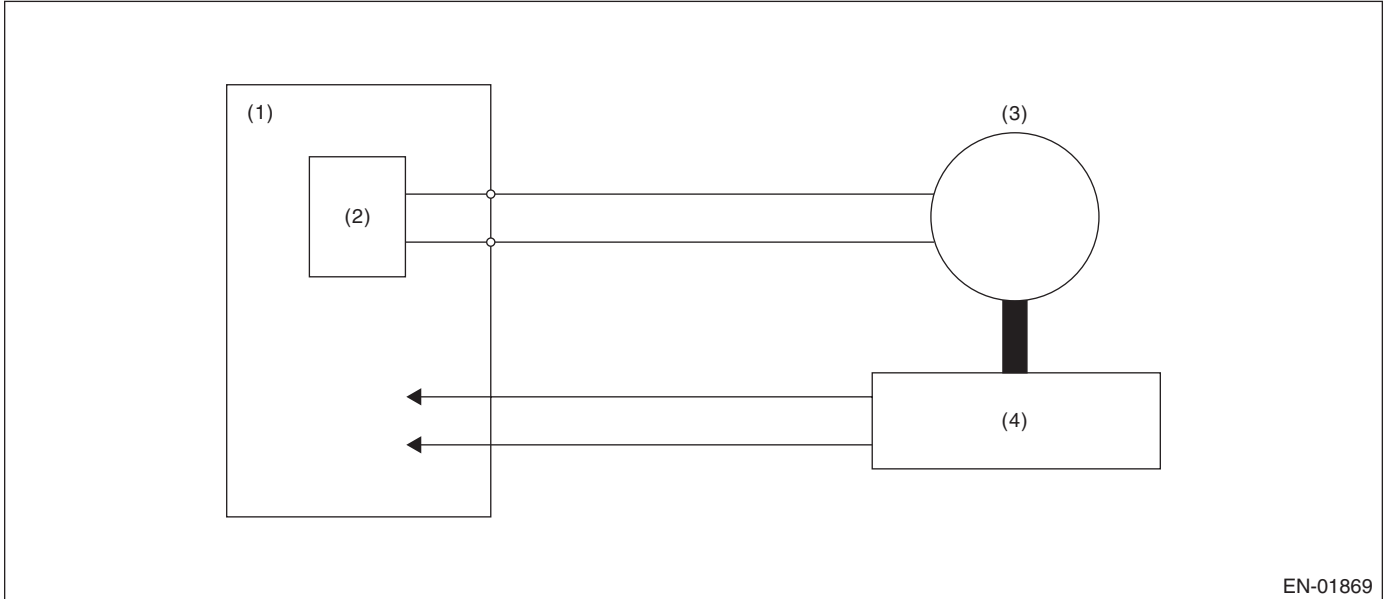
## GENERAL DESCRIPTION

### DR:DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when all close point learning cannot be conducted or an abnormal value is detected.

#### 2. COMPONENT DESCRIPTION



EN-01869

- (1) Engine control module (ECM)
- (2) Drive circuit
- (3) Motor
- (4) Throttle position sensor

#### 3. ENABLE CONDITION

| Secondary Parameters                      | Enable Conditions |
|---|-------------------|
| Ignition switch                           | ON → OFF          |
| Ignition switch (after clear memory only) | OFF → ON          |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis at all close point learning.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria                                | Threshold Value        |
|---|------------------------|
| Throttle sensor voltage at all close point learning | 0.41 — 0.79 V          |
| Time for all close point learning completion        | Within 80 milliseconds |

**Time Needed for Diagnosis:** None

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)



# Diagnostic Trouble Code (DTC) Detecting Criteria

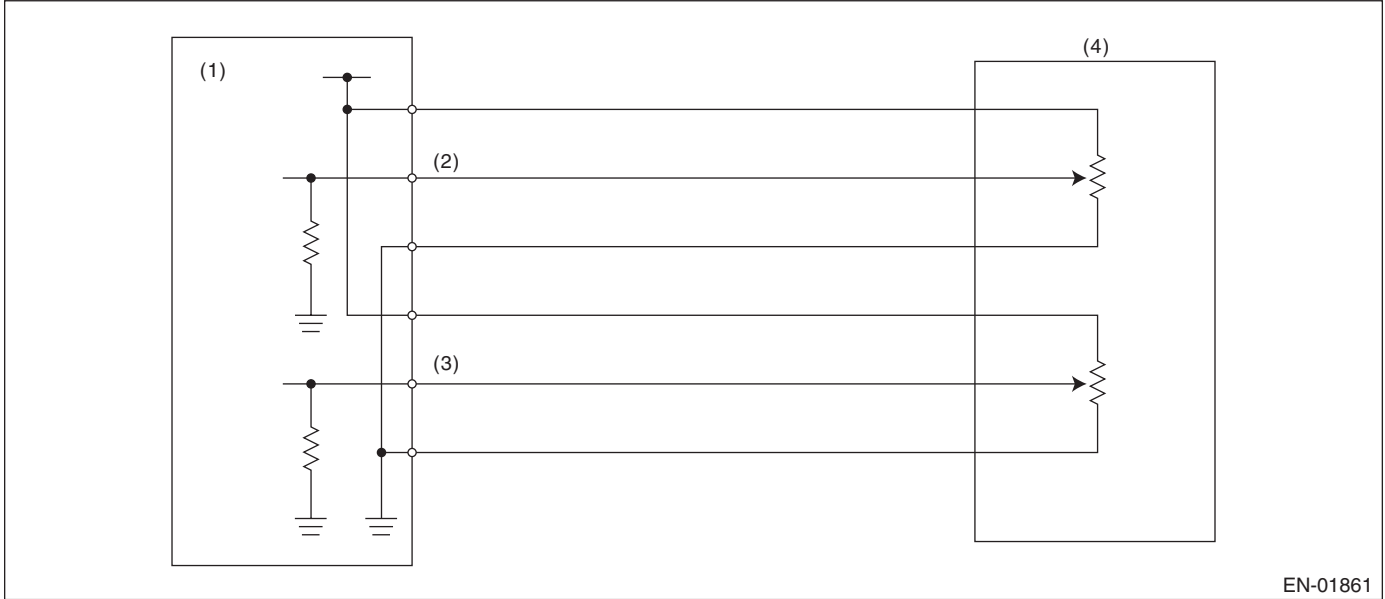
## GENERAL DESCRIPTION

### DS:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



EN-01861

- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\geq 0.308$ V  |

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

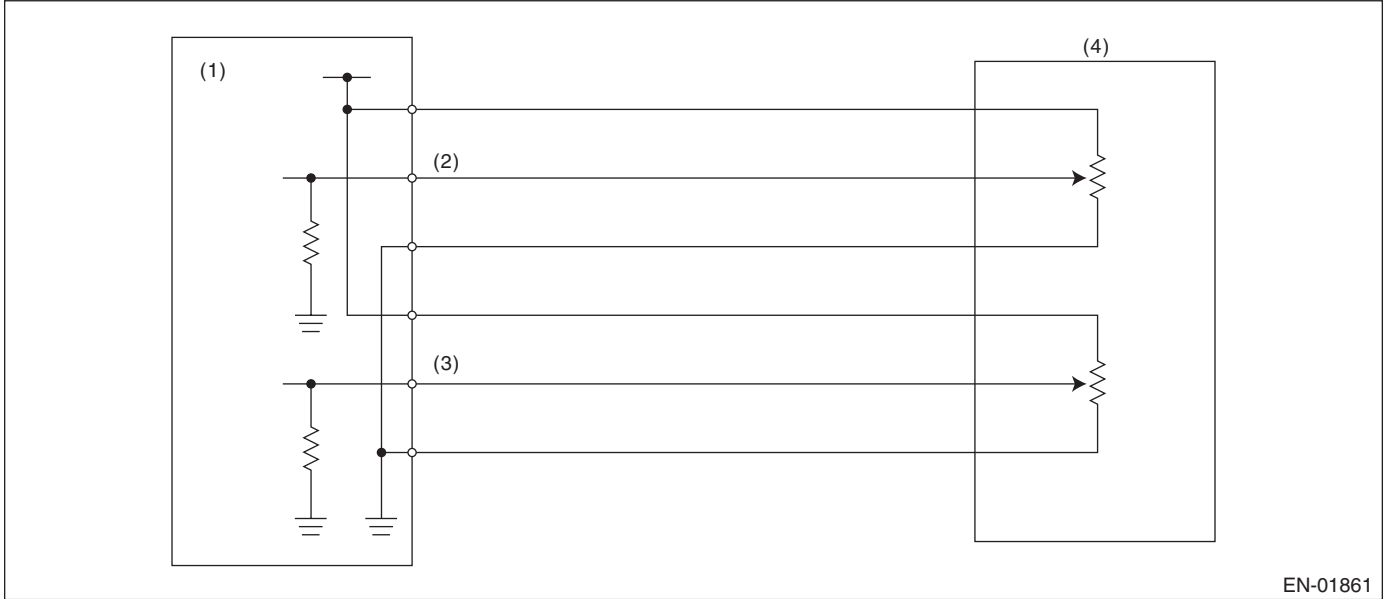
## GENERAL DESCRIPTION

### DT:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\leq 4.856$ V  |

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

## Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

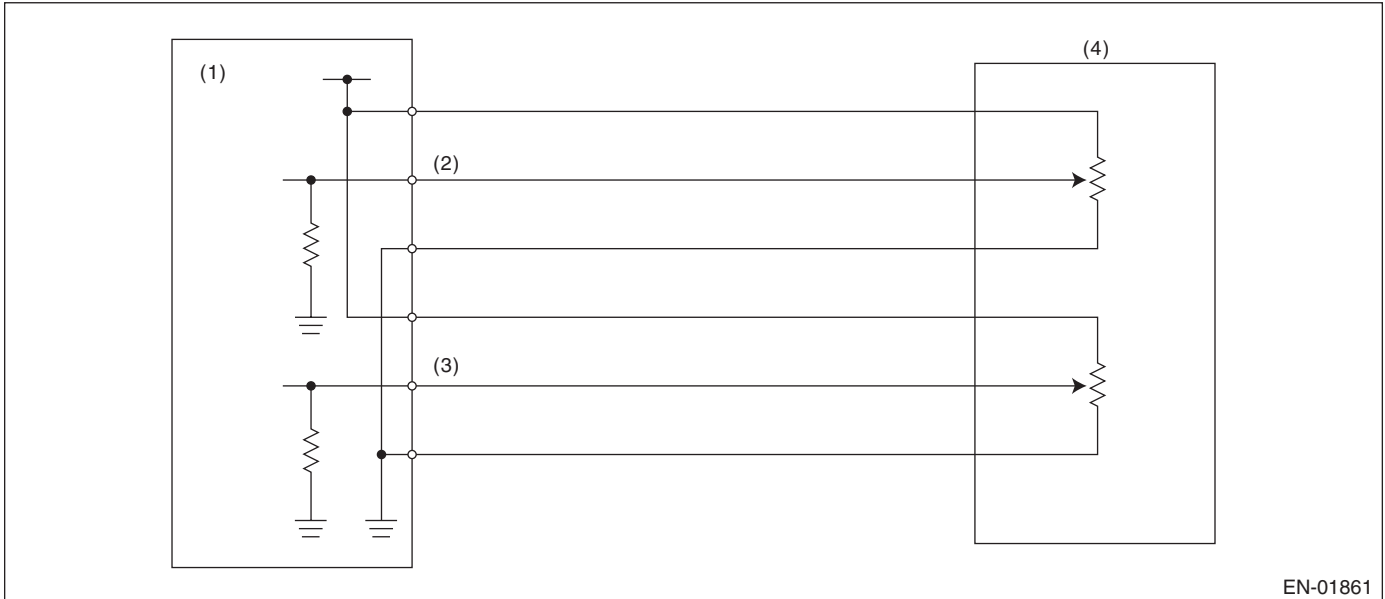
## GENERAL DESCRIPTION

### DU:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\geq 0.308$ V  |

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

## 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

## 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

## 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

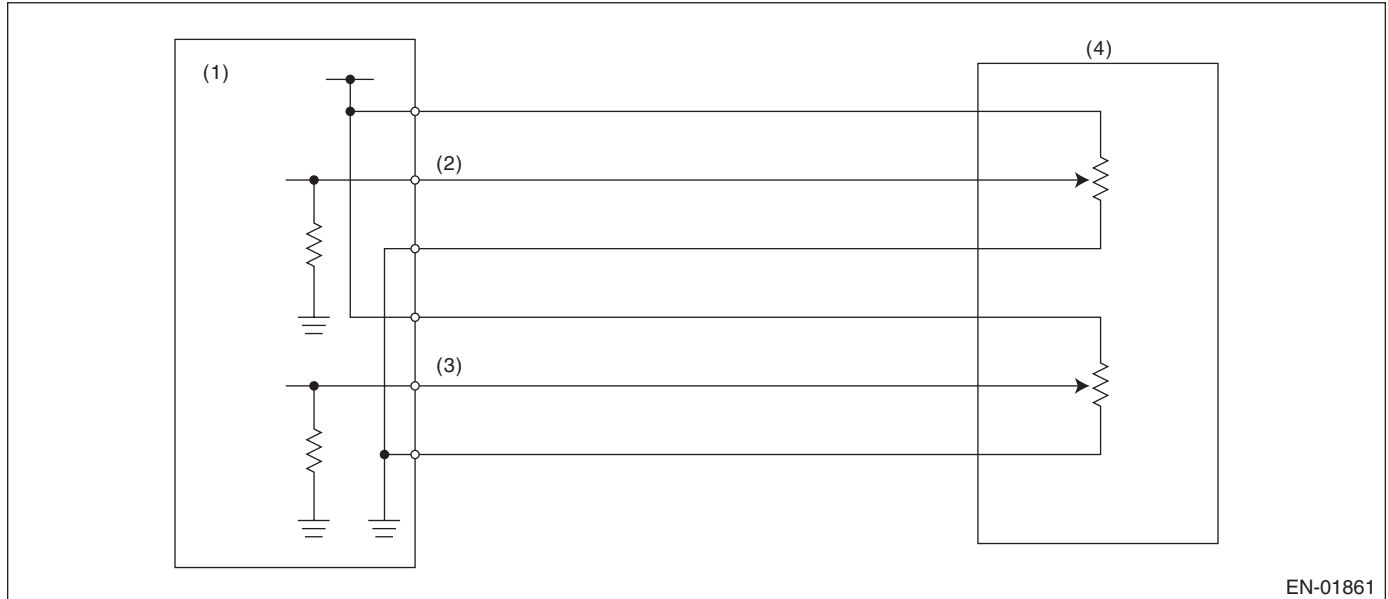
## GENERAL DESCRIPTION

### DV:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria   | Threshold Value |
|------------------------|-----------------|
| Sensor 1 input voltage | $\geq 0.308$ V  |

**Time Needed for Diagnosis:** 100 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

## Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

---

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)



# Diagnostic Trouble Code (DTC) Detecting Criteria

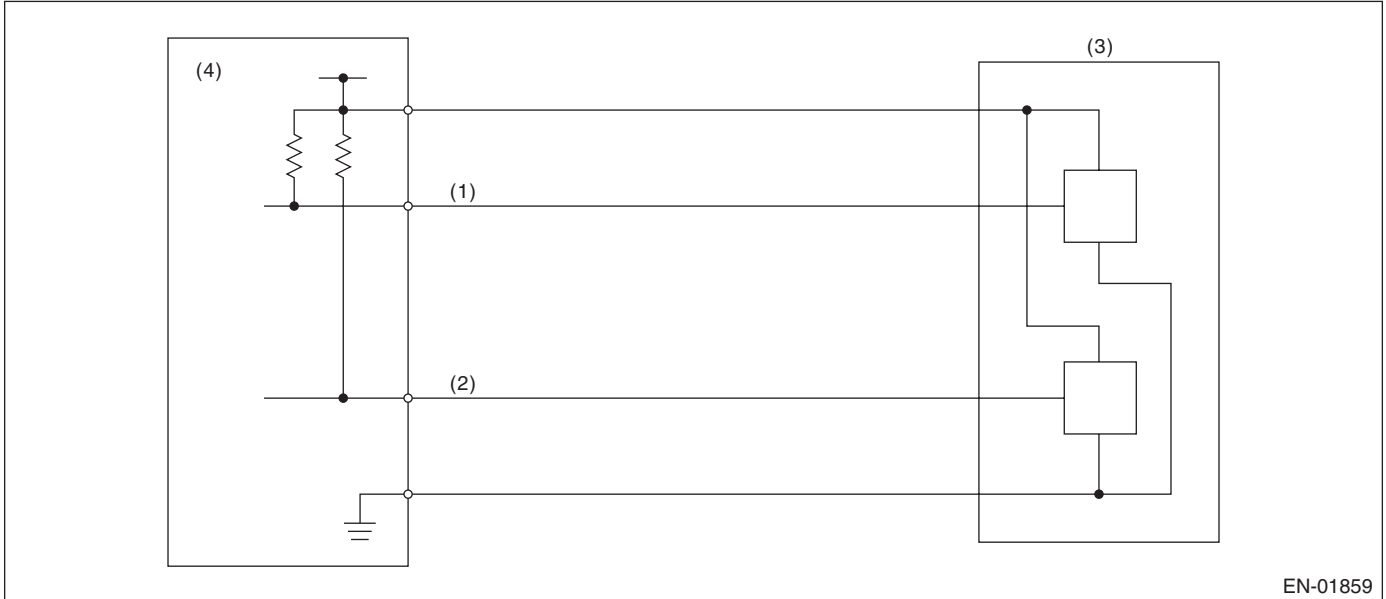
## GENERAL DESCRIPTION

### DW:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

#### 2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal.
- (2) Throttle position sensor 2 signal.
- (3) Throttle position sensor
- (4) Engine control module (ECM)

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

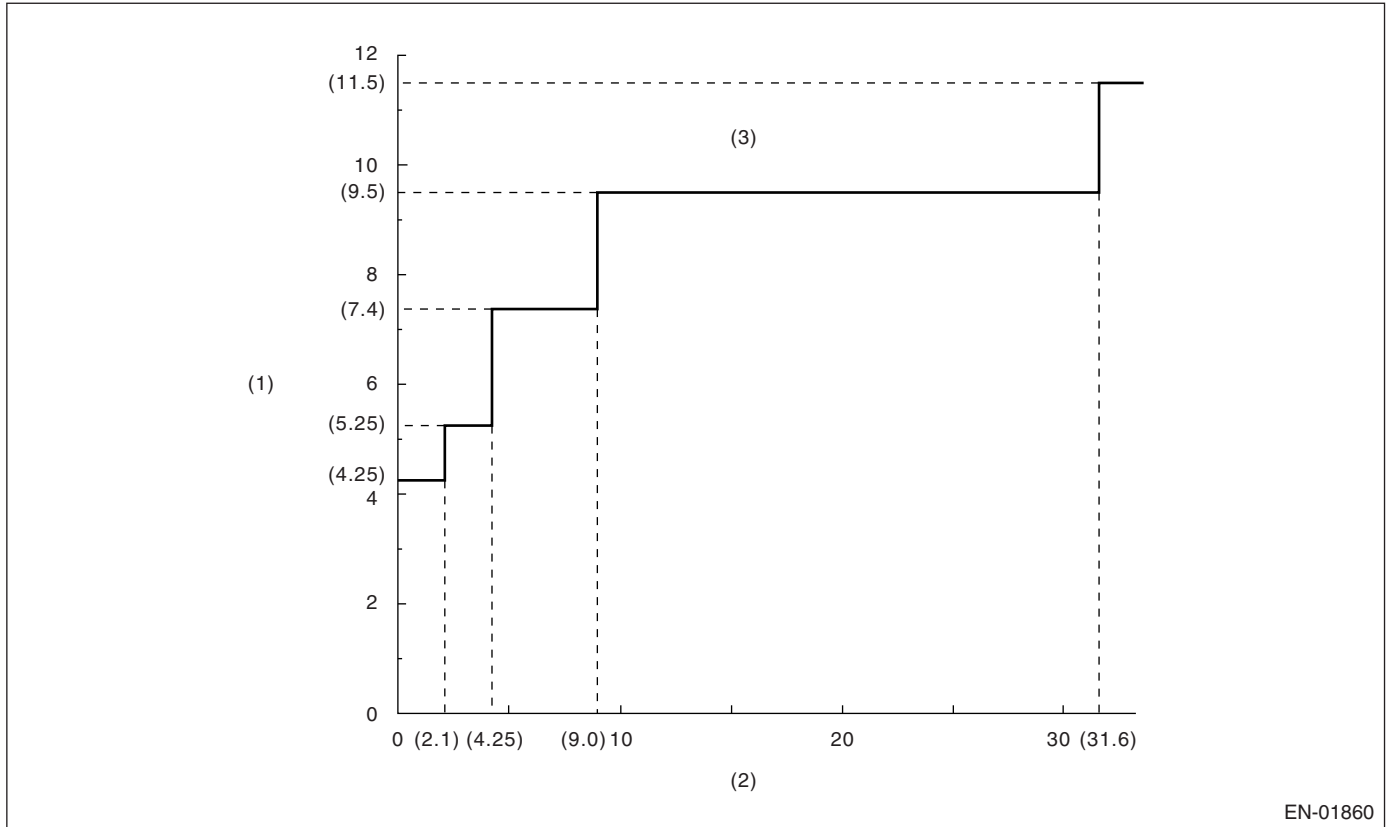
##### Judgment Value

| Malfunction Criteria                  | Threshold Value |
|---------------------------------------|-----------------|
| Signal difference between two sensors | $\leq 4.25$     |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## Details of Judgment Value



- (1) Sensor output difference (°)
- (2) Throttle position sensor 1 opening angle (°)
- (3) NG area

**Time Needed for Diagnosis:** 212 milliseconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

### 8. FAIL SAFE

Stop the continuity to ETC motor. (Fix the throttle opening angle to 6°.)

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

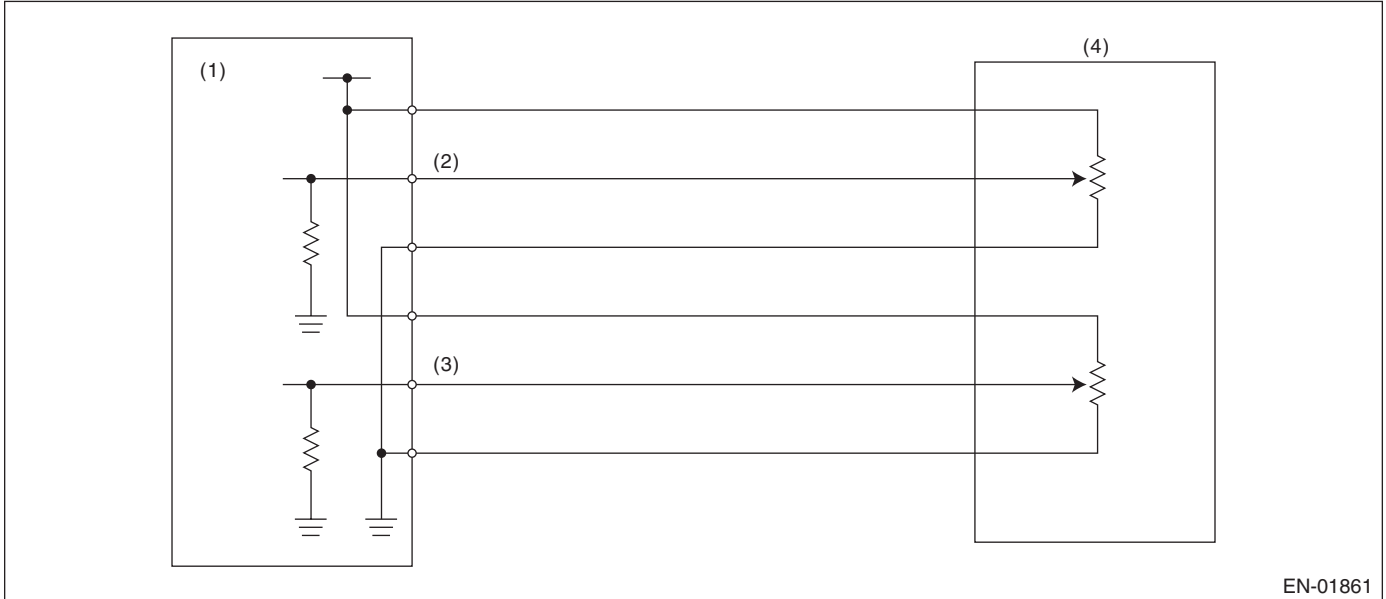
## GENERAL DESCRIPTION

### DX:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY

#### 1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

#### 2. COMPONENT DESCRIPTION



EN-01861

- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| Ignition switch      | ON                |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

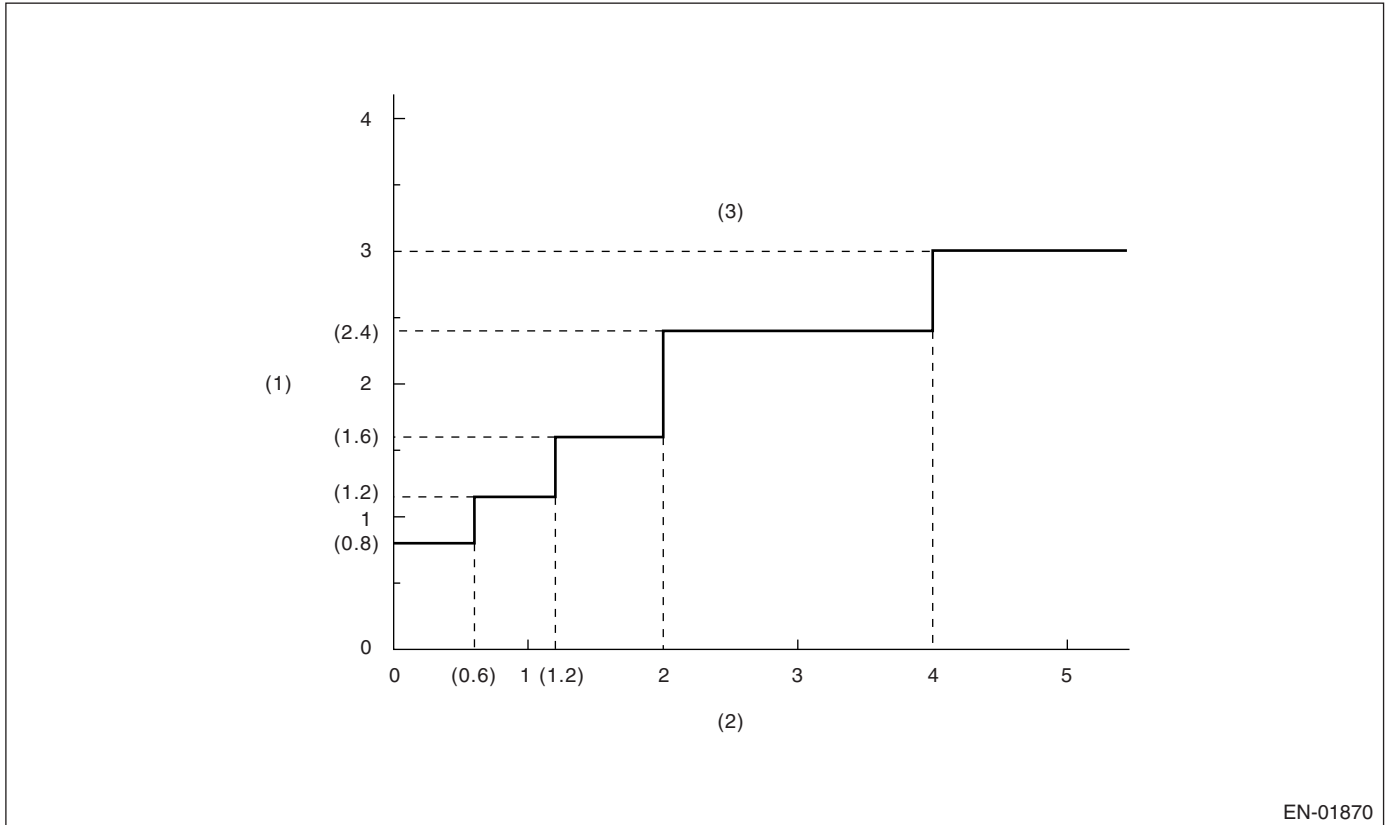
##### Judgment Value

| Malfunction Criteria                  | Threshold Value  |
|---------------------------------------|------------------|
| Signal difference between two sensors | $\leq 0.8^\circ$ |

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## Details of Judgment Value



EN-01870

- (1) Sensor output difference (°)
- (2) Accelerator pedal position sensor 2 opening angle (°)
- (3) NG area

### Time Needed for Diagnosis:

- 116 milliseconds (For NG)
- 1,000 milliseconds (For OK)

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Fix the throttle opening angle to 6°.

### 9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

### DY:DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

#### 1. OUTLINE OF DIAGNOSIS

Detect the malfunction of atmospheric pressure sensor output property. Judge NG when the atmospheric pressure sensor output is largely different from the intake manifold pressure at engine starting.

#### 2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

#### 3. ENABLE CONDITION

| Secondary Parameters                               | Enable Conditions   |
|--|---------------------|
| Engine speed at engine starting                    | < 300 rpm           |
| Vehicle speed                                      | < 1 km/h (0.62 MPH) |
| Diagnosis for atmospheric pressure sensor property | Not finished        |

#### 4. GENERAL DRIVING CYCLE

Perform the diagnosis once turning the ignition switch to ON.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.33 seconds.

##### Judgment Value

| Malfunction Criteria   | Threshold Value                  |
|--|----------------------------------|
| IAtmospheric – manifold absolute pressureI                                 | ≥ 26.7 kPa (200 mmHg, 7.88 inHg) |
| IIntake manifold pressure at engine starting – manifold absolute pressureI | < 1.33 kPa (10 mmHg, 2.95 inHg)  |

**Time Needed for Diagnosis:** 0.3 seconds

**Malfunction Indicator Light Illumination:** Detect when malfunction occurs in 2 continuous driving cycles.

##### • Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 0.26 seconds.

##### Judgment Value

| Malfunction Criteria                     | Threshold Value                  |
|--|----------------------------------|
| Atmospheric – manifold absolute pressure | < 26.7 kPa (200 mmHg, 7.88 inHg) |

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

#### 8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101 kPa (760 mmHg, 29.8 inHg).

#### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

## DZ:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW INPUT

### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.  
Judge NG when out of the standard value.

### 2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

### 5. DIAGNOSTIC METHOD

#### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | < 0.118 V       |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

#### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

#### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | ≥ 0.118 V       |

### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

### 8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

# Diagnostic Trouble Code (DTC) Detecting Criteria

## GENERAL DESCRIPTION

---

### EA:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

#### 1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.  
Judge NG when out of the standard value.

#### 2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

#### 3. ENABLE CONDITION

| Secondary Parameters | Enable Conditions |
|----------------------|-------------------|
| None                 |                   |

#### 4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

#### 5. DIAGNOSTIC METHOD

##### • Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | $\geq 4.936$ V  |

**Time Needed for Diagnosis:** 0.5 seconds

**Malfunction Indicator Light Illumination:** Illuminates as soon as malfunction occurs.

##### • Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

##### Judgment Value

| Malfunction Criteria | Threshold Value |
|----------------------|-----------------|
| Ignition switch      | ON              |
| Output voltage       | $< 4.936$ V     |

#### 6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

#### 7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

#### 8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

#### 9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

## TRANSMISSION SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

CONTROL SYSTEMS

CS

AUTOMATIC TRANSMISSION

4AT

AUTOMATIC TRANSMISSION  
(DIAGNOSTICS)

4AT(D)(diag)

MANUAL TRANSMISSION AND  
DIFFERENTIAL

5MT

MANUAL TRANSMISSION AND  
DIFFERENTIAL

6MT

MANUAL TRANSMISSION AND  
DIFFERENTIAL (DIAGNOSTICS)

6MT(diag)

CLUTCH SYSTEM

CL





# CONTROL SYSTEMS



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| 4. Select Cable .....                                | 27          |
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# General Description

CONTROL SYSTEMS

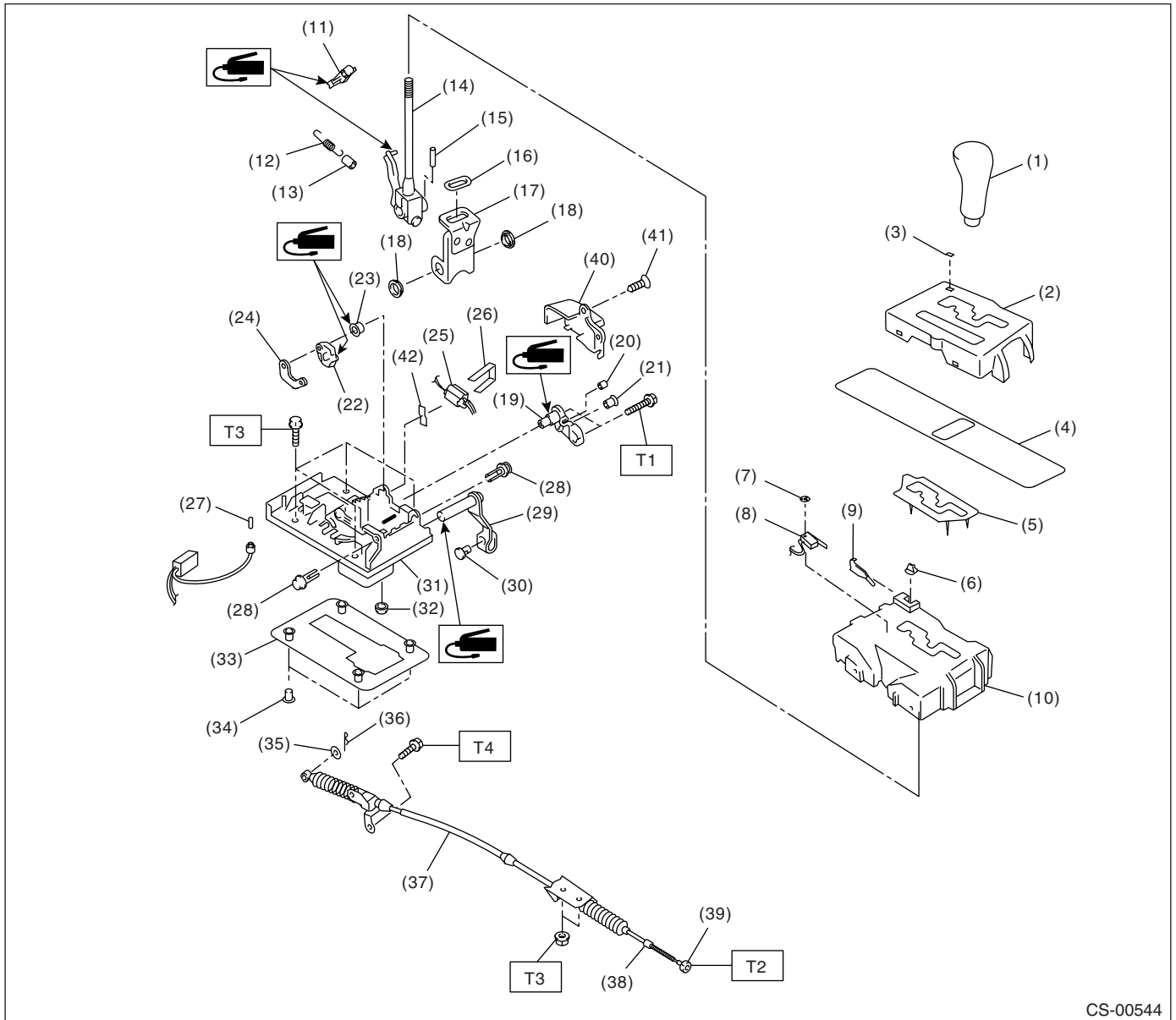
## 1. General Description

### A: SPECIFICATION

| Item                              |              | Specification            |
|-----------------------------------|--------------|--------------------------|
| Swing torque of rod against lever | N (kgf, lbf) | 3.7 (0.38, 0.84) or less |

### B: COMPONENT

#### 1. AT SELECT LEVER



CS-00544

# General Description

CONTROL SYSTEMS

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|                        |                           |                      |
|------------------------|---------------------------|----------------------|
| (1) Grip               | (17) Bracket              | (33) Packing         |
| (2) Indicator cover    | (18) Bushing              | (34) Spacer          |
| (3) Cover              | (19) Lock plate B         | (35) Washer          |
| (4) Blind              | (20) Bushing              | (36) Snap pin        |
| (5) Cushion            | (21) Bushing              | (37) Select cable    |
| (6) Button             | (22) Lock plate A         | (38) Adjusting nut B |
| (7) Clip               | (23) Bushing              | (39) Adjusting nut A |
| (8) "P" range switch   | (24) Lock plate C         | (40) Cover           |
| (9) Spring             | (25) Shift lock solenoid  | (41) Clip            |
| (10) Guide plate       | (26) Clamp                | (42) Cushion         |
| (11) Detent arm        | (27) Indicator light bulb |                      |
| (12) Detent spring     | (28) Clip                 |                      |
| (13) Tube              | (29) Select lever arm     |                      |
| (14) Select lever ASSY | (30) Bushing ASSY         |                      |
| (15) Spring pin        | (31) Base plate           |                      |
| (16) Bushing           | (32) Grommet              |                      |

---

**Tightening torque: N·m (kgf-m, ft-lb)**

**T1: 2.0 (0.2, 1.4)**

**T2: 7.5 (0.76, 5.5)**

**T3: 13 (1.3, 9.4)**

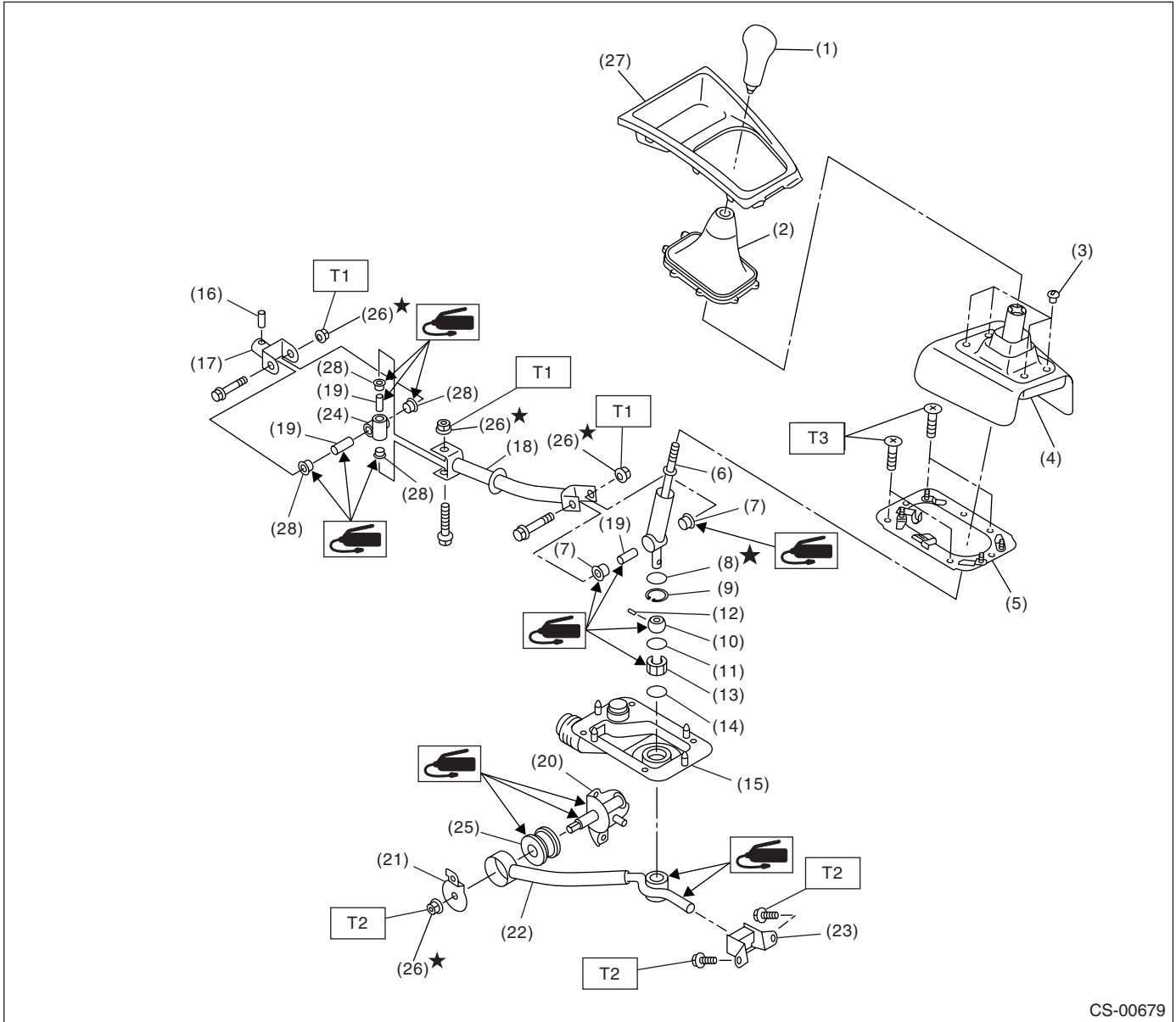
**T4: 18 (1.8, 13.0)**

---

# General Description

CONTROL SYSTEMS

## 2. 5MT GEAR SHIFT LEVER



CS-00679

- |                           |                 |                       |
|---------------------------|-----------------|-----------------------|
| (1) Gear shift knob       | (12) Spring pin | (23) Cushion rubber   |
| (2) Console boot          | (13) Bushing B  | (24) Boss             |
| (3) Clamp                 | (14) O-ring     | (25) Bushing          |
| (4) Boot & insulator ASSY | (15) Boot       | (26) Self-locking nut |
| (5) Plate ASSY            | (16) Spring pin | (27) Front cover      |
| (6) Lever                 | (17) Joint      | (28) Bushing          |
| (7) Bushing               | (18) Rod        |                       |
| (8) Lock wire             | (19) Spacer     |                       |
| (9) Snap ring             | (20) Bracket    |                       |
| (10) Bushing              | (21) Washer     |                       |
| (11) O-ring               | (22) Stay       |                       |

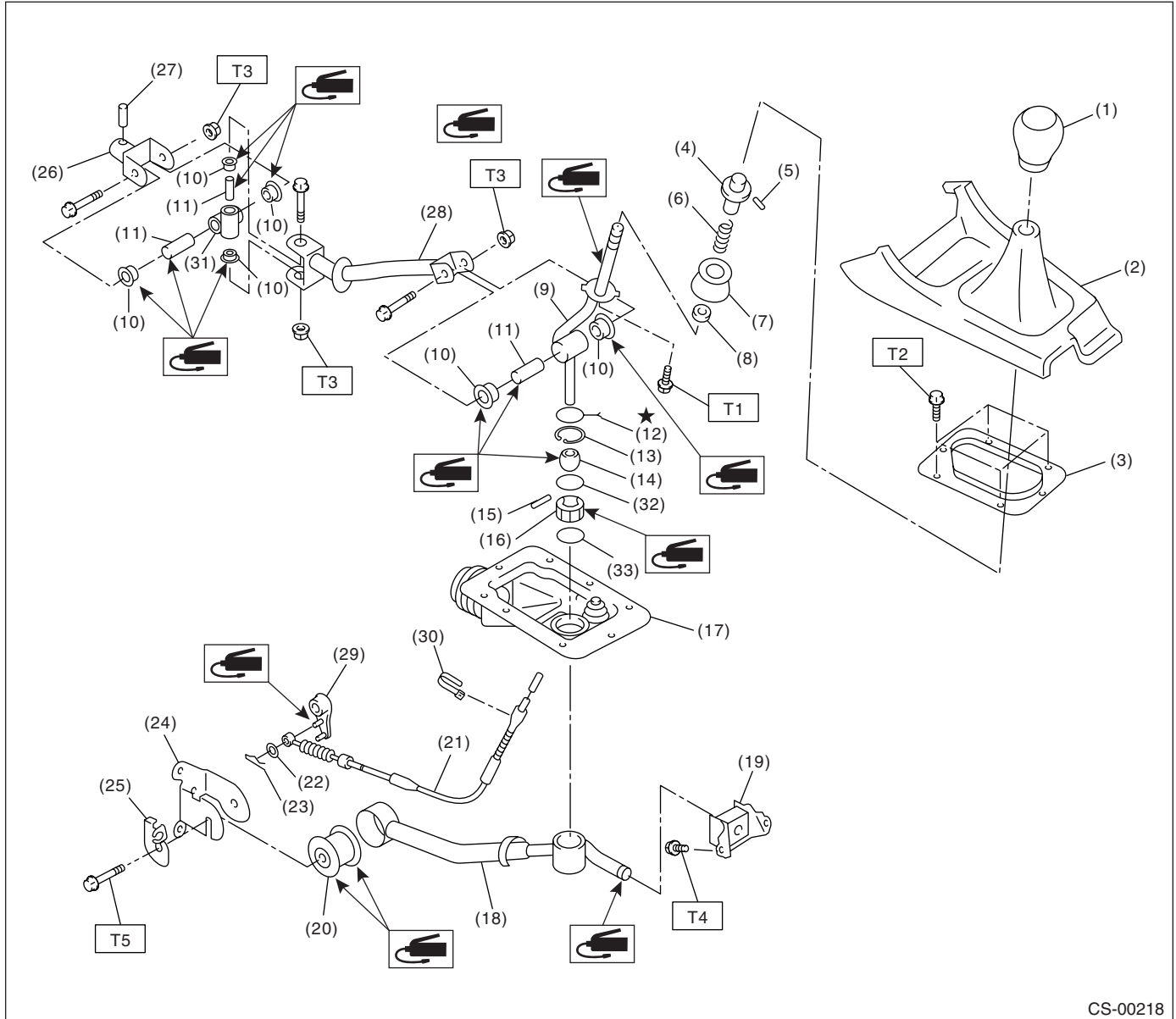
**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 12 (1.2, 8.9)**

**T2: 18 (1.8, 13.0)**

**T3: 7.5 (0.76, 5.5)**

## 3. 6MT GEAR SHIFT LEVER



- |                       |                          |                          |
|-----------------------|--------------------------|--------------------------|
| (1) Gear shift knob   | (15) Spring pin          | (29) Reverse check lever |
| (2) Console box front | (16) Bushing             | (30) Band clip           |
| (3) Plate             | (17) Boot                | (31) Boss                |
| (4) Slider            | (18) Stay                | (32) O-ring              |
| (5) Spring pin        | (19) Cushion rubber      | (33) O-ring              |
| (6) Spring            | (20) Bushing             |                          |
| (7) Holder            | (21) Reverse check cable |                          |
| (8) Seat cushion      | (22) Washer              |                          |
| (9) Lever             | (23) Snap pin            |                          |
| (10) Bushing          | (24) Bracket             |                          |
| (11) Spacer           | (25) Cable plate         |                          |
| (12) Lock wire        | (26) Joint               |                          |
| (13) Snap ring        | (27) Spring pin          |                          |
| (14) Bushing          | (28) Rod                 |                          |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 1.3 (0.13, 0.96)**

**T2: 7.5 (0.76, 5.5)**

**T3: 11.8 (1.2, 8.7)**

**T4: 18 (1.8, 13.0)**

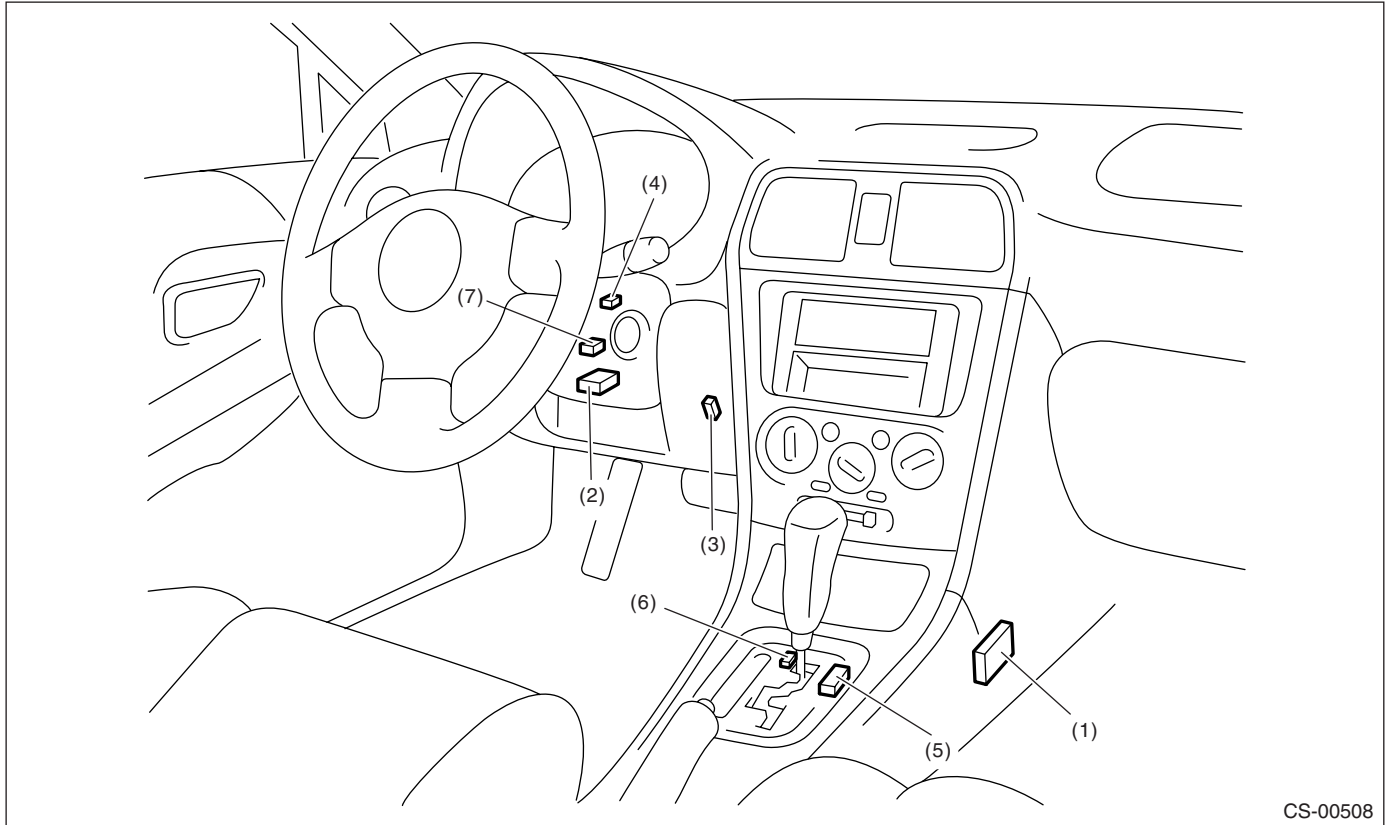
**T5: 32 (3.3, 23.6)**

#### **C: CAUTION**

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply grease onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Before disconnecting electrical connectors, be sure to disconnect the ground cable from battery.

## 2. AT Shift Lock Control System

### A: LOCATION



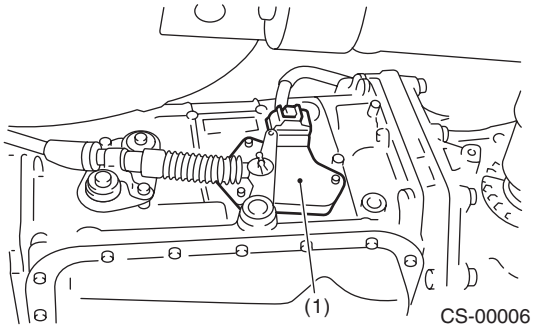
CS-00508

- |                            |                         |                       |
|----------------------------|-------------------------|-----------------------|
| (1) Inhibitor switch       | (4) Key warning switch  | (7) Key lock solenoid |
| (2) Body integrated module | (5) Shift lock solenoid |                       |
| (3) Stop light switch      | (6) "P" range switch    |                       |

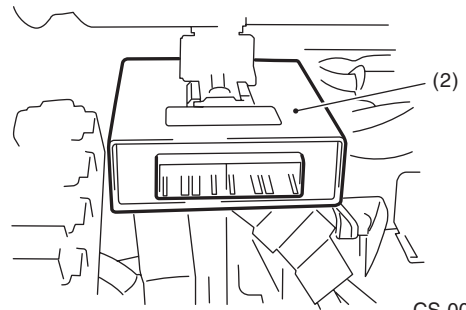


# AT Shift Lock Control System

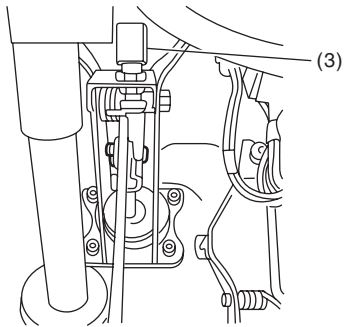
## CONTROL SYSTEMS



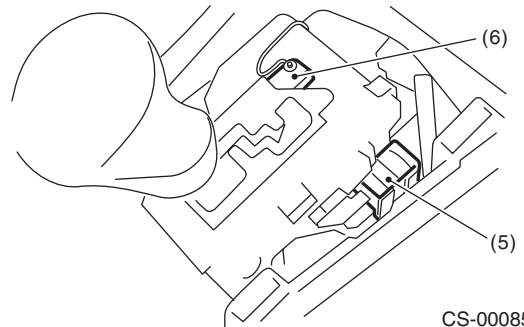
CS-00006



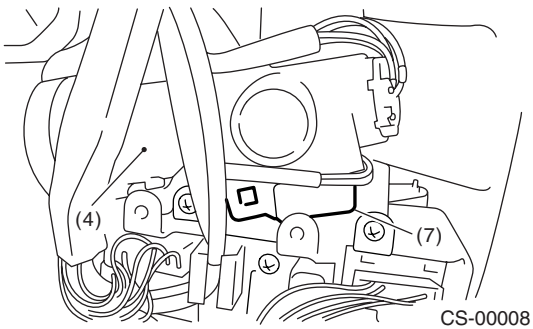
CS-00194



CS-00193



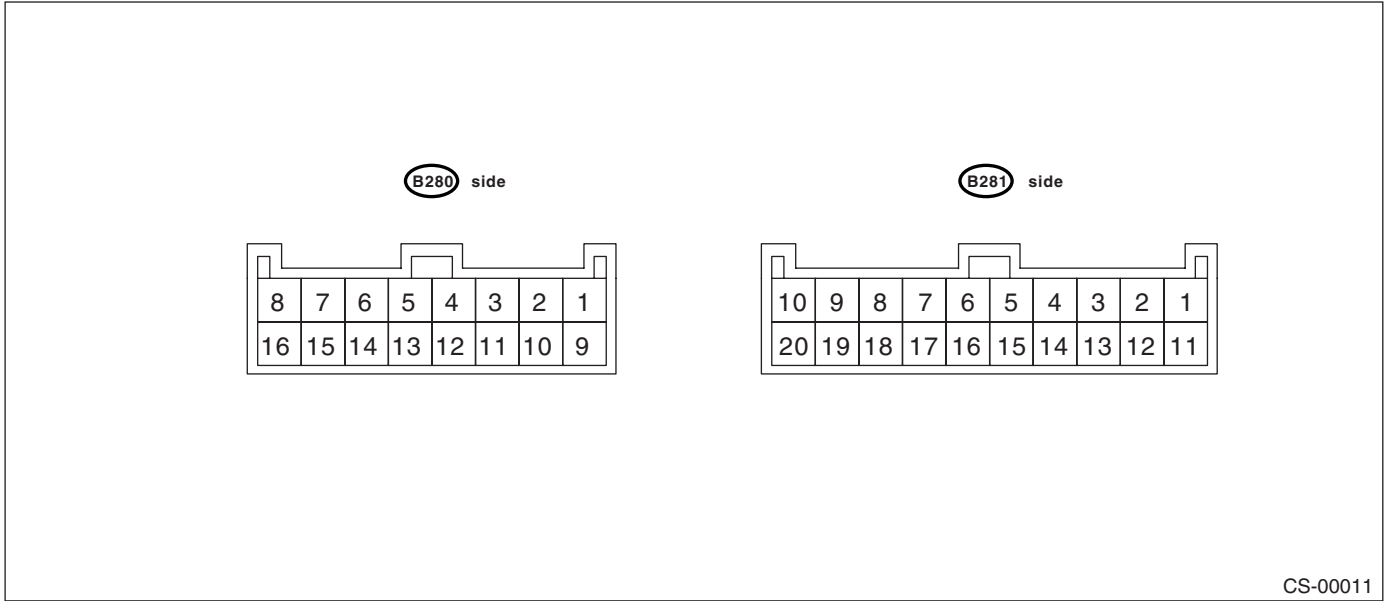
CS-00085



CS-00008

SUBARU.

## B: ELECTRICAL SPECIFICATION

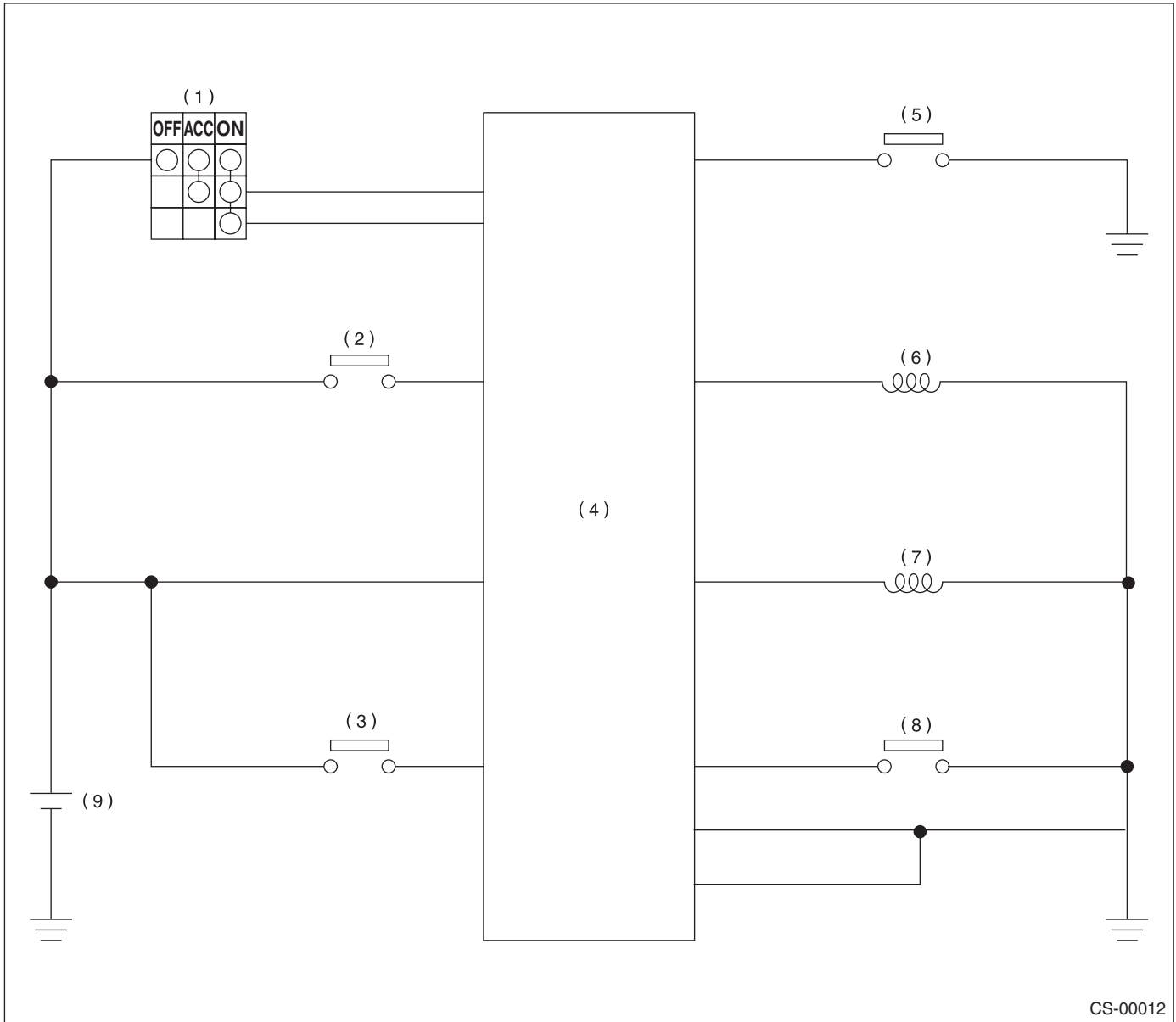


| Contents                     | To Connector No. | Terminal No. | Input/Output signal  |
|------------------------------|------------------|--------------|--|
|                              |                  |              | Measured value and measuring conditions  |
| Battery power supply         | B280             | 2            | 9 — 16 V   |
| Ignition power supply        | B281             | 19           | 10 — 15 V when ignition switch is at ON or START.  |
| Ignition power supply        | B281             | 10           | 10 — 15 V when ignition switch is at ACC.  |
| Inhibitor Switch (“P” range) | B281             | 5            | 0 V when select lever is in “P” range.<br>9 — 16 V when select lever is in other ranges than “P” range.                                    |
| Stop light switch            | B281             | 9            | 9 — 16 V when stop light switch is ON.<br>0 V when stop light switch is OFF.   |
| “P” range switch             | B281             | 6            | 0 V when select lever is in “P” range.<br>9 — 16 V when select lever is in other ranges than “P” range.                                    |
| Shift lock solenoid signal   | B280             | 9            | 8.5 — 16 V when shift lock is released.<br>0 V when shift lock is operating.   |
| Key warning switch signal    | B281             | 20           | 9 — 16 V when key is inserted.<br>0 V when key is removed.   |
| Key lock solenoid signal     | B280             | 3            | 7.5 — 16 V when turning ignition switch to ON, select lever is in “P” range and brake switch is ON.<br>0 V at other conditions than above. |
| Ground                       | B280             | 4            | —  |
| Ground                       | B280             | 13           | —  |

# AT Shift Lock Control System

CONTROL SYSTEMS

## C: WIRING DIAGRAM



## D: INSPECTION

### 1. SHIFT LOCK OPERATION

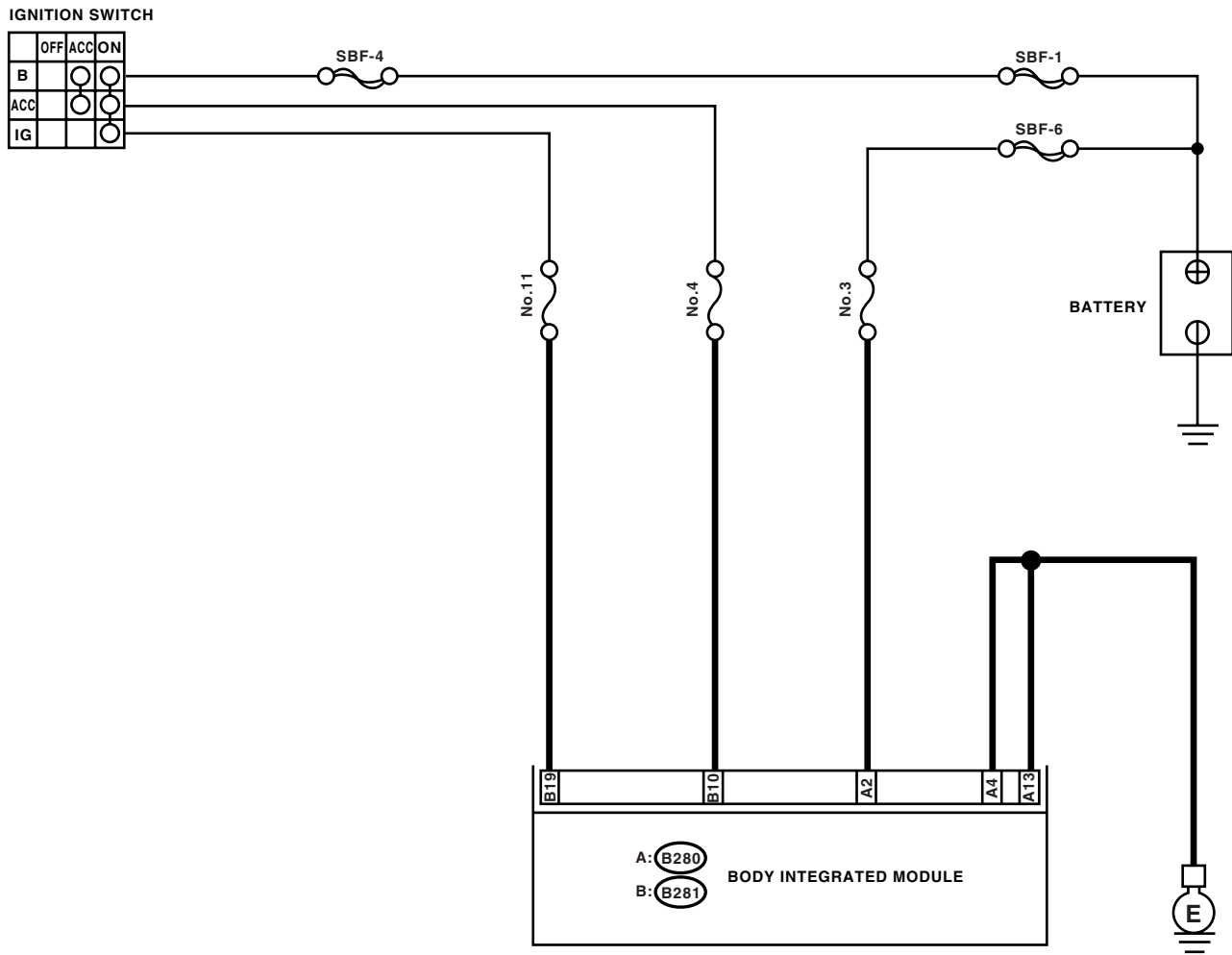
| Step  | Check   | Yes  | No  |
|---|---|--|---|
| <b>1</b><br><b>CHECK SHIFT LOCK.</b><br>1) Turn the ignition switch ON.<br>2) Move the select lever to "P" range. | While the brake pedal is not depressed, can select lever move from "P" range to other ranges?   | After inspection of "BODY INTEGRATED MODULE POWER SUPPLY AND GROUND LINE", inspect "SELECT LEVER SHIFT LOCK IS NOT OPERATED".<br><Ref. to CS-13, BODY INTEGRATED MODULE POWER SUPPLY AND GROUND LINE, INSPECTION, AT Shift Lock Control System.> <Ref. to CS-17, SELECT LEVER SHIFT LOCK IS NOT OPERATED, INSPECTION, AT Shift Lock Control System.> | Go to step 2.   |
| <b>2</b><br><b>CHECK SHIFT LOCK.</b>  | While the brake pedal is depressed, can select lever move from "P" range to other ranges?       | Go to step 3.  | Inspect "SELECT LEVER CANNOT BE SHIFTED".<br><Ref. to CS-15, SELECT LEVER CANNOT BE SHIFTED, INSPECTION, AT Shift Lock Control System.> |
| <b>3</b><br><b>CHECK KEY INTERLOCK.</b>   | When the select lever is in other than "P" range, does ignition switch turn to "LOCK" position? | Inspect "KEY INTERLOCK DOES NOT BE LOCKED OR RELEASED. <Ref. to CS-17, SELECT LEVER SHIFT LOCK IS NOT OPERATED, INSPECTION, AT Shift Lock Control System.>   | Go to step 4.   |

# AT Shift Lock Control System

## CONTROL SYSTEMS

| Step                             | Check  | Yes                             | No   |
|----------------------------------|--|---------------------------------|--|
| 4<br><b>CHECK KEY INTERLOCK.</b> | When the select lever is in "P" range, does ignition switch turn to "LOCK" position? | AT shift lock system is normal. | Inspect "KEY INTERLOCK DOES NOT BE LOCKED OR RELEASED. <Ref. to CS-17, SELECT LEVER SHIFT LOCK IS NOT OPERATED, INSPECTION, AT Shift Lock Control System.> |

## 2. BODY INTEGRATED MODULE POWER SUPPLY AND GROUND LINE



(B281)

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |

(B280)

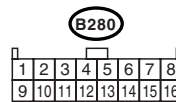
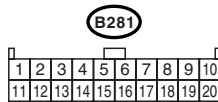
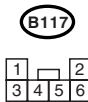
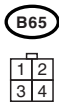
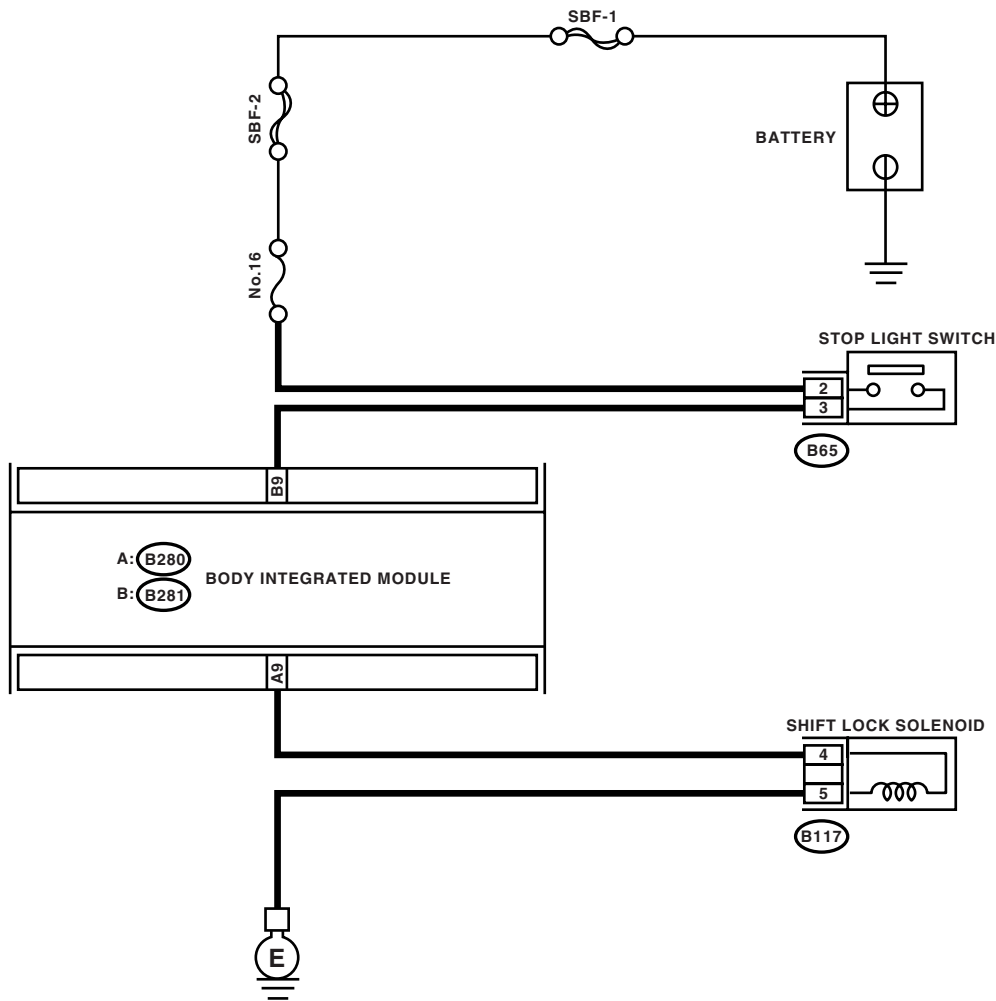
|   |    |    |    |    |    |    |    |
|---|----|----|----|----|----|----|----|
| 1 | 2  | 3  | 4  | 5  | 6  | 7  | 8  |
| 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |

# AT Shift Lock Control System

## CONTROL SYSTEMS

| Step   | Check                                    | Yes   | No  |
|--|--|---|---|
| <b>1 CHECK FUSE.</b><br>Remove the fuse (No. 3, 4 and 11).   | Is the fuse (No. 3, 4 or 11) blown out?  | Replace the fuse (No. 3, 4 or 11). If the replaced fuse (No. 3, 4 or 11) has blown out easily, repair short circuit in harness between fuse and body integrated module. | Go to step 2.   |
| <b>2 CHECK HARNESS CONNECTOR BETWEEN BODY INTEGRATED MODULE AND BODY GROUND.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance of harness between body integrated module and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B280) No. 4 — Chassis ground:</i><br><i>(B280) No. 13 — Chassis ground:</i> | Is the resistance less than 1 $\Omega$ ? | Go to step 3.   | Repair the open circuit in harness between body integrated module and body ground.                                  |
| <b>3 CHECK BATTERY POWER SUPPLY.</b><br>1) Turn the ignition switch to ON (engine OFF).<br>2) Measure the voltages between body integrated module and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B280) No. 2 (+) — Chassis ground (-):</i>  | Is the voltage more than 9 V?            | Go to step 4.   | Repair the open circuit harness between battery and body integrated module, and poor contact in coupling connector. |
| <b>4 CHECK IGNITION POWER SUPPLY CIRCUIT.</b><br>1) Turn the ignition switch to ACC.<br>2) Measure the voltage between body integrated module and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B281) No. 10 (+) — Chassis ground (-):</i>   | Is the voltage more than 9 V?            | Go to step 5.   | Repair the open circuit harness between battery and body integrated module, and poor contact in coupling connector. |
| <b>5 CHECK IGNITION POWER SUPPLY CIRCUIT.</b><br>1) Turn the ignition switch to ON (engine OFF).<br>2) Measure the voltage between body integrated module and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B281) No. 19 (+) — Chassis ground (-):</i>   | Is the voltage more than 9 V?            | Go to step 6.   | Repair the open circuit harness between battery and body integrated module, and poor contact in coupling connector. |
| <b>6 CHECK POOR CONTACT.</b>   | Is there poor contact in connector?      | Repair the poor contact.  | Replace the body integrated module.   |

## 3. SELECT LEVER CANNOT BE SHIFTED



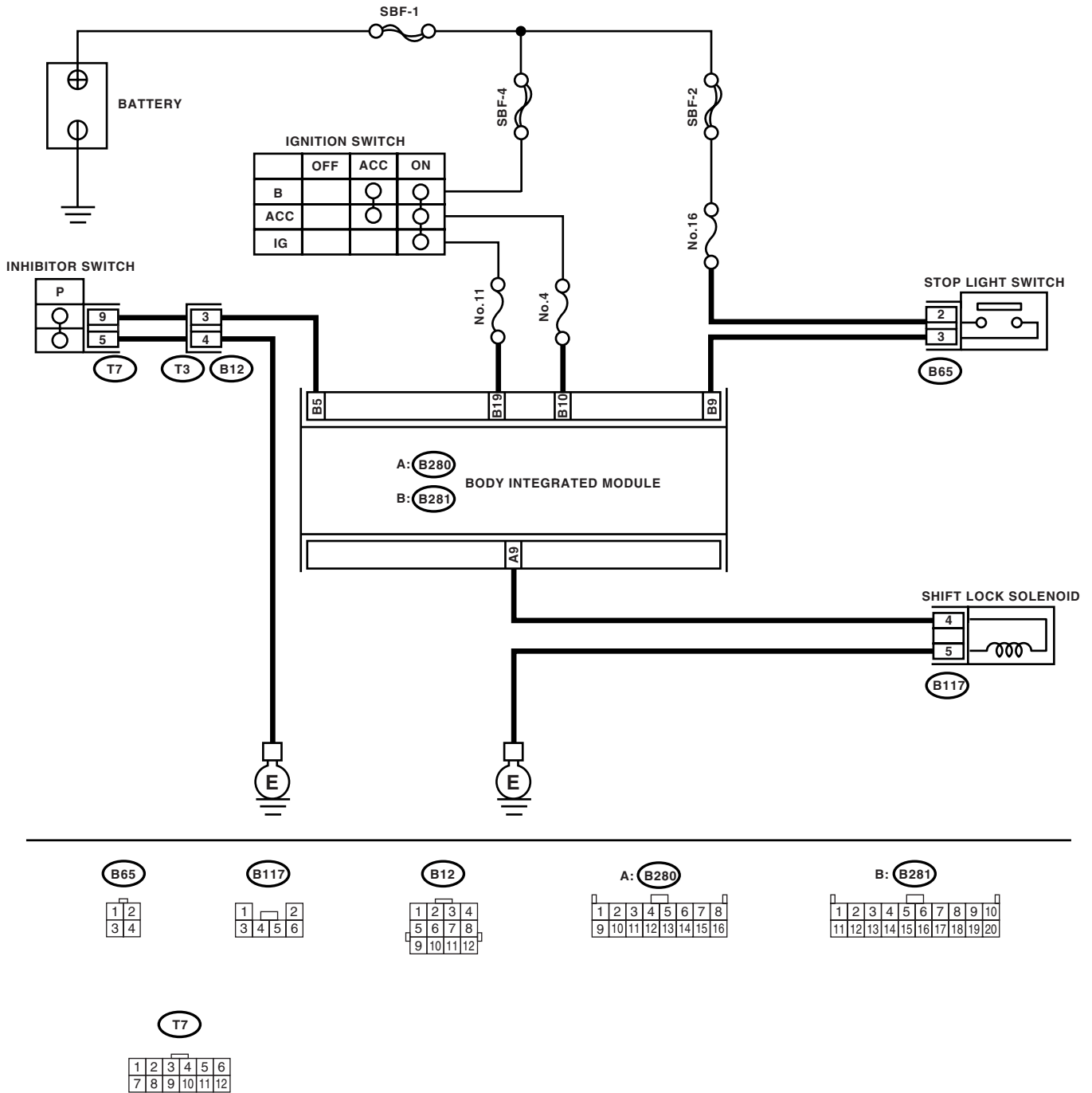


# AT Shift Lock Control System

## CONTROL SYSTEMS

| Step | Check  | Yes  | No  |                                     |
|------|--|--|---|-------------------------------------|
| 1    | <b>CHECK STOP LIGHT SWITCH.</b><br>Depress the brake pedal.  | Does the stop light turn on?                   | Go to step 2.   | Inspect the stop light system.      |
| 2    | <b>CHECK HARNESS BETWEEN STOP LIGHT SWITCH AND BODY INTEGRATED MODULE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the body integrated module and stoplight switch connector.<br>3) Measure the resistance of harness between stop light switch and body integrated module.<br><b>Connector &amp; terminal</b><br><b>(B65) No. 3 — (B281) No. 9:</b> | Is the resistance more than 1 M $\Omega$ ?     | Repair the open circuit in harness between body integrated module and stop light switch.    | Go to step 3.                       |
| 3    | <b>CHECK HARNESS BETWEEN STOP LIGHT SWITCH AND BODY INTEGRATED MODULE.</b><br>Measure the resistance of harness between stop light switch and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B65) No. 3 — Chassis ground:</b>   | Is the resistance less than 1 $\Omega$ ?       | Repair the short circuit in harness between body integrated module and stop light switch.   | Go to step 4.                       |
| 4    | <b>CHECK HARNESS BETWEEN BODY INTEGRATED MODULE AND SHIFT LOCK SOLENOID.</b><br>1) Disconnect the shift lock solenoid connector.<br>2) Measure the resistance of harness between body integrated module and shift lock solenoid.<br><b>Connector &amp; terminal</b><br><b>(B117) No. 4 — (B280) No. 9:</b>   | Is the resistance more than 1 M $\Omega$ ?     | Repair the open circuit in harness between body integrated module and shift lock solenoid.  | Go to step 5.                       |
| 5    | <b>CHECK HARNESS BETWEEN BODY INTEGRATED MODULE AND SHIFT LOCK SOLENOID.</b><br>Measure the resistance of harness between shift lock solenoid and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B117) No. 4 — Chassis ground:</b>  | Is the resistance less than 1 $\Omega$ ?       | Repair the short circuit in harness between body integrated module and shift lock solenoid. | Go to step 6.                       |
| 6    | <b>CHECK HARNESS BETWEEN SHIFT LOCK SOLENOID AND CHASSIS GROUND.</b><br>Measure the resistance of harness between shift lock solenoid and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B117) No. 5 — Chassis ground:</b>  | Is the resistance more than 1 M $\Omega$ ?     | Repair the open circuit in harness between shift lock solenoid and body ground.             | Go to step 7.                       |
| 7    | <b>CHECK SHIFT LOCK SOLENOID.</b><br>Measure the resistance of shift lock solenoid connector terminals.<br><b>Terminals</b><br><b>No. 4 — No. 5:</b>   | Is the resistance 20 — 40 $\Omega$ ?           | Go to step 8.   | Replace the shift lock solenoid.    |
| 8    | <b>CHECK SHIFT LOCK SOLENOID.</b><br>Connect the battery with shift lock solenoid connector terminal and operate solenoid.<br><b>Terminals</b><br><b>No. 4 (+) — No. 5 (-):</b>  | Does the shift lock solenoid operate properly? | Go to step 9.   | Replace the shift lock solenoid.    |
| 9    | <b>CHECK POOR CONTACT.</b>   | Is there poor contact in connector?            | Repair the poor contact.  | Replace the body integrated module. |

## 4. SELECT LEVER SHIFT LOCK IS NOT OPERATED



CS-00681

# AT Shift Lock Control System

## CONTROL SYSTEMS

| Step   | Check   | Yes  | No  |
|--|---|--|---|
| <b>1 CHECK INHIBITOR SWITCH.</b><br>1) Turn the ignition switch to ON (engine OFF).<br>2) Move the select lever from "P" to "1" range.   | Are combination meter indicator light and select lever "P", "R", "N", "3", "2" and "1" correctly matched? | Go to step 2.  | Adjust the inhibitor switch and select cable.   |
| <b>2 CHECK IGNITION POWER SUPPLY CIRCUIT.</b><br>1) Turn the ignition switch to ON (engine OFF).<br>2) Measure the voltage between body integrated module and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B281) No. 19 (+) — Chassis ground (-):</i>   | Is the voltage more than 9 V?   | Go to step 3.  | Repair the open circuit harness between battery and body integrated module, and poor contact in coupling connector. |
| <b>3 CHECK HARNESS BETWEEN INHIBITOR SWITCH AND BODY INTEGRATED MODULE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector of transmission harness and body integrated module.<br>3) Measure the resistance of harness between body integrated module and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B281) No. 5 — Chassis ground:</i> | Is the resistance less than 1 $\Omega$ ?  | Repair the short circuit in harness between body integrated module and transmission connector. | Go to step 4.   |
| <b>4 CHECK HARNESS BETWEEN INHIBITOR SWITCH AND BODY INTEGRATED MODULE.</b><br>Measure the resistance of harness between body integrated module and inhibitor switch.<br><i>Connector &amp; terminal</i><br><i>(B12) No. 3 — (B281) No. 5:</i>   | Is the resistance more than 1 $M\Omega$ ?   | Repair the open circuit in harness between body integrated module and transmission connector   | Go to step 5.   |
| <b>5 CHECK HARNESS BETWEEN INHIBITOR SWITCH AND CHASSIS GROUND.</b><br>Measure the resistance of harness between body integrated module and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B12) No. 4 — Chassis ground:</i>   | Is the resistance less than 1 $\Omega$ ?  | Go to step 6.  | Repair the open circuit in harness between body integrated module and chassis ground.                               |
| <b>6 CHECK INHIBITOR SWITCH.</b><br>1) Move the select lever to "P" range.<br>2) Measure the resistance of transmission harness connector terminals.<br><i>Connector &amp; terminal</i><br><i>(T3) No. 3 — No. 4:</i>  | Is the resistance more than 1 $M\Omega$ ?   | Repair or replace the inhibitor switch.  | Go to step 7.   |
| <b>7 CHECK OUTPUT SIGNAL FOR BODY INTEGRATED MODULE.</b><br>1) Connect all connectors.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between body integrated module and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B281) No. 5 (+) — Chassis ground (-):</i>  | Is the voltage 9 — 16 V?  | Go to step 8.  | Go to step 16.  |
| <b>8 CHECK STOP LIGHT SWITCH.</b><br>Depress the brake pedal.  | Does the stop light turn on?  | Go to step 9.  | Inspect the stop light system.  |

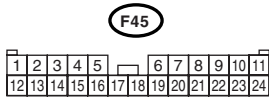
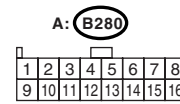
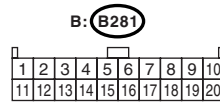
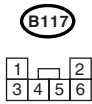
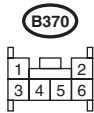
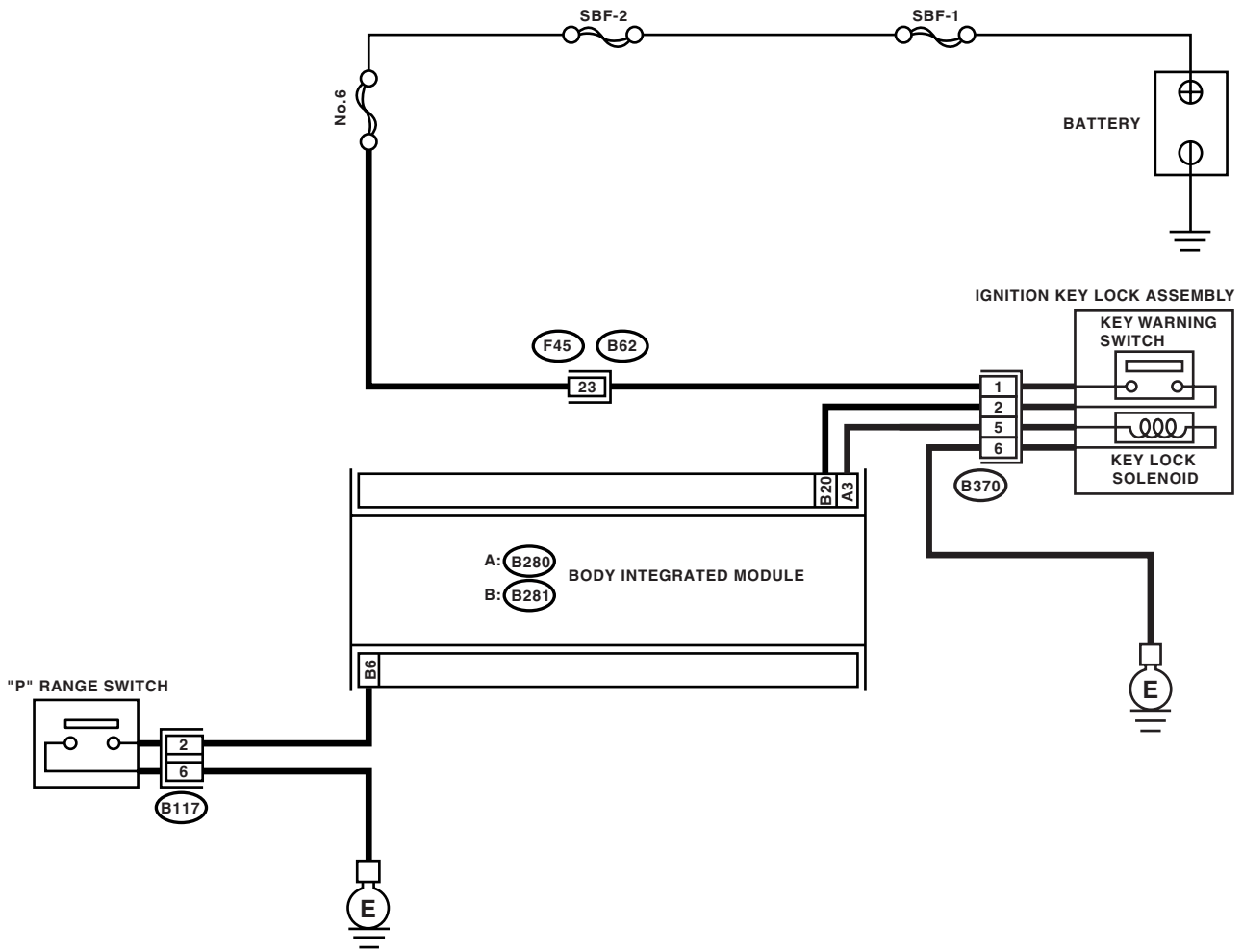
# AT Shift Lock Control System

| Step   | Check  | Yes  | No  |
|--|--|--|---|
| <b>9 CHECK HARNESS BETWEEN STOP LIGHT SWITCH AND AT SHIFT LOCK CONTROL MODULE.</b><br>1) Depress the brake pedal.<br>2) Measure the voltage between body integrated module and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B281) No. 9 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 9 V?                  | Go to step 10.   | Repair the open or short circuit in harness between body integrated module and stop light switch. |
| <b>10 CHECK HARNESS BETWEEN BODY INTEGRATED MODULE AND SHIFT LOCK SOLENOID.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from shift lock solenoid and body integrated module.<br>3) Measure the resistance of harness between body integrated module and shift lock solenoid.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B280) No. 9 — (B117) No. 4:</b></i> | Is the resistance more than 1 M $\Omega$ ?     | Repair the open circuit in harness between body integrated module and shift lock solenoid. | Go to step 11.  |
| <b>11 CHECK HARNESS BETWEEN BODY INTEGRATED MODULE AND SHIFT LOCK SOLENOID.</b><br>Measure the resistance of harness between shift lock solenoid and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B280) No. 9 — Chassis ground:</b></i>   | Is the resistance less than 10 $\Omega$ ?      | Go to step 12.   | Repair the short circuit in harness between body integrated module and shift lock solenoid.       |
| <b>12 CHECK HARNESS BETWEEN SHIFT LOCK SOLENOID AND CHASSIS GROUND.</b><br>Measure the resistance of harness between shift lock solenoid and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B117) No. 5 — Chassis ground:</b></i>   | Is the resistance less than 1 $\Omega$ ?       | Go to step 13.   | Repair the open circuit in harness between shift lock solenoid and chassis ground.                |
| <b>13 CHECK SHIFT LOCK SOLENOID.</b><br>Measure the resistance of shift lock solenoid connector terminals.<br><i><b>Terminals</b></i><br><i><b>No. 4 — No. 5:</b></i>  | Is the resistance 20 — 40 $\Omega$ ?           | Go to step 14.   | Replace the shift lock solenoid.  |
| <b>14 CHECK SHIFT LOCK SOLENOID.</b><br>Connect the battery with shift lock solenoid connector terminal and operate solenoid.<br><i><b>Terminals</b></i><br><i><b>No. 4 (+) — No. 5 (-):</b></i>   | Is the shift lock solenoid operating properly? | Go to step 15.   | Replace the shift lock solenoid.  |
| <b>15 CHECK OUTPUT SIGNAL FOR AT SHIFT LOCK CONTROL MODULE.</b><br>1) Turn the ignition switch to ON (engine OFF).<br>2) Measure the voltage between body integrated module and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B280) No. 9 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 8.5 V?                | Go to step 16.   | Replace the body integrated module.   |
| <b>16 CHECK POOR CONTACT.</b>  | Is there poor contact in connector?            | Repair the poor contact.   | Replace the body integrated module.   |

# AT Shift Lock Control System

CONTROL SYSTEMS

## 5. KEY INTERLOCK DOES NOT LOCK OR RELEASE



CS-00467

# AT Shift Lock Control System

CONTROL SYSTEMS

| Step  | Check                                      | Yes  | No  |
|---|--|--|---|
| <b>1 CHECK HARNESS BETWEEN BATTERY AND KEY WARNING SWITCH.</b><br>1) Disconnect the connector key warning switch.<br>2) Measure the voltage of harness between key warning switch and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B370) No. 1 (+) — Chassis ground (-):</b></i>                       | Is the voltage 9 — 16 V?                   | Go to step 2.  | Repair the open or short circuit in harness between battery and key warning switch.       |
| <b>2 CHECK KEY WARNING SWITCH.</b><br>Measure the resistance of key warning switch connector terminals.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i>  | Is the resistance more than 1 M $\Omega$ ? | Replace the key warning switch.  | Go to step 3.   |
| <b>3 CHECK KEY WARNING SWITCH.</b><br>1) Remove the key.<br>2) Measure the resistance of key warning switch connector terminals.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i>   | Is the resistance more than 1 M $\Omega$ ? | Go to step 4.  | Replace the key warning switch.   |
| <b>4 CHECK HARNESS BETWEEN AT SHIFT LOCK CONTROL MODULE AND KEY WARNING SWITCH.</b><br>1) Disconnect the body integrated module connector.<br>2) Measure the voltage of harness body integrated module and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B281) No. 20 (+) — Chassis ground (-):</b></i> | Is the voltage more than 9 V?              | Go to step 5.  | Repair the open circuit in harness between body integrated module and key warning switch. |
| <b>5 CHECK HARNESS BETWEEN BODY INTEGRATED MODULE AND KEY LOCK SOLENOID.</b><br>1) Disconnect the connector of key lock solenoid.<br>2) Measure the resistance of harness between body integrated module and key lock solenoid.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B370) No. 5 — (B280) No. 3:</b></i>       | Is the resistance more than 1 M $\Omega$ ? | Repair the open circuit in harness between body integrated module and key lock solenoid. | Go to step 6.   |
| <b>6 CHECK HARNESS BETWEEN BODY INTEGRATED MODULE AND KEY LOCK SOLENOID.</b><br>Measure the resistance of harness between body integrated module and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B280) No. 3 — Chassis ground:</b></i>  | Is the resistance more than 1 $\Omega$ ?   | Go to step 7.  | Repair the short circuit in harness between body integrated module and key lock solenoid. |
| <b>7 CHECK HARNESS BETWEEN KEY LOCK SOLENOID AND CHASSIS GROUND.</b><br>Measure the resistance of harness between key lock solenoid and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B370) No. 6 — Chassis ground:</b></i>   | Is the resistance less than 10 $\Omega$ ?  | Go to step 8.  | Repair the open circuit in harness between key lock solenoid and chassis ground.          |
| <b>8 CHECK KEY LOCK SOLENOID.</b><br>Measure the resistance of key lock solenoid connector terminals.<br><i><b>Terminals</b></i><br><i><b>No. 5 — No. 6:</b></i>  | Is the resistance 4 — 8 $\Omega$ ?         | Go to step 9.  | Replace the key lock solenoid.  |

# AT Shift Lock Control System

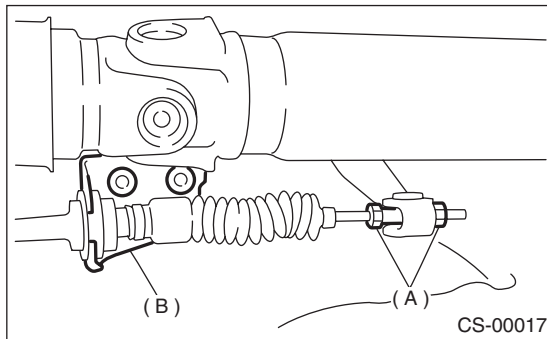
## CONTROL SYSTEMS

| Step   | Check                                     | Yes   | No   |
|--|---|---|--|
| <b>9 CHECK HARNESS BETWEEN “P” RANGE SWITCH AND CHASSIS GROUND.</b><br>Measure the resistance of harness between “P” range switch and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B117) No. 2 — Chassis ground:</b></i>  | Is the resistance less than 1 $\Omega$ ?  | Go to step 10.  | Repair the short circuit in harness between “P” range switch and body integrated module. |
| <b>10 CHECK HARNESS BETWEEN AT SHIFT LOCK CONTROL MODULE AND “P” RANGE SWITCH.</b><br>1) Disconnect the connector from “P” range switch.<br>2) Measure the resistance of harness between body integrated module and “P” range switch.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B117) No. 2 — (B281) No. 6:</b></i>  | Is the resistance more than 1 $M\Omega$ ? | Repair the open circuit in harness between body integrated module and “P” range switch. | Go to step 11.   |
| <b>11 CHECK HARNESS BETWEEN “P” RANGE SWITCH AND CHASSIS GROUND.</b><br>Measure the resistance of harness “P” range switch and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B117) No. 6 — Chassis ground:</b></i>   | Is the resistance more than 1 $M\Omega$ ? | Repair the open circuit in harness between “P” range switch and chassis ground.         | Go to step 12.   |
| <b>12 CHECK “P” RANGE SWITCH.</b><br>1) Move the select lever to “P” range.<br>2) Measure resistance between “P” range switch connector terminals.<br><i><b>Terminals</b></i><br><i><b>No. 2 — No. 6:</b></i>  | Is the resistance less than 1 $\Omega$ ?  | Go to step 13.  | Replace the “P” range switch.  |
| <b>13 CHECK “P” RANGE SWITCH.</b><br>1) Move the select lever to other than “P” range.<br>2) Measure resistance between “P” range switch connector terminals.<br><i><b>Terminals</b></i><br><i><b>No. 2 — No. 6:</b></i>   | Is the resistance more than 1 $M\Omega$ ? | Go to step 14.  | Replace the “P” range switch.  |
| <b>14 CHECK OUTPUT SIGNAL FOR BODY INTEGRATED MODULE.</b><br>1) Connect all connectors.<br>2) Turn the ignition switch to ON (engine OFF).<br>3) Move the select lever to “P” range.<br>4) Press the brake pedal.<br>5) Measure the voltage between body integrated module connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B280) No. 3 (+) — Chassis ground (-):</b></i> | Is the voltage 7.5 — 16 V?                | Go to step 15.  | Replace the body integrated module.  |
| <b>15 CHECK POOR CONTACT.</b>  | Is there poor contact in connector?       | Repair the poor contact.  | Replace the body integrated module.  |

## 3. Select Lever

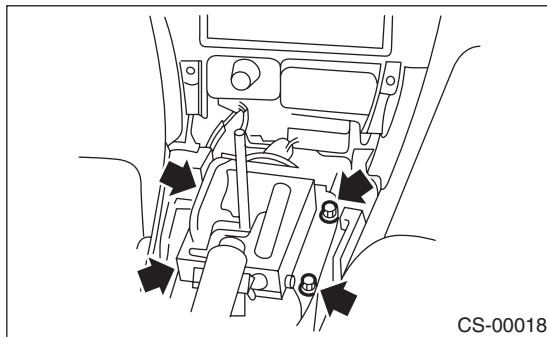
### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Set the select lever to the "N" range.
- 4) Lift-up the vehicle.
- 5) Remove the rear exhaust pipe and muffler.
  - SOHC model  
<Ref. to EX(H4SO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, REMOVAL, Muffler.>
  - DOHC turbo model  
<Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>
- 6) Disconnect the cable from select lever, and then remove the cable bracket.



- (A) Adjusting nuts  
(B) Cable bracket

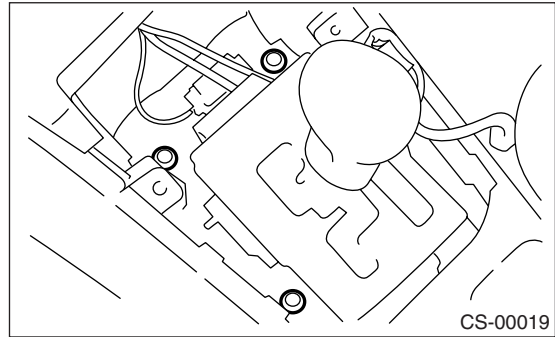
- 7) Lower the vehicle.
- 8) Remove the console box. <Ref. to EI-46, REMOVAL, Console Box.>
- 9) Disconnect the connectors, then remove the four bolts to take out the select lever from the body.



### B: INSTALLATION

- 1) Mount the select lever onto the vehicle body.
- 2) Tighten the four bolts to install the select lever to the vehicle body, then connect connector.

**Tightening torque:**  
**13 N·m (1.3 kgf-m, 9.4 ft-lb)**



- 3) Install the console box. <Ref. to EI-46, INSTALLATION, Console Box.>
- 4) Set location of the select lever at "N" range.
- 5) Lift-up the vehicle.
- 6) Set location of the range select lever to "N" range.
- 7) Insert the thread portion of the other inner cable and into the connector hole of the select lever, and fix the other outer cable end to the bracket.

**Tightening torque:**  
**18 N·m (1.8 kgf-m, 13.0 ft-lb)**

- 8) Adjust the select cable position. <Ref. to CS-28, ADJUSTMENT, Select Cable.>
- 9) After completion of fitting, make sure that the select lever operates smoothly all across the operating range.
- 10) Install the rear exhaust pipe and muffler.
  - SOHC model  
<Ref. to EX(H4SO)-7, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, INSTALLATION, Muffler.>
  - DOHC turbo model  
<Ref. to EX(H4DOTC)-15, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, INSTALLATION, Muffler.>
- 11) Inspect the following items. If the following inspection reveals faults, adjust the select cable and inhibitor switch. <Ref. to CS-28, ADJUSTMENT, Select Cable.> <Ref. to 4AT-48, ADJUSTMENT, Inhibitor Switch.>

- (1) The engine starts operating when select lever is in range "P" and "N", but not in other ranges.
- (2) The back-up light is lit when the select lever is in range "R", but not in other ranges.
- (3) Select lever and indicator ranges are matched.

### C: DISASSEMBLY

- 1) Remove the packing.
- 2) Remove the grip.
- 3) Remove the indicator light, and then remove the indicator cover.

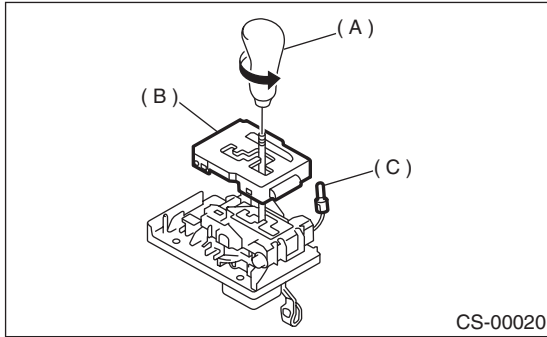


# Select Lever

## CONTROL SYSTEMS

### NOTE:

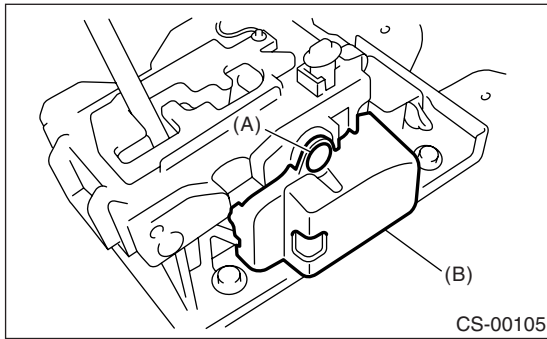
Be careful not to break the indicator light during removal.



- (A) Grip
- (B) Indicator cover
- (C) Indicator light

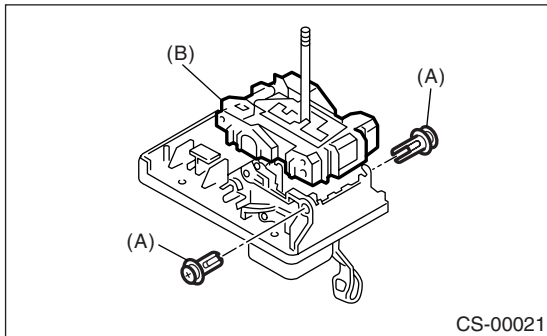
4) Remove the blind.

5) Remove the cover.



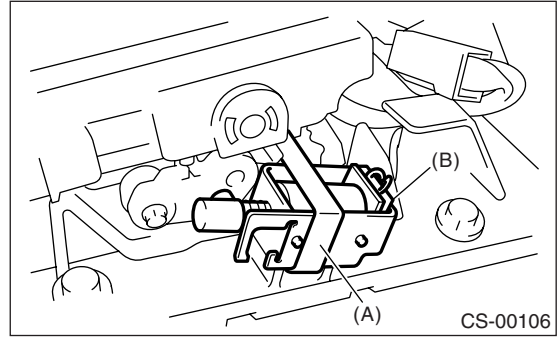
- (A) Clip
- (B) Cover

6) Remove the clips, and then remove the guide plate.



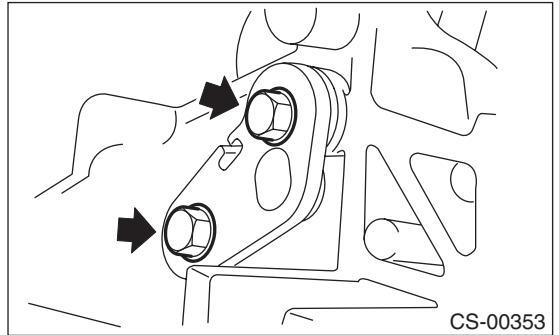
- (A) Clips
- (B) Guide plate

7) Remove the clamp, and then remove the shift lock solenoid.

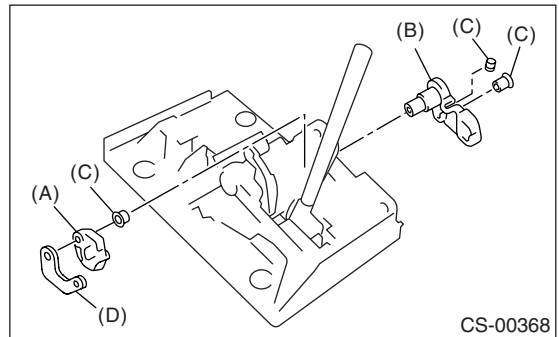


- (A) Clamp
- (B) Shift lock solenoid

8) Remove the bolt securing lock plate B.

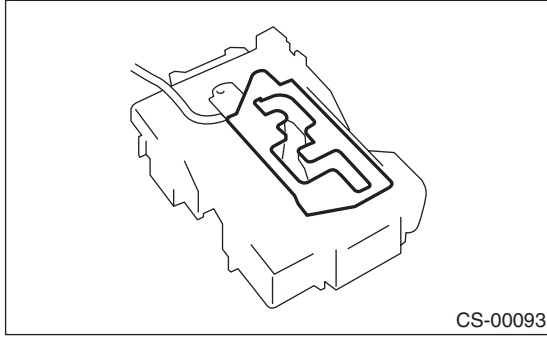


9) Remove the lock plates A, B, C and bushing.

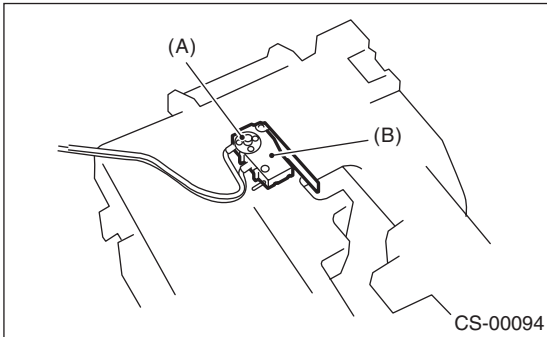


- (A) Lock plate A
- (B) Lock plate B
- (C) Bushing
- (D) Lock plate C

10) Remove the cushion plate.

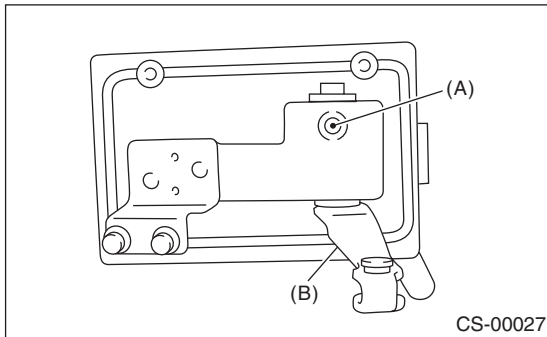


11) Remove the clip, and then remove the "P" range switch.



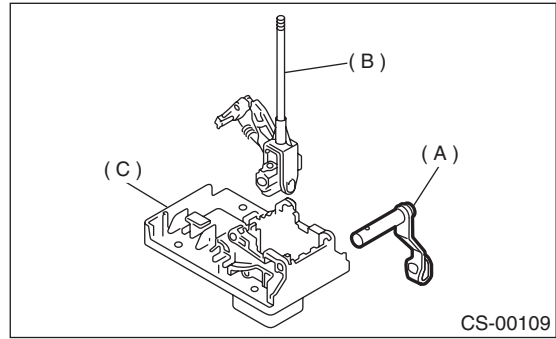
- (A) Clip
- (B) "P" range switch

12) Remove the grommet, and then extract spring pin.



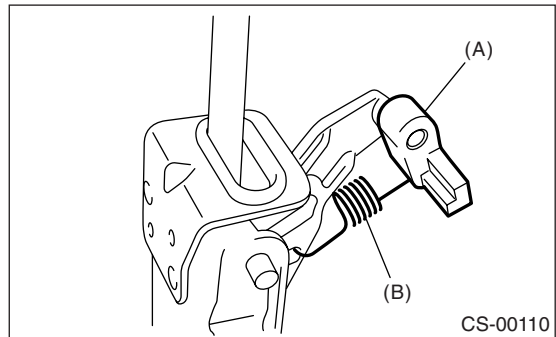
- (A) Spring pin
- (B) Select lever arm

13) Remove the select lever arm, and then take away the select lever assembly from plate.



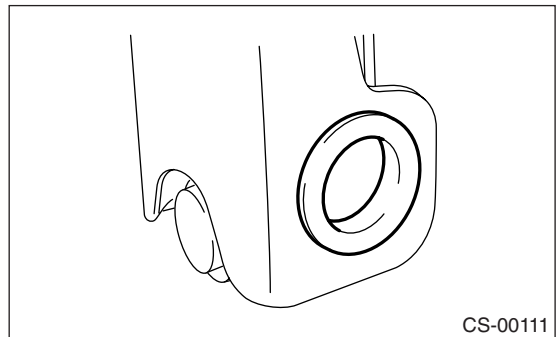
- (A) Select lever arm
- (B) Select lever ASSY
- (C) Plate

14) Remove the detent spring, and then remove the detent arm.

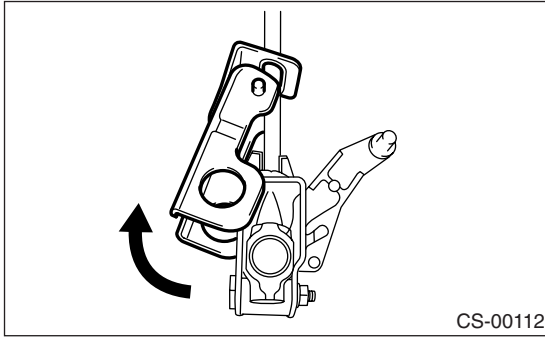


- (A) Detent arm
- (B) Detent spring

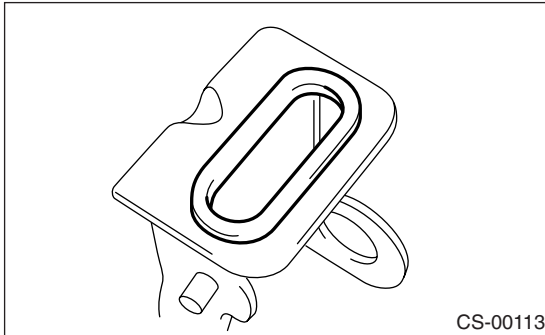
15) Remove the select lever assembly bushing from bracket.



- 16) Remove the bracket from select lever assembly.



- 17) Remove the bushing from bracket.



### D: ASSEMBLY

- 1) Clean all parts before assembly.
- 2) Apply grease to each select lever parts. <Ref. to CS-2, AT SELECT LEVER, COMPONENT, General Description.>

**Lock plate:**

**SUNCALL GREASE (Part No. 002948040)**

**Except lock plate:**

**KOPR-KOTE (Part No. 003603001) or equivalent**

- 3) Assembly is in the reverse order of disassembly.
- 4) After completion of fitting, transfer the select lever to range "P" — "1", then check whether the indicator and select lever agree, whether the pointer and position mark agree and what the operating force is.

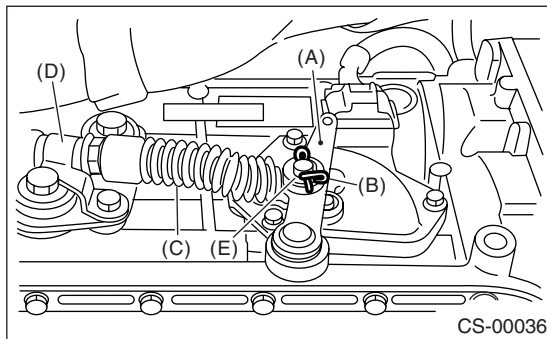
### E: INSPECTION

- 1) Inspect the removed parts for deformation, damage and wear. Correct or replace if defective.
- 2) Confirm the following parts for operating condition before assembly. Moving condition of the select lever assembly, it should move smoothly.

## 4. Select Cable

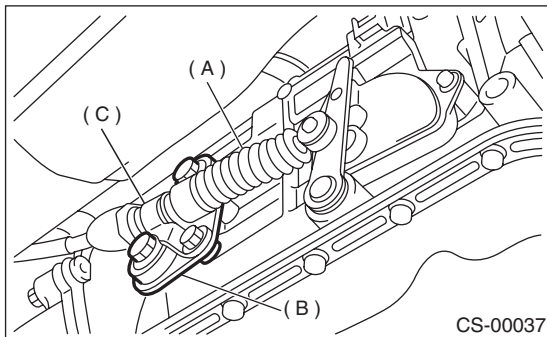
### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Set the select lever to "N" range.
- 3) Disconnect negative cable from battery.
- 4) Lift-up the vehicle.
- 5) Remove front, center, rear exhaust pipe and muffler. (SOHC model)  
 <Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.> <Ref. to EX(H4SO)-6, REMOVAL, Center Exhaust Pipe.> <Ref. to EX(H4SO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, REMOVAL, Muffler.>
- 6) Remove the center and rear exhaust pipes and muffler. (DOHC turbo model)  
 <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>
- 7) Remove the snap pin and washer from range select lever.



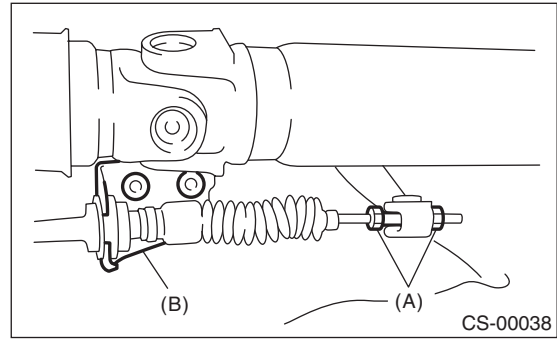
- (A) Range select lever
- (B) Snap pin
- (C) Select cable
- (D) Clamp
- (E) Washer

- 8) Remove the plate assembly from transmission case.



- (A) Select cable
- (B) Plate ASSY
- (C) Clamp

- 9) Disconnect the cable from select lever, and then remove the cable bracket.



- (A) Adjusting nuts
- (B) Cable bracket

- 10) Remove the select cable from plate assembly.

### B: INSTALLATION

- 1) Install the select cable to plate assembly.

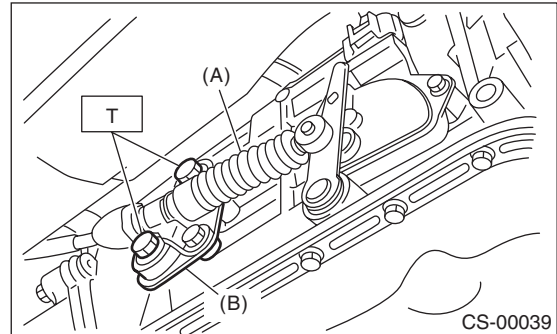
#### Tightening torque:

**18 N·m (1.8 kgf-m, 13.0 ft-lb)**

- 2) Install the select cable to range select lever.
- 3) Install the plate assembly to transmission.

#### Tightening torque:

**T: 24.5 N·m (2.5 kgf-m, 18.1 ft-lb)**

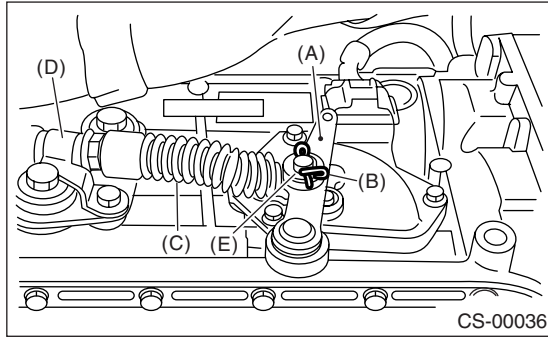


- (A) Select cable
- (B) Plate ASSY

# Select Cable

## CONTROL SYSTEMS

4) Install the washer and snap pin to range select lever.



- (A) Range select lever
- (B) Snap pin
- (C) Select cable
- (D) Clamp
- (E) Washer

5) Insert the thread portion of other inner cable and into connector hole of select lever, and fix the other outer cable end to the bracket.

### Tightening torque:

**18 N·m (1.8 kgf·m, 13.0 ft·lb)**

6) Move the select lever to “N” range, and then adjust the select cable position. <Ref. to CS-28, ADJUSTMENT, Select Cable.>

7) Install the front, center, rear exhaust pipe and muffler. (SOHC model)

<Ref. to EX(H4SO)-4, INSTALLATION, Front Exhaust Pipe.> <Ref. to EX(H4SO)-6, INSTALLATION, Center Exhaust Pipe.> <Ref. to EX(H4SO)-7, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, INSTALLATION, Muffler.>

8) Install center and rear exhaust pipes and muffler. (DOHC turbo model)

<Ref. to EX(H4DOTC)-11, INSTALLATION, Center Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, INSTALLATION, Muffler.>

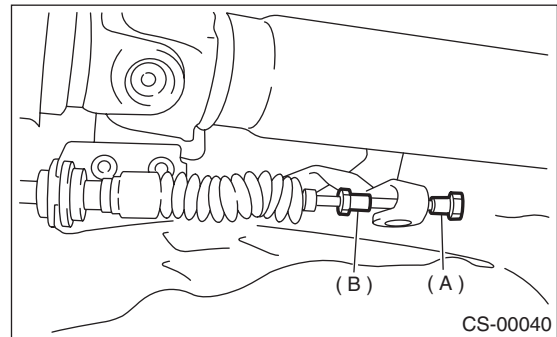
## C: INSPECTION

Check the removed cable and replace if damaged, rusty, or malfunctioning.

- 1) Check for smooth operation of the cable.
- 2) Check the inner cable for damage and rust.
- 3) Check the outer cable for damage, bends, and cracks.
- 4) Check the boot for damage, cracks, and deterioration.
- 5) Move the select lever from “P” range to “1” range. You should be able to feel the detents in each range. If the detents cannot be felt or the range pointer is improperly aligned, adjust the cable.

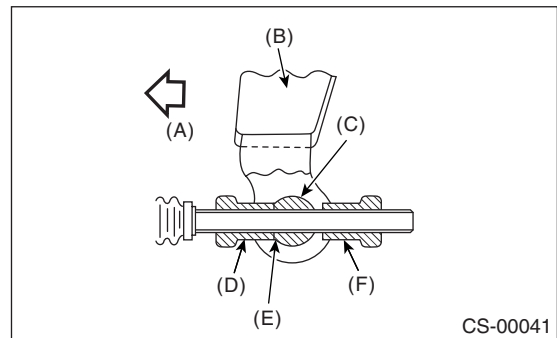
## D: ADJUSTMENT

- 1) Set the vehicle on a lift.
- 2) Set the select lever to “N” range.
- 3) Lift-up the vehicle.
- 4) Remove the rear exhaust pipe and muffler.
  - SOHC model  
<Ref. to EX(H4SO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, REMOVAL, Muffler.>
  - DOHC turbo model  
<Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>
- 5) Loosen the adjusting nut on each side.



- (A) Adjusting nut A
- (B) Adjusting nut B

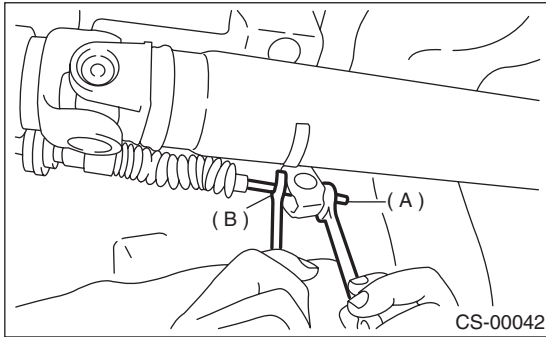
6) Turn the adjusting nut B until it lightly touches the connector.



- (A) Front side
- (B) Select lever
- (C) Connector
- (D) Adjusting nut B
- (E) Contact point
- (F) Adjusting nut A

7) While preventing the adjusting nut B from moving with a wrench, tighten the adjusting nut A.

**Tightening torque:**  
**7.5 N·m (0.76 kgf·m, 5.5 ft-lb)**



- (A) Adjusting nut A
- (B) Adjusting nut B

- 8) After completion of fitting, make sure that the select lever operates smoothly all across the operating range.
- 9) Install in the reverse order of removal.

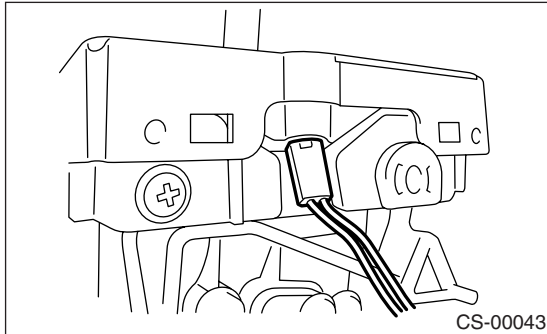
# AT Shift Lock Solenoid and "P" Range Switch

## CONTROL SYSTEMS

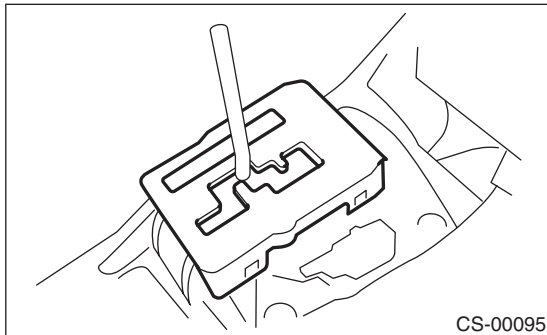
### 5. AT Shift Lock Solenoid and "P" Range Switch

#### A: REMOVAL

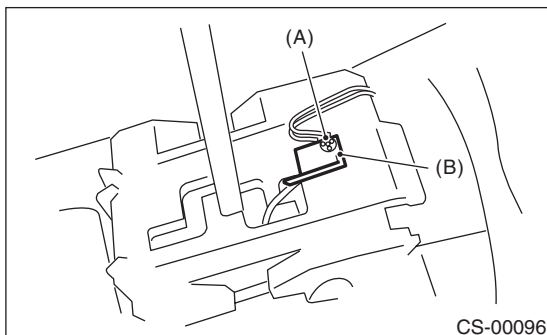
- 1) Disconnect the ground cable from battery.
- 2) Remove the console box. <Ref. to EI-46, REMOVAL, Console Box.>
- 3) Disconnect the connector.
- 4) Remove the grip.
- 5) Remove the indicator bulb from indicator cover.



- 6) Remove the indicator cover.

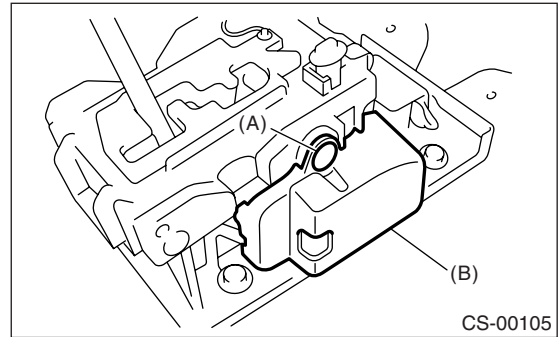


- 7) Remove the blind.
- 8) Remove the cushion.
- 9) Remove the clip, and then remove the "P" range switch.



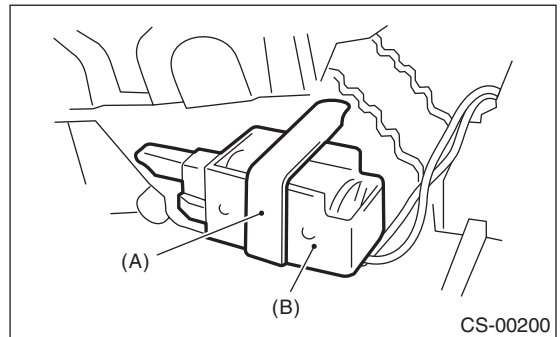
- (A) Clip  
(B) "P" range switch

- 10) Remove the cover.



- (A) Clip  
(B) Cover

- 11) Remove the clamp, and then remove the shift lock solenoid.



- (A) Clamp  
(B) Shift lock solenoid

#### B: INSTALLATION

Install in the reverse order of removal.

# AT Shift Lock Solenoid and “P” Range Switch

## C: INSPECTION

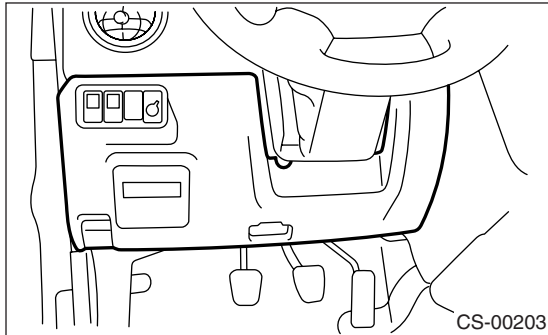
| Step   | Check  | Yes           | No   |
|--|--|---------------|--|
| <b>1</b><br><b>CHECK SHIFT LOCK SOLENOID.</b><br>Measure the resistance of shift lock solenoid connector terminals.<br><i>Terminals</i><br><i>No. 4 — No. 5:</i>                         | Is the resistance between 20 and 40 $\Omega$ ? | Go to step 2. | Replace the shift lock solenoid and “P” range switch assembly. |
| <b>2</b><br><b>CHECK SHIFT LOCK SOLENOID.</b><br>Connect the battery with shift lock solenoid connector terminal, operate solenoid.<br><i>Terminals</i><br><i>No. 4 (+) — No. 5 (-):</i> | Is the shift lock solenoid operating properly? | Go to step 3. | Replace the shift lock solenoid and “P” range switch assembly. |
| <b>3</b><br><b>CHECK “P” RANGE SWITCH.</b><br>1) Move the select lever to “P” range.<br>2) Measure the resistance between “P” range switch connector terminals.                          | Is the resistance less than 1 $\Omega$ ?       | Go to step 4. | Replace the “P” range switch.                                  |
| <b>4</b><br><b>CHECK “P” RANGE SWITCH.</b><br>1) Move the select lever to other than “P” range.<br>2) Measure the resistance between “P” range switch connector terminals.               | Is the resistance more than 1 $M\Omega$ ?      | Normal        | Replace the “P” range switch.                                  |



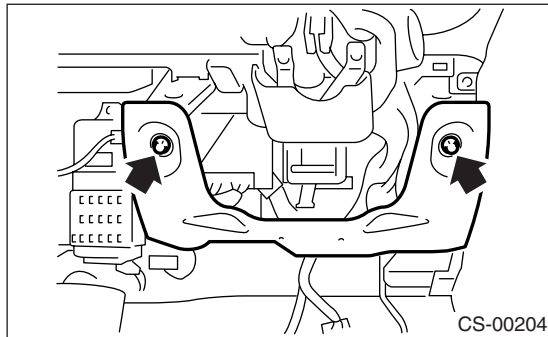
## 6. Body Integrated Module

### A: REMOVAL

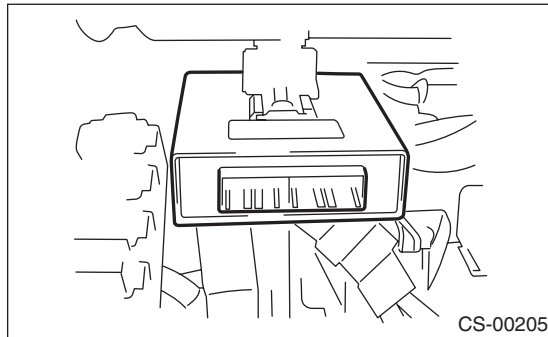
- 1) Disconnect the ground cable from battery.
- 2) Remove the lower cover.



- 3) Remove the knee bolster.



- 4) Disconnect the connector from body integrated module.
- 5) Remove the body integrated module.



### B: INSTALLATION

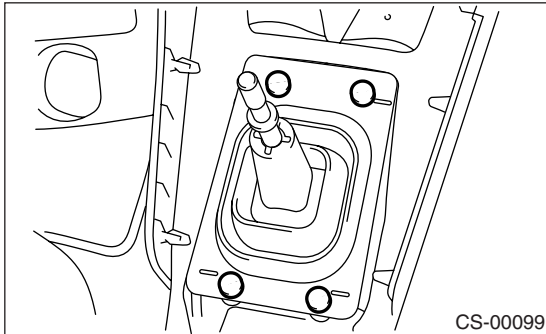
Install in the reverse order of removal.

## 7. MT Gear Shift Lever

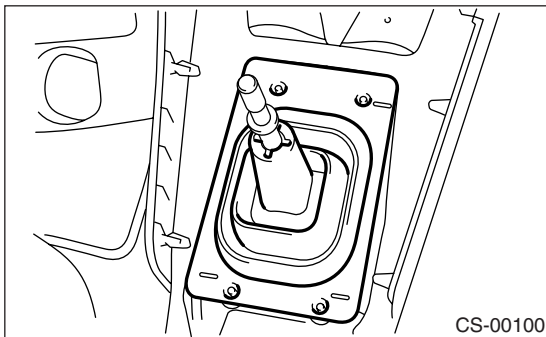
### A: REMOVAL

#### 1. 5MT

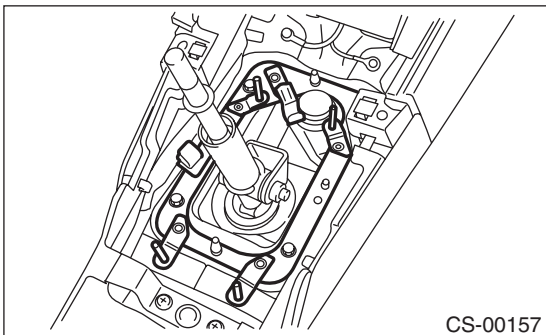
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the gear shift knob.
- 4) Remove the console box. <Ref. to EI-46, REMOVAL, Console Box.>
- 5) Remove the clamp.



- 6) Remove the boot and insulator assembly.

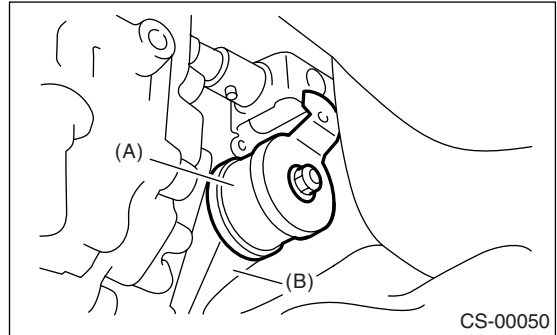


- 7) Remove the plate assembly from body.



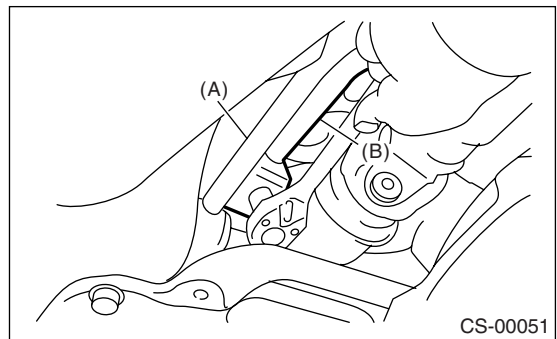
- 8) Lift-up the vehicle.
- 9) Remove the rear exhaust pipe and muffler.
  - SOHC model  
<Ref. to EX(H4SO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, REMOVAL, Muffler.>
  - DOHC turbo model  
<Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>

- 10) Remove the stay from transmission bracket.



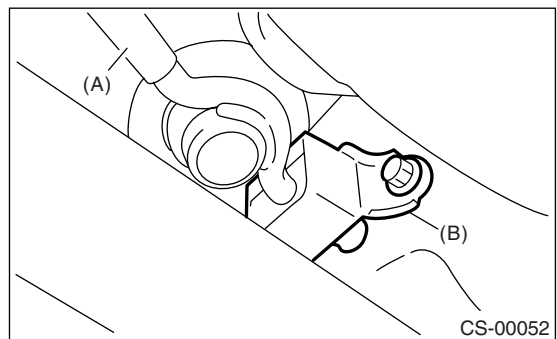
- (A) Stay
- (B) Transmission bracket

- 11) Remove the rod from joint.



- (A) Stay
- (B) Rod

- 12) Remove the cushion rubber from body.

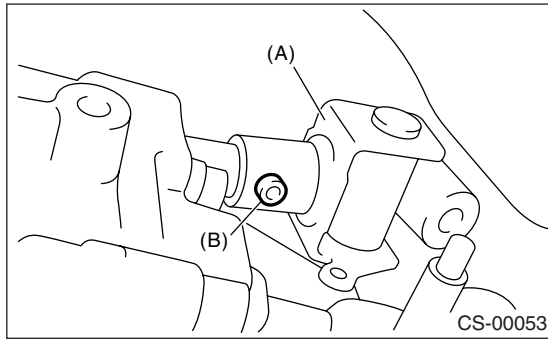


- (A) Stay
- (B) Cushion rubber

# MT Gear Shift Lever

## CONTROL SYSTEMS

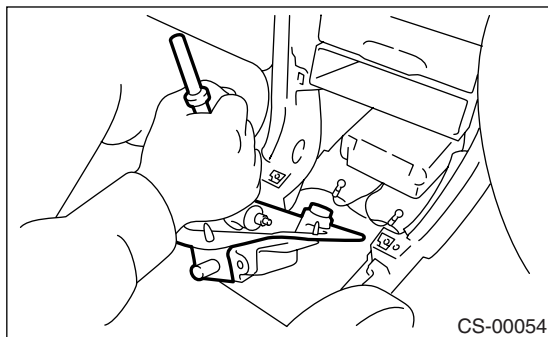
13) Extract the spring pin, and then remove the joint.



- (A) Joint
- (B) Spring pin

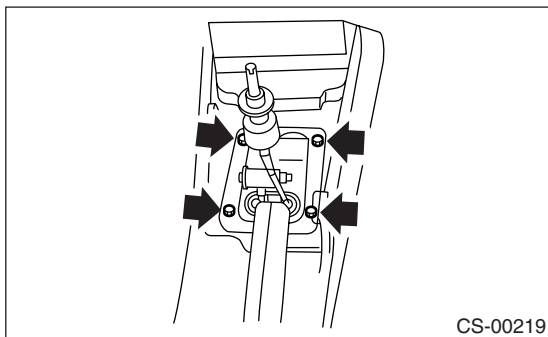
14) Lower the vehicle.

15) Remove the gear shift lever.



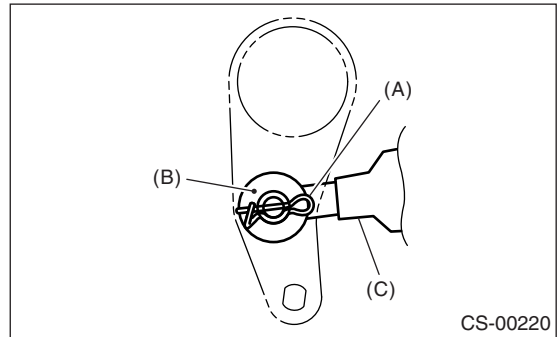
## 2. 6MT

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the gear shift knob.
- 4) Remove the console box front. <Ref. to EI-46, REMOVAL, Console Box.>
- 5) Remove the boot plate from body.



- 6) Lift-up the vehicle.
- 7) Remove the under cover.
- 8) Remove the rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>
- 9) Remove the crossmember. <Ref. to 6MT-34, REMOVAL, Transmission Mounting System.>

10) Remove the snap pin and washer, and then remove the reverse check cable from reverse check lever.

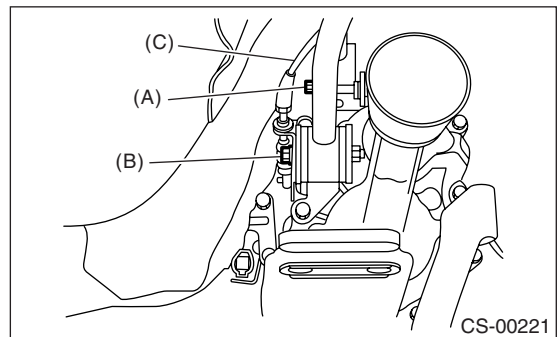


- (A) Snap pin
- (B) Washer
- (C) Reverse check cable

11) Move the transmission to right side, and then remove the joint COMPL, stay bolt and reverse check cable.

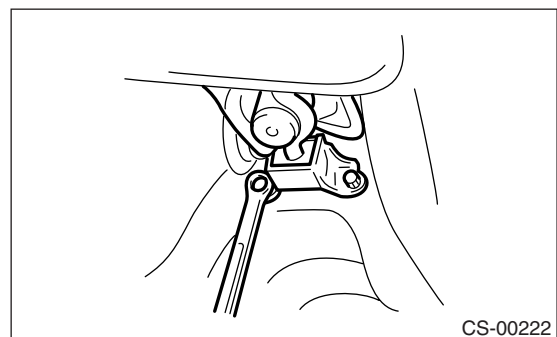
### NOTE:

If the transmission is not moved, the joint COMPL and stay bolt will contact body and damage may occur.



- (A) Joint COMPL bolt
- (B) Stay bolt
- (C) Reverse check cable

12) Remove the cushion rubber from body.



- 13) Lower the vehicle.
- 14) Remove the gear shift lever.

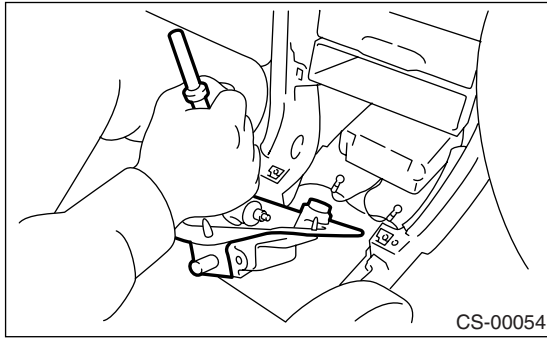
## B: INSTALLATION

### 1. 5MT

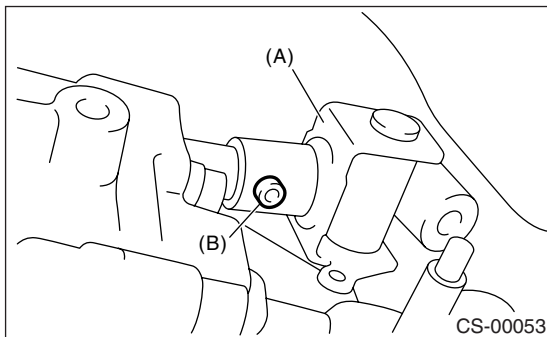
- 1) Install the joint to the transmission and secure with the spring pin.
- 2) Insert gear shift lever from room side.

**NOTE:**

After inserting rod and stay, position them onto transmission mount.



- 3) Lift-up the vehicle.
- 4) Install the joint to shifter arm.
- 5) Insert the spring pin.

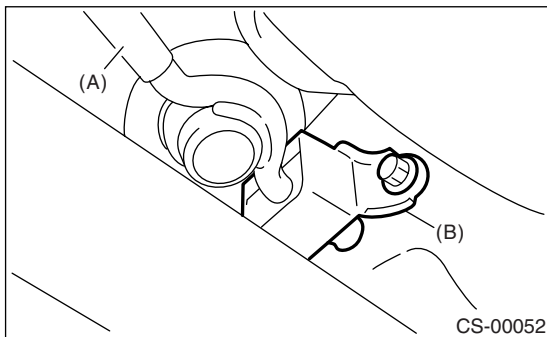


- (A) Joint
- (B) Spring pin

- 6) Mount the cushion rubber on body.

**Tightening torque:**

**18 N·m (1.8 kgf-m, 13.0 ft-lb)**

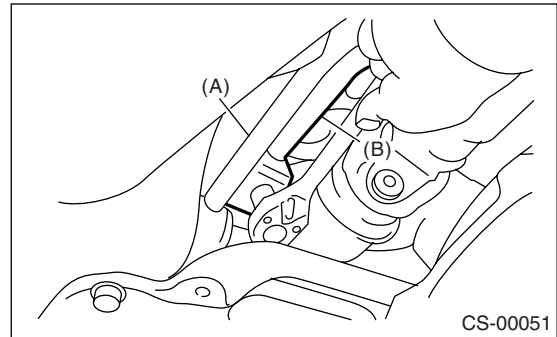


- (A) Stay
- (B) Cushion rubber

- 7) Connect the rod to the joint.

**Tightening torque:**

**12 N·m (1.2 kgf-m, 8.9 ft-lb)**

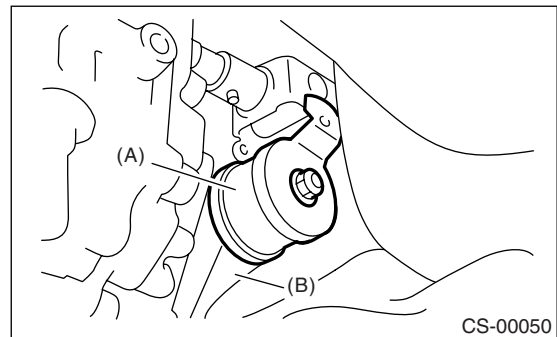


- (A) Stay
- (B) Rod

- 8) Connect the stay to transmission bracket.

**Tightening torque:**

**18 N·m (1.8 kgf-m, 13.0 ft-lb)**



- (A) Stay
- (B) Transmission bracket

- 9) Install the rear exhaust pipe and muffler.

- SOHC model  
<Ref. to EX(H4SO)-7, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, INSTALLATION, Muffler.>

- DOHC turbo model  
<Ref. to EX(H4DOTC)-15, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, INSTALLATION, Muffler.>

- 10) Lower the vehicle.

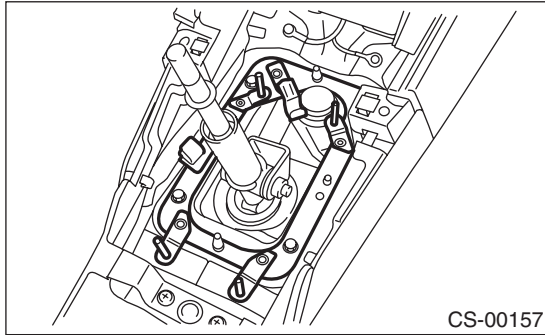
- 11) Install the plate assembly to body.

# MT Gear Shift Lever

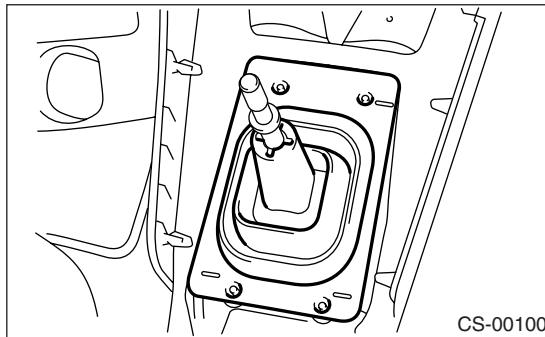
## CONTROL SYSTEMS

### Tightening torque:

**7.5 N·m (0.76 kgf·m, 5.5 ft·lb)**



12) Pay attention to the direction of boot and insulator assembly and install them to the vehicle.



13) Install the clamp.

14) Install console box. <Ref. to EI-46, INSTALLATION, Console Box.>

## 2. 6MT

1) Insert the gear shift lever from room side.

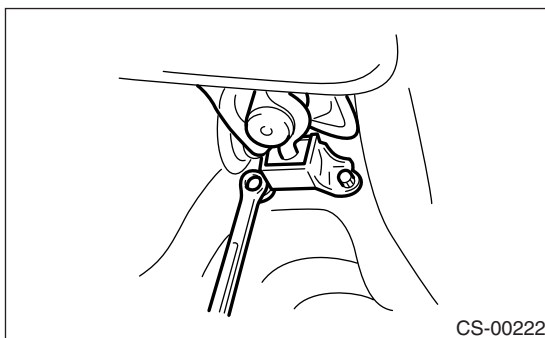
### NOTE:

After inserting the rod and stay, temporarily put them onto transmission mount.

2) Mount the cushion rubber on body.

### Tightening torque:

**18 N·m (1.8 kgf·m, 13.0 ft·lb)**

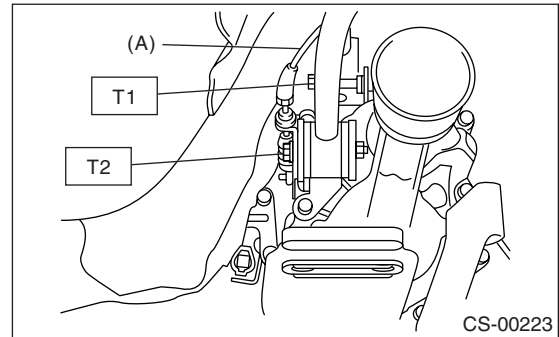


3) Move the transmission to right side, and then install the joint COMPL and stay.

### Tightening torque:

**T1: 11.8 N·m (1.2 kgf·m, 8.7 ft·lb)**

**T2: 32 N·m (3.3 kgf·m, 23.6 ft·lb)**



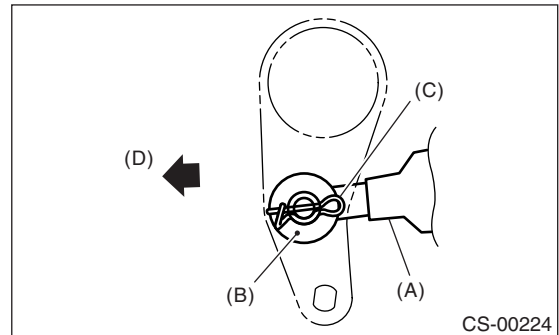
(A) Reverse check cable

4) Install the crossmember. <Ref. to 6MT-34, INSTALLATION, Transmission Mounting System.>

5) Install the reverse check cable end, washer and snap pin to reverse check lever.

### NOTE:

- Take care to install the snap pin in proper direction.
- Conduct the adjustment of reverse check cable before installation. <Ref. to CS-49, ADJUSTMENT, Reverse Check Cable.>



(A) Reverse check cable

(B) Washer

(C) Snap pin

(D) Front side

6) Install the rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-15, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, INSTALLATION, Muffler.>

7) Install the under cover.

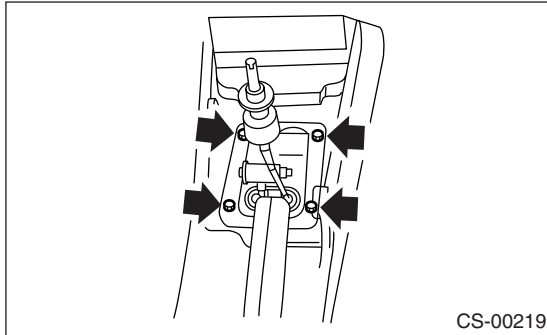
8) Install the boot plate.

### NOTE:

Install the inner boot without any twist.

**Tightening torque:**

**7.5 N·m (0.76 kgf-m, 5.5 ft-lb)**



CS-00219

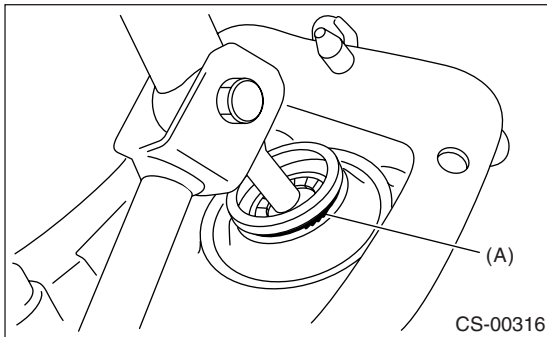
9) Install the console box. <Ref. to EI-46, INSTALLATION, Console Box.>

10) Check that the gear shift is correctly shifted to each gear.

**C: DISASSEMBLY**

**1. 5MT**

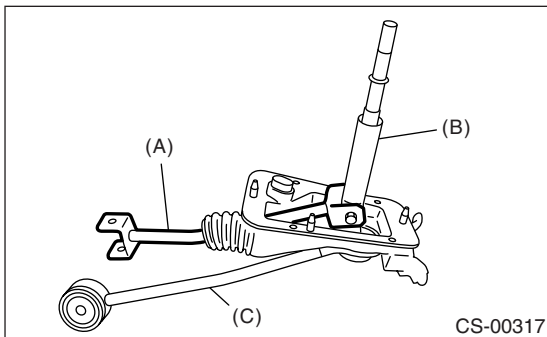
1) Disassemble the lock wire.



CS-00316

(A) Lock wire

2) Remove the rod from lever.

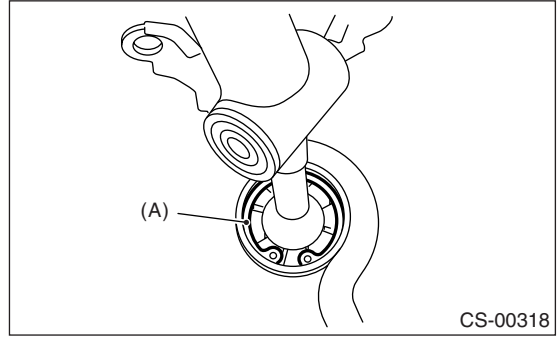


CS-00317

(A) Rod  
(B) Lever  
(C) Stay

3) Separate the rod and inner boot.

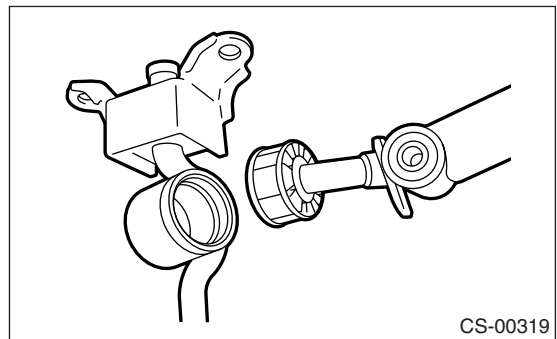
4) Remove the snap ring from the stay.



CS-00318

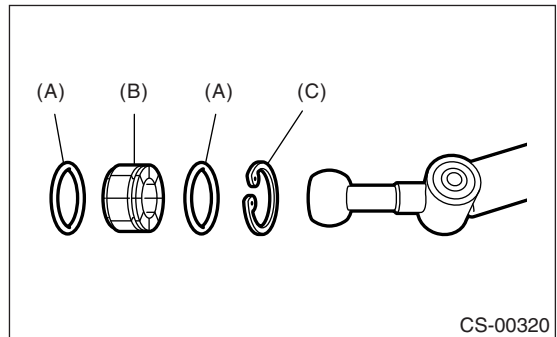
(A) Snap ring

5) Separate the gear shift lever and the stay.



CS-00319

6) Remove the boot, bushing and snap ring from gear shift lever.



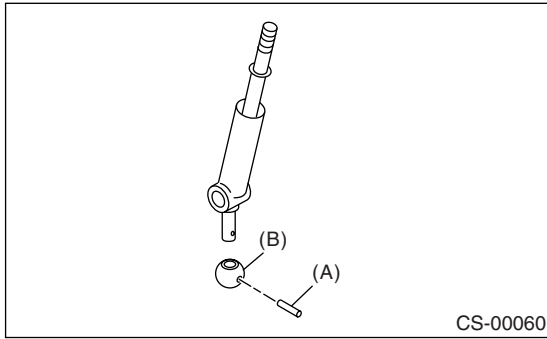
CS-00320

(A) O-ring  
(B) Bushing  
(C) Snap ring

# MT Gear Shift Lever

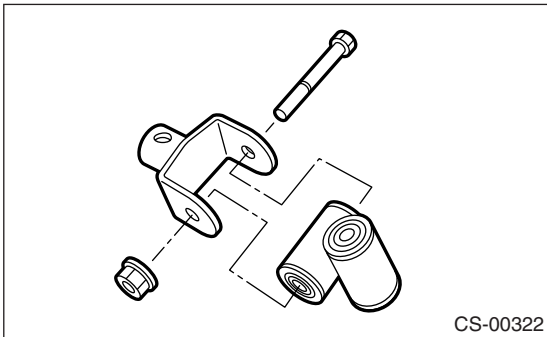
## CONTROL SYSTEMS

7) Remove the spring pin, and then remove the bushing and snap ring.



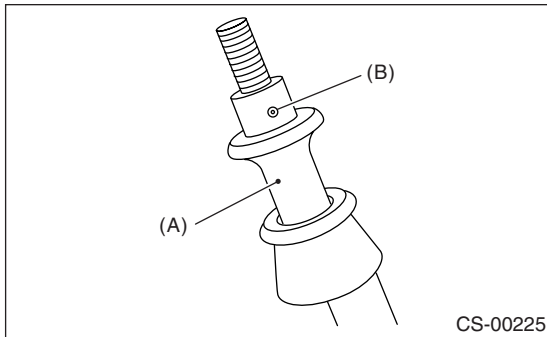
- (A) Spring pin
- (B) Bushing

8) Remove the boss from the joint.



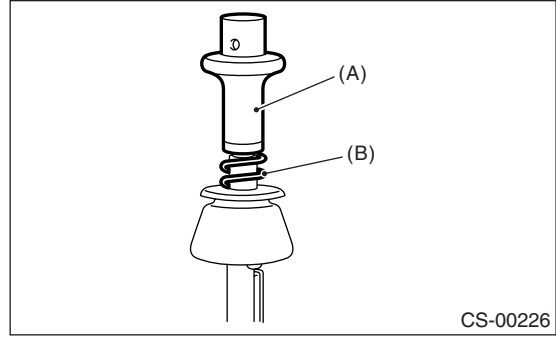
## 2. 6MT

1) Remove the spring pin from slider.



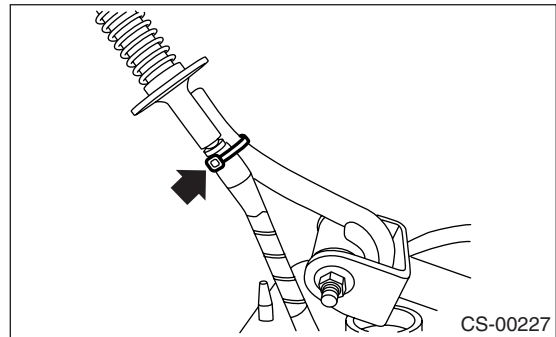
- (A) Slider
- (B) Spring pin

2) Remove the slider and spring.

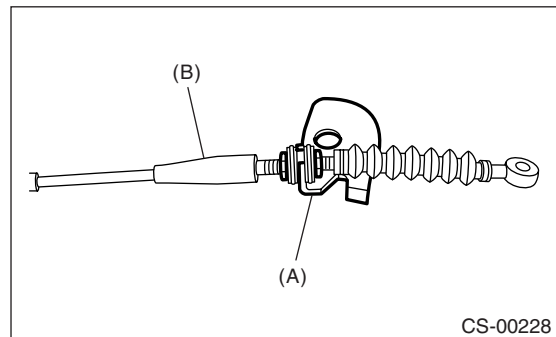


- (A) Slider
- (B) Spring

3) Cut the band clip.

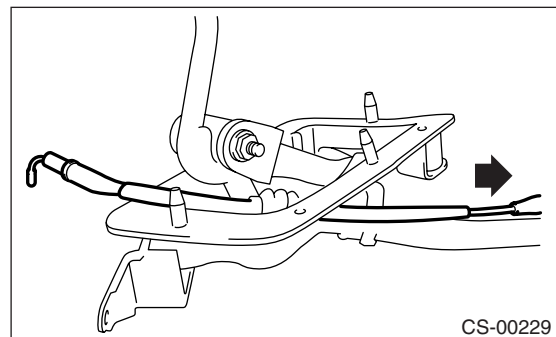


4) Remove the reverse check cable from cable plate.

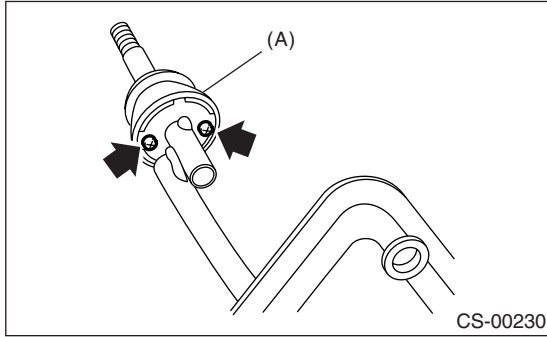


- (A) Cable plate
- (B) Reverse check cable

5) Remove the reverse check cable from gear shift assembly.



6) Remove the holder and spring seat.

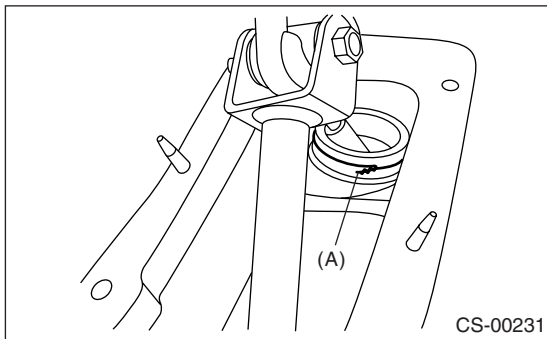


(A) Holder

7) Disassemble the lock wire.

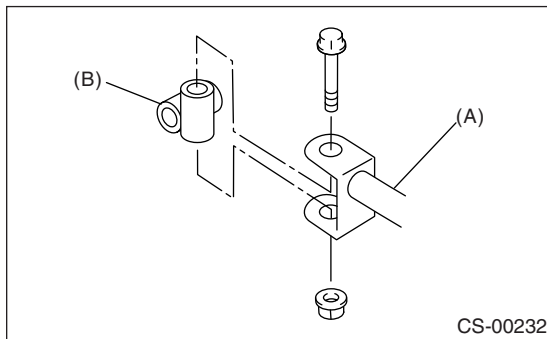
**NOTE:**

Do not reuse the lock wire.



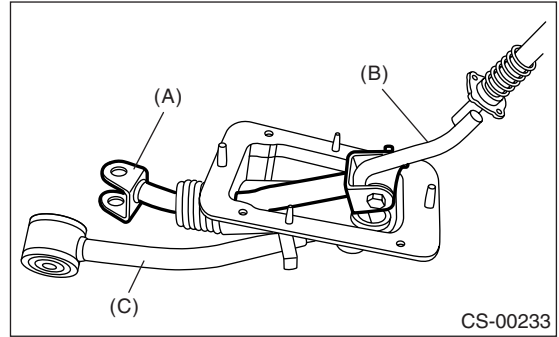
(A) Lock wire

8) Remove the boss from rod.



(A) Rod  
(B) Boss

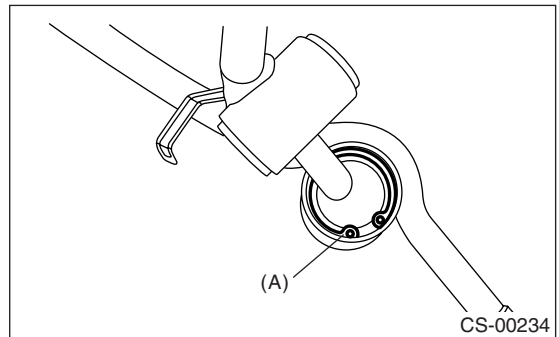
9) Remove the rod from lever.



(A) Rod  
(B) Lever  
(C) Stay

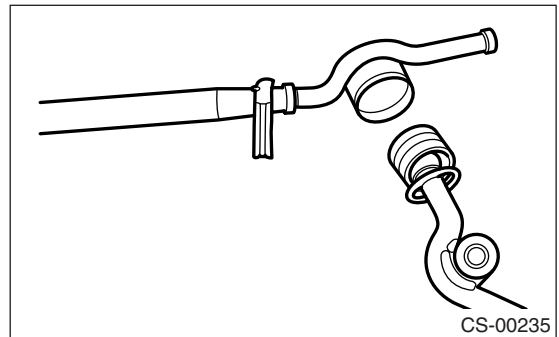
10) Separate the rod and inner boot.

11) Remove the snap ring from stay.



(A) Snap ring

12) Separate the gear shift lever and stay.

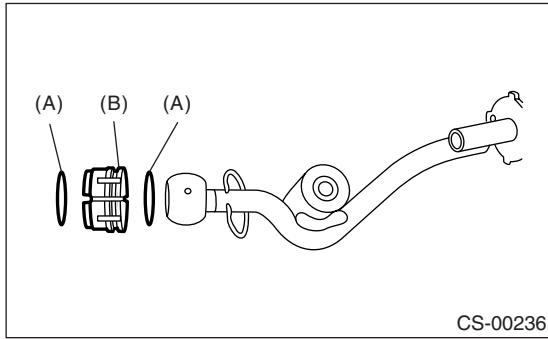




# MT Gear Shift Lever

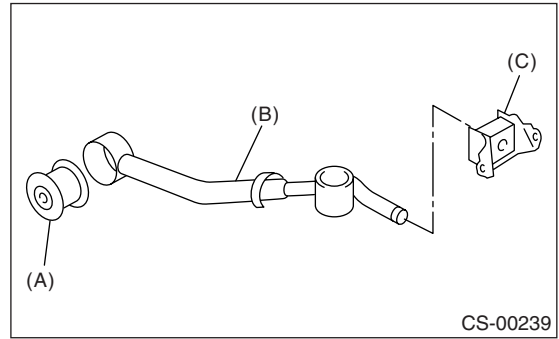
## CONTROL SYSTEMS

13) Remove the boot and bushing from gear shift lever.



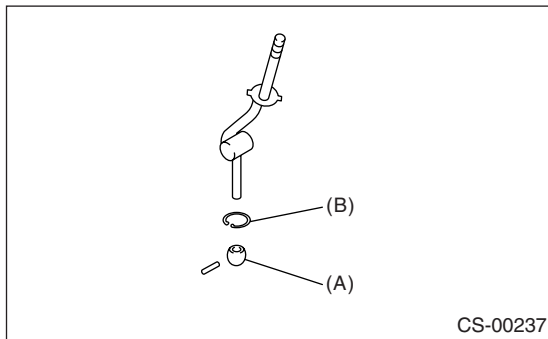
- (A) O-ring
- (B) Bushing

16) Remove the bushing and cushion rubber from stay.



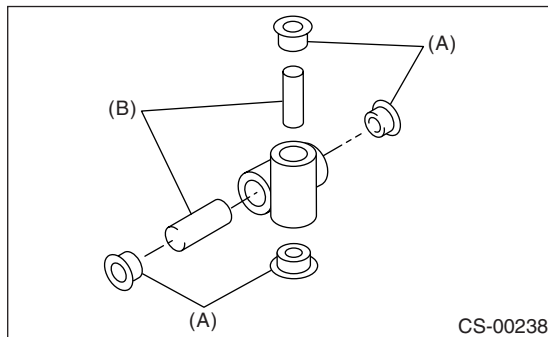
- (A) Bushing
- (B) Stay
- (C) Cushion rubber

14) Remove the spring pin, and then remove the bushing and snap ring.



- (A) Bushing
- (B) Snap ring

15) Remove the bushing and spacer from boss.



- (A) Bushing
- (B) Spacer

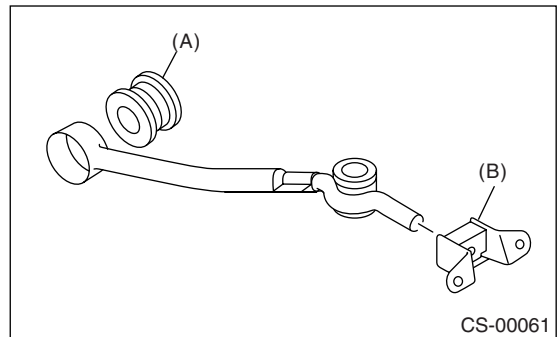
## D: ASSEMBLY

### 1. 5MT

#### NOTE:

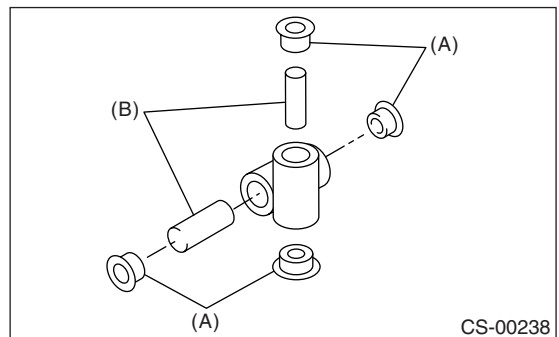
- Clean all the parts before assembly.
- Apply grease [KOPR-KOTE (Part No. 003603001) or equivalent] to each part.

1) Mount the bushing and cushion rubber on the stay.



- (A) Bushing
- (B) Cushion rubber

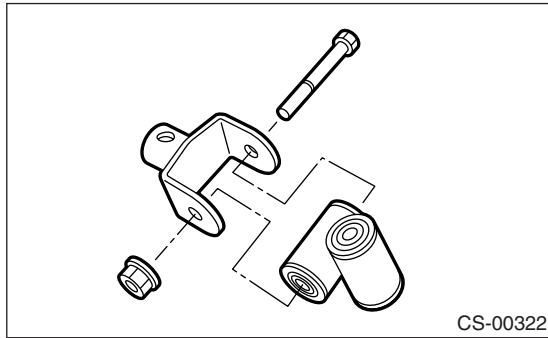
2) Install the bushing and spacer to boss.



- (A) Bushing
- (B) Spacer

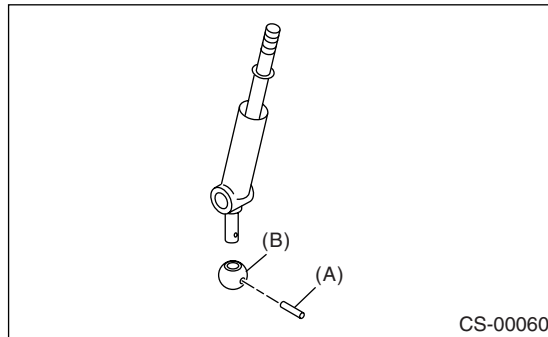
3) Using new self-locking nuts, install the boss to the joint.

**Tightening torque:**  
**12 N·m (1.2 kgf·m, 8.9 ft·lb)**

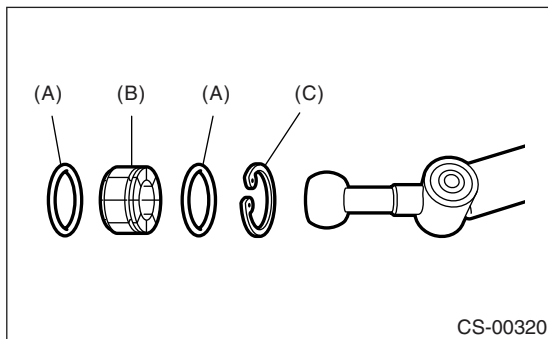


4) Install the snap ring to gear shift lever and install the bushing.

**NOTE:**  
 Apply grease to the bushing.

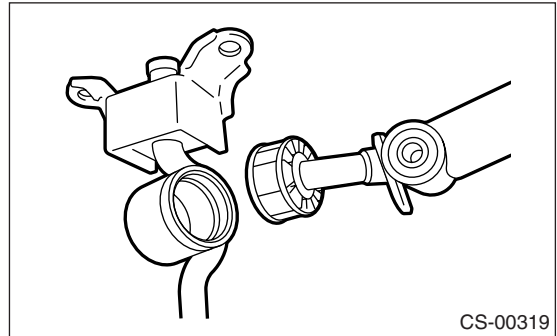


5) Apply grease to the bushing and O-ring, and then install to the gear shift lever.

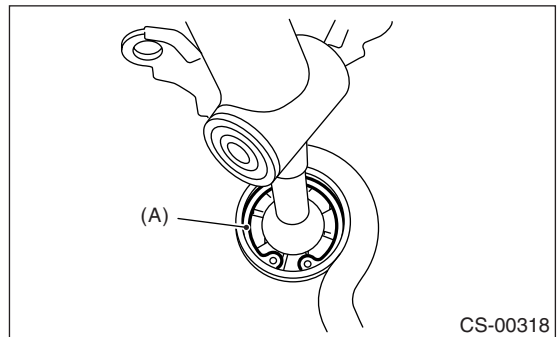


- (A) O-ring
- (B) Bushing
- (C) Snap ring

6) Apply sufficient grease into boss, and then install the gear shift lever to the stay.



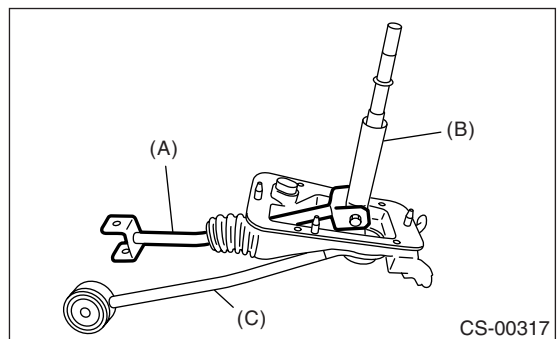
7) Install the washer and snap ring.



- (A) Snap ring

8) Insert the gear shift lever and rod into boot hole.  
 9) Install the rod.

**Tightening torque:**  
**12 N·m (1.2 kgf·m, 8.9 ft·lb)**

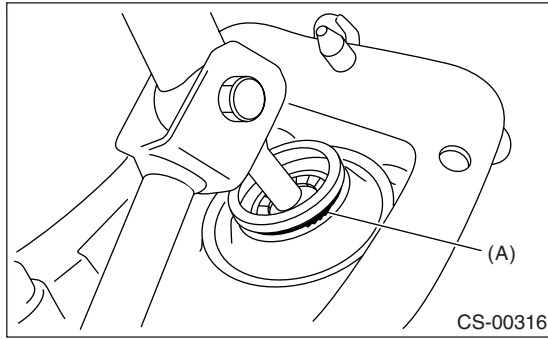


- (A) Rod
- (B) Lever
- (C) Stay

# MT Gear Shift Lever

## CONTROL SYSTEMS

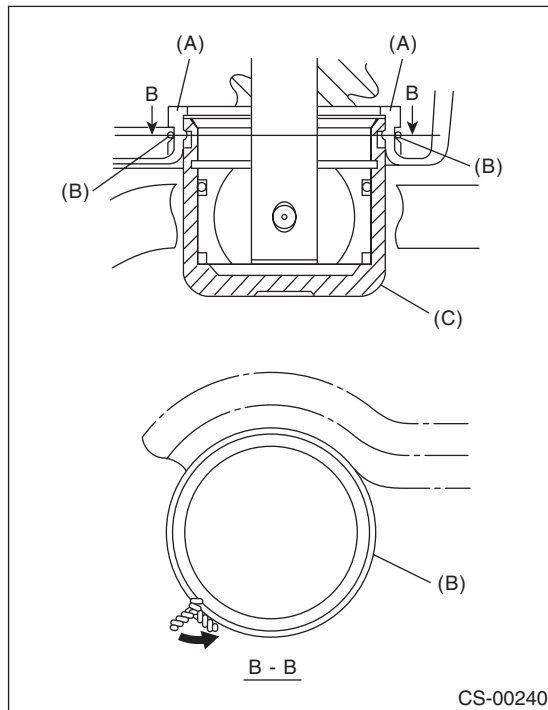
10) Install a new lock wire.



(A) Lock wire

**NOTE:**

- Install the lock wire to the stay groove.
- Bend the extra wire to same direction of lock wire winding.



(A) Inner boot  
(B) Lock wire  
(C) Stay

11) Check the swing torque of rod in relation to the gear shift lever.

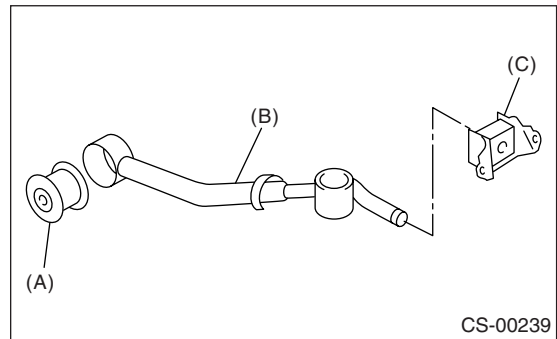
12) Check that there is no excessive play and that parts move smoothly.

## 2. 6MT

**NOTE:**

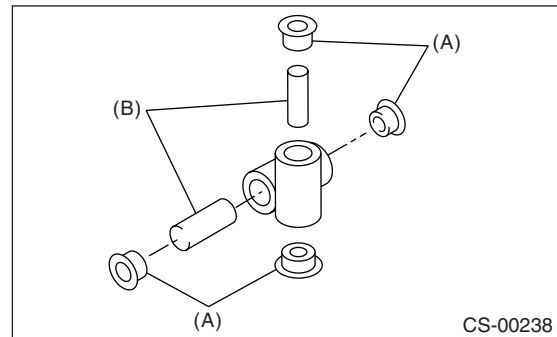
- Clean all parts before assembly.
- Apply NIGTIGHT LYW No. 2 grease or equivalent to each parts.

1) Mount the bushing and cushion rubber on the stay.



(A) Bushing  
(B) Stay  
(C) Cushion rubber

2) Install the bushing and spacer to boss.

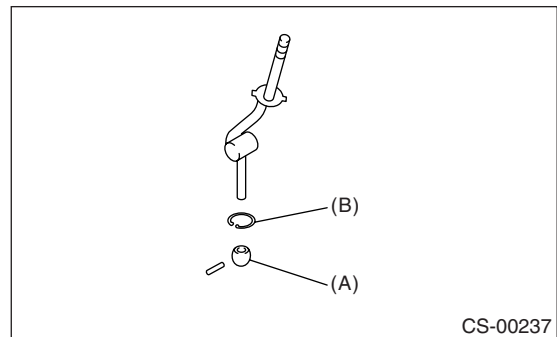


(A) Bushing  
(B) Spacer

3) Install the snap ring to gear shift lever, and then install the bushing.

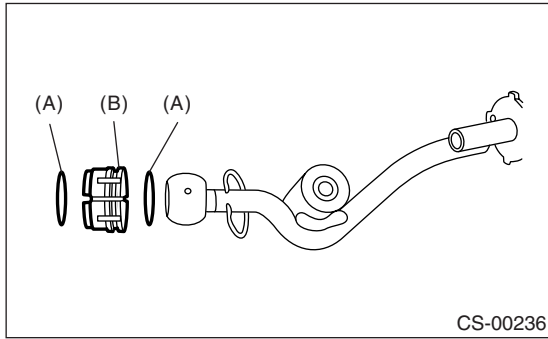
**NOTE:**

Apply grease to the bushing.



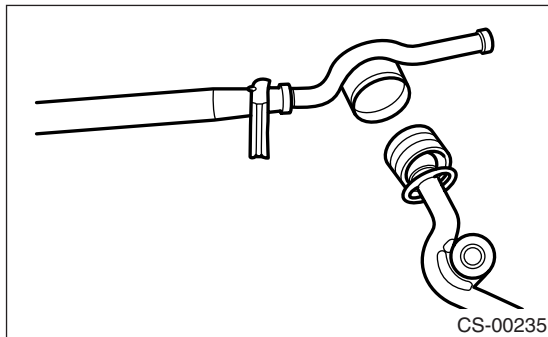
(A) Bushing  
(B) Snap ring

4) Apply grease to the bushing and O-ring, and then install to the gear shift lever.

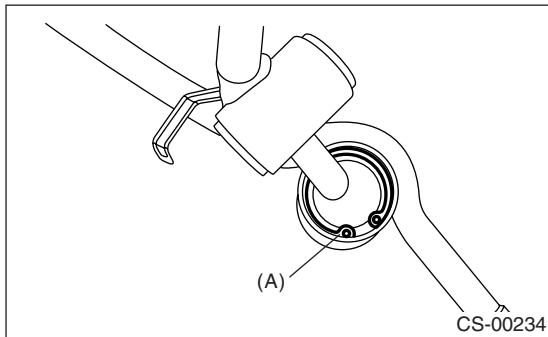


- (A) O-ring
- (B) Bushing

5) Apply sufficient grease into the boss, and then install the gear shift lever to stay.



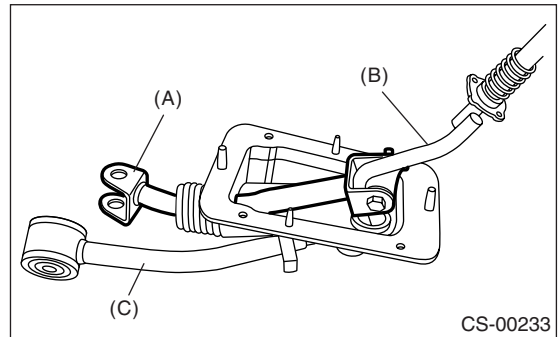
6) Install the washer and snap ring.



- (A) Snap ring

7) Insert the gear shift lever and rod into boot hole.  
8) Install the rod.

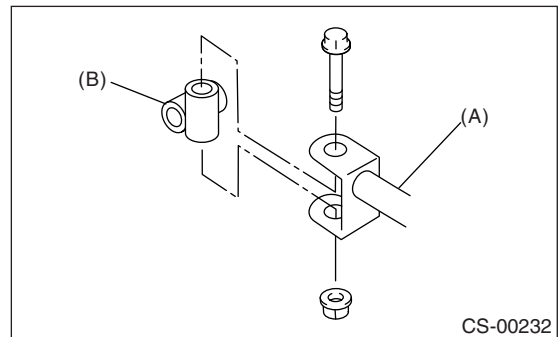
**Tightening torque:**  
**11.8 N·m (1.2 kgf-m, 8.7 ft-lb)**



- (A) Rod
- (B) Lever
- (C) Stay

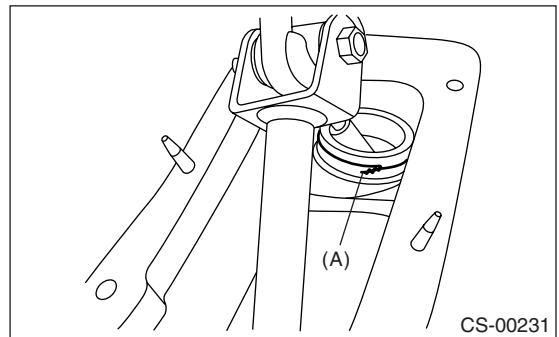
9) Install the boss to rod.

**Tightening torque:**  
**11.8 N·m (1.2 kgf-m, 8.7 ft-lb)**



- (A) Rod
- (B) Boss

10) Install a new lock wire.



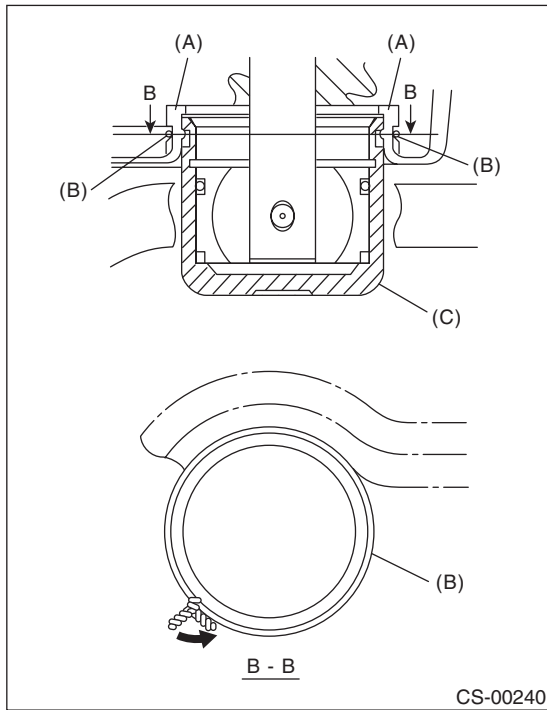
- (A) Lock wire

# MT Gear Shift Lever

## CONTROL SYSTEMS

### NOTE:

- Install the lock wire to the stay groove.
- Bend the extra wire to same direction of lock wire winding.

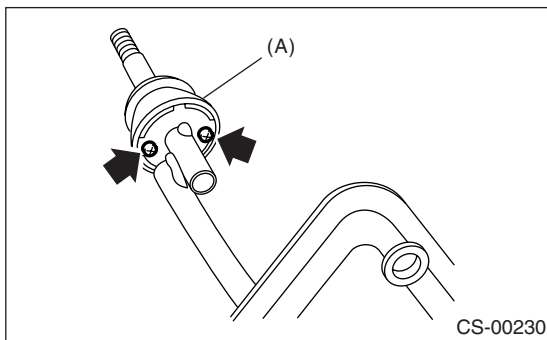


- (A) Inner boot  
(B) Lock wire  
(C) Stay

11) Install the holder.

### Tightening torque:

**1.3 N·m (0.13 kgf·m, 0.96 ft·lb)**



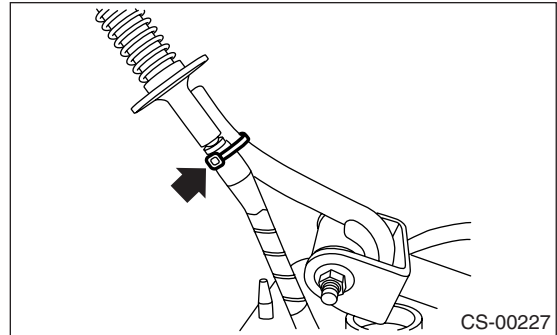
- (A) Holder

12) Insert the reverse check cable into boot hole.

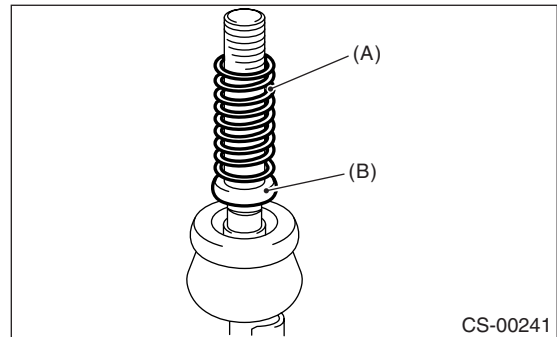
13) Insert the reverse check cable into gear shift assembly, and fix with band clip.

### NOTE:

- Cut off the extra band clip.
- Make sure that the reverse check cable is inserted into gear shift lever assembly without any clearance.



14) Install the seat cushion and spring.

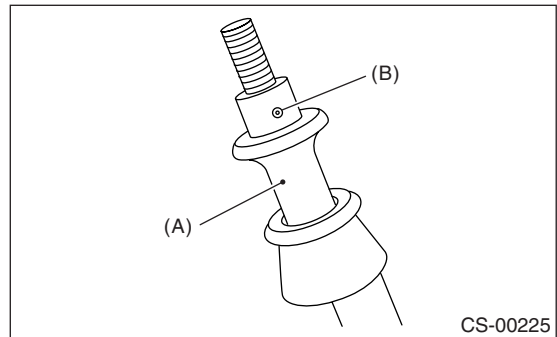


- (A) Spring  
(B) Seat cushion

15) Fix the slider and reverse check cable end with spring pin.

### NOTE:

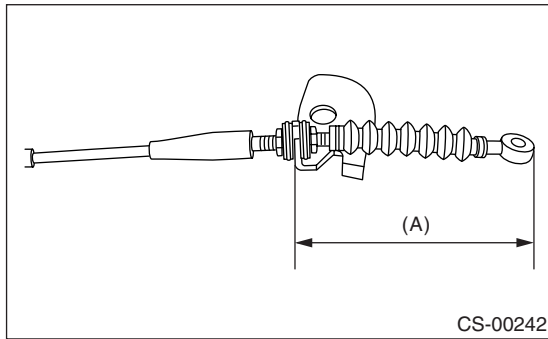
Apply grease to the sliding part of slider.



- (A) Slider  
(B) Spring pin

16) With the cable pulled (slider lowered), adjust the length between end of cable plate and reverse check cable to 84 mm (3.31 in), and then tighten the lock nut.

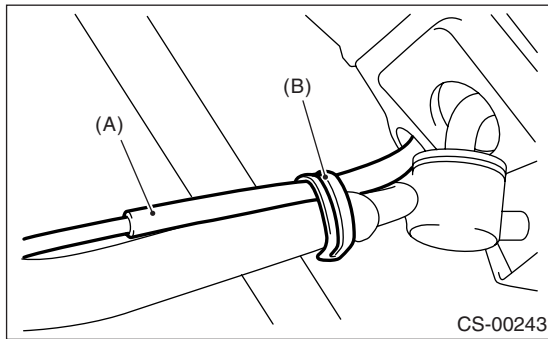
**Tightening torque:**  
**6 N·m (0.6 kgf·m, 4.4 ft·lb)**



(A) 84 mm (3.31 in)

17) Fix the reverse check cable to clip of stay.

**NOTE:**  
 Install the reverse check cable to upper side of stay.

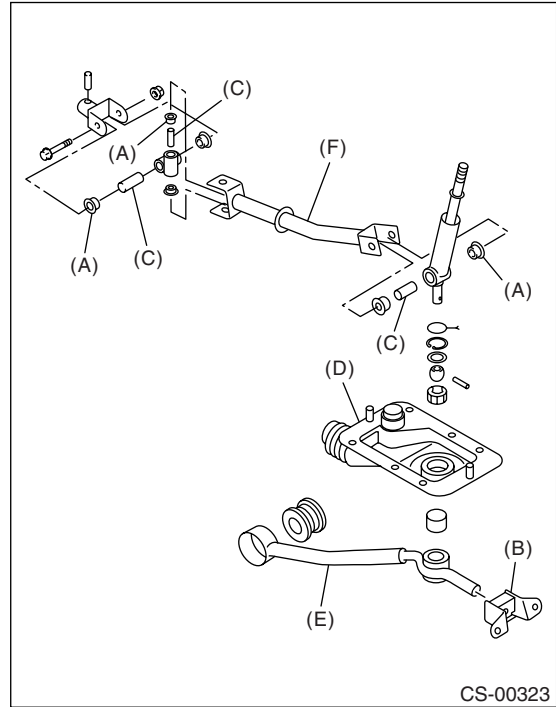


(A) Reverse check cable  
 (B) Clip

## E: INSPECTION

1) Check the removed parts (bushing, cushion rubber, spacer, boot, stay, rod, etc.) for deformation, damage and wear. Repair or replace any defective part.

- 5MT

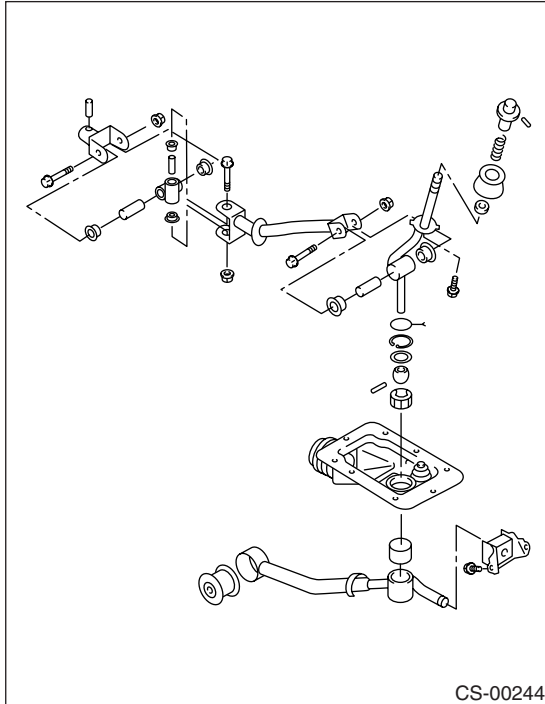


(A) Bushing  
 (B) Cushion rubber  
 (C) Spacer  
 (D) Boot  
 (E) Stay  
 (F) Rod

# MT Gear Shift Lever

## CONTROL SYSTEMS

- 6MT

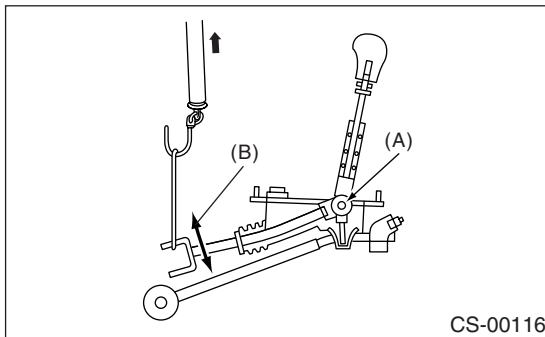


2) Check the swing torque of the rod in relation of the gear shift lever.

If the torque exceeds the specification, replace the bushing or retighten the nuts.

**Swing torque:**

**3.7 N (0.38 kgf, 0.84 lbf) or less**

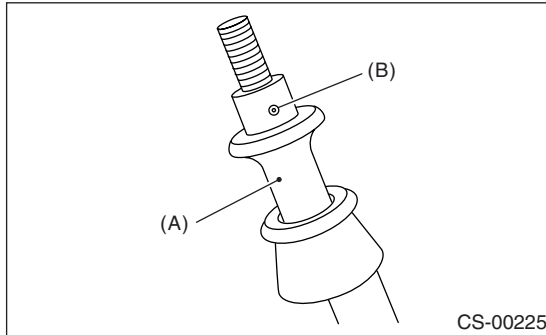


- (A) Center of rotation
- (B) Swing torque

## 8. Reverse Check Cable

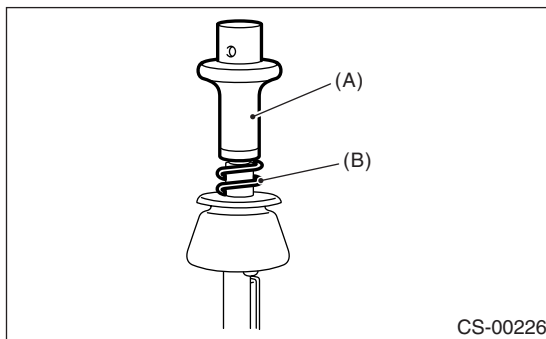
### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Remove the gear shift knob.
- 3) Remove the console box front. <Ref. to EI-46, REMOVAL, Console Box.>
- 4) Remove the spring pin from slider.



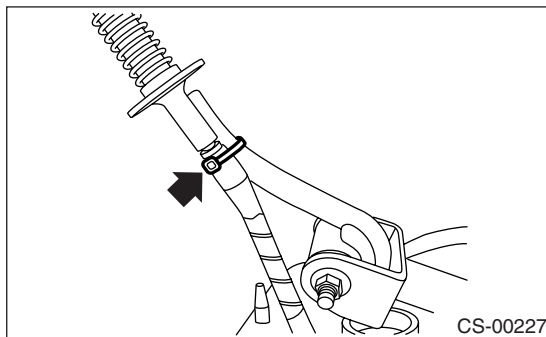
- (A) Slider
- (B) Spring pin

- 5) Remove the slider and spring.



- (A) Slider
- (B) Spring

- 6) Cut the band clip, and then separate the reverse check cable from gear shift lever.

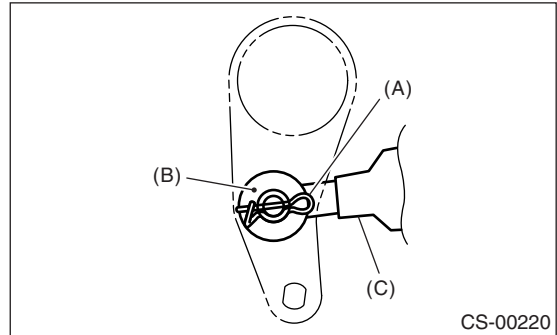


- 7) Lift-up the vehicle.
- 8) Remove the under cover.

- 9) Remove the rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>

- 10) Remove the crossmember. <Ref. to 6MT-34, REMOVAL, Transmission Mounting System.>

- 11) Remove the snap pin and washer, and then separate the reverse check cable from reverse check lever.

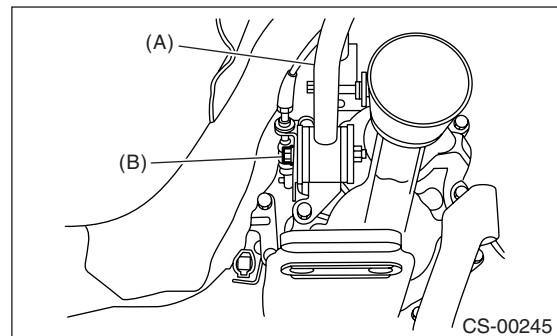


- (A) Snap pin
- (B) Washer
- (C) Reverse check cable

- 12) Move the transmission to right side, and then remove the stay bolt and reverse check cable.

#### NOTE:

If the transmission is not moved, the stay bolt will contact body and damage may occur.



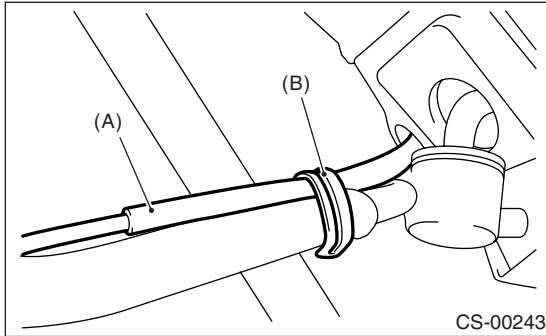
- (A) Stay
- (B) Stay bolt



# Reverse Check Cable

## CONTROL SYSTEMS

13) Raise the clip of stay, and then separate the stay and reverse check cable.



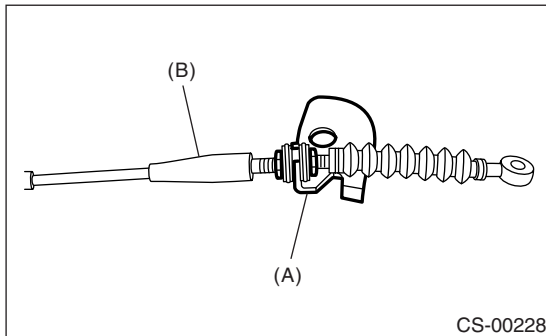
- (A) Reverse check cable
- (B) Clip

14) Remove the reverse check cable by pulling from underneath the vehicle.

### NOTE:

Take care not to damage the inner boot.

15) Loosen the lock nut, then remove the reverse check cable from cable plate.



- (A) Cable plate
- (B) Reverse check cable

## B: INSTALLATION

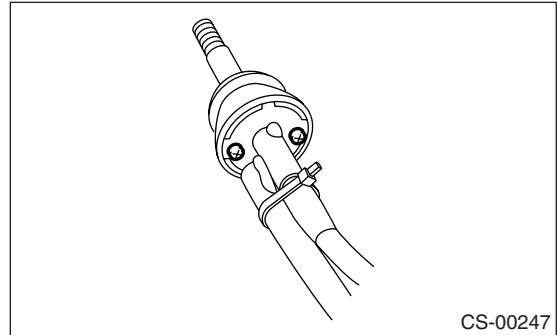
1) Insert the reverse check cable to the hole of inner boots from underneath the vehicle.

2) Insert the reverse check cable to the gear shift lever assembly, then fix with the band clip.

### NOTE:

- Cut off the extra band clip.

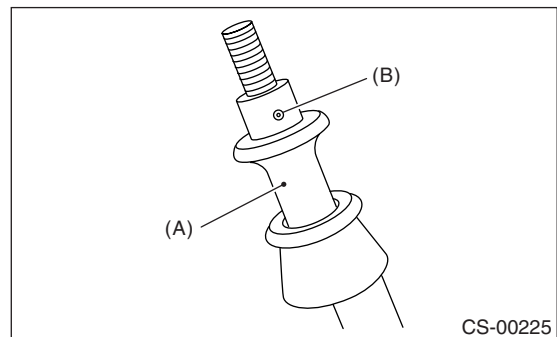
- Make sure that the reverse check cable is inserted into gear shift lever assembly without any clearance.



3) Fix the slider and reverse check cable end with spring pin.

### NOTE:

Apply grease to the sliding part of slider.

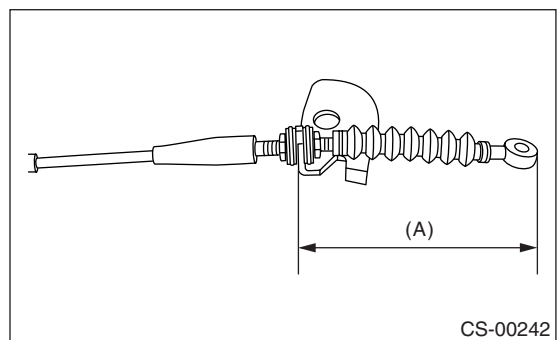


- (A) Slider
- (B) Spring pin

4) With the cable pulled (slider lowered), adjust the length between end of cable plate and reverse check cable to 84 mm (3.31 in), and then tighten the lock nut.

### Tightening torque:

**6 N·m (0.6 kgf-m, 4.4 ft-lb)**

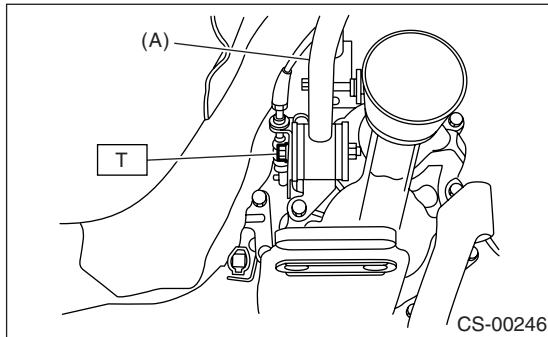


- (A) 84 mm (3.31 in)

5) Move the transmission to right side, and then install the stay.

**Tightening torque:**

**T: 32 N·m (3.3 kgf-m, 23.6 ft-lb)**

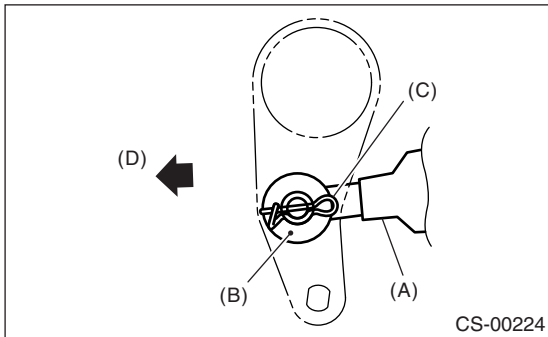


(A) Stay

6) Install the reverse check cable end, washer and snap pin to reverse check lever.

**NOTE:**

Take care to install the snap pin in proper direction.

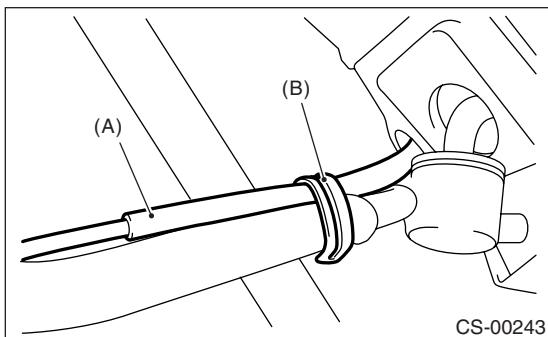


(A) Reverse check cable  
(B) Washer  
(C) Snap pin  
(D) Front side

7) Fix the reverse check cable to clip of stay.

**NOTE:**

Install the reverse check cable to upper side of stay.



(A) Reverse check cable  
(B) Clip

8) Install the rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-15, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, INSTALLATION, Muffler.>

9) Install the console box. <Ref. to EI-46, INSTALLATION, Console Box.>

**C: INSPECTION**

1) Verify whether the slider moves smoothly. If not, adjust the reverse check cable or check damage of slider. <Ref. to CS-49, ADJUSTMENT, Reverse Check Cable.>

2) Check that the gear can be shift to reverse, when the slider is pulled up. If the gear can not be shift to reverse, adjust the reverse check cable. <Ref. to CS-49, ADJUSTMENT, Reverse Check Cable.>

3) Check that the gear can not be shift to reverse, when the slider is not pulled up. If the gear can be shift to reverse, adjust or replace the reverse check cable. <Ref. to CS-49, ADJUSTMENT, Reverse Check Cable.>

**D: ADJUSTMENT**

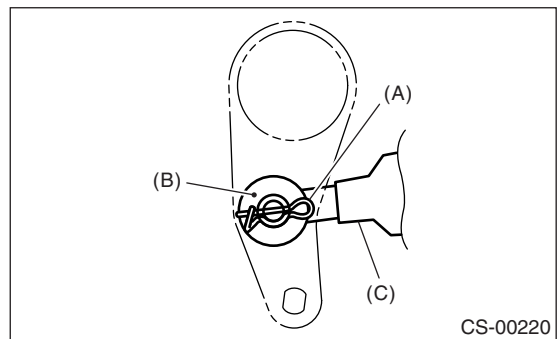
1) Set the vehicle on a lift.

2) Remove the under cover.

3) Remove the rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>

4) Remove the crossmember. <Ref. to 6MT-34, REMOVAL, Transmission Mounting System.>

5) Remove the snap pin and washer, and then separate the reverse check cable from reverse check lever.



(A) Snap pin  
(B) Washer  
(C) Reverse check cable

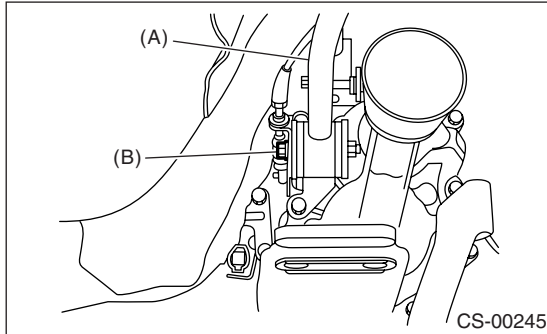
6) Move the transmission to right side, and then remove the stay bolt and reverse check cable.

# Reverse Check Cable

## CONTROL SYSTEMS

### NOTE:

If the transmission is not moved, the stay bolt will contact body and damage may occur.

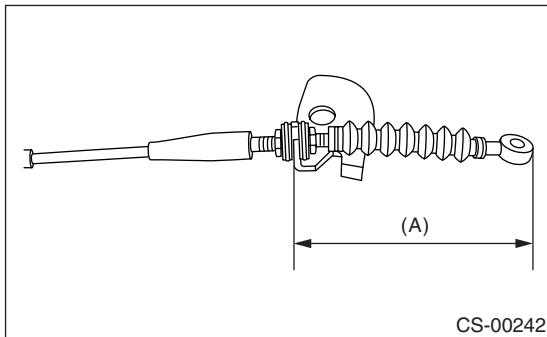


- (A) Stay
- (B) Stay bolt

7) With the cable pulled (slider lowered), adjust the length between end of cable plate and reverse check cable to 84 mm (3.31 in), and then tighten the lock nut.

### Tightening torque:

**6 N·m (0.6 kgf·m, 4.4 ft·lb)**

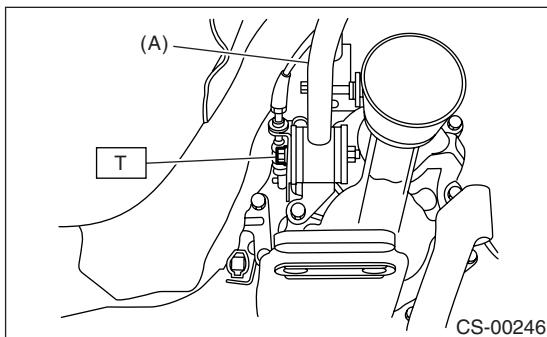


- (A) 84 mm (3.31 in)

8) Move the transmission to right side, and then install the stay.

### Tightening torque:

**T: 32 N·m (3.3 kgf·m, 23.6 ft·lb)**



- (A) Stay

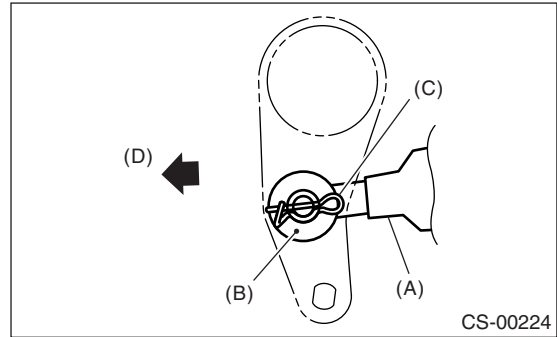
9) Install the crossmember. <Ref. to 6MT-34, INSTALLATION, Transmission Mounting System.>

10) Install the rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-15, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, INSTALLATION, Muffler.>

11) Install the reverse check cable end, washer and snap pin to reverse check lever.

### NOTE:

Take care to install the snap pin in proper direction.



- (A) Reverse check cable
- (B) Washer
- (C) Snap pin
- (D) Front side

12) Install the under cover.

## 9. General Diagnostic Table

### A: INSPECTION

| Symptom   | Remedy  |
|---|---|
| Starter does not run.   | Adjust select cable and inhibitor switch, or inspect circuit.   |
| Back-up light does not light up.  | Adjust select cable and inhibitor switch, or inspect circuit.   |
| AT shift lock system does not operate normally.                         | Adjust select cable and inhibitor switch, or inspect circuit.   |
| Shift into reverse is impossible. (6MT)                                 | Adjust reverse check cable.   |
| Shift into reverse is possible without pulling up slider. (6MT)         | Adjust or replace reverse check cable.  |
| Slider cannot be pulled up. Or slider is pulled up being sticked. (6MT) | <ul style="list-style-type: none"> <li>• Inspect reverse check system of transmission.</li> <li>• Adjust or replace reverse check cable.</li> </ul> |

# General Diagnostic Table

CONTROL SYSTEMS

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# AUTOMATIC TRANSMISSION

# 4AT

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# General Description

AUTOMATIC TRANSMISSION

## 1. General Description

### A: SPECIFICATION

#### 1. TORQUE CONVERTER CLUTCH

| Model                          | Non-turbo  | Turbo         |
|--------------------------------|--|---------------|
| Type                           | Symmetric, 3 element, single stage, 2 phase torque converter |               |
| Stall torque ratio             | 2.05 — 2.35  |               |
| Nominal diameter mm (in)       | 246 (9.69)   |               |
| Stall speed (at sea level) rpm | 2,200 — 2,700  | 2,700 — 3,200 |
| One-way clutch                 | Sprague type one-way clutch                                  |               |

#### 2. OIL PUMP

|                 |                                      |    |
|-----------------|--------------------------------------|----|
| Type            | Parachoid constant-displacement pump |    |
| Driving method  | Driven by engine                     |    |
| Number of teeth | Inner rotor                          | 9  |
|                 | Outer rotor                          | 10 |

#### 3. TRANSMISSION CONTROL ELEMENT

|                               |  |
|-------------------------------|--|
| Type                          | 4-forward, 1-reverse, double-row planetary gears |
| Multi-plate clutch            | 3 sets   |
| Multi-plate brake             | 2 sets   |
| One-way clutch (sprague type) | 1 set  |

#### 4. TRANSMISSION GEAR RATIO

|     |       |
|-----|-------|
| 1st | 2.785 |
| 2nd | 1.545 |
| 3rd | 1.000 |
| 4th | 0.694 |
| Rev | 2.272 |

#### 5. PLANETARY GEAR AND PLATE

| Model                                     | Non-turbo | Turbo |
|---|-----------|-------|
| Tooth number of front sun gear            | 33        |       |
| Tooth number of front pinion              | 21        |       |
| Tooth number of front internal gear       | 75        |       |
| Tooth number of rear sun gear             | 42        |       |
| Tooth number of rear pinion               | 17        |       |
| Tooth number of rear internal gear        | 75        |       |
| Drive plate number of high clutch         | 4         | 5     |
| Drive plate number of low clutch          | 5         | 7     |
| Drive plate number of reverse clutch      | 2         |       |
| Drive plate number of 2-4 brake           | 3         | 4     |
| Drive plate number of low & reverse brake | 5         | 7     |

#### 6. SELECTOR POSITION

|                |   |
|----------------|---|
| P (Park)       | Transmission in neutral, output member immovable, and engine start possible |
| R (Reverse)    | Transmission in reverse for backing   |
| N (Neutral)    | Transmission in neutral and engine start possible                           |
| D (Drive)      | Automatic gear change<br>1st ← → 2nd ← → 3rd ← → 4th                        |
| 3 (3rd)        | Automatic gear change<br>1st ← → 2nd ← → 3rd ← 4th                          |
| 2 (2nd)        | 2nd gear locked<br>(Deceleration possible 2nd ← 3rd ← 4th)                  |
| 1 (1st)        | 1st gear locked<br>(Deceleration possible 1st ← 2nd ← 3rd ← 4th)            |
| Control method | Wire cable type   |

# General Description

AUTOMATIC TRANSMISSION

## 7. HYDRAULIC CONTROL AND LUBRICATION

|                                     |  |   |
|-------------------------------------|--|---|
| Type                                | Electronic hydraulic control<br>[Four forward speed changes by electrical signals of vehicle speed and accelerator (throttle) opening] |   |
| Fluid                               | Recommended  | SUBARU ATF Type-HP                      |
|                                     | Alternative  | Idemitsu: ATF HP<br>Castrol: Transmax J |
| Fluid capacity<br>ℓ (US qt, Imp qt) | 9.3 — 9.6<br>(9.8 — 10.1, 8.2 — 8.4)   |   |
| Lubrication system                  | Forced feed lubrication with oil pump  |   |
| Oil                                 | Automatic transmission fluid (above mentioned)   |   |

## 8. COOLING AND HARNESS

|                      |   |
|----------------------|---|
| Cooling system       | Liquid-cooled cooler incorporated in radiator |
| Inhibitor switch     | 12 poles                                      |
| Transmission harness | 20 poles                                      |

## 11.RECOMMENDED GEAR OIL

|                 |   |
|-----------------|---|
| Lubrication oil | <p>(1) Item<br/>(2) Front differential gear oil<br/>(3) API standard<br/>(4) SAE viscosity No. and applicable temperature</p> |
|                 | Front differential oil capacity<br>ℓ (US qt, Imp qt)  |

## 9. TRANSFER

| Model  | Non-turbo  | Turbo                              |
|--|--|------------------------------------|
| Transfer type                                  | Multi-plate transfer (MP-T)  | Variable torque distribution (VTD) |
| Drive & driven plate number of transfer clutch | 5  | 3                                  |
| Control method                                 | Electronic hydraulic type  |                                    |
| Lubricant                                      | The same Automatic transmission fluid used in automatic transmission |                                    |
| 1st reduction gear ratio                       | 1.000 (53/53)  |                                    |

## 10.FINAL REDUCTION

|                  | Non-turbo    | Turbo         |
|------------------|--------------|---------------|
| Final gear ratio | 4.111 (37/9) | 3.900 (39/10) |

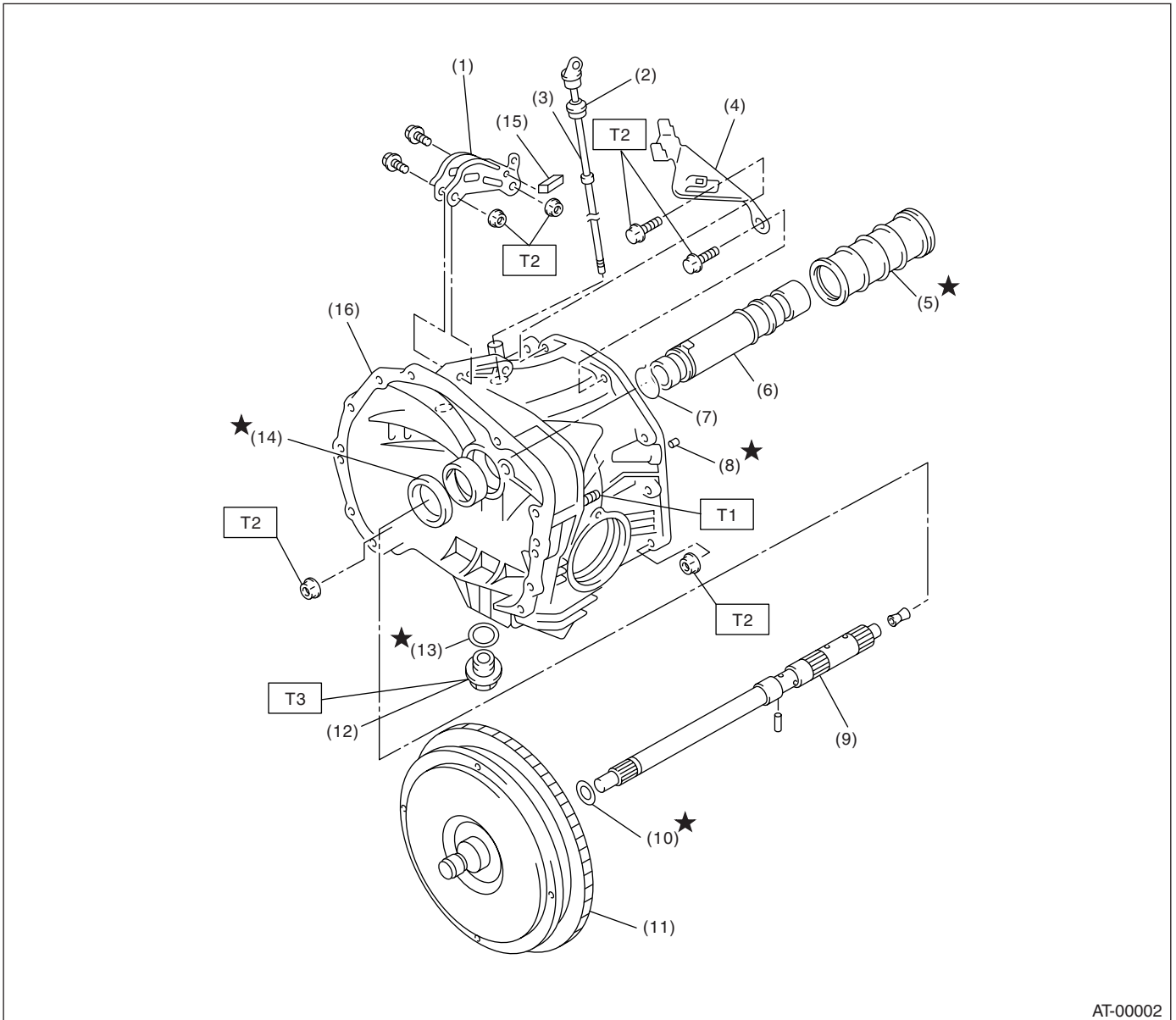


# General Description

AUTOMATIC TRANSMISSION

## B: COMPONENT

### 1. TORQUE CONVERTER CLUTCH AND CASE



AT-00002

- |                                  |                                   |
|----------------------------------|-----------------------------------|
| (1) Pitching stopper bracket     | (9) Input shaft                   |
| (2) O-ring                       | (10) O-ring                       |
| (3) Differential oil level gauge | (11) Torque converter clutch ASSY |
| (4) Stay                         | (12) Drain plug                   |
| (5) Seal pipe                    | (13) Gasket                       |
| (6) Oil pump shaft               | (14) Oil seal                     |
| (7) Clip                         | (15) Clip (Turbo model)           |
| (8) Rubber seal                  | (16) Converter case               |

**Tightening torque: N·m (kgf·m, ft·lb)**

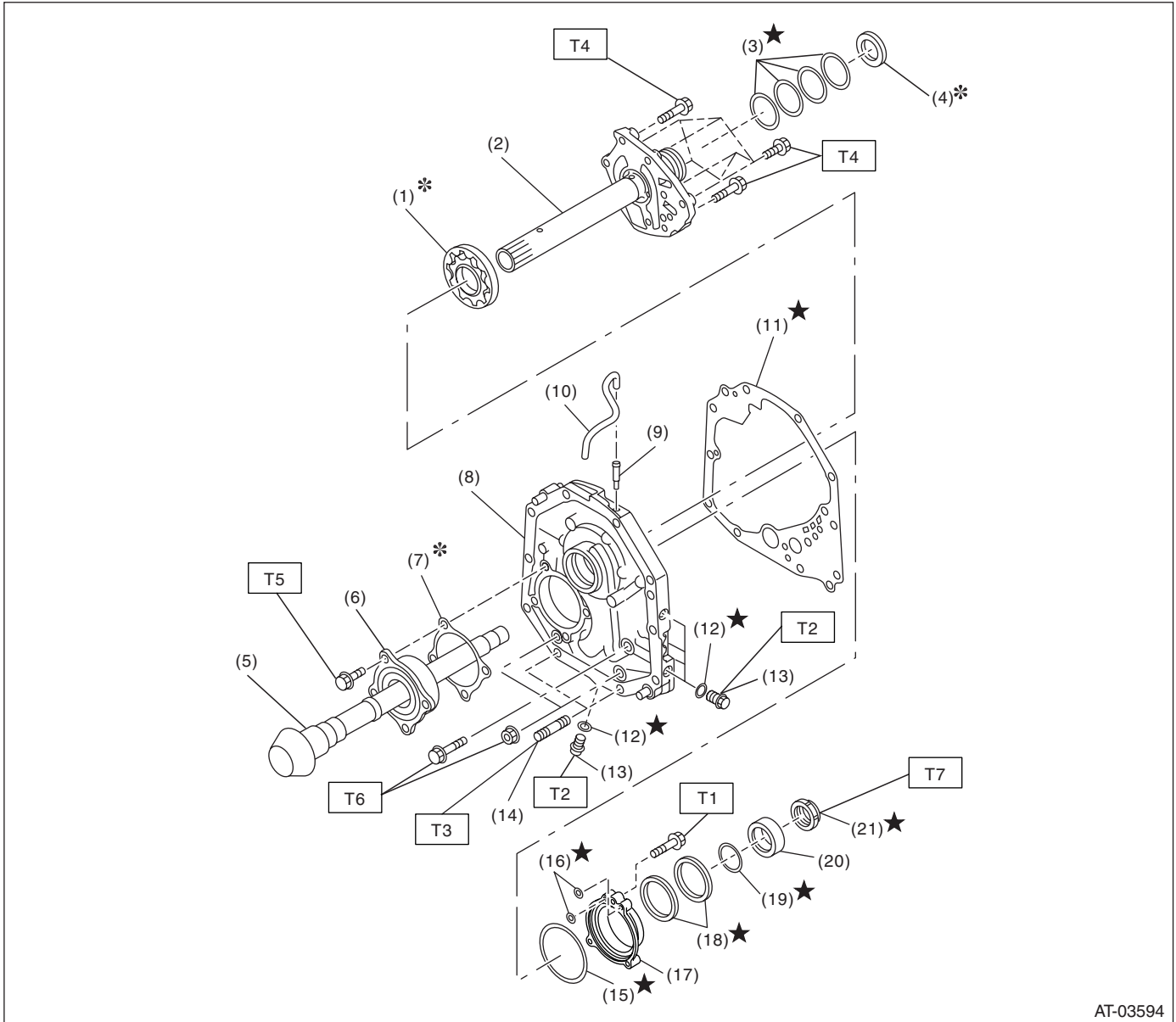
**T1: 18 (1.8, 13.3)**

**T2: 41 (4.2, 30.2)**

**T3: 44 (4.5, 32.5) (Aluminum gasket)**

**70 (7.1, 51.6) (Copper gasket)**

## 2. OIL PUMP



AT-03594

- (1) Oil pump rotor
- (2) Oil pump cover
- (3) Seal ring
- (4) Thrust needle bearing
- (5) Drive pinion shaft
- (6) Roller bearing
- (7) Shim
- (8) Oil pump housing
- (9) Nipple
- (10) Air breather hose

- (11) Gasket
- (12) O-ring
- (13) Test plug
- (14) Stud bolt
- (15) O-ring
- (16) O-ring
- (17) Oil seal retainer
- (18) Oil seal
- (19) O-ring
- (20) Drive pinion collar

- (21) Lock nut

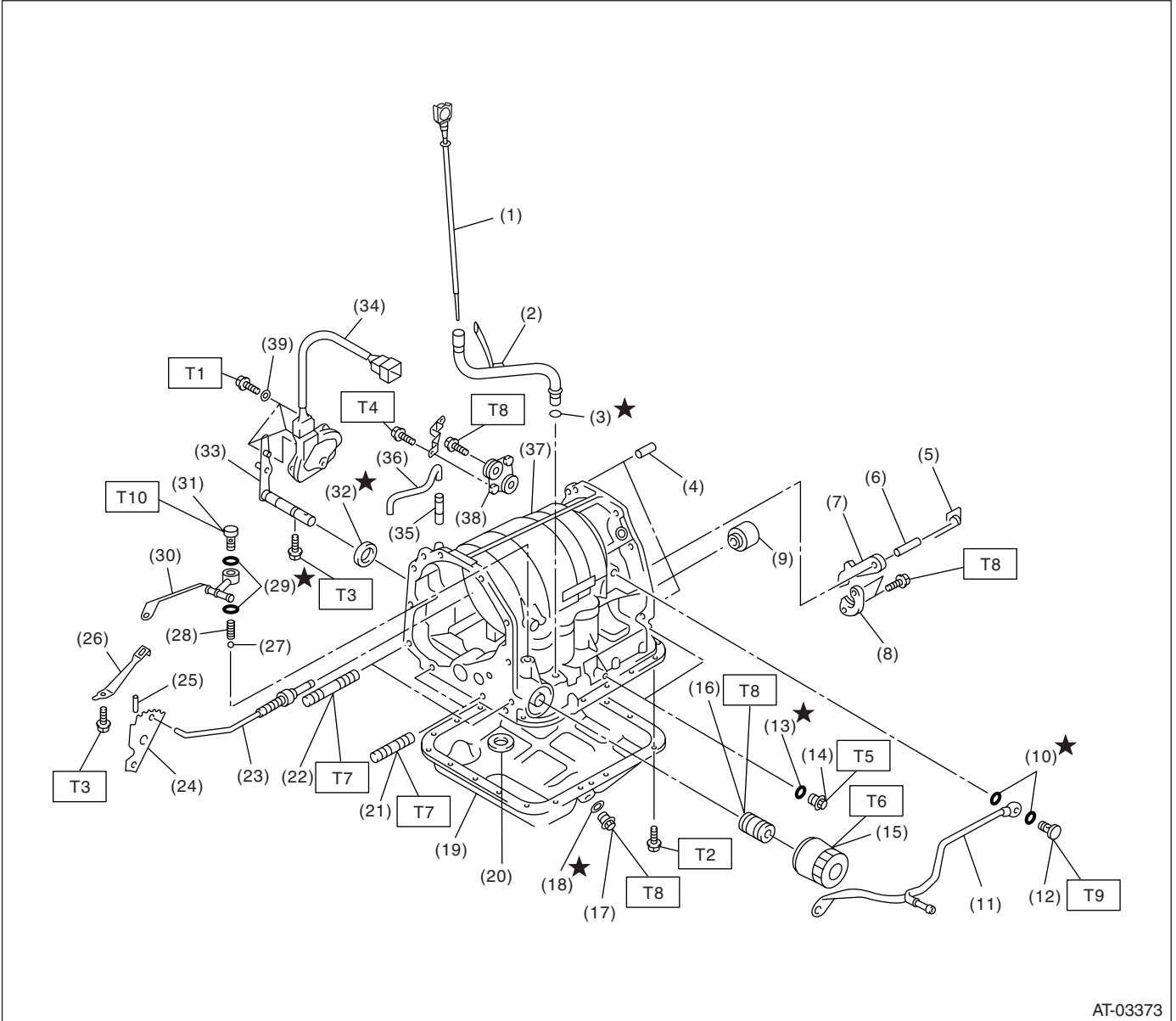
**Tightening torque: N·m (kgf·m, ft·lb)**

- T1: 7 (0.7, 5.1)**
- T2: 13 (1.3, 9.6)**
- T3: 18 (1.8, 13.3)**
- T4: 25 (2.5, 18.4)**
- T5: 40 (4.1, 30)**
- T6: 42 (4.3, 31)**
- T7: 116 (11.8, 85)**

# General Description

AUTOMATIC TRANSMISSION

## 3. TRANSMISSION CASE AND CONTROL DEVICE



AT-03373

# General Description

AUTOMATIC TRANSMISSION

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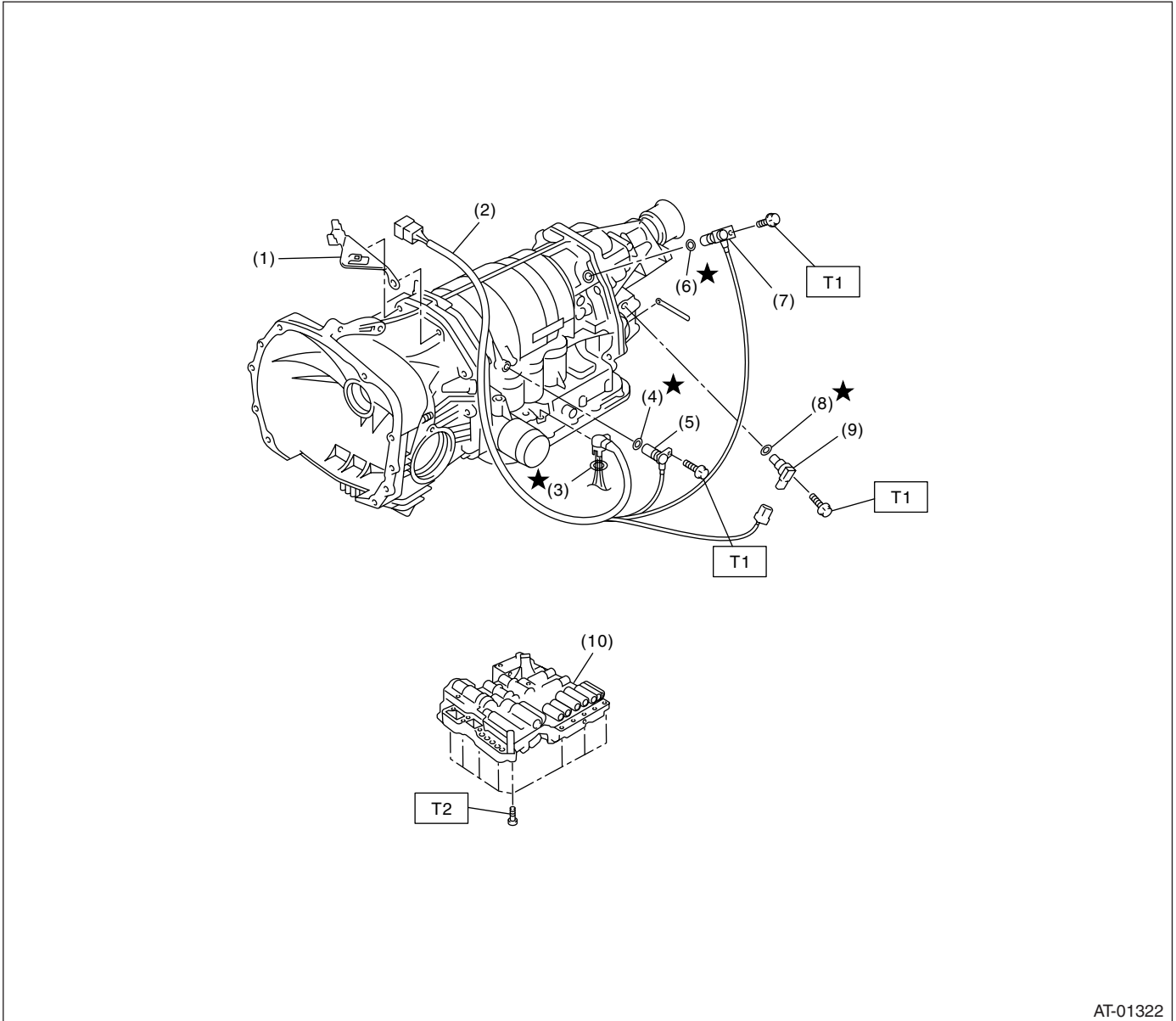
|                           |                            |  |
|---------------------------|----------------------------|--|
| (1) ATF level gauge       | (18) Gasket                | (35) Nipple  |
| (2) Oil charge pipe       | (19) Oil pan               | (36) Air breather hose                             |
| (3) O-ring                | (20) Magnet                | (37) Transmission case                             |
| (4) Straight pin          | (21) Stud bolt (Short)     | (38) Plate ASSY                                    |
| (5) Return spring         | (22) Stud bolt (Long)      | (39) Washer  |
| (6) Shaft                 | (23) Parking rod           |  |
| (7) Parking pawl          | (24) Manual plate          | <hr/> <b>Tightening torque: N·m (kgf-m, ft-lb)</b> |
| (8) Parking support       | (25) Spring pin            | <b>T1: 3.5 (0.36, 2.6)</b>                         |
| (9) Transfer clutch seal  | (26) Detent spring         | <b>T2: 5 (0.5, 3.6)</b>                            |
| (10) Gasket               | (27) Ball                  | <b>T3: 6 (0.6, 4.3)</b>                            |
| (11) Inlet pipe           | (28) Spring                | <b>T4: 12 (1.2, 9)</b>                             |
| (12) Union screw          | (29) Gasket                | <b>T5: 13 (1.3, 9.6)</b>                           |
| (13) O-ring               | (30) Outlet pipe           | <b>T6: 14 (1.4, 10)</b>                            |
| (14) Test plug            | (31) Union screw           | <b>T7: 18 (1.8, 13.3)</b>                          |
| (15) Oil filter           | (32) Oil seal              | <b>T8: 25 (2.5, 18.4)</b>                          |
| (16) Oil filter stud bolt | (33) Range select lever    | <b>T9: 40 (4.1, 30)</b>                            |
| (17) Drain plug           | (34) Inhibitor switch ASSY | <b>T10: 45 (4.6, 33)</b>                           |

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# General Description

AUTOMATIC TRANSMISSION

## 4. CONTROL VALVE AND HARNESS ROUTING



AT-01322

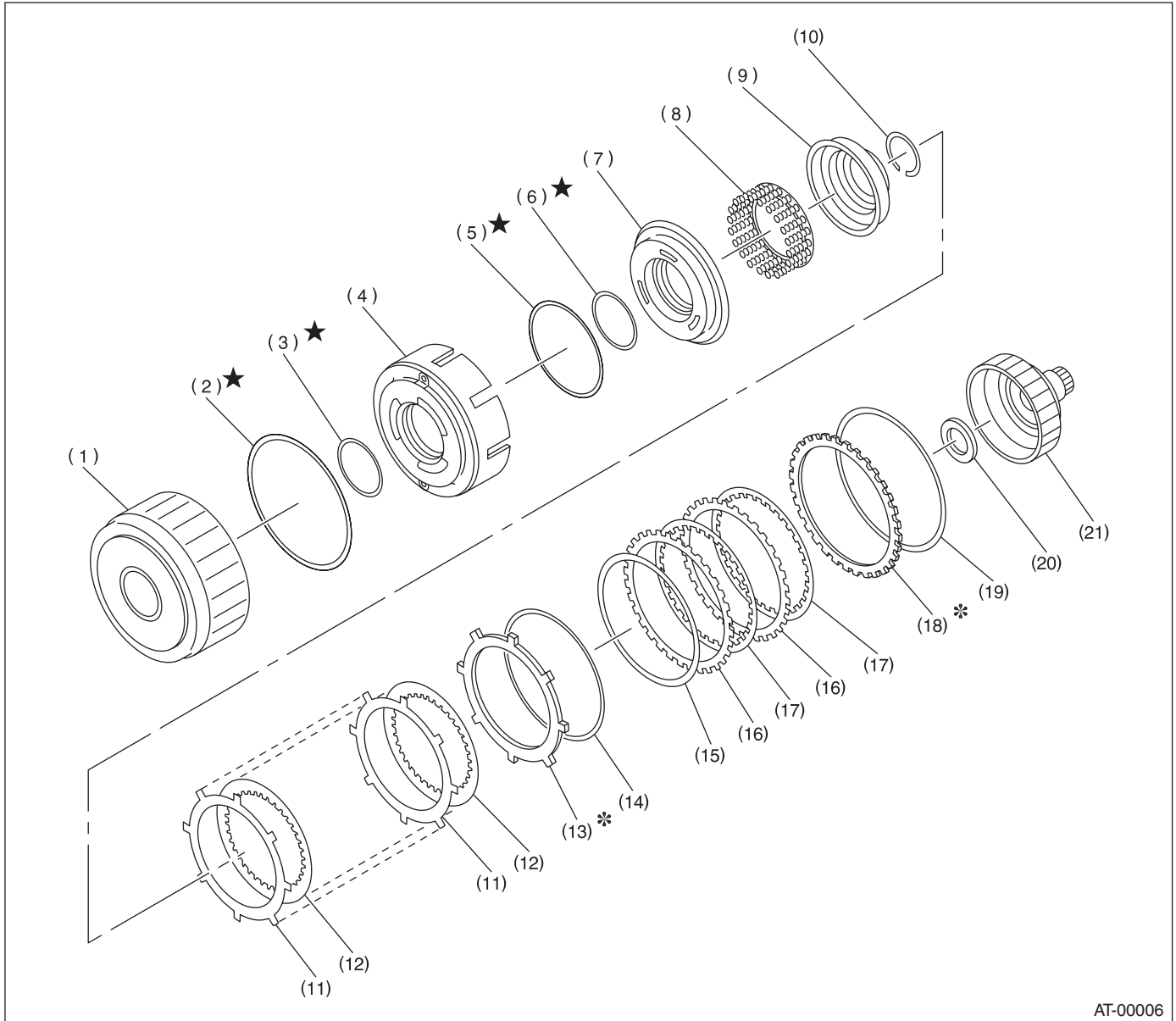
- |   |                                |
|---|--------------------------------|
| (1) Stay                                  | (6) O-ring                     |
| (2) Transmission harness                  | (7) Front vehicle speed sensor |
| (3) O-ring                                | (8) O-ring                     |
| (4) O-ring                                | (9) Rear vehicle speed sensor  |
| (5) Torque converter turbine speed sensor | (10) Control valve ASSY        |

**Tightening torque: N·m (kgf-m, ft-lb)**

**T1: 7 (0.7, 5.1)**

**T2: 8 (0.8, 5.8)**

## 5. HIGH CLUTCH AND REVERSE CLUTCH



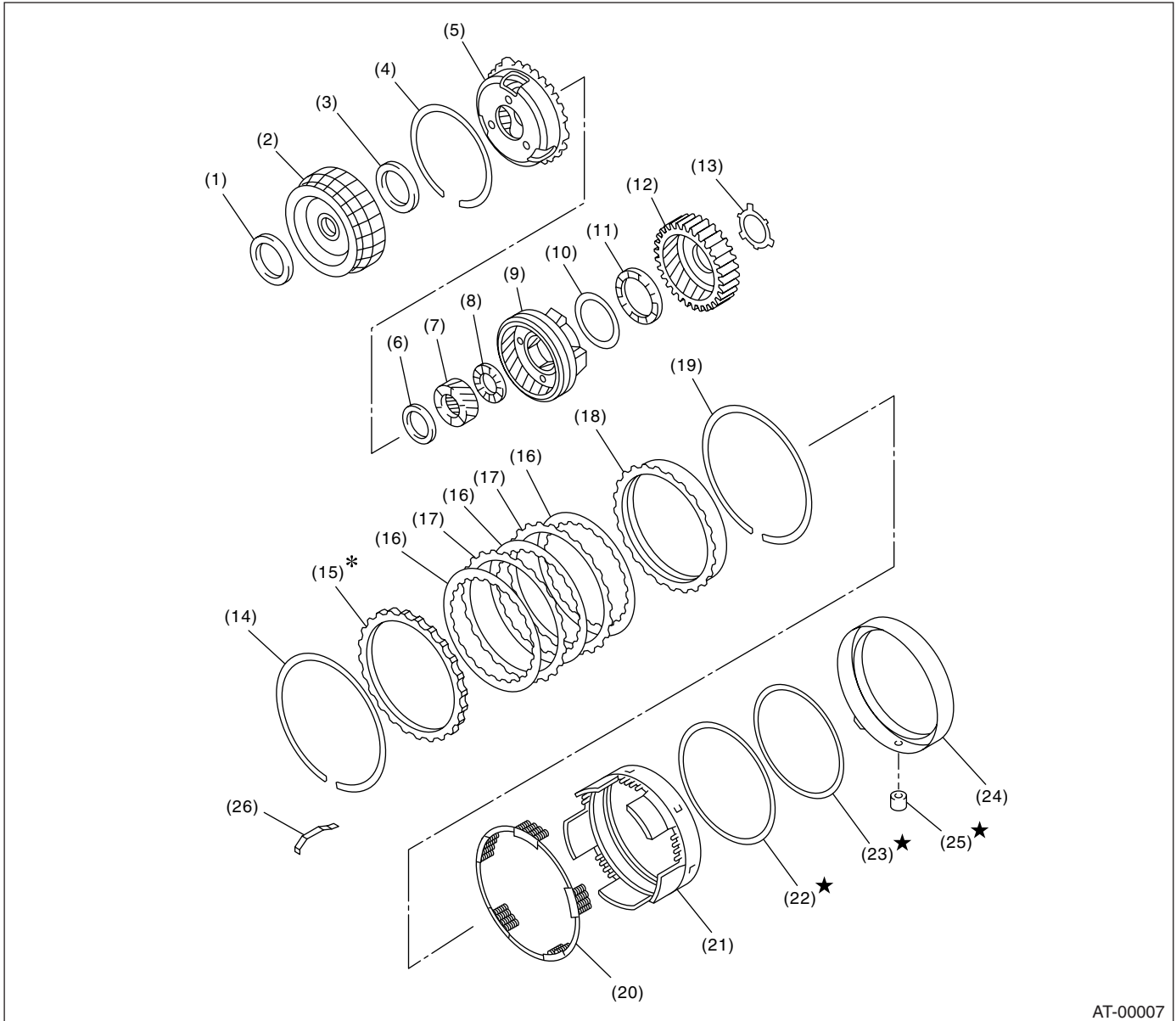
AT-00006

- |                           |                                    |                                       |
|---------------------------|------------------------------------|---------------------------------------|
| (1) High clutch drum      | (8) Spring retainer                | (15) Dish plate                       |
| (2) Lip seal              | (9) Cover                          | (16) Driven plate (Reverse clutch)    |
| (3) D-ring                | (10) Snap ring                     | (17) Drive plate (Reverse clutch)     |
| (4) Reverse clutch piston | (11) Driven plate (High clutch)    | (18) Retaining plate (Reverse clutch) |
| (5) D-ring                | (12) Drive plate (High clutch)     | (19) Snap ring                        |
| (6) D-ring                | (13) Retaining plate (High clutch) | (20) Thrust needle bearing            |
| (7) High clutch piston    | (14) Snap ring                     | (21) High clutch hub                  |

# General Description

## AUTOMATIC TRANSMISSION

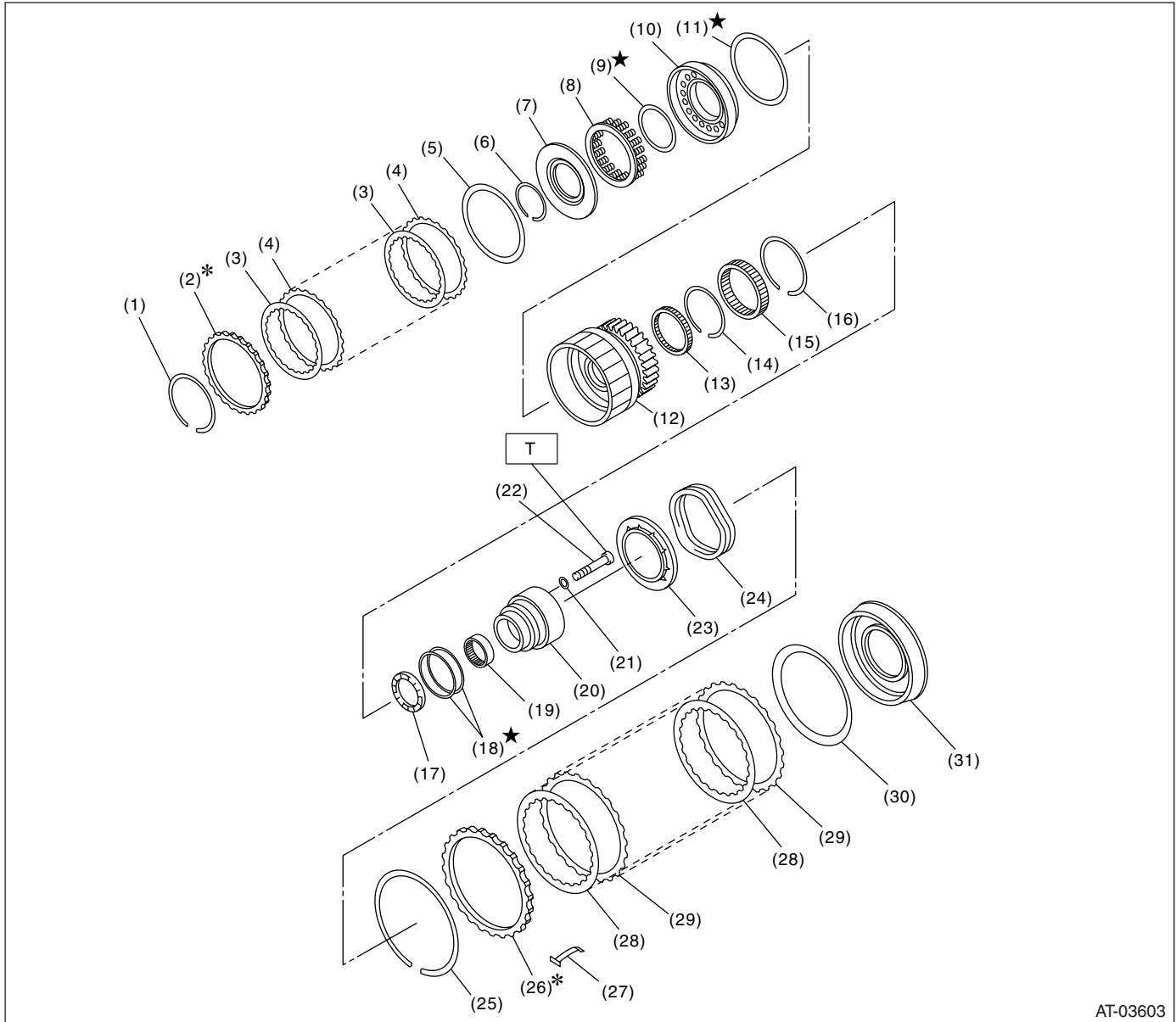
### 6. PLANETARY GEAR AND 2-4 BRAKE



AT-00007

- |                             |                            |                                |
|-----------------------------|----------------------------|--------------------------------|
| (1) Thrust needle bearing   | (10) Washer                | (19) Snap ring                 |
| (2) Front sun gear          | (11) Thrust needle bearing | (20) Spring retainer           |
| (3) Thrust needle bearing   | (12) Rear internal gear    | (21) 2-4 brake piston          |
| (4) Snap ring               | (13) Washer                | (22) D-ring                    |
| (5) Front planetary carrier | (14) Snap ring             | (23) D-ring                    |
| (6) Thrust needle bearing   | (15) Retaining plate       | (24) 2-4 brake piston retainer |
| (7) Rear sun gear           | (16) Drive plate           | (25)★ 2-4 brake seal           |
| (8) Thrust needle bearing   | (17) Driven plate          | (26) Leaf spring               |
| (9) Rear planetary carrier  | (18) Pressure rear plate   |                                |

## 7. LOW CLUTCH AND LOW & REVERSE BRAKE



AT-03603

- |                        |                                |                                 |
|------------------------|--------------------------------|---------------------------------|
| (1) Snap ring          | (13) Needle bearing            | (25) Snap ring                  |
| (2) Retaining plate    | (14) Snap ring                 | (26) Retaining plate            |
| (3) Drive plate        | (15) One-way clutch            | (27) Leaf spring                |
| (4) Driven plate       | (16) Snap ring                 | (28) Drive plate                |
| (5) Dish plate         | (17) Thrust needle bearing     | (29) Driven plate               |
| (6) Snap ring          | (18) Seal ring                 | (30) Dish plate                 |
| (7) Cover              | (19) Needle bearing            | (31) Low & reverse brake piston |
| (8) Spring retainer    | (20) One-way clutch inner race |                                 |
| (9) D-ring             | (21) Washer                    |                                 |
| (10) Low clutch piston | (22) Socket bolt               |                                 |
| (11) D-ring            | (23) Spring retainer           |                                 |
| (12) Low clutch drum   | (24) Return spring             |                                 |

**Tightening torque: N·m (kgf·m, ft·lb)**

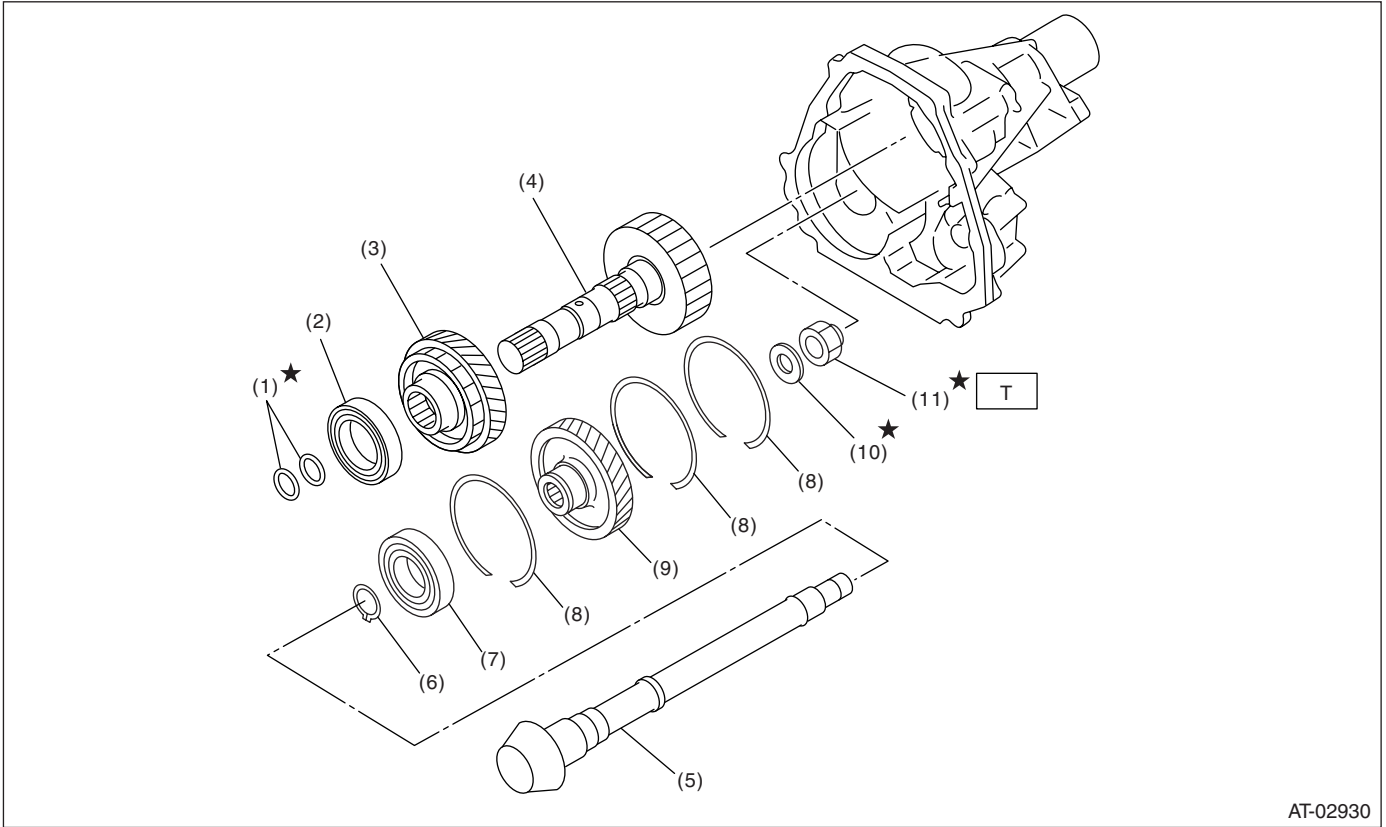
**T: 25 (2.5, 18.4)**



# General Description

AUTOMATIC TRANSMISSION

## 8. REDUCTION GEAR WITH MP-T



- (1) Seal ring
- (2) Ball bearing
- (3) Reduction drive gear
- (4) Reduction drive shaft
- (5) Drive pinion shaft

- (6) Snap ring
- (7) Ball bearing
- (8) Snap ring
- (9) Reduction driven gear
- (10) Washer

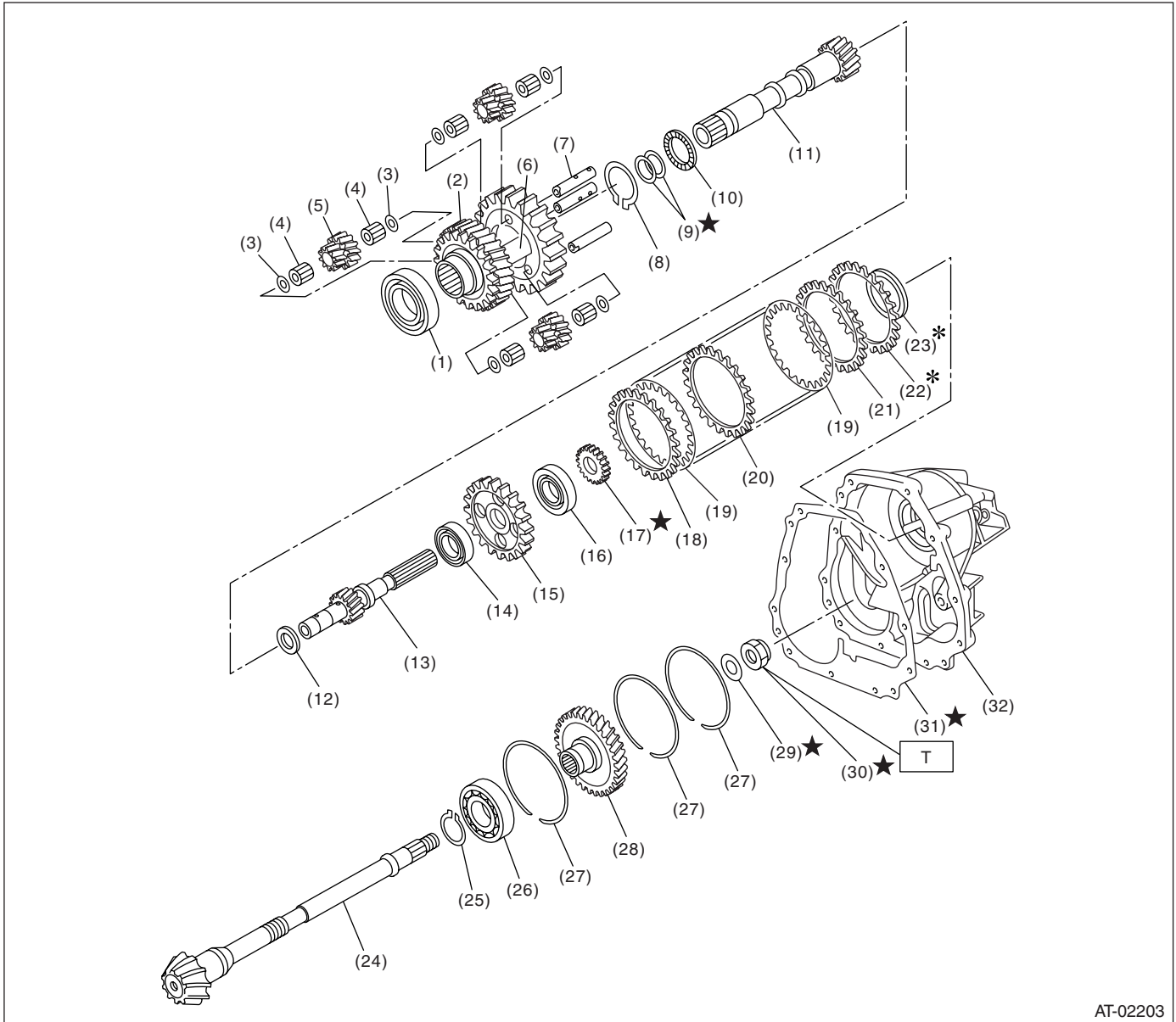
- (11) Lock nut

---

**Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 100 (10.2, 73.8)**

---

## 9. REDUCTION GEAR WITH VTD



AT-02203

- |                            |                                   |                            |
|----------------------------|-----------------------------------|----------------------------|
| (1) Ball bearing           | (13) Rear drive shaft             | (25) Snap ring             |
| (2) Reduction drive gear   | (14) Ball bearing                 | (26) Ball bearing          |
| (3) Washer                 | (15) Multi-plate clutch (LSD) hub | (27) Snap ring             |
| (4) Needle bearing         | (16) Ball bearing                 | (28) Reduction driven gear |
| (5) Pinion gear            | (17) Revolution gear              | (29) Lock washer           |
| (6) Carrier                | (18) Driven plate (Thick)         | (30) Lock nut              |
| (7) Planetary pinion shaft | (19) Drive plate                  | (31) Gasket                |
| (8) Snap ring              | (20) Driven plate (Thin)          | (32) Extension case        |
| (9) Seal ring              | (21) Driven plate (Thick)         |                            |
| (10) Thrust needle bearing | (22) Retaining plate              |                            |
| (11) Intermediate shaft    | (23) Rear drive shaft shim        |                            |
| (12) Thrust washer         | (24) Drive pinion shaft           |                            |

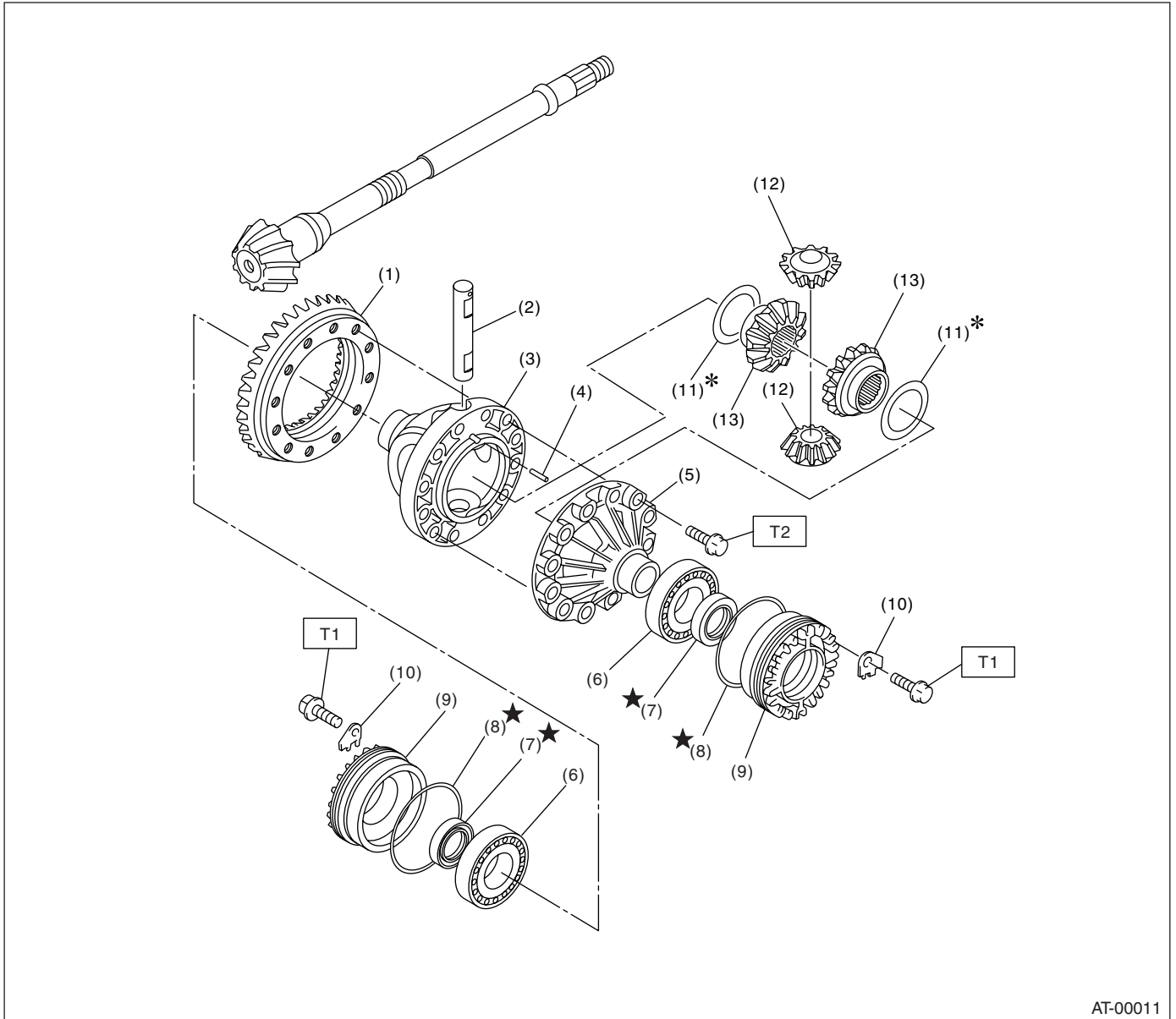
**Tightening torque: N·m (kgf·m, ft·lb)**

**T: 100 (10.2, 73.8)**

# General Description

AUTOMATIC TRANSMISSION

## 10. DIFFERENTIAL GEAR



AT-00011

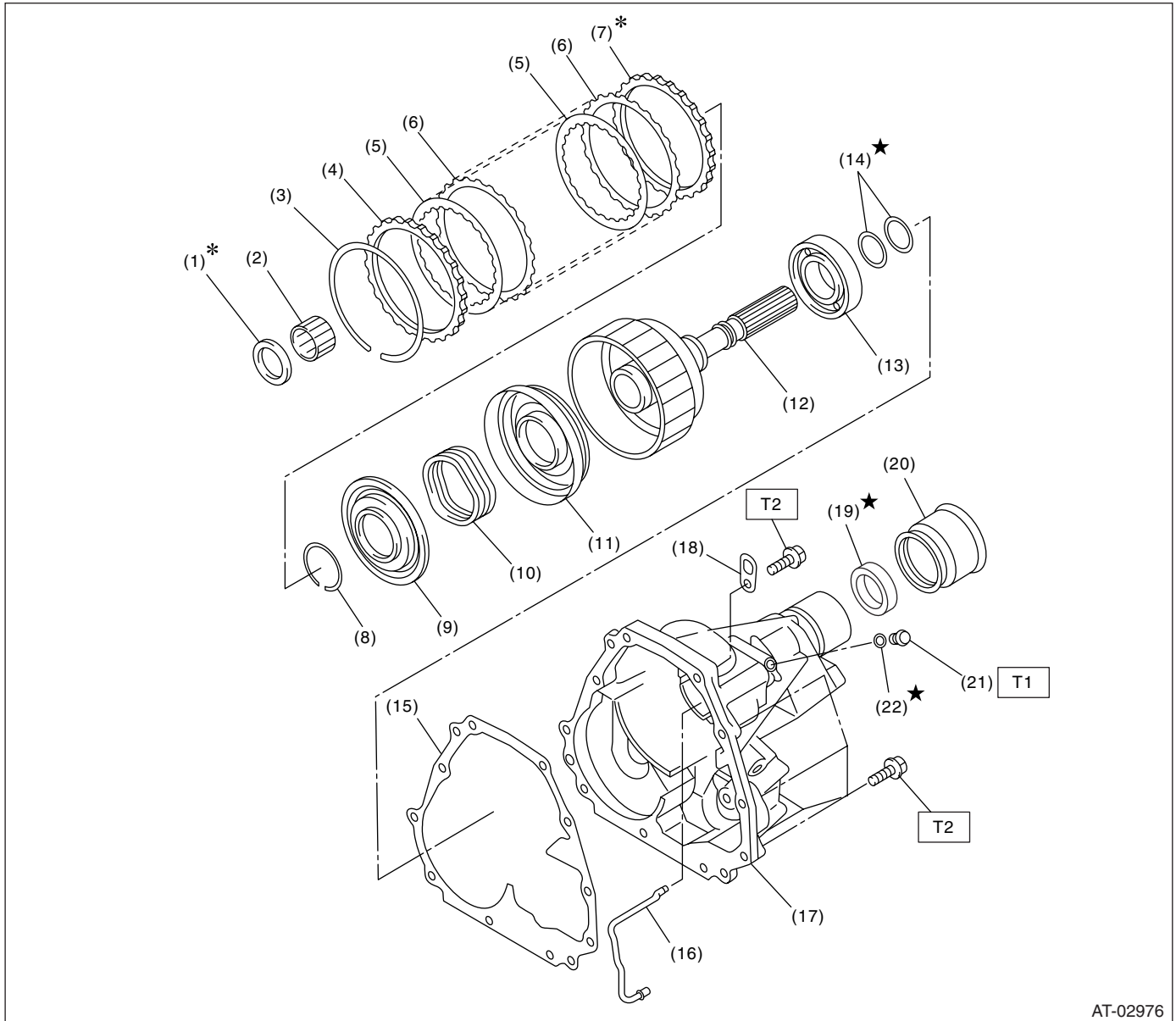
- |                            |                                |                              |
|----------------------------|--------------------------------|------------------------------|
| (1) Hypoid driven gear     | (7) Oil seal                   | (13) Differential bevel gear |
| (2) Pinion shaft           | (8) O-ring                     |                              |
| (3) Differential case (RH) | (9) Differential side retainer |                              |
| (4) Straight pin           | (10) Lock plate                |                              |
| (5) Differential case (LH) | (11) Washer                    |                              |
| (6) Taper roller bearing   | (12) Differential bevel pinion |                              |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 25 (2.5, 18.4)**

**T2: 62 (6.3, 45.7)**

## 11. TRANSFER AND EXTENSION CASE WITH MP-T



AT-02976

- |                                 |                             |                |
|---------------------------------|-----------------------------|----------------|
| (1) Thrust needle bearing       | (11) Transfer clutch piston | (21) Test plug |
| (2) Needle bearing              | (12) Rear drive shaft       | (22) O-ring    |
| (3) Snap ring                   | (13) Ball bearing           |                |
| (4) Driven plate (Thick)        | (14) Seal ring              |                |
| (5) Drive plate                 | (15) Gasket                 |                |
| (6) Driven plate (Thin)         | (16) Transfer clutch pipe   |                |
| (7) Retaining plate             | (17) Extension case         |                |
| (8) Snap ring                   | (18) Transmission hanger    |                |
| (9) Transfer clutch piston seal | (19) Oil seal               |                |
| (10) Return spring              | (20) Dust cover             |                |
|                                 |                             | (21) Test plug |
|                                 |                             | (22) O-ring    |

**Tightening torque: N·m (kgf·m, ft·lb)**

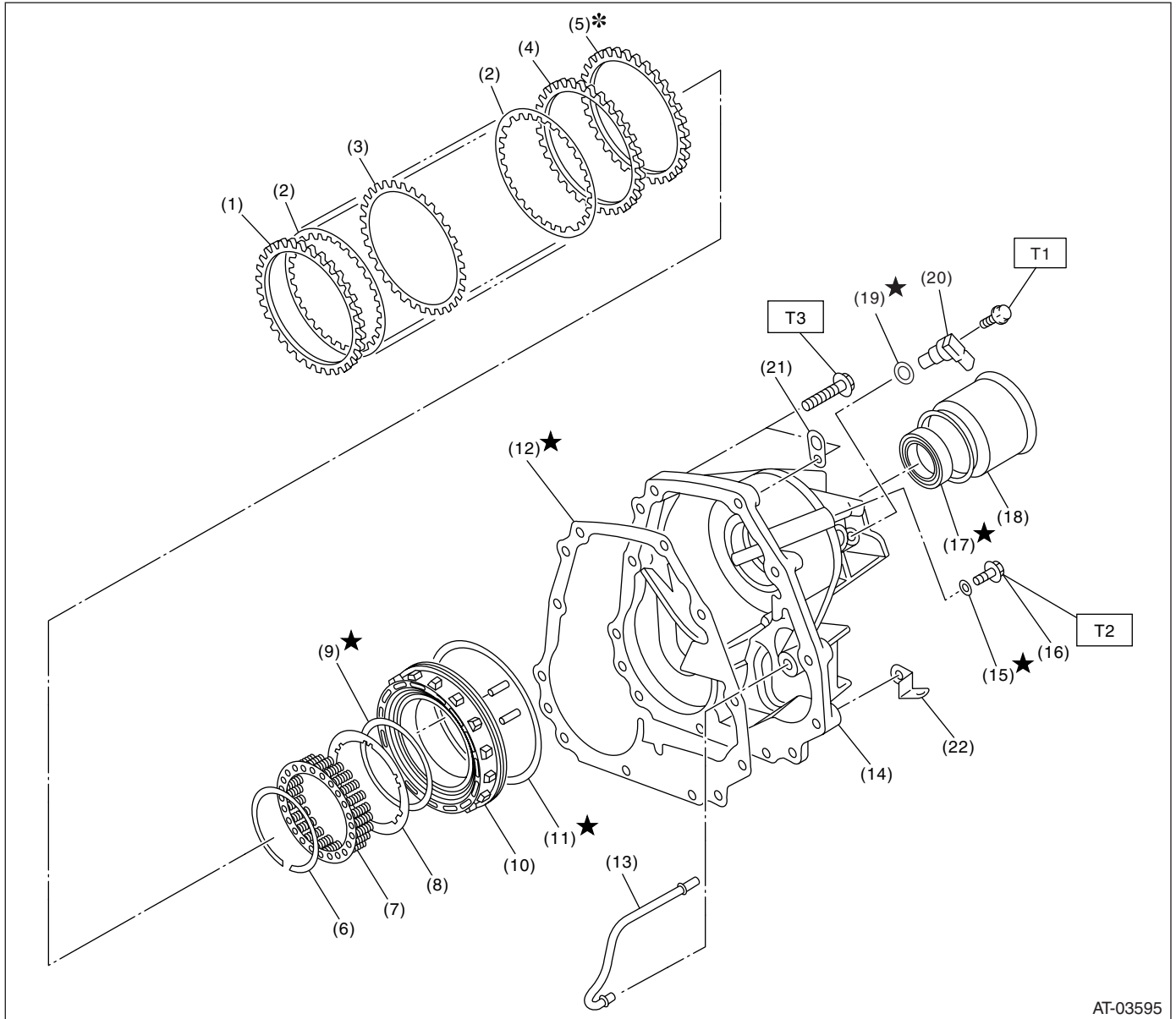
**T1: 13 (1.3, 9.6)**

**T2: 25 (2.5, 18.4)**

# General Description

AUTOMATIC TRANSMISSION

## 12. TRANSFER AND EXTENSION CASE WITH VTD



AT-03595

- |                          |                                      |                                |
|--------------------------|--------------------------------------|--------------------------------|
| (1) Driven plate (Thick) | (10) Multi-plate clutch (LSD) piston | (19) O-ring                    |
| (2) Drive plate          | (11) D-ring                          | (20) Rear vehicle speed sensor |
| (3) Driven plate (Thin)  | (12) Gasket                          | (21) Transmission hanger       |
| (4) Driven plate (Thick) | (13) Multi-plate clutch (LSD) pipe   | (22) Harness bracket           |
| (5) Retaining plate      | (14) Extension case                  |                                |
| (6) Snap ring            | (15) O-ring                          |                                |
| (7) Spring retainer      | (16) Test plug                       |                                |
| (8) Plate                | (17) Oil seal                        |                                |
| (9) O-ring               | (18) Dust cover                      |                                |

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**Tightening torque: N·m (kgf·m, ft·lb)**

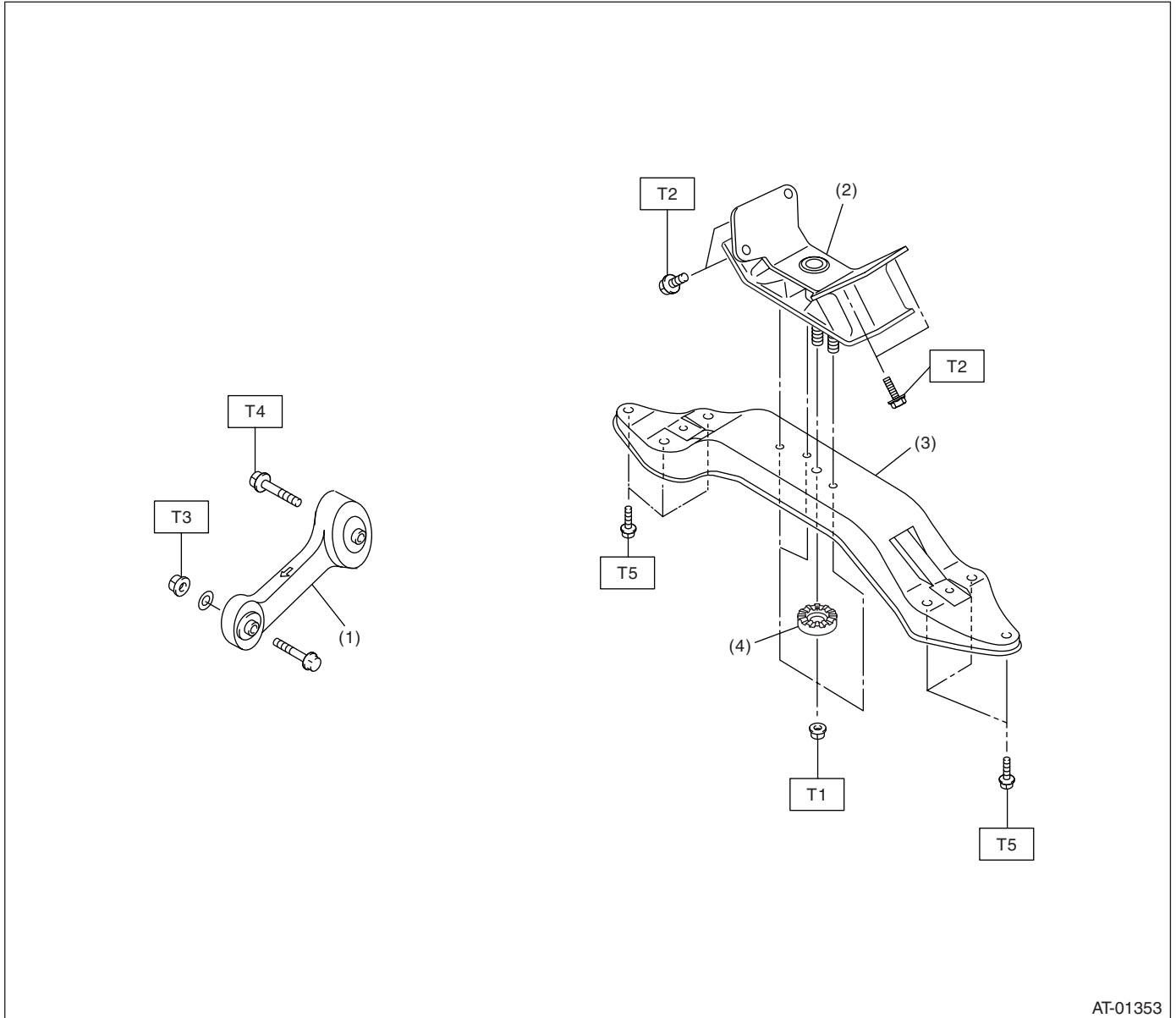
**T1: 7 (0.7, 5.1)**

**T2: 13 (1.3, 9.6)**

**T3: 25 (2.5, 18.4)**

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## 13. TRANSMISSION MOUNTING



AT-01353

- (1) Pitching stopper
- (2) Rear cushion rubber
- (3) Transmission rear crossmember
- (4) Stopper

**Tightening torque: N·m (kgf-m, ft-lb)**

**T1: 35 (3.6, 26)**

**T2: 39 (4.0, 29)**

**T3: 50 (5.1, 36.9)**

**T4: 58 (5.9, 43)**

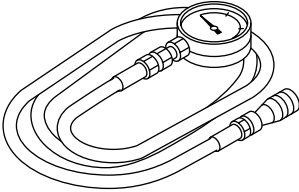
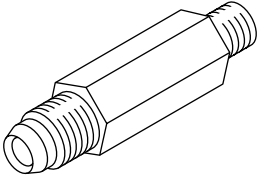
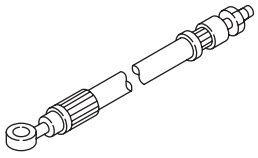
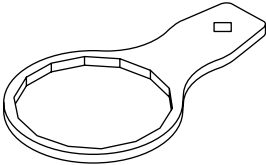
**T5: 70 (7.1, 51.6)**

#### **C: CAUTION**

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation, and disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Do not place the oil pan with its inner side facing upward until it is installed so as to prevent foreign matter intrusion into valve body.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- When disassembling the case and other light alloy parts, use a plastic hammer to open. Do not pry it apart with a screwdriver or other tool.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Use genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply ATF or gear oil onto sliding or revolution surfaces before installation in view of components usage.
- Replace deformed or otherwise damaged snap rings with new ones.
- Before installing O-rings or oil seals, apply sufficient amount of ATF to avoid damage and deformation.
- Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Avoid damaging the mating surface of the case.
- Before applying liquid gasket, completely remove the old seal.
- When disassembling AT, be sure to use nylon or paper towel, do not use cloth glove and cloth.

## D: PREPARATION TOOL

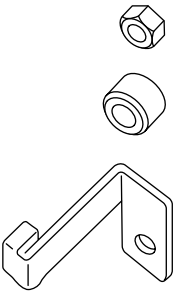
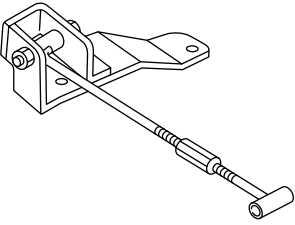
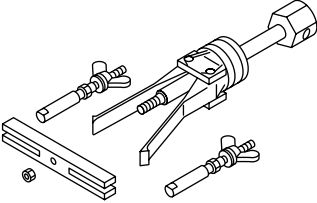
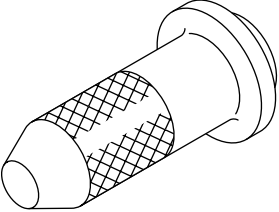
### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION                | REMARKS   |
|---|-------------|----------------------------|---|
|  <p style="text-align: center;">ST-498575400</p>   | 498575400   | OIL PRESSURE GAUGE ASSY    | Used for measuring oil pressure.  |
|  <p style="text-align: center;">ST-498897200</p>   | 498897200   | OIL PRESSURE GAUGE ADAPTER | Used oil pump housing when measuring reverse clutch pressure and line pressure. |
|  <p style="text-align: center;">ST-498897700</p> | 498897700   | OIL PRESSURE ADAPTER SET   | Used for measuring transfer clutch pressure.                                    |
|  <p style="text-align: center;">ST-498545400</p> | 498545400   | OIL FILTER WRENCH          | Used for removing and installing ATF filter.                                    |



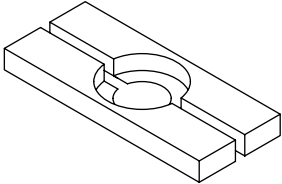
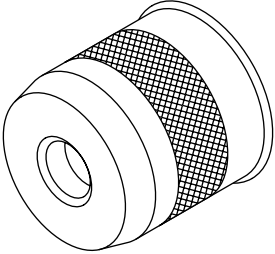
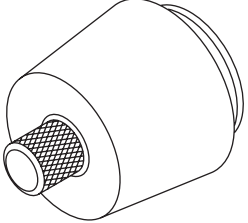
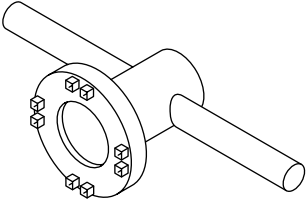
# General Description

## AUTOMATIC TRANSMISSION

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION         | REMARKS  |
|---|-------------|---------------------|--|
|  <p style="text-align: center;">ST-498277200</p>   | 498277200   | STOPPER SET         | Used for removing and installing automatic transmission assembly to engine.  |
|  <p style="text-align: center;">ST41099AC000</p>   | 41099AC000  | ENGINE SUPPORT ASSY | Used for supporting engine.  |
|  <p style="text-align: center;">ST-398527700</p> | 398527700   | PULLER ASSY         | <ul style="list-style-type: none"> <li>• Used for removing extension case roller bearing.</li> <li>• Used for removing extension oil seal.</li> <li>• Used for removing front differential side retainer bearing outer race.</li> <li>• Used for removing front differential side retainer bearing outer ball race.</li> </ul> |
|  <p style="text-align: center;">ST-498057300</p> | 498057300   | INSTALLER           | Used for installing extension oil seal.  |

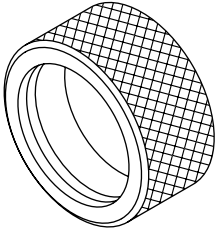
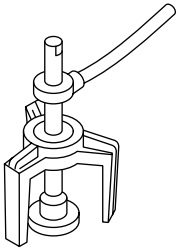
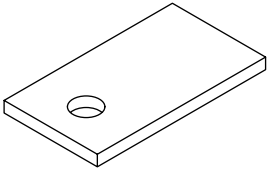
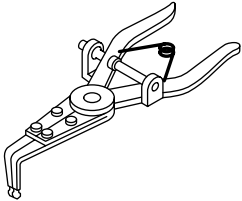
# General Description

AUTOMATIC TRANSMISSION

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION              | REMARKS   |
|---|-------------|--------------------------|---|
|  <p>ST-498077000</p>   | 498077000   | REMOVER                  | Used for removing differential taper roller bearing.  |
|  <p>ST-499247400</p>   | 499247400   | INSTALLER                | <ul style="list-style-type: none"> <li>• Used for installing transfer outer snap ring.</li> <li>• Used with SNAP RING OUTER GUIDE (499257300).</li> </ul> |
|  <p>ST-499257300</p> | 499257300   | SNAP RING<br>OUTER GUIDE | <ul style="list-style-type: none"> <li>• Used for installing transfer outer snap ring.</li> <li>• Used with INSTALLER (499247400).</li> </ul>             |
|  <p>ST-499787000</p> | 499787000   | WRENCH ASSY              | Used for removing and installing differential side retainer.  |

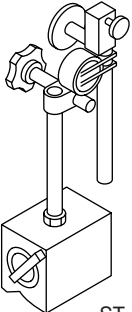
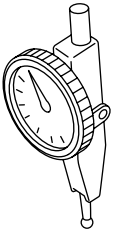
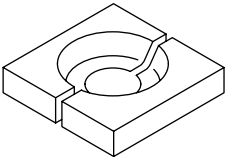
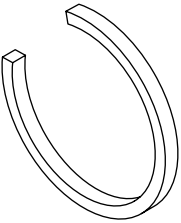
# General Description

## AUTOMATIC TRANSMISSION

| ILLUSTRATION  | TOOL NUMBER                                  | DESCRIPTION       | REMARKS   |
|---|--|-------------------|---|
|  <p style="text-align: center;">ST-398437700</p>   | <p style="text-align: center;">398437700</p> | <p>DRIFT</p>      | <ul style="list-style-type: none"> <li>• Used for installing converter case oil seal.</li> <li>• Used for installing taper roller bearing of front differential.</li> </ul> |
|  <p style="text-align: center;">ST-398673600</p>   | <p style="text-align: center;">398673600</p> | <p>COMPRESSOR</p> | <p>Used for removing and installing clutch spring.</p>  |
|  <p style="text-align: center;">ST-498255400</p> | <p style="text-align: center;">498255400</p> | <p>PLATE</p>      | <p>Used for measuring backlash of hypoid gear.</p>  |
|  <p style="text-align: center;">ST-399893600</p> | <p style="text-align: center;">399893600</p> | <p>PLIERS</p>     | <p>Used for removing and installing clutch spring.</p>  |

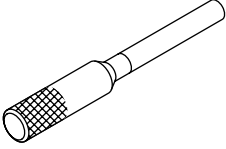
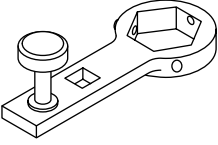
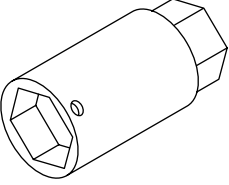
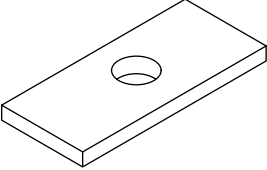
# General Description

AUTOMATIC TRANSMISSION

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION | REMARKS   |
|---|-------------|-------------|---|
|  <p>ST-498247001</p>     | 498247001   | MAGNET BASE | <ul style="list-style-type: none"> <li>• Used for measuring gear backlash.</li> <li>• Used with DIAL GAUGE (498247100).</li> </ul>  |
|  <p>ST-498247100</p>     | 498247100   | DIAL GAUGE  | <ul style="list-style-type: none"> <li>• Used for measuring gear backlash.</li> <li>• Used with MAGNET BASE (498247001).</li> </ul> |
|  <p>ST-498517000</p> | 498517000   | REPLACER    | Used for removing front roller bearing.   |
|  <p>ST-398623600</p> | 398623600   | SEAT        | Used for removing spring of transfer clutch piston.   |

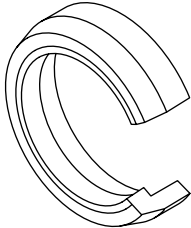
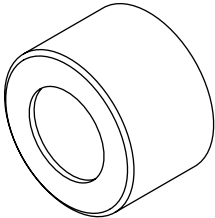
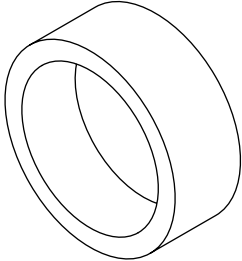
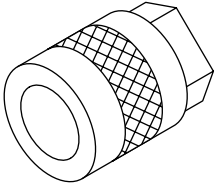
# General Description

## AUTOMATIC TRANSMISSION

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION | REMARKS  |
|---|-------------|-------------|--|
|  <p style="text-align: center;">ST-499267300</p>   | 499267300   | STOPPER PIN | Used for installing inhibitor switch.  |
|  <p style="text-align: center;">ST-499787700</p>   | 499787700   | WRENCH      | Used for removing and installing drive pinion lock nut.                        |
|  <p style="text-align: center;">ST-499787500</p> | 499787500   | ADAPTER     | Used for removing and installing drive pinion lock nut.                        |
|  <p style="text-align: center;">ST-398643600</p> | 398643600   | GAUGE       | Used for measuring total end play, extension end play and drive pinion height. |

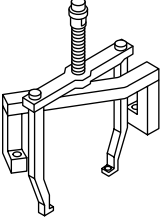
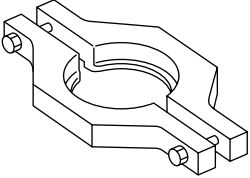
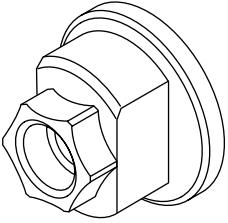
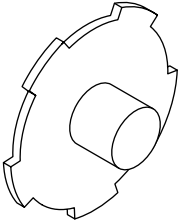
# General Description

AUTOMATIC TRANSMISSION

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION | REMARKS   |
|---|-------------|-------------|---|
|  <p style="text-align: center;">ST-498627100</p>   | 498627100   | SEAT        | Used for holding low clutch piston retainer spring when installing snap ring.   |
|  <p style="text-align: center;">ST-499577000</p>   | 499577000   | GAUGE       | <ul style="list-style-type: none"> <li>• Used for measuring the transmission case mating surface to the reduction gear end surface.</li> <li>• For MP-T model.</li> </ul> |
|  <p style="text-align: center;">ST-398744300</p> | 398744300   | GAUGE       | <ul style="list-style-type: none"> <li>• Use for measuring contact face between multi-plate clutch end and transmission.</li> <li>• For VTD model.</li> </ul>             |
|  <p style="text-align: center;">ST-499737000</p> | 499737000   | PULLER      | Used for removing reduction driven gear assembly.   |

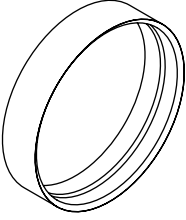
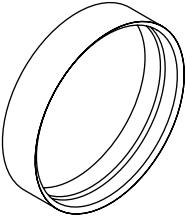
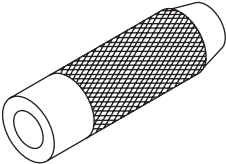
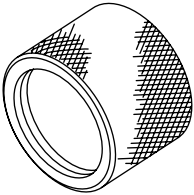
# General Description

## AUTOMATIC TRANSMISSION

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION | REMARKS   |
|---|-------------|-------------|---|
|  <p style="text-align: center;">ST-499737100</p>   | 499737100   | PULLER SET  | Used for removing reduction drive gear assembly.        |
|  <p style="text-align: center;">ST-498077600</p>   | 498077600   | REMOVER     | Used for removing ball bearing.                         |
|  <p style="text-align: center;">ST-498937110</p> | 498937110   | HOLDER      | Used for removing and installing drive pinion lock nut. |
|  <p style="text-align: center;">ST-498677100</p> | 498677100   | COMPRESSOR  | Used for installing 2-4 brake snap ring.                |

# General Description

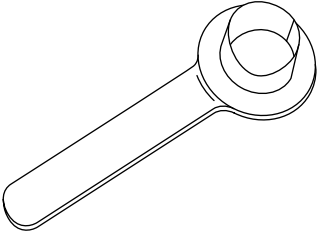
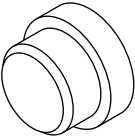
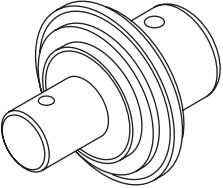
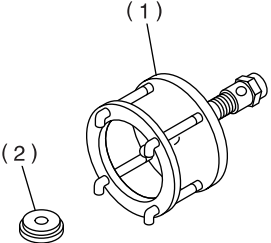
AUTOMATIC TRANSMISSION

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION                          | REMARKS  |
|---|-------------|--------------------------------------|--|
|  <p>ST-498437000</p>     | 498437000   | HIGH CLUTCH PISTON GUIDE             | Used for installing high clutch piston.                      |
|  <p>ST-498437100</p>     | 498437100   | LOW CLUTCH PISTON GUIDE              | Used for installing low clutch piston.                       |
|  <p>ST-899580100</p> | 899580100   | INSTALLER                            | Used for press-fitting the ball bearing for transfer clutch. |
|  <p>ST18675AA000</p> | 18675AA000  | DIFFERENTIAL SIDE OIL SEAL INSTALLER | Used for installing differential side retainer oil seal.     |



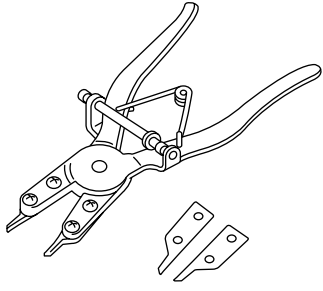
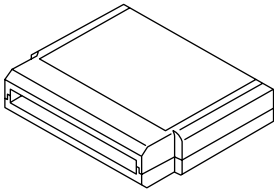

# General Description

## AUTOMATIC TRANSMISSION

| ILLUSTRATION  | TOOL NUMBER                                   | DESCRIPTION               | REMARKS   |
|---|---|---------------------------|---|
|  <p style="text-align: center;">ST28399SA010</p>   | <p style="text-align: center;">28399SA010</p> | <p>OIL SEAL PROTECTOR</p> | <p>Used for installing front drive shaft.</p>   |
|  <p style="text-align: center;">ST-398497701</p>   | <p style="text-align: center;">398497701</p>  | <p>INSTALLER</p>          | <p>Used for installing needle bearing.</p>  |
|  <p style="text-align: center;">ST-499247300</p> | <p style="text-align: center;">499247300</p>  | <p>INSTALLER</p>          | <p>Used for installing drive pinion shaft oil seal.</p>   |
|  <p style="text-align: center;">ST-899524100</p> | <p style="text-align: center;">899524100</p>  | <p>PULLER SET</p>         | <p>Used for bolt only.</p> <ul style="list-style-type: none"> <li>• Used with PULLER SET (499737100).</li> <li>• Used with PULLER (499737000).</li> </ul> <p>(1) Puller<br/>(2) Cap</p> |

# General Description

AUTOMATIC TRANSMISSION

| ILLUSTRATION  | TOOL NUMBER                        | DESCRIPTION                  | REMARKS                                     |
|---|------------------------------------|------------------------------|---|
|  <p style="text-align: center;">ST-398663600</p>   | 398663600                          | PLIERS                       | Used for removing and installing snap ring. |
|  <p style="text-align: center;">ST18482AA010</p>   | 18482AA010<br>(Newly adopted tool) | CARTRIDGE                    | Troubleshooting for electrical systems.     |
|  <p style="text-align: center;">ST22771AA030</p> | 22771AA030                         | SUBARU SELECT<br>MONITOR KIT | Troubleshooting for electrical systems.     |

## 2. GENERAL TOOL

| TOOL NAME       | REMARKS  |
|-----------------|--|
| Depth gauge     | Used for measuring transmission end play.                          |
| Thickness gauge | Used for measuring clearances of clutch, brake and oil pump.       |
| Micro meter     | Used for measuring thickness of drive pinion.                      |
| Spring balance  | Used for measuring starting torque of drive pinion.                |
| Circuit tester  | Used for measuring resistance and voltage.                         |
| TORX® T70       | Used for removing and installing differential gear oil drain plug. |
| Push/pull gauge | Used for measuring low & reverse and high clutch piston stroke.    |

# Automatic Transmission Fluid

## AUTOMATIC TRANSMISSION

## 2. Automatic Transmission Fluid

### A: INSPECTION

#### NOTE:

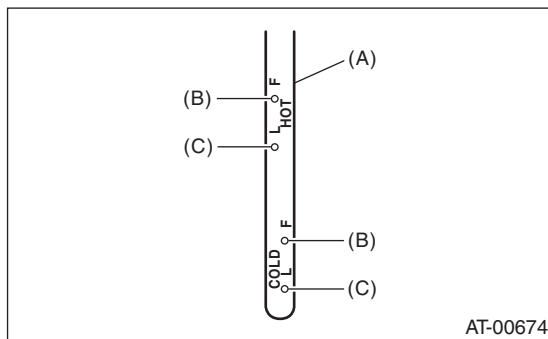
The level of ATF varies with fluid temperature. Pay attention to the fluid temperature when checking ATF level.

1) Raise the ATF temperature by driving a distance of 5 to 10 km (3 to 6 miles). Otherwise, idle the engine to raise ATF temperature to 70 — 80°C (158 — 176°F) on SUBARU Select Monitor.

<Ref. to 4AT(D)(diag)-13, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>

2) Make sure the vehicle is level.

3) After selecting all positions (P, R, N, D, 3, 2, 1), set the select lever in “P” range. Measure the ATF level with the engine idling for one or two minutes.



- (A) ATF level gauge
- (B) Upper level
- (C) Lower level

4) Make sure that ATF level is between the upper level and lower level at HOT side.

If the level is below the lower level, check for leaks in the transmission. If there are leaks, it is necessary to repair or replace gasket, oil seals, plugs or other parts.

#### CAUTION:

- Use care not to exceed the upper limit level.
- Filling of ATF to the upper level when the transmission is cold will result in overfilling of ATF, causing a transmission failure.

5) Check ATF level after raising ATF temperature to 70 — 80°C (158 — 176°F) by driving the distance of 5 to 10 km (3 to 6 miles) or by idling the engine.

### B: REPLACEMENT

1) Lift-up the vehicle.

2) Drain the ATF completely.

3) Check the ATF for condition. <Ref. to 4AT-31, CONDITION CHECK, Automatic Transmission Fluid.>

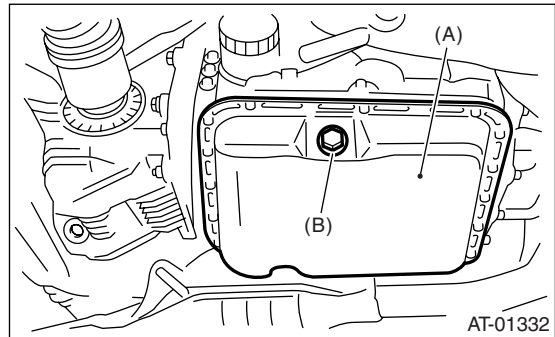
#### CAUTION:

Directly after the vehicle has been running, the ATF is hot. Therefore, be careful not to burn yourself.

4) Replace with a new gasket, and then tighten the ATF drain plug.

#### Tightening torque:

**25 N·m (2.5 kgf-m, 18.4 ft-lb)**



- (A) Oil pan
- (B) Drain plug (ATF)

5) Lower the vehicle.

6) Pour ATF through the oil charge pipe.

#### Recommended fluid:

<Ref. to RM-4, FLUID, RECOMMENDED MATERIALS, Recommended Materials.>

#### Fluid capacity:

Fill the same amount of ATF drained from drain plug hole.

#### Capacity when transmission is overhauled:

**9.3 — 9.6 ℓ (9.8 — 10.1 US qt, 8.2 — 8.4 Imp qt)**

7) Check the level and leaks of ATF.

<Ref. to 4AT-30, INSPECTION, Automatic Transmission Fluid.>

## C: CONDITION CHECK

**NOTE:**

When replacing ATF, check the inside condition of the transmission body by inspecting the drained ATF.

| Fluid condition                              | Trouble and possible cause                               | Corrective action                                       |
|--|--|---|
| Large amount of metallic pieces are found.   | Excessive wear of the internal of the transmission body. | Replace ATF and check if AT operates correctly.         |
| Thick and varnish-form fluid.                | Burned clutch and etc.                                   | Replace ATF and check AT itself and vehicle for faulty. |
| Clouded fluid or bubbles are found in fluid. | Water mixed in fluid.                                    | Replace ATF and check the water entering point.         |

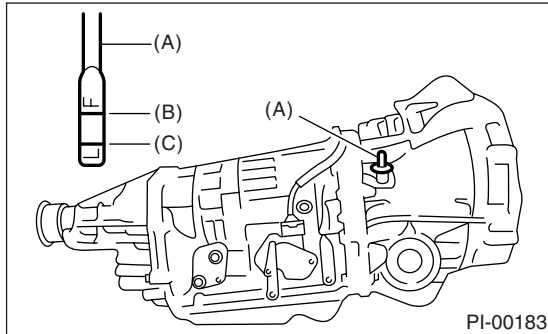
# Differential Gear Oil

## AUTOMATIC TRANSMISSION

### 3. Differential Gear Oil

#### A: INSPECTION

- 1) Park the vehicle on a level surface.
- 2) Remove the oil level gauge and wipe it clean.
- 3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
- 4) Remove it again and check the level. If the differential gear oil level is below the "L" line, add oil to bring the level up to the "F" line.
- 5) To prevent overfilling the differential gear oil, do not replenish oil above the "F" line.



- (A) Oil level gauge
- (B) Upper level
- (C) Lower level

#### B: REPLACEMENT

- 1) Lift-up the vehicle.
- 2) Remove the differential gear oil drain plug using TORX® T70, and then drain the differential gear oil completely.

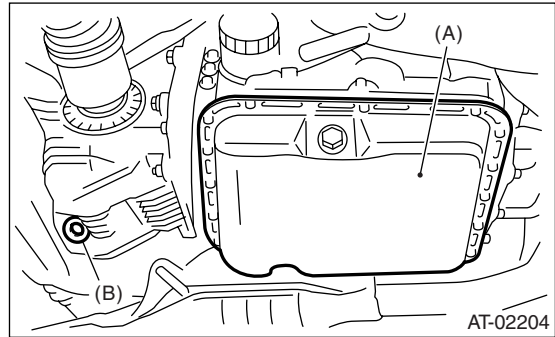
#### CAUTION:

- Directly after the vehicle has been running, the differential gear oil is hot. Therefore, be careful not to burn yourself.
  - Be careful not to spill the differential gear oil on exhaust pipe to prevent it from emitting smoke or fire. When the differential gear oil is spilled on exhaust pipe, wipe it away completely.
- 3) Replace the gasket with a new one, and then tighten the differential gear oil drain plug using TORX® T70.

#### Tightening torque:

**44 N·m (4.5 kgf-m, 32.5 ft-lb) (Aluminum gasket)**

**70 N·m (7.1 kgf-m, 51.6 ft-lb) (Copper gasket)**



- (A) Oil pan
- (B) Differential oil drain plug

- 4) Lower the vehicle.
- 5) Pour gear oil into the gauge hole.

#### Recommended fluid:

<Ref. to 4AT-3, HYDRAULIC CONTROL AND LUBRICATION, SPECIFICATION, **General Description.**>

#### Gear oil capacity:

**1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)**

- 6) Check the level of differential gear oil.  
<Ref. to 4AT-32, INSPECTION, Differential Gear Oil.>

## 4. Road Test

### A: INSPECTION

#### 1. GENERAL PRECAUTION

Road tests should be conducted to properly diagnose the condition of the automatic transmission.

**NOTE:**

When performing the test, do not exceed posted speed limit.

#### 2. D RANGE SHIFT FUNCTION

Check shifting between 1st ↔ 2nd ↔ 3rd ↔ 4th while driving on normal city streets.

#### 3. D RANGE SHIFT SHOCK

Check the shock level when shifting up during normal driving.

#### 4. KICK-DOWN FUNCTION

Check kick-down for each gear. Also check the kick-down shock level.

#### 5. ENGINE BRAKE OPERATION

- Check the 3rd gear engine brake when shifting between D ↔ 3rd range while driving in 4th gear of D range [50 to 60 km/h (31 to 37 MPH)].
- Check the 2nd gear engine brake when shifting between 3 ↔ 2 range while driving in the 3 range 3rd gear [40 to 50 km/h (25 to 31 MPH)].
- Check the 1st gear engine brake when shifting between 2 ↔ 1 range while driving in the 2 range 2nd gear [20 to 30 km/h (12 to 19 MPH)].

#### 6. LOCK-UP FUNCTION

- Check that engine speed does not change sharply when the accelerator pedal is lightly depressed when driving on flat roads at normal speed in the D range.
- Check slip lock-up with following procedures. Subaru Select Monitor is needed for checking. Before start checking, check that no DTC is displayed. Perform the collective action with DTC and make sure that no more DTC is displayed, and then start the checking.

1) Perform the check on flat and straight road or free roller.

**NOTE:**

- Slip lock-up does not operate when the vehicle is lifted up, because of not occurring surface resistance.
- Also when checking on the free roller, check with depressing the foot brake lightly to make the checking easier, because the surface resistance will be deficient.

2) Connect the Subaru Select Monitor.

3) Check the ATF temperature using Subaru Select Monitor.

**NOTE:**

- ATF temperature is between 50 — 100°C (122 — 212°F)
  - When the temperature is low, warm-up the ATF by running the vehicle or etc.
- 4) Start the engine, so that the lock-up duty can be read on data display of Subaru Select Monitor.
- 5) Drive the vehicle at a constant speed of 35 — 40 km/h (22 — 25 MPH).
- 6) Read the lock-up duty while vehicle is running.

**Standard value:**

**25 — 45%**

**NOTE:**

The value may be lower on the free roller.

- Slip lock-up control is not operating when the lock-up duty is less than 5%, or when the lock-up duty goes down immediately after starts rising. On these cases, improper ATF or deterioration of ATF may be the cause. Check the amount of ATF or replace them, and then recheck it.

#### 7. P RANGE OPERATION

Stop the vehicle on an uphill grade of 5% or more and shift to “P” range. Check that the vehicle does not move when the parking brake is released.

#### 8. UNUSUAL SOUNDS AND VIBRATION

Check for unusual sounds and vibration while driving and during shifting.

#### 9. CLIMBING CONTROL FUNCTION

- Check that the gear remains in 3rd when going up a grade.
- Check that the gear remains in 3rd when applying the brakes while going down a grade.

#### 10. TRANSFER CLUTCH

Check if the tight corner braking occurs when the vehicle is started with steering wheel held at fully turned position.

#### 11. OIL LEAKS

After the driving test, inspect for oil leaks.

# Stall Test

## AUTOMATIC TRANSMISSION

### 5. Stall Test

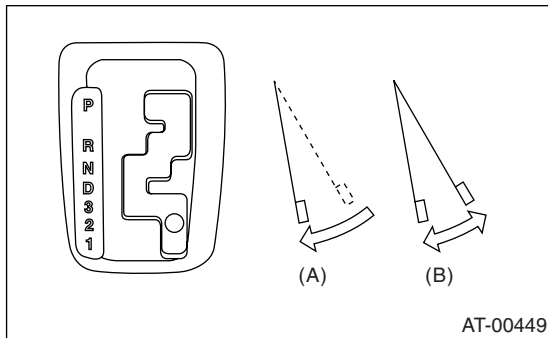
#### A: INSPECTION

**NOTE:**

The stall test is of extreme importance in diagnosing the condition of the automatic transmission and the engine. It should be conducted to measure the engine stall speeds in "R" and "2" ranges.

Purposes of the stall test:

- To check the operation of the automatic transmission clutch
  - To check the operation of the torque converter clutch
  - To check engine performance
- 1) Check that throttle valve opens fully.
  - 2) Check that engine oil level is correct.
  - 3) Check that engine coolant level is correct.
  - 4) Check that ATF level is correct.
  - 5) Check that differential gear oil level is correct.
  - 6) Increase ATF temperature to 70 to 80°C (158 to 176°F) by idling the engine for approx. 30 minutes (with select lever set to "N" or "P").
  - 7) Place the wheel chocks at the front and rear of all wheels and apply the parking brake.
  - 8) Move the manual linkage to ensure it operates properly, and shift the select lever to the "2" range.
  - 9) While depressing the foot brake pedal, gradually depress the accelerator pedal until the engine operates at full throttle.



(A) Brake pedal  
(B) Accelerator pedal

10) When the engine speed is stabilized, record that speed quickly and release the accelerator pedal.

11) Shift the select lever to "N" range, and cool down the engine by idling it for more than one minute.

12) If the stall speed in "2" range is higher than specifications, low clutch slipping and 2-4 brake slipping may occur. To identify it, conduct the same test as above in "R" range.

13) Perform the stall tests with the select lever in "D" range.

**NOTE:**

- Do not continue the stall test for MORE THAN 5 SECONDS at a time (from closed throttle, fully open throttle to stall speed reading). Failure to follow this instruction causes the engine oil and ATF to deteriorate and the clutch and brake to be adversely affected.
- Be sure to cool down the engine for at least 1 minute after each stall test with the select lever set in the "P" or "N" range and with the idle speed lower than 1,200 rpm.
- If the stall speed is higher than the specified range, attempt to finish the stall test in as short a time as possible, in order to prevent the automatic transmission from sustaining damage.

**Stall speed (at sea level):**

**Non-turbo model:**

**2,200 — 2,700 rpm**

**Turbo model:**

**2,700 — 3,200 rpm**

| Stall speed (at sea level)  | Position | Cause  |
|-----------------------------|----------|--|
| Less than specifications    | 2, R     | <ul style="list-style-type: none"> <li>• Throttle valve not fully open</li> <li>• Erroneous engine operation</li> <li>• Torque converter clutch's one-way clutch slipping</li> </ul> |
| Greater than specifications | D        | <ul style="list-style-type: none"> <li>• Line pressure too low</li> <li>• Low clutch slipping</li> <li>• One-way clutch malfunction</li> </ul>                                       |
|                             | R        | <ul style="list-style-type: none"> <li>• Line pressure too low</li> <li>• Reverse clutch slipping</li> <li>• Low &amp; reverse brake slipping</li> </ul>                             |
|                             | 2        | <ul style="list-style-type: none"> <li>• Line pressure too low</li> <li>• Low clutch slipping</li> <li>• 2-4 brake slipping</li> </ul>   |

## 6. Time Lag Test

### A: INSPECTION

**NOTE:**

If the select lever is shifted while the engine is idling, there will be a certain time elapse or lag before the shock can be felt. This is used for checking the condition of the low clutch, reverse clutch, low & reverse brake and one-way clutch.

- Perform the test at normal operating fluid temperature 70 to 80°C (158 to 176°F).
- Be sure to allow a 1 minute interval between tests.
- Make three measurements and take the average value.

1) Apply the parking brake.

2) Start the engine.

Check the idling speed (A/C OFF).

3) Shift the select lever from "N" to "D" range.

Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

Time lag: Less than 1.2 seconds

If "N" → "D" time lag is longer than specified:

- Line pressure too low
- Low clutch worn
- One-way clutch not operating properly
- D-ring worn

4) In the same manner, measure the time lag for "N" → "R".

Time lag: Less than 1.5 seconds

If "N" → "R" time lag is longer than specified:

- Line pressure too low
- Reverse clutch worn
- Low & reverse brake worn
- D-ring worn



## Line Pressure Test

AUTOMATIC TRANSMISSION

### 7. Line Pressure Test

#### A: MEASUREMENT

**NOTE:**

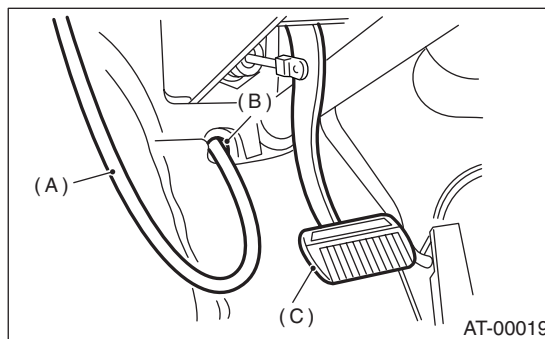
If the clutch or the brake shows a sign of slippage or shifting sensation is not correct, the line pressure should be checked.

- Excessive shocks during upshifting or shifting takes place at a higher point than under normal circumstances, may be due to the line pressure being too high.

- Slippage or inability to operate the vehicle may, in most cases, be due to loss of oil pressure for the operation of the clutch, brake or control valve.

- 1) Line pressure measurement (under no load)
  - (1) Before measuring the line pressure, lift-up the vehicle.
  - (2) Maintain the temperature of ATF at approx. 70 — 80°C (158 — 176°F) during measurement. (ATF will reach the above temperature after idling the engine for approx. 30 minutes with select lever in “N” or “P”.)
- 2) Line pressure measurement (under heavy load)
  - (1) Before measuring the line pressure, apply both foot and parking brakes with all wheels chocked (Same as for “stall” test conditions).
  - (2) Measure the line pressure when select lever is in “R” or “2” with engine under stall conditions.
  - (3) Measure the line pressure within 5 seconds after shifting the select lever to each position. (If line pressure needs to be measured again, allow the engine to idle, and then stop it to cool down for at least one minute.)
  - (4) Maintain the temperature of ATF at approx. 70 — 80°C (158 — 176°F) during measurement. (ATF will reach the above temperature after idling the engine for approx. 30 minutes with the select lever in “N” or “P”.)
- 3) Temporarily attach the ST to a suitable place in the driver’s compartment, remove the blind plug located in front of the toe board and pass the hose of the ST to engine compartment.

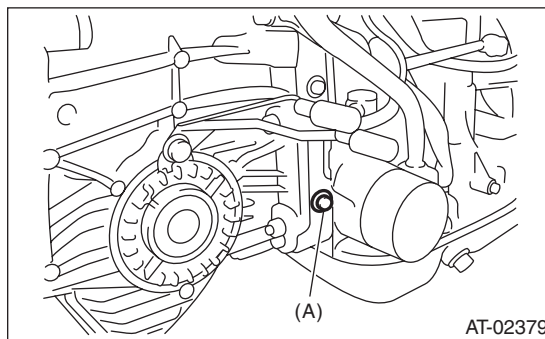
ST 498575400 OIL PRESSURE GAUGE ASSY



- (A) Pressure gauge hose
- (B) Hole in toe board (blank cap hole)
- (C) Brake pedal

4) Remove the test plug and install the ST instead.

ST 498897200 OIL PRESSURE GAUGE ADAPTER



- (A) Test plug

5) Connect the ST1 with ST2.

ST1 498897200 OIL PRESSURE GAUGE ADAPTER

ST2 498575400 OIL PRESSURE GAUGE ASSY

6) Check for duty ratio changes by opening and closing the throttle valve using SUBARU Select Monitor.

| Standard line pressure |                              |                   |   |
|------------------------|------------------------------|-------------------|---|
| Range position         | Line pressure duty ratio (%) | Throttle position | Line pressure kPa (kgf/cm <sup>2</sup> , psi) |
| 2                      | 25 — 35                      | 100 (Full open)   | 1,000 — 1,300 (10.2 — 13.3, 145 — 189)        |
| R                      | 15 — 25                      | 100 (Full open)   | 1,500 — 1,850 (15.3 — 18.9, 218 — 268)        |
| D                      | 35 — 43                      | 0 (Full closed)   | 500 — 800 (5.1 — 8.2, 73 — 116)               |

## 8. Transfer Clutch Pressure Test

### A: INSPECTION

- MP-T model

Check the transfer clutch pressure in accordance with the following chart in the same manner as with line pressure. <Ref. to 4AT-36, Line Pressure Test.>

ST 498897700 OIL PRESSURE ADAPTER SET

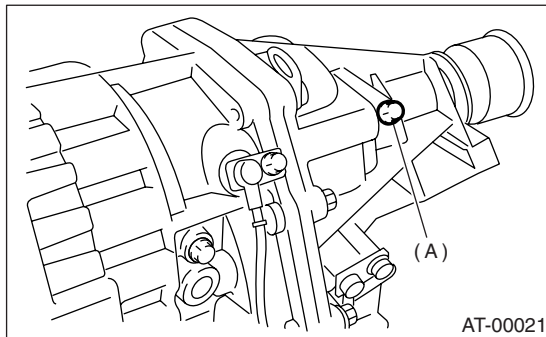
ST 498575400 OIL PRESSURE GAUGE ASSY

AWD mode: "D" range

FWD mode: "P" range, engine speed 2,000 rpm

NOTE:

Before setting in FWD mode, install the spare fuse on FWD switch.



(A) Test plug

NOTE:

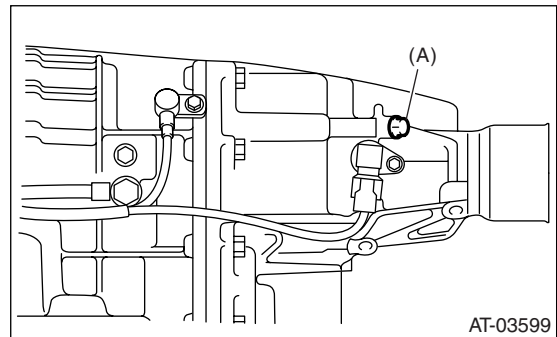
If the oil pressure is not produced or if it does not change in the AWD mode, the transfer duty solenoid or transfer valve assembly may be malfunctioning. If the oil pressure is produced in the FWD mode, the problem is similar to that in the AWD mode.

- VTD model

Check transfer clutch pressure using the following chart. <Ref. to 4AT-36, Line Pressure Test.>

ST 498897700 OIL PRESSURE ADAPTER SET

ST 498575400 OIL PRESSURE GAUGE ASSY



(A) Test plug

### STANDARD TRANSFER CLUTCH PRESSURE:

| Range position | ON Duty ratio (%) | Acceleration opening angle (%) | Transfer clutch pressure (kPa (kgf/cm <sup>2</sup> , psi)) |          |
|----------------|-------------------|--------------------------------|--|----------|
|                |                   |                                | AWD mode   | FWD mode |
| 2              | 95                | Fully opens (100)              | 1,000 — 1,200<br>(10.2 — 12.2, 145 — 174)                  | —        |
|                | 60                | Adjust ON Duty ratio to 60%.   | 500 — 700<br>(5.1 — 7.1, 73 — 102)                         | —        |
|                | 5                 | Fully closed (0)               | —  | 0 (0, 0) |
| N or P         | 5                 | Fully closed (0)               | 0  | —        |

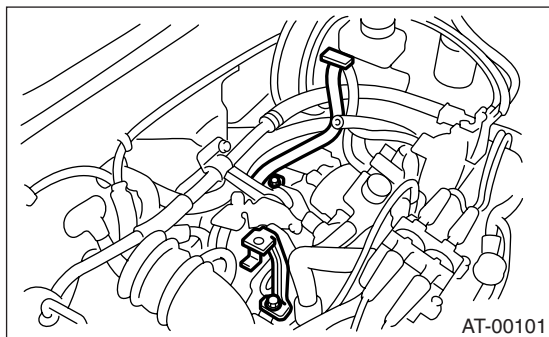
# Automatic Transmission Assembly

## AUTOMATIC TRANSMISSION

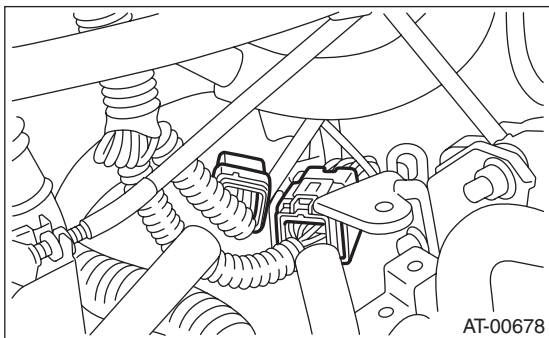
### 9. Automatic Transmission Assembly

#### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Open the front hood fully, and support it with a stay.
- 3) Disconnect the battery ground cable.
- 4) Remove the air intake chamber and intake duct. (Non-turbo model) <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Chamber.>
- 5) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 6) Remove the air intake chamber stay. (Non-turbo model)

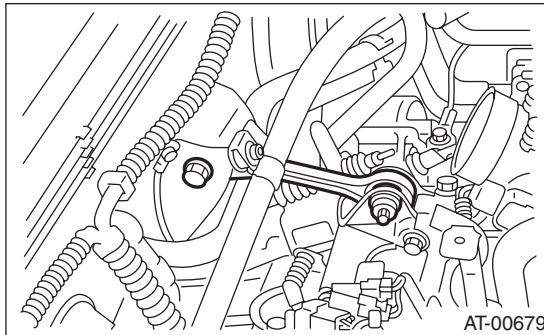


- 7) Disconnect the following connectors.
  - (1) Transmission harness connector



- (2) Transmission ground terminal
- 8) Remove the starter. <Ref. to SC(H4SO)-8, REMOVAL, Starter.>
- 9) Remove the throttle body. <Ref. to FU(H4SO)-12, REMOVAL, Throttle Body.> <Ref. to FU(H4DOTC)-13, REMOVAL, Throttle Body.>

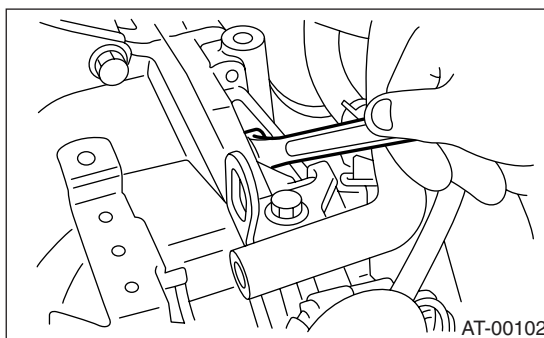
- 10) Remove the pitching stopper.



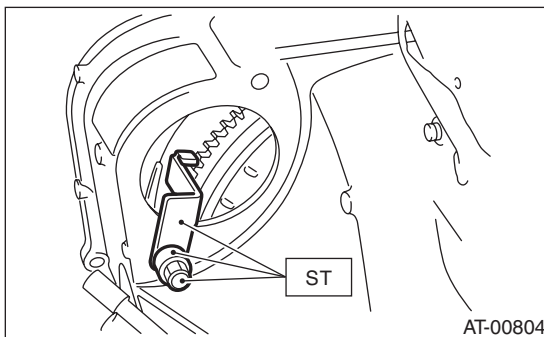
- 11) Separate the torque converter clutch from drive plate.

- (1) Install the V-belt cover.
- (2) Remove the service hole plug.
- (3) Remove the bolts which hold the torque converter clutch to drive plate.
- (4) While rotating the crank pulley in the direction of engine rotation little by little, remove all the bolts.

**CAUTION:**  
Be careful not to drop bolts into torque converter clutch housing.



- 12) Install the ST to converter case.  
ST 498277200 STOPPER SET



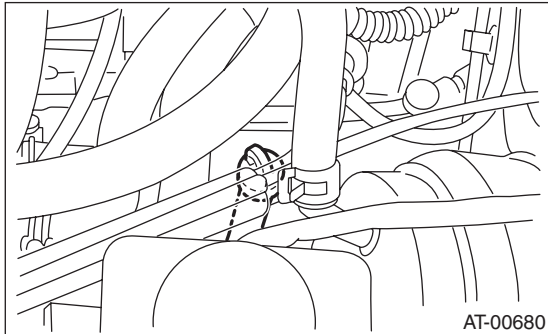
- 13) Remove the ATF level gauge.

# Automatic Transmission Assembly

AUTOMATIC TRANSMISSION

**NOTE:**

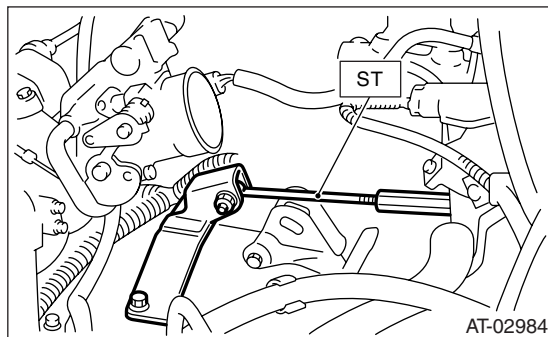
Plug the opening to prevent the entry of foreign particles into transmission fluid.



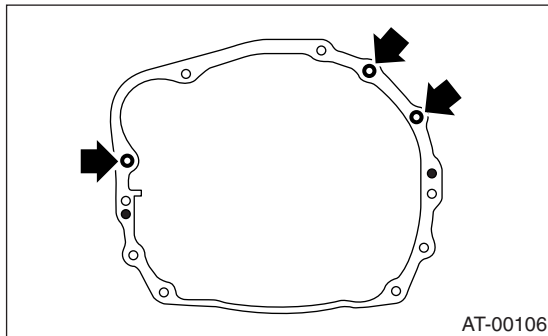
14) Remove the pitching stopper bracket.

15) Set the ST.

ST 41099AC000 ENGINE SUPPORT ASSY



16) Remove the bolt which holds the upper side of transmission to engine.



17) Lift-up the vehicle.

18) Remove the under cover.

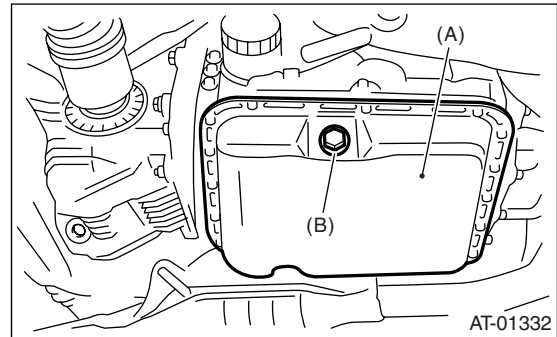
19) Remove the front, center, rear exhaust pipe and muffler. (Non-turbo model)

<Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.> <Ref. to EX(H4SO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, REMOVAL, Muffler.>

20) Remove the center and rear exhaust pipes, and muffler. (Turbo model)

<Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>

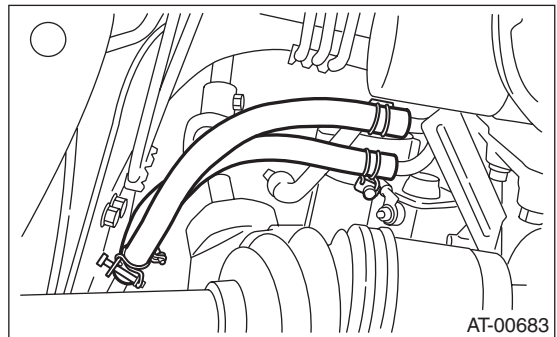
21) Drain ATF to remove the ATF drain plug.



(A) Oil pan

(B) Drain plug (ATF)

22) Disconnect the ATF cooler hoses from pipes of transmission side, and remove the oil charge pipe.



23) Remove the propeller shaft.

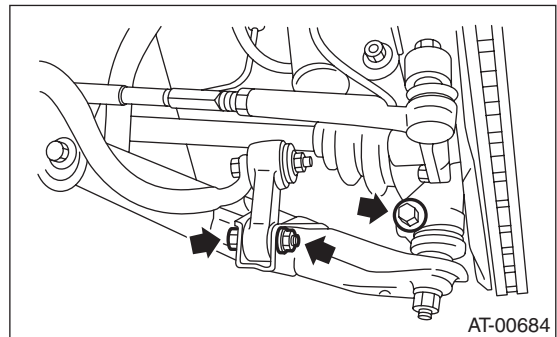
<Ref. to DS-16, REMOVAL, Propeller Shaft.>

24) Remove the shift select cable.

<Ref. to CS-27, REMOVAL, Select Cable.>

25) Disconnect the stabilizer link from transverse link.

26) Remove the bolt securing ball joint of transverse link to housing.



27) Pull out the front drive shaft from transmission.

(1) Using a tire lever or a pinch bar, etc., pull out the front drive shaft until its joint facing to transmission can move smoothly.

**NOTE:**

Place cloth between tire lever or pinch bar and transmission in order to avoid damaging the side retainer of transmission.

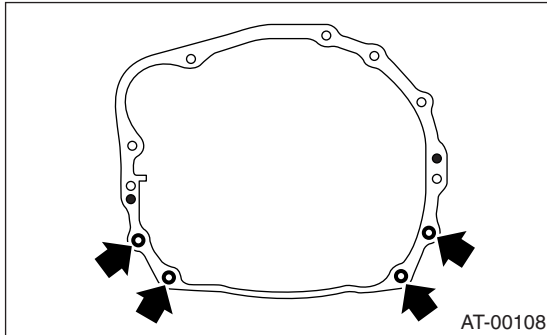
# Automatic Transmission Assembly

## AUTOMATIC TRANSMISSION

(2) Hold the transmission side joint portion of front drive shaft by hand and extract the housing from the transmission by pressing it outside so as not to stretch the boot.

28) Remove the bolts which hold the clutch housing cover.

29) Remove the nuts which hold the lower side of transmission to engine.

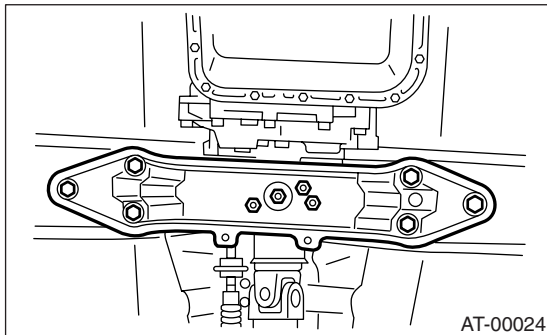


30) Place the transmission jack under transmission.

### NOTE:

Make sure that the support plates of transmission jack don't touch the oil pan.

31) Remove the transmission rear crossmember from vehicle.

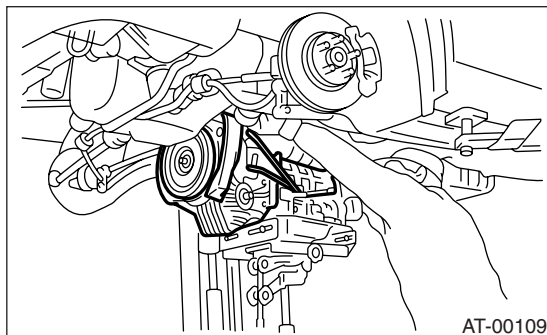


32) While gradually lowering the transmission jack, fully contact the engine support, and then tilt the engine rearward.

33) Remove the transmission.

### CAUTION:

**Move the transmission and torque converter as a unit away from engine.**



34) Separate the transmission assembly and rear cushion rubber.

## B: INSTALLATION

1) Replace the differential side oil seal with new one. <Ref. to 4AT-47, REPLACEMENT, Differential Side Retainer Oil Seal.>

### NOTE:

Replacement is not necessary when new oil seal has been installed.

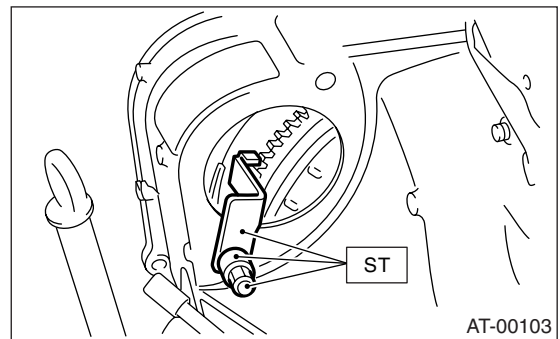
2) Install the rear cushion rubber to transmission assembly.

### Tightening torque:

**39 N·m (4.0 kgf-m, 29 ft-lb)**

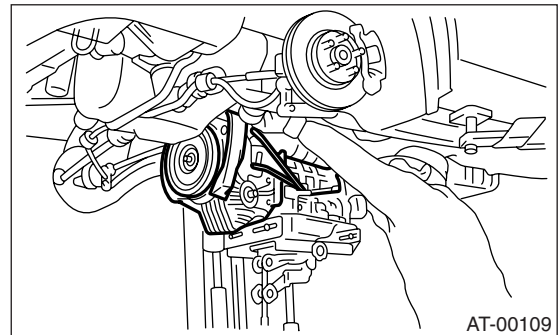
3) Install the ST to converter case.

ST 498277200 STOPPER SET



4) Install the transmission onto engine.

(1) Gradually raise the transmission with transmission jack.



(2) Engage them at splines.

(3) While gradually lifting the transmission jack, turn the screw of engine support, and then tilt the engine forward.

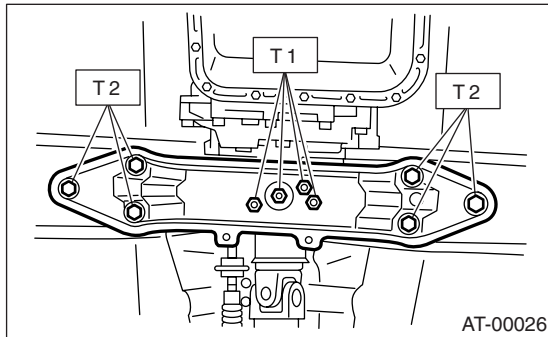
5) Install the transmission rear crossmember.



**Tightening torque:**

**T1: 35 N·m (3.6 kgf-m, 26 ft-lb)**

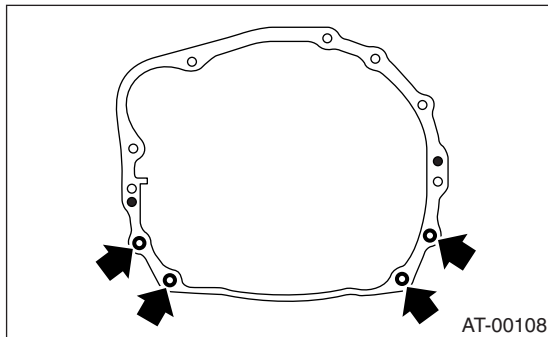
**T2: 70 N·m (7.1 kgf-m, 51.6 ft-lb)**



- 6) Take off the transmission jack.
- 7) Tighten the nuts and bolts which hold the lower side of transmission to engine.

**Tightening torque:**

**50 N·m (5.1 kgf-m, 36.9 ft-lb)**



- 8) Tighten the bolt of clutch housing cover.
- 9) Lower the vehicle.
- 10) Connect the engine and transmission.
  - (1) Remove the ST from converter case.

**NOTE:**

Be careful not to drop the ST into the converter case when removing ST.

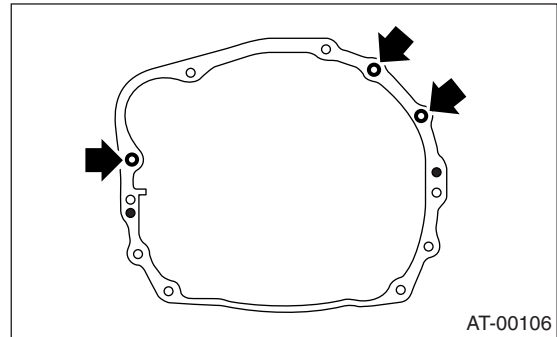
ST 498277200 STOPPER SET

- (2) Install the starter.
 

<Ref. to SC(H4SO)-8, INSTALLATION, Starter.>
- (3) Tighten the bolt which holds the upper side of transmission to engine.

**Tightening torque:**

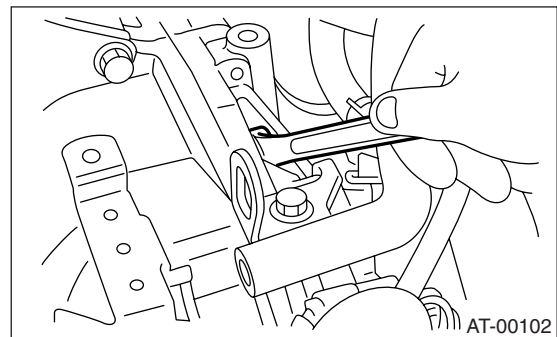
**50 N·m (5.1 kgf-m, 36.9 ft-lb)**



- 11) Install the torque converter clutch to drive plate.
  - (1) Tighten the bolts which hold the torque converter clutch to drive plate.
  - (2) While rotating the crank pulley in the direction of engine rotation little by little, tighten all the bolts.

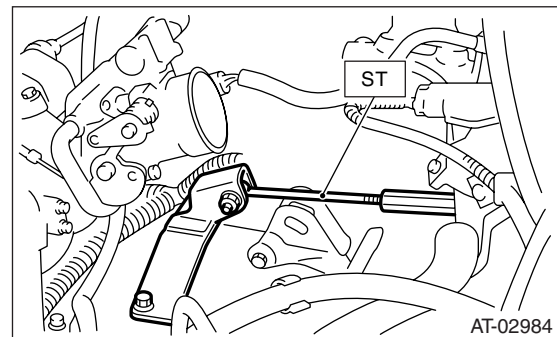
**Tightening torque:**

**25 N·m (2.5 kgf-m, 18.4 ft-lb)**



- (3) Clog the plug onto service hole.
- (4) Install the V-belt cover.
- 12) Remove the STs.

ST 41099AC000 ENGINE SUPPORT ASSY



- 13) Install the pitching stopper bracket.

**Tightening torque:**

**41 N·m (4.2 kgf-m, 30.2 ft-lb)**

- 14) Install the pitching stopper.

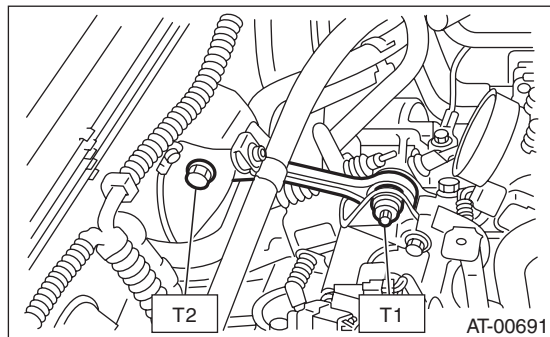
# Automatic Transmission Assembly

## AUTOMATIC TRANSMISSION

### Tightening torque:

**T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)**

**T2: 58 N·m (5.9 kgf-m, 43 ft-lb)**



15) Install the throttle body. <Ref. to FU(H4SO)-12, INSTALLATION, Throttle Body.> <Ref. to FU(H4DOTC)-13, INSTALLATION, Throttle Body.>

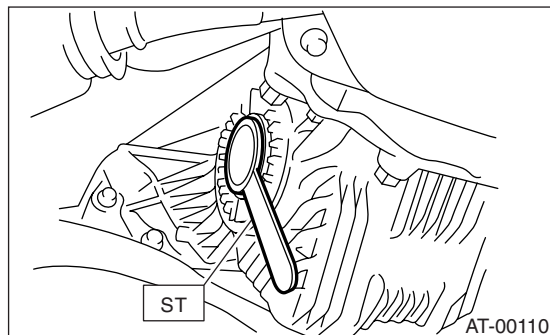
16) Lift-up the vehicle.

17) Replace the snap ring of front drive shaft with a new one.

18) Apply grease to the oil seal lips.

19) Install the ST to side retainer.

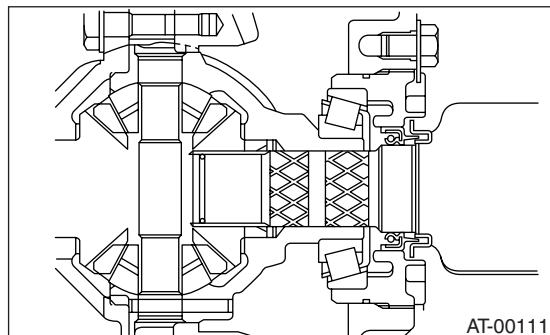
ST 28399SA010 OIL SEAL PROTECTOR



20) Align the spline of front differential shaft to that of differential bevel gear for insertion, and remove them using ST.

ST 28399SA010 OIL SEAL PROTECTOR

21) Insert the front drive shaft into transmission securely by pressing the front housing from outside.



22) Install the ball joint into housing.

23) Connect the stabilizer link to transverse link, and tighten the bolts.

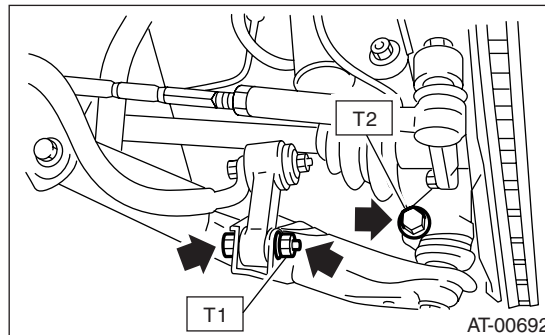
### NOTE:

Use a new self-locking nut.

### Tightening torque:

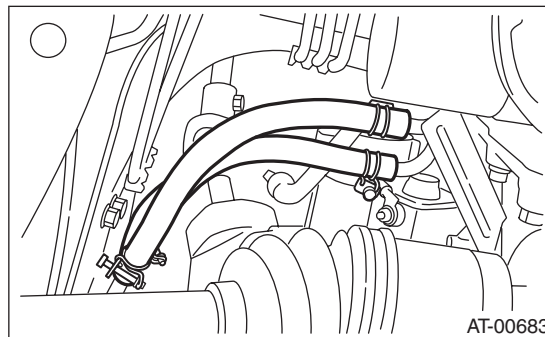
**T1: 30 N·m (3.1 kgf-m, 22.1 ft-lb)**

**T2: 50 N·m (5.1 kgf-m, 36.9 ft-lb)**



24) Install the shift select cable onto select lever. <Ref. to CS-27, INSTALLATION, Select Cable.>

25) Install the oil charge pipe, and connect the ATF cooler hoses to pipe.



26) Install the propeller shaft.

<Ref. to DS-17, INSTALLATION, Propeller Shaft.>

27) Install the rear exhaust pipe and muffler assembly.

Non-turbo model

<Ref. to EX(H4SO)-7, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, INSTALLATION, Muffler.>

Turbo model

<Ref. to EX(H4DOTC)-15, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, INSTALLATION, Muffler.>

28) Install the front and center exhaust pipe. (Non-turbo model)

<Ref. to EX(H4SO)-4, INSTALLATION, Front Exhaust Pipe.>

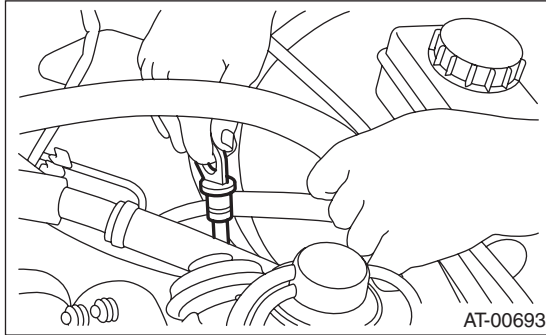
29) Install the center exhaust pipe. (Turbo model)

<Ref. to EX(H4DOTC)-11, INSTALLATION, Center Exhaust Pipe.>

30) Install the under cover.

31) Lower the vehicle.

32) Install the ATF level gauge.



33) Connect the following connectors.

- (1) Transmission harness connectors
- (2) Transmission ground terminal

34) Install the air intake chamber stay.

**Tightening torque:**

**16 N·m (1.6 kgf-m, 11.8 ft-lb)**

35) Install the air intake chamber and intake duct. (Non-turbo model) <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Chamber.>

36) Install the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

37) Connect the battery ground cable.

38) Fill ATF up to the middle of the "COLD" side on level gauge by using oil charge pipe. <Ref. to 4AT-30, Automatic Transmission Fluid.>

39) Take off the vehicle from lift arms.

40) Check select lever operation. <Ref. to 4AT-48, INSPECTION, Inhibitor Switch.>

41) Bleed air from control valve. <Ref. to 4AT-62, PROCEDURE, Air Bleeding of Control Valve.>

42) Check the ATF level. <Ref. to 4AT-30, Automatic Transmission Fluid.>

43) Perform the advance operation of learning control.

<Ref. to 4AT(D)(diag)-15, FACILITATION OF LEARNING CONTROL, OPERATION, Subaru Select Monitor.>

44) Check the road test.

<Ref. to 4AT-33, Road Test.>



# Transmission Mounting System

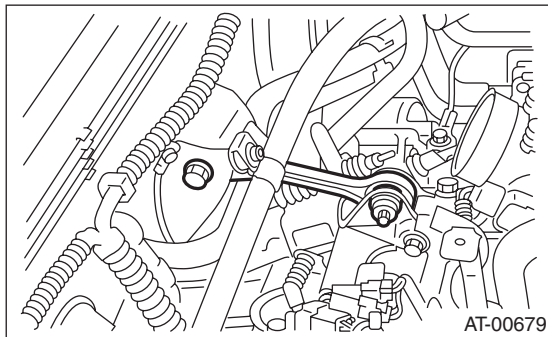
AUTOMATIC TRANSMISSION

## 10. Transmission Mounting System

### A: REMOVAL

#### 1. PITCHING STOPPER

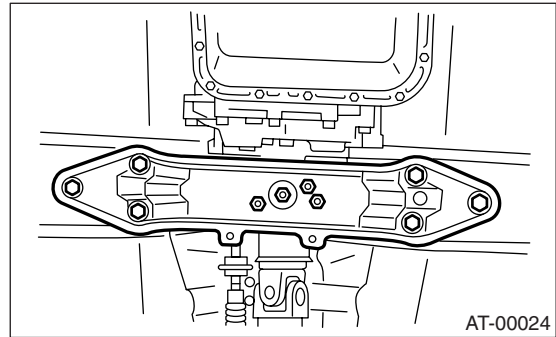
- 1) Disconnect the ground cable from battery.
- 2) Remove the air intake chamber. (Non-turbo model) <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Chamber.>
- 3) Remove intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 4) Remove the throttle body. <Ref. to FU(H4SO)-12, REMOVAL, Throttle Body.> <Ref. to FU(H4DOTC)-13, REMOVAL, Throttle Body.>
- 5) Remove the pitching stopper.



#### 2. TRANSMISSION REAR CROSSMEMBER AND REAR CUSHION RUBBER

- 1) Disconnect the ground cable from battery.
- 2) Jack-up the vehicle and support it with sturdy racks.
- 3) Remove the front, center, rear exhaust pipes and muffler. (Non-turbo model) <Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.> <Ref. to EX(H4SO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, REMOVAL, Muffler.>
- 4) Remove center and rear exhaust pipes, and muffler. (Turbo model) <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>
- 5) Set the transmission jack under the transmission. Make sure that the support plates of transmission jack don't touch the oil pan.

- 6) Remove the transmission rear crossmember.



- 7) Remove the rear cushion rubber.

### B: INSTALLATION

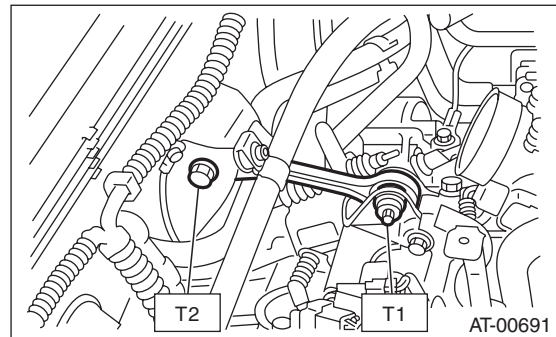
#### 1. PITCHING STOPPER

- 1) Install the pitching stopper.

#### Tightening torque:

**T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)**

**T2: 58 N·m (5.9 kgf-m, 43 ft-lb)**



- 2) Install the throttle body. <Ref. to FU(H4SO)-12, INSTALLATION, Throttle Body.> <Ref. to FU(H4DOTC)-13, INSTALLATION, Throttle Body.>
- 3) Install the air intake chamber. (Non-turbo model) <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Chamber.>
- 4) Remove intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

#### 2. TRANSMISSION REAR CROSSMEMBER AND REAR CUSHION RUBBER

- 1) Install the rear cushion rubber.

#### Tightening torque:

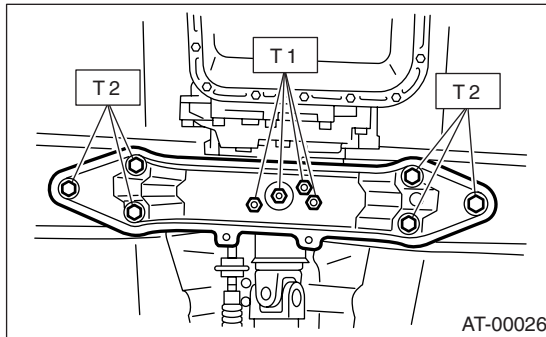
**39 N·m (4.0 kgf-m, 29 ft-lb)**

- 2) Install the crossmember.

## Tightening torque:

**T1: 35 N·m (3.6 kgf-m, 26 ft-lb)**

**T2: 70 N·m (7.1 kgf-m, 51.6 ft-lb)**



- 3) Remove the transmission jack.
- 4) Install the front, center, rear exhaust pipes and the muffler. (Non-turbo model)  
<Ref. to EX(H4SO)-4, INSTALLATION, Front Exhaust Pipe.> <Ref. to EX(H4SO)-7, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, INSTALLATION, Muffler.>
- 5) Install center and rear exhaust pipes, and muffler. (Turbo model)  
<Ref. to EX(H4DOTC)-11, INSTALLATION, Center Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, INSTALLATION, Muffler.>

## C: INSPECTION

Repair or replace parts if the results of the inspection below are not satisfactory.

### 1. PITCHING STOPPER

Make sure that the pitching stopper is not bent or damaged. Make sure that the rubber is not stiff, cracked, or otherwise damaged.

### 2. TRANSMISSION REAR CROSSMEMBER AND REAR CUSHION RUBBER

Make sure that the crossmember is not bent or damaged. Make sure that the cushion rubber is not stiff, cracked, or otherwise damaged.

# Extension Case Oil Seal

AUTOMATIC TRANSMISSION

## 11.Extension Case Oil Seal

### A: INSPECTION

Make sure the ATF does not leak from the joint of transmission and propeller shaft. If so, replace the oil seal. <Ref. to 4AT-46, REPLACEMENT, Extension Case Oil Seal.>

### B: REPLACEMENT

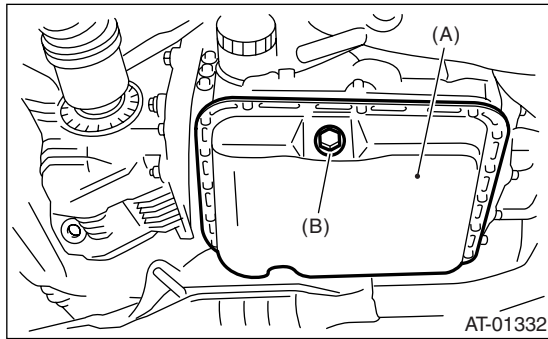
- 1) Clean the transmission exterior.
- 2) Drain the ATF completely.

NOTE:

- Tighten the ATF drain plug after draining the ATF.
- Use a new gasket.

**Tightening torque:**

**25 N·m (2.5 kgf-m, 18.4 ft-lb)**



- (A) Oil pan  
(B) Drain plug (ATF)

- 3) Remove the rear exhaust pipe and muffler.

Non-turbo model

<Ref. to EX(H4SO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, REMOVAL, Muffler.>

Turbo model

<Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>

- 4) Remove the propeller shaft. <Ref. to DS-16, REMOVAL, Propeller Shaft.>

- 5) Using the ST, remove the oil seal.

ST 398527700 PULLER ASSY

- 6) Using the ST, install the oil seal.

ST 498057300 INSTALLER

- 7) Install the propeller shaft. <Ref. to DS-17, INSTALLATION, Propeller Shaft.>

- 8) Install the rear exhaust pipe and muffler.

Non-turbo model

<Ref. to EX(H4SO)-7, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, INSTALLATION, Muffler.>

Turbo model

<Ref. to EX(H4DOTC)-15, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, INSTALLATION, Muffler.>

- 9) Pour ATF and check the ATF level. <Ref. to 4AT-30, Automatic Transmission Fluid.>

## 12. Differential Side Retainer Oil Seal

### A: INSPECTION

Check the leakage of gear oil from differential side retainer oil seal part. If there is oil leakage, replace the oil seal.

### B: REPLACEMENT

- 1) Lift-up the vehicle.
- 2) Remove the front exhaust pipe and center exhaust pipe.

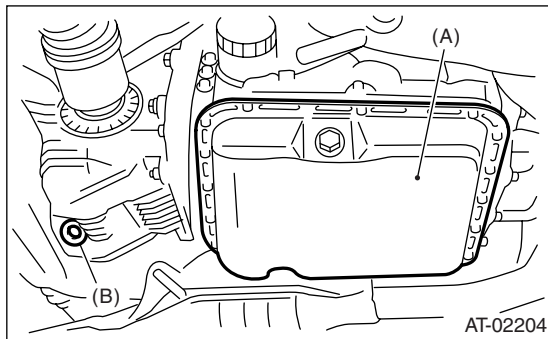
Non-turbo model

<Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>

Turbo model

<Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>

- 3) Drain the differential gear by removing differential gear oil drain plug.



- (A) Oil pan  
(B) Differential gear oil drain plug

- 4) Replace new gasket and tighten the differential oil drain plug.

#### Tightening torque:

**44 N·m (4.5 kgf·m, 32.5 ft·lb) (Aluminum gasket)**

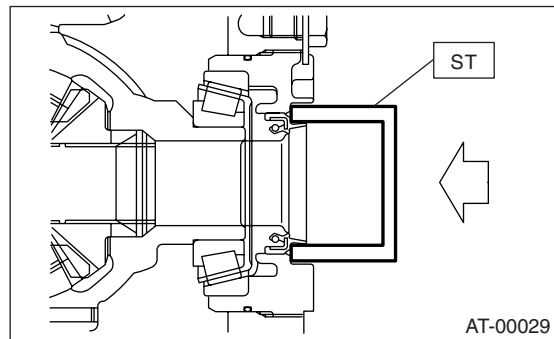
**70 N·m (7.1 kgf·m, 51.6 ft·lb) (Copper gasket)**

- 5) Separate the front drive shaft from transmission. <Ref. to DS-33, REMOVAL, Front Drive Shaft.>

- 6) Remove the differential side retainer oil seal using driver which wrapped with vinyl tape or etc.

- 7) Using ST, install the differential side retainer oil seal by slightly tapping with hammer.

ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER



- 8) Apply oil to the oil seal lips.

- 9) Using the ST, install the front drive shaft. <Ref. to DS-33, INSTALLATION, Front Drive Shaft.>

ST 28399SA010 OIL SEAL PROTECTOR

- 10) Install the front exhaust pipe and center exhaust pipe.

Non-turbo model

<Ref. to EX(H4SO)-4, INSTALLATION, Front Exhaust Pipe.>

Turbo model

<Ref. to EX(H4DOTC)-11, INSTALLATION, Center Exhaust Pipe.>

- 11) Lower the vehicle.

- 12) Pour differential gear oil into the gauge hole.

#### Recommended gear oil:

**<Ref. to RM-2, LUBRICANTS, RECOMMENDED MATERIALS, Recommended Materials.>**

#### Differential gear oil capacity:

**1.1 — 1.3 ℓ (1.3 — 1.4 US qt, 1.0 — 1.1 Imp qt)**

- 13) Check the gear oil amount. <Ref. to 4AT-32, INSPECTION, Differential Gear Oil.>

## 13. Inhibitor Switch

### A: INSPECTION

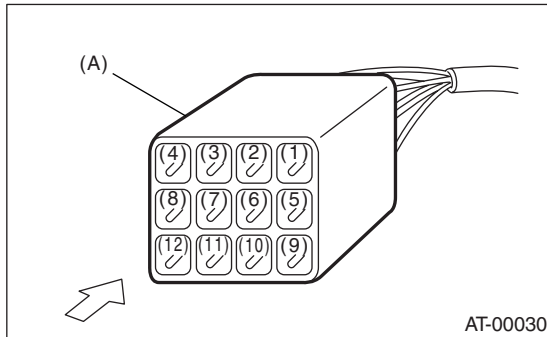
When the driving condition or starter motor operation is erroneous, first check the shift linkage for improper operation. If the shift linkage is functioning properly, check the inhibitor switch.

- 1) Disconnect the inhibitor switch connector.
- 2) Check continuity in inhibitor switch circuits with the select lever moved to each position.

**NOTE:**

- Also check that continuity in ignition circuit does not exist when the select lever is in “R”, “D”, “3”, “2” and “1” ranges.
- If the inhibitor switch is inoperative, check for poor contact of connector on transmission side.

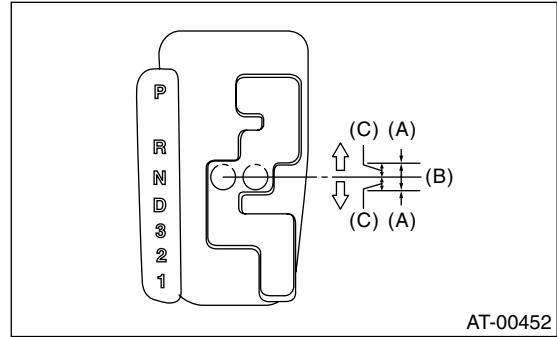
|                       | Position | Pin No. |
|-----------------------|----------|---------|
| Signal sent to TCM    | P        | 4 — 3   |
|                       | R        | 4 — 2   |
|                       | N        | 4 — 1   |
|                       | D        | 4 — 8   |
|                       | 3        | 4 — 7   |
|                       | 2        | 4 — 6   |
|                       | 1        | 4 — 5   |
| Ignition circuit      | P/N      | 12 — 11 |
| Back-up light circuit | R        | 10 — 9  |



(A) Inhibitor switch connector

- 3) Check if there is continuity at equal points when the select lever is tilted 1.5° in both directions from “N” range.

If there is continuity in one direction and the continuity in the other or if there is continuity at unequal points, adjust the inhibitor switch. <Ref. to 4AT-48, ADJUSTMENT, Inhibitor Switch.>

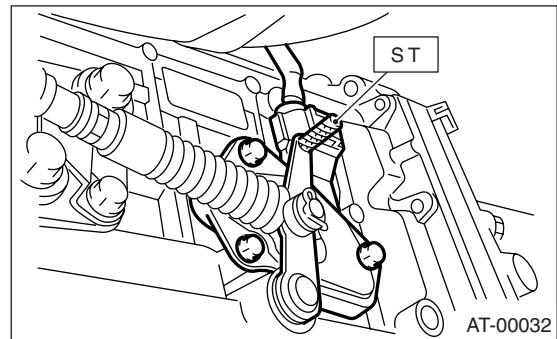


- (A) Continuity does not exist.
- (B) Continuity exists.
- (C) 1.5°

- 4) Repeat the above checks. If there are abnormalities, adjust the select cable. <Ref. to CS-28, ADJUSTMENT, Select Cable.>

### B: ADJUSTMENT

- 1) Move the select lever to “N” range.
- 2) Loosen the three inhibitor switch securing bolts.
- 3) Insert the ST as vertical as possible into the holes in inhibitor switch lever and switch body.  
ST 499267300 STOPPER PIN



- 4) Tighten the three inhibitor switch bolts.

**Tightening torque:**

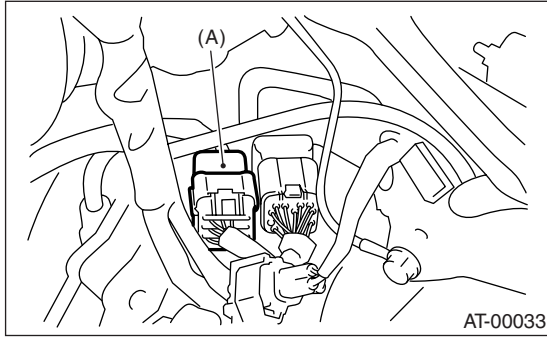
**3.5 N·m (0.36 kgf·m, 2.6 ft·lb)**

- 5) Repeat the above checks. If the inhibitor switch is determined to be “faulty”, replace it.

### C: REMOVAL

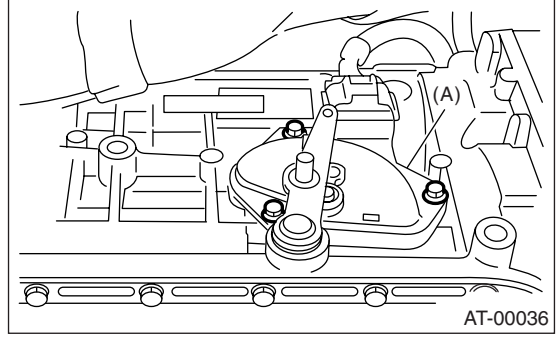
- 1) Set up the vehicle on a lift.
- 2) Move the select lever to “N” range.
- 3) Remove the air intake chamber (Non-turbo model). <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Chamber.>
- 4) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>

5) Disconnect the inhibitor switch connector.



(A) Inhibitor switch

11) Remove the bolts.



(A) Inhibitor switch

6) Remove the inhibitor switch connector from stay.

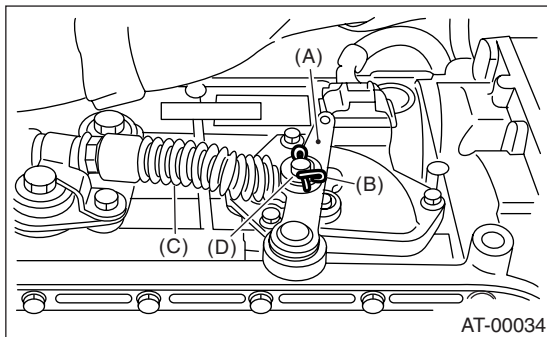
7) Lift-up the vehicle.

8) Remove the front and center exhaust pipes.

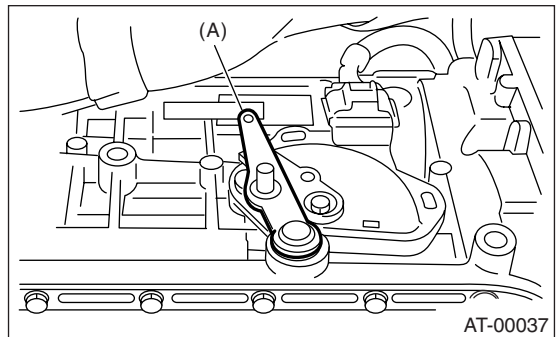
<Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.> <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>

9) Remove the snap pin and washer from range select lever.

12) Move the range select lever to parking position (left side).



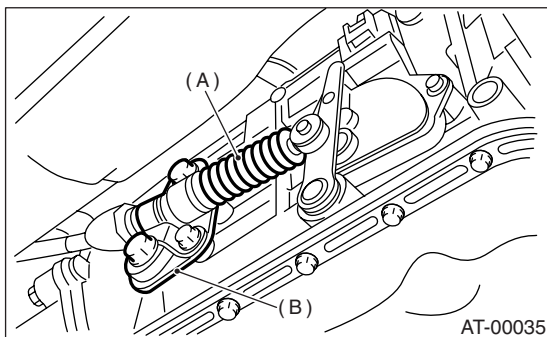
(A) Range select lever  
 (B) Snap pin  
 (C) Select cable  
 (D) Washer



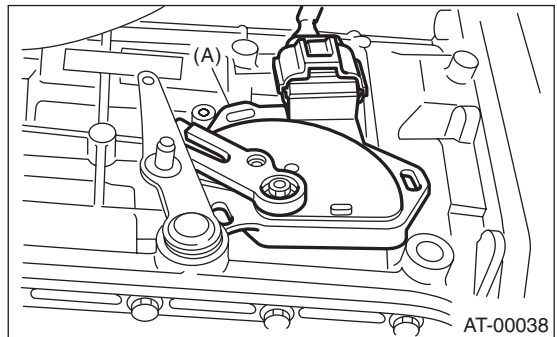
(A) Range select lever

10) Remove the plate assembly from transmission case.

13) Remove the inhibitor switch from transmission.



(A) Select cable  
 (B) Plate ASSY



(A) Inhibitor switch

14) Disconnect the inhibitor switch harness connector from inhibitor switch.

## D: INSTALLATION

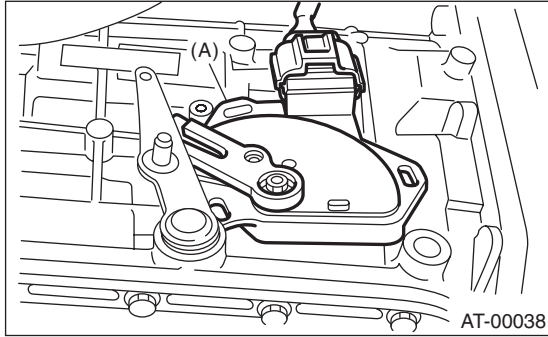
1) Connect the inhibitor switch harness connector to inhibitor switch.



# Inhibitor Switch

## AUTOMATIC TRANSMISSION

2) Install the inhibitor switch to transmission case.

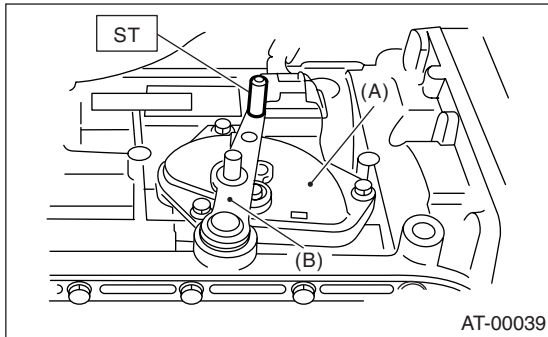


(A) Inhibitor switch

3) Move the range select lever to neutral position.  
4) Using the ST, tighten the bolts of inhibitor switch.  
ST 499267300 STOPPER PIN

### Tightening torque:

**3.5 N·m (0.36 kgf-m, 2.6 ft-lb)**

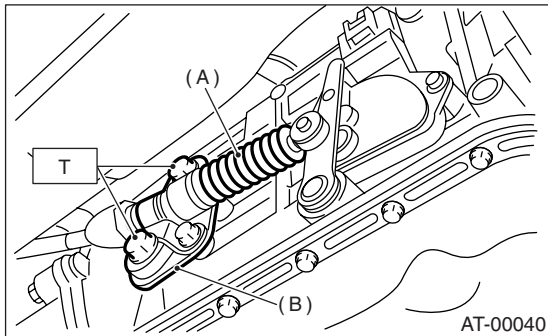


(A) Inhibitor switch  
(B) Range select lever

5) Install the select cable to range select lever.  
6) Install the plate assembly to transmission.

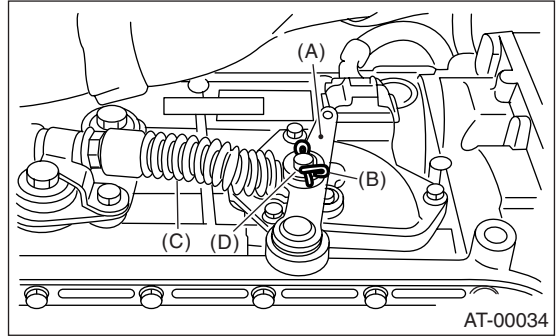
### Tightening torque:

**T: 25 N·m (2.5 kgf-m, 18.4 ft-lb)**



(A) Select cable  
(B) Plate ASSY

7) Install the washer and snap pin to range select lever.



(A) Range select lever  
(B) Snap ring  
(C) Select cable  
(D) Washer

8) Install the front and center exhaust pipes. (Non-turbo model)

<Ref. to EX(H4SO)-4, INSTALLATION, Front Exhaust Pipe.>

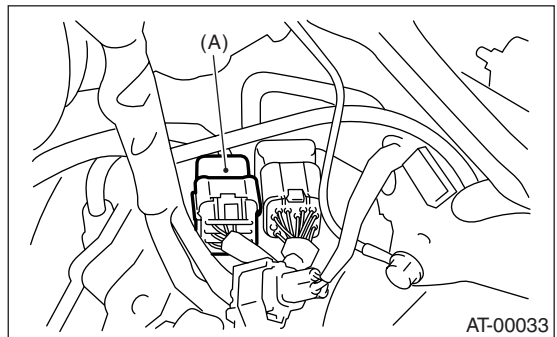
9) Install the center exhaust pipe. (Turbo model)

<Ref. to EX(H4DOTC)-11, INSTALLATION, Center Exhaust Pipe.>

10) Lower the vehicle.

11) Install the inhibitor switch connector from stay.

12) Connect the inhibitor switch connector.



(A) Inhibitor switch

13) Install the air intake chamber. (Non-turbo model) <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Chamber.>

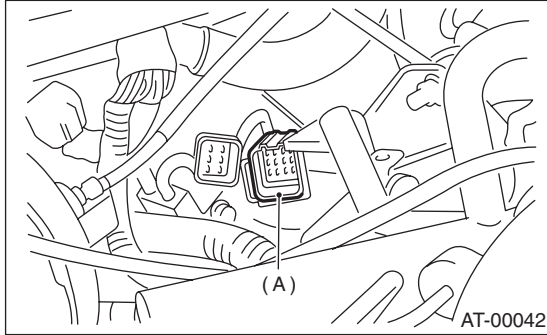
14) Install the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

15) Inspect the inhibitor switch. <Ref. to 4AT-48, INSPECTION, Inhibitor Switch.>

## 14. Front Vehicle Speed Sensor

### A: REMOVAL

- 1) Set up the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the air intake chamber. (Non-turbo model) <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Chamber.>
- 4) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 5) Disconnect the transmission connector.



(A) Transmission connector

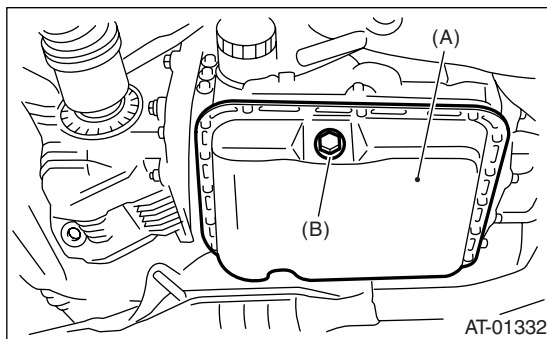
- 6) Remove the pitching stopper. <Ref. to 4AT-44, REMOVAL, Transmission Mounting System.>
- 7) Remove the transmission connector from stay.
- 8) Lift-up the vehicle.
- 9) Clean the transmission exterior.
- 10) Drain the ATF completely.

#### NOTE:

- Tighten the ATF drain plug after draining the ATF.
- Use a new gasket.

#### Tightening torque:

**25 N·m (2.5 kgf-m, 18.4 ft-lb)**



(A) Oil pan  
(B) Drain plug (ATF)

- 11) Remove the front, center, exhaust pipes and muffler. (Non-turbo model) <Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.> <Ref. to EX(H4SO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, REMOVAL, Muffler.>

- 12) Remove the center, rear exhaust pipe and muffler. (Turbo model)

- <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>

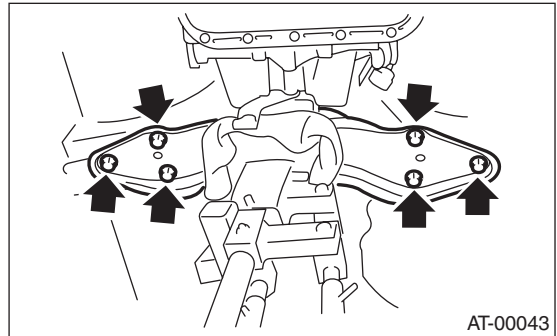
- 13) Remove the propeller shaft. <Ref. to DS-16, REMOVAL, Propeller Shaft.>

- 14) Place the transmission jack under transmission.

#### NOTE:

Make sure that the support plates of transmission jack don't touch the crossmember.

- 15) Remove the transmission rear crossmember bolts.



- 16) Lower the AT jack.

#### NOTE:

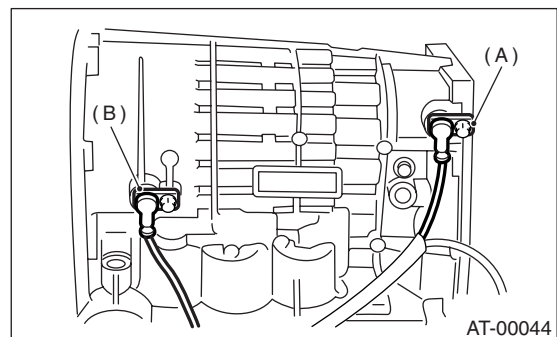
Do not separate the AT jack and transmission.

- 17) Remove the oil cooler inlet and outlet pipe.

#### NOTE:

When removing the outlet pipe, be careful not to lose balls and springs used with retaining screws.

- 18) Remove the front and torque converter turbine speed sensor.



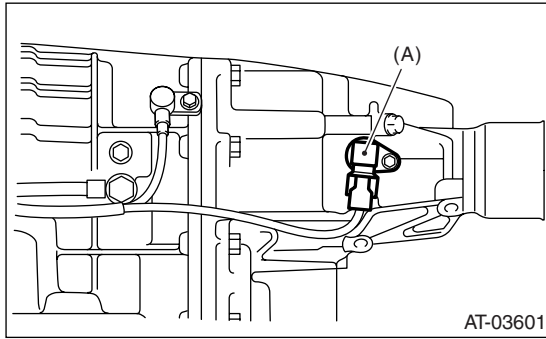
(A) Front vehicle speed sensor  
(B) Torque converter turbine speed sensor



# Front Vehicle Speed Sensor

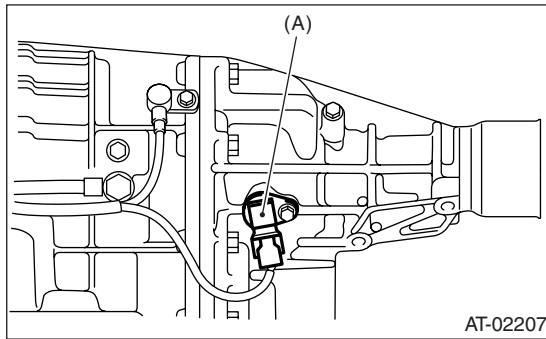
## AUTOMATIC TRANSMISSION

19) Disconnect the connector of rear vehicle speed sensor. (VTD model)



(A) Rear vehicle speed sensor

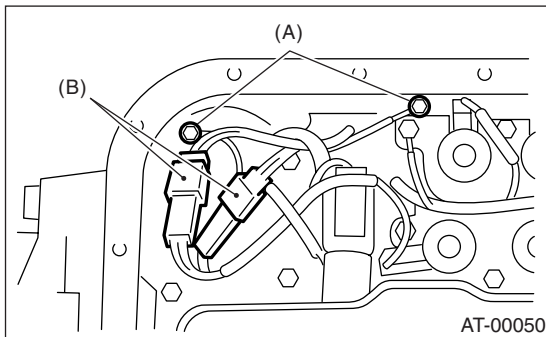
20) Disconnect the connector from rear vehicle speed sensor. (MP-T model)



(A) Rear vehicle speed sensor

21) Remove the oil pan.

22) Disconnect the harness connector and transmission ground terminal.



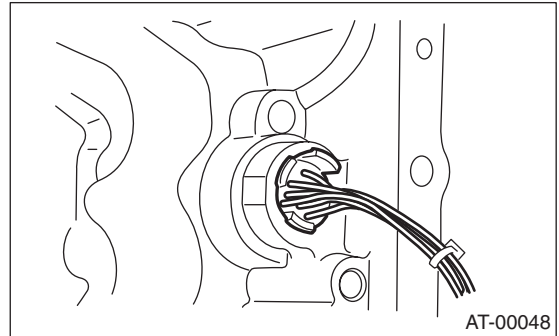
(A) Transmission ground

(B) Harness connector

23) Remove the harness assembly.

## B: INSTALLATION

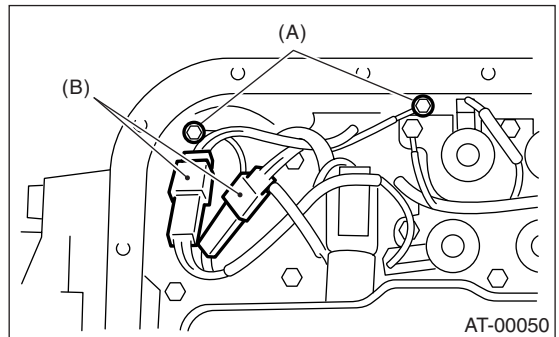
1) Pass the harness assembly through the hole in the transmission case.



2) Connect the harness connector and transmission ground.

**Tightening torque:**

**8 N·m (0.8 kgf·m, 5.8 ft·lb)**



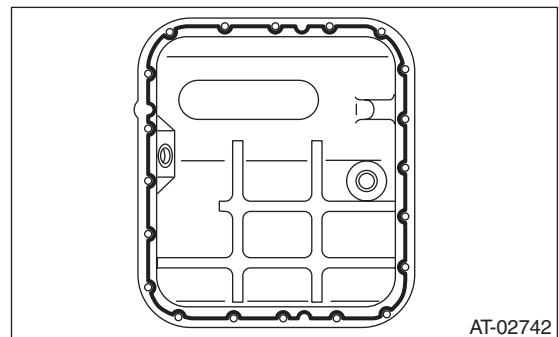
(A) Transmission ground

(B) Harness connector

3) Apply proper amount of liquid gasket to the entire oil pan mating surface.

**Liquid gasket:**

**THREE BOND 1217B (Part No. K0877YA020)**

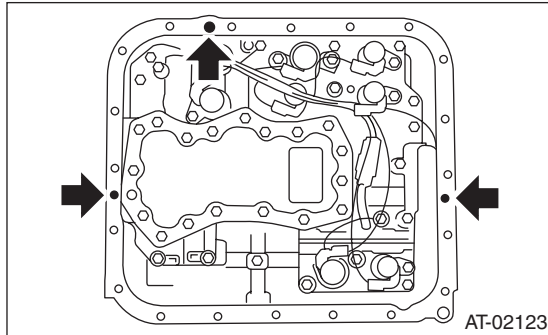


4) Apply liquid gasket fully to three holes other than screw holes on transmission case.

# Front Vehicle Speed Sensor

AUTOMATIC TRANSMISSION

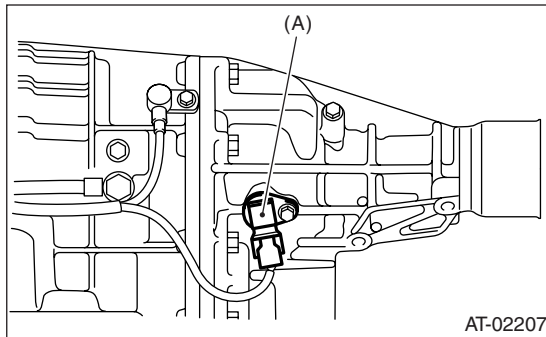
**Liquid gasket:**  
**THREE BOND 1217B (Part No. K0877YA020)**



5) Install the oil pan.

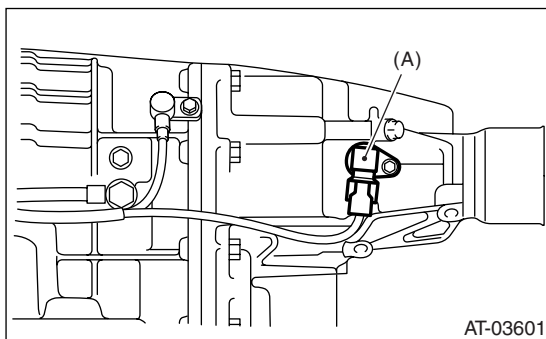
**Tightening torque:**  
**5 N·m (0.5 kgf-m, 3.6 ft-lb)**

6) Connect the connector of rear vehicle speed sensor. (MP-T model)



(A) Rear vehicle speed sensor

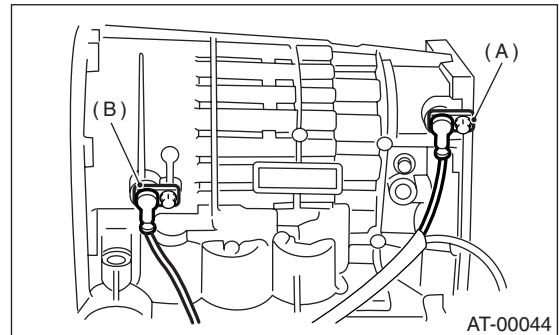
7) Connect the connector of rear vehicle speed sensor. (VTD model)



(A) Rear vehicle speed sensor

8) Install the front vehicle speed sensor and torque converter turbine speed sensor, and then fasten the harness.

**Tightening torque:**  
**7 N·m (0.7 kgf-m, 5.1 ft-lb)**



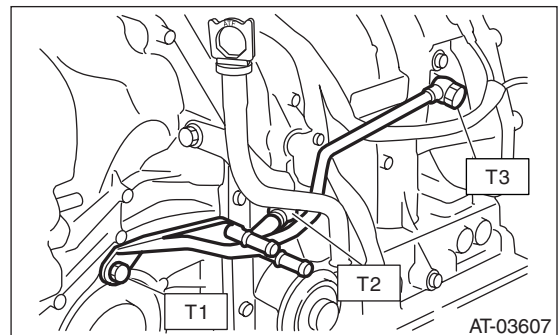
(A) Front vehicle speed sensor  
(B) Torque converter turbine speed sensor

9) Install the inlet pipe.

**NOTE:**

Be sure to use a new copper washer.

**Tightening torque:**  
**T1: 25 N·m (2.5 kgf-m, 18.4 ft-lb)**  
**T2: 45 N·m (4.6 kgf-m, 33 ft-lb)**  
**T3: 40 N·m (4.1 kgf-m, 29.5 ft-lb)**



10) Install the transmission rear crossmember bolts.

**Tightening torque:**  
**70 N·m (7.1 kgf-m, 51 ft-lb)**

11) Install the propeller shaft. <Ref. to DS-17, INSTALLATION, Propeller Shaft.>

12) Install the front, center, rear exhaust pipes and muffler. (Non-turbo model)

<Ref. to EX(H4SO)-4, INSTALLATION, Front Exhaust Pipe.> <Ref. to EX(H4SO)-7, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, INSTALLATION, Muffler.>

13) Install the center, rear exhaust pipes and muffler. (Turbo model)

<Ref. to EX(H4DOTC)-11, INSTALLATION, Center Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, INSTALLATION, Muffler.>

14) Lower the vehicle.

15) Install the transmission connector to the stay.

## Front Vehicle Speed Sensor

### AUTOMATIC TRANSMISSION

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16) Install the pitching stopper. <Ref. to 4AT-44, INSTALLATION, Transmission Mounting System.>

17) Install the air intake chamber. (Non-turbo model) <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Chamber.>

18) Install the intercooler. (Turbo model)

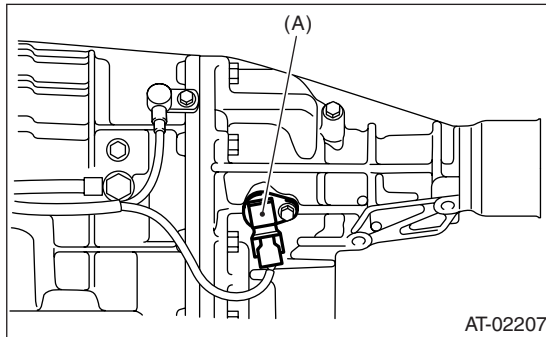
<Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

## 15.Rear Vehicle Speed Sensor

### A: REMOVAL

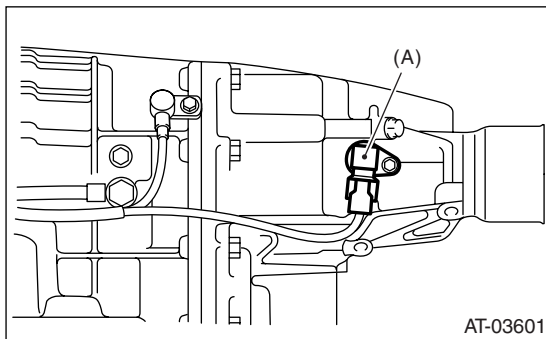
- 1) Set the vehicle on a lift, and then lift-up the vehicle.
- 2) Disconnect the connector from rear vehicle speed sensor.

- MP-T model



(A) Rear vehicle speed sensor

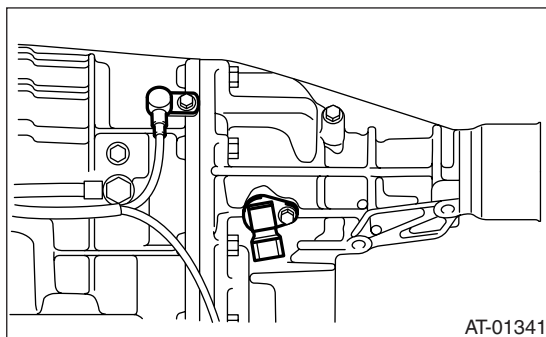
- VTD model



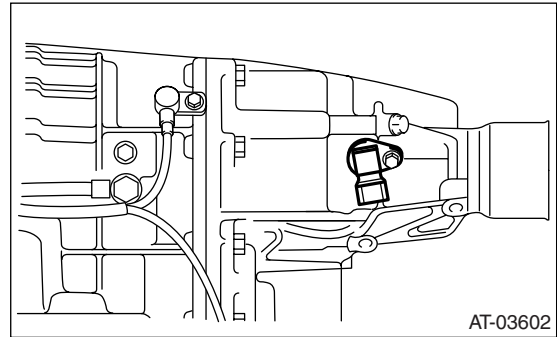
(A) Rear vehicle speed sensor

- 3) Remove the rear vehicle speed sensor.

- MP-T model



- VTD model



### B: INSTALLATION

Install in the reverse order of removal.

#### NOTE:

Replace with a new O-ring.

#### **Tightening torque:**

**7 N·m (0.7 kgf-m, 5.1 ft-lb)**

## 16. Torque Converter Turbine Speed Sensor

### A: REMOVAL

When removing the torque converter turbine speed sensor, refer to "Front Vehicle Speed Sensor".  
<Ref. to 4AT-51, REMOVAL, Front Vehicle Speed Sensor.>

### B: INSTALLATION

When installing the torque converter turbine speed sensor, refer to "Front Vehicle Speed Sensor"  
<Ref. to 4AT-52, INSTALLATION, Front Vehicle Speed Sensor.>

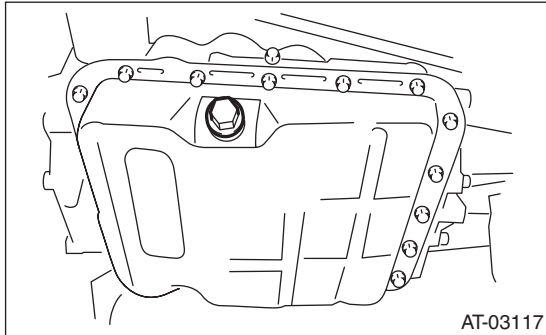
## 17. Control Valve Strainer

### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.
- 3) Lift up the vehicle.
- 4) Clean the transmission exterior.
- 5) Remove the drain plug (ATF) to drain the ATF.

**CAUTION:**

The ATF will be extremely hot after driving. Be careful not to receive burns.



- 6) Perform replacement with a new gasket, and tighten the drain plug (ATF).

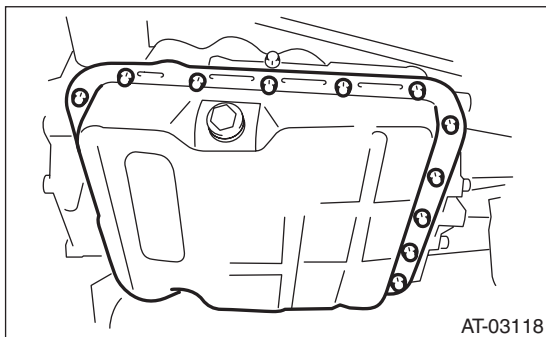
**Tightening torque:**

**25 N·m (2.5 kgf·m, 18.4 ft·lb)**

- 7) Remove the oil pan.

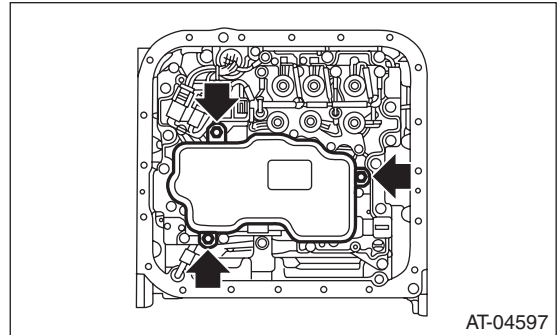
**CAUTION:**

Be careful not to allow foreign matter such as dust or dirt to enter the oil pan.



- 8) Remove the magnet.
- 9) Clean the magnet.
- 10) Completely remove the remaining liquid gasket on the transmission case and oil pan.

- 11) Remove the control valve strainer tightening bolt, and remove control valve strainer from the control valve body.



### B: INSTALLATION

- 1) Check the control valve body for dust and other foreign matter.
- 2) Mount new control valve strainer to the control valve body.

- (1) Apply ATF to the entire perimeter of the O-ring on the control valve strainer.

**CAUTION:**

Protect the O-ring from dust and dirt while applying ATF.

- (2) Install the control valve strainer to the control valve body from the O-ring side.

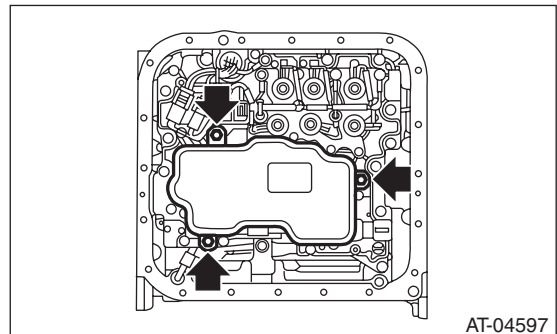
**CAUTION:**

If the control valve strainer is pushed in at an angle, the O-ring may be damaged. Be sure to push in the control valve strainer straight to install.

- (3) Tighten the three bolts.

**Tightening torque:**

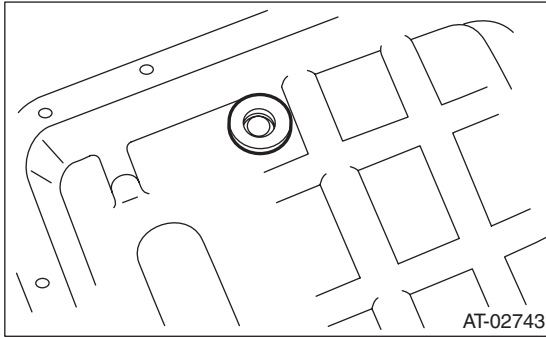
**10 N·m (1.0 kgf·m, 7.4 ft·lb)**



# Control Valve Strainer

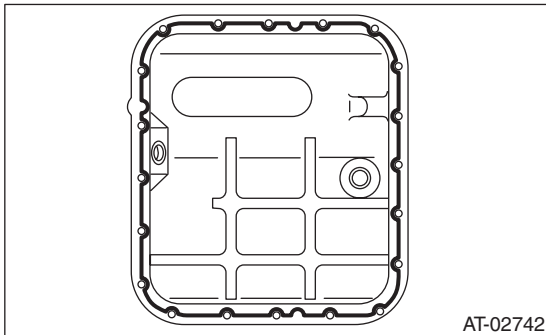
## AUTOMATIC TRANSMISSION

- 3) Attach the magnet at the specified position of the oil pan.



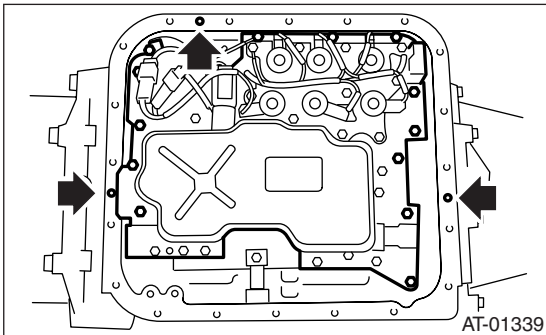
- 4) Apply proper amount of liquid gasket to the entire oil pan mating surface.

**Liquid gasket:**  
**THREE BOND 1217B (Part No. K0877YA020)**  
**or equivalent**



- 5) Fill the three holes aside from the bolt holes in the transmission case, with liquid gasket.

**Liquid gasket:**  
**THREE BOND 1217B (Part No. K0877YA020)**  
**or equivalent**



- 6) Install the oil pan by equally tightening the bolts.

**Tightening torque:**  
**5 N·m (0.5 kgf·m, 3.7 ft·lb)**

- 7) Fill ATF from the oil charge pipe.

**Recommended fluid:**  
**<Ref. to 4AT-3, HYDRAULIC CONTROL AND LUBRICATION, SPECIFICATION, General Description.>**

**Capacity:**  
**Fill with the same amount of ATF as drained.**

- 8) Bleed the air of control valve. <Ref. to 4AT-62, Air Bleeding of Control Valve.>

- 9) Check the ATF level. <Ref. to 4AT-30, Automatic Transmission Fluid.>

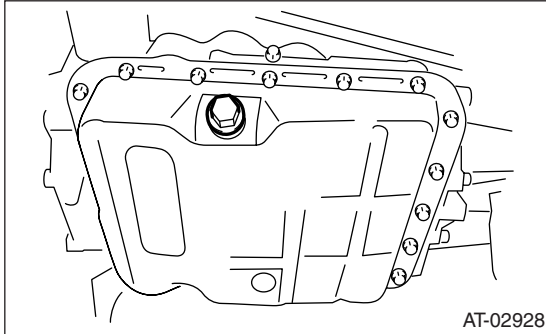
## C: INSPECTION

Check the control valve strainer for holes, damages or adhesion of dust and other foreign particles.

## 18. Control Valve Body

### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Lift-up the vehicle.
- 4) Clean the transmission exterior.
- 5) Remove the drain plug and gasket, and then drain ATF.



- 6) Replace the gasket with a new one, and then tighten the drain plug.

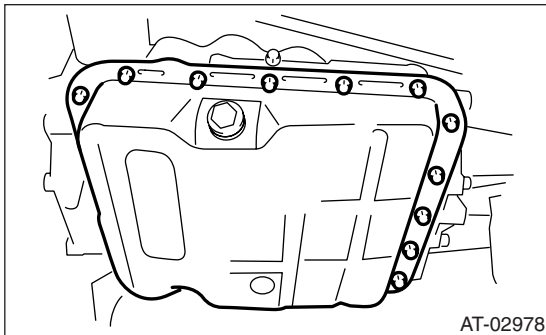
**Tightening torque:**

**25 N·m (2.5 kgf-m, 18.4 ft-lb)**

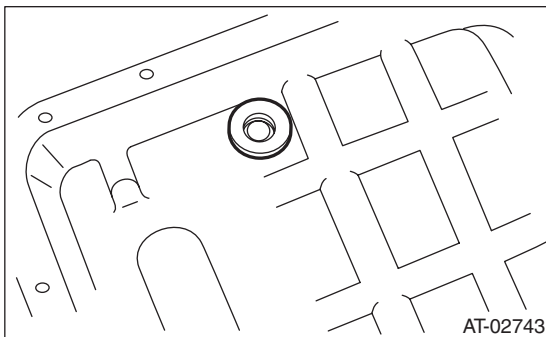
- 7) Remove the oil pan.

**CAUTION:**

**Be careful not to allow dirt or dust to get into the oil pan.**

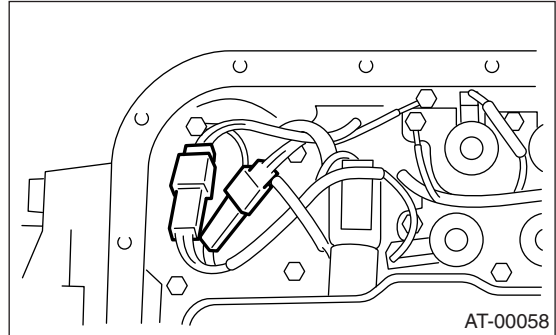


- 8) Remove the magnet.

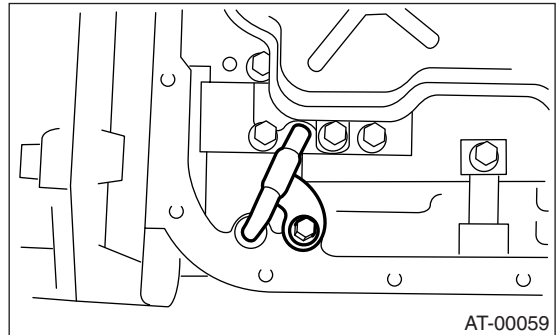


- 9) Clean the magnet.
- 10) Remove the liquid gasket completely from oil pan and transmission case.

- 11) Remove the control valve connector.



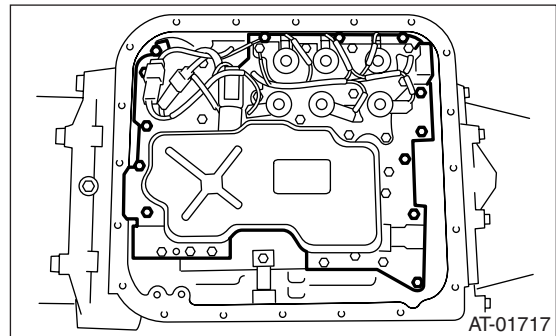
- 12) Remove the oil cooler pipe.



- 13) Remove the control valve body.

**NOTE:**

Replace the control valve body as assembly, because the control valve body can not be disassembled.



### B: INSTALLATION

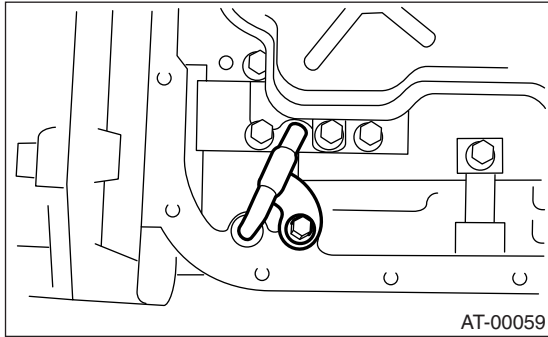
- 1) Check the control valve body for dirt and dust.
- 2) Temporarily install the control valve body to transmission.
- 3) Install the oil cooler pipe.



# Control Valve Body

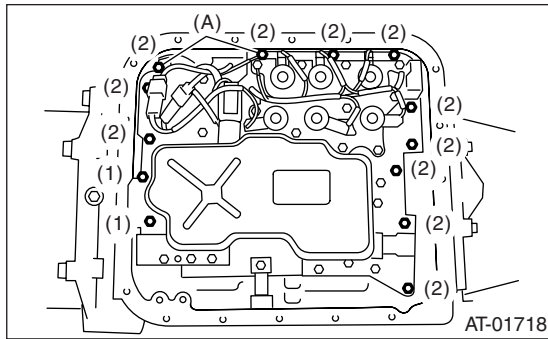
AUTOMATIC TRANSMISSION

**Tightening torque:**  
**8 N·m (0.8 kgf·m, 5.8 ft·lb)**



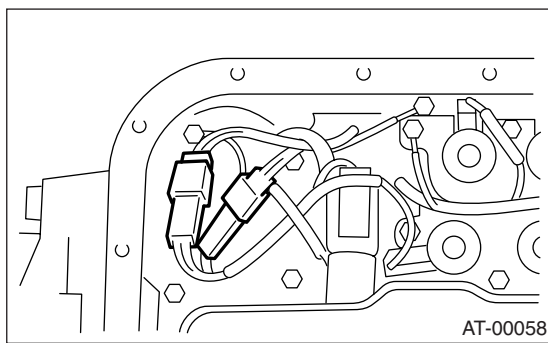
4) Tighten the bolts evenly.

**Tightening torque:**  
**8 N·m (0.8 kgf·m, 5.8 ft·lb)**

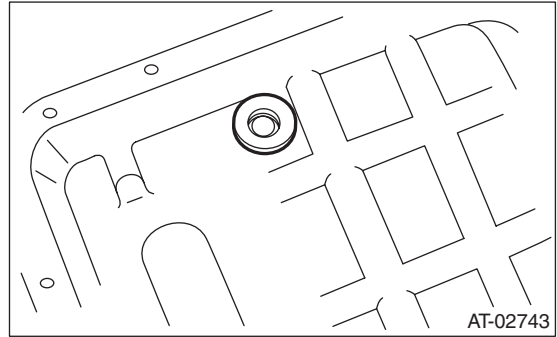


- (A) Transmission ground
- Bolt length mm (in)
- (1) 35 (1.38)
- (2) 30 (1.18)

5) Connect the control valve connector.

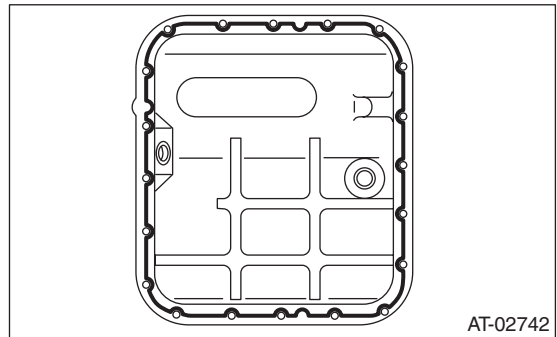


6) Attach the magnet at specified position of oil pan.



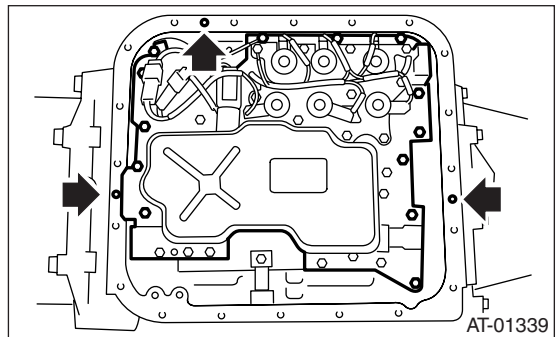
7) Apply proper amount of liquid gasket to the entire oil pan mating surface.

**Liquid gasket:**  
**THREE BOND 1217B (Part No. K0877YA020)**



8) Apply liquid gasket fully to three holes other than screw holes on transmission case.

**Liquid gasket:**  
**THREE BOND 1217B (Part No. K0877YA020)**



9) Install the oil pan with tightening bolts evenly.

**Tightening torque:**  
**5 N·m (0.5 kgf·m, 3.6 ft·lb)**

10) Pour ATF into the oil charge pipe.

**Recommended fluid:**  
**<Ref. to 4AT-3, HYDRAULIC CONTROL AND LUBRICATION, SPECIFICATION, General Description.>**

**Fluid capacity:**

***Fill the same amount of fluid drained from drain plug hole.***

11) Bleed the air from control valve. <Ref. to 4AT-62, Air Bleeding of Control Valve.>

12) Check the level of ATF. <Ref. to 4AT-30, Automatic Transmission Fluid.>

13) Perform the advance operation of learning control.

<Ref. to 4AT(D)(diag)-15, FACILITATION OF LEARNING CONTROL, OPERATION, Subaru Select Monitor.>

**C: INSPECTION**

Make sure that each component is free of harmful gouges, cuts, or dust.

### 19. Air Bleeding of Control Valve

#### A: PROCEDURE

- 1) Set the select lever to "P" range and apply parking brake, then lift-up the vehicle.
- 2) Connect the SUBARU Select Monitor to vehicle.
- 3) Using SUBARU Select Monitor, check that the DTC is not output.
- 4) Using SUBARU Select Monitor, check that ATF temperature is less than 60°C (140°F). <Ref. to 4AT(D)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>
- 5) Set the SUBARU Select Monitor to OFF.
- 6) Turn the ignition switch to OFF.
- 7) With pressing shift lock release button, set the select lever to "R" range.
- 8) Depress the brake pedal fully with left foot until air bleeding is complete.
- 9) Turn the ignition switch to ON.
- 10) Set the select lever to "P" range, and then wait for more than three seconds.
- 11) Set the select lever to "R" range, and then wait for more than three seconds.
- 12) Set the select lever to "N" range, and then wait for more than three seconds.
- 13) Set the select lever to "D" range, and then wait for more than three seconds.
- 14) Set the select lever to "N" range, and then wait for more than three seconds.
- 15) Slightly depress the accelerator pedal to full open.
- 16) Slightly release the accelerator pedal to close.
- 17) Start the engine.
- 18) Set the select lever to "D" range.
- 19) Turn the SUBARU Select Monitor power to ON.
- 20) On the SUBARU Select Monitor, select the "individual system inspection" of main menu.
- 21) On the "individual system inspection" selection menu, select the "individual system inspection" and air bleeding of control valve will start in transmission. At this time, AT OIL TEMP light in the combination meter blinks at 2 Hz. If the AT OIL TEMP light does not blink, repeat the procedures from step 4).
- 22) Air bleeding of control valve is finished, when AT OIL TEMP light blink in the combination meter changes from 2 Hz to 0.5 Hz, on control valve will finish.

#### NOTE:

Repeat the procedure from step 4) if AT OIL TEMP light blink change from 2 Hz to 4 Hz during air bleeding.

- 23) Set the select lever to "N" range, and turn the ignition switch to OFF.
- 24) Set the select lever to "P" range to finish air bleeding.

## 20.ATF Filter

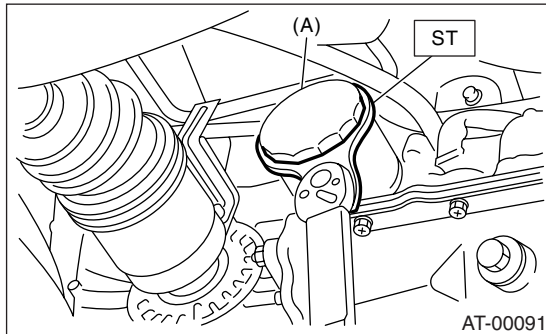
### A: REMOVAL

**NOTE:**

The ATF filter is maintenance free.

- 1) Lift-up the vehicle.
- 2) Using ST, remove ATF filter.

ST 498545400 OIL FILTER WRENCH



(A) ATF filter

### B: INSTALLATION

- 1) Get new ATF filter and apply a thin coat of ATF to the oil seal.
- 2) Install ATF filter. Turn it by hand, being careful not to damage oil seal.
- 3) Using ST, tighten ATF filter.

Calculate ATF filter torque specifications using the following formula.

$$T2 = L2 / (L1 + L2) \times T1$$

T1: 14 N·m (1.4 kgf·m, 10.1 ft·lb)

[Required torque setting]

T2: Tightening torque

L1: ST length 78 mm (3.07 in)

L2: Torque wrench length

Example:

| Torque wrench length<br>mm (in) | Tightening torque<br>N·m (kgf·m, ft·lb) |
|---------------------------------|---|
| 100 (3.94)                      | 7.7 (0.79, 5.7)                         |
| 150 (5.91)                      | 9.0 (0.92, 6.7)                         |
| 200 (7.87)                      | 10 (1.0, 7.4)                           |

**NOTE:**

Align ST with torque wrench while tightening ATF filter.

ST 498545400 OIL FILTER WRENCH

- 4) Add ATF.
- 5) Inspect level of ATF. <Ref. to 4AT-30, Automatic Transmission Fluid.>

### C: INSPECTION

Check for rust, hole, ATF leaks, and other damage.

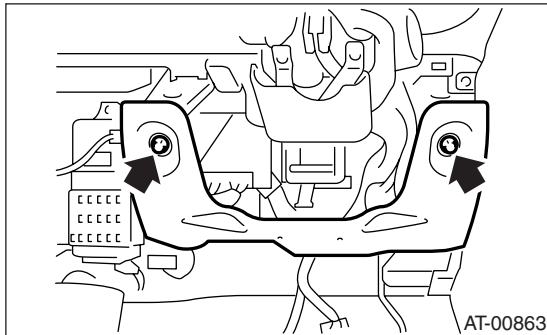
# Transmission Control Module (TCM)

AUTOMATIC TRANSMISSION

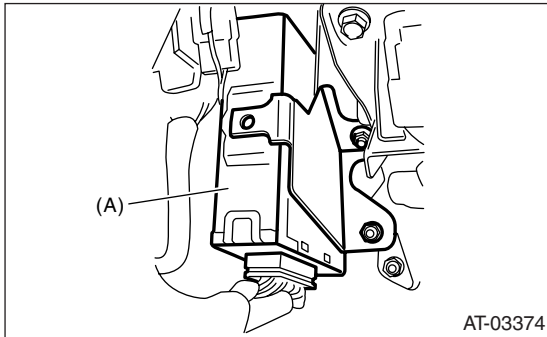
## 21. Transmission Control Module (TCM)

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the lower cover and then disconnect the connector.
- 3) Remove the knee bolster.



- 4) Disconnect the connectors from TCM.



(A) Transmission control module (TCM)

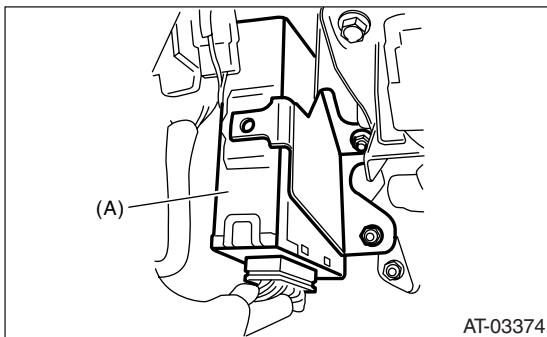
- 5) Remove the TCM.

### B: INSTALLATION

- 1) Install the TCM.

#### **Tightening torque:**

**7.5 N·m (0.76 kgf-m, 5.5 ft-lb)**



(A) Transmission control module (TCM)

- 2) Connect the connectors to TCM.
- 3) Install in the reverse order of removal.

4) If replacing the TCM, execute the advance operation of learning control promotion. <Ref. to 4AT(D)(diag)-15, FACILITATION OF LEARNING CONTROL, OPERATION, Subaru Select Monitor.>

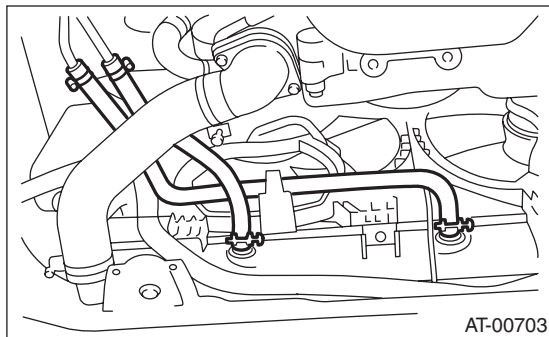
## 22.ATF Cooler Pipe and Hose

### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Remove battery and washer tank.
- 3) Lift-up the vehicle.
- 4) Remove the under cover.
- 5) Disconnect ATF cooler hose from radiator.

**NOTE:**

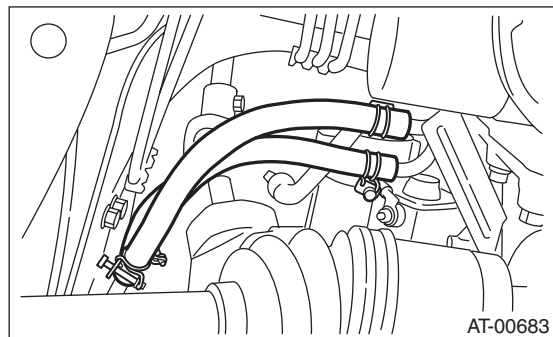
- Do not remove with a screwdriver or other pointed tools.
- When the hose is difficult to remove, wrap a shop cloth around the hose to protect it. Turn it with pliers, and then pull directly out with your hand.



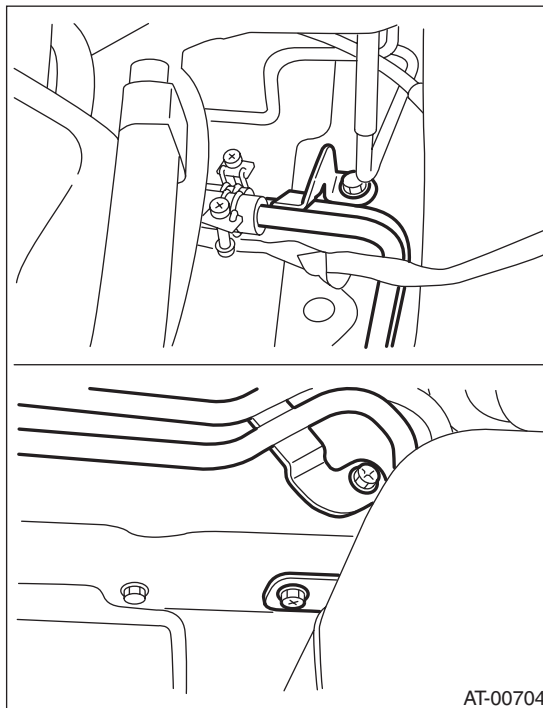
- 6) Disconnect ATF cooler hoses from pipes.

**NOTE:**

- Do not remove with a screwdriver or other pointed tools.
- When the hose is difficult to remove, wrap a shop cloth around the hose to protect it. Turn it with pliers, and then pull directly out with your hand.



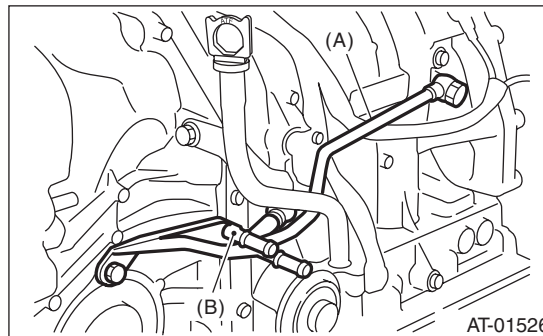
- 7) Remove ATF cooler pipe from frame.



- 8) Remove the oil cooler inlet and outlet pipes.

**NOTE:**

When removing outlet pipe, be careful not to lose ball and spring used with retaining screw.



- (A) Inlet pipe
- (B) Outlet pipe

### B: INSTALLATION

- 1) Install the oil cooler outlet and inlet pipes using a new aluminum washer.

# ATF Cooler Pipe and Hose

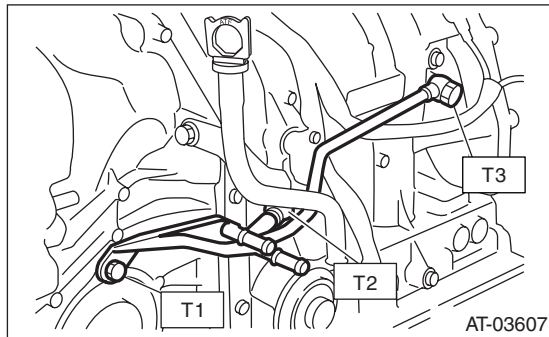
## AUTOMATIC TRANSMISSION

### Tightening torque:

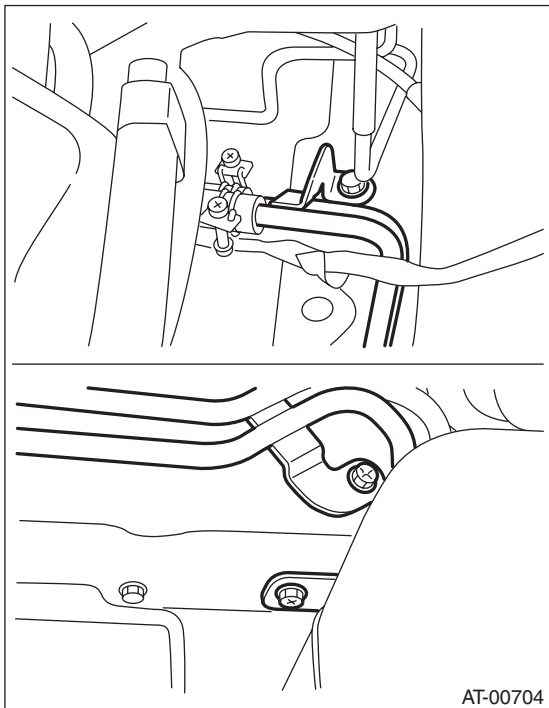
**T1: 25 N·m (2.5 kgf-m, 18.4 ft-lb)**

**T2: 45 N·m (4.6 kgf-m, 33 ft-lb)**

**T3: 40 N·m (4.1 kgf-m, 30 ft-lb)**



2) Install ATF cooler pipe to frame.

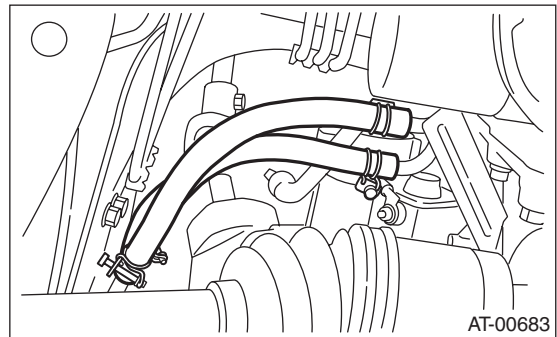


3) Connect ATF cooler hose to pipe transmission side.

### NOTE:

- Install so that the hose is not folded over, excessively bent, or twisted.

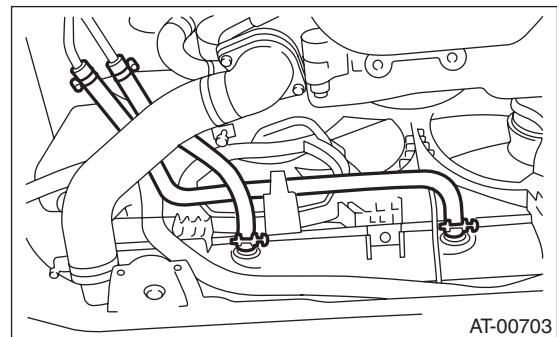
- Be careful to insert the hose to the specified position.



4) Connect ATF cooler hose to pipe of radiator side.

### NOTE:

- Install so that the hose is not folded over, excessively bent, or twisted.
- Be careful to insert the hose to the specified position.



5) Install the under cover.

6) Install battery and washer tank.

7) Fill ATF. <Ref. to 4AT-30, Automatic Transmission Fluid.>

### NOTE:

Make sure there are no ATF leaks in joints between the transmission, radiator, pipes, and hoses.

## C: INSPECTION

Repair or replace any defective hoses, pipes, clamps, and washers found from the inspection below.

- 1) Check for ATF leaks in joints between the transmission, radiator, pipes, and hoses.
- 2) Check for deformed clamps.
- 3) Lightly bend the hose and check for cracks in the surface and other damage.
- 4) Pinch the hose with your fingers and check for poor elasticity. Also check for poor elasticity in the parts where the clamp was by pressing with your fingernail.
- 5) Check for peeling, cracks, and deformation at the tip of the hose.

## 23. Air Breather Hose

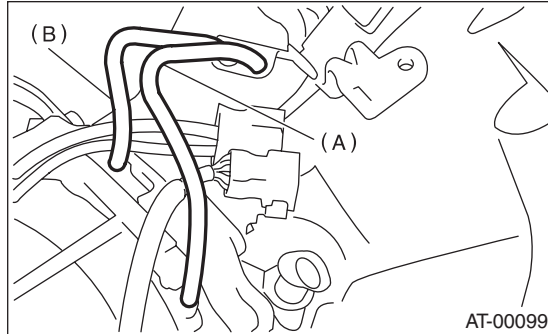
### A: REMOVAL

1) Remove the air intake chamber. (Non-turbo model) <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Chamber.>

2) Remove intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>

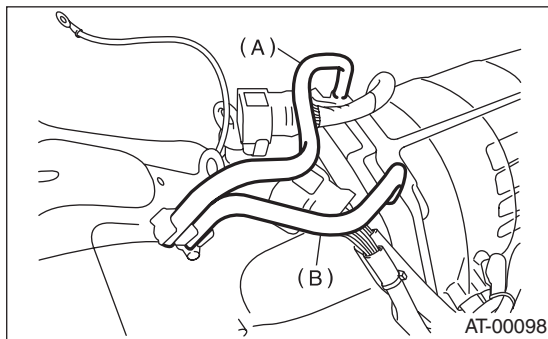
3) Disconnect the air breather hoses.

- Non-turbo model



- (A) Air breather hose (Transmission case)
- (B) Air breather hose (Oil pump housing)

- Turbo model



- (A) Air breather hose (Transmission case)
- (B) Air breather hose (Oil pump housing)

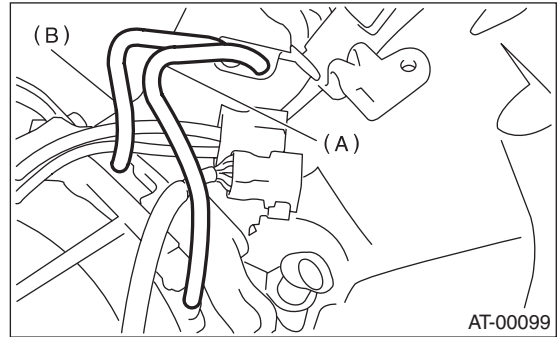
### B: INSTALLATION

1) Install air breather hoses.

NOTE:

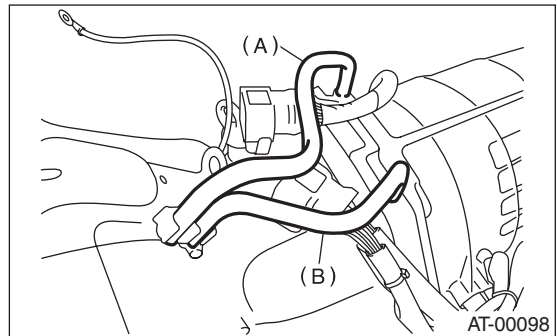
Install so that the hose is not folded over, excessively bent, or twisted.

- Non-turbo model



- (A) Air breather hose (Transmission case)
- (B) Air breather hose (Oil pump housing)

- Turbo model



- (A) Air breather hose (Transmission case)
- (B) Air breather hose (Oil pump housing)

2) Install the air intake chamber. (Non-turbo model) <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Chamber.>

3) Install intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

### C: INSPECTION

Make sure the hose is not cracked or clogged.



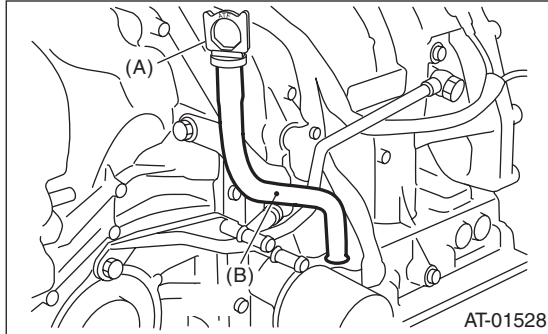
## 24. Oil Charge Pipe

### A: REMOVAL

1) Remove the air intake chamber. (Non-turbo model) <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Chamber.>

2) Remove intercooler. (Turbo model)  
<Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>

3) Remove the oil charge pipe, and remove the O-ring from the flange face.



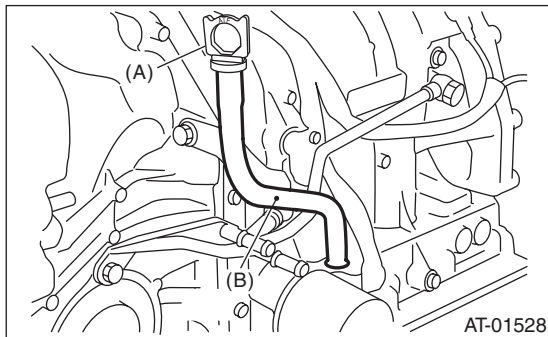
- (A) Oil level gauge
- (B) Oil charge pipe

### B: INSTALLATION

1) Install the oil charge pipe with new O-ring.

#### **Tightening torque:**

**41 N·m (4.2 kgf·m, 30.2 ft·lb)**



- (A) Oil level gauge
- (B) Oil charge pipe

2) Install the air intake chamber. (Non-turbo model)  
<Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Chamber.>

3) Install intercooler. (Turbo model)  
<Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

### C: INSPECTION

Make sure the oil charge pipe is not deformed or otherwise damaged.

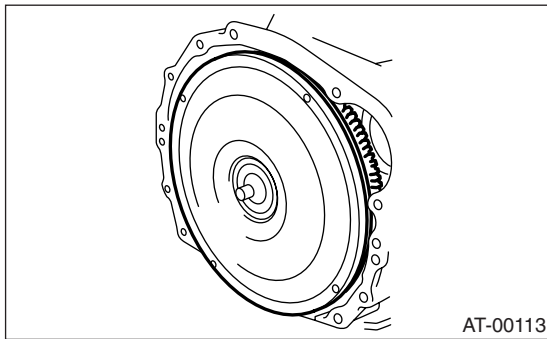
## 25. Torque Converter Clutch Assembly

### A: REMOVAL

- 1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-38, REMOVAL, Automatic Transmission Assembly.>
- 2) Extract the torque converter clutch and oil pump shaft horizontally.

**NOTE:**

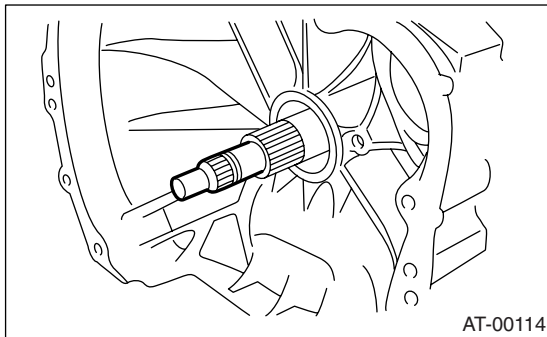
Be careful not to scratch the bushing inside the oil pump shaft.



- 3) Remove the input shaft.

**NOTE:**

When the torque converter clutch assembly is removed, the input shaft will come out.

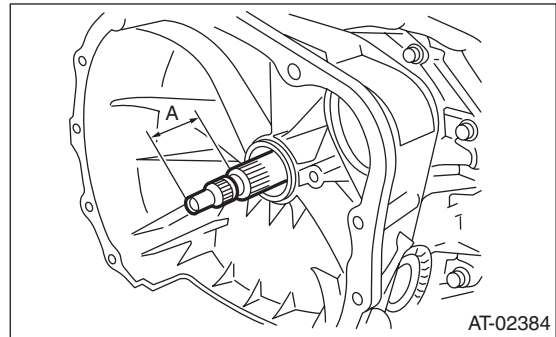


- 4) Remove the clip from torque converter clutch.

### B: INSTALLATION

- 1) Install the clip to torque converter clutch.
- 2) Install the oil pump shaft to the torque converter clutch, and then check the clip fits securely in its groove.
- 3) Insert the input shaft while rotating it lightly by hand, and then check the protrusion amount.

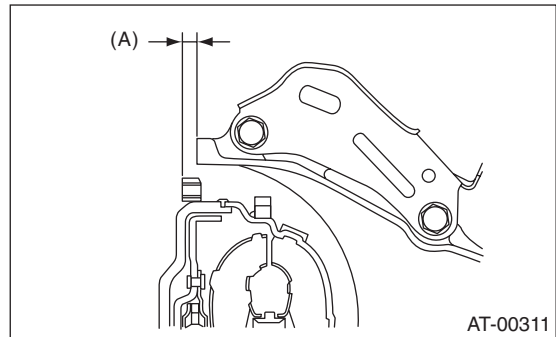
**Normal protrusion amount A:**  
50 — 55 mm (1.97 — 2.17 in)



- 4) Holding the torque converter clutch assembly by hand, carefully install it to the converter case. Be careful not to damage the bushing. Also avoid undue contact between the oil pump shaft bushing and stator shaft portion of the oil pump cover.
- 5) Rotate the shaft lightly by hand to engage the splines securely.

**Dimension A:**

2.7 — 2.9 mm (0.106 — 0.114 in)



(A) Dimension A

- 6) Install the transmission assembly to vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

### C: INSPECTION

Make sure the ring gear is not damaged and that the protrusion on the edge of the torque converter clutch is not deformed or otherwise damaged.

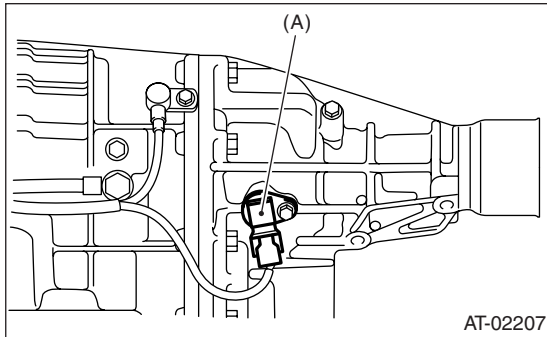
# Extension Case

## AUTOMATIC TRANSMISSION

### 26.Extension Case

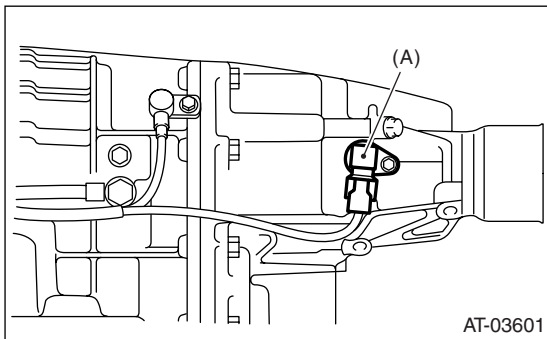
#### A: REMOVAL

- 1) Remove the transmission assembly.  
<Ref. to 4AT-38, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove the rear vehicle speed sensor.
  - MP-T model



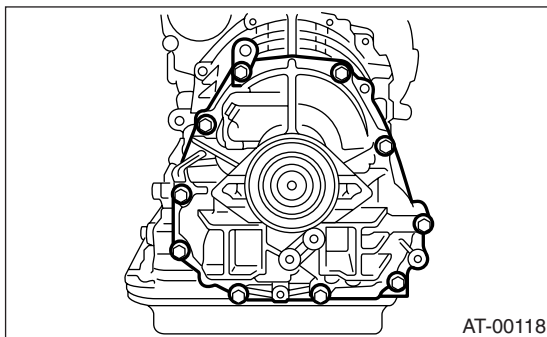
(A) Rear vehicle speed sensor

- VTD model



(A) Rear vehicle speed sensor

- 3) Separate transmission case and extension case sections.



#### B: INSTALLATION

- 1) Attach the selected thrust needle bearing to the end surface of reduction drive gear with vaseline.

#### NOTE:

Install thrust needle bearing in the correct direction.

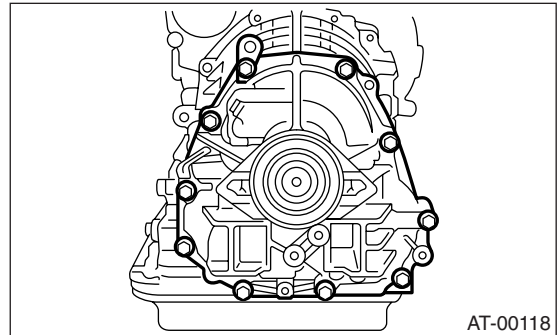
- 2) Install new gasket.

- 3) Install the extension case to the transmission case.

- 4) Tighten bolts to secure the case.

#### Tightening torque:

**25 N·m (2.5 kgf·m, 18.4 ft·lb)**

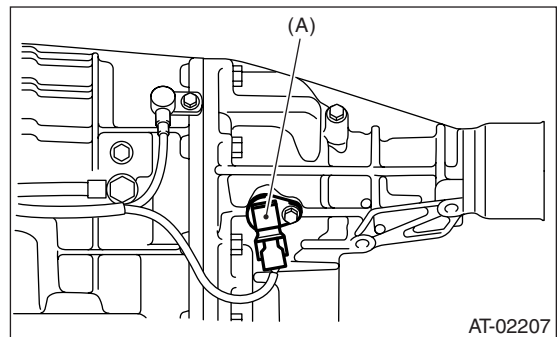


- 5) Install the rear vehicle speed sensor.

#### Tightening torque:

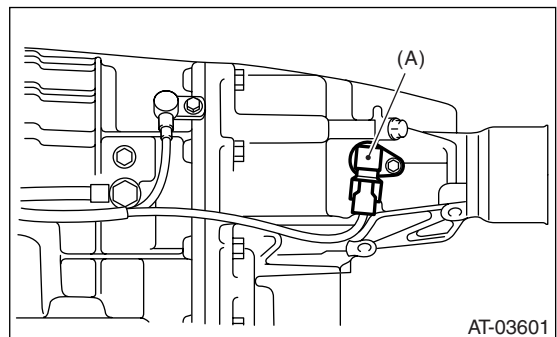
**7 N·m (0.7 kgf·m, 5.1 ft·lb)**

- MP-T model



(A) Rear vehicle speed sensor

- VTD model



(A) Rear vehicle speed sensor

- 6) Install the transmission assembly.  
<Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

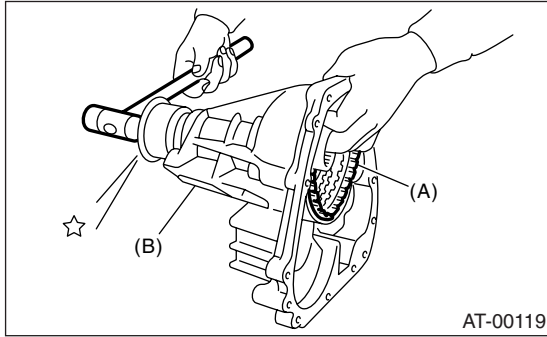
## C: DISASSEMBLY

### 1. MP-T MODEL

1) Take out the transfer clutch by lightly tapping the end of the rear drive shaft.

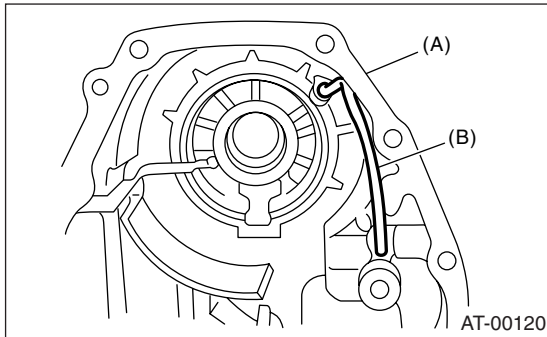
**NOTE:**

Be careful not to damage the oil seal in the extension.



- (A) Transfer clutch
- (B) Extension case

2) Remove the transmission clutch pipe without deforming pipe.



- (A) Extension case
- (B) Transfer clutch pipe

3) Remove the dust cover from extension case.

4) Remove the oil seal from extension case.

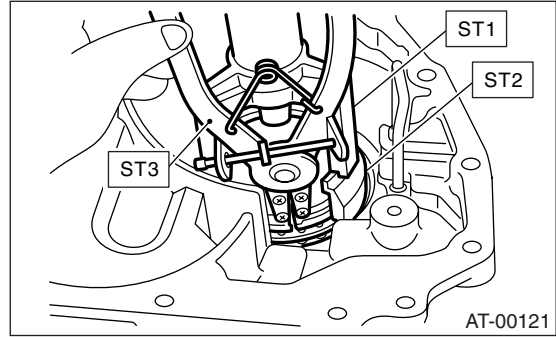
### 2. VTD MODEL

1) Remove snap ring using ST1, ST2, ST3 and a press.

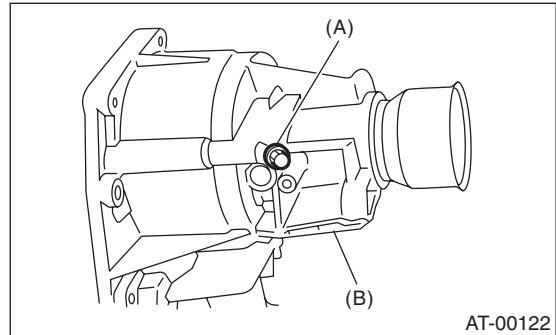
ST1 398673600 COMPRESSOR

ST2 498627100 SEAT

ST3 398663600 PLIERS

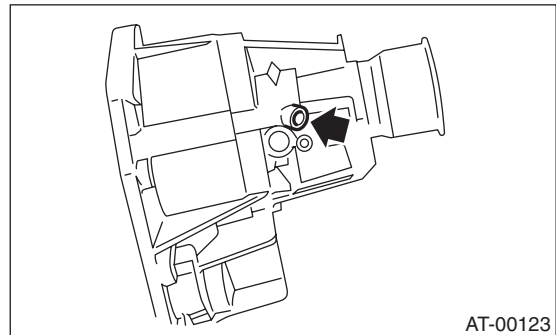


2) Remove test plug.

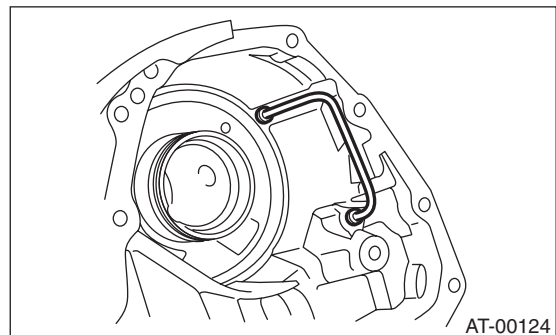


- (A) Test plug
- (B) Extension case

3) Remove clutch piston using compressed air.



4) Pay attention, not to deform pipe, and remove transfer clutch pipe.



5) Remove the dust cover from the extension case.  
6) Remove the oil seal from the extension case.

# Extension Case

## AUTOMATIC TRANSMISSION

### D: ASSEMBLY

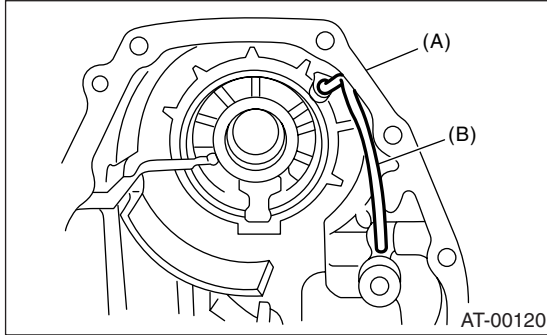
#### 1. MP-T MODEL

1) Using the ST and a press, press in a new oil seal.

ST 498057300 INSTALLER

2) Press in the dust cover.

3) Install the transfer clutch pipe to extension case without deforming pipe.

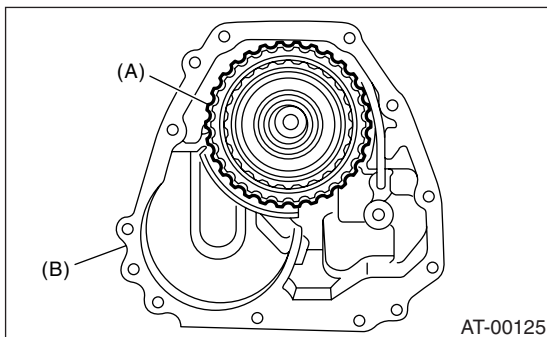


- (A) Extension case
- (B) Transfer clutch pipe

4) Install the transfer clutch assembly to the case.

#### NOTE:

- Be careful not to damage the seal rings.
- Insert the clutch assembly fully into position until the bearing shoulder bottoms.



- (A) Transfer clutch
- (B) Extension case

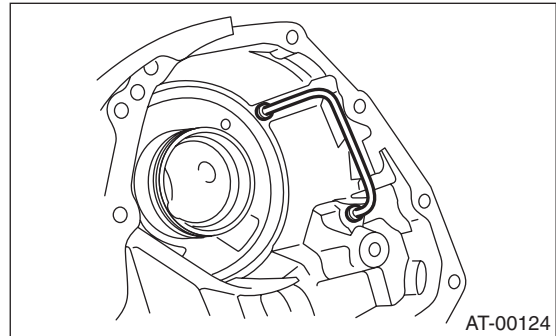
#### 2. VTD MODEL

1) Press new oil seal using ST and a press.

ST 498057300 INSTALLER

2) Press dust cover.

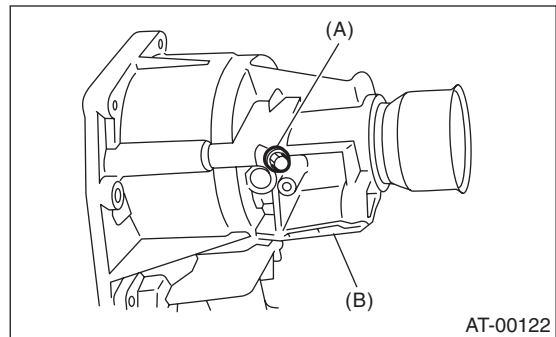
3) Install the transfer clutch pipe onto the extension case, taking care not to deform the pipe.



4) Apply ATF to new O-ring and install the test plug.

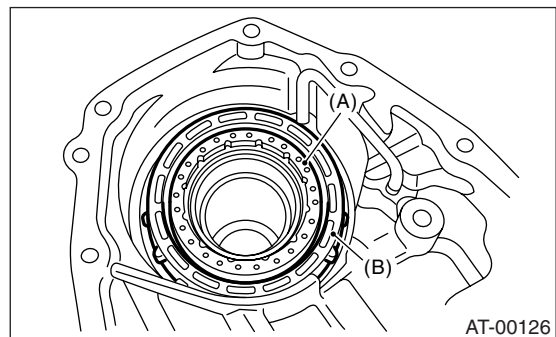
#### Tightening torque:

**13 N·m (1.3 kgf-m, 9.6 ft-lb)**



- (A) Test plug
- (B) Extension case

5) Insert the multi-plate clutch, drive plates, driven plates, and spring retainer.



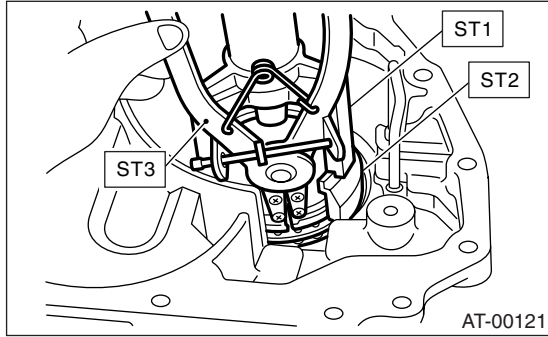
- (A) Spring retainer
- (B) Multi-plate clutch (LSD) piston ASSY

6) Install the snap ring using special tools 1, 2, and 3.

ST1 398673600 COMPRESSOR

ST2 498627100 SEAT

ST3 398663600 PLIERS



## E: INSPECTION

- Use forced air to make sure the transfer pipe and extension case routes are not clogged and do not leak.
- Measure the extension end play and adjust it to within specifications.

MP-T model <Ref. to 4AT-77, MP-T MODEL, ADJUSTMENT, Transfer Clutch.>

VTD model <Ref. to 4AT-78, VTD MODEL, ADJUSTMENT, Transfer Clutch.>

# Transfer Clutch

AUTOMATIC TRANSMISSION

## 27. Transfer Clutch

### A: REMOVAL

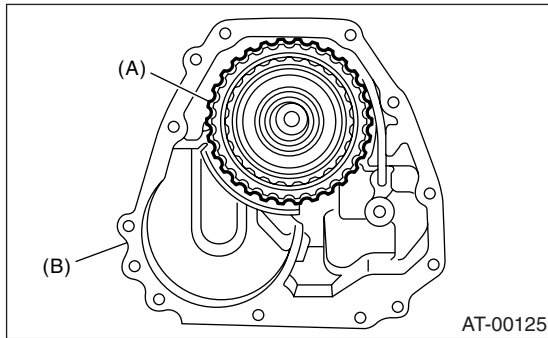
1) Remove the transmission assembly from vehicle. <Ref. to 4AT-38, REMOVAL, Automatic Transmission Assembly.>

2) Remove the extension case and remove the transfer clutch. <Ref. to 4AT-70, REMOVAL, Extension Case.> <Ref. to 4AT-71, DISASSEMBLY, Extension Case.>

### B: INSTALLATION

1) Select the thrust needle bearing. <Ref. to 4AT-77, ADJUSTMENT, Transfer Clutch.>

2) Install the transfer clutch assembly to the case.

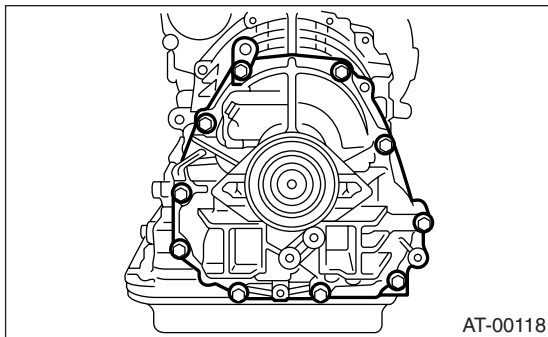


(A) Transfer clutch  
(B) Extension case

3) Replace with new gasket, and tighten bolts to secure the case.

#### Tightening torque:

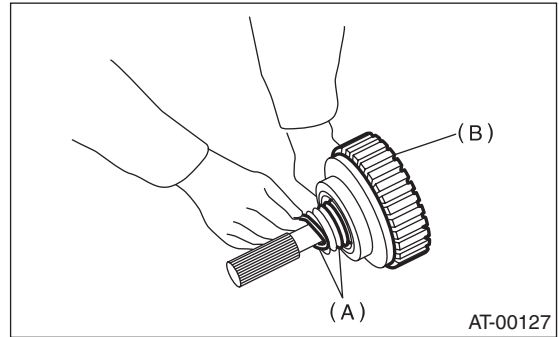
**25 N·m (2.5 kgf·m, 18.4 ft·lb)**



4) Install the transmission assembly to vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

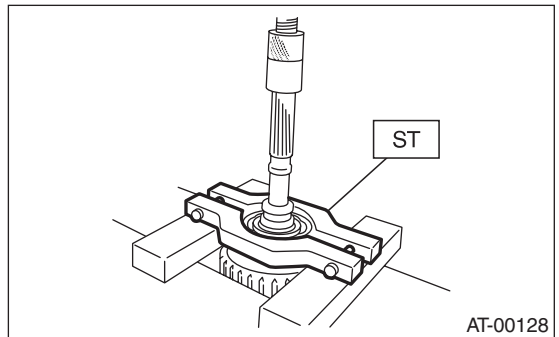
### C: DISASSEMBLY

1) Remove the seal ring.

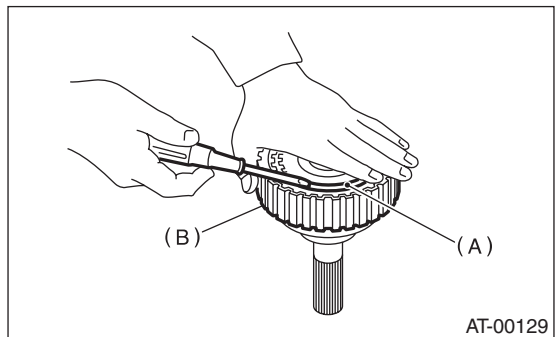


(A) Seal ring  
(B) Transfer clutch

2) Using a press and ST, remove the ball bearing.  
ST 498077600 REMOVER



3) Remove the snap ring, and take out the pressure plate, drive plates, and driven plates.



(A) Snap ring  
(B) Transfer clutch

4) Remove the snap ring with ST1, ST2 and ST3, and take out the return spring and transfer clutch piston seal.

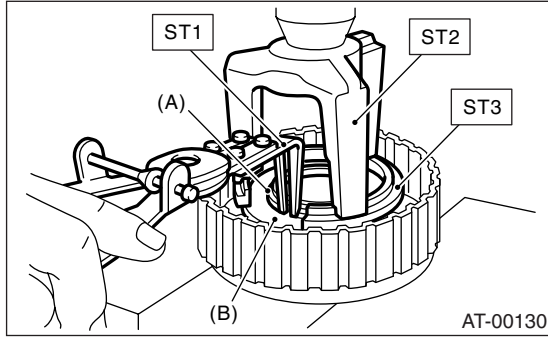
ST1 399893600 PLIERS  
ST2 398673600 COMPRESSOR



# Transfer Clutch

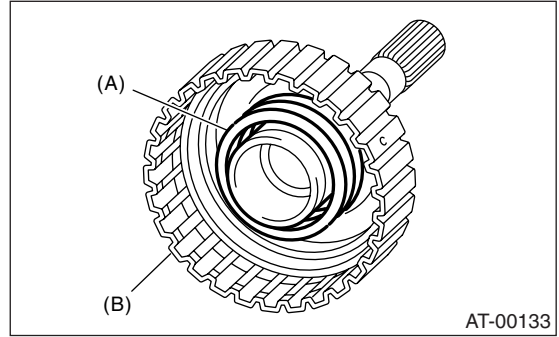
AUTOMATIC TRANSMISSION

ST3 398623600 SEAT



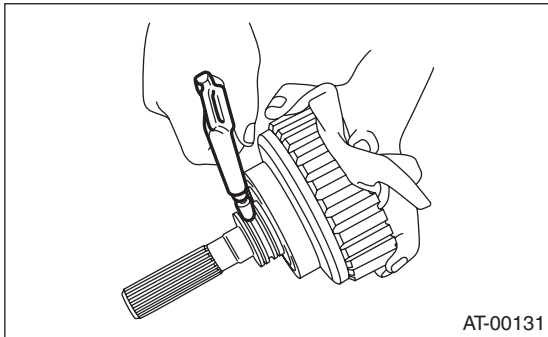
- (A) Snap ring
- (B) Transfer piston seal

2) Install return spring to transfer piston.



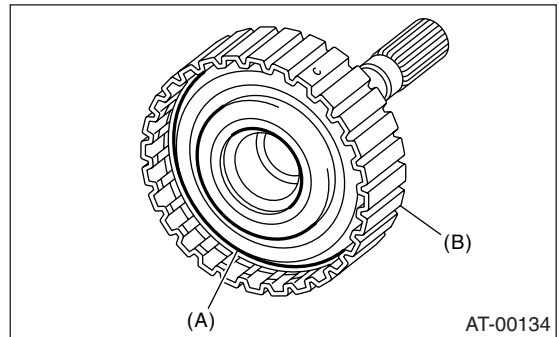
- (A) Return spring
- (B) Rear drive shaft

5) Apply compressed air to the rear drive shaft to remove the piston.



AT-00131

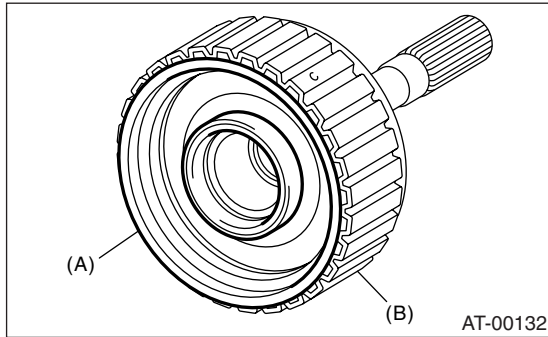
3) Apply ATF to the transfer clutch piston seal lip and install it.



- (A) Transfer clutch piston seal
- (B) Rear drive shaft

## D: ASSEMBLY

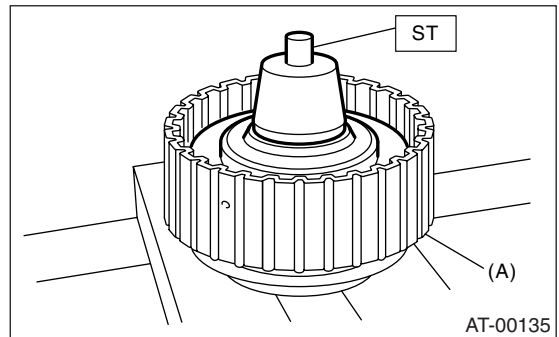
1) Install the transfer clutch piston.



- (A) Transfer clutch piston
- (B) Rear drive shaft

4) Install ST to rear drive shaft.

ST 499257300 SNAP RING OUTER GUIDE



- (A) Rear drive shaft

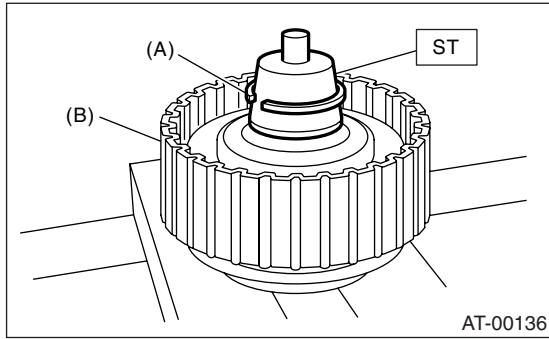
5) Install snap ring to ST.



# Transfer Clutch

AUTOMATIC TRANSMISSION

ST 499257300 SNAP RING OUTER GUIDE

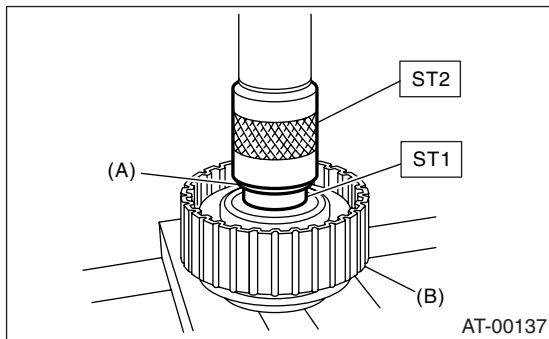


(A) Snap ring  
(B) Transfer clutch

6) Using ST1 and ST2, install snap ring to rear drive shaft.

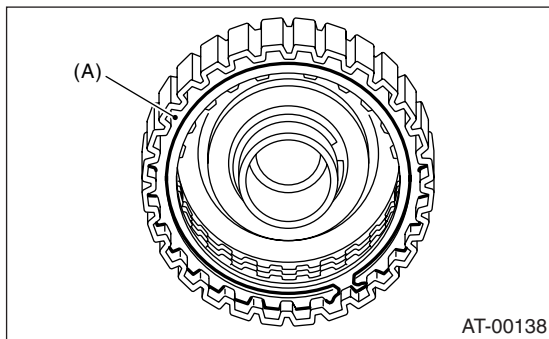
ST1 499257300 SNAP RING OUTER GUIDE

ST2 499247400 INSTALLER



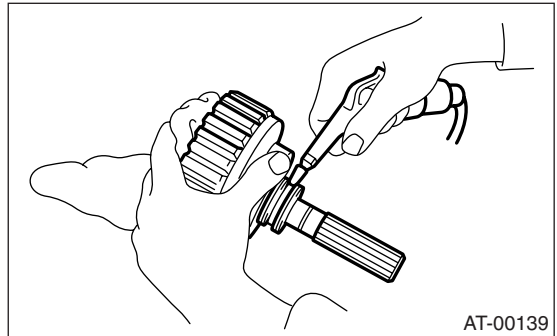
(A) Snap ring  
(B) Transfer clutch

7) Install the driven plates, drive plates, pressure plate and snap ring.



(A) Snap ring

8) Apply compressed air to see if the assembled parts move smoothly.

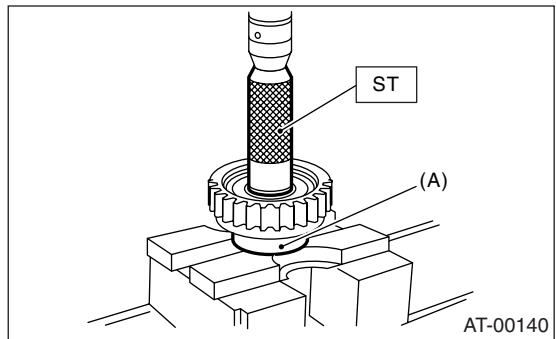


AT-00139

9) Check clearance between snap ring and pressure plate. <Ref. to 4AT-77, INSPECTION, Transfer Clutch.>

10) Press-fit a new ball bearing with ST.

ST 899580100 INSTALLER

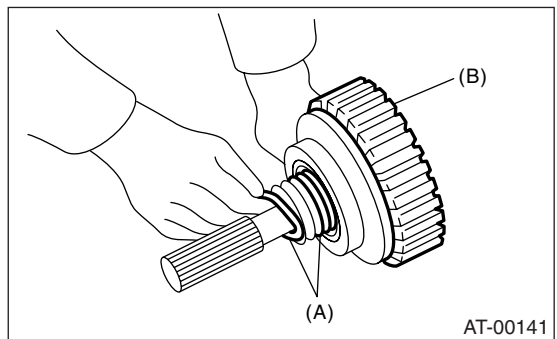


(A) Ball bearing

11) Coat a new seal ring with vaseline, and install it in the seal ring groove of the shaft.

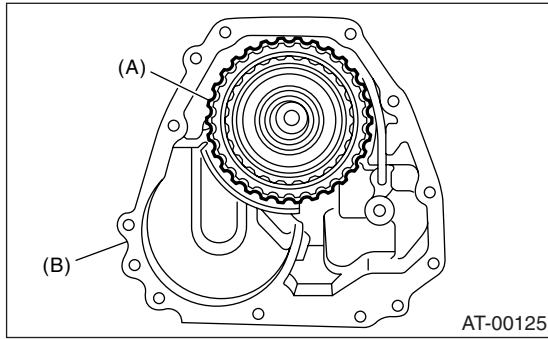
NOTE:

Do not expand the seal ring excessively when installing.



(A) Snap ring  
(B) Transfer clutch

12) Install the transfer clutch assembly without damaging seal ring.



(A) Transfer clutch  
(B) Extension case

## E: INSPECTION

- Check the drive plate facing for wear and damage.
- Check the snap ring for wear, return spring for permanent set and breakage, and return spring for deformation.
- Check the D-ring for damage.
- Measure the extension end play and adjust it to within specifications. <Ref. to 4AT-77, ADJUSTMENT, Transfer Clutch.>

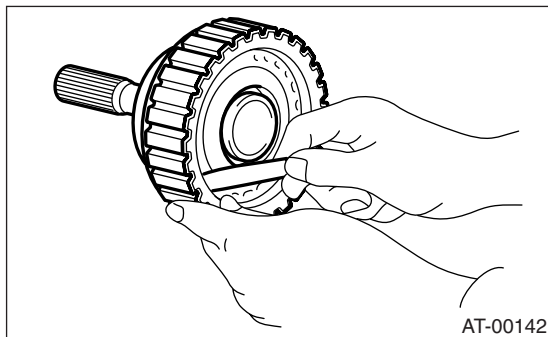
- 1) Inspect clearance between snap ring and pressure plate.
- 2) Before measuring clearance, place the same thickness of shim on both sides to prevent pressure plate from tilting.
- 3) If the clearance is not within specification, adjust it by selecting a suitable pressure plate on the transfer clutch piston side. If it exceeds the service limit, replace the drive plate with new one and adjust it within the specification by selecting the pressure plate.

**Initial standard:**

**0.7 — 1.1 mm (0.028 — 0.043 in)**

**Limit thickness:**

**1.6 mm (0.063 in)**



AT-00142

| Pressure plates |                   |
|-----------------|-------------------|
| Part No.        | Thickness mm (in) |
| 31593AA151      | 3.3 (0.130)       |
| 31593AA161      | 3.7 (0.146)       |
| 31593AA171      | 4.1 (0.161)       |
| 31593AA181      | 4.5 (0.177)       |

4) Check if the tight corner braking does not occur when the vehicle is started with steering wheel held at fully turned position. If tight corner braking occurs, perform the following procedures.

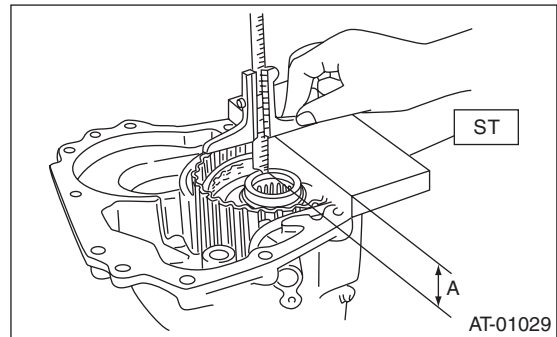
- (1) With the steering wheel held at fully turned position, drive the vehicle in “D” range and with vehicle speed at approx. 5 km/h (3 MPH) in both clockwise and counterclockwise directions for approx. ten times each, while repeating acceleration and braking intermittently.
- (2) If the tight corner braking still persists, drive the vehicle again in a circle for several laps.

## F: ADJUSTMENT

### 1. MP-T MODEL

1) Using the ST, measure the distance “A” from the end surface of ST to the end surface of rear drive shaft.

ST 398643600 GAUGE



A: Measured value

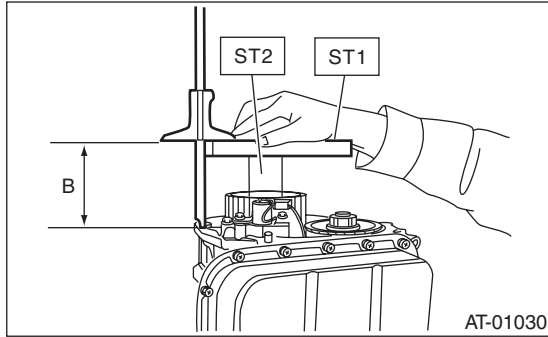
2) Using the ST1 and ST2, measure the distance “B” from the transmission case mating surface to the end surface of ST.

ST1 398643600 GAUGE

# Transfer Clutch

AUTOMATIC TRANSMISSION

ST2 499577000 GAUGE



B: Measured value

3) Calculation formula:

NOTE:

Calculate "T":

$$T = A - B + 35.4 \text{ mm}$$

$$[T = A - B + 1.3937 \text{ in}]$$

T: Thrust needle bearing thickness

A: Distance from the end surface of ST to the end surface of rear drive shaft

B: Distance from the mating surface of transmission case to the end surface of ST

Example:

When, A = 33.6 mm (1.3228 in), B = 65.05 mm (2.5610 in)

$$T = 33.6 - 65.05 + 35.4 = 3.95$$

$$[T = 1.3228 - 2.5610 + 1.3937 = 0.1555]$$

After calculation, the value of "T" becomes 3.95 mm (0.1555 in), therefore select bearing thickness of 3.8 mm (0.150 in).

NOTE:

Calculation formula for "T" is applied when measuring using ST (398643600 GAUGE, 499577000 GAUGE). When not using ST, apply

$$T = (A - \alpha + 0.45 \text{ mm}) - (B - \beta) - H$$

$$[T = (A - \alpha + 0.0177 \text{ in}) - (B - \beta) - H].$$

T: Thrust needle bearing thickness

A: Distance from the end surface of collar as substitute for ST to the end surface of reduction drive shaft

B: Distance from the mating surface of transmission case to the end surface of collar as substitute for ST

$\alpha$ : Collar thickness used when measuring "A"

$\beta$ : Collar thickness used when measuring "B"

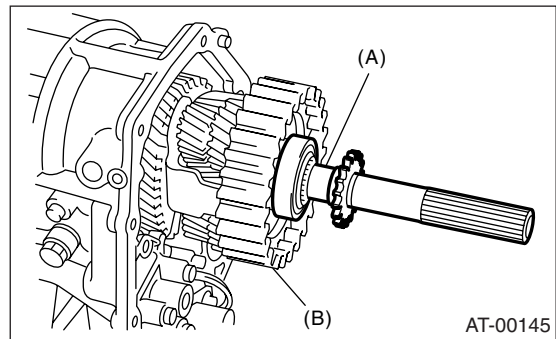
0.45 (0.0177): Gasket thickness (mm (in))

H: Shim clearance

| Thrust needle bearing |                   |
|-----------------------|-------------------|
| Part No.              | Thickness mm (in) |
| 806536020             | 3.8 (0.150)       |
| 806535030             | 4.0 (0.157)       |
| 806535040             | 4.2 (0.165)       |
| 806535050             | 4.4 (0.173)       |
| 806535060             | 4.6 (0.181)       |
| 806535070             | 4.8 (0.189)       |
| 806535090             | 5.0 (0.197)       |

## 2. VTD MODEL

1) Insert the rear driveshaft into the reduction drive gear and center differential assembly.

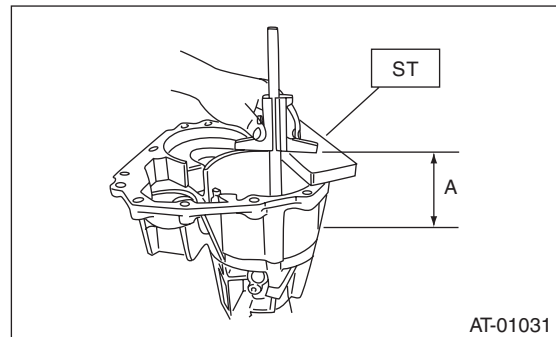


(A) Rear drive shaft

(B) Center differential carrier

2) Using the ST, measure the distance "A" from the end surface of ST to the ball bearing outer ring contact surface of rear drive shaft.

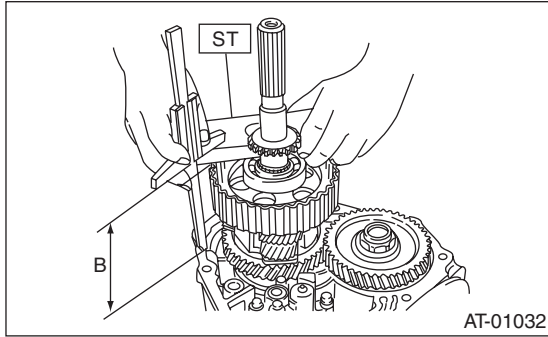
ST 398643600 GAUGE



A Measured value

3) Using the ST, measure the distance "B" from the mating surface of transmission case to the end surface of ST.

ST 398643600 GAUGE



B Measured value

4) Formula:

NOTE:

Calculation of "T":

When clearances are 0.05 mm (0.0020 in), select up to four adjusting shims from the table, suitable for clearance value.

When clearances are 0.05 mm (0.0020 in)

$$T = A - B + 0.40 \text{ mm}$$

$$[T = A - B + 0.0157 \text{ in}]$$

When clearances are 0.25 mm (0.0098 in)

$$T = A - B + 0.20 \text{ mm}$$

$$[T = A - B + 0.0079 \text{ in}]$$

T: Shim clearance

A: Distance from the end surface of ST to the ball bearing outer ring contact surface of rear drive shaft

B: Distance from the mating surface of transmission case to the end surface of ST

T: Shim thickness

0.05 — 0.25 mm (0.0020 — 0.0098 in)

Example:

When, A = 90.50 mm (3.5630 in), B = 90.35 mm (3.5571 in)

Calculation for 0.05 mm (0.0020 in) of clearance

$$T = 90.50 - 90.35 + 0.4 = 0.55$$

$$[T = 3.5630 - 3.5571 + 0.0157 = 0.0216]$$

Calculation when clearance is 0.25 mm (0.0098 in)

$$T = 90.50 - 90.35 + 0.2 = 0.35$$

$$[T = 3.5630 - 3.5571 + 0.0079 = 0.0138]$$

NOTE:

Calculation formula for "T" is applied when measuring using ST (398643600 GAUGE). When not using ST, apply

$$T = (A - \alpha + 0.45 \text{ mm}) - (B - \beta) - H$$

$$[T = (A - \alpha + 0.0177 \text{ in}) - (B - \beta) - H]$$

T: Thrust needle bearing thickness

A: Distance from the end surface of collar as substitute for ST to the rear drive shaft ball bearing outer ring contact surface

B: Distance from the mating surface of transmission case to the end surface of collar as substitute for ST

$\alpha$ : Collar thickness used when measuring "A"

$\beta$ : Collar thickness used when measuring "B"

0.45 (0.0177): Gasket thickness (mm (in))

H: Shim clearance

After calculation, the value of "T" becomes between 0.35 mm (0.0138 in) and 0.55 mm (0.0216 in), therefore select two shims with thickness of 0.2 mm (0.010 in) or one shim with thickness of 0.5 mm (0.020 in).

| Adjusting shim |                   |
|----------------|-------------------|
| Part No.       | Thickness mm (in) |
| 33281AA001     | 0.2 (0.008)       |
| 33281AA011     | 0.5 (0.020)       |

# Multi-plate Clutch

AUTOMATIC TRANSMISSION

## 28. Multi-plate Clutch

### A: REMOVAL

Remove multi-plate clutch following the same instructions as for the extension case. <Ref. to 4AT-70, REMOVAL, Extension Case.>

### B: INSTALLATION

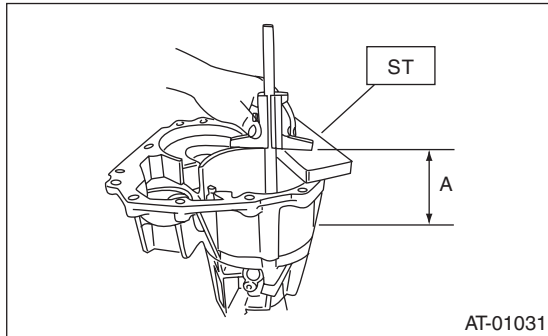
Install multi-plate clutch following the same instructions as for the extension case. <Ref. to 4AT-70, INSTALLATION, Extension Case.>

### C: INSPECTION

- Inspect drive plate facing for wear and damage.
- Make sure snap ring is not worn and return spring has no permanent distortion, damage, or deformation.
- Inspect D-ring for damage.
- Measure multi-plate clutch clearance and adjust it to within the specification range. <Ref. to 4AT-80, ADJUSTMENT, Multi-plate Clutch.>

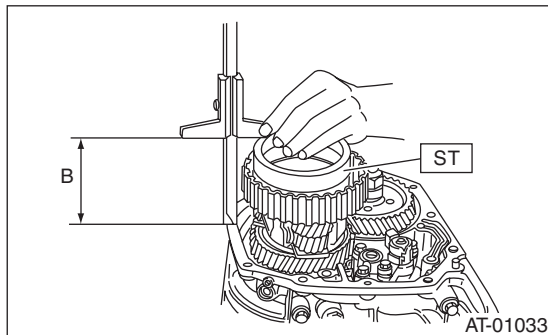
### D: ADJUSTMENT

- 1) Install the drive plate and driven plate to center differential carrier.
- 2) Using the ST, measure the distance “A” from the end surface of ST to multi-plate clutch piston.  
ST 398643600 GAUGE



A Measured value

- 3) Using the ST, measure the height “B” from the mating surface of transmission case to the end surface of ST.  
ST 398744300 GAUGE



B Measured value

4) Calculation formula:

$$T = A - B + 0.45 \text{ mm}$$

$$[T = A - B + 0.0177 \text{ in}]$$

NOTE:

- Calculation formula for “T” is applied when measuring using ST (398643600 GAUGE, 398744300 GAUGE). When not using ST, apply

$$T = (A - \alpha + 0.45 \text{ mm}) - (B - \beta)$$

$$[T = (A - \alpha + 0.0177 \text{ in}) - (B - \beta)]$$

T: Thrust needle bearing thickness

A: Distance from the end surface of collar as substitute for ST to multi-plate clutch piston

B: Distance from the mating surface of transmission case to the end surface of collar as substitute for ST

$\alpha$ : Collar thickness used when measuring “A”

$\beta$ : Collar thickness used when measuring “B”

0.45 (0.0177): Gasket thickness (mm (in))

- Measure multi-plate clutch driven and drive plate thickness to find the clearance between measurement value and “T”.

**Standard value:**

**0.2 — 0.6 mm (0.008 — 0.024 in)**

**Limit value:**

**1.6 mm (0.063 in)**

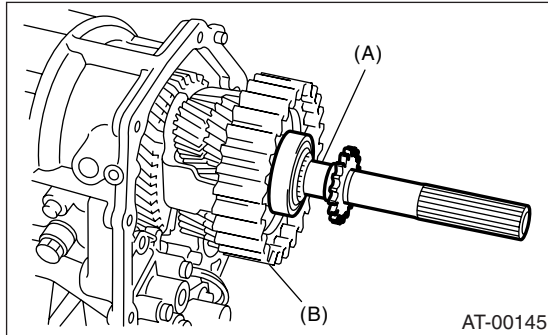
If outside the standard value, replace the plate set (drive and driven plate). Select a multi-plate clutch piston side adjustment plate that will bring clearance within the standard value.

| Obtainable driven plate |                   |
|-------------------------|-------------------|
| Part No.                | Thickness mm (in) |
| 31589AA041              | 1.6 (0.063)       |
| 31589AA050              | 2.0 (0.079)       |
| 31589AA060              | 2.4 (0.094)       |
| 31589AA070              | 2.8 (0.110)       |

## 29.Rear Drive Shaft

### A: REMOVAL

- 1) Remove transmission assembly. <Ref. to 4AT-38, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove rear wheel speed sensor and separate extension case from transmission case. <Ref. to 4AT-70, REMOVAL, Extension Case.>
- 3) Pull out the rear driveshaft from the center differential assembly.



- (A) Rear driveshaft  
(B) Center differential carrier

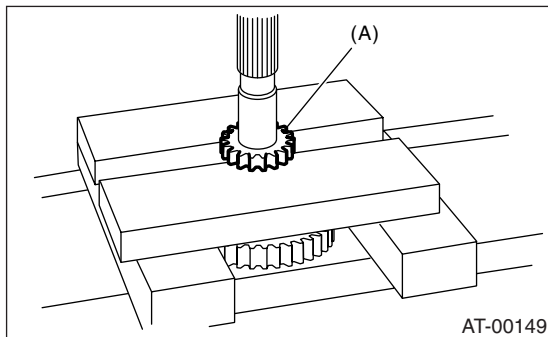
- 4) Remove drive plate and driven plate.

### B: INSTALLATION

- 1) Select the appropriate shim. <Ref. to 4AT-78, VTD MODEL, ADJUSTMENT, Transfer Clutch.>
- 2) Install drive plate and driven plate.
- 3) Insert rear driveshaft into the center differential assembly.
- 4) Join transmission case and extension case. Install rear wheel speed sensor. <Ref. to 4AT-70, INSTALLATION, Extension Case.>
- 5) Install transmission assembly. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

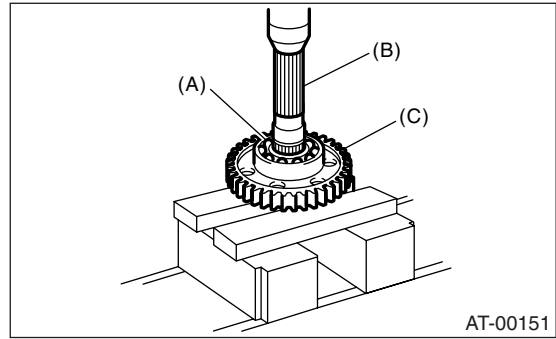
### C: DISASSEMBLY

- 1) Using a press, remove revolution gear.



- (A) Revolution gear

- 2) Using a press, remove the front and rear side ball bearings and clutch hub.



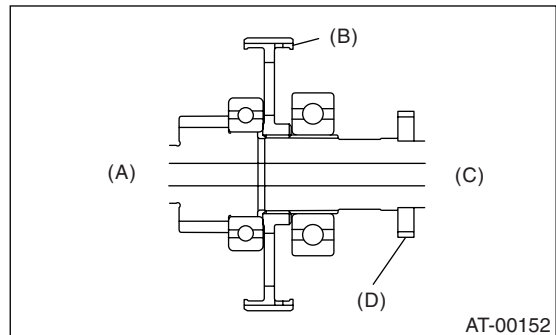
- (A) Rear ball bearing  
(B) Rear driveshaft  
(C) Clutch hub

### D: ASSEMBLY

Assemble in the reverse order of disassembly.

#### NOTE:

- Use a new revolution gear and ball bearings.
- Make sure the clutch hub is oriented in the correct direction.



- (A) Front side  
(B) Clutch hub  
(C) Rear side  
(D) Revolution gear

### E: INSPECTION

- Inspect parts to make sure there are no holes, cuts, and that they are not dusty.
- Inspect extension end play and adjust it to within the standard value. <Ref. to 4AT-78, VTD MODEL, ADJUSTMENT, Transfer Clutch.>

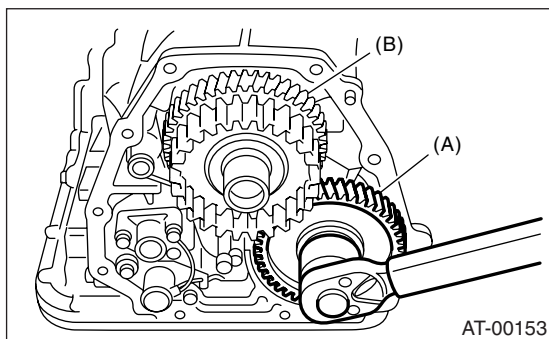


## 30.Reduction Driven Gear

### A: REMOVAL

#### 1. MP-T MODEL

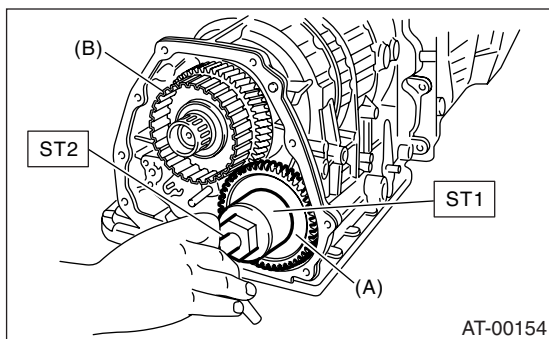
- 1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-38, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove rear vehicle speed sensor, and separate the transmission case and extension case. <Ref. to 4AT-70, REMOVAL, Extension Case.>
- 3) Set the range select lever to "P".
- 4) Straighten the staked portion, and remove the lock nut.



- (A) Reduction driven gear
- (B) Reduction drive gear

- 5) Using the ST1 and ST2, extract the reduction driven gear.

ST1 499737000 PULLER  
ST2 899524100 PULLER SET

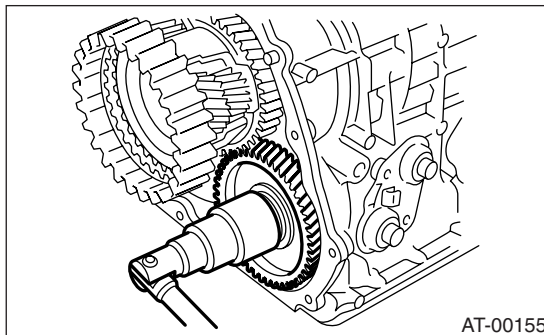


- (A) Reduction driven gear
- (B) Reduction drive gear

#### 2. VTD MODEL

- 1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-38, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove rear vehicle speed sensor, and separate the transmission case and extension case. <Ref. to 4AT-70, REMOVAL, Extension Case.>
- 3) Remove the rear drive shaft. <Ref. to 4AT-81, REMOVAL, Rear Drive Shaft.>

- 4) Set the range select lever to "P".
- 5) Straighten the staked portion, and remove the lock nut.



- 6) Using the ST1 and ST2, extract the reduction driven gear.

ST1 499737000 PULLER  
ST2 899524100 PULLER SET

- 7) Pull out the center differential assembly. <Ref. to 4AT-86, REMOVAL, Center Differential Carrier.>

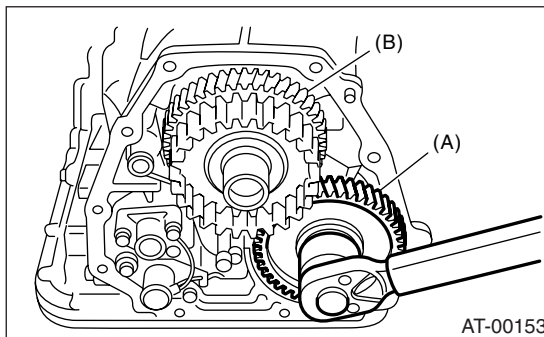
### B: INSTALLATION

#### 1. MP-T MODEL

- 1) Set the select lever to "P" range.
- 2) Using a plastic hammer, install reduction driven gear assembly and new washer, and tighten new drive pinion lock nut.

#### **Tightening torque:**

**100 N·m (10.2 kgf-m, 73.8 ft-lb)**



- (A) Reduction driven gear
- (B) Reduction drive gear

- 3) After tightening, stake the lock nut securely.
- 4) Combine the transmission case with the extension case, and install rear vehicle speed sensor. <Ref. to 4AT-70, INSTALLATION, Extension Case.>
- 5) Install the transmission assembly to vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

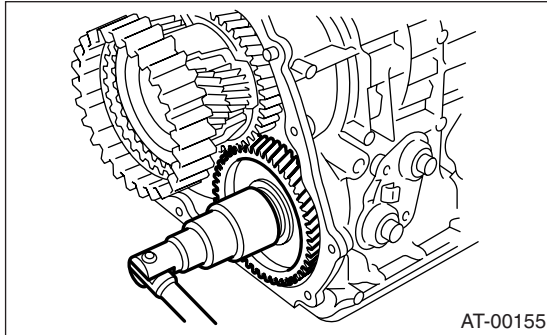
#### 2. VTD MODEL

- 1) Set the select lever to "P" range.

- 2) Using a plastic hammer, install reduction driven gear assembly.
- 3) Using a plastic hammer, install the center differential assembly.
- 4) Install a new self-lock nut and a washer.

**Tightening torque:**

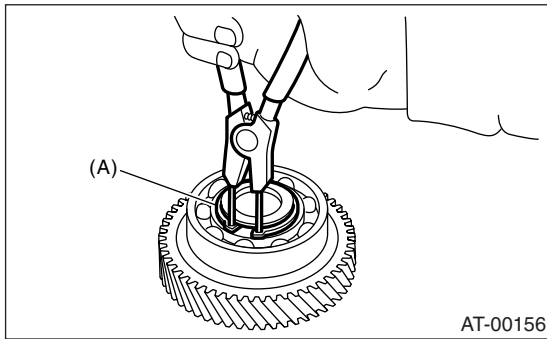
**100 N·m (10.2 kgf-m, 73.8 ft-lb)**



- 5) After tightening, stake the lock nut securely.
- 6) Insert the rear drive shaft assembly. <Ref. to 4AT-81, INSTALLATION, Rear Drive Shaft.>
- 7) Combine the transmission case with the extension case, and install rear vehicle speed sensor. <Ref. to 4AT-70, INSTALLATION, Extension Case.>
- 8) Install the transmission assembly to vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

**C: DISASSEMBLY**

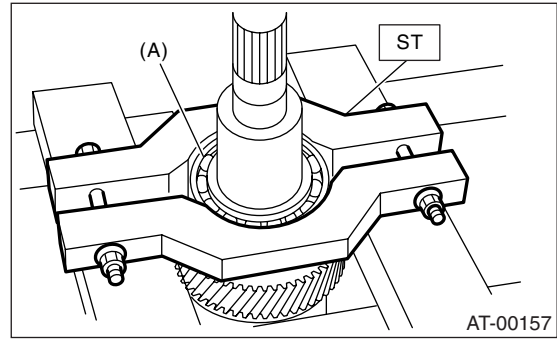
- 1) Remove snap ring from reduction driven gear.



(A) Snap ring

- 2) Using ST, remove ball bearing from reduction driven gear.

**ST 498077600 REMOVER**

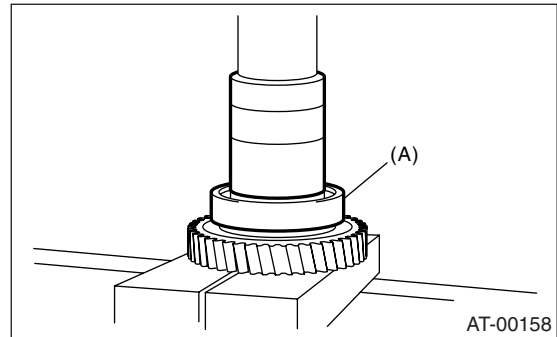


(A) Ball bearing

- 3) Remove snap ring reduction driven gear.

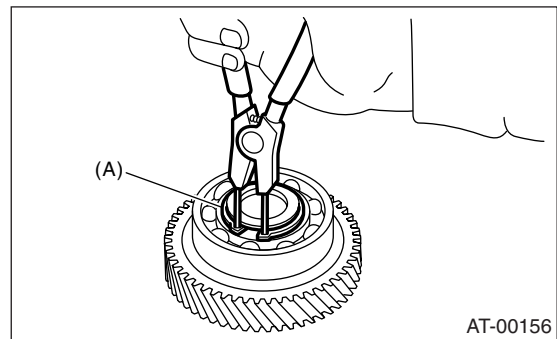
**D: ASSEMBLY**

- 1) Install snap ring to reduction driven gear.
- 2) Using a press, install a new ball bearing to reduction driven gear.



(A) Ball bearing

- 3) Install snap ring to reduction driven gear.



(A) Snap ring

**E: INSPECTION**

Check ball bearing and gear for dents or damage.

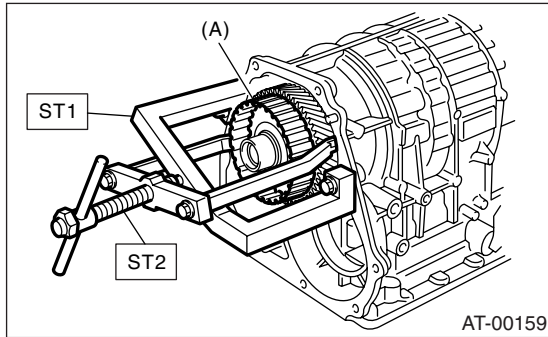


## 31.Reduction Drive Gear

### A: REMOVAL

- 1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-38, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove rear vehicle speed sensor, and separate the transmission case and extension case. <Ref. to 4AT-70, REMOVAL, Extension Case.>
- 3) Remove the reduction driven gear. <Ref. to 4AT-82, REMOVAL, Reduction Driven Gear.>
- 4) Using ST, extract the reduction drive gear.

ST1 499737100 PULLER SET  
ST2 899524100 PULLER SET



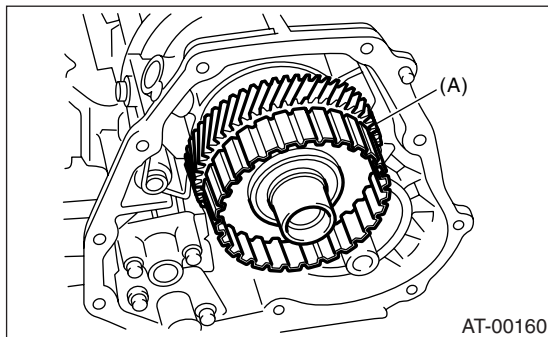
(A) Reduction drive gear

### B: INSTALLATION

- 1) Install the reduction drive gear assembly.

**NOTE:**

Insert it fully into position until the bearing shoulder bottoms.

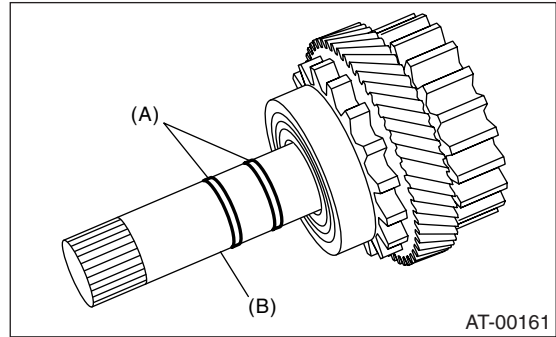


(A) Reduction drive gear

- 2) Install the reduction driven gear. <Ref. to 4AT-82, INSTALLATION, Reduction Driven Gear.>
- 3) Combine the transmission case with the extension case, and install rear vehicle speed sensor. <Ref. to 4AT-70, INSTALLATION, Extension Case.>
- 4) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

### C: DISASSEMBLY

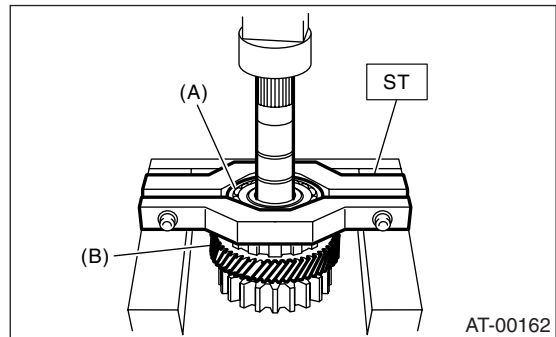
- 1) Take out the seal rings.



(A) Seal rings  
(B) Reduction drive shaft

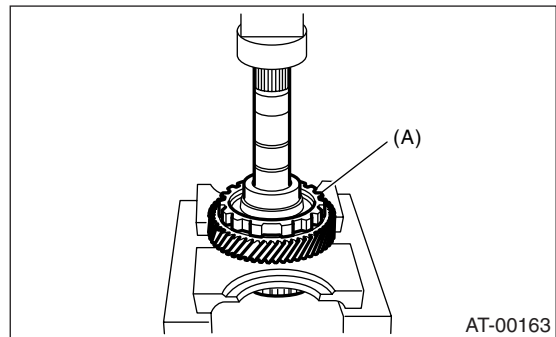
- 2) Using ST, remove the ball bearing.

ST 498077600 REMOVER



(A) Ball bearing  
(B) Reduction drive gear

- 3) Using a press, remove the reduction drive gear.

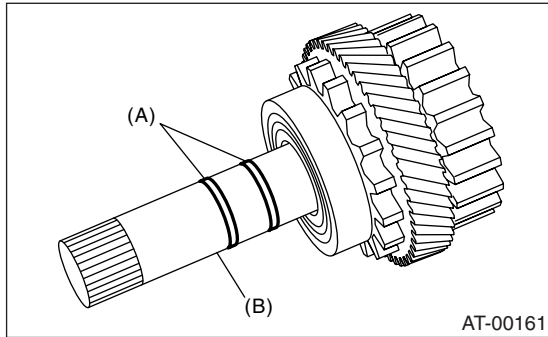


(A) Reduction drive gear

### D: ASSEMBLY

- 1) Press-fit the reduction drive gear to the shaft.
- 2) Press-fit the a new ball bearing to the reduction drive gear.
- 3) Apply vaseline to outer surface of seal ring and shaft groove.

4) Apply ATF to new seal rings and attach them.



- (A) Seal rings
- (B) Reduction drive shaft

## E: INSPECTION

- Rotate bearing by hand, make sure it rotates smoothly.
- Make sure that each component is free of harmful gouges, cuts, or dust.
- Measure the extension end play and adjust it to within specifications. <Ref. to 4AT-77, ADJUSTMENT, Transfer Clutch.>

# Center Differential Carrier

AUTOMATIC TRANSMISSION

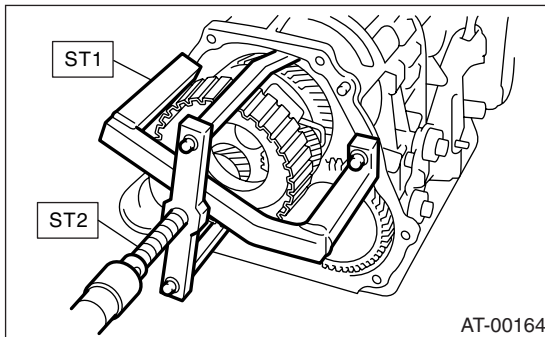
## 32.Center Differential Carrier

### A: REMOVAL

- 1) Remove the transmission assembly from vehicle. <Ref. to 4AT-38, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove the rear wheel speed sensor, and separate the extension case from the transmission case. <Ref. to 4AT-70, REMOVAL, Extension Case.>
- 3) Pull out the rear drive shaft. <Ref. to 4AT-81, REMOVAL, Rear Drive Shaft.>
- 4) Using the special tools, pull out the center differential carrier assembly.

ST1 499737100 PULLER SET

ST2 899524100 PULLER SET



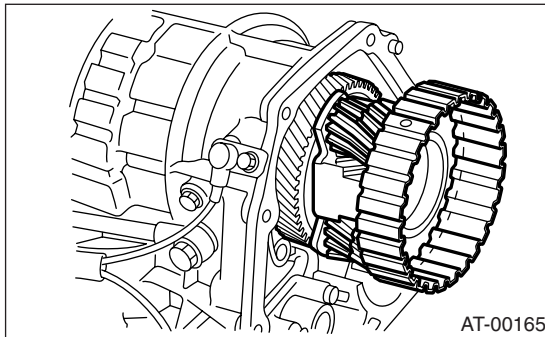
- 5) Pull out the shim(s) from transmission case.

### B: INSTALLATION

- 1) Install the center differential assembly with the shim(s).

#### NOTE:

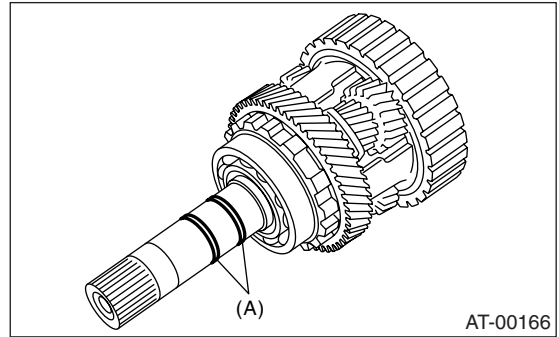
Insert the center differential assembly and shim(s) completely into the bearing shoulder bottom.



- 2) Insert the rear drive shaft. <Ref. to 4AT-81, INSTALLATION, Rear Drive Shaft.>
- 3) Connect the transmission case and extension case, and install the rear wheel speed sensor. <Ref. to 4AT-70, INSTALLATION, Extension Case.>
- 4) Install the transmission assembly onto vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

### C: DISASSEMBLY

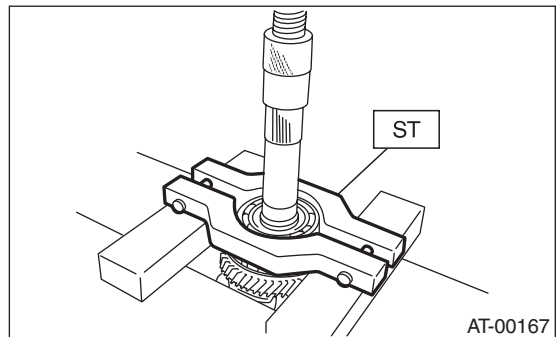
- 1) Remove the seal rings.



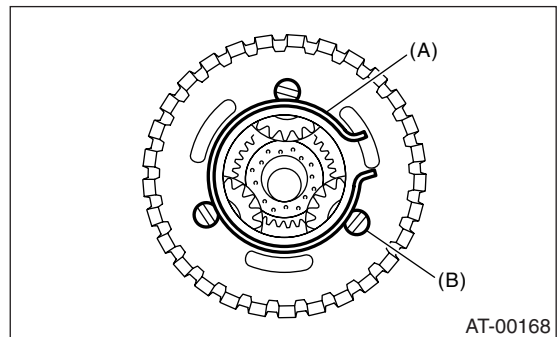
(A) Seal ring

- 2) Using a press and the special tool, remove the ball bearing.

ST 498077600 REMOVER



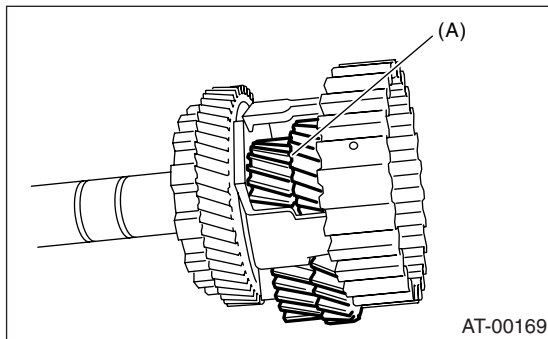
- 3) Remove the snap ring, and pull out the shaft from the center differential assembly.



(A) Snap ring

(B) Shaft

- 4) Remove the thrust washers, pinion gears, and washers from the center differential assembly.



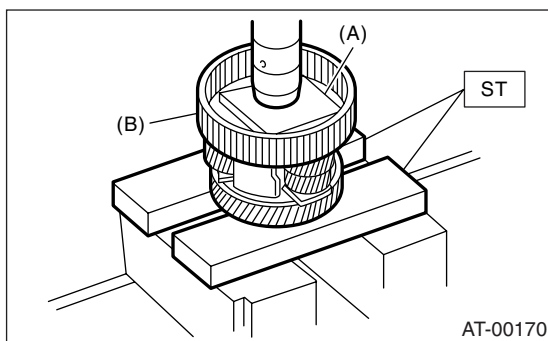
(A) Pinion gear

- 5) Pull out the intermediate shaft and thrust bearing.

## D: ASSEMBLY

- 1) Install the thrust washer onto the intermediate shaft.
- 2) Install thrust bearing onto the intermediate shaft.
- 3) Install the pinion gears and washers.
- 4) Insert the shaft into the center differential assembly.
- 5) Install the snap ring.
- 6) Using a press, install a new ball bearing into the center differential assembly.

ST 498077000 REMOVER



(A) Plate

(B) Center differential carrier

- 7) Apply Vaseline onto the seal ring outer surface and shaft grooves.
- 8) Apply ATF to new seal rings and install them.

## E: INSPECTION

- Check all parts for hole, score, or dirt.
- Check the play of the extension end, and if necessary, adjust it. <Ref. to 4AT-78, VTD MODEL, ADJUSTMENT, Transfer Clutch.>

## 33. Parking Pawl

### A: REMOVAL

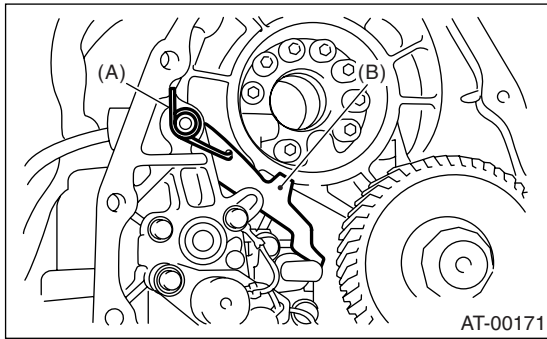
- 1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-38, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove rear vehicle speed sensor and separate transmission case and extension case sections. <Ref. to 4AT-70, REMOVAL, Extension Case.>
- 3) Remove the reduction drive gear. (MP-T model) <Ref. to 4AT-84, REMOVAL, Reduction Drive Gear.>
- 4) Remove the center differential carrier. (VTD model) <Ref. to 4AT-86, REMOVAL, Center Differential Carrier.>
- 5) Remove the parking pawl, return spring and shaft.

4) Install the rear vehicle speed sensor and extension case. <Ref. to 4AT-70, INSTALLATION, Extension Case.>

5) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

### C: INSPECTION

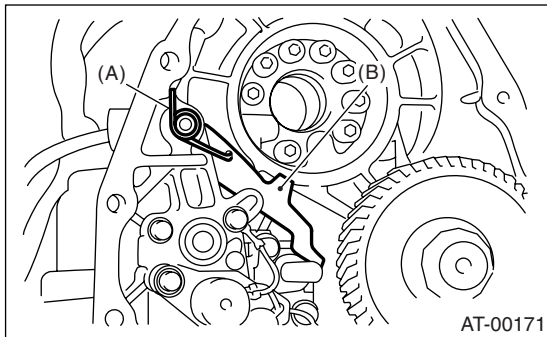
Make sure that the tab of the parking pole on the reduction gear is not worn or otherwise damaged.



- (A) Return spring
- (B) Parking pawl

### B: INSTALLATION

- 1) Install the parking pawl, shaft and return spring.



- (A) Return spring
- (B) Parking pawl

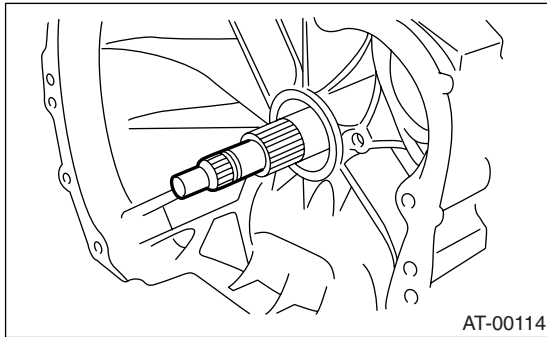
2) Install the reduction drive gear. (MP-T model) <Ref. to 4AT-84, INSTALLATION, Reduction Drive Gear.>

3) Install the center differential carrier. (VTD model) <Ref. to 4AT-86, INSTALLATION, Center Differential Carrier.>

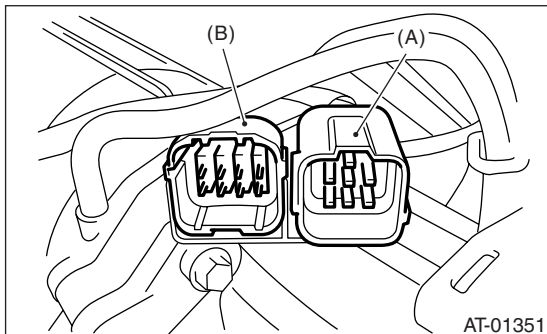
## 34. Converter Case

### A: REMOVAL

- 1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-38, REMOVAL, Automatic Transmission Assembly.>
- 2) Extract the torque converter clutch assembly. <Ref. to 4AT-69, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.



- 4) Lift-up lever behind the connector and disconnect it from stay.
- 5) Disconnect inhibitor switch connector from stay.



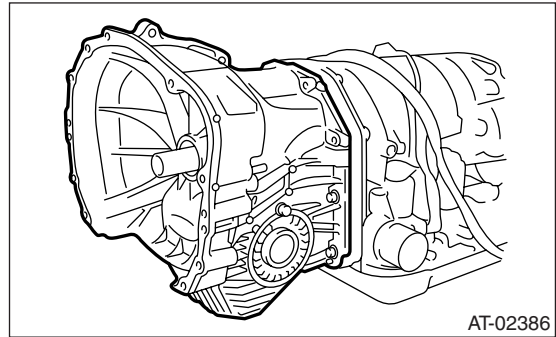
- (A) Transmission harness  
(B) Inhibitor switch harness

- 6) Remove the oil charge pipe. <Ref. to 4AT-68, REMOVAL, Oil Charge Pipe.>
- 7) Remove the oil cooler inlet and outlet pipes. <Ref. to 4AT-65, REMOVAL, ATF Cooler Pipe and Hose.>
- 8) Lightly tapping the converter case with plastic hammer, separate the transmission case and converter case.

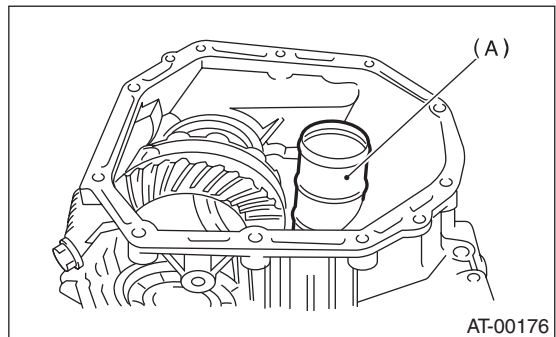
#### NOTE:

- Be careful not to damage the oil seal and bushing inside the converter case by the oil pump cover.

- Be careful not to lose the rubber seal.



- 9) Remove the seal pipe if it is attached. (Reusing is not allowed.)

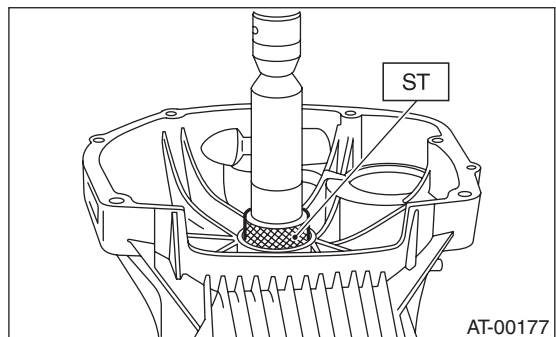


- (A) Seal pipe

- 10) Remove the differential assembly. <Ref. to 4AT-101, REMOVAL, Front Differential Assembly.>
- 11) Remove the oil seal from converter case.

### B: INSTALLATION

- 1) Check the appearance of each component and clean.
  - 2) Force-fit the oil seal to the converter case with ST.
- ST 398437700 DRIFT



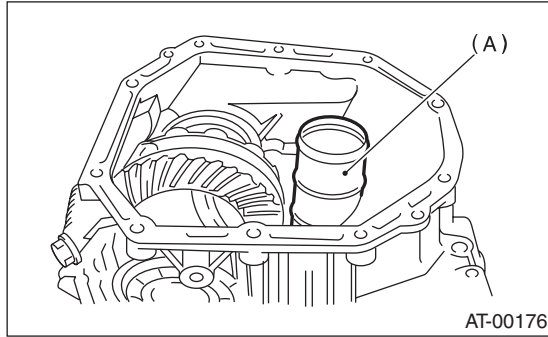
- 3) Install the differential assembly to the case. <Ref. to 4AT-101, INSTALLATION, Front Differential Assembly.>
- 4) Install the left and right side retainers. <Ref. to 4AT-105, ADJUSTMENT, Front Differential Assembly.>



# Converter Case

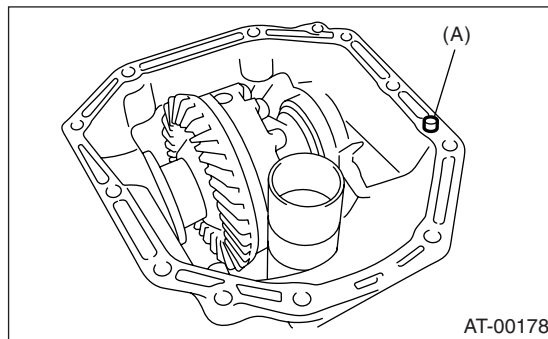
## AUTOMATIC TRANSMISSION

5) Install the new seal pipe to the converter case.



(A) Seal pipe

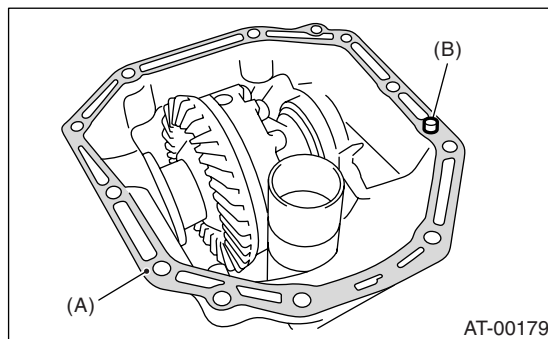
6) Install the rubber seal to the converter case.



(A) Rubber seal

7) Apply proper amount of liquid gasket to the entire converter case mating surface.

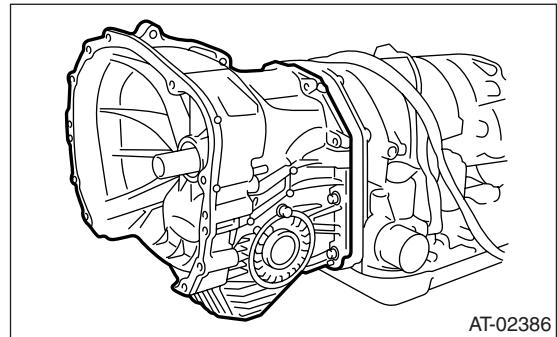
**Liquid gasket:**  
**THREE BOND 1215 (Part No. 004403007)**



(A) THREE BOND 1215  
(B) Rubber seal

8) Install the converter case assembly without damaging bushing and oil seal and secure with six bolts and four nuts.

**Tightening torque:**  
**41 N·m (4.2 kgf-m, 30.2 ft-lb)**



9) Insert inhibitor switch and transmission connector into stay.

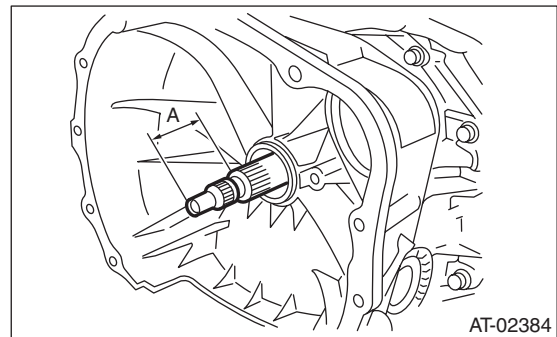
10) Install air breather hose. <Ref. to 4AT-67, INSTALLATION, Air Breather Hose.>

11) Install the oil cooler pipes. <Ref. to 4AT-65, INSTALLATION, ATF Cooler Pipe and Hose.>

12) Install the oil charge pipe with O-ring. <Ref. to 4AT-68, INSTALLATION, Oil Charge Pipe.>

13) Insert the input shaft while turning lightly by hand and verify the protrusion amount.

**Normal protrusion A:**  
**50 — 55 mm (1.97 — 2.17 in)**



14) Install the torque converter clutch assembly. <Ref. to 4AT-69, INSTALLATION, Torque Converter Clutch Assembly.>

15) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

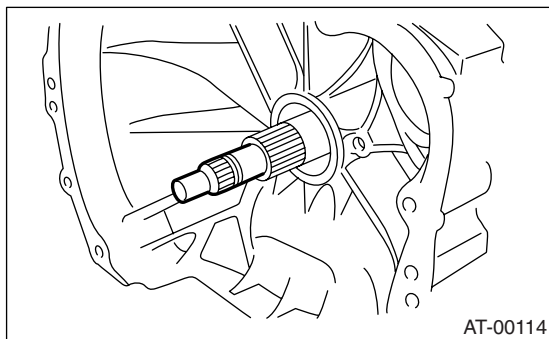
## C: INSPECTION

Measure the backlash and adjust to within specifications. <Ref. to 4AT-99, ADJUSTMENT, Drive Pinion Shaft Assembly.>

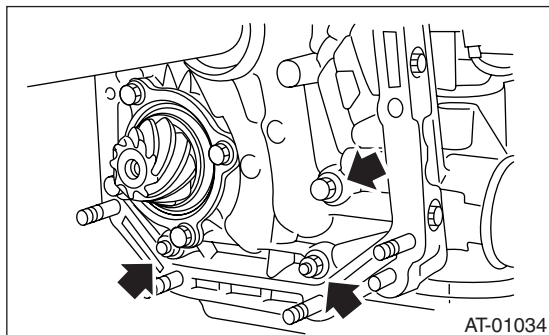
## 35. Oil Pump Housing

### A: REMOVAL

- 1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-38, REMOVAL, Automatic Transmission Assembly.>
- 2) Extract the torque converter clutch assembly. <Ref. to 4AT-69, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.



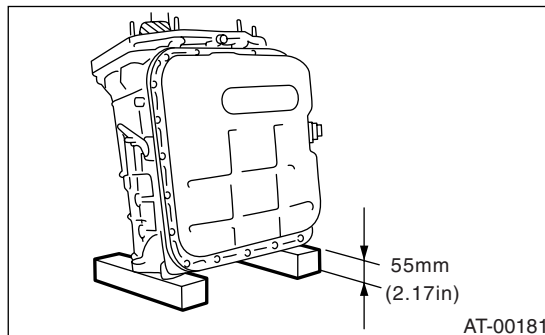
- 4) Lift-up lever behind the transmission harness connector and disconnect it from stay.
- 5) Disconnect inhibitor switch connector from stay.
- 6) Remove the oil charge pipe. <Ref. to 4AT-68, REMOVAL, Oil Charge Pipe.>
- 7) Remove the ATF oil cooler inlet and outlet pipes. <Ref. to 4AT-65, REMOVAL, ATF Cooler Pipe and Hose.>
- 8) Separation of converter case and transmission case sections <Ref. to 4AT-89, REMOVAL, Converter Case.>
- 9) Separate transmission case and extension case sections. <Ref. to 4AT-70, REMOVAL, Extension Case.>
- 10) Remove the reduction drive gear. (MP-T model) <Ref. to 4AT-84, REMOVAL, Reduction Drive Gear.>
- 11) Remove the center differential carrier. (VTD model) <Ref. to 4AT-86, REMOVAL, Center Differential Carrier.>
- 12) Remove the reduction driven gear. <Ref. to 4AT-82, REMOVAL, Reduction Driven Gear.>
- 13) Loosen the oil pump housing mounting bolts.



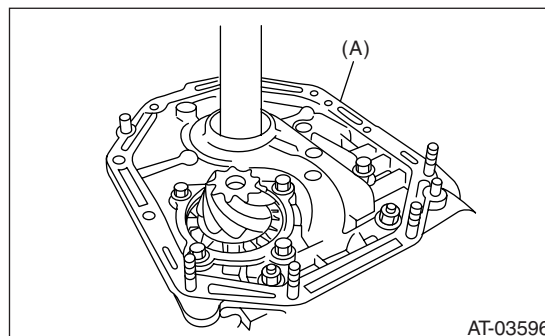
- 14) Place two wooden blocks on the workbench, and stand the transmission case with its rear end facing down.

### NOTE:

- Be careful not to scratch the rear mating surface of the transmission case.
- Note that the parking rod and drive pinion protrude from the mating surface.



- 15) Remove the oil pump housing and adjusting thrust washer.



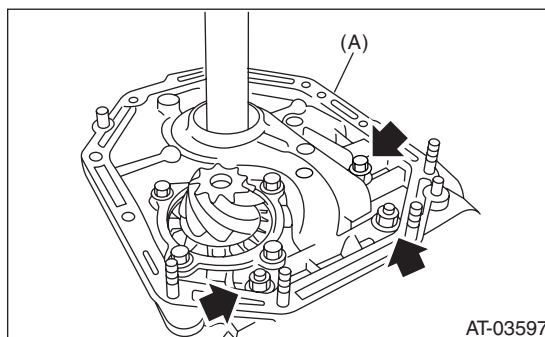
(A) Oil pump housing

### B: INSTALLATION

- 1) Secure the oil pump housing with two nuts and a bolt.

### Tightening torque:

**42 N·m (4.3 kgf-m, 31 ft-lb)**



(A) Oil pump housing



# Oil Pump Housing

## AUTOMATIC TRANSMISSION

2) Install the converter case assembly to the transmission case assembly. <Ref. to 4AT-69, INSTALLATION, Torque Converter Clutch Assembly.>

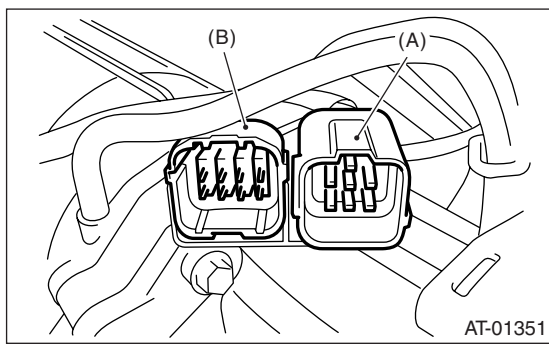
3) Install reduction driven gear. <Ref. to 4AT-82, INSTALLATION, Reduction Driven Gear.>

4) Install the reduction drive gear. (MP-T model) <Ref. to 4AT-84, INSTALLATION, Reduction Drive Gear.>

5) Install the center differential carrier. (VTD model) <Ref. to 4AT-86, INSTALLATION, Center Differential Carrier.>

6) Combine the extension case with the transmission case, and install rear vehicle speed sensor. <Ref. to 4AT-70, INSTALLATION, Extension Case.>

7) Insert inhibitor switch and transmission connector into stay.



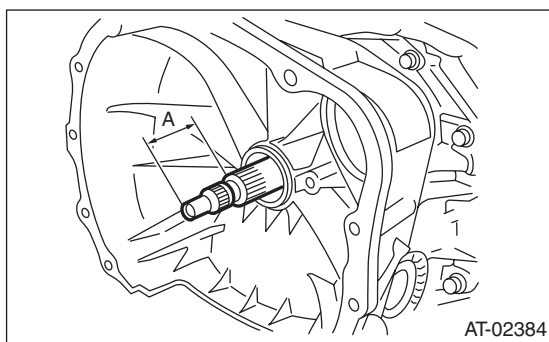
- (A) Transmission harness
- (B) Inhibitor switch harness

8) Install the ATF cooler pipe. <Ref. to 4AT-65, INSTALLATION, ATF Cooler Pipe and Hose.>

9) Install the oil charge pipe with O-ring. <Ref. to 4AT-68, INSTALLATION, Oil Charge Pipe.>

10) Insert the input shaft while rotating it lightly by hand, and then check the protrusion amount.

**Normal protrusion amount A:**  
**50 — 55 mm (1.97 — 2.17 in)**



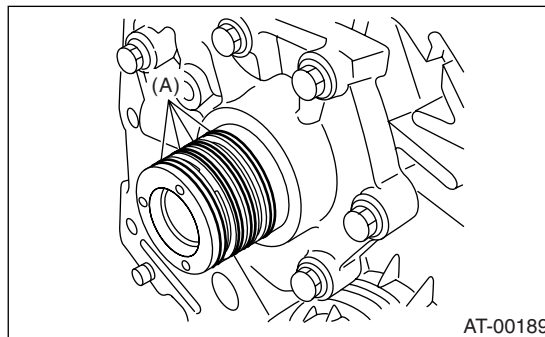
11) Install the torque converter clutch assembly. <Ref. to 4AT-69, INSTALLATION, Torque Converter Clutch Assembly.>

12) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

## C: DISASSEMBLY

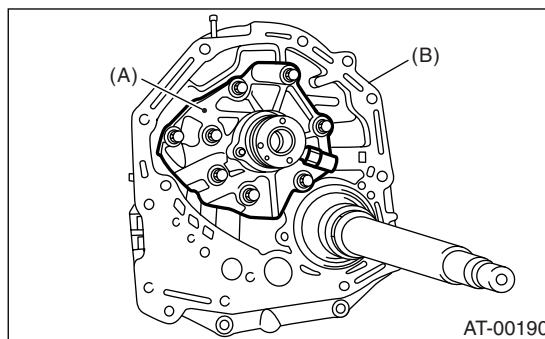
### 1. OIL PUMP COVER

1) Remove four seal rings.



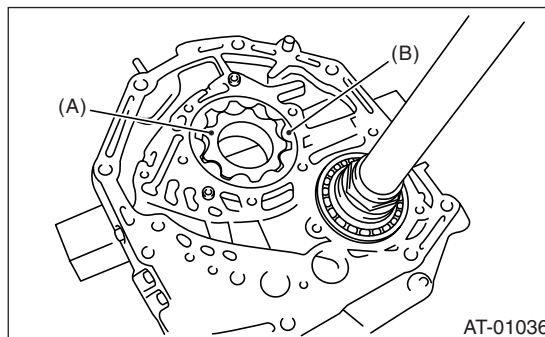
- (A) Seal rings

2) Lightly tap the end of the stator shaft to remove the cover.



- (A) Oil pump cover
- (B) Oil pump housing

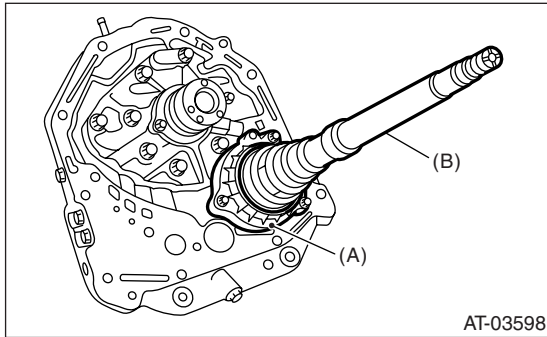
3) Remove the inner and outer rotor.



- (A) Inner rotor
- (B) Outer rotor

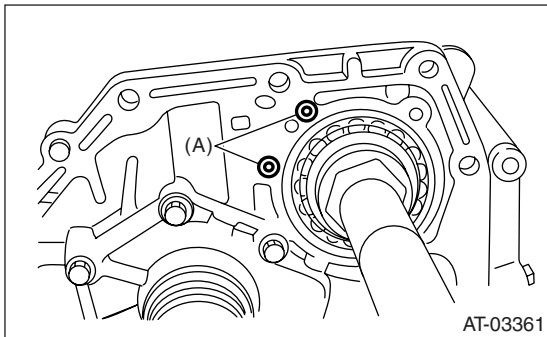
## 2. OIL SEAL RETAINER

1) Remove the oil seal retainer.



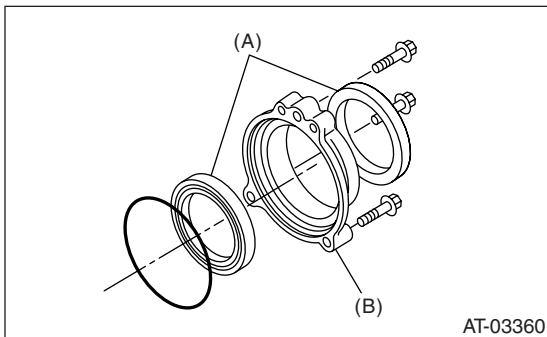
- (A) Oil seal retainer
- (B) Drive pinion shaft

2) Remove the O-ring.



- (A) O-ring

3) Remove the oil seal from oil seal retainer.

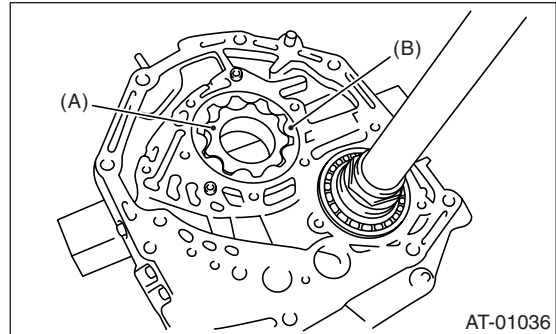


- (A) Oil seal
- (B) Oil seal retainer

## D: ASSEMBLY

### 1. OIL PUMP COVER

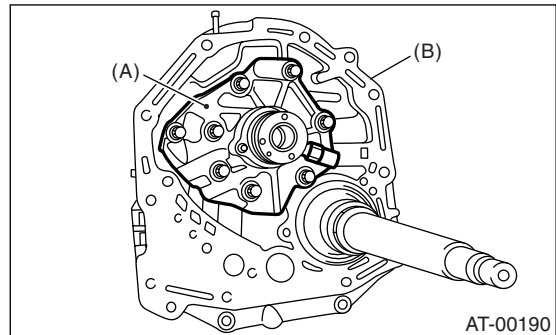
1) Install oil pump rotor assembly to oil pump housing.



- (A) Inner rotor
- (B) Outer rotor

2) Align both pivots with the pivot holes of the cover, and install the oil pump cover being careful not to apply undue force to the pivots.

**Tightening torque:**  
**25 N·m (2.5 kgf-m, 18.4 ft-lb)**



- (A) Oil pump cover
- (B) Oil pump housing

3) After assembling, turn the oil pump shaft to check for smooth rotation of the rotor.

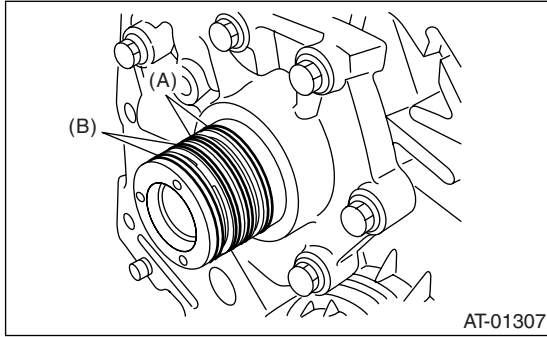
4) Install the oil seal retainer and new seal rings. After adjusting the drive pinion backlash and tooth

# Oil Pump Housing

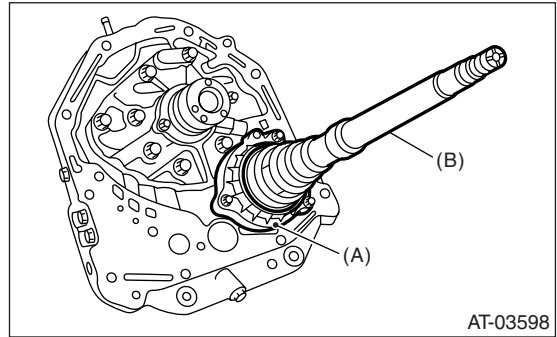
## AUTOMATIC TRANSMISSION

contact. <Ref. to 4AT-95, ADJUSTMENT, Oil Pump Housing.>

**Tightening torque:**  
**7 N·m (0.7 kgf-m, 5.1 ft-lb)**



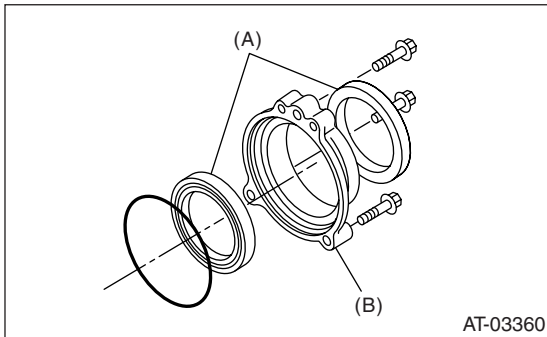
- (A) Seal rings (Black)
- (B) Seal rings (Brown)



- (A) Oil seal retainer
- (B) Drive pinion shaft

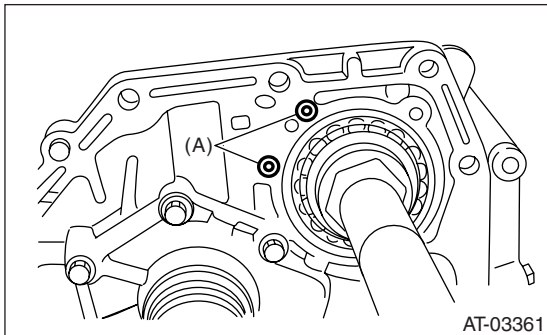
## 2. OIL SEAL RETAINER

1) Install two new oil seals to the oil seal retainer in proper position using ST.  
ST 499247300 INSTALLER



- (A) Oil seal
- (B) Oil seal retainer

2) Install a new O-ring to the oil seal retainer using vaseline. Install the seal to oil pump housing bore.



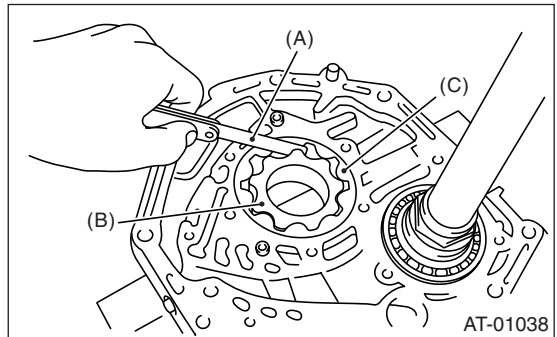
- (A) O-ring

3) Install the oil seal and secure it using three bolts being careful not to damage oil seal lip.

## E: INSPECTION

- 1) Check seal ring and O-ring oil seal for breaks or damage.
- 2) Check other parts for dents or abnormalities.
- 3) Selection of oil pump rotor assembly
  - (1) Tip clearance  
Install inner rotor and outer rotor to oil pump. With rotor gears facing each other, measure crest-to-crest clearance.

**Tip clearance:**  
**0.02 — 0.15 mm (0.0008 — 0.0059 in)**

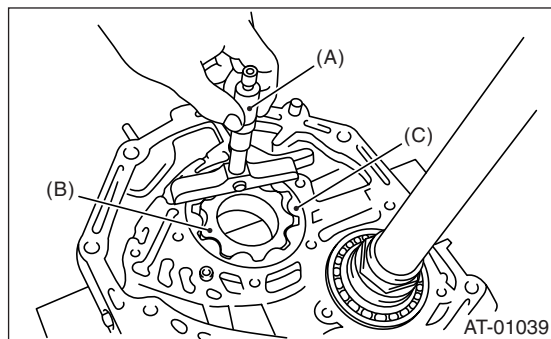


- (A) Thickness gauge
- (B) Inner rotor
- (C) Outer rotor

(2) Side clearance  
Set a depth gauge to oil pump housing, then measure oil pump housing-to-rotor clearances.

**Side clearance:**

**0.02 — 0.04 mm (0.0008 — 0.0016 in)**



- (A) Depth gauge
- (B) Inner rotor
- (C) Outer rotor

(3) If depth and/or side clearances are outside specifications, replace oil pump rotor assembly.

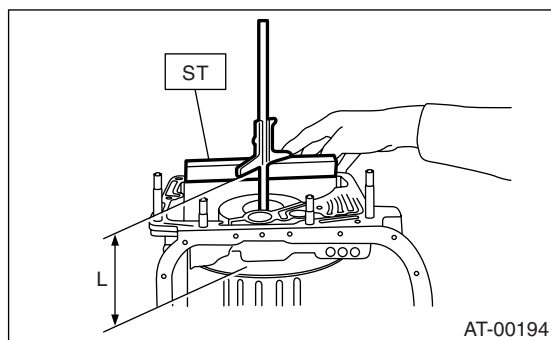
| Oil pump rotor assembly |                                 |
|-------------------------|---------------------------------|
| Part No.                | Thickness mm (in)               |
| 15008AA060              | 11.37 — 11.38 (0.4476 — 0.4480) |
| 15008AA070              | 11.38 — 11.39 (0.4480 — 0.4484) |
| 15008AA080              | 11.39 — 11.40 (0.4484 — 0.4488) |

Measure the total end play and adjust to within specifications. <Ref. to 4AT-95, ADJUSTMENT, Oil Pump Housing.>

**F: ADJUSTMENT**

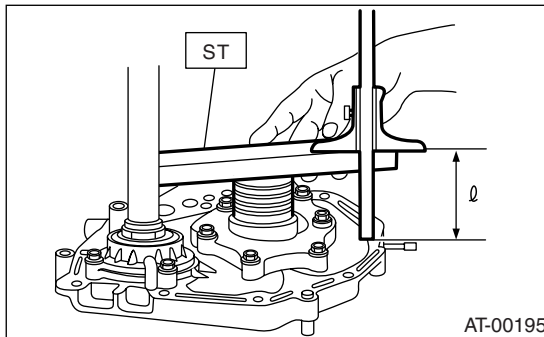
1) Using the ST, measure the distance from the end surface of ST to the recessed portion “L” of the high clutch drum.

ST 398643600 GAUGE



2) Using the ST, measure the distance from the oil pump housing mating surface to the end surface of ST.

ST 398643600 GAUGE

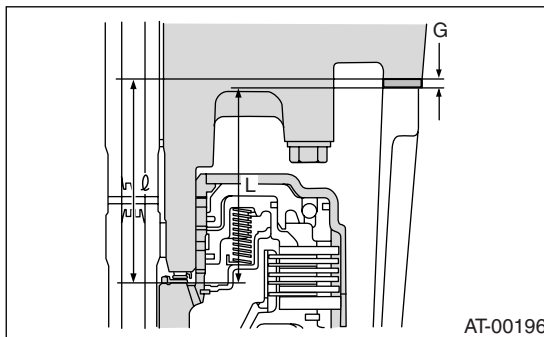


**3) Calculation of total end play**

Select suitable bearing race from among those listed in this table so that clearance C is in the 0.25 to 0.55 mm (0.0098 to 0.0217 in) range.

$$C = (L + G) - l$$

|   |   |
|---|---|
| C | Clearance between concave portion of high clutch and end of clutch drum support |
| L | Length from case mating surface to the end surface of ST                        |
| G | Gasket thickness [0.28 mm (0.0110 in)]  |
| l | Height from housing mating surface to the end surface of ST                     |



| Thrust needle bearing |                   |
|-----------------------|-------------------|
| Part No.              | Thickness mm (in) |
| 806528050             | 4.1 (0.161)       |
| 806528060             | 4.3 (0.169)       |
| 806528070             | 4.5 (0.177)       |
| 806528080             | 4.7 (0.185)       |
| 806528090             | 4.9 (0.193)       |
| 806528100             | 5.1 (0.201)       |

4) After completing end play adjustment, insert the bearing race in the recess of the high clutch. Attach the thrust needle bearing to the oil pump cover with vaseline.

5) After correctly installing the new gasket to the case mating surface, carefully install the oil pump housing assembly. Be careful to avoid hitting the drive pinion against the inside of the case.

6) Install both parts with dowel pins aligned. Make sure no clearance exists at the mating surface.

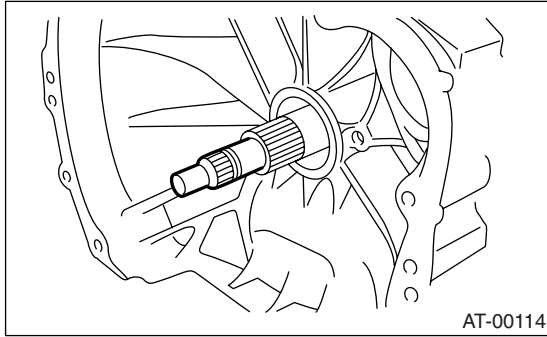
# Drive Pinion Shaft Assembly

## AUTOMATIC TRANSMISSION

### 36. Drive Pinion Shaft Assembly

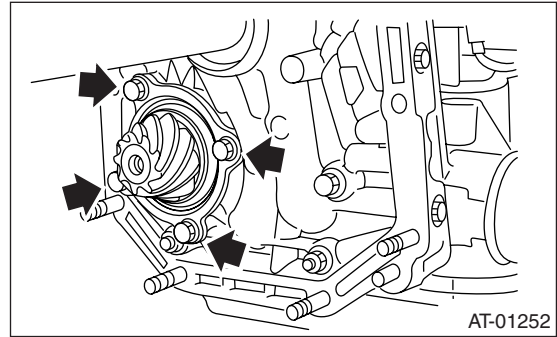
#### A: REMOVAL

- 1) Remove the transmission assembly from vehicle. <Ref. to 4AT-38, REMOVAL, Automatic Transmission Assembly.>
- 2) Extract the torque converter clutch assembly. <Ref. to 4AT-69, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.



- 4) Lift-up lever behind the transmission harness connector and disconnect it from stay.
- 5) Disconnect inhibitor switch connector from stay.
- 6) Disconnect the air breather hose. <Ref. to 4AT-67, REMOVAL, Air Breather Hose.>
- 7) Remove the oil charge pipe. <Ref. to 4AT-68, REMOVAL, Oil Charge Pipe.>
- 8) Remove the oil cooler inlet and outlet pipes. <Ref. to 4AT-65, REMOVAL, ATF Cooler Pipe and Hose.>
- 9) Separation of converter case and transmission case sections <Ref. to 4AT-89, REMOVAL, Converter Case.>
- 10) Separate transmission case and extension case sections. <Ref. to 4AT-70, REMOVAL, Extension Case.>
- 11) Remove the reduction drive gear. (MP-T model) <Ref. to 4AT-84, REMOVAL, Reduction Drive Gear.>
- 12) Remove the center differential carrier. (VTD model) <Ref. to 4AT-86, REMOVAL, Center Differential Carrier.>
- 13) Remove the reduction driven gear. <Ref. to 4AT-82, REMOVAL, Reduction Driven Gear.>

- 14) Remove the drive pinion shaft mounting bolt and remove the drive shaft assembly from oil pump housing.



#### B: INSTALLATION

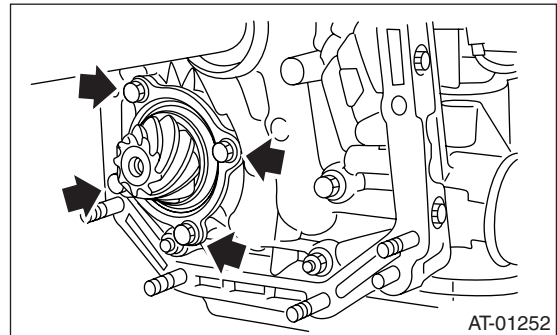
- 1) Assemble the drive pinion assembly to the oil pump housing.

#### NOTE:

- Pay attention not to bend the shim.
- Pay attention not to press the pinion into housing bore.

#### Tightening torque:

**40 N·m (4.1 kgf-m, 29.5 ft-lb)**



- 2) Combine the torque converter case with the transmission case. <Ref. to 4AT-89, INSTALLATION, Converter Case.>
- 3) Install the reduction driven gear. <Ref. to 4AT-82, INSTALLATION, Reduction Driven Gear.>
- 4) Install the reduction drive gear. (MP-T model) <Ref. to 4AT-84, INSTALLATION, Reduction Drive Gear.>
- 5) Install the center differential carrier. (VTD model) <Ref. to 4AT-86, INSTALLATION, Center Differential Carrier.>
- 6) Join transmission case and extension case. Install rear vehicle speed sensor. <Ref. to 4AT-70, INSTALLATION, Extension Case.>
- 7) Insert inhibitor switch and transmission connector into stay.
- 8) Install the oil cooler inlet and outlet pipes. <Ref. to 4AT-65, INSTALLATION, ATF Cooler Pipe and Hose.>
- 9) Install the oil charge pipe with O-ring.

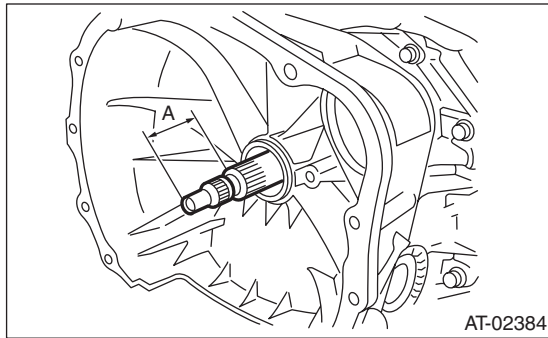


# Drive Pinion Shaft Assembly

AUTOMATIC TRANSMISSION

10) Insert the input shaft while rotating it lightly by hand, and then check the protrusion amount.

**Normal protrusion amount A:**  
**50 — 55 mm (1.97 — 2.17 in)**



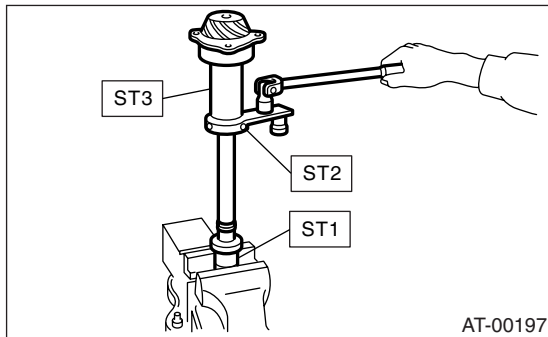
11) Install the torque converter clutch assembly.  
<Ref. to 4AT-69, INSTALLATION, Torque Converter Clutch Assembly.>

12) Install the transmission assembly to vehicle.  
<Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

## C: DISASSEMBLY

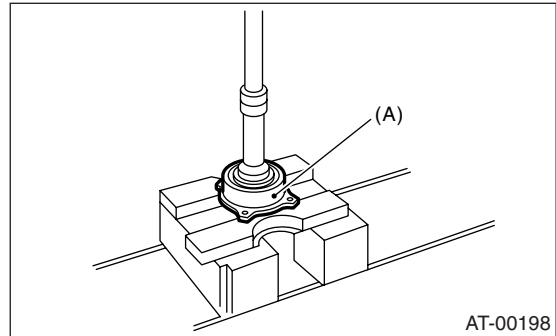
1) Straighten the staked portion of the lock nut, and remove the lock nut while locking the rear spline portion of the shaft with ST1 and ST2. Then pull off the drive pinion collar.

ST1 498937110 HOLDER  
ST2 499787700 WRENCH  
ST3 499787500 ADAPTER



2) Remove the O-ring.

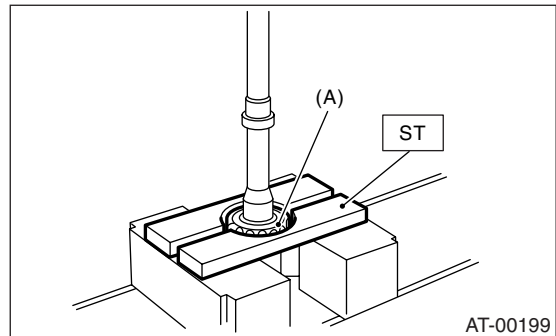
3) Using a press, separate the rear roller bearing and outer race from the shaft.



(A) Outer race

4) Using a press and ST, separate the front roller bearing from the shaft.

ST 498517000 REPLACER

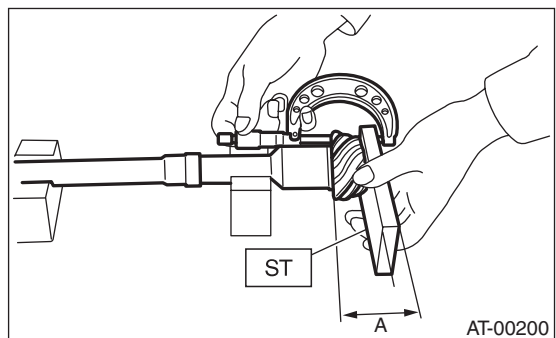


(A) Front roller bearing

## D: ASSEMBLY

1) Measure dimension "A" of the drive pinion shaft.

ST 398643600 GAUGE



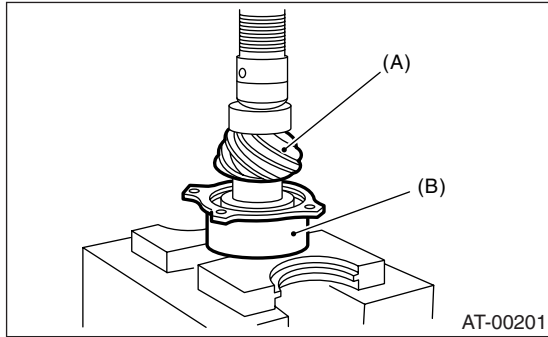
2) Using a press, force-fit a new roller bearing in position.

# Drive Pinion Shaft Assembly

## AUTOMATIC TRANSMISSION

### NOTE:

If too much pressure is applied, the roller bearing will not turn easily.



- (A) Drive pinion shaft
- (B) Roller bearing

3) After fitting a new O-ring to the shaft, attach the drive pinion collar to the shaft.

4) Install the lock washer to drive pinion shaft in proper direction.

5) Tighten a new lock nut with ST1, ST2 and ST3. Calculate lock washer and lock nut specifications using the following formula.

$$T2 = L2 / (L1 + L2) \times T1$$

T1: 116 N·m (11.8 kgf·m, 85.3 ft·lb)

[Required torque setting]

T2: Tightening torque

L1: ST2 length 0.072 m (2.83 in)

L2: Torque wrench length

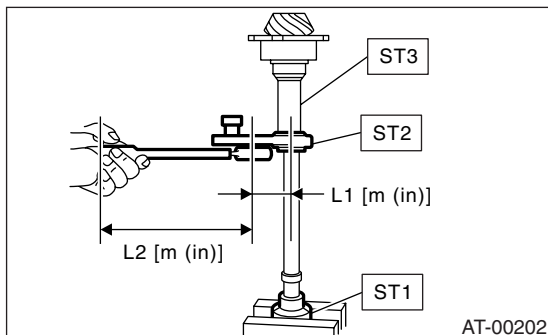
Example:

| Torque wrench length<br>m (in) | Tightening torque<br>N·m (kgf·m, ft·lb) |
|--------------------------------|---|
| 0.4 (15.75)                    | 98 (10.0, 72)                           |
| 0.45 (17.72)                   | 100 (10.2, 73.8)                        |
| 0.5 (19.69)                    | 101 (10.3, 74.5)                        |
| 0.55 (21.65)                   | 102 (10.4, 75)                          |

- ST1 498937110 HOLDER
- ST2 499787700 WRENCH
- ST3 499787500 ADAPTER

### NOTE:

Install ST2 to torque wrench as straight as possible.



6) Measure the starting torque of the bearing. Make sure the starting torque is within the specified range. If out of the allowable range, replace the roller bearing.

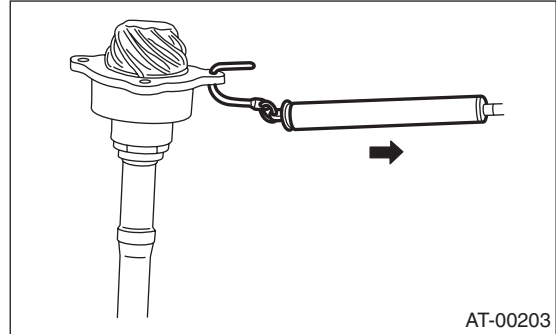
### Starting torque:

#### MP-T model

7.6 — 38.1 N (0.776 — 3.88 kgf, 1.7 — 8.6 lbf)

#### VTD model

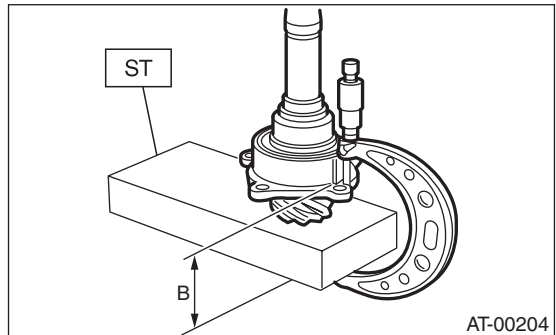
6.8 — 47.5 N (0.69 — 4.84 kgf, 1.52 — 10.67 lbf)



7) Stake the lock nut securely at two places.

8) Measure dimension "B" of the drive pinion shaft.

ST 398643600 GAUGE



9) The thickness "t" (mm) of the drive pinion shim.

$$t = 6.5 \pm 0.0625 - (B - A)$$

10) Select three or less shims from following table.

| Available drive pinion shims |                   |
|------------------------------|-------------------|
| Part No.                     | Thickness mm (in) |
| 31451AA050                   | 0.150 (0.0059)    |
| 31451AA060                   | 0.175 (0.0069)    |
| 31451AA070                   | 0.200 (0.0079)    |
| 31451AA080                   | 0.225 (0.0089)    |
| 31451AA090                   | 0.250 (0.0098)    |
| 31451AA100                   | 0.275 (0.0108)    |

## E: INSPECTION

- Make sure that all component parts are free of harmful cuts, gouges, and other faults.
- Adjust the teeth alignment. <Ref. to 4AT-99, ADJUSTMENT, Drive Pinion Shaft Assembly.>

## F: ADJUSTMENT

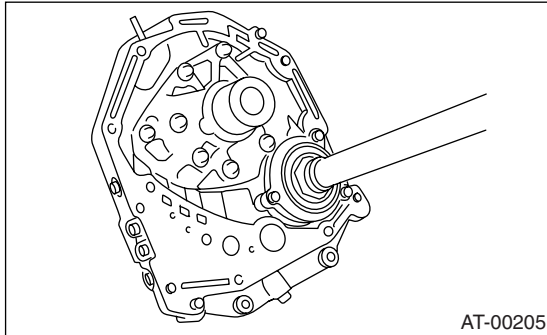
- 1) Thoroughly remove the liquid gasket from the case mating surface beforehand.
- 2) Install the oil pump housing assembly to the converter case, and secure evenly by tightening four bolts.

**NOTE:**

Use an old gasket or an aluminum washer so as not to damage the mating surface of the housing.

**Tightening torque:**

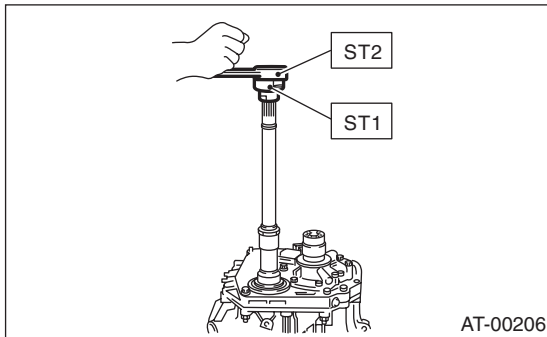
**41 N·m (4.2 kgf-m, 30.2 ft-lb)**



AT-00205

- 3) Rotate the drive pinion several times with ST1 and ST2.

ST1 498937110 HOLDER  
ST2 499787700 WRENCH



AT-00206

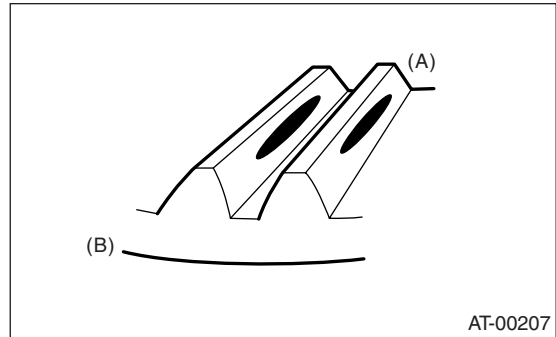
- 4) Adjust the backlash between drive pinion and hypoid driven gear. <Ref. to 4AT-105, ADJUSTMENT, Front Differential Assembly.>

5) Apply red lead evenly to the surfaces of three or four teeth of the hypoid driven gear. Rotate the drive pinion in the forward and reverse directions several times. Then remove the oil pump housing, and check the tooth contact pattern.

If tooth contact is improper, readjust the backlash or shim thickness. <Ref. to 4AT-105, ADJUSTMENT, Front Differential Assembly.>

- Tooth contact

**Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]**



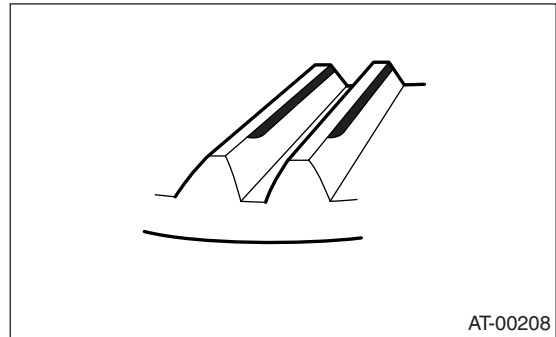
AT-00207

(A) Toe side

(B) Heel side

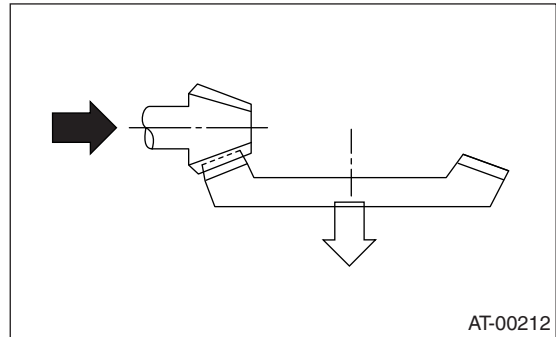
- Face contact

**Checking item: Backlash is too large.**  
Contact pattern



AT-00208

**Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.**



AT-00212



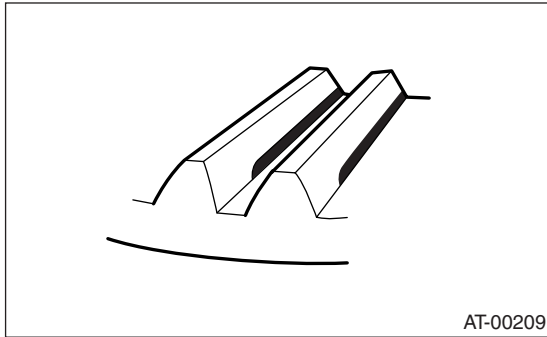
# Drive Pinion Shaft Assembly

## AUTOMATIC TRANSMISSION

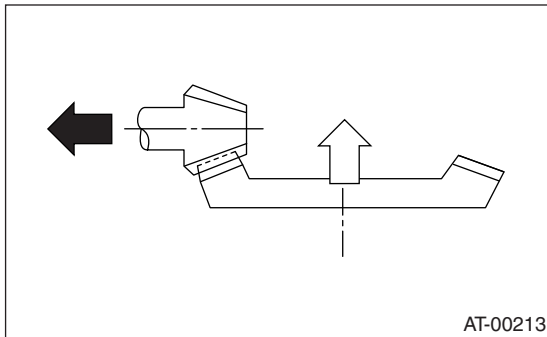
- Flank contact

**Checking item: Backlash is too small.**

Contact pattern



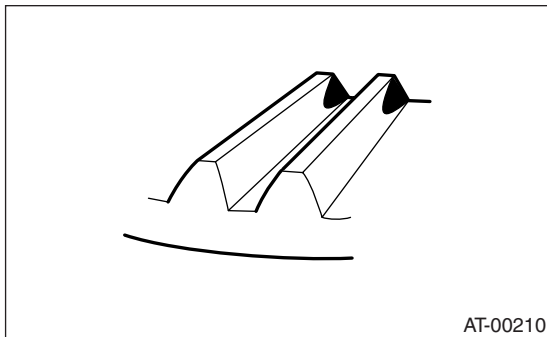
Corrective action: Reduce thickness of drive pinion height adjusting washer in order to move drive pinion away from hypoid driven gear.



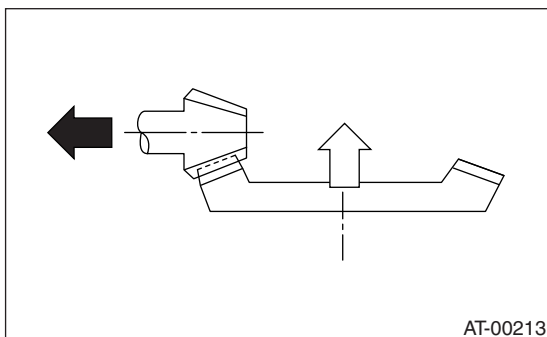
- Toe contact (Inside end contact)

**Checking item: Contact area is small.**

Contact pattern



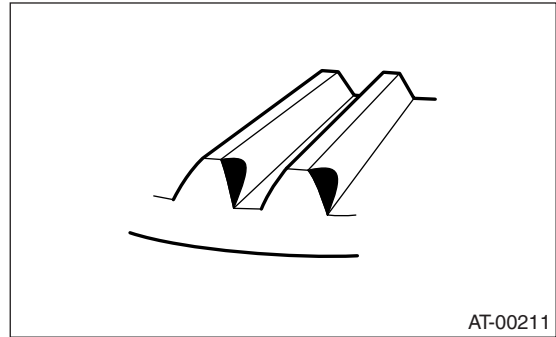
Corrective action: Decrease thickness of drive pinion height adjusting washer in order to move drive pinion away from hypoid driven gear.



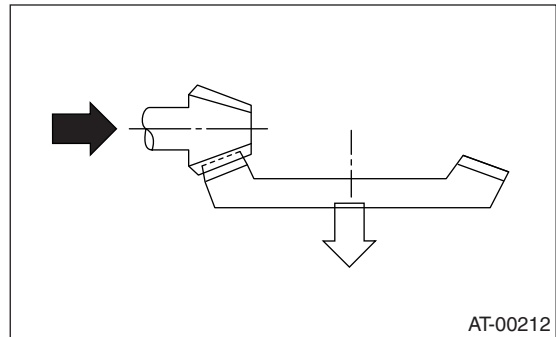
- Heel contact (Outside end contact)

**Checking item: Contact area is small.**

Contact pattern



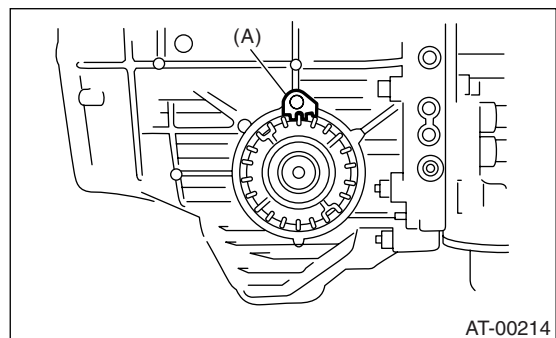
Corrective action: Increase thickness of drive pinion height adjusting washer in order to move drive pinion close to hypoid driven gear.



6) If tooth contact is correct, mark the retainer position and loosen it. After fitting a new O-ring and oil seal, screw in the retainer to the marked position. Then tighten the lock plate to the specified torque.

**Tightening torque:**

**25 N·m (2.5 kgf-m, 18.4 ft-lb)**

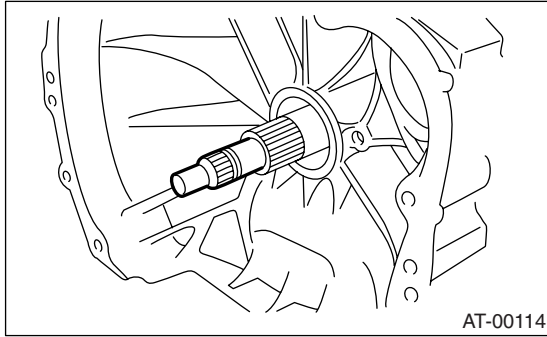


(A) Lock plate

## 37. Front Differential Assembly

### A: REMOVAL

- 1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-38, REMOVAL, Automatic Transmission Assembly.>
- 2) Extract the torque converter clutch assembly. <Ref. to 4AT-69, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.



- 4) Lift-up lever behind the transmission harness connector and disconnect it from stay.
- 5) Disconnect inhibitor switch from stay.
- 6) Remove the oil charge pipe. <Ref. to 4AT-68, REMOVAL, Oil Charge Pipe.>
- 7) Remove the oil cooler inlet and outlet pipes. <Ref. to 4AT-65, REMOVAL, ATF Cooler Pipe and Hose.>
- 8) Separation of converter case and transmission case. <Ref. to 4AT-89, REMOVAL, Converter Case.>
- 9) Remove the seal pipe.
- 10) Remove the differential side retainer with ST.

#### NOTE:

Hold the differential case assembly by hand to avoid damaging retainer mounting hole of the converter case.

ST 499787000 WRENCH ASSY

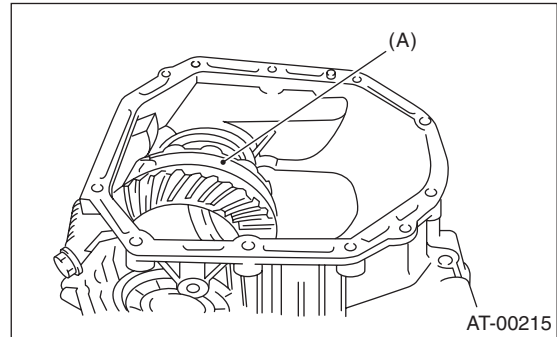
- 11) Remove the differential assembly without damaging installation part of retainer.

### B: INSTALLATION

- 1) Install the differential assembly to the torque converter clutch case.

#### CAUTION:

**Do not damage the inside of the torque converter clutch case (particularly, the differential side retainer contact surface).**

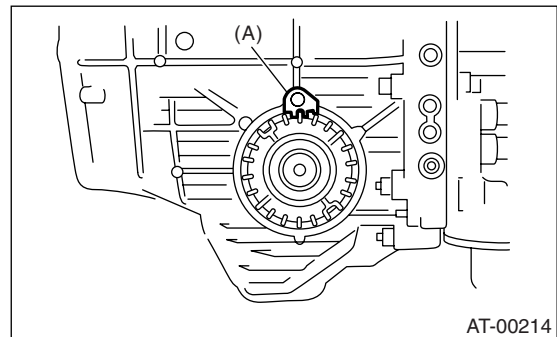


(A) Differential ASSY

- 2) Install the O-rings from left and right side retainer.
- 3) Using ST, install the side retainers. <Ref. to 4AT-101, REMOVAL, Front Differential Assembly.>  
ST 499787000 WRENCH ASSY
- 4) Adjust the front differential backlash. <Ref. to 4AT-105, ADJUSTMENT, Front Differential Assembly.>
- 5) Install the lock plate.

#### Tightening torque:

**25 N·m (2.5 kgf·m, 18.4 ft·lb)**

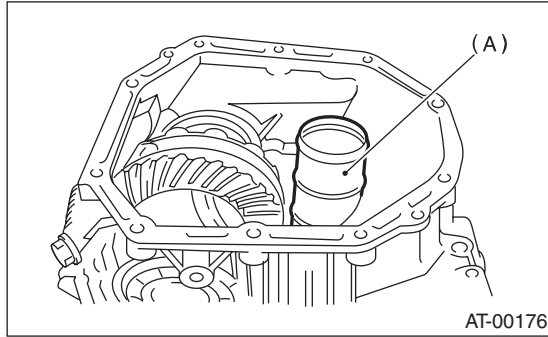


(A) Lock plate

# Front Differential Assembly

## AUTOMATIC TRANSMISSION

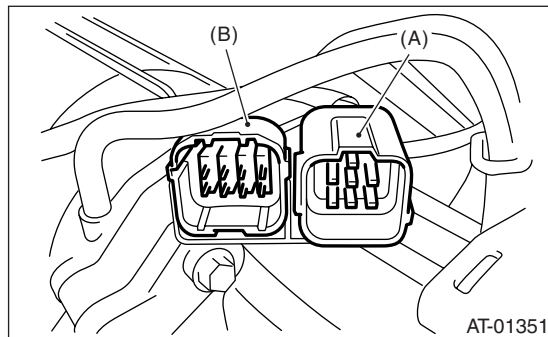
6) Install the new seal pipe to the converter case.



(A) Seal pipe

7) Install the converter case to transmission case. <Ref. to 4AT-89, INSTALLATION, Converter Case.>

8) Insert inhibitor switch and transmission connector into stay.



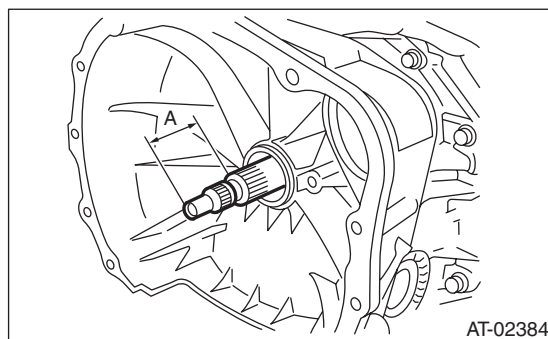
(A) Transmission harness  
(B) Inhibitor switch harness

9) Install oil cooler pipes. <Ref. to 4AT-65, INSTALLATION, ATF Cooler Pipe and Hose.>

10) Install the oil charge pipe with O-ring. <Ref. to 4AT-68, INSTALLATION, Oil Charge Pipe.>

11) Insert the input shaft while rotating it lightly by hand, and then check the protrusion amount.

**Normal protrusion amount A:**  
**50 — 55 mm (1.97 — 2.17 in)**



12) Install the torque converter clutch assembly. <Ref. to 4AT-69, INSTALLATION, Torque Converter Clutch Assembly.>

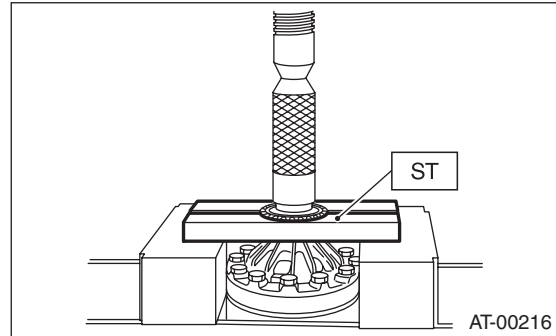
13) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

## C: DISASSEMBLY

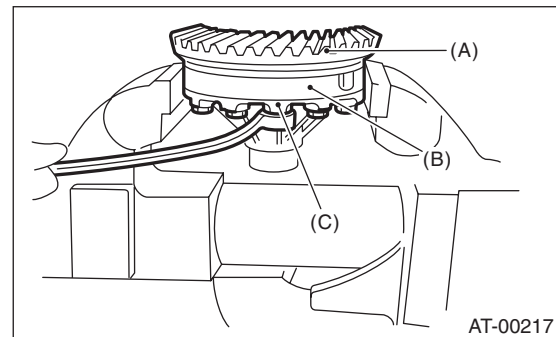
### 1. DIFFERENTIAL CASE ASSEMBLY

1) Using a press and ST, remove the taper roller bearing.

ST 498077000 REMOVER

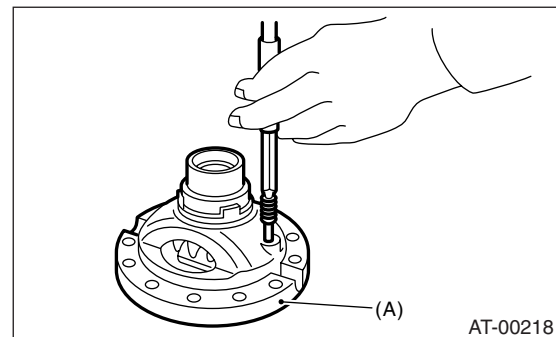


2) Secure the case in a vise and remove the hypoid driven gear tightening bolts, then separate the hypoid driven gear, case (RH) and case (LH).



(A) Hypoid driven gear  
(B) Differential case (RH)  
(C) Differential case (LH)

3) Pull out the straight pin and shaft, and remove the differential bevel gear, washer, and differential bevel pinion.



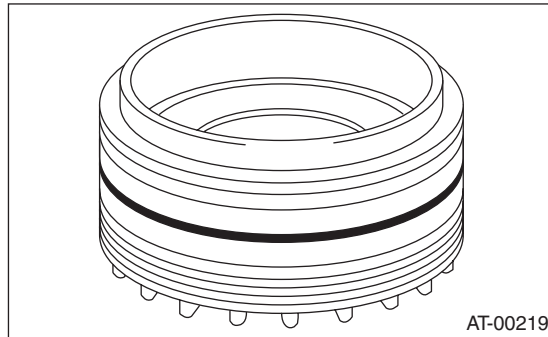
(A) Differential case (RH)

## 2. SIDE RETAINER

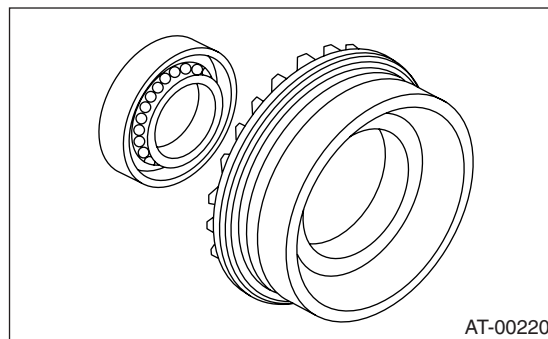
**NOTE:**

After adjusting the drive pinion backlash and tooth contact, remove and install the oil seal and O-ring.

1) Remove O-ring.

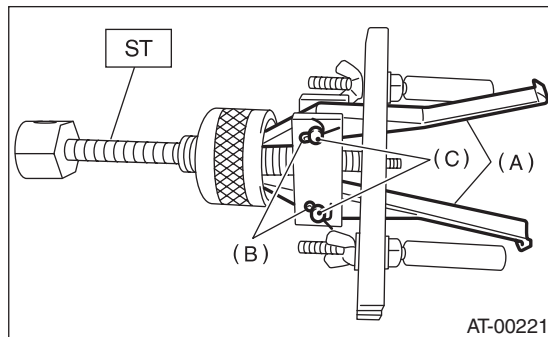


2) Remove oil seal.



3) Take out either split pin, remove claw.

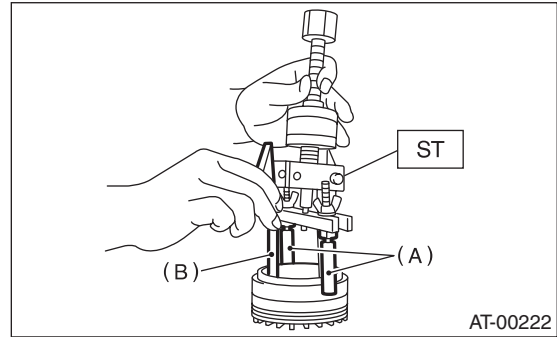
ST 398527700 PULLER ASSY



- (A) Claw
- (B) Split pin
- (C) Pin

4) Securely attach two claws to outer race, set ST to side retainer.

ST 398527700 PULLER ASSY



- (A) Shaft
- (B) Claw

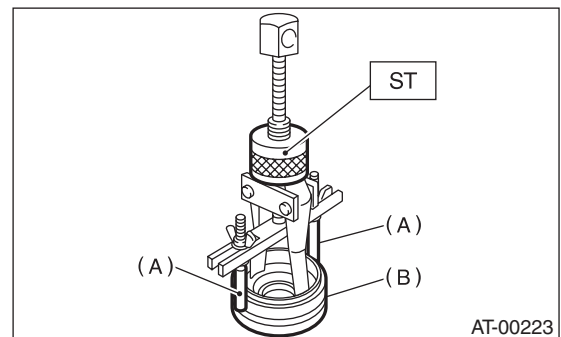
5) Return removed claw to the original position, and install pin and split pin.

6) Hold the shaft of ST to avoid removing from side retainer, and then remove the bearing outer race.

ST 398527700 PULLER ASSY

**NOTE:**

Replace bearing inner and outer races as a single unit.



- (A) Shaft
- (B) Side retainer

## D: ASSEMBLY

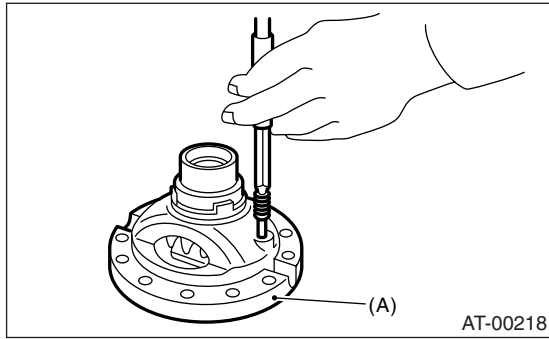
### 1. DIFFERENTIAL CASE ASSEMBLY

1) Install the washer, differential bevel gear and differential bevel pinion in the differential case (RH). Insert the pinion shaft.

# Front Differential Assembly

AUTOMATIC TRANSMISSION

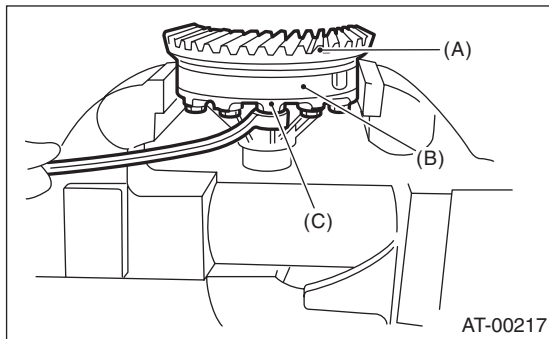
2) Install straight pin from reverse direction.



(A) Differential case (RH)

3) Install the washer and differential bevel gear to the differential case (LH). Then put the case over the differential case (RH), and connect both cases.  
4) Install the hypoid driven gear and secure by tightening the bolt.

**Standard tightening torque:**  
**62 N·m (6.3 kgf·m, 45.7 ft·lb)**



(A) Hypoid driven gear  
(B) Differential case (RH)  
(C) Differential case (LH)

5) Measurement of backlash (Selection of washer)  
(1) Install the genuine axle shaft to differential case.

Part No. 38415AA070 AXLE SHAFT

(2) Measure the gear backlash with ST1 and ST2, and insert ST2 through the access window of the case.

ST1 498247001 MAGNET BASE

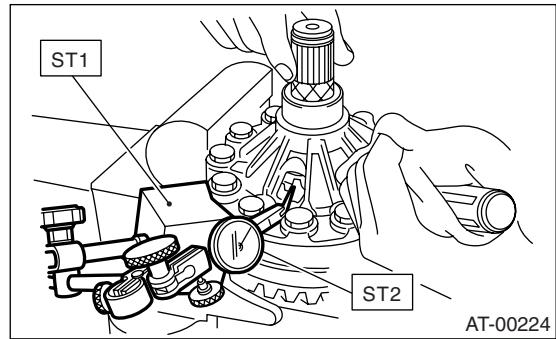
ST2 498247100 DIAL GAUGE

NOTE:

- Measure the backlash by applying a pinion tooth between two bevel gear teeth.
- Fix bevel pinion gear in place with a screwdriver or similar tool when measuring.

**Standard value:**

**0.13 — 0.18 mm (0.0051 — 0.0071 in)**

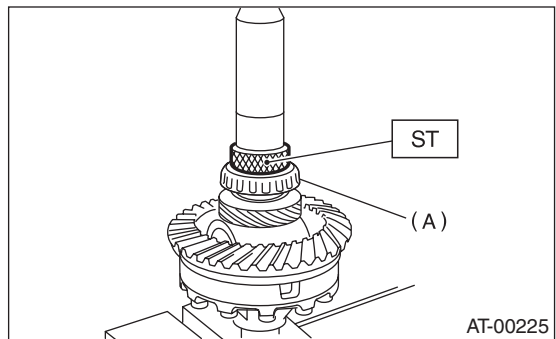


(3) If backlash is not as specified, select a washer from the table below.

| Washer    |                   |
|-----------|-------------------|
| Part No.  | Thickness mm (in) |
| 803038021 | 0.95 (0.037)      |
| 803038022 | 1.00 (0.039)      |
| 803038023 | 1.05 (0.041)      |

6) Using ST, install taper roller bearing.

ST 398437700 DRIFT



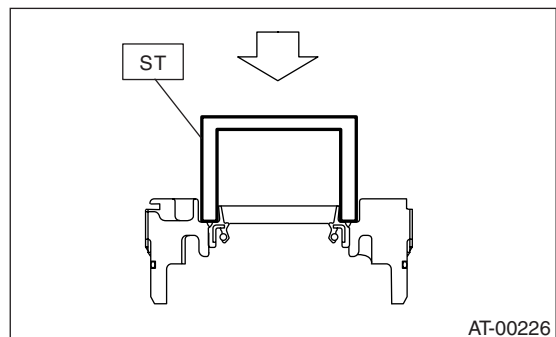
(A) Taper roller bearing

## 2. SIDE RETAINER

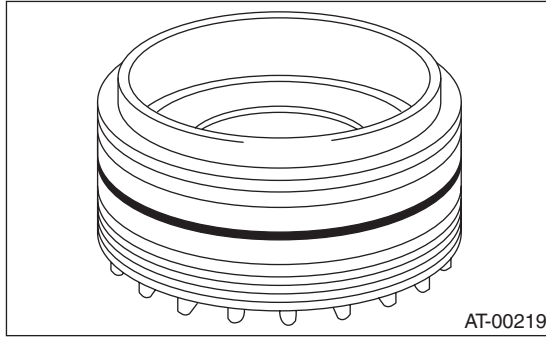
1) Install bearing outer race to side retainer.

2) Install a new oil seal using the ST and hammer.

ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER



3) Apply gear oil to new O-ring and install it.



## E: INSPECTION

- Check each component for harmful cuts, damage and other faults.
- Measure the backlash and adjust to within specifications.

<Ref. to 4AT-105, ADJUSTMENT, Front Differential Assembly.>

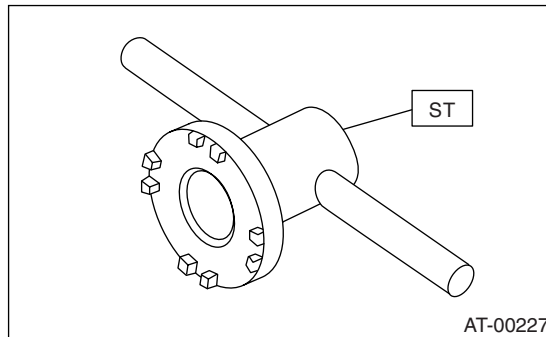
## F: ADJUSTMENT

1) Using ST, screw in the retainer until light contact is felt.

### NOTE:

Screw in the RH side slightly deeper than the LH side.

ST 499787000 WRENCH ASSY



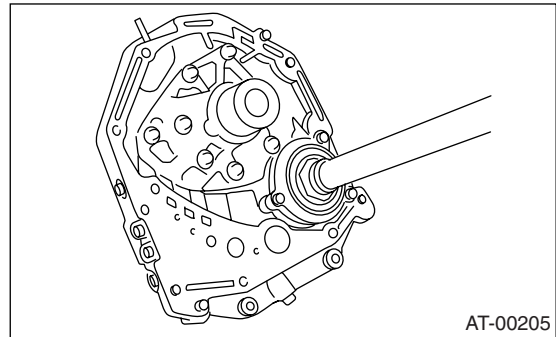
- 2) Remove the oil pump housing.
- 3) Thoroughly remove the liquid gasket from the case mating surface beforehand.
- 4) Install the oil pump housing assembly to the converter case, and secure evenly by tightening four bolts.

### NOTE:

Use an old gasket or an aluminum washer so as not to damage the mating surface of the housing.

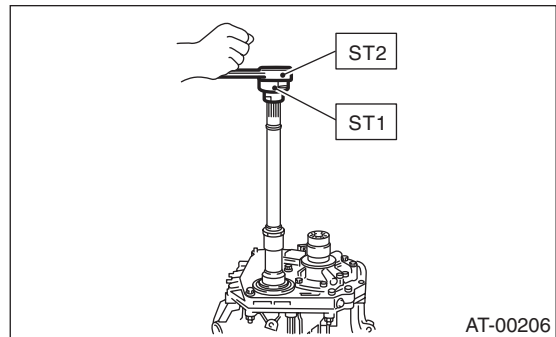
## Tightening torque:

**41 N·m (4.2 kgf-m, 30.2 ft-lb)**

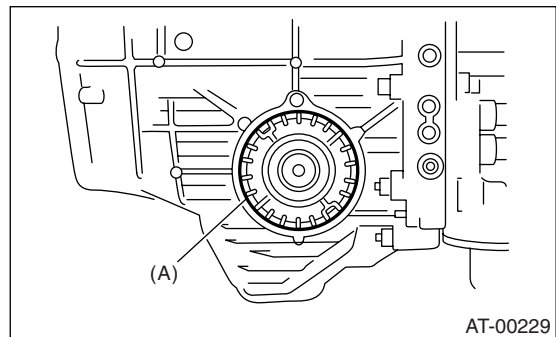


5) Rotate the drive pinion several times with ST1 and ST2.

ST1 498937110 HOLDER  
ST2 499787700 WRENCH



6) Tighten the LH retainer until contact is felt while rotating the shaft. Then loosen the RH retainer. Keep tightening the LH retainer and loosening the RH retainer until the pinion shaft can no longer be turned. This is the "zero" state.



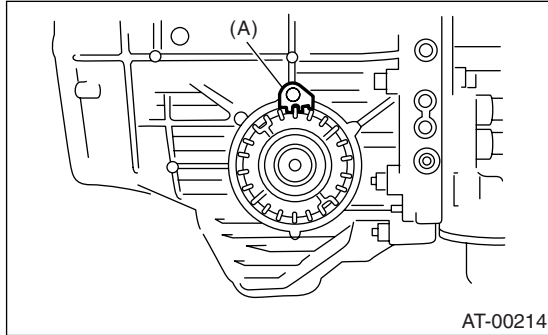
(A) Retainer

# Front Differential Assembly

## AUTOMATIC TRANSMISSION

7) After the “zero” state is established, back off the LH retainer 3 notches and secure it with the lock plate. Then back off the RH retainer and retighten until it stops. Rotate drive pinion a few times. Tighten the RH retainer 1-3/4 notches further. This sets the preload. Finally, secure the retainer with its lock plate.

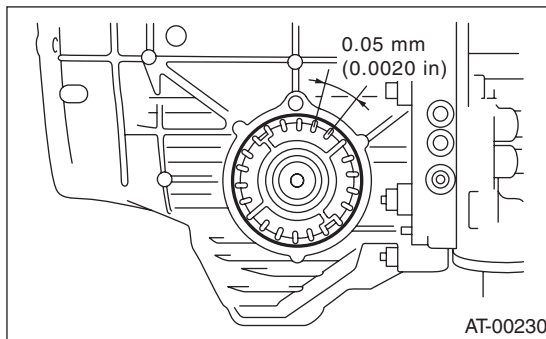
9) Adjust the tooth contact between front differential and drive shaft. <Ref. to 4AT-99, ADJUSTMENT, Drive Pinion Shaft Assembly.>



(A) Lock plate

### NOTE:

Turning the retainer by one tooth changes the backlash about 0.05 mm (0.0020 in).

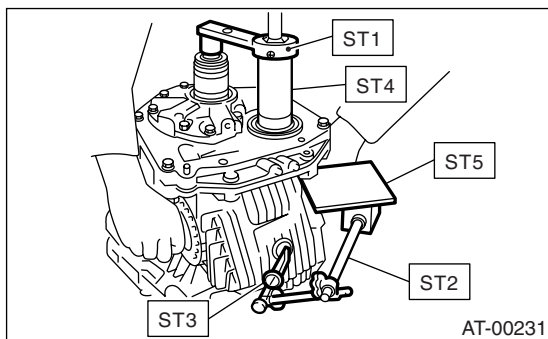


8) Turn the drive pinion several rotations with ST1 and check to see if the backlash is within the standard value with ST2, ST3, ST4 and ST5.

|     |           |             |
|-----|-----------|-------------|
| ST1 | 499787700 | WRENCH      |
| ST2 | 498247001 | MAGNET BASE |
| ST3 | 498247100 | DIAL GAUGE  |
| ST4 | 499787500 | ADAPTER     |
| ST5 | 498255400 | PLATE       |

### **Backlash:**

**0.13 — 0.18 mm (0.0051 — 0.0071 in)**

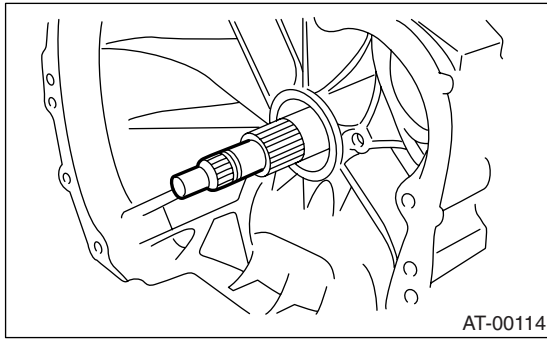




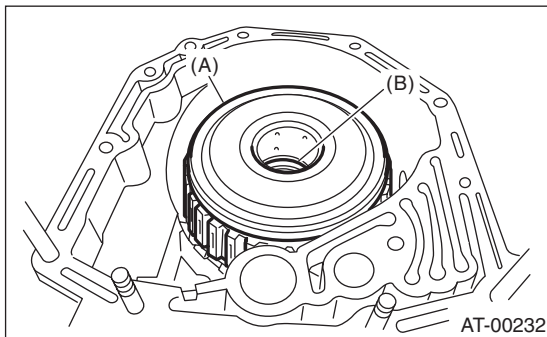
### 38.AT Main Case

#### A: REMOVAL

- 1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-38, REMOVAL, Automatic Transmission Assembly.>
- 2) Extract the torque converter clutch assembly. <Ref. to 4AT-69, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.

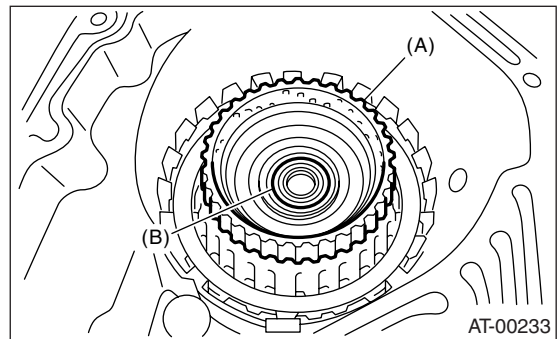


- 4) Lift-up lever behind the transmission harness connector and disconnect it from stay.
- 5) Disconnect inhibitor switch connector from stay.
- 6) Disconnect the air breather hose.
- 7) Remove the oil charge pipe. <Ref. to 4AT-68, REMOVAL, Oil Charge Pipe.>
- 8) Remove the oil cooler inlet and outlet pipes. <Ref. to 4AT-65, REMOVAL, ATF Cooler Pipe and Hose.>
- 9) Separation of converter case and transmission case. <Ref. to 4AT-89, REMOVAL, Converter Case.>
- 10) Remove the oil pump housing. <Ref. to 4AT-91, REMOVAL, Oil Pump Housing.>
- 11) Take out the high clutch, thrust needle bearing and reverse clutch assembly.



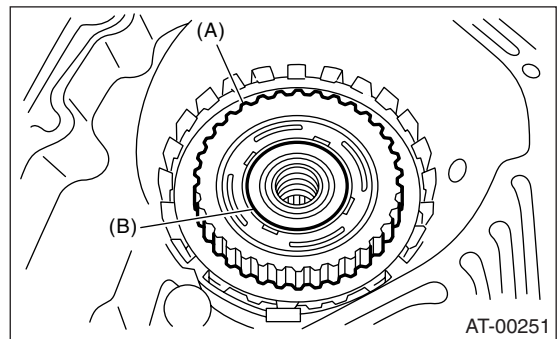
- (A) High clutch and reverse clutch ASSY
- (B) Thrust needle bearing

- 12) Take out the high clutch hub and the thrust bearing.



- (A) High clutch hub
- (B) Thrust needle bearing

- 13) Take out the front sun gear and the thrust bearing.

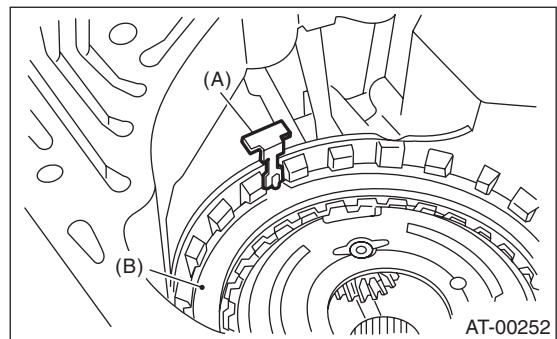


- (A) Front sun gear
- (B) Thrust needle bearing

- 14) Pull out leaf spring without folding.

#### NOTE:

Remove it while pressing down on lower leaf spring.



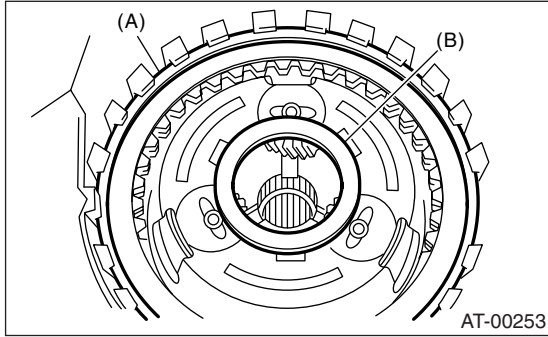
- (A) Leaf spring
- (B) Retaining plate



# AT Main Case

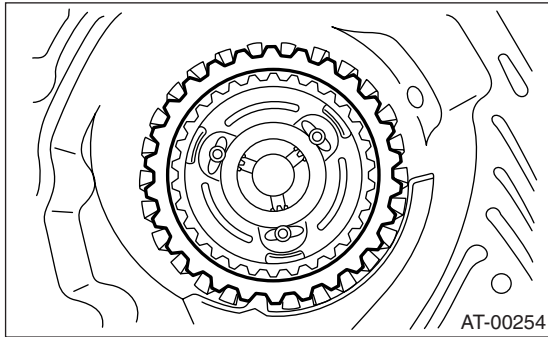
## AUTOMATIC TRANSMISSION

15) Remove snap ring and thrust needle bearing.

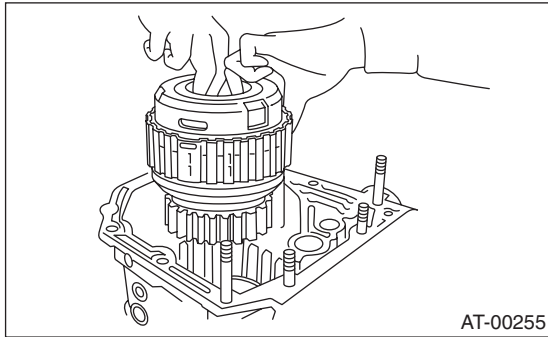


- (A) Snap ring
- (B) Thrust needle bearing

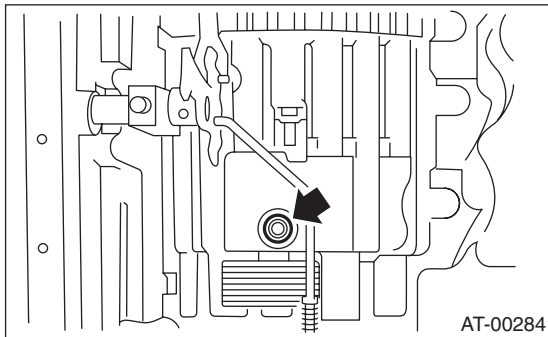
16) Take out retaining plate, drive plate and driven plate of 2-4 brake.



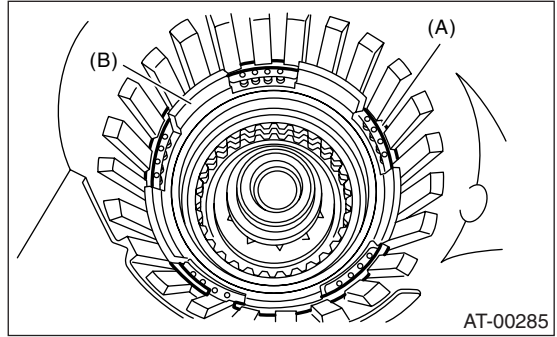
17) Take out the thrust needle bearing, planetary gear assembly and the low clutch assembly.



18) Remove 2-4 brake seal.

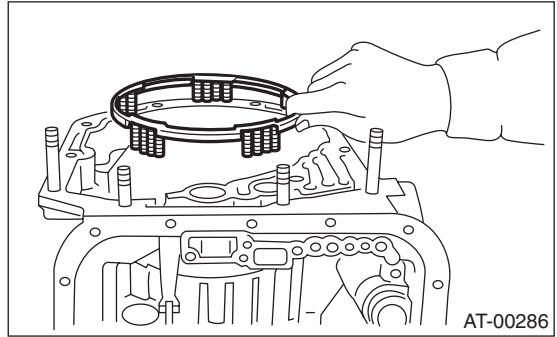


19) Remove snap ring.

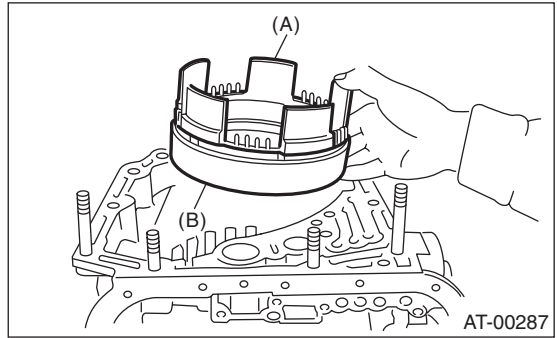


- (A) Snap ring
- (B) 2-4 brake piston

20) Take out 2-4 brake return spring.

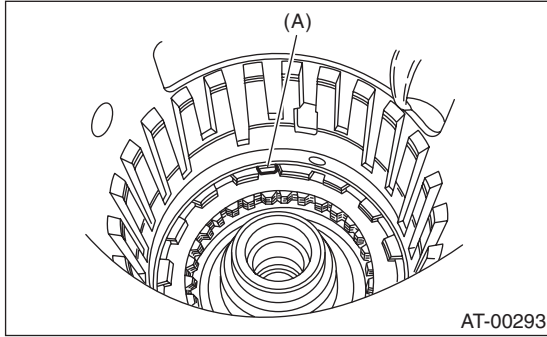


21) Remove the 2-4 brake piston and piston retainer without damaging.



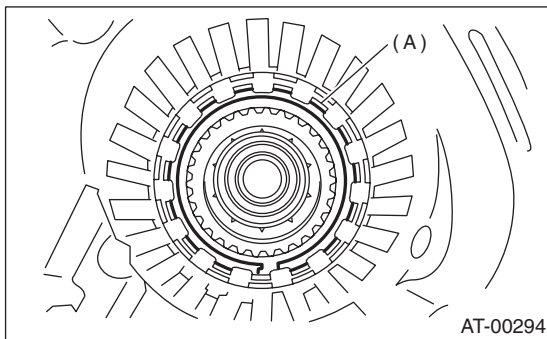
- (A) 2-4 brake piston
- (B) 2-4 brake piston retainer

22) Pull out the leaf spring without folding.



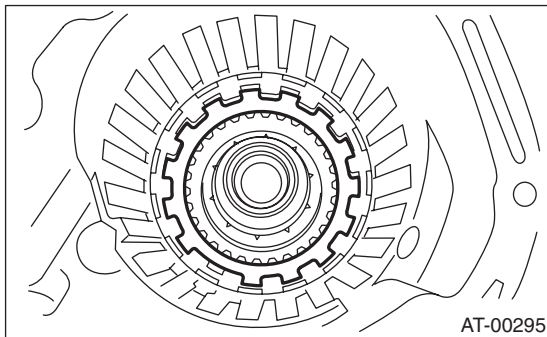
(A) Leaf spring

23) Remove snap ring.

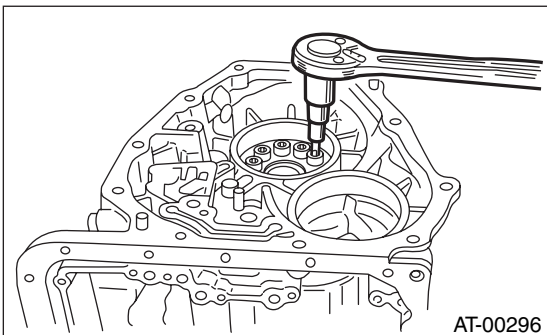


(A) Snap ring

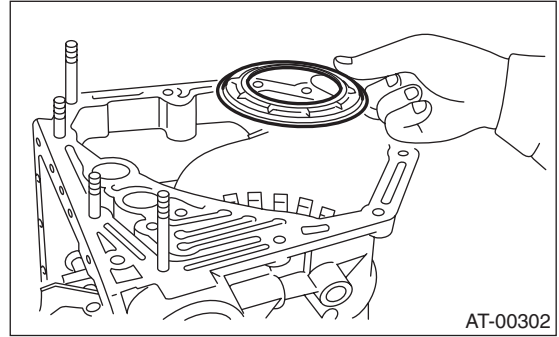
24) Take out retaining plate, drive plate, driven plate and dish plate.



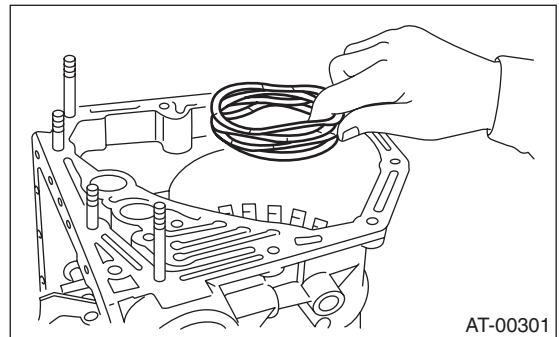
25) Turn the transmission case upside down, and then take out the socket bolts while holding the one-way clutch inner race with hand.



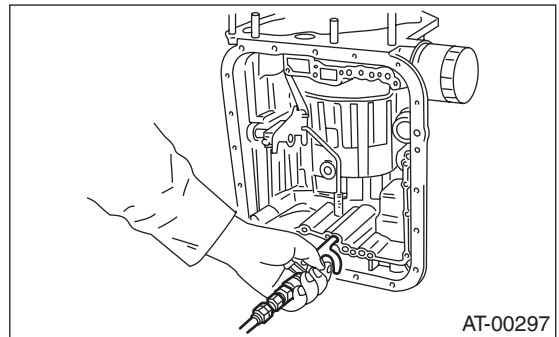
26) Take out the spring retainer.



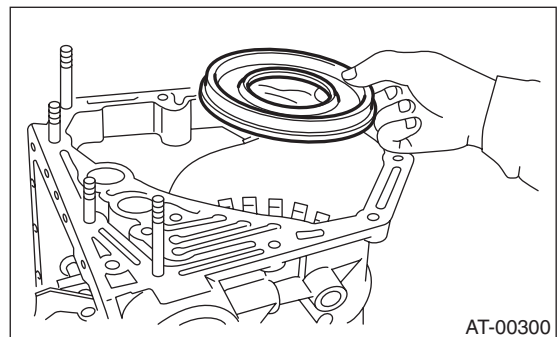
27) Take out the return spring.



28) Apply compressed air.



29) Take out the low & reverse piston.



# AT Main Case

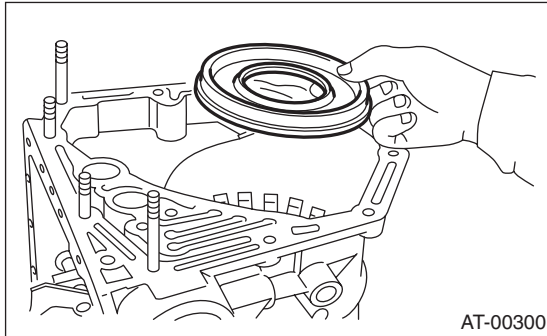
## AUTOMATIC TRANSMISSION

### B: INSTALLATION

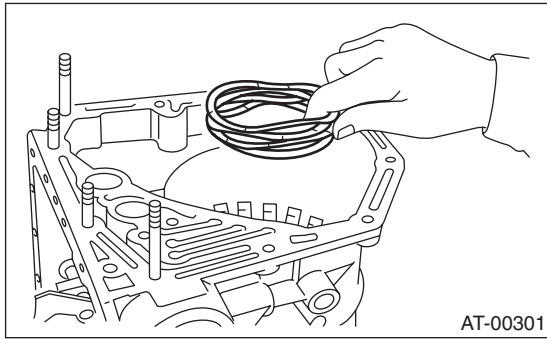
1) Install the low & reverse piston without tilting.

**NOTE:**

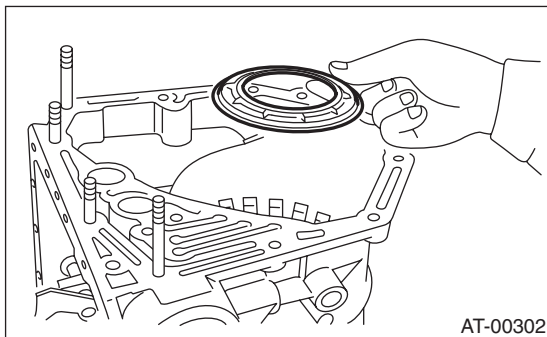
Be careful not to damage the lip seal.



2) Install return spring.



3) Install spring retainer.

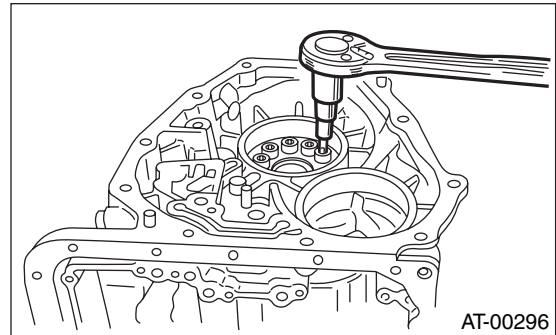


4) Install the one-way clutch inner race, spring retainer and return spring.

5) Tighten socket head bolts evenly from the rear side of the transmission case.

**Tightening torque:**

**25 N·m (2.5 kgf·m, 18.4 ft·lb)**



6) Place the front side of transmission body up.

7) Install thrust needle bearing.

8) Place the dish plate, driven plate, drive plate and retaining plate neatly in this order on surface table.

9) Set the micro gauge to retaining plate, and read its scale. Make more than three measurements at even distance and take the average value.

**NOTE:**

The value, which is read in the gauge at this time, is zero point.

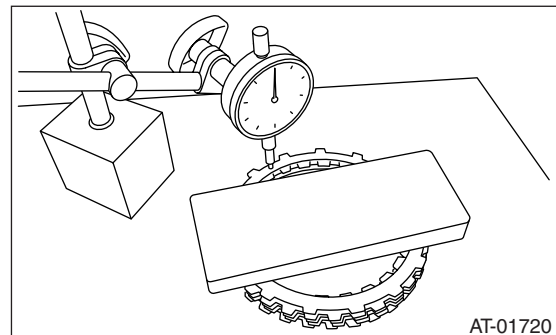
10) Scale and record the weight Z of a flat board which will be put on plates.

**NOTE:**

- Use a stiff flat board which does not bend against load.

- Use a flat board of its weight less than 8.5 kg (18.7 lb).

11) Put the flat board on retaining plate.



12) Using the following formula, calculate N indicated on the push/pull gauge.

$$N = 83 \text{ N (8.5 kgf, 18.7 lbf)} - Z$$

N: Value indicated on push/pull gauge

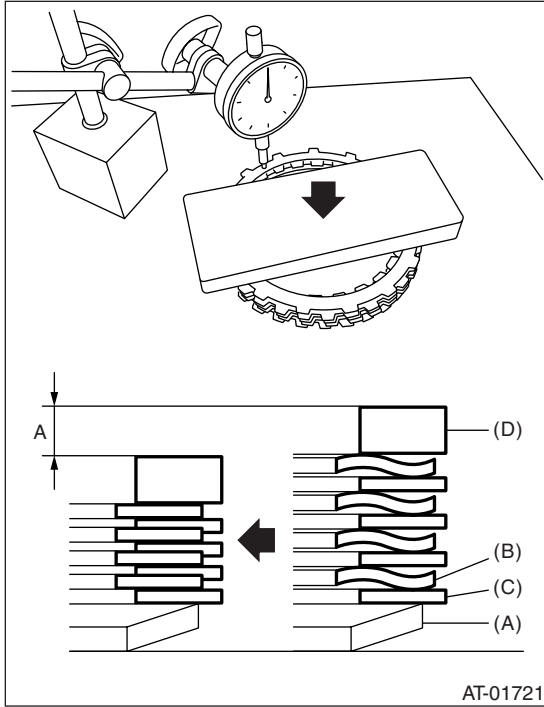
83 N (8.5 kgf, 18.7 lbf): Load applied to clutch plate

Z: Flat board weight

13) Press the center of retaining plate applying force of N with push/pull gauge, and then measure and record the height "A". Make more than three measurements at even distance and take the average value.

**NOTE:**

If three points, measure the height every 120°. If four points, measure the height every 90°.

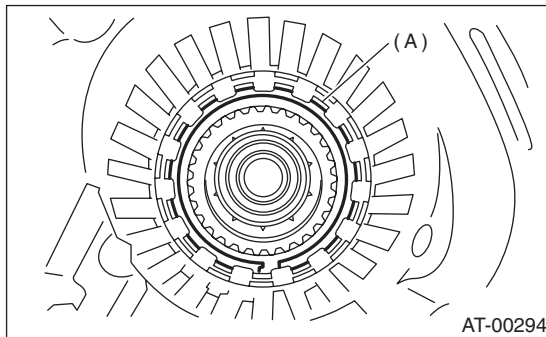


- (A) Dish plate
- (B) Driven plate
- (C) Drive plate
- (D) Retaining plate

14) Installation of the low & reverse brake:  
Install the dish plate, driven plate and retaining plate, and then secure them with snap ring.

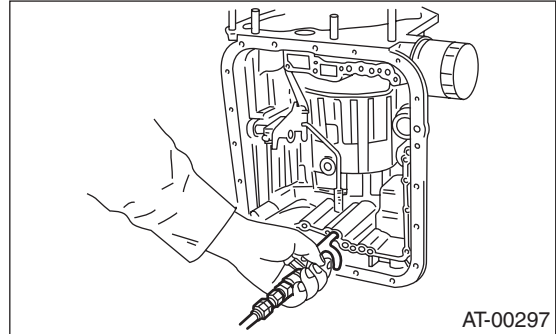
**NOTE:**

Pay attention to the orientation of dish plate.



- (A) Snap ring

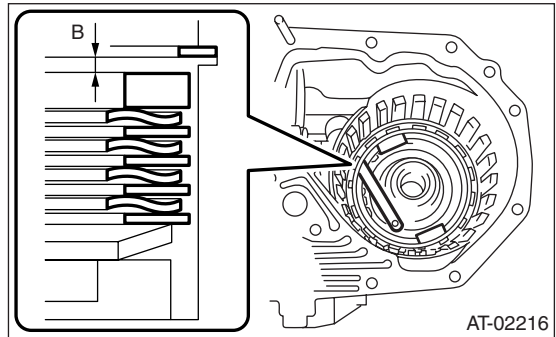
15) Apply compressed air intermittently to check for operation.



16) Place the same thickness of shim on both sides to prevent the plate from tilting, and then measure and record the clearance "B".

**NOTE:**

Do not press the shim downward with excessive force, or else the waveform of drive plates will be broken down.



17) Piston stroke calculation

Calculate with "A" and "B" dimensions which have been recorded before, and if the value exceeds the service limit, replace the drive plate with a new one and adjust it within the specification.

$$T = A + B$$

T: Piston stroke

A: Collapse amount of drive plate

B: Clearance between retaining plate and snap ring

**Non-turbo model**

**Initial standard:**

**2.15 — 2.65 mm (0.073 — 0.093 in)**

**Limit thickness:**

**2.95 mm (0.104 in)**

**Turbo model**

**Initial standard:**

**2.70 — 3.20 mm (0.106 — 0.126 in)**

**Limit thickness:**

**3.90 mm (0.154 in)**

# AT Main Case

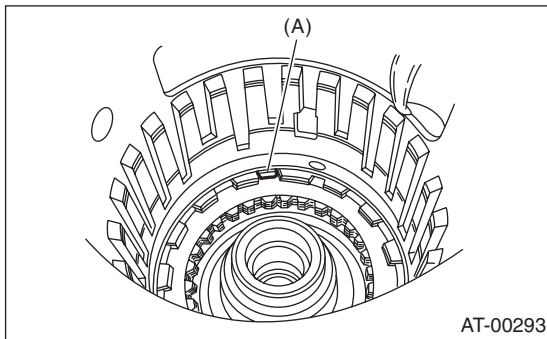
## AUTOMATIC TRANSMISSION

| Retaining plate |                   |
|-----------------|-------------------|
| Part number     | Thickness mm (in) |
| 31667AA420      | 3.8 (0.150)       |
| 31667AA320      | 4.1 (0.161)       |
| 31667AA330      | 4.4 (0.173)       |
| 31667AA340      | 4.7 (0.185)       |
| 31667AA350      | 5.0 (0.197)       |
| 31667AA360      | 5.3 (0.209)       |
| 31667AA370      | 5.6 (0.220)       |
| 31667AA380      | 5.9 (0.232)       |

**NOTE:**

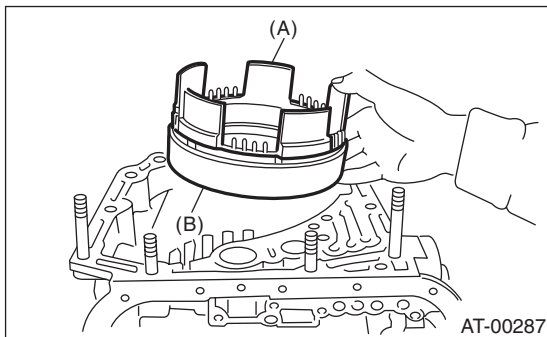
Do not make adjustment unless the drive plate is replaced.

18) Install the low & reverse brake leaf spring.



(A) Leaf spring

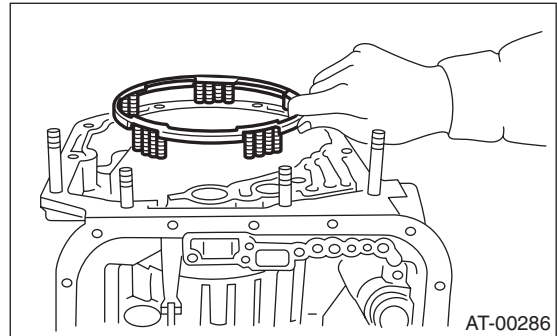
19) Install the 2-4 brake piston and 2-4 brake retainer by aligning hole of 2-4 brake retainer and hole of transmission case.



(A) 2-4 brake piston

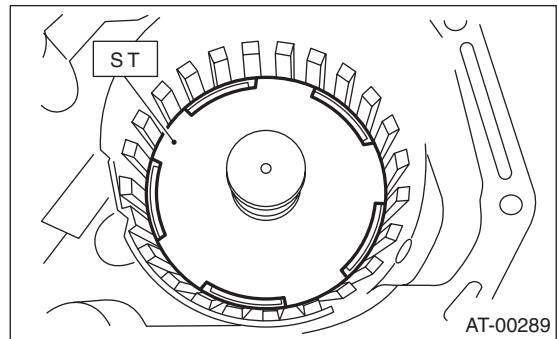
(B) 2-4 brake piston retainer

20) Install 2-4 brake piston return spring to transmission case.



21) Position snap ring in transmission. Using ST, press the snap ring into place.

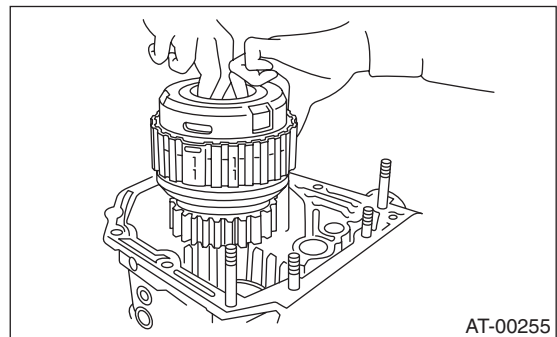
ST 498677100 COMPRESSOR



22) Install planetary gear and low clutch assembly to transmission case.

**CAUTION:**

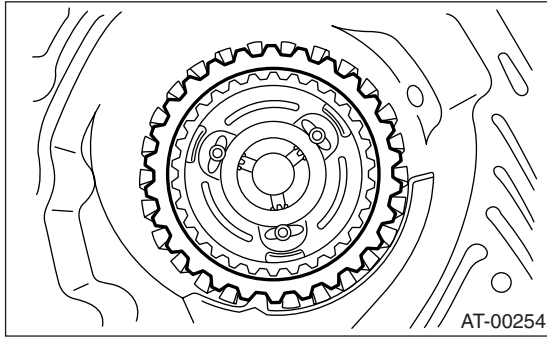
If installing it while rotating the low clutch and planetary gear assembly, rotate them slowly and pay attention not to damage the seal ring.



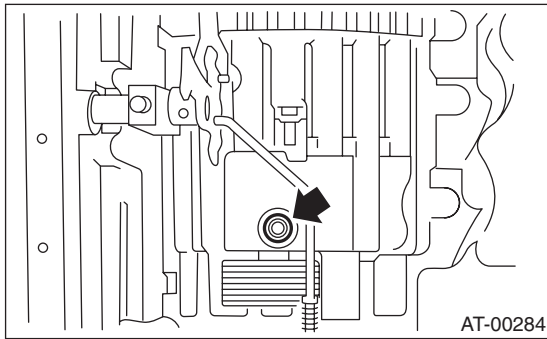
23) Selection of 2-4 brake retaining plate (Turbo model)



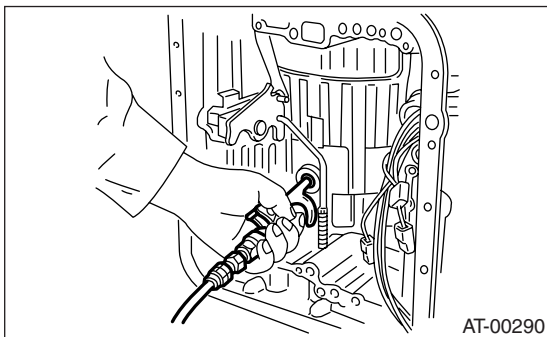
- (1) Install pressure plate, drive plate, driven plate, retaining plate and snap ring.



- (2) Install a new 2-4 brake oil seal to transmission case.



- (3) After all 2-4 brake component parts have been installed, blow in air intermittently and confirm the operation of the brake.



- (4) Check the clearance between the retaining plate and the snap ring.

**NOTE:**

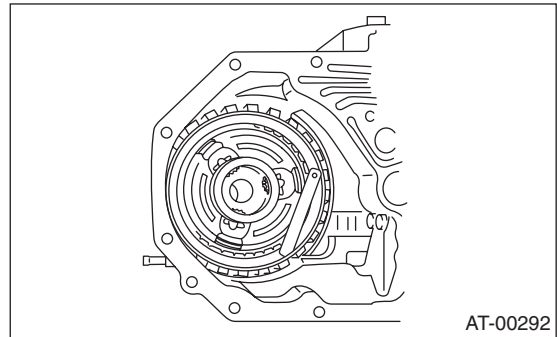
Do not make adjustment unless the drive plate is replaced.

If it exceeds the service limit, replace the drive plate with a new one and adjust it within the specification.

**Initial standard:**

**0.8 — 1.2 mm (0.031 — 0.047 in)**

**Limit thickness:**  
**1.5 mm (0.059 in)**



| Retaining plate |                   |
|-----------------|-------------------|
| Part No.        | Thickness mm (in) |
| 31567AA991      | 5.6 (0.220)       |
| 31567AB001      | 5.8 (0.228)       |
| 31567AB011      | 6.0 (0.236)       |
| 31567AB021      | 6.2 (0.244)       |
| 31567AB031      | 6.4 (0.252)       |
| 31567AB041      | 6.6 (0.260)       |

- 24) Selection of 2-4 brake retaining plate (Non-turbo model)

(1) Place the dish plate, driven plate, drive plate and retaining plate neatly in this order on surface table.

(2) Set the micro gauge to clutch, and read its scale.

**NOTE:**

The value, which is read in the gauge at this time, is zero point.

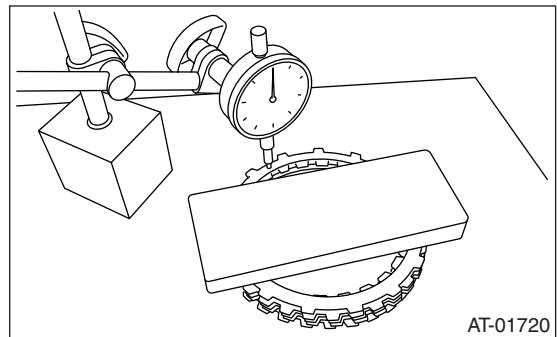
(3) Scale and record the weight Z of a flat board which will be put on plates.

**NOTE:**

- Use a stiff flat board which does not bend against load.

- Use a flat board of its weight less than 10.2 kg (22.5 lb).

(4) Put the flat board on retaining plate.



# AT Main Case

## AUTOMATIC TRANSMISSION

(5) Using the following formula, calculate N indicated on the push/pull gauge.

$$N = 100 N (10.2 \text{ kgf}, 22.5 \text{ lbf}) - Z$$

N: Value indicated on push/pull gauge

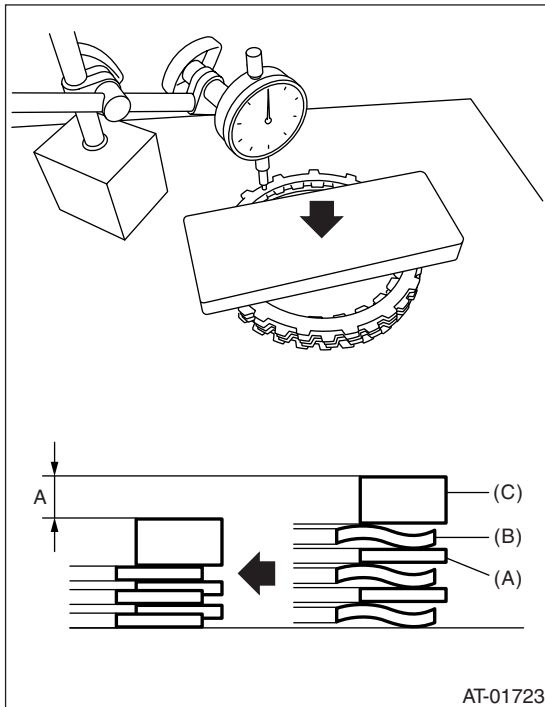
100 N (10.2 kgf, 22.5 lbf): Load applied to clutch plate

Z: Flat board weight

(6) Press the center of retaining plate applying force of N with push/pull gauge, and then measure and record the height "A". Make more than three measurements at even distance and take the average value.

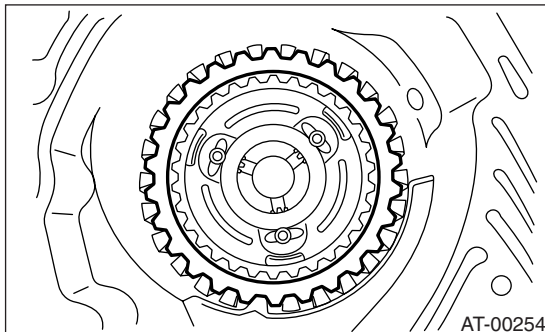
### NOTE:

If three points, measure the height every 120°. If four points, measure the height every 90°.

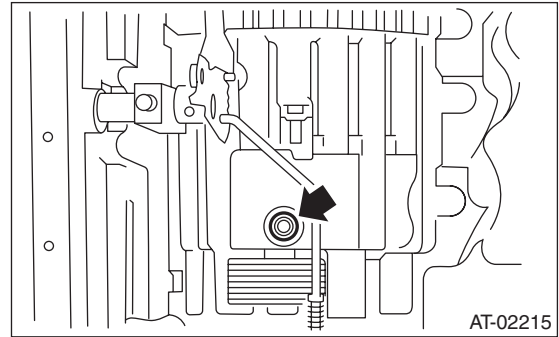


- (A) Driven plate
- (B) Drive plate
- (C) Retaining plate

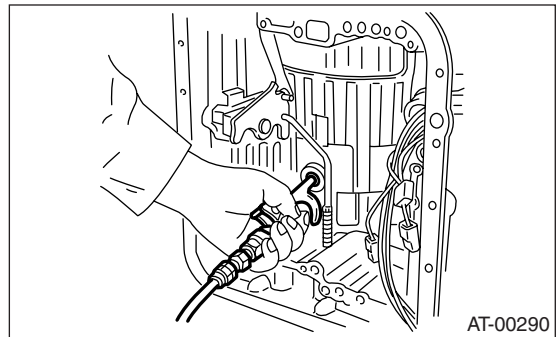
(7) Install the pressure plate, drive plate, driven plate, retaining plate and snap ring.



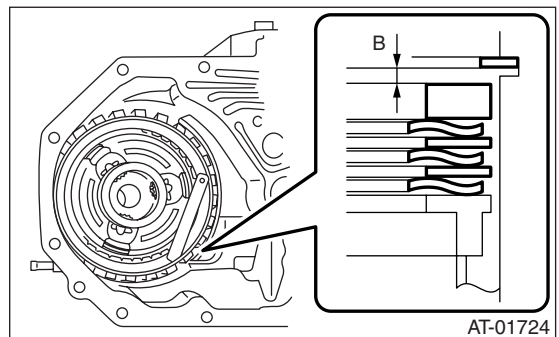
(8) Install a new 2-4 brake oil seal to transmission case.



(9) After all 2-4 brake component parts have been installed, blow air intermittently and confirm the operation of brake.



(10) Measure and record the clearance "B" between the retaining plate and snap ring.



(11) Piston stroke calculation

Calculate with "A" and "B" dimensions which have been recorded before, and if the value exceeds the service limit, replace the drive plate with a new one and adjust it within the specification.

$$T = A + B$$

T: Piston stroke

A: Collapse amount of drive plate

B: Clearance between retaining plate and snap ring

**Initial standard:**

**1.7 — 2.1 mm (0.067 — 0.083 in)**

**Limit thickness:**

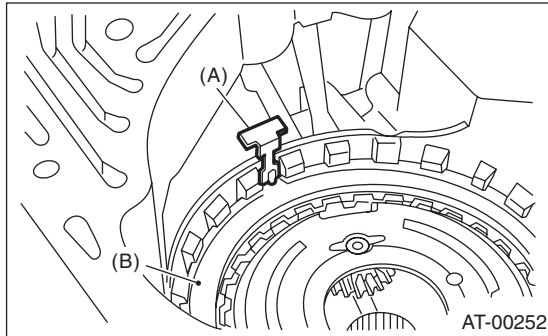
**2.3 mm (0.091 in)**

| Retaining plate |                   |
|-----------------|-------------------|
| Part number     | Thickness mm (in) |
| 31567AA991      | 5.6 (0.220)       |
| 31567AB001      | 5.8 (0.228)       |
| 31567AB011      | 6.0 (0.236)       |
| 31567AB021      | 6.2 (0.244)       |
| 31567AB031      | 6.4 (0.252)       |
| 31567AB041      | 6.6 (0.260)       |

**NOTE:**

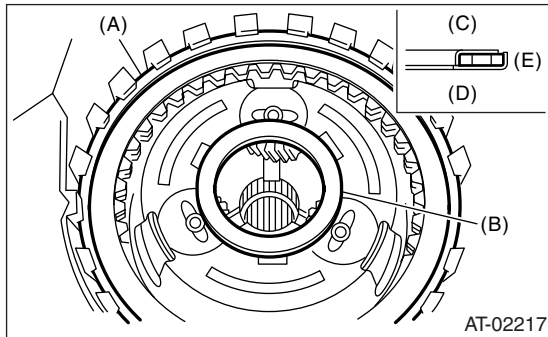
Do not make adjustment unless the drive plate is replaced.

25) Be careful not to mistake the location of the leaf spring to be inserted.



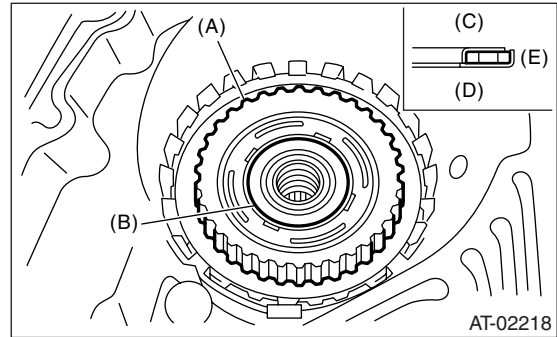
- (A) Leaf spring
- (B) Retaining plate

26) Install thrust needle bearing in the correct direction.



- (A) Snap ring
- (B) Thrust needle bearing
- (C) Upside
- (D) Downside
- (E) Outside

27) Install front sun gear and thrust needle bearing.

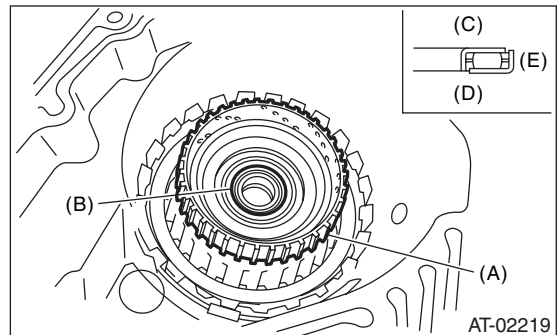


- (A) Front sun gear
- (B) Thrust needle bearing
- (C) Clutch hub side
- (D) Front sun gear side
- (E) Outside

28) Install the high clutch hub.

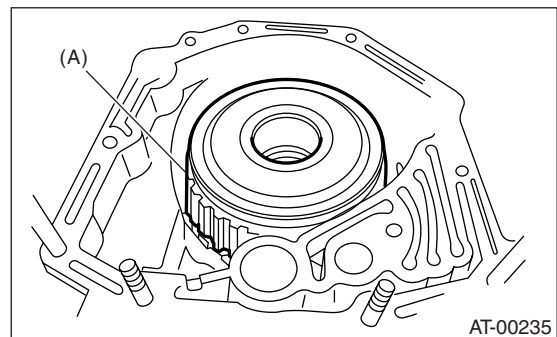
Attach the thrust needle bearing to the hub with vaseline and install the hub by correctly engaging the splines of the front planetary carrier.

29) Install the thrust needle bearing in proper direction.



- (A) High clutch hub
- (B) Thrust needle bearing
- (C) Upside
- (D) Downside
- (E) Outside

30) Install the high clutch assembly.



- (A) High clutch and reverse clutch ASSY

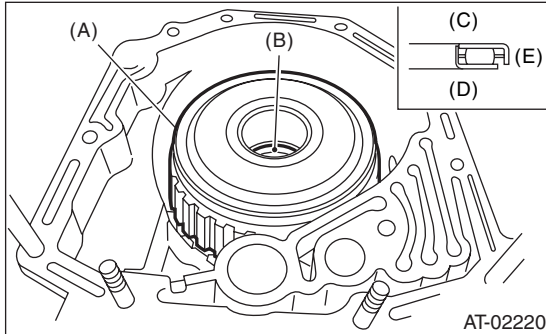


# AT Main Case

## AUTOMATIC TRANSMISSION

31) Adjust total end play. <Ref. to 4AT-95, ADJUSTMENT, Oil Pump Housing.>

32) Install the thrust needle bearing in proper direction.

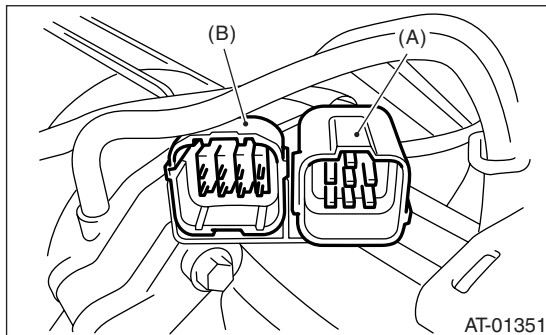


- (A) High clutch and reverse clutch ASSY
- (B) Thrust needle bearing
- (C) Upside
- (D) Downside
- (E) Outside

33) Install the oil pump housing assembly.

34) Install the converter case assembly to the transmission case assembly. <Ref. to 4AT-89, INSTALLATION, Converter Case.>

35) Insert inhibitor switch and transmission connector into stay.



- (A) Transmission harness
- (B) Inhibitor switch harness

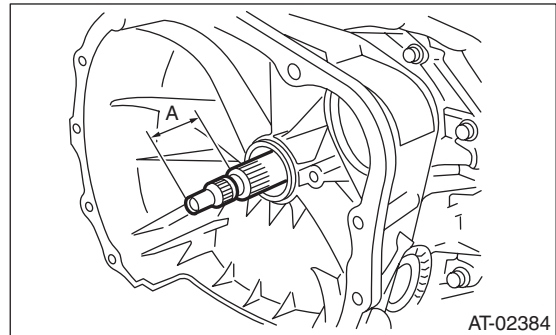
36) Install air breather hose. <Ref. to 4AT-67, INSTALLATION, Air Breather Hose.>

37) Install oil cooler pipes. <Ref. to 4AT-65, INSTALLATION, ATF Cooler Pipe and Hose.>

38) Install the oil charge pipe with O-ring. <Ref. to 4AT-68, INSTALLATION, Oil Charge Pipe.>

39) Insert the input shaft while rotating it lightly by hand, and then check the protrusion amount.

**Normal protrusion amount A:**  
**50 — 55 mm (1.97 — 2.17 in)**



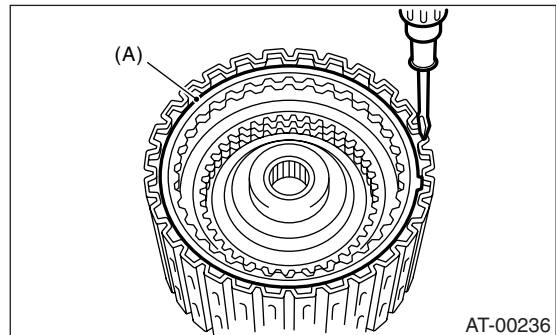
40) Install the torque converter clutch assembly. <Ref. to 4AT-69, INSTALLATION, Torque Converter Clutch Assembly.>

41) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

## C: DISASSEMBLY

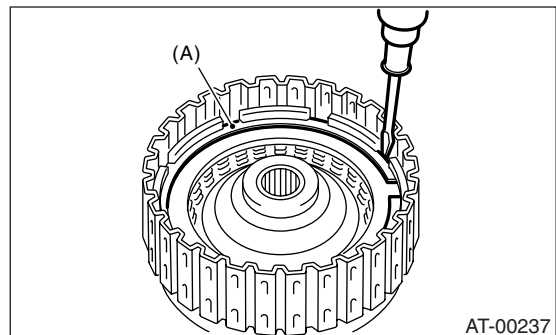
### 1. HIGH CLUTCH, REVERSE CLUTCH

1) Remove the snap ring, and take out the retaining plate, drive plates, driven plates.



(A) Snap ring

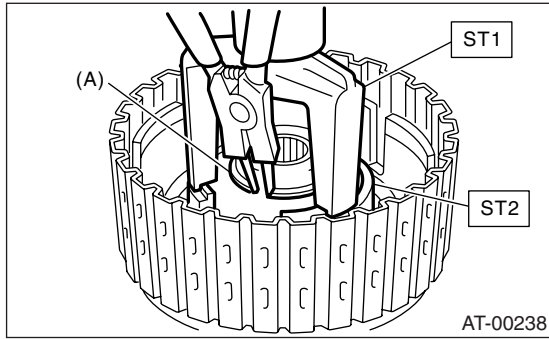
2) Remove snap ring, and take out the retaining plate, drive plates and driven plates.



(A) Snap ring

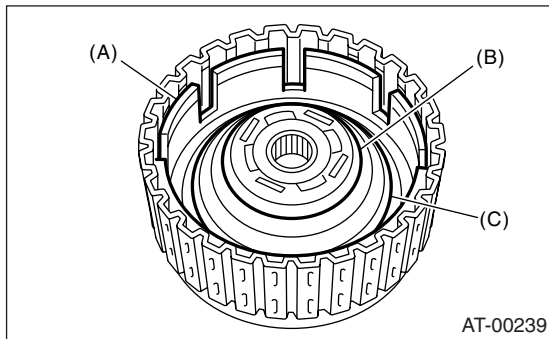
3) Using ST1 and ST2, remove snap ring.  
ST1 398673600 COMPRESSOR

ST2 498627100 SEAT



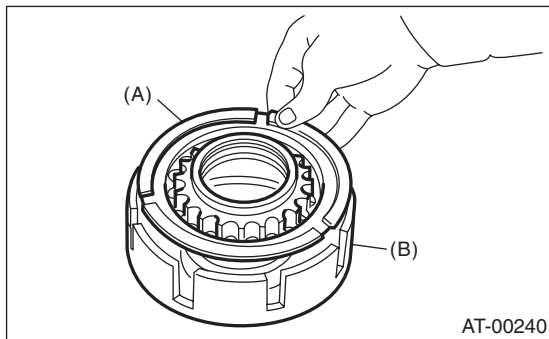
(A) Snap ring

4) Take out clutch cover, spring retainer, high clutch piston and reverse clutch piston.



(A) Reverse clutch piston  
(B) Cover  
(C) Return spring

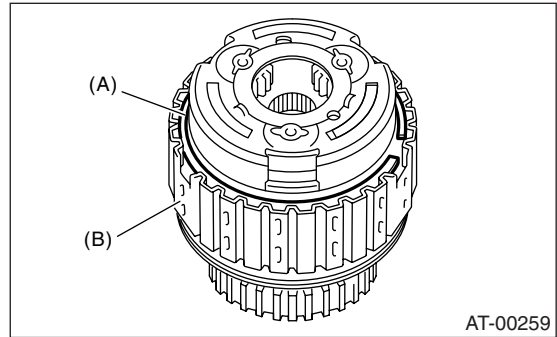
5) Remove seal rings and lip seal from high clutch piston and reverse clutch piston.



(A) High clutch piston  
(B) Reverse clutch piston

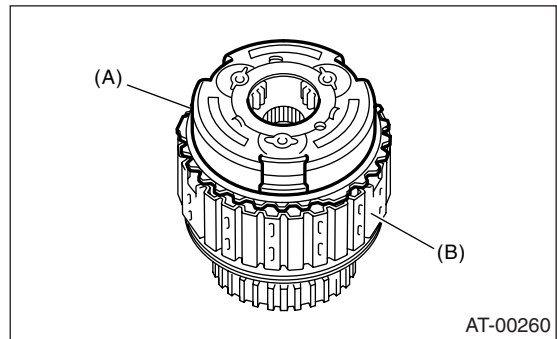
## 2. PLANETARY GEAR, LOW CLUTCH

1) Remove snap ring from the low clutch drum.



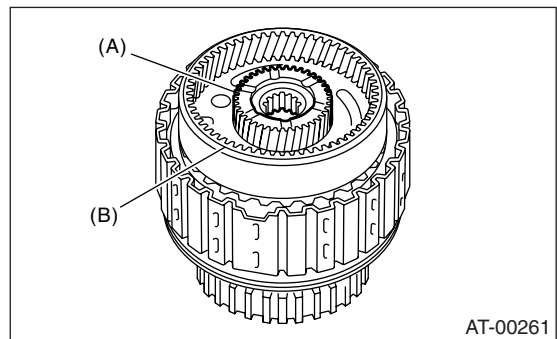
(A) Snap ring  
(B) Low clutch drum

2) Take out front planetary carrier.



(A) Front planetary carrier  
(B) Low clutch drum

3) Take out rear sun gear.

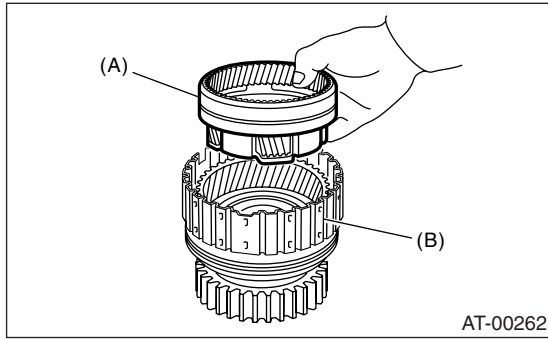


(A) Rear sun gear  
(B) Rear planetary carrier

# AT Main Case

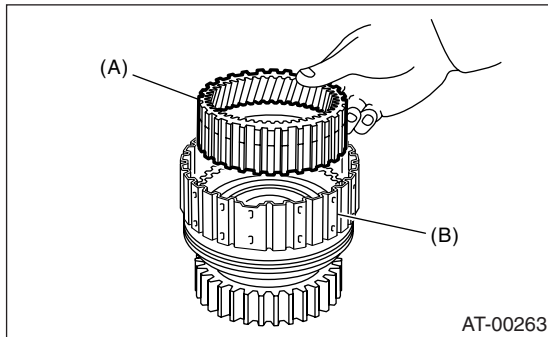
## AUTOMATIC TRANSMISSION

4) Take out rear planetary carrier, washer and thrust needle bearing.



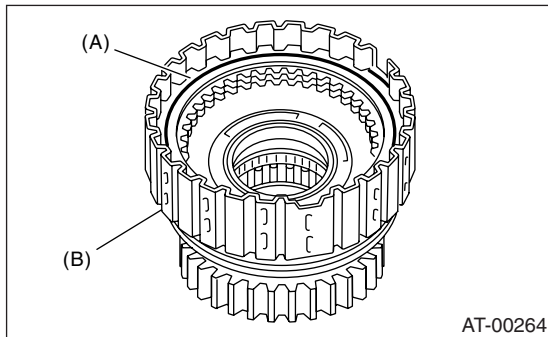
- (A) Rear planetary carrier
- (B) Low clutch drum

5) Take out rear internal gear.



- (A) Rear internal gear
- (B) Low clutch drum

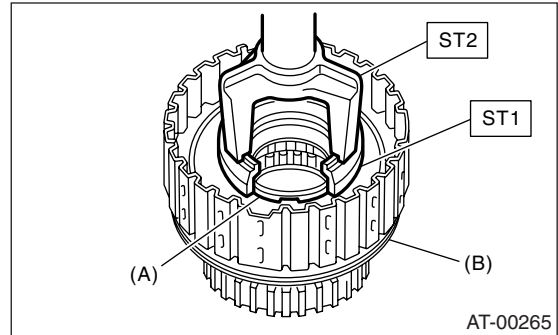
6) Remove the snap ring from the low clutch drum.



- (A) Snap ring
- (B) Low clutch drum

7) Compress the spring retainer, and remove the snap ring from the low clutch drum, by using ST1 and ST2.

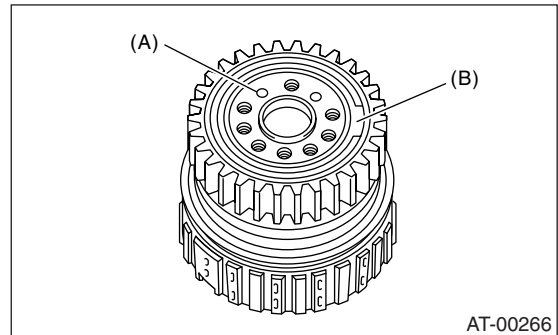
ST1 498627100 SEAT  
ST2 398673600 COMPRESSOR



- (A) Snap ring
- (B) Low clutch drum

8) Remove one-way clutch. <Ref. to 4AT-107, REMOVAL, AT Main Case.>

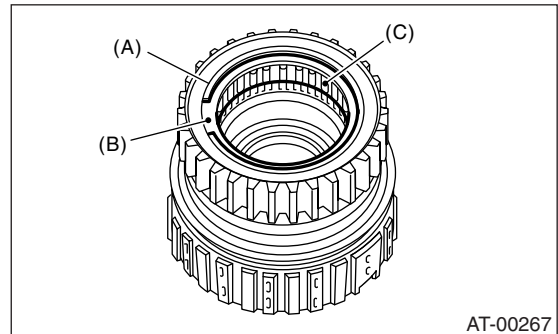
9) Install the one-way clutch inner race to the low clutch drum, and apply compressed air to remove the low clutch piston.



- (A) Apply compressed air.
- (B) One-way clutch inner race

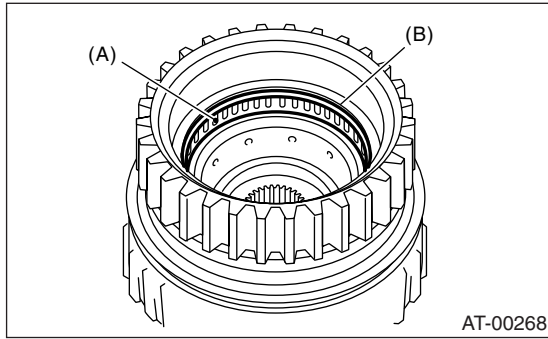
10) Remove the one-way clutch inner race.

11) Remove the one-way clutch after taking out the snap ring.



- (A) Snap ring
- (B) Plate
- (C) One-way clutch

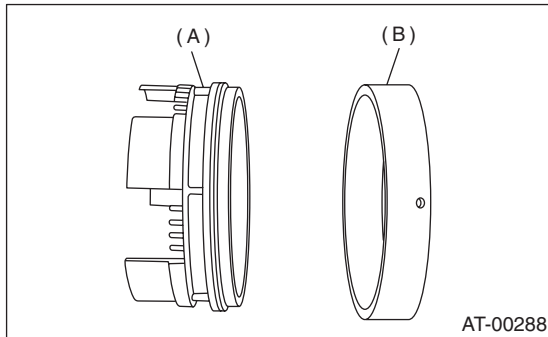
12) Remove the needle bearing after taking out the snap ring.



- (A) Needle bearing
- (B) Snap ring

### 3. 2-4 BRAKE

1) Separate 2-4 brake piston and piston retainer.

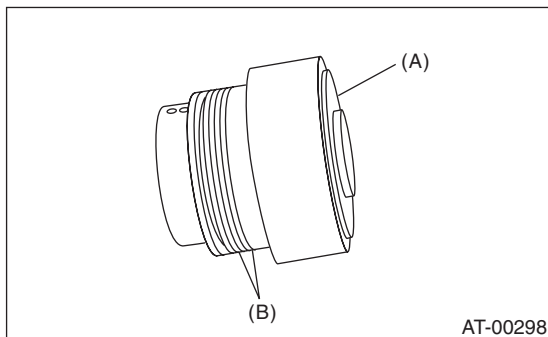


- (A) 2-4 brake piston
- (B) 2-4 brake piston retainer

2) Remove the D-ring from 2-4 brake piston.

### 4. ONE-WAY CLUTCH INNER RACE

1) Remove seal rings.

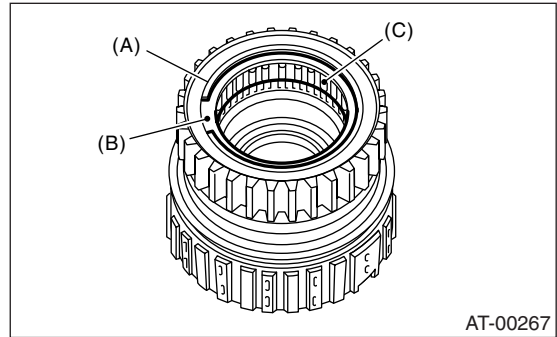


- (A) One way clutch inner race
- (B) Seal rings

2) Using ST, remove needle bearing.  
ST 398527700 PULLER ASSY

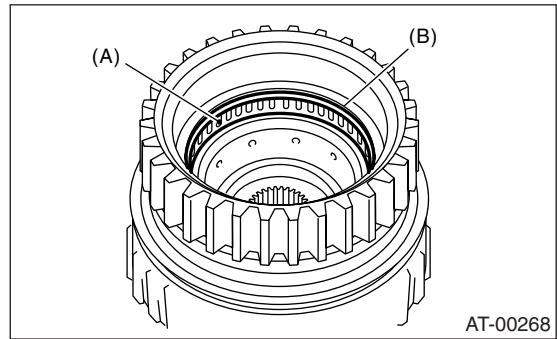
### 5. ONE-WAY CLUTCH OUTER RACE

1) Remove the one-way clutch after taking out the snap ring.



- (A) Snap ring
- (B) Plate
- (C) One-way clutch

2) Remove the needle bearing after taking out the snap ring.



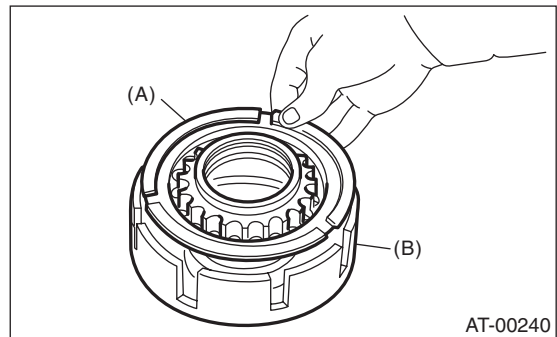
- (A) Needle bearing
- (B) Snap ring

## D: ASSEMBLY

### 1. HIGH CLUTCH, REVERSE CLUTCH

1) Install seal rings and lip seal to high clutch piston and reverse clutch piston.

2) Install high clutch piston to reverse clutch piston.

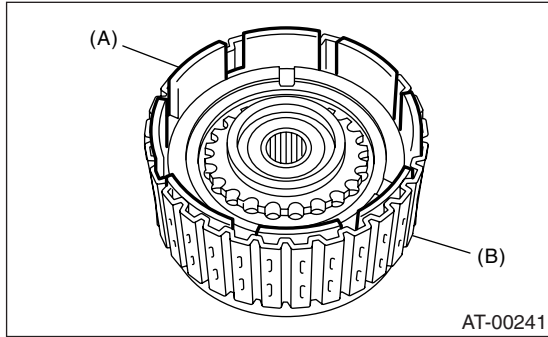


- (A) High clutch piston
- (B) Reverse clutch piston

# AT Main Case

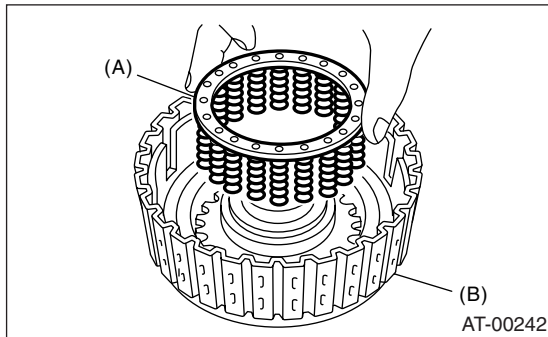
## AUTOMATIC TRANSMISSION

3) Install reverse clutch to high clutch drum. Align the groove on the reverse clutch piston with the groove on the high clutch drum during installation.



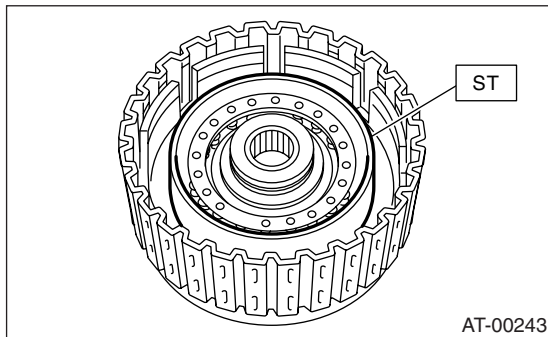
(A) Reverse clutch piston  
(B) High clutch drum

4) Install spring retainer to high clutch piston.



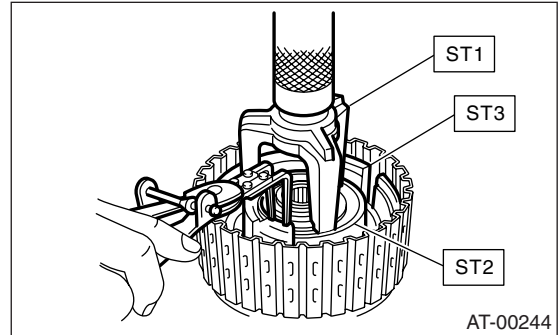
(A) Return spring  
(B) High clutch drum

5) Install ST to high clutch piston.  
ST 498437000 HIGH CLUTCH PISTON GUIDE

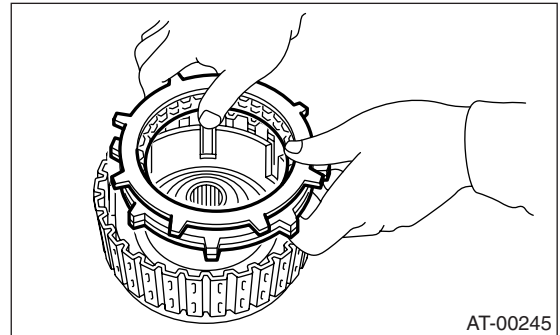


6) Avoid folding the high clutch piston seal, when installing the cover to high clutch piston.

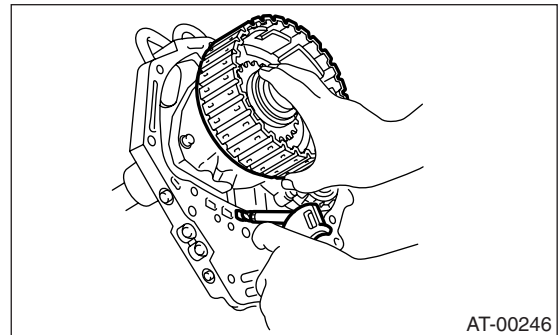
7) Install the snap ring using ST 1, 2, and 3.  
ST1 398673600 COMPRESSOR  
ST2 498627100 SEAT  
ST3 498437000 HIGH CLUTCH PISTON GUIDE



8) Install the thickest driven plate to piston side, and then install the driven plate, drive plate, retaining plate to high clutch drum.



9) Install the snap ring to high clutch drum.  
10) Apply compressed air intermittently to check for operation.



11) Selection of high clutch retaining plate (Non-turbo model)

- (1) Place the dish plate, driven plate, drive plate and retaining plate neatly in this order on surface table.
- (2) Set the dial gauge to clutch, and read its scale.

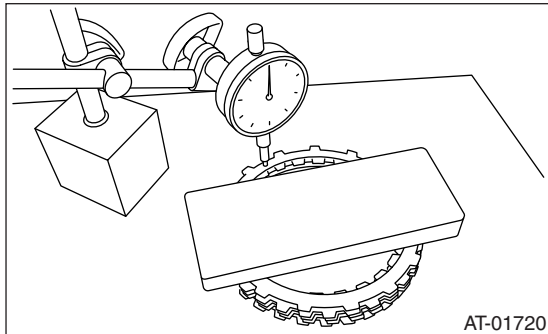
NOTE:  
The value, which is read in the gauge at this time, is zero point.

(3) Scale and record the weight Z of a flat board which will be put on plates.

**NOTE:**

- Use a stiff flat board which does not bend against load.
- Use a flat board of its weight less than 25.5 kg (56.2 lb).

(4) Put the flat board on retaining plate.



(5) Using the following formula, calculate N indicated on the push/pull gauge.

$$N = 250 \text{ N (25.5 kgf, 56.2 lbf)} - Z$$

N: Value indicated on push/pull gauge

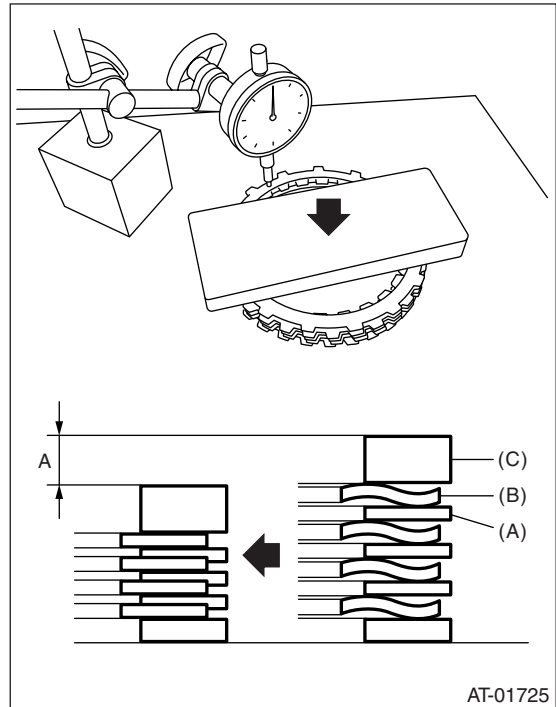
250 N (25.5 kgf, 56.2 lbf): Load applied to clutch plate

Z: Flat board weight

(6) Press the center of retaining plate applying force of N with push/pull gauge, and then measure and record the height "A". Make more than three measurements at even distance and take the average value.

**NOTE:**

If three points, measure the height every 120°. If four points, measure the height every 90°.



- (A) Driven plate
- (B) Drive plate
- (C) Retaining plate

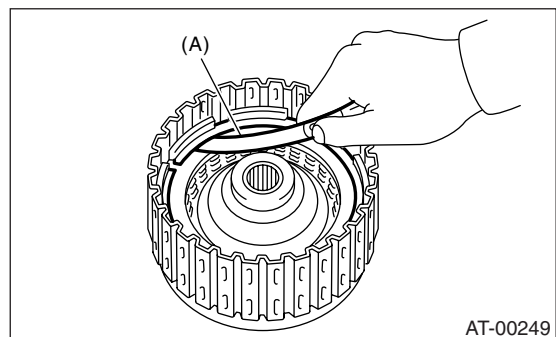
12) Measure the clearance between the retaining plate of high clutch and snap ring. (Turbo model) At this time, do not press down the retaining plate.

**Initial standard:**

**0.8 — 1.1 mm (0.031 — 0.043 in)**

**Limit thickness:**

**1.5 mm (0.059 in)**



- (A) Thickness gauge

If it exceeds the service limit, replace the drive plate with a new one and adjust it within the specification.



# AT Main Case

## AUTOMATIC TRANSMISSION

| High clutch retaining plate |                   |
|-----------------------------|-------------------|
| Part number                 | Thickness mm (in) |
| 31567AA710                  | 4.7 (0.185)       |
| 31567AA720                  | 4.8 (0.189)       |
| 31567AA730                  | 4.9 (0.193)       |
| 31567AA740                  | 5.0 (0.197)       |
| 31567AA670                  | 5.1 (0.201)       |
| 31567AA680                  | 5.2 (0.205)       |
| 31567AA690                  | 5.3 (0.209)       |
| 31567AA700                  | 5.4 (0.213)       |

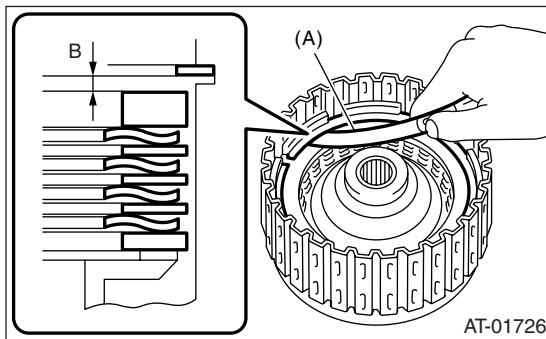
**NOTE:**

Do not make adjustment unless the drive plate is replaced.

13) Check the piston stroke. (Non-turbo model)

- Measure and record the clearance "B" between the retaining plate and snap ring. (High clutch)

At this time, do not press down the retaining plate.



(A) Thickness gauge

(2) Piston stroke calculation

Calculate with "A" and "B" dimensions which have been recorded before, and if the value exceeds the service limit, replace the drive plate with a new one and adjust it within the specification.

$$T = A + B$$

T: Piston stroke

A: Collapse amount of drive plate

B: Clearance between retaining plate and snap ring

**Initial standard:**

2.0 — 2.3 mm (0.079 — 0.091 in)

**Limit thickness:**

2.6 mm (0.102 in)

| High clutch retaining plate |                   |
|-----------------------------|-------------------|
| Part number                 | Thickness mm (in) |
| 31567AA670                  | 5.1 (0.201)       |
| 31567AA680                  | 5.2 (0.205)       |
| 31567AA690                  | 5.3 (0.209)       |
| 31567AA700                  | 5.4 (0.213)       |
| 31567AA710                  | 4.7 (0.185)       |
| 31567AA720                  | 4.8 (0.189)       |
| 31567AA730                  | 4.9 (0.193)       |
| 31567AA740                  | 5.0 (0.197)       |

14) Selection of reverse clutch retaining plate

- Place the dish plate, driven plate, drive plate and retaining plate neatly in this order on surface table.

- Set the dial gauge to clutch, and read its scale.

**NOTE:**

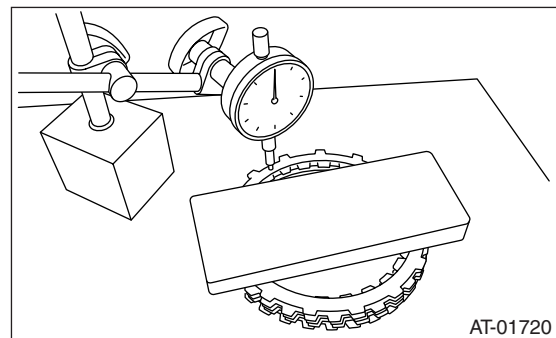
The value, which is read in the gauge at this time, is zero point.

- Scale and record the weight Z of a flat board which will be put on plates.

**NOTE:**

- Use a stiff flat board which does not bend against load.
- Use a flat board of its weight less than 15.3 kg (33.7 lb).

- Put the flat board on retaining plate.



- Using the following formula, calculate N indicated on the push/pull gauge.

$$N = 150 \text{ N (15.3 kgf, 33.7 lbf)} - Z$$

N: Value indicated on push/pull gauge

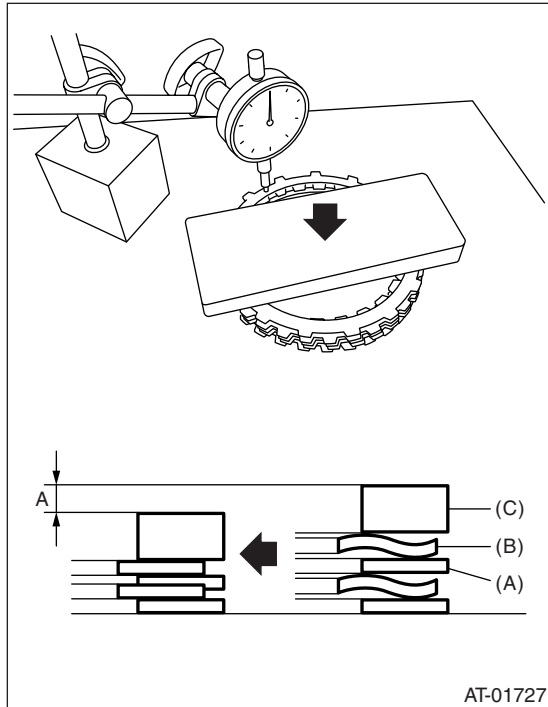
150 N (15.3 kgf, 33.7 lbf): Load applied to clutch plate

Z: Flat board weight

- Press the center of retaining plate applying force of N with push/pull gauge, and then measure and record the height "A". Make more than three measurements at even distance and take the average value.

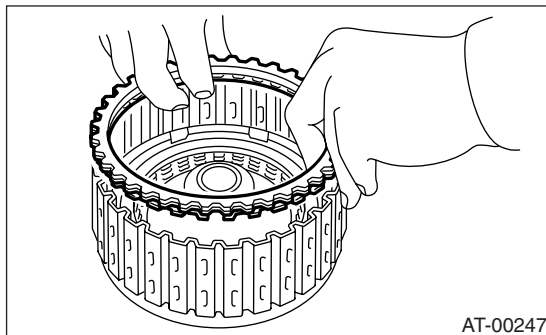
**NOTE:**

If three points, measure the height every 120°. If four points, measure the height every 90°.

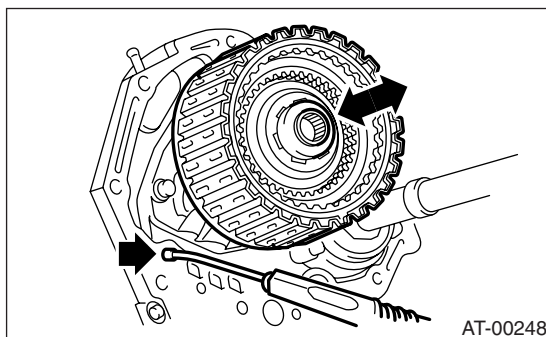


- (A) Driven plate
- (B) Drive plate
- (C) Retaining plate

(7) Install the driven plate, drive plate, retaining plate and snap ring.



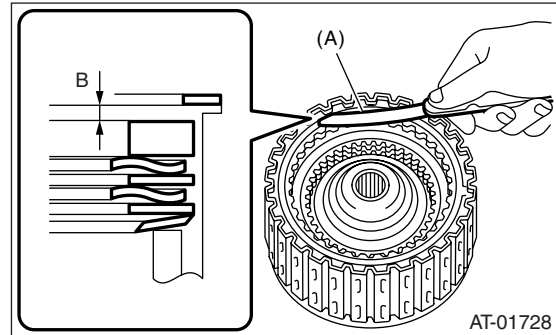
(8) Apply compressed air intermittently to check for operation.



15) Check the piston stroke.

(1) Measure and record the clearance "B" between the retaining plate and snap ring. (Reverse clutch)

At this time, do not press down the retaining plate.



(A) Thickness gauge

(2) Piston stroke calculation

Calculate with "A" and "B" dimensions which have been recorded before, and if the value exceeds the service limit, replace the drive plate with a new one and adjust it within the specification.

$$T = A + B$$

T: Piston stroke

A: Collapse amount of drive plate

B: Clearance between retaining plate and snap ring

**Initial standard:**

**1.1 — 1.4 mm (0.043 — 0.055 in)**

**Limit thickness:**

**1.6 mm (0.063 in)**

| Reverse clutch retaining plate |                   |
|--------------------------------|-------------------|
| Part number                    | Thickness mm (in) |
| 31567AA910                     | 4.0 (0.157)       |
| 31567AA920                     | 4.2 (0.165)       |
| 31567AA930                     | 4.4 (0.173)       |
| 31567AA940                     | 4.6 (0.181)       |
| 31567AA950                     | 4.8 (0.189)       |
| 31567AA960                     | 5.0 (0.197)       |
| 31567AA970                     | 5.2 (0.205)       |
| 31567AA980                     | 5.4 (0.213)       |

**NOTE:**

Do not make adjustment unless the drive plate is replaced.

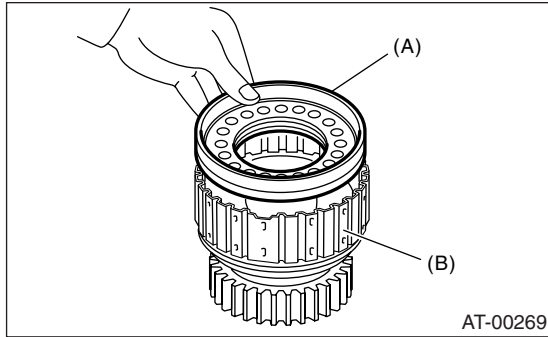


# AT Main Case

## AUTOMATIC TRANSMISSION

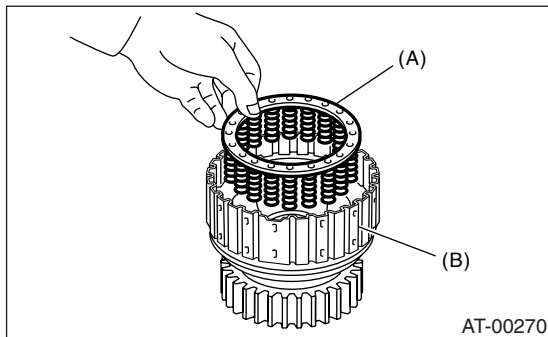
### 2. PLANETARY GEAR, LOW CLUTCH

- 1) Install D-ring to low clutch piston.
- 2) Fit the low clutch piston to the low clutch drum.



- (A) Low clutch piston
- (B) Low clutch drum

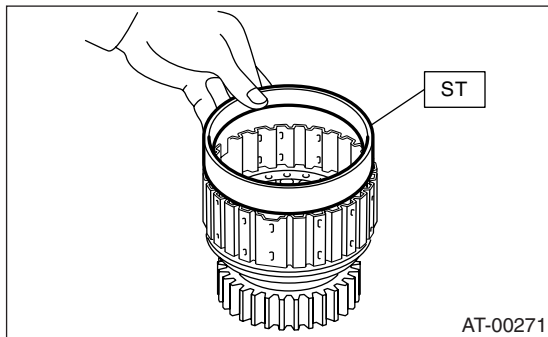
- 3) Install spring retainer to low clutch piston.



- (A) Spring retainer
- (B) Low clutch drum

- 4) Install ST to low clutch drum.

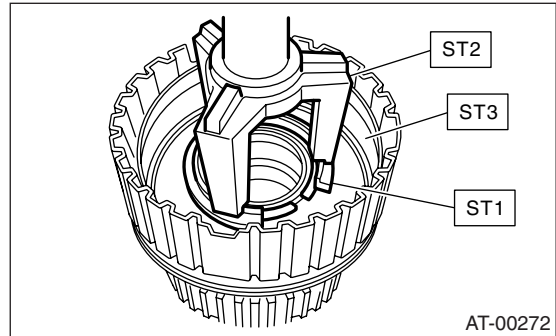
ST 498437100 LOW CLUTCH PISTON GUIDE



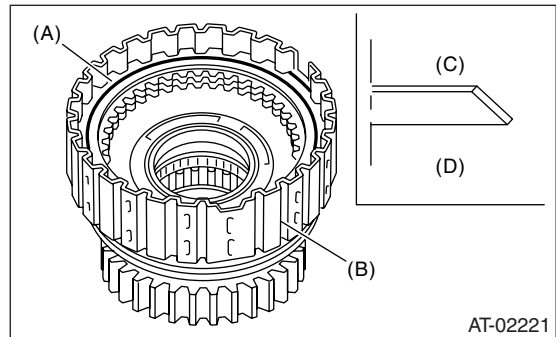
- 5) Set the cover on the piston with a press using ST1 and ST2, and attach the snap ring. At this time, be careful not to fold cover seal during installation.

ST1 498627100 SEAT  
ST2 398673600 COMPRESSOR

ST3 498437100 LOW CLUTCH PISTON GUIDE



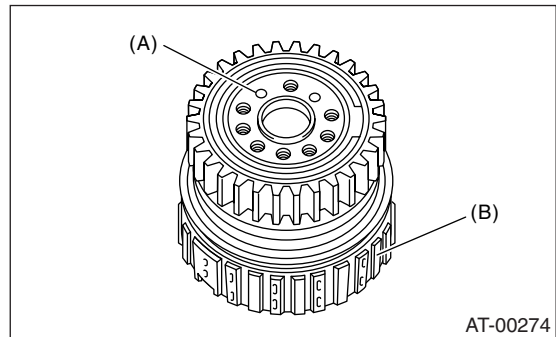
- 6) Install the dish plate, driven plates, drive plates, and retaining plate, and secure with the snap ring.



- (A) Snap ring
- (B) Low clutch drum
- (C) Dish plate
- (D) Low clutch piston side

- 7) Check the low clutch for operation.

- (1) Remove one-way clutch. <Ref. to 4AT-107, REMOVAL, AT Main Case.>
- (2) Set the one-way clutch inner race, and apply compressed air for checking.



- (A) Apply compressed air.
- (B) Low clutch drum

- 8) Checking low clutch clearance.

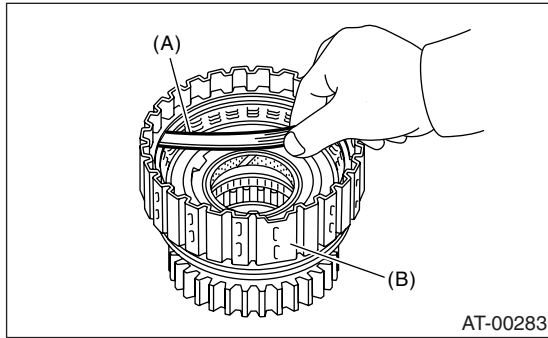
- (1) Place the same thickness of shim on both sides to prevent retaining plate from tilting.
- (2) Inspect clearance between retaining plate and operation of the low clutch.

**Initial standard:**

**0.7 — 1.1 mm (0.028 — 0.043 in)**

**Limit thickness:**

**1.6 mm (0.063 in)**

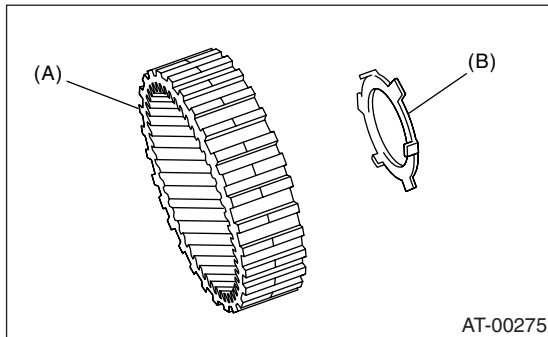


- (A) Thickness gauge
- (B) Low clutch drum

Do not make adjustment unless the drive plate is replaced.  
If it exceeds the service limit, replace the drive plate with a new one and adjust it to the specification.

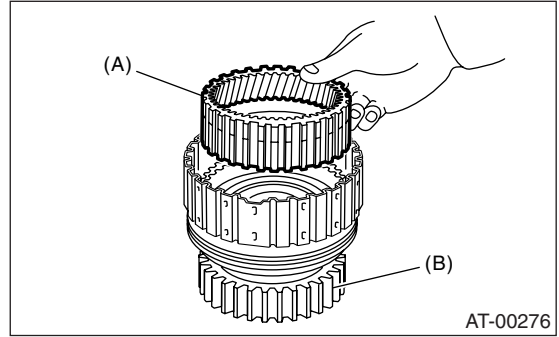
| Available retaining plate |                   |
|---------------------------|-------------------|
| Part No.                  | Thickness mm (in) |
| 31567AA830                | 3.8 (0.150)       |
| 31567AA840                | 4.0 (0.157)       |
| 31567AA850                | 4.2 (0.165)       |
| 31567AA860                | 4.4 (0.173)       |
| 31567AA870                | 4.6 (0.181)       |

9) Install washer to rear internal gear.



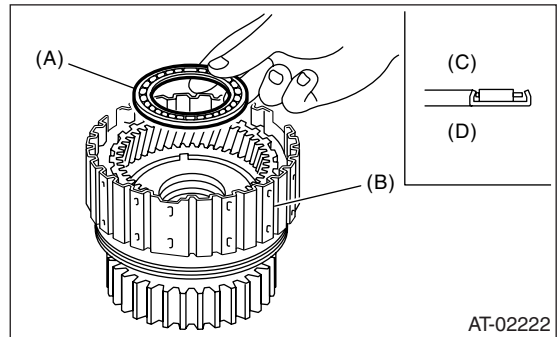
- (A) Rear internal gear
- (B) Washer

10) Install rear internal gear.



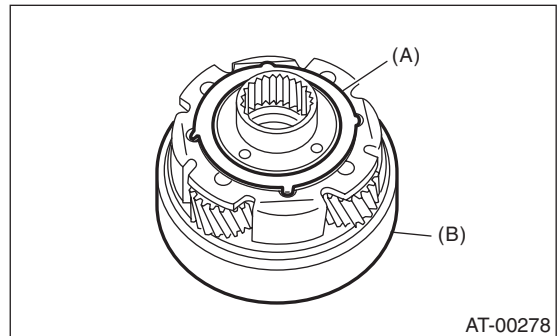
- (A) Rear internal gear
- (B) Low clutch drum

11) Install thrust needle bearing in the correct direction.



- (A) Thrust needle bearing
- (B) Low clutch drum
- (C) Rear planetary carrier side
- (D) Low clutch drum side

12) Install the washer by aligning protrusion of washer and hole of rear planetary carrier.

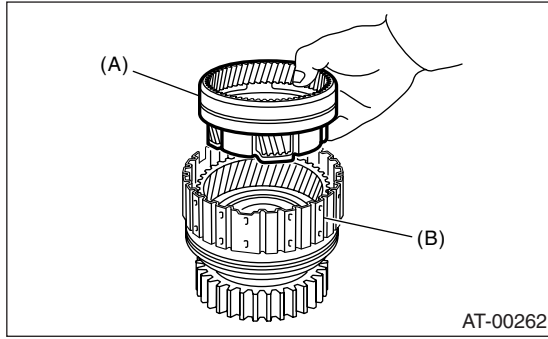


- (A) Washer
- (B) Rear planetary carrier

# AT Main Case

## AUTOMATIC TRANSMISSION

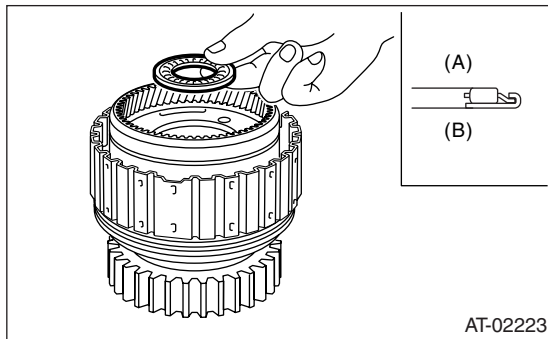
13) Install rear planetary carrier to low clutch drum.



(A) Rear planetary carrier

(B) Low clutch drum

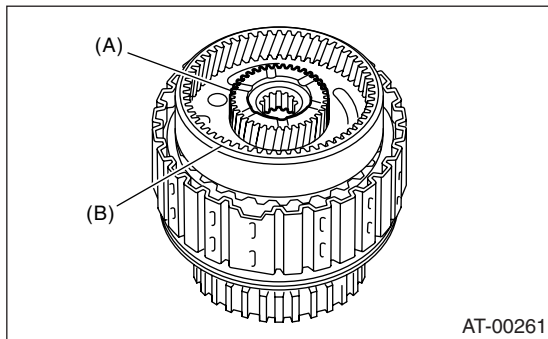
14) Install thrust needle bearing in the correct direction.



(A) Rear sun gear side

(B) Low clutch drum side

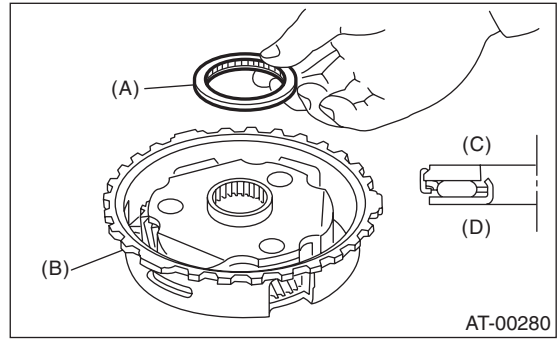
15) Install the rear sun gear in proper direction.



(A) Rear sun gear

(B) Rear planetary carrier

16) Install the thrust needle bearing in proper direction.



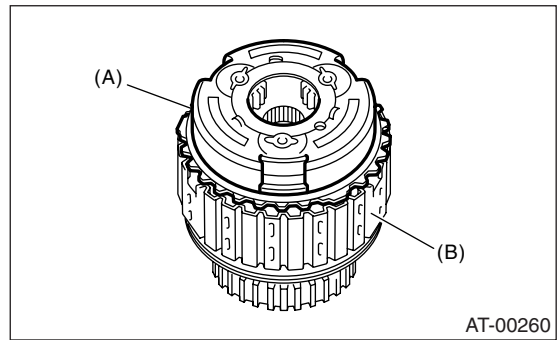
(A) Thrust needle bearing

(B) Front planetary carrier

(C) Rear sun gear side

(D) Front planetary carrier side

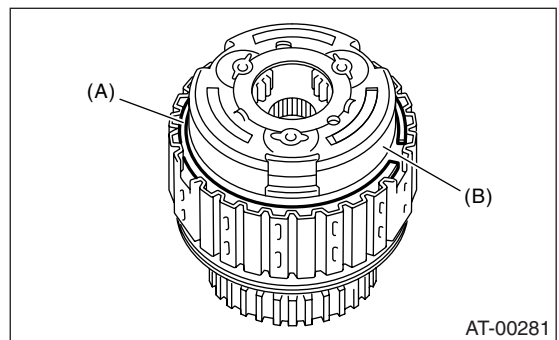
17) Install front planetary carrier to low clutch drum.



(A) Front planetary carrier

(B) Low clutch drum

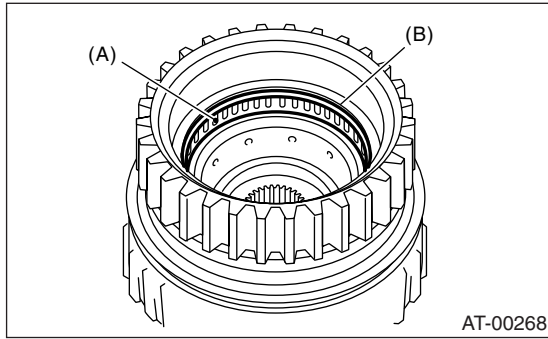
18) Install snap ring to low clutch drum.



(A) Snap ring

(B) Front planetary carrier

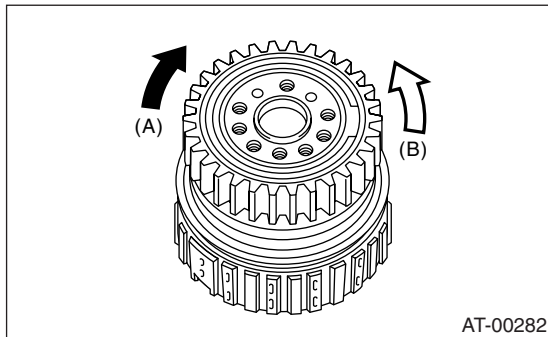
19) Install the needle bearing, and secure with the snap ring.



- (A) Needle bearing
- (B) Snap ring

20) Install the one-way clutch, and secure with the snap ring.

21) Set the inner race. Make sure that the clutch is locked in the clockwise direction and rotates in the counterclockwise direction.

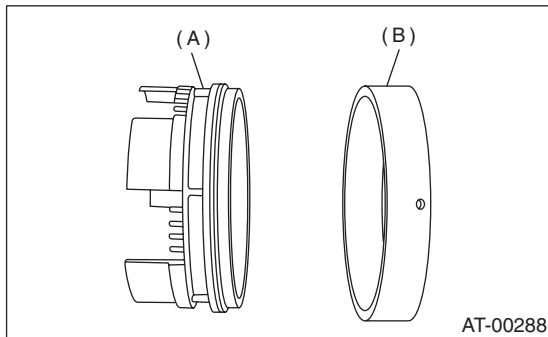


- (A) Locked
- (B) Rotates

### 3. 2-4 BRAKE

1) Apply ATF to new D-ring, and install it to 2-4 brake piston.

2) Install 2-4 brake piston to 2-4 brake piston retainer.

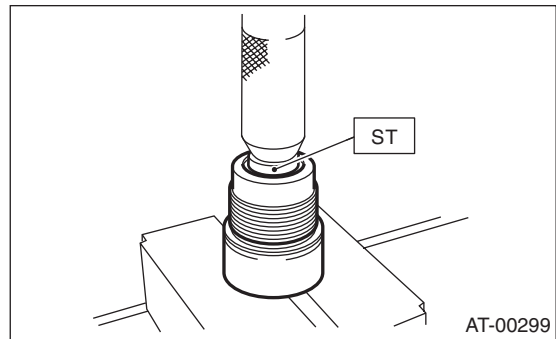


- (A) 2-4 brake piston
- (B) 2-4 brake piston retainer

### 4. ONE-WAY CLUTCH INNER RACE

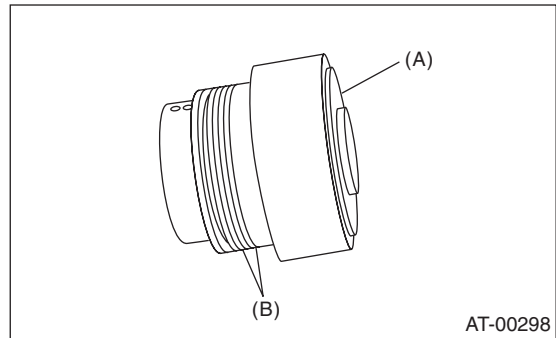
1) Using a press and ST, install the needle bearing to the inner race.

ST 398497701 INSTALLER



2) Apply vaseline to the groove of the inner race and to the seal ring.

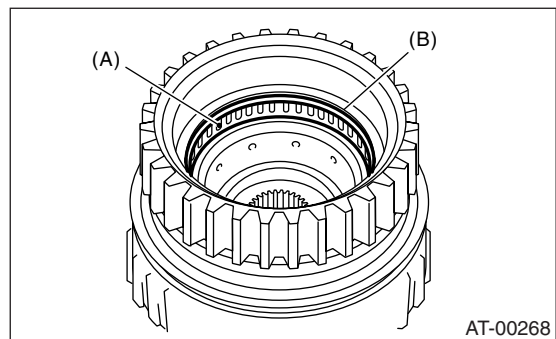
3) Install two seal rings to one-way clutch inner race.



- (A) One way clutch inner race
- (B) Seal rings

### 5. ONE-WAY CLUTCH OUTER RACE

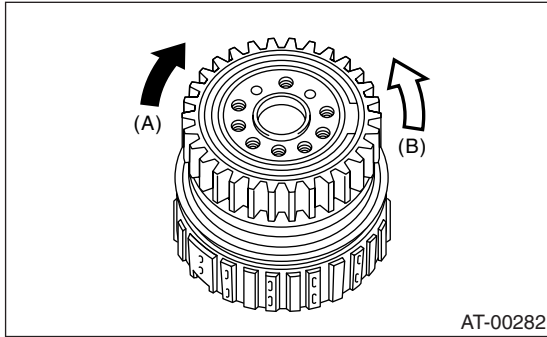
1) Install the needle bearing, and secure with the snap ring.



- (A) Needle bearing
- (B) Snap ring

2) Install the one-way clutch, one-way clutch inner race and plate, and secure with the snap ring.

3) Set the inner race. Make sure that the clutch is locked in the clockwise direction and rotates in the counterclockwise direction.



- (A) Locked
- (B) Rotates

## E: INSPECTION

### 1. HIGH CLUTCH AND REVERSE CLUTCH

Inspect the following items:

- Drive plate facing for wear and damage
- Discoloration of driven plate (Burnt color)
- Snap ring for wear, return spring for setting and breakage, and snap ring retainer for deformation
- Lip seal and D-ring for damage
- Piston and drum check ball for operation
- Adjust total end play. <Ref. to 4AT-95, ADJUSTMENT, Oil Pump Housing.>

### 2. PLANETARY GEAR AND LOW CLUTCH

Inspect the following items:

- Drive plate facing for wear and damage
- Discoloration of driven plate (Burnt color)
- Snap ring for wear, return spring for breakage or setting, and spring retainer for deformation
- Lip seal and D-ring for damage
- Piston check ball for operation
- Measure the total end play and adjust to within specifications. <Ref. to 4AT-95, ADJUSTMENT, Oil Pump Housing.>

### 3. 2-4 BRAKE

Inspect the following items:

- Drive plate facing for wear and damage
- Discoloration of driven plate (Burnt color)
- Snap ring for wear and spring retainer for deformation
- Lip seal and D-ring for damage
- Measure the total end play and adjust to within specifications. <Ref. to 4AT-95, ADJUSTMENT, Oil Pump Housing.>

### 4. ONE-WAY CLUTCH

- Make sure the snap ring is not worn and the seal rings are not damaged.
- Measure the total end play and adjust to within specifications. <Ref. to 4AT-95, ADJUSTMENT, Oil Pump Housing.>

### 5. LOW & REVERSE BRAKE

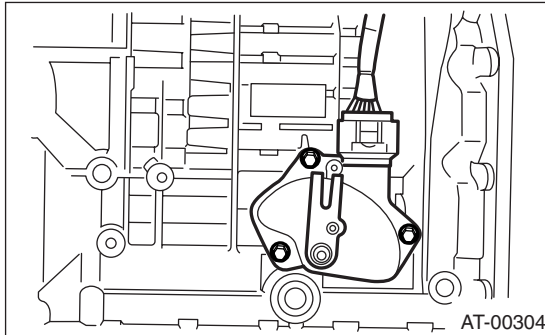
Check for the following:

- Drive plate facing for wear or damage
- Discoloration of driven plate (Burnt color)
- Snap ring for wear and spring retainer for deformation

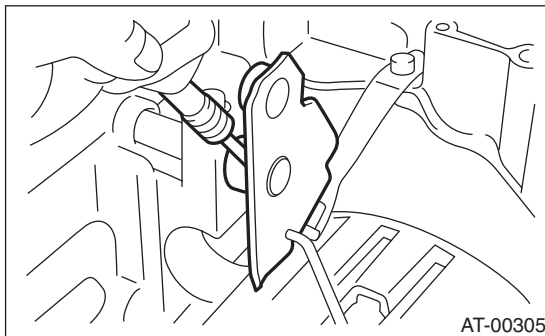
## 39. Transmission Control Device

### A: REMOVAL

- 1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-38, REMOVAL, Automatic Transmission Assembly.>
- 2) Extract the torque converter clutch assembly. <Ref. to 4AT-69, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.
- 4) Lift-up lever behind the transmission harness connector and disconnect it from stay.
- 5) Disconnect the air breather hoses. <Ref. to 4AT-67, REMOVAL, Air Breather Hose.>
- 6) Disconnect inhibitor switch connector from stay.
- 7) Wrap vinyl tape around the nipple attached to the air breather hose.
- 8) Remove pitching stopper bracket.
- 9) Remove the inhibitor switch.



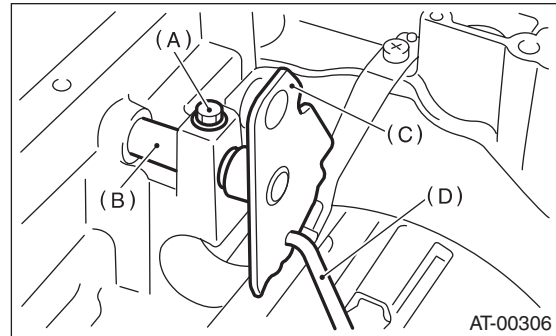
- 10) Remove control valve body assembly. <Ref. to 4AT-59, REMOVAL, Control Valve Body.>
- 11) Pull off the straight pin of manual plate.



- 12) Remove bolt securing select lever, then remove select lever, manual plate and parking rod.

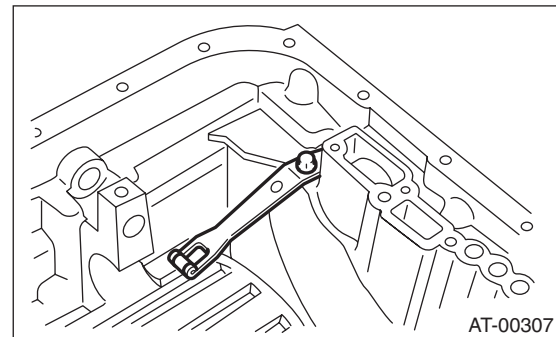
### NOTE:

Be careful not to damage the lips of the press-fitted oil seal in the case.



- (A) Bolt
- (B) Range select lever
- (C) Manual plate
- (D) Parking rod

- 13) Remove the detent spring.

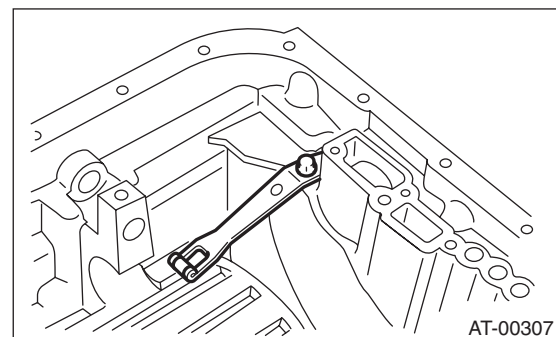


### B: INSTALLATION

- 1) Install detent spring to transmission case.

#### **Tightening torque:**

**6 N·m (0.6 kgf-m, 4.3 ft-lb)**



- 2) Insert range select lever, and tighten bolt.

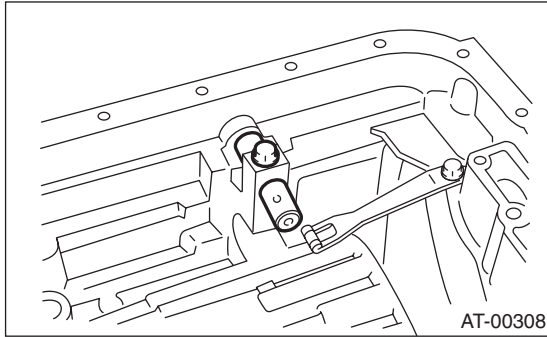


# Transmission Control Device

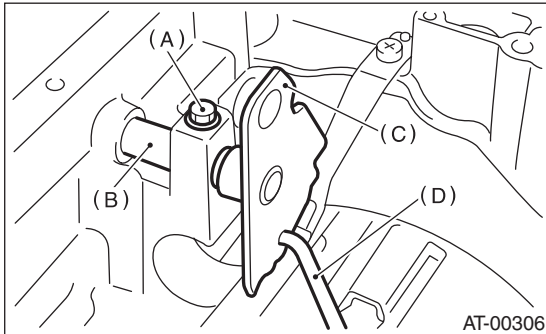
## AUTOMATIC TRANSMISSION

### Tightening torque:

**6 N·m (0.6 kgf-m, 4.3 ft-lb)**

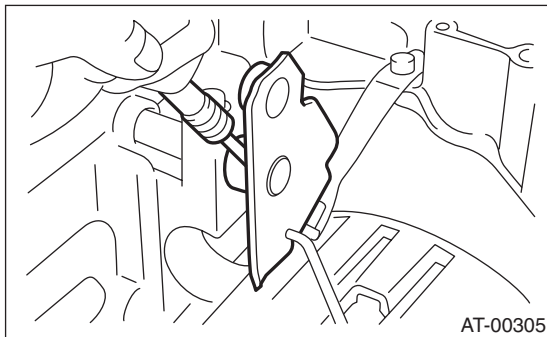


3) Install the manual plate and parking rod.



- (A) Bolt
- (B) Range select lever
- (C) Manual plate
- (D) Parking rod

4) Insert spring pin to manual plate.



5) Install control valve assembly and oil pan. <Ref. to 4AT-59, INSTALLATION, Control Valve Body.>

6) Turn over the transmission case to its original position.

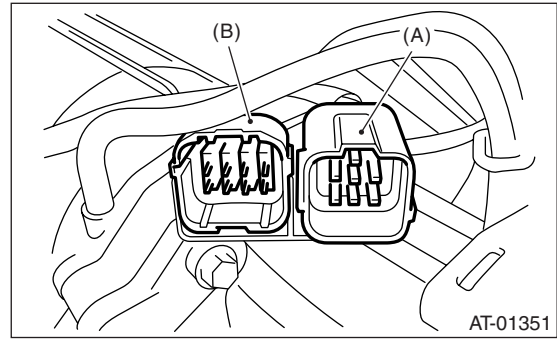
7) Install pitching stopper bracket.

### Tightening torque:

**41 N·m (4.2 kgf-m, 30.2 ft-lb)**

8) Install inhibitor switch and adjust the inhibitor switch. <Ref. to 4AT-48, Inhibitor Switch.>

9) Insert inhibitor switch and transmission connector into stay.



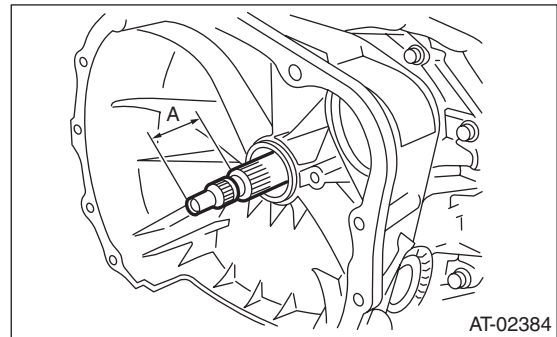
- (A) Transmission harness
- (B) Inhibitor switch harness

10) Install air breather hose. <Ref. to 4AT-67, INSTALLATION, Air Breather Hose.>

11) Insert the input shaft while rotating it lightly by hand, and then check the protrusion amount.

### Normal protrusion amount A:

**50 — 55 mm (1.97 — 2.17 in)**



12) Install the torque converter clutch assembly. <Ref. to 4AT-69, INSTALLATION, Torque Converter Clutch Assembly.>

13) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

## C: INSPECTION

Make sure the manual lever and detent spring are not worn or otherwise damaged.

# AUTOMATIC TRANSMISSION (DIAGNOSTICS)

## *4AT(D)(diag)*

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| 3. General Description .....   | 5           |
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| 6. Subaru Select Monitor .....                                       | 13          |
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# Basic Diagnostic Procedure

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

### 1. Basic Diagnostic Procedure

#### A: PROCEDURE

| Step  | Check   | Yes                              | No                           |
|---|---|----------------------------------|------------------------------|
| <b>1</b><br><b>CHECK PRE-INSPECTION.</b><br>1) Ask the customer when and how trouble occurred using interview checklist. <Ref. to 4AT(D)(diag)-4, Check List for Interview.><br>2) Before performing the diagnosis, inspect following items which might influence the AT problems.<br>• General inspection <Ref. to 4AT(D)(diag)-5, INSPECTION, General Description.><br>• Oil leak<br>• Stall speed test <Ref. to 4AT-34, Stall Test.><br>• Line pressure test <Ref. to 4AT-36, Line Pressure Test.><br>• Transfer clutch pressure test <Ref. to 4AT-37, Transfer Clutch Pressure Test.><br>• Time lag test <Ref. to 4AT-35, Time Lag Test.><br>• Road test <Ref. to 4AT-33, Road Test.><br>• Inhibitor switch <Ref. to 4AT-48, Inhibitor Switch.> | Is the item that might influence AT problem normal? | Go to step 2.                    | Repair or replace each item. |
| <b>2</b><br><b>CHECK AT OIL TEMP WARNING LIGHT.</b><br>Turn the ignition switch to ON.  | Does the AT OIL TEMP warning light illuminate?      | Go to step 4.                    | Go to step 3.                |
| <b>3</b><br><b>CHECK AT OIL TEMP WARNING LIGHT.</b><br>1) Turn the ignition switch to OFF.<br>2) Repair the AT OIL TEMP warning light circuit or power supply and ground line circuit. <Ref. to 4AT(D)(diag)-19, AT OIL TEMP Warning Light Display.><br>3) Turn the ignition switch to ON.  | Is the AT OIL TEMP warning light illuminate?        | Go to step 4.                    | Go to step 5.                |
| <b>4</b><br><b>CHECK INDICATION OF DTC.</b><br>Calling up the DTC.<br><Ref. to 4AT(D)(diag)-16, OPERATION, Read Diagnostic Trouble Code (DTC).><br>NOTE:<br>If the communication function of select monitor cannot be executed normally, check the communication circuit. <Ref. to 4AT(D)(diag)-26, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostic Procedure for Select Monitor Communication.>  | Is the DTC displayed?                               | Record all DTC.<br>Go to step 6. | Go to step 5.                |

# Basic Diagnostic Procedure

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check                 | Yes   | No                      |
|---|-----------------------|---|-------------------------|
| <p><b>5</b></p> <p><b>PERFORM THE GENERAL DIAGNOSTICS.</b></p> <p>1) Inspect using “Diagnostic Procedure without Diagnostic Trouble Code (DTC)”. &lt;Ref. to 4AT(D)(diag)-88, Diagnostic Procedure without Diagnostic Trouble Code (DTC).&gt;</p> <p>2) Inspect using “General Diagnostic Table”. &lt;Ref. to 4AT(D)(diag)-91, General Diagnostic Table.&gt;</p> <p>3) Perform the clear memory mode. &lt;Ref. to 4AT(D)(diag)-18, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.&gt;</p> <p>4) Perform the inspection mode. &lt;Ref. to 4AT(D)(diag)-17, Inspection Mode.&gt;</p> <p>5) Calling up the DTC. &lt;Ref. to 4AT(D)(diag)-16, OPERATION, Read Diagnostic Trouble Code (DTC).&gt;</p>   | Is the DTC displayed? | Go to step 6.   | Complete the diagnosis. |
| <p><b>6</b></p> <p><b>PERFORM THE DIAGNOSIS.</b></p> <p>1) Inspect using “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. &lt;Ref. to 4AT(D)(diag)-32, Diagnostic Procedure with Diagnostic Trouble Code (DTC).&gt;</p> <p><b>NOTE:</b><br/>For DTC table, refer to “List of Diagnostic Trouble Code (DTC)”. &lt;Ref. to 4AT(D)(diag)-30, List of Diagnostic Trouble Code (DTC).&gt;</p> <p>2) Repair the trouble cause.</p> <p>3) Perform the clear memory mode. &lt;Ref. to 4AT(D)(diag)-18, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.&gt;</p> <p>4) Perform the inspection mode. &lt;Ref. to 4AT(D)(diag)-17, Inspection Mode.&gt;</p> <p>5) Calling up the DTC. &lt;Ref. to 4AT(D)(diag)-16, OPERATION, Read Diagnostic Trouble Code (DTC).&gt;</p> | Is the DTC displayed? | Inspect using “Diagnostics Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to 4AT(D)(diag)-32, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> | Complete the diagnosis. |

## Check List for Interview

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

---

## 2. Check List for Interview

### A: CHECK

Check the following items when problem has occurred.

#### NOTE:

Use copies of this page for interviewing customers.

|   |   |  |
|---|---|--|
| Customer's name   |   |  |
| Date of purchase  |   |  |
| Date of repair  |   |  |
| Trans. model  | TRANSMISSION  | VIN  |
| Odometer reading  | km/h or miles   |  |
| Frequency   | <input type="checkbox"/> Continuous <input type="checkbox"/> Intermittent (    times a day)   |  |
| Weather   | <input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy<br><input type="checkbox"/> Various/Others<br>(                    )                                    |  |
| Place   | <input type="checkbox"/> High <input type="checkbox"/> Suburbs <input type="checkbox"/> Inner city <input type="checkbox"/> Uphill <input type="checkbox"/> Rough road<br><input type="checkbox"/> Others<br>(                    ) |  |
| Outdoor temperature                                       | <input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold  |  |
| Vehicle speed   | km/h (MPH)  |  |
| AT diagnostic indicator light (AT OIL TEMP warning light) | <input type="checkbox"/> Continuously blinking  | <input type="checkbox"/> Not blinking  |
| Select lever position                                     | <input type="checkbox"/> P <input type="checkbox"/> R <input type="checkbox"/> N <input type="checkbox"/> D <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1  |  |
| Driving condition   | <input type="checkbox"/> Not affected<br><input type="checkbox"/> At racing<br><input type="checkbox"/> While decelerating  | <input type="checkbox"/> At starting<br><input type="checkbox"/> While accelerating<br><input type="checkbox"/> While turning ( <input type="checkbox"/> RH / <input type="checkbox"/> LH)<br><input type="checkbox"/> While idling<br><input type="checkbox"/> While cruising |
| POWER switch  | <input type="checkbox"/> ON <input type="checkbox"/> OFF  |  |
| HOLD switch   | <input type="checkbox"/> ON <input type="checkbox"/> OFF  |  |
| Symptoms  | <input type="checkbox"/> No up-shift  |  |
|   | <input type="checkbox"/> No down-shift  |  |
|   | <input type="checkbox"/> No kick down   |  |
|   | <input type="checkbox"/> Vehicle does not move ( <input type="checkbox"/> Any position <input type="checkbox"/> Particular position)  |  |
|   | <input type="checkbox"/> Lock-up malfunction  |  |
|   | <input type="checkbox"/> Noise or vibration   |  |
|   | <input type="checkbox"/> Shift shock or slip  |  |
|   | <input type="checkbox"/> Select lever does not move   |  |
|   | <input type="checkbox"/> Others<br>(                    )   |  |

# General Description

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

### 3. General Description

#### A: CAUTION

- **Supplemental Restraint System “Airbag”**

The airbag system wiring harness is routed near the TCM.

#### CAUTION:

- **Airbag system connectors are colored yellow. Do not use an electrical test equipment on these circuit.**
- **Be careful not to damage the airbag system wiring harness when performing diagnostics and servicing the TCM.**

- **Measurement**

When measuring the voltage and resistance of ECM, TCM or each sensor, use a tapered pin with diameter of less than 0.64 mm (0.025 in) in order to avoid poor contact. Do not insert the pin more than 0.65 mm (0.026 in).

#### B: INSPECTION

##### 1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

**Standard voltage: 12 V or more**

**Specific gravity: Above 1.260**

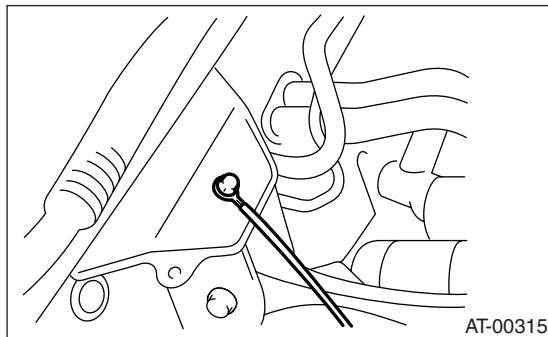
##### 2. TRANSMISSION GROUND

Make sure that the ground terminal bolt is tightened securely.

- **Chassis side**

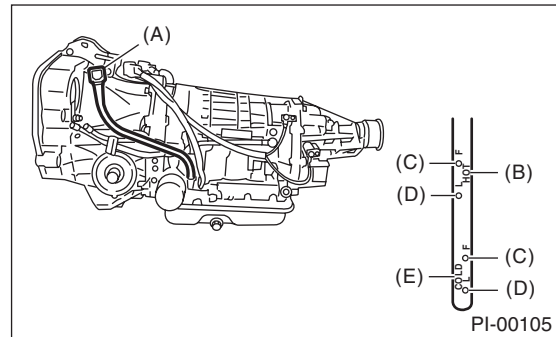
**Tightening torque:**

**13 N·m (1.3 kgf·m, 9.4 ft·lb)**



##### 3. ATF LEVEL

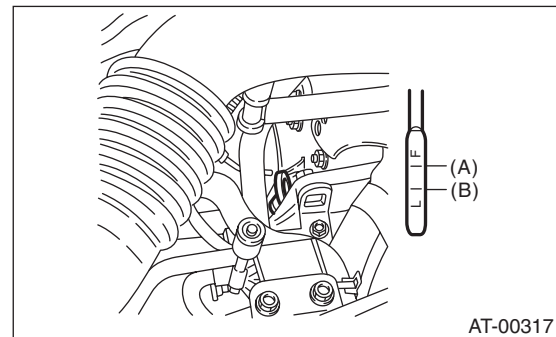
Make sure that ATF level is within the specification. <Ref. to 4AT-30, INSPECTION, Automatic Transmission Fluid.>



- (A) Level gauge
- (B) “HOT” side
- (C) Upper level
- (D) Lower level
- (E) “COLD” side

##### 4. FRONT DIFFERENTIAL OIL LEVEL

Make sure that front differential oil level is within the specification. <Ref. to 4AT-32, INSPECTION, Differential Gear Oil.>



- (A) Upper level
- (B) Lower level

##### 5. OPERATION OF SELECT LEVER

Make sure there is no abnormal noise, dragging or contact pattern in each select lever range.

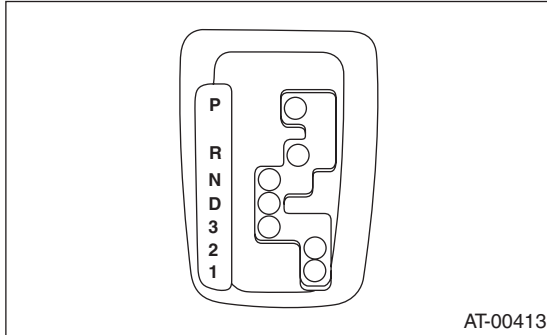
# General Description

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

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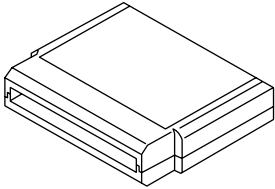

**WARNING:**

**Stop the engine while checking operation of select lever.**



### C: PREPARATION TOOL

#### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER  | DESCRIPTION               | REMARKS                                 |
|---|--|---------------------------|---|
|  <p style="text-align: center;">ST18482AA010</p>  | <p style="text-align: center;">18482AA010<br/>(Newly adopted tool)</p> | CARTRIDGE                 | Troubleshooting for electrical systems. |
|  <p style="text-align: center;">ST22771AA030</p> | <p style="text-align: center;">22771AA030</p>                          | SUBARU SELECT MONITOR KIT | Troubleshooting for electrical systems. |

#### 2. GENERAL TOOL

| TOOL NAME      | REMARKS  |
|----------------|--|
| Circuit tester | Used for measuring resistance, voltage and ampere. |
| Oscilloscope   | Used for measuring sensor.                         |

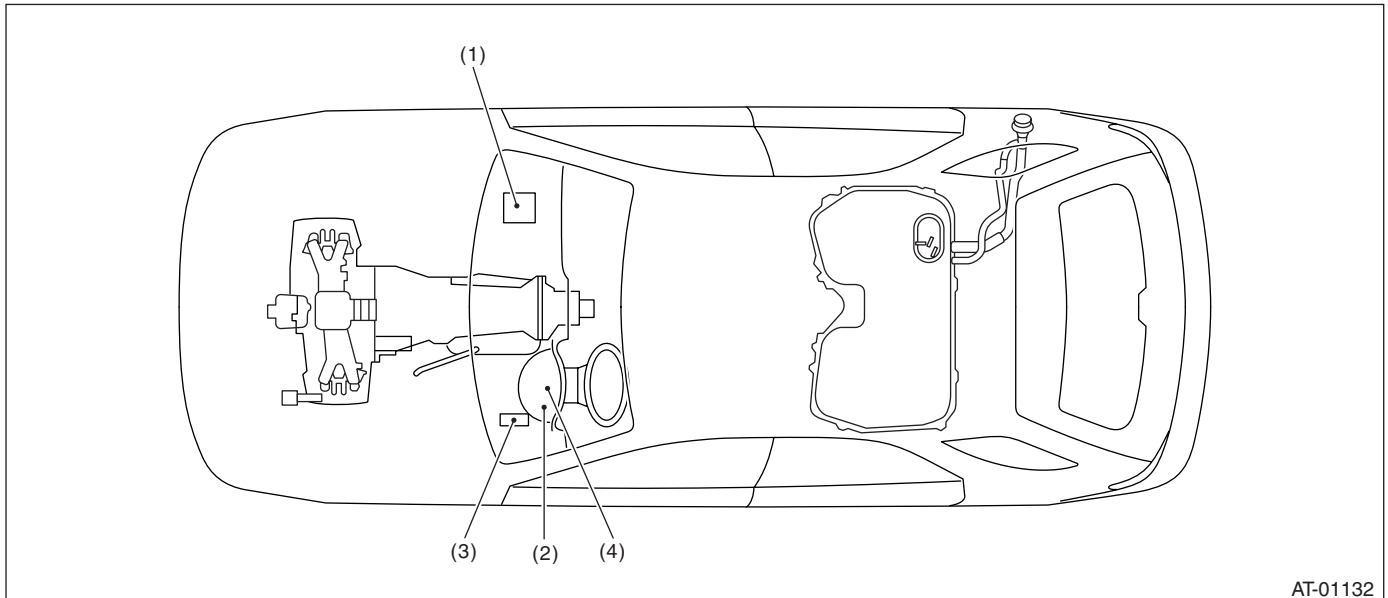
# Electrical Component Location

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

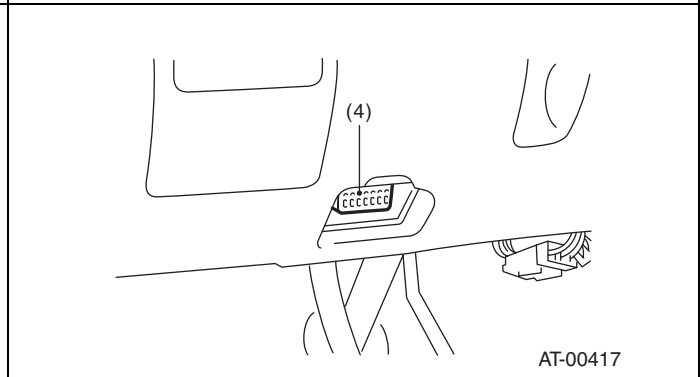
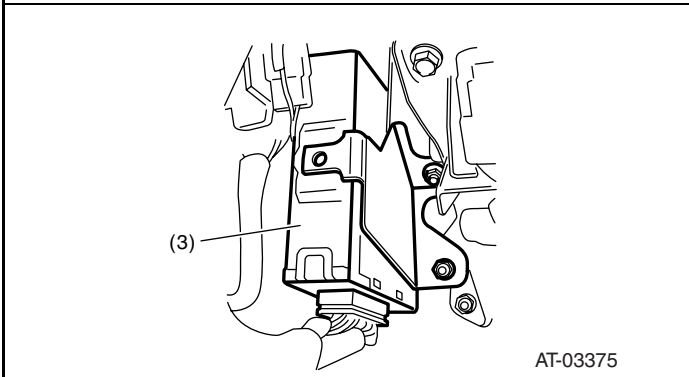
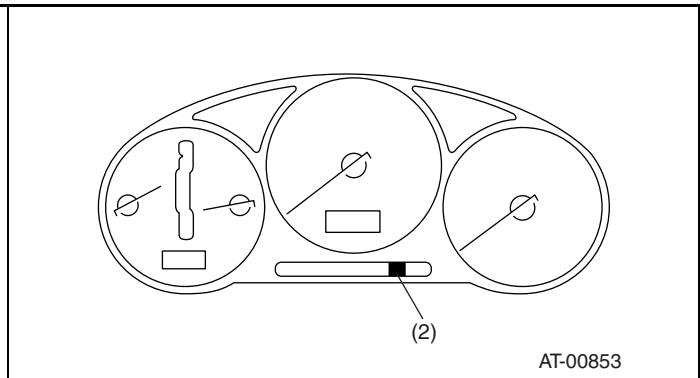
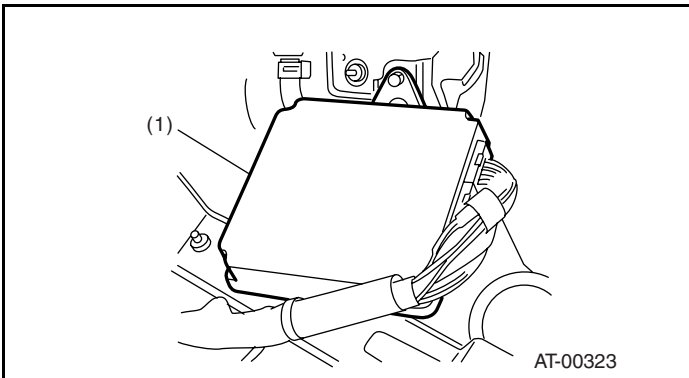
## 4. Electrical Component Location

### A: LOCATION

#### 1. CONTROL MODULE



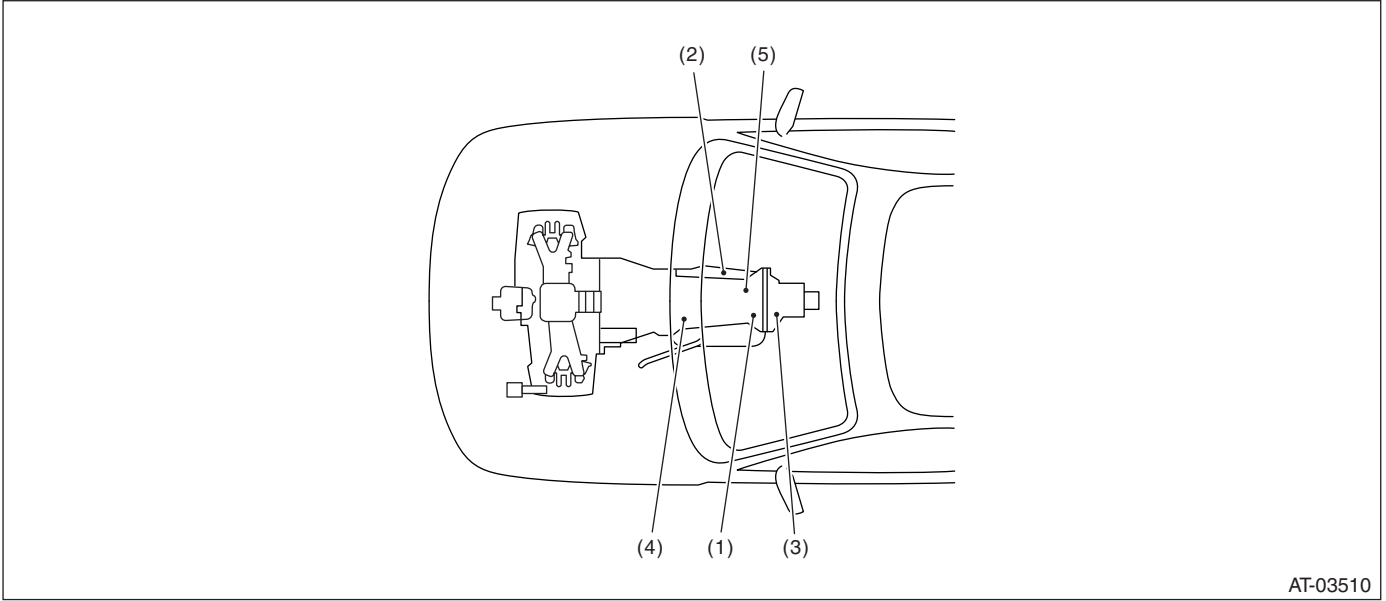
- (1) Engine control module (ECM)
- (2) AT OIL TEMP warning light (AT warning light)
- (3) Transmission control module (TCM)
- (4) Data link connector



# Electrical Component Location

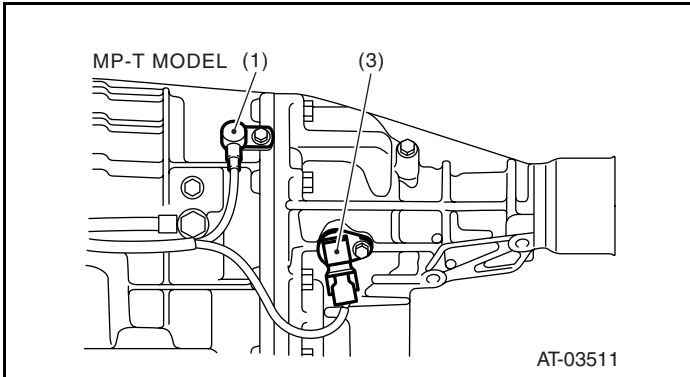
## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

### 2. SENSOR

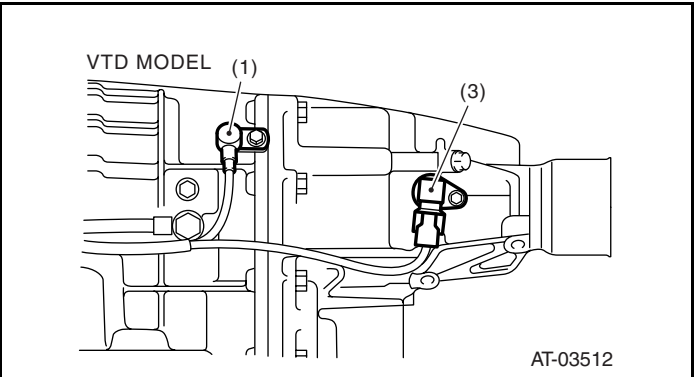


AT-03510

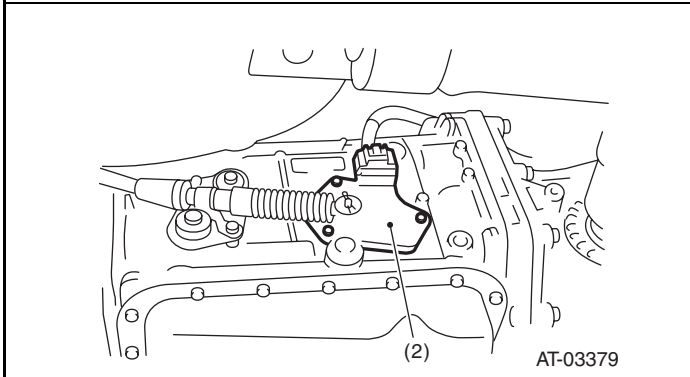
- (1) Front vehicle speed sensor
- (2) Inhibitor switch
- (3) Rear vehicle speed sensor
- (4) Torque converter turbine speed sensor
- (5) ATF temperature sensor



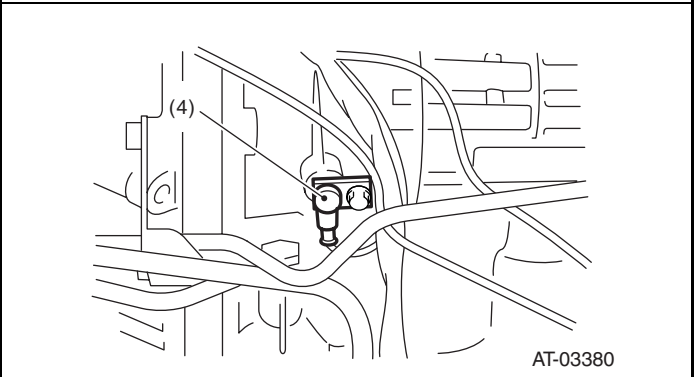
AT-03511



AT-03512



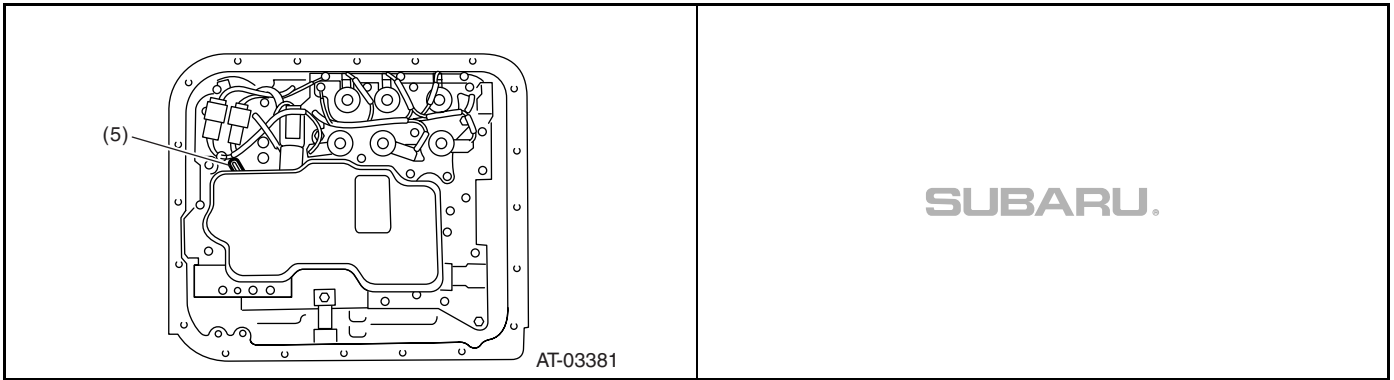
AT-03379



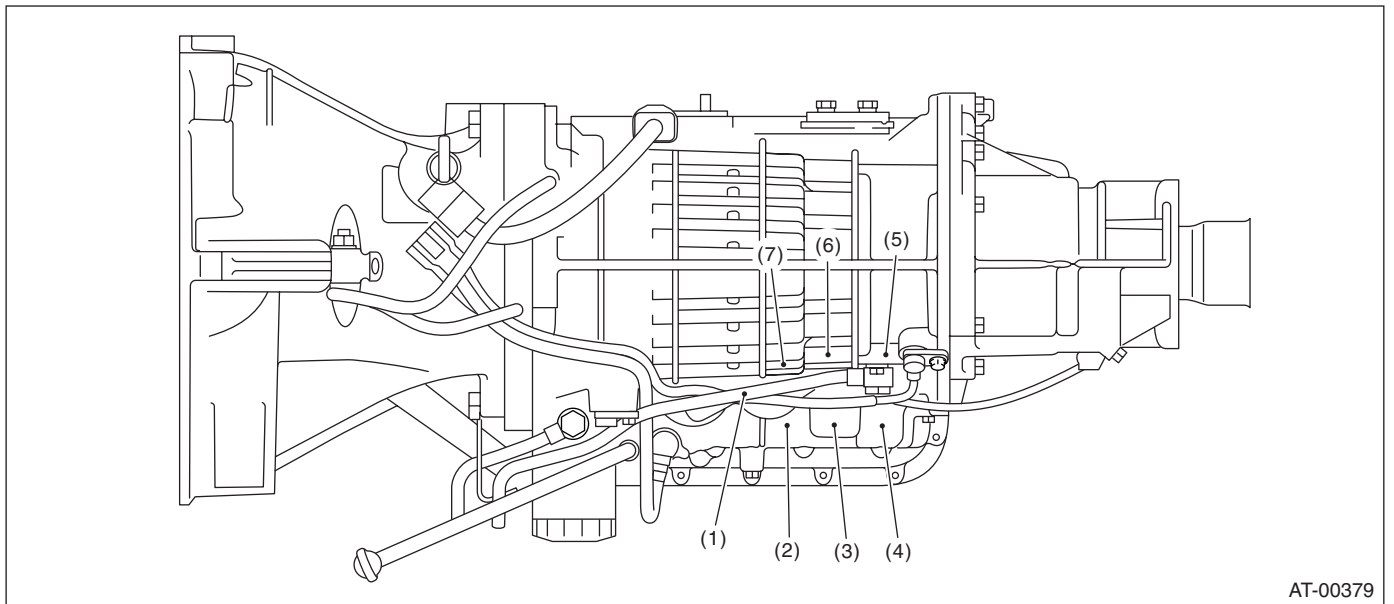
AT-03380

# Electrical Component Location

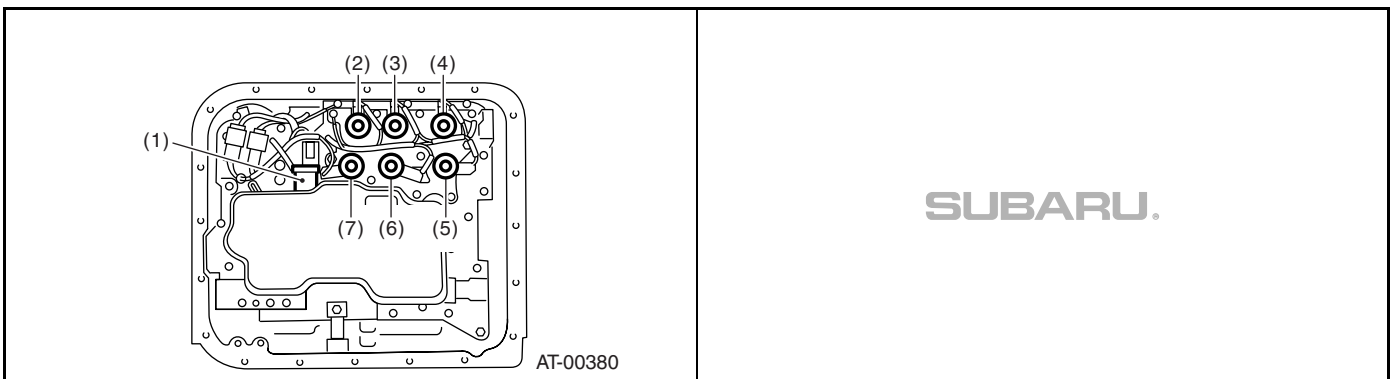
AUTOMATIC TRANSMISSION (DIAGNOSTICS)



## 3. SOLENOID



- |                                   |                                 |                           |
|-----------------------------------|---------------------------------|---------------------------|
| (1) Line pressure linear solenoid | (4) Low & reverse duty solenoid | (7) Lock-up duty solenoid |
| (2) High clutch duty solenoid     | (5) Low clutch duty solenoid    |                           |
| (3) 2-4 brake duty solenoid       | (6) Transfer duty solenoid      |                           |



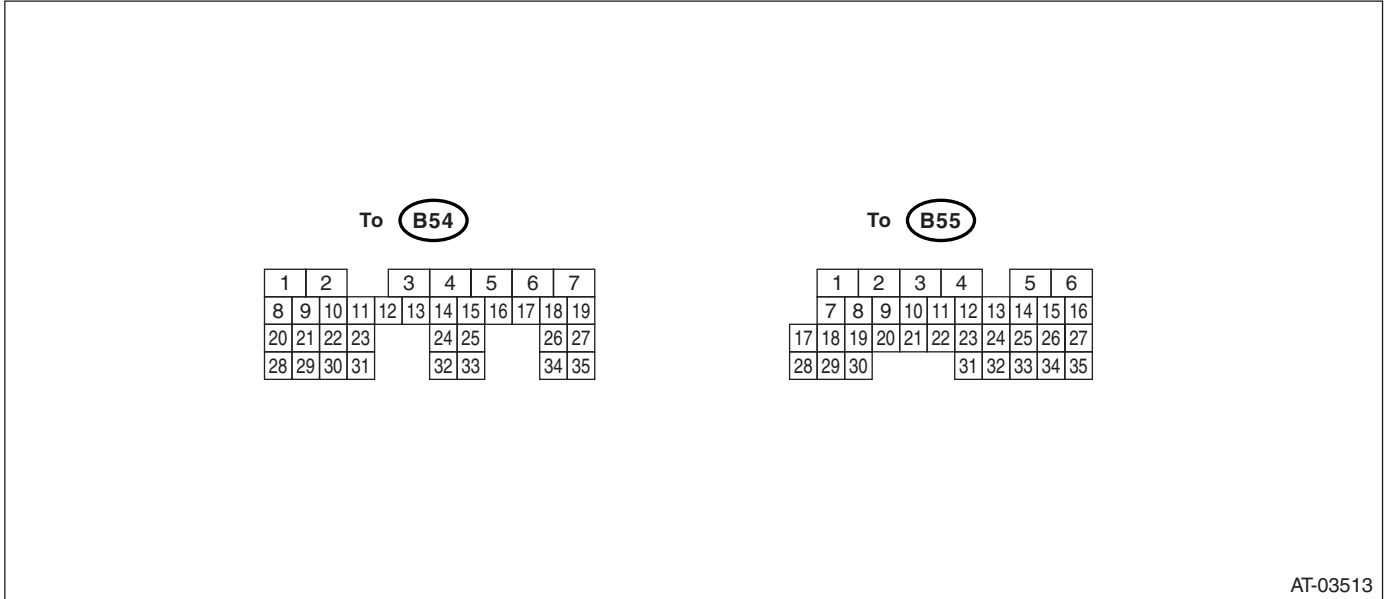


# Transmission Control Module (TCM) I/O Signal

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

## 5. Transmission Control Module (TCM) I/O Signal

### A: ELECTRICAL SPECIFICATION



AT-03513

| Check with ignition switch ON. |                  |              |                                      |   |                                 |   |
|--------------------------------|------------------|--------------|--------------------------------------|---|---------------------------------|---|
| Content                        | Connector No.    | Terminal No. | Measuring conditions                 | Voltage (V)   | Resistance to body ( $\Omega$ ) |   |
| Back-up power supply           | B54              | 25           | Ignition switch OFF                  | 10 — 13   | —                               |   |
|                                |                  | 26           |                                      |   |                                 |   |
|                                |                  | 27           |                                      |   |                                 |   |
| ACC power supply               | B54              | 12           | Ignition switch ACC                  | 10 — 13   | —                               |   |
| Ignition power supply          | B54              | 1            | Ignition switch ON (with engine OFF) | 10 — 13   | —                               |   |
|                                |                  | 2            |                                      |   |                                 |   |
| Inhibitor switch               | "P" range switch | B55          | 14                                   | Select lever in "P" range                                   | Less than 1                     | — |
|                                |                  |              |                                      | Select lever in any other than "P" range (except "N" range) | More than 8                     |   |
|                                | "N" range switch | B55          | 11                                   | Select lever in "N" range                                   | Less than 1                     | — |
|                                |                  |              |                                      | Select lever in any other than "N" range                    | More than 8                     |   |
|                                | "R" range switch | B55          | 13                                   | Select lever in "R" range                                   | Less than 1                     | — |
|                                |                  |              |                                      | Select lever in any other than "R" range                    | More than 8                     |   |
|                                | "D" range switch | B55          | 10                                   | Select lever in "D" range                                   | Less than 1                     | — |
|                                |                  |              |                                      | Select lever in any other than "D" range                    | More than 8                     |   |
|                                | "3" range switch | B55          | 8                                    | Select lever in "3" range                                   | Less than 1                     | — |
|                                |                  |              |                                      | Select lever in any other than "3" range                    | More than 8                     |   |
|                                | "2" range switch | B55          | 7                                    | Select lever in "2" range                                   | Less than 1                     | — |
|                                |                  |              |                                      | Select lever in any other than "2" range                    | More than 8                     |   |
|                                | "1" range switch | B55          | 19                                   | Select lever in "1" range                                   | Less than 1                     | — |
|                                |                  |              |                                      | Select lever in any other than "1" range                    | More than 8                     |   |
| Brake switch                   | B55              | 20           | Brake pedal depressed.               | More than 10.5  | —                               |   |
|                                |                  |              | Brake pedal released.                | Less than 1   |                                 |   |

# Transmission Control Module (TCM) I/O Signal

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Check with ignition switch ON.               |               |              |  |                                |                        |
|--|---------------|--------------|--|--------------------------------|------------------------|
| Content                                      | Connector No. | Terminal No. | Measuring conditions   | Voltage (V)                    | Resistance to body (Ω) |
| AT OIL TEMP warning light                    | B54           | 15           | Light ON   | Less than 1                    | —                      |
|  |               |              | Light OFF  | More than 9                    |                        |
| ATF temperature sensor                       | B55           | 23           | ATF temperature 20°C (68°F)  | 3.5 — 4.3                      | 2.3 k — 5.3 k          |
|  |               |              | ATF temperature 80°C (176°F)   | 1.5 — 1.9                      | 300 — 800              |
| Rear vehicle speed sensor                    | B55           | 26           | Vehicle speed at least 20 km/h (12 MPH)  | More than 2 (AC range)         | —                      |
| Front vehicle speed sensor                   | B55           | 27           | Vehicle stopped.   | 0                              | 450 — 650              |
|  |               |              | Vehicle speed at least 20 km/h (12 MPH)  | More than 1 (AC range)         |                        |
| Torque converter turbine speed sensor        | B55           | 1            | Engine idling after warm-up. ("D" range)   | 0                              | 450 — 650              |
|  |               |              | Engine idling after warm-up. ("N" range)   | More than 1 (AC range)         |                        |
| Vehicle speed output signal                  | B55           | 21           | Vehicle speed at least 10 km/h (6 MPH)   | Less than 1 ←<br>→ More than 4 | —                      |
| Engine speed signal                          | B54           | 11           | Ignition switch ON (with engine OFF)   | Less than 1                    | —                      |
|  |               |              | Ignition switch ON (with engine ON)  | More than 5 (AC range)         |                        |
| Line pressure linear solenoid                | B55           | 4            | Ignition switch ON (with engine OFF)<br>Throttle fully closed after warm-up. ("R" range) | 3.7 — 7.5                      | 4.0 — 8.0              |
|  |               |              | Ignition switch ON (with engine OFF)<br>Throttle fully open after warm-up. ("R" range)   | 1.0 — 5.1                      |                        |
| Lock-up duty solenoid                        | B55           | 6            | When lock up occurs.   | More than 10.5                 | 2.0 — 6.0              |
|  |               |              | When lock up is released.  | Less than 1                    |                        |
| Transfer duty solenoid                       | B55           | 5            | "P" or "N" range   | Less than 1                    | 2.0 — 6.0              |
|  |               |              | Select lever in 1st gear.  | 1.7 — 4.0                      |                        |
| 2-4 brake duty solenoid                      | B54           | 4            | "P" or "N" range   | More than 10.5                 | 2.0 — 6.0              |
|  |               |              | 2nd or 4th gear  | Less than 1                    |                        |
| High clutch duty solenoid                    | B54           | 6            | 3rd or 4th gear  | Less than 1                    | 2.0 — 6.0              |
|  |               |              | "P" or "N" range   | More than 10.5                 |                        |
| Low clutch duty solenoid                     | B54           | 7            | 1st or 2nd gear  | Less than 1                    | 2.0 — 6.0              |
|  |               |              | "P" or "N" range   | More than 10.5                 |                        |
| Low & reverse duty solenoid                  | B54           | 5            | "P" or "N" range   | More than 10.5                 | 2.0 — 6.0              |
|  |               |              | "1" range  | 5 — 10                         |                        |
| Front vehicle speed sensor ground            | B55           | 16           | —  | 0                              | Less than 1            |
| Rear vehicle speed sensor ground             | B55           | 15           | —  | 0                              | Less than 1            |
| System ground line                           | B54           | 23           | —  | 0                              | Less than 1            |
|  | B54           | 20           |  |                                |                        |
|  | B54           | 21           |  |                                |                        |
|  | B54           | 22           |  |                                |                        |
| Torque converter turbine speed sensor ground | B55           | 2            | —  | 0                              | Less than 1            |
| Sensor ground line 4                         | B55           | 12           | —  | 0                              | Less than 1            |

## Transmission Control Module (TCM) I/O Signal

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Check with ignition switch ON.           |               |              |                               |                |                                 |
|--|---------------|--------------|-------------------------------|----------------|---------------------------------|
| Content                                  | Connector No. | Terminal No. | Measuring conditions          | Voltage (V)    | Resistance to body ( $\Omega$ ) |
| Range lock signal                        | B54           | 3            | "D" range 0 km/h (0 mile)     | More than 10.5 | 7 — 18                          |
|  |               |              | "D" range 20 km/h (12 mile/h) | Less than 1    |                                 |
| Data link signal (Subaru Select Monitor) | B54           | 8            | —                             | —              | —                               |
| FWD switch                               | B54           | 10           | Fuse removed                  | 9.5            | —                               |
|  |               |              | Fuse installed                | Less than 1    |                                 |
| AWD warning light                        | B54           | 13           | FWD switch fuse installed     | Less than 1    | —                               |
|  |               |              | FWD switch fuse removed       | More than 9    |                                 |
| CAN communication signal (+)             | B55           | 18           | Ignition switch ON            | Pulse signal   | —                               |
| CAN communication signal (-)             | B55           | 17           | Ignition switch ON            | Pulse signal   | —                               |
| Line pressure linear solenoid ground     | B55           | 3            | —                             | Less than 1    | Less than 1                     |

# Subaru Select Monitor

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

## 6. Subaru Select Monitor

### A: OPERATION

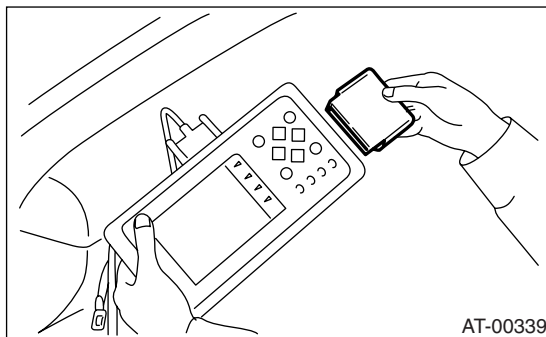
#### 1. READ DIAGNOSTIC TROUBLE CODE

1) Prepare the Subaru Select Monitor kit.



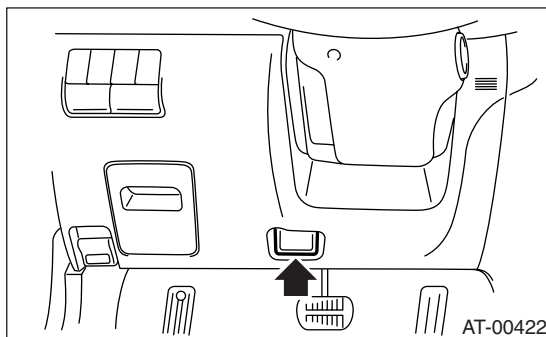
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor.  
<Ref. to 4AT(D)(diag)-6, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector located in the lower portion of instrument panel (on driver's side).

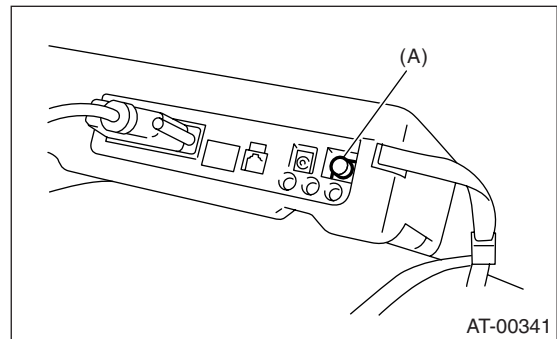


(2) Connect the diagnosis cable to data link connector.

#### NOTE:

Do not connect scan tools except for Subaru Select Monitor.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor power switch to ON.



(A) POWER switch

6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.

7) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.

8) Press the [YES] key after the information of transmission type is displayed.

9) On the «Transmission Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.

#### NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

- For details concerning the DTC, refer to the DTC LIST. <Ref. to 4AT(D)(diag)-30, List of Diagnostic Trouble Code (DTC).>

#### 2. READ CURRENT DATA

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.

2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.

3) Press the [YES] key after the information of transmission type is displayed.

4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.

5) On the «Transmission Diagnosis» display screen, select the {Data Display} and press the [YES] key.

# Subaru Select Monitor

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

6) Using the scroll key, move the display screen up or down until desired data is shown.

- A list of the support data is shown in the following table.

| Contents                                     | Display                  | Unit of measure |
|--|--------------------------|-----------------|
| Battery voltage                              | Battery Voltage          | V               |
| Rear vehicle speed sensor signal             | Rear Wheel Speed         | km/h or MPH     |
| Front vehicle speed sensor signal            | Front Wheel Speed        | km/h or MPH     |
| Engine speed signal                          | Engine Speed             | rpm             |
| ATF temperature signal                       | ATF Temp.                | °C or °F        |
| Gear position                                | Gear Position            | —               |
| Line pressure control duty ratio             | Line Pressure Duty Ratio | %               |
| Lock up clutch control duty ratio            | Lock Up Duty Ratio       | %               |
| Transfer clutch control duty ratio           | Transfer Duty Ratio      | %               |
| Torque converter turbine speed signal        | Turbine Revolution Speed | rpm             |
| 2-4 brake timing pressure control duty ratio | Brake Clutch Duty Ratio  | %               |
| Low clutch duty ratio                        | L/C Duty                 | %               |
| High clutch duty ratio                       | H/C Duty                 | %               |
| Low & reverse brake duty ratio               | L&R/B Duty               | %               |
| Stop light switch signal                     | Stop Light Switch        | ON or OFF       |
| Parking range signal                         | P Range Signal           | ON or OFF       |
| Neutral range signal                         | N Range Signal           | ON or OFF       |
| Reverse range signal                         | R Range Signal           | ON or OFF       |
| Drive range signal                           | D Range Signal           | ON or OFF       |
| 3rd range signal                             | 3rd Range Signal         | ON or OFF       |
| 2nd range signal                             | 2nd Range Signal         | ON or OFF       |
| 1st range signal                             | 1st Range Signal         | ON or OFF       |
| AT diagnosis indicator lamp                  | Diagnosis Lamp           | ON or OFF       |
| Shift lock solenoid signal                   | Shift Lock solenoid      | ON or OFF       |
| FWD switch signal                            | FWD SW                   | ON or OFF       |
| Cruise control On signal                     | Cruise Control Signal    | ON or OFF       |
| AT OIL TEMP warning light                    | AT OIL TEMP light        | ON or OFF       |

### NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

### 3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.

2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.

3) Press the [YES] key after the information of transmission type is displayed.

4) On the «Transmission Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.

5) When the “Done” is shown on display screen, turn the Subaru Select Monitor power switch and ignition switch to OFF.

### NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

- When {Clear Memory 2} is selected and executed, DTC and learned control memory is cleared. If Clear Memory 2 is performed, execute the learning control. <Ref. to 4AT(D)(diag)-15, FACILITATION OF LEARNING CONTROL, OPERATION, Subaru Select Monitor.>

### 4. FACILITATION OF LEARNING CONTROL

#### NOTE:

When the following services have been performed or when the shifting shock is occurred during the total check with vehicle driving, perform the learning with following procedures.

- Replacement of TCM
  - Replacement of transmission assembly
  - Replacement of each clutch
  - Replacement of control valve body
  - When memory clear 2 is performed
- 1) Shift the select lever to “P” range, and apply parking brake.
  - 2) Lift-up the vehicle.
  - 3) Connect the Subaru Select Monitor to data link connector, and then turn the ignition switch to ON.
  - 4) Perform the {Clear Memory 2} using Subaru Select Monitor. <Ref. to 4AT(D)(diag)-14, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.>
  - 5) Using Subaru Select Monitor, check that the DTC is not output. <Ref. to 4AT(D)(diag)-13, READ DIAGNOSTIC TROUBLE CODE, OPERATION, Subaru Select Monitor.>
  - 6) Warm-up the engine until the ATF temperature which is displayed on the Subaru Select Monitor is within 60 — 90°C (140 — 194°F). <Ref. to 4AT(D)(diag)-13, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>
  - 7) Shift the select lever to “R” range.
  - 8) Turn all switches including headlight, air conditioner, seat heater, rear defogger and etc. to OFF.
  - 9) Turn the ignition switch to OFF.
  - 10) Depress the brake pedal fully until the facilitation of learning control is completed when the “Communication Failed!” is displayed on Subaru Select Monitor.
  - 11) Turn the ignition switch to ON.
  - 12) Read the current data to check that the Subaru Select Monitor is returned to normal operation. <Ref. to 4AT(D)(diag)-13, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>
  - 13) Shift the select lever to “P” range, and then wait for more than 3 seconds.
  - 14) Shift the select lever to “R” range, and then wait for more than 3 seconds.
  - 15) Shift the select lever to “N” range, and then wait for more than 3 seconds.
  - 16) Shift the select lever to “D” range, and then wait for more than 3 seconds.
  - 17) Shift the select lever to “N” range, and then wait for more than 3 seconds.
  - 18) Slowly depress the accelerator pedal fully.
  - 19) Slowly release the accelerator pedal fully.

20) Start the engine, and idle it.

21) Shift the select lever to “D” range.

22) Start the facilitation of learning control. At this time, the AT OIL TEMP warning light in combination meter blinks at 2 Hz. When the AT OIL TEMP warning light does not blink, turn the ignition switch to OFF and repeat the procedures from step 4). When the AT OIL TEMP warning light which blinking at 2 Hz changes to blink at 0.5 Hz, facilitation of learning control is completed.

#### NOTE:

When blinking of AT OIL TEMP warning light changes from 2 Hz to 4 Hz during facilitation of learning control, repeat the procedure from step 4).

23) Shift the select lever to “N” range, and then turn the ignition switch to OFF.

24) Shift the select lever to the “P” range, and then complete the facilitation of learning control.

## **Read Diagnostic Trouble Code (DTC)**

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

---

### **7. Read Diagnostic Trouble Code (DTC)**

#### **A: OPERATION**

Refer to Subaru Select Monitor for information about how to obtain and understand DTC. <Ref. to 4AT(D)(diag)-13, OPERATION, Subaru Select Monitor.>

#### **NOTE:**

DTC can not be read through AT OIL TEMP warning light.

## 8. Inspection Mode

### A: OPERATION

**WARNING:**

**Observe the road traffic law.**

Move the select lever to “D” range, and then drive the vehicle at 60 km/h (37 MPH) for at least 10 seconds.



## Clear Memory Mode

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

---

### 9. Clear Memory Mode

#### A: OPERATION

##### 1. WITH SUBARU SELECT MONITOR

Refer to Subaru Select Monitor for information about how to clear DTC.

<Ref. to 4AT(D)(diag)-14, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.>

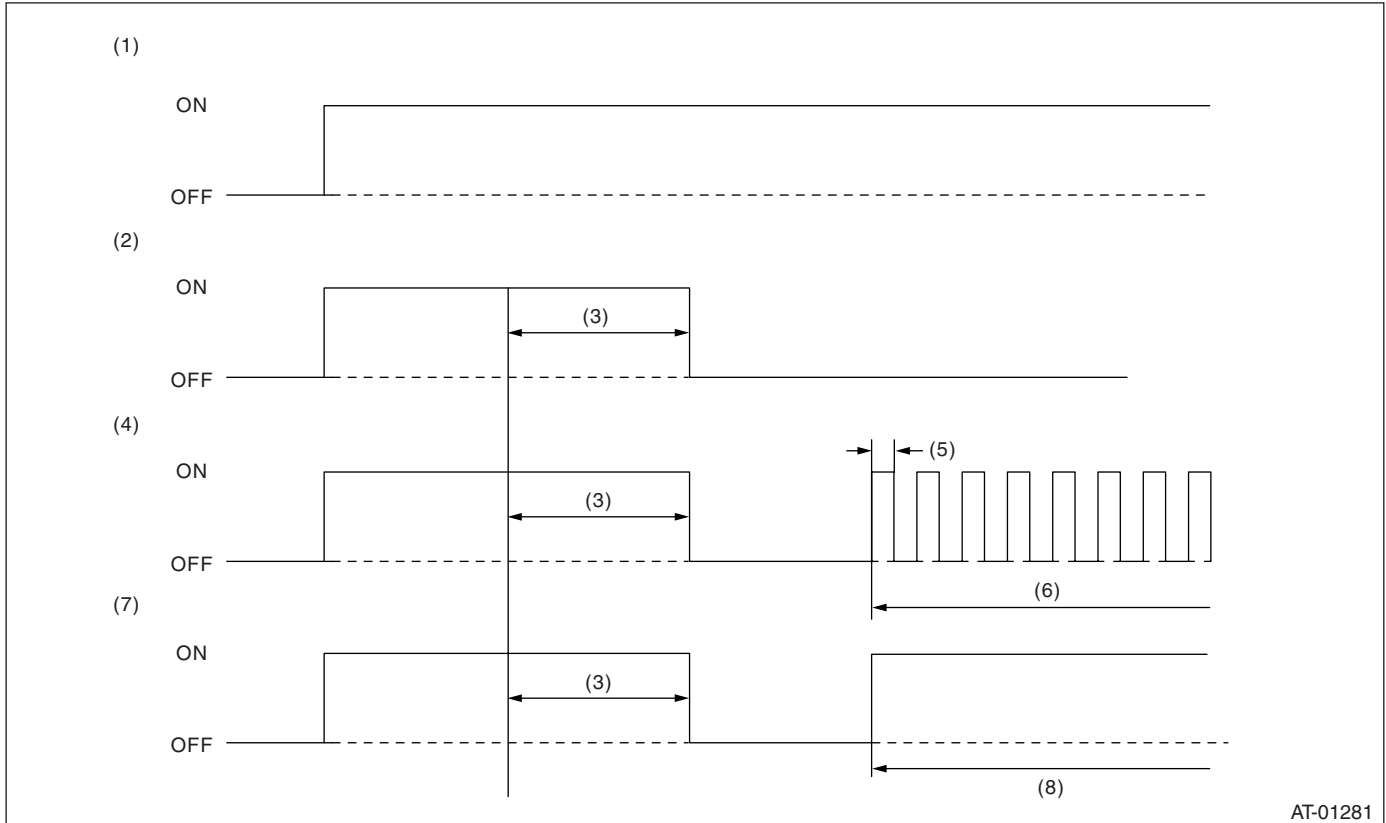
# AT OIL TEMP Warning Light Display

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

## 10. AT OIL TEMP Warning Light Display

### A: OPERATION

When any on-board diagnostics item is malfunctioning, the display on AT OIL TEMP warning light blinks from the time malfunction is detected after starting the engine until ignition switch is turned to OFF. The malfunctioning part or unit can be determined by a DTC during on-board diagnostics operation. Problems which occurred previously can also be identified through the memory function. If the POWER indicator does not show a problem (although a problem is occurring), the problem can be determined by checking the performance characteristics of each sensor using Subaru Select Monitor. The indicator signal is as shown in the figure.



AT-01281

(1) Ignition switch (engine OFF)

(4) Abnormal (Trouble occurs)

(7) Normal (ATF temperature is high)

(2) Normal

(5) 0.25 secs

(8) ATF temperature is high

(3) 2 secs

(6) Blink

Execute the inspection if AT OIL TEMP warning light does not operate normally. <Ref. to 4AT(D)(diag)-20, INSPECTION, AT OIL TEMP Warning Light Display.>

# AT OIL TEMP Warning Light Display

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

## B: INSPECTION

### DIAGNOSIS:

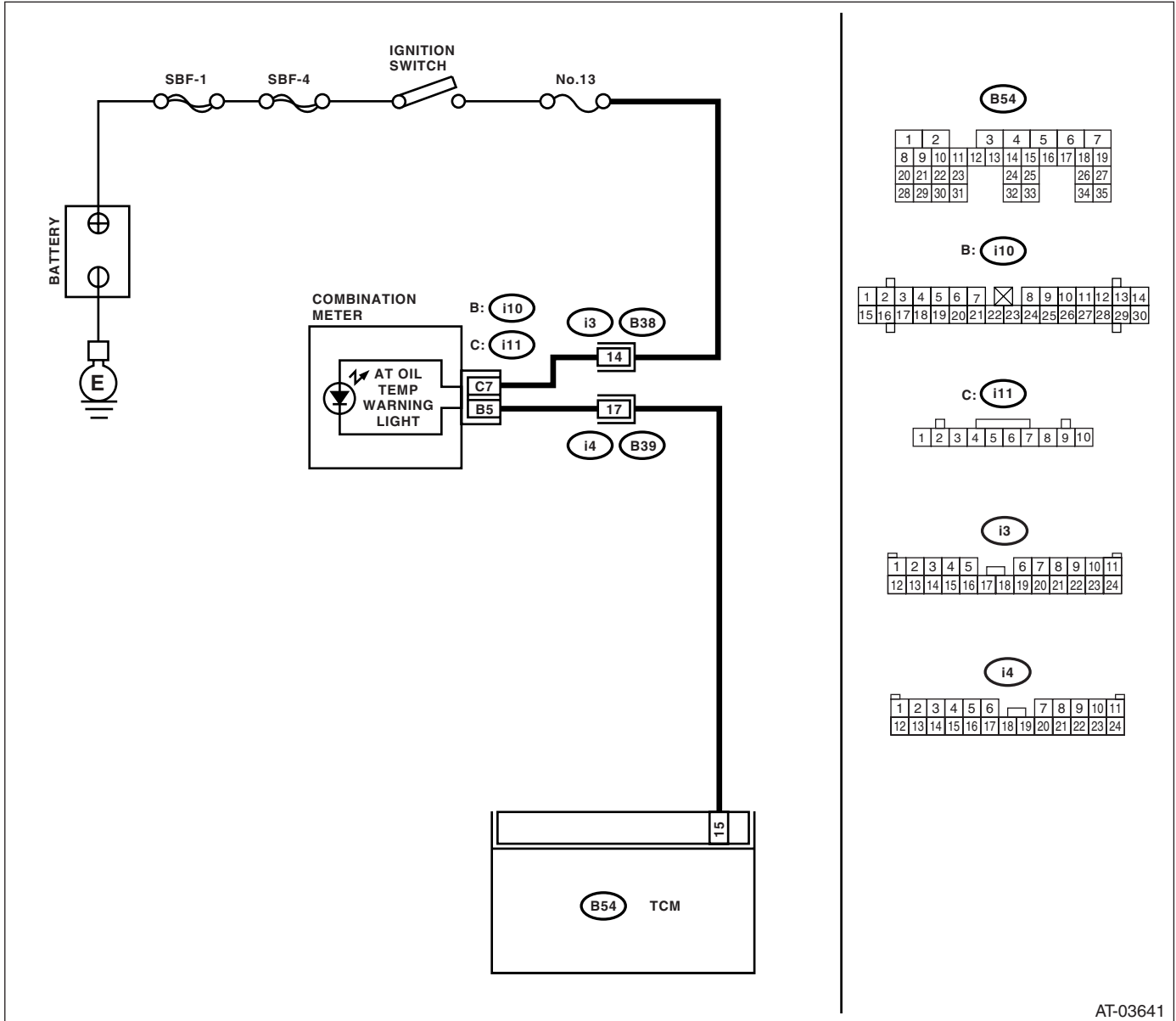
The AT OIL TEMP warning light circuit is open or shorted.

### TROUBLE SYMPTOM:

- When the ignition switch is turned to ON (engine OFF), AT OIL TEMP warning light does not illuminate.

### WIRING DIAGRAM:

- Non-turbo model

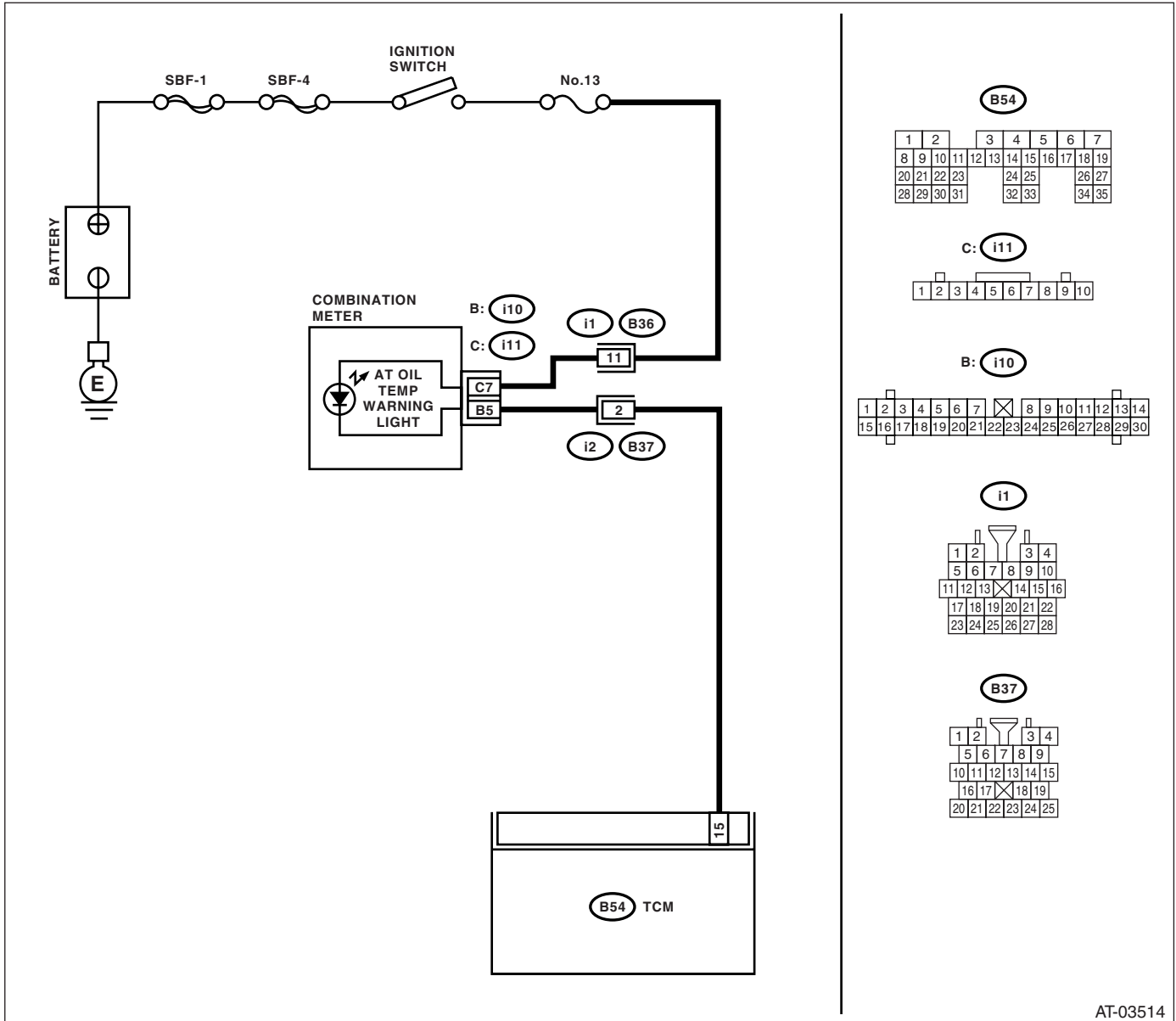


AT-03641

# AT OIL TEMP Warning Light Display

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

- Turbo model



AT-03514

| Step | Check  | Yes  | No                           |
|------|--|--|------------------------------|
| 1    | <b>CHECK AT OIL TEMP WARNING LIGHT.</b><br>Turn the ignition switch to ON (engine OFF).                            | Does the AT OIL TEMP warning light illuminate?   | Go to step 2.                |
| 2    | <b>CHECK FUSE (No. 13).</b><br>Remove the fuse (No. 13).   | Is the fuse (No. 13) blown out?  | Go to step 3.                |
| 3    | <b>CHECK AT OIL TEMP WARNING LIGHT.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the combination meter. | Is the AT OIL TEMP warning light OK?   | Go to step 4.                |
|      |  | Replace the fuse (No. 13). If replaced fuse (No. 13) is blown out easily, repair short circuit in harness between fuse (No. 13) and combination meter. | Check the combination meter. |

# AT OIL TEMP Warning Light Display

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <b>4 CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND IGNITION SWITCH.</b><br>1) Turn the ignition switch to ON (engine OFF).<br>2) Measure the voltage between combination meter connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(i11) No. 7 (+) — Chassis ground (-):</i>   | Is the voltage more than 9 V?                  | Go to step 5.   | Repair the open circuit in harness between combination meter and battery.                                     |
| <b>5 CHECK COMBINATION METER.</b><br>Measure the voltage between combination meter connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(i10) No. 5 (+) — Chassis ground (-):</i>   | Is the voltage less than 9 V?                  | Repair the combination meter.<br><Ref. to IDI-10, Combination Meter.> | Go to step 6.   |
| <b>6 CHECK OPEN CIRCUIT OF HARNESS.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from combination meter connector.<br>3) Measure the resistance of harness between combination meter.<br><b>Connector &amp; terminal</b><br><i>(B54) No. 15 — (i10) No. 5:</i>               | Is the resistance less than 1 $\Omega$ ?       | Go to step 7.   | Repair the open circuit in harness between TCM and combination meter, and poor contact in coupling connector. |
| <b>7 CHECK INPUT SIGNAL FOR TCM.</b><br>1) Connect the connector to TCM and combination meter.<br>2) Turn the ignition switch to ON (engine OFF).<br>3) Measure the voltage between TCM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B54) No. 15 (+) — Chassis ground (-):</i> | Is the voltage less than 1 V?                  | Go to step 8.   | Replace the TCM.<br><Ref. to 4AT-64, Transmission Control Module (TCM).>                                      |
| <b>8 INSPECT AT OIL TEMP WARNING LIGHT.</b>   | Does the AT OIL TEMP warning light illuminate? | Diagnose according to basic diagnostic procedure.                     | Inspect power supply and ground circuit.  |

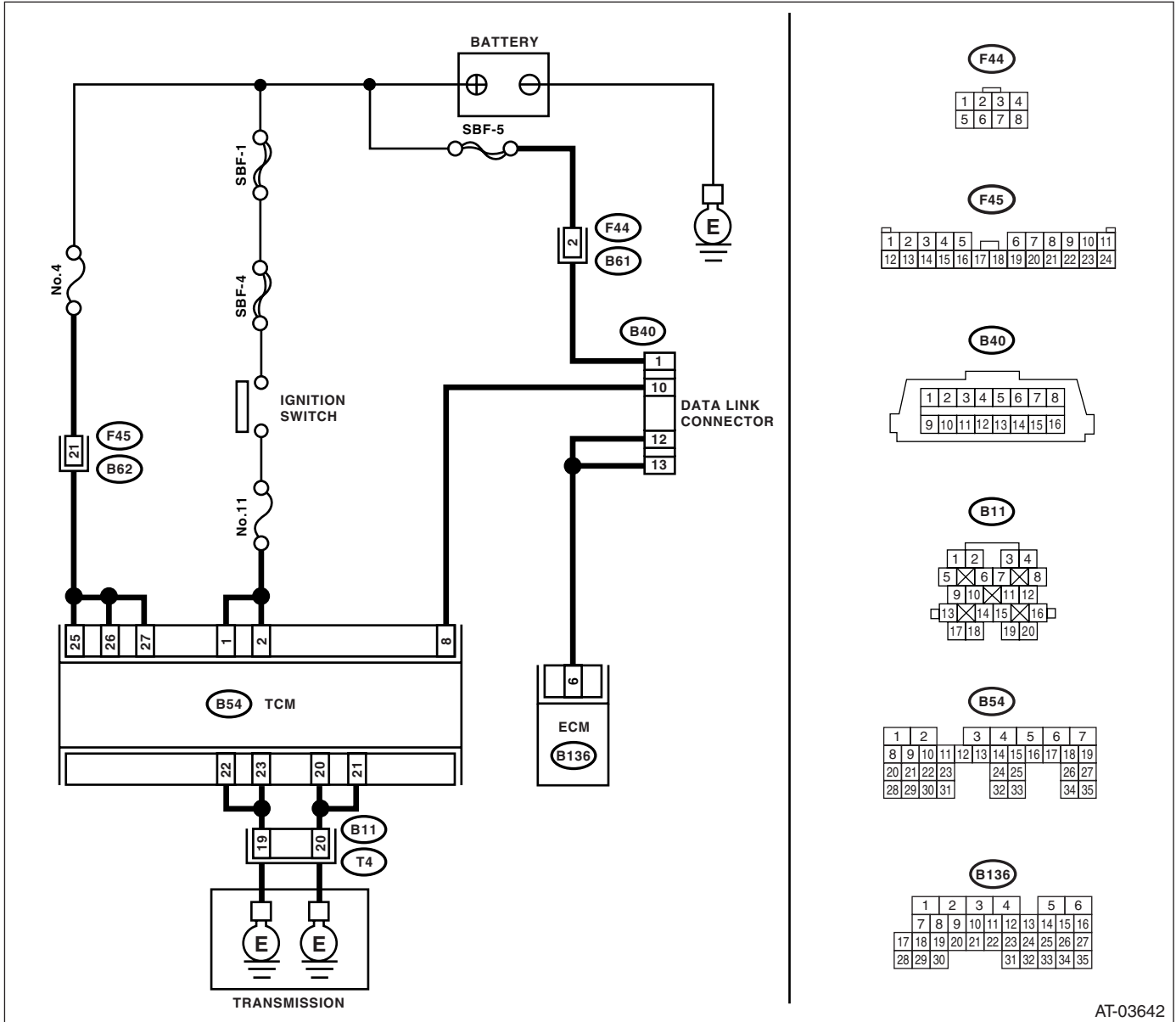
# AT OIL TEMP Warning Light Display

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

## C: CHECK POWER SUPPLY AND GROUND LINE

### WIRING DIAGRAM:

- Non-turbo model

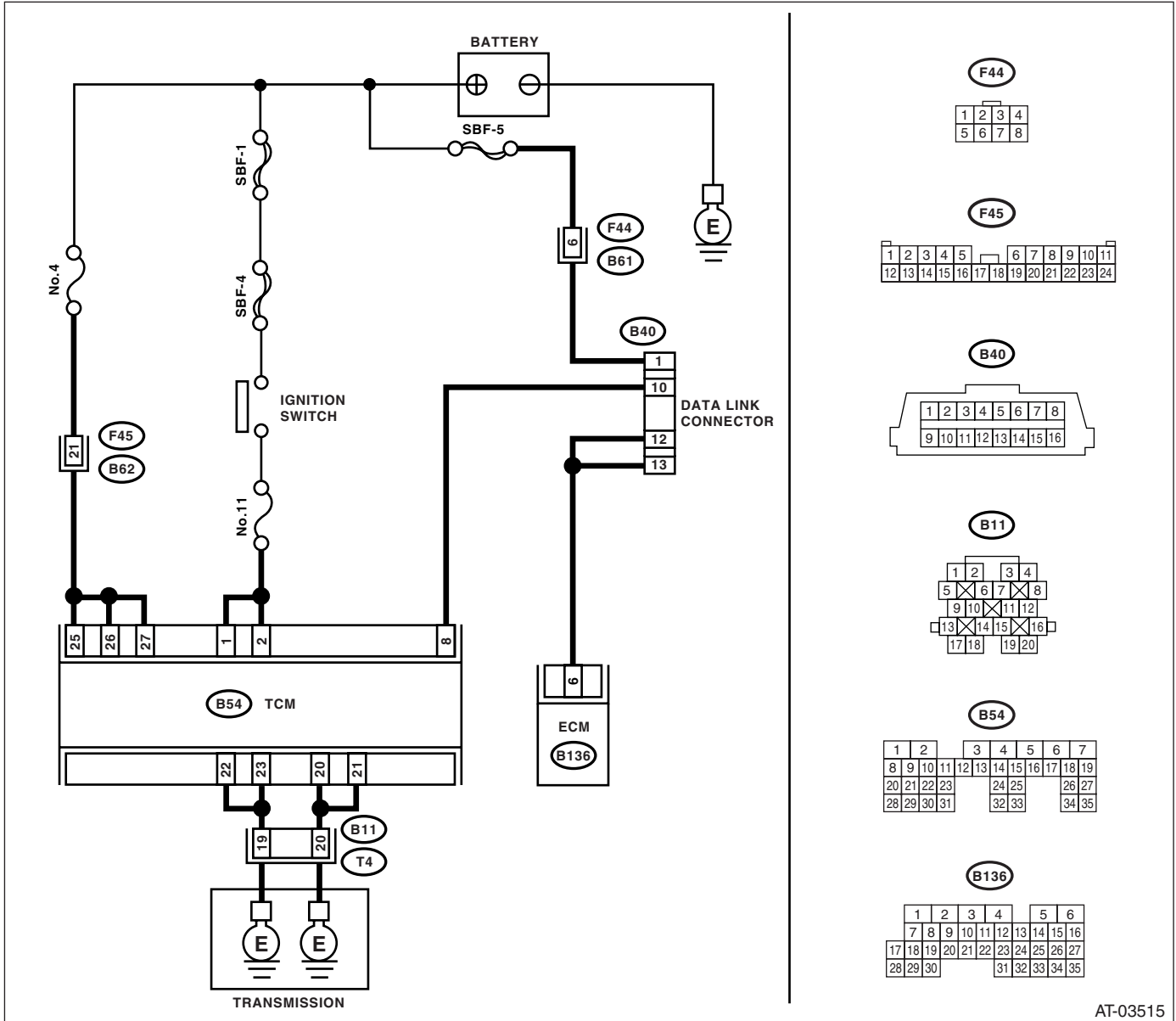


AT-03642

# AT OIL TEMP Warning Light Display

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

- Turbo model



AT-03515

| Step | Check  | Yes  | No  |
|------|--|--|---|
| 1    | <b>CHECK BATTERY TERMINAL.</b><br>Turn the ignition switch to OFF.   | Is there poor contact at battery terminal? | Repair the poor contact.<br>Go to step 2. |
| 2    | <b>CHECK POWER SUPPLY OF TCM.</b><br>1) Disconnect the connector from TCM.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between TCM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B54) No. 25 (+) — Chassis ground (-):</i><br><i>(B54) No. 26 (+) — Chassis ground (-):</i><br><i>(B54) No. 27 (+) — Chassis ground (-):</i> | Is the voltage 10 — 13 V?                  | Go to step 4.<br>Go to step 3.            |

# AT OIL TEMP Warning Light Display

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <b>3</b><br><b>CHECK FUSE (No. 4).</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the fuse (No. 4).  | Is the fuse (No. 4) blown out?  | Replace the fuse (No. 4). If replaced fuse (No. 4) has blown out easily, repair short circuit in harness between fuse (No. 4) and TCM.    | Repair the open circuit in harness between fuse (No. 4) and TCM, or fuse (No. 4) and battery, and poor contact in coupling connector. |
| <b>4</b><br><b>CHECK IGNITION POWER SUPPLY CIRCUIT.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the ignition power supply voltage between TCM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B54) No. 1 (+) — Chassis ground (-):</b></i><br><i><b>(B54) No. 2 (+) — Chassis ground (-):</b></i>   | Is the voltage 10 — 13 V?   | Go to step 6.   | Go to step 5.   |
| <b>5</b><br><b>CHECK FUSE (No. 11).</b><br>Remove the fuse (No. 11).  | Is the fuse (No. 11) blown out?   | Replace the fuse (No. 11). If replaced fuse (No. 11) has blown out easily, repair short circuit in harness between fuse (No. 11) and TCM. | Repair the open circuit in harness between fuse (No. 4) and TCM, or fuse (No. 4) and battery, and poor contact in coupling connector. |
| <b>6</b><br><b>CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from TCM and transmission.<br>3) Measure the resistance of harness between TCM and transmission connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B54) No. 22 — (B11) No. 19:</b></i><br><i><b>(B54) No. 23 — (B11) No. 19:</b></i><br><i><b>(B54) No. 20 — (B11) No. 20:</b></i><br><i><b>(B54) No. 21 — (B11) No. 20:</b></i> | Is the resistance less than 1 $\Omega$ ?  | Go to step 7.   | Repair the open circuit in harness between TCM and transmission harness connector, and poor contact in coupling connector.            |
| <b>7</b><br><b>CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND TRANSMISSION GROUND.</b><br>Measure the resistance of harness between transmission and transmission ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(T4) No. 19 — Transmission ground:</b></i><br><i><b>(T4) No. 20 — Transmission ground:</b></i>   | Is the resistance less than 1 $\Omega$ ?  | Go to step 8.   | Repair the open circuit in harness between transmission and transmission ground.  |
| <b>8</b><br><b>CHECK POOR CONTACT IN CONNECTORS.</b>  | Is there poor contact in TCM power supply, ground line and data link connector? | Repair the connector.   | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>   |



# Diagnostic Procedure for Select Monitor Communication

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

## 11. Diagnostic Procedure for Select Monitor Communication

### A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

#### DIAGNOSIS:

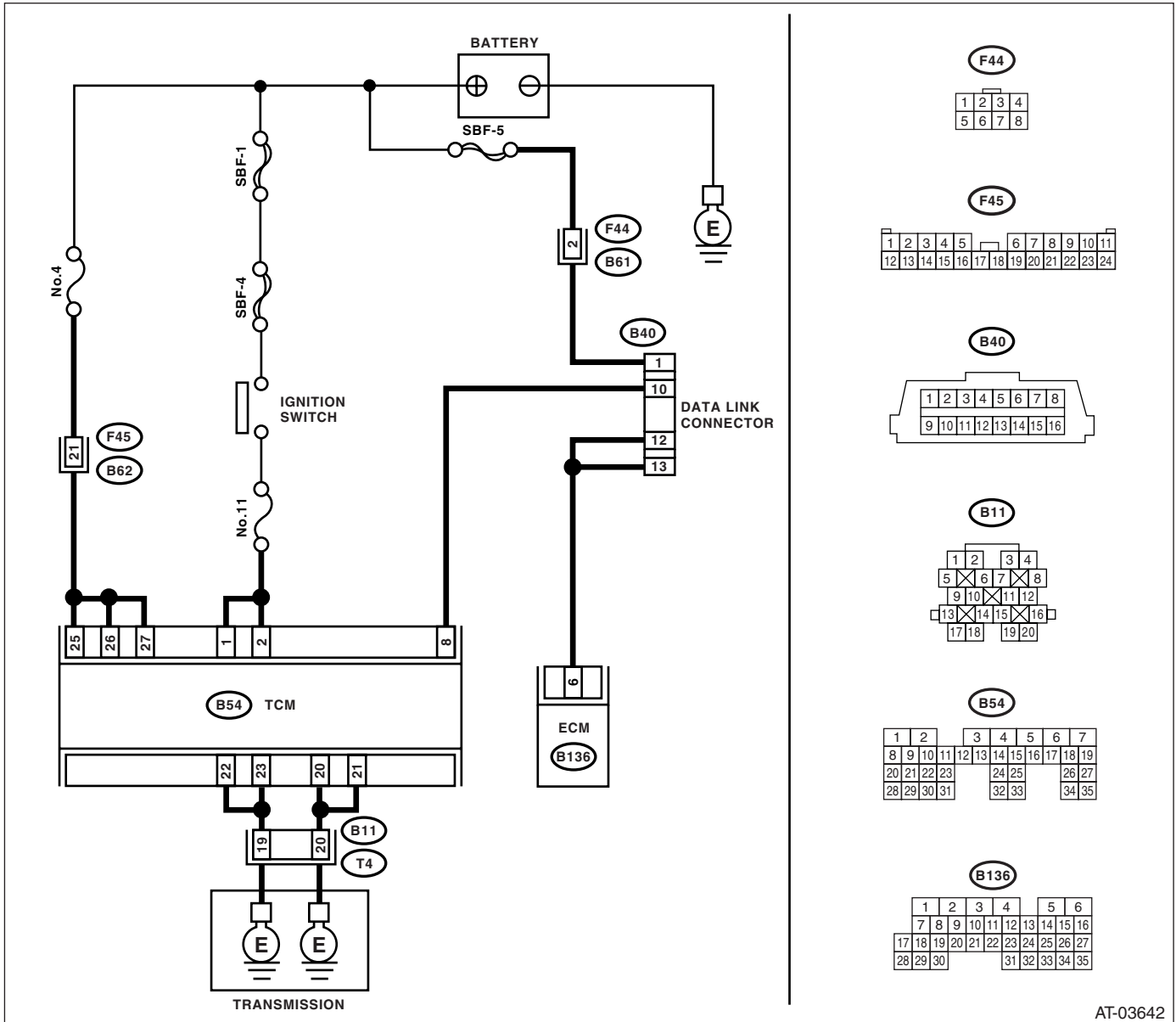
- Faulty harness connector

#### TROUBLE SYMPTOM:

- Subaru select monitor communication failure

#### WIRING DIAGRAM:

- Non-turbo model

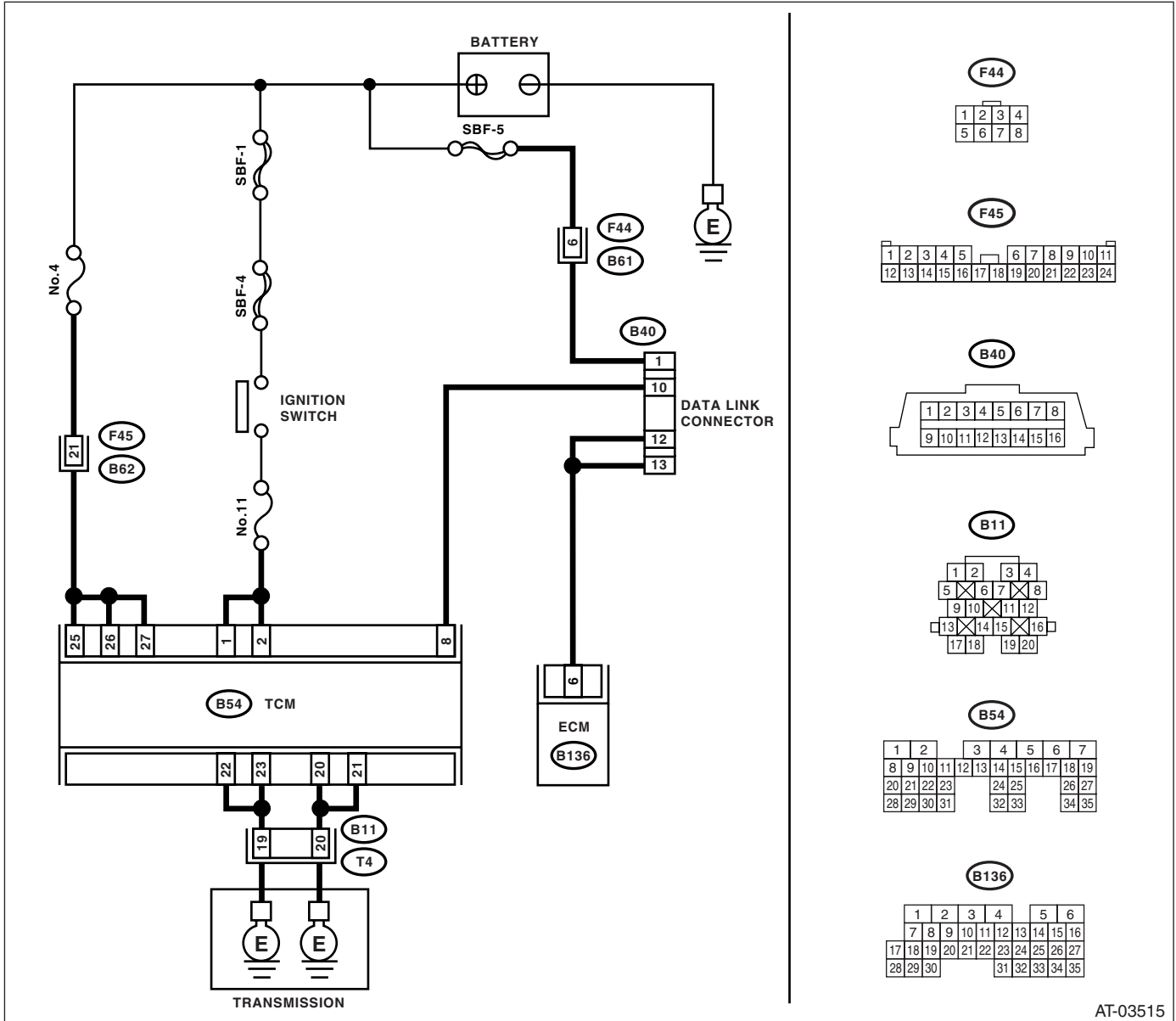


AT-03642

# Diagnostic Procedure for Select Monitor Communication

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

- Turbo model



AT-03515

| Step  | Check                                   | Yes                  | No   |
|---|---|----------------------|--|
| <p><b>1</b></p> <p><b>CHECK SUBARU SELECT MONITOR POWER SUPPLY CIRCUIT.</b><br/>Measure the voltage between data link connector and chassis ground.<br/><b>Connector &amp; terminal</b><br/><b>(B40) No. 1 (+) — Chassis ground (-):</b></p>  | <p>Is the voltage more than 10 V?</p>   | <p>Go to step 2.</p> | <p>Repair the harness and connector between battery and data link connector, and poor contact in coupling connector.</p>           |
| <p><b>2</b></p> <p><b>CHECK SUBARU SELECT MONITOR GROUND CIRCUIT.</b><br/>Measure the resistance of harness between data link connector and chassis ground.<br/><b>Connector &amp; terminal</b><br/><b>(B40) No. 12 — Chassis ground:</b><br/><b>(B40) No. 13 — Chassis ground:</b></p> | <p>Is the resistance less than 1 Ω?</p> | <p>Go to step 3.</p> | <p>Repair the open circuit in harness between data link connector and ground terminal, and poor contact in coupling connector.</p> |

## Diagnostic Procedure for Select Monitor Communication

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step   | Check   | Yes   | No   |
|--|---|---|--|
| <b>3 CHECK COMMUNICATION OF SUBARU SELECT MONITOR.</b><br>1) Turn the ignition switch to ON.<br>2) Using the Subaru Select Monitor, check whether communication to transmission systems can be executed normally.  | Are the name of system displayed on Subaru Select Monitor?                      | Go to step 8.   | Go to step 4.  |
| <b>4 CHECK COMMUNICATION OF SUBARU SELECT MONITOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the TCM connector.<br>3) Turn the ignition switch to ON and turn Subaru Select Monitor power switch to ON.<br>4) Check whether communication to engine systems can be executed normally.                    | Are the name of system displayed on Subaru Select Monitor?                      | Go to step 6.   | Go to step 5.  |
| <b>5 CHECK COMMUNICATION OF SUBARU SELECT MONITOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the TCM connector.<br>3) Check whether communication to transmission systems can be executed normally.   | Are the name of system displayed on Subaru Select Monitor?                      | Inspect the ECM.  | Go to step 6.  |
| <b>6 CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the TCM and ECM connectors.<br>3) Measure the resistance between TCM connector and chassis ground.<br><br><i>Connector &amp; terminal<br/>(B40) No. 10 — Chassis ground:</i> | Is the resistance more than 1 M $\Omega$ ?                                      | Go to step 7.   | Check the harness and connector between each control module and data link connector. |
| <b>7 CHECK OUTPUT SIGNAL FOR TCM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between TCM and chassis ground.<br><br><i>Connector &amp; terminal<br/>(B40) No. 10 (+) — Chassis ground (-):</i>  | Is the voltage more than 1 V?   | Repair the harness and connector between each control module and data link connector. | Go to step 8.  |
| <b>8 CHECK HARNESS/CONNECTOR BETWEEN TCM AND DATA LINK CONNECTOR.</b><br>Measure the resistance between TCM connector and data link connector.<br><br><i>Connector &amp; terminal<br/>(B54) No. 8 — (B40) No. 10:</i>  | Is the resistance less than 0.5 $\Omega$ ?                                      | Go to step 9.   | Check the harness and connector between TCM and data link connector.                 |
| <b>9 CHECK INSTALLATION OF TCM CONNECTOR.</b><br>Turn the ignition switch to OFF.  | Is the TCM connector inserted into TCM?   | Go to step 10.  | Insert the TCM connector into TCM.   |
| <b>10 INSPECTION OF TRANSMISSION HARNESS CONNECTOR.</b>  | Is the transmission harness connector inserted into bulkhead harness connector? | Go to step 11.  | Connect the bulkhead harness connector to transmission harness connector.            |
| <b>11 CHECK POOR CONTACT IN CONNECTORS.</b>  | Is there poor contact in control module and data link connector?                | Repair the poor contact.  | Go to step 12.   |

# Diagnostic Procedure for Select Monitor Communication

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <b>12 CHECK IGNITION POWER SUPPLY CIRCUIT.</b><br>1) Turn the ignition switch to ON (engine OFF).<br>2) Measure the ignition power supply voltage between TCM connector and chassis ground.<br><i>Connector &amp; terminal</i><br>(B54) No. 25 (+) — Chassis ground (-):<br>(B54) No. 26 (+) — Chassis ground (-):<br>(B54) No. 27 (+) — Chassis ground (-):  | Is the voltage 10 — 13 V?   | Go to step 14.  | Go to step 13.  |
| <b>13 CHECK FUSE (No. 11).</b><br>Remove the fuse (No. 11).   | Is the fuse (No. 11) blown out?   | Replace the fuse (No. 11). If replaced fuse (No. 11) has blown out easily, repair short circuit in harness between fuse (No. 11) and TCM. | Repair the open circuit in harness between fuse (No. 11) and TCM, or fuse (No. 11) and battery, and poor contact in coupling connector. |
| <b>14 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from TCM and transmission.<br>3) Measure the resistance of harness between TCM and transmission connector.<br><i>Connector &amp; terminal</i><br>(B54) No. 22 — (B11) No. 19:<br>(B54) No. 23 — (B11) No. 19:<br>(B54) No. 20 — (B11) No. 20:<br>(B54) No. 21 — (B11) No. 20: | Is the resistance less than 1 $\Omega$ ?  | Go to step 15.  | Repair the open circuit in harness between TCM and transmission harness connector, and poor contact in connector.                       |
| <b>15 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND TRANSMISSION GROUND.</b><br>Measure the resistance of harness between transmission and transmission ground.<br><i>Connector &amp; terminal</i><br>(T4) No. 19 — Transmission ground:<br>(T4) No. 20 — Transmission ground:   | Is the resistance less than 1 $\Omega$ ?  | Go to step 16.  | Repair the open circuit in harness between transmission and transmission ground.  |
| <b>16 CHECK POOR CONTACT IN CONNECTORS.</b>   | Is there poor contact in TCM power supply, ground line and data link connector? | Repair the connector.   | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>   |

## List of Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

### 12. List of Diagnostic Trouble Code (DTC)

#### A: LIST

| DTC   | Item   | Diagnosis content   | Reference   |
|-------|--|---|---|
| P0705 | Transmission Range Sensor Circuit (PRNDL Input)          | Inhibitor switch malfunction, open or short circuit                                       | <Ref. to 4AT(D)(diag)-32, DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>          |
| P0712 | Transmission Fluid Temperature Sensor Circuit Low Input  | ATF temperature sensor malfunction, open input signal circuit                             | <Ref. to 4AT(D)(diag)-42, DTC P0712 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P0713 | Transmission Fluid Temperature Sensor Circuit High Input | ATF temperature sensor malfunction, open input signal circuit                             | <Ref. to 4AT(D)(diag)-45, DTC P0713 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0715 | Input/Turbine Speed Sensor Circuit                       | Torque converter turbine speed sensor malfunction, open or short input signal circuit     | <Ref. to 4AT(D)(diag)-48, DTC P0715 INPUT/TURBINE SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                       |
| P0719 | Torque Converter/Brake Switch "B" Circuit Low            | Brake switch malfunction, open input signal circuit                                       | <Ref. to 4AT(D)(diag)-50, DTC P0719 TORQUE CONVERTER/BRAKE SWITCH "B" CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>            |
| P0720 | AT Vehicle Speed Sensor Circuit                          | Front vehicle speed sensor malfunction, open or short input signal circuit                | <Ref. to 4AT(D)(diag)-52, DTC P0720 OUTPUT SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                              |
| P0724 | Torque Converter/Brake Switch "B" Circuit High           | Brake switch malfunction, short input signal circuit                                      | <Ref. to 4AT(D)(diag)-56, DTC P0724 TORQUE CONVERTER/BRAKE SWITCH "B" CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>           |
| P0725 | Engine Speed Input Circuit                               | Open or short engine speed output signal circuit  | <Ref. to 4AT(D)(diag)-58, DTC P0725 ENGINE SPEED INPUT CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                               |
| P0731 | Gear 1 Incorrect Ratio                                   | Vehicle speed sensor, torque converter turbine speed sensor, or control valve malfunction | <Ref. to 4AT(D)(diag)-59, DTC P0731 GEAR 1 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                   |
| P0732 | Gear 2 Incorrect Ratio                                   | Vehicle speed sensor, torque converter turbine speed sensor, or control valve malfunction | <Ref. to 4AT(D)(diag)-59, DTC P0732 GEAR 2 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                   |
| P0733 | Gear 3 Incorrect Ratio                                   | Vehicle speed sensor, torque converter turbine speed sensor, or control valve malfunction | <Ref. to 4AT(D)(diag)-59, DTC P0733 GEAR 3 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                   |
| P0734 | Gear 4 Incorrect Ratio                                   | Vehicle speed sensor, torque converter turbine speed sensor, or control valve malfunction | <Ref. to 4AT(D)(diag)-59, DTC P0734 GEAR 4 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                   |

## List of Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| DTC   | Item   | Diagnosis content   | Reference   |
|-------|--|---|---|
| P0736 | Reverse Incorrect Ratio                                  | Vehicle speed sensor, torque converter turbine speed sensor, or control valve malfunction | <Ref. to 4AT(D)(diag)-60, DTC P0736 REVERSE INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                  |
| P0741 | Torque Converter Clutch Circuit Performance or Stuck Off | Lock up clutch malfunction or locking of valve  | <Ref. to 4AT(D)(diag)-61, DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P0743 | Torque Converter Clutch Circuit Electrical               | Lock up solenoid malfunction, open or short output signal circuit                         | <Ref. to 4AT(D)(diag)-62, DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>               |
| P0748 | Pressure Control Solenoid "A" Electrical                 | Line pressure linear solenoid malfunction, open or short output signal circuit            | <Ref. to 4AT(D)(diag)-65, DTC P0748 PRESSURE CONTROL SOLENOID "A" ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                 |
| P0753 | Shift Solenoid "A" Electrical                            | Low clutch duty solenoid malfunction, open or short output signal circuit                 | <Ref. to 4AT(D)(diag)-67, DTC P0753 SHIFT SOLENOID "A" ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0758 | Shift Solenoid "B" Electrical                            | 2-4 brake duty solenoid malfunction, open or short output signal circuit                  | <Ref. to 4AT(D)(diag)-70, DTC P0758 SHIFT SOLENOID "B" ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0763 | Shift Solenoid "C" Electrical                            | High clutch duty solenoid malfunction, open or short output signal circuit                | <Ref. to 4AT(D)(diag)-73, DTC P0763 SHIFT SOLENOID "C" ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0768 | Shift Solenoid "D" Electrical                            | Low & reverse duty solenoid malfunction, open or short output signal circuit              | <Ref. to 4AT(D)(diag)-76, DTC P0768 SHIFT SOLENOID "D" ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| P0801 | Reverse Inhibitor Control Circuit                        | Shift lock solenoid malfunction, open or short output signal circuit                      | <Ref. to 4AT(D)(diag)-79, DTC P0801 REVERSE INHIBIT CONTROL CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                          |
| P1706 | AT Vehicle Speed Sensor Circuit Malfunction (rear wheel) | Rear vehicle speed sensor malfunction, open or short input signal circuit                 | <Ref. to 4AT(D)(diag)-81, DTC P1706 AT VEHICLE SPEED SENSOR CIRCUIT MALFUNCTION (REAR WHEEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P1707 | AT AWD Solenoid Valve Circuit Malfunction                | Transfer duty solenoid malfunction, open or short output signal circuit                   | <Ref. to 4AT(D)(diag)-84, DTC P1707 AT AWD SOLENOID VALVE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                |
| P1718 | CAN Communication Circuit                                | Open or short AT communication signal circuit   | <Ref. to 4AT(D)(diag)-86, DTC P1718 CAN COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                |

## **Diagnostic Procedure with Diagnostic Trouble Code (DTC)**

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

---

### **13. Diagnostic Procedure with Diagnostic Trouble Code (DTC)**

#### **A: DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT)**

##### **DIAGNOSIS:**

- There is malfunction in inhibitor switch.
- The input signal circuit of inhibitor switch is open or shorted.

##### **TROUBLE SYMPTOM:**

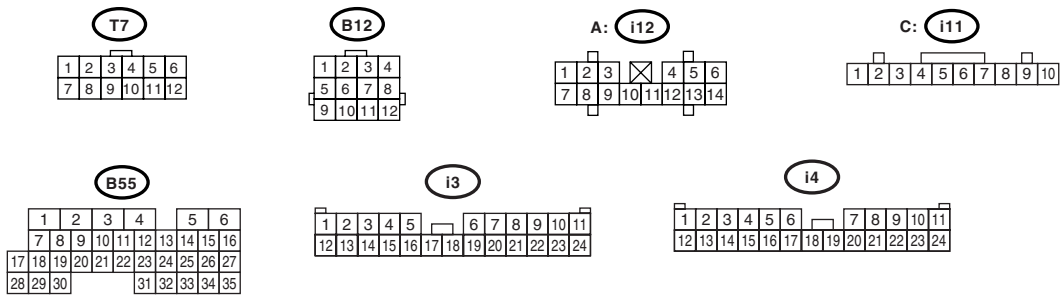
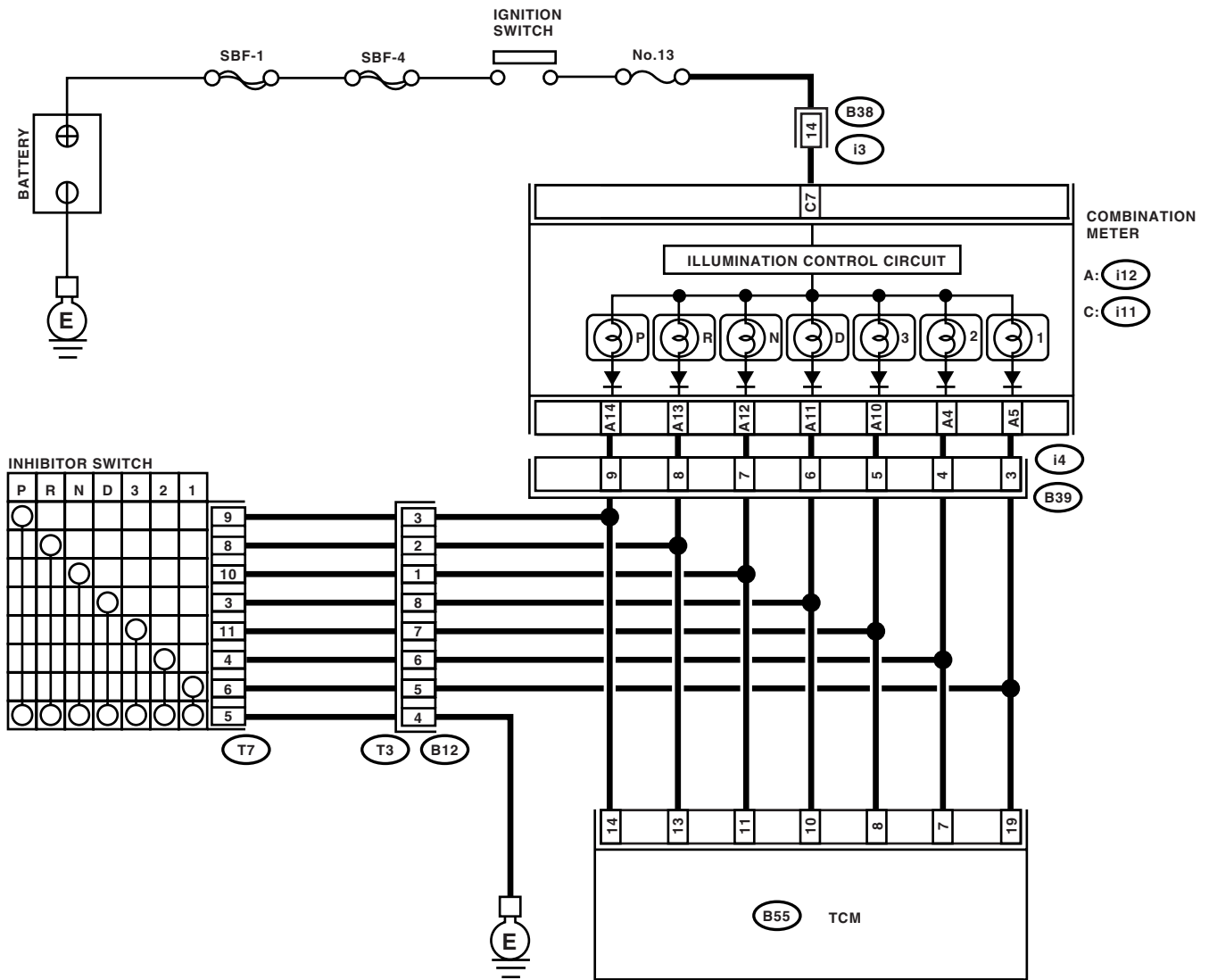
- Shift characteristics are erroneous.
- Engine brake is not effected when select lever is in “3” range.
- Engine brake is not effected when select lever is in “2” range.
- Engine brake is not effected when select lever is in “1” range.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

### WIRING DIAGRAM:

- Non-turbo model



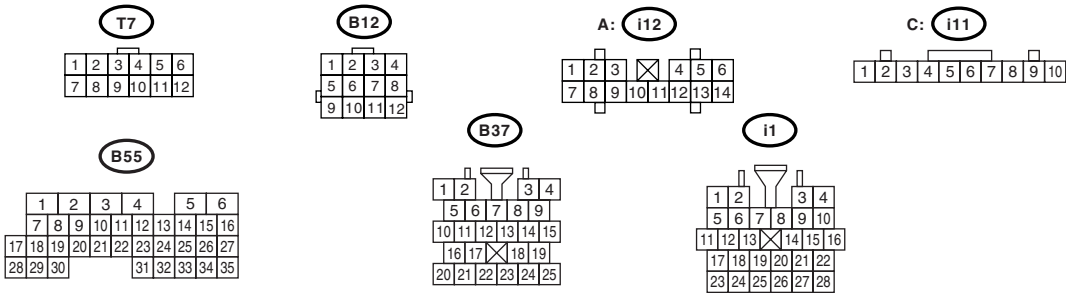
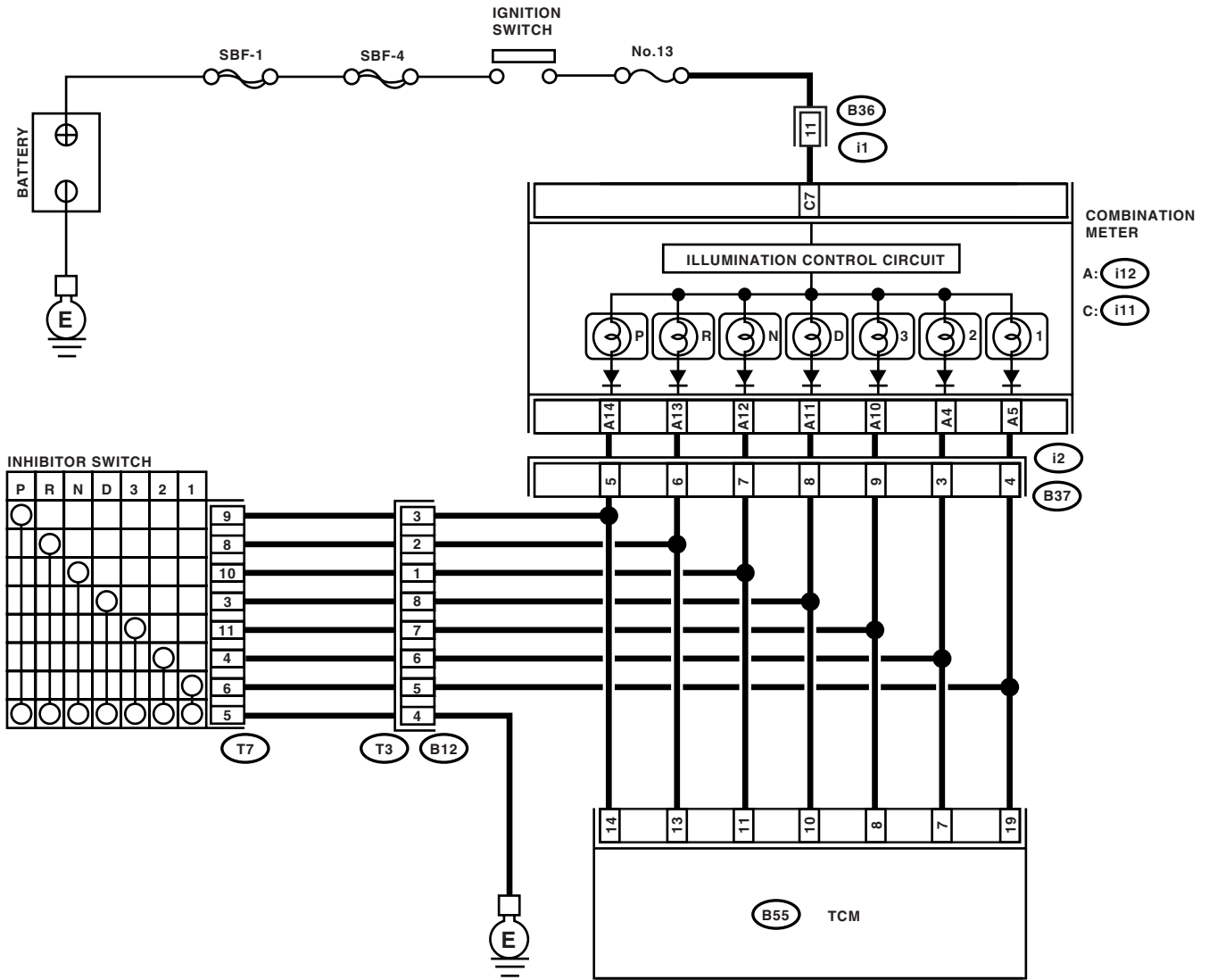
AT-03643



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

- Turbo model



AT-03516

| Step | Check                          | Yes           | No             |
|------|--------------------------------|---------------|----------------|
| 1    | <b>CHECK "P" RANGE SWITCH.</b> | Go to step 2. | Go to step 22. |
| 2    | <b>CHECK INDICATOR LIGHT.</b>  | Go to step 3. | Go to step 26. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step | Check   | Yes  | No             |   |
|------|---|--|----------------|---|
| 3    | <b>CHECK "P" RANGE SWITCH.</b>  | When the "R" range is selected, does "P" range LED light up? | Go to step 28. | Go to step 4.   |
| 4    | <b>CHECK "R" RANGE SWITCH.</b>  | When the "R" range is selected, does LED light up?           | Go to step 5.  | Go to step 29.  |
| 5    | <b>CHECK INDICATOR LIGHT.</b>   | Does the combination meter "R" range indicator illuminate?   | Go to step 6.  | Go to step 32.  |
| 6    | <b>CHECK "R" RANGE SWITCH.</b>  | When the "N" range is selected, does "R" range LED light up? | Go to step 34. | Go to step 7.   |
| 7    | <b>CHECK "N" RANGE SWITCH.</b>  | When the "N" range is selected, does LED light up?           | Go to step 8.  | Go to step 35.  |
| 8    | <b>CHECK INDICATOR LIGHT.</b>   | Does the combination meter "N" range indicator illuminate?   | Go to step 9.  | Go to step 38.  |
| 9    | <b>CHECK "N" RANGE SWITCH.</b>  | When the "D" range is selected, does "N" range LED light up? | Go to step 40. | Go to step 10.  |
| 10   | <b>CHECK "D" RANGE SWITCH.</b>  | When the "D" range is selected, does LED light up?           | Go to step 11. | Go to step 41.  |
| 11   | <b>CHECK INDICATOR LIGHT.</b>   | Does the combination meter "D" range indicator illuminate?   | Go to step 12. | Go to step 44.  |
| 12   | <b>CHECK "D" RANGE SWITCH.</b>  | When the "3" range is selected, does "D" range LED light up? | Go to step 46. | Go to step 13.  |
| 13   | <b>CHECK "3" RANGE SWITCH.</b>  | When the "3" range is selected, does LED light up?           | Go to step 14. | Go to step 47.  |
| 14   | <b>CHECK INDICATOR LIGHT.</b>   | Does the combination meter "3" range indicator illuminate?   | Go to step 15. | Go to step 50.  |
| 15   | <b>CHECK "3" RANGE SWITCH.</b>  | When the "2" range is selected, does "3" range LED light up? | Go to step 52. | Go to step 16.  |
| 16   | <b>CHECK "2" RANGE SWITCH.</b>  | When the "2" range is selected, does LED light up?           | Go to step 17. | Go to step 53.  |
| 17   | <b>CHECK INDICATOR LIGHT.</b>   | Does the combination meter "2" range indicator illuminate?   | Go to step 18. | Go to step 56.  |
| 18   | <b>CHECK "2" RANGE SWITCH.</b>  | When the "1" range is selected, does "2" range LED light up? | Go to step 58. | Go to step 19.  |
| 19   | <b>CHECK "1" RANGE SWITCH.</b>  | When the "1" range is selected, does LED light up?           | Go to step 20. | Go to step 59.  |
| 20   | <b>CHECK INDICATOR LIGHT.</b>   | Does the combination meter "1" range indicator illuminate?   | Go to step 21. | Go to step 62.  |
| 21   | <b>CHECK "1" RANGE SWITCH.</b>  | When the "2" range is selected, does "1" range LED light up? | Go to step 64. | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>   |
| 22   | <b>CHECK HARNESS CONNECTOR BETWEEN INHIBITOR SWITCH AND CHASSIS GROUND.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from inhibitor switch.<br>3) Measure the resistance of harness between inhibitor switch and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(T7) No. 5 — Chassis ground:</b> | Is the resistance less than 1 Ω?                             | Go to step 23. | Repair the open circuit in harness between inhibitor switch connector and chassis ground, and poor contact in coupling connector. |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check                                     | Yes            | No  |
|---|---|----------------|---|
| <b>23 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from TCM and inhibitor switch.<br>3) Measure the resistance of harness between TCM and inhibitor switch connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B55) No. 14 — (T7) No. 9:</b></i>                               | Is the resistance less than 1 $\Omega$ ?  | Go to step 24. | Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.  |
| <b>24 CHECK INPUT SIGNAL FOR TCM.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the connector to TCM and inhibitor switch.<br>3) Turn the ignition switch to ON.<br>4) Move the select lever to "P" range.<br>5) Measure the voltage between TCM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B55) No. 14 (+) — Chassis ground (-):</b></i> | Is the voltage less than 1 V?             | Go to step 25. | Go to step 65.  |
| <b>25 CHECK INPUT SIGNAL FOR TCM.</b><br>1) Move the select lever except for "P" range.<br>2) Measure the voltage between TCM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B55) No. 14 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 8 V?             | Go to step 65. | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>   |
| <b>26 CHECK "P" RANGE INDICATOR LIGHT BULB.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the combination meter.  | Is the "P" range indicator light OK?      | Go to step 27. | Replace the combination meter. <Ref. to IDI-10, Combination Meter.>   |
| <b>27 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.</b><br>1) Disconnect the connectors from TCM and combination meter.<br>2) Measure the resistance of harness between TCM and combination meter.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B55) No. 14 — (i12) No. 14:</b></i>   | Is the resistance less than 1 $\Omega$ ?  | Go to step 65. | Repair the open circuit in harness between TCM connector and combination meter, and poor contact in coupling connector. |
| <b>28 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from TCM, inhibitor switch and combination meter.<br>3) Measure the resistance of harness between TCM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B55) No. 14 — Chassis ground:</b></i>          | Is the resistance more than 1 $M\Omega$ ? | Go to step 29. | Repair the ground short circuit in "P" range circuit.   |
| <b>29 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from TCM and inhibitor switch.<br>3) Measure the resistance of harness between TCM and inhibitor switch connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B55) No. 13 — (T7) No. 8:</b></i>                               | Is the resistance less than 1 $\Omega$ ?  | Go to step 30. | Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check                                      | Yes            | No   |
|---|--|----------------|--|
| <b>30 CHECK INPUT SIGNAL FOR TCM.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the connector to TCM and inhibitor switch.<br>3) Turn the ignition switch to ON.<br>4) Move the select lever to "R" range.<br>5) Measure the voltage between TCM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B55) No. 13 (+) — Chassis ground (-):</b> | Is the voltage less than 1 V?              | Go to step 31. | Go to step 65.   |
| <b>31 CHECK INPUT SIGNAL FOR TCM.</b><br>1) Move the select lever except for "R" range.<br>2) Measure the voltage between TCM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B55) No. 13 (+) — Chassis ground (-):</b>   | Is the voltage more than 8 V?              | Go to step 65. | Replace the TCM.<br><Ref. to 4AT-64, Transmission Control Module (TCM).>   |
| <b>32 CHECK "R" RANGE INDICATOR LIGHT BULB.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the combination meter.  | Is "R" range indicator light OK?           | Go to step 33. | Replace the combination meter.<br><Ref. to IDI-10, Combination Meter.>   |
| <b>33 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.</b><br>1) Disconnect the connectors from TCM and combination meter.<br>2) Measure the resistance of harness between TCM and combination meter.<br><b>Connector &amp; terminal</b><br><b>(B55) No. 13 — (I12) No. 13:</b>   | Is the resistance less than 1 $\Omega$ ?   | Go to step 65. | Repair the open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.     |
| <b>34 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from TCM, inhibitor switch and combination meter.<br>3) Measure the resistance of harness between TCM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B55) No. 13 — Chassis ground:</b>          | Is the resistance more than 1 M $\Omega$ ? | Go to step 35. | Repair the ground short circuit in "R" range circuit.  |
| <b>35 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from TCM and inhibitor switch.<br>3) Measure the resistance of harness between TCM and inhibitor switch connector.<br><b>Connector &amp; terminal</b><br><b>(B55) No. 11 — (T7) No. 10:</b>                              | Is the resistance less than 1 $\Omega$ ?   | Go to step 36. | Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector. |
| <b>36 CHECK INPUT SIGNAL FOR TCM.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the connector to TCM and inhibitor switch.<br>3) Turn the ignition switch to ON.<br>4) Move the select lever to "N" range.<br>5) Measure the voltage between TCM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B55) No. 11 (+) — Chassis ground (-):</b> | Is the voltage less than 1 V?              | Go to step 37. | Go to step 65.   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check                                     | Yes                    | No   |
|---|---|------------------------|--|
| <b>37 CHECK INPUT SIGNAL FOR TCM.</b><br>1) Move the select lever to except for "N" range.<br>2) Measure the voltage between TCM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B55) No. 11 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 8 V?             | Go to step <b>65</b> . | Replace the TCM.<br><Ref. to 4AT-64, Transmission Control Module (TCM).>   |
| <b>38 CHECK "N" RANGE INDICATOR LIGHT BULB.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the combination meter.  | Is the "N" range indicator light OK?      | Go to step <b>39</b> . | Replace the combination meter.<br><Ref. to IDI-10, Combination Meter.>   |
| <b>39 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.</b><br>1) Disconnect the connectors from TCM and combination meter.<br>2) Measure the resistance of harness between TCM and combination meter.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B55) No. 11 — (i12) No. 12:</b></i>   | Is the resistance less than 1 $\Omega$ ?  | Go to step <b>65</b> . | Repair the open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.     |
| <b>40 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from TCM, inhibitor switch and combination meter.<br>3) Measure the resistance of harness between TCM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B55) No. 11 — Chassis ground:</b></i>          | Is the resistance more than 1 $M\Omega$ ? | Go to step <b>41</b> . | Repair the ground short circuit in "N" range circuit.  |
| <b>41 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from TCM and inhibitor switch.<br>3) Measure the resistance of harness between TCM and inhibitor switch connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B55) No. 10 — (T7) No. 3:</b></i>                               | Is the resistance less than 1 $\Omega$ ?  | Go to step <b>42</b> . | Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector. |
| <b>42 CHECK INPUT SIGNAL FOR TCM.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the connector to TCM and inhibitor switch.<br>3) Turn the ignition switch to ON.<br>4) Move the select lever to "D" range.<br>5) Measure the voltage between TCM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B55) No. 10 (+) — Chassis ground (-):</b></i> | Is the voltage less than 1 V?             | Go to step <b>43</b> . | Go to step <b>65</b> .   |
| <b>43 CHECK INPUT SIGNAL FOR TCM.</b><br>1) Move the select lever except for "D" range.<br>2) Measure the voltage between TCM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B55) No. 10 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 8 V?             | Go to step <b>65</b> . | Replace the TCM.<br><Ref. to 4AT-64, Transmission Control Module (TCM).>   |
| <b>44 CHECK "D" RANGE INDICATOR LIGHT BULB.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the combination meter.  | Is the "D" range indicator light OK?      | Go to step <b>45</b> . | Replace the combination meter.<br><Ref. to IDI-10, Combination Meter.>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step   | Check                                      | Yes            | No   |
|--|--|----------------|--|
| <b>45 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.</b><br>1) Disconnect the connectors from TCM and combination meter.<br>2) Measure the resistance of harness between TCM and combination meter.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 10 — (i12) No. 11:</i>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 65. | Repair the open circuit in harness between TCM connector and combination meter, and TCM connector.                     |
| <b>46 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from TCM, inhibitor switch and combination meter.<br>3) Measure the resistance of harness between TCM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 10 — Chassis ground:</i>         | Is the resistance more than 1 M $\Omega$ ? | Go to step 47. | Repair the ground short circuit in "D" range circuit.  |
| <b>47 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from TCM and inhibitor switch.<br>3) Measure the resistance of harness between TCM and inhibitor switch connector.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 8 — (T7) No. 11:</i>                               | Is the resistance less than 1 $\Omega$ ?   | Go to step 48. | Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector. |
| <b>48 CHECK INPUT SIGNAL FOR TCM.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the connector to TCM and inhibitor switch.<br>3) Turn the ignition switch to ON.<br>4) Move the select lever to "3" range.<br>5) Measure the voltage between TCM and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 8 (+) — Chassis ground (-):</i> | Is the voltage less than 1 V?              | Go to step 49. | Go to step 65.   |
| <b>49 CHECK INPUT SIGNAL FOR TCM.</b><br>1) Move the select lever except for "3" range.<br>2) Measure the voltage between TCM and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 8 (+) — Chassis ground (-):</i>   | Is the voltage more than 8 V?              | Go to step 65. | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>  |
| <b>50 CHECK "3" RANGE INDICATOR LIGHT BULB.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the combination meter.   | Is the "3" range indicator light OK?       | Go to step 51. | Replace the combination meter. <Ref. to IDI-10, Combination Meter.>  |
| <b>51 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.</b><br>1) Disconnect the connectors from TCM and combination meter.<br>2) Measure the resistance of harness between TCM and combination meter.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 8 — (i12) No. 10:</i>   | Is the resistance less than 1 $\Omega$ ?   | Go to step 65. | Repair the open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.     |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step   | Check                                      | Yes            | No   |
|--|--|----------------|--|
| <b>52 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from TCM, inhibitor switch and combination meter.<br>3) Measure the resistance of harness between TCM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 8 — Chassis ground:</i>          | Is the resistance more than 1 M $\Omega$ ? | Go to step 53. | Repair the ground short circuit in “3” range circuit.  |
| <b>53 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from TCM and inhibitor switch.<br>3) Measure the resistance of harness between TCM and inhibitor switch connector.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 7 — (T7) No. 4:</i>                                | Is the resistance less than 1 $\Omega$ ?   | Go to step 54. | Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector. |
| <b>54 CHECK INPUT SIGNAL FOR TCM.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the connector to TCM and inhibitor switch.<br>3) Turn the ignition switch to ON.<br>4) Move the select lever to “2” range.<br>5) Measure the voltage between TCM and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 7 (+) — Chassis ground (-):</i> | Is the voltage less than 1 V?              | Go to step 55. | Go to step 65.   |
| <b>55 CHECK INPUT SIGNAL FOR TCM.</b><br>1) Move the select lever except for “2” range.<br>2) Measure the voltage between TCM and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 7 (+) — Chassis ground (-):</i>   | Is the voltage more than 8 V?              | Go to step 65. | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>  |
| <b>56 CHECK “2” RANGE INDICATOR LIGHT BULB.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the combination meter.   | Is the “2” range indicator light OK?       | Go to step 57. | Replace the combination meter. <Ref. to IDI-10, Combination Meter.>  |
| <b>57 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.</b><br>1) Disconnect the connectors from TCM and combination meter.<br>2) Measure the resistance of harness between TCM and combination meter.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 7 — (i12) No. 4:</i>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 65. | Repair the open circuit in harness between TCM and combination meter, and poor contact in TCM connector.               |
| <b>58 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from TCM, inhibitor switch and combination meter.<br>3) Measure the resistance of harness between TCM and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 7 — Chassis ground:</i>                    | Is the resistance more than 1 M $\Omega$ ? | Go to step 59. | Repair the ground short circuit in “2” range circuit.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <b>59 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from TCM and inhibitor switch.<br>3) Measure the resistance of harness between TCM and inhibitor switch connector.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 19 — (T7) No. 6:</i>                               | Is the resistance less than 1 $\Omega$ ?           | Go to step 60.  | Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector. |
| <b>60 CHECK INPUT SIGNAL FOR TCM.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the connector to TCM and inhibitor switch.<br>3) Turn the ignition switch to ON.<br>4) Move the select lever to "1" range.<br>5) Measure the voltage between TCM and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 19 (+) — Chassis ground (-):</i> | Is the voltage less than 1 V?                      | Go to step 61.  | Go to step 65.   |
| <b>61 CHECK INPUT SIGNAL FOR TCM.</b><br>1) Move the select lever except for "1" range.<br>2) Measure the voltage between TCM and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 19 (+) — Chassis ground (-):</i>   | Is the voltage more than 8 V?                      | Go to step 65.  | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>  |
| <b>62 CHECK "1" RANGE INDICATOR LIGHT BULB.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the combination meter.  | Is the "1" range indicator light OK?               | Go to step 63.  | Replace the combination meter. <Ref. to IDI-10, Combination Meter.>  |
| <b>63 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.</b><br>1) Disconnect the connectors from TCM and combination meter.<br>2) Measure the resistance of harness between TCM and combination meter.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 19 — (i12) No. 5:</i>  | Is the resistance less than 1 $\Omega$ ?           | Go to step 65.  | Repair the open circuit in harness between TCM and combination meter, poor contact in TCM connector.                   |
| <b>64 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from TCM, inhibitor switch and combination meter.<br>3) Measure the resistance of harness between TCM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 19 — Chassis ground:</i>          | Is the resistance more than 1 $M\Omega$ ?          | Go to step 65.  | Repair the ground short circuit in "1" range circuit.  |
| <b>65 CHECK POOR CONTACT.</b>   | Is there poor contact in inhibitor switch circuit? | Repair the poor contact.  | Go to step 66.   |
| <b>66 CHECK INHIBITOR SWITCH.</b>   | Is the inhibitor switch in proper position?        | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).> | Adjust the inhibitor switch and select cable. <Ref. to 4AT-48, Inhibitor Switch.> and <Ref. to CS-27, Select Cable.>   |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

## B: DTC P0712 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT LOW INPUT

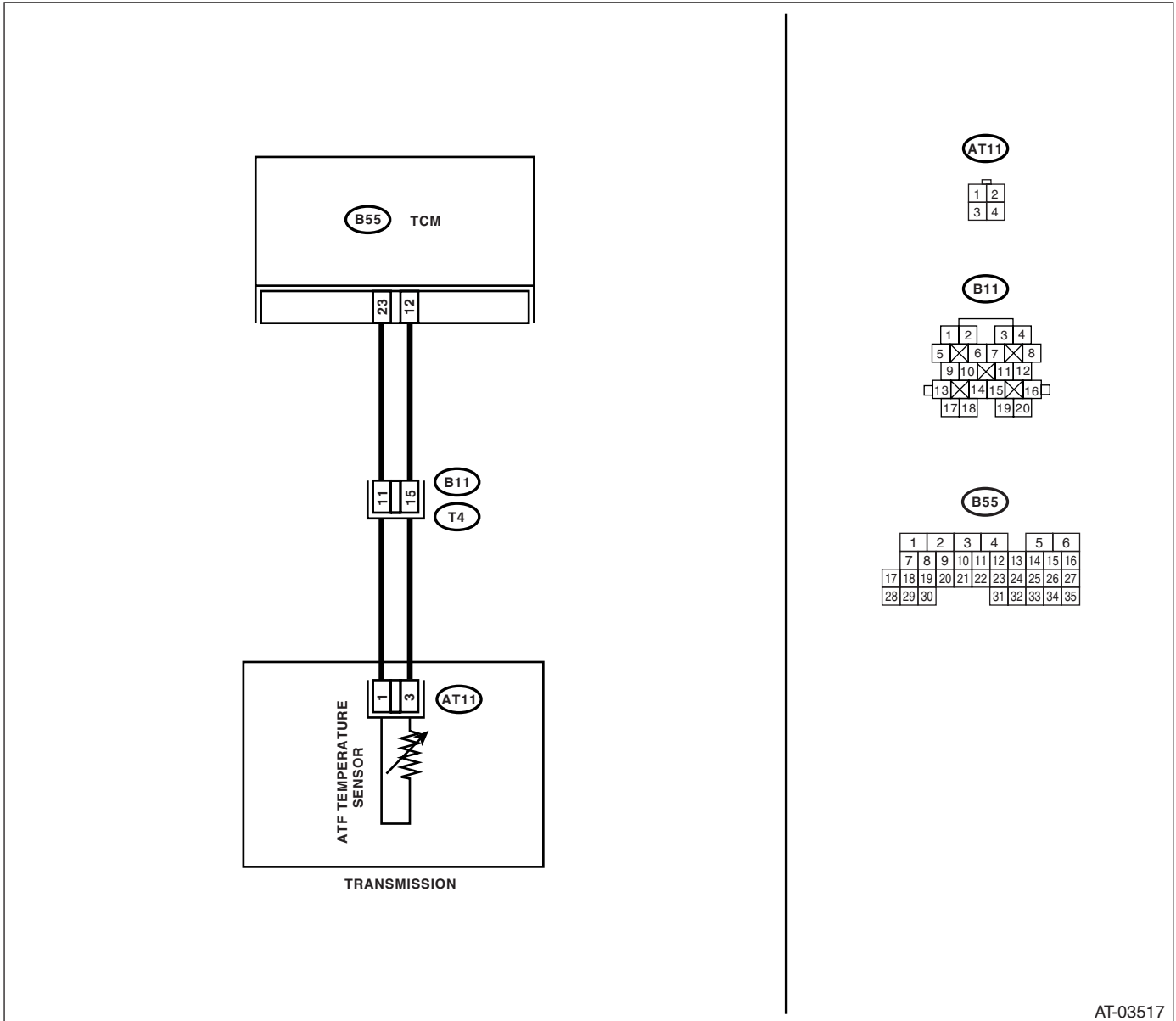
### DIAGNOSIS:

The input signal circuit of TCM to ATF temperature sensor is open or shorted.

### TROUBLE SYMPTOM:

Excessive shift shock.

### WIRING DIAGRAM:



AT-03517

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <b>1 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from transmission and TCM.<br>3) Measure the resistance of harness between TCM and transmission connector.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 23 — (B11) No. 11:</i>   | Is the resistance less than 1 $\Omega$ ?                           | Go to step 2.   | Repair the open circuit in harness between TCM and transmission connector. |
| <b>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.</b><br>Measure the resistance of harness between TCM and transmission connector.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 12 — (B11) No. 15:</i>   | Is the resistance less than 1 $\Omega$ ?                           | Go to step 3.   | Repair the open circuit in harness between TCM and transmission connector. |
| <b>3 CHECK ATF TEMPERATURE SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the connectors to transmission and TCM.<br>3) Turn the ignition switch to ON and start engine.<br>4) Warm-up the transmission until ATF temperature reaches to 80°C (176°F).<br>NOTE:<br>If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature.<br>5) Disconnect the connector from transmission.<br>6) Measure the resistance between transmission connector terminals.<br><i>Connector &amp; terminal</i><br><i>(T4) No. 11 — No. 15:</i> | Is the resistance 300 — 800 $\Omega$ ?                             | Go to step 4.   | Go to step 7.  |
| <b>4 CHECK ATF TEMPERATURE SENSOR.</b><br>Measure the resistance between transmission connector terminals.<br><i>Connector &amp; terminal</i><br><i>(T4) No. 11 — No. 15:</i>   | Does the resistance value increase when ATF temperature decreases? | Go to step 5.   | Go to step 7.  |
| <b>5 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.</b><br>1) Connect the connector to transmission.<br>2) Turn the ignition switch to ON (engine OFF).  | Does the ATF temperature gradually decrease?                       | Even if the AT OIL TEMP warning light blinks, the circuit has returned to a normal condition at this time. Temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in ATF temperature sensor and transmission connector. | Go to step 6.  |
| <b>6 CHECK POOR CONTACT.</b>  | Is there poor contact in ATF temperature sensor circuit?           | Repair the poor contact.  | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>      |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <p><b>7</b></p> <p><b>CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from transmission.<br/>                     3) Remove the transmission connector from bracket.<br/>                     4) Lift-up the vehicle.</p> <p>NOTE:<br/>                     Raise all wheels off floor.</p> <p>5) Drain the ATF.</p> <p><b>CAUTION:</b><br/> <b>Do not drain the ATF until it cools down.</b></p> <p>6) Remove the oil pan, and disconnect the connector from ATF temperature sensor connector.<br/>                     7) Measure the resistance of harness between ATF temperature sensor and transmission connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T4) No. 11 — (AT11) No. 1:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | <p>Go to step <b>8</b>.</p>   | <p>Repair the open circuit in harness between ATF temperature sensor and transmission connector.</p>  |
| <p><b>8</b></p> <p><b>CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR.</b></p> <p>Measure the resistance of harness between ATF temperature sensor and transmission connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T4) No. 15 — (AT11) No. 3:</b></p>  | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | <p>Go to step <b>9</b>.</p>   | <p>Repair the open circuit in harness between ATF temperature sensor and transmission connector.</p>  |
| <p><b>9</b></p> <p><b>CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR.</b></p> <p>Measure the resistance of harness between transmission connector and transmission ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T4) No. 11 — Transmission ground:</b></p>  | <p>Is the resistance more than 1 M<math>\Omega</math>?</p> | <p>Go to step <b>10</b>.</p>  | <p>Repair the short circuit in harness between ATF temperature sensor and transmission connector.</p> |
| <p><b>10</b></p> <p><b>CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR.</b></p> <p>Measure the resistance of harness between transmission connector and transmission ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T4) No. 15 — Transmission ground:</b></p>   | <p>Is the resistance more than 1 M<math>\Omega</math>?</p> | <p>Replace the control valve body.<br/>                     &lt;Ref. to 4AT-59, Control Valve Body.&gt;</p> | <p>Repair the short circuit in harness between ATF temperature sensor and transmission connector.</p> |

**C: DTC P0713 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT HIGH INPUT**

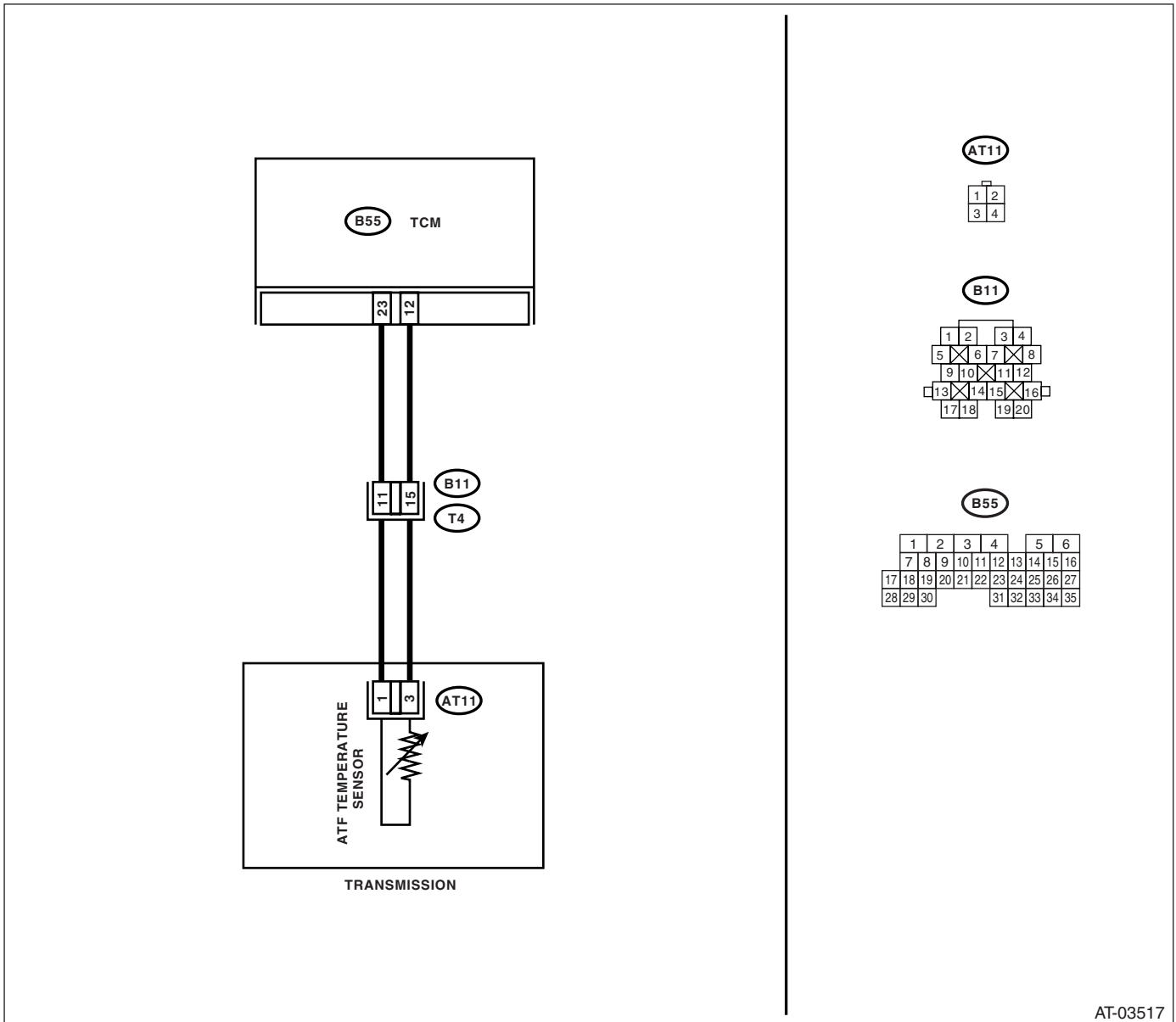
**DIAGNOSIS:**

The input signal circuit of TCM to ATF temperature sensor is open or shorted.

**TROUBLE SYMPTOM:**

Excessive shift shock.

**WIRING DIAGRAM:**



AT-03517

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check                              | Yes  | No  |
|---|------------------------------------|--|---|
| <b>1 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from TCM.<br>3) Measure the resistance between TCM connector terminals.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 23 — No. 12:</i>                                      | Is the resistance more than 500 Ω? | Go to step 2.  | Go to step 4.   |
| <b>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.</b><br>Measure the resistance of harness between TCM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 23 — Chassis ground:</i>   | Is the resistance more than 1 MΩ?  | Go to step 3.  | Go to step 4.   |
| <b>3 CHECK HARNESS.</b><br>Measure the resistance between TCM connector terminals while shaking the harness.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 23 — No. 12:</i>  | Does the resistance change?        | Go to step 4.  | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>     |
| <b>4 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from transmission.<br>3) Measure the resistance of harness between TCM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 23 — Chassis ground:</i> | Is the resistance more than 1 MΩ?  | Go to step 5.  | Repair the short circuit in harness between TCM and transmission harness. |
| <b>5 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.</b><br>Measure the resistance of harness between TCM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 12 — Chassis ground:</i>   | Is the resistance more than 1 MΩ?  | Go to step 6.  | Repair the short circuit in harness between TCM and transmission harness. |
| <b>6 CHECK ATF TEMPERATURE SENSOR.</b><br>Measure the resistance between transmission connector terminals.<br><i>Connector &amp; terminal</i><br><i>(T4) No. 11 — No. 15:</i>   | Is the resistance more than 500 Ω? | Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary short circuit of connector or harness may be the cause. Repair the harness or connector. | Go to step 7.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step   | Check                                      | Yes  | No   |
|--|--|--|--|
| <b>7</b><br><b>CHECK TRANSMISSION HARNESS.</b><br>1) Lift-up the vehicle.<br>2) Drain the ATF.<br>NOTE:<br>Do not drain the ATF until it cools down.<br>3) Remove the oil pan.<br>4) Disconnect the harness connector from control valve.<br>5) Measure the resistance between ATF temperature sensor connector terminals<br>6) Measure the resistance between transmission connector and transmission ground.<br><b>Connector &amp; terminal</b><br><b>(T4) No. 11 — Transmission ground:</b> | Is the resistance more than 1 M $\Omega$ ? | Go to step <b>8</b> .  | Replace the transmission harness.  |
| <b>8</b><br><b>CHECK TRANSMISSION HARNESS.</b><br>Measure the resistance between transmission connector and transmission ground,<br><b>Connector &amp; terminal</b><br><b>(T4) No. 15 — Transmission ground:</b>   | Is the resistance more than 1 M $\Omega$ ? | Go to step <b>9</b> .  | Replace the transmission harness.  |
| <b>9</b><br><b>CHECK ATF TEMPERATURE SENSOR.</b><br>Measure the resistance between control valve connector terminals<br><b>Terminal</b><br><b>No. 1 — No. 3:</b>   | Is the resistance more than 500 $\Omega$ ? | Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary short circuit of connector or harness may be the cause. Repair the harness or connector. | Replace the control valve body.<br><Ref. to 4AT-59, Control Valve Body.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

## D: DTC P0715 INPUT/TURBINE SPEED SENSOR CIRCUIT

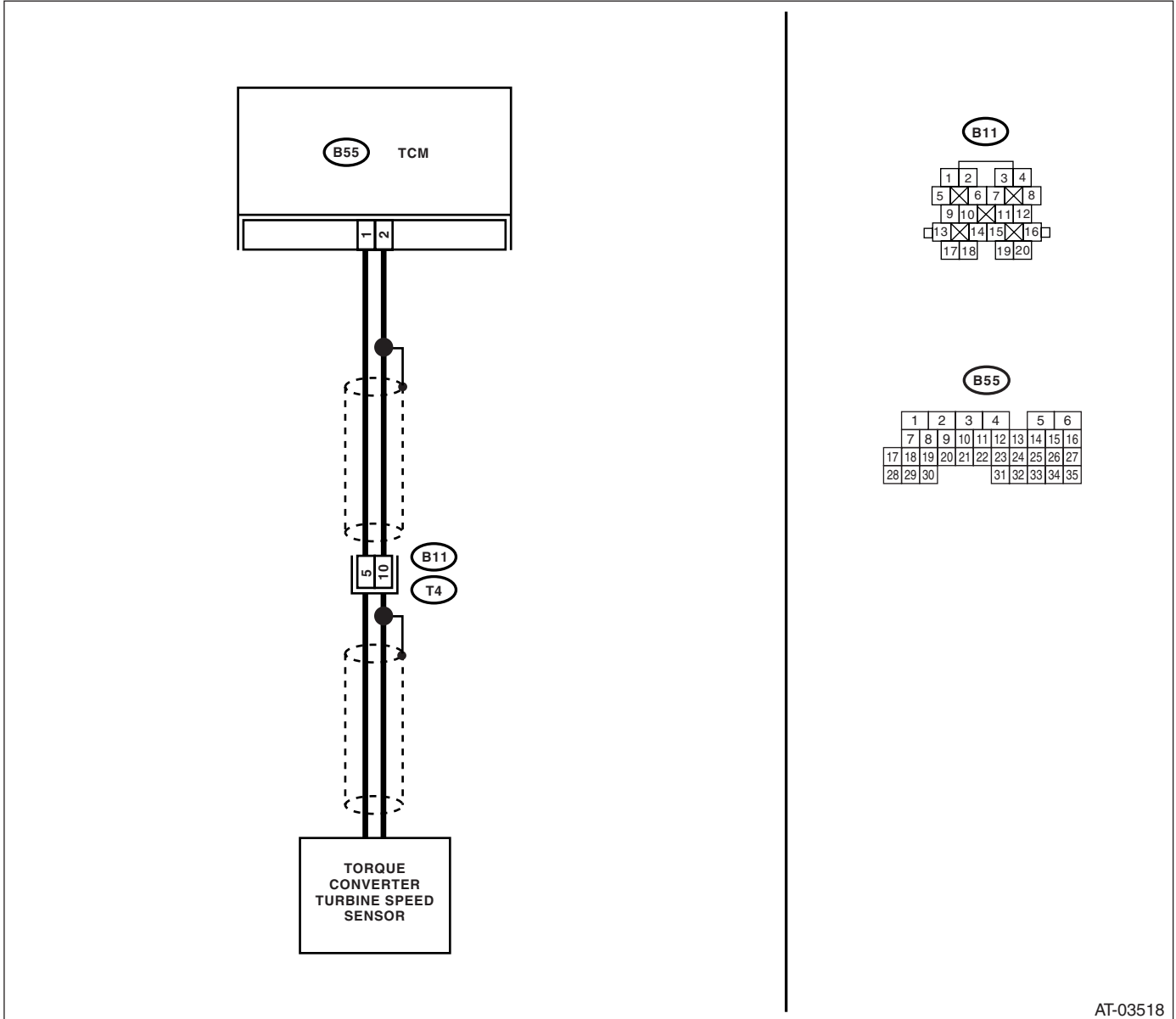
### DIAGNOSIS:

The input signal circuit of TCM is open or shorted.

### TROUBLE SYMPTOM:

Excessive shift shock.

### WIRING DIAGRAM:



AT-03518

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <b>1 CHECK TORQUE CONVERTER TURBINE SPEED SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from transmission.<br>3) Measure the resistance between transmission connector receptacle's terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(T4) No. 5 — No. 10:</b></i>  | Is the resistance 450 — 650 $\Omega$ ?   | Go to step 2.  | Replace the torque converter turbine speed sensor. <Ref. to 4AT-56, Torque Converter Turbine Speed Sensor.>         |
| <b>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>1) Disconnect the connector from TCM.<br>2) Measure the resistance of harness between TCM connector and transmission connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B55) No. 1 — (B11) No. 5:</b></i>   | Is the resistance less than 1 $\Omega$ ?   | Go to step 3.  | Repair the open circuit in harness between TCM and transmission connector.  |
| <b>3 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>Measure the resistance of harness between TCM connector and transmission connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B55) No. 2 — (B11) No. 10:</b></i>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.  | Repair the open circuit in harness between TCM and transmission connector, and poor contact in coupling connector.  |
| <b>4 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>Measure the resistance of harness between TCM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B55) No. 2 — Chassis ground:</b></i>  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 5.  | Repair the short circuit in harness between TCM and transmission connector.   |
| <b>5 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>Measure the resistance of harness between TCM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B55) No. 1 — Chassis ground:</b></i>  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 6.  | Repair the short circuit in harness between TCM and transmission connector, and poor contact in coupling connector. |
| <b>6 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.</b><br>1) Connect the connectors to TCM and transmission.<br>2) Connect the Subaru Select Monitor to data link connector.<br>3) Turn the ignition switch to ON and turn Subaru Select Monitor power switch to ON.<br>4) Start the engine.<br>5) Move the select lever to "P" or "N" range.<br>6) Read the data of turbine speed using Subaru Select Monitor.<br>Compare the tachometer reading with Subaru Select Monitor indications. | Is the revolution value same as the tachometer reading shown on the combination meter? | Even if the AT OIL TEMP warning light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission. | Go to step 7.   |
| <b>7 CHECK POOR CONTACT.</b>  | Is there poor contact in torque converter turbine speed sensor circuit?                | Repair the poor contact.   | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>   |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

## E: DTC P0719 TORQUE CONVERTER/BRAKE SWITCH "B" CIRCUIT LOW

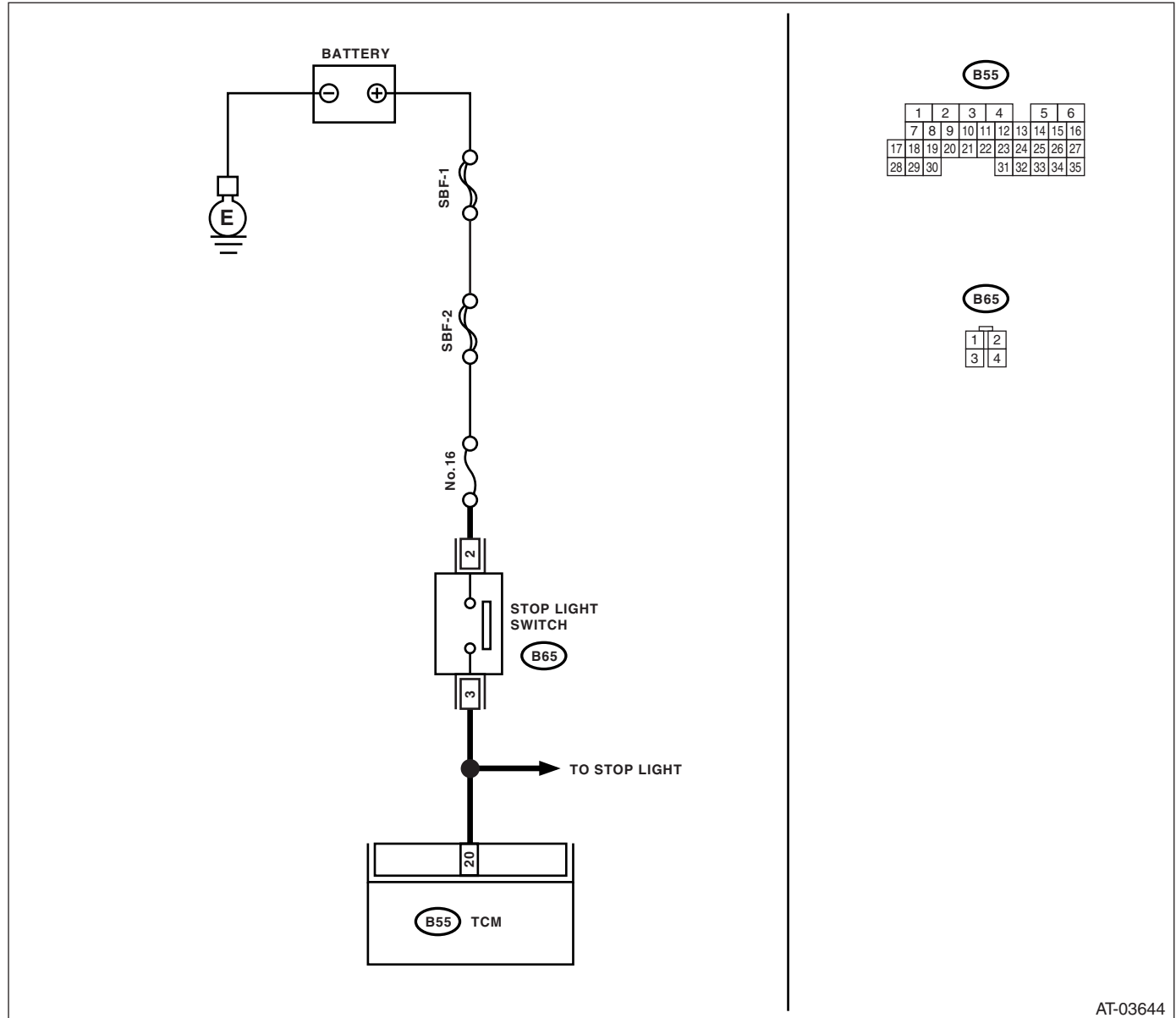
### DIAGNOSIS:

Brake switch malfunction or input signal open circuit.

### TROUBLE SYMPTOM:

Gear is not shifted down when climbing hill.

### WIRING DIAGRAM:



AT-03644

| Step  | Check                            | Yes   | No                             |
|---|----------------------------------|---|--------------------------------|
| 1<br><b>CHECK FUSE (No. 16).</b><br>Remove the fuse (No. 16).           | Is the fuse (No. 16) blown?      | Replace the fuse (No. 16). If the replaced fuse (No. 16) blown out easily, repair the short circuit in harness between fuse (No. 16) and stop light switch. | Go to step 2.                  |
| 2<br><b>CHECK OPERATION OF BRAKE LIGHT.</b><br>Depress the brake pedal. | Does the brake light illuminate? | Go to step 3.   | Check the brake light circuit. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step   | Check   | Yes                  | No  |
|--|---|----------------------|---|
| <b>3 CHECK TCM INPUT SIGNAL.</b><br>1) Depress the brake pedal.<br>2) Measure the voltage of harness between TCM and stop light switch.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B55) No. 20 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10 V?                                  | Go to step 6.        | Go to step 4.   |
| <b>4 CHECK HARNESS CONNECTOR BETWEEN TCM AND STOP LIGHT SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from TCM and stop light switch.<br>3) Measure the resistance between TCM and stop light switch.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B55) No. 20 — (B65) No. 3:</b></i> | Is the resistance less than 1 $\Omega$ ?                        | Go to step 5.        | Repair the open harness between TCM and stop light switch.            |
| <b>5 CHECK HARNESS CONNECTOR BETWEEN TCM AND STOP LIGHT SWITCH.</b><br>Measure the resistance between TCM and stop light switch.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B55) No. 20 — (B65) No. 3:</b></i>  | Is the resistance more than 1 $M\Omega$ ?                       | Go to step 6.        | Repair the short harness between TCM and stop light switch.           |
| <b>6 INSPECT POOR CONTACT.</b>   | Is there poor contact in the brake switch input signal circuit? | Repair poor contact. | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

### F: DTC P0720 OUTPUT SPEED SENSOR CIRCUIT

#### DIAGNOSIS:

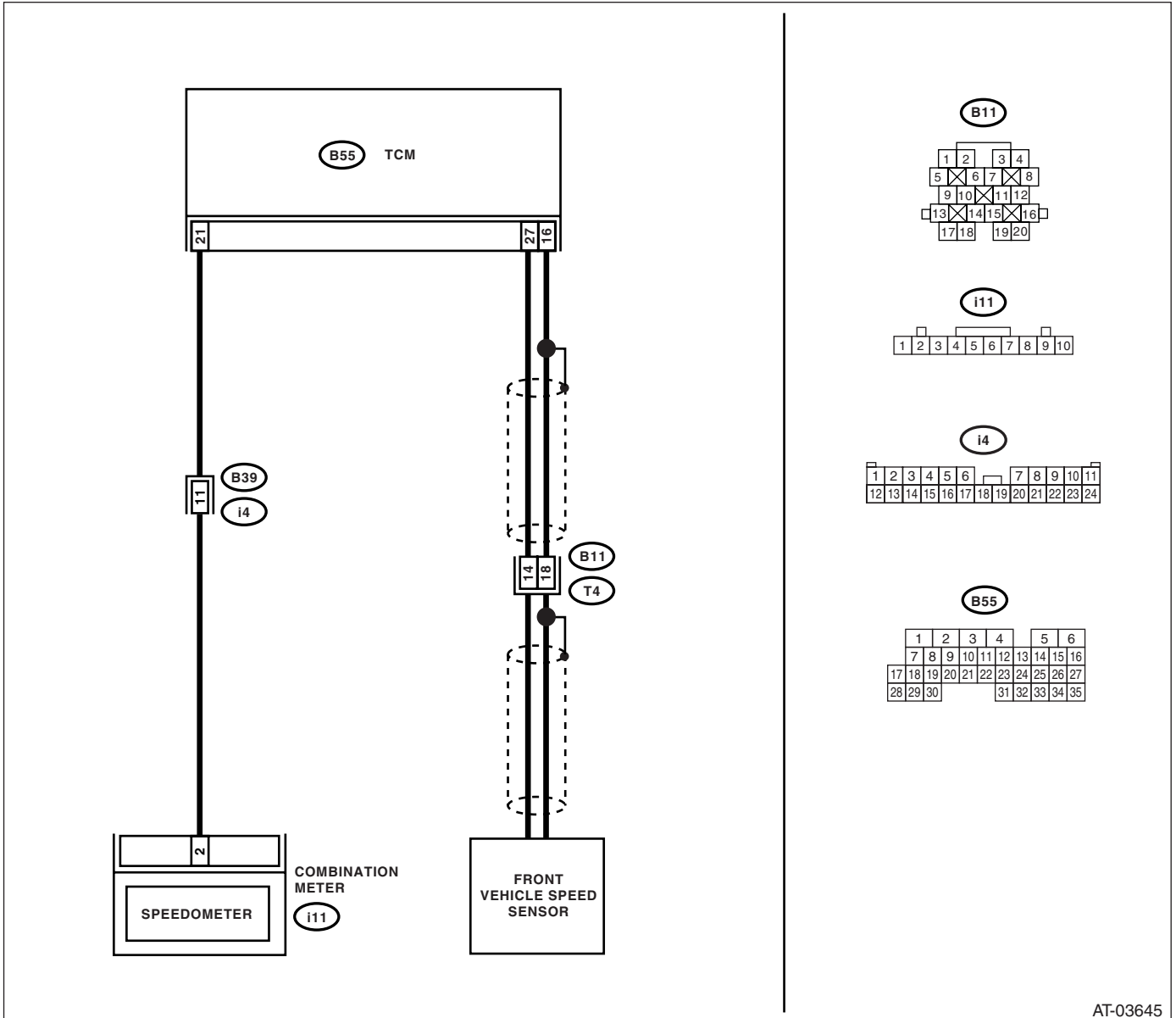
- The vehicle speed signal is abnormal.
- The circuit in combination meter is faulty.
- The harness connector between TCM and vehicle speed sensor is in short or open.

#### TROUBLE SYMPTOM:

- Erroneous idling.
- Engine stalls.
- Poor driving performance.

#### WIRING DIAGRAM:

- Non-turbo model

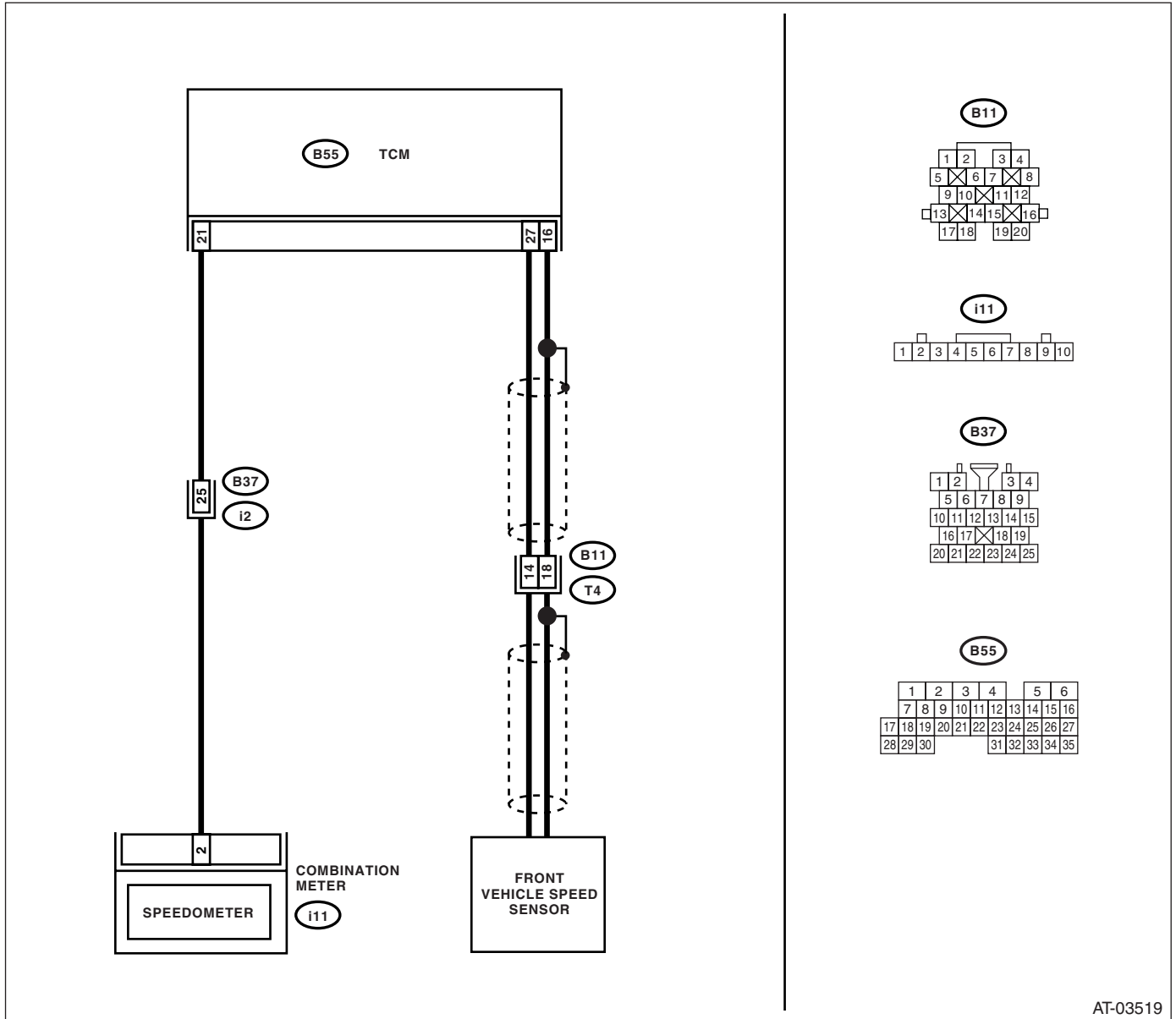


AT-03645

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

- Turbo model



AT-03519

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check                                     | Yes           | No  |
|---|---|---------------|---|
| <b>1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from TCM and transmission.<br>3) Measure the resistance of harness between TCM connector and transmission connector.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 27 — (B11) No. 14:</i> | Is the resistance less than 1 $\Omega$ ?  | Go to step 2. | Repair the open circuit in harness between TCM and transmission connector.  |
| <b>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>Measure the resistance of harness between TCM connector and transmission connector.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 16 — (B11) No. 18:</i>   | Is the resistance less than 1 $\Omega$ ?  | Go to step 3. | Repair the open circuit in harness between TCM and transmission connector, and poor contact in coupling connector.  |
| <b>3 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>Measure the resistance of harness between TCM connector and transmission connector.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 27 — Chassis ground:</i>   | Is the resistance more than 1 $M\Omega$ ? | Go to step 4. | Repair the short circuit in harness between TCM and transmission connector.   |
| <b>4 CHECK HARNESS CONNECTOR BETWEEN TCM CONNECTOR AND TRANSMISSION.</b><br>Measure the resistance of harness between TCM connector and transmission connector.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 16 — Chassis ground:</i>   | Is the resistance more than 1 $M\Omega$ ? | Go to step 5. | Repair the short circuit in harness between TCM and transmission connector, and poor contact in coupling connector. |
| <b>5 CHECK FRONT VEHICLE SPEED SENSOR.</b><br>Measure the resistance between transmission connector receptacle's terminals.<br><i>Connector &amp; terminal</i><br><i>(T4) No. 14 — No. 18:</i>  | Is the resistance 450 — 650 $\Omega$ ?    | Go to step 6. | Replace the front vehicle speed sensor. <Ref. to 4AT-51, Front Vehicle Speed Sensor.>                               |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step   | Check   | Yes  | No   |
|--|---|--|--|
| <p><b>6 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.</b></p> <p>1) Connect all connectors.<br/>                     2) Connect the Subaru Select Monitor to data link connector.<br/>                     3) Lift-up the vehicle.</p> <p>NOTE:<br/>                     Raise all wheels off floor.</p> <p>4) Turn the ignition switch to ON and turn Subaru Select Monitor power switch to ON.<br/>                     5) Start the engine.<br/>                     6) Read the data of vehicle speed using Subaru Select Monitor.</p> <ul style="list-style-type: none"> <li>• Compare the speedometer reading with Subaru Select Monitor indications.</li> <li>• Vehicle speed is indicated in "km/h" or "MPH".</li> </ul> <p>7) Slowly increase the vehicle speed to 60 km/h or 37 MPH.</p> <p>NOTE:<br/>                     The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. &lt;Ref. to ABS(diag)-26, Clear Memory Mode.&gt;</p> | <p>Does the speedometer indication increase as Subaru Select Monitor front speed sensor data increases?</p> | <p>Even if the AT OIL TEMP warning light blinks, the circuit has returned to a normal condition at this time. A temporary poor connector or harness may be the cause. Repair the harness or connector in front vehicle speed sensor circuit.</p> | <p>Go to step 7.</p>   |
| <p><b>7 CHECK POOR CONTACT.</b></p>  | <p>Is there poor contact in front vehicle speed sensor circuit?</p>   | <p>Repair the poor contact.</p>  | <p>Replace the TCM. &lt;Ref. to 4AT-64, Transmission Control Module (TCM).&gt;</p> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

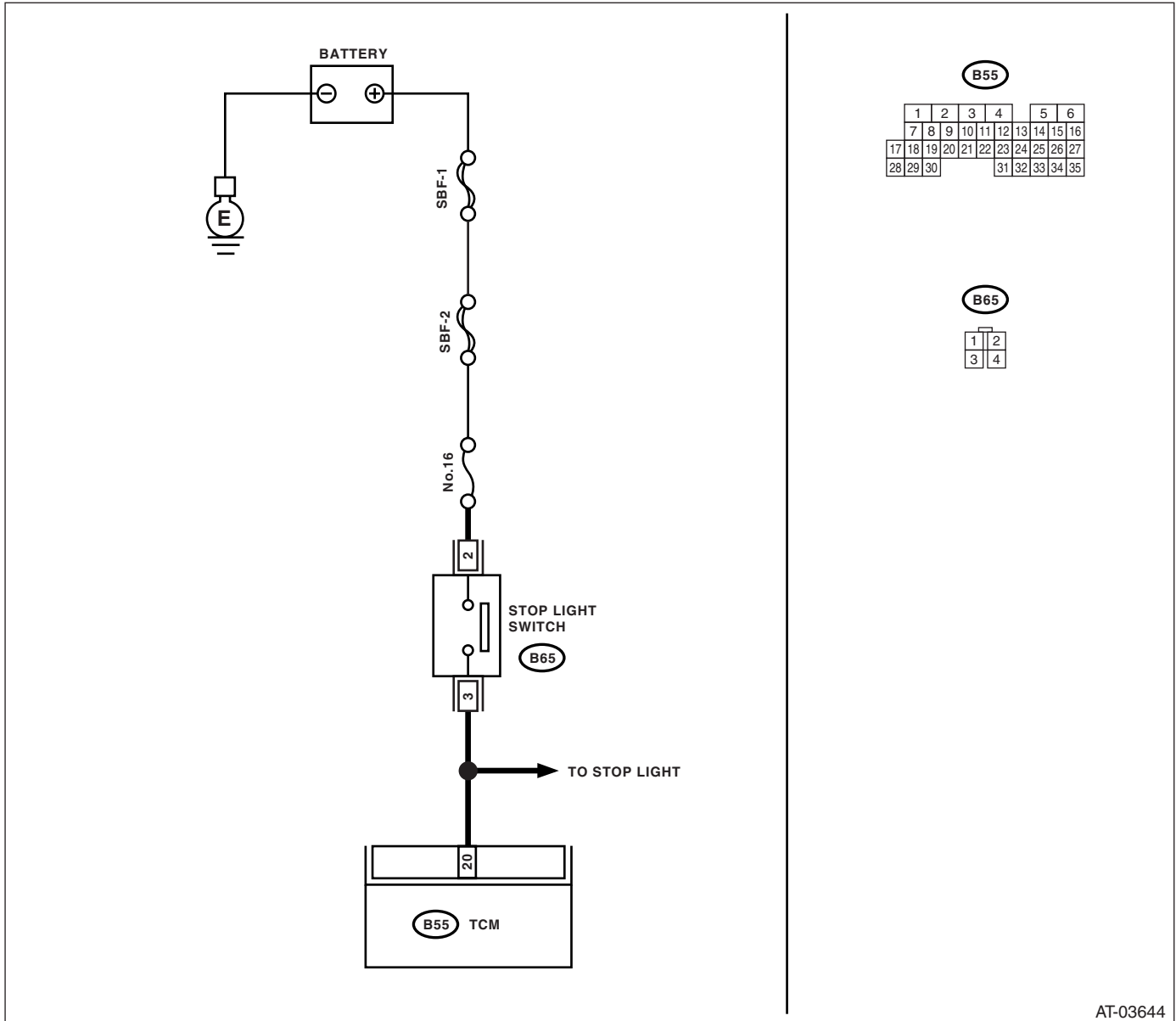
### G: DTC P0724 TORQUE CONVERTER/BRAKE SWITCH "B" CIRCUIT HIGH

**DIAGNOSIS:**  
Brake switch malfunction or open brake switch input signal circuit.

**TROUBLE SYMPTOM:**

Gear is not shifted down at downhill.

**WIRING DIAGRAM:**



AT-03644

| Step | Check   | Yes           | No                             |
|------|---|---------------|--------------------------------|
| 1    | <b>CHECK OPERATION OF BRAKE LIGHT.</b><br>Depress the brake pedal.  | Go to step 2. | Check the brake light circuit. |
| 2    | <b>CHECK TCM INPUT SIGNAL.</b><br>1) Disconnect the harness connector from TCM.<br>2) Measure the voltage of harness between TCM and stop light switch.<br><b>Connector &amp; terminal</b><br><b>(B55) No. 20 (+) — Chassis ground (-):</b> | Go to step 3. | Go to step 5.                  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check   | Yes                  | No   |
|---|---|----------------------|--|
| <b>3</b><br><b>CHECK STOP LIGHT SWITCH.</b><br>1) Turn the ignition switch OFF.<br>2) Disconnect the connector from stop light switch.<br>3) Measure the resistance of harness between stop light switch connector.<br><b>Connector &amp; terminal</b><br><b>No. 2 — No. 3:</b> | Is the resistance more than 1 M $\Omega$ ?                      | Go to step 4.        | Replace the stop light switch.   |
| <b>4</b><br><b>CHECK HARNESS CONNECTOR BETWEEN TCM AND STOP LIGHT SWITCH.</b><br>1) Turn the ignition switch ON.<br>2) Measure the voltage of harness between TCM and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B55) No. 20 (+) — Chassis ground (-):</b>       | Is the voltage less than 1 V?                                   | Go to step 5.        | Repair the short in power supply circuit to harness between TCM and stop light switch. |
| <b>5</b><br><b>INSPECT POOR CONTACT.</b>  | Is there poor contact in the brake switch input signal circuit? | Repair poor contact. | Replace the TCM.<br><Ref. to 4AT-64, Transmission Control Module (TCM).>               |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

## H: DTC P0725 ENGINE SPEED INPUT CIRCUIT

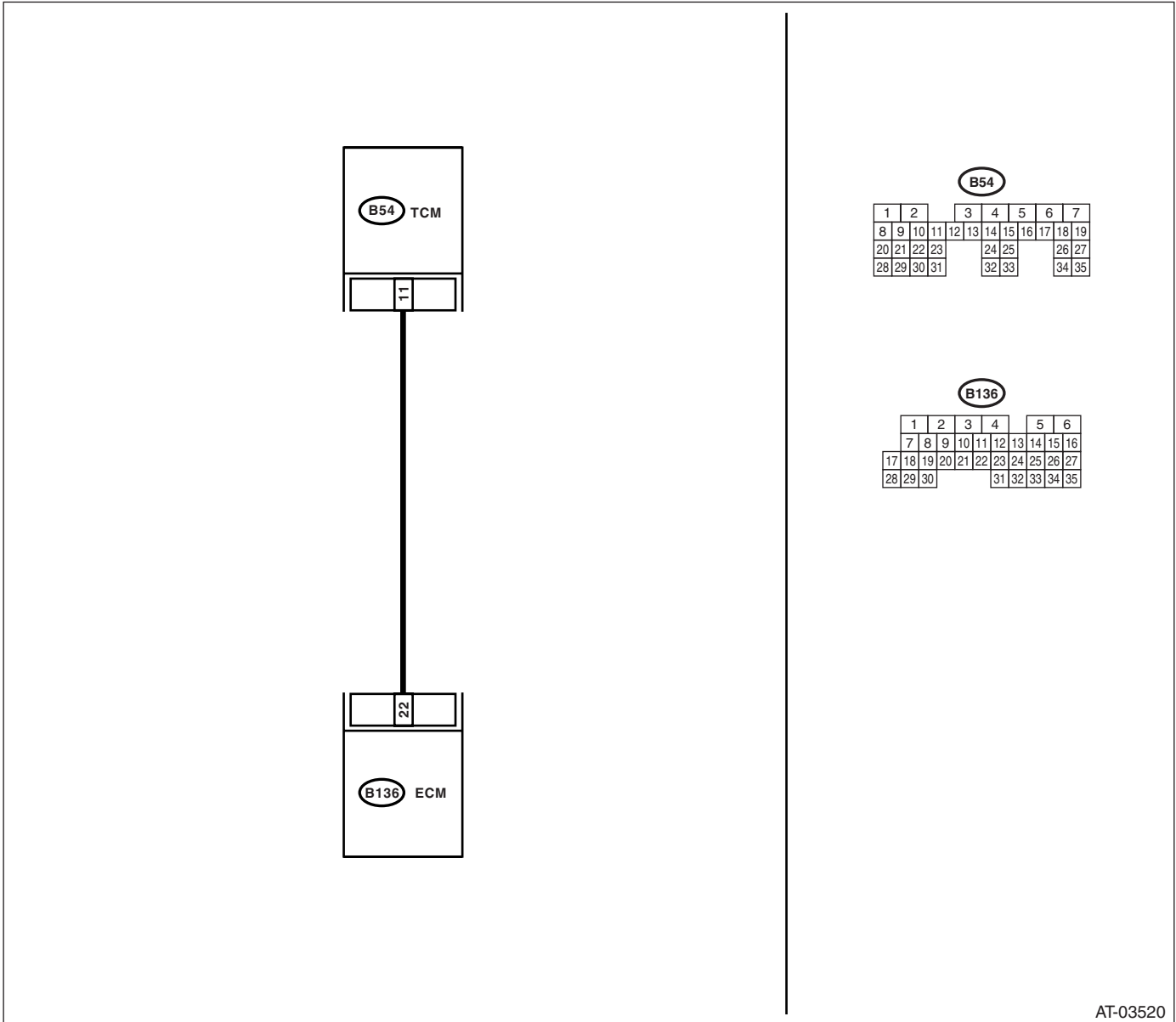
### DIAGNOSIS:

The engine speed input signal circuit is open or shorted.

### TROUBLE SYMPTOM:

- No lock-up (after engine warm-up).
- The AT OIL TEMP warning light remains on when vehicle speed is "0".

### WIRING DIAGRAM:



AT-03520

| Step   | Check                            | Yes           | No  |
|--|----------------------------------|---------------|---|
| <b>1</b><br><b>CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from TCM and ECM.<br>3) Measure the resistance of harness between TCM and ECM connector.<br><b>Connector &amp; terminal</b><br><b>(B54) No. 11 — (B136) No. 22:</b> | Is the resistance less than 1 Ω? | Go to step 2. | Repair the open circuit in harness between TCM and ECM connector. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <b>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.</b><br>Measure the resistance of harness between TCM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B54) No. 11 — Chassis ground:</b>  | Is the resistance more than 1 MΩ?  | Go to step 3.   | Repair the short circuit in harness between TCM and ECM connector. |
| <b>3 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.</b><br>1) Connect the connectors to TCM and ECM.<br>2) Connect the Subaru Select Monitor to data link connector.<br>3) Start the engine and turn Subaru Select Monitor power switch to ON.<br>4) Idle the engine.<br>5) Read the data of engine speed using Subaru Select Monitor.<br>Display shows the engine speed signal value sent from ECM. | Is the revolution value same as tachometer reading shown on combination meter? | Even if the AT OIL TEMP warning light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM. | Go to step 4.  |
| <b>4 CHECK POOR CONTACT.</b>  | Is there poor contact in engine speed signal circuit?                          | Repair the poor contact.  | Go to step 5.  |
| <b>5 CONFIRM DTC P0725.</b><br>Replace the ECM with a new one.  | Does the DTC appear again, after memory has been cleared?                      | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>   | Replace the ECM.   |

## I: DTC P0731 GEAR 1 INCORRECT RATIO

NOTE:

Refer to DTC P0736 for diagnostic procedure. <Ref. to 4AT(D)(diag)-60, DTC P0736 REVERSE INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## J: DTC P0732 GEAR 2 INCORRECT RATIO

NOTE:

Refer to DTC P0736 for diagnostic procedure. <Ref. to 4AT(D)(diag)-60, DTC P0736 REVERSE INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## K: DTC P0733 GEAR 3 INCORRECT RATIO

NOTE:

Refer to DTC P0736 for diagnostic procedure. <Ref. to 4AT(D)(diag)-60, DTC P0736 REVERSE INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## L: DTC P0734 GEAR 4 INCORRECT RATIO

NOTE:

Refer to DTC P0736 for diagnostic procedure. <Ref. to 4AT(D)(diag)-60, DTC P0736 REVERSE INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

### M: DTC P0736 REVERSE INCORRECT RATIO

#### DIAGNOSIS:

Vehicle speed sensor malfunction and torque converter turbine speed sensor malfunction, etc. or control valve malfunction.

#### TROUBLE SYMPTOM:

- Shift point is too high or too low.
- Excessive shift shock.
- Tight cornering condition is occurred.
- Gear is not shifted to reverse.
- Gear position is held by fail safe function.

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>1 CHECK ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Connect the Subaru Select Monitor to data link connector.<br>2) Turn the ignition switch to ON.<br>3) Read the value of accelerator pedal position sensor using Subaru Select Monitor.  | Does the value of accelerator pedal position sensor change from 0% to 100% smoothly when throttle position sensor was operated from fully closing to fully opening? | Go to step 2.   | Check accelerator pedal position sensor circuit.         |
| <b>2 FRONT VEHICLE SPEED SENSOR.</b><br>1) Lift-up the vehicle.<br>2) Start the engine.<br>3) Move the select lever "D" range and slowly increase vehicle speed.<br><br>NOTE:<br>The speed difference between front and rear wheels may light ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. | Does the vehicle speed displayed by Subaru Select Monitor almost correspond with vehicle speed indicated by combination meter?                                      | Go to step 3.   | Check the front vehicle speed sensor circuit.            |
| <b>3 CHECK TORQUE CONVERTER TURBINE SPEED SENSOR.</b><br>1) Move the select lever to "P" or "N" range.<br>2) Idle the engine.   | Does the turbine speed sensor revolution displayed by Subaru Select Monitor almost correspond with engine revolution indicated by tachometer?                       | There are malfunctions in TCM, TCM connector poor contact, or transmission assembly mechanical malfunction. | Check the torque converter turbine speed sensor circuit. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

## N: DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF

### DIAGNOSIS:

- Lock up clutch malfunction
- Locking of valve

### TROUBLE SYMPTOM:

Lock up is not operated.

### WIRING DIAGRAM:

| Step | Check   | Yes   | No  |
|------|---|---|---|
| 1    | <b>CHECK LOCK UP DUTY SOLENOID CIRCUIT.</b><br>Check according as DTC P0743 procedure.  | Is there malfunction?   | Repair or replace the lock up duty solenoid circuit.<br>Go to step 2.   |
| 2    | <b>CHECK INHIBITOR SWITCH CIRCUIT.</b><br>Check according as DTC P0705 procedure.   | Is there malfunction?   | Repair or replace the inhibitor switch circuit.<br>Go to step 3.  |
| 3    | <b>CHECK STOP LIGHT SWITCH CIRCUIT.</b><br>Check according as DTC P0719 and DTC P0724 procedure.  | Is there malfunction?   | Repair or replace the stop light switch circuit.<br>Go to step 4.   |
| 4    | <b>CHECK ATF TEMPERATURE SENSOR CIRCUIT.</b><br>Check according to DTC P0712 and DTC P0713 procedure.   | Is there malfunction?   | Repair or replace the ATF temperature sensor circuit.<br>Go to step 5.  |
| 5    | <b>CHECK THROTTLE POSITION SENSOR.</b><br>1) Connect the Subaru Select Monitor to data link connector.<br>2) Turn the ignition switch to ON.<br>3) Read the value of accelerator pedal position sensor using Subaru Select Monitor. | Does the value of accelerator pedal position sensor change from 0% to 100% smoothly when throttle position sensor was operated from fully closing to fully opening? | Go to step 6.<br>Check the throttle position sensor circuit.  |
| 6    | <b>CHECK TORQUE CONVERTER TURBINE SPEED SENSOR.</b><br>1) Move the select lever to "P" or "N" range.<br>2) Idle the engine.   | Does the engine revolution displayed by Subaru Select Monitor almost correspond with engine revolution indicated by tachometer?                                     | Go to step 7.<br>Check the torque converter turbine speed sensor circuit.   |
| 7    | <b>CHECK ENGINE SPEED SIGNAL.</b><br>Idle the engine.   | Does the engine revolution displayed by Subaru Select Monitor almost correspond with engine revolution indicated by tachometer?                                     | There is malfunction in TCM, TCM connector poor contact, or transmission assembly mechanical malfunction.<br>Check the engine speed signal circuit. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

## O: DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL

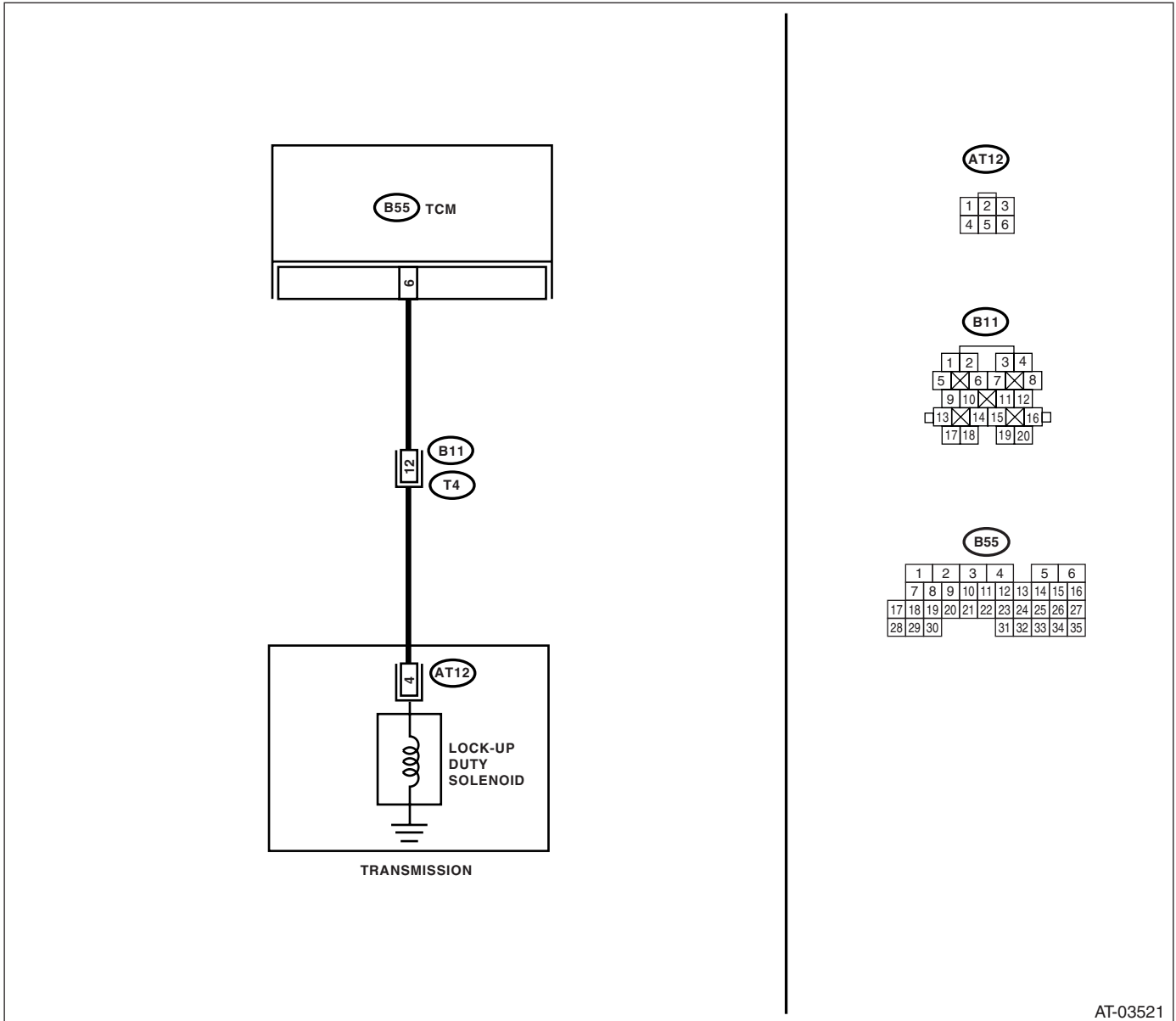
### DIAGNOSIS:

The output signal circuit of lock-up duty solenoid is open or shorted.

### TROUBLE SYMPTOM:

No "lock-up" (after engine warm-up).

### WIRING DIAGRAM:



AT-03521

| Step | Check                                     | Yes                                     | No            |
|------|---|---|---------------|
| 1    | CHECK DTC.<br>Is any other DTC displayed? | Perform the diagnosis according to DTC. | Go to step 2. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check  | Yes                  | No   |
|---|--|----------------------|--|
| <p><b>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from TCM and transmission.<br/>                     3) Measure the resistance of harness between TCM and transmission connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B55) No. 6 — (B11) No. 12:</b></p>   | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | <p>Go to step 3.</p> | <p>Repair the open circuit in harness between TCM and transmission connector.</p>  |
| <p><b>3 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b></p> <p>Measure the resistance of harness connector between TCM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B55) No. 6 — Chassis ground:</b></p>   | <p>Is the resistance more than 1 M<math>\Omega</math>?</p> | <p>Go to step 4.</p> | <p>Repair the short circuit in harness between TCM and transmission connector.</p> |
| <p><b>4 CHECK LOCK-UP DUTY SOLENOID.</b></p> <p>Measure the resistance between transmission connector receptacle's terminals.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T4) No. 12 — No. 20:</b></p>  | <p>Is the resistance 2.0 — 6.0 <math>\Omega</math>?</p>    | <p>Go to step 5.</p> | <p>Go to step 8.</p>   |
| <p><b>5 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.</b></p> <p>1) Connect the connectors to TCM and transmission.<br/>                     2) Lift-up the vehicle.</p> <p><b>NOTE:</b><br/>                     Raise all wheels off floor.</p> <p>3) Connect the Subaru Select Monitor to data link connector.<br/>                     4) Start the engine, and turn the Subaru Select Monitor switch to ON.<br/>                     5) Start the engine and warm-up the engine until the ATF temperature is above 80°C (176°F).</p> <p><b>NOTE:</b><br/>                     If the ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.</p> <p>6) Read the data of lock-up duty solenoid using Subaru Select Monitor.<br/>                     Lock-up duty solenoid is indicated in "%".<br/>                     7) Shift the select lever to "D", and slowly increase vehicle speed to 60 km/h (37 MPH).</p> <p><b>NOTE:</b><br/>                     The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure. &lt;Ref. to ABS(diag)-26, Clear Memory Mode.&gt;</p> | <p>Is the value 95%?</p>                                   | <p>Go to step 6.</p> | <p>Go to step 7.</p>   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check   | Yes  | No  |
|---|---|--|---|
| <b>6</b><br><b>CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.</b><br>Return the engine to idling speed, shift the select lever to "N" range and read data.   | Is the value 5%?  | Even if the ATF OIL TEMP. warning light is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the harness or connector in TCM and transmission.                  | Go to step 7.   |
| <b>7</b><br><b>CHECK POOR CONTACT.</b>  | Is there poor contact in lock-up duty solenoid circuit? | Repair the poor contact.   | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>                         |
| <b>8</b><br><b>CHECK LOCK-UP DUTY SOLENOID (IN TRANSMISSION).</b><br>1) Disconnect the transmission connector.<br>2) Drain the ATF.<br><b>CAUTION:</b><br><b>Do not drain the ATF until it cools down.</b><br>3) Remove the oil pan and disconnect connector from lock-up duty solenoid.<br>4) Measure the resistance between lock-up duty solenoid and transmission ground.<br><i>Connector &amp; terminal</i><br><i>(AT12) No. 4 — Transmission ground:</i> | Is the resistance 2.0 — 6.0 $\Omega$ ?                  | Go to step 9.  | Replace the control valve body. <Ref. to 4AT-59, Control Valve Body.>                         |
| <b>9</b><br><b>CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION.</b><br>Measure the resistance of harness between lock-up duty solenoid and transmission connector.<br><i>Connector &amp; terminal</i><br><i>(T4) No. 12 — (AT12) No. 4:</i>  | Is the resistance less than 1 $\Omega$ ?                | Go to step 10.   | Repair the open circuit in harness between TCM and transmission connector.                    |
| <b>10</b><br><b>CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION.</b><br>Measure the resistance of harness between transmission connector and transmission ground.<br><i>Connector &amp; terminal</i><br><i>(T4) No. 12 — Transmission ground:</i>  | Is the resistance more than 1 M $\Omega$ ?              | Even if the AT OIL TEMP warning light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in lock-up duty solenoid and transmission. | Repair the short circuit in harness between lock-up duty solenoid and transmission connector. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

## P: DTC P0748 PRESSURE CONTROL SOLENOID “A” ELECTRICAL

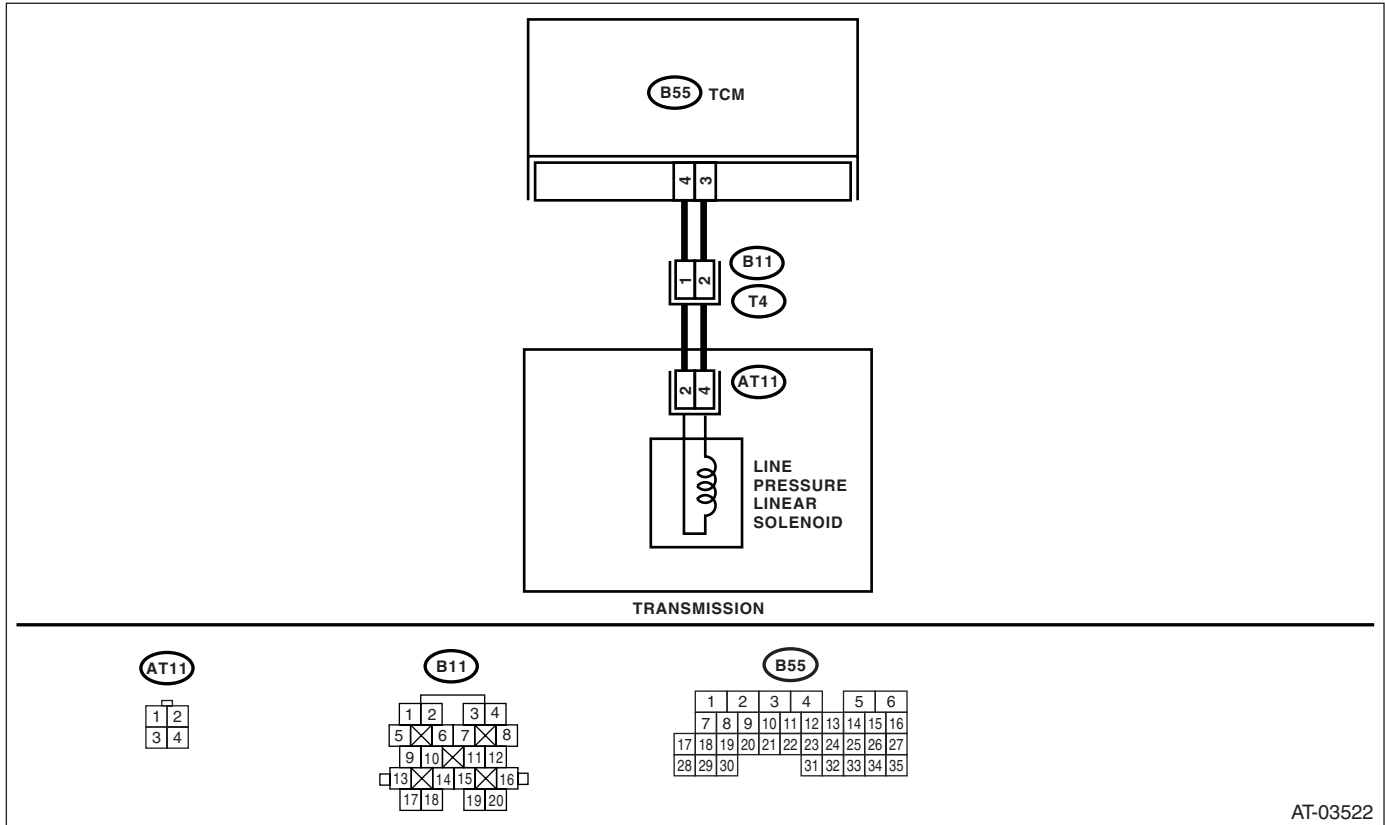
### DIAGNOSIS:

The output signal circuit of line pressure linear solenoid is open or shorted.

### TROUBLE SYMPTOM:

Excessive shift shock.

### WIRING DIAGRAM:



AT-03522

| Step   | Check                                      | Yes           | No  |
|--|--|---------------|---|
| <b>1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from transmission and TCM.<br>3) Measure the resistance of harness between TCM and transmission connector.<br><i>Connector &amp; terminal</i><br>(B55) No. 3 — (B11) No. 2:<br>(B55) No. 4 — (B11) No. 1: | Is the resistance less than 1 $\Omega$ ?   | Go to step 2. | Repair the open circuit in harness between TCM and transmission connector.  |
| <b>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND.</b><br>Measure the resistance of harness between TCM connector and chassis ground.<br><i>Connector &amp; terminal</i><br>(B55) No. 3 — Chassis ground:<br>(B55) No. 4 — Chassis ground:   | Is the resistance more than 1 M $\Omega$ ? | Go to step 3. | Repair the short circuit in harness between TCM and transmission connector. |
| <b>3 CHECK LINE PRESSURE LINEAR SOLENOID.</b><br>Measure the resistance between transmission connector receptacle's terminals.<br><i>Connector &amp; terminal</i><br>(T4) No. 1 — No. 2:   | Is the resistance 4 — 8 $\Omega$ ?         | Go to step 4. | Go to step 5.   |



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check   | Yes  | No  |
|---|---|--|---|
| <b>4</b><br><b>CHECK POOR CONTACT.</b>  | Is there poor contact in line pressure linear solenoid circuit? | Repair the poor contact.   | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>                                 |
| <b>5</b><br><b>CHECK LINE PRESSURE LINEAR SOLENOID (IN TRANSMISSION).</b><br>1) Remove the transmission connector from bracket.<br>2) Drain the ATF.<br><b>CAUTION:</b><br><b>Do not drain the ATF until it cools down.</b><br>3) Remove the oil pan, and disconnect connector from line pressure linear solenoid.<br>4) Measure the resistance between line pressure linear solenoid connector and transmission ground.<br><b>Connector &amp; terminal</b><br><b>(AT11) No. 2 — No. 4:</b> | Is the resistance 4 — 8 Ω?                                      | Go to step 6.  | Replace the control valve body. <Ref. to 4AT-59, Control Valve Body.>                                 |
| <b>6</b><br><b>CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE LINEAR SOLENOID.</b><br>Measure the resistance of harness between line pressure linear solenoid and transmission connector.<br><b>Connector &amp; terminal</b><br><b>(T4) No. 2 — (AT11) No. 4:</b><br><b>(T4) No. 1 — (AT11) No. 2:</b>  | Is the resistance less than 1 Ω?                                | Go to step 7.  | Repair the open circuit in harness between line pressure linear solenoid and transmission connector.  |
| <b>7</b><br><b>CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE LINEAR SOLENOID.</b><br>Measure the resistance of harness between transmission connector and transmission ground.<br><b>Connector &amp; terminal</b><br><b>(T4) No. 1 — Transmission ground:</b><br><b>(T4) No. 2 — Transmission ground:</b>  | Is the resistance more than 1 MΩ?                               | Even if the AT OIL TEMP warning light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in line pressure linear solenoid and transmission. | Repair the short circuit in harness between line pressure linear solenoid and transmission connector. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

## Q: DTC P0753 SHIFT SOLENOID "A" ELECTRICAL

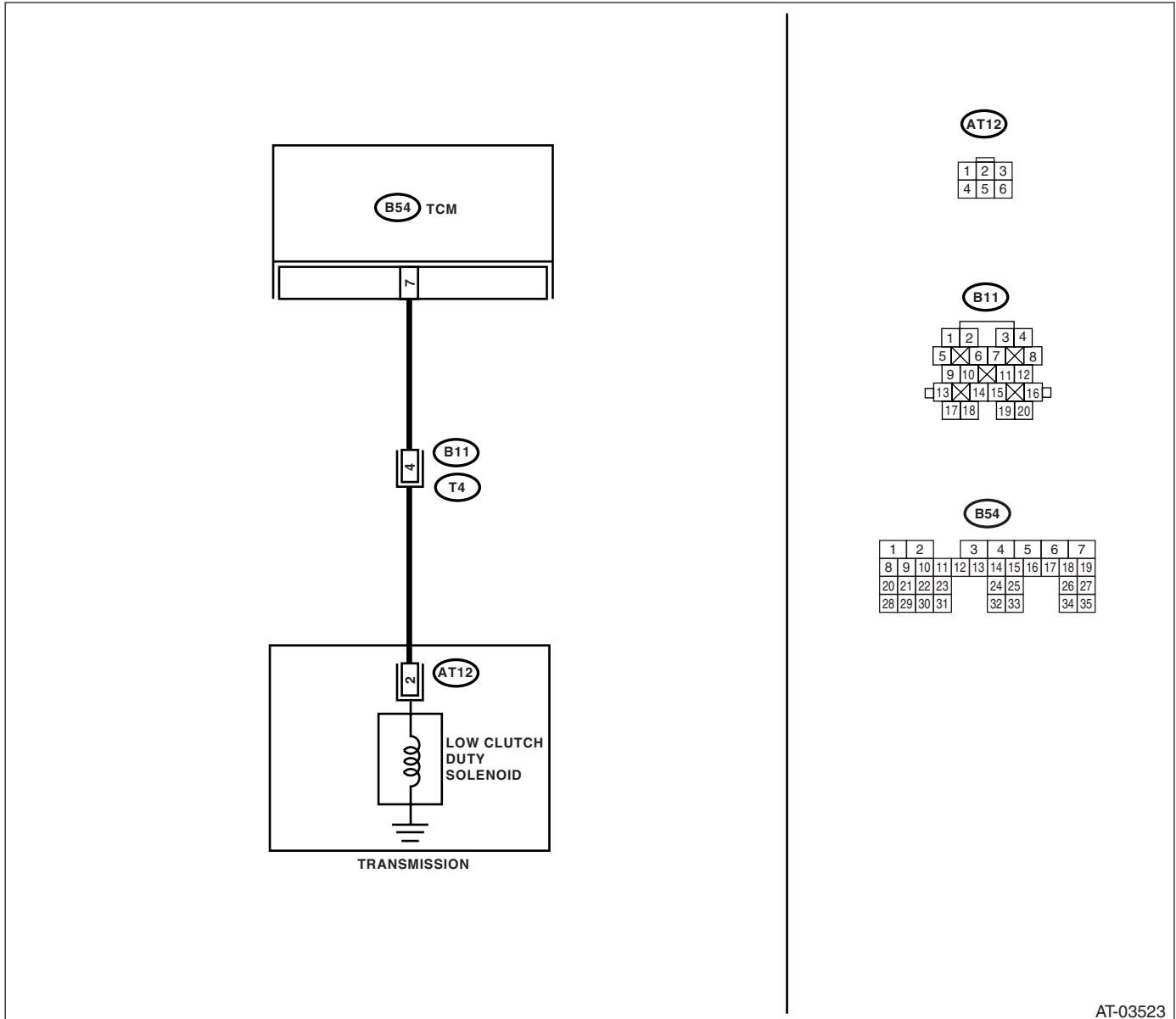
### DIAGNOSIS:

The output signal circuit of low clutch duty solenoid is open or shorted.

### TROUBLE SYMPTOM:

Excessive shift shock.

### WIRING DIAGRAM:



AT-03523

| Step  | Check                                    | Yes           | No   |
|---|--|---------------|--|
| <b>1</b><br><b>CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from TCM and transmission.<br>3) Measure the resistance of harness between TCM and transmission connector.<br><b>Connector &amp; terminal</b><br><b>(B54) No. 7 — (B11) No. 4:</b> | Is the resistance less than 1 $\Omega$ ? | Go to step 2. | Repair the open circuit in harness between TCM and transmission connector. |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <b>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>Measure the resistance of harness between TCM connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B54) No. 7 — Chassis ground:</b></i>  | Is the resistance more than 1 MΩ?                          | Go to step 3.  | Repair the short circuit in harness between TCM and transmission connector. |
| <b>3 CHECK LOW CLUTCH DUTY SOLENOID.</b><br>Measure the resistance between transmission connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(T4) No. 4 — No. 20:</b></i>  | Is the resistance 2.0 — 6.0 Ω?                             | Go to step 4.  | Go to step 7.   |
| <b>4 CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.</b><br>1) Connect the connectors to TCM and transmission.<br>2) Connect the Subaru Select Monitor to data link connector.<br>3) Start the engine and turn Subaru Select Monitor power switch to ON.<br>4) Warm-up the transmission until ATF temperature is above 80°C (176°F).<br>NOTE:<br>If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature.<br>5) Stop the engine and turn ignition switch to ON (engine OFF).<br>6) Shift the select lever to “P” or “N” range, and depress the accelerator pedal.<br>7) Read the data of low clutch duty solenoid using Subaru Select Monitor.<br>Low clutch duty solenoid is indicated in “%”. | Is the value 100%?   | Go to step 5.  | Go to step 6.   |
| <b>5 CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.</b><br>1) Turn the ignition switch to ON (engine OFF).<br>2) Move the select lever to “D” range.<br>3) Read the data of low clutch duty solenoid.  | Is the value 0%?   | Even if the AT OIL TEMP warning light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in transmission. | Go to step 6.   |
| <b>6 CHECK POOR CONTACT.</b>  | Is there poor contact in low clutch duty solenoid circuit? | Repair the poor contact.   | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>       |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <p><b>7</b></p> <p><b>CHECK LOW CLUTCH DUTY SOLENOID (IN TRANSMISSION).</b></p> <p>1) Remove the transmission connector from bracket.</p> <p>2) Drain the ATF.</p> <p><b>CAUTION:</b><br/><b>Do not drain the ATF until it cools down.</b></p> <p>3) Remove the oil pan, and disconnect connector from low clutch duty solenoid.</p> <p>4) Measure the resistance between low clutch duty solenoid connector and transmission ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(AT12) No. 2 — Transmission ground:</b></p> | <p>Is the resistance 2.0 — 6.0 <math>\Omega</math>?</p>    | <p>Go to step <b>8</b>.</p>  | <p>Replace the control valve body.<br/>&lt;Ref. to 4AT-59, Control Valve Body.&gt;</p>                  |
| <p><b>8</b></p> <p><b>CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LOW CLUTCH DUTY SOLENOID.</b></p> <p>Measure the resistance of harness between low clutch duty solenoid and transmission connector.</p> <p><b>Connector &amp; terminal</b><br/><b>(T4) No. 4 — (AT12) No. 2:</b></p>   | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | <p>Go to step <b>9</b>.</p>  | <p>Repair the open circuit in harness between low clutch duty solenoid and transmission connector.</p>  |
| <p><b>9</b></p> <p><b>CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LOW CLUTCH DUTY SOLENOID.</b></p> <p>Measure the resistance of harness between transmission connector and transmission ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(T4) No. 4 — Transmission ground:</b></p>   | <p>Is the resistance more than 1 M<math>\Omega</math>?</p> | <p>Even if the AT OIL TEMP warning light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in low clutch duty solenoid and transmission.</p> | <p>Repair the short circuit in harness between low clutch duty solenoid and transmission connector.</p> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

### R: DTC P0758 SHIFT SOLENOID "B" ELECTRICAL

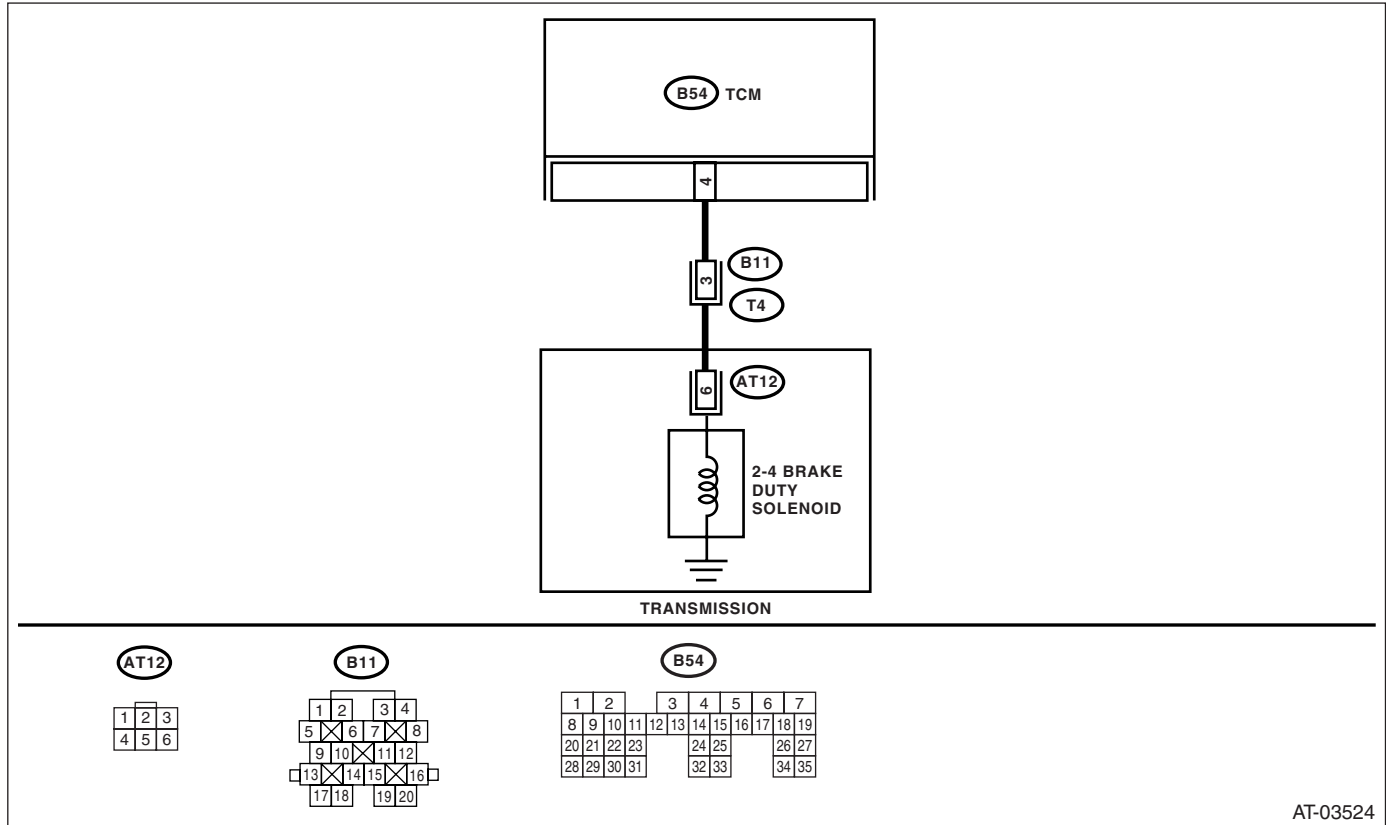
#### DIAGNOSIS:

The output signal circuit of 2-4 brake duty solenoid is open or shorted.

#### TROUBLE SYMPTOM:

Excessive shift shock.

#### WIRING DIAGRAM:



AT-03524

| Step     | Check   | Yes                                       | No            |   |
|----------|---|---|---------------|---|
| <b>1</b> | <p><b>CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from TCM and transmission.</p> <p>3) Measure the resistance of harness between TCM connector and shift transmission connector.</p> <p><b>Connector &amp; terminal</b><br/><b>(B54) No. 4 — (B11) No. 3:</b></p> | Is the resistance less than 1 $\Omega$ ?  | Go to step 2. | Repair the open circuit in harness between TCM and transmission connector.  |
| <b>2</b> | <p><b>CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND.</b></p> <p>Measure the resistance of harness between TCM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B54) No. 4 — Chassis ground:</b></p>  | Is the resistance more than 1 $M\Omega$ ? | Go to step 3. | Repair the short circuit in harness between TCM and transmission connector. |
| <b>3</b> | <p><b>CHECK 2-4 BRAKE DUTY SOLENOID.</b></p> <p>Measure the resistance between transmission connector terminals.</p> <p><b>Connector &amp; terminal</b><br/><b>(T4) No. 3 — No. 20:</b></p>   | Is the resistance 2.0 — 6.0 $\Omega$ ?    | Go to step 4. | Go to step 7.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <p><b>4 CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.</b></p> <p>1) Connect all connectors.<br/>                     2) Connect the Subaru Select Monitor to data link connector.<br/>                     3) Start the engine and turn Subaru Select Monitor power switch to ON.<br/>                     4) Warm-up the transmission until ATF temperature is above 80°C (176°F).</p> <p><b>NOTE:</b><br/>                     If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature.</p> <p>5) Stop the engine and turn ignition switch to ON (engine OFF).<br/>                     6) Move the select lever to “N” range.<br/>                     7) Read the data of 2-4 brake duty solenoid using Subaru Select Monitor.</p> <ul style="list-style-type: none"> <li>• 2-4 brake duty solenoid is indicated in “%”.</li> </ul> | Is the value 100%?  | Go to step 5.  | Go to step 6.  |
| <p><b>5 CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.</b></p> <p>1) Move the select lever to “2” range.<br/>                     2) Turn the HOLD switch to ON.</p>   | Is the value 0%?  | Even if the AT OIL TEMP warning light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission. | Go to step 6.  |
| <p><b>6 CHECK POOR CONTACT.</b></p>   | Is there poor contact in 2-4 brake duty solenoid circuit? | Repair the poor contact.   | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>                          |
| <p><b>7 CHECK 2-4 BRAKE DUTY SOLENOID (IN TRANSMISSION).</b></p> <p>1) Remove the transmission connector from bracket.<br/>                     2) Drain the ATF.</p> <p><b>CAUTION:</b><br/> <b>Do not drain the ATF until it cools down.</b></p> <p>3) Remove the oil pan, and disconnect connector from 2-4 brake duty solenoid.<br/>                     4) Measure the resistance of harness between 2-4 brake duty solenoid connector and transmission ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(AT12) No. 6 — Transmission ground:</b></p>   | Is the resistance 2.0 — 6.0 Ω?                            | Go to step 8.  | Replace the control valve body. <Ref. to 4AT-59, Control Valve Body.>                          |
| <p><b>8 CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE DUTY SOLENOID AND TRANSMISSION.</b></p> <p>Measure the resistance of harness between 2-4 brake duty solenoid and transmission connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T4) No. 3 — (AT12) No. 6:</b></p>  | Is the resistance less than 1 Ω?                          | Go to step 9.  | Repair the open circuit in harness between 2-4 brake duty solenoid and transmission connector. |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <p><b>9</b>      <b>CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE DUTY SOLENOID AND TRANSMISSION.</b><br/>Measure the resistance of harness between transmission connector and transmission ground.<br/><b>Connector &amp; terminal</b><br/><b>(T4) No. 3 — Transmission ground:</b></p> | <p>Is the resistance more than 1 M<math>\Omega</math>?</p> | <p>Even if the AT OIL TEMP warning light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in high clutch duty solenoid and transmission.</p> | <p>Repair the short circuit harness between 2-4 brake duty solenoid and transmission connector.</p> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

## S: DTC P0763 SHIFT SOLENOID "C" ELECTRICAL

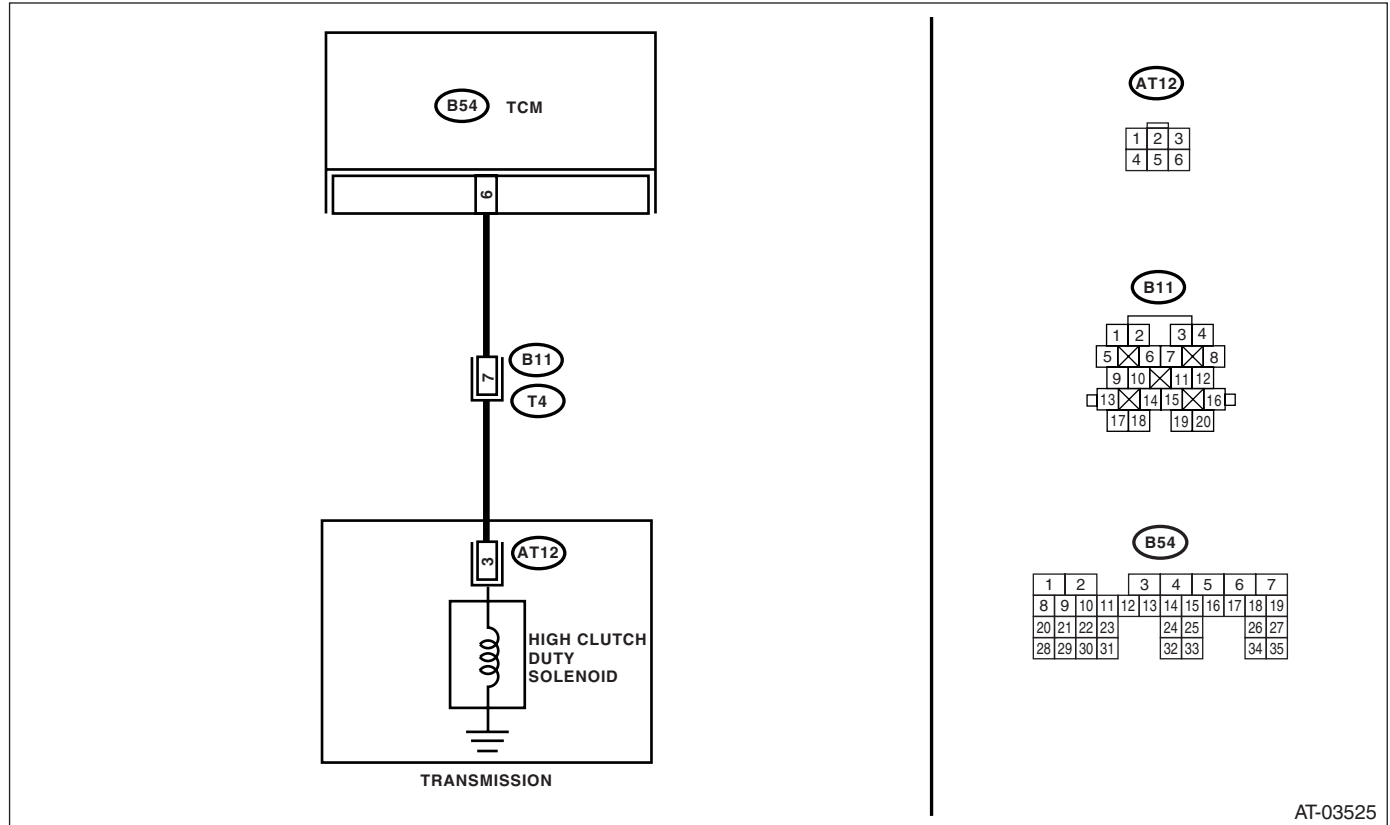
### DIAGNOSIS:

The output signal circuit of high clutch duty solenoid is open or shorted.

### TROUBLE SYMPTOM:

Excessive shift shock.

### WIRING DIAGRAM:



AT-03525

| Step  | Check                                     | Yes           | No  |
|---|---|---------------|---|
| <b>1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from TCM and transmission.<br>3) Measure the resistance of harness between TCM and transmission connector.<br><i>Connector &amp; terminal (B55) No. 6 — (B11) No. 7:</i> | Is the resistance less than 1 $\Omega$ ?  | Go to step 2. | Repair the open circuit in harness between TCM and transmission connector.  |
| <b>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>Measure the resistance of harness connector between TCM connector and chassis ground.<br><i>Connector &amp; terminal (B55) No. 6 — Chassis ground:</i>  | Is the resistance more than 1 $M\Omega$ ? | Go to step 3. | Repair the short circuit in harness between TCM and transmission connector. |
| <b>3 CHECK HIGH CLUTCH DUTY SOLENOID.</b><br>Measure the resistance between transmission connector receptacle's terminals.<br><i>Connector &amp; terminal (T4) No. 7 — No. 20:</i>  | Is the resistance 2.0 — 6.0 $\Omega$ ?    | Go to step 4. | Go to step 7.   |



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step   | Check  | Yes  | No  |
|--|--|--|---|
| <p><b>4 CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.</b></p> <p>1) Connect the connectors to TCM and transmission.</p> <p>2) Lift-up the vehicle.</p> <p>NOTE:<br/>Raise all wheels off ground.</p> <p>3) Connect the Subaru Select Monitor to data link connector.</p> <p>4) Start the engine and turn Subaru Select Monitor power switch to ON.</p> <p>5) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F).</p> <p>NOTE:<br/>If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature.</p> <p>6) Read the data of high clutch duty solenoid using Subaru Select Monitor.</p> <ul style="list-style-type: none"> <li>• High clutch duty solenoid is indicated in “%”.</li> </ul> <p>7) Move the select lever to “D” range and slowly increase vehicle speed and measure at 3rd or 4th gear.</p> <p>NOTE:<br/>The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. &lt;Ref. to ABS(diag)-26, Clear Memory Mode.&gt;</p> | Is the value 0%?                                   | Go to step 5.  | Go to step 6.   |
| <p><b>5 CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.</b></p> <p>Return the engine to idling speed and move select lever to “N” range.</p> <p>NOTE:<br/>The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. &lt;Ref. to ABS(diag)-26, Clear Memory Mode.&gt;</p>  | Is the value 100%?                                 | Even if the AT OIL TEMP warning light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission. | Go to step 6.   |
| <p><b>6 CHECK POOR CONTACT.</b></p>  | Is there poor contact in high clutch duty circuit? | Repair poor contact.   | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <p><b>7</b></p> <p><b>CHECK HIGH CLUTCH DUTY SOLENOID (IN TRANSMISSION).</b><br/>                     1) Remove the transmission connector from bracket.<br/>                     2) Drain the ATF.</p> <p><b>CAUTION:</b><br/> <b>Do not drain the ATF until it cools down.</b></p> <p>3) Remove the oil pan and disconnect connector from high clutch duty solenoid.<br/>                     4) Measure the resistance between high clutch duty solenoid connector and transmission ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(AT12) No. 3 — Transmission ground:</b></p> | <p>Is the resistance 2.0 — 6.0 <math>\Omega</math>?</p>    | <p>Go to step <b>8</b>.</p>   | <p>Replace the control valve body.<br/>                     &lt;Ref. to 4AT-59, Control Valve Body.&gt;</p> |
| <p><b>8</b></p> <p><b>CHECK HARNESS CONNECTOR BETWEEN HIGH CLUTCH DUTY SOLENOID AND TRANSMISSION.</b><br/>                     Measure the resistance of harness between high clutch duty solenoid and transmission connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T4) No. 7 — (AT12) No. 3:</b></p>  | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | <p>Go to step <b>9</b>.</p>   | <p>Repair the open circuit in harness between TCM and transmission connector.</p>                           |
| <p><b>9</b></p> <p><b>CHECK HARNESS CONNECTOR BETWEEN HIGH CLUTCH DUTY SOLENOID AND TRANSMISSION.</b><br/>                     Measure the resistance of harness between transmission connector and transmission ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T4) No. 7 — Transmission ground:</b></p>   | <p>Is the resistance more than 1 M<math>\Omega</math>?</p> | <p>Even if the AT OIL TEMP warning light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in high clutch duty solenoid and transmission.</p> | <p>Repair the short circuit in harness between high clutch duty solenoid and transmission connector.</p>    |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

### T: DTC P0768 SHIFT SOLENOID “D” ELECTRICAL

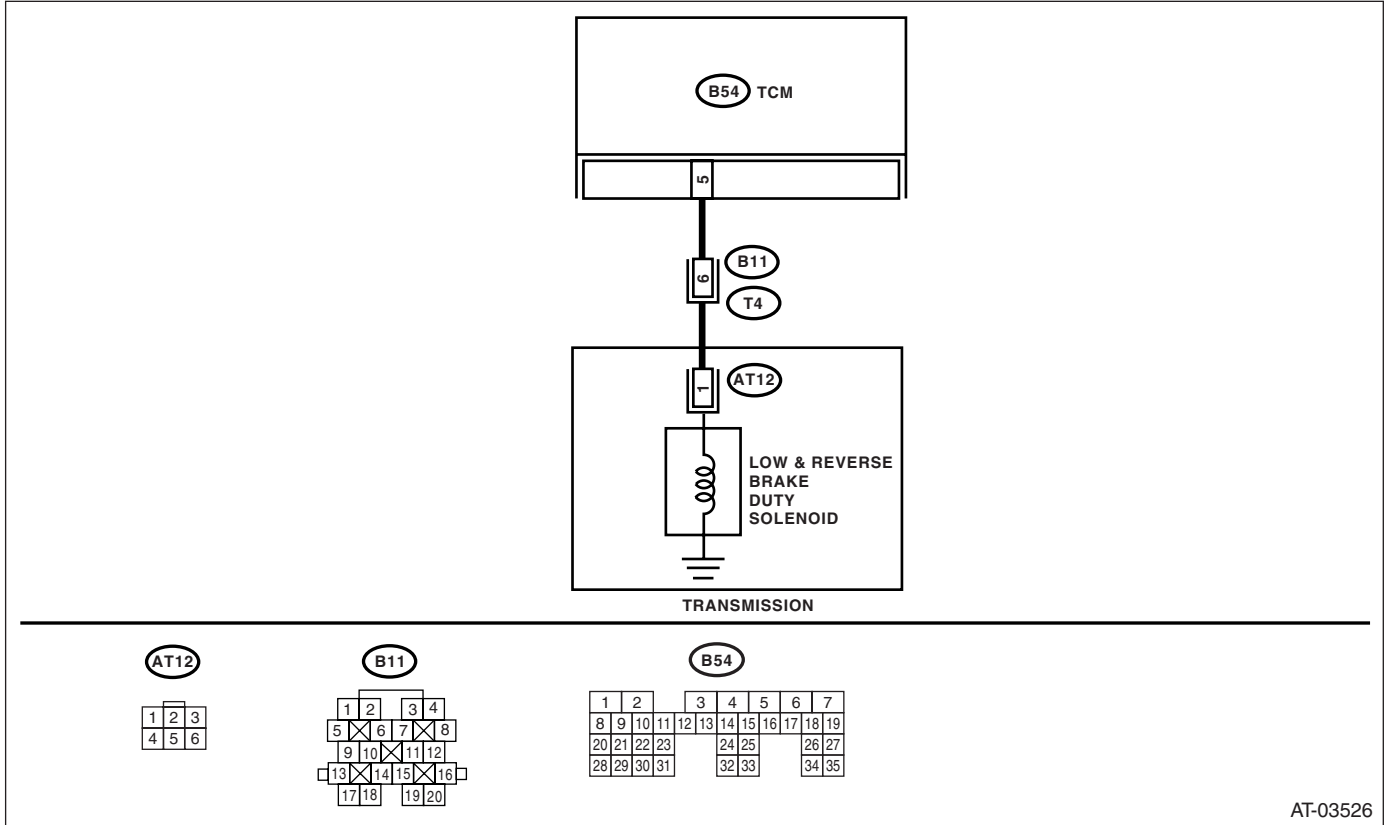
**DIAGNOSIS:**

The output signal circuit of low & reverse duty solenoid is open or shorted.

**TROUBLE SYMPTOM:**

Gear is not changed.

**WIRING DIAGRAM:**



AT-03526

|   | Step   | Check                             | Yes           | No  |
|---|--|-----------------------------------|---------------|---|
| 1 | <p><b>CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector from transmission and TCM.<br/>                     3) Measure the resistance of harness between TCM connector and transmission connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B54) No. 5 — (B11) No. 6:</b></p> | Is the resistance less than 1 Ω?  | Go to step 2. | Repair the open circuit in harness between TCM and transmission connector.  |
| 2 | <p><b>CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND.</b></p> <p>Measure the resistance of harness between TCM connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B54) No. 5 — Chassis ground:</b></p>  | Is the resistance more than 1 MΩ? | Go to step 3. | Repair the short circuit in harness between TCM and transmission connector. |
| 3 | <p><b>CHECK LOW &amp; REVERSE BRAKE DUTY SOLENOID.</b></p> <p>Measure the resistance between transmission connector receptacle's terminals.</p> <p><b>Connector &amp; terminal</b><br/> <b>(T4) No. 6 — No. 20:</b></p>  | Is the resistance 2.0 — 6.0 Ω?    | Go to step 4. | Go to step 7.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step   | Check   | Yes  | No   |
|--|---|--|--|
| <p><b>4</b></p> <p><b>CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.</b></p> <p>1) Connect all connectors.<br/>                     2) Connect the Subaru Select Monitor to data link connector.<br/>                     3) Start the engine and turn Subaru Select Monitor power switch to ON.<br/>                     4) Warm-up the transmission until ATF temperature is above 80°C (176°F).</p> <p><b>NOTE:</b><br/>                     If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature.</p> <p>5) Stop the engine and turn ignition switch to ON (engine OFF).<br/>                     6) Shift the select lever to “P” or “N” range, and depress the accelerator pedal.<br/>                     7) Read the data of low &amp; reverse duty solenoid using Subaru Select Monitor.</p> <ul style="list-style-type: none"> <li>• Low &amp; reverse duty solenoid is indicated in “%”.</li> </ul> | Is the value 100%?  | Go to step 5.  | Go to step 6.  |
| <p><b>5</b></p> <p><b>CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.</b></p> <p>1) Move the select lever to “1” range.<br/>                     2) Read the data of low &amp; reverse duty solenoid.</p>  | Is the value 55%?   | Even if the AT OIL TEMP warning light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission. | Go to step 6.  |
| <p><b>6</b></p> <p><b>CHECK POOR CONTACT.</b></p>  | Is there poor contact in low & reverse duty solenoid circuit? | Repair the poor contact.   | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>                |
| <p><b>7</b></p> <p><b>CHECK LOW &amp; REVERSE BRAKE DUTY SOLENOID (IN TRANSMISSION).</b></p> <p>1) Remove the transmission connector from bracket.<br/>                     2) Drain the ATF.</p> <p><b>CAUTION:</b><br/> <b>Do not drain the ATF until it cools down.</b></p> <p>3) Remove the oil pan, and disconnect connector from low &amp; reverse duty solenoid.<br/>                     4) Measure the resistance between low &amp; reverse duty solenoid connector and transmission ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(AT12) No. 1 — Transmission ground:</b></p>   | Is the resistance 2.0 — 6.0 Ω?                                | Go to step 8.  | Replace the low & reverse brake duty solenoid. <Ref. to 4AT-59, Control Valve Body.> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step   | Check                                     | Yes  | No  |
|--|---|--|---|
| <b>8</b><br><b>CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LOW &amp; REVERSE DUTY SOLENOID.</b><br>Measure the resistance of harness between low & reverse duty solenoid and transmission connector.<br><i>Connector &amp; terminal</i><br><i>(T4) No. 6 — (AT12) No. 1:</i>      | Is the resistance less than 1 $\Omega$ ?  | Go to step 9.  | Repair the open circuit in harness between low & reverse brake duty solenoid and transmission connector.  |
| <b>9</b><br><b>CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LOW &amp; REVERSE BRAKE DUTY SOLENOID.</b><br>Measure the resistance of harness between transmission connector and transmission ground.<br><i>Connector &amp; terminal</i><br><i>(T4) No. 6 — Transmission ground:</i> | Is the resistance more than 1 $M\Omega$ ? | Even if the AT OIL TEMP warning light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in low & reverse brake duty solenoid and transmission. | Repair the short circuit in harness between low & reverse brake duty solenoid and transmission connector. |

**U: DTC P0801 REVERSE INHIBIT CONTROL CIRCUIT**

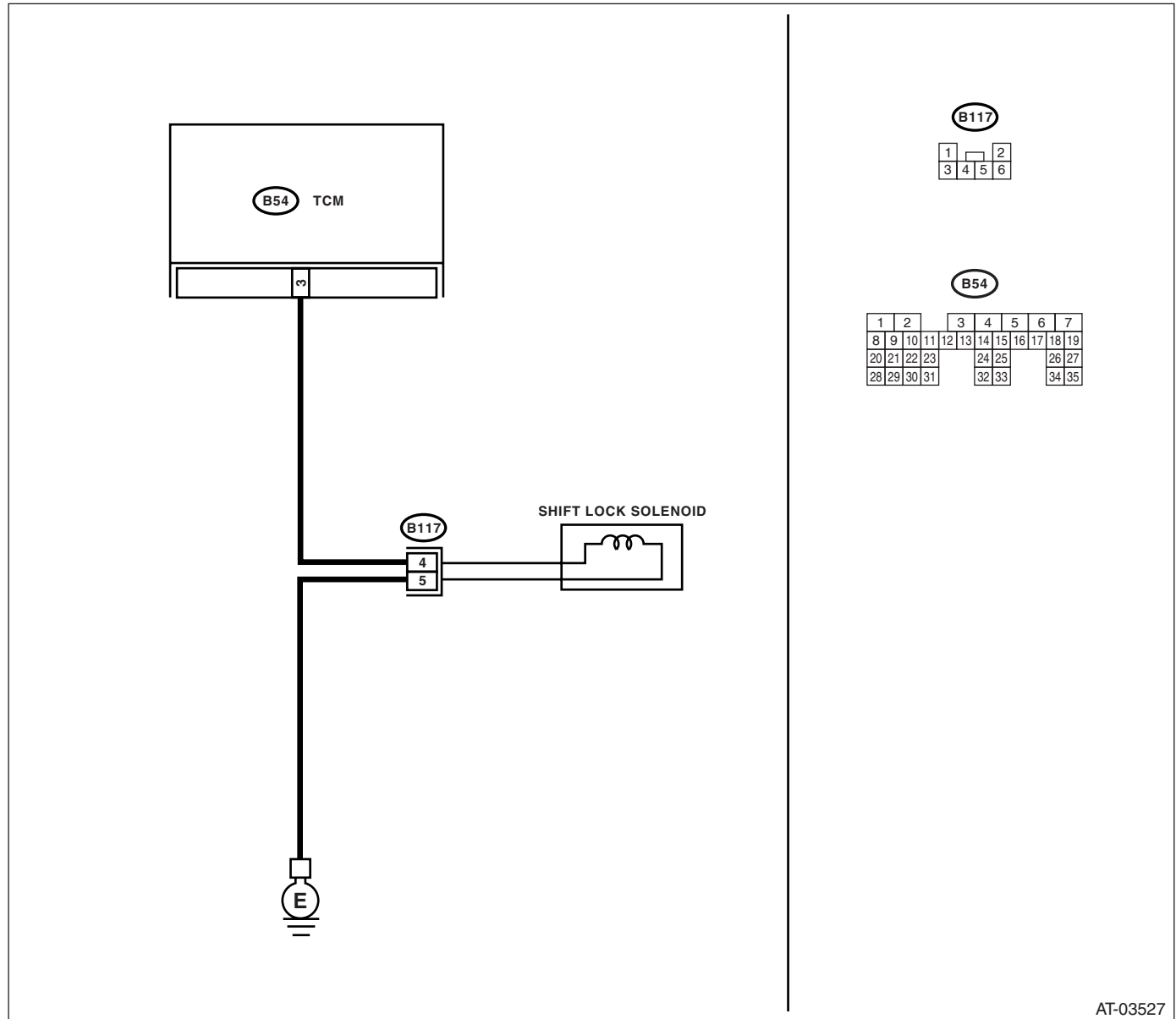
**DIAGNOSIS:**

Shift lock solenoid malfunction, open or short reverse inhibitor control circuit.

**TROUBLE SYMPTOM:**

- Gear is shifted from “N” range to “R” range during driving at 20 km/h (12 MPH) or more.
- Gear can not be shifted from “N” range to “R” range.

**WIRING DIAGRAM:**



AT-03527

| Step  | Check   | Yes                  | No   |
|---|---|----------------------|--|
| <p><b>1</b></p> <p><b>CHECK HARNESS CONNECTOR BETWEEN TCM AND SHIFT LOCK SOLENOID.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from TCM and shift lock solenoid.</p> <p>3) Measure the resistance of harness between TCM and shift lock solenoid connector.</p> <p><b>Connector &amp; terminal</b><br/><b>(B54) No. 3 — (B117) No. 4:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p> | <p>Go to step 2.</p> | <p>Repair the open circuit in harness between TCM and shift lock solenoid connector.</p> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <b>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND SHIFT LOCK SOLENOID.</b><br>Measure the resistance of harness between TCM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B54) No. 3 — Chassis ground:</b></i>   | Is the resistance more than 1 M $\Omega$ ?                      | Go to step 3.   | Repair the ground short circuit in harness between TCM and shift lock solenoid connector.             |
| <b>3 CHECK HARNESS BETWEEN SHIFT LOCK SOLENOID AND CHASSIS GROUND.</b><br>Measure the resistance of harness between shift lock solenoid and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B117) No. 5 — Chassis ground:</b></i>   | Is the resistance less than 1 $\Omega$ ?                        | Go to step 4.   | Repair the open circuit in harness between chassis ground terminal and shift lock solenoid connector. |
| <b>4 CHECK SHIFT LOCK SOLENOID.</b><br>Measure the resistance between shift lock solenoid.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B117) No. 5 — No. 4:</b></i>   | Is the resistance 7 — 18 $\Omega$ ?                             | Go to step 5.   | Replace the shift lock solenoid.  |
| <b>5 CHECK TCM OUTPUT SIGNAL.</b><br>1) Connect all connectors.<br>2) Turn the ignition switch to ON.<br>3) Move the select lever to "D" range.<br>4) Measure the voltage between TCM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B54) No. 3 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10.5 V?                                | Go to step 6.   | Go to step 7.   |
| <b>6 CHECK OUTPUT SIGNAL FROM TCM.</b><br>1) Lift-up the vehicle.<br>NOTE:<br>Raise all wheels off ground.<br>2) Start the engine.<br>3) Move the select lever "D" range and slowly increase vehicle speed to 20 km/h (12 MPH).<br>NOTE:<br>The speed difference between front and rear wheels may light ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system.<br>4) Measure the voltage between TCM and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B54) No. 3 (+) — Chassis ground (-):</b></i> | Is the voltage less than 1 V?                                   | Even if the AT OIL TEMP warning light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be cause. Repair the harness or connector in reverse inhibitor control circuit. | Go to step 7.   |
| <b>7 CHECK POOR CONTACT.</b>  | Is there poor contact in the reverse inhibitor control circuit? | Repair the poor contact.  | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>                                 |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

## V: DTC P1706 AT VEHICLE SPEED SENSOR CIRCUIT MALFUNCTION (REAR WHEEL)

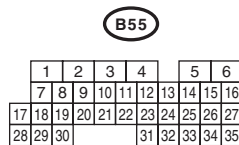
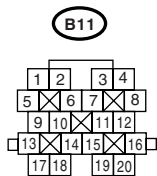
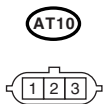
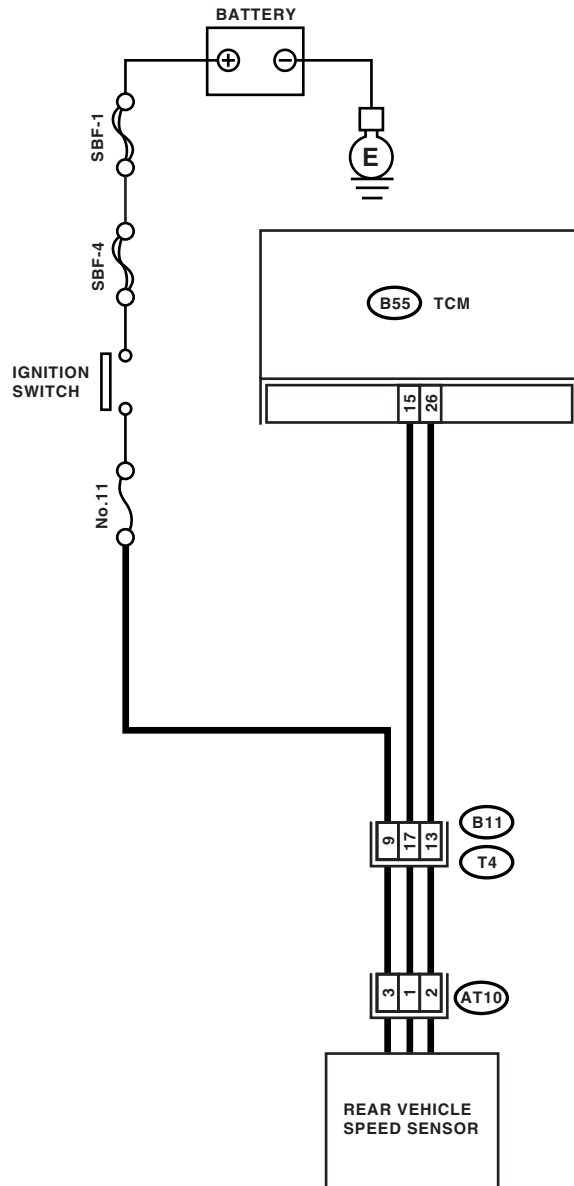
### DIAGNOSIS:

The input signal circuit of TCM is open or shorted.

### TROUBLE SYMPTOM:

No lock-up or excessive tight corner "braking".

### WIRING DIAGRAM:



AT-03528



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step   | Check                                      | Yes           | No   |
|--|--|---------------|--|
| <b>1 CHECK IGNITION POWER SUPPLY CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from rear vehicle speed sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the ignition power supply between rear vehicle speed sensor connector and transmission ground.<br><i>Connector &amp; terminal</i><br><i>(AT10) No. 3 (+) — Transmission ground (-):</i>  | Is the voltage more than 10 V?             | Go to step 2. | Check harness between rear vehicle speed sensor and battery for open circuit, short or poor contact. Repair the harness if required. |
| <b>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance of harness between TCM and transmission connector.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 15 — (AT10) No. 1:</i>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 3. | Repair the open circuit or poor contact of connector in harness between TCM and rear vehicle speed sensor connector.                 |
| <b>3 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>Measure the resistance of harness between TCM and transmission connector.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 26 — (AT10) No. 2:</i>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 4. | Repair the open circuit or poor contact of connector in harness between TCM and rear vehicle speed sensor connector.                 |
| <b>4 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>Measure the resistance of harness between TCM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 15 — Chassis ground:</i>  | Is the resistance more than 1 M $\Omega$ ? | Go to step 5. | Repair the short circuit in harness between TCM and rear vehicle speed sensor connector.   |
| <b>5 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>Measure the resistance of harness between TCM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 26 — Chassis ground:</i>  | Is the resistance more than 1 M $\Omega$ ? | Go to step 6. | Repair the short circuit in harness between TCM and rear vehicle speed sensor connector.   |
| <b>6 PREPARE OSCILLOSCOPE.</b>   | Do you have an oscilloscope?               | Go to step 8. | Go to step 7.  |
| <b>7 CHECK INPUT SIGNAL FOR TCM.</b><br>1) Connect the connectors to TCM and transmission.<br>2) Lift-up the vehicle.<br>NOTE:<br>Raise all wheels off ground.<br>3) Start the engine and set vehicle in 20 km/h (12 MPH) condition.<br>NOTE:<br>The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-26, Clear Memory Mode.><br>4) Measure the AC voltage between TCM connector terminals.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 26 (+) — No. 15 (-):</i> | Is the voltage more than 2 V?              | Go to step 9. | Replace the rear vehicle speed sensor.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step   | Check  | Yes                             | No   |
|--|--|---------------------------------|--|
| <p><b>8</b>      <b>CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE.</b></p> <p>1) Connect the connectors to TCM and transmission.<br/>2) Lift-up the vehicle.</p> <p>NOTE:<br/>Raise all wheels off ground.</p> <p>3) Set the oscilloscope to TCM connector terminals.</p> <p style="padding-left: 20px;"><b>Connector &amp; terminal</b><br/><b>Positive lead; (B55) No. 26:</b><br/><b>Earth lead; (B55) No. 15:</b></p> <p>4) Start the engine and set vehicle in 20 km/h (12 MPH) condition.</p> <p>NOTE:<br/>The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. &lt;Ref. to ABS(diag)-26, Clear Memory Mode.&gt;</p> <p>5) Measure the signal voltage indicated on oscilloscope.</p> | <p>Is the pulse voltage approx. 5 V?</p>                           | <p>Go to step <b>9</b>.</p>     | <p>Replace the rear vehicle speed sensor.</p>                                      |
| <p><b>9</b>      <b>CHECK POOR CONTACT.</b></p>  | <p>Is there poor contact in rear vehicle speed sensor circuit?</p> | <p>Repair the poor contact.</p> | <p>Replace the TCM. &lt;Ref. to 4AT-64, Transmission Control Module (TCM).&gt;</p> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

### W: DTC P1707 AT AWD SOLENOID VALVE CIRCUIT MALFUNCTION

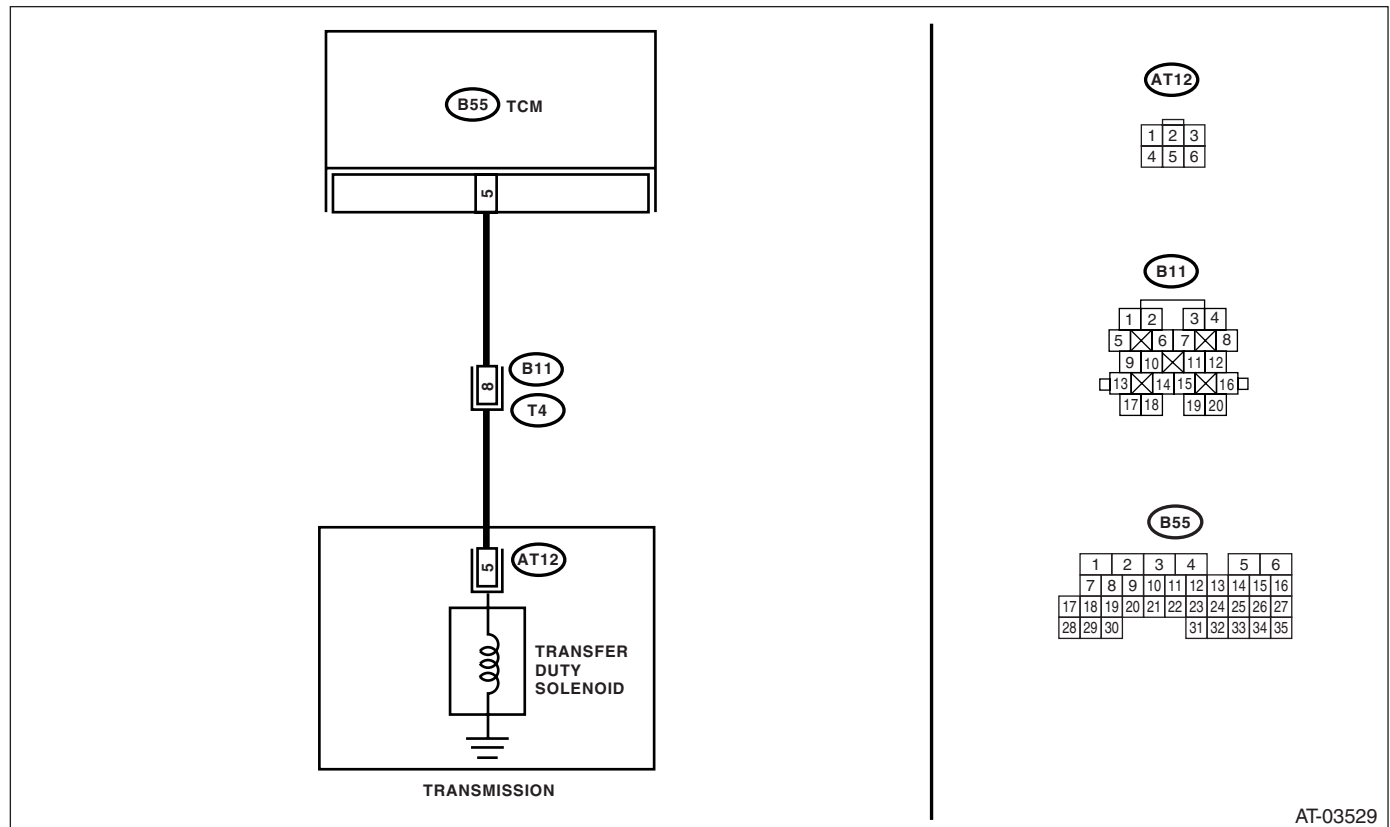
#### DIAGNOSIS:

The output signal circuit of transfer duty solenoid is open or shorted.

#### TROUBLE SYMPTOM:

- Excessive tight corner “braking”.
- Front wheel slips on the slippery road.

#### WIRING DIAGRAM:



AT-03529

| Step  | Check                                     | Yes           | No   |
|---|---|---------------|--|
| <b>1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from TCM and transmission.<br>3) Measure the resistance of harness between TCM connector and transmission connector.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 5 — (B11) No. 8:</i> | Is the resistance less than 1 $\Omega$    | Go to step 2. | Repair the open circuit in harness between TCM and transmission connector.         |
| <b>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</b><br>Measure the resistance harness connector between TCM and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B55) No. 5 — Chassis ground:</i>   | Is the resistance more than 1 $M\Omega$ ? | Go to step 3. | Repair the ground short circuit in harness between TCM and transmission connector. |
| <b>3 CHECK TRANSFER DUTY SOLENOID.</b><br>Measure the resistance between transmission connector and transmission terminals.<br><i>Connector &amp; terminal</i><br><i>(T4) No. 8 — No. 20:</i>   | Is the resistance 2.0 — 6.0 $\Omega$ ?    | Go to step 5. | Go to step 4.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step   | Check  | Yes  | No  |
|--|--|--|---|
| <p><b>4</b></p> <p><b>CHECK TRANSFER DUTY SOLENOID (IN TRANSMISSION).</b><br/>                     1) Lift-up the vehicle.<br/>                     NOTE:<br/>                     Raise all wheels off ground.<br/>                     2) Drain the ATF.<br/>                     CAUTION:<br/>                     Do not drain the ATF until it cools down.<br/>                     3) Remove the extension case and disconnect connector from transfer duty solenoid.<br/>                     4) Measure the resistance between transfer duty solenoid connector and transmission ground.<br/> <i>Connector &amp; terminal<br/>                     (AT12) No. 5 — Transmission ground:</i></p> | <p>Is the resistance 2.0 — 6.0 <math>\Omega</math>?</p>    | <p>Go to step 5.</p>   | <p>Replace the control valve body.<br/>                     &lt;Ref. to 4AT-59, Control Valve Body.&gt;</p> |
| <p><b>5</b></p> <p><b>CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION.</b><br/>                     Measure the resistance of harness between transfer duty solenoid and transmission connector.<br/> <i>Connector &amp; terminal<br/>                     (T4) No. 8 — (AT12) No. 5:</i></p>  | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | <p>Go to step 6.</p>   | <p>Repair the open circuit in harness between transfer duty solenoid and transmission connector.</p>        |
| <p><b>6</b></p> <p><b>CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION.</b><br/>                     Measure the resistance of harness between transmission connector and transmission ground.<br/> <i>Connector &amp; terminal<br/>                     (T4) No. 8 — Transmission ground:</i></p>  | <p>Is the resistance more than 1 M<math>\Omega</math>?</p> | <p>Even if the AT OIL TEMP warning light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in transfer duty solenoid and transmission.</p> | <p>Repair the short circuit in harness between transfer duty solenoid and transmission connector.</p>       |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

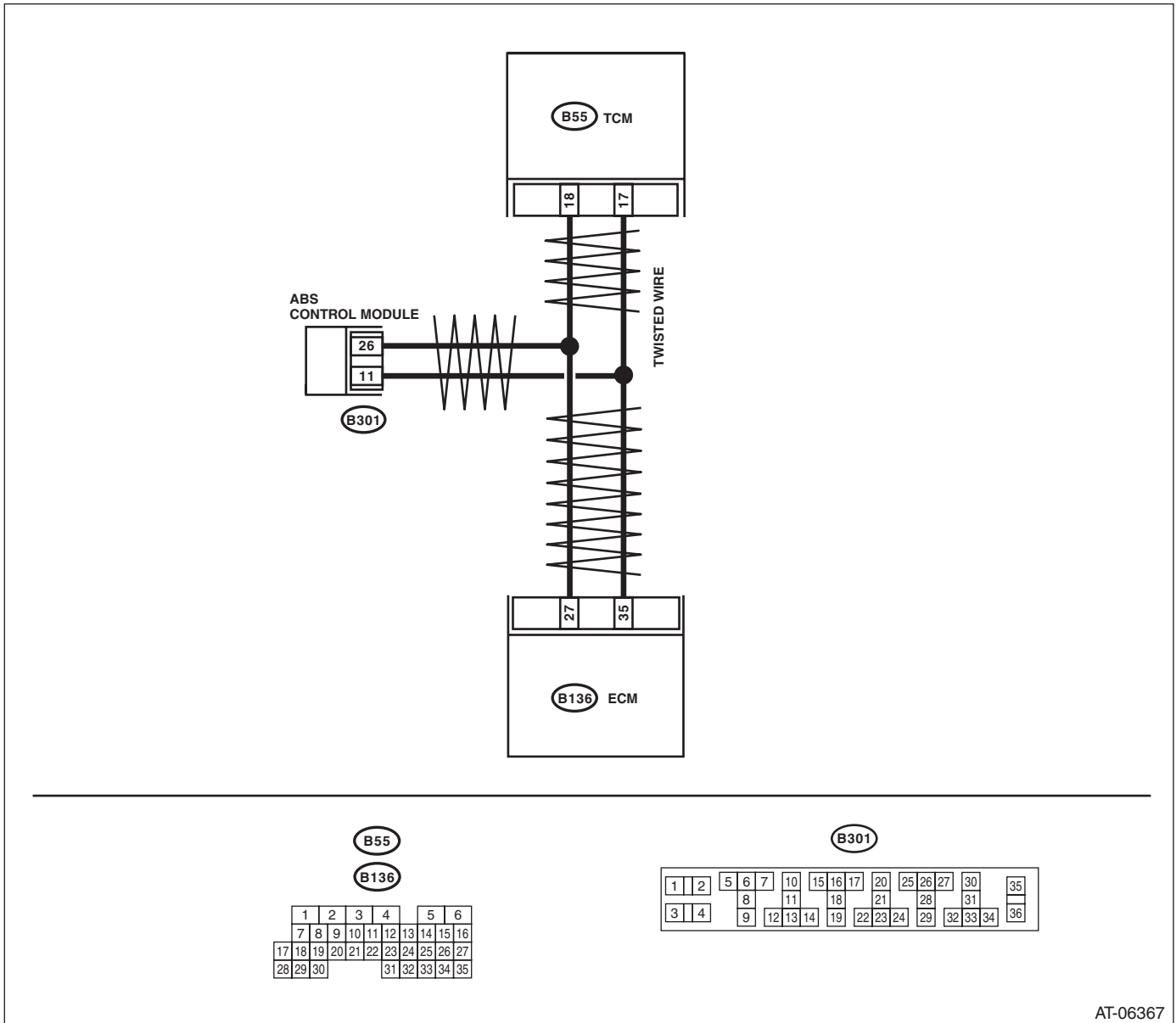
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

## X: DTC P1718 CAN COMMUNICATION CIRCUIT

### DIAGNOSIS:

Input signal circuit of TCM is open or shorted.

### WIRING DIAGRAM:



AT-06367

| Step   | Check                                | Yes              | No  |
|--|--------------------------------------|------------------|---|
| <b>1</b><br><b>CHECK DTC.</b><br>Check if multiple trouble codes appear in the on-board diagnostics test mode.   | Are multiple DTCs displayed?         | Go to other DTC. | Go to step 2.   |
| <b>2</b><br><b>CHECK HARNESS CONNECTOR BETWEEN TCM, ECM AND ABSCM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect TCM, ECM and ABSCM connectors.<br>3) Measure resistance of harness between TCM, ECM and ABSCM connector.<br><b>Connector &amp; Terminal</b><br>(B55) No. 17 — (B136) No. 35:<br>(B55) No. 17 — (B301) No. 11: | Is the measured value less than 1 Ω? | Go to step 3.    | Repair open circuit in harness between TCM, ECM and ABSCM, or poor contact in coupling connector. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step   | Check  | Yes  | No  |
|--|--|--|---|
| <b>3</b><br><b>CHECK HARNESS CONNECTOR BETWEEN TCM, ECM AND ABSCM.</b><br>Measure resistance of harness between TCM, ECM and ABSCM connector.<br><b>Connector &amp; Terminal</b><br><b>(B55) No. 18 — (B136) No. 27:</b><br><b>(B55) No. 18 — (B301) No. 26:</b> | Is the measured value less than 1 $\Omega$ ?   | Go to step 4.  | Repair open circuit in harness between TCM, ECM and ABSCM, or poor contact in coupling connector. |
| <b>4</b><br><b>CHECK HARNESS CONNECTOR BETWEEN TCM, ECM AND ABSCM.</b><br>Measure resistance of harness between TCM and chassis ground.<br><b>Connector &amp; Terminal</b><br><b>(B55) No. 17 — Chassis ground:</b><br><b>(B55) No. 18 — Chassis ground:</b>     | Is the measured value more than 1 M $\Omega$ ? | There is failure in the TCM, ECM or ABSCM. (Replace and check again) | Repair short circuit in harness between TCM, ECM and ABSCM.                                       |

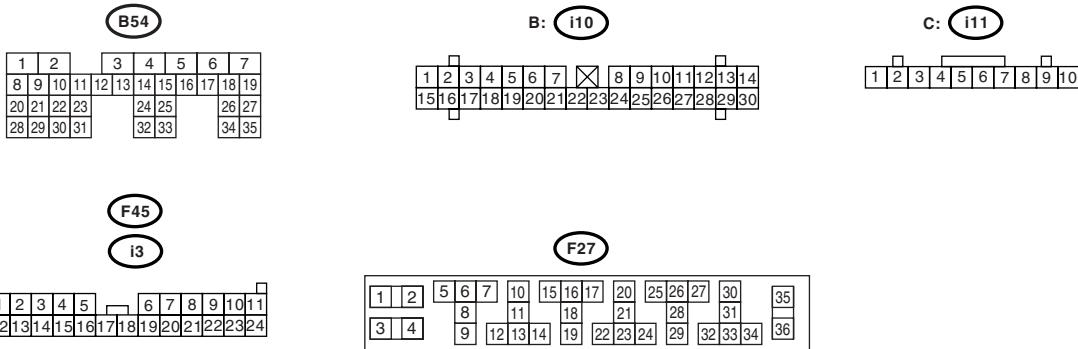
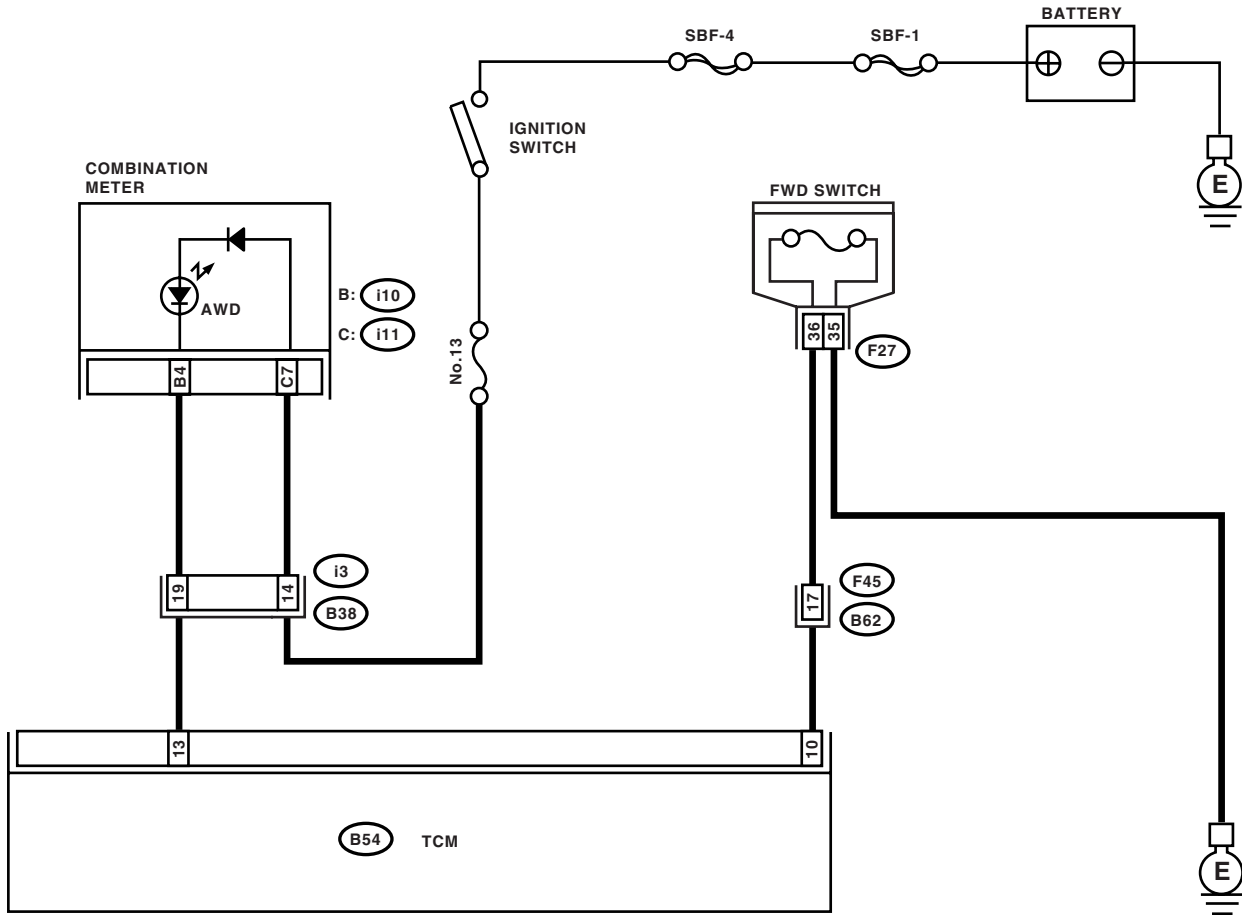
## 14. Diagnostic Procedure without Diagnostic Trouble Code (DTC)

### A: INSPECTION OF FWD SWITCH

#### DIAGNOSIS:

- The LED does not come on even if FWD switch is ON.
- The FWD switch circuit is open or short.

#### WIRING DIAGRAM:



# Diagnostic Procedure without Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step     | Check   | Yes   | No   |   |
|----------|---|---|--|---|
| <b>1</b> | <b>CHECK SPARE FUSE.</b>  | Is the spare fuse OK?   | Go to step <b>2</b> .  | Replace the fuse.   |
| <b>2</b> | <b>CHECK FWD SWITCH.</b><br>Connect the Subaru Select Monitor to data link connector.   | When the fuse is inserted to FWD switch, does the LED light up? | Go to step <b>3</b> .  | Go to step <b>4</b> .   |
| <b>3</b> | <b>CHECK COMBINATION METER.</b>   | Does the AWD warning light illuminate?                          | Go to INSPECTION FOR CRUISE CONTROL SWITCH.<br><Ref. to 4AT(D)(diag)-90, CHECK CRUISE CONTROL SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).> | Go to step <b>9</b> .   |
| <b>4</b> | <b>CHECK HARNESS CONNECTOR BETWEEN TCM AND FWD SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from TCM.<br>3) Measure the resistance of harness between TCM and FWD switch connector.<br><b>Connector &amp; terminal</b><br><b>(B54) No. 10 — (F27) No. 36:</b>                                  | Is the resistance less than 1 $\Omega$ ?                        | Go to step <b>5</b> .  | Repair the open circuit in harness between TCM and FWD switch connector.            |
| <b>5</b> | <b>CHECK HARNESS CONNECTOR BETWEEN FWD SWITCH AND CHASSIS GROUND.</b><br>Measure the resistance of harness between FWD switch and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F27) No. 35 — Chassis ground:</b>   | Is the resistance less than 1 $\Omega$ ?                        | Go to step <b>6</b> .  | Repair the open circuit in harness between FWD switch connector and chassis ground. |
| <b>6</b> | <b>CHECK HARNESS CONNECTOR BETWEEN TCM AND FWD SWITCH.</b><br>Measure the resistance of harness connector between TCM and body to make sure that circuit does not short.<br><b>Connector &amp; terminal</b><br><b>(B54) No. 10 — Chassis ground:</b>  | Is the resistance more than 1 M $\Omega$ ?                      | Go to step <b>7</b> .  | Repair the short circuit in harness between TCM and FWD switch connector.           |
| <b>7</b> | <b>CHECK INPUT SIGNAL FOR TCM.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the connector to TCM.<br>3) Turn the ignition switch to ON.<br>4) Measure the signal voltage for TCM while installing the fuse to FWD switch connector.<br><b>Connector &amp; terminal</b><br><b>(B54) No. 10 (+) — Chassis ground (-):</b> | Is the voltage less than 1 V?                                   | Go to step <b>8</b> .  | Go to step <b>12</b> .  |
| <b>8</b> | <b>CHECK INPUT SIGNAL FOR TCM.</b><br>Measure the signal voltage for TCM while removing the fuse from FWD switch connector.<br><b>Connector &amp; terminal</b><br><b>(B54) No. 10 (+) — Chassis ground (-):</b>   | Is the voltage 6 — 9.1 V?                                       | Go to step <b>9</b> .  | Replace the TCM.<br><Ref. to 4AT-64, Transmission Control Module (TCM).>            |



## Diagnostic Procedure without Diagnostic Trouble Code (DTC)

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Step   | Check  | Yes                      | No   |
|--|--|--------------------------|--|
| <b>9 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from TCM and combination meter.<br>3) Measure the resistance of harness between TCM and check connector.<br><i>Connector &amp; terminal</i><br><i>(B54) No. 13 — (i10) No. 4:</i>  | Is the resistance less than 1 $\Omega$ ?     | Go to step 10.           | Repair the open circuit in harness between TCM and combination meter and poor contact in coupling connector. |
| <b>10 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.</b><br>Measure the resistance of harness connector between TCM and chassis ground to make sure that circuit does not short.<br><i>Connector &amp; terminal</i><br><i>(B54) No. 13 — Chassis ground:</i>   | Is the resistance more than 1 M $\Omega$ ?   | Go to step 11.           | Repair the short circuit in harness between TCM and combination meter connector.                             |
| <b>11 CHECK OUTPUT SIGNAL EMITTED FROM TCM.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the connector to TCM and combination meter.<br>3) Turn the ignition switch to ON.<br>4) Measure the signal voltage for TCM while installing the fuse to FWD switch connector.<br><i>Connector &amp; terminal</i><br><i>(B54) No. 13 (+) — Chassis ground (-):</i> | Is the voltage less than 1 V?                | Go to step 12.           | Go to step 13.   |
| <b>12 CHECK OUTPUT SIGNAL EMITTED FROM TCM.</b><br>Measure the signal voltage for TCM while removing the fuse from FWD switch connector.<br><i>Connector &amp; terminal</i><br><i>(B54) No. 13 (+) — Chassis ground (-):</i>   | Is the voltage 6 — 9.1 V?                    | Go to step 13.           | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>  |
| <b>13 CHECK FUSE.</b>  | Is the fuse OK?                              | Go to step 14.           | Replace the fuse.  |
| <b>14 CHECK POOR CONTACT.</b>  | Is there poor contact in FWD switch circuit? | Repair the poor contact. | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>  |

## B: CHECK CRUISE CONTROL SWITCH

| Step                                  | Check  | Yes   | No   |
|---------------------------------------|--|---|--|
| <b>1 CHECK CRUISE CONTROL SWITCH.</b> | When the cruise control is set, does LED light up? | Go to step CHECK INHIBITOR SWITCH. <Ref. to 4AT(D)(diag)-32, DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> | Check the cruise control. <Ref. to CC(ETC)(diag)-22, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |

# General Diagnostic Table

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

## 15. General Diagnostic Table

### A: INSPECTION

| Symptom   | Problem parts  |
|---|--|
| Starter does not rotate when select lever is in "P" or "N" range, starter rotates when select lever is in "R", "D", "3" or "2" range. | <ul style="list-style-type: none"> <li>• Inhibitor switch</li> <li>• Select cable</li> <li>• Select lever</li> <li>• Starter motor and harness</li> </ul>  |
| Noise when select lever is in "P" or "N" range.   | <ul style="list-style-type: none"> <li>• Strainer</li> <li>• Transfer duty solenoid</li> <li>• Oil pump</li> <li>• Drive plate</li> <li>• ATF level too high or too low</li> </ul>   |
| Hissing noise occurs during standing start.   | <ul style="list-style-type: none"> <li>• Strainer</li> <li>• ATF level too high or too low</li> </ul>  |
| Noise occurs while driving in "D1".   | <ul style="list-style-type: none"> <li>• Final gear</li> <li>• Planetary gear</li> <li>• Reduction gear</li> <li>• Differential gear oil level too high or too low</li> </ul>  |
| Noise occurs while driving in "D2".   |  |
| Noise occurs while driving in "D3".   | <ul style="list-style-type: none"> <li>• Final gear</li> <li>• Low &amp; reverse brake</li> <li>• Reduction gear</li> <li>• Differential gear oil level too high or too low</li> </ul>   |
| Noise occurs while driving in "D4".   | <ul style="list-style-type: none"> <li>• Final gear</li> <li>• Low &amp; reverse brake</li> <li>• Planetary gear</li> <li>• Reduction gear</li> <li>• Differential gear oil level too high or too low</li> </ul>   |
| Engine stalls while shifting from "1" range to another.   | <ul style="list-style-type: none"> <li>• Control valve</li> <li>• Lock-up damper</li> <li>• Engine performance</li> <li>• Input shaft</li> </ul>   |
| Vehicle moves when select lever is in "N" range.  | <ul style="list-style-type: none"> <li>• Select cable</li> <li>• Inhibitor switch</li> <li>• TCM</li> <li>• Low clutch</li> </ul>  |
| Shock occurs when select lever is moved from "N" to "D" range.  | <ul style="list-style-type: none"> <li>• Accelerator pedal position sensor</li> <li>• ATF temperature sensor</li> <li>• Line pressure linear solenoid</li> <li>• Low clutch duty solenoid</li> <li>• Low clutch</li> <li>• TCM</li> <li>• Harness</li> <li>• Control valve</li> <li>• ATF deterioration</li> </ul> |
| Excessive time lag occurs when select lever is moved from "N" to "D" range.   | <ul style="list-style-type: none"> <li>• Control valve</li> <li>• Low clutch</li> <li>• Line pressure linear solenoid</li> <li>• Seal ring</li> <li>• Front gasket of transmission case</li> </ul>   |
| Shock occurs when select lever is moved from "N" to "R" range.  | <ul style="list-style-type: none"> <li>• Accelerator pedal position sensor</li> <li>• ATF temperature sensor</li> <li>• Line pressure linear solenoid</li> <li>• TCM</li> <li>• Harness</li> <li>• Control valve</li> <li>• ATF deterioration</li> </ul>   |

## General Diagnostic Table

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Symptom  | Problem parts  |
|--|--|
| Excessive time lag occurs when select lever is moved from "N" to "R" range.            | <ul style="list-style-type: none"> <li>• Control valve</li> <li>• Low &amp; reverse clutch</li> <li>• Reverse clutch</li> <li>• Line pressure linear solenoid</li> <li>• Seal ring</li> <li>• Front gasket of transmission case</li> </ul>   |
| Vehicle does not start in any shift range (engine stalls).                             | <ul style="list-style-type: none"> <li>• Parking brake mechanism</li> <li>• Planetary gear</li> </ul>  |
| Vehicle does not start in any shift range (engine revving up).                         | <ul style="list-style-type: none"> <li>• Strainer</li> <li>• Line pressure linear solenoid</li> <li>• Control valve</li> <li>• Drive pinion</li> <li>• Hypoid gear</li> <li>• Axle shaft</li> <li>• Differential gear</li> <li>• Oil pump</li> <li>• Input shaft</li> <li>• Output shaft</li> <li>• Planetary gear</li> <li>• Drive plate</li> <li>• ATF level too low</li> <li>• Front gasket of transmission case</li> </ul> |
| Vehicle does not start in "R" range only (engine revving up).                          | <ul style="list-style-type: none"> <li>• Select cable</li> <li>• Select lever</li> <li>• Line pressure linear solenoid</li> <li>• Control valve</li> <li>• Low &amp; reverse clutch</li> <li>• Reverse clutch</li> </ul>   |
| Vehicle does not start in "R" range only (engine stalls).                              | <ul style="list-style-type: none"> <li>• Low clutch</li> <li>• 2-4 brake</li> <li>• Planetary gear</li> <li>• Parking brake mechanism</li> </ul>   |
| Vehicle does not start in "D", "3" range only (engine revving up).                     | <ul style="list-style-type: none"> <li>• Low clutch</li> <li>• One-way clutch</li> </ul>   |
| Vehicle does not start in "D", "3" or "2" range only (engine revving up).              | <ul style="list-style-type: none"> <li>• Low clutch</li> </ul>   |
| Vehicle does not start in "D", "3" or "2" range only (engine stalls).                  | <ul style="list-style-type: none"> <li>• Reverse clutch</li> </ul>   |
| Vehicle starts in "R" range only (engine revving up).                                  | <ul style="list-style-type: none"> <li>• Control valve</li> </ul>  |
| Acceleration during standing starts is poor (high stall rpm).                          | <ul style="list-style-type: none"> <li>• Control valve</li> <li>• Low clutch</li> <li>• Reverse clutch</li> <li>• ATF level too low</li> <li>• ATF deterioration</li> <li>• Front gasket of transmission case</li> <li>• Differential gear oil level too high or too low</li> </ul>  |
| Acceleration during standing starts is poor (low stall rpm).                           | <ul style="list-style-type: none"> <li>• Oil pump</li> <li>• Torque converter one-way clutch</li> <li>• Engine performance</li> </ul>  |
| Acceleration is poor when select lever is in "D", "3" or "2" range (normal stall rpm). | <ul style="list-style-type: none"> <li>• TCM</li> <li>• Control valve</li> <li>• High clutch</li> <li>• 2-4 brake</li> <li>• Planetary gear</li> </ul>   |
| Acceleration is poor when select lever is in "R" (normal stall rpm).                   | <ul style="list-style-type: none"> <li>• Control valve</li> <li>• High clutch</li> <li>• 2-4 brake</li> <li>• Planetary gear</li> </ul>  |

# General Diagnostic Table

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Symptom  | Problem parts   |
|--|---|
| Does not shift from 1st to 2nd gear.                                   | <ul style="list-style-type: none"> <li>• TCM</li> <li>• Rear vehicle speed sensor</li> <li>• Front vehicle speed sensor</li> <li>• Accelerator pedal position sensor</li> <li>• Control valve</li> <li>• 2-4 brake</li> </ul>   |
| Does not shift from 2nd to 3rd gear.                                   | <ul style="list-style-type: none"> <li>• TCM</li> <li>• Control valve</li> <li>• High clutch</li> </ul>   |
| Does not shift from 3rd to 4th gear.                                   | <ul style="list-style-type: none"> <li>• TCM</li> <li>• ATF temperature sensor</li> <li>• Control valve</li> <li>• 2-4 brake</li> </ul>   |
| Engine brake is not effected when select lever is in "3" range.        | <ul style="list-style-type: none"> <li>• Inhibitor switch</li> <li>• TCM</li> <li>• Accelerator pedal position sensor</li> <li>• Control valve</li> </ul>   |
| Engine brake is not effected when select lever is in "3" or "2" range. | <ul style="list-style-type: none"> <li>• Control valve</li> </ul>   |
| Engine brake is not effected when select lever is in "1" range.        | <ul style="list-style-type: none"> <li>• Control valve</li> <li>• Low &amp; reverse brake</li> </ul>  |
| Shift characteristics are erroneous.                                   | <ul style="list-style-type: none"> <li>• Inhibitor switch</li> <li>• TCM</li> <li>• Front vehicle speed sensor</li> <li>• Rear vehicle speed sensor</li> <li>• Accelerator pedal position sensor</li> <li>• Control valve</li> <li>• Ground earth</li> </ul>  |
| No lock-up occurs.   | <ul style="list-style-type: none"> <li>• TCM</li> <li>• Accelerator pedal position sensor</li> <li>• ATF temperature sensor</li> <li>• Control valve</li> <li>• Lock-up facing</li> <li>• Engine speed signal</li> </ul>  |
| Parking brake is not effected.   | <ul style="list-style-type: none"> <li>• Select cable</li> <li>• Select lever</li> <li>• Parking mechanism</li> </ul>   |
| Shift lever cannot be moved or is hard to move from "P" range.         |   |
| ATF spurts out.  | <ul style="list-style-type: none"> <li>• ATF level too high</li> </ul>  |
| Differential oil spurts out.   | <ul style="list-style-type: none"> <li>• Differential gear oil too high</li> </ul>  |
| Differential oil level changes excessively.                            | <ul style="list-style-type: none"> <li>• Seal pipe</li> <li>• Double oil seal</li> </ul>  |
| Odor is produced from ATF supply pipe.                                 | <ul style="list-style-type: none"> <li>• High clutch</li> <li>• 2-4 brake</li> <li>• Low &amp; reverse clutch</li> <li>• Reverse clutch</li> <li>• Lock-up facing</li> <li>• ATF deterioration</li> </ul>   |
| Shock occurs from 1st to 2nd gear.                                     | <ul style="list-style-type: none"> <li>• TCM</li> <li>• Torque converter turbine speed sensor</li> <li>• Accelerator pedal position sensor</li> <li>• 2-4 brake duty solenoid</li> <li>• ATF temperature sensor</li> <li>• Line pressure linear solenoid</li> <li>• Control valve</li> <li>• 2-4 brake</li> <li>• ATF deterioration</li> <li>• Engine performance</li> <li>• Low &amp; reverse duty solenoid</li> </ul> |

## General Diagnostic Table

### AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Symptom  | Problem parts   |
|--|---|
| Slippage occurs from 1st to 2nd gear.                          | <ul style="list-style-type: none"> <li>• TCM</li> <li>• Accelerator pedal position sensor</li> <li>• 2-4 brake duty solenoid</li> <li>• ATF temperature sensor</li> <li>• Line pressure linear solenoid</li> <li>• Control valve</li> <li>• 2-4 brake</li> </ul>  |
| Shock occurs from 2nd to 3rd gear.                             | <ul style="list-style-type: none"> <li>• TCM</li> <li>• Torque converter turbine speed sensor</li> <li>• Accelerator pedal position sensor</li> <li>• 2-4 brake duty solenoid</li> <li>• ATF temperature sensor</li> <li>• Line pressure linear solenoid</li> <li>• Low &amp; reverse duty solenoid</li> <li>• Control valve</li> <li>• High clutch</li> <li>• 2-4 brake</li> <li>• ATF deterioration</li> <li>• Engine performance</li> <li>• High clutch duty solenoid</li> </ul> |
| Slippage occurs from 2nd to 3rd gear.                          | <ul style="list-style-type: none"> <li>• TCM</li> <li>• Accelerator pedal position sensor</li> <li>• 2-4 brake duty solenoid</li> <li>• ATF temperature sensor</li> <li>• Line pressure linear solenoid</li> <li>• Control valve</li> <li>• High clutch</li> <li>• 2-4 brake</li> <li>• Low &amp; reverse duty solenoid</li> </ul>  |
| Shock occurs from 3rd to 4th gear.                             | <ul style="list-style-type: none"> <li>• TCM</li> <li>• Torque converter turbine speed sensor</li> <li>• Accelerator pedal position sensor</li> <li>• 2-4 brake duty solenoid</li> <li>• ATF temperature sensor</li> <li>• Line pressure linear solenoid</li> <li>• Control valve</li> <li>• Low clutch duty solenoid</li> <li>• 2-4 brake</li> <li>• ATF deterioration</li> <li>• Engine performance</li> </ul>  |
| Slippage occurs from 3rd to 4th gear.                          | <ul style="list-style-type: none"> <li>• TCM</li> <li>• Accelerator pedal position sensor</li> <li>• 2-4 brake duty solenoid</li> <li>• ATF temperature sensor</li> <li>• Line pressure linear solenoid</li> <li>• Control valve</li> <li>• 2-4 brake</li> </ul>  |
| Shock occurs when select lever is moved from "3" to "2" range. | <ul style="list-style-type: none"> <li>• TCM</li> <li>• Torque converter turbine speed sensor</li> <li>• Accelerator pedal position sensor</li> <li>• ATF temperature sensor</li> <li>• Line pressure linear solenoid</li> <li>• Control valve</li> <li>• 2-4 brake duty solenoid</li> <li>• 2-4 brake</li> <li>• ATF deterioration</li> <li>• High clutch duty solenoid</li> </ul>   |

# General Diagnostic Table

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Symptom   | Problem parts  |
|---|--|
| Shock occurs when select lever is moved from "D" to "1" range.      | <ul style="list-style-type: none"> <li>• TCM</li> <li>• Torque converter turbine speed sensor</li> <li>• Accelerator pedal position sensor</li> <li>• ATF temperature sensor</li> <li>• Line pressure linear solenoid</li> <li>• Control valve</li> <li>• ATF deterioration</li> <li>• Low &amp; reverse brake duty solenoid</li> <li>• Low &amp; reverse clutch solenoid</li> </ul>                           |
| Shock occurs when select lever is moved from "2" to "1" range.      | <ul style="list-style-type: none"> <li>• TCM</li> <li>• Torque converter turbine speed sensor</li> <li>• Accelerator pedal position sensor</li> <li>• ATF temperature sensor</li> <li>• Line pressure linear solenoid</li> <li>• Control valve</li> <li>• Low &amp; reverse clutch</li> <li>• ATF deterioration</li> <li>• 2-4 brake duty solenoid</li> <li>• Low &amp; reverse brake duty solenoid</li> </ul> |
| Shock occurs when accelerator pedal is released at medium speeds.   | <ul style="list-style-type: none"> <li>• TCM</li> <li>• Accelerator pedal position sensor</li> <li>• ATF temperature sensor</li> <li>• Line pressure linear solenoid</li> <li>• Control valve</li> <li>• Lock-up damper</li> <li>• Engine performance</li> </ul>   |
| Vibration occurs during straight-forward operation.                 | <ul style="list-style-type: none"> <li>• TCM</li> <li>• Lock-up duty solenoid</li> <li>• Lock-up facing</li> <li>• Lock-up damper</li> </ul>   |
| Vibration occurs during turns (tight corner "braking" phenomenon).  | <ul style="list-style-type: none"> <li>• TCM</li> <li>• Front vehicle speed sensor</li> <li>• Rear vehicle speed sensor</li> <li>• Accelerator pedal position sensor</li> <li>• ATF temperature sensor</li> <li>• Transfer clutch</li> <li>• Transfer valve</li> <li>• Transfer duty solenoid</li> <li>• ATF deterioration</li> <li>• Harness</li> </ul>   |
| Front wheel slippage occurs during standing starts.                 | <ul style="list-style-type: none"> <li>• TCM</li> <li>• Front vehicle speed sensor</li> <li>• Accelerator pedal position sensor</li> <li>• ATF temperature sensor</li> <li>• Transfer clutch</li> <li>• Control valve</li> <li>• Transfer pipe</li> <li>• Transfer duty solenoid</li> </ul>  |
| Vehicle is not set in FWD mode.                                     | <ul style="list-style-type: none"> <li>• TCM</li> <li>• Transfer clutch</li> <li>• Control valve</li> <li>• Transfer duty solenoid</li> <li>• FWD fuse</li> </ul>  |
| Select lever is hard to move.                                       | <ul style="list-style-type: none"> <li>• Select cable</li> <li>• Select lever</li> <li>• Detent spring</li> <li>• Manual plate</li> </ul>  |
| Select lever is excessively hard to move (unreasonable resistance). | <ul style="list-style-type: none"> <li>• Detent spring</li> <li>• Manual plate</li> </ul>  |

# General Diagnostic Table

## AUTOMATIC TRANSMISSION (DIAGNOSTICS)

| Symptom  | Problem parts  |
|--|--|
| Select lever slips out of operation during acceleration or while driving on rough terrain. | <ul style="list-style-type: none"><li>• Select cable</li><li>• Select lever</li><li>• Detent spring</li><li>• Manual plate</li></ul> |

# MANUAL TRANSMISSION AND DIFFERENTIAL

# 5MT

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# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 1. General Description

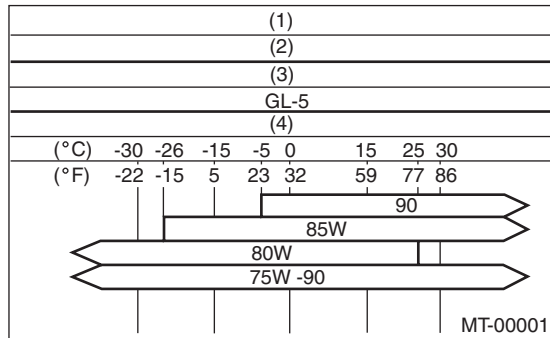
#### A: SPECIFICATION

##### 1. MANUAL TRANSMISSION AND DIFFERENTIAL

|                           |                         |   |             |
|---------------------------|-------------------------|---|-------------|
| Model                     |                         | 2.5 L   | 2.5 L Turbo |
|                           |                         | 2.5i, OUTBACK   |             |
| Type                      |                         | 5-forward speeds with synchromesh and 1-reverse                           |             |
| Transmission gear ratio   |                         | 1st   | 3.454       |
|                           |                         | 2nd   | 2.062       |
|                           |                         | 3rd   | 1.448       |
|                           |                         | 4th   | 1.088       |
|                           |                         | 5th   | 0.780       |
|                           |                         | Reverse   | 3.333       |
| Front reduction gear      | Final                   | Type of gear  | Hypoid      |
|                           |                         | Gear ratio  | 3.900       |
| Rear reduction gear       | Transfer                | Type of gear  | Helical     |
|                           |                         | Gear ratio  | 1.000       |
|                           | Final                   | Type of gear  | Hypoid      |
|                           |                         | Gear ratio  | 3.900       |
| Front differential        | Type and number of gear | Straight bevel gear (Bevel pinion: 2, Bevel gear: 2)                      |             |
| Center differential       | Type and number of gear | Straight bevel gear (Bevel pinion: 2, Bevel gear: 2 and viscous coupling) |             |
| Transmission gear oil     |                         | GL-5  |             |
| Transmission oil capacity |                         | 3.5 ℓ (3.7 US qt, 3.1 Imp qt)   |             |

##### 2. TRANSMISSION GEAR OIL

###### Recommended oil:



- (1) Item
- (2) Transmission gear oil
- (3) API standard
- (4) SAE viscosity No. and applicable temperature

##### 3. TRANSMISSION CASE ASSEMBLY

Drive pinion shim adjustment

###### Hypoid gear backlash:

**0.13 — 0.18 mm (0.0051 — 0.0071 in)**

| Drive pinion shim |                   |            |                   |
|-------------------|-------------------|------------|-------------------|
| Part No.          | Thickness mm (in) | Part No.   | Thickness mm (in) |
| 32295AA031        | 0.150<br>(0.0059) | 32295AA071 | 0.250<br>(0.0098) |
| 32295AA041        | 0.175<br>(0.0069) | 32295AA081 | 0.275<br>(0.0108) |
| 32295AA051        | 0.200<br>(0.0079) | 32295AA091 | 0.300<br>(0.0118) |
| 32295AA061        | 0.225<br>(0.0089) | 32295AA101 | 0.500<br>(0.0197) |

Selection of main shaft rear plate

| Main shaft rear plate            |            |      |
|----------------------------------|------------|------|
| Dimension "A" mm (in)            | Part No.   | Mark |
| 4.00 — 4.13<br>(0.1575 — 0.1626) | 32294AA041 | 1    |
| 3.87 — 3.99<br>(0.1524 — 0.1571) | 32294AA051 | 2    |

# General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

## 4. DRIVE PINION ASSEMBLY

Preload adjustment of thrust bearing

### Starting torque:

**0.3 — 0.8 N·m (0.03 — 0.08 kgf-m, 0.2 — 0.6 ft-lb)**

| Adjusting washer No. 1 |                   |
|------------------------|-------------------|
| Part No.               | Thickness mm (in) |
| 803025051              | 3.925 (0.1545)    |
| 803025052              | 3.950 (0.1555)    |
| 803025053              | 3.975 (0.1565)    |
| 803025054              | 4.000 (0.1575)    |
| 803025055              | 4.025 (0.1585)    |
| 803025056              | 4.050 (0.1594)    |
| 803025057              | 4.075 (0.1604)    |

| Adjusting washer No. 2 |                   |
|------------------------|-------------------|
| Part No.               | Thickness mm (in) |
| 803025059              | 3.850 (0.1516)    |
| 803025054              | 4.000 (0.1575)    |
| 803025058              | 4.150 (0.1634)    |

## 5. REVERSE IDLER GEAR

Adjustment of reverse idler gear position

### Reverse idler gear to transmission case (LH) wall clearance:

**6.0 — 7.5 mm (0.236 — 0.295 in)**

| Reverse shifter lever |      |                         |
|-----------------------|------|-------------------------|
| Part No.              | Mark | Remarks                 |
| 32820AA070            | 7    | Further from case wall  |
| 32820AA080            | 8    | Standard                |
| 32820AA090            | 9    | Closer to the case wall |

After installing a suitable reverse shifter lever, adjust the clearance using washers.

### Reverse idler gear to transmission case wall clearance:

**0 — 0.5 mm (0 — 0.020 in)**

| Washer (20.5 × 26 × t) |                   |           |                   |
|------------------------|-------------------|-----------|-------------------|
| Part No.               | Thickness mm (in) | Part No.  | Thickness mm (in) |
| 803020151              | 0.4 (0.016)       | 803020154 | 1.9 (0.075)       |
| 803020152              | 1.1 (0.043)       | 803020155 | 2.3 (0.091)       |
| 803020153              | 1.5 (0.059)       | —         | —                 |

## 6. SHIFTER FORK AND ROD

Select the suitable shifter forks so that both coupling sleeve and reverse driven gear are positioned in the center of their synchromesh mechanisms.

### Rod end clearance:

**A: 1st-2nd — 3rd-4th**

**0.4 — 1.4 mm (0.016 — 0.055 in)**

**B: 3rd-4th — 5th**

**0.5 — 1.3 mm (0.020 — 0.051 in)**

| 1st-2nd shifter fork |         |   |
|----------------------|---------|---|
| Part No.             | Mark    | Remarks                                   |
| 32804AA060           | 1       | Approach to 1st gear by 0.2 mm (0.008 in) |
| 32804AA070           | No mark | Standard                                  |
| 32804AA080           | 3       | Approach to 2nd gear by 0.2 mm (0.008 in) |

| 3rd-4th shifter fork |         |   |
|----------------------|---------|---|
| Part No.             | Mark    | Remarks                                   |
| 32810AA061           | 1       | Approach to 4th gear by 0.2 mm (0.008 in) |
| 32810AA071           | No mark | Standard                                  |
| 32810AA101           | 3       | Approach to 3rd gear by 0.2 mm (0.008 in) |

| 5th shifter fork (Non-turbo model) |         |   |
|------------------------------------|---------|---|
| Part No.                           | Mark    | Remarks   |
| 32812AA201                         | 7       | Approach to 5th gear by 0.2 mm (0.008 in)         |
| 32812AA211                         | No mark | Standard  |
| 32812AA221                         | 9       | Become distant from 5th gear by 0.2 mm (0.008 in) |

| 5th shifter fork (Turbo model) |         |   |
|--------------------------------|---------|---|
| Part No.                       | Mark    | Remarks   |
| 32812AA231                     | 7       | Approach to 5th gear by 0.2 mm (0.008 in)         |
| 32812AA241                     | No mark | Standard  |
| 32812AA251                     | 9       | Become distant from 5th gear by 0.2 mm (0.008 in) |

# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 7. TRANSFER CASE OR REAR CASE

#### Neutral position adjustment

| Adjusting shim |                   |
|----------------|-------------------|
| Part No.       | Thickness mm (in) |
| 32190AA000     | 0.15 (0.0059)     |
| 32190AA010     | 0.30 (0.0118)     |

| Reverse accent shaft |      |   |
|----------------------|------|---|
| Part No.             | Mark | Remarks                                     |
| 32188AA130           | S    | Neutral position is closer to 1st.          |
| 32188AA140           | T    | Standard                                    |
| 32188AA150           | U    | Neutral position is closer to reverse gear. |

#### Reverse check plate adjustment

| Reverse check plate |      |                |                                   |
|---------------------|------|----------------|-----------------------------------|
| Part No.            | Mark | Angle $\theta$ | Remarks                           |
| 32189AA000          | 0    | 28°            | Arm stops closer to 5th gear.     |
| 32189AA010          | 1    | 31°            | Arm stops closer to 5th gear.     |
| 33189AA020          | 2    | 34°            | Arm stops in the center.          |
| 32189AA030          | 3    | 37°            | Arm stops closer to reverse gear. |
| 32189AA040          | 4    | 40°            | Arm stops closer to reverse gear. |

### 8. EXTENSION ASSEMBLY

#### **Preload of the taper roller bearing (amount of standard protrusion):**

**0.15 — 0.20 mm (0.006 — 0.008 in)**

#### NOTE:

Be sure that the amount of preload is within the standard value.

| Thrust washer (50 × 61 × t) |                   |
|-----------------------------|-------------------|
| Part No.                    | Thickness mm (in) |
| 803050060                   | 0.50 (0.0197)     |
| 803050061                   | 0.55 (0.0217)     |
| 803050062                   | 0.60 (0.0236)     |
| 803050063                   | 0.65 (0.0256)     |
| 803050064                   | 0.70 (0.0276)     |
| 803050065                   | 0.75 (0.0295)     |
| 803050066                   | 0.80 (0.0315)     |
| 803050067                   | 0.85 (0.0335)     |
| 803050068                   | 0.90 (0.0354)     |
| 803050069                   | 0.95 (0.0374)     |
| 803050070                   | 1.00 (0.0394)     |
| 803050071                   | 1.05 (0.0413)     |
| 803050072                   | 1.10 (0.0433)     |
| 803050073                   | 1.15 (0.0453)     |
| 803050074                   | 1.20 (0.0472)     |
| 803050075                   | 1.25 (0.0492)     |
| 803050076                   | 1.30 (0.0512)     |
| 803050077                   | 1.35 (0.0531)     |
| 803050078                   | 1.40 (0.0551)     |
| 803050079                   | 1.45 (0.0571)     |

#### **Thrust washer to center differential side clearance:**

**0.15 — 0.35 mm (0.0059 — 0.0138 in)**

| Thrust washer |                   |
|---------------|-------------------|
| Part No.      | Thickness mm (in) |
| 803036050     | 0.9 (0.035)       |
| 803036054     | 1.0 (0.039)       |
| 803036051     | 1.1 (0.043)       |
| 803036055     | 1.2 (0.047)       |
| 803036052     | 1.3 (0.051)       |
| 803036056     | 1.4 (0.055)       |
| 803036053     | 1.5 (0.059)       |
| 803036057     | 1.6 (0.063)       |
| 803036058     | 1.7 (0.067)       |

# General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

## 9. FRONT DIFFERENTIAL

**Bevel gear to pinion backlash:**

**0.13 — 0.18 mm (0.0051 — 0.0071 in)**

| Washer (38.1 × 50 × t) |  |           |  |
|------------------------|--|-----------|--|
| Part No.               | Thickness<br>mm (in)                     | Part No.  | Thickness<br>mm (in)                     |
| 803038021              | 0.925 —<br>0.950<br>(0.0364 —<br>0.0374) | 803038023 | 1.025 —<br>1.050<br>(0.0404 —<br>0.0413) |
| 803038022              | 0.975 —<br>1.000<br>(0.0384 —<br>0.0394) | —         | —  |

**Pinion shaft to axle drive shaft clearance:**

**0 — 0.2 mm (0 — 0.008 in)**

| Snap ring (Outer-28) |                      |           |                      |
|----------------------|----------------------|-----------|----------------------|
| Part No.             | Thickness<br>mm (in) | Part No.  | Thickness<br>mm (in) |
| 805028011            | 1.05 (0.0413)        | 805028012 | 1.20 (0.0472)        |

## 10. TRANSFER DRIVE GEAR

**Snap ring (Outer-30) to ball bearing clearance:**

**0.01 — 0.15 mm (0.0004 — 0.0059 in)**

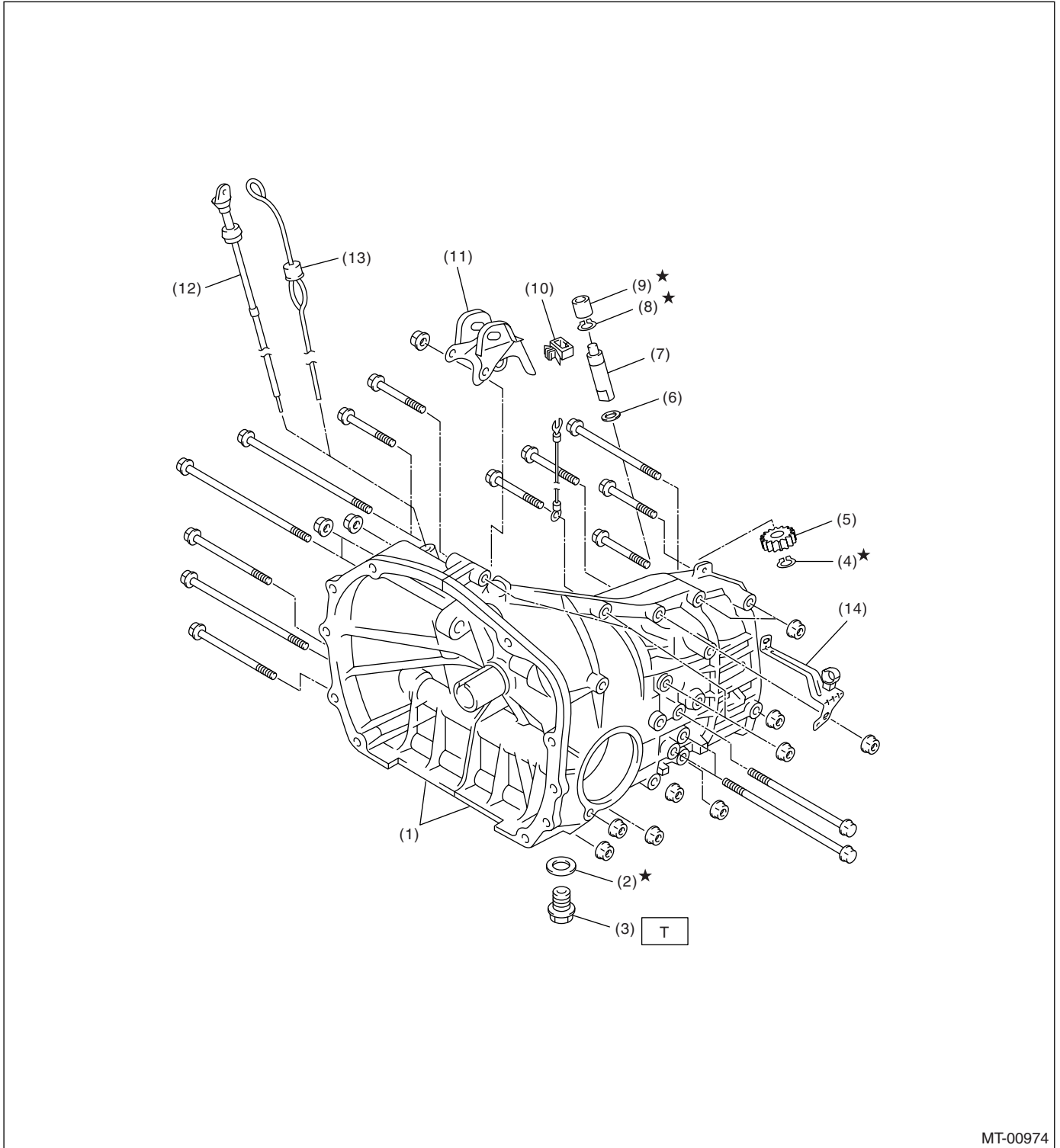
| Snap ring (Outer-30) |                   |
|----------------------|-------------------|
| Part No.             | Thickness mm (in) |
| 805030041            | 1.53 (0.0602)     |
| 805030042            | 1.65 (0.0650)     |
| 805030043            | 1.77 (0.0697)     |

# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

### B: COMPONENT

#### 1. TRANSMISSION CASE



MT-00974

# General Description

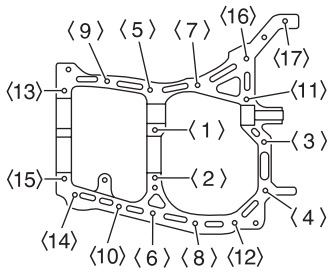
## MANUAL TRANSMISSION AND DIFFERENTIAL

- |                             |  |  |
|-----------------------------|--|--|
| (1) Transmission case ASSY  | (8) Snap ring (Outer)                  | (14) Harness bracket (Non-turbo model) |
| (2) Gasket                  | (9) Oil seal                           |  |
| (3) Drain plug              | (10) Clamp                             |  |
| (4) Snap ring (Outer)       | (11) Pitching stopper bracket          |  |
| (5) Speedometer driven gear | (12) Oil level gauge (Non-turbo model) |  |
| (6) Washer                  | (13) Oil level gauge (Turbo model)     |  |
| (7) Speedometer shaft       |  |  |

**Tightening torque: N·m (kgf-m, ft-lb)**

**T: 44 (4.5, 32.5) (Aluminum gasket)  
70 (7.1, 51.6) (Copper gasket)**

### Transmission case tightening torque:

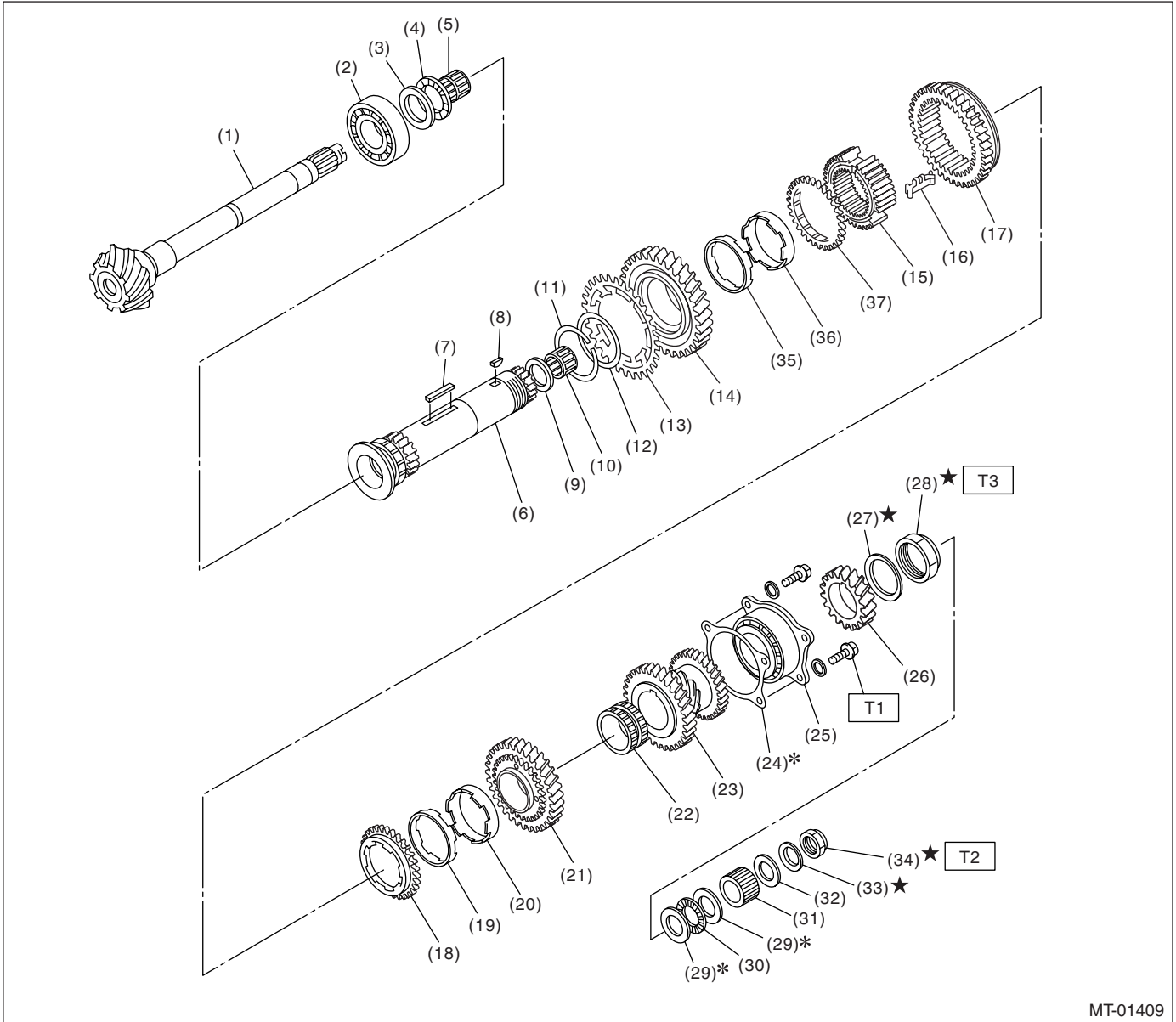
|  | Bolt No.                 | Bolt size<br>mm | Tightening torque<br>N·m (kgf-m, ft-lb) |
|---|--------------------------|-----------------|---|
|   |                          | (5) to (15)     | 8                                       |
|   | (1) to (4)<br>(16), (17) | 10              | 39 (4.0, 28.9)                          |

MT-00003

# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 2. DRIVE PINION ASSEMBLY



MT-01409

- |  |                               |                                     |
|--|-------------------------------|-------------------------------------|
| (1) Drive pinion shaft                   | (15) 1st-2nd synchronizer hub | (30) Thrust bearing                 |
| (2) Roller bearing                       | (16) Insert key               | (31) Differential bevel gear sleeve |
| (3) Washer                               | (17) Reverse driven gear      | (32) Washer                         |
| (4) Thrust bearing                       | (18) Outer baulk ring         | (33) Lock washer                    |
| (5) Needle bearing                       | (19) Synchro cone             | (34) Lock nut                       |
| (6) Driven shaft                         | (20) Inner baulk ring         | (35) Inner baulk ring               |
| (7) Key                                  | (21) 2nd driven gear          | (36) Synchro cone                   |
| (8) Woodruff key                         | (22) 2nd driven gear bushing  | (37) Outer baulk ring               |
| (9) Drive pinion collar                  | (23) 3rd-4th driven gear      |                                     |
| (10) Needle bearing                      | (24) Driven pinion shim       |                                     |
| (11) Snap ring (Outer) (Non-turbo model) | (25) Roller bearing           |                                     |
| (12) Washer (Non-turbo model)            | (26) 5th driven gear          |                                     |
| (13) Sub gear (Non-turbo model)          | (27) Lock washer              |                                     |
| (14) 1st driven gear                     | (28) Lock nut                 |                                     |
|  | (29) Adjusting washer         |                                     |
|  |                               | (29)* (30)                          |
|  |                               | (31) (32) (33) (34) (35) (36) (37)  |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 30 (3.1, 22.1)**

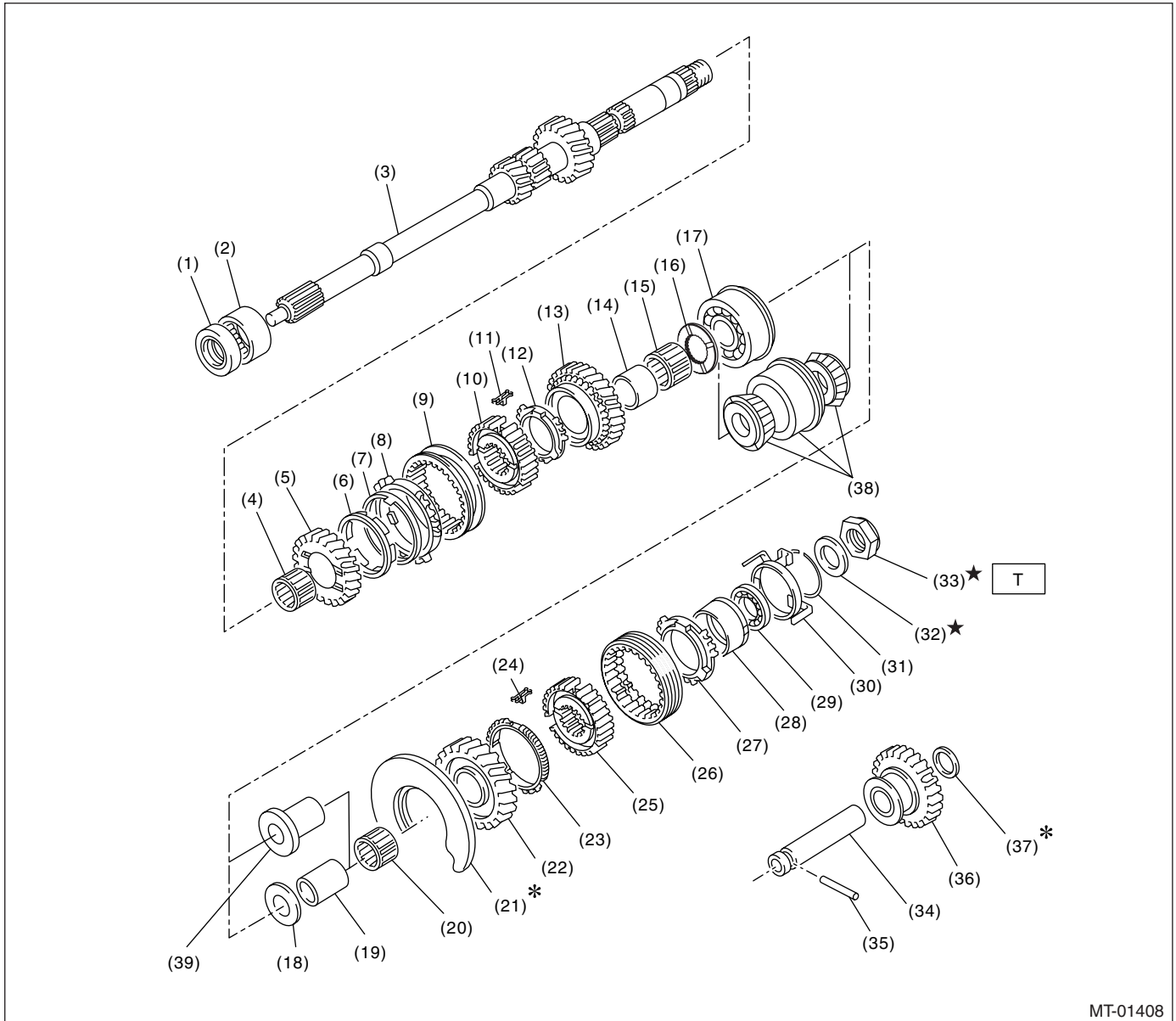
**T2: 120 (12.2, 88.5)**

**T3: 260 (26.5, 191.8)**

# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 3. MAIN SHAFT ASSEMBLY



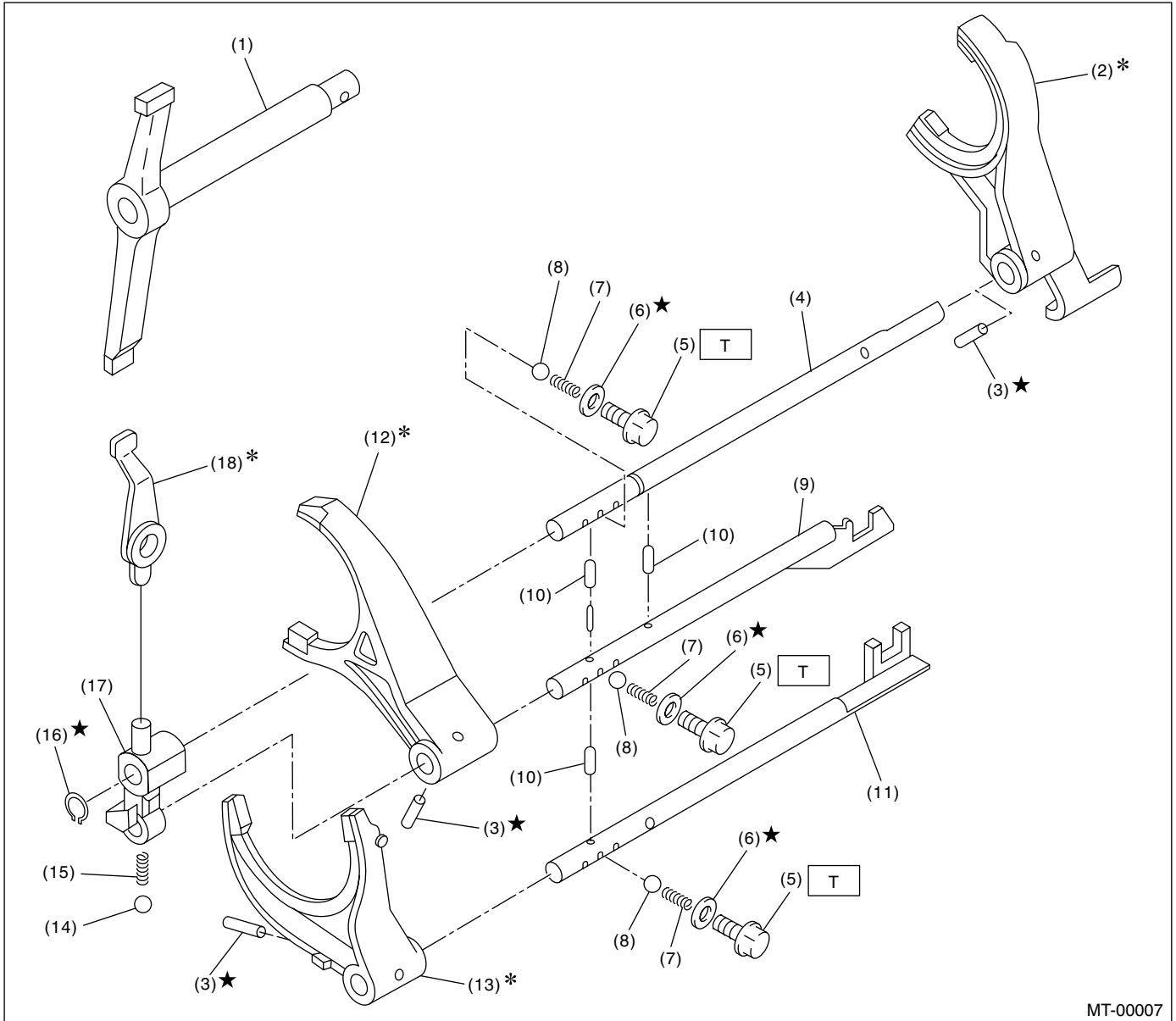
- |                                  |  |  |
|----------------------------------|--|--|
| (1) Oil seal                     | (16) 4th gear thrust washer                    | (29) Ball bearing                          |
| (2) Needle bearing               | (17) Ball bearing (Non-turbo model)            | (30) Synchro cone stopper                  |
| (3) Transmission main shaft      | (18) 5th gear thrust washer (Non-turbo model)  | (31) Snap ring                             |
| (4) Needle bearing               | (19) 5th needle bearing race (Non-turbo model) | (32) Lock washer                           |
| (5) 3rd drive gear               | (20) Needle bearing                            | (33) Lock nut                              |
| (6) Inner baulk ring             | (21) Main shaft rear plate                     | (34) Reverse idler gear shaft              |
| (7) 3rd synchro cone             | (22) 5th drive gear                            | (35) Straight pin                          |
| (8) Outer baulk ring             | (23) 5th baulk ring                            | (36) Reverse idler gear                    |
| (9) 3rd-4th coupling sleeve      | (24) 5th-Rev shifting insert key               | (37) Washer                                |
| (10) 3rd-4th synchronizer hub    | (25) 5th-Rev synchronizer hub                  | (38) Taper roller bearing (Turbo model)    |
| (11) 3rd-4th shifting insert key | (26) 5th-Rev coupling sleeve                   | (39) 5th needle bearing race (Turbo model) |
| (12) 4th baulk ring              | (27) Rev baulk ring                            |  |
| (13) 4th drive gear              | (28) Rev synchro cone                          |  |
| (14) 4th needle bearing race     |  |  |
| (15) Needle bearing              |  |  |
- Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 120 (12.2, 88.5)**



# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 4. SHIFTER FORK AND SHIFTER ROD



MT-00007

- |                          |                           |                            |
|--------------------------|---------------------------|----------------------------|
| (1) Shifter arm          | (9) 3rd-4th fork rod      | (17) Reverse fork rod arm  |
| (2) 5th shifter fork     | (10) Interlock plunger    | (18) Reverse shifter lever |
| (3) Straight pin         | (11) 1st-2nd fork rod     |                            |
| (4) Reverse fork rod     | (12) 3rd-4th shifter fork |                            |
| (5) Checking ball plug   | (13) 1st-2nd shifter fork |                            |
| (6) Gasket               | (14) Ball                 |                            |
| (7) Checking ball spring | (15) Spring               |                            |
| (8) Ball                 | (16) Snap ring (Outer)    |                            |

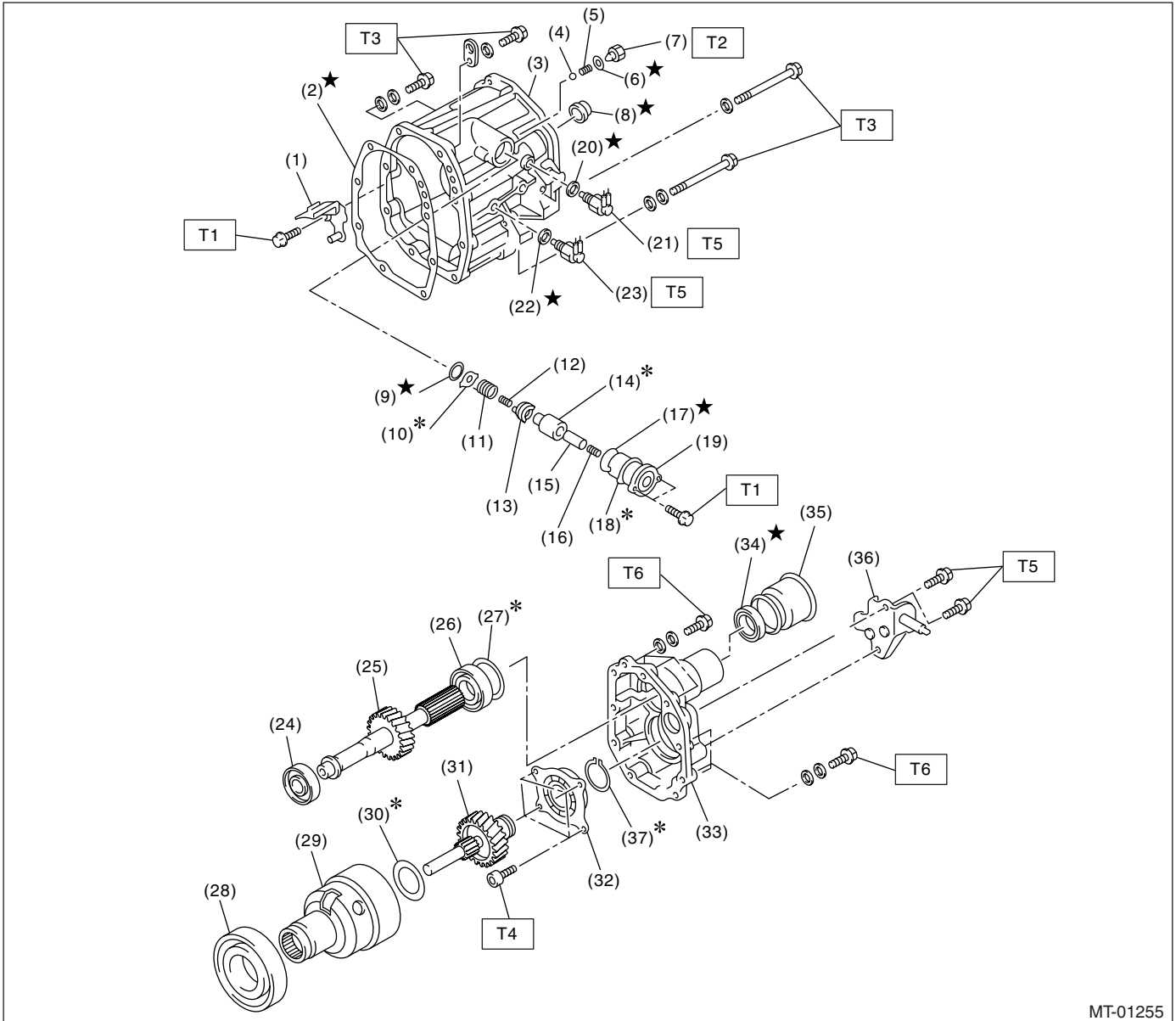
**Tightening torque: N·m (kgf·m, ft·lb)**

**T: 20 (2.0, 14.8)**

# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 5. TRANSFER CASE AND EXTENSION



MT-01255

- |                            |                            |                          |
|----------------------------|----------------------------|--------------------------|
| (1) Oil guide              | (16) Return spring         | (31) Transfer drive gear |
| (2) Gasket                 | (17) O-ring                | (32) Ball bearing        |
| (3) Transfer case          | (18) Adjusting select shim | (33) Extension case      |
| (4) Ball                   | (19) Reverse check sleeve  | (34) Oil seal            |
| (5) Reverse accent spring  | (20) Gasket                | (35) Dust cover          |
| (6) Gasket                 | (21) Neutral switch        | (36) Shift bracket       |
| (7) Plug                   | (22) Gasket                | (37) Snap ring           |
| (8) Oil seal               | (23) Back-up light switch  |                          |
| (9) Snap ring (Inner)      | (24) Roller bearing        |                          |
| (10) Reverse check plate   | (25) Transfer driven gear  |                          |
| (11) Reverse check spring  | (26) Roller bearing        |                          |
| (12) Reverse return spring | (27) Adjusting washer      |                          |
| (13) Reverse check cam     | (28) Ball bearing          |                          |
| (14) Reverse accent shaft  | (29) Center differential   |                          |
| (15) Return spring cap     | (30) Adjusting washer      |                          |

**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 6.4 (0.65, 4.7)**

**T2: 9.75 (1.0, 7.2)**

**T3: 24.5 (2.5, 18.1)**

**T4: 26 (2.7, 20)**

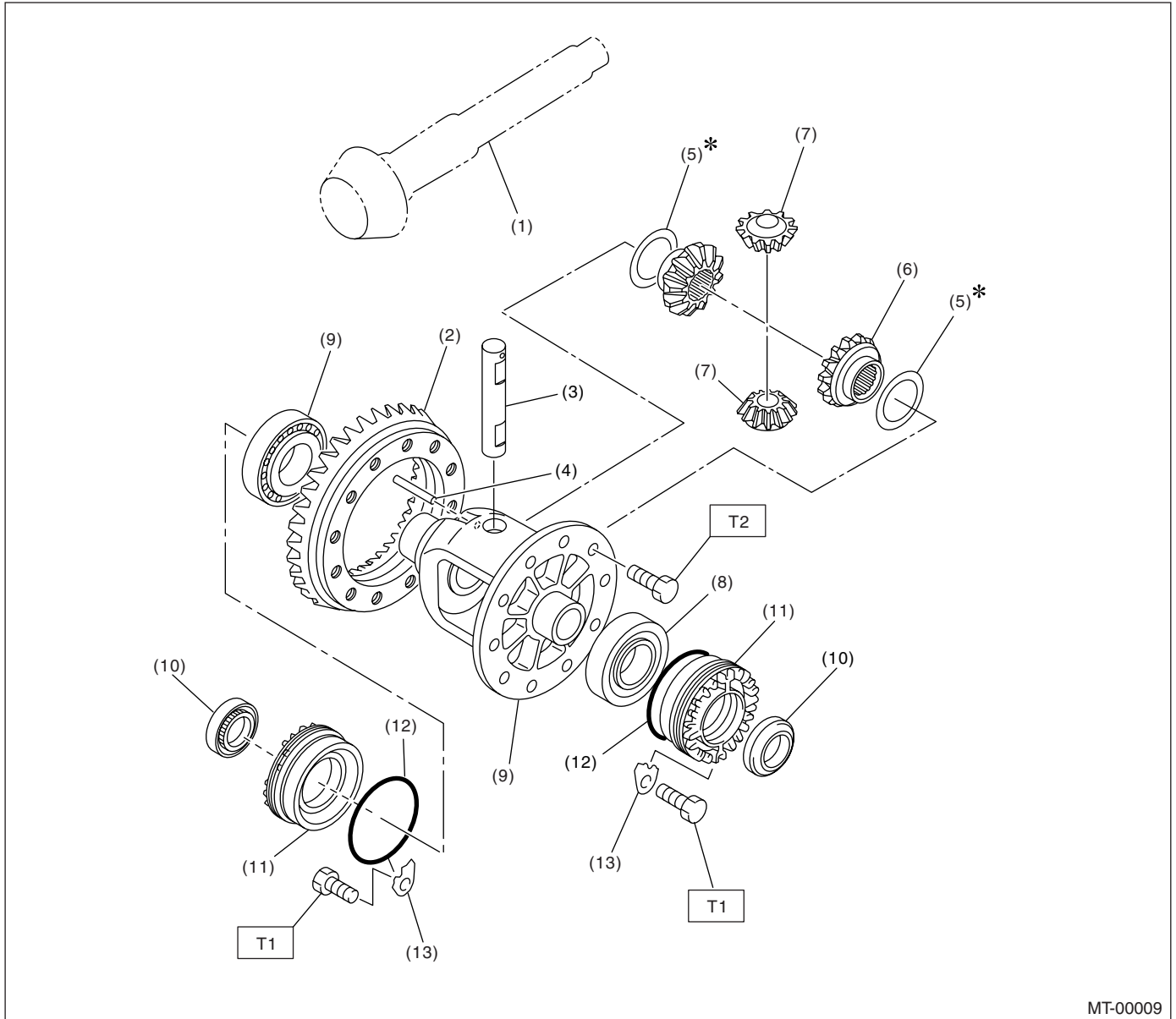
**T5: 32.3 (3.3, 23.8)**

**T6: 40 (4.1, 29.7)**

# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 6. FRONT DIFFERENTIAL



MT-00009

- |                             |                                 |                          |
|-----------------------------|---------------------------------|--------------------------|
| (1) Drive pinion shaft      | (7) Differential bevel pinion   | (13) Retainer lock plate |
| (2) Hypoid driven gear      | (8) Roller bearing              |                          |
| (3) Pinion shaft            | (9) Differential case           |                          |
| (4) Straight pin            | (10) Oil seal                   |                          |
| (5) Washer                  | (11) Differential side retainer |                          |
| (6) Differential bevel gear | (12) O-ring                     |                          |

**Tightening torque: N·m (kgf·m, ft·lb)**

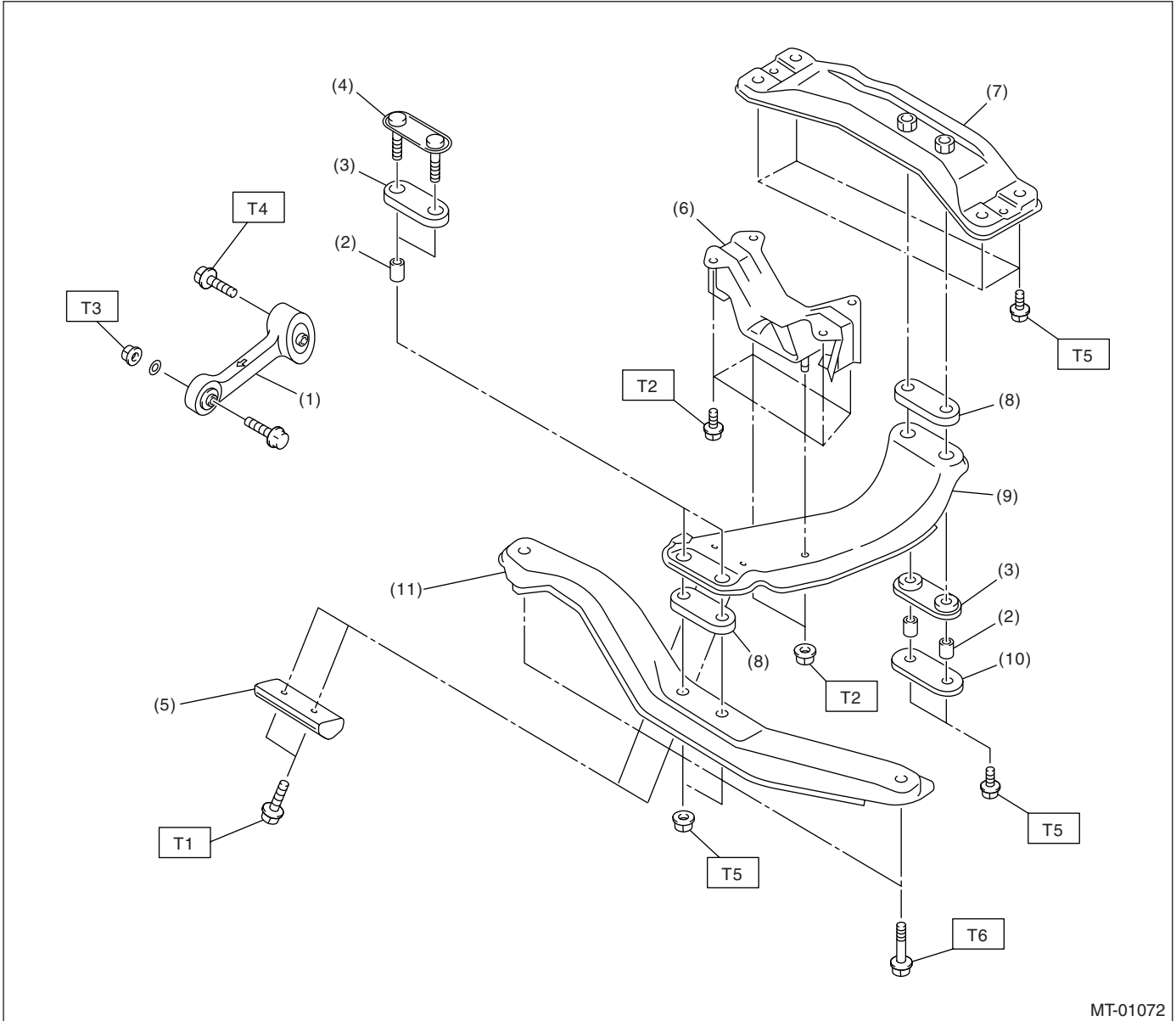
**T1: 25 (2.5, 18.4)**

**T2: 62 (6.3, 45.6)**

# General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

## 7. TRANSMISSION MOUNTING



MT-01072

- |                         |                        |
|-------------------------|------------------------|
| (1) Pitching stopper    | (8) Cushion D          |
| (2) Spacer              | (9) Center crossmember |
| (3) Cushion C           | (10) Rear plate        |
| (4) Front plate         | (11) Front crossmember |
| (5) Dynamic damper      |                        |
| (6) Rear cushion rubber |                        |
| (7) Rear crossmember    |                        |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 7.5 (0.76, 5.5)**

**T2: 35 (3.6, 26)**

**T3: 50 (5.1, 37)**

**T4: 58 (5.9, 43)**

**T5: 70 (7.1, 51.6)**

**T6: 140 (14.3, 103)**

# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

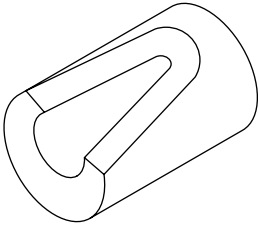
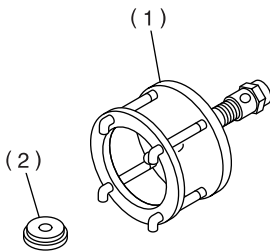
### C: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation, and disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- When disassembling the case and other light alloy parts, use a plastic hammer to open the case. Do not pry it apart with a screwdriver or other tool.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.

- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply gear oil onto sliding or revolution surfaces before installation.
- Replace deformed or otherwise damaged snap rings with new ones.
- Before installing O-rings or oil seals, apply sufficient amount of gear oil to avoid damage and deformation.
- Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Avoid damaging the mating surface of the case.
- Before applying sealant, completely remove the old seal.

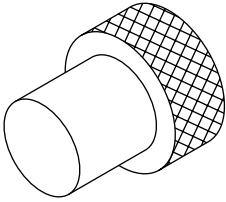
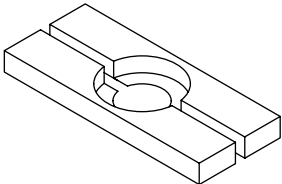
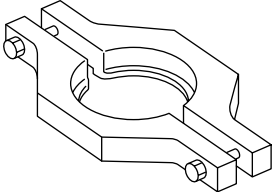
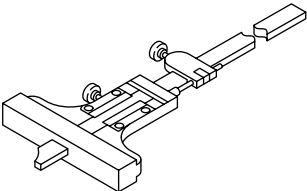
### D: PREPARATION TOOL

#### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION           | REMARKS  |
|---|-------------|-----------------------|--|
|  <p>ST-399411700</p> | 399411700   | ACCENT BALL INSTALLER | Used for installing reverse shifter rail arm.  |
|  <p>ST-899524100</p> | 899524100   | PULLER SET            | Used for removing and installing roller bearing (Differential).<br>(1) PULLER<br>(2) CAP |

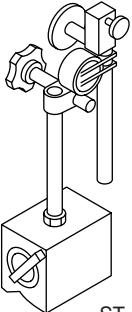
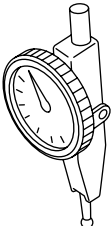
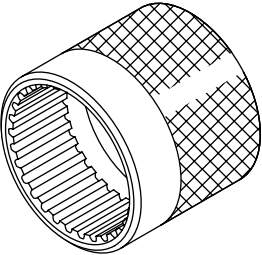
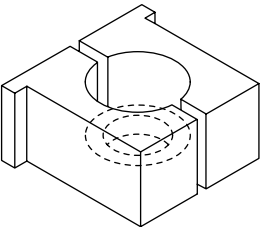
# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION                         | REMARKS   |
|---|-------------|-------------------------------------|---|
|  <p style="text-align: center;">ST-399780104</p>   | 399780104   | WEIGHT                              | Used for measuring preload on roller bearing.                 |
|  <p style="text-align: center;">ST-498077000</p>   | 498077000   | REMOVER                             | Used for removing roller bearing of drive pinion shaft.       |
|  <p style="text-align: center;">ST-498077300</p> | 498077300   | CENTER DIFFERENTIAL BEARING REMOVER | Used for removing the center differential cover ball bearing. |
|  <p style="text-align: center;">ST-498147000</p> | 498147000   | DEPTH GAUGE                         | Used for adjusting main shaft axial end play.                 |

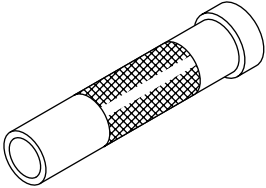
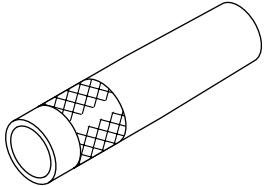
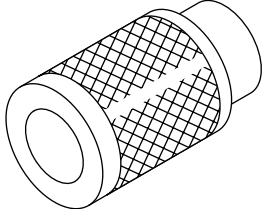
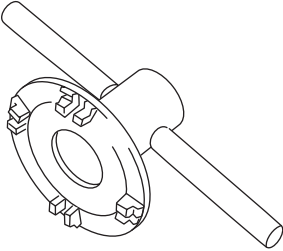
# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION         | REMARKS  |
|---|-------------|---------------------|--|
|  <p style="text-align: center;">ST-498247001</p>   | 498247001   | MAGNET BASE         | <ul style="list-style-type: none"> <li>• Used for measuring backlash between side gear and pinion, and hypoid gear.</li> <li>• Used with DIAL GAUGE (498247100).</li> </ul>  |
|  <p style="text-align: center;">ST-498247100</p>   | 498247100   | DIAL GAUGE          | <ul style="list-style-type: none"> <li>• Used for measuring backlash between side gear and pinion, and hypoid gear.</li> <li>• Used with MAGNET BASE (498247001).</li> </ul> |
|  <p style="text-align: center;">ST-498427100</p> | 498427100   | STOPPER             | Used for securing the drive pinion shaft assembly and driven gear assembly when removing the drive pinion shaft assembly lock nut.   |
|  <p style="text-align: center;">ST-498937000</p> | 498937000   | TRANSMISSION HOLDER | Used for removing and installing transmission main shaft lock nut.   |

# General Description

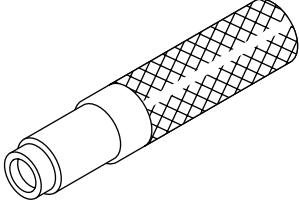
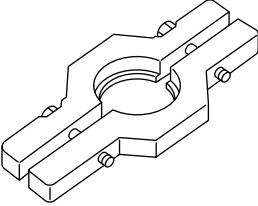
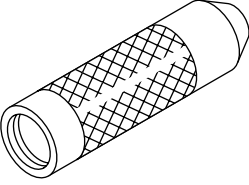
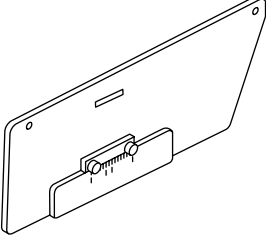
## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION              | REMARKS  |
|---|-------------|--------------------------|--|
|  <p style="text-align: center;">ST-499277100</p>   | 499277100   | BUSHING 1-2<br>INSTALLER | <ul style="list-style-type: none"> <li>• Used for installing 1st driven gear thrust plate and 1st-2nd driven gear bushing.</li> <li>• Used for installing roller bearing outer races to differential case.</li> </ul>  |
|  <p style="text-align: center;">ST-499277200</p>   | 499277200   | INSTALLER                | Used for press-fitting the 2nd driven gear, roller bearings and 5th driven gear onto the driven shaft.   |
|  <p style="text-align: center;">ST-499757002</p> | 499757002   | INSTALLER                | <ul style="list-style-type: none"> <li>• Used for installing snap ring (OUT 25) and ball bearing (25 × 26 × 17).</li> <li>• Used for installing bearing cone of transfer driven gear (extension core side).</li> </ul> |
|  <p style="text-align: center;">ST18630AA010</p> | 18630AA010  | WRENCH COMPL<br>RETAINER | <ul style="list-style-type: none"> <li>• Used for removing and installing differential side retainer.</li> <li>• WRENCH ASSEMBLY (499787000) can also be used.</li> </ul>  |



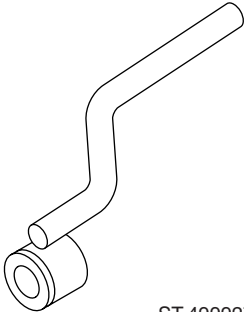
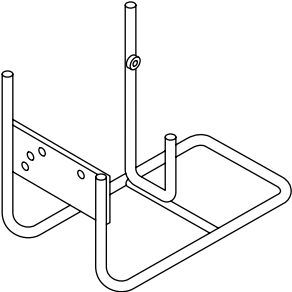
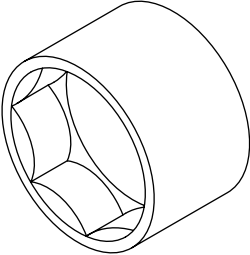
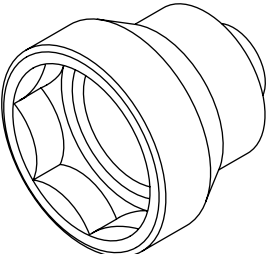
# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION             | REMARKS  |
|---|-------------|-------------------------|--|
|  <p style="text-align: center;">ST-499827000</p>   | 499827000   | PRESS                   | Used for installing speedometer oil seal when installing speedometer cable to transmission.  |
|  <p style="text-align: center;">ST-499857000</p>   | 499857000   | 5TH DRIVEN GEAR REMOVER | Used for removing 5th driven gear.   |
|  <p style="text-align: center;">ST-499877000</p> | 499877000   | RACE 4-5 INSTALLER      | <ul style="list-style-type: none"> <li>• Used for installing 4th needle bearing race and ball bearing onto transmission main shaft.</li> <li>• Used with REMOVER (899714110).</li> </ul> |
|  <p style="text-align: center;">ST-499917500</p> | 499917500   | DRIVE PINION GAUGE ASSY | Used for adjusting drive pinion shim.  |

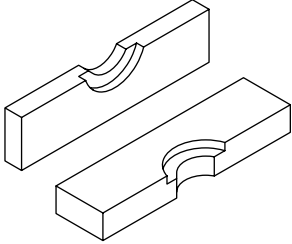
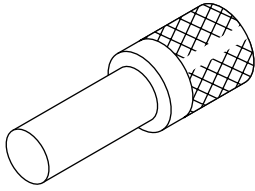
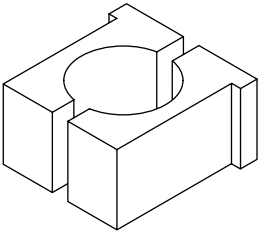
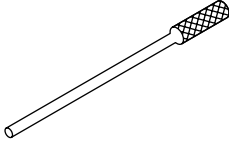
# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION           | REMARKS  |
|---|-------------|-----------------------|--|
|  <p style="text-align: center;">ST-499927100</p>   | 499927100   | HANDLE                | Used for fitting transmission main shaft.  |
|  <p style="text-align: center;">ST-499937100</p>   | 499937100   | TRANSMISSION<br>STAND | Stand used for transmission disassembly and assembly.                            |
|  <p style="text-align: center;">ST-499987003</p> | 499987003   | SOCKET WRENCH<br>(35) | Used for removing and installing driven pinion lock nut and main shaft lock nut. |
|  <p style="text-align: center;">ST-499987300</p> | 499987300   | SOCKET WRENCH<br>(50) | Used for removing and installing driven gear assembly lock nut.                  |

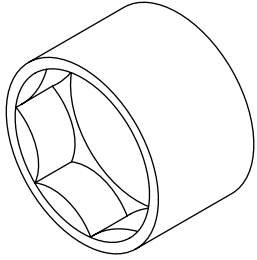
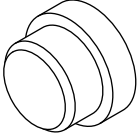
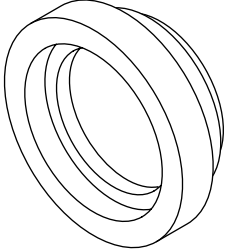
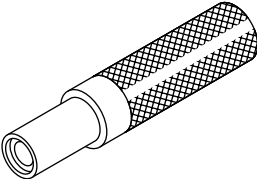
# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION             | REMARKS   |
|---|-------------|-------------------------|---|
|  <p style="text-align: center;">ST-899714110</p>   | 899714110   | REMOVER                 | Used for installing transmission main shaft, drive pinion and rear drive shaft. |
|  <p style="text-align: center;">ST-899864100</p>   | 899864100   | REMOVER                 | Used for removing parts on transmission main shaft and drive pinion.            |
|  <p style="text-align: center;">ST-899884100</p> | 899884100   | HOLDER                  | Used for tightening lock nut on sleeve.   |
|  <p style="text-align: center;">ST-899904100</p> | 899904100   | STRAIGHT PIN<br>REMOVER | Used for removing and installing straight pin.                                  |

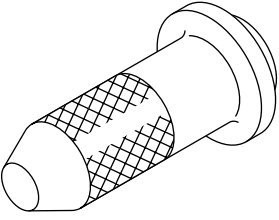
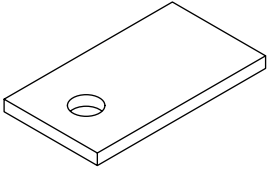
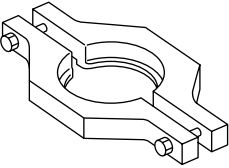
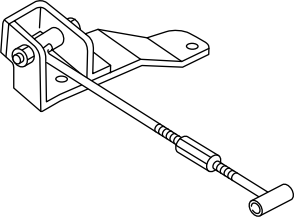
# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION           | REMARKS  |
|---|-------------|-----------------------|--|
|  <p style="text-align: center;">ST-899988608</p>   | 899988608   | SOCKET WRENCH<br>(27) | Used for removing and installing drive pinion lock nut.  |
|  <p style="text-align: center;">ST-398497701</p>   | 398497701   | ADAPTER               | <ul style="list-style-type: none"> <li>• Used for installing roller bearing onto differential case.</li> <li>• Used with BUSHING 1-2 INSTALLER (499277100).</li> </ul> |
|  <p style="text-align: center;">ST-499587000</p> | 499587000   | INSTALLER             | Used for installing driven gears to driven shaft.  |
|  <p style="text-align: center;">ST-899824100</p> | 899824100   | PRESS                 | Used for installing speedometer shaft oil seal.  |

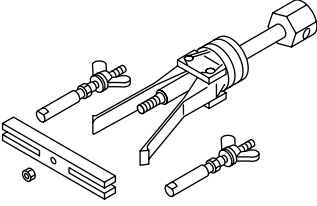
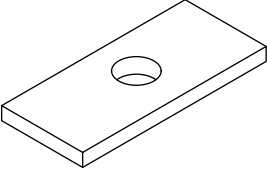
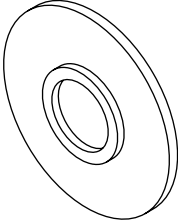
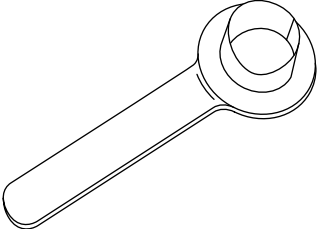
# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION               | REMARKS  |
|---|-------------|---------------------------|--|
|  <p style="text-align: center;">ST-498057300</p>   | 498057300   | INSTALLER                 | Used for installing extension oil seal.  |
|  <p style="text-align: center;">ST-498255400</p>   | 498255400   | PLATE                     | Used for measuring backlash.   |
|  <p style="text-align: center;">ST-498077400</p> | 498077400   | SYNCHRO CONE<br>REMOVER   | <ul style="list-style-type: none"> <li>• Used for removing synchronizer cone of main shaft.</li> <li>• Used for removing 5th driven gear of drive pinion shaft.</li> </ul> |
|  <p style="text-align: center;">ST41099AC000</p> | 41099AC000  | ENGINE SUPPORT<br>BRACKET | Used for supporting engine.  |

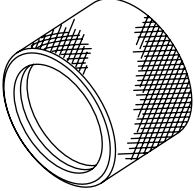
# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION        | REMARKS   |
|---|-------------|--------------------|---|
|  <p style="text-align: center;">ST-398527700</p>   | 398527700   | PULLER ASSY        | Used for removing extension case roller bearing.  |
|  <p style="text-align: center;">ST-398643600</p>   | 398643600   | GAUGE              | Used for measuring total end play, extension end play and drive pinion height.  |
|  <p style="text-align: center;">ST-398177700</p> | 38177700    | INSTALLER          | <ul style="list-style-type: none"> <li>• Used for installing bearing cone of transfer driven gear (transfer case side).</li> <li>• Used for installing ball bearing of transfer driven gear.</li> </ul> |
|  <p style="text-align: center;">ST28399SA010</p> | 28399SA010  | OIL SEAL PROTECTOR | Used for protecting oil seal from damage when inserting front drive shaft.  |

# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION                                | REMARKS  |
|---|-------------|--|--|
| <br>ST18675AA000 | 18675AA000  | DIFFERENTIAL<br>SIDE OIL SEAL<br>INSTALLER | Used for installing differential side retainer oil seal. |

## 2. GENERAL TOOL

| TOOL NAME      | REMARKS  |
|----------------|--|
| Circuit tester | Used for measuring resistance, voltage and ampere.                 |
| TORX® BIT T70  | Used for installing and removing transmission gear oil drain plug. |

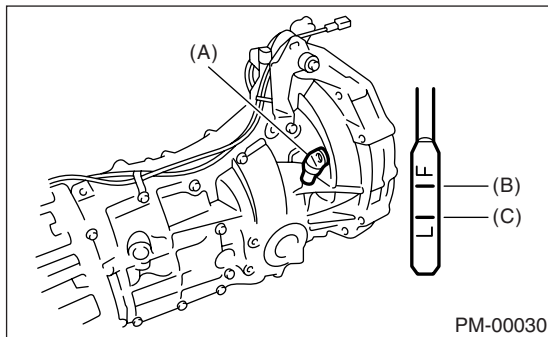
# Transmission Gear Oil

MANUAL TRANSMISSION AND DIFFERENTIAL

## 2. Transmission Gear Oil

### A: INSPECTION

- 1) Park the vehicle on a level surface.
- 2) Turn the ignition switch to OFF, and then wait until the engine cools.
- 3) Remove the oil level gauge and wipe it clean.
- 4) Reinsert the level gauge all the way. Be sure the level gauge is correctly inserted and in the proper direction.
- 5) Pull out the oil level gauge again and check the oil level on it. If it is below the lower level, add oil through the oil level gauge hole to bring the level up to the upper level.



- (A) Oil level gauge
- (B) Upper level
- (C) Lower level

### B: REPLACEMENT

- 1) Pull out the oil level gauge.
- 2) Lift-up the vehicle.
- 3) Remove the drain plug using TORX® BIT T70, and drain the transmission gear oil completely.

#### CAUTION:

**Directly after the engine has been running, the transmission gear oil is hot. Be careful not to burn yourself.**

#### NOTE:

Tighten the transmission drain plug after draining the transmission gear oil.

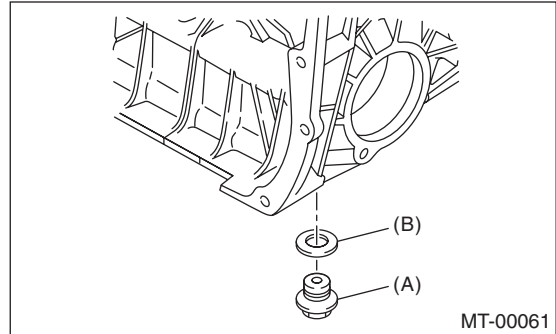
#### Tightening torque:

**Aluminum gasket**

**44 N·m (4.5 kgf-m, 32.5 ft-lb)**

**Copper gasket**

**70 N·m (7.1 kgf-m, 51.6 ft-lb)**



- (A) Drain plug
- (B) Gasket

- 4) Lower the vehicle.
- 5) Pour gear oil into the gauge hole.

#### Recommended gear oil:

**Use GL-5 (75W-90) or equivalent.**

#### Gear oil capacity:

**3.5 l (3.7 US qt, 3.1 Imp qt)**

- 6) Check the level of the transmission gear oil.

#### CAUTION:

**When inserting the level gauge into transmission gear, align the protrusion on the top end of level gauge with the notch in the gauge hole.**

#### NOTE:

The level should be within the specified range marked on the gauge.



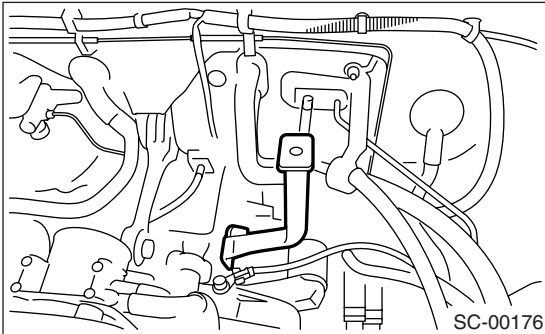
# Manual Transmission Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

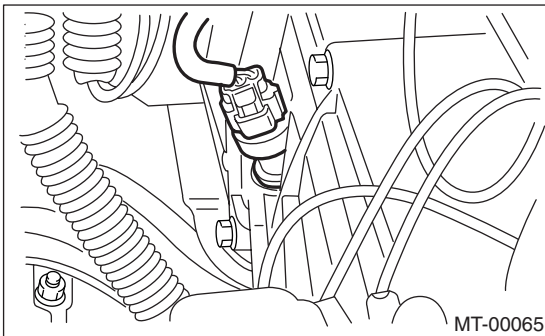
### 3. Manual Transmission Assembly

#### A: REMOVAL

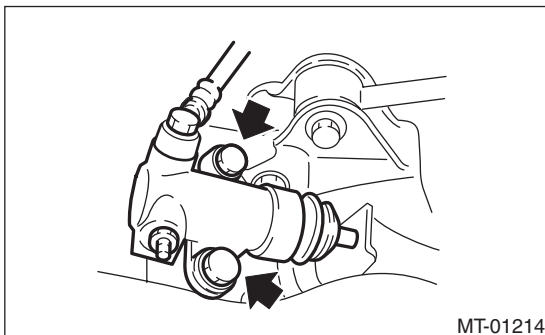
- 1) Open the front hood fully, and support with stay.
- 2) Disconnect the ground cable from battery.
- 3) Remove the air intake duct and cleaner case. (Non-turbo model) <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.> <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
- 4) Remove the air cleaner case stay. (Non-turbo model)



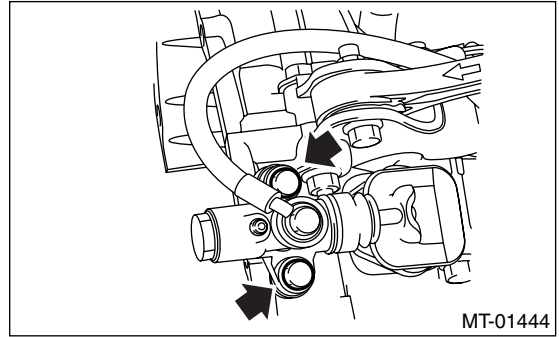
- 5) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 6) Disconnect the following connectors:
  - (1) Neutral position switch connector
  - (2) Back-up light switch connector
  - (3) Vehicle speed sensor



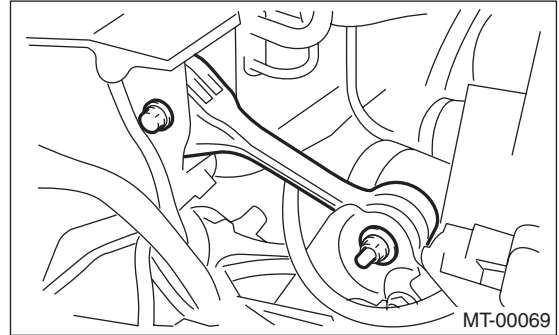
- 7) Remove the starter. <Ref. to SC(H4SO)-8, REMOVAL, Starter.>
- 8) Remove the operating cylinder from transmission.
  - Non-turbo model



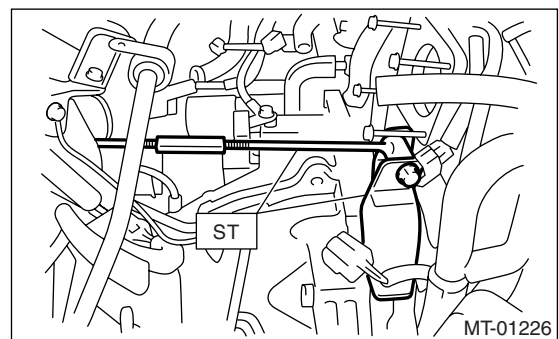
- Turbo model



- 9) Remove the throttle body.
  - Non-turbo model <Ref. to FU(H4SO)-12, REMOVAL, Throttle Body.>
  - Turbo model <Ref. to FU(H4DOTC)-13, REMOVAL, Throttle Body.>
- 10) Remove the pitching stopper.



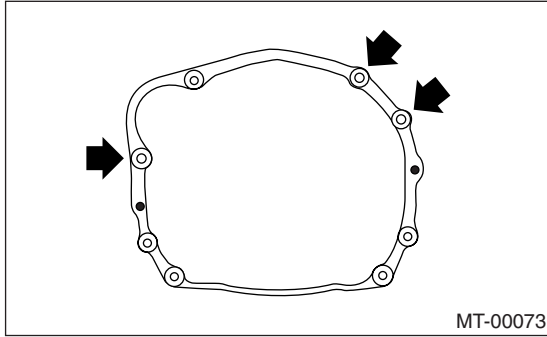
- 11) Set the ST.  
ST 41099AC000 ENGINE SUPPORT BRACKET



# Manual Transmission Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

12) Remove the bolt which holds the right upper side of transmission to engine.



13) Remove the front and center exhaust pipes. (Non-turbo model) <Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>

14) Remove the center exhaust pipe. (Turbo model). <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>

15) Remove the rear exhaust pipe and muffler.

- Non-turbo model

<Ref. to EX(H4SO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, REMOVAL, Muffler.>

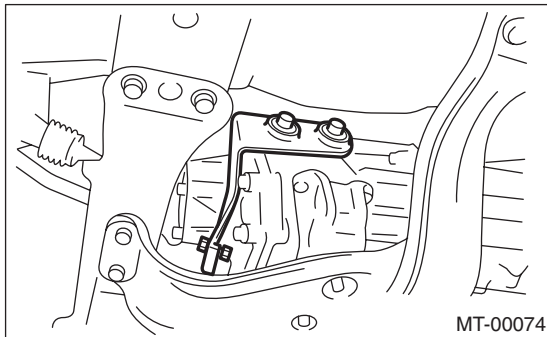
- Turbo model

<Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>

**CAUTION:**

**When removing the exhaust pipes, be careful each exhaust pipe does not drop out.**

16) Remove the hanger bracket from right side of transmission.

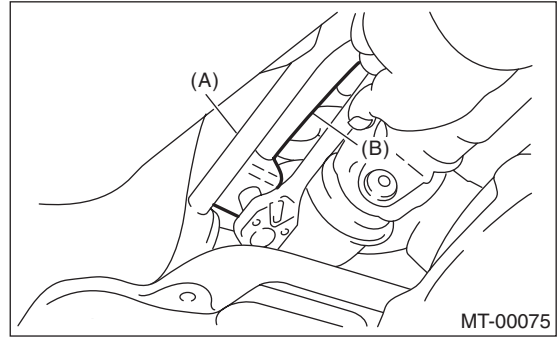


17) Remove the propeller shaft. <Ref. to DS-16, REMOVAL, Propeller Shaft.>

18) Remove the gear shift rod and the stay from transmission.

(1) Disconnect the stay from transmission.

(2) Disconnect the rod from transmission.



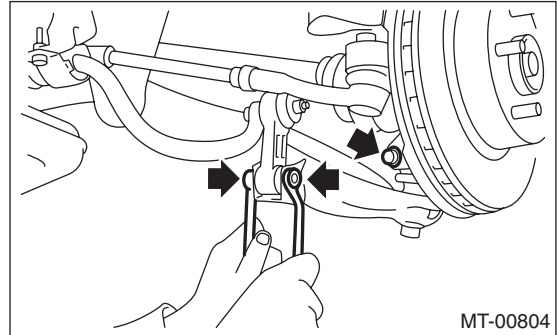
(A) Stay

(B) Rod

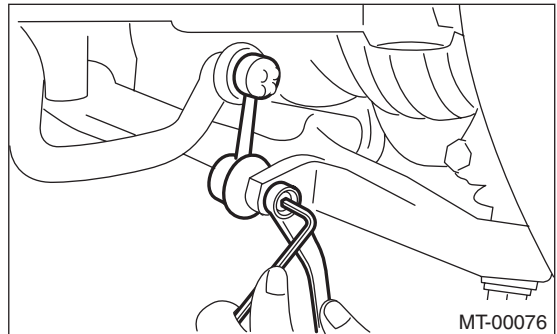
19) Disconnect the stabilizer link from transverse link.

20) Remove the bolt securing ball joint of transverse link to housing.

- Wagon model



- Sedan model

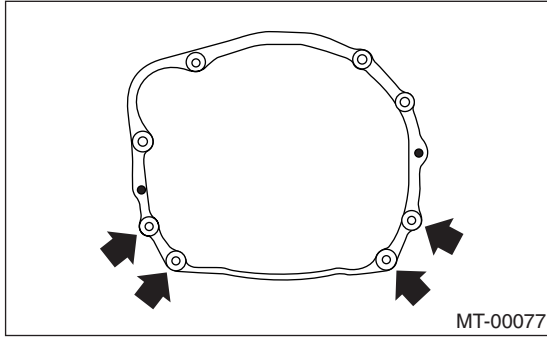


21) Remove the drive shafts from the transmission. <Ref. to DS-33, REMOVAL, Front Drive Shaft.>

# Manual Transmission Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

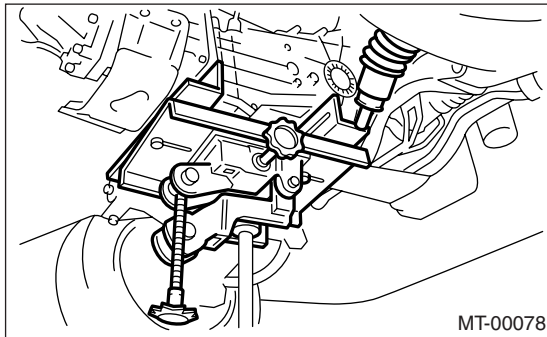
22) Remove the nuts which hold the lower side of transmission to engine.



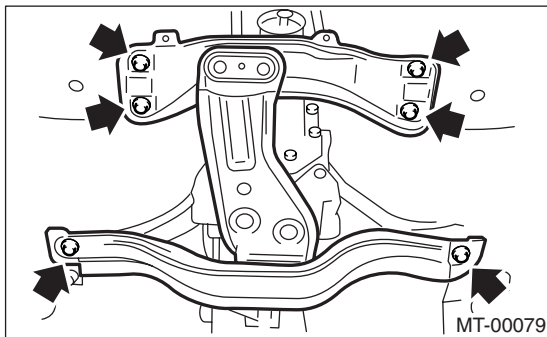
23) Place the transmission jack under transmission.

### CAUTION:

Always support the transmission case with a transmission jack.



24) Remove the transmission rear crossmember from vehicle.



25) Remove the transmission.

### NOTE:

Move the transmission jack toward rear until main shaft is withdrawn from clutch cover.

26) Separate the transmission assembly and rear cushion rubber.

## B: INSTALLATION

1) Install the rear cushion rubber to transmission assembly.

### Tightening torque:

**35 N·m (3.6 kgf-m, 26 ft-lb)**

2) Install the transmission onto engine.

(1) Gradually raise the transmission with transmission jack.

(2) Engage them at splines.

### NOTE:

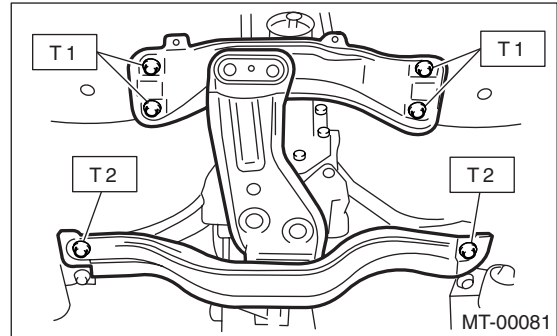
Be careful not to strike the main shaft against clutch cover.

3) Install the transmission rear crossmember.

### Tightening torque:

**T1: 70 N·m (7.1 kgf-m, 51.6 ft-lb)**

**T2: 140 N·m (14.3 kgf-m, 103 ft-lb)**

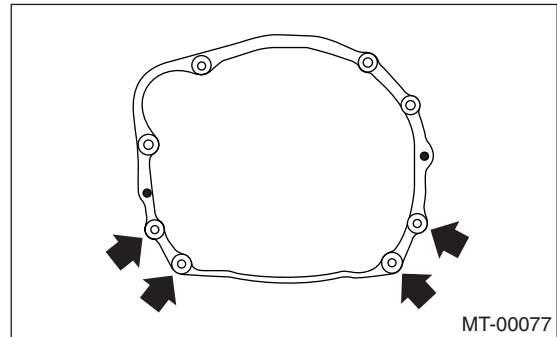


4) Take off the transmission jack.

5) Tighten the nuts which hold the lower side of transmission to engine.

### Tightening torque:

**50 N·m (5.1 kgf-m, 37 ft-lb)**



6) Connect the engine and transmission.

(1) Install the starter.

<Ref. to SC(H4SO)-8, INSTALLATION, Starter.>

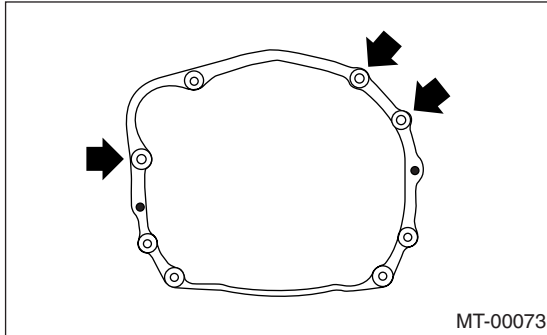
(2) Tighten the bolt which holds right upper side of transmission to engine.

# Manual Transmission Assembly

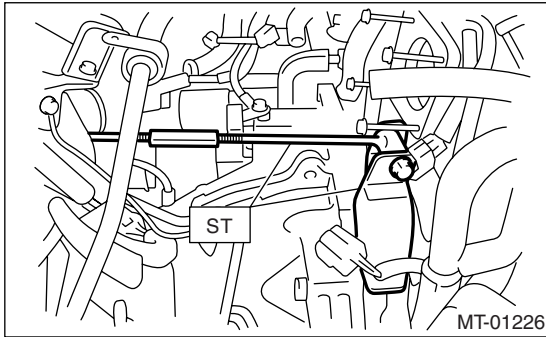
MANUAL TRANSMISSION AND DIFFERENTIAL

## Tightening torque:

**50 N·m (5.1 kgf-m, 37 ft-lb)**



7) Remove the ST.

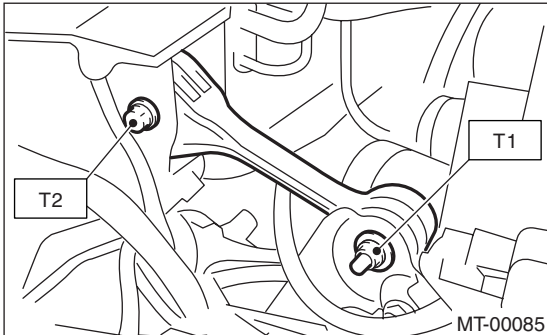


8) Install the pitching stopper.

## Tightening torque:

**T1: 50 N·m (5.1 kgf-m, 37 ft-lb)**

**T2: 58 N·m (5.9 kgf-m, 43 ft-lb)**



9) Install the throttle body.

- Non-turbo model

<Ref. to FU(H4SO)-12, INSTALLATION, Throttle Body.>

- Turbo model

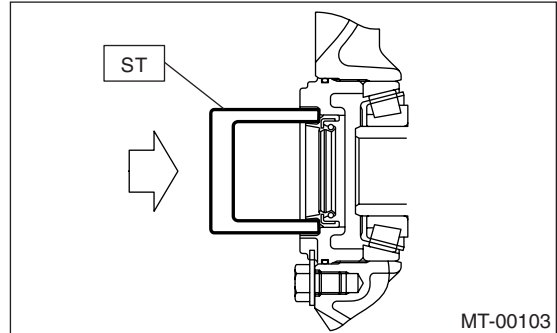
<Ref. to FU(H4DOTC)-13, INSTALLATION, Throttle Body.>

10) Lift-up the vehicle.

11) Replace the differential side retainer oil seal.

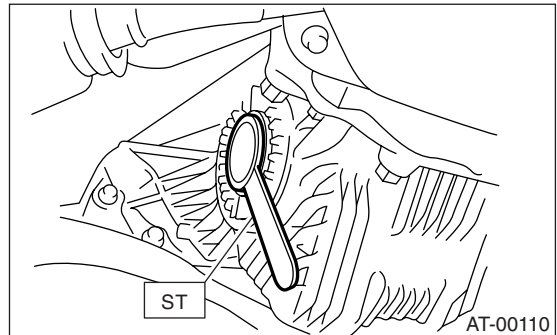
## NOTE:

Be sure to replace the differential side retainer oil seal after the procedure of removing the front drive shaft.



12) Install the front drive shaft into transmission.

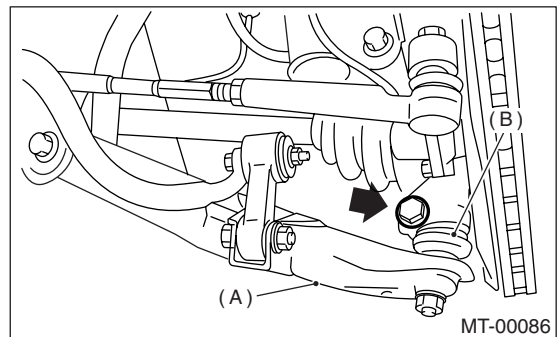
ST 28399SA010 OIL SEAL PROTECTOR



13) Install the ball joints of lower arm into knuckle arm of housing, and tighten the installing bolts.

## Tightening torque:

**49 N·m (5.0 kgf-m, 36 ft-lb)**



(A) Transverse link

(B) Ball joint

# Manual Transmission Assembly

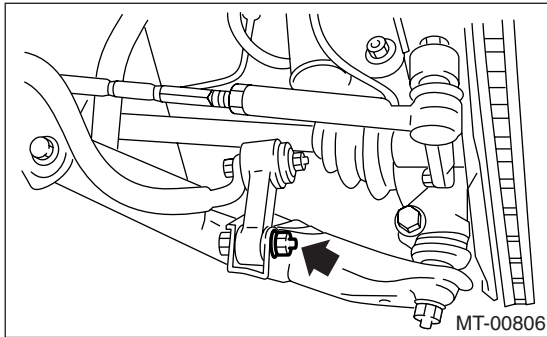
## MANUAL TRANSMISSION AND DIFFERENTIAL

14) Install the stabilizer link from transverse link.

- Wagon model

**Tightening torque:**

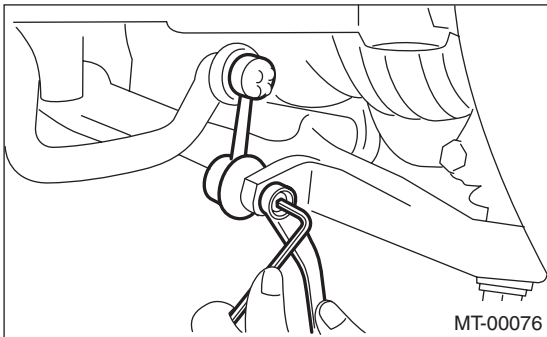
**30 N·m (3.1 kgf·m, 22 ft·lb)**



- Sedan model

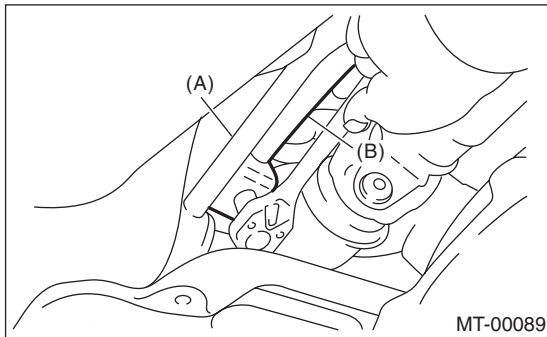
**Tightening torque:**

**45 N·m (4.6 kgf·m, 33 ft·lb)**



15) Install the gear shift rod and the stay.

- (1) Install the gear shift rod onto transmission.

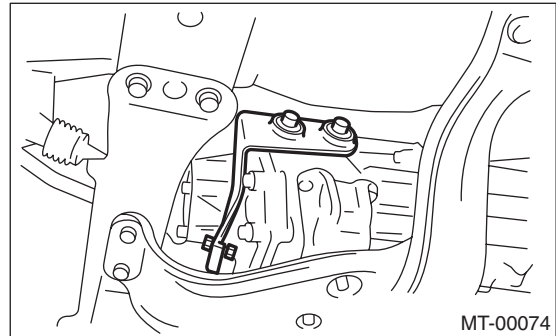


- (A) Stay  
(B) Rod

- (2) Install the stay onto transmission.

16) Install the propeller shaft. <Ref. to DS-17, INSTALLATION, Propeller Shaft.>

17) Install the hanger bracket on right side of transmission.



18) Install the rear exhaust pipe and muffler.

- Non-turbo model

<Ref. to EX(H4SO)-7, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, INSTALLATION, Muffler.>

- Turbo model

<Ref. to EX(H4DOTC)-15, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, INSTALLATION, Muffler.>

19) Install the front exhaust pipe and center exhaust pipe. (Non-turbo model)

<Ref. to EX(H4SO)-4, INSTALLATION, Front Exhaust Pipe.>

20) Install the center exhaust pipe. (Turbo model) <Ref. to EX(H4DOTC)-11, INSTALLATION, Center Exhaust Pipe.>

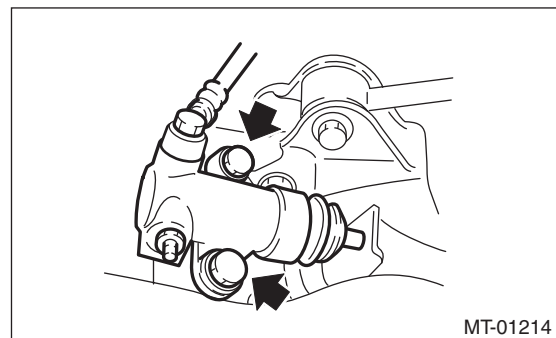
21) Install the under cover.

22) Install the operating cylinder.

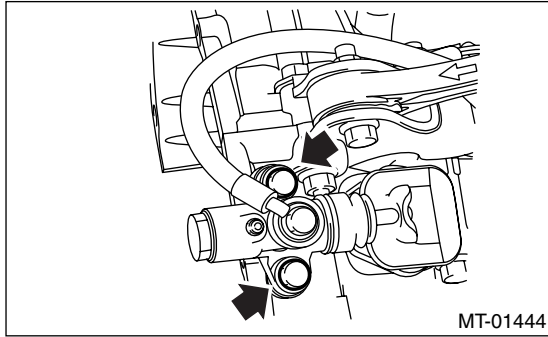
**Tightening torque:**

**37 N·m (3.8 kgf·m, 27.5 ft·lb)**

- Non-turbo model



- Turbo model



- 23) Connect the following connectors:  
(1) Transmission ground cable

**Tightening torque:**

**13 N·m (1.3 kgf-m, 9.4 ft-lb)**

- (2) Vehicle speed sensor connector  
(3) Neutral position switch connector  
(4) Back-up light switch connector
- 24) Install the air cleaner case stay.

**Tightening torque:**

**16 N·m (1.6 kgf-m, 11.6 ft-lb)**

- 25) Install the air intake duct and cleaner case.  
(Non-turbo model)
- 26) Install the intercooler. (Turbo model).
- 27) Connect the battery ground cable to battery.
- 28) Take off the vehicle from lift arms.



# Transmission Mounting System

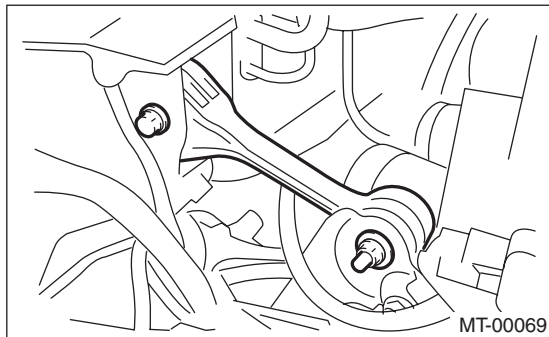
MANUAL TRANSMISSION AND DIFFERENTIAL

## 4. Transmission Mounting System

### A: REMOVAL

#### 1. PITCHING STOPPER

- 1) Disconnect the ground cable from battery.
- 2) Remove the air intake duct. (Non-turbo model)  
<Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>
- 3) Remove the air cleaner case. (Non-turbo model)  
<Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
- 4) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 5) Remove the throttle body.
  - Non-turbo model  
<Ref. to FU(H4SO)-12, REMOVAL, Throttle Body.>
  - Turbo model  
<Ref. to FU(H4DOTC)-13, REMOVAL, Throttle Body.>
- 6) Remove the pitching stopper.



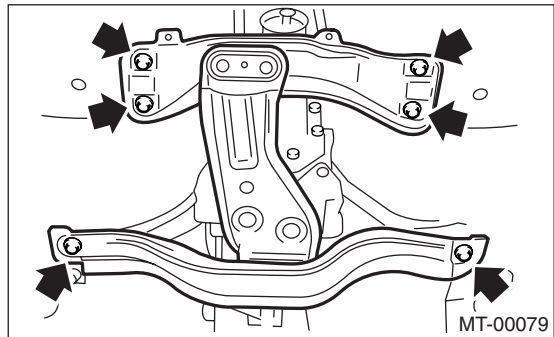
#### 2. CROSSMEMBER AND CUSHION RUBBER

- 1) Disconnect the ground cable from battery.
- 2) Jack-up the vehicle and support it with rigid racks.
- 3) Remove the front and center exhaust pipes. (Non-turbo model)  
<Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>
- 4) Remove the center exhaust pipe. (Turbo model)  
<Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>
- 5) Remove the rear exhaust pipe and muffler.
  - Non-turbo model  
<Ref. to EX(H4SO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, REMOVAL, Muffler.>
  - Turbo model  
<Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>
- 6) Set the transmission jack under the transmission body.

### CAUTION:

Always support the transmission case with a transmission jack.

- 7) Remove the rear crossmember.



- 8) Remove the rear cushion rubber.

### B: INSTALLATION

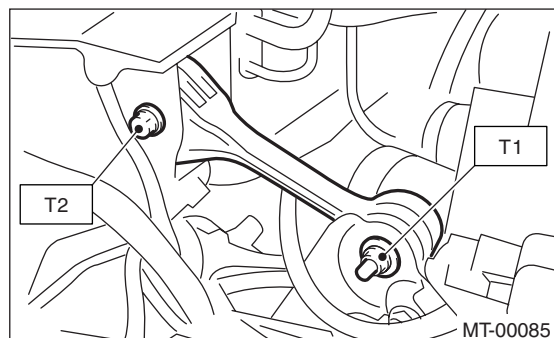
#### 1. PITCHING STOPPER

- 1) Install the pitching stopper.

#### Tightening torque:

**T1: 50 N·m (5.1 kgf-m, 37 ft-lb)**

**T2: 58 N·m (5.9 kgf-m, 43 ft-lb)**



- 2) Install the throttle body.

- Non-turbo model  
<Ref. to FU(H4SO)-12, INSTALLATION, Throttle Body.>
  - Turbo model  
<Ref. to FU(H4DOTC)-13, INSTALLATION, Throttle Body.>
- 3) Install the air intake duct and cleaner case. (Non-turbo model)  
<Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.>
  - 4) Install the intercooler. (Turbo model)  
<Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
  - 5) Connect the battery ground cable to battery.

## 2. CROSSMEMBER AND CUSHION RUBBER

1) Install the rear cushion rubber.

### **Tightening torque:**

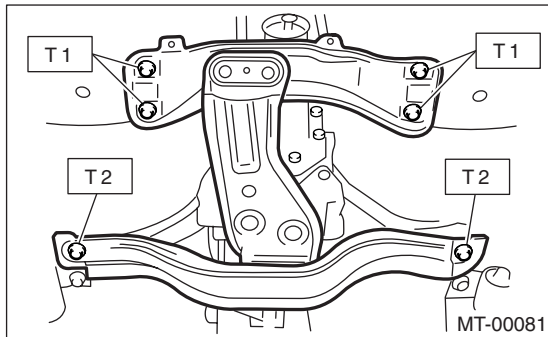
**35 N·m (3.6 kgf-m, 26 ft-lb)**

2) Install the rear crossmember.

### **Tightening torque:**

**T1: 70 N·m (7.1 kgf-m, 51 ft-lb)**

**T2: 140 N·m (14.3 kgf-m, 103 ft-lb)**



3) Remove the transmission jack.

4) Install the front and center exhaust pipes. (Non-turbo model)

<Ref. to EX(H4SO)-4, INSTALLATION, Front Exhaust Pipe.>

5) Install the center exhaust pipe. (Turbo model)  
<Ref. to EX(H4DOTC)-11, INSTALLATION, Center Exhaust Pipe.>

6) Install the rear exhaust pipe and muffler.

- Non-turbo model

<Ref. to EX(H4SO)-7, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, INSTALLATION, Muffler.>

- Turbo model

<Ref. to EX(H4DOTC)-15, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, INSTALLATION, Muffler.>

## C: INSPECTION

Repair or replace parts if the results of the inspection below are not satisfactory.

### 1. PITCHING STOPPER

Make sure the pitching stopper is not bent or damaged. Make sure the rubber is not stiff, cracked, or otherwise damaged.

### 2. CROSSMEMBER AND CUSHION RUBBER

Make sure the crossmember is not bent or damaged. Make sure the cushion rubber is not stiff, cracked, or otherwise damaged.



# Oil Seal

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 5. Oil Seal

#### A: INSPECTION

Check the oil seal portion for leakage. If leakage is found, replace the oil seal with a new one.

#### B: REPLACEMENT

- 1) Clean the transmission exterior.
- 2) Remove the drain plug using TORX® BIT T70, and drain the transmission gear oil completely.

NOTE:

Tighten the drain plug after draining gear oil.

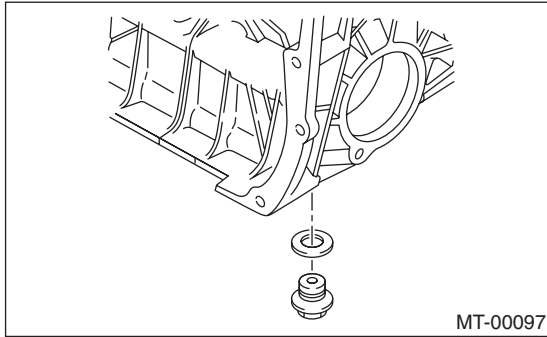
#### Tightening torque:

##### Aluminum gasket

**44 N·m (4.5 kgf·m, 32.5 ft·lb)**

##### Copper gasket

**70 N·m (7.1 kgf·m, 51.6 ft·lb)**



- 3) Remove the rear exhaust pipe and muffler.

- Non-turbo model

<Ref. to EX(H4SO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, REMOVAL, Muffler.>

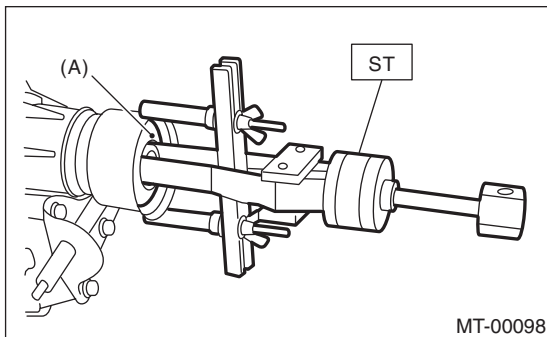
- Turbo model

<Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>

- 4) Remove the propeller shaft. <Ref. to DS-16, REMOVAL, Propeller Shaft.>

- 5) Using the ST, remove the oil seal.

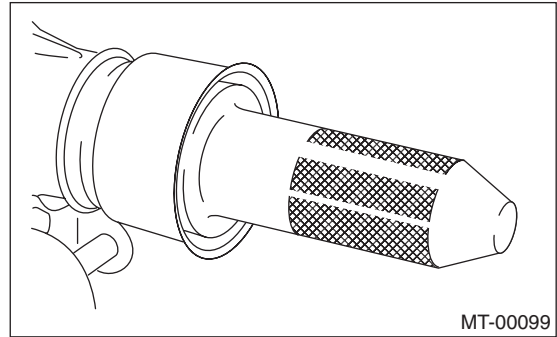
ST 398527700 PULLER ASSY



(A) Oil seal

- 6) Using the ST, install the oil seal.

ST 498057300 INSTALLER



- 7) Install the propeller shaft. <Ref. to DS-17, INSTALLATION, Propeller Shaft.>

- 8) Install the rear exhaust pipe and muffler.

- Non-turbo model

<Ref. to EX(H4SO)-7, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, INSTALLATION, Muffler.>

- Turbo model

<Ref. to EX(H4DOTC)-15, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, INSTALLATION, Muffler.>

- 9) Pour gear oil and check the oil level. <Ref. to 5MT-25, REPLACEMENT, Transmission Gear Oil.>

# Differential Side Retainer Oil Seal

MANUAL TRANSMISSION AND DIFFERENTIAL

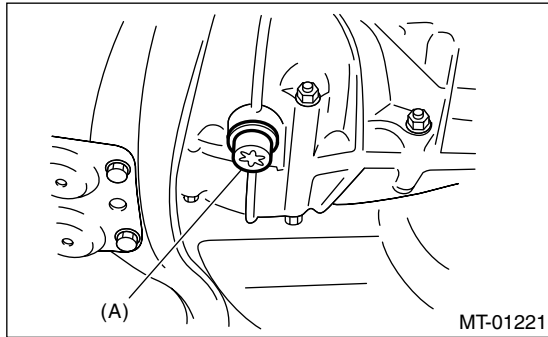
## 6. Differential Side Retainer Oil Seal

### A: INSPECTION

Check leakage of gear oil from the differential side retainer oil seal part. If there is oil leakage, replace with a new oil seal, and check drive shaft.

### B: REPLACEMENT

- 1) Lift-up the vehicle.
- 2) Remove the drain plug using TORX® BIT T70, and drain the differential gear oil completely.



(A) Drain plug

- 3) Replace with a new gasket and tighten the drain plug using TORX® BIT T70.

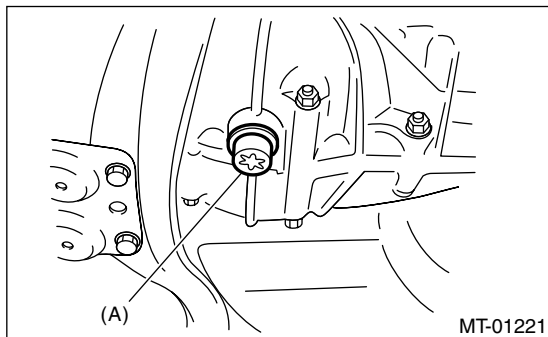
#### Tightening torque:

##### Aluminum gasket

**44 N·m (4.5 kgf·m, 32.5 ft·lb)**

##### Copper gasket

**70 N·m (7.1 kgf·m, 51.6 ft·lb)**



(A) Drain plug

- 4) Remove the front and center exhaust pipe. (Non-turbo model)  
<Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>
- 5) Separate the front drive shaft from transmission.  
<Ref. to DS-33, REMOVAL, Front Drive Shaft.>
- 6) Remove the differential side retainer oil seal.

#### NOTE:

- Be sure to replace the differential side retainer oil seal after the procedure of removing the front drive shaft from transmission.

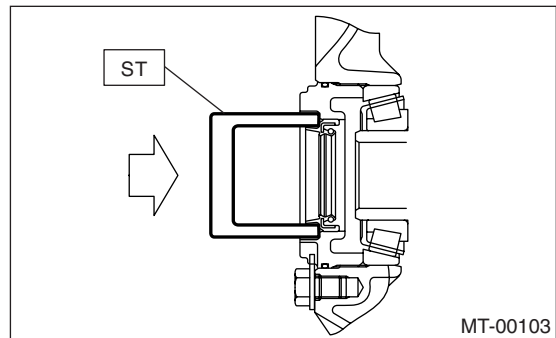
- When removing the oil seal, using the ST 398527700 PULLER ASSY. Also when using a flat tip screwdriver, be careful not to scratch the differential side retainer

7) Using the ST, install the differential side retainer by slightly tapping with a plastic hammer.

ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER

#### NOTE:

Apply oil to the oil seal lips.



MT-00103

8) Install the front drive shaft. <Ref. to DS-33, INSTALLATION, Front Drive Shaft.>

ST 28399SA010 OIL SEAL PROTECTOR

9) Install the front and center exhaust pipe. (Non-turbo model)

<Ref. to EX(H4SO)-4, INSTALLATION, Front Exhaust Pipe.>

10) Lower the vehicle.

11) Pour gear oil through the gauge hole. <Ref. to 5MT-25, REPLACEMENT, Transmission Gear Oil.>

# Switches and Harness

## MANUAL TRANSMISSION AND DIFFERENTIAL

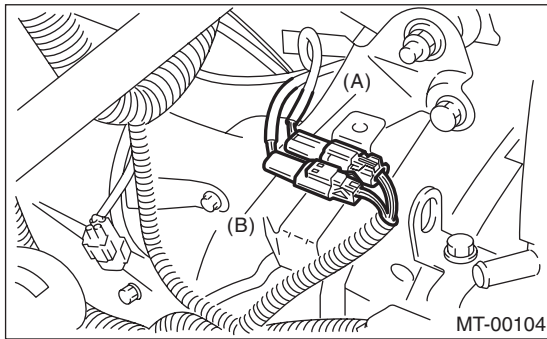
### 7. Switches and Harness

#### A: REMOVAL

##### 1. BACK-UP LIGHT AND NEUTRAL POSITION SWITCH

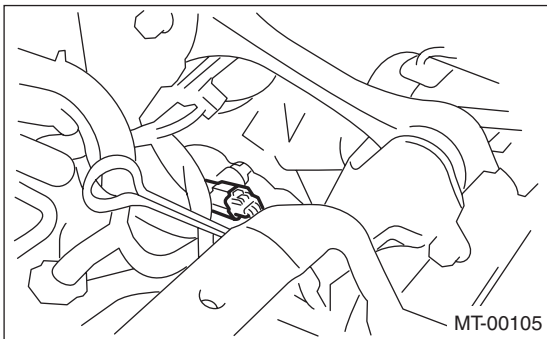
- 1) Disconnect the ground cable from battery.
- 2) Remove the air intake duct and cleaner case. (Non-turbo model) <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.> <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>
- 3) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 4) Disconnect the connector of back-up light switch and neutral position switch.

- Non-turbo model



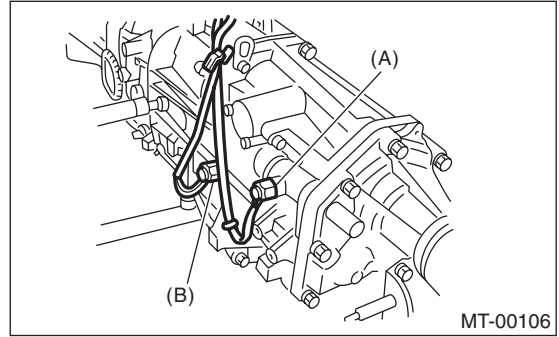
- (A) Neutral switch (Brown)
- (B) Back-up light switch (Gray)

- Turbo model



- 5) Lift-up the vehicle.

- 6) Remove the back-up light switch and neutral position switch with harness.



- (A) Neutral position switch (Brown)
- (B) Back-up light switch (Gray)

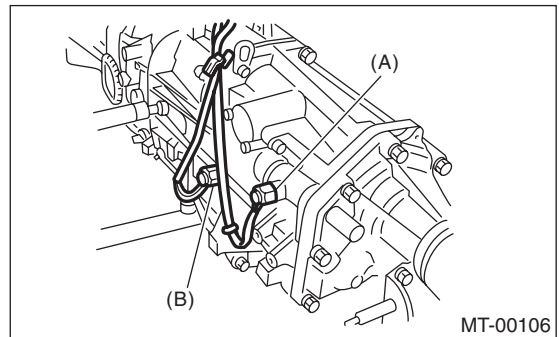
#### B: INSTALLATION

##### 1. BACK-UP LIGHT SWITCH AND NEUTRAL POSITION SWITCH

- 1) Install the back-up light switch and neutral position switch with harness.

##### *Tightening torque:*

**32.3 N·m (3.3 kgf·m, 23.8 ft·lb)**



- (A) Neutral position switch
- (B) Back-up light switch

- 2) Connect the connector of back-up light switch and neutral position switch.
- 3) Install the air intake duct and cleaner case. (Non-turbo model) <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.>
- 4) Install the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
- 5) Connect the battery ground cable to battery.

## C: INSPECTION

### 1. BACK-UP LIGHT SWITCH

Inspect the back-up light switch. <Ref. to LI-6, INSPECTION, Back-up Light System.>

### 2. NEUTRAL POSITION SWITCH

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the connector of neutral position switch.
- 3) Measure the resistance between neutral position switch terminals.

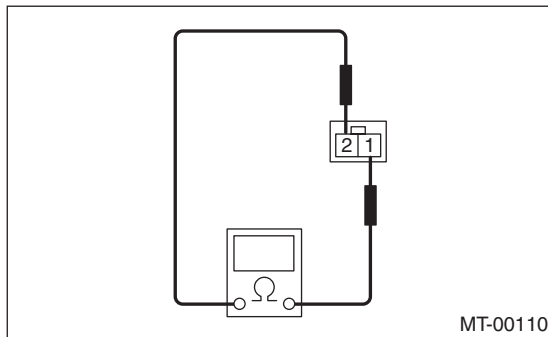
#### Non-turbo model:

| Gear shift position | Terminal No. | Specified resistance |
|---------------------|--------------|----------------------|
| Neutral position    | 1 and 2      | Less than 1 $\Omega$ |
| Other positions     |              | 1 M $\Omega$ or more |

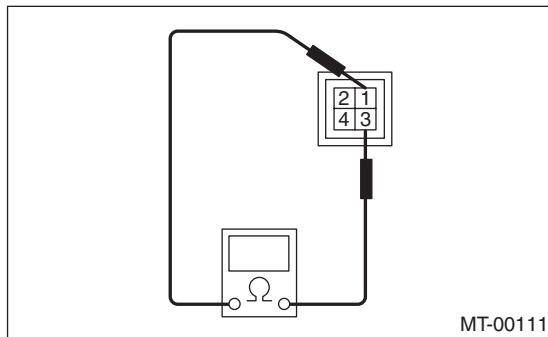
#### Turbo model:

| Gear shift position | Terminal No. | Specified resistance |
|---------------------|--------------|----------------------|
| Neutral position    | 1 and 3      | Less than 1 $\Omega$ |
| Other positions     |              | 1 M $\Omega$ or more |

- Non-turbo model



- Turbo model



- 4) Replace defective parts.

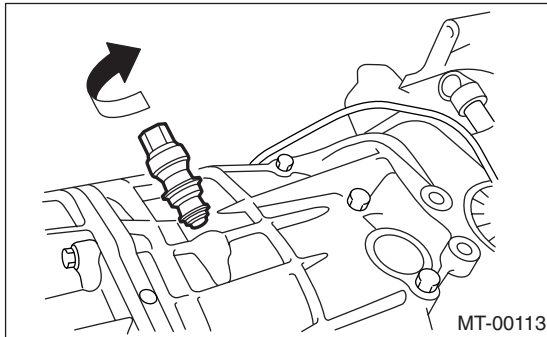
# Vehicle Speed Sensor

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 8. Vehicle Speed Sensor

#### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Remove the front, center and rear exhaust pipes and muffler.
  - Non-turbo model  
<Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.> <Ref. to EX(H4SO)-6, REMOVAL, Center Exhaust Pipe.> <Ref. to EX(H4SO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, REMOVAL, Muffler.>
  - Turbo model  
<Ref. to EX(H4DOTC)-8, REMOVAL, Front Exhaust Pipe.> <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>
- 4) Disconnect the connector from vehicle speed sensor.
- 5) Turn and remove the vehicle speed sensor.



#### B: INSTALLATION

##### NOTE:

- When the vehicle speed sensor is removed, discard it and replace with a new one.
  - Ensure the sensor mounting hole is clean and free of foreign matter.
  - Align the tip end of key with key groove on end of speedometer shaft during installation.
- 1) Hand tighten the vehicle speed sensor.
  - 2) Tighten the vehicle speed sensor using suitable tool.

##### **Tightening torque:**

**5.9 N·m (0.6 kgf·m, 4.3 ft·lb)**

- 3) Connect the connector to vehicle speed sensor.
- 4) Install the front, center and rear exhaust pipes and muffler.
  - Non-turbo model  
<Ref. to EX(H4SO)-4, INSTALLATION, Front Exhaust Pipe.> <Ref. to EX(H4SO)-6, INSTALLATION, Center Exhaust Pipe.> <Ref. to EX(H4SO)-7, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, INSTALLATION, Muffler.>

- Turbo model  
<Ref. to EX(H4DOTC)-8, INSTALLATION, Front Exhaust Pipe.> <Ref. to EX(H4DOTC)-11, INSTALLATION, Center Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, INSTALLATION, Muffler.>
- 5) Lower the vehicle.
  - 6) Connect the battery ground cable to battery.

#### C: INSPECTION

The vehicle speed sensor can not be inspected as a single unit. Check if speedometer operates normally. If it does not operate normally, inspect the combination meter system. <Ref. to IDI-3, INSPECTION, Combination Meter System.>

## 9. Preparation for Overhaul

### A: PROCEDURE

- 1) Clean oil, grease, dirt and dust from transmission.
- 2) Remove the drain plug using TORX® BIT T70, and drain the oil completely. After draining, retighten it.

**NOTE:**

Replace the gasket with a new one.

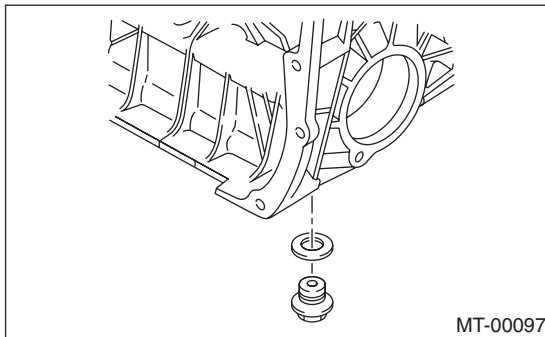
**Tightening torque:**

**Aluminum gasket**

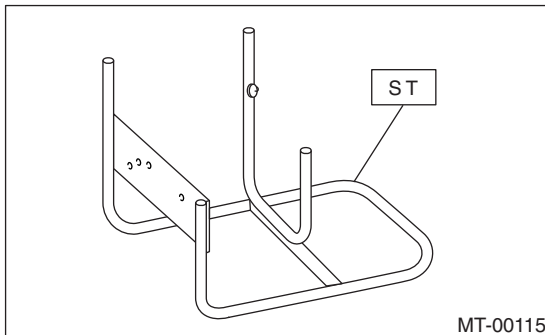
**44 N·m (4.5 kgf·m, 32.5 ft·lb)**

**Copper gasket**

**70 N·m (7.1 kgf·m, 51.6 ft·lb)**



- 3) Attach the transmission to ST.  
ST 499937100 TRANSMISSION STAND



- 4) Rotating parts should be coated with oil prior to assembly.
- 5) All disassembled parts, if to be reused, should be reinstalled in the original positions and directions.
- 6) Gaskets, lock washers and lock nut must be replaced with new ones.
- 7) Liquid gasket should be used where specified to prevent leakage.

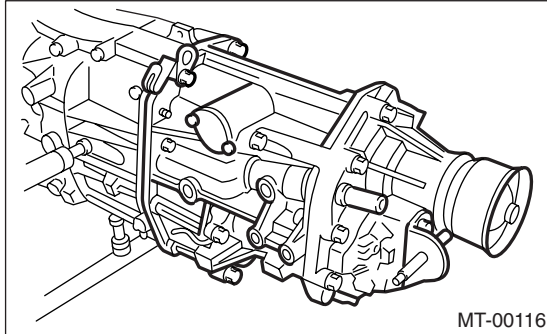
# Transfer Case and Extension Case Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

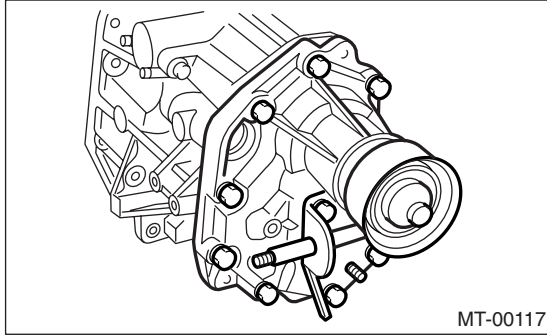
### 10. Transfer Case and Extension Case Assembly

#### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-36, REMOVAL, Switches and Harness.>
- 3) Remove the transfer case with extension case assembly.

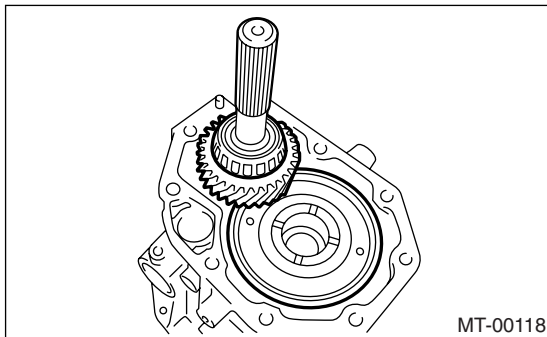


- 4) Remove the shifter arm.
- 5) Remove the extension case assembly.

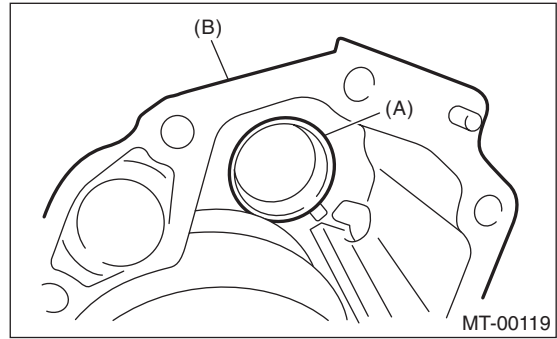


#### B: INSTALLATION

- 1) Install the center differential and transfer driven gear into transfer case.

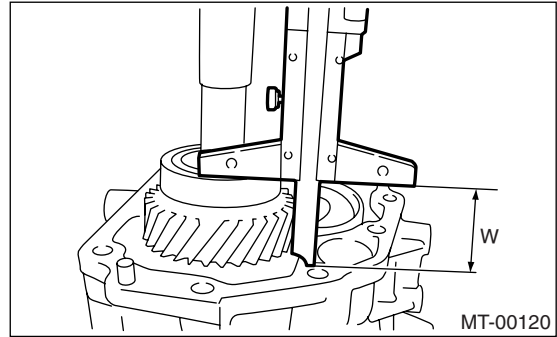


- 2) Remove the bearing outer race from the extension case.



- (A) Bearing outer race  
(B) Extension case

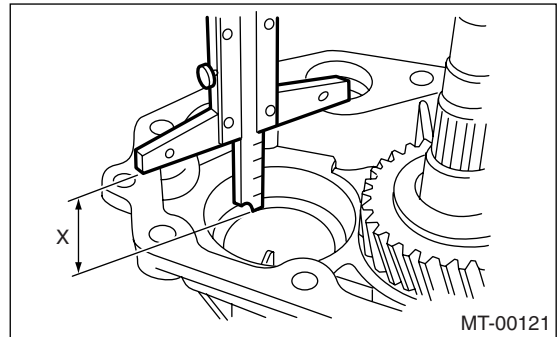
- 3) While pressing the bearing outer race horizontally, turn the driven shaft ten rotations.
- 4) Measure the height "W" between transfer case and taper roller bearing on the transfer driven gear.



- 5) Measure the depth "X".

#### NOTE:

Measure with bearing outer race and thrust washer removed.



- 6) Calculate the thrust washer thickness "t" using the following calculation.  
 $t = X - W + 0.15 \text{ to } 0.20 \text{ mm (0.006 to 0.008 in)}$
- 7) Select the nearest washer in the following table:

**Preload of the taper roller bearing (amount of standard protrusion):**

**0.15 — 0.20 mm (0.006 — 0.008 in)**



# Transfer Case and Extension Case Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

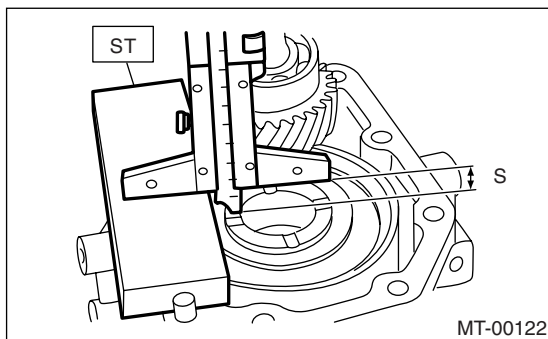
**NOTE:**

Be sure that the amount of preload is within the standard value.

| Thrust washer (50 × 61 × t) |                   |
|-----------------------------|-------------------|
| Part No.                    | Thickness mm (in) |
| 803050060                   | 0.50 (0.0197)     |
| 803050061                   | 0.55 (0.0217)     |
| 803050062                   | 0.60 (0.0236)     |
| 803050063                   | 0.65 (0.0256)     |
| 803050064                   | 0.70 (0.0276)     |
| 803050065                   | 0.75 (0.0295)     |
| 803050066                   | 0.80 (0.0315)     |
| 803050067                   | 0.85 (0.0335)     |
| 803050068                   | 0.90 (0.0354)     |
| 803050069                   | 0.95 (0.0374)     |
| 803050070                   | 1.00 (0.0394)     |
| 803050071                   | 1.05 (0.0413)     |
| 803050072                   | 1.10 (0.0433)     |
| 803050073                   | 1.15 (0.0453)     |
| 803050074                   | 1.20 (0.0472)     |
| 803050075                   | 1.25 (0.0492)     |
| 803050076                   | 1.30 (0.0512)     |
| 803050077                   | 1.35 (0.0531)     |
| 803050078                   | 1.40 (0.0551)     |
| 803050079                   | 1.45 (0.0571)     |

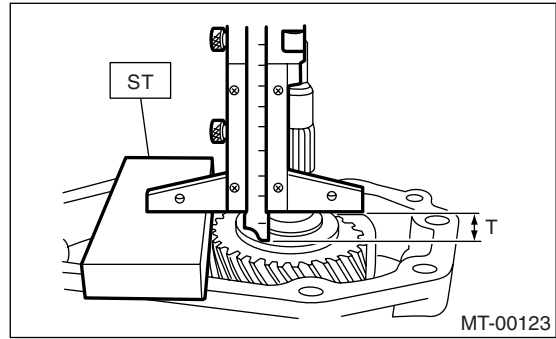
- 8) Fit the thrust washers on transfer drive shaft.
- 9) Install the bearing outer race into extension case.
- 10) Measure the depth “S” between transfer case and center differential.

ST 398643600 GAUGE



- 11) Measure the depth “T” between extension case and transfer drive gear.

ST 398643600 GAUGE



**NOTE:**

Thickness of ST: 15 mm (0.59 in)

12) Calculate the space “U” using the following equation:  $U = S + T - 30 \text{ mm (1.18 in)}$  [Thickness of ST]

13) Select the suitable washer in the following table:

**Standard clearance:**

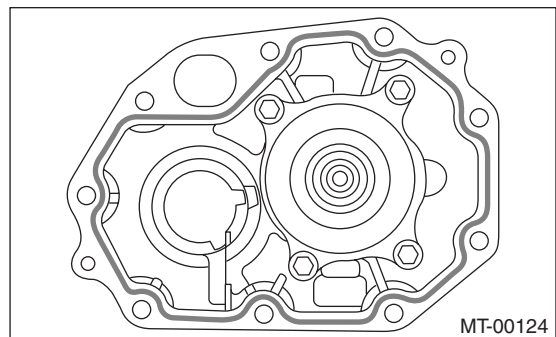
**0.15 — 0.35 mm (0.0059 — 0.0138 in)**

| Thrust washer |                   |
|---------------|-------------------|
| Part No.      | Thickness mm (in) |
| 803036050     | 0.9 (0.035)       |
| 803036054     | 1.0 (0.039)       |
| 803036051     | 1.1 (0.043)       |
| 803036055     | 1.2 (0.047)       |
| 803036052     | 1.3 (0.051)       |
| 803036056     | 1.4 (0.055)       |
| 803036053     | 1.5 (0.059)       |
| 803036057     | 1.6 (0.063)       |
| 803036058     | 1.7 (0.067)       |

- 14) Fit the thrust washer on center differential.
- 15) Apply proper amount of liquid gasket to the transfer case mating surface.

**Liquid gasket:**

**THREE BOND 1215B (Part No. 004403007) or equivalent**



- 16) Install the extension assembly into transfer case.

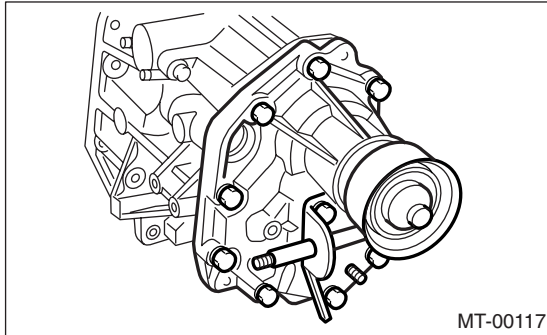


# Transfer Case and Extension Case Assembly

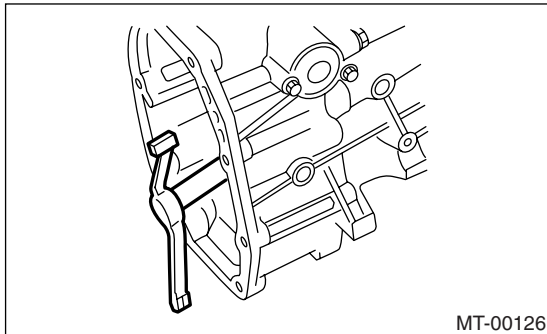
## MANUAL TRANSMISSION AND DIFFERENTIAL

### Tightening torque:

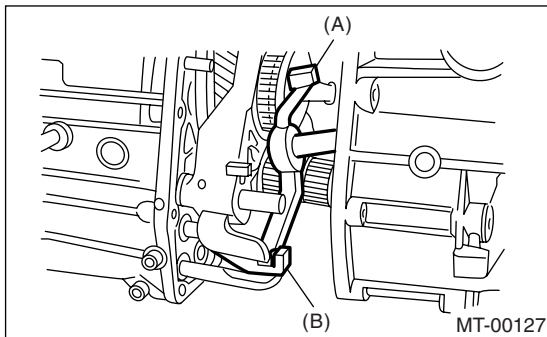
**40 N·m (4.1 kgf-m, 29.7 ft-lb)**



17) Install the shifter arm to transfer case.



18) Hang the shifter arm on 3rd-4th fork rod.



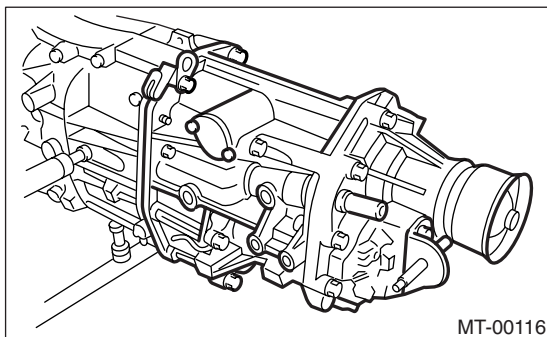
(A) Shifter arm

(B) 3rd-4th fork rod

19) Install the transfer case with extension case assembly to transmission case.

### Tightening torque:

**24.5 N·m (2.5 kgf-m, 18.1 ft-lb)**

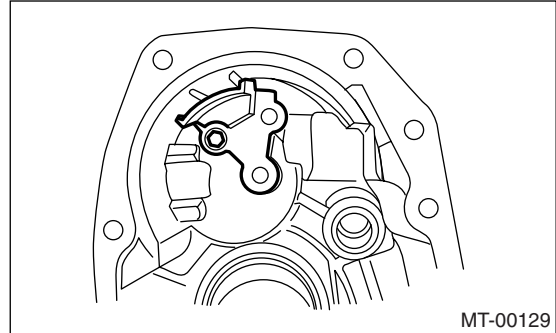


## C: DISASSEMBLY

### 1. TRANSFER CASE

1) Remove the reverse check assembly. <Ref. to 5MT-49, REMOVAL, Reverse Check Sleeve.>

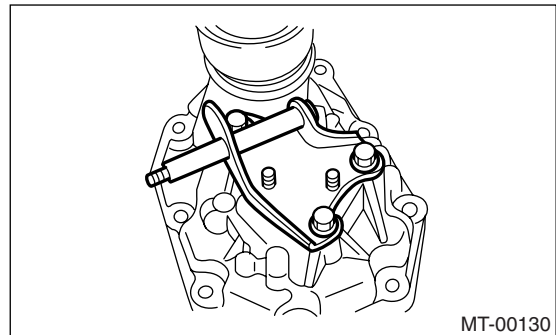
2) Remove the oil guide.



### 2. EXTENSION CASE

1) Remove the transfer drive gear assembly. <Ref. to 5MT-44, REMOVAL, Transfer Drive Gear.>

2) Remove the shift bracket.



3) Remove the oil seal from extension case. <Ref. to 5MT-34, Oil Seal.>

## D: ASSEMBLY

### 1. EXTENSION CASE

1) Using the ST, install the oil seal to extension case. <Ref. to 5MT-34, Oil Seal.>

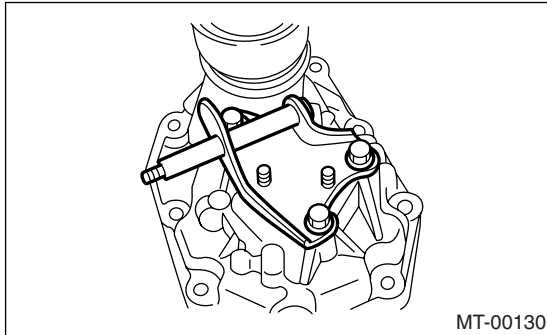
**NOTE:**

Use a new oil seal.

2) Install the shift bracket to extension case.

**Tightening torque:**

**24.5 N·m (2.5 kgf-m, 18.1 ft-lb)**



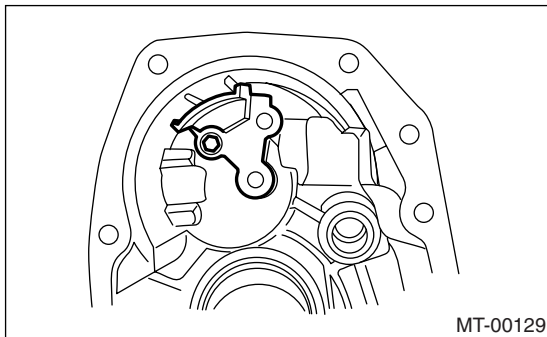
3) Install the transfer drive gear to extension case. <Ref. to 5MT-44, INSTALLATION, Transfer Drive Gear.>

### 2. TRANSFER CASE

1) Install the oil guide to transfer case.

**Tightening torque:**

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



2) Install the reverse check sleeve assembly to transfer case. <Ref. to 5MT-49, INSTALLATION, Reverse Check Sleeve.>

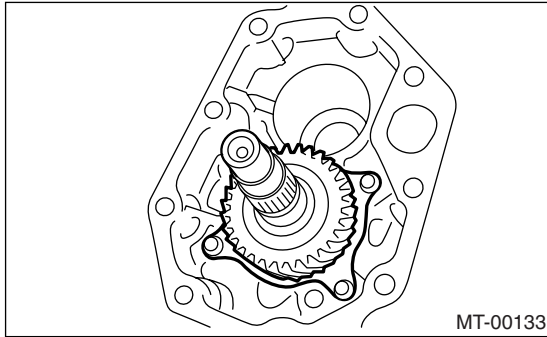
# Transfer Drive Gear

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 11. Transfer Drive Gear

#### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-36, REMOVAL, Switches and Harness.>
- 3) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the extension case assembly.
- 5) Remove the transfer driven gear.
- 6) Remove the transfer drive gear.

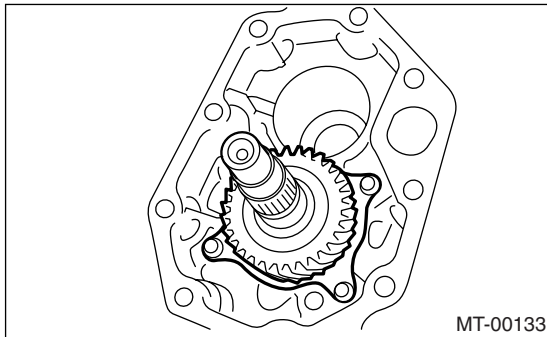


#### B: INSTALLATION

- 1) Install the transfer drive gear.

#### Tightening torque:

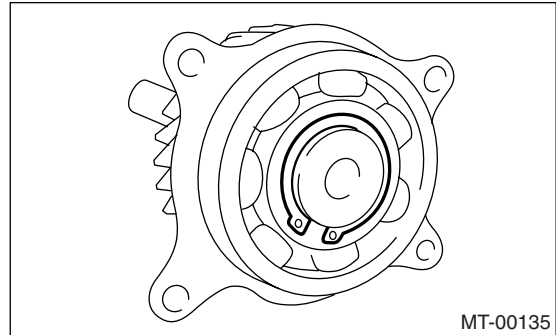
**26 N·m (2.7 kgf·m, 20 ft·lb)**



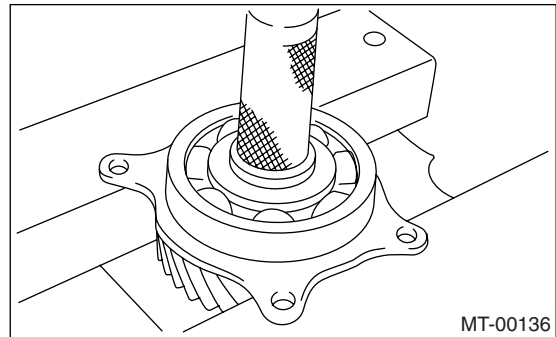
- 2) Install the transfer driven gear.
- 3) Install the extension case assembly.
- 4) Install the transfer case and extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 5) Install the back-up light switch and neutral position switch. <Ref. to 5MT-36, INSTALLATION, Switches and Harness.>
- 6) Install the manual transmission assembly from vehicle. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

#### C: DISASSEMBLY

- 1) Remove the snap ring.



- 2) Remove the ball bearing.



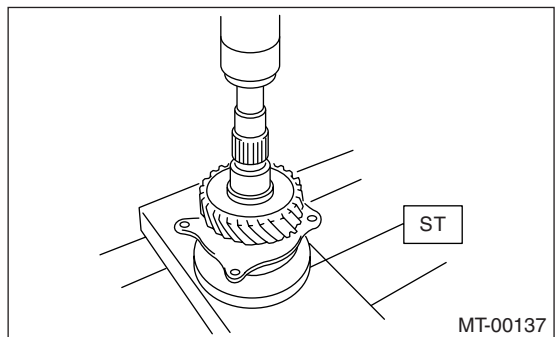
#### D: ASSEMBLY

- 1) Set the ST applying to inner race of bearing and install to drive shaft.

ST 398177700 INSTALLER

#### NOTE:

- Use a new bearing.
- Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



- 2) Install the snap ring on transfer drive shaft.
- 3) Check the clearance between snap ring and ball bearing. <Ref. to 5MT-45, INSPECTION, Transfer Drive Gear.>

## E: INSPECTION

### 1) Bearings

Replace the bearings in the following cases:

- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make noise when turned after gear oil lubrication.

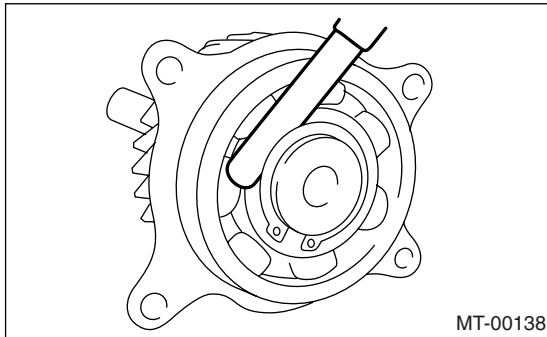
### 2) Drive gear

Replace the drive gear if their tooth surfaces and shaft are excessively broken or damaged.

3) Measure the clearance between snap ring and inner race of ball bearing with a thickness gauge.

### Clearance:

**0.01 — 0.15 mm (0.0004 — 0.0059 in)**



If the measurement is not within specification, select a suitable snap ring and replace.

| Snap ring (Outer-30) |                   |
|----------------------|-------------------|
| Part No.             | Thickness mm (in) |
| 805030041            | 1.53 (0.0602)     |
| 805030042            | 1.65 (0.0650)     |
| 805030043            | 1.77 (0.0697)     |

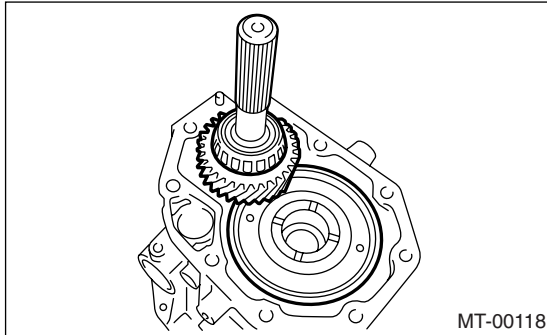
# Transfer Driven Gear

## MANUAL TRANSMISSION AND DIFFERENTIAL

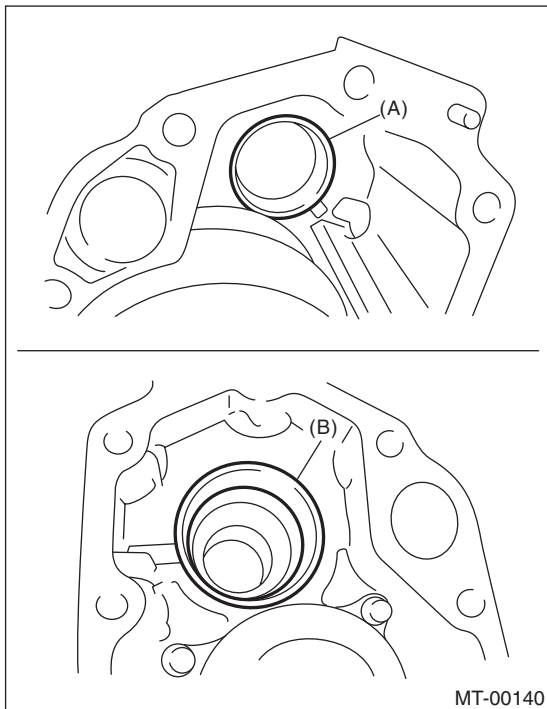
### 12. Transfer Driven Gear

#### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-36, REMOVAL, Switches and Harness.>
- 3) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the extension case assembly.
- 5) Remove the transfer driven gear.



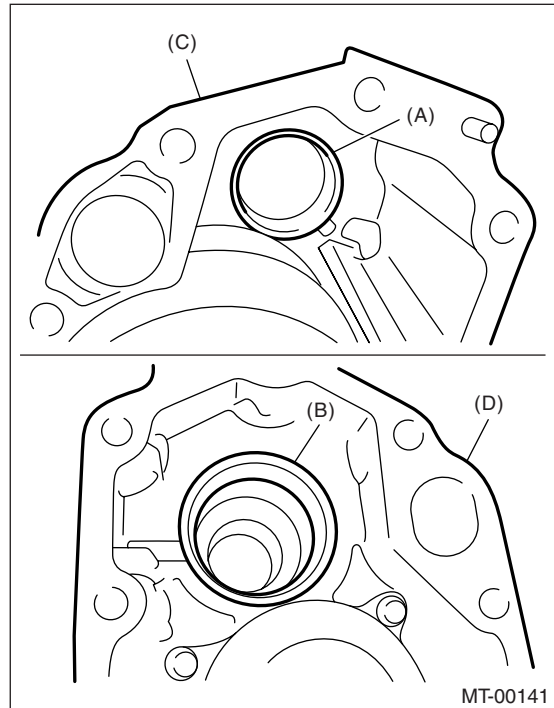
- 6) Remove the bearing outer race from extension case and transfer case.



- (A) Bearing outer race (transfer case side)
- (B) Bearing outer race (extension case side)

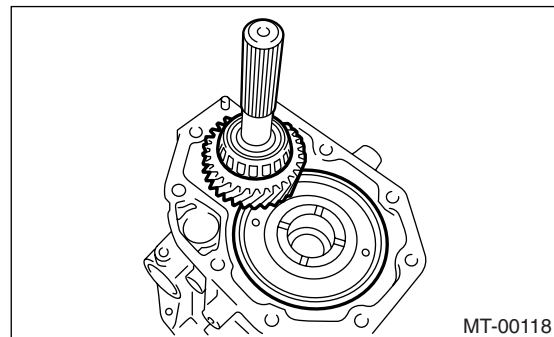
#### B: INSTALLATION

- 1) Install the bearing outer race to extension case and transfer case.



- (A) Bearing outer race
- (B) Bearing outer race
- (C) Transfer case
- (D) Extension case

- 2) Install the transfer driven gear.



- 3) Install the transfer case and extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 4) Install the back-up light switch and neutral position switch. <Ref. to 5MT-36, INSTALLATION, Switches and Harness.>
- 5) Install the manual transmission assembly to vehicle. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

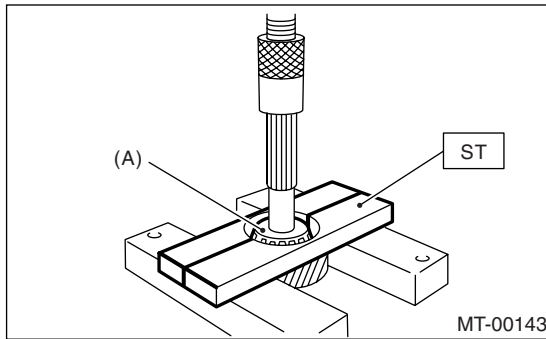
# Transfer Driven Gear

MANUAL TRANSMISSION AND DIFFERENTIAL

## C: DISASSEMBLY

1) Using the ST, remove the roller bearing (extension case side).

ST 498077000 REMOVER

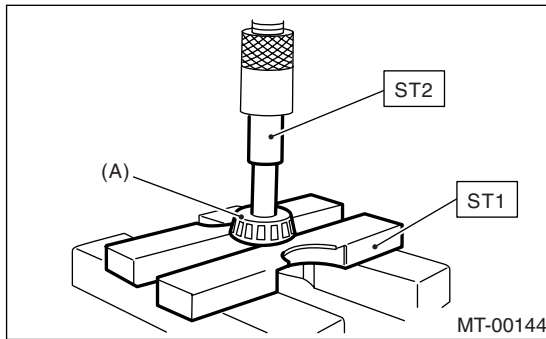


(A) Roller bearing

2) Using the ST1 and ST2, remove the roller bearing (transfer case side).

ST1 498077000 REMOVER

ST2 899864100 REMOVER



(A) Roller bearing

## D: ASSEMBLY

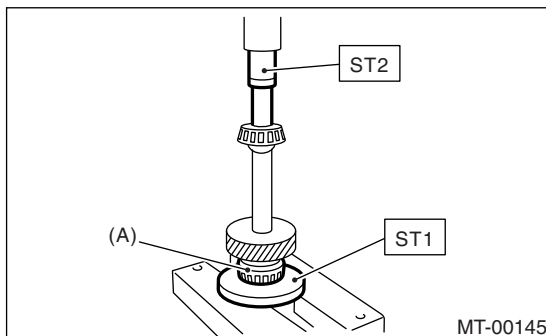
1) Using the ST, install the roller bearing (extension case side).

ST1 398177700 INSTALLER

ST2 899864100 REMOVER

NOTE:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



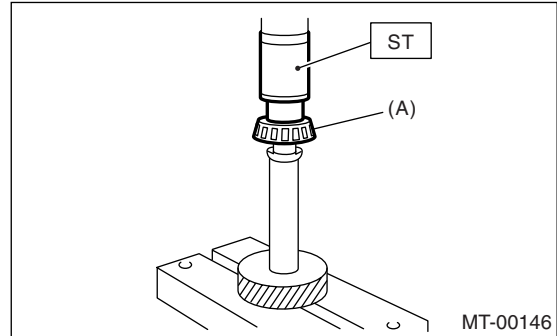
(A) Roller bearing

2) Using the ST, install the roller bearing (transfer case side).

ST 499757002 INSTALLER

NOTE:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



(A) Roller bearing

## E: INSPECTION

1) Bearings

Replace the bearings in the following cases:

- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make noise when turned after gear oil lubrication.

2) Driven gear

Replace the driven gear if their tooth surfaces and shaft are excessively broken or damaged.

# Center Differential

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 13.Center Differential

#### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove the extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the transfer driven gear. <Ref. to 5MT-46, REMOVAL, Transfer Driven Gear.>
- 5) Remove the center differential.

#### B: INSTALLATION

- 1) Install the center differential into transfer case.
- 2) Install the transfer driven gear. <Ref. to 5MT-46, INSTALLATION, Transfer Driven Gear.>
- 3) Install the extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 4) Install the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
- 5) Install the back-up light switch and neutral position switch. <Ref. to 5MT-36, REMOVAL, Switches and Harness.>
- 6) Install the manual transmission assembly to vehicle. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

#### C: DISASSEMBLY

##### NOTE:

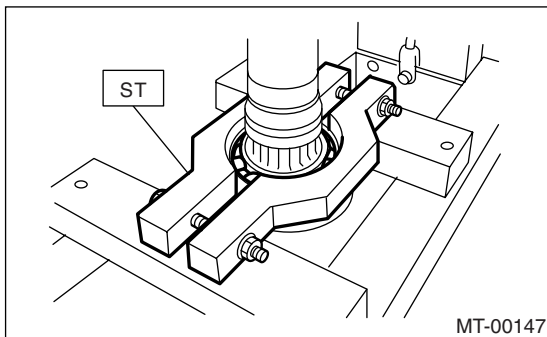
Do not disassemble the center differential because it is a non-disassemble part.

Remove the ball bearing using ST.

##### NOTE:

Do not reuse the ball bearing.

ST 498077300 CENTER DIFFERENTIAL BEARING REMOVER

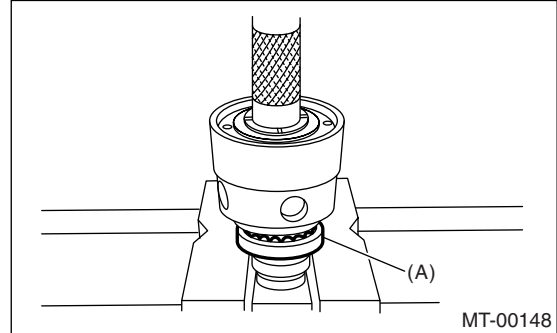


#### D: ASSEMBLY

Install the ball bearing to center differential assembly.

##### NOTE:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).



(A) Ball bearing

#### E: INSPECTION

##### 1) Bearings

Replace the bearings in the following cases:

- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make noise when turned after gear oil lubrication.
- Bearings having other defects

##### 2) Center differential

Replace the center differential assembly if it is worn or damaged.



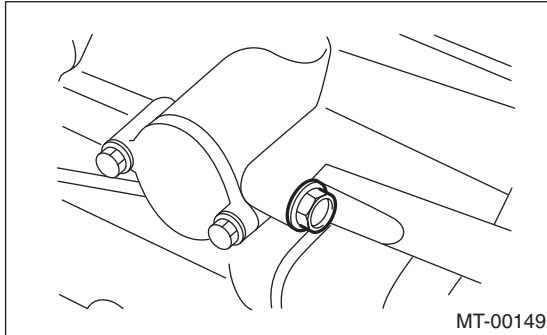
# Reverse Check Sleeve

MANUAL TRANSMISSION AND DIFFERENTIAL

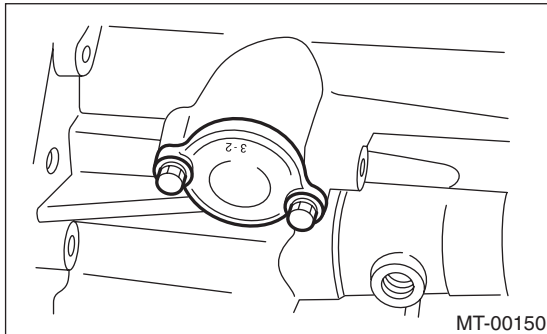
## 14. Reverse Check Sleeve

### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove the shifter arm.
- 4) Remove the plug, spring, washer and reverse check ball.



- 5) Remove the reverse check sleeve.

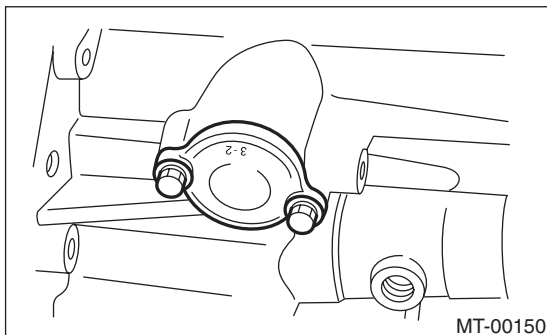


### B: INSTALLATION

- 1) Install the reverse check sleeve.

**Tightening torque:**

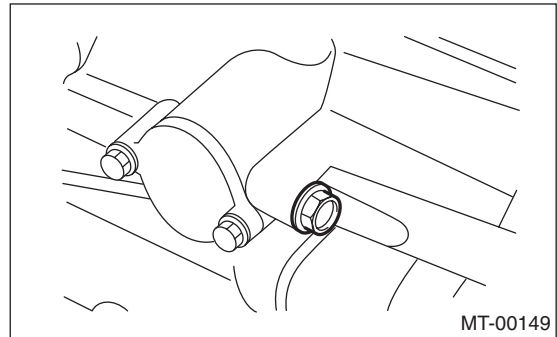
**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



- 2) Install the ball, spring, washer and plug to transfer case.

**Tightening torque:**

**9.75 N·m (1.0 kgf-m, 7.2 ft-lb)**



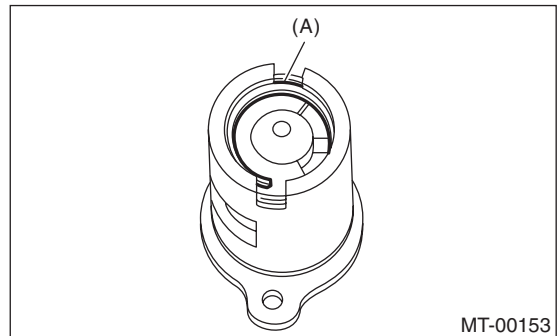
- 3) Install the shifter arm to transfer case assembly.
- 4) Install the transfer case with extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 5) Install the manual transmission assembly to vehicle. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

### C: DISASSEMBLY

- 1) Cover the reverse check sleeve with a rag, and remove the snap ring using a screwdriver.

**NOTE:**

Replace the snap ring with a new one if deformed or weakened.



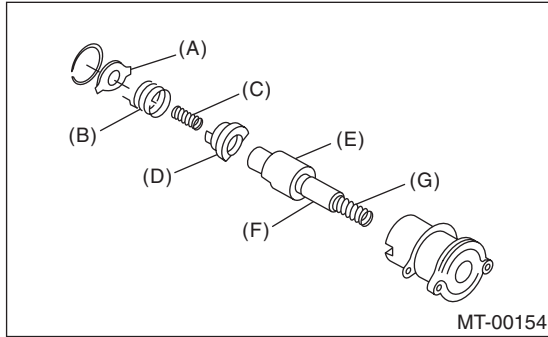
(A) Snap ring



# Reverse Check Sleeve

## MANUAL TRANSMISSION AND DIFFERENTIAL

2) Remove the reverse check plate, reverse check spring, reverse check cam, return spring (5th-Rev), reverse accent shaft, return spring cap and return spring (1st-2nd).



- (A) Reverse check plate
- (B) Reverse check spring
- (C) Return spring (5th-Rev)
- (D) Reverse check cam
- (E) Reverse accent shaft
- (F) Return spring cap
- (G) Return spring (1st-2nd)

3) Remove the O-ring.

### NOTE:

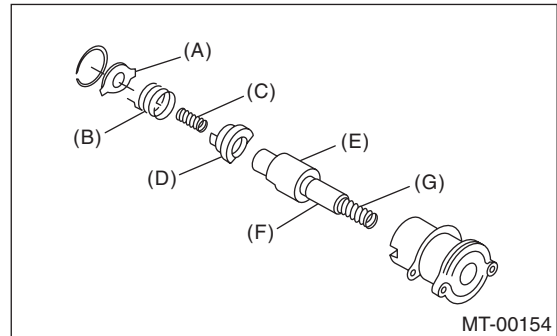
- For reverse check sleeve assembly, use an O-ring which should not be scratched.
- Be careful not to break the adjusting shim placed between reverse check sleeve assembly and case.

### D: ASSEMBLY

1) Install the return spring (1st-2nd), return spring cap, reverse accent shaft, check cam, return spring and check spring onto reverse check sleeve.

### NOTE:

Be sure the bent section of reverse check spring is positioned in the groove in check cam.



- (A) Reverse check plate
- (B) Reverse check spring
- (C) Return spring (5th-Rev)
- (D) Reverse check cam
- (E) Reverse accent shaft
- (F) Return spring cap
- (G) Return spring (1st-2nd)

2) Hook the bent section of reverse check spring over reverse check plate.

3) Rotate the cam so that the protrusion of reverse check cam is at the opening in plate.

4) With the cam held in that position, install the plate onto reverse check sleeve and hold with snap ring.

5) Position the O-ring in groove in sleeve.

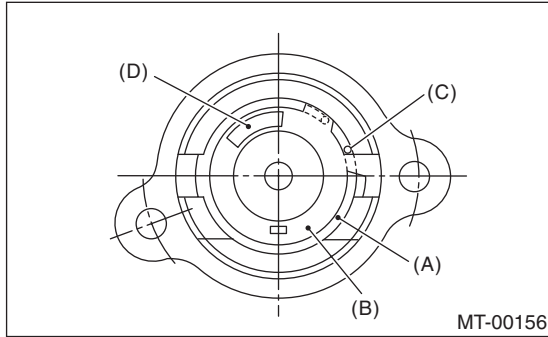
### E: INSPECTION

- Make sure the cutout section of reverse accent shaft is aligned with the opening in reverse check sleeve.
- Spin the cam by hand for smooth rotation.
- Move the cam and shaft all the way toward plate and release.

# Reverse Check Sleeve

MANUAL TRANSMISSION AND DIFFERENTIAL

If the cam does not return properly, replace the reverse check spring; if shaft does not, check for scratches on the inner surface of sleeve. If sleeve is in good order, replace the spring.



- (A) Snap ring
- (B) Reverse check plate
- (C) Check spring
- (D) Check cam

• Select a suitable reverse accent shaft and reverse check plate. <Ref. to 5MT-51, ADJUSTMENT, Reverse Check Sleeve.>

## F: ADJUSTMENT

### 1. NEUTRAL POSITION ADJUSTMENT

- 1) Shift the gear into 3rd gear position.
- 2) Shifter arm turns lightly toward the 1st/2nd gear side but heavily toward the reverse gear side because of the function of return spring, until arm contacts the stopper.
- 3) Make adjustment so that the heavy stroke (reverse side) is a little more than the light stroke (1st/2nd side).
- 4) To adjust, remove the bolts holding reverse check sleeve assembly to the case, move the sleeve assembly outward, and place adjusting shim between sleeve assembly and case to adjust the clearance.

#### CAUTION:

**Be careful not to break the O-ring when placing shim(s).**

#### NOTE:

- When the shim is removed, the neutral position will move closer to reverse; when shim is added, the neutral position will move closer to 1st gear.
- If the shims alone cannot adjust clearance, replace the reverse accent shaft and re-adjust.

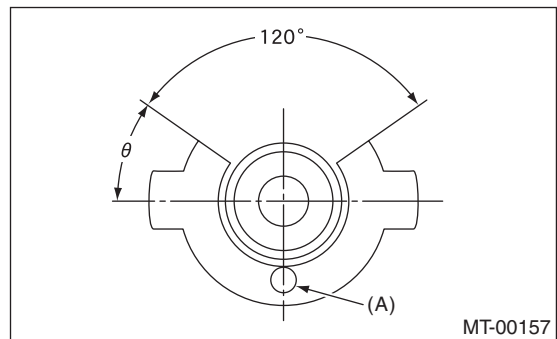
| Adjusting shim |                   |
|----------------|-------------------|
| Part No.       | Thickness mm (in) |
| 32190AA000     | 0.15 (0.0059)     |
| 32190AA010     | 0.30 (0.0118)     |

| Reverse accent shaft |      |   |
|----------------------|------|---|
| Part No.             | Mark | Remarks                                     |
| 32188AA130           | S    | Neutral position is closer to 1st gear.     |
| 32188AA140           | T    | Standard                                    |
| 32188AA150           | U    | Neutral position is closer to reverse gear. |

### 2. REVERSE CHECK PLATE ADJUSTMENT

- 1) Shift the shifter arm to "5th" and then to reverse to see if reverse check mechanism operates properly.
- 2) Also check to see if the arm returns to neutral when released from reverse position. If the arm does not return properly, replace the reverse check plate.

| Reverse check plate |          |                |                                   |
|---------------------|----------|----------------|-----------------------------------|
| Part No.            | (A): No. | Angle $\theta$ | Remarks                           |
| 32189AA001          | 0        | 28°            | Arm stops closer to 5th gear.     |
| 32189AA011          | 1        | 31°            | Arm stops closer to 5th gear.     |
| 32189AA021          | 2        | 34°            | Arm stops in the center.          |
| 32189AA031          | 3        | 37°            | Arm stops closer to reverse gear. |
| 32189AA041          | 4        | 40°            | Arm stops closer to reverse gear. |



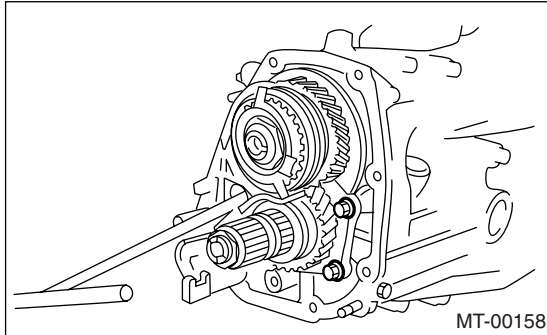
# Transmission Case

## MANUAL TRANSMISSION AND DIFFERENTIAL

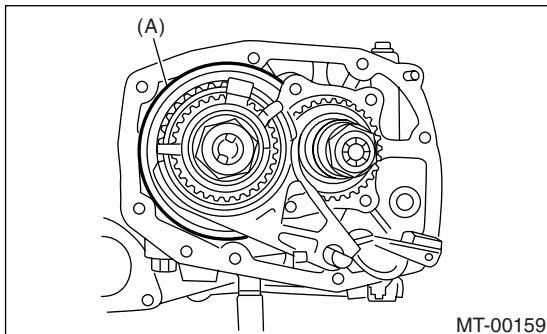
### 15. Transmission Case

#### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the clutch release lever. <Ref. to CL-18, REMOVAL, Release Bearing and Lever.>
- 3) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the bearing mounting bolts.

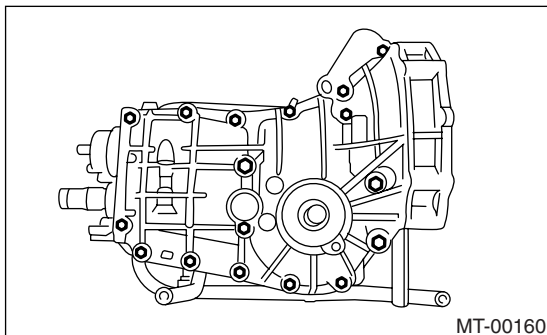


- 5) Remove the main shaft rear plate.



(A) Main shaft rear plate

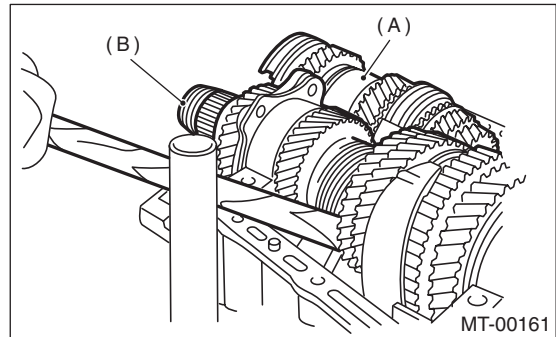
- 6) Separate the transmission case into right and left cases by loosening the coupling bolts and nuts.



- 7) Remove the drive pinion shaft assembly from left side transmission case.

#### NOTE:

Use a hammer handle, etc. to remove if too tight.



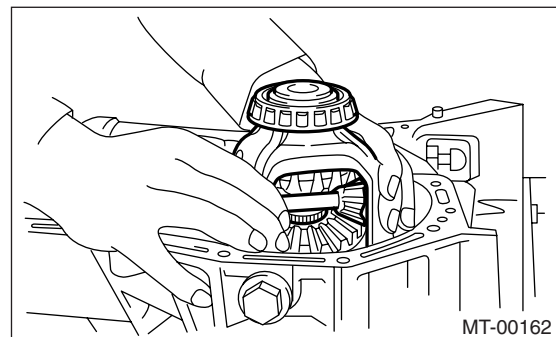
(A) Main shaft ASSY

(B) Drive pinion shaft ASSY

- 8) Remove the main shaft assembly.
- 9) Remove the differential assembly.

#### NOTE:

- Be careful not to confuse the right and left roller bearing outer races.
- Be careful not to damage the retainer oil seal.



#### B: INSTALLATION

- 1) Wipe off grease, oil and dust on the mating surfaces of transmission cases with white gasoline.
- 2) Install the front differential assembly.
- 3) Install the main shaft assembly.  
Install the transmission case knock pin into needle bearing knock pin hole.
- 4) Install the drive pinion shaft assembly.  
Install the transmission case knock pin into roller bearing knock pin hole.
- 5) Apply liquid gasket, and then put the case right side and left side together.

#### Liquid gasket:

**THREE BOND 1215B (Part No. 004403007) or equivalent**

- 6) Tighten the seventeen bolts with bracket, clip, etc. as shown in the figure.

#### NOTE:

- Insert the bolts from bottom and tighten the nuts at top.

# Transmission Case

MANUAL TRANSMISSION AND DIFFERENTIAL

- Put the cases together so that drive pinion shim and input shaft holder shim are not caught up in between.
- Confirm that the speedometer gear is meshed.

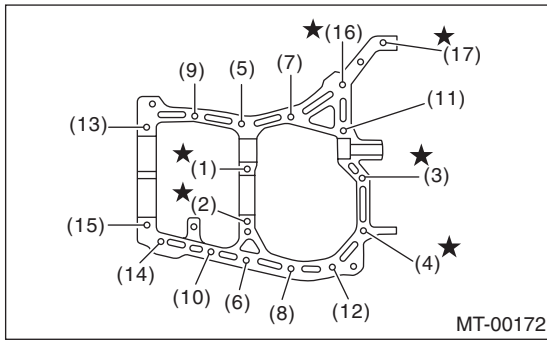
### Tightening torque:

**8 mm bolt**

**25 N·m (2.5 kgf·m, 18.4 ft·lb)**

**★ 10 mm bolt**

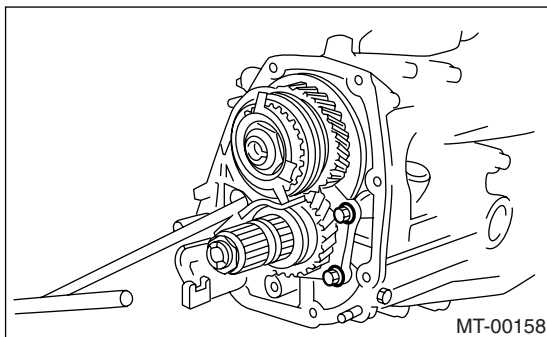
**39 N·m (4.0 kgf·m, 28.9 ft·lb)**



7) Tighten the ball bearing attachment bolts.

### Tightening torque:

**30 N·m (3.1 kgf·m, 22.1 ft·lb)**

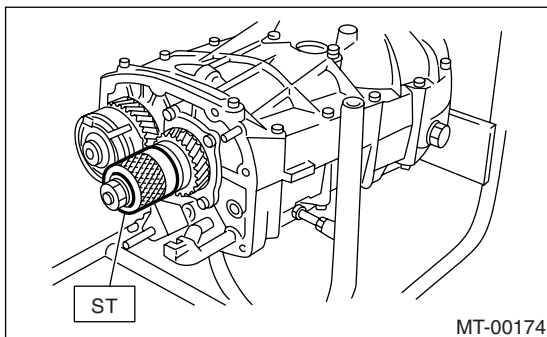


8) Backlash adjustment of hypoid gear and preload adjustment of roller bearing:

### NOTE:

Support the drive pinion shaft assembly with ST.

ST 498427100 STOPPER



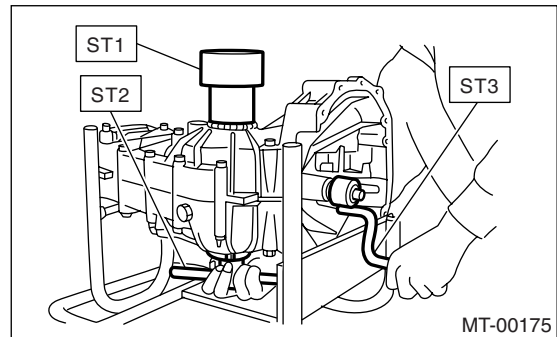
9) Place the transmission with case left side facing downward and put ST1 on bearing cup.

10) Screw the retainer assembly into left case from the bottom using ST2. Fit the ST3 on transmission main shaft. Shift the gear into 4th or 5th and turn the shaft several times. Screw in the retainer while turning ST3 until a slight resistance is felt on ST2. This is the contact point of hypoid gear and drive pinion shaft. Repeat the above sequence several times to ensure the contact point.

ST1 399780104 WEIGHT

ST2 18630AA010 WRENCH COMPL RETAINER

ST3 499927100 HANDLE

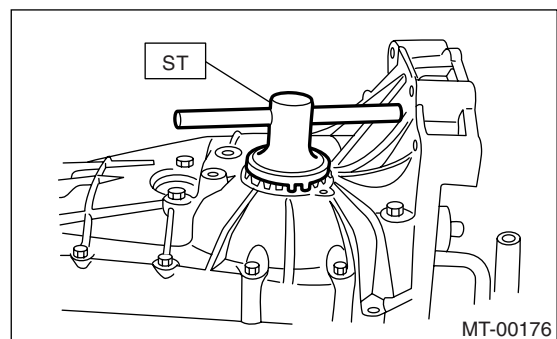


11) Remove the weight and screw in the retainer without O-ring on upper side and stop at the point where slight resistance is felt.

### NOTE:

At this point, the backlash between hypoid gear and drive pinion shaft is zero.

ST 18630AA010 WRENCH COMPL RETAINER



12) Loosen the retainer on the lower side by 3 notches and turn in the retainer on the upper side by the same amount in order to obtain the backlash.

13) Turn in the retainer on the upper side additionally by 1 notch in order to apply preload on taper roller bearing.

14) Install temporarily both the upper and lower lock plates and mark both holder and lock plate for later readjustment.

### NOTE:

Install the lock plate upside down if it is hard to install.

# Transmission Case

## MANUAL TRANSMISSION AND DIFFERENTIAL

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15) Turn the transmission main shaft several times while tapping around the retainer lightly with plastic hammer.

16) Inspect and adjust the backlash and tooth contact of hypoid gear. <Ref. to 5MT-71, INSPECTION, Front Differential Assembly.>

17) After checking the tooth contact of hypoid gears, remove the lock plate. Then loosen the retainer until the O-ring groove appears. Fit O-ring into the groove and tighten the retainer to the original position.

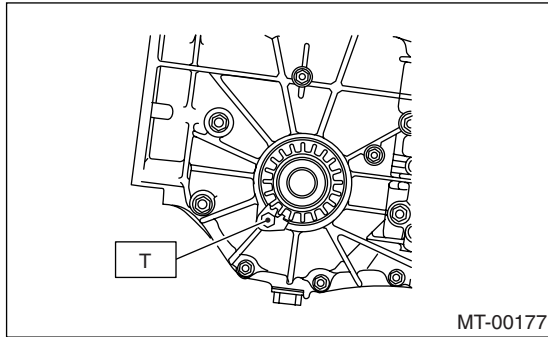
Install the lock plate.

### NOTE:

- Record how many times the retainer is turned while loosening.
- Carry out this job on both upper and lower retainers.

### **Tightening torque:**

**T: 25 N·m (2.5 kgf-m, 18.4 ft-lb)**



18) Selection of main shaft rear plate <Ref. to 5MT-59, ADJUSTMENT, Main Shaft Assembly.>

19) Install the clutch release lever and bearing. <Ref. to CL-18, INSTALLATION, Release Bearing and Lever.>

20) Install the transfer case with extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>

21) Install the manual transmission assembly into the vehicle. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

## **C: INSPECTION**

Check the transmission case for cracks, damage, and oil leaks.

# Main Shaft Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

## 16. Main Shaft Assembly

### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove the transmission case. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the drive pinion shaft assembly. <Ref. to 5MT-60, REMOVAL, Drive Pinion Shaft Assembly.>
- 5) Remove the main shaft assembly.

### B: INSTALLATION

- 1) Install the needle bearing and oil seal onto the front of transmission main shaft assembly.

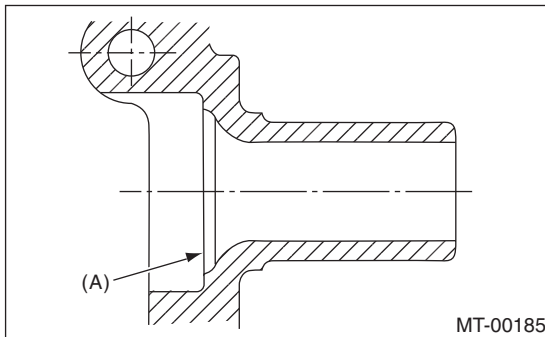
#### NOTE:

- Wrap the clutch splined section with vinyl tape to prevent damage to oil seal.
- Apply Unilube #2 or equivalent to the sealing lip of oil seal.
- Use a new one.

- 2) Install the transmission case knock pin into needle bearing outer race knock pin hole.

#### NOTE:

Align the end face of seal with surface (A) when installing oil seal.



- 3) Install the drive pinion shaft assembly. <Ref. to 5MT-60, INSTALLATION, Drive Pinion Shaft Assembly.>
- 4) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>
- 5) Install the transfer case with extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 6) Install the manual transmission assembly to vehicle. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

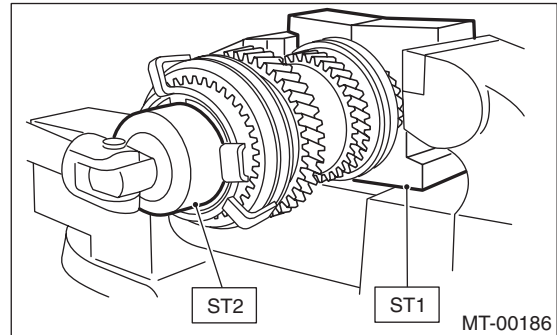
### C: DISASSEMBLY

- 1) Put vinyl tape around the main shaft splines to protect oil seal from damage. Then pull out the oil seal and needle bearing by hand.
- 2) Remove the lock nut from transmission main shaft assembly.

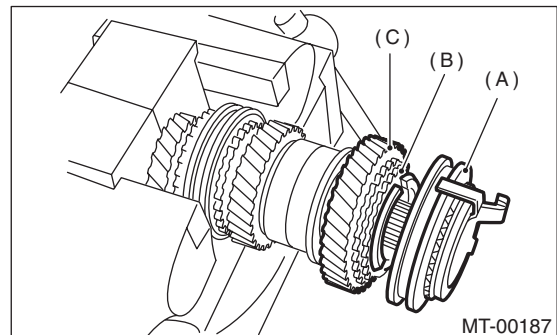
#### NOTE:

Remove the caulking before removing lock nut.

- |     |           |                     |
|-----|-----------|---------------------|
| ST1 | 498937000 | TRANSMISSION HOLDER |
| ST2 | 499987003 | SOCKET WRENCH (35)  |

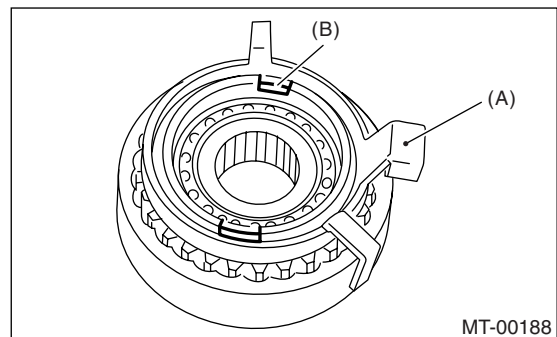


- 3) Remove the 5th-Rev sleeve & hub assembly, baulk ring, 5th drive gear and needle bearing.



- (A) 5th-Rev sleeve & hub ASSY
- (B) Baulk ring
- (C) 5th drive gear

- 4) Remove the snap ring and synchro cone stopper from 5th-Rev sleeve & hub assembly.



- (A) Synchro cone stopper
- (B) Snap ring



# Main Shaft Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

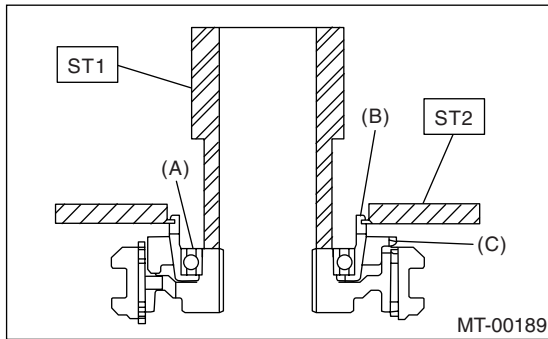
5) Using the ST1, ST2 and a press, remove the ball bearing, synchro cone and baulk ring (Rev).

**NOTE:**

- Replace the sleeve and hub with new ones. Do not attempt to disassemble because they must engage at a specified point. If they should be disassembled, mark engagement point on splines beforehand.
- Do not reuse the ball bearing.

ST1 499757002 INSTALLER

ST2 498077400 SYNCHRO CONE REMOVER



- (A) Ball bearing
- (B) Synchro cone
- (C) Baulk ring

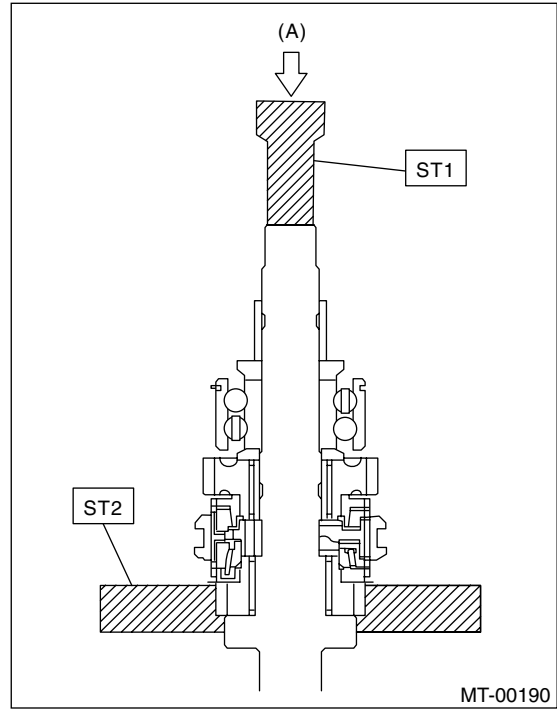
6) Using the ST1 and ST2, remove rest of the parts.

**NOTE:**

Replace the sleeve and hub with new ones. Do not attempt to disassemble because they must engage at a specified point. If they should be disassembled, mark engagement point on splines beforehand.

ST1 899864100 REMOVER

ST2 899714110 REMOVER



- (A) Press

# Main Shaft Assembly

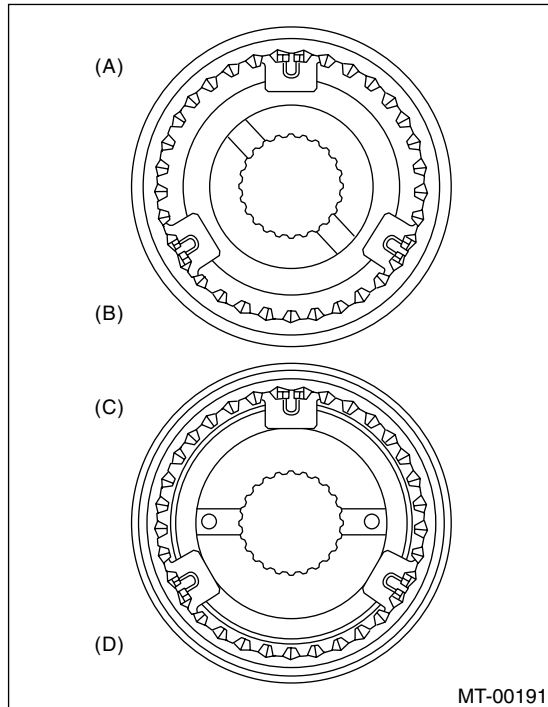
MANUAL TRANSMISSION AND DIFFERENTIAL

## D: ASSEMBLY

1) Assemble each sleeve & hub assembly.

**NOTE:**

Position the open ends of spring 120° apart.

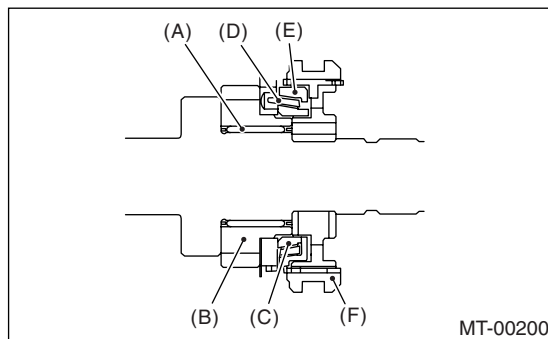


- (A) 3rd-4th hub ASSY
- (B) 3rd gear side
- (C) 5th-Rev hub ASSY
- (D) 5th gear side

2) Install the 3rd drive gear, outer baulk ring, synchro cone, inner baulk ring, sleeve & hub assembly for 3rd needle bearing on transmission main shaft.

**NOTE:**

Align the groove in baulk ring with shifting insert.



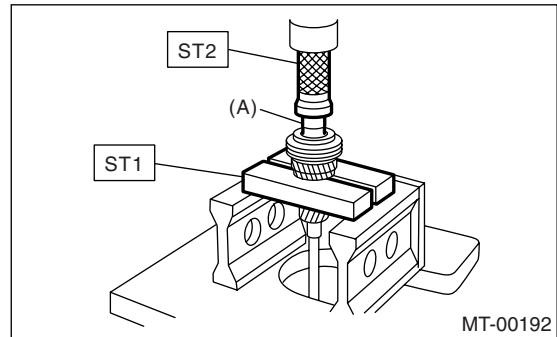
- (A) 3rd needle bearing
- (B) 3rd drive gear
- (C) Inner baulk ring
- (D) Synchro cone
- (E) Outer baulk ring
- (F) Sleeve & hub ASSY

3) Install the 4th needle bearing race onto transmission main shaft using ST1, ST2 and a press.

**NOTE:**

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

- ST1 899714110 REMOVER
- ST2 499877000 RACE 4-5 INSTALLER

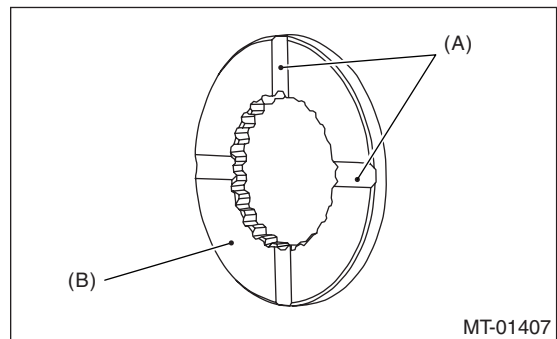


(A) 4th needle bearing race

4) Install the baulk ring, needle bearing, 4th drive gear and 4th gear thrust washer to transmission main shaft.

**NOTE:**

- Align the baulk ring and gear & hub assembly with key convex portion.
- Be careful with the direction of thrust washer.



- (A) Groove
- (B) Face this surface to 4th gear side

5) Drive the ball bearing onto the rear section of transmission main shaft using ST1, ST2 and a press.

**NOTE:**

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

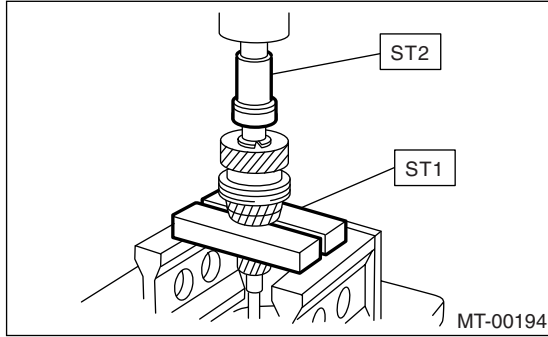
- ST1 899714110 REMOVER



# Main Shaft Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

ST2 499877000 RACE 4-5 INSTALLER



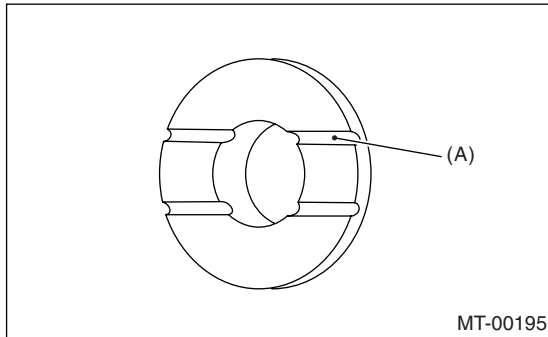
6) Using the ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of transmission main shaft.

**NOTE:**

- Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
- Face the thrust washer in correct direction.

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER



(A) Face this surface to 5th gear side.

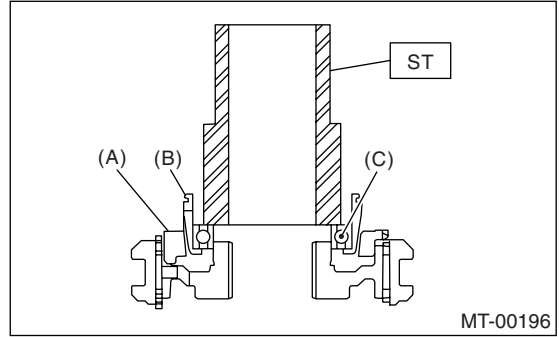
7) Install the bearing onto synchro cone.

8) Install the baulk ring and synchro cone onto 5th-Rev sleeve & hub assembly using ST and a press.

**NOTE:**

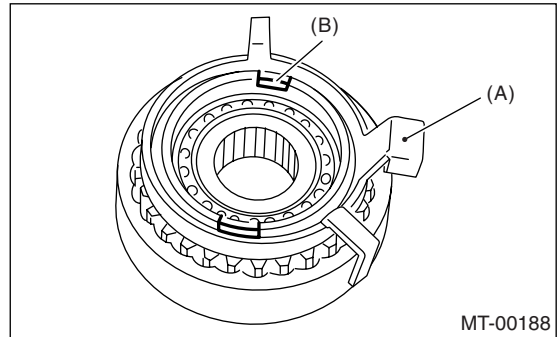
- Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
- Use a new ball bearing.
- After press fitting, make sure the synchro cone rotates freely.

ST 499757002 INSTALLER



- (A) Baulk ring
- (B) Synchro cone
- (C) Ball bearing

9) Install the synchro cone stopper and snap ring to 5th-Rev sleeve & hub assembly.

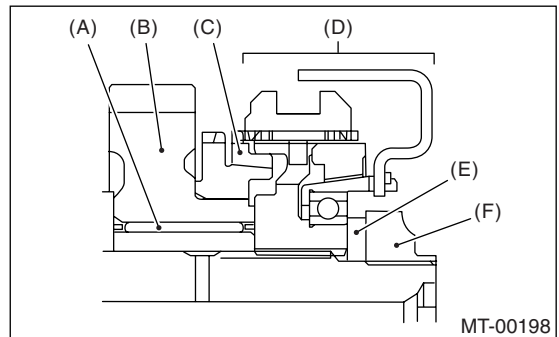


- (A) Synchro cone stopper
- (B) Snap ring

10) Install the rest parts to the rear section of transmission main shaft.

**NOTE:**

Align the groove in baulk ring with shifting insert.



- (A) Needle bearing
- (B) 5th drive gear
- (C) Baulk ring
- (D) 5th-Rev sleeve & hub ASSY
- (E) Lock washer
- (F) Lock nuts

# Main Shaft Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

11) Tighten the lock nuts to the specified torque using ST1 and ST2.

**NOTE:**

Secure the lock nuts in two places after tightening.

ST1 499987003 SOCKET WRENCH (35)  
ST2 498937000 TRANSMISSION HOLDER

**Tightening torque:**

**120 N·m (12.2 kgf·m, 88.5 ft·lb)**

**E: INSPECTION**

Disassembled parts should be washed clean first and then inspected carefully.

1) Bearings

Replace the bearings in the following cases:

- Bearings whose balls, outer races and inner races are broken or rusty.
- Worn bearings
- Bearings that fail to turn smoothly or make noise when turned after gear oil lubrication.
- Bearings having other defects

2) Bushing (each gear)

Replace the bushing in the following cases:

- When the sliding surface is damaged or abnormally worn.
- When the inner wall is abnormally worn.

3) Gears

Replace the gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.

- Correct or replace if the cone that contacts the baulk ring is rough or damaged.
- Correct or replace if the inner surface or end face is damaged.

4) Baulk ring

Replace the ring in the following cases:

- When the inner surface and end face are damaged.
- When the ring inner surface is abnormally or partially worn down.
- When the contact surface of the synchronizer ring insert is scored or abnormally worn down.

5) Shifting insert key

Replace the insert if deformed, excessively worn or defective in any way.

6) Oil seal

Replace the oil seal if the lip is deformed, hardened, damaged, worn or defective in any way.

7) O-ring

Replace the O-ring if the sealing face is deformed, hardened, damaged, worn or defective in any way.

8) Gearshift mechanism

Repair or replace the gearshift mechanism if excessively worn, bent or defective in any way.

**F: ADJUSTMENT**

Selection of main shaft rear plate:

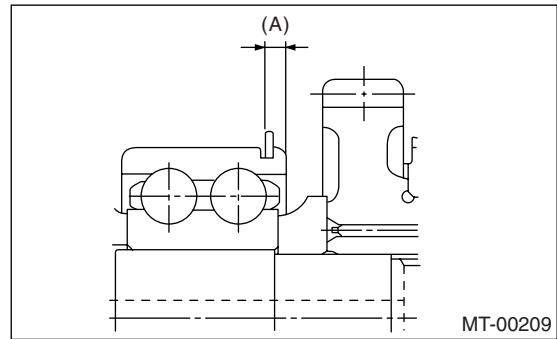
Using the ST, measure the amount (A) of ball bearing protrusion from transmission main case surface and select the proper plate in the following table.

**NOTE:**

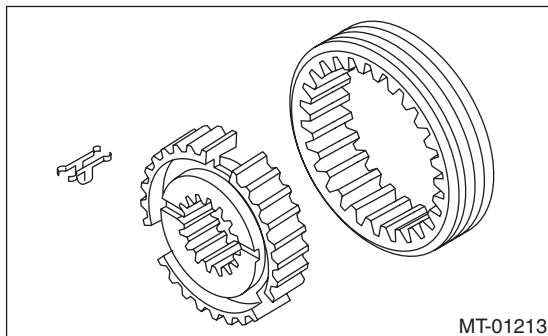
Before measuring, tap the end of main shaft with a plastic hammer lightly in order to make the clearance zero between the main case surface and the moving flange of bearing.

ST 498147000 DEPTH GAUGE

| Dimension (A)<br>mm (in)         | Part No.   | Mark |
|----------------------------------|------------|------|
| 4.00 — 4.13<br>(0.1575 — 0.1626) | 32294AA041 | 1    |
| 3.87 — 3.99<br>(0.1524 — 0.1571) | 32294AA051 | 2    |



MT-00209



MT-01213

# Drive Pinion Shaft Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

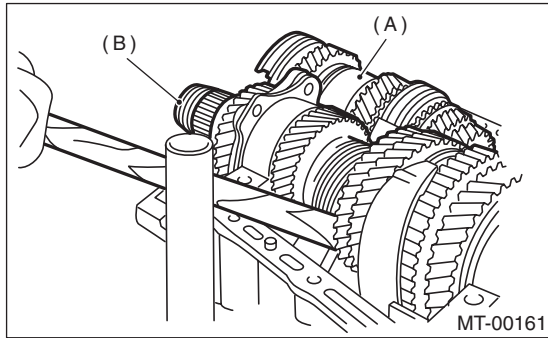
### 17. Drive Pinion Shaft Assembly

#### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove the transmission case. <Ref. to 5MT-52, REMOVAL, Transmission Case.>
- 4) Remove the drive pinion shaft assembly.

#### NOTE:

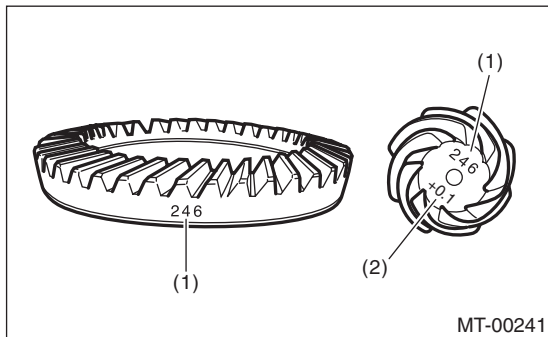
Use a hammer handle, etc. to remove if too tight.



- (A) Main shaft ASSY  
(B) Drive pinion shaft ASSY

#### B: INSTALLATION

- 1) Remove the differential assembly.
- 2) Alignment marks/numbers on hypoid gear set  
The upper number on drive pinion is the match number for combining it with hypoid driven gear. The lower number is for shim adjustment. If no lower number is shown, the value is zero. The number on hypoid driven gear indicates a number for combination with drive pinion.



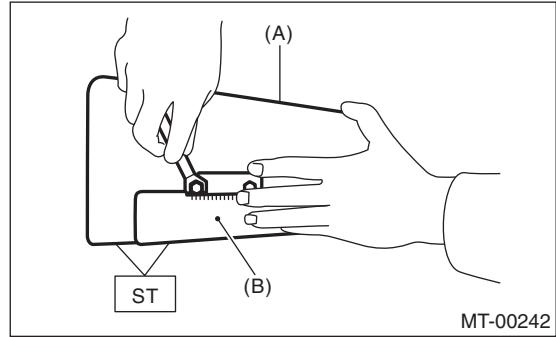
- (1) Match number  
(2) Shim adjust number

- 3) Place the drive pinion shaft assembly on right hand transmission main case without shim and tighten the bearing mounting bolts.
- 4) Inspection and adjustment of ST

#### NOTE:

- Loosen the two bolts and adjust so that the scale indicates 0.5 correctly when the plate end and the scale end are on the same level.
- Tighten the two bolts.

ST 499917500 DRIVE PINION GAUGE ASSY



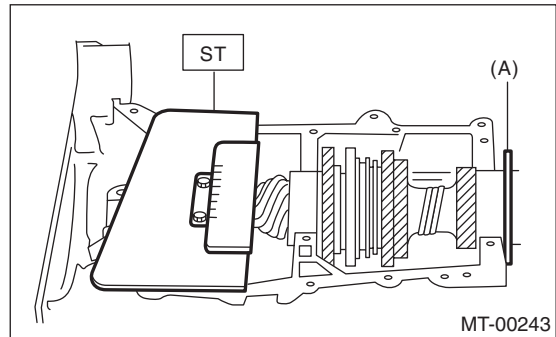
- (A) Plate  
(B) Scale

- 5) Position the ST by inserting the knock pin of ST into the knock hole in transmission case.

ST 499917500 DRIVE PINION GAUGE ASSY

- 6) Slide the drive pinion gauge scale with finger tip and read the value at the point where it matches with the end face of drive pinion.

ST 499917500 DRIVE PINION GAUGE ASSY



- (A) Adjust clearance to zero without shim.

- 7) The thickness of shim shall be determined by adding the value indicated on drive pinion to the value indicated on ST. (Add if the number on drive pinion is prefixed by + and subtract if the number is prefixed by -.)

ST 499917500 DRIVE PINION GAUGE ASSY

- 8) Select one to three shims from the next table for the value determined as described above and take a shim thickness which is closest to the indicated value.

# Drive Pinion Shaft Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

| Drive pinion shim |                   |
|-------------------|-------------------|
| Part No.          | Thickness mm (in) |
| 32295AA031        | 0.150 (0.0059)    |
| 32295AA041        | 0.175 (0.0069)    |
| 32295AA051        | 0.200 (0.0079)    |
| 32295AA061        | 0.225 (0.0089)    |
| 32295AA071        | 0.250 (0.0098)    |
| 32295AA081        | 0.275 (0.0108)    |
| 32295AA091        | 0.300 (0.0118)    |
| 32295AA101        | 0.500 (0.0197)    |

9) Install the differential assembly. <Ref. to 5MT-68, INSTALLATION, Front Differential Assembly.>

10) Set the transmission main shaft assembly and drive pinion shaft assembly in position. (So there is no clearance between the two when moved all the way to the front). Inspect the suitable 1st-2nd, 3rd-4th and 5th shifter fork so that coupling sleeve and reverse driven gear are positioned in the center of their synchronizing mechanisms. <Ref. to 5MT-65, INSPECTION, Drive Pinion Shaft Assembly.>

11) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>

12) Install the transfer case with extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>

13) Install the manual transmission assembly to vehicle. <Ref. to 5MT-26, Manual Transmission Assembly.>

## C: DISASSEMBLY

### NOTE:

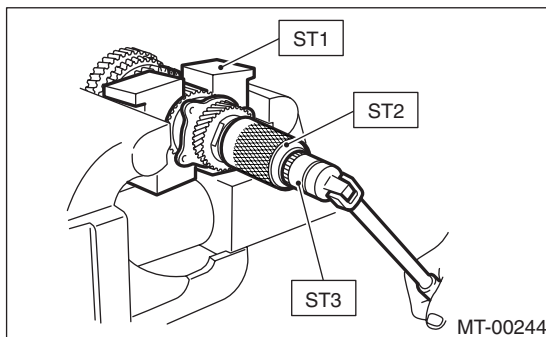
Attach a cloth to the end of driven shaft (on the frictional side of thrust needle bearing) to prevent damage during disassembly or reassembly.

1) Straighten the lock nut at staked portion. Remove the lock nut using ST1, ST2 and ST3.

ST1 899884100 HOLDER

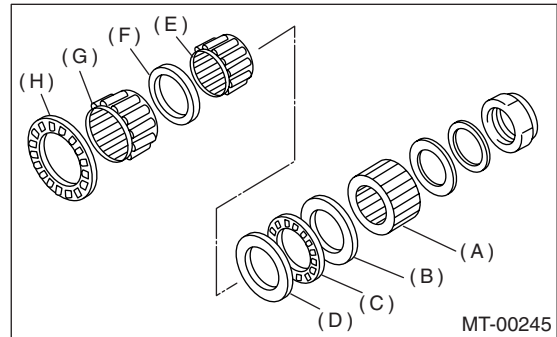
ST2 498427100 STOPPER

ST3 899988608 SOCKET WRENCH (27)



2) Withdraw the drive pinion from driven shaft.

Remove the differential bevel gear sleeve, adjusting washer No. 1, adjusting washer No. 2, thrust bearing, needle bearing and drive pinion collar.



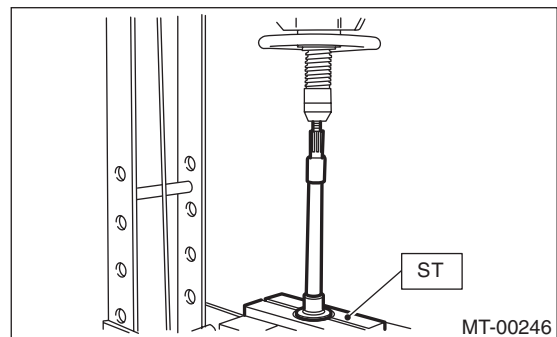
- (A) Differential bevel gear sleeve
- (B) Adjusting washer No. 1 (25 × 37.5 × t)
- (C) Thrust bearing (25 × 37.5 × 3)
- (D) Adjusting washer No. 2 (25 × 37.5 × 4)
- (E) Needle bearing (25 × 30 × 20)
- (F) Drive pinion collar
- (G) Needle bearing (30 × 37 × 23)
- (H) Thrust bearing (33 × 50 × 3)

3) Remove the roller bearing and washer using ST and press.

### NOTE:

Do not reuse the roller bearing.

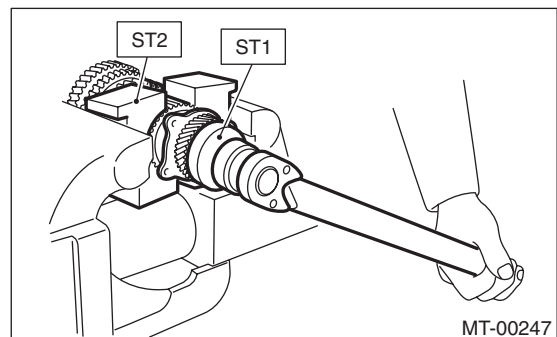
ST 498077000 REMOVER



4) Straighten the lock nut at staked portion. Remove the lock nut using ST1 and ST2.

ST1 499987300 SOCKET WRENCH (50)

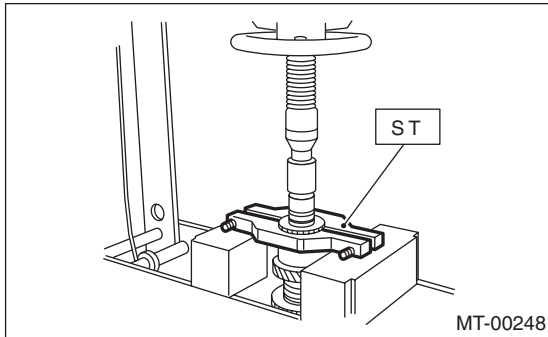
ST2 899884100 HOLDER



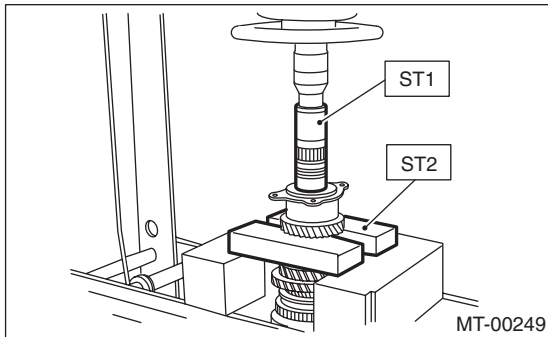
# Drive Pinion Shaft Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

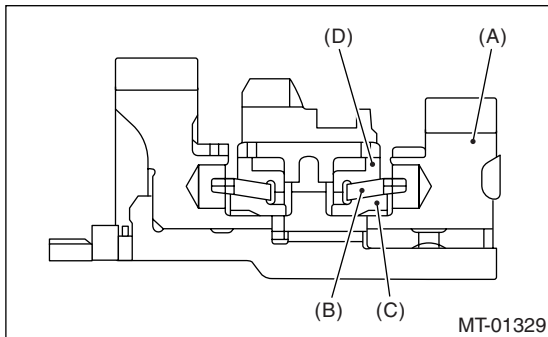
- 5) Remove the 5th driven gear using ST.  
ST 499857000 5TH DRIVEN GEAR REMO-  
VER



- 6) Remove the woodruff key.  
7) Remove the roller bearing, 3rd-4th driven gear  
using ST1 and ST2.  
ST1 499757002 INSTALLER  
ST2 899714110 REMOVER

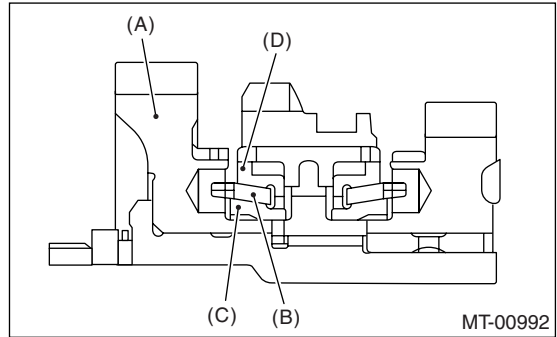


- 8) Remove the key.  
9) Remove the 2nd driven gear, inner baulk ring,  
synchro cone and outer baulk ring.



- (A) 2nd driven gear
- (B) Inner baulk ring
- (C) Synchro cone
- (D) Outer baulk ring

- 10) Remove the 1st driven gear, inner baulk ring,  
synchro cone, outer baulk ring, 2nd gear bushing,  
gear and hub using ST1 and ST2.

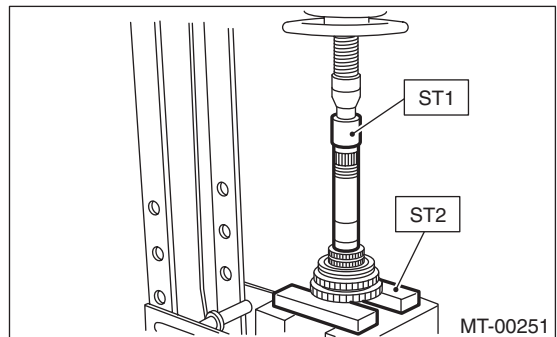


- (A) 1st driven gear
- (B) Inner baulk ring
- (C) Synchro cone
- (D) Outer baulk ring

### NOTE:

Replace the gear and hub if necessary. Do not disassemble because they must engage at a specified point. If they have to be disassembled, mark the engaging point on the spline beforehand.

- ST1 499757002 INSTALLER  
ST2 899714110 REMOVER



### D: ASSEMBLY

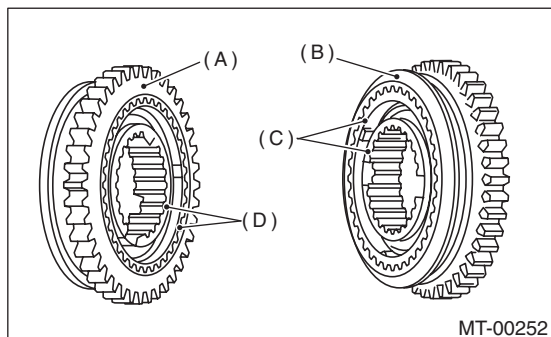
- 1) Install the sleeve and hub assembly by matching alignment marks.

# Drive Pinion Shaft Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

**NOTE:**

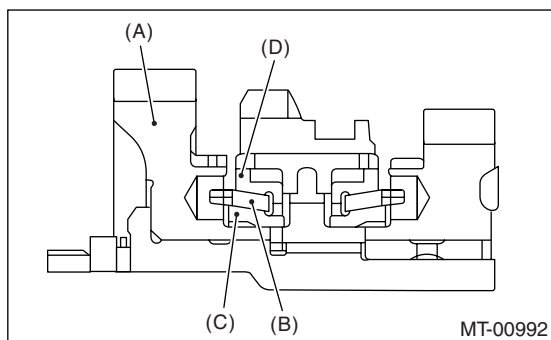
Use the new gear and hub assembly, when replacing the gear or hub.



- (A) 1st gear side
- (B) 2nd gear side
- (C) Flush surface
- (D) Stepped surface

2) Install the washer, snap ring and sub gear to 1st driven gear.

3) Install the 1st driven gear, inner baulk ring, synchro cone, outer baulk ring, gear and hub assembly onto driven shaft. (Turbo model)



- (A) 1st driven gear
- (B) Inner baulk ring
- (C) Synchro cone
- (D) Outer baulk ring

**NOTE:**

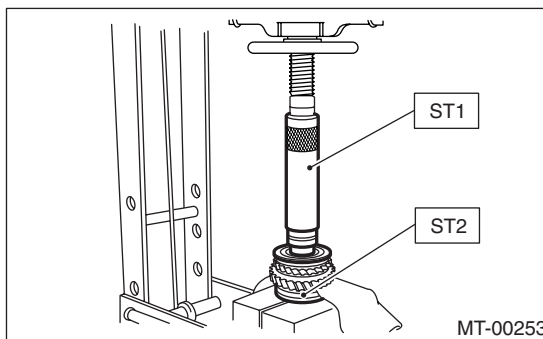
- Take care to install the gear and hub assembly in proper direction.
- Align the baulk ring and gear and hub assembly with key groove.

4) Install the 2nd driven gear bushing onto driven shaft using ST1, ST2 and a press.

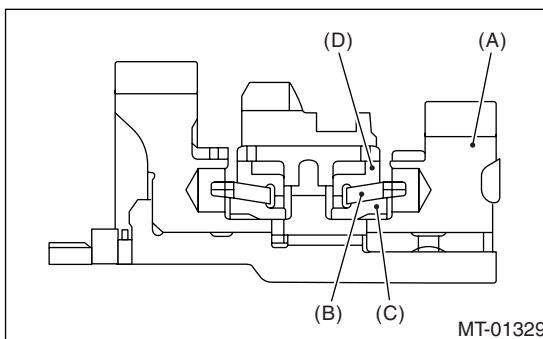
**NOTE:**

- Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
- Attach a cloth to the end of driven shaft to prevent damage.
- When press-fitting, align the oil holes of shaft and bushing.

- ST1 499277200 INSTALLER
- ST2 499587000 INSTALLER



5) Install the 2nd driven gear, inner baulk ring, synchro cone and outer baulk ring, and insert onto driven shaft.



- (A) 2nd driven gear
- (B) Inner baulk ring
- (C) Synchro cone
- (D) Outer baulk ring

6) After installing the key on driven shaft, install the 3rd-4th driven gear using ST and press.

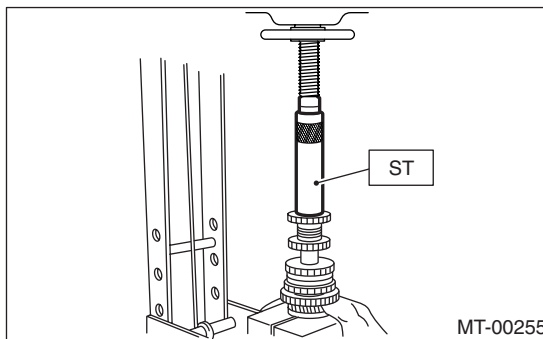
**CAUTION:**

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

**NOTE:**

Align the groove in baulk ring with insert.

- ST 499277200 INSTALLER



7) Install a set of roller bearings onto the driven shaft using ST and press.



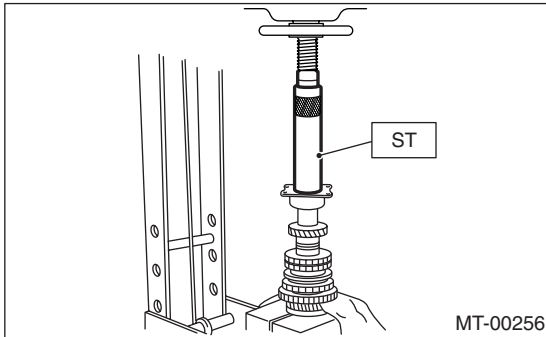
# Drive Pinion Shaft Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

### CAUTION:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

ST 499277200 INSTALLER

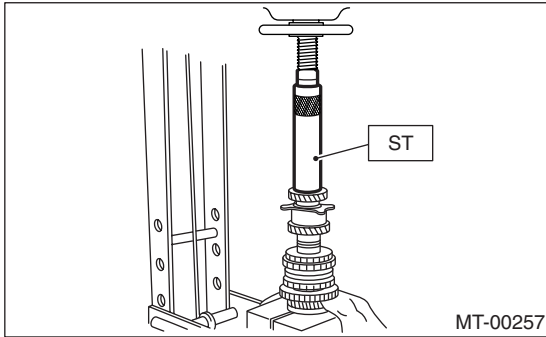


8) Position the woodruff key in groove on the rear of driven shaft. Install 5th driven gear onto the driven shaft using ST and press.

### CAUTION:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

ST 499277200 INSTALLER

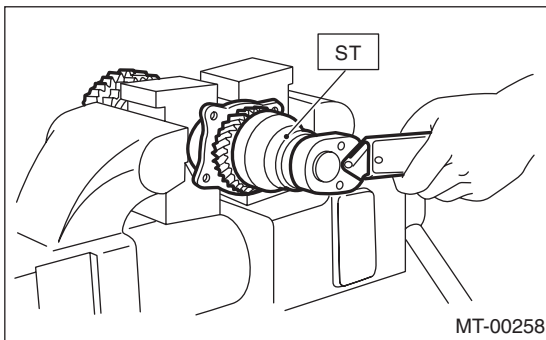


9) Install the lock washer. Install the lock nut and tighten to the specified torque using ST.

ST 499987300 SOCKET WRENCH (50)

### Tightening torque:

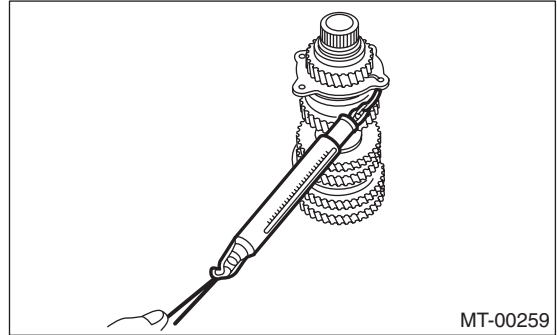
260 N·m (26.5 kgf·m, 191.8 ft·lb)



### NOTE:

- Stake the caulking of lock nut at two points.

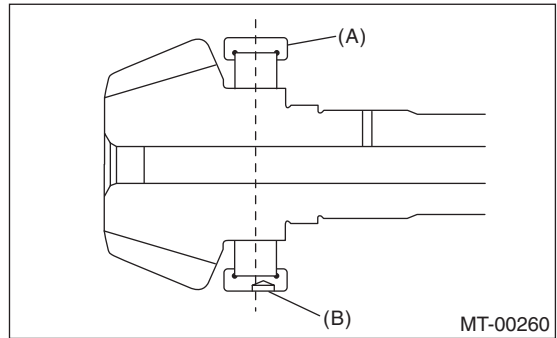
- Using a spring balancer, check that starting torque of roller bearing is 0.1 — 1.5 N (0.01 — 0.15 kgf, 0.02 — 0.33 lbf).



10) Install the roller bearing onto drive pinion.

### NOTE:

When installing roller bearing, note its directions (front and rear) because the knock pin hole in outer race is offset.



- (A) Roller bearing
- (B) Knock pin hole

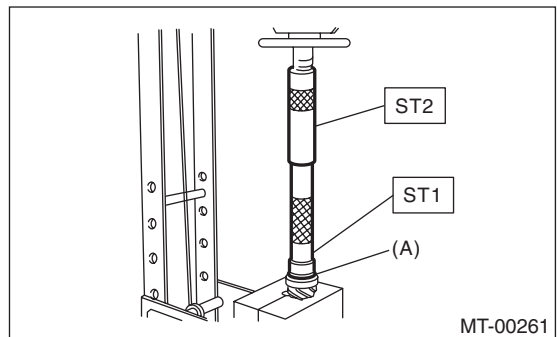
11) Install the washer using ST1, ST2 and a press.

### NOTE:

- Do not apply pressure more than 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
- Use a new lock nut.
- Caulk the lock nut at four points.

ST1 499277100 BUSHING 1-2 INSTALLER

ST2 499277200 INSTALLER

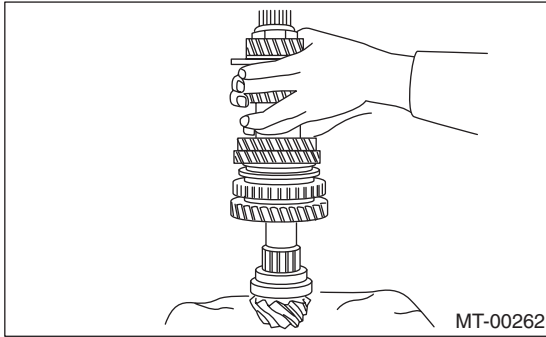


- (A) Washer

# Drive Pinion Shaft Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

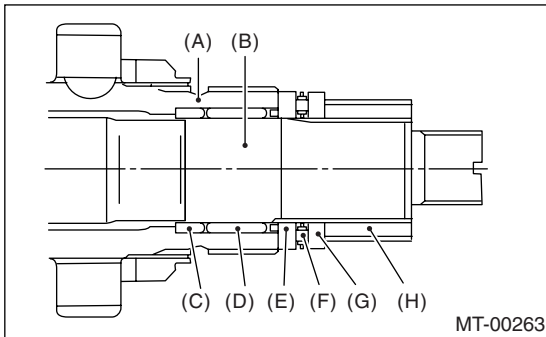
12) Install the thrust bearing and needle bearing. Install the driven shaft assembly.



13) Install the drive pinion collar, needle bearing, adjusting washer No. 2, thrust bearing, adjusting washer No. 1 and differential bevel gear sleeve in this order.

**NOTE:**

Be careful because the spacer must be installed in proper direction.



- (A) Driven shaft
- (B) Drive shaft
- (C) Drive pinion collar
- (D) Needle bearing (25 × 30 × 20)
- (E) Adjusting washer No. 2 (25 × 36 × 4)
- (F) Thrust bearing (25 × 37.5 × 3)
- (G) Adjusting washer No. 1 (25 × 36 × t)
- (H) Differential bevel gear sleeve

14) Adjust the thrust bearing preload. <Ref. to 5MT-66, THRUST BEARING PRELOAD, ADJUSTMENT, Drive Pinion Shaft Assembly.>

**E: INSPECTION**

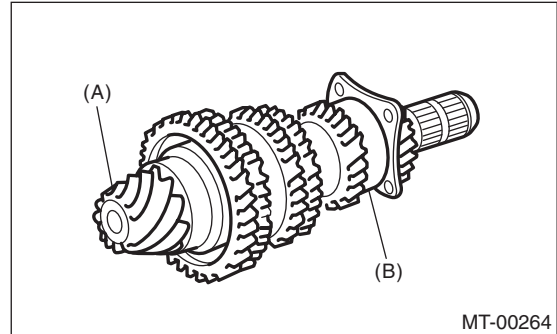
Disassembled parts should be washed clean first and then inspected carefully.

1) Bearings

Replace the bearings in the following cases:

- Bearings whose balls, outer races and inner races are broken or rusty.
- Worn bearings
- Bearings that fail to turn smoothly or make noise when turned after gear oil lubrication.

- The ball bearing on the rear side of the drive pinion shaft should be checked for smooth rotation before the drive pinion shaft assembly is disassembled. In this case, because a preload is working on the bearing, its rotation feels like it is slightly dragging unlike other bearings.

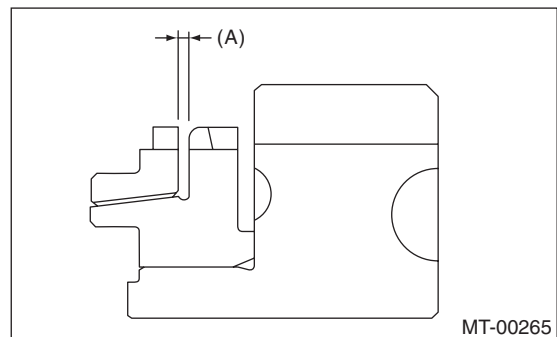


- (A) Drive pinion shaft
- (B) Ball bearing

- Bearings having other defects
- 2) Bushing (each gear)  
Replace the bushing in the following cases:
- When the sliding surface is damaged or abnormally worn.
  - When the inner wall is abnormally worn.
- 3) Gears
- Replace the gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.
  - Correct or replace if the cone that contacts the baulk ring is rough or damaged.
  - Correct or replace if the inner surface or end face is damaged.
- 4) Baulk ring  
Replace the ring in the following cases:
- When the inner surface and end face are damaged.
  - When the ring inner surface is abnormally or partially worn down.
  - When the gap between the end faces of the ring and the gear splined part is excessively small.

**Clearance (A):**

**0.5 — 1.0 mm (0.020 — 0.040 in)**

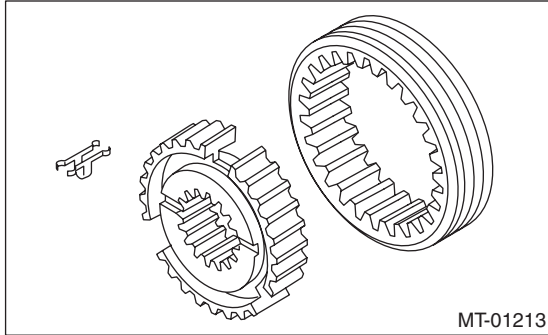




# Drive Pinion Shaft Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

- When the contact surface of the synchronizer ring insert is scored or abnormally worn down.
- 5) Shifting insert key  
 Replace the insert if deformed, excessively worn or defective in any way.

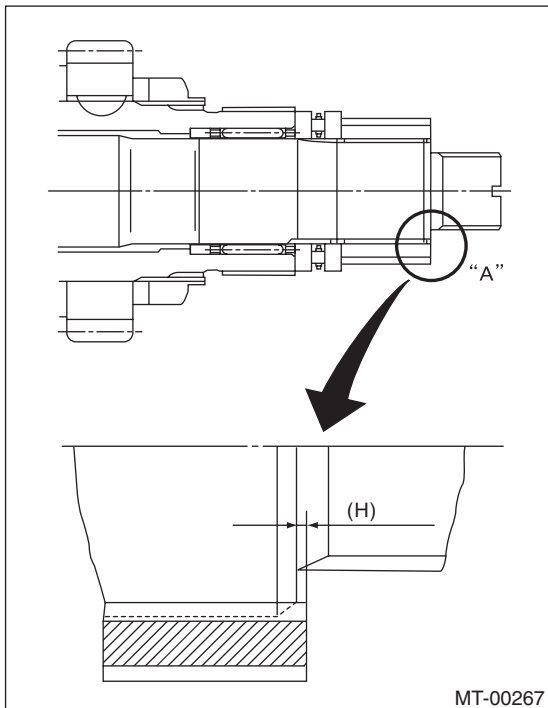


- 6) Oil seal  
 Replace the oil seal if the lip is deformed, hardened, damaged, worn or defective in any way.
- 7) O-ring  
 Replace the O-ring if the sealing face is deformed, hardened, damaged, worn or defective in any way.

## F: ADJUSTMENT

### 1. THRUST BEARING PRELOAD

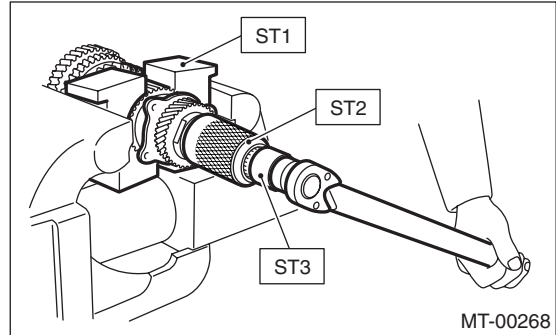
- 1) Select the adjusting washer No. 1 so that dimension (H) is zero through visual check. Position the washer (18.3 × 30 × 4) and lock washer (18 × 30 × 2) and install the lock nut (18 × 13.5).



- 2) Using the ST1, ST2 and ST3, tighten the new lock nut to specified torque.
- ST1 899884100 HOLDER  
 ST2 498427100 STOPPER

ST3 899988608 SOCKET WRENCH (27)

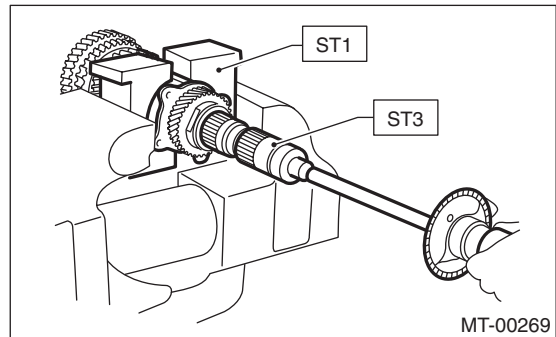
**Tightening torque:**  
**120 N·m (12.2 kgf·m, 88.5 ft·lb)**



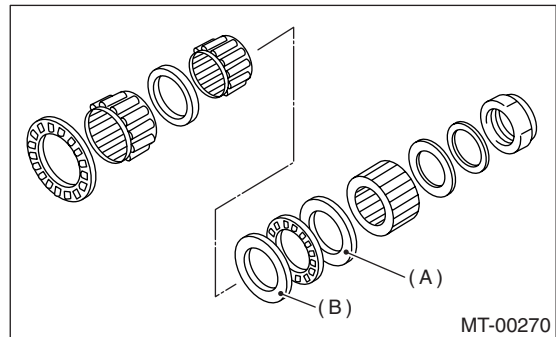
- 3) After removing the ST2, measure the starting torque using torque driver.

ST1 899884100 HOLDER  
 ST3 899988608 SOCKET WRENCH (27)

**Starting torque:**  
**0.3 — 0.8 N·m (0.03 — 0.08 kgf·m, 0.2 — 0.6 ft·lb)**



- 4) If the starting torque is not within specified limit, select a new adjusting washer No. 1 and recheck starting torque.

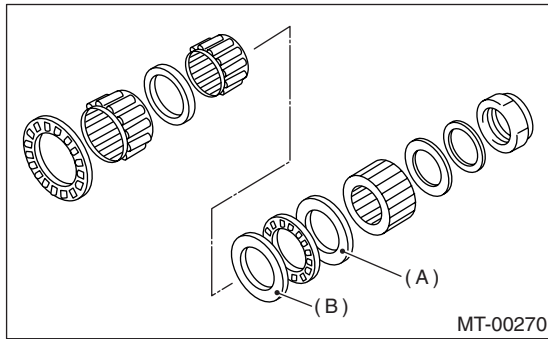


- (A) Adjusting washer No. 1  
 (B) Adjusting washer No. 2

# Drive Pinion Shaft Assembly

| Adjusting washer No. 1 |                   |
|------------------------|-------------------|
| Part No.               | Thickness mm (in) |
| 803025051              | 3.925 (0.1545)    |
| 803025052              | 3.950 (0.1555)    |
| 803025053              | 3.975 (0.1565)    |
| 803025054              | 4.000 (0.1575)    |
| 803025055              | 4.025 (0.1585)    |
| 803025056              | 4.050 (0.1594)    |
| 803025057              | 4.075 (0.1604)    |

5) If the specified starting torque range cannot be obtained when a No. 1 adjusting washer is used, then select a suitable No. 2 adjusting washer from those listed in the following table. Repeat steps 1) through 4) to adjust starting torque.



- (A) Adjusting washer No. 1
- (B) Adjusting washer No. 2

| Starting torque | Dimension H | Adjusting washer No. 2 |
|-----------------|-------------|------------------------|
| Low             | Small       | Select thicker one.    |
| High            | Large       | Select thinner one.    |

| Adjusting washer No. 2 |                   |
|------------------------|-------------------|
| Part No.               | Thickness mm (in) |
| 803025059              | 3.850 (0.1516)    |
| 803025054              | 4.000 (0.1575)    |
| 803025058              | 4.150 (0.1634)    |

6) Recheck that the starting torque is within specified range, then clinch the lock nut at four positions.

# Front Differential Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

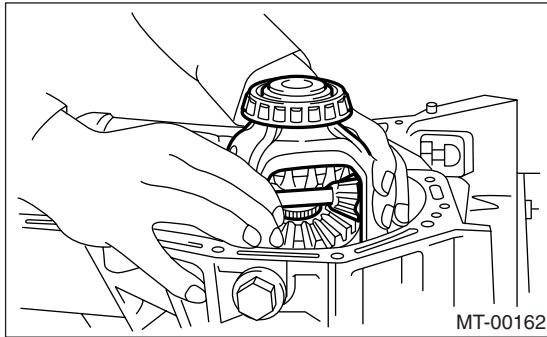
### 18. Front Differential Assembly

#### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove the transmission case. <Ref. to 5MT-52, REMOVAL, Transmission Case.>
- 4) Remove the drive pinion shaft assembly. <Ref. to 5MT-60, REMOVAL, Drive Pinion Shaft Assembly.>
- 5) Remove the main shaft assembly. <Ref. to 5MT-55, REMOVAL, Main Shaft Assembly.>
- 6) Remove the differential assembly.

#### NOTE:

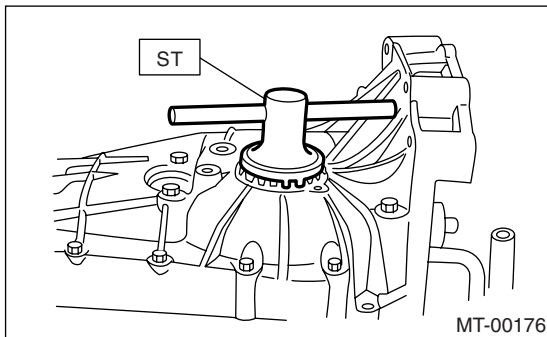
- Be careful not to confuse the right and left roller bearing outer races.
- Be careful not to damage the retainer oil seal.



- 7) Remove the differential side retainers using ST. ST 18630AA010 WRENCH COMPL RETAINER

#### NOTE:

WRENCH ASSY (ST 499787000) can also be used.



- 8) Remove the bearing outer race from transmission case. ST 398527700 PULLER ASSEMBLY

#### B: INSTALLATION

- 1) Install the bearing outer race to transmission case.

#### NOTE:

Apply transmission gear oil to the outer periphery of bearing outer race.

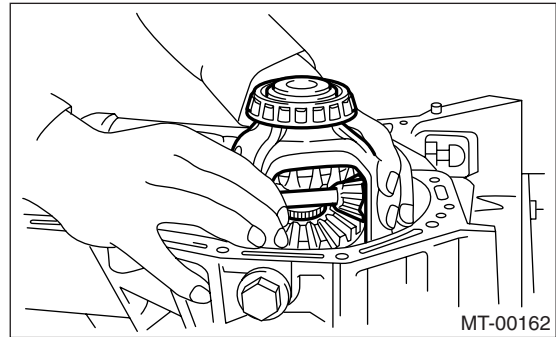
- 2) Install the differential side retainers using ST. ST 18630AA010 WRENCH COMPL RETAINER

- 3) Install the bearing outer race to transmission case.

- 4) Install the differential assembly.

#### NOTE:

Be careful not to fold the sealing lip of oil seal.



- 5) Install the main shaft assembly. <Ref. to 5MT-55, INSTALLATION, Main Shaft Assembly.>
- 6) Install the drive pinion shaft assembly. <Ref. to 5MT-60, INSTALLATION, Drive Pinion Shaft Assembly.>
- 7) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>
- 8) Install the transfer case with extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 9) Install the manual transmission assembly to vehicle. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

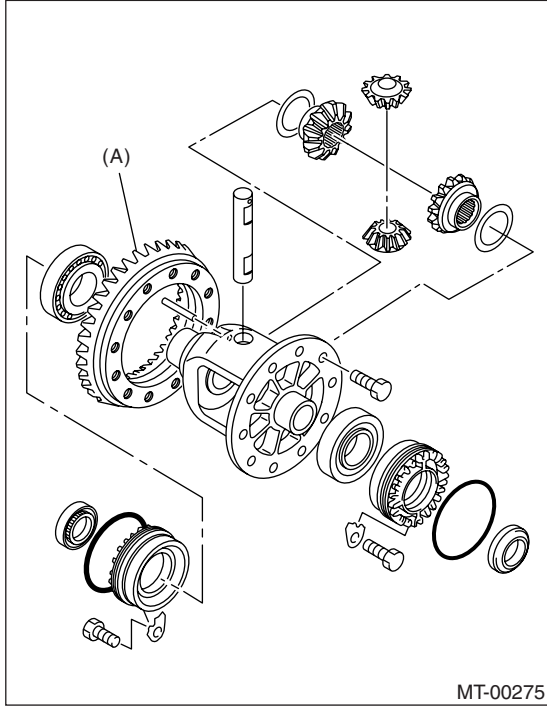
# Front Differential Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

## C: DISASSEMBLY

### 1. DIFFERENTIAL CASE ASSEMBLY

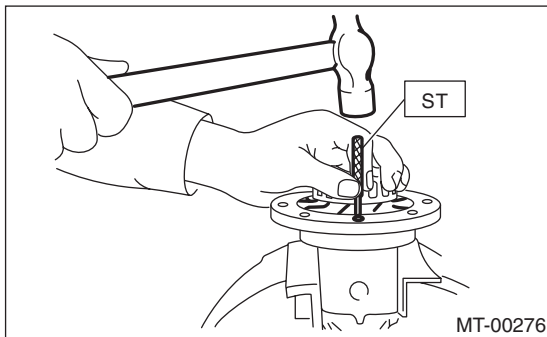
1) Loosen the twelve bolts and remove the hypoid driven gear.



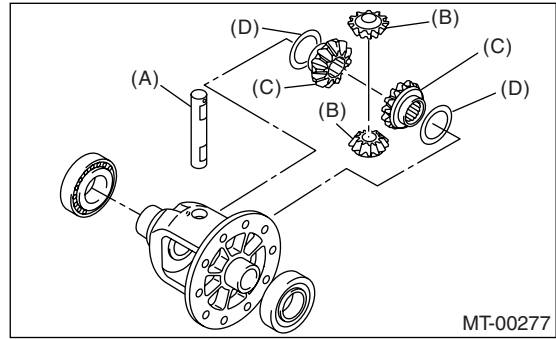
(A) Hypoid driven gear

2) Drive out the straight pin from differential assembly toward hypoid driven gear.

ST 899904100 STRAIGHT PIN REMOVER

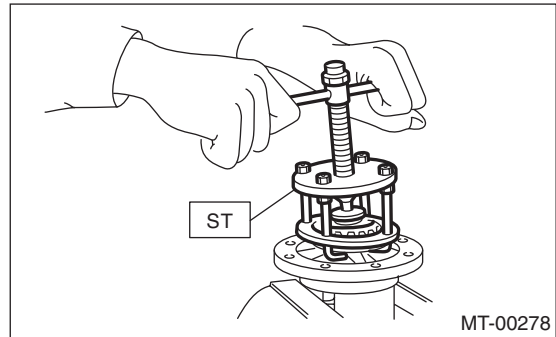


3) Pull out the pinion shaft, and remove the differential bevel pinion and gear and washer.



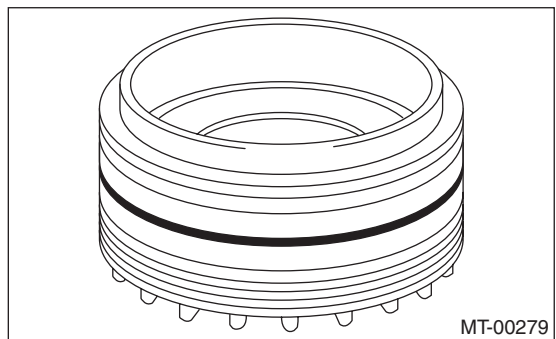
- (A) Pinion shaft
- (B) Bevel pinion
- (C) Bevel gear
- (D) Washer

4) Remove the roller bearing using ST.  
ST 899524100 PULLER SET



### 2. SIDE RETAINER

1) Remove the O-ring.



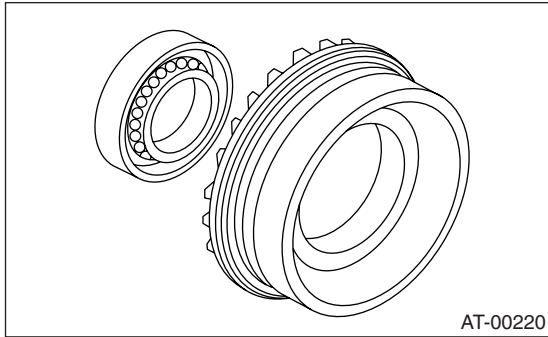
2) Remove the oil seal.

# Front Differential Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

**NOTE:**

Do not reuse the oil seal. Prepare a new oil seal.



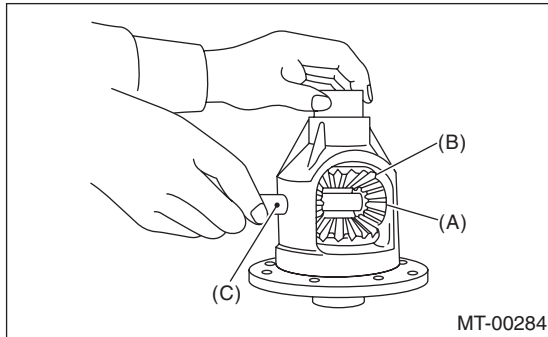
### D: ASSEMBLY

#### 1. DIFFERENTIAL CASE ASSEMBLY

1) Install the differential bevel gear and differential bevel pinion together with washers, and insert pinion shaft.

**NOTE:**

Face the chamfered side of washer toward gear.



- (A) Differential bevel pinion
- (B) Differential bevel gear
- (C) Pinion shaft

2) Measure the backlash between differential bevel gear and pinion. If it is not within specifications, install a suitable washer to adjust it. <Ref. to 5MT-73, ADJUSTMENT, Front Differential Assembly.>

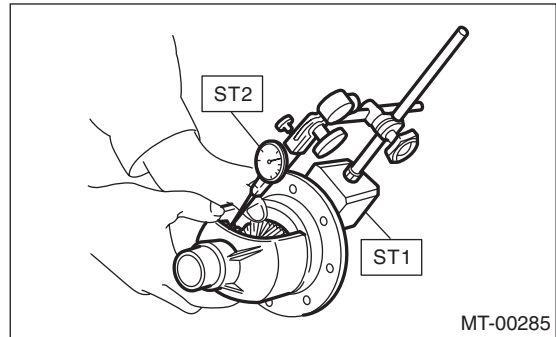
**NOTE:**

Be sure the pinion gear tooth contacts adjacent gear teeth during measurement.

- ST1 498247001 MAGNET BASE
- ST2 498247100 DIAL GAUGE

**Standard backlash:**

**0.13 — 0.18 mm (0.0051 — 0.0071 in)**

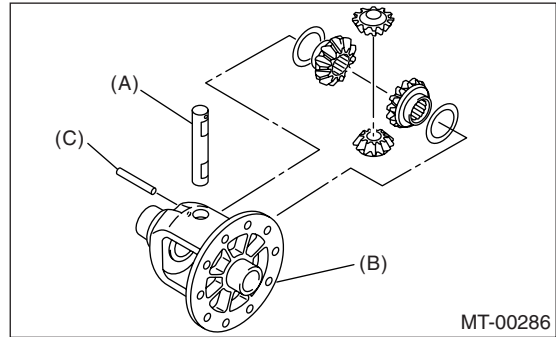


3) Align the pinion shaft and differential case at their holes, and drive the straight pin into holes from the hypoid driven gear side, using ST.

**NOTE:**

Lock the straight pin after installing.

ST 899904100 STRAIGHT PIN REMOVER



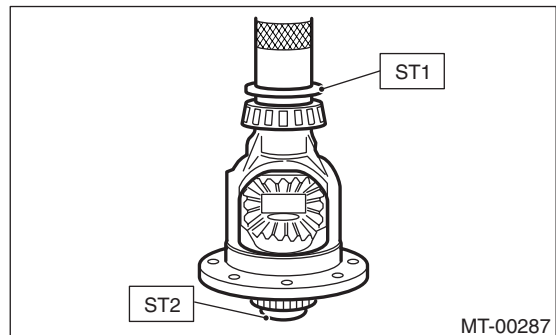
- (A) Pinion shaft
- (B) Differential case
- (C) Straight pin

4) Install the roller bearing to differential case.

**NOTE:**

- Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
- Be careful because the roller bearing outer races are used as a set.

- ST1 499277100 BUSHING 1-2 INSTALLER
- ST2 398497701 ADAPTER



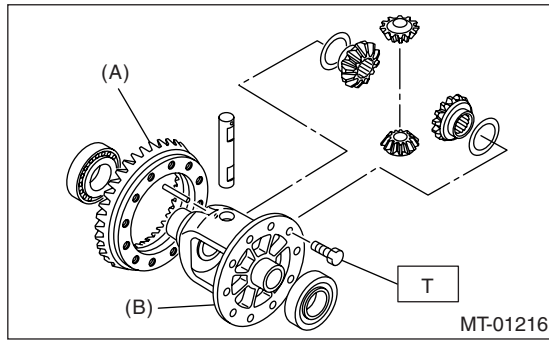
# Front Differential Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

5) Install the hypoid driven gear to differential case using twelve bolts.

**Tightening torque:**

**T: 62 N·m (6.3 kgf-m, 45.6 ft-lb)**



- (A) Hypoid driven gear
- (B) Differential case

6) Set the drive axle shaft into differential case and hold it using outer spring. Measure the shaft to case clearance to check if it is within specifications using thickness gauge.

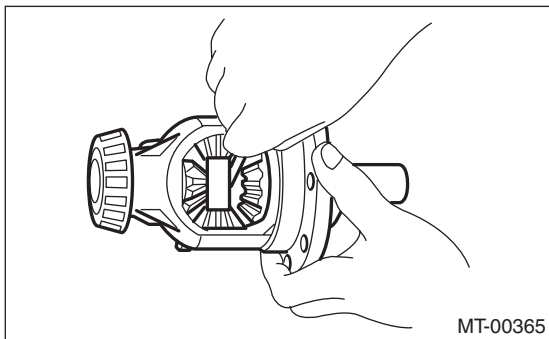
**NOTE:**

Replace the snap ring with suitable one, if the measurement is not within specifications.

| Snap ring (Outer) |                   |
|-------------------|-------------------|
| Part No.          | Thickness mm (in) |
| 805028011         | 1.05 (0.0413)     |
| 805028012         | 1.20 (0.0472)     |

**Clearance:**

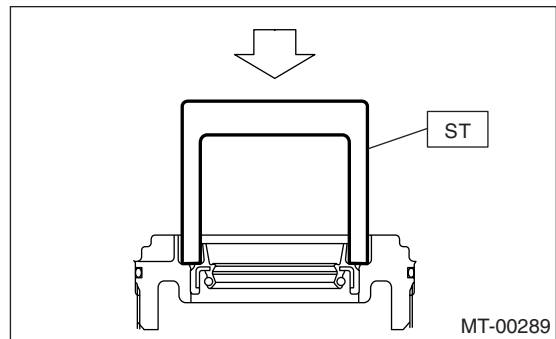
**0 — 0.2 mm (0 — 0.008 in)**



## 2. SIDE RETAINER

1) Install a new oil seal.

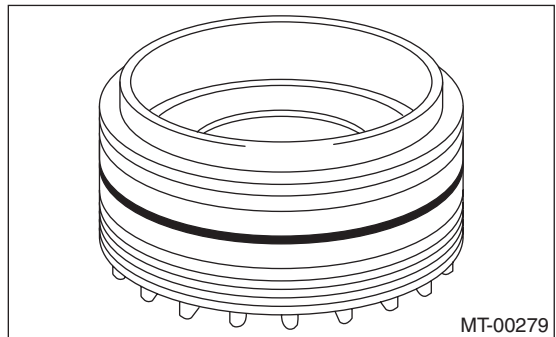
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER



2) Install a new O-ring.

**NOTE:**

Do not stretch or damage the O-ring.



## E: INSPECTION

Repair or replace the differential gear in the following cases:

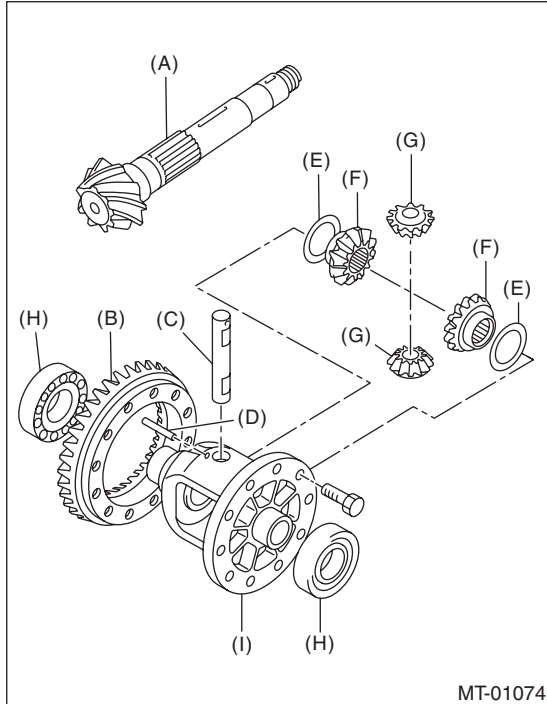
- The hypoid drive gear and drive pinion shaft tooth surface are damaged, excessively worn, or seized.
- The roller bearing on the drive pinion shaft has a worn or damaged roller path.
- There is damage, wear, or seizure of the differential bevel pinion, differential bevel gear, washer, pinion shaft, and straight pin.



# Front Differential Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

- The differential case has worn or damaged sliding surfaces.



- (A) Drive pinion shaft
- (B) Hypoid driven gear
- (C) Pinion shaft
- (D) Straight pin
- (E) Washer
- (F) Differential bevel gear
- (G) Differential bevel pinion
- (H) Roller bearing
- (I) Differential case

### 1. BEVEL PINION GEAR BACKLASH

Measure the backlash between differential bevel gear and pinion. If it is not within specifications, install a suitable washer to adjust it.

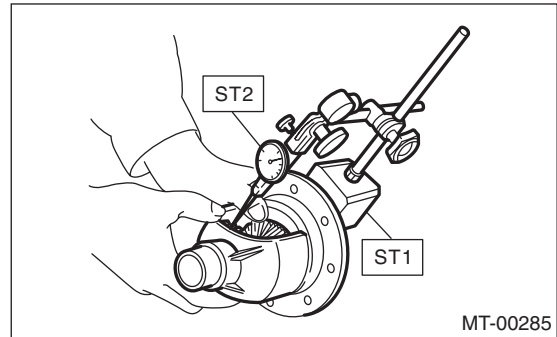
#### NOTE:

Be sure the pinion gear tooth contacts adjacent gear teeth during measurement.

- ST1 498247001 MAGNET BASE
- ST2 498247100 DIAL GAUGE

#### Standard backlash:

**0.13 — 0.18 mm (0.0051 — 0.0071 in)**



### 2. HYPOID GEAR BACKLASH

1) Set the ST1, ST2 and ST3. Insert the needle through transmission oil drain plug hole so that the needle comes in contact with the tooth surface at a right angle and check the backlash.

ST1 498247001 MAGNET BASE

ST2 498247100 DIAL GAUGE

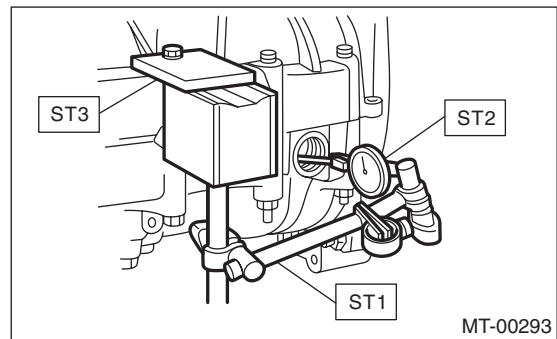
ST3 498255400 PLATE

2) Install the axle shafts to both sides, rotate in the reverse direction so that the dial gauge contacts the tooth surface, and read the dial gauge.

Part No. 38415AA100AXLE SHAFT

#### Backlash:

**0.13 — 0.18 mm (0.0051 — 0.0071 in)**



#### NOTE:

If the backlash is outside specified range, adjust it by turning the holder in right side case.

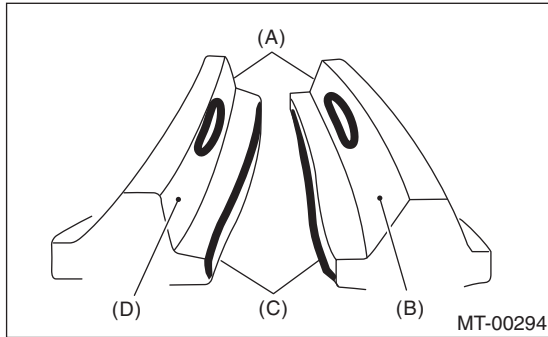
### 3. TOOTH CONTACT OF HYPOID GEAR

Check the tooth contact of hypoid gear as follows: Apply a uniform thin coat of red lead on both tooth surfaces of 3 or 4 teeth of the hypoid gear. Move the hypoid gear back and forth by turning the transmission main shaft until a definite contact pattern is developed on hypoid gear, and judge whether face contact is correct. If it is inaccurate, make adjustment. <Ref. to 5MT-73, ADJUSTMENT, Front Differential Assembly.>

# Front Differential Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

- Tooth contact is correct.



- (A) Toe
- (B) Coast side
- (C) Heel
- (D) Drive side

## F: ADJUSTMENT

### 1. BEVEL PINION GEAR BACKLASH

- 1) Disassemble the front differential. <Ref. to 5MT-68, REMOVAL, Front Differential Assembly.>
- 2) Select a differential washer from the table and install.

| Washer    |                                    |
|-----------|------------------------------------|
| Part No.  | Thickness mm (in)                  |
| 803038021 | 0.925 — 0.950<br>(0.0364 — 0.0374) |
| 803038022 | 0.975 — 1.000<br>(0.0384 — 0.0394) |
| 803038023 | 1.025 — 1.050<br>(0.0404 — 0.0413) |

- 3) Adjust until the specified value is obtained.

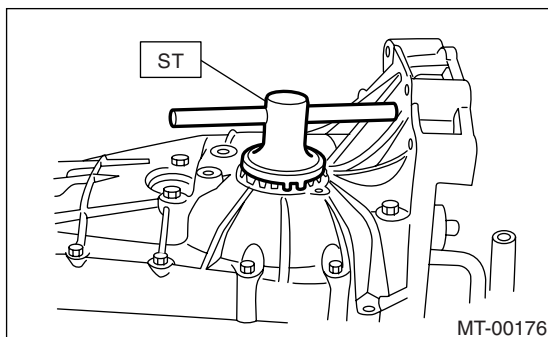
#### Standard backlash:

**0.13 — 0.18 mm (0.0051 — 0.0071 in)**

### 2. HYPOID GEAR BACKLASH

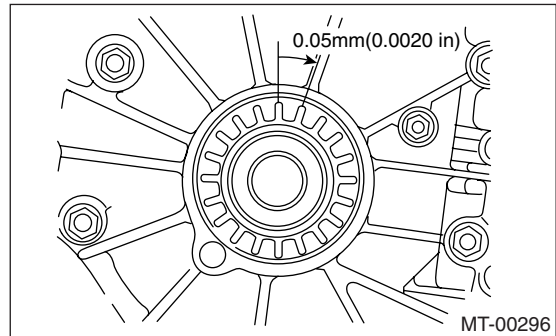
Adjust backlash by turning the holder in right side case.

ST 18630AA010 WRENCH COMPL RETAINER



#### NOTE:

Each time holder rotates one tooth, backlash changes by 0.05 mm (0.020 in).

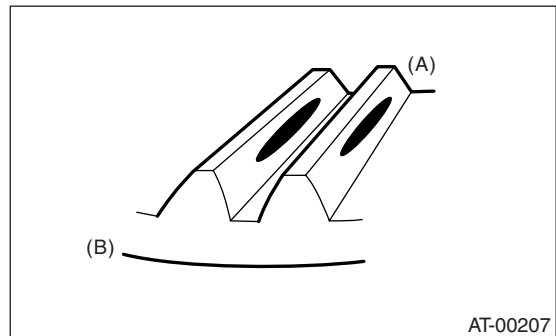


### 3. TOOTH CONTACT OF HYPOID GEAR

- 1) Adjust until the tooth contact is correct.
- 2) Check and adjust the tooth contact with following.

- Tooth contact

**Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]**

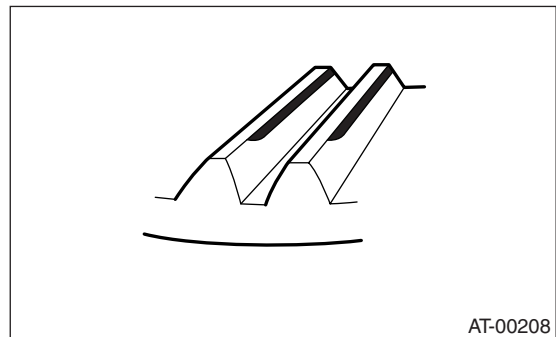


- (A) Toe side
- (B) Heel side

- Face contact

**Checking item: Backlash is too large.**

Contact pattern

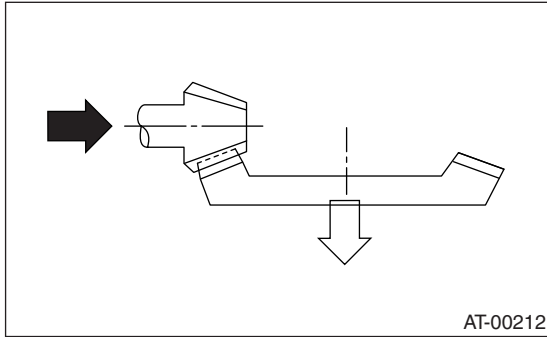




# Front Differential Assembly

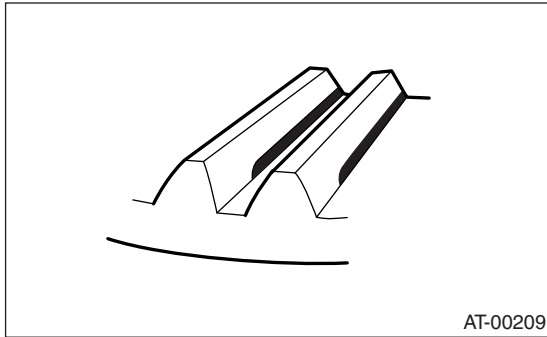
## MANUAL TRANSMISSION AND DIFFERENTIAL

Corrective action: Reduce thickness of pinion height adjusting washer in order to bring drive pinion close to driven gear.



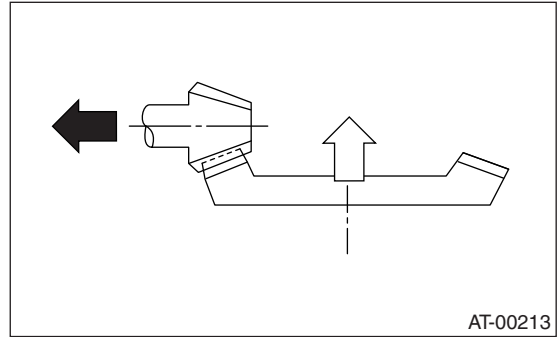
- Flank contact

**Checking item: Backlash is too small.**  
Contact pattern



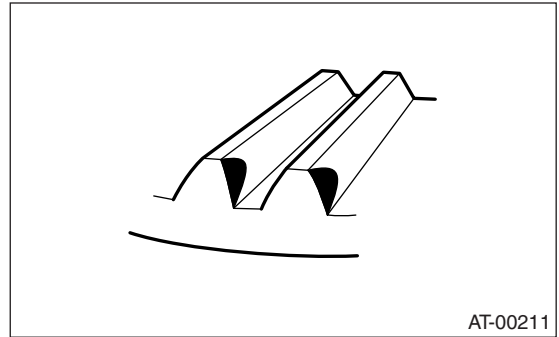
Corrective action: Increase thickness of pinion height adjusting washer in order to move drive pinion away from driven gear.

Corrective action: Increase thickness of pinion height adjusting washer in order to bring drive pinion close to driven gear.

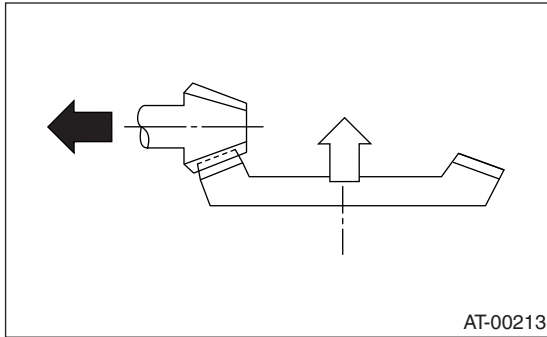


- Heel contact (Outside end contact)

**Checking item: Contact area is small.**  
Contact pattern

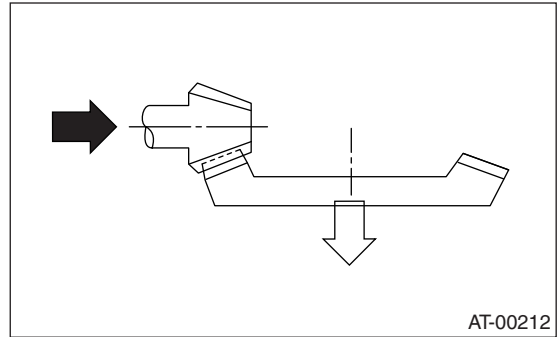
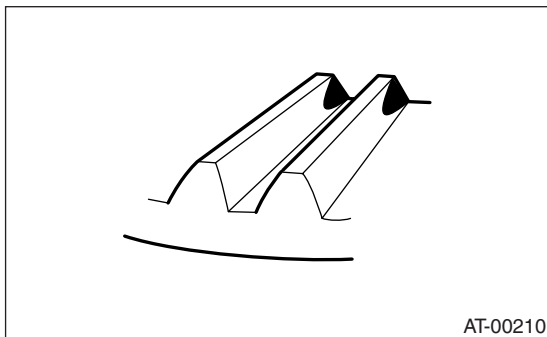


Corrective action: Reduce thickness of pinion height adjusting washer in order to move drive pinion away from driven gear.



- Toe contact (Inside end contact)

**Checking item: Contact area is small.**  
Contact pattern



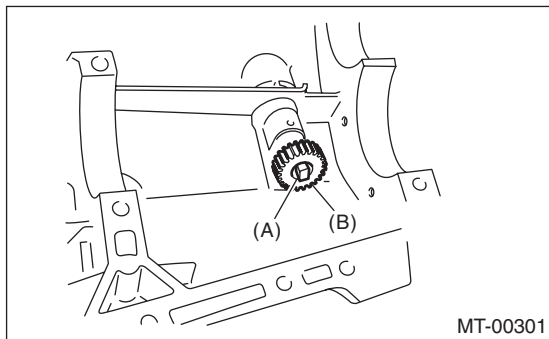
# Speedometer Gear

MANUAL TRANSMISSION AND DIFFERENTIAL

## 19.Speedometer Gear

### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-36, REMOVAL, Switches and Harness.>
- 3) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the transmission case. <Ref. to 5MT-52, REMOVAL, Transmission Case.>
- 5) Remove the vehicle speed sensor. <Ref. to 5MT-38, REMOVAL, Vehicle Speed Sensor.>
- 6) Remove the outer snap ring and pull out speedometer driven gear. Next, remove the oil seal, speedometer shaft and washer.



- (A) Outer snap ring  
(B) Speedometer driven gear

### B: INSTALLATION

- 1) Install the washer and speedometer shaft, and press fit the oil seal with ST.

#### NOTE:

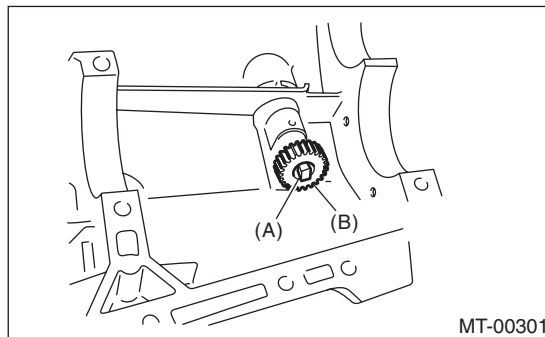
Use a new oil seal, if it has been removed.

ST 899824100 or 499827000 PRESS

- 2) Install the vehicle speed sensor. <Ref. to 5MT-38, INSTALLATION, Vehicle Speed Sensor.>
- 3) Install the speedometer driven gear and snap ring.

#### NOTE:

Use a new snap ring, if it has been removed.



- (A) Outer snap ring  
(B) Speedometer driven gear

- 4) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>
- 5) Install the transfer case with extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 6) Install the back-up light switch and neutral position switch. <Ref. to 5MT-36, INSTALLATION, Switches and Harness.>
- 7) Install the manual transmission assembly to vehicle. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

### C: INSPECTION

Check the speedometer gear, oil seal and speedometer shaft for damage. Replace if damaged.

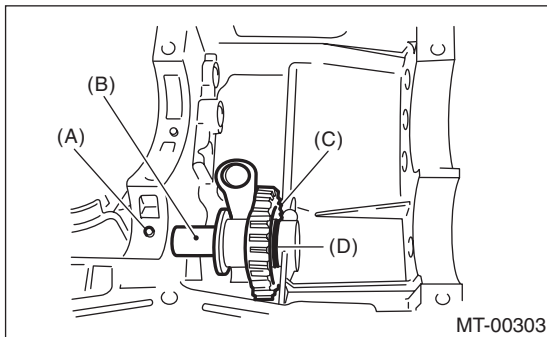
# Reverse Idler Gear

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 20. Reverse Idler Gear

#### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-36, REMOVAL, Switches and Harness.>
- 3) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the transmission case. <Ref. to 5MT-60, REMOVAL, Drive Pinion Shaft Assembly.>
- 5) Remove the drive pinion shaft assembly. <Ref. to 5MT-60, REMOVAL, Drive Pinion Shaft Assembly.>
- 6) Remove the main shaft assembly. <Ref. to 5MT-55, REMOVAL, Main Shaft Assembly.>
- 7) Remove the differential assembly. <Ref. to 5MT-68, REMOVAL, Front Differential Assembly.>
- 8) Remove the shifter forks and rods. <Ref. to 5MT-78, REMOVAL, Shifter Fork and Rod.>
- 9) Pull out the straight pin, and remove the reverse idler gear shaft, reverse idler gear and washer.



- (A) Straight pin
- (B) Reverse idler gear shaft
- (C) Reverse idler gear
- (D) Washer

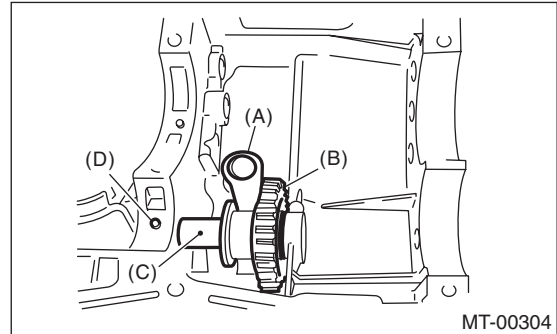
- 10) Remove the reverse shifter lever.

#### B: INSTALLATION

- 1) Install the reverse shifter lever, reverse idler gear and reverse idler gear shaft, and secure with straight pin.

#### NOTE:

Be sure to install the reverse idler shaft from rear side.



- (A) Reverse shifter lever
- (B) Reverse idler gear
- (C) Reverse idler gear shaft
- (D) Straight pin

- 2) Inspect and adjust the clearance between reverse idler gear and transmission case wall. <Ref. to 5MT-76, INSTALLATION, Reverse Idler Gear.> <Ref. to 5MT-77, ADJUSTMENT, Reverse Idler Gear.>
- 3) Install the shifter forks and rods. <Ref. to 5MT-78, INSTALLATION, Shifter Fork and Rod.>
- 4) Install the differential assembly. <Ref. to 5MT-68, INSTALLATION, Front Differential Assembly.>
- 5) Install the main shaft assembly. <Ref. to 5MT-55, INSTALLATION, Main Shaft Assembly.>
- 6) Install the drive pinion shaft assembly. <Ref. to 5MT-60, INSTALLATION, Drive Pinion Shaft Assembly.>
- 7) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>
- 8) Install the transfer case with extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 9) Install the back-up light switch and neutral position switch. <Ref. to 5MT-36, INSTALLATION, Switches and Harness.>
- 10) Install the manual transmission assembly to vehicle. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

# Reverse Idler Gear

MANUAL TRANSMISSION AND DIFFERENTIAL

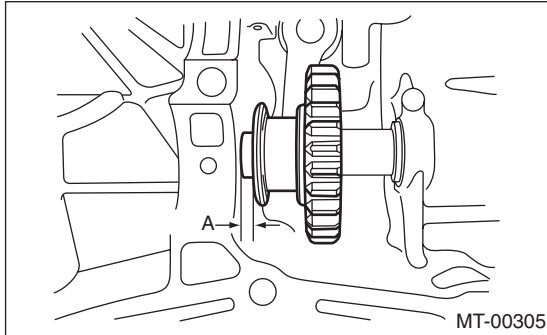
## C: INSPECTION

1) Move the reverse shifter rod toward the reverse side. Inspect the clearance between reverse idler gear and transmission case wall.

If out of specification, select the appropriate reverse shifter lever and adjust.

### Clearance A:

**6.0 — 7.5 mm (0.236 — 0.295 in)**

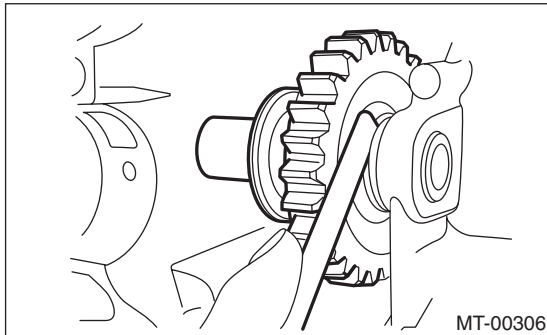


2) After installing a suitable reverse shifter lever, shift into neutral. Inspect the clearance between reverse idler gear and transmission case wall.

If out of specification, select the appropriate washer and adjust.

### Clearance:

**0 — 0.5 mm (0 — 0.020 in)**



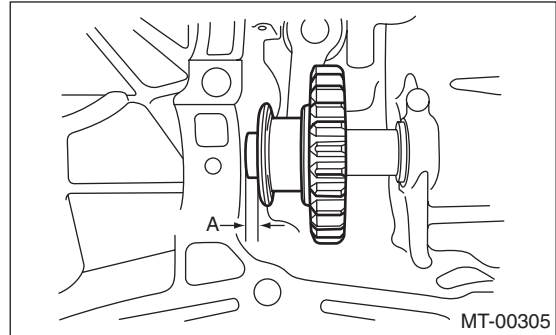
3) Check the reverse idler gear and shaft for damage. Replace if damaged.

## D: ADJUSTMENT

1) Select the appropriate reverse shifter lever from the table below, and adjust until the gap between the reverse idler gear and transmission case wall is within specification.

### Clearance A:

**6.0 — 7.5 mm (0.236 — 0.295 in)**

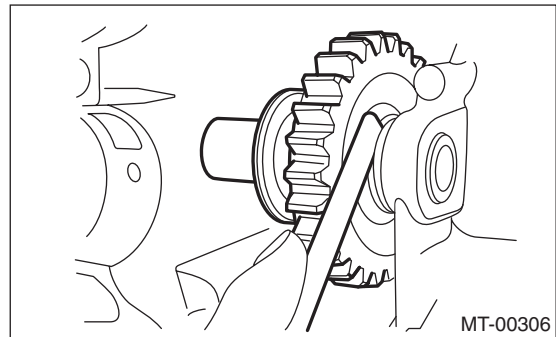


| Reverse shifter lever |      |                        |
|-----------------------|------|------------------------|
| Part No.              | Mark | Remarks                |
| 32820AA070            | 7    | Further from case wall |
| 32820AA080            | 8    | Standard               |
| 32820AA090            | 9    | Closer to case wall    |

2) Select the appropriate washer from the table below, and adjust until the gap between the reverse idler gear and transmission case wall is within specification.

### Clearance:

**0 — 0.5 mm (0 — 0.020 in)**



| Washer    |                   |
|-----------|-------------------|
| Part No.  | Thickness mm (in) |
| 803020151 | 0.4 (0.016)       |
| 803020152 | 1.1 (0.043)       |
| 803020153 | 1.5 (0.059)       |
| 803020154 | 1.9 (0.075)       |
| 803020155 | 2.3 (0.091)       |

# Shifter Fork and Rod

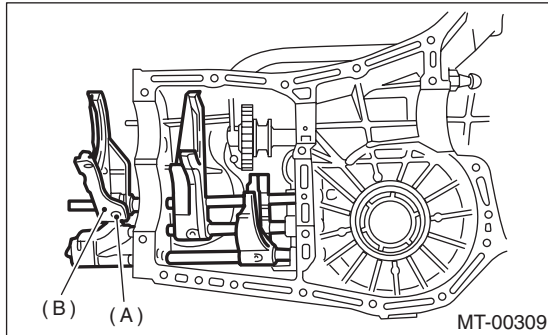
## MANUAL TRANSMISSION AND DIFFERENTIAL

### 21. Shifter Fork and Rod

#### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-36, REMOVAL, Switches and Harness.>
- 3) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the transmission case. <Ref. to 5MT-52, REMOVAL, Transmission Case.>
- 5) Remove the drive pinion shaft assembly. <Ref. to 5MT-60, REMOVAL, Drive Pinion Shaft Assembly.>
- 6) Remove the main shaft assembly. <Ref. to 5MT-55, REMOVAL, Main Shaft Assembly.>
- 7) Remove the differential assembly. <Ref. to 5MT-68, REMOVAL, Front Differential Assembly.>
- 8) Drive out the straight pin with ST, and 5th shifter fork.

ST 398791700 STRAIGHT PIN REMOVER

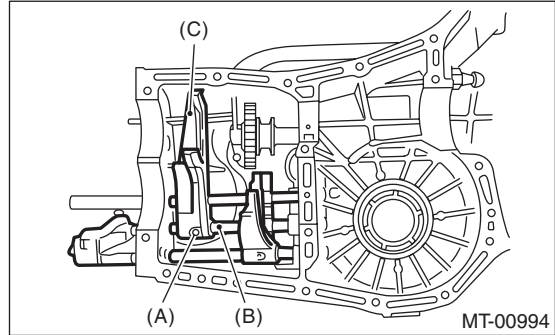


- (A) Straight pin
- (B) 5th shifter fork

- 9) Remove the plugs, springs and checking balls.
- 10) Drive out the straight pin, and pull out 3rd-4th fork rod and shifter fork.

#### NOTE:

When removing the rod, keep other rods in neutral. Also, when pulling out the straight pin, remove it toward the inside of case so that it does not hit against the case.



- (A) Straight pin
- (B) 3rd-4th fork rod
- (C) Shifter fork

- 11) Drive out the straight pin, and pull out 1st-2nd fork rod and shifter fork.

12) Remove the outer snap ring, and pull out the reverse shifter rod arm and reverse fork rod. Then take out the ball, spring and interlock plunger from rod.

And then remove the rod.

#### NOTE:

When pulling out the reverse shifter rod arm, be careful not to let the ball pop out of arm.

- 13) Remove the reverse shifter lever.

#### B: INSTALLATION

1) Install the reverse arm fork spring, ball and interlock plunger to reverse fork rod arm. Insert the reverse fork rod into hole in reverse fork rod arm, and hold it with outer snap ring using ST.

#### NOTE:

Apply grease to plunger to prevent it from falling.

ST 399411700 ACCENT BALL INSTALLER

2) Position the ball, spring and new gasket in reverse shifter rod hole, on left side transmission case, and tighten the checking ball plug.

3) Install the 1st-2nd fork rod into 1st-2nd shifter fork via the hole on the rear of transmission case.

4) Align the holes in rod and fork, and new drive straight pin into these holes using ST.

#### NOTE:

- Set other rods to neutral.
- Make sure the interlock plunger is on the 3rd-4th fork rod side.

ST 398791700 STRAIGHT PIN REMOVER

- 5) Install the interlock plunger onto 3rd-4th fork rod.

# Shifter Fork and Rod

MANUAL TRANSMISSION AND DIFFERENTIAL

**NOTE:**

Apply a coat of grease to plunger to prevent it from falling.

6) Install the 3rd-4th fork rod into 3rd-4th shifter fork via the hole on the rear of transmission case.

7) Align the holes in rod and fork, and new drive straight pin into these holes.

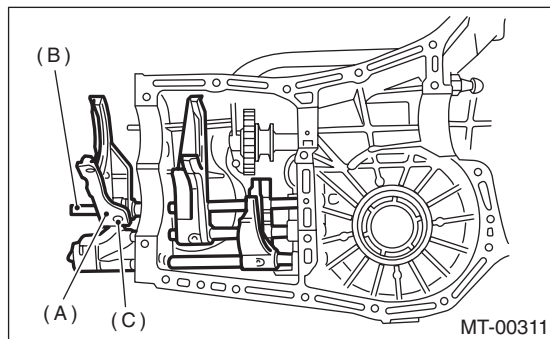
**NOTE:**

- Set the reverse fork rod to neutral.
- Make sure the interlock plunger to be installed is on the reverse fork rod side.

ST 398791700 STRAIGHT PIN REMOVER

8) Install the 5th shifter fork onto the rear of reverse fork rod. Align holes in the two parts and new drive straight pin into place.

ST 398791700 STRAIGHT PIN REMOVER

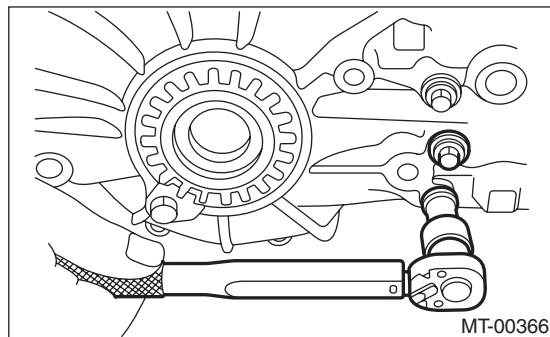


- (A) 5th shifter fork
- (B) Reverse fork rod
- (C) Straight pin

9) Position the balls, checking ball springs and new gaskets into 3rd-4th and 1st-2nd rod holes, and install plugs.

**Tightening torque:**

**20 N·m (2.0 kgf·m, 14.5 ft·lb)**



10) Install the differential assembly. <Ref. to 5MT-68, INSTALLATION, Front Differential Assembly.>

11) Install the main shaft assembly.

<Ref. to 5MT-55, INSTALLATION, Main Shaft Assembly.>

12) Install the drive pinion shaft assembly. <Ref. to 5MT-60, INSTALLATION, Drive Pinion Shaft Assembly.>

13) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>

14) Install the transfer case with extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>

15) Install the back-up light switch and neutral position switch. <Ref. to 5MT-36, INSTALLATION, Switches and Harness.>

16) Install the manual transmission assembly to vehicle. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

**C: INSPECTION**

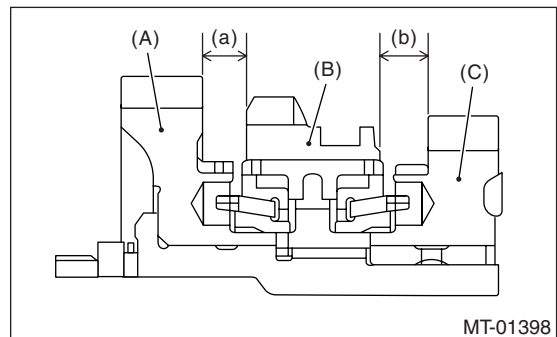
1) Check the shift shaft and shift rod for damage. Replace if damaged.

2) Gearshift mechanism:

Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

3) Inspect the clearance between 1st, 2nd driven gear and reverse driven gear. If any clearance is not within specifications, replace the shifter fork as required.

**Clearance (a) and (b):**  
**9.5 mm (0.374 in)**



- (A) 1st driven gear
- (B) Reverse driven gear
- (C) 2nd driven gear

| 1st-2nd shifter fork |         |  |
|----------------------|---------|--|
| Part No.             | Mark    | Remarks  |
| 32804AA060           | 1       | Approach to 1st gear by 0.2 mm (0.008 in).         |
| 32804AA070           | No mark | Standard   |
| 32804AA080           | 3       | Become distant from 2nd gear by 0.2 mm (0.008 in). |

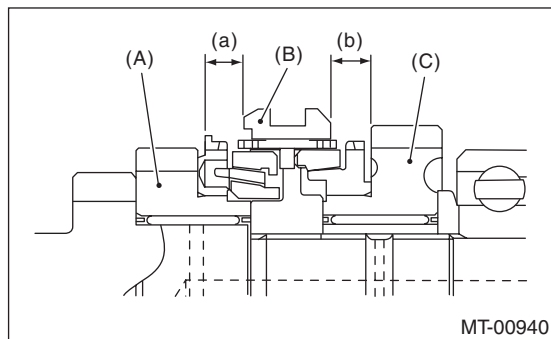
4) Inspect the clearance between 3rd, 4th drive gear and coupling sleeve. If any clearance is not within specifications, replace the shifter fork as required.



# Shifter Fork and Rod

## MANUAL TRANSMISSION AND DIFFERENTIAL

**Clearance (a) and (b):**  
**9.3 mm (0.366 in)**

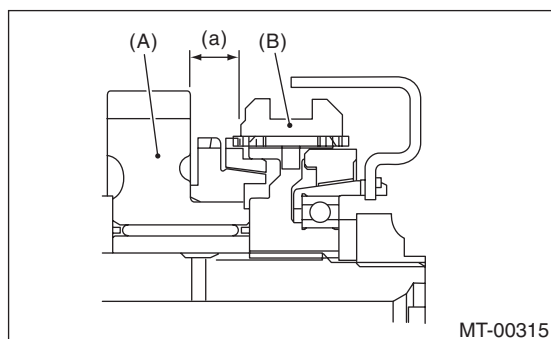


- (A) 3rd drive gear
- (B) Coupling sleeve
- (C) 4th drive gear

| 3rd-4th shifter fork |         |  |
|----------------------|---------|--|
| Part No.             | Mark    | Remarks  |
| 32810AA061           | 1       | Approach to 4th gear by 0.2 mm (0.008 in).         |
| 32810AA071           | No mark | Standard   |
| 32810AA101           | 3       | Become distant from 3rd gear by 0.2 mm (0.008 in). |

5) Inspect the clearance between 5th drive gear and coupling sleeve. If any clearance is not within specifications, replace the shifter fork as required.

**Clearance (a):**  
**9.3 mm (0.366 in)**



- (A) 5th drive gear
- (B) Coupling sleeve

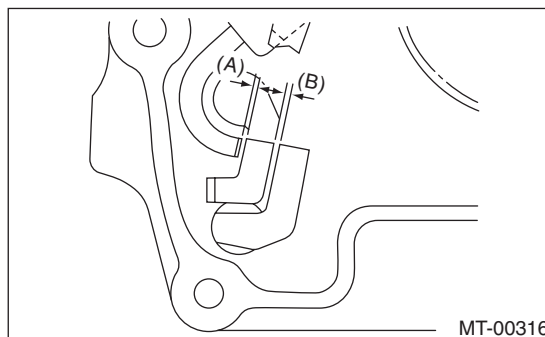
| 5th shifter fork (Non-turbo model) |         |  |
|------------------------------------|---------|--|
| Part No.                           | Mark    | Remarks  |
| 32812AA201                         | 7       | Approach to 5th gear by 0.2 mm (0.008 in).         |
| 32812AA211                         | No mark | Standard   |
| 32812AA221                         | 9       | Become distant from 5th gear by 0.2 mm (0.008 in). |

| 5th shifter fork (Turbo model) |         |  |
|--------------------------------|---------|--|
| Part No.                       | Mark    | Remarks  |
| 32812AA231                     | 7       | Approach to 5th gear by 0.2 mm (0.008 in).         |
| 32812AA241                     | No mark | Standard   |
| 32812AA251                     | 9       | Become distant from 5th gear by 0.2 mm (0.008 in). |

6) Inspect the rod end clearances (A) and (B). If any clearance is not within specifications, replace the rod or fork as required.

**Clearance (A):**  
**3rd-4th to 5th:**  
**0.5 — 1.3 mm (0.020 — 0.051 in)**

**Clearance (B):**  
**1st-2nd to 3rd-4th:**  
**0.4 — 1.4 mm (0.016 — 0.055 in)**



# General Diagnostic Table

MANUAL TRANSMISSION AND DIFFERENTIAL

## 22. General Diagnostic Table

### A: INSPECTION

#### 1. MANUAL TRANSMISSION

| Symptom   | Possible cause  | Remedy                                   |
|---|---|--|
| 1. Gears are difficult to intermesh.<br>NOTE:<br>The cause for difficulty in shifting gears can be classified into two kinds: one is malfunction of the gear shift system and the other is malfunction of the transmission. However, if the operation is heavy and engagement of the gears is difficult, defective clutch disengagement may also be responsible. Check whether the clutch is correctly functioning, before checking the gear shift system and transmission. | (a) Worn, damaged or burred chamfer of internal spline of sleeve and reverse driven gear  | Replace.                                 |
|   | (b) Worn, damaged or burred chamfer of spline of gears  | Replace.                                 |
|   | (c) Worn or scratched bushings  | Replace.                                 |
|   | (d) Incorrect contact between synchronizer ring and gear cone or wear   | Correct or replace.                      |
| 2. Gear slips out.<br>• Gear slips out when coasting on rough road.<br>• Gear slips out during acceleration.  | (a) Defective pitching stopper adjustment   | Adjust.                                  |
|   | (b) Loose engine mounting bolts   | Tighten or replace.                      |
|   | (c) Worn fork shifter, broken shifter fork rail spring  | Replace.                                 |
|   | (d) Worn or damaged ball bearing  | Replace.                                 |
|   | (e) Excessive clearance between splines of synchronizer hub and synchronizer sleeve   | Replace.                                 |
|   | (f) Worn tooth step of synchronizer hub (responsible for slip-out of 3rd gear)  | Replace.                                 |
|   | (g) Worn 1st driven gear and driven shaft   | Replace.                                 |
|   | (h) Worn 2nd driven gear and bushing  | Replace.                                 |
|   | (i) Worn 3rd drive gear and needle bearing  | Replace.                                 |
|   | (j) Worn 4th drive gear and needle bearing  | Replace.                                 |
|   | (k) Worn reverse idler gear and bushing   | Replace.                                 |
| 3. Noise comes from transmission.<br>NOTE:<br>If an noise is heard when the vehicle is parked with its engine idling and if the noise ceases when the clutch is disengaged, it may be considered that the noise comes from the transmission.  | (a) Insufficient or improper lubrication  | Lubricate with specified oil or replace. |
|   | (b) Worn or damaged gears and bearings<br>NOTE:<br>If the trouble is only wear of the tooth surfaces, merely a high roaring noise will occur at high speeds, but if any part is broken, rhythmical knocking sound will be heard even at low speeds. | Replace.                                 |



# General Diagnostic Table

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 2. DIFFERENTIAL

| Symptom   | Possible cause  | Remedy  |
|---|---|---|
| <p>1. Broken differential (case, gear, bearing, etc.)</p> <p>NOTE:<br/>Noise will develop and finally it will become impossible to continue to run due to broken pieces obstructing the gear revolution.</p>  | (a) Insufficient or improper oil  | Disassemble the differential and replace broken components and at the same time check other components for any trouble, and replace if necessary. |
|   | (b) Use of vehicle under severe conditions such as excessive load and improper use of clutch  | Readjust the bearing preload and backlash and face contact of gears.  |
|   | (c) Improper adjustment of taper roller bearing   | Adjust.   |
|   | (d) Improper adjustment of drive pinion and hypoid driven gear  | Adjust.   |
|   | (e) Excessive backlash due to worn differential side gear, washer or differential pinion vehicle under severe operating conditions. | Add recommended oil to specified level. Do not use the vehicle under severe operating conditions.   |
|   | (f) Loose hypoid driven gear clamping bolts   | Tighten.  |
| <p>2. Differential and hypoid gear noises</p> <p>Troubles of the differential and hypoid gear always appear as noise problems. Therefore noise is the first indication of the trouble. However noises from the engine, muffler, tire, exhaust gas, bearing, body, etc. are easily mistaken for the differential noise. Pay special attention to the hypoid gear noise because it is easily confused with other gear noises. There are the following four kinds of noises.</p> <ul style="list-style-type: none"> <li>• Gear noise when driving: If noise increases as vehicle speed increases it may be due to insufficient gear oil, incorrect gear engagement, damaged gears, etc.</li> <li>• Gear noise when coasting: Damaged gears due to maladjusted bearings and incorrect shim adjustment</li> <li>• Bearing noise when driving or when coasting: Cracked, broken or damaged bearings</li> <li>• Noise which mainly occurs when turning: Unusual noise from differential side gear, differential pinion, differential pinion shaft, etc.</li> </ul> | (a) Insufficient oil  | Lubricate.  |
|   | (b) Improper adjustment of hypoid driven gear and drive pinion  | Check tooth contact.  |
|   | (c) Worn teeth of hypoid driven gear and drive pinion   | Replace as a set.<br>Readjust the bearing preload.  |
|   | (d) Loose roller bearing  | Readjust the hypoid driven gear to drive pinion backlash and check tooth contact.   |
|   | (e) Distorted hypoid driven gear or differential case   | Replace.  |
|   | (f) Worn washer and differential pinion shaft   | Replace.  |

# MANUAL TRANSMISSION AND DIFFERENTIAL

# 6MT

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# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 1. General Description

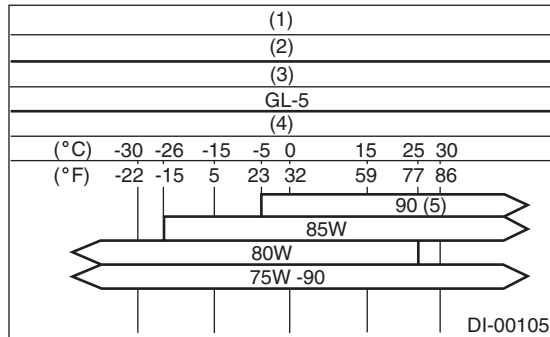
#### A: SPECIFICATION

##### 1. MANUAL TRANSMISSION AND DIFFERENTIAL

|                                |                         |                                |   |
|--------------------------------|-------------------------|--------------------------------|---|
| Type                           |                         | 6-forward speeds and 1-reverse |   |
| Transmission gear ratio        |                         | 1st                            | 3.636   |
|                                |                         | 2nd                            | 2.375   |
|                                |                         | 3rd                            | 1.761   |
|                                |                         | 4th                            | 1.346   |
|                                |                         | 5th                            | 0.971   |
|                                |                         | 6th                            | 0.756   |
|                                |                         | Reverse                        | 3.545   |
| Front reduction gear           | Final                   | Type of gear                   | Hypoid  |
|                                |                         | Gear ratio                     | 3.900   |
| Rear reduction gear            | Transfer                | Type of gear                   | Helical   |
|                                |                         | Gear ratio                     | 1.100   |
|                                | Final                   | Type of gear                   | Hypoid  |
|                                |                         | Gear ratio                     | 3.545   |
| Front differential             | Type and number of gear |                                | Planetary gear (Pinion gear: 8, Gear: 2)  |
|                                | Type of LSD             |                                | Helical   |
| Center differential            | Type and number of gear |                                | Planetary gear<br>(Internal gear: 1, Pinion gear: 6, Sun gear: 1 and Electromagnetic floating variable control multiple clutch) |
| Transmission gear oil          |                         | GL-5                           |   |
| Transmission gear oil capacity |                         | 4.1 ℓ (4.3 US qt, 3.6 Imp qt)  |   |

### 2. TRANSMISSION GEAR OIL

#### Recommended oil:



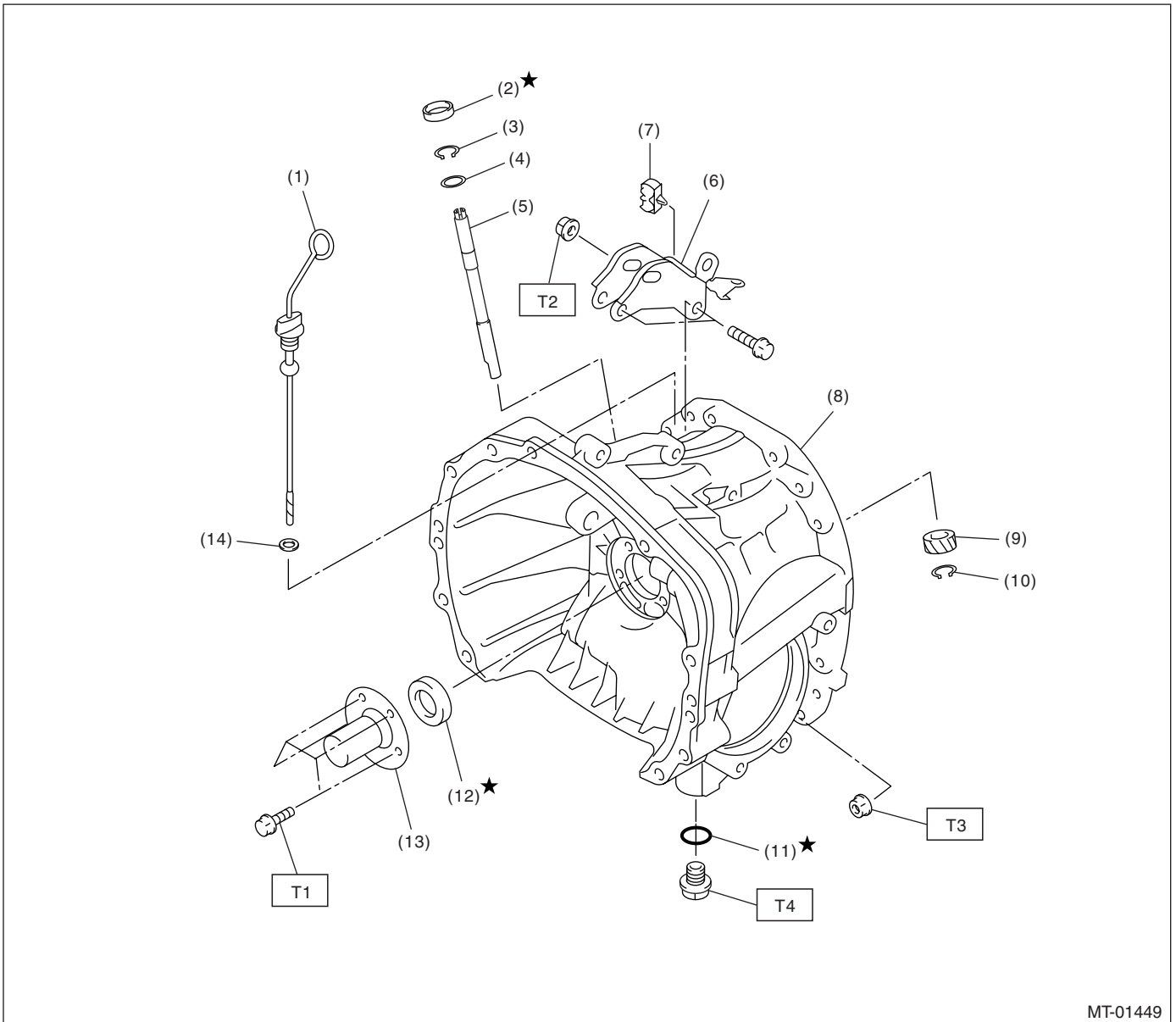
- (1) Item
- (2) Transmission gear oil
- (3) API standard
- (4) SAE viscosity No. and applicable temperature
- (5) STI model

# General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

## B: COMPONENT

### 1. CLUTCH HOUSING



MT-01449

- |                                   |                                   |
|-----------------------------------|-----------------------------------|
| (1) Oil level gauge               | (8) Clutch housing                |
| (2) Oil seal                      | (9) Speedometer driven gear       |
| (3) Snap ring                     | (10) Snap ring                    |
| (4) Washer                        | (11) Gasket                       |
| (5) Speedometer driven gear shaft | (12) Oil seal                     |
| (6) Pitching stopper bracket      | (13) Clutch release bearing guide |
| (7) Clip                          | (14) O-ring                       |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 6.4 (0.65, 4.7)**

**T2: 41 (4.2, 30.2)**

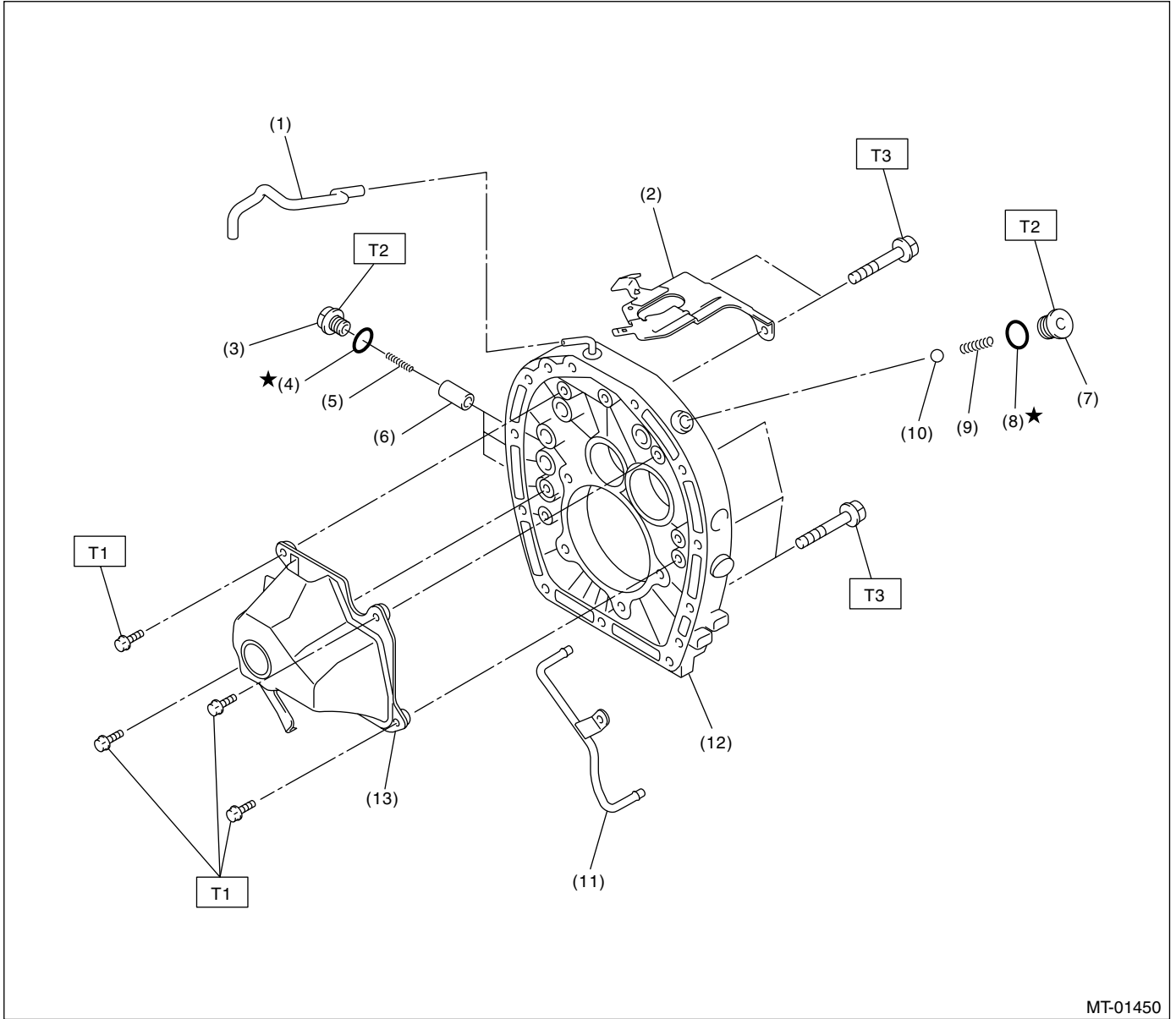
**T3: 50 (5.1, 36.9)**

**T4: 70 (7.1, 51.6)**

# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 2. ADAPTER PLATE



- (1) Air breather hose
- (2) Transmission harness stay
- (3) Plug
- (4) Gasket
- (5) Spring
- (6) Plunger

- (7) Plug
- (8) Gasket
- (9) Spring
- (10) Ball
- (11) Lubrication pipe
- (12) Adapter plate

- (13) Oil chamber

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 6.4 (0.65, 4.7)**

**T2: 37 (3.8, 27.3)**

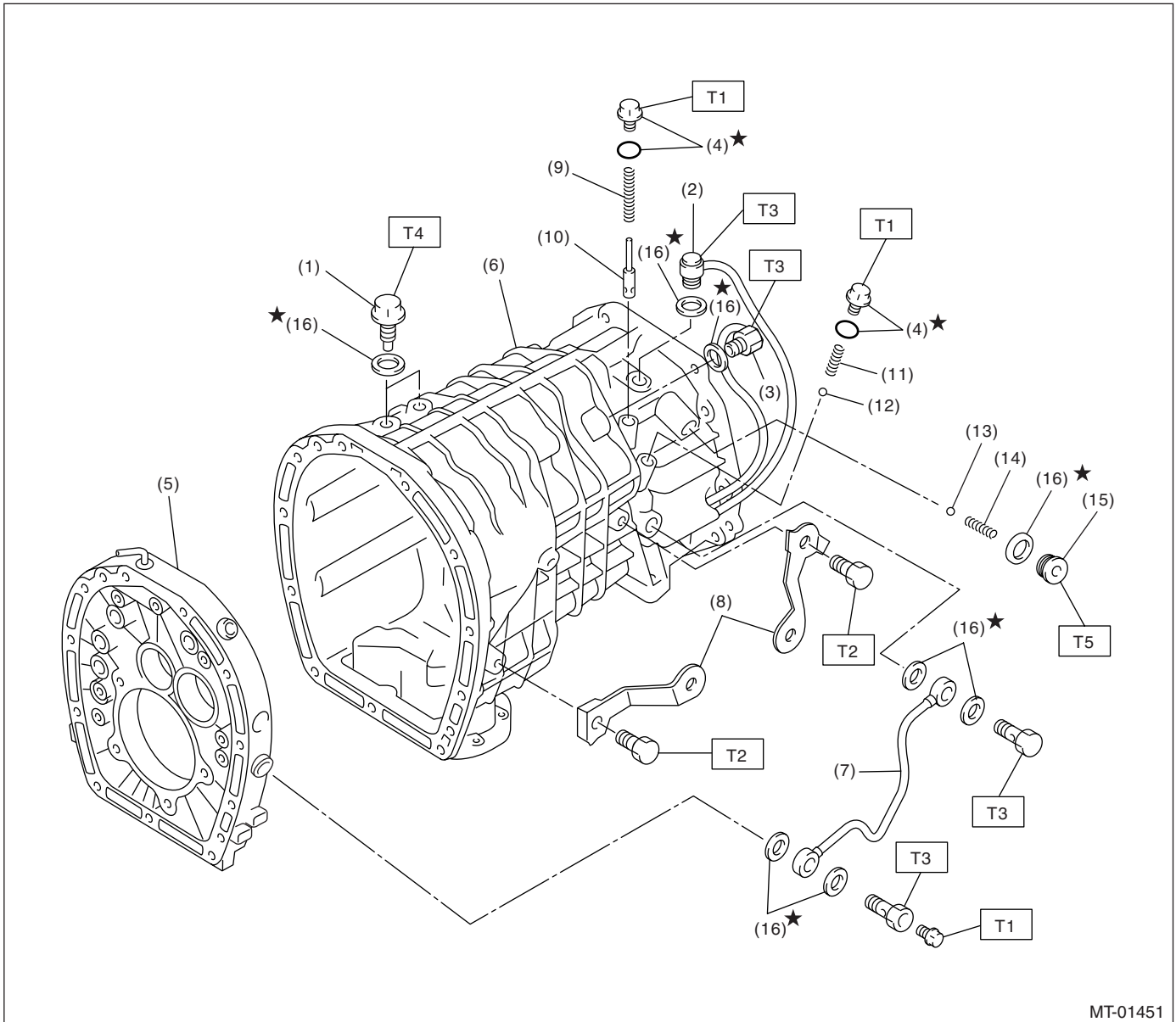
**T3: 50 (5.1, 36.9)**

# General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

## 3. TRANSMISSION CASE

- Transmission serial No. 144576 or earlier



MT-01451

- |                             |                            |
|-----------------------------|----------------------------|
| (1) Pilot bolt              | (9) Return spring          |
| (2) Neutral position switch | (10) Pressure relief valve |
| (3) Back-up light switch    | (11) Return spring         |
| (4) O-ring                  | (12) Ball                  |
| (5) Adapter plate           | (13) Ball                  |
| (6) Transmission case       | (14) Spring                |
| (7) Oil pipe                | (15) Plug                  |
| (8) Harness bracket         | (16) Gasket                |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 13 (1.3, 9.6)**

**T2: 16 (1.6, 11.8)**

**T3: 32 (3.3, 23.6)**

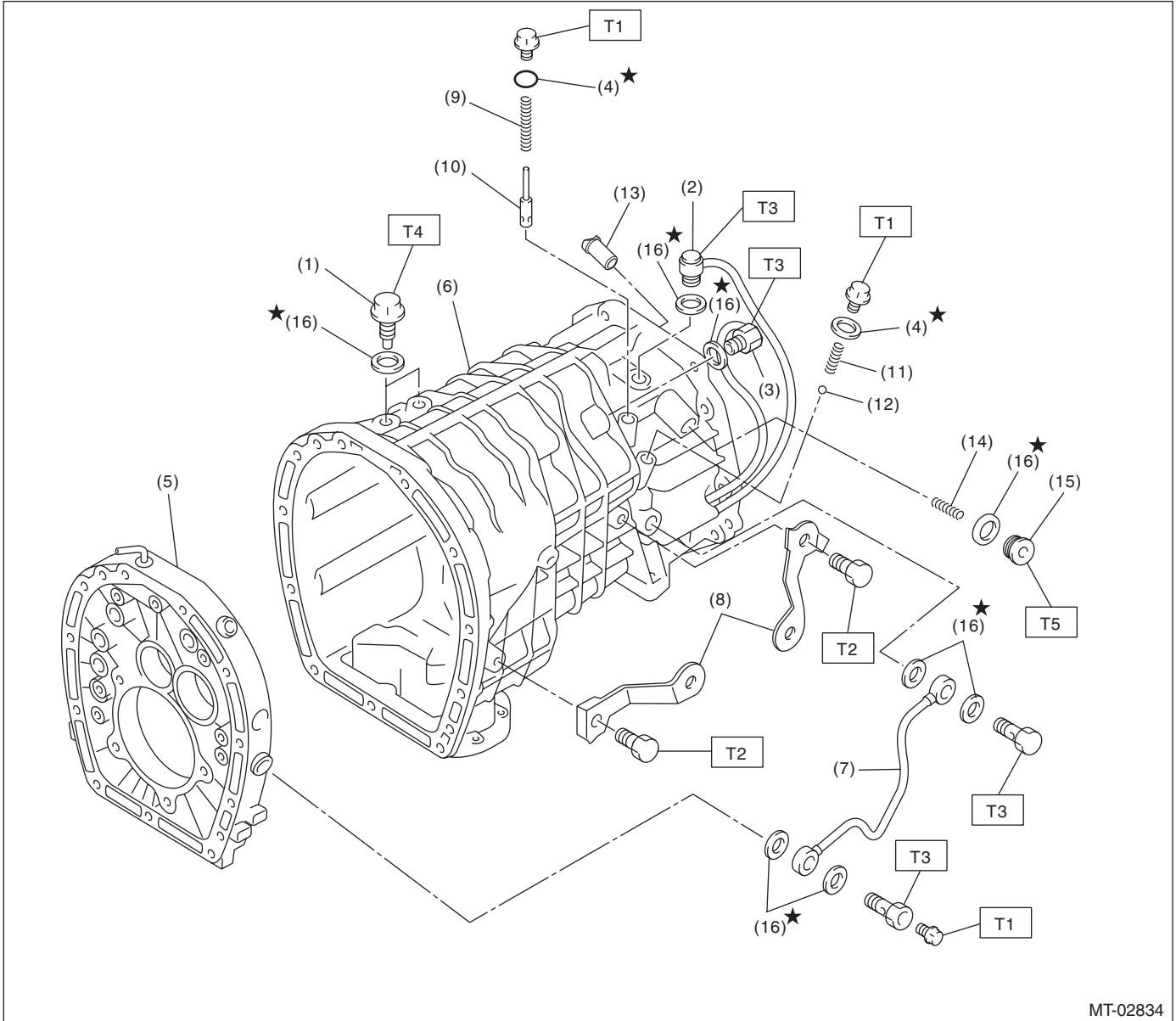
**T4: 34 (3.5, 25.1)**

**T5: 41 (4.2, 30.2)**

# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

- Transmission serial No. 144577 or later



MT-02834

- |                             |                            |
|-----------------------------|----------------------------|
| (1) Pilot bolt              | (9) Return spring          |
| (2) Neutral position switch | (10) Pressure relief valve |
| (3) Back-up light switch    | (11) Return spring         |
| (4) O-ring                  | (12) Ball                  |
| (5) Adapter plate           | (13) Selector plunger      |
| (6) Transmission case       | (14) Spring                |
| (7) Oil pipe                | (15) Plug                  |
| (8) Harness bracket         | (16) Gasket                |

### **Tightening torque: N·m (kgf-m, ft-lb)**

**T1: 13 (1.3, 9.6)**

**T2: 16 (1.6, 11.8)**

**T3: 32 (3.3, 23.6)**

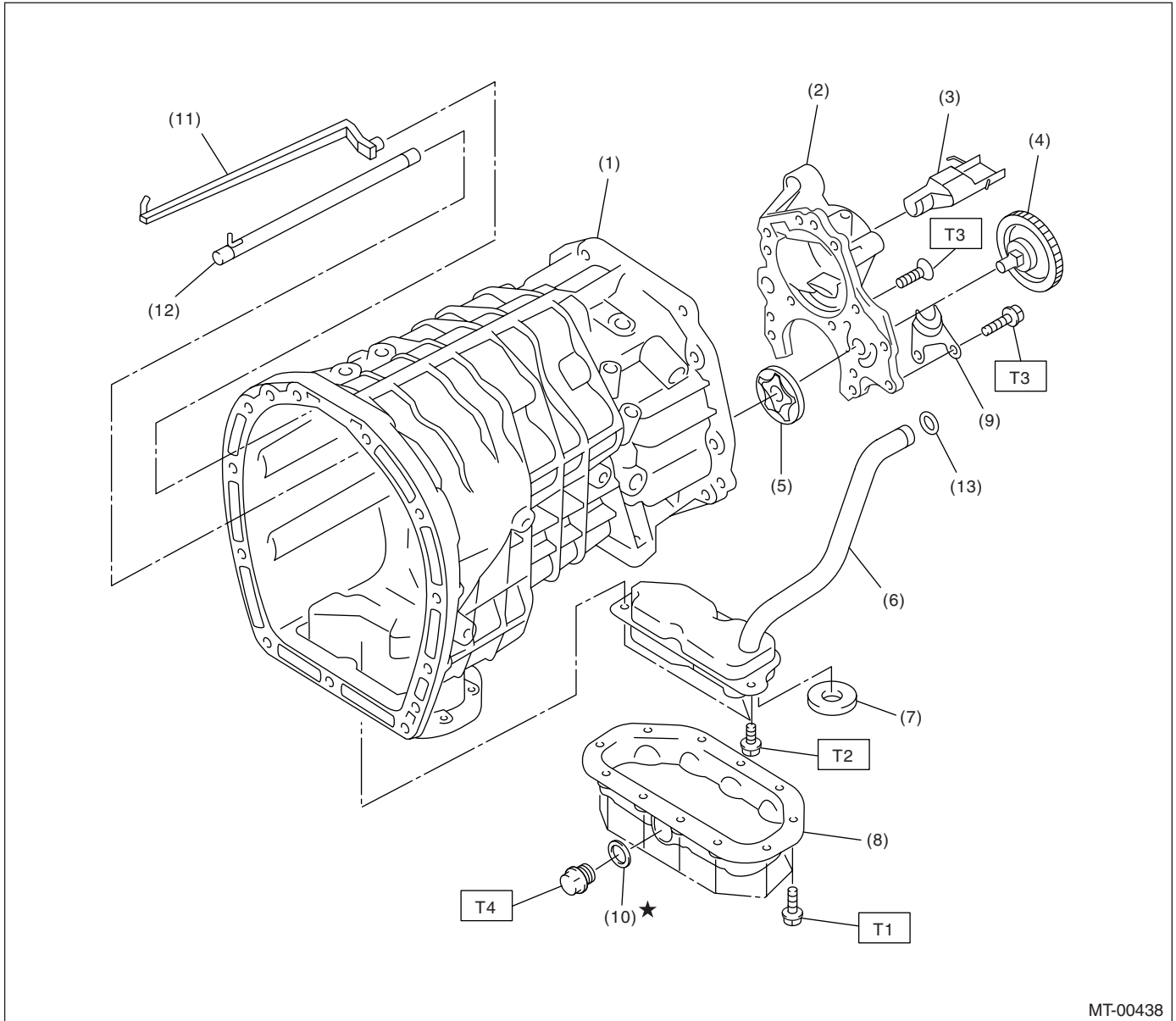
**T4: 34 (3.5, 25.1)**

**T5: 41 (4.2, 30.2)**

# General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

## 4. OIL PAN AND OIL PUMP



MT-00438

- |                               |                |
|-------------------------------|----------------|
| (1) Transmission case         | (8) Oil pan    |
| (2) Oil pump cover            | (9) Plate      |
| (3) Oil guide                 | (10) Gasket    |
| (4) Oil pump driven gear ASSY | (11) Oil guide |
| (5) Oil pump rotor ASSY       | (12) Oil pipe  |
| (6) Strainer ASSY             | (13) O-ring    |
| (7) Magnet                    |                |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 6.4 (0.65, 4.7)**

**T2: 10 (1.0, 7.4)**

**T3: 25 (2.5, 18.1)**

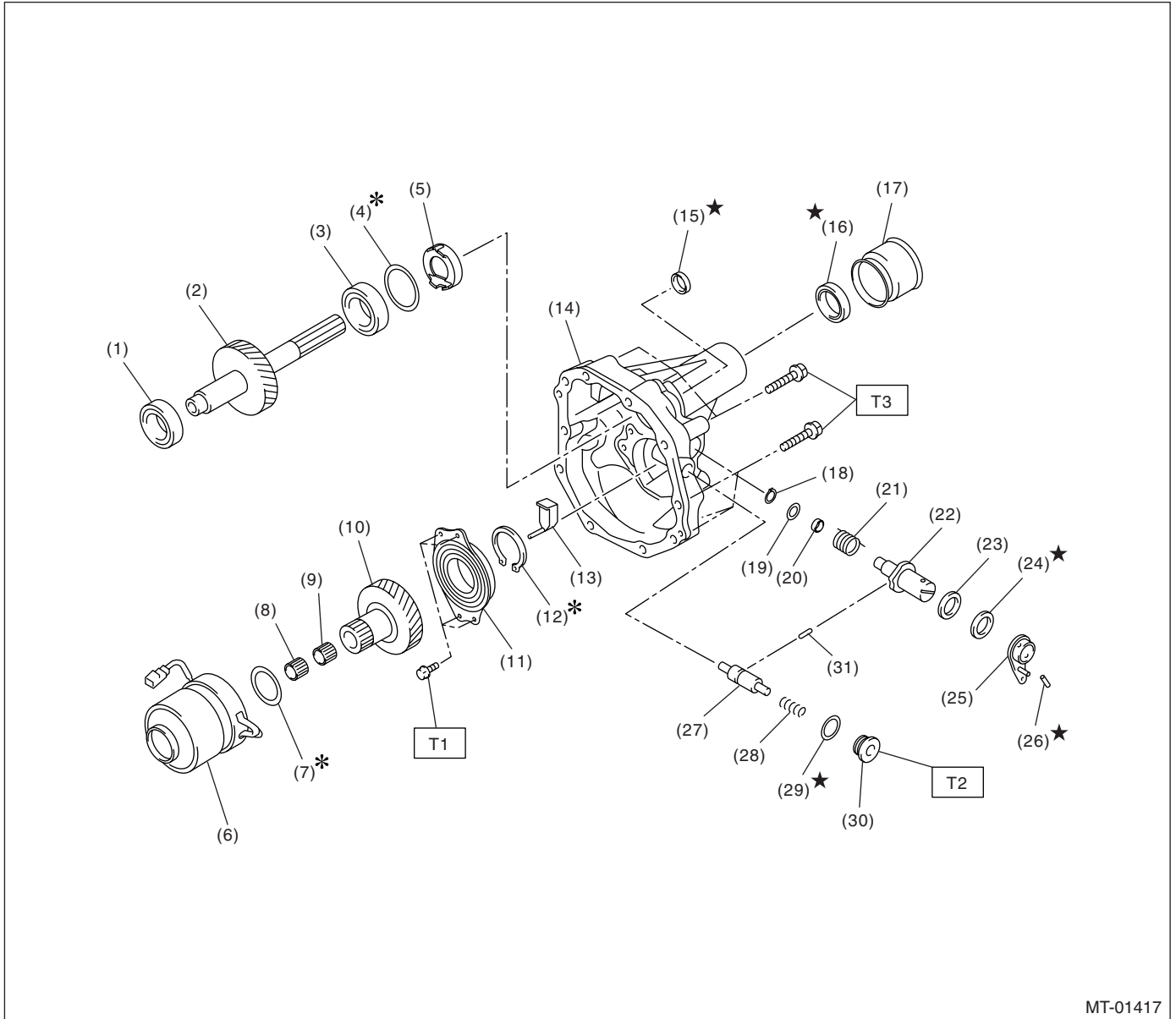
**T4: 44 (4.5, 32.5)**



# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 5. EXTENSION CASE AND CENTER DIFFERENTIAL



MT-01417

- |                                 |                          |                                |
|---------------------------------|--------------------------|--------------------------------|
| (1) Taper roller bearing        | (13) Extension guide     | (25) Reverse check lever COMPL |
| (2) Transfer driven gear        | (14) Extension case      | (26) Straight pin              |
| (3) Taper roller bearing        | (15) Oil seal            | (27) Reverse check plug        |
| (4) Shim                        | (16) Oil seal            | (28) Spring                    |
| (5) Oil plate                   | (17) Dust cover          | (29) Gasket                    |
| (6) Center differential         | (18) Snap ring           | (30) Plug                      |
| (7) Shim                        | (19) Washer              | (31) Plunger                   |
| (8) Needle bearing              | (20) Bushing             |                                |
| (9) Needle bearing              | (21) Spring              |                                |
| (10) Transfer drive gear        | (22) Reverse check shaft |                                |
| (11) Ball bearing (with flange) | (23) Ball bearing        |                                |
| (12) Snap ring                  | (24) Oil seal            |                                |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 25 (2.5, 18.1)**

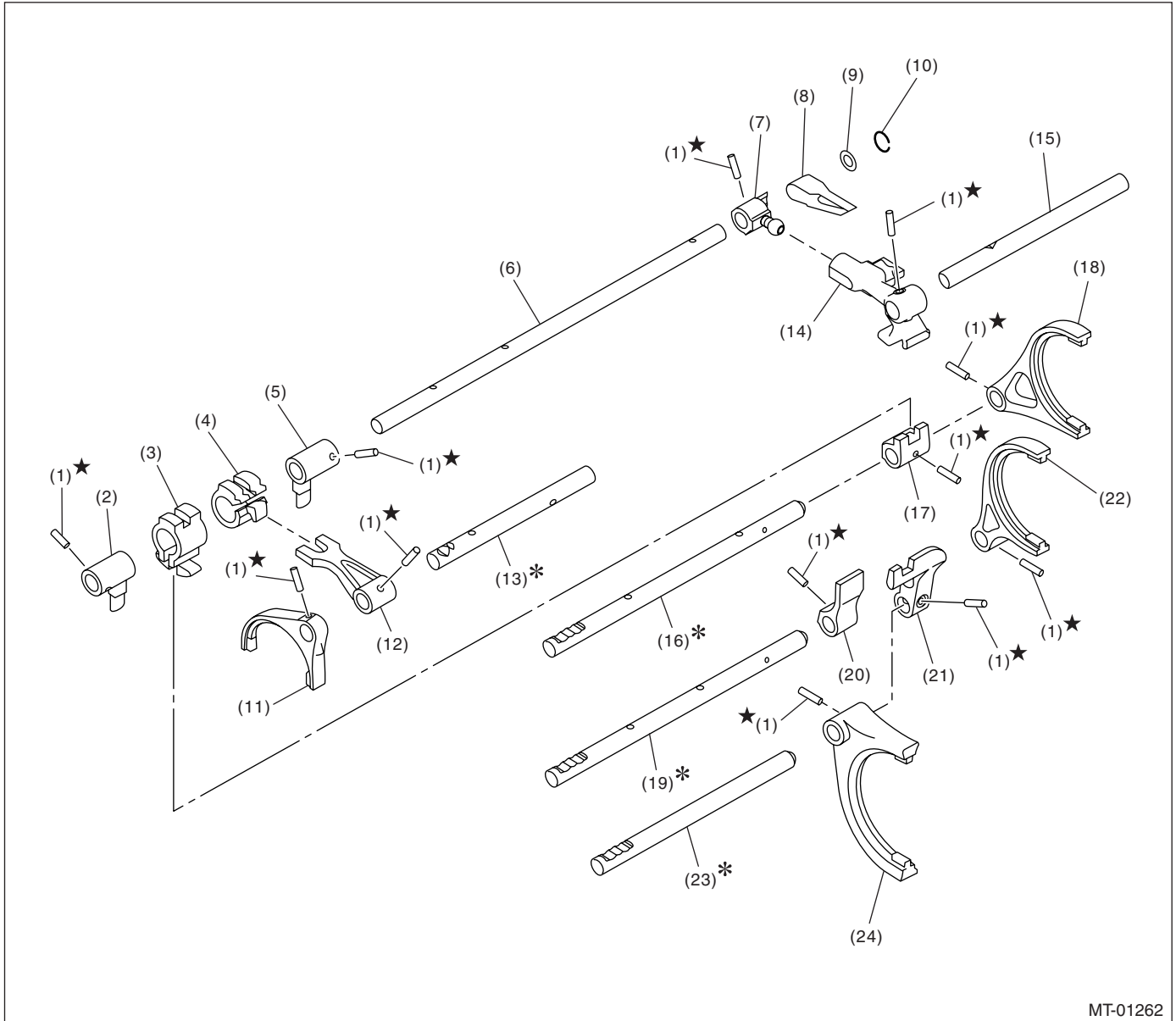
**T2: 41 (4.2, 30.2)**

**T3: 48 (4.9, 35.4)**

# General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

## 6. SHIFTER FORK AND FORK ROD



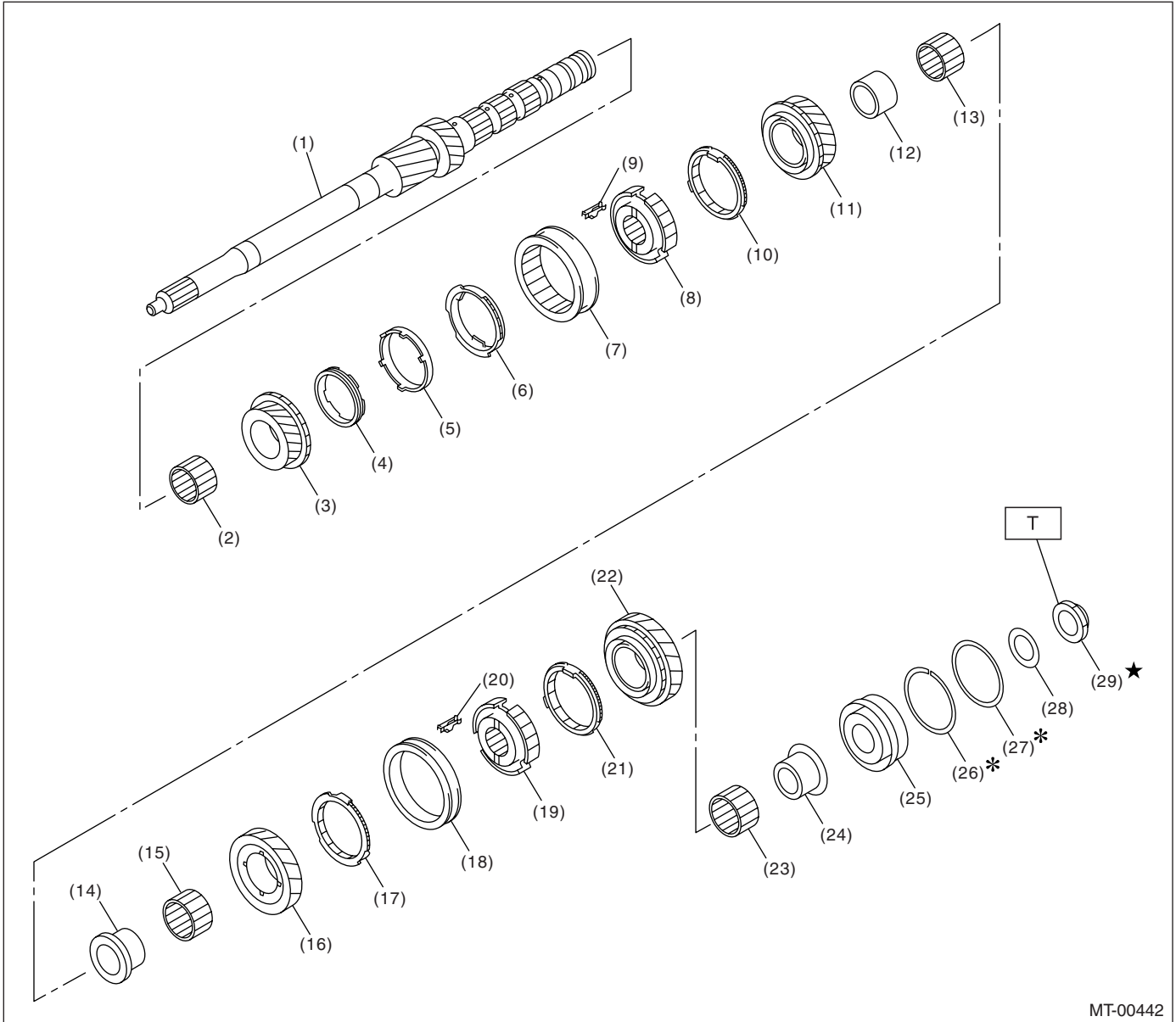
MT-01262

- |                             |                          |                          |
|-----------------------------|--------------------------|--------------------------|
| (1) Spring pin              | (9) Washer               | (17) 5th-6th shifter arm |
| (2) Interlock arm           | (10) Snap ring           | (18) 5th-6th fork COMPL  |
| (3) Interlock block         | (11) Reverse fork COMPL  | (19) 3rd-4th fork rod    |
| (4) Reverse interlock block | (12) Reverse shifter arm | (20) 3rd-4th shifter arm |
| (5) Interlock arm           | (13) Reverse fork rod    | (21) 1st-2nd shifter arm |
| (6) Striking rod            | (14) Selector arm        | (22) 3rd-4th fork COMPL  |
| (7) Selector arm No. 2      | (15) Shifter arm shaft   | (23) 1st-2nd fork rod    |
| (8) Neutral set spring      | (16) 5th-6th fork rod    | (24) 1st-2nd fork COMPL  |

# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 7. MAIN SHAFT ASSEMBLY



MT-00442

- |                         |                          |                           |
|-------------------------|--------------------------|---------------------------|
| (1) Main shaft          | (12) 4th bushing         | (23) Needle bearing       |
| (2) Needle bearing      | (13) Needle bearing      | (24) 6th bushing          |
| (3) 3rd drive gear      | (14) 5th bushing         | (25) Taper roller bearing |
| (4) Inner baulk ring    | (15) Needle bearing      | (26) Snap ring            |
| (5) Synchro cone        | (16) 5th drive gear      | (27) Washer               |
| (6) Outer baulk ring    | (17) 5th baulk ring      | (28) Washer               |
| (7) 3rd-4th sleeve      | (18) 5th-6th sleeve      | (29) Lock nut             |
| (8) 3rd-4th hub         | (19) 5th-6th hub         |                           |
| (9) Shifting insert key | (20) Shifting insert key |                           |
| (10) 4th baulk ring     | (21) 6th baulk ring      |                           |
| (11) 4th gear           | (22) 6th drive gear      |                           |

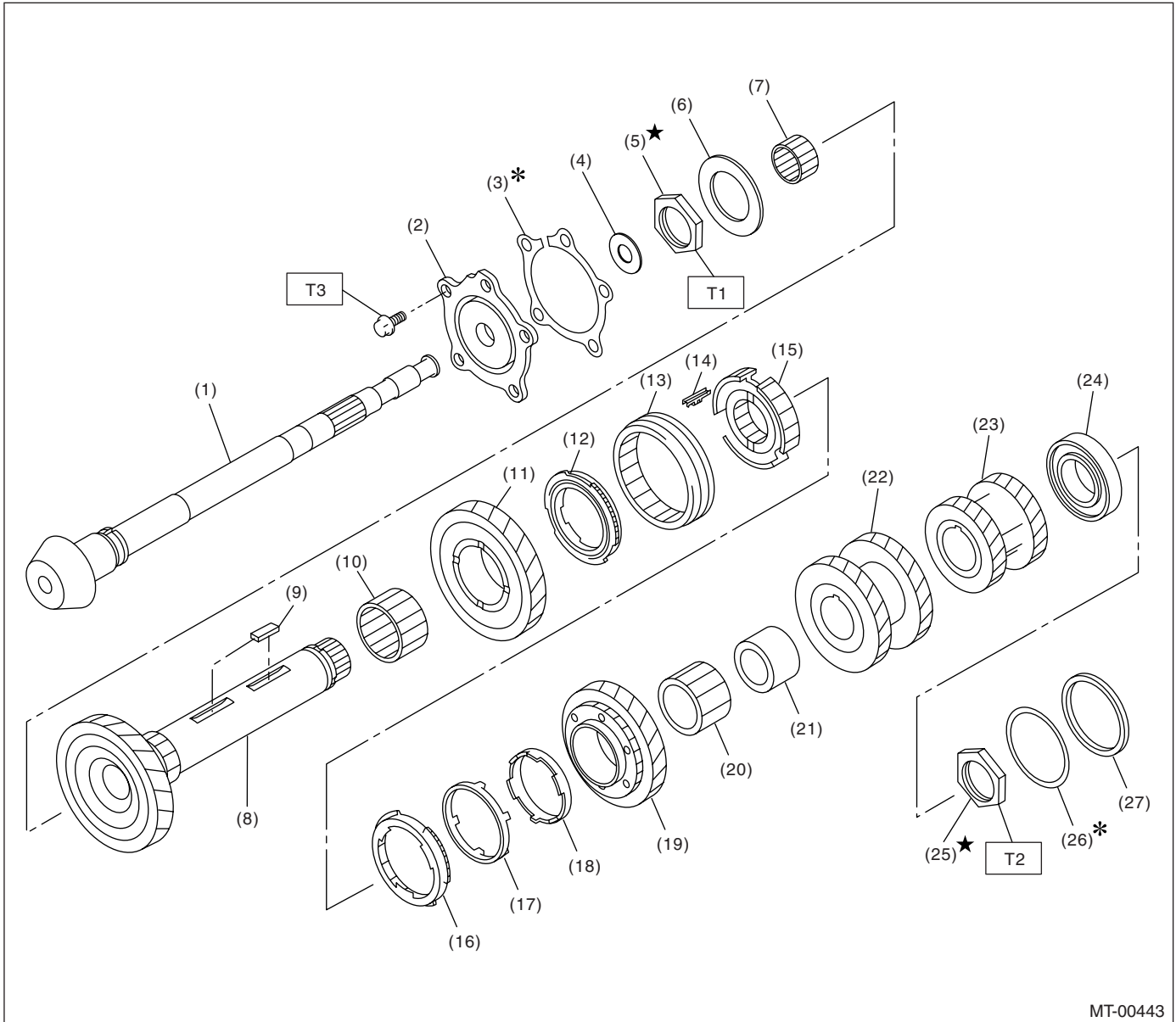
**Tightening torque: N-m (kgf-m, ft-lb)**

**T: 392 (40.0, 289)**

# General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

## 8. DRIVE PINION AND DRIVEN SHAFT ASSEMBLY



MT-00443

- (1) Drive pinion shaft
- (2) Taper roller bearing
- (3) Shim
- (4) Washer
- (5) Lock nut
- (6) Thrust bearing
- (7) Needle bearing
- (8) Driven shaft
- (9) Key
- (10) Needle bearing
- (11) 1st driven gear
- (12) 1st synchro ring ASSY

- (13) 1st-2nd sleeve
- (14) Shifting insert key
- (15) 1st-2nd hub
- (16) Outer baulk ring
- (17) Synchro cone
- (18) Inner baulk ring
- (19) 2nd driven gear
- (20) Needle bearing
- (21) 2nd bushing
- (22) 3rd-4th driven gear
- (23) 5th-6th driven gear
- (24) Ball bearing

- (25) Lock nut
- (26) Shim
- (27) Collar

**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 285 (29.1, 210)**  
\* 265 (27.0, 195)

**T2: 570 (58.1, 420)**  
\* 530 (54.0, 391)

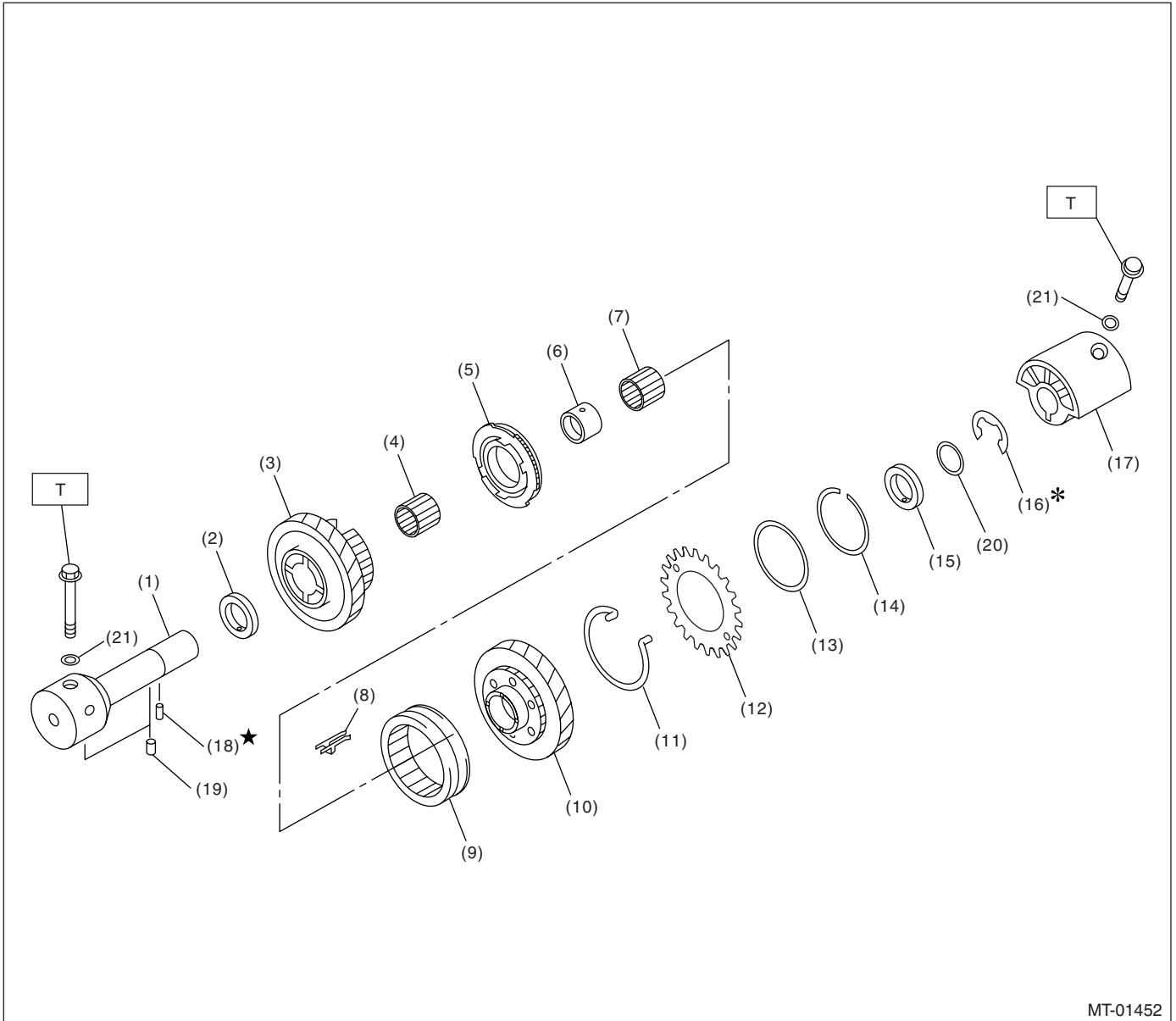
**T3: 54 (5.5, 39.8)**

\* Tightening torque when using ST.

# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 9. REVERSE IDLER GEAR ASSEMBLY



MT-01452

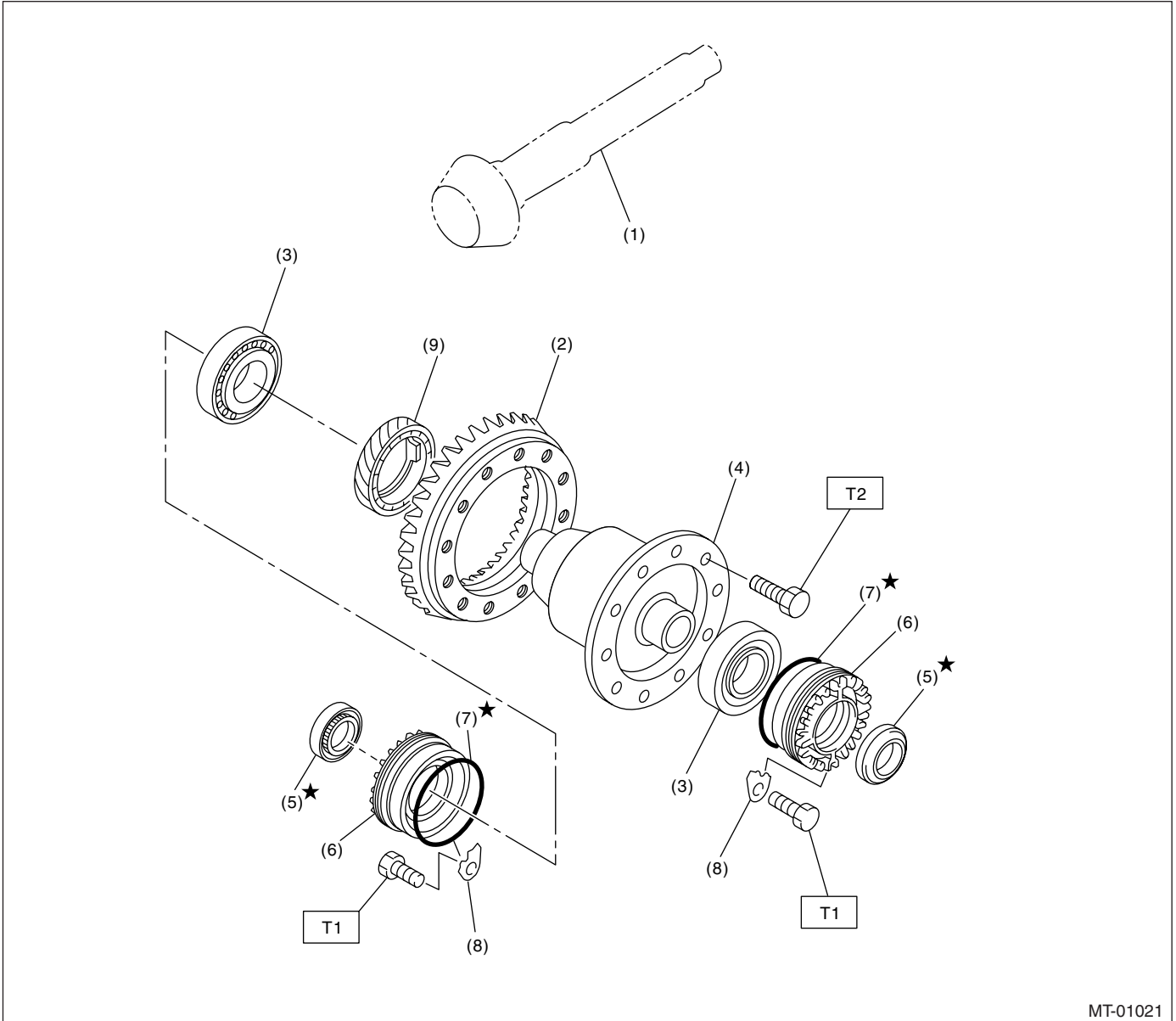
- |                                |                             |                           |
|--------------------------------|-----------------------------|---------------------------|
| (1) Base                       | (9) Reverse coupling sleeve | (17) Reverse idler holder |
| (2) Washer                     | (10) Reverse idler gear     | (18) Spring pin           |
| (3) Reverse idler gear No. 2   | (11) Spring                 | (19) Knock pin            |
| (4) Needle bearing             | (12) Sub gear               | (20) Washer               |
| (5) Reverse idler synchro set  | (13) Friction plate         | (21) Gasket               |
| (6) Reverse idler gear bushing | (14) Snap ring              |                           |
| (7) Needle bearing             | (15) Washer                 |                           |
| (8) Shifting insert key        | (16) Snap ring              |                           |

**Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 25 (2.5, 18.1)**

# General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

## 10.FRONT DIFFERENTIAL



MT-01021

- |                        |                                |
|------------------------|--------------------------------|
| (1) Drive pinion shaft | (6) Differential side retainer |
| (2) Hypoid driven gear | (7) O-ring                     |
| (3) Roller bearing     | (8) Retainer lock plate        |
| (4) Differential ASSY  | (9) Speedometer drive gear     |
| (5) Oil seal           |                                |

**Tightening torque: N·m (kgf·m, ft·lb)**

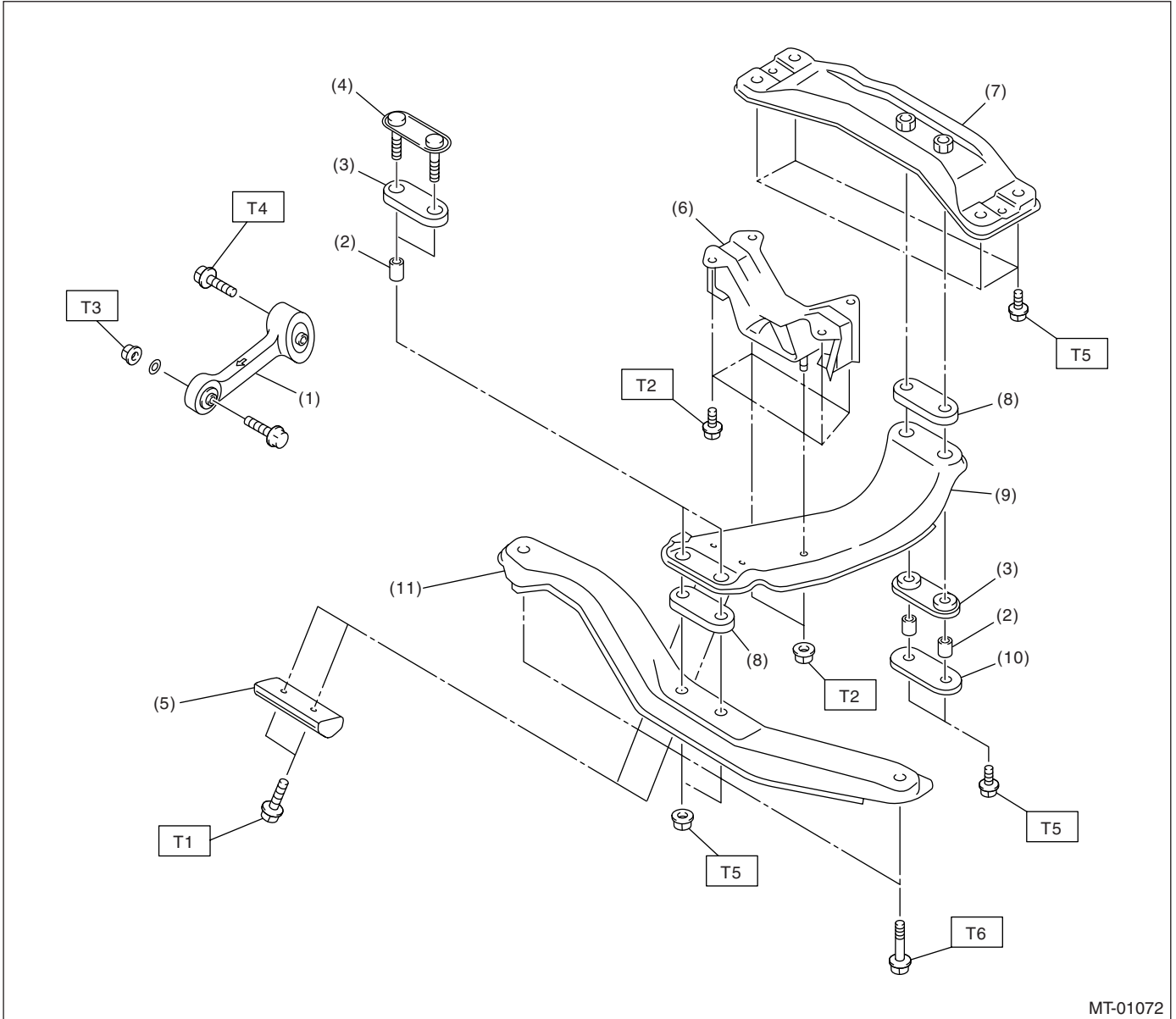
**T1: 25 (2.5, 18.1)**

**T2: 69 (7.0, 50.9)**

# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 11. TRANSMISSION MOUNTING



- |                         |                        |
|-------------------------|------------------------|
| (1) Pitching stopper    | (7) Rear crossmember   |
| (2) Spacer              | (8) Cushion D          |
| (3) Cushion C           | (9) Center crossmember |
| (4) Front plate         | (10) Rear plate        |
| (5) Dynamic damper      | (11) Front crossmember |
| (6) Rear cushion rubber |                        |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 7.5 (0.76, 5.5)**

**T2: 35 (3.6, 25.8)**

**T3: 50 (5.1, 36.9)**

**T4: 58 (5.9, 42.8)**

**T5: 70 (7.1, 51.6)**

**T6: 140 (14.3, 103)**

# General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

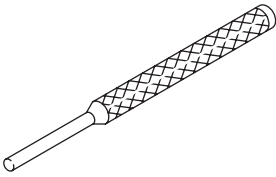
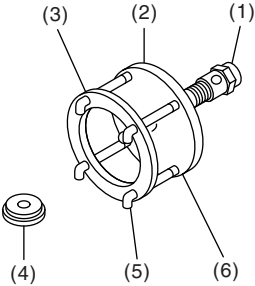
## C: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation, and disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- When disassembling the case and other light alloy parts, use a plastic hammer to force it apart. Do not pry it apart with a screwdriver or other tool.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.

- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply gear oil onto sliding or revolution surfaces before installation.
- Replace deformed or otherwise damaged snap rings with new ones.
- Before installing O-rings or oil seals, apply sufficient amount of gear oil to avoid damage and deformation.
- Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate or shop cloth between the part and the vise.
- Avoid damaging the mating surface of the case.
- Before applying sealant, completely remove the old seal.

## D: PREPARATION TOOL

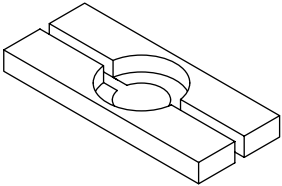
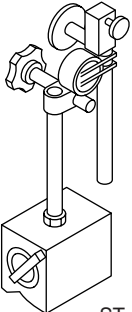
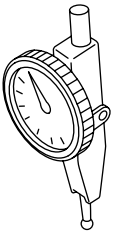
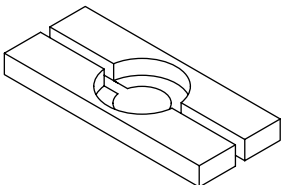
### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION | REMARKS   |
|---|-------------|-------------|---|
|  <p>ST-398791700</p> | 398791700   | REMOVER     | Used for removing and installing spring pin (6 mm).   |
|  <p>ST-399527700</p> | 399527700   | PULLER SET  | Used for removing and installing roller bearing (Differential).<br>(1) BOLT<br>(2) PULLER<br>(3) HOLDER<br>(4) ADAPTER<br>(5) BOLT<br>(6) NUT |



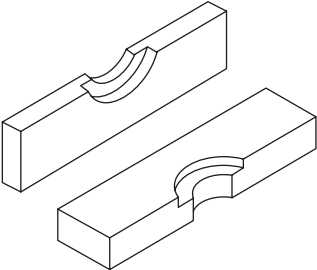
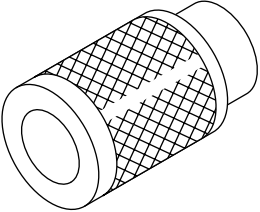
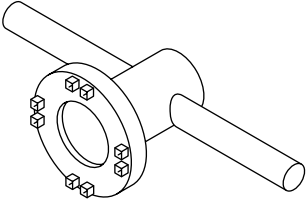
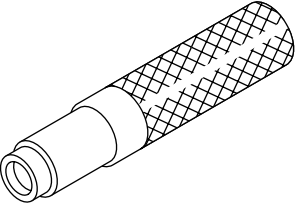
# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION | REMARKS  |
|---|-------------|-------------|--|
|  <p style="text-align: center;">ST-498515700</p>   | 498515700   | REMOVER     | Used for removing roller bearing of drive pinion shaft.  |
|  <p style="text-align: center;">ST-498247001</p>   | 498247001   | MAGNET BASE | <ul style="list-style-type: none"> <li>• Used for measuring backlash between side gear and pinion, and hypoid gear.</li> <li>• Used with DIAL GAUGE (498247100).</li> </ul>  |
|  <p style="text-align: center;">ST-498247100</p> | 498247100   | DIAL GAUGE  | <ul style="list-style-type: none"> <li>• Used for measuring backlash between side gear and pinion, and hypoid gear.</li> <li>• Used with MAGNET BASE (498247001).</li> </ul> |
|  <p style="text-align: center;">ST-498077000</p> | 498077000   | REMOVER     | Used for removing differential taper roller bearing.   |

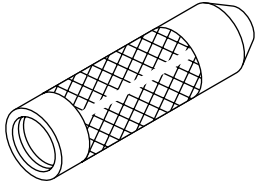
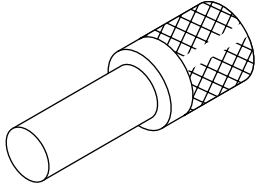
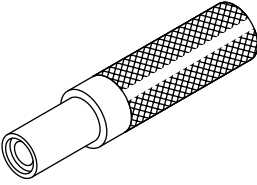
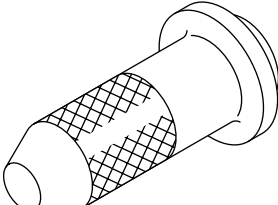
# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION | REMARKS   |
|---|-------------|-------------|---|
|  <p style="text-align: center;">ST-899858600</p>   | 899858600   | REMOVER     | Used for removing roller bearing.   |
|  <p style="text-align: center;">ST-499757002</p>   | 499757002   | INSTALLER   | Used for installing bearing cone of transfer driven gear (extension core side).             |
|  <p style="text-align: center;">ST-499787000</p> | 499787000   | WRENCH ASSY | Used for removing and installing differential side retainer RH.                             |
|  <p style="text-align: center;">ST-499827000</p> | 499827000   | PRESS       | Used for installing speedometer oil seal when installing speedometer cable to transmission. |

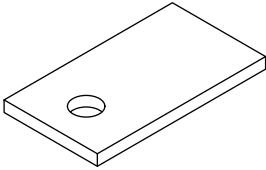
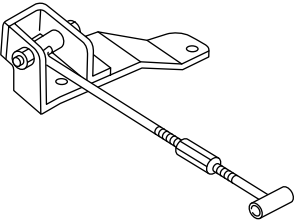
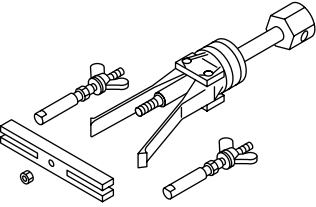
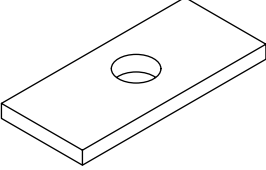
# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION           | REMARKS  |
|---|-------------|-----------------------|--|
|  <p style="text-align: center;">ST-499877000</p>   | 499877000   | RACE 4-5<br>INSTALLER | Used for disassembling driven shaft and transfer driven gear.        |
|  <p style="text-align: center;">ST-899864100</p>   | 899864100   | REMOVER               | Used for removing parts on transmission main shaft and drive pinion. |
|  <p style="text-align: center;">ST-899824100</p> | 899824100   | PRESS                 | Used for installing speedometer shaft oil seal.                      |
|  <p style="text-align: center;">ST-498057300</p> | 498057300   | INSTALLER             | Used for installing extension oil seal.                              |

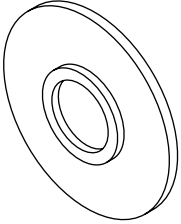
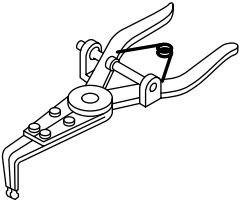
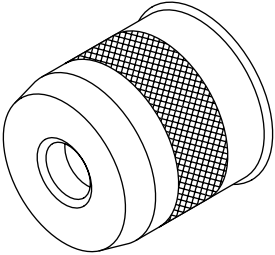
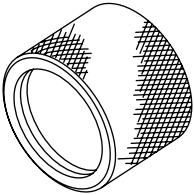
# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION    | REMARKS  |
|---|-------------|----------------|--|
|  <p style="text-align: center;">ST-498255400</p>   | 498255400   | PLATE          | Used for measuring backlash.   |
|  <p style="text-align: center;">ST41099AC000</p>   | 41099AC000  | ENGINE SUPPORT | Used for supporting engine.  |
|  <p style="text-align: center;">ST-398527700</p> | 398527700   | PULLER ASSY    | Used for removing extension case oil seal and clutch housing oil seal.         |
|  <p style="text-align: center;">ST-499575500</p> | 499575500   | GAUGE          | Used for measuring total end play, extension end play and drive pinion height. |

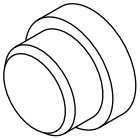
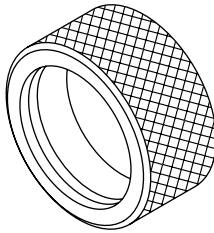
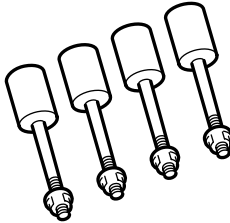

# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION                                | REMARKS  |
|---|-------------|--|--|
|  <p style="text-align: center;">ST-398177700</p>   | 398177700   | INSTALLER                                  | Used for assembling main shaft.  |
|  <p style="text-align: center;">ST-399893600</p>   | 399893600   | PLIERS                                     | <ul style="list-style-type: none"> <li>• Used for removing and installing neutral set spring.</li> <li>• Used with CLAW (18756AA000).</li> </ul> |
|  <p style="text-align: center;">ST-499247400</p> | 499247400   | INSTALLER                                  | Used for installing transfer drive gear ball bearing.  |
|  <p style="text-align: center;">ST18675AA000</p> | 18675AA000  | DIFFERENTIAL<br>SIDE OIL SEAL<br>INSTALLER | Used for installing differential side retainer oil seal.   |

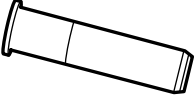
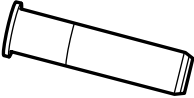
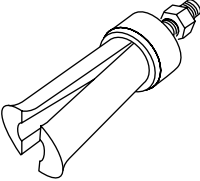
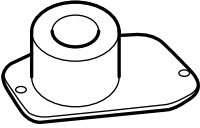
# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION    | REMARKS   |
|---|-------------|----------------|---|
|  <p style="text-align: center;">ST-398497701</p>   | 398497701   | SEAT           | Used for installing transfer drive gear ball bearing.   |
|  <p style="text-align: center;">ST-398437700</p>   | 398437700   | INSTALLER      | Used for installing front differential side bearing.  |
|  <p style="text-align: center;">ST18632AA000</p> | 18632AA000  | STAND ASSY     | Used for disassembling and assembling transmission.   |
|  <p style="text-align: center;">ST18671AA000</p> | 18671AA000  | OIL SEAL GUIDE | <ul style="list-style-type: none"> <li>• Used for installing oil seal to reverse check.</li> <li>• Used with INSTALLER (18657AA010).</li> </ul> |

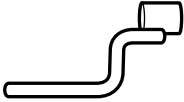
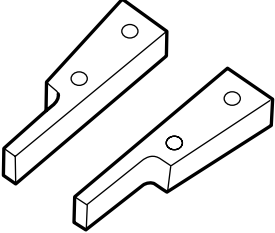
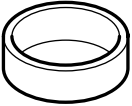

# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION | REMARKS  |
|---|-------------|-------------|--|
|  <p style="text-align: center;">ST18657AA010</p>   | 18657AA010  | INSTALLER   | <ul style="list-style-type: none"> <li>• Used for installing oil seal to reverse check.</li> <li>• Used with OIL SEAL GUIDE (18671AA000).</li> </ul> |
|  <p style="text-align: center;">ST18657AA000</p>   | 18657AA000  | INSTALLER   | Used for installing oil seal to shift rod.   |
|  <p style="text-align: center;">ST18758AA000</p> | 18758AA000  | PULLER      | Used for removing extension taper roller bearing outer race.   |
|  <p style="text-align: center;">ST18831AA000</p> | 18831AA000  | GAUGE       | Used for measuring extension taper roller bearing.   |

# General Description

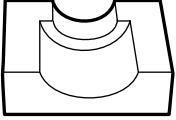
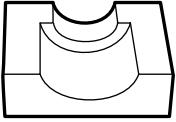
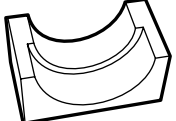
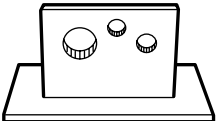
## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION             | REMARKS   |
|---|-------------|-------------------------|---|
|  <p style="text-align: center;">ST18631AA000</p>   | 18631AA000  | HANDLE                  | Used for measuring front differential backlash.   |
|  <p style="text-align: center;">ST18756AA000</p>   | 18756AA000  | CLAW                    | <ul style="list-style-type: none"> <li>• Used for installing and removing neutral set spring.</li> <li>• Used with PLIERS (399893600).</li> </ul> |
|  <p style="text-align: center;">ST18754AA000</p> | 18754AA000  | REMOVER                 | Used for removing each parts of driven gear.  |
|  <p style="text-align: center;">ST18757AA000</p> | 18757AA000  | STRAIGHT PIN<br>REMOVER | Used for installing reverse idler gear.   |




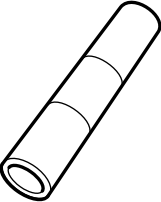
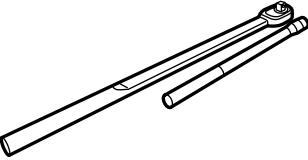

# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION | REMARKS   |
|---|-------------|-------------|---|
|  <p style="text-align: center;">ST18665AA000</p>   | 18665AA000  | HOLDER      | <ul style="list-style-type: none"> <li>• Used for installing and removing main shaft lock nut.</li> <li>• Used with BASE (18664AA000).</li> </ul>   |
|  <p style="text-align: center;">ST18666AA000</p>   | 18666AA000  | HOLDER      | <ul style="list-style-type: none"> <li>• Used for installing and removing driven shaft lock nut.</li> <li>• Used with BASE (18664AA000).</li> </ul>   |
|  <p style="text-align: center;">ST18667AA000</p> | 18667AA000  | HOLDER      | <ul style="list-style-type: none"> <li>• Used for installing and removing drive pinion shaft lock nut.</li> <li>• Used with BASE (18664AA000).</li> </ul>   |
|  <p style="text-align: center;">ST18664AA000</p> | 18664AA000  | BASE        | <ul style="list-style-type: none"> <li>• Used for installing and removing main shaft lock nut.</li> <li>• Used for installing and removing drive pinion shaft lock nut.</li> <li>• Used for installing and removing driven shaft lock nut.</li> </ul> |



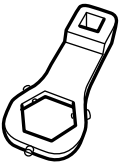
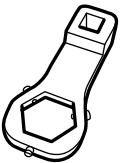
# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION   | REMARKS  |
|---|-------------|---------------|--|
|  <p style="text-align: center;">ST18722AA010</p>   | 18722AA010  | REMOVER       | Used for disassembling main shaft.   |
|  <p style="text-align: center;">ST18651AA000</p>   | 18651AA000  | INSTALLER     | Used for assembling main shaft.  |
|  <p style="text-align: center;">ST18852AA000</p> | 18852AA000  | TORQUE WRENCH | <ul style="list-style-type: none"> <li>• Used for tightening main shaft lock nut.</li> <li>• Used for tightening drive pinion shaft lock nut.</li> <li>• Used for tightening driven shaft lock nut.</li> </ul> |
|  <p style="text-align: center;">ST18668AA000</p> | 18668AA000  | PUNCH         | Used for caulking main shaft lock nut.   |

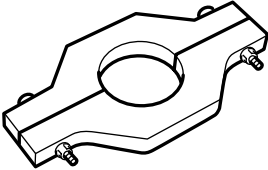
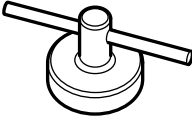
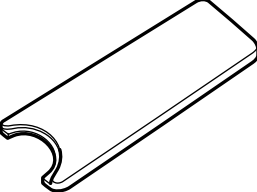

## General Description

### MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION       | REMARKS   |
|---|-------------|-------------------|---|
|  <p style="text-align: center;">ST18669AA000</p>   | 18669AA000  | PUNCH             | Used for caulking driven shaft lock nut.                      |
|  <p style="text-align: center;">ST18670AA000</p>   | 18670AA000  | PUNCH             | Used for caulking drive pinion shaft lock nut.                |
|  <p style="text-align: center;">ST18620AA000</p> | 18620AA000  | ADAPTER<br>WRENCH | Used for installing and removing driven gear shaft lock nut.  |
|  <p style="text-align: center;">ST18621AA000</p> | 18621AA000  | ADAPTER<br>WRENCH | Used for installing and removing drive pinion shaft lock nut. |

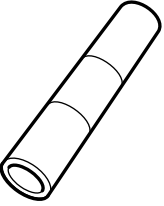
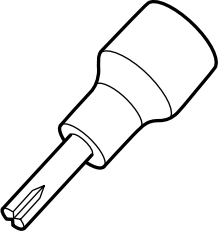
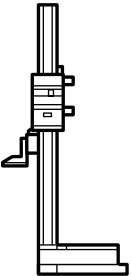
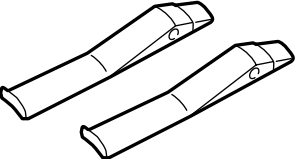
# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION | REMARKS  |
|---|-------------|-------------|--|
|  <p style="text-align: center;">ST18723AA000</p>   | 18723AA000  | REMOVER     | Used for disassembling the driven shaft.                                 |
|  <p style="text-align: center;">ST18630AA000</p>   | 18630AA000  | WRENCH ASSY | Used for removing and installing differential side retainer (left side). |
|  <p style="text-align: center;">ST18672AA000</p> | 18672AA000  | GUIDE CLIP  | Used for installing reverse idler gear snap ring.                        |
|  <p style="text-align: center;">ST18720AA000</p> | 18720AA000  | REMOVER     | Used for disassembling main shaft.                                       |

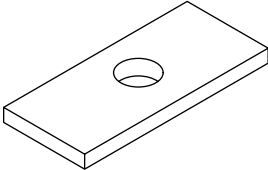
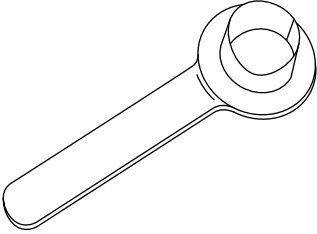
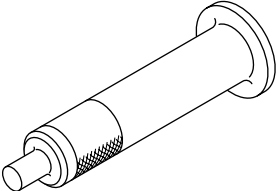
# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION  | REMARKS   |
|---|-------------|--------------|---|
|  <p style="text-align: center;">ST18654AA000</p>   | 18654AA000  | INSTALLER    | Used for assembling driven shaft.   |
|  <p style="text-align: center;">ST18663AA000</p>   | 18663AA000  | SOCKET       | Used for installing and removing oil pump cover.  |
|  <p style="text-align: center;">ST18853AA000</p> | 18853AA000  | HEIGHT GAUGE | Used for selecting shift rod.   |
|  <p style="text-align: center;">ST18760AA000</p> | 18760AA000  | CLAW         | <ul style="list-style-type: none"> <li>• Used for removing front side retainer bearing outer race.</li> <li>• Used with PULLER ASSY (398527700).</li> </ul> |

# General Description

## MANUAL TRANSMISSION AND DIFFERENTIAL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION        | REMARKS   |
|---|-------------|--------------------|---|
| <br>ST-398643600   | 398643600   | GAUGE              | Used for measuring drive pinion height.                         |
| <br>ST28399SA010   | 28399SA010  | OIL SEAL PROTECTOR | Used for protecting oil seal when installing front drive shaft. |
| <br>ST18657AA020 | 18657AA020  | OIL SEAL INSTALLER | Used for installing oil seal.                                   |

### 2. GENERAL TOOL

| TOOL NAME      | REMARKS  |
|----------------|--|
| Circuit tester | Used for measuring resistance, voltage and ampere. |
| Bar            | Used for extracting drive shaft.                   |

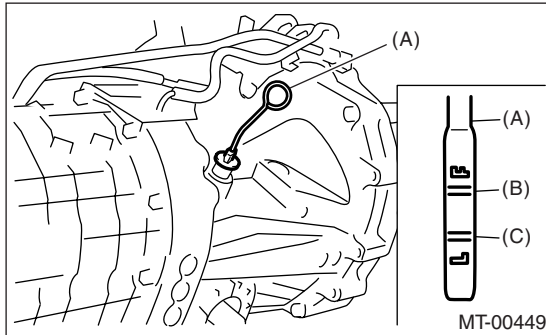
# Transmission Gear Oil

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 2. Transmission Gear Oil

#### A: INSPECTION

- 1) Park the vehicle on a level surface.
- 2) Turn the ignition switch to OFF, and wait until the engine cools.
- 3) Remove the oil level gauge and wipe it clean.
- 4) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper direction.
- 5) Pull out the oil level gauge again and record the oil level. If it is below the lower level, add oil through the oil level gauge hole to bring the level up to the upper level.



- (A) Oil level gauge
- (B) Upper level
- (C) Lower level

#### B: REPLACEMENT

- 1) Pull out the oil level gauge.
- 2) Lift-up the vehicle.
- 3) Remove the transmission under cover.
- 4) Drain the transmission gear oil completely.

#### CAUTION:

**Directly after the vehicle has been running or the engine has been long idle running, the transmission gear oil is hot. Be careful not to burn yourself.**

#### NOTE:

- Tighten the transmission gear oil drain plug after draining transmission gear oil.
- Use a new gasket.

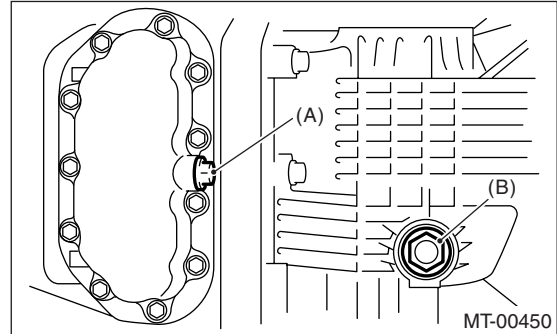
#### Tightening torque:

##### Oil pan side

**44 N·m (4.5 kgf-m, 32.5 ft-lb)**

##### Clutch housing side

**70 N·m (7.1 kgf-m, 51.6 ft-lb)**



- (A) Drain plug (Oil pan side)
- (B) Drain plug (Clutch housing side)

- 5) Lower the vehicle.
- 6) Pour gear oil into the gauge hole.

#### Recommended gear oil:

**Use GL-5 or equivalent.**

#### Gear oil capacity:

**4.1 ℓ (4.3 US qt, 3.6 Imp qt)**

- 7) Check the level of the transmission gear oil.

#### NOTE:

- When inserting the level gauge into transmission gear, align the protrusion on the side of the top part of the level gauge with the notch in the gauge hole.
- The gear oil level should be within the specified range marked on the level gauge.

## 3. Oil Seal

### A: INSPECTION

Inspect for oil leakage from the oil seal. Replace the oil seal if the lips is deformed, hardened, damaged, worn or defective if any.

### B: REPLACEMENT

- 1) Clean the transmission exterior.
- 2) Drain the gear oil completely.

**NOTE:**

- Tighten the drain plug after draining gear oil.
- Use a new gasket.

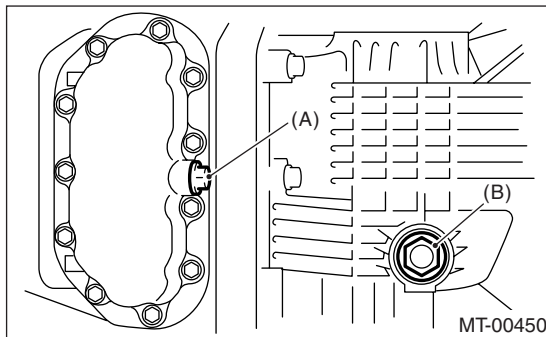
**Tightening torque:**

**Oil pan side**

**44 N·m (4.5 kgf·m, 32.5 ft·lb)**

**Clutch housing side**

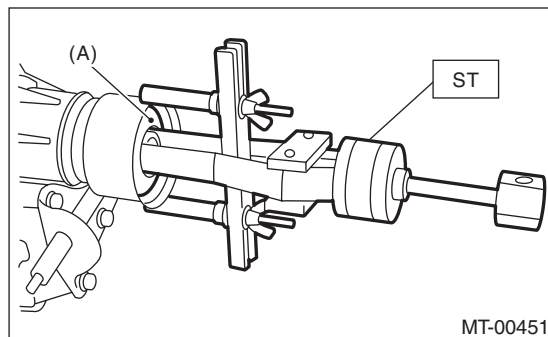
**70 N·m (7.1 kgf·m, 51.6 ft·lb)**



- (A) Drain plug (Oil pan side)  
 (B) Drain plug (Clutch housing side)

- 3) Remove the rear exhaust pipe and muffler.
- 4) Remove the propeller shaft. <Ref. to DS-16, REMOVAL, Propeller Shaft.>
- 5) Using the ST, remove the oil seal.

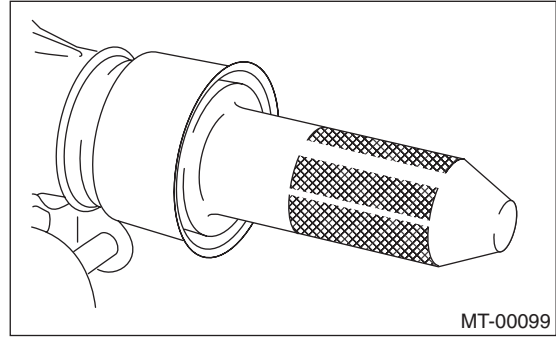
ST 398527700 PULLER ASSY



- (A) Oil seal

- 6) Using the ST, install the oil seal.

ST 498057300 INSTALLER



- 7) Install the propeller shaft. <Ref. to DS-17, INSTALLATION, Propeller Shaft.>
- 8) Install the rear exhaust pipe and muffler.
- 9) Pour gear oil and check the oil level. <Ref. to 6MT-30, REPLACEMENT, Transmission Gear Oil.>



# Differential Side Retainer Oil Seal

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 4. Differential Side Retainer Oil Seal

#### A: INSPECTION

Inspect for oil leakage from the differential side retainer oil seal. If there is oil leakage, perform the following procedure.

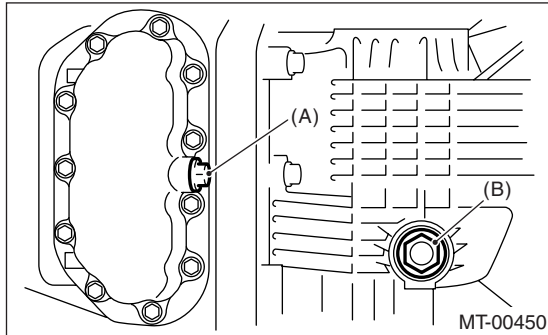
- Replace the oil seal.
- Check the front drive shaft.

#### B: REPLACEMENT

- 1) Lift-up the vehicle.
- 2) Remove the front and center exhaust pipes. <Ref. to EX(H4DOTC)-8, REMOVAL, Front Exhaust Pipe.>
- 3) Drain the gear oil from drain plug.

#### CAUTION:

- **Directly after the vehicle has been running or the engine has been long idle running, the differential gear oil is hot. Be careful not to burn yourself.**
- **Be careful not to spill the differential gear oil on exhaust pipe to prevent it from emitting smoke or fire. When the differential gear oil is spilled on exhaust pipe, wipe it away completely.**



- (A) Drain plug (Oil pan side)  
(B) Drain plug (Clutch housing side)

- 4) Tighten the drain plug.

#### NOTE:

Use a new gasket.

#### Tightening torque:

##### Oil pan side

**44 N·m (4.5 kgf·m, 32.5 ft·lb)**

##### Clutch housing side

**70 N·m (7.1 kgf·m, 51.6 ft·lb)**

- 5) Separate the front drive shaft from transmission. <Ref. to DS-33, REMOVAL, Front Drive Shaft.>
- 6) Remove the differential side retainer oil seal using driver wrapped with vinyl tape or etc.
- 7) Using the ST, install the differential side retainer by slightly tapping with hammer.

ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER

- 8) Apply gear oil to the oil seal lips.

- 9) Set ST to side retainer.

ST 28399SA010 OIL SEAL PROTECTOR

- 10) Install the front drive shaft into transmission.

#### NOTE:

Replace the circlip of drive shaft with a new one.

- 11) Install the front drive shaft into transmission, remove the ST and insert the drive shaft securely.

ST 28399SA010 OIL SEAL PROTECTOR

- 12) Install the front and center exhaust pipes. <Ref. to EX(H4DOTC)-8, INSTALLATION, Front Exhaust Pipe.>

- 13) Lower the vehicle.

- 14) Pour gear oil through the oil level gauge hole.

#### Recommended gear oil:

<Ref. to 6MT-2, TRANSMISSION GEAR OIL, SPECIFICATION, General Description.>

#### Gear oil capacity:

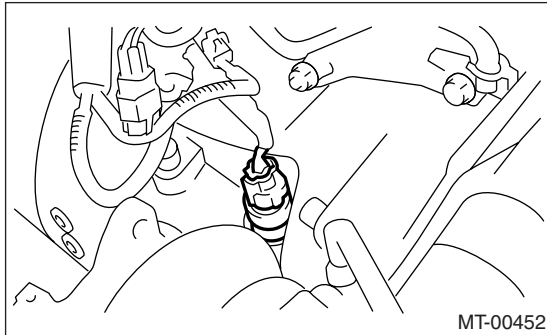
**4.1 ℓ (4.3 US qt, 3.6 Imp qt)**

- 15) Check the level of the gear oil. <Ref. to 6MT-30, INSPECTION, Transmission Gear Oil.>

## 5. Vehicle Speed Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Disconnect the vehicle speed sensor connector.



- 4) Remove the vehicle speed sensor.

### B: INSTALLATION

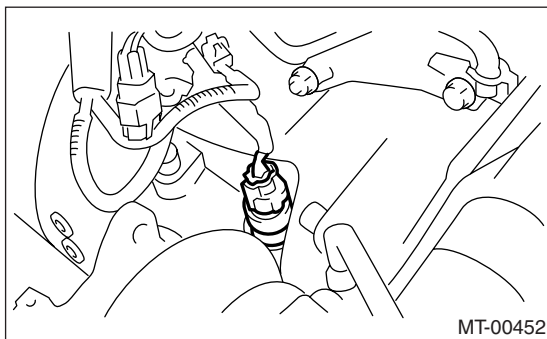
- 1) Align the tip end of vehicle speed sensor key with key groove on the end of speedometer driven gear shaft, and then install it.

#### **Tightening torque:**

**5.9 N·m (0.6 kgf-m, 4.4 ft-lb)**

#### **NOTE:**

- Ensure the sensor mounting hole is clean and free of foreign matter.
- Discard the vehicle speed sensor after removal, and replace it with a new one.



- 2) Connect the connector to vehicle speed sensor.
- 3) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

### C: INSPECTION

Inspect that the speedometer is normally operated, because vehicle speed sensor cannot be inspected as a single part. If it is not normally operated, inspect the combination meter system. <Ref. to IDI-3, INSPECTION, Combination Meter System.>

# Transmission Mounting System

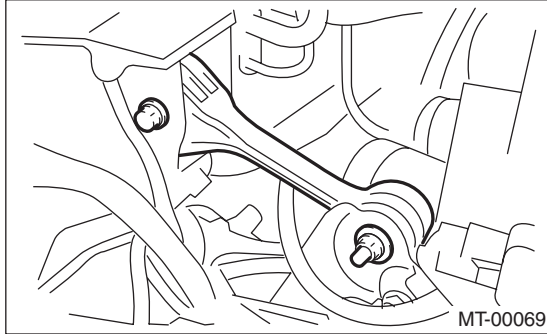
MANUAL TRANSMISSION AND DIFFERENTIAL

## 6. Transmission Mounting System

### A: REMOVAL

#### 1. PITCHING STOPPER

- 1) Disconnect the ground cable from battery.
- 2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Remove the pitching stopper.



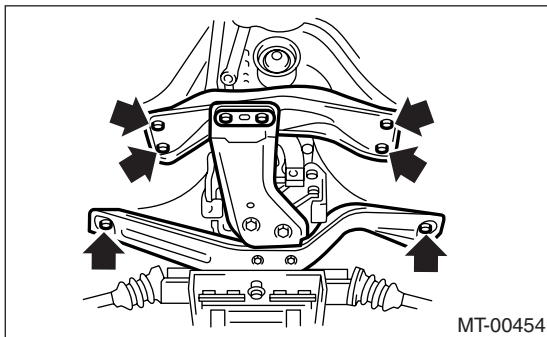
#### 2. CROSSMEMBER AND CUSHION RUBBER

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>
- 4) Remove the rear exhaust pipe and muffler.
- 5) Set the transmission jack under the transmission body.

#### CAUTION:

**Always support the transmission case with a transmission jack.**

- 6) Remove the rear crossmember.



- 7) Remove the rear cushion rubber.

### B: INSTALLATION

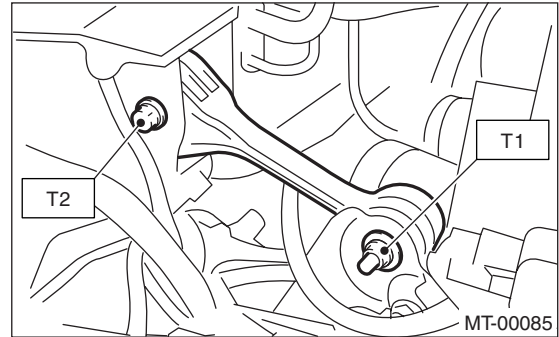
#### 1. PITCHING STOPPER

- 1) Install the pitching stopper.

#### Tightening torque:

**T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)**

**T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)**



- 2) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
- 3) Connect the battery ground cable to battery.

#### 2. CROSSMEMBER AND CUSHION RUBBER

- 1) Install the rear cushion rubber.

#### Tightening torque:

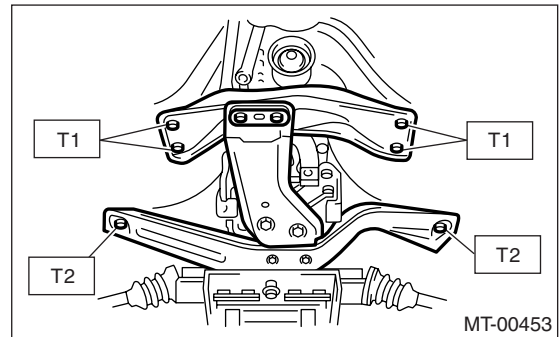
**35 N·m (3.6 kgf-m, 25.8 ft-lb)**

- 2) Install the crossmember.

#### Tightening torque:

**T1: 70 N·m (7.1 kgf-m, 51.6 ft-lb)**

**T2: 140 N·m (14.3 kgf-m, 103 ft-lb)**



- 3) Remove the transmission jack.
- 4) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-11, INSTALLATION, Center Exhaust Pipe.>
- 5) Install the rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-15, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, INSTALLATION, Muffler.>

## **C: INSPECTION**

Repair or replace parts if the results of the inspection below are not satisfactory.

### **1. PITCHING STOPPER**

Make sure that the pitching stopper is not bent or damaged. Make sure that the rubber is not stiff, cracked, or otherwise damaged.

### **2. CROSSMEMBER AND CUSHION RUBBER**

Make sure that the crossmember is not bent or damaged. Make sure that the cushion rubber is not stiff, cracked, or otherwise damaged.

# Manual Transmission Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 7. Manual Transmission Assembly

#### A: REMOVAL

1) Set the vehicle on a lift, and then open the front hood and support it with hood stay.

#### NOTE:

Set the hood stay to its specified hole.

2) Remove the front wheel.

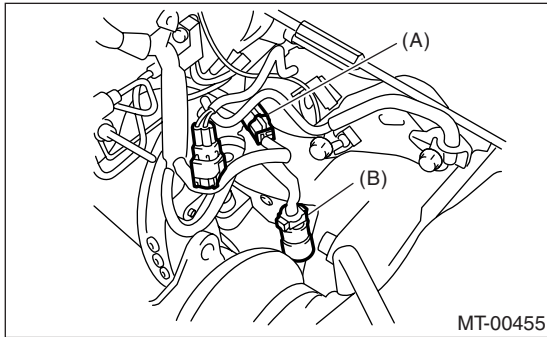
3) Disconnect the ground cable from battery.

4) Remove the intercooler assembly. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>

5) Lift-up the vehicle, and then remove the under cover.

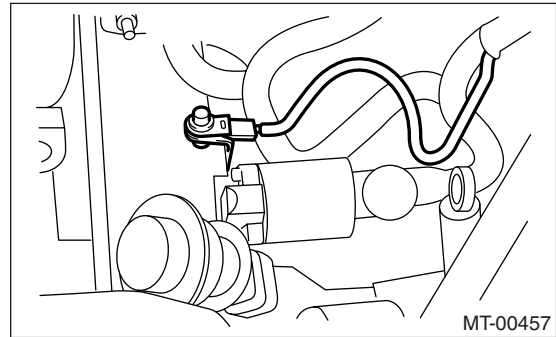
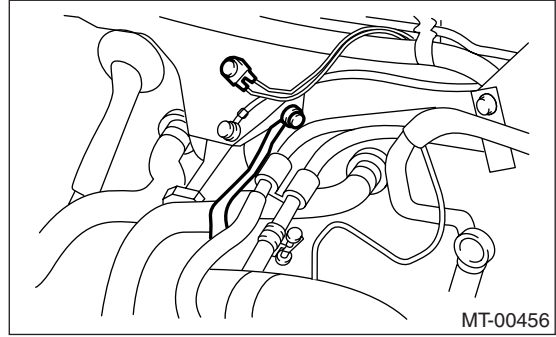
6) Remove the steering universal joint. <Ref. to PS-21, REMOVAL, Universal Joint.>

7) Lower the vehicle and disconnect the connector located on upper side of transmission.



- (A) Transmission connector
- (B) Vehicle speed sensor connector

8) Disconnect the ground cable at upper side of transmission case and body.

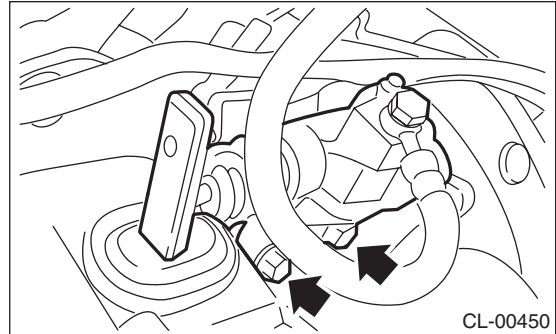


9) Remove the starter assembly. <Ref. to SC(H4SO)-8, REMOVAL, Starter.>

10) Remove the operating cylinder.

#### NOTE:

Hang the removed operating cylinder with a wire, etc.



11) Remove the clutch release shaft.

(1) Remove the plug with hexagon wrench.

(2) Install a 6 mm bolt to the release shaft, then pull out the release shaft.

(3) Lift up the release fork, and then remove it from the release bearing claw. Pull it to the engine side and set it free.

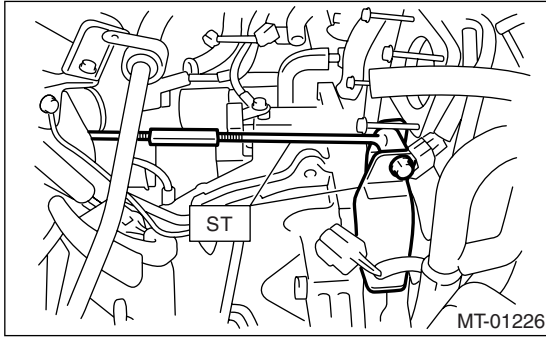
12) Remove the throttle body. <Ref. to FU(STI)-12, REMOVAL, Throttle Body.>

13) Remove the pitching stopper, and then remove the pitching stopper bracket.

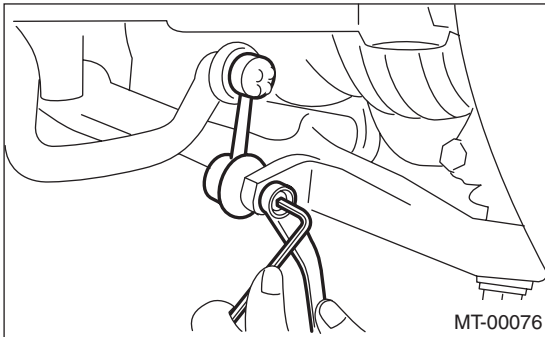
# Manual Transmission Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

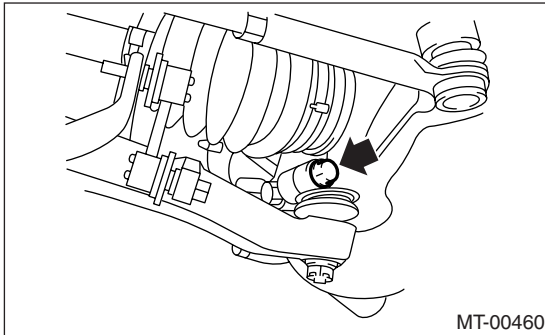
- 14) Set the ST.  
ST 41099AC000 ENGINE SUPPORT



- 15) Remove the center and rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>  
16) Drain the transmission gear oil. <Ref. to 6MT-30, Transmission Gear Oil.>  
17) Remove the propeller shaft. <Ref. to DS-16, REMOVAL, Propeller Shaft.>  
18) Remove the front stabilizer bolt.

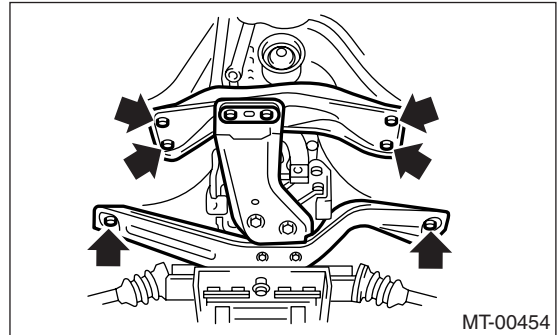


- 19) Remove the ball joint of transverse link from housing.



- 20) Remove the front drive shaft. <Ref. to DS-33, REMOVAL, Front Drive Shaft.>  
21) Remove the front drive shaft, then take the front drive shaft.

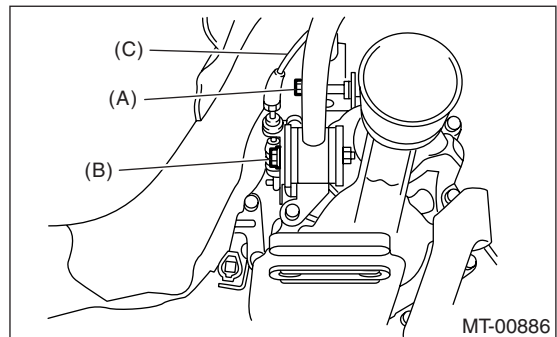
- 22) Set the transmission jack under the transmission, then remove the front crossmember and rear crossmember.



- 23) Move the transmission to right side, then remove the joint COMPL, stay bolt and reverse check cable.

**NOTE:**

If the transmission is not moved, the joint COMPL and stay bolt will contact body and damage may occur.



- (A) Joint COMPL bolt  
(B) Stay bolt  
(C) Reverse check cable

- 24) Remove the fixing bolt of engine and transmission, then remove the transmission from vehicle.

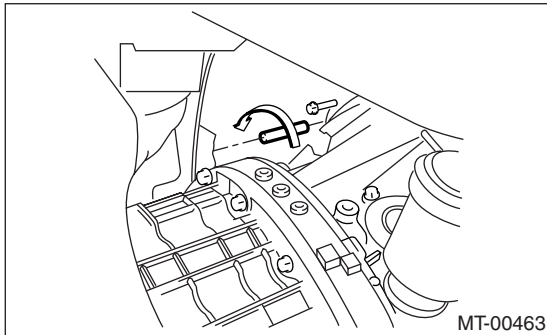
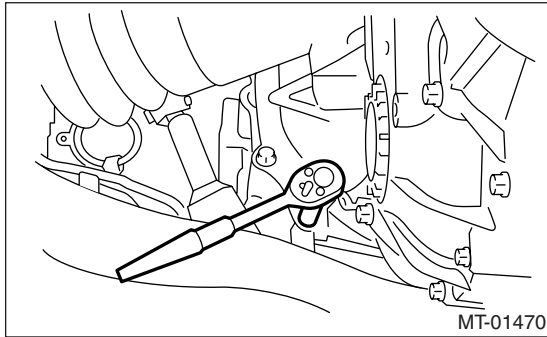
**NOTE:**

- Rotate the turn buckle of ST (ENGINE SUPPORT ASSY) and lower the rear side of engine to facilitate removal.
- Take care not to contact the transmission with body when pulling backward to remove.

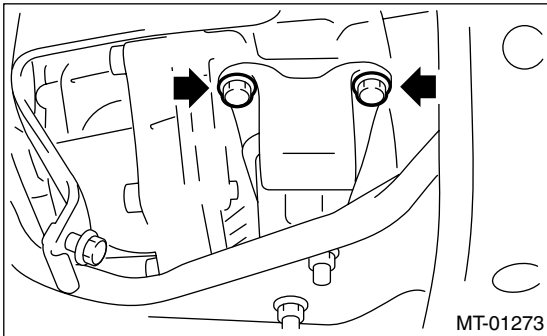
# Manual Transmission Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

- Remove the clutch pipe and breather pipe carefully which may interfere each other.



- 25) Remove the crossmember from transmission.

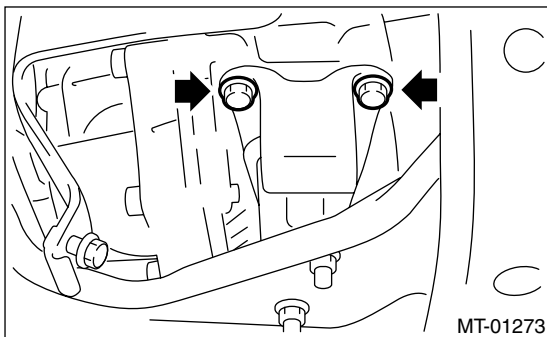


### B: INSTALLATION

- 1) Set the release fork, release bearing and release shaft to transmission. <Ref. to CL-18, INSTALLATION, Release Bearing and Lever.>
- 2) Install the crossmember to transmission.

#### Tightening torque:

**35 N·m (3.6 kgf-m, 25.8 ft-lb)**



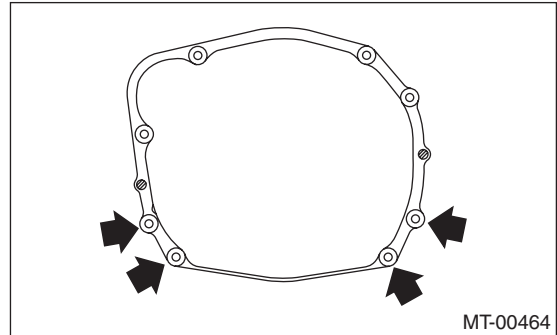
- 3) Install the transmission.

#### NOTE:

- Make sure the main shaft spline part is inserted completely.
- Make sure the rear side of engine is lowered.

#### Tightening torque:

**50 N·m (5.1 kgf-m, 36.9 ft-lb)**

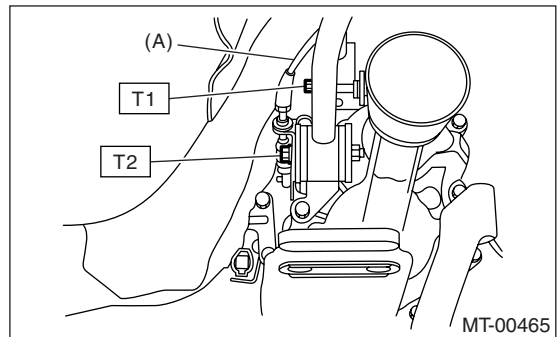


- 4) Move the transmission to the right side, then install the joint COMPL bolt, stay bolt and reverse check cable.

#### Tightening torque:

**T1: 11.8 N·m (1.2 kgf-m, 8.7 ft-lb)**

**T2: 32 N·m (3.3 kgf-m, 23.6 ft-lb)**



(A) Reverse check cable

- 5) Install the front crossmember and rear crossmember.

#### NOTE:

Rotate the turn buckle of ST (ENGINE SUPPORT ASSY) and lift up the rear side of engine to facilitate installation.



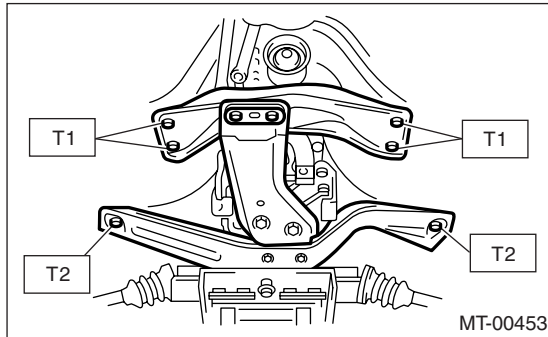
# Manual Transmission Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

## Tightening torque:

**T1: 70 N·m (7.1 kgf-m, 51.6 ft-lb)**

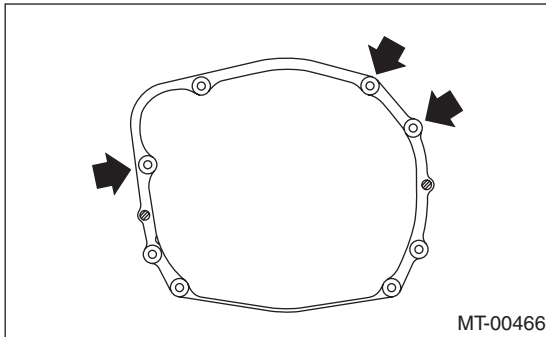
**T2: 140 N·m (14.3 kgf-m, 103 ft-lb)**



6) Lower the vehicle and install the fixing bolt.

## Tightening torque:

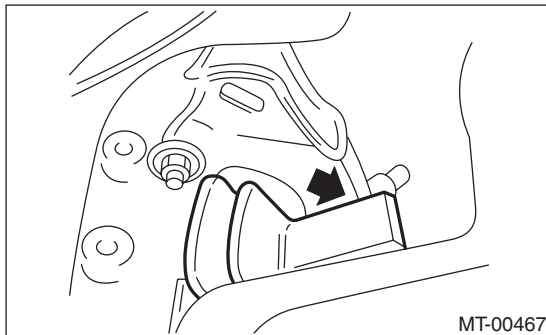
**50 N·m (5.1 kgf-m, 36.9 ft-lb)**



7) Make sure the release bearing is installed completely.

## NOTE:

- Push the release fork to operating cylinder side until you hear a “click” sound. Pull the release fork to engine side. Setting is completed if the release fork does not contact the case.
- Make sure the boot cover is firmly set.



8) Install the pitching stopper bracket.

## Tightening torque:

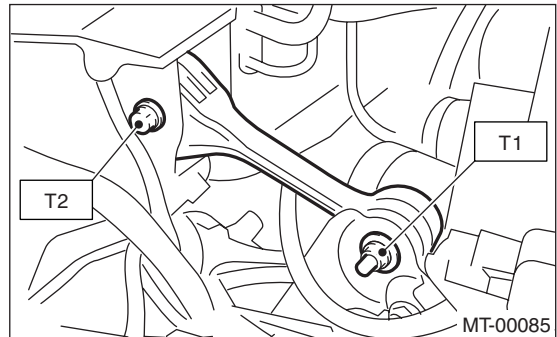
**41 N·m (4.2 kgf-m, 30.2 ft-lb)**

9) Install the pitching stopper.

## Tightening torque:

**T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)**

**T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)**



10) Install the throttle body. <Ref. to FU(STI)-12, INSTALLATION, Throttle Body.>

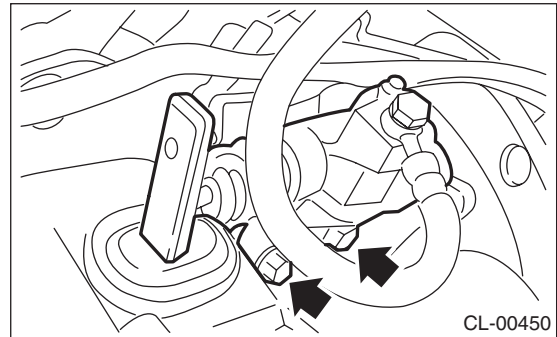
11) Install the operating cylinder.

## Tightening torque:

**41 N·m (4.2 kgf-m, 30.2 ft-lb)**

## NOTE:

Check that the clutch hose is routed properly.



12) Install the starter assembly.

## Tightening torque:

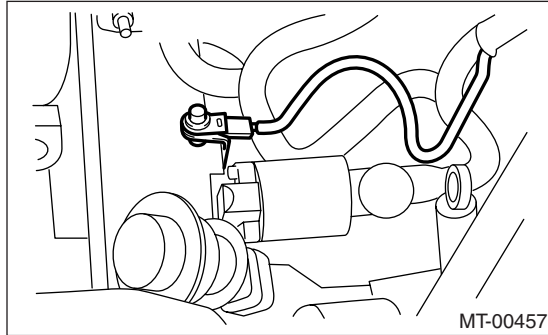
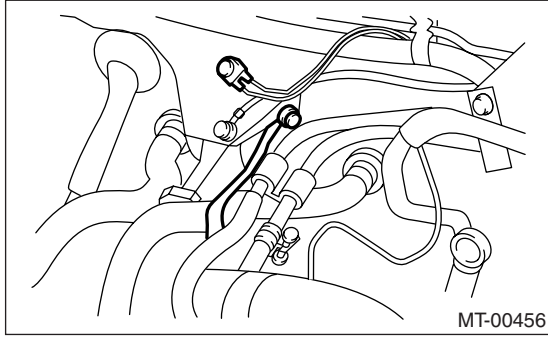
**50 N·m (5.1 kgf-m, 36.9 ft-lb)**



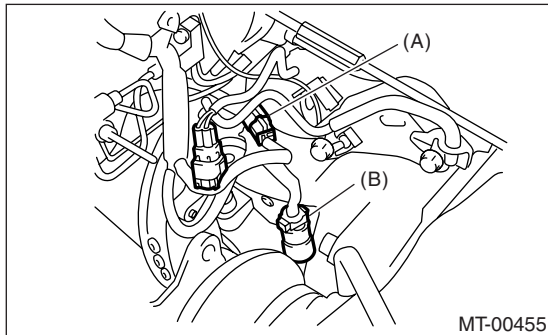
# Manual Transmission Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

13) Install the transmission and body ground cable.



14) Connect the connector located on the upper side of transmission.



- (A) Transmission connector  
(B) Vehicle speed sensor connector

15) Replace the front differential side retainer oil seal.

(1) Remove the oil seal by using flat tip screwdriver and etc.

(2) Fit a new oil seal using ST.

ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER

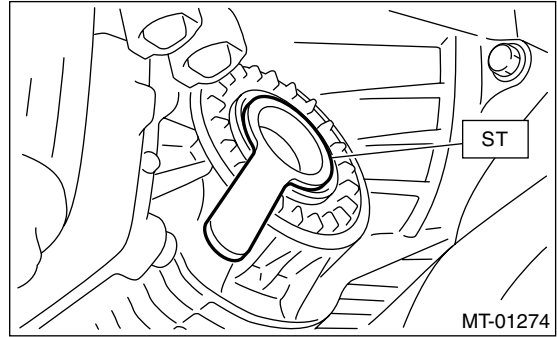
### NOTE:

- Apply oil to the oil seal lips.
- Always replace the differential side oil seal after extracting front drive shaft from the transmission.

16) Apply grease to the oil seal lips.

17) Set the ST to the differential side retainer.

ST 28399SA010 OIL SEAL PROTECTOR



18) Install the front drive shaft into transmission.

### NOTE:

Replace the circlip of drive shaft with a new one.

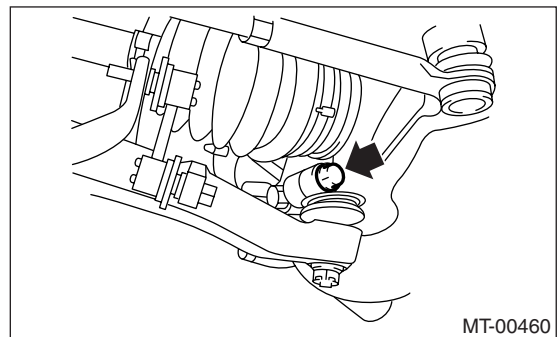
19) Install the front drive shaft into transmission, remove the ST and insert the drive shaft securely.

ST 28399SA010 OIL SEAL PROTECTOR

20) Install the ball joint of transverse link to housing.

### Tightening torque:

**50 N·m (5.1 kgf-m, 36.9 ft-lb)**



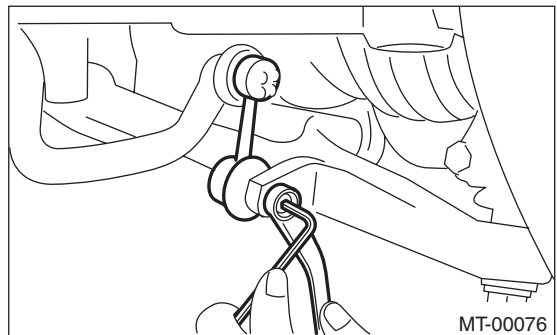
21) Install the stabilizer nut.

### Tightening torque:

**45 N·m (4.6 kgf-m, 33.2 ft-lb)**

### NOTE:

Use a new self-locking nut.



22) Install the propeller shaft. <Ref. to DS-17, INSTALLATION, Propeller Shaft.>

23) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-11, INSTALLATION, Center Exhaust Pipe.>

# Manual Transmission Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

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- 24) Install the rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-15, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(H4DOTC)-16, INSTALLATION, Muffler.>
- 25) Install the universal joint. <Ref. to PS-21, INSTALLATION, Universal Joint.>
- 26) Install the under cover.
- 27) Install the intercooler assembly. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
- 28) Connect the battery ground cable to battery.

# Preparation for Overhaul

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 8. Preparation for Overhaul

#### A: PROCEDURE

- 1) Clean oil, grease, dirt and dust from transmission.
- 2) Remove the drain plug to drain oil. After draining, retighten it as before.

**NOTE:**

Replace the gasket with a new one.

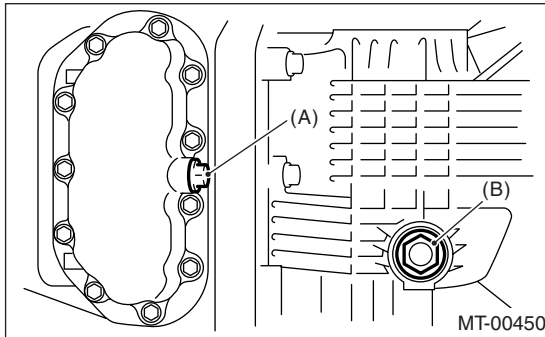
**Tightening torque:**

**Oil pan side**

**44 N·m (4.5 kgf-m, 32.5 ft-lb)**

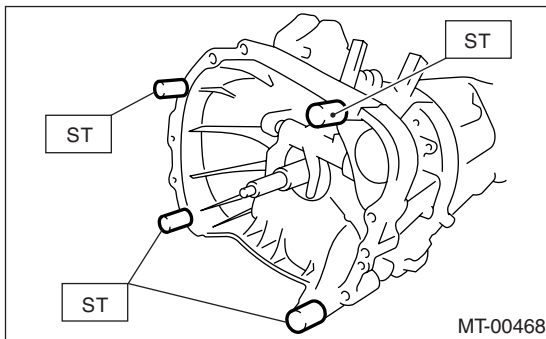
**Clutch housing side**

**70 N·m (7.1 kgf-m, 51.6 ft-lb)**



- (A) Drain plug (Oil pan side)
- (B) Drain plug (Clutch housing side)

- 3) Attach the transmission to ST.  
ST 18632AA000 STAND ASSY

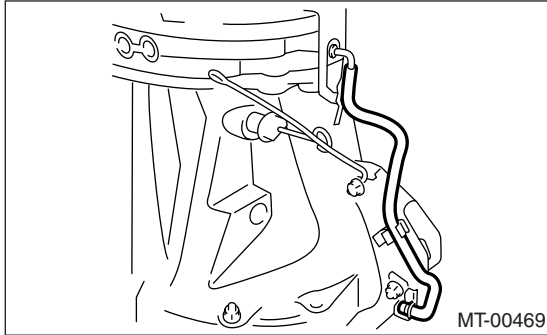


- 4) Rotating parts should be coated with oil prior to assembly.
- 5) All disassembled parts, if to be reused, should be reinstalled in the original positions and directions.
- 6) Gaskets, lock washers and lock nut must be replaced with new ones.
- 7) Liquid gasket should be used where specified to prevent leakage.

## 9. Air Breather Hose

### A: REMOVAL

Disconnect the air breather hose.

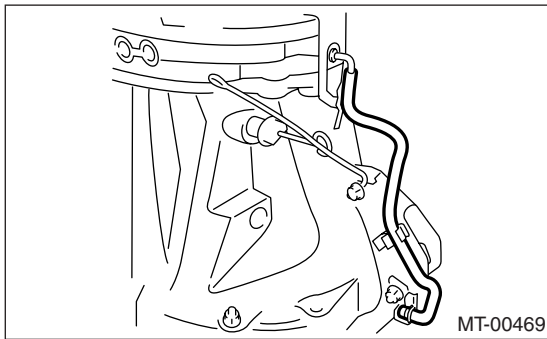


### B: INSTALLATION

Install the air breather hose.

#### NOTE:

Install so that the hose is not folded over, excessively bent or twisted.



### C: INSPECTION

Make sure the hose is not cracked or clogged.

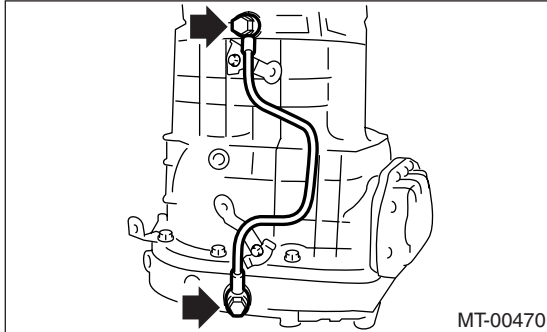
## 10.Oil Pipe

### A: REMOVAL

Remove the oil pipe.

NOTE:

Use a new gasket.



### B: INSTALLATION

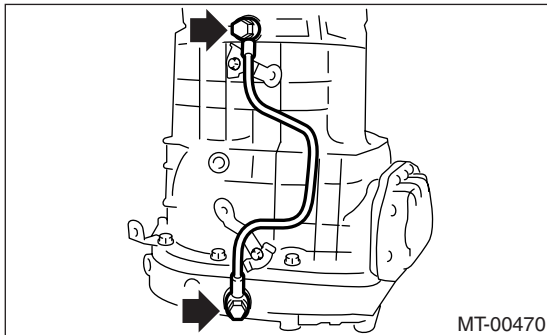
Install in the reverse order of removal.

NOTE:

Use a new gasket.

**Tightening torque:**

**32 N·m (3.3 kgf·m, 23.6 ft·lb)**



### C: INSPECTION

- 1) Make sure there is no damage on pipe. If there is damage, replace the pipe.
- 2) Check the joint parts of pipe for oil leakage. If there is oil leakage, replace the gasket.

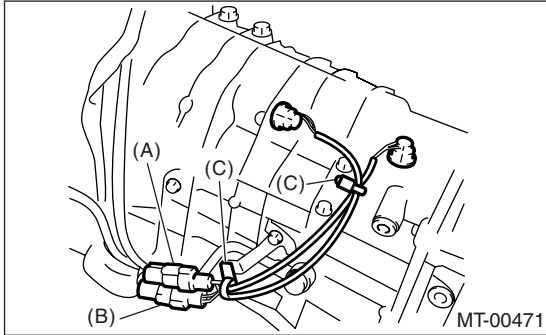
# Back-up Light Switch

MANUAL TRANSMISSION AND DIFFERENTIAL

## 11. Back-up Light Switch

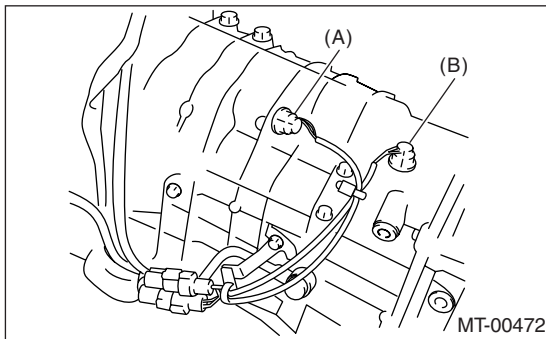
### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
- 2) Disconnect the back-up light switch connector.



- (A) Back-up light switch connector (White)
- (B) Neutral position switch connector (Black)
- (C) Clip

- 3) Remove the back-up light switch.



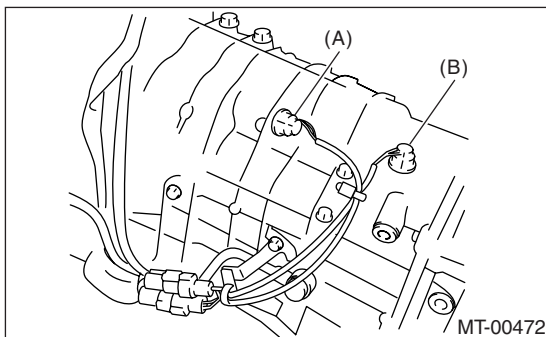
- (A) Back-up light switch
- (B) Neutral position switch

### B: INSTALLATION

- 1) Install the back-up light switch.

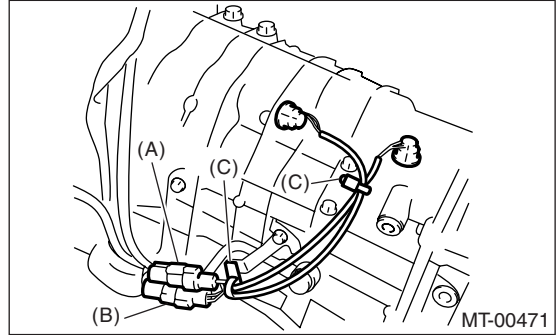
#### Tightening torque:

**32 N·m (3.3 kgf·m, 23.6 ft·lb)**



- (A) Back-up light switch
- (B) Neutral position switch

- 2) Connect the back-up light switch connector.

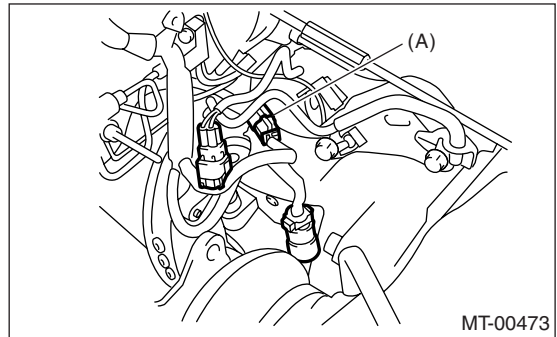


- (A) Back-up light switch connector (White)
- (B) Neutral position switch connector (Black)
- (C) Clip

- 3) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

### C: INSPECTION

- 1) Disconnect the ground cable from battery.
- 2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Disconnect the transmission harness and chassis harness.



- (A) Transmission connector

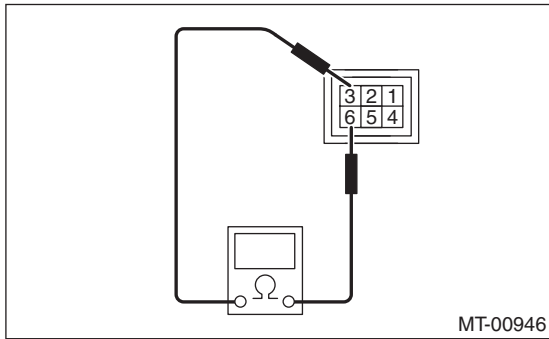
- 4) Measure the resistance between back-up light switch terminals. If it is not within specifications, replace the back-up light switch.

# Back-up Light Switch

## MANUAL TRANSMISSION AND DIFFERENTIAL

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| Gear shift position | Terminal No. | Specified resistance   |
|---------------------|--------------|------------------------|
| Back-up position    | 3 and 6      | Less than 1 $\Omega$   |
| Other positions     |              | More than 1 M $\Omega$ |



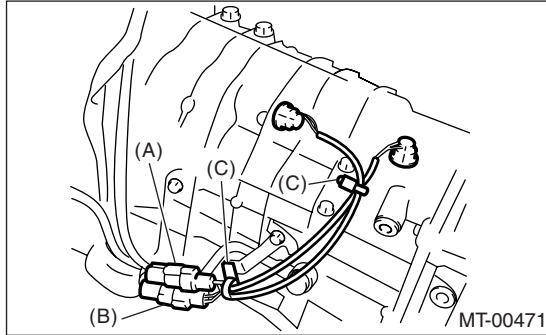
# Neutral Position Switch

MANUAL TRANSMISSION AND DIFFERENTIAL

## 12. Neutral Position Switch

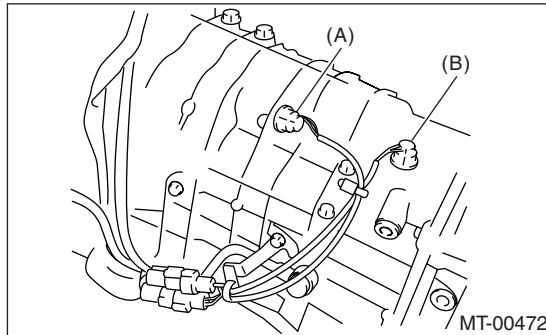
### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
- 2) Disconnect the neutral position switch connector and clip.



- (A) Back-up light switch connector (White)
- (B) Neutral position switch connector (Black)
- (C) Clip

- 3) Remove the neutral position switch.



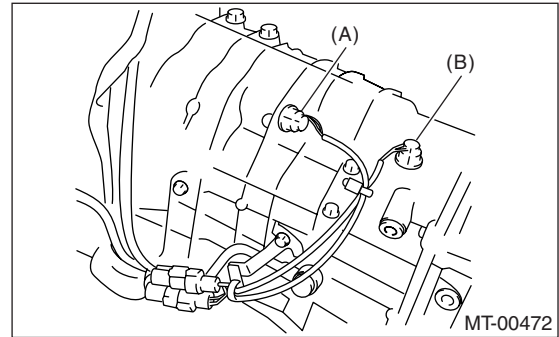
- (A) Back-up light switch
- (B) Neutral position switch

### B: INSTALLATION

- 1) Install the neutral position switch.

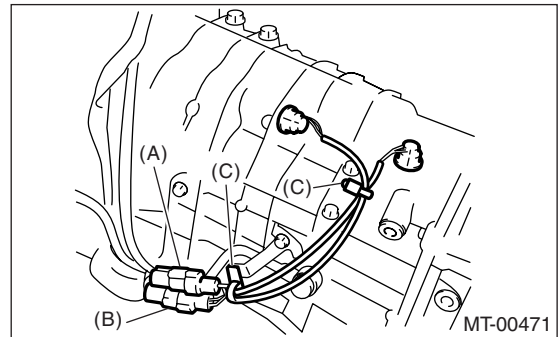
**Tightening torque:**

**32 N·m (3.3 kgf-m, 23.6 ft-lb)**



- (A) Back-up light switch
- (B) Neutral position switch

- 2) Connect the neutral position switch connector and clip.

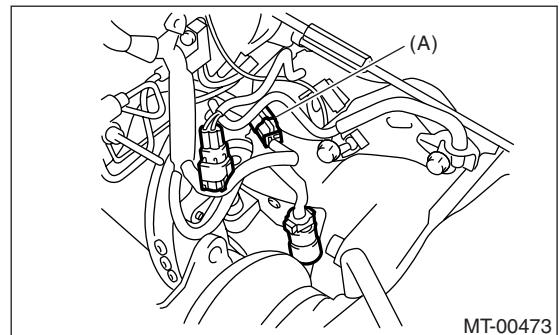


- (A) Back-up light switch connector (White)
- (B) Neutral position switch connector (Black)
- (C) Clip

- 3) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

### C: INSPECTION

- 1) Disconnect the ground cable from battery.
- 2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Disconnect the transmission harness and chassis harness.



- (A) Transmission connector



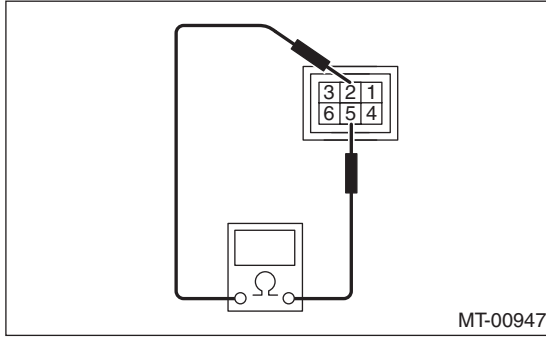
# Neutral Position Switch

## MANUAL TRANSMISSION AND DIFFERENTIAL

---

4) Measure the resistance between neutral position switch terminals. If it is not within specifications, replace the neutral position switch.

| Gear shift position | Terminal No. | Specified resistance   |
|---------------------|--------------|------------------------|
| Neutral position    | 2 and 5      | Less than 1 $\Omega$   |
| Other positions     |              | More than 1 M $\Omega$ |



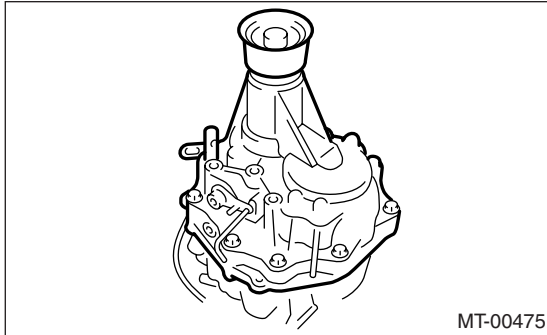
# Extension Case

MANUAL TRANSMISSION AND DIFFERENTIAL

## 13.Extension Case

### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
- 2) Prepare the transmission for overhaul. <Ref. to 6MT-42, Preparation for Overhaul.>
- 3) Remove the extension case.



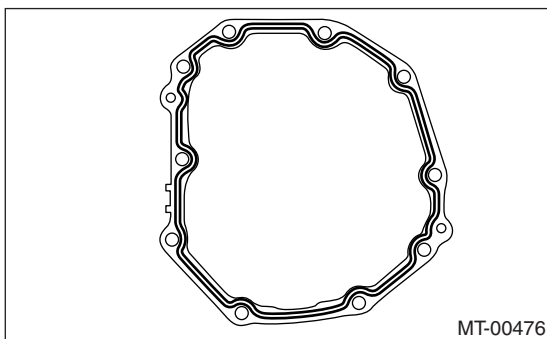
- 4) Completely remove the remaining liquid gasket from the extension case and transmission case.

### B: INSTALLATION

- 1) Select the transfer driven gear thrust washer, and then install it to extension case. <Ref. to 6MT-51, ADJUSTMENT, Extension Case.>
- 2) Apply oil lightly to the outer periphery of bearing cone, and then install it to extension case.
- 3) Select the thrust washer of transfer drive gear, and then install it to center differential.
- 4) Apply liquid gasket to the transmission case.

#### Liquid gasket:

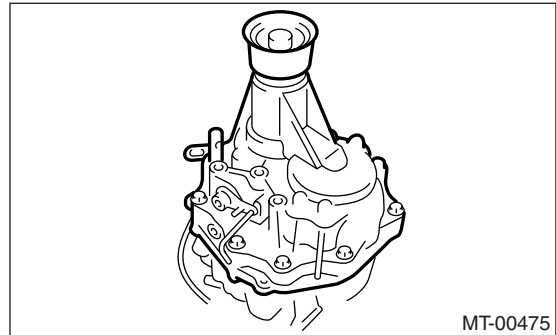
**THREE BOND 1215 (Part No. 004403007)**



- 5) Install the extension case.

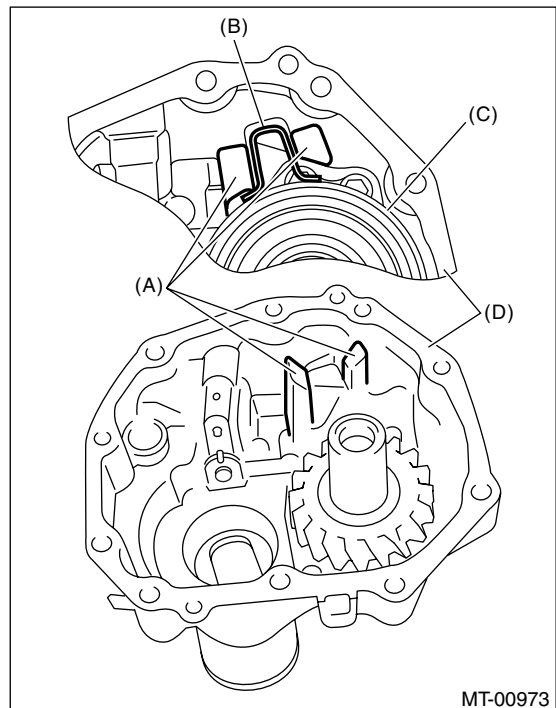
#### Tightening torque:

**48 N·m (4.9 kgf-m, 35.4 ft-lb)**



#### NOTE:

Insert the stopper portion of center differential between extension guides.



- (A) Extension guides
- (B) Stopper
- (C) Center differential
- (D) Extension case

- 6) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

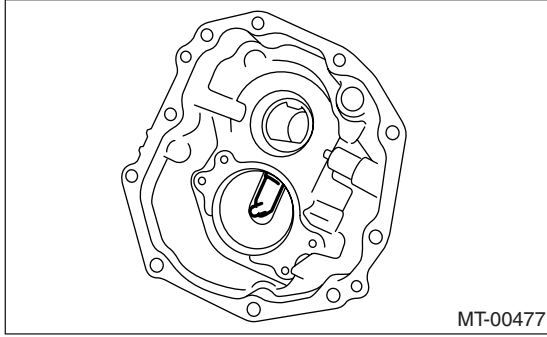
### C: DISASSEMBLY

- 1) Remove the transfer drive gear. <Ref. to 6MT-59, REMOVAL, Transfer Drive Gear.>

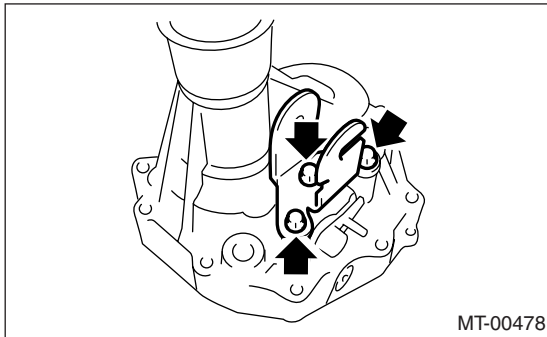
# Extension Case

## MANUAL TRANSMISSION AND DIFFERENTIAL

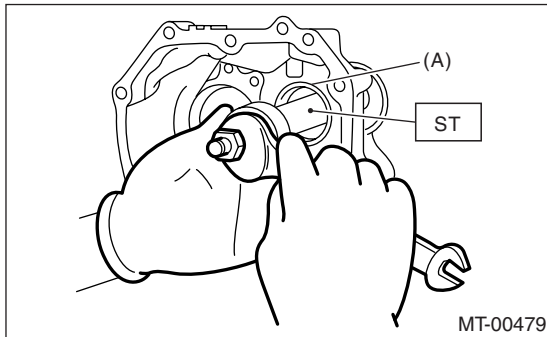
2) Remove the extension guide.



3) Remove the shift bracket.

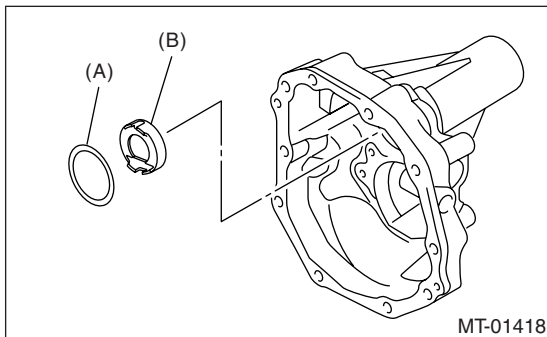


4) Using the ST, remove the bearing cone.  
ST 18758AA000 PULLER



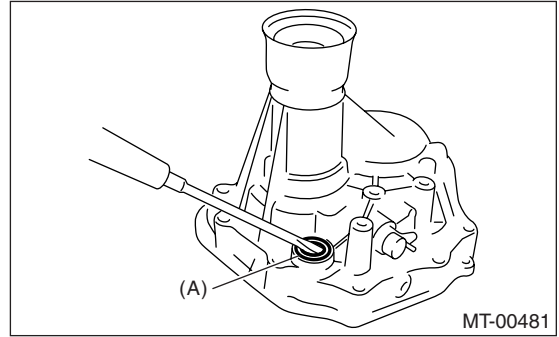
(A) Bearing cone

5) Remove the thrust washer and oil plate.



(A) Thrust washer  
(B) Oil plate

6) Remove the shifter arm oil seal.



(A) Oil seal

7) Remove the reverse checking system. <Ref. to 6MT-56, REMOVAL, Reverse Check System.>

8) Remove the extension oil seal. <Ref. to 6MT-31, REPLACEMENT, Oil Seal.>

### D: ASSEMBLY

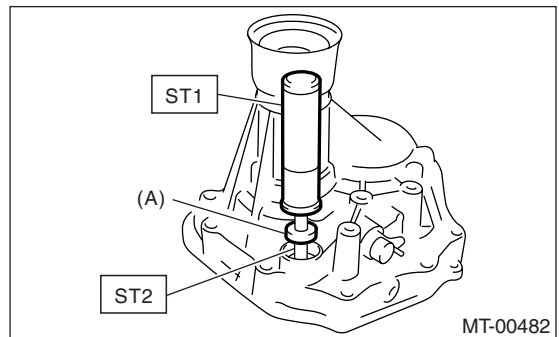
1) Install the reverse checking system. <Ref. to 6MT-57, INSTALLATION, Reverse Check System.>

2) Install the extension case oil seal. <Ref. to 6MT-31, REPLACEMENT, Oil Seal.>

3) Using the ST, install the shifter arm oil seal.

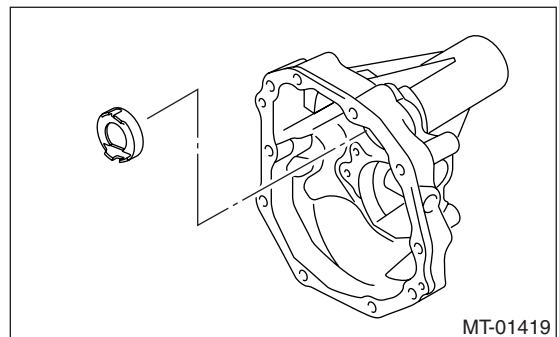
ST1 18657AA000 INSTALLER

ST2 18671AA000 OIL SEAL GUIDE



(A) Oil seal

4) Install the oil plate.



5) Select the bearing thrust washer, and then install it to extension case. <Ref. to 6MT-51, ADJUSTMENT, Extension Case.>

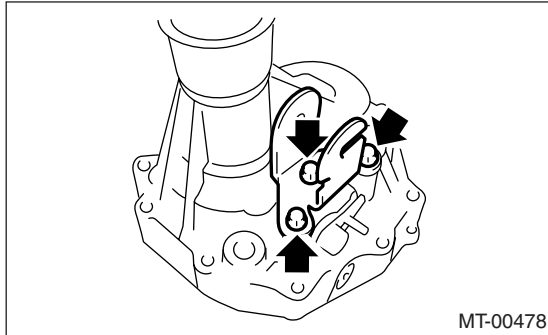
# Extension Case

## MANUAL TRANSMISSION AND DIFFERENTIAL

- 6) Apply oil lightly to the outer periphery of bearing cone, and then install it to extension case.
- 7) Install the shift bracket.

### Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



- 8) Install the extension guide, and then install the transfer driven gear. <Ref. to 6MT-59, INSTALLATION, Transfer Drive Gear.>

## E: INSPECTION

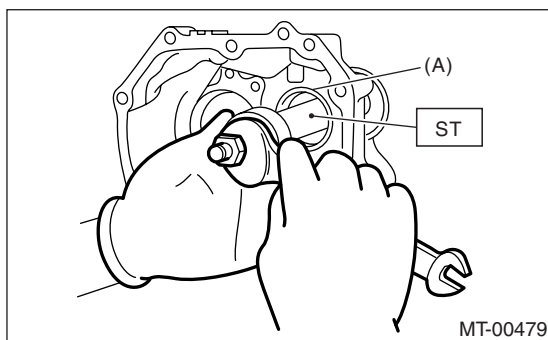
- 1) Make sure there is no damage or crack on extension case. If there is damage or crack, replace the extension case.
- 2) Check each oil seal and joint part of extension case and transmission case for oil leakage. If there is oil leakage, replace the oil seal and liquid gasket.

## F: ADJUSTMENT

### 1. TRANSFER DRIVEN GEAR BEARING THRUST WASHER ADJUSTMENT

- 1) Using the ST, remove the bearing cone from extension case.

ST 18758AA000 PULLER

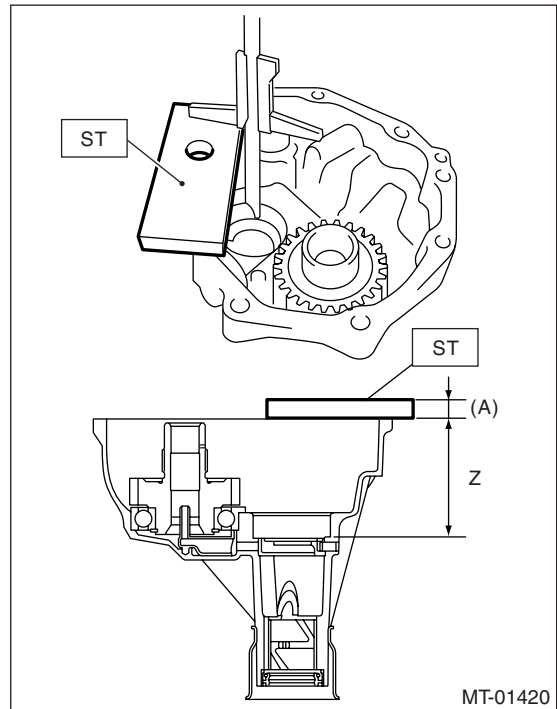


(A) Bearing cone

- 2) Remove the thrust washer.
  - 3) Measure the depth "Z" between end of extension case and contact point of bearing cone.
- ST 499575500 GAUGE

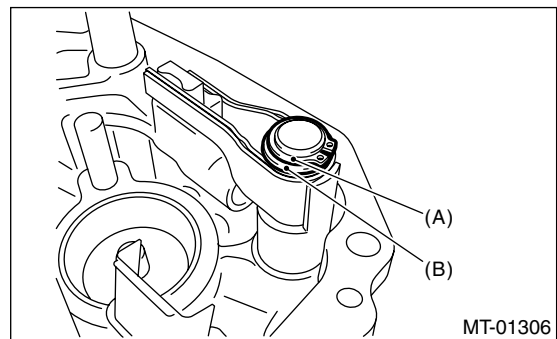
### NOTE:

To measure the depth "Z", subtract the thickness of ST [15 mm (0.59 in)] from the measured value.



(A) 15 mm (0.59 in)

- 4) Remove the transfer driven gear. <Ref. to 6MT-61, REMOVAL, Transfer Driven Gear.>
- 5) Remove the center differential. <Ref. to 6MT-63, REMOVAL, Center Differential.>
- 6) Remove the snap ring and flat washer from selector arm part.



(A) Snap ring

(B) Flat washer

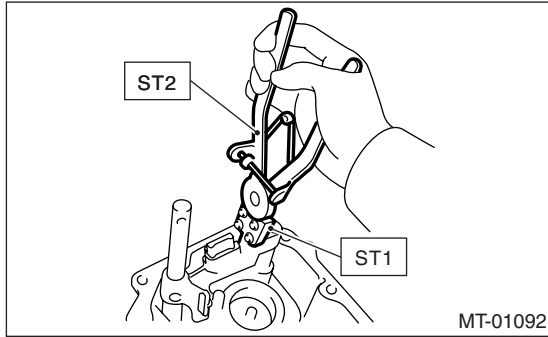
- 7) Using the ST, remove the neutral set spring and support.

ST1 18756AA000 CLAW

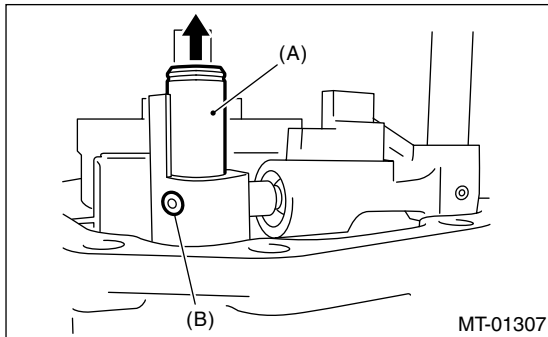
# Extension Case

## MANUAL TRANSMISSION AND DIFFERENTIAL

ST2 399893600 PLIERS

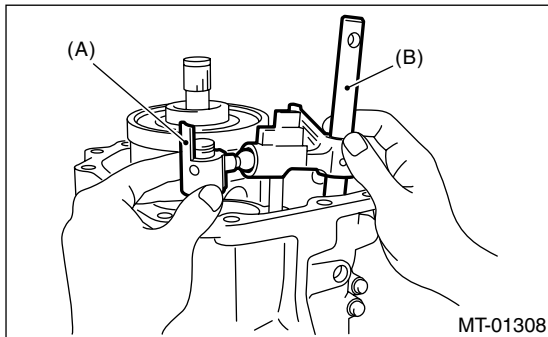


8) Lift-up the striking rod and remove the spring pin.



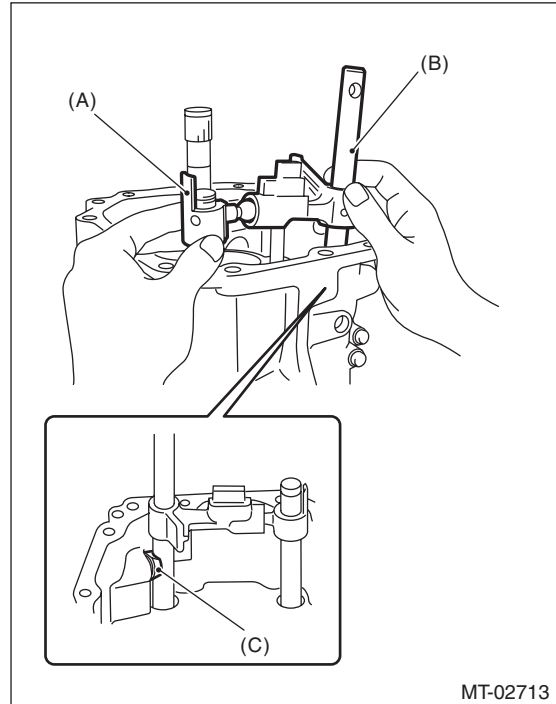
- (A) Striking rod
- (B) Spring pin

9) Remove the selector arm No. 2 and shifter arm. (Transmission serial No. 144576 or earlier)



- (A) Selector arm No. 2
- (B) Shifter arm

10) Remove the selector arm No. 2, shifter arm, selector plunger and spring. (Transmission serial No. 144577 or later)

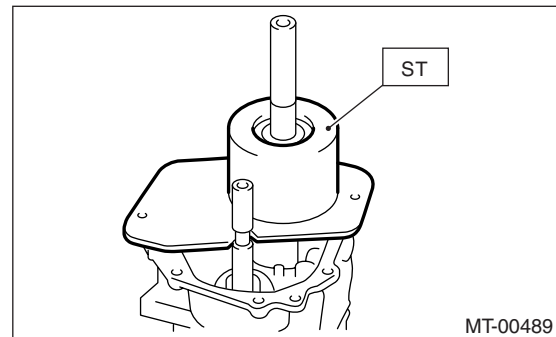


- (A) Selector arm No. 2
- (B) Shifter arm
- (C) Selector plunger

11) Install the bearing cone to transfer driven gear.

12) Set the ST.

ST 18831AA000 GAUGE



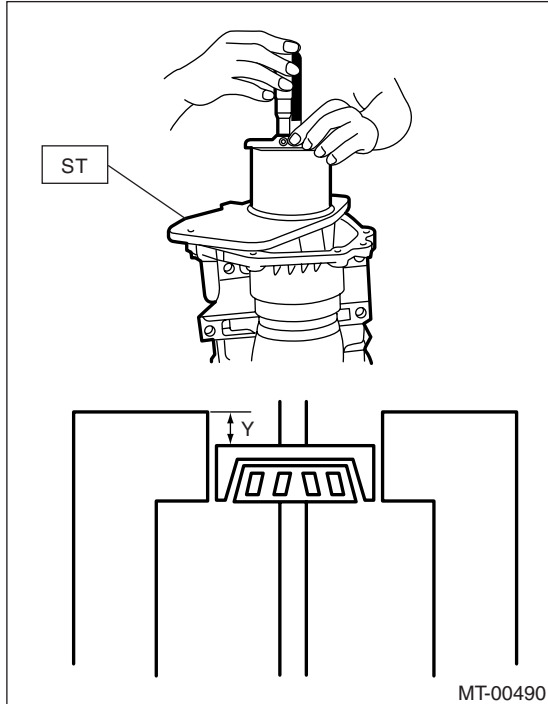
13) Rotate the transfer driven gear approx. ten times to get the bearing accustomed.

14) Measure the depth "Y" between end of ST and bearing cone.

# Extension Case

## MANUAL TRANSMISSION AND DIFFERENTIAL

ST 18831AA000 GAUGE



15) Calculate the value  $t$  of transfer driven gear bearing thrust washer using the following equation.  
 $t = Z - (100 - Y) - \{0.02 \text{ to } 0.11 \text{ mm (0.0008 to 0.0043 in)}\}$

|  |  |
|--|--|
| $t$<br>mm (in)                         | Thickness of transfer driven gear bearing thrust washer.           |
| $Y$<br>mm (in)                         | Depth from end of ST to bearing cone.                              |
| $Z$<br>mm (in)                         | Depth from end of extension case to contact point of bearing cone. |
| 0.02 — 0.11 mm<br>(0.0008 — 0.0043 in) | Standard clearance between thrust washer and taper roller bearing. |
| 100 mm (3.94 in)                       | Height of ST.  |

16) Select the nearest thrust washer from the following table, according to the calculated value  $t$ .

**Standard clearance between thrust washer and taper roller bearing:**

**0.02 — 0.11 mm (0.0008 — 0.0043 in)**

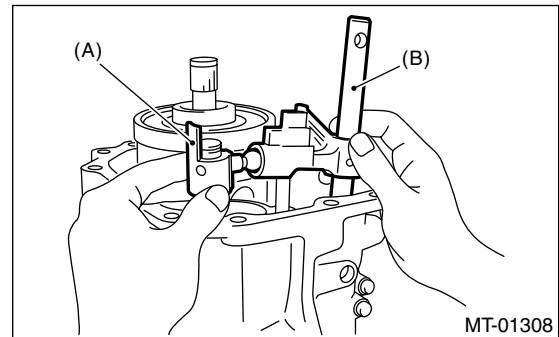
NOTE:

Make clearance within standard.

| Thrust washer (50 × 61 × t) |                   |
|-----------------------------|-------------------|
| Part No.                    | Thickness mm (in) |
| 803050060                   | 0.50 (0.0197)     |
| 803050061                   | 0.55 (0.0217)     |
| 803050062                   | 0.60 (0.0236)     |
| 803050063                   | 0.65 (0.0256)     |
| 803050064                   | 0.70 (0.0276)     |
| 803050065                   | 0.75 (0.0295)     |
| 803050066                   | 0.80 (0.0315)     |
| 803050067                   | 0.85 (0.0335)     |

| Thrust washer (50 × 61 × t) |                   |
|-----------------------------|-------------------|
| Part No.                    | Thickness mm (in) |
| 803050068                   | 0.90 (0.0354)     |
| 803050069                   | 0.95 (0.0374)     |
| 803050070                   | 1.00 (0.0394)     |
| 803050071                   | 1.05 (0.0413)     |
| 803050072                   | 1.10 (0.0433)     |
| 803050073                   | 1.15 (0.0453)     |
| 803050074                   | 1.20 (0.0472)     |
| 803050075                   | 1.25 (0.0492)     |
| 803050076                   | 1.30 (0.0512)     |
| 803050077                   | 1.35 (0.0531)     |
| 803050078                   | 1.40 (0.0551)     |
| 803050079                   | 1.45 (0.0571)     |

17) Install the selector arm No. 2 and shifter arm.  
 (Transmission serial No. 144576 or earlier)



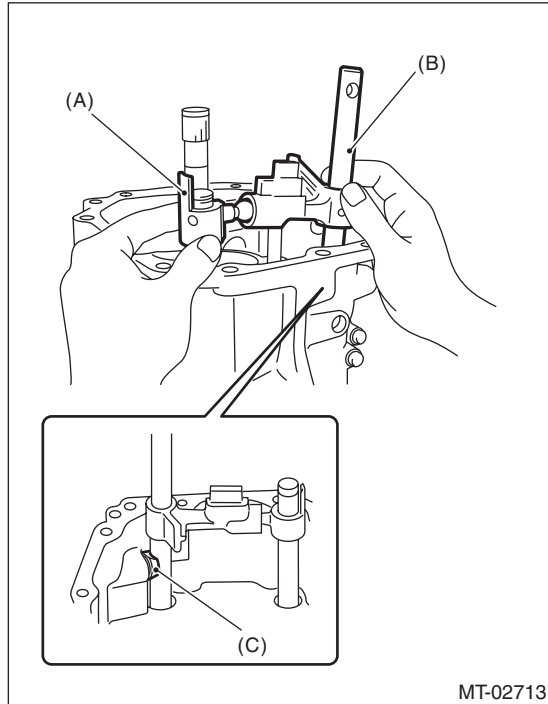
(A) Selector arm No. 2

(B) Shifter arm

## Extension Case

### MANUAL TRANSMISSION AND DIFFERENTIAL

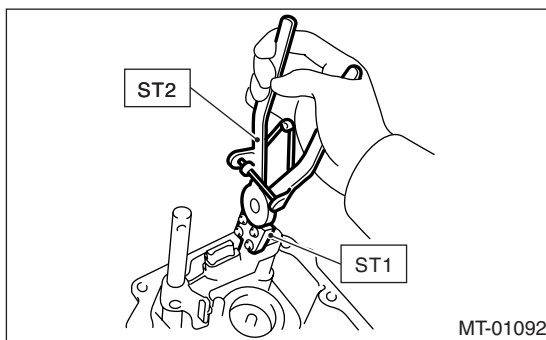
18) Install the selector arm No. 2, shifter arm, selector plunger and spring. (Transmission serial No. 144577 or later)



- (A) Selector arm No. 2
- (B) Shifter arm
- (C) Selector plunger

19) Install a new spring pin.  
20) Using the ST, install the neutral set spring and support.

ST1 18756AA000 CLAW  
ST2 399893600 PLIERS

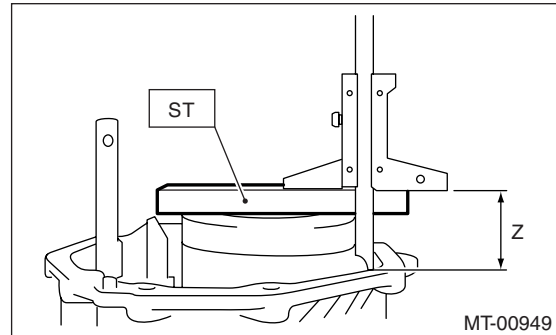


21) Install the snap ring and flat washer.  
22) Install the center differential.

## 2. SELECTING THE TRANSFER DRIVE GEAR THRUST WASHER

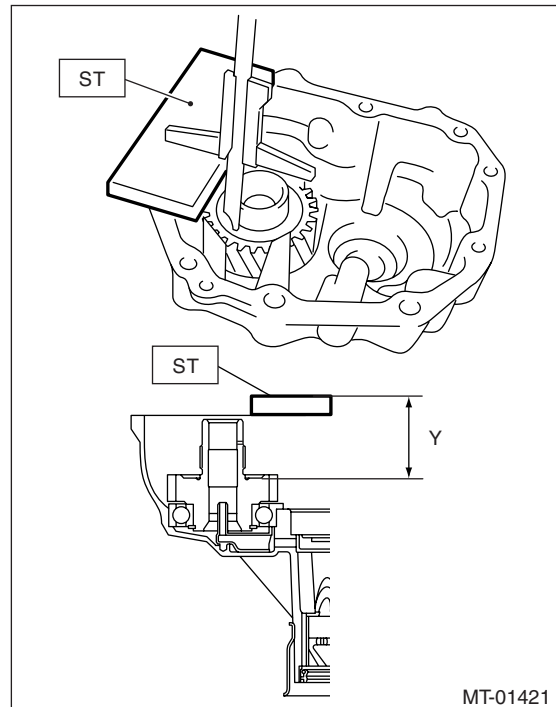
1) Measure the height "Z" between end of transmission case and end of ST.

ST 499575500 GAUGE



2) Measure the depth "Y" between end of ST and transfer drive gear.

ST 499575500 GAUGE



3) Calculate the value t of transfer drive gear thrust washer using the following equation.

$$t = \{Y - 15 \text{ mm (1.18 in)}\} - \{Z - 15 \text{ mm (1.18 in)}\} - 0.75 \text{ to } 0.95 \text{ mm (0.030 to 0.037 in)}$$

|                                      |   |
|--------------------------------------|---|
| t<br>mm (in)                         | Thickness of transfer drive gear thrust washer                    |
| Y<br>mm (in)                         | Depth from end of ST to transfer drive gear                       |
| Z<br>mm (in)                         | Height from end of transmission case to the end of ST             |
| 0.75 — 0.95 mm<br>(0.030 — 0.037 in) | Standard clearance between thrust washer and transfer drive gear. |
| 15 mm (1.18 in)                      | Thickness of ST   |

## Extension Case

MANUAL TRANSMISSION AND DIFFERENTIAL

---

4) Select the nearest thrust washer from the following table, according to the calculated value  $t$ .

**Standard clearance between thrust washer and transfer drive gear:**

**0.75 — 0.95 mm (0.030 — 0.037 in)**

| Thrust washer (36.3 × 52 × t) |                   |
|-------------------------------|-------------------|
| Part No.                      | Thickness mm (in) |
| 803036070                     | 0.80 (0.0315)     |
| 803036071                     | 0.95 (0.0374)     |
| 803036072                     | 1.10 (0.0433)     |
| 803036073                     | 1.25 (0.0492)     |
| 803036074                     | 1.40 (0.0551)     |
| 803036075                     | 0.65 (0.0256)     |

5) Install the selected thrust washer.



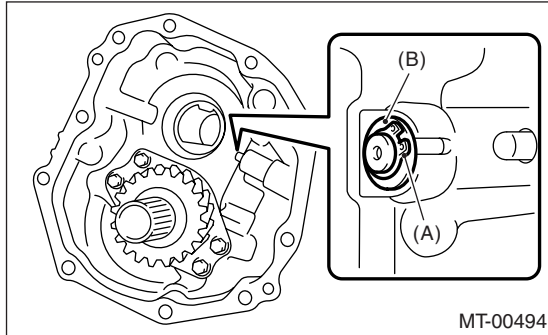
# Reverse Check System

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 14. Reverse Check System

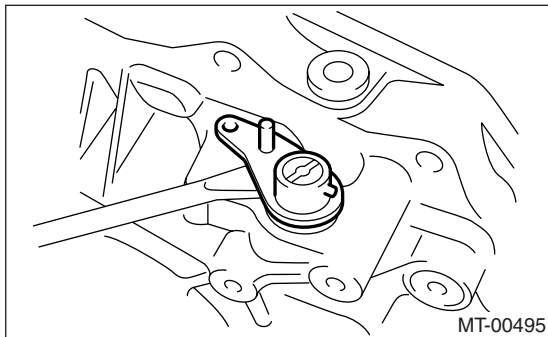
#### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
- 2) Prepare the transmission for overhaul. <Ref. to 6MT-42, Preparation for Overhaul.>
- 3) Remove the extension case. <Ref. to 6MT-49, REMOVAL, Extension Case.>
- 4) Remove the snap ring and washer from reverse check shaft.



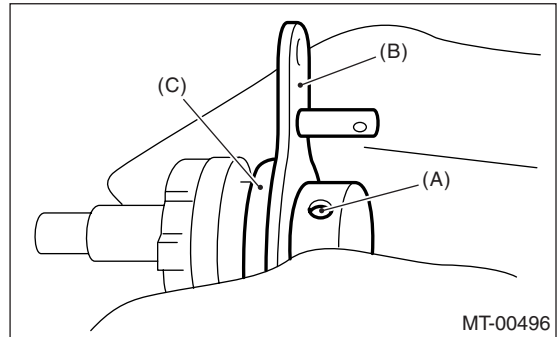
- (A) Snap ring
- (B) Washer

- 5) Remove the reverse check shaft and spring from extension case.



- 6) Remove the spring pin, and then remove the reverse check lever and oil seal from reverse check shaft.

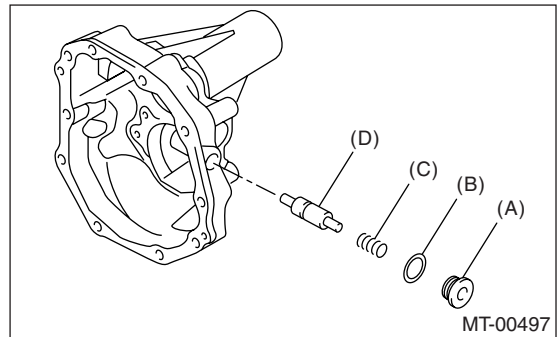
NOTE:  
Do not reuse the oil seal.



- (A) Spring pin
- (B) Reverse check lever
- (C) Oil seal

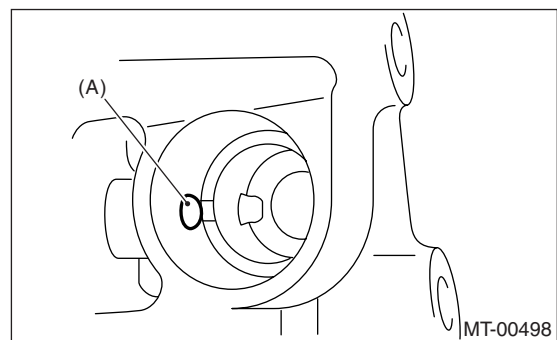
- 7) Remove the plug from extension case, then remove the gasket, spring and plunger.

NOTE:  
Do not reuse the gasket.



- (A) Plug
- (B) Gasket
- (C) Spring
- (D) Plunger

- 8) Remove the reverse lock plunger.



- (A) Reverse lock plunger

# Reverse Check System

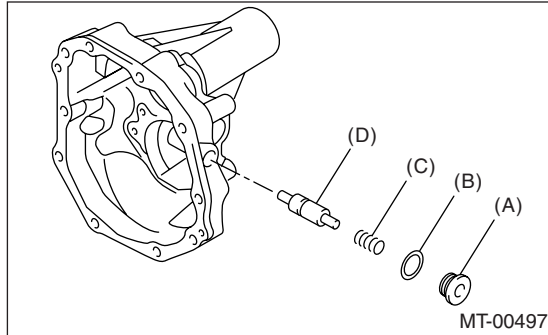
MANUAL TRANSMISSION AND DIFFERENTIAL

## B: INSTALLATION

- 1) Insert the reverse lock plunger.
- 2) Install in the order of reverse check plug, spring, gasket and plug.

### Tightening torque:

**41 N·m (4.2 kgf-m, 30.2 ft-lb)**

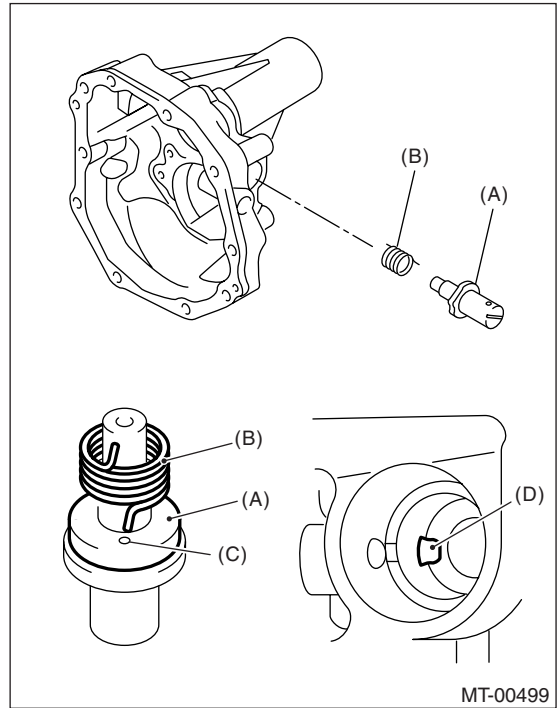


- (A) Plug
- (B) Gasket
- (C) Spring
- (D) Reverse check plug

- 3) Install the spring and reverse check shaft to extension case.

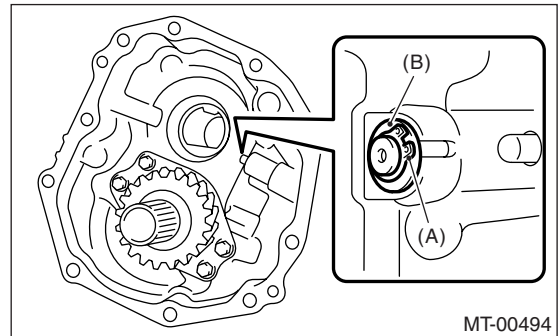
### NOTE:

Be sure the spring end aligns with the hole of reverse check shaft and cutout portion of extension case.



- (A) Reverse check shaft
- (B) Spring
- (C) Hole
- (D) Cutout portion

- 4) Install the washer and snap ring.



- (A) Snap ring
- (B) Washer

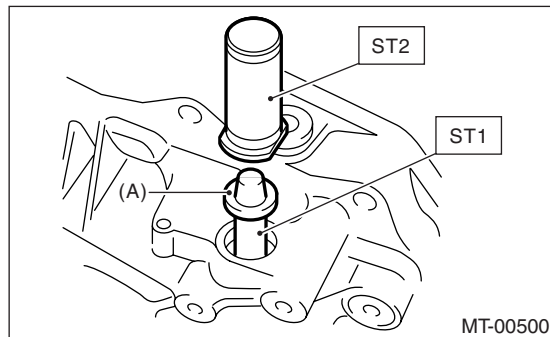
- 5) Set the ST1 to reverse check shaft. Install a new oil seal, then press with ST2.

ST1 18671AA000 OIL SEAL GUIDE

# Reverse Check System

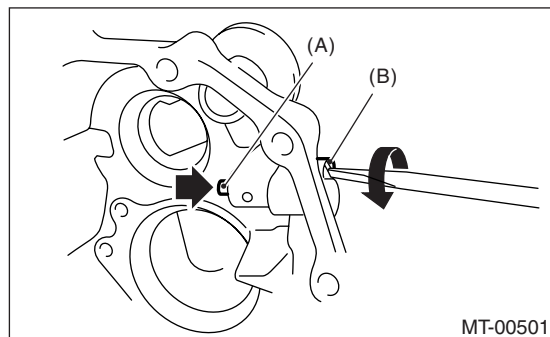
## MANUAL TRANSMISSION AND DIFFERENTIAL

### ST2 18657AA010 INSTALLER



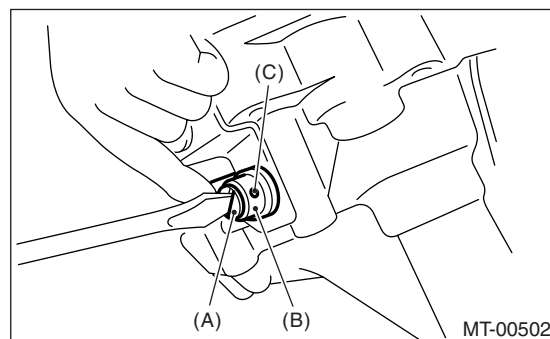
(A) Oil seal

6) Insert the reverse check lever, then rotate the reverse check shaft until the plunger can be pushed in first.



(A) Plunger  
(B) Reverse check shaft

7) Align the hole of reverse check lever and reverse check shaft, then install the spring pin.



(A) Reverse check shaft  
(B) Reverse check lever  
(C) Hole

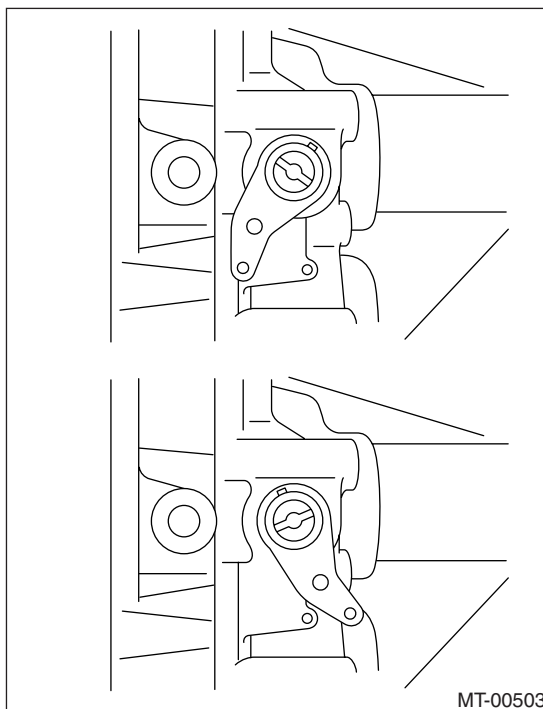
8) Make sure the reverse check operates correctly. <Ref. to 6MT-58, INSPECTION, Reverse Check System.>

9) Install the extension case. <Ref. to 6MT-49, INSTALLATION, Extension Case.>

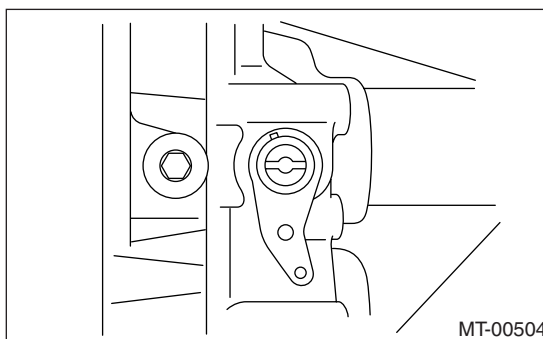
10) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

### C: INSPECTION

- 1) Make sure there is no damage on each parts.
- 2) Make sure the reverse check lever operates smoothly.
- 3) Make sure there is no oil leakage on oil seal part of reverse check shaft. If there is oil leakage, replace the oil seal.
- 4) Inspect the reverse check operation.
  - (1) The plunger can be pushed or the gear can be shifted to reverse, when reverse check lever is in the following position.



(2) The plunger cannot be pushed or the gear cannot be shifted to reverse, when reverse check lever is in the following position.



5) If not as specified, reassemble the reverse check system.

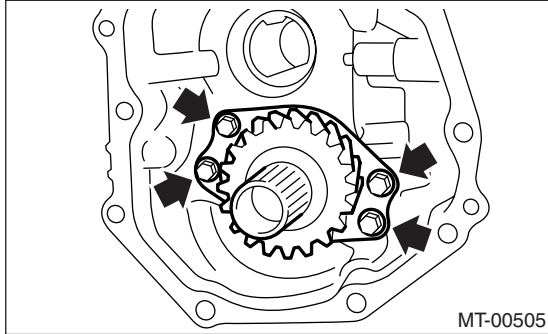
# Transfer Drive Gear

MANUAL TRANSMISSION AND DIFFERENTIAL

## 15. Transfer Drive Gear

### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
- 2) Prepare the transmission for overhaul. <Ref. to 6MT-42, Preparation for Overhaul.>
- 3) Remove the extension case. <Ref. to 6MT-49, REMOVAL, Extension Case.>
- 4) Remove the transfer drive gear.

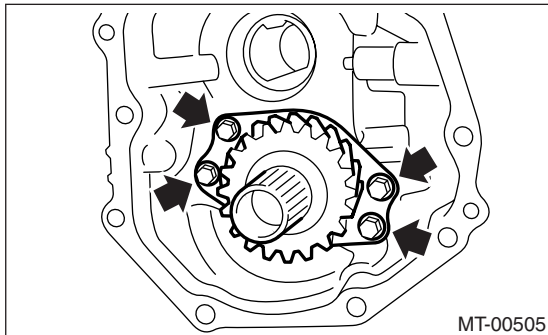


### B: INSTALLATION

- 1) Install the transfer drive gear.

#### **Tightening torque:**

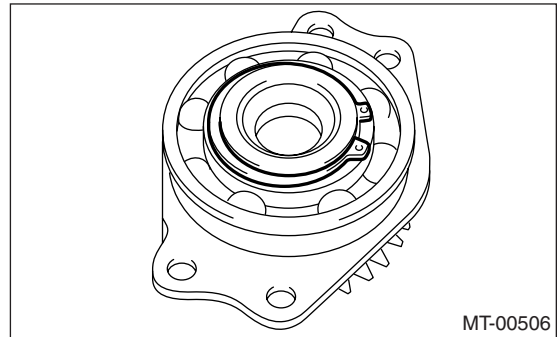
**25 N·m (2.5 kgf·m, 18.1 ft·lb)**



- 2) If the ball bearing, transfer drive gear or snap ring is replaced, select the transfer drive gear thrust washer. <Ref. to 6MT-50, ASSEMBLY, Extension Case.>
- 3) Install the extension case. <Ref. to 6MT-49, INSTALLATION, Extension Case.>
- 4) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

### C: DISASSEMBLY

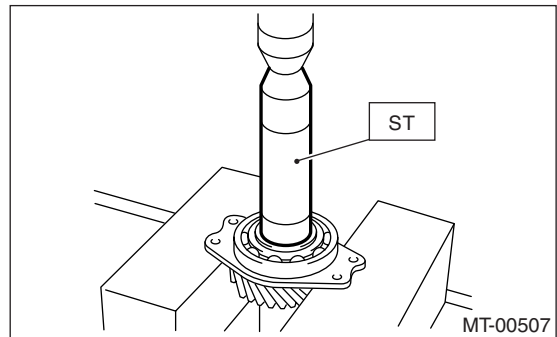
- 1) Remove the snap ring.



- 2) Using the ST, remove the ball bearing.  
ST 499877000 RACE 4-5 INSTALLER

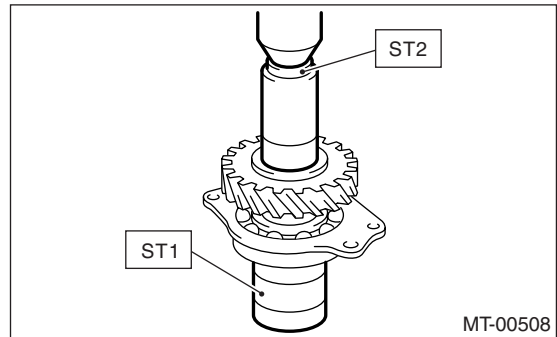
#### **NOTE:**

Do not reuse the ball bearing.

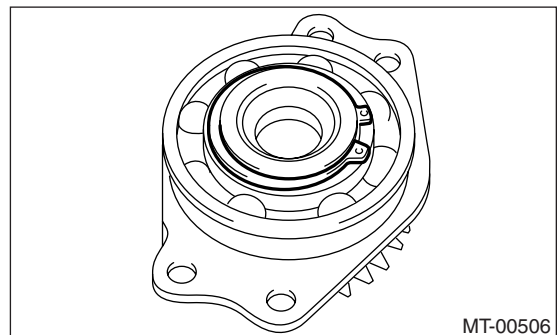


### D: ASSEMBLY

- 1) Using the ST, install the ball bearing.  
ST1 499247400 INSTALLER  
ST2 398497701 SEAT



- 2) Install the snap ring.



# Transfer Drive Gear

## MANUAL TRANSMISSION AND DIFFERENTIAL

3) Inspect the clearance between snap ring and ball bearing. <Ref. to 6MT-60, INSPECTION, Transfer Drive Gear.>

### E: INSPECTION

#### 1) Bearings

Replace the bearings in the following cases.

- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make abnormal noise.

#### 2) Drive gear

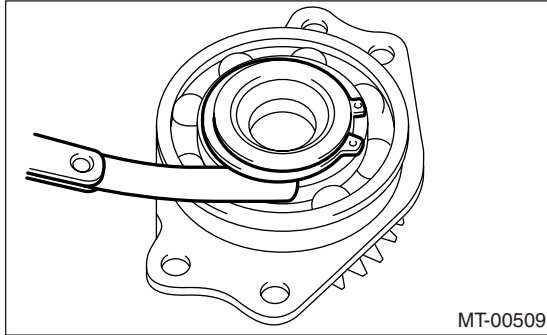
Replace the drive gear in the following cases.

- If their tooth surface and shaft are excessively broken or damaged.

3) Measure the clearance between snap ring and inner race of ball bearing with a thickness gauge.

**Standard clearance between snap ring and inner race:**

**0 — 0.15 mm (0 — 0.0059 in)**



4) If the measurement is not within specifications, select suitable snap ring.

| Thrust washer |                   |
|---------------|-------------------|
| Part No.      | Thickness mm (in) |
| 805045050     | 1.76 (0.069)      |
| 805045060     | 1.88 (0.074)      |
| 805045070     | 2.00 (0.079)      |

After replacement of the snap ring, inspect the clearance again.

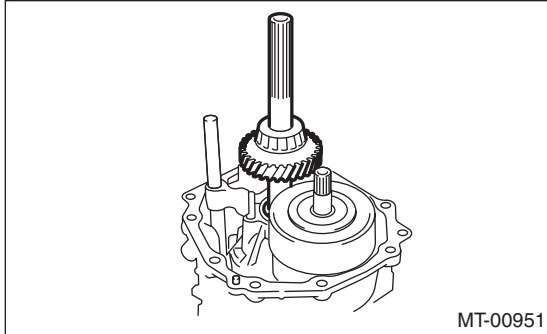
# Transfer Driven Gear

MANUAL TRANSMISSION AND DIFFERENTIAL

## 16. Transfer Driven Gear

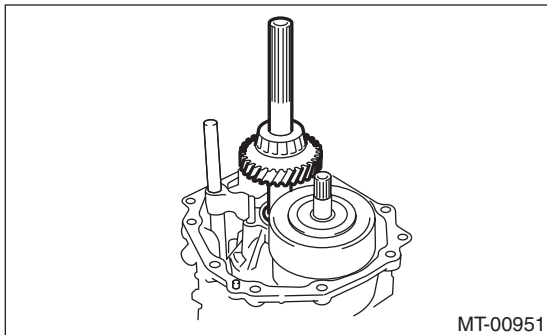
### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
- 2) Prepare the transmission for overhaul. <Ref. to 6MT-42, Preparation for Overhaul.>
- 3) Remove the extension case. <Ref. to 6MT-49, REMOVAL, Extension Case.>
- 4) Remove the transfer driven gear.



### B: INSTALLATION

- 1) Install the transfer driven gear.

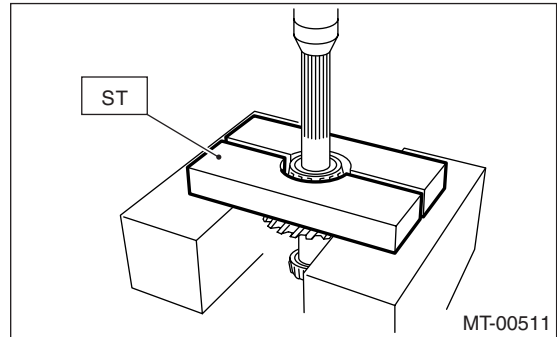


- 2) If the bearing or transfer driven gear is replaced, select the transfer driven thrust washer. <Ref. to 6MT-51, ADJUSTMENT, Extension Case.>
- 3) Install the extension case. <Ref. to 6MT-49, INSTALLATION, Extension Case.>
- 4) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

### C: DISASSEMBLY

- 1) Using the ST, remove the roller bearing of extension case side.

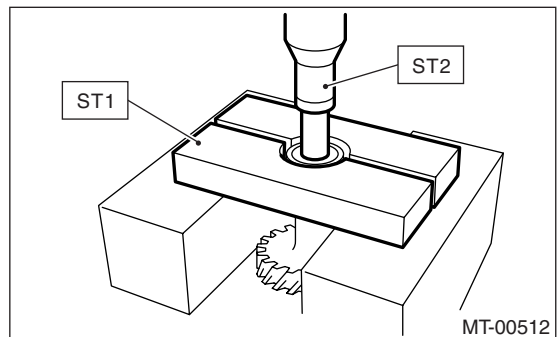
ST 498515700 REMOVER



- 2) Using the ST, remove the roller bearing of transmission case side.

ST1 899858600 REMOVER

ST2 899864100 REMOVER



### D: ASSEMBLY

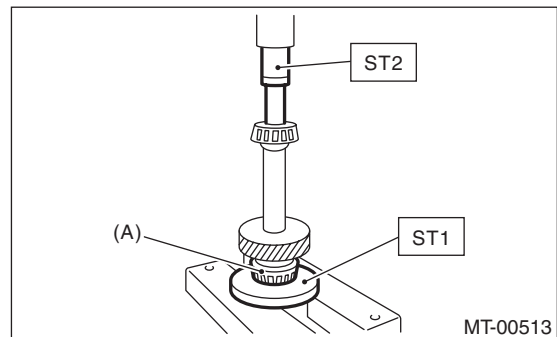
- 1) Using the ST, install the roller bearing of extension case side.

ST1 398177700 INSTALLER

ST2 899864100 REMOVER

#### CAUTION:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).



(A) Roller bearing

- 2) Using the ST, install the roller bearing of transmission case side.

ST 499757002 INSTALLER

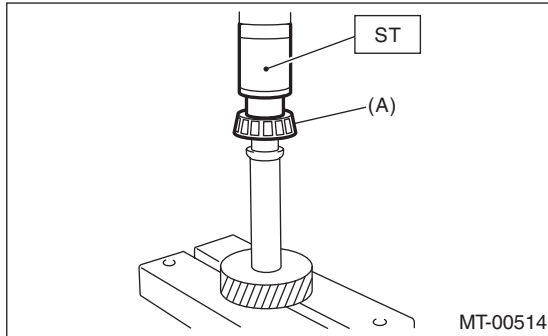
# Transfer Driven Gear

## MANUAL TRANSMISSION AND DIFFERENTIAL

---

### CAUTION:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).



(A) Roller bearing

### E: INSPECTION

#### 1) Bearings

Replace the bearing in following cases.

- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make noise when turned after gear oil lubrication.

#### 2) Driven gear

Replace the driven gear in following case.

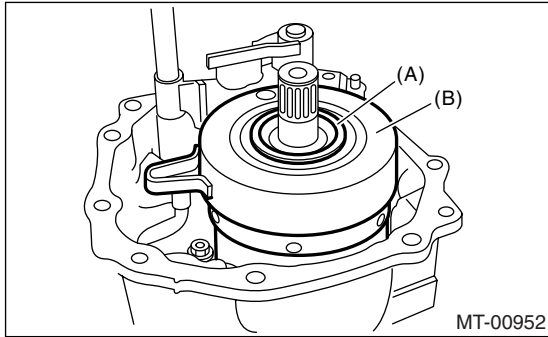
If their tooth surfaces and shaft are excessively broken or damaged.

# Center Differential

## 17.Center Differential

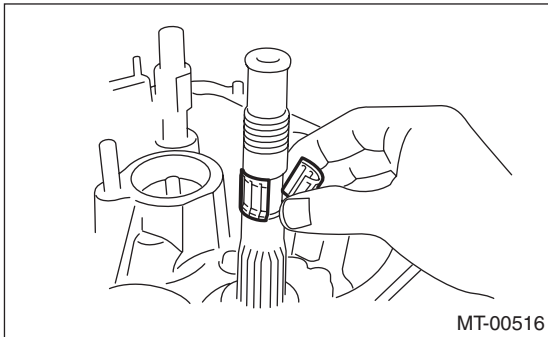
### A: REMOVAL

- 1) Remove the manual transmission case assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
- 2) Prepare the transmission for overhaul. <Ref. to 6MT-42, Preparation for Overhaul.>
- 3) Remove the extension case. <Ref. to 6MT-49, REMOVAL, Extension Case.>
- 4) Remove the transfer driven gear. <Ref. to 6MT-61, REMOVAL, Transfer Driven Gear.>
- 5) Disconnect the center differential connector.
- 6) Remove the thrust washer and center differential.



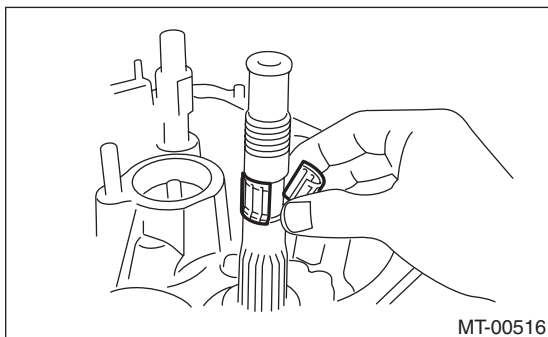
- (A) Thrust washer
- (B) Center differential

- 7) Remove the needle bearing.

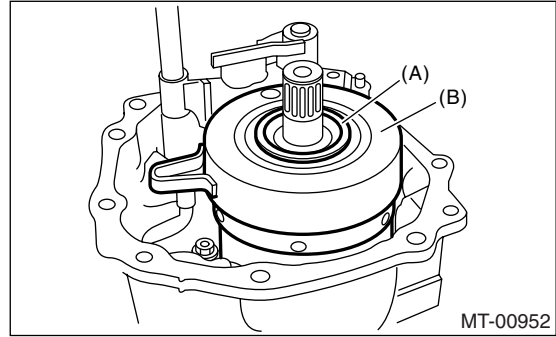


### B: INSTALLATION

- 1) Install the needle bearing.



- 2) Install the thrust washer and center differential.



- (A) Thrust washer
- (B) Center differential

- 3) If replacing the center differential, select the transfer drive gear and thrust washer and install. <Ref. to 6MT-51, ADJUSTMENT, Extension Case.>
- 4) Connect the center differential connector, and secure it to oil guide.
- 5) Install the transfer driven gear. <Ref. to 6MT-61, INSTALLATION, Transfer Driven Gear.>
- 6) Install the extension case. <Ref. to 6MT-49, INSTALLATION, Extension Case.>
- 7) Install the manual transmission case assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

### C: INSPECTION

Make sure there is no damage on the center differential, ball bearing and oil pump drive gear. Replace the center differential assembly if damaged.



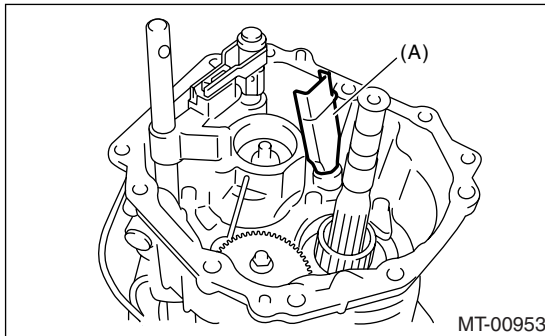
# Oil Pump

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 18.Oil Pump

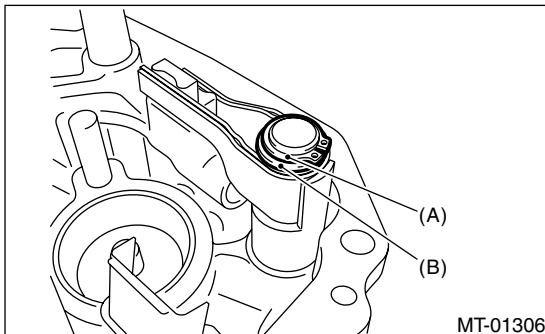
#### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
- 2) Prepare the transmission for overhaul. <Ref. to 6MT-42, Preparation for Overhaul.>
- 3) Remove the extension case. <Ref. to 6MT-49, REMOVAL, Extension Case.>
- 4) Remove the transfer driven gear. <Ref. to 6MT-61, REMOVAL, Transfer Driven Gear.>
- 5) Remove the center differential. <Ref. to 6MT-63, REMOVAL, Center Differential.>
- 6) Remove the oil guide.



(A) Oil guide

- 7) Remove the snap ring and flat washer.

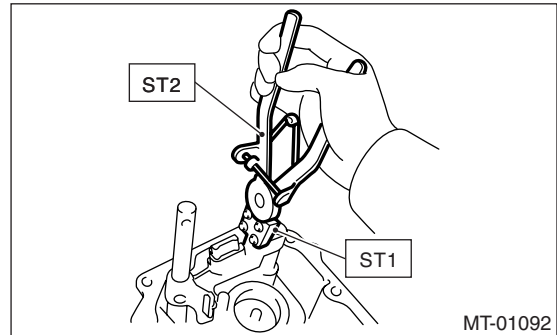


(A) Snap ring  
(B) Flat washer

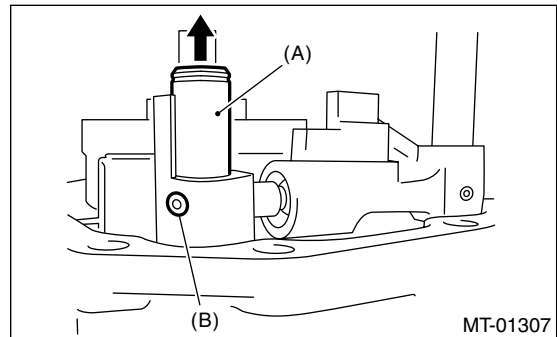
- 8) Using the ST, remove the neutral set spring and support.

ST1 18756AA000 CLAW

ST2 399893600 PLIERS

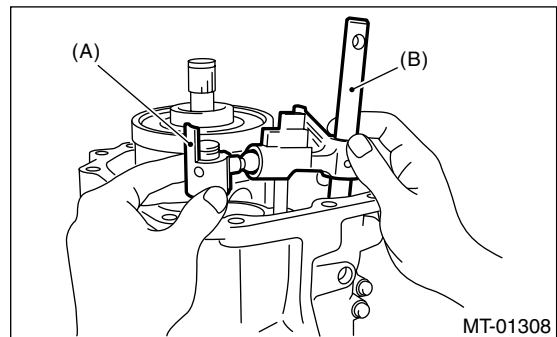


- 9) Raise the striking rod up, and then remove the spring pin.



(A) Striking rod  
(B) Spring pin

- 10) Remove the selector arm No. 2 and shifter arm. (Transmission serial No. 144576 or earlier)

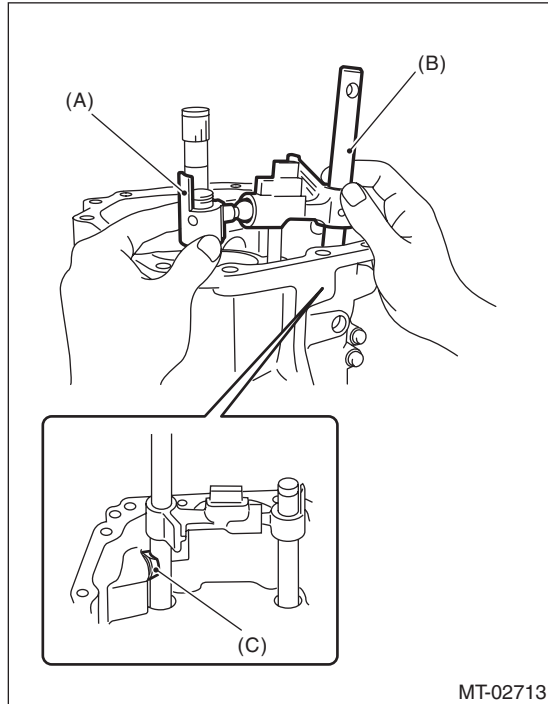


(A) Selector arm No. 2  
(B) Shifter arm

# Oil Pump

## MANUAL TRANSMISSION AND DIFFERENTIAL

11) Remove the selector arm No. 2, shifter arm, selector plunger and spring. (Transmission serial No. 144577 or later)



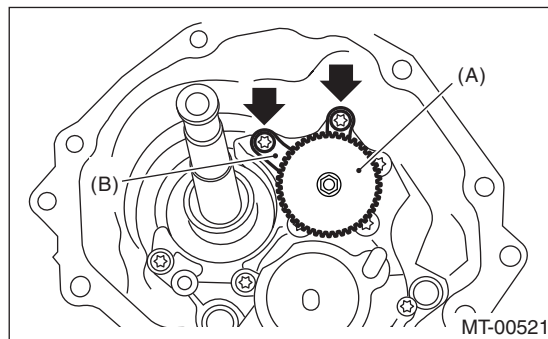
- (A) Selector arm No. 2
- (B) Shifter arm
- (C) Selector plunger

12) Remove the oil pump shaft assembly and plate.

### NOTE:

Remove the bolts using ST, because tool may break if general tool is used.

ST 18663AA000 SOCKET



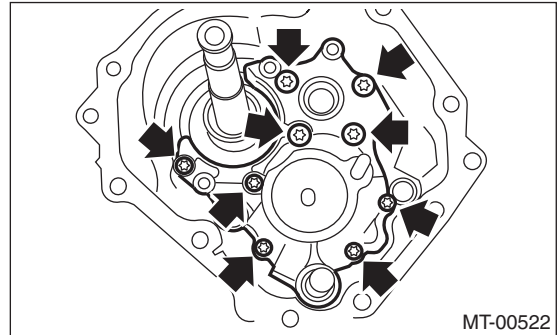
- (A) Oil pump shaft ASSY
- (B) Plate

13) Remove the oil pump cover assembly.

### NOTE:

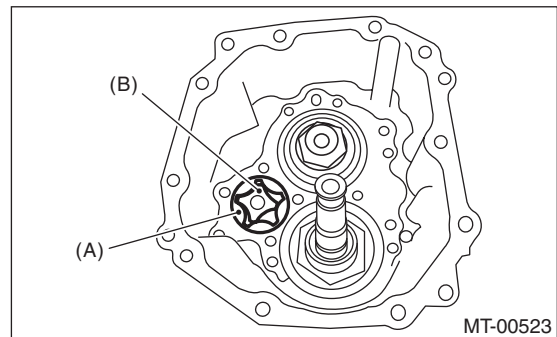
Remove the bolts using ST, because tool may break if general tool is used.

ST 18663AA000 SOCKET



14) Remove the thrust washer on main shaft part.

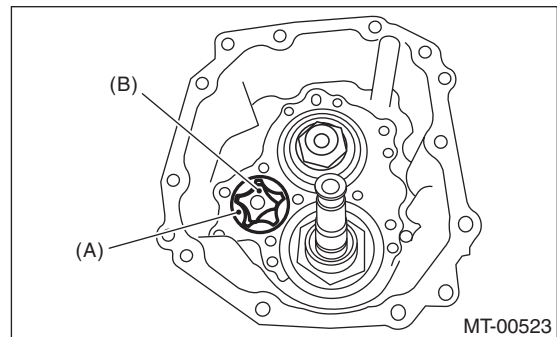
15) Remove the oil pump rotor.



- (A) Outer rotor
- (B) Inner rotor

## B: INSTALLATION

1) Apply oil to the outer periphery of outer rotor, then install to transmission case.



- (A) Outer rotor
- (B) Inner rotor

2) Install the thrust washer to main shaft part.

3) Install the oil pump cover assembly.

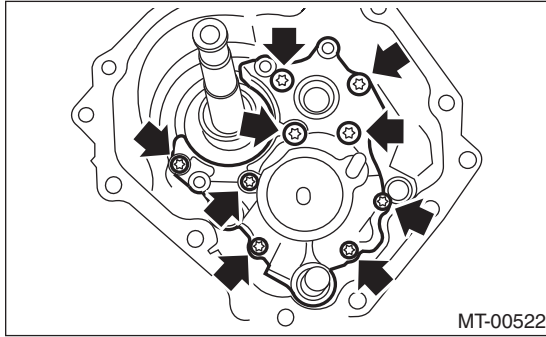
### Tightening torque:

**25 N·m (2.5 kgf·m, 18.1 ft·lb)**

# Oil Pump

## MANUAL TRANSMISSION AND DIFFERENTIAL

ST 18663AA000 SOCKET

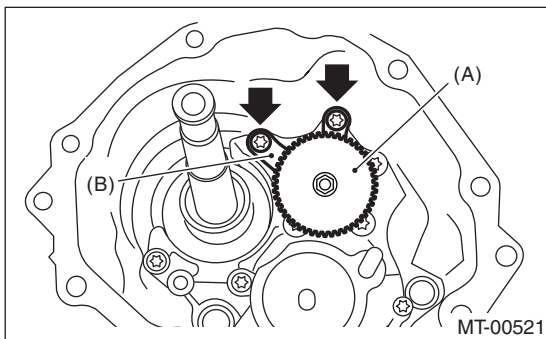


4) Install the oil pump shaft assembly and plate.

**Tightening torque:**

**25 N·m (2.5 kgf·m, 18.1 ft·lb)**

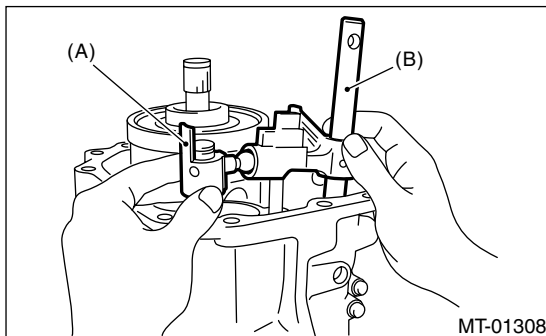
ST 18663AA000 SOCKET



- (A) Oil pump shaft ASSY
- (B) Plate

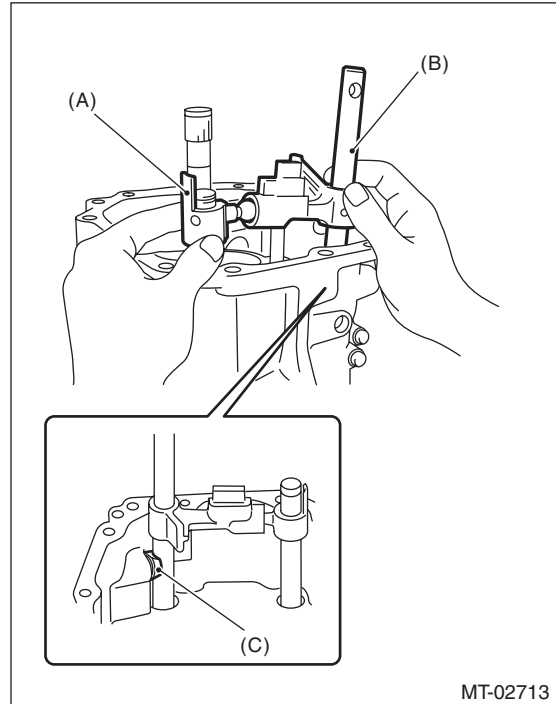
5) If replacing the oil pump cover assembly, select the transfer driven gear and thrust washer, then install them to the extension case. <Ref. to 6MT-51, ADJUSTMENT, Extension Case.>

6) Install the selector arm No. 2 and shifter arm. (Transmission serial No. 144576 or earlier)



- (A) Selector arm No. 2
- (B) Shifter arm

7) Install the selector arm No. 2, shifter arm, selector plunger and spring. (Transmission serial No. 144577 or later)



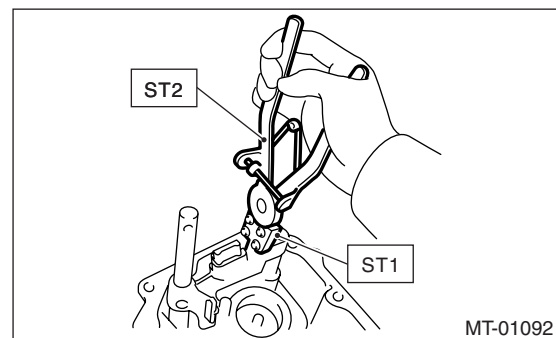
- (A) Selector arm No. 2
- (B) Shifter arm
- (C) Selector plunger

8) Install a new spring pin.

9) Using the ST, install the neutral set spring and support.

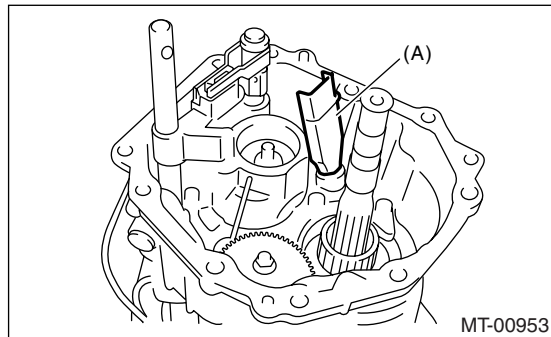
ST1 18756AA000 CLAW

ST2 399893600 PLIERS



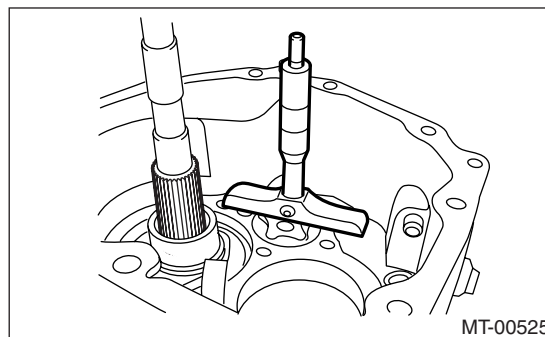
10) Install the snap ring and flat washer.

11) Install the oil guide.



(A) Oil guide

**Specification of side clearance:**  
**0.03 — 0.10 mm (0.0012 — 0.0039 in)**



12) Install the center differential. <Ref. to 6MT-63, INSTALLATION, Center Differential.>

13) Install the transfer driven gear. <Ref. to 6MT-61, INSTALLATION, Transfer Driven Gear.>

14) Install the extension case. <Ref. to 6MT-49, INSTALLATION, Extension Case.>

15) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

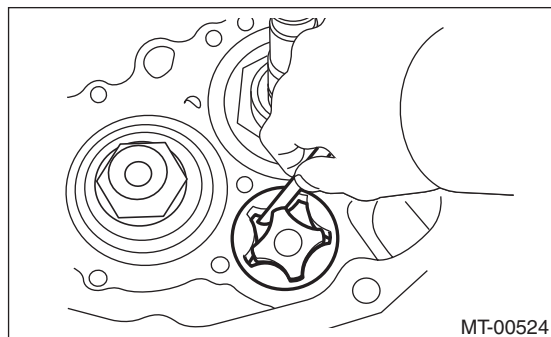
## C: INSPECTION

1) Make sure there is no damage on the inner rotor and outer rotor. Replace the inner rotor and outer rotor as assembly if damaged.

2) Clearance at tip

Install the inner rotor and outer rotor to transmission case. Align tip of the inner rotor and outer rotor, then measure the clearance. Replace the inner rotor and outer rotor as a set if clearance exceeds specification.

**Specification of clearance at tip:**  
**Less than 0.15 mm (0.0059 in)**



3) Side clearance

Measure to the transmission case and rotor. Replace the inner rotor and outer rotor as a set if clearance exceeds specification.

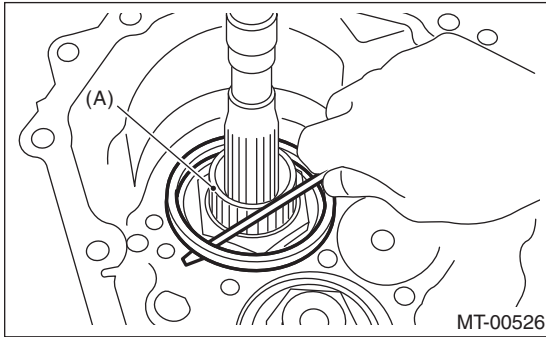
# Transmission Case

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 19. Transmission Case

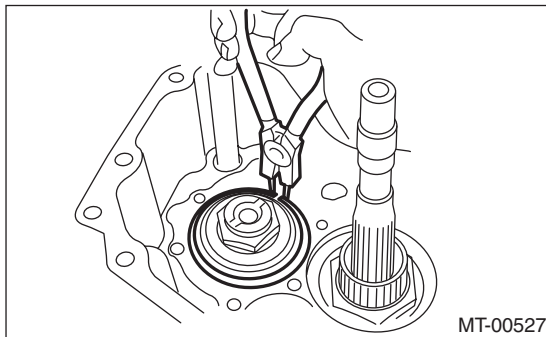
#### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
- 2) Prepare the transmission for overhaul. <Ref. to 6MT-42, Preparation for Overhaul.>
- 3) Remove the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-44, REMOVAL, Oil Pipe.> <Ref. to 6MT-47, REMOVAL, Neutral Position Switch.> <Ref. to 6MT-45, REMOVAL, Back-up Light Switch.>
- 4) Remove the extension case. <Ref. to 6MT-49, REMOVAL, Extension Case.>
- 5) Remove the transfer driven gear. <Ref. to 6MT-61, REMOVAL, Transfer Driven Gear.>
- 6) Remove the center differential. <Ref. to 6MT-63, REMOVAL, Center Differential.>
- 7) Remove the oil pump. <Ref. to 6MT-64, REMOVAL, Oil Pump.>
- 8) Remove the shim and spacer of driven gear assembly.

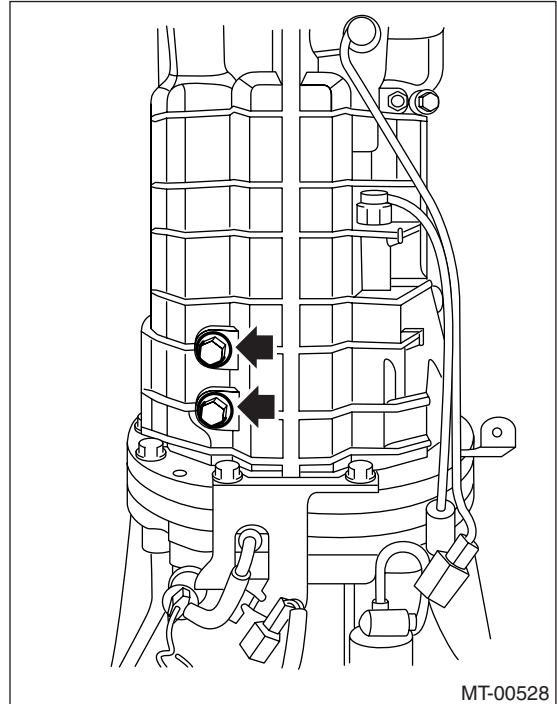


(A) Driven gear ASSY

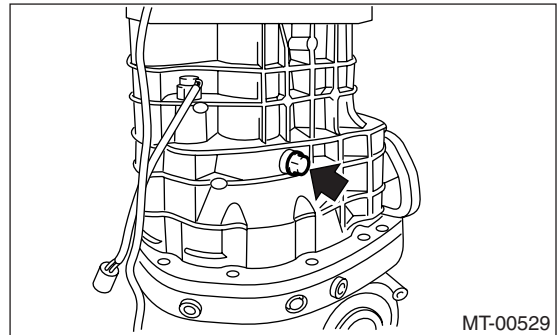
- 9) Remove the snap ring.



- 10) Remove the pilot bolt.



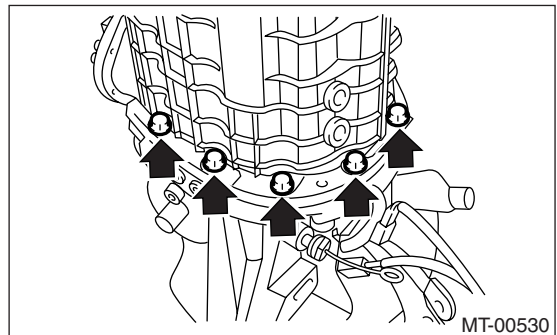
- 11) Remove the holder reverse bolt.



- 12) Remove the transmission case.

#### NOTE:

If the oil guide catches on shift fork, the transmission case may be difficult to be removed. Move the oil guide right and left to remove. Do not pull the transmission case by force.



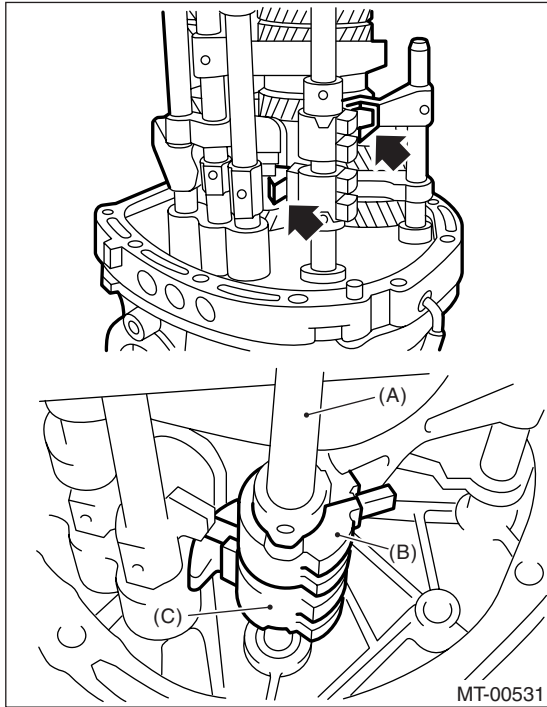
- 13) Completely remove the remaining liquid gasket on transmission case and adapter plate.

# Transmission Case

MANUAL TRANSMISSION AND DIFFERENTIAL

## B: INSTALLATION

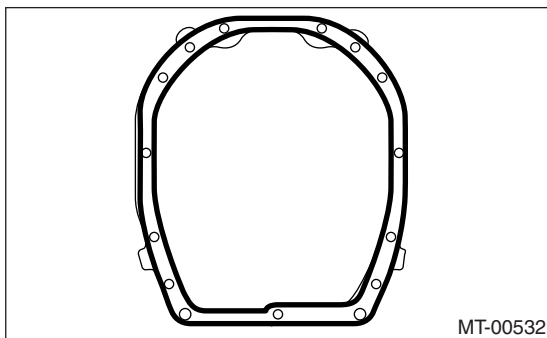
1) Make sure that each shifter fork and interlock block is shifted to neutral position. If not, shift to neutral position.



- (A) Striking rod
- (B) Reverse interlock block
- (C) Interlock block

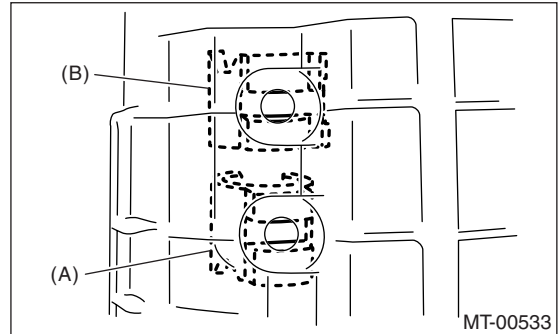
2) Apply liquid gasket to the adapter plate.

**Liquid gasket:**  
**THREE BOND 1215 (Part No. 004403007)**



3) Install the transmission case.

4) Make sure the interlock block and reverse interlock block are aligned in neutral position by inspecting through the pilot bolt installation hole. If not aligned, remove the transmission case, then shift each shifter fork and interlock block to neutral position.



- (A) Interlock block
- (B) Reverse interlock block

5) Using a new gasket, install the pilot bolts temporarily.

6) Tighten the transmission case with bolts and nuts.

**Tightening torque:**  
**50 N·m (5.1 kgf-m, 36.9 ft-lb)**

7) Tighten the pilot bolts.

**Tightening torque:**  
**34 N·m (3.5 kgf-m, 25.1 ft-lb)**

8) Tighten the holder reverse bolt.

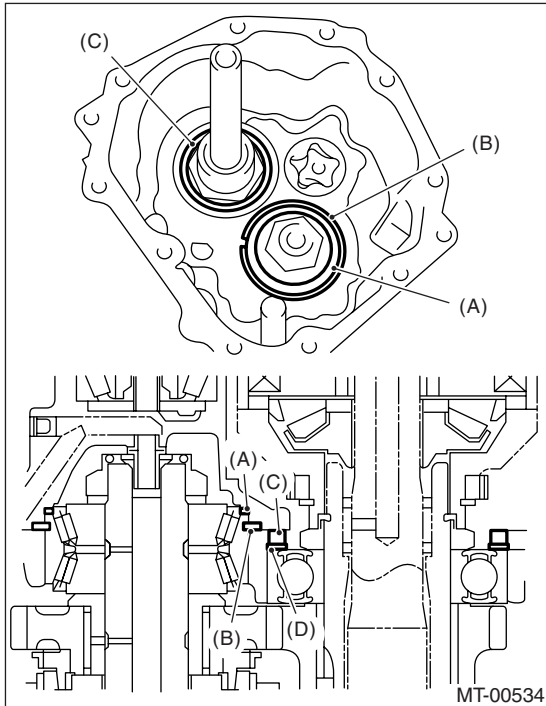
**Tightening torque:**  
**25 N·m (2.5 kgf-m, 18.1 ft-lb)**



# Transmission Case

## MANUAL TRANSMISSION AND DIFFERENTIAL

9) Install the snap ring, washer and collar of driven gear assembly.



- (A) Washer
- (B) Snap ring
- (C) Collar
- (D) Washer

10) Install the oil pump. <Ref. to 6MT-65, INSTALLATION, Oil Pump.>

11) Install the center differential. <Ref. to 6MT-63, INSTALLATION, Center Differential.>

12) Install the transfer driven gear. <Ref. to 6MT-61, INSTALLATION, Transfer Driven Gear.>

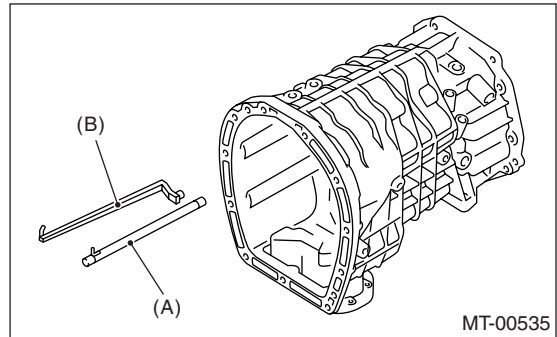
13) Install the extension case. <Ref. to 6MT-49, INSTALLATION, Extension Case.>

14) Install the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-44, INSTALLATION, Oil Pipe.> <Ref. to 6MT-47, INSTALLATION, Neutral Position Switch.> <Ref. to 6MT-45, INSTALLATION, Back-up Light Switch.>

15) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

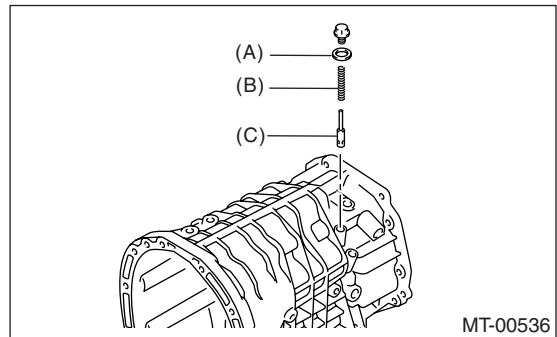
## C: DISASSEMBLY

1) Remove the oil pipe and oil guide.



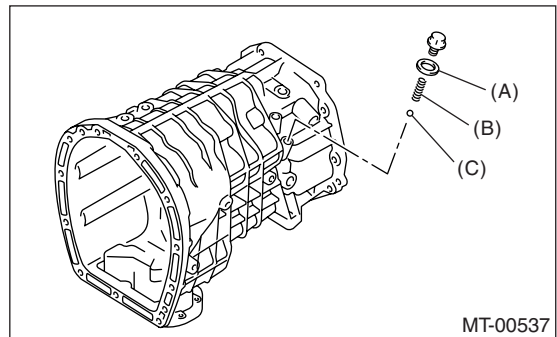
- (A) Oil pipe
- (B) Oil guide

2) Remove the bolt, and then remove the O-ring, relief spring and relief valve.



- (A) O-ring
- (B) Relief valve spring
- (C) Relief valve

3) Remove the bolt, and then remove the O-ring, valve spring and ball.

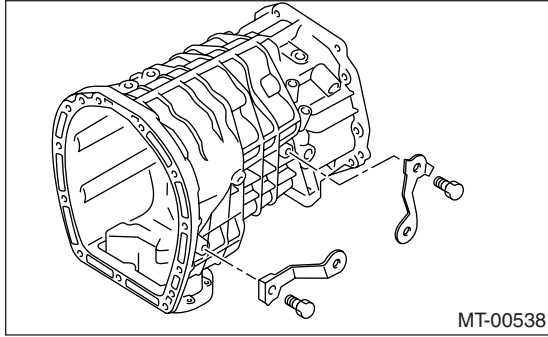


- (A) O-ring
- (B) Valve spring
- (C) Ball

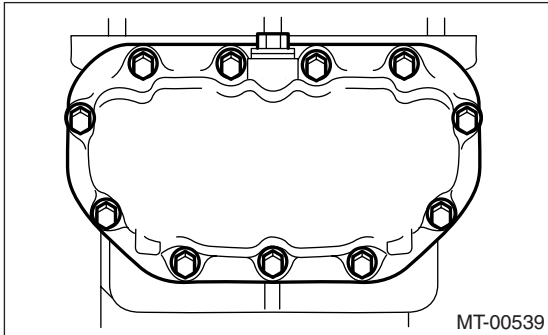
# Transmission Case

MANUAL TRANSMISSION AND DIFFERENTIAL

4) Remove the harness bracket.

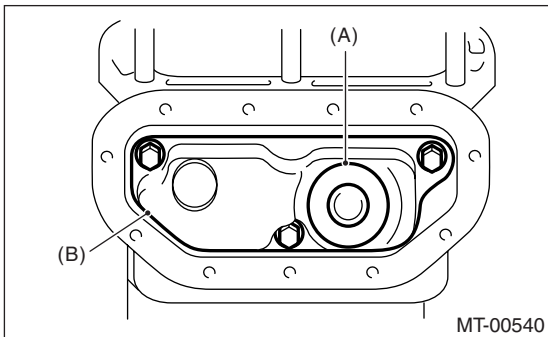


5) Remove the oil pan.



6) Completely remove the remaining liquid gasket on transmission case and oil pan.

7) Remove the oil pan magnet, and then remove the oil strainer.



(A) Oil pan magnet

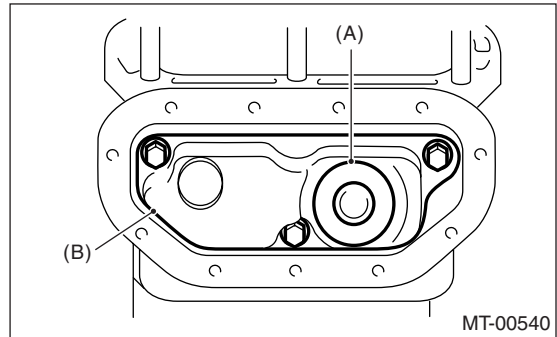
(B) Oil strainer

## D: ASSEMBLY

1) Install the oil strainer and magnet.

**Tightening torque:**

**10 N·m (1.0 kgf-m, 7.4 ft-lb)**



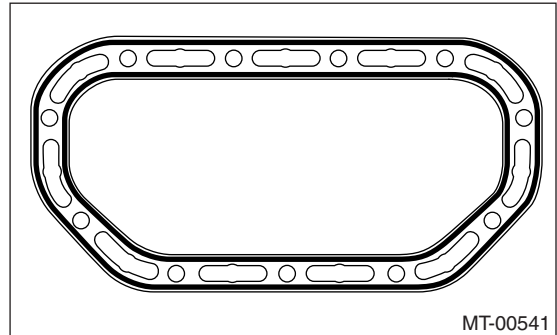
(A) Oil pan magnet

(B) Oil strainer

2) Apply liquid gasket to the oil pan.

**Liquid gasket:**

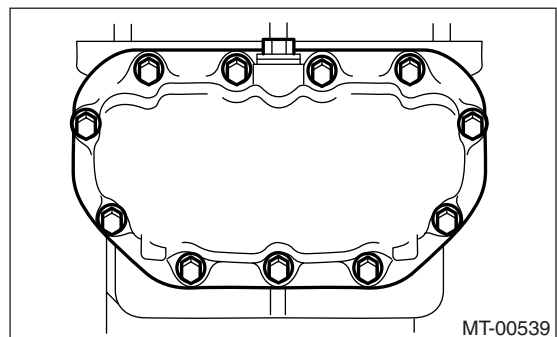
**THREE BOND 1215 (Part No. 004403007)**



3) Install the oil pan.

**Tightening torque:**

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



4) Install the relief valve, relief valve spring and new O-ring.

5) Install the ball, valve spring and new O-ring.



# Transmission Case

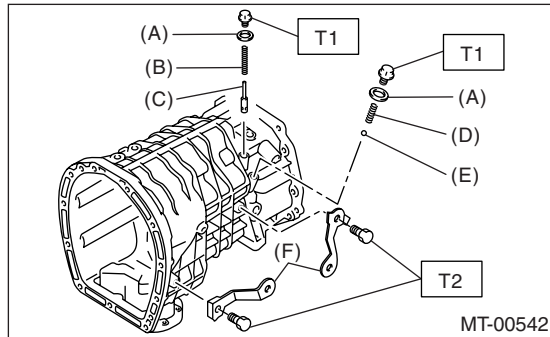
## MANUAL TRANSMISSION AND DIFFERENTIAL

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### Tightening torque:

**T1: 13 N·m (1.3 kgf-m, 9.6 ft-lb)**

**T2: 16 N·m (1.6 kgf-m, 11.8 ft-lb)**



- (A) O-ring
- (B) Relief valve spring
- (C) Relief valve
- (D) Valve spring
- (E) Ball
- (F) Harness bracket

### E: INSPECTION

- 1) Completely remove with shop cloth if sludge is adhered to the oil pan magnet.
- 2) Make sure there is no clog on the oil strainer. If clogged, remove clog or replace the oil strainer.
- 3) Make sure there is no damage on each parts. Replace damaged parts with new parts.

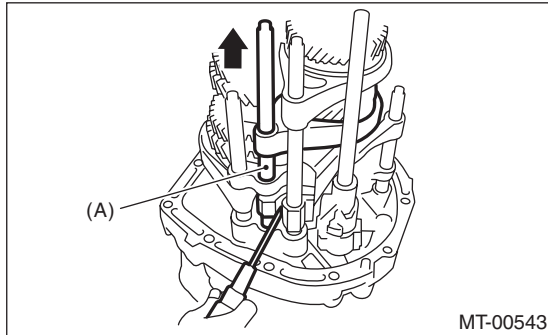
# Main Shaft Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

## 20. Main Shaft Assembly

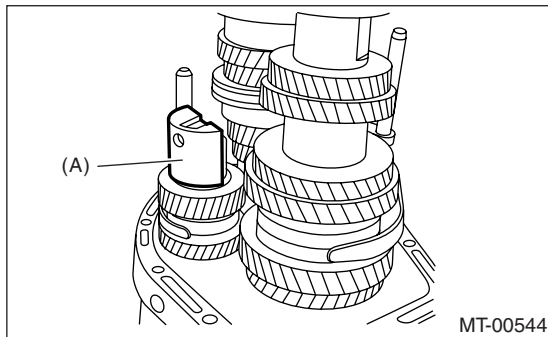
### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
- 2) Prepare the transmission for overhaul. <Ref. to 6MT-42, Preparation for Overhaul.>
- 3) Remove the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-44, REMOVAL, Oil Pipe.> <Ref. to 6MT-47, REMOVAL, Neutral Position Switch.> <Ref. to 6MT-45, REMOVAL, Back-up Light Switch.>
- 4) Remove the extension case. <Ref. to 6MT-49, REMOVAL, Extension Case.>
- 5) Remove the transfer driven gear. <Ref. to 6MT-61, REMOVAL, Transfer Driven Gear.>
- 6) Remove the center differential. <Ref. to 6MT-63, REMOVAL, Center Differential.>
- 7) Remove the oil pump. <Ref. to 6MT-64, REMOVAL, Oil Pump.>
- 8) Remove the transmission case. <Ref. to 6MT-68, REMOVAL, Transmission Case.>
- 9) Remove the striking rod.
- 10) Using a screwdriver, shift to 4th gear position.



(A) 3rd-4th shift rod

- 11) Remove the reverse idler holder.

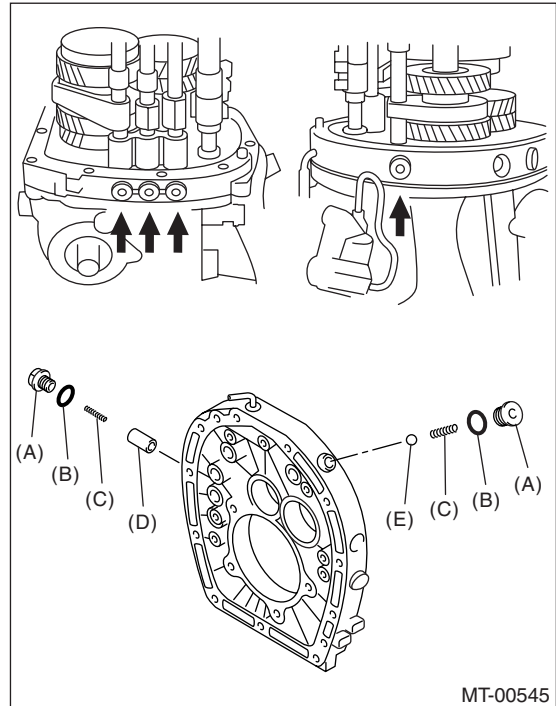


(A) Reverse idler holder

- 12) Remove all checking plug, gasket, checking spring, plunger and checking ball from adapter plate.

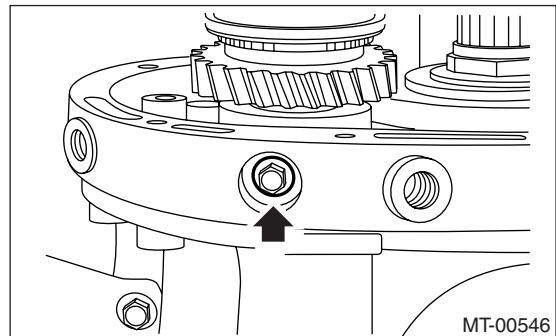
### NOTE:

Do not reuse the gasket.



- (A) Checking plug
- (B) Gasket
- (C) Checking spring
- (D) Plunger
- (E) Checking ball

- 13) Remove the bolt and gasket installing reverse idler shaft.



- 14) Press the main shaft assembly, driven gear assembly, reverse idler gear and each shifter fork, then remove from the adapter plate at once.

### NOTE:

Two people should do the work.

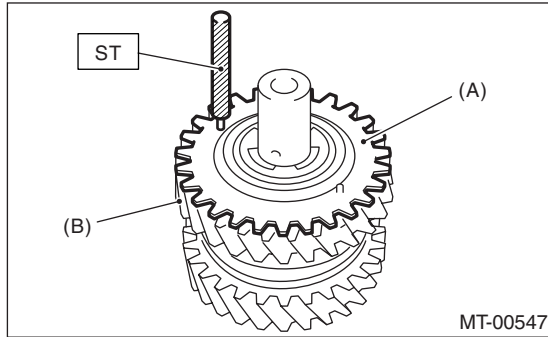
### B: INSTALLATION

- 1) Adjust the 3rd-4th, and 5th-6th shifter fork rod. <Ref. to 6MT-118, ADJUSTMENT, Shifter Fork and Rod.>

# Main Shaft Assembly

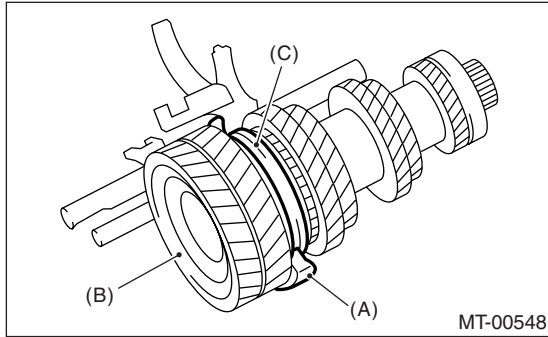
## MANUAL TRANSMISSION AND DIFFERENTIAL

2) Turn the sub gear counterclockwise for approx. three teeth. Align the sub gear and reverse idler gear hole, then insert the ST.  
ST 18757AA000 STRAIGHT PIN REMOVER



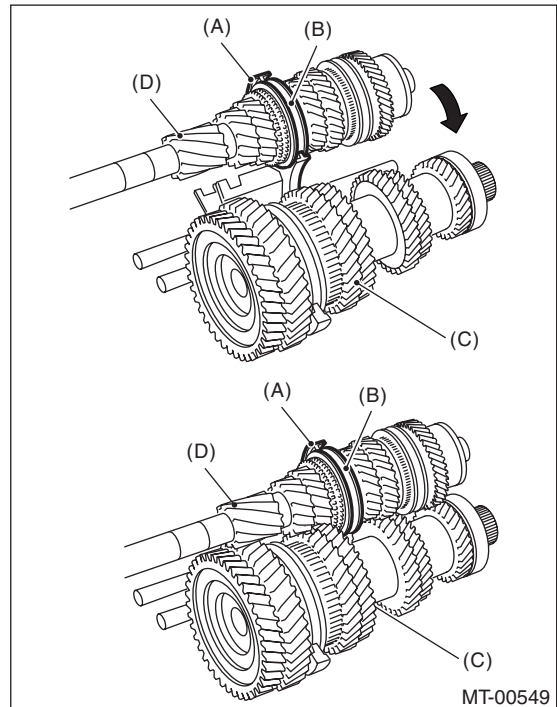
- (A) Sub gear
- (B) Reverse idler gear

3) Install the driven gear assembly to 1st-2nd shifter fork assembly.



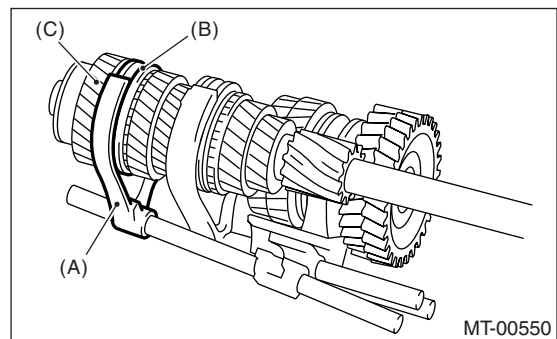
- (A) 1st-2nd shifter fork
- (B) Driven gear ASSY
- (C) 1st-2nd sleeve

4) Install the main shaft assembly to 3rd-4th shifter fork, and then assemble to driven gear assembly.



- (A) 3rd-4th shifter fork
- (B) 3rd-4th sleeve
- (C) Driven gear ASSY
- (D) Main shaft ASSY

5) Install the 5th-6th shifter fork assembly to main shaft assembly.



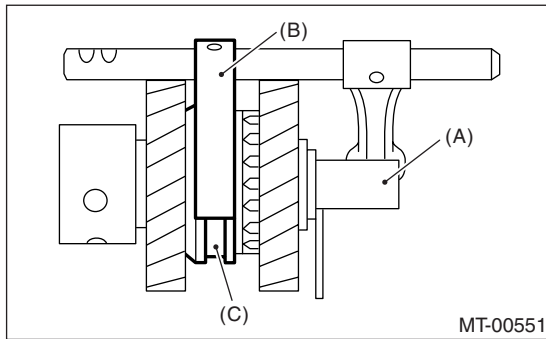
- (A) 5th-6th shifter fork
- (B) 5th-6th sleeve
- (C) Main shaft ASSY

# Main Shaft Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

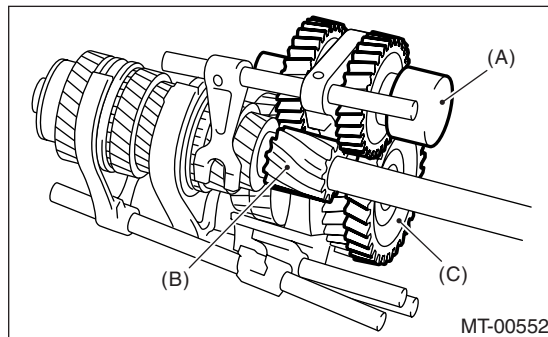
6) Install the reverse shifter fork assembly to reverse idler gear assembly.

**Tightening torque:**  
**37 N·m (3.8 kgf-m, 27.3 ft-lb)**



- (A) Reverse idler gear ASSY
- (B) Reverse shifter fork
- (C) Reverse sleeve

7) Install the reverse idler gear assembly.



- (A) Reverse idler gear ASSY
- (B) 1st drive gear
- (C) Reverse gear

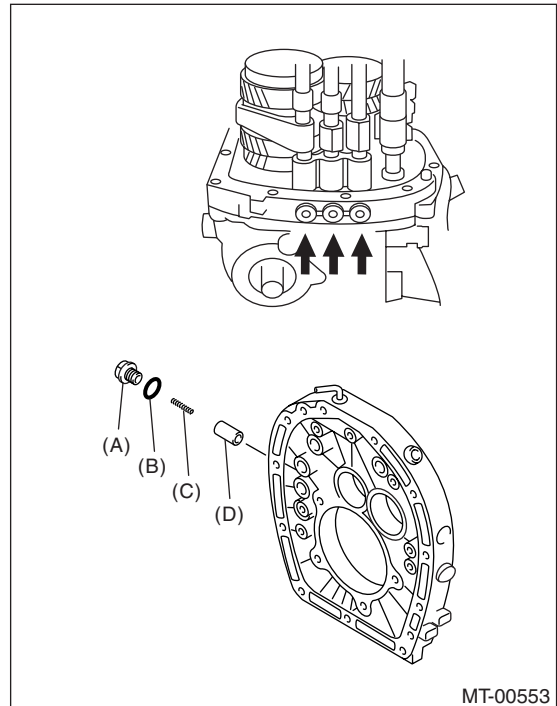
8) Install the thrust bearing of driven gear assembly.

9) Press each shifter fork, main shaft assembly, driven gear assembly and reverse idler gear assembly, then install them to the adapter plate at once.

### NOTE:

Two people should do the work.

10) Install the plunger, checking spring, new gasket and checking plug.



- (A) Checking plug
- (B) Gasket
- (C) Checking spring
- (D) Plunger

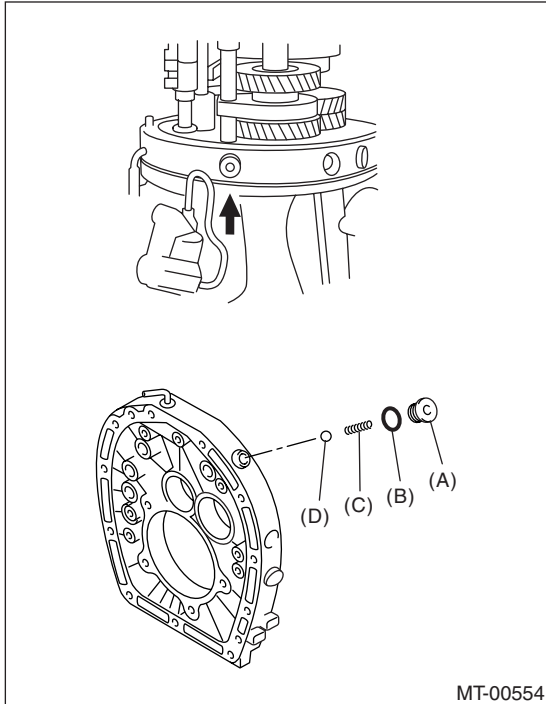
11) Install the checking ball, checking spring, new gasket and checking plug.

# Main Shaft Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

### Tightening torque:

**37 N·m (3.8 kgf-m, 27.3 ft-lb)**

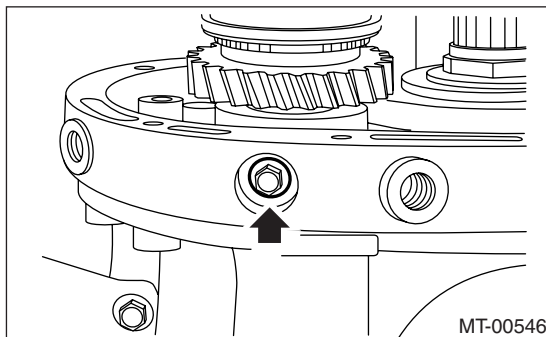


- (A) Checking plug
- (B) Gasket
- (C) Checking spring
- (D) Checking ball

12) Install the bolt and a new gasket.

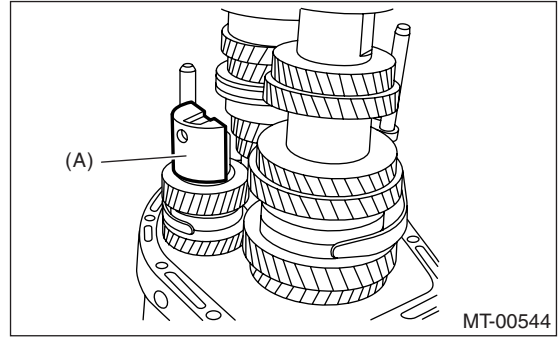
### Tightening torque:

**25 N·m (2.5 kgf-m, 18.1 ft-lb)**



13) Using a screwdriver, shift to 4th gear position.

14) Install the reverse idler holder



(A) Reverse idler holder

15) Install the striking rod.

16) Install the transmission case. <Ref. to 6MT-69, INSTALLATION, Transmission Case.>

17) Install the selected main shaft snap ring and washer.

18) Install the oil pump. <Ref. to 6MT-65, INSTALLATION, Oil Pump.>

19) Install the center differential. <Ref. to 6MT-63, INSTALLATION, Center Differential.>

20) Install the transfer driven gear. <Ref. to 6MT-61, INSTALLATION, Transfer Driven Gear.>

21) Install the extension case. <Ref. to 6MT-49, INSTALLATION, Extension Case.>

22) Install the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-44, INSTALLATION, Oil Pipe.> <Ref. to 6MT-47, INSTALLATION, Neutral Position Switch.> <Ref. to 6MT-45, INSTALLATION, Back-up Light Switch.>

23) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

## C: DISASSEMBLY

### NOTE:

Each sleeve and hub engage at a specified point. Mark an engagement point on the sleeve and hub before disassembly.

1) Secure the ST on workbench.

ST 18664AA000 BASE

2) Lift the caulking of lock nut.

3) Set the main shaft assembly on ST, then remove the lock nut and washer.

ST1 18665AA000 HOLDER

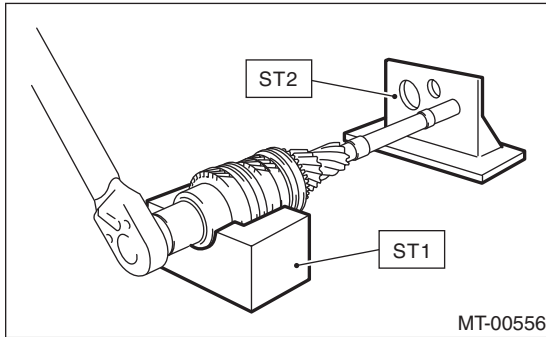
ST2 18664AA000 BASE

# Main Shaft Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

## NOTE:

Use a 38 mm socket wrench.

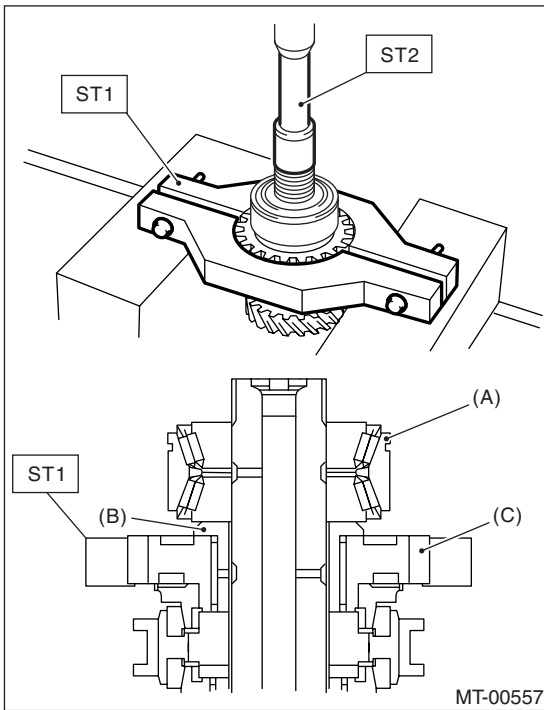


4) Remove the main shaft assembly from ST.

5) Set the ST1 on 6th drive gear, then remove the taper roller bearing, bushing and 6th drive gear using press.

ST1 18722AA010 REMOVER

ST2 899864100 REMOVER

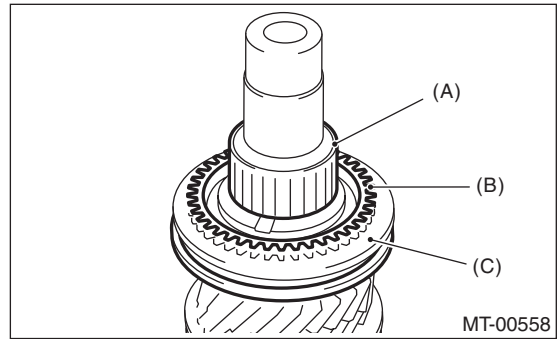


(A) Taper roller bearing

(B) Bushing

(C) 6th drive gear

6) Remove the 5th-6th sleeve, 6th needle bearing and 6th baulk ring.



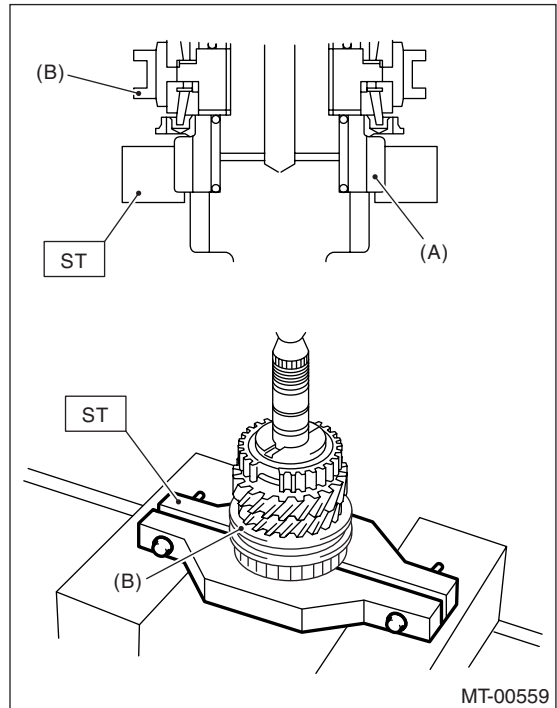
(A) Needle bearing

(B) 6th baulk ring

(C) 5th-6th sleeve

7) Set the ST on 3rd drive gear, then remove each part using press.

ST 18720AA000 REMOVER



(A) 3rd drive gear

(B) 3rd-4th sleeve

## D: ASSEMBLY

### NOTE:

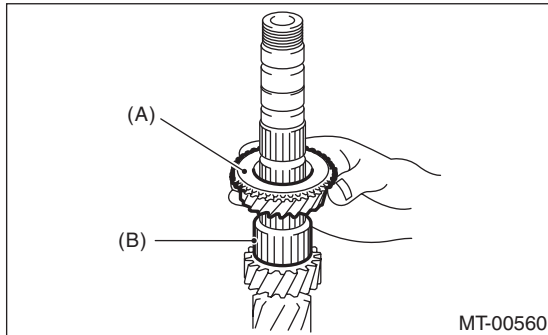
Replace the following parts as a set.

- Sleeve and hub
- Outer baulk ring, 3rd synchro cone and inner baulk ring
- Taper roller bearing

# Main Shaft Assembly

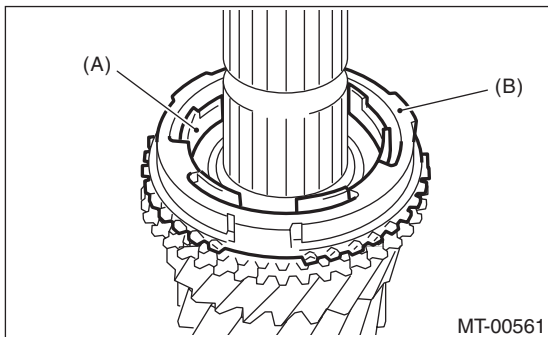
## MANUAL TRANSMISSION AND DIFFERENTIAL

- 1) Sufficiently apply gear oil to the main shaft, 3rd needle bearing and inner periphery of 3rd drive gear.
- 2) Install the 3rd needle bearing and 3rd drive gear to main shaft.



- (A) 3rd needle bearing
- (B) 3rd drive gear

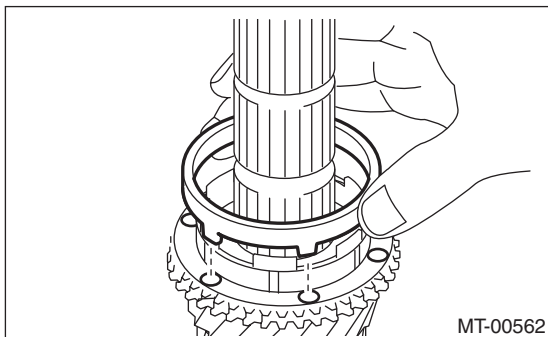
- 3) Install the inner baulk ring, 3rd synchro cone and outer baulk ring.



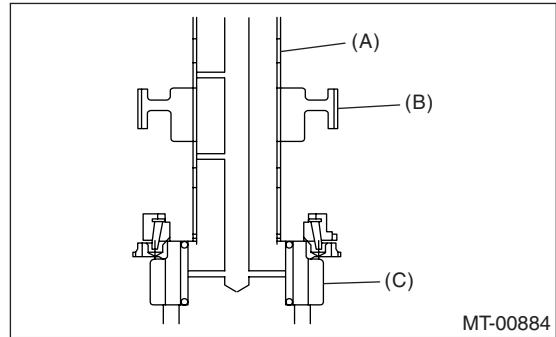
- (A) Inner baulk ring
- (B) Outer baulk ring

**NOTE:**

Install the 3rd synchro cone, by aligning protrusion portions of the 3rd synchro cone with 3rd drive gear hole portion.

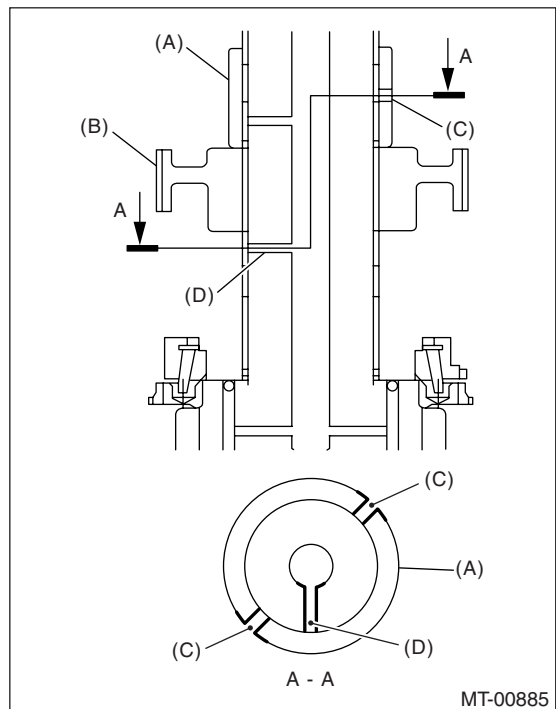


- 4) Install the 3rd-4th hub and 4th bushing.
  - (1) Set them to the main shaft, taking care of 3rd-4th hub installing direction.



- (A) Main shaft
- (B) 3rd-4th hub
- (C) 3rd drive gear

- (2) Set them to the main shaft, taking care not to overlap the main shaft oil hole and 4th bushing oil hole.



- (A) 4th bushing
- (B) 3rd-4th hub
- (C) 4th bushing oil hole
- (D) Main shaft oil hole

- (3) Using the ST, press in the 3rd-4th hub and 4th bushing at once.

ST1 18651AA000 INSTALLER  
ST2 398177700 INSTALLER



# Main Shaft Assembly

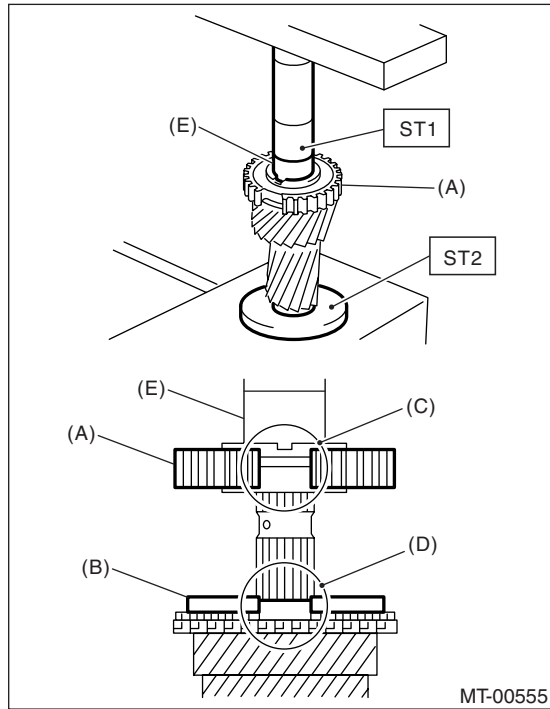
MANUAL TRANSMISSION AND DIFFERENTIAL

## CAUTION:

Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).

## NOTE:

When pressing in 3rd-4th hub and 4th bushing, align the protrusion portion of outer baulk ring and cutout portion of 3rd-4th bushing by moving the outer baulk ring.



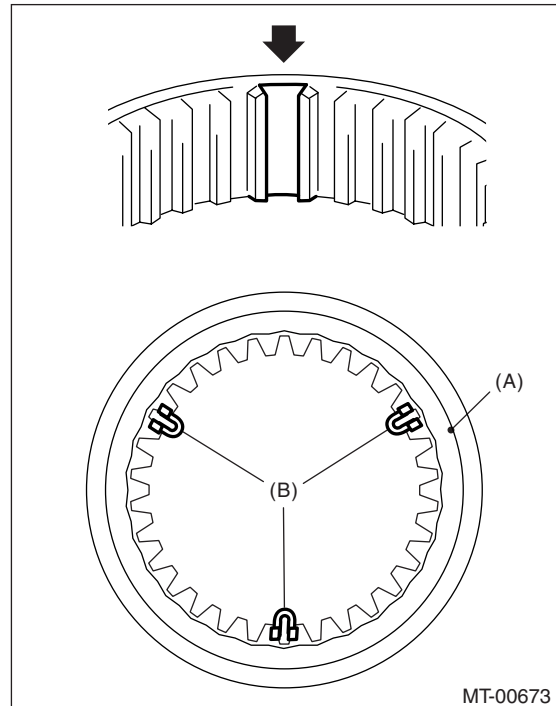
- (A) 3rd-4th hub
- (B) Outer baulk ring
- (C) Cutout portion of 3rd-4th hub
- (D) Protrusion portion of outer baulk ring
- (E) 4th bushing

5) Make sure the 3rd drive gear is smoothly turned by hand. If not, reassemble.

6) Install the 3rd-4th shifting insert key in proper place of 3rd-4th sleeve.

## NOTE:

Angle of each shifting insert key is 120 apart.

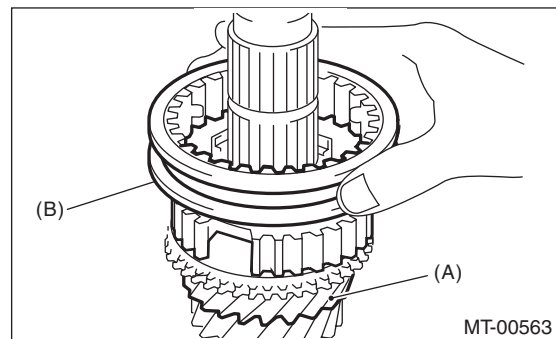


- (A) 3rd-4th sleeve
- (B) 3rd-4th shifting insert key

7) Install the 3rd-4th sleeve to 3rd-4th hub.

## NOTE:

- 3rd-4th sleeve has a groove for identification.
- Install the 3rd-4th sleeve with groove facing to 3rd drive gear side.



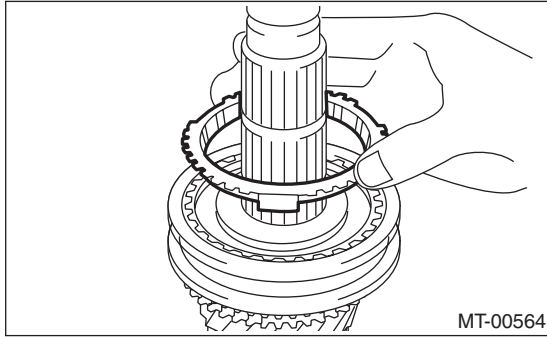
- (A) 3rd drive gear
- (B) Groove (single line) for identification of 3rd-4th sleeve



# Main Shaft Assembly

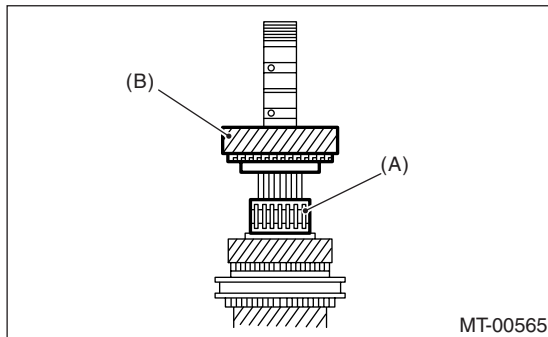
## MANUAL TRANSMISSION AND DIFFERENTIAL

8) Install the 4th baulk ring.



9) Sufficiently apply gear oil to the main shaft, 4th needle bearing and inner periphery of 4th drive gear.

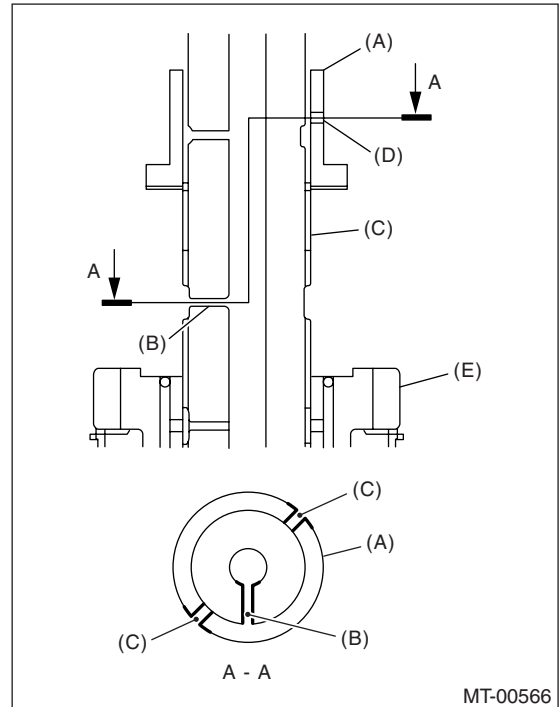
10) Install the 4th needle bearing and 4th drive gear.



- (A) 4th needle bearing
- (B) 4th drive gear

11) Install the 5th bushing.

(1) Set it to the main shaft, taking care not to overlap the main shaft oil hole and 5th bushing oil hole.



- (A) 5th bushing
- (B) Main shaft oil hole
- (C) Main shaft
- (D) 5th bushing oil hole
- (E) 4th drive gear

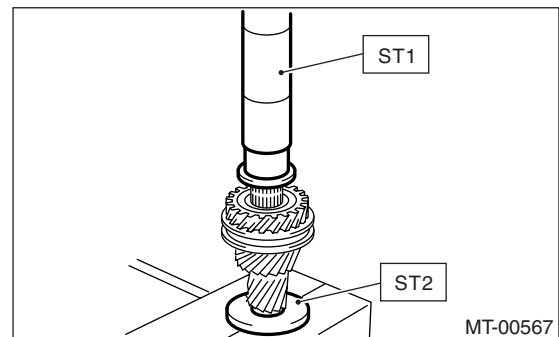
(2) Using the ST, press in the 5th bushing.

ST1 18651AA000 INSTALLER

ST2 398177700 INSTALLER

### CAUTION:

**Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).**



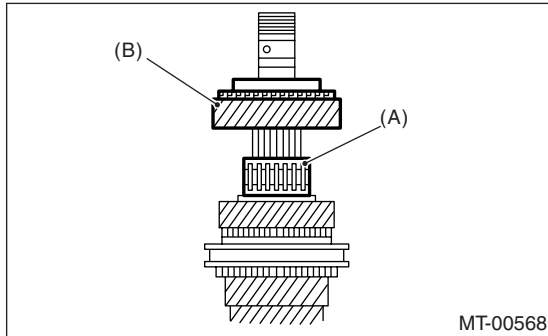
12) Make sure the 4th drive gear is smoothly turned by hand. If not, reassemble.

13) Sufficiently apply gear oil to the main shaft, 5th needle bearing and inner periphery of 5th drive gear.

# Main Shaft Assembly

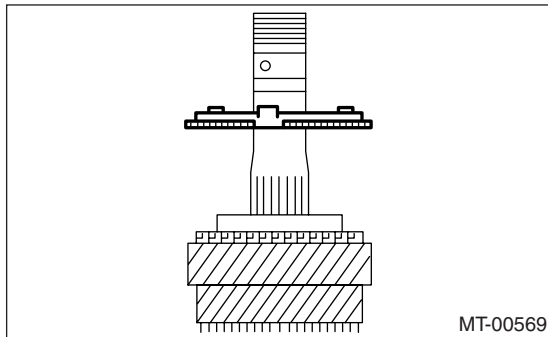
MANUAL TRANSMISSION AND DIFFERENTIAL

14) Install the 5th needle bearing and 5th drive gear.



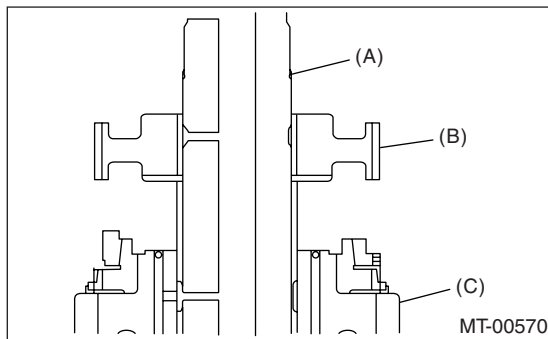
- (A) 5th needle bearing
- (B) 5th drive gear

15) Install the 5th baulk ring.



16) Install the 5th-6th hub.

- (1) Set it to the main shaft, taking care of 5th-6th hub installing direction.



- (A) Main shaft
- (B) 5th-6th hub
- (C) 5th drive gear

- (2) Using the ST, press in the 5th-6th hub.

ST1 18651AA000 INSTALLER

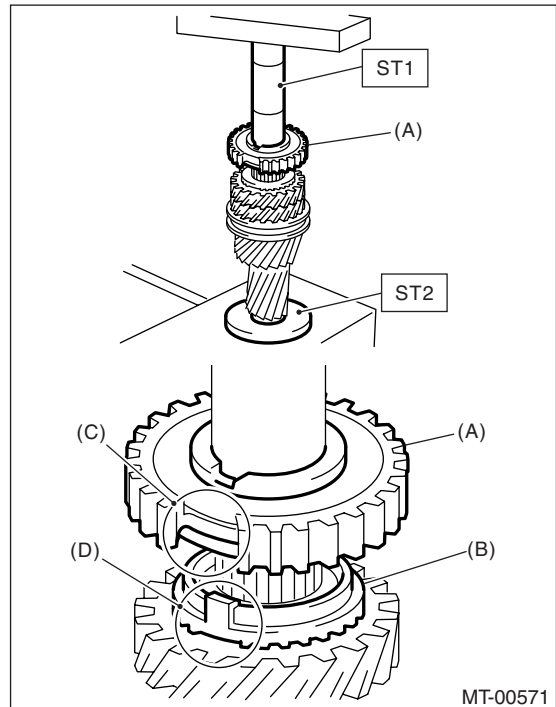
ST2 398177700 INSTALLER

### CAUTION:

Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).

### NOTE:

When pressing in 5th-6th hub, align the protrusion portion of outer baulk ring and cutout portion of 5th-6th bushing by moving the outer baulk ring.



- (A) 5th-6th hub
- (B) Outer baulk ring
- (C) Cutout portion of 5th-6th hub
- (D) Protrusion portion of outer baulk ring

17) Make sure the 5th drive gear is smoothly turned by hand. If not, reassemble.

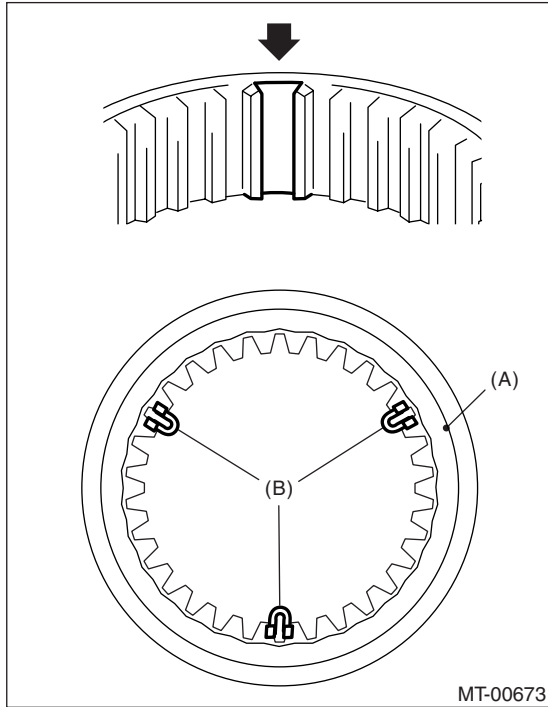
18) Install the 5th-6th shifting insert key in proper place of 5th-6th sleeve.

# Main Shaft Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

### NOTE:

Angle of each shifting insert key is 120° apart.

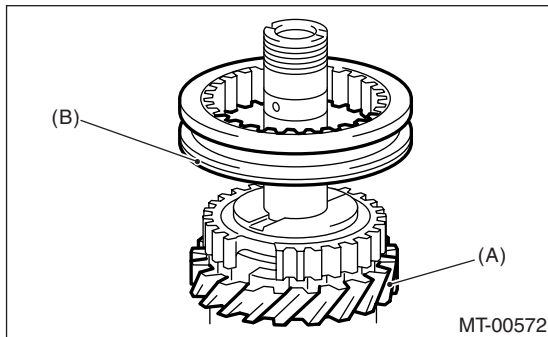


- (A) 5th-6th sleeve
- (B) Shifting insert key

19) Install the 5th-6th sleeve to 5th-6th hub.

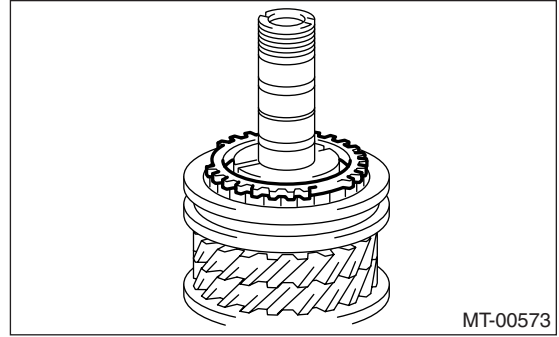
### NOTE:

- 5th-6th sleeve has two grooves for identification.
- Install the 5th-6th sleeve with the groove facing to 5th drive gear side.



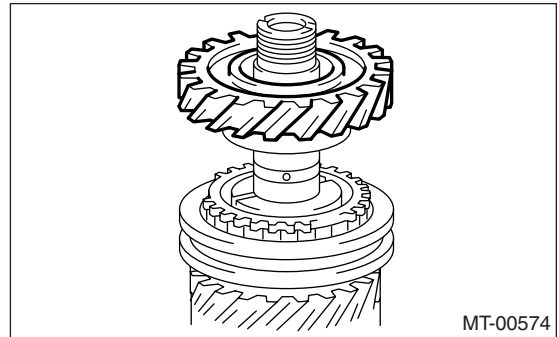
- (A) 5th drive gear
- (B) Groove (2 lines) for identification of 5th-6th sleeve

20) Install the 6th baulk ring.

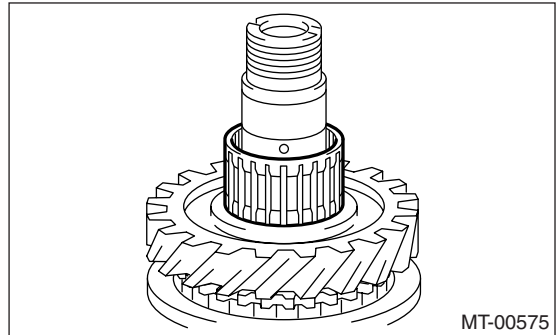


21) Sufficiently apply gear oil to the main shaft, 6th needle bearing and inner periphery of 6th drive gear.

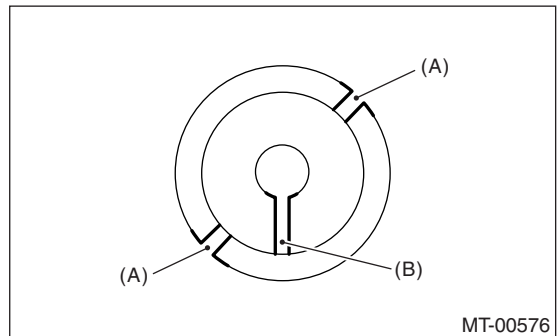
22) Install the 6th drive gear.



23) Install the 6th needle bearing.



24) Set the 6th bushing to main shaft, taking care not to overlap the 6th bushing oil hole and main shaft oil hole.



- (A) 6th bushing oil hole
- (B) Main shaft oil hole

# Main Shaft Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

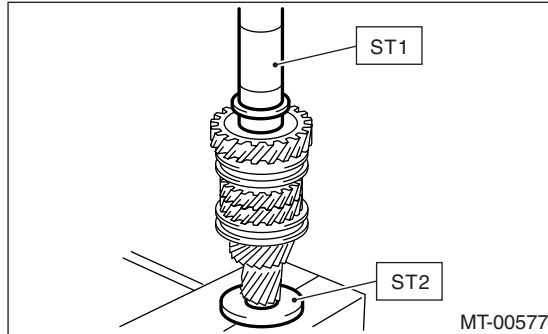
25) Using the ST, install the 6th bushing.

ST1 18651AA000 INSTALLER

ST2 398177700 INSTALLER

### CAUTION:

Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).



26) Make sure the 6th drive gear is smoothly turned by hand. If not, reassemble.

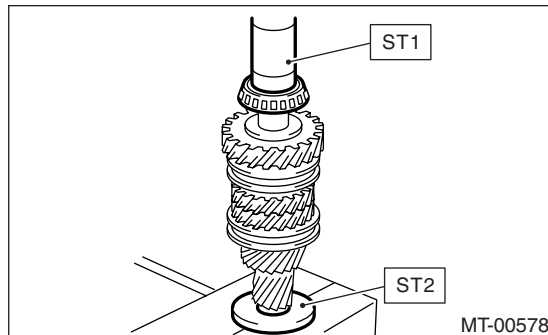
27) Using the ST, install the inner bearing inner race.

ST1 18651AA000 INSTALLER

ST2 398177700 INSTALLER

### CAUTION:

Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).



28) Using the ST, install the retainer and outer bearing inner race.

ST1 18651AA000 INSTALLER

ST2 398177700 INSTALLER

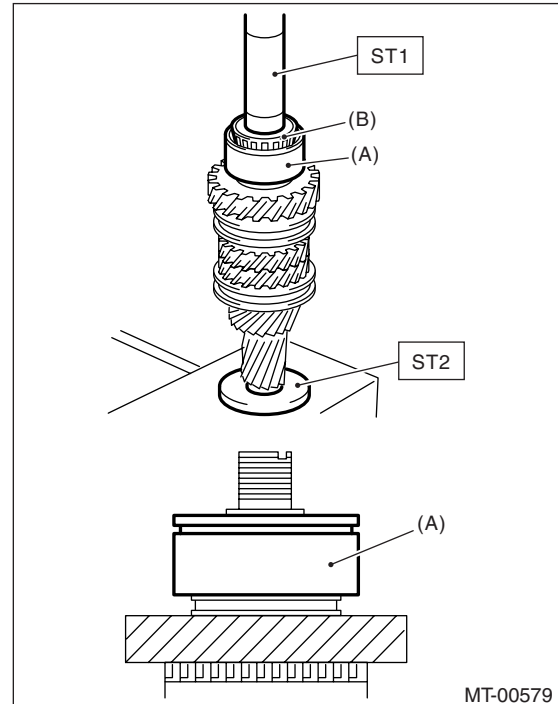
### CAUTION:

Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).

### NOTE:

- Make sure to install the retainer in proper direction.

- Press in until there is no backlash in retainer and where bearing is smoothly turned by hand.



(A) Retainer

(B) Outer bearing inner race

29) Make sure the taper roller bearing is smoothly turned by hand. If not, replace the taper roller bearing as a set and reassemble.

30) Install the lock washer and new lock nut.

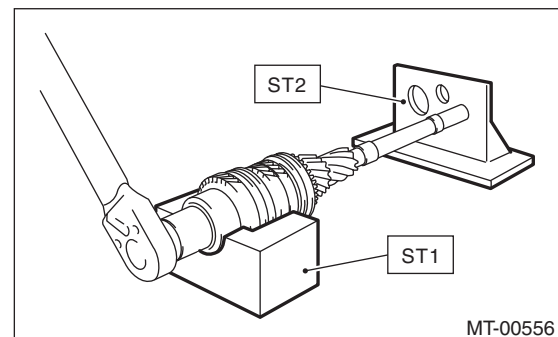
31) Set the main shaft assembly to ST, then tighten the lock nut.

ST1 18665AA000 HOLDER

ST2 18664AA000 BASE

### Tightening torque:

**392 N·m (40.0 kgf·m, 289 ft·lb)**



32) Using the ST, caulk four portions on the lock nut to obtain dimension A  $27 \pm 0.3$  mm ( $1.06 \pm 0.01$  in).

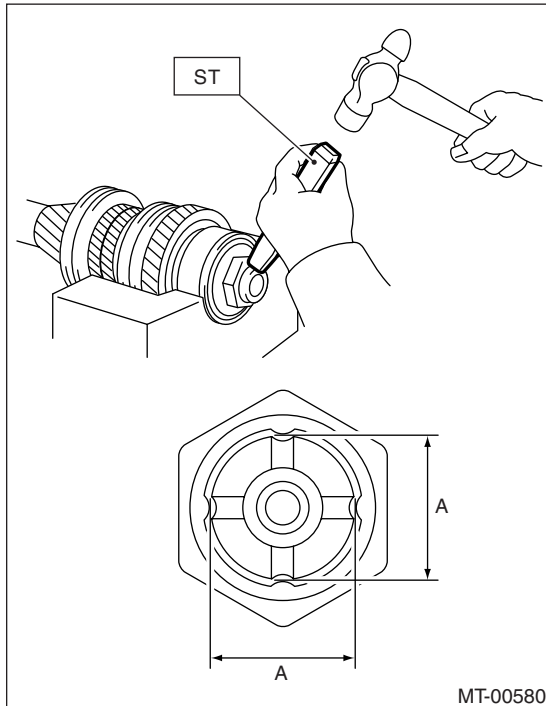
ST 18668AA000 PUNCH

# Main Shaft Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

### NOTE:

Do not crack the caulking part of lock nut.



### E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

#### 1) Bearing

Replace the bearings in the following cases.

- Worn, rusted and damaged bearing
- Bearings that fail to turn smoothly or make abnormal noise when turned
- Bearings having other defects

#### 2) Bushing (each gear)

Replace the bushings in the following case.

- When the sliding surface is damaged or abnormally worn.

#### 3) Gears

Replace the gears in the following cases.

- Gear teeth surfaces are broken or excessively worn.
- Parts that contact the baulk ring is damaged.
- The inner surface of gear is damaged.

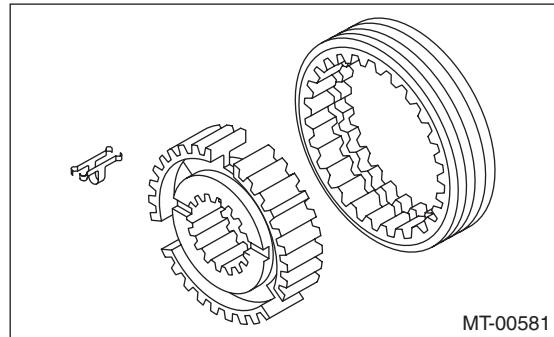
#### 4) Baulk ring, synchro cone

Replace the baulk ring and synchro cone in the following case.

- Worn, rusted and damaged baulk ring

#### 5) Shifting insert key

Replace the shifting insert key if deformed, excessively worn or defective in any way.



### F: ADJUSTMENT

#### 1. SELECTION OF MAIN SHAFT SNAP RING AND WASHER

### NOTE:

Perform the following procedures when:

- Replacing the 1st to 6th driven gear.
- Replacing the 1st and 2nd synchro ring assembly.
- Replacing the ball bearing.
- Replacing the adapter plate.
- Replacing the driven shaft.

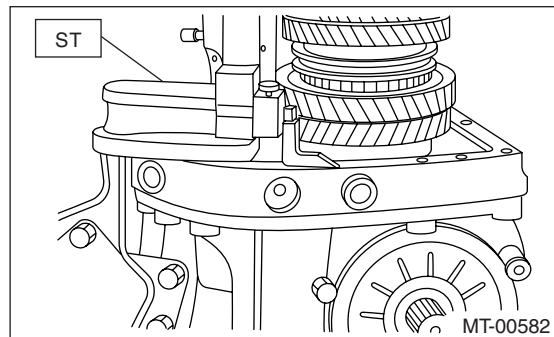
1) Insert the drive pinion assembly in adapter plate.

### NOTE:

Make sure the thrust bearing outer race is not removed and drive pinion is not lift-up.

2) Set the height gauge to adapter plate. Lower the indicator of height gauge to mating surface of adapter plate and case, then set to zero point.

ST 18853AA000 HEIGHT GAUGE



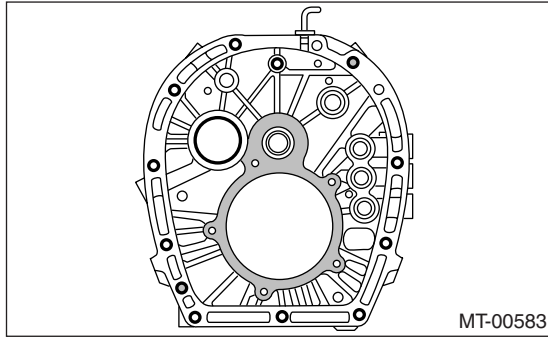
### NOTE:

- Remove the remaining gasket on edge surface with scraper, since the adapter plate is base point of measurement.

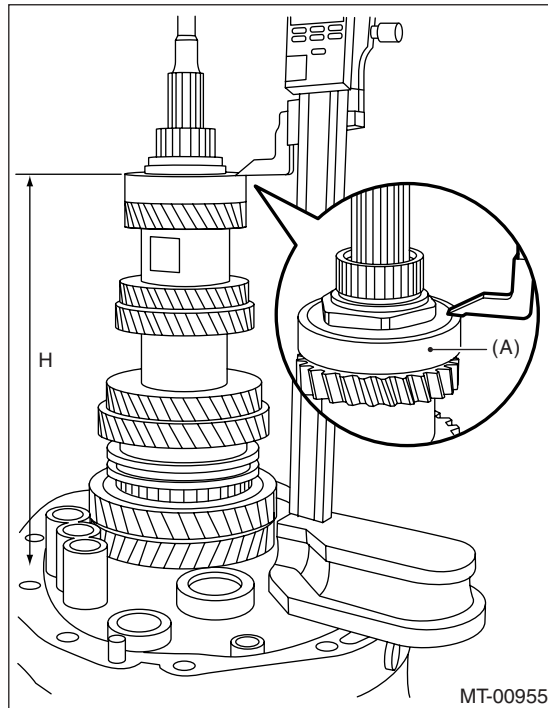
# Main Shaft Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

- Do not place the height gauge on shaded area in the figure during measurement.



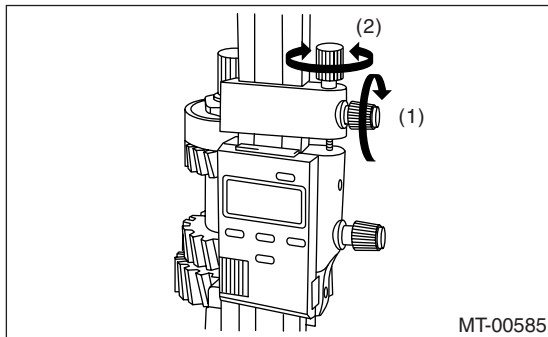
- 3) Measure the height to edge surface of ball bearing (height H).



(A) Ball bearing

**NOTE:**

Set the indicator of height gauge near measuring object, then lock the dial (1) as shown in the figure. Turn dial (2) to set the indicator to edge surface of bearing.



Measure the five points of ball bearing by turning every approx. 120°. Round off each two upper and lower measurement value. Use the remaining center value as measurement value.

- 4) According to measurement value, select the snap ring and washer from the following table.

**Snap ring**

| H: mm (in)                         | Part No.  | Thickness: mm (in) |
|------------------------------------|-----------|--------------------|
| 270.83 — 271.40<br>(10.66 — 10.69) | 805072010 | 1.65<br>(0.065)    |
| 271.41 — 271.98<br>(10.69 — 10.71) | 805072011 | 1.95<br>(0.077)    |
| 271.99 — 272.56<br>(10.71 — 10.73) | 805072012 | 2.25<br>(0.089)    |

**Washer**

| H: mm (in)                         | Part No.  | Thickness: mm (in) |
|------------------------------------|-----------|--------------------|
| 270.83 — 271.40<br>(10.66 — 10.69) | 803067012 | 1.6<br>(0.063)     |
| 271.41 — 271.98<br>(10.69 — 10.71) | 803067011 | 1.3<br>(0.051)     |
| 271.99 — 272.56<br>(10.71 — 10.73) | 803067010 | 1.0<br>(0.039)     |

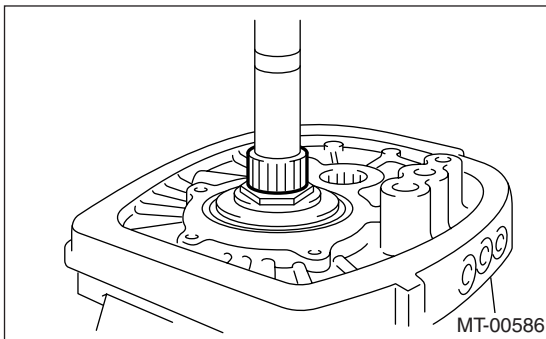
# Driven Gear Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 21. Driven Gear Assembly

#### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
- 2) Prepare the transmission for overhaul. <Ref. to 6MT-42, Preparation for Overhaul.>
- 3) Remove the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-44, REMOVAL, Oil Pipe.> <Ref. to 6MT-47, REMOVAL, Neutral Position Switch.> <Ref. to 6MT-45, REMOVAL, Back-up Light Switch.>
- 4) Remove the extension case. <Ref. to 6MT-49, REMOVAL, Extension Case.>
- 5) Remove the transfer driven gear. <Ref. to 6MT-61, REMOVAL, Transfer Driven Gear.>
- 6) Remove the center differential. <Ref. to 6MT-63, REMOVAL, Center Differential.>
- 7) Remove the oil pump. <Ref. to 6MT-64, REMOVAL, Oil Pump.>
- 8) Remove the transmission case. <Ref. to 6MT-68, REMOVAL, Transmission Case.>
- 9) Remove the driven gear assembly. <Ref. to 6MT-73, REMOVAL, Main Shaft Assembly.>
- 10) Remove the needle bearing.



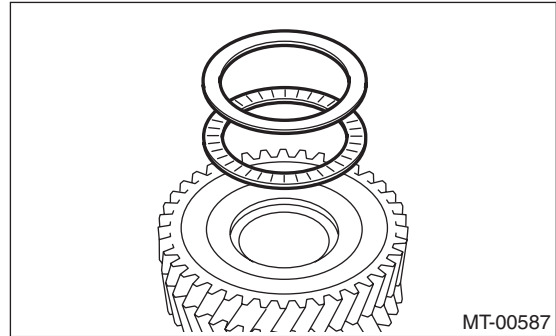
- 11) Remove the thrust needle bearing.

#### B: INSTALLATION

- 1) Adjust the main shaft snap ring. <Ref. to 6MT-84, ADJUSTMENT, Main Shaft Assembly.>
- 2) Adjust the 1st-2nd shifter rod. <Ref. to 6MT-118, ADJUSTMENT, Shifter Fork and Rod.>
- 3) Install the thrust needle bearing.

#### NOTE:

Make sure to install the thrust needle bearing in proper direction.



- 4) Install the 1st needle bearing.
- 5) Install the driven gear assembly. <Ref. to 6MT-73, INSTALLATION, Main Shaft Assembly.>
- 6) Install the transmission case. <Ref. to 6MT-69, INSTALLATION, Transmission Case.>
- 7) Adjust backlash at axial direction of driven gear assembly. <Ref. to 6MT-93, ADJUSTMENT, Driven Gear Assembly.>
- 8) Install the oil pump. <Ref. to 6MT-65, INSTALLATION, Oil Pump.>
- 9) Install the center differential. <Ref. to 6MT-63, INSTALLATION, Center Differential.>
- 10) Install the transfer driven gear. <Ref. to 6MT-61, INSTALLATION, Transfer Driven Gear.>
- 11) Install the extension case. <Ref. to 6MT-49, INSTALLATION, Extension Case.>
- 12) Install the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-44, INSTALLATION, Oil Pipe.> <Ref. to 6MT-47, INSTALLATION, Neutral Position Switch.> <Ref. to 6MT-45, INSTALLATION, Back-up Light Switch.>
- 13) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

#### C: DISASSEMBLY

#### NOTE:

Each sleeve and hub engage at a specified point. Mark an engagement point on the sleeve and hub before disassembly.

- 1) Secure the ST on workbench.  
ST 18664AA000 BASE
- 2) Lift the caulking of lock nut.



# Driven Gear Assembly

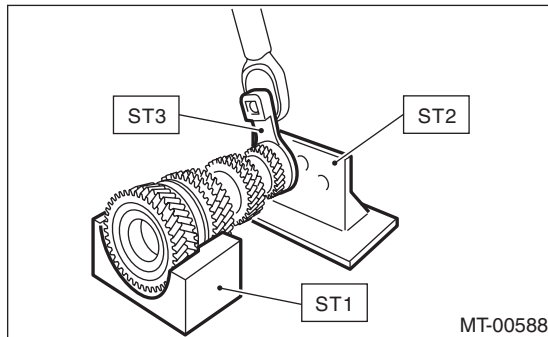
MANUAL TRANSMISSION AND DIFFERENTIAL

3) Install the ST3 to lock nut, set the driven gear assembly on ST, then remove the lock nut.

ST1 18666AA000 HOLDER

ST2 18664AA000 BASE

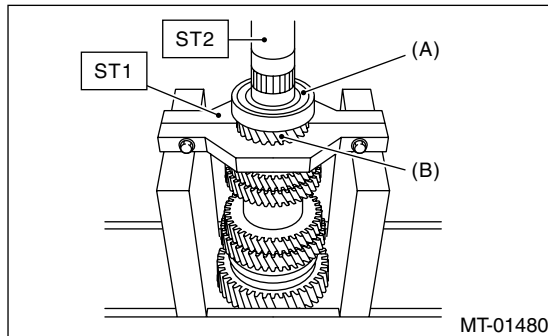
ST3 18620AA000 ADAPTER WRENCH



4) Install the ST1 to 6th gear, then remove the ball bearing and 5th-6th driven gear.

ST1 18723AA000 REMOVER

ST2 499877000 RACE 4-5 INSTALLER



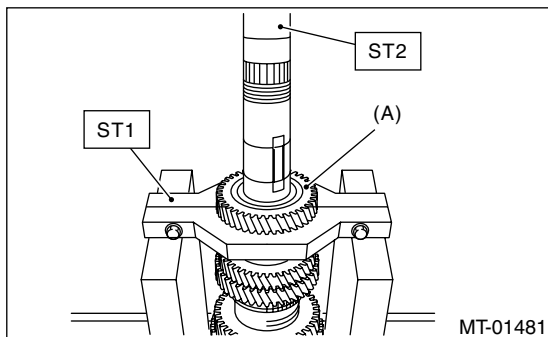
(A) Ball bearing

(B) 5th-6th driven gear

5) Install the ST1 to 4th gear, then remove the 3rd-4th driven gear.

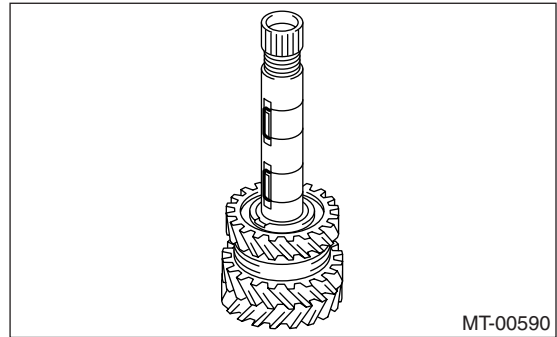
ST1 18723AA000 REMOVER

ST2 499877000 RACE 4-5 INSTALLER

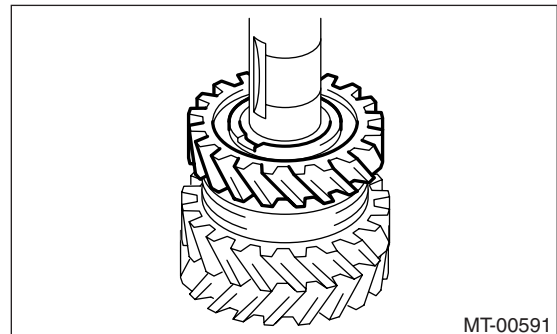


(A) 3rd-4th driven gear

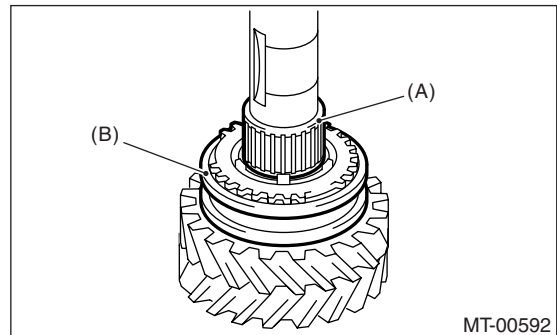
6) Remove the driven gear key.



7) Remove the 2nd gear.



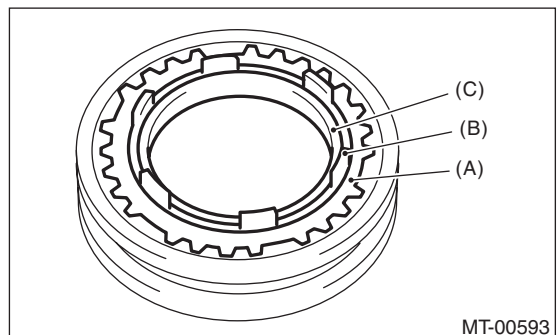
8) Remove the needle bearing and 1st-2nd sleeve.



(A) Needle bearing

(B) 1st-2nd sleeve

9) Remove the outer baulk ring, 2nd synchro cone and inner baulk ring.



(A) Outer baulk ring

(B) 2nd synchro cone

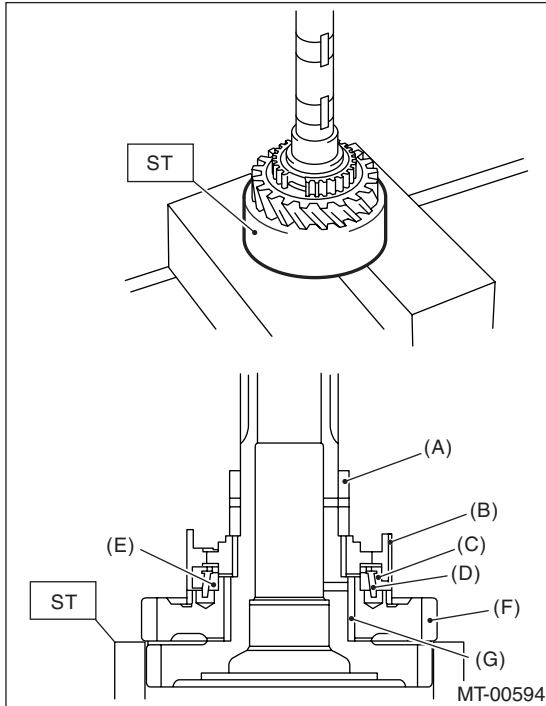
(C) Inner baulk ring



# Driven Gear Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

- 10) Using the ST, remove each part.  
ST 18754AA000 REMOVER



- (A) 2nd bushing
- (B) 1st-2nd hub
- (C) Outer baulk ring
- (D) 1st synchro cone
- (E) Inner baulk ring
- (F) 1st driven gear
- (G) 1st needle bearing

## D: ASSEMBLY

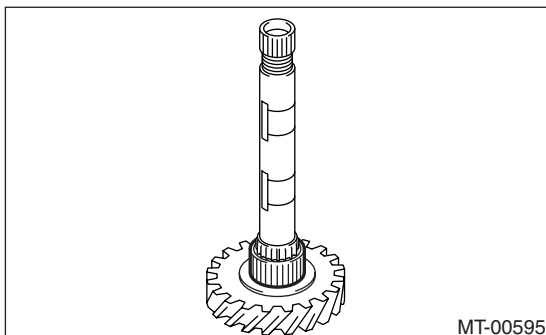
### NOTE:

Replace the following parts as a set.

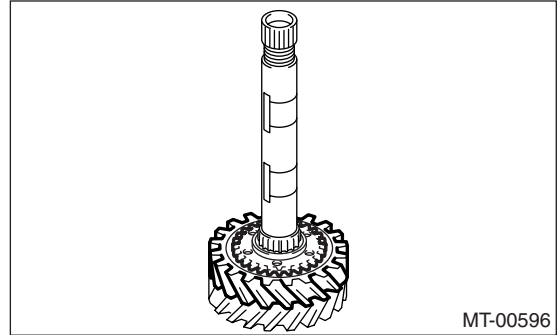
- Sleeve and hub
- Outer baulk ring, 1st synchro cone, inner baulk ring
- Outer baulk ring, 2nd synchro cone, inner baulk ring

1) Sufficiently apply gear oil to the drive shaft, 1st needle bearing and inner periphery of 1st driven gear.

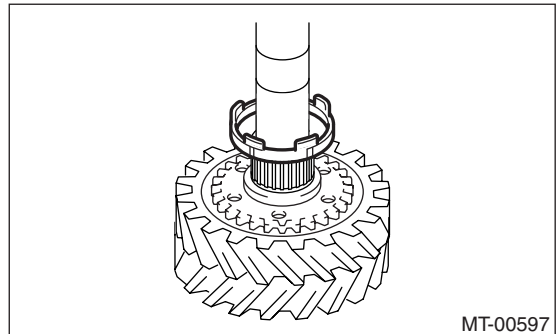
2) Install the 1st needle bearing.



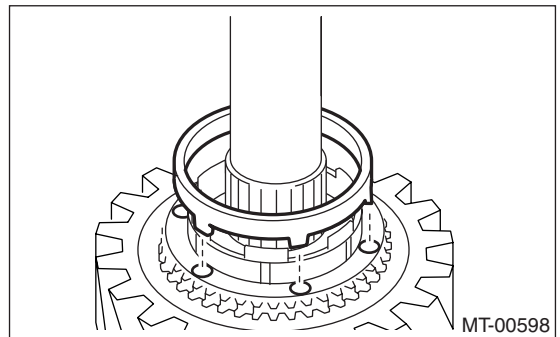
- 3) Install the 1st driven gear to driven shaft.



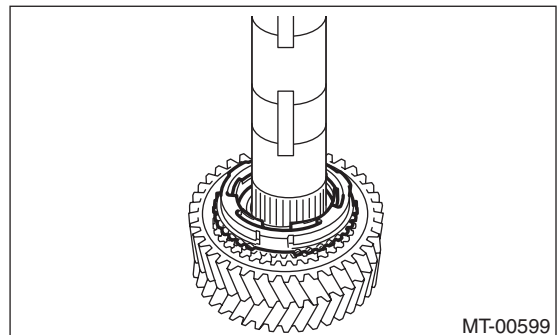
- 4) Install the inner baulk ring.



- 5) Align protrusion portions of the 1st synchro cone to the holes of 1st drive gear to install.



- 6) Install the outer baulk ring.



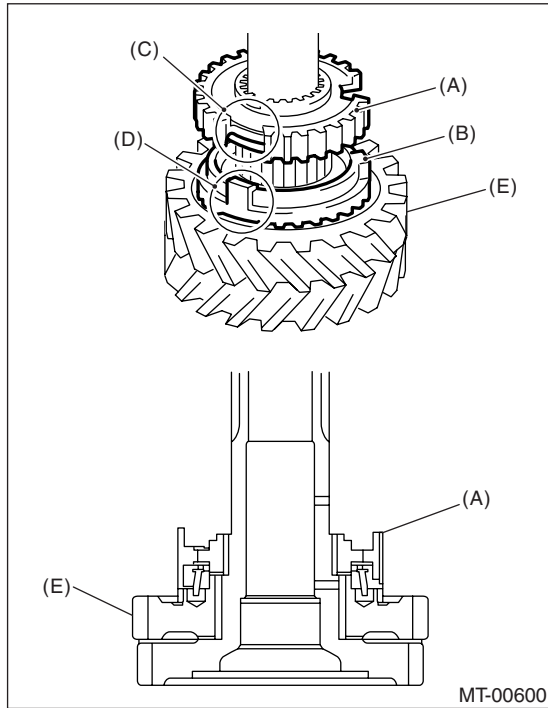
- 7) Install the 1st-2nd hub.

# Driven Gear Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

**NOTE:**

- Align the protrusion portion of outer baulk ring and cutout portion of 1st-2nd hub, then install.
- Make sure to install the 1st-2nd hub in proper direction.



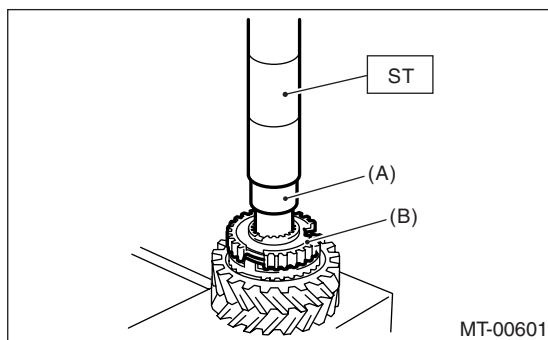
- (A) 1st-2nd hub
- (B) Outer baulk ring
- (C) Cutout portion of 1st-2nd hub
- (D) Protrusion portion of outer baulk ring
- (E) 1st driven gear

8) Using the ST, install the 2nd hub.

ST 18654AA000 INSTALLER

**CAUTION:**

**Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).**



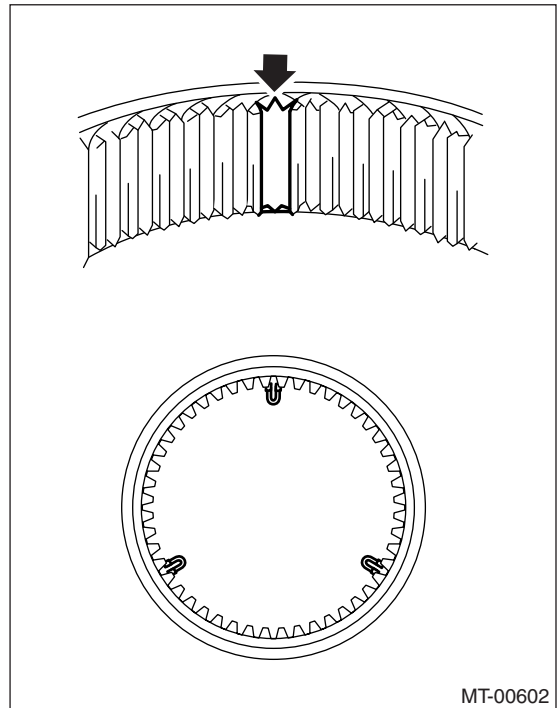
- (A) 2nd bushing
- (B) 1st-2nd hub

9) Make sure the 1st drive gear is smoothly turned by hand. If not, reassemble.

10) Install the shifting insert key in proper place of 1st-2nd sleeve.

**NOTE:**

Angle of each shifting insert key is 120° apart.



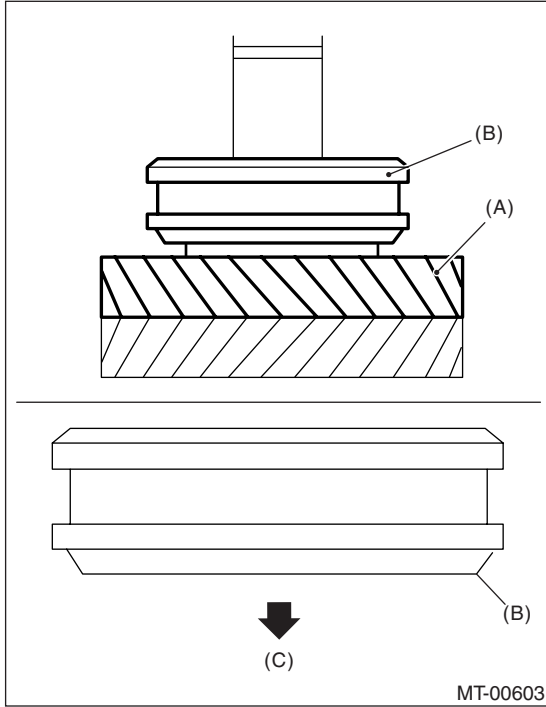
11) Install the 1st-2nd sleeve to 1st-2nd hub.

# Driven Gear Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

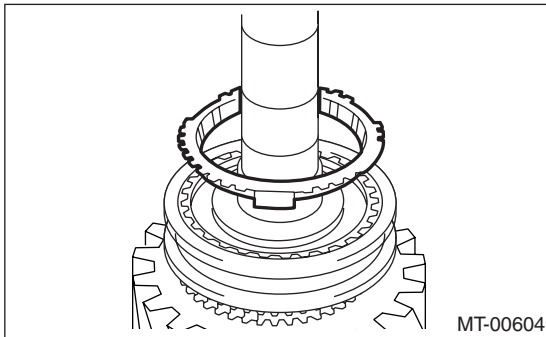
### NOTE:

Make sure to install the 1st-2nd sleeve in proper direction.

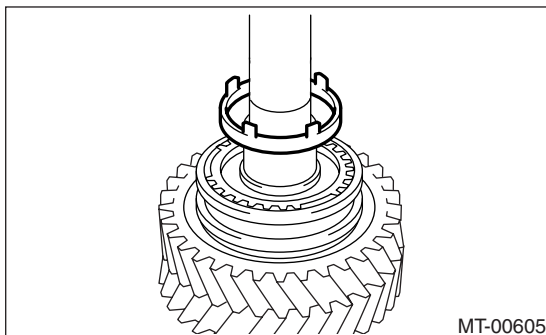


- (A) 1st driven gear
- (B) 1st-2nd sleeve
- (C) 1st driven gear side

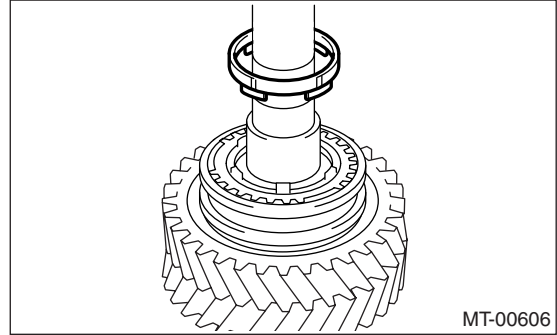
12) Install the outer baulk ring.



13) Install the 2nd synchro cone.



14) Install the inner baulk ring.

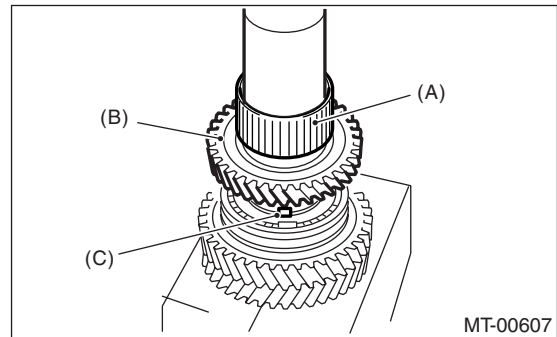


15) Sufficiently apply gear oil to the bushing, 2nd needle bearing and inner periphery of 2nd drive gear.

16) Install the 2nd needle bearing and 2nd driven gear.

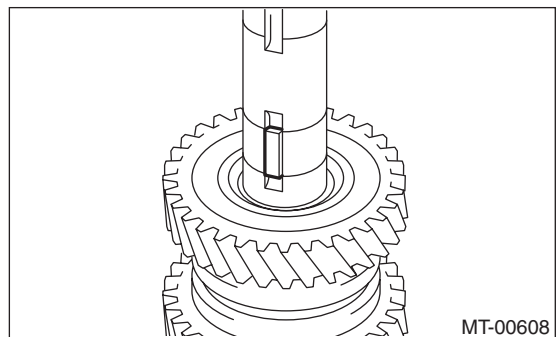
### NOTE:

Align the protrusion portion of 2nd synchro cone with 2nd driven gear hole, then install them.



- (A) 2nd needle bearing
- (B) 2nd driven gear
- (C) Protrusion portion of 2nd synchro cone

17) Install the key.



18) Using the ST, install the 3rd-4th driven gear.  
ST 18654AA000 INSTALLER

### CAUTION:

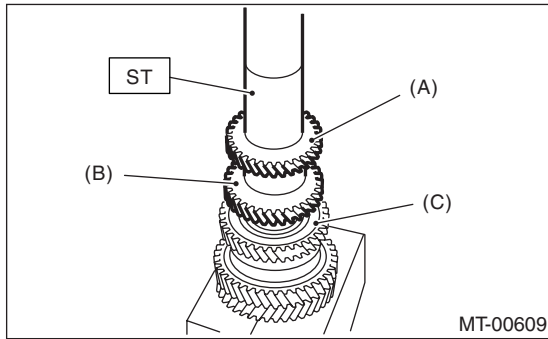
Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).

# Driven Gear Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

### NOTE:

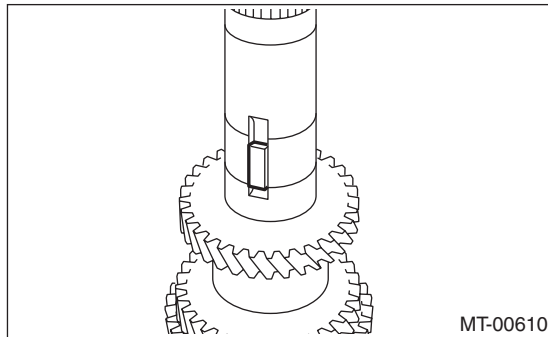
- Make sure to install the 3rd-4th driven gear in proper direction.
- Align the groove of 3rd-4th driven gear with key.



- (A) 4th gear
- (B) 3rd gear
- (C) 2nd gear

19) Make sure the 2nd driven gear is smoothly turned by hand. If not, reassemble.

20) Install the key.



21) Using the ST, install the 5th-6th driven gear.  
ST 18654AA000 INSTALLER

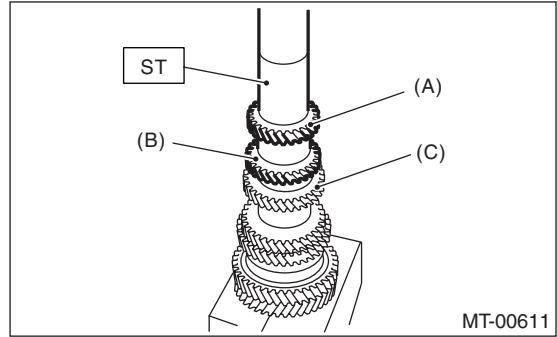
### CAUTION:

**Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).**

### NOTE:

- Make sure to install the 5th-6th driven gear in proper direction.

- Align the groove of 5th-6th driven gear with key.



- (A) 6th gear
- (B) 5th gear
- (C) 4th gear

22) Using the ST, install the ball bearing.

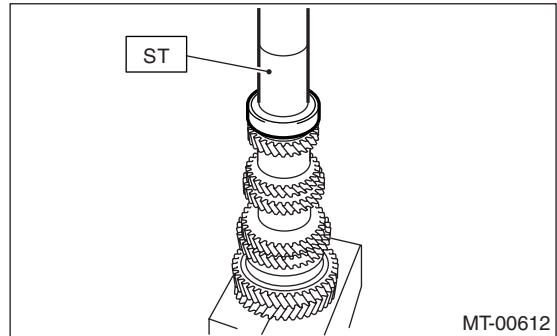
ST 18654AA000 INSTALLER

### CAUTION:

**Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).**

### NOTE:

Make sure to install the ball bearing in proper direction.



23) Make sure the ball bearing is smoothly turned by hand. If not, reassemble.

24) Install a new lock nut.

25) Install the ST3 to lock nut, then install the ST to driven gear assembly and tighten lock nut.

ST1 18666AA000 HOLDER

ST2 18664AA000 BASE

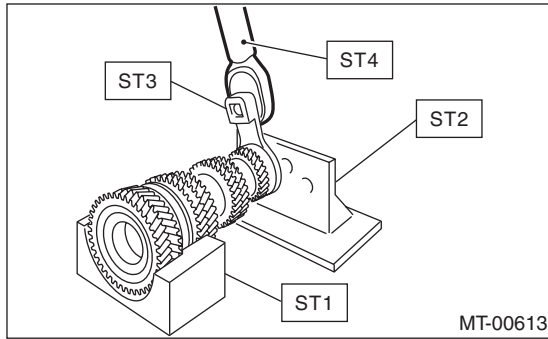
ST3 18620AA000 ADAPTER WRENCH

ST4 18852AA000 TORQUE WRENCH

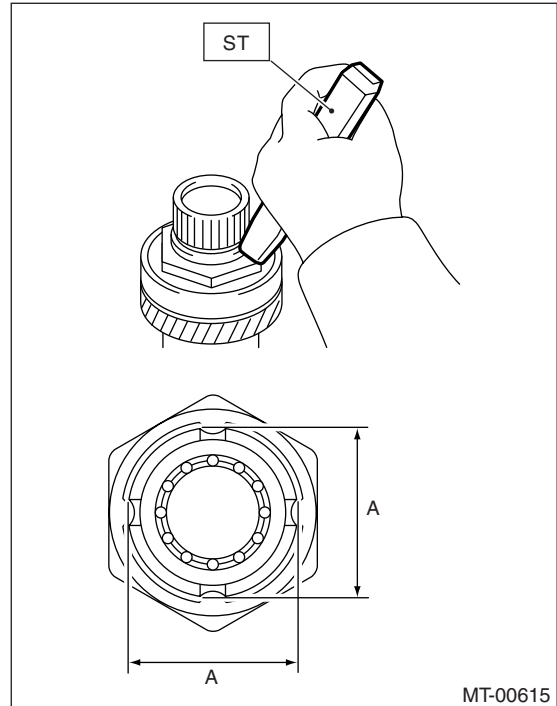
# Driven Gear Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

**Tightening torque:**  
**530 N·m (54.0 kgf·m, 391 ft·lb)**



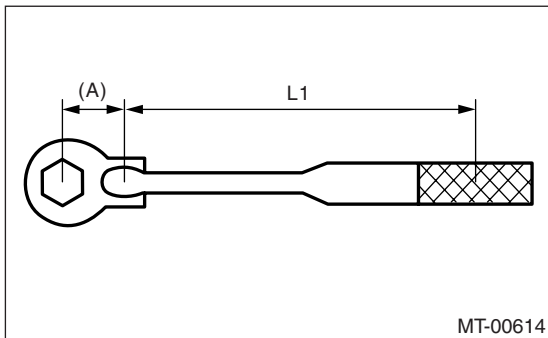
**NOTE:**  
 Do not crack the caulking part of lock nut.



**NOTE:**  
 If torque wrench except ST4 is used, calculate the following equation, then tighten the lock nut.

$$T = L1 / (0.1 + L1) \times 570$$

| T                               | N·m (kgf·m, ft·lb) | Setting value of torque wrench |
|---------------------------------|--------------------|--------------------------------|
| L1                              | m (in)             | Torque wrench length           |
| 0.1 m (3.94 in)                 |                    | ST length                      |
| 570 N·m (58.1 kgf·m, 420 ft·lb) |                    | Tightening torque of lock nut  |



(A) 0.1 m (3.94 in)

26) Using the ST, caulk four portions on the lock nut to obtain dimension A  $44 \pm 0.5$  mm ( $1.73 \pm 0.02$  in).

ST 18669AA000 PUNCH

## E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

### 1) Bearing

Replace the bearings in the following cases.

- Worn, rusted and damaged bearing
- Bearings that fail to turn smoothly or make abnormal noise when turned
- Bearings having other defects

### 2) Bushing (each gear)

Replace the bushings in the following case.

- When the sliding surface is damaged or abnormally worn.

### 3) Gears

Replace the gears in the following cases.

- Gear teeth surfaces are broken or excessively worn.
- Parts that contact the baulk ring is damaged.
- The inner surface of gear is damaged.

### 4) Baulk ring, synchro cone

Replace the baulk ring and synchro cone in the following case:

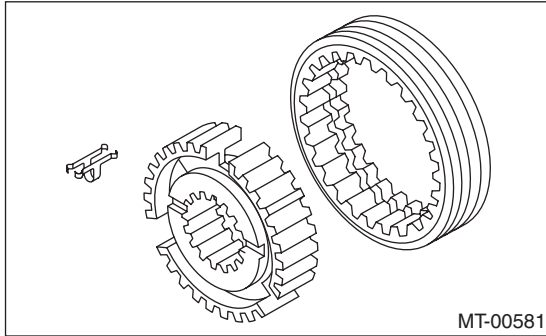
- Worn, rusted and damaged baulk ring

### 5) Shifting insert key

# Driven Gear Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

Replace the shifting insert key if deformed, excessively worn or defective in any way.



MT-00581

3) Select 0 to 3 washers from the following table to adjust backlash closest to specification.

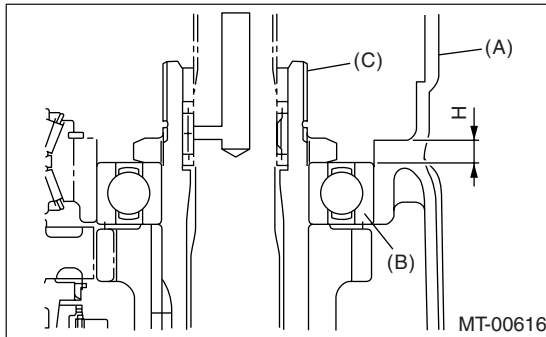
**Backlash specification at axial direction of driven gear assembly:**

**0.1 — 0.3 mm (0.0039 — 0.0118 in)**

| Washer    |                     |
|-----------|---------------------|
| Part No.  | Thickness t mm (in) |
| 803072030 | 0.15 (0.0059)       |
| 803072031 | 0.30 (0.0118)       |
| 803072032 | 0.45 (0.0177)       |
| 803072033 | 0.60 (0.0236)       |

## F: ADJUSTMENT

1) Measure length “H”, which is from transmission case and oil pump cover mating surface to ball bearing edge.



MT-00616

- (A) Transmission case
- (B) Ball bearing
- (C) Driven gear ASSY

2) Using the following equation, calculate the washer thickness of driven gear assembly.

$$T = H - \{5.8 \pm 0.05 \text{ mm (0.23} \pm 0.002 \text{ in)}\} - \{0.1 \text{ to } 0.3 \text{ mm (0.0039 to 0.0118 in)}\}$$

|  |  |
|--|--|
| t                                      | Thickness of washer  |
| H                                      | Length from transmission case and oil pump cover mating surface to ball bearing edge |
| 5.8±0.05 mm<br>(0.23±0.002 in)         | Thickness of collar  |
| 0.1 to 0.3 mm<br>(0.0039 to 0.0118 in) | Backlash specification at axial direction of driven gear assembly                    |

# Reverse Idler Gear Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

## 22.Reverse Idler Gear Assembly

### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
- 2) Prepare the transmission for overhaul. <Ref. to 6MT-42, Preparation for Overhaul.>
- 3) Remove the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-44, REMOVAL, Oil Pipe.> <Ref. to 6MT-47, REMOVAL, Neutral Position Switch.> <Ref. to 6MT-45, REMOVAL, Back-up Light Switch.>
- 4) Remove the extension case. <Ref. to 6MT-49, REMOVAL, Extension Case.>
- 5) Remove the transfer driven gear. <Ref. to 6MT-61, REMOVAL, Transfer Driven Gear.>
- 6) Remove the center differential. <Ref. to 6MT-63, REMOVAL, Center Differential.>
- 7) Remove the oil pump. <Ref. to 6MT-64, REMOVAL, Oil Pump.>
- 8) Remove the transmission case. <Ref. to 6MT-68, REMOVAL, Transmission Case.>
- 9) Remove the reverse idler gear assembly. <Ref. to 6MT-73, REMOVAL, Main Shaft Assembly.>

### B: INSTALLATION

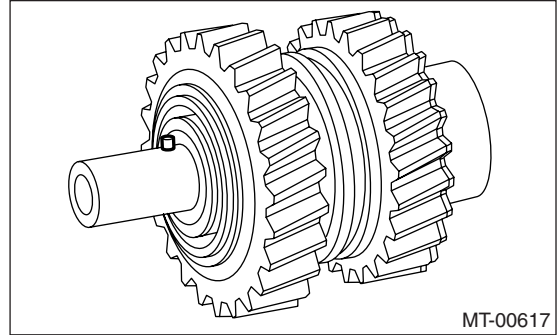
- 1) Select the reverse fork rod. <Ref. to 6MT-118, ADJUSTMENT, Shifter Fork and Rod.>
- 2) Install the reverse idler gear assembly. <Ref. to 6MT-73, INSTALLATION, Main Shaft Assembly.>
- 3) Install the transmission case. <Ref. to 6MT-69, INSTALLATION, Transmission Case.>
- 4) Install the oil pump. <Ref. to 6MT-65, INSTALLATION, Oil Pump.>
- 5) Install the center differential. <Ref. to 6MT-63, INSTALLATION, Center Differential.>
- 6) Install the transfer driven gear. <Ref. to 6MT-61, INSTALLATION, Transfer Driven Gear.>
- 7) Install the extension case. <Ref. to 6MT-49, INSTALLATION, Extension Case.>
- 8) Install the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-44, INSTALLATION, Oil Pipe.> <Ref. to 6MT-47, INSTALLATION, Neutral Position Switch.> <Ref. to 6MT-45, INSTALLATION, Back-up Light Switch.>
- 9) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

### C: DISASSEMBLY

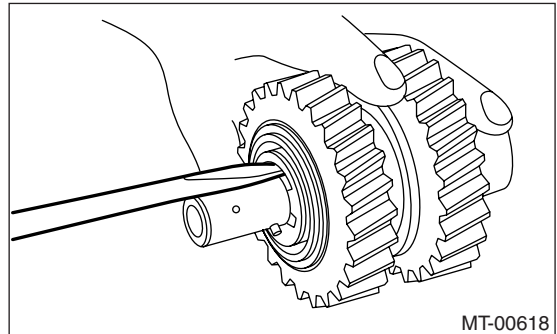
#### NOTE:

Sleeve and reverse gear engage at a specified point. Mark an engagement point on the sleeve and hub before disassembly.

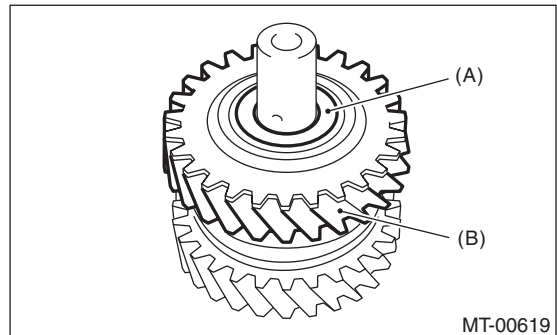
- 1) Remove the spring pin.



- 2) Remove the snap ring.

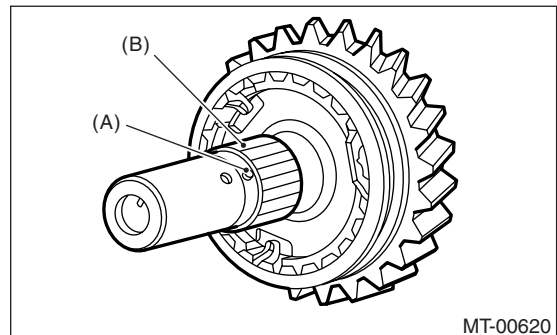


- 3) Remove the washer and reverse idler gear.



- (A) Washer  
(B) Reverse idler gear

- 4) Remove the knock pin and reverse idler gear needle bearing.



- (A) Knock pin  
(B) Reverse idler gear needle bearing

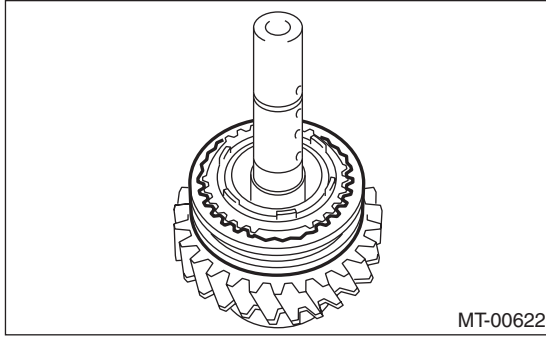


# Reverse Idler Gear Assembly

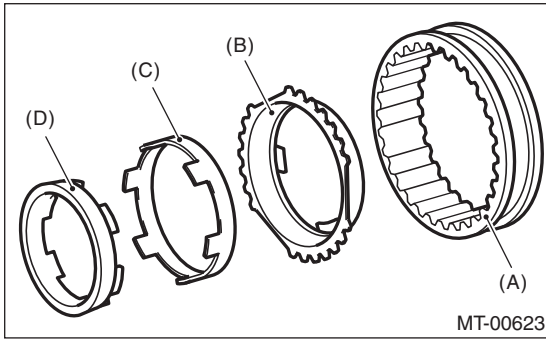
MANUAL TRANSMISSION AND DIFFERENTIAL

5) Remove the collar.

6) Remove the reverse sleeve.

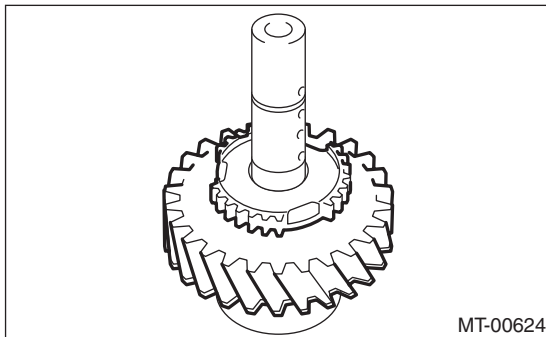


7) Remove the outer baulk ring, reverse synchro cone and inner baulk ring from reverse sleeve.

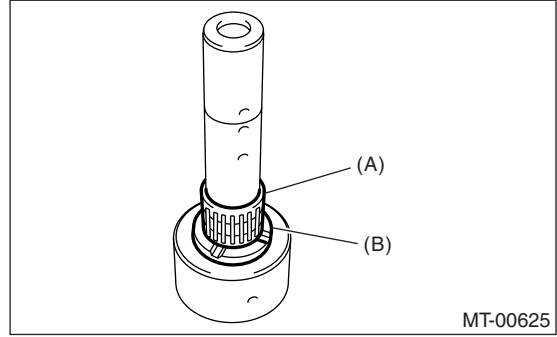


- (A) Reverse sleeve
- (B) Outer baulk ring
- (C) Reverse synchro cone
- (D) Inner baulk ring

8) Remove the reverse idler gear No. 2.

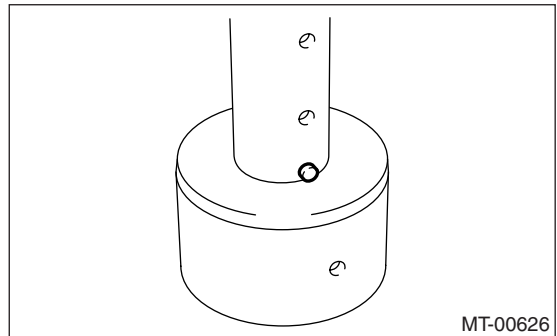


9) Remove the washer and needle bearing.

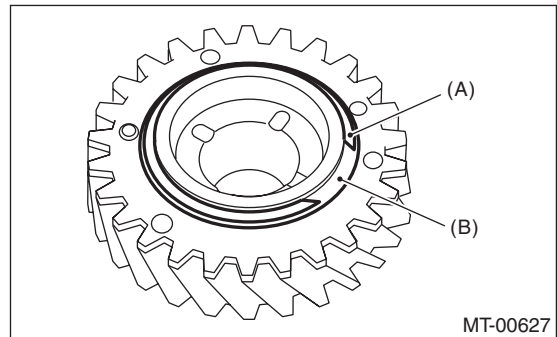


- (A) Needle bearing
- (B) Washer

10) Remove the knock pin.



11) Remove the snap ring and friction plate from reverse gear.

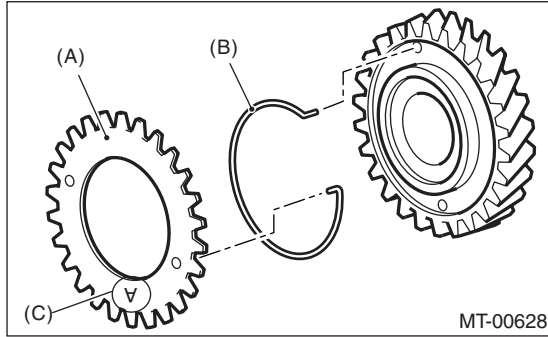


- (A) Snap ring
- (B) Friction plate



# Reverse Idler Gear Assembly

12) Remove the sub gear and spring.



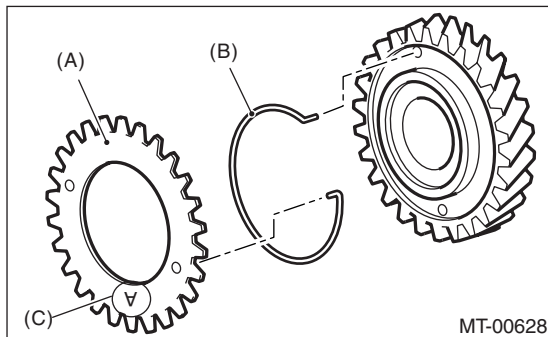
- (A) Sub gear
- (B) Spring
- (C) Punch mark (mark A)

## D: ASSEMBLY

1) Install the sub gear and spring.

NOTE:

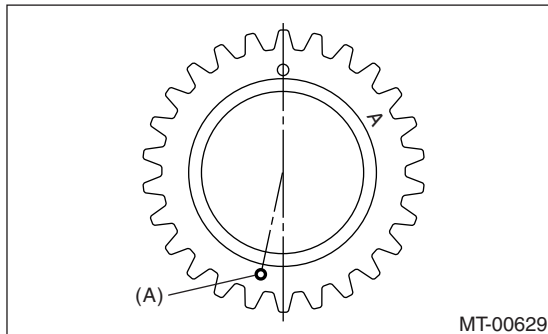
- Install the spring with white marking on hook part facing to sub gear side.
- Install the sub gear with punch mark (mark A) facing outside.



- (A) Sub gear
- (B) Spring
- (C) Punch mark (mark A)

NOTE:

- Install the spring and sub gear, taking care to install the sub gear installation hole in proper direction.

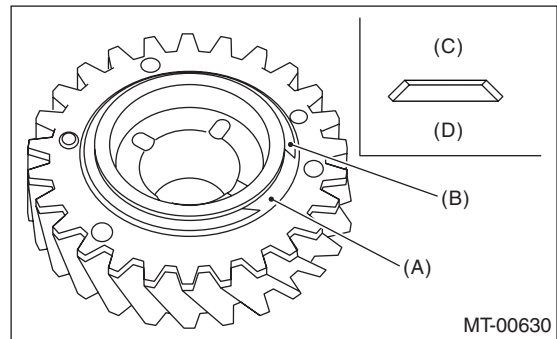


- (A) Installation hole

2) Install the friction plate and snap ring.

NOTE:

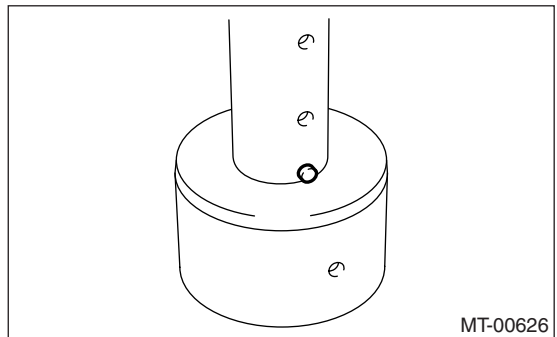
- Make sure to install the friction plate in proper direction.



- (A) Friction plate
- (B) Snap ring
- (C) Snap ring side
- (D) Sub gear side

3) Sufficiently apply gear oil to the shaft, needle bearing and inner periphery of reverse drive gear.

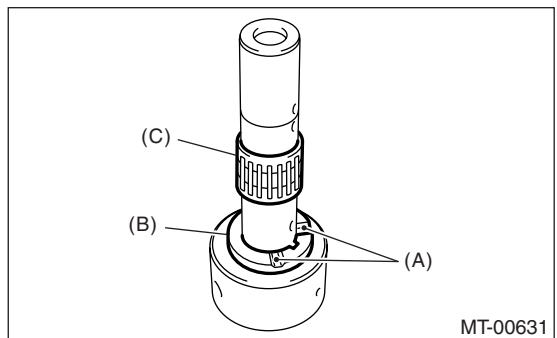
4) Install the knock pin.



5) Install the washer and needle bearing.

NOTE:

- Install the washer with groove facing to reverse idler gear.

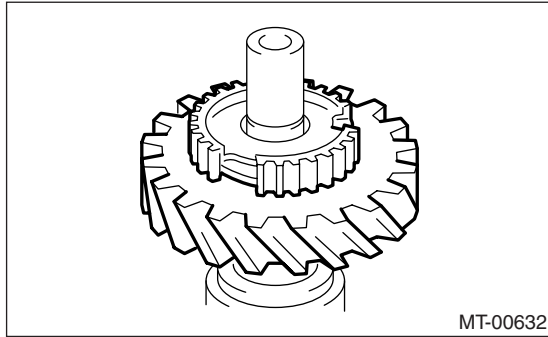


- (A) Groove
- (B) Washer
- (C) Needle bearing

# Reverse Idler Gear Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

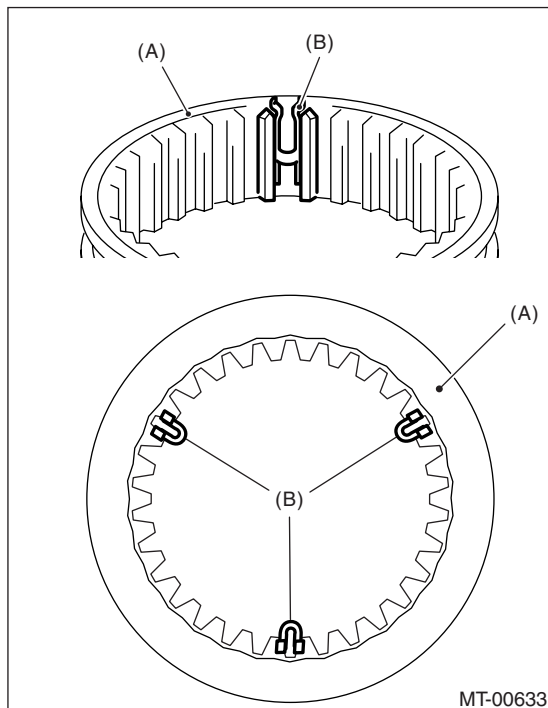
6) Install the reverse idler gear No. 2.



7) Install the shifting insert key in proper place of reverse sleeve.

NOTE:

Angle of each shifting insert key is 120° apart.

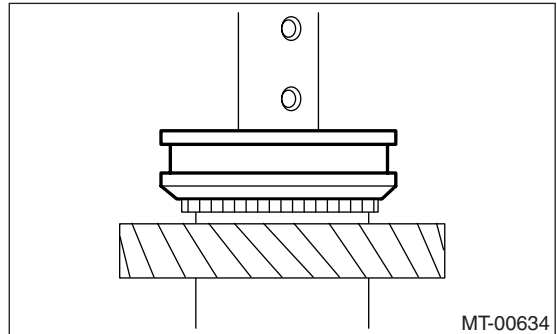


- (A) Reverse sleeve
- (B) Shifting insert key

8) Install the reverse sleeve to reverse idler gear No. 2.

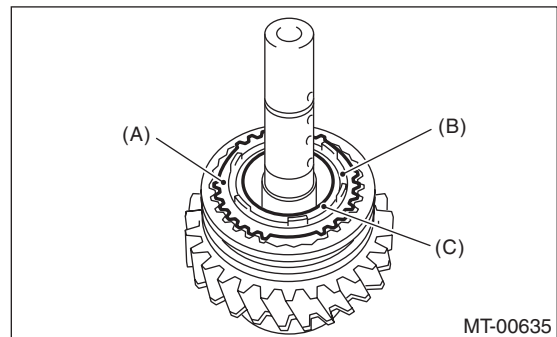
NOTE:

Make sure to install the reverse sleeve in proper direction.



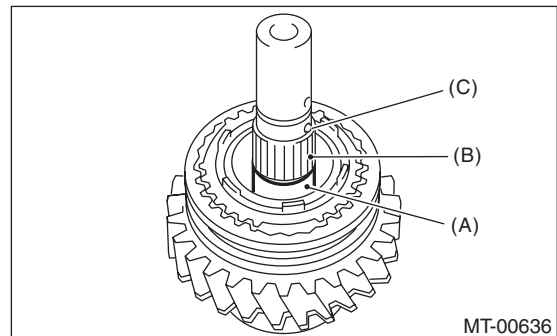
9) Sufficiently apply gear oil to the collar, needle bearing and inner periphery of reverse drive gear.

10) Install the outer baulk ring, reverse synchro cone and inner baulk ring.



- (A) Outer baulk ring
- (B) Reverse synchro cone
- (C) Inner baulk ring

11) Install the collar and needle bearing, then install the knock pin.

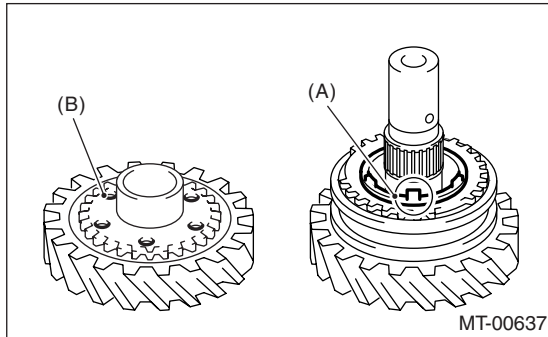


- (A) Collar
- (B) Needle bearing
- (C) Knock pin

# Reverse Idler Gear Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

12) Align the protrusion portion of reverse synchro cone with reverse idler gear hole, then install the reverse idler gear.

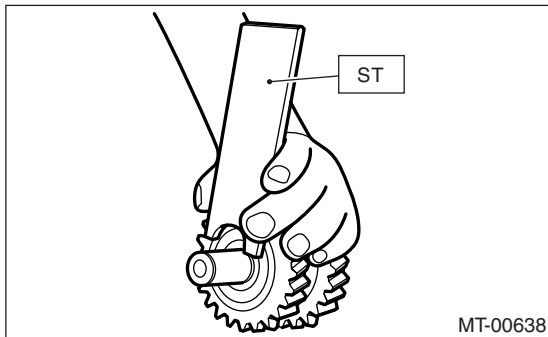


- (A) Protrusion portion of reverse synchro cone
- (B) Reverse idler gear hole

13) Install the washer with groove facing to reverse idler gear.

14) Using the ST, install the snap ring.

ST 18672AA000 GUIDE CLIP



15) Inspect and adjust the clearance between snap ring and washer. <Ref. to 6MT-98, INSPECTION, Reverse Idler Gear Assembly.>

16) Install a new spring pin.

### E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

#### 1) Bearings

Replace the bearings in the following cases.

- Worn, rusted and damaged bearing
- Bearings that fail to turn smoothly or make abnormal noise when turned
- Bearings having other defects

#### 2) Bushing (each gear)

Replace the bushings in the following case:

- When the sliding surface is damaged or abnormally worn.

#### 3) Gears

Replace the gears in the following cases:

- The gear teeth surfaces are broken or excessively worn.
- The parts that contact the baulk ring is damaged.
- The inner surface of gear is damaged.

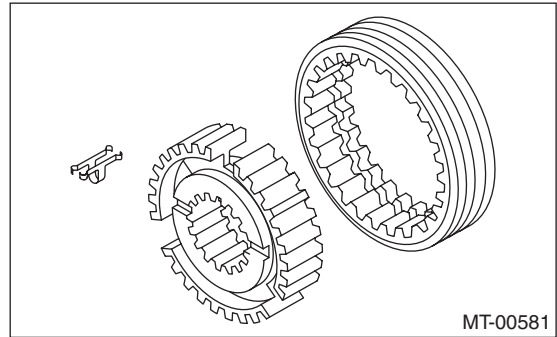
#### 4) Baulk ring, synchro cone

Replace the baulk ring and synchro cone in the following case:

Worn, rusted and damaged baulk ring

#### 5) Shifting insert key

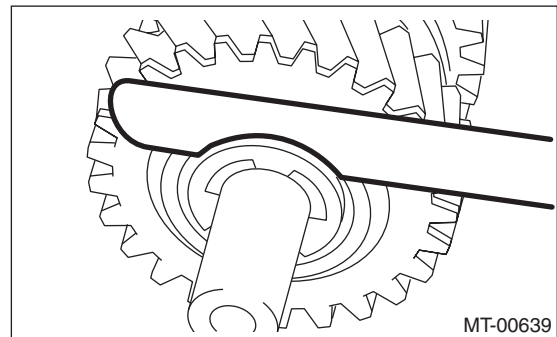
Replace the shifting insert key if deformed, excessively worn or defective in any way.



6) Inspect the clearance between snap ring and washer.

#### Specification of clearance:

**0.1 — 0.3 mm (0.0039 — 0.0118 in)**



Select and replace the snap ring from the following table if clearance is out of specification.

| Snap ring |                   |
|-----------|-------------------|
| Parts No. | Thickness mm (in) |
| 031319000 | 1.50 (0.059)      |
| 805019030 | 1.60 (0.062)      |
| 805019010 | 1.72 (0.068)      |

Inspect the clearance again after replacing snap ring.

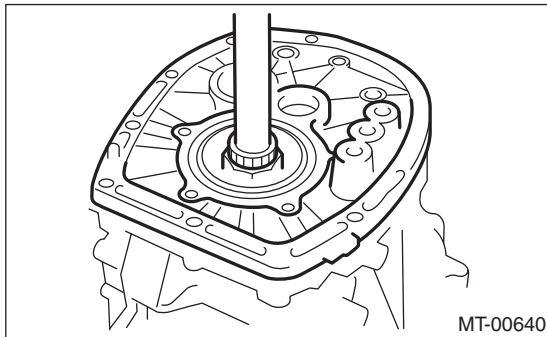
# Drive Pinion Shaft Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

## 23. Drive Pinion Shaft Assembly

### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
- 2) Prepare the transmission for overhaul. <Ref. to 6MT-42, Preparation for Overhaul.>
- 3) Remove the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-44, REMOVAL, Oil Pipe.> <Ref. to 6MT-47, REMOVAL, Neutral Position Switch.> <Ref. to 6MT-45, REMOVAL, Back-up Light Switch.>
- 4) Remove the extension case. <Ref. to 6MT-49, REMOVAL, Extension Case.>
- 5) Remove the transfer driven gear. <Ref. to 6MT-61, REMOVAL, Transfer Driven Gear.>
- 6) Remove the center differential. <Ref. to 6MT-63, REMOVAL, Center Differential.>
- 7) Remove the oil pump. <Ref. to 6MT-64, REMOVAL, Oil Pump.>
- 8) Remove the transmission case. <Ref. to 6MT-68, REMOVAL, Transmission Case.>
- 9) Remove each gear assembly. <Ref. to 6MT-73, REMOVAL, Main Shaft Assembly.>
- 10) Remove the drive pinion shaft assembly.

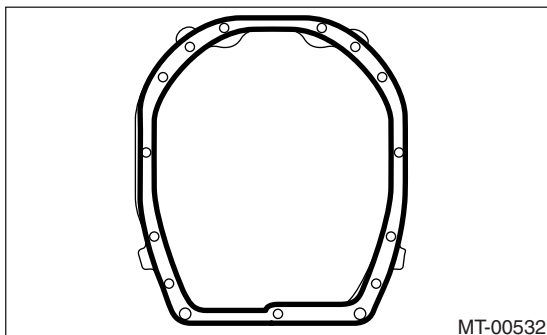


### B: INSTALLATION

- 1) Completely remove the remaining gasket on drive plate and clutch housing.
- 2) Apply liquid gasket to the clutch housing.

#### Liquid gasket:

**THREE BOND 1215 (Part No. 004403007)**



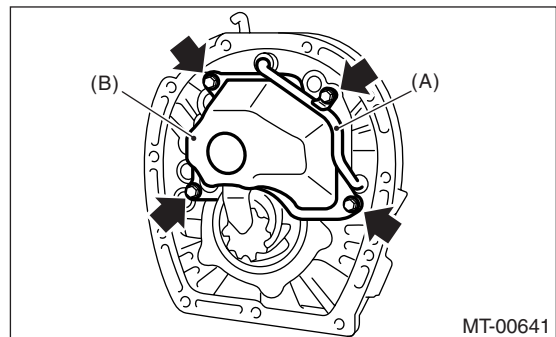
- 3) Install each gear assembly. <Ref. to 6MT-73, INSTALLATION, Main Shaft Assembly.>
- 4) Install the transmission case. <Ref. to 6MT-69, INSTALLATION, Transmission Case.>
- 5) Install the oil pump. <Ref. to 6MT-65, INSTALLATION, Oil Pump.>
- 6) Install the center differential. <Ref. to 6MT-63, INSTALLATION, Center Differential.>
- 7) Install the transfer driven gear. <Ref. to 6MT-61, INSTALLATION, Transfer Driven Gear.>
- 8) Install the extension case. <Ref. to 6MT-49, INSTALLATION, Extension Case.>
- 9) Install the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-44, INSTALLATION, Oil Pipe.> <Ref. to 6MT-47, INSTALLATION, Neutral Position Switch.> <Ref. to 6MT-45, INSTALLATION, Back-up Light Switch.>
- 10) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

### C: DISASSEMBLY

#### NOTE:

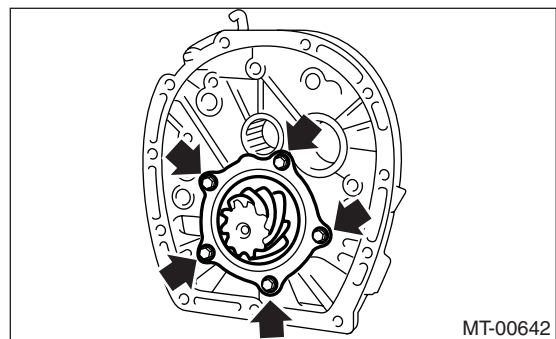
Replace the drive pinion shaft as a set with hypoid driven gear.

- 1) Remove the pipe and oil chamber.



- (A) Pipe  
(B) Oil chamber

- 2) Remove the drive pinion shaft and shim from adapter plate.



- 3) Secure the ST on workbench.  
ST 18664AA000 BASE
- 4) Lift the caulking of lock nut.

# Drive Pinion Shaft Assembly

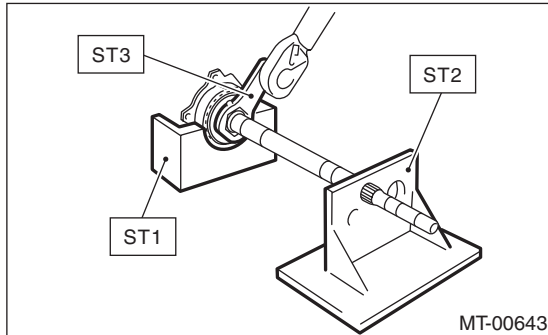
## MANUAL TRANSMISSION AND DIFFERENTIAL

5) Install the ST3 to lock nut, then set drive pinion shaft to ST. Remove the lock nut and washer.

ST1 18667AA000 HOLDER

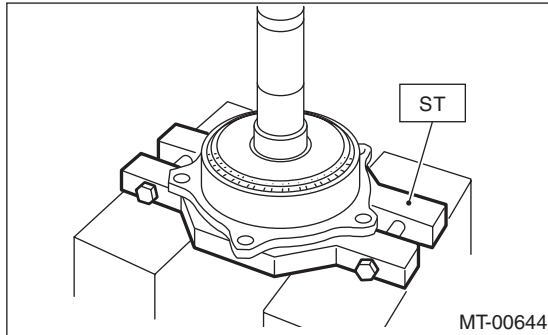
ST2 18664AA000 BASE

ST3 18621AA000 ADAPTER WRENCH



6) Using the ST, remove the taper roller bearing assembly.

ST 18723AA000 REMOVER



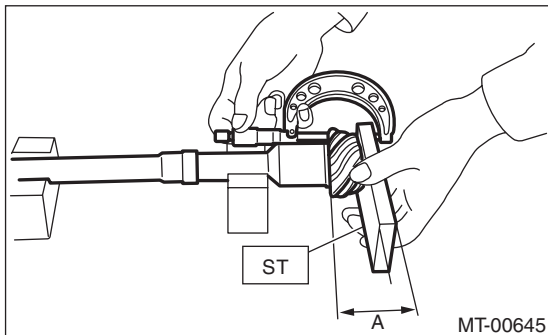
## D: ASSEMBLY

1) Using the ST, measure dimension "A" of drive pinion.

NOTE:

Note dimension "A" for selection of drive pinion shim.

ST 398643600 GAUGE

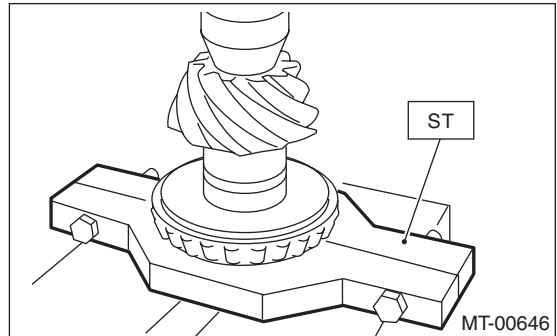


2) Install the inner bearing inner race to drive pinion shaft using ST and press.

ST 18723AA000 REMOVER

**CAUTION:**

**Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).**

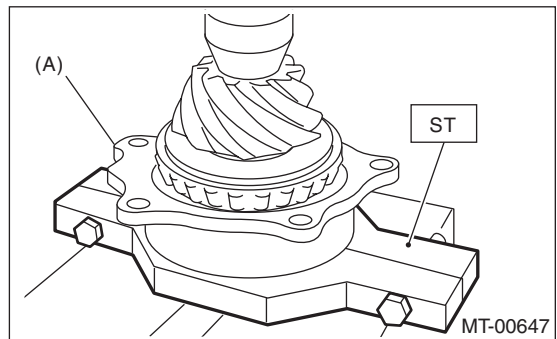


3) Install the retainer and outer bearing inner race to drive pinion shaft using ST and press.

ST 18723AA000 REMOVER

NOTE:

Press to the point where bearing is turned smoothly without slack.



(A) Retainer

4) Install the washer and a new lock nut.

5) Set the ST to drive pinion, then tighten the lock nut.

ST1 18667AA000 HOLDER

ST2 18664AA000 BASE

ST3 18621AA000 ADAPTER WRENCH

ST4 18852AA000 TORQUE WRENCH

NOTE:

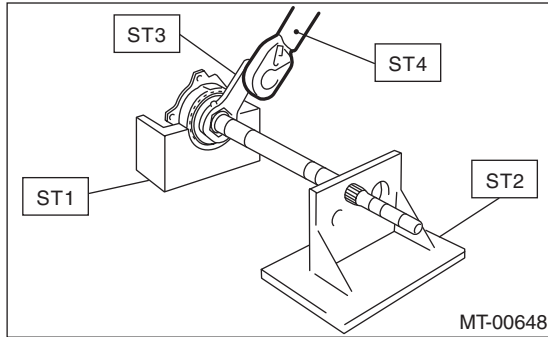
Tighten with the ST and torque wrench straight-lined.

# Drive Pinion Shaft Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

## Tightening torque:

**265 N·m (27.0 kgf-m, 195 ft-lb)**

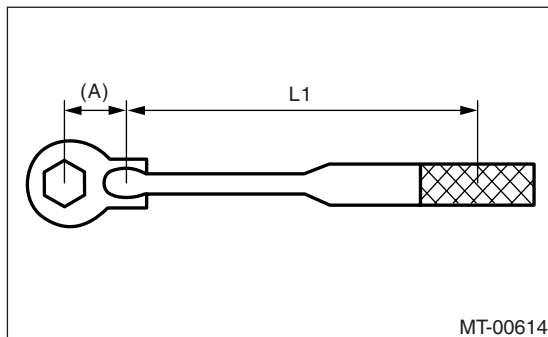


## NOTE:

- If torque wrench except ST4 is used, calculate the following equation, then tighten the lock nut.
- Tighten with the ST and torque wrench straight-lined.

$$T = L1 / (0.1 + L1) \times 285$$

|                                 |                    |                                |
|---------------------------------|--------------------|--------------------------------|
| T                               | N·m (kgf-m, ft-lb) | Setting value of torque wrench |
| L1                              | m (in)             | Torque wrench length           |
| 0.1 m (3.94 in)                 |                    | ST length                      |
| 285 N·m (29.0 kgf-m, 210 ft-lb) |                    | Tightening torque of lock nut  |



(A) 0.1 m (3.94 in)

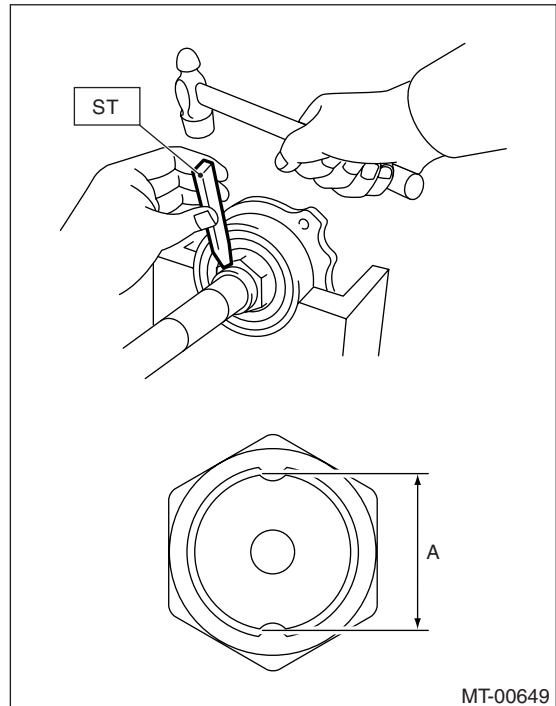
6) Measure the starting torque. <Ref. to 6MT-102, INSPECTION, Drive Pinion Shaft Assembly.>

7) Using the ST, caulk two portions on the lock nut to obtain dimension "A"  $37 \pm 0.5$  mm ( $1.46 \pm 0.02$  in).

ST 18670AA000 PUNCH

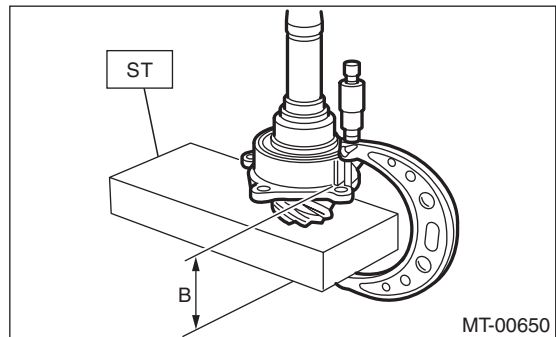
## NOTE:

Do not crack the caulking part of lock nut.



8) Using the ST, measure dimension "B" of the drive pinion.

ST 398643600 GAUGE



9) Calculate the following formula, then select one or two pieces of drive pinion shim from the table below.

$$6.5 \pm 0.0625 \text{ mm} - (B - A) [0.26 \pm 0.0025 \text{ in} - (B - A)]$$

## NOTE:

A: Measured value from step 1).

B: Measured value from step 8).

| Drive pinion shim |                   |
|-------------------|-------------------|
| Part No.          | Thickness mm (in) |
| 32295AA270        | 0.15 (0.0059)     |
| 32295AA280        | 0.175 (0.0069)    |
| 32295AA290        | 0.20 (0.0079)     |
| 32295AA300        | 0.225 (0.0089)    |
| 32295AA310        | 0.25 (0.0098)     |
| 32295AA320        | 0.275 (0.0108)    |



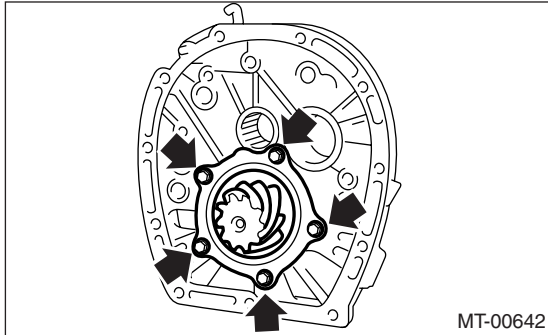
# Drive Pinion Shaft Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

10) Apply gear oil to the side face of taper roller bearing, then install the drive pinion shaft and selected shim to adapter plate.

### Tightening torque:

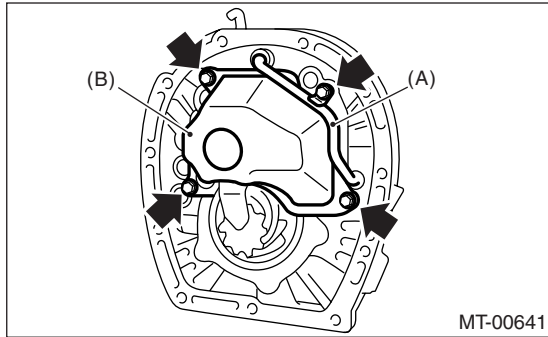
**54 N·m (5.5 kgf-m, 39.8 ft-lb)**



11) Install the oil chamber and pipe.

### Tightening torque:

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



(A) Pipe

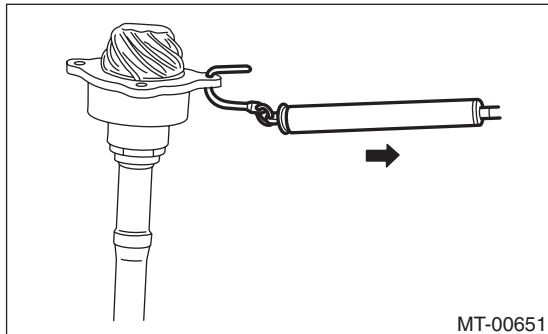
(B) Oil chamber

## E: INSPECTION

1) Using the spring balancer, measure the starting torque. If the starting torque is out of specification, replace the taper roller bearing.

### Starting torque:

**0 — 0.95 N (0 — 0.097 kgf, 0 — 0.21 lbf)**



2) Gears

Replace the gears in the following case.

- Gear teeth surfaces are broken or excessively worn.

3) Bearings

Replace the bearings in the following cases.

- Worn, rusted and damaged bearing
- Bearings that fail to turn smoothly or make abnormal noise when turned

4) Adapter plate

Replace the adapter plate in the following cases.

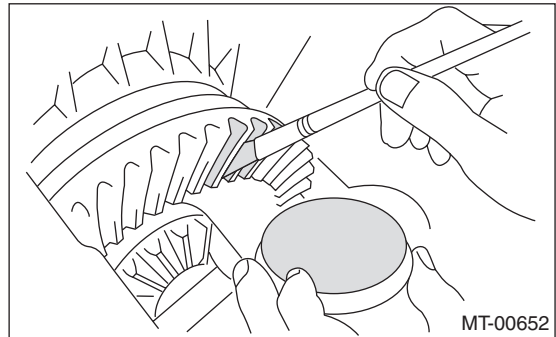
- Worn, rusted and damaged bearing
- Damaged adapter plate

5) Make sure the pipe and pipe chamber is not damaged or clogged. Repair or replace if damaged or clogged.

## F: ADJUSTMENT

1) Inspect and adjust the backlash between hypoid driven gear and drive pinion. <Ref. to 6MT-109, HYPOID GEAR BACKLASH, ADJUSTMENT, Front Differential Assembly.>

2) Apply a uniform thin coat of red lead on both teeth surfaces of three or four teeth of the hypoid driven gear.



3) Install the drive pinion shaft assembly to clutch housing, then tighten it with at least four bolts.

### NOTE:

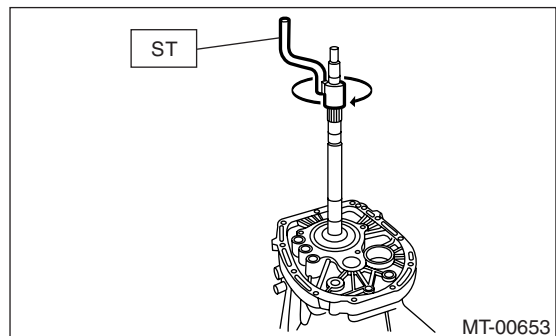
Install it with the remaining liquid gasket to prevent the mating surface of clutch housing and adapter plate from damaging.

### Tightening torque:

**50 N·m (5.1 kgf-m, 36.9 ft-lb)**

4) Using the ST, rotate several times.

ST 18631AA000 HANDLE

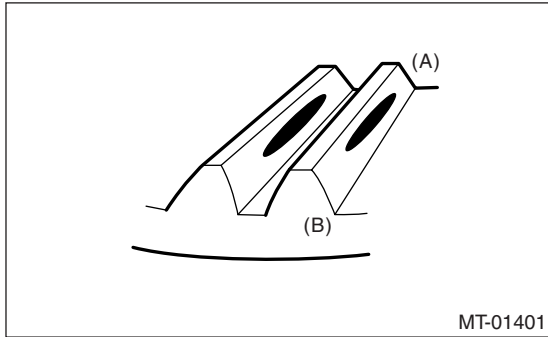


# Drive Pinion Shaft Assembly

5) Remove the drive pinion shaft assembly, and then check tooth contact. If it is inaccurate, adjust the backlash or thickness of shim.

- Tooth contact

**Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]**

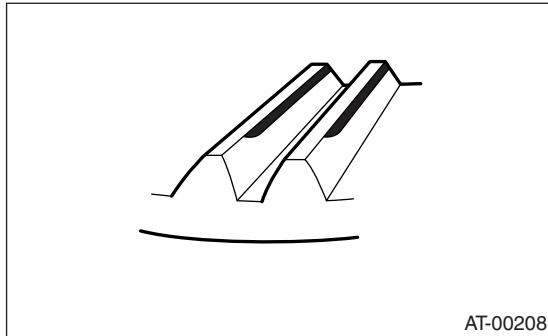


- (A) Toe side
- (B) Heel side

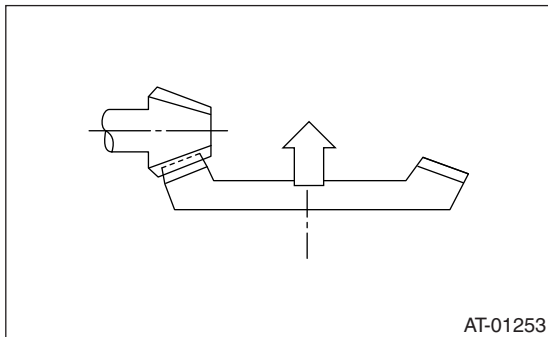
- Face contact

**Checking item: Backlash is too large.**

Contact pattern



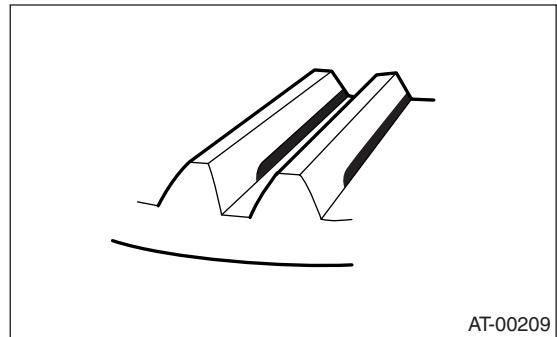
Corrective action: Verify the backlash again, and then adjust it.



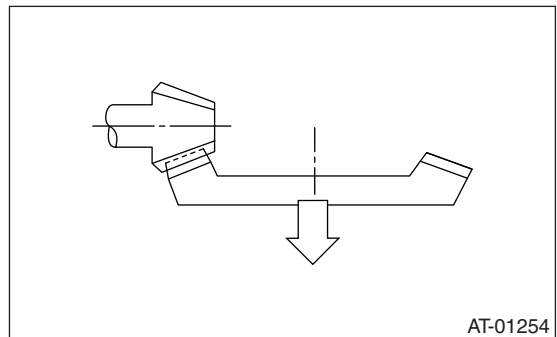
- Flank contact

**Checking item: Backlash is too small.**

Contact pattern



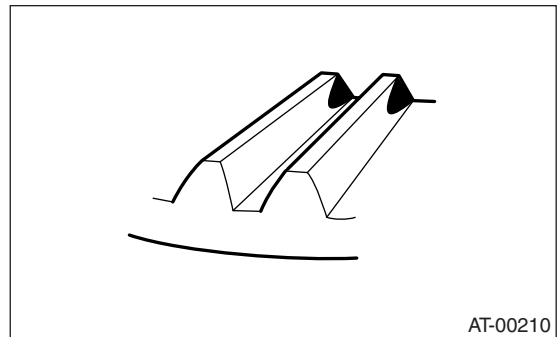
Corrective action: Verify the backlash again, and then adjust it.



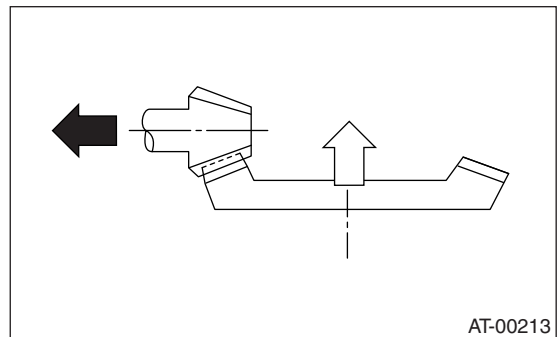
- Toe contact (Inside end contact)

**Checking item: Contact areas is small.**

Contact pattern



Corrective action: Reduce thickness of drive pinion shim in order to move drive pinion away from crown gear.





# Drive Pinion Shaft Assembly

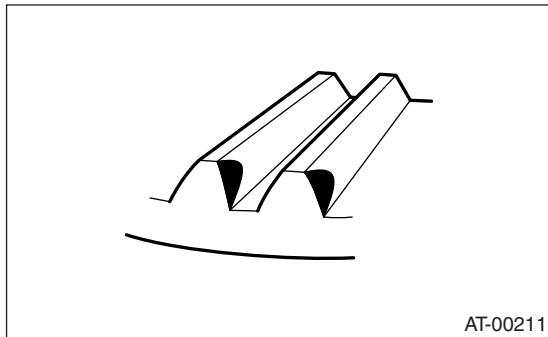
## MANUAL TRANSMISSION AND DIFFERENTIAL

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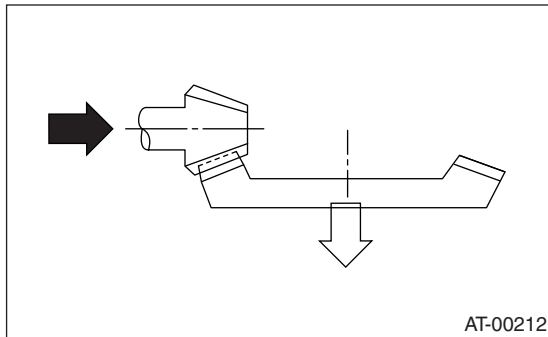
- Heel contact (Outside end contact)

**Checking item: Contact areas is small.**

Contact pattern



Corrective action: Increase thickness of drive pinion shim in order to bring drive pinion close to crown gear.



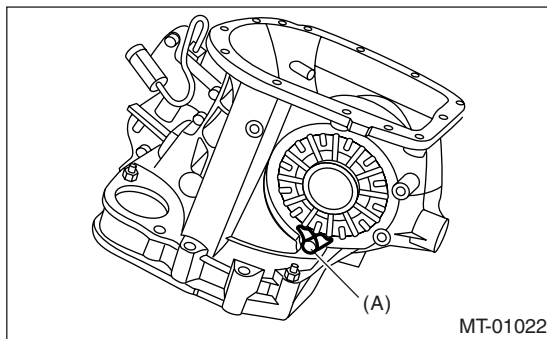
# Front Differential Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

## 24. Front Differential Assembly

### A: REMOVAL

- 1) Remove the manual transmission assembly. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
- 2) Prepare the transmission for overhaul. <Ref. to 6MT-42, Preparation for Overhaul.>
- 3) Remove the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-44, REMOVAL, Oil Pipe.> <Ref. to 6MT-47, REMOVAL, Neutral Position Switch.> <Ref. to 6MT-45, REMOVAL, Back-up Light Switch.>
- 4) Remove the extension case. <Ref. to 6MT-49, REMOVAL, Extension Case.>
- 5) Remove the transfer driven gear. <Ref. to 6MT-61, REMOVAL, Transfer Driven Gear.>
- 6) Remove the center differential. <Ref. to 6MT-63, REMOVAL, Center Differential.>
- 7) Remove the oil pump. <Ref. to 6MT-64, REMOVAL, Oil Pump.>
- 8) Remove the transmission case. <Ref. to 6MT-68, REMOVAL, Transmission Case.>
- 9) Remove each gear assembly. <Ref. to 6MT-73, REMOVAL, Main Shaft Assembly.>
- 10) Remove the drive pinion shaft assembly. <Ref. to 6MT-99, REMOVAL, Drive Pinion Shaft Assembly.>
- 11) Remove the retainer lock plates on both side.



(A) Retainer lock plate

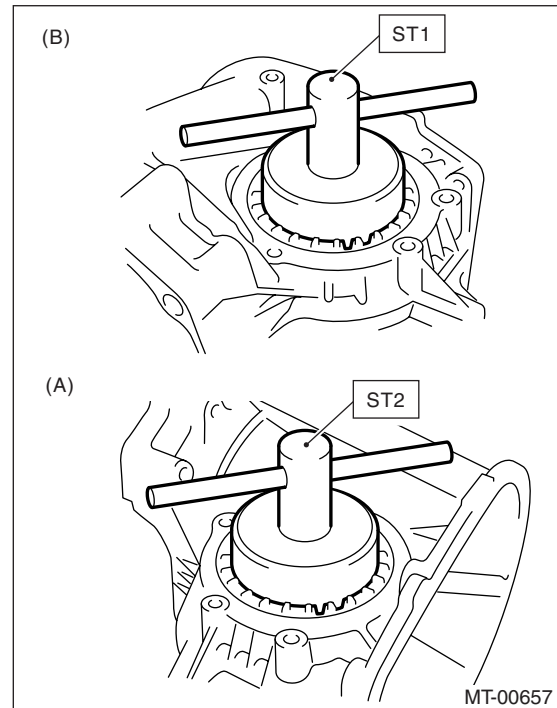
- 12) Using the ST, remove the differential side retainer on both side.

ST1 499787000 WRENCH ASSY (RIGHT SIDE)

ST2 18630AA000 WRENCH ASSY (LEFT SIDE)

### NOTE:

Be careful not to damage the part of clutch case where the retainer is to be installed.



(A) Left side

(B) Right side

- 13) Remove the front differential.

### B: INSTALLATION

- 1) Install the differential assembly into clutch housing.
- 2) Apply oil to the threaded portion part of differential side retainer.
- 3) Remove the O-ring from differential side retainer of both sides.
- 4) Using the ST, install the differential side retainer to both sides.

ST1 499787000 WRENCH ASSY (RIGHT SIDE)

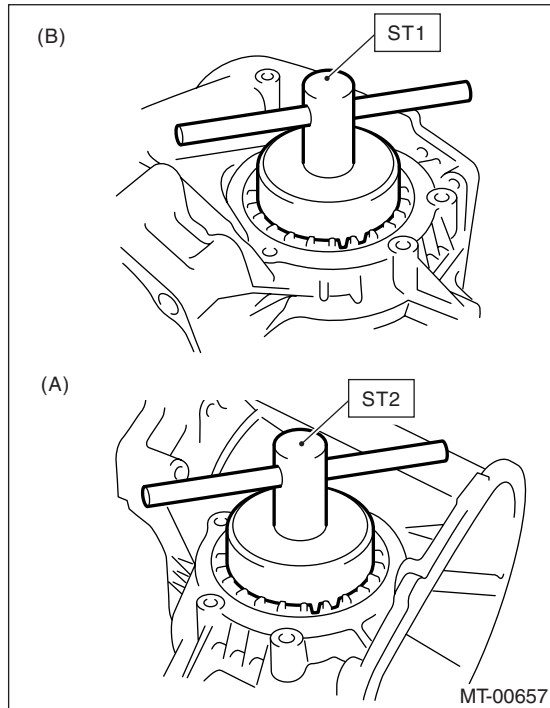
ST2 18630AA000 WRENCH ASSY (LEFT SIDE)

# Front Differential Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

### NOTE:

Be careful not to damage the oil seal.

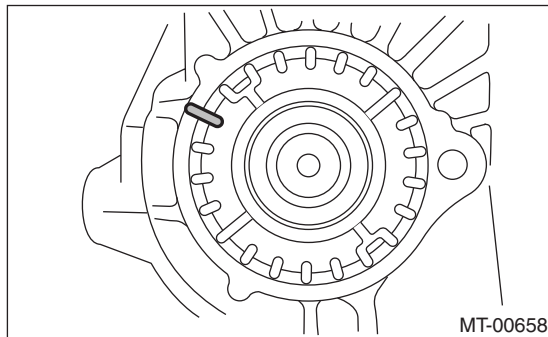


- (A) Left side
- (B) Right side

5) Check and adjust the hypoid gear backlash. <Ref. to 6MT-109, HYPOID GEAR BACKLASH, INSPECTION, Front Differential Assembly.>

6) Check and adjust the tooth contact. <Ref. to 6MT-102, ADJUSTMENT, Drive Pinion Shaft Assembly.>

7) Mark an engagement point on the right and left side retainer and clutch housing.



8) Remove the differential side retainer from both sides.

### NOTE:

Note the rotating number of time till removal, when removing the differential side retainer.

9) Install a new O-ring to differential side retainer of both sides.

10) Install the differential side retainer to both sides.

### NOTE:

Install the differential side retainer by screwing in the same rotating number of time till removal, and then align the mark.

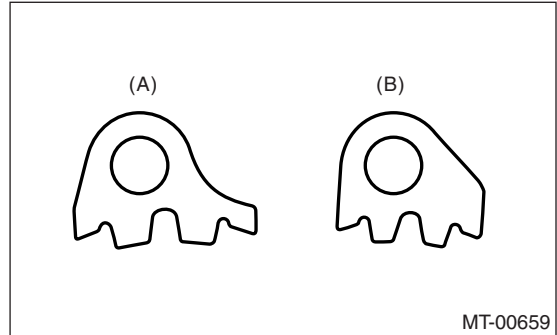
11) Install the retainer lock plate.

### Tightening torque:

**25 N·m (2.5 kgf-m, 18.1 ft-lb)**

### NOTE:

Be careful not to confuse right and left retainer lock plates.



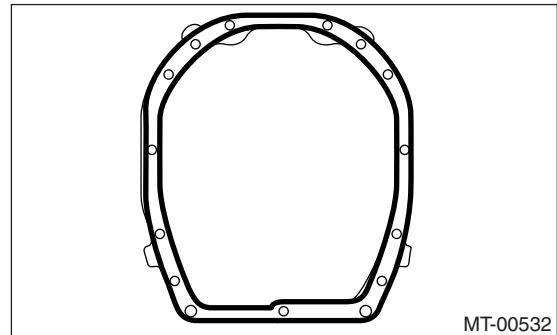
- (A) Left
- (B) Right

12) Completely remove the remaining gasket from the clutch housing and adapter plate.

13) Apply liquid gasket to the clutch housing.

### Liquid gasket:

**THREE BOND 1215 (Part No. 004403007)**



14) Install the drive pinion shaft assembly. <Ref. to 6MT-99, INSTALLATION, Drive Pinion Shaft Assembly.>

15) Install each gear assembly at once. <Ref. to 6MT-73, INSTALLATION, Main Shaft Assembly.>

16) Install the transmission case. <Ref. to 6MT-69, INSTALLATION, Transmission Case.>

17) Install the oil pump. <Ref. to 6MT-65, INSTALLATION, Oil Pump.>

18) Install the center differential. <Ref. to 6MT-63, INSTALLATION, Center Differential.>

19) Install the transfer driven gear. <Ref. to 6MT-61, INSTALLATION, Transfer Driven Gear.>

# Front Differential Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

20) Install the extension case. <Ref. to 6MT-49, INSTALLATION, Extension Case.>

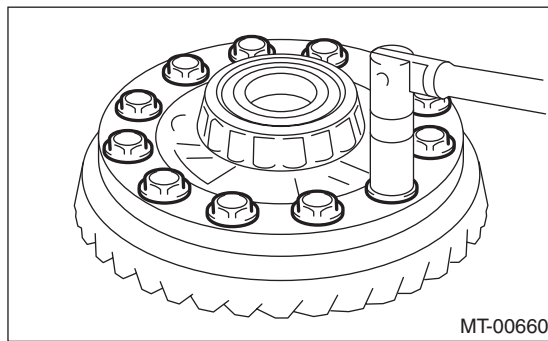
21) Install the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-44, INSTALLATION, Oil Pipe.> <Ref. to 6MT-47, INSTALLATION, Neutral Position Switch.> <Ref. to 6MT-45, INSTALLATION, Back-up Light Switch.>

22) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

## C: DISASSEMBLY

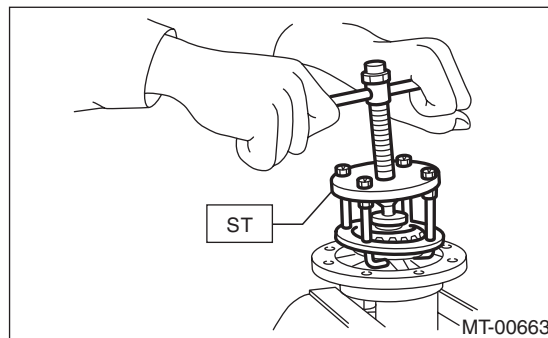
### 1. DIFFERENTIAL CASE

1) Secure the differential assembly on a vise, and then remove the hypoid driven gear.



2) Using the ST, remove the hypoid driven gear side bearing.

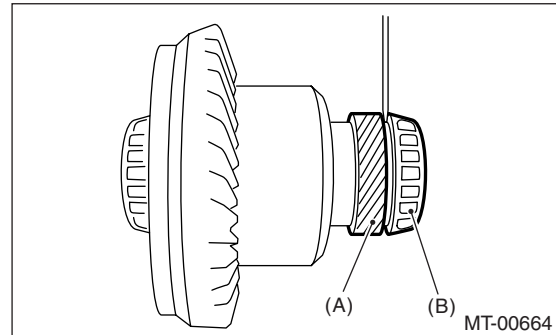
ST 399527700 PULLER SET



3) Using a screw driver, make clearance of 2 — 3 mm (0.079 — 0.118 in) between the speedometer drive gear and roller bearing.

### NOTE:

Be careful not to damage the differential case.

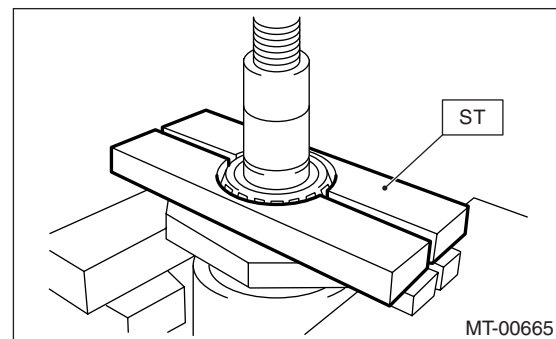


(A) Speedometer drive gear

(B) Roller bearing

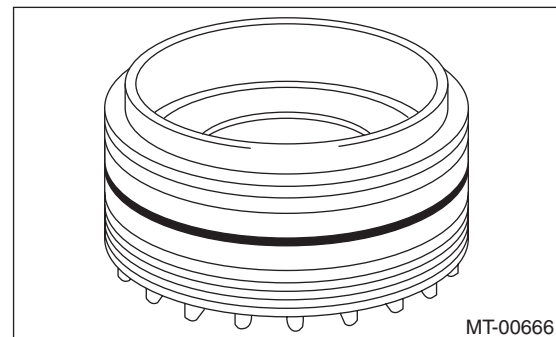
4) Using the ST, remove the roller bearing.

ST 498077000 REMOVER



### 2. DIFFERENTIAL SIDE RETAINER

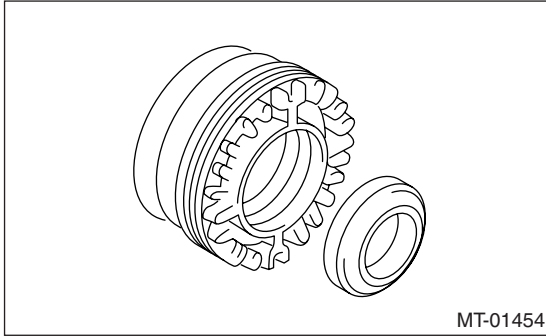
1) Remove the O-ring from differential side retainer.



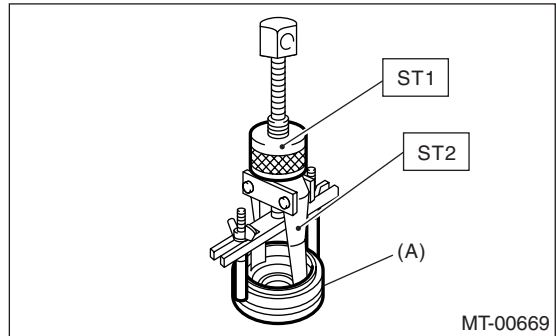
# Front Differential Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

2) Remove the oil seal from differential side retainer.

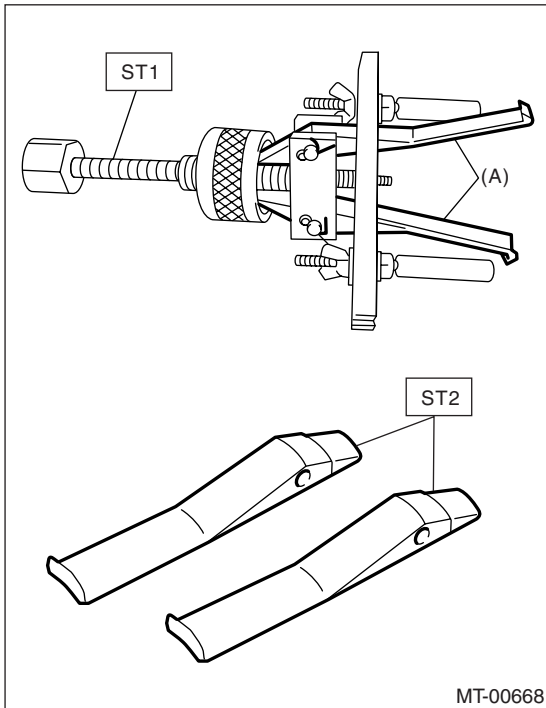


ST1 398527700 PULLER ASSY  
ST2 18760AA000 CLAW



3) Remove the claw of ST1, and then install the claw of ST2.

ST1 398527700 PULLER ASSY  
ST2 18760AA000 CLAW



(A) Differential side retainer

(A) Claw

## D: ASSEMBLY

### 1. DIFFERENTIAL CASE

1) Using the ST, install a new speedometer drive gear and right and left side bearing inner race to differential case.

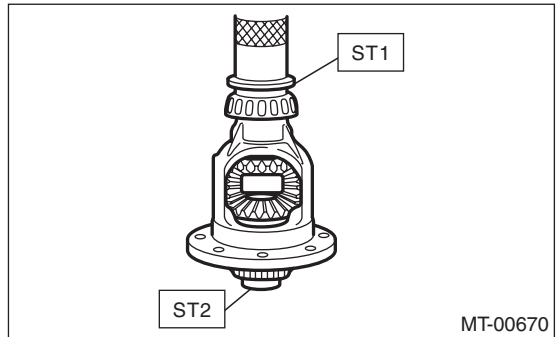
ST1 398437700 INSTALLER  
ST2 398497701 SEAT

#### CAUTION:

Do not apply pressure in excess of 20 kN (2.0 ton, 2.2 US ton, 2.0 Imp ton).

#### NOTE:

Always replace the inner race and outer race as a set.

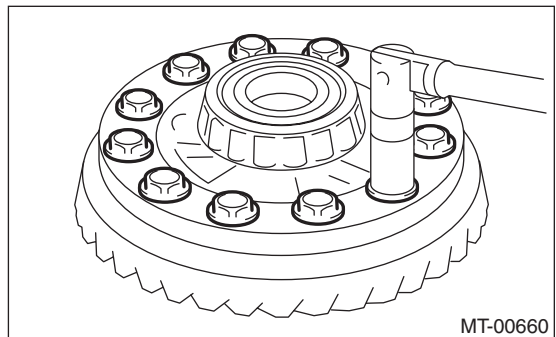


4) Remove the bearing outer race from differential side retainer.

2) Install the hypoid driven gear to differential case.

#### Tightening torque:

**69 N·m (7.0 kgf-m, 50.9 ft-lb)**

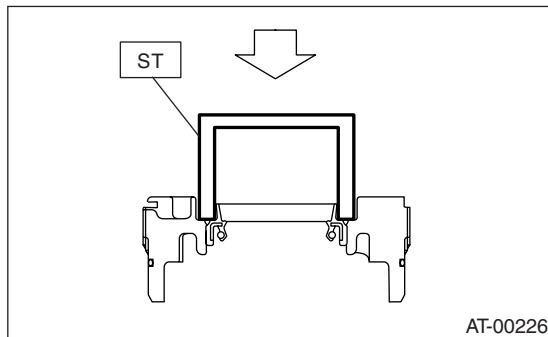


# Front Differential Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

## 2. DIFFERENTIAL SIDE RETAINER

- 1) Using the ST, install the oil seal.  
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER



- 2) Install the bearing outer race to differential side retainer on both sides.
- 3) Install the O-ring to differential side retainer on both sides.

### NOTE:

Be careful not to damage the O-ring.

## E: INSPECTION

Repair or replace the front differential in following cases.

- Each gear is damaged, seized, or excessively worn.
- Sliding surface of the differential case is damaged, seized or excessively worn.
- Bearings and bearings part are damaged, rusted or worn.
- Bearings fail to turn smoothly or make abnormal noise when turned.

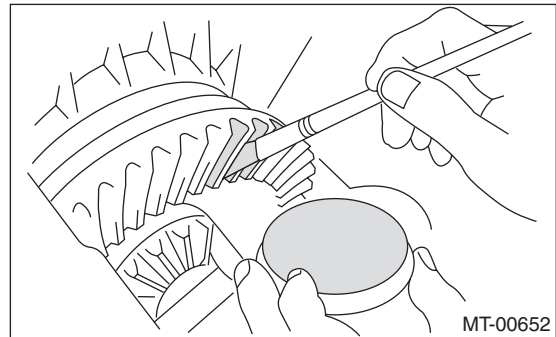
## 1. HYPOID GEAR BACKLASH

Check the hypoid gear backlash. If it is not within specifications, adjust it. <Ref. to 6MT-109, HYPOID GEAR BACKLASH, ADJUSTMENT, Front Differential Assembly.>

## 2. TOOTH CONTACT OF HYPOID GEAR

- 1) Be sure the hypoid gear backlash is within specifications. If it is not within specifications, adjust it. <Ref. to 6MT-109, HYPOID GEAR BACKLASH, ADJUSTMENT, Front Differential Assembly.>

- 2) Apply a uniform thin coat of red lead on both tooth surfaces of three or four teeth of the hypoid driven gear.



- 3) Install the drive pinion shaft assembly, and then secure it with five bolts.

### NOTE:

Use the old gasket and washer to prevent the mating surface of housing from damaging.

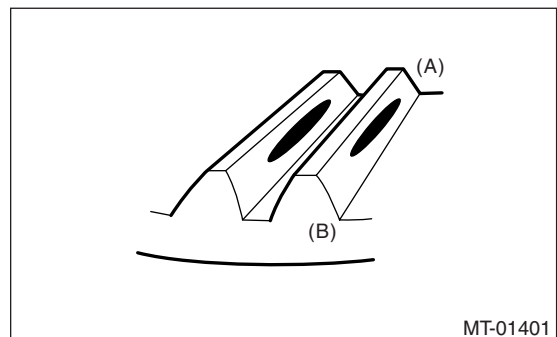
### Tightening torque:

**50 N·m (5.1 kgf-m, 36.9 ft-lb)**

- 4) Rotate the drive pinion shaft to right and left for several times.
- 5) Remove the drive pinion shaft assembly, and then check tooth contact. If tooth contact is inaccurate, adjust it. <Ref. to 6MT-102, ADJUSTMENT, Drive Pinion Shaft Assembly.>
  - Correct tooth contact.

### NOTE:

Under no load, tooth contacts 50 — 60% from center to toe side (tooth contact shifts to heel side when driving).



- (A) Toe side
- (B) Heel side

## F: ADJUSTMENT

### 1. HYPOID GEAR BACKLASH

- 1) Install the right and left side differential side retainer.

ST1 499787000 WRENCH ASSY (RIGHT SIDE)

ST2 18630AA000 WRENCH ASSY (LEFT SIDE)

# Front Differential Assembly

## MANUAL TRANSMISSION AND DIFFERENTIAL

### NOTE:

Screw in the right side differential side retainer a bit further than left side.

2) Install the drive pinion shaft assembly, and then secure it with five bolts.

### NOTE:

Use the old gasket and washer to prevent the mating surface of housing from damaging.

### Tightening torque:

**50 N·m (5.1 kgf-m, 36.9 ft-lb)**

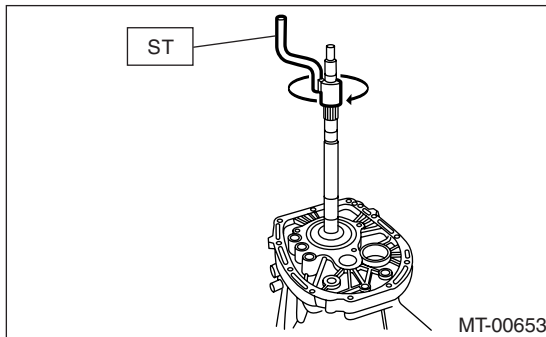
3) Using the ST, screw in the left side differential side retainer until the drive pinion and hypoid driven gear contacts lightly. Then loosen the right side differential side retainer.

ST1 499787000 WRENCH ASSY (RIGHT SIDE)

ST2 18630AA000 WRENCH ASSY (LEFT SIDE)

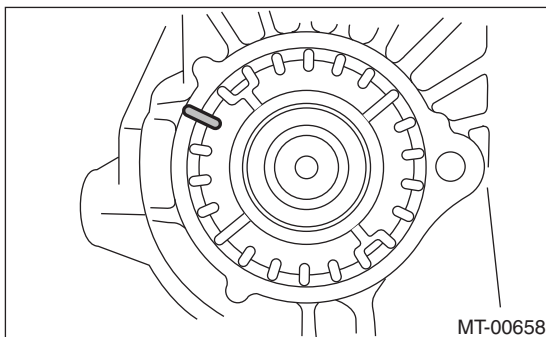
4) Using the ST, rotate the drive pinion shaft several times.

ST 18631AA000 HANDLE



5) Repeat step 3) and 4) until the left side differential side retainer can not be rotated. For the right side differential side retainer, screw it in until the inner race and outer race contacts lightly. This condition is "0" backlash.

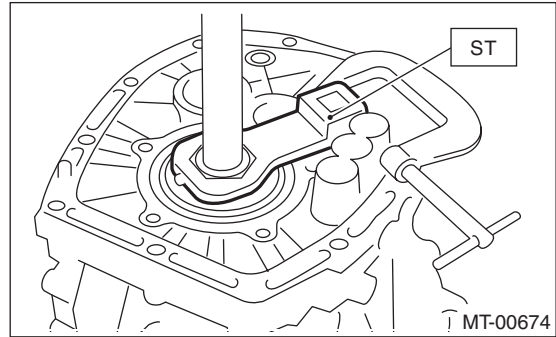
6) Mark an engagement point on the right and left side retainer and clutch housing.



7) Return the left side differential side retainer for three teeth, and screw in the right side differential side retainer for three teeth.

8) Using the ST, secure the drive pinion shaft.

ST 18621AA000 ADAPTER WRENCH



9) Install the axle shafts to both sides of front differential.

Parts No. 38415AA000 AXLE SHAFT

10) Move the axle shaft, and measure the hypoid gear backlash.

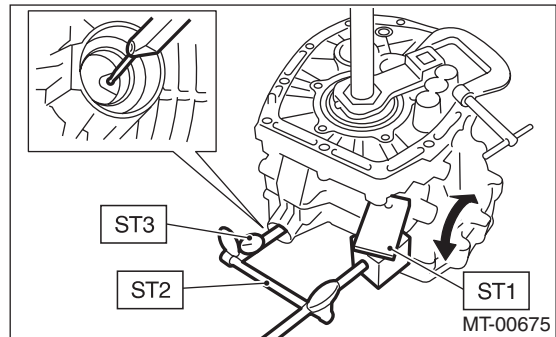
ST1 498255400 PLATE

ST2 498247001 MAGNET BASE

ST3 498247100 DIAL GAUGE

### Hypoid gear backlash:

**0.13 — 0.18 mm (0.0051 — 0.0071 in)**



11) If the backlash is out of specification, adjust it by turning the right and left side differential side retainers.

12) Screw in the right side differential side retainer for further 1.75 teeth.

## 2. TOOTH CONTACT OF HYPOID GEAR

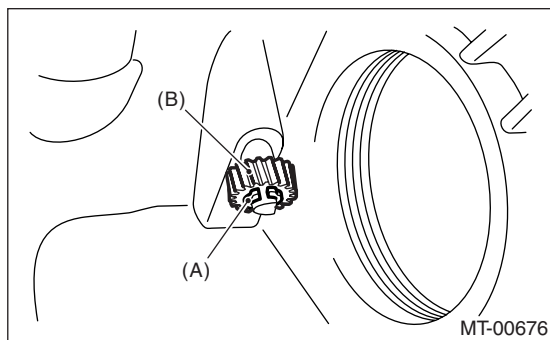
Refer to the section of drive pinion shaft for checking of tooth contact. <Ref. to 6MT-109, TOOTH CONTACT OF HYPOID GEAR, INSPECTION, Front Differential Assembly.>



## 25.Speedometer Gear

### A: REMOVAL

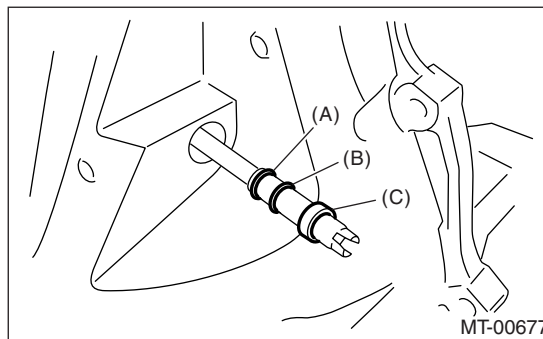
- 1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
- 2) Prepare the transmission for overhaul. <Ref. to 6MT-42, Preparation for Overhaul.>
- 3) Remove the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-44, REMOVAL, Oil Pipe.> <Ref. to 6MT-47, REMOVAL, Neutral Position Switch.> <Ref. to 6MT-45, REMOVAL, Back-up Light Switch.>
- 4) Remove the extension case. <Ref. to 6MT-49, REMOVAL, Extension Case.>
- 5) Remove the transfer driven gear. <Ref. to 6MT-61, REMOVAL, Transfer Driven Gear.>
- 6) Remove the center differential. <Ref. to 6MT-63, REMOVAL, Center Differential.>
- 7) Remove the oil pump. <Ref. to 6MT-64, REMOVAL, Oil Pump.>
- 8) Remove the transmission case. <Ref. to 6MT-68, REMOVAL, Transmission Case.>
- 9) Remove each gear assembly. <Ref. to 6MT-73, REMOVAL, Main Shaft Assembly.>
- 10) Remove the drive pinion shaft assembly. <Ref. to 6MT-99, REMOVAL, Drive Pinion Shaft Assembly.>
- 11) Remove the front differential assembly. <Ref. to 6MT-105, REMOVAL, Front Differential Assembly.>
- 12) Remove the vehicle speed sensor. <Ref. to 6MT-33, REMOVAL, Vehicle Speed Sensor.>
- 13) Remove the snap ring, and then remove the speedometer driven gear.



- (A) Snap ring  
(B) Speedometer driven gear

- 14) Remove the speedometer driven gear shaft from clutch housing.

- 15) Remove the oil seal, speedometer driven gear shaft and washer.



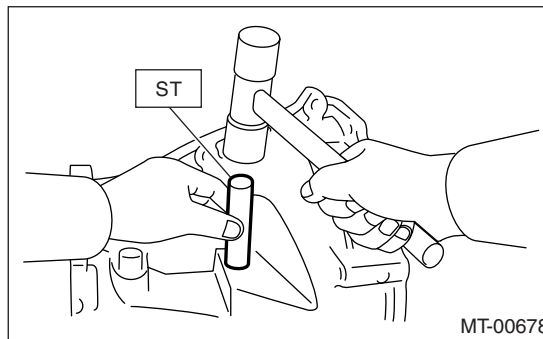
- (A) Washer  
(B) Snap ring  
(C) Oil seal

- 16) Remove the snap ring from speedometer driven gear shaft.

### B: INSTALLATION

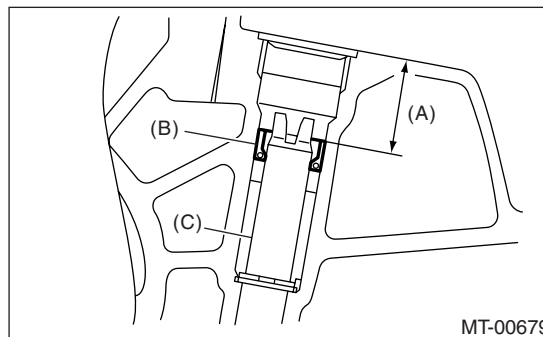
- 1) Install the oil seal, washer and snap ring to speedometer driven gear shaft.
- 2) Insert the speedometer driven gear shaft. Using the ST, press the oil seal.

ST 899824100 or 499827000 PRESS



#### NOTE:

- Replace the oil seal with a new one.
- Insert the oil seal approx. 24 mm (0.94 in) from the edge of clutch case.



- (A) Approx. 24 mm (0.94 in)  
(B) Oil seal  
(C) Speedometer driven gear shaft

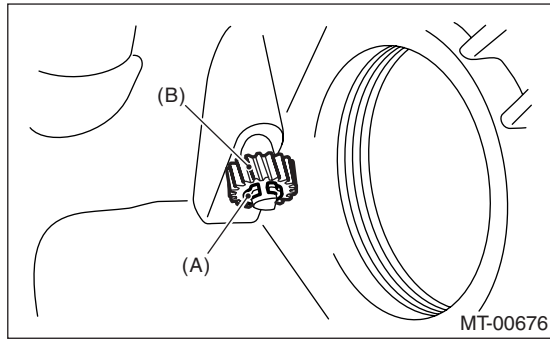


## Speedometer Gear

### MANUAL TRANSMISSION AND DIFFERENTIAL

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3) Install the speedometer driven gear and snap ring.



- (A) Snap ring
- (B) Speedometer driven gear

4) Install the vehicle speed sensor. <Ref. to 6MT-33, INSTALLATION, Vehicle Speed Sensor.>

5) Install the front differential assembly. <Ref. to 6MT-105, INSTALLATION, Front Differential Assembly.>

6) Install the drive pinion shaft assembly. <Ref. to 6MT-99, INSTALLATION, Drive Pinion Shaft Assembly.>

7) Install each gear assembly at once. <Ref. to 6MT-73, INSTALLATION, Main Shaft Assembly.>

8) Install the transmission case. <Ref. to 6MT-69, INSTALLATION, Transmission Case.>

9) Install the oil pump. <Ref. to 6MT-65, INSTALLATION, Oil Pump.>

10) Install the center differential. <Ref. to 6MT-63, INSTALLATION, Center Differential.>

11) Install the transfer driven gear. <Ref. to 6MT-61, INSTALLATION, Transfer Driven Gear.>

12) Install the extension case. <Ref. to 6MT-49, INSTALLATION, Extension Case.>

13) Install the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-44, INSTALLATION, Oil Pipe.> <Ref. to 6MT-47, INSTALLATION, Neutral Position Switch.> <Ref. to 6MT-45, INSTALLATION, Back-up Light Switch.>

14) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

# Shifter Fork and Rod

MANUAL TRANSMISSION AND DIFFERENTIAL

## 26. Shifter Fork and Rod

### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
- 2) Prepare the transmission for overhaul. <Ref. to 6MT-42, Preparation for Overhaul.>
- 3) Remove the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-44, REMOVAL, Oil Pipe.> <Ref. to 6MT-47, REMOVAL, Neutral Position Switch.> <Ref. to 6MT-45, REMOVAL, Back-up Light Switch.>
- 4) Remove the extension case. <Ref. to 6MT-49, REMOVAL, Extension Case.>
- 5) Remove the transfer driven gear. <Ref. to 6MT-61, REMOVAL, Transfer Driven Gear.>
- 6) Remove the center differential. <Ref. to 6MT-63, REMOVAL, Center Differential.>
- 7) Remove the oil pump. <Ref. to 6MT-64, REMOVAL, Oil Pump.>
- 8) Remove the transmission case. <Ref. to 6MT-68, REMOVAL, Transmission Case.>
- 9) Remove each gear assembly. <Ref. to 6MT-73, REMOVAL, Main Shaft Assembly.>

### B: INSTALLATION

- 1) Install each gear assembly at once. <Ref. to 6MT-73, INSTALLATION, Main Shaft Assembly.>
- 2) Install the transmission case. <Ref. to 6MT-69, INSTALLATION, Transmission Case.>
- 3) Install the oil pump. <Ref. to 6MT-65, INSTALLATION, Oil Pump.>
- 4) Install the center differential. <Ref. to 6MT-63, INSTALLATION, Center Differential.>
- 5) Install the transfer driven gear. <Ref. to 6MT-61, INSTALLATION, Transfer Driven Gear.>
- 6) Install the extension case. <Ref. to 6MT-49, INSTALLATION, Extension Case.>
- 7) Install the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-44, INSTALLATION, Oil Pipe.> <Ref. to 6MT-47, INSTALLATION, Neutral Position Switch.> <Ref. to 6MT-45, INSTALLATION, Back-up Light Switch.>
- 8) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

### C: DISASSEMBLY

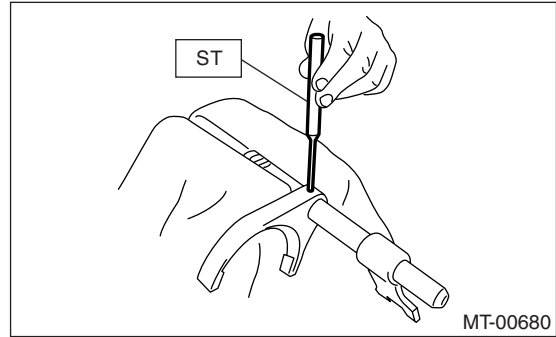
#### NOTE:

Discard the removed spring pin and replace it with a new one.

#### 1. REVERSE SHIFTER FORK

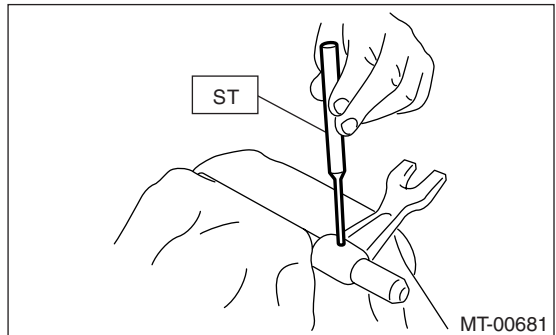
- 1) Using the ST, remove the reverse fork.

ST 398791700 REMOVER



- 2) Using the ST, remove the reverse shifter arm.

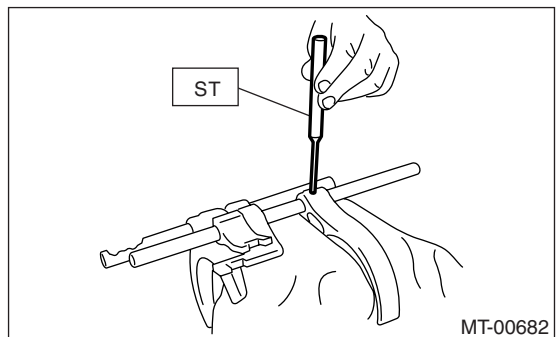
ST 398791700 REMOVER



#### 2. 1st-2nd, 3rd-4th SHIFTER FORK

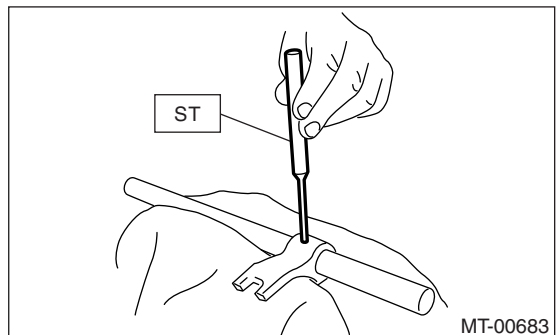
- 1) Using the ST, remove the 3rd-4th shifter fork.

ST 398791700 REMOVER



- 2) Using the ST, remove the 3rd-4th shifter arm.

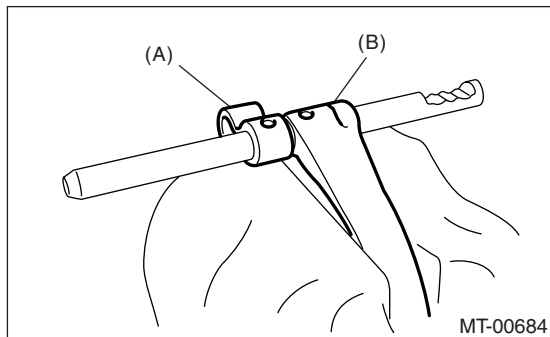
ST 398791700 REMOVER



- 3) Using the ST, remove the 1st-2nd shifter arm and 1st-2nd shifter fork.

# Shifter Fork and Rod

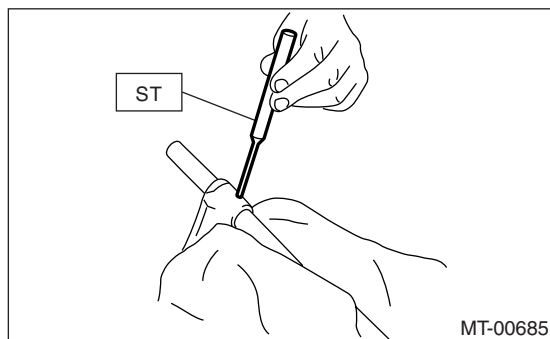
ST 398791700 REMOVER



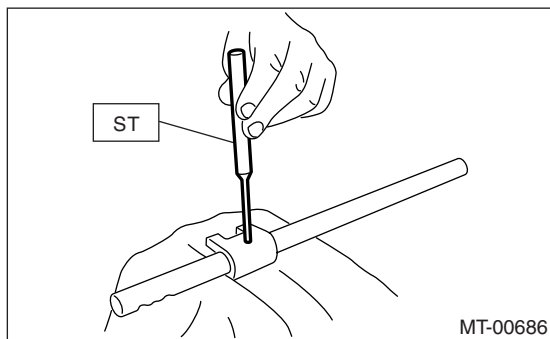
- (A) 1st-2nd shifter arm
- (B) 1st-2nd shifter fork

### 3. 5th-6th SHIFTER FORK

1) Using the ST, remove the 5th-6th shifter fork.  
ST 398791700 REMOVER



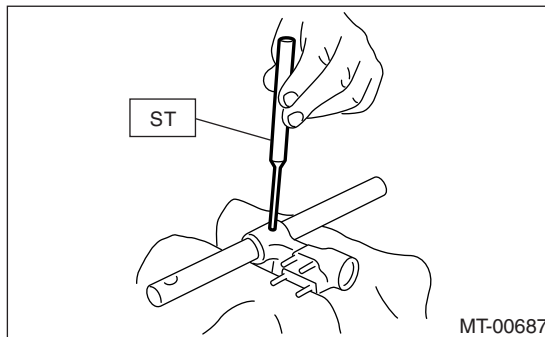
2) Using the ST, remove the 5th-6th shifter arm.  
ST 398791700 REMOVER



### 4. SHIFT ARM SHAFT

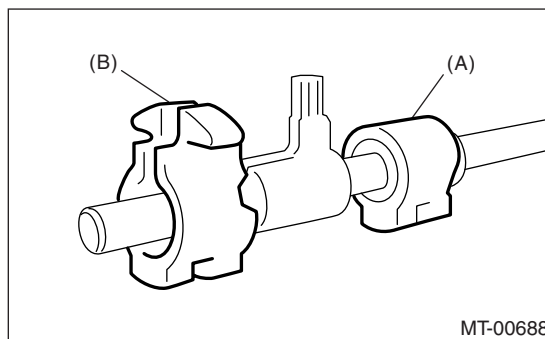
Using the ST, remove the selector arm.

ST 398791700 REMOVER



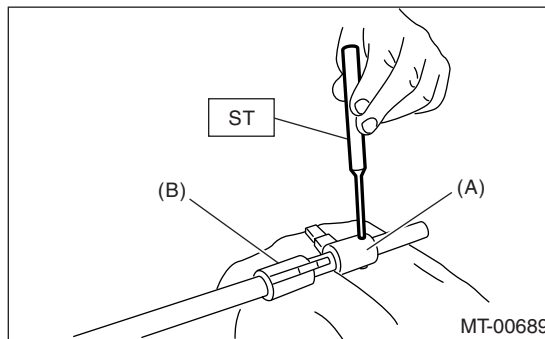
### 5. STRIKING ROD

1) Remove the reverse interlock block and interlock block from striking rod.



- (A) Reverse interlock block
- (B) Interlock block

2) Using the ST, remove the reverse interlock arm.  
ST 398791700 REMOVER



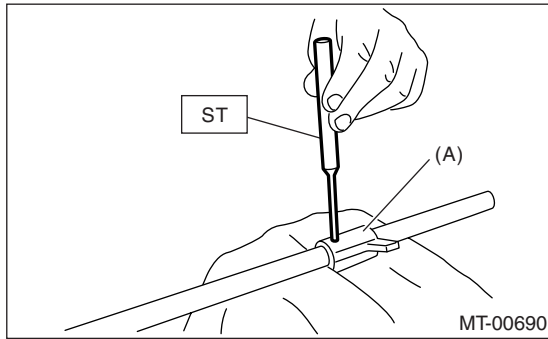
- (A) Reverse interlock arm
- (B) Interlock arm

3) Using the ST, remove the interlock arm.

# Shifter Fork and Rod

MANUAL TRANSMISSION AND DIFFERENTIAL

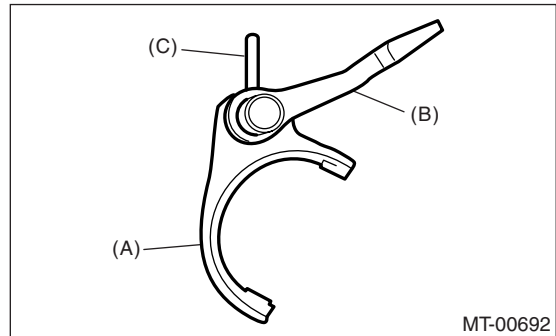
ST 398791700 REMOVER



(A) Interlock arm

NOTE:

Make sure to install the reverse arm and rod in proper direction.



- (A) Reverse arm
- (B) Reverse fork rod
- (C) Spring pin

## D: ASSEMBLY

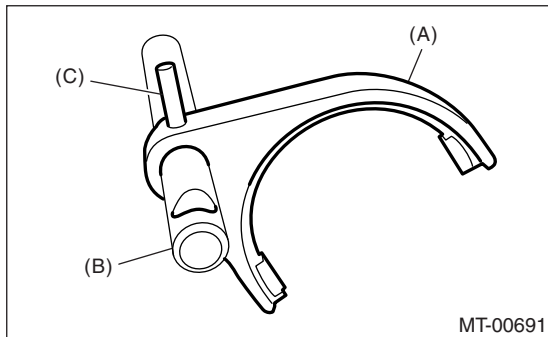
### 1. REVERSE SHIFTER FORK

1) Using the ST, install the reverse fork.

ST 398791700 REMOVER

NOTE:

Make sure to install the reverse fork and rod in proper direction.



- (A) Reverse fork
- (B) Reverse fork rod
- (C) Spring pin

2) Using the ST, install the reverse arm.

ST 398791700 REMOVER

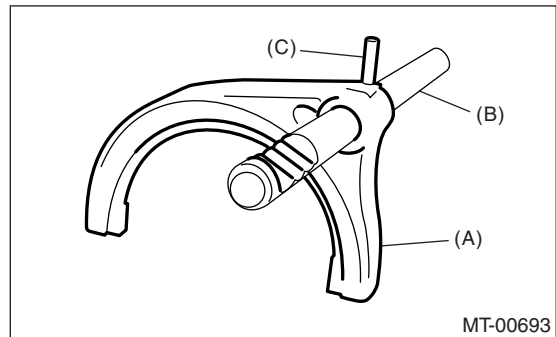
### 2. 1st-2nd, 3rd-4th SHIFTER FORK

1) Using the ST, install the 1st-2nd shifter fork.

ST 398791700 REMOVER

NOTE:

Make sure to install the 1st-2nd shifter fork and rod in proper direction.



- (A) 1st-2nd shifter fork
- (B) 1st-2nd fork rod
- (C) Spring pin

2) Using the ST, install the 1st-2nd shifter arm.

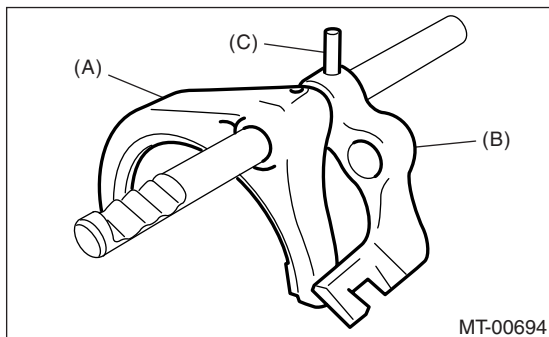
ST 398791700 REMOVER

# Shifter Fork and Rod

## MANUAL TRANSMISSION AND DIFFERENTIAL

### NOTE:

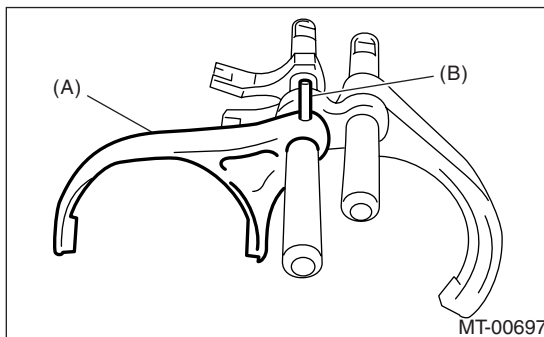
Make sure to install the 1st-2nd shifter arm and fork in proper direction.



- (A) 1st-2nd shifter fork
- (B) 1st-2nd fork arm
- (C) Spring pin

### NOTE:

Make sure to install the 3rd-4th shifter fork in proper direction.

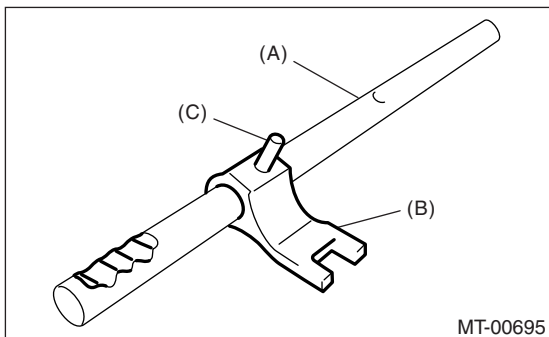


- (A) 3rd-4th shifter fork
- (B) Spring pin

3) Using the ST, install the 3rd-4th shifter arm.  
ST 398791700 REMOVER

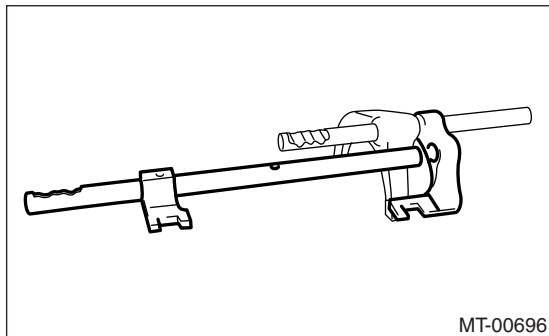
### NOTE:

Make sure to install the 3rd-4th shifter arm and rod in proper direction.



- (A) 3rd-4th fork rod
- (B) 3rd-4th shifter arm
- (C) Spring pin

4) Install the 3rd-4th fork rod into 1st-2nd shifter arm.



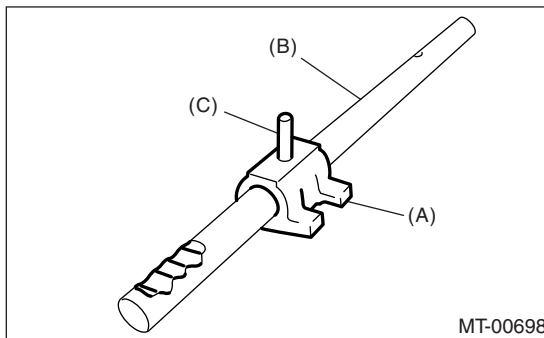
5) Using the ST, install the 3rd-4th shifter fork.  
ST 398791700 REMOVER

### 3. 5th-6th SHIFTER FORK

1) Using ST, install the 5th-6th shifter arm.  
ST 398791700 REMOVER

### NOTE:

Make sure to install the 5th-6th shifter arm and rod in proper direction.



- (A) 5th-6th shifter arm
- (B) 5th-6th fork rod
- (C) Spring pin

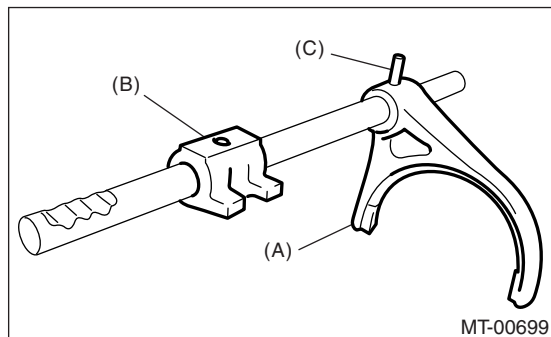
2) Using the ST, install the 5th-6th shifter fork.  
ST 398791700 REMOVER

# Shifter Fork and Rod

MANUAL TRANSMISSION AND DIFFERENTIAL

## NOTE:

Make sure to install the 5th-6th shifter fork and arm in proper direction.



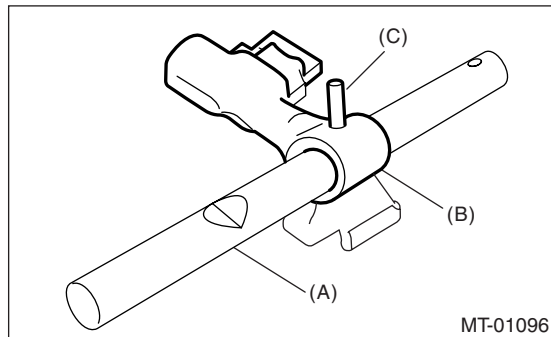
- (A) 5th-6th shifter fork
- (B) 5th-6th shifter arm
- (C) Spring pin

## 4. SHIFT ARM SHAFT

Using the ST, install the selector arm.  
ST 398791700 REMOVER

## NOTE:

Make sure to install the selector arm and rod in proper direction.



- (A) Selector rod
- (B) Selector arm
- (C) Spring pin

## 5. STRIKING ROD

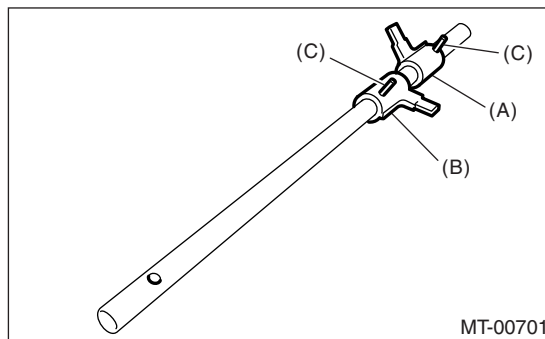
1) Using the ST, install the reverse interlock arm and interlock arm.

ST 398791700 REMOVER

## NOTE:

• Make sure to install the reverse interlock arm and rod in proper direction.

• Make sure to install the interlock arm and rod in proper direction.

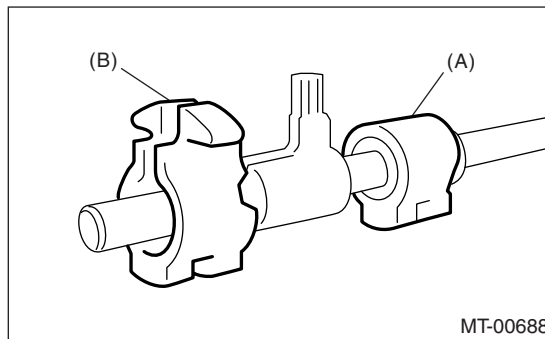


- (A) Reverse interlock arm
- (B) Interlock arm
- (C) Spring pin

2) Install the reverse interlock block and interlock block to striking rod.

## NOTE:

Make sure to install the reverse interlock block and interlock block in proper direction.



- (A) Reverse interlock block
- (B) Interlock block

## E: INSPECTION

1) Check the shift shaft and shift rod for damage. Replace if damaged.

2) Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

# Shifter Fork and Rod

## MANUAL TRANSMISSION AND DIFFERENTIAL

### F: ADJUSTMENT

#### 1. SELECTION OF 1st-2nd FORK ROD

##### NOTE:

- Perform the following procedures when.  
Replacing the 1st, 2nd driven gear.
- Replacing the 1st, 2nd synchro ring assembly.
- Replacing the adapter plate.
- Replacing the driven shaft.
- Replacing the 1st-2nd hub, sleeve assembly.

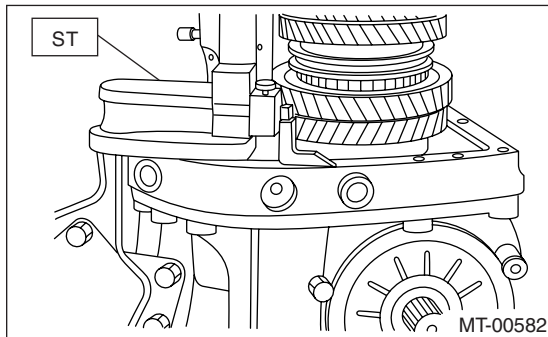
1) Insert the drive pinion assembly in adapter plate.

##### NOTE:

Make sure the thrust bearing outer race is not removed and drive pinion is not lift-up.

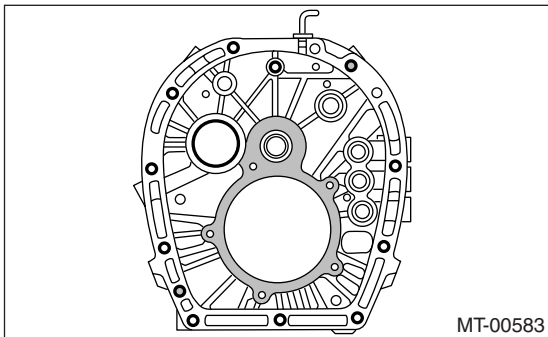
2) Set the height gauge to adapter plate. Lower the indicator of height gauge to mating surface of adapter plate and case, then set to zero point.

ST 18853AA000 HEIGHT GAUGE



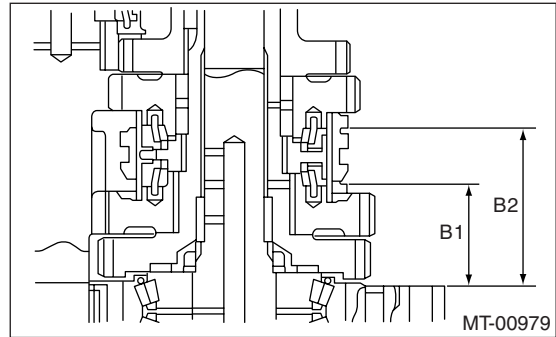
##### NOTE:

- Remove the remaining gasket on edge surface with scraper, since the adapter plate is base point of measurement.
- Do not place the height gauge on shaded area in the figure during measurement.

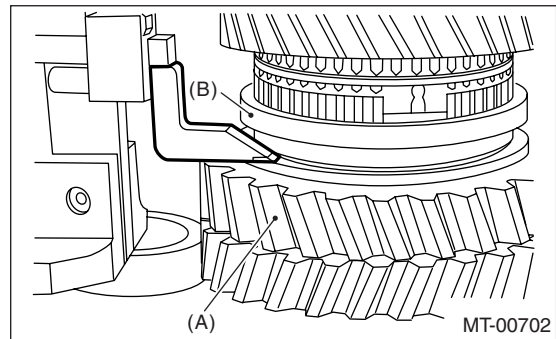


3) Select the main shaft snap ring. <Ref. to 6MT-84, ADJUSTMENT, Main Shaft Assembly.>

4) Measure "B1" and "B2" as shown in the figure.



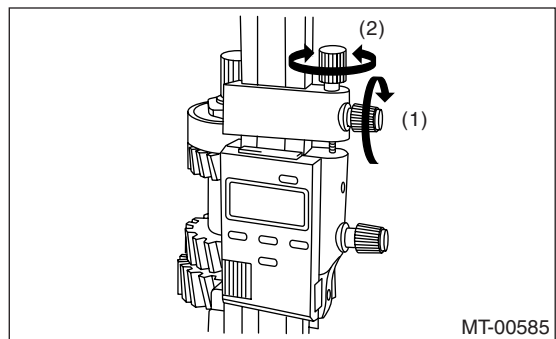
(1) Shift the 1st-2nd sleeve to 1st driven gear side, then press down to the stopper and measure "B1".



- (A) 1st driven gear
- (B) 1st-2nd sleeve

##### NOTE:

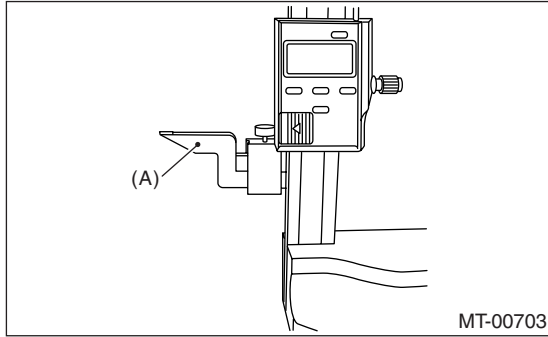
- Set the indicator of height gauge near measuring object, then lock the dial (1) as shown in the figure. Turn dial (2) to set the indicator to edge surface of sleeve 1st side.
- Measure five points of the sleeve turning every approx. 72°. Round off each two upper and lower measurement value. Use the remaining center value as measurement value.





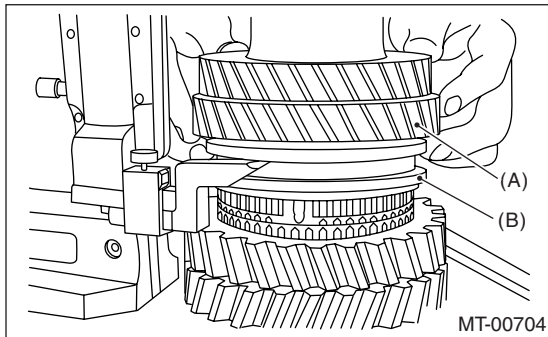
# Shifter Fork and Rod

(2) Set the height gauge indicator upside down.



(A) Indicator

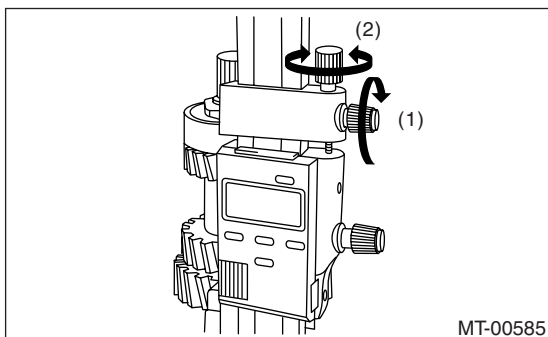
(3) Shift the 1st-2nd sleeve to 2nd driven gear side, then press up to the stopper and measure "B2".



(A) 2nd driven gear  
(B) 1st-2nd sleeve

**NOTE:**

- Set the indicator of height gauge near measuring object, then lock the dial (1) as shown in the figure. Turn dial (2) to set the indicator to edge surface of sleeve 2nd side.
- Perform the measuring procedure with two people, and measure the sleeve lifted up straight.
- Measure five points of the sleeve turning every approx. 72° apart. Round off each two upper and lower measurement value. Use the remaining center value as measurement value.



(4) According to both measurements, calculate the 1st-2nd sleeve neutral position. Select the

fork rod which applies to the calculated value from following equation.

**Equation:  $T = (B1 + B2) / 2$**

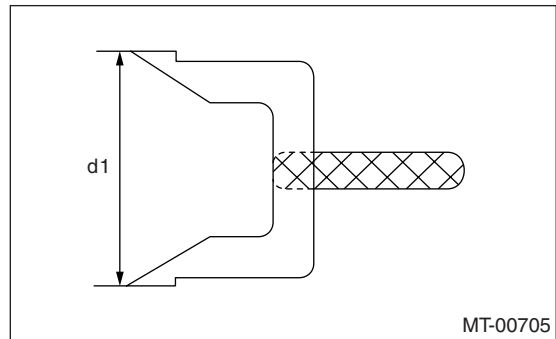
T: 1st-2nd sleeve center position

B1: Height from adapter plate edge to sleeve edge when shifted to 1st gear.

B2: Height from adapter plate edge to sleeve edge when shifted to 2nd gear. [measurement value + 55 mm (2.17 in)]

**NOTE:**

The indicator is installed upside down compared to the setting procedure of zero point. Add "d1" [fixing value: 55 mm (2.17 in)] from the following figure to "B2", to obtain measurement value of "B2".



| T             | mm (in)           | Lot No. (Mark)    |
|---------------|-------------------|-------------------|
| 62.93 — 63.23 | (2.4776 — 2.4894) | 32801AA111 (1)    |
| 63.23 — 63.53 | (2.4894 — 2.5012) | 32801AA131 (None) |
| 63.53 — 63.83 | (2.5012 — 2.5130) | 32801AA141 (2)    |

## 2. SELECTION OF 3rd-4th FORK ROD

**NOTE:**

Perform the following procedures when.

- Replacing the main shaft.
- Replacing the 3rd, 3rd to 6th drive gear and bushing.
- Replacing the 3rd, 3rd to 6th synchro assembly.
- Replacing the 3rd-4th hub, sleeve assembly.

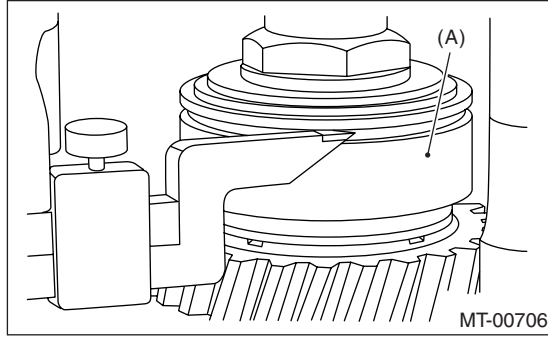
- 1) Insert the main shaft assembly in adapter plate.
- 2) Set the height gauge to adapter plate. Lower the indicator of height gauge to upper surface of snap ring groove, on the upper side of main rear bearing, then set to zero point.



# Shifter Fork and Rod

## MANUAL TRANSMISSION AND DIFFERENTIAL

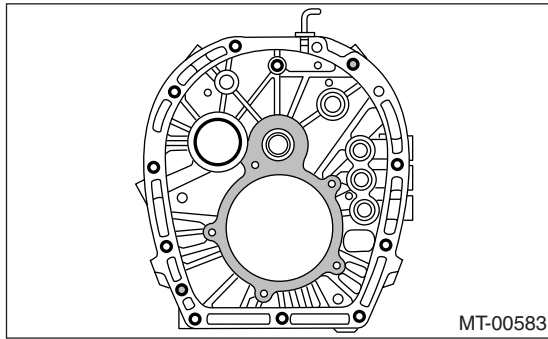
### ST 18853AA000 HEIGHT GAUGE



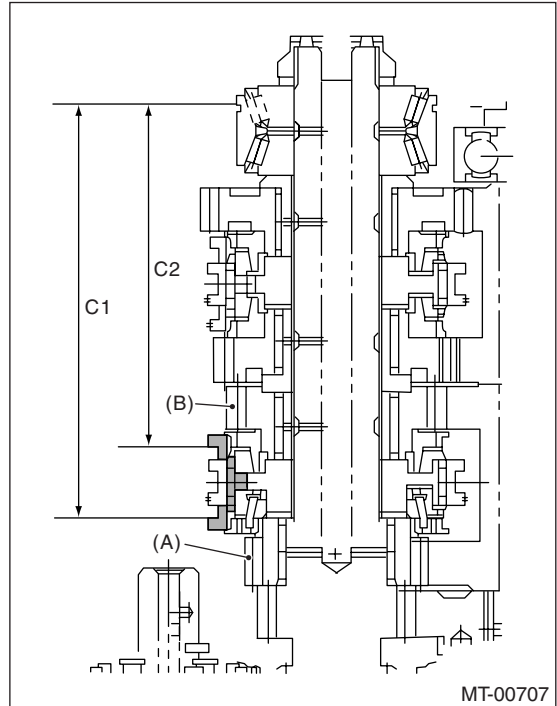
(A) Roller bearing

#### NOTE:

- Remove the remaining gasket on edge surface with scraper, since the height gauge is set on adapter plate during measurement.
- Do not put the height gauge on shaded area in the figure during the measurement.

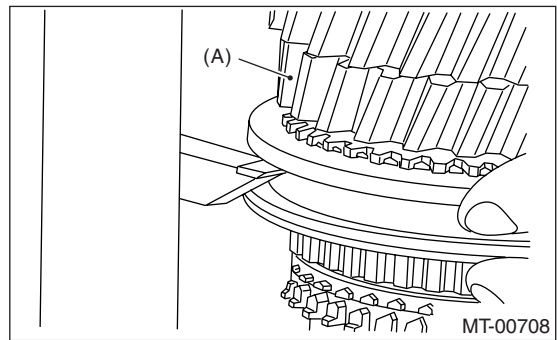


3) Using the height gauge, measure "C1" and "C2" shown in the figure.



- (A) 3rd drive gear  
(B) 4th drive gear

(1) Shift the 3rd-4th sleeve to 4th gear side, then press up to the stopper and measure "C2".



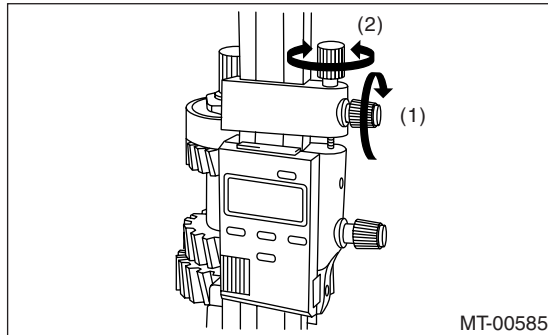
(A) 4th drive gear

#### NOTE:

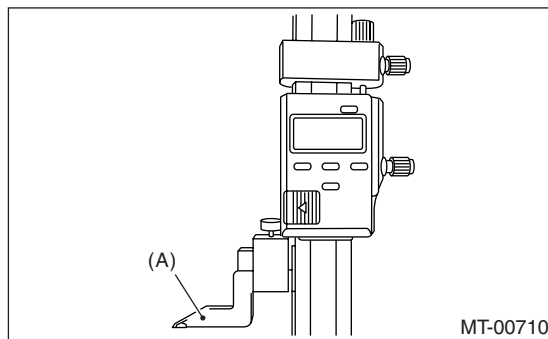
- Set the indicator of height gauge near measuring object, then lock the dial (1) as shown in the figure.
- Turn dial (2) to set the indicator to edge surface of sleeve 4th side.
- Perform the measuring procedure with two people, and measure the sleeve lifted up straight.

# Shifter Fork and Rod

- Measure five points of the sleeve turning every approx. 72°. Round off each two upper and lower measurement value. Use the remaining center value as measurement value.

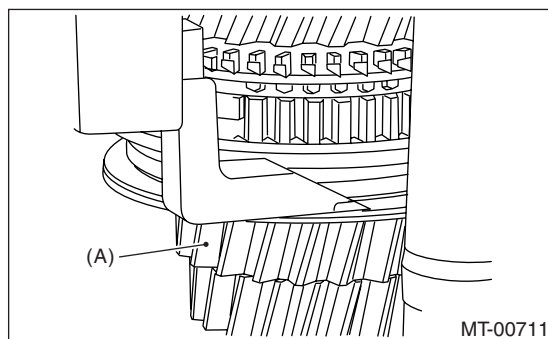


(2) Set the height gauge indicator upside down.



(A) Indicator

(3) Shift the 3rd-4th sleeve to 3rd drive gear side, then press down to the stopper and measure "C1".

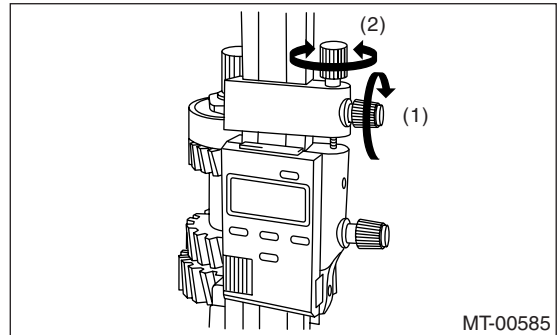


(A) 3rd drive gear

**NOTE:**

- Set the indicator of height gauge near measuring object, then lock the dial (1) as shown in the figure. Turn dial (2) to set the indicator to edge surface of sleeve 3rd side.

- Measure five points of the sleeve turning every approx. 72°. Round off each two upper and lower measurement value. Use the remaining center value as measurement value.



4) According to both measurements, calculate the 3rd-4th sleeve neutral position. Select the fork rod which applies to the calculated value from following equation.

**Equation:  $T = (C1 + C2) / 2$**

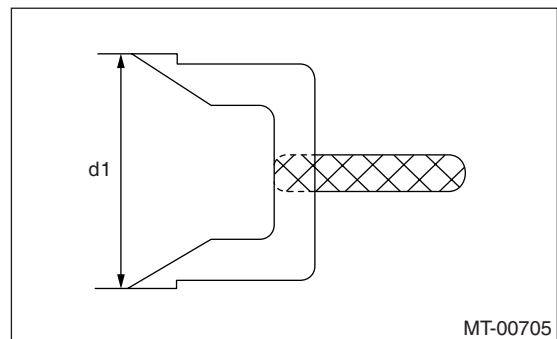
T: 3rd-4th sleeve center position

C1: Length from main shaft rear bearing snap ring groove to sleeve edge when shifted to 3rd gear. [measurement value +55 mm (2.17 in)]

C2: Length from main shaft rear bearing snap ring groove to sleeve edge when shifted to 4th gear.

**NOTE:**

The indicator is installed upside down compared to the setting procedure of zero point. Add "d1" [fixing value: 55 mm (2.17 in)] from the following figure to "C1", to obtain measurement value of "C1".



# Shifter Fork and Rod

## MANUAL TRANSMISSION AND DIFFERENTIAL

| T mm (in)                                  | Lot No. (Mark)   |  |  |
|--|--|--|--|
|  | M.SFT<br>Snap ring<br>805072010<br>[t = 1.65 mm<br>(0.065 in)] | M.SFT<br>Snap ring<br>805072011<br>[t = 1.95 mm<br>(0.077 in)] | M.SFT<br>Snap ring<br>805072012<br>[t = 2.25 mm<br>(0.089 in)] |
| 137.22 —<br>137.52<br>(5.4024 —<br>5.4142) | 32809AA171<br>(None)   | 32809AA181<br>(2)  | 32809AA191<br>(4)  |
| 137.52 —<br>137.82<br>(5.4142 —<br>5.4260) | 32809AA161<br>(1)  | 32809AA171<br>(None)   | 32809AA181<br>(2)  |
| 137.82 —<br>138.12<br>(5.4260 —<br>5.4379) | 32809AA141<br>(3)  | 32809AA161<br>(1)  | 32809AA171<br>(None)   |

T = Thickness

### 3. SELECTION OF 5th-6th FORK ROD

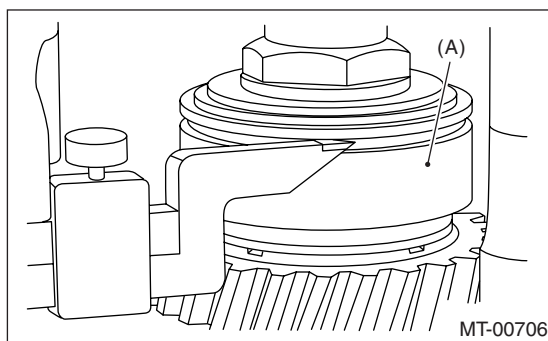
#### NOTE:

Perform the following procedures when.

- Replacing the main shaft.
- Replacing the 3rd to 6th drive gear and bushing.
- Replacing the 3rd to 6th synchro ring assembly.
- Replacing the 3rd-4th hub, sleeve assembly.
- Replacing the 5th-6th hub, sleeve assembly.

- 1) Insert the main shaft assembly in adapter plate.
- 2) Set the height gauge to adapter plate. Lower the indicator of height gauge to upper surface of snap ring groove, or the upper side of main rear bearing. Then set to zero point.

ST 18853AA000 HEIGHT GAUGE

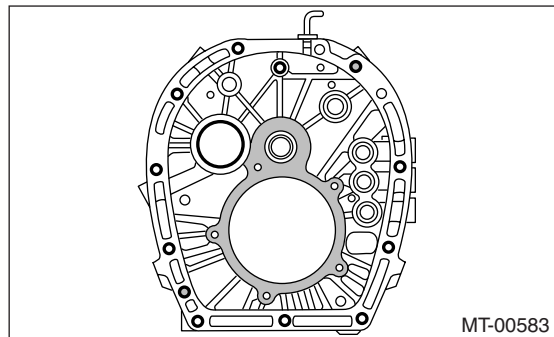


(A) Ball bearing

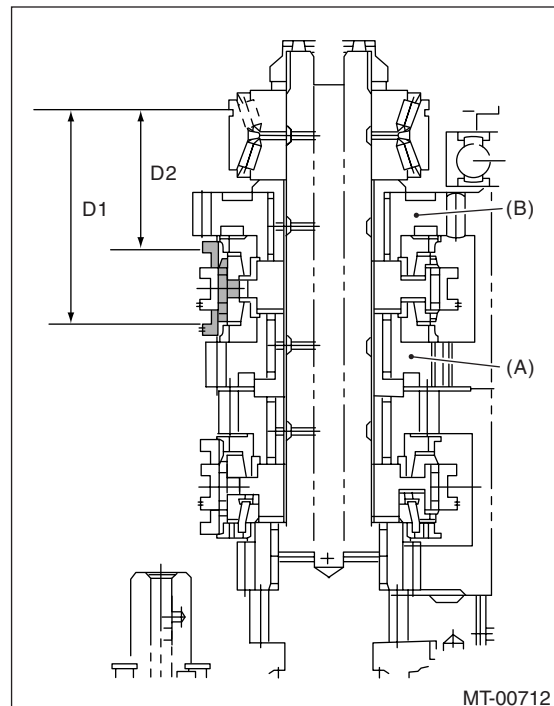
#### NOTE:

- Remove the remaining gasket on edge surface with scraper, since the height gauge is set on adapter plate during measurement.

- Do not place the height gauge on shaded area in the figure during the measurement.

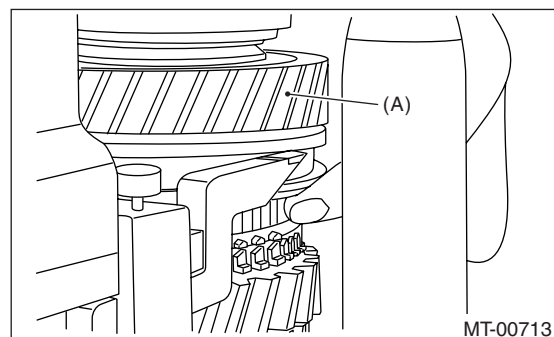


- 3) Using the height gauge, measure “D1” and “D2” shown in the figure.



- (A) 5th main gear  
(B) 6th main gear

- (1) Shift the 5th-6th sleeve to 6th main gear side, then press up to the stopper and measure “D2”.

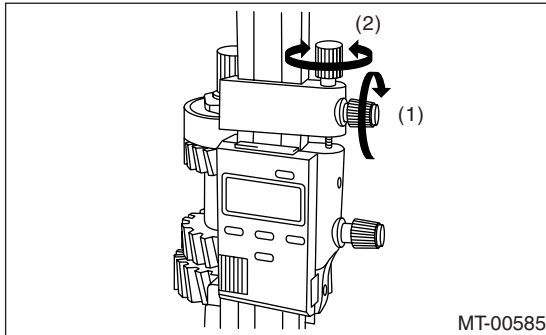


(A) 6th main gear

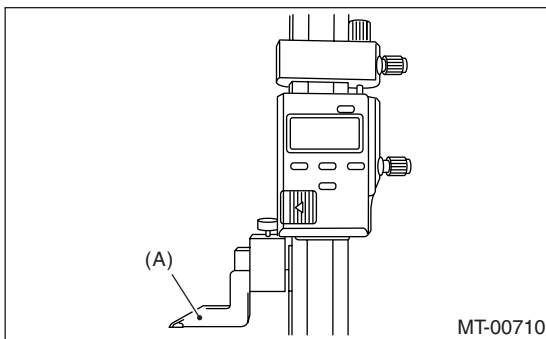
# Shifter Fork and Rod

**NOTE:**

- Set the indicator of height gauge near measuring object, then lock the dial (1) as shown in the figure. Turn dial (2) to set the indicator to edge surface of sleeve 6th side.
- Perform the measuring procedure with two people, and measure the sleeve lifted up straight.
- Measure five points of the sleeve turning every approx. 72°. Round off each two upper and lower measurement value. Use the remaining center value as measurement value.

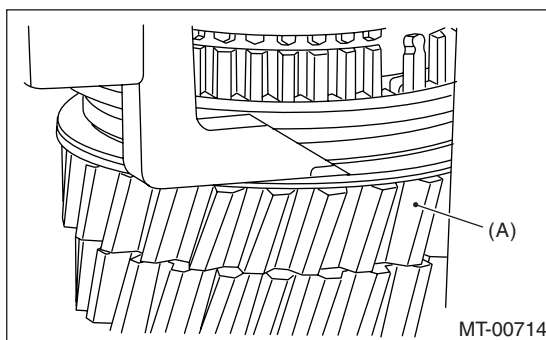


(2) Set the height gauge indicator upside down.



(A) Indicator

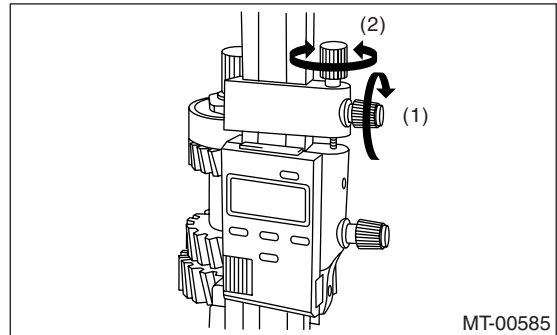
(3) Shift the 5th-6th sleeve to 5th main gear side, then press down to the stopper and measure "D1".



(A) 5th main gear

**NOTE:**

- Set the indicator of height gauge near measuring object, then lock the dial (1) as shown in the figure. Turn dial (2) to set the indicator to edge surface of sleeve 5th side.
- Measure five points of the sleeve turning every approx. 72°. Round off each two upper and lower measurement value. Use the remaining center value as measurement value.



4) According to both measurements, calculate the 5th-6th sleeve neutral position. Select the fork rod, which applies to the calculated value from following equation.

**Equation:  $T = (D1 + D2) / 2$**

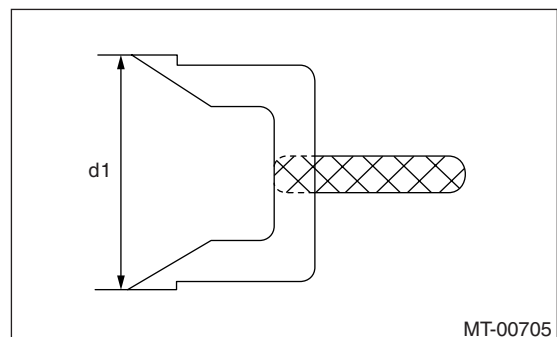
T: 5th-6th sleeve center position

D1: Length from the shaft rear bearing snap ring groove to sleeve groove edge when shifted to 5th gear. [measurement value + 55 mm (2.17 in)]

D2: Length from main shaft rear bearing snap ring groove to sleeve groove edge when shifted to 6th gear.

**NOTE:**

The indicator is installed upside down compared to the setting procedure of zero point. Add "d1" [fixing value: 55 mm (2.17 in)] from the following figure to "D1", to obtain measurement value of "D1".



# Shifter Fork and Rod

## MANUAL TRANSMISSION AND DIFFERENTIAL

| T mm (in)                                | Lot No. (Mark)   |  |  |
|--|--|--|--|
|  | M.SFT<br>Snap ring<br>805072010<br>[t = 1.65 mm<br>(0.065 in)] | M.SFT<br>Snap ring<br>805072011<br>[t = 1.95 mm<br>(0.077 in)] | M.SFT<br>Snap ring<br>805072012<br>[t = 2.25 mm<br>(0.089 in)] |
| 64.12 —<br>64.42<br>(2.5244 —<br>2.5362) | 32945AA021<br>(None)   | 32945AA031<br>(2)  | 32945AA041<br>(4)  |
| 64.42 —<br>64.72<br>(2.5362 —<br>2.5480) | 32945AA011<br>(1)  | 32945AA021<br>(None)   | 32945AA031<br>(2)  |
| 64.72 —<br>65.02<br>(2.5480 —<br>2.5598) | 32945AA001<br>(3)  | 32945AA011<br>(1)  | 32945AA021<br>(None)   |

T = Thickness

### 4. SELECTION OF REVERSE FORK ROD

#### NOTE:

Perform the following procedures when.

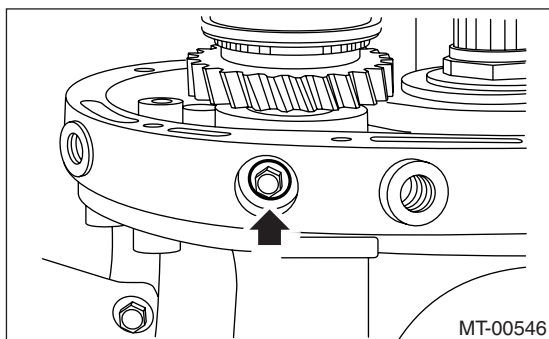
- Replacing the reverse idler gear.
- Replacing the reverse idler gear No. 2.
- Replacing the adapter plate.
- Replacing the base.

1) Insert the reverse idler gear assembly in adapter plate.

2) Tighten the base COMPL fixing bolt.

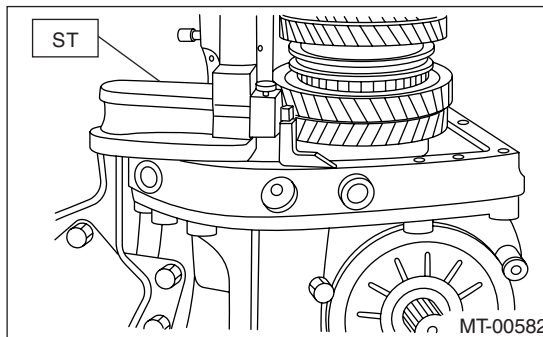
#### **Tightening torque:**

**25 N·m (2.5 kgf·m, 18.1 ft·lb)**



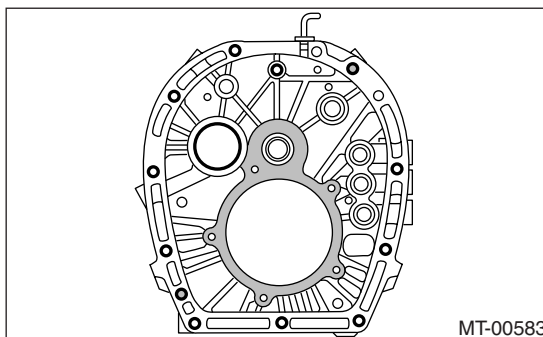
3) Set the height gauge to adapter plate. Lower the indicator of height gauge to mating surface of adapter plate and case, then set to zero point.

### ST 18853AA000 HEIGHT GAUGE



#### NOTE:

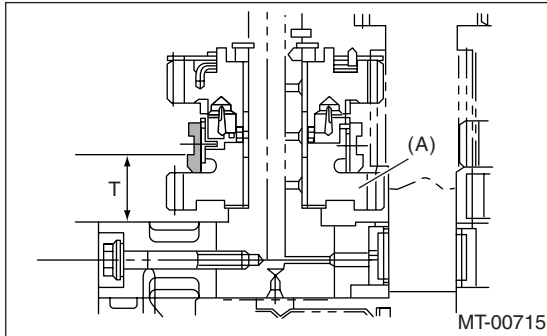
- Remove the remaining gasket on edge surface with scraper, since the adapter plate is base point of measurement.
- Do not place the height gauge on shaded area in the figure during measurement.



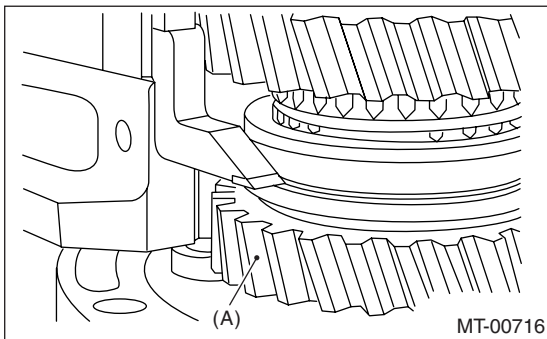
# Shifter Fork and Rod

## MANUAL TRANSMISSION AND DIFFERENTIAL

4) Press the reverse sleeve to reverse side idler gear No. 2, then measure "T".



(A) Reverse idler gear No. 2

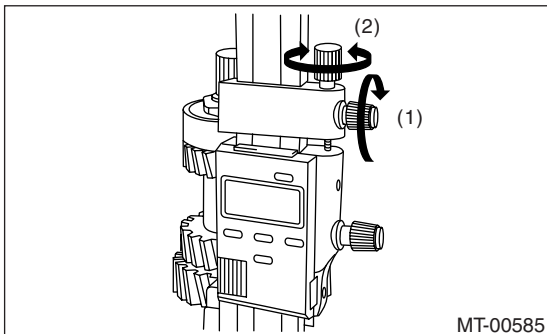


(A) Reverse idler gear No. 2

| T + 4.8 mm (0.189 in)              | Lot No. (Mark)    |
|------------------------------------|-------------------|
| 33.50 — 33.80<br>(1.3189 — 1.3307) | 32816AA110 (1)    |
| 33.80 — 34.10<br>(1.3307 — 1.3425) | 32816AA130 (None) |
| 34.10 — 34.40<br>(1.3425 — 1.3543) | 32816AA140 (2)    |
| T = Thickness                      |                   |

### NOTE:

- Set the indicator of height gauge near measuring object, then lock the dial (1) as shown in the figure. Turn dial (2) to set the indicator to edge surface of reverse sleeve side.
- Measure five points of the sleeve turning every approx. 72°. Round off each two upper and lower measurement value. Use the remaining center value as measurement value.



5) According to measurement, calculate the reverse sleeve neutral position. Select the fork rod which applies to the calculated value from following equation.

**Equation:  $T + 4.8 \text{ mm (0.189 in)}$**

# Clutch Housing

## MANUAL TRANSMISSION AND DIFFERENTIAL

### 27. Clutch Housing

#### A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
- 2) Prepare the transmission for overhaul. <Ref. to 6MT-42, Preparation for Overhaul.>
- 3) Remove the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-44, REMOVAL, Oil Pipe.> <Ref. to 6MT-47, REMOVAL, Neutral Position Switch.> <Ref. to 6MT-45, REMOVAL, Back-up Light Switch.>
- 4) Remove the extension case. <Ref. to 6MT-49, REMOVAL, Extension Case.>
- 5) Remove the transfer driven gear. <Ref. to 6MT-61, REMOVAL, Transfer Driven Gear.>
- 6) Remove the center differential. <Ref. to 6MT-63, REMOVAL, Center Differential.>
- 7) Remove the oil pump. <Ref. to 6MT-64, REMOVAL, Oil Pump.>
- 8) Remove the transmission case. <Ref. to 6MT-68, REMOVAL, Transmission Case.>
- 9) Remove each gear assembly. <Ref. to 6MT-73, REMOVAL, Main Shaft Assembly.>
- 10) Remove the drive pinion shaft assembly. <Ref. to 6MT-99, REMOVAL, Drive Pinion Shaft Assembly.>
- 11) Remove the front differential assembly. <Ref. to 6MT-105, REMOVAL, Front Differential Assembly.>
- 12) Remove the vehicle speed sensor. <Ref. to 6MT-33, REMOVAL, Vehicle Speed Sensor.>
- 13) Remove the speedometer gear. <Ref. to 6MT-111, REMOVAL, Speedometer Gear.>

#### B: INSTALLATION

- 1) Install the pitching stopper bracket.

##### *Tightening torque:*

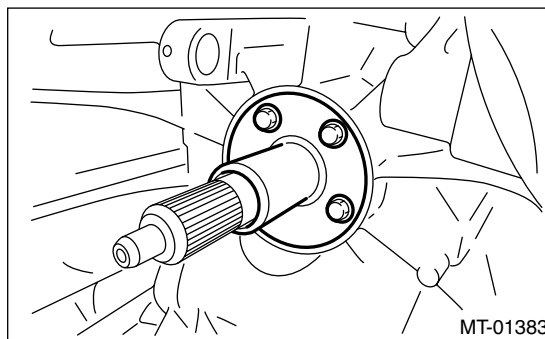
**41 N·m (4.2 kgf·m, 30.2 ft·lb)**

- 2) Install the speedometer gear. <Ref. to 6MT-111, INSTALLATION, Speedometer Gear.>
- 3) Install the vehicle speed sensor. <Ref. to 6MT-33, INSTALLATION, Vehicle Speed Sensor.>
- 4) Install the front differential assembly. <Ref. to 6MT-105, INSTALLATION, Front Differential Assembly.>
- 5) Install the drive pinion shaft assembly. <Ref. to 6MT-99, INSTALLATION, Drive Pinion Shaft Assembly.>
- 6) Install each gear assembly at once. <Ref. to 6MT-73, INSTALLATION, Main Shaft Assembly.>
- 7) Install the transmission case. <Ref. to 6MT-69, INSTALLATION, Transmission Case.>
- 8) Install the oil pump. <Ref. to 6MT-65, INSTALLATION, Oil Pump.>

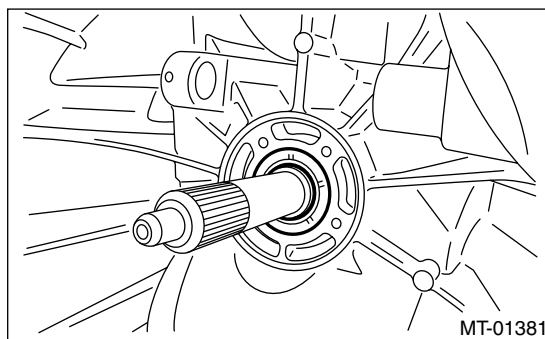
- 9) Install the center differential. <Ref. to 6MT-63, INSTALLATION, Center Differential.>
- 10) Install the transfer driven gear. <Ref. to 6MT-61, INSTALLATION, Transfer Driven Gear.>
- 11) Install the extension case. <Ref. to 6MT-49, INSTALLATION, Extension Case.>
- 12) Install the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-44, INSTALLATION, Oil Pipe.> <Ref. to 6MT-47, INSTALLATION, Neutral Position Switch.> <Ref. to 6MT-45, INSTALLATION, Back-up Light Switch.>
- 13) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

#### C: DISASSEMBLY

- 1) Remove the clutch release bearing guide.



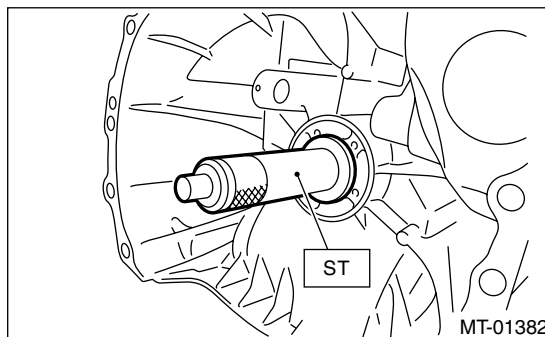
- 2) Remove the oil seal.



#### D: ASSEMBLY

- 1) Install the oil seal into clutch housing without damaging.

ST 18657AA020 OIL SEAL INSTALLER



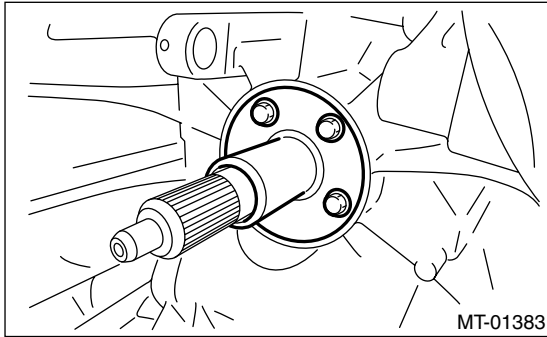
- 2) Install the clutch release bearing guide.

# Clutch Housing

MANUAL TRANSMISSION AND DIFFERENTIAL

## **Tightening torque:**

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**



## **E: INSPECTION**

- 1) Make sure there is no damage or crack on the clutch housing. Replace the clutch housing with a new one if there is excessive damage.
- 2) Check the clutch housing for gear oil leakage. If there is oil leakage, repair or replace the leakage part.



## Yaw Rate and Lateral G Sensor

MANUAL TRANSMISSION AND DIFFERENTIAL

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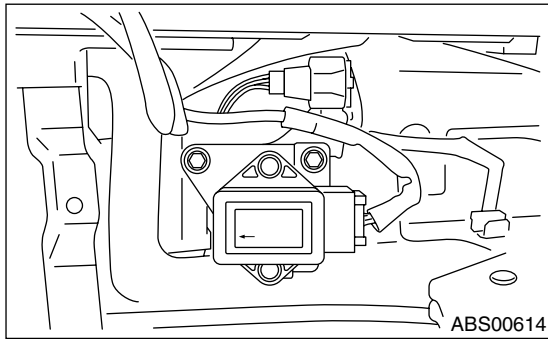
### 28. Yaw Rate and Lateral G Sensor

#### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the console cover. <Ref. to EI-46, Console Box.>
- 3) Disconnect the connector from yaw rate & lateral G sensor.
- 4) Remove the yaw rate & lateral G sensor from body.

#### CAUTION:

**Do not drop or bump the yaw rate & lateral G sensor.**



#### B: INSTALLATION

Install in the reverse order of removal.

#### CAUTION:

**Do not drop or bump the yaw rate & lateral G sensor.**

*Tightening torque:*

**18 N·m (1.8 kgf-m, 13 ft-lb)**

## 29. Driver's Control Center Differential Control Module

### A: REMOVAL

- 1) Remove the ground cable from battery.
- 2) Remove the glove box. <Ref. to EI-43, REMOVAL, Glove Box.>
- 3) Disconnect the connector after removing the bolt from the inside of glove box, and then remove the control module.

### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

***44 N·m (4.5 kgf-m, 32.5 ft-lb)***

# Steering Angle Sensor

MANUAL TRANSMISSION AND DIFFERENTIAL

## 30. Steering Angle Sensor

### A: REPLACEMENT

#### CAUTION:

- Do not perform the removal except when the replacement.
- When replacing three times or more, replace the combination switch as assembly to protect screw part.

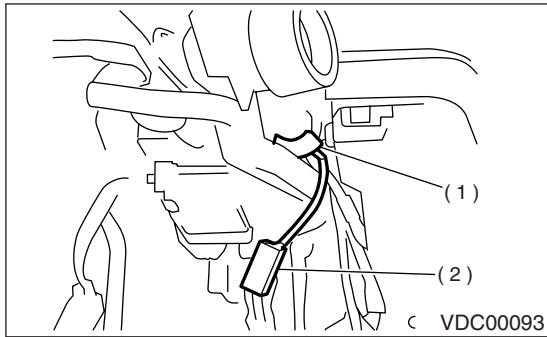
- 1) Set the steering wheel in a straight-ahead position.
- 2) Disconnect the ground cable from battery.
- 3) Remove the airbag module.  
<Ref. to AB-14, REMOVAL, Driver's Airbag Module.>

#### WARNING:

Always refer to "Airbag System" when performing the airbag module repair service.

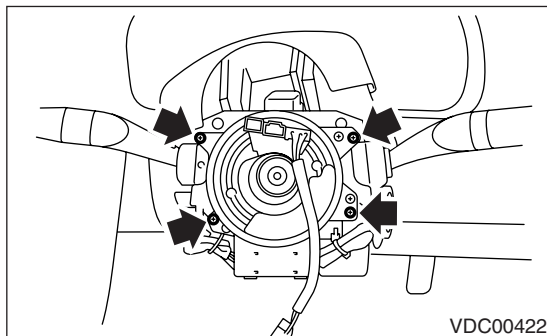
<Ref. to AB-3, CAUTION, General Description.>

- 4) Remove the steering wheel.  
<Ref. to PS-20, REMOVAL, Steering Wheel.>
- 5) Remove the screws and detach the steering column lower cover.
- 6) Remove the two screws securing the steering column upper cover.
- 7) Unlock the harness band and disconnect the connector of steering angle sensor.

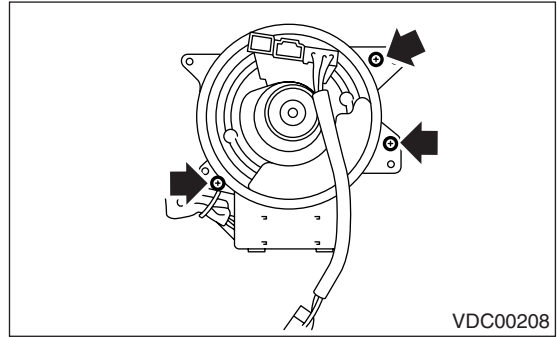


- (1) Harness band
- (2) Connector

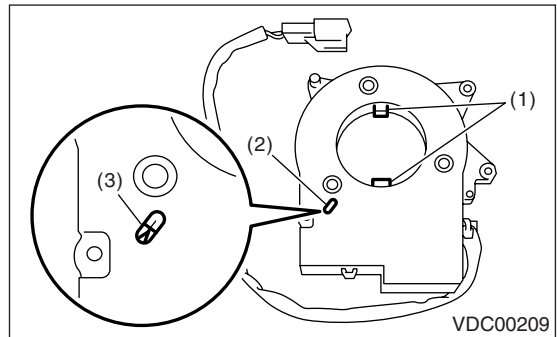
- 8) Remove the screws which secure the roll connector to the steering column.



- 9) Remove the steering angle sensor from the roll connector.



- 10) Turn the protrusion portion of new steering angle sensor to match the alignment mark of inspection hole.

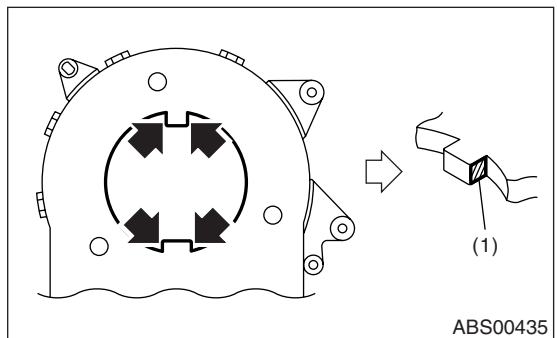


- (1) Protrusion portion
- (2) Inspection hole
- (3) Alignment mark

#### CAUTION:

Be careful not to allow foreign particles to enter from inspection hole.

- 11) Align the center of roll connector.  
<Ref. to AB-20, INSTALLATION, Roll Connector.>
- 12) Apply thin coat of grease which is enclosed with new part to the protruding parts (four) of steering angle sensor.



- (1) Apply grease.

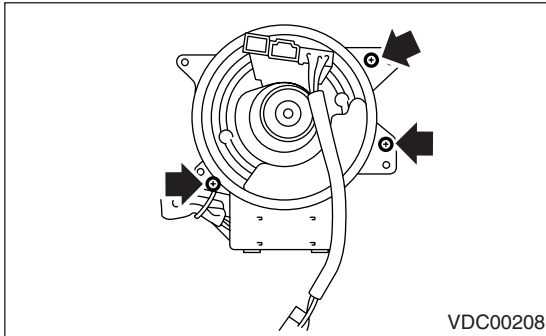
# Steering Angle Sensor

MANUAL TRANSMISSION AND DIFFERENTIAL

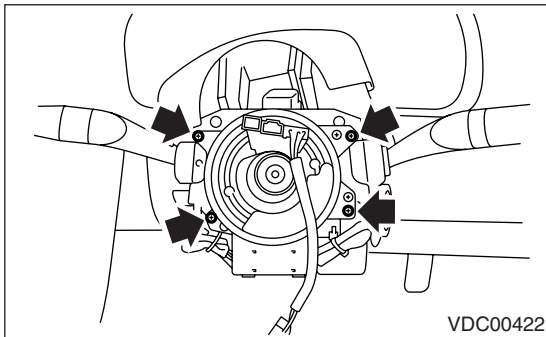
13) Align the position of protrusion portion and install the roll connector to the steering angle sensor.

**Tightening torque:**

**0.5 N·m (0.05 kgf-m, 0.36 ft-lb)**



14) Install the roll connector to combination switch.



15) Install the steering wheel.  
<Ref. to PS-20, INSTALLATION, Steering Wheel.>

**Tightening torque:**

**44 N·m (4.5 kgf-m, 32.5 ft-lb)**

16) Install the airbag module to steering wheel.  
<Ref. to AB-14, INSTALLATION, Driver's Airbag Module.>

**WARNING:**

**Always refer to "Airbag System" before performing the service operation.**

<Ref. to AB-3, CAUTION, General Description.>

17) Connect the battery ground cable to battery.

# General Diagnostic Table

MANUAL TRANSMISSION AND DIFFERENTIAL

## 31. General Diagnostic Table

### A: INSPECTION

#### 1. MANUAL TRANSMISSION

| Symptom   | Possible cause  | Remedy                                   |
|---|---|--|
| 1. Gears are difficult to intermesh.<br>NOTE:<br>The cause for difficulty in shifting gears can be classified into two kinds: one is malfunction of the gear shift system and the other is malfunction of the transmission. However, if the operation is heavy and engagement of the gears is difficult, defective clutch disengagement may also be responsible. Check whether the clutch is correctly functioning, before checking the gear shift system and transmission. | (a) Worn, damaged or burred chamfer of internal spline of sleeve and reverse driven gear  | Replace.                                 |
|   | (b) Worn, damaged or burred chamfer of spline of gears  | Replace.                                 |
|   | (c) Worn or scratched bushings  | Replace.                                 |
|   | (d) Incorrect contact between synchronizer ring and gear cone or wear   | Correct or replace.                      |
| 2. Gear slips out.<br>• Gear slips out when coasting on rough road.<br>• Gear slips out during acceleration.  | (a) Defective pitching stopper adjustment   | Adjust.                                  |
|   | (b) Loose engine mounting bolts   | Tighten or replace.                      |
|   | (c) Worn fork shifter, broken shifter fork rail spring  | Replace.                                 |
|   | (d) Worn or damaged ball bearing  | Replace.                                 |
|   | (e) Excessive clearance between splines of synchronizer hub and synchronizer sleeve   | Replace.                                 |
|   | (f) Worn tooth step of synchronizer hub (responsible for slip-out of 3rd gear)  | Replace.                                 |
|   | (g) Worn 1st driven gear, needle bearing and race   | Replace.                                 |
|   | (h) Worn 2nd driven gear, needle bearing and race   | Replace.                                 |
|   | (i) Worn 3rd drive gear and bushing   | Replace.                                 |
|   | (j) Worn 4th drive gear and bushing   | Replace.                                 |
|   | (k) Worn 5th drive gear and bushing   | Replace.                                 |
|   | (l) Worn 6th drive gear and bushing   | Replace.                                 |
|   | (m) Worn reverse idler gear and bushing   | Replace.                                 |
| 3. Unusual noise comes from transmission.<br>NOTE:<br>If an unusual noise is heard when the vehicle is parked with its engine idling and if the noise ceases when the clutch is disengaged, it may be considered that the noise comes from the transmission.  | (a) Insufficient or improper lubrication  | Lubricate or replace with specified oil. |
|   | (b) Worn or damaged gears and bearings<br>NOTE:<br>If the trouble is only wear of the tooth surfaces, merely a high roaring noise will occur at high speeds, but if any part is broken, rhythmical knocking sound will be heard even at low speeds. | Replace.                                 |

# General Diagnostic Table

MANUAL TRANSMISSION AND DIFFERENTIAL

## 2. DIFFERENTIAL

| Symptom  | Possible cause   | Remedy  |
|--|--|---|
| 1. Broken differential (case, gear, bearing, etc.)<br>NOTE:<br>Abnormal noise will develop and finally it will become impossible to continue to run due to broken pieces obstructing the gear revolution.  | (a) Insufficient or improper oil   | Replace.  |
|  | (b) Use of vehicle under severe conditions such as excessive load and improper use of clutch | Replace.  |
|  | (c) Improper adjustment of taper roller bearing  | Adjust.   |
|  | (d) Improper adjustment of drive pinion and hypoid driven gear                               | Adjust.   |
|  | (e) Loose hypoid driven gear clamping bolts  | Tighten.  |
| 2. Differential and hypoid gear noises<br>Troubles of the differential and hypoid gear always appear as noise problems. Therefore noise is the first indication of the trouble. However noises from the engine, muffler, tire, exhaust gas, bearing, body, etc. are easily mistaken for the differential noise. Pay special attention to the hypoid gear noise because it is easily confused with other gear noises. There are the following four kinds of noises. <ul style="list-style-type: none"> <li>• Gear noise when driving: If noise increases as the vehicle speed increases it may be due to insufficient gear oil, incorrect gear engagement, damaged gears, etc.</li> <li>• Gear noise when coasting: Damaged gears due to maladjusted bearings and incorrect shim adjustment</li> <li>• Bearing noise when driving or when coasting: Cracked, broken or damaged bearings</li> <li>• Noise which mainly occurs when turning: Unusual noise from the differential side gear, differential pinion, differential pinion shaft, etc.</li> </ul> | (a) Insufficient oil   | Lubricate.  |
|  | (b) Improper adjustment of hypoid driven gear and drive pinion                               | Check tooth contact.  |
|  | (c) Worn teeth of hypoid driven gear and drive pinion  | Replace as a set.<br>Readjust bearing preload.                                |
|  | (d) Loose roller bearing   | Readjust hypoid driven gear to drive pinion backlash and check tooth contact. |
|  | (e) Distorted hypoid driven gear or differential case  | Replace.  |
|  | (f) Broken or damaged LSD.   | Replace.  |

# General Diagnostic Table

MANUAL TRANSMISSION AND DIFFERENTIAL

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# MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

## *6MT(diag)*

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| 3. General Description .....  | 5           |
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# Basic Diagnostic Procedure

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

### 1. Basic Diagnostic Procedure

#### A: PROCEDURE

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <p><b>1</b></p> <p><b>CHECK PRE-INSPECTION.</b></p> <p>1) Ask the customer when and how trouble occurred using the check list for interview. &lt;Ref. to 6MT(diag)-4, Check List for Interview.&gt;</p> <p>2) Before performing diagnosis, inspect the unit which might influence the driver's control center differential. &lt;Ref. to 6MT(diag)-5, INSPECTION, General Description.&gt;</p>   | Is unit that might influence the driver's control center differential problem normal? | Go to step 2.   | Repair the faulty unit.   |
| <p><b>2</b></p> <p><b>CALLING UP THE DTC.</b></p> <p>Check the DTC. &lt;Ref. to 6MT(diag)-20, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).&gt;</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• For DTC, refer to "List of Diagnostic Trouble Code (DTC)". &lt;Ref. to 6MT(diag)-25, List of Diagnostic Trouble Code (DTC).&gt;</li> <li>• If the communication function of the Subaru Select Monitor cannot be executed normally, check the communication circuit.</li> </ul>   | Is the DTC called up?   | Go to step 3.<br>NOTE:<br>Record all DTC.   | Go to step 4.   |
| <p><b>3</b></p> <p><b>PERFORM THE DIAGNOSIS.</b></p> <p>1) Inspect and repair the all DTC using "Diagnostic Procedure with Diagnostic Trouble Code (DTC)". &lt;Ref. to 6MT(diag)-27, Diagnostic Procedure with Diagnostic Trouble Code (DTC).&gt;</p> <p>NOTE:<br/>For DTC, refer to "List of Diagnostic Trouble Code (DTC)". &lt;Ref. to 6MT(diag)-25, List of Diagnostic Trouble Code (DTC).&gt;</p> <p>2) Start the engine.</p> <p>3) Read the DTC using Subaru Select Monitor. &lt;Ref. to 6MT(diag)-20, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).&gt;</p> | Is the DTC displayed?   | Record all DTC, and inspect using "Diagnostic Procedure with Diagnostic Trouble Code (DTC)" <Ref. to 6MT(diag)-27, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Repeat "PERFORM THE DIAGNOSIS" until any DTC is not displayed. | Go to step 4.   |
| <p><b>4</b></p> <p><b>READ THE DTC WITH COMBINATION METER.</b></p> <p>Check DTC with combination meter. &lt;Ref. to 6MT(diag)-20, READ DIAGNOSTIC TROUBLE CODE (DTC) WITH DIAGNOSTIC INDICATOR LIGHT., OPERATION, Read Diagnostic Trouble Code (DTC).&gt;</p> <p>NOTE:<br/>For details concerning DTCs refer to the "List of Diagnostic Trouble Code (DTC)". &lt;Ref. to 6MT(diag)-25, List of Diagnostic Trouble Code (DTC).&gt;</p>   | Is the DTC called up?   | Go to step 5.<br>NOTE:<br>Record all DTC.   | Inspect using "Can not calling up DTC". <Ref. to 6MT(diag)-27, DTC CANNOT BE CALLED UP, Diagnostic Procedure with Diagnostic Trouble Code (DTC).><br>NOTE:<br>After the inspection, read the DTC again. |

# Basic Diagnostic Procedure

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step  | Check                 | Yes   | No  |
|---|-----------------------|---|---|
| <p><b>5</b>      <b>PERFORM THE DIAGNOSIS.</b><br/>1) Inspect and repair the all DTC using “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. &lt;Ref. to 6MT(diag)-27, Diagnostic Procedure with Diagnostic Trouble Code (DTC).&gt;<br/>NOTE:<br/>For DTC, refer to “List of Diagnostic Trouble Code (DTC)”. &lt;Ref. to 6MT(diag)-25, List of Diagnostic Trouble Code (DTC).&gt;<br/>2) Perform the inspection mode. &lt;Ref. to 6MT(diag)-22, Inspection Mode.&gt;</p> | Is the DTC displayed? | Record all DTC, and inspect using “Diagnostic Procedure with Diagnostic Trouble Code (DTC)” <Ref. to 6MT(diag)-27, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Repeat “PERFORM THE DIAGNOSIS” until any DTC is not displayed. | Inspect using “General Diagnostic Table”. |

## Check List for Interview

MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

---

### 2. Check List for Interview

#### A: CHECK

Check the following items when problem has occurred.

NOTE:

Use copies of this page for interviewing customers.

|  |   |   |  |
|--|---|---|--|
| Customer's name                                      |   |   |  |
| Date of purchase                                     |   |   |  |
| Date of repair                                       |   |   |  |
| Trans. model   | TRANSMISSION  | VIN   |  |
| Odometer reading                                     |   |   |  |
|  | km or miles   |   |  |
| Frequency  | <input type="checkbox"/> Continuous <input type="checkbox"/> Intermittent (    times a day)   |   |  |
| Weather  | <input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy<br><input type="checkbox"/> Various/Others<br>(                    )                                    |   |  |
| Place  | <input type="checkbox"/> High <input type="checkbox"/> Suburbs <input type="checkbox"/> Inner city <input type="checkbox"/> Uphill <input type="checkbox"/> Rough road<br><input type="checkbox"/> Others<br>(                    ) |   |  |
| Outdoor temperature                                  | <input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold  |   |  |
| Vehicle speed  |   |   |  |
|  | km/h (MPH)  |   |  |
| Driver's control center differential indicator light | <input type="checkbox"/> Flashing   |   | <input type="checkbox"/> Except flashing   |
| Driving condition                                    | <input type="checkbox"/> Not affected<br><input type="checkbox"/> While decelerating  | <input type="checkbox"/> At starting<br><input type="checkbox"/> While accelerating | <input type="checkbox"/> While turning ( <input type="checkbox"/> RH / <input type="checkbox"/> LH)<br><input type="checkbox"/> While cruising |
| Symptoms   | <input type="checkbox"/> No change to AUTO or MANUAL  |   |  |
|  | <input type="checkbox"/> No change of front and rear torque distribution  |   |  |
|  | <input type="checkbox"/> No change to differential free   |   |  |
|  | <input type="checkbox"/> No change to differential lock   |   |  |
|  | <input type="checkbox"/> Tight cornering condition is occurred in AUTO or MANUAL mode with differential free  |   |  |
|  | <input type="checkbox"/> Noise or vibration   |   |  |
|  | <input type="checkbox"/> Others<br>(                    )   |   |  |

# General Description

MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

## 3. General Description

### A: CAUTION

Supplemental restraint system airbag wiring harness is routed near the driver's control center differential control module.

#### CAUTION:

- All airbag system connectors are colored yellow. Do not use the electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when performing diagnostics and servicing the driver's control center differential control module.

- When measuring the voltage or resistance of each control unit or each sensor, use a tapered pin with diameter of less than 0.64 mm (0.025 in) in order to avoid poor contact. Do not insert the pin with diameter of more than 0.65 mm (0.026 in).

### B: INSPECTION

#### 1. POWER SUPPLY

1) Measure battery voltage and specific gravity of electrolyte.

**Standard of voltage: More than 12 V**

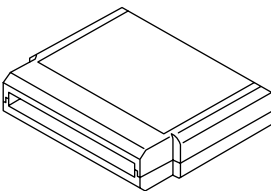
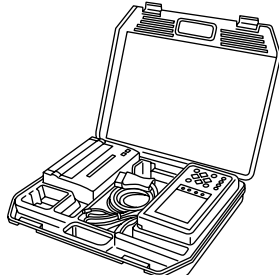
**Standard of gravity: More than 1.260**

2) Check the condition of fuse.

3) Check the condition of harness and harness connector.

### C: PREPARATION TOOL

#### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER                        | DESCRIPTION               | REMARKS                                |
|---|------------------------------------|---------------------------|--|
|  <p>ST18482AA010</p>  | 18482AA010<br>(Newly adopted tool) | CARTRIDGE                 | Troubleshooting for electrical system. |
|  <p>ST22771AA030</p> | 22771AA030                         | SUBARU SELECT MONITOR KIT | Troubleshooting for electrical system. |

#### 2. GENERAL TOOL

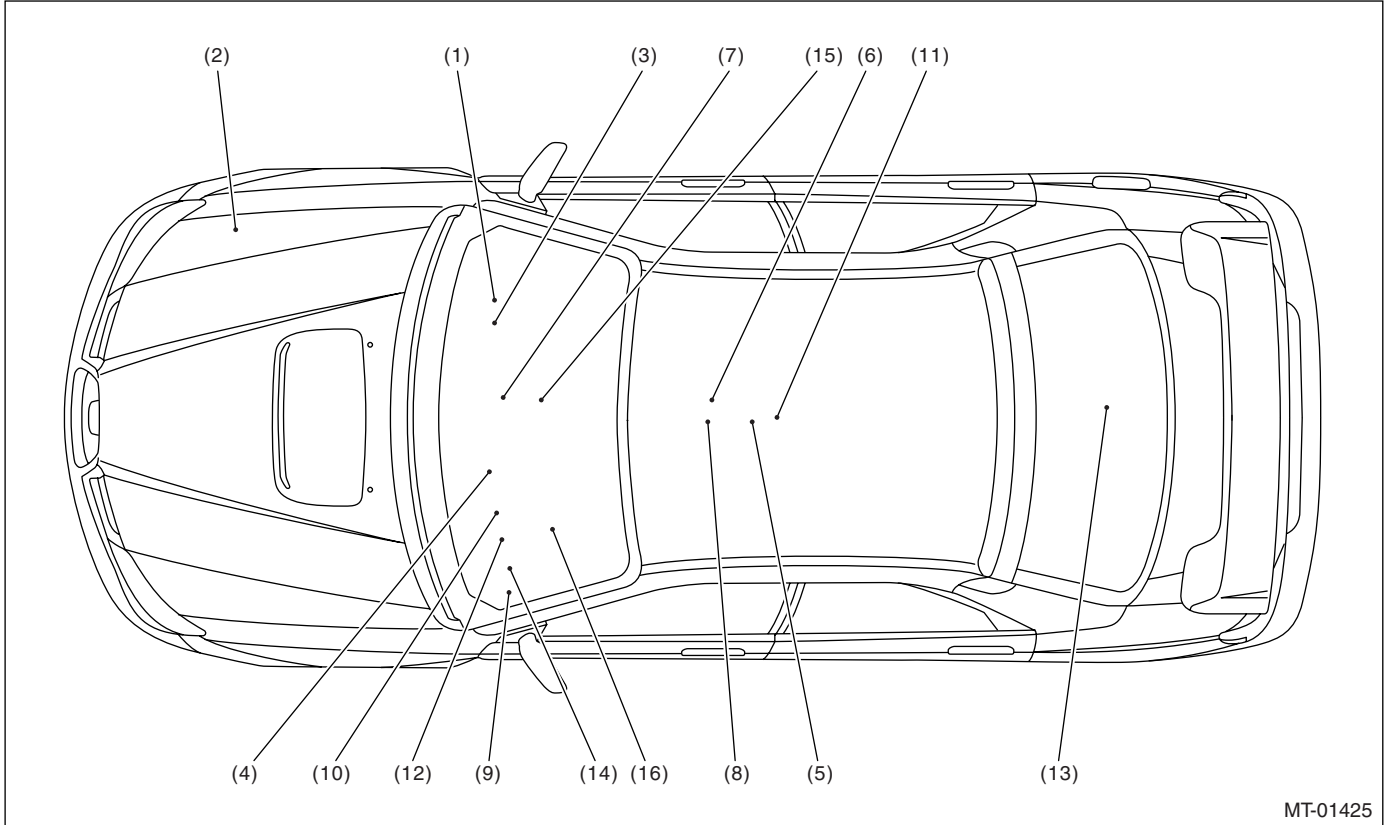
| TOOL NAME      | REMARKS  |
|----------------|--|
| Circuit tester | Used for measuring resistance, voltage and ampere. |
| Oscilloscope   | Used for measuring sensor.                         |

# Electrical Component Location

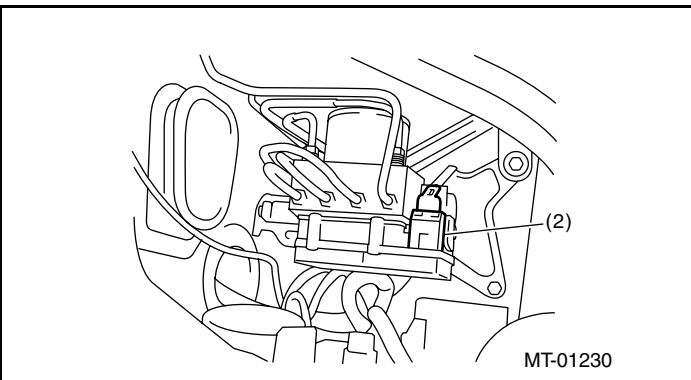
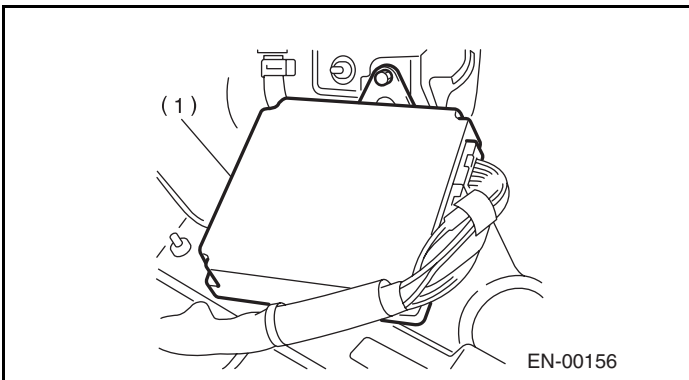
## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

### 4. Electrical Component Location

#### A: LOCATION

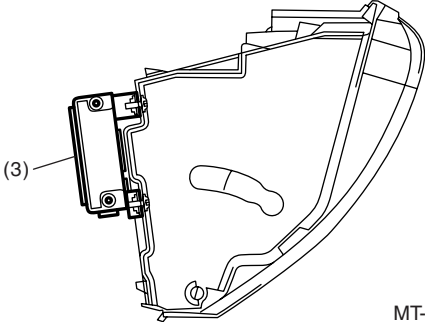
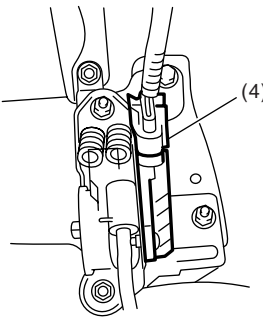
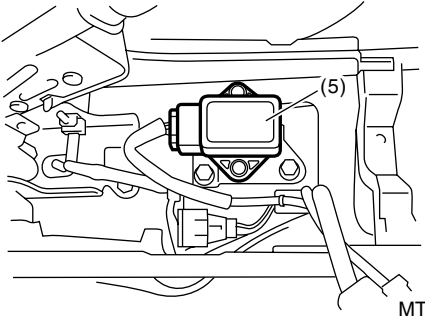
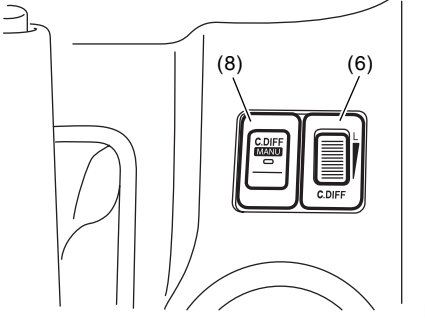
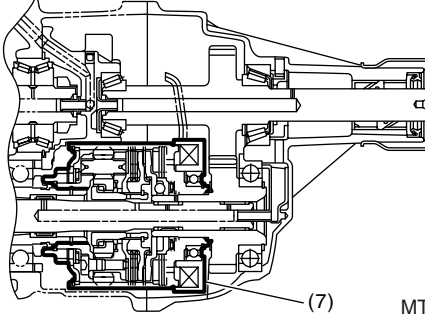
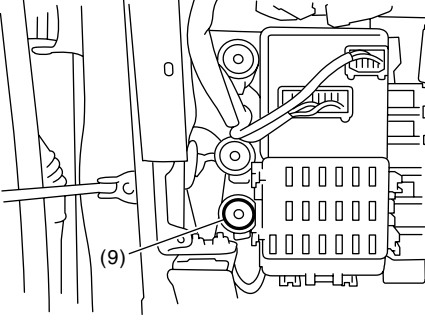
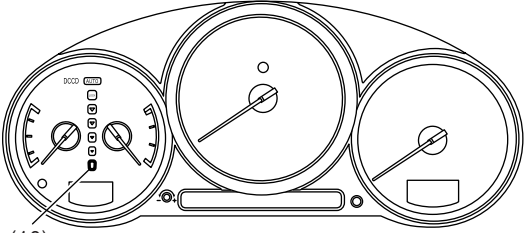
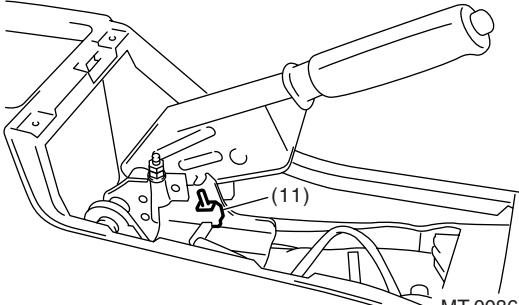


- |   |   |   |
|---|---|---|
| (1) Engine control module (ECM)                             | (7) Center differential   | (11) Parking brake switch                     |
| (2) ABS control module & hydraulic control unit (ABSCM&H/U) | (8) Manual mode switch  | (12) Brake light switch                       |
| (3) Driver's control center differential control module     | (9) Driver's control center differential relay  | (13) Rear differential oil temperature switch |
| (4) Accelerator pedal position sensor                       | (10) Driver's control center differential indicator light (driver's control center differential diagnostic indicator light) | (14) Data link connector                      |
| (5) Yaw rate & lateral G sensor                             |   | (15) Neutral position switch                  |
| (6) Center differential control dial                        |   | (16) Steering angle sensor                    |



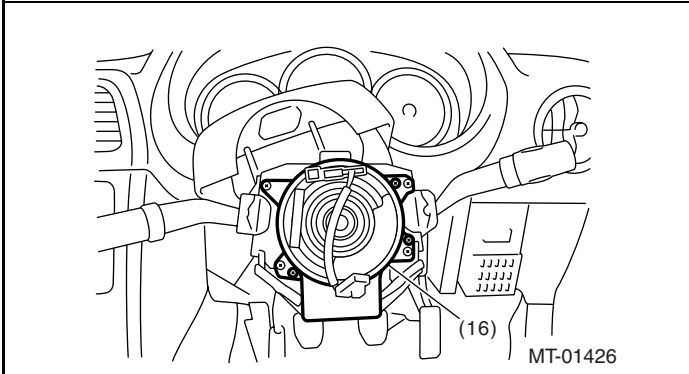
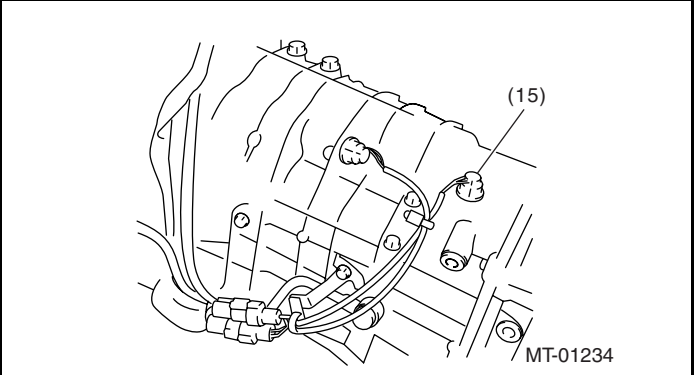
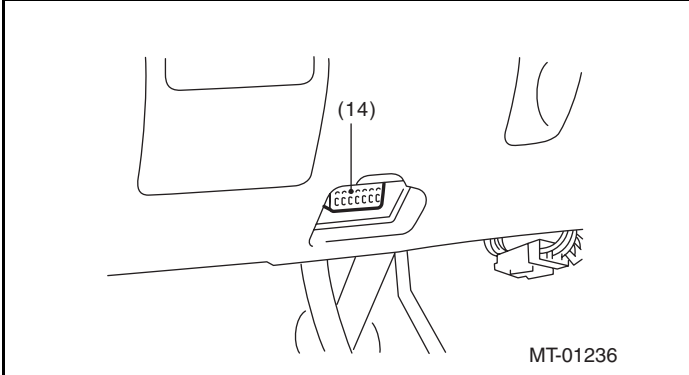
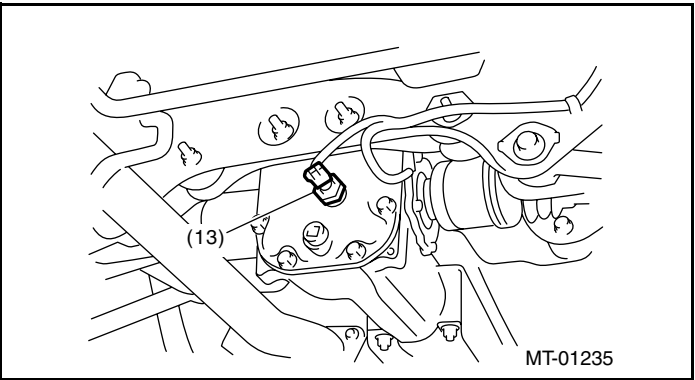
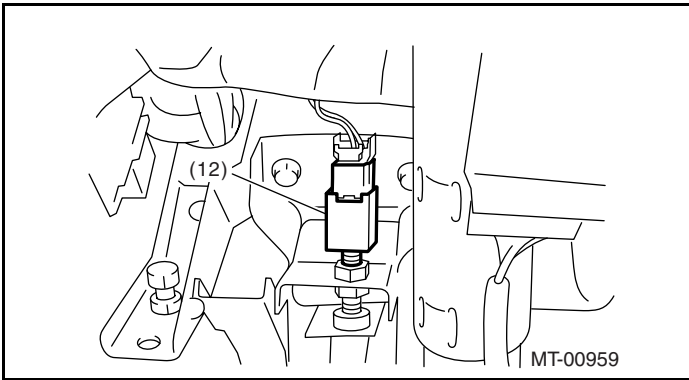
# Electrical Component Location

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

|   |  |
|---|--|
|  <p>MT-00957</p>   |  <p>MT-00958</p>  |
|  <p>MT-01231</p>   |  <p>MT-01232</p>   |
|  <p>MT-01455</p>  |  <p>MT-01233</p>  |
|  <p>MT-00860</p> |  <p>MT-00861</p> |

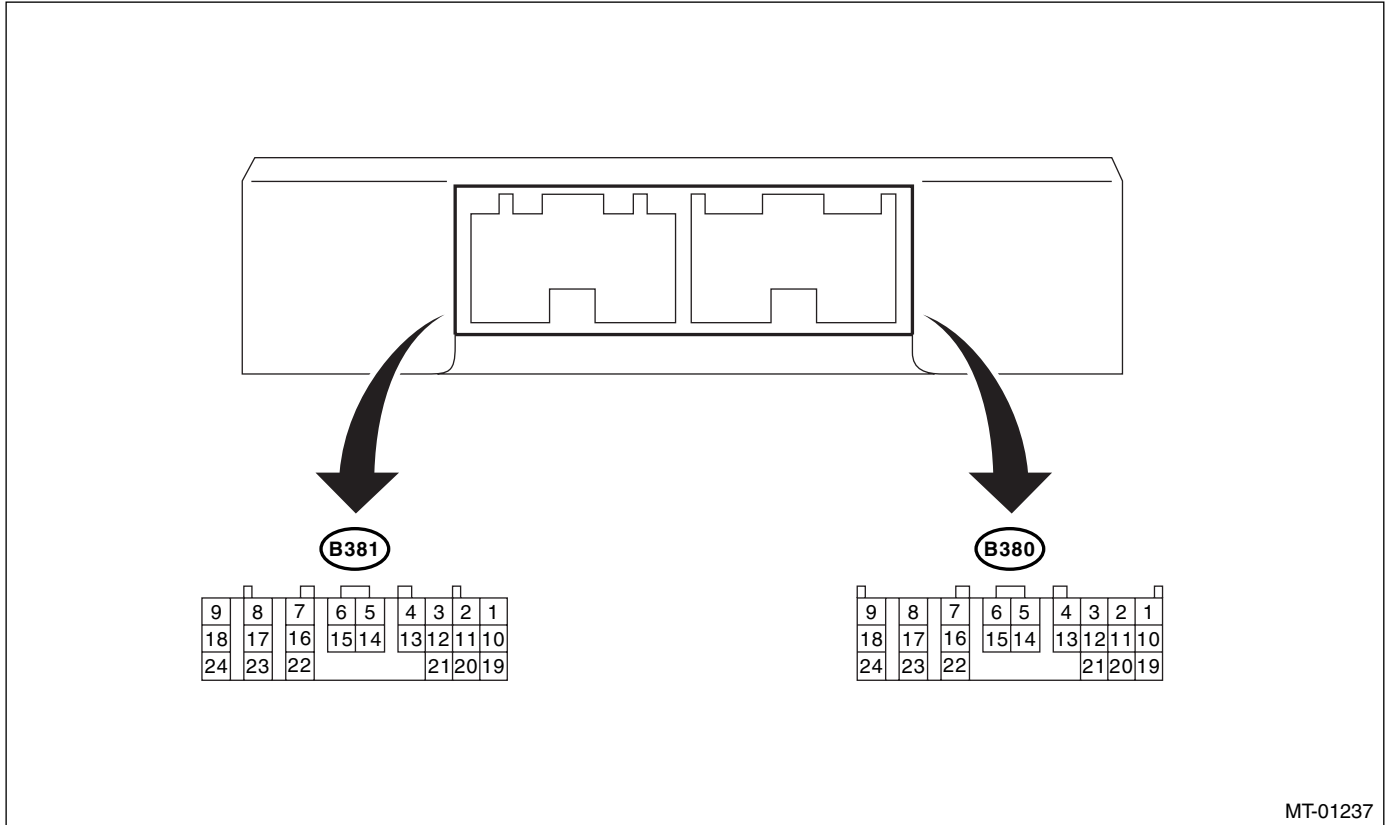
# Electrical Component Location

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)



## 5. Driver's Control Center Differential Control Module I/O Signal

### A: ELECTRICAL SPECIFICATION



MT-01237

| Check with ignition switch ON.                       |   |                    |  |               |                   |
|--|---|--------------------|--|---------------|-------------------|
| Item   | Measurement terminal<br>(Connector & terminal<br>No.) |                    | Measuring conditions                     | Voltage (V)   | Resistance<br>(Ω) |
|  | Positive<br>terminal                                  | Ground<br>terminal |  |               |                   |
| Back-up power supply                                 | (B381)<br>No. 17                                      | Chassis<br>ground  | —  | 10 — 13       | —                 |
| Ignition power supply                                | (B381)<br>No. 5                                       | Chassis<br>ground  | Ignition switch ON (engine OFF)          | 10 — 13       | —                 |
|  | (B381)<br>No. 6                                       | Chassis<br>ground  |  |               |                   |
| Driver's control center differential<br>power supply | (B381)<br>No. 7                                       | Chassis<br>ground  | Ignition switch ON (engine OFF)          | 10 — 13       | —                 |
|  | (B381)<br>No. 8                                       |                    |  |               | —                 |
| Driver's control relay                               | (B381)<br>No. 10                                      | Chassis<br>ground  | Ignition switch ON (engine OFF)          | Less than 1   | —                 |
| Accelerator pedal position sen-<br>sor               | (B380)<br>No. 2                                       | Chassis<br>ground  | Accelerator pedal is released.           | 0.3 — 0.8     | —                 |
|  |   |                    | Accelerator pedal is fully<br>depressed. | 2.8 — 4.7     | —                 |
| Center differential control dial<br>power supply     | (B380)<br>No. 23                                      | (B381)<br>No. 14   | Ignition switch ON (engine OFF)          | Approx. 5     | —                 |
| Center differential control dial<br>ground           | (B381)<br>No. 14                                      | Chassis<br>ground  | —  | —             | —                 |
| Center differential control dial<br>input signal     | (B380)<br>No. 3                                       | (B381)<br>No. 14   | When differential is locked              | Approx. 5     | —                 |
|  |   |                    | When differential is free                | Less than 0.5 | —                 |



# Driver's Control Center Differential Control Module I/O Signal

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

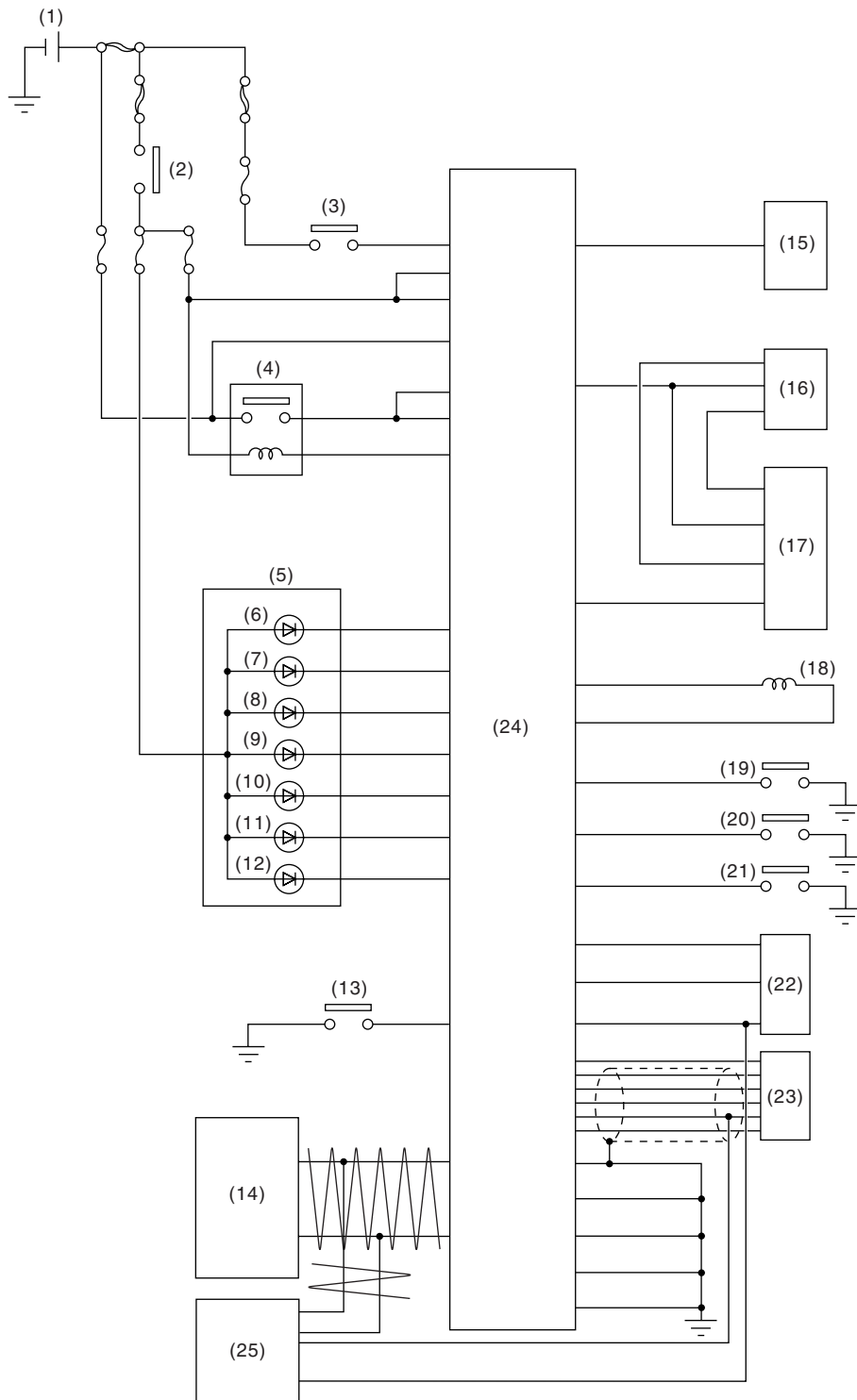
| Check with ignition switch ON.   |   |                    |   |                      |                            |
|--|---|--------------------|---|----------------------|----------------------------|
| Item   | Measurement terminal<br>(Connector & terminal<br>No.) |                    | Measuring conditions  | Voltage (V)          | Resistance<br>( $\Omega$ ) |
|  | Positive<br>terminal                                  | Ground<br>terminal |   |                      |                            |
| Driver's control center differential output                            | (B381)<br>No. 9                                       | (B381)<br>No. 24   | When differential is locked (When driver's control center differential indicator light is in differential lock) | 7.0 — 9.0            | 1.2 — 2.5                  |
|  |   |                    | When differential is free (When parking brake is applied)   | Less than 0.5        |                            |
| Driver's control center differential ground                            | (B381)<br>No. 24                                      | Chassis ground     | When differential is free   | Less than 0.5        | —                          |
| Parking brake switch   | (B380)<br>No. 5                                       | Chassis ground     | When parking brake is applied.  | Less than 0.4        | —                          |
|  |   |                    | When parking brake is released.   | 8 or more            |                            |
| Driver's control center differential indicator light (Lock ratio 0%)   | (B381)<br>No. 4                                       | Chassis ground     | When illuminates  | Less than 1          | —                          |
|  |   |                    | When turned off   | 8 or more            |                            |
| Driver's control center differential indicator light (Lock ratio 15%)  | (B381)<br>No. 3                                       | Chassis ground     | When illuminates  | Less than 1          | —                          |
|  |   |                    | When turned off   | 8 or more            |                            |
| Driver's control center differential indicator light (Lock ratio 35%)  | (B381)<br>No. 2                                       | Chassis ground     | When illuminates  | Less than 1          | —                          |
|  |   |                    | When turned off   | 8 or more            |                            |
| Driver's control center differential indicator light (Lock ratio 65%)  | (B381)<br>No. 1                                       | Chassis ground     | When illuminates  | Less than 1          | —                          |
|  |   |                    | When turned off   | 8 or more            |                            |
| Driver's control center differential indicator light (Lock ratio 85%)  | (B381)<br>No. 13                                      | Chassis ground     | When illuminates  | Less than 1          | —                          |
|  |   |                    | When turned off   | 8 or more            |                            |
| Driver's control center differential indicator light (Lock ratio 100%) | (B381)<br>No. 12                                      | Chassis ground     | When illuminates  | Less than 1          | —                          |
|  |   |                    | When turned off   | 8 or more            |                            |
| AUTO indicator light   | (B381)<br>No. 11                                      | Chassis ground     | When illuminates  | Less than 1          | —                          |
|  |   |                    | When turned off   | 8 or more            |                            |
| Stop light switch  | (B380)<br>No. 4                                       | Chassis ground     | When brake pedal is depressed.  | 8 or more            | —                          |
|  |   |                    | When brake pedal is released.   | Less than 1          |                            |
| Rear differential oil temperature switch                               | (B380)<br>No. 14                                      | Chassis ground     | Rear differential switch ON   | 8 or more            | —                          |
|  |   |                    | Rear differential switch OFF  | Less than 0.4        |                            |
| Manual mode switch   | (B380)<br>No. 13                                      | Chassis ground     | Switch is released  | 4.3 or more          | —                          |
|  |   |                    | When throttle fully opens   | Less than 0.1        |                            |
| Data link signal (Subaru Select Monitor)                               | (B380)<br>No. 9                                       | Chassis ground     | —   | —                    | —                          |
| CAN communication signal (+)   | (B380)<br>No. 18                                      | Chassis ground     | Ignition switch ON  | Pulse signal         | —                          |
| CAN communication signal (-)   | (B380)<br>No. 24                                      | Chassis ground     | Ignition switch ON  | Pulse signal         | —                          |
| Neutral position switch  | (B380)<br>No. 15                                      | Chassis ground     | When neutral  | Less than 1          | —                          |
|  |   |                    | Except neutral  | 8 or more            | —                          |
| Engine speed signal  | (B380)<br>No. 6                                       | Chassis ground     | Ignition switch ON (engine OFF)   | Less than 1          | —                          |
|  |   |                    | Ignition switch ON (idling)   | 5 or more (AC range) |                            |

# Driver's Control Center Differential Control Module I/O Signal

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Check with ignition switch ON.     |                                 |  |                 |  |   |                |
|------------------------------------|---------------------------------|--|-----------------|--|---|----------------|
| Item                               |                                 | Measurement terminal<br>(Connector & terminal No.) |                 | Measuring conditions   | Voltage (V)   | Resistance (Ω) |
|                                    |                                 | Positive terminal                                  | Ground terminal |  |   |                |
| Yaw rate & lateral G sensor        | Input (Lateral G sensor)        | (B380) No. 1                                       | (B380) No. 11   | Ignition switch ON (When vehicle on the level)                           | 2.35 — 2.65   | —              |
|                                    | Power supply output             | (B380) No. 22                                      | (B380) No. 11   | Ignition switch ON   | 8 or more   | —              |
|                                    | Input (Yaw rate sensor)         | (B380) No. 10                                      | (B380) No. 11   | Ignition switch ON (engine OFF, vehicle parked, ABS in normal condition) | Waveform <Ref. to 6MT(diag)-13, WAVEFORM, MEASUREMENT, Driver's Control Center Differential Control Module I/O Signal.> | —              |
|                                    | Specification (Yaw rate sensor) | (B380) No. 19                                      | (B380) No. 11   | Ignition switch ON   | 2.1 — 2.9   | —              |
|                                    | Test                            | (B380) No. 21                                      | (B380) No. 11   | Ignition switch ON (engine OFF, vehicle parked, ABS in normal condition) | Waveform <Ref. to 6MT(diag)-13, WAVEFORM, MEASUREMENT, Driver's Control Center Differential Control Module I/O Signal.> | —              |
|                                    | Ground                          | (B380) No. 11                                      | Chassis ground  | —  | —   | —              |
| Steering angle sensor power supply |                                 | (B380) No. 22                                      | (B381) No. 14   | Ignition switch ON   | 8 or more   | —              |
| Steering angle sensor ground       |                                 | (B381) No. 14                                      | Chassis ground  | —  | —   | —              |
| System ground circuit              |                                 | (B380) No. 20                                      | Chassis ground  | —  | 0   | Less than 1    |
|                                    |                                 | (B381) No. 15                                      | Chassis ground  |  |   |                |
|                                    |                                 | (B381) No. 16                                      | Chassis ground  |  |   |                |
|                                    |                                 | (B381) No. 22                                      | Chassis ground  |  |   |                |
|                                    |                                 | (B381) No. 23                                      | Chassis ground  |  |   |                |

**B: WIRING DIAGRAM**



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# Driver's Control Center Differential Control Module I/O Signal

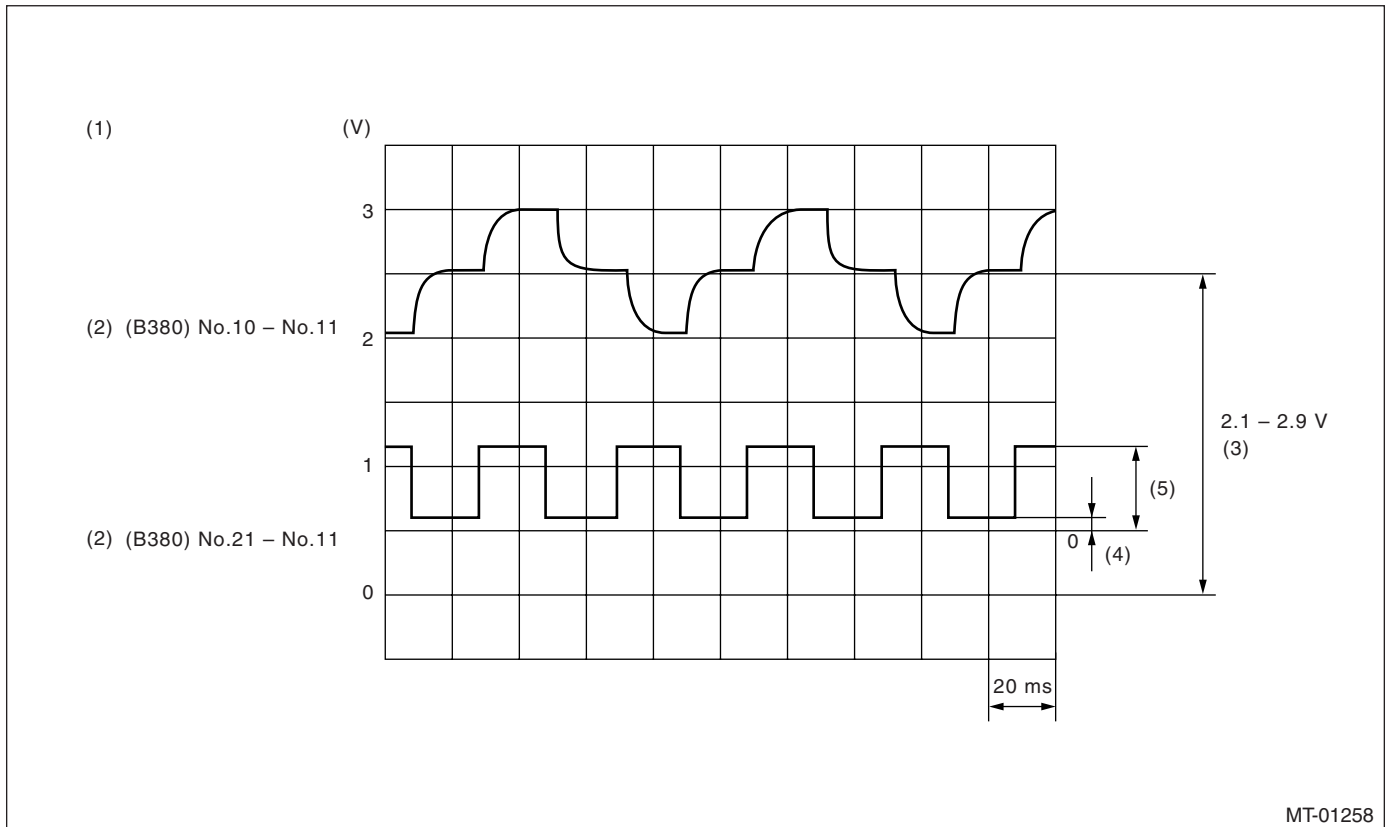
## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

- |   |   |  |
|---|---|--|
| (1) Battery   | (9) Driver's control center differential indicator light (Lock ratio 65%)   | (17) Engine control module (ECM)                         |
| (2) Ignition relay  | (10) Driver's control center differential indicator light (Lock ratio 85%)  | (18) Driver's control center differential                |
| (3) Stop light switch   | (11) Driver's control center differential indicator light (Lock ratio 100%) | (19) Parking brake switch                                |
| (4) Driver's control center differential relay                            | (12) AUTO indicator light   | (20) Manual mode switch                                  |
| (5) Combination meter   | (13) Neutral position switch  | (21) Rear differential oil temperature switch            |
| (6) Driver's control center differential indicator light (Lock ratio 0%)  | (14) ABS control module & hydraulic control unit (ABSCM&H/U)                | (22) Center differential control dial                    |
| (7) Driver's control center differential indicator light (Lock ratio 15%) | (15) Data link connector  | (23) Yaw rate & lateral G sensor                         |
| (8) Driver's control center differential indicator light (Lock ratio 35%) | (16) Accelerator pedal position sensor                                      | (24) Driver's control center differential control module |
|   |   | (25) Steering angle sensor                               |

### C: MEASUREMENT

Measure input and output signal voltage.

#### 1. WAVEFORM



- |                     |  |                   |
|---------------------|--|-------------------|
| (1) Yaw rate sensor | (3) Vehicle is at a standstill. (engine OFF, ABS is in normal condition) | (4) Less than 1 V |
| (2) Terminal No.    |  | (5) Approx. 6 V   |

# Subaru Select Monitor

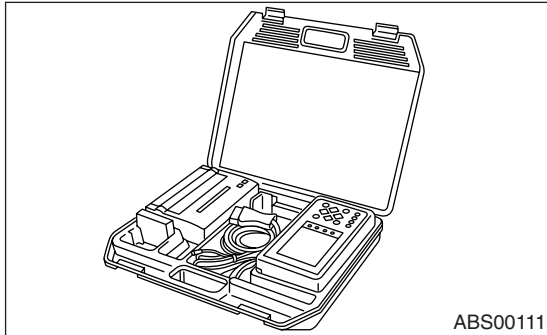
## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

### 6. Subaru Select Monitor

#### A: OPERATION

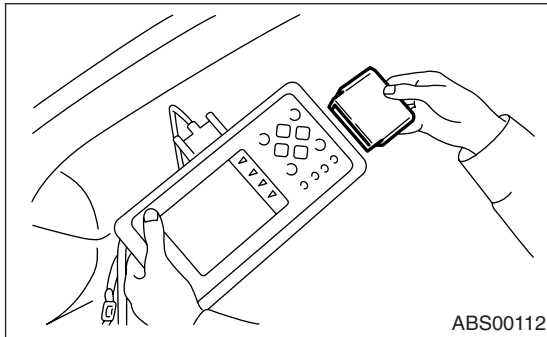
##### 1. READ DIAGNOSTIC TROUBLE CODE (DTC)

1) Prepare the Subaru Select Monitor kit. <Ref. to 6MT(diag)-5, SPECIAL TOOL, PREPARATION TOOL, General Description.>



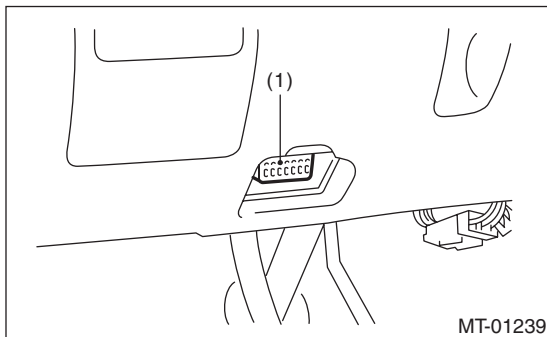
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge to Subaru Select Monitor. <Ref. to 6MT(diag)-5, SPECIAL TOOL, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).



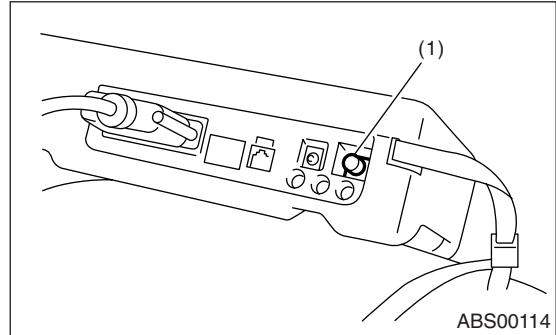
(1) Data link connector

(2) Connect the diagnosis cable to data link connector.

#### CAUTION:

Do not connect the scan tools except for Subaru Select Monitor or general scan tool.

5) Turn the ignition switch to ON (engine OFF) and turn the Subaru Select Monitor power switch to ON.



(1) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.

7) On the «System Selection Menu» display screen, select the {Transmission} and press the [YES] key.

8) Press the [YES] key after the {Center Differential Control} is displayed.

9) On the «Transmission Diagnosis» display screen, select the {DTC Display} and press the [YES] key.

#### NOTE:

- For details concerning operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".

- For details concerning DTCs, refer to the "List of Diagnostic Trouble Code (DTC)". <Ref. to 6MT(diag)-25, List of Diagnostic Trouble Code (DTC).>

10) If transmission and Subaru Select Monitor cannot communicate, check the communication circuit. <Ref. to 6MT(diag)-17, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>

11) On the «Check DTC» display screen, select the {Latest Code} or {Memory Code} and press the [Yes] key.

| Display     | Contents to be monitored  |
|-------------|---|
| Latest      | Indicate the latest DTC on the Subaru Select Monitor display.                     |
| Memory Code | Indicate the latest DTC in previous trouble on the Subaru Select Monitor display. |

# Subaru Select Monitor

MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

## 2. READ CURRENT DATA

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
  - 2) On the «System Selection Menu» display screen, select the {Transmission} and press the [YES] key.
  - 3) Press the [YES] key after the {Center Differential Control} is displayed.
  - 4) On the «Transmission Diagnosis» screen, select the {Current Data Display/Save}, and then press the [YES] key.
  - 5) On the «Data Display Menu» screen, select the data display style and press the [YES] key.
  - 6) Using a scroll key, move the display screen up or down until necessary data is shown.
- A list of the support data is shown in the following table.

| Display                              | Contents to be monitored  | Unit of measure |
|--------------------------------------|---|-----------------|
| Lateral G Sensor                     | Lateral G sensor voltage is displayed.                                | V               |
| Center Differential Switch Voltage   | Center differential switch voltage is displayed.                      | V               |
| Center Differential Actual Current   | Actual current of center differential is displayed.                   | A               |
| Center Differential Set Current      | Set current of center differential is displayed.                      | A               |
| FR Wheel Speed                       | Wheel speed detected by front ABS wheel speed sensor RH is displayed. | km/h or MPH     |
| FL Wheel Speed                       | Wheel speed detected by front ABS wheel speed sensor LH is displayed. | km/h or MPH     |
| RR Wheel Speed                       | Wheel speed detected by rear ABS wheel speed sensor RH is displayed.  | km/h or MPH     |
| RL Wheel Speed                       | Wheel speed detected by rear ABS wheel speed sensor LH is displayed.  | km/h or MPH     |
| Sub-Accelerator Sensor               | Accelerator pedal position sensor voltage is displayed.               | V               |
| Yaw rate sensor voltage              | Voltage detected by yaw rate sensor is displayed.                     | V               |
| Yaw rate & G sensor ref. V           | Reference voltage of yaw rate & lateral G sensor is displayed.        | V               |
| Steering Angle Sensor                | Steering angle is displayed.  | deg             |
| Engine Speed                         | Current engine speed is displayed.                                    | rpm             |
| ABS Signal                           | ON/OFF of ABS signal is displayed.                                    | ON or OFF       |
| Stop Light SW                        | ON/OFF of stop light switch is displayed.                             | ON or OFF       |
| Rear differential Oil Temperature SW | ON/OFF of rear differential oil temperature switch is displayed.      | ON or OFF       |
| Module Identification Signal         | ON/OFF of module identification signal is displayed.                  | ON or OFF       |
| Center Differential Light 1          | ON/OFF of center differential light 1 is displayed.                   | ON or OFF       |
| Center Differential Light 2          | ON/OFF of center differential light 2 is displayed.                   | ON or OFF       |
| Center Differential Light 3          | ON/OFF of center differential light 3 is displayed.                   | ON or OFF       |
| Center Differential Light 4          | ON/OFF of center differential light 4 is displayed.                   | ON or OFF       |
| Center Differential Light 5          | ON/OFF of center differential light 5 is displayed.                   | ON or OFF       |
| Center Differential Light 6          | ON/OFF of center differential light 6 is displayed.                   | ON or OFF       |
| Parking SW                           | ON/OFF of parking switch is displayed.                                | ON or OFF       |
| Center Differential Relay            | ON/OFF of center differential relay is displayed.                     | ON or OFF       |
| AUTO/MANUAL Mode Change SW           | ON/OFF of AUTO/MANUAL mode change switch is displayed.                | ON or OFF       |
| AUTO Mode Light                      | ON/OFF of AUTO mode light is displayed.                               | ON or OFF       |
| Neutral Switch                       | Neutral switch condition (neutral/except neutral) is displayed.       | ON or OFF       |

### NOTE:

For details concerning operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

# Subaru Select Monitor

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

### 3. CLEAR MEMORY MODE

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Transmission} and press the [YES] key.
- 3) Press the [YES] key after the {Center Differential Control} is displayed.
- 4) On the «Transmission Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.

| Display                          | Contents to be monitored  |
|----------------------------------|---------------------------|
| Is a memory clearance performed? | Function of clearing DTC. |

- 5) When “Done” and “Turn ignition switch OFF” are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

#### NOTE:

For details concerning operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

### 4. FREEZE FRAME DATA

#### NOTE:

- Data stored at the time of trouble occurrence is shown on display.
- Each time trouble occurs, the latest information is stored in the freeze frame data in memory.
- Freeze frame data will be memorized up to nine.

| DTC   | Content   | Contents be monitored   |
|-------|---|---|
| P1521 | Brake switch circuit range                      | Brake switch circuit condition is displayed.                          |
| P1720 | DCCD CAN system circuit                         | CAN communication circuit condition is displayed.                     |
| P1721 | DCCD engine rpm signal system                   | Engine speed signal circuit condition is displayed.                   |
| P1759 | Lateral G sensor                                | Lateral G sensor circuit condition is displayed.                      |
| P1764 | Yaw rate sensor system circuit                  | Yaw rate & lateral G sensor circuit condition is displayed.           |
| P1765 | Yaw rate side G sensor reference system circuit | Yaw rate & lateral G sensor reference circuit condition is displayed. |
| P1767 | DCCD steering angle sensor                      | Steering angle circuit condition is displayed.                        |
| P1875 | Center differential                             | Center differential circuit condition is displayed.                   |
| P2125 | Accelerator pedal position sensor               | Accelerator pedal position sensor circuit condition is displayed.     |

# Subaru Select Monitor

MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

## B: INSPECTION

### 1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

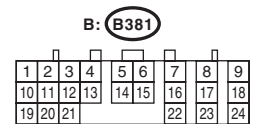
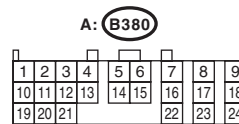
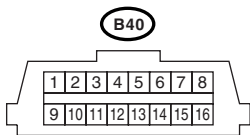
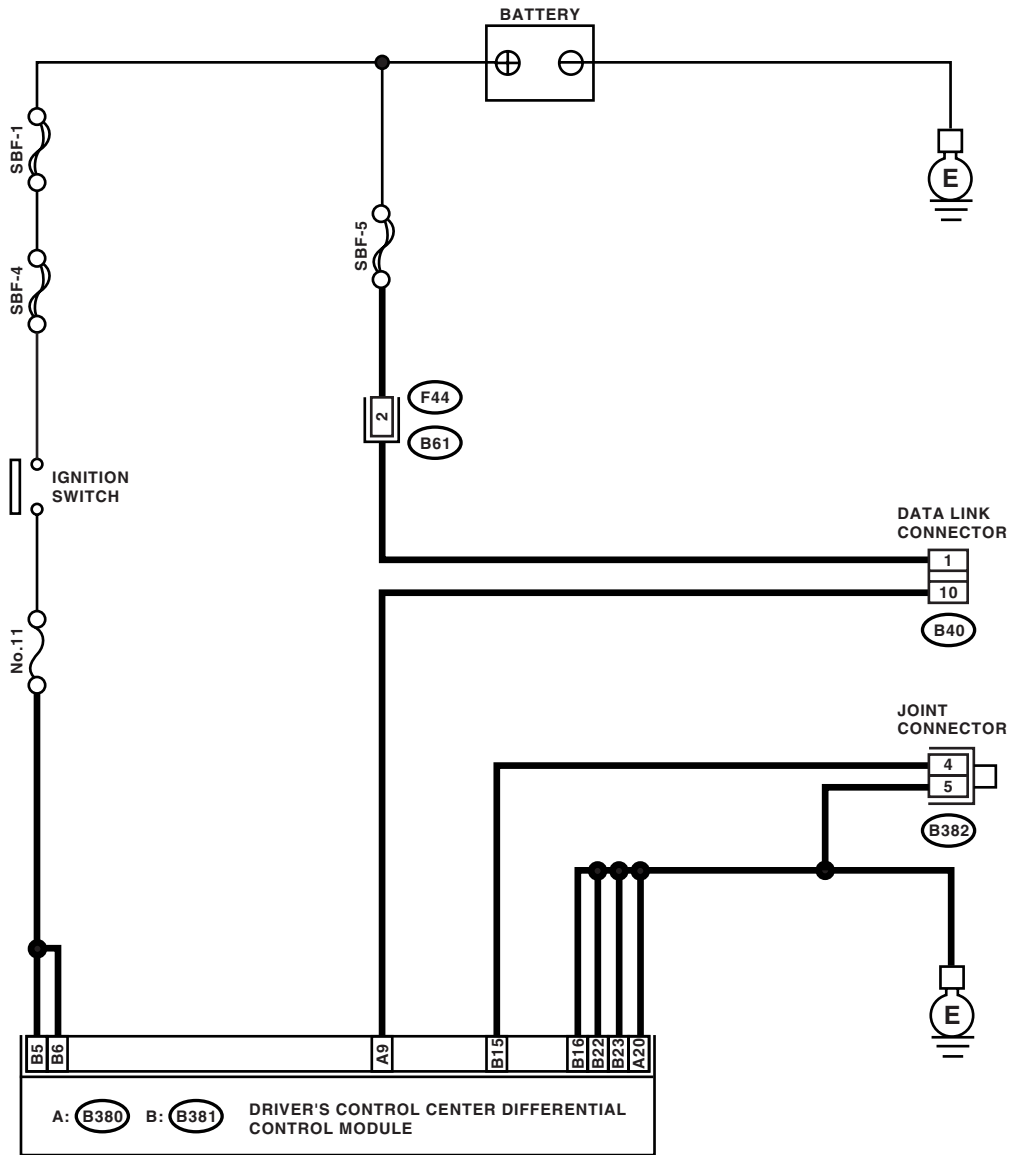
#### DETECTING CONDITION:

Faulty harness connector.

#### TROUBLE SYMPTOM:

Communication is impossible between driver's control center differential control module and Subaru Select Monitor.

#### WIRING DIAGRAM:





# Subaru Select Monitor

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step     | Check  | Yes  | No   |
|----------|--|--|--|
| <b>1</b> | <b>CHECK IGNITION SWITCH.</b>  | Go to step 2.  | Turn the ignition switch to ON, and select transmission mode using Subaru Select Monitor.                                      |
| <b>2</b> | <b>CHECK BATTERY.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the battery voltage.  | Go to step 3.  | Charge or replace the battery.   |
| <b>3</b> | <b>CHECK BATTERY TERMINAL.</b>   | Repair or tighten the battery terminal.  | Go to step 4.  |
| <b>4</b> | <b>CHECK INSTALLATION OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE CONNECTOR.</b><br>Turn the ignition switch to OFF.  | Go to step 5.  | Insert driver's control center differential control module connector into driver's control center differential control module. |
| <b>5</b> | <b>CHECK SUBARU SELECT MONITOR COMMUNICATION.</b><br>1) Turn the ignition switch to ON.<br>2) Using Subaru Select Monitor, check whether communication to other system can be executed normally.   | Go to step 9.  | Go to step 6.  |
| <b>6</b> | <b>CHECK SUBARU SELECT MONITOR COMMUNICATION.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the driver's control center differential control module connector.<br>3) Turn the ignition switch to ON.<br>4) Check whether communication to other systems can be executed normally.  | Replace driver's control center differential control module. <Ref. to 6MT(diag)-6, LOCATION, Electrical Component Location.> | Go to step 7.  |
| <b>7</b> | <b>CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect driver's control center differential control module connector, ECM connector and ABSCM connector.<br>3) Measure the resistance between data link connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B40) No. 10 — Chassis ground:</b> | Go to step 8.  | Repair harness and connector between each control module and data link connector.  |
| <b>8</b> | <b>CHECK OUTPUT SIGNAL FOR DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between data link connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B40) No. 5 (+) — Chassis ground (-):</b>   | Go to step 9.  | Repair harness and connector between each control module and data link connector.  |

# Subaru Select Monitor

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step  | Check   | Yes                   | No   |
|---|---|-----------------------|--|
| <b>9</b><br><b>CHECK HARNESS CONNECTOR BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND DATA LINK CONNECTOR.</b><br>1) Turn the ignition switch OFF.<br>2) Disconnect the driver's control center differential control module connector.<br>3) Measure the resistance between driver's control center differential control module connector and data link connector.<br><b>Connector &amp; terminal</b><br><b>(B380) No. 9 — (B40) No. 10:</b>   | Is the resistance less than 1 $\Omega$ ?  | Go to step 10.        | Repair harness and connector between driver's control center differential control module and data link connector.  |
| <b>10</b><br><b>CHECK POWER SUPPLY CIRCUIT.</b><br>1) Turn the ignition switch to ON. (engine OFF)<br>2) Measure the ignition power supply voltage between driver's control center differential control module connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B381) No. 15 (+) — Chassis ground (-):</b><br><b>(B381) No. 16 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?  | Go to step 11.        | Repair open circuit in harness between driver's control center differential control module and battery.  |
| <b>11</b><br><b>CHECK HARNESS CONNECTOR BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND CHASSIS GROUND.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance of harness between driver's control center differential control module and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B380) No. 20 — Chassis ground:</b><br><b>(B381) No. 15 — Chassis ground:</b><br><b>(B381) No. 16 — Chassis ground:</b><br><b>(B381) No. 22 — Chassis ground:</b><br><b>(B381) No. 23 — Chassis ground:</b> | Is the resistance less than 1 $\Omega$ ?  | Go to step 12.        | Repair open circuit in harness between driver's control center differential control module and inhibitor side connector, and poor contact in coupling connector. |
| <b>12</b><br><b>CHECK POOR CONTACT IN CONNECTOR.</b>  | Is there poor contact in control module power supply, ground circuit and data link connector? | Repair the connector. | Replace the driver's control center differential control module.<br><Ref. to 6MT(diag)-6, LOCATION, Electrical Component Location.>                              |

## Read Diagnostic Trouble Code (DTC)

MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

---

### 7. Read Diagnostic Trouble Code (DTC)

#### A: OPERATION

##### 1. READ DIAGNOSTIC TROUBLE CODE (DTC) WITH DIAGNOSTIC INDICATOR LIGHT.

**NOTE:**

Perform the following step 4) to 8) within 30 sec.

- 1) Securely apply the parking brake.
- 2) Set the center differential control dial to differential free.
- 3) Start the engine.
- 4) Set the center differential control dial to differential lock.
- 5) Release the parking brake.
- 6) Set the center differential control dial to differential free.
- 7) Securely apply the parking brake.
- 8) Repeat the step 4) to 7) for twice.

**NOTE:**

Repeat the step from the beginning when diagnostic indicator light does not blink.

9) Execute inspection mode. <Ref. to 6MT(diag)-22, Inspection Mode.>

**NOTE:**

Refer to "HOW TO READ DIAGNOSTIC TROUBLE CODE (DTC)" for reading DTC. <Ref. to 6MT(diag)-21, HOW TO READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Read Diagnostic Trouble Code (DTC).>

##### 2. WITH SUBARU SELECT MONITOR

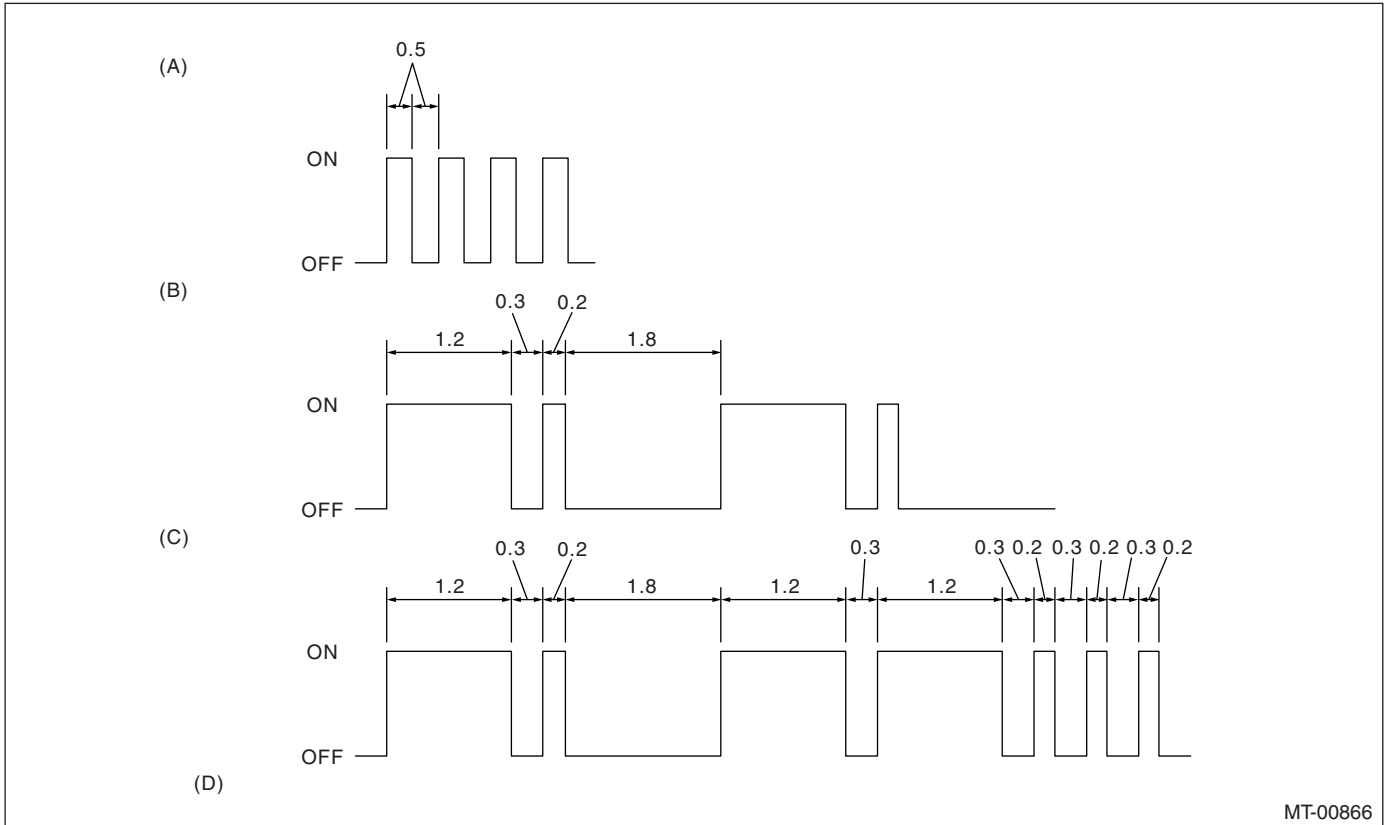
Detail procedure for reading DTC, refer to "SUBARU SELECT MONITOR". <Ref. to 6MT(diag)-14, Subaru Select Monitor.>

# Read Diagnostic Trouble Code (DTC)

MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

## 3. HOW TO READ DIAGNOSTIC TROUBLE CODE (DTC)

DTC for faulty part is indicated by blinking of driver's control center differential indicator. Long blink (1.2 sec.) means ten's place, short blink (0.2 sec.) means one's place.



(A) Normal code

(B) DTC 11

(C) DTC 11 and 23

(D) Unit: Seconds

### NOTE:

- The codes which are memorized in control module, and the codes which are appeared to inform the trouble to driver in normal driving condition are only nine; "21", "22", "23", "25", "26", "27", "28", "29" and "33".
- For details of DTC, refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to 6MT(diag)-25, List of Diagnostic Trouble Code (DTC).>

## 8. Inspection Mode

### A: PROCEDURE

#### WARNING:

**Observe the road traffic law.**

- 1) Call up the Self-diagnosis diagnostic trouble code (DTC). <Ref. to 6MT(diag)-20, READ DIAGNOSTIC TROUBLE CODE (DTC) WITH DIAGNOSTIC INDICATOR LIGHT., OPERATION, Read Diagnostic Trouble Code (DTC).>
- 2) A brake pedal is stepped on and a brake pedal is returned.
- 3) Operate the Manual mode switch once or more, and then set to Manual mode.
- 4) Turn the center differential control dial to differential lock and differential free for once, and turn it to differential lock, and then wait three seconds.
- 5) With the vehicle parked, shift the gear position to 1st then neutral.

## Clear Memory Mode

MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

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### 9. Clear Memory Mode

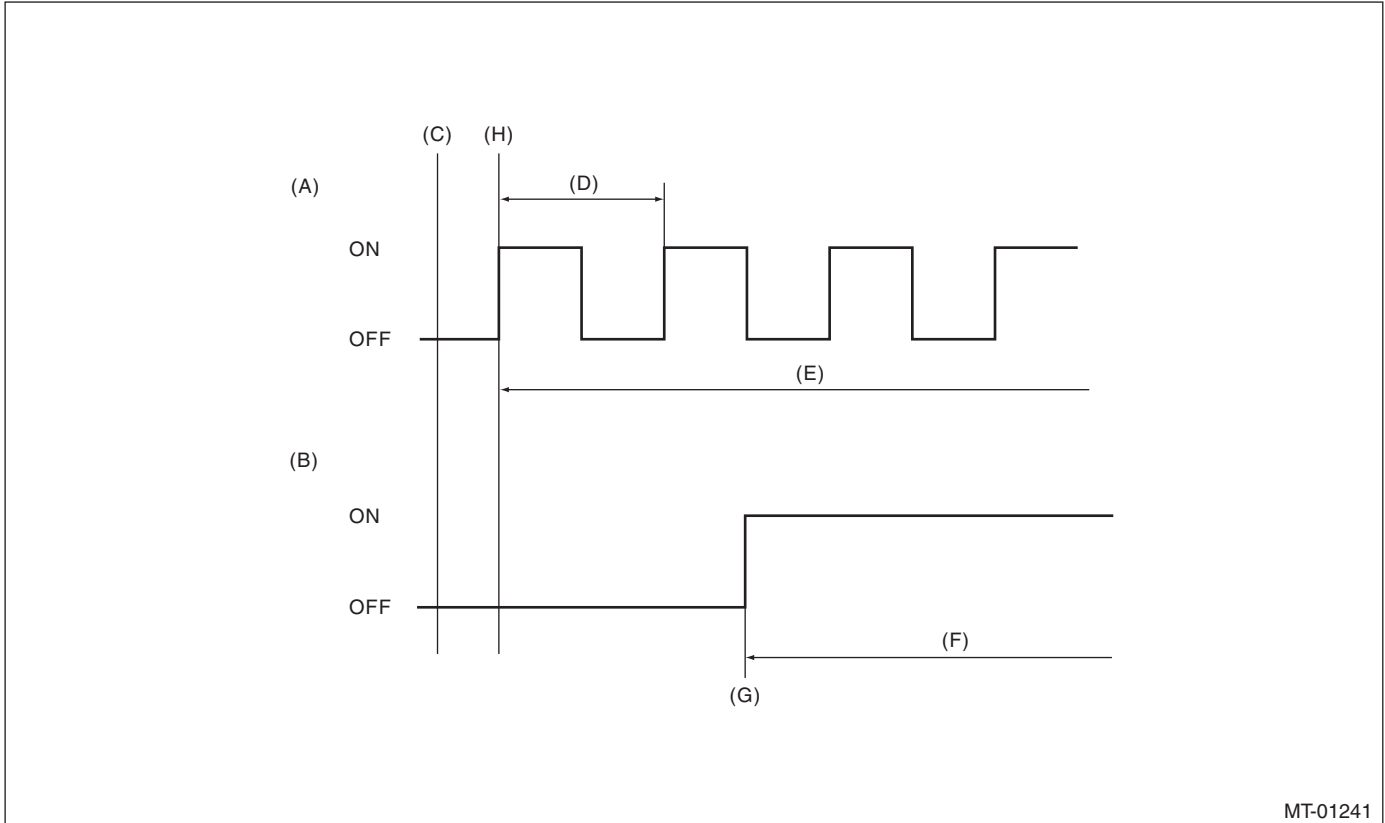
#### A: OPERATION

Detail procedure for clearing DTCs, refer to "SUBARU SELECT MONITOR". <Ref. to 6MT(diag)-14, Subaru Select Monitor.>

## 10.Driver's Control Center Differential Indicator Light Display

### A: INSPECTION

When the malfunction occurs on part or unit, the control module performs self diagnosis and driver's control center differential indicator light (at the bottom differential free light) keep blinking until detect the malfunction and the ignition switch is turned to OFF. Faulty part or unit can be identified by calling up DTC. Indicator display is as shown in the figure.



MT-01241

- |                        |  |  |
|------------------------|--|--|
| (A) Faulty             | (E) Blink  | (G) Set manual mode dial to differential free position |
| (B) Normal             | (F) Driver's control center differential indicator light illuminates | (H) Malfunction is detected                            |
| (C) Ignition switch ON |  |  |
| (D) 1 sec.             |  |  |

# List of Diagnostic Trouble Code (DTC)

MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

## 11. List of Diagnostic Trouble Code (DTC)

### A: LIST

#### 1. SUBARU SELECT MONITOR DISPLAY

| DTC   | Content   | Content of diagnosis  | Index   |
|-------|---|---|---|
| P1521 | Brake Switch Circuit Range                      | Stop light switch circuit is open or shorted.                             | <Ref. to 6MT(diag)-33, DTC P1521 BRAKE SWITCH CIRCUIT RANGE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P1720 | DCCD CAN system circuit                         | CAN communication system circuit is open or shorted.                      | <Ref. to 6MT(diag)-35, DTC P1720 DCCD CAN SYSTEM CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                         |
| P1721 | DCCD engine rpm signal system circuit           | Engine speed signal system circuit is open or shorted.                    | <Ref. to 6MT(diag)-37, DTC P1721 DCCD ENGINE RPM SIGNAL SYSTEM CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>           |
| P1759 | Lateral Acceleration Sensor Circuit             | Lateral G sensor circuit is open or shorted.                              | <Ref. to 6MT(diag)-40, DTC P1759 LATERAL ACCELERATION SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>             |
| P1764 | Yaw rate sensor system circuit                  | Yaw rate & lateral G sensor circuit is open, shorted or stuck.            | <Ref. to 6MT(diag)-43, DTC P1764 YAW RATE SENSOR SYSTEM CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                  |
| P1765 | Yaw rate side G sensor reference system circuit | Yaw rate & lateral G sensor reference circuit is open or shorted.         | <Ref. to 6MT(diag)-47, DTC P1765 YAW RATE SIDE G SENSOR REFERENCE SYSTEM CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P1767 | DCCD Steering Angle Sensor                      | Steering angle sensor circuit is open or shorted, or communication error. | <Ref. to 6MT(diag)-50, DTC P1767 DCCD STEERING ANGLE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| P1875 | Circuit of Center Diff.                         | Driver's control center differential circuit is open or shorted.          | <Ref. to 6MT(diag)-52, DTC P1875 CIRCUIT OF CENTER DIFF., Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                         |
| P2125 | Accelerator Position Sensor E                   | Accelerator pedal position sensor circuit is open or shorted.             | <Ref. to 6MT(diag)-58, DTC P2125 ACCELERATOR POSITION SENSOR E, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                   |

#### 2. COMBINATION METER INDICATOR LIGHT

| DTC | Content                                | Content of diagnosis   | Index  |
|-----|--|--|--|
| 21  | Accelerator Position Sensor E          | Accelerator pedal position sensor circuit is open or shorted.    | <Ref. to 6MT(diag)-58, DTC P2125 ACCELERATOR POSITION SENSOR E, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>        |
| 22  | Lateral Acceleration Sensor Circuit    | Lateral G sensor circuit is open or shorted.                     | <Ref. to 6MT(diag)-40, DTC P1759 LATERAL ACCELERATION SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| 23  | Circuit of Center Diff.                | Driver's control center differential circuit is open or shorted. | <Ref. to 6MT(diag)-52, DTC P1875 CIRCUIT OF CENTER DIFF., Diagnostic Procedure with Diagnostic Trouble Code (DTC).>              |
| 24  | Check Center Differential Control Dial | Center differential control dial circuit is open or shorted.     | <Ref. to 6MT(diag)-61, DTC 24 CHECK CENTER DIFFERENTIAL CONTROL DIAL., Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 25  | DCCD CAN system circuit                | CAN communication system circuit is open or shorted.             | <Ref. to 6MT(diag)-35, DTC P1720 DCCD CAN SYSTEM CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>              |



## List of Diagnostic Trouble Code (DTC)

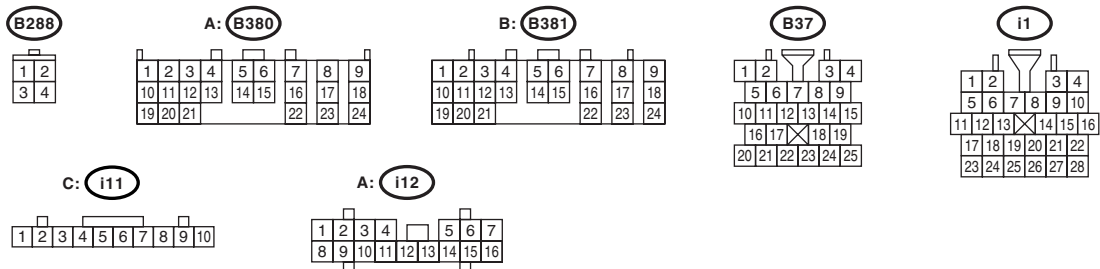
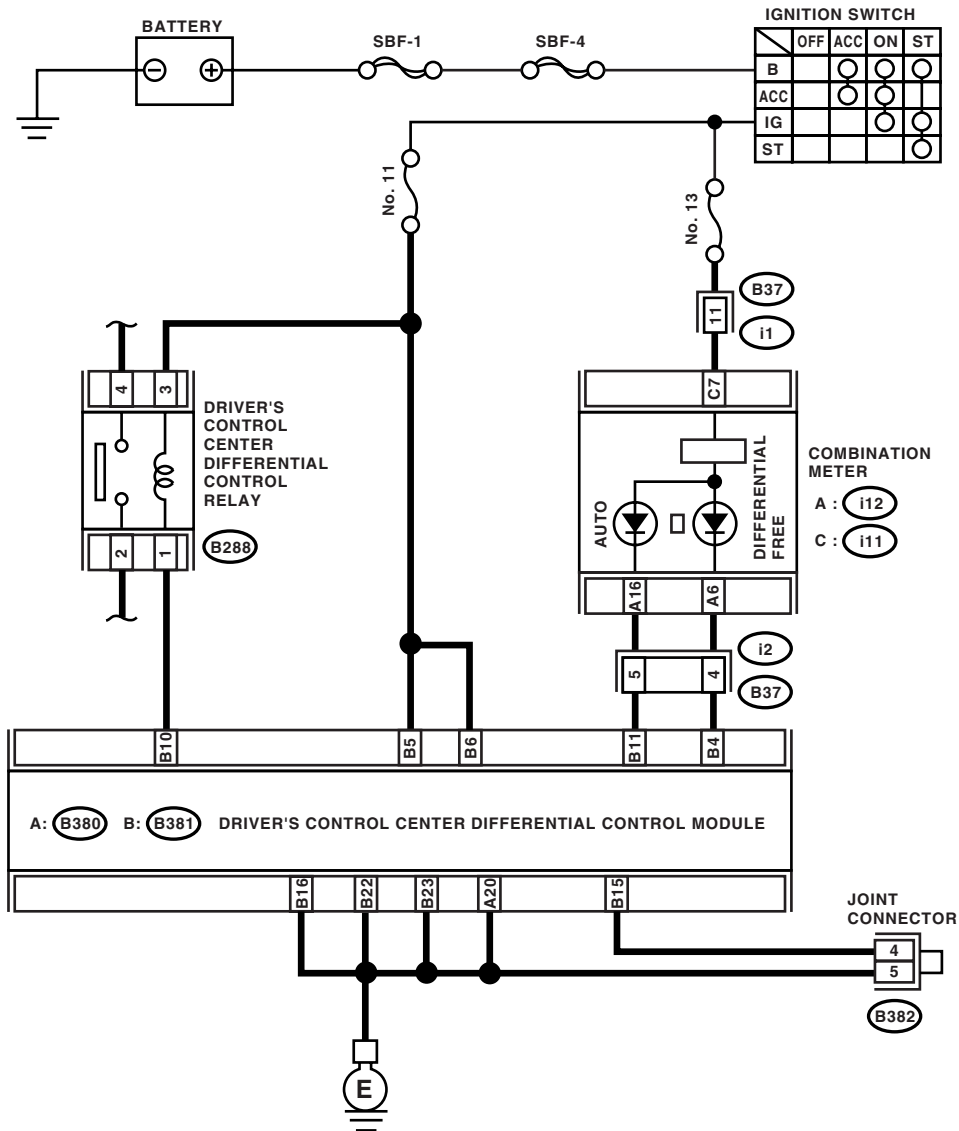
### MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| DTC | Content   | Content of diagnosis  | Index   |
|-----|---|---|---|
| 26  | DCCD engine rpm signal system                   | Engine speed signal system circuit is open or shorted.                    | <Ref. to 6MT(diag)-37, DTC P1721 DCCD ENGINE RPM SIGNAL SYSTEM CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>           |
| 27  | Yaw rate side G sensor reference system circuit | Yaw rate & lateral G sensor reference circuit is open or shorted.         | <Ref. to 6MT(diag)-47, DTC P1765 YAW RATE SIDE G SENSOR REFERENCE SYSTEM CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 28  | Yaw rate sensor system circuit                  | Yaw rate & lateral G sensor circuit is open, shorted or stuck.            | <Ref. to 6MT(diag)-43, DTC P1764 YAW RATE SENSOR SYSTEM CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                  |
| 29  | DCCD Steering Angle Sensor                      | Steering angle sensor circuit is open or shorted, or communication error. | <Ref. to 6MT(diag)-50, DTC P1767 DCCD STEERING ANGLE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| 31  | Manual mode switch                              | Manual mode switch circuit is open or shorted.                            | <Ref. to 6MT(diag)-64, DTC 31 MANUAL MODE SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                 |
| 32  | Check Parking Brake Switch                      | Parking brake switch circuit is open or shorted.                          | <Ref. to 6MT(diag)-67, DTC 32 CHECK PARKING BRAKE SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                         |
| 33  | Brake Switch Circuit Range                      | Brake switch circuit is open or shorted.                                  | <Ref. to 6MT(diag)-33, DTC P1521 BRAKE SWITCH CIRCUIT RANGE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
| 37  | Neutral position switch                         | Neutral position switch circuit is open or shorted.                       | <Ref. to 6MT(diag)-69, DTC 37 NEUTRAL POSITION SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |

## 12. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### A: DTC CANNOT BE CALLED UP

WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step | Check   | Yes  | No   |   |
|------|---|--|--|---|
| 1    | <b>CHECK THE AUTO INDICATOR LIGHT.</b><br>Turn the ignition switch to ON.   | Does the AUTO indicator light illuminate?  | Go to step 5.  | Go to step 2.   |
| 2    | <b>CHECK THE GROUND CIRCUIT OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector of driver's control center differential control module.<br>3) Measure the resistance between driver's control center differential control module harness connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B380) No. 20 — Chassis ground:</b><br><b>(B381) No. 15 — Chassis ground:</b><br><b>(B381) No. 16 — Chassis ground:</b><br><b>(B381) No. 22 — Chassis ground:</b><br><b>(B381) No. 23 — Chassis ground:</b> | Is the resistance less than 1 Ω?   | Go to step 3.  | Repair the open circuit of driver's control center differential control module ground circuit.  |
| 3    | <b>CHECK FUSE (No. 11).</b><br>Remove the fuse (No. 11).  | Is the fuse (No. 11) is blown out?   | Replace fuse (No. 11). If the replaced fuse (No. 11) is blown out easily, repair short circuit in harness between fuse (No. 11) and driver's control center differential control module. | Go to step 4.   |
| 4    | <b>CHECK IGNITION POWER SUPPLY CIRCUIT OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Turn the ignition switch to ON. (engine OFF)<br>2) Measure the voltage between driver's control center differential control module and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B381) No. 5 (+) — Chassis ground (-):</b><br><b>(B381) No. 6 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?   | Go to step 5.  | Repair the open circuit in harness between fuse (No. 11) and driver's control center differential control module, or fuse (No. 11) and battery. |
| 5    | <b>CHECK MANUAL MODE SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect all connectors.<br>3) Turn the ignition switch to ON.<br>4) Push the manual mode switch to enter the manual mode.   | Is the manual mode obtained?   | Go to step 6.  | Repair the switch.<br><Ref. to 6MT(diag)-64, DTC 31 MANUAL MODE SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>               |
| 6    | <b>CHECK DRIVER'S CONTROL CENTER DIFFERENTIAL INDICATOR LIGHT.</b><br>Operate the center differential control dial.   | Does the center differential indicator light illuminate according to center differential control dial? | Go to step 8.  | Go to step 7.   |
| 7    | <b>CHECK THE CENTER DIFFERENTIAL CONTROL DIAL</b><br><Ref. to 6MT(diag)-61, DTC 24 CHECK CENTER DIFFERENTIAL CONTROL DIAL., Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   | Is the center differential control dial circuit normal?  | Go to step 8.  | Repair it.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step   | Check   | Yes  | No  |
|--|---|--|---|
| <b>8 CHECK THE PARKING BRAKE SWITCH</b><br><Ref. to 6MT(diag)-67, DTC 32 CHECK PARKING BRAKE SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   | Is the parking brake switch circuit normal?   | Go to step 9.  | Repair it.  |
| <b>9 READ THE DTC.</b><br>Read the DTC. <Ref. to 6MT(diag)-20, OPERATION, Read Diagnostic Trouble Code (DTC).>   | Is the DTC called up?   | Go back to the Basic Diagnostic Procedure. <Ref. to 6MT(diag)-2, PROCEDURE, Basic Diagnostic Procedure.> | Go to step 10.  |
| <b>10 CHECK THE DRIVER'S CONTROL CENTER DIFFERENTIAL INDICATOR LIGHT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect harness connector from combination meter.<br>3) Turn the ignition switch to ON. (engine OFF)<br>4) Short between the combination meter harness connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(i12) No. 6 — Chassis ground:</i>  | Does the lowest light of driver's control center differential indicator illuminate? | Go to step 11.   | Check the combination meter.  |
| <b>11 CHECK THE HARNESS BETWEEN COMBINATION METER AND DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the harness connector from driver's control center differential control module.<br>3) Measure the resistance of harness between combination meter harness connector and driver's control center differential control module harness connector.<br><b>Connector &amp; terminal</b><br><i>(i12) No. 6 — (B381) No. 4:</i> | Is the resistance less than 1 $\Omega$ ?  | Go to step 12.   | Repair the open circuit and connector of harness between combination meter harness connector and driver's control center differential control module harness connector. |
| <b>12 CHECK THE HARNESS BETWEEN COMBINATION METER AND DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>Measure the resistance of harness between driver's control center differential control module harness connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B381) No. 4 — Chassis ground:</i>  | Is the resistance more than 1 $M\Omega$ ?   | Go to step 13.   | Repair the short of harness between combination meter harness connector and driver's control center differential control module harness connector.                      |
| <b>13 CHECK THE POOR CONTACT IN HARNESS CONNECTOR</b>  | Is there any poor contact in harness connectors of each circuit?                    | Repair the poor contact.   | Replace the driver's control center differential control module.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

### B: CHECK REAR DIFFERENTIAL OIL TEMPERATURE SWITCH

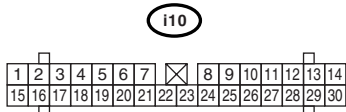
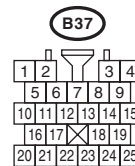
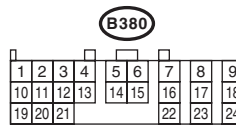
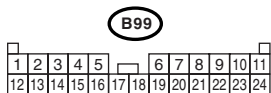
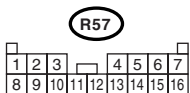
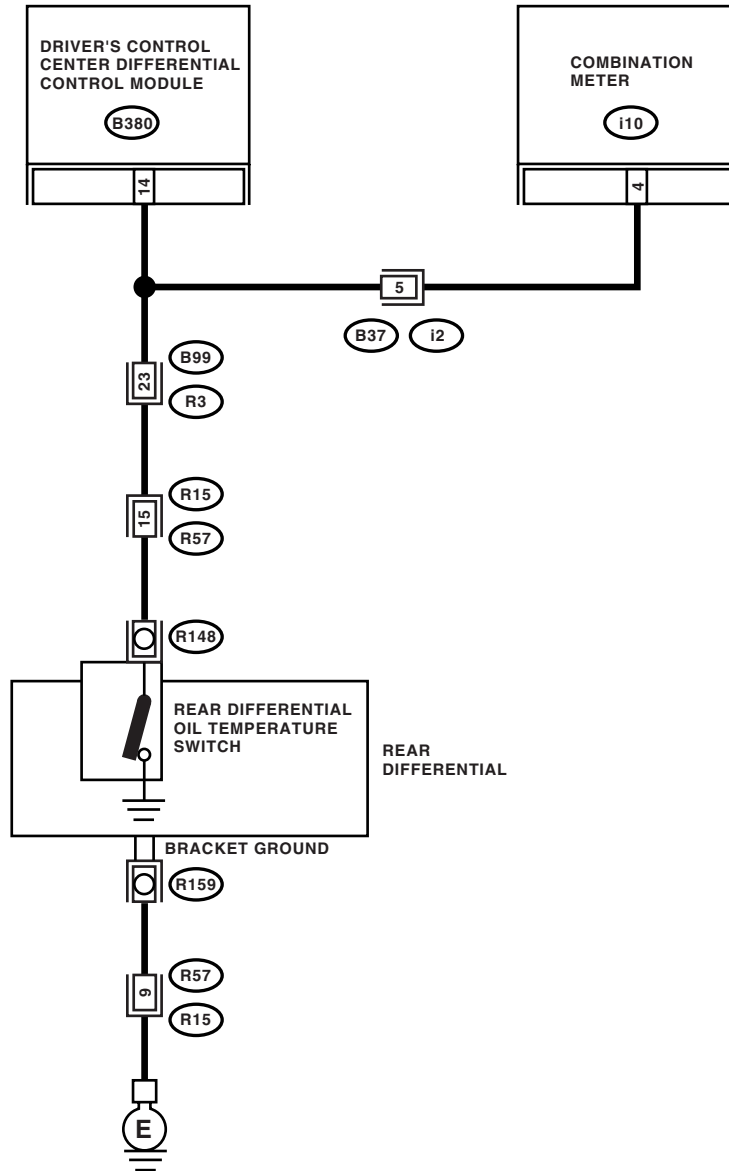
#### DIAGNOSIS:

Input signal circuit of rear differential oil temperature switch is open or shorted.

#### TROUBLE SYMPTOM:

- Center differential stays free.
- Handling tends to oversteer.
- Rear differential oil temperature switch warning light illuminates.

#### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <p><b>1</b></p> <p><b>CHECK REAR DIFFERENTIAL OIL TEMPERATURE SWITCH WARNING LIGHT CIRCUIT.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connector of driver's control center differential control module harness connector.<br/>                     3) Turn the ignition switch to ON. (engine OFF)<br/>                     4) Measure the voltage of rear differential oil temperature switch.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B380) No. 14 (+) — Chassis ground (-):</b></p>   | Is the voltage less than 0.4 V?   | Go to step 7.   | Go to step 2.   |
| <p><b>2</b></p> <p><b>CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND COMBINATION METER.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the harness connector from the combination meter.<br/>                     3) Disconnect the connector from the rear differential oil temperature switch.<br/>                     4) Measure the resistance between combination meter and driver's control center differential control module harness connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B380) No. 14 — (i10) No. 4:</b></p> | Is the resistance less than 1 $\Omega$ ?                                  | Go to step 3.   | Repair the open circuit between driver's control center differential control module and combination meter.                        |
| <p><b>3</b></p> <p><b>CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND REAR DIFFERENTIAL OIL TEMPERATURE SWITCH.</b></p> <p>Measure the resistance between driver's control center differential control module harness connector and rear differential oil temperature switch harness connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B380) No. 14 — (R148) No. 1:</b></p>   | Is the resistance less than 1 $\Omega$ ?                                  | Go to step 4.   | Repair the open circuit between driver's control center differential control module and rear differential oil temperature switch. |
| <p><b>4</b></p> <p><b>CHECK REAR DIFFERENTIAL OIL TEMPERATURE SWITCH GROUND CIRCUIT.</b></p> <p>1) Disconnect the harness connector from bracket ground of rear differential.<br/>                     2) Measure the resistance between the rear differential oil temperature switch ground harness connector and chassis ground.</p> <p><b>Connector &amp; terminals</b><br/> <b>(R159) No. 1 — Chassis ground:</b></p>  | Is the resistance more than 1 M $\Omega$ ?                                | Repair the open circuit of rear differential oil temperature switch ground circuit and poor contact of harness connector. | Go to step 5.   |
| <p><b>5</b></p> <p><b>CHECK REAR DIFFERENTIAL OIL TEMPERATURE SWITCH.</b></p> <p>Measure the resistance between rear differential oil temperature switch terminal and rear differential oil temperature switch body.</p> <p><b>Terminals</b><br/> <b>No. 1 — Rear differential oil temperature switch body:</b></p>  | Is the resistance less than 1 $\Omega$ ?                                  | Go to step 6.   | Replace the rear differential oil temperature switch.   |
| <p><b>6</b></p> <p><b>CHECK REAR DIFFERENTIAL OIL TEMPERATURE SWITCH WARNING LIGHT.</b></p> <p>1) Turn the ignition switch to ON.<br/>                     2) Short between the combination meter harness connector and chassis ground.</p> <p><b>Connector &amp; Terminals</b><br/> <b>(i10) No. 4 (+) — Chassis ground (-):</b></p>  | Does the rear differential oil temperature switch warning light turn OFF? | Go to step 7.   | Replace the combination meter.  |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

|   | Step                       | Check   | Yes                      | No   |
|---|----------------------------|---|--------------------------|--|
| 7 | <b>CHECK POOR CONTACT.</b> | Is there any poor contact in the circuit of rear differential oil temperature switch? | Repair the poor contact. | Replace the driver's control center differential control module. |

**C: DTC P1521 BRAKE SWITCH CIRCUIT RANGE**

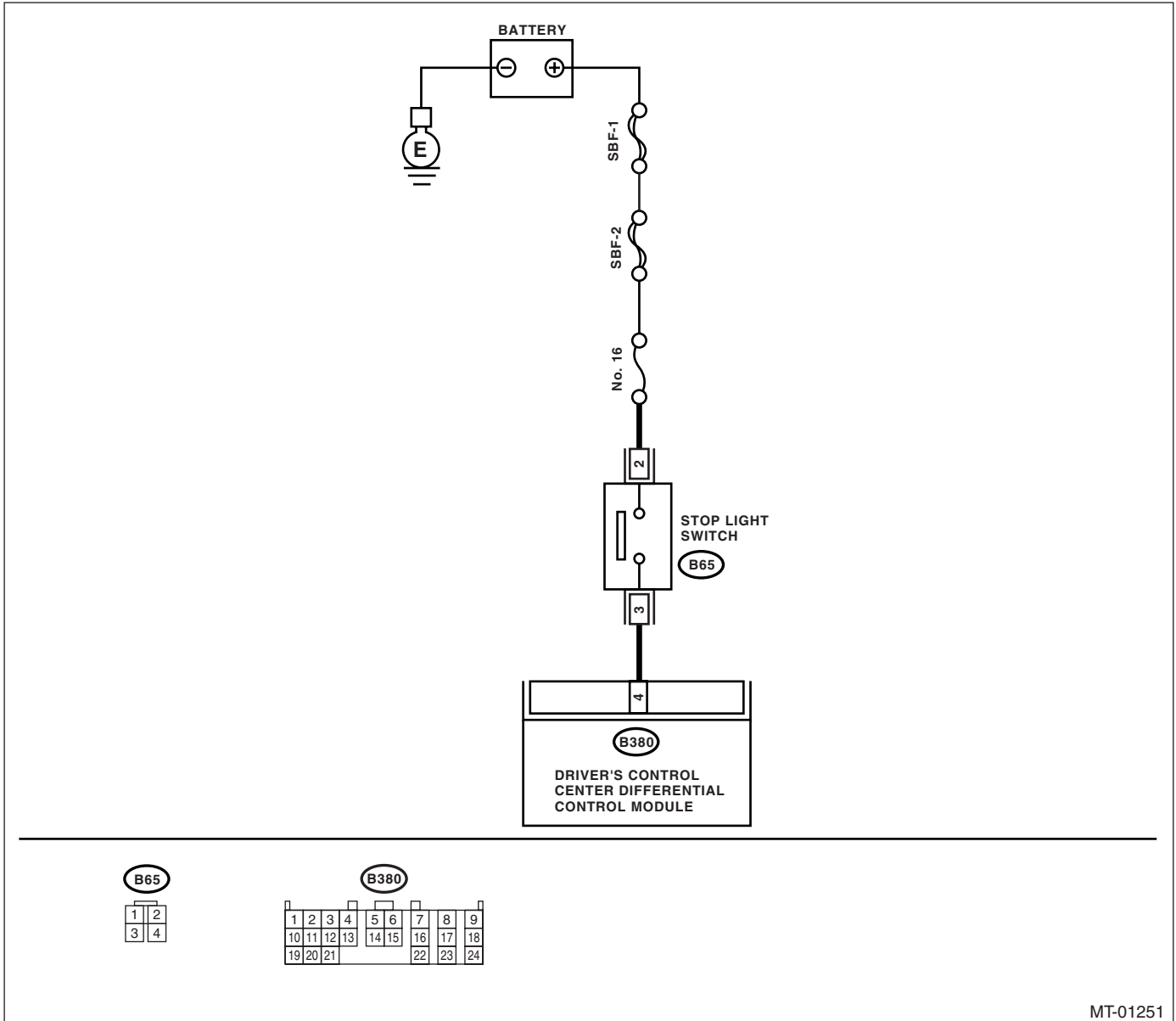
**DIAGNOSIS:**

Open or short circuit in stop light switch circuit

**TROUBLE SYMPTOM:**

Wheels are locked while the ABS operates.

**WIRING DIAGRAM:**



| Step                   | Check   | Yes                         | No            |
|------------------------|---|-----------------------------|---------------|
| 1<br><b>CHECK DTC.</b> | Is the stop light switch related DTC displayed during ABS self-diagnosis test mode? | Check according to ABS DTC. | Go to step 2. |



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <b>2 CHECK DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the Subaru Select Monitor to data link connector.<br>3) Turn the ignition switch to ON, and Subaru Select Monitor power switch to ON.<br>4) Read the data of "Stop Light Switch" using Subaru Select Monitor.  | Is the "OFF" displayed?                             | Go to step 3.  | Replace the driver's control center differential control module.   |
| <b>3 CHECK DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Depress the brake pedal and hold it.<br>2) Read the data of "Stop Light Switch" using Subaru Select Monitor.  | Is the "ON" displayed?                              | Go to step 6.  | Go to step 4.  |
| <b>4 CHECK INPUT SIGNAL FOR DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the harness connector of driver's control center differential control module.<br>3) Depress the brake pedal and hold it.<br>4) Measure the voltage between driver's control center differential control module and chassis ground.<br><i>Connector &amp; terminal<br/>(B380) No. 4 (+) — Chassis ground (-):</i> | Is the voltage more than 8 V?                       | Go to step 5.  | Repair the open circuit in harness between driver's control center differential control module and stop light switch.  |
| <b>5 CHECK POOR CONTACT.</b>  | Is there poor contact in stop light switch circuit? | Repair the poor contact in harness connector.                    | Go to step 6.  |
| <b>6 CHECK DTC.</b><br>Read the DTC from combination meter. <Ref. to 6MT(diag)-20, Read Diagnostic Trouble Code (DTC).>   | Is the DTC 33 displayed?                            | Replace the driver's control center differential control module. | Go to step 7.  |
| <b>7 CHECK FOR OTHER DTC ON DISPLAY.</b>  | Is there any DTC other than 33 displayed?           | Perform the diagnosis according to DTC.                          | Stop light switch circuit is in normal condition. Temporary poor contact occurs.<br>Repair the harness or connector between driver's control center differential control module and stop light switch. |

**D: DTC P1720 DCCD CAN SYSTEM CIRCUIT**

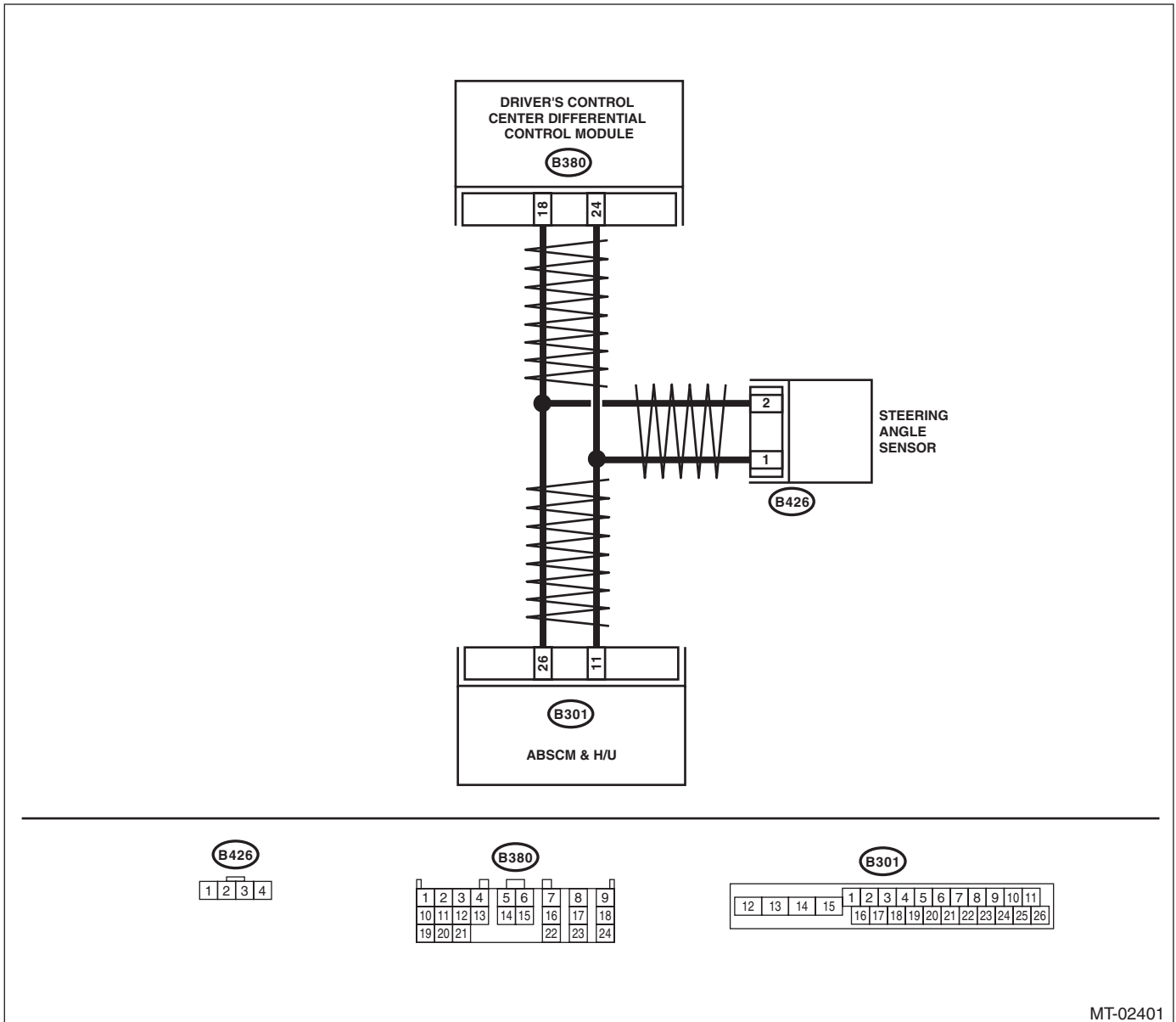
**DIAGNOSIS:**

Open or short circuit in CAN communication circuit

**TROUBLE SYMPTOM:**

- Tight corner braking phenomenon is occurred.
- ABS does not operate.
- ABS warning light illuminates.

**WIRING DIAGRAM:**



MT-02401

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step   | Check   | Yes   | No   |
|--|---|---|--|
| <b>1 CHECK HARNESS CONNECTOR BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ABSCM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from driver's control center differential control module and ABSCM&H/U.<br>3) Measure the resistance of harness connector between driver's control center differential control module and ABSCM&H/U.<br><b>Connector &amp; terminal</b><br><b>(B380) No. 18 — (B301) No. 26:</b><br><b>(B380) No. 24 — (B301) No. 11:</b> | Is the resistance less than 1 $\Omega$ ?                    | Go to step 2.   | Repair the open circuit in harness between driver's control center differential control module and ABSCM&H/U.  |
| <b>2 CHECK HARNESS CONNECTOR BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ABSCM.</b><br>1) Disconnect the connector from steering from steering angle sensor.<br>2) Measure the resistance between driver's control center differential control module and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B380) No. 18 — Chassis ground:</b><br><b>(B380) No. 24 — Chassis ground:</b>   | Is the resistance more than 1 $M\Omega$ ?                   | Go to step 3.   | Repair the short circuit in harness between driver's control center differential control module and ABSCM&H/U. |
| <b>3 CHECK HARNESS CONNECTOR BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ABSCM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between driver's control center differential control module connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B380) No. 18 (+) — Chassis ground (-):</b><br><b>(B380) No. 24 (+) — Chassis ground (-):</b>   | Is the voltage less than 1 V?                               | Go to step 4.   | Repair the short circuit in harness between driver's control center differential control module and ABSCM&H/U. |
| <b>4 CHECK POOR CONTACT.</b>   | Is there poor contact in CAN communication circuit?         | Repair the poor contact.  | Go to step 5.  |
| <b>5 CHECK STEERING ANGLE SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the connectors of ABSCM and driver's control center differential control module.<br>3) Start the engine.<br>4) Read the DTC.  | Is DTC P1720 displayed?                                     | Go to step 6.   | Replace the steering angle sensor.<br><Ref. to 6MT-130, Steering Angle Sensor.>                                |
| <b>6 CHECK ABSCM.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect all the connectors.<br>3) Clear DTCs.<br>4) Read the DTC.   | Is the DTC of CAN communication circuit displayed on ABSCM? | Replace the driver's control center differential control module.<br><Ref. to 6MT-129, Driver's Control Center Differential Control Module.> | Check ABSCM.   |

**E: DTC P1721 DCCD ENGINE RPM SIGNAL SYSTEM CIRCUIT**

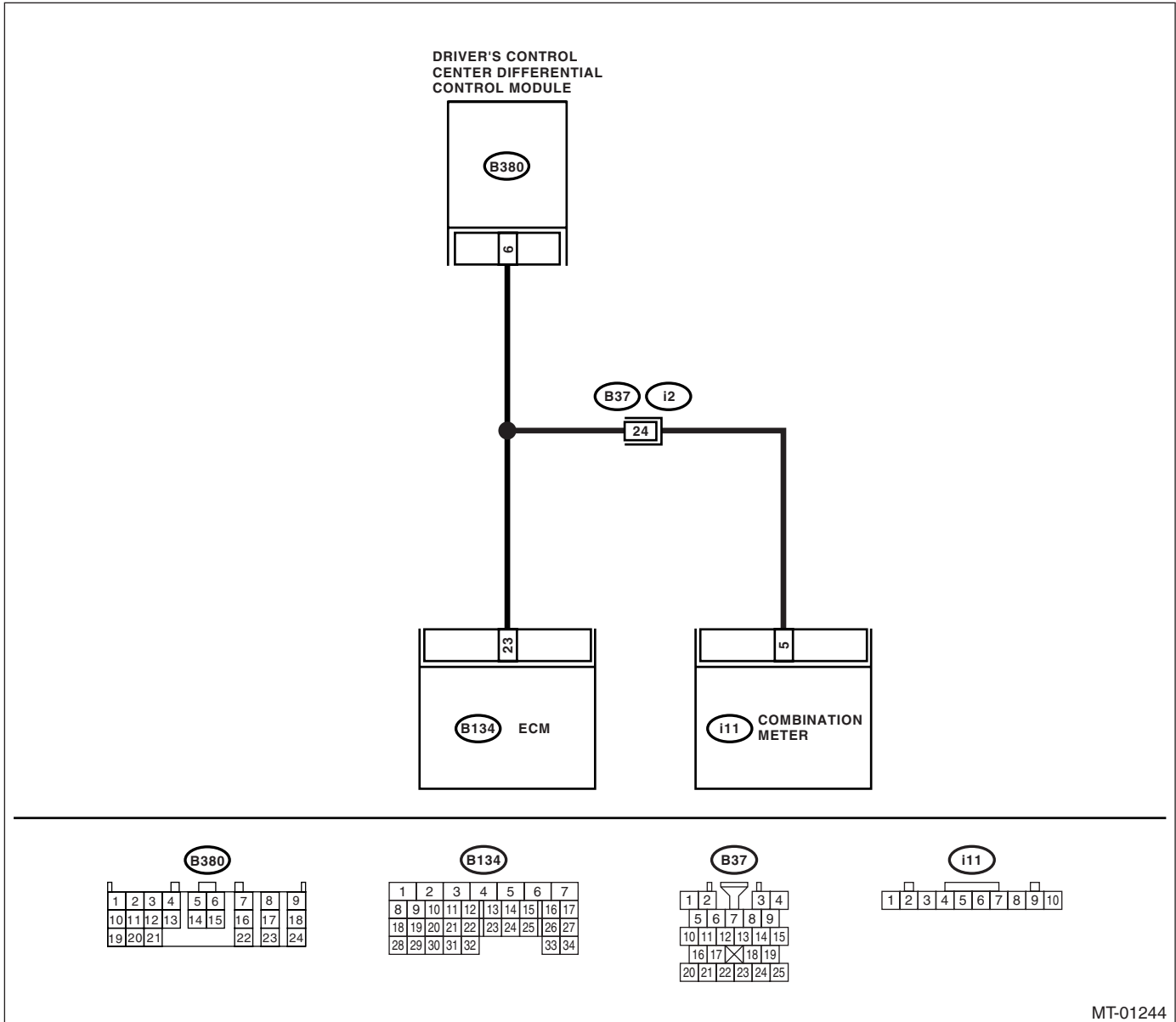
**DIAGNOSIS:**

Open or short in DCCD engine speed output signal circuit

**TROUBLE SYMPTOM:**

The tendency of oversteer occurred when high speed cornering.

**WIRING DIAGRAM:**



MT-01244

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <b>1 CHECK HARNESS CONNECTOR BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from driver's control center differential control module, Combination Meter and ECM.<br>3) Measure the resistance of harness connector between driver's control center differential control module and ECM.<br><i>Connector &amp; terminal<br/>(B380) No. 6 — (B134) No. 23:</i> | Is the resistance less than 1 $\Omega$ ?   | Go to step 2.   | Repair the open circuit in harness between driver's control center differential control module and ECM.  |
| <b>2 CHECK HARNESS CONNECTOR BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ECM.</b><br>Measure the resistance between driver's control center differential control module and chassis ground.<br><i>Connector &amp; terminal<br/>(B380) No. 6 — Chassis ground:</i>   | Is the resistance more than 1 $M\Omega$ ?  | Go to step 3.   | Repair the short circuit in harness between driver's control center differential control module and ECM. |
| <b>3 CHECK HARNESS CONNECTOR BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ECM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the resistance between driver's control center differential control module and chassis ground.<br><i>Connector &amp; terminal<br/>(B380) No. 6 (+) — Chassis ground (-):</i>  | Is the voltage less than 1 V?  | Go to step 4.   | Repair the short circuit in harness between driver's control center differential control module and ECM. |
| <b>4 CHECK INPUT SIGNAL FOR DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect all connectors.<br>3) Start the engine and let it idle.   | Does the tachometer in the combination meter operate?  | Go to step 5.   | Check ECM.   |
| <b>5 CHECK INPUT SIGNAL FOR DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the Subaru Select Monitor to data link connector.<br>3) Start the engine and Subaru Select Monitor power switch to ON.<br>4) Idle the engine.<br>5) Read the data of engine speed using Subaru Select Monitor.  | Is the revolution value about the same as tachometer reading shown in the combination meter? | Go to step 7.   | Go to step 6.  |
| <b>6 CHECK POOR CONTACT.</b>  | Is there poor contact in engine speed signal circuit?  | Repair the poor contact.  | Go to step 7.  |
| <b>7 CHECK DTC.</b><br>Perform the inspection mode and read DTC.  | Is the DTC 26 displayed?   | Replace the driver's control center differential control module.<br><Ref. to 6MT-129, Driver's Control Center Differential Control Module.> | Go to step 8.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step   | Check                                     | Yes                                     | No  |
|--|---|---|---|
| <b>8</b><br><b>CHECK FOR OTHER DTC ON DISPLAY.</b> | Is there any DTC other than 26 displayed? | Perform the diagnosis according to DTC. | Even if the center differential indicator light (differential free position) blinks, the circuit is in normal condition. Temporary poor contact occurs.<br>Repair the harness or connector between driver's control center differential control module and ECM. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

### F: DTC P1759 LATERAL ACCELERATION SENSOR CIRCUIT

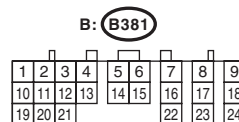
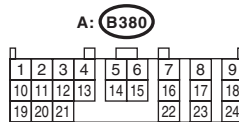
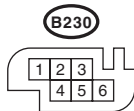
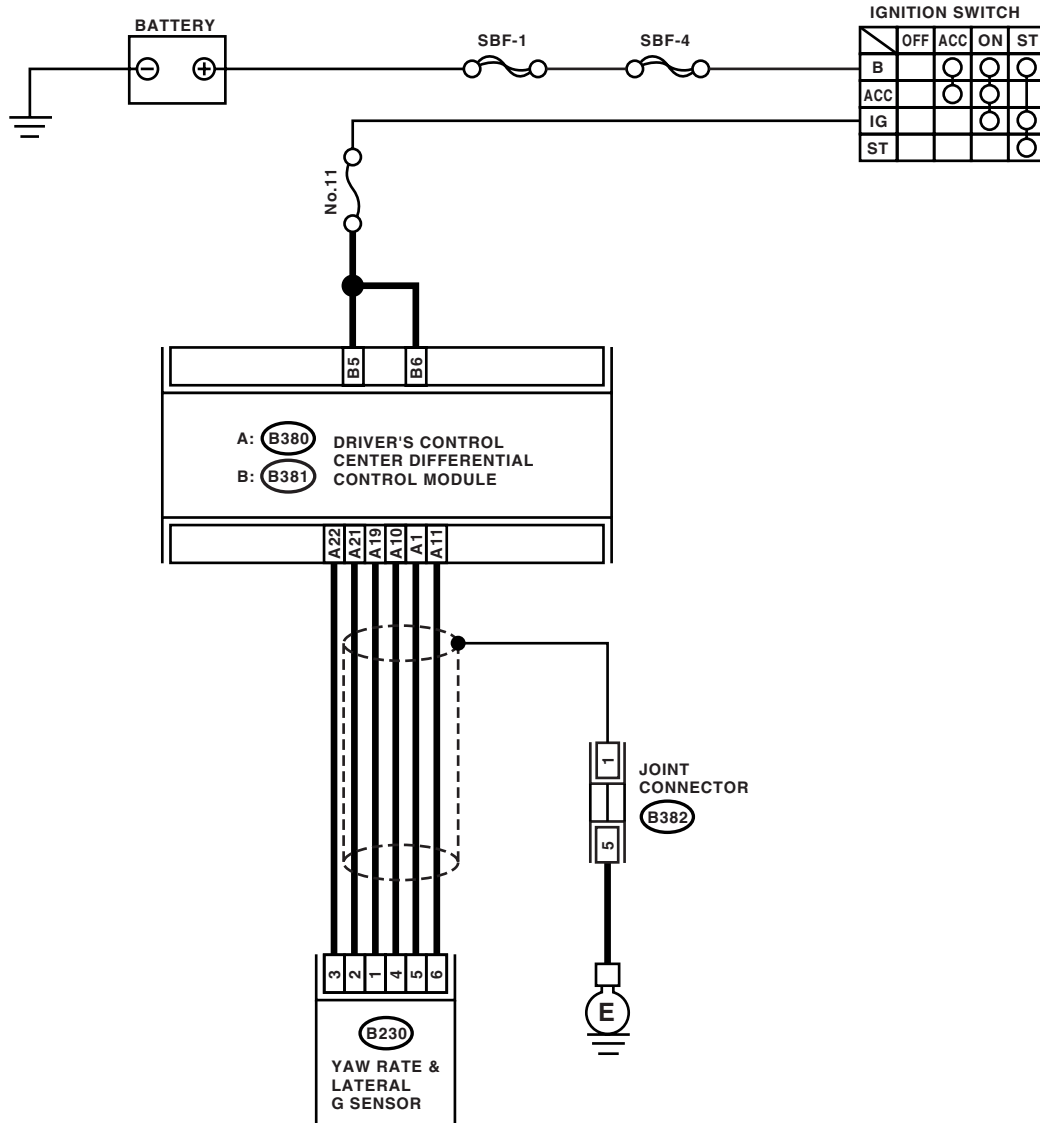
#### DIAGNOSIS:

Open or short in yaw rate & lateral G sensor circuit

#### TROUBLE SYMPTOM:

The tendency of understeer occurred when high speed cornering.

#### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step   | Check                                     | Yes   | No   |
|--|---|---|--|
| <p><b>1 CHECK YAW RATE &amp; LATERAL G SENSOR VOLTAGE.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connectors from yaw rate &amp; lateral G sensor.<br/>                     3) Turn the ignition switch to ON. (engine OFF)<br/>                     4) Measure the voltage between yaw rate &amp; lateral G sensor harness connector and Chassis ground (-).</p> <p><b>Connector &amp; terminal</b><br/> <b>(B230) No. 3 (+) — Chassis ground (-):</b></p> | Is the voltage more than 12 V?            | Go to step 4.   | Go to step 2.  |
| <p><b>2 CHECK OUTPUT SIGNAL OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b></p> <p>Measure the voltage between driver's control center differential control module and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B380) No. 22 (+) — Chassis ground (-):</b></p>  | Is the voltage more than 12 V?            | Repair the open circuit in harness between driver's control center differential control module and yaw rate & lateral G sensor. | Go to step 3.  |
| <p><b>3 CHECK DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE POWER SUPPLY VOLTAGE.</b></p> <p>Measure the voltage between driver's control center differential control module harness connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B381) No. 5 (+) — Chassis ground (-):</b><br/> <b>(B381) No. 6 (+) — Chassis ground (-):</b></p>  | Is the voltage more than 12 V?            | Go to step 11.  | Check the harness connectors between driver's control center differential control module power supply circuit, battery and driver's control center differential control module, and replace or charge the battery. |
| <p><b>4 CHECK YAW RATE &amp; LATERAL G SENSOR GROUND CIRCUIT.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connectors from driver's control center differential control module.<br/>                     3) Measure the resistance between driver's control center differential control module and yaw rate &amp; lateral G sensor.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B380) No. 10 — (B230) No. 4:</b></p>                                      | Is the resistance less than 1 $\Omega$ ?  | Go to step 5.   | Repair the open circuit in harness between driver's control center differential control module and yaw rate & lateral G sensor.  |
| <p><b>5 CHECK YAW RATE &amp; LATERAL G SENSOR GROUND CIRCUIT.</b></p> <p>Measure the resistance between driver's control center differential control module connector and Chassis ground (-).</p> <p><b>Connector &amp; terminal</b><br/> <b>(B380) No. 10 — Chassis ground:</b></p>   | Is the resistance more than 1 $M\Omega$ ? | Go to step 6.   | Repair the short circuit in harness between driver's control center differential control module and yaw rate & lateral G sensor.   |
| <p><b>6 CHECK HARNESS CONNECTOR BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND YAW RATE &amp; LATERAL G SENSOR.</b></p> <p>Measure the resistance between driver's control center differential control module and yaw rate &amp; lateral G sensor.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B380) No. 1 — (B230) No. 5:</b></p>  | Is the resistance less than 1 $\Omega$ ?  | Go to step 7.   | Repair the open circuit in harness between driver's control center differential control module and yaw rate & lateral G sensor.  |



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step   | Check  | Yes  | No  |
|--|--|--|---|
| <b>7 CHECK HARNESS CONNECTOR BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND YAW RATE &amp; LATERAL G SENSOR.</b><br>Measure the resistance between driver's control center differential control module harness connector and Chassis ground (-).<br><b>Connector &amp; terminal</b><br><b>(B380) No. 1 — Chassis ground:</b>  | Is the resistance more than 1 MΩ?                  | Go to step 8.  | Repair the short circuit in harness between driver's control center differential control module and yaw rate & lateral G sensor.  |
| <b>8 CHECK YAW RATE &amp; LATERAL G SENSOR.</b><br>1) Remove the yaw rate & lateral G sensor from body.<br>2) Connect the connector to yaw rate & lateral G sensor.<br>3) Connect the connector to driver's control center differential control module.<br>4) Turn the ignition switch to ON.<br>5) Measure the voltage between yaw rate & lateral G sensor terminals when the yaw rate & lateral G sensor is horizontal.<br><b>Connector &amp; terminal</b><br><b>(B230) No. 5 (+) — No. 6 (-):</b> | Is the voltage 2.35 — 2.65 V?                      | Go to step 9.  | Replace the yaw rate & lateral G sensor.  |
| <b>9 CHECK YAW RATE &amp; LATERAL G SENSOR.</b><br>Measure the voltage between yaw rate & lateral G sensor terminals when the yaw rate & lateral G sensor connector is tilted 90° to right.<br><b>Connector &amp; terminal</b><br><b>(B230) No. 5 (+) — No. 6 (-):</b>   | Is the voltage 3.3 — 3.7 V?                        | Go to step 10.   | Replace the yaw rate & lateral G sensor.  |
| <b>10 CHECK YAW RATE &amp; LATERAL G SENSOR.</b><br>Measure the voltage between yaw rate & lateral G sensor terminals when the yaw rate & lateral G sensor connector is tilted 90° to left.<br><b>Connector &amp; terminal</b><br><b>(B230) No. 5 (+) — No. 6 (-):</b>   | Is the voltage 1.3 — 1.7 V?                        | Go to step 11.   | Replace the yaw rate & lateral G sensor.  |
| <b>11 CHECK POOR CONTACT.</b>  | Is there poor contact in lateral G sensor circuit? | Repair the poor contact.   | Go to step 12.  |
| <b>12 CHECK DTC.</b><br>1) Perform the "clear memory". <Ref. to 6MT(diag)-23, Clear Memory Mode.><br>2) Start the engine.<br>3) Read the DTC using Subaru Select Monitor. <Ref. to 6MT(diag)-20, Read Diagnostic Trouble Code (DTC).>  | Is the DTC P1759 displayed?                        | Replace the driver's control center differential control module. | Go to step 13.  |
| <b>13 CHECK FOR OTHER DTC ON DISPLAY.</b>  | Is there any DTC other than P1759 displayed?       | Perform the diagnosis according to DTC.                          | Lateral G sensor circuit is in normal condition. Temporary poor contact occurs.<br>Repair the harness or connector between driver's control center differential control module and yaw rate & lateral G sensor. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

### G: DTC P1764 YAW RATE SENSOR SYSTEM CIRCUIT

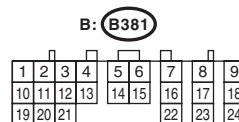
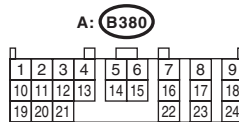
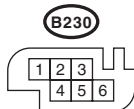
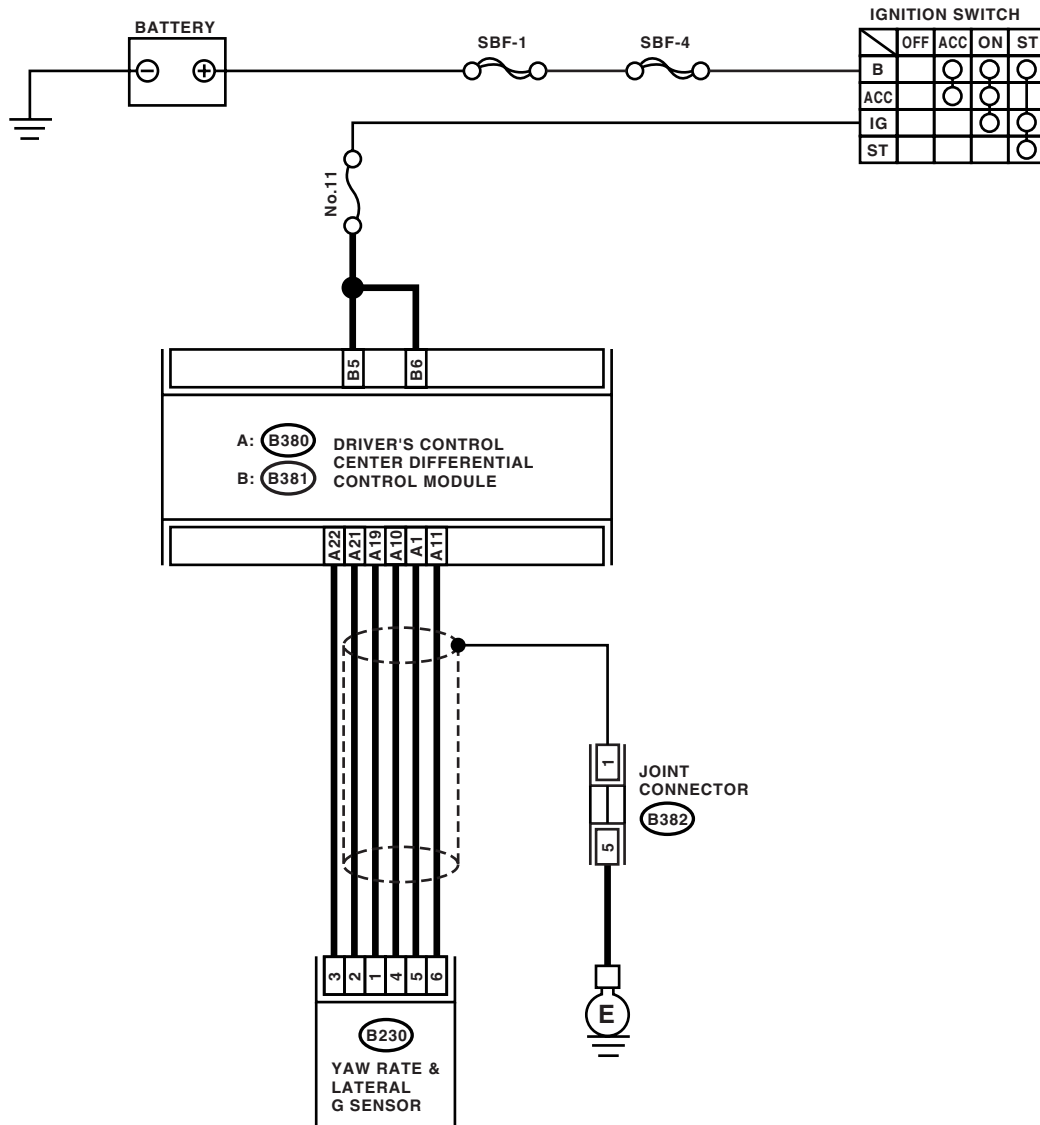
**DIAGNOSIS:**

Yaw rate & lateral G sensor circuit is open, shorted or stuck.

**TROUBLE SYMPTOM:**

The tendency of understeer occurred when high speed cornering.

**WIRING DIAGRAM:**



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step  | Check                                      | Yes   | No   |
|---|--|---|--|
| <p><b>1 CHECK YAW RATE &amp; LATERAL G SENSOR POWER SUPPLY.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connectors from yaw rate &amp; lateral G sensor.<br/>                     3) Turn the ignition switch to ON. (engine OFF)<br/>                     4) Measure the voltage between yaw rate &amp; lateral G sensor and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B230) No. 3 (+) — Chassis ground (-):</b></p> | Is the voltage more than 12 V?             | Go to step 4.   | Go to step 2.  |
| <p><b>2 CHECK DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE POWER SUPPLY OUTPUT.</b></p> <p>Measure the resistance between driver's control center differential control module and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B380) No. 22 (+) — Chassis ground (-):</b></p>   | Is the voltage more than 12 V?             | Repair the open circuit in harness between driver's control center differential control module and yaw rate & lateral G sensor. | Go to step 3.  |
| <p><b>3 CHECK DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE POWER SUPPLY VOLTAGE.</b></p> <p>Measure the voltage between driver's control center differential control module harness connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B381) No. 5 (+) — Chassis ground (-):</b><br/> <b>(B381) No. 6 (+) — Chassis ground (-):</b></p>   | Is the voltage more than 12 V?             | Go to step 10.  | Check the harness connectors between driver's control center differential control module power supply circuit, battery and driver's control center differential control module, and replace or charge the battery. |
| <p><b>4 CHECK YAW RATE &amp; LATERAL G SENSOR GROUND CIRCUIT.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the connectors from driver's control center differential control module.<br/>                     3) Measure the resistance between driver's control center differential control module and yaw rate &amp; lateral G sensor.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B380) No. 11 — (B230) No. 6:</b></p>                     | Is the resistance less than 1 $\Omega$ ?   | Go to step 5.   | Repair the open circuit in harness between driver's control center differential control module and yaw rate & lateral G sensor.  |
| <p><b>5 CHECK YAW RATE &amp; LATERAL G SENSOR GROUND CIRCUIT.</b></p> <p>Measure the resistance between driver's control center differential control module and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B380) No. 11 — Chassis ground:</b></p>  | Is the resistance more than 1 M $\Omega$ ? | Go to step 6.   | Repair the short circuit in harness between driver's control center differential control module and yaw rate & lateral G sensor.   |
| <p><b>6 CHECK DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND YAW RATE &amp; LATERAL G SENSOR GROUND CIRCUIT.</b></p> <p>Measure the resistance between driver's control center differential control module and yaw rate &amp; lateral G sensor.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B380) No. 10 — (B230) No. 4:</b></p>   | Is the resistance less than 1 $\Omega$ ?   | Go to step 7.   | Repair the open circuit in harness between driver's control center differential control module and yaw rate & lateral G sensor.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step   | Check   | Yes  | No   |
|--|---|--|--|
| <p><b>7</b></p> <p><b>CHECK DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND YAW RATE &amp; LATERAL G SENSOR GROUND CIRCUIT.</b></p> <p>Measure the resistance between driver's control center differential control module and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B380) No. 10 — Chassis ground:</b></p>  | <p>Is the resistance more than 1 M<math>\Omega</math>?</p>  | Go to step 8.  | Repair the short circuit in harness between driver's control center differential control module and yaw rate & lateral G sensor. |
| <p><b>8</b></p> <p><b>CHECK INPUT SIGNAL FOR DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b></p> <p>1) Connect all the connectors.<br/>2) Connect the Subaru Select Monitor to vehicle.<br/>3) Turn the ignition switch to ON.<br/>4) Turn the Subaru Select Monitor power switch to ON.<br/>5) Read the data of "Yaw rate sensor signal" using Subaru Select Monitor. &lt;Ref. to 6MT(diag)-14, OPERATION, Subaru Select Monitor.&gt;</p>  | <p>Is the voltage of 2.0 V <math>\longleftrightarrow</math> 2.5 V <math>\longleftrightarrow</math> 3.0 V displayed?</p>   | Go to step 12.   | Go to step 9.  |
| <p><b>9</b></p> <p><b>CHECK OUTPUT SIGNAL OF YAW RATE &amp; LATERAL G SENSOR.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Check the oscilloscope signal pattern between driver's control center differential control module connector terminals.</p> <p><b>Connector &amp; terminal</b><br/><b>Positive test lead: (B380) No. 10</b><br/><b>Negative lead: (B380) No. 20</b></p> <p>3) Turn the ignition switch to ON.</p>                 | <p>Is the oscilloscope pattern the same waveform as shown in the figure? &lt;Ref. to 6MT(diag)-13, WAVEFORM, MEASUREMENT, Driver's Control Center Differential Control Module I/O Signal.&gt;</p> | Go to step 10.   | Replace the driver's control center differential control module.   |
| <p><b>10</b></p> <p><b>CHECK OUTPUT SIGNAL OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Check the oscilloscope signal pattern between driver's control center differential control module connector terminals.</p> <p><b>Connector &amp; terminal</b><br/><b>Positive lead: (B380) No. 19</b><br/><b>Negative lead: (B380) No. 20</b></p> <p>3) Turn the ignition switch to ON.</p> | <p>Is the oscilloscope pattern the same waveform as shown in the figure? &lt;Ref. to 6MT(diag)-13, WAVEFORM, MEASUREMENT, Driver's Control Center Differential Control Module I/O Signal.&gt;</p> | Go to step 11.   | Replace the yaw rate & lateral G sensor.   |
| <p><b>11</b></p> <p><b>CHECK POOR CONTACT.</b></p>   | <p>Is there poor contact in yaw rate sensor circuit?</p>  | Repair the poor contact.   | Go to step 12.   |
| <p><b>12</b></p> <p><b>CHECK DTC.</b></p> <p>1) Perform the "clear memory". &lt;Ref. to 6MT(diag)-23, Clear Memory Mode.&gt;<br/>2) Start the engine.<br/>3) Read the DTC using Subaru Select Monitor. &lt;Ref. to 6MT(diag)-20, Read Diagnostic Trouble Code (DTC).&gt;</p>   | <p>Is the DTC P1764 displayed?</p>  | Replace the driver's control center differential control module. | Go to step 13.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step | Check                                  | Yes  | No  |
|------|--|--|---|
| 13   | <b>CHECK FOR OTHER DTC ON DISPLAY.</b> | Is there any DTC other than P1764 displayed? | Perform the diagnosis according to DTC.<br><br>Yaw rate sensor circuit is in normal condition. Temporary poor contact occurs.<br>Repair the harness or connector between driver's control center differential control module and yaw rate & lateral G sensor. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

### H: DTC P1765 YAW RATE SIDE G SENSOR REFERENCE SYSTEM CIRCUIT

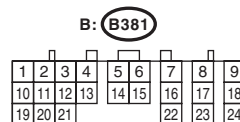
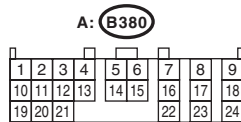
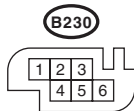
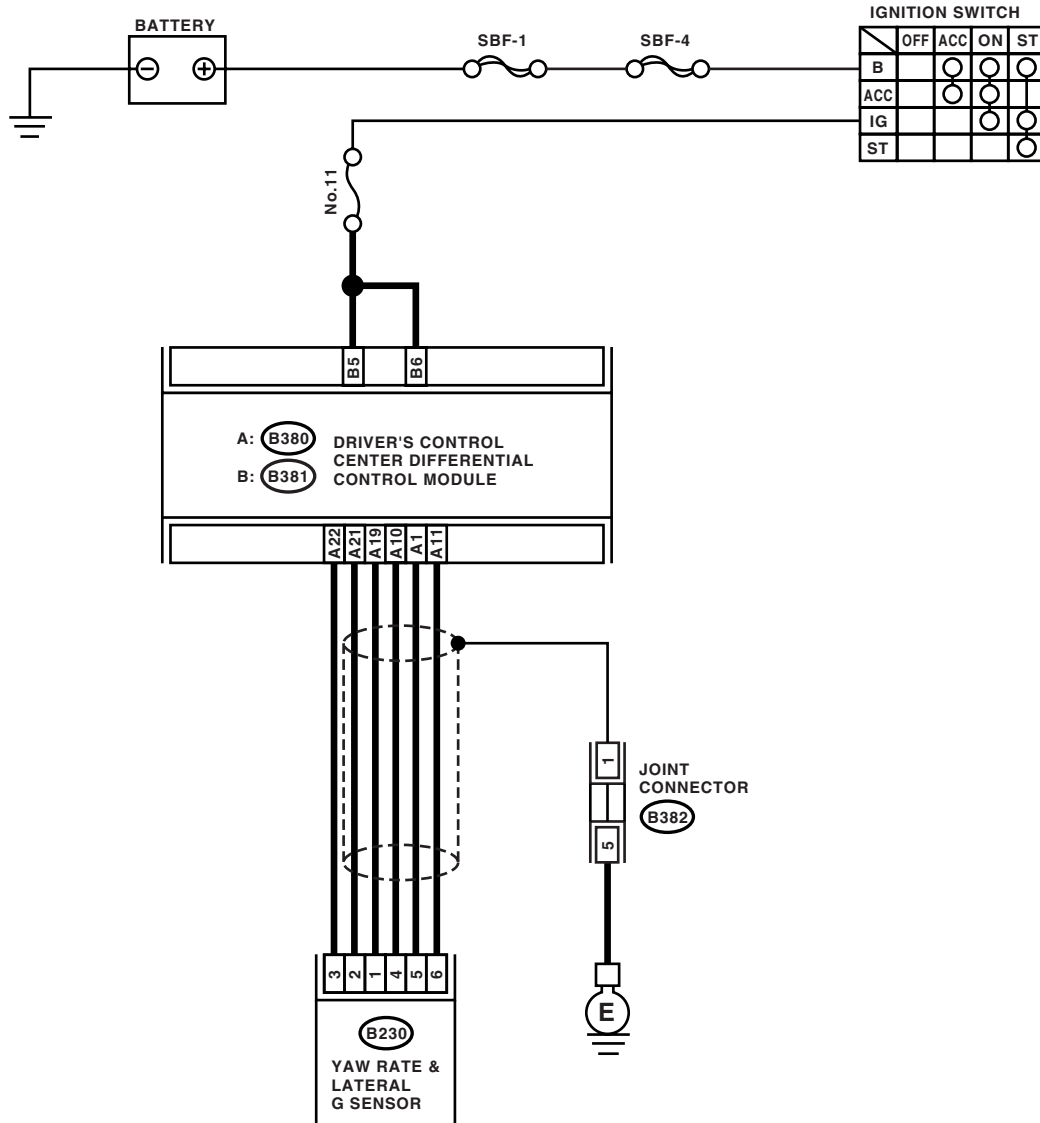
**DIAGNOSIS:**

Open or short in yaw rate & lateral G sensor reference circuit

**TROUBLE SYMPTOM:**

The tendency of understeer occurred when high speed cornering.

**WIRING DIAGRAM:**



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step   | Check                                      | Yes   | No   |
|--|--|---|--|
| <b>1 CHECK YAW RATE &amp; LATERAL G SENSOR VOLTAGE.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from yaw rate & lateral G sensor.<br>3) Turn the ignition switch to ON. (engine OFF)<br>4) Measure the voltage between yaw rate & lateral G sensor harness connector and chassis ground (-).<br><i>Connector &amp; terminal</i><br><i>(B230) No. 3 (+) — Chassis ground (-):</i>        | Is the voltage more than 12 V?             | Go to step 4.   | Go to step 2.  |
| <b>2 CHECK DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE VOLTAGE.</b><br>Measure the voltage between driver's control center differential control module harness connector and chassis ground (-).<br><i>Connector &amp; terminal</i><br><i>(B380) No. 22 (+) — Chassis ground (-):</i>  | Is the voltage more than 12 V?             | Repair the open circuit in harness between driver's control center differential control module and yaw rate & lateral G sensor. | Go to step 3.  |
| <b>3 CHECK DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE POWER SUPPLY VOLTAGE.</b><br>Measure the voltage between driver's control center differential control module harness connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B381) No. 5 (+) — Chassis ground (-):</i><br><i>(B381) No. 6 (+) — Chassis ground (-):</i>   | Is the voltage more than 12 V?             | Go to step 10.  | Check the harness connectors between driver's control center differential control module power supply circuit, battery and driver's control center differential control module, and replace or charge the battery. |
| <b>4 CHECK YAW RATE &amp; LATERAL G SENSOR GROUND CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from driver's control center differential control module.<br>3) Measure the resistance between driver's control center differential control module harness connector and yaw rate & lateral G sensor.<br><i>Connector &amp; terminal</i><br><i>(B380) No. 11 — (B230) No. 6:</i> | Is the resistance less than 1 $\Omega$ ?   | Go to step 5.   | Repair the open circuit in harness between driver's control center differential control module and yaw rate & lateral G sensor.  |
| <b>5 CHECK YAW RATE &amp; LATERAL G SENSOR GROUND CIRCUIT.</b><br>Measure the resistance between driver's control center differential control module harness connector and Chassis ground (-).<br><i>Connector &amp; terminal</i><br><i>(B380) No. 11 — Chassis ground:</i>  | Is the resistance more than 1 M $\Omega$ ? | Go to step 6.   | Repair the short circuit in harness between driver's control center differential control module and yaw rate & lateral G sensor.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step  | Check   | Yes  | No  |
|---|---|--|---|
| <b>6 CHECK HARNESS CONNECTOR BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND YAW RATE &amp; LATERAL G SENSOR.</b><br>Measure the resistance between driver's control center differential control module harness connector and yaw rate & lateral G sensor.<br><i>Connector &amp; terminal</i><br><i>(B380) No. 19 — (B230) No. 1:</i>   | Is the resistance less than 1 $\Omega$ ?                                | Go to step 7.  | Repair the open circuit in harness between driver's control center differential control module and yaw rate & lateral G sensor.   |
| <b>7 CHECK HARNESS CONNECTOR BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND YAW RATE &amp; LATERAL G SENSOR.</b><br>Measure the resistance between driver's control center differential control module harness connector and Chassis ground (-).<br><i>Connector &amp; terminal</i><br><i>(B380) No. 19 — Chassis ground:</i>  | Is the resistance more than 1 M $\Omega$ ?                              | Go to step 8.  | Repair the short circuit in harness between driver's control center differential control module and yaw rate & lateral G sensor.  |
| <b>8 CHECK LATERAL G SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect all the connectors.<br>3) Connect the Subaru Select Monitor to data link connector.<br>4) Turn the ignition switch to ON, and Subaru Select Monitor power switch to ON.<br>Read the data of "Yaw rate & lateral G sensor" using Subaru Select Monitor. <Ref. to 6MT(diag)-15, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> | Is the data 2.1 — 2.9?  | Go to step 11.   | Go to step 9.   |
| <b>9 CHECK YAW RATE &amp; LATERAL G SENSOR.</b><br>Measure the driver's control center differential control module harness connector voltage.<br><i>Connector &amp; terminal</i><br><i>(B380) No. 19 (+) — No. 20 (-):</i>  | Is the voltage 2.1 — 2.9 V?   | Go to step 10.   | Replace the yaw rate & lateral G sensor.  |
| <b>10 CHECK POOR CONTACT.</b>   | Is there poor contact in yaw rate & lateral G sensor reference circuit? | Repair the poor contact.   | Go to step 11.  |
| <b>11 CHECK DTC.</b><br>1) Perform the "clear memory". <Ref. to 6MT(diag)-23, Clear Memory Mode.><br>2) Start the engine.<br>3) Read the DTC. <Ref. to 6MT(diag)-20, Read Diagnostic Trouble Code (DTC).>   | Is the DTC P1765 displayed?   | Replace the driver's control center differential control module. | Go to step 12.  |
| <b>12 CHECK FOR OTHER DTC ON DISPLAY.</b>   | Is there any DTC other than P1765 displayed?                            | Perform the diagnosis according to DTC.                          | Lateral G sensor circuit is in normal condition. Temporary poor contact occurs.<br>Repair the harness or connector between driver's control center differential control module and yaw rate & lateral G sensor. |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

### I: DTC P1767 DCCD STEERING ANGLE SENSOR

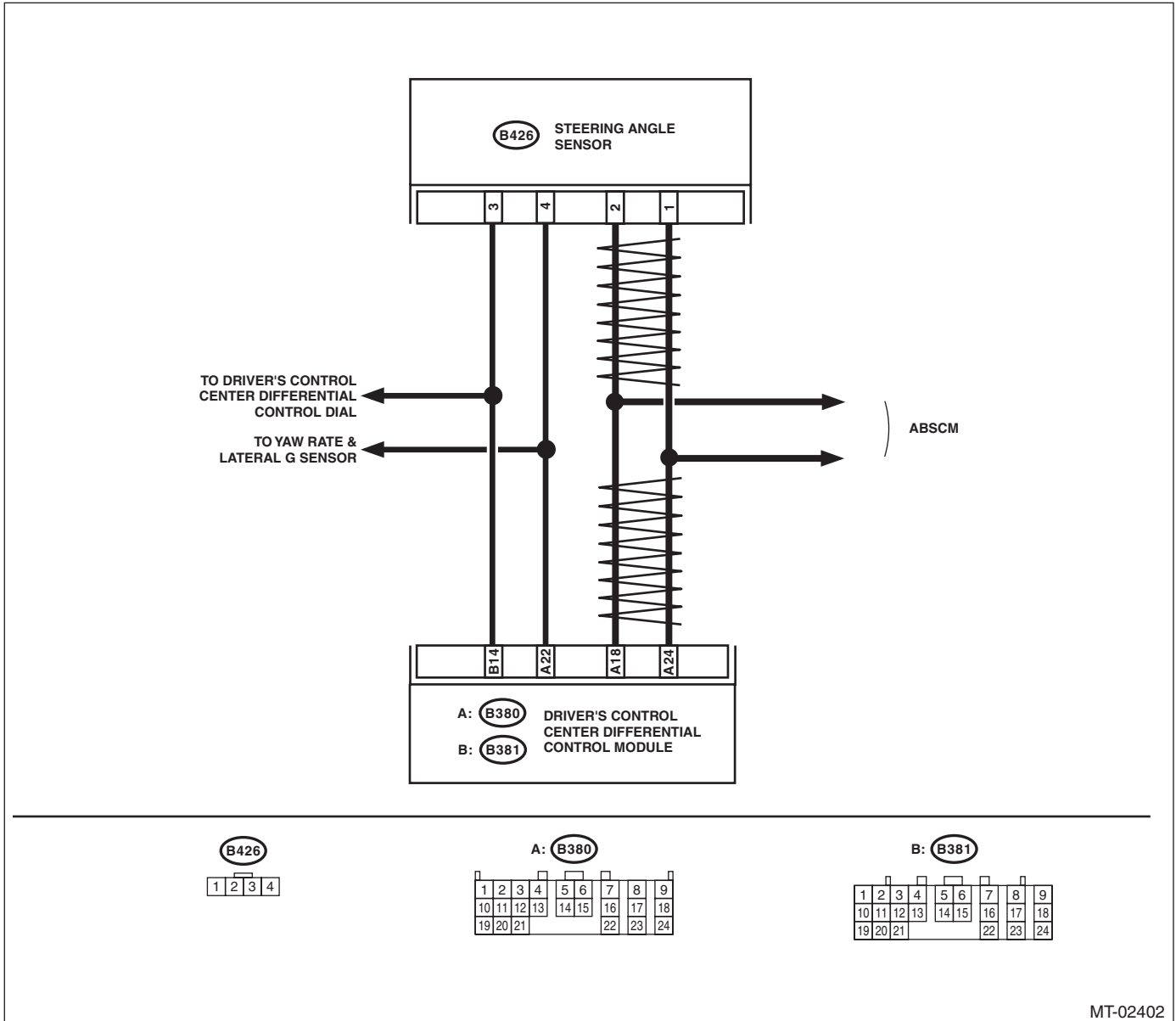
#### DIAGNOSIS:

Steering angle sensor circuit is open or shorted, or communication error.

#### TROUBLE SYMPTOM:

Tight corner braking phenomenon is occurred.

#### WIRING DIAGRAM:



MT-02402

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step | Check   | Yes  | No   |
|------|---|--|--|
| 1    | <b>CHECK DTC.</b>   | Is DTC P1720 displayed?  | Perform the diagnosis according to DTC.  |
| 2    | <b>CHECK POWER SUPPLY FOR STEERING ANGLE SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from steering angle sensor.<br>3) Turn the ignition switch to ON. (Engine OFF)<br>4) Measure the voltage between steering angle sensor and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B426) No. 4 (+) — Chassis ground (-):</b> | Is the voltage more than 12 V?   | Go to step 3.<br><br>Repair the open circuit of harness between steering angle sensor and driver's control center differential control module. |
| 3    | <b>CHECK GROUND CIRCUIT OF STEERING ANGLE SENSOR.</b><br>Measure the resistance between steering angle sensor and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B426) No. 3 — Chassis ground:</b>   | Is the resistance less than 1 $\Omega$ ?   | Go to step 4.<br><br>Repair the open circuit of harness between steering angle sensor and driver's control center differential control module. |
| 4    | <b>CHECK HARNESS BETWEEN STEERING ANGLE SENSOR AND DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>Measure the resistance between steering angle sensor and driver's control center differential control module.<br><b>Connector &amp; terminal</b><br><b>(B426) No. 2 — (B380) No. 18:</b><br><b>(B426) No. 1 — (B380) No. 24:</b>                           | Is the resistance less than 1 $\Omega$ ?   | Go to step 5.<br><br>Repair the open circuit of harness between steering angle sensor and driver's control center differential control module. |
| 5    | <b>CHECK INPUT SIGNAL FOR DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL.</b><br>1) Connect all the connectors.<br>2) Connect the Subaru Select Monitor to the vehicle.<br>3) Turn the ignition switch to ON. (Engine OFF)<br>4) Read the data "deg" of steering angle sensor using Subaru Select Monitor. <Ref. to 6MT(diag)-14, OPERATION, Subaru Select Monitor.>        | Does the value on the Subaru Select Monitor vary in accordance with steering wheel turning angle when turning it to the right or left? | Go to step 6.<br><br>Go to step 8.   |
| 6    | <b>CHECK POOR CONTACT.</b>  | Is there poor contact in steering angle sensor circuit?  | Repair the poor contact.<br><br>Go to step 7.  |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <b>7</b><br><b>CHECK DTC.</b><br>1) Turn the ignition switch to OFF.<br>2) Erase the memory.<br>3) Start the engine.<br>4) Read the DTC.  | Is DTC P1767 displayed?                      | Go to step <b>8</b> .  | Even if the center differential indicator light (differential free position) is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the connector or harness between driver's control center differential control module and steering angle sensor. |
| <b>8</b><br><b>CHECK DTC.</b><br>1) Turn the ignition switch to OFF.<br>2) Replace the steering angle sensor. <Ref. to 6MT-130, Steering Angle Sensor.><br>3) Erase the memory.<br>4) Start the engine.<br>5) Read the DTC. | Is DTC P1767 displayed?                      | Replace the driver's control center differential control module. | Go to step <b>9</b> .  |
| <b>9</b><br><b>CHECK FOR OTHER DTC ON DISPLAY.</b>  | Is there any DTC other than P1767 displayed? | Perform the diagnosis according to DTC.                          | The original steering angle sensor is faulty.  |

### **J: DTC P1875 CIRCUIT OF CENTER DIFF.**

#### **DIAGNOSIS:**

Driver's control center differential circuit is open or shorted.

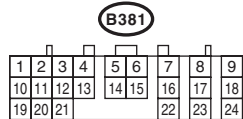
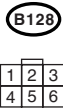
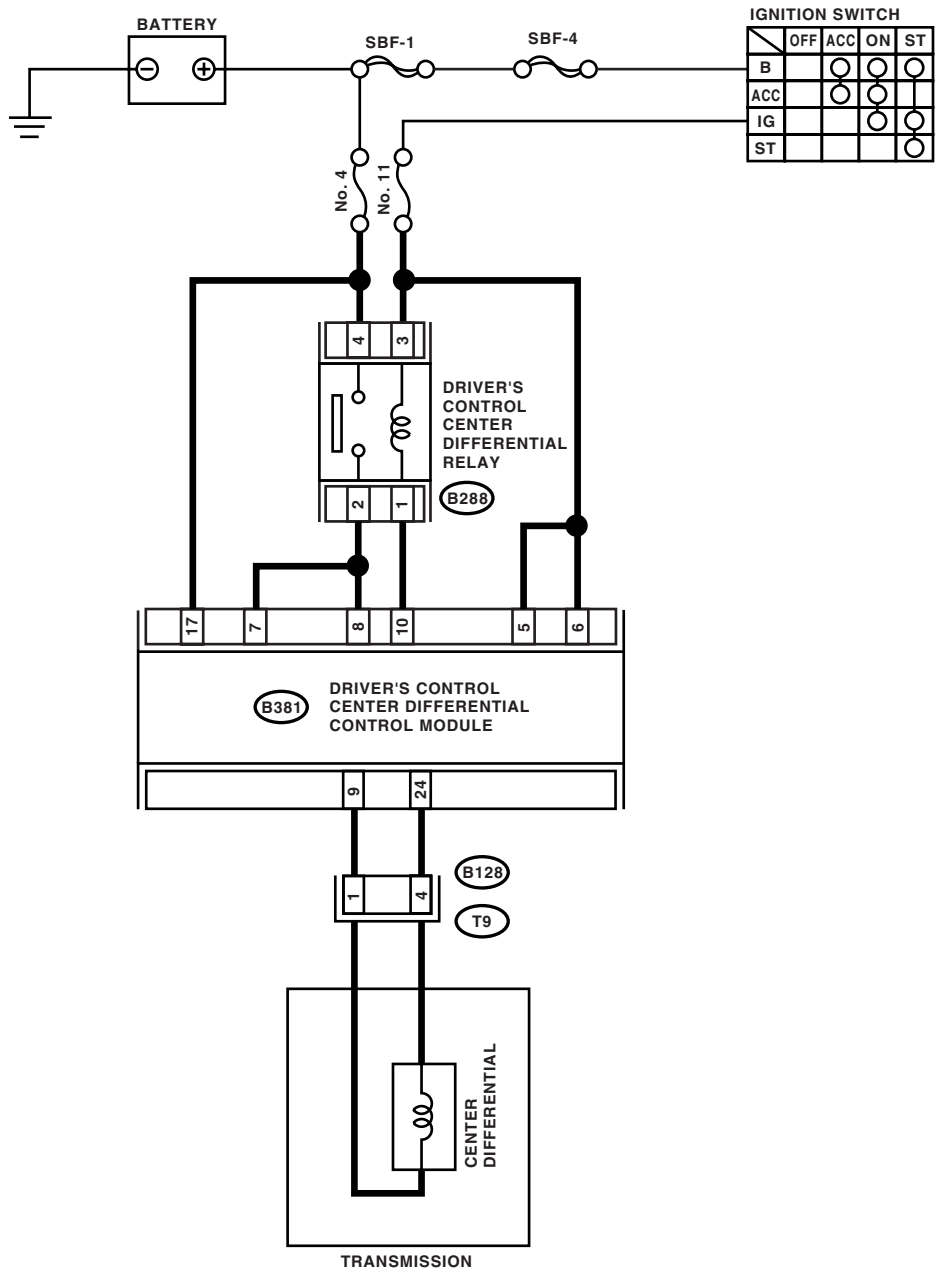
#### **TROUBLE SYMPTOM:**

- Center differential does not operate.
- Lock ratio of center differential does not variation, or malfunction occurs.
- Tight corner braking condition occurs.
- Handling tends to oversteer.
- The tendency of understeer occurred when high speed cornering.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

### WIRING DIAGRAM:



MT-01246

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step   | Check  | Yes                  | No  |
|--|--|----------------------|---|
| <p><b>1</b></p> <p><b>CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND TRANSMISSION HARNESS.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the harness connector of driver's control center differential control module.<br/>                     3) Disconnect the transmission harness connector and bulk harness connector.<br/>                     4) Measure the resistance of harness between driver's control center differential control module harness connector and transmission harness connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B381) No. 9 — (B128) No. 1:</b><br/> <b>(B381) No. 24 — (B128) No. 4:</b></p>                      | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | <p>Go to step 2.</p> | <p>Repair the open circuit of bulk harness between driver's control center differential control module and transmission harness.</p>  |
| <p><b>2</b></p> <p><b>CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND TRANSMISSION HARNESS.</b></p> <p>Measure the resistance between driver's control center differential control module harness connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B381) No. 9 — Chassis ground:</b><br/> <b>(B381) No. 24 — Chassis ground:</b></p>  | <p>Is the resistance more than 1 M<math>\Omega</math>?</p> | <p>Go to step 3.</p> | <p>Repair the short circuit of bulk harness between driver's control center differential control module and transmission harness.</p> |
| <p><b>3</b></p> <p><b>CHECK THE CENTER DIFFERENTIAL.</b></p> <p>Measure the resistance between transmission harness connector terminals.</p> <p><b>Connector &amp; terminals</b><br/> <b>(T9) No. 1 — No. 4:</b></p>   | <p>Is the resistance 1.2 — 2.5 <math>\Omega</math>?</p>    | <p>Go to step 4.</p> | <p>Replace the center differential.</p>   |
| <p><b>4</b></p> <p><b>CHECK THE OUTPUT SIGNAL OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b></p> <p>1) Connect all the harness connectors.<br/>                     2) Turn the ignition switch to ON. (engine OFF)<br/>                     3) Release the parking brake.<br/>                     4) Set the driver's control center differential to manual mode by pressing manual mode switch.<br/>                     5) Set the center differential control dial to differential lock.<br/>                     6) Measure the voltage between driver's control center differential control module and harness connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B381) No. 9 (+) — (B381) No. 24 (-):</b></p> | <p>Is the voltage 7.0 — 9.0 V?</p>                         | <p>Go to step 5.</p> | <p>Go to step 6.</p>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step   | Check                                    | Yes  | No  |
|--|--|--|---|
| <p><b>5</b></p> <p><b>CHECK THE OUTPUT SIGNAL OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b></p> <p>1) Turn the center differential control dial from differential lock to differential free position.</p> <p>2) Measure the voltage between driver's control center differential control module and harness connector.</p> <p><b>Connector &amp; terminal</b><br/><b>(B381) No. 9 (+) — (B381) No. 24 (-):</b></p>               | <p>Does the voltage change smoothly?</p> | <p>Circuit is in normal condition this time though the indicator blink illuminates. A temporary poor connector or harness may be the case. Repair the poor contact in connector or harness of driver's control center differential control module and transmission harness. Check the poor contact in power supply circuit, too.</p> | <p>Go to step 6.</p>  |
| <p><b>6</b></p> <p><b>CHECK FUSE (No. 4).</b><br/>Remove the fuse (No. 4).</p>   | <p>Is the fuse (No. 4) is blown out?</p> | <p>Replace fuse (No. 4). If the replaced fuse (No. 4) is blown out easily, repair short circuit in harness between fuse (No. 4) and driver's control center differential control module.</p>   | <p>Go to step 7.</p>  |
| <p><b>7</b></p> <p><b>CHECK POWER SUPPLY CIRCUIT OF DRIVER'S CONTROL CENTER DIFFERENTIAL RELAY.</b></p> <p>1) Fuse installation.</p> <p>2) Disconnect the harness connector of driver's control center differential relay.</p> <p>3) Measure the voltage between driver's control center differential relay harness connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B288) No. 4 (+) — Chassis ground (-):</b></p> | <p>Is the voltage more than 10 V?</p>    | <p>Go to step 8.</p>   | <p>Repair the open or short circuit between fuse (No. 4) and driver's control center differential relay, battery.</p> |
| <p><b>8</b></p> <p><b>CHECK IGNITION POWER SUPPLY CIRCUIT OF DRIVER'S CONTROL CENTER DIFFERENTIAL RELAY.</b></p> <p>Measure the voltage between driver's control center differential relay and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B288) No. 3 (+) — Chassis ground (-):</b></p>  | <p>Is the voltage more than 10 V?</p>    | <p>Go to step 9.</p>   | <p>Repair the open circuit between fuse (No. 11) and driver's control center differential control module.</p>         |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step   | Check  | Yes            | No  |
|--|--|----------------|---|
| <p><b>9</b></p> <p><b>CHECK HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND DRIVER'S CONTROL RELAY.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the driver's control center differential control unit connector.<br/>3) Measure the resistance of harness between driver's control center differential control module harness connector and driver's control relay harness connector.</p> <p><b>Connector &amp; terminal</b><br/><b>(B381) No. 18 — (B288) No. 2:</b><br/><b>(B381) No. 19 — (B288) No. 2:</b><br/><b>(B381) No. 21 — (B288) No. 1:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | Go to step 10. | Repair the open circuit between driver's control center differential control module harness connector and driver's control relay harness connector.           |
| <p><b>10</b></p> <p><b>CHECK HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND DRIVER'S CONTROL RELAY.</b></p> <p>Measure the resistance of harness between driver's control center differential control module harness connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B381) No. 7 — Chassis ground:</b><br/><b>(B381) No. 8 — Chassis ground:</b><br/><b>(B381) No. 10 — Chassis ground:</b></p>  | <p>Is the resistance more than 1 <math>M\Omega</math>?</p> | Go to step 11. | Repair the short circuit between driver's control center differential control module harness connector and driver's control relay, battery harness connector. |
| <p><b>11</b></p> <p><b>CHECK DRIVER'S CONTROL RELAY.</b></p> <p>Measure the resistance between driver's control relay terminals.</p> <p><b>Terminals</b><br/><b>No. 4 — No. 2:</b></p>   | <p>Is the resistance more than 1 <math>M\Omega</math>?</p> | Go to step 12. | Replace the driver's control relay.   |
| <p><b>12</b></p> <p><b>CHECK DRIVER'S CONTROL RELAY.</b></p> <p>Connect the battery positive lead to terminal No. 3 and battery negative lead to terminal No. 1, and then measure the resistance between driver's control relay terminals.</p> <p><b>Terminals</b><br/><b>No. 4 — No. 2:</b></p>   | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | Go to step 13. | Replace the driver's control relay.   |
| <p><b>13</b></p> <p><b>CHECK IGNITION POWER SUPPLY CIRCUIT FOR DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL UNIT.</b></p> <p>1) Connect all the connectors.<br/>2) Turn the ignition switch to ON.<br/>3) Measure the voltage between driver's control center differential control unit and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B381) No. 10 (+) — Chassis ground (-):</b></p>  | <p>Is the voltage less than 1 V?</p>                       | Go to step 14. | Go to step 16.  |
| <p><b>14</b></p> <p><b>CHECK IGNITION POWER SUPPLY CIRCUIT FOR DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL UNIT.</b></p> <p>Measure the voltage between driver's control center differential control unit and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/><b>(B381) No. 7 (+) — Chassis ground (-):</b><br/><b>(B381) No. 8 (+) — Chassis ground (-):</b></p>  | <p>Is the voltage more than 8 V?</p>                       | Go to step 15. | Go to step 16.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step  | Check   | Yes  | No  |
|---|---|--|---|
| <b>15 CHECK CENTER DIFFERENTIAL.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the Subaru Select Monitor to the data link connector.<br>3) Turn the ignition switch and Subaru Select Monitor power switch to ON.<br>4) Set the driver's control center differential to manual mode by pressing manual mode switch.<br>5) Release the parking brake.<br>6) Set the center differential control dial to lock position.<br>7) Read the data of "center differential indicator current" and "center differential actual current" using Subaru Select Monitor. | Are both of the "center differential indicator current" and "center differential actual current" approx. 3.6 — 4.0 A? | Go to step 16.   | Go to step 17.  |
| <b>16 CHECK CENTER DIFFERENTIAL.</b><br>1) Operate the center differential control dial so that the "2A" is displayed for "center differential indicator current" on the Subaru Select Monitor.<br>2) Read the data of "center differential actual current" using Subaru Select Monitor.  | Is the "center differential actual current" almost same as "center differential indicator current"?                   | Go to step 18.   | Go to step 17.  |
| <b>17 CHECK POOR CONTACT IN HARNESS CONNECTOR.</b>  | Is there poor contact in harness connector?   | Repair the poor contact.                                       | Go to step 18.  |
| <b>18 CHECK DTC.</b><br>1) Erase the memory. <Ref. to 6MT(diag)-23, Clear Memory Mode.><br>2) Read the DTC using Subaru Select Monitor. <Ref. to 6MT(diag)-20, Read Diagnostic Trouble Code (DTC).>   | Is P1875 displayed?   | Replace the driver's control center differential control unit. | Go to step 19.  |
| <b>19 CHECK FOR OTHER DTC ON DISPLAY.</b>   | Is there any DTC other than P1875 displayed?  | Diagnose according to DTC.                                     | The center differential circuit is in normal condition. A temporary poor contact of connector or harness may be the cause. Repair harness or connector in driver's control center differential circuit. |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

### K: DTC P2125 ACCELERATOR POSITION SENSOR E

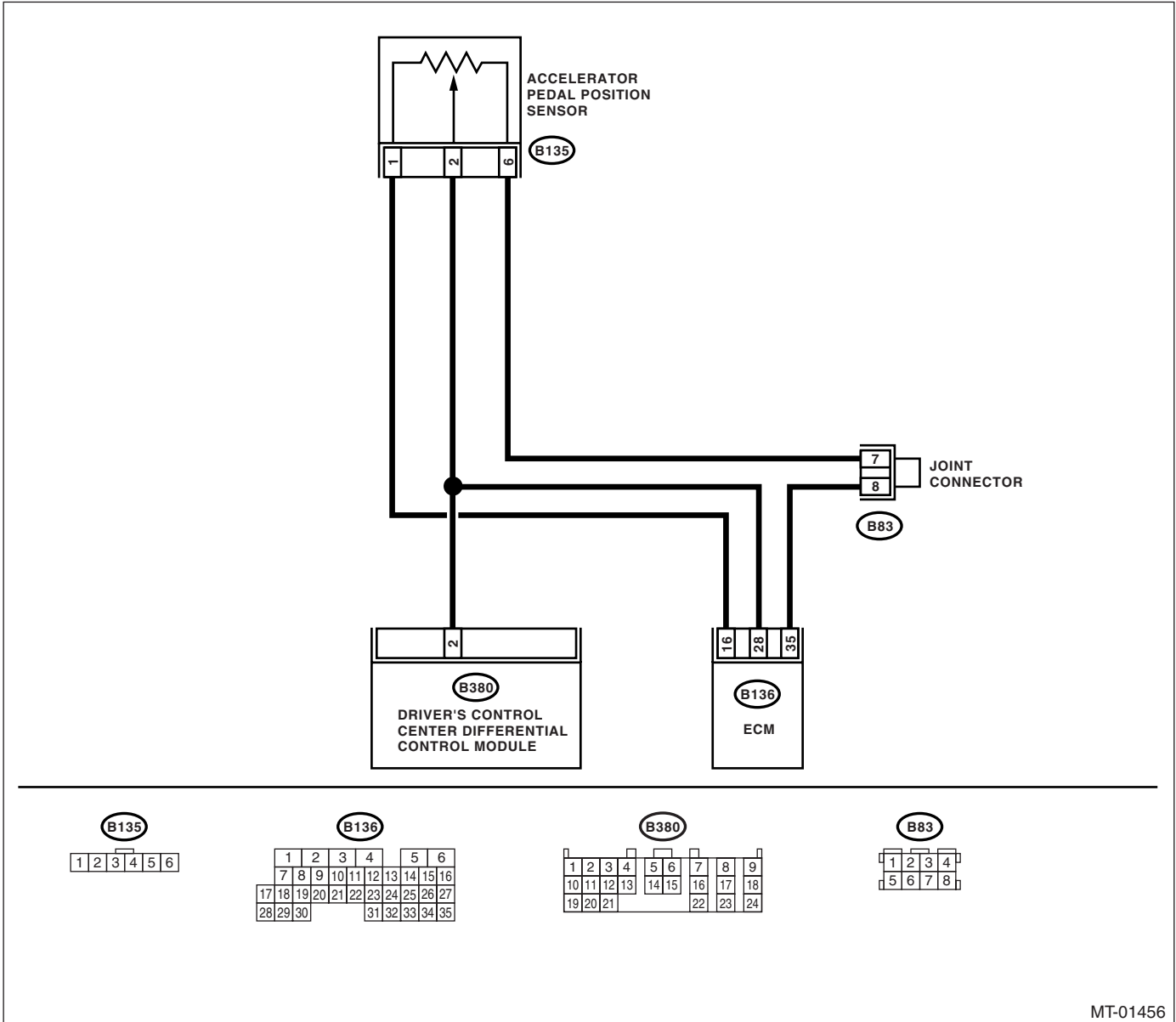
#### DIAGNOSIS:

The accelerator pedal position sensor circuit is open or shorted.

#### TROUBLE SYMPTOM:

- Tight corner braking condition occurs.
- Handling tends to oversteer.

#### WIRING DIAGRAM:



MT-01456

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <b>1</b><br><b>CHECK DTC.</b>   | Is the DTC displayed on engine self diagnosis test mode? | Check with referring to DTC section of engine.<br><Ref. to EN(H4DOTC)(diag)-74, LIST, List of Diagnostic Trouble Code (DTC).> | Go to step 2.  |
| <b>2</b><br><b>CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the harness connector of driver's control center differential control module, ECM and accelerator pedal position sensor.<br>3) Measure the resistance of harness between driver's control center differential control module harness connector and accelerator pedal position sensor.<br><b>Connector &amp; terminal</b><br><b>(B380) No. 2 — (B135) No. 2:</b> | Is the resistance less than 1 $\Omega$ ?                 | Go to step 3.   | Repair the open circuit of harness between driver's control center differential control module and accelerator pedal position sensor.          |
| <b>3</b><br><b>CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ECM.</b><br>Measure the resistance of harness between driver's control center differential control module harness connector and ECM harness connector.<br><b>Connector &amp; terminal</b><br><b>(B380) No. 2 — (B136) No. 28:</b>  | Is the resistance less than 1 $\Omega$ ?                 | Go to step 4.   | Repair the open circuit of harness between driver's control center differential control module and ECM.  |
| <b>4</b><br><b>CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ACCELERATOR PEDAL POSITION SENSOR.</b><br>Measure the resistance of harness between driver's control center differential control module harness connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B380) No. 2 — Chassis ground:</b>  | Is the resistance more than 1 $M\Omega$ ?                | Go to step 5.   | Repair the short circuit of harness between driver's control center differential control module and accelerator pedal position sensor and ECM. |
| <b>5</b><br><b>CHECK INPUT SIGNAL OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Connect the Subaru Select Monitor to data link connector.<br>3) Turn the ignition switch to ON (engine OFF), and Subaru Select Monitor switch to ON.<br>4) Read the data of sub accelerator sensor signal using Subaru Select Monitor.<br>Check the measured value is within specification without depressing the accelerator pedal.  | Is the voltage 0.3 — 1.8 V?                              | Go to step 6.   | Go to step 7.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step  | Check   | Yes  | No  |
|---|---|--|---|
| <b>6 CHECK INPUT SIGNAL OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Fully depress the accelerator pedal.<br>2) Read the data of sub accelerator sensor signal using Subaru Select Monitor.<br>Check the measured value is within specification the accelerator pedal depressed. | Is the data 2.8 — 4.7 V?  | Go to step <b>10</b> .   | Go to step <b>7</b> .   |
| <b>7 CHECK ACCELERATOR PEDAL POSITION SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector of accelerator pedal position sensor.<br>3) Measure the resistance of accelerator pedal position sensor.<br><i>Terminal</i><br><i>No. 1 — No. 6:</i>                          | Is the resistance 0.75 k — 3.15 kΩ?                                     | Go to step <b>8</b> .  | Replace the accelerator pedal position sensor.  |
| <b>8 CHECK ACCELERATOR PEDAL POSITION SENSOR.</b><br>Measure the resistance of accelerator pedal position sensor.<br><i>Terminal</i><br><i>No. 2 — No. 6:</i>   | Is the resistance 0.15 k — 0.63 kΩ?                                     | Go to step <b>9</b> .  | Replace the accelerator pedal position sensor.  |
| <b>9 CHECK THE POOR CONTACT.</b>  | Is there any poor contact in accelerator pedal position sensor circuit? | Repair the poor contact.   | Go to step <b>10</b> .  |
| <b>10 CHECK DTC.</b><br>1) Perform the "clear memory". <Ref. to 6MT(diag)-23, Clear Memory Mode.><br>2) Read the DTC using Subaru Select Monitor. <Ref. to 6MT(diag)-20, Read Diagnostic Trouble Code (DTC).>   | Is the DTC P2125 displayed?   | Replace the driver's control center differential control module. | Go to step <b>11</b> .  |
| <b>11 CHECK FOR OTHER DTC ON DISPLAY.</b>   | Is there any DTC other than P2125 displayed?                            | Perform the diagnosis according to DTC.                          | Accelerator pedal position sensor circuit is in normal condition. Temporary poor contact occurs.<br>Repair the harness or connector between driver's control center differential control module, accelerator pedal position sensor and ECM. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

### L: DTC 24 CHECK CENTER DIFFERENTIAL CONTROL DIAL.

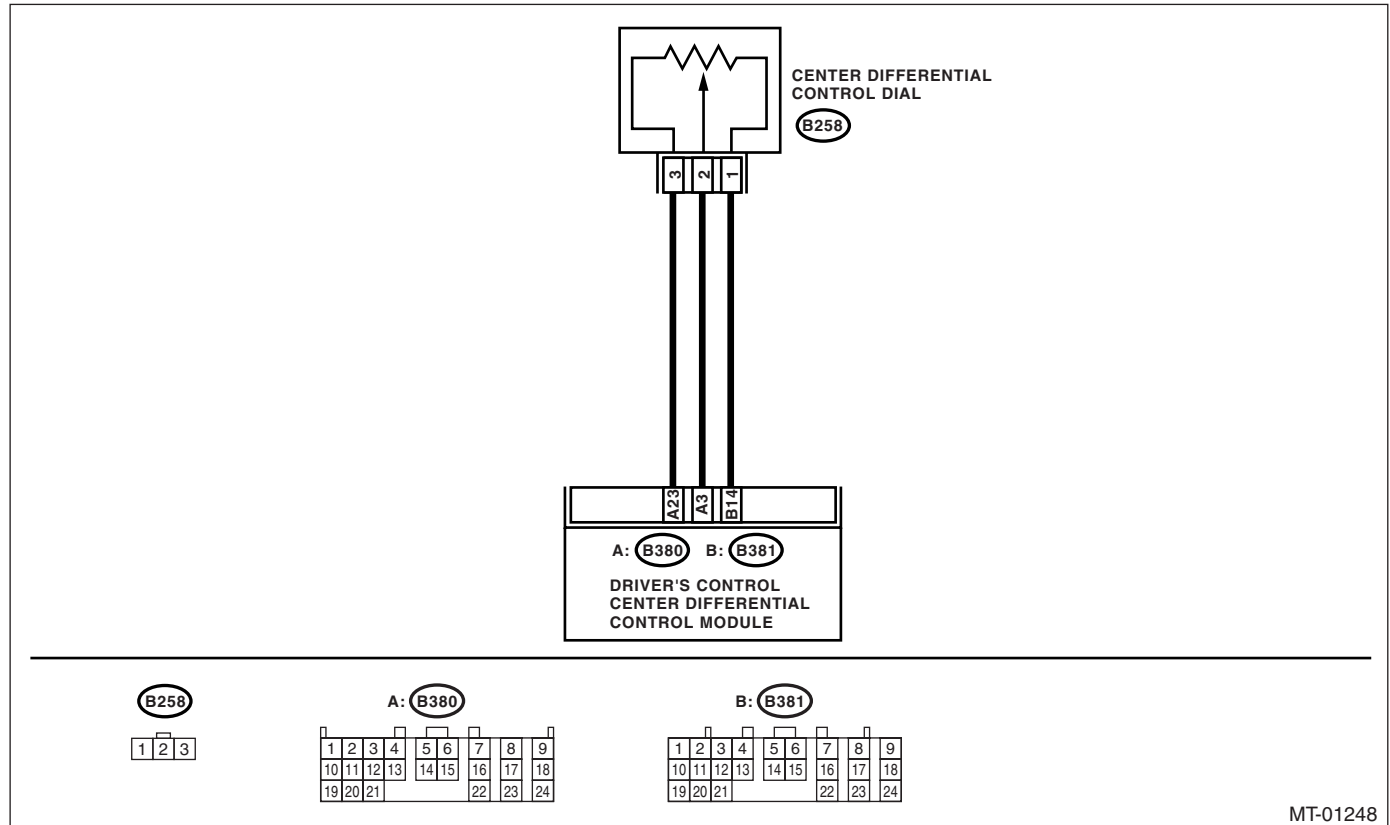
#### DIAGNOSIS:

Center differential control dial circuit is open or shorted.

#### TROUBLE SYMPTOM:

- Indicator light does not operate though setting the center differential control dial.
- Torque characteristics do not change.

#### WIRING DIAGRAM:



| Step   | Check   | Yes                  | No   |
|--|---|----------------------|--|
| <p><b>1</b></p> <p><b>CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND CENTER DIFFERENTIAL CONTROL DIAL.</b></p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector of driver's control center differential control module and center differential control dial.</p> <p>3) Measure the resistance of harness between driver's control center differential control module and center differential control dial harness connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B380) No. 3 — (B258) No. 2:</b><br/> <b>(B380) No. 23 — (B258) No. 3:</b><br/> <b>(B381) No. 14 — (B258) No. 1:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p> | <p>Go to step 2.</p> | <p>Repair the open circuit between driver's control center differential control module and center differential control dial.</p> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step  | Check  | Yes                  | No  |
|---|--|----------------------|---|
| <p><b>2</b></p> <p><b>CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND CENTER DIFFERENTIAL CONTROL DIAL.</b></p> <p>Measure the resistance between driver's control center differential control module harness connector and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B380) No. 3 — Chassis ground:</b><br/> <b>(B380) No. 23 — Chassis ground:</b><br/> <b>(B381) No. 14 — Chassis ground:</b></p> | <p>Is the resistance more than 1 M<math>\Omega</math>?</p>   | <p>Go to step 3.</p> | <p>Repair the short circuit between driver's control center differential control module and center differential control dial.</p> |
| <p><b>3</b></p> <p><b>CHECK THE CENTER DIFFERENTIAL CONTROL DIAL.</b></p> <p>1) Remove the center differential control dial.<br/>                 2) Measure the resistance between center differential control dial connectors.</p> <p><b>Terminals</b><br/> <b>No. 1 — No. 3:</b></p>   | <p>Is the resistance 7.5 — 12.5 k<math>\Omega</math>?</p>  | <p>Go to step 4.</p> | <p>Replace the driver's control dial.</p>   |
| <p><b>4</b></p> <p><b>CHECK THE CENTER DIFFERENTIAL CONTROL DIAL.</b></p> <p>Measure the resistance between center differential control dial connectors.</p> <p><b>Terminals</b><br/> <b>No. 1 — No. 2:</b></p>   | <p>Does the resistance change smoothly when setting the dial from differential lock to differential free?</p>                | <p>Go to step 5.</p> | <p>Replace the center differential control dial.</p>  |
| <p><b>5</b></p> <p><b>CHECK THE OUTPUT POWER SUPPLY OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b></p> <p>1) Connect all the harness connectors.<br/>                 2) Turn the ignition switch to ON. (engine OFF)<br/>                 3) Measure the voltage driver's control center differential control module harness connector.</p> <p><b>Connector &amp; terminal</b><br/> <b>(B380) No. 23 (+) — (B381) No. 14 (-)</b></p>          | <p>Is the voltage approx. 5 V?</p>   | <p>Go to step 6.</p> | <p>Replace the driver's control center differential control module.</p>   |
| <p><b>6</b></p> <p><b>CHECK INPUT SIGNAL OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                 2) Connect the Subaru Select Monitor to data link connector.<br/>                 3) Turn the ignition switch to ON (engine OFF), and Subaru Select Monitor power switch to ON.<br/>                 4) Read the data of "Voltage C-diff. SW" using Subaru Select Monitor.</p>         | <p>Does the voltage decrease from 5 V to 0 V smoothly when setting the dial from differential lock to differential free?</p> | <p>Go to step 7.</p> | <p>Replace the driver's control center differential control module.</p>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step | Check                      | Yes  | No   |
|------|----------------------------|--|--|
| 7    | <b>CHECK POOR CONTACT.</b> | Is there poor contact in center differential control dial circuit? | Repair the poor contact.<br><br>Center differential control dial circuit is in normal condition. A temporary poor contact of connector or harness is the cause of trouble. Repair the harness or connector between driver's control center differential control module and center differential control dial. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

### M: DTC 31 MANUAL MODE SWITCH

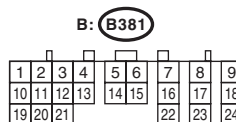
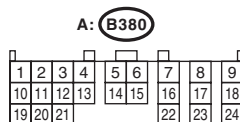
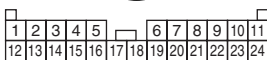
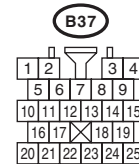
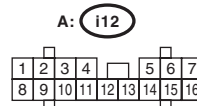
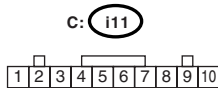
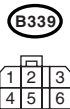
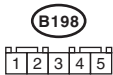
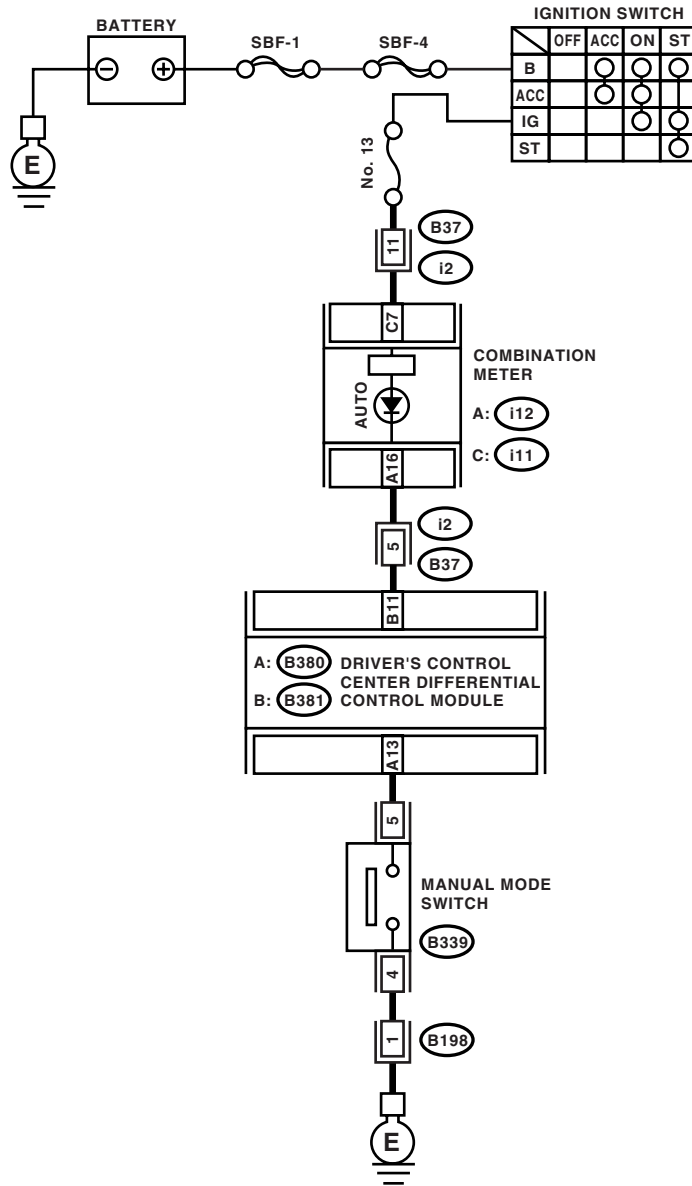
#### DIAGNOSIS:

Manual mode switch circuit is open or shorted.

#### TROUBLE SYMPTOM:

- Driver's control center differential can not be manual mode. Or can not be auto mode.
- AUTO indicator does not illuminate, or does not go off.

#### WIRING DIAGRAM:



MT-01249

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step   | Check                                      | Yes   | No  |
|--|--|---|---|
| <b>1 CHECK GROUND CIRCUIT OF MANUAL MODE SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the manual mode switch connector.<br>3) Measure the resistance between manual mode switch harness connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B339) No. 4 — Chassis ground:</i>   | Is the resistance more than 1 M $\Omega$ ? | Repair the open circuit of harness between manual mode switch harness connector and chassis ground. | Go to step 2.   |
| <b>2 CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND MANUAL MODE SWITCH.</b><br>1) Disconnect the driver's control center differential control module harness connector.<br>2) Measure the resistance of harness between driver's control center differential control module and manual mode switch.<br><i>Connector &amp; terminal</i><br><i>(B380) No. 13 — (B339) No. 5:</i>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 3.   | Repair the open circuit of harness between driver's control center differential control module and manual mode switch.  |
| <b>3 CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND MANUAL MODE SWITCH.</b><br>Measure the resistance of harness between driver's control center differential control module and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B380) No. 13 — Chassis ground:</i>   | Is the resistance more than 1 M $\Omega$ ? | Go to step 4.   | Repair the short circuit of harness between driver's control center differential control module and manual mode switch. |
| <b>4 CHECK THE MANUAL MODE SWITCH.</b><br>1) Remove the manual mode switch.<br>2) Measure the resistance of between manual mode switch connectors.<br><i>Terminals</i><br><i>No. 4 — No. 5:</i>  | Is the resistance more than 1 M $\Omega$ ? | Go to step 5.   | Replace the manual mode switch.   |
| <b>5 CHECK THE MANUAL MODE SWITCH.</b><br>1) Keep depressing the manual mode switch.<br>2) Measure the resistance of between manual mode switch connectors.<br><i>Terminals</i><br><i>No. 4 — No. 5:</i>   | Is the resistance less than 1 $\Omega$ ?   | Go to step 6.   | Replace the manual mode switch.   |
| <b>6 CHECK THE INPUT SIGNAL OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Install the manual mode switch.<br>2) Connect the harness connector of driver's control center differential control module.<br>3) Connect the Subaru Select Monitor to data link connector.<br>4) Turn the ignition switch to ON. (engine OFF)<br>5) Turn the Subaru Select Monitor power switch to ON.<br>6) Read the data of AUTO/MANUAL mode switch signal using Subaru Select Monitor. | Is the data OFF?                           | Go to step 7.   | Go to step 8.   |



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step   | Check  | Yes  | No   |
|--|--|--|--|
| <b>7</b><br><b>CHECK THE INPUT SIGNAL OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Keep depressing the manual mode switch.<br>2) Read the data of AUTO/MANUAL mode switch signal using Subaru Select Monitor. | Is the data ON?  | Go to step <b>9</b> .  | Go to step <b>8</b> .  |
| <b>8</b><br><b>CHECK POOR CONTACT IN HARNESS CONNECTOR.</b>  | Is there any poor contact in manual mode switch circuit? | Repair the poor contact.   | Go to step <b>9</b> .  |
| <b>9</b><br><b>CHECK DTC.</b><br>Read the DTC from combination meter. <Ref. to 6MT(diag)-20, Read Diagnostic Trouble Code (DTC).>  | Is the DTC 31 displayed?                                 | Replace the driver's control center differential control module. | Go to step <b>10</b> .   |
| <b>10</b><br><b>CHECK FOR OTHER DTC.</b>   | Is there any DTC other than 31 displayed?                | Perform the diagnosis according to DTC.                          | Center differential control dial circuit is in normal condition. Temporary poor contact occurs.<br>Repair the harness or connector between driver's control center differential control module, manual mode switch and chassis ground. |

## N: DTC 32 CHECK PARKING BRAKE SWITCH

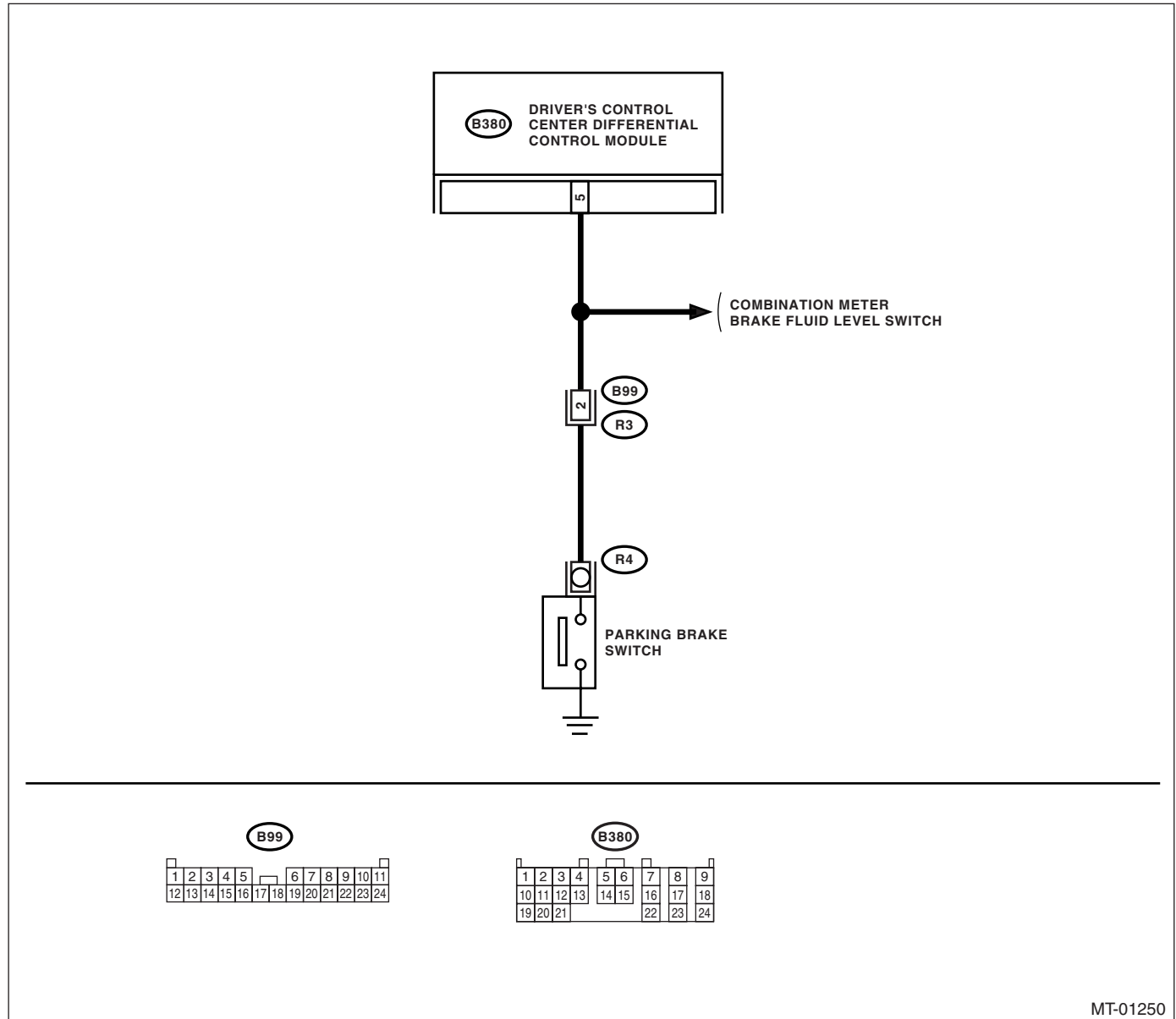
### DIAGNOSIS:

Parking brake switch circuit is open or shorted.

### TROUBLE SYMPTOM:

- Differential does not tend to be free though apply the parking brake.
- Differential stays free by releasing the parking brake.

### WIRING DIAGRAM:



MT-01250

| Step  | Check  | Yes           | No  |
|---|--|---------------|---|
| <b>1 CHECK THE PARKING BRAKE SWITCH CIRCUIT.</b><br>1) Turn the ignition switch to ON.<br>2) Start the engine.<br>3) Apply the parking brake. | Does the parking brake warning light illuminate? | Go to step 2. | Check the parking pilot & brake fluid warning light circuit.                          |
| <b>2 CHECK THE PARKING BRAKE SWITCH CIRCUIT.</b><br>Release the parking brake.  | Does the parking brake warning light turn OFF?   | Go to step 3. | Check the brake fluid level, parking pilot & brake fluid level warning light circuit. |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step   | Check  | Yes   | No  |
|--|--|---|---|
| <b>3</b><br><b>CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND PARKING BRAKE SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the harness connector of driver's control center differential control module, combination meter and parking brake switch.<br>3) Measure the resistance of harness between driver's control center differential control module and parking brake switch.<br><b>Connector &amp; terminal</b><br><b>(B380) No. 5 — (R4) No. 1:</b> | Is the resistance less than 1 $\Omega$ ?                                 | Go to step 4.                                 | Repair the open circuit of harness and poor contact of connector.   |
| <b>4</b><br><b>CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND PARKING BRAKE SWITCH.</b><br>Measure the resistance between driver's control center differential control module harness connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B380) No. 5 — Chassis ground:</b>   | Is the resistance more than 1 M $\Omega$ ?                               | Go to step 5.                                 | Repair the short circuit of harness.  |
| <b>5</b><br><b>CHECK THE INPUT SIGNAL OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Connect all the harness connectors.<br>2) Connect the Subaru Select Monitor to data link connector.<br>3) Turn the ignition switch to ON, and Subaru Select Monitor power switch to ON.<br>4) Release the parking brake.<br>5) Read the data of "Parking Position Switch" using subaru Select Monitor.   | Is the data OFF?   | Go to step 6.                                 | Replace the driver's control center differential control module.  |
| <b>6</b><br><b>CHECK THE INPUT SIGNAL OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Apply the parking brake.<br>2) Read the data of "Parking Position Switch" using subaru Select Monitor.   | Is the data ON?  | Go to step 7.                                 | Replace the driver's control center differential control module.  |
| <b>7</b><br><b>CHECK POOR CONTACT IN HARNESS CONNECTOR.</b>  | Is there any poor contact in harness connector of parking brake circuit? | Repair the poor contact of harness connector. | The parking brake switch circuit is in normal condition. A temporary poor contact of connector or harness may be the cause. Repair harness or connector between driver's control center differential control module, brake fluid level switch, ABS unit, combination meter and parking brake switch. Also, check the brake fluid level. |

**O: DTC 37 NEUTRAL POSITION SWITCH**

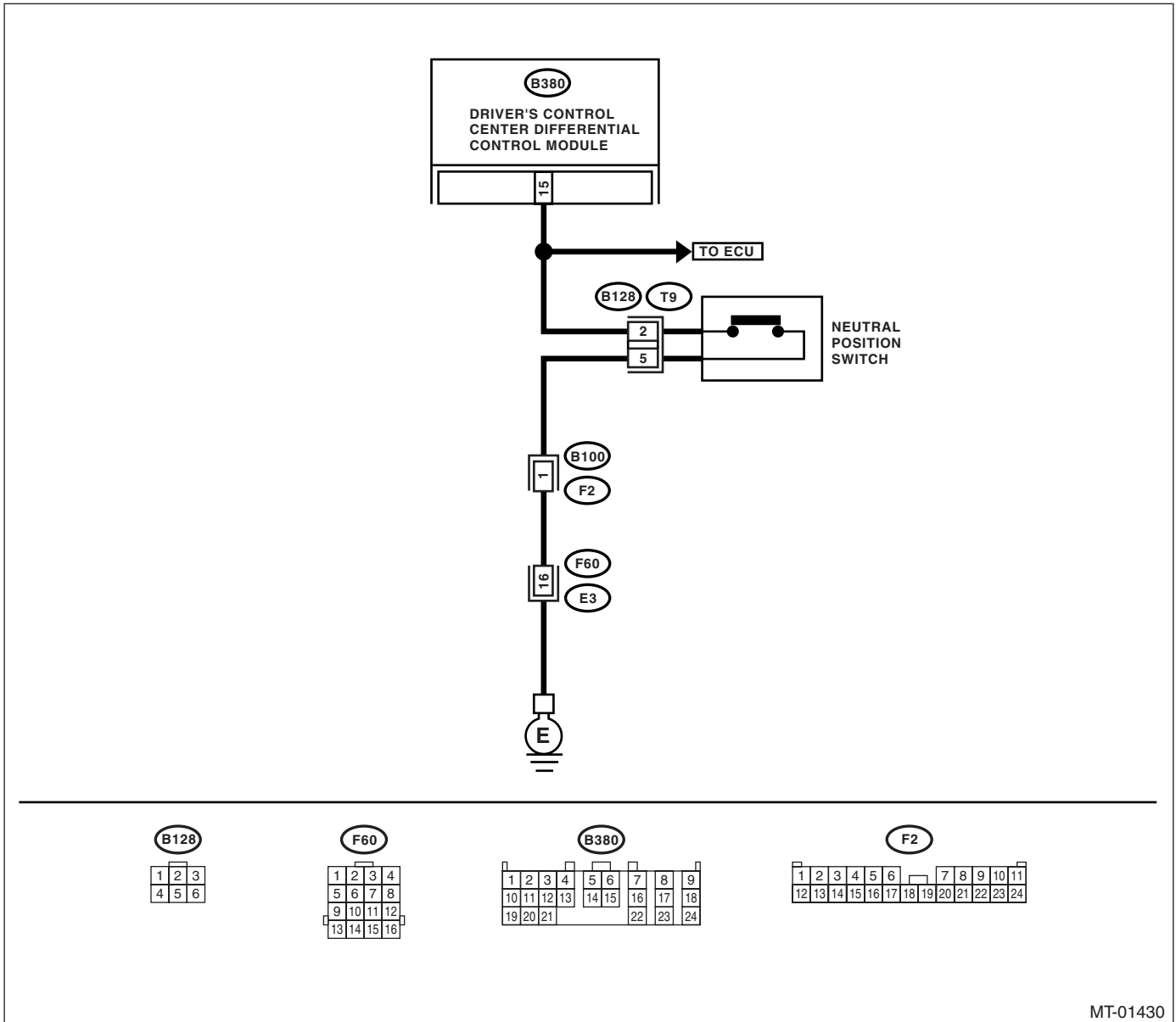
**DIAGNOSIS:**

Open or short in neutral position switch circuit

**TROUBLE SYMPTOM:**

- Handling tends to oversteer.
- The tendency of understeer occurred when high speed cornering.

**WIRING DIAGRAM:**



MT-01430

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step  | Check                                     | Yes           | No   |
|---|---|---------------|--|
| <b>1 CHECK HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND NEUTRAL POSITION SWITCH.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from driver's control center differential control module, ECM and in neutral position switch.<br>3) Measure the resistance between driver's control center differential control module and neutral position switch.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B380) No. 15 — (B128) No. 2:</b></i> | Is the resistance less than 1 $\Omega$ ?  | Go to step 2. | Repair the open circuit in harness between neutral position switch connector and Engine ground (-).                        |
| <b>2 CHECK HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND NEUTRAL POSITION SWITCH.</b><br>Measure the resistance between driver's control center differential control module connector and Chassis ground (-).<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B380) No. 15 — Chassis ground:</b></i>  | Is the resistance more than 1 $M\Omega$ ? | Go to step 3. | Repair the short circuit in harness between neutral position switch and driver's control center differential control unit. |
| <b>3 CHECK HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ENGINE GROUND.</b><br>Measure the resistance between neutral position switch connector and Engine ground (-).<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B128) No. 5 — Engine ground:</b></i>   | Is the resistance less than 1 $\Omega$ ?  | Go to step 4. | Repair the open circuit in harness between neutral position switch connector and Engine ground (-).                        |
| <b>4 CHECK NEUTRAL POSITION SWITCH.</b><br>1) Move the shift lever to "N".<br>2) Measure the resistance between transmission harness connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(T9) No. 2 — No. 5:</b></i>  | Is the resistance less than 1 $\Omega$ ?  | Go to step 5. | Replace the neutral position switch.   |
| <b>5 CHECK NEUTRAL POSITION SWITCH.</b><br>1) Move the shift lever to other than "N".<br>2) Measure the resistance between transmission harness connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(T9) No. 2 — No. 5:</b></i>   | Is the resistance more than 1 $M\Omega$ ? | Go to step 6. | Replace the neutral position switch.   |
| <b>6 CHECK INPUT SIGNAL FOR DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Connect all the connectors.<br>2) Turn the ignition switch to ON.<br>3) Subaru Select Monitor switch to ON.<br>4) Move the shift lever to "N".<br>5) Read the data of "Neutral switch" using Subaru Select Monitor.  | Is the "ON" displayed?                    | Go to step 7. | Go to step 8.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>7</b><br><b>CHECK INPUT SIGNAL FOR DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Move the shift lever to other than "N".<br>2) Read the data of "Neutral switch" using Subaru Select Monitor. | Is the "OFF" displayed?                                       | Neutral switch circuit is in normal condition. Temporary poor contact occurs.<br>Repair the harness or connector between driver's control center differential control module, neutral switch and ECM. | Go to step <b>8</b> .  |
| <b>8</b><br><b>CHECK POOR CONTACT.</b>  | Is there any poor contact in neutral position switch circuit? | Repair the poor contact.  | Go to step <b>9</b> .  |
| <b>9</b><br><b>CHECK DTC.</b><br>Read the DTC from combination meter. <Ref. to 6MT(diag)-20, Read Diagnostic Trouble Code (DTC).>   | Is DTC 37 displayed?  | Replace the driver's control center differential control unit.  | Go to step <b>10</b> .   |
| <b>10</b><br><b>CHECK FOR OTHER DTC.</b>  | Is any DTC except DTC 37 displayed?                           | Diagnose according to DTC.  | The neutral position switch circuit is in normal condition. A temporary poor contact of connector or harness may be the cause. Repair harness or connector in neutral position switch circuit. |

# General Diagnostic Table

MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

## 13. General Diagnostic Table

### A: INSPECTION

| Symptom   | Abnormal units/parts   |
|---|--|
| Tight cornering condition   | <ul style="list-style-type: none"> <li>• ABSCM&amp;H/U</li> <li>• ABS wheel speed sensor</li> <li>• Yaw rate &amp; lateral G sensor</li> <li>• CAN communication signal</li> <li>• Steering angle sensor</li> <li>• Center differential</li> <li>• Center differential control dial</li> <li>• Manual mode switch</li> <li>• Tire/Wheel</li> <li>• Driver's control center differential control module</li> </ul>  |
| Tendency to oversteer   | <ul style="list-style-type: none"> <li>• Accelerator pedal position sensor</li> <li>• ECM</li> <li>• Center differential control dial</li> <li>• Manual mode switch</li> <li>• Tire/Wheel</li> <li>• Driver's control center differential control module</li> <li>• Center differential</li> <li>• Driver's control center differential relay</li> <li>• Rear differential oil temperature switch</li> <li>• Neutral position switch</li> <li>• Steering angle sensor</li> </ul> |
| Tendency to understeer at high speed cornering  | <ul style="list-style-type: none"> <li>• ABSCM</li> <li>• ABS wheel speed sensor</li> <li>• CAN communication signal</li> <li>• Accelerator pedal position sensor</li> <li>• Yaw rate &amp; lateral G sensor</li> <li>• Center differential</li> <li>• ECM</li> <li>• Engine speed signal</li> <li>• Neutral position switch</li> <li>• Steering angle sensor</li> </ul>   |
| No change in the center differential torque character   | <ul style="list-style-type: none"> <li>• Center differential control dial</li> <li>• Driver's control center differential relay</li> <li>• Center differential</li> <li>• Driver's control center differential control module</li> </ul>   |
| Driver's control center differential indicator does not operate   | <ul style="list-style-type: none"> <li>• Combination meter</li> <li>• Driver's control center differential control module</li> </ul>   |
| Driver's control center differential indicator does not operate though setting the center differential control dial | <ul style="list-style-type: none"> <li>• Center differential control dial</li> <li>• Combination meter</li> <li>• Driver's control center differential control module</li> </ul>   |
| No change to AUTO or MANUAL   | <ul style="list-style-type: none"> <li>• Manual mode switch</li> <li>• Combination meter</li> <li>• Driver's control center differential control module</li> </ul>   |
| AUTO indicator light does not illuminate  | <ul style="list-style-type: none"> <li>• Manual mode switch</li> <li>• Combination meter</li> <li>• Driver's control center differential control module</li> </ul>   |
| Differential does not become free, or stays free  | <ul style="list-style-type: none"> <li>• Parking brake switch</li> <li>• Center differential</li> <li>• Manual mode switch</li> <li>• Center differential control dial</li> <li>• Rear differential</li> <li>• Tire/Wheel</li> <li>• Driver's control center differential relay</li> <li>• Rear differential oil temperature switch</li> <li>• Driver's control center differential control module</li> </ul>  |

# General Diagnostic Table

## MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

| Symptom  | Abnormal units/parts  |
|--|---|
| ABS does not operation                           | <ul style="list-style-type: none"><li>• ABSCM&amp;H/U</li><li>• CAN communication signal</li><li>• Stop light switch</li><li>• Driver's control center differential control module</li></ul>  |
| Differential does not become lock, or stays lock | <ul style="list-style-type: none"><li>• ABSCM&amp;H/U</li><li>• ABS wheel speed sensor</li><li>• CAN communication signal</li><li>• Center differential</li><li>• Center differential control dial</li><li>• Manual mode switch</li><li>• Tire/Wheel</li><li>• Driver's control center differential control module</li><li>• Driver's control center differential relay</li></ul> |



# General Diagnostic Table

MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

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# CLUTCH SYSTEM

# CL

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# General Description

## CLUTCH SYSTEM

### 1. General Description

#### A: SPECIFICATION

| Model                      |                                    |                     | 2.5 L TURBO                           | 2.5 L NON-TURBO                      |
|----------------------------|------------------------------------|---------------------|---------------------------------------|--------------------------------------|
| Clutch cover               | Type                               |                     | Push type                             |                                      |
|                            | Diaphragm set load      kgf (lbf)  |                     | 800 (1,764)                           | 580 (1,279)                          |
| Clutch disc                | Facing material                    |                     | Woven (Non asbestos)                  |                                      |
|                            | O.D. × I.D. × thickness<br>mm (in) | Pressure plate side | 230 × 155 × 3.5 (9.06 × 6.10 × 0.138) | 225 × 150 × 3.5 (8.86 × 5.9 × 0.138) |
|                            |                                    | Flywheel side       | 230 × 155 × 3.2 (9.06 × 6.10 × 0.126) |                                      |
|                            | Spline O.D.      mm (in)           |                     | 25.2 (0.992), (No. of teeth: 24)      |                                      |
| Clutch release lever ratio |                                    |                     | 1.6                                   |                                      |
| Release bearing            |                                    |                     | Grease-packed self-aligning           |                                      |
| Clutch pedal               | Full stroke      mm (in)           |                     | 130 — 135 (5.12 — 5.31)               |                                      |
|                            | Free play      mm (in)             |                     | 4 — 11 (0.16 — 0.43)                  |                                      |
| Release lever              | Stroke      mm (in)                |                     | 11.1 — 12.5 (0.437 — 0.492)           | 12.1 — 13.5 (0.48 — 0.53)            |
| Clutch disc                | Depth of rivet head<br>mm (in)     | Clutch cover side   | 1.65 — 2.25 (0.065 — 0.089)           |                                      |
|                            |                                    | Flywheel side       | 1.35 — 1.95 (0.053 — 0.077)           |                                      |
|                            |                                    | Limit of sinking    | 0.3 (0.012)                           |                                      |
|                            | Limit for deflection      mm (in)  |                     | 0.7 (0.028) at R = 110 (4.33)         | 0.7 (0.028) at R = 107.5 (4.23)      |

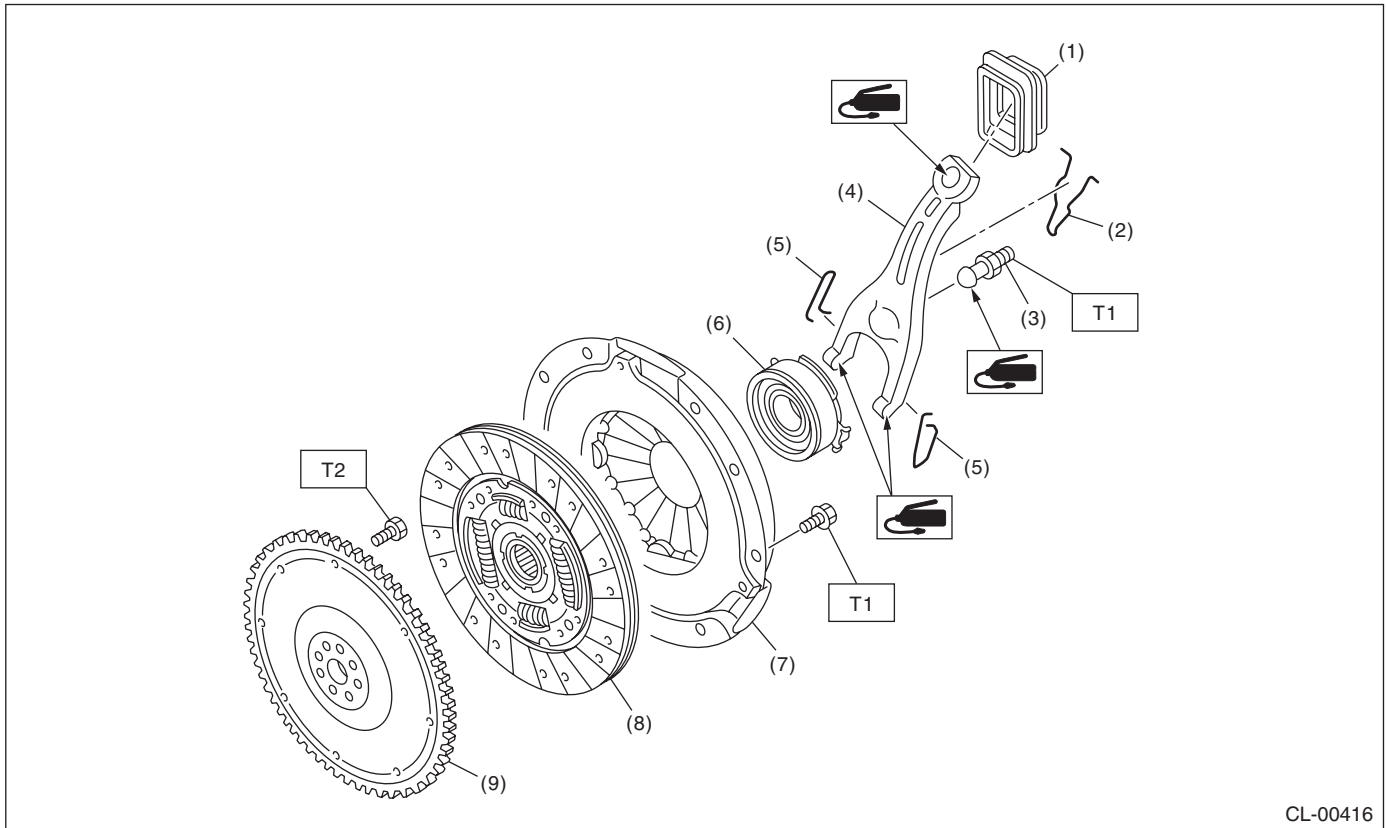
| Model                      |                                    |  | 2.5 L TURBO STI  |                                  |
|----------------------------|------------------------------------|--|--|----------------------------------|
| Clutch cover               | Type                               |  | Pull type  |                                  |
|                            | Diaphragm set load      kgf (lbf)  |  | 930 (2,050)  |                                  |
| Clutch disc                | Facing material                    |  | Woven (Non asbestos)   |                                  |
|                            | O.D. × I.D. × thickness<br>mm (in) | Flywheel side: 240 × 160 × 3.2 (9.45 × 6.30 × 0.126)<br>Clutch cover side: 240 × 160 × 3.5 (9.45 × 6.30 × 0.138) |  |                                  |
|                            |                                    | Spline O.D.      mm (in)   |  | 25.2 (0.992), (No. of teeth: 24) |
| Clutch release lever ratio |                                    |  | 1.7  |                                  |
| Release bearing            |                                    |  | Grease-packed self-aligning  |                                  |
| Clutch pedal               | Full stroke      mm (in)           |  | 130 — 135 (5.12 — 5.31)  |                                  |
|                            | Free play      mm (in)             |  | 3 — 13 (0.12 — 0.51)   |                                  |
| Release lever              | Stroke      mm (in)                |  | 13.3 — 14.7 (0.524 — 0.579)  |                                  |
| Clutch disc                | Depth of rivet head<br>mm (in)     | Standard   | Flywheel side: 1.35 — 1.95 (0.053 — 0.077)<br>Clutch cover side: 1.65 — 2.25 (0.065 — 0.089) |                                  |
|                            |                                    | Limit of sinking   | 0.3 (0.012)  |                                  |
|                            | Limit for deflection      mm (in)  |  | 0.7 (0.028) at R = 115 (4.53)  |                                  |

I.D.: Inner diameter O.D.: Outer diameter

## B: COMPONENT

### 1. CLUTCH ASSEMBLY

#### • NON-TURBO MODEL



CL-00416

- |                   |                     |
|-------------------|---------------------|
| (1) Dust cover    | (6) Release bearing |
| (2) Lever spring  | (7) Clutch cover    |
| (3) Pivot         | (8) Clutch disc     |
| (4) Release lever | (9) Flywheel        |
| (5) Clip          |                     |

**Tightening torque: N·m (kgf·m, ft·lb)**

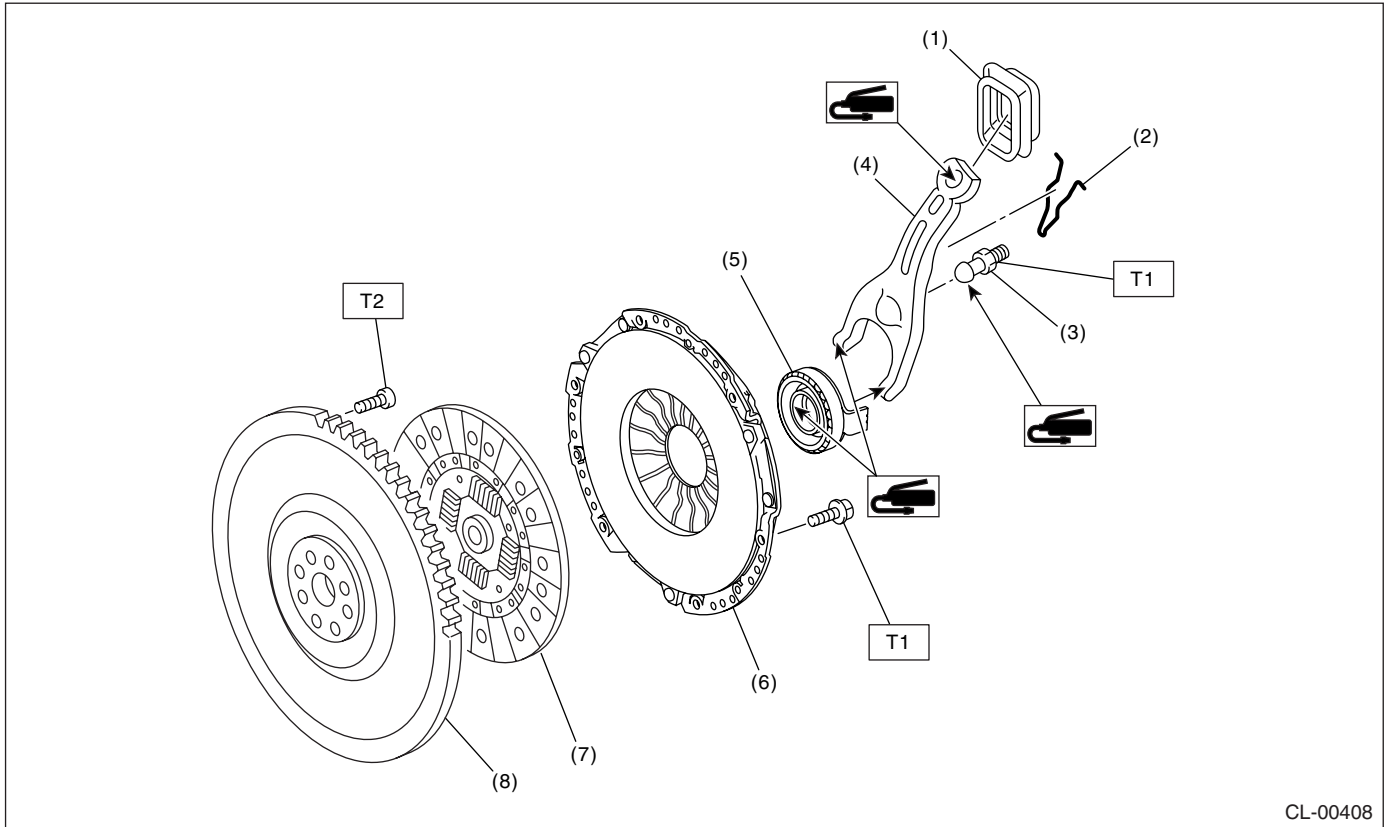
**T1: 16 (1.6, 11.8)**

**T2: 72 (7.3, 52.8)**

# General Description

## CLUTCH SYSTEM

### • TURBO MODEL



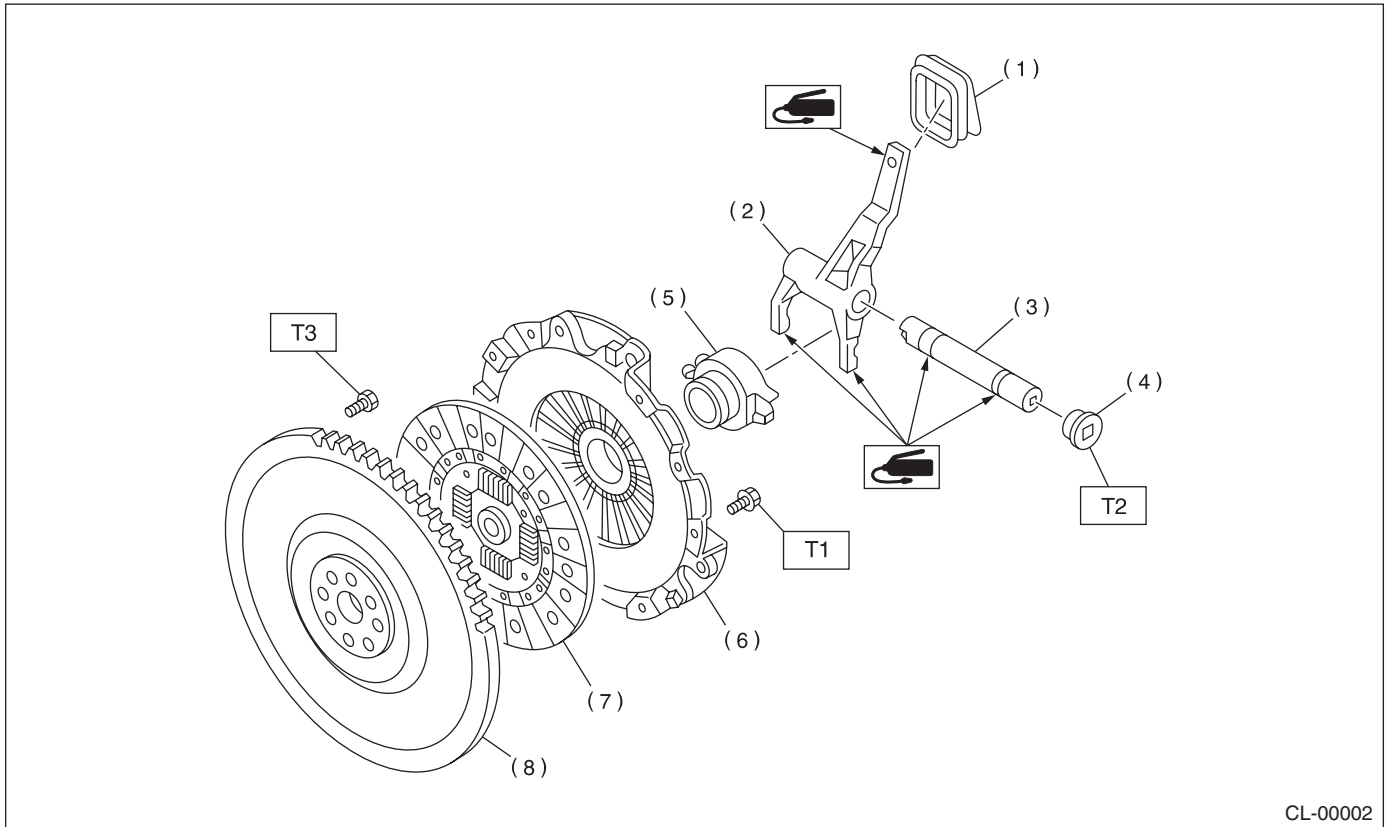
- |                   |                     |
|-------------------|---------------------|
| (1) Dust cover    | (5) Release bearing |
| (2) Lever spring  | (6) Clutch cover    |
| (3) Pivot         | (7) Clutch disc     |
| (4) Release lever | (8) Flywheel        |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 16 (1.6, 11.8)**

**T2: 72 (7.3, 52.8)**

### • STI MODEL



- (1) Dust cover
- (2) Release lever
- (3) Clutch release lever shaft
- (4) Plug

- (5) Release bearing
- (6) Clutch cover
- (7) Clutch disc
- (8) Flywheel

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 16 (1.6, 11.8)**

**T2: 44 (4.5, 32.5)**

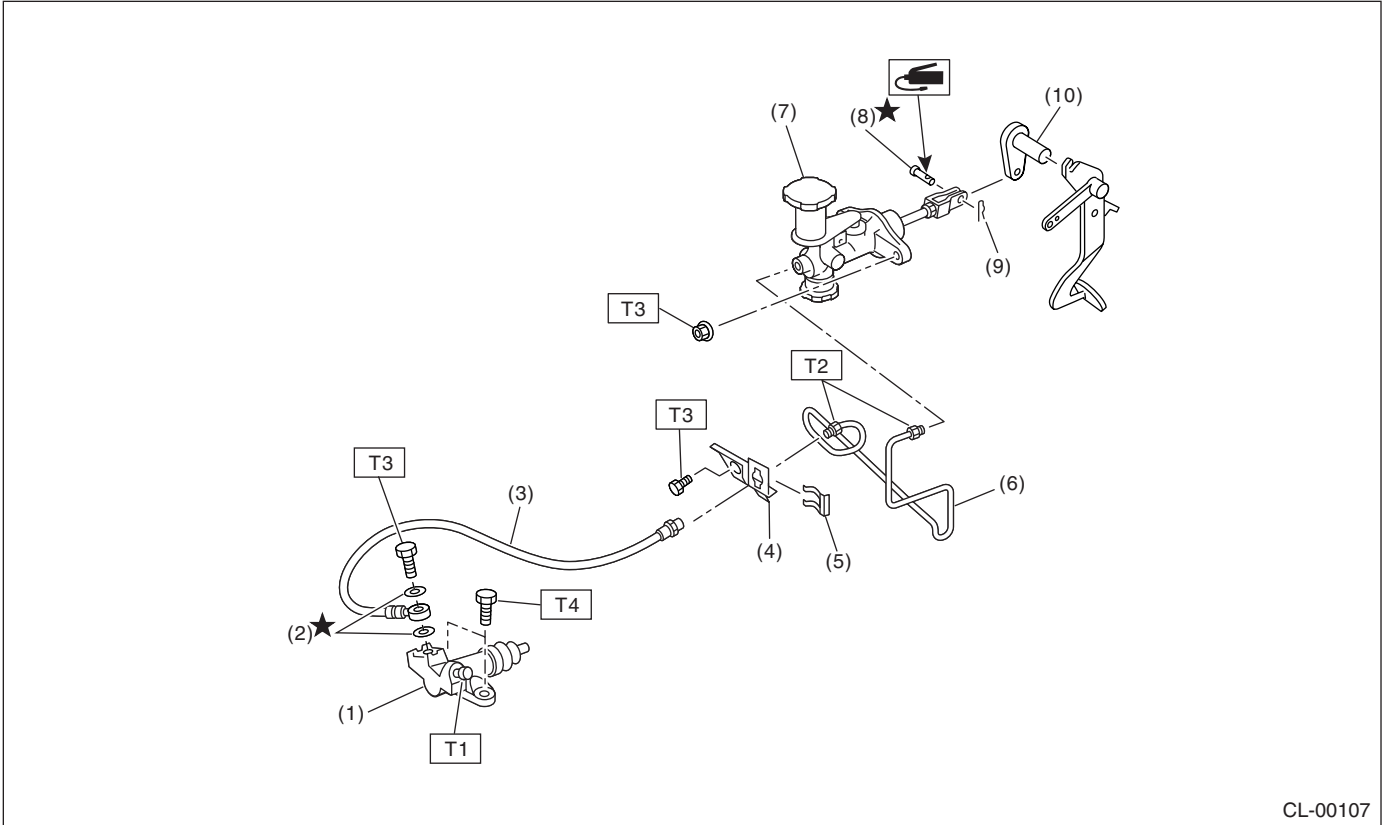
**T3: 75 (7.6, 55.3)**

# General Description

## CLUTCH SYSTEM

### 2. CLUTCH PIPE AND HOSE

#### • NON-TURBO MODEL



- |                        |                          |
|------------------------|--------------------------|
| (1) Operating cylinder | (6) Clutch pipe          |
| (2) Washer             | (7) Master cylinder ASSY |
| (3) Clutch hose        | (8) Clevis pin           |
| (4) Bracket            | (9) Snap pin             |
| (5) Clip               | (10) Lever               |

**Tightening torque: N·m (kgf·m, ft·lb)**

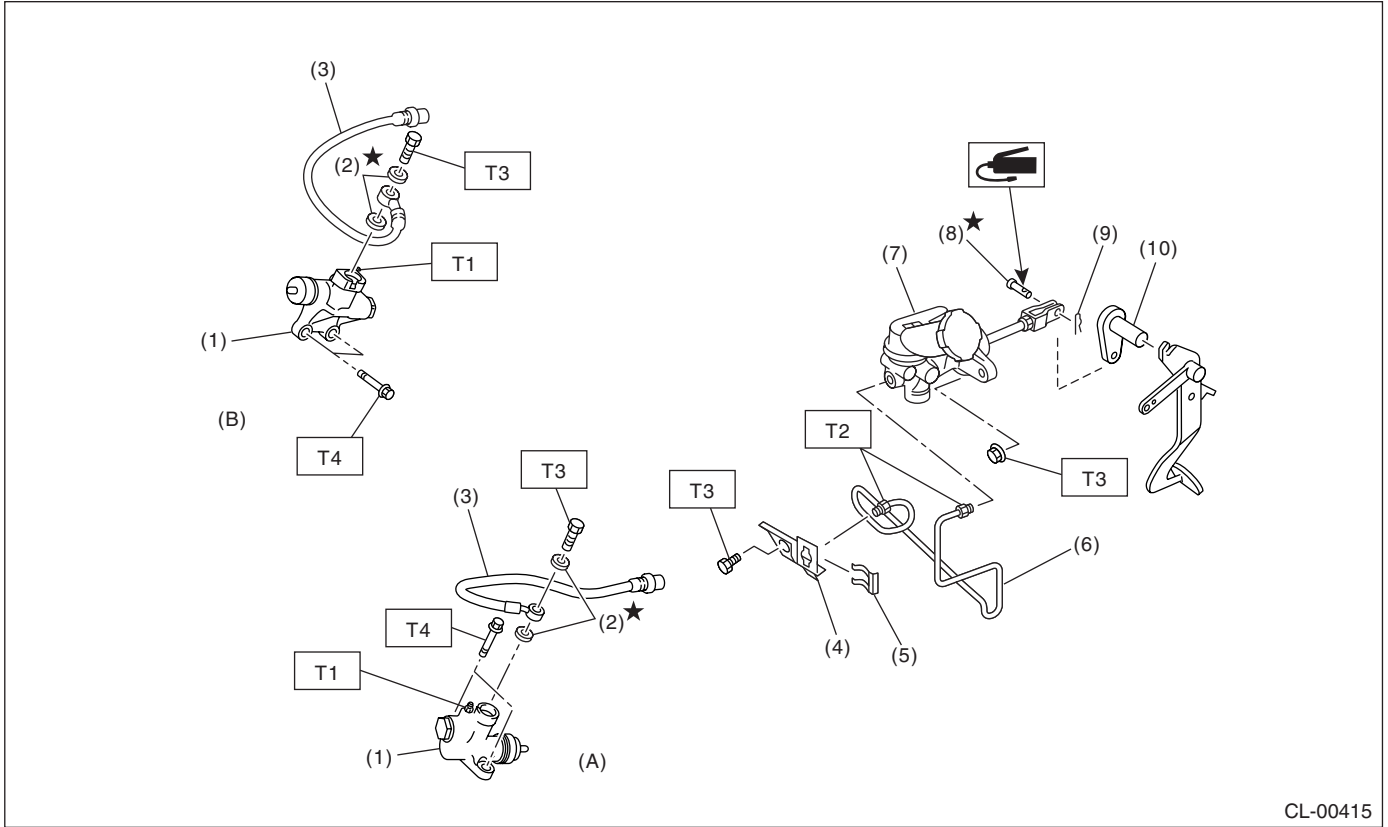
**T1: 7.8 (0.8, 5.8)**

**T2: 15 (1.5, 10.8)**

**T3: 18 (1.8, 13.3)**

**T4: 37 (3.8, 27.5)**

• TURBO MODEL



CL-00415

(A) Turbo model

(B) STI model

- (1) Operating cylinder
- (2) Washer
- (3) Clutch hose
- (4) Bracket
- (5) Clip

- (6) Clutch pipe
- (7) Master cylinder ASSY
- (8) Clevis pin
- (9) Snap pin
- (10) Lever

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 7.8 (0.8, 5.8)**

**T2: 15 (1.5, 10.8)**

**T3: 18 (1.8, 13.3)**

**T4: Except STI model**

**37 (3.8, 27.5)**

**STI model**

**41 (4.2, 30.2)**

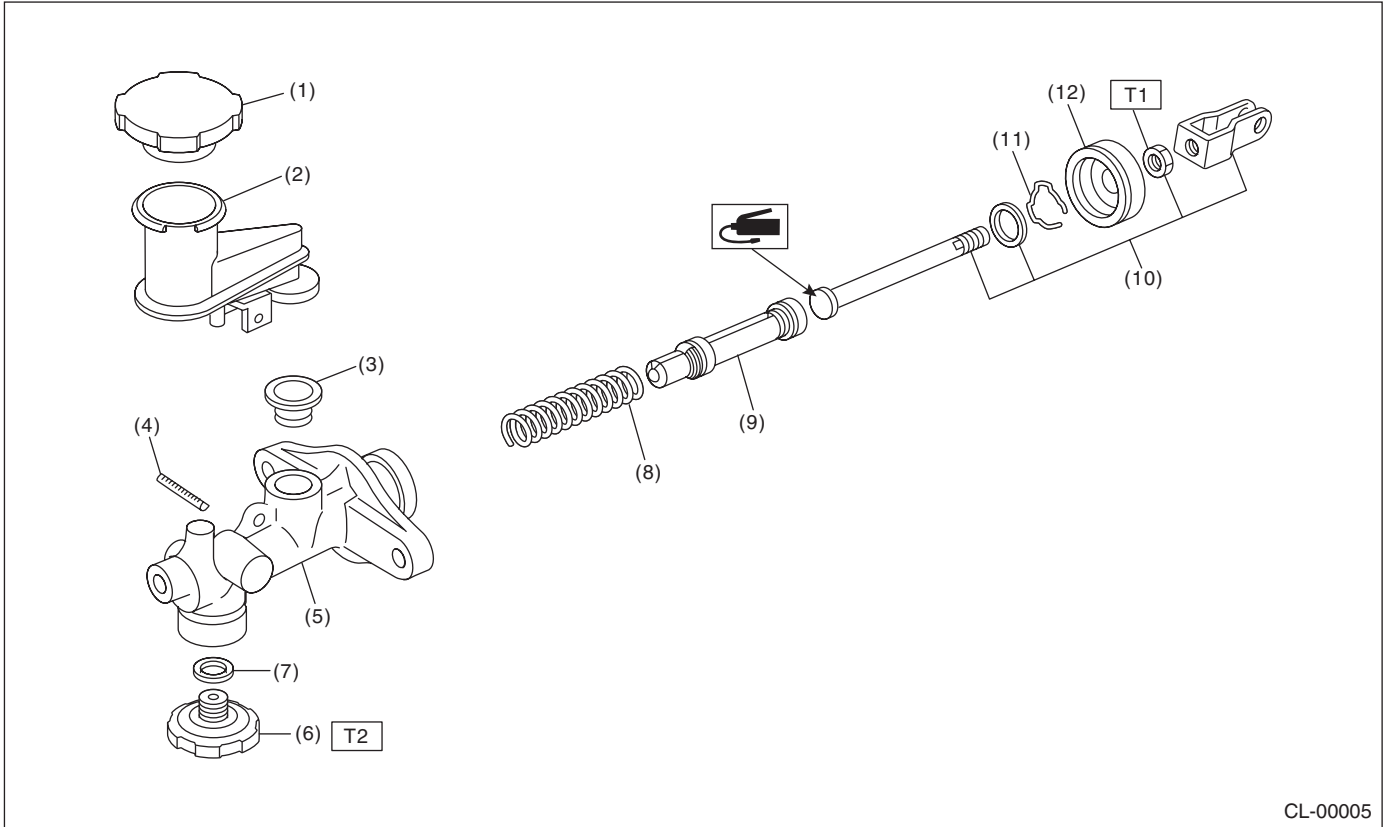


# General Description

## CLUTCH SYSTEM

### 3. MASTER CYLINDER

#### • NON-TURBO MODEL



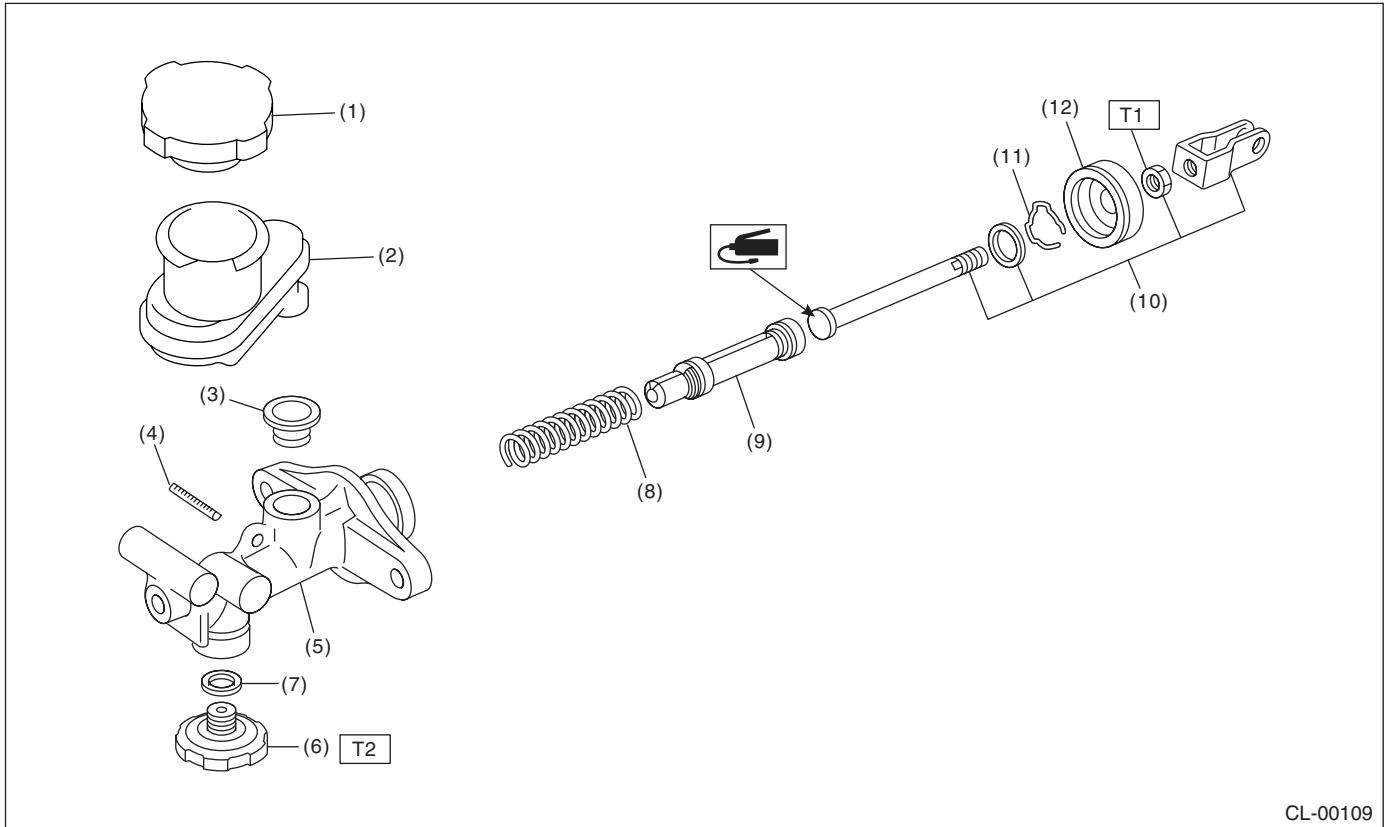
- |                     |                       |
|---------------------|-----------------------|
| (1) Reservoir cap   | (7) Gasket            |
| (2) Reservoir tank  | (8) Return spring     |
| (3) Oil seal        | (9) Piston            |
| (4) Straight pin    | (10) Push rod ASSY    |
| (5) Master cylinder | (11) Piston stop ring |
| (6) Clutch damper   | (12) Cylinder boot    |

**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 10 (1.0, 7)**

**T2: 46.6 (4.75, 34.4)**

• TURBO MODEL



CL-00109

- |                     |                       |
|---------------------|-----------------------|
| (1) Reservoir cap   | (7) Gasket            |
| (2) Reservoir tank  | (8) Return spring     |
| (3) Oil seal        | (9) Piston            |
| (4) Straight pin    | (10) Push rod ASSY    |
| (5) Master cylinder | (11) Piston stop ring |
| (6) Clutch damper   | (12) Cylinder boot    |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 10 (1.0, 7)**

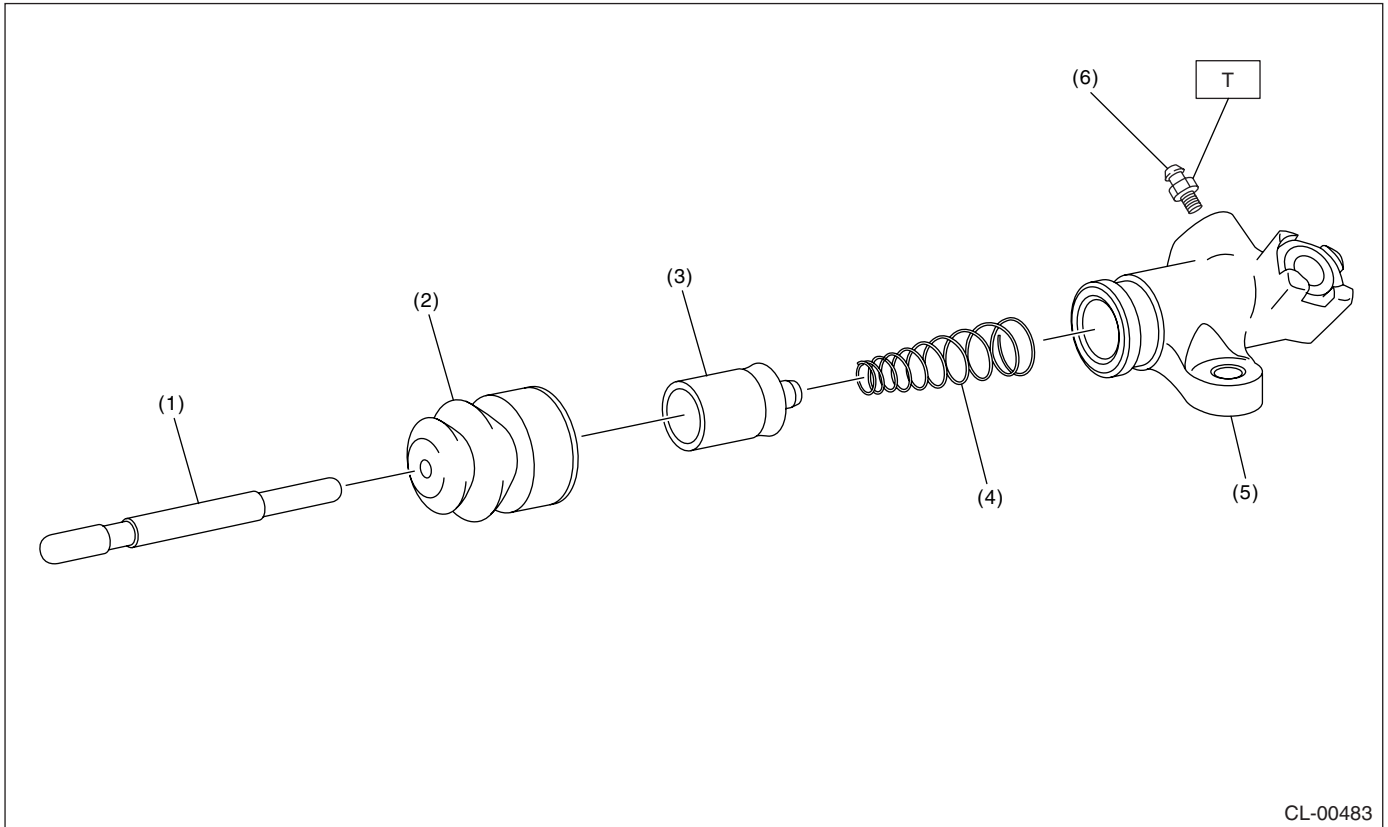
**T2: 46.6 (4.75, 34.4)**

# General Description

## CLUTCH SYSTEM

### 4. OPERATING CYLINDER

#### • NON-TURBO MODEL

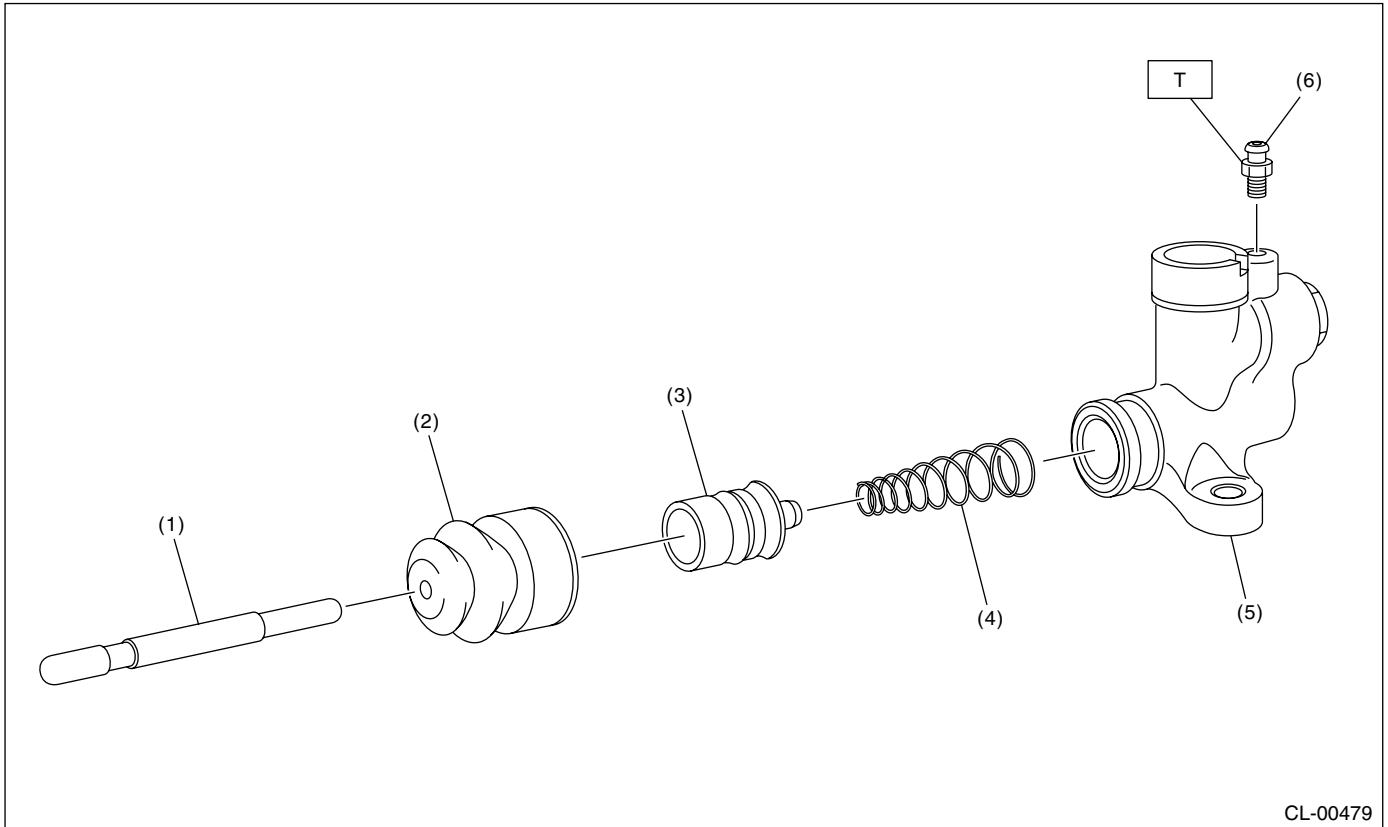


- |              |                        |
|--------------|------------------------|
| (1) Push rod | (4) Piston spring      |
| (2) Boot     | (5) Operating cylinder |
| (3) Piston   | (6) Bleeder screw      |

***Tightening torque: N-m (kgf-m, ft-lb)***

***T: 8 (0.8, 5.8)***

• EXCEPT NON-TURBO MODEL AND STI MODEL



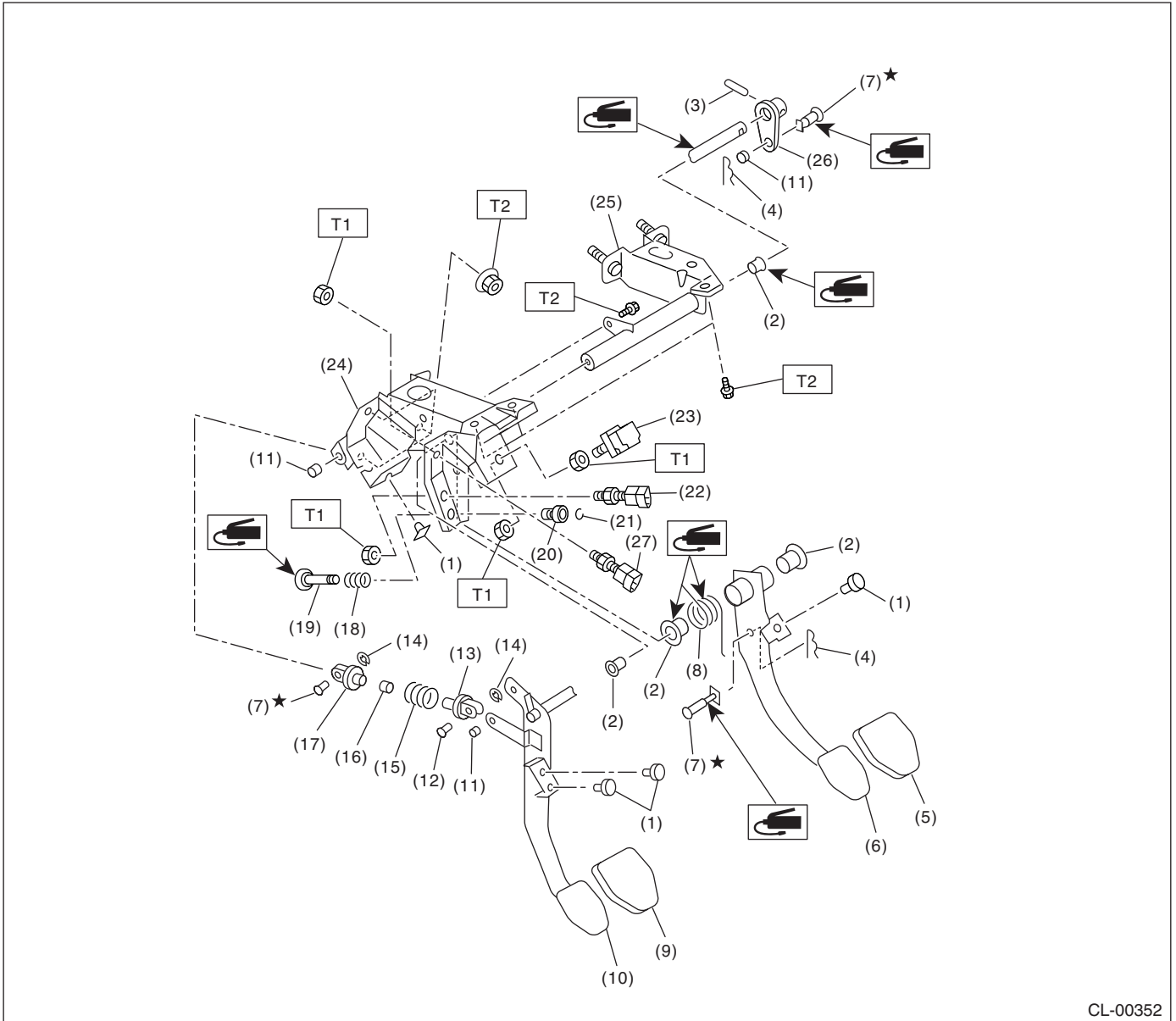
- |              |                        |
|--------------|------------------------|
| (1) Push rod | (4) Piston spring      |
| (2) Boot     | (5) Operating cylinder |
| (3) Piston   | (6) Bleeder screw      |

**Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 8 (0.8, 5.8)**

# General Description

## CLUTCH SYSTEM

### 5. CLUTCH PEDAL



CL-00352

- |                        |  |  |
|------------------------|--|--|
| (1) Stopper            | (13) Assist rod A                              | (24) Pedal bracket                     |
| (2) Bushing            | (14) Clip                                      | (25) Clutch master cylinder bracket    |
| (3) Spring pin         | (15) Assist spring                             | (26) Lever                             |
| (4) Snap pin           | (16) Assist bushing                            | (27) Clutch switch (Starter interlock) |
| (5) Brake pedal pad    | (17) Assist rod B                              |  |
| (6) Brake pedal        | (18) Spring S                                  |  |
| (7) Clevis pin         | (19) Rod S                                     |  |
| (8) Brake pedal spring | (20) Bushing S                                 |  |
| (9) Clutch pedal pad   | (21) Clip                                      |  |
| (10) Clutch pedal      | (22) Clutch switch (Model with cruise control) |  |
| (11) Bushing C         | (23) Stop light switch                         |  |
| (12) Clutch clevis pin |  |  |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 8 (0.8, 5.9)**

**T2: 18 (1.8, 13.3)**

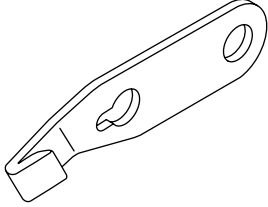
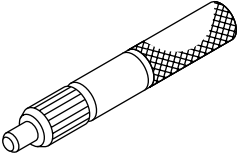
## C: CAUTION

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Use Subaru genuine fluid, grease etc. or the equivalent. Do not mix fluid, grease etc. with that of another grade or from other manufacturers.

- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply grease onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of fluid to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Keep fluid away from the vehicle body. If any fluid contacts the vehicle body, immediately flush the area with water.

## D: PREPARATION TOOL

### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION        | REMARKS   |
|---|-------------|--------------------|---|
| <br>ST-498497100  | 498497100   | CRANKSHAFT STOPPER | Used for stopping rotation of flywheel when loosening tightening bolt, etc. |
| <br>ST-499747100 | 499747100   | CLUTCH DISC GUIDE  | Used when installing clutch disc to flywheel.                               |

### 2. GENERAL TOOL

| TOOL NAME      | REMARKS  |
|----------------|--|
| Circuit tester | Used for measuring resistance, voltage and ampere. |
| Dial gauge     | Used for measuring clutch disc run-out.            |
| Depth gauge    | Used for measuring clutch disc wear.               |

# Clutch Disc and Cover

## CLUTCH SYSTEM

### 2. Clutch Disc and Cover

#### A: REMOVAL

1) Remove the transmission assembly from vehicle body.

5MT:

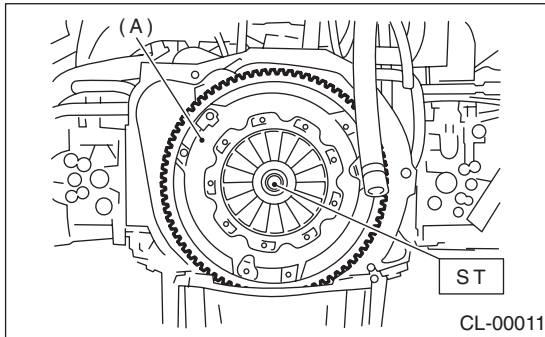
<Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>

6MT:

<Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>

2) Install the ST on flywheel.

ST 499747100 CLUTCH DISC GUIDE



(A) Clutch cover

3) Remove the clutch cover and clutch disc.

NOTE:

- Take care not to allow oil on the clutch disc facing.
- Do not disassemble the clutch cover and clutch disc.
- Be sure to put alignment marks on the flywheel and clutch cover before removing clutch cover.

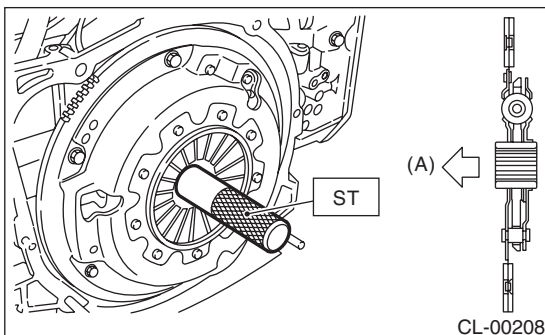
#### B: INSTALLATION

1) Insert the ST into clutch disc and install them on the flywheel by inserting the ST end into pilot bearing.

NOTE:

When installing the clutch disc, be careful to its direction.

ST 499747100 CLUTCH DISC GUIDE



(A) Flywheel side

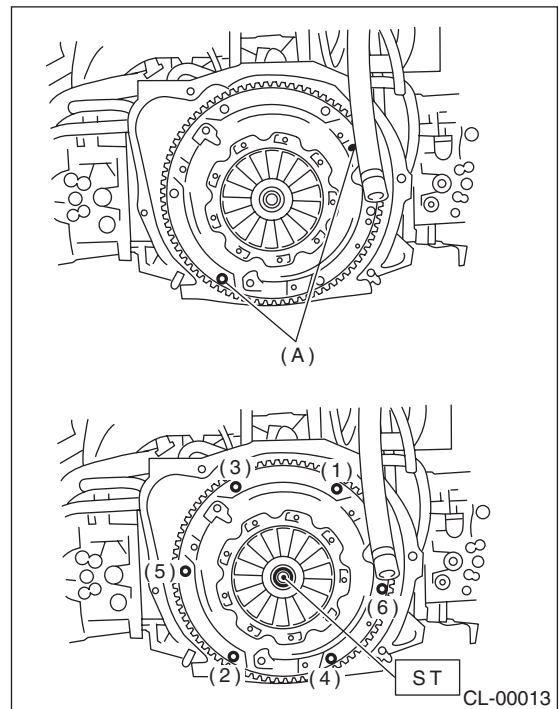
2) Install the clutch cover on flywheel and tighten the bolts to specified torque.

NOTE:

- When reinstalling, align the alignment marks.
- When installing a new clutch cover, position the clutch cover so that there is a gap of 120° or more between “0” marks on the flywheel and clutch cover. (“0” marks indicate the directions of residual unbalance.)
- Note the front and rear of the clutch disc when installing.
- Tighten the clutch cover installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross order.

**Tightening torque:**

**16 N·m (1.6 kgf·m, 11.8 ft·lb)**



(A) “0” marks

3) Remove the ST.

ST 499747100 CLUTCH DISC GUIDE

4) Install the transmission assembly.

5MT:

<Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

6MT:

<Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

## C: INSPECTION

### 1. CLUTCH DISC

#### 1) Facing wear

Measure the depth of rivet head from the surface of facing. Replace if facings are worn locally or worn down to less than the specified value.

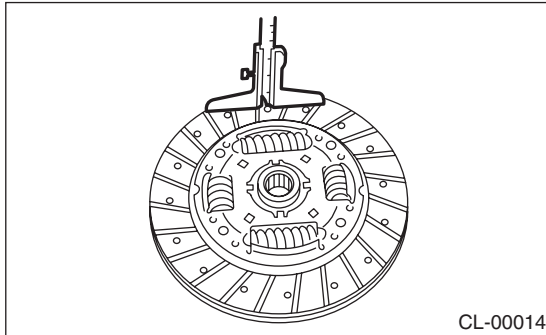
#### Depth of rivet head:

##### Limit of sinking

**0.3 mm (0.012 in)**

#### NOTE:

Do not wash the clutch disc with any cleaning fluid.

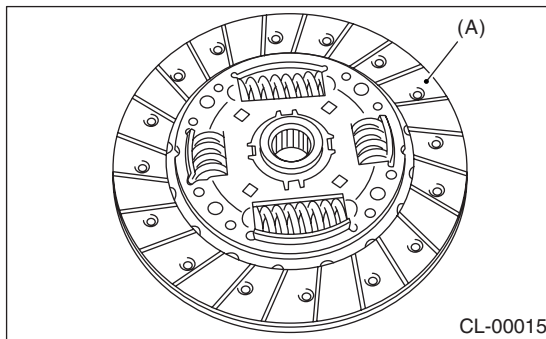


#### 2) Hardened facing

Correct by using emery paper or replace.

#### 3) Oil leakage on facing

Replace the clutch disc and inspect the transmission front oil seal, transmission case mating surface, engine rear oil seal and other points for oil leakage.



(A) Clutch facing

#### 4) Deflection on facing

If deflection exceeds the specified value at the outer circumference of facing, repair or replace.

ST 499747100 CLUTCH DISC GUIDE

#### Limit for deflection:

##### Non-turbo model

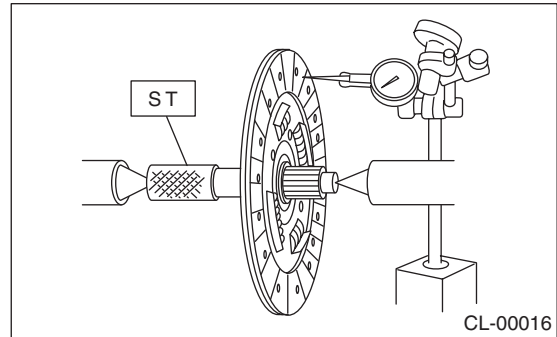
**0.7 mm (0.028 in) at R = 107.5 mm (4.23 in)**

##### Turbo model

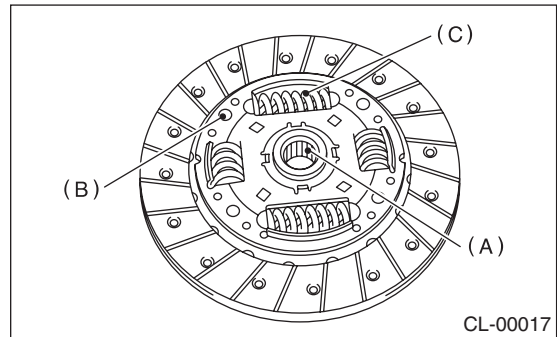
**0.7 mm (0.028 in) at R = 110 mm (4.33 in)**

##### STI model

**0.7 mm (0.028 in) at R = 115 mm (4.53 in)**



5) If worn spline, loose rivets or damper spring failure is found, replace the clutch disc.



(A) Spline

(B) Rivet

(C) Damper spring

### 2. CLUTCH COVER

#### NOTE:

Visually check for the following items without disassembling, and replace or repair if defective.

1) Loose thrust rivet

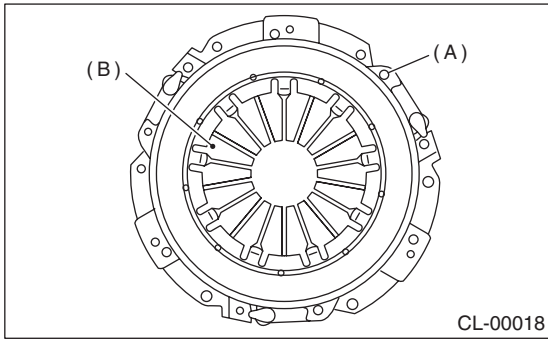


## Clutch Disc and Cover

### CLUTCH SYSTEM

---

2) Damaged or worn bearing contact area at center of diaphragm spring



- (A) Thrust rivet
- (B) Diaphragm spring

## 3. Flywheel

### A: REMOVAL

1) Remove the transmission assembly.

5MT:

<Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>

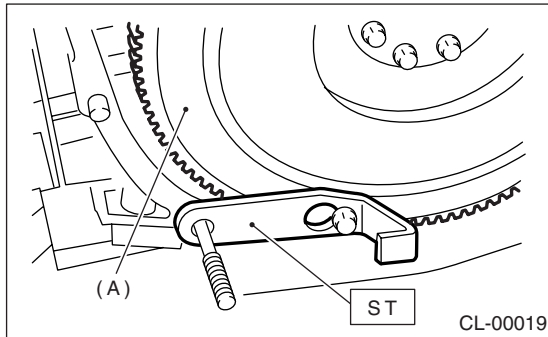
6MT:

<Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>

2) Remove the clutch cover and clutch disc. <Ref. to CL-14, REMOVAL, Clutch Disc and Cover.>

3) Using the ST, remove the flywheel.

ST 498497100 CRANKSHAFT STOPPER

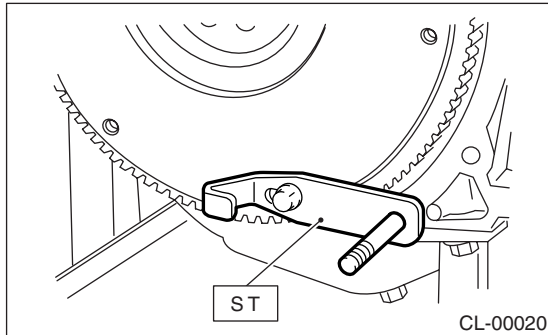


(A) Flywheel

### B: INSTALLATION

1) Install the flywheel and ST.

ST 498497100 CRANKSHAFT STOPPER



2) Tighten the flywheel attaching bolts to the specified torque.

**NOTE:**

Tighten the flywheel installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross fashion.

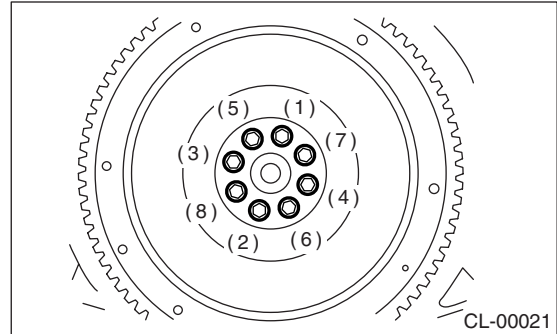
**Tightening torque:**

**Except STI model**

**72 N·m (7.3 kgf-m, 52.8 ft-lb)**

**STI model**

**75 N·m (7.6 kgf-m, 55.3 ft-lb)**



3) Install the clutch disc and cover. <Ref. to CL-14, INSTALLATION, Clutch Disc and Cover.>

4) Install the transmission assembly.

5MT:

<Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

6MT:

<Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

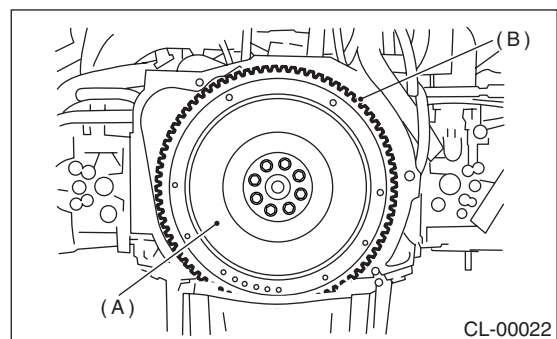
### C: INSPECTION

**CAUTION:**

**Since this bearing is grease sealed and is of a non-lubrication type, do not wash with gasoline or any solvent.**

1) Damage on sliding surface of facing and ring gear

If defective, replace the flywheel.



(A) Flywheel

(B) Ring gear

2) Smoothness of rotation

Rotate the ball bearing applying pressure in thrust direction.

3) If noise or excessive play is noted, replace the flywheel.

## 4. Release Bearing and Lever

### A: REMOVAL

#### 1. EXCEPT STI MODEL

1) Remove the transmission assembly from vehicle body.

<Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>

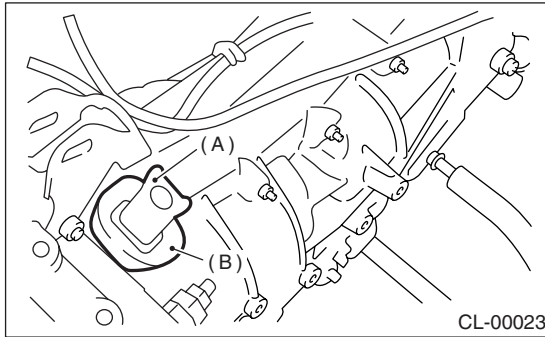
2) Remove the two clips from release lever and remove the release bearing. (Non-turbo model)

**CAUTION:**

**Be careful not to deform clips.**

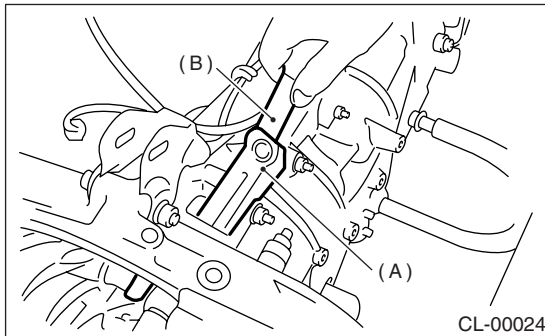
3) Remove the release bearing from release lever. (Turbo model)

4) Remove the dust cover.



(A) Release lever  
(B) Dust cover

5) Remove the lever spring from pivot with a screwdriver by accessing it through clutch housing release lever hole. Then remove the release lever.



(A) Release lever  
(B) Screwdriver

#### 2. STI MODEL

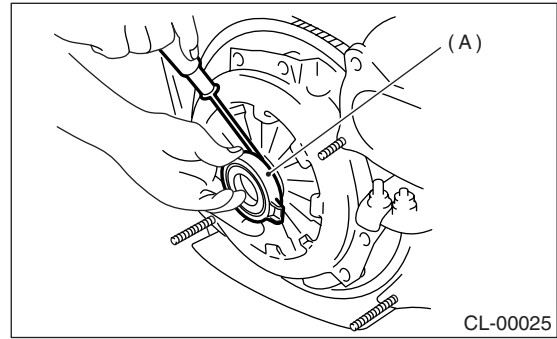
1) Remove the transmission assembly from vehicle body.

<Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>

2) Remove the release lever from transmission.

3) Put the release bearing in engine side.

4) Remove the release bearing from the clutch cover using flat-type screwdriver.



(A) Release bearing

### B: INSTALLATION

#### 1. EXCEPT STI MODEL

**NOTE:**

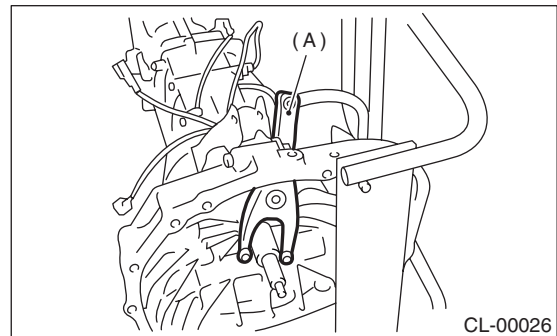
Before or during assembling, lubricate the following points with a light coat of grease.

- Contact surface of lever and pivot
- Contact surface of lever and bearing
- Transmission main shaft spline (Use grease containing molybdenum disulphide.)

1) While pushing the release lever to pivot and twisting it to both sides, fit the lever spring onto the constricted portion of pivot.

**NOTE:**

- Apply grease (KOPR-KOTE: Part No. 003603001) to the contact point of release lever and operating cylinder.
- Confirm that the lever spring is securely fitted by observing it through the main case hole.

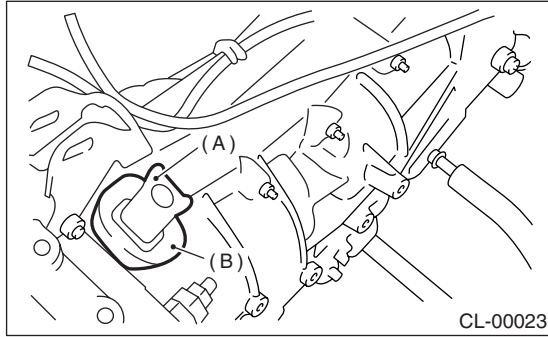


(A) Release lever

2) Install the release bearing and fasten it with two clips. (Non-turbo model)

3) Install the release bearing. (Turbo model)

4) Install the dust cover.



- (A) Release lever
- (B) Dust cover

5) Check smooth movement of the bearing with operating release lever.

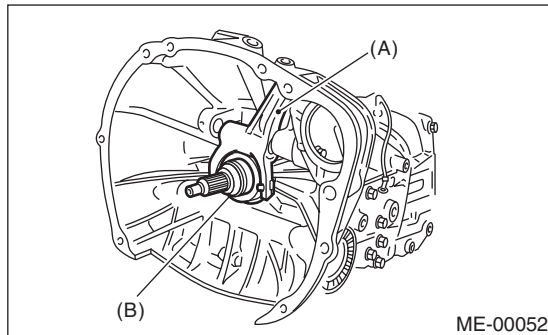
6) Install the transmission assembly.

<Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

## 2. STI MODEL

1) Install the release bearing on transmission.

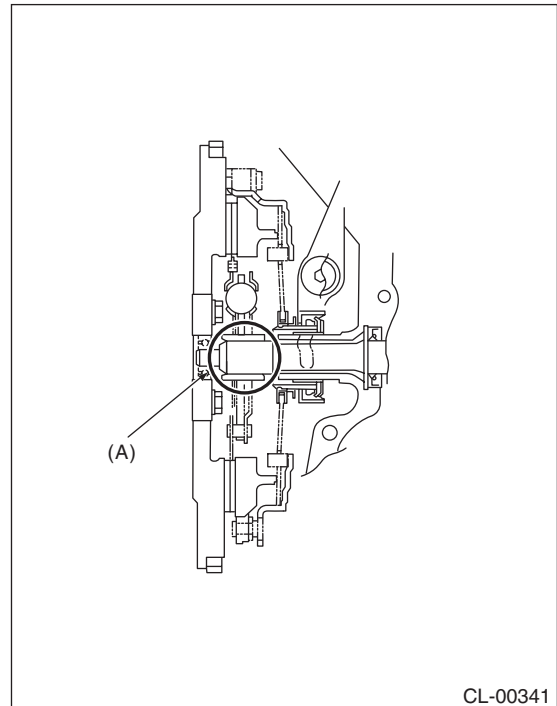
2) Insert the release fork into release bearing tab.



- (A) Release fork
- (B) Release bearing

3) Apply grease to the spline portion.

**Grease:**  
**NICHIMOLY 130**

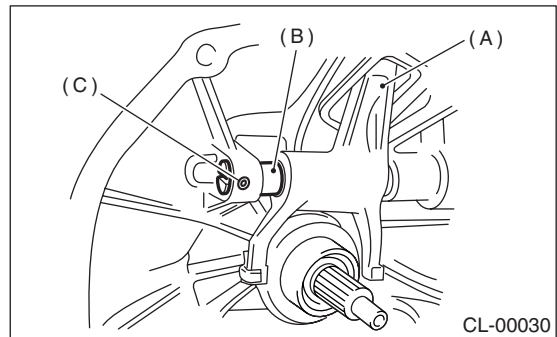


- (A) Spline

4) Insert the release fork shaft into release fork.

**NOTE:**

Make sure the cutout portion of release fork shaft contacts spring pin.



- (A) Release fork
- (B) Release shaft
- (C) Spring pin

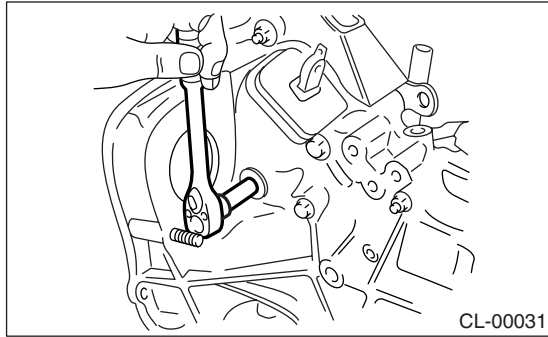
5) Tighten the plug.

# Release Bearing and Lever

## CLUTCH SYSTEM

### Tightening torque:

**44 N·m (4.5 kgf-m, 32.5 ft-lb)**



6) Install the transmission assembly.  
<Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

## C: INSPECTION

### 1. RELEASE BEARING

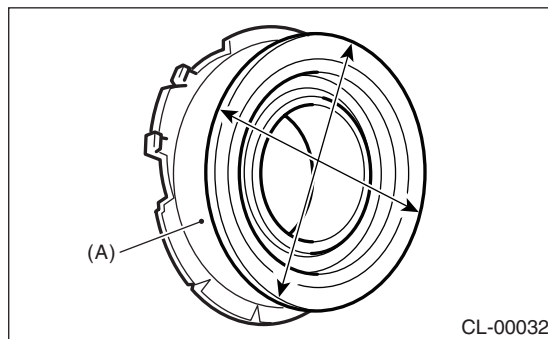
#### CAUTION:

Since this bearing is grease sealed and is of a non-lubrication type, do not wash with gasoline or any solvent when servicing the clutch.

1) Check the bearing for smooth movement by applying force in the radial direction.

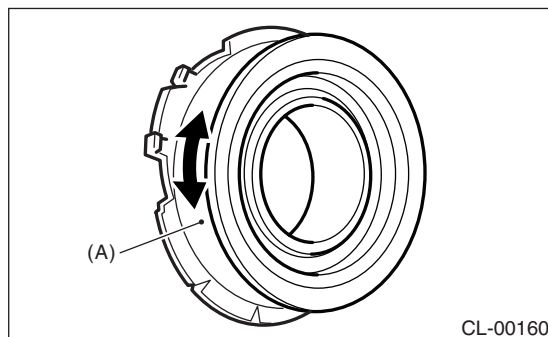
#### Radial direction stroke:

**1.4 mm (0.055 in)**



(A) Bearing case

2) Check the bearing for smooth rotation by applying pressure in the thrust direction.

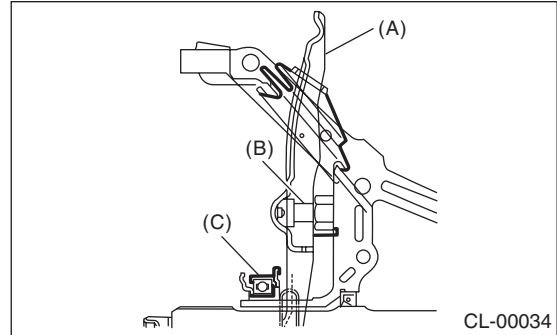


(A) Bearing case

3) Check wear and damage of the bearing case surface contacting with lever.

### 2. RELEASE LEVER

Check the lever pivot portion and the point of contact with release bearing case for wear.



- (A) Release lever
- (B) Pivot
- (C) Release bearing

## 5. Operating Cylinder

### A: REMOVAL

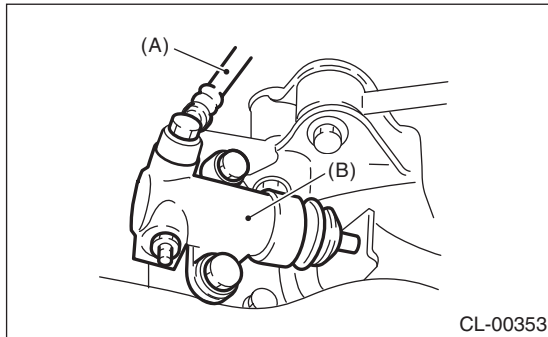
1) Remove the air intake chamber (Non-turbo model). <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Chamber.>

2) Remove the intercooler. (Turbo model)  
<Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>

3) Remove the clutch hose from operating cylinder.

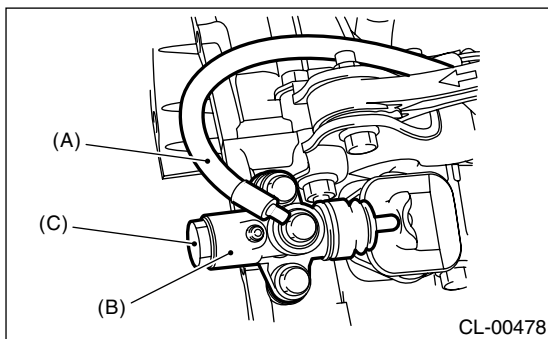
#### CAUTION:

- Cover the hose joint to prevent clutch fluid from flowing out.
- Do not loosen or remove the cap bolt. (Turbo model and STI model)
- Non-turbo model



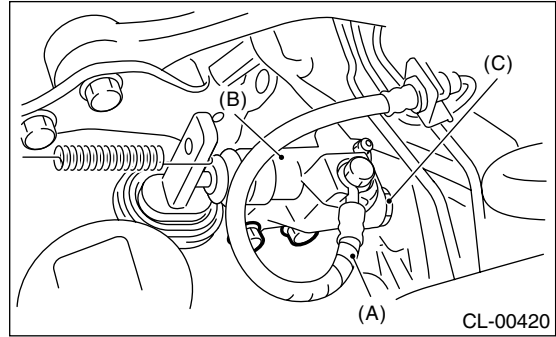
- (A) Clutch hose
- (B) Operating cylinder

- Turbo model



- (A) Clutch hose
- (B) Operating cylinder
- (C) Cap bolt

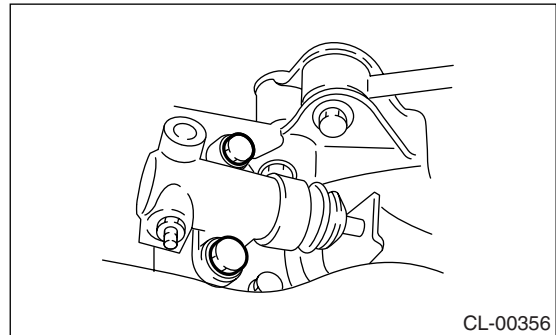
- STI model



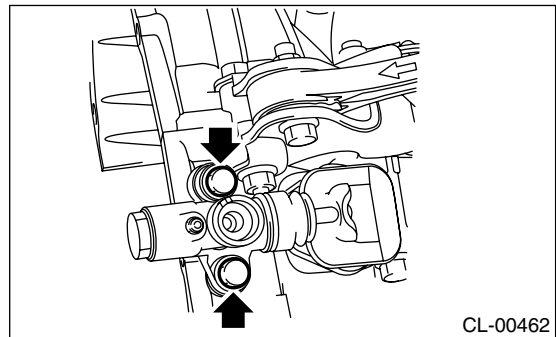
- (A) Clutch hose
- (B) Operating cylinder
- (C) Cap bolt

4) Remove the operating cylinder from transmission.

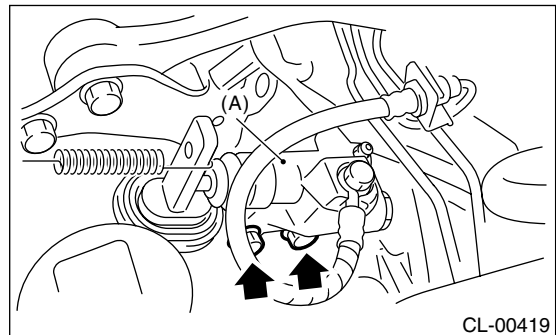
- Non-turbo model



- Turbo model



- STI model



- (A) Operating cylinder

# Operating Cylinder

## CLUTCH SYSTEM

### B: INSTALLATION

1) Install in the reverse order of removal.

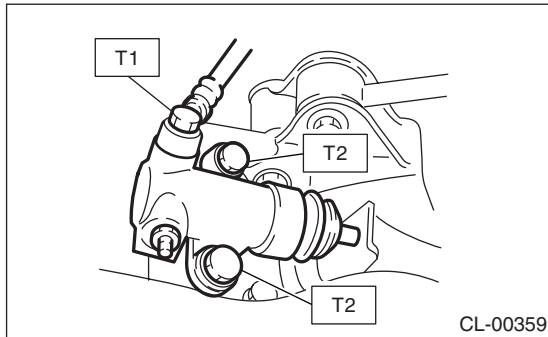
#### NOTE:

- Before installing the operating cylinder, apply grease (KOPR-KOTE: Part No. 003603001) to contact point of the release lever and operating cylinder.
- For turbo model, bleed air with the operating cylinder attached to clutch hose, and then install it to vehicle. <Ref. to CL-30, STI MODEL, PROCEDURE, Clutch Fluid Air Bleeding.>
- Non-turbo model

#### Tightening torque:

**T1: 18 N·m (1.8 kgf-m, 13.3 ft-lb)**

**T2: 37 N·m (3.8 kgf-m, 27.5 ft-lb)**

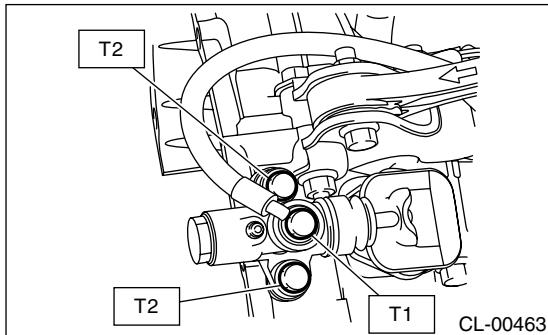


- Turbo model

#### Tightening torque:

**T1: 18 N·m (1.8 kgf-m, 13.3 ft-lb)**

**T2: 37 N·m (3.8 kgf-m, 27.5 ft-lb)**

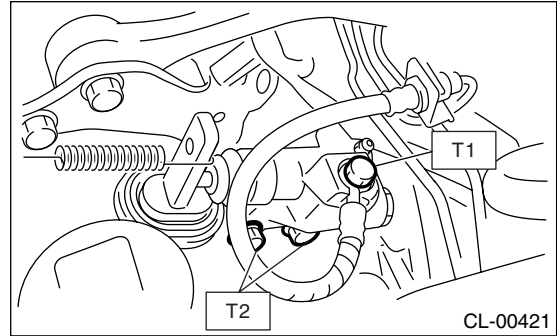


- STI model

#### Tightening torque:

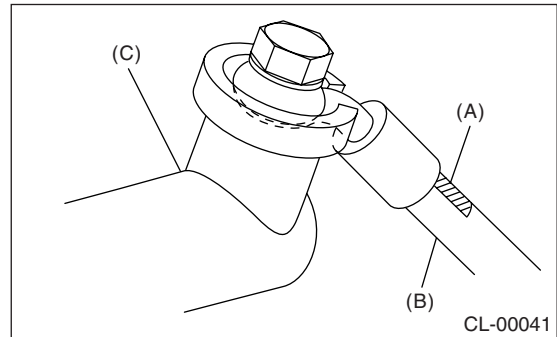
**T1: 18 N·m (1.8 kgf-m, 13.3 ft-lb)**

**T2: 41 N·m (4.2 kgf-m, 30.2 ft-lb)**



#### NOTE:

- Be sure to install the clutch hose with the mark side facing upward.
- Be careful not to twist the clutch hose during installation.



- (A) Marking
- (B) Clutch hose
- (C) Operating cylinder

2) After bleeding air from the operating cylinder, ensure that clutch operates properly.

<Ref. to CL-29, Clutch Fluid Air Bleeding.>

### C: DISASSEMBLY

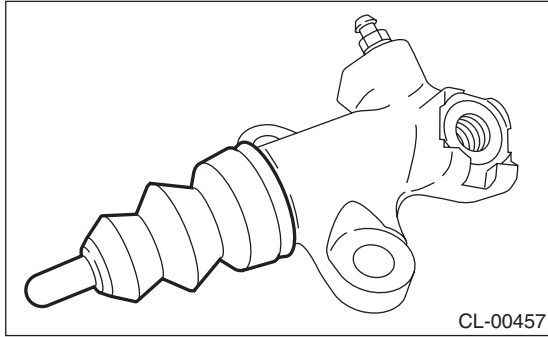
#### NOTE:

Disassembly for operating cylinder of only 5MT model can be performed. That of 6MT model is a component that cannot be disassembled.

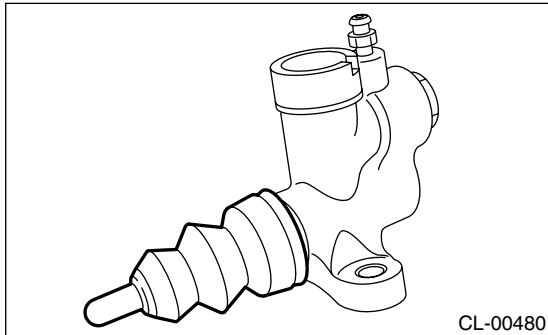
1) Remove the boot and push rod.



- Non-turbo model



- Except Non-turbo model and STI model

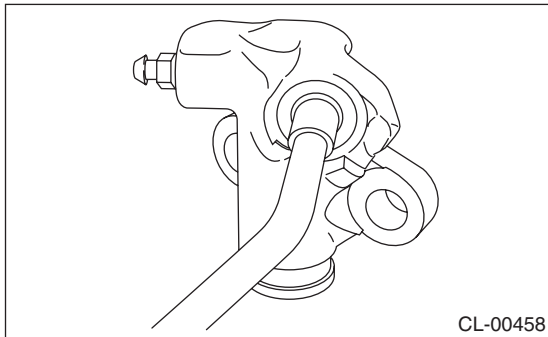


2) Apply compressed air through the clutch hose attaching hole.

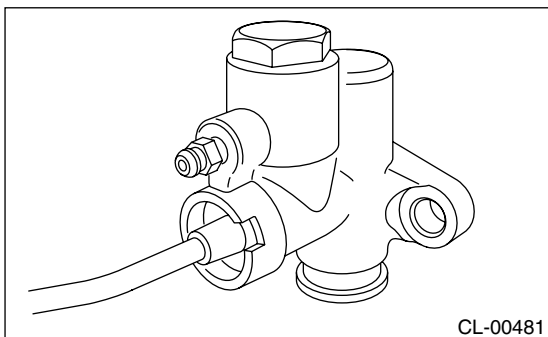
**NOTE:**

Face the piston hole downward and place a wooden block to prevent the piston from jumping out.

- Non-turbo model

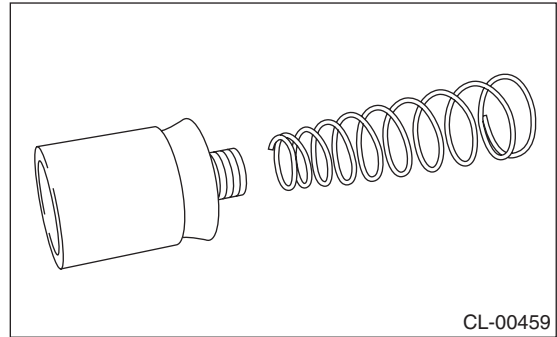


- Except Non-turbo model and STI model

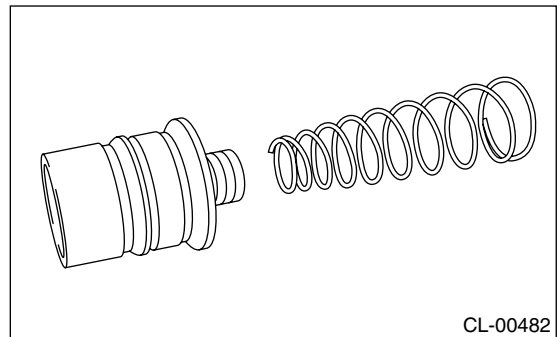


3) Separate the piston and piston spring.

- Non-turbo model



- Except Non-turbo model and STI model



## D: ASSEMBLY

**NOTE:**

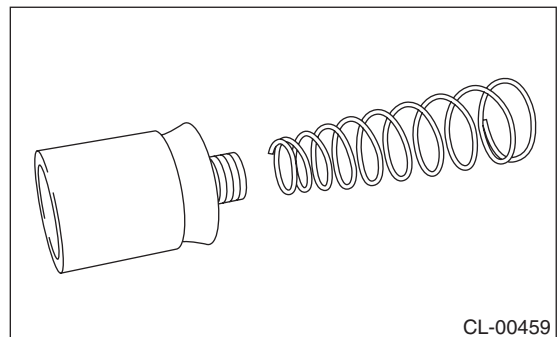
- Keep applying working fluid to all the parts during assembly.
- Assembly for operating cylinder of only 5MT model can be performed. That of 6MT model is a component that cannot be disassembled.

**Recommended clutch fluid:**

**FMVSS No. 116, fresh DOT3 or 4 brake fluid**

1) Install the piston spring to piston.

- Non-turbo model



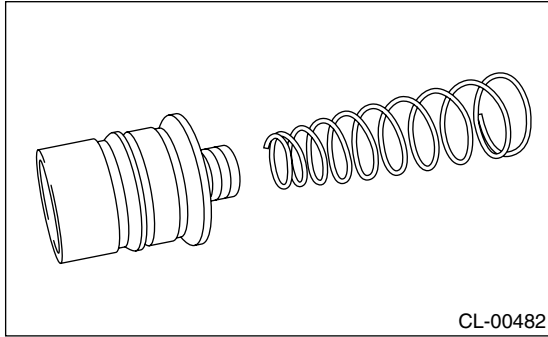


# Operating Cylinder

## CLUTCH SYSTEM

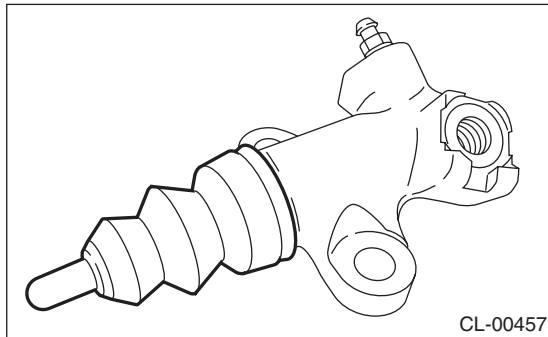
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- Except Non-turbo model and STI model

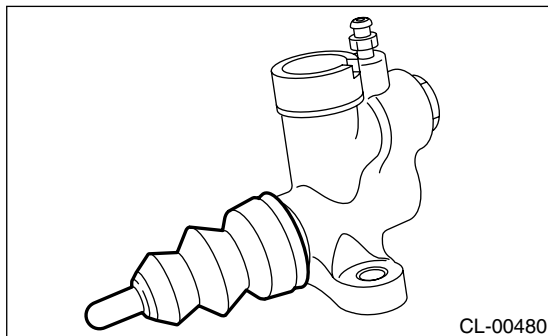


- 2) Insert the piston into operating cylinder.
- 3) Install the push rod to boot.
- 4) Install the boot and push rod to operating cylinder.

- Non-turbo model



- Except Non-turbo model and STI model



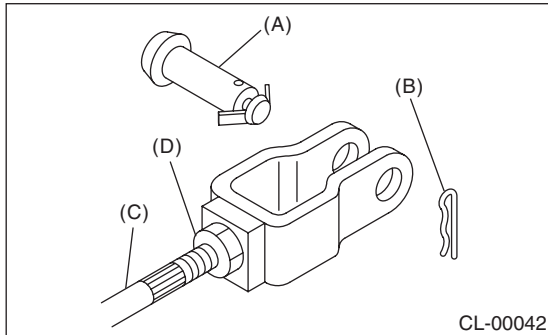
### **E: INSPECTION**

- 1) Check the operating cylinder for damage. If operating cylinder is damaged, replace it.
- 2) Check the operating cylinder for fluid leakage or damage on boot. If any leakage or damage is found, replace the operating cylinder.

## 6. Master Cylinder

### A: REMOVAL

- 1) Thoroughly drain the brake fluid from reservoir tank.
- 2) Remove the snap pin, clevis pin and separate the push rod of master cylinder from clutch pedal.

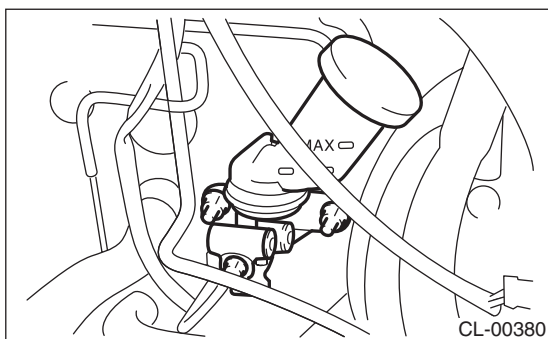


- (A) Clevis pin
- (B) Snap pin
- (C) Push rod
- (D) Lock nut

- 3) Remove the air intake chamber (Non-turbo model). <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Chamber.>
- 4) Remove the intercooler (Turbo model). <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 5) Disconnect the clutch pipe from master cylinder.
- 6) Remove the master cylinder and reservoir tank as a unit.

### CAUTION:

**Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the paint surface; wipe it off quickly if spilt.**



### B: INSTALLATION

- 1) Install the master cylinder to body, and connect the clutch pipe to master cylinder.

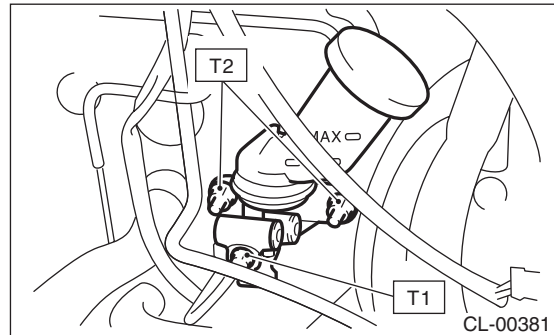
### NOTE:

Check that the pipe is routed properly.

### Tightening torque:

**T1: 15 N·m (1.5 kgf-m, 10.8 ft-lb)**

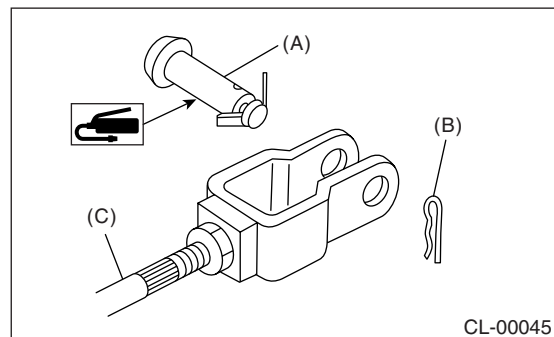
**T2: 18 N·m (1.8 kgf-m, 13.3 ft-lb)**



- 2) Connect the push rod of master cylinder to clutch pedal, and install the clevis pin and snap pin.

### NOTE:

Apply grease to the clevis pin.



- (A) Clevis pin
- (B) Snap pin
- (C) Push rod

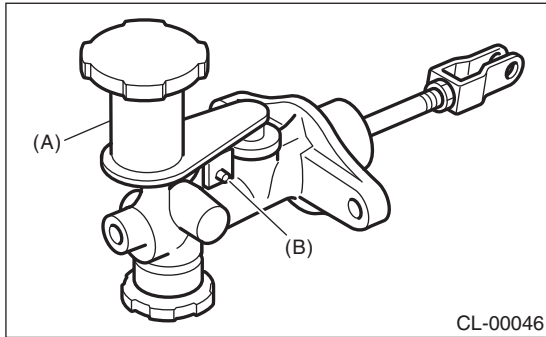
- 3) After bleeding air from the clutch system, ensure that clutch operates properly. <Ref. to CL-29, Clutch Fluid Air Bleeding.>
- 4) Install the air intake chamber. (Non-turbo model) <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Chamber.>
- 5) Install the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

# Master Cylinder

## CLUTCH SYSTEM

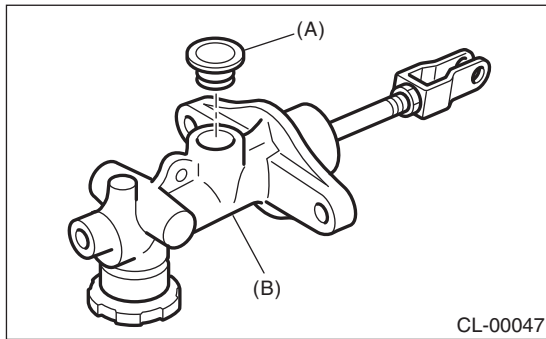
### C: DISASSEMBLY

1) Remove the straight pin and reservoir tank.



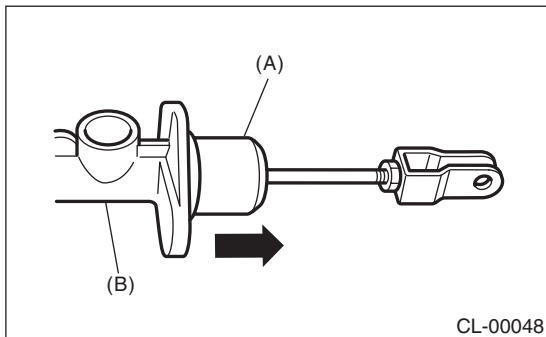
- (A) Reservoir tank
- (B) Straight pin

2) Remove the oil seal.



- (A) Oil seal
- (B) Master cylinder

3) Move the cylinder boot backward.



- (A) Cylinder boot
- (B) Master cylinder

4) Remove the snap ring.

**CAUTION:**  
Be careful when removing the snap ring to prevent the rod, washer, piston and return spring from flying out.

5) Remove the clutch damper.

### D: ASSEMBLY

1) Install the clutch damper.

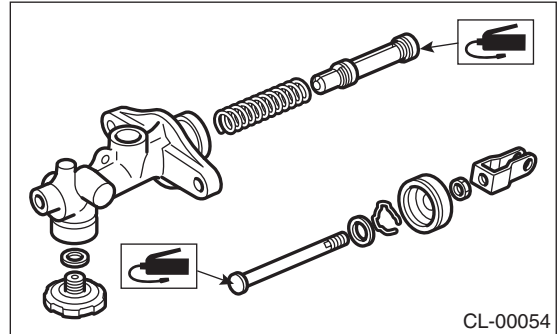
**Tightening torque:**

**46.6 N·m (4.75 kgf-m, 34.4 ft-lb)**

2) Apply a coat of grease to the contacting surfaces of the push rod and piston before installation.

**Grease:**

**SILICONE GREASE G-40M (Part No. 004404003)**



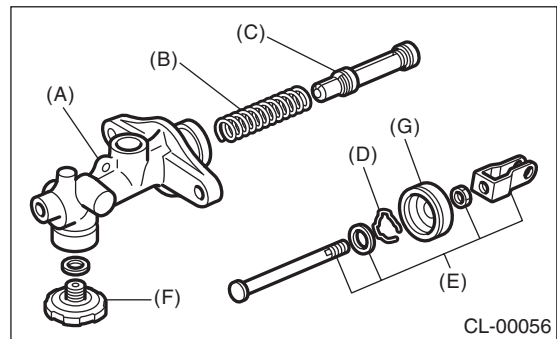
3) Assemble in the reverse order of disassembly.

**Tightening torque:**

**10 N·m (1.0 kgf-m, 7 ft-lb)**

### E: INSPECTION

If any damage, deformation, wear, swelling, rust or other faults are found on the cylinder, piston, push rod, fluid reservoir, return spring, gasket, clutch damper, cylinder boot and hose replace the faulty part.

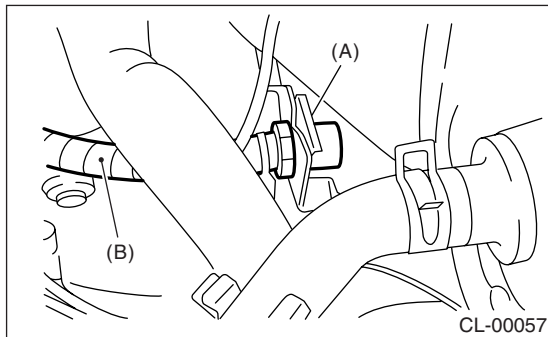


- (A) Master cylinder body
- (B) Return spring
- (C) Piston
- (D) Stop ring
- (E) Push rod ASSY
- (F) Clutch damper
- (G) Cylinder boot

## 7. Clutch Pipe and Hose

### A: REMOVAL

- 1) Remove the air intake chamber and air intake duct. (Non-turbo model) <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Chamber.> <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>
- 2) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Drain the clutch fluid. <Ref. to CL-28, Clutch Fluid.>
- 4) Remove the clutch pipe from the clutch hose and master cylinder.
- 5) Pull out the clamp, then remove the clutch hose from bracket.



- (A) Clamp
- (B) Clutch hose

- 6) Remove the hose from operating cylinder.
- 7) Remove the bracket.

### B: INSTALLATION

Install in the reverse order of removal.

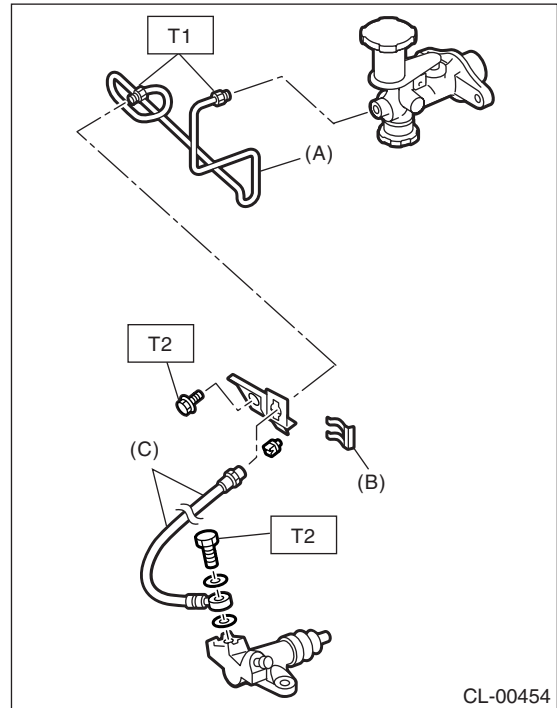
#### NOTE:

Bleed air of the clutch fluid. <Ref. to CL-29, Clutch Fluid Air Bleeding.>

#### Tightening torque:

**T1: 15 N·m (1.5 kgf-m, 10.8 ft-lb)**

**T2: 18 N·m (1.8 kgf-m, 13.3 ft-lb)**



- (A) Clutch pipe
- (B) Clip
- (C) Clutch hose

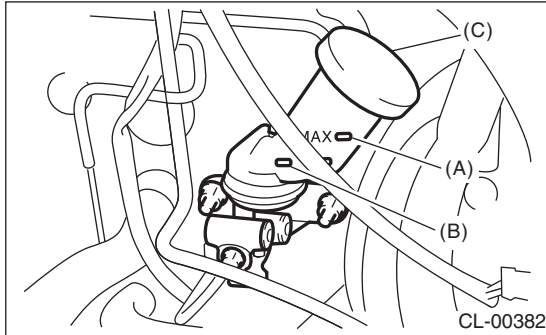
### C: INSPECTION

Check the pipes and hoses for cracks, breakage, or damage. Check the joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace the applicable pipe or hose.

### 8. Clutch Fluid

#### A: INSPECTION

- 1) Park the vehicle on a level surface.
- 2) Inspect the fluid level using scale on the outside of the reservoir tank. If the level is below "MIN", add fluid to bring it up to "MAX", and also inspect for leakage.



- (A) Max. level
- (B) Min. level
- (C) Reservoir tank

#### B: REPLACEMENT

##### CAUTION:

- The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
- Cover the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
- Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
- Be careful not to allow dirt or dust to get into the reservoir tank.

##### NOTE:

- During bleeding operation, keep the clutch reservoir tank filled with brake fluid to eliminate entry of air.
  - Clutch pedal operating must be very slow.
  - Bleed air from the oil line with help of a co-worker.
  - The amount of brake fluid required is approx. 70 ml (2.4 US fl oz, 2.5 Imp fl oz) for total clutch system.
- 1) Remove the air intake chamber. (Non-turbo model) <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Chamber.>
  - 2) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
  - 3) Either jack-up the vehicle and place a rigid racks under it, or lift-up the vehicle.
  - 4) Drain brake fluid from the reservoir tank.
  - 5) Refill the reservoir tank with recommended brake fluid.

##### Recommended brake fluid:

**FMVSS No. 116, fresh DOT3 or 4 brake fluid**

- 6) Drain all contaminated fluid in the same method as air bleeding.
- 7) Refill the brake fluid before reservoir tank becomes empty, and drain contaminated fluid again.
- 8) Repeat the above procedure until the contaminated fluid is completely drained.

## 9. Clutch Fluid Air Bleeding

### A: PROCEDURE

#### 1. EXCEPT STI MODEL

**NOTE:**

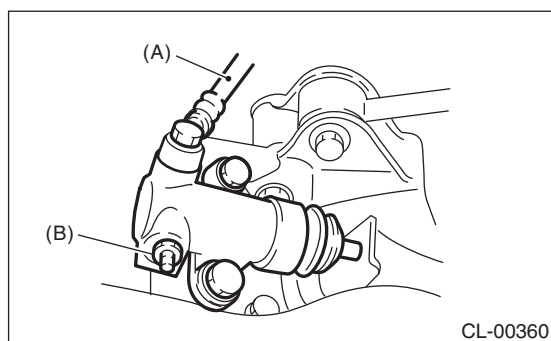
Bleed air from the oil line with help of a co-worker.

1) Remove the air intake chamber. (Non-turbo model) <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Chamber.>

2) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>

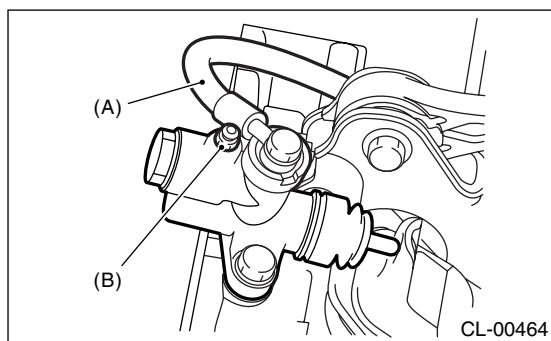
3) Fit one end of a vinyl tube into the air bleeder of operating cylinder and put the other end into a brake fluid container.

- Non-turbo model



(A) Clutch hose  
(B) Air bleeder

- Turbo model



(A) Clutch hose  
(B) Air bleeder

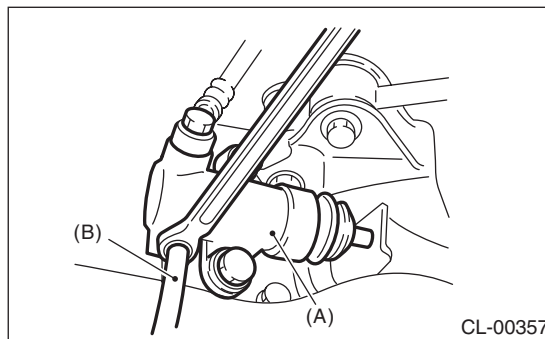
4) Slowly depress the clutch pedal and keep it depressed. Then open the air bleeder to discharge air together with the fluid.

Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the clutch pedal.

**CAUTION:**

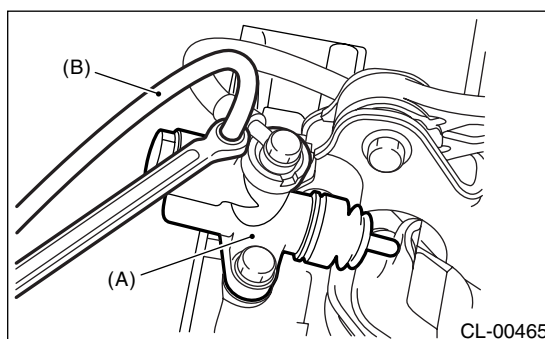
**Cover the bleeder with waste cloth when loosening it, to prevent brake fluid from being splashed over surrounding parts.**

- Non-turbo model



(A) Operating cylinder  
(B) Vinyl tube

- Turbo model



(A) Operating cylinder  
(B) Vinyl tube

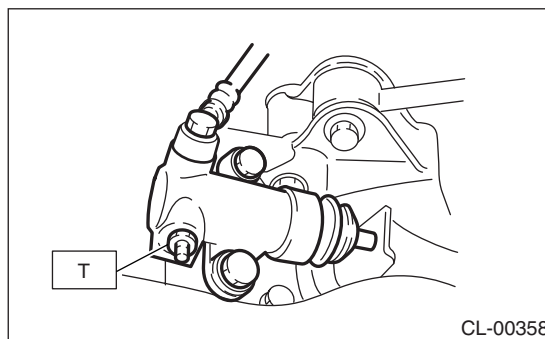
5) Repeat the procedure 4), until there are no more air bubbles in the vinyl tube.

6) Tighten the air bleeder.

**Tightening torque:**

**T: 7.8 N·m (0.8 kgf-m, 5.8 ft-lb)**

- Non-turbo model

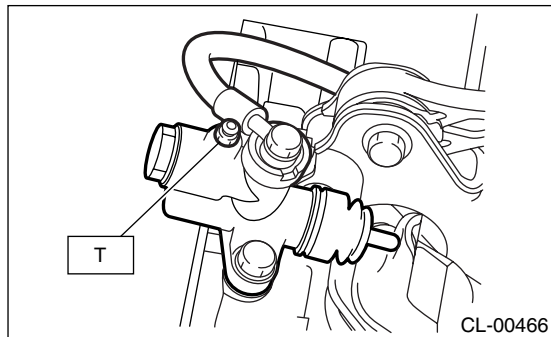


CL-00358

# Clutch Fluid Air Bleeding

## CLUTCH SYSTEM

- Turbo model



7) After depressing the clutch pedal, make sure that there are no leaks evident in the entire clutch system.

8) After bleeding air from the clutch system, ensure that clutch operates properly.

9) Install the air intake chamber. (Non-turbo model) <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Chamber.>

10) Install the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

## 2. STI MODEL

### NOTE:

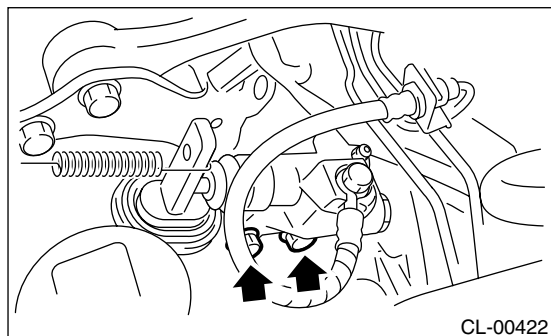
Bleed air from the oil line with help of a co-worker.

1) Remove the intercooler. <Ref. to IN(STI)-11, REMOVAL, Intercooler.>

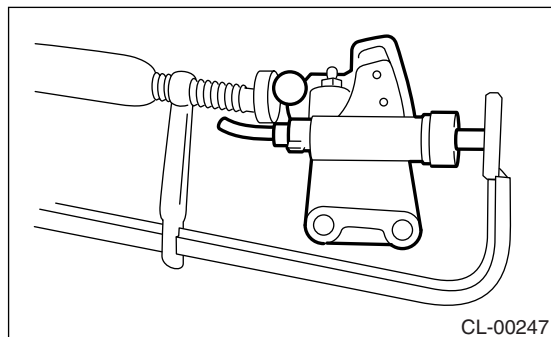
2) Remove the operating cylinder.

### NOTE:

Do not remove the clutch hose.



3) Fix the piston with clamp to avoid the piston from jumping out.



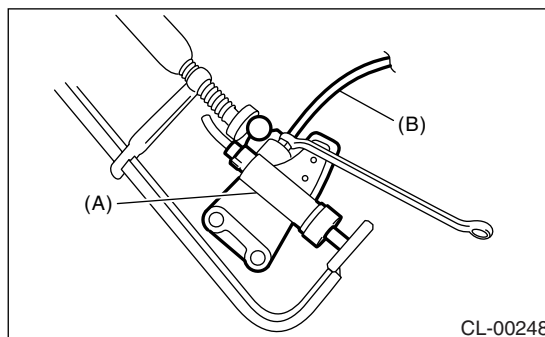
4) Fit one end of a vinyl tube into the air bleeder of operating cylinder and put the other end into a brake fluid container.

5) Slowly depress the clutch pedal and keep it depressed. Then open the air bleeder to discharge air together with the fluid.

Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the clutch pedal.

### NOTE:

Set the air breather screw position higher than the tip of operating cylinder when performing this procedure.



(A) Operating cylinder

(B) Vinyl tube

6) Repeat these steps until there are no more air bubbles in the vinyl tube.

### CAUTION:

**Cover the bleeder with waste cloth when loosening it, to prevent brake fluid from being splashed over surrounding parts.**

7) Tighten the air bleeder.

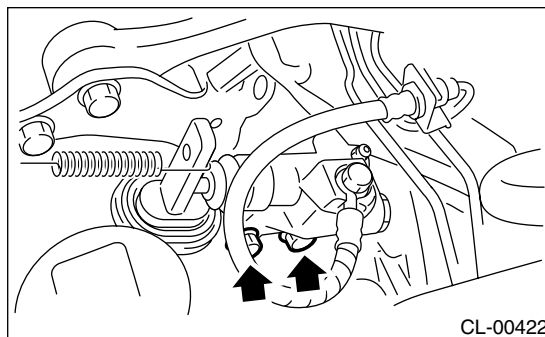
### Tightening torque:

**7.8 N·m (0.8 kgf·m, 5.8 ft·lb)**

8) Install the operating cylinder.

### Tightening torque:

**41 N·m (4.2 kgf·m, 30.2 ft·lb)**



9) After depressing the clutch pedal, make sure that there are no leaks evident in the entire system.

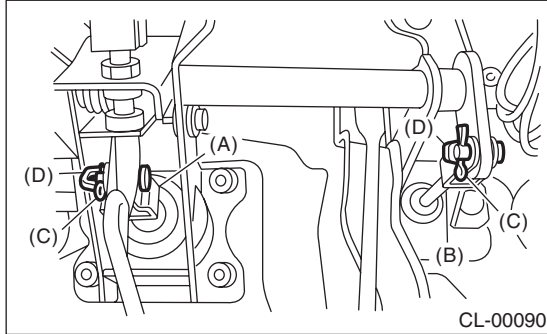
- 10) After bleeding air from the system, ensure that clutch operates properly.
- 11) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>



## 10. Clutch Pedal

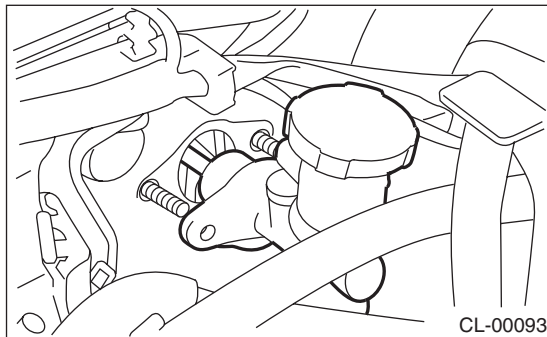
### A: REMOVAL

- 1) Remove the steering column. <Ref. to PS-23, REMOVAL, Tilt Steering Column.>
- 2) Disconnect the connectors from stop light and clutch switches.
- 3) Remove the snap pins which secure lever to push rod and operating rod.
- 4) Remove the clevis pins which secure lever to push rod and operating rod.



- (A) Operating rod
- (B) Push rod
- (C) Snap pin
- (D) Clevis pin

- 5) Remove the air intake chamber. (Non-turbo model) <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Chamber.>
- 6) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 7) Remove the nut which secures clutch master cylinder.



- 8) Remove the bolts and nuts which secure brake and clutch pedals, and remove the pedal assembly.

### B: INSTALLATION

- 1) Install in the reverse order of removal.

**NOTE:**

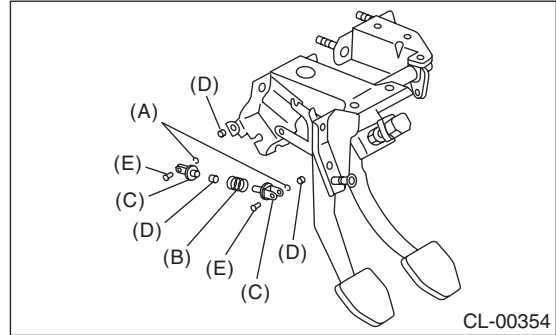
Always use new clevis pins.

- 2) Adjust the clutch pedal after installation. <Ref. to CL-33, ADJUSTMENT, Clutch Pedal.>

- 3) Adjust the clutch switch (Starter interlock). <Ref. to CL-37, ADJUSTMENT, Clutch Switch.>

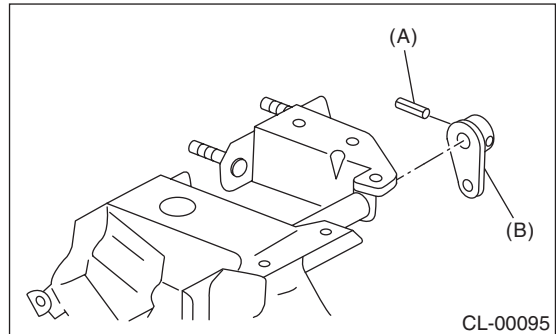
### C: DISASSEMBLY

- 1) Remove the clips, assist spring, rod and bushing.



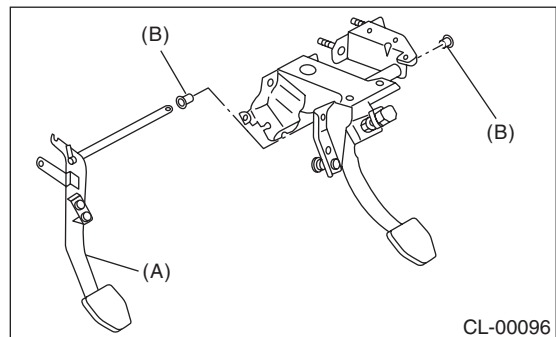
- (A) Clip
- (B) Assist spring
- (C) Assist rod
- (D) Bushing
- (E) Clevis pin

- 2) Remove the spring pin and lever.



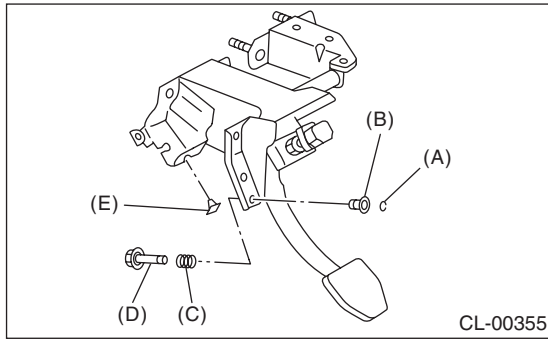
- (A) Pin
- (B) Lever

- 3) Remove the clutch pedal and bushings.



- (A) Clutch pedal
- (B) Bushing

4) Remove the stopper, clip, O-ring, rod S, and then remove the spring S and bushing S.



- (A) Clip
- (B) Bushing S
- (C) Spring S
- (D) Rod S
- (E) Stopper

5) Remove the stoppers from clutch pedal.  
6) Remove the clutch pedal pad. (Non-turbo model)

## D: ASSEMBLY

- 1) Attach the stopper, etc. to pedal bracket temporarily.
- 2) Clean inside of bores of clutch pedal and brake pedal, apply grease, and set bushings into bores.

### Grease:

**SUNLIGHT 2 (Part No. 003602010) or equivalent**

- 3) Align bores of pedal bracket, clutch pedal and brake pedal, attach the brake pedal return spring, assist rods, spring, and bushing.

### NOTE:

Clean up inside of bushings and apply grease before installing the spacer.

## E: INSPECTION

Move the clutch pedal pads in the lateral direction with a force of approximately 10 N (1 kgf, 2 lbf) to ensure pedal play is in specified range.

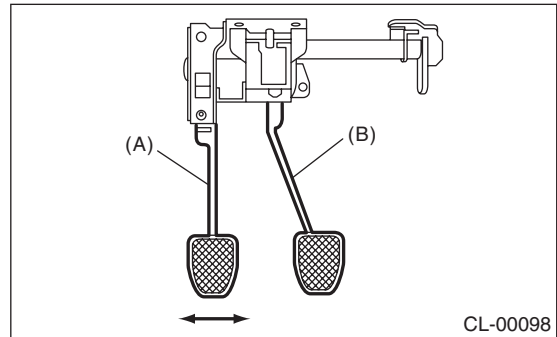
### CAUTION:

**If excessive movement is noted, replace the bushings with new ones.**

### Play of clutch pedal:

#### Service limit

**5.0 mm (0.197 in) or less**



- (A) Clutch pedal
- (B) Brake pedal

## F: ADJUSTMENT

- 1) Turn the lock nuts until clutch pedal full stroke length is within specifications.

### CAUTION:

**Do not attempt to turn the clutch switch to adjust clutch pedal full stroke length.**

### NOTE:

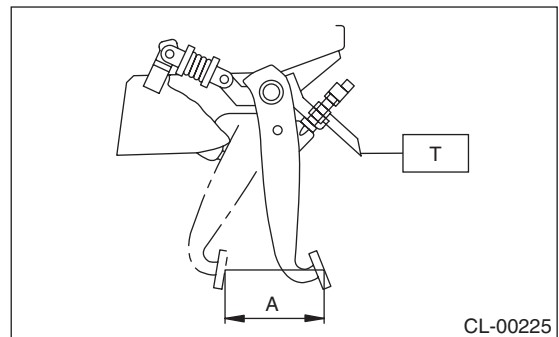
If lock nuts cannot adjust the clutch pedal full stroke length to specifications, turn the master cylinder push rod to adjust it.

#### Clutch pedal full stroke A:

**130 — 135 mm (5.12 — 5.31 in)**

#### Tightening torque (Clutch switch lock nut):

**T: 8 N·m (0.8 kgf·m, 5.9 ft-lb)**



- 2) If the full stroke is out of specifications, loosen the clutch stopper nut (model without cruise control) or clutch switch lock nut (model with cruise control) to adjust.

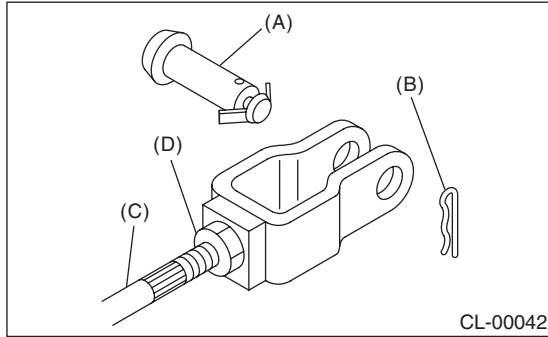
#### Tightening torque:

**8 N·m (0.8 kgf·m, 5.8 ft-lb)**

# Clutch Pedal

## CLUTCH SYSTEM

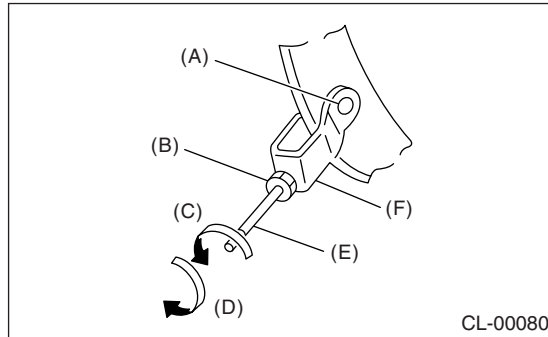
### 3) Loosen the push rod lock nut.



- (A) Clevis pin
- (B) Snap pin
- (C) Push rod
- (D) Push rod lock nut

### 4) Turn the push rod to adjust.

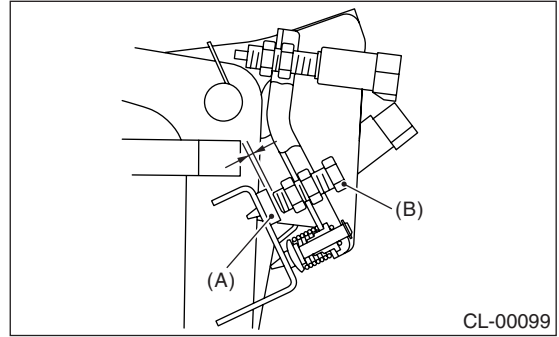
- (1) Make sure that the clutch pedal contacts the stopper bolt side (model without cruise control) or the clutch switch side (model with cruise control) when releasing the clutch pedal.
- (2) Make sure that the clutch pedal contacts clutch pedal bracket stopper, when fully depressing the clutch pedal.



- (A) Clevis hole
- (B) Push rod lock nut
- (C) Shortening direction
- (D) Lengthening direction
- (E) Push rod
- (F) Clevis

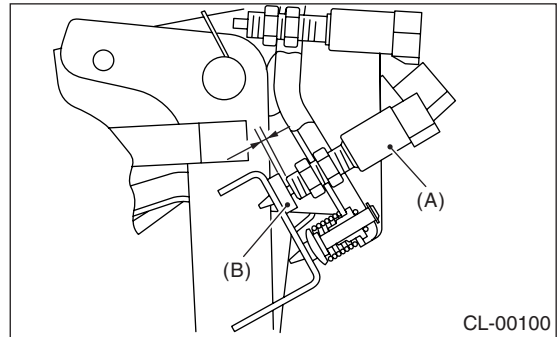
### 5) Turn the push rod to shorten until the clearance is made at the stopper bolt side (model without cruise control) or the clutch switch side (model with cruise control).

### • Model without cruise control



- (A) Stopper
- (B) Stopper bolt

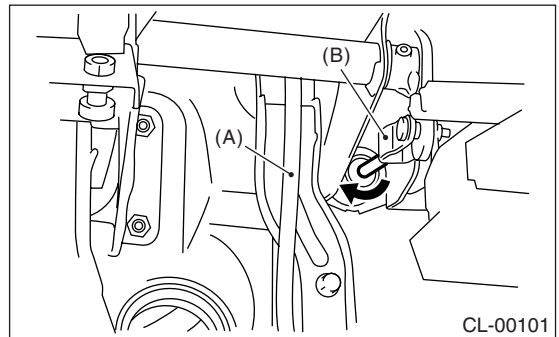
### • Model with cruise control



- (A) Clutch switch
- (B) Stopper

### 6) Turn the push rod to lengthen until the clutch pedal contacts the stopper bolt (model without cruise control) or clutch switch (model with cruise control).

### 7) Turn the push rod further 270° to shorten (in the arrow direction as shown in the figure).

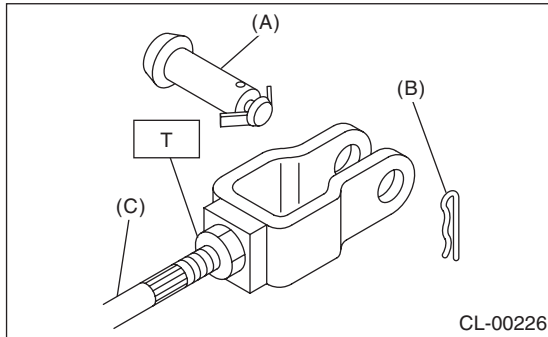


- (A) Accelerator pedal
- (B) Clevis

### 8) Move the clevis pin to the right and left to make sure it moves smoothly.

### 9) Tighten the push rod lock nut.

**Tightening torque (Push rod lock nut):**  
**T: 10 N·m (1.0 kgf-m, 7 ft-lb)**



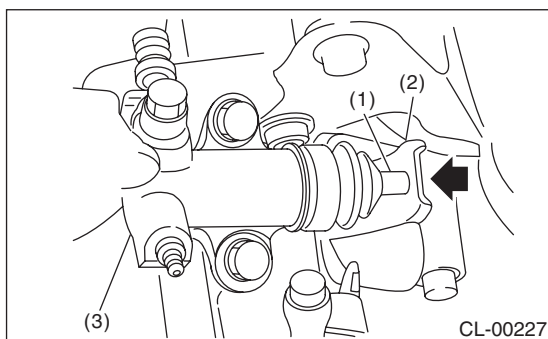
- (A) Clevis pin
- (B) Snap pin
- (C) Push rod

10) Depress and release the clutch pedal two to three times to ensure that clutch pedal and release fork operates smoothly. If the clutch pedal and release fork do not operate smoothly, bleed air from the clutch hydraulic system. <Ref. to CL-29, Clutch Fluid Air Bleeding.>

11) Measure the clutch pedal full stroke length again to ensure that it is within specifications. If it is not, repeat adjustment procedures again from the beginning.

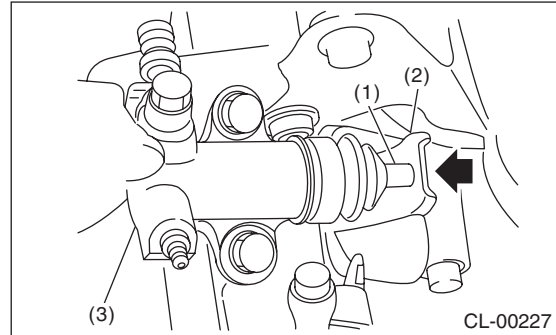
**Clutch pedal full stroke:**  
**130 — 135 mm (5.12 — 5.31 in)**

12) Push the release lever until operating cylinder push rod retracts. Ensure that clutch fluid level in reservoir tank increases. If the clutch fluid level increases, the hydraulic clutch is properly adjusted; if fluid level does not increase or push rod does not retract, replace the master cylinder with a new one. <Ref. to CL-25, Master Cylinder.>



- (1) Push rod
- (2) Release lever
- (3) Operating cylinder

13) Push the release lever until operating cylinder push rod retracts. Check that the clutch fluid level in reservoir tank increases.



- (1) Push rod
- (2) Release lever
- (3) Operating cylinder

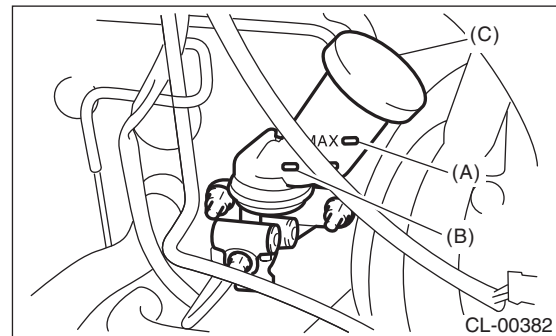
14) If the clutch fluid level increases, hydraulic clutch play is correct.

15) If the clutch fluid level does not increase or push rod does not retract, clutch pedal must be re-adjusted.

16) Check the fluid level on the outside of the reservoir tank. If the level is below "MIN", add clutch fluid to bring it up to "MAX".

**Recommended clutch fluid:**

**FMVSS No. 116, fresh DOT 3 or DOT 4 brake fluid**



- (A) Max. level
- (B) Min. level
- (C) Reservoir tank

# Clutch Switch

## CLUTCH SYSTEM

### 11. Clutch Switch

#### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the instrument panel lower cover.
- 3) Disconnect the connector from clutch switch.
- 4) Remove the clutch switch.

#### B: INSTALLATION

##### 1. CLUTCH SWITCH (CRUISE CONTROL)

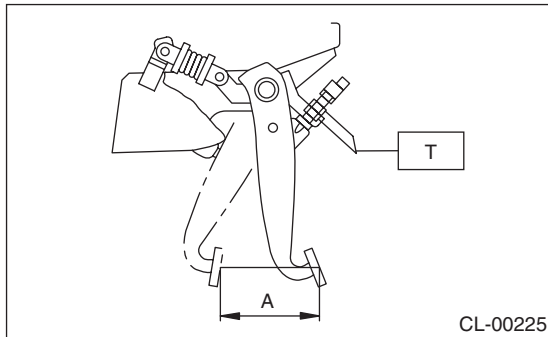
- 1) Move the clevis pin of the push rod right and left and hold where it moves smoothly, then measure stroke of clutch pedal.

##### **Specified clutch pedal full stroke A:**

**130 — 135 mm (5.12 — 5.31 in)**

##### **Tightening torque:**

**T: 8 N·m (0.8 kgf·m, 5.9 ft·lb)**



- 2) If the clutch pedal stroke is out of specification, adjust the stroke. <Ref. to CL-33, ADJUSTMENT, Clutch Pedal.>

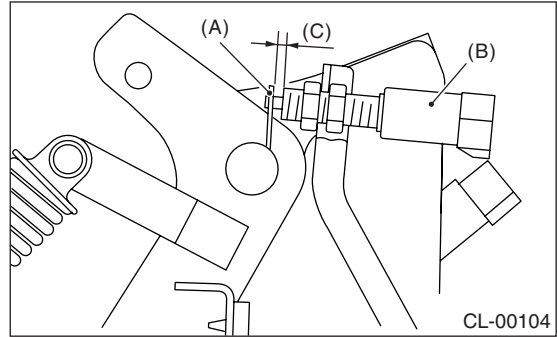
- 3) Connect clutch switch connector.

##### 2. CLUTCH SWITCH (STARTER INTER-LOCK)

- 1) Fully depress the clutch pedal.
- 2) Install the clutch pedal plate and clutch switch so that the gap between them is 3 — 3.5 mm (0.12 — 0.14 in), and then tighten the lock nut.

##### **Tightening torque:**

**8 N·m (0.8 kgf·m, 5.9 ft·lb)**



(A) Plate

(B) Clutch switch

(C) 3 — 3.5 mm (0.12 — 0.14 in)

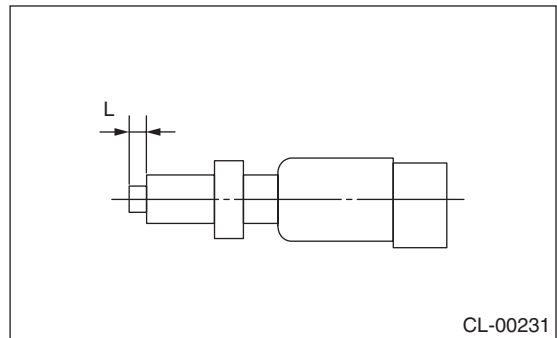
- 3) Connect the clutch switch connector.
- 4) Confirm that the engine does not start when the clutch pedal is released.
- 5) Confirm that the engine starts when the clutch pedal is fully depressed.

#### C: INSPECTION

- 1) If the clutch switch (cruise control) does not operate properly (or if it does not stop at the specified position), replace with a new one.

##### **Specified position L:**

**2+1.5 mm (0.079+0.059 in)**



- 2) Check the clutch switch continuity. If the resistance is not as specified, replace the switch.

- (1) Disconnect the clutch switch connector.
- (2) Measure the resistance between 1 and 2 of switch terminal.

- Clutch switch (Cruise control)

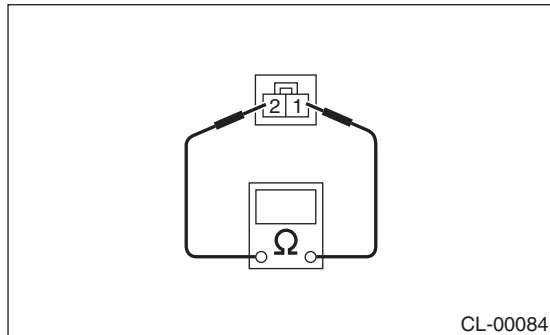
**Terminals/Specified resistance**

**When clutch pedal depressed:**

**No. 1 — No. 2/More than 1 MΩ**

**When clutch pedal not depressed:**

**No. 1 — No. 2/Less than 1 Ω**



- Clutch switch (Starter interlock)

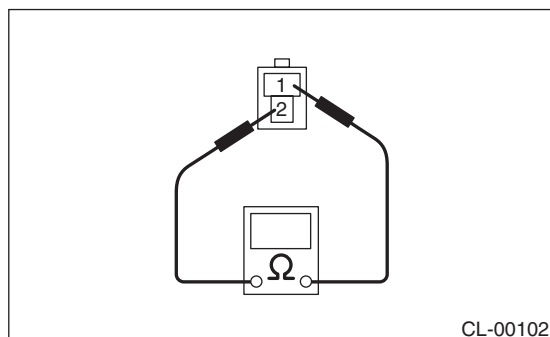
**Terminals/Specified resistance**

**When clutch pedal depressed:**

**No. 1 — No. 2/Less than 1 Ω**

**When clutch pedal not depressed:**

**No. 1 — No. 2/More than 1 MΩ**

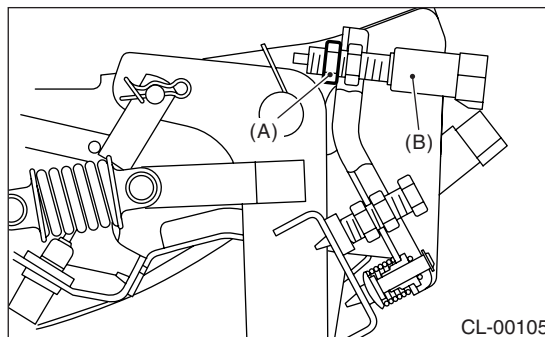


3) Confirm that the engine does not start when the clutch pedal is not depressed. If the engine starts, adjust the clutch switch, and inspect the starter interlock circuit.

4) Confirm that the engine starts when the clutch pedal is fully depressed. If the engine does not start, adjust the clutch switch, and inspect the starter interlock circuit.

## D: ADJUSTMENT

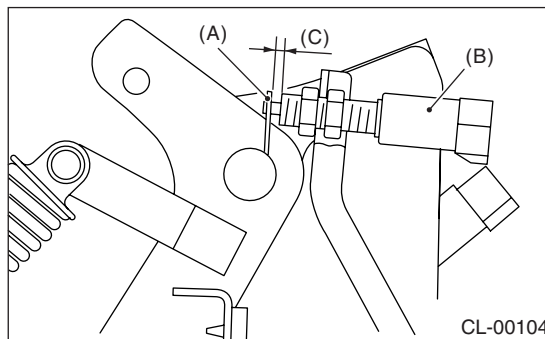
1) Loosen the clutch switch mounting lock nut (Starter interlock).



- (A) Lock nut
- (B) Clutch switch (Starter interlock)

2) Fully depress the clutch pedal.

3) Adjust the clutch pedal plate and clutch switch so that the gap between them is 3 — 3.5 mm (0.12 — 0.14 in).



- (A) Plate
- (B) Clutch switch (Starter interlock)
- (C) 3 — 3.5 mm (0.12 — 0.14 in)

4) Tighten the lock nut.

**Tightening torque:**

**8 N·m (0.8 kgf·m, 5.9 ft·lb)**

# General Diagnostic Table

## CLUTCH SYSTEM

### 12. General Diagnostic Table

#### A: INSPECTION

##### 1. CLUTCH

| Symptom   | Possible cause                                      | Corrective                         |
|---|---|------------------------------------|
| <p>1. Clutch slippage</p> <p>It is hard to perceive clutch slippage in the early stage, but pay attention to the following symptoms</p> <ul style="list-style-type: none"> <li>• Engine speed up when shifting.</li> <li>• High speed driving is impossible; especially rapid acceleration impossible and vehicle speed does not increase in proportion to an increase in engine speed.</li> <li>• Power falls, particularly when ascending a slope, and there is a smell of burning of the clutch facing.</li> <li>• Method of testing: Put the vehicle in stationary condition with parking brake fully applied. Disengage the clutch and shift the transmission gear into the first. Gradually allow the clutch to engage while gradually increasing the engine speed. The clutch function is satisfactory if the engine stalls. However, the clutch is slipping if the vehicle does not start off and the engine does not stall.</li> </ul> | (a) Clutch facing smeared by oil                    | Replace.                           |
|   | (b) Worn clutch facing                              | Replace.                           |
|   | (c) Deteriorated diaphragm spring                   | Replace.                           |
|   | (d) Distorted pressure plate or flywheel            | Correct or replace.                |
|   | (e) Defective release bearing holder                | Correct or replace.                |
| <p>2. Clutch drags.</p> <p>As a symptom of this trouble, a harsh scratching noise develops and control becomes quite difficult when shifting gears. The symptom becomes more apparent when shifting into the first gear. However, because much trouble of this sort is due to defective synchronization mechanism, carry out the test as described after.</p> <ul style="list-style-type: none"> <li>• Method of testing: &lt;Ref. to CL-39, DIAGNOSTIC DIAGRAM OF CLUTCH DRAG, INSPECTION, General Diagnostic Table.&gt;</li> </ul> <p>It may be judged as insufficient disengagement of clutch if any noise occurs during this test.</p>  | (a) Worn or rusty clutch disc hub spline            | Replace the clutch disc.           |
|   | (b) Excessive deflection of clutch disc facing      | Correct or replace.                |
|   | (c) Seized crankshaft pilot needle bearing          | Replace.                           |
|   | (d) Cracked clutch disc facing                      | Replace.                           |
|   | (e) Stuck clutch disc (smeared by oil or water)     | Replace.                           |
| <p>3. Clutch chatters.</p> <p>Clutch chattering is an unpleasant vibration to the whole body when the vehicle is just started with clutch partially engaged.</p>  | (a) Adhesion of oil on the facing                   | Replace the clutch disc.           |
|   | (b) Weak or broken damper spring                    | Replace the clutch disc.           |
|   | (c) Defective facing contact or excessive disc wear | Replace the defective clutch disc. |
|   | (d) Warped pressure plate or flywheel               | Correct or replace.                |
|   | (e) Loose disc rivets                               | Replace the clutch disc.           |
|   | (f) Loose engine mounting                           | Retighten or replace the mounting. |
|   | (g) Improper adjustment of pitching stopper         | Adjustment.                        |

# General Diagnostic Table

| Symptom  | Possible cause   | Corrective  |
|--|--|---|
| 4. Noisy clutch<br>The noise is generated when the clutch is disengaged, engaged, or partially engaged.  | (a) Broken, worn or unlubricated release bearing       | Replace the release bearing.  |
|  | (b) Insufficient lubrication of pilot bearing          | Apply grease or replace the pilot bearing.                            |
|  | (c) Loose clutch disc hub                              | Replace the clutch disc.  |
|  | (d) Loose damper spring retainer                       | Replace the clutch disc.  |
|  | (e) Deteriorated or broken damper spring               | Replace the clutch disc.  |
| 5. Clutch grabs.<br>When starting the vehicle with the clutch partially engaged, the clutch engages suddenly and the vehicle jumps instead of making a smooth start. | (a) Grease or oil on facing                            | Replace the clutch disc.  |
|  | (b) Deteriorated cushioning spring                     | Replace the clutch disc.  |
|  | (c) Worn or rusted spline of clutch disc or main shaft | Take off rust, apply grease or replace the clutch disc or main shaft. |
|  | (d) Deteriorated or broken damper spring               | Replace the clutch disc.  |
|  | (e) Loose engine mounting                              | Retighten or replace the mounting.                                    |
|  | (f) Deteriorated diaphragm spring                      | Replace.  |

## 2. CLUTCH PEDAL

| Trouble   | Corrective action                                |
|---|--|
| Insufficient pedal play                                 | Adjust pedal play.                               |
| Clutch pedal free play insufficient                     | Adjust pedal free play.                          |
| Excessively worn and damaged pedal shaft and/or bushing | Replace the bushing and/or shaft with a new one. |

## 3. DIAGNOSTIC DIAGRAM OF CLUTCH DRAG

| Step   | Check   | Yes  | No   |
|--|---|--|--|
| <b>1</b><br><b>CHECK GEAR NOISE.</b><br>1) Start the engine.<br>2) Disengage the clutch and shift quickly from neutral to reverse in idling condition.   | Is there any abnormal noise from the transmission gear? | Go to step 2.  | Clutch is normal.  |
| <b>2</b><br><b>CHECK GEAR NOISE.</b><br>Disengage the clutch at idle and shift from neutral to reverse within 0.5 — 1.0 seconds.   | Is there any abnormal noise from the transmission gear? | Go to step 3.  | Defective transmission or excessive clutch drag torque. Inspect the pilot bearing, clutch disc, transmission and clutch disc hub spline. |
| <b>3</b><br><b>CHECK GEAR NOISE.</b><br>1) Disengage the clutch at idle and shift from neutral to reverse within 0.5 — 1.0 seconds.<br>2) With the clutch disengaged, shift from N to R, R to N several times. | Is there any abnormal noise from the transmission gear? | Defect in clutch disengaging. Inspect the clutch disc, clutch cover, clutch release, and clutch pedal free play. | Clutch and fly-wheel seizure. Inspect the clutch disc, spline of clutch disc hub.  |



# General Diagnostic Table

CLUTCH SYSTEM

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**CHASSIS SECTION**

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

**FRONT SUSPENSION****FS****REAR SUSPENSION****RS****WHEEL AND TIRE SYSTEM****WT****DIFFERENTIALS****DI****TRANSFER CASE****TC****DRIVE SHAFT SYSTEM****DS****ABS****ABS****ABS (DIAGNOSTICS)****ABS(diag)****BRAKE****BR****PARKING BRAKE****PB****POWER ASSISTED SYSTEM  
(POWER STEERING)****PS**



# FRONT SUSPENSION



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# General Description

## FRONT SUSPENSION

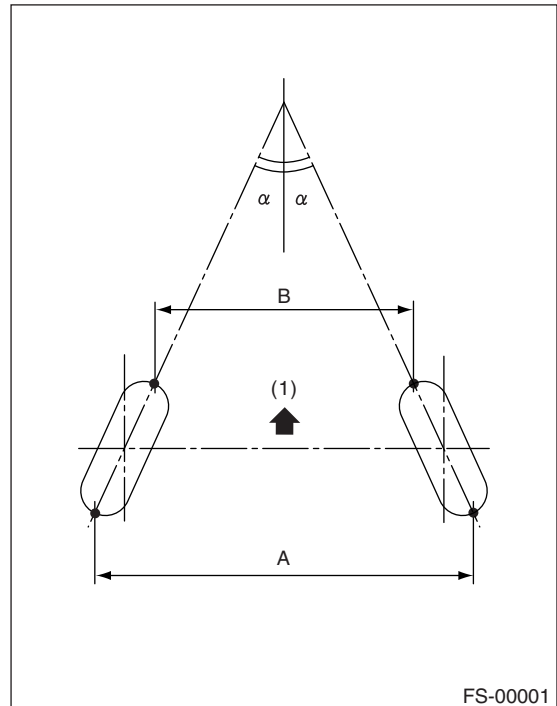
### 1. General Description

#### A: SPECIFICATION

|       | Model   | Sedan   |                      |                      | Wagon                |                      | OUT-<br>BACK         |
|-------|---|---|----------------------|----------------------|----------------------|----------------------|----------------------|
|       |   | Non-turbo   | Turbo                | STI                  | Non-turbo            | Turbo                |                      |
| Front | Camber (tolerance: $\pm 0^{\circ}45'$ adjustment standard: $\pm 0^{\circ}30'$ ) | $-0^{\circ}15'$   | $-0^{\circ}25'$      | $-0^{\circ}30'$      | $-0^{\circ}10'$      | $-0^{\circ}20'$      | $-0^{\circ}05'$      |
|       | Caster  | $3^{\circ}25'$  | $3^{\circ}30'$       | $4^{\circ}50'$       | $3^{\circ}25'$       | $3^{\circ}30'$       | $3^{\circ}25'$       |
|       | Toe-in  | Tolerance: $0 \pm 3$ mm ( $0 \pm 0.12$ in), Toe angle (The sum of both wheels): $0^{\circ} \pm 15'$<br>Adjustment standard: $0 \pm 2$ mm ( $0 \pm 0.08$ in),<br>Toe angle (The sum of both wheels): $0^{\circ} \pm 10'$ |                      |                      |                      |                      |                      |
|       | Kingpin anglet  | $14^{\circ}20'$   | $14^{\circ}35'$      | $14^{\circ}50'$      | $13^{\circ}30'$      | $13^{\circ}45'$      | $13^{\circ}20'$      |
|       | Wheel arch height<br>[tolerance: $+12_{-24}$ mm ( $+0.47_{-0.94}$ in)]          | 406 mm<br>(15.98 in)  | 396 mm<br>(15.59 in) | 386 mm<br>(15.20 in) | 397 mm<br>(15.28 in) | 387 mm<br>(15.24 in) | 402 mm<br>(15.83 in) |
|       | Diameter of stabilizer  | 20 mm (0.79 in)   |                      |                      |                      |                      |                      |
| Rear  | Camber (tolerance: $\pm 0^{\circ}45'$ adjustment standard: $\pm 0^{\circ}30'$ ) | $-1^{\circ}25'$   | $-1^{\circ}30'$      | $-1^{\circ}40'$      | $-1^{\circ}15'$      | $-1^{\circ}20'$      | $-1^{\circ}10'$      |
|       | Toe-in  | Tolerance: $0 \pm 3$ mm ( $0 \pm 0.12$ in), Toe angle (The sum of both wheels): $0^{\circ} \pm 15'$<br>Adjustment standard: $0 \pm 2$ mm ( $0 \pm 0.08$ in),<br>Toe angle (The sum of both wheels): $0^{\circ} \pm 10'$ |                      |                      |                      |                      |                      |
|       | Thrust angle  | Tolerance: $\pm 0^{\circ}30'$ , Adjustment standard value: $0^{\circ} \pm 20'$  |                      |                      |                      |                      |                      |
|       | Wheel arch height<br>[tolerance: $+12_{-24}$ mm ( $+0.47_{-0.94}$ in)]          | 381 mm<br>(15.0 in)   | 376 mm<br>(14.80 in) | 363 mm<br>(14.29 in) | 381 mm<br>(15.0 in)  | 376 mm<br>(14.80 in) | 386 mm<br>(15.20 in) |
|       | Diameter of stabilizer  | 13 mm<br>(0.51 in)  | 17 mm<br>(0.67 in)   | 20 mm<br>(0.79 in)   | 13 mm<br>(0.51 in)   | 17 mm<br>(0.67 in)   | 13 mm<br>(0.51 in)   |

#### NOTE:

- Front and rear toe-in and front camber can be adjusted. If toe-in or camber exceeds tolerance, adjust toe-in and camber to the adjustment standard.
- The other items indicated in the specification table cannot be adjusted. If the other items exceed specifications, check suspension parts and connections for deformities; replace with new ones as required.



(1) Front

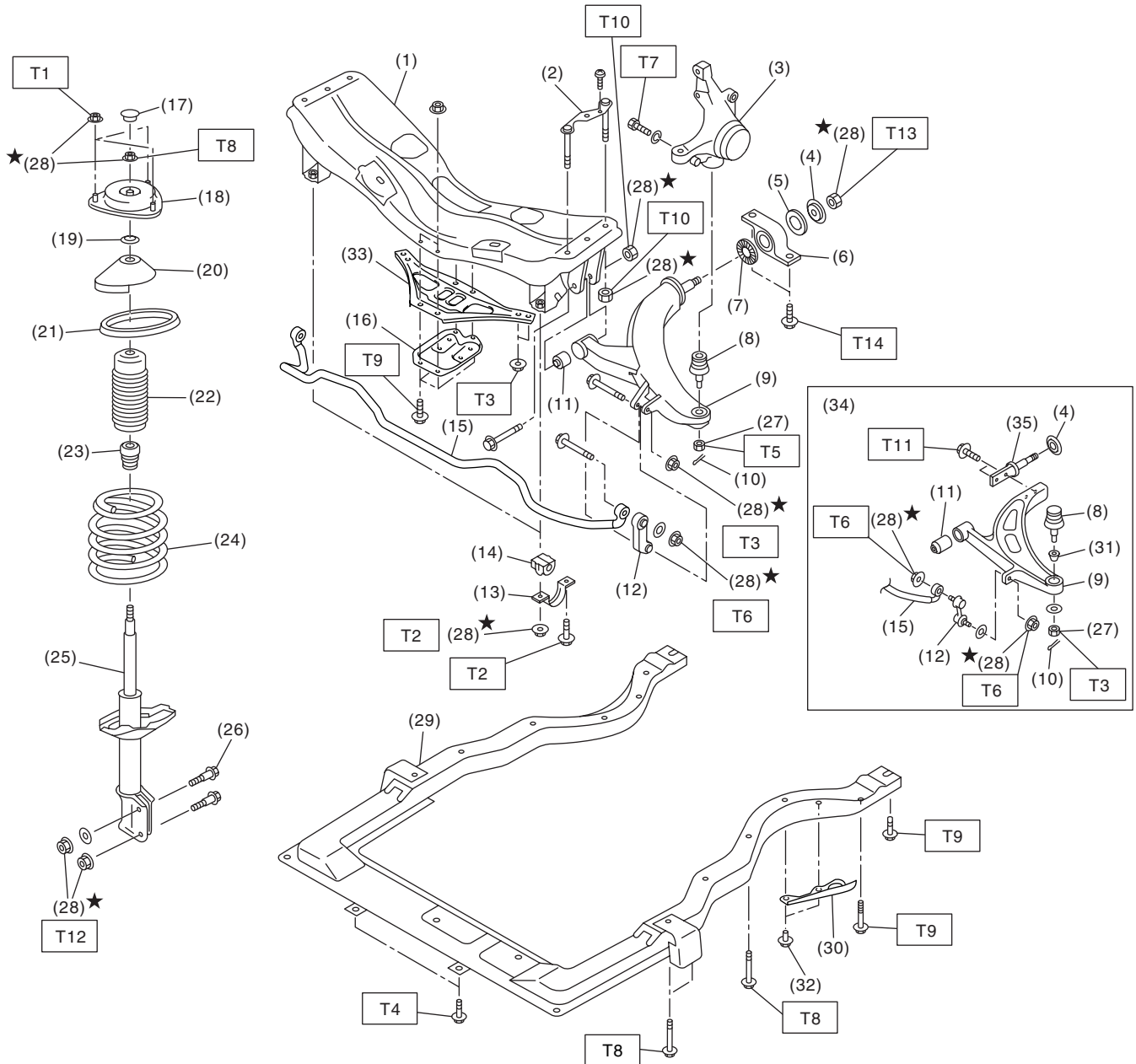
A – B = Positive: Toe-in, Negative: Toe-out

$\alpha$  = Each toe angle

# General Description

## FRONT SUSPENSION

### B: COMPONENT



FS-00222

## General Description

### FRONT SUSPENSION

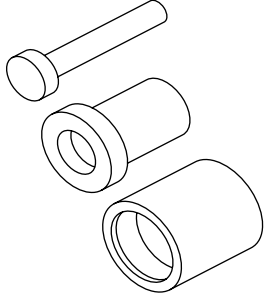
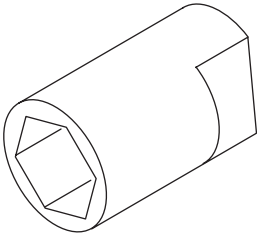
|                                      |  |  |                             |
|--------------------------------------|--|--|-----------------------------|
| (1) Front crossmember                | (19) Spacer                                    | <b>Tightening torque: N-m (kgf-m, ft-lb)</b> |                             |
| (2) Bolt ASSY                        | (20) Upper spring seat                         |  | <b>T1: 20 (2.0, 14.5)</b>   |
| (3) Housing                          | (21) Rubber seat                               |  | <b>T2: 25 (2.5, 18.1)</b>   |
| (4) Washer                           | (22) Dust cover                                |  | <b>T3: 30 (3.1, 22)</b>     |
| (5) Stopper rubber (Rear)            | (23) Helper                                    |  | <b>T4: 34 (3.5, 25)</b>     |
| (6) Rear bushing                     | (24) Coil spring                               |  | <b>T5: 40 (4.1, 30)</b>     |
| (7) Stopper rubber (Front)           | (25) Damper strut                              |  | <b>T6: 45 (4.6, 33)</b>     |
| (8) Ball joint                       | (26) Adjusting bolt                            |  | <b>T7: 50 (5.1, 37)</b>     |
| (9) Transverse link                  | (27) Castle nut                                |  | <b>T8: 55 (5.6, 41)</b>     |
| (10) Cotter pin                      | (28) Self-locking nut                          |  | <b>T9: 70 (7.1, 52)</b>     |
| (11) Front bushing                   | (29) Sub frame                                 |  | <b>T10: 95 (9.7, 70.1)</b>  |
| (12) Stabilizer link                 | (30) Cover                                     |  | <b>T11: 155 (15.8, 114)</b> |
| (13) Clamp                           | (31) Boss                                      |  | <b>T12: 175 (17.8, 129)</b> |
| (14) Bushing                         | (32) Clip                                      |  | <b>T13: 190 (19.4, 140)</b> |
| (15) Stabilizer                      | (33) Jack-up plate (Turbo model and STI model) | <b>T14: 250 (25.5, 184)</b>                  |                             |
| (16) Jack-up plate (Non-turbo model) | (34) Sedan turbo model and STI model           |  |                             |
| (17) Dust seal                       | (35) Fitting                                   |  |                             |

### C: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.

## D: PREPARATION TOOL

### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION                | REMARKS  |
|---|-------------|----------------------------|--|
|  <p style="text-align: center;">ST-927680000</p> | 927680000   | INSTALLER &<br>REMOVER SET | Used for replacing transverse link bushing.                  |
|  <p style="text-align: center;">ST-927760000</p> | 927760000   | STRUT MOUNT<br>SOCKET      | Used for disassembling and assembling strut and shock mount. |

### 2. GENERAL TOOL

| TOOL NAME               | REMARKS                               |
|-------------------------|---------------------------------------|
| Alignment gauge         | Used for wheel alignment measurement. |
| Alignment gauge adapter | Used for wheel alignment measurement. |
| Turning radius gauge    | Used for wheel alignment measurement. |
| Toe-in gauge            | Used for toe-in measurement.          |
| Dial gauge              | Used for damper strut measurement.    |
| Coil spring compressor  | Used for strut disassembly/assembly.  |



# Wheel Alignment

## FRONT SUSPENSION

### 2. Wheel Alignment

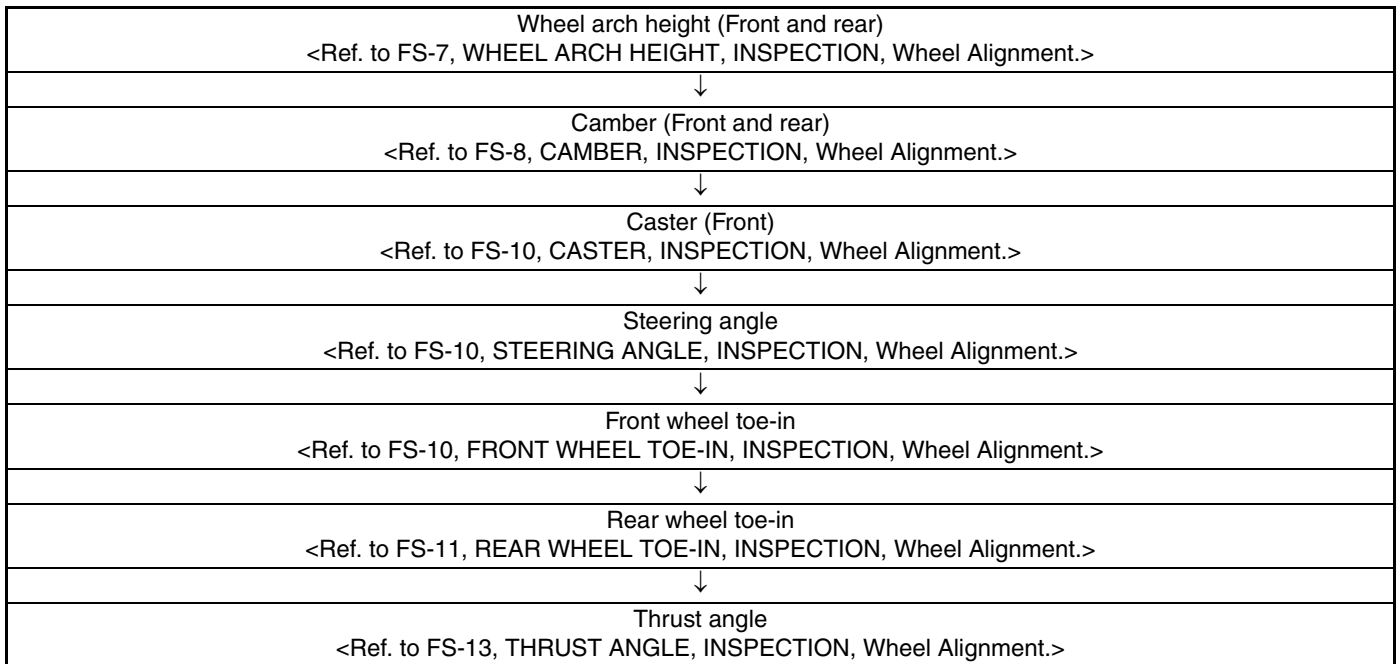
#### A: INSPECTION

Check the following items before taking wheel alignment measurement.

Check items before taking wheel alignment measurement:

- tire air pressure
- unbalanced right and left tire wear, size difference
- tire run-out
- ball joint excessive play, wear
- tie rod end excessive play, wear
- wheel bearing excessive play
- right and left wheel base imbalance
- steering link part deformed, excessive play
- suspension part deformed, excessive play

Check, adjust and/or measure the wheel alignment in accordance with procedures indicated in the figure:



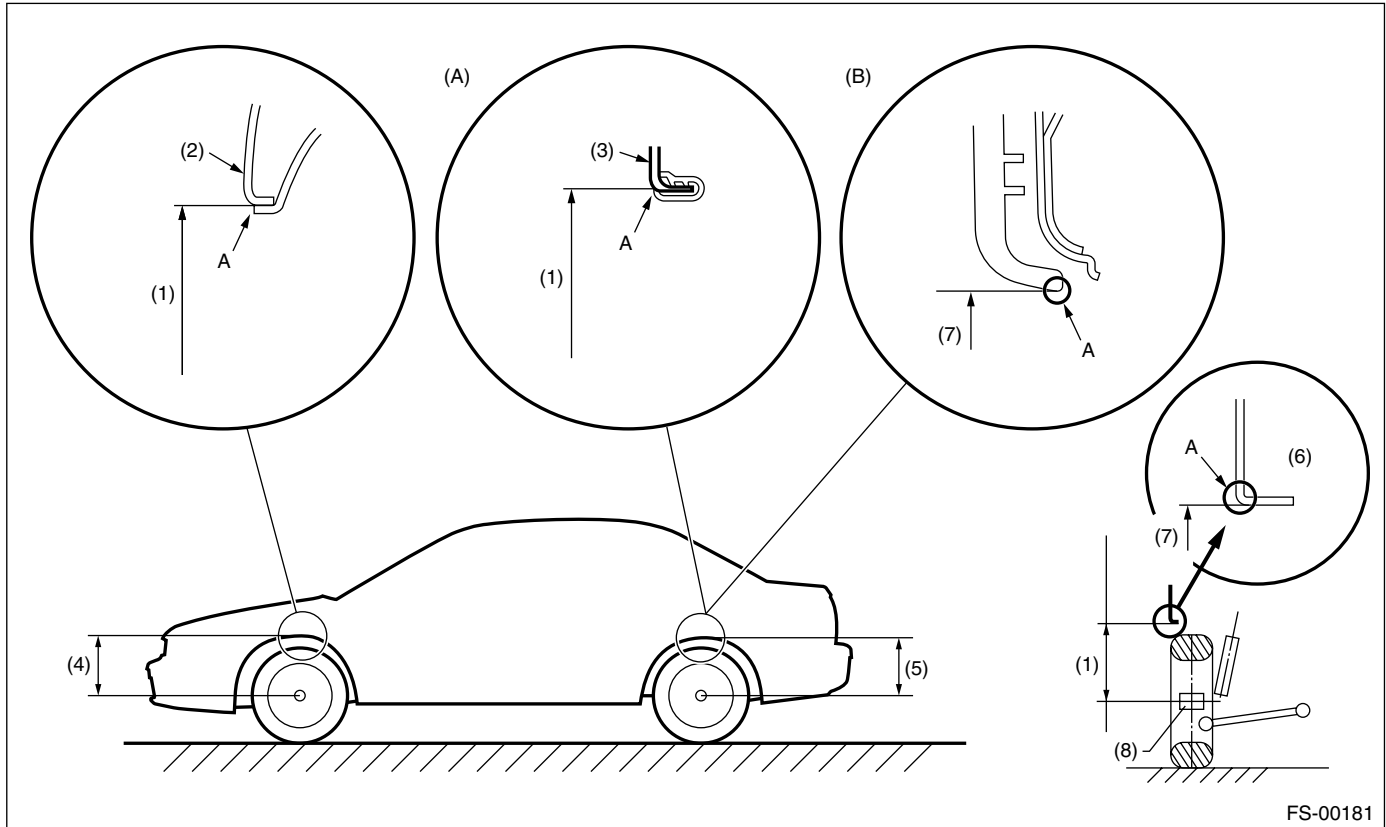
# Wheel Alignment

## FRONT SUSPENSION

### 1. WHEEL ARCH HEIGHT

- 1) Set the vehicle on a level surface.
- 2) Set the vehicle to “curb weight” conditions. (Empty luggage compartment, install spare tire, jack, service tools, and top up fuel tank.)

- 3) Set the steering wheel in a straight line, then remove the vehicle straight ahead more than 5 m (16 ft) to settle the suspension.
- 4) Suspend the thread from wheel arch (point “A” in figure below) to determine a point directly above center of wheel.
- 5) Measure the distance between measuring point “A” and center of wheel.



FS-00181

(A) Except STI model

(B) STI model

(1) Wheel arch height

(4) Front wheel arch height

(7) Measuring point

(2) Front fender

(5) Rear wheel arch height

(8) End of spindle

(3) Rear quarter

(6) Flange bend line

| Model   |       | Specified wheel arch height [Tolerance: $+12_{-24}$ mm ( $+0.47_{-0.94}$ in)] |                   |
|---------|-------|---|-------------------|
|         |       | Non-turbo   | Turbo             |
| Sedan   | Front | 406 mm (15.98 in)   | 396 mm (15.59 in) |
|         | Rear  | 381 mm (15.0 in)  | 376 mm (14.80 in) |
| Wagon   | Front | 397 mm (15.63 in)   | 387 mm (15.24 in) |
|         | Rear  | 381 mm (15.0 in)  | 376 mm (14.80 in) |
| OUTBACK | Front | 402 mm (15.83 in)   | —                 |
|         | Rear  | 386 mm (15.20 in)   | —                 |
| STI     | Front | —   | 386 mm (15.20 in) |
|         | Rear  | —   | 363 mm (14.29 in) |

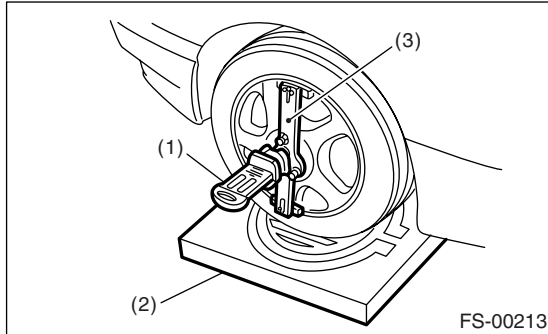
# Wheel Alignment

## FRONT SUSPENSION

### 2. CAMBER

#### • Inspection

- 1) Place the front wheel on turning radius gauge. Make sure ground contacting surfaces of front and rear wheels are set at the same height.
- 2) Set the adapter into the center of wheel, and then install the wheel alignment gauge.



- (1) Alignment gauge
- (2) Turning radius gauge
- (3) Adapter

- 3) Follow the wheel alignment gauge operation manual to measure camber angle.

#### NOTE:

Refer to the "SPECIFICATION" for camber values.  
Front: <Ref. to FS-2, SPECIFICATION, General Description.>

Rear: <Ref. to RS-2, SPECIFICATION, General Description.>

#### • Front Camber Adjustment

- 1) Loosen the two self-locking nuts located at lower front portion of strut.

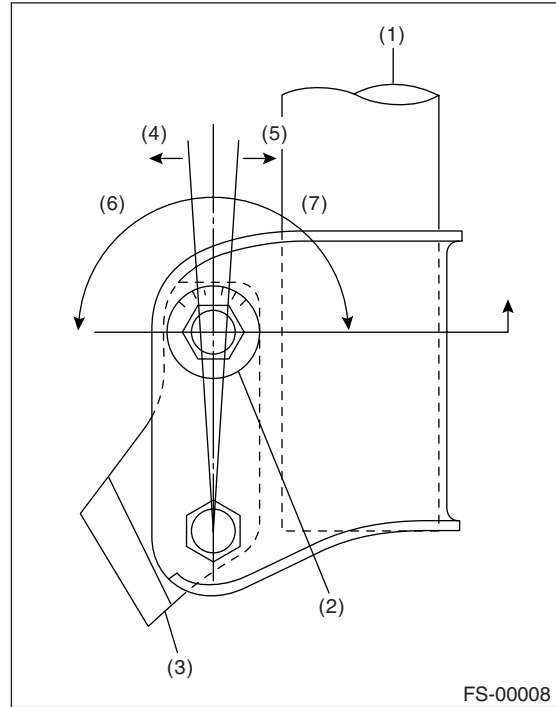
#### NOTE:

When adjusting bolt needs to be loosened or tightened, hold its head with a wrench and turn self-locking nut.

- 2) Turn the camber adjusting bolt so that camber is set at the specification.

#### NOTE:

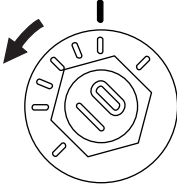
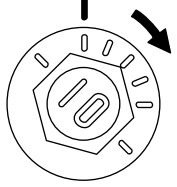
Moving the adjusting bolt by one scale graduation changes camber by approx.  $0^{\circ}10'$ .

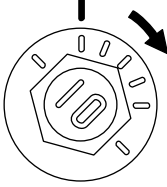
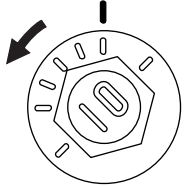


- (1) Strut
- (2) Adjusting bolt
- (3) Housing
- (4) Outer
- (5) Inner
- (6) Camber is increased.
- (7) Camber is decreased.

# Wheel Alignment

FRONT SUSPENSION

| To increase Camber:   |   |
|---|---|
| Rotate camber adjusting bolt LH counterclockwise.                                 | Rotate camber adjusting bolt RH clockwise.  |
|  |  |
| FS-00009  | FS-00010  |

| To decrease Camber:  |  |
|--|--|
| Rotate camber adjusting bolt LH clockwise.   | Rotate camber adjusting bolt RH counterclockwise.                                    |
|  |  |
| FS-00010   | FS-00009   |

3) Tighten two new self-locking nuts.

**Tightening torque:**

**175 N·m (17.8 kgf·m, 129 ft·lb)**

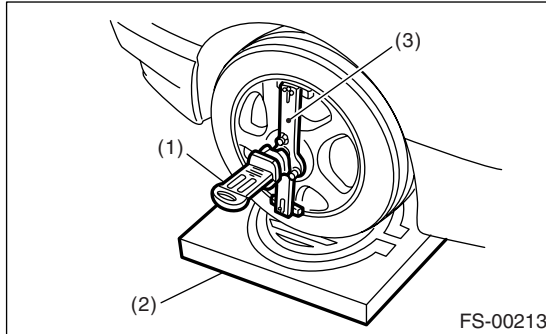
# Wheel Alignment

## FRONT SUSPENSION

### 3. CASTER

#### • Inspection

- 1) Place the front wheel on turning radius gauge. Make sure ground contacting surfaces of front and rear wheels are set at the same height.
- 2) Set the adapter into center of wheel, and then install the wheel alignment gauge.



- (1) Alignment gauge
- (2) Turning radius gauge
- (3) Adapter

- 3) Follow the wheel alignment gauge operation manual to measure caster angle.

#### NOTE:

Refer to "SPECIFICATION" for caster values. <Ref. to FS-2, SPECIFICATION, General Description.>

### 4. STEERING ANGLE

#### • Inspection

- 1) Place the vehicle on a turning radius gauge.
- 2) While depressing the brake pedal, turn the steering wheel fully to the right and left. With the steering wheel held at each fully turned position, measure both the inner and outer wheel steering angle.

#### Steering angle:

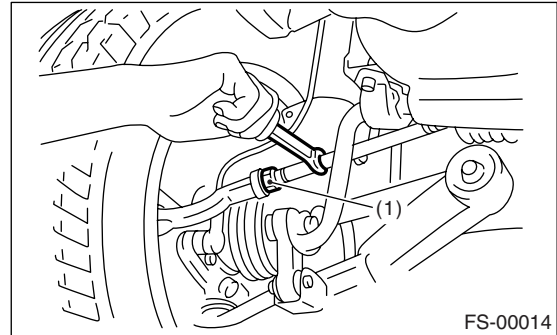
| Model       | Except STI model               | STI model                      |
|-------------|--------------------------------|--------------------------------|
| Inner wheel | $34.5^{\circ} \pm 1.5^{\circ}$ | $32.9^{\circ} \pm 1.5^{\circ}$ |
| Outer wheel | $30.3^{\circ} \pm 1.5^{\circ}$ | $28.5^{\circ} \pm 1.5^{\circ}$ |

#### • Adjustment

- 1) Turn the tie-rod to adjust steering angle of both inner and outer wheels.
- 2) Check the toe-in.

#### NOTE:

Correct the boot if it is twisted.



- (1) Lock nut

### 5. FRONT WHEEL TOE-IN

#### • Inspection

#### Toe-in:

$0 \pm 3 \text{ mm}$  ( $0 \pm 0.12 \text{ in}$ ) (tolerance)

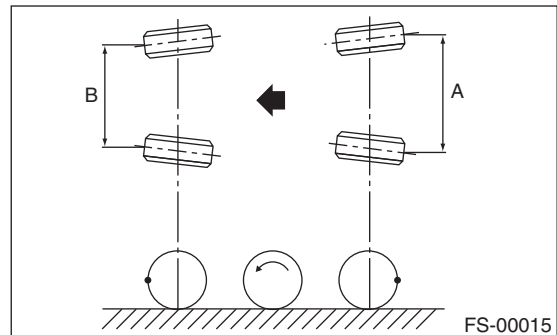
- 1) Set the toe-in gauge to rear sides of right and left front tires at height corresponding to center of spindle.
- 2) Mark each right and left tires at height corresponding to center of spindle and measure the distance "A" between marks.
- 3) Move the vehicle forward to rotate wheels  $180^{\circ}$ .

#### NOTE:

Whenever rotating the wheels, drive the vehicle forward.

- 4) Measure the distance "B" between right and left marks. Toe-in can then be obtained by the following equation:

$$A - B = \text{Toe-in}$$



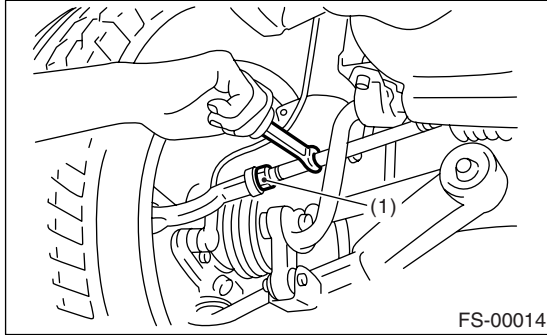
#### • Adjustment

- 1) Make sure that the right and left steering angles are within specified value.
- 2) Loosen the right and left side steering tie-rods lock nuts.
- 3) Turn the right and left tie rods equal amounts until the toe-in is at the specification.

**Toe-in:**

**$0 \pm 2$  mm ( $0 \pm 0.08$  in) (adjustment standard)**

Both the right and left tie-rods are right-hand threaded. To increase toe-in, turn both tie-rods clockwise equal amounts (as viewed from inside of the vehicle).



(1) Lock nut

4) Tighten the tie-rod lock nut.

**Tightening torque:**

**Non- turbo model:**

**83 N·m (8.5 kgf·m, 61.5 ft·lb)**

**Turbo model and STI model:**

**85 N·m (8.6 kgf·m, 62.2 ft·lb)**

**NOTE:**

Correct the tie-rod boot, if it is twisted.

## 6. REAR WHEEL TOE-IN

• **Inspection**

**Toe-in:**

**$0 \pm 3$  mm ( $0 \pm 0.12$  in) (tolerance)**

For rear toe-in inspection procedure, refer to FRONT WHEEL TOE-IN procedure.

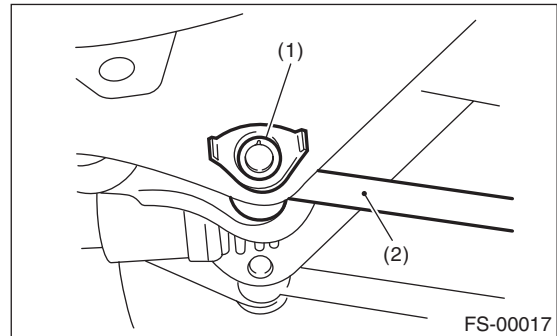
<Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

• **Adjustment**

1) Loosen the self-locking nut on inner side of link rear.

**NOTE:**

When loosening or tightening the adjusting bolt, hold the bolt head and turn self-locking nut.



(1) Adjusting bolt

(2) Link rear

2) Turn the adjusting bolt head until toe-in is at the specification.

**Toe-in:**

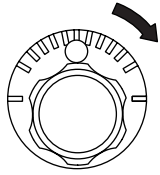
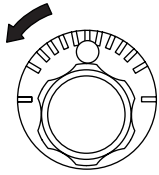
**$0 \pm 2$  mm ( $0 \pm 0.08$  in) (adjustment standard)**

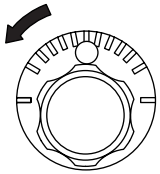
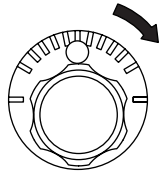
**NOTE:**

When the right and left wheels are adjusted for toe-in at the same time, the movement of one scale graduation changes toe-in by approx. 1.5 mm (0.6 in).

# Wheel Alignment

## FRONT SUSPENSION

| To increase Toe-in:  |  |
|--|--|
| Rotate camber adjusting bolt LH clockwise.   | Rotate camber adjusting bolt RH counterclockwise.  |
|  <p>Diagram showing the camber adjusting bolt on the left side (LH) rotated clockwise, indicated by a curved arrow.</p> |  <p>Diagram showing the camber adjusting bolt on the right side (RH) rotated counterclockwise, indicated by a curved arrow.</p> |
| FS-00018   | FS-00019   |

| To decrease Toe-in:  |  |
|--|--|
| Rotate camber adjusting bolt LH counterclockwise.  | Rotate camber adjusting bolt RH clockwise.   |
|  <p>Diagram showing the camber adjusting bolt on the left side (LH) rotated counterclockwise, indicated by a curved arrow.</p> |  <p>Diagram showing the camber adjusting bolt on the right side (RH) rotated clockwise, indicated by a curved arrow.</p> |
| FS-00019   | FS-00018   |

3) Tighten a new self-locking nut.

**Tightening torque:**

**100 N·m (10.2 kgf·m, 74 ft·lb)**

## 7. THRUST ANGLE

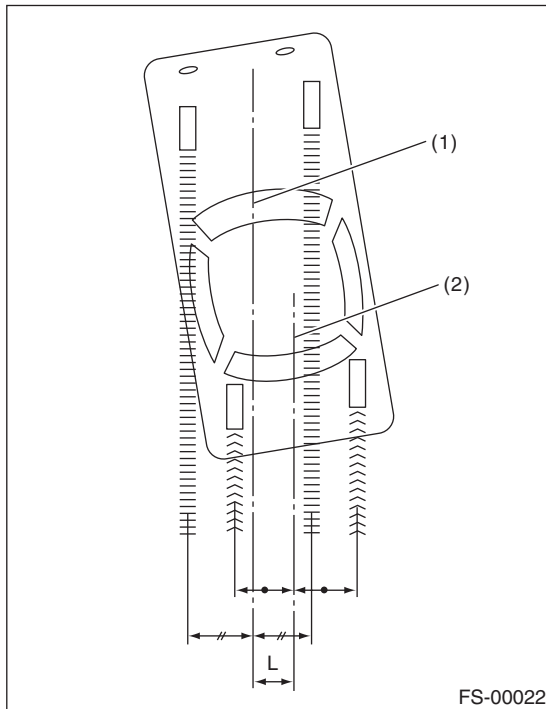
### • Inspection

- 1) Position the vehicle on a level surface.
- 2) Move the vehicle 3 to 4 m (10 to 13 ft) directly forward.
- 3) Determine the center lines of loci of both front and rear axles.
- 4) Measure the distance "L" between center lines of loci of the axles.

### Thrust angle:

$0^{\circ} \pm 30'$  (tolerance)

Less than 30' when "L" is less than 22 mm (0.9 in).



- (1) Center line of loci (front axle)  
 (2) Center line of loci (rear axle)

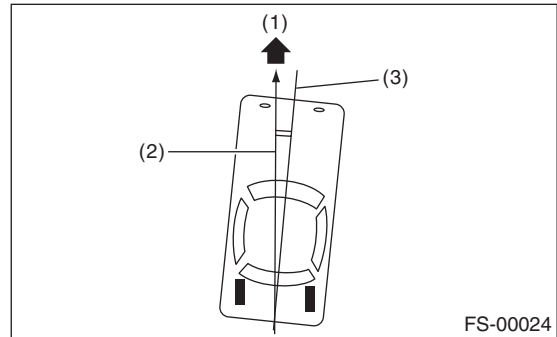
### • Adjustment

- 1) Make the thrust angle adjustments by turning toe-in adjusting bolts of rear suspension equally in the same direction.
- 2) When one rear wheel is adjusted in a toe-in direction, adjust the other rear wheel equally in toe-out direction, in order to make thrust angle adjustment.
- 3) When the right and left adjusting bolts are turned incrementally by one graduation in the same direction, the thrust angle will change approx. 16' ["L" is almost equal to 12 mm (0.472 in)].

### Thrust angle:

$0^{\circ} \pm 20'$  (adjustment standard)

Less than 20' when "L" is less than 13 mm (0.51 in).



- (1) Front  
 (2) Thrust angle  
 (3) Body center line

### NOTE:

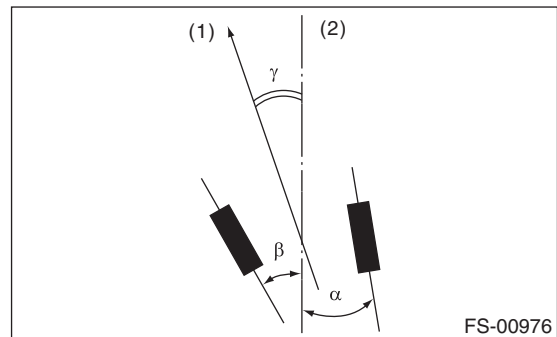
Thrust angle refers to a mean value of right and left rear wheel toe angles in relation to the vehicle body center line. Vehicle is driven straight in the thrust angle direction while swinging in the oblique direction depending on the degree of the mean thrust angle.

**Thrust angle:  $r = (\alpha - \beta)/2$**

$\alpha$ : Right rear wheel toe-in angle

$\beta$ : Left rear wheel toe-in angle

Here, use only positive toe-in values from each wheel to substitute for  $\alpha$  and  $\beta$  in the equation.



- (1) Front  
 (2) Body center line



# Front Transverse Link

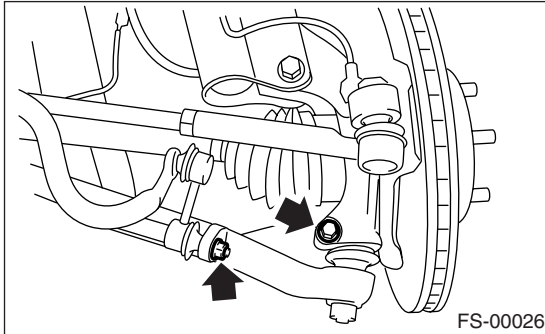
## FRONT SUSPENSION

### 3. Front Transverse Link

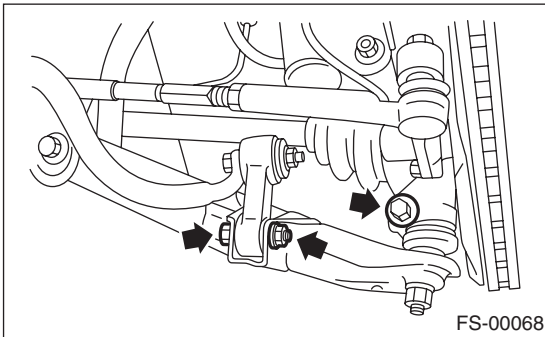
#### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Lift-up the vehicle and remove the wheel.
- 3) Remove the sub frame.
- 4) Disconnect the stabilizer link from transverse link.
- 5) Remove the bolt securing ball joint of transverse link to housing.

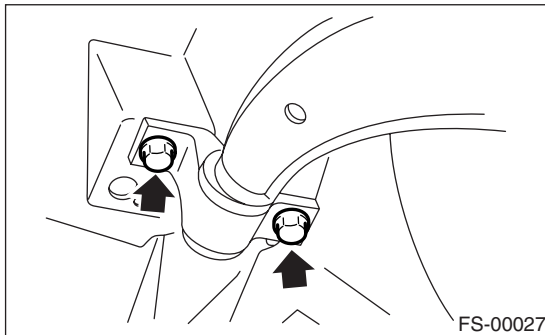
- Sedan turbo model and STI model



- Except Sedan turbo model and STI model

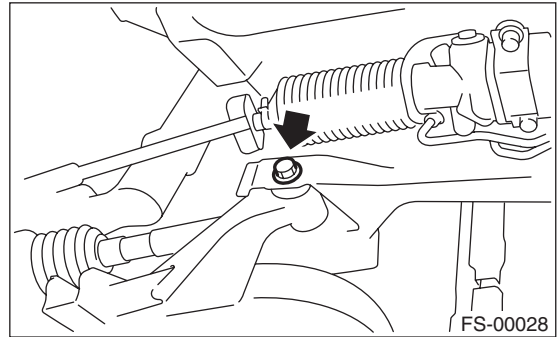


- 6) Remove the nut (do not remove bolt) securing transverse link to crossmember.
- 7) Remove the two bolts securing bushing bracket of transverse link to the vehicle body at rear bushing location.



- 8) Extract the ball joint from housing.

- 9) Remove the bolt securing transverse link to crossmember, and then extract the transverse link from crossmember.



#### B: INSTALLATION

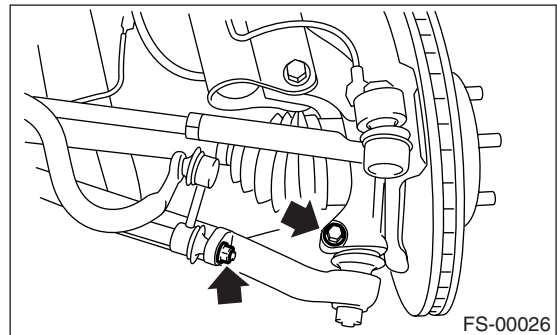
- 1) Temporarily tighten the two bolts used to secure rear bushing of transverse link to body.

#### NOTE:

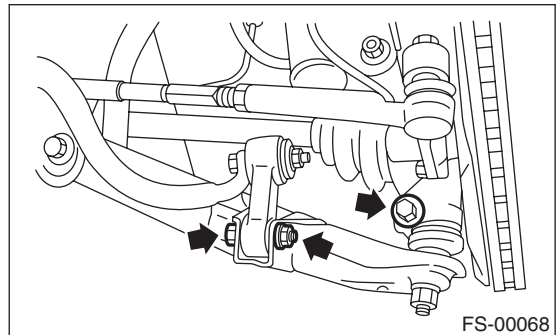
These bolts should be tightened to such an extent that they can still move back and forth in the oblong shaped hole in the bracket (which holds the bushing).

- 2) Install the bolts used to connect transverse link to crossmember and temporarily tighten with a new self-locking nut.
- 3) Insert the ball joint into housing.
- 4) Connect the stabilizer link to transverse link, and then temporarily tighten a new self-locking nut.

- Sedan turbo model and STI model



- Except Sedan turbo model and STI model



- 5) Tighten the following points in the order shown below when tires are in full contact with the ground and vehicle is curb weight.

- (1) Transverse link to stabilizer link, and stabilizer to stabilizer link (Sedan turbo model and STI model)

**Tightening torque:**

**45 N-m (4.6 kgf-m, 33 ft-lb)**

- (2) Transverse link to stabilizer link, and stabilizer to stabilizer link (Except Sedan turbo model and STI model)

**Tightening torque:**

**Transverse link to stabilizer link:**

**30 N-m (3.1 kgf-m, 22 ft-lb)**

**Stabilizer to stabilizer link:**

**45 N-m (4.6 kgf-m, 33 ft-lb)**

- (3) Transverse link and crossmember

**Tightening torque:**

**95 N-m (9.7 kgf-m, 70.1 ft-lb)**

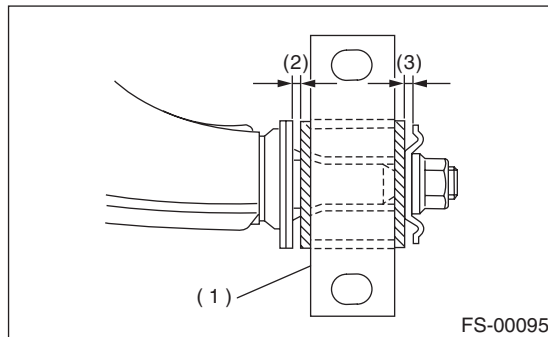
- (4) Transverse link rear bushing and body

**Tightening torque:**

**250 N-m (25.5 kgf-m, 184 ft-lb)**

**NOTE:**

Move the rear bushing back and forth until transverse link-to-rear bushing clearance is established (as indicated in the figure) before tightening.



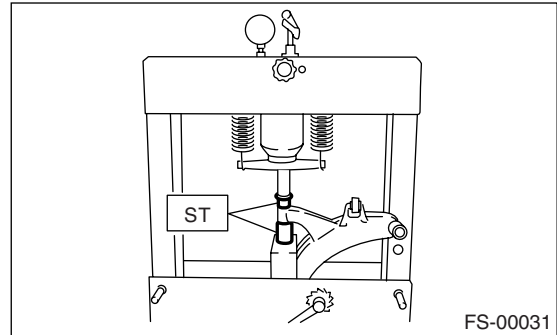
- (1) Rear bushing
- (2) 1 mm (0.04 in)
- (3) 1.5 mm (0.059 in)

- 6) Check the wheel alignment and adjust if necessary.

## C: DISASSEMBLY

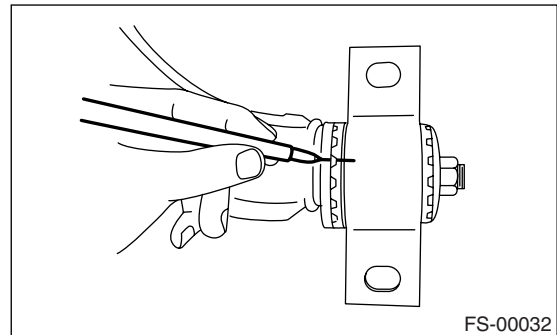
### 1. FRONT BUSHING

Using the ST, press the front bushing out of place.  
ST 927680000 INSTALLER & REMOVER SET



### 2. REAR BUSHING

- 1) Scribe an aligning mark on the transverse link and rear bushing.
- 2) Loosen the nut, and then remove the rear bushing.



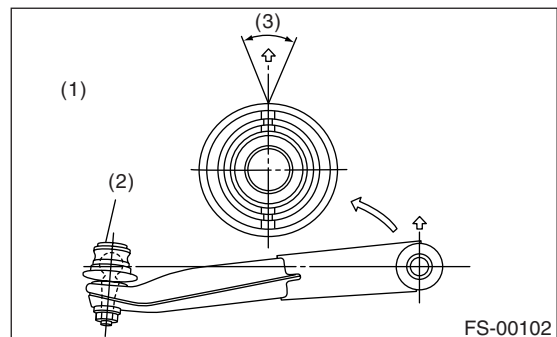
## D: ASSEMBLY

### 1. FRONT BUSHING

Assemble in the reverse order of disassembly.

**CAUTION:**

**Install the front bushing in correct direction, as shown in the figure.**



- (1) Face bushing toward center of ball joint
- (2) Ball joint
- (3) ±3°

# Front Transverse Link

## FRONT SUSPENSION

---

### 2. REAR BUSHING

- 1) Install the rear bushing to transverse link, and then align the aligning marks scribed on the two.
- 2) Tighten the new self-locking nut.

#### NOTE:

While holding the rear bushing so as not to change position of aligning marks, tighten the self-locking nut.

#### *Tightening torque:*

*190 N·m (19.4 kgf-m, 140 ft-lb)*

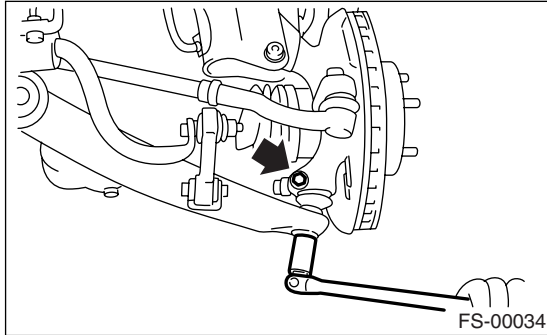
### E: INSPECTION

- 1) Check the transverse link for wear, damage and cracks, and correct or replace if defective.
- 2) Check the bushings for large cracks, fatigue or damage.
- 3) Check the rear bushing for oil leaks.

## 4. Front Ball Joint

### A: REMOVAL

- 1) Remove the wheel.
- 2) Pull out the cotter pin from ball stud, remove the castle nut, and extract the ball stud from transverse link.
- 3) Remove the bolt securing ball joint to housing.



- 4) Extract the ball joint from housing.

### B: INSTALLATION

- 1) Install the ball joint onto housing.

**Tightening torque (Bolt):**  
**50 N·m (5.1 kgf·m, 37 ft·lb)**

#### CAUTION:

**Do not apply grease to tapered portion of ball stud.**

- 2) Connect the ball joint to transverse link.

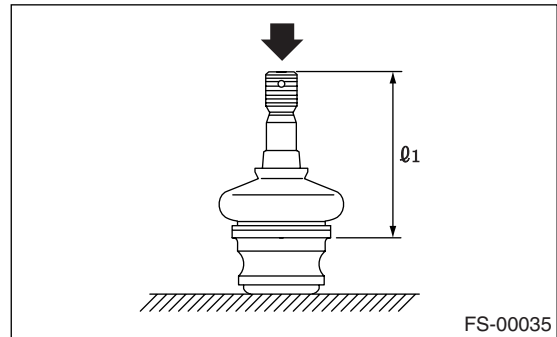
**Tightening torque (Castle nut):**  
**Sedan turbo model and STI model:**  
**30 N·m (3.1 kgf·m, 22 ft·lb)**  
**Except Sedan turbo model and STI model:**  
**40 N·m (4.1 kgf·m, 30 ft·lb)**

- 3) Retighten the castle nut further within 60° until a slot in castle nut is aligned with the hole in ball stud end, then insert a new cotter pin and bend it around castle nut.
- 4) Install the front wheel.

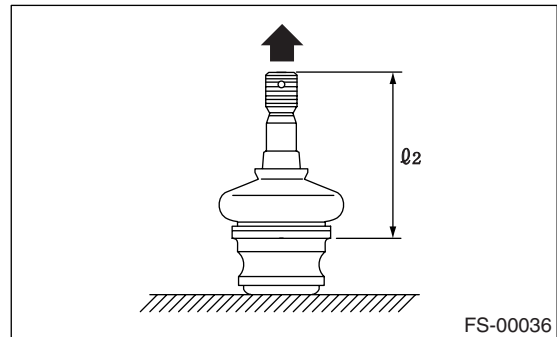
### C: INSPECTION

- 1) Measure the play of ball joint by the following procedures. Replace with a new one when the play exceeds specified value.

- (1) With 686 N (70 kgf, 154 lbf) loaded in direction shown in the figure, measure the dimension  $l_1$ .



- (2) With 686 N (70 kgf, 154 lbf) loaded in opposite direction shown in the figure, measure the dimension  $l_2$ .



- (3) Calculate plays from the following formula.  
 $S = l_2 - l_1$

- (4) When plays are larger than the following value, replace with a new one.

#### FRONT BALL JOINT:

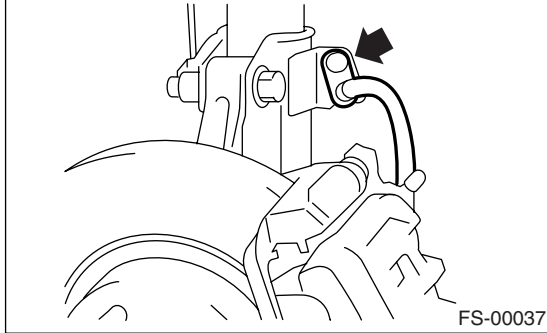
**Specified play for replacement S:**  
**Less than 0.3 mm (0.012 in)**

- 2) When the play is smaller than specified value, visually inspect the dust cover.
- 3) The ball joint and cover that have been removed must be checked for wear, damage or cracks, and any defective part must be replaced.
- 4) If the dust cover is damaged, replace with a new ball joint.

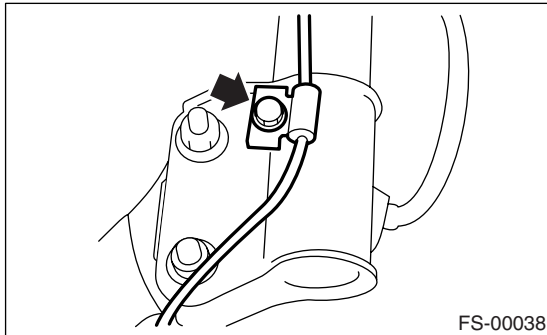
## 5. Front Strut

### A: REMOVAL

- 1) Remove the wheel.
- 2) Remove the bolt securing the brake hose from strut.



- 3) Scribe an alignment mark on the camber adjusting bolt which secures the strut to housing.
- 4) Remove the bolt securing ABS wheel speed sensor harness.

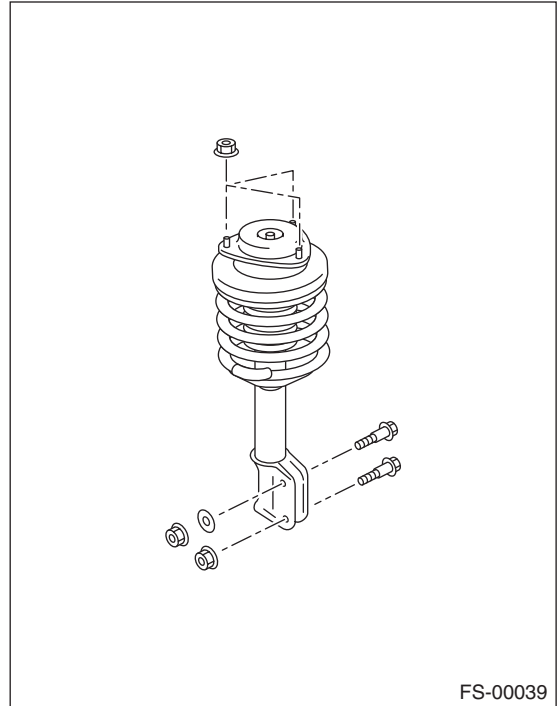


- 5) Remove the two bolts securing housing to strut.

**NOTE:**

While holding the head of adjusting bolt, loosen self-locking nut.

- 6) Remove the three nuts securing the strut mount to body.



### B: INSTALLATION

- 1) Install the strut mount at upper side of strut to body, and then tighten with the nuts.

**Tightening torque:**

**20 N·m (2.0 kgf-m, 14.5 ft-lb)**

- 2) Position the aligning mark on camber adjustment bolt with aligning mark on lower side of strut. Install the strut to housing with a new self-locking nut.

**NOTE:**

While holding the head of adjusting bolt, tighten the self-locking nut.

**Tightening torque:**

**175 N·m (17.8 kgf-m, 129 ft-lb)**

- 3) Install the ABS wheel speed sensor harness to strut.

**Tightening torque:**

**33 N·m (3.3 kgf-m, 24 ft-lb)**

- 4) Install the bolts which secure the brake hose to strut.

**Tightening torque:**

**33 N·m (3.4 kgf-m, 24.3 ft-lb)**

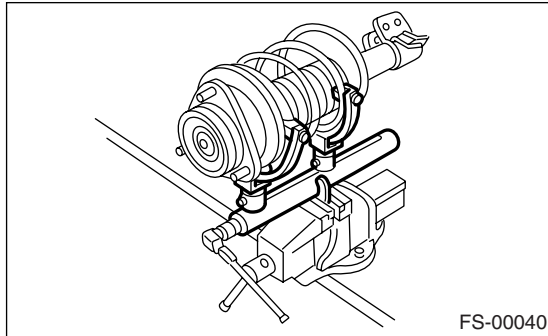
- 5) Install the wheels.

**NOTE:**

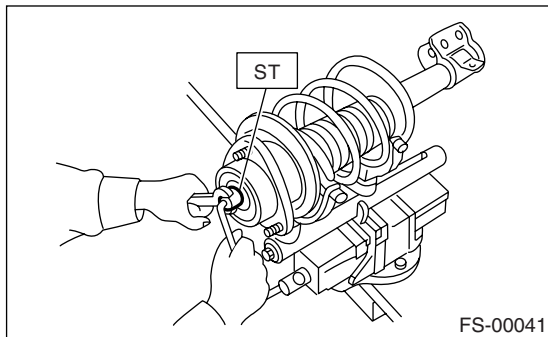
Check the wheel alignment and adjust if necessary.

## C: DISASSEMBLY

- 1) Using a coil spring compressor, compress the coil spring.



- 2) Using the ST, remove the self-locking nut.  
ST 927760000 STRUT MOUNT SOCKET



- 3) Remove the strut mount, upper spring seat and rubber seat from strut.
- 4) Gradually decreasing the compression force of compressor, and then remove the coil spring.
- 5) Remove the dust cover and helper spring.

## D: ASSEMBLY

- 1) Before installing the coil spring, strut mount, etc., on strut, check for the presence of air in the damping force generating mechanism of strut since air prevents proper damping force from being produced.
  - 2) Checking for the presence of air
    - (1) Place the strut vertically with piston rod facing up.
    - (2) Move the piston rod to center of its entire stroke.
    - (3) While holding the piston rod end with fingertips, move the rod up and down.
    - (4) If the piston rod moves at least 10 mm (0.39 in) in the former step, purge air from the strut.
  - 3) Air purging procedure
    - (1) Place the strut vertically with piston rod facing up.
    - (2) Fully extend the piston rod.
    - (3) With the piston rod fully extended, place the piston rod side down. The strut must stand vertically.
    - (4) Fully contract the piston rod.

- (5) Repeat three or four times from first step.

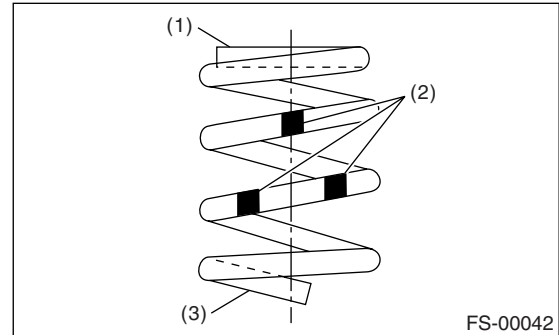
### NOTE:

After completely purging air from strut, be sure to place the strut with piston rod facing up. If it is laid down, check for entry of air in the strut as outlined under "Checking for the presence of air".

- 4) Using a coil spring compressor, compress the coil spring.

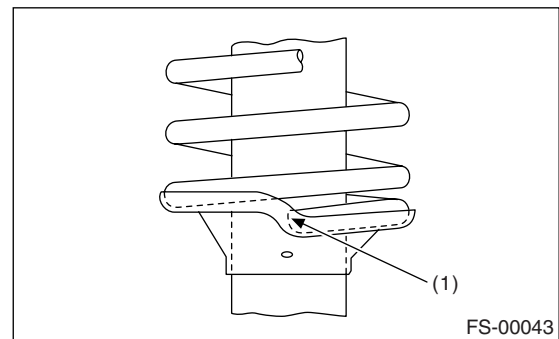
### NOTE:

Make sure that the installing direction of coil spring is as shown in the figure.



- (1) Flat (top side)
- (2) Identification paint
- (3) Inclined (bottom side)

- 5) Set the coil spring correctly so that its end face fits well into the spring seat as shown in the figure.



- (1) Coil spring end face

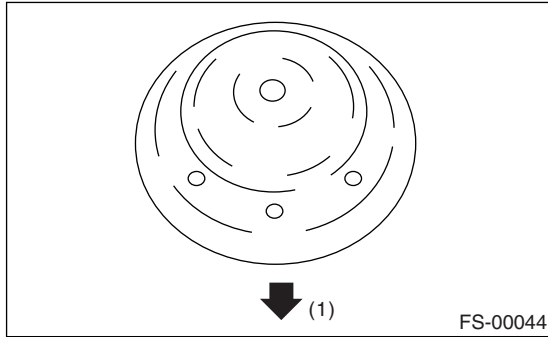
- 6) Install the helper and dust cover to the piston rod.
- 7) Pull the piston rod fully upward, and install the rubber seat and spring seat.

# Front Strut

## FRONT SUSPENSION

### NOTE:

Ensure that the upper spring seat is positioned as shown in the figure.



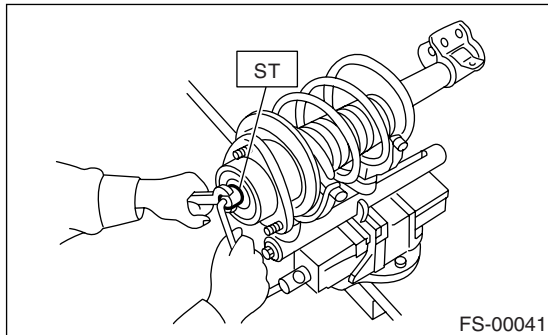
(1) Outside of body

8) Install the strut mount to the piston rod, and then tighten a new self-locking nut temporarily.

9) Using a hexagon wrench to prevent strut rod from turning, tighten the self-locking nut with ST.  
ST 927760000 STRUT MOUNT SOCKET

### Tightening torque:

**55 N·m (5.6 kgf·m, 41 ft·lb)**



10) Loosen the coil spring carefully.

## E: INSPECTION

Check the disassembled parts for cracks, damage and wear, and replace with new parts if defective.

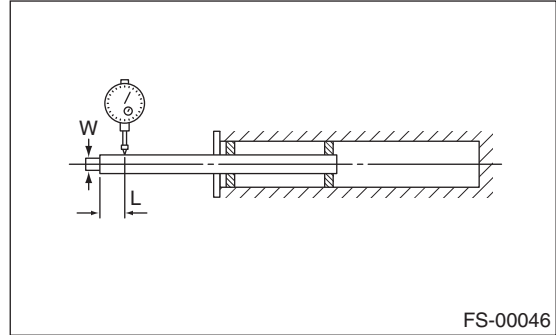
### 1. DAMPER STRUT

- 1) Check for oil leakage.
- 2) Move the piston rod up and down to check that it operates smoothly without any binding.

3) Play of piston rod

- Measure the play as follows:

Fix outer shell and fully extend the rod. Set a dial gauge at the end of rod: L [10 mm (0.39 in)], then apply a force of W [20 N (2 kgf, 4 lbf)] to threaded portion. With the force of 20 N (2 kgf, 4 lbf) applied, read dial gauge indication:  $P_1$ . Apply a force of 20 N (2 kgf, 4 lbf) in the opposite direction of "W", then read dial gauge indication:  $P_2$ .



**Limit of play ( $P_1 + P_2$ ):**  
**0.8 mm (0.031 in)**

If the play is greater than limit, replace the strut.

### 2. STRUT MOUNT

Check the rubber part for large cracks, deformation and deterioration, and replace it with a new one if defective.

### 3. DUST COVER

If any large cracks or damage are found, replace it with a new one.

### 4. COIL SPRING

One having permanent strain should be replaced with a new one. When the vehicle posture is uneven, although there are no considerable reasons like tire puncture, uneven loading, etc., check the coil spring for its free length referring to specifications, cracks, etc., and replace it with a new one if defective.

### 5. HELPER

Replace it with a new one if cracked excessively or damaged.

## F: DISPOSAL

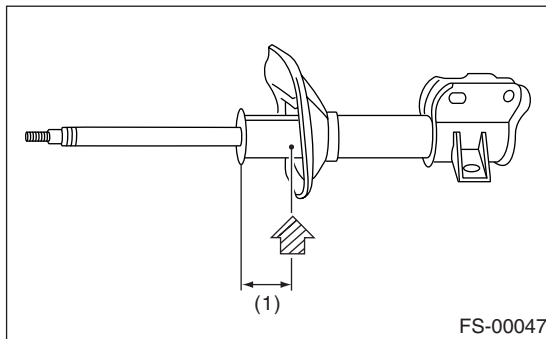
### 1. EXCEPT STI MODEL

**CAUTION:**

- Before handling gas filled struts, be sure to wear goggles to protect eyes from gas, oil and filings.
- Do not disassemble the strut damper or place into a fire.
- Drill holes before disposing of gas filled struts.

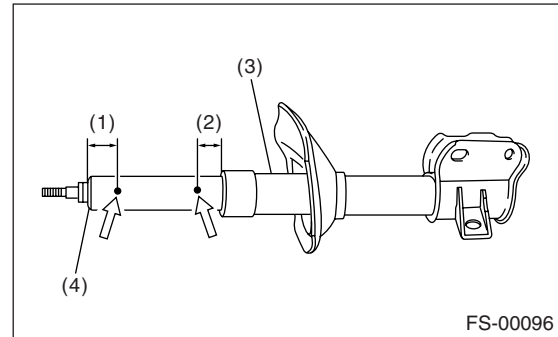
1) Place the gas filled strut on a flat and level surface with piston rod fully extended.

2) Using a 2 to 3 mm (0.08 to 0.12 in) dia. drill, make holes in areas shown in the figure.



(1) 40 mm (1.57 in)

2) Using a 2 to 3 mm (0.08 to 0.12 in) dia. drill, make holes in (1), and then make a hole in (2).



- (1) 20 mm (0.78 in)
- (2) 10 mm (0.39 in)
- (3) Strut
- (4) Damping tube

### 2. STI MODEL

**CAUTION:**

- Before handling gas filled struts, be sure to wear goggles to protect eyes from gas, oil and filings.
- Do not disassemble the strut damper or place into a fire.
- Drill holes before disposing of gas filled struts.

1) Place the gas filled strut on a flat and level surface with damping tube fully extended.



# Front Stabilizer

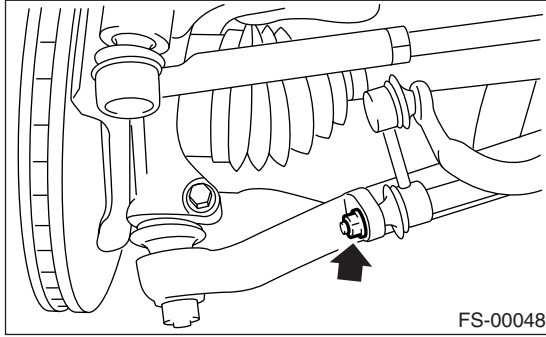
## FRONT SUSPENSION

### 6. Front Stabilizer

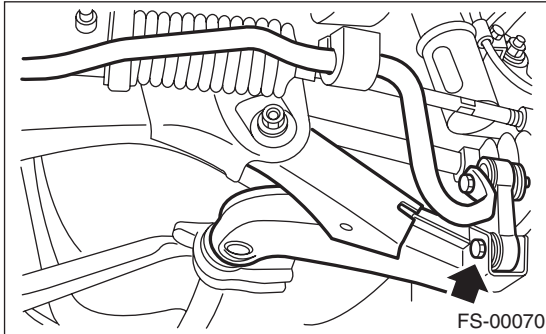
#### A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove the jack-up plate from lower part of crossmember.
- 3) Remove the sub frame.
- 4) Remove the nut which secures stabilizer link to front transverse link.

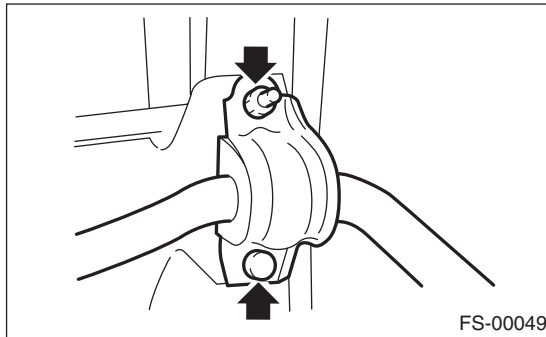
- Sedan turbo model and STI model



- Except Sedan turbo model and STI model



- 5) Remove the bolts which secure stabilizer to crossmember.



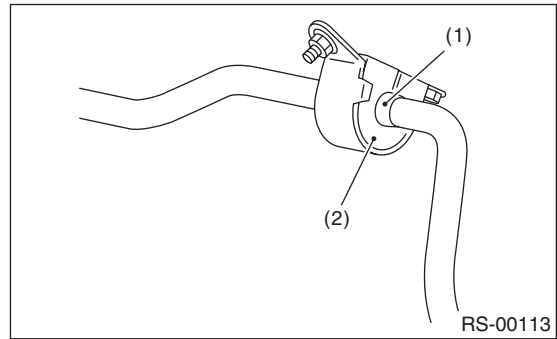
#### B: INSTALLATION

- 1) Install in the reverse order of removal.

#### NOTE:

- Install the bushing (on front crossmember side) while aligning it with paint mark on stabilizer.

- Ensure that bushing and stabilizer have the same identification colors when installing.



- (1) Mark stamped on stabilizer
- (2) Bushing identification color

- 2) Always tighten the bushing location when tires are in full contact with the ground and vehicle is curb weight.

#### Tightening torque:

##### Jack-up plate to crossmember:

70 N·m (7.1 kgf-m, 52 ft-lb)

##### Stabilizer link to front transverse link (Sedan turbo model and STI model):

45 N·m (4.6 kgf-m, 33 ft-lb)

##### Stabilizer link to front transverse link (Except Sedan turbo model and STI model):

30 N·m (3.1 kgf-m, 22 ft-lb)

##### Stabilizer to crossmember:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

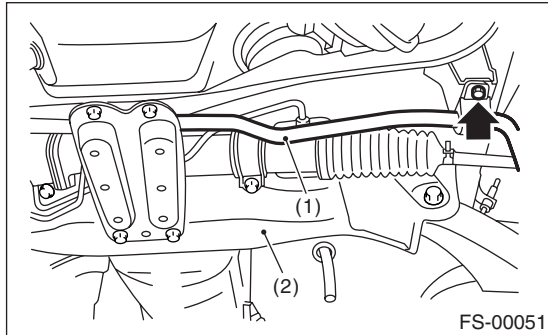
#### C: INSPECTION

- 1) Check the bushing for large cracks, fatigue or damage.
- 2) Check the stabilizer link for deformities, cracks, or damage, and bushing for protrusions from the hole of stabilizer link.

## 7. Front Crossmember

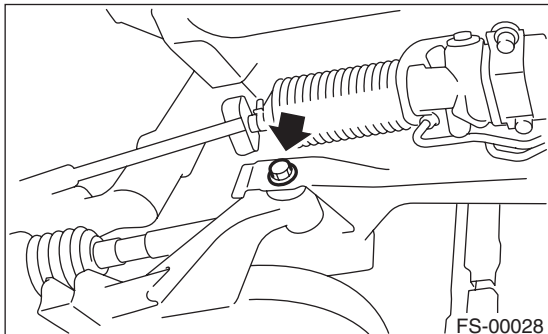
### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle, and then remove the front wheels.
- 3) Remove the sub frame.
- 4) Remove both the stabilizer and jack-up plate.



- (1) Front stabilizer
- (2) Front crossmember

- 5) Disconnect the tie-rod end from housing.
- 6) Remove the front exhaust pipe. <Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.> <Ref. to EX(H4DOTC)-8, REMOVAL, Front Exhaust Pipe.>
- 7) Remove the front transverse link from front crossmember and body.



- 8) Remove the nuts attaching engine mount cushion rubber to crossmember.
- 9) Remove the steering universal joint.
- 10) Disconnect the power steering pipe from steering gear box.
- 11) Lift the engine by approx. 10 mm (0.39 in) by using chain block.
- 12) Support the crossmember with a jack, remove nuts securing crossmember to body and lower the crossmember gradually along with steering gear-box.

### CAUTION:

**When removing the crossmember downward, be careful that tie-rod end does not interfere with SFJ boot.**

### B: INSTALLATION

- 1) Install in the reverse order of removal.

#### NOTE:

Always tighten the bushing when tires are in full contact with the ground and vehicle is curb weight.

#### Tightening torque:

**Transverse link bushing to crossmember:**

**95 N·m (9.7 kgf-m, 70.1 ft-lb)**

**Stabilizer to bushing:**

**25 N·m (2.5 kgf-m, 18.1 ft-lb)**

**Tie-rod end to housing:**

**27.0 N·m (2.75 kgf-m, 19.9 ft-lb)**

**Front cushion rubber to crossmember:**

**85 N·m (8.7 kgf-m, 62.7 ft-lb)**

**Universal joint to pinion shaft:**

**24 N·m (2.4 kgf-m, 17.4 ft-lb)**

**Crossmember to body:**

**95 N·m (9.7 kgf-m, 70.1 ft-lb)**

- 2) Purge air from the power steering system.
- 3) Check the wheel alignment and adjust if necessary.

### C: INSPECTION

Check the crossmember for wear, damage and cracks, and correct or replace if defective.

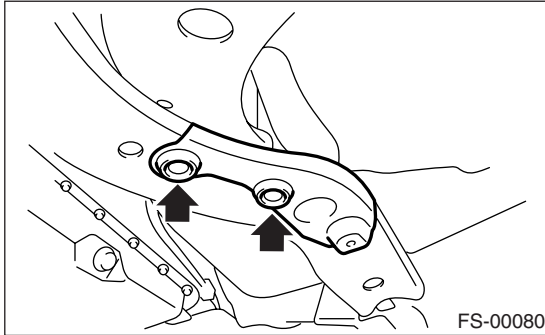
# Sub Frame

## FRONT SUSPENSION

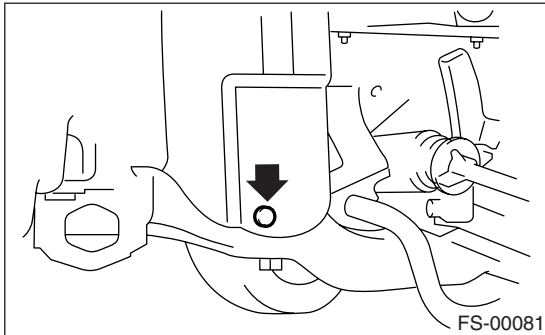
### 8. Sub Frame

#### A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove the under cover. <Ref. to EI-23, REMOVAL, Front Under Cover.>
- 3) Remove the bolt cover.



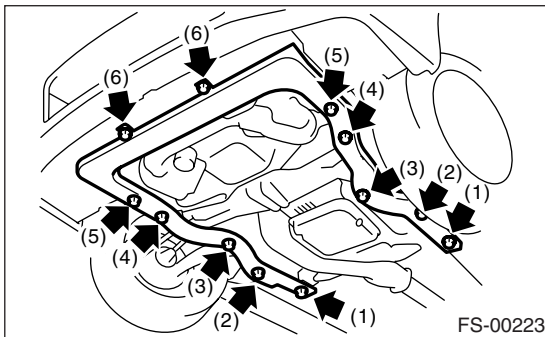
- 4) Remove the clip.



- 5) Remove the sub frame.

#### NOTE:

Loosen bolt (1) and leave a few threads caught, then remove the bolts in the order of (2), (3), (4), (5), and (6).



#### B: INSTALLATION

Install in the reverse order of removal.

#### NOTE:

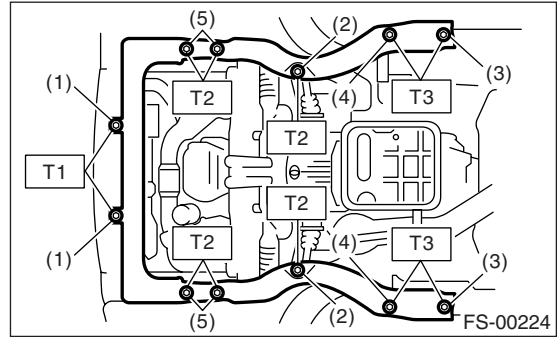
Replace the M12 bolt with a new one.

#### Tightening torque:

**T1: 34 N·m (3.5 kgf-m, 25 ft-lb)**

**T2: 55 N·m (5.6 kgf-m, 41 ft-lb)**

**T3: 70 N·m (7.1 kgf-m, 52 ft-lb)**



- (1) M8 bolt
- (2) M12 bolt (with wax)
- (3) M10 bolt
- (4) M10 bolt
- (5) M12 bolt (with wax)

#### C: INSPECTION

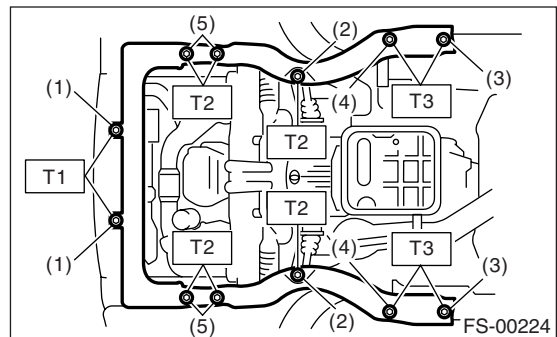
- 1) Check that there is no damage and distortion at the sub frame.
- 2) Check that the bolts are tightened with the specified torque. If there is looseness, tighten to the specified torque.

#### Tightening torque:

**T1: 34 N·m (3.5 kgf-m, 25 ft-lb)**

**T2: 55 N·m (5.6 kgf-m, 41 ft-lb)**

**T3: 70 N·m (7.1 kgf-m, 52 ft-lb)**

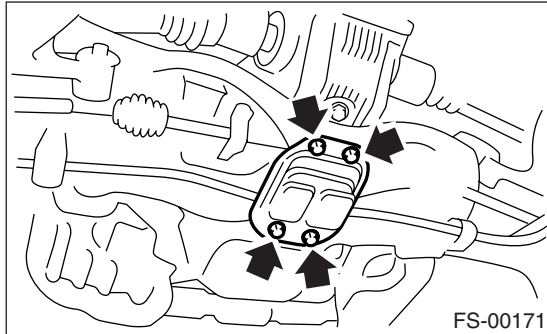


- (1) M8 bolt
- (2) M12 bolt
- (3) M10 bolt
- (4) M10 bolt
- (5) M12 bolt

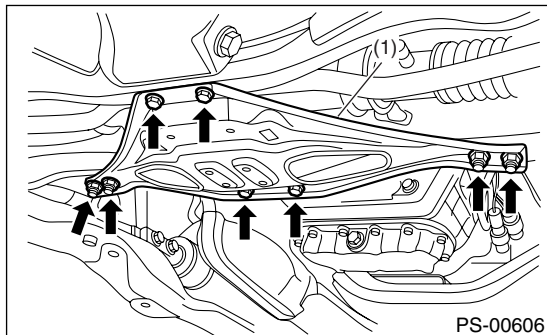
## 9. Jack-up Plate

### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Lift-up the vehicle.
- 3) Remove the under cover. <Ref. to EI-23, REMOVAL, Front Under Cover.>
- 4) Remove the jack-up plate.
  - Non-turbo model



- Turbo model and STI model



### B: INSTALLATION

Install in the reverse order of removal.

#### **Tightening torque:**

**Jack-up plate to crossmember:**

**70 N·m (7.1 kgf-m, 52 ft-lb)**

#### **Turbo model and STI model**

#### **Tightening torque:**

**Both end of jack-up plate to crossmember:**

**30 N·m (3.1 kgf-m, 22 ft-lb)**

### C: INSPECTION

Check the jack-up plate for wear, damage and cracks, and correct or replace if defective.

# General Diagnostic Table

## FRONT SUSPENSION

### 10. General Diagnostic Table

#### A: INSPECTION

##### 1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

| Possible causes  | Countermeasures            |
|--|----------------------------|
| (1) Permanent distortion or breakage of coil spring          | Replace.                   |
| (2) Unsmooth operation of damper strut and/or shock absorber | Replace.                   |
| (3) Installation of wrong strut and/or shock absorber        | Replace with proper parts. |
| (4) Installation of wrong coil spring                        | Replace with proper parts. |

##### 2. POOR RIDE COMFORT

- 1) Large rebound shock
- 2) Rocking of the vehicle continues too long after running over bump and/or hump.
- 3) Large shock in bumping

| Possible causes  | Countermeasures                                   |
|--|---|
| (1) Breakage of coil spring  | Replace.  |
| (2) Overinflating pressure of tire   | Adjust.   |
| (3) Improper wheel arch height   | Adjust or replace the coil springs with new ones. |
| (4) Fault in operation of damper strut and/or shock absorber                             | Replace.  |
| (5) Large crack or deformation of strut mount and/or shock absorber mount                | Replace.  |
| (6) Unsuitability of maximum and/or minimum length of damper strut and/or shock absorber | Replace with proper parts.                        |
| (7) Large deformation or loss of bushing   | Replace.  |
| (8) Deformation or damage of helper in strut assembly and/or shock absorber              | Replace.  |
| (9) Oil leakage of damper strut and/or shock absorber                                    | Replace.  |

##### 3. NOISE

| Possible causes  | Countermeasures                    |
|--|------------------------------------|
| (1) Wear or damage of damper strut and/or shock absorber component parts                 | Replace.                           |
| (2) Loosening of suspension link installing bolt   | Retighten to the specified torque. |
| (3) Large deformation or loss of bushing   | Replace.                           |
| (4) Unsuitability of maximum and/or minimum length of damper strut and/or shock absorber | Replace with proper parts.         |
| (5) Breakage of coil spring  | Replace.                           |
| (6) Wear or damage of ball joint   | Replace.                           |
| (7) Deformation of stabilizer clamp  | Replace.                           |

# REAR SUSPENSION

# RS

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|                                  | <b>Page</b> |
|----------------------------------|-------------|
| 1. General Description .....     | 2           |
| 2. Wheel Alignment .....         | 7           |
| 3. Rear Stabilizer.....          | 8           |
| 4. Rear Trailing Link .....      | 9           |
| 5. Rear Strut.....               | 13          |
| 6. Lateral link.....             | 14          |
| 7. Rear Crossmember .....        | 17          |
| 8. General Diagnostic Table..... | 18          |

# General Description

## REAR SUSPENSION

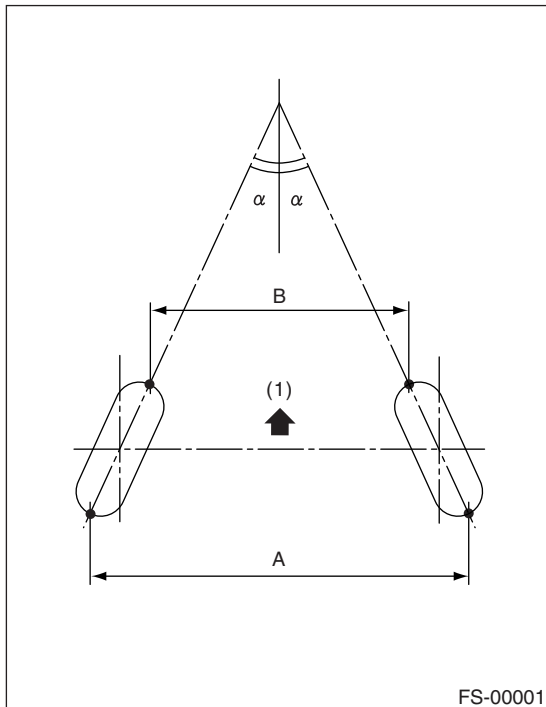
### 1. General Description

#### A: SPECIFICATION

| Model  | Sedan  |                      |                      | Wagon               |                      | OUTBACK              |
|--|--|----------------------|----------------------|---------------------|----------------------|----------------------|
|  | Non-turbo  | Turbo                | STI                  | Non-turbo           | Turbo                |                      |
| Camber<br>(Tolerance: $\pm 0^{\circ}45'$ Adjustment standard: $\pm 0^{\circ}30'$ ) | $-1^{\circ}25'$  | $-1^{\circ}30'$      | $-1^{\circ}40'$      | $-1^{\circ}15'$     | $-1^{\circ}20'$      | $-1^{\circ}10'$      |
| Toe-in   | Tolerance: $0 \pm 3$ mm ( $0 \pm 0.12$ in), Toe angle (The sum of both wheels): $\pm 0^{\circ}15'$<br>Tolerance: $0 \pm 2$ mm ( $0 \pm 0.08$ in), Toe angle (The sum of both wheels): $\pm 0^{\circ}10'$ |                      |                      |                     |                      |                      |
| Wheel arch height<br>[Tolerance: $+12_{-24}$ mm ( $+0.47_{-0.94}$ in)]             | 381 mm<br>(15.0 in)  | 376 mm<br>(14.80 in) | 363 mm<br>(14.29 in) | 381 mm<br>(15.0 in) | 376 mm<br>(14.80 in) | 386 mm<br>(15.20 in) |
| Thrust angle   | Tolerance: $\pm 0^{\circ}30'$ , Adjustment standard: $\pm 0^{\circ}20'$  |                      |                      |                     |                      |                      |
| Diameter of stabilizer   | 13 mm<br>(0.51 in)   | 17 mm<br>(0.67 in)   | 20 mm<br>(0.79 in)   | 13 mm<br>(0.51 in)  | 17 mm<br>(0.67 in)   | 13 mm<br>(0.51 in)   |

#### NOTE:

- Front and rear toe-in and front camber can be adjusted. If toe-in or camber exceeds tolerance, adjust toe-in and camber to the adjustment standard.
- The other items indicated in the specification table cannot be adjusted. If the other items exceed specifications, check suspension parts and connections for deformities; replace with new ones as required.



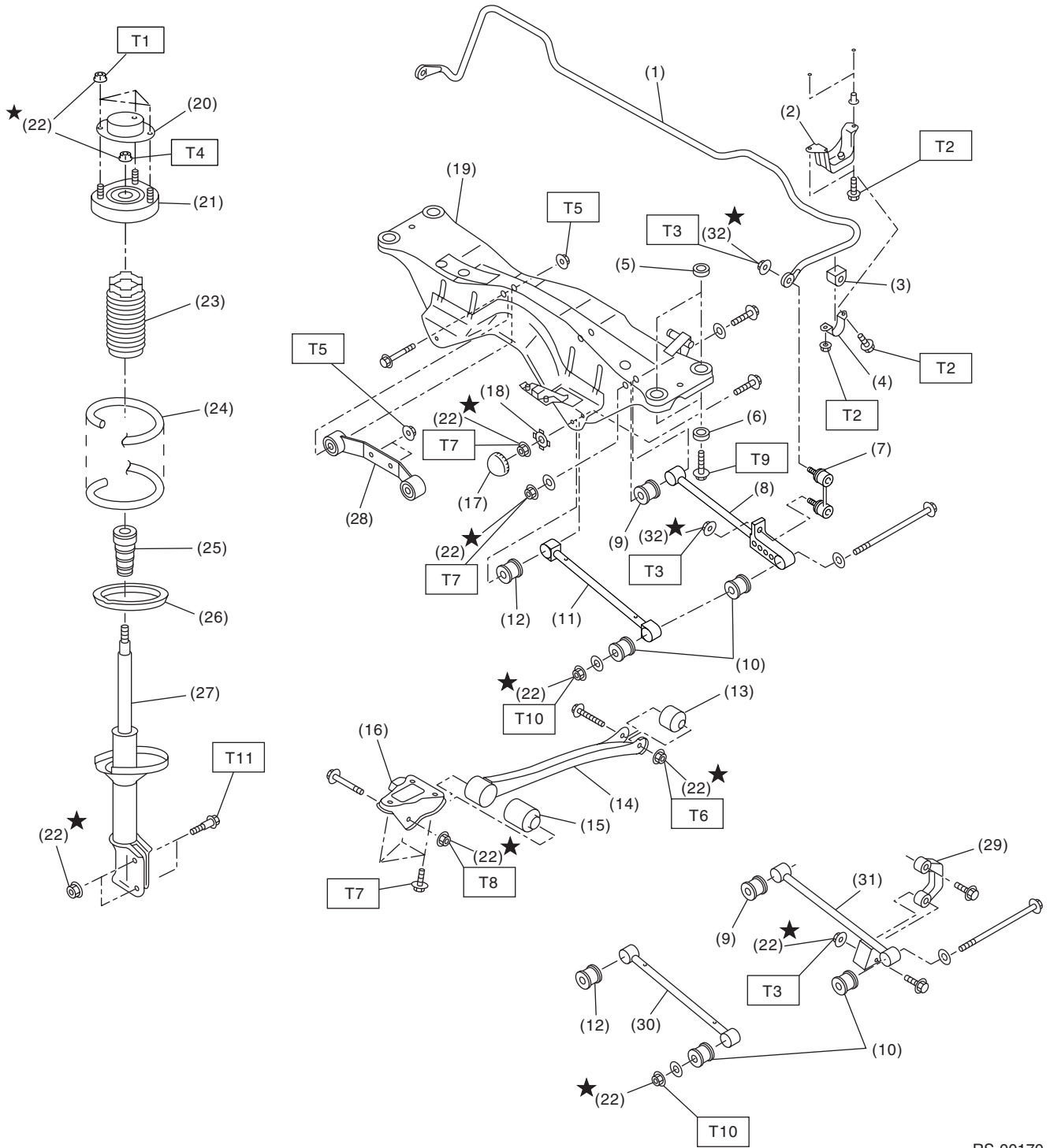
(1) Front

A – B = Positive: Toe-in, Negative: Toe-out

$\alpha$  = Each toe angle

**B: COMPONENT**

**1. REAR SUSPENSION**



RS-00170



# General Description

## REAR SUSPENSION

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|   |   |  |
|---|---|--|
| (1) Stabilizer                                      | (16) Trailing link bracket                | (31) Rear lateral link (Except STI model)          |
| (2) Stabilizer bracket                              | (17) Cap (Protection)                     | (32) Flange nut                                    |
| (3) Stabilizer bushing                              | (18) Washer                               |  |
| (4) Clamp   | (19) Rear crossmember                     |  |
| (5) Floating bushing                                | (20) Strut mount cap                      | <hr/> <b>Tightening torque: N·m (kgf-m, ft-lb)</b> |
| (6) Stopper   | (21) Strut mount                          | <b>T1: 20 (2.0, 14.5)</b>                          |
| (7) Stabilizer link (STI model)                     | (22) Self-locking nut                     | <b>T2: 25 (2.5, 18.1)</b>                          |
| (8) Rear lateral link (STI model)                   | (23) Dust cover                           | <b>T3: 45 (4.6, 33.2)</b>                          |
| (9) Bushing (C)                                     | (24) Coil spring                          | <b>T4: 55 (5.6, 40.6)</b>                          |
| (10) Bushing (A)                                    | (25) Helper                               | <b>T5: 70 (7.1, 52)</b>                            |
| (11) Front lateral link (Turbo model and STI model) | (26) Lower rubber seat                    | <b>T6: 90 (9.2, 66)</b>                            |
| (12) Bushing (B)                                    | (27) Damper strut                         | <b>T7: 100 (10.2, 74)</b>                          |
| (13) Trailing link rear bushing                     | (28) Differential rear member             | <b>T8: 115 (11.7, 85)</b>                          |
| (14) Trailing link                                  | (29) Stabilizer link (Except STI model)   | <b>T9: 130 (13.3, 96)</b>                          |
| (15) Trailing link front bushing                    | (30) Front lateral link (Non-turbo model) | <b>T10: 140 (14.3, 103)</b>                        |
|   |   | <b>T11: 200 (20.0, 145)</b>                        |

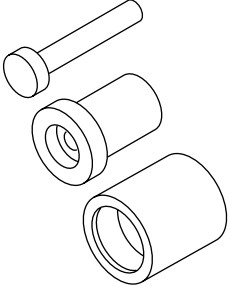
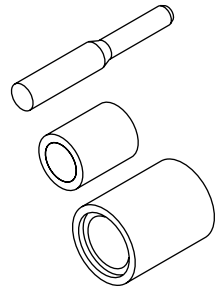
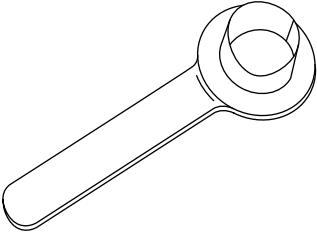
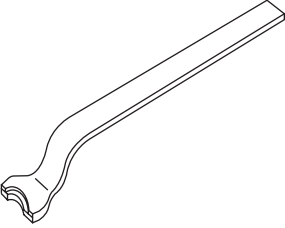
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### C: CAUTION

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Before disposing shock absorbers, be sure to bleed gas completely. Also, do not throw away in fire.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

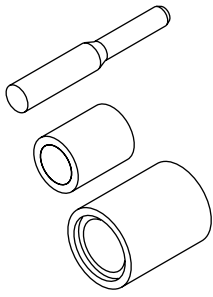
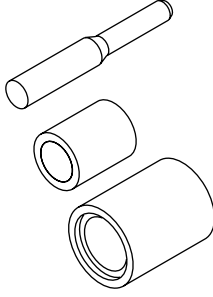
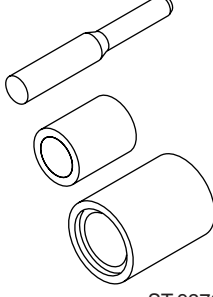
## D: PREPARATION TOOL

### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION             | REMARKS  |
|---|-------------|-------------------------|--|
|  <p style="text-align: center;">ST-927720000</p>   | 927720000   | INSTALLER & REMOVER SET | Used for replacing front bushing.  |
|  <p style="text-align: center;">ST-927730000</p>  | 927730000   | INSTALLER & REMOVER SET | Used for replacing rear bushing.   |
|  <p style="text-align: center;">ST28099PA090</p> | 28099PA090  | OIL SEAL PROTECTOR      | <ul style="list-style-type: none"> <li>• Used for installing rear drive shaft to rear differential.</li> <li>• For protecting oil seal.</li> </ul> |
|  <p style="text-align: center;">ST28099PA100</p> | 28099PA100  | DRIVE SHAFT REMOVER     | Used for removing DOJ.   |

# General Description

## REAR SUSPENSION

| ILLUSTRATION   | TOOL NUMBER | DESCRIPTION                | REMARKS                                  |
|--|-------------|----------------------------|--|
|  <p style="text-align: center;">ST-927710000</p>  | 927710000   | INSTALLER &<br>REMOVER SET | Used for replacing lateral link bushing. |
|  <p style="text-align: center;">ST-927700000</p>  | 927700000   | INSTALLER &<br>REMOVER SET | Used for replacing lateral link bushing. |
|  <p style="text-align: center;">ST-927690000</p> | 927690000   | INSTALLER &<br>REMOVER SET | Used for replacing lateral link bushing. |

## 2. GENERAL TOOL

| TOOL NAME               | REMARKS                                   |
|-------------------------|---|
| Alignment gauge         | Used for wheel alignment measurement.     |
| Alignment gauge adapter | Used for wheel alignment measurement.     |
| Turning radius gauge    | Used for wheel alignment measurement.     |
| Toe-in gauge            | Used for toe-in measurement.              |
| Transmission jack       | Used for suspension assembly/disassembly. |
| Bearing puller          | Used for removing bushings.               |
| Coil spring compressor  | Used for strut assembly/disassembly.      |

## 2. Wheel Alignment

### A: INSPECTION

**NOTE:**

Front and rear wheel alignment must be measured and/or adjusted at a time. Follow the procedure in "FS" section "Wheel Alignment" for measurement and/or adjustment of wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

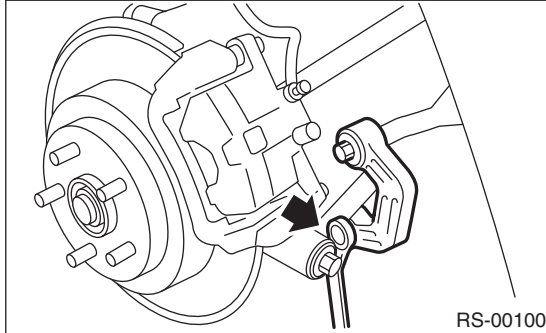
# Rear Stabilizer

## REAR SUSPENSION

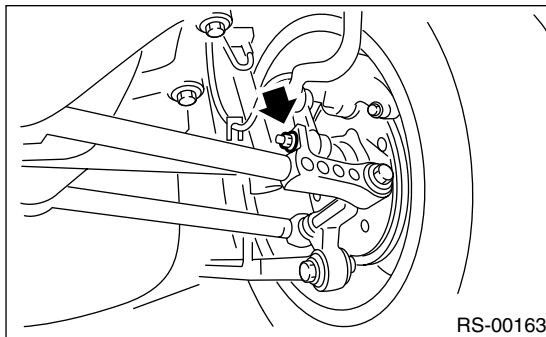
### 3. Rear Stabilizer

#### A: REMOVAL

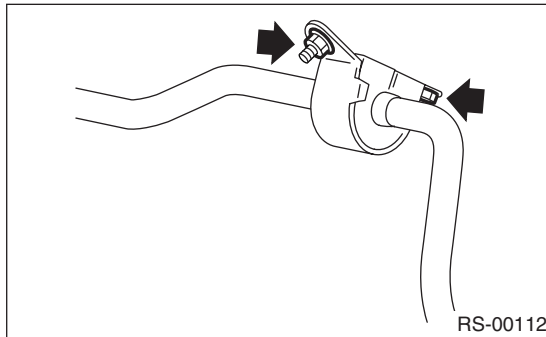
- 1) Lift-up the vehicle.
- 2) Remove the stabilizer link.
  - Except STI model



- STI model



- 3) Remove the bolt and nut which secure the stabilizer to stabilizer bracket.



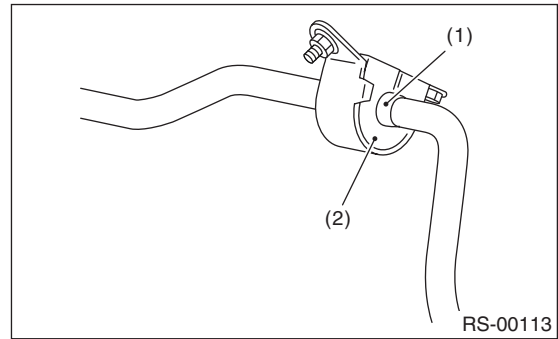
#### B: INSTALLATION

- 1) Install in the reverse order of removal.

#### NOTE:

- Install the stabilizer bushing while aligning it with paint mark on stabilizer.

- Ensure the stabilizer bushing and stabilizer have the same identification colors when installing.



- (1) Mark painted on stabilizer
- (2) Bushing identification color

- 2) Always tighten the stabilizer bushing location when tires are in full contact with the ground and the vehicle is curb weight.

#### Tightening torque:

**Stabilizer link to rear lateral link**

**45 N·m (4.6 kgf-m, 33.2 ft-lb)**

**Stabilizer to stabilizer bracket**

**25 N·m (2.5 kgf-m, 18.1 ft-lb)**

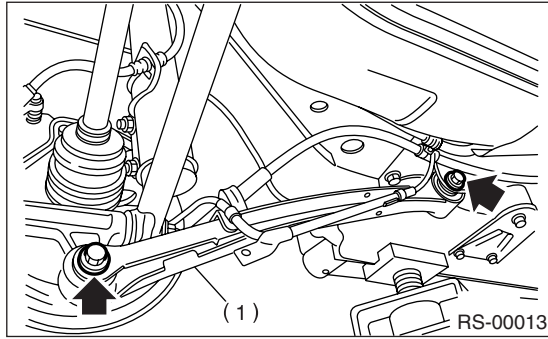
#### C: INSPECTION

- 1) Check the bushing for large cracks, fatigue or damage.
- 2) Check the stabilizer links for deformities, cracks, or damage, and bushing for protrusions from the hole of stabilizer link.

## 4. Rear Trailing Link

### A: REMOVAL

- 1) Loosen the rear wheel nuts.
- 2) Lift-up the vehicle, and then remove the rear wheels.
- 3) Remove both the rear parking brake clamp and ABS wheel speed sensor harness.
- 4) Remove the bolt which secures the trailing link to trailing link bracket.



(1) Trailing link

- 5) Remove the bolt which secures the trailing link to rear housing.

### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Always tighten the bushing location when tires are in full contact with the ground and the vehicle is at curb weight condition.

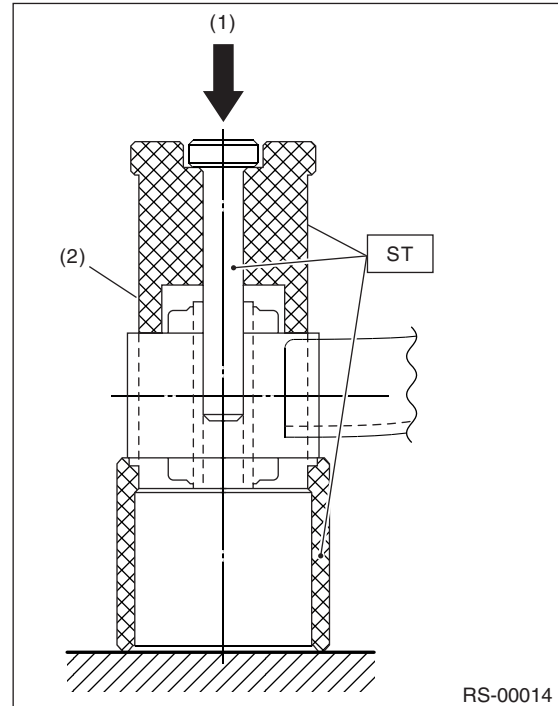
#### NOTE:

Check the wheel alignment and adjust if necessary.

## C: DISASSEMBLY

### 1. FRONT BUSHING

Using the ST, press the front bushing out of place.  
 ST 927720000 INSTALLER & REMOVER SET



- (1) Press
- (2) Trailing link

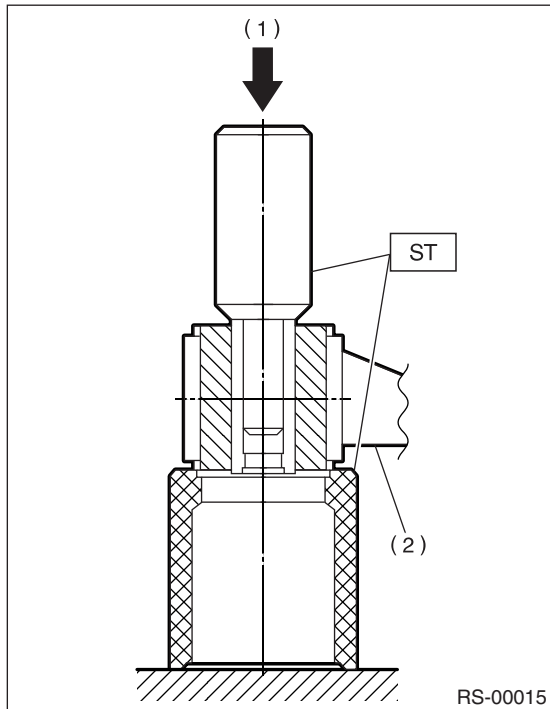
### 2. REAR BUSHING

- 1) Remove the housing. <Ref. to DS-27, REMOVAL, Rear Axle.>
- 2) Using the ST, press the rear bushing out of place.

# Rear Trailing Link

REAR SUSPENSION

ST 927730000 INSTALLER & REMOVER SET



- (1) Press
- (2) Housing

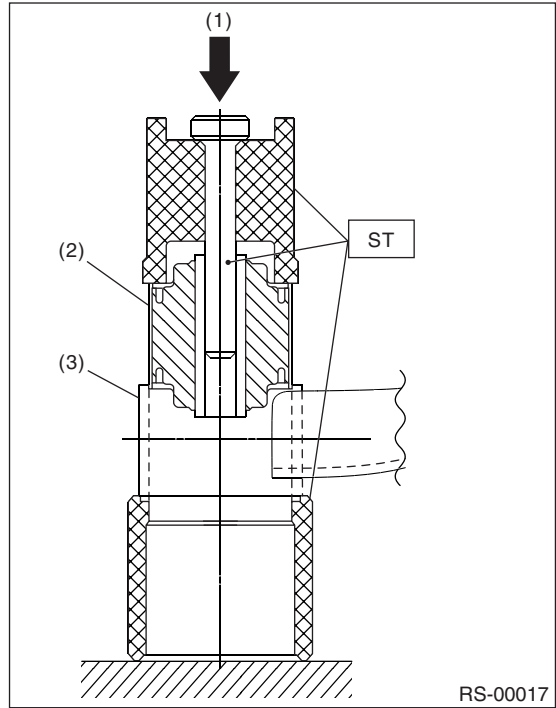
## D: ASSEMBLY

### 1. FRONT BUSHING

Using the ST, press the bushing into trailing link.

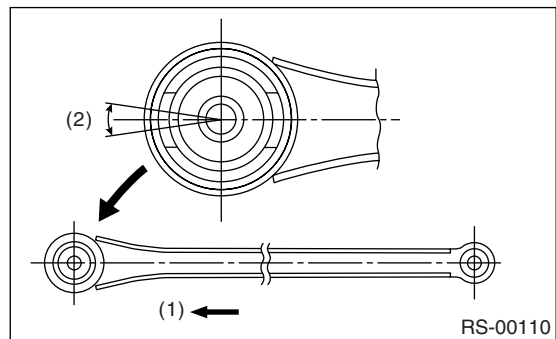
ST 927720000 INSTALLER & REMOVER SET

**CAUTION:**  
Turn the ST plunger upside down and press it until the plunger end surface contacts the trailing link end surface.



- (1) Press
- (2) Front bushing
- (3) Trailing link

**CAUTION:**  
Install the front bushing in the proper direction, as shown in the figure.



- (1) Front
- (2)  $\pm 5^\circ$

## 2. REAR BUSHING

1) Using the ST, press the bushing into trailing link.

ST 927730000 INSTALLER & REMOVER SET

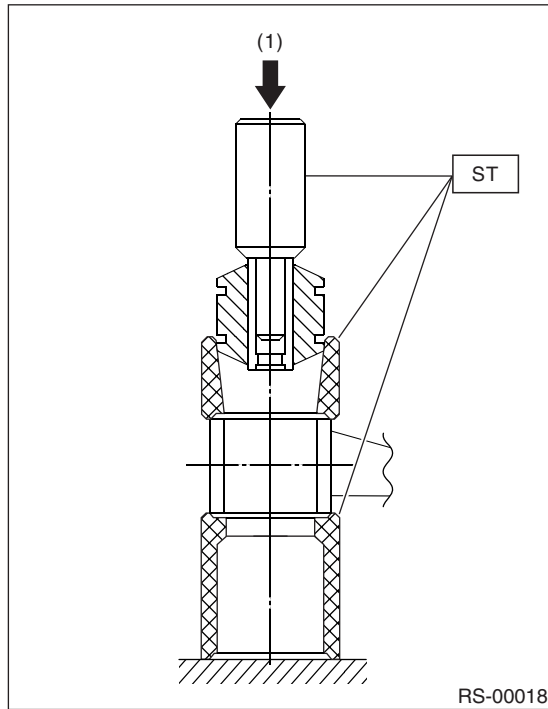
**NOTE:**

If it is difficult to press the bushing into trailing link, apply water-diluted TIRE LUBE to the inner surface of ST as a lubricant.

**Specified lubricant:**

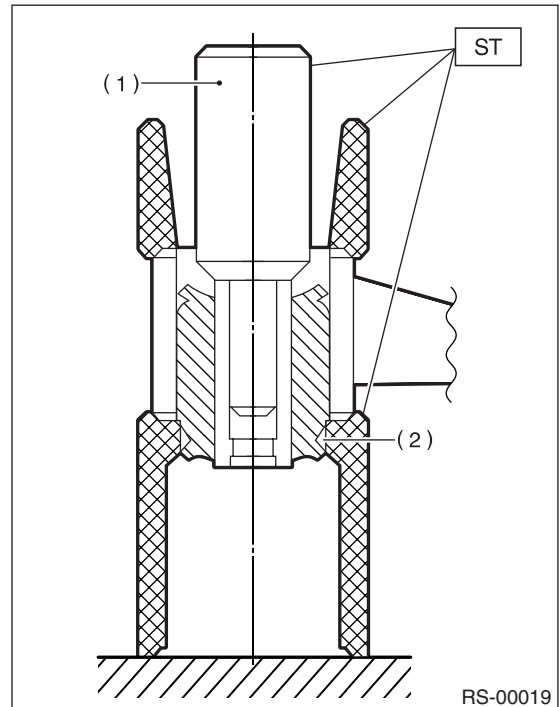
**TIRE LUBE: water = 1: 3**

ST 927730000 INSTALLER & REMOVER SET



(1) Press

2) Press the ST plunger until the bushing flange protrudes beyond trailing link.



(1) Plunger  
(2) Flange

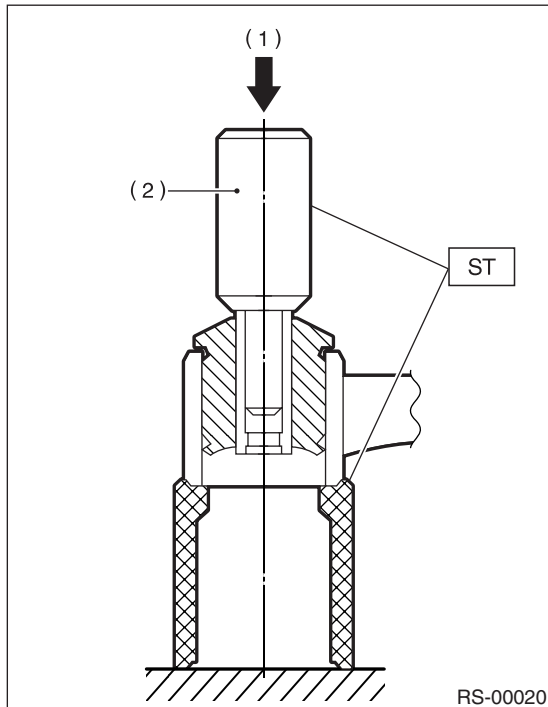
3) Turn the trailing link upside down. Press the ST plunger in the opposite direction that outlines in the former procedure until bushing is correctly positioned in trailing link.



# Rear Trailing Link

REAR SUSPENSION

ST 927730000 INSTALLER & REMOVER SET



- (1) Press
- (2) Plunger

4) Install the housing. <Ref. to DS-28, INSTALLATION, Rear Axle.>

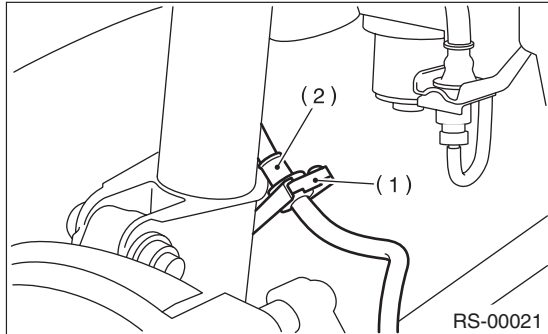
## **E: INSPECTION**

Check the trailing links for bends, corrosion or damage.

## 5. Rear Strut

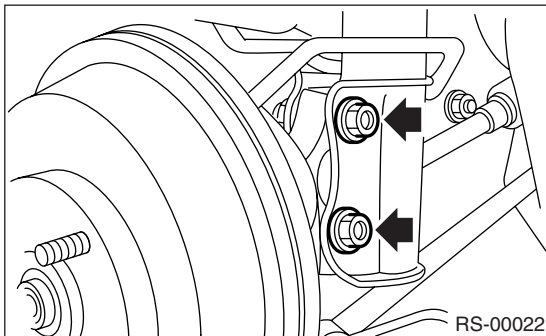
### A: REMOVAL

- 1) Remove the rear seat cushion and backrest. (Sedan model)
- 2) Remove the strut cap of quarter trim. (Wagon model)
- 3) Loosen the rear wheel nuts.
- 4) Lift-up the vehicle, and remove rear wheels.
- 5) Remove the brake hose clip, and then remove the brake hose from rear strut.



- (1) Brake hose clip
- (2) Brake hose

- 6) Remove the bolts which secure the rear strut to housing.



- 7) Remove the nuts securing strut mount to body.

### B: INSTALLATION

- 1) Secure the strut mount to vehicle body using a new self-locking nut.

#### **Tightening torque:**

**20 N·m (2.0 kgf-m, 14.5 ft-lb)**

- 2) Secure the rear strut to housing using a new self-locking nut.

#### **Tightening torque:**

**200 N·m (20.0 kgf-m, 145 ft-lb)**

- 3) Install the brake hose to lower side of strut, then insert the brake hose clip.

#### **CAUTION:**

- Check the hose clip is positioned properly.
- Check the brake hose for twisting, or excessive tension.

- Do not subject the ABS wheel speed sensor harness to excessive tension.

- 4) Lower the vehicle and tighten wheel nut.

#### **Tightening torque:**

**90 N·m (9.2 kgf-m, 66 ft-lb)**

- 5) Install the rear seat backrest and rear seat cushion. (Sedan model)

- 6) Install the strut cap to rear quarter trim. (Wagon model)

#### **NOTE:**

Check the wheel alignment and adjust if necessary.

### C: DISASSEMBLY

For disassembly of rear strut, refer to procedures outlined under front strut as a guide. <Ref. to FS-19, DISASSEMBLY, Front Strut.>

### D: ASSEMBLY

Refer to Front Strut as a guide for assembly procedures. <Ref. to FS-19, ASSEMBLY, Front Strut.>

### E: INSPECTION

Refer to Front Strut as a guide for inspection procedures. <Ref. to FS-20, INSPECTION, Front Strut.>

### F: DISPOSAL

Refer to Front Strut as a guide for disposal procedures. <Ref. to FS-21, DISPOSAL, Front Strut.>

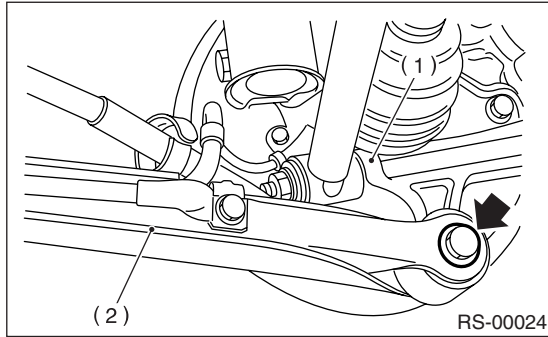
# Lateral link

## REAR SUSPENSION

### 6. Lateral link

#### A: REMOVAL

- 1) Loosen the wheel nuts. Lift-up the vehicle and remove wheel.
- 2) Remove the stabilizers.
- 3) Remove the ABS wheel speed sensor harness from trailing link.
- 4) Remove the bolt securing trailing link to rear housing.

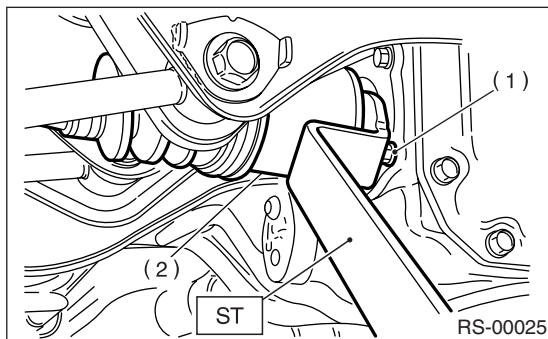


- (1) Rear housing
- (2) Trailing link

- 5) Remove the bolts which secure the lateral link assembly to rear housing.
- 6) Remove the DOJ from rear differential using ST. ST 28099PA100 DRIVE SHAFT REMOVER

#### NOTE:

The side spline shaft snap ring comes out together with the shaft.



- (1) Bolt
- (2) DOJ

#### CAUTION:

Be careful not to damage the side bearing retainer. Always use bolt shown in the figure, as supporting point for ST during removal.

- 7) Scribe an alignment mark on the rear lateral link adjusting bolt and crossmember.
- 8) Remove the bolts securing front and rear lateral links to crossmember, detach lateral links.

#### CAUTION:

To loosen the adjusting bolt, always loosen the nut while holding head of adjusting bolt.

#### B: INSTALLATION

Install in the reverse order of removal. Observe the following instructions.

- Installation of DOJ to differential: <Ref. to DS-42, INSTALLATION, Rear Drive Shaft.>

#### CAUTION:

- Replace the self-locking nut and DOJ snap ring with new ones.
- Always use the special tool not to allow the DOJ splines to damage the side oil seal. ST 28099PA090 OIL SEAL PROTECTOR
- Always tighten the bushing location when tires are in full contact with the ground and vehicle is curb weight.
- Secure the bolt head and tighten the nut when installing the adjusting bolt.

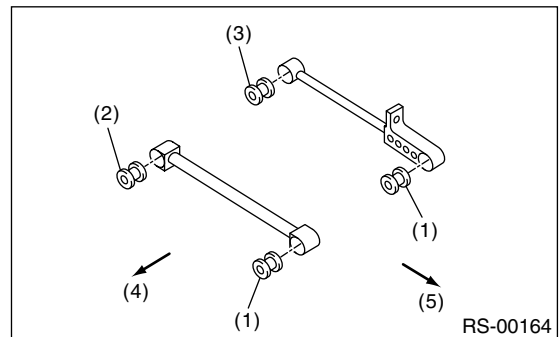
#### NOTE:

Check the wheel alignment and adjust if necessary.

#### C: DISASSEMBLY

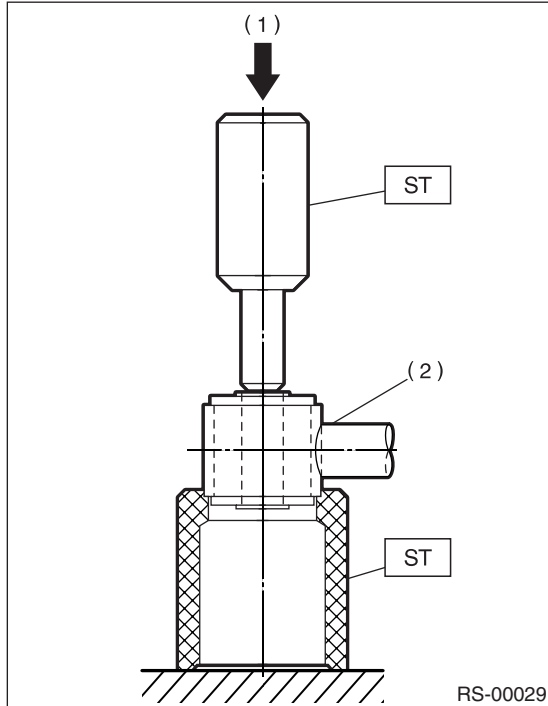
- 1) Using the following table as a guide, verify the type of bushings.
- 2) Select the ST according to type of bushings used.

| Bushing   | ST: INSTALLER & REMOVER SET |
|-----------|-----------------------------|
| Bushing A | 927700000                   |
| Bushing B | 927690000                   |
| Bushing C | 927700000                   |



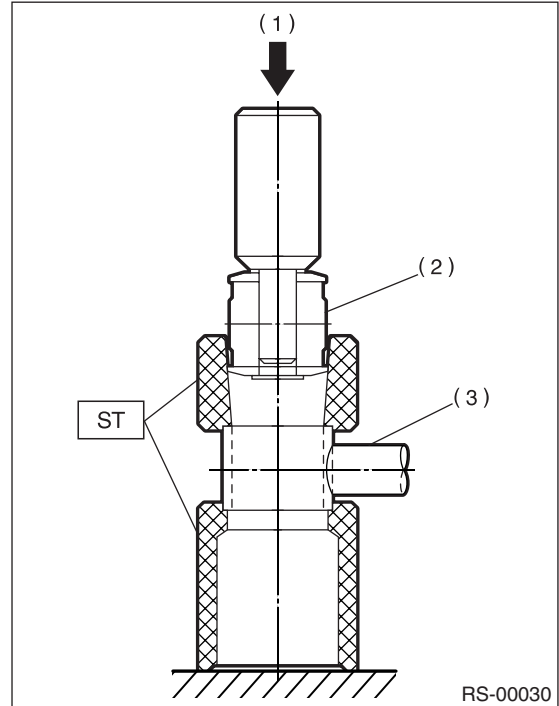
- (1) Bushing A
- (2) Bushing B
- (3) Bushing C
- (4) Front
- (5) Outside of body

3) Using the ST, press the bushing out of place.



- (1) Press
- (2) Lateral link

3) Using the ST, press the bushing into place.



- (1) Press
- (2) Bushing
- (3) Lateral link

## D: ASSEMBLY

- 1) Use the same ST that was used during disassembly.
- 2) If it is difficult to press the bushing into trailing link, apply water-diluted TIRE LUBE to the inner surface of ST as a lubricant.

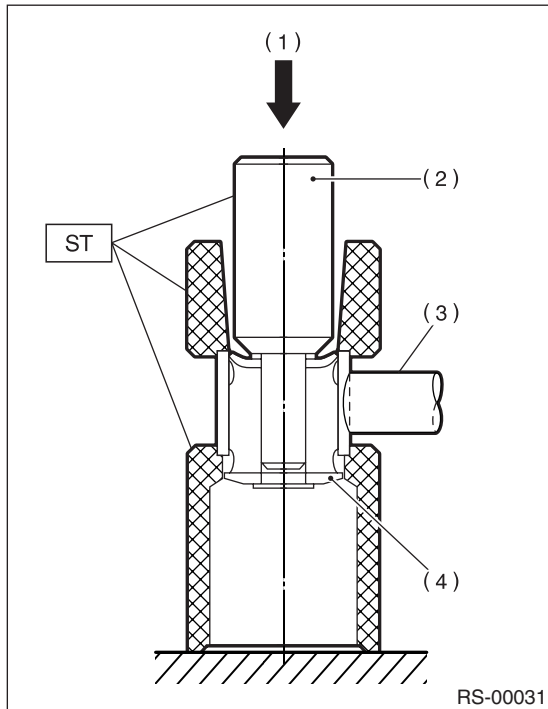
### **Specified lubricant:**

**TIRE LUBE: water = 1: 3**

# Lateral link

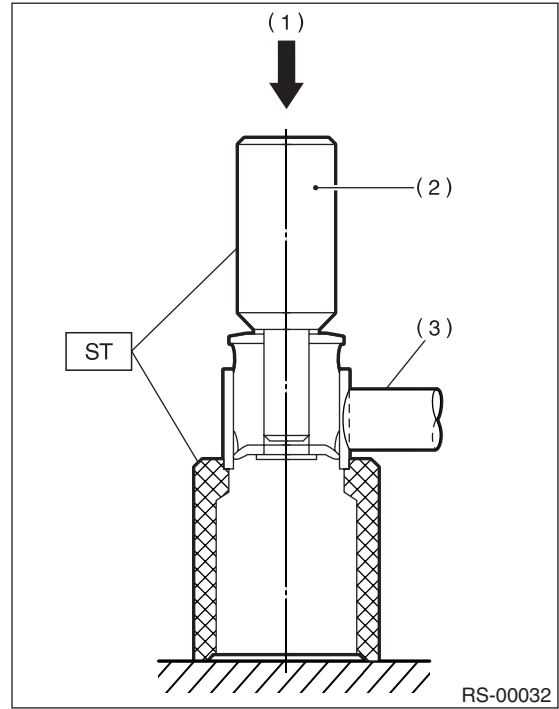
## REAR SUSPENSION

4) Press the ST plunger until bushing flange protrudes beyond lateral link.



- (1) Press
- (2) Plunger
- (3) Lateral link
- (4) Flange

5) Turn the lateral link upside down. Press the ST plunger in opposite direction that outlined in the former procedure until bushing is correctly positioned in trailing link.



- (1) Press
- (2) Plunger
- (3) Lateral link

### E: INSPECTION

Visually check the lateral links for damage or bends.

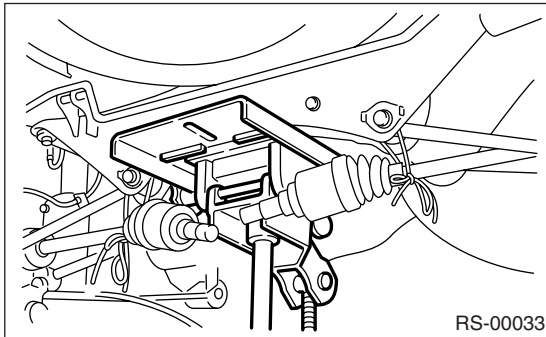
## 7. Rear Crossmember

### A: REMOVAL

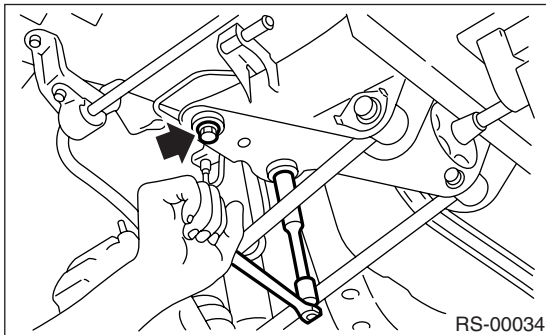
#### CAUTION:

**Do not subject the ABS wheel speed sensor harness to excessive tension.**

- 1) Separate the front exhaust pipe and rear exhaust pipe.
- 2) Remove the rear exhaust pipe and muffler.
  - Non-turbo model  
<Ref. to EX(H4SO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, REMOVAL, Muffler.>
  - Turbo model  
<Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>
- 3) Remove the rear differential. <Ref. to DI-21, REMOVAL, Rear Differential.>
- 4) Place the transmission jack under rear crossmember.



- 5) Remove the bolts securing crossmember to vehicle body, and then remove the crossmember.



- 6) Scribe an alignment mark on the rear lateral link cam bolt and crossmember.
- 7) Remove the front and rear lateral links by loosening nuts.

### B: INSTALLATION

#### NOTE:

- Discard the loosened self-locking nut and replace it with a new one.
- Always secure the bolt head and tighten the nut when tightening the adjusting bolt.

- 1) Install in the reverse order of removal.
- 2) Install the rear differential.  
<Ref. to DI-23, INSTALLATION, Rear Differential.>
- 3) Always tighten the rubber bushing when tires are in full contact with the ground and vehicle is curb weight.
- 4) Check the wheel alignment and adjust if necessary.

### C: INSPECTION

Check the removed parts for wear, damage and cracks, and correct or replace if defective.

# General Diagnostic Table

REAR SUSPENSION

## 8. General Diagnostic Table

### A: INSPECTION

#### 1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

| Possible causes   | Countermeasures            |
|---|----------------------------|
| (1) Permanent distortion or breakage of coil spring       | Replace.                   |
| (2) Irregular operation of damper strut or shock absorber | Replace.                   |
| (3) Installation of wrong strut or shock absorber         | Replace with proper parts. |
| (4) Installation of wrong coil spring                     | Replace with proper parts. |

#### 2. POOR RIDE COMFORT

- 1) Large rebound shock
- 2) Rocking of the vehicle continues too long after running over bump and/or hump
- 3) Large shock in bumping

| Possible causes  | Countermeasures                                   |
|--|---|
| (1) Breakage of coil spring  | Replace.  |
| (2) Overinflating pressure of tire   | Adjust.   |
| (3) Improper wheel arch height   | Adjust or replace the coil springs with new ones. |
| (4) Fault in operation of damper strut or shock absorber                         | Replace.  |
| (5) Large crack or deformation of strut mount or shock absorber mount            | Replace.  |
| (6) Unsuitability of maximum or minimum length of damper strut or shock absorber | Replace with proper parts.                        |
| (7) Large deformation or loss of bushing   | Replace.  |
| (8) Deformation or damage of helper in strut assembly or shock absorber          | Replace.  |
| (9) Oil leakage of damper strut or shock absorber                                | Replace.  |

#### 3. NOISE

| Possible causes  | Countermeasures                    |
|--|------------------------------------|
| (1) Wear or damage of damper strut or shock absorber component parts             | Replace.                           |
| (2) Loosening of suspension link installing bolt                                 | Retighten to the specified torque. |
| (3) Large deformation or loss of bushing   | Replace.                           |
| (4) Unsuitability of maximum or minimum length of damper strut or shock absorber | Replace with proper parts.         |
| (5) Breakage of coil spring  | Replace.                           |
| (6) Wear or damage of ball joint   | Replace.                           |
| (7) Deformation of stabilizer clamp  | Replace.                           |

# WHEEL AND TIRE SYSTEM

# WT

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|                                  | <b>Page</b> |
|----------------------------------|-------------|
| 1. General Description .....     | 2           |
| 2. Tire .....                    | 4           |
| 3. Aluminum Wheel .....          | 5           |
| 4. Wheel Balancing .....         | 6           |
| 5. "T-type" Tire .....           | 8           |
| 6. General Diagnostic Table..... | 9           |



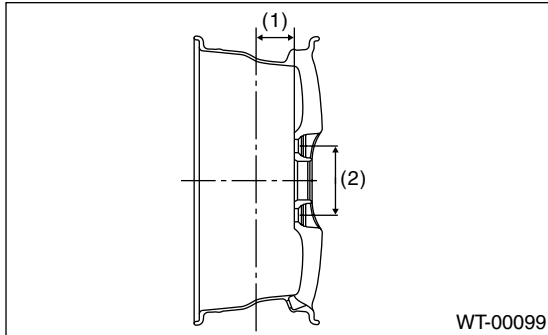
# General Description

## WHEEL AND TIRE SYSTEM

### 1. General Description

#### A: SPECIFICATION

##### 1. WHEEL AND TIRE SIZE



WT-00099

(1) Offset

(2) P.C.D.

| Specification | Tire size             | Wheel size      | Offset<br>mm (in) | P.C.D.<br>mm (in) | Tire inflation pressure<br>kPa (kgf/cm <sup>2</sup> , psi) |               |  |
|---------------|-----------------------|-----------------|-------------------|-------------------|--|---------------|--|
|               |                       |                 |                   |                   | Front wheel  | Rear wheel    |  |
| 2.5i, OUTBACK | 205/55R16 89V         | 16×6 1/2JJ      | 55 (2.17)         | 100 (3.94)        | 230 (2.3, 33)  | 210 (2.1, 30) |  |
| WRX           | 215/45R17 91W         | 17 × 7JJ        | 55 (2.17)         |                   | 230 (2.3, 33)  | 220 (2.2, 32) |  |
| STI           | 225/45R17 90W         | 17 × 8JJ        | 53 (2.09)         | 114.3 (4.50)      | 250 (2.5, 36)  | 210 (2.1, 30) |  |
| "T-type" Tire | 2.5i, OUTBACK,<br>WRX | T135/70D16 100M | 16 × 4T           | 50 (1.97)         | 100 (3.94)   | 420 (4.2, 60) |  |
|               | STI                   | T135/70D17 102M | 17 × 4T           | 40 (1.57)         | 114.3 (4.50)   |               |  |

**NOTE:**

"T-type" tire for temporary use is supplied as a spare tire.

# General Description

WHEEL AND TIRE SYSTEM

## 2. SERVICE DATA

| Item           | Axial runout      | Radial runout |
|----------------|-------------------|---------------|
| Aluminum wheel | 1.0 mm (0.039 in) |               |

## 3. ADJUSTING PARTS

| Wheel balance     | Standard                | Service limit |
|-------------------|-------------------------|---------------|
| Dynamic unbalance | Less than 5 g (0.18 oz) |               |

| Balance weight part number<br>(Knock-on type weight for aluminum wheel) | Weight         |
|---|----------------|
| 28101SA000  | 5 g (0.18 oz)  |
| 28101SA010  | 10 g (0.35 oz) |
| 28101SA020  | 15 g (0.53 oz) |
| 28101SA030  | 20 g (0.71 oz) |
| 28101SA040  | 25 g (0.88 oz) |
| 28101SA100  | 30 g (1.06 oz) |
| 28101SA110  | 35 g (1.23 oz) |
| 28101SA120  | 40 g (1.41 oz) |
| 28101SA130  | 45 g (1.59 oz) |
| 28101SA140  | 50 g (1.76 oz) |
| —   | 55 g (1.94 oz) |
| 28101SA150  | 60 g (2.12 oz) |

| Balance weight part number<br>(Adhesive type weight for aluminum wheel) | Weight           |
|---|------------------|
| 28101AG001  | 5 g (0.18 oz)    |
| 28101AG011  | 7.5 g (0.26 oz)  |
| 28101AG021  | 10 g (0.35 oz)   |
| 28101AG031  | 12.5 g (0.44 oz) |
| 28101AG041  | 15 g (0.53 oz)   |
| 28101AG051  | 17.5 g (0.62 oz) |
| 28101AG061  | 20 g (0.71 oz)   |
| 28101AG071  | 22.5 g (0.79 oz) |
| 28101AG081  | 25 g (0.88 oz)   |
| 28101AG091  | 27.5 g (0.97 oz) |
| 28101AG101  | 30 g (1.06 oz)   |
| 28101AG111  | 32.5 g (1.15 oz) |
| 28101AG121  | 35 g (1.23 oz)   |
| 28101AG131  | 37.5 g (1.32 oz) |
| 28101AG141  | 40 g (1.41 oz)   |
| 28101AG151  | 42.5 g (1.50 oz) |
| 28101AG161  | 45 g (1.59 oz)   |
| 28101AG171  | 47.5 g (1.68 oz) |
| 28101AG181  | 50 g (1.76 oz)   |
| 28101AG191  | 52.5 g (1.85 oz) |
| 28101AG201  | 55 g (1.94 oz)   |
| 28101AG211  | 57.5 g (2.03 oz) |
| 28101AG221  | 60 g (2.12 oz)   |
| 28101AG231  | 62.5 g (2.20 oz) |
| 28101AG241  | 65 g (2.29 oz)   |

| Balance weight part number<br>(Adhesive type weight for aluminum wheel) | Weight           |
|---|------------------|
| 28101AG251  | 67.5 g (2.38 oz) |
| 28101AG261  | 70 g (2.47 oz)   |
| 28101AG271  | 72.5 g (2.56 oz) |
| 28101AG281  | 75 g (2.65 oz)   |
| 28101AG291  | 77.5 g (2.73 oz) |
| 28101AG301  | 80 g (2.82 oz)   |
| 28101AG311  | 82.5 g (2.91 oz) |
| 28101AG321  | 85 g (3.00 oz)   |
| 28101AG331  | 87.5 g (3.09 oz) |
| 28101AG341  | 90 g (3.17 oz)   |
| 28101AG351  | 92.5 g (3.26 oz) |
| 28101AG361  | 95 g (3.35 oz)   |
| 28101AG371  | 97.5 g (3.44 oz) |
| 28101AG381  | 100 g (3.53 oz)  |

## B: PREPARATION TOOL

### 1. GENERAL TOOL

| TOOL NAME          | REMARKS                               |
|--------------------|---------------------------------------|
| Air pressure gauge | Used for measuring tire air pressure. |
| Dial gauge         | Used for measuring wheel runout.      |
| Wheel balancer     | Used for adjusting wheel balance.     |

## 2. Tire

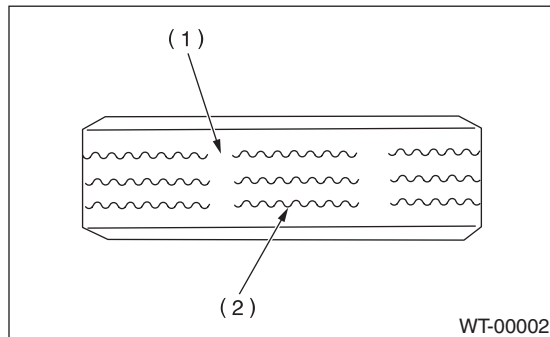
### A: INSPECTION

- 1) Take stone, glass, nail etc. off from tread groove.
- 2) Replace the tire if as follows.

#### CAUTION:

**When replacing a tire, make sure to use only the same size, construction and load range tire as originally installed.**

- (1) When a large crack on the side wall, damage or a crack on tread are found.
- (2) When the "tread wear indicator" appears as a solid band across the tread.

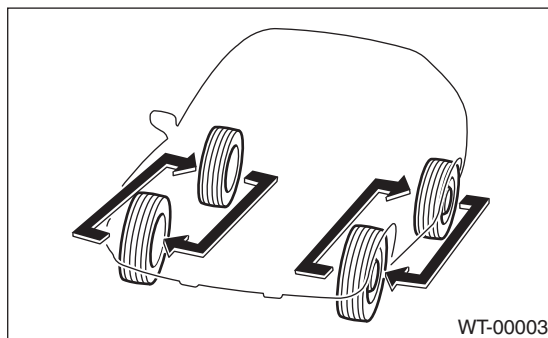


- (1) Tread wear indicator
- (2) Tire tread

- 3) When a crack on tire valve is found, replace the tire valve.

### 1. TIRE ROTATION

Rotate tires periodically (12,500 km/7,500 miles) as shown in the figure, in order to prevent them from uneven wear and to prolong their life.



## 3. Aluminum Wheel

### A: REMOVAL

- 1) Apply parking brake, and position the select lever or shift lever to "P" range (AT model) or "1st gear" (MT model).
- 2) Set jacks or a lift to the specified point, and support the vehicle with its tires slightly contacting the floor.
- 3) Loosen the wheel nuts.
- 4) Raise the vehicle until its tires take off the ground using a jack or a lift.
- 5) Remove the wheel nuts and wheels.

**NOTE:**

- While removing the wheels, prevent the hub bolts from damage.
- Place the wheels with their outer sides facing upward to prevent the wheels from damage.

### B: INSTALLATION

- 1) Remove dirt from the mating surface of wheel and brake rotor.
- 2) Attach the wheel to hub by aligning the wheel bolt hole with hub bolt.
- 3) Temporarily attach the wheel nuts to hub bolts, using SUBARU genuine wheel nut.
- 4) Manually tighten the nuts making sure the wheel hub hole is aligned correctly to guide portion of hub.
- 5) Tighten the wheel nuts in a diagonal selection to specified torque. Use a wheel nut wrench.

**Wheel nut tightening torque:**  
**90 N·m (9.1 kgf·m, 65.7 ft·lb)**

**CAUTION:**

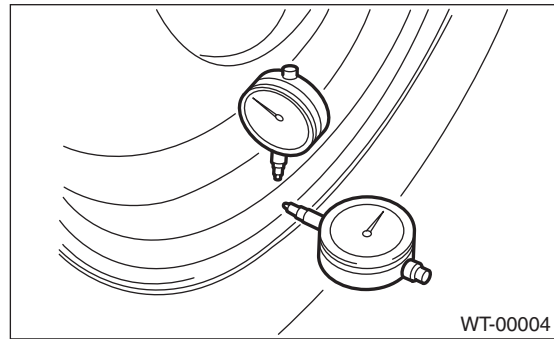
- Tighten the wheel nuts in two or three steps by gradually increasing the torque and working diagonally, until the specified torque is reached.
- Do not depress the wrench with foot; Always use both hands when tightening.
- Make sure the bolt, nut and nut seating surface of the wheel are free from oils.

6) If a wheel is removed for replacement or for repair of a puncture, retighten the wheel nuts to the specified torque after running 1,000 km (600 miles).

### C: INSPECTION

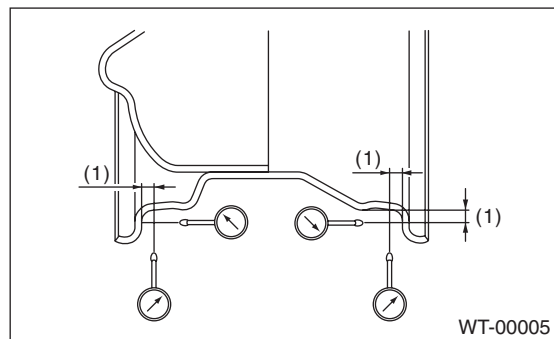
- 1) Deformation or damage on the rim can cause air leakage. Check the rim flange for deformation, crack or damage, and repair or replace as necessary.
- 2) Jack-up the vehicle until tires clear the floor.

3) Slowly rotate the wheel to check the rim "runout" using a dial gauge.



| Axial runout limit | Radial runout limit |
|--------------------|---------------------|
| 1.0 mm (0.039 in)  |                     |

4) If the rim runout exceeds specifications, remove the tire from rim and check runout while attaching the dial gauge to positions shown in the figure.



(1) Approx. 7 mm (0.28 in)

5) If the measured runout still exceeds specifications, replace the wheel.

### D: CAUTION

Aluminum wheels are easily scratched. To maintain their appearance and safety, do the following:

- 1) Do not damage the aluminum wheels during removal, installation, wheel balancing, etc. After removing, place them on a rubber mat, etc.
- 2) While the vehicle is being driven, be careful not to ride over sharp obstacles or allow the wheels to contact the shoulder of road.
- 3) When installing a tire chain, be sure to install it properly not to have slack; otherwise it may hit the wheel while driving.
- 4) When washing the aluminum wheel, use neutral synthetic detergent and water. Avoid using the cleanser including abrasive, hard brushes or an automatic car washer.

# Wheel Balancing

## WHEEL AND TIRE SYSTEM

### 4. Wheel Balancing

#### A: REPLACEMENT

##### 1. STICK-ON TYPE BALANCE WEIGHT

- 1) Remove balance weights.
- 2) Using dynamic balancing, measure wheel balance.
- 3) Select a weight close to the value measured by dynamic balancing.

| Balance weight part number<br>(Knock-on type weight for aluminum wheel) | Weight         |
|---|----------------|
| 28101SA000  | 5 g (0.18 oz)  |
| 28101SA010  | 10 g (0.35 oz) |
| 28101SA020  | 15 g (0.53 oz) |
| 28101SA030  | 20 g (0.71 oz) |
| 28101SA040  | 25 g (0.88 oz) |
| 28101SA100  | 30 g (1.06 oz) |
| 28101SA110  | 35 g (1.23 oz) |
| 28101SA120  | 40 g (1.41 oz) |
| 28101SA130  | 45 g (1.59 oz) |
| 28101SA140  | 50 g (1.76 oz) |
| —   | 55 g (1.94 oz) |
| 28101SA150  | 60 g (2.12 oz) |

- 4) Install the selected weight to the point designated by dynamic balancing.
- 5) Using dynamic balancing, measure wheel balance again. Check that wheel balance is correctly adjusted.

##### 2. PASTE-ON TYPE BALANCE WEIGHT

- 1) Remove balance weights.
- 2) Remove traces of two-sided tape on wheel and clean adhesive layer.
- 3) Set balancing (dynamic balancing for stick-on balance weight is available) and measure wheel balance.

| Balance weight part number<br>(Adhesive type weight for aluminum wheel) | Weight           |
|---|------------------|
| 28101AG001  | 5 g (0.18 oz)    |
| 28101AG011  | 7.5 g (0.26 oz)  |
| 28101AG021  | 10 g (0.35 oz)   |
| 28101AG031  | 12.5 g (0.44 oz) |
| 28101AG041  | 15 g (0.53 oz)   |
| 28101AG051  | 17.5 g (0.62 oz) |
| 28101AG061  | 20 g (0.71 oz)   |
| 28101AG071  | 22.5 g (0.79 oz) |
| 28101AG081  | 25 g (0.88 oz)   |
| 28101AG091  | 27.5 g (0.97 oz) |
| 28101AG101  | 30 g (1.06 oz)   |
| 28101AG111  | 32.5 g (1.15 oz) |

| Balance weight part number<br>(Adhesive type weight for aluminum wheel) | Weight           |
|---|------------------|
| 28101AG121  | 35 g (1.23 oz)   |
| 28101AG131  | 37.5 g (1.32 oz) |
| 28101AG141  | 40 g (1.41 oz)   |
| 28101AG151  | 42.5 g (1.50 oz) |
| 28101AG161  | 45 g (1.59 oz)   |
| 28101AG171  | 47.5 g (1.68 oz) |
| 28101AG181  | 50 g (1.76 oz)   |
| 28101AG191  | 52.5 g (1.85 oz) |
| 28101AG201  | 55 g (1.94 oz)   |
| 28101AG211  | 57.5 g (2.03 oz) |
| 28101AG221  | 60 g (2.12 oz)   |
| 28101AG231  | 62.5 g (2.20 oz) |
| 28101AG241  | 65 g (2.29 oz)   |
| 28101AG251  | 67.5 g (2.38 oz) |
| 28101AG261  | 70 g (2.47 oz)   |
| 28101AG271  | 72.5 g (2.56 oz) |
| 28101AG281  | 75 g (2.65 oz)   |
| 28101AG291  | 77.5 g (2.73 oz) |
| 28101AG301  | 80 g (2.82 oz)   |
| 28101AG311  | 82.5 g (2.91 oz) |
| 28101AG321  | 85 g (3.00 oz)   |
| 28101AG331  | 87.5 g (3.09 oz) |
| 28101AG341  | 90 g (3.17 oz)   |
| 28101AG351  | 92.5 g (3.26 oz) |
| 28101AG361  | 95 g (3.35 oz)   |
| 28101AG371  | 97.5 g (3.44 oz) |
| 28101AG381  | 100 g (3.53 oz)  |

- 4) Select a weight close to the calculated value, clean the point designated by balancing and paste on the weight there.

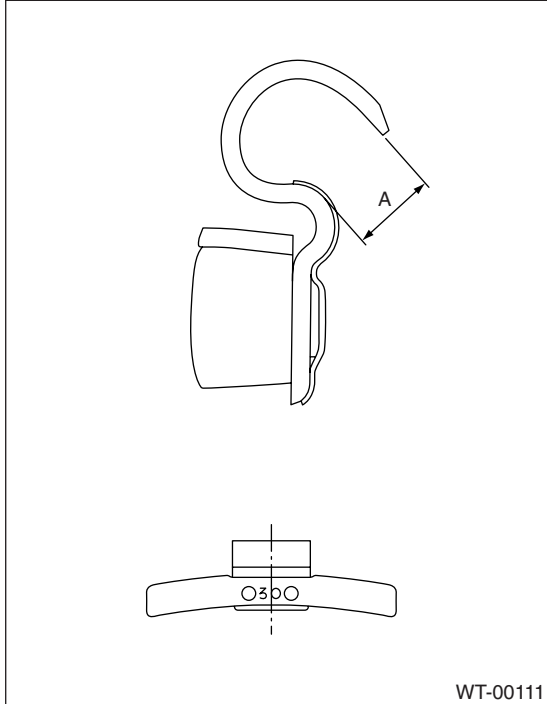
#### CAUTION:

- Press on the weight for more than 2 seconds with a force of 25 N·m (2.6 kgf-m, 18 ft-lb) or more per 5 g (0.18 oz) to paste on.
- Adjust weight balance from outside first and then inside.
- The weight to be pasted on must be under 100 g (3.53 oz).

#### B: INSPECTION

- 1) Proper wheel balance may be lost if the tire is repaired or if it wears. Check the tire for dynamic balance, and repair as necessary.
- 2) To check for dynamic balance, use a dynamic balancer. Drive in the balance weight on both the top and rear sides of the rim.
- 3) Some types of balancer can cause damage to the wheel. Use an appropriate balancer when adjusting the wheel balance.

4) Use genuine balance weights.



WT-00111

**Service limit A:**  
**5.0 mm (0.20 in)**

### 5. “T-type” Tire

#### A: NOTE

“T-type” tire for temporary use is prepared as a spare tire.

#### CAUTION:

- Do not use a tire chain with the “T-type” tire. Because of the smaller tire size, a tire chain will not fit properly and will result in damage to the vehicle and the tire.
- Do not drive at a speed greater than 80 km/h (50 MPH).
- Drive as slowly as possible and avoid passing over bumps.

#### B: REPLACEMENT

Refer to Aluminum Wheel for removal and installation of “T-type” tires. <Ref. to WT-5, Aluminum Wheel.>

#### CAUTION:

Replace with a conventional tire as soon as possible since the “T-type” tire is only for temporary use.

#### C: INSPECTION

1) Check the tire inflation pressure.

##### *Specification:*

***420 kPa (4.2 kgf/cm<sup>2</sup>, 60 psi)***

2) Take stones, glass, nails, etc. out of the tread groove.

3) Check the tires for deformation, cracks, partial or over limit wear.

#### CAUTION:

Replace the tire with a new one.

## 6. General Diagnostic Table

### A: INSPECTION

| Symptom            | Possible cause                    | Remedy   |
|--------------------|-----------------------------------|--|
| Front wheel shimmy | Worn or improperly inflated tire. | In case of worn tire, replace the tire.<br>In case of improperly inflated tire, adjust the tire air pressure properly. |
|                    | Wheel is out of balance.          | Adjustment.  |
| Abnormal tire wear | Improperly inflated tire.         | Replace.   |
| Sways/pitches      | Worn or improperly inflated tire. | In case of worn tire, replace the tire.<br>In case of improperly inflated tire, adjust the tire air pressure properly. |
| Sways/shimmies     | Worn or improperly inflated tire. | In case of worn tire, replace the tire.<br>In case of improperly inflated tire, adjust the tire air pressure properly. |



# General Diagnostic Table

WHEEL AND TIRE SYSTEM

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# DIFFERENTIALS

***DI***

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# General Description

## DIFFERENTIALS

### 1. General Description

#### A: SPECIFICATION

When replacing a rear differential assembly, select the correct one according to the following table.

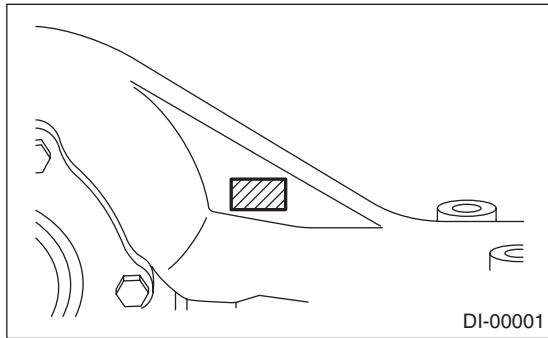
**NOTE:**

Using the different rear differential assembly causes the drive line and tires to “drag” or emit noise when AWD is selected.

| Model                             | 2.5i, OUTBACK                 |               |              | WRX                   |               |
|-----------------------------------|-------------------------------|---------------|--------------|-----------------------|---------------|
|                                   | AT                            | MT            |              | AT                    | MT            |
| Rear differential type            | T-type model without LSD      |               |              | T-type model with LSD |               |
| LSD type                          | —                             |               |              | Viscous coupling      |               |
| Identification                    | EH                            | EG            |              | P1                    | ER            |
| Type of gear                      | Hypoid gear                   |               |              |                       |               |
| Gear ratio (Number of gear teeth) | 4.111 (37/9)                  | 3.900 (39/10) | 4.111 (37/9) | 3.900 (39/10)         | 3.700 (37/10) |
| Oil capacity                      | 0.8 ℓ (0.8 US qt, 0.7 Imp qt) |               |              |                       |               |
| Rear differential gear oil        | GL-5                          |               |              |                       |               |

| Model                             | STI                           |
|-----------------------------------|-------------------------------|
|                                   | 6MT                           |
| Rear differential type            | T-type model with LSD         |
| LSD type                          | Mechanical                    |
| Identification                    | HX                            |
| Type of gear                      | Hypoid gear                   |
| Gear ratio (Number of gear teeth) | 3.545 (39/11)                 |
| Oil capacity                      | 1.0 ℓ (1.1 US qt, 0.9 Imp qt) |
| Rear differential gear oil        | GL-5 (For mechanical LSD)     |

• **Identification**

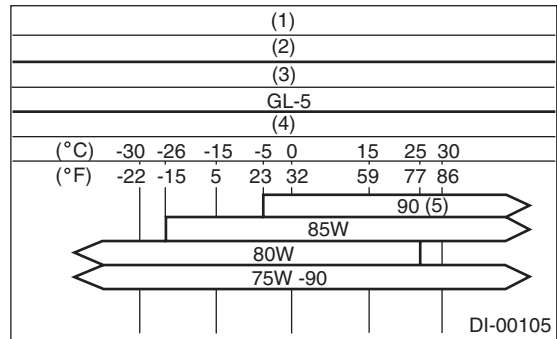


• **Rear differential gear oil**

Recommended oil

**CAUTION:**

Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.



- (1) Item
- (2) Differential gear oil
- (3) API Standard
- (4) SAE viscosity No. and application temperature
- (5) STI model

# General Description

DIFFERENTIALS

## 1. SERVICE DATA

|  |              |                  |                                    |
|--|--------------|------------------|------------------------------------|
| Drive pinion bearing preload at companion flange bolt hole | N (kgf, lbf) | Except STI model | 17.7 — 38.8 (1.8 — 4.0, 4.0 — 8.7) |
|  |              | STI model        | 24.1 — 38.6 (2.5 — 3.9, 5.4 — 8.7) |
| Side gear backlash   |              | mm (in)          | 0.10 — 0.20 (0.004 — 0.008)        |
| Side bearing standard width                                |              | mm (in)          | 20.00 (0.7874)                     |
| Hypoid driven gear to drive pinion backlash                |              | mm (in)          | 0.10 — 0.20 (0.004 — 0.008)        |
| Hypoid driven gear runout on its back surface              |              | mm (in)          | Less than 0.05 (0.0020)            |

## 2. ADJUSTING PARTS

### • Except STI model

|  |              |                                    |                |
|--|--------------|------------------------------------|----------------|
| Drive pinion bearing preload at companion flange bolt hole | N (kgf, lbf) | 17.7 — 38.8 (1.8 — 4.0, 4.0 — 8.7) |                |
| Preload adjusting spacer                                   |              | Part No.                           | Length mm (in) |
|  |              | 383695201                          | 56.2 (2.213)   |
|  |              | 383695202                          | 56.4 (2.220)   |
|  |              | 383695203                          | 56.6 (2.228)   |
|  |              | 383695204                          | 56.8 (2.236)   |
|  |              | 383695205                          | 57.0 (2.244)   |
|  |              | 383695206                          | 57.2 (2.252)   |
| Preload adjusting washer                                   |              | Part No.                           | Length mm (in) |
|  |              | 383705200                          | 2.59 (0.1020)  |
|  |              | 383715200                          | 2.57 (0.1012)  |
|  |              | 383725200                          | 2.55 (0.1004)  |
|  |              | 383735200                          | 2.53 (0.0996)  |
|  |              | 383745200                          | 2.51 (0.0988)  |
|  |              | 383755200                          | 2.49 (0.0980)  |
|  |              | 383765200                          | 2.47 (0.0972)  |
|  |              | 383775200                          | 2.45 (0.0965)  |
|  |              | 383785200                          | 2.43 (0.0957)  |
|  |              | 383795200                          | 2.41 (0.0949)  |
|  |              | 383805200                          | 2.39 (0.0941)  |
|  |              | 383815200                          | 2.37 (0.0933)  |
|  |              | 383825200                          | 2.35 (0.0925)  |
|  | 383835200    | 2.33 (0.0917)                      |                |
|  | 383845200    | 2.31 (0.0909)                      |                |

# General Description

## DIFFERENTIALS

|  |   |                               |                             |
|--|---|-------------------------------|-----------------------------|
| Pinion height adjusting washer                 | Part No.                                      | Thickness mm (in)             |                             |
|  | 383495200                                     | 3.09 (0.1217)                 |                             |
|  | 383505200                                     | 3.12 (0.1228)                 |                             |
|  | 383515200                                     | 3.15 (0.1240)                 |                             |
|  | 383525200                                     | 3.18 (0.1252)                 |                             |
|  | 383535200                                     | 3.21 (0.1264)                 |                             |
|  | 383545200                                     | 3.24 (0.1276)                 |                             |
|  | 383555200                                     | 3.27 (0.1287)                 |                             |
|  | 383565200                                     | 3.30 (0.1299)                 |                             |
|  | 383575200                                     | 3.33 (0.1311)                 |                             |
|  | 383585200                                     | 3.36 (0.1323)                 |                             |
|  | 383595200                                     | 3.39 (0.1335)                 |                             |
|  | 383605200                                     | 3.42 (0.1346)                 |                             |
|  | 383615200                                     | 3.45 (0.1358)                 |                             |
|  | 383625200                                     | 3.48 (0.1370)                 |                             |
|  | 383635200                                     | 3.51 (0.1382)                 |                             |
|  | 383645200                                     | 3.54 (0.1394)                 |                             |
|  | 383655200                                     | 3.57 (0.1406)                 |                             |
|  | 383665200                                     | 3.60 (0.1417)                 |                             |
|  | 383675200                                     | 3.63 (0.1429)                 |                             |
| 383685200                                      | 3.66 (0.1441)                                 |                               |                             |
| Side gear backlash                             | mm (in)                                       | 0.1 — 0.2 (0.004 — 0.008)     |                             |
| Side gear thrust washer<br>(Model without LSD) | Part No.                                      | Thickness mm (in)             |                             |
|  | 383445201                                     | 0.75 — 0.80 (0.0295 — 0.0315) |                             |
|  | 383445202                                     | 0.80 — 0.85 (0.0315 — 0.0335) |                             |
|  | 383445203                                     | 0.85 — 0.90 (0.0335 — 0.0354) |                             |
| Side bearing standard width                    | mm (in)                                       | —<br>20.00 (0.7874)           |                             |
| Side bearing retainer shim                     | Part No.                                      | Thickness mm (in)             |                             |
|  | 383475201                                     | 0.20 (0.0079)                 |                             |
|  | 383475202                                     | 0.25 (0.0098)                 |                             |
|  | 383475203                                     | 0.30 (0.0118)                 |                             |
|  | 383475204                                     | 0.40 (0.0157)                 |                             |
|  | 383475205                                     | 0.50 (0.0197)                 |                             |
| Limit  | Hypoid driven gear to drive pinion backlash   | —                             | 0.10 — 0.20 (0.004 — 0.008) |
|  | Hypoid driven gear runout on its back surface |                               | 0.05 (0.0020)               |

• **STI model**

|  |              |                                    |
|--|--------------|------------------------------------|
| Drive pinion bearing preload at companion flange bolt hole | N (kgf, lbf) | 24.1 — 38.6 (2.5 — 3.9, 5.4 — 8.7) |
| Preload adjusting spacer                                   | Part No.     | Length mm (in)                     |
|  | 31454AA130   | 52.2 (2.055)                       |
|  | 31454AA140   | 52.4 (2.063)                       |
|  | 31454AA150   | 52.6 (2.071)                       |
|  | 31454AA160   | 52.8 (2.079)                       |
|  | 31454AA170   | 53.0 (2.087)                       |
|  | 31454AA180   | 53.2 (2.094)                       |

# General Description

DIFFERENTIALS

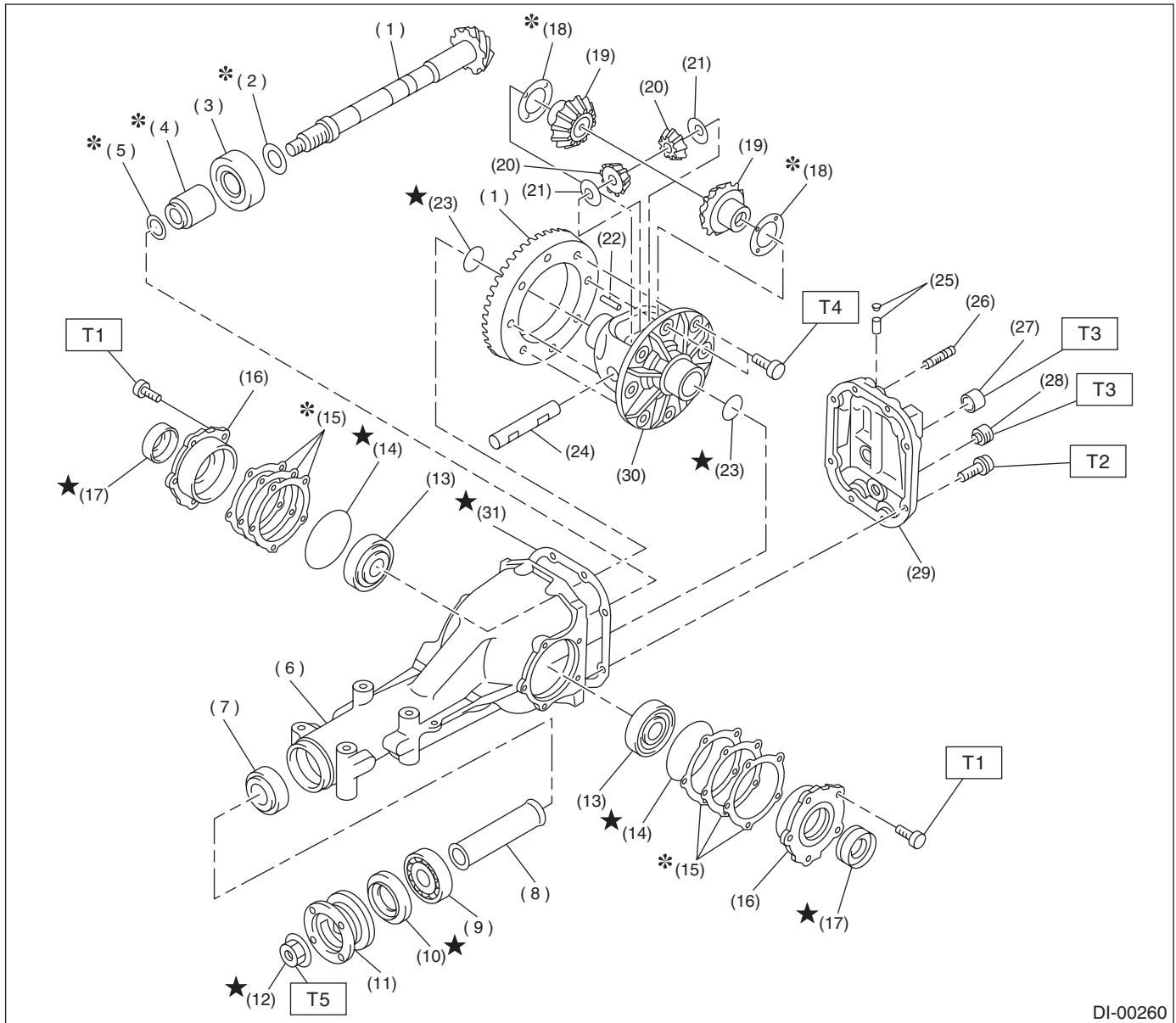
|                             |               |   |                             |
|-----------------------------|---------------|---|-----------------------------|
| Preload adjusting washer    |               | Part No.                                      | Length mm (in)              |
|                             |               | 383705200                                     | 2.59 (0.1020)               |
|                             |               | 383715200                                     | 2.57 (0.1012)               |
|                             |               | 383725200                                     | 2.55 (0.1004)               |
|                             |               | 383735200                                     | 2.53 (0.0996)               |
|                             |               | 383745200                                     | 2.51 (0.0988)               |
|                             |               | 383755200                                     | 2.49 (0.0980)               |
|                             |               | 383765200                                     | 2.47 (0.0972)               |
|                             |               | 383775200                                     | 2.45 (0.0965)               |
|                             |               | 383785200                                     | 2.43 (0.0957)               |
|                             |               | 383795200                                     | 2.41 (0.0949)               |
|                             |               | 383805200                                     | 2.39 (0.0941)               |
|                             |               | 383815200                                     | 2.37 (0.0933)               |
|                             |               | 383825200                                     | 2.35 (0.0925)               |
|                             |               | 383835200                                     | 2.33 (0.0917)               |
|                             |               | 383845200                                     | 2.31 (0.0909)               |
|                             |               | Pinion height adjusting washer                |                             |
| 38336AA230                  | 3.09 (0.1217) |   |                             |
| 38336AA240                  | 3.12 (0.1228) |   |                             |
| 38336AA250                  | 3.15 (0.1240) |   |                             |
| 38336AA260                  | 3.18 (0.1252) |   |                             |
| 38336AA270                  | 3.21 (0.1264) |   |                             |
| 38336AA280                  | 3.24 (0.1276) |   |                             |
| 38336AA290                  | 3.27 (0.1287) |   |                             |
| 38336AA300                  | 3.30 (0.1299) |   |                             |
| 38336AA310                  | 3.33 (0.1311) |   |                             |
| 38336AA320                  | 3.36 (0.1323) |   |                             |
| 38336AA330                  | 3.39 (0.1335) |   |                             |
| 38336AA340                  | 3.42 (0.1346) |   |                             |
| 38336AA350                  | 3.45 (0.1358) |   |                             |
| 38336AA360                  | 3.48 (0.1370) |   |                             |
| 38336AA370                  | 3.51 (0.1382) |   |                             |
| 38336AA380                  | 3.54 (0.1394) |   |                             |
| 38336AA390                  | 3.57 (0.1406) |   |                             |
| 38336AA400                  | 3.60 (0.1417) |   |                             |
| 38336AA410                  | 3.63 (0.1429) |   |                             |
| 38336AA420                  | 3.66 (0.1441) |   |                             |
| Side bearing standard width |               | mm (in)                                       | 20.00 (0.7874)              |
| Side bearing retainer shim  |               | Part No.                                      | Thickness mm (in)           |
|                             |               | 383475201                                     | 0.20 (0.0079)               |
|                             |               | 383475202                                     | 0.25 (0.0098)               |
|                             |               | 383475203                                     | 0.30 (0.0118)               |
|                             |               | 383475204                                     | 0.40 (0.0157)               |
|                             |               | 383475205                                     | 0.50 (0.0197)               |
| Limit                       | mm (in)       | Hypoid driven gear to drive pinion backlash   | 0.10 — 0.20 (0.004 — 0.008) |
|                             |               | Hypoid driven gear runout on its back surface | 0.05 (0.0020)               |

# General Description

## DIFFERENTIALS

### B: COMPONENT

#### 1. REAR DIFFERENTIAL WITHOUT LSD



DI-00260

- |                                      |                                 |                        |
|--------------------------------------|---------------------------------|------------------------|
| (1) Driven gear and drive pinion set | (14) O-ring                     | (27) Oil filler plug   |
| (2) Pinion height adjusting washer   | (15) Side bearing retainer shim | (28) Oil drain plug    |
| (3) Rear bearing                     | (16) Side bearing retainer      | (29) Rear cover        |
| (4) Bearing preload adjusting spacer | (17) Side oil seal              | (30) Differential case |
| (5) Bearing preload adjusting washer | (18) Side gear thrust washer    | (31) Gasket            |
| (6) Differential carrier             | (19) Side gear                  |                        |
| (7) Front bearing                    | (20) Pinion mate gear           |                        |
| (8) Spacer                           | (21) Pinion mate gear washer    |                        |
| (9) Pilot bearing                    | (22) Pinion shaft lock pin      |                        |
| (10) Front oil seal                  | (23) Snap ring                  |                        |
| (11) Companion flange                | (24) Pinion mate shaft          |                        |
| (12) Self-locking nut                | (25) Air breather cap           |                        |
| (13) Side bearing                    | (26) Stud bolt                  |                        |

#### **Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 10.5 (1.1, 7.7)**

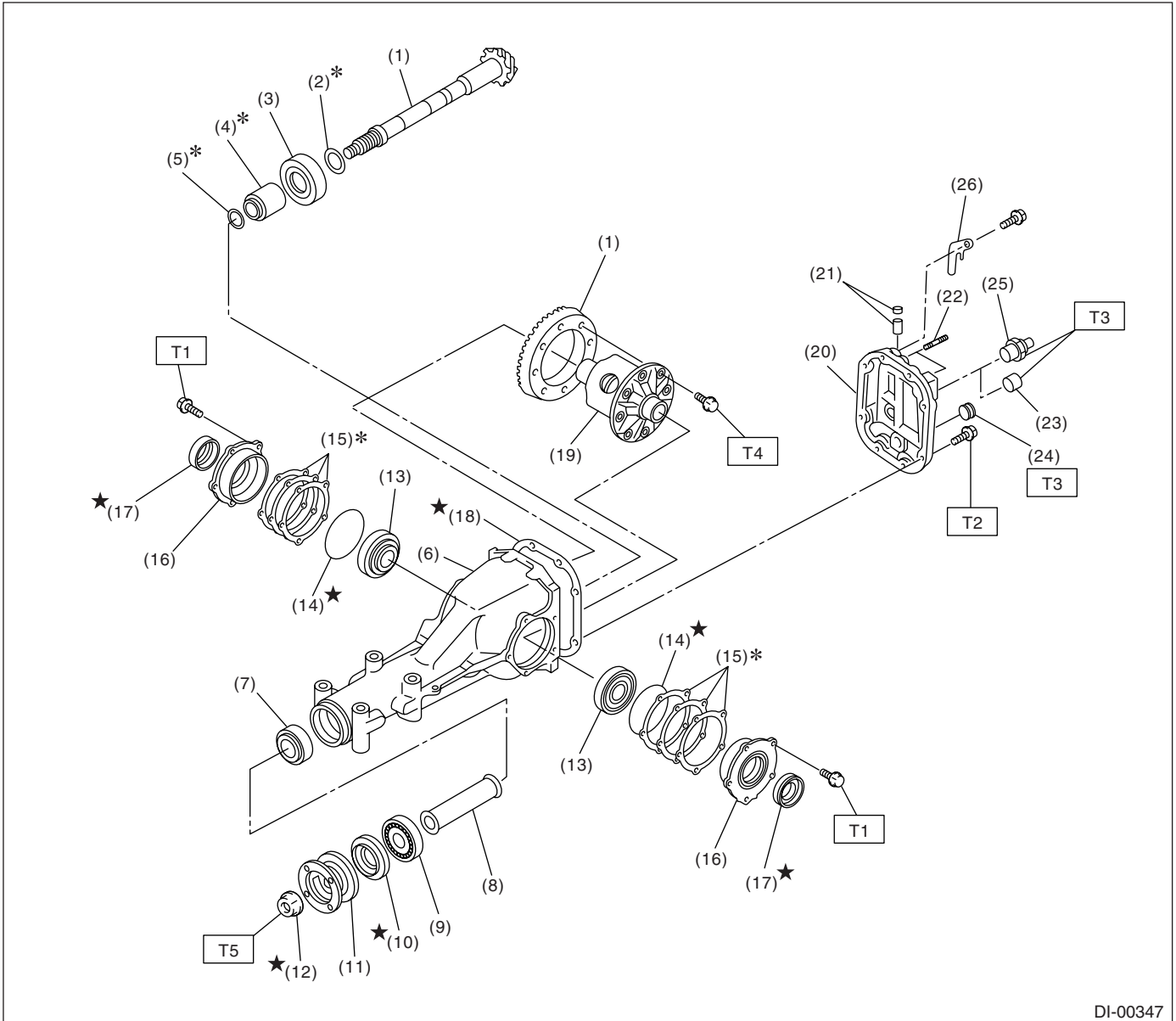
**T2: 29.5 (3.0, 21.8)**

**T3: 49 (5.0, 36.2)**

**T4: 103 (10.5, 76)**

**T5: 181.5 (18.5, 134)**

## 2. REAR DIFFERENTIAL WITH LSD



DI-00347

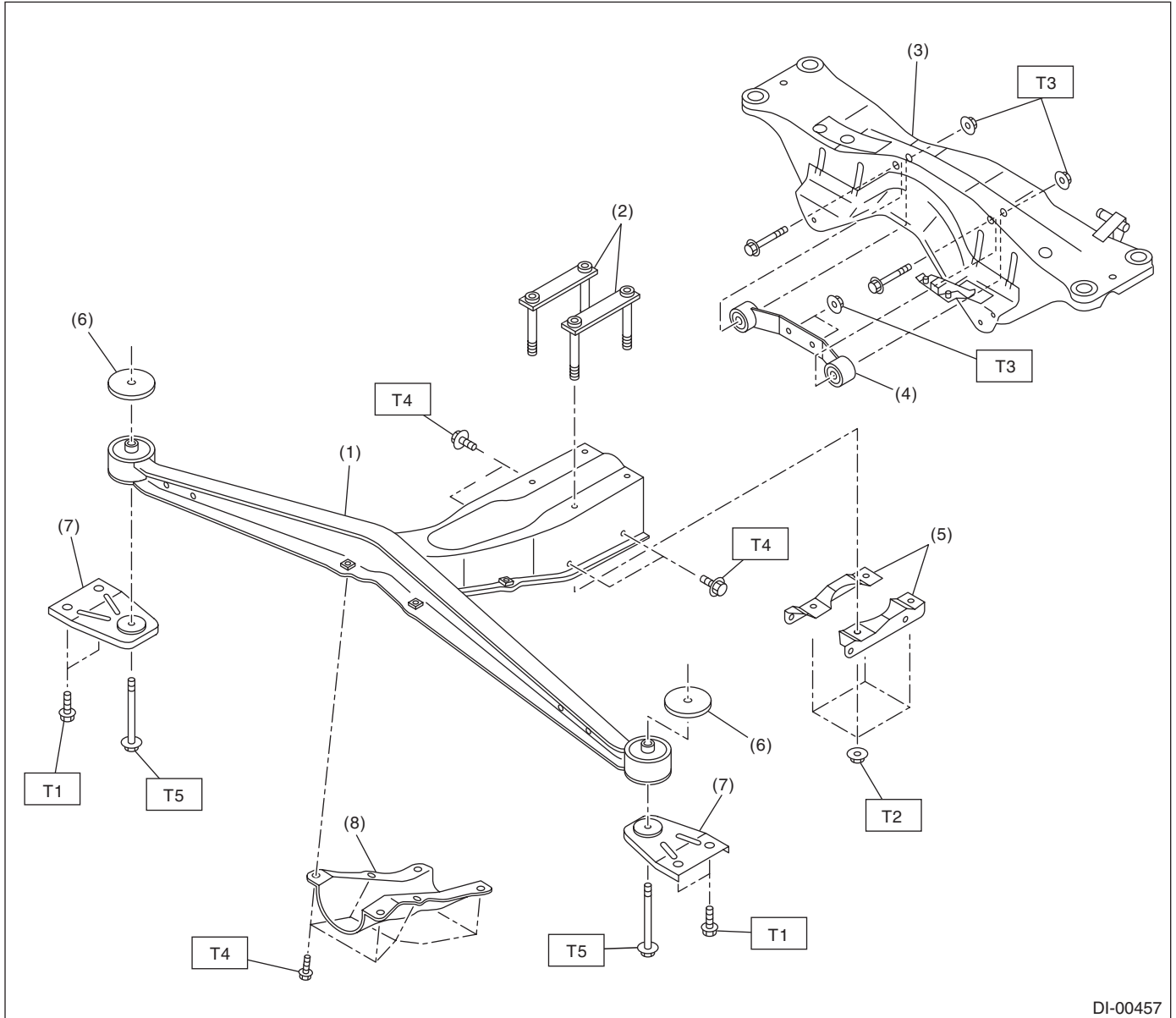
- |   |  |   |
|---|--|---|
| <p>(1) Driven gear and drive pinion set</p> <p>(2) Pinion height adjusting washer</p> <p>(3) Rear bearing</p> <p>(4) Bearing preload adjusting spacer</p> <p>(5) Bearing preload adjusting washer</p> <p>(6) Differential carrier</p> <p>(7) Front bearing</p> <p>(8) Collar</p> <p>(9) Pilot bearing</p> <p>(10) Front oil seal</p> <p>(11) Companion flange</p> <p>(12) Self-locking nut</p> <p>(13) Side bearing</p> | <p>(14) O-ring</p> <p>(15) Side bearing retainer shim</p> <p>(16) Side bearing retainer</p> <p>(17) Side oil seal</p> <p>(18) Gasket</p> <p>(19) Differential case (Viscous coupling type) (Except STI model)</p> <p style="padding-left: 20px;">Differential case (Mechanical type) (STI model)</p> <p>(20) Rear cover</p> <p>(21) Air breather cap</p> <p>(22) Stud bolt</p> <p>(23) Oil filler plug</p> | <p>(24) Oil drain plug</p> <p>(25) Oil filler plug (Rear differential oil temperature switch) (STI model)</p> <p>(26) Stay ground (STI model)</p> |
|---|--|---|
- 
- |  |  |  |
|--|--|--|
| <b>Tightening torque: N·m (kgf·m, ft·lb)</b> |  |  |
| <b>T1:</b>                                   | <b>10.5 (1.1, 7.7)</b>                     |  |
| <b>T2:</b>                                   | <b>29.5 (3.0, 21.8) (Except STI model)</b> |  |
|  | <b>44 (4.5, 32.5) (STI model)</b>          |  |
| <b>T3:</b>                                   | <b>49 (5.0, 36.2)</b>                      |  |
| <b>T4:</b>                                   | <b>103 (10.5, 76)</b>                      |  |
| <b>T5:</b>                                   | <b>181.5 (18.5, 134)</b>                   |  |



# General Description

## DIFFERENTIALS

### 3. REAR DIFFERENTIAL MOUNTING SYSTEM



- |                                      |                                    |
|--------------------------------------|------------------------------------|
| (1) Differential front member        | (7) Differential mount bracket     |
| (2) Plate                            | (8) Differential mount front cover |
| (3) Crossmember                      |                                    |
| (4) Differential rear member         |                                    |
| (5) Differential mount lower bracket |                                    |
| (6) Stopper                          |                                    |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 33 (3.4, 24.3)**

**T2: 50 (5.1, 36.9)**

**T3: 70 (7.1, 51.6)**

**T4: 90 (9.2, 66.4)**

**T5: 100 (10.2, 73.8)**

### **C: CAUTION**

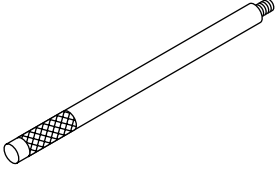
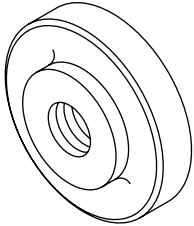
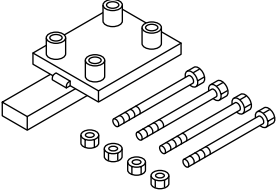
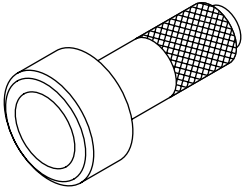
- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply gear oil onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of gear oil to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Avoid damaging the mating face of the case.

# General Description

## DIFFERENTIALS

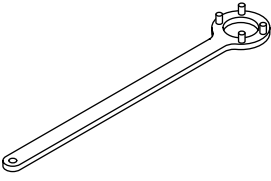
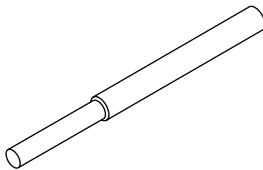
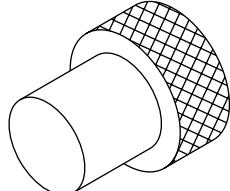
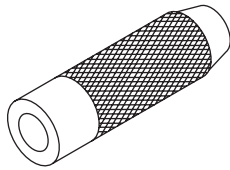
### D: PREPARATION TOOL

#### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION    | REMARKS  |
|---|-------------|----------------|--|
| <br>ST-398477701   | 398477701   | HANDLE         | Used for installing front and rear bearing cone.                         |
| <br>ST-398477702  | 398477702   | DRIFT          | Used for press-fitting the bearing race (front) of differential carrier. |
| <br>ST-398217700 | 398217700   | ATTACHMENT SET | Stand for rear differential carrier disassembly and assembly.            |
| <br>ST-498447120 | 498447120   | INSTALLER      | Used for installing front oil seal.                                      |

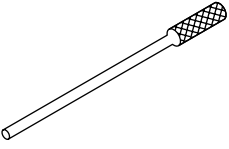
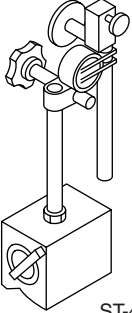
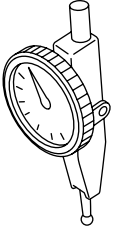
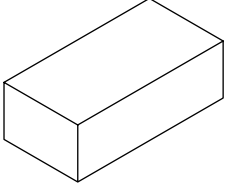
# General Description

DIFFERENTIALS

| ILLUSTRATION  | TOOL NUMBER                                  | DESCRIPTION          | REMARKS   |
|---|--|----------------------|---|
|  <p style="text-align: center;">ST-498427200</p>   | <p style="text-align: center;">498427200</p> | <p>FLANGE WRENCH</p> | <ul style="list-style-type: none"> <li>• Used for stopping rotation of companion flange when loosening and tightening self-locking nut.</li> <li>• For except STI model.</li> </ul> |
|  <p style="text-align: center;">ST-398467700</p>   | <p style="text-align: center;">398467700</p> | <p>DRIFT</p>         | <p>Used for removing pinion, pilot bearing and front bearing cone.</p>  |
|  <p style="text-align: center;">ST-399780104</p> | <p style="text-align: center;">399780104</p> | <p>WEIGHT</p>        | <p>Used for installing front bearing cone, pilot bearing companion flange.</p>  |
|  <p style="text-align: center;">ST-899580100</p> | <p style="text-align: center;">899580100</p> | <p>INSTALLER</p>     | <p>Used for press-fitting the front bearing cone, pilot bearing.</p>  |

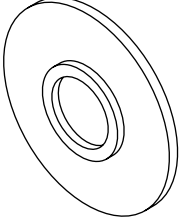
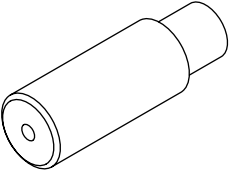
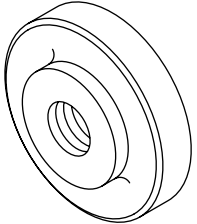
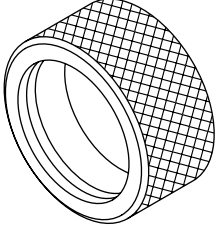
# General Description

## DIFFERENTIALS

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION          | REMARKS   |
|---|-------------|----------------------|---|
|  <p style="text-align: center;">ST-899904100</p>   | 899904100   | STRAIGHT PIN REMOVER | Used for driving out differential pinion shaft lock pin.  |
|  <p style="text-align: center;">ST-498247001</p>   | 498247001   | MAGNET BASE          | <ul style="list-style-type: none"> <li>• Used for measuring backlash between side gear and pinion, and hypoid gear.</li> <li>• Used with DIAL GAUGE (498247100).</li> </ul> |
|  <p style="text-align: center;">ST-498247100</p> | 498247100   | DIAL GAUGE           | <ul style="list-style-type: none"> <li>• Used measuring backlash between side gear and pinion, hypoid gear.</li> <li>• Used with MAGNET BASE (498247001).</li> </ul>        |
|  <p style="text-align: center;">ST-398507704</p> | 398507704   | BLOCK                | Used for adjusting pinion height and preload.   |

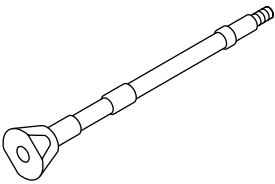
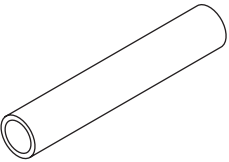
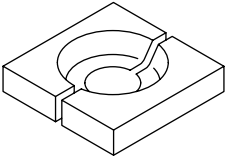
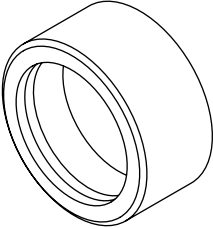
# General Description

DIFFERENTIALS

| ILLUSTRATION  | TOOL NUMBER                                  | DESCRIPTION                                   | REMARKS  |
|---|--|---|--|
|  <p style="text-align: center;">ST-398177700</p>   | <p style="text-align: center;">398177700</p> | <p style="text-align: center;">INSTALLER</p>  | <p>Used for installing rear bearing cone.</p>                                  |
|  <p style="text-align: center;">ST-398457700</p>   | <p style="text-align: center;">398457700</p> | <p style="text-align: center;">ATTACHMENT</p> | <p>Used for removing side bearing retainer.</p>                                |
|  <p style="text-align: center;">ST-398477703</p> | <p style="text-align: center;">398477703</p> | <p style="text-align: center;">DRIFT2</p>     | <p>Used for press-fitting the bearing race (rear) of differential carrier.</p> |
|  <p style="text-align: center;">ST-398437700</p> | <p style="text-align: center;">398437700</p> | <p style="text-align: center;">DRIFT</p>      | <p>Used for installing side oil seal.</p>                                      |

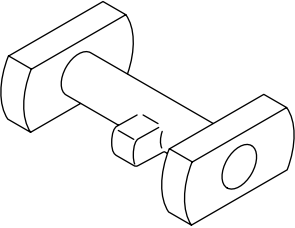
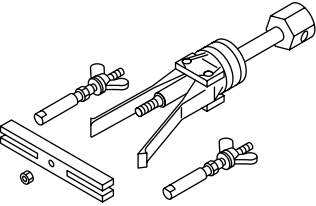
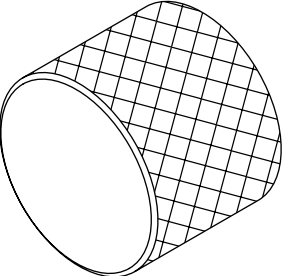
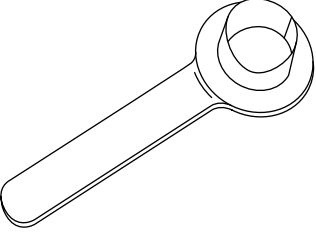
# General Description

## DIFFERENTIALS

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION  | REMARKS                                       |
|---|-------------|--------------|---|
|  <p style="text-align: center;">ST-398507702</p>   | 398507702   | DUMMY SHAFT  | Used for adjusting pinion height and preload. |
|  <p style="text-align: center;">ST-398507703</p>   | 398507703   | DUMMY COLLAR | Used for adjusting pinion height and preload. |
|  <p style="text-align: center;">ST-398517700</p> | 398517700   | REPLACER     | Used for removing rear bearing cone.          |
|  <p style="text-align: center;">ST-398487700</p> | 398487700   | DRIFT        | Used for press-fitting the side bearing cone. |

# General Description

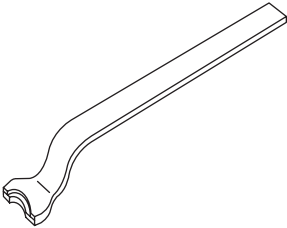
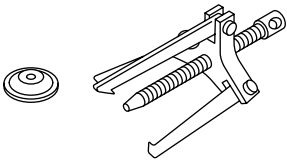
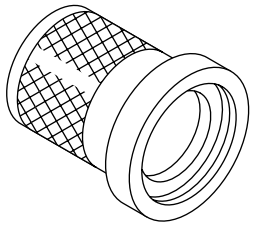
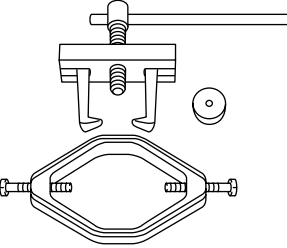
DIFFERENTIALS

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION                | REMARKS  |
|---|-------------|----------------------------|--|
|  <p>ST-398507701</p>     | 398507701   | DIFFERENTIAL CARRIER GAUGE | Used for adjusting pinion height.  |
|  <p>ST-398527700</p>     | 398527700   | PULLER ASSY                | <ul style="list-style-type: none"> <li>• Used for removing front oil seal.</li> <li>• Used for removing side bearing cup.</li> </ul>                 |
|  <p>ST-398227700</p> | 398227700   | WEIGHT                     | Used for installing side bearing.  |
|  <p>ST28099PA090</p> | 28099PA090  | OIL SEAL PROTECTOR         | <ul style="list-style-type: none"> <li>• Used for installing rear drive shaft into rear differential.</li> <li>• For protecting oil seal.</li> </ul> |



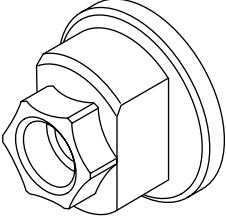
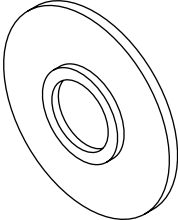
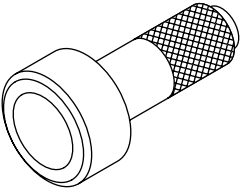
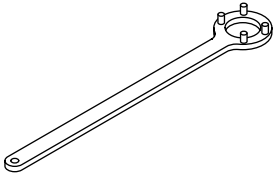
# General Description

## DIFFERENTIALS

| ILLUSTRATION  | TOOL NUMBER                                   | DESCRIPTION                    | REMARKS   |
|---|---|--------------------------------|---|
|  <p style="text-align: center;">ST28099PA100</p>   | <p style="text-align: center;">28099PA100</p> | <p>DRIVE SHAFT<br/>REMOVER</p> | <p>Used for removing rear drive shaft from rear differential.</p> |
|  <p style="text-align: center;">ST-399703600</p>   | <p style="text-align: center;">399703600</p>  | <p>PULLER ASSY</p>             | <p>Used for removing companion flange.</p>                        |
|  <p style="text-align: center;">ST-899874100</p> | <p style="text-align: center;">899874100</p>  | <p>INSTALLER</p>               | <p>Used for installing companion flange.</p>                      |
|  <p style="text-align: center;">ST18759AA000</p> | <p style="text-align: center;">18759AA000</p> | <p>PULLER ASSY</p>             | <p>Used for removing side bearing cone of differential.</p>       |

# General Description

DIFFERENTIALS

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION  | REMARKS  |
|---|-------------|--------------|--|
|  <p style="text-align: center;">ST-498937110</p>   | 498937110   | HOLDER       | <ul style="list-style-type: none"> <li>• Used for installing pilot bearing.</li> <li>• For STI model.</li> </ul>   |
|  <p style="text-align: center;">ST18674AA000</p>   | 18674AA000  | INSTALLER    | <ul style="list-style-type: none"> <li>• Used for installing rear bearing cone.</li> <li>• For STI model.</li> </ul>   |
|  <p style="text-align: center;">ST-398417700</p> | 398417700   | DRIFT        | Used for installing side bearing race.   |
|  <p style="text-align: center;">ST18633AA000</p> | 18633AA000  | WRENCH COMPL | <ul style="list-style-type: none"> <li>• Used for stopping rotating of companion flange when loosening and tightening self-locking nut.</li> <li>• For STI model.</li> </ul> |

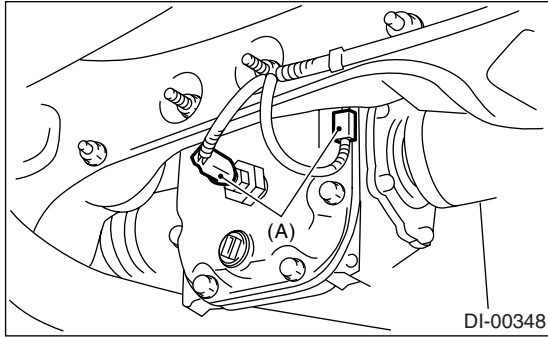
## 2. GENERAL TOOL

| TOOL NAME         | REMARKS   |
|-------------------|---|
| Transmission jack | Used for assembly/disassembly of rear differential. |
| Puller            | Used for removal of side bearing retainer.          |
| Thickness gauge   | Used for measuring clearance.                       |

## 2. Differential Gear Oil

### A: INSPECTION

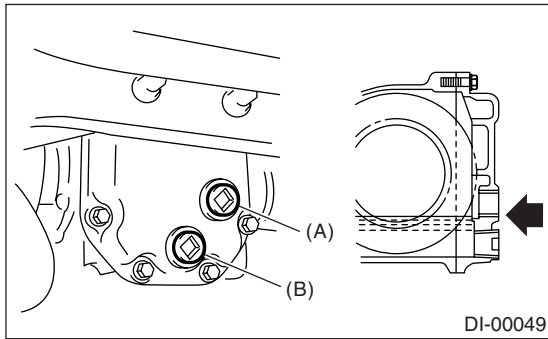
1) Disconnect the oil temperature switch connector. (STI model)



(A) Connector

2) Remove the filler plug or rear differential oil temperature switch and then check the gear oil. If it is contaminated or deteriorated, replace the gear oil. <Ref. to DI-18, REPLACEMENT, Differential Gear Oil.>

3) Check the gear oil level is up to the bottom part of filler bolt. If the level is low, refill up to the bottom of filler bolt.

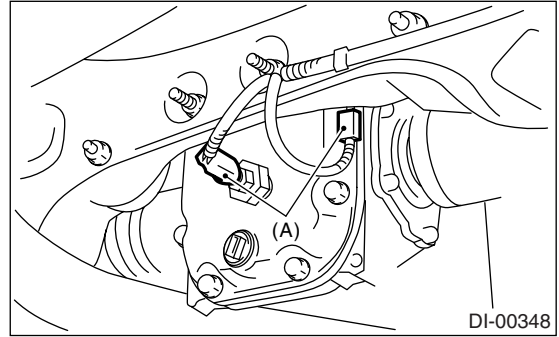


(A) Filler plug  
(B) Drain plug

### B: REPLACEMENT

1) Lift-up the vehicle.

2) Disconnect the oil temperature switch connector. (STI model)

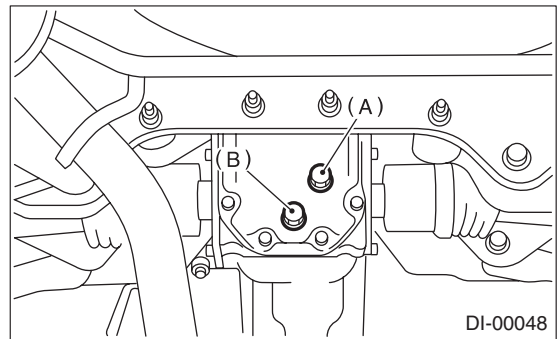


(A) Connector

3) Remove the oil drain plug and filler plug, and drain the gear oil.

#### CAUTION:

**Be careful not to burn your hands, because gear oil becomes extremely hot after running.**



(A) Filler plug  
(B) Drain plug

4) Tighten the oil drain plug.

#### NOTE:

Apply liquid gasket to the drain plug.

#### Liquid gasket:

**THREE BOND 1105 (Part No. 004403010) or equivalent**

#### Tightening torque:

**49 N·m (5.0 kgf·m, 36.2 ft·lb)**

5) Fill the differential carrier with gear oil to the upper plug level.

#### NOTE:

- Carefully refill oil while watching the level. Excess or insufficient oil must be avoided.
- Use gear oil for the mechanical LSD for STI model.

**Recommended oil:**

**Except STI model:**

**GL-5 (75W-90) or equivalent**

**STI model:**

**GEAR OIL LSD (Part No. K0305Y0900), GL-5 (90) or equivalent**

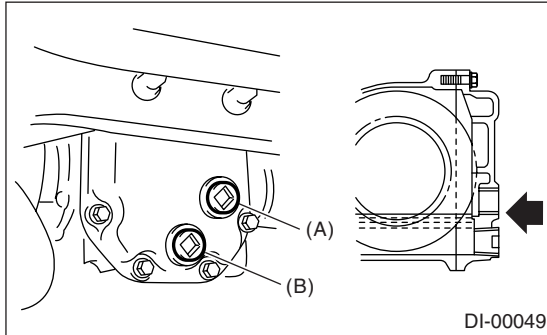
**Oil capacity:**

**Except STI model:**

**0.8 ℓ (0.8 US qt, 0.7 Imp qt)**

**STI model:**

**1.0 ℓ (1.1 US qt, 0.9 Imp qt)**



- (A) Filler plug
- (B) Drain plug

6) Install the filler plug or rear differential oil temperature switch.

**NOTE:**

Apply liquid gasket to the filler plug or rear differential oil temperature switch.

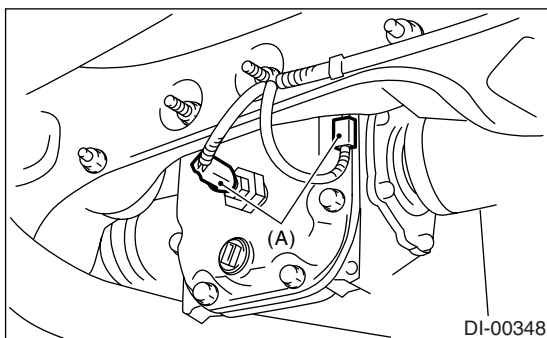
**Liquid gasket:**

**THREE BOND 1105 (Part No. 004403010) or equivalent**

**Tightening torque:**

**49 N·m (5.0 kgf·m, 36.2 ft·lb)**

7) Connect the oil temperature switch connector. (STI model)



- (A) Connector

### 3. Front Differential Assembly

#### A: NOTE

##### 1. AT MODEL

For front differential of AUTOMATIC TRANSMISSION, refer to "AT" section. <Ref. to 4AT-101, Front Differential Assembly.>

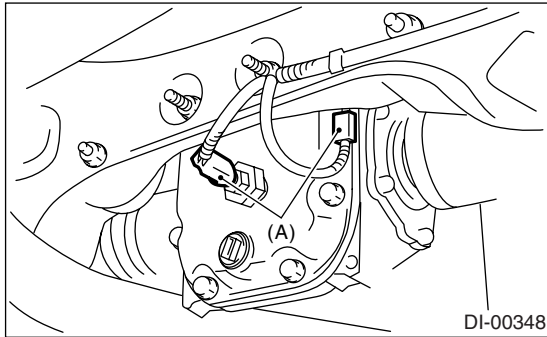
##### 2. MT MODEL

For front differential of manual transmission, refer to "5MT" or "6MT" section. <Ref. to 5MT-68, Front Differential Assembly.> <Ref. to 6MT-105, Front Differential Assembly.>

## 4. Rear Differential

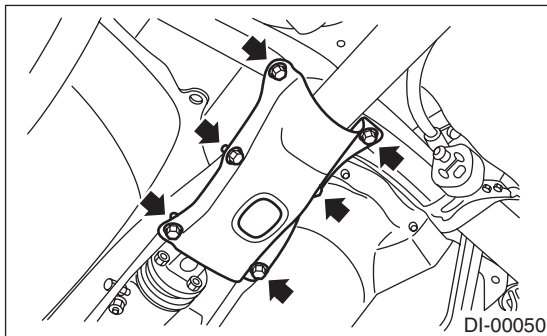
### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Move the select lever or gear shift lever to "N".
- 4) Release the parking brake.
- 5) Loosen the wheel nut.
- 6) Jack-up the vehicle and support it with sturdy racks.
- 7) Remove the wheel.
- 8) Disconnect the connector from oil temperature switch. (STI model)



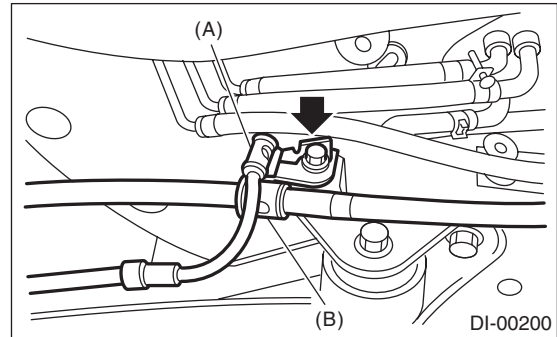
(A) Connector

- 9) Remove the rear exhaust pipe and muffler. SOHC model  
<Ref. to EX(H4SO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, REMOVAL, Muffler.>  
DOHC Turbo model  
<Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>
- 10) Remove the front cover of rear differential mount.



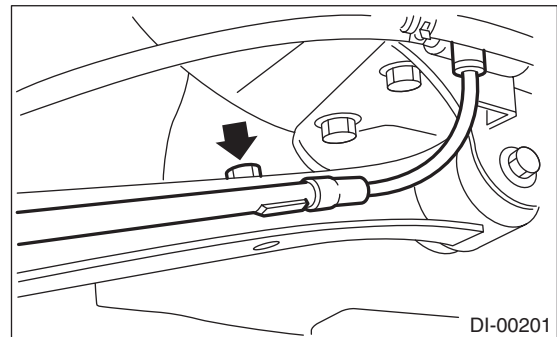
- 11) Remove the propeller shaft. <Ref. to DS-16, REMOVAL, Propeller Shaft.>
- 12) Remove the rear differential protector. (If equipped)
- 13) Remove the DOJ of rear drive shaft from rear differential.

- (1) Remove the ABS wheel speed sensor cable clamp and parking brake cable clamp from bracket.

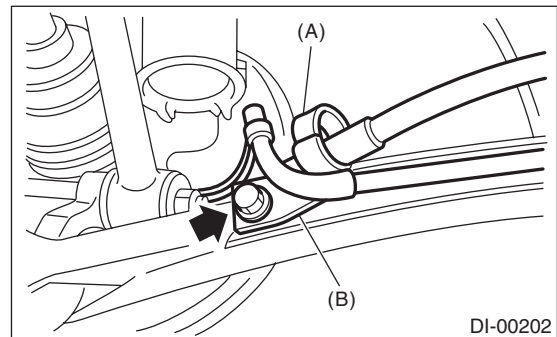


(A) ABS wheel speed sensor cable clamp  
(B) Parking brake cable clamp

- (2) Remove the ABS wheel speed sensor cable clamp from trailing link.



- (3) Remove the ABS wheel speed sensor cable clamp and parking brake cable guide from trailing link.

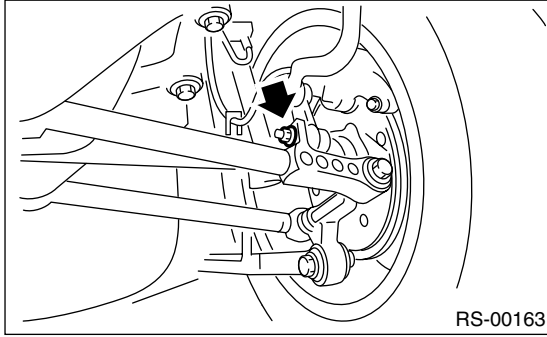


(A) Parking brake cable guide  
(B) ABS wheel speed sensor cable clamp

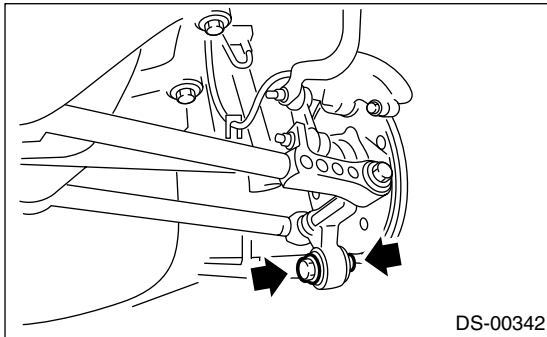
# Rear Differential

## DIFFERENTIALS

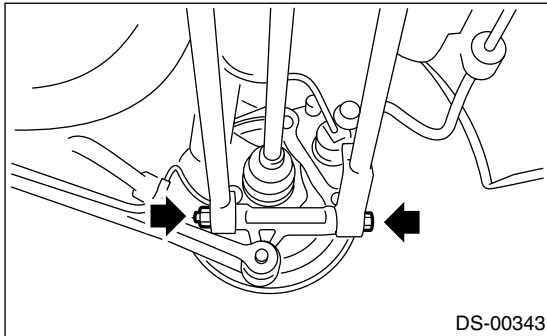
(4) Remove the rear stabilizer link.



(5) Remove the bolts which secure trailing link to housing.



(6) Remove the bolts which secure the front and rear lateral link to rear housing.

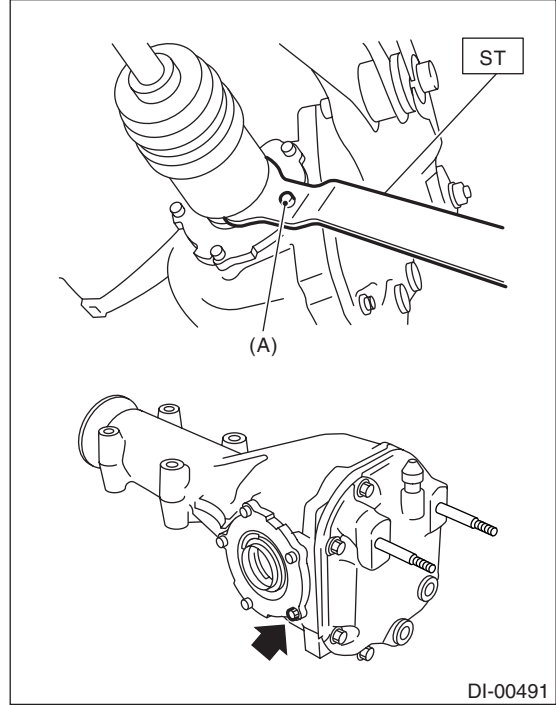


(7) Remove the DOJ from the rear differential by using ST.

### NOTE:

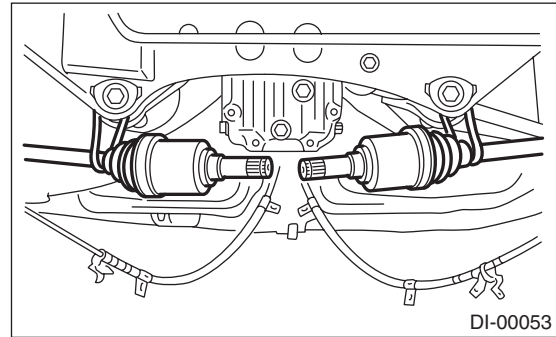
When removing the DOJ from rear differential, fit ST to the bolts as shown in the figure so as not to damage the side bearing retainer.

ST 208099PA100 DRIVE SHAFT REMOVER

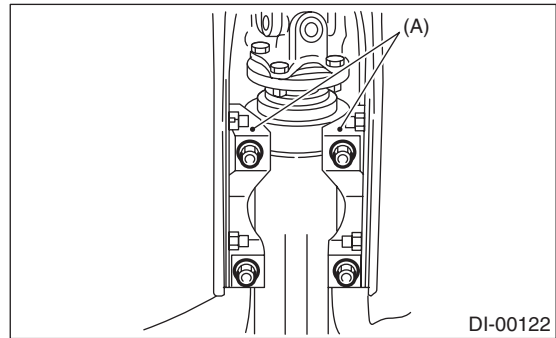


(A) Bolt

14) Secure the rear drive shaft to rear crossmember using wire.

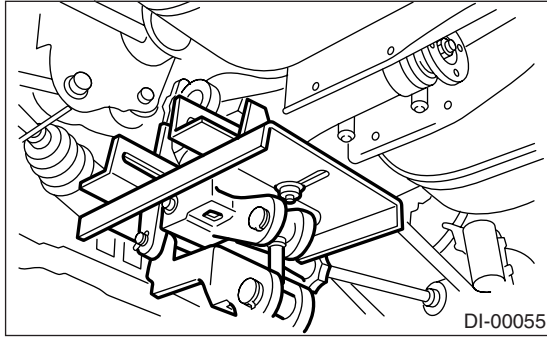


15) Remove the differential mount lower bracket.

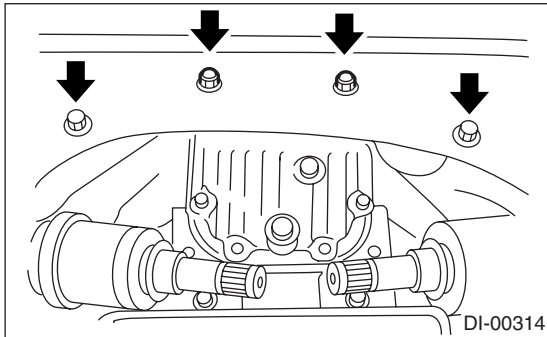


(A) Differential mount lower bracket

16) Support the rear differential with transmission jack.



17) Remove the self-locking nuts and bolts.

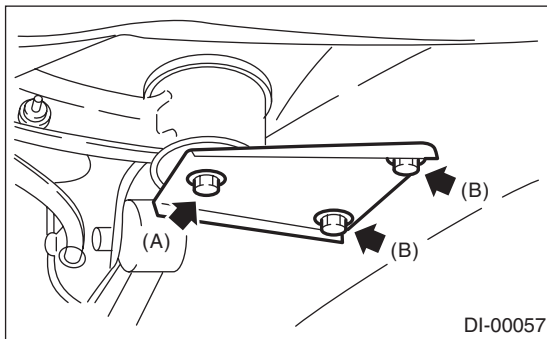


18) Remove the bolts which secure the front differential member to body.

Loosen the bolt A first, then remove the bolts B.

NOTE:

Support the differential front member with use of a helper to prevent it from dropping.

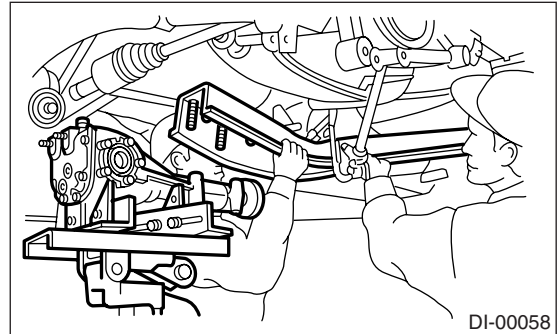


(A) Bolt A

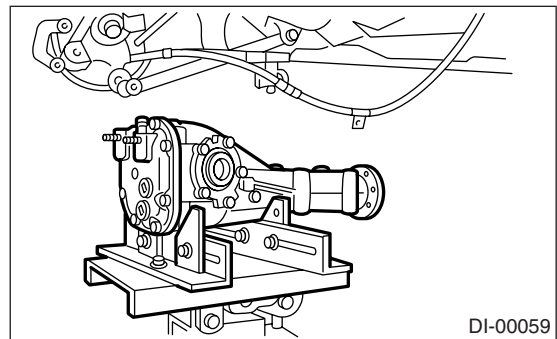
(B) Bolt B

19) Remove the bolt A.

20) While slowly lowering the transmission jack, move the rear differential forward and remove differential front member and rear differential from vehicle.



21) Remove the rear differential from vehicle.



## B: INSTALLATION

1) Install the air breather cap tapping with a plastic hammer.

NOTE:

Be sure to install a new air breather cap.

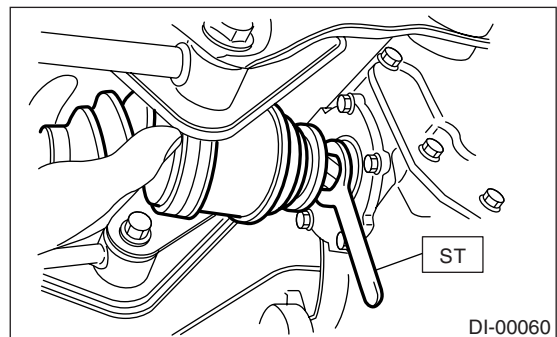
2) Position the differential front member on body by passing it under the parking brake cable and securing to rear differential.

NOTE:

When installing the differential front member of rear differential, do not confuse the installation sequence of the upper and lower stoppers.

3) Install the DOJ of drive shaft into rear differential. <Ref. to DI-50, REPLACEMENT, Rear Differential Side Oil Seal.>

ST 28099PA090 OIL SEAL PROTECTOR





# Rear Differential

## DIFFERENTIALS

4) Installing procedure hereafter is in the reverse order of removal.

5) After installation, fill the differential carrier with gear oil to the filler plug level. <Ref. to DI-18, Differential Gear Oil.>

### C: DISASSEMBLY

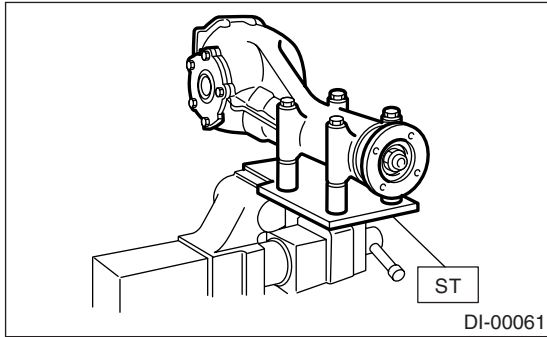
#### 1. EXCEPT STI MODEL

To detect the real cause of trouble, inspect the following items before disassembling.

- Tooth contact of hypoid driven gear and pinion, and backlash
- Runout of hypoid driven gear at its back surface
- Total preload of drive pinion

1) Set the ST on vise and install the differential assembly to ST.

ST 398217700 ATTACHMENT

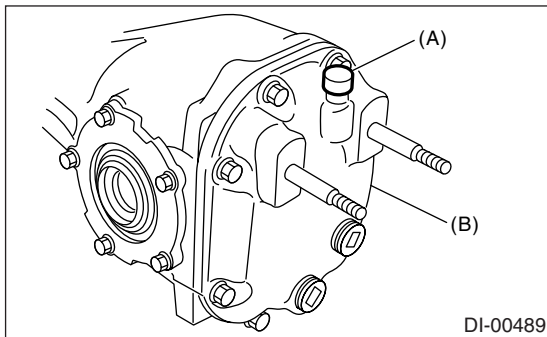


2) Drain the gear oil by removing the plug.

3) Remove the air breather cap.

NOTE:

- Do not attempt to remove the air breather cap if unnecessary.
- When removing the air breather cap, replace the air breather cap with a new one.



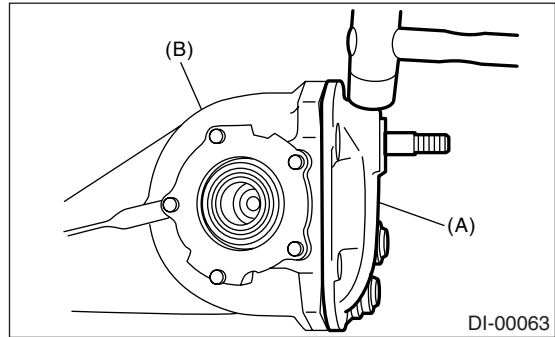
(A) Air breather cap

(B) Rear cover

4) Remove the bolts, and then remove the rear cover.

NOTE:

Remove it by tapping with plastic hammer.



(A) Rear cover

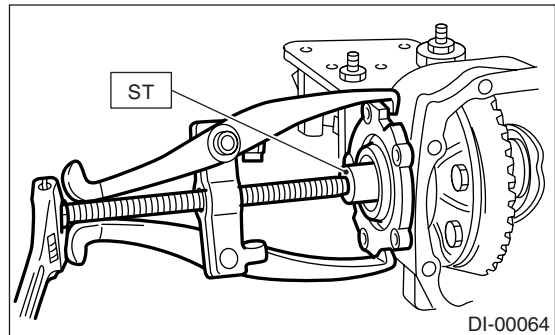
(B) Differential carrier

5) Make right and left side bearing retainers in order to identify them at reassembly. Remove the side bearing retainer attaching bolts, set the ST to differential case, and extract right and left side bearing retainers with a puller.

NOTE:

Each shim, which is installed to adjust the side bearing preload, should be kept together with its mating retainer.

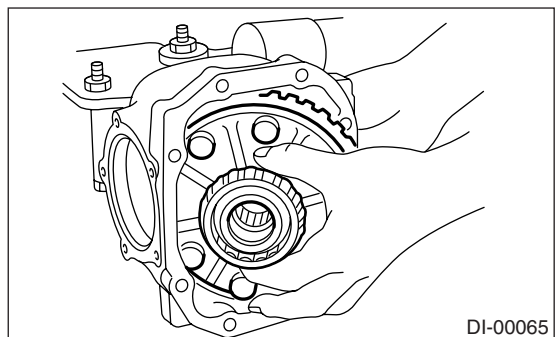
ST 398457700 ATTACHMENT



6) Pull out the differential case assembly from differential carrier.

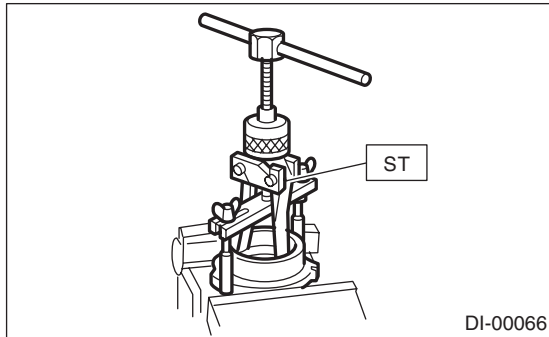
NOTE:

Be careful not to hit the teeth against the case.



7) When replacing the side bearing, pull the bearing cup from side bearing retainer using ST.

ST 398527700 PULLER ASSY

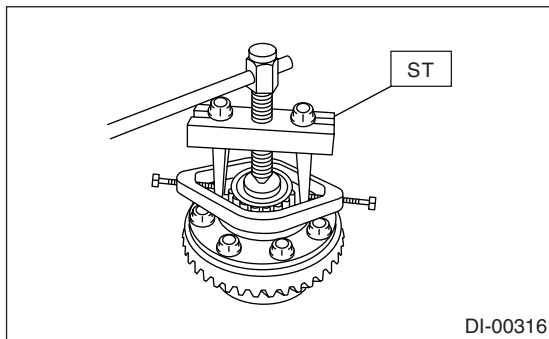


8) Extract the bearing cone with ST.

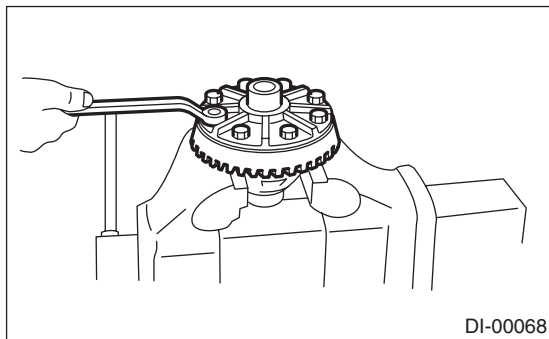
NOTE:

- Do not attempt to disassemble the parts unless necessary.
- Set the puller so that its claws catch the edge of bearing cone.
- Never mix up the right and left hand bearing races and cones.

ST 18759AA000 PULLER ASSY



9) Remove the hypoid driven gear by loosening the hypoid driven gear bolts.

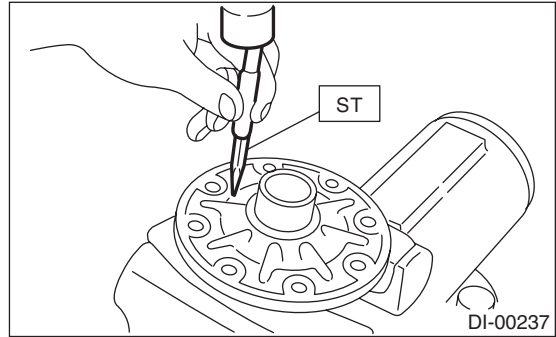


10) Drive out the pinion shaft lock pin from hypoid driven gear side. (Model without LSD)

NOTE:

The lock pin is staked at the pin hole end on the differential carrier; do not drive it out forcibly before unstaking it.

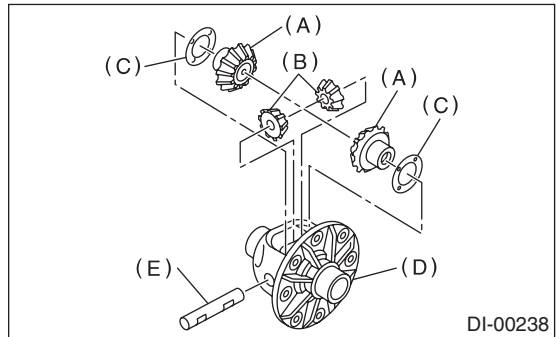
ST 899904100 STRAIGHT PIN REMOVER



11) Draw out the pinion mate shaft and remove the pinion mate gears, side gears and thrust washers. (Model without LSD)

NOTE:

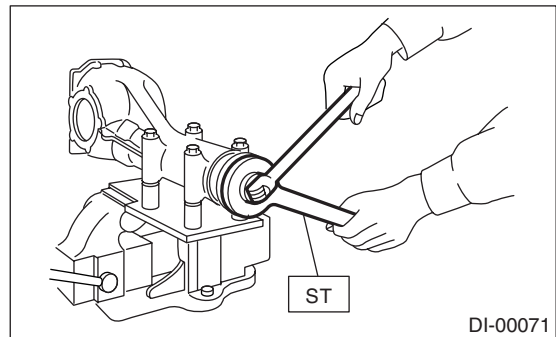
The gears as well as thrust washers should be marked or kept separated right and left, front and rear.



- (A) Side gear
- (B) Pinion mate gear
- (C) Thrust washer
- (D) Differential case
- (E) Pinion mate shaft

12) Hold the companion flange with ST and remove self-locking nut.

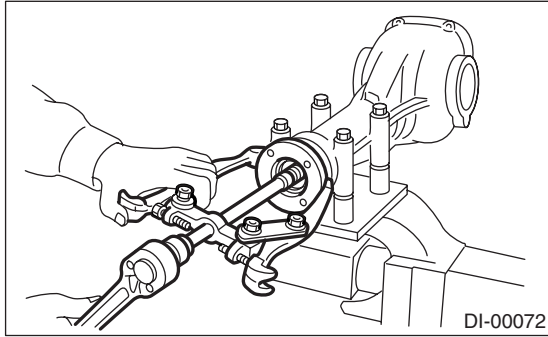
ST 498427200 FLANGE WRENCH



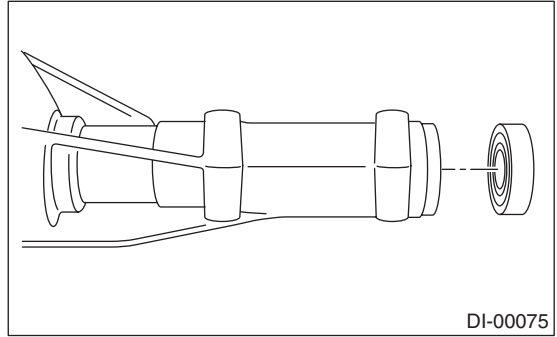
# Rear Differential

## DIFFERENTIALS

13) Extract the companion flange with a puller.



ST 398527700 PULLER ASSY

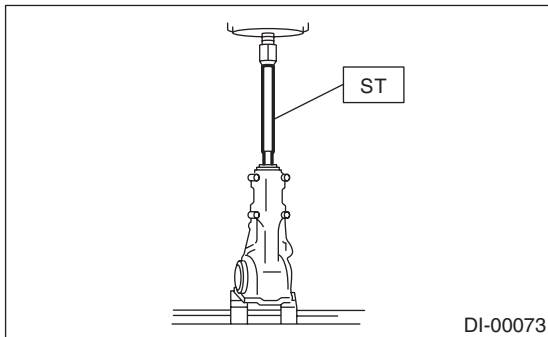


14) Press the end of drive pinion shaft and extract it together with the rear bearing cone, preload adjusting spacer and washer.

NOTE:

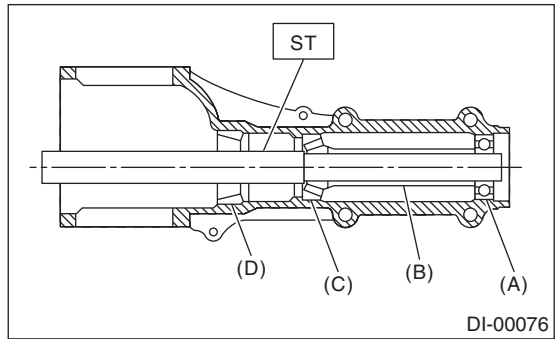
Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT



17) Remove the pilot bearing together with front bearing cone and spacer using ST.

ST 398467700 DRIFT



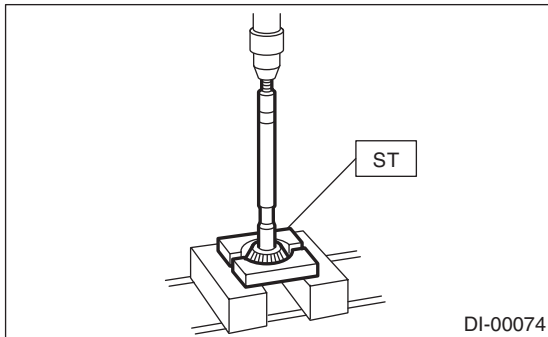
- (A) Pilot bearing
- (B) Spacer
- (C) Front bearing
- (D) Rear bearing cup

15) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

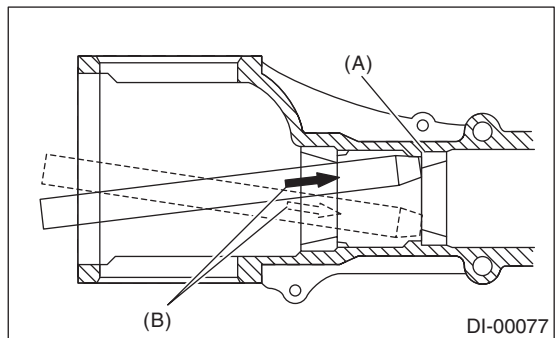
NOTE:

Place the replacer so that its center-recessed side faces the pinion gear.

ST 398517700 REPLACER



18) When replacing the bearings, hit out the front bearing cup and rear bearing cup in this order out of case by using a brass bar.



- (A) 2 cutouts along diagonal lines
- (B) Hit out alternately with brass bar.

16) Remove the front oil seal from differential carrier using ST.

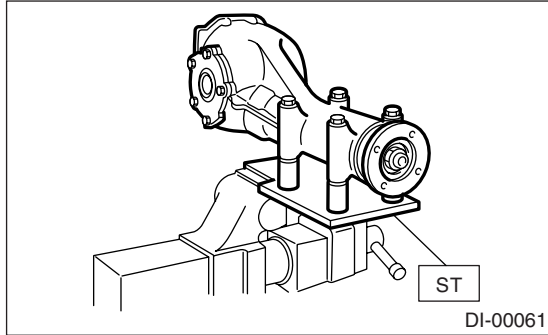
## 2. STI MODEL

To detect the real cause of trouble, inspect the following items before disassembling.

- Tooth contact of hypoid driven gear and pinion, and backlash
- Runout of hypoid driven gear at its back surface
- Total preload of drive pinion

1) Set the ST on vise and install the differential assembly to ST.

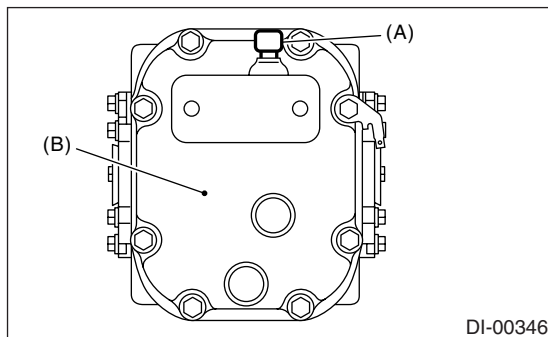
ST 398217700 ATTACHMENT



- 2) Drain the gear oil by removing the plug.
- 3) Remove the air breather cap.

NOTE:

- Do not attempt to remove the air breather cap if unnecessary.
- When removing the air breather cap, replace the air breather cap with a new one.

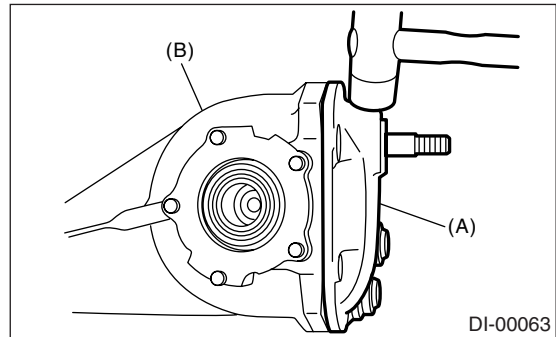


- (A) Air breather cap  
(B) Rear cover

- 4) Remove the bolts, and then remove the rear cover.

NOTE:

Remove it by tapping with plastic hammer.



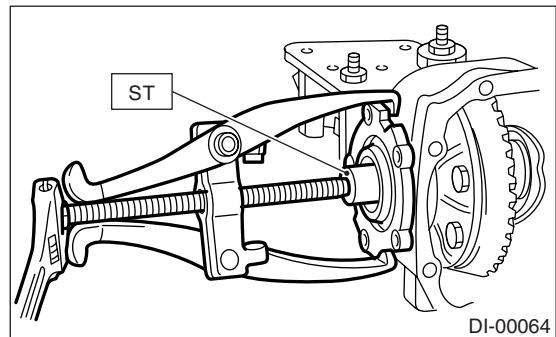
- (A) Rear cover  
(B) Differential carrier

- 5) Make right and left side bearing retainers in order to identify them at reassembly. Remove the side bearing retainer attaching bolts, set the ST to differential case, and extract right and left side bearing retainers with a puller.

NOTE:

Each shim, which is installed to adjust the side bearing preload, should be kept together with its mating retainer.

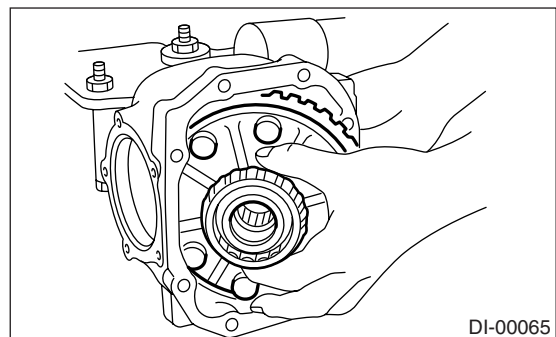
ST 398457700 ATTACHMENT



- 6) Pull out the differential case assembly from differential carrier.

NOTE:

Be careful not to hit the teeth against the case.

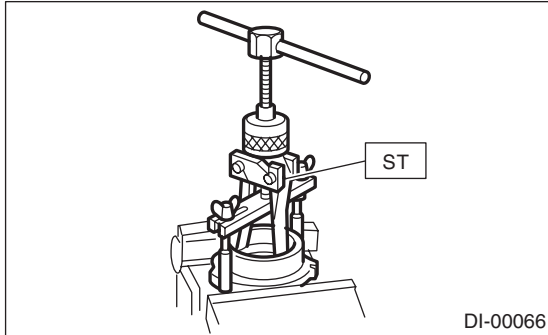


# Rear Differential

## DIFFERENTIALS

7) When replacing the side bearing, pull the bearing cup from side bearing retainer using ST.

ST 398527700 PULLER ASSY

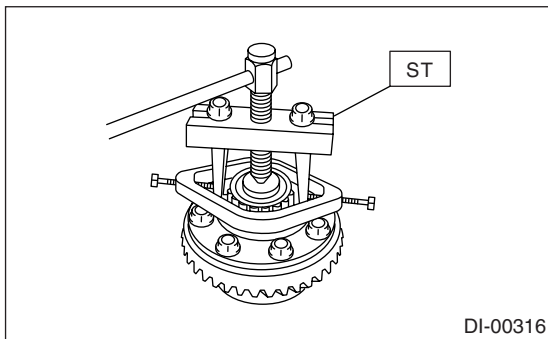


8) Extract the bearing cone with ST.

**NOTE:**

- Do not attempt to disassemble the parts if unnecessary.
- Set the puller so that its claws catch the edge of bearing cone.
- Never mix up the right and left hand bearing races and cones.

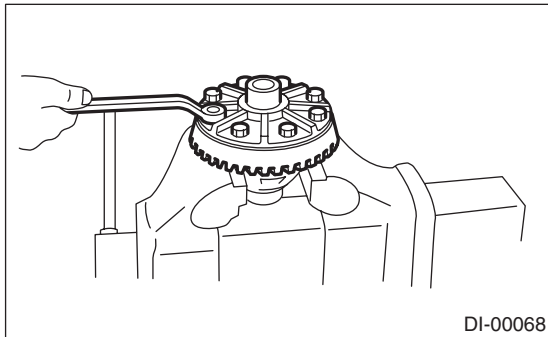
ST 18759AA000 PULLER ASSY



9) Remove the hypoid driven gear by loosening the hypoid driven gear bolts.

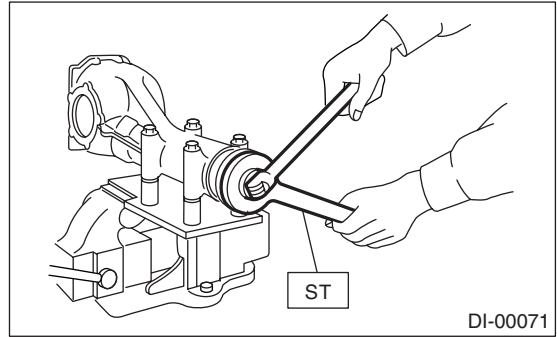
**NOTE:**

Disassembling the differential case is not allowed.

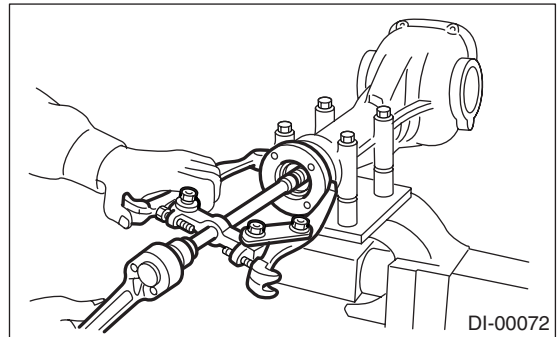


10) Hold the companion flange with ST and remove self-locking nut.

ST 18633AA000 WRENCH COMPL



11) Extract the companion flange with a puller.

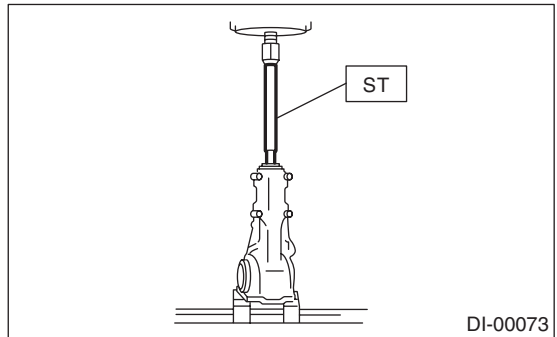


12) Press the end of drive pinion shaft and extract it together with the rear bearing cone, preload adjusting spacer and washer.

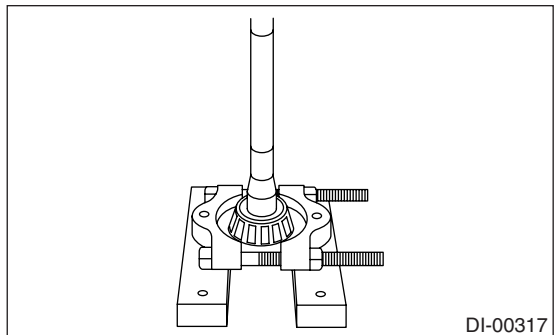
**NOTE:**

Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT

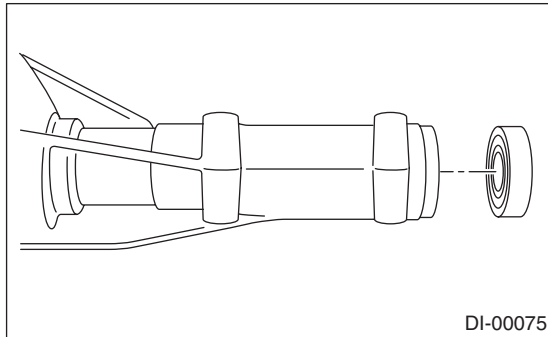


13) Remove the rear bearing cone from drive pinion.



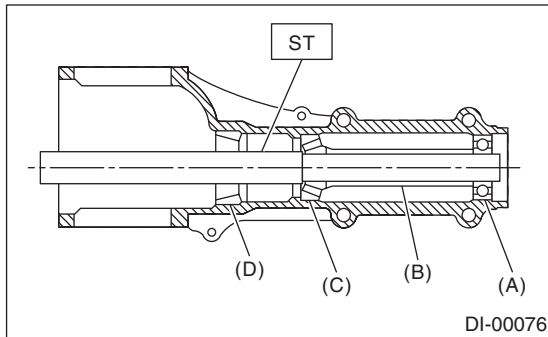
14) Remove the front oil seal from differential carrier using ST.

ST 398527700 PULLER ASSY



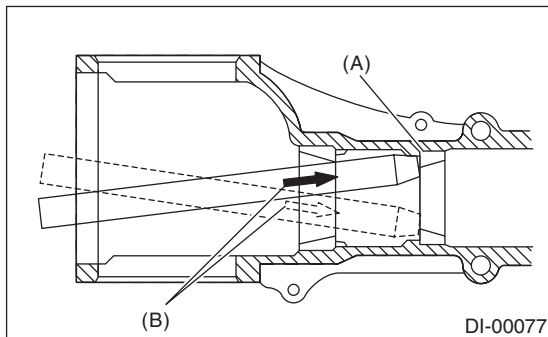
15) Remove the pilot bearing together with front bearing cone and spacer using ST.

ST 398467700 DRIFT



- (A) Pilot bearing
- (B) Spacer
- (C) Front bearing
- (D) Rear bearing cup

16) When replacing the bearings, tap the front bearing cup and rear bearing cup in this order out of case by using a brass bar.



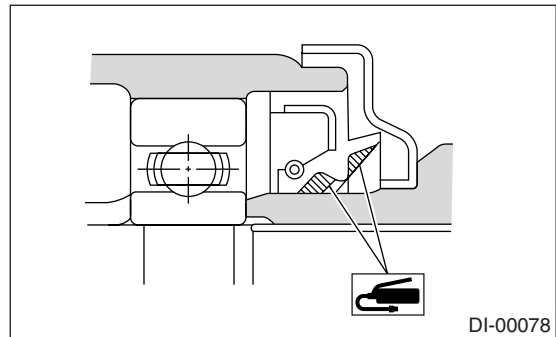
- (A) 2 cutouts along diagonal lines
- (B) Hit out alternately with brass bar.

## D: ASSEMBLY

### 1. EXCEPT STI MODEL

#### NOTE:

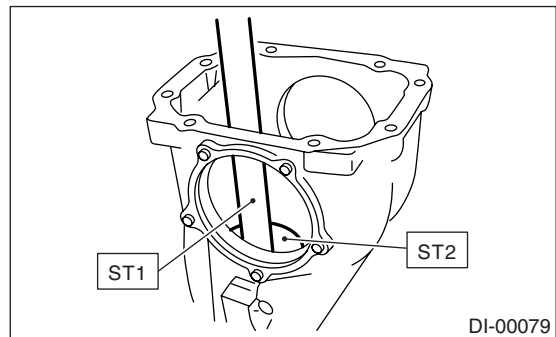
- Assemble in the reverse order of disassembling.
- Check and adjust each part during assembly.
- Keep the shims and washers in order, so that they are not improperly installed.
- Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
- Apply gear oil when installing the bearings and thrust washers.
- Be careful not to mix up the right and left hand races of the bearings.
- Use a new O-ring and gasket.
- Replace the oil seal with a new one at every disassembly. Apply chassis grease between the lips when installing the oil seal.
- Be careful not to confuse the installing direction of oil seal.



1) Adjusting preload for front and rear bearings  
Adjust the bearing preload with spacer and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

(1) Press the rear bearing race into differential carrier using ST1 and ST2.

ST1 398477701 HANDLE  
ST2 398477703 DRIFT 2





# Rear Differential

## DIFFERENTIALS

(2) Install the front bearing race to differential carrier using ST1 and ST2.

ST1 398477701 HANDLE

ST2 398477702 DRIFT

(3) Insert the ST1 into carrier with pinion height adjusting washer and rear bearing cone fitted onto it.

### NOTE:

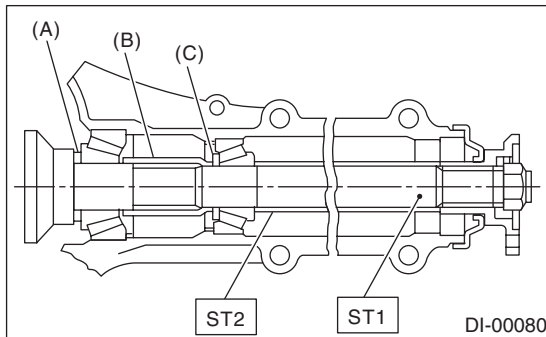
- If tooth contact (Drive pinion, Hypoid driven gear) is normal in the inspection before disassembling, verify that the washer is not deformed, and then re-use the used washer.

- Use a new rear bearing cone.

(4) Then install the preload adjusting spacer and washer, front bearing cone, ST2, companion flange, and washer and drive pinion nut.

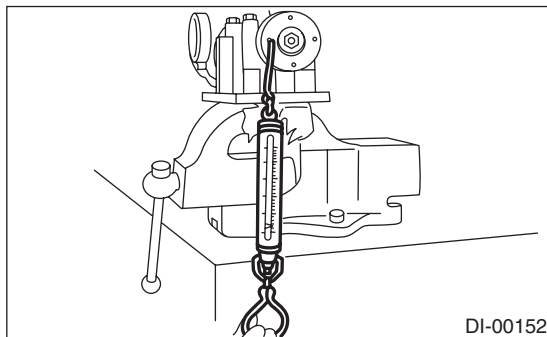
ST1 398507702 DUMMY SHAFT

ST2 398507703 DUMMY COLLAR



- (A) Pinion height adjusting washer
- (B) Preload adjusting spacer
- (C) Preload adjusting washer

(5) Turn the ST1 with hand to make the bearing accustomed, and tighten the self-locking nut while measuring the starting load or starting torque with spring balance or torque wrench. Select the preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.



### NOTE:

- Use a new self-locking nut.
- Be careful not to give excessive preload.

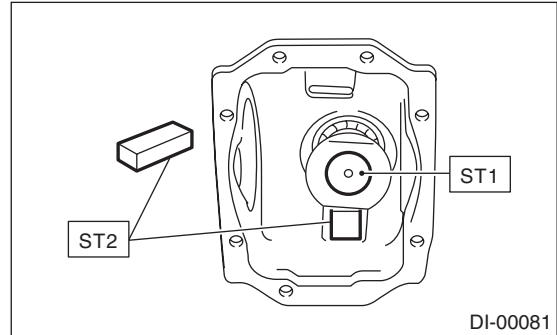
- When tightening the self-locking nut, lock ST1 with ST2 as shown in the figure.
- Measure the preload in direction of tangent to flange.

ST1 398507702 DUMMY SHAFT

ST2 398507704 BLOCK

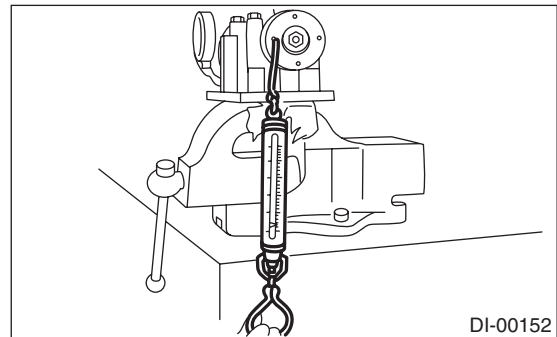
### Tightening torque:

**181.5 N·m (18.5 kgf·m, 134 ft·lb)**



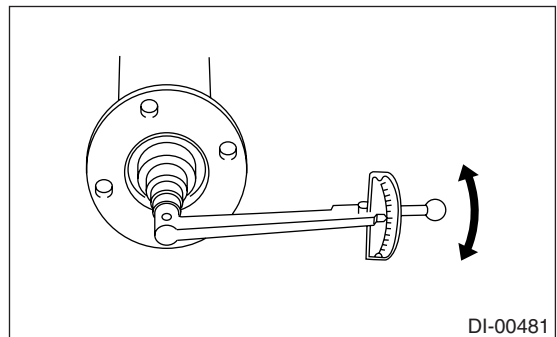
### Starting load:

**17.7 — 38.8 N (1.8 — 4.0 kgf, 4.0 — 8.7 lbf)**



### Starting torque:

**0.48 — 1.22 N·m (0.045 — 0.124 kgf·m, 0.32 — 0.9 ft·lb)**



| Preload adjusting washer | Part No.      | Thickness mm (in) |
|--------------------------|---------------|-------------------|
|                          | 383705200     | 2.59 (0.1020)     |
|                          | 383715200     | 2.57 (0.1012)     |
|                          | 383725200     | 2.55 (0.1004)     |
|                          | 383735200     | 2.53 (0.0996)     |
|                          | 383745200     | 2.51 (0.0988)     |
|                          | 383755200     | 2.49 (0.0980)     |
|                          | 383765200     | 2.47 (0.0972)     |
|                          | 383775200     | 2.45 (0.0965)     |
|                          | 383785200     | 2.43 (0.0957)     |
|                          | 383795200     | 2.41 (0.0949)     |
|                          | 383805200     | 2.39 (0.0941)     |
|                          | 383815200     | 2.37 (0.0933)     |
|                          | 383825200     | 2.35 (0.0925)     |
|                          | 383835200     | 2.33 (0.0917)     |
| 383845200                | 2.31 (0.0909) |                   |

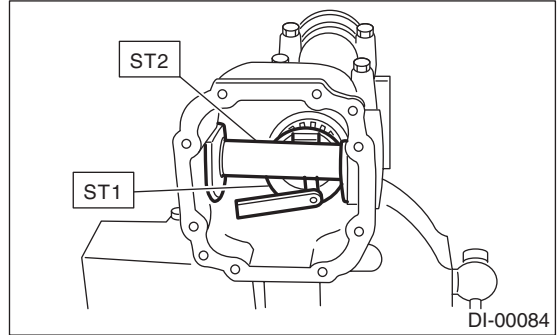
  

| Preload adjusting spacer | Part No.  | Length mm (in) |
|--------------------------|-----------|----------------|
|                          | 383695201 | 56.2 (2.213)   |
|                          | 383695202 | 56.4 (2.220)   |
|                          | 383695203 | 56.6 (2.228)   |
|                          | 383695204 | 56.8 (2.236)   |
|                          | 383695205 | 57.0 (2.244)   |
|                          | 383695206 | 57.2 (2.252)   |

**NOTE:**

Make sure there is no clearance between the case and ST2.

- ST1 398507702 DUMMY SHAFT
- ST2 398507701 DIFFERENTIAL CARRIER GAUGE



(3) Obtain the thickness of pinion height adjusting washer to be inserted from the following formula, and replace the temporarily installed shim with this one.

$$T = T_o + N - (H \times 0.01) - 0.20 \text{ mm (0.0079 in)}$$

**NOTE:**

Use copies of this page.

|                |   |         |  |
|----------------|---|---------|--|
| T              | Thickness of pinion height adjusting washer | mm (in) |  |
| T <sub>o</sub> | Thickness of washer temporarily inserted    | mm (in) |  |
| N              | Reading of thickness gauge                  | mm (in) |  |
| H              | Figure marked on drive pinion head          |         |  |
| Memo:          |   |         |  |

(Example of calculation)

$$T_o = 2.20 + 1.20 = 3.40 \text{ mm}$$

$$N = 0.23 \text{ mm}$$

$$H = + 1$$

$$T = 3.40 + 0.23 - 0.01 - 0.20 = 3.42$$

Result: Thickness = 3.42 mm

Therefore use the washer 383605200.

**2) Drive pinion height adjustment**

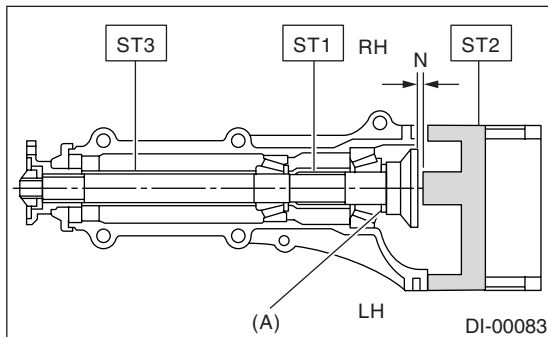
Adjust the drive pinion height with shim installed between the rear bearing cone and back of pinion gear.

(1) Install the ST2.

**NOTE:**

At this time, install a pinion height adjusting washer which is temporarily selected or the same as that used before. Measure and record the thickness.

- ST1 398507702 DUMMY SHAFT
- ST2 398507701 DIFFERENTIAL CARRIER GAUGE
- ST3 398507703 DUMMY COLLAR



(A) Pinion height adjusting washer

(2) Measure the clearance N between the end of ST2 and end surface of ST1 by using a thickness gauge.

| Pinion height adjusting washer |                   |
|--------------------------------|-------------------|
| Part No.                       | Thickness mm (in) |
| 383495200                      | 3.09 (0.1217)     |
| 383505200                      | 3.12 (0.1228)     |
| 383515200                      | 3.15 (0.1240)     |
| 383525200                      | 3.18 (0.1252)     |
| 383535200                      | 3.21 (0.1264)     |
| 383545200                      | 3.24 (0.1276)     |
| 383555200                      | 3.27 (0.1287)     |
| 383565200                      | 3.30 (0.1299)     |
| 383575200                      | 3.33 (0.1311)     |
| 383585200                      | 3.36 (0.1323)     |



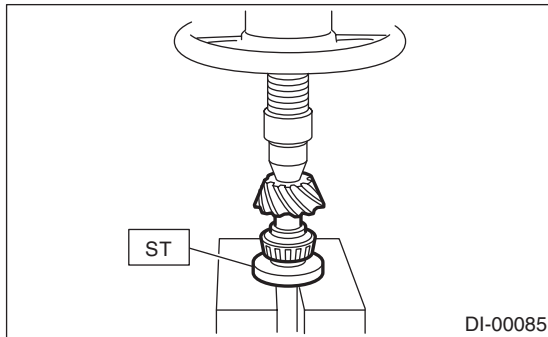
# Rear Differential

## DIFFERENTIALS

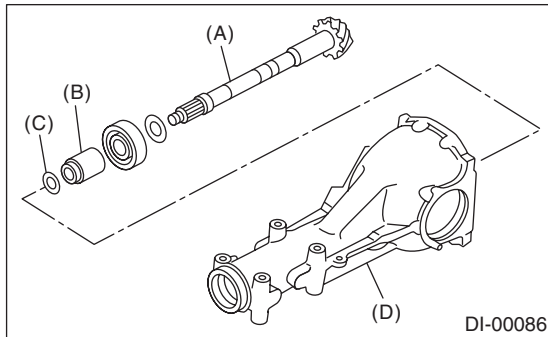
| Pinion height adjusting washer |                   |
|--------------------------------|-------------------|
| Part No.                       | Thickness mm (in) |
| 383595200                      | 3.39 (0.1335)     |
| 383605200                      | 3.42 (0.1346)     |
| 383615200                      | 3.45 (0.1358)     |
| 383625200                      | 3.48 (0.1370)     |
| 383635200                      | 3.51 (0.1382)     |
| 383645200                      | 3.54 (0.1394)     |
| 383655200                      | 3.57 (0.1406)     |
| 383665200                      | 3.60 (0.1417)     |
| 383675200                      | 3.63 (0.1429)     |
| 383685200                      | 3.66 (0.1441)     |

3) Install the selected pinion height adjusting washer on drive pinion, and press the rear bearing cone into position with ST.

ST 398177700 INSTALLER



4) Insert the drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.

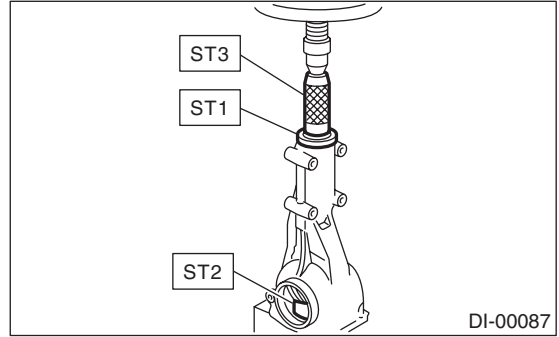


- (A) Drive pinion
- (B) Bearing preload adjusting spacer
- (C) Bearing preload adjusting washer
- (D) Differential carrier

5) Press-fit the front bearing cone into case with ST1, ST2 and ST3.

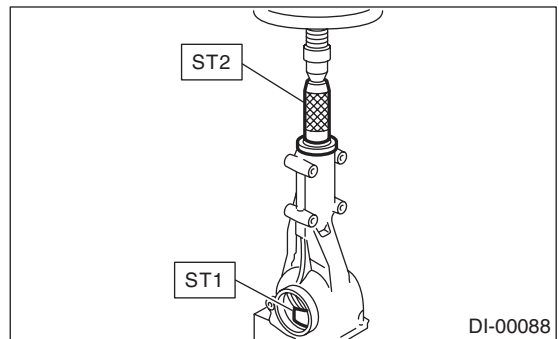
ST1 398507703 DUMMY COLLAR  
ST2 399780104 WEIGHT

ST3 899580100 INSTALLER



6) Insert the spacer, then press-fit the pilot bearing with ST1 and ST2.

ST1 399780104 WEIGHT  
ST2 899580100 INSTALLER

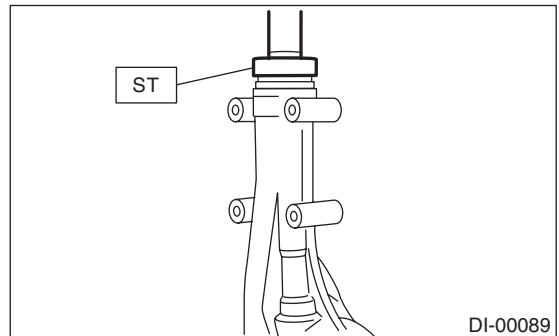


7) Fit a new oil seal with ST.

NOTE:

- Press-fit until the end of oil seal is 1 mm (0.04 in) inward from end of carrier.
- Apply grease between the oil seal lips.

ST 498447120 INSTALLER



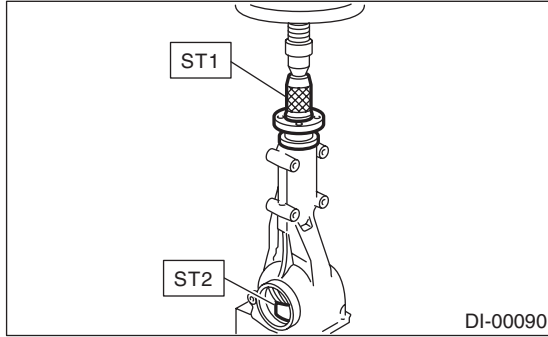
8) Press-fit the companion flange with ST1 and ST2.

NOTE:

Be careful not to damage the bearing.

ST1 899874100 INSTALLER

ST2 399780104 WEIGHT



9) Apply Lock Tite to the bolt threads of drive pinion shaft, and the seating surface of new self-locking nut.

**Lock Tite:**

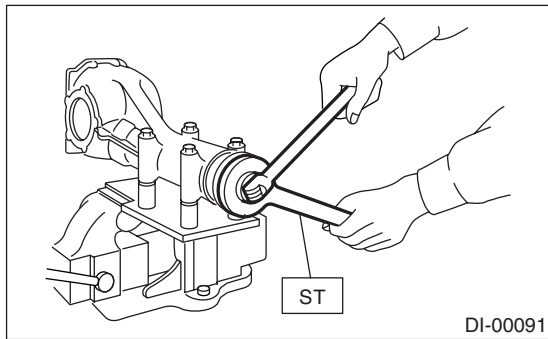
**THREE BOND 1324 (Part No. 004403042)**

10) Install a new self-locking nut. Then tighten it with the ST.

ST 498427200 FLANGE WRENCH

**Tightening torque:**

**181.5 N·m (18.5 kgf·m, 134 ft·lb)**



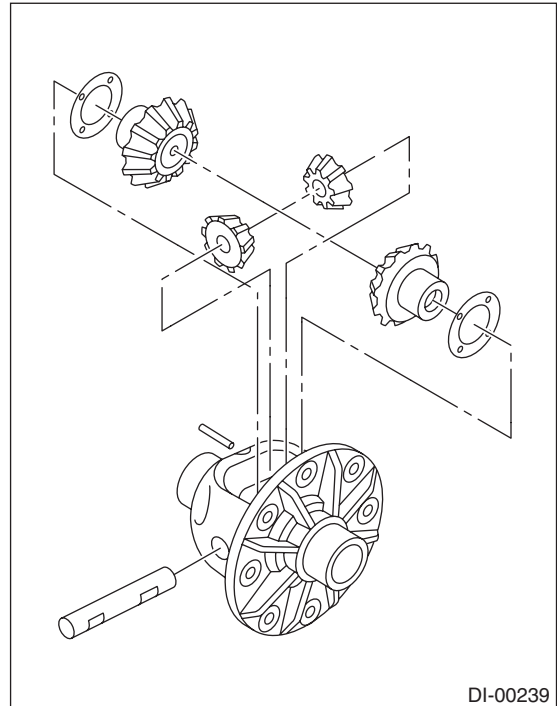
**11) Assembling differential case**

Install the side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case. (Model without LSD)

**NOTE:**

- Apply gear oil on both sides of the washer and on the side gear shaft before installing.

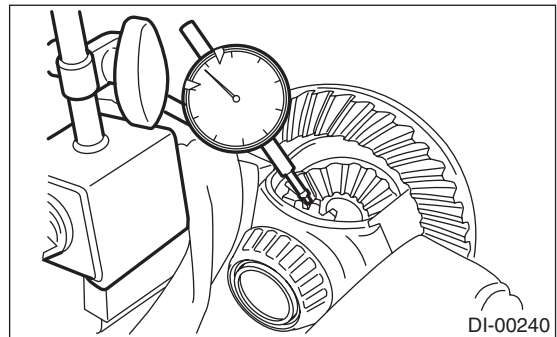
- Insert the pinion mate shaft into the differential case by aligning the lock pin holes.



(1) Measure the side gear backlash.

**Side gear backlash:**

**0.10 — 0.20 mm (0.004 — 0.008 in)**



(2) Adjust the backlash as specified by selecting the side gear thrust washer.

| Side gear thrust washer |                               |
|-------------------------|-------------------------------|
| Part No.                | Thickness mm (in)             |
| 383445201               | 0.75 — 0.80 (0.0295 — 0.0315) |
| 383445202               | 0.80 — 0.85 (0.0315 — 0.0335) |
| 383445203               | 0.85 — 0.90 (0.0335 — 0.0354) |

(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.

(4) After inserting the pinion shaft lock pin into differential case, stake both sides of the hole to prevent pin from falling off.

12) Install the hypoid driven gear on differential case.

# Rear Differential

## DIFFERENTIALS

### NOTE:

- Before installing the bolts, apply Lock Tite to bolt threads.
- Make sure that there is no clearance between differential case and driven gear.

### Lock Tite:

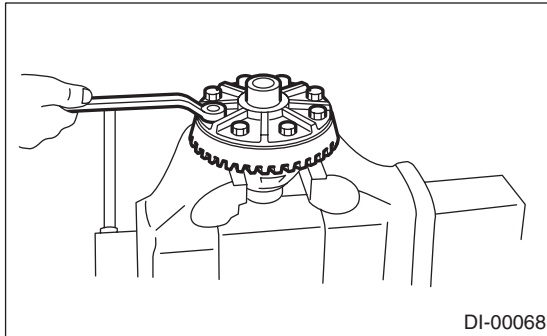
**THREE BOND 1324 (Part No. 004403042) or equivalent**

### NOTE:

Tighten diagonally while tapping the bolt heads.

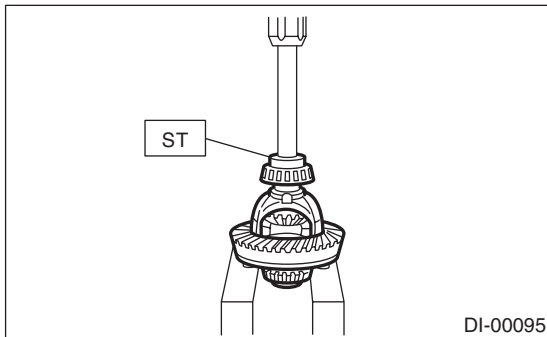
### Tightening torque:

**103 N·m (10.5 kgf·m, 76 ft·lb)**



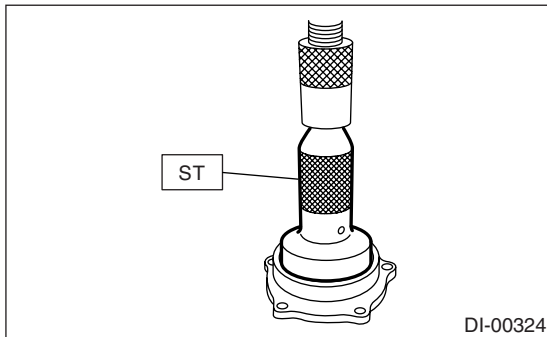
13) Press-fit the side bearing into differential case using ST.

ST 398487700 DRIFT



14) Press the side bearing outer race into side bearing retainer using ST.

ST 398417700 DRIFT



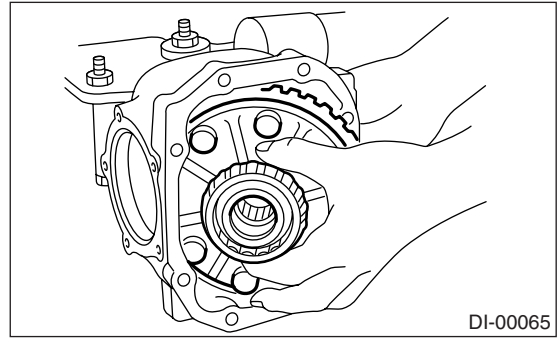
15) Adjusting side bearing retainer shims

(1) The driven gear backlash and side bearing preload can be determined by the side bearing retainer shim thickness.

(2) Install the differential case assembly into differential carrier in the reverse order of disassembly.

### NOTE:

Be careful not to hit the teeth against the case.



(3) Install the side bearing retainer shims to the right and left retainers from which they were removed.

### NOTE:

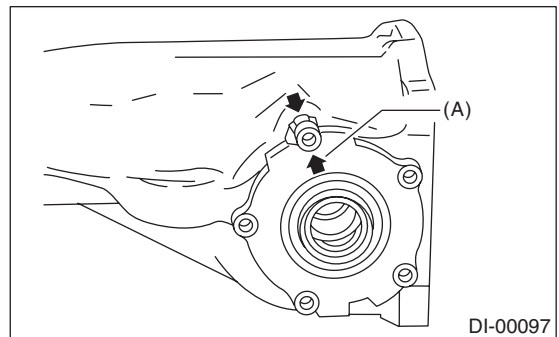
Replace the broken or corroded side bearing retainer shim with a new one of same thickness.

| Side bearing retainer shim |                   |
|----------------------------|-------------------|
| Part No.                   | Thickness mm (in) |
| 383475201                  | 0.20 (0.0079)     |
| 383475202                  | 0.25 (0.0098)     |
| 383475203                  | 0.30 (0.0118)     |
| 383475204                  | 0.40 (0.0157)     |
| 383475205                  | 0.50 (0.0197)     |

(4) Align the arrow mark on differential carrier with the mark on side bearing retainer during installation.

### NOTE:

Be careful that side bearing outer race is not damaged by bearing roller.

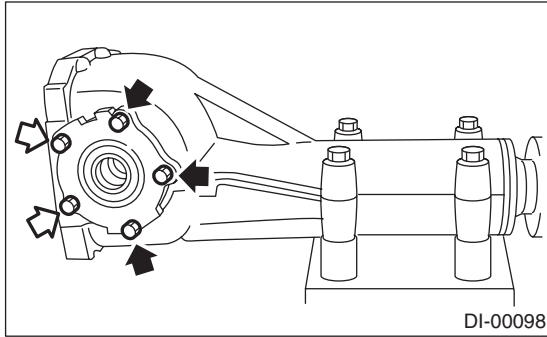


(A) Arrow mark

(5) Tighten the side bearing retainer bolts.

**Tightening torque:**

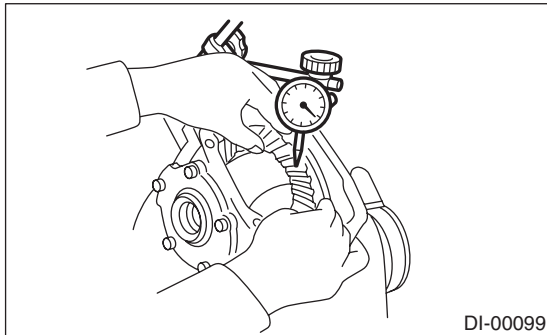
**10.5 N·m (1.1 kgf·m, 7.7 ft·lb)**



(6) Measure the hypoid driven gear-to-drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of hypoid driven gear, and move the hypoid driven gear while holding drive pinion still. Read the value indicated on dial gauge.

**Backlash:**

**0.10 — 0.20 mm (0.004 — 0.008 in)**



**NOTE:**

If the backlash exceeds 0.20 mm (0.008 in), reduce the thickness of shim on the back face of hypoid driven gear and increase the thickness of shim on the tooth face of hypoid driven gear. If the backlash is less than 0.10 mm (0.004 in), increase the thickness of shim on the back face of hypoid driven gear and reduce the thickness of shim on the tooth face of hypoid driven gear.

(7) At the same time, measure the total preload of drive pinion. Compared with the resistance when differential case is not installed, if the total preload is not within specification, adjust the thickness of side bearing retainer shims, increasing/reducing by an even amount at a time.

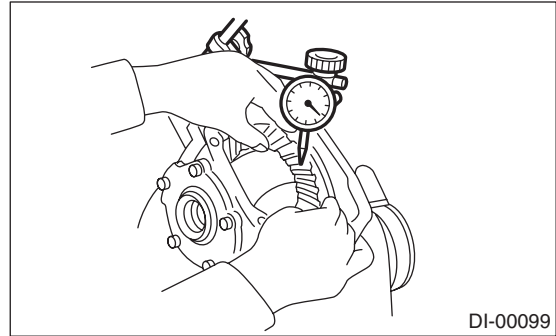
**Total preload:**

**20.7 — 54.4 N (2.1 — 5.5 kgf, 4.7 — 12.2 lbf)**

16) Re-check the hypoid driven gear-to-pinion backlash.

**Backlash:**

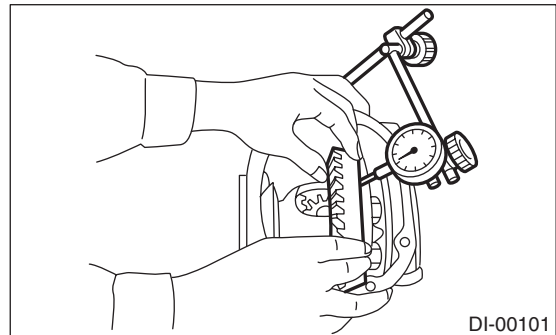
**0.10 — 0.20 mm (0.004 — 0.008 in)**



17) Check the hypoid driven gear runout on its back surface, and make sure that pinion and hypoid driven gear rotate smoothly.

**Limit of runout:**

**Less than 0.05 mm (0.0020 in)**



18) Checking and adjusting tooth contact of hypoid driven gear

(1) Apply an even coat of red lead on both sides of three or four teeth on the hypoid driven gear. Check the contact pattern after rotating the hypoid driven gear several revolutions back and forth until a definite contact pattern appears on the hypoid driven gear.

(2) When the contact pattern is incorrect, readjust according to the instructions given in "TOOTH CONTACT PATTERN".

**NOTE:**

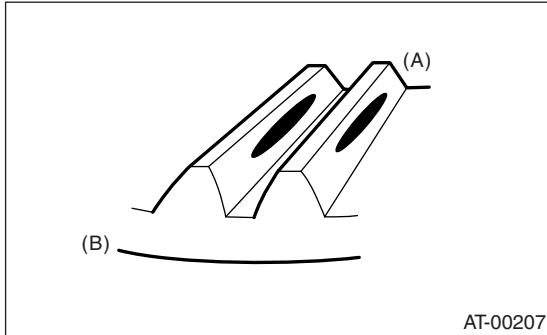
Be sure to wipe off red lead completely after adjustment is completed.

# Rear Differential

## DIFFERENTIALS

- Correct tooth contact

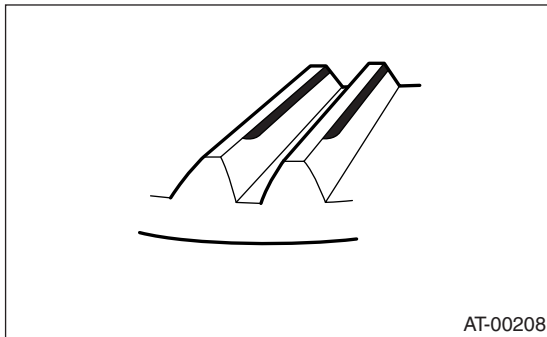
**Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. (When loaded, contact pattern moves toward heel)**



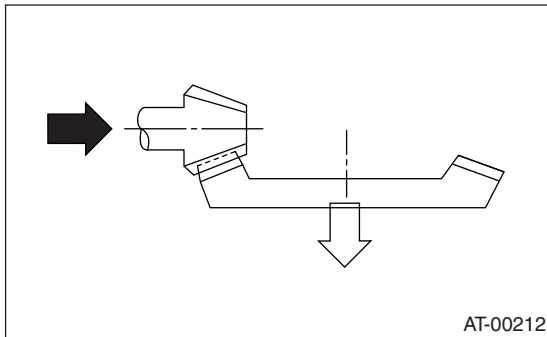
- (A) Toe side
- (B) Heel side

- Face contact

**Checking item: Backlash is too large.**  
Contact pattern

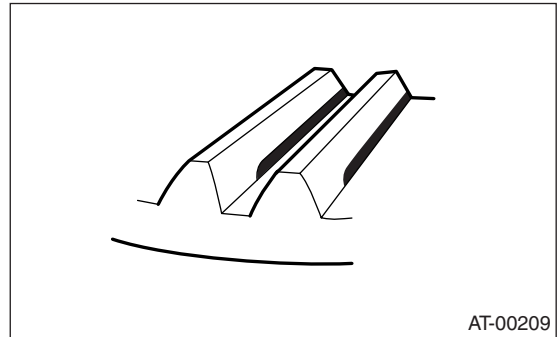


**Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.**

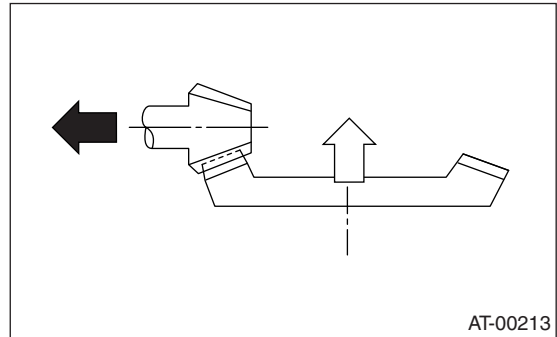


- Flank contact

**Checking item: Backlash is too small.**  
Contact pattern

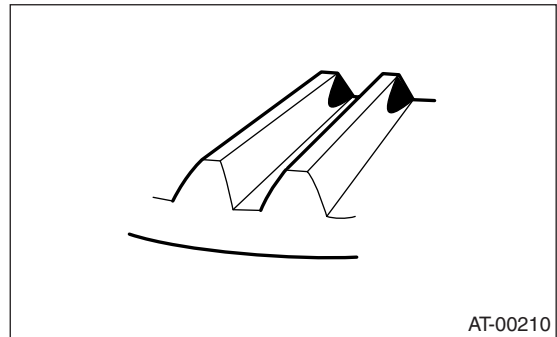


**Corrective action: Reduce thickness of drive pinion height adjusting washer in order to move drive pinion away from hypoid driven gear.**

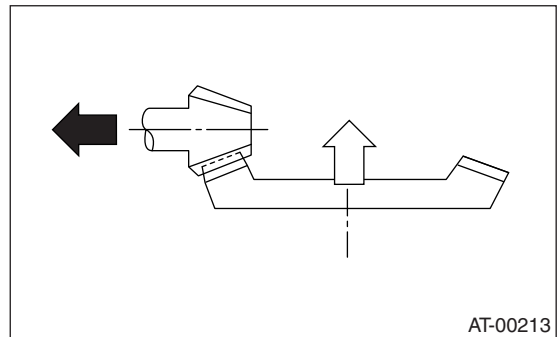


- Toe contact (Inside end contact)

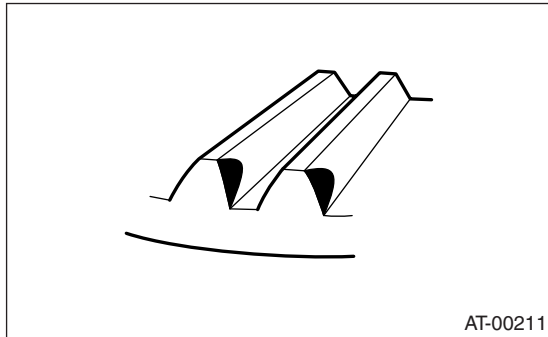
**Checking item: Contact area is small.**  
Contact pattern



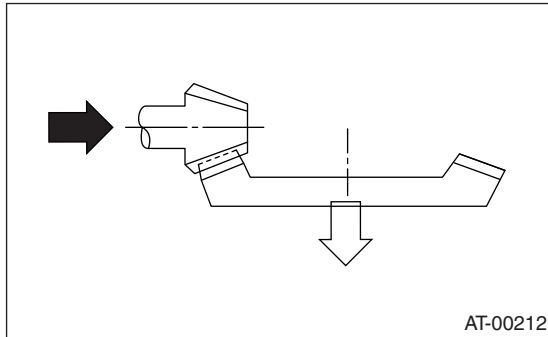
**Corrective action: Reduce thickness of drive pinion height adjusting washer in order to move drive pinion away from hypoid driven gear.**



- Heel contact (Outside end contact)
- Checking item: Contact area is small.**  
Contact pattern



Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.



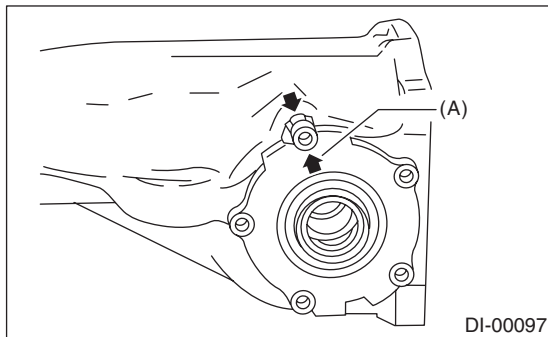
19) If proper tooth contact is not obtained, once again adjust the drive pinion height by changing RH and LH side bearing retainer shims and the hypoid gear backlash.

20) Remove the side bearing retainers on right and left side.

21) Install new O-rings to side bearing retainers on right and left side.

22) Install the oil seals to side bearing retainers on right and left side.

23) Align the arrow mark on differential carrier with the mark on side bearing retainer during installation.

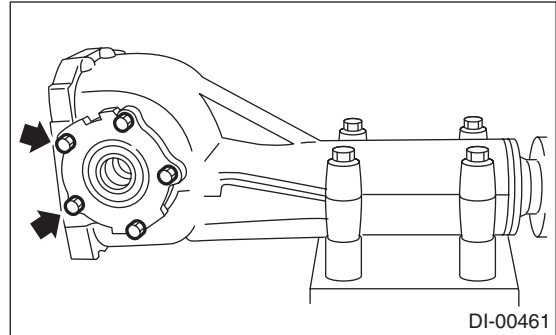


(A) Arrow mark

24) Apply liquid gasket to the bolt with arrow mark, and install the side bearing retainer.

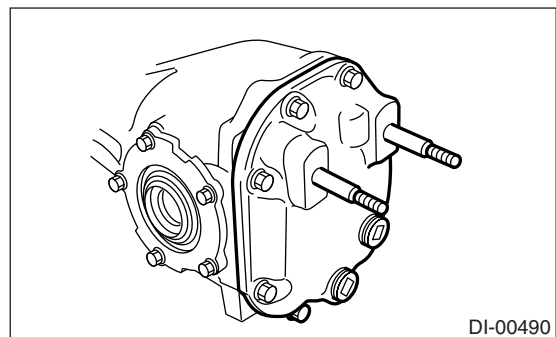
**Liquid gasket:**  
**THREE BOND 1105 (Part No. 004403010) or equivalent**

**Tightening torque:**  
**10.5 N·m (1.1 kgf-m, 7.7 ft-lb)**



25) Install the new gasket and rear cover and tighten the bolts to specified torque.

**Tightening torque:**  
**29.5 N·m (3.0 kgf-m, 21.8 ft-lb)**



26) Install the air breather cap.

27) Install the drain plug and filler plug.

**Tightening torque:**  
**49 N·m (5.0 kgf-m, 36.2 ft-lb)**

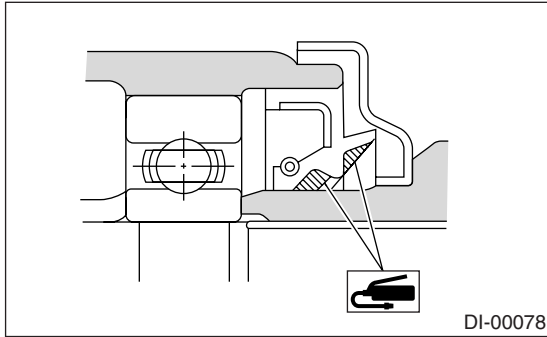
## 2. STI MODEL

- 1) Precautions for assembling
  - Assemble in the reverse order of disassembling.
  - Check and adjust each part during assembly.
  - Keep the shims and washers in order, so that they are not improperly installed.
  - Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
  - Apply gear oil when installing the bearings and thrust washers.
  - Be careful not to mix up the right and left hand races of the bearings.

# Rear Differential

## DIFFERENTIALS

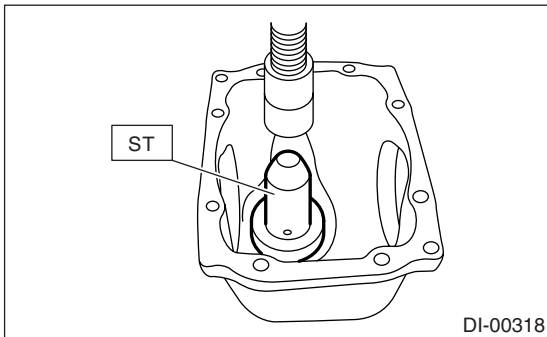
- Replace the oil seal with a new one at every dis-assembly. Apply chassis grease between the lips when installing the oil seal.



- Adjust the bearing preload with spacer and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

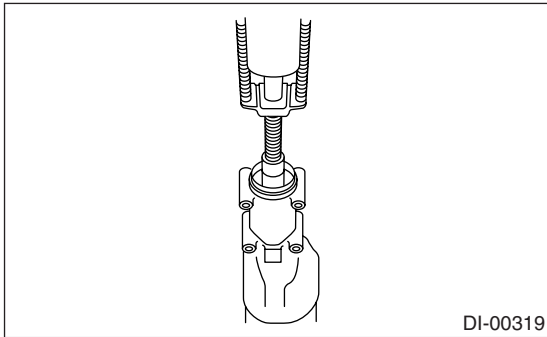
2) Press-fit the rear bearing race into differential carrier using ST.

ST 398417700 DRIFT



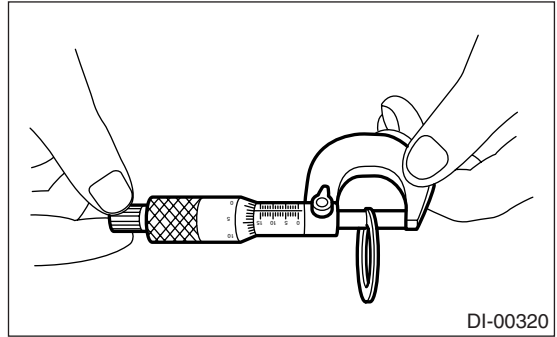
3) Press-fit the front bearing race into differential carrier using ST.

ST 398477702 DRIFT



4) Pinion height adjusting washer selection.

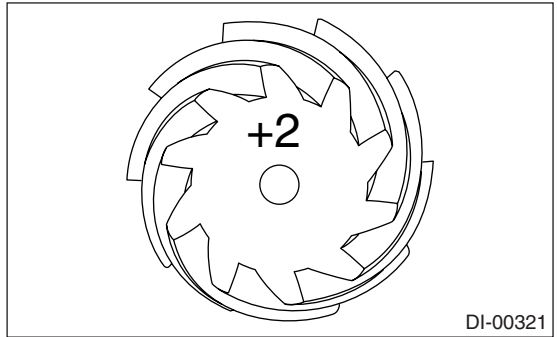
(1) Measure the thickness of inserted pinion height adjusting washer.



(2) Read the punch mark of installed drive pinion gear and new one.

NOTE:

If there is no punch mark, it means 0 (zero).



(3) Obtain the thickness of pinion height adjust shim to be inserted from the following formula, and replace the inserted shim with this one.

$$T = T1 + (T2 \times 0.01 - T3 \times 0.01)$$

|          |   |
|----------|---|
| T<br>mm  | Thickness of selected pinion height adjusting washer. |
| T1<br>mm | Thickness of inserted pinion height adjusting washer. |
| T2<br>mm | Punch mark number on installed drive pinion gear.     |
| T3<br>mm | Punch mark number on new drive pinion gear.           |

(Example of calculation)

$$T1 = 3.30, T2 = +2, T3 = -1$$

$$T = 3.30 + \{(2 \times 0.01) - (-1 \times 0.01)\} = 3.33$$

Result: Thickness = 3.33 mm

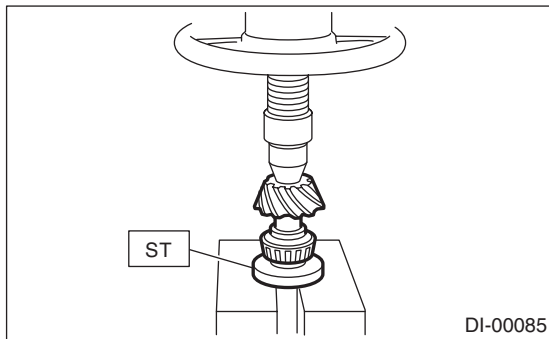
Therefore use the washer 38336AA310.



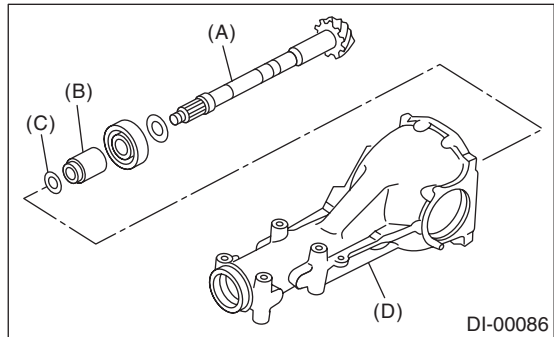
| Pinion height adjusting washer |                     |
|--------------------------------|---------------------|
| Part No.                       | Thickness T mm (in) |
| 38336AA230                     | 3.09 (0.1217)       |
| 38336AA240                     | 3.12 (0.1228)       |
| 38336AA250                     | 3.15 (0.1240)       |
| 38336AA260                     | 3.18 (0.1252)       |
| 38336AA270                     | 3.21 (0.1264)       |
| 38336AA280                     | 3.24 (0.1276)       |
| 38336AA290                     | 3.27 (0.1287)       |
| 38336AA300                     | 3.30 (0.1299)       |
| 38336AA310                     | 3.33 (0.1311)       |
| 38336AA320                     | 3.36 (0.1323)       |
| 38336AA330                     | 3.39 (0.1335)       |
| 38336AA340                     | 3.42 (0.1346)       |
| 38336AA350                     | 3.45 (0.1358)       |
| 38336AA360                     | 3.48 (0.1370)       |
| 38336AA370                     | 3.51 (0.1382)       |
| 38336AA380                     | 3.54 (0.1394)       |
| 38336AA390                     | 3.57 (0.1406)       |
| 38336AA400                     | 3.60 (0.1417)       |
| 38336AA410                     | 3.63 (0.1429)       |
| 38336AA420                     | 3.66 (0.1441)       |

5) Install the selected pinion height adjusting washer on drive pinion, and press-fit the rear bearing cone into position with ST.

ST 18674AA000 INSTALLER



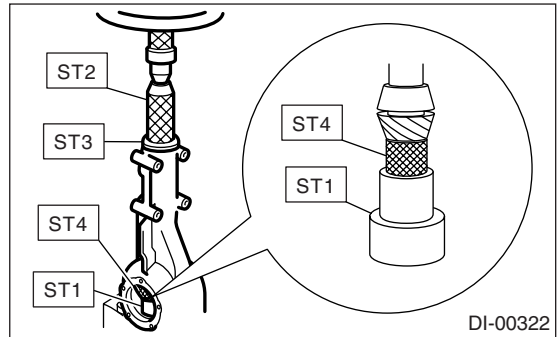
6) Insert the drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.



- (A) Drive pinion
- (B) Bearing preload adjusting spacer
- (C) Bearing preload adjusting washer
- (D) Differential carrier

7) Insert the spacer, then press-fit the pilot bearing with STs.

- ST1 399780104 WEIGHT
- ST2 899580100 INSTALLER
- ST3 398507703 DUMMY COLLER
- ST4 498937110 HOLDER

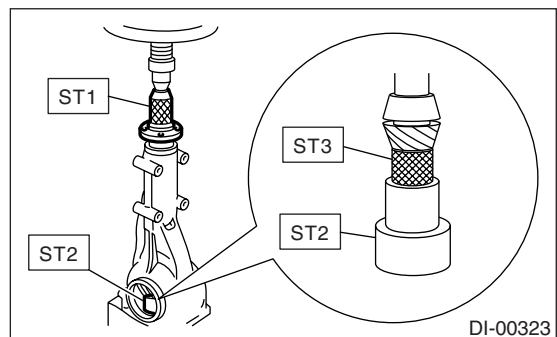


8) Press-fit the companion flange with ST1, ST2 and ST3.

NOTE:

Be careful not to damage the bearing.

- ST1 899874100 INSTALLER
- ST2 399780104 WEIGHT
- ST3 498937110 HOLDER





# Rear Differential

## DIFFERENTIALS

9) Apply Lock Tite to the bolt threads of drive pinion shaft, and the seating surface of new self-locking nut.

**Lock Tite:**

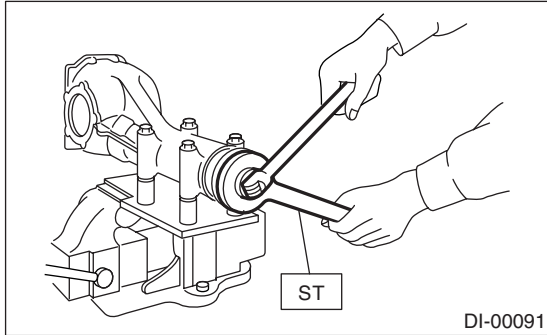
**THREE BOND 1324 (Part No. 004403042)**

10) Install the self-locking nut. Then tighten it with the ST.

ST 18633AA000 WRENCH COMPL

**Tightening torque:**

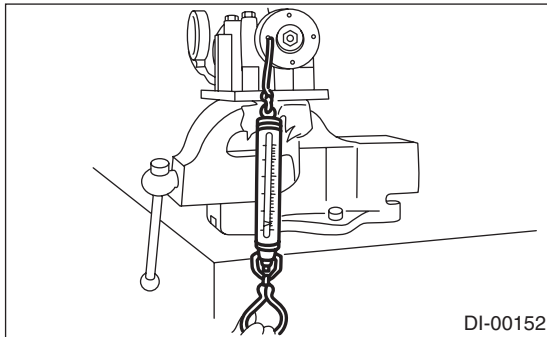
**181.5 N·m (18.5 kgf·m, 134 ft·lb)**



11) Rotate the drive pinion shaft more than ten times to accustom each taper roller bearing, and then measure the preload.

**Bearing preload:**

**24.1 — 38.6 N (2.5 — 3.9 kgf, 5.4 — 8.7 lbf)**

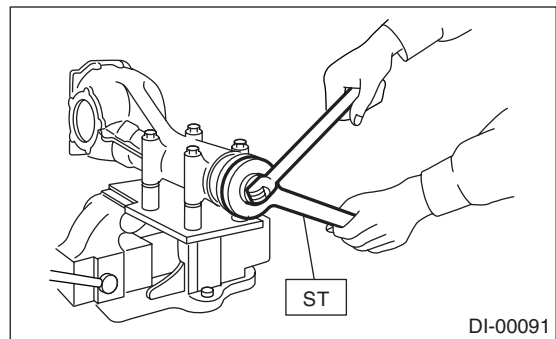


12) If bearing preload is out of specification, adjust to specification by selecting preload adjusting washer and spacer from the following table.

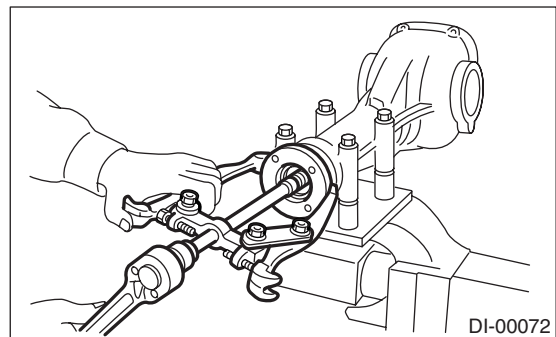
| Preload adjusting washer | Part No.      | Thickness mm (in) |
|--------------------------|---------------|-------------------|
|                          | 383705200     | 2.59 (0.1020)     |
|                          | 383715200     | 2.57 (0.1012)     |
|                          | 383725200     | 2.55 (0.1004)     |
|                          | 383735200     | 2.53 (0.0996)     |
|                          | 383745200     | 2.51 (0.0988)     |
|                          | 383755200     | 2.49 (0.0980)     |
|                          | 383765200     | 2.47 (0.0972)     |
|                          | 383775200     | 2.45 (0.0965)     |
|                          | 383785200     | 2.43 (0.0957)     |
|                          | 383795200     | 2.41 (0.0949)     |
|                          | 383805200     | 2.39 (0.0941)     |
|                          | 383815200     | 2.37 (0.0933)     |
|                          | 383825200     | 2.35 (0.0925)     |
| 383835200                | 2.33 (0.0917) |                   |
| 383845200                | 2.31 (0.0909) |                   |
| Preload adjusting spacer | Part No.      | Length mm (in)    |
|                          | 31454AA130    | 52.2 (2.055)      |
|                          | 31454AA140    | 52.4 (2.063)      |
|                          | 31454AA150    | 52.6 (2.071)      |
|                          | 31454AA160    | 52.8 (2.079)      |
|                          | 31454AA170    | 53.0 (2.087)      |
|                          | 31454AA180    | 53.2 (2.094)      |

13) Hold the companion flange with ST and remove the self-locking nut.

ST 18633AA000 WRENCH COMPL



14) Extract the companion flange with a puller.

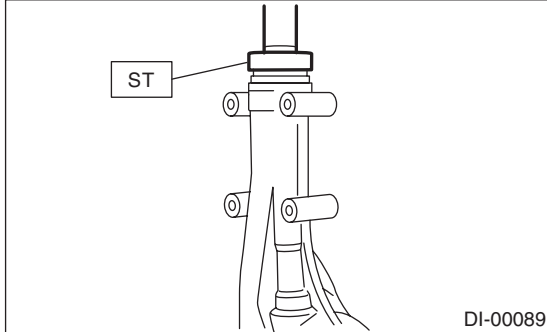


15) Fit a new oil seal with ST.

**NOTE:**

- Press-fit until the end of oil seal is 1 mm (0.04 in) inward from end of carrier.
- Apply grease between the oil seal lips.

ST 498447120 INSTALLER

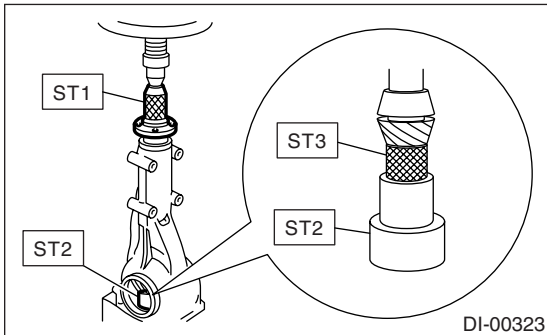


16) Press-fit the companion flange with ST1, ST2 and ST3.

ST1 899874100 INSTALLER  
 ST2 399780104 WEIGHT  
 ST3 498937110 HOLDER

**NOTE:**

Be careful not to damage the bearing.



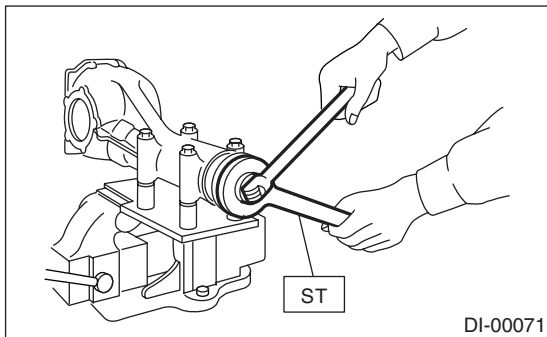
17) Apply Lock Tite to the bolt threads of drive pinion shaft, and the seating surface of new self-locking nut.

**Lock Tite:**

**THREE BOND 1324 (Part No. 004403042)**

18) Install the self-locking nut. Then tighten it with the ST.

ST 18633AA000 WRENCH COMPL



19) Install the hypoid driven gear on differential case.

**NOTE:**

- Before installing the bolts, apply Lock Tite to bolt threads.
- Make sure that there is no clearance between differential case and driven gear.

**Lock Tite:**

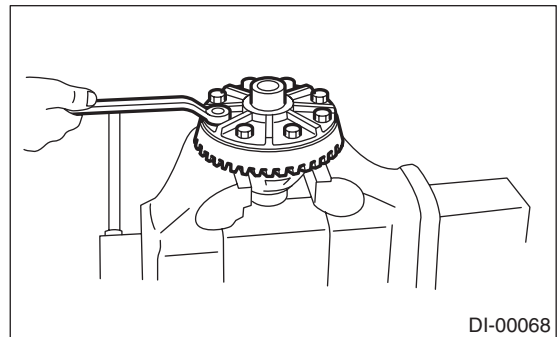
**THREE BOND 1324 (Part No. 004403042) or equivalent**

**NOTE:**

Tighten diagonally while tapping the bolt heads.

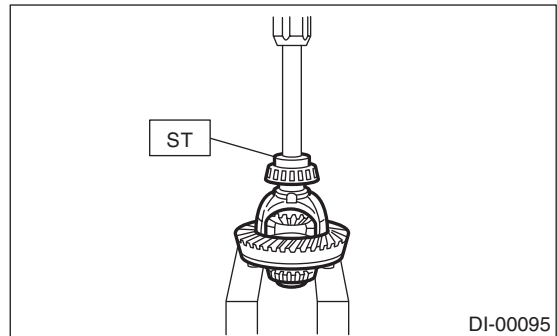
**Tightening torque:**

**103 N·m (10.5 kgf-m, 76 ft-lb)**



20) Press-fit the side bearing onto differential case with ST.

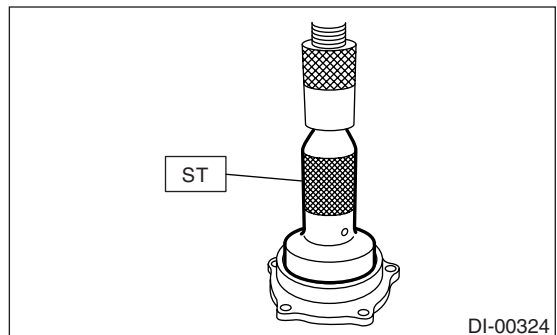
ST 398487700 DRIFT



21) Assembling side bearing retainer.

(1) Press-fit the side bearing outer race with press and ST.

ST 398417700 DRIFT



# Rear Differential

## DIFFERENTIALS

(2) Install the oil seal. <Ref. to DI-50, REPLACEMENT, Rear Differential Side Oil Seal.>

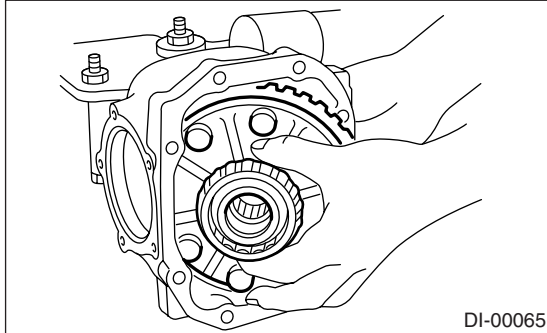
### 22) Adjusting side bearing retainer shims

(1) The driven gear backlash and side bearing preload can be determined by the side bearing retainer shim thickness.

(2) Install the differential case assembly into differential carrier in the reverse order of disassembly.

**NOTE:**

Be careful not to hit the teeth against the case.



DI-00065

(3) Install the side bearing retainer shims to the right and left retainers from which they were removed.

**NOTE:**

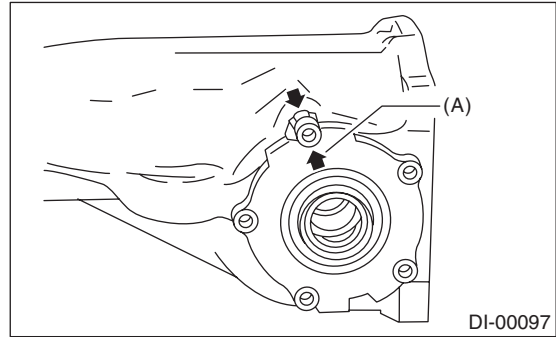
Replace the broken or corroded side bearing retainer shim with a new one of same thickness.

| Side bearing retainer shim |                   |
|----------------------------|-------------------|
| Part No.                   | Thickness mm (in) |
| 383475201                  | 0.20 (0.0079)     |
| 383475202                  | 0.25 (0.0098)     |
| 383475203                  | 0.30 (0.0118)     |
| 383475204                  | 0.40 (0.0157)     |
| 383475205                  | 0.50 (0.0197)     |

(4) Align the arrow mark on differential carrier with the mark on side bearing retainer during installation.

**NOTE:**

Be careful that side bearing outer race is not damaged by bearing roller.



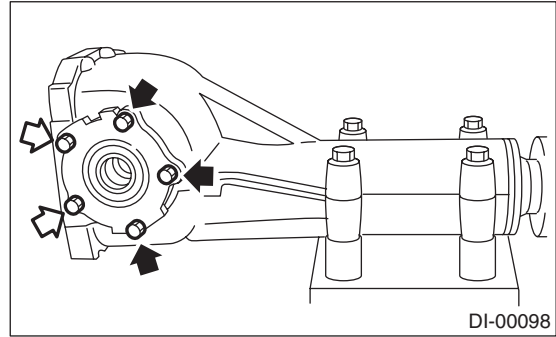
DI-00097

(A) Arrow mark

(5) Tighten the side bearing retainer bolts.

**Tightening torque:**

**10.5 N·m (1.1 kgf·m, 7.7 ft·lb)**

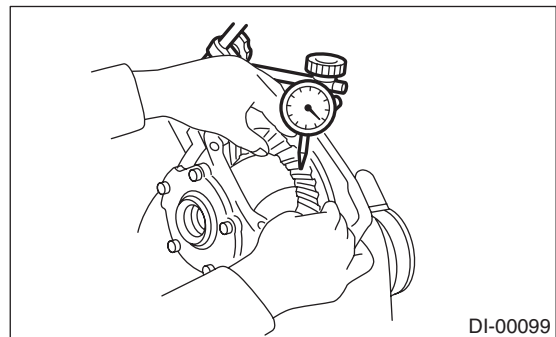


DI-00098

(6) Measure the hypoid driven gear-to-drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of hypoid driven gear, and move the hypoid driven gear while holding drive pinion still. Read the value indicated on dial gauge.

**Backlash:**

**0.10 — 0.20 mm (0.004 — 0.008 in)**



DI-00099

**NOTE:**

If the backlash exceeds 0.20 mm (0.008 in), reduce the thickness of shim on the back face of hypoid driven gear and increase the thickness of shim on the tooth face of hypoid driven gear. If the backlash is less than 0.10 mm (0.004 in), increase the thickness of shim on the back face of hypoid driven gear and reduce the thickness of shim on the tooth face of hypoid driven gear.

(7) At the same time, measure the total preload of drive pinion. Compared with the resistance when differential case is not installed, if the total preload is not within the specified range, readjust side bearing retainer shims, increasing/reducing by an even amount at a time.

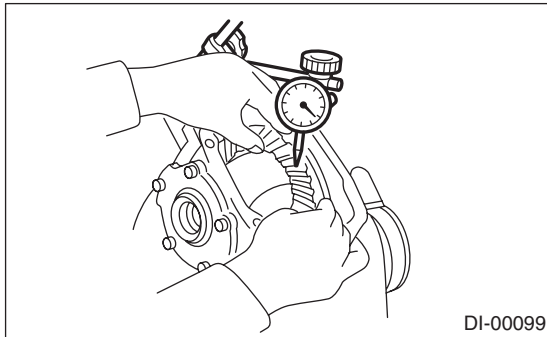
**Total preload:**

**27 — 54 N (2.8 — 5.50 kgf, 6.1 — 12.2 lbf)**

23) Re-check the hypoid driven gear-to-pinion backlash.

**Backlash:**

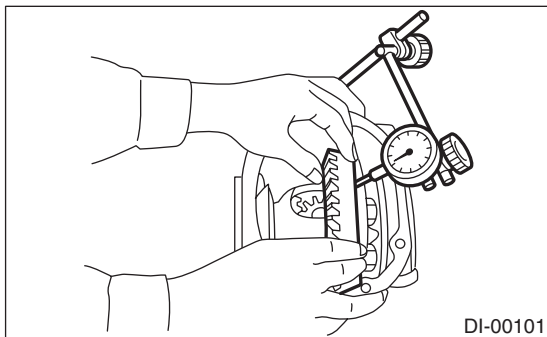
**0.10 — 0.20 mm (0.004 — 0.008 in)**



24) Check the hypoid driven gear runout on its back surface, and make sure that pinion and hypoid driven gear rotate smoothly.

**Limit of runout:**

**Less than 0.05 mm (0.0020 in)**



25) Checking and adjusting tooth contact of hypoid driven gear

(1) Apply an even coat of red lead on both sides of three or four teeth on the hypoid driven gear. Check the contact pattern after rotating the hypoid driven gear several revolutions back and forth until a definite contact pattern appears on the hypoid driven gear.

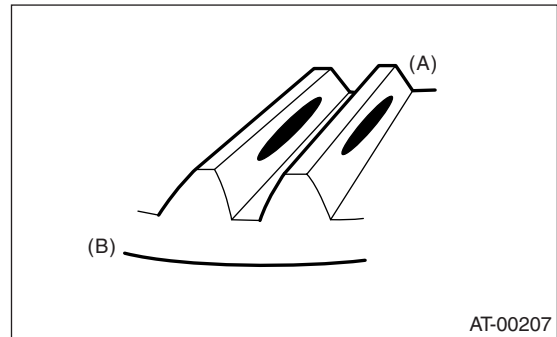
(2) When the contact pattern is incorrect, readjust according to the instructions given in "TOOTH CONTACT PATTERN".

**NOTE:**

Be sure to wipe off red lead completely after adjustment is completed.

- Correct tooth contact

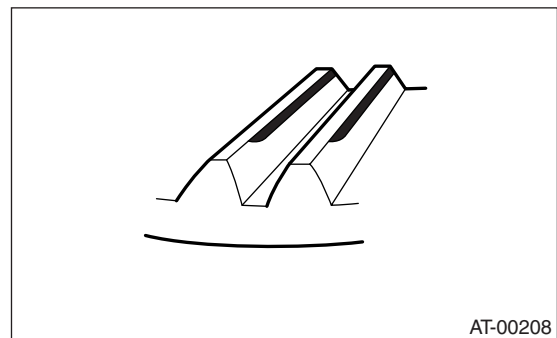
**Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. (When loaded, contact pattern moves toward heel)**



- (A) Toe side
- (B) Heel side

- Face contact

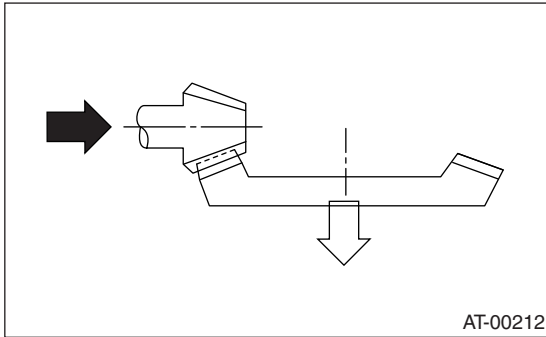
**Checking item: Backlash is too large. Contact pattern**



# Rear Differential

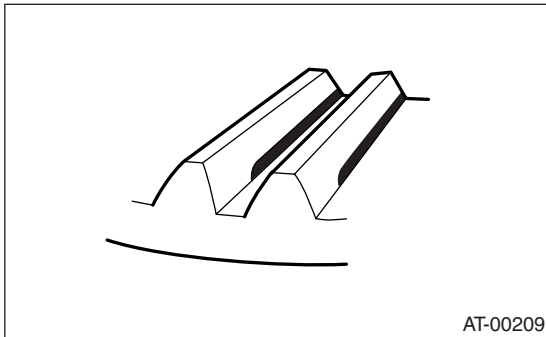
## DIFFERENTIALS

Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.

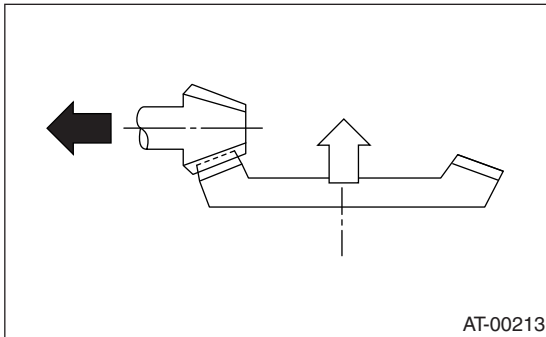


- Flank contact

**Checking item: Backlash is too small.**  
Contact pattern

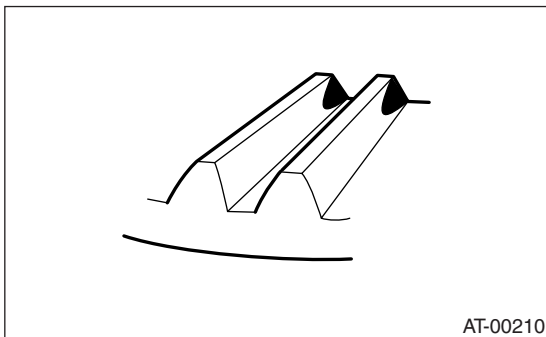


Corrective action: Reduce thickness of drive pinion height adjusting washer in order to move drive pinion away from hypoid driven gear.

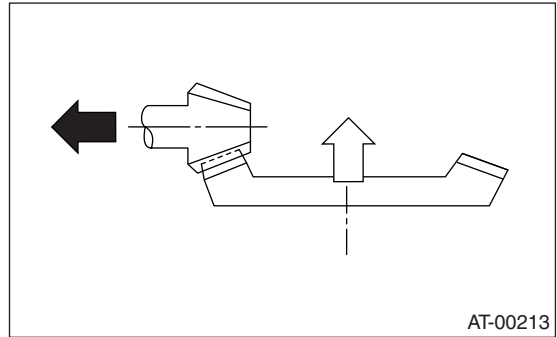


- Toe contact (Inside end contact)

**Checking item: Contact area is small.**  
Contact pattern

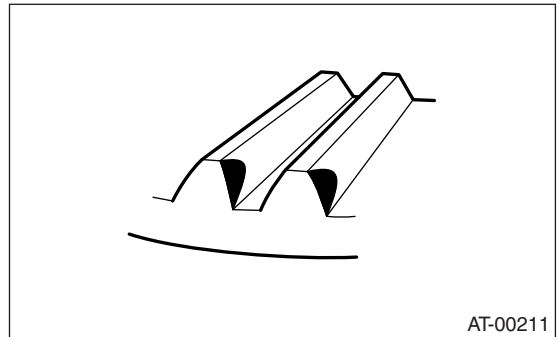


Corrective action: Reduce thickness of drive pinion height adjusting washer in order to move drive pinion away from hypoid driven gear.

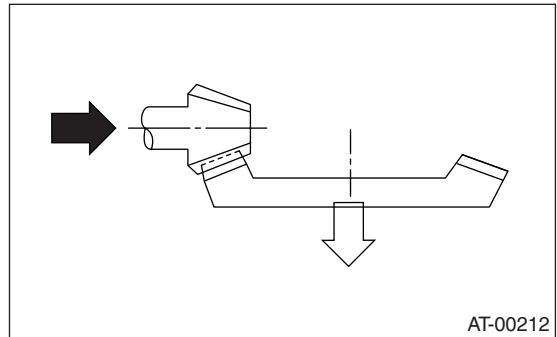


- Heel contact (Outside end contact)

**Checking item: Contact area is small.**  
Contact pattern



Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.

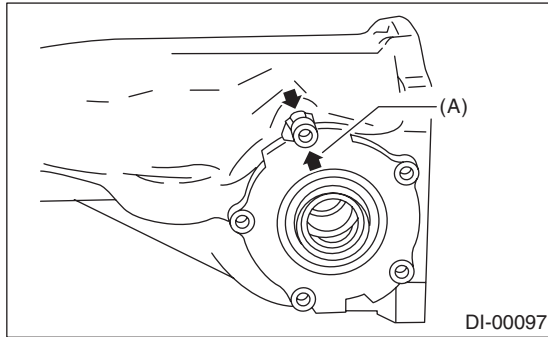


26) If proper tooth contact is not obtained, once again adjust the drive pinion height by changing RH and LH side bearing retainer shims and the hypoid gear backlash.

27) Remove the side bearing retainers on right and left side.

28) Install new O-rings to side bearing retainers on right and left side.

29) Align the arrow mark on differential carrier with the mark on side bearing retainer during installation.



(A) Arrow mark

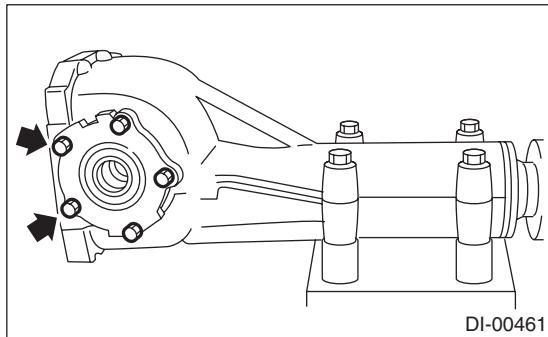
30) Apply liquid gasket to the bolt with arrow mark, and install the side bearing retainer.

**Liquid gasket:**

**THREE BOND 1105 (Part No. 004403010) or equivalent**

**Tightening torque:**

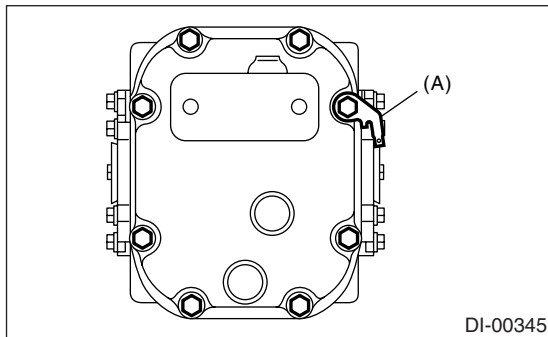
**10.5 N-m (1.1 kgf-m, 7.7 ft-lb)**



31) Install the new gasket, rear cover and stay ground and tighten the bolts to specified torque.

**Tightening torque:**

**44 N-m (4.5 kgf-m, 32.5 ft-lb)**



(A) Stay ground

32) Install the new air breather cap.

33) Install the drain plug and rear differential oil temperature switch or oil temperature sensor.

**Tightening torque:**

**49 N-m (5.0 kgf-m, 36.2 ft-lb)**

**E: INSPECTION**

Wash all the disassembled parts clean, and examine them for wear, damage, or other defects. Repair or replace defective parts as necessary.

- 1) Hypoid driven gear and drive pinion
  - If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact at assembly. Replace the gear if excessively worn or incapable of adjustment.
  - If crack, score, or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.
- 2) Side gear and pinion mate gear
  - Replace if crack, score, or other defects are evident on tooth surface.
  - Replace if thrust washer contacting surface is worn or seized. Slight damage of the surface can be corrected by oil stone or the like.
- 3) Bearing
 

Replace if seizure, peeling, wear, rust, dragging during rotation, abnormal noise or other defect is evident.
- 4) Thrust washers of side gear and pinion mate gear
 

Replace if seizure, flaw, abnormal wear or other defect is evident.
- 5) Oil seal
 

Replace if deformed or damaged, and at every disassembling.
- 6) Differential carrier
 

Replace if the bearing bores are worn or damaged.
- 7) Differential case
 

Replace if its sliding surfaces are worn or cracked.
- 8) Companion flange
 

Replace if the oil seal lip contacting surfaces have flaws.
- 9) Rear differential oil temperature switch
 

If the results of the following inspections are not satisfactory, replace rear differential temperature switch.

  - (1) At room temperature, check for continuity between the sensor terminal and body.
  - (2) Soak the sensor in oil, then raise the oil temperature. Check that the continuity is cut off when the oil temperature is between 144°C (291°F) and 156°C (313°F). Then, check that the continuity resumes by the time the oil temperature drops to 135°C (275°F).



# Rear Differential

## DIFFERENTIALS

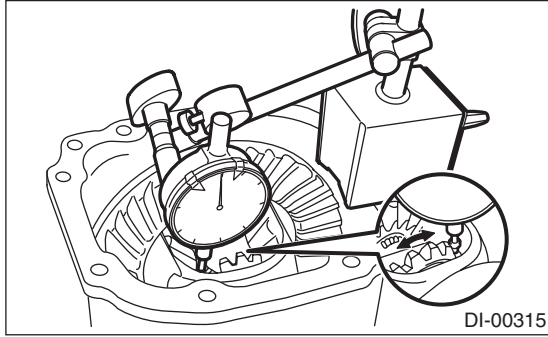
### 1. SIDE GEAR BACKLASH

Using a dial gauge, check the backlash of the side gear.

**Side gear backlash:**

**0.1 — 0.2 mm (0.004 — 0.008 in)**

If the side gear backlash is not within the specification, adjust clearance as specified by selecting the side gear thrust washer.



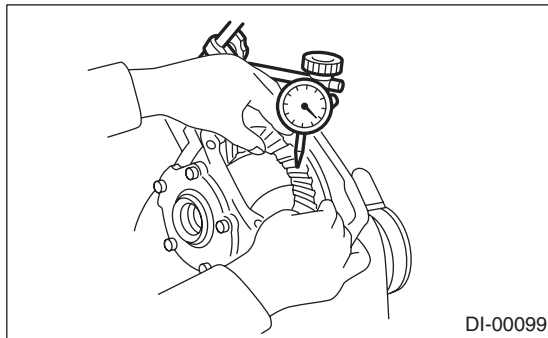
### 2. HYPOID DRIVEN GEAR BACKLASH

Using a dial gauge, check the backlash of the hypoid driven gear.

**Hypoid driven gear backlash:**

**0.1 — 0.2 mm (0.004 — 0.008 in)**

If the hypoid driven gear backlash is not within the specification, adjust the side bearing preload or repair if necessary.



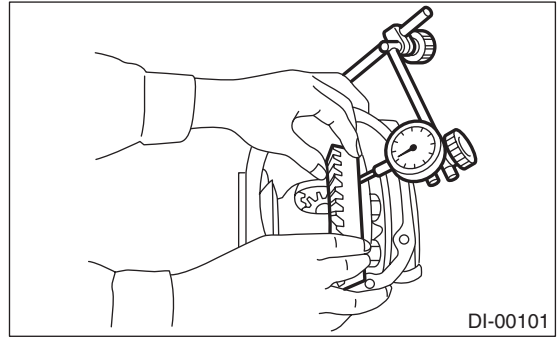
### 3. HYPOID DRIVEN GEAR RUNOUT

Using a dial gauge, check the hypoid driven gear runout.

**Hypoid driven gear runout:**

**Less than 0.05 mm (0.0020 in)**

If the hypoid driven gear runout exceeds 0.05 mm (0.0020 in), replace the hypoid driven gear.



### 4. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Inspect the tooth contact between hypoid driven gear and driven pinion. <Ref. to DI-29, ASSEMBLY, Rear Differential.>

### 5. TOTAL PRELOAD

Using a gauge, check the turning resistance increase.

**Total preload:**

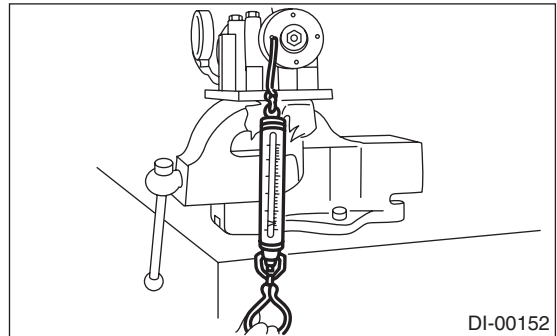
**Except STI model:**

**20.7 — 54.4 N (2.1 — 5.5 kgf, 4.7 — 12.2 lbf)**

**STI model:**

**27 — 54 N (2.8 — 5.50 kgf, 6.1 — 12.2 lbf)**

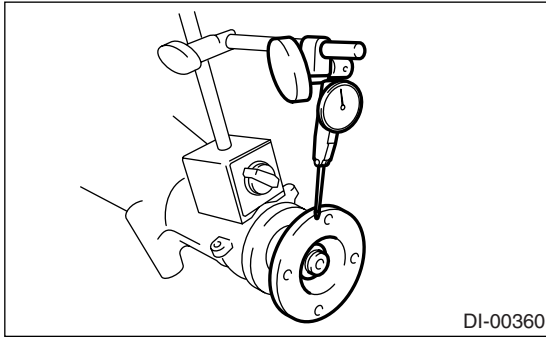
If the total preload is not within the specification, adjust the side bearing retainer shims.



## 6. COMPANION FLANGE

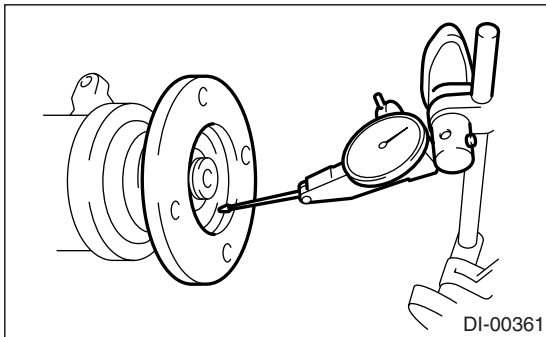
- 1) If rust or dirt is attached to the companion flange, remove them.
- 2) Set a dial gauge at a companion flange surface (mating surface of propeller shaft and companion flange), and then measure the companion flange runout.

**Limit of runout:**  
**0.08 mm (0.003 in)**



- 3) Set the gauge inside of the companion flange, and measure the runout.

**Limit of runout:**  
**0.08 mm (0.003 in)**



- 4) If either runout exceeds the limit, move the phase of companion flange and drive pinion 90° each, and find the point where the runout is within the limit.
- 5) If the runout exceeds the limit after changing the phase, replace the companion flange and recheck the runout.
- 6) If the runout exceeds the limit after replacing the companion flange, the drive pinion may be assembled incorrectly or bearing is faulty.

## F: ADJUSTMENT

### 1. SIDE GEAR BACKLASH

Adjust the side gear backlash. <Ref. to DI-29, ASSEMBLY, Rear Differential.>

### 2. HYPOID DRIVEN GEAR BACKLASH

Adjust the hypoid driven gear backlash. <Ref. to DI-29, ASSEMBLY, Rear Differential.>

### 3. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Adjust the tooth contact between hypoid driven gear and drive pinion gear. <Ref. to DI-29, ASSEMBLY, Rear Differential.>

### 4. TOTAL PRELOAD

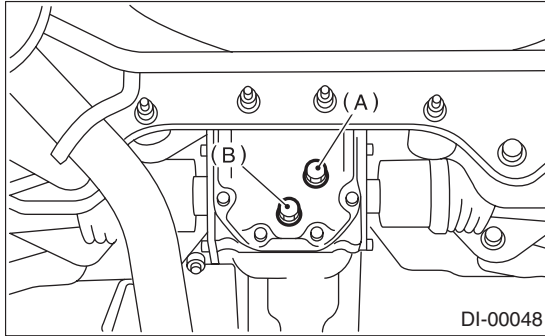
Adjust the side bearing shim. <Ref. to DI-29, ASSEMBLY, Rear Differential.>



## 5. Rear Differential Front Oil Seal

### A: REPLACEMENT

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Move the select lever or gear shift lever to "N".
- 4) Release the parking brake.
- 5) Remove the oil drain plug, and drain the gear oil.



- (A) Filler plug  
(B) Drain plug

- 6) Install the oil drain plug.

**NOTE:**

Apply liquid gasket to the drain plug.

**Liquid gasket:**

**THREE BOND 1105 (Part No. 004403010) or equivalent.**

**Tightening torque:**

**49 N·m (5.0 kgf·m, 36.2 ft·lb)**

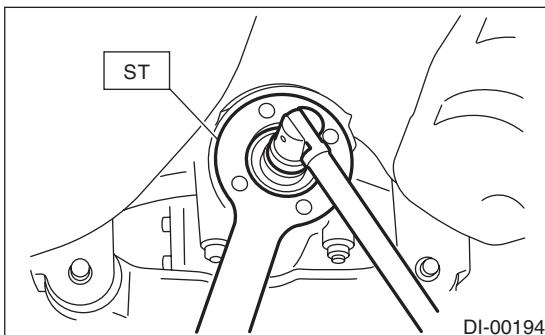
- 7) Lift-up the vehicle.
- 8) Remove the rear exhaust pipe and muffler.
- 9) Remove the propeller shaft from body. <Ref. to DS-16, REMOVAL, Propeller Shaft.>
- 10) Remove the self-locking nut while holding the companion flange with ST.

Except STI model

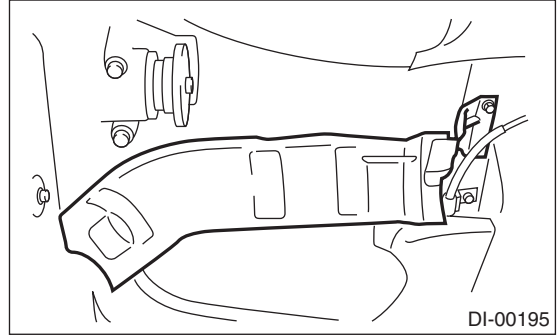
ST 498427200 FLANGE WRENCH

STI model

ST 18633AA000 WRENCH COMPL

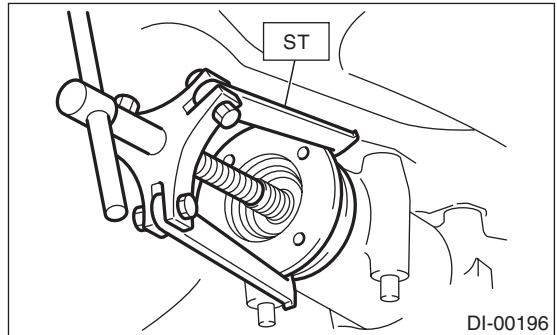


- 11) Remove the center heat shield cover.



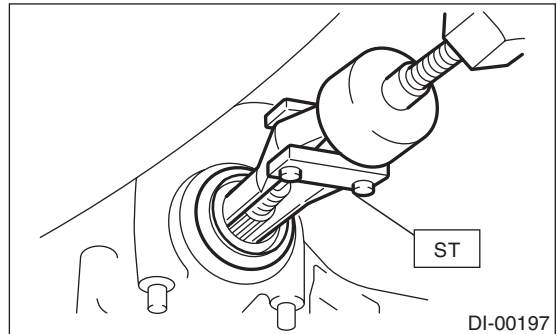
- 12) Extract the companion flange using ST.

ST 399703600 PULLER ASSY



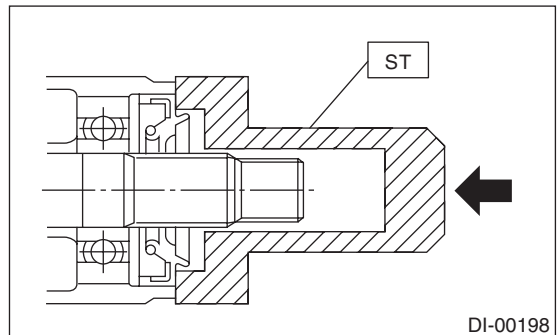
- 13) Remove the oil seal using ST.

ST 398527700 PULLER ASSY



- 14) Fit a new oil seal using ST.

ST 498447120 INSTALLER



- 15) Install the companion flange.

**NOTE:**

Use a plastic hammer to install the companion flange.

16) Apply Lock Tite to the bolt threads of drive pinion shaft, and the seating surface of new self-locking nut.

**Lock Tite:**

**THREE BOND 1324 (Part No. 004403042)**

17) Tighten the self-locking nut within the specified torque range so that the preload of companion flange becomes the same as that before replacing oil seal.

Except STI model

ST 498427200 FLANGE WRENCH

STI model

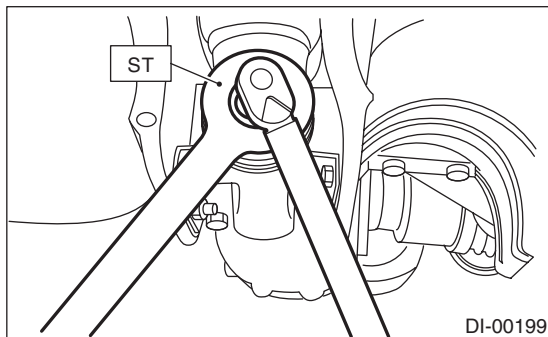
ST 18633AA000 WRENCH COMPL

NOTE:

Use a new self-locking nut.

**Tightening torque:**

**181.5 N·m (18.5 kgf-m, 134 ft-lb)**



18) Hereafter, reassemble in the reverse order of disassembly.

19) Fill the differential carrier with gear oil to the bottom of filler plug hole after installing. <Ref. to DI-18, Differential Gear Oil.>

# Rear Differential Side Oil Seal

## DIFFERENTIALS

### 6. Rear Differential Side Oil Seal

#### A: INSPECTION

Make sure that there is no oil leakage from side oil seal.

If there is any oil leakage, replace the oil seal.

#### B: REPLACEMENT

- 1) Move the select lever or gear shift lever to "N".
- 2) Release the parking brake.
- 3) Loosen both wheel nuts.
- 4) Lift-up the vehicle.
- 5) Remove the wheels.
- 6) Remove the rear exhaust pipe and muffler.

- Non-turbo model

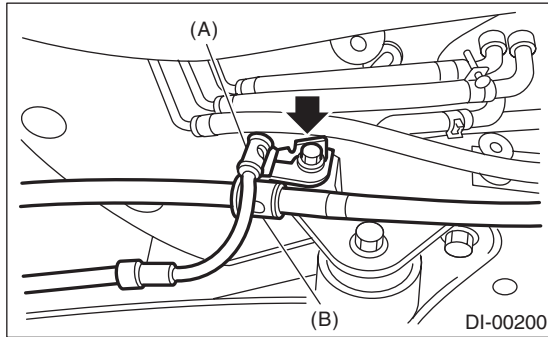
<Ref. to EX(H4SO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, REMOVAL, Muffler.>

- Turbo model and STI model

<Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>

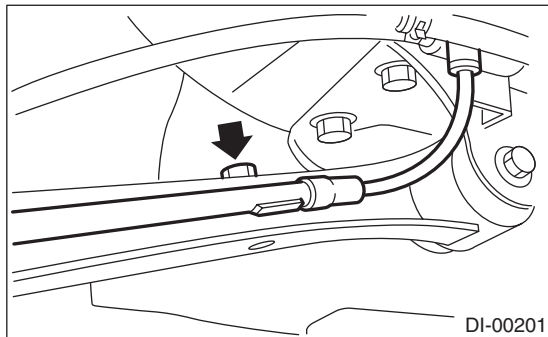
7) Remove the DOJ of rear drive shaft from rear differential.

- (1) Remove the ABS wheel speed sensor cable clamp and parking brake cable clamp from bracket.

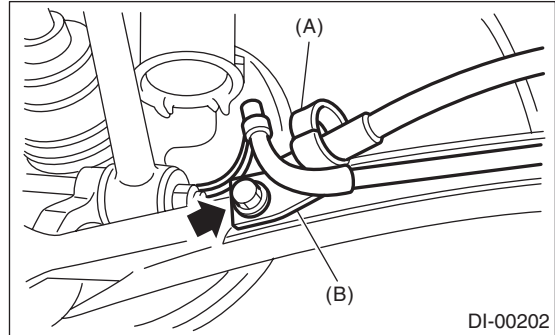


- (A) ABS wheel speed sensor cable clamp
- (B) Parking brake cable clamp

- (2) Remove the ABS wheel speed sensor cable clamp from trailing link.

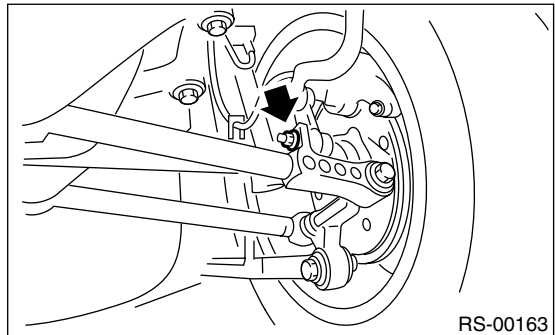


- (3) Remove the ABS wheel speed sensor cable clamp and parking brake cable guide from trailing link.

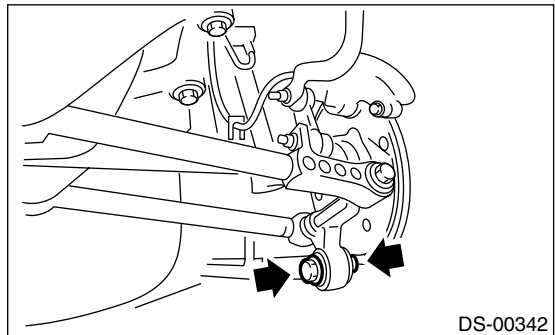


- (A) Parking brake cable guide
- (B) ABS wheel speed sensor cable clamp

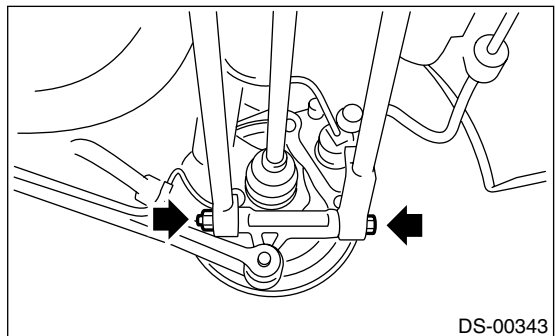
- (4) Remove the rear stabilizer link.



- (5) Remove the bolts which secure trailing link to housing.



- (6) Remove the bolts which secure the front and rear lateral link to rear housing.

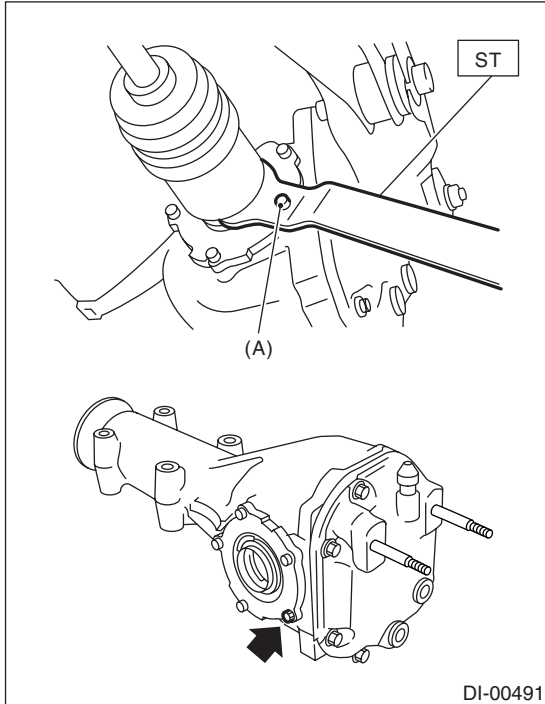


(7) Remove the DOJ from the rear differential by using ST.

**NOTE:**

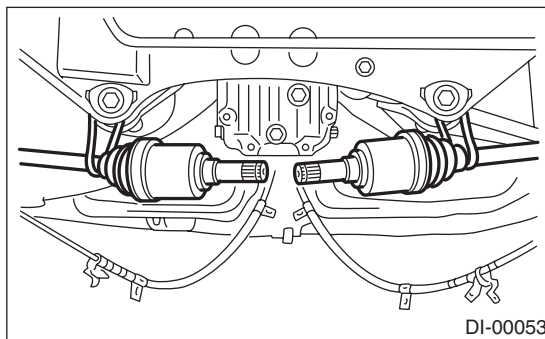
When removing the DOJ from rear differential, fit ST to the bolts as shown in the figure so as not to damage the side bearing retainer.

ST 208099PA100 DRIVE SHAFT REMOVER



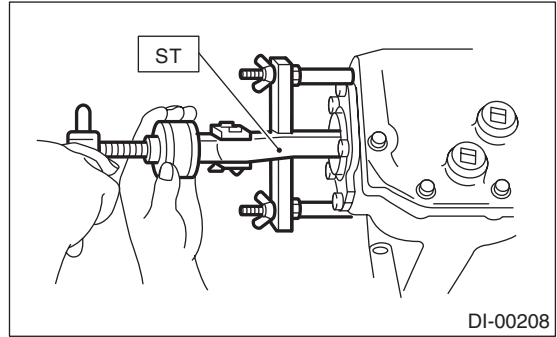
(A) Bolt

8) Suspend the rear drive shaft to the rear cross-member using wire.



9) Remove the oil seal using ST.

ST 398527700 PULLER ASSY

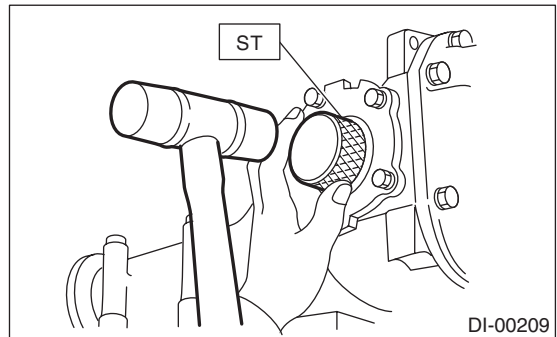


10) Drive in a new side oil seal using ST.

**NOTE:**

Apply chassis grease between the oil seal lips.

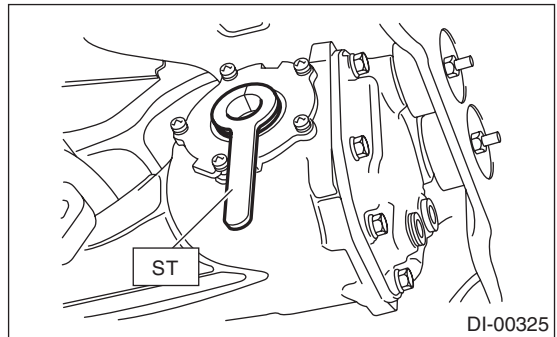
ST 398437700 DRIFT



11) Insert the DOJ into rear differential.

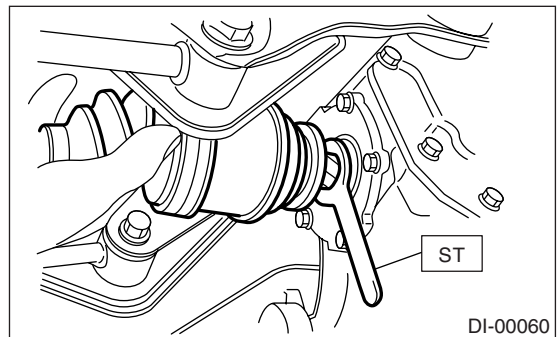
(1) Install the ST to rear differential.

ST 28099PA090 OIL SEAL PROTECTOR



(2) Install the spline shaft until the spline portion is inside the side oil seal using ST.

ST 28099PA090 OIL SEAL PROTECTOR



## Rear Differential Side Oil Seal

### DIFFERENTIALS

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- (3) Remove the ST.
- ST 28099PA090 OIL SEAL PROTECTOR
- 12) Hereafter, reassemble in the reverse order of disassembly.

## 7. Rear Differential Member

### A: REMOVAL

When removing the differential front member, work the removal procedure as rear differential.

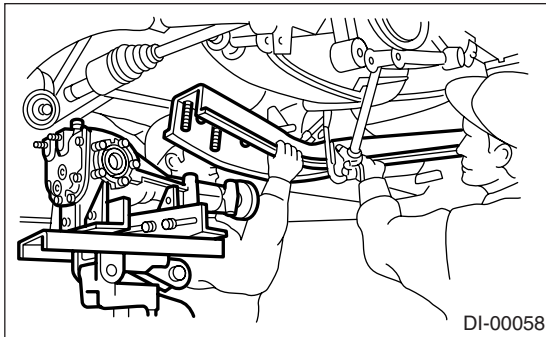
<Ref. to DI-21, REMOVAL, Rear Differential.>

### B: INSTALLATION

1) Position the differential front member on body by passing it under the parking brake cable and securing to rear differential.

#### NOTE:

When installing the differential front member, do not confuse the installation sequence of the stopper.

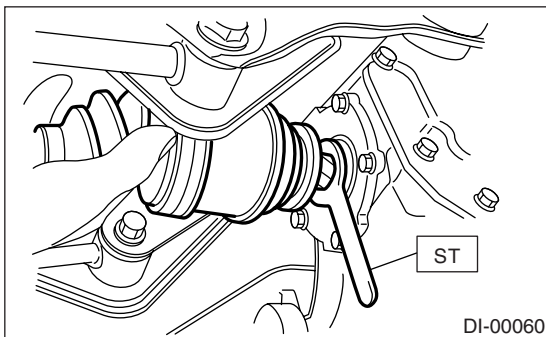


2) Insert the DOJ of rear drive shaft into rear differential. <Ref. to DI-50, REPLACEMENT, Rear Differential Side Oil Seal.>

#### NOTE:

Before inserting, replace the differential side oil seal with a new one.

ST 28099PA090 OIL SEAL PROTECTOR



3) Hereafter, install in the reverse order of removal.

### C: INSPECTION

1) Check the rear differential member for damage, bend, or corrosion.

If damage, bend, or corrosion is excessive, replace the rear differential member.

2) Check the bushings of rear differential member for cracking, hardening, or damage.

If cracking, hardening, or damage is excessive, replace the rear differential member.

# General Diagnostic Table

DIFFERENTIALS

## 8. General Diagnostic Table

### A: INSPECTION

| Symptom or trouble  | Possible cause  | Remedy  |
|---|---|---|
| <b>1. Oil leakage</b>   | (1) Worn, scratched, or incorrectly seated front or side oil seal. Scored, battered, or excessively worn sliding surface of companion flange. | Repair or replace.  |
|   | (2) Clogged or damaged air breather cap.  | Clean, repair or replace.   |
|   | (3) Loose bolts on differential spindle or side bearing retainer, or incorrectly fitted O-ring.   | Tighten the bolts to specified torque.<br>Replace the O-ring.                         |
|   | (4) Loose rear cover attaching bolts or damaged gasket.   | Tighten the bolts to specified torque.<br>Replace the gasket and apply liquid gasket. |
|   | (5) Loose oil filler or drain plug.   | Retighten and apply liquid gasket.  |
|   | (6) Wear, damage or incorrectly fitting for spindle, side bearing retainer and oil seal.  | Repair or replace.  |
| <b>2. Seizure</b><br>NOTE:<br>Seized or damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.                  | (1) Insufficient backlash for hypoid gear.  | Readjust or replace.  |
|   | (2) Excessive preload for side, rear, or front bearing.   | Readjust or replace.  |
|   | (3) Insufficient or improper oil used.  | Replace the seized part and fill with specified oil to specified level.               |
| <b>3. Damage</b><br>NOTE:<br>Damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.                             | (1) Improper backlash for hypoid gear.  | Replace.  |
|   | (2) Insufficient or excessive preload for side, rear, or front bearing.   | Readjust or replace.  |
|   | (3) Excessive backlash for differential gear.   | Replace the gear or thrust washer.  |
|   | (4) Loose bolts and nuts such as hypoid driven gear bolt.   | Retighten.  |
|   | (5) Damage due to overloading.  | Replace.  |
| <b>4. Noises when starting or shifting gears</b><br>NOTE:<br>Noises may be caused by differential assembly, universal joint, wheel bearing, etc. Find out what is actually making noise before disassembly. | (1) Excessive backlash for hypoid gear.   | Readjust.   |
|   | (2) Excessive backlash for differential gear.   | Replace the gear or thrust washer.  |
|   | (3) Insufficient preload for front or rear bearing.   | Readjust.   |
|   | (4) Loose drive pinion nut.   | Tighten to specified torque.  |
|   | (5) Loose bolts and nuts such as side bearing retainer attaching bolt.  | Tighten to specified torque.  |
| <b>5. Noises when cornering</b>   | (1) Damaged differential gear.  | Replace.  |
|   | (2) Excessive wear or damage of thrust washer.  | Replace.  |
|   | (3) Broken pinion mate shaft.   | Replace.  |
|   | (4) Seized or damaged side bearing.   | Replace.  |

# General Diagnostic Table

DIFFERENTIALS

| Symptom or trouble  | Possible cause  | Remedy                                   |
|---|---|--|
| <b>6. Gear noises</b><br>NOTE:<br>Since noises from engine, muffler, transmission, propeller shaft, wheel bearings, tires, and body are sometimes mistaken for noises from differential assembly, be careful in checking them. Inspection methods to locate noises include coasting, accelerating, cruising, and lifting-up all four wheels. Perform these inspections according to condition of trouble. When listening to noises, shift gears into four wheel drive and fourth speed position, trying to pick up only differential noise. | (1) Improper tooth contact of hypoid gear.            | Readjust or replace the hypoid gear set. |
|   | (2) Improper backlash for hypoid gear.                | Readjust.                                |
|   | (3) Scored or chipped teeth of hypoid gear.           | Replace the hypoid gear set.             |
|   | (4) Seized hypoid gear.                               | Replace the hypoid gear set.             |
|   | (5) Improper preload for front or rear bearings.      | Readjust.                                |
|   | (6) Seized, scored, or chipped front or rear bearing. | Replace.                                 |
|   | (7) Seized, scored, or chipped side bearing.          | Replace.                                 |
|   | (8) Vibrating differential carrier.                   | Replace.                                 |



# General Diagnostic Table

DIFFERENTIALS

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# TRANSFER CASE

# TC

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| 2. Transfer Case and Extension Case Assembly..... | 3           |
| 3. Transfer Clutch.....                           | 4           |
| 4. Oil Seal.....                                  | 5           |
| 5. Transfer Drive Gear .....                      | 6           |
| 6. Transfer Driven Gear .....                     | 7           |
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| 8. Reduction Driven Gear.....                     | 9           |
| 9. Center Differential .....                      | 10          |
| 10. Transfer Clutch Pressure Test .....           | 11          |

## 1. General Description

### A: NOTE

For general description, refer to "4AT", "5MT" or "6MT" section.

4AT model:

<Ref. to 4AT-2, General Description.>

5MT model:

<Ref. to 5MT-2, General Description.>

6MT model:

<Ref. to 6MT-2, General Description.>

## 2. Transfer Case and Extension Case Assembly

### A: NOTE

For removal, installation and inspection work, refer to "5MT" or "6MT" section.

5MT model:

<Ref. to 5MT-40, Transfer Case and Extension Case Assembly.>

6MT model:

<Ref. to 6MT-49, Extension Case.>

## 3. Transfer Clutch

### A: NOTE

For removal, installation and inspection work, refer to "4AT" section. <Ref. to 4AT-74, Transfer Clutch.>

## 4. Oil Seal

### A: NOTE

For removal, installation and inspection work, refer to "4AT", "5MT" or "6MT" section.

4AT model:

<Ref. to 4AT-46, Extension Case Oil Seal.>

5MT model:

<Ref. to 5MT-34, Oil Seal.>

6MT model:

<Ref. to 6MT-31, Oil Seal.>

### 5. Transfer Drive Gear

#### A: NOTE

For removal, installation and inspection work, refer to "5MT" or "6MT" section.

5MT model:

<Ref. to 5MT-44, Transfer Drive Gear.>

6MT model:

<Ref. to 6MT-59, Transfer Drive Gear.>

## 6. Transfer Driven Gear

### A: NOTE

For removal, installation and inspection work, refer to "5MT" or "6MT" section.

5MT model:

<Ref. to 5MT-46, Transfer Driven Gear.>

6MT model:

<Ref. to 6MT-61, Transfer Driven Gear.>



### 7. Reduction Drive Gear

#### **A: NOTE**

For removal, installation and inspection work, refer to "4AT" section. <Ref. to 4AT-84, Reduction Drive Gear.>

## 8. Reduction Driven Gear

### A: NOTE

For removal, installation and inspection work, refer to "4AT" section. <Ref. to 4AT-82, Reduction Driven Gear.>

## 9. Center Differential

### A: NOTE

For removal, installation and inspection work, refer to "4AT", "5MT" or "6MT" section.

4AT model:

<Ref. to 4AT-86, Center Differential Carrier.>

5MT model:

<Ref. to 5MT-48, Center Differential.>

6MT model:

<Ref. to 6MT-63, Center Differential.>

## 10. Transfer Clutch Pressure Test

### A: NOTE

For inspection work, refer to "4AT" section. <Ref. to 4AT-37, Transfer Clutch Pressure Test.>

# Transfer Clutch Pressure Test

TRANSFER CASE

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# DRIVE SHAFT SYSTEM

# *DS*

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| 7. Rear Drive Shaft.....         | 41          |
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# General Description

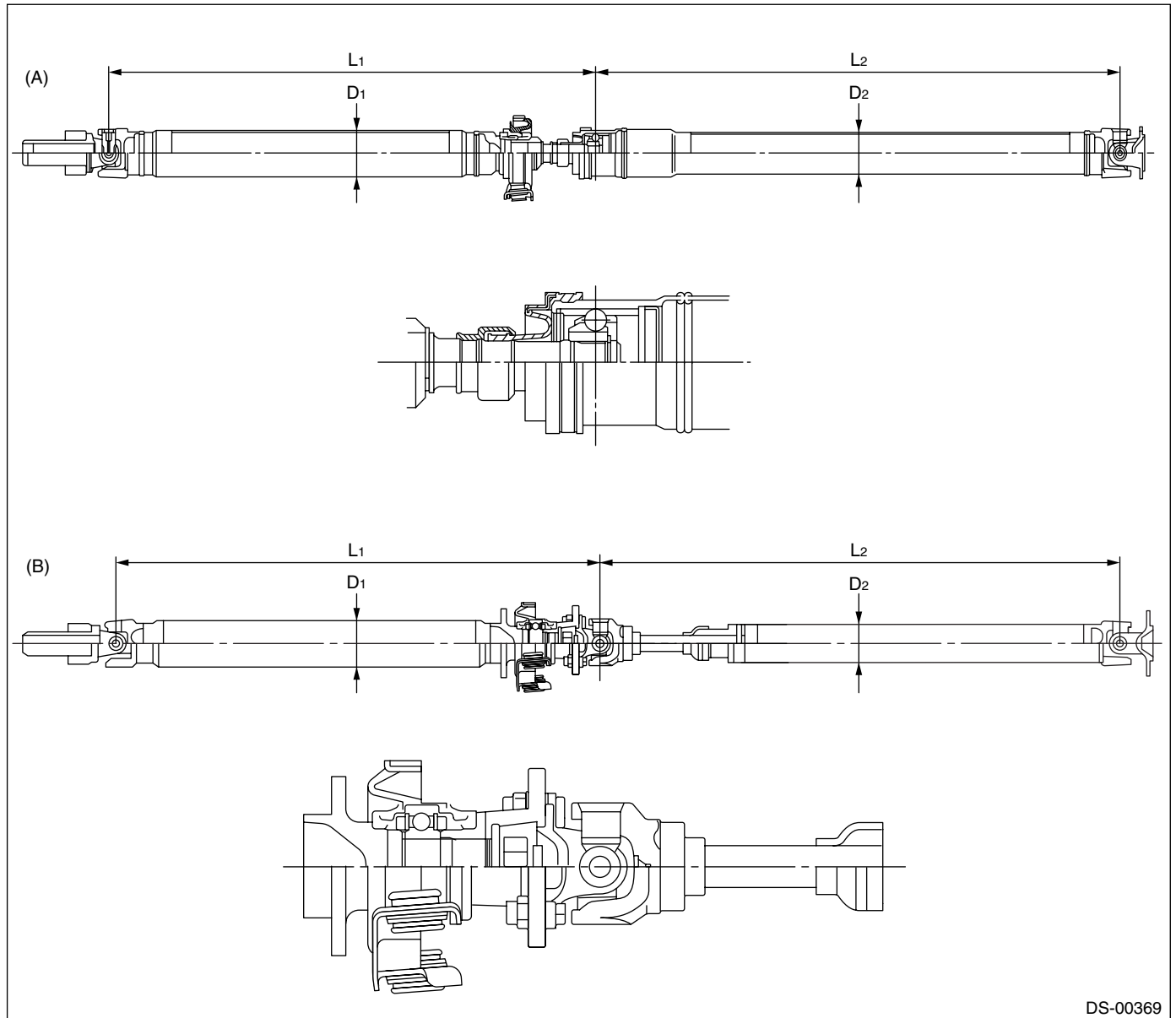
## DRIVE SHAFT SYSTEM

### 1. General Description

#### A: SPECIFICATION

##### 1. PROPELLER SHAFT

| Model   |                | Except STI   | STI         |
|---|----------------|--------------|-------------|
| Propeller shaft type  |                | EDJ          | 3UJ         |
| Front propeller shaft Joint-to-joint length: L <sub>1</sub> | mm (in)        | 608 (23.94)  | —           |
|   | AT             | 668 (26.30)  | 574 (22.60) |
| Rear propeller shaft Joint-to-joint length: L <sub>2</sub>  | mm (in)        | 684 (26.93)  | 706 (27.80) |
| Outer diameter of tube:                                     | D <sub>1</sub> | 63.5 (2.500) | 70 (2.756)  |
|   | D <sub>2</sub> | 57.5 (2.264) | 57 (2.244)  |



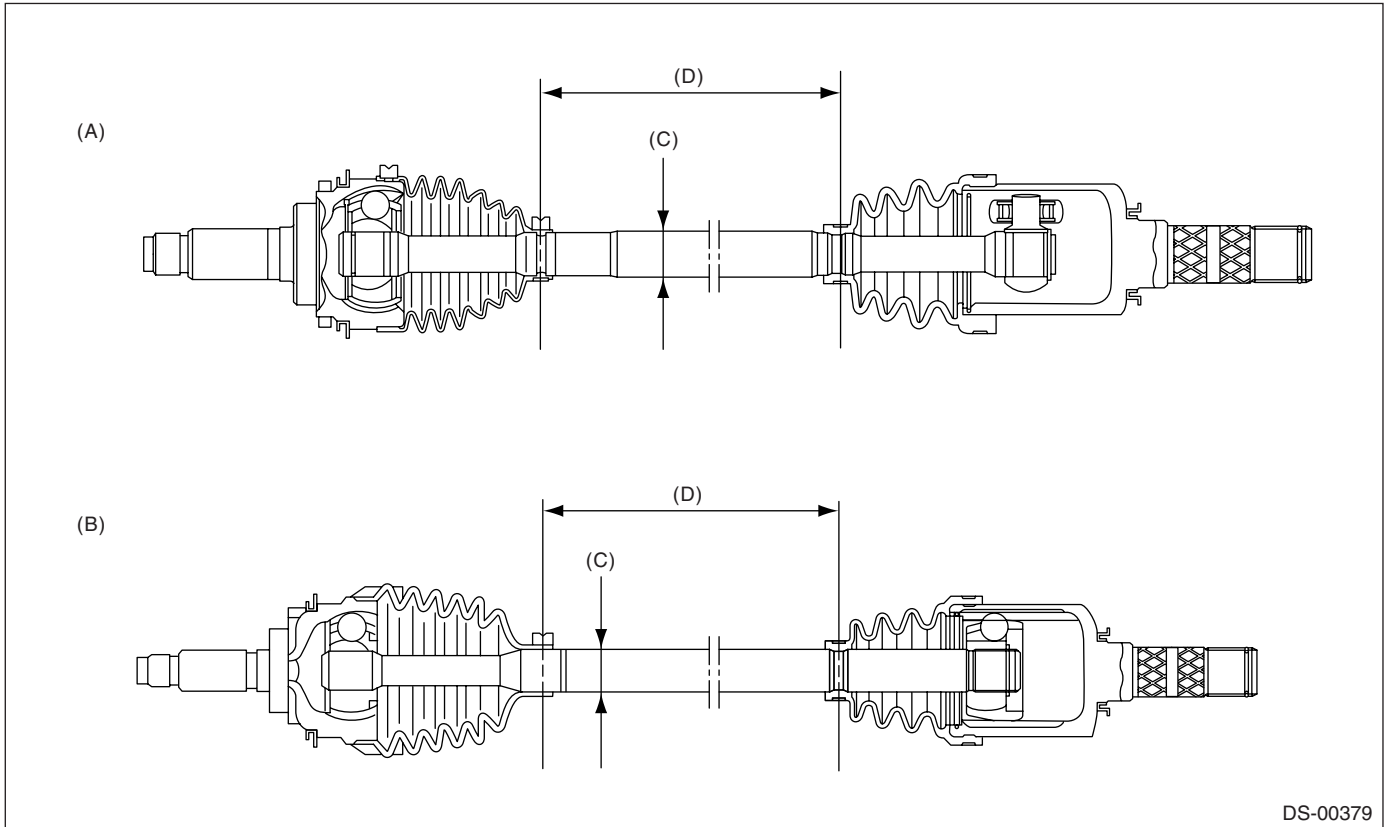
DS-00369

(A) EDJ type (Except STI model)

(B) 3UJ type (STI model)

## 2. FRONT DRIVE SHAFT ASSEMBLY

| Model |                           | Type of drive shaft | Axle diameter $\phi$ D<br>mm (in) | Axle length L mm (in) |
|-------|---------------------------|---------------------|-----------------------------------|-----------------------|
| Sedan | Non-turbo, Turbo AT       | EBJ+PTJ             | 26 (1.02)                         | 338.8 (13.34)         |
|       | Turbo MT (except for STI) | EBJ+PTJ             | 28 (1.10)                         | 338.8 (13.34)         |
|       | Turbo MT (STI)            | BJ+DOJ              | 28 (1.10)                         | 295.6 (11.64)         |
| Wagon | Non-turbo, Turbo AT       | EBJ+PTJ             | 26 (1.02)                         | 329.6 (12.98)         |
|       | Turbo MT                  | EBJ+PTJ             | 28 (1.10)                         | 329.6 (12.98)         |



DS-00379

(A) EBJ+PTJ  
(B) BJ+DOJ

(C) Axle diameter D

(D) Axle length L

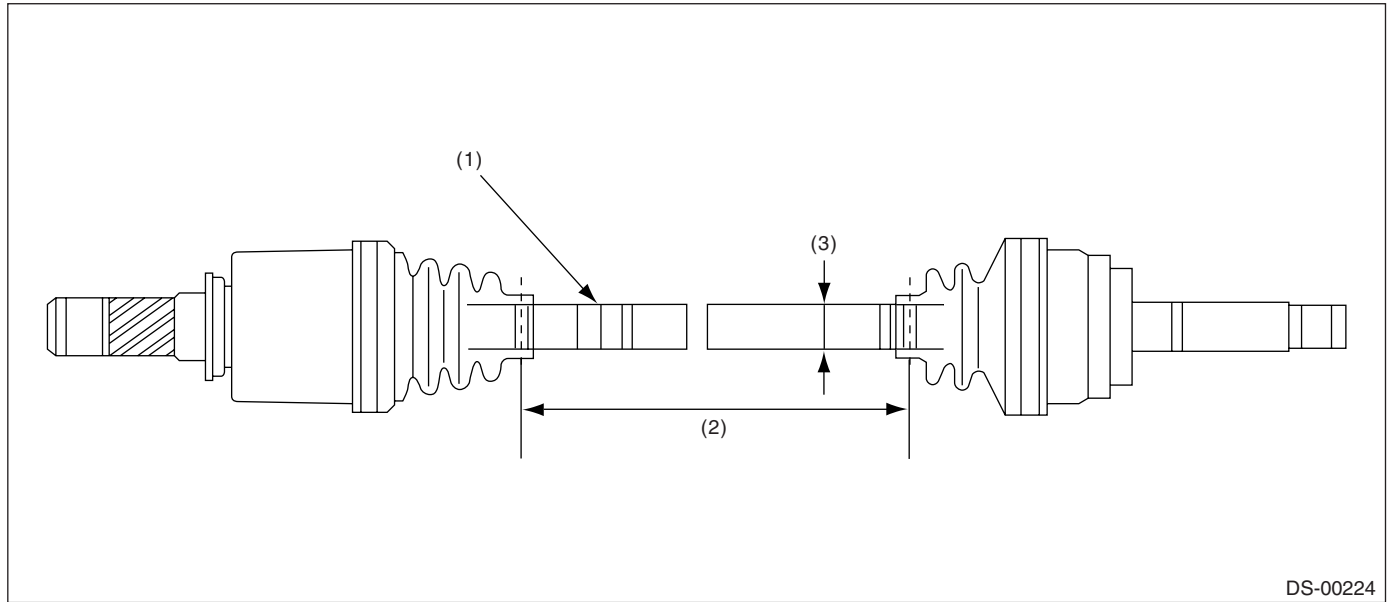


# General Description

## DRIVE SHAFT SYSTEM

### 3. REAR DRIVE SHAFT ASSEMBLY

| Model | Type of drive shaft assembly | No. of identification protrusion on shaft | Axle diameter $\phi D$<br>mm (in) | Axle length L<br>mm (in) |
|-------|------------------------------|---|-----------------------------------|--------------------------|
| Sedan | EBJ+DOJ RH                   | 1 (One)                                   | 24 (0.94)                         | 367.4 (14.46)            |
|       | EBJ+DOJ LH                   | 0 (Zero)                                  | 24 (0.94)                         | 357.4 (14.07)            |
| Wagon | EBJ+DOJ RH                   | 2 (Two)                                   | 24 (0.94)                         | 357.5 (14.07)            |
|       | EBJ+DOJ LH                   | 1 (One)                                   | 24 (0.94)                         | 347.5 (13.68)            |
| STI   | EBJ+EDJ                      | —   | 25 (0.98)                         | 316 (12.44)              |



DS-00224

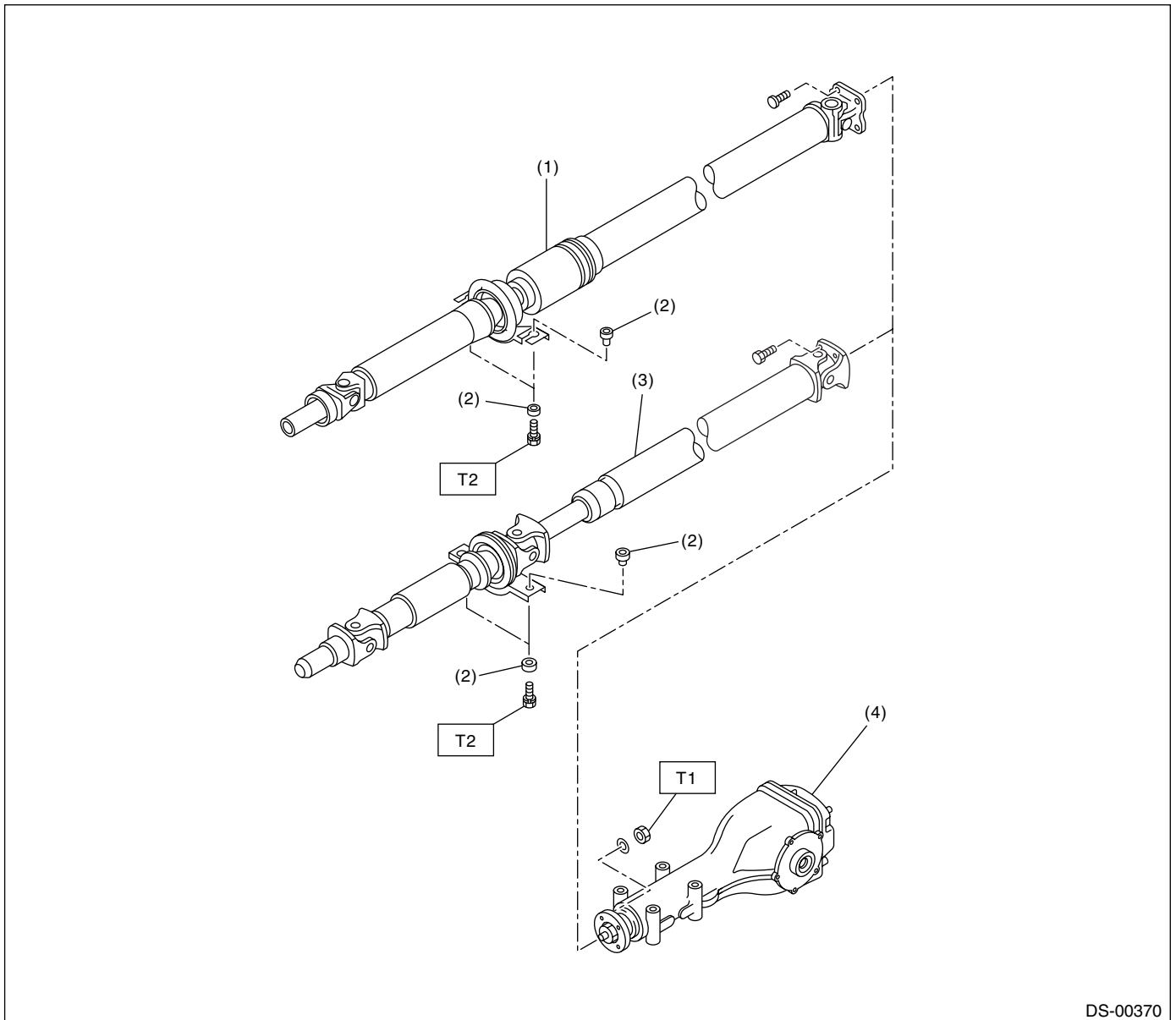
(1) Identification protrusion

(2) Axle length L

(3) Axle diameter D

## B: COMPONENT

### 1. PROPELLER SHAFT



DS-00370

(1) Propeller shaft (EDJ type) (Except STI model)

(3) Propeller shaft (3UJ type) (STI model)

(2) Bushing

(4) Rear differential

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 31 (3.2, 22.9)**

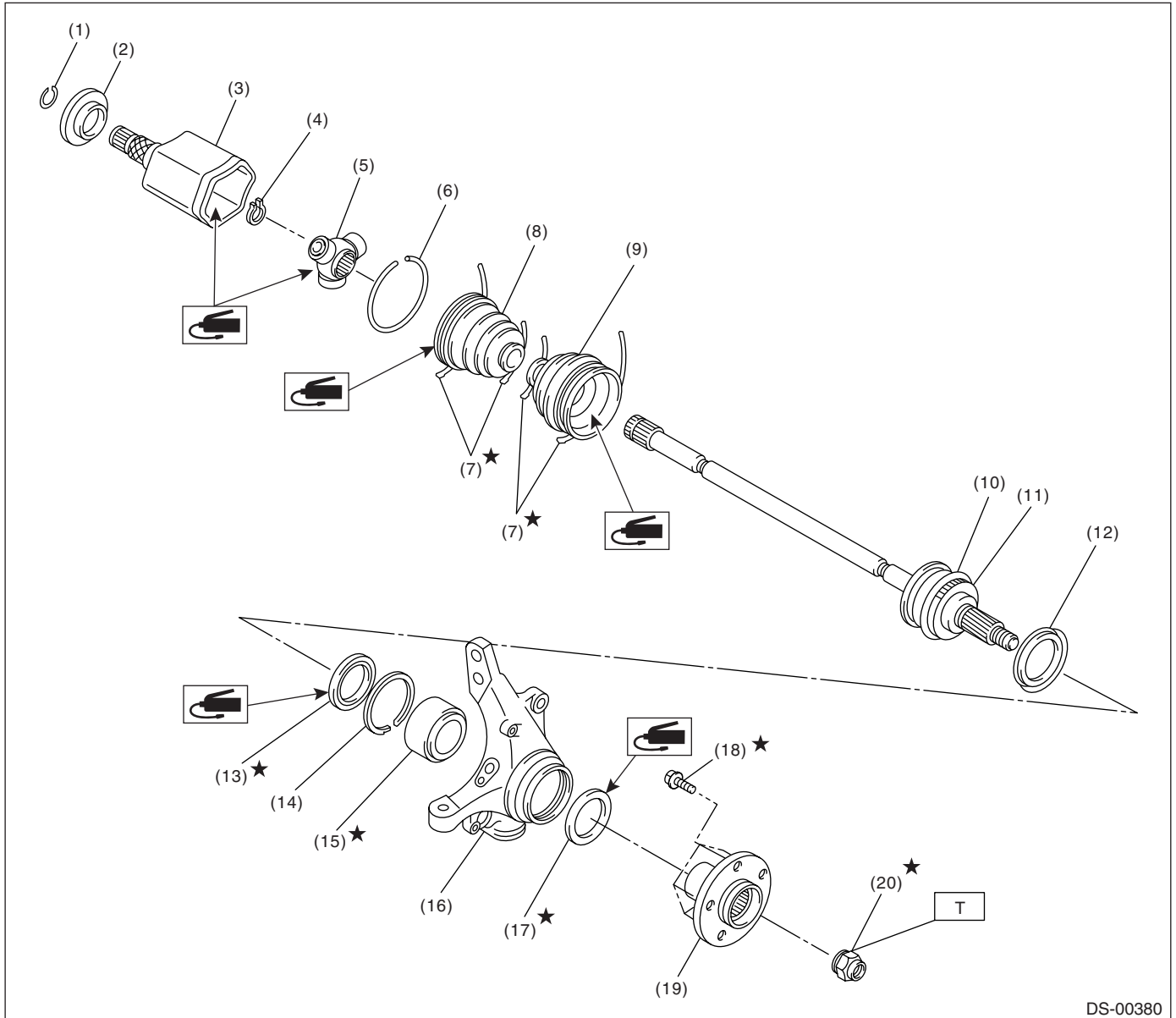
**T2: 52 (5.3, 38.3)**

# General Description

## DRIVE SHAFT SYSTEM

### 2. FRONT AXLE

- EBJ+PTJ type



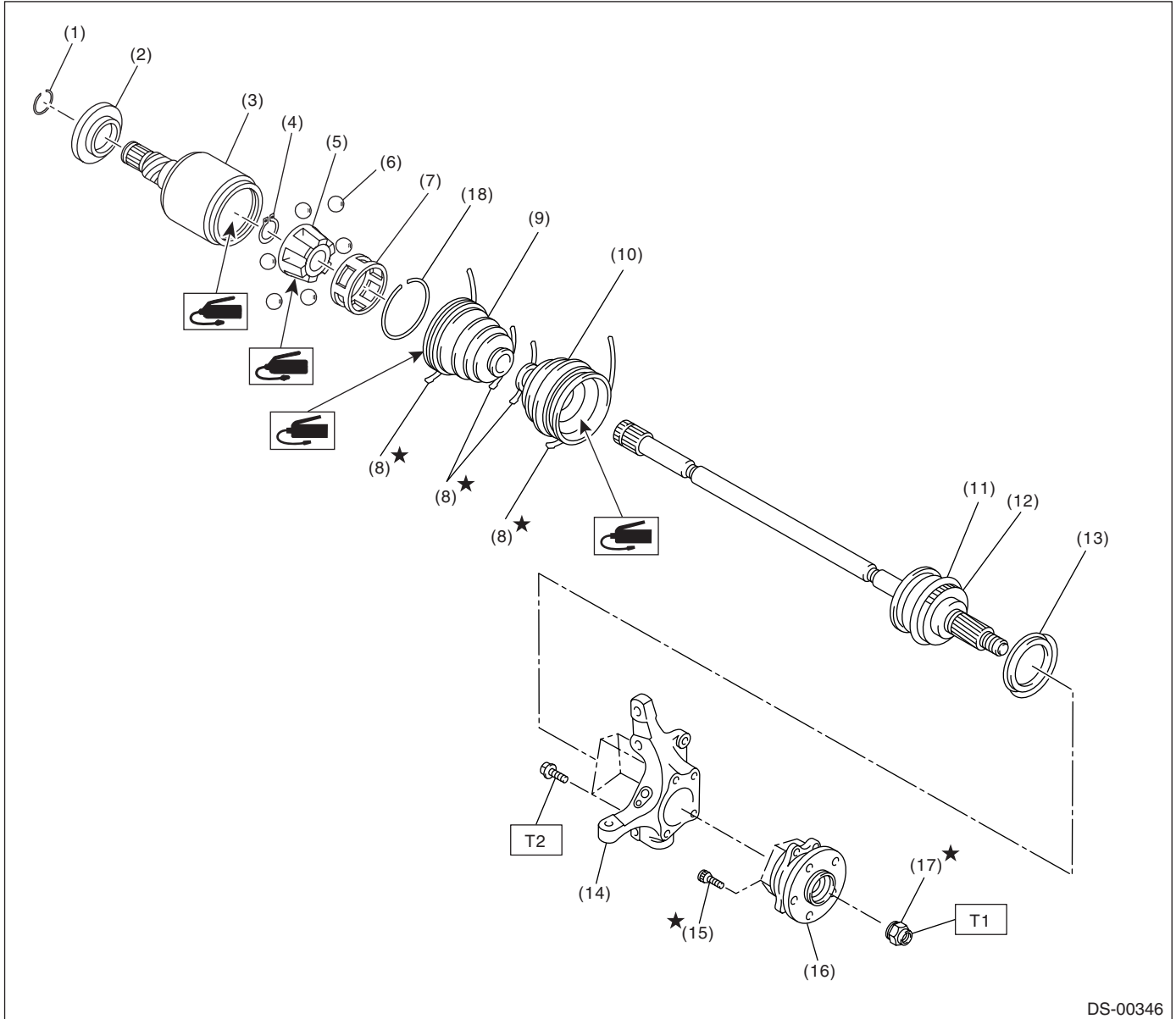
DS-00380

- |                        |                    |                     |
|------------------------|--------------------|---------------------|
| (1) Circlip            | (9) Boot (EBJ)     | (17) Oil seal (OUT) |
| (2) Baffle plate (PTJ) | (10) EBJ ASSY      | (18) Hub bolt       |
| (3) Outer race (PTJ)   | (11) Tone wheel    | (19) Hub            |
| (4) Snap ring          | (12) Baffle plate  | (20) Axle nut       |
| (5) Trunnion           | (13) Oil seal (IN) |                     |
| (6) Circlip            | (14) Snap ring     |                     |
| (7) Boot band          | (15) Bearing       |                     |
| (8) Boot (PTJ)         | (16) Housing       |                     |

**Tightening torque: N-m (kgf-m, ft-lb)**  
**T: 220 (22.4, 162)**

# General Description

• BJ+DOJ type



DS-00346

- (1) Circlip
- (2) Baffle plate
- (3) Outer race (DOJ)
- (4) Snap ring
- (5) Inner race
- (6) Ball
- (7) Cage
- (8) Boot band

- (9) Boot (DOJ)
- (10) Boot (BJ)
- (11) BJ ASSY
- (12) Tone wheel
- (13) Baffle plate
- (14) Housing
- (15) Hub bolt
- (16) Front hub unit bearing

- (17) Axle nut
- (18) Snap ring

**Tightening torque: N·m (kgf·m, ft·lb)**

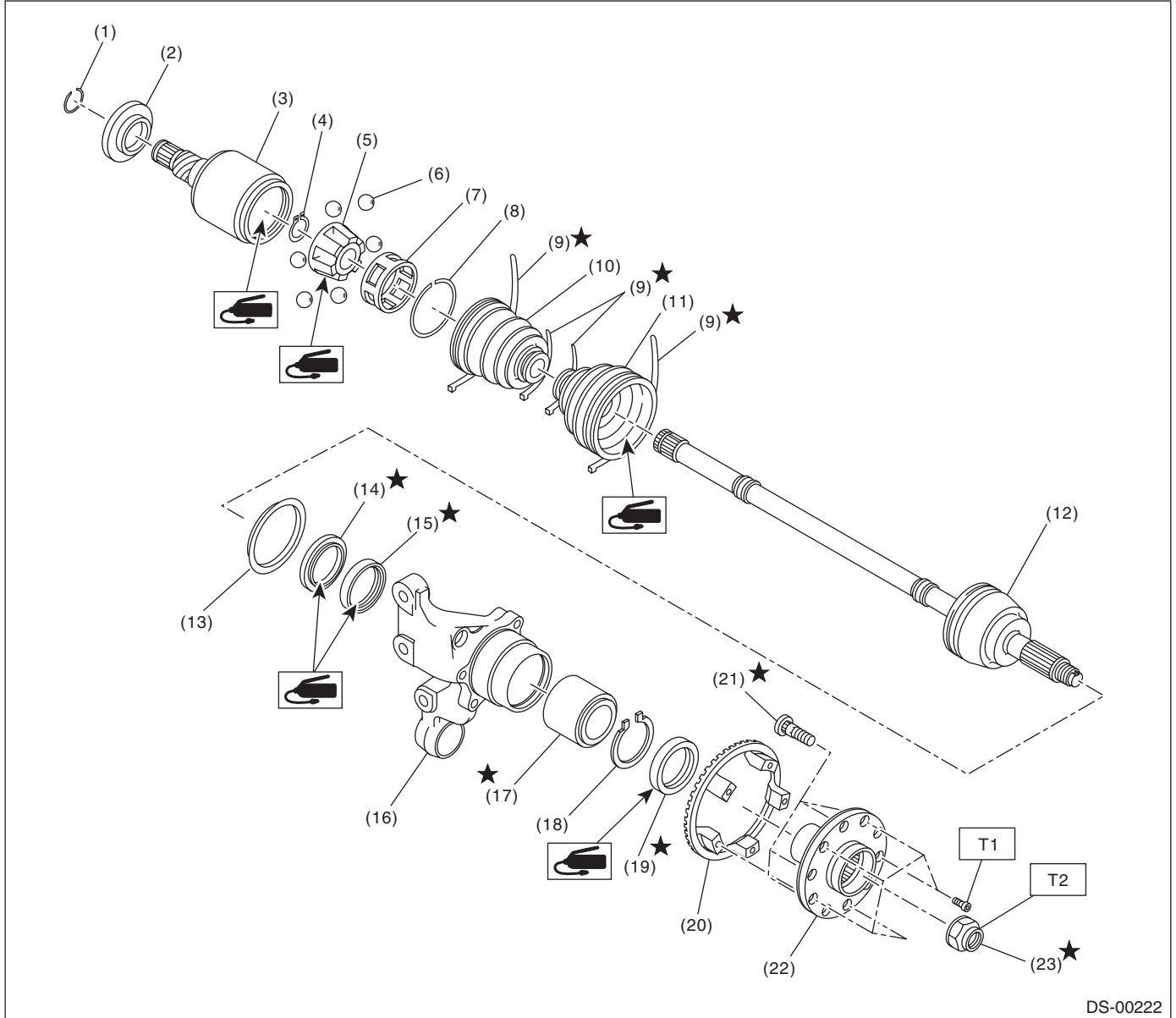
**T1: 220 (22.4, 162)**

**T2: 65 (6.6, 47.9)**

# General Description

## DRIVE SHAFT SYSTEM

### 3. REAR AXLE



DS-00222

- (1) Circlip
- (2) Baffle plate (DOJ)
- (3) Outer race DOJ: Except STI model  
Outer race EDJ: STI model
- (4) Snap ring
- (5) Inner race
- (6) Ball
- (7) Cage
- (8) Snap ring

- (9) Boot band
- (10) Boot (DOJ)
- (11) Boot
- (12) EBJ ASSY
- (13) Baffle plate
- (14) Oil seal (IN. No. 2)
- (15) Oil seal (IN.)
- (16) Housing
- (17) Bearing
- (18) Snap ring

- (19) Oil seal (OUT)
- (20) Tone wheel
- (21) Hub bolt
- (22) Hub
- (23) Axle nut

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 13 (1.3, 9.4)**

**T2: 190 (19.4, 140)**

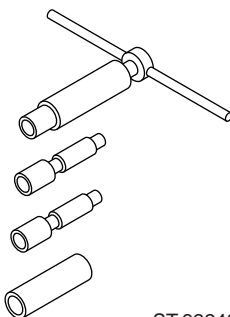
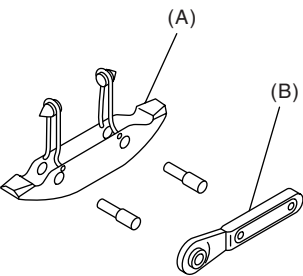
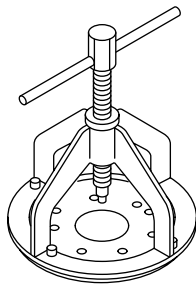
## C: CAUTION

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.

- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply grease onto sliding or revolution surfaces before installation.
- Before installing snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

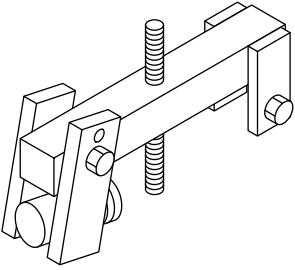
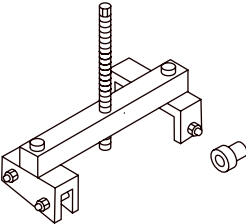
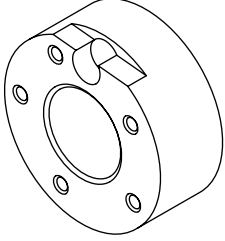
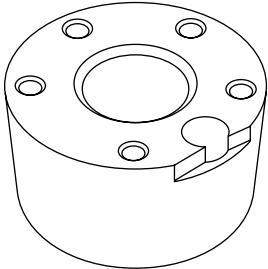
## D: PREPARATION TOOL

### 1. SPECIAL TOOL

| ILLUSTRATION   | TOOL NUMBER | DESCRIPTION          | REMARKS  |
|--|-------------|----------------------|--|
|  <p style="text-align: right;">ST-922431000</p>  | 922431000   | AXLE SHAFT INSTALLER | <ul style="list-style-type: none"> <li>• Used for installing axle shaft into housing.</li> <li>• Used with ADAPTER (927390000).</li> </ul>   |
|  <p style="text-align: right;">ST-925091000</p> | 925091000   | BAND TIGHTENING TOOL | Used for tightening boot band.<br>(A) Jig for band<br>(B) Ratchet wrench   |
|  <p style="text-align: right;">ST-926470000</p> | 926470000   | AXLE SHAFT PULLER    | <ul style="list-style-type: none"> <li>• Used for removing axle shaft.</li> <li>• Used with AXLE SHAFT PULLER PLATE (28099PA110).</li> </ul> |

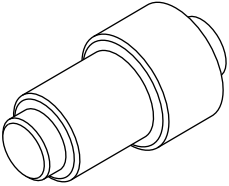
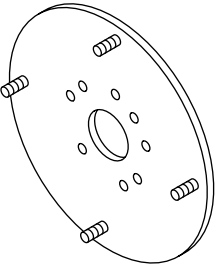
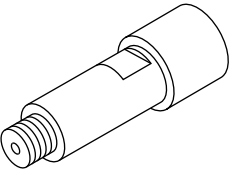
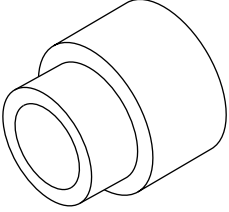
# General Description

## DRIVE SHAFT SYSTEM

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION | REMARKS  |
|---|-------------|-------------|--|
|  <p style="text-align: center;">ST-927060000</p>   | 927060000   | HUB REMOVER | <ul style="list-style-type: none"> <li>• Used for removing front hub.</li> <li>• Used with HUB STAND (927080000).</li> </ul> |
|  <p style="text-align: center;">ST-927420000</p>   | 927420000   | HUB REMOVER | <ul style="list-style-type: none"> <li>• Used for removing rear hub.</li> <li>• Used with HUB STAND (927080000).</li> </ul>  |
|  <p style="text-align: center;">ST-927080000</p> | 927080000   | HUB STAND   | Used for disassembling and assembling hub bolt in hub. (Except STI model)  |
|  <p style="text-align: center;">ST28099PA080</p> | 28099PA080  | HUB STAND   | Used for disassembling and assembling hub bolt in hub. (STI model)   |

# General Description

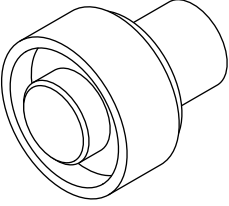
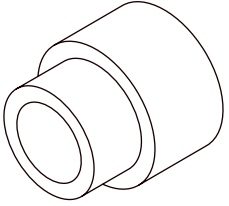
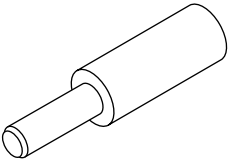
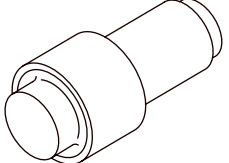
DRIVE SHAFT SYSTEM

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION             | REMARKS  |
|---|-------------|-------------------------|--|
|  <p>ST-927100000</p>     | 927100000   | BEARING PULLER          | <ul style="list-style-type: none"> <li>• Used for disassembling and assembling front housing bearing.</li> <li>• Used with HOUSING STAND (927400000) (Except STI model).</li> <li>• Used with HOUSING STAND (28099PA060) (STI model).</li> </ul> |
|  <p>ST28099PA110</p>     | 28099PA110  | AXLE SHAFT PULLER PLATE | Replace plate of AXLE SHAFT PULLER (926470000) with this PLATE to be used.   |
|  <p>ST-927390000</p> | 927390000   | ADAPTER                 | Used as an adapter for AXLE SHAFT INSTALLER (922431000).   |
|  <p>ST-927400000</p> | 927400000   | HOUSING STAND           | <ul style="list-style-type: none"> <li>• Used for disassembling and assembling front housing bearing.</li> <li>• Used with BEARING PULLER (927100000).</li> </ul>  |



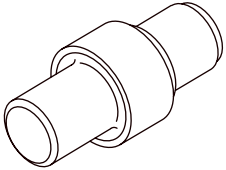
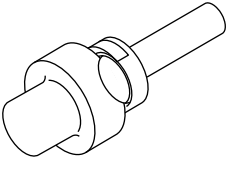
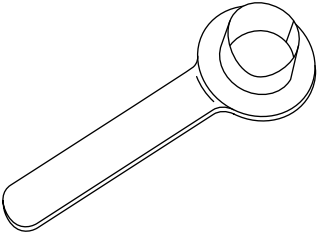
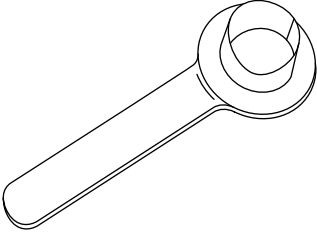
# General Description

## DRIVE SHAFT SYSTEM

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION        | REMARKS  |
|---|-------------|--------------------|--|
|  <p style="text-align: center;">ST-927410000</p>   | 927410000   | OIL SEAL INSTALLER | <ul style="list-style-type: none"> <li>• Used for installing oil seal into front housing.</li> <li>• Used with HOUSING STAND (927400000).</li> </ul>             |
|  <p style="text-align: center;">ST-927430000</p>   | 927430000   | HOUSING STAND      | <ul style="list-style-type: none"> <li>• Used for disassembling and assembling rear housing bearing.</li> <li>• Used with BEARING PULLER (927440000).</li> </ul> |
|  <p style="text-align: center;">ST-927120000</p> | 927120000   | HUB INSTALLER      | Used for installing hub.   |
|  <p style="text-align: center;">ST-927440000</p> | 927440000   | BEARING PULLER     | <ul style="list-style-type: none"> <li>• Used for disassembling and assembling rear wheel bearing.</li> <li>• Used with HOUSING STAND (927430000).</li> </ul>    |

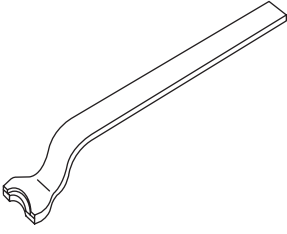
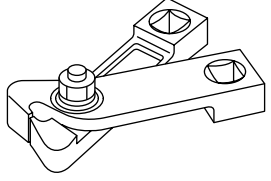
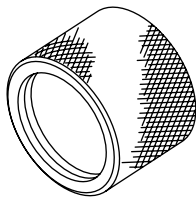
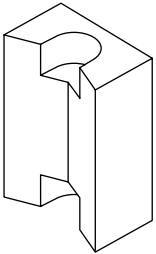
# General Description

DRIVE SHAFT SYSTEM

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION        | REMARKS  |
|---|-------------|--------------------|--|
|  <p>ST-927460000</p>     | 927460000   | OIL SEAL INSTALLER | <ul style="list-style-type: none"> <li>• Used for installing outer oil seal.</li> <li>• Used with HOUSING STAND (927430000).</li> </ul>              |
|  <p>ST-927450000</p>     | 927450000   | HUB INSTALLER      | <ul style="list-style-type: none"> <li>• Used for pressing hub bearing into hub.</li> <li>• Used with HUB STAND (927080000).</li> </ul>              |
|  <p>ST28099PA090</p> | 28099PA090  | OIL SEAL PROTECTOR | <ul style="list-style-type: none"> <li>• Used for installing rear drive shaft into rear differential.</li> <li>• For protecting oil seal.</li> </ul> |
|  <p>ST28399SA010</p> | 28399SA010  | OIL SEAL PROTECTOR | <ul style="list-style-type: none"> <li>• Used for installing front drive shaft to transmission.</li> <li>• For protecting oil seal.</li> </ul>       |

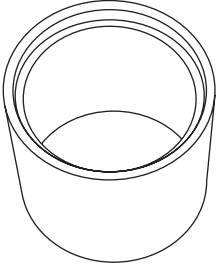
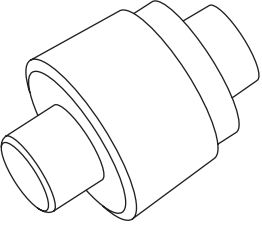
# General Description

## DRIVE SHAFT SYSTEM

| ILLUSTRATION  | TOOL NUMBER                                   | DESCRIPTION   | REMARKS   |
|---|---|---|---|
|  <p style="text-align: center;">ST28099PA100</p>   | <p style="text-align: center;">28099PA100</p> | <p>DRIVE SHAFT<br/>REMOVER</p>                      | <p>Used for removing rear drive shaft from rear differential.</p> |
|  <p style="text-align: center;">ST28099AC000</p>   | <p style="text-align: center;">28099AC000</p> | <p>BOOT BAND PLI-<br/>ERS</p>                       | <p>Used for tightening front BJ boot band.</p>                    |
|  <p style="text-align: center;">ST18675AA000</p> | <p style="text-align: center;">18675AA000</p> | <p>DIFFERENTIAL<br/>SIDE OIL SEAL<br/>INSTALLER</p> | <p>Used for installing differential side retainer oil seal.</p>   |
|  <p style="text-align: center;">ST28399AG000</p> | <p style="text-align: center;">28399AG000</p> | <p>HUB STAND</p>                                    | <p>Used for extracting hub bolt. (ST1 model)</p>                  |

# General Description

DRIVE SHAFT SYSTEM

| ILLUSTRATION   | TOOL NUMBER | DESCRIPTION           | REMARKS  |
|--|-------------|-----------------------|--|
| <br>ST-28099PA060 | 28099PA060  | HOUSING STAND         | <ul style="list-style-type: none"> <li>• Used for disassembling and assembling rear housing bearing. (STI model)</li> <li>• Used with BEARING PULLER (927100000).</li> </ul> |
| <br>ST-28099PA070 | 28099PA070  | OIL SEAL<br>INSTALLER | <ul style="list-style-type: none"> <li>• Used for press-fitting the rear housing oil seal. (STI model)</li> <li>• Used with HOUSING STAND (28099PA060).</li> </ul>           |

## 2. GENERAL TOOL

| TOOL NAME        | REMARKS  |
|------------------|--|
| Puller           | Used for removing ball joint from knuckle arm. |
| Dial gauge       | Used for inspecting propeller shaft run-out.   |
| Snap ring pliers | Used for installing and removing snap ring.    |
| Bar              | Used for extracting drive shaft.               |

# Propeller Shaft

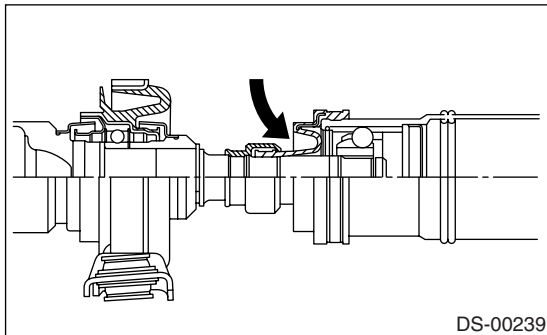
## DRIVE SHAFT SYSTEM

### 2. Propeller Shaft

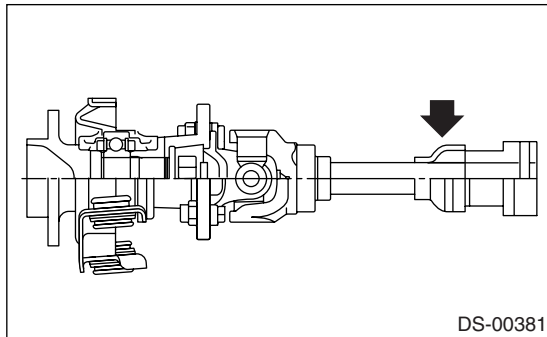
#### A: REMOVAL

##### NOTE:

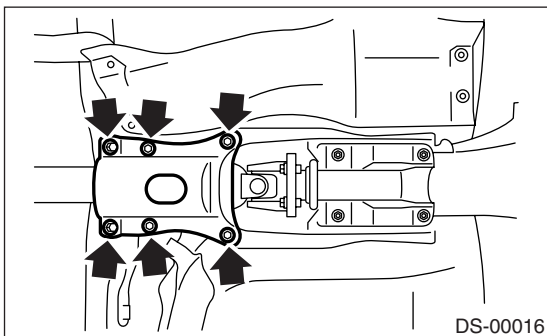
- Before removing the propeller shaft, wrap the metal parts with a cloth or rubber material.
- In case of EDJ type, before removing the propeller shaft, wrap the metal parts (installed at the rubber boot of center EDJ) with a cloth or rubber material, as shown in the figure. Rubber boot may be damaged due to interference with adjacent metal parts while bending the EDJ during removal.
- Except STI model



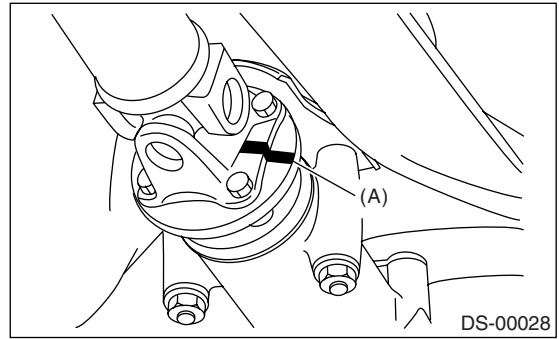
- STI model



- 1) Disconnect the ground cable from battery.
- 2) Move the select lever or gear shift lever to "N".
- 3) Release the parking brake.
- 4) Jack-up the vehicle and support it with sturdy racks.
- 5) Remove the center exhaust pipes.
- 6) Remove the rear exhaust pipe and muffler.
- 7) Remove the differential mount front cover.

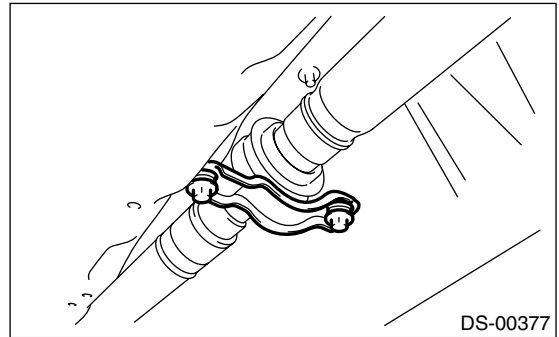


- 8) Make matching marks on affected parts before removal.



(A) Matching mark

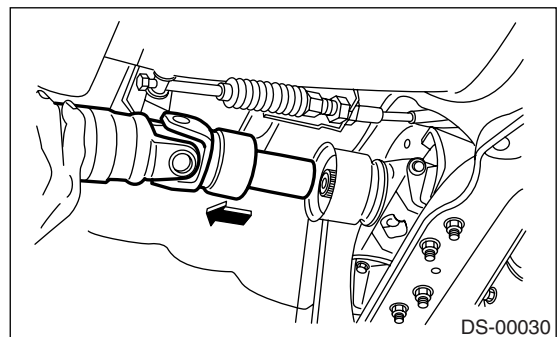
- 9) Remove the three bolts which hold the propeller shaft to rear differential.
- 10) Remove the remaining bolt.
- 11) Remove the two bolts which hold the center bearing to vehicle body.



- 12) Remove the propeller shaft from transmission.

##### CAUTION:

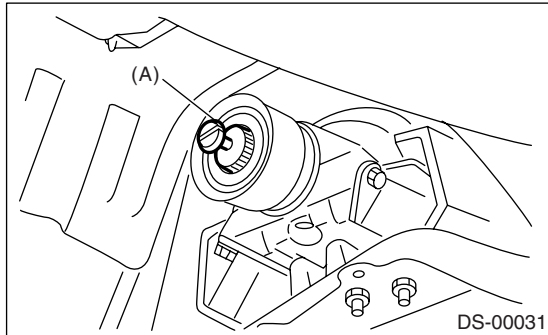
- Be careful not to damage the oil seals and frictional surface of sleeve yoke.
- Cover the center exhaust pipe with a cloth to keep off any ATF or oil spilled from transmission when removing the propeller shaft.



13) Install the extension cap to transmission.

**NOTE:**

If the extension cap is not available, place a vinyl bag over opening and fasten it with string to prevent gear oil or ATF from leaking.



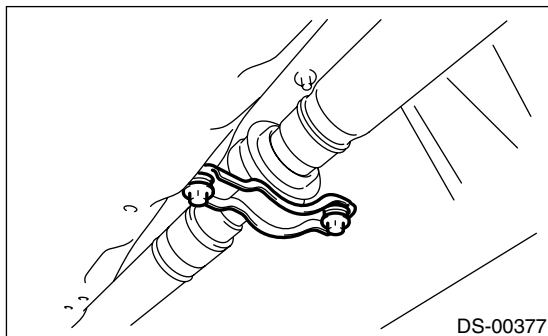
(A) Extension cap

**B: INSTALLATION**

1) Insert the sleeve yoke into transmission, and then attach the center bearing to body.

**Tightening torque:**

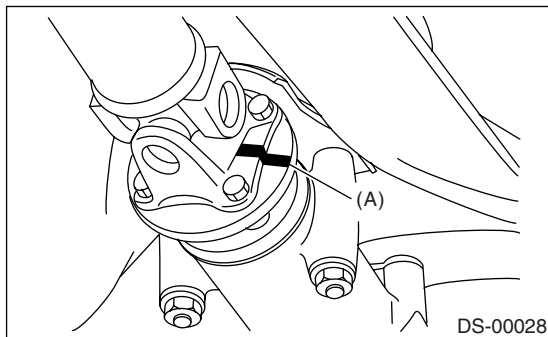
**52 N·m (5.3 kgf-m, 38.3 ft-lb)**



2) Align the matching marks, and then connect the flange yoke and rear differential.

**Tightening torque:**

**31 N·m (3.2 kgf-m, 22.9 ft-lb)**



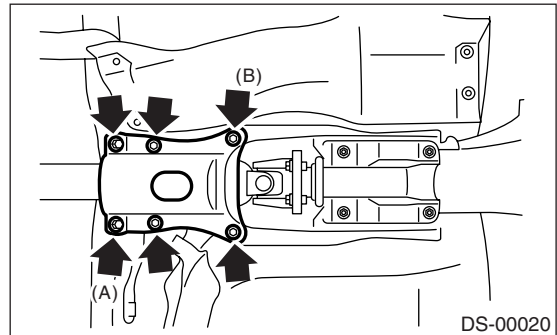
(A) Matching mark

3) Using new bolts, install the differential mount front cover.

- (1) Temporarily tighten the bolt (A) while pushing cover forward.
- (2) Tighten the bolt (B) to specified torque.
- (3) Tighten the bolt (A) to specified torque.
- (4) Tighten the remaining bolts to specified torque.

**Tightening torque:**

**90 N·m (9.2 kgf-m, 66 ft-lb)**



- 4) Install the center exhaust pipes.
- 5) Install the rear exhaust pipe and muffler.

**C: INSPECTION**

**NOTE:**

Do not disassemble the propeller shaft. Check the following and replace if necessary.

- 1) Tube surfaces for dents or cracks
- 2) Splines for deformation or abnormal wear
- 3) Joints for non-smooth operation or abnormal noise
- 4) Center bearing for free play, noise or non-smooth operation
- 5) Oil seals for abnormal wear or damage
- 6) Center bearing for breakage

Check the following points with propeller shaft installed in vehicle.

**1. JOINTS AND CONNECTIONS**

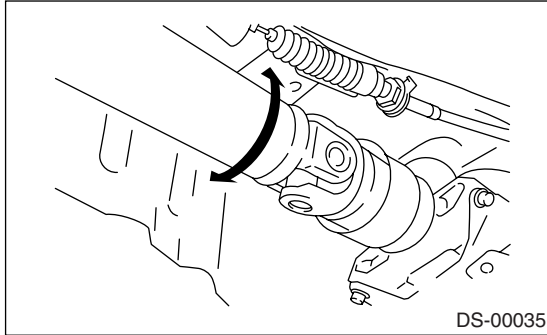
- 1) Remove the center exhaust pipes.
- 2) Check for any looseness of the yoke flange mounting bolts which connect to rear differential and center bearing bracket mounting bolts.

# Propeller Shaft

## DRIVE SHAFT SYSTEM

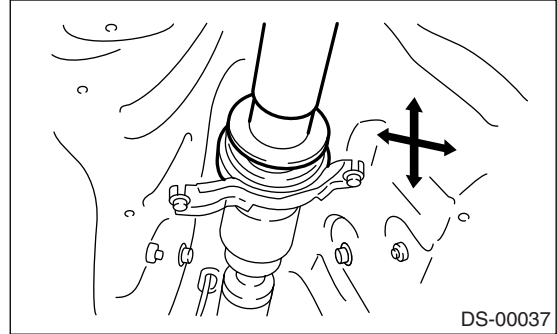
### 2. SPLINES AND BEARING LOCATIONS

- 1) Remove the center exhaust pipes.
- 2) Remove the rear exhaust pipe and muffler.
- 3) Turn the propeller shaft by hand to see if abnormal free play exists at splines. Also move the yokes to see if abnormal free play exists at spiders and bearings.



### 4. CENTER BEARING FREE PLAY

- 1) Remove the front and center exhaust pipes.
- 2) Remove the rear exhaust pipe and muffler.
- 3) Move the propeller shaft near center bearing up and down, and left and right with your hand to check for any abnormal bearing free play.

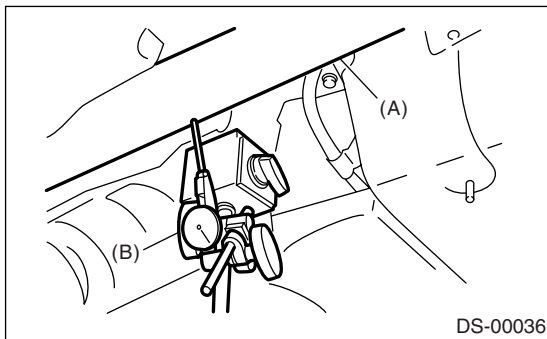


### 3. RUNOUT OF PROPELLER SHAFT

- 1) Remove the center exhaust pipes.
- 2) Remove the rear exhaust pipe and muffler.
- 3) Set the dial gauge with its indicator stem at center of propeller shaft tube.
- 4) Turn the propeller shaft slowly by hands to check for “runout” of propeller shaft.

#### **Runout:**

**Limit 0.6 mm (0.024 in)**

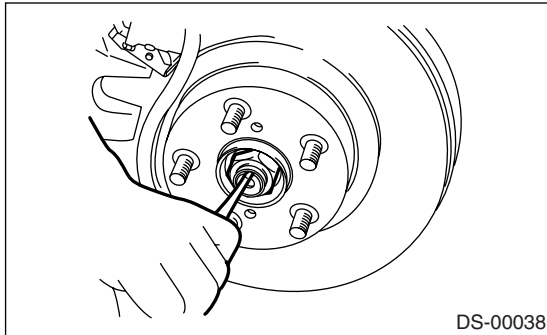


- (A) Propeller shaft
- (B) Dial gauge

## 3. Front Axle

### A: REMOVAL

- 1) Lift-up the vehicle and remove the front wheels.
- 2) Unlock the axle nut.



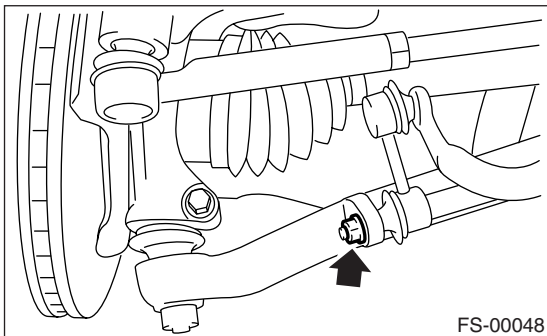
- 3) Remove the axle nut using a socket wrench while depressing the brake pedal.

#### CAUTION:

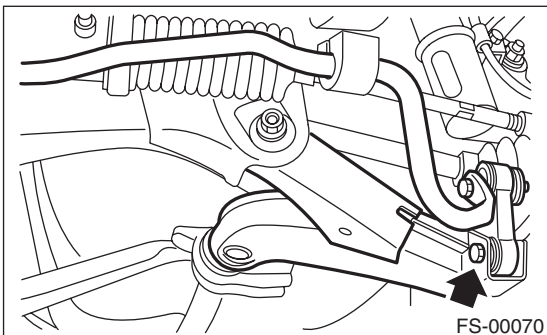
**Remove the axle nut with vehicle weight not applied on axle. Failure to follow this rule may damage the wheel bearings.**

- 4) Remove the stabilizer link.

- Sedan model



- Wagon model

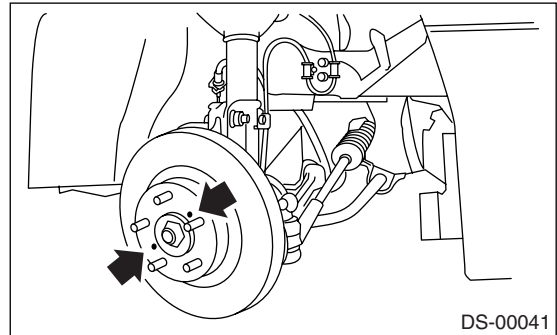


- 5) Remove the disc brake caliper from housing, and suspend it from strut using a wire.

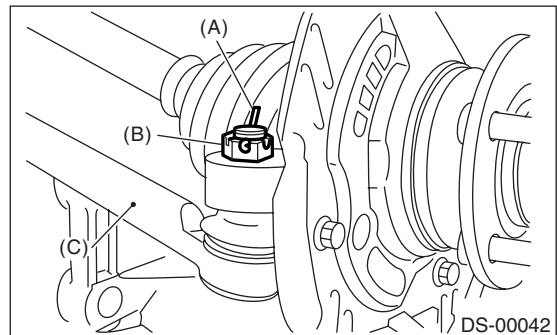
- 6) Remove the disc rotor from hub.

#### NOTE:

If the disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in screw hole on rotor.

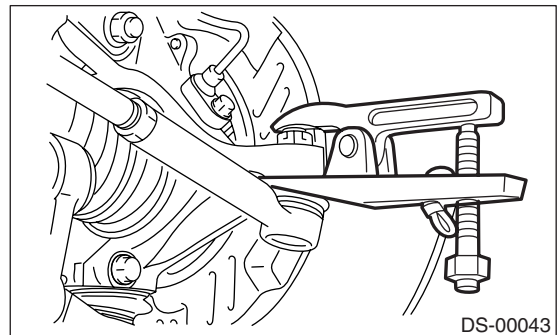


- 7) Remove the cotter pin and castle nut which secure tie-rod end to housing knuckle arm.



- (A) Cotter pin
- (B) Castle nut
- (C) Tie-rod

- 8) Using a puller, remove the tie-rod ball joint from knuckle arm.

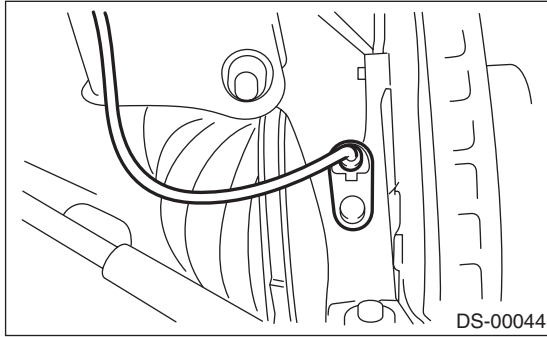




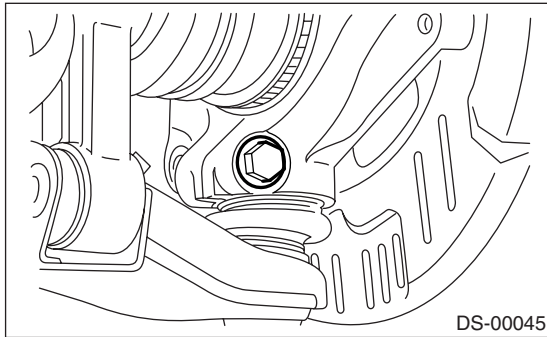
## Front Axle

### DRIVE SHAFT SYSTEM

9) Remove the ABS wheel speed sensor assembly and harness.



10) Remove the transverse link ball joint from housing.

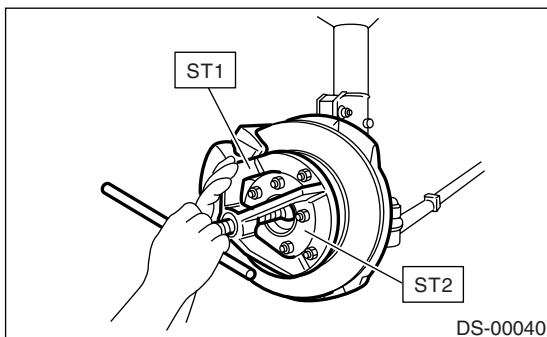


11) Remove the front drive shaft assembly from hub. If it is hard to remove, use the STs.

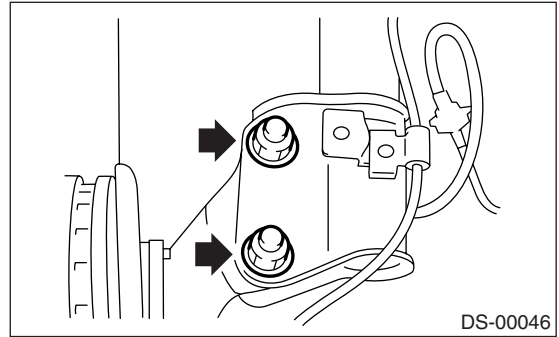
ST1 926470000 AXLE SHAFT PULLER  
ST2 28099PA110 AXLE SHAFT PULLER  
PLATE

#### CAUTION:

- Be sure to replace the differential side retainer oil seal at transmission side with a new one when removing the front drive shaft.
- Suspend the front drive shaft to vehicle body using a wire.



12) After scribing an alignment mark on the camber adjusting bolt head, remove the bolts which connect the housing and strut, and disconnect the housing from strut.



### B: INSTALLATION

- 1) Temporarily tighten the front axle to front strut.
- 2) Insert the front drive shaft into front axle.
- 3) Temporarily tighten the axle nut.
- 4) Install the transverse link ball joint to housing.

#### Tightening torque:

**50 N·m (5.1 kgf-m, 37 ft-lb)**

- 5) While aligning the alignment mark on the camber adjusting bolt head, tighten the housing and strut using a new self-locking nut.

#### Tightening torque:

**175 N·m (17.8 kgf-m, 129 ft-lb)**

- 6) Connect the tie-rod end ball joint to the knuckle arm with a castle nut.

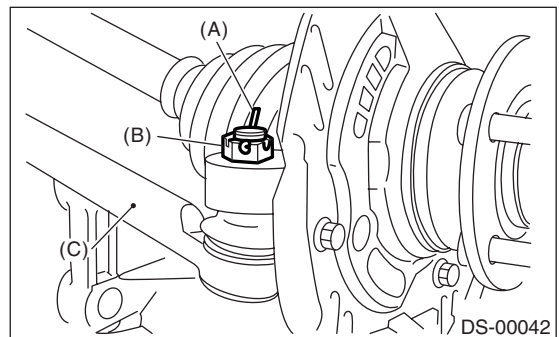
#### Tightening torque:

**27.0 N·m (2.75 kgf-m, 19.9 ft-lb)**

#### CAUTION:

When connecting, do not hit the cap at bottom of tie-rod with hammer.

- 7) Tighten the castle nut to specified torque and tighten further within 60° until the pin hole is aligned with the slot in nut. Bend the cotter pin to lock.



- (A) Cotter pin  
(B) Castle nut  
(C) Tie-rod

- 8) Install the disc rotor on hub.

9) Install the disc brake caliper on housing.

**Tightening torque:**

**Except STI model**

**80 N·m (8.2 kgf·m, 59 ft·lb)**

**STI model**

**155 N·m (15.8 kgf·m, 114.3 ft·lb)**

10) Connect the stabilizer link.

**Tightening torque:**

**Except STI model**

**30 N·m (3.1 kgf·m, 22 ft·lb)**

**STI model**

**45 N·m (4.6 kgf·m, 33 ft·lb)**

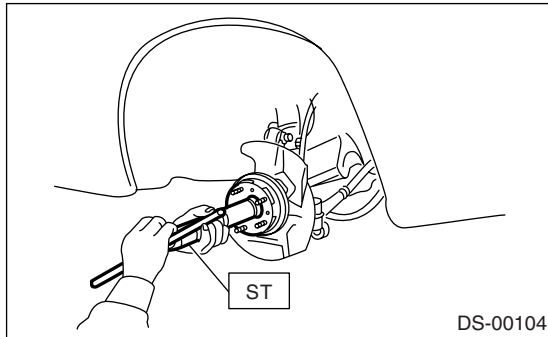
**CAUTION:**

**Use a new self-locking nut.**

11) Using the ST1 and ST2, pull the front drive shaft into place.

ST1 922431000 AXLE SHAFT INSTALLER

ST2 927390000 ADAPTER



12) While depressing the brake pedal, tighten a new axle nut to specified torque and lock it securely.

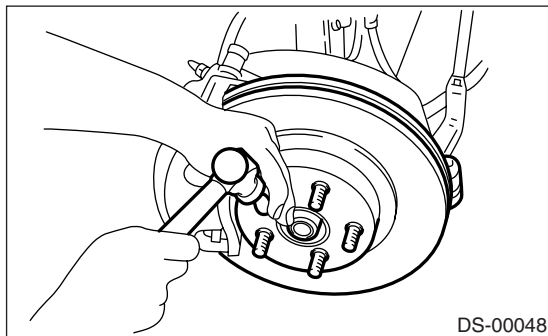
**Tightening torque:**

**220 N·m (22.4 kgf·m, 162 ft·lb)**

**CAUTION:**

**Do not overtighten it as this may damage the wheel bearing.**

13) After tightening the axle nut, lock it securely.



14) Install the ABS wheel speed sensor on housing.

**Tightening torque:**

**33 N·m (3.4 kgf·m, 24 ft·lb)**

15) Install the wheel and tighten the wheel nuts to specified torque.

**Tightening torque:**

**90 N·m (9.1 kgf·m, 65.7 ft·lb)**

### C: DISASSEMBLY

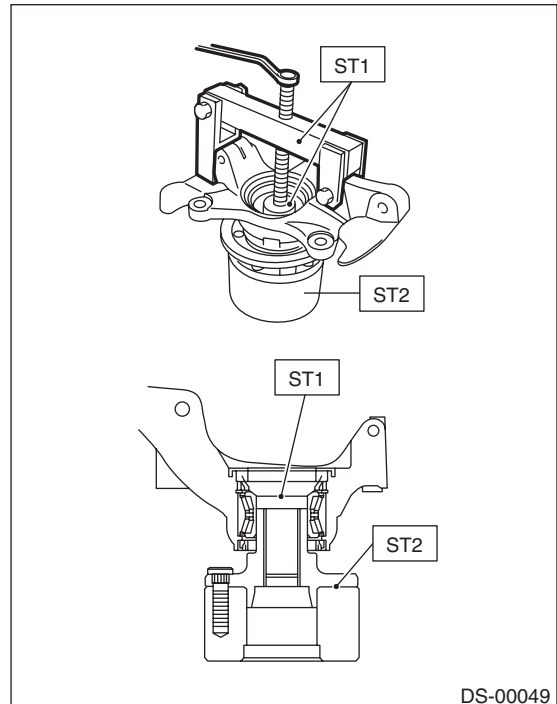
#### 1. EXCEPT STI MODEL

1) Using the ST1, support the housing and hub securely.

2) Attach the ST2 to housing and drive the hub out.

ST1 927060000 HUB REMOVER

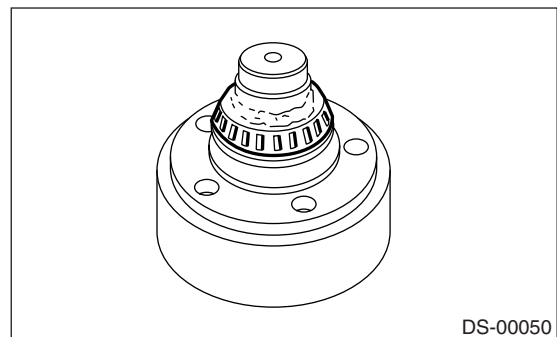
ST2 927080000 HUB STAND



If the inner bearing race remains in hub, remove it with a suitable tool (commercially available).

**NOTE:**

Be careful not to scratch the polished area of hub.



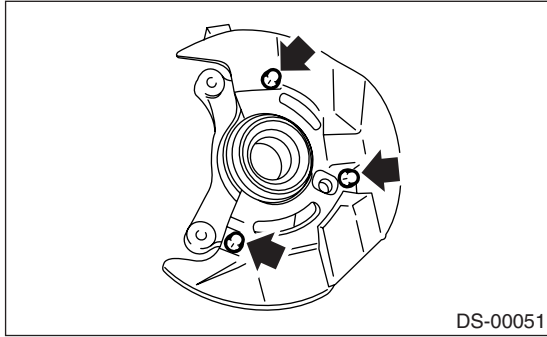
**CAUTION:**

**Do not reuse the bearing if the hub was removed.**

# Front Axle

## DRIVE SHAFT SYSTEM

3) Remove the disc cover from housing.

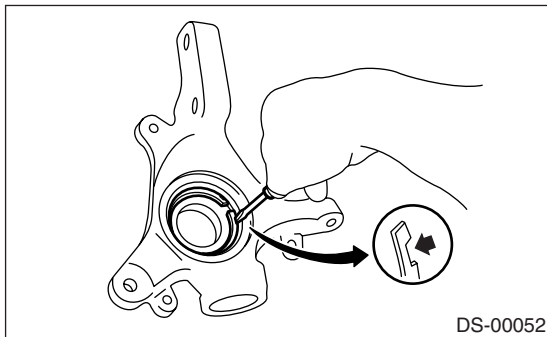


4) Using a standard screwdriver, remove the outer and inner oil seals.

5) Using a flat tip screwdriver, remove the snap ring.

**NOTE:**

Be careful not to damage the housing at removal.

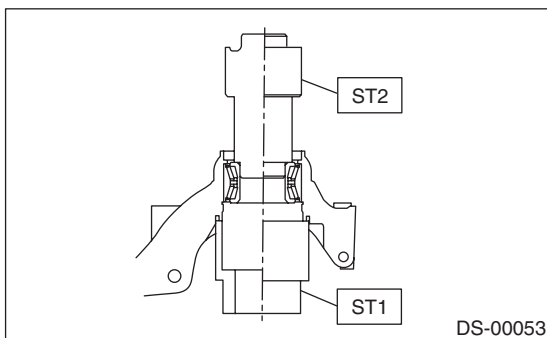


6) Using the ST1, support the housing securely.

7) Using the ST2, hold the inner race to drive out the outer race of bearing.

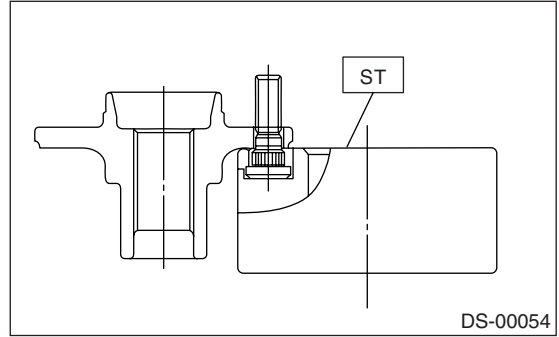
ST1 927400000 HOUSING STAND

ST2 927100000 BEARING PULLER



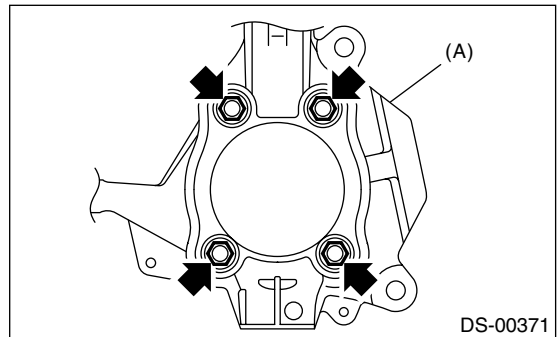
8) Using the ST and a hydraulic press, drive the hub bolts out.

ST 927080000 HUB STAND



## 2. STI MODEL

1) Remove the four bolts from housing, and remove the front hub unit bearing.



(A) Housing

2) Disassemble the front hub unit bearing. <Ref. to DS-21, DISASSEMBLY, Front Axle.>

## D: ASSEMBLY

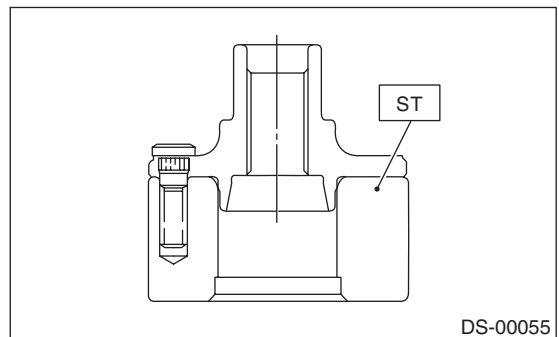
### 1. EXCEPT STI MODEL

**NOTE:**

When the hub is to be removed from housing, replace the bearing set and oil seal with new ones.

1) Attach the hub to ST securely.

ST 927080000 HUB STAND



2) Using a hydraulic press, press new hub bolts until their seating surfaces contact the hub.

**NOTE:**

Use 12 mm (0.47 in) dia. holes in HUB STAND to prevent bolts from tilting.

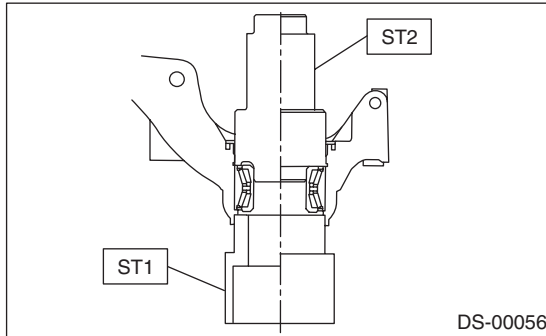
3) Clean dust or foreign particles from inside of housing.

4) Using the ST1 and ST2, press a new bearing into place.

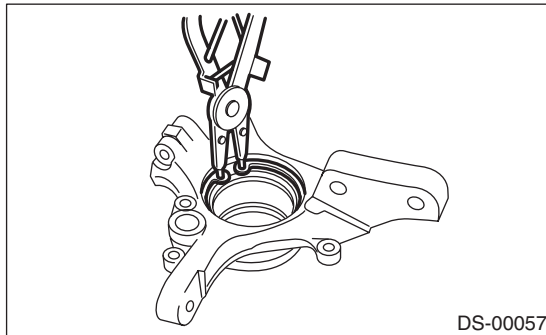
ST1 927400000 HOUSING STAND  
ST2 927100000 BEARING PULLER

**NOTE:**

Be careful not to remove the plastic lock from inner race when installing the bearing.

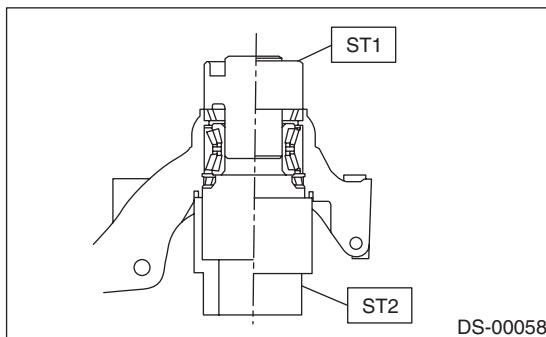


5) Using pliers, install the snap ring firmly.



6) Using the ST1 and ST2, press the outer oil seal until it contacts the bottom of housing.

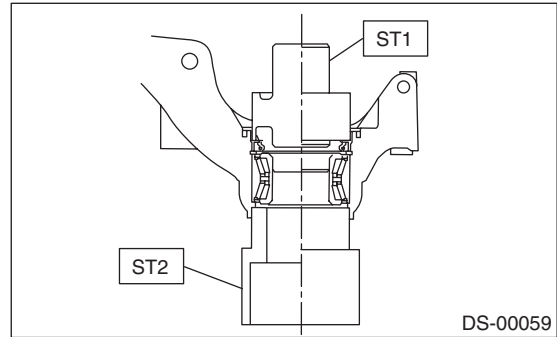
ST1 927410000 OIL SEAL INSTALLER  
ST2 927400000 HOUSING STAND



7) Using the ST1 and ST2, press the inner oil seal until it contacts the circlip.

ST1 927410000 OIL SEAL INSTALLER

ST2 927400000 HOUSING STAND



8) Invert the ST and housing.

ST 927400000 HOUSING STAND

9) Apply sufficient grease to the oil seal lip.

**Specified grease:**  
**SHELL 6459N**

**NOTE:**

- If specified grease is not available, remove the bearing grease and apply Auto Rex A instead.
- Do not mix different types of grease.

10) Install the disc cover to housing with three bolts.

**Tightening torque:**

**18 N·m (1.8 kgf·m, 13.0 ft·lb)**

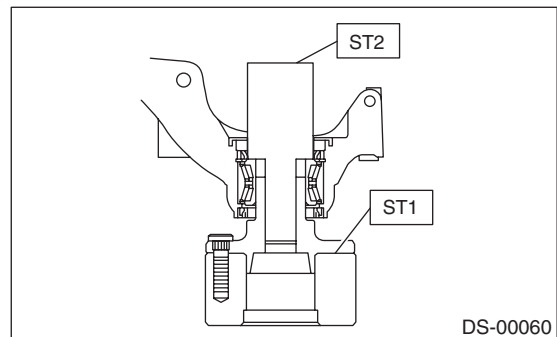
11) Attach the hub to ST1 securely.

12) Clean dust or foreign particles from the polished surface of hub.

13) Using the ST2, press the bearing into hub by driving the inner race.

ST1 927080000 HUB STAND

ST2 927120000 HUB INSTALLER

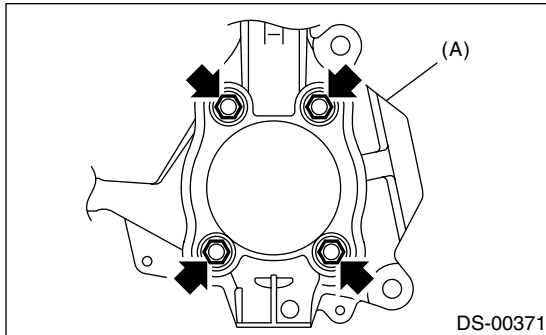


### 2. STI MODEL

- 1) Assemble the front hub unit bearing. <Ref. to DS-26, ASSEMBLY, Front Hub Unit Bearing.>
- 2) Tighten the front hub unit bearing to the housing with four bolts.

**Tightening torque:**

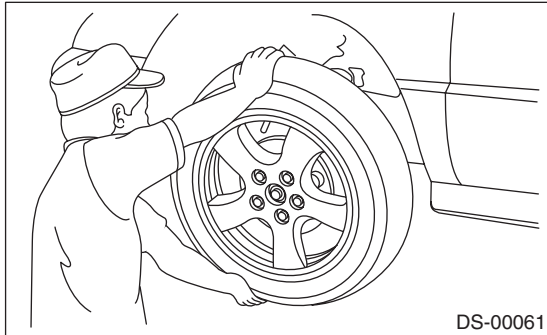
**65 N·m (6.6 kgf·m, 47.9 ft·lb)**



(A) Housing

### E: INSPECTION

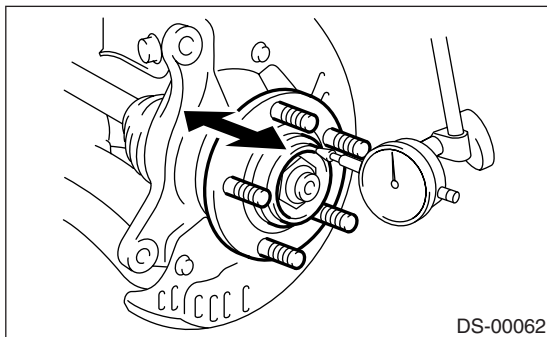
- 1) Moving the front tire up and down by hand, check there is no play in bearing, and check the wheel rotates smoothly.



- 2) Inspect the lean of axis direction using a dial gauge. Replace the hub bearing if the load range exceeds the limitation.

**Limit:**

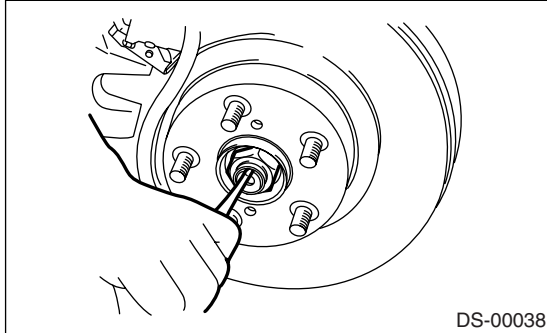
**Maximum: 0.05 mm (0.0020 in)**



## 4. Front Hub Unit Bearing

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle and remove the front wheels.
- 3) Unlock the axle nut.



- 4) Remove the axle nut using a socket wrench while depressing the brake pedal.

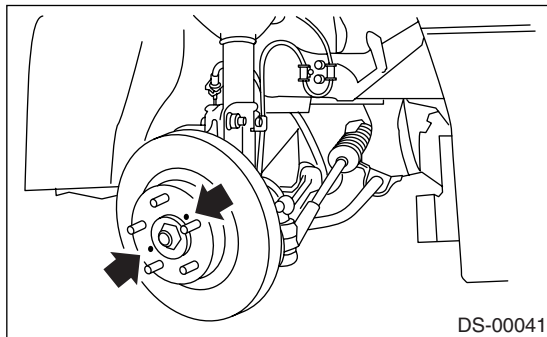
#### CAUTION:

**Remove the wheel before loosening the axle nut. Failure to follow this rule may damage the wheel bearings.**

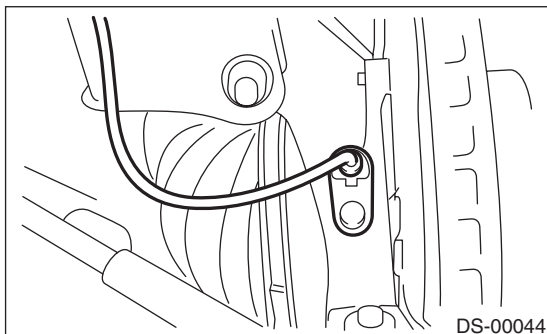
- 5) Remove the disc brake caliper from housing, and suspend it from strut using a wire.
- 6) Remove the disc rotor from hub.

#### NOTE:

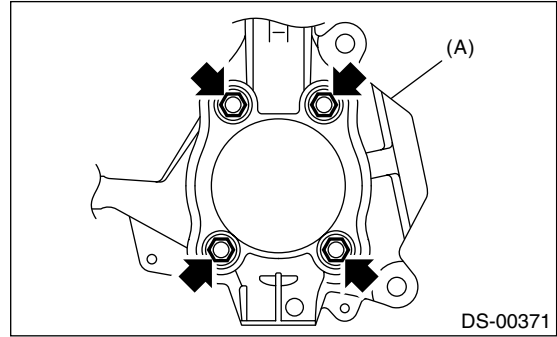
If the disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in screw hole on rotor.



- 7) Remove the ABS wheel speed sensor assembly and harness.



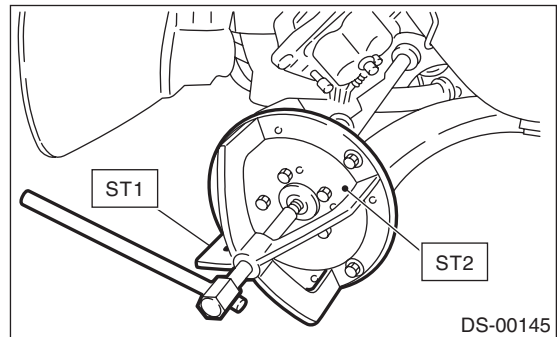
- 8) Remove four bolts from housing.



(A) Housing

- 9) Remove the front hub unit bearing. If it is hard to remove, use STs.

ST1 926470000 AXLE SHAFT PULLER  
ST2 28099PA110 AXLE SHAFT PULLER PLATE

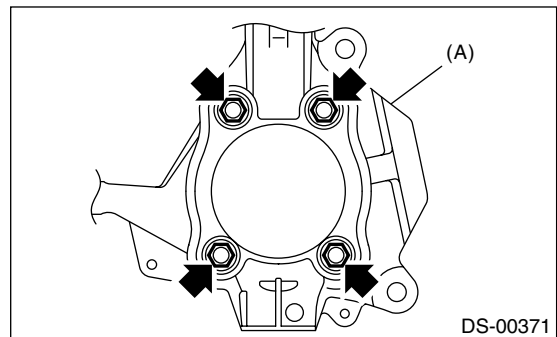


### B: INSTALLATION

- 1) Tighten the front hub unit bearing to the housing with four bolts.

#### Tightening torque:

**65 N·m (6.6 kgf-m, 47.9 ft-lb)**



(A) Housing

- 2) Install the front drive shaft. <Ref. to DS-33, INSTALLATION, Front Drive Shaft.>
- 3) Tighten the axle nut temporarily.
- 4) Install the disc rotor on hub.
- 5) Install the disc brake caliper on the housing.

# Front Hub Unit Bearing

## DRIVE SHAFT SYSTEM

### Tightening torque:

**78 N·m (8.0 kgf·m, 57.9 ft·lb)**

6) While depressing the brake pedal, tighten a new axle nut (olive color) to specified torque and lock it securely.

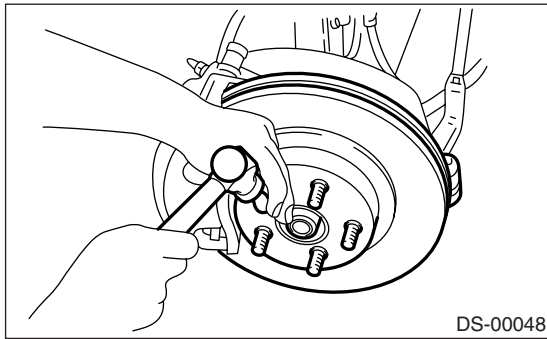
### Tightening torque:

**220 N·m (22.4 kgf·m, 162 ft·lb)**

### CAUTION:

- Install the wheel after installation of the axle nut. Failure to follow this rule may damage the wheel bearing.
- Do not overtighten it as this may damage wheel bearing.

7) After tightening the axle nut, lock it securely.



8) Install the ABS wheel speed sensor on housing.

### Tightening torque:

**33 N·m (3.4 kgf·m, 24 ft·lb)**

9) Install the wheel and tighten the wheel nuts to specified torque.

### Tightening torque:

**90 N·m (9.1 kgf·m, 65.7 ft·lb)**

## C: DISASSEMBLY

Using the ST and a hydraulic press, drive hub bolts out.

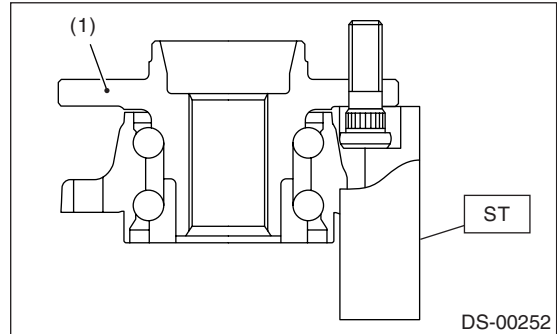
ST 28399AG000 HUB STAND

### CAUTION:

- Be careful not to hammer the hub bolts. This may deform the hub.
- Do not reuse the hub bolt.

### NOTE:

Since the hub unit bearing can not be disassembled, only hub bolts can be removed.

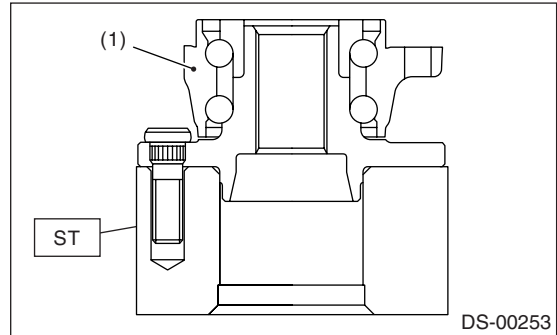


(1) Front hub unit bearing

## D: ASSEMBLY

1) Attach the hub to ST securely.

ST 28099PA080 HUB STAND



(1) Front hub unit bearing

2) Using a press, press new hub bolts until their seating surfaces contact the hub.

### NOTE:

Use 12 mm (0.47 in) dia. holes in HUB STAND to prevent bolts from tilting.

## E: INSPECTION

Refer to "FRONT AXLE" for inspection procedures. <Ref. to DS-24, INSPECTION, Front Axle.>

### CAUTION:

If there is any fault in the bearing, replace hub unit bearing.



## 5. Rear Axle

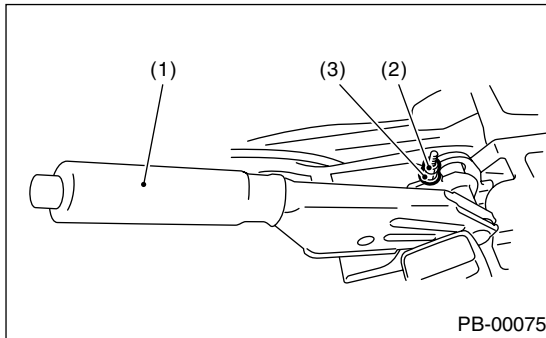
### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle, and remove the rear wheel.
- 3) Unlock the axle nut.
- 4) Remove the axle nut using a socket wrench with parking brake applied.

#### CAUTION:

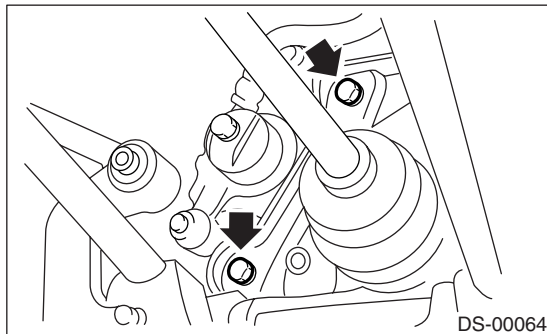
**Remove the axle nut with vehicle weight not applied on axle. Failure to follow this rule may damage the wheel bearings.**

- 5) Return the parking brake lever and loosen the adjusting nut.



- (1) Parking brake lever
- (2) Lock nut
- (3) Adjusting nut

- 6) Remove the disc brake caliper from back plate, and suspend it from strut using a piece of wire.

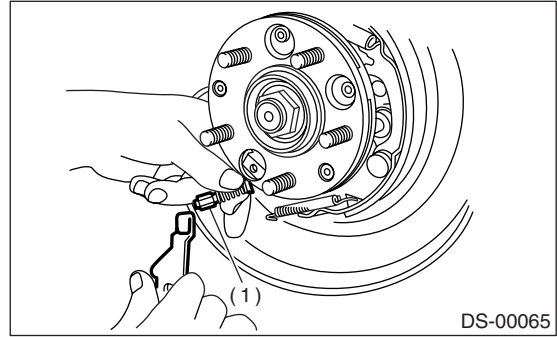


- 7) Remove the disc rotor from hub.

#### NOTE:

If the disc rotor seizes up within hub, drive it out by installing an 8-mm bolt into bolt hole in disc rotor.

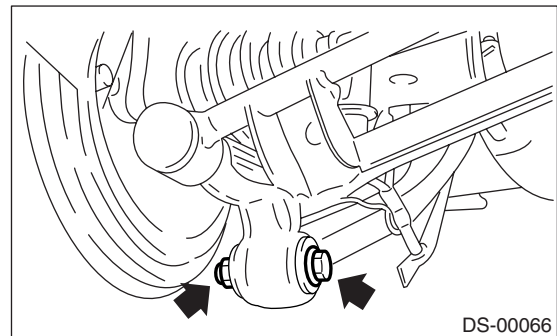
- 8) Disconnect the parking brake cable end.



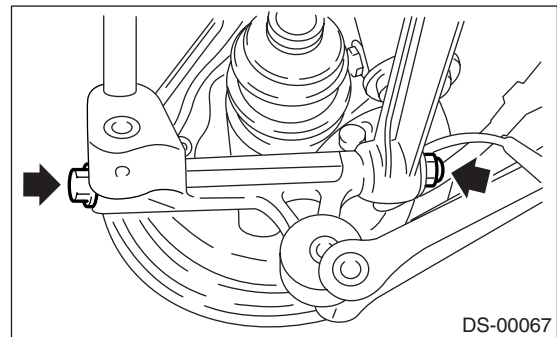
- (1) Cable end

- 9) Disconnect the rear stabilizer from rear lateral link.

- 10) Remove the bolts which secure the trailing link assembly to rear housing.



- 11) Remove the bolts which secure the lateral assembly to rear housing.

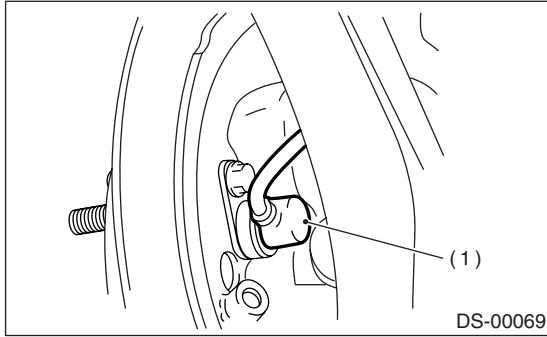




# Rear Axle

## DRIVE SHAFT SYSTEM

12) Remove the rear ABS wheel speed sensor from back plate.



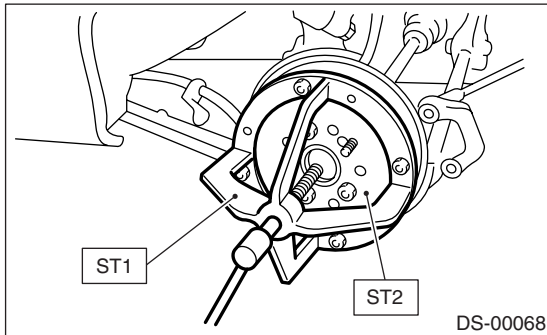
(1) ABS wheel speed sensor

13) Disengage the BJ from housing splines, and then remove the rear drive shaft assembly. If it is hard to remove, use the STs.

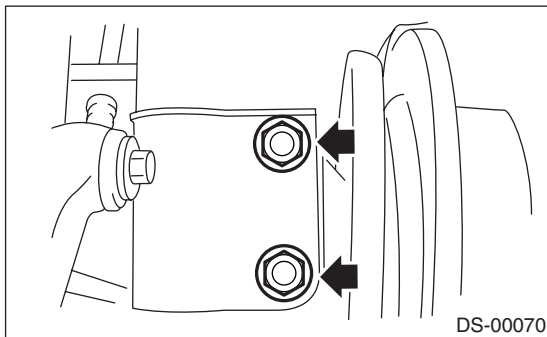
ST1 926470000 AXLE SHAFT PULLER  
ST2 28099PA110 AXLE SHAFT PULLER PLATE

### NOTE:

- Be careful not to damage the oil seal lip when removing the rear drive shaft.
- When the rear drive shaft is to be replaced, also replace the inner oil seal with a new one.



14) Remove the bolts which secure the rear housing to strut, and separate the two.



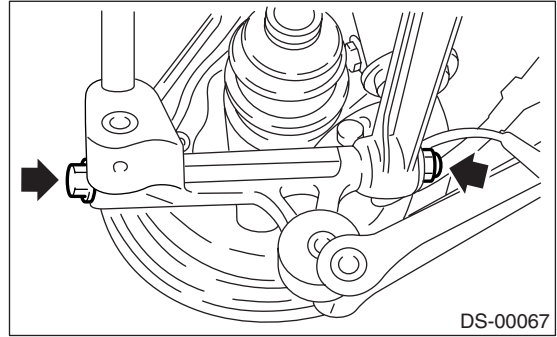
## B: INSTALLATION

- 1) Temporarily tighten the rear axle to strut.
- 2) Insert the rear drive shaft into rear axle.

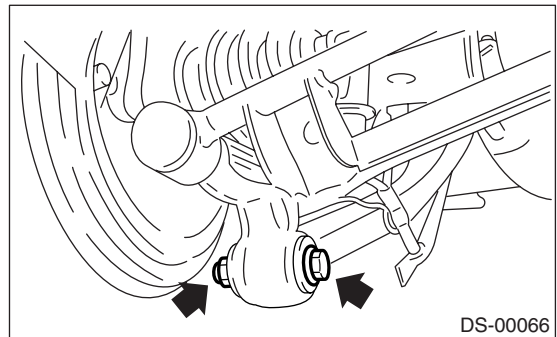
### NOTE:

Be careful not to damage the inner oil seal lip.

- 3) Temporarily tighten the axle nut.
- 4) Using a new self-locking nut, temporarily tighten the rear housing assembly and lateral link assembly.



- 5) Using a new self-locking nut, temporarily tighten the rear housing assembly and trailing link assembly.



- 6) Tighten the rear housing assembly and strut assembly using a new self-locking nut.

### Tightening torque:

**200 N·m (20.0 kgf-m, 145 ft-lb)**

- 7) Using a new self-locking nut, install the rear stabilizer and rear lateral link.

### Tightening torque:

**45 N·m (4.5 kgf-m, 33.2 ft-lb)**

- 8) Connect the parking brake cable to parking brake.
- 9) Install the disc rotor on rear housing assembly.
- 10) Install the disc brake caliper on back plate.

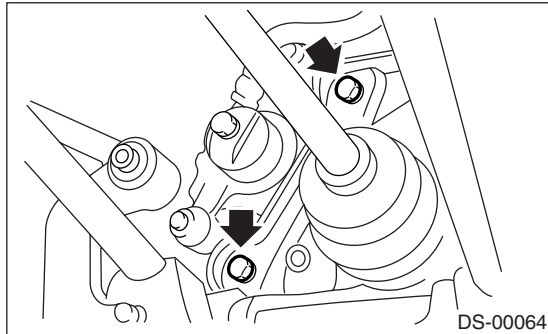
**Tightening torque:**

**Except STI model**

**53 N·m (5.4 kgf·m, 39.1 ft·lb)**

**STI model**

**65 N·m (6.6 kgf·m, 47.9 ft·lb)**



11) Adjust the parking brake lever stroke by turning the adjuster.

12) While applying the parking brake, tighten a new axle nut using a socket wrench. Lock the axle nut after tightening.

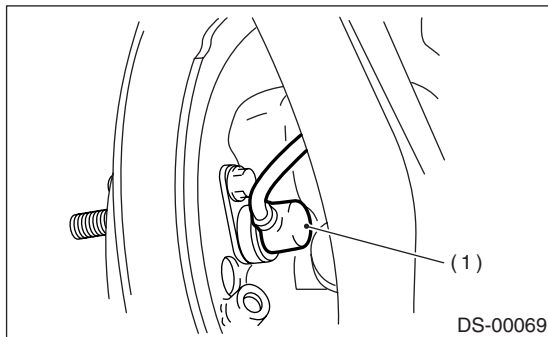
**Tightening torque:**

**190 N·m (19.4 kgf·m, 140 ft·lb)**

**CAUTION:**

**Do not overtighten it as this may damage the wheel bearing.**

13) Install rear ABS wheel speed sensor.



(1) ABS wheel speed sensor

14) Install the wheel and tighten the wheel nuts to specified torque.

**Tightening torque:**

**90 N·m (9.1 kgf·m, 65.7 ft·lb)**

15) Make the tires contact the ground fully.

**CAUTION:**

**Make the tires contact the ground fully and the vehicle be in curb weight whenever carrying out the tightening of bushing portions.**

16) Tighten the installation bolt of rear housing assembly and lateral link assembly.

**Tightening torque:**

**140 N·m (14.3 kgf·m, 103 ft·lb)**

17) Tighten the installation bolt of rear housing assembly and trailing link assembly.

**Tightening torque:**

**90 N·m (9.2 kgf·m, 66 ft·lb)**

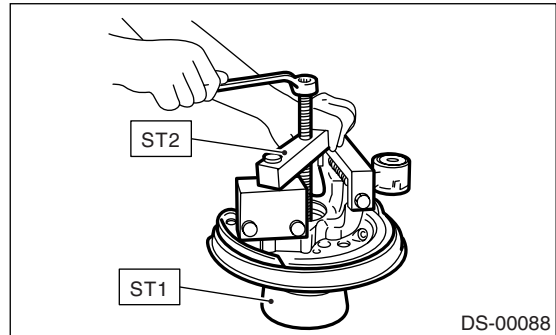
**C: DISASSEMBLY**

1) Using the ST1 and ST2, remove the hub from rear housing.

ST1 927080000 HUB STAND (Except STI model)

ST1 28099PA080 HUB STAND (STI model)

ST2 927420000 HUB REMOVER



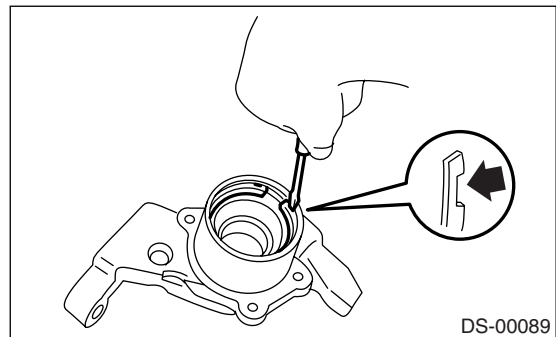
2) Remove the back plate from rear housing.

3) Using a standard screwdriver, remove the outer and inner oil seals.

4) Using a flat tip screwdriver, remove the snap ring.

**NOTE:**

Be careful not to damage the housing at removal.



## Rear Axle

### DRIVE SHAFT SYSTEM

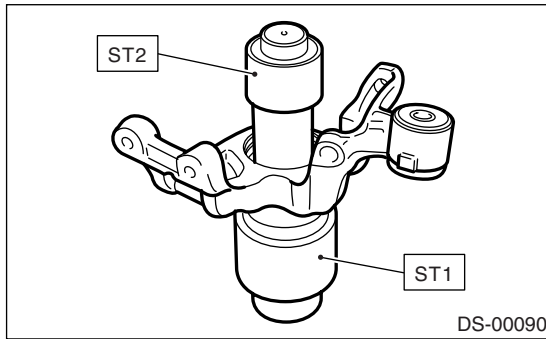
5) Using the ST1 and ST2, remove the bearing by pressing the inner race.

ST1 927430000 HOUSING STAND (Except STI model)

ST1 28099PA060 HOUSING STAND (STI model)

ST2 927440000 BEARING PULLER (Except STI model)

ST2 927100000 BEARING PULLER (STI model)



6) Remove the tone wheel bolts, and then remove the tone wheel from hub.

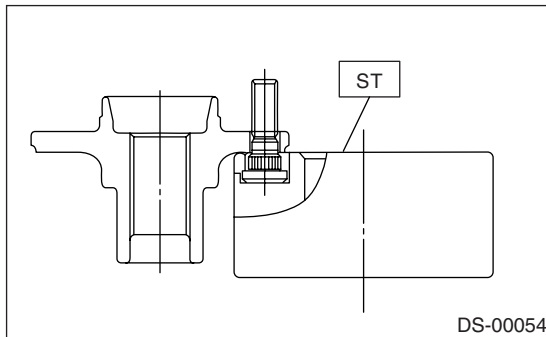
7) Using the ST, press the hub bolt out.

ST 927080000 HUB STAND (Except STI model)

ST 28099PA080 HUB STAND (STI model)

#### CAUTION:

**Be careful not to hammer the hub bolts. This may deform the hub.**



## D: ASSEMBLY

#### NOTE:

When the hub is to be removed from housing, replace the bearing set and oil seal with new ones.

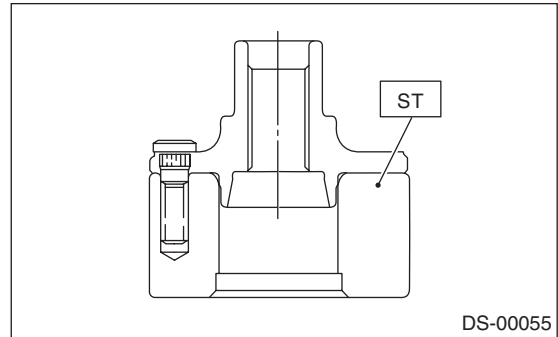
1) Using the ST, press the new hub bolt into place.

#### NOTE:

- Ensure the hub bolt closely contacts the hub.
- Use a 12 mm (0.47 in) hole in the ST to prevent the hub bolt from tilting during installation.

ST 927080000 HUB STAND (Except STI model)

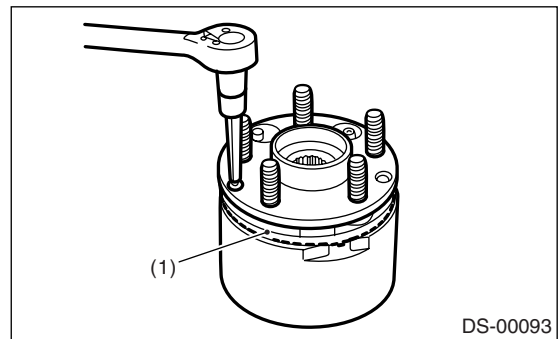
ST 28099PA080 HUB STAND (STI model)



2) Remove foreign particles (dust, rust, etc.) from mating surfaces of the hub tone wheel, and then install the tone wheel to hub.

#### NOTE:

- Ensure the tone wheel closely contacts the hub.
- Be careful not to damage the tone wheel teeth.



(1) Tone wheel

3) Clean the housing interior completely. Using the ST1 and ST2, press the bearing into housing.

ST1 927430000 HOUSING STAND (Except STI model)

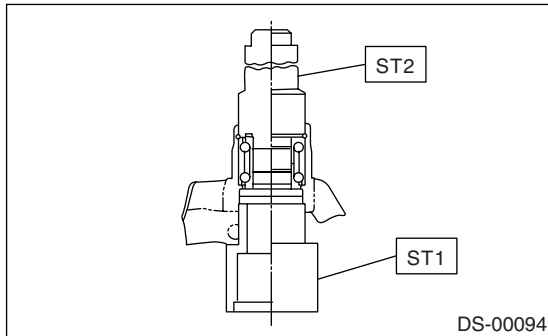
ST1 28099PA060 HOUSING STAND (STI model)

ST2 927440000 BEARING PULLER (Except STI model)

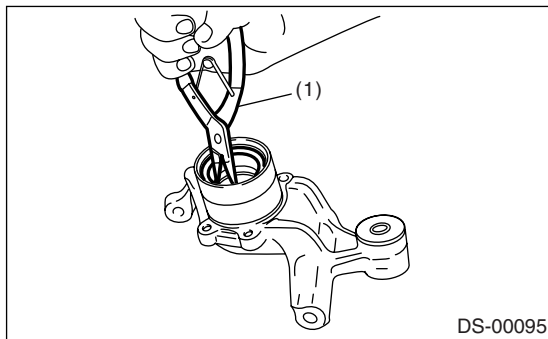
ST2 927100000 BEARING PULLER (STI model)

**NOTE:**

Be careful not to remove the plastic lock from inner race when installing the bearing.



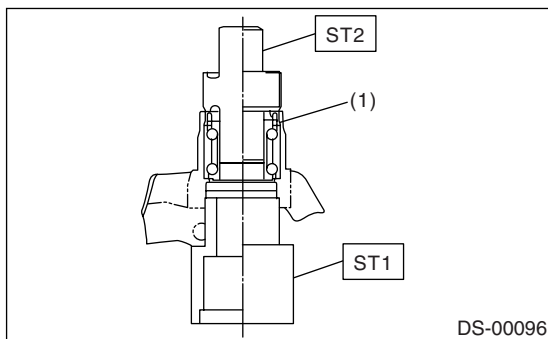
4) Using pliers, install the snap ring firmly.



(1) Pliers

5) Using the ST1 and ST2, press the outer oil seal until it comes in contact with snap ring.

- ST1 927430000 HOUSING STAND (Except STI model)
- ST1 28099PA060 HOUSING STAND (STI model)
- ST2 927460000 OIL SEAL INSTALLER (Except STI model)
- ST2 28099PA070 OIL SEAL INSTALLER (STI model)

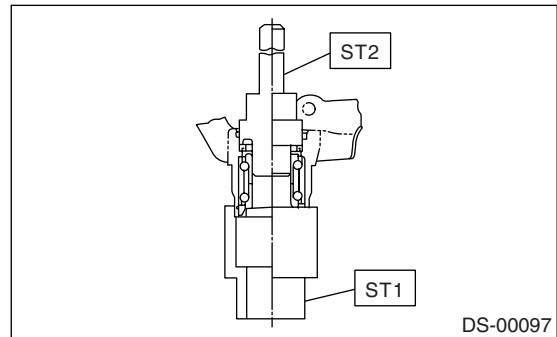


(1) Snap ring

6) Invert both ST1 and housing.

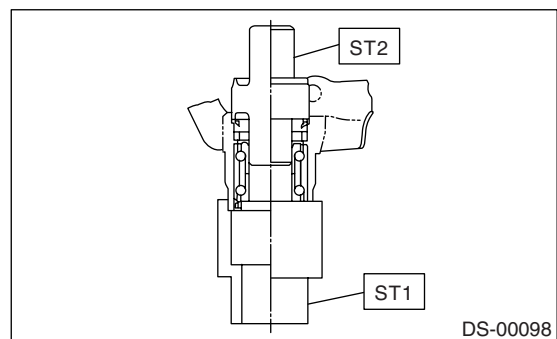
7) Using the ST2, press the inner oil seal into housing until it touches the bottom.

- ST1 927430000 HOUSING STAND (Except STI model)
- ST1 28099PA060 HOUSING STAND (STI model)
- ST2 927460000 OIL SEAL INSTALLER (Except STI model)
- ST2 28099PA070 OIL SEAL INSTALLER (STI model)



8) Using the ST1 and ST2, press the sub seal into place.

- ST1 927430000 HOUSING STAND (Except STI model)
- ST1 28099PA060 HOUSING STAND (STI model)
- ST2 927460000 OIL SEAL INSTALLER (Except STI model)
- ST2 28099PA070 OIL SEAL INSTALLER (STI model)



9) Apply sufficient grease to oil seal lip.

**Specified grease:**  
**SHELL 6459N**

**NOTE:**

- If specified grease is not available, remove the bearing grease and apply Auto Rex A instead.
- Do not mix different types of grease.

10) Install the back plate to rear housing.

**Tightening torque:**  
**52 N·m (5.3 kgf·m, 38.3 ft·lb)**

# Rear Axle

## DRIVE SHAFT SYSTEM

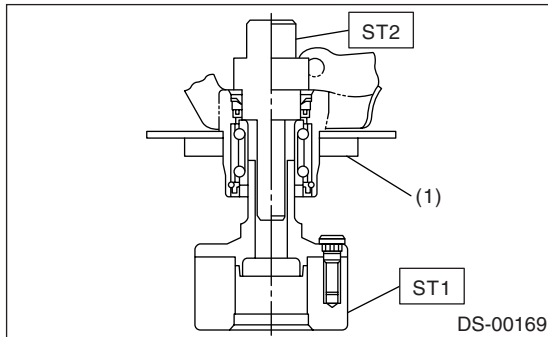
11) Using the ST1 and ST2, press the bearing into hub.

ST1 927080000 HUB STAND (Except STI model)

ST1 28099PA080 HUB STAND (STI model)

ST2 927450000 HUB INSTALLER (Except STI model)

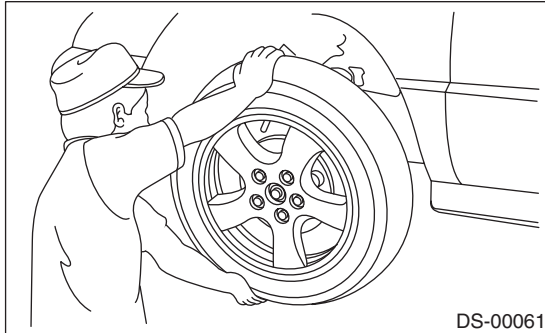
ST2 927120000 HUB INSTALLER (STI model)



(1) Back plate

## E: INSPECTION

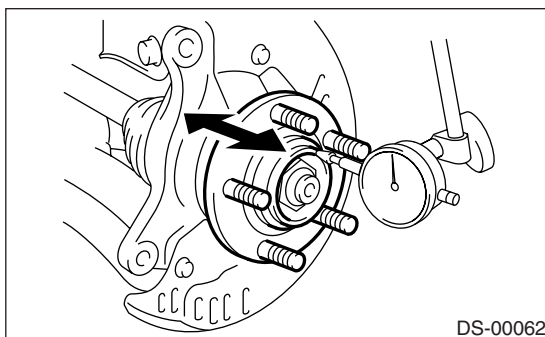
1) Moving the rear tire up and down by hand, check there is no play in bearing, and check the wheel rotates smoothly.



2) Inspect the lean of axis direction using a dial gauge. Replace the hub bearing if the load range exceeds the limitation.

**Limit:**

**Maximum: 0.05 mm (0.0020 in)**



## 6. Front Drive Shaft

### A: REMOVAL

- 1) Jack-up the vehicle, support it with rigid racks, and then remove the front wheel cap and wheels.
- 2) Raise the caulking portion of axle nut.
- 3) Depress the brake pedal and remove the axle nut using a socket wrench.

**CAUTION:**

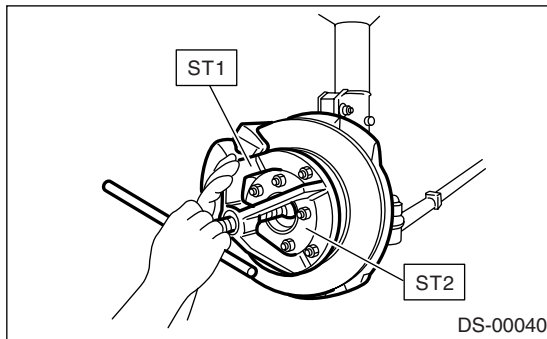
**Be sure to loosen the axle nut after removing the wheel from vehicle. Failure to follow this rule may damage the wheel bearings.**

- 4) Remove the stabilizer link from transverse link.
- 5) Disconnect the transverse link from housing.
- 6) Remove the front drive shaft assembly. If it is hard to remove, use the ST1 and ST2.

ST1 926470000 AXLE SHAFT PULLER  
 ST2 28099PA110 AXLE SHAFT PULLER PLATE

**CAUTION:**

- Be careful not to damage the oil seal lip and tone wheel when removing the front drive shaft.
- When the front drive shaft is to be replaced, also replace the inner oil seal.



- 7) Remove the front drive shaft from transmission using bar.

**CAUTION:**

**Be careful not to damage the holder portion.**

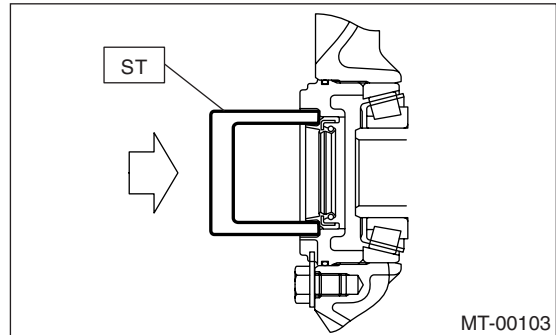
### B: INSTALLATION

- 1) Using the ST, replace the differential side retainer oil seal with a new one.

ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER

**NOTE:**

After pulling out the drive shaft, be sure to replace with a new oil seal.



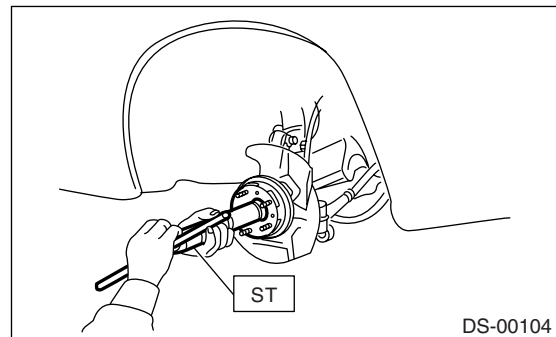
- 2) Insert the EBJ into hub splines.

**CAUTION:**

**Be careful not to damage the inner oil seal lip and tone wheel.**

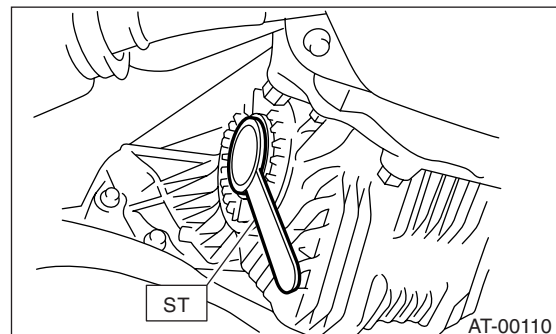
- 3) Using the ST1 and ST2, pull the drive shaft into place.

ST1 922431000 AXLE SHAFT INSTALLER  
 ST2 927390000 ADAPTER



- 4) Tighten the axle nut temporarily.
- 5) Using the ST, install the front drive shaft to transmission.

ST 28399SA010 OIL SEAL PROTECTOR



# Front Drive Shaft

## DRIVE SHAFT SYSTEM

6) Connect the transverse link to housing.

**Tightening torque:**

**50 N·m (5.1 kgf·m, 37 ft·lb)**

7) Install the stabilizer bracket.

8) While depressing the brake pedal, tighten the axle nut to specified torque.

**Tightening torque:**

**220 N·m (22.4 kgf·m, 162 ft·lb)**

**CAUTION:**

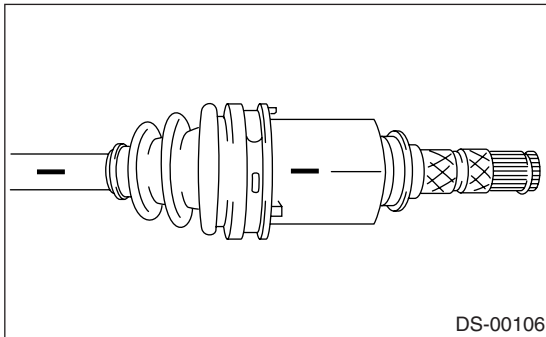
- Always tighten the axle nut before installing wheel on vehicle. If the tire is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
- Do not overtighten it as this may damage the wheel bearing.

9) After tightening the axle nut, caulk and lock it.

## C: DISASSEMBLY

### 1. EBJ+PTJ TYPE

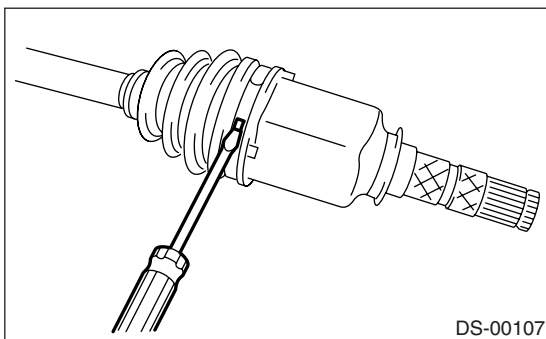
1) Place alignment marks on shaft and outer race.



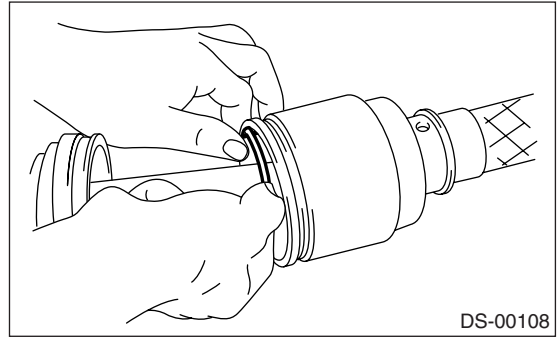
2) Remove the PTJ boot band and boot.

**CAUTION:**

**Be careful not to damage the boot.**



3) Remove the circlip from PTJ outer race using a screwdriver.



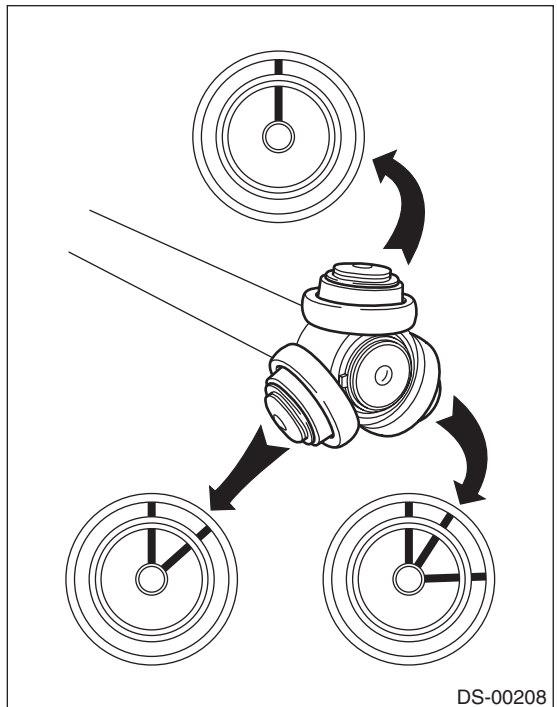
4) Remove the PTJ outer race from shaft assembly.

5) Wipe off the grease.

**CAUTION:**

**The grease is a special grease. Do not confuse with other greases.**

6) Place alignment marks on roller kit and trunnion.



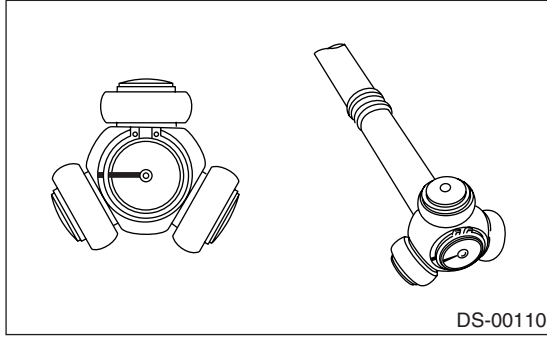
7) Remove the roller kit from trunnion.

**CAUTION:**

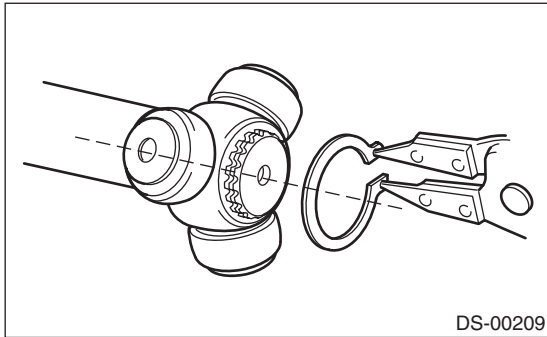
**Be careful with the roller kit position.**



8) Place an alignment mark on trunnion and shaft.



9) Remove the snap ring and trunnion.



**CAUTION:**

**Be sure to wrap the shaft splines with vinyl tape to prevent the boot from scratches.**

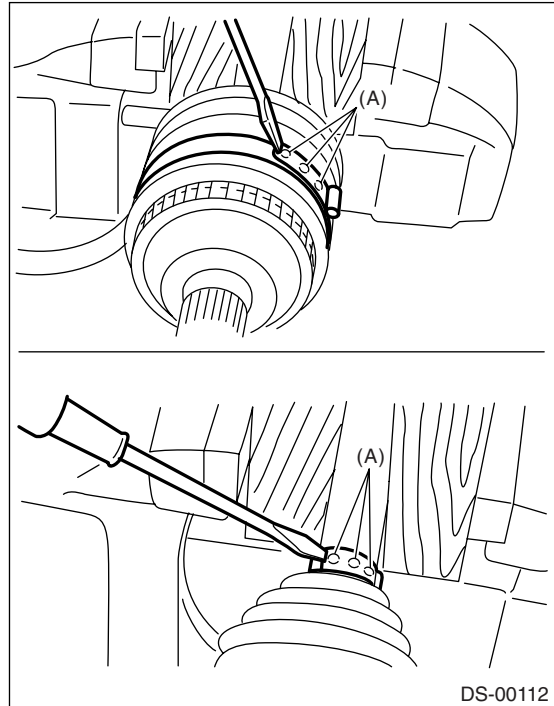
10) Remove the PTJ boot.

11) Place the drive shaft in a vise between wooden blocks.

**CAUTION:**

**Do not place the drive shaft directly in a vise; use wooden block.**

12) Raise the boot band claws by means of screwdriver and hammer.

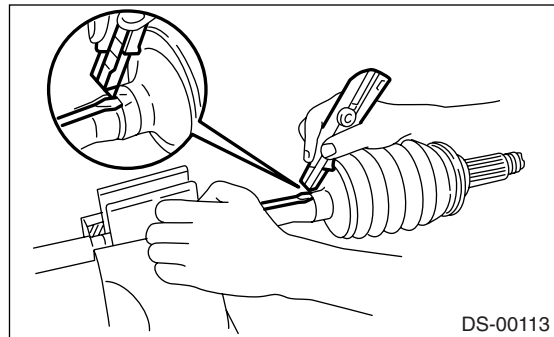


(A) Boot band claws

13) Cut and remove the boot.

**CAUTION:**

**The boot must be replaced with a new one whenever it is removed.**



**NOTE:**

Further disassembly of axle is impossible because the EBJ cannot be disassembled.

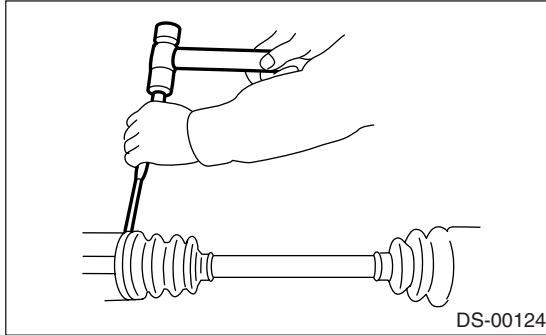


# Front Drive Shaft

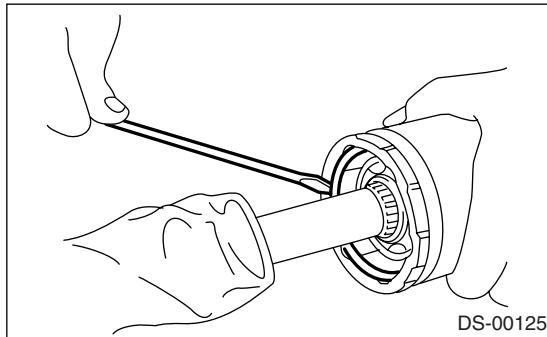
## DRIVE SHAFT SYSTEM

### 2. BJ+DOJ TYPE

- 1) Straighten the bent claw of larger end of DOJ boot.
- 2) Loosen the band by means of screwdriver or pliers with care of not damaging boot.



- 3) Remove the boot band on the small end of DOJ boot in the same manner.
- 4) Remove the larger end of DOJ boot from DOJ outer race.
- 5) Pry and remove the round circlip located at neck of DOJ outer race with a screwdriver.

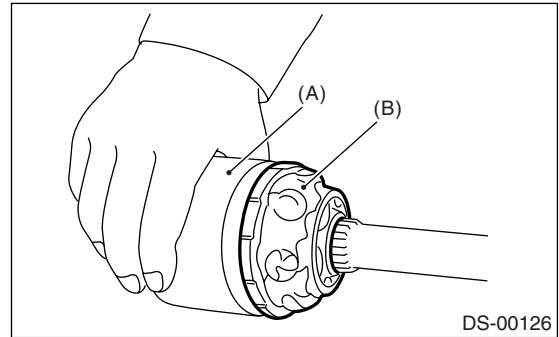


- 6) Take out the DOJ outer race from shaft assembly.
- 7) Wipe off the grease, and then take out the balls.

#### NOTE:

- The grease is a special grease (grease for constant velocity joint). Do not confuse with other greases.

- Disassemble with exercising care not to lose balls (6 pcs).



- (A) Outer race  
(B) Grease

- 8) To remove the cage from inner race, turn the cage by a half pitch to the track groove of inner race, and shift the cage.
- 9) Remove the snap ring, which fixes the inner race to shaft, by using pliers.
- 10) Take out the DOJ inner race.
- 11) Take off the DOJ cage from shaft and remove the DOJ boot.
- 12) Wrap the shaft splines with vinyl tape.
- 13) Remove the BJ boot in the same procedure as DOJ boot.

#### NOTE:

Further disassembly of axle is impossible because the BJ cannot be disassembled.

### D: ASSEMBLY

#### 1. EBJ+PTJ TYPE

#### NOTE:

Use specified grease.

#### EBJ side:

**NTG2218-M (Part No. 28395AG010)**

#### PTJ side:

**NKG302 (Part No. 28495AE010)**

- 1) Place the EBJ boot and small boot band on EBJ side of shaft.

#### CAUTION:

**Be sure to wrap the shaft splines with vinyl tape to prevent the boot from scratches.**

- 2) Place the drive shaft in a vise.

#### CAUTION:

**Do not place the drive shaft directly in a vise; use wooden blocks.**

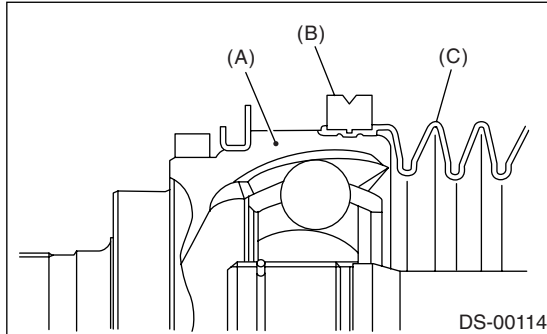
- 3) Apply a coat of specified grease [60 to 70 g (2.12 to 2.47 oz)] to EBJ.

4) Apply an even coat of specified grease [20 to 30 g (0.71 to 1.06 oz)] to entire inner surface of boot. Also apply grease to shaft.

**NOTE:**

EBJ installation surface of EBJ boot shall be cleaned so as to be free from grease and other substances.

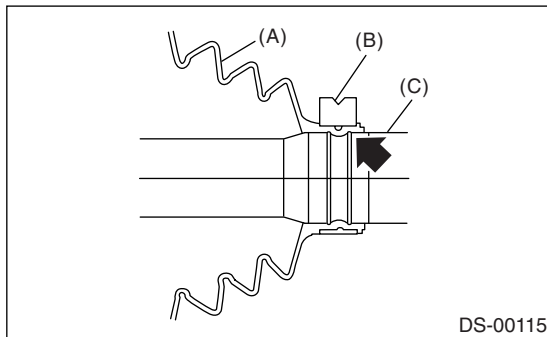
5) Install the boot projecting portion to EBJ groove.



- (A) EBJ
- (B) Large boot band
- (C) Boot

6) Set the large boot band in place.

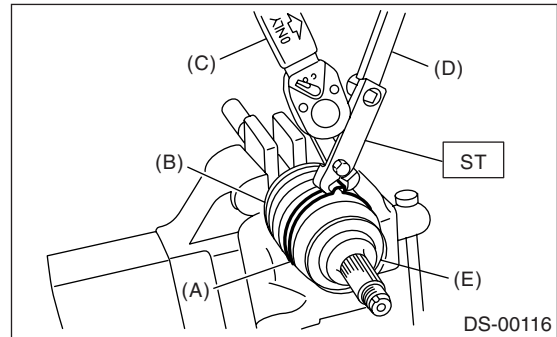
7) Install the boot projecting portion to shaft groove.



- (A) Boot
- (B) Small boot band
- (C) Shaft

8) Tighten the boot bands using the ST, torque wrench and socket flex handle.

ST 28099AC000 BOOT BAND PLIER



- (A) Large boot band
- (B) Boot
- (C) Torque wrench
- (D) Socket flex handle
- (E) EBJ

**Tightening torque:**

**Large boot band**

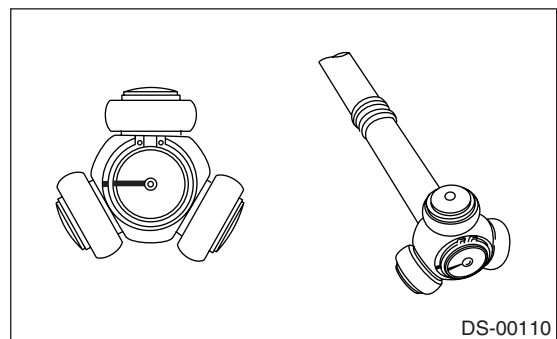
**157 N·m (16.0 kgf-m, 116 ft-lb) or more**

**Small boot band**

**133 N·m (13.6 kgf-m, 98 ft-lb) or more**

9) Place the PTJ boot at the center of shaft.

10) Align the alignment marks, and then install the trunnion on shaft.



11) Install the snap ring to shaft.

**CAUTION:**

**Confirm that the snap ring is completely fitted in shaft groove.**

12) Fill 100 to 110 g (3.53 to 3.88 oz) of specified grease into the interior of PTJ outer race.

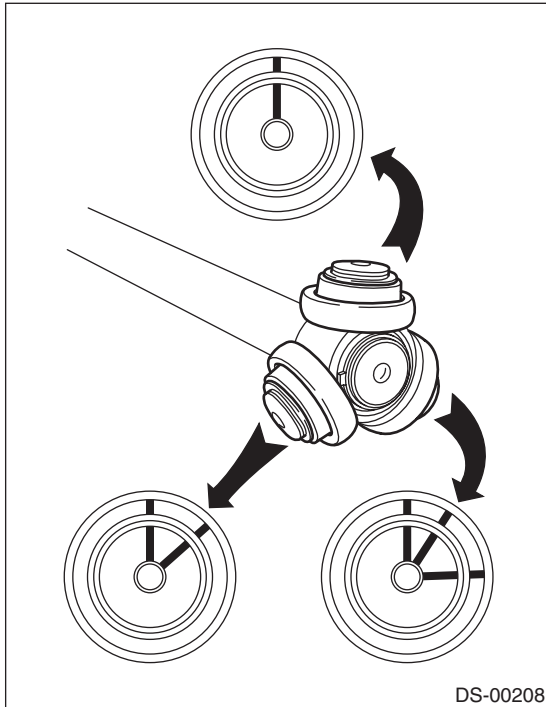
13) Apply a coat of specified grease to roller kit and trunnion.

14) Align the alignment marks on roller kit and trunnion, and then install the free ring.

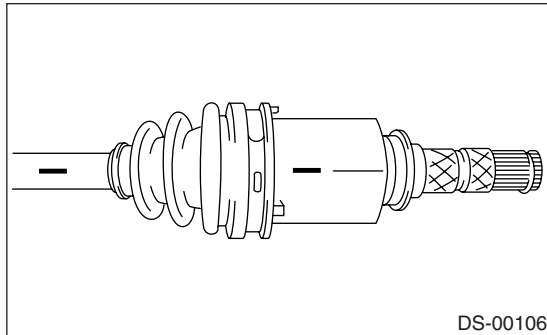
# Front Drive Shaft

## DRIVE SHAFT SYSTEM

**CAUTION:**  
Be careful with the roller kit position.



15) Align the alignment marks on shaft and outer race, and then install the outer race.



16) Install the circlip in the groove on PTJ outer race.

**CAUTION:**  
Pull the shaft lightly and assure the circlip is completely fitted in groove.

17) Apply an even coat of the specified grease 30 to 40 g (1.06 to 1.41 oz) to the entire inner surface of boot.

18) Install the PTJ boot taking care not to twist it.

**CAUTION:**

- PTJ installation surface of PTJ boot shall be cleaned so as to be free from grease and other substances.

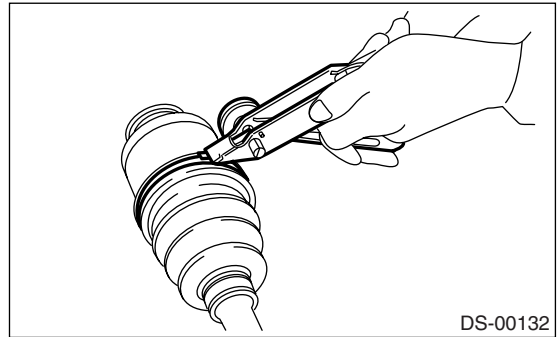
- When installing the PTJ boot, position the outer race of PTJ at center of its travel.

19) Put a new band through the clip and wind twice in alignment with band groove of boot.

20) Tighten the band by using the ST.  
ST 925091000 BAND TIGHTENING TOOL

**NOTE:**

Tighten the band until it cannot be moved by hand.

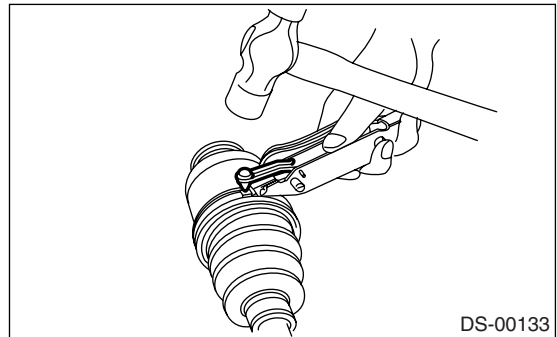


21) Tap on the clip with punch provided at the end of ST.

ST 925091000 BAND TIGHTENING TOOL

**CAUTION:**

Tap to an extent that the boot underneath is not damaged.



22) Cut off the band with an allowance of about 10 mm (0.39 in) left from clip, and bend this allowance over clip.

**CAUTION:**

Be careful so that the end of band is in close contact with clip.

23) Extend and retract the PTJ to provide equal grease coating.

## 2. BJ+DOJ TYPE

**NOTE:**

Use specified grease.

**BJ side:**

*NTG2218-M (Part No. 28395AG030)*

**DOJ side:**

*NKG205 (Part No. 28495AG010)*

1) Install the BJ boot in specified position, and fill it with 60 to 70 g (2.12 to 2.47 oz) of specified grease.

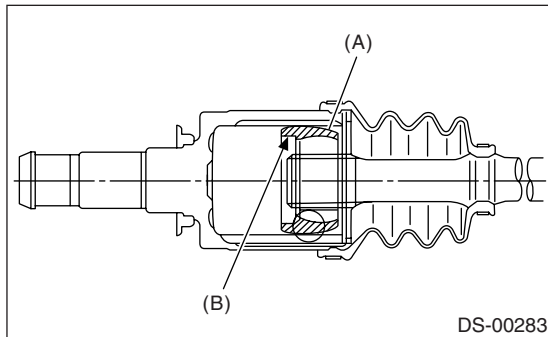
2) Place the DOJ boot at the center of shaft.

3) Wrap the shaft splines with vinyl tape.

4) Insert the DOJ cage onto shaft.

**NOTE:**

Insert the cage with cut-out portion facing the shaft end, since the cage has an orientation.

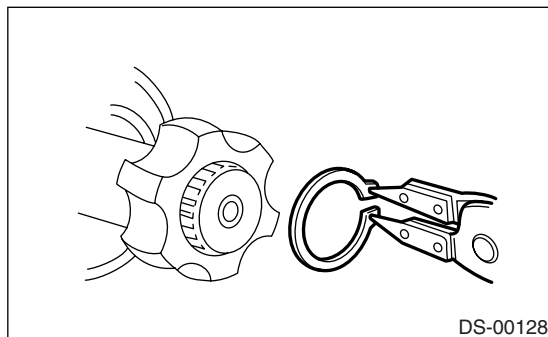


(A) Cage  
(B) Cut-out portion

5) Install the DOJ inner race on shaft, and fit the snap ring with pliers.

**NOTE:**

Confirm the snap ring is completely fitted in shaft groove.

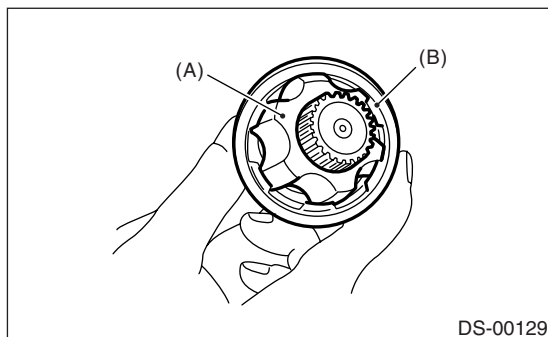


DS-00128

6) Install the cage, which was previously fitted, to inner race fixed upon shaft.

**NOTE:**

Fit the cage with protruded part aligned with the track on inner race, and then turn by a half pitch.



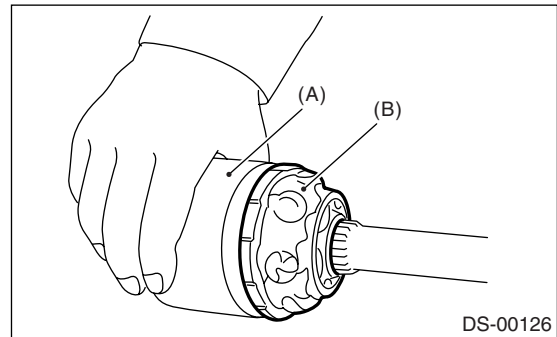
(A) Inner race  
(B) Cage

7) Fill 80 to 90 g (2.82 to 3.17 oz) of specified grease into the interior of DOJ outer race.

8) Apply a coat of specified grease to cage pocket and six balls.

9) Insert six balls into cage pocket.

10) Align the outer race track and ball positions and place in the part where shaft, inner race, cage and balls are previously installed, and then fit the outer race.

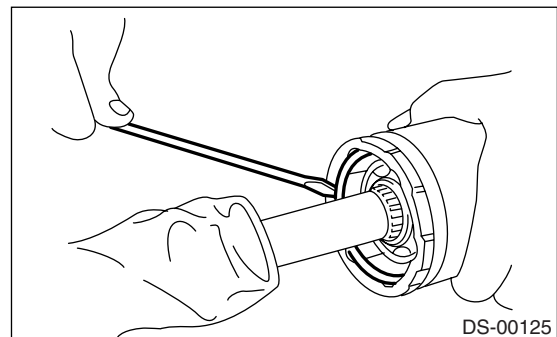


(A) Outer race  
(B) Grease

11) Install the circlip in the groove on DOJ outer race.

**NOTE:**

- Assure the balls, cage and inner race are completely fitted in the outer race of DOJ.
- Exercise care not to place the matched position of circlip in ball groove of outer race.
- Pull the shaft lightly and assure that the circlip is completely fitted in groove.



DS-00125

12) Apply an even coat of the specified grease [20 to 30 g (0.71 to 1.06 oz)] to the entire inner surface of boot. Also apply grease to shaft.

13) Install the DOJ boot taking care not to twist it.

**NOTE:**

- Inside of the larger end of DOJ boot and boot groove shall be cleaned so as to be free from grease and other substances.
- When installing the DOJ boot, position the outer race of DOJ at center of its travel.

# Front Drive Shaft

## DRIVE SHAFT SYSTEM

14) Put a new band through the clip and wind twice in alignment with band groove of boot.

**NOTE:**

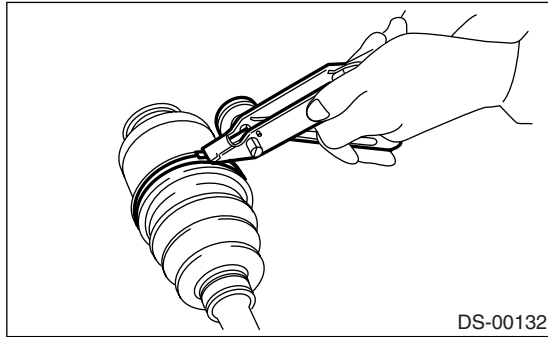
When tightening the boot, exercise care so that air within boot is appropriate.

15) Tighten the band using the ST.

ST 925091000 BAND TIGHTENING TOOL

**NOTE:**

Tighten the band until it cannot be moved by hand.

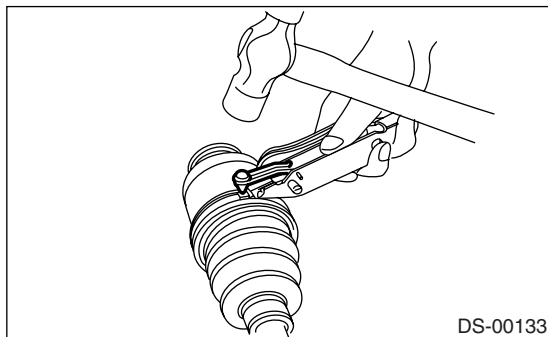


16) Tap on the clip with the punch provided at the end of ST.

ST 925091000 BAND TIGHTENING TOOL

**NOTE:**

Tap to an extent that the boot underneath is not damaged.



17) Cut off the band with an allowance of about 10 mm (0.39 in) left from clip, and bend this allowance over the clip.

**NOTE:**

Be careful so that the end of band is in close contact with clip.

18) Fix up the boot on BJ in the same manner.

19) Extend and retract the DOJ to provide equal grease coating.

## E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. If faulty, repair or replace.

1) DOJ (Double Offset Joint)

Check seizure, corrosion, damage, wear and excessive play.

2) PTJ (Pillow tripod Joint)

Check seizure, corrosion, damage and excessive play.

3) Shaft

Check excessive bending, twisting, damage and wear.

4) EBJ (High-efficiency compact ball fixed joint)

Check seizure, corrosion, damage and excessive play.

5) Boot

Check for wear, warping, breakage or scratches.

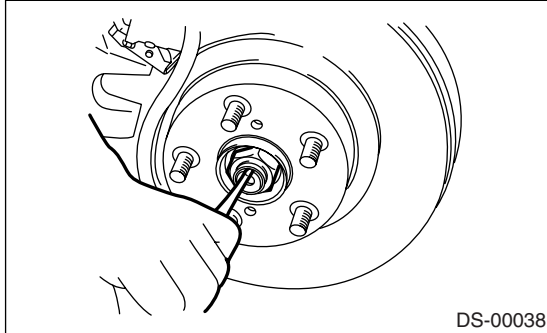
6) Grease

Check for discoloration or fluidity.

## 7. Rear Drive Shaft

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle, and remove the rear wheel.
- 3) Unlock the axle nut.

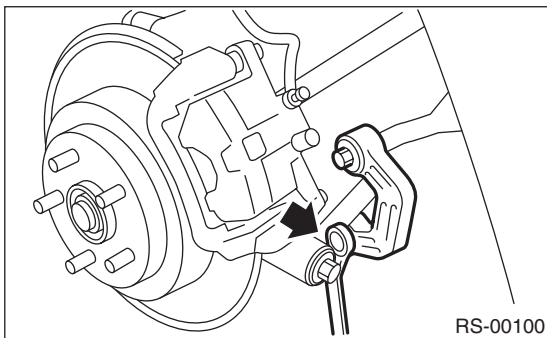


- 4) Remove the axle nut using a socket wrench with parking brake applied.

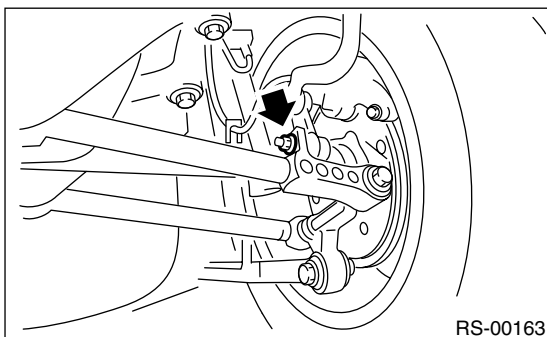
**CAUTION:**

Remove the axle nut with vehicle weight not applied on axle.

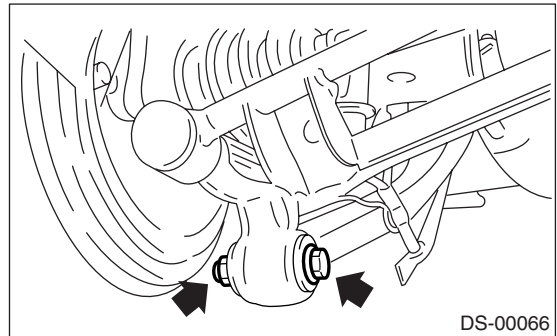
- 5) Disconnect the stabilizer link.
  - Except STI model



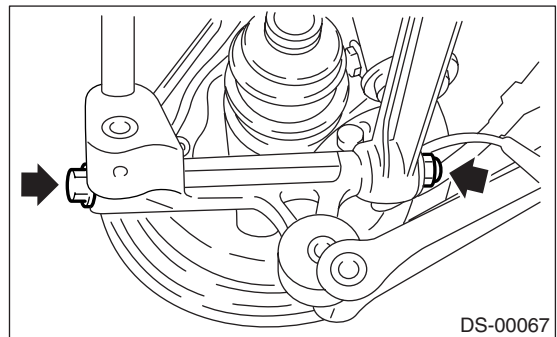
- STI model



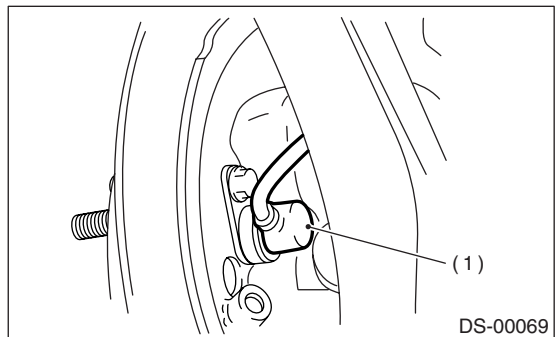
- 6) Remove the bolt which secures the trailing link to housing.



- 7) Remove the bolts which secure the front lateral link and rear lateral link to housing.



- 8) Remove the rear ABS wheel speed sensor from back plate.



(1) ABS wheel speed sensor

- 9) Remove the rear drive shaft from rear axle. If it is hard to remove, remove the brake disk rotor using the ST1 and ST2.

- |     |            |                         |
|-----|------------|-------------------------|
| ST1 | 926470000  | AXLE SHAFT PULLER       |
| ST2 | 28099PA110 | AXLE SHAFT PULLER PLATE |

**CAUTION:**

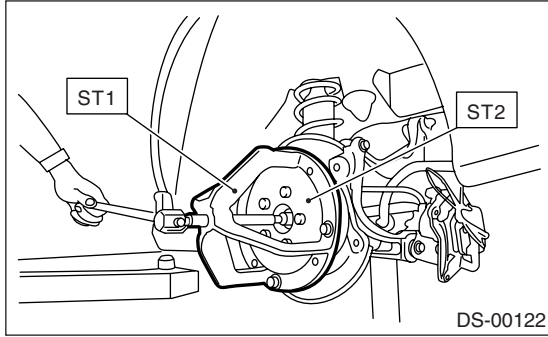
- Do not hammer the drive shaft when removing.



# Rear Drive Shaft

## DRIVE SHAFT SYSTEM

- Do not damage the oil seal and tone wheel.

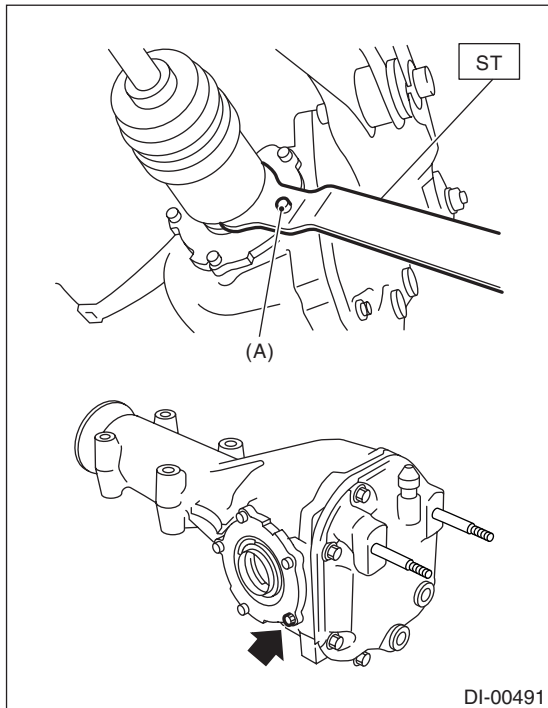


10) Remove the rear drive shaft from rear differential using the ST.

ST 28099PA100 DRIVE SHAFT REMOVER

### NOTE:

Fit the ST to the bolt (A) as shown in the figure to avoid damage on the side bearing retainer.

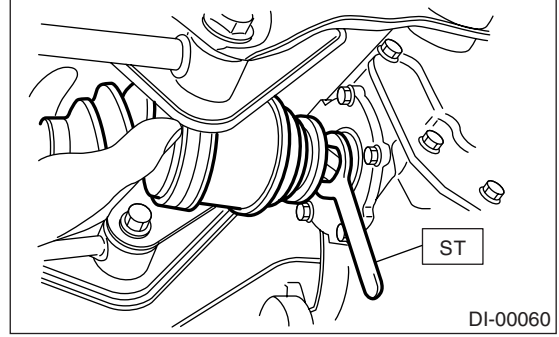


(A) Bolt

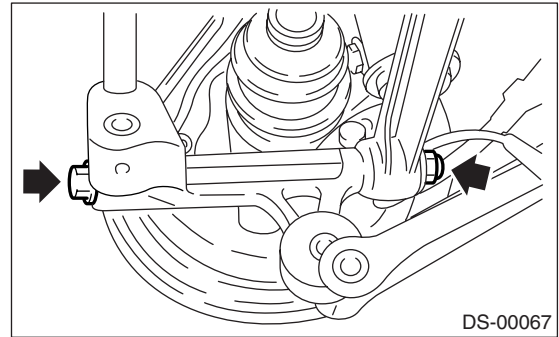
## B: INSTALLATION

- 1) Insert the rear drive shaft into rear axle.
- 2) Temporarily tighten the axle nut.
- 3) Install the rear drive shaft to rear differential using the ST.

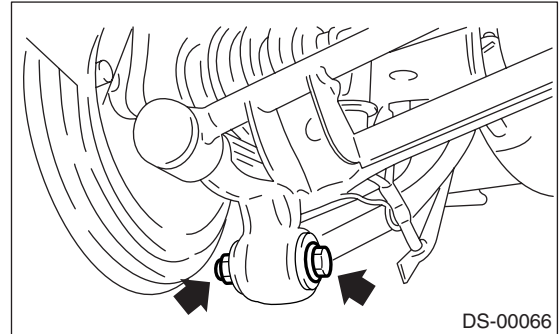
ST 28099PA090 OIL SEAL PROTECTOR



4) Temporarily tighten the front lateral link and rear lateral link to housing using a new self-locking nuts.



5) Temporarily tighten the trailing link to housing using a new self-locking nut.

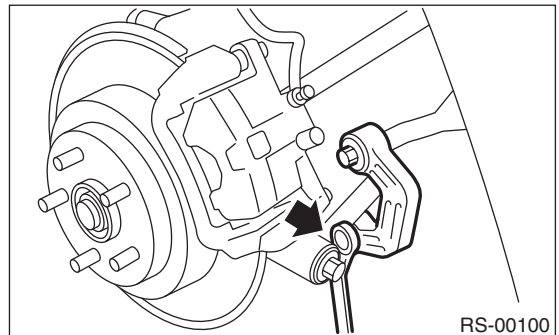


6) Install the stabilizer link.

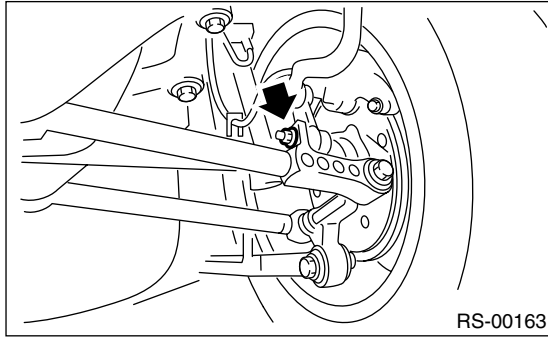
### Tightening torque:

**45 N·m (4.5 kgf·m, 33.2 ft·lb)**

- Except STI model



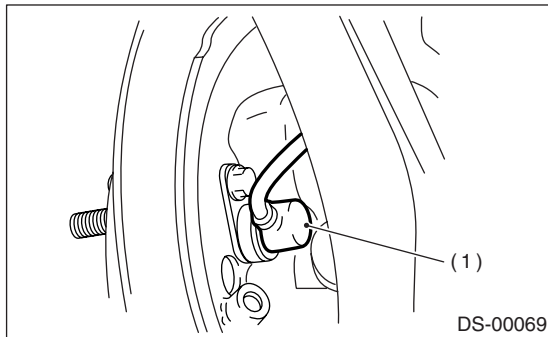
- ST1 model



7) Install the ABS wheel speed sensor.

**Tightening torque:**

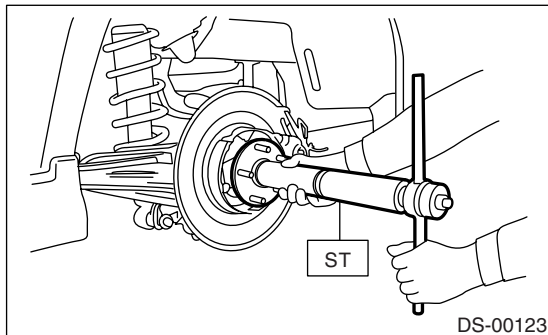
**32 N·m (3.3 kgf·m, 24 ft·lb)**



(1) ABS wheel speed sensor

8) Using the ST1 and ST2, pull the rear drive shaft into place.

- ST1 922431000 AXLE SHAFT INSTALLER
- ST2 927390000 ADAPTER

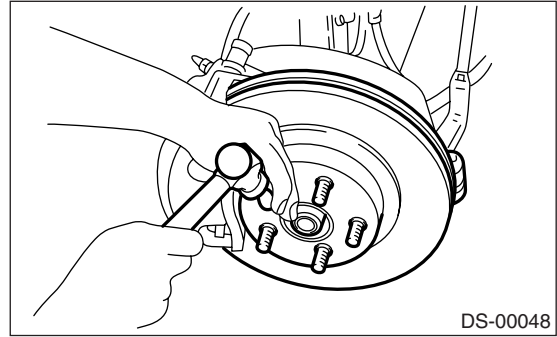


9) Tighten a new axle nut to the specified torque with parking brake applied.

**Tightening torque:**

**190 N·m (19.4 kgf·m, 140 ft·lb)**

10) Lock the axle nut.



11) Install the wheel.

**Tightening torque:**

**90 N·m (9.1 kgf·m, 65.7 ft·lb)**

12) Make the tires contact the ground fully.

**CAUTION:**

**Make the tires contact the ground fully and the vehicle be in curb weight whenever carrying out the tightening of bushing portions.**

13) Tighten the installation bolt of rear housing assembly and lateral link assembly.

**Tightening torque:**

**140 N·m (14.3 kgf·m, 103 ft·lb)**

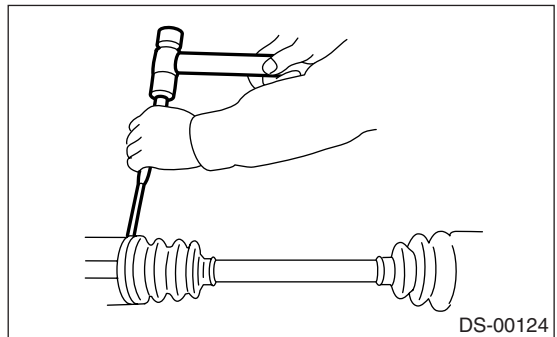
14) Tighten the installation bolt of rear housing assembly and trailing link assembly.

**Tightening torque:**

**90 N·m (9.2 kgf·m, 66 ft·lb)**

**C: DISASSEMBLY**

- 1) Straighten the bent claw of larger end of DOJ boot.
- 2) Loosen the band by means of screwdriver or pliers with care of not damaging boot.



3) Remove the boot band on the small end of DOJ boot in the same manner.

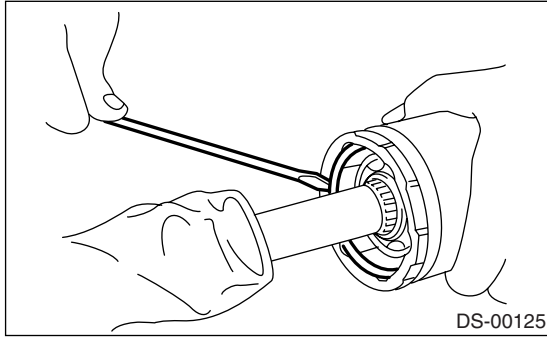
4) Remove the larger end of DOJ boot from DOJ outer race.



# Rear Drive Shaft

## DRIVE SHAFT SYSTEM

5) Pry and remove the round circlip located at neck of DOJ outer race with a screwdriver.

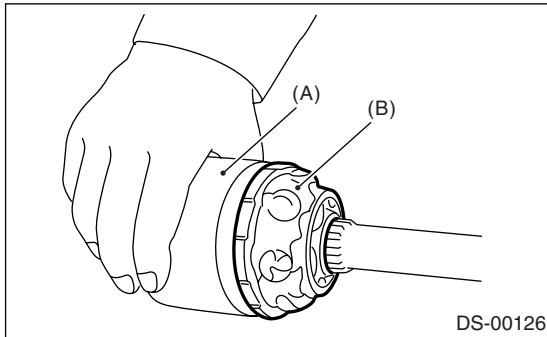


6) Take out the DOJ outer race from shaft assembly.

7) Wipe off the grease, and then take out the balls.

**NOTE:**

- The grease is a special grease (grease for constant velocity joint). Do not confuse with other greases.
- Disassemble with exercising care not to lose balls (6 pcs).



- (A) Outer race  
(B) Grease

8) To remove the cage from inner race, turn the cage by a half pitch to the track groove of inner race, and shift the cage.

9) Remove the snap ring, which fixes the inner race to shaft, by using pliers.

10) Take out the DOJ inner race.

11) Take off the DOJ cage from shaft and remove the DOJ boot.

12) Wrap the shaft splines with vinyl tape.

13) Remove the EBJ boot in the same procedure as DOJ boot.

**NOTE:**

Further disassembly of axle is impossible because the EBJ cannot be disassembled.

## D: ASSEMBLY

**NOTE:**

Use specified grease.

**EBJ side:**

**NTG2218-M (Part No. 28395AG010)**

**DOJ side:**

**Except STI model**

**NKG205 (Part No. 28495AG000)**

**EDJ side:**

**STI model**

**NKG205 (Part No. 28495AG010)**

1) Install the EBJ boot in specified position, and fill it with 60 to 70 g (2.12 to 2.47 oz) of specified grease.

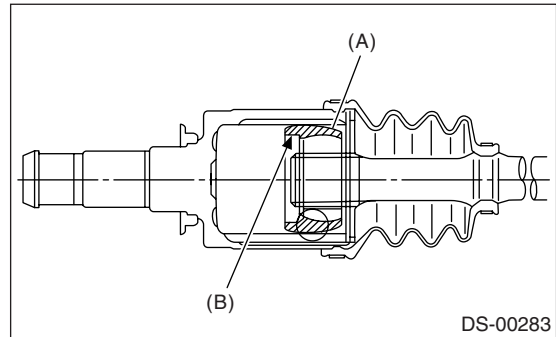
2) Place the DOJ boot at the center of shaft.

3) Wrap the shaft splines with vinyl tape.

4) Insert the DOJ cage onto shaft.

**NOTE:**

Insert the cage with cut-out portion facing the shaft end, since the cage has an orientation.

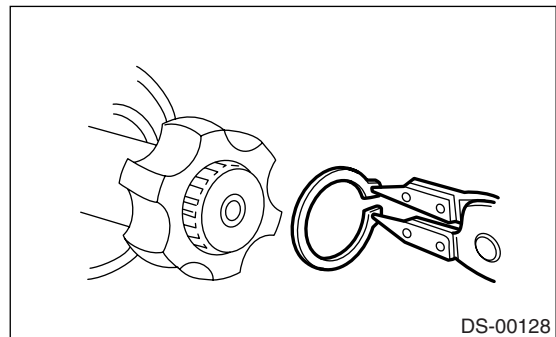


- (A) Cage  
(B) Cut-out portion

5) Install the DOJ inner race on shaft, and fit the snap ring with pliers.

**NOTE:**

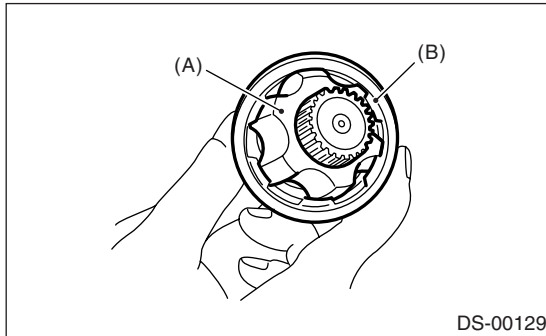
Confirm the snap ring is completely fitted in shaft groove.



6) Install the cage, which was previously fitted, to inner race fixed upon shaft.

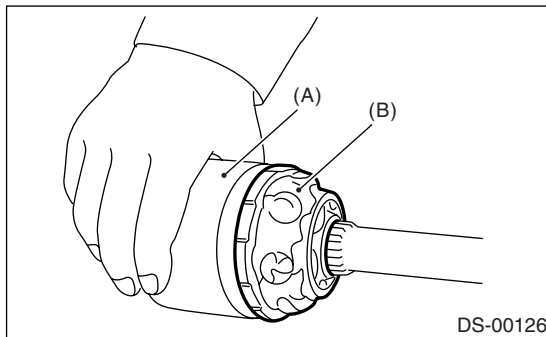
**NOTE:**

Fit the cage with protruded part aligned with the track on inner race, and then turn by a half pitch.



(A) Inner race  
(B) Cage

- 7) Fill 80 to 90 g (2.82 to 3.17 oz) of specified grease into the interior of DOJ outer race.
- 8) Apply a coat of specified grease to cage pocket and six balls.
- 9) Insert six balls into cage pocket.
- 10) Align the outer race track and ball positions and place in the part where shaft, inner race, cage and balls are previously installed, and then fit the outer race.



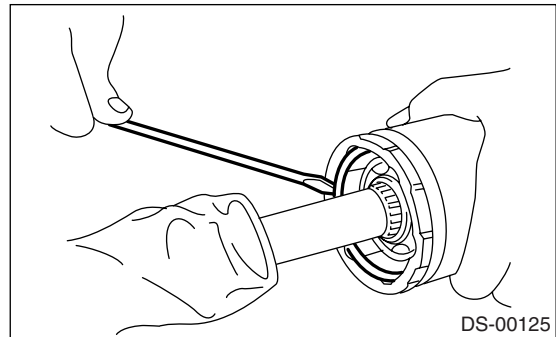
(A) Outer race  
(B) Grease

- 11) Install the circlip in the groove on DOJ outer race.

**NOTE:**

- Assure the balls, cage and inner race are completely fitted in the outer race of DOJ.
- Exercise care not to place the matched position of circlip in ball groove of outer race.

- Pull the shaft lightly and assure that the circlip is completely fitted in groove.



- 12) Apply an even coat of the specified grease [20 to 30 g (0.71 to 1.06 oz)] to the entire inner surface of boot. Also apply grease to shaft.
- 13) Install the DOJ boot taking care not to twist it.

**NOTE:**

- Inside of the larger end of DOJ boot and boot groove shall be cleaned so as to be free from grease and other substances.
- When installing the DOJ boot, position the outer race of DOJ at center of its travel.

- 14) Put a new band through the clip and wind twice in alignment with band groove of boot.

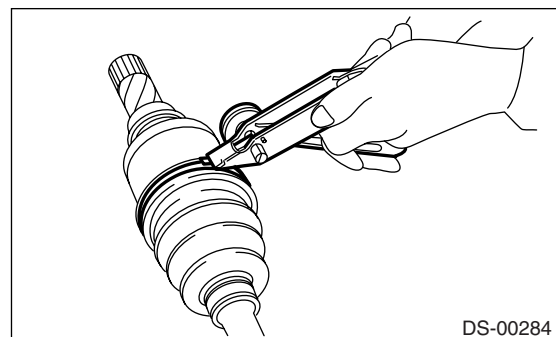
**NOTE:**

When tightening the boot, exercise care so that air within boot is appropriate.

- 15) Tighten the band using the ST.  
ST 925091000 BAND TIGHTENING TOOL

**NOTE:**

Tighten the band until it cannot be moved by hand.



- 16) Tap on the clip with the punch provided at the end of ST.  
ST 925091000 BAND TIGHTENING TOOL

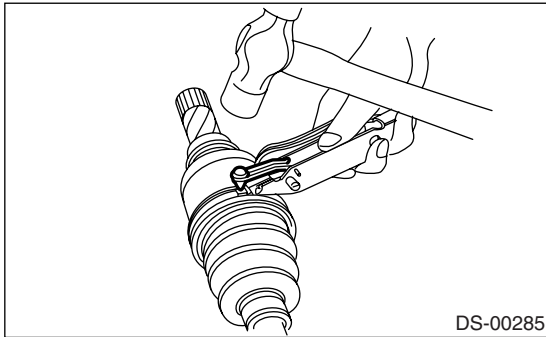
# Rear Drive Shaft

## DRIVE SHAFT SYSTEM

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### NOTE:

Tap to an extent that the boot underneath is not damaged.



17) Cut off the band with an allowance of about 10 mm (0.39 in) left from clip, and bend this allowance over the clip.

### NOTE:

Be careful so that the end of band is in close contact with clip.

18) Fix up the boot on EBJ in the same manner.

19) Extend and retract the DOJ to provide equal grease coating.

## E: INSPECTION

Check the removed parts for damage, wear, corrosion, etc. If faulty, repair or replace.

1) DOJ (Double Offset Joint)

Check seizure, corrosion, damage, wear and excessive play.

2) EDJ (High-efficiency compact double offset joint)

Check for seizure, corrosion, damage, wear or excessive play.

3) Shaft

Check excessive bending, twisting, damage and wear.

4) EBJ (High-efficiency compact ball fixed Joint)

Check seizure, corrosion, damage and excessive play.

5) Boot

Check for wear, warping, breakage or scratches.

6) Grease

Check for discoloration or fluidity.

## 8. General Diagnostic Table

### A: INSPECTION

**NOTE:**

Vibration while cruising may be caused by an unbalanced tire, improper tire inflation pressure, improper wheel alignment, etc.

| Symptom  | Possible cause                   | Corrective action   |
|--|----------------------------------|---|
| <b>Noise or vibration from propeller shaft</b> | Center bearing                   | Check the center bearing. <Ref. to DS-18, CENTER BEARING FREE PLAY, INSPECTION, Propeller Shaft.>   |
|  | Runout of propeller shaft        | Check the vibration of propeller shaft. <Ref. to DS-18, RUNOUT OF PROPELLER SHAFT, INSPECTION, Propeller Shaft.>  |
|  | Loose or free play of connection | Check joint and connector. <Ref. to DS-17, JOINTS AND CONNECTIONS, INSPECTION, Propeller Shaft.><br>Check splines and bearing. <Ref. to DS-18, SPLINES AND BEARING LOCATIONS, INSPECTION, Propeller Shaft.> |
| <b>Abnormal wheel vibration</b>                | Wheel is out of balance.         | Check the wheel balance. <Ref. to WT-6, INSPECTION, Wheel Balancing.>   |
|  | Wheel alignment                  | Check the wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>   |
|  | Front strut                      | Check the front strut. <Ref. to FS-20, INSPECTION, Front Strut.>  |
|  | Rear strut                       | Check the rear strut. <Ref. to RS-13, INSPECTION, Rear Strut.>  |
|  | Front drive shaft                | Check the front drive shaft. <Ref. to DS-40, INSPECTION, Front Drive Shaft.>  |
|  | Rear drive shaft                 | Check the rear drive shaft. <Ref. to DS-46, INSPECTION, Rear Drive Shaft.>  |
|  | Front axle                       | Check the front axle. <Ref. to DS-24, INSPECTION, Front Axle.>  |
|  | Front hub unit bearing           | Check the front hub unit bearing. <Ref. to DS-26, INSPECTION, Front Hub Unit Bearing.>  |
|  | Rear axle                        | Check the rear axle. <Ref. to DS-32, INSPECTION, Rear Axle.>  |
| <b>Noise from the underbody</b>                | Wheel is out of balance.         | Check the wheel balance. <Ref. to WT-6, INSPECTION, Wheel Balancing.>   |
|  | Wheel alignment                  | Check the wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>   |
|  | Front strut                      | Check the front strut. <Ref. to FS-20, INSPECTION, Front Strut.>  |
|  | Rear strut                       | Check the rear strut. <Ref. to RS-13, INSPECTION, Rear Strut.>  |

# General Diagnostic Table

DRIVE SHAFT SYSTEM

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# ABS

# ABS

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# General Description

ABS

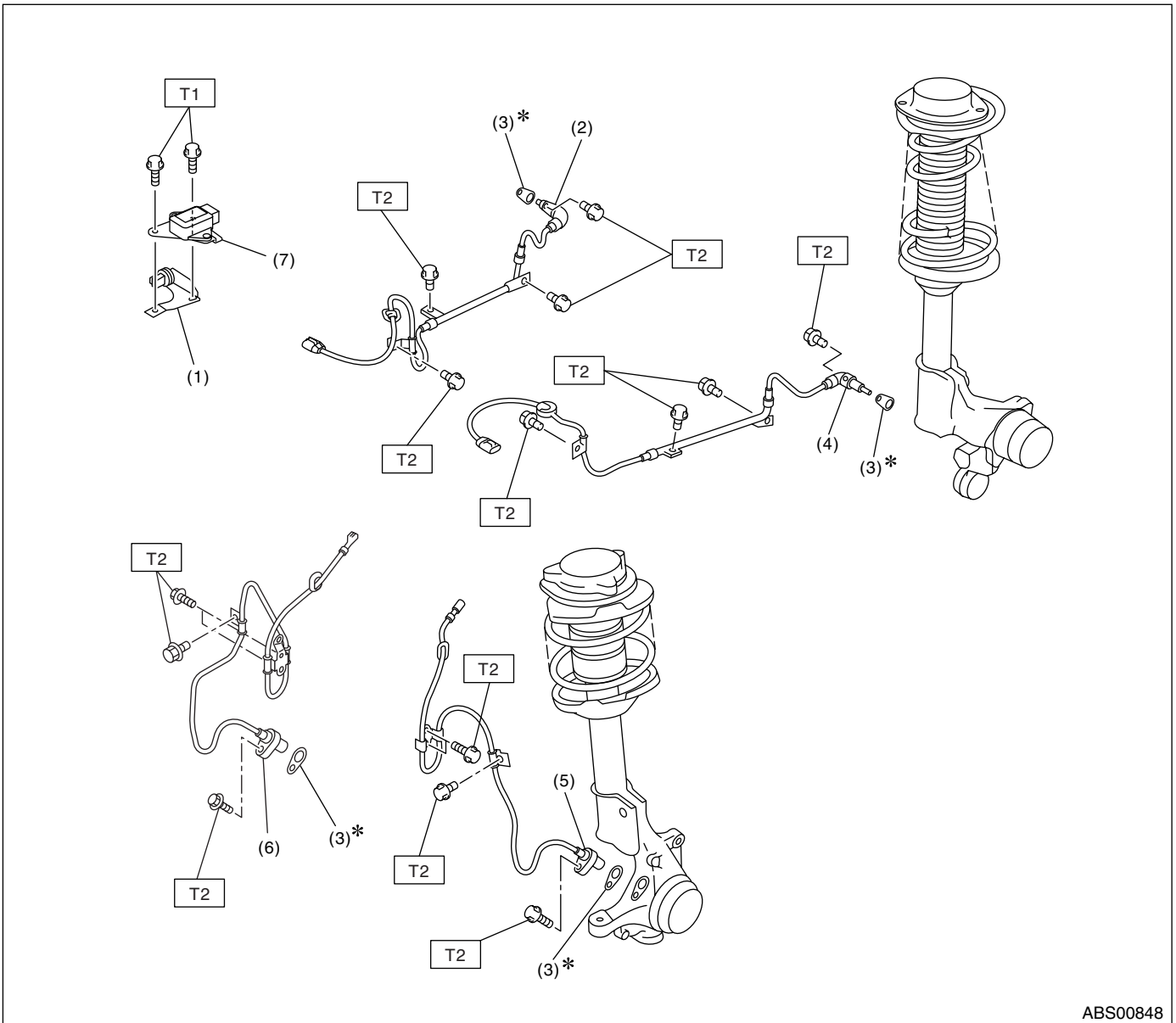
## 1. General Description

### A: SPECIFICATION

| Item                         |                                   |       | Standard value or identification |        |
|------------------------------|-----------------------------------|-------|----------------------------------|--------|
| ABS wheel speed sensor       | ABS wheel speed sensor gap        | Front | 0.3 — 0.8 mm (0.012 — 0.031 in)  |        |
|                              |                                   | Rear  | 0.7 — 1.2 mm (0.028 — 0.047 in)  |        |
|                              | ABS wheel speed sensor resistance | Front | 1.25±0.25 kΩ                     |        |
|                              |                                   | Rear  | 1.15±0.115 kΩ                    |        |
|                              | Marks of harness                  | Front | RH                               | White  |
|                              |                                   |       | LH                               | Yellow |
| Rear                         |                                   | RH    | Light blue                       |        |
|                              |                                   | LH    | Brown                            |        |
| G sensor                     | G sensor voltage                  |       | 2.3±0.2 V                        |        |
| Lateral G sensor (STI model) | Lateral G sensor voltage          |       | 2.5±0.2 V                        |        |
| ABSCM&H/U marks              | AT model                          |       | PK                               |        |
|                              | MT model (Except STI model)       |       | PL                               |        |
|                              | MT model (STI model)              |       | MJ                               |        |

## B: COMPONENT

### 1. SENSOR



ABS00848

- |                                    |   |
|------------------------------------|---|
| (1) G sensor                       | (5) Front ABS wheel speed sensor LH         |
| (2) Rear ABS wheel speed sensor RH | (6) Front ABS wheel speed sensor RH         |
| (3) Adjusting spacer               | (7) Yaw rate & lateral G sensor (STI model) |
| (4) Rear ABS wheel speed sensor LH |   |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 18 (1.8, 13.0)**

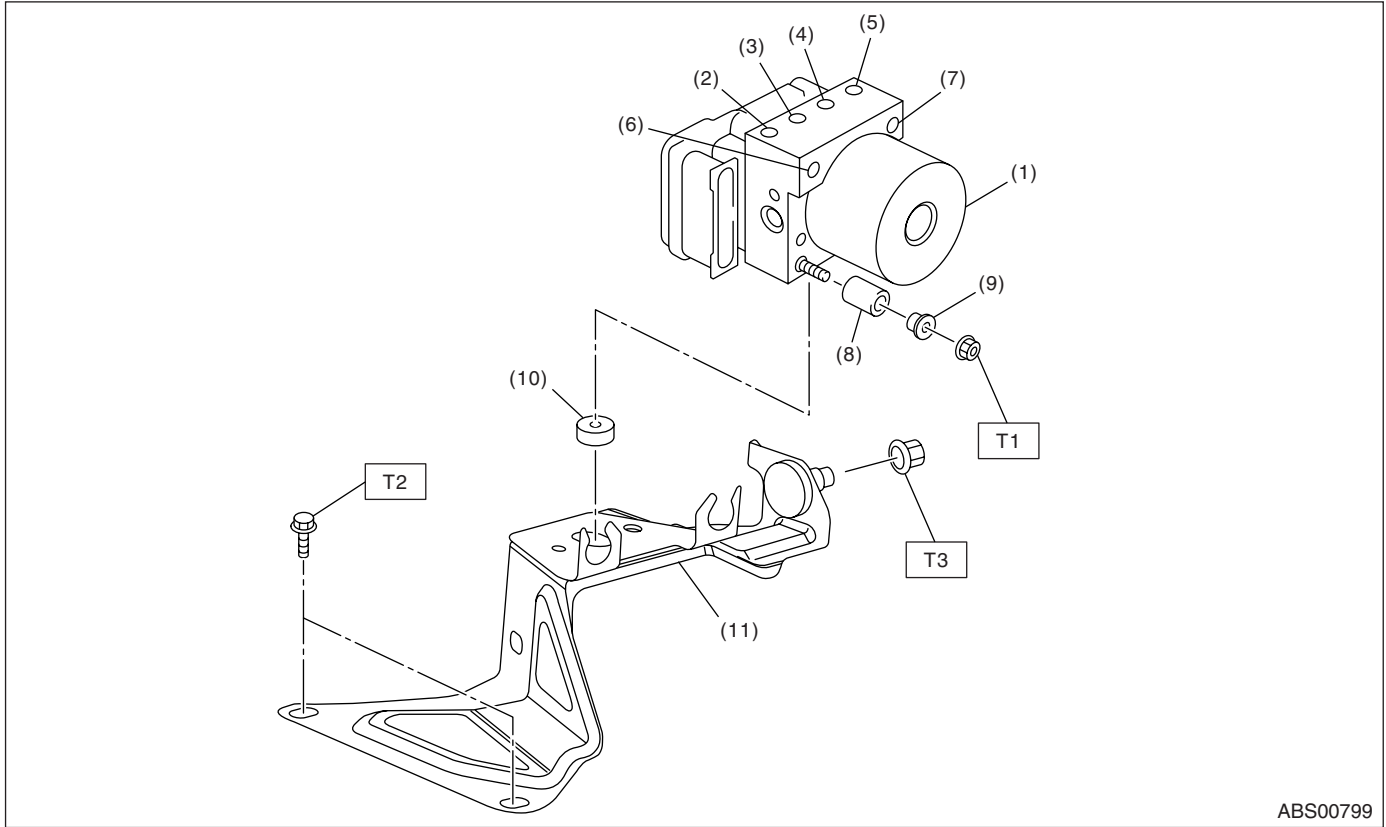
**T2: 33 (3.3, 24)**



# General Description

ABS

## 2. ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)



ABS00799

- |   |                     |
|---|---------------------|
| (1) ABS control module and hydraulic control unit (ABSCM&H/U) | (6) Primary inlet   |
| (2) Front outlet RH   | (7) Secondary inlet |
| (3) Rear outlet LH  | (8) Damper          |
| (4) Rear outlet RH  | (9) Spacer          |
| (5) Front outlet LH   | (10) Damper         |
|   | (11) Bracket        |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 7.5 (0.76, 5.5)**

**T2: 33 (3.3, 24)**

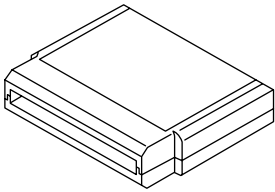

**T3: 38 (3.8, 27.5)**

### C: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.

**D: PREPARATION TOOL**

**1. SPECIAL TOOL**

| ILLUSTRATION   | TOOL NUMBER  | DESCRIPTION  | REMARKS   |
|--|--|--|---|
|  <p>ST18482AA010</p>    | <p>18482AA010<br/>(Newly adopted tool)</p> | <p>CARTRIDGE</p>                     | <p>Troubleshooting for electrical systems.</p> |
|  <p>ST22771AA030</p> | <p>22771AA030</p>                          | <p>SUBARU SELECT<br/>MONITOR KIT</p> | <p>Troubleshooting for electrical systems.</p> |

**2. GENERAL TOOL**

| TOOL NAME      | REMARKS  |
|----------------|--|
| Circuit tester | Used for measuring resistance, voltage and ampere. |
| Pressure gauge | Used for measuring oil pressure.                   |
| Oscilloscope   | Used for measuring sensor.                         |
| TORX® BIT E5   | Used for removing ABSCM.                           |

# ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

ABS

## 2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the air intake duct and air cleaner case from the engine compartment to facilitate removal of ABSCM&H/U. <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.> <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.> <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.> <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
- 3) Use compressed air to get rid of water around the ABSCM&H/U.

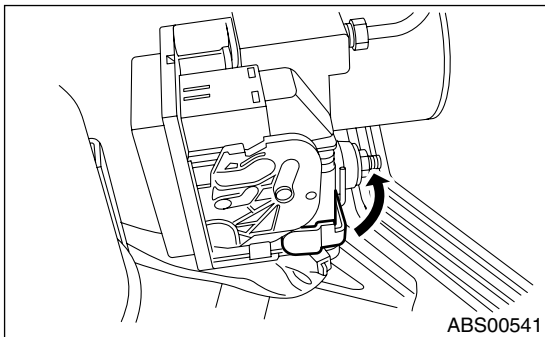
#### NOTE:

Contact will be insufficient if the terminal gets wet.

- 4) Disconnect the ABSCM&H/U connector pulling up the lock lever.

#### CAUTION:

**Do not pull the harness when disconnecting connector.**



- 5) Remove the harness clip.
- 6) Disconnect the brake pipes from ABSCM&H/U.
- 7) Wrap the brake pipe using a vinyl bag not to spill the brake fluid on the vehicle body.

#### CAUTION:

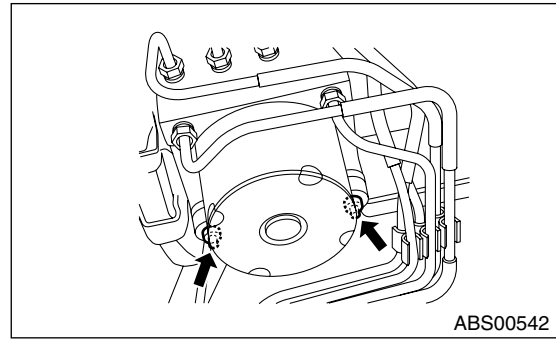
**When brake fluid is attached to the vehicle body, wash it off with water and wipe the water.**

- 8) Remove the nuts and remove the ABSCM&H/U.

#### CAUTION:

- Do not drop or bump the ABSCM&H/U.
- Do not turn ABSCM&H/U upside down or place it sideways for storage.
- Be careful that no foreign objects are mixed in ABSCM&H/U.

- Be careful that no water enters inside the connectors.



- 9) Remove the ABSCM&H/U bracket.

### B: INSTALLATION

- 1) Install the ABSCM&H/U bracket.

#### Tightening torque:

**33 N·m (3.3 kgf-m, 24 ft-lb)**

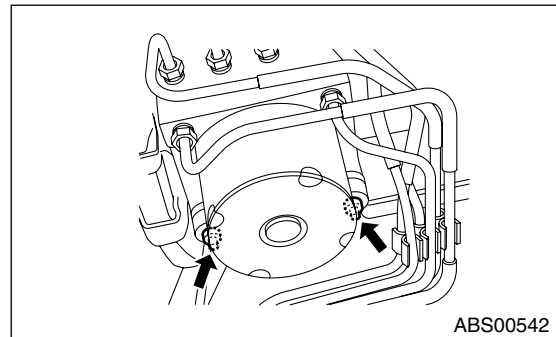
- 2) Install the ABSCM&H/U aligning the groove of damper on ABSCM&H/U side with the pawl of bracket.

#### NOTE:

Check the identification mark of ABSCM&H/U.

#### Tightening torque:

**7.5 N·m (0.76 kgf-m, 5.5 ft-lb)**



- 3) Connect the brake pipes to their correct ABSCM&H/U connections.

#### Tightening torque:

**15 N·m (1.5 kgf-m, 10.8 ft-lb)**

- 4) Using the cable clip, secure the ABSCM&H/U harness to bracket.
- 5) Connect the connector to ABSCM&H/U.

#### NOTE:

- Be sure to remove all foreign matter from inside of the connector before connecting.
- Ensure that the ABSCM&H/U connector is securely locked.

- 6) Connect the ground cable to ABSCM&H/U, and then apply anti-corrosive wax.

- 7) Install the air cleaner case and air intake duct. <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.> <Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H4DOTC)-9, INSTALLATION, Air Intake Duct.>
- 8) Bleed air from the brake system.

## C: REPLACEMENT

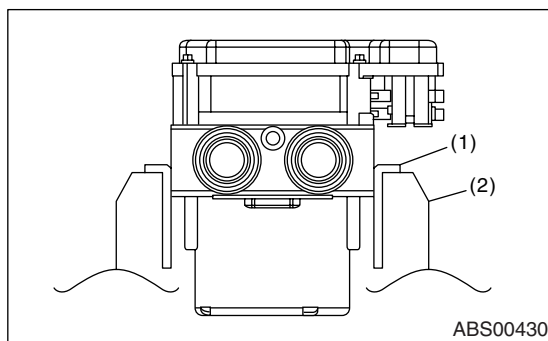
### CAUTION:

- Because the seal of ABSCM cannot be replaced, do not pull or peel it with lifting up.
- Because the screw part of H/U deteriorates in every replacement procedure, do not perform the replacement more than five times on it. When the malfunction is found though the replacement that performed is less than five times, replace the H/U body.
- Use new screws for installation of ABSCM.
- When the sealing surface of ABSCM or H/U is dirty or damaged and it cannot be removed or repaired, replace it with new one.

- 1) Remove the ABSCM&H/U. <Ref. to ABS-6, REMOVAL, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
- 2) To prevent entering foreign matter and brake fluid leakage, plug the oil pressure port of ABSCM&H/U using screw plug and etc.
- 3) Set the pump motor part of removed ABSCM&H/U faces down in the vise.

### NOTE:

Before securing a part on a vice, place cushioning material such as wood blocks, aluminum plate or cloth between the part and vice.

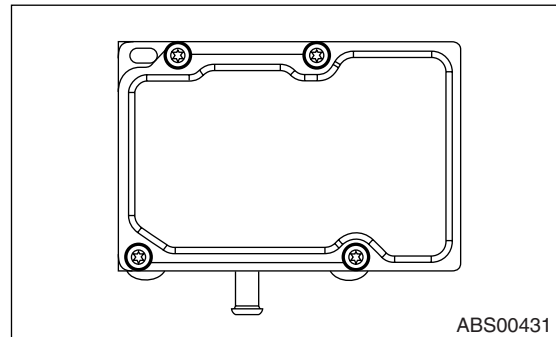


- (1) Aluminum plate or etc.
- (2) Vise

- 4) Using TORX® BIT E5, remove the four screws of ABSCM.

### NOTE:

Always use new screws.



- 5) Slowly remove the ABSCM upward from H/U.

### NOTE:

To prevent damaging of coil part, remove the ABSCM straightly from H/U.

- 6) Ensure there are no dirt or damage on sealing surface of H/U.

### CAUTION:

- Do not clean the ABSCM & H/U with applying compressed air.
- Do not repair the damages of H/U sealing surface using file or metal scraper. To remove the sealing, use resin scraper. Do not use the chemical materials (thinner and etc.).

- 7) Position the coil of new ABSCM to align H/U valve.

- 8) To prevent deforming of ABSCM housing cover, hold the corner of ABSCM and install it to the H/U without tilting.

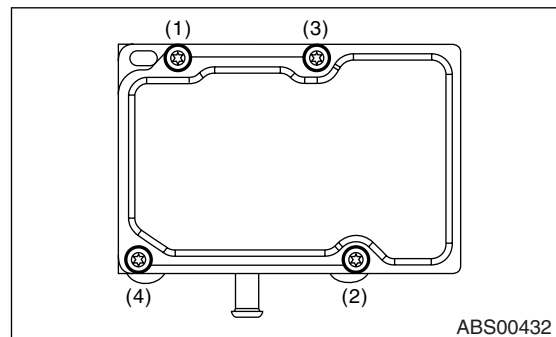
- 9) Using TORX® BIT E5, tighten the screws stepwise in the order of (1) through (4).

### CAUTION:

Always use new screws.

### Tightening torque:

**1.5 N·m (0.15 kgf·m, 1.1 ft·lb)**



- 10) Check that there is no foreign matter in aligning part between ABSCM and H/U.

# ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

ABS

11) Using TORX® BIT E5, tighten the screws stepwise in the order of (1) through (4) again.

### Tightening torque:

**3 N·m (0.3 kgf·m, 2.2 ft·lb)**

12) Check that there is no clearance in aligning part between ABSCM and H/U.

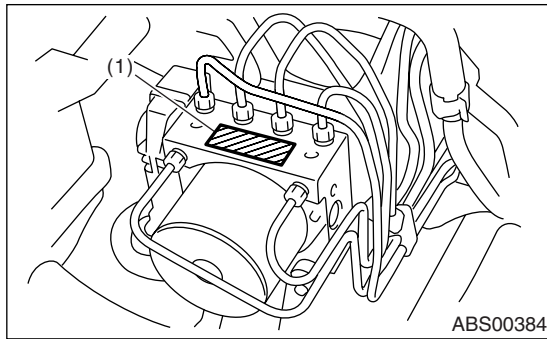
13) Install the ABSCM&H/U to vehicle. <Ref. to ABS-6, INSTALLATION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

## D: INSPECTION

1) Check the connected and fixed condition of connector.

2) Check specifications of the mark with ABSCM&H/U.

| Mark | Model               |
|------|---------------------|
| PK   | AT                  |
| PL   | MT (Except for STI) |
| MJ   | STI                 |



(1) Mark

## 1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

1) Lift-up the vehicle and remove the wheels.

2) Disconnect the air bleeder screws from the FL and FR caliper bodies.

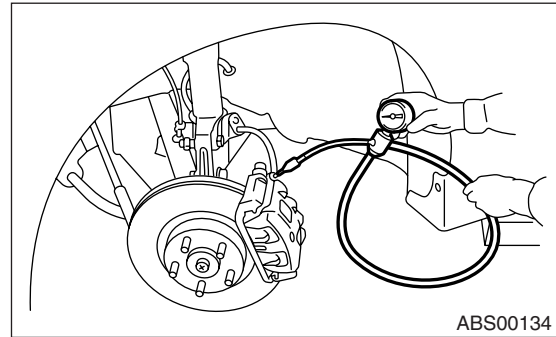
3) Connect two pressure gauges to the FL and FR caliper bodies.

### CAUTION:

- Pressure gauges used exclusively for brake fluid must be used.
- Do not employ pressure gauge previously used for transmission oil pressure since the piston seal is expanded which may lead to malfunction of the brake.

### NOTE:

Wrap sealing tape around the pressure gauge.



ABS00134

4) Bleed air from the pressure gauges.

5) Perform the ABS sequence control.

<Ref. to ABS-10, ABS Sequence Control.>

6) When the hydraulic unit begins to work and first the FL side performs decompression, holding and compression, and then the FR side performs decompression, holding and compression.

7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check if any irregular brake pedal tightness is felt.

|               | Front wheel  | Rear wheel   |
|---------------|--|--|
| Initial value | 3,500 kPa<br>(35 kgf/cm <sup>2</sup> , 498 psi)            | 3,500 kPa<br>(35 kgf/cm <sup>2</sup> , 498 psi)            |
| Decompressed  | 500 kPa<br>(5 kgf/cm <sup>2</sup> , 71 psi)<br>or less     | 500 kPa<br>(5 kgf/cm <sup>2</sup> , 71 psi)<br>or less     |
| Compressed    | 3,500 kPa<br>(35 kgf/cm <sup>2</sup> , 498 psi)<br>or more | 3,500 kPa<br>(35 kgf/cm <sup>2</sup> , 498 psi)<br>or more |

8) Remove the pressure gauges from FL and FR caliper bodies.

9) Remove the air bleeder screws from the RL and RR caliper bodies.

10) Connect the air bleeder screws to the FL and FR caliper bodies.

11) Connect two pressure gauges to the RL and RR caliper bodies.

12) Bleed air from the FL and FR caliper bodies.

13) Perform the ABS sequence control.

<Ref. to ABS-10, ABS Sequence Control.>

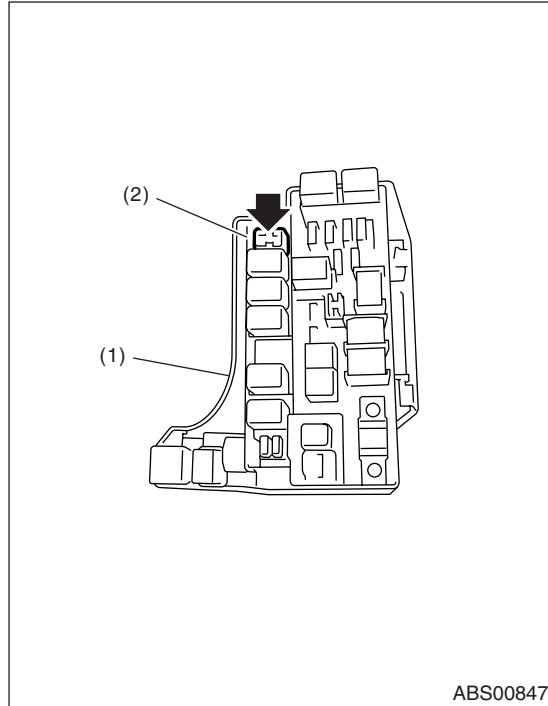
14) When the hydraulic unit begins to work, at first the RR side performs decompression, holding and compression, and then the RL side performs decompression, holding and compression.

15) Read values indicated on the pressure gauges and check if they meet the standard value.

- 16) After checking, remove the pressure gauges from caliper bodies.
- 17) Connect the air bleeder screws to RL and RR caliper bodies.
- 18) Bleed air from the brake system.

## 2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER

1) In the case of non-turbo AT model, install a spare fuse with the FWD connector in the main fuse box to simulate FWD model.



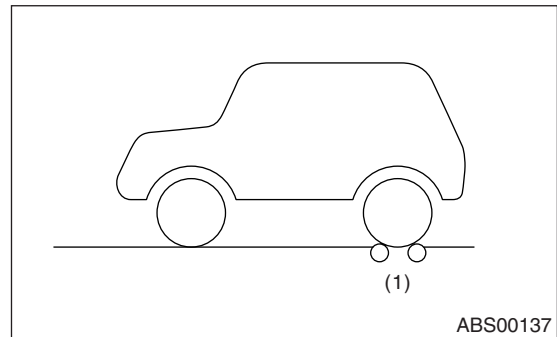
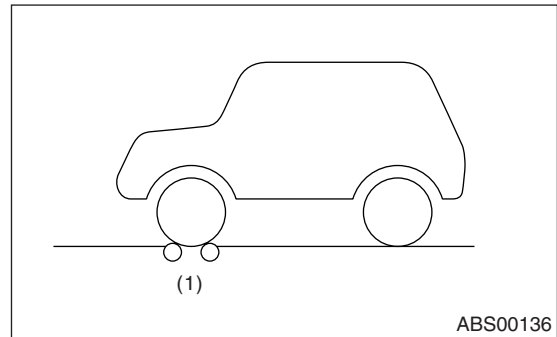
- (1) Main fuse box
- (2) FWD connector

**NOTE:**

The AWD circuit of MT and turbo AT model can not be disabled.

2) Prepare for operating the ABS sequence control.  
<Ref. to ABS-10, ABS Sequence Control.>

3) Set the front wheels or rear wheels on the brake tester and set the select lever's position at "N" range.



(1) Brake tester

- 4) Operate the brake tester.
- 5) Perform the ABS sequence control.  
<Ref. to ABS-10, ABS Sequence Control.>
- 6) Hydraulic unit begins to work; and check the following working sequence.

- (1) The FL side performs decompression, holding and compression in sequence, and subsequently the FR side repeats the cycle.
- (2) The RR side performs decompression, holding and compression in sequence, and subsequently the RL side repeats the cycle.

7) Read values indicated on the brake tester and check if the fluctuation of values, while decompressed and compressed, meet the standard values.

|               | Front wheel                              | Rear wheel                               |
|---------------|--|--|
| Initial value | 1,000 N<br>(100 kgf, 221 lbf)            | 1,000 N<br>(100 kgf, 221 lbf)            |
| Decompressed  | 500 N<br>(50 kgf, 110 lbf)<br>or less    | 500 N<br>(50 kgf, 110 lbf)<br>or less    |
| Compressed    | 1,000 N<br>(100 kgf, 221 lbf)<br>or more | 1,000 N<br>(100 kgf, 221 lbf)<br>or more |

8) After checking, also check if any irregular brake pedal tightness is felt.

## 3. ABS Sequence Control

### A: OPERATION

- 1) Under the ABS sequence control, after the hydraulic unit solenoid valve is driven, the operation of the hydraulic unit can be checked by means of the brake tester or pressure gauge.
- 2) ABS sequence control can be started by Subaru Select Monitor.

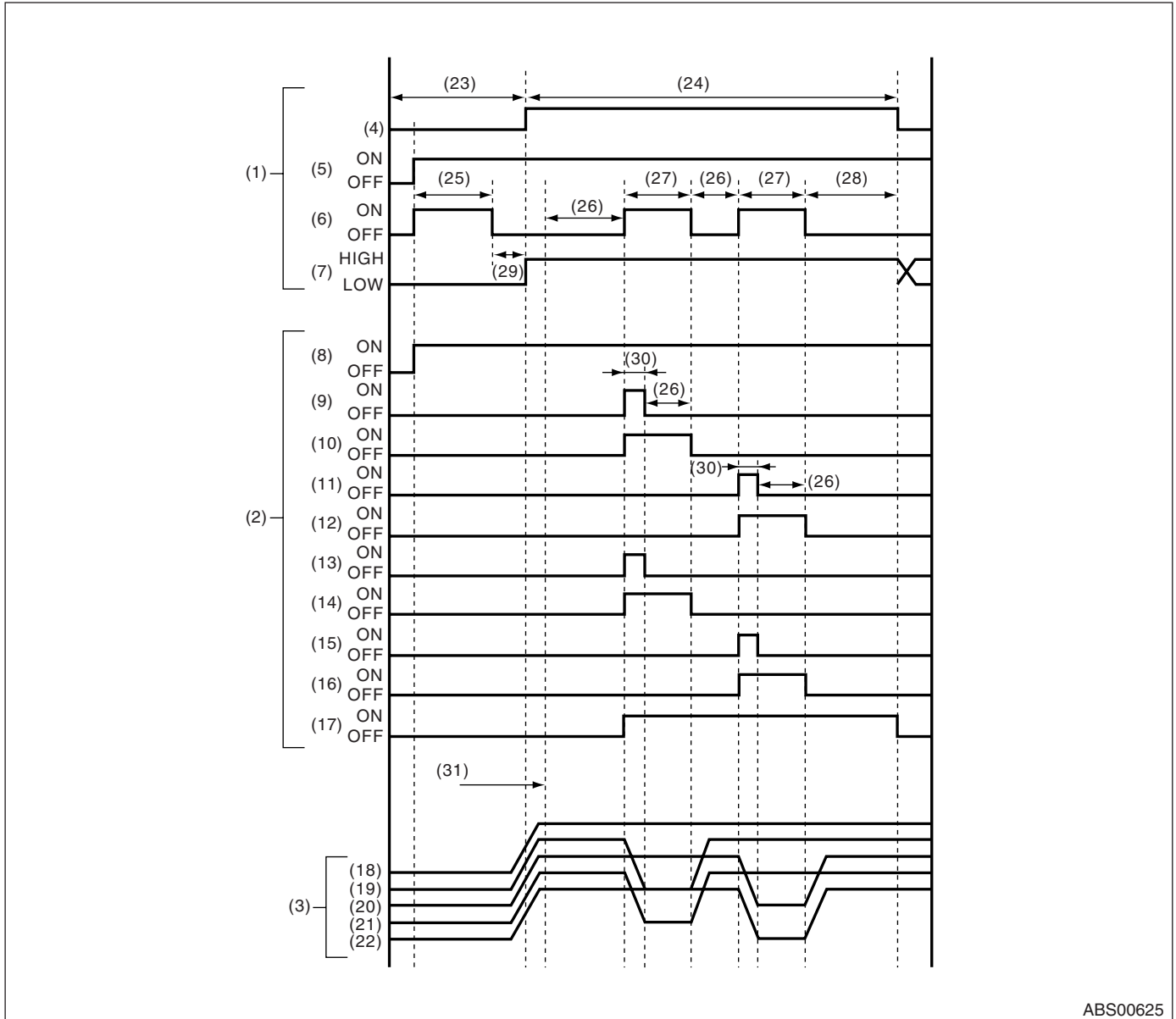
#### 1. ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

**NOTE:**

In the event of any trouble, the sequence control may not be operative. In such a case, perform the diagnosis. <Ref. to ABS(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

- 1) Connect the Subaru Select Monitor to data link connector under driver's seat instrument panel lower cover.
- 2) Turn the ignition switch to ON.
- 3) Turn the Subaru Select Monitor switch to ON.
- 4) Put the Subaru Select Monitor to {BRAKE CONTROL} mode.
- 5) When {Function check sequence} is selected, ABS sequence control will start.
- 6) When the message {Press Brake Pedal with braking force of 100 to 150 kgf} is displayed, perform the followings.
  - (1) When using the brake tester, depress the brake pedal with braking force of 981 N (100 kgf, 221 lbf).
  - (2) When using the pressure gauge, depress the brake pedal so as to make the pressure gauge indicate 3,432 kPa (35 kgf/cm<sup>2</sup>, 498 psi).
- 7) When the message {Press YES} is displayed, press the [YES] key.
- 8) The braking system in operation is displayed on Subaru Select Monitor.

## 2. CONDITIONS FOR ABS SEQUENCE CONTROL



- |  |  |  |
|--|--|--|
| <p>(1) Operational guide line of sequence control</p> <p>(2) Operational pattern of sequence control</p> <p>(3) Operational pressure of sequence control</p> | <p>(10) FL inlet valve</p> <p>(11) FR outlet valve</p> <p>(12) FR inlet valve</p> <p>(13) RR outlet valve</p> <p>(14) RR inlet valve</p> <p>(15) RL outlet valve</p> <p>(16) RL inlet valve</p> <p>(17) Pump motor</p> <p>(18) Pressure of master cylinder</p> <p>(19) Pressure of FL wheel cylinder</p> <p>(20) Pressure of FR wheel cylinder</p> <p>(21) Pressure of RR wheel cylinder</p> | <p>(22) Pressure of RL wheel cylinder</p> <p>(23) 4 km/h (2 MPH) or less</p> <p>(24) 10 km/h (6 MPH) or less</p> <p>(25) Approx. 2.0 seconds</p> <p>(26) 1.0 second</p> <p>(27) 1.4 seconds</p> <p>(28) 0.6 seconds</p> <p>(29) Within 0.5 seconds</p> <p>(30) 0.4 seconds</p> <p>(31) Point A</p> |
|--|--|--|



**NOTE:**

- When the Subaru Select Monitor is used, control operation starts at point A. (However, the stop light switch must be ON before point A.)
- HIGH means high voltage.
- LOW means low voltage.

## **B: SPECIFICATION**

### **1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL**

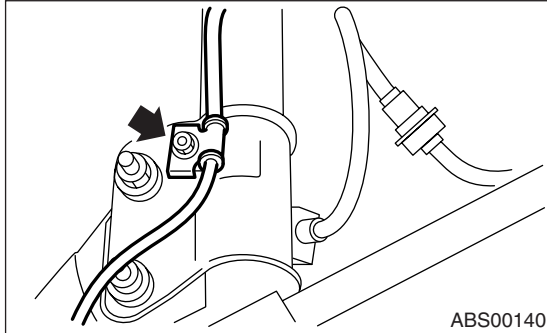
When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.

- 1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
- 2) When the brake pedal is released during sequence control and the stop light switch is set to off.
- 3) After completion of the sequence control.
- 4) When malfunction is detected.

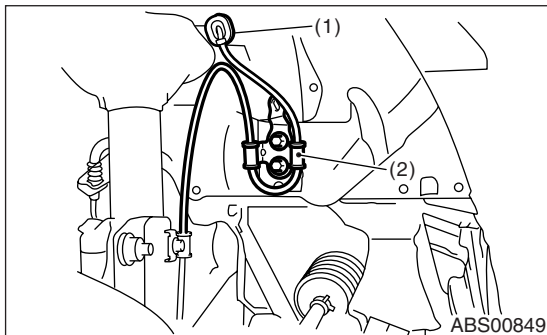
## 4. Front ABS Wheel Speed Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the front ABS wheel speed sensor connector located next to the front strut mounting house in engine compartment. Pull the connector out from grommet hole to tire side.
- 3) Remove the bolts which secure the sensor harness to strut.



- 4) Remove the bolts which secure the sensor harness to body.



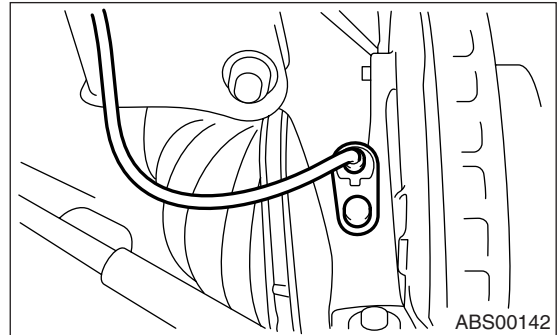
- (1) To front ABS wheel speed sensor connector
- (2) Bracket

- 5) Remove the bolts which secure the front ABS wheel speed sensor to housing, and remove the front ABS wheel speed sensor.

### CAUTION:

- Be careful not to damage the pole piece located at tip of the sensor and teeth faces during removal.

- Do not pull the sensor harness during removal.

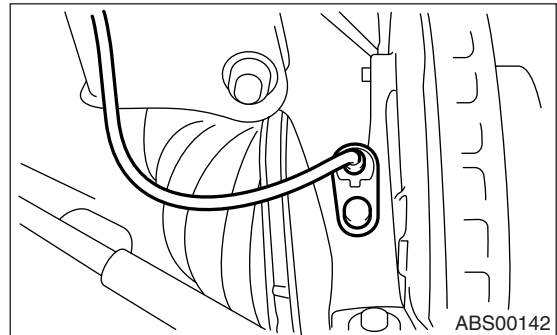


### B: INSTALLATION

- 1) Temporarily install the front ABS wheel speed sensor on housing.

### CAUTION:

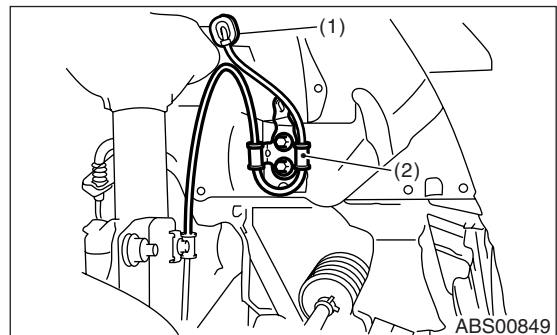
- Be careful not to strike the ABS wheel speed sensor's pole piece against tone wheel and adjacent metal parts during installation.



- 2) Install the front ABS wheel speed sensor on strut and wheel apron.

### Tightening torque:

**33 N·m (3.3 kgf-m, 24 ft-lb)**



- (1) To front ABS wheel speed sensor connector
- (2) Bracket

- 3) Check the ABS wheel speed sensor gap. <Ref. to ABS-14, SENSOR GAP, INSPECTION, Front ABS Wheel Speed Sensor.> After standard clearance is obtained, tighten the ABS wheel speed sensor on housing to specified torque.

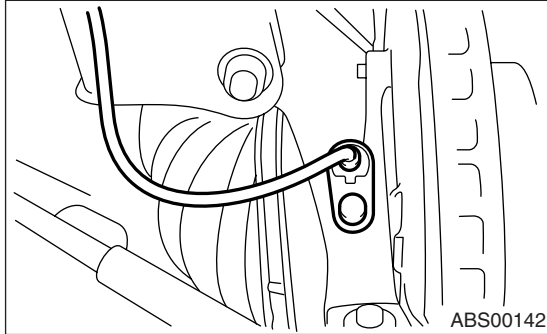
# Front ABS Wheel Speed Sensor

ABS

If the clearance is outside specification, readjust using spacer (Part No. 26755AA000).

**ABS wheel speed sensor standard clearance:**  
**0.3 — 0.8 mm (0.012 — 0.031 in)**

**Tightening torque:**  
**33 N·m (3.3 kgf·m, 24 ft·lb)**



**NOTE:**

- Check the marks on the harness and make sure that no kink exists. (RH: White, LH: Yellow)
- Make sure the harness is not pulled and does not contact to suspension or body when steering wheel is turned.

4) After confirmation of the ABS wheel speed sensor clearance, connect the connector to ABS wheel speed sensor.

5) Connect the battery ground cable to battery.

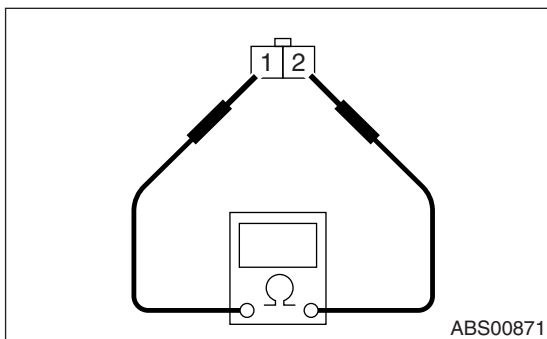
## C: INSPECTION

### 1. ABS WHEEL SPEED SENSOR

1) Check the pole piece of ABS wheel speed sensor for foreign particles or damage. If necessary, clean the pole piece or replace ABS wheel speed sensor.

2) Measure the ABS wheel speed sensor resistance.

If the resistance is outside standard value, replace the ABS wheel speed sensor with a new one.



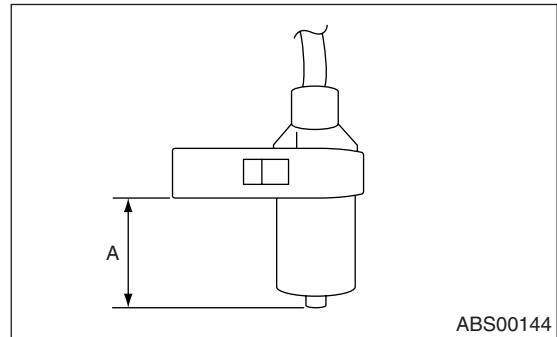
| Terminal No. | Standard     |
|--------------|--------------|
| 1 and 2      | 1.25±0.25 kΩ |

**NOTE:**

Check the ABS wheel speed sensor cable for discontinuity. If necessary, replace with a new one.

### 2. SENSOR GAP

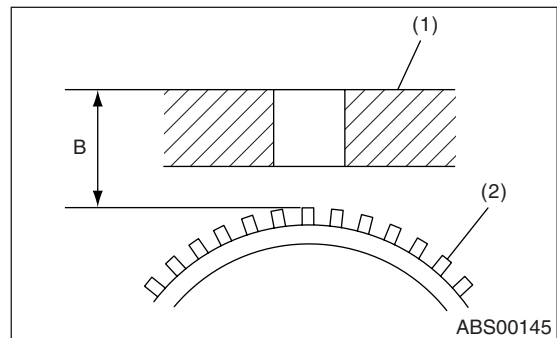
1) Measure the distance “A” between ABS wheel speed sensor surface and sensor pole face.



2) Measure the distance “B” between surface where the front axle housing meets the ABS wheel speed sensor, and the tone wheel.

**NOTE:**

Measure so that the gauge touches the tone wheel teeth top.



- (1) Axle housing  
 (2) Tone wheel

3) Find the gap between the ABS wheel speed sensor pole face and the surface of the tone wheel teeth by putting the measured values in the formula below and calculating.

**ABS wheel speed sensor clearance = B – A**

**ABS wheel speed sensor standard clearance:**  
**0.3 — 0.8 mm (0.012 — 0.031 in)**

**NOTE:**

If the clearance is out of specification, readjust using spacer (Part No. 26755AA000).

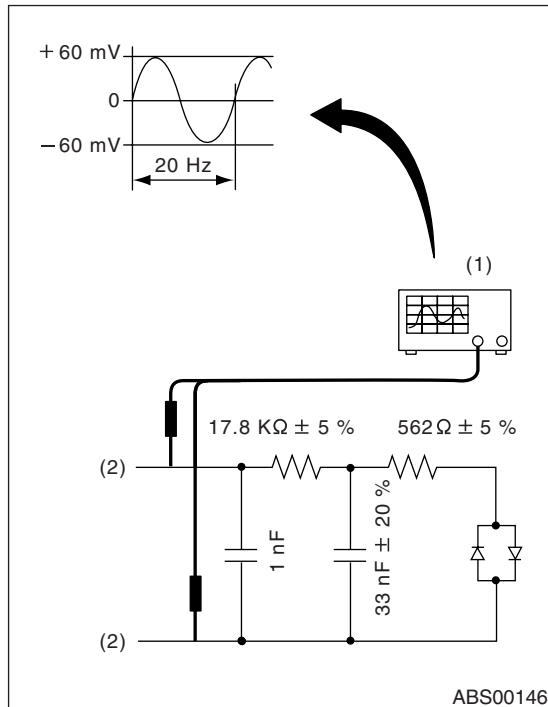
## 3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install the resistor and condenser, then rotate the wheel about 2.75 km/h (2 MPH) or equivalent.

**Output voltage specification:**  
**0.12 to 1 V (at 20 Hz)**

**NOTE:**

Regarding terminal No., please refer to item 1. ABS WHEEL SPEED SENSOR. <Ref. to ABS-14, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>



- (1) Oscilloscope
- (2) Terminal

## D: ADJUSTMENT

Adjust the gap using spacer (Part No. 26755A000).

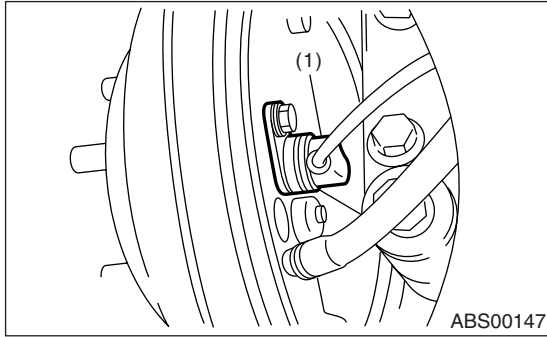
## 5. Rear ABS Wheel Speed Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Remove the rear seat and disconnect the rear ABS wheel speed sensor connector. Pull the connector out from grommet hole to under floor.
- 4) Remove the rear sensor harness bracket from the rear trailing link and bracket.
- 5) Remove the rear ABS wheel speed sensor from back plate.

#### CAUTION:

- Be careful not to damage the pole piece located at tip of the sensor and teeth faces during removal.
- Do not pull the sensor harness during removal.



(1) Rear ABS wheel speed sensor

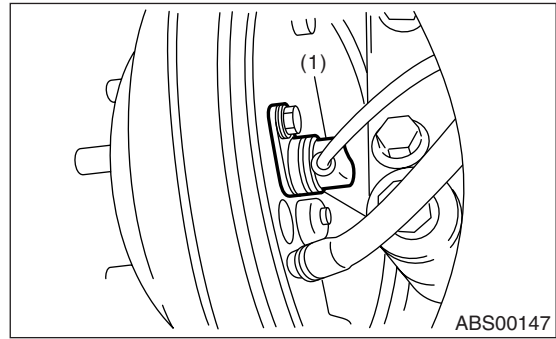
- 6) Remove the rear tone wheel while removing the hub from housing and hub assembly. <Ref. to DS-27, REMOVAL, Rear Axle.>

### B: INSTALLATION

- 1) Install the rear tone wheel on hub, then rear housing on hub. <Ref. to DS-30, ASSEMBLY, Rear Axle.>
- 2) Temporarily install the rear ABS wheel speed sensor on back plate.

#### CAUTION:

Be careful not to strike the ABS wheel speed sensor's pole piece against tone wheel and adjacent metal parts during installation.

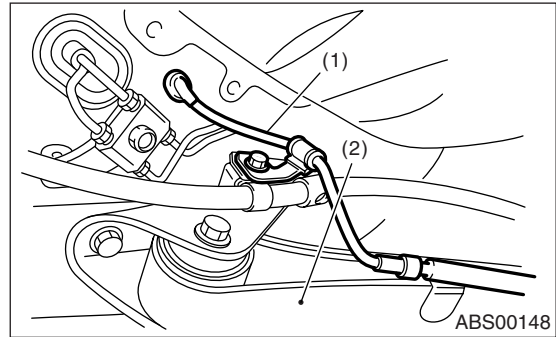


(1) Rear ABS wheel speed sensor

- 3) Install the rear drive shaft to rear housing and rear differential spindle. <Ref. to DS-28, INSTALLATION, Rear Axle.>
- 4) Install the rear sensor harness on rear trailing link.

#### Tightening torque:

**33 N·m (3.3 kgf-m, 24 ft-lb)**



(1) Rear sensor harness

(2) Trailing link

- 5) Check the ABS wheel speed sensor gap. <Ref. to ABS-17, SENSOR GAP, INSPECTION, Rear ABS Wheel Speed Sensor.> After standard clearance is obtained, tighten the ABS wheel speed sensor on back plate to specified torque. If the clearance is outside specification, readjust using spacer (Part No. 26755AA000).

#### ABS wheel speed sensor standard clearance:

**0.7 — 1.2 mm (0.028 — 0.047 in)**

#### Tightening torque:

**33 N·m (3.3 kgf-m, 24 ft-lb)**

#### NOTE:

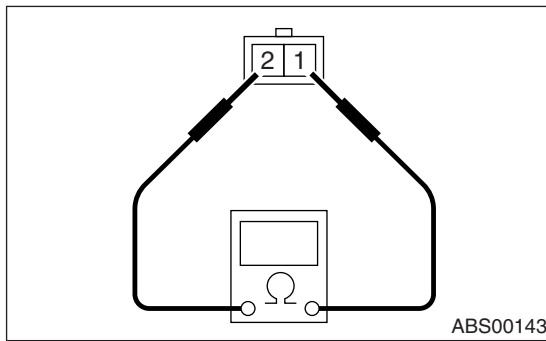
Check the marks on the harness and make sure no kink exists. (RH: Light blue, LH: Brown)

- 6) After confirmation of the ABS wheel speed sensor clearance, connect the connector to ABS wheel speed sensor.
- 7) Connect the battery ground cable to battery.

## C: INSPECTION

### 1. ABS WHEEL SPEED SENSOR

- 1) Check the pole piece of ABS wheel speed sensor for foreign particles or damage. If necessary, clean the pole piece or replace ABS wheel speed sensor.
  - 2) Measure the ABS wheel speed sensor resistance.
- If resistance is out of standard value, replace the ABS wheel speed sensor with a new one.



| Terminal No. | Standard      |
|--------------|---------------|
| 1 and 2      | 1.15±0.115 kΩ |

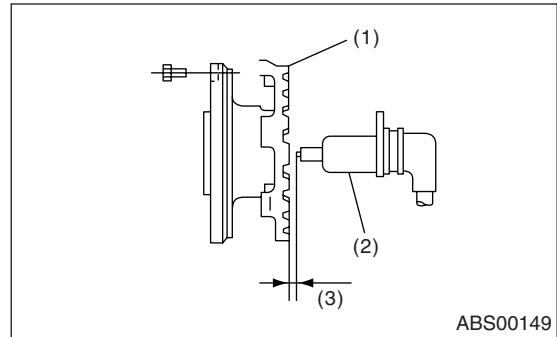
**NOTE:**  
Check the ABS wheel speed sensor cable for discontinuity. If necessary, replace with a new one.

### 2. SENSOR GAP

- 1) Measure the clearance between tone wheel and ABS wheel speed sensor at whole periphery.

**NOTE:**  
If clearance is narrow, adjust by using spacer (Part No. 26755AA000).  
If clearance is wide, check the outputted voltage then replace the ABS wheel speed sensor or tone wheel if the outputted voltage is outside specification.

**ABS wheel speed sensor clearance:**  
**0.7 — 1.2 mm (0.028 — 0.047 in)**



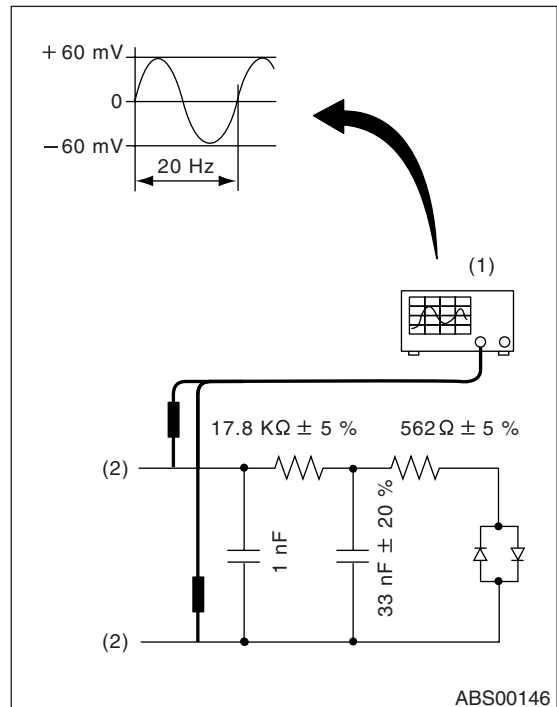
- (1) Tone wheel
- (2) ABS wheel speed sensor
- (3) Sensor gap

### 3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install the resistor and condenser, then rotate the wheel about 2.75 km/h (2 MPH) or equivalent.

**Output voltage specification:**  
**0.12 — 1 V (at 20 Hz)**

**NOTE:**  
Regarding terminal No., please refer to item 1. ABS WHEEL SPEED SENSOR. <Ref. to ABS-17, ABS WHEEL SPEED SENSOR, INSPECTION, Rear ABS Wheel Speed Sensor.>



- (1) Oscilloscope
- (2) Terminal

## Rear ABS Wheel Speed Sensor

ABS

---

### **D: ADJUSTMENT**

Adjust the gap using spacer (Part No. 26755AA000).

## 6. Front Tone Wheel

### A: REMOVAL

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft.

<Ref. to DS-33, REMOVAL, Front Drive Shaft.>

### B: INSTALLATION

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft.

<Ref. to DS-33, INSTALLATION, Front Drive Shaft.>

### C: INSPECTION

Visually check the tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace the tone wheel with a new one.

#### NOTE:

Tone wheel forms a unit with BJ assembly of drive shaft. Replace the BJ assembly when the tone wheel is damaged.



### 7. Rear Tone Wheel

#### **A: REMOVAL**

Refer to Rear Axle, because the rear tone wheel is installed to rear hub.

<Ref. to DS-27, REMOVAL, Rear Axle.>

#### **B: INSTALLATION**

Refer to Rear Axle, because the rear tone wheel is installed to rear hub.

<Ref. to DS-28, INSTALLATION, Rear Axle.>

#### **C: INSPECTION**

Visually check the tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace the tone wheel with a new one.

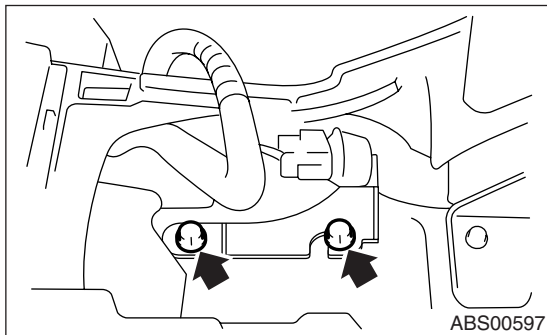
## 8. G Sensor

### A: REMOVAL

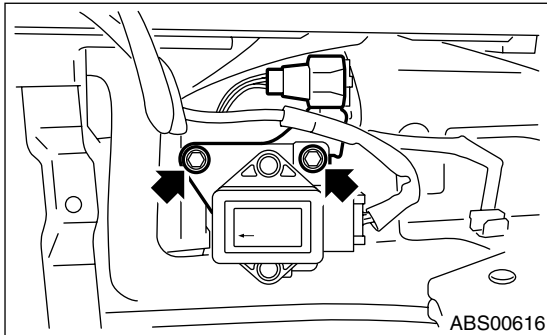
- 1) Disconnect the ground cable from battery.
- 2) Remove the console cover. <Ref. to EI-46, REMOVAL, Console Box.>
- 3) Disconnect the connector from G sensor.
- 4) Remove the G sensor from body.

#### CAUTION:

- Do not drop or bump the G sensor.
- G sensor and the bracket are integrated into one unit. Therefore, do not disassemble it.
  - Except for STI model



- STI model



### B: INSTALLATION

Install in the reverse order of removal.

#### CAUTION:

Do not drop or bump the G sensor.

*Tightening torque:*

*18 N·m (1.8 kgf·m, 13.0 ft·lb)*

# G Sensor

ABS

## C: INSPECTION

| Step     | Check   | Yes                 | No                    |
|----------|---|---------------------|-----------------------|
| <b>1</b> | <b>CHECK SUBARU SELECT MONITOR.</b>   | Go to step 5.       | Go to step 2.         |
| <b>2</b> | <b>CHECK G SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the G sensor from vehicle.<br>3) Connect the connector to G sensor.<br>4) Turn the ignition switch to ON.<br>5) Measure the voltage between G sensor connector terminals.<br><b>Connector &amp; terminal</b><br><b>(B292) No. 2 (+) — No. 3 (-):</b> | Go to step 3.       | Replace the G sensor. |
| <b>3</b> | <b>CHECK G SENSOR.</b><br>Measure the voltage between G sensor connector terminals.<br><b>Connector &amp; terminal</b><br><b>(B292) No. 2 (+) — No. 3 (-):</b>  | Go to step 4.       | Replace the G sensor. |
| <b>4</b> | <b>CHECK G SENSOR.</b><br>Measure the voltage between G sensor connector terminals.<br><b>Connector &amp; terminal</b><br><b>(B292) No. 2 (+) — No. 3 (-):</b>  | G sensor is normal. | Replace the G sensor. |
| <b>5</b> | <b>CHECK G SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the Subaru Select Monitor to data link connector.<br>3) Turn the Subaru Select Monitor into {BRAKE CONTROL} mode.<br>4) Set the display in the {Current Data Display & Save} mode.<br>5) Read the G sensor output value.                            | Go to step 6.       | Replace the G sensor. |
| <b>6</b> | <b>CHECK G SENSOR.</b><br>1) Remove the console box.<br>2) Remove the G sensor from vehicle. (Do not disconnect the connector.)<br>3) Read the Subaru Select Monitor display.   | Go to step 7.       | Replace the G sensor. |
| <b>7</b> | <b>CHECK G SENSOR.</b><br>Read the Subaru Select Monitor display.   | G sensor is normal. | Replace the G sensor. |

## 9. Yaw Rate and Lateral G Sensor

### A: REMOVAL

For removal procedure of the yaw rate & lateral G sensor, refer to "6MT" section. <Ref. to 6MT-128, REMOVAL, Yaw Rate and Lateral G Sensor.>

### B: INSTALLATION

For installation procedure of the yaw rate & lateral G sensor, refer to "6MT" section. <Ref. to 6MT-128, INSTALLATION, Yaw Rate and Lateral G Sensor.>



# ABS (DIAGNOSTICS)

# *ABS(diag)*

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# Basic Diagnostic Procedure

ABS (DIAGNOSTICS)

## 1. Basic Diagnostic Procedure

### A: PROCEDURE

**CAUTION:**

Remove foreign matters (dust, water, oil, etc.) from the ABSCM&H/U connector during removal and installation.

**NOTE:**

- To check harness for broken wires or short circuits, shake trouble spot or connector.
- Refer to “Check List for Interview”. <Ref. to ABS(diag)-4, Check List for Interview.>

| Step  | Check  | Yes                   | No   |
|---|--|-----------------------|--|
| <b>1 CHECK PRE-INSPECTION.</b><br>1) Ask the customer when and how the trouble occurred using interview checklist. <Ref. to ABS(diag)-4, Check List for Interview.><br>2) Before performing diagnostics, check the component which might affect ABS problems. <Ref. to ABS(diag)-8, INSPECTION, General Description.>   | Is the component that might influence the ABS problem normal?              | Go to step 2.         | Repair or replace each unit.   |
| <b>2 CHECK INDICATION OF DTC ON SCREEN.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the Subaru Select Monitor to data link connector.<br>3) Turn the ignition switch to ON and Subaru Select Monitor power switch to ON.<br><b>NOTE:</b><br>If the communication function of the Subaru Select Monitor cannot be executed normally, check the communication circuit. <Ref. to ABS(diag)-19, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.><br>4) Read the DTC. <Ref. to ABS(diag)-24, OPERATION, Read Diagnostic Trouble Code (DTC).><br>5) Record all DTCs and Freeze Frame Data. | Is DTC displayed?  | Go to step 4.         | Go to step 3.  |
| <b>3 PERFORM THE GENERAL DIAGNOSTICS.</b><br>1) Inspect using “General Diagnostic Table”. <Ref. to ABS(diag)-77, General Diagnostic Table.><br>2) Perform clear memory mode. <Ref. to ABS(diag)-17, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.><br>3) Perform the inspection mode. <Ref. to ABS(diag)-25, Inspection Mode.><br>4) Read the DTC. <Ref. to ABS(diag)-16, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.><br>Check the DTC does not displayed.  | Does the ABS warning light go off after turning the ignition switch to ON? | Finish the diagnosis. | Check in accordance with “Diagnostic Procedure for ABS”. <Ref. to ABS(diag)-21, NO TROUBLE CODE, INSPECTION, Subaru Select Monitor.> |

# Basic Diagnostic Procedure

ABS (DIAGNOSTICS)

| Step   | Check             | Yes  | No                    |
|--|-------------------|--|-----------------------|
| <b>4</b><br><b>PERFORM THE DIAGNOSIS.</b><br>1) Refer to the "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-34, LIST, List of Diagnostic Trouble Code (DTC).><br>2) Fix the wrong part.<br>3) Perform clear memory mode. <Ref. to ABS(diag)-17, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.><br>4) Perform the inspection mode. <Ref. to ABS(diag)-25, Inspection Mode.><br>5) Read the DTC. <Ref. to ABS(diag)-16, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.> | Is DTC displayed? | Repeat step 1 to 4 until DTC is not shown. | Finish the diagnosis. |



# Check List for Interview

ABS (DIAGNOSTICS)

## 2. Check List for Interview

### A: CHECK

Check the following items about the vehicle's state.

#### 1. STATE OF ABS WARNING LIGHT

|  |   |                 |      |
|--|---|-----------------|------|
| ABS warning light comes on.                                    | <input type="checkbox"/> Always<br><input type="checkbox"/> Sometimes<br><input type="checkbox"/> Only once<br><input type="checkbox"/> Not come on<br>• When / how long does it come on?   |                 |      |
| Ignition key position  | <input type="checkbox"/> LOCK<br><input type="checkbox"/> ACC<br><input type="checkbox"/> ON (before starting engine)<br><input type="checkbox"/> START<br><input type="checkbox"/> ON (after Engine starting, engine is running)<br><input type="checkbox"/> ON (after Engine starting, engine is at a standstill) |                 |      |
| Timing   | <input type="checkbox"/> Immediately after turning the ignition to ON<br><input type="checkbox"/> Immediately after turning the ignition to START   |                 |      |
|  | <input type="checkbox"/> When accelerating  | —               | km/h |
|  |   | —               | MPH  |
|  | <input type="checkbox"/> When driving at a constant speed   | km/h            | MPH  |
|  | <input type="checkbox"/> When decelerating  | —               | km/h |
|  |   | —               | MPH  |
|  | <input type="checkbox"/> When turning to the right  | Steering angle: | deg  |
|  |   | Steering time:  | Sec. |
|  | <input type="checkbox"/> When turning to the left   | Steering angle: | deg  |
|  |   | Steering time:  | Sec. |
| <input type="checkbox"/> When operating other electrical parts |   |                 |      |
| • Parts name:<br>• Operating condition:                        |   |                 |      |

# Check List for Interview

ABS (DIAGNOSTICS)

## 2. STATE OF BRAKE WARNING LIGHT

|                               |  |                 |      |
|-------------------------------|--|-----------------|------|
| Brake warning light comes on. | <input type="checkbox"/> Always<br><input type="checkbox"/> Sometimes<br><input type="checkbox"/> Only once<br><input type="checkbox"/> Not come on<br><input type="checkbox"/> When pulling the parking brake lever up.<br><input type="checkbox"/> When releasing the parking brake lever down.<br><input type="checkbox"/> When / how long does it come on? |                 |      |
| Ignition key position         | <input type="checkbox"/> LOCK<br><input type="checkbox"/> ACC<br><input type="checkbox"/> ON (before starting engine)<br><input type="checkbox"/> START<br><input type="checkbox"/> ON (after Engine starting, engine is running)<br><input type="checkbox"/> ON (after Engine starting, engine is at a standstill)  |                 |      |
| Timing                        | <input type="checkbox"/> Immediately after turning the ignition to ON<br><input type="checkbox"/> Immediately after turning the ignition to START  |                 |      |
|                               | <input type="checkbox"/> When accelerating   | —               | km/h |
|                               |  | —               | MPH  |
|                               | <input type="checkbox"/> When driving at a constant speed  | km/h            | MPH  |
|                               | <input type="checkbox"/> When decelerating   | —               | km/h |
|                               |  | —               | MPH  |
|                               | <input type="checkbox"/> When turning to the right   | Steering angle: | deg  |
|                               |  | Steering time:  | Sec. |
|                               | <input type="checkbox"/> When turning to the left  | Steering angle: | deg  |
|                               |  | Steering time:  | Sec. |
|                               | <input type="checkbox"/> When operating other electrical parts   |                 |      |
|                               | <input type="checkbox"/> Parts name:   |                 |      |
|                               | <input type="checkbox"/> Operating condition:  |                 |      |

## Check List for Interview

ABS (DIAGNOSTICS)

### 3. SYMPTOMS

|  |  |   |      |
|--|--|---|------|
| ABS operating condition  | <input type="checkbox"/> Does not move.  |   |      |
|  | <input type="checkbox"/> Operates only when applying an abrupt brake.  | Vehicle speed:  | km/h |
|  | MPH  |   |      |
|  | • How to step on brake pedal:  |   |      |
|  | a) Operating time:   |   | Sec. |
|  | b) Operating noise: <input type="checkbox"/> Occurs. / <input type="checkbox"/> Does not occur.  |   |      |
|  | • What kind of noise?  | <input type="checkbox"/> Knocking<br><input type="checkbox"/> Gong gong<br><input type="checkbox"/> Bong<br><input type="checkbox"/> Buzz<br><input type="checkbox"/> Gong gong buzz<br><input type="checkbox"/> Others:            |      |
|  | c) Reaction force of brake pedal   |   |      |
|  | <input type="checkbox"/> Stick<br><input type="checkbox"/> Weak pedal resistance<br><input type="checkbox"/> Strong pedal resistance<br><input type="checkbox"/> Others: |   |      |
| Behavior of vehicle  | a) Directional stability cannot be obtained or the steering refuses to work when applying brakes:<br><input type="checkbox"/> Yes / <input type="checkbox"/> No          |   |      |
|  | • When:  | <input type="checkbox"/> When turning to the right<br><input type="checkbox"/> When turning to the left<br><input type="checkbox"/> When spinning<br><input type="checkbox"/> Others:   |      |
|  | b) Directional stability cannot be obtained or the steering refuses to work when accelerating:<br><input type="checkbox"/> Yes / <input type="checkbox"/> No             |   |      |
|  | • When:  | <input type="checkbox"/> When turning to the right<br><input type="checkbox"/> When turning to the left<br><input type="checkbox"/> When spinning<br><input type="checkbox"/> Others:   |      |
|  | c) Poor brake performance: <input type="checkbox"/> Yes / <input type="checkbox"/> No  |   |      |
|  | • What kind:   | <input type="checkbox"/> Long braking/stopping distance<br><input type="checkbox"/> Brakes lock or drag<br><input type="checkbox"/> Long pedal stroke<br><input type="checkbox"/> Pedal sticks.<br><input type="checkbox"/> Others: |      |
|  | d) Poor acceleration: <input type="checkbox"/> Yes / <input type="checkbox"/> No   |   |      |
|  | • What kind:   | <input type="checkbox"/> Not accelerate<br><input type="checkbox"/> Engine stalls.<br><input type="checkbox"/> Others:  |      |
|  | e) Occurrence of vibration: <input type="checkbox"/> Yes / <input type="checkbox"/> No   |   |      |
|  | • Where  |   |      |
|  | • What kind:   |   |      |
|  | f) Occurrence of noise: <input type="checkbox"/> Yes / <input type="checkbox"/> No   |   |      |
| • Where  |  |   |      |
| • What kind:   |  |   |      |
| g) Other troubles occurred: <input type="checkbox"/> Yes / <input type="checkbox"/> No |  |   |      |
| • What kind:   |  |   |      |

# Check List for Interview

ABS (DIAGNOSTICS)

## 4. CONDITIONS UNDER WHICH TROUBLE OCCURS

|                                       |  |  |     |
|---------------------------------------|--|--|-----|
| Environment                           | a) Weather   | <input type="checkbox"/> Fine<br><input type="checkbox"/> Cloudy<br><input type="checkbox"/> Rainy<br><input type="checkbox"/> Snowy<br><input type="checkbox"/> Others:   |     |
|                                       | b) Ambient temperature                                     | °C (°F)  |     |
|                                       | c) Road  | <input type="checkbox"/> Inner city<br><input type="checkbox"/> Suburbs<br><input type="checkbox"/> Highway<br><input type="checkbox"/> Local street<br><input type="checkbox"/> Uphill<br><input type="checkbox"/> Downhill<br><input type="checkbox"/> Paved road<br><input type="checkbox"/> Gravel road<br><input type="checkbox"/> Muddy road<br><input type="checkbox"/> Sandy place<br><input type="checkbox"/> Others: |     |
|                                       | d) Road surface  | <input type="checkbox"/> Dried<br><input type="checkbox"/> Wet<br><input type="checkbox"/> Covered with fresh snow<br><input type="checkbox"/> Covered with hardened snow<br><input type="checkbox"/> Frozen slope<br><input type="checkbox"/> Others:   |     |
| Condition                             | a) Brakes  | Deceleration: <span style="float: right;">G</span>   |     |
|                                       |  | <input type="checkbox"/> Intermittent / <input type="checkbox"/> Temporary   |     |
|                                       | b) Accelerator   | Acceleration: <span style="float: right;">G</span>   |     |
|                                       |  | <input type="checkbox"/> Intermittent / <input type="checkbox"/> Temporary   |     |
|                                       | c) Vehicle speed   | km/h   | MPH |
|                                       |  | <input type="checkbox"/> Advancing<br><input type="checkbox"/> When accelerating<br><input type="checkbox"/> When decelerating<br><input type="checkbox"/> At low speed<br><input type="checkbox"/> When turning<br><input type="checkbox"/> Others:   |     |
|                                       | d) Tire inflation pressure                                 | Front RH tire:   | kPa |
|                                       |  | Front LH tire:   | kPa |
|                                       |  | Rear RH tire:  | kPa |
|                                       |  | Rear LH tire:  | kPa |
|                                       | e) Degree of wear  | Front RH tire:   |     |
|                                       |  | Front LH tire:   |     |
|                                       |  | Rear RH tire:  |     |
|                                       |  | Rear LH tire:  |     |
| f) Genuine parts are used.:           | <input type="checkbox"/> Yes / <input type="checkbox"/> No |  |     |
| g) Tire chain is attached.:           | <input type="checkbox"/> Yes / <input type="checkbox"/> No |  |     |
| h) T-type tire is used.:              | <input type="checkbox"/> Yes / <input type="checkbox"/> No |  |     |
| i) Condition of suspension alignment: |  |  |     |
| j) Loading state:                     |  |  |     |
| k) Repair parts are used.:            | <input type="checkbox"/> Yes / <input type="checkbox"/> No |  |     |
| • Contents:                           |  |  |     |
| l) Others:                            |  |  |     |

## 3. General Description

### A: CAUTION

#### 1. SUPPLEMENTAL RESTRAINT SYSTEM “AIRBAG”

Airbag system wiring harness is routed near the ABS wheel speed sensor and ABSCM&H/U.

#### CAUTION:

- Airbag system connectors are colored yellow. Do not use the electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the ABS wheel speed sensor and ABSCM&H/U.

### B: INSPECTION

Before performing diagnosis, check the following items which might affect ABS problems.

#### 1. BATTERY

Measure battery voltage and check electrolyte.

**Standard voltage: 12 V or more**

**Specific gravity: More than 1.260**

#### 2. GROUND

Check the ABS ground (B302) bolt, tightening torque.

**Tightening torque:**

**13 N·m (1.3 kgf·m, 9.4 ft-lb)**

#### 3. BRAKE FLUID

- 1) Check the brake fluid level.
- 2) Check the brake fluid for leaks.

#### 4. HYDRAULIC UNIT

Check the hydraulic unit.

- With brake tester <Ref. to ABS-9, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
- Without brake tester <Ref. to ABS-8, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

#### 5. BRAKE DRAG

Check for brake drag.

#### 6. BRAKE PAD AND ROTOR

Check the brake pad and rotor.

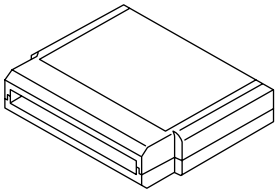

- FRONT <Ref. to BR-19, INSPECTION, Front Brake Pad.> <Ref. to BR-21, INSPECTION, Front Disc Rotor.>
- REAR <Ref. to BR-30, INSPECTION, Rear Brake Pad.> <Ref. to BR-32, INSPECTION, Rear Disc Rotor.>

#### 7. TIRE

Check the tire specifications, tire wear and air pressure. <Ref. to WT-2, SPECIFICATION, General Description.>

**C: PREPARATION TOOL**

**1. SPECIAL TOOL**

| ILLUSTRATION   | TOOL NUMBER                        | DESCRIPTION                  | REMARKS                                 |
|--|------------------------------------|------------------------------|---|
| <br><br>ST18482AA010  | 18482AA010<br>(Newly adopted tool) | CARTRIDGE                    | Troubleshooting for electrical systems. |
| <br><br>ST22771AA030 | 22771AA030                         | SUBARU SELECT<br>MONITOR KIT | Troubleshooting for electrical systems. |

**2. GENERAL PURPOSE TOOL**

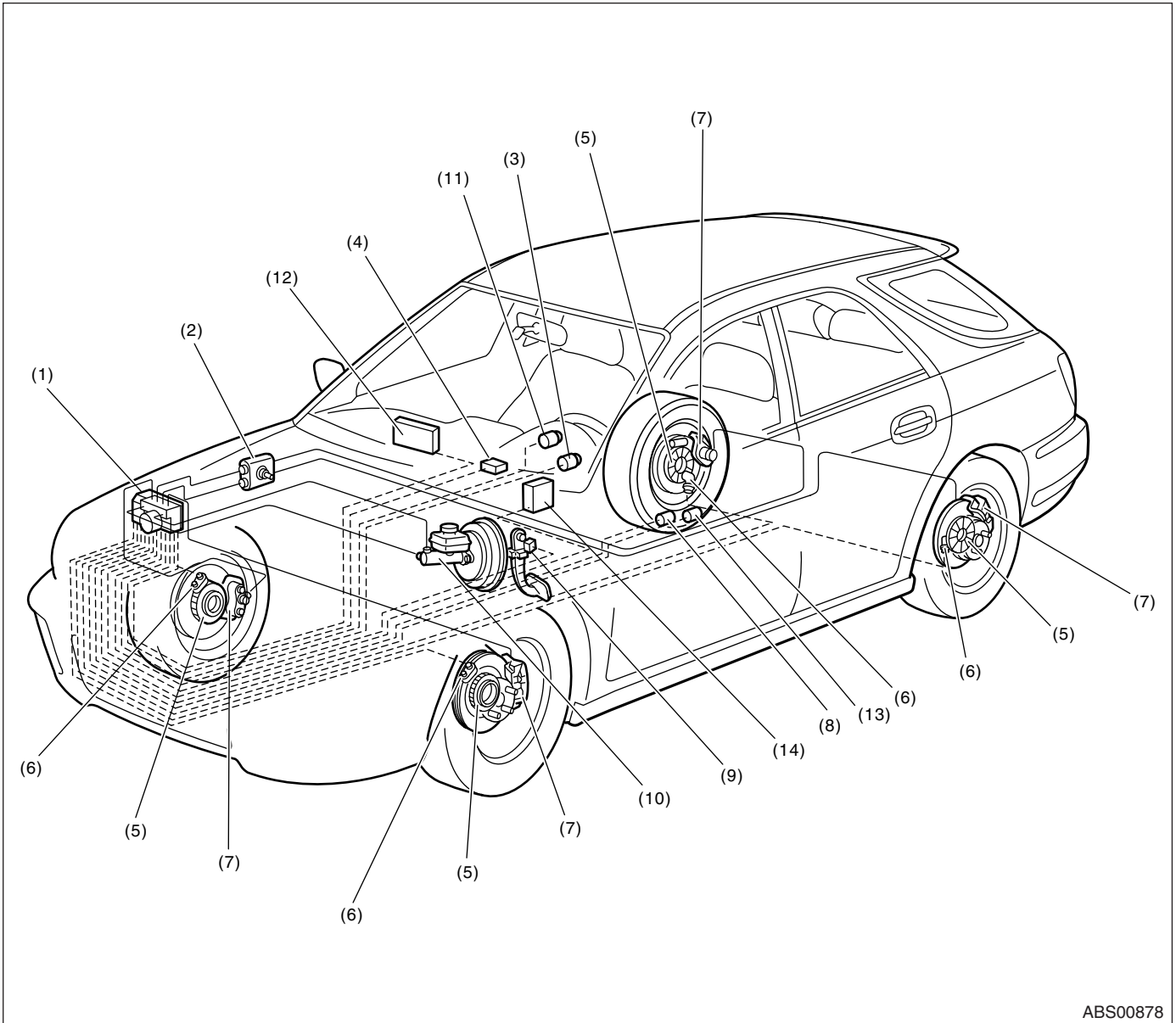
| TOOL NAME      | REMARKS  |
|----------------|--|
| Circuit tester | Used for measuring resistance, voltage and amperage. |
| Oscilloscope   | Used for measuring sensor.                           |

# Electrical Component Location

ABS (DIAGNOSTICS)

## 4. Electrical Component Location

### A: LOCATION



ABS00878

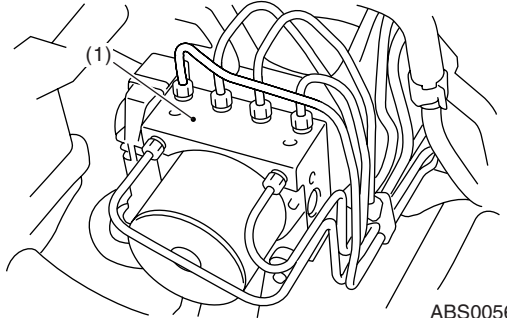
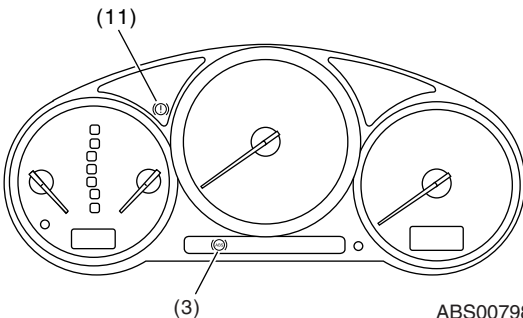
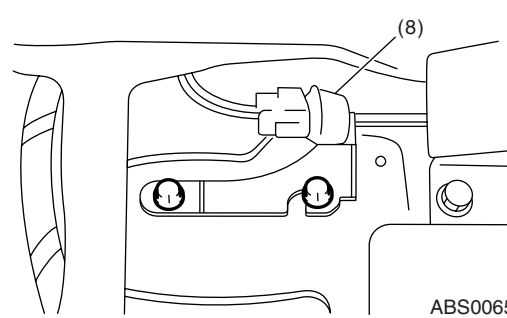
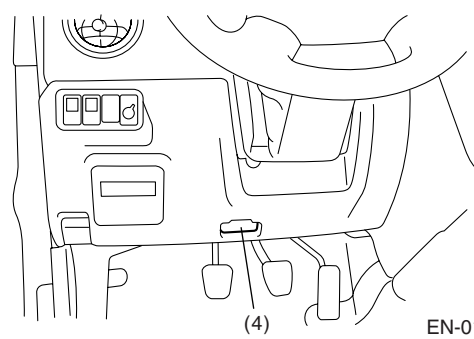
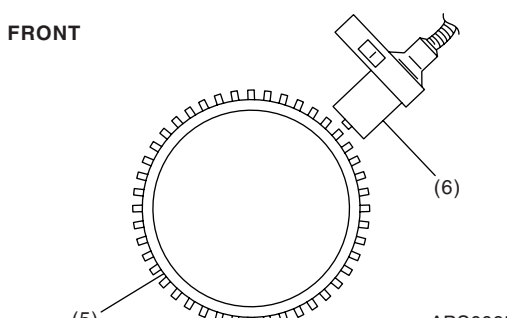
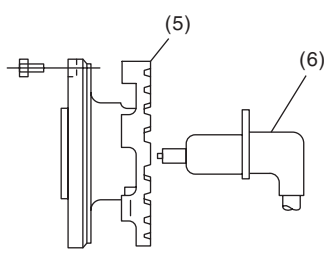
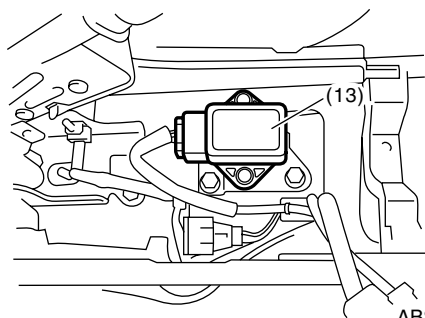
- (1) ABS control module and hydraulic control unit (ABSCM&H/U)
- (2) Connector
- (3) ABS warning light
- (4) Data link connector (for Subaru Select Monitor)

- (5) Tone wheel
- (6) ABS wheel speed sensor
- (7) Wheel cylinder
- (8) G sensor
- (9) Stop light switch
- (10) Master cylinder

- (11) Brake and EBD warning light
- (12) Driver's control center differential control module (STI model)
- (13) Yaw rate & lateral G sensor (STI model)
- (14) Transmission control module (AT model)

# Electrical Component Location

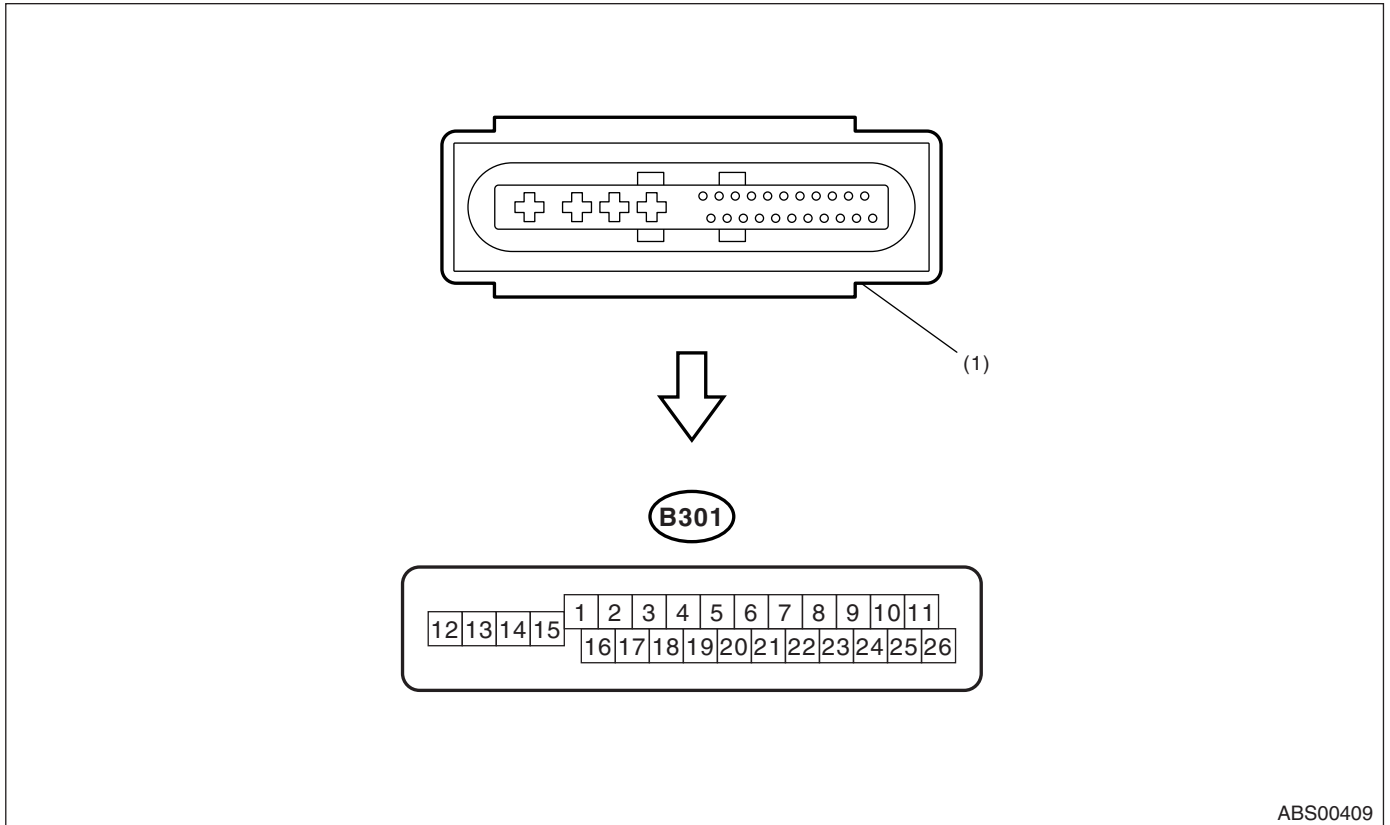
ABS (DIAGNOSTICS)

|   |   |
|---|---|
|  <p>ABS00563</p>               |  <p>ABS00798</p>              |
|  <p>ABS00658</p>               |  <p>EN-01150</p>              |
| <p>FRONT</p>  <p>ABS00659</p> | <p>REAR</p>  <p>ABS00660</p> |
|  <p>ABS00651</p>             | <p>SUBARU.</p>  |



## 5. Control Module I/O Signal

### A: ELECTRICAL SPECIFICATION



ABS00409

(1) ABS control module and hydraulic control unit (ABSCM&H/U) connector

**NOTE:**

- Terminal numbers in ABSCM&H/U connector are as shown in the figure.
- ABS warning light is illuminates when the connector is removed from ABSCM&H/U.

# Control Module I/O Signal

ABS (DIAGNOSTICS)

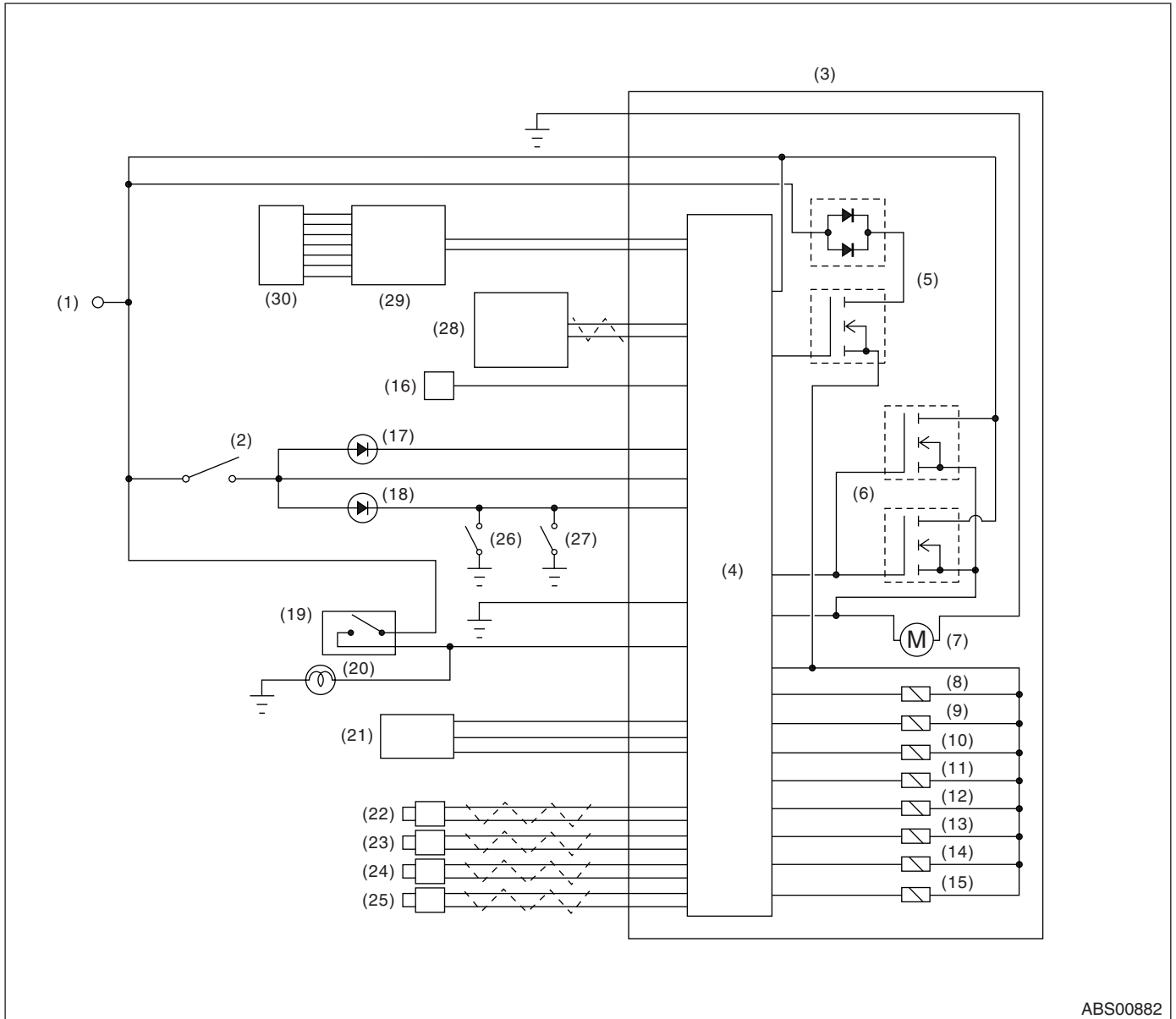
| Description                                    |                |        | Terminal No.<br>(+) — (-)  | Input/Output signal   |
|--|----------------|--------|----------------------------|---|
|  |                |        |                            | Measured value and measuring conditions   |
| ABS wheel speed sensor<br>(Wheel speed sensor) | Front LH wheel | Ground | 16                         | —   |
|  |                | Signal | 1 — 16                     | When the 20 Hz. 0.12 — 1 V  |
|  | Front RH wheel | Ground | 5                          | —   |
|  |                | Signal | 6 — 5                      | When the 20 Hz. 0.12 — 1 V  |
|  | Rear LH wheel  | Ground | 2                          | —   |
|  |                | Signal | 3 — 2                      | When the 20 Hz. 0.12 — 1 V  |
| Rear RH wheel                                  | Ground         | 4      | —                          |   |
|  | Signal         | 19 — 4 | When the 20 Hz. 0.12 — 1 V |   |
| CAN communication line (+)                     |                |        | 26                         | 2.5 — 1.5 V pulse signal  |
| CAN communication line (-)                     |                |        | 11                         | 3.5 — 2.5 V pulse signal  |
| Valve relay power supply *1                    |                |        | 14 — 15                    | 10 — 15 V   |
| Motor relay power supply *1                    |                |        | 13 — 15                    | 10 — 15 V   |
| G sensor                                       | Power supply   |        | 24 — 10                    | 4.75 — 5.25 V   |
|  | Ground         |        | 10                         | —   |
|  | Output         |        | 21 — 10                    | 2.1 — 2.5 V when the vehicle is on a level surface  |
| Stop light switch *1                           |                |        | 20 — 15                    | Less than 1.5 V when the stop light is OFF; otherwise, 10 — 15 V when the stop light is ON.                         |
| ABS warning light                              |                |        | 22 — 15                    | After turning the ignition switch to ON, 10 — 15 V during 1.5 seconds and less than 1.5 V after 1.5 seconds passed. |
| Brake warning light (EBD warning light)        |                |        | 8 — 15                     | After turning the ignition switch to ON, 10 — 15 V during 1.5 seconds and less than 1.5 V after 1.5 seconds passed. |
| Subaru Select Monitor                          |                |        | 7 — 15                     | Less than 1.5 V when no data is received.<br>0 ↔ 12 V pulse (in communication)                                      |
| Power supply *1                                |                |        | 18 — 15                    | When the ignition switch is ON, 10 — 15 V.  |
| Grounding line                                 |                |        | 12                         | —   |
| Grounding line                                 |                |        | 15                         | —   |

\*1: Measure the I/O signal voltage after removing the connector from the ABSCM&H/U terminal.

# Control Module I/O Signal

ABS (DIAGNOSTICS)

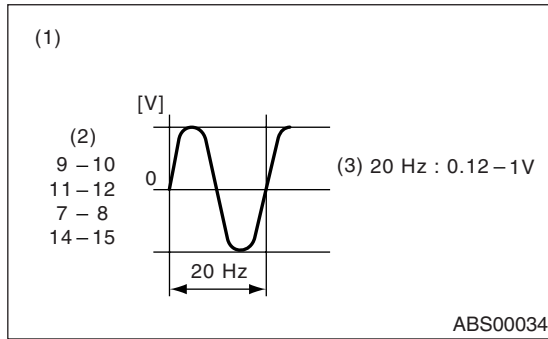
## B: WIRING DIAGRAM



ABS00882

- |   |                                      |  |
|---|--------------------------------------|--|
| (1) Battery   | (12) Rear inlet solenoid valve LH    | (23) Front ABS wheel speed sensor RH                                 |
| (2) Ignition switch   | (13) Rear outlet solenoid valve LH   | (24) Rear ABS wheel speed sensor LH                                  |
| (3) ABS control module and hydraulic control unit (ABSCM&H/U) | (14) Rear inlet solenoid valve RH    | (25) Rear ABS wheel speed sensor RH                                  |
| (4) ABS control module  | (15) Rear outlet solenoid valve RH   | (26) Parking brake switch  |
| (5) Valve relay   | (16) Data link connector             | (27) Brake fluid level switch  |
| (6) Motor relay   | (17) ABS warning light               | (28) Transmission control module (AT model)                          |
| (7) Motor   | (18) Brake warning light             | (29) Driver's control center differential control module (STI model) |
| (8) Front inlet solenoid valve LH                             | (19) Stop light switch               | (30) Yaw rate & lateral G sensor (STI model)                         |
| (9) Front outlet solenoid valve LH                            | (20) Stop light                      |  |
| (10) Front inlet solenoid valve RH                            | (21) G sensor                        |  |
| (11) Front outlet solenoid valve RH                           | (22) Front ABS wheel speed sensor LH |  |

## C: WAVEFORM



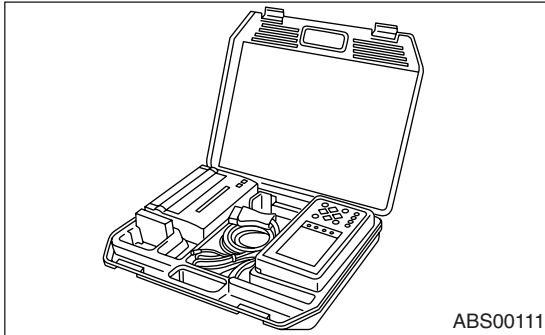
- (1) ABS wheel speed sensor
- (2) Terminal No.
- (3) Standard output voltage

## 6. Subaru Select Monitor

### A: OPERATION

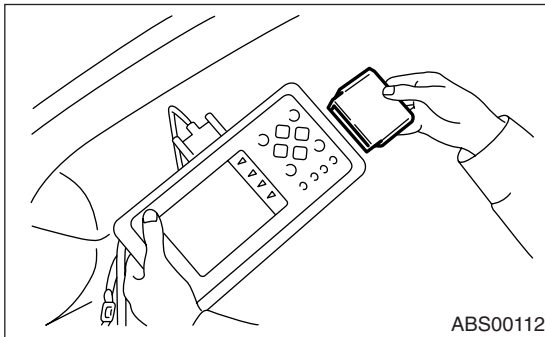
#### 1. READ DIAGNOSTIC TROUBLE CODE (DTC)

1) Prepare the Subaru Select Monitor kit.



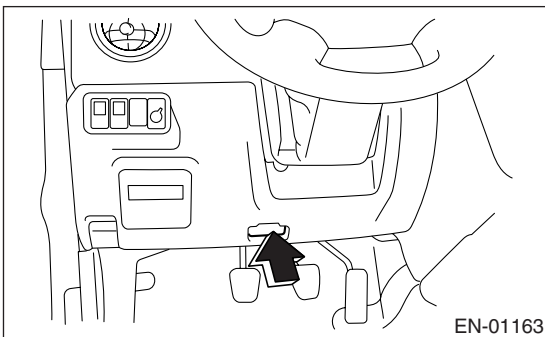
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor. <Ref. to ABS(diag)-9, SPECIAL TOOL, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector located in the lower portion of instrument panel (on the driver's side).

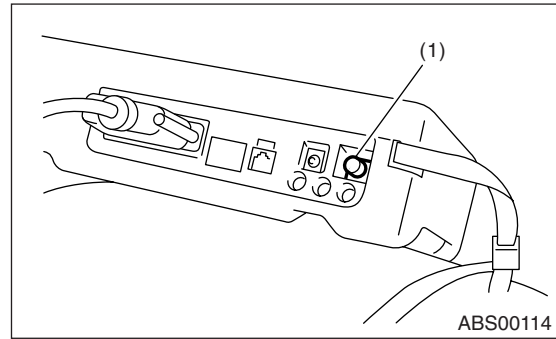


(2) Connect the diagnosis cable to data link connector.

#### CAUTION:

Do not connect the scan tools except for Subaru Select Monitor and general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor power switch to ON.



(1) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.

7) On the «System Selection Menu» display screen, select the {Brake Control System} and press [YES] key.

8) Press the [YES] key after the information of engine type is displayed.

9) On the «ABS Diagnosis» display screen, select the {DTC Display} and press [YES] key.

10) On the «DTC Display» display screen, select the {Current DTC} or {History DTC} and press [YES] key.

#### NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

- For detailed concerning the DTC, refer to the LIST OF DTC. <Ref. to ABS(diag)-34, List of Diagnostic Trouble Code (DTC).>

- A maximum of 3 DTCs are displayed in order of occurrence.

- If a particular DTC is not properly stored in memory (due to a drop in ABSCM&H/U power supply, etc.) when a problem occurs, the DTC, followed by a question mark "?", appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

| Display screen | Contents to be monitored   |
|----------------|--|
| Latest         | The most recent DTC appears on Subaru Select Monitor display.        |
| Old            | The second most recent DTC appears on Subaru Select Monitor display. |
| Older          | The third most recent DTC appears on Subaru Select Monitor display.  |
| Reference      | DTC issued after elapse of a specified period of time.               |

## 2. READ CURRENT DATA

- 1) On the «Main Menu» display screen, select the {Each System Check} and press «YES» key.
- 2) On the «System Selection Menu» display screen, select the {Brake Control System} and press «YES» key.
- 3) Press the «YES» key after the information of ABS type is displayed.
- 4) On the «Brake Control Diagnosis» display screen, select the {Current Data Display & Save} and press «YES» key.
- 5) On the «Data Display Menu» display screen, select the {Data Display} and press «YES» key.
- 6) Using the scroll key, move the display screen up or down until desired data is shown.
  - A list of the support data is shown in the following table.

| Display screen                 | Contents to be monitored  | Unit of measure         |
|--------------------------------|---|-------------------------|
| FR Wheel Speed                 | Wheel speed detected by Front ABS wheel speed sensor RH is displayed        | km/h or MPH             |
| FL Wheel Speed                 | Wheel speed detected by Front ABS wheel speed sensor LH is displayed        | km/h or MPH             |
| RR Wheel Speed                 | Wheel speed detected by Rear ABS wheel speed sensor RH is displayed         | km/h or MPH             |
| RL Wheel Speed                 | Wheel speed detected by Rear ABS wheel speed sensor LH is displayed         | km/h or MPH             |
| Stop Light Switch              | Stop light switch signal  | ON or OFF               |
| G Sensor Output Signal         | Vehicle acceleration detected by analog G sensor is displayed.              | m/s (m/s <sup>2</sup> ) |
| Lateral G Sensor Output Signal | Lateral G detected by Lateral G sensor is displayed in voltage. (STI model) | m/s (m/s <sup>2</sup> ) |
| Valve Relay Signal             | Valve Relay Signal  | ON or OFF               |
| ABS Warning Lamp               | ON operation of ABS warning light is displayed.                             | ON or OFF               |
| EBD Warning Light              | ON operation of EBD warning light is displayed.                             | ON or OFF               |
| Motor Relay Monitor            | Monitor voltage of motor relay is displayed.                                | V                       |
| IG power supply voltage        | Voltage supplied to ABSCM&H/U is displayed.                                 | V                       |
| ABS Control Flag               | ABS control condition is displayed.   | ON or OFF               |
| ABS OK B Signal                | ABS system normal/abnormal is displayed.                                    | ON or OFF               |

**NOTE:**

For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

## 3. CLEAR MEMORY MODE

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press «YES» key.
- 2) On the «System Select Menu» display screen, select the {Brake System} and press «YES» key.
- 3) Press the «YES» key after the information of engine type is displayed.
- 4) On the «Brake Control Diagnosis» display screen, select the {Clear Memory} and press «YES» key.

**NOTE:**

For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

| Display screen | Contents to be monitored  |
|----------------|---------------------------|
| Clear memory?  | Function of clearing DTC. |

- 5) When the “Done” and “turn ignition switch to OFF” are shown on display screen, turn the Subaru Select Monitor power switch and ignition switch to OFF.

## 4. ABS SEQUENCE CONTROL

| Display screen       | Contents to be monitored   | Index No.                               |
|----------------------|--|---|
| ABS sequence control | Perform ABS sequence control by operating valve and pump motor sequentially. | <Ref. to ABS-10, ABS Sequence Control.> |

## 5. FREEZE FRAME DATA

**NOTE:**

- Data stored at the time of trouble occurrence is shown on display.
- Each time trouble occurs, the latest information is stored in the freeze frame data in memory.
- Freeze frame data will be memorized maximum to three.
- If freeze frame data is not properly stored in memory (due to a drop in ABSCM power supply, etc.), a DTC, preceded by a question mark “?”, appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

| Display screen                  | Contents to be monitored  |
|---------------------------------|---|
| FR wheel speed                  | Wheel speed detected by Front ABS wheel speed sensor RH is displayed in km/h or mile/h. |
| FL wheel speed                  | Wheel speed detected by Front ABS wheel speed sensor LH is displayed in km/h or mile/h. |
| RR wheel speed                  | Wheel speed detected by Rear ABS wheel speed sensor RH is displayed in km/h or mile/h.  |
| RL wheel speed                  | Wheel speed detected by Rear ABS wheel speed sensor LH is displayed in km/h or mile/h.  |
| IG power voltage                | Power (in volts) supplied to ABSCM & H/U appears on the Subaru Select Monitor display.  |
| G sensor output voltage         | Voltage equivalent to vehicle acceleration detected by analog G sensor is displayed.    |
| Lateral G sensor output voltage | Voltage equivalent to Lateral G detected by analog Lateral G sensor is displayed.       |
| Motor relay monitor             | Motor relay operation monitor signal  |
| Stop light switch               | Stop light switch signal  |
| ABS operation signal            | ABS operation signal  |
| Power Supply Failure            | Occurrence of abnormal voltage during malfunction is displayed.                         |
| Vehicle speed                   | Vehicle speed is displayed.   |

## B: INSPECTION

### 1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

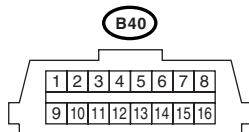
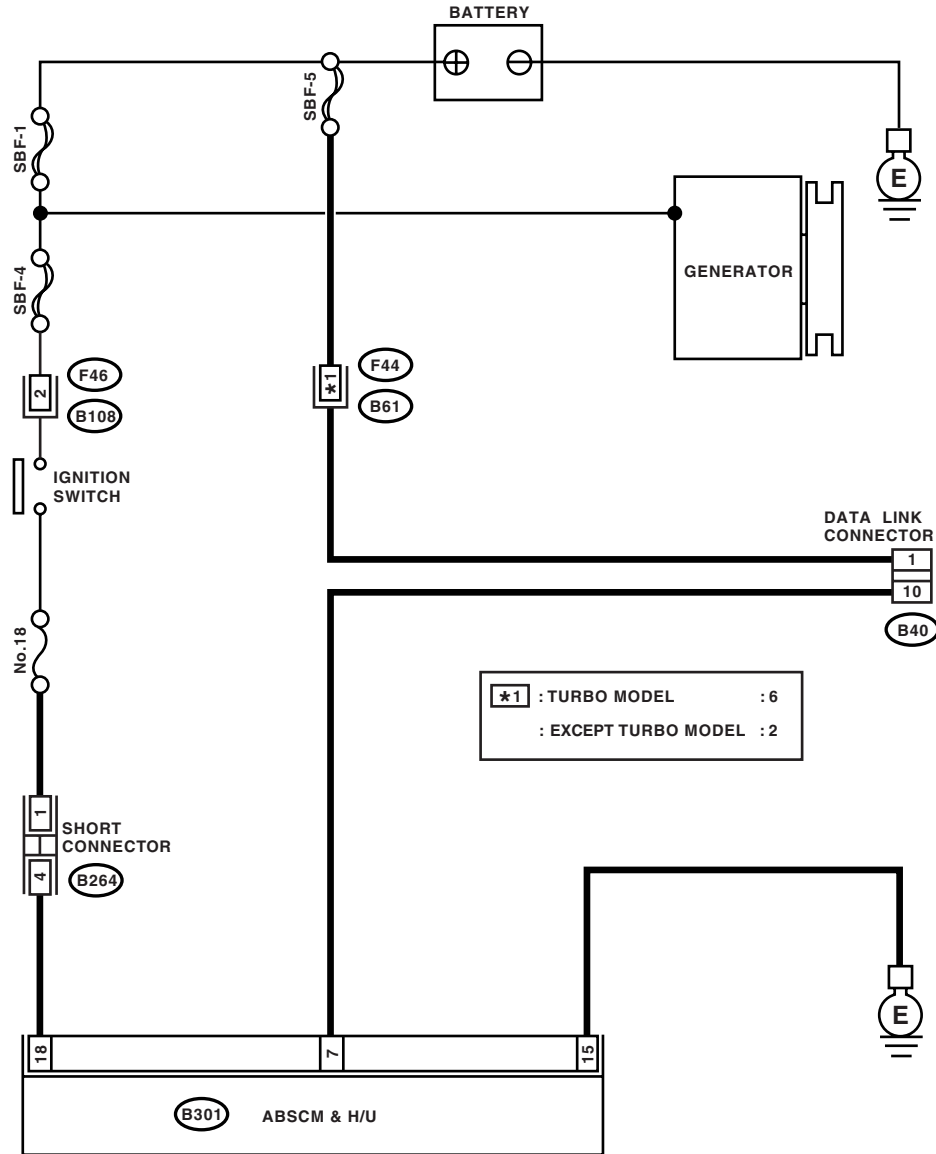
**DETECTING CONDITION:**

Faulty harness connector

**TROUBLE SYMPTOM:**

Communication cannot be executed between ABS and Subaru select monitor.

**WIRING DIAGRAM:**





# Subaru Select Monitor

## ABS (DIAGNOSTICS)

| Step     | Check   | Yes   | No  |   |
|----------|---|---|---|---|
| <b>1</b> | <b>CHECK IGNITION SWITCH.</b>   | Is the ignition switch turned to ON?  | Go to step <b>2</b> .   | Turn the ignition switch to ON, and select ABS mode using Subaru Select Monitor.      |
| <b>2</b> | <b>CHECK BATTERY.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the battery voltage.   | Is the voltage more than 11 V?  | Go to step <b>3</b> .   | Charge or replace the battery.  |
| <b>3</b> | <b>CHECK BATTERY TERMINAL.</b>  | Is there poor contact at battery terminal?  | Repair or tighten the battery terminal.   | Go to step <b>4</b> .   |
| <b>4</b> | <b>CHECK COMMUNICATION OF SUBARU SELECT MONITOR.</b><br>1) Turn the ignition switch to ON.<br>2) Using the Subaru Select Monitor, check whether communication to other system can be executed normally.   | Are the name and year of system displayed on Subaru Select Monitor?               | Go to step <b>8</b> .   | Go to step <b>5</b> .   |
| <b>5</b> | <b>CHECK COMMUNICATION OF SUBARU SELECT MONITOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the ABSCM&H/U connector.<br>3) Turn the ignition switch to ON.<br>4) Check whether communication to other systems can be executed normally.  | Are the name and year of system displayed on Subaru Select Monitor?               | Replace the ABSCM&H/U.<br><Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> | Go to step <b>6</b> .   |
| <b>6</b> | <b>CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the ABSCM&H/U, ECM and TCM connectors.<br>3) Measure the resistance between data link connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B40) No. 10 — Chassis ground:</b> | Is the resistance more than 1 M $\Omega$ ?  | Go to step <b>7</b> .   | Repair the harness and connector between each control module and data link connector. |
| <b>7</b> | <b>CHECK OUTPUT SIGNAL FOR ABSCM&amp;H/U.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ABSCM&H/U and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B40) No. 10 (+) — Chassis ground (-):</b>   | Is the voltage less than 1 V?   | Go to step <b>8</b> .   | Repair the harness and connector between each control module and data link connector. |
| <b>8</b> | <b>CHECK HARNESS/CONNECTOR BETWEEN ABSCM&amp;H/U AND DATA LINK CONNECTOR.</b><br>Measure the resistance between ABSCM&H/U connector and data link connector.<br><b>Connector &amp; terminal</b><br><b>(B301) No. 7 — (B40) No. 10:</b>  | Is the resistance less than 0.5 $\Omega$ ?  | Go to step <b>9</b> .   | Repair the harness and connector between ABSCM&H/U and data link connector.           |
| <b>9</b> | <b>CHECK INSTALLATION OF ABSCM&amp;H/U CONNECTOR.</b><br>Turn the ignition switch to OFF.   | Is the ABSCM&H/U connector inserted into ABSCM&H/U until the clamp locks onto it? | Go to step <b>10</b> .  | Insert the ABSCM&H/U connector into ABSCM&H/U.  |

| Step  | Check  | Yes                   | No   |
|---|--|-----------------------|--|
| <b>10 CHECK POWER SUPPLY CIRCUIT.</b><br>1) Turn the ignition switch to ON (engine OFF).<br>2) Measure the ignition power supply voltage between ABSCM&H/U connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B301) No. 18 (+) — Chassis ground (-):</i>   | Is the voltage 10 — 15 V?  | Go to step 11.        | Repair the open circuit in harness between ABSCM&H/U and battery.  |
| <b>11 CHECK HARNESS CONNECTOR BETWEEN ABSCM&amp;H/U AND CHASSIS GROUND.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ABSCM&H/U and transmission.<br>3) Measure the resistance of harness between ABSCM&H/U and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B301) No. 15 — Chassis ground:</i> | Is the resistance less than 0.5 $\Omega$ ?   | Go to step 12.        | Repair the open circuit in harness between ABSCM&H/U and inhibitor side connector, and poor contact in coupling connector. |
| <b>12 CHECK POOR CONTACT IN CONNECTORS.</b>   | Is there poor contact in control module power supply, ground line and data link connector? | Repair the connector. | Replace the ABSCM&H/U.<br><Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>                      |

## 2. NO TROUBLE CODE

### DETECTING CONDITION:

ABS warning light circuit is shorted.

### TROUBLE SYMPTOM:

- ABS warning light remains on.
- “NO TROUBLE CODE” displayed on the Subaru Select Monitor.

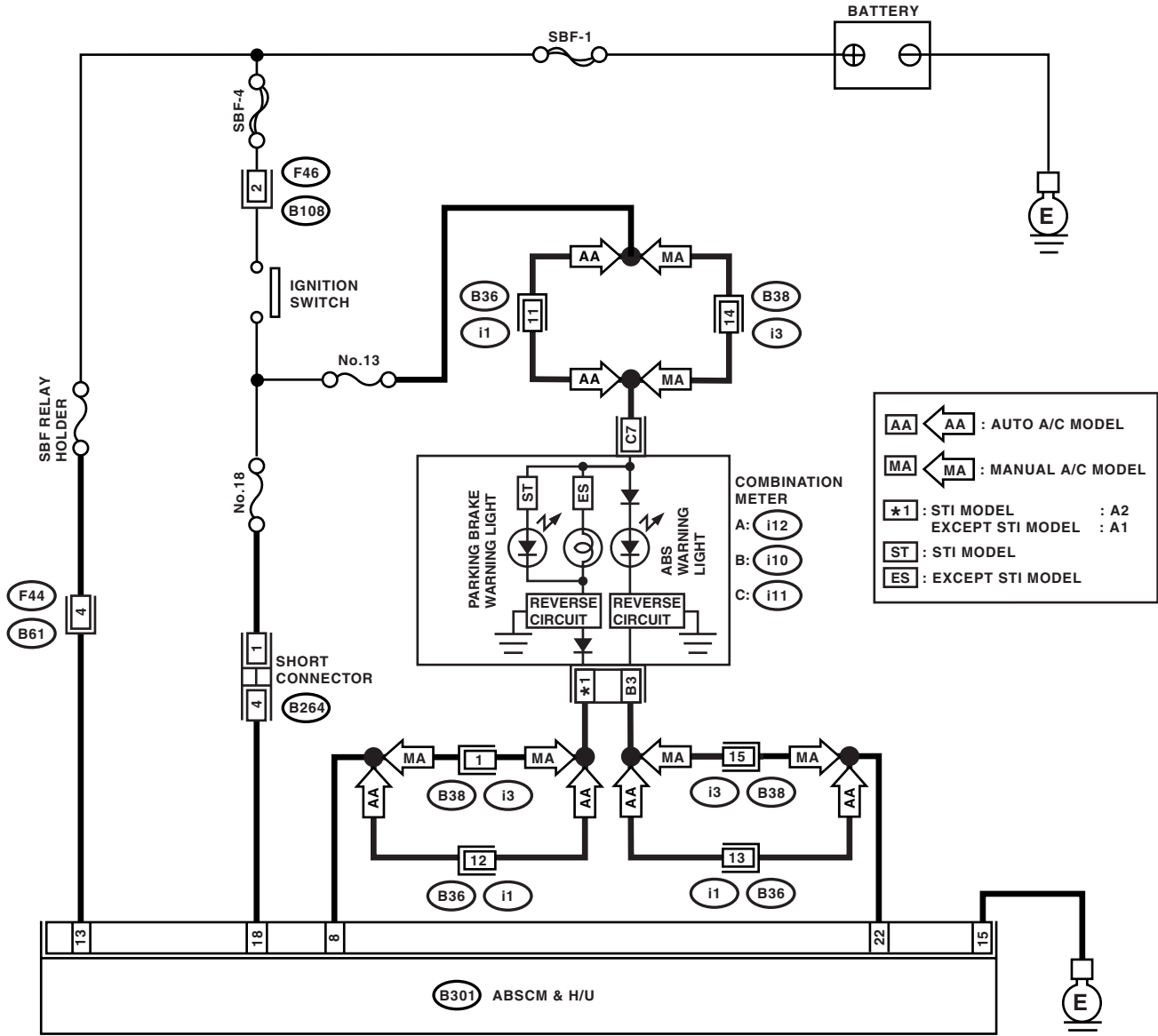
### NOTE:

When the ABS warning light is OFF and “NO TROUBLE CODE” is displayed on Subaru Select Monitor, the system is in normal condition.

# Subaru Select Monitor

ABS (DIAGNOSTICS)

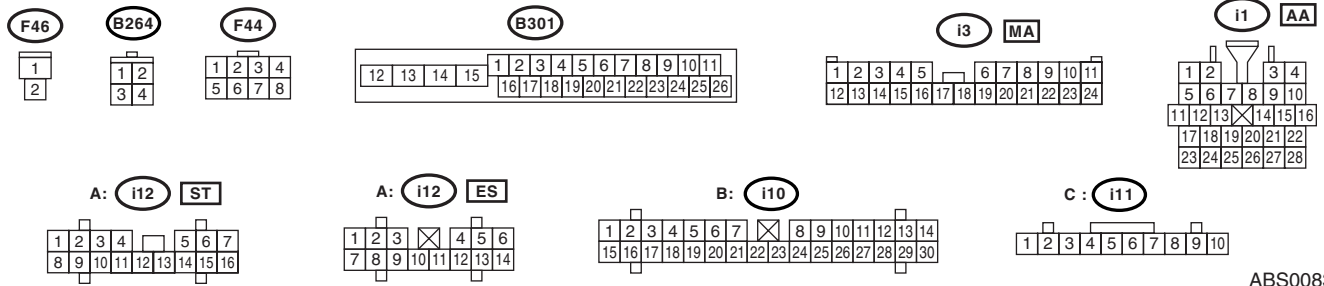
## WIRING DIAGRAM:



**COMBINATION METER**

- AA ← AA : AUTO A/C MODEL
- MA ← MA : MANUAL A/C MODEL
- ★1 : STI MODEL : A2  
EXCEPT STI MODEL : A1
- ST : STI MODEL
- ES : EXCEPT STI MODEL

A: (112)  
B: (110)  
C: (111)



ABS00833

# Subaru Select Monitor

ABS (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <b>1 DATA CHECK SUBARU SELECT MONITOR.</b><br>1) Select {Current Data Display & Save} in Subaru Select Monitor.<br>2) Read the condition of "ABS warning light".  | Is "ON" indicated?  | Replace the ABSCM only.<br><Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> | Go to step 2.   |
| <b>2 CHECK WIRING HARNESS.</b><br>Measure the resistance between ABSCM connector and combination meter connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(i10) No. 3 — (B301) No. 22:</b></i> | Is the resistance less than 0.5 Ω?  | Go to step 3.   | Repair harness and connector between ABSCM&H/U and combination meter connector. |
| <b>3 CHECK POOR CONTACT IN CONNECTOR.</b>   | Is there poor contact in ABSCM connector and combination meter connector? | Repair the connector.   | Check the combination meter.  |

## Read Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

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### 7. Read Diagnostic Trouble Code (DTC)

#### A: OPERATION

Refer to SUBARU SELECT MONITOR for details about reading of DTCs. <Ref. to ABS(diag)-16, Subaru Select Monitor.>

## 8. Inspection Mode

### A: PROCEDURE

Reproduce the condition under which the problem has occurred as much as possible.

Drive the vehicle at a speed more than 40 km/h (25 MPH) for at least 1 minute.

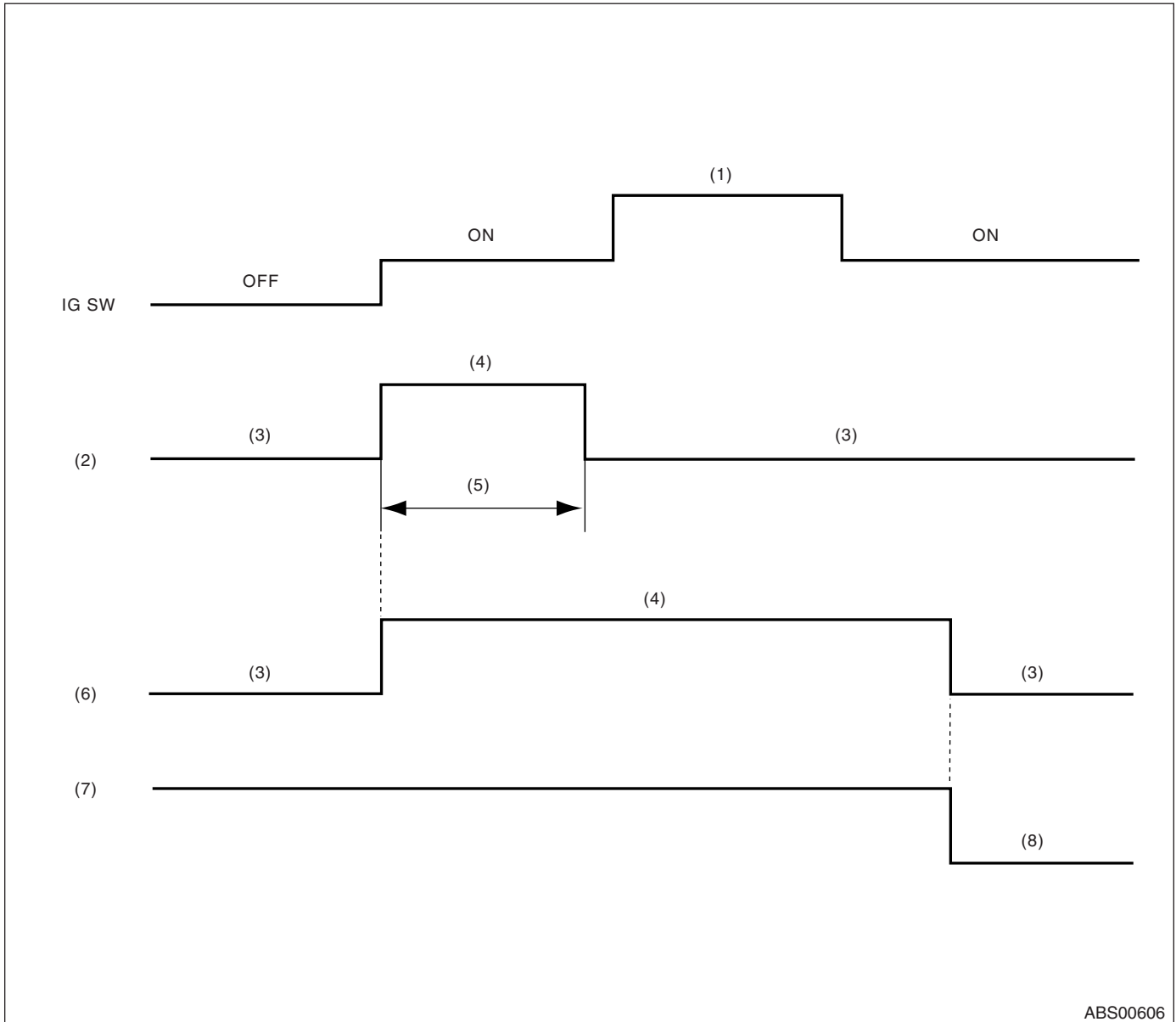
### **9. Clear Memory Mode**

#### **A: OPERATION**

Refer to SUBARU SELECT MONITOR for details about how to clear DTC. <Ref. to ABS(diag)-16, Subaru Select Monitor.>

## 10.ABS Warning Light/Brake Warning Light Illumination Pattern

### A: INSPECTION



ABS00606

- |                       |   |                   |
|-----------------------|---|-------------------|
| (1) Start             | (4) Illuminates                             | (7) Parking brake |
| (2) ABS warning light | (5) About 2 sec.                            | (8) Release       |
| (3) Goes out          | (6) Brake warning light (EBD warning light) |                   |

1) When the ABS warning light does not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.

2) When the ABS warning light remains constantly OFF, repair the ABS warning light circuit or diagnosis circuit.

**NOTE:**

Even though the ABS warning light does not go out about 2 seconds after it illuminates, the ABS system operates normally when the warning light goes out while driving at approx. 12 km/h (7 MPH). However, the Anti-lock brakes do not work while ABS warning light is illuminated.



# ABS Warning Light/Brake Warning Light Illumination Pattern

ABS (DIAGNOSTICS)

## B: ABS WARNING LIGHT DOES NOT COME ON

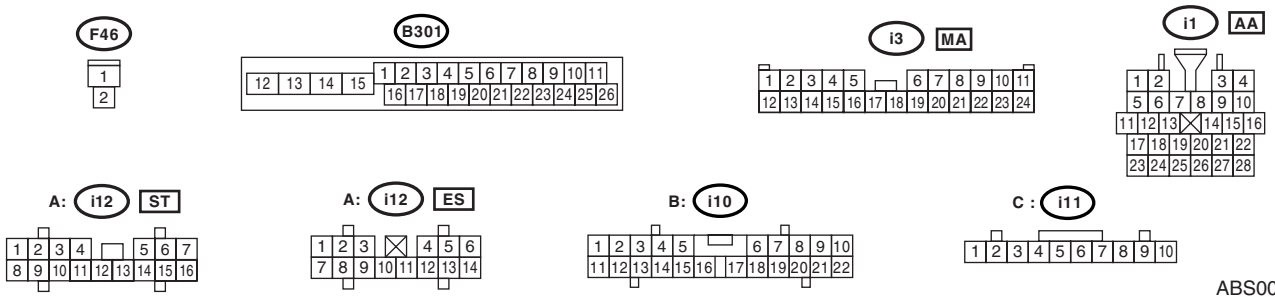
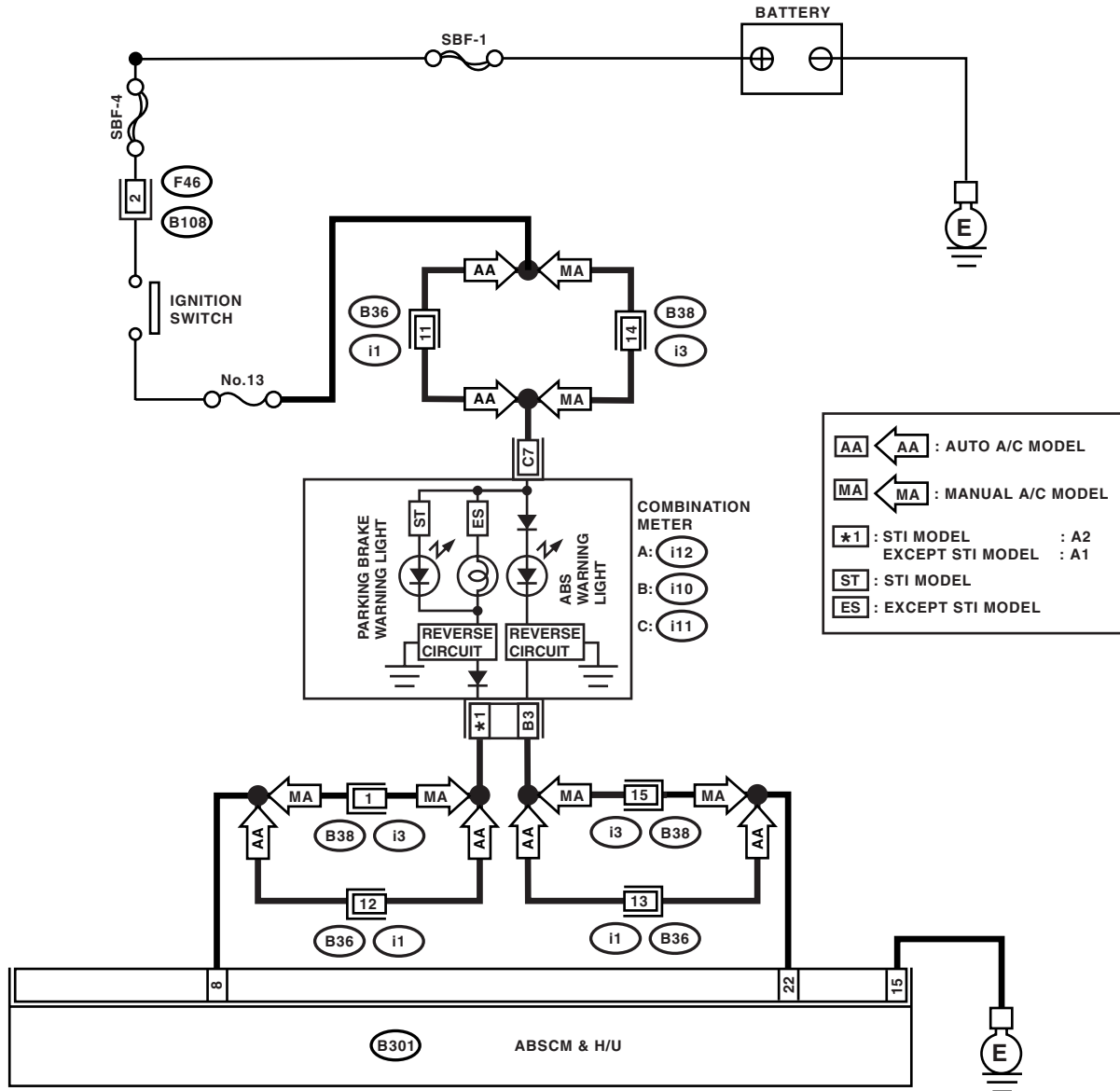
### DETECTING CONDITION:

- Defective combination meter
- Defective harness

### TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), ABS warning light does not come on.

### WIRING DIAGRAM:



ABS00834

# ABS Warning Light/Brake Warning Light Illumination Pattern

ABS (DIAGNOSTICS)

| Step  | Check                               | Yes                                     | No  |
|---|-------------------------------------|---|---|
| <b>1</b><br><b>CHECK ILLUMINATION OF OTHER LIGHTS.</b><br>Turn the ignition switch to ON. (engine OFF)  | Do other warning lights illuminate? | Go to step <b>2</b> .                   | Check the combination meter.  |
| <b>2</b><br><b>READ DTC.</b><br>Read the DTC. <Ref. to ABS(diag)-24, Read Diagnostic Trouble Code (DTC).>   | Is DTC displayed?                   | Perform the diagnosis according to DTC. | Go to step <b>3</b> .   |
| <b>3</b><br><b>CHECK GROUND SHORT OF HARNESS.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ABSCM&H/U.<br>3) Disconnect the connector from the combination meter.<br>4) Measure the resistance between ABSCM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B301) No. 22 — Chassis ground:</b>          | Is the resistance more than 1 MΩ?   | Go to step <b>4</b> .                   | Repair harness and connector between ABSCM&H/U and combination meter connector.                                     |
| <b>4</b><br><b>CHECK ABSCM.</b><br>1) Connect the connector to the ABSCM&H/U.<br>2) Turn the ignition to ON.<br>3) Immediately after turning ignition switch to ON (within 1.5 seconds), measure the resistance of harness between the combination meter connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(i10) No. 3 — Chassis ground:</b> | Is the resistance more than 1 MΩ?   | Check the combination meter.            | Replace the ABSCM only.<br><Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> |

# ABS Warning Light/Brake Warning Light Illumination Pattern

ABS (DIAGNOSTICS)

## C: ABS WARNING LIGHT DOES NOT GO OFF

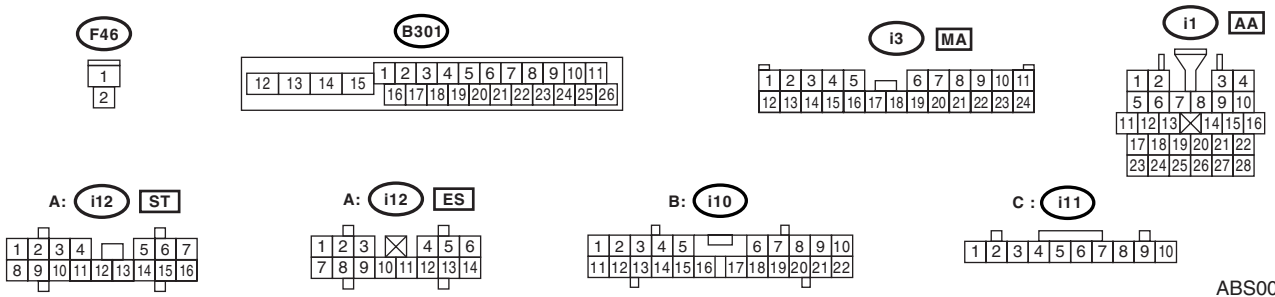
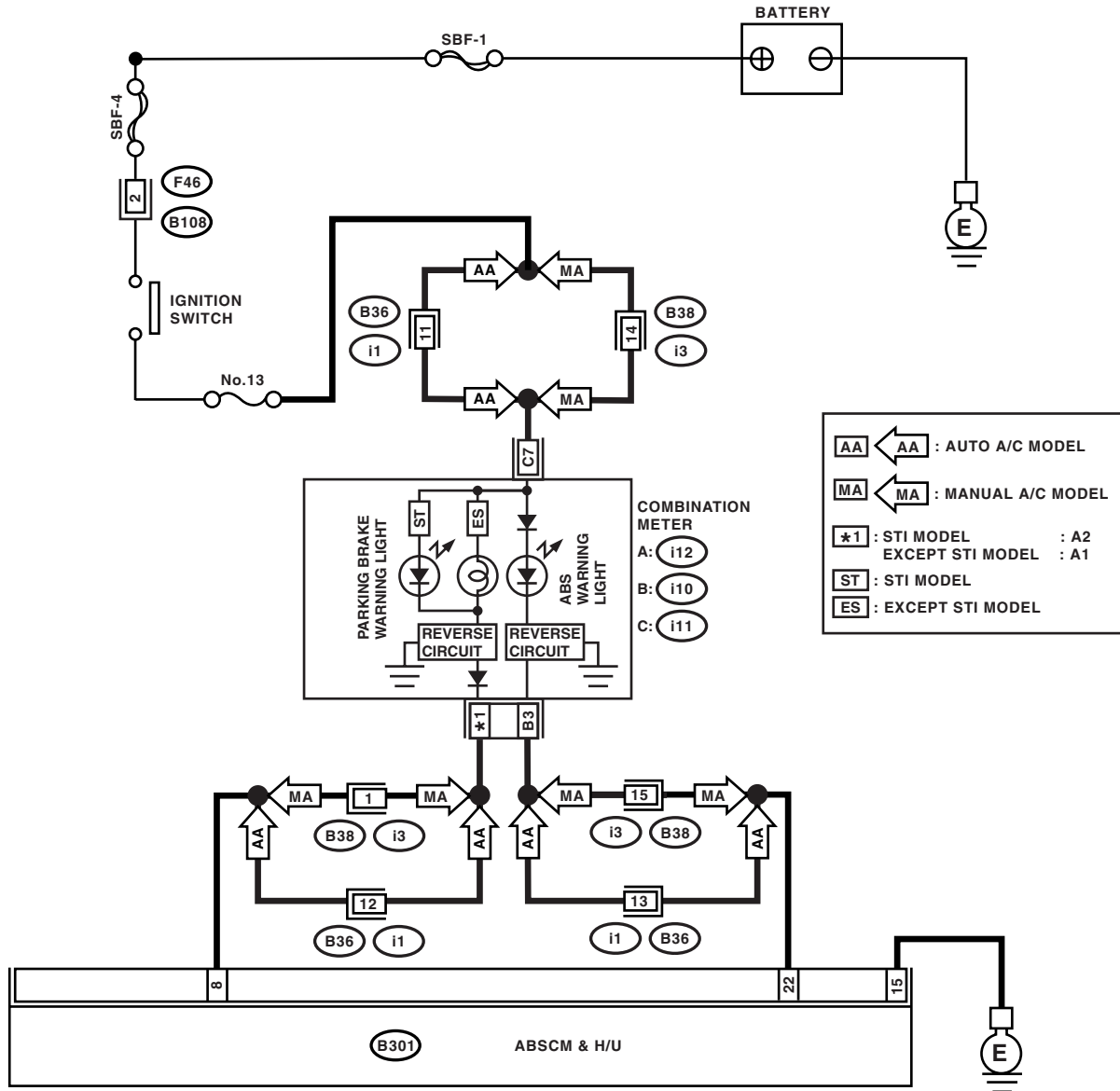
### DETECTING CONDITION:

- Defective combination meter
- Open in harness

### TROUBLE SYMPTOM:

When starting the engine, the ABS warning light is kept on.

### WIRING DIAGRAM:



ABS00834

# ABS Warning Light/Brake Warning Light Illumination Pattern

ABS (DIAGNOSTICS)

| Step  | Check                                      | Yes                                     | No   |
|---|--|---|--|
| <b>1 READ DTC.</b><br>Read the DTC. <Ref. to ABS(diag)-24, Read Diagnostic Trouble Code (DTC).>   | Is DTC displayed?                          | Perform the diagnosis according to DTC. | Go to step 2.  |
| <b>2 CHECK WIRING HARNESS.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ABSCM&H/U.<br>3) Disconnect the connector from the combination meter.<br>4) Measure the resistance between ABSCM connector and combination meter connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B301) No. 22 — (i10) No. 3:</b></i> | Is the resistance less than 0.5 $\Omega$ ? | Go to step 3.                           | Repair harness and connector between ABSCM&H/U and combination meter connector.                                  |
| <b>3 CHECK POOR CONTACT IN CONNECTOR.</b><br>Check poor contact in all connectors.  | Is there poor contact?                     | Repair the connector.                   | Go to step 4.  |
| <b>4 CHECK ABSCM.</b><br>1) Connect the connector to the ABSCM&H/U.<br>2) Turn the ignition switch to ON.<br>3) Measure the resistance between combination meter connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(i10) No. 3 — Chassis ground:</b></i>   | Is the resistance less than 0.5 $\Omega$ ? | Check the combination meter.            | Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> |

# ABS Warning Light/Brake Warning Light Illumination Pattern

ABS (DIAGNOSTICS)

## D: BRAKE WARNING LIGHT DOES NOT GO OFF

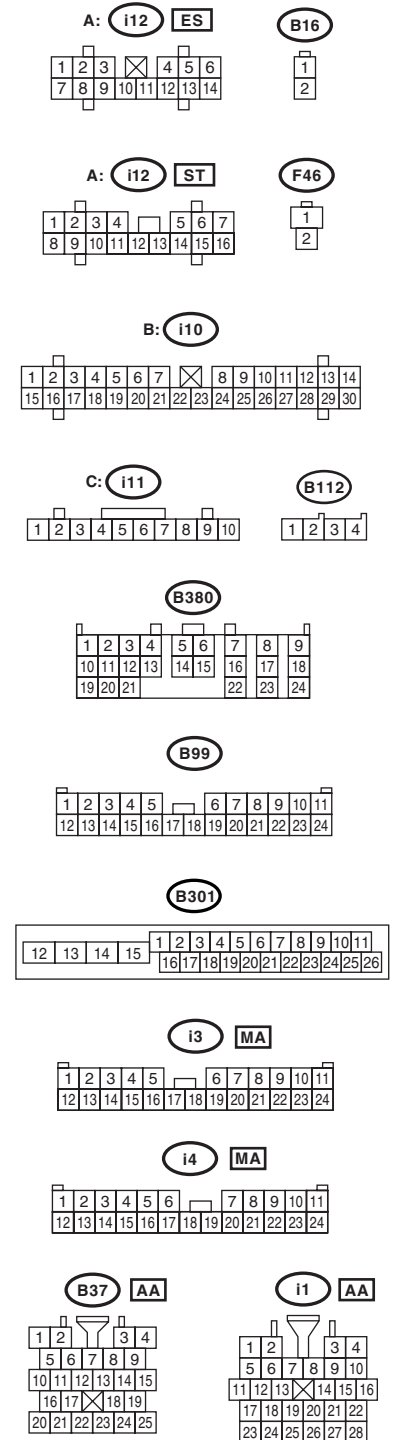
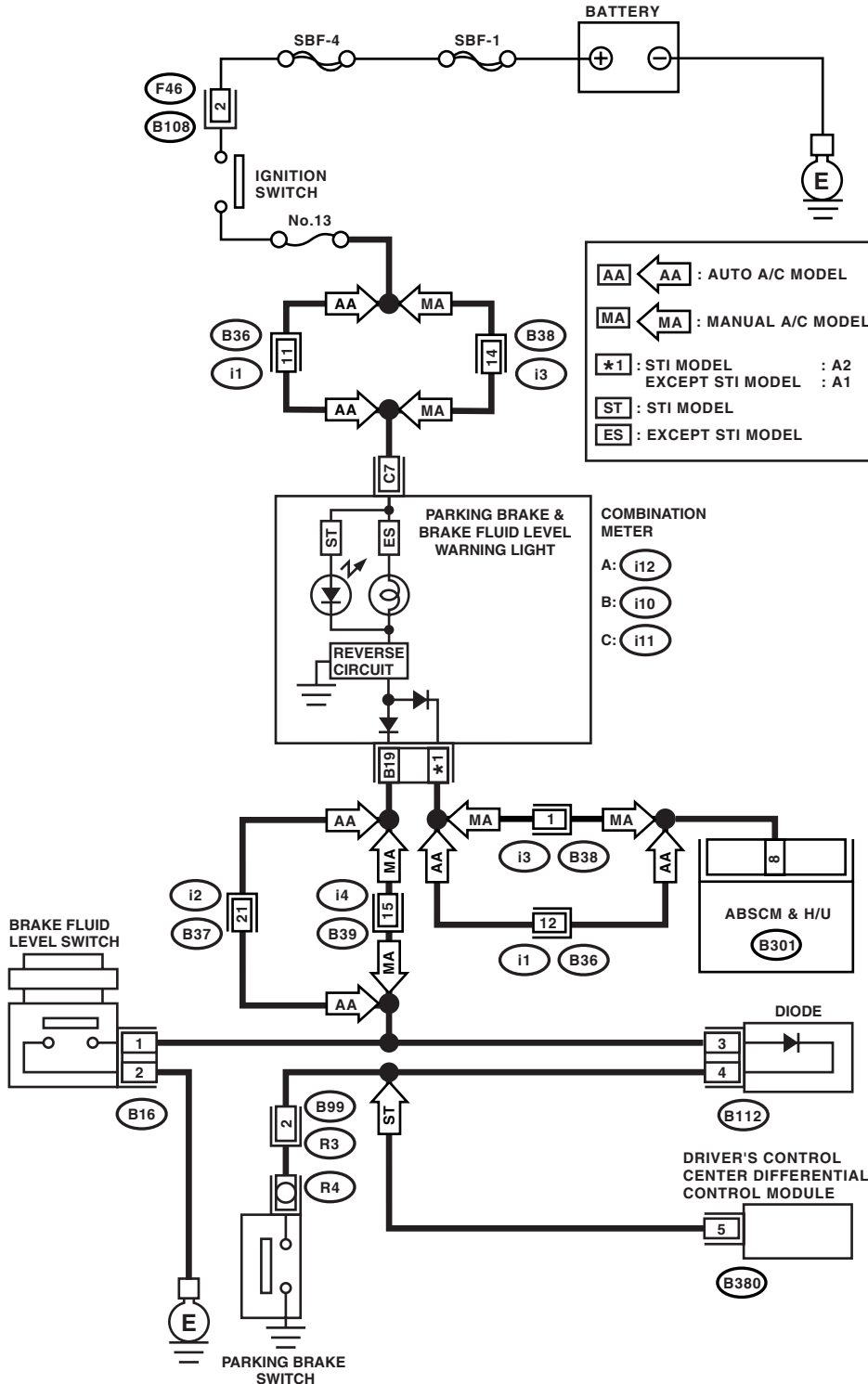
### DETECTING CONDITION:

- Brake warning light circuit is shorted.
- Defective sensor/connector

### TROUBLE SYMPTOM:

After starting the engine, the brake warning light is kept on though the parking lever is released.

### WIRING DIAGRAM:



ABS00835

# ABS Warning Light/Brake Warning Light Illumination Pattern

ABS (DIAGNOSTICS)

| Step   | Check  | Yes                                     | No   |
|--|--|---|--|
| <b>1</b><br><b>CHECK INSTALLATION OF ABSCM&amp;H/U CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Check that the ABSCM&H/U connector is inserted to ABSCM&H/U until the clamp locks onto it.  | Is the connector correctly inserted?                           | Go to step 2.                           | Insert the ABSCM&H/U connector until the clamp locks onto it.  |
| <b>2</b><br><b>READ DTC.</b><br>Read the DTC. <Ref. to ABS(diag)-24, Read Diagnostic Trouble Code (DTC).>  | Is DTC displayed?  | Perform the diagnosis according to DTC. | Go to step 3.  |
| <b>3</b><br><b>CHECK THE BRAKE FLUID AMOUNT.</b><br>Check the amount of brake fluid in the reservoir tank of master cylinder.  | Is the amount of brake fluid between the lines of MAX and MIN? | Go to step 4.                           | Replenish brake fluid to the specified value.  |
| <b>4</b><br><b>CHECK BRAKE FLUID LEVEL SWITCH.</b><br>1) Disconnect the brake fluid level switch connector (B16) from master cylinder.<br>2) Measure the resistance of brake fluid switch terminals.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b>  | Is the resistance more than 1 M $\Omega$ ?                     | Go to step 5.                           | Replace the master cylinder.   |
| <b>5</b><br><b>CHECK PARKING BRAKE SWITCH.</b><br>1) Disconnect the connector (R4) from parking brake switch.<br>2) Release the parking brake.<br>3) Measure the resistance between parking brake switch terminal and chassis ground.  | Is the resistance more than 1 M $\Omega$ ?                     | Go to step 6.                           | Replace the parking brake switch.  |
| <b>6</b><br><b>CHECK GROUND SHORT OF HARNESS.</b><br>1) Disconnect the connector from combination meter.<br>2) Measure the resistance between combination meter connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(i10) No. 19 — Chassis ground:</b>                                      | Is the resistance more than 1 M $\Omega$ ?                     | Go to step 7.                           | Repair the harness connector between combination meter and parking brake switch.                                 |
| <b>7</b><br><b>CHECK HARNESS.</b><br>1) Disconnect the connector from ABSCM&H/U.<br>2) Disconnect the connector from the combination meter.<br>3) Measure the resistance between ABSCM&H/U connector and combination meter connector.<br><b>Connector &amp; terminal</b><br><b>(B301) No. 8 — (i12) No. 1:</b> | Is the resistance less than 0.5 $\Omega$ ?                     | Go to step 8.                           | Repair harness between ABSCM&H/U and combination meter connector.  |
| <b>8</b><br><b>CHECK POOR CONTACT IN CONNECTOR.</b><br>Check poor contact in all connectors.   | Is there poor contact?   | Repair the connector.                   | Go to step 9.  |
| <b>9</b><br><b>CHECK ABSCM.</b><br>1) Connect the connector to the ABSCM&H/U.<br>2) Turn the ignition switch to ON.<br>3) Measure the resistance between combination meter connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(i12) No. 1 — Chassis ground:</b>                            | Is the resistance less than 0.5 $\Omega$ ?                     | Check the combination meter.            | Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> |

## List of Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

### 11. List of Diagnostic Trouble Code (DTC)

#### A: LIST

| DTC | Display screen   | Contents of diagnosis   | Index No.  |
|-----|--|---|--|
| —   | Communication for initializing impossible                        | Subaru Select Monitor communication failure   | <Ref. to ABS(diag)-19, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>  |
| —   | No DTC   | Although no DTC appears on the Subaru Select Monitor display, the ABS warning light remains on. | <Ref. to ABS(diag)-21, NO TROUBLE CODE, INSPECTION, Subaru Select Monitor.>  |
| 21  | Open or short circuit in Front ABS wheel speed sensor RH circuit | Open or short circuit in Front ABS wheel speed sensor RH circuit                                | <Ref. to ABS(diag)-36, DTC 21 OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 22  | Front ABS wheel speed sensor RH abnormal signal                  | Front ABS wheel speed sensor RH abnormal signal   | <Ref. to ABS(diag)-42, DTC 22 FRONT RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                  |
| 23  | Open or short circuit in Front ABS wheel speed sensor LH circuit | Open or short circuit in Front ABS wheel speed sensor LH circuit                                | <Ref. to ABS(diag)-36, DTC 23 OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| 24  | Front ABS wheel speed sensor LH abnormal signal                  | Front ABS wheel speed sensor LH abnormal signal   | <Ref. to ABS(diag)-42, DTC 24 FRONT LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                   |
| 25  | Open or short circuit in Rear ABS wheel speed sensor RH circuit  | Open or short circuit in Rear ABS wheel speed sensor RH circuit                                 | <Ref. to ABS(diag)-36, DTC 25 OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| 26  | Rear ABS wheel speed sensor RH abnormal signal                   | Rear ABS wheel speed sensor RH abnormal signal  | <Ref. to ABS(diag)-42, DTC 26 REAR RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                   |
| 27  | Open or short circuit in Rear ABS wheel speed sensor LH circuit  | Open or short circuit in Rear ABS wheel speed sensor LH circuit                                 | <Ref. to ABS(diag)-37, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| 28  | Rear ABS wheel speed sensor LH abnormal signal                   | Rear ABS wheel speed sensor LH abnormal signal  | <Ref. to ABS(diag)-43, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                    |
| 29  | Abnormal ABS wheel speed sensor signal on any one of four sensor | Abnormal ABS wheel speed sensor signal on any one of four                                       | <Ref. to ABS(diag)-47, DTC 29 ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>    |
| 31  | Front inlet valve RH malfunction                                 | Front inlet valve RH malfunction  | <Ref. to ABS(diag)-51, DTC 31 FRONT RIGHT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                 |
| 32  | Front outlet valve RH malfunction                                | Front outlet valve RH malfunction   | <Ref. to ABS(diag)-53, DTC 32 FRONT RIGHT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                |
| 33  | Front inlet valve LH malfunction                                 | Front inlet valve LH malfunction  | <Ref. to ABS(diag)-51, DTC 33 FRONT LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                  |
| 34  | Front outlet valve LH malfunction                                | Front outlet valve LH malfunction   | <Ref. to ABS(diag)-53, DTC 34 FRONT LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                 |
| 35  | Rear inlet valve RH malfunction                                  | Rear inlet valve RH malfunction   | <Ref. to ABS(diag)-51, DTC 35 REAR RIGHT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                  |

## List of Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

| DTC | Display screen                               | Contents of diagnosis  | Index No.   |
|-----|--|--|---|
| 36  | Rear outlet valve RH malfunction             | Rear outlet valve RH malfunction                             | <Ref. to ABS(diag)-53, DTC 36 REAR RIGHT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                          |
| 37  | Rear inlet valve LH malfunction              | Rear inlet valve LH malfunction                              | <Ref. to ABS(diag)-51, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                            |
| 38  | Rear outlet valve LH malfunction             | Rear outlet valve LH malfunction                             | <Ref. to ABS(diag)-53, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                           |
| 41  | ABS control module malfunction               | ABSCM&H/U  | <Ref. to ABS(diag)-56, DTC 41 ABS CONTROL MODULE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                               |
| 42  | Power supply voltage Failure                 | Power voltage malfunction                                    | <Ref. to ABS(diag)-57, DTC 42 POWER VOLTAGE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                    |
| 47  | Improper CAN Communication                   | CAN communication circuit failure                            | <Ref. to ABS(diag)-60, DTC 47 IMPROPER CAN COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                   |
| 51  | Valve relay malfunction                      | Valve relay malfunction                                      | <Ref. to ABS(diag)-63, DTC 51 VALVE RELAY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                      |
| 52  | Motor and motor Relay                        | Motor/motor relay on failure                                 | <Ref. to ABS(diag)-66, DTC 52 MOTOR / MOTOR RELAY ON FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                               |
| 54  | Stop light switch signal circuit malfunction | Stop light switch signal circuit malfunction                 | <Ref. to ABS(diag)-69, DTC 54 STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                 |
| 56  | G sensor Failure                             | Faulty G sensor output voltage or output signal              | <Ref. to ABS(diag)-71, DTC 56 FAULTY G SENSOR OUTPUT VOLTAGE OR OUTPUT SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>              |
| 73  | Lateral G sensor Failure                     | Lateral G sensor output voltage or output signal malfunction | <Ref. to ABS(diag)-74, DTC 73 LATERAL G SENSOR OUTPUT VOLTAGE OR OUTPUT SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

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### 12. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

#### **A: DTC 21 OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS WHEEL SPEED SENSOR CIRCUIT**

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS(diag)-37, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

#### **B: DTC 23 OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS WHEEL SPEED SENSOR CIRCUIT**

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS(diag)-37, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

#### **C: DTC 25 OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS WHEEL SPEED SENSOR CIRCUIT**

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS(diag)-37, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

## D: DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT

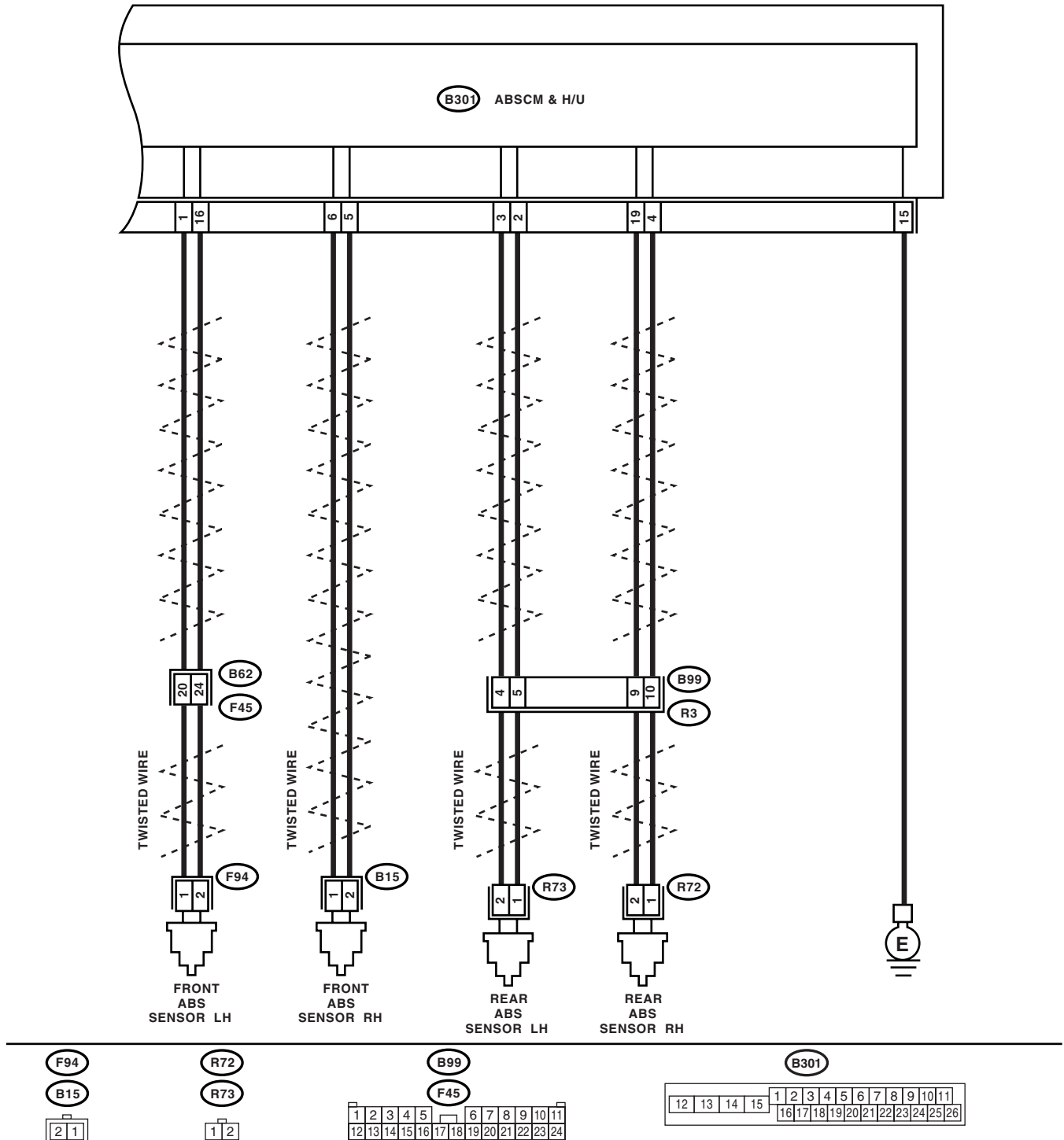
### DIAGNOSIS:

- Faulty ABS wheel speed sensor (Broken wire, input voltage too high)
- Faulty harness connector

### TROUBLE SYMPTOM:

ABS does not operate.

### WIRING DIAGRAM:



ABS00607

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ABS (DIAGNOSTICS)

| Step | Check   | Yes   | No  |  |
|------|---|---|---|--|
| 1    | <b>CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR.</b><br>1) Select "Current data display & Save" on the Subaru Select Monitor.<br>2) Read the ABS wheel speed sensor output corresponding to faulty system in the Subaru Select Monitor data display mode. | Does the speed indicated on display change in response to speedometer reading during acceleration/deceleration when the steering wheel is in straight-ahead position? | Go to step 2.   | Go to step 8.  |
| 2    | <b>CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.</b>  | Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?   | Go to step 3.   | Tighten the ABS wheel speed sensor installation bolts securely.  |
| 3    | <b>CHECK ABS WHEEL SPEED SENSOR GAP.</b><br>Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.  | Is the gap as following value?<br>Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in)<br>Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)   | Go to step 4.   | Adjust the gap.<br>NOTE:<br>Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel. |
| 4    | <b>CHECK TONE WHEEL RUNOUT.</b><br>Measure the tone wheel runout.   | Is the runout less than 0.05 mm (0.0020 in)?  | Go to step 5.   | Replace the tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.><br>Rear: <Ref. to ABS-20, Rear Tone Wheel.>   |
| 5    | <b>CHECK POOR CONTACT IN CONNECTORS.</b><br>Turn the ignition switch to OFF.  | Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?   | Repair the connector.   | Go to step 6.  |
| 6    | <b>CHECK ABSCM&amp;H/U.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.  | Is the same DTC as in the current diagnosis still being output?   | Replace the ABSCM&H/U.<br><Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> | Go to step 7.  |
| 7    | <b>CHECK ANY OTHER DTC APPEARANCE.</b>  | Are other DTCs being output?  | Proceed with the diagnosis corresponding to DTC.  | A temporary poor contact.<br>NOTE:<br>Check the harness and connectors between ABSCM&H/U and ABS wheel speed sensor.                                       |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

| Step   | Check  | Yes            | No  |
|--|--|----------------|---|
| <b>8 CHECK ABS WHEEL SPEED SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ABS wheel speed sensor.<br>3) Measure the resistance of ABS wheel speed sensor connector terminals while shaking the harness lightly.<br><i>Terminals</i><br><i>Front RH No. 1 — No. 2:</i><br><i>Front LH No. 1 — No. 2:</i><br><i>Rear RH No. 1 — No. 2:</i><br><i>Rear LH No. 1 — No. 2:</i>  | Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ | Go to step 9.  | Replace the ABS wheel speed sensor. Front: <Ref. to ABS-13, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-16, Rear ABS Wheel Speed Sensor.> |
| <b>9 CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.</b><br>1) Disconnect the connector from ABSCM&H/U.<br>2) Measure the voltage between ABS wheel speed sensor and chassis ground.<br><i>Terminals</i><br><i>Front RH No. 1 (+) — Chassis ground (-):</i><br><i>Front LH No. 1 (+) — Chassis ground (-):</i><br><i>Rear RH No. 1 (+) — Chassis ground (-):</i><br><i>Rear LH No. 1 (+) — Chassis ground (-):</i>  | Is the voltage less than 1 V?  | Go to step 10. | Replace the ABS wheel speed sensor. Front: <Ref. to ABS-13, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-16, Rear ABS Wheel Speed Sensor.> |
| <b>10 CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ABS wheel speed sensor and chassis ground.<br><i>Terminals</i><br><i>Front RH No. 1 (+) — Chassis ground (-):</i><br><i>Front LH No. 1 (+) — Chassis ground (-):</i><br><i>Rear RH No. 1 (+) — Chassis ground (-):</i><br><i>Rear LH No. 1 (+) — Chassis ground (-):</i>  | Is the voltage less than 1 V?  | Go to step 11. | Replace the ABS wheel speed sensor. Front: <Ref. to ABS-13, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-16, Rear ABS Wheel Speed Sensor.> |
| <b>11 CHECK HARNESS/CONNECTOR BETWEEN ABSCM&amp;H/U AND ABS WHEEL SPEED SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the connector to ABS wheel speed sensor.<br>3) Measure the resistance between ABSCM&H/U connector terminals.<br><i>Connector &amp; terminal</i><br><i>DTC 21</i><br><i>(B301) No. 6 — No. 5:</i><br><i>DTC 23</i><br><i>(B301) No. 1 — No. 16:</i><br><i>DTC 25</i><br><i>(B301) No. 19 — No. 4:</i><br><i>DTC 27</i><br><i>(B301) No. 3 — No. 2:</i> | Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ | Go to step 12. | Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.  |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ABS (DIAGNOSTICS)

| Step   | Check  | Yes            | No   |
|--|--|----------------|--|
| <b>12 CHECK BATTERY SHORT OF HARNESS.</b><br>Measure the voltage between ABSCM&H/U connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>DTC 21</b></i><br><i><b>(B301) No. 6 (+) — Chassis ground (-):</b></i><br><i><b>DTC 23</b></i><br><i><b>(B301) No. 1 (+) — Chassis ground (-):</b></i><br><i><b>DTC 25</b></i><br><i><b>(B301) No. 19 (+) — Chassis ground (-):</b></i><br><i><b>DTC 27</b></i><br><i><b>(B301) No. 3 (+) — Chassis ground (-):</b></i>  | Is the voltage less than 1 V?  | Go to step 13. | Repair the harness between ABSCM&H/U and ABS wheel speed sensor.   |
| <b>13 CHECK BATTERY SHORT OF HARNESS.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between ABSCM&H/U connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>DTC 21</b></i><br><i><b>(B301) No. 6 (+) — Chassis ground (-):</b></i><br><i><b>DTC 23</b></i><br><i><b>(B301) No. 1 (+) — Chassis ground (-):</b></i><br><i><b>DTC 25</b></i><br><i><b>(B301) No. 19 (+) — Chassis ground (-):</b></i><br><i><b>DTC 27</b></i><br><i><b>(B301) No. 3 (+) — Chassis ground (-):</b></i> | Is the voltage less than 1 V?  | Go to step 14. | Repair the harness between ABSCM&H/U and ABS wheel speed sensor.   |
| <b>14 CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.</b>  | Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf·m, 24 ft·lb)?                                  | Go to step 15. | Tighten the ABS wheel speed sensor installation bolts securely.  |
| <b>15 CHECK ABS WHEEL SPEED SENSOR GAP.</b><br>Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.  | Is the gap as following value?<br>Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in) | Go to step 16. | Adjust the gap.<br><br>NOTE:<br>Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel. |
| <b>16 CHECK TONE WHEEL RUNOUT.</b><br>Measure the tone wheel runout.   | Is the runout less than 0.05 mm (0.0020 in)?   | Go to step 17. | Replace the tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.><br>Rear: <Ref. to ABS-20, Rear Tone Wheel.>   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

| Step   | Check   | Yes  | No   |
|--|---|--|--|
| <b>17 CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the resistance between ABS wheel speed sensor and chassis ground.<br><b>Terminals</b><br><i>Front RH No. 1 — Chassis ground:</i><br><i>Front LH No. 1 — Chassis ground:</i><br><i>Rear RH No. 1 — Chassis ground:</i><br><i>Rear LH No. 1 — Chassis ground:</i>  | Is the resistance more than 1 M $\Omega$ ?  | Go to step 18.                                   | Replace the ABS wheel speed sensor and ABSCM&H/U.<br>Front: <Ref. to ABS-13, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-16, Rear ABS Wheel Speed Sensor.> and <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> |
| <b>18 CHECK GROUND SHORT OF HARNESS.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the connector to ABS wheel speed sensor.<br>3) Measure the resistance between ABSCM&H/U connector terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>DTC 21</b><br><i>(B301) No. 6 — Chassis ground:</i><br><b>DTC 23</b><br><i>(B301) No. 1 — Chassis ground:</i><br><b>DTC 25</b><br><i>(B301) No. 19 — Chassis ground:</i><br><b>DTC 27</b><br><i>(B301) No. 3 — Chassis ground:</i> | Is the resistance more than 1 M $\Omega$ ?  | Go to step 19.                                   | Repair the harness between ABSCM&H/U and ABS wheel speed sensor.<br>And replace the ABSCM&H/U.<br><Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>  |
| <b>19 CHECK POOR CONTACT IN CONNECTORS.</b>  | Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor? | Repair the connector.                            | Go to step 20.   |
| <b>20 CHECK ABSCM&amp;H/U.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.  | Is the same DTC as in current diagnosis still being output?                       | Replace the ABSCM&H/U.                           | Go to step 21.   |
| <b>21 CHECK ANY OTHER DTC APPEARANCE.</b>  | Are other DTCs being output?  | Proceed with the diagnosis corresponding to DTC. | A temporary poor contact.<br>NOTE:<br>Check the harness and connectors between ABSCM&H/U and ABS wheel speed sensor.   |

## **Diagnostic Procedure with Diagnostic Trouble Code (DTC)**

ABS (DIAGNOSTICS)

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### **E: DTC 22 FRONT RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL**

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS(diag)-43, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **F: DTC 24 FRONT LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL**

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS(diag)-43, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

### **G: DTC 26 REAR RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL**

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS(diag)-43, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

## H: DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL

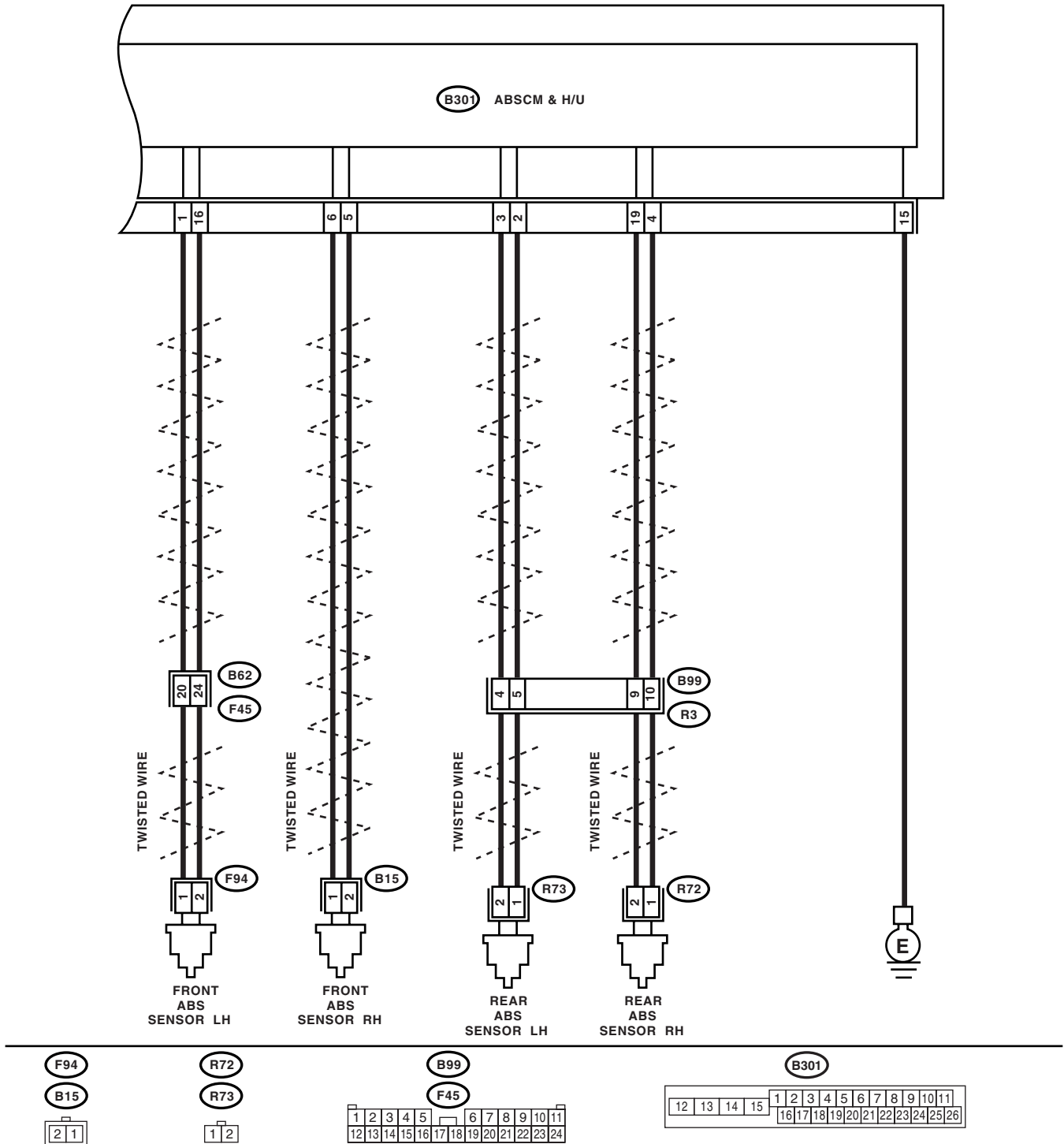
### DIAGNOSIS:

- Faulty ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

### TROUBLE SYMPTOM:

ABS does not operate.

### WIRING DIAGRAM:



ABS00607



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ABS (DIAGNOSTICS)

| Step     | Check   | Yes   | No  |  |
|----------|---|---|---|--|
| <b>1</b> | <b>CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR.</b><br>1) Select "Current data display & Save" on the Subaru Select Monitor.<br>2) Read the ABS wheel speed sensor output corresponding to faulty system in the Subaru Select Monitor data display mode. | Does the speed indicated on display change in response to speedometer reading during acceleration/deceleration when the steering wheel is in straight-ahead position? | Go to step 2.   | Go to step 7.  |
| <b>2</b> | <b>CHECK POOR CONTACT IN CONNECTORS.</b><br>Turn the ignition switch to OFF.  | Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?   | Repair the connector.   | Go to step 3.  |
| <b>3</b> | <b>CHECK SOURCES OF SIGNAL NOISE.</b>   | Is the car telephone or wireless transmitter properly installed?  | Go to step 4.   | Properly install the car telephone or wireless transmitter.  |
| <b>4</b> | <b>CHECK SOURCES OF SIGNAL NOISE.</b>   | Are noise sources (such as an antenna) installed near the sensor harness?   | Install the noise sources apart from sensor harness.  | Go to step 5.  |
| <b>5</b> | <b>CHECK ABSCM&amp;H/U.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.  | Is the same DTC as in the current diagnosis still being output?   | Replace the ABSCM&H/U.<br><Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> | Go to step 6.  |
| <b>6</b> | <b>CHECK ANY OTHER DTC APPEARANCE.</b>  | Are other DTCs being output?  | Proceed with the diagnosis corresponding to DTC.  | A temporary noise interference.  |
| <b>7</b> | <b>CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.</b>  | Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?   | Go to step 8.   | Tighten the ABS wheel speed sensor installation bolts securely.  |
| <b>8</b> | <b>CHECK ABS WHEEL SPEED SENSOR GAP.</b><br>Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of wheel.  | Is the gap as following value?<br>Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)  | Go to step 9.   | Adjust the gap.<br>NOTE:<br>Adjust the gap using spacer (Part No. 26755AA000).<br>If the spacers cannot correct gap, replace worn sensor or worn tone wheel. |
| <b>9</b> | <b>PREPARE OSCILLOSCOPE.</b>  | Is an oscilloscope available?   | Go to step 10.  | Go to step 11.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

| Step   | Check   | Yes   | No   |
|--|---|---|--|
| <b>10 CHECK ABS WHEEL SPEED SENSOR SIGNAL.</b><br>1) Raise all four wheels off ground.<br>2) Turn the ignition switch to OFF.<br>3) Connect the oscilloscope to the connector.<br>4) Turn the ignition switch to ON.<br>5) Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS(diag)-15, WAVEFORM, Control Module I/O Signal.><br><br><b>NOTE:</b><br>When this inspection is completed, the ABS&H/U sometimes stores DTC 29 or DTC 56.<br><br><i>Connector &amp; terminal</i><br><b>DTC 22</b><br>(B15) No. 1 (+) — No. 2 (-):<br><b>DTC 24</b><br>(B62) No. 20 (+) — No. 24 (-):<br><b>DTC 26</b><br>(B99) No. 10 (+) — No. 9 (-):<br><b>DTC 28</b><br>(B99) No. 5 (+) — No. 4 (-): | Is the waveform pattern on oscilloscope as shown in the figure?                                 | Go to step 14.                                  | Go to step 11.   |
| <b>11 CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.</b><br>Remove the disc rotor or drum from hub in accordance with DTC.   | Is the ABS wheel speed sensor piece or tone wheel contaminated by dirt or other foreign matter? | Thoroughly remove dirt or other foreign matter. | Go to step 12.   |
| <b>12 CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.</b>  | Are there broken or damaged in the ABS wheel speed sensor piece or tone wheel?                  | Go to step 13.                                  | Replace the ABS wheel speed sensor or tone wheel.<br>Front: <Ref. to ABS-13, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-16, Rear ABS Wheel Speed Sensor.> and Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.> |
| <b>13 CHECK TONE WHEEL RUNOUT.</b><br>Measure the tone wheel runout.   | Is the runout less than 0.05 mm (0.0020 in)?  | Go to step 14.                                  | Replace the tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>  |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ABS (DIAGNOSTICS)

| Step  | Check  | Yes                   | No  |
|---|--|-----------------------|---|
| <b>14 CHECK RESISTANCE OF ABS WHEEL SPEED SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ABS wheel speed sensor.<br>3) Measure the resistance between ABS wheel speed sensor connector terminals while shaking the harness lightly.<br><b>Terminals</b><br><i>Front RH No. 1 — No. 2:</i><br><i>Front LH No. 1 — No. 2:</i><br><i>Rear RH No. 1 — No. 2:</i><br><i>Rear LH No. 1 — No. 2:</i>   | Is the resistance as following value? Front: 1 — 1.5 k $\Omega$ Rear: 1.025 — 1.265 k $\Omega$ | Go to step 15.        | Replace the ABS wheel speed sensor. Front: <Ref. to ABS-13, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-16, Rear ABS Wheel Speed Sensor.> |
| <b>15 CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR.</b><br>Measure the resistance between ABS wheel speed sensor and chassis ground.<br><b>Terminals</b><br><i>Front RH No. 1 — Chassis ground:</i><br><i>Front LH No. 1 — Chassis ground:</i><br><i>Rear RH No. 1 — Chassis ground:</i><br><i>Rear LH No. 1 — Chassis ground:</i>  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 16.        | Replace the ABS wheel speed sensor. Front: <Ref. to ABS-13, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-16, Rear ABS Wheel Speed Sensor.> |
| <b>16 CHECK HARNESS/CONNECTOR BETWEEN ABSCM&amp;H/U AND ABS WHEEL SPEED SENSOR.</b><br>1) Connect the connector to ABS wheel speed sensor.<br>2) Disconnect the connector from ABSCM&H/U.<br>3) Measure the resistance at ABSCM&H/U connector terminals.<br><b>Connector &amp; terminal</b><br><b>DTC 22</b><br><i>(B301) No. 6 — No. 5:</i><br><b>DTC 24</b><br><i>(B301) No. 1 — No. 16:</i><br><b>DTC 26</b><br><i>(B301) No. 19 — No. 4:</i><br><b>DTC 28</b><br><i>(B301) No. 3 — No. 2:</i> | Is the resistance as following value? Front: 1 — 1.5 k $\Omega$ Rear: 1.025 — 1.265 k $\Omega$ | Go to step 17.        | Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.  |
| <b>17 CHECK GROUND SHORT OF HARNESS.</b><br>Measure the resistance between ABSCM&H/U connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>DTC 22</b><br><i>(B301) No. 6 — Chassis ground:</i><br><b>DTC 24</b><br><i>(B301) No. 1 — Chassis ground:</i><br><b>DTC 26</b><br><i>(B301) No. 19 — Chassis ground:</i><br><b>DTC 28</b><br><i>(B301) No. 3 — Chassis ground:</i>  | Is the resistance more than 1 M $\Omega$ ?   | Go to step 18.        | Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.  |
| <b>18 CHECK GROUND CIRCUIT OF ABSCM&amp;H/U.</b><br>Measure the resistance between ABSCM&H/U and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(B301) No. 15 — Chassis ground:</i>   | Is the resistance less than 0.5 $\Omega$ ?   | Go to step 19.        | Repair the ABSCM&H/U ground harness.  |
| <b>19 CHECK POOR CONTACT IN CONNECTORS.</b>   | Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?              | Repair the connector. | Go to step 20.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

| Step      | Check  | Yes   | No  |   |
|-----------|--|---|---|---|
| <b>20</b> | <b>CHECK SOURCES OF SIGNAL NOISE.</b>  | Is the car telephone or the wireless transmitter properly installed?      | Go to step <b>21</b> .  | Properly install the car telephone or wireless transmitter.   |
| <b>21</b> | <b>CHECK SOURCES OF SIGNAL NOISE.</b>  | Are noise sources (such as an antenna) installed near the sensor harness? | Install the noise sources apart from sensor harness.  | Go to step <b>22</b> .  |
| <b>22</b> | <b>CHECK ABSCM&amp;H/U.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC. | Is the same DTC as in the current diagnosis still being output?           | Replace the ABSCM&H/U.<br><Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> | Go to step <b>23</b> .  |
| <b>23</b> | <b>CHECK ANY OTHER DTC APPEARANCE.</b>   | Are other DTCs being output?  | Proceed with the diagnosis corresponding to DTC.  | A temporary noise interference.<br><br>NOTE:<br>Although the ABS warning light remains illuminating at this point, this is a normal condition. Vehicle must be driven at approx. 12 km/h (7.46 MPH) or faster to turn off ABS warning light. Make sure that the ABS warning light goes off after driving vehicle. |

## I: DTC 29 ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR

### DIAGNOSIS:

- Faulty ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

### TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

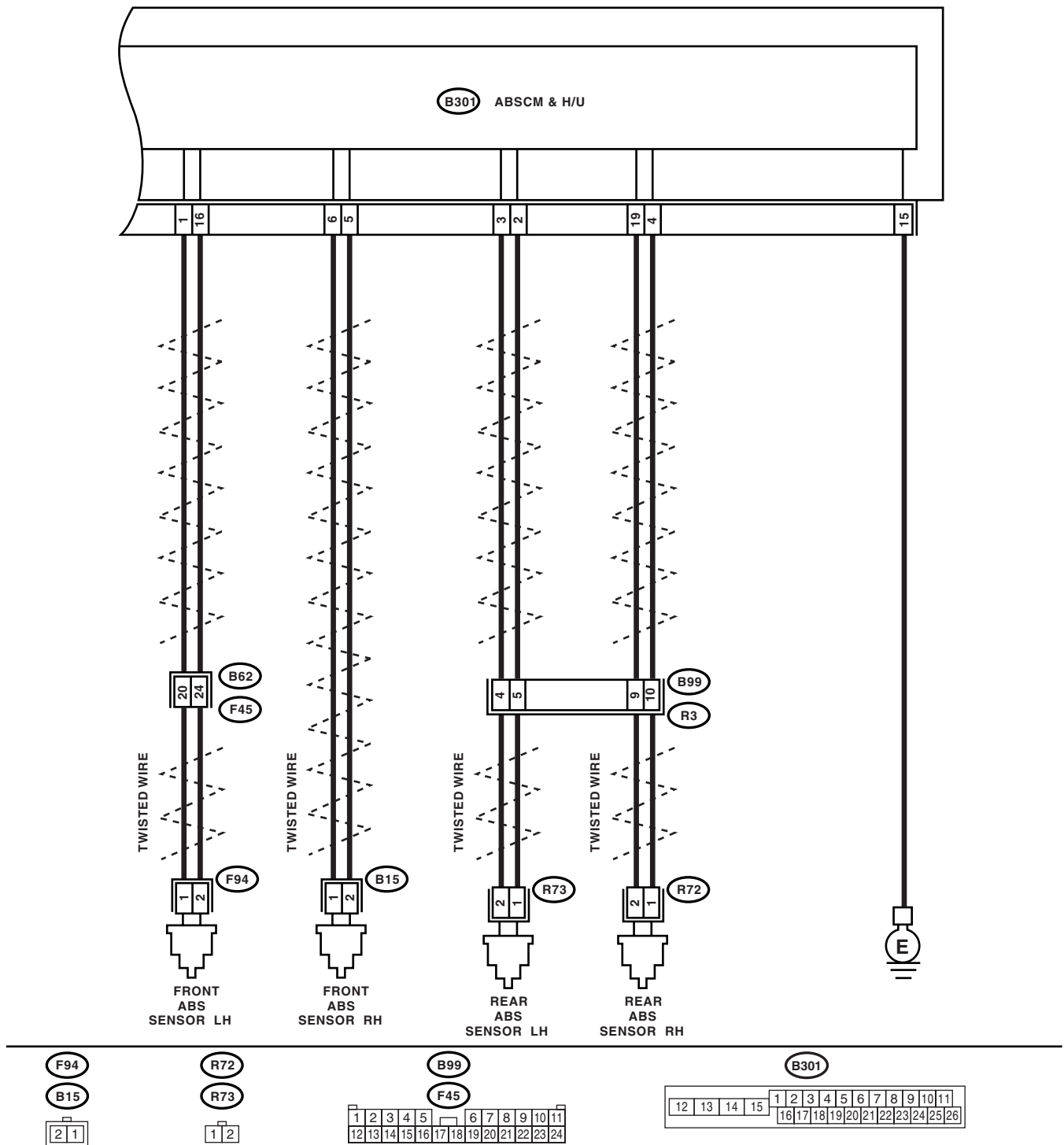
### NOTE:

In addition to the ABS warning light, brake warning light illuminates.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

## WIRING DIAGRAM:



ABS00607

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

| Step     | Check   | Yes   | No   |  |
|----------|---|---|--|--|
| <b>1</b> | <b>CHECK IF THE WHEELS HAVE TURNED FREELY FOR A LONG TIME.</b>  | Is the wheels have been turned freely for more than one minute, such as when vehicle is jacked-up, under full-lock cornering or the tires not in contact with road surface? | The ABS is normal. Erase the DTC.<br><b>NOTE:</b><br>When the wheels turn freely for a long time, such as when vehicle is towed or jacked-up, or when steering wheel is continuously turned all way, this DTC may sometimes occur. | Go to step 2.  |
| <b>2</b> | <b>CHECK TIRE SPECIFICATIONS.</b><br>Turn the ignition switch to OFF.   | Are the tire specifications correct?  | Go to step 3.  | Replace the tire.  |
| <b>3</b> | <b>CHECK WEAR OF TIRE.</b>  | Is the tire worn excessively?   | Replace the tire.  | Go to step 4.  |
| <b>4</b> | <b>CHECK TIRE PRESSURE.</b>   | Is the tire pressure correct?   | Go to step 5.  | Adjust the tire pressure.  |
| <b>5</b> | <b>CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.</b>  | Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf·m, 24 ft·lb)?   | Go to step 6.  | Tighten the ABS wheel speed sensor installation bolts securely.  |
| <b>6</b> | <b>CHECK ABS WHEEL SPEED SENSOR GAP.</b><br>Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.  | Is the gap as following value?<br>Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)  | Go to step 7.  | Adjust the gap.<br><b>NOTE:</b><br>Adjust the gap using spacer (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel. |
| <b>7</b> | <b>PREPARE OSCILLOSCOPE.</b>  | Is an oscilloscope available?   | Go to step 8.  | Go to step 9.  |
| <b>8</b> | <b>CHECK ABS WHEEL SPEED SENSOR SIGNAL.</b><br>1) Raise all four wheels off ground.<br>2) Turn the ignition switch to OFF.<br>3) Connect the oscilloscope to the connector.<br>4) Turn the ignition switch to ON.<br>5) Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS(diag)-15, WAVEFORM, Control Module I/O Signal.><br><b>NOTE:</b><br>When this inspection is completed, ABSCM&H/U sometimes stores the DTC 29.<br><br><b>Connector &amp; terminal</b><br><b>Front RH</b><br>(B15) No. 1 (+) — No. 2 (-):<br><b>Front LH</b><br>(B62) No. 20 (+) — No. 24 (-):<br><b>Rear RH</b><br>(B99) No. 10 (+) — No. 9 (-):<br><b>Rear LH</b><br>(B99) No. 5 (+) — No. 4 (-): | Is the waveform pattern on oscilloscope as shown in the figure?   | Go to step 12.   | Go to step 9.  |
| <b>9</b> | <b>CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.</b><br>Remove the disc rotor or drum from hub.  | Is the ABS wheel speed sensor piece or tone wheel contaminated by dirt or other foreign matter?   | Thoroughly remove dirt or other foreign matter.  | Go to step 10.   |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

| Step      | Check   | Yes  | No   |   |
|-----------|---|--|--|---|
| <b>10</b> | <b>CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.</b>  | Are there broken or damaged teeth in the ABS wheel speed sensor piece or tone wheel? | Replace the ABS wheel speed sensor or tone wheel.<br>Front: <Ref. to ABS-13, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-16, Rear ABS Wheel Speed Sensor.> and Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.> | Go to step <b>11</b> .  |
| <b>11</b> | <b>CHECK TONE WHEEL RUNOUT.</b><br>Measure the tone wheel runout.   | Is the runout less than 0.05 mm (0.0020 in)?   | Go to step <b>12</b> .   | Replace the tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.> |
| <b>12</b> | <b>CHECK ABSCM&amp;H/U.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect all connectors.<br>3) Erase the memory.<br>4) Perform the inspection mode.<br>5) Read out the DTC. | Is the same DTC as in the current diagnosis still being output?                      | Replace the ABSCM&H/U.<br><Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>  | Go to step <b>13</b> .  |
| <b>13</b> | <b>CHECK ANY OTHER DTC APPEARANCE.</b>  | Are other DTCs being output?   | Proceed with the diagnosis corresponding to DTC.   | A temporary poor contact.   |

## **J: DTC 31 FRONT RIGHT INLET VALVE MALFUNCTION**

**NOTE:**

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS(diag)-51, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## **K: DTC 33 FRONT LEFT INLET VALVE MALFUNCTION**

**NOTE:**

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS(diag)-51, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## **L: DTC 35 REAR RIGHT INLET VALVE MALFUNCTION**

**NOTE:**

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS(diag)-51, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## **M: DTC 37 REAR LEFT INLET VALVE MALFUNCTION**

**DIAGNOSIS:**

- Faulty harness/connector
- Faulty inlet solenoid valve

**TROUBLE SYMPTOM:**

- ABS does not operate.
- EBD does not operate.

**NOTE:**

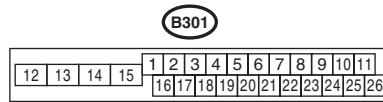
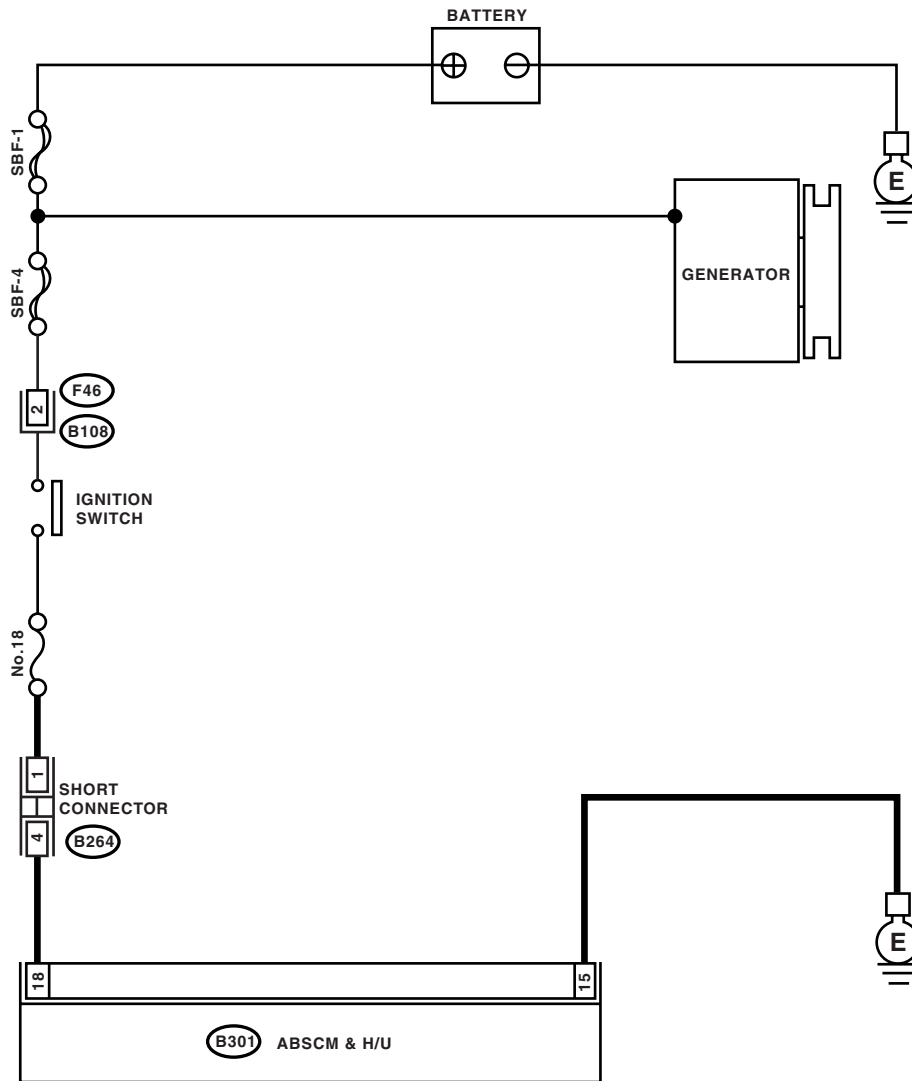
In addition to the ABS warning light, brake warning light illuminates.



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

## WIRING DIAGRAM:



ABS00836

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>1 CHECK INPUT VOLTAGE OF ABSCM&amp;H/U.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ABSCM&H/U.<br>3) Run the engine at idle.<br>4) Measure the voltage between ABSCM&H/U connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B301) No. 18 (+) — Chassis ground (-):</i> | Is the voltage 10 — 15 V?   | Go to step 2.   | Repair the harness connector between battery, ignition switch and ABSCM&H/U. |
| <b>2 CHECK GROUND CIRCUIT OF ABSCM&amp;H/U.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between ABSCM&H/U connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B301) No. 15 — Chassis ground:</i>  | Is the resistance less than 0.5 Ω?  | Go to step 3.   | Repair the ABSCM&H/U ground harness.   |
| <b>3 CHECK POOR CONTACT IN CONNECTORS.</b>  | Is there poor contact in connectors between generator, battery and ABSCM&H/U? | Repair the connector.   | Go to step 4.  |
| <b>4 CHECK ABSCM&amp;H/U.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.  | Is the same DTC as in the current diagnosis still being output?               | Replace the ABSCM&H/U.<br><Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> | Go to step 5.  |
| <b>5 CHECK ANY OTHER DTC APPEARANCE.</b>  | Are other DTCs being output?  | Proceed with the diagnosis corresponding to DTC.  | A temporary poor contact.  |

## N: DTC 32 FRONT RIGHT OUTLET VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS(diag)-53, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## O: DTC 34 FRONT LEFT OUTLET VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS(diag)-53, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## P: DTC 36 REAR RIGHT OUTLET VALVE MALFUNCTION

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS(diag)-53, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## Q: DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION

**DIAGNOSIS:**

- Faulty harness/connector
- Faulty outlet solenoid valve

**TROUBLE SYMPTOM:**

- ABS does not operate.
- EBD does not operate.

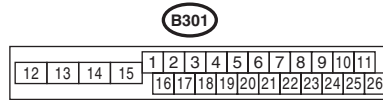
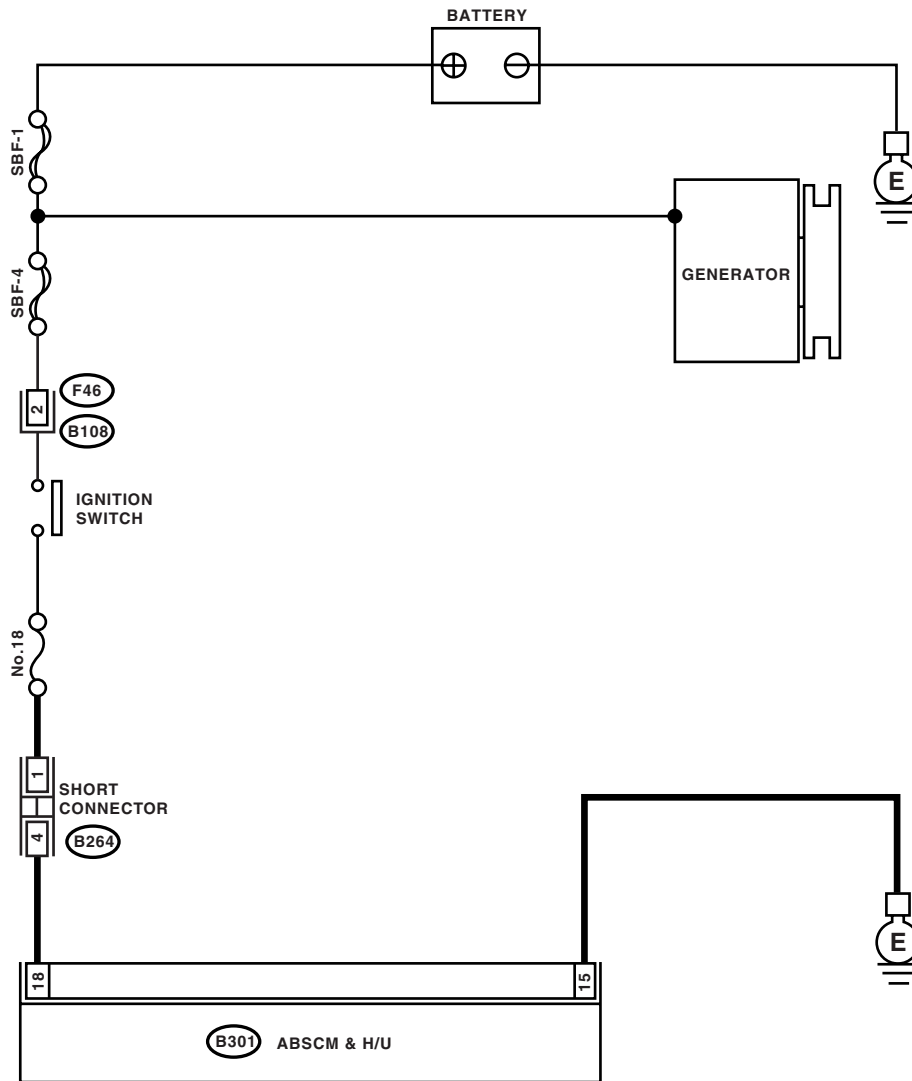
NOTE:

In addition to the ABS warning light, brake warning light illuminates.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

## WIRING DIAGRAM:



ABS00836

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>1 CHECK INPUT VOLTAGE OF ABSCM&amp;H/U.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ABSCM&H/U.<br>3) Run the engine at idle.<br>4) Measure the voltage between ABSCM&H/U connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B301) No. 18 (+) — Chassis ground (-):</b> | Is the voltage 10 — 15 V?   | Go to step 2.   | Repair the harness connector between battery, ignition switch and ABSCM&H/U. |
| <b>2 CHECK GROUND CIRCUIT OF ABSCM&amp;H/U.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between ABSCM&H/U connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B301) No. 15 — Chassis ground:</b>  | Is the resistance less than 0.5 $\Omega$ ?                                    | Go to step 3.   | Repair the ABSCM&H/U ground harness.   |
| <b>3 CHECK POOR CONTACT IN CONNECTORS.</b>  | Is there poor contact in connectors between generator, battery and ABSCM&H/U? | Repair the connector.   | Go to step 4.  |
| <b>4 CHECK ABSCM&amp;H/U.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.  | Is the same DTC as in the current diagnosis still being output?               | Replace the ABSCM&H/U.<br><Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> | Go to step 5.  |
| <b>5 CHECK ANY OTHER DTC APPEARANCE.</b>  | Are other DTCs being output?  | Proceed with the diagnosis corresponding to DTC.  | A temporary poor contact.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

## R: DTC 41 ABS CONTROL MODULE MALFUNCTION

### DIAGNOSIS:

Faulty ABSCM&H/U

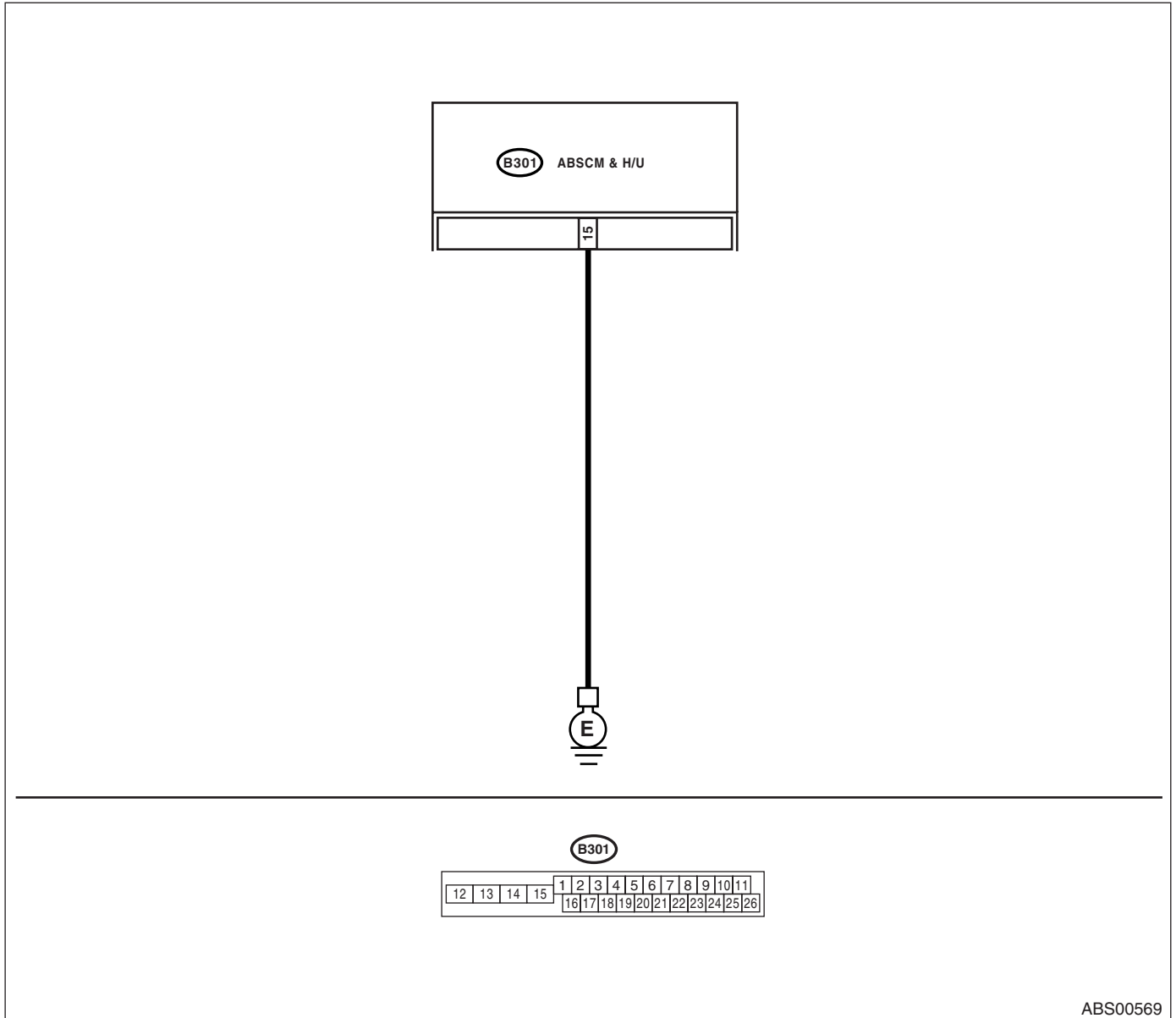
### TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

### NOTE:

In addition to the ABS warning light, brake warning light illuminates.

### WIRING DIAGRAM:



ABS00569

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <b>1 CHECK GROUND CIRCUIT OF ABSCM&amp;H/U.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ABSCM&H/U.<br>3) Measure the resistance between ABSCM&H/U and chassis ground.<br><i>Connector &amp; terminal<br/>(B301) No. 15 — Chassis ground:</i> | Is the resistance less than 0.5 Ω?  | Go to step 2.   | Repair the ABSCM&H/U ground harness.                        |
| <b>2 CHECK POOR CONTACT IN CONNECTORS.</b>  | Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U? | Repair the connector.   | Go to step 3.   |
| <b>3 CHECK SOURCES OF SIGNAL NOISE.</b>   | Is the car telephone or wireless transmitter properly installed?                    | Go to step 4.   | Properly install the car telephone or wireless transmitter. |
| <b>4 CHECK SOURCES OF SIGNAL NOISE.</b>   | Are noise sources (such as an antenna) installed near the sensor harness?           | Install the noise sources apart from sensor harness.  | Go to step 5.   |
| <b>5 CHECK ABSCM&amp;H/U.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect all connectors.<br>3) Erase the memory.<br>4) Perform the inspection mode.<br>5) Read out the DTC.   | Is the same DTC as in current diagnosis still being output?                         | Replace the ABSCM&H/U.<br><Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> | Go to step 6.   |
| <b>6 CHECK ANY OTHER DTC APPEARANCE.</b>  | Are other DTCs being output?  | Proceed with the diagnosis corresponding to DTC.  | A temporary poor contact.                                   |

## S: DTC 42 POWER VOLTAGE MALFUNCTION

### DIAGNOSIS:

Power voltage of the ABSCM&H/U is too low or too high.

### TROUBLE SYMPTOM:

- ABS does not operate.
- EBD may not operate.

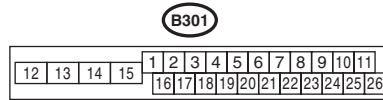
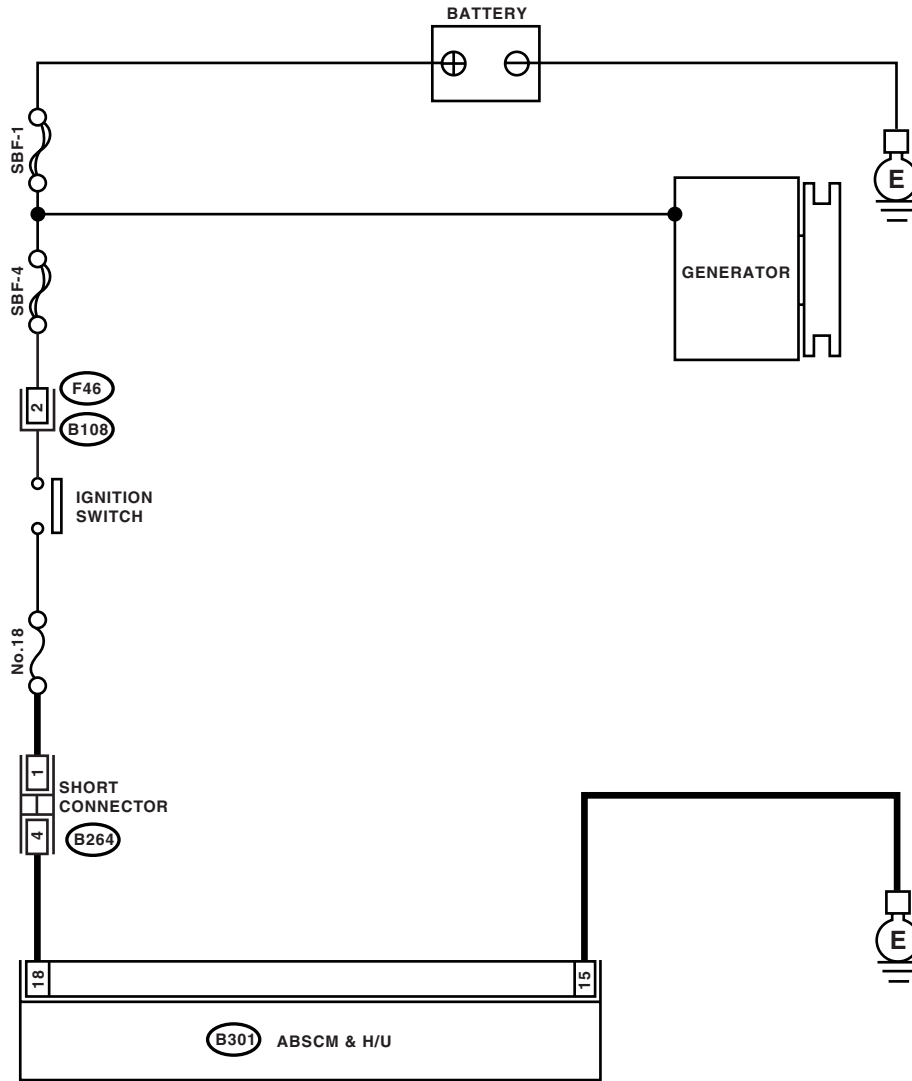
### NOTE:

If EBD does not operate, brake warning light comes on as well as ABS warning light. Both warning lights go off if voltage returns.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

## WIRING DIAGRAM:



ABS00836

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

| Step   | Check   | Yes   | No   |
|--|---|---|--|
| <b>1 CHECK GENERATOR.</b><br>1) Start the engine.<br>2) Idle after warm-up.<br>3) Measure the voltage between generator B terminal and chassis ground.<br><i>Terminals</i><br><i>Generator B terminal (+) — Chassis ground (-):</i>  | Is the voltage 10 — 17 V?   | Go to step 2.   | Repair the generator. <Ref. to SC(H4SO)-14, Generator.>                      |
| <b>2 CHECK BATTERY TERMINAL.</b><br>Turn the ignition switch to OFF.   | Are the positive and negative battery terminals tightly clamped?              | Go to step 3.   | Tighten the clamp of terminal.   |
| <b>3 CHECK INPUT VOLTAGE OF ABSCM&amp;H/U.</b><br>1) Disconnect the connector from ABSCM&H/U.<br>2) Run the engine at idle.<br>3) Operate the electric load applying devices, such as the headlight, A/C, and defogger.<br>4) Measure the voltage between ABSCM&H/U connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B301) No. 18 (+) — Chassis ground (-):</i> | Is the voltage 10 — 17 V?   | Go to step 4.   | Repair the harness connector between battery, ignition switch and ABSCM&H/U. |
| <b>4 CHECK GROUND CIRCUIT OF ABSCM&amp;H/U.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between ABSCM&H/U connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B301) No. 15 — Chassis ground:</i>   | Is the resistance less than 0.5 $\Omega$ ?                                    | Go to step 5.   | Repair the ABSCM&H/U ground harness.   |
| <b>5 CHECK POOR CONTACT IN CONNECTORS.</b>   | Is there poor contact in connectors between generator, battery and ABSCM&H/U? | Repair the connector.   | Go to step 6.  |
| <b>6 CHECK ABSCM&amp;H/U.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.   | Is the same DTC as in the current diagnosis still being output?               | Replace the ABSCM&H/U.<br><Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> | Go to step 7.  |
| <b>7 CHECK ANY OTHER DTC APPEARANCE.</b>   | Are other DTCs being output?  | Proceed with the diagnosis corresponding to DTC.  | A temporary poor contact.  |



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

## T: DTC 47 IMPROPER CAN COMMUNICATION

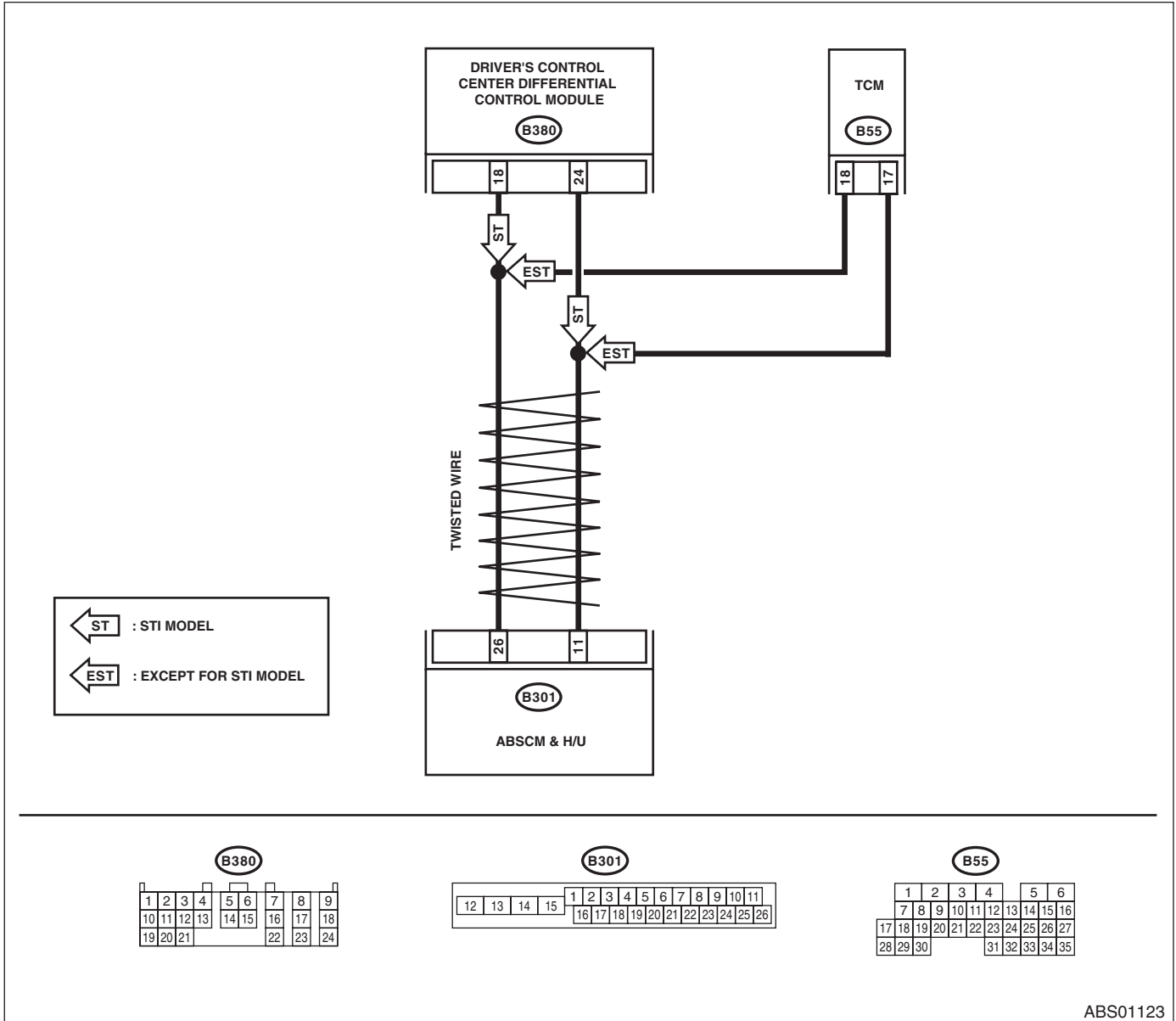
### DIAGNOSIS:

CAN communication circuit is damaged or shorted.

### TROUBLE SYMPTOM:

- ABS does not operate. (STI model)
- Tight corner braking phenomenon occurs. (AT model)

### WIRING DIAGRAM:



ABS01123

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

| Step     | Check  | Yes                                     | No   |
|----------|--|---|--|
| <b>1</b> | <b>CHECK MODEL TYPE.</b>   | Go to step 2.                           | Go to step 11.   |
| <b>2</b> | <b>CHECK HARNESS CONNECTOR BETWEEN ABSCM AND DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Turn the ignition switch to ON.<br>2) Disconnect the connector from ABSCM and driver's control center differential control module.<br>3) Measure the resistance of harness connector between ABSCM and driver's control center differential control module.<br><i>Connector &amp; terminal</i><br><i>(B301) No. 26 — (B380) No. 18:</i><br><i>(B301) No. 11 — (B380) No. 24:</i> | Go to step 3.                           | Repair or replace the harness connector between ABSCM and driver's control center differential control module. |
| <b>3</b> | <b>CHECK GROUND SHORT OF HARNESS CONNECTOR BETWEEN ABSCM AND DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>Measure the resistance between ABSCM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B301) No. 26 — Chassis ground:</i><br><i>(B301) No. 11 — Chassis ground:</i>   | Go to step 4.                           | Repair or replace the harness connector between ABSCM and driver's control center differential control module. |
| <b>4</b> | <b>CHECK BATTERY SHORT OF HARNESS CONNECTOR BETWEEN ABSCM AND DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the resistance between ABSCM connector and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B301) No. 26 — Chassis ground:</i><br><i>(B301) No. 11 — Chassis ground:</i>   | Go to step 5.                           | Repair or replace the harness connector between ABSCM and driver's control center differential control module. |
| <b>5</b> | <b>CHECK ABSCM.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the connector to ABSCM.<br>3) Measure the resistance between driver's control center differential control module connector terminals.<br><i>Connector &amp; terminal</i><br><i>(B380) No. 18 — (B380) No. 24:</i>   | Go to step 7.                           | Go to step 6.  |
| <b>6</b> | <b>CHECK POOR CONTACT IN ABSCM CONNECTOR.</b>  | Repair poor contact in ABSCM connector. | Replace the ABSCM. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>                 |
| <b>7</b> | <b>CHECK DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.</b><br>1) Connect the connector to driver's control differential control module.<br>2) Disconnect the connector from ABSCM.<br>3) Measure the resistance between ABSCM connector terminals.<br><i>Connector &amp; terminal</i><br><i>(B301) No. 11 — (B301) No. 26:</i>  | Go to step 9.                           | Go to step 8.  |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

| Step  | Check                                      | Yes  | No   |
|---|--|--|--|
| <b>8</b><br><b>CHECK POOR CONTACT IN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE CONNECTOR.</b>   | Is there poor contact?                     | Repair poor contact in driver's control center differential control module connector.  | Replace the driver's control center differential control module. <Ref. to 6MT-129, Driver's Control Center Differential Control Module.> |
| <b>9</b><br><b>CHECK DTC.</b>   | Is DTC 47 detected?                        | Replace the ABSCM. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>   | Go to step <b>10</b> .   |
| <b>10</b><br><b>CHECK DTC P1720 INDICATION FOR DRIVER'S CONTROL CENTER DIFFERENTIAL AUTO SYSTEM.</b>  | Is DTC P1720 displayed?                    | Replace the driver's control center differential control module. <Ref. to 6MT-129, Driver's Control Center Differential Control Module.> | Replace the ABSCM. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>   |
| <b>11</b><br><b>CHECK HARNESS CONNECTOR BETWEEN ABSCM AND TCM.</b><br>1) Turn the ignition switch to ON.<br>2) Disconnect the connector from ABSCM and TCM.<br>3) Measure the resistance of harness connector between ABSCM and TCM.<br><b>Connector &amp; terminal</b><br><b>(B301) No. 26 — (B55) No. 18:</b><br><b>(B301) No. 11 — (B55) No. 17:</b> | Is the resistance less than 0.5 $\Omega$ ? | Go to step <b>12</b> .   | Repair or replace the harness connector between ABSCM and TCM.   |
| <b>12</b><br><b>CHECK GROUND SHORT OF HARNESS CONNECTOR BETWEEN ABSCM AND TCM.</b><br>Measure the resistance between ABSCM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B301) No. 26 — Chassis ground:</b><br><b>(B301) No. 11 — Chassis ground:</b>   | Is the resistance more than 1 M $\Omega$ ? | Go to step <b>13</b> .   | Repair or replace the harness connector between ABSCM and TCM.   |
| <b>13</b><br><b>CHECK BATTERY SHORT OF HARNESS CONNECTOR BETWEEN ABSCM AND TCM.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the resistance between ABSCM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B301) No. 26 — Chassis ground:</b><br><b>(B301) No. 11 — Chassis ground:</b>                               | Is the voltage less than 1.0 V?            | Go to step <b>14</b> .   | Repair or replace the harness connector between ABSCM and TCM.   |
| <b>14</b><br><b>CHECK ABSCM.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the connector to ABSCM.<br>3) Measure the resistance between TCM connector terminals.<br><b>Connector &amp; terminal</b><br><b>(B55) No. 17 — (B55) No. 18:</b>   | Is the resistance 120 $\pm$ 6 $\Omega$ ?   | Go to step <b>16</b> .   | Go to step <b>15</b> .   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

| Step  | Check                                  | Yes  | No   |
|---|--|--|--|
| <b>15</b><br><b>CHECK POOR CONTACT IN ABSCM CONNECTOR.</b>  | Is there poor contact?                 | Repair poor contact in ABSCM connector.  | Replace the ABSCM. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> |
| <b>16</b><br><b>CHECK TCM.</b><br>1) Connect the connector to TCM.<br>2) Disconnect the connector from ABSCM.<br>3) Measure the resistance between ABSCM connector terminals.<br><b>Connector &amp; terminal</b><br><b>(B301) No. 11 — (B301) No. 26:</b> | Is the resistance $120 \pm 6 \Omega$ ? | Go to step <b>18</b> .   | Go to step <b>17</b> .   |
| <b>17</b><br><b>CHECK POOR CONTACT IN TCM CONNECTOR.</b>  | Is there poor contact?                 | Repair poor contact in TCM connector.  | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>                          |
| <b>18</b><br><b>CHECK DTC.</b>  | Is DTC 47 detected?                    | Replace the ABSCM. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> | Go to step <b>19</b> .   |
| <b>19</b><br><b>CHECK DTC P1718 INDICATION FOR TCM SYSTEM.</b>  | Is DTC P1718 displayed?                | Replace the TCM. <Ref. to 4AT-64, Transmission Control Module (TCM).>                          | Replace the ABSCM. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> |

## U: DTC 51 VALVE RELAY MALFUNCTION

### DIAGNOSIS:

Faulty valve relay

### TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate depending on the trouble contents.

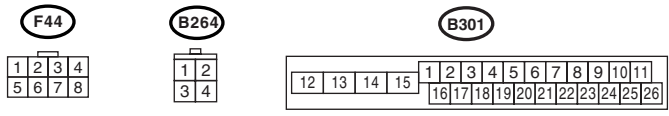
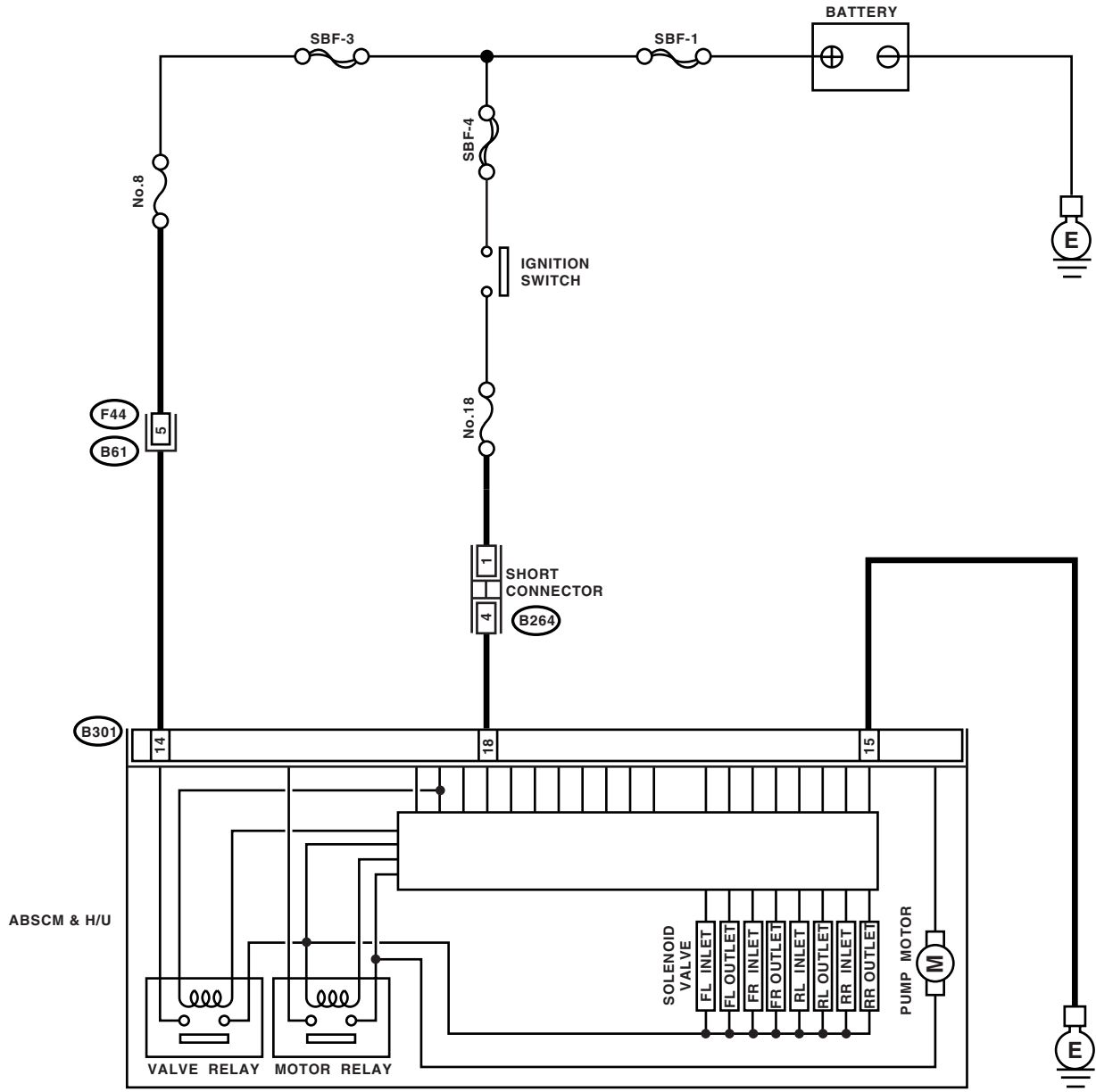
### NOTE:

In addition to the ABS warning light, brake warning light illuminates.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

## WIRING DIAGRAM:



ABS00872

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

| Step   | Check   | Yes  | No  |
|--|---|--|---|
| <b>1 CHECK INPUT VOLTAGE OF ABSCM&amp;H/U.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ABSCM&H/U.<br>3) Run the engine at idle.<br>4) Measure the voltage between ABSCM&H/U connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B301) No. 18 (+) — Chassis ground (-):</b></i><br><i><b>(B301) No. 14 (+) — Chassis ground (-):</b></i> | Is the voltage 10 — 15 V?   | Go to step 2.  | Repair the harness connector between battery and ABSCM&H/U.   |
| <b>2 CHECK GROUND CIRCUIT OF ABSCM&amp;H/U.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between ABSCM&H/U connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B301) No. 15 — Chassis ground:</b></i>   | Is the resistance less than 0.5 $\Omega$ ?                                    | Go to step 3.  | Repair the ABSCM&H/U ground harness.  |
| <b>3 CHECK VALVE RELAY IN ABSCM&amp;H/U.</b><br>Measure the resistance between ABSCM&H/U terminals.<br><i><b>Terminals</b></i><br><i><b>No. 14 — No. 15:</b></i>   | Is the resistance more than 1 M $\Omega$ ?                                    | Go to step 4.  | Replace the ABSCM only.<br><Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> |
| <b>4 CHECK POOR CONTACT IN CONNECTORS.</b>   | Is there poor contact in connectors between generator, battery and ABSCM&H/U? | Repair the connector.  | Go to step 5.   |
| <b>5 CHECK ABSCM&amp;H/U.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.   | Is the same DTC still displayed?  | Replace the ABSCM only.<br><Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>              | Go to step 6.   |
| <b>6 CHECK ANY OTHER DTC.</b>  | Is any other DTC displayed?   | Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”.<br><Ref. to ABS(diag)-34, List of Diagnostic Trouble Code (DTC).> | Temporary poor contact.   |

## **Diagnostic Procedure with Diagnostic Trouble Code (DTC)**

ABS (DIAGNOSTICS)

---

### **V: DTC 52 MOTOR / MOTOR RELAY ON FAILURE**

#### **DIAGNOSIS:**

- Faulty motor
- Faulty motor relay
- Faulty harness connector
- Insufficient tightening of earth bolt

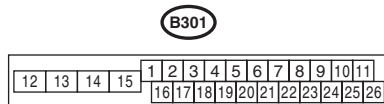
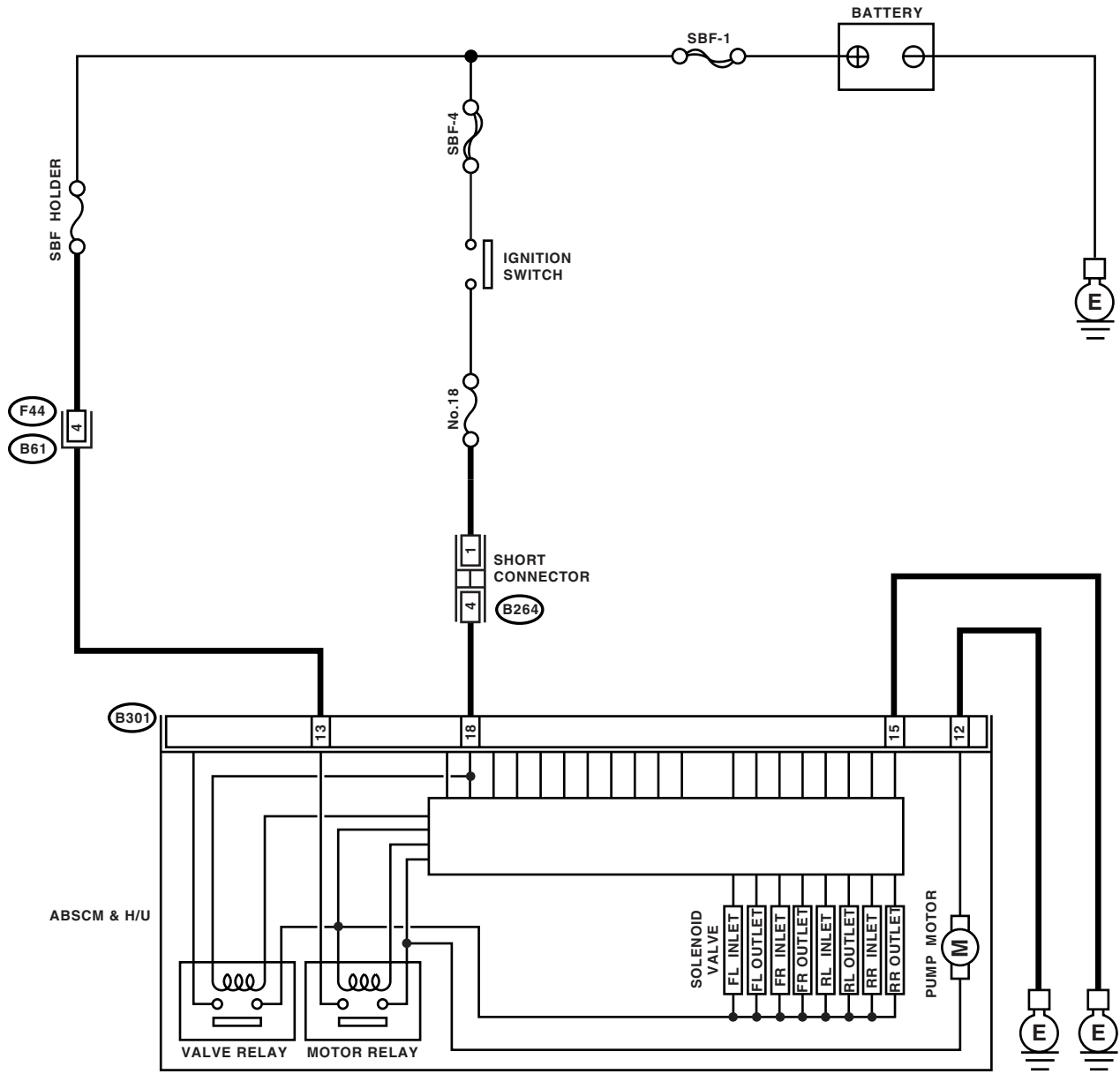
#### **TROUBLE SYMPTOM:**

- ABS does not operate.
- EBD does not operate.

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

## WIRING DIAGRAM:



ABS00873



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ABS (DIAGNOSTICS)

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <b>1 CHECK INPUT VOLTAGE OF ABSCM&amp;H/U.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ABSCM&H/U.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between ABSCM&H/U connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B301) No. 13 (+) — Chassis ground (-):</b></i> | Is the voltage 10 — 15 V?  | Go to step 2.  | Repair the harness/connector between battery and ABSCM&H/U and check fuse SBF8.                    |
| <b>2 CHECK GROUND CIRCUIT OF MOTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between ABSCM&H/U connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B301) No. 12 — Chassis ground:</b></i>  | Is the resistance less than 0.5 $\Omega$ ?   | Go to step 3.  | Repair the ABSCM&H/U ground harness.   |
| <b>3 CHECK INPUT VOLTAGE OF ABSCM&amp;H/U.</b><br>1) Run the engine at idle.<br>2) Measure the voltage between ABSCM&H/U connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B301) No. 18 (+) — Chassis ground (-):</b></i>   | Is the voltage 10 — 15 V?  | Go to step 4.  | Repair the harness connector between battery, ignition switch and ABSCM&H/U.                       |
| <b>4 CHECK GROUND CIRCUIT OF ABSCM&amp;H/U.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between ABSCM&H/U connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B301) No. 15 — Chassis ground:</b></i>  | Is the resistance less than 0.5 $\Omega$ ?   | Go to step 5.  | Repair the ABSCM&H/U ground harness.   |
| <b>5 CHECK MOTOR OPERATION.</b><br>Operate the sequence control. <Ref. to ABS-10, ABS Sequence Control.><br><br>NOTE:<br>Use the diagnosis connector to operate sequence control.   | Can motor revolution noise (buzz) be heard when carrying out the sequence control? | Go to step 6.  | Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> |
| <b>6 CHECK POOR CONTACT IN CONNECTORS.</b><br>Turn the ignition switch to OFF.  | Is there poor contact in connector between generator, battery and ABSCM&H/U?       | Repair the connector.  | Go to step 7.  |
| <b>7 CHECK ABSCM&amp;H/U.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.  | Is the same DTC as in current diagnosis still being output?                        | Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> | Go to step 8.  |
| <b>8 CHECK ANY OTHER DTC APPEARANCE.</b>  | Are other DTCs being output?   | Proceed with the diagnosis corresponding to DTC.   | A temporary poor contact.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

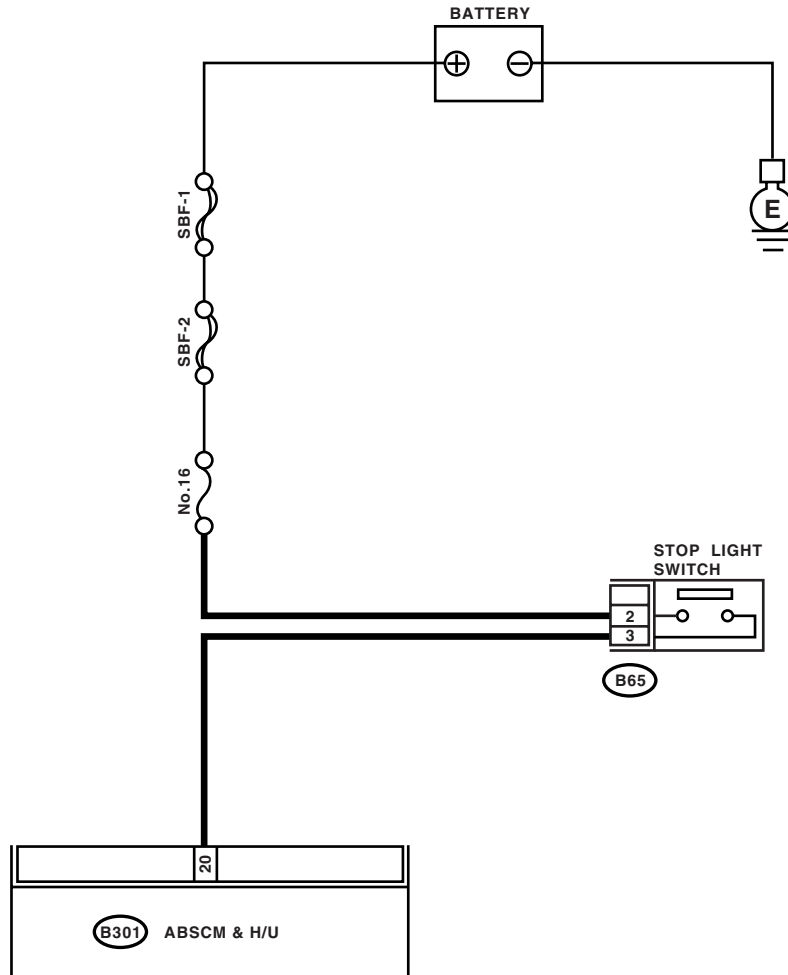
ABS (DIAGNOSTICS)

## W: DTC 54 STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION

### DIAGNOSIS:

Faulty stop light switch

### WIRING DIAGRAM:



ABS00573

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### ABS (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <b>1 CHECK OUTPUT OF STOP LIGHT SWITCH USING SUBARU SELECT MONITOR.</b><br>1) Select "Current data display & Save" on the Subaru Select Monitor.<br>2) Release the brake pedal.<br>3) Read the stop light switch signal in Subaru Select Monitor data display.  | Is "OFF" indicated?   | Go to step 2.   | Go to step 3.   |
| <b>2 CHECK OUTPUT OF STOP LIGHT SWITCH USING SUBARU SELECT MONITOR.</b><br>1) Depress the brake pedal.<br>2) Read the stop light switch signal in Subaru Select Monitor data display.   | Is "ON" indicated?  | Go to step 5.   | Go to step 3.   |
| <b>3 CHECK IF STOP LIGHTS COME ON.</b><br>Depress the brake pedal.  | Do the stop lights turn on?   | Go to step 4.   | Repair the stop lights circuit.                                       |
| <b>4 CHECK OPEN CIRCUIT IN HARNESS.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ABSCM&H/U.<br>3) Depress the brake pedal.<br>4) Measure the voltage between ABSCM&H/U connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B301) No. 20 (+) — Chassis ground (-):</b> | Is the voltage 10 — 15 V?   | Go to step 5.   | Repair the harness between stop light switch and ABSCM&H/U connector. |
| <b>5 CHECK POOR CONTACT IN CONNECTORS.</b>  | Is there poor contact in connector between stop light switch and ABSCM&H/U? | Go to step 6.   | Repair the connector.   |
| <b>6 CHECK ABSCM&amp;H/U.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.  | Is the same DTC as in current diagnosis still being output?                 | Replace the ABSCM&H/U.<br><Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> | Go to step 7.   |
| <b>7 CHECK ANY OTHER DTC APPEARANCE.</b>  | Are other DTCs being output?  | Proceed with the diagnosis corresponding to DTC.  | A temporary poor contact.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

## X: DTC 56 FAULTY G SENSOR OUTPUT VOLTAGE OR OUTPUT SIGNAL

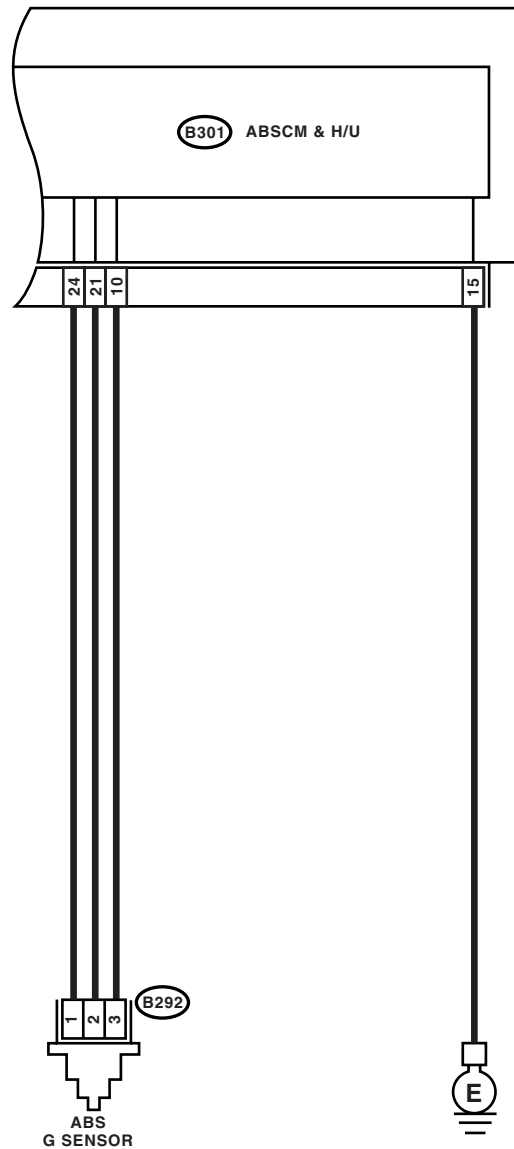
### DIAGNOSIS:

Faulty G sensor

### TROUBLE SYMPTOM:

ABS does not operate.

### WIRING DIAGRAM:



ABS00574

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

| Step     | Check  | Yes   | No   |
|----------|--|---|--|
| <b>1</b> | <b>WHETHER A WHEEL TURNED FREELY OR NOT.</b>   | ABS is normal.<br>Erase the memory.   | Go to step 2.  |
| <b>2</b> | <b>CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.</b><br>1) Select {Current Data Display & Save} in Subaru Select Monitor.<br>2) Read the G sensor output on Subaru Select Monitor.   | Is the reading indicated on display -1.2 — 1.2 m/s when G sensor is horizontal? | Go to step 3.  |
| <b>3</b> | <b>CHECK POOR CONTACT IN CONNECTORS.</b>   | Is there poor contact in connector between ABSCM&H/U and G sensor?              | Repair the connector.<br>Go to step 4.   |
| <b>4</b> | <b>CHECK ABSCM&amp;H/U.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.   | Is the same DTC still displayed?  | Replace the ABSCM only.<br><Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).><br>Go to step 5.                               |
| <b>5</b> | <b>CHECK ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Inspect the DTC using "List of Diagnostic Trouble Code (DTC)".<br><Ref. to ABS(diag)-34, List of Diagnostic Trouble Code (DTC).><br>Temporary poor contact occurs. |
| <b>6</b> | <b>CHECK INPUT VOLTAGE OF G SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the console box.<br>3) Remove the G sensor from vehicle. (Do not disconnect connector.)<br>4) Turn the ignition switch to ON.<br>5) Measure the voltage between G sensor connector terminals.<br><b>Connector &amp; terminal</b><br><b>(B292) No. 1 (+) — No. 3 (-):</b> | Is the voltage 4.75 — 5.25 V?   | Go to step 7.<br>Repair the harness connector between G sensor and ABSCM&H/U.  |
| <b>7</b> | <b>CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ABSCM&H/U.<br>3) Measure the resistance between ABSCM&H/U connector terminals.<br><b>Connector &amp; terminal</b><br><b>(B301) No. 21 — No. 10:</b>  | Is the resistance 3.6 — 3.8 kΩ?   | Go to step 8.<br>Repair the harness connector between G sensor and ABSCM&H/U.  |
| <b>8</b> | <b>CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS.</b><br>1) Disconnect the connector from G sensor.<br>2) Measure the resistance between ABSCM&H/U connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B301) No. 21 — Chassis ground:</b>  | Is the resistance more than 1 MΩ?   | Go to step 9.<br>Repair the harness/connector between G sensor and ABSCM&H/U.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <b>9 CHECK G SENSOR.</b><br>1) Connect the connector to G sensor.<br>2) Connect the connector to ABSCM&H/U.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between G sensor connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B292) No. 2 (+) — No. 3 (-):</b></i> | Is the voltage 2.1 — 2.5 V when G sensor is on a level?               | Go to step 10.  | Replace the G sensor. <Ref. to ABS-21, G Sensor.> |
| <b>10 CHECK G SENSOR.</b><br>Measure the voltage between G sensor connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B292) No. 2 (+) — No. 3 (-):</b></i>  | Is the voltage 3.6 — 4.1 V when G sensor is inclined forwards to 90°? | Go to step 11.  | Replace the G sensor. <Ref. to ABS-21, G Sensor.> |
| <b>11 CHECK G SENSOR.</b><br>Measure the voltage between G sensor connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B292) No. 2 (+) — No. 3 (-):</b></i>  | Is the voltage 0.5 — 1.0 V when G sensor is inclined backward to 90°? | Go to step 12.  | Replace the G sensor. <Ref. to ABS-21, G Sensor.> |
| <b>12 CHECK POOR CONTACT IN CONNECTOR.</b><br>Turn the ignition switch to OFF.   | Is there poor contact in connector between ABSCM&H/U and G sensor?    | Repair the connector.   | Go to step 13.                                    |
| <b>13 CHECK ABSCM&amp;H/U.</b><br>1) Connect all the connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read the DTC.  | Is the same DTC still displayed?                                      | Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>              | Go to step 14.                                    |
| <b>14 CHECK ANY OTHER DTC.</b>   | Is any other DTC displayed?   | Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-34, List of Diagnostic Trouble Code (DTC).> | Temporary poor contact.                           |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

## Y: DTC 73 LATERAL G SENSOR OUTPUT VOLTAGE OR OUTPUT SIGNAL MALFUNCTION

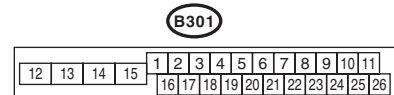
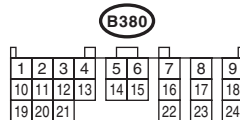
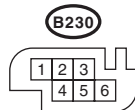
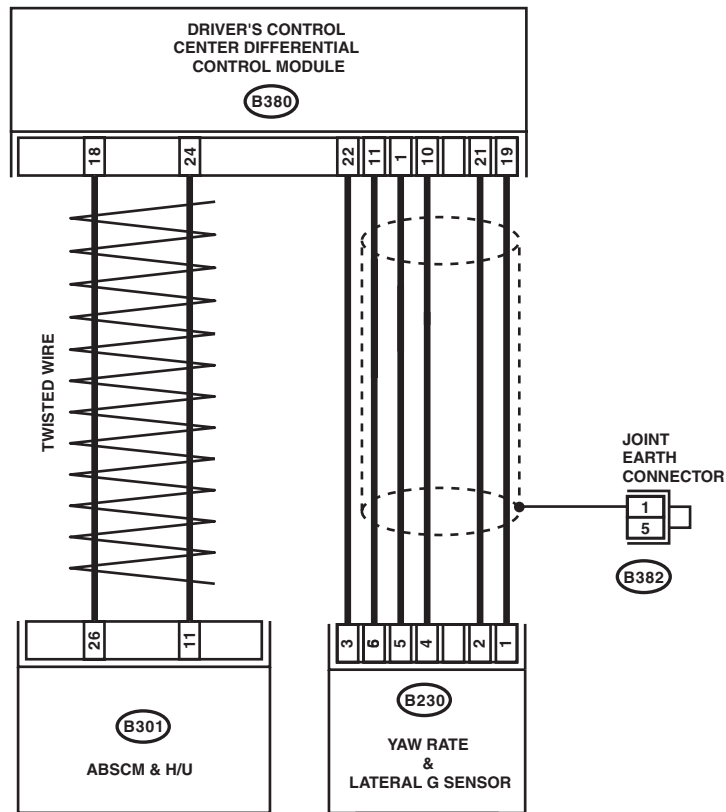
### DIAGNOSIS:

Faulty Lateral G sensor

### TROUBLE SYMPTOM:

ABS does not operate.

### WIRING DIAGRAM:



ABS01124

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

| Step     | Check   | Yes  | No   |
|----------|---|--|--|
| <b>1</b> | <b>CHECK ALL FOUR WHEELS FOR FREE TURNING.</b>  | The ABS is normal. Erase the DTC.  | Go to step 2.  |
| <b>2</b> | <b>CHECK OUTPUT OF YAW RATE &amp; LATERAL G SENSOR USING SUBARU SELECT MONITOR.</b><br>1) Select "Current data display & Save" on the Subaru Select Monitor.<br>2) Read the Subaru Select Monitor display.  | Go to step 3.  | Go to step 8.  |
| <b>3</b> | <b>CHECK OUTPUT OF YAW RATE &amp; LATERAL G SENSOR USING SUBARU SELECT MONITOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the console box.<br>3) Remove the yaw rate & lateral G sensor from vehicle. (Do not disconnect the connector.)<br>4) Turn the ignition switch to ON.<br>5) Select "Current data display & Save" on the Subaru Select Monitor.<br>6) Read the Subaru Select Monitor display. | Go to step 4.  | Replace the yaw rate & lateral G sensor. <Ref. to 6MT-128, Yaw Rate and Lateral G Sensor.> |
| <b>4</b> | <b>CHECK OUTPUT OF YAW RATE &amp; LATERAL G SENSOR USING SUBARU SELECT MONITOR.</b><br>Read the Subaru Select Monitor display.  | Go to step 5.  | Replace the yaw rate & lateral G sensor. <Ref. to 6MT-128, Yaw Rate and Lateral G Sensor.> |
| <b>5</b> | <b>CHECK POOR CONTACT IN CONNECTORS.</b><br>Turn the ignition switch to OFF.  | Repair the connector.  | Go to step 6.  |
| <b>6</b> | <b>CHECK ABSCM&amp;H/U.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.  | Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> | Go to step 7.  |
| <b>7</b> | <b>CHECK ANY OTHER DTC APPEARANCE.</b>  | Proceed with the diagnosis corresponding to DTC.   | A temporary poor contact.  |
| <b>8</b> | <b>CHECK OPEN CIRCUIT IN YAW RATE &amp; LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from driver's control center differential control module.<br>3) Measure the resistance between driver's control center differential control module connector terminals.<br><b>Connector &amp; terminal</b><br><b>(B380) No. 1 — No. 11:</b>   | Go to step 9.  | Repair the harness/connector between yaw rate & lateral G sensor and ABSCM&H/U.            |



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

| Step   | Check  | Yes  | No  |
|--|--|--|---|
| <b>9 CHECK GROUND SHORT OF HARNESS.</b><br>Measure the resistance between ABSCM&H/U connector and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B380) No. 11 — Chassis ground:</b></i>   | Is the resistance more than 1 MΩ?  | Go to step 10.   | Repair the harness between yaw rate & lateral G sensor and driver's control center differential control module. Replace the driver's control center differential control module.<br><Ref. to 6MT-129, Driver's Control Center Differential Control Module.> |
| <b>10 CHECK YAW RATE &amp; LATERAL G SENSOR.</b><br>1) Remove the console box.<br>2) Remove the yaw rate & lateral G sensor from vehicle.<br>3) Connect the connector to yaw rate & lateral G sensor.<br>4) Connect the connector to ABSCM&H/U.<br>5) Turn the ignition switch to ON.<br>6) Measure the voltage between yaw rate & lateral G sensor connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B230) No. 5 (+) — (B230) No. 6 (-):</b></i> | Is the voltage 2.1 — 2.5 V when yaw rate & lateral G sensor is in horizontal position? | Go to step 11.   | Replace the yaw rate & lateral G sensor. <Ref. to 6MT-128, Yaw Rate and Lateral G Sensor.>  |
| <b>11 CHECK YAW RATE &amp; LATERAL G SENSOR.</b><br>Measure the voltage between yaw rate & lateral G sensor connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B230) No. 5 (+) — (B230) No. 6 (-):</b></i>   | Is the voltage 3.3 — 3.7 V when yaw rate & lateral G sensor is inclined right to 90°?  | Go to step 12.   | Replace the lateral G sensor. <Ref. to 6MT-128, Yaw Rate and Lateral G Sensor.>   |
| <b>12 CHECK YAW RATE &amp; LATERAL G SENSOR.</b><br>Measure the voltage between yaw rate & lateral G sensor connector terminals.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B230) No. 5 (+) — (B230) No. 6 (-):</b></i>   | Is the voltage 0.5 — 0.9 V when yaw rate & lateral G sensor is inclined left to 90°?   | Go to step 13.   | Replace the lateral G sensor. <Ref. to 6MT-128, Yaw Rate and Lateral G Sensor.>   |
| <b>13 CHECK ABSCM&amp;H/U.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect all connectors.<br>3) Erase the memory.<br>4) Perform the inspection mode.<br>5) Read out the DTC.   | Is the same DTC as in current diagnosis still being output?                            | Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> | Go to step 14.  |
| <b>14 CHECK ANY OTHER DTC APPEARANCE.</b>  | Are other DTCs being output?   | Proceed with the diagnosis corresponding to DTC.   | A temporary poor contact.   |

## 13. General Diagnostic Table

### A: INSPECTION

| Symptom   |                                | Probable faulty units/parts  |
|---|--------------------------------|--|
| Vehicle instability during braking                          | Vehicle pulls to either side.  | <ul style="list-style-type: none"> <li>• ABSCM&amp;H/U (solenoid valve)</li> <li>• ABS wheel speed sensor</li> <li>• Brake (caliper &amp; piston, pads)</li> <li>• Wheel alignment</li> <li>• Tire specifications, tire wear and air pressures</li> <li>• Incorrect wiring or piping connections</li> <li>• Road surface (uneven, camber)</li> </ul> |
|   | Vehicle spins.                 | <ul style="list-style-type: none"> <li>• ABSCM&amp;H/U (solenoid valve)</li> <li>• ABS wheel speed sensor</li> <li>• Brake (pads)</li> <li>• Tire specifications, tire wear and air pressures</li> <li>• Incorrect wiring or piping connections</li> </ul>   |
| Poor braking  | Long braking/stopping distance | <ul style="list-style-type: none"> <li>• ABSCM&amp;H/U (solenoid valve)</li> <li>• Brake (pads)</li> <li>• Air in brake line</li> <li>• Tire specifications, tire wear and air pressures</li> <li>• Incorrect wiring or piping connections</li> </ul>  |
|   | Wheel locks.                   | <ul style="list-style-type: none"> <li>• ABSCM&amp;H/U (solenoid valve, motor)</li> <li>• ABS wheel speed sensor</li> <li>• Incorrect wiring or piping connections</li> </ul>  |
|   | Brake dragging                 | <ul style="list-style-type: none"> <li>• ABSCM&amp;H/U (solenoid valve)</li> <li>• ABS wheel speed sensor</li> <li>• Master cylinder</li> <li>• Brake (caliper &amp; piston)</li> <li>• Parking brake</li> <li>• Axle &amp; wheels</li> <li>• Brake pedal play</li> </ul>  |
|   | Long brake pedal stroke        | <ul style="list-style-type: none"> <li>• Air in brake line</li> <li>• Brake pedal play</li> </ul>  |
|   | Vehicle pitching               | <ul style="list-style-type: none"> <li>• Suspension play or fatigue (reduced damping)</li> <li>• Incorrect wiring or piping connections</li> <li>• Road surface (uneven)</li> </ul>  |
|   | Unstable or uneven braking     | <ul style="list-style-type: none"> <li>• ABSCM&amp;H/U (solenoid valve)</li> <li>• ABS wheel speed sensor</li> <li>• Brake (caliper &amp; piston, pads)</li> <li>• Tire specifications, tire wear and air pressures</li> <li>• Incorrect wiring or piping connections</li> <li>• Road surface (uneven)</li> </ul>                                    |
|   | Excessive pedal vibration      | <ul style="list-style-type: none"> <li>• Incorrect wiring or piping connections</li> <li>• Road surface (uneven)</li> </ul>  |
| Vibration and/or noise<br>(while driving on slippery roads) | Noise from ABSCM&H/U           | <ul style="list-style-type: none"> <li>• ABSCM&amp;H/U (mount bushing)</li> <li>• ABS wheel speed sensor</li> <li>• Brake piping</li> </ul>  |
|   | Noise from front of vehicle    | <ul style="list-style-type: none"> <li>• ABSCM&amp;H/U (mount bushing)</li> <li>• ABS wheel speed sensor</li> <li>• Master cylinder</li> <li>• Brake (caliper &amp; piston, pads, rotor)</li> <li>• Brake piping</li> <li>• Brake booster &amp; check valve</li> <li>• Suspension play or fatigue</li> </ul>   |
|   | Noise from rear of vehicle     | <ul style="list-style-type: none"> <li>• ABS wheel speed sensor</li> <li>• Brake (caliper &amp; piston, pads, rotor)</li> <li>• Parking brake</li> <li>• Brake piping</li> <li>• Suspension play or fatigue</li> </ul>   |
|   |                                |  |

# General Diagnostic Table

ABS (DIAGNOSTICS)

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# BRAKE

# BR

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# General Description

## BRAKE

### 1. General Description

#### A: SPECIFICATION

| Model  |  | Other models   | WRX  | STI  |
|--|--|--|--|--|
| Front disc brake   | Size   | 15 inch type   | 16 inch type   | 17 inch type   |
|  | Type   | Disc (Floating type, ventilated)                     | Disc (Fixed type, ventilated)                        |  |
|  | Effective disc diameter                        | 228 mm (8.98 in)                                     | 255 mm (10.04 in)                                    | 268 mm (10.55 in)  |
|  | Disc thickness × Outer diameter                | 24 × 277 mm<br>(0.94 × 10.91 in)                     | 24 × 294 mm<br>(0.94 × 11.57 in)                     | 30 × 326 mm<br>(1.18 × 12.83 in)                         |
|  | Effective cylinder diameter                    | 42.8 mm (1.685 in) × 2                               | 40.4 mm (1.591 in) × 4                               | 40.0 mm × 2, 46.0 mm × 2<br>(1.575 in × 2, 1.811 in × 2) |
|  | Pad dimensions<br>(length × width × thickness) | 117.8 × 50.5 × 11.0 mm<br>(4.638 × 1.988 × 0.433 in) | 116.0 × 47.7 × 10.0 mm<br>(4.567 × 1.878 × 0.394 in) | 129.8 × 60.5 × 9.2 mm<br>(5.110 × 2.382 × 0.362 in)      |
|  | Clearance adjustment                           | Automatic adjustment                                 |  |  |
| Rear disc brake  | Size   | 14 inch type   | 15 inch type   | 17 inch type   |
|  | Type   | Disc (Floating type)                                 | Disc (Fixed type, ventilated)                        |  |
|  | Effective disc diameter                        | 230 mm (9.06 in)                                     | 261 mm (10.28 in)                                    | 268 mm (10.55 in)  |
|  | Disc thickness × Outer diameter                | 10 × 266 mm<br>(0.39 × 10.47 in)                     | 18 × 290 mm<br>(0.71 × 11.42 in)                     | 20 × 316 mm<br>(0.79 × 12.44 in)                         |
|  | Effective cylinder diameter                    | 38.1 mm (1.500 in)                                   |  | 36.0 mm (1.417 in)                                       |
|  | Pad dimensions<br>(length × width × thickness) | 89.4 × 33.7 × 9.0 mm<br>(3.520 × 1.327 × 0.354 in)   | 71.8 × 35.0 × 11.5 mm<br>(2.827 × 1.378 × 0.453 in)  | 74.8 × 45.0 × 9.0 mm<br>(2.945 × 1.772 × 0.354 in)       |
|  | Clearance adjustment                           | Automatic adjustment                                 |  |  |
| Master cylinder  | Type   | Tandem   |  |  |
|  | Effective diameter                             | 26.99 mm (1-1/16 in)                                 | 25.4 mm (1 in)                                       | 26.99 mm (1-1/16 in)                                     |
|  | Reservoir type                                 | Sealed type  |  |  |
|  | Brake fluid reservoir capacity                 | 205 cm <sup>3</sup> (12.51 cu in)                    |  |  |
| Brake booster  | Type   | Vacuum suspended                                     |  |  |
|  | Effective diameter                             | 205 + 230 mm<br>(8.07 + 9.06 in)                     |  |  |
| Brake line   |  | Dual circuit system                                  |  |  |
| Brake fluid<br><b>CAUTION:</b><br>• Avoid mixing brake fluid of different brands to prevent the fluid performance from degrading.<br>• When brake fluid is supplemented, be careful not to allow any dust into the reservoir.<br>• Use fresh DOT3 brake fluid when replacing or refilling the fluid. |  | FMVSS No. 116, DOT3 or DOT4                          |  |  |

**NOTE:**

Refer to "PB section" for parking brake specifications. <Ref. to PB-2, SPECIFICATION, General Description.>

# General Description

BRAKE

| ITEM  |                  | STANDARD                              | SERVICE LIMIT       |
|---|------------------|---------------------------------------|---------------------|
| Front brake                                       | Pad thickness    | 15"                                   | 11 mm (0.43 in)     |
|   |                  | 16"                                   | 10 mm (0.393 in)    |
|   |                  | 17"                                   | 9.2 mm (0.362 in)   |
|   | Disc thickness   | Except 17"                            | 24 mm (0.94 in)     |
|   |                  | 17"                                   | 30 mm (1.18 in)     |
| Disc runout                                       | —                | 0.075 mm (0.0030 in)                  |                     |
| Rear brake (Disc type)                            | Pad thickness    | 14"                                   | 9.0 mm (0.354 in)   |
|   |                  | 15"                                   | 11.5 mm (0.452 in)  |
|   |                  | 17"                                   | 9.0 mm (0.354 in)   |
|   | Disc thickness   | 14"                                   | 10 mm (0.39 in)     |
|   |                  | 15"                                   | 18 mm (0.71 in)     |
|   |                  | 17"                                   | 20 mm (0.79 in)     |
|   | Disc runout      | —                                     | 0.07 mm (0.0028 in) |
| Rear brake (Disc type parking) (Except STI model) | Inside diameter  | 170 mm (6.69 in)                      | 171 mm (6.73 in)    |
|   | Lining thickness | 3.2 mm (0.126 in)                     | 1.5 mm (0.059 in)   |
| Rear brake (Disc type parking) (STI model)        | Inside diameter  | 190 mm (7.48 in)                      | 191 mm (7.52 in)    |
|   | Lining thickness | 3.2 mm (0.126 in)                     | 1.5 mm (0.059 in)   |
| Parking brake                                     | Lever stroke     | 7 to 8 notches/196 N (20 kgf, 44 lbf) |                     |

|               |  | Brake pedal force         | Fluid pressure                                    |   |   |
|---------------|--|---------------------------|---|---|---|
|               |  |                           | Other models                                      | WRX   | STI   |
| Brake booster | Brake fluid pressure without engine running  | 147 N<br>(15 kgf, 33 lbf) | 588 kPa<br>(6 kgf/cm <sup>2</sup> , 85 psi)       |   |   |
|               |  | 294 N<br>(30 kgf, 66 lbf) | 1,471 kPa<br>(15 kgf/cm <sup>2</sup> , 213 psi)   | 1,667 kPa<br>(17 kgf/cm <sup>2</sup> , 242 psi)     | 1,471 kPa<br>(15 kgf/cm <sup>2</sup> , 213 psi)   |
|               | Brake fluid pressure with engine running and vacuum at 66.7 kPa (500 mmHg, 19.69 inHg) | 147 N<br>(15 kgf, 33 lbf) | 5,296 kPa<br>(54 kgf/cm <sup>2</sup> , 768 psi)   | 6,276 kPa<br>(64 kgf/cm <sup>2</sup> , 910 psi)     | 4,021 kPa<br>(41 kgf/cm <sup>2</sup> , 583 psi)   |
|               |  | 294 N<br>(30 kgf, 66 lbf) | 9,120 kPa<br>(93 kgf/cm <sup>2</sup> , 1,323 psi) | 10,000 kPa<br>(102 kgf/cm <sup>2</sup> , 1,450 psi) | 8,336 kPa<br>(85 kgf/cm <sup>2</sup> , 1,209 psi) |

|             |           |   |
|-------------|-----------|---|
| Brake pedal | Free play | 0.5 — 2 mm (0.02 — 0.08 in)<br>[Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lbf).] |
|-------------|-----------|---|

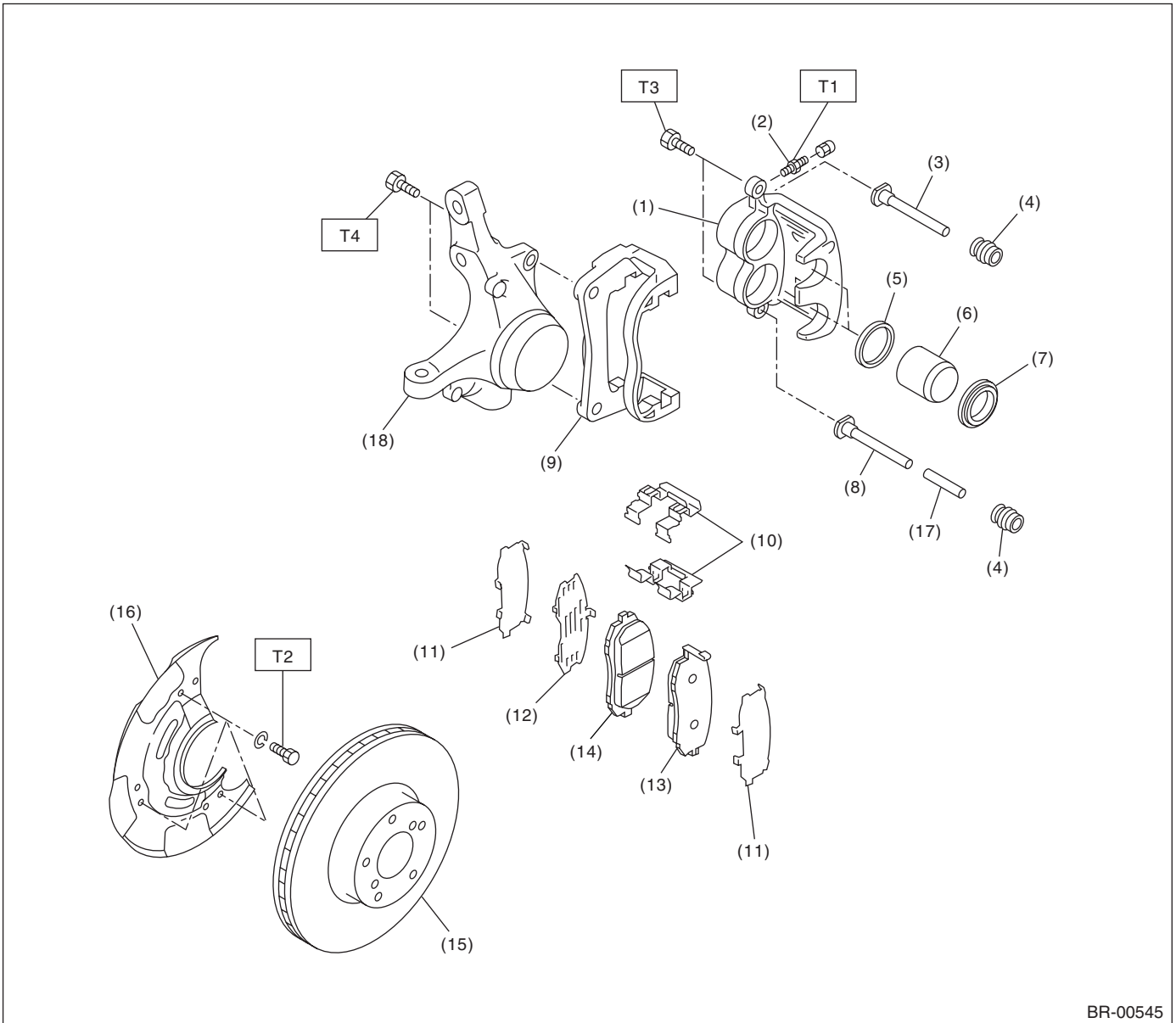
# General Description

BRAKE

## B: COMPONENT

### 1. FRONT DISC BRAKE

#### • 15 INCH TYPE



- (1) Caliper body
- (2) Air bleeder screw
- (3) Guide pin (Green)
- (4) Pin boot
- (5) Piston seal
- (6) Piston
- (7) Piston boot
- (8) Lock pin (Yellow)

- (9) Support
- (10) Pad clip
- (11) Outer shim
- (12) Inner shim
- (13) Pad (Outside)
- (14) Pad (Inside)
- (15) Disc rotor
- (16) Disc cover

- (17) Bushing
- (18) Housing

**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 8 (0.8, 5.8)**

**T2: 18 (1.8, 13.0)**

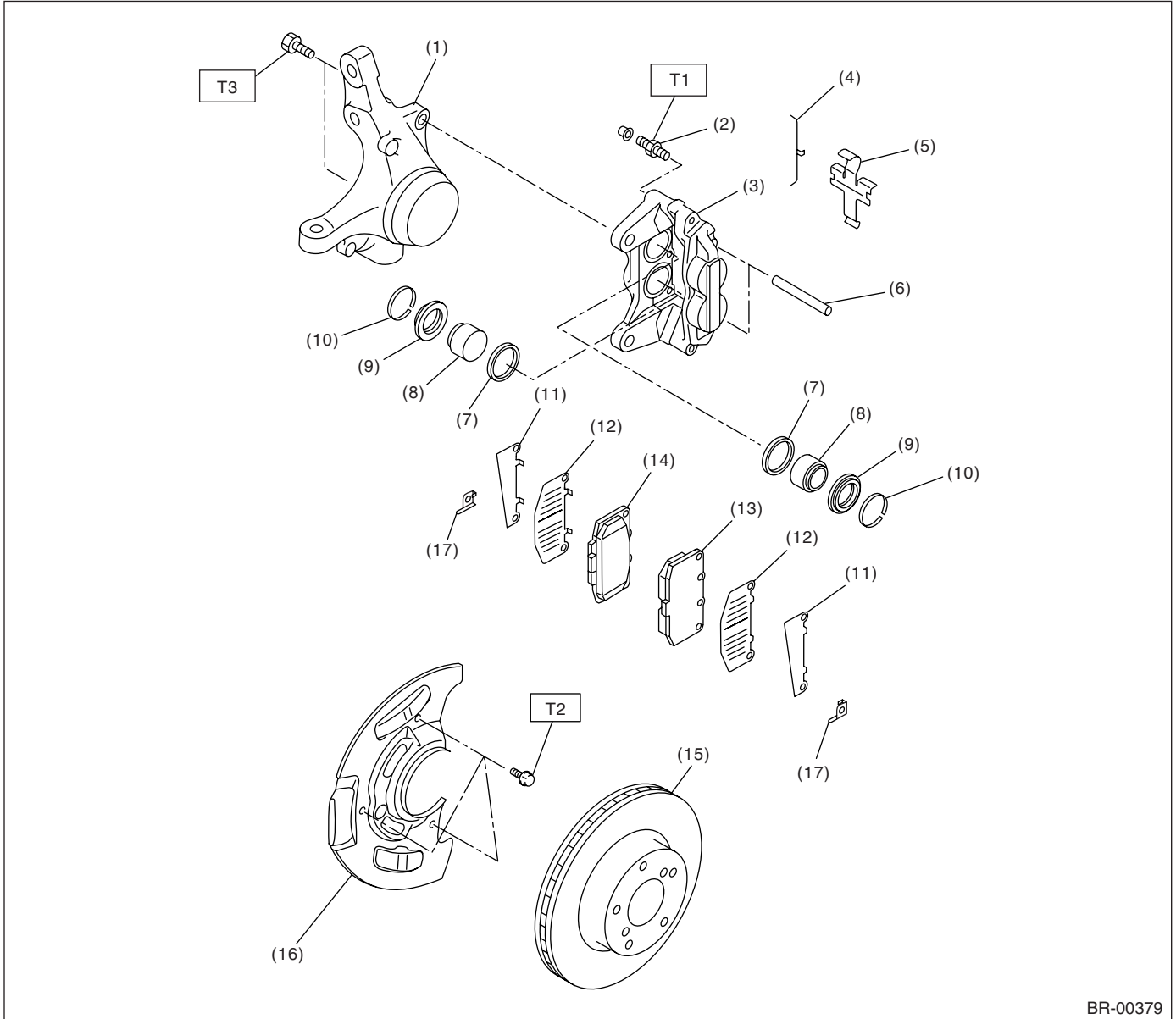
**T3: 26.5 (2.7, 19.5)**

**T4: 80 (8.2, 59)**

# General Description

BRAKE

## • 16 INCH TYPE



BR-00379

- |                       |                    |
|-----------------------|--------------------|
| (1) Housing           | (10) Boot ring     |
| (2) Air bleeder screw | (11) Outer shim    |
| (3) Caliper body      | (12) Inner shim    |
| (4) M clip            | (13) Pad (Outside) |
| (5) Cross spring      | (14) Pad (Inside)  |
| (6) Pad pin           | (15) Disc rotor    |
| (7) Piston seal       | (16) Disc cover    |
| (8) Piston            | (17) Spacer        |
| (9) Piston boot       |                    |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 8 (0.8, 5.8)**

**T2: 18 (1.8, 13.0)**

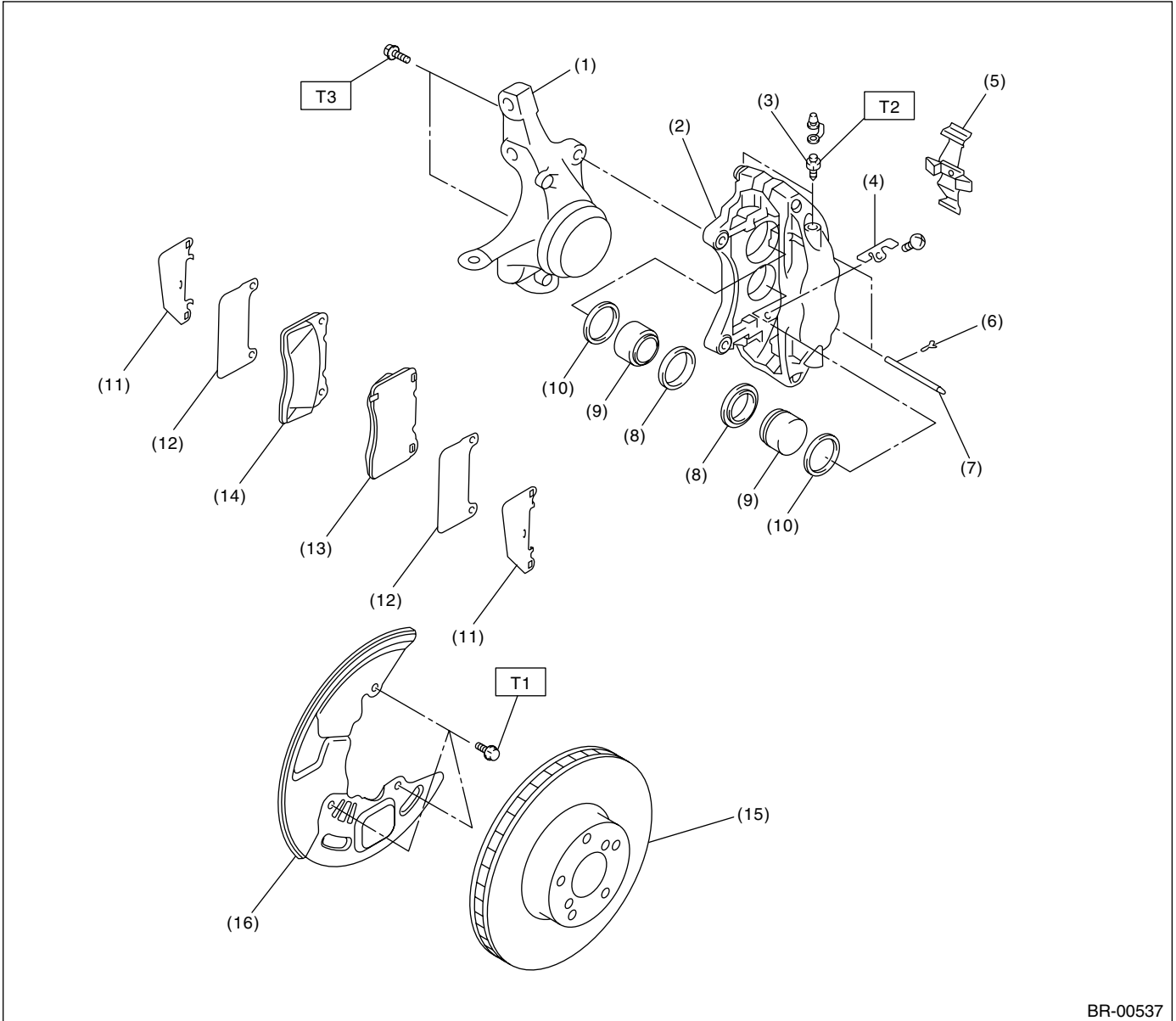
**T3: 80 (8.2, 59)**



# General Description

BRAKE

## • 17 INCH TYPE



BR-00537

- |                       |                         |                 |
|-----------------------|-------------------------|-----------------|
| (1) Housing           | (8) Piston boot         | (15) Disc rotor |
| (2) Caliper body      | (9) Piston              | (16) Disc cover |
| (3) Air bleeder screw | (10) Piston seal        |                 |
| (4) Guide plate       | (11) Pad shim (Outside) |                 |
| (5) Cross spring      | (12) Pad shim (Inside)  |                 |
| (6) Clip              | (13) Pad (Outside)      |                 |
| (7) Pad pin           | (14) Pad (Inside)       |                 |

**Tightening torque: N-m (kgf-m, ft-lb)**

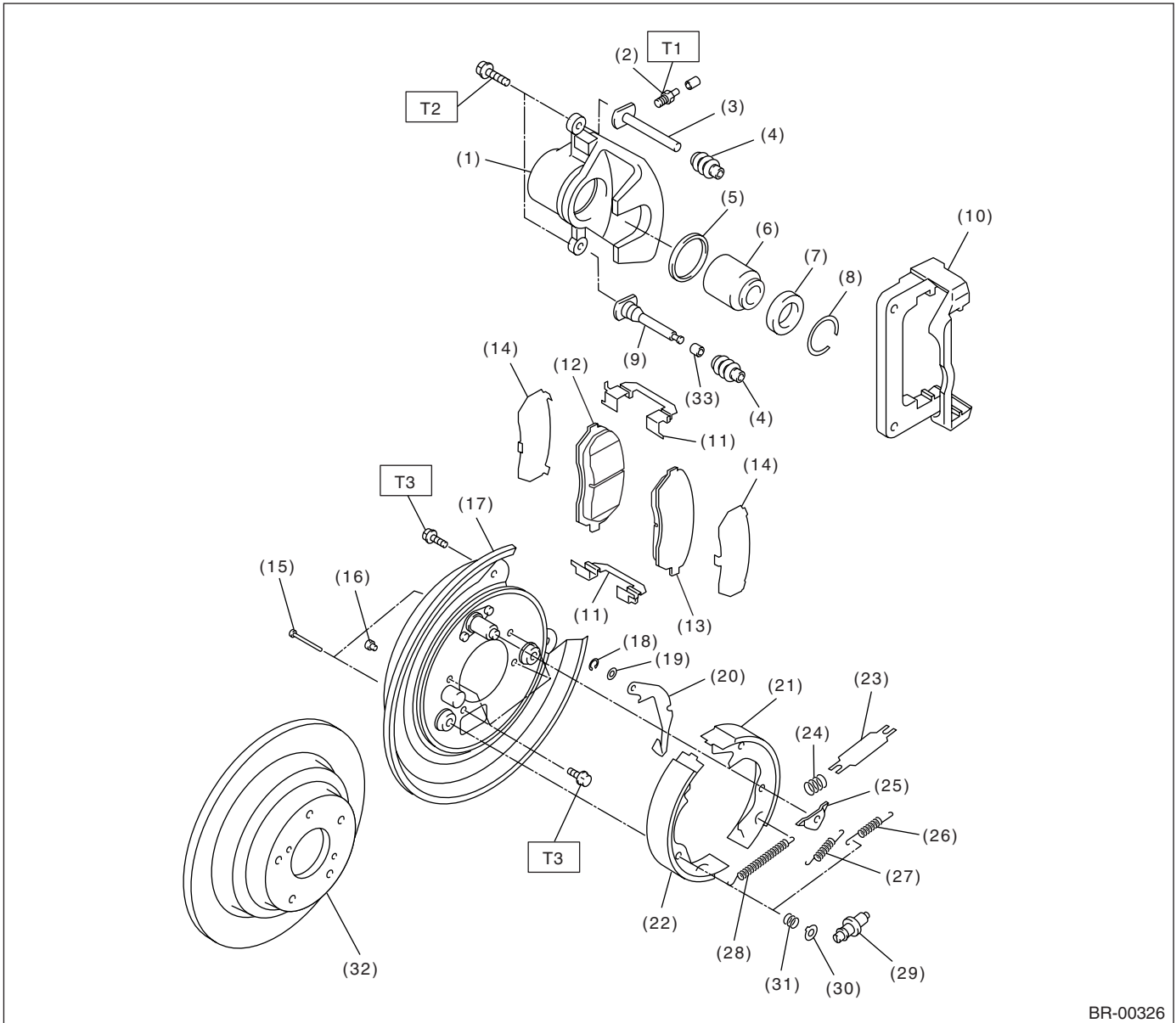
**T1: 18 (1.8, 13.0)**

**T2: 20 (2.0, 14.5)**

**T3: 155 (15.8, 114.3)**

## 2. REAR DISC BRAKE

### • 14 INCH TYPE



BR-00326

- |                       |                                     |                                 |
|-----------------------|-------------------------------------|---------------------------------|
| (1) Caliper body      | (14) Shim                           | (27) Primary shoe return spring |
| (2) Air bleeder screw | (15) Shoe hold-down pin             | (28) Adjusting spring           |
| (3) Guide pin (Green) | (16) Cover                          | (29) Adjuster                   |
| (4) Pin boot          | (17) Back plate                     | (30) Shoe hold-down cup         |
| (5) Piston seal       | (18) Retainer                       | (31) Shoe hold-down spring      |
| (6) Piston            | (19) Spring washer                  | (32) Disc rotor                 |
| (7) Piston boot       | (20) Parking brake lever            | (33) Bushing                    |
| (8) Boot ring         | (21) Parking brake shoe (Secondary) |                                 |
| (9) Lock pin (Yellow) | (22) Parking brake shoe (Primary)   |                                 |
| (10) Support          | (23) Strut                          |                                 |
| (11) Pad clip         | (24) Strut shoe spring              |                                 |
| (12) Inner pad        | (25) Shoe guide plate               |                                 |
| (13) Outer pad        | (26) Secondary shoe return spring   |                                 |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 8 (0.8, 5.8)**

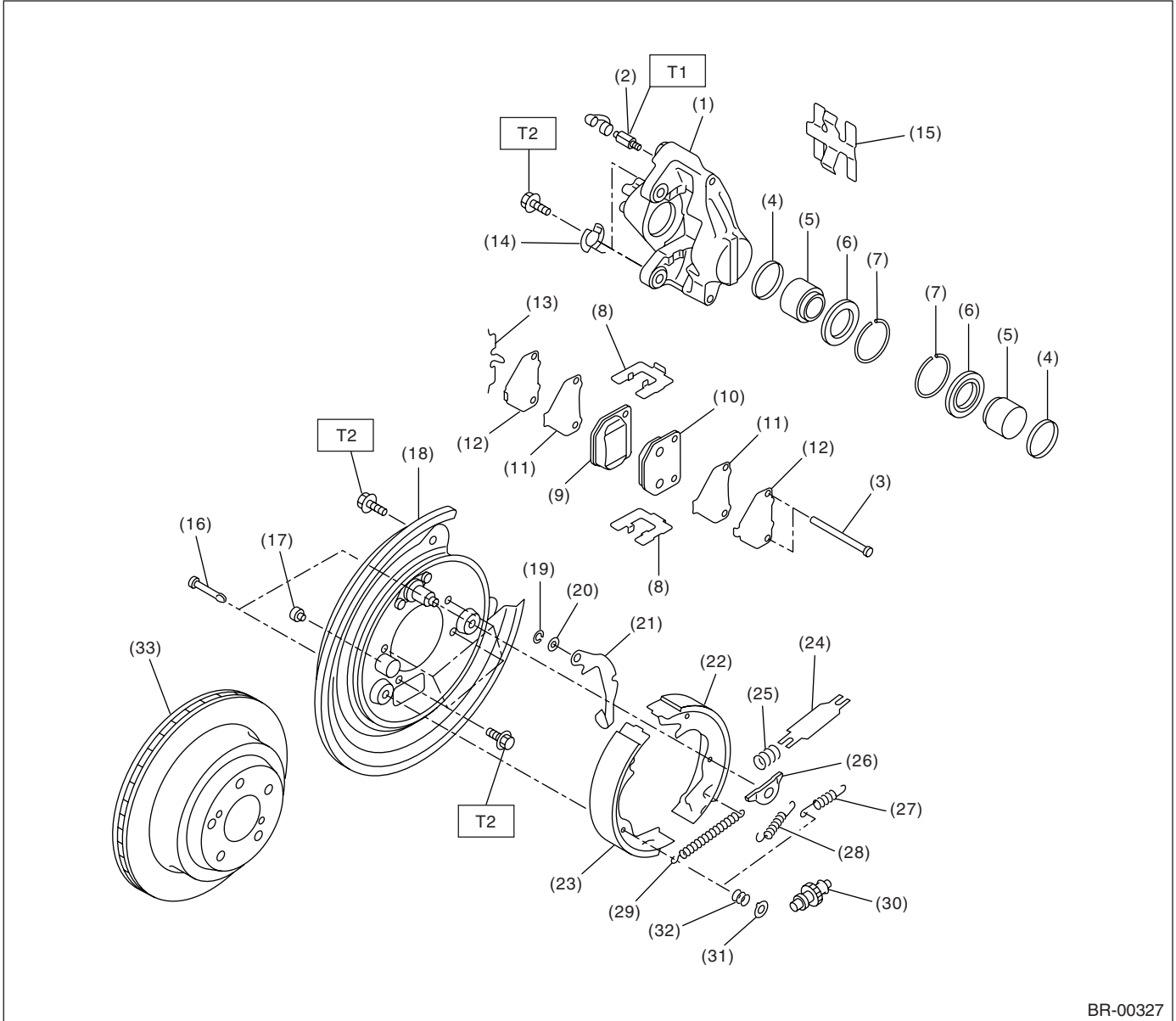
**T2: 37 (3.8, 27.5)**

**T3: 53 (5.4, 39.1)**

# General Description

BRAKE

## • 15 INCH TYPE



BR-00327

- |                       |                                     |                                   |
|-----------------------|-------------------------------------|-----------------------------------|
| (1) Caliper body      | (14) Washer                         | (27) Secondary shoe return spring |
| (2) Air bleeder screw | (15) Cross spring                   | (28) Primary shoe return spring   |
| (3) Pad pin           | (16) Shoe hold-down pin             | (29) Adjusting spring             |
| (4) Piston seal       | (17) Cover                          | (30) Adjuster                     |
| (5) Piston            | (18) Back plate                     | (31) Shoe hold-down cup           |
| (6) Piston boot       | (19) Retainer                       | (32) Shoe hold-down spring        |
| (7) Boot ring         | (20) Spring washer                  | (33) Disc rotor                   |
| (8) Pad clip          | (21) Parking brake lever            |                                   |
| (9) Inner pad         | (22) Parking brake shoe (Secondary) |                                   |
| (10) Outer pad        | (23) Parking brake shoe (Primary)   |                                   |
| (11) Inner shim       | (24) Strut                          |                                   |
| (12) Outer shim       | (25) Strut shoe spring              |                                   |
| (13) M clip           | (26) Shoe guide plate               |                                   |

**Tightening torque: N·m (kgf·m, ft·lb)**

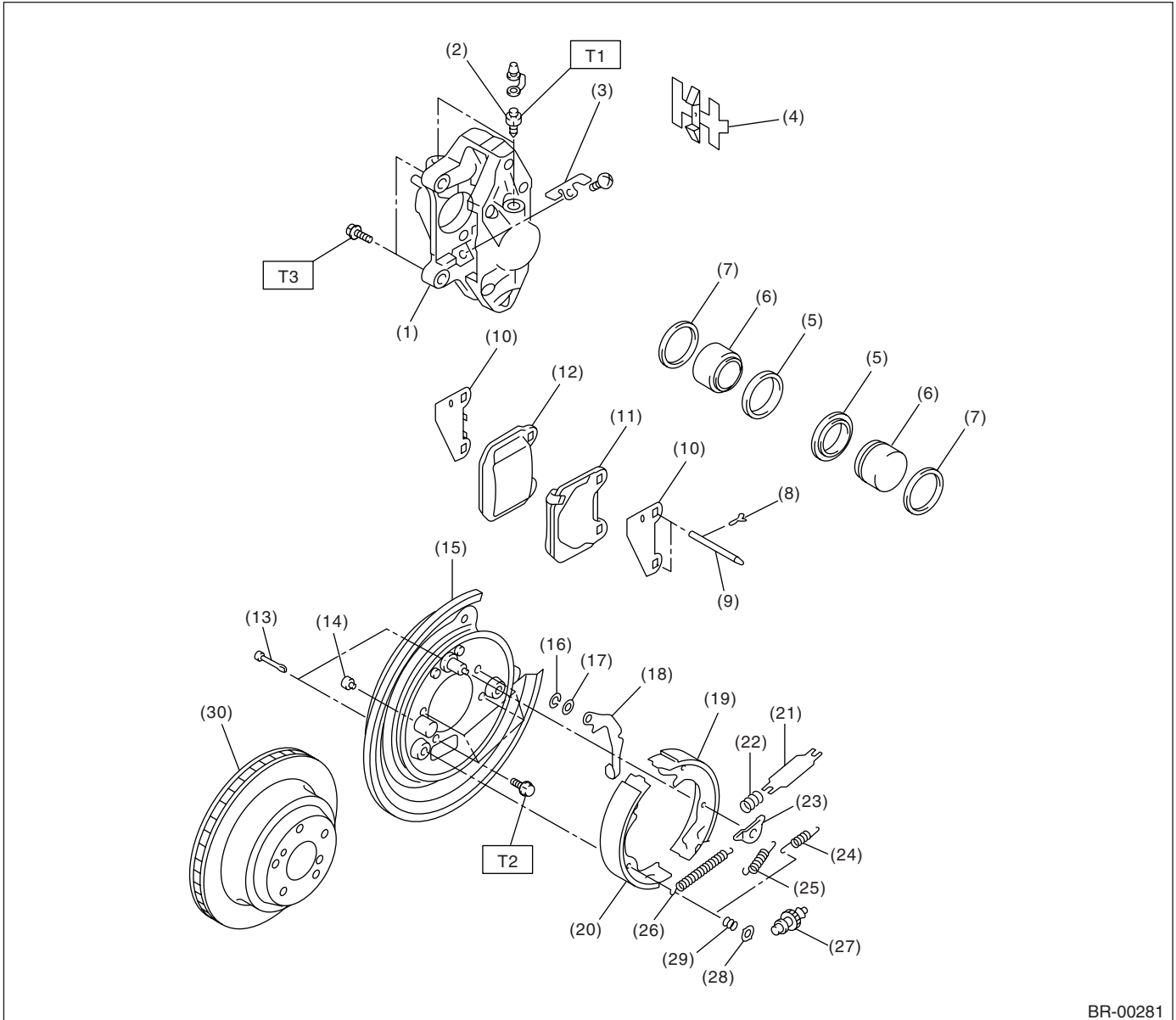
**T1: 8 (0.8, 5.8)**

**T2: 53 (5.4, 39.1)**

# General Description

BRAKE

## • 17 INCH TYPE



BR-00281

- |                       |                                     |                                 |
|-----------------------|-------------------------------------|---------------------------------|
| (1) Caliper body      | (13) Shoe hold-down pin             | (25) Primary shoe return spring |
| (2) Air bleeder screw | (14) Cover                          | (26) Adjusting spring           |
| (3) Guide plate       | (15) Back plate                     | (27) Adjuster                   |
| (4) Cross spring      | (16) Retainer                       | (28) Shoe hold-down cup         |
| (5) Piston boot       | (17) Spring washer                  | (29) Shoe hold-down spring      |
| (6) Piston            | (18) Parking brake lever            | (30) Disc rotor                 |
| (7) Piston seal       | (19) Parking brake shoe (Secondary) |                                 |
| (8) Clip              | (20) Parking brake shoe (Primary)   |                                 |
| (9) Pad pin           | (21) Strut                          |                                 |
| (10) Pad shim         | (22) Strut shoe spring              |                                 |
| (11) Pad (Outside)    | (23) Shoe guide plate               |                                 |
| (12) Pad (Inside)     | (24) Secondary shoe return spring   |                                 |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 20 (2.0, 14.5)**

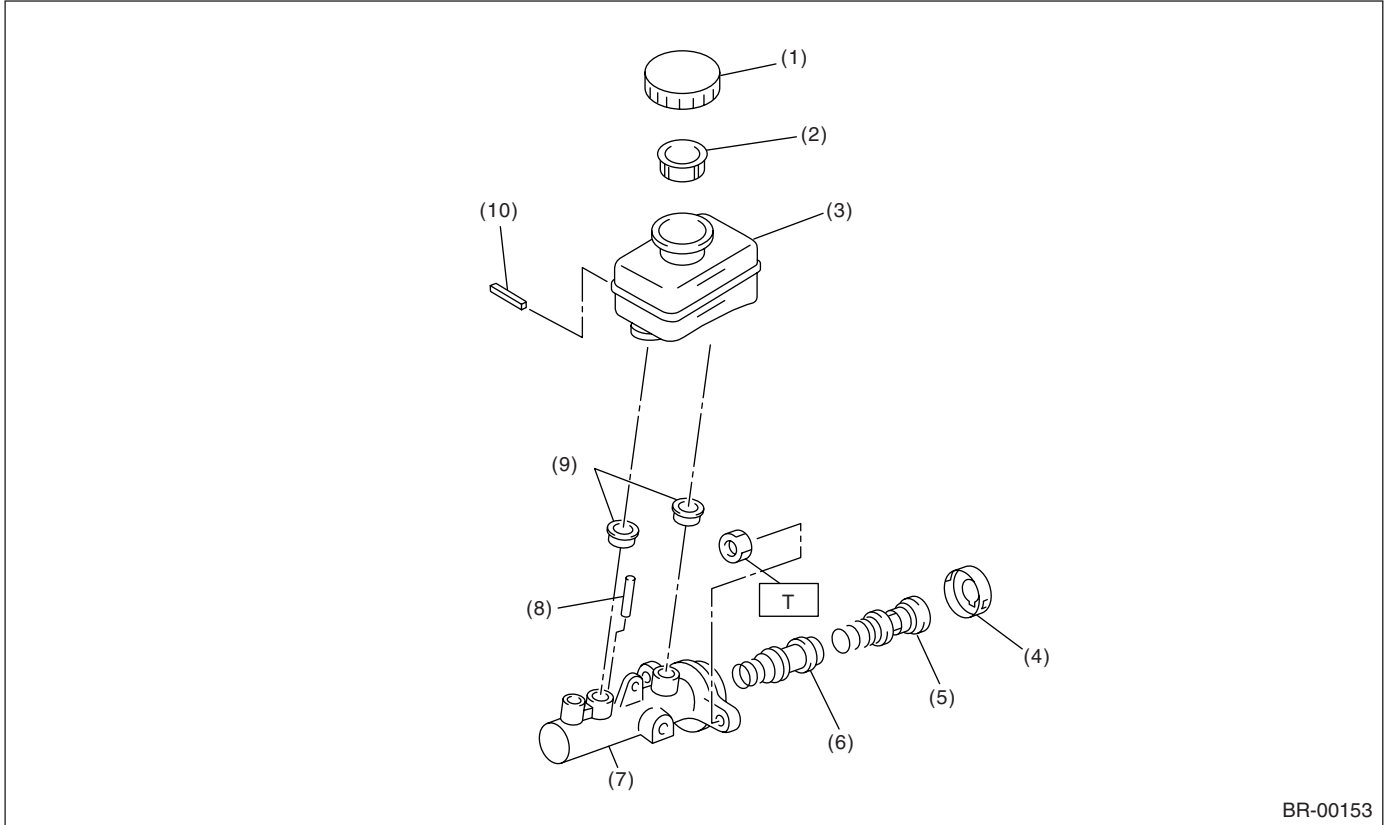
**T2: 53 (5.4, 39.1)**

**T3: 65 (6.6, 47.9)**

# General Description

BRAKE

## 3. MASTER CYLINDER



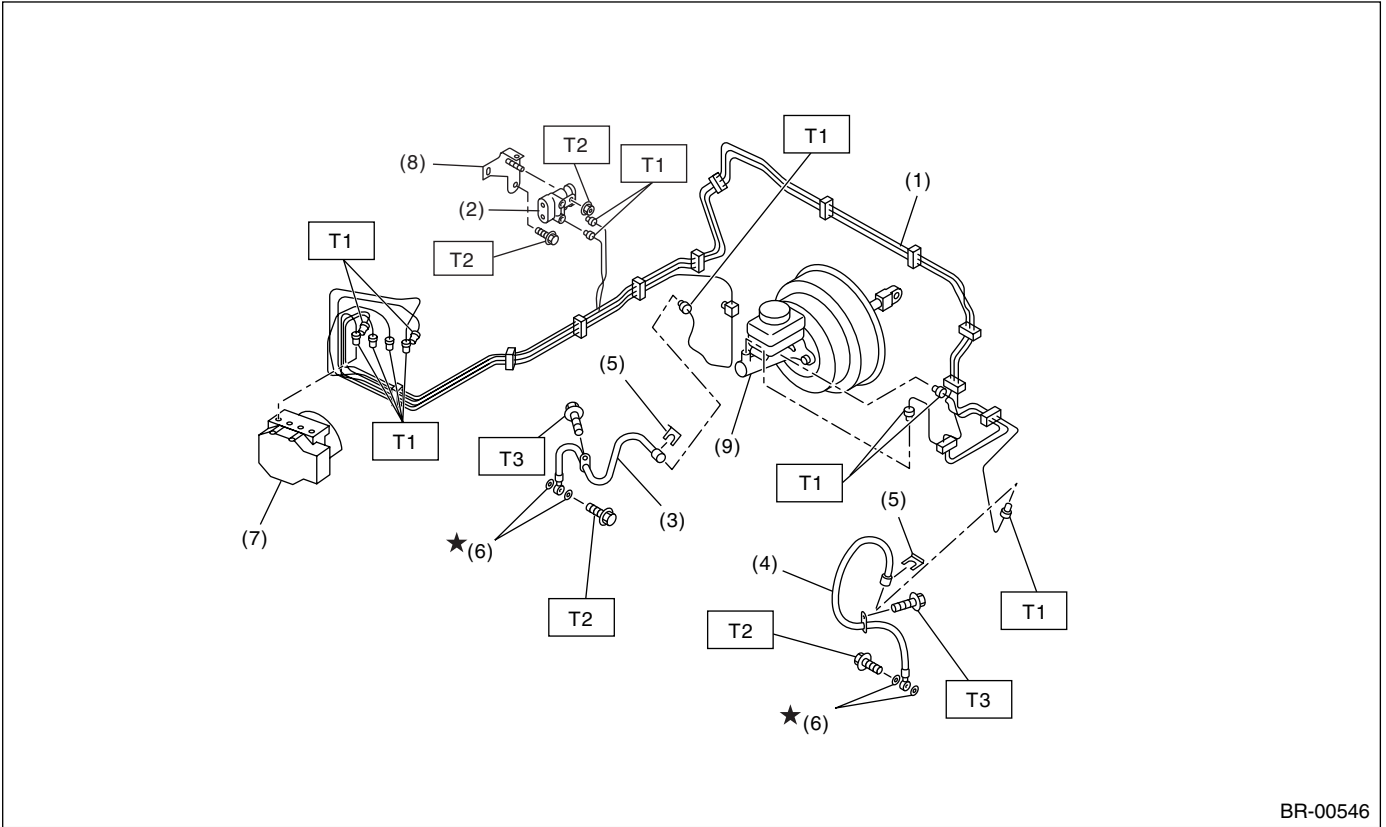
BR-00153

- |                     |                      |
|---------------------|----------------------|
| (1) Cap             | (6) Secondary piston |
| (2) Filter          | (7) Cylinder body    |
| (3) Reservoir tank  | (8) Cylinder pin     |
| (4) Piston retainer | (9) Seal             |
| (5) Primary piston  | (10) Pin             |

**Tightening torque: N-m (kgf-m, ft-lb)**

**T: 15 (1.5, 10.8)**

## 4. FRONT BRAKE PIPES AND HOSE



BR-00546

- |                           |   |
|---------------------------|---|
| (1) Front brake pipe ASSY | (6) Gasket  |
| (2) Two-way connector     | (7) ABS control module and hydraulic control unit (ABSCM&H/U) |
| (3) Front brake hose RH   | (8) Bracket   |
| (4) Front brake hose LH   | (9) Master cylinder   |
| (5) Clamp                 |   |

**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 15 (1.5, 10.8)**

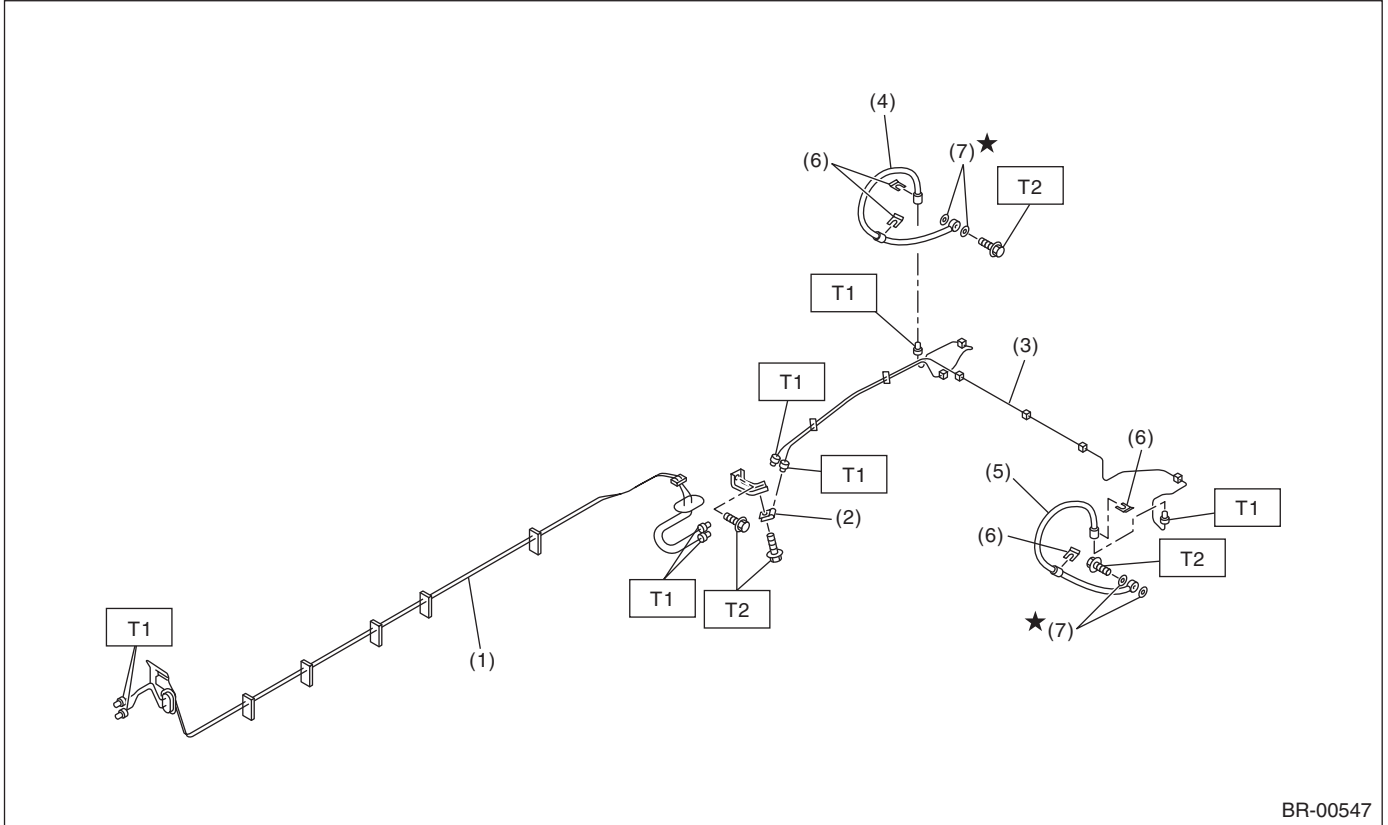
**T2: 18 (1.8, 13.0)**

**T3: 33 (3.4, 25)**

# General Description

BRAKE

## 5. CENTER AND REAR BRAKE PIPES AND HOSES



BR-00547

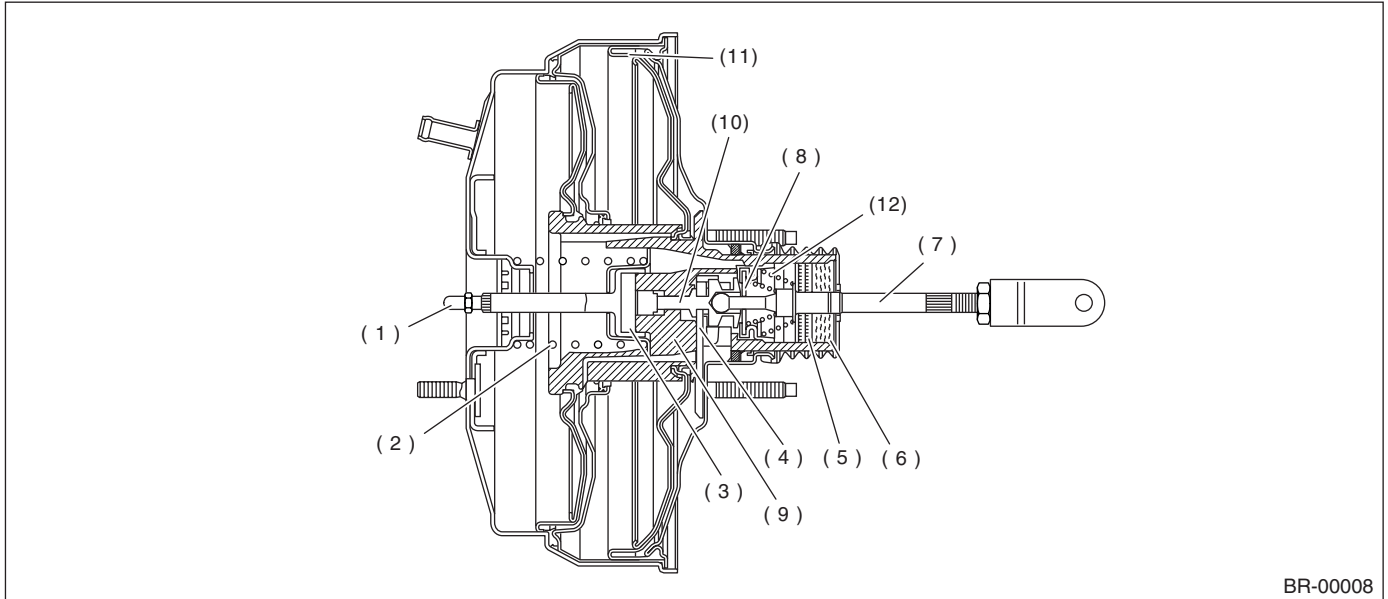
- |                            |                        |
|----------------------------|------------------------|
| (1) Center brake pipe ASSY | (5) Rear brake hose LH |
| (2) Two-way connector      | (6) Clamp              |
| (3) Rear brake pipe ASSY   | (7) Gasket             |
| (4) Rear brake hose RH     |                        |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 15 (1.5, 10.8)**

**T2: 18 (1.8, 13.0)**

## 6. BRAKE BOOSTER



BR-00008

- |                   |                   |                          |
|-------------------|-------------------|--------------------------|
| (1) Push rod      | (5) Filter        | (9) Valve body           |
| (2) Return spring | (6) Silencer      | (10) Plunger valve       |
| (3) Reaction disc | (7) Operating rod | (11) Diaphragm plate     |
| (4) Key           | (8) Poppet valve  | (12) Valve return spring |

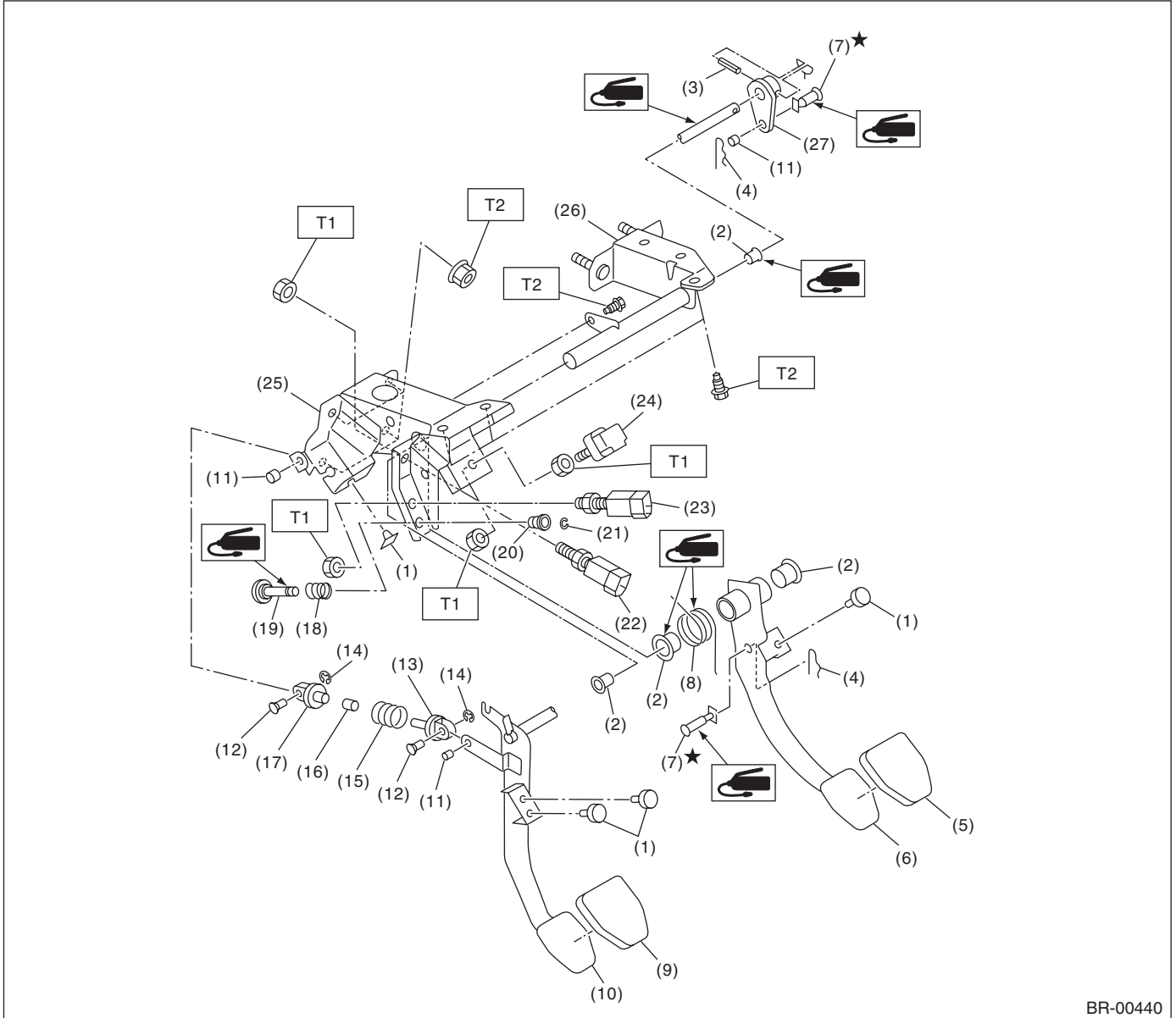


# General Description

BRAKE

## 7. BRAKE PEDAL

• MT MODEL



BR-00440

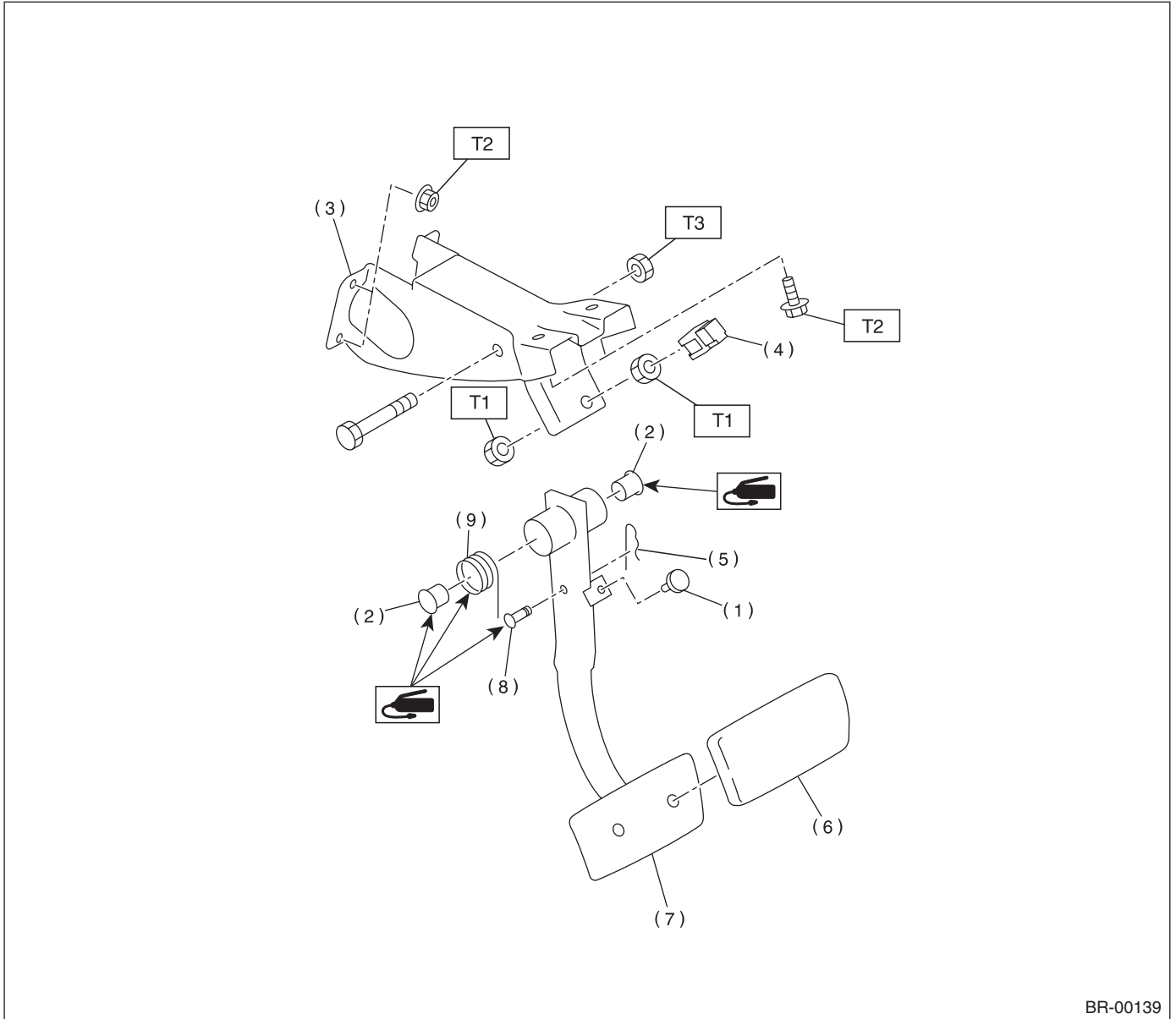
- |                        |  |  |
|------------------------|--|--|
| (1) Stopper            | (12) Clutch clevis pin                 | (23) Clutch switch (With cruise control) |
| (2) Bushing            | (13) Assist rod A                      | (24) Stop light switch                   |
| (3) Spring pin         | (14) Clip                              | (25) Pedal bracket                       |
| (4) Snap pin           | (15) Assist spring                     | (26) Clutch master cylinder bracket      |
| (5) Brake pedal pad    | (16) Assist bushing                    | (27) Lever                               |
| (6) Brake pedal        | (17) Assist rod B                      |  |
| (7) Clevis pin         | (18) Spring S                          |  |
| (8) Brake pedal spring | (19) Rod S                             |  |
| (9) Clutch pedal pad   | (20) Bushing S                         |  |
| (10) Clutch pedal      | (21) Clip                              |  |
| (11) Bushing C         | (22) Clutch switch (Starter interlock) |  |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 8 (0.8, 5.8)**

**T2: 18 (1.8, 13.0)**

• AT MODEL



BR-00139

- |                       |                        |
|-----------------------|------------------------|
| (1) Stopper           | (6) Brake pedal pad    |
| (2) Bushing           | (7) Brake pedal        |
| (3) Pedal bracket     | (8) Clevis pin         |
| (4) Stop light switch | (9) Brake pedal spring |
| (5) Snap pin          |                        |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 8 (0.8, 5.8)**

**T2: 18 (1.8, 13.0)**

**T3: 30 (3.1, 22.1)**

# General Description

BRAKE

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## C: CAUTION

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

## D: PREPARATION TOOL

### 1. GENERAL TOOL

| TOOL NAME        | REMARKS                                     |
|------------------|---|
| Snap ring pliers | Used for removing and installing snap ring. |

## 2. Front Brake Pad

### A: REMOVAL

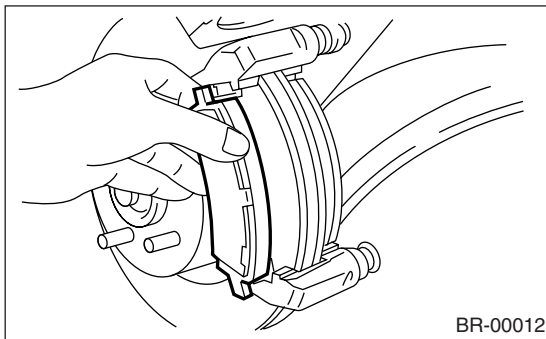
#### 1. 15 INCH TYPE

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the front wheel.
- 4) Remove the lower caliper bolt.
- 5) Raise the caliper body upward and support it.

**NOTE:**

Do not disconnect the brake hose from caliper body.

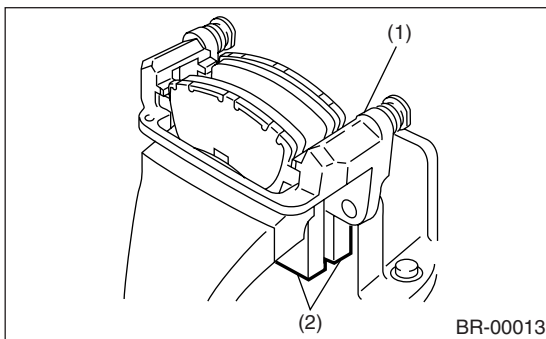
- 6) Remove the pad.



**NOTE:**

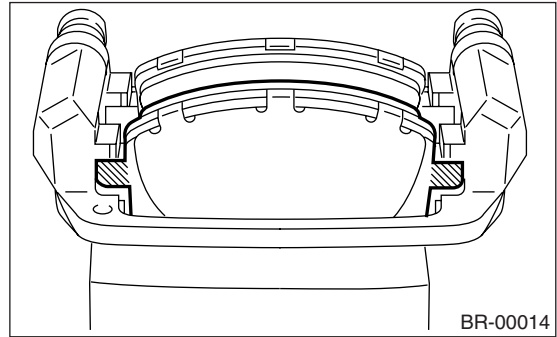
If the brake pad is difficult to remove, proceed as follows:

- (1) Remove the caliper body from support.
- (2) Remove the support.
- (3) Place a support in a vise between wooden blocks.



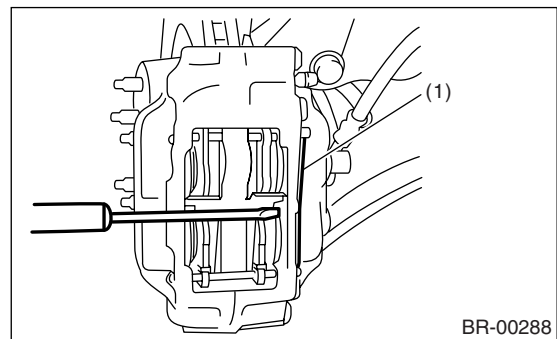
- (1) Support
- (2) Wooden blocks

- (4) Attach a rod of less than 12 mm (0.47 in) dia. to the shaded area of brake pad, and strike the rod with a hammer to drive brake pad out of place.



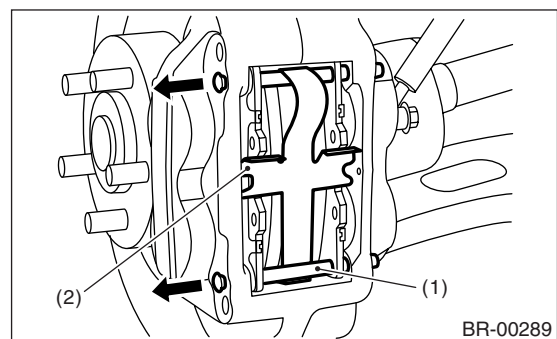
#### 2. 16 INCH TYPE

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the front wheel.
- 4) Remove the M clip.



- (1) M clip

- 5) Remove the pad pins, then remove the cross spring.

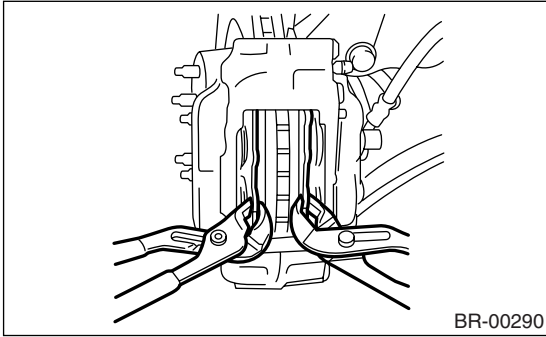


- (1) Pad pin
- (2) Cross spring

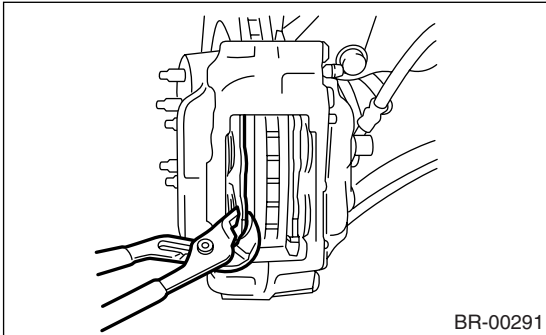
# Front Brake Pad

## BRAKE

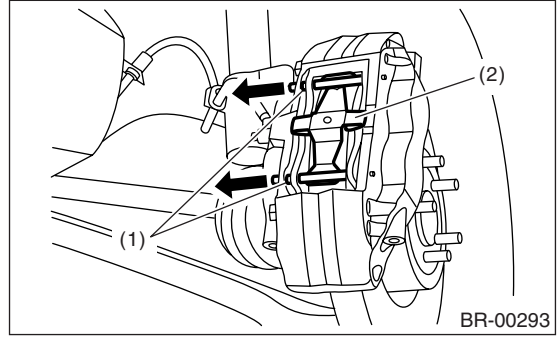
6) Use a wrench to expand the pads, and then push the piston back.



7) Remove the pad.

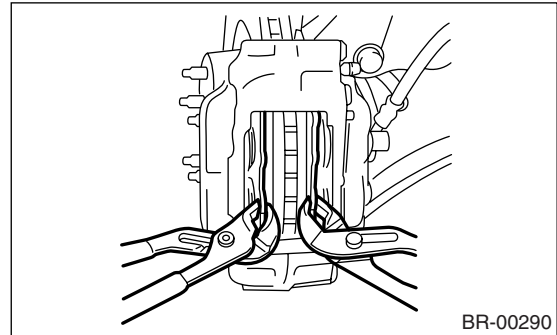


5) Remove the pad pins and cross spring.

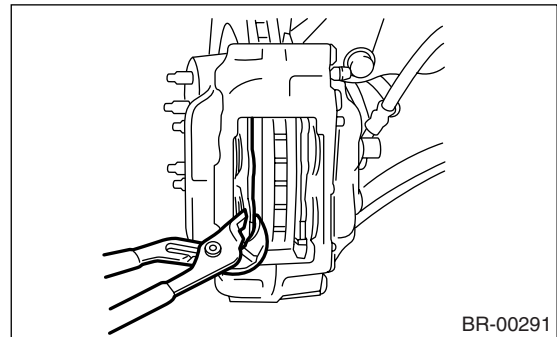


- (1) Pad pin
- (2) Cross spring

6) Use a wrench to expand the pads, and then push the piston back.

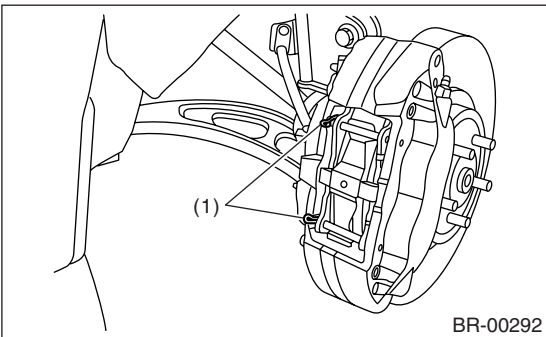


7) Remove the pad.



### 3. 17 INCH TYPE

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the front wheel.
- 4) Remove the clip.



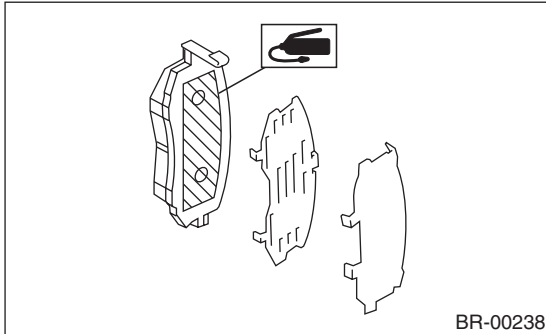
- (1) Clip

## B: INSTALLATION

### 1. 15 INCH TYPE

1) Apply thin coat of Molykote AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.

2) Apply thin coat of Molykote AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad inner shim.



- 3) Install the pads on support.
- 4) Install the caliper body on support.

#### **Tightening torque:**

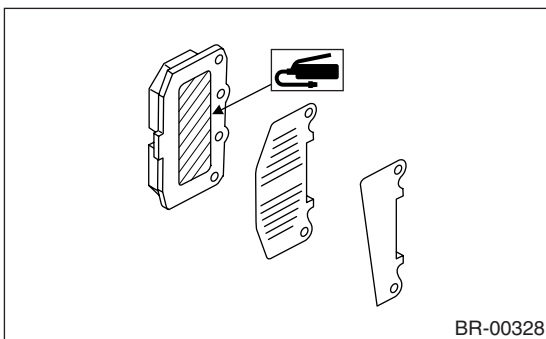
**26.5 N·m (2.7 kgf-m, 19.5 ft-lb)**

#### **NOTE:**

If it is difficult to push the piston during pad replacement, loosen the air bleeder screw to facilitate work.

### 2. 16 INCH TYPE

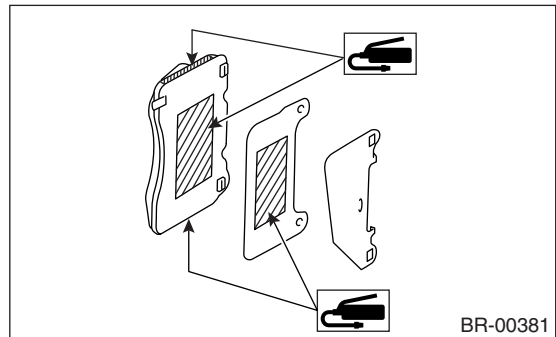
1) Apply thin coat of Molykote AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad inner shim.



- 2) Install the pads on caliper body.
- 3) Install the pad pin on caliper body.
- 4) Install the M clip.
- 5) Install the cross spring.

### 3. 17 INCH TYPE

1) Apply thin coat of Molykote AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad shim.

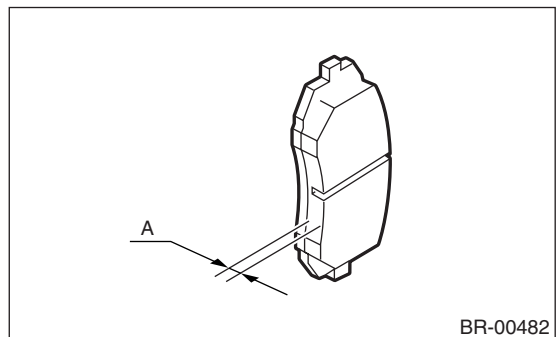


- 2) Install the pads on caliper body.
- 3) Install the cross spring.
- 4) Install the pad pins.
- 5) Install the clip.

## C: INSPECTION

### 1. 15 INCH TYPE

Check the pad thickness A.



|               |                |                   |
|---------------|----------------|-------------------|
| Pad thickness | Standard value | 11 mm (0.43 in)   |
|               | Wear limit     | 1.5 mm (0.059 in) |

#### **NOTE:**

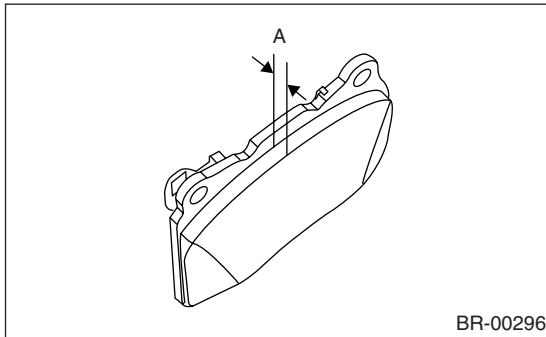
- Always replace the pads for both right and left wheels at the same time.
- Also replace the pad clips if they are twisted or worn.
- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- Replace the pad if there is oil or grease on it.

# Front Brake Pad

## BRAKE

### 2. 16 INCH TYPE

Check the pad thickness A.



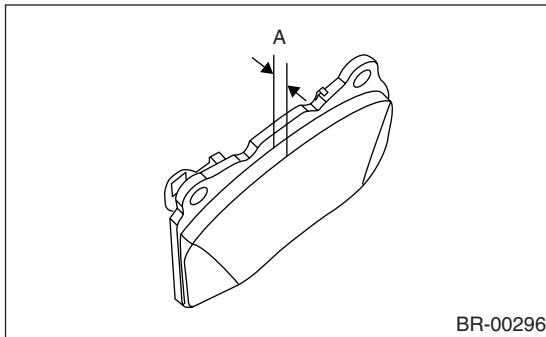
|               |                |                   |
|---------------|----------------|-------------------|
| Pad thickness | Standard value | 10 mm (0.393 in)  |
|               | Wear limit     | 1.5 mm (0.059 in) |

#### NOTE:

- Always replace the pads for both right and left wheels at the same time.
- Also replace the pad clips if they are twisted or worn.
- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- Replace the pad if there is oil or grease on it.

### 3. 17 INCH TYPE

Check the pad thickness A.



|               |                |                   |
|---------------|----------------|-------------------|
| Pad thickness | Standard value | 9.2 mm (0.362 in) |
|               | Wear limit     | 1.2 mm (0.047 in) |

#### NOTE:

- Always replace the pads for both right and left wheels at the same time.
- Also replace the pad clips if they are twisted or worn.

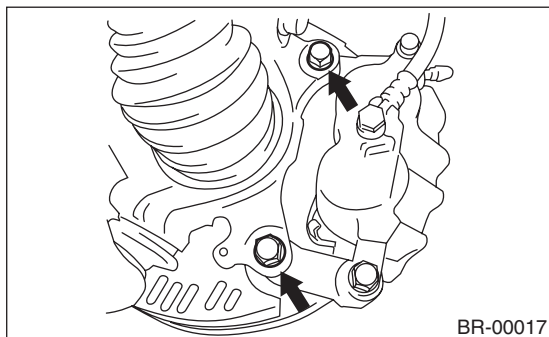
- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- Replace the pad if there is oil or grease on it.

## 3. Front Disc Rotor

### A: REMOVAL

#### 1. 15 INCH TYPE

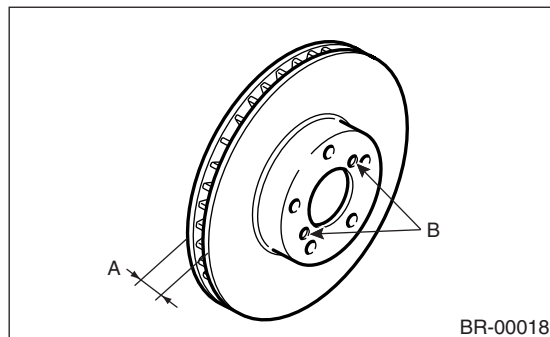
- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the front wheel.
- 4) Remove the caliper body and support from housing, and suspend it from strut using a wire.



- 5) Remove the disc rotor.

**NOTE:**

If the disc rotor seizes up within the hub, drive the disc rotor out by installing an 8-mm bolt in holes (B) on disc rotor.

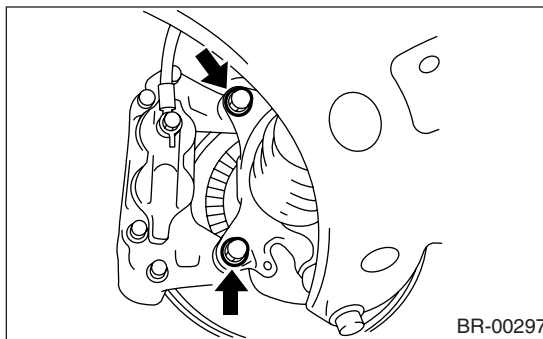


- 6) Clean mud and foreign particles from the caliper body assembly and support.

#### 2. 16 INCH TYPE & 17 INCH TYPE

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nut.
- 3) Lift-up the vehicle, and then remove the front wheel.

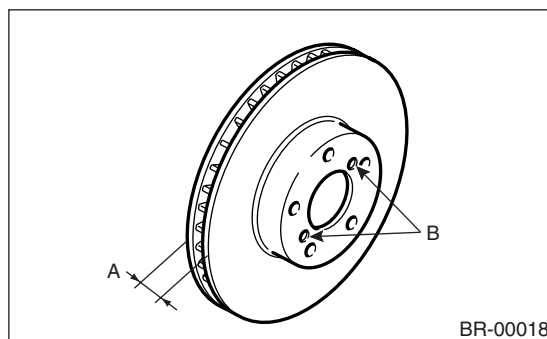
- 4) Remove the caliper body from housing, and suspend it from strut using a wire.



- 5) Remove the disc rotor from hub.

**NOTE:**

If the disc rotor seizes up within the hub, drive the disc rotor out by installing an 8-mm bolt in holes B on disc rotor.



- 6) Clean mud and foreign particles from the caliper body assembly.

### B: INSTALLATION

- 1) Install the disc rotor.
- 2) Install the caliper body and support to housing.

**Tightening torque:**

*Except 17 inch type:*

**80 N·m (8.2 kgf-m, 59 ft-lb)**

*17 inch type:*

**155 N·m (15.8 kgf-m, 114.3 ft-lb)**

- 3) Install the wheel.

### C: INSPECTION

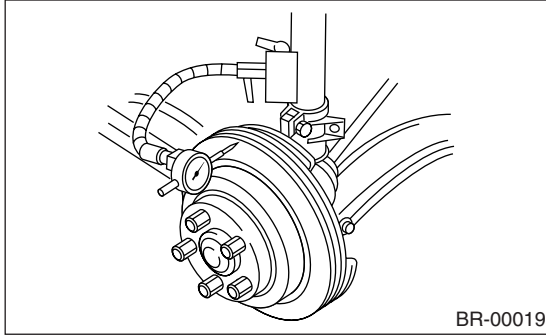
- 1) Check front wheel bearing play and axle hub play before disc rotor runout limit inspection. <Ref. to DS-24, INSPECTION, Front Axle.>
- 2) Secure the disc rotor by tightening five wheel nuts.



# Front Disc Rotor

## BRAKE

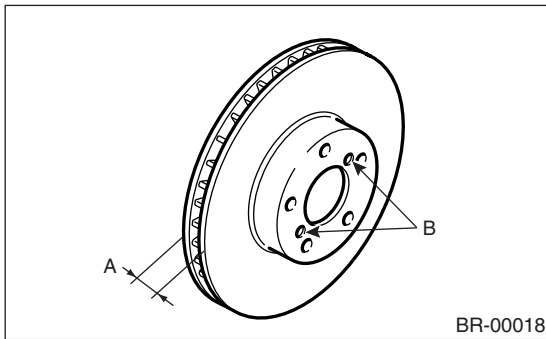
3) Set a dial gauge 10 mm (0.39 in) inward of rotor outer perimeter. Turn the disc rotor to check runout. If the disc rotor runout exceeds the service limit, resurface the disc rotor. After resurfacing, check disc rotor thickness as in step 4.



BR-00019

**Disc rotor runout limit:  
0.075 mm (0.0030 in)**

4) Set a micrometer 10 mm (0.39 in) inward of the rotor outer perimeter, and then measure the disc rotor thickness. If the thickness of disc rotor exceeds the service limit, replace with a new disc rotor.



BR-00018

|                        |     | Standard value     | Service limit      | Disc outer dia.      |
|------------------------|-----|--------------------|--------------------|----------------------|
| Disc rotor thickness A | 15" | 24 mm<br>(0.94 in) | 22 mm<br>(0.87 in) | 277 mm<br>(10.91 in) |
|                        | 16" | 24 mm<br>(0.94 in) | 22 mm<br>(0.87 in) | 294 mm<br>(11.57 in) |
|                        | 17" | 30 mm<br>(1.18 in) | 28 mm<br>(1.10 in) | 326 mm<br>(12.83 in) |

## 4. Front Disc Brake Assembly

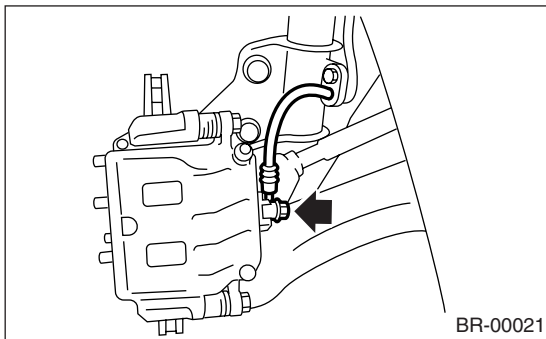
### A: REMOVAL

#### 1. 15 INCH TYPE

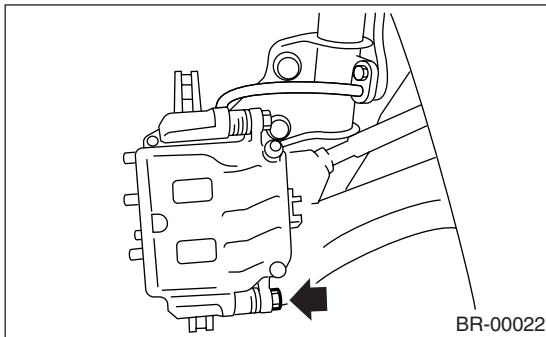
**CAUTION:**

Do not allow brake fluid to come in contact with vehicle body; wash away immediately with water and wipe off completely if spilled.

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the front wheel.
- 4) Remove the union bolt, and then disconnect the brake hose from caliper body assembly.



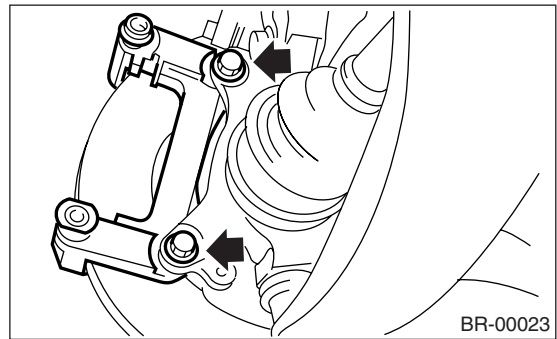
- 5) Remove the bolt securing lock pin to caliper body.



- 6) Raise the caliper body, and then move it toward vehicle center to separate it from support.
- 7) Remove the support from housing.

**NOTE:**

Remove the support only when replacing it or the disc rotor. It need not be removed when servicing the caliper body assembly.



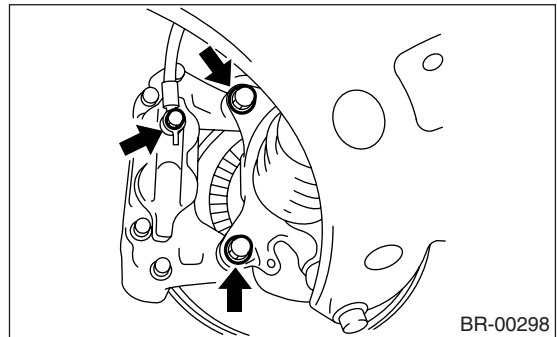
- 8) Clean mud and foreign particles from the caliper body assembly and support.

#### 2. 16 INCH TYPE

**CAUTION:**

Do not allow brake fluid to come in contact with vehicle body; wash away at once with water and wipe off completely if spilled.

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the front wheel.
- 4) Remove the union bolt, and then disconnect the brake hose from caliper body assembly.
- 5) Remove the caliper body from housing.



- 6) Clean mud and foreign particles from the caliper body assembly and support.

#### 3. 17 INCH TYPE

**CAUTION:**

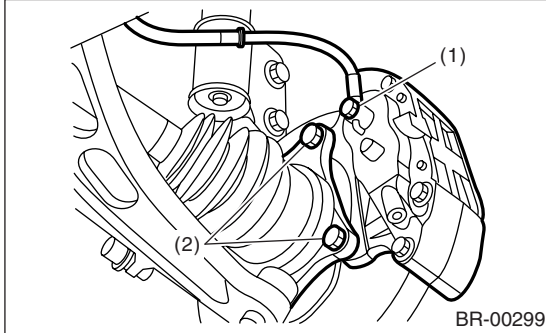
Do not allow brake fluid to come in contact with vehicle body; wash away immediately with water and wipe off completely if spilled.

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the front wheel.

# Front Disc Brake Assembly

## BRAKE

- 4) Remove the brake pads from caliper body. <Ref. to BR-18, 17 INCH TYPE, REMOVAL, Front Brake Pad.>
- 5) Remove the union bolt (1) and brake hose from caliper body assembly.
- 6) Remove installation bolts (2) from housing.



- (1) Union bolt
- (2) Installation bolt

- 7) Clean mud and foreign particles from the caliper body assembly.

## B: INSTALLATION

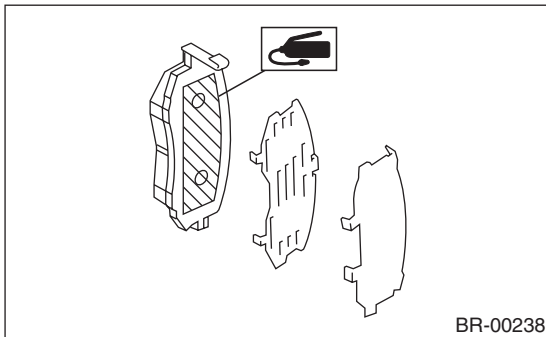
### 1. 15 INCH TYPE

- 1) Install the support on housing.

#### **Tightening torque:**

**80 N·m (8.2 kgf·m, 59 ft·lb)**

- 2) Apply thin coat of Molykote AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
- 3) Apply thin coat of Molykote AS-880N (Part No. K0777YA010) to the frictional portion between pad and inner shim.



- 4) Install the pads on support.
- 5) Install the caliper body on support.

#### **Tightening torque:**

**26.5 N·m (2.7 kgf·m, 19.5 ft·lb)**

- 6) Replace the brake hose gaskets with new ones, and then connect the brake hose.

#### **Tightening torque:**

**18 N·m (1.8 kgf·m, 13.0 ft·lb)**

- 7) Bleed air from the brake system.

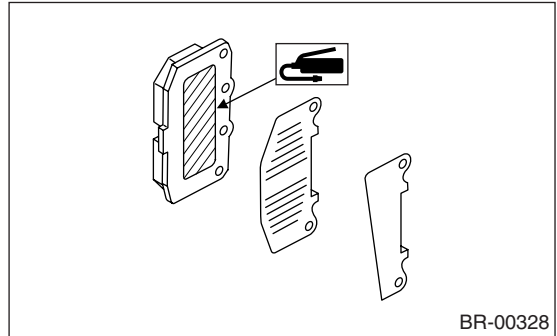
### 2. 16 INCH TYPE

- 1) Install the caliper body on housing.

#### **Tightening torque:**

**80 N·m (8.2 kgf·m, 59 ft·lb)**

- 2) Apply thin coat of Molykote AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad inner shim.



- 3) Install the pads on caliper body.
- 4) Install the pad pin and cross spring on caliper body.
- 5) Install the M clip.
- 6) Replace the brake hose gaskets with new ones, and then connect the brake hose.

#### **Tightening torque:**

**18 N·m (1.8 kgf·m, 13.0 ft·lb)**

- 7) Bleed air from the brake system.

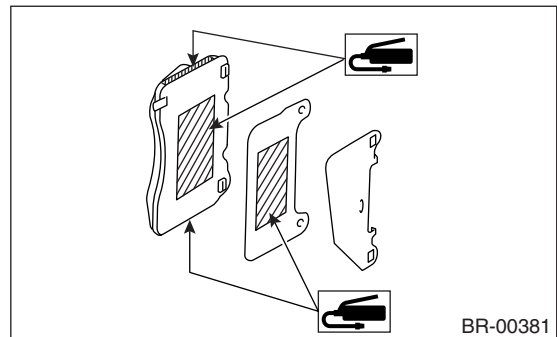
### 3. 17 INCH TYPE

- 1) Install the caliper body assembly on housing.

#### **Tightening torque:**

**155 N·m (15.8 kgf·m, 114.3 ft·lb)**

- 2) Apply thin coat of Molykote AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad shim.



- 3) Install the pads on caliper body.
- 4) Install the cross spring.
- 5) Install the pad pins.
- 6) Install the clip.
- 7) Replace the brake hose gaskets with new ones, and then connect the brake hose.

**Tightening torque:**

**18 N·m (1.8 kgf·m, 13.0 ft·lb)**

8) Bleed air from the brake system.

**C: DISASSEMBLY**

**1. 15 INCH TYPE**

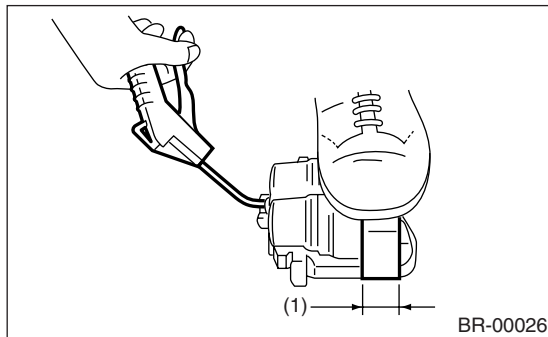
1) Clean mud and foreign particles from the caliper body assembly and support.

**CAUTION:**

**Be careful not to allow foreign particles to enter the brake hose connector.**

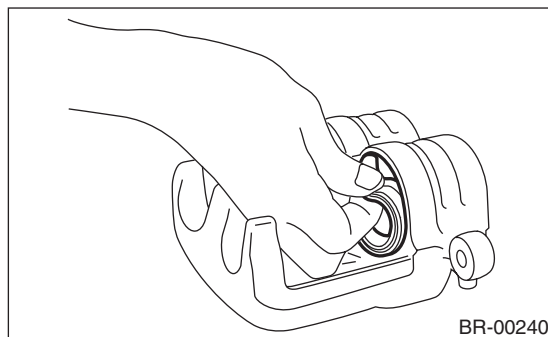
2) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.

3) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



(1) Place a 30 mm (1.18 in) wide wooden block here.

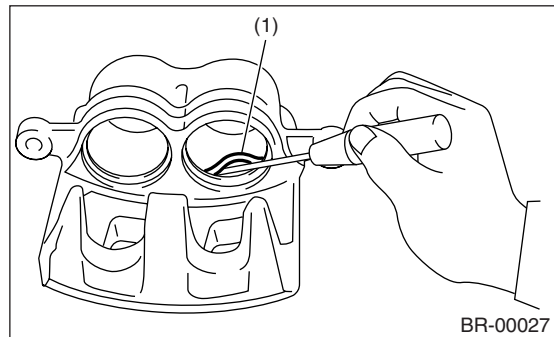
4) Remove the piston boot.



5) Remove the piston seal from caliper body cylinder.

**CAUTION:**

**Do not damage the cylinder and piston seal groove.**



(1) Piston seal

6) Remove the guide pin and boot from caliper body.

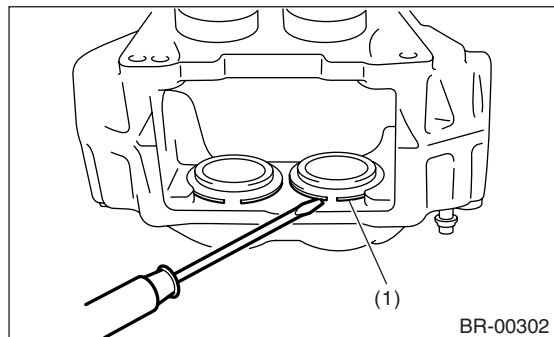
**2. 16 INCH TYPE**

1) Clean mud and foreign particles from the caliper body assembly.

**CAUTION:**

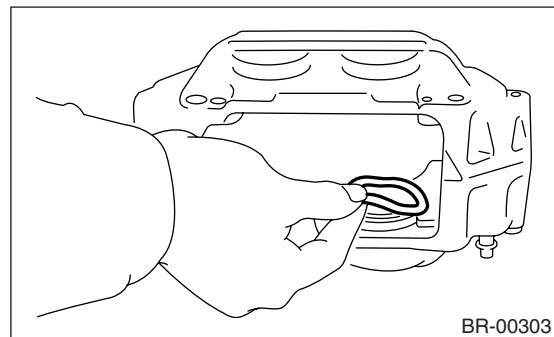
**Be careful not to allow foreign particles to enter the brake hose connector.**

2) Using a standard screwdriver, remove the boot ring from piston.



(1) Boot ring

3) Remove the boot from piston end.

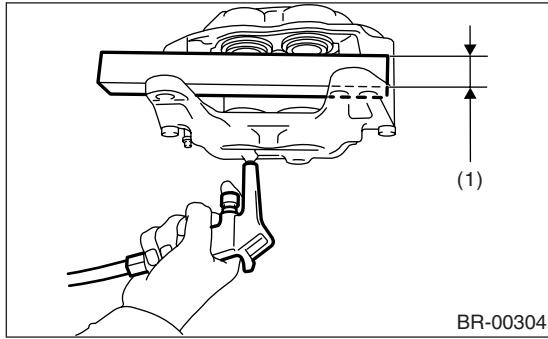


4) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.

# Front Disc Brake Assembly

## BRAKE

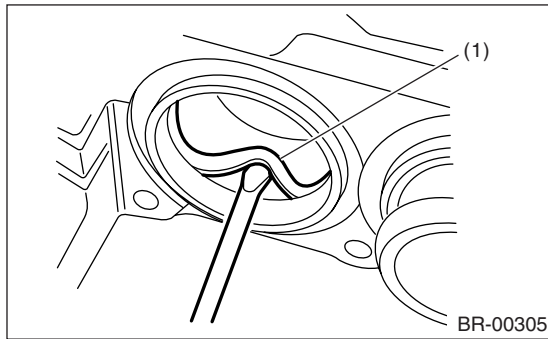
5) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



(1) Place a 30 mm (1.18 in) wide wooden block here.

6) Remove the piston seal from caliper body cylinder.

**CAUTION:**  
Do not damage the cylinder and piston seal groove.



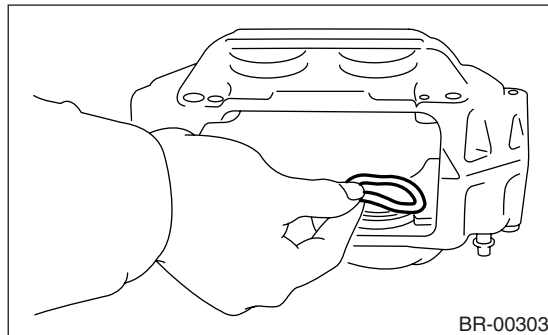
(1) Piston seal

### 3. 17 INCH TYPE

1) Clean mud and foreign particles from the caliper body assembly.

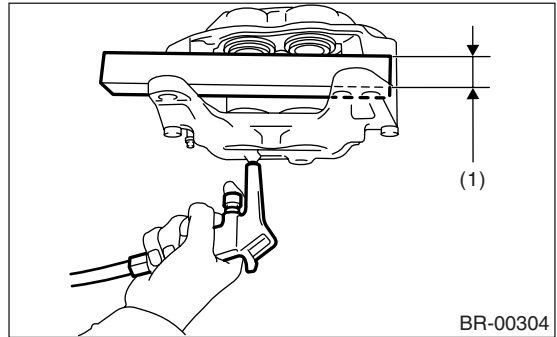
**CAUTION:**  
Be careful not to allow foreign particles to enter the brake hose connector.

2) Remove the piston boots from each piston end.



3) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.

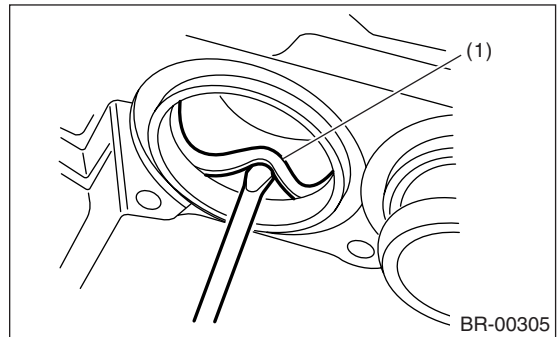
4) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



(1) Place a 30 mm (1.18 in) wide wooden block here.

5) Remove the piston seal from caliper body cylinder.

**CAUTION:**  
Do not damage the cylinder and piston seal groove.



(1) Piston seal

## D: ASSEMBLY

### 1. 15 INCH TYPE

- 1) Clean the caliper body interior using brake fluid.
- 2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
- 3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
- 4) Apply a coat of specified grease to the boot and install the piston boot to the groove on ends of cylinder.

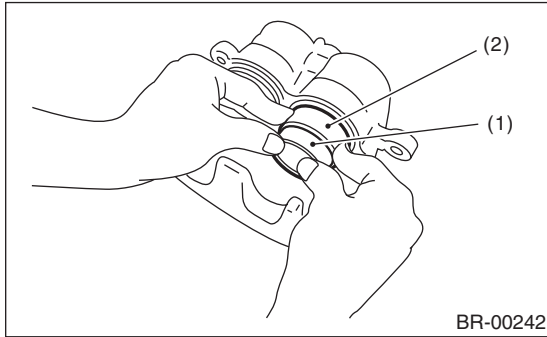
**Grease:**

**NIGLUBE RX-2 (Part No. K0779GA102)**

- 5) Insert the piston into cylinder.

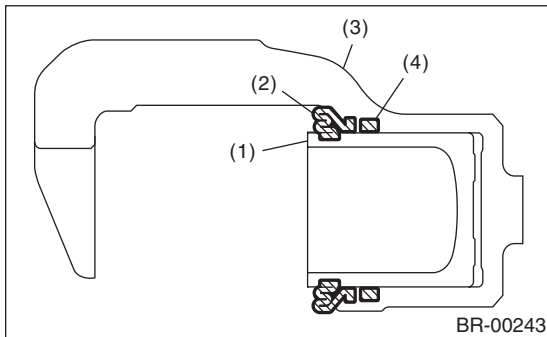
**CAUTION:**

**Do not force the piston into cylinder.**



- (1) Piston
- (2) Piston boot

6) Position the boot in grooves on cylinder and piston.



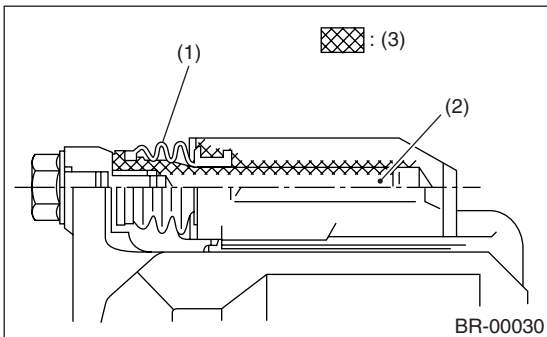
- (1) Piston
- (2) Piston boot
- (3) Caliper body
- (4) Piston seal

7) Apply a coat of specified grease to the lock pin and guide pin outer surface, cylinder inner surface, and boot grooves.

**Grease:**

***NIGLUBE RX-2 (Part No. K0779GA102)***

8) Install the lock and guide pin boot on support.



- (1) Pin boot
- (2) Lock pin or guide pin
- (3) Apply grease.

## 2. 16 INCH TYPE

- 1) Clean the caliper body interior using brake fluid.
- 2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
- 3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
- 4) Apply a coat of specified grease to the boot and fit in groove on ends of cylinder and piston.

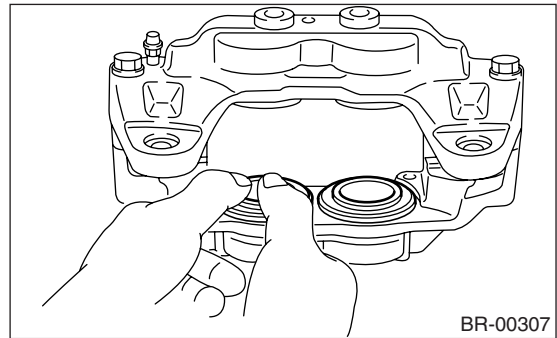
**Grease:**

***NIGLUBE RX-2 (Part No. K0779GA102)***

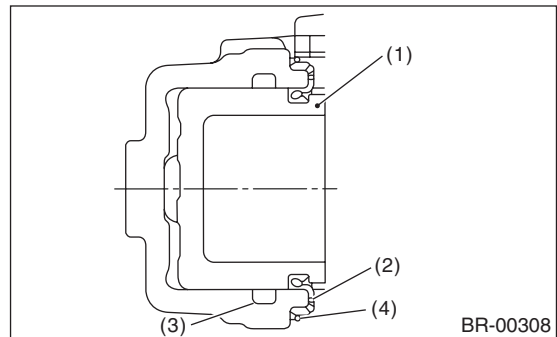
5) Insert the piston into cylinder.

**CAUTION:**

**Do not force the piston into cylinder.**



6) Position the boot in grooves on cylinder and piston.



- (1) Piston
- (2) Piston boot
- (3) Piston seal
- (4) Boot ring

7) Install the boot ring. Be careful not to scratch the boot.

## 3. 17 INCH TYPE

- 1) Clean the caliper body interior using brake fluid.
- 2) Apply a coat of brake fluid to the piston seal, and then install the piston seal in groove on caliper body.
- 3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
- 4) Apply a coat of specified grease to the boot and install it in the groove on piston.

# Front Disc Brake Assembly

## BRAKE

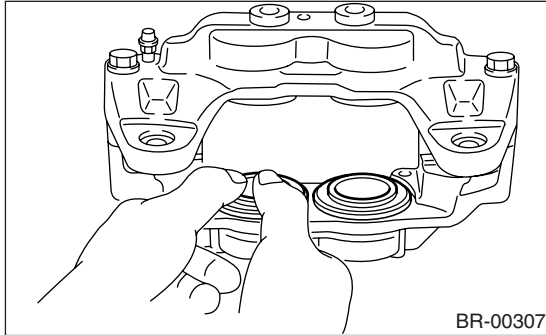
### Grease:

**NIGLUBE RX-2 (Part No. K0779GA102)**

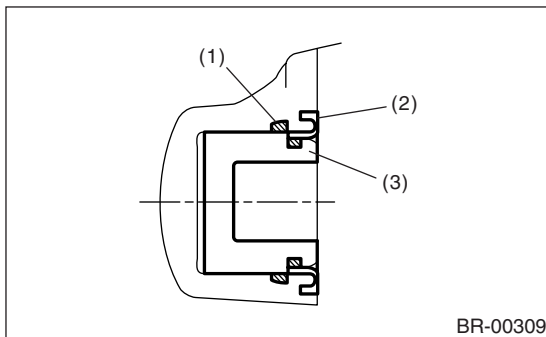
5) Insert the piston into cylinder.

### CAUTION:

**Do not force the piston into cylinder.**



6) Position the boot in grooves on cylinder and piston.



- (1) Piston seal
- (2) Piston boot
- (3) Piston

## E: INSPECTION

- 1) Repair or replace the faulty parts.
- 2) Check the caliper body and piston for uneven wear, damage or rust.
- 3) Check the rubber parts for damage or deterioration.

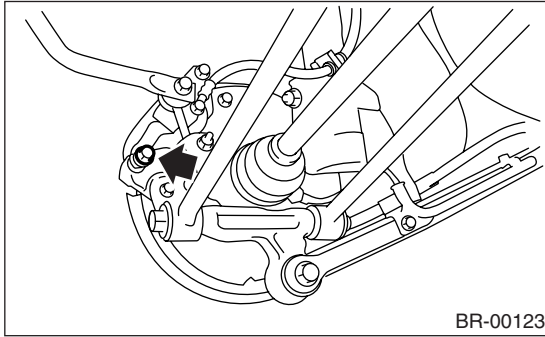


## 5. Rear Brake Pad

### A: REMOVAL

#### 1. 14 INCH TYPE

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the rear wheel.
- 4) Remove the lower caliper bolt.



- 5) Raise the caliper body upward and support it.

**NOTE:**

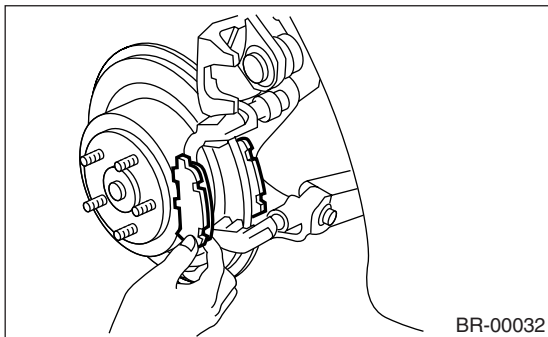
Do not disconnect the brake hose from caliper body.

- 6) Remove the pad.

**NOTE:**

If the brake pad is difficult to remove, use the same procedure as for front disc brake pad.

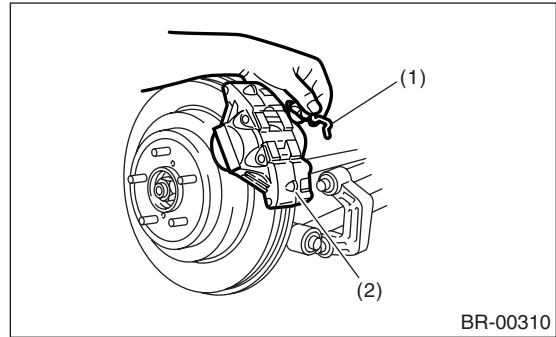
<Ref. to BR-17, REMOVAL, Front Brake Pad.>



#### 2. 15 INCH TYPE

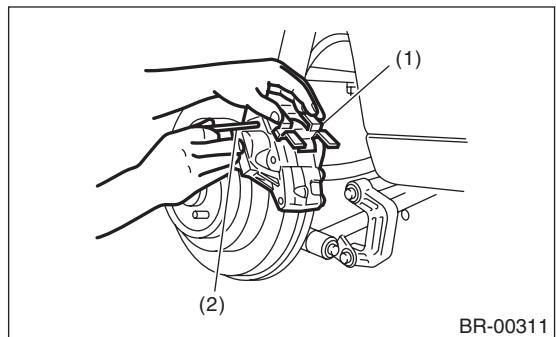
- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the rear wheel.

- 4) Remove the M clip.



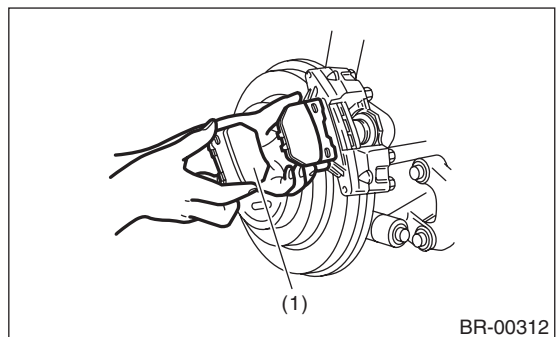
- (1) M clip
- (2) Caliper body

- 5) Remove the two pad pins.
- 6) Remove the cross spring.



- (1) Cross spring
- (2) Pad pin

- 7) Expand the pads and push piston back.
- 8) Remove the pad and shim.



- (1) Brake pad

#### 3. 17 INCH TYPE

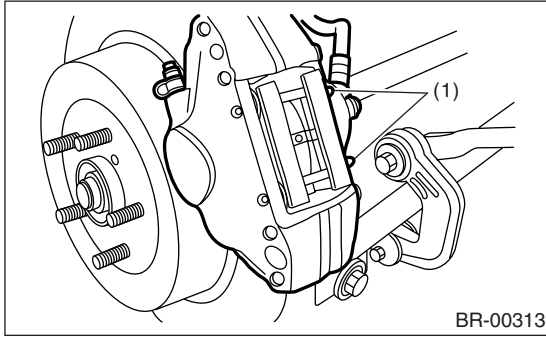
- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the rear wheel.



# Rear Brake Pad

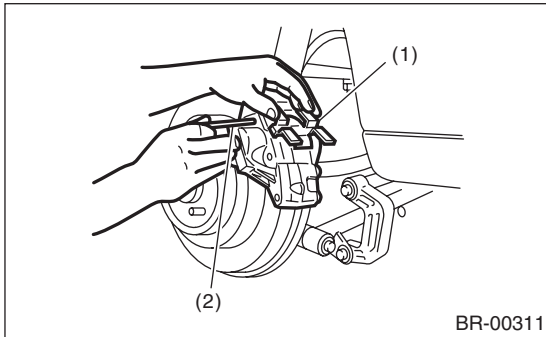
## BRAKE

4) Remove the clip.



(1) Clip

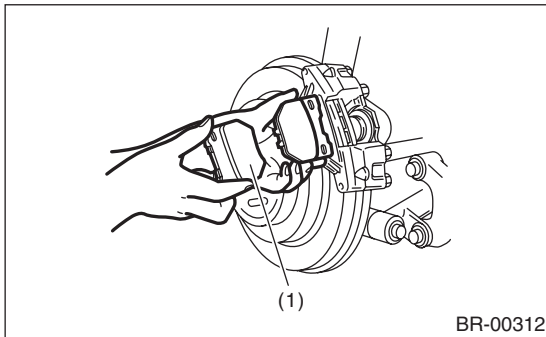
5) Remove the pad pins and cross spring.



(1) Cross spring  
(2) Pad pin

6) Expand the pads and push piston back.

7) Remove the pad.



(1) Rear brake pad

## B: INSTALLATION

### 1. 14 INCH TYPE

1) Apply a thin coat of Molykote AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.

2) Install the pads on support.

3) Install the caliper body on support.

#### Tightening torque:

**37 N·m (3.8 kgf·m, 27.5 ft·lb)**

#### NOTE:

If it is difficult to push the piston during pad replacement, loosen the air bleeder screw to facilitate work.

### 2. 15 INCH TYPE

1) Apply a thin coat of Molykote AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad inner shim.

2) Install the pads on caliper body.

3) Install the cross spring.

4) Install the pad pin on caliper body.

5) Install the M clip.

### 3. 17 INCH TYPE

1) Apply a thin coat of Molykote AS-880N (Part No. K0777YA010) to frictional portion between pad and pad inner shim.

2) Install the pads on caliper body.

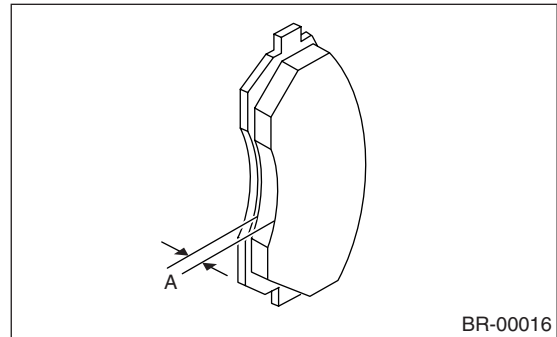
3) Install the cross spring and pad pins.

4) Install the clip.

## C: INSPECTION

### 1. 14 INCH TYPE

Check pad thickness A.



|               |                |                   |
|---------------|----------------|-------------------|
| Pad thickness | Standard value | 9.0 mm (0.354 in) |
|               | Wear limit     | 1.5 mm (0.059 in) |

#### NOTE:

- Always replace the pads for both right and left wheels at the same time.

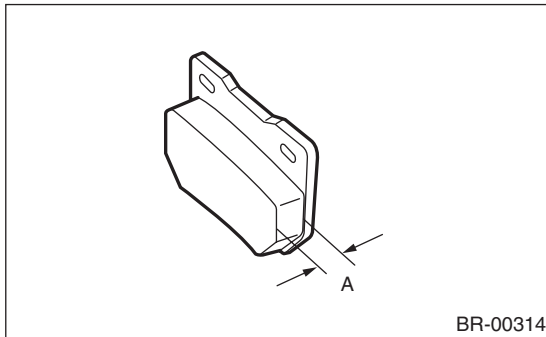
- Also replace the pad clips if they are twisted or worn.

- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.

- Replace the pad if there is oil or grease on it.

## 2. 15 INCH TYPE

Check the pad thickness A.



- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- Replace the pad if there is oil or grease on it.

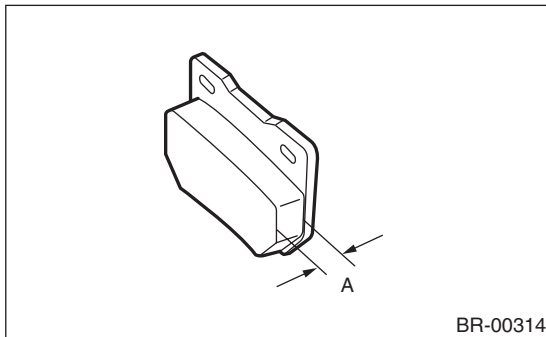
|               |                |                    |
|---------------|----------------|--------------------|
| Pad thickness | Standard value | 11.5 mm (0.452 in) |
|               | Wear limit     | 1.5 mm (0.059 in)  |

**NOTE:**

- Always replace the pads for both right and left wheels at the same time.
- Also replace the pad clips if they are twisted or worn.
- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- Replace the pad if there is oil or grease on it.

## 3. 17 INCH TYPE

Check the pad thickness A.



|               |                |                   |
|---------------|----------------|-------------------|
| Pad thickness | Standard value | 9.0 mm (0.354 in) |
|               | Wear limit     | 1.2 mm (0.047 in) |

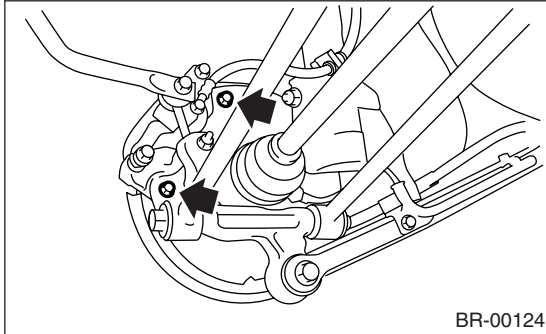
**NOTE:**

- Always replace the pads for both right and left wheels at the same time.
- Also replace the pad clips if they are twisted or worn.

## 6. Rear Disc Rotor

### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the wheels.
- 4) Release the parking brake.
- 5) Remove the two mounting bolts, and then remove the disc brake assembly.

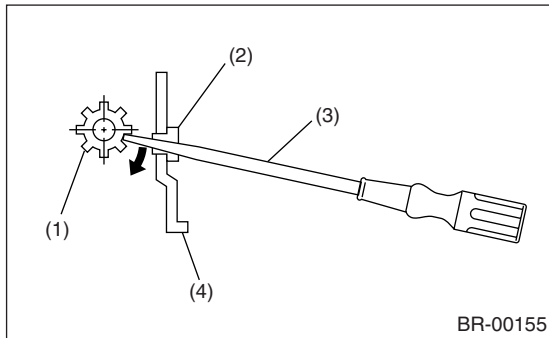


- 6) Suspend the disc brake assembly so that hose is not stretched.
- 7) Remove the disc rotor.

### NOTE:

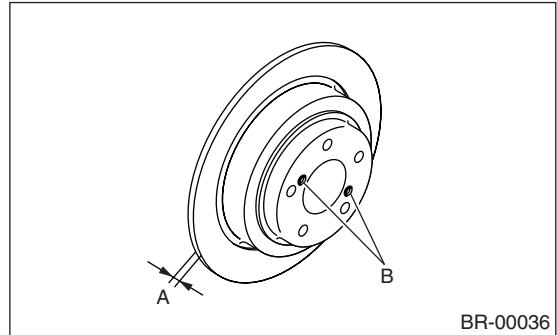
If the disc rotor is difficult to remove try following two methods in order.

- (1) Turn the adjusting screw using a flat tip screwdriver until brake shoe gets away enough from the disc rotor.



- (1) Adjusting screw
- (2) Cover
- (3) Flat tip screwdriver
- (4) Back plate

- (2) If the disc rotor seizes up within hub, drive the disc rotor out by installing an 8-mm bolt in holes B on disc rotor.

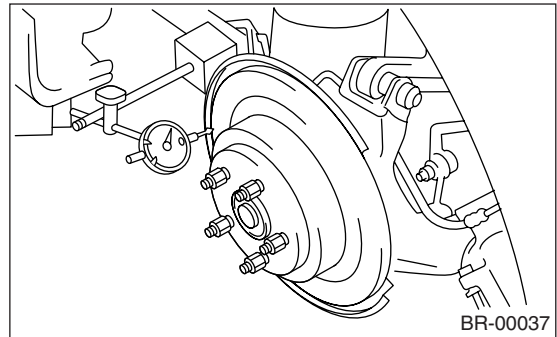


### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

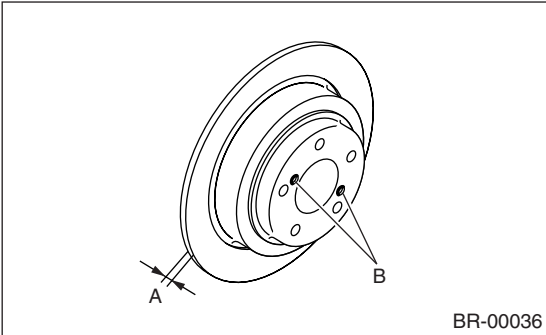
### C: INSPECTION

- 1) Check bearing axial end play and hub runout before disc rotor runout limit inspection. <Ref. to DS-32, INSPECTION, Rear Axle.>
- 2) Secure the disc rotor by tightening five wheel nuts.
- 3) Set a dial gauge 10 mm (0.39 in) inward of rotor outer perimeter. Turn the disc rotor to check runout. If the disc rotor runout exceeds the service limit, resurface the disc rotor. After resurfacing, check disc rotor thickness as in step 4.



**Disc rotor runout limit:**  
**0.070 mm (0.0028 in)**

4) Set a micrometer 10 mm (0.39 in) inward of the rotor outer perimeter, and then measure the disc rotor thickness. If the thickness of disc rotor exceeds the service limit, replace with a new disc rotor.



BR-00036

|                        |     | Standard           | Limit                | Disc outer dia.      |
|------------------------|-----|--------------------|----------------------|----------------------|
| Disc rotor thickness A | 14" | 10 mm<br>(0.39 in) | 8.5 mm<br>(0.335 in) | 266 mm<br>(10.47 in) |
|                        | 15" | 18 mm<br>(0.71 in) | 16 mm<br>(0.63 in)   | 290 mm<br>(11.42 in) |
|                        | 17" | 20 mm<br>(0.79 in) | 18 mm<br>(0.71 in)   | 316 mm<br>(12.44 in) |

## 7. Rear Disc Brake Assembly

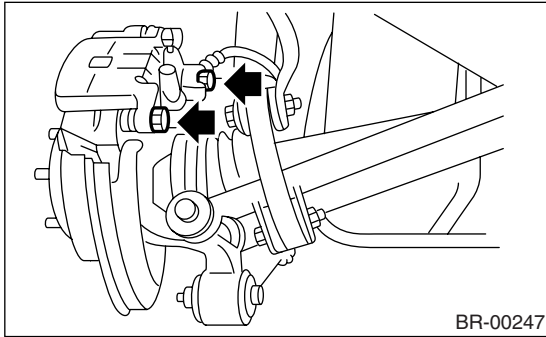
### A: REMOVAL

#### 1. 14 INCH TYPE

**CAUTION:**

**Do not allow brake fluid to come in contact with vehicle body; wash away immediately with water and wipe off completely if spilled.**

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the wheels.
- 4) Disconnect the brake hose from caliper body assembly.
- 5) Remove the bolt securing lock pin to caliper body.



- 6) Raise the caliper body and move it toward vehicle center to separate it from support.
- 7) Remove the support from housing.

**NOTE:**

Remove the support only when replacing it or the disc rotor. It need not be removed when servicing the caliper body assembly.

- 8) Clean mud and foreign particles from the caliper body assembly and support.

**CAUTION:**

**Be careful not to allow foreign particles to enter brake hose connector.**

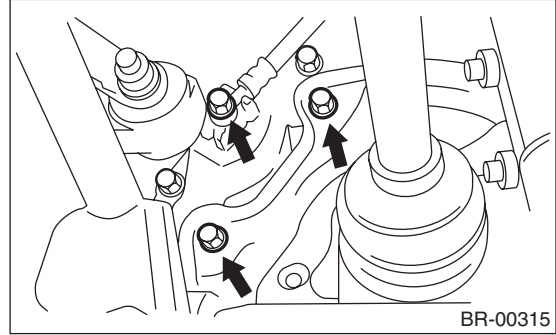
#### 2. 15 INCH TYPE

**CAUTION:**

**Do not allow brake fluid to come in contact with vehicle body; wash away at once with water and wipe off completely if spilled.**

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the wheels.
- 4) Remove the pads from caliper body. <Ref. to BR-29, REMOVAL, Rear Brake Pad.>
- 5) Disconnect the brake hose from caliper body assembly.

- 6) Remove the caliper body from housing.



- 7) Clean mud and foreign particles from the caliper body assembly.

**CAUTION:**

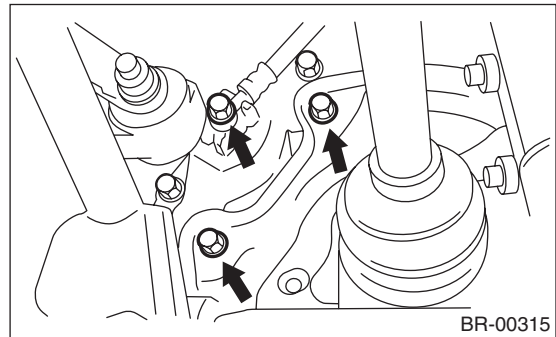
**Be careful not to allow foreign particles to enter brake hose connector.**

#### 3. 17 INCH TYPE

**CAUTION:**

**Do not allow brake fluid to come in contact with vehicle body; wash away immediately with water and wipe off completely if spilled.**

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the wheels.
- 4) Remove the brake pads from caliper body. <Ref. to BR-29, 17 INCH TYPE, REMOVAL, Rear Brake Pad.>
- 5) Disconnect the brake hose from caliper body.
- 6) Remove the caliper body from housing.



- 7) Clean mud and foreign particles from the caliper body.

**CAUTION:**

**Be careful not to allow foreign particles to enter brake hose connector.**

## B: INSTALLATION

### 1. 14 INCH TYPE

- 1) Install the support on housing.

**Tightening torque:**

**53 N·m (5.4 kgf-m, 39.1 ft-lb)**

- 2) Apply thin coat of Molykote AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
- 3) Install the pads on support.
- 4) Install the caliper body on support.

**Tightening torque:**

**37 N·m (3.8 kgf-m, 27.5 ft-lb)**

- 5) Replace the brake hose gaskets with new ones, and then connect the brake hose.

**Tightening torque:**

**18 N·m (1.8 kgf-m, 13.0 ft-lb)**

- 6) Bleed air from the brake system.

### 2. 15 INCH TYPE

- 1) Install the caliper body on housing.

**Tightening torque:**

**53 N·m (5.4 kgf-m, 39.1 ft-lb)**

- 2) Apply a thin coat of Molykote AS-880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
- 3) Install the pads on caliper body.
- 4) Replace the brake hose gaskets with new ones, and then connect the brake hose.

**Tightening torque:**

**18 N·m (1.8 kgf-m, 13.0 ft-lb)**

- 5) Bleed air from the brake system.

### 3. 17 INCH TYPE

- 1) Install the caliper body on housing.

**Tightening torque:**

**65 N·m (6.6 kgf-m, 47.9 ft-lb)**

- 2) Install the pads on caliper body.
- 3) Replace the brake hose gaskets with new ones, and then connect the brake hose.

**Tightening torque:**

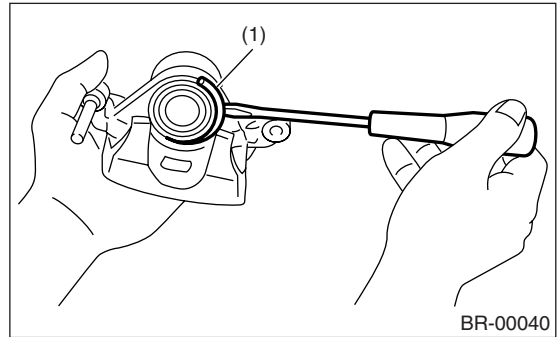
**18 N·m (1.8 kgf-m, 13.0 ft-lb)**

- 4) Bleed air from the brake system.

## C: DISASSEMBLY

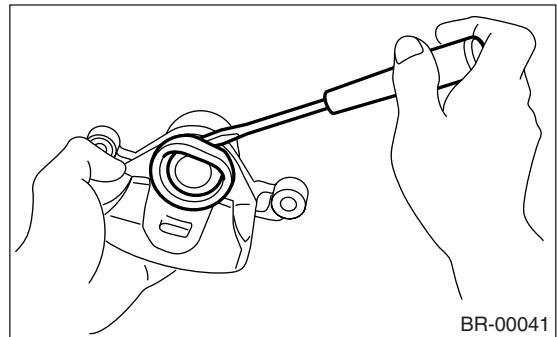
### 1. 14 INCH TYPE

- 1) Remove the boot ring.



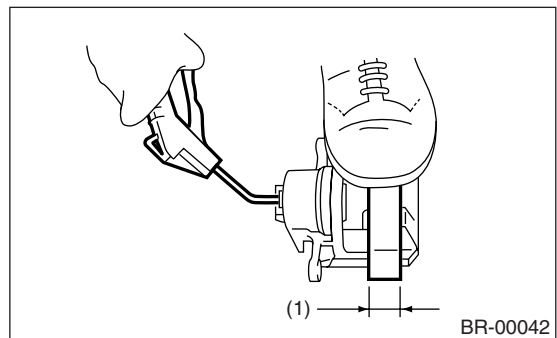
(1) Boot ring

- 2) Remove the piston boot.



- 3) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.

- 4) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



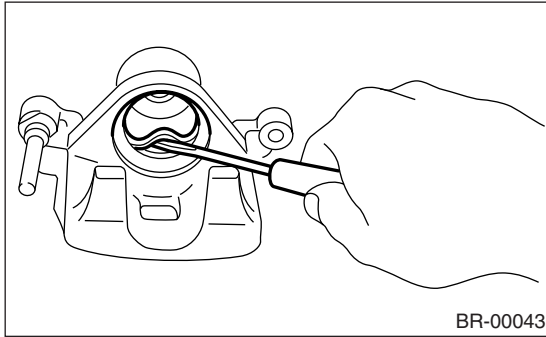
(1) Place a 30 mm (1.18 in) wide wooden block here.

- 5) Remove the piston seal from caliper body cylinder.

# Rear Disc Brake Assembly

## BRAKE

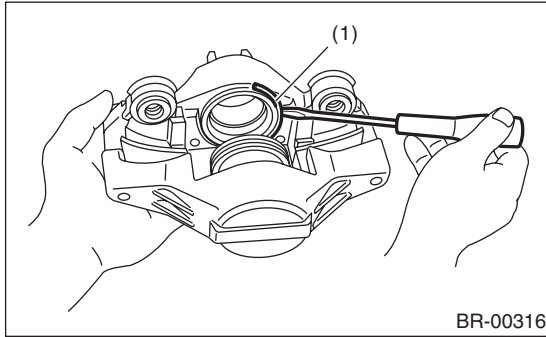
**CAUTION:**  
Do not damage the cylinder and piston seal groove.



- 6) Remove the lock pin sleeve and boot from caliper body.
- 7) Remove the guide pin boot.

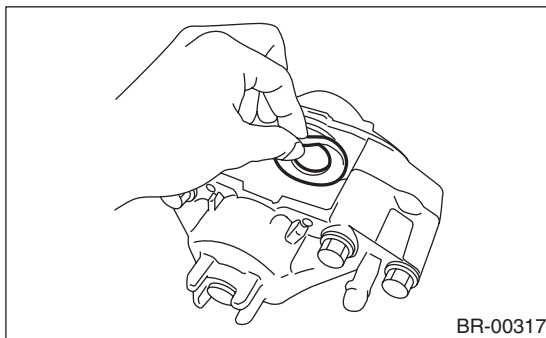
### 2. 15 INCH TYPE

- 1) Remove the boot ring.



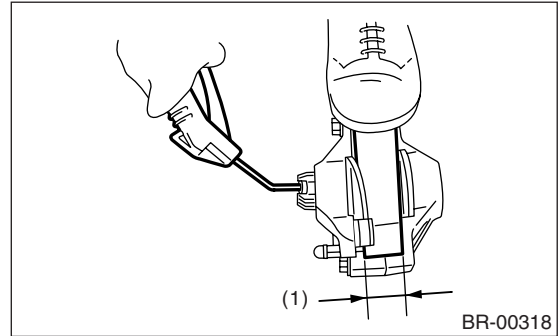
- (1) Boot ring

- 2) Remove the piston boot.



- 3) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.

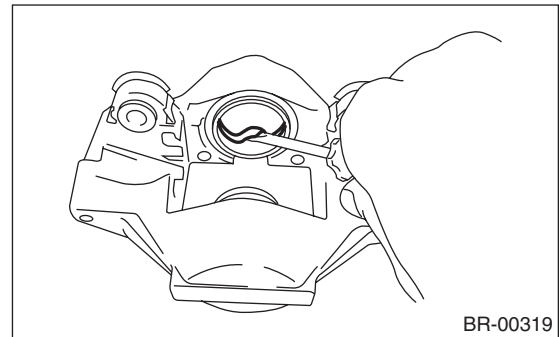
- 4) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



- (1) Place a 30 mm (1.18 in) wide wooden block here.

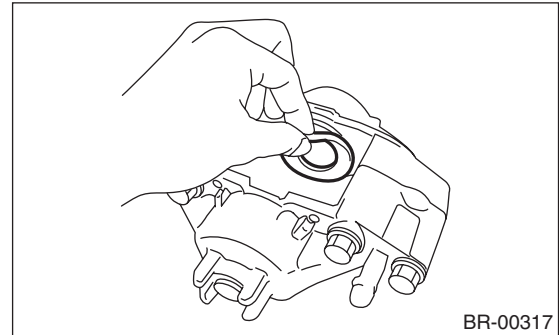
- 5) Remove the piston seal from caliper body cylinder.

**CAUTION:**  
Do not damage the cylinder and piston seal groove.



### 3. 17 INCH TYPE

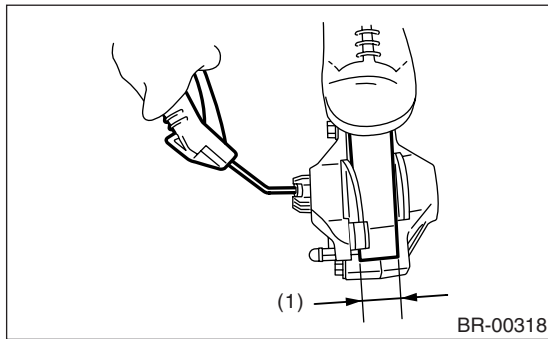
- 1) Remove the piston boots from each piston end.



- 2) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.



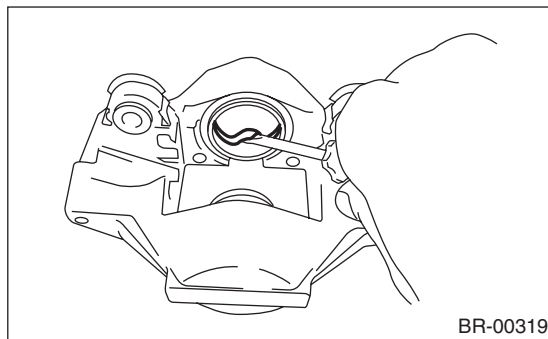
3) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



(1) Place a 20 mm (0.79 in) wide wooden block here.

4) Remove the piston seal from caliper body cylinder.

**CAUTION:**  
Do not damage the cylinder and piston seal groove.



## D: ASSEMBLY

### 1. 14 INCH TYPE

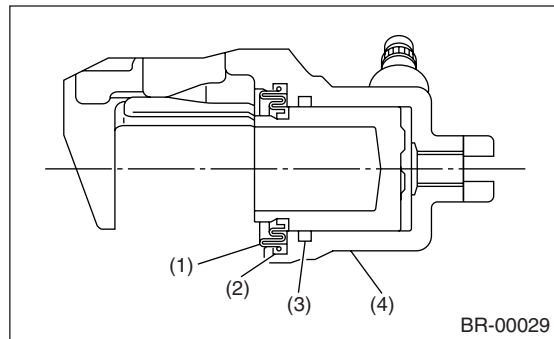
- 1) Clean the caliper body interior using brake fluid.
- 2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
- 3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
- 4) Insert the piston into cylinder.

**CAUTION:**  
Do not force piston into cylinder.

- 5) Apply a coat of specified grease to the boot and fit in groove on ends of cylinder and piston.

**Grease:**  
**NIGLUBE RX-2 (Part No. K0779GA102)**

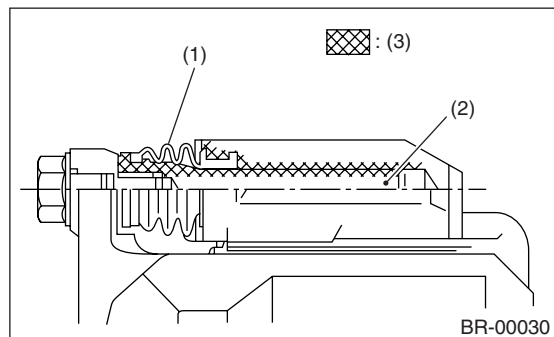
6) Install the piston boot to caliper body, and then attach boot ring.



- (1) Piston boot
- (2) Boot ring
- (3) Piston seal
- (4) Caliper body

7) Apply a coat of specified grease to the guide pin, outer surface, sleeve outer surface, cylinder inner surface, and boot grooves.

**Grease:**  
**NIGLUBE RX-2 (Part No. K0779GA102)**



- (1) Pin boot
- (2) Lock pin or guide pin
- (3) Apply grease.

- 8) Install the guide pin boot on support.
- 9) Install the lock pin boot on support, and then insert the lock pin sleeve into place.

### 2. 15 INCH TYPE

- 1) Clean the caliper body interior using brake fluid.
- 2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
- 3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
- 4) Apply a coat of specified grease to the boot and install it in the groove on piston.

**Grease:**  
**NIGLUBE RX-2 (Part No. K0779GA102)**

- 5) Insert the piston into cylinder.



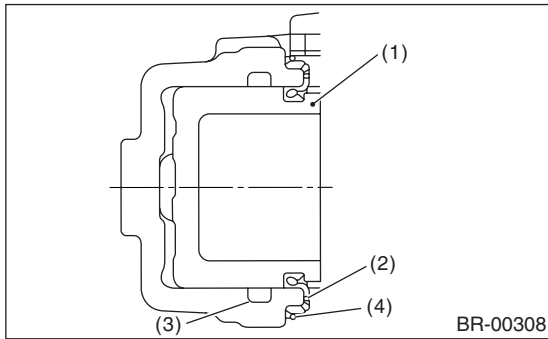
# Rear Disc Brake Assembly

## BRAKE

### CAUTION:

**Do not force the piston into cylinder.**

6) Install the piston boot to caliper body, and then attach boot ring.



- (1) Piston
- (2) Piston boot
- (3) Piston seal
- (4) Boot ring

### 3. 17 INCH TYPE

- 1) Clean the caliper body interior using brake fluid.
- 2) Apply a coat of brake fluid to the piston seal and install the piston seal in groove on caliper body.
- 3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
- 4) Apply a coat of specified grease to the boot and install it in the groove on piston.

### Grease:

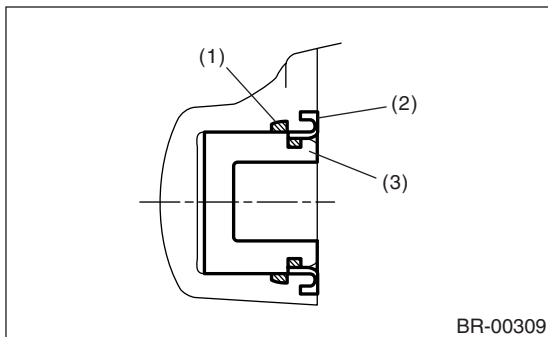
***NIGLUBE RX-2 (Part No. K0779GA102)***

5) Insert the piston into cylinder.

### CAUTION:

**Do not force the piston into cylinder.**

6) Position the boot in grooves on cylinder and piston.



- (1) Piston seal
- (2) Piston boot
- (3) Piston

### E: INSPECTION

- 1) Repair or replace the faulty parts.
- 2) Check the caliper body and piston for uneven wear, damage or rust.
- 3) Check the rubber parts for damage or deterioration.

## 8. Master Cylinder

### A: REMOVAL

**CAUTION:**

Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

- 1) Thoroughly drain brake fluid from reservoir tank.
- 2) Disconnect the fluid level indicator harness connector.
- 3) Remove the brake pipes from master cylinder.
- 4) Remove the master cylinder mounting nuts, and take out master cylinder from brake booster.

### B: INSTALLATION

- 1) To install the master cylinder to body, reverse the sequence of removal procedure.

**Tightening torque:**

**Master cylinder mounting nut**

15 N·m (1.5 kgf-m, 10.8 ft-lb)

**Piping flare nut**

15 N·m (1.5 kgf-m, 10.8 ft-lb)

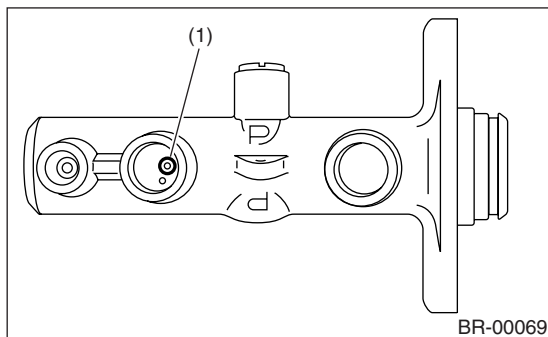
**CAUTION:**

Be sure to use recommended brake fluid.

- 2) Bleed air from the brake system. <Ref. to BR-47, PROCEDURE, Air Bleeding.>

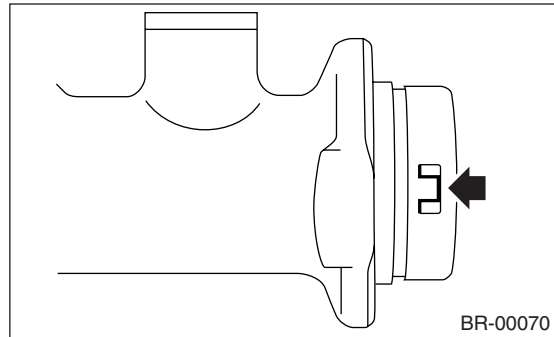
### C: DISASSEMBLY

- 1) Remove mud and dirt from the surface of brake master cylinder.
- 2) Secure the master cylinder on a vise.
- 3) Remove the pin which secures reservoir tank to master cylinder, and then remove the reservoir tank and grommet.
- 4) Remove the cylinder pin with magnetic pick-up tool while pushing in primary piston by screwdriver which wrapped with tape.



(1) Cylinder pin (straight pin)

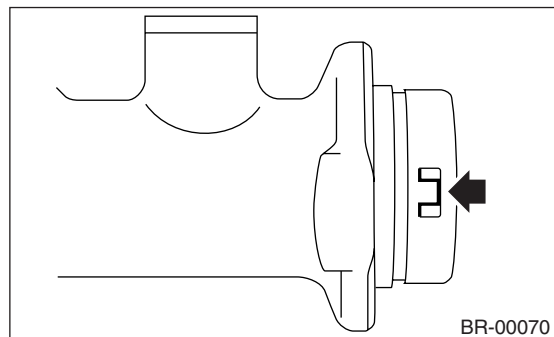
- 5) Pry up the pawl, and then remove the piston retainer. Hold piston retainer tight, because the piston may jump out from master cylinder.



- 6) Extract the primary piston assembly and secondary piston assembly straight out, while taking care not to scratch the inner surface of cylinder.
- 7) Use brake fluid to wash the inside wall of cylinder, and piston assembly. If any damage, deformation, wear, rust, and other faults are found, replace the faulty part.

### D: ASSEMBLY

- 1) Apply recommended brake fluid to the inside wall of cylinder, and to outer surface of the piston assembly.
- 2) Ensure that the inside wall of cylinder, and piston assembly are free from dirt when assembling. Install the primary piston assembly and secondary piston assembly, while taking care not to damage, scratch, or dent the cylinder inside wall, and piston assembly.
- 3) Install the cylinder pin while pushing in primary piston by screwdriver which wrapped with tape.
- 4) Install the piston retainer, and then secure it by pressing the pawl.

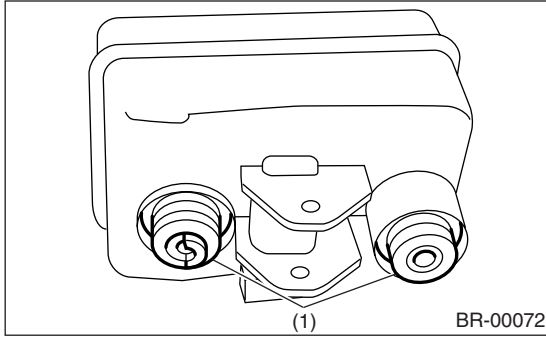


# Master Cylinder

## BRAKE

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5) Install the seal to reservoir tank.



(1) Seal

6) Install the reservoir tank to master cylinder and secure with pin.

### **E: INSPECTION**

If any damage, deformation, wear, swelling, rust, and other faults are found on the primary piston assembly or secondary piston assembly, replace the faulty part.

#### **NOTE:**

- The primary and secondary pistons must be replaced as complete assemblies.
- The service limit of clearance between each piston and the master cylinder inner dia. is 0.11 mm (0.0043 in).

## 9. Brake Booster

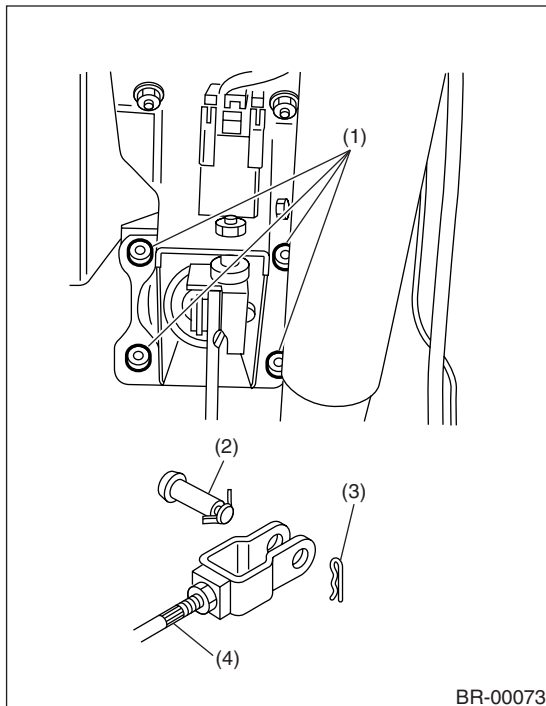
### A: REMOVAL

1) Remove or disconnect the following parts at engine compartment.

- (1) Disconnect the connector for brake fluid level indicator.
- (2) Remove the brake pipes from master cylinder.
- (3) Remove the master cylinder installing nuts.
- (4) Disconnect the vacuum hose from brake booster.

2) Remove the following parts from pedal bracket.

- (1) Snap pin and clevis pin
- (2) Four brake booster installing nuts



- (1) Nuts
- (2) Clevis pin
- (3) Snap pin
- (4) Operating rod

3) Remove the brake booster while shunning brake pipes.

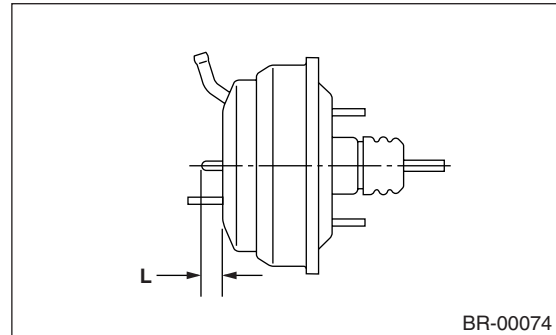
#### NOTE:

- Be careful not to drop the brake booster. The brake booster should be discarded if it has been dropped.
- Use special care when handling the operating rod. If excessive force is applied to the operating rod, sufficient to cause a change in the angle in excess of  $\pm 3^\circ$ , it may result in damage to the power piston cylinder.
- Use care when placing the brake booster on floor.

- Do not change the push rod length. If it has been changed, reset the projected length "L" to standard length.

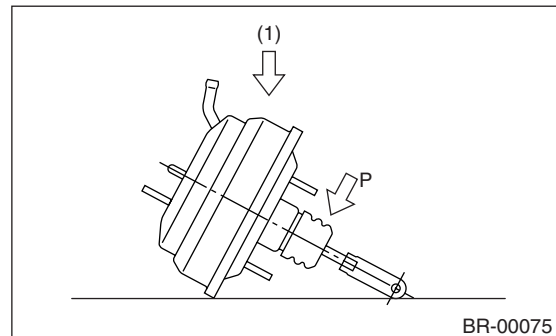
#### Standard L:

**10.05 mm (0.40 in)**



#### CAUTION:

If external force is applied from above when the brake booster is placed in this position, the resin portion as indicated by "P", may be damaged.



(1) Force

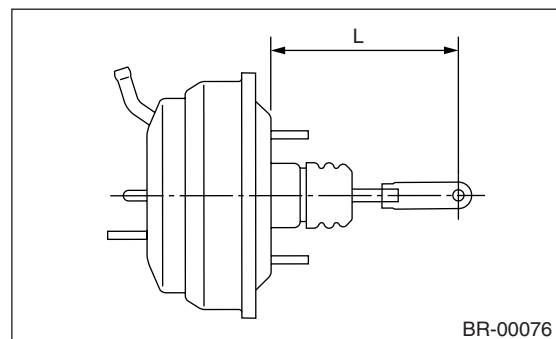
### B: INSTALLATION

1) Adjust the operating rod of brake booster.

#### Standard L:

**144.6 mm (5.69 in)**

If it is not within specified value, adjust it by adjusting the brake booster operating rod.

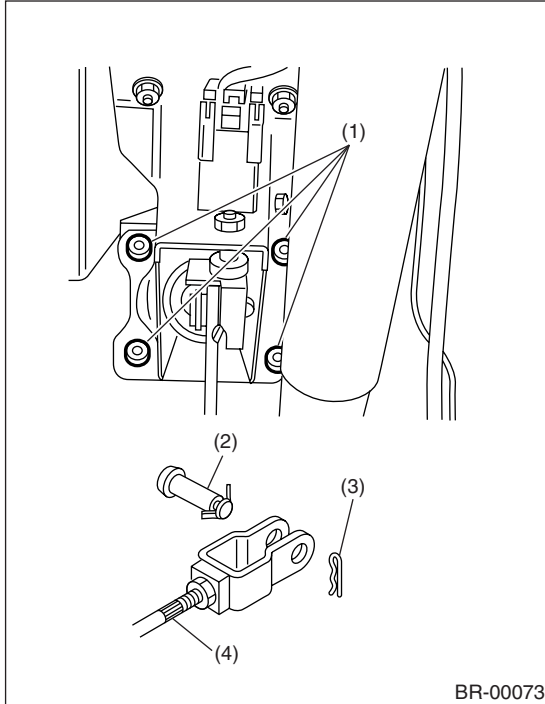


2) Mount the brake booster in position.

# Brake Booster

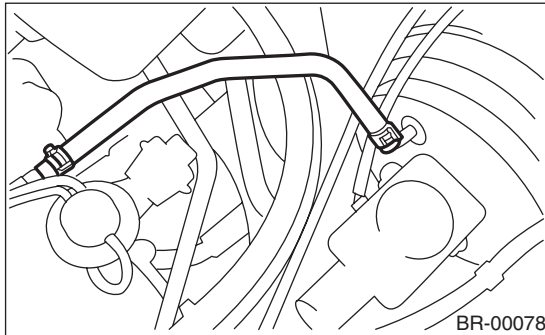
## BRAKE

3) Connect the operating rod to brake pedal with clevis pin and snap pin.



- (1) Nuts
- (2) Clevis pin
- (3) Snap pin
- (4) Operating rod

4) Connect the vacuum hose to brake booster.

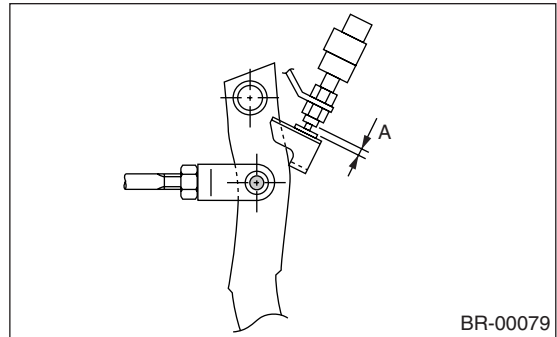


- 5) Mount the master cylinder onto brake booster.
- 6) Connect the brake pipes to master cylinder.
- 7) Connect the electric connector for brake fluid level indicator.
- 8) Measure the clearance between threaded end of stop light switch and stopper.  
If it is not within specified value, adjust it by adjusting the position of stop light switch. <Ref. to BR-56, ADJUSTMENT, Stop Light Switch.>

### CAUTION:

Be careful not to rotate the stop light switch.

**Stop light switch clearance A:**  
**0.3 mm (0.012 in)**



- 9) Apply grease to operating rod connecting pin to prevent it from wearing.
- 10) Bleed air from the brake system.

**Tightening torque (Air bleeder screw):**

**Except 17 inch type:**

**8 N·m (0.8 kgf-m, 5.8 ft-lb)**

**17 inch type:**

**20 N·m (2.0 kgf-m, 14.5 ft-lb)**

- 11) Conduct road tests to ensure brakes do not drag.

## C: INSPECTION

### 1. OPERATION CHECK (WITHOUT GAUGES)

#### CAUTION:

When checking operation, be sure to securely apply the parking brake.

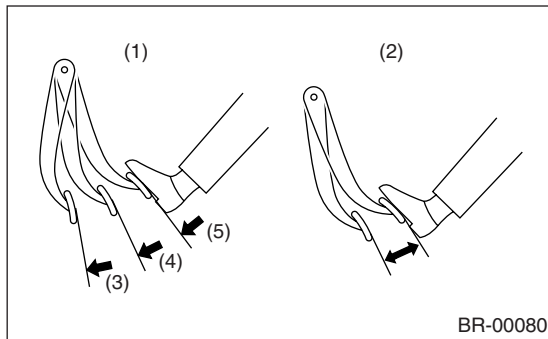
#### • Checking without gauges

This method cannot determine the exact portion which has failed, but it can provide a rough understanding of the nature of failure if checking is conducted in accordance with the following procedures.

#### • Air tightness check

Start the engine, and run it for 1 to 2 minutes, then turn it off. Depress the brake pedal several times applying same pedal force as that used in ordinary braking operations. The pedal stroke should be greatest on 1st depression, and it should become smaller with each successive depression. If no

change occurs in the pedal height while in a depressed state, the brake booster is faulty.



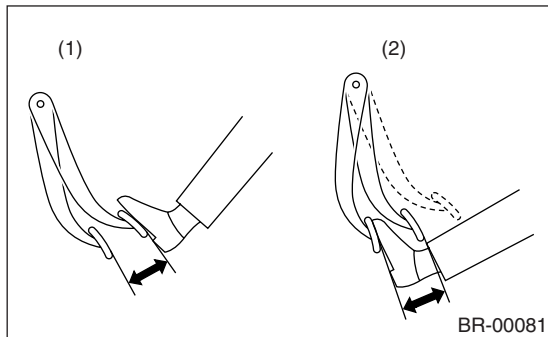
- (1) OK
- (2) NG
- (3) 1st
- (4) 2nd
- (5) 3rd

**NOTE:**

- In the event of defective operation, inspect the condition of check valve and vacuum hose.
- Replace them if faulty and conduct the test again.
- If no improvement is observed, check precisely with gauges.

**• Operation check**

1) With the engine off, depress the brake pedal several times applying same pedal force and make sure that pedal height does not vary with each depression of pedal.



- (1) When engine is stopped
- (2) When engine is started

2) With the brake pedal depressed, start the engine.

3) As the engine starts, the brake pedal should move slightly toward the floor. If no change occurs in the pedal height, the brake booster is faulty.

**NOTE:**

If faulty, check precisely with gauges.

**• Loaded air tightness check**

Depress the brake pedal while engine is running, and turn off the engine while pedal is still depressed. Keep the pedal depressed for 30 seconds; if no change occurs in the pedal height, the brake booster is functioning normally; if the pedal height increases, it is faulty.

**NOTE:**

If faulty, check precisely with gauges.

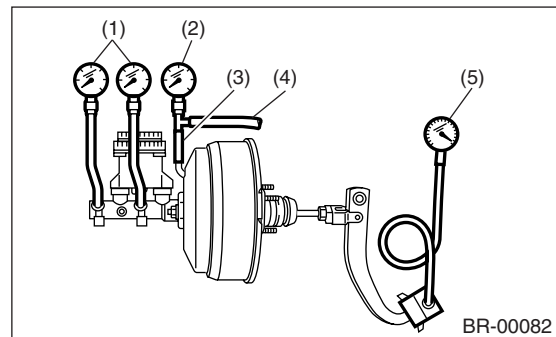
**2. OPERATION CHECK (WITH GAUGES)**

**CAUTION:**

**When checking operation, be sure to securely apply the parking brake.**

**• Checking with gauges**

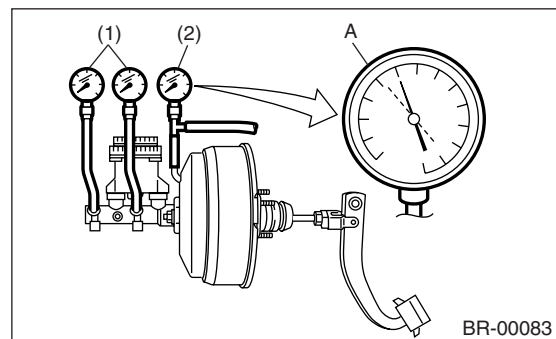
Connect gauges as shown in the figure. After bleeding air from pressure gauges, proceed to each check.



- (1) Pressure gauge
- (2) Vacuum gauge
- (3) Adapter hose
- (4) Vacuum hose
- (5) Pedal force gauge

**• Air tightness check**

1) Start the engine and keep it running until a vacuum of 66.7 kPa (500 mmHg, 19.69 inHg) = point A is indicated on vacuum gauge. Do not depress the brake pedal.



- (1) Pressure gauge
- (2) Vacuum gauge

# Brake Booster

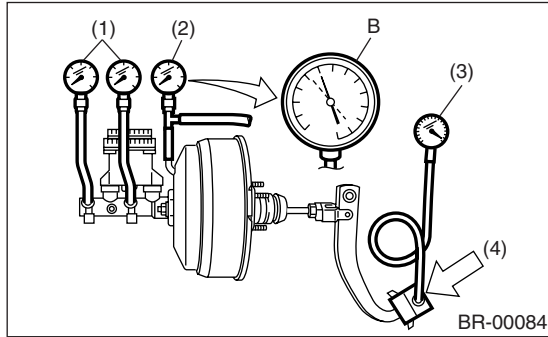
## BRAKE

2) Stop the engine and watch the gauge. If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, the brake booster is functioning properly. If defective, the cause may be one of those listed below.

- Check valve malfunction
- Leak from vacuum hose
- Leak from the shell jointed portion or stud bolt welded portion
- Damaged diaphragm
- Leak from valve body seal and bearing portion
- Leak from plate and seal assembly portion
- Leak from poppet valve assembly portion

### • Loaded air tightness check

1) Start the engine and depress brake pedal with pedal force of 196 N (20 kgf, 44 lbf). Keep the engine running until a vacuum of 66.7 kPa (500 mmHg, 19.69 inHg) = point B is indicated on vacuum gauge while the pedal is still depressed.



- (1) Pressure gauge
- (2) Vacuum gauge
- (3) Pedal force gauge
- (4) Depress.

2) Stop the engine and watch vacuum gauge. If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, the brake booster is functioning properly. If defective, refer to "AIR TIGHTNESS CHECK". <Ref. to BR-42, INSPECTION, Brake Booster.>  
3) If any fault is found on brake booster, replace the brake booster with a new one.

### • Lack of boosting action check

Turn off the engine, and set the vacuum gauge reading at "0". Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed.

| Brake pedal force |     | 147 N<br>(15 kgf, 33 lbf)                   | 294 N<br>(30 kgf, 66 lbf)                       |
|-------------------|-----|---|---|
| Fluid pressure    | 15" | 588 kPa<br>(6 kgf/cm <sup>2</sup> , 85 psi) | 1,471 kPa<br>(15 kgf/cm <sup>2</sup> , 213 psi) |
|                   | 16" |   | 1,667 kPa<br>(17 kgf/cm <sup>2</sup> , 242 psi) |
|                   | 17" |   | 1,471 kPa<br>(15 kgf/cm <sup>2</sup> , 213 psi) |

### • Boosting action check

Set the vacuum gauge reading at 66.7 kPa (500 mmHg, 19.69 inHg) by running engine. Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed.

| Brake pedal force |     | 147 N<br>(15 kgf, 33 lbf)                       | 294 N<br>(30 kgf, 66 lbf)                           |
|-------------------|-----|---|---|
| Fluid pressure    | 15" | 5,296 kPa<br>(54 kgf/cm <sup>2</sup> , 768 psi) | 9,120 kPa<br>(93 kgf/cm <sup>2</sup> , 1,323 psi)   |
|                   | 16" | 6,276 kPa<br>(64 kgf/cm <sup>2</sup> , 910 psi) | 10,000 kPa<br>(102 kgf/cm <sup>2</sup> , 1,450 psi) |
|                   | 17" | 4,021 kPa<br>(41 kgf/cm <sup>2</sup> , 583 psi) | 8,336 kPa<br>(85 kgf/cm <sup>2</sup> , 1,209 psi)   |



## 10.Brake Fluid

### A: INSPECTION

- 1) Check that the brake fluid level remains between "MIN" and "MAX". If out of the specified range, refill or drain fluid. If the fluid level becomes close to "MIN", refill the fluid.
- 2) Check the fluid for discoloration. If the fluid color has excessively changed, drain the fluid and refill with new fluid.

### B: REPLACEMENT

#### CAUTION:

- To always maintain the brake fluid characteristics, replace the brake fluid according to maintenance schedule or earlier than that when used in severe condition.
- The FMVSS No. 116, fresh DOT3 or DOT4 brake fluid must be used.
- Cover the air bleeder screw with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
- Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.
- Avoid mixing different brands of brake fluid to prevent degrading the quality of fluid.
- Be careful not to allow dirt or dust to get into the reservoir tank.

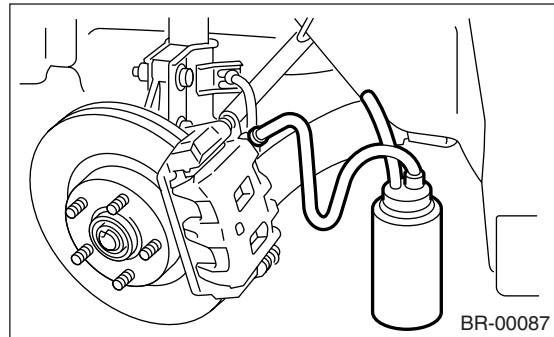
#### NOTE:

- During replacement, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
  - The brake pedal operating must be very slow.
  - For convenience and safety, two people should do the work.
  - The amount of brake fluid required is approx. 500 ml (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.
- 1) Either lift-up the vehicle and place a rigid racks under it, or lift-up vehicle.
  - 2) Remove both front and rear wheels.
  - 3) Draw out the brake fluid from master cylinder with syringe.
  - 4) Refill the reservoir tank with recommended brake fluid.

#### **Recommended brake fluid:**

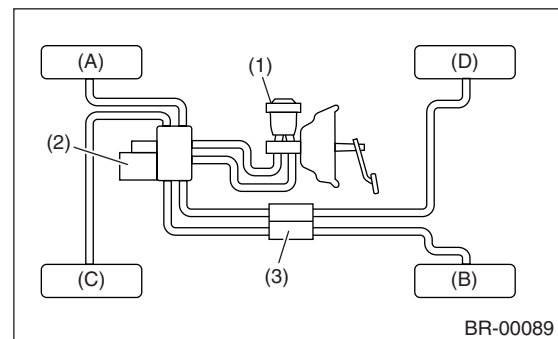
**FMVSS No. 116, fresh DOT3 or DOT4 brake fluid**

- 5) Install one end of a vinyl tube onto the air bleeder screw and insert the other end of the tube into a container to collect the brake fluid.



#### CAUTION:

**Brake fluid replacement sequence; (A) Front right → (B) Rear left → (C) Front left → (D) Rear right**



- (1) Master cylinder
- (2) Hydraulic unit
- (3) Two-way connector

- 6) Instruct your co-worker to depress the brake pedal slowly two or three times and then hold it depressed.
- 7) Loosen the air bleeder screw approx. 1/4 turn until a small amount of brake fluid drains into container, and then quickly tighten the screw.
- 8) Release the brake pedal slowly. Repeat steps 6) through 8) until new fluid flows through vinyl tube.

#### NOTE:

Add brake fluid as necessary during replacement, in order to prevent the tank from running short of brake fluid.

- 9) After completing the replacement, hold brake pedal depressed and tighten screw and install air bleeder screw cap.

#### **Tightening torque (Air bleeder screw):**

**Except 17 inch type:**

**8 N·m (0.8 kgf·m, 5.8 ft·lb)**

**17 inch type:**

**20 N·m (2.0 kgf·m, 14.5 ft·lb)**



## Brake Fluid

### BRAKE

---

10) Replace brake fluid of each wheel cylinder using the same procedures as described in steps 6) through 8) above.

11) Depress the brake pedal with a force of approx. 294 N (30 kg, 66 lbf) and hold it there for approx. 20 seconds. At this time check for mix in air and pedal height change.

Visually inspect the air bleeder screws and brake pipe joints to make sure that there is no fluid leakage.

12) Install the wheels, and drive the vehicle for a short distance between 2 to 3 km (1 to 2 miles) to make sure that brakes are operating properly.

## 11. Air Bleeding

### A: PROCEDURE

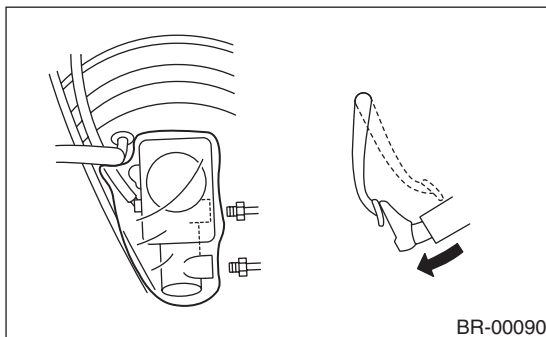
#### CAUTION:

- The FMVSS No. 116, fresh DOT3 or DOT4 brake fluid must be used.
- Cover the air bleeder screw with waste cloth when loosening it to prevent brake fluid from being splashed over surrounding parts.
- Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.
- Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
- Be careful not to allow dirt or dust to get into the reservoir tank.

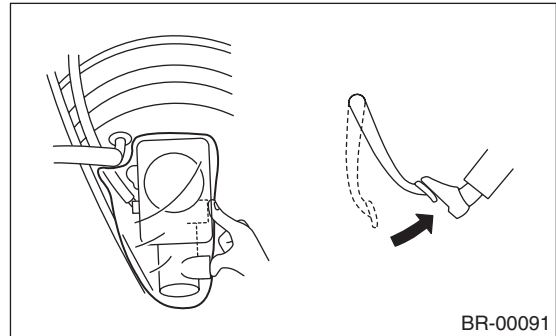
### 1. MASTER CYLINDER

#### NOTE:

- If the master cylinder is disassembled or reservoir tank is empty, bleed the master cylinder.
  - During the bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
  - The brake pedal operating must be very slow.
  - For convenience and safety, two people should do the work.
- 1) Loosen the wheel nuts, jack-up the vehicle, support it with rigid racks, and remove the wheel.
  - 2) Disconnect the brake line at primary and secondary sides.
  - 3) Put a plastic bag cover on master cylinder.
  - 4) Carefully depress and hold the brake pedal.



- 5) Close the outlet plug with your finger, and then release the brake pedal.



- 6) Repeat step 4) and 5) until the brake fluid is completely bled from outlet plug.
- 7) Remove the plastic bag.
- 8) Install the brake pipes to master cylinder.

#### Tightening torque:

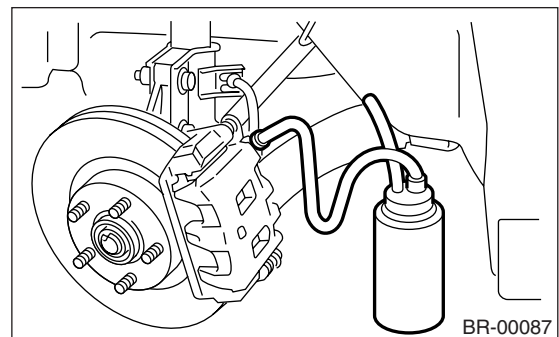
**15 N·m (1.5 kgf-m, 10.8 ft-lb)**

- 9) Bleed air from the brake line. <Ref. to BR-47, BRAKE LINE, PROCEDURE, Air Bleeding.>

### 2. BRAKE LINE

#### NOTE:

- During the bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
  - The brake pedal operating must be very slow.
  - For convenience and safety, two people should do the work.
- 1) Make sure that there is no leak from the joints and connections of brake system.
  - 2) Fit one end of vinyl tube into the air bleeder screw and put the other end into a brake fluid container.

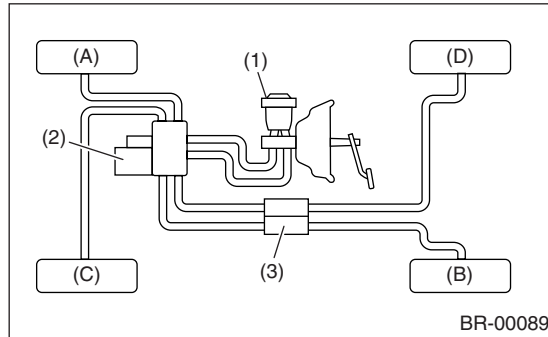


# Air Bleeding

## BRAKE

### CAUTION:

**Brake fluid replacement sequence; (A) Front right → (B) Rear left → (C) Front left → (D) Rear right**



- (1) Master cylinder
- (2) Hydraulic unit
- (3) Proportioning valve

3) Slowly depress the brake pedal and keep it depressed. Then, open the air bleeder screw to discharge air together with the fluid.

Release the air bleeder screw for 1 to 2 seconds.

Next, with the air bleeder screw closed, slowly release the brake pedal.

Repeat these steps until there are no more air bubbles in the vinyl tube.

Allow 3 to 4 seconds between two brake pedal operations.

### CAUTION:

**Cover the air bleeder screw with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.**

### NOTE:

The brake pedal operating must be very slow.

4) Tighten the air bleeder screw securely when no air bubbles are visible.

### Tightening torque:

#### Except 17 inch type:

**8 N·m (0.8 kgf-m, 5.8 ft-lb)**

#### 17 inch type:

**20 N·m (2.0 kgf-m, 14.5 ft-lb)**

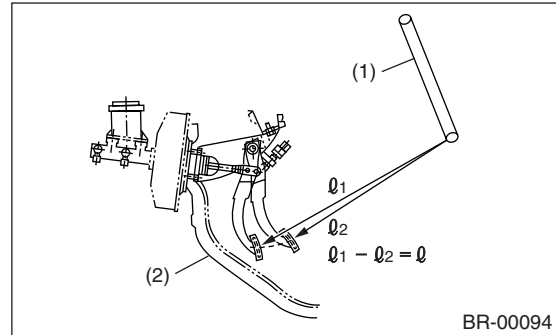
### NOTE:

For 17 inch type, do not allow brake fluid come in contact with caliper body; wash away with water. (Especially for air bleeder screw.)

5) Perform these steps for the brakes connecting to secondary chamber of master cylinder, first, and then for the ones connecting to primary chamber. With all procedures completed, fully depress the brake pedal and keep it in that position for approx. 20 seconds to make sure that there is no leak evident in the entire system.

6) Check the pedal stroke.

While the engine is idling, depress the brake pedal with a 490 N (50 kgf, 110 lbf) load and measure the distance between brake pedal and steering wheel. With the brake pedal released, measure the distance between pedal and steering wheel again. The difference between the two measurements must not be more than specified.



- (1) Steering wheel
- (2) Toe board

### Specified pedal stroke

#### WRX model

**105 mm (4.13 in)**

#### Except WRX model

**90 mm (3.54 in)**

**When depressing brake pedal with a 490 N (50 kgf, 110 lbf) load.**

7) If the distance is more than the specifications, there is a possibility that air is in the brake line. Bleed the brake line until pedal stroke meets the specification.

8) Operate the hydraulic control unit in the sequence control mode. <Ref. to ABS-10, ABS Sequence Control.>

9) Recheck the pedal stroke.

10) If the distance is more than specifications, there is a possibility air is in the inside of hydraulic unit. Repeat above steps 2) to 9) above until pedal stroke meets the specification.

11) Add brake fluid to the required level (MAX. level) of reservoir tank.

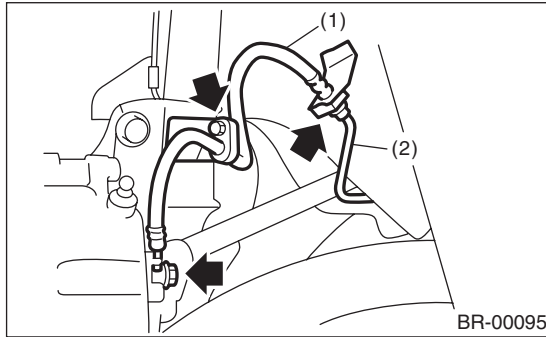
12) As a final step, test run the vehicle at low speed and apply brakes to ensure that brakes provide normal braking action.

## 12.Brake Hose

### A: REMOVAL

#### 1. FRONT BRAKE HOSE

- 1) Separate the brake pipe from brake hose.  
(Always use the flare nut wrench and be careful not to deform the flare nut.)
- 2) Pull out the clamp to remove brake hose.
- 3) Remove the bolt at strut and union bolt.



- (1) Brake hose
- (2) Brake pipe

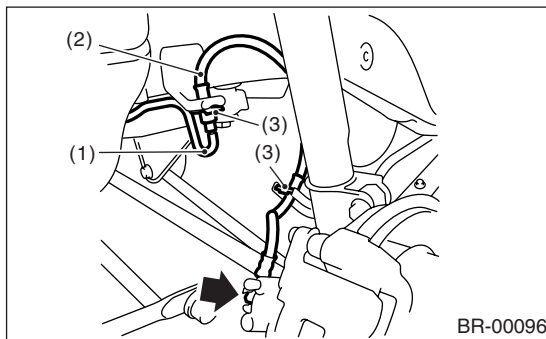
#### 2. REAR BRAKE HOSE

- 1) Separate the brake pipe from brake hose.

**NOTE:**

Always use the flare nut wrench and be careful not to deform the flare nut.

- 2) Remove the clamp and union bolt.



- (1) Brake pipe
- (2) Brake hose
- (3) Brake hose clamp

### B: INSTALLATION

#### 1. FRONT BRAKE HOSE

- 1) Secure the brake hose to strut mount.

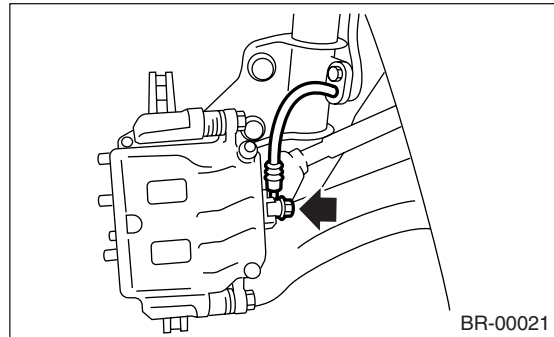
**Tightening torque:**

**33 N·m (3.4 kgf-m, 25 ft-lb)**

- 2) Install the brake hose to caliper body using a new gasket.

**Tightening torque (Union bolt):**

**18 N·m (1.8 kgf-m, 13.0 ft-lb)**



- 3) Position the disc in straight-forward direction and route brake hose through hole in bracket on wheel apron side.

**CAUTION:**

**Be sure brake hose is not twisted.**

- 4) Temporarily tighten the flare nut to connect brake pipe and hose.
- 5) Fix the brake hose with clamp at wheel apron bracket.
- 6) While holding the hexagonal part of brake hose fitting with a wrench, tighten the flare nut to the specified torque.

**Tightening torque (Brake pipe flare nut):**

**15 N·m (1.5 kgf-m, 10.8 ft-lb)**

- 7) Bleed air from the brake system.

#### 2. REAR BRAKE HOSE

- 1) Pass the brake hose through hole of bracket, and then lightly tighten the flare nut to connect brake pipe.
- 2) Insert the clamp upward to fix brake hose.
- 3) Install the brake hose to caliper body using a new gasket.

**Tightening torque (Union bolt):**

**18 N·m (1.8 kgf-m, 13.0 ft-lb)**

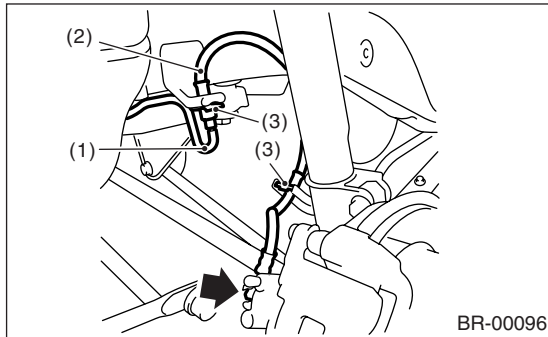
- 4) While holding the hexagonal part of brake hose fitting with a wrench, tighten the flare nut to the specified torque.

# Brake Hose

## BRAKE

---

**Tightening torque (Brake pipe flare nut):**  
**15 N·m (1.5 kgf-m, 10.8 ft-lb)**



- (1) Brake pipe
- (2) Brake hose
- (3) Brake hose clamp

5) Bleed air from the brake system.

### **C: INSPECTION**

Ensure there are no cracks, breakage, or damage on the hoses. Check the joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace the hose.

## 13.Brake Pipe

### A: REMOVAL

**NOTE:**

Airbag system wiring harness is routed near the center brake pipe.

**CAUTION:**

- Airbag system connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
- When removing the brake pipe, use flare nut wrench.
- When removing the brake pipe, make sure that it is not bent.

### B: INSTALLATION

**NOTE:**

Airbag system wiring harness is routed near the center brake pipe.

**CAUTION:**

- Airbag system connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
- When installing the brake pipe, use flare nut wrench.
- When installing the brake pipe, make sure that it is not bent.
- After installing the brake pipe and hose, bleed the air.
- After installing the brake hose, make sure that it does not touch the tire or suspension assembly, etc.

***Tightening torque (Brake pipe):***

***15 N·m (1.5 kgf·m, 10.8 ft·lb)***

### C: INSPECTION

Ensure there are no cracks, breakage, or damage on pipes. Check the joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace the pipe.

**NOTE:**

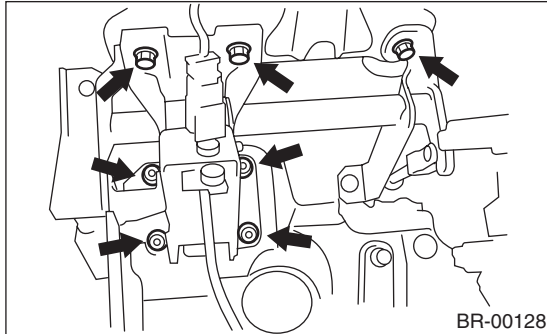
Use a mirror when inspecting low-visible part or back side.

## 14. Brake Pedal

### A: REMOVAL

#### 1. MT MODEL

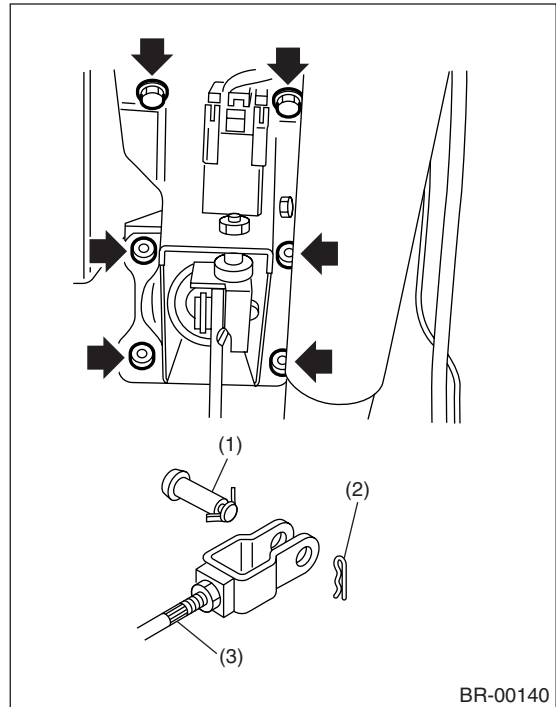
- 1) Remove the steering shaft.
- 2) Disconnect the connectors (for stop light switch, etc.) from pedal bracket.
- 3) Remove the clevis pin which secures the lever to push rod.
- 4) Remove the nut which secures the clutch master cylinder.
- 5) Remove the accelerator pedal.
- 6) Remove the bolts and nuts which the secure pedal bracket.



#### 2. AT MODEL

- 1) Disconnect the ground cable from battery.
- 2) Remove the instrument panel lower cover from instrument panel.
- 3) Remove the clevis pin which secures the brake pedal to brake booster operating rod. Also disconnect the stop light switch connector.

- 4) Remove the four bolts and four nuts which secure the brake pedal to pedal.



- (1) Clevis pin
- (2) Snap pin
- (3) Operating rod

### B: INSTALLATION

- 1) Install in the reverse order of removal.

#### CAUTION:

- If the cable clamp is damaged, replace it with a new one.
- Never fail to cover the outer cable end with boot.
- Always use new clevis pins.

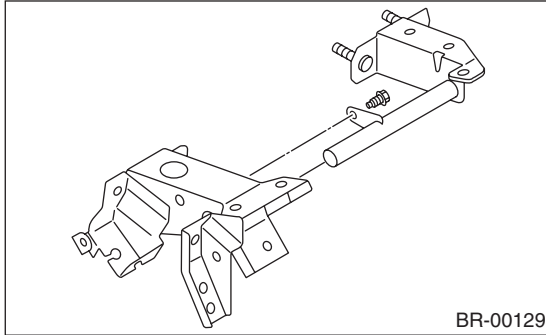
- 2) Adjust the clutch pedal <Ref. to CL-33, ADJUSTMENT, Clutch Pedal.>
- 3) Inspect the brake pedal after installation <Ref. to BR-53, INSPECTION, Brake Pedal.>

### C: DISASSEMBLY

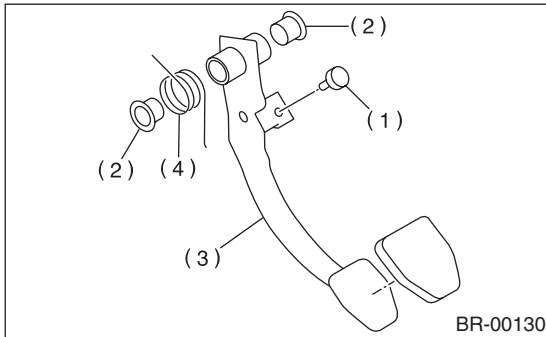
#### 1. MT MODEL

- 1) Remove the brake switch. <Ref. to BR-55, REMOVAL, Stop Light Switch.>
- 2) Remove the clutch pedal. <Ref. to CL-32, DISASSEMBLY, Clutch Pedal.>

3) Remove the clutch master cylinder bracket.



4) Remove the bushing, spring and stopper.

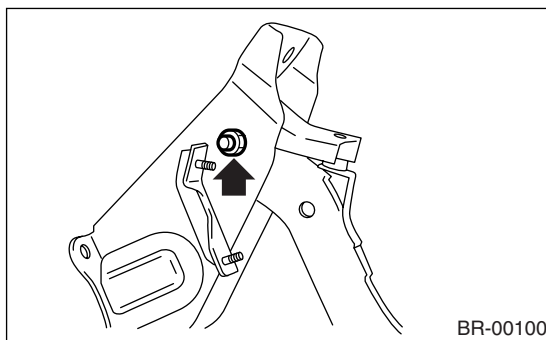


- (1) Stopper
- (2) Bushing
- (3) Brake pedal
- (4) Brake pedal spring

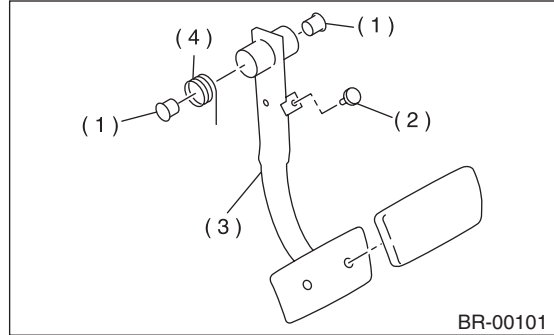
5) Remove the brake pedal pad.

## 2. AT MODEL

- 1) Remove the brake switch.
- 2) Unbolt, and then remove the brake pedal.



3) Remove the bushing, spacer and spring.



- (1) Plug
- (2) Stopper
- (3) Brake pedal
- (4) Brake pedal spring

4) Remove the brake pedal pad.

## D: ASSEMBLY

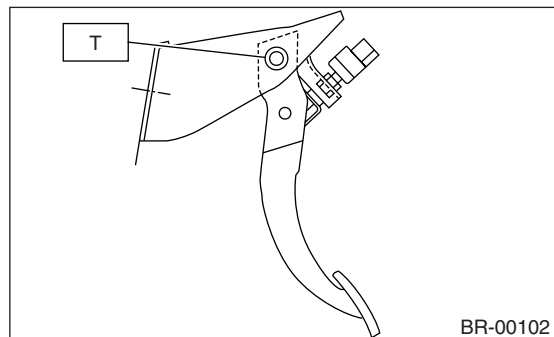
- 1) Attach the stop light switch, etc. to pedal bracket temporarily.
- 2) Clean the inside of bores of clutch pedal and brake pedal, apply grease, and set the bushings into bores.
- 3) Align bores of the pedal bracket, clutch pedal and brake pedal, attach the brake pedal return spring, and then install the pedal bolt.

### NOTE:

Clean up the inside of bushings and apply grease before installing spacer.

### Tightening torque:

**T: 30 N·m (3.1 kgf-m, 22.1 ft-lb)**



4) Adjust the stop light switch position after installing the brake pedal to vehicle.

## E: INSPECTION

- 1) Move the brake and clutch pedal pads in the lateral direction with a force of approx. 10 N (1 kgf, 2 lbf) to ensure pedal deflection is in specified range.

### CAUTION:

**If excessive deflection is noted, replace the bushings with new ones.**

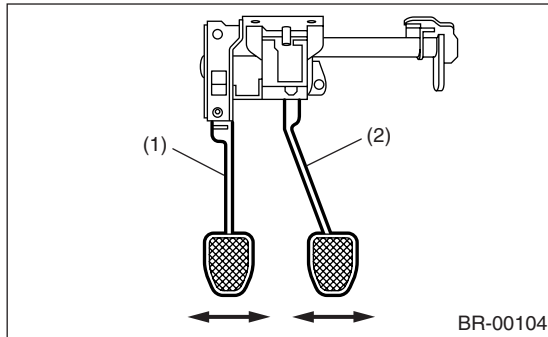


# Brake Pedal

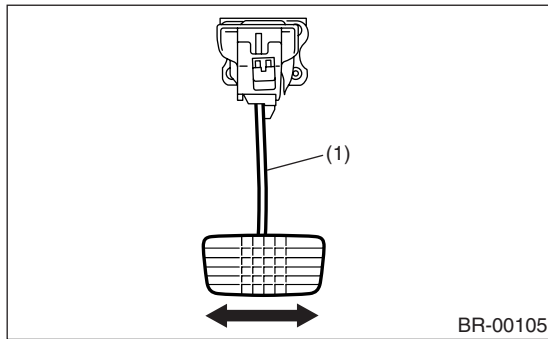
## BRAKE

**Deflection of brake and clutch pedal:**  
**Service limit**  
**5.0 mm (0.197 in) or less**

3) If it is not within specified value, adjust it by adjusting the brake booster operating rod length.



- (1) Clutch pedal
- (2) Brake pedal

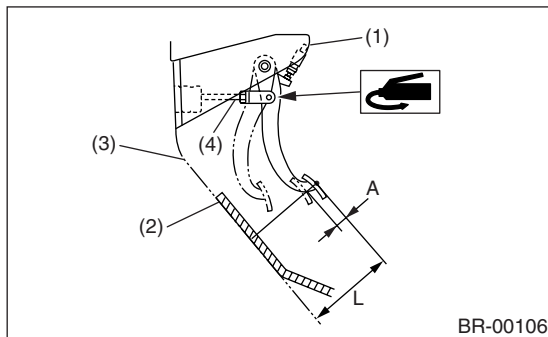


- (1) Brake pedal

2) Check the position of pedal pad.

**Pedal height L:**  
**148 mm (5.83 in)**

**Brake pedal free play A:**  
**0.5 — 2.0 mm (0.02 — 0.08 in) [Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lbf).]**

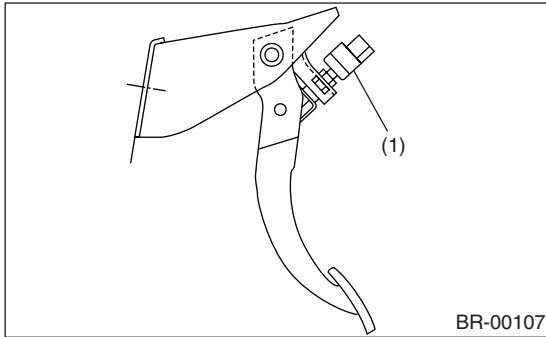


- (1) Stop light switch
- (2) Mat
- (3) Toe board
- (4) Brake booster operating rod

## 15. Stop Light Switch

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the stop light switch connector.
- 3) Loosen nuts, and unscrew stop light switch to remove.



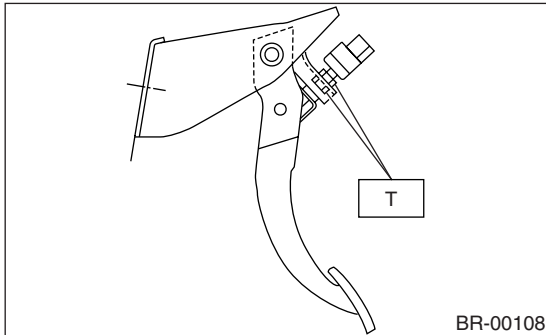
(1) Stop light switch

### B: INSTALLATION

- 1) Screw the stop light switch onto a bracket and secure it temporarily with a nut.
  - 2) Adjust the stop light switch position, and then tighten the nut.
- <Ref. to BR-56, ADJUSTMENT, Stop Light Switch.>

#### Tightening torque:

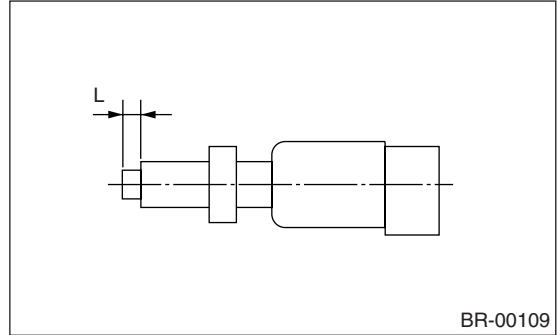
**8 N·m (0.8 kgf·m, 5.8 ft·lb)**



### C: INSPECTION

- 1) If the stop light switch does not operate properly (or if it does not stop at the specified position), replace with a new one.

**Specified position L:**  
**2 mm (0.079 in)**

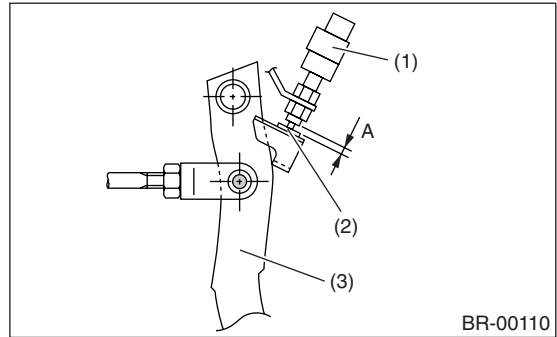


- 2) Measure the clearance between threaded end of stop light switch and stopper.

#### CAUTION:

**Be careful not to rotate stop light switch.**

**Stop light switch clearance A:**  
**0.3 mm (0.012 in)**



- (1) Stop light switch
- (2) Stopper
- (3) Brake pedal

- 3) If it is not within specified value, adjust it by adjusting position of stop light switch.

#### CAUTION:

**Be careful not to rotate the stop light switch.**

# Stop Light Switch

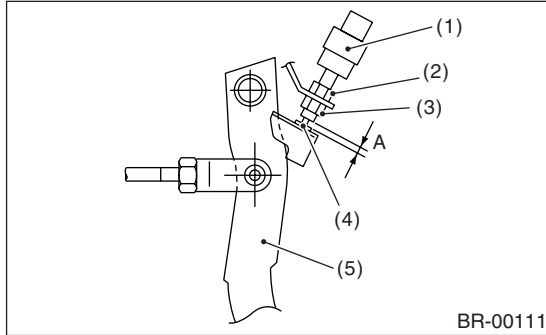
BRAKE

## D: ADJUSTMENT

Loosen the lock nut, and adjust the stop light switch position until the clearance between threaded end of stop light switch and stopper (A) becomes 0.3 mm (0.012 in). Then, tighten the lock nut.

### ***Tightening torque:***

***8 N·m (0.8 kgf-m, 5.8 ft-lb)***



- (1) Stop light switch
- (2) Lock nut A
- (3) Lock nut B
- (4) Stopper
- (5) Brake pedal

### **NOTE:**

Tighten the lock nut B until the clearance between threaded end of stop light switch and stopper becomes 0 mm (0 in). Hold the stop light switch to prevent turning, and then loosen the lock nut B approx. 60°. The clearance (A) will become 0.3 mm (0.012 in).

## 16. General Diagnostic Table

### A: INSPECTION

|   | Trouble and possible cause  | Corrective action  |
|---|---|--|
| <b>1. Insufficient braking</b>                    | (1) Fluid leakage from the hydraulic mechanism  | Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose). |
|   | (2) Entry of air into the hydraulic mechanism   | Bleed the air.   |
|   | (3) Excessively wide shoe clearance   | Adjust the clearance.  |
|   | (4) Wear, deteriorated surface material, adhering water or fluid on the lining                  | Replace, grind or clean.   |
|   | (5) Improper operation of master cylinder, disc caliper, brake booster or check valve           | Correct or replace.  |
| <b>2. Unstable or uneven braking</b>              | (1) Fluid on the lining, drum or disc rotor   | Eliminate cause of fluid leakage, clean, or replace.   |
|   | (2) Drum or disc rotor eccentricity   | Correct or replace the drum or disc rotor.   |
|   | (3) Worn brake drum, or damage to the drum caused by sand                                       | Correct by grinding, or replace.   |
|   | (4) Improper lining contact, deteriorated surface material, improper inferior material, or wear | Correct by grinding, or replace.   |
|   | (5) Deformed back plate   | Correct or replace.  |
|   | (6) Improper tire inflation   | Inflate to correct pressure.   |
|   | (7) Disordered wheel alignment  | Adjust alignment.  |
|   | (8) Loosened back plate or the support installing bolts   | Retighten.   |
|   | (9) Loosened wheel bearing  | Retighten to normal tightening torque or replace.  |
|   | (10) Trouble in the hydraulic system  | Replace the cylinder, brake pipe or hose.  |
|   | (11) Uneven effect of the parking brake   | Check, adjust, or replace the rear brake and cable system.                                   |
| <b>3. Excessive pedal stroke</b>                  | (1) Entry of air into the hydraulic mechanism   | Bleed the air.   |
|   | (2) Excessive play in the master cylinder push rod  | Adjust.  |
|   | (3) Fluid leakage from the hydraulic mechanism  | Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose). |
|   | (4) Improperly adjusted shoe clearance  | Adjust.  |
|   | (5) Improper lining contact or worn lining  | Correct or replace.  |
| <b>4. Brake dragging or improper brake return</b> | (1) Insufficient pedal play   | Adjust play.   |
|   | (2) Improper master cylinder return   | Clean or replace the cylinder.   |
|   | (3) Clogged hydraulic system  | Replace.   |
|   | (4) Improper return or adjustment of parking brake  | Correct or adjust.   |
|   | (5) Weakened spring tension or breakage of shoe return spring                                   | Replace the spring.  |
|   | (6) Excessively narrow shoe clearance   | Adjust the clearance.  |
|   | (7) Improper disc caliper operation   | Correct or replace.  |
|   | (8) Wheel bearing faulty  | Replace the wheel bearing.   |
| <b>5. Brake noise (1) (creak sound)</b>           | (1) Hardened or deteriorated lining   | Replace the shoe assembly or pad.  |
|   | (2) Worn lining   | Replace the shoe assembly or pad.  |
|   | (3) Loosened back plate or the support installing bolts   | Retighten.   |
|   | (4) Loose wheel bearing   | Retighten to normal tightening torque.   |
|   | (5) Dirty drum or disc rotor  | Clean the drum or disc rotor, or clean and replace the brake assembly.                       |
| <b>6. Brake noise (2) (hissing sound)</b>         | (1) Worn lining   | Replace the shoe assembly or pad.  |
|   | (2) Improper installed shoe or pad  | Correct or replace the shoe assembly or pad.   |
|   | (3) Loose or bent drum or disc rotor  | Retighten or replace.  |

# General Diagnostic Table

## BRAKE

|   | Trouble and possible cause                           | Corrective action               |
|---|--|---------------------------------|
| <b>7. Brake noise (3)<br/>(click sound)</b> | In the case of the disc brake:                       |                                 |
|   | (1) Excessively worn pad or the support              | Replace the pad or the support. |
|   | In the case of the drum brake:                       |                                 |
|   | (1) Excessively worn shoe ridge                      | Replace the back plate.         |
|   | (2) Lack of oil on the shoe ridge surface and anchor | Add more grease.                |

# PARKING BRAKE

# *PB*

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|   | <b>Page</b> |
|---|-------------|
| 1. General Description .....                      | 2           |
| 2. Parking Brake Lever.....                       | 4           |
| 3. Parking Brake Cable .....                      | 5           |
| 4. Parking Brake Assembly (Rear Disc Brake) ..... | 6           |
| 5. General Diagnostic Table.....                  | 9           |

# General Description

## PARKING BRAKE

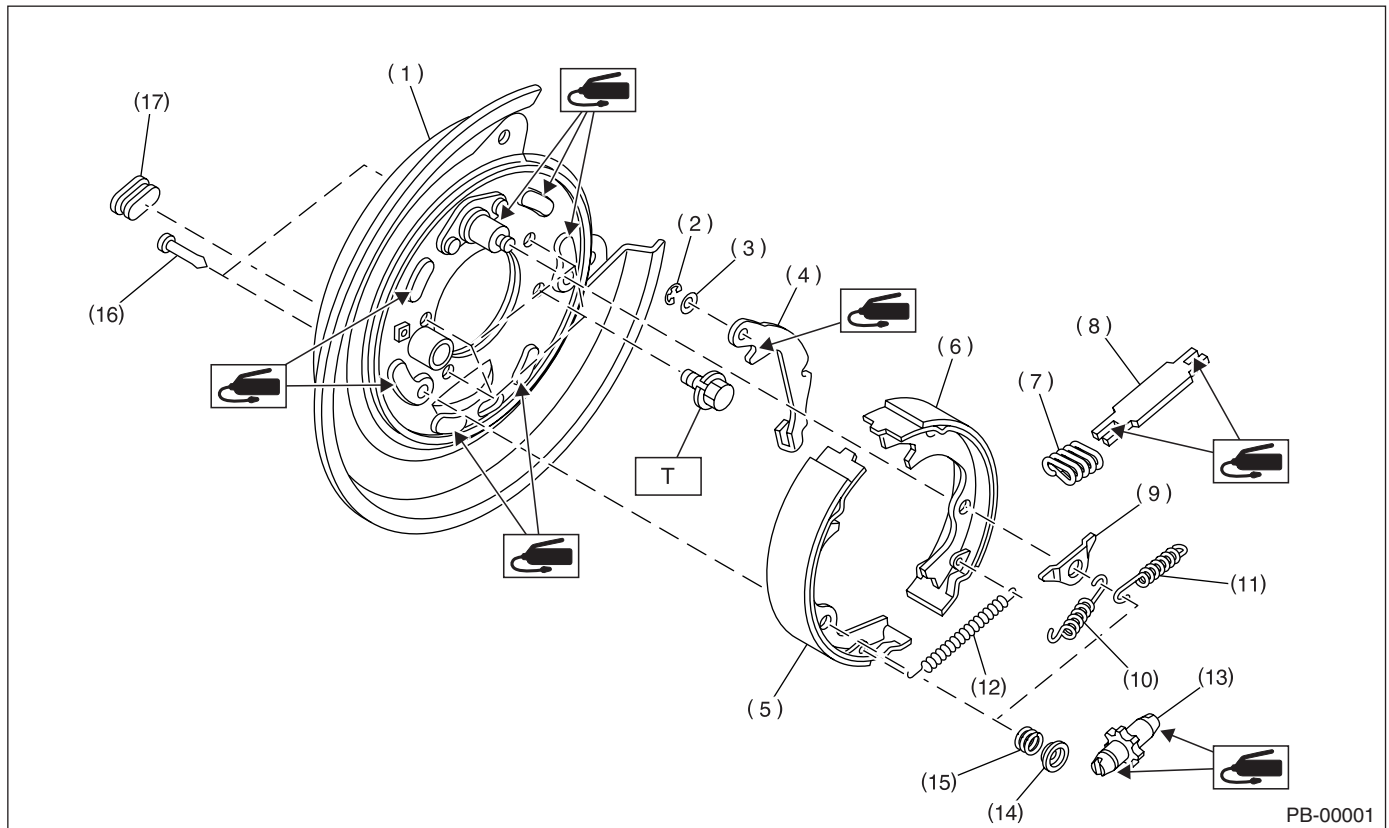
### 1. General Description

#### A: SPECIFICATION

| Model   |                      | Except STI model                             | STI model                                    |
|---|----------------------|--|--|
| Type  |                      | Mechanical on rear brakes, drum in disc      |  |
| Effective drum diameter                           | mm (in)              | 170 (6.69)                                   | 190 (7.48)                                   |
| Lining dimensions<br>(length × width × thickness) | mm (in)              | 162.6 × 30.0 × 3.2<br>(6.40 × 1.181 × 0.126) | 182.3 × 30.0 × 3.2<br>(7.18 × 1.181 × 0.126) |
| Clearance adjustment                              |                      | Manual adjustment                            |  |
| Lever stroke                                      | notches/N (kgf, lbf) | 7 to 8/196 (20, 44)                          |  |

#### B: COMPONENT

##### 1. PARKING BRAKE (REAR DISC BRAKE)



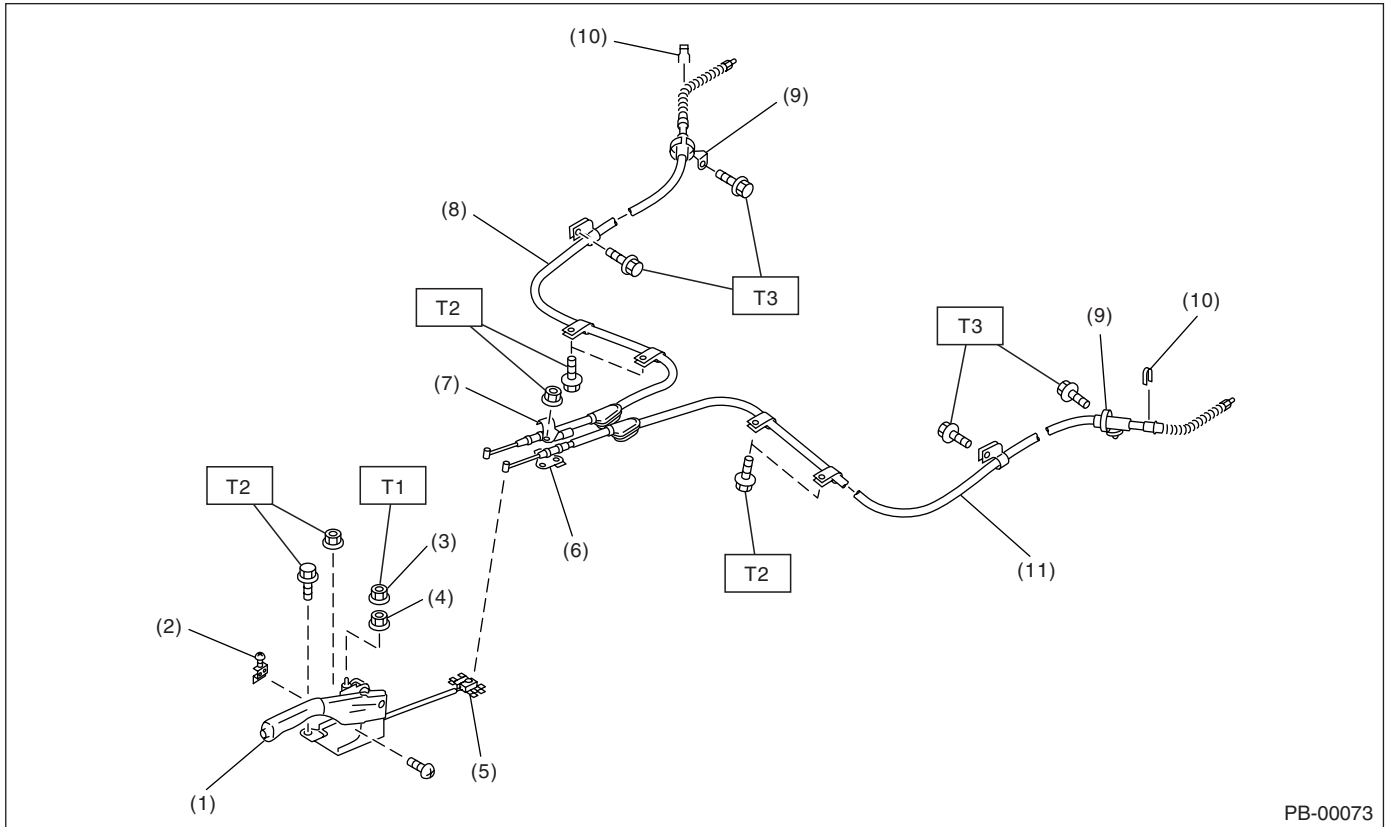
PB-00001

- |                                    |                              |                            |
|------------------------------------|------------------------------|----------------------------|
| (1) Back plate                     | (8) Strut                    | (15) Shoe hold-down spring |
| (2) Retainer                       | (9) Shoe guide plate         | (16) Shoe hold-down pin    |
| (3) Spring washer                  | (10) Primary return spring   | (17) Adjusting hole cover  |
| (4) Lever                          | (11) Secondary return spring |                            |
| (5) Parking brake shoe (Primary)   | (12) Adjusting spring        |                            |
| (6) Parking brake shoe (Secondary) | (13) Adjuster                |                            |
| (7) Strut spring                   | (14) Shoe hold-down cup      |                            |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T: 53 (5.4, 39.1)**

## 2. PARKING BRAKE CABLE



- |                          |                                    |
|--------------------------|------------------------------------|
| (1) Parking brake lever  | (7) Clamp                          |
| (2) Parking brake switch | (8) Parking brake cable RH         |
| (3) Lock nut             | (9) Cable guide                    |
| (4) Adjusting nut        | (10) Clamp (Rear disc brake model) |
| (5) Equalizer            | (11) Parking brake cable LH        |
| (6) Bracket              |                                    |

**Tightening torque: N·m (kgf·m, ft·lb)**

- |                           |
|---------------------------|
| <b>T1: 6 (0.6, 4.4)</b>   |
| <b>T2: 18 (1.8, 13.0)</b> |
| <b>T3: 32 (3.3, 23.6)</b> |

### C: CAUTION

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Keep grease etc. away from parking brake shoes.



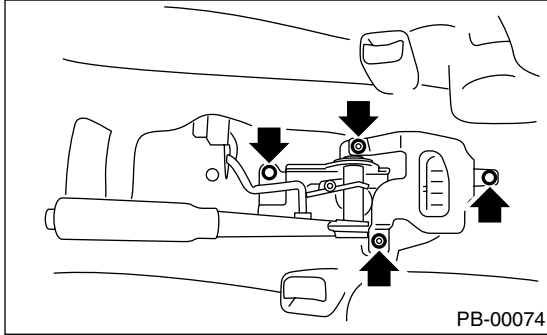
# Parking Brake Lever

## PARKING BRAKE

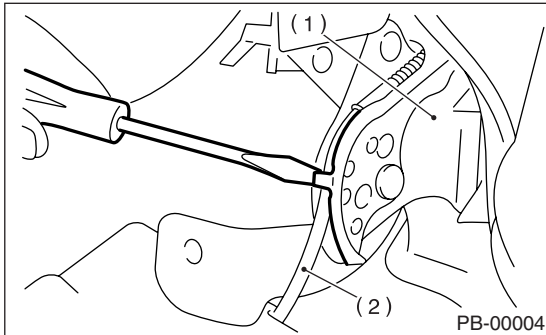
### 2. Parking Brake Lever

#### A: REMOVAL

- 1) Lift up the vehicle.
- 2) Remove the rear wheel.
- 3) Remove the rear seat cushion.
- 4) Remove the console box.
- 5) Loosen the parking cable adjusting nut and console bracket.
- 6) Disconnect the connector of parking brake switch.
- 7) Remove the parking brake lever.



- 8) Unbend the parking brake lever pawls and remove cable.



- (1) Parking brake lever
- (2) Cable

#### B: INSTALLATION

- 1) Install in the reverse order of removal.

##### Tightening torque:

##### **Parking brake lever;**

**18 N·m (1.8 kgf·m, 13.0 ft·lb)**

##### **Lock nut;**

**6 N·m (0.6 kgf·m, 4.4 ft·lb)**

- 2) Be sure to adjust the lever stroke. <Ref. to PB-4, ADJUSTMENT, Parking Brake Lever.>

#### C: INSPECTION

While pulling the parking brake lever upward, count the notches.

##### **Lever stroke:**

**7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lbf)**

If not as specified, adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

#### D: ADJUSTMENT

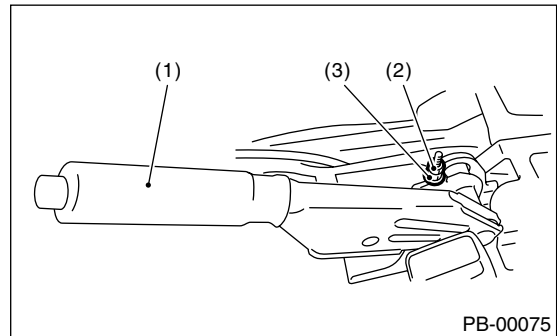
- 1) Remove the console cover.
- 2) Forcibly pull the parking brake lever 3 to 5 times.
- 3) Adjust the parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kgf, 44 lbf).
- 4) Tighten the lock nut.

##### **Lever stroke:**

**7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lbf)**

##### **Tightening torque (Lock nut):**

**6 N·m (0.6 kgf·m, 4.4 ft·lb)**



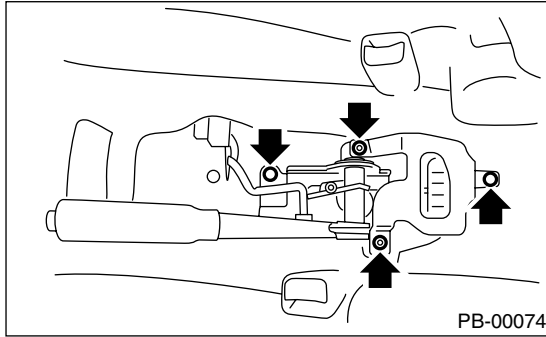
- (1) Parking brake lever
- (2) Lock nut
- (3) Adjusting nut

- 5) Install the console cover.

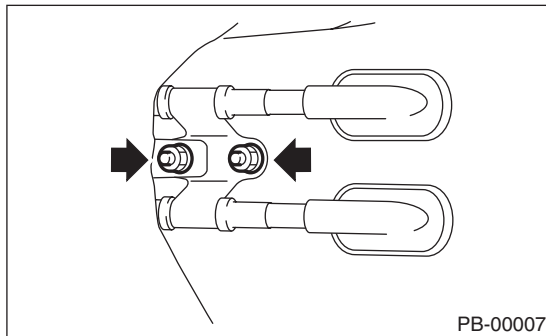
## 3. Parking Brake Cable

### A: REMOVAL

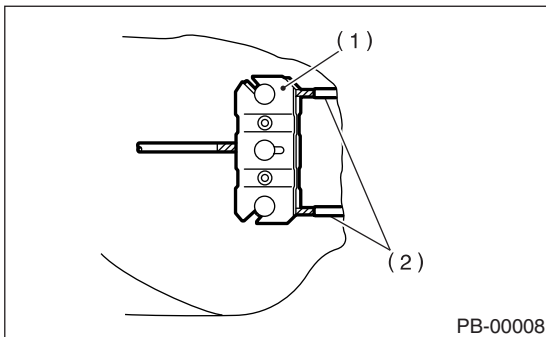
- 1) Lift up the vehicle.
- 2) Remove the rear wheels.
- 3) Remove the rear seat cushion.
- 4) Remove the console box.
- 5) Loosen the parking cable adjusting nut and console bracket.
- 6) Remove the parking brake lever.



- 7) Roll up the floor mat and remove clamps.



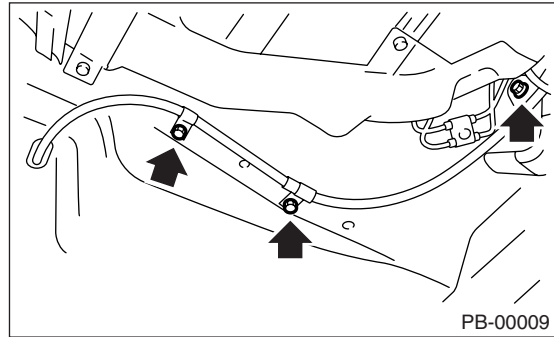
- 8) Remove the equalizer cover.
- 9) Remove the inner cable end from equalizer.



- (1) Equalizer
- (2) Inner cable end

- 10) Remove the parking brake cable from rear brake. <Ref. to PB-6, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
- 11) Remove the clamp from rear brake.
- 12) Remove the bolt and bracket from trailing link bracket.

- 13) Remove the bolt and clamp from rear floor.



- 14) Detach the grommet from rear floor.
- 15) Remove the cable assembly from cabin by forcibly pulling it backward.
- 16) Detach the parking brake cable from cable guide at rear trailing link.

### B: INSTALLATION

- 1) Install in the reverse order of removal.

#### NOTE:

Be sure to pass the cable through cable guide inside the tunnel.

2) Be sure to adjust the lever stroke. <Ref. to PB-4, ADJUSTMENT, Parking Brake Lever.>

### C: INSPECTION

Check the removed cable and replace it if damaged, rusty or malfunctioning.

- 1) Check for smooth operation of the cable.
- 2) Check the inner cable for damage and rust.
- 3) Check the outer cable for damage, bends and cracks.
- 4) Check the boot for damage, cracks and deterioration.

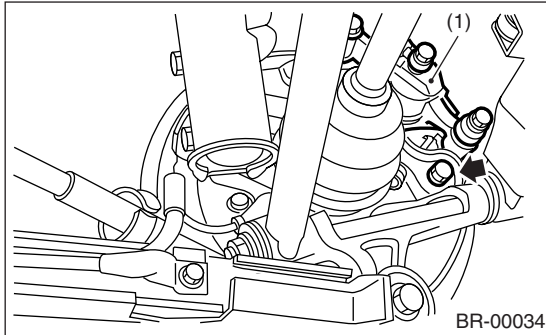
# Parking Brake Assembly (Rear Disc Brake)

## PARKING BRAKE

### 4. Parking Brake Assembly (Rear Disc Brake)

#### A: REMOVAL

- 1) Pull down and release the parking brake.
- 2) Remove the two mounting bolts and remove the brake caliper assembly.



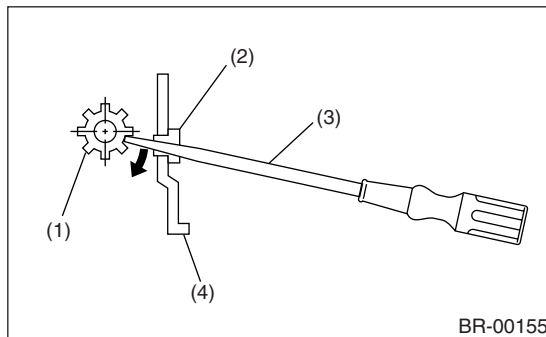
(1) Brake caliper ASSY

- 3) Suspend the brake caliper assembly so that the hose is not stretched.
- 4) Remove the disc rotor.

#### NOTE:

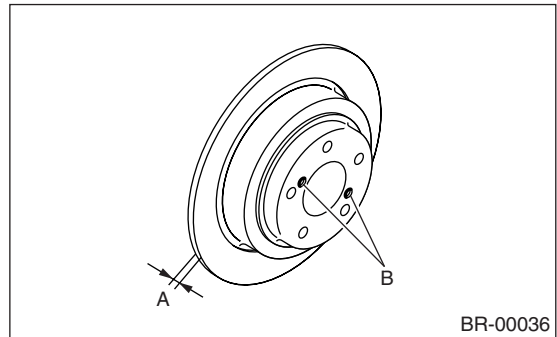
If the disc rotor is difficult to remove, try the two following methods in order.

- (1) Turn the adjusting screw using a flat tip screwdriver until brake shoe gets away enough from the disc rotor.

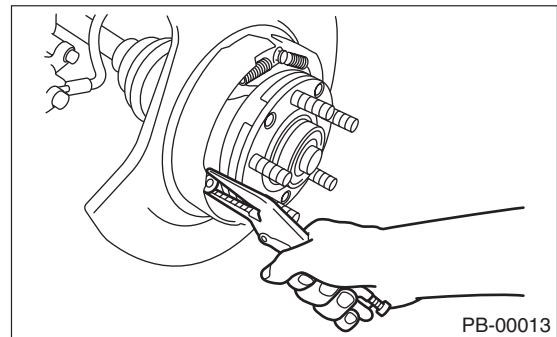


- (1) Adjusting screw
- (2) Adjusting hole cover (rubber)
- (3) Flat tip screwdriver
- (4) Back plate

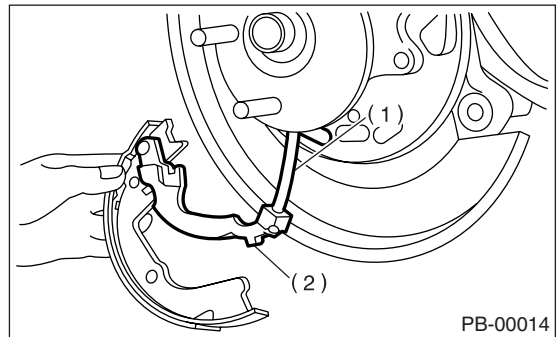
- (2) If the disc rotor seizes up within hub, drive the disc rotor out by installing two 8-mm bolts in holes B on rotor.



- 5) Remove the shoe return spring from parking brake assembly.
- 6) Remove the front shoe hold-down spring and pin with pliers.



- 7) Remove the strut and strut spring.
- 8) Remove the adjuster assembly from parking brake assembly.
- 9) Remove the brake shoe.
- 10) Remove the rear shoe hold-down spring and pin with pliers.
- 11) Remove the parking brake cable from lever.



- (1) Parking brake cable
- (2) Lever

- 12) Using a standard screwdriver, raise the retain-er. Remove the lever and washer from brake shoe.

## B: INSTALLATION

### CAUTION:

Be sure the lining surface is free from oil and grease contamination.

1) Apply brake grease to the following places.

#### Brake grease:

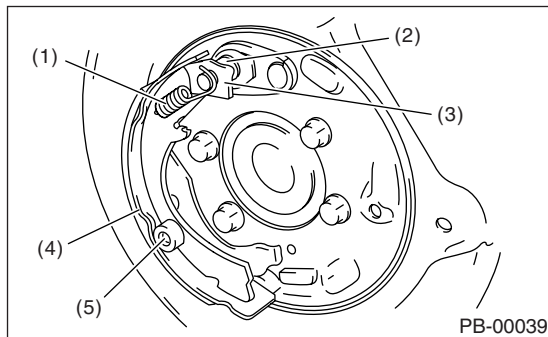
##### Brake Grease (Part No. 003602002)

- Six contact surfaces of shoe rim and back plate packing
- Contact surface of shoe wave and anchor pin
- Contact surface of lever and strut
- Contact surface of shoe wave and adjuster assembly
- Contact surface of shoe wave and strut
- Contact surface of lever and shoe wave

2) Insert the primary side brake shoe into anchor pin groove.

3) Secure the brake shoe with shoe hold-down pin and cup.

4) Install the plate to anchor pin, and then assemble the primary return spring to anchor pin.



- (1) Primary return spring
- (2) Anchor pin
- (3) Shoe guide plate
- (4) Primary shoe
- (5) Shoe hold-down pin & cup

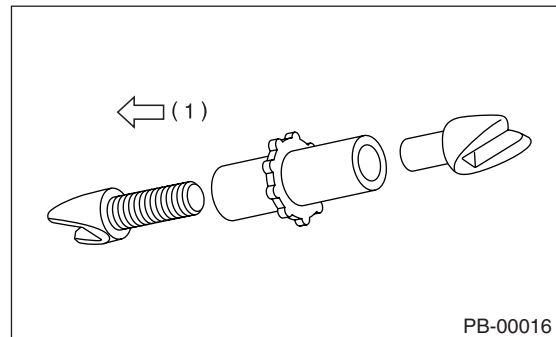
5) Install the parking brake cable to lever.

6) Assemble the strut and adjuster, and then secure the secondary side brake shoe with shoe hold-down pin & cup.

### NOTE:

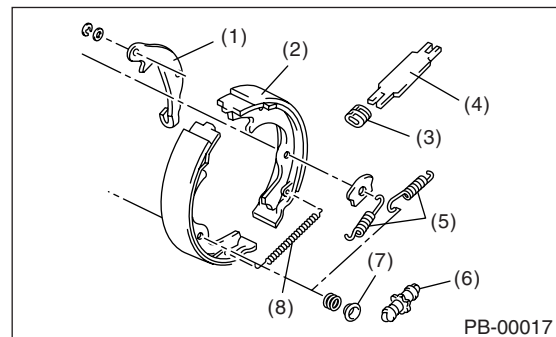
- Install the strut spring of both right and left wheels facing vehicle front.

- Install the adjuster assembly with screw on left side.



- (1) Left

7) Install the secondary return spring and adjusting spring.



- (1) Lever
- (2) Secondary brake shoe
- (3) Strut spring
- (4) Strut
- (5) Return spring
- (6) Adjuster
- (7) Shoe hold-down cup
- (8) Adjusting spring

8) Adjust the parking brakes. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

9) Drive the vehicle for parking brake lining "break-in".

- (1) Drive the vehicle at about 35 km/h (22 MPH).
- (2) With the parking brake release button pushed in, pull the parking brake lever gently.
- (3) Drive the vehicle for about 200 meter (0.12 mile) in this condition.
- (4) Wait 5 to 10 minutes for the parking brake to cool down. Repeat this procedure once more.
- (5) After breaking-in, re-adjust the parking brakes.

# Parking Brake Assembly (Rear Disc Brake)

## PARKING BRAKE

### C: INSPECTION

1) Measure the brake disc rotor inside diameter. If the disc is scored or worn, replace the brake disc rotor.

#### **Disc rotor inside diameter:**

##### **Standard**

**Except STI model 170 mm (6.69 in)**

**STI model 190 mm (7.48 in)**

##### **Service limit**

**Except STI model 171 mm (6.73 in)**

**STI model 191 mm (7.52 in)**

2) Measure the lining thickness. If it exceeds the limit, replace the shoe assembly.

#### **Lining thickness:**

##### **Standard**

**3.2 mm (0.126 in)**

##### **Service limit**

**1.5 mm (0.059 in)**

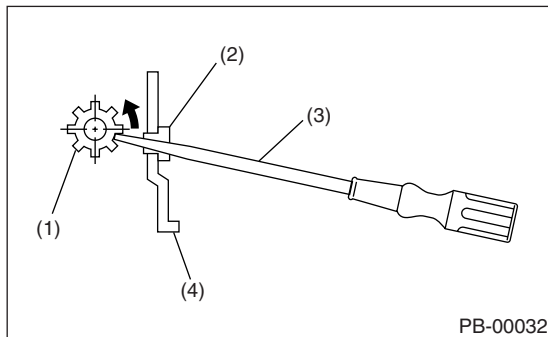
#### **NOTE:**

Replace the right and left brake shoes at the same time.

### D: ADJUSTMENT

#### 1. SHOE CLEARANCE

- 1) Return the parking brake completely.
- 2) Remove the adjusting hole cover from back plate.
- 3) Turn the adjusting screw using a flat tip screwdriver until brake shoe is in close contact with disc rotor.



- (1) Adjusting screw
- (2) Adjusting hole cover (rubber)
- (3) Flat tip screwdriver
- (4) Back plate

4) Turn back (downward) the adjusting screw 3 or 4 notches.

#### **CAUTION:**

**Be sure that the brake is not dragging.**

5) Install the adjusting hole cover to back plate.

6) Adjust the parking brake lever stroke. <Ref. to PB-8, LEVER STROKE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

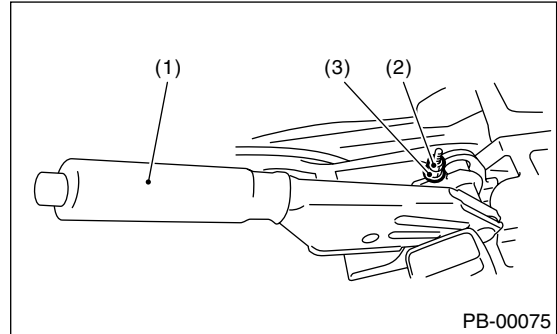
#### 2. LEVER STROKE

1) Before adjusting the lever stroke, adjust the shoe clearance. <Ref. to PB-8, SHOE CLEARANCE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

2) Remove the console box lid.

3) Forcibly pull the parking brake lever 3 to 5 times.

4) Adjust the parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kgf, 44 lbf).



- (1) Parking brake lever
- (2) Lock nut
- (3) Adjusting nut

#### **Lever stroke:**

**7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lbf)**

5) Tighten the lock nut.

#### **Tightening torque (Lock nut):**

**6 N·m (0.6 kgf-m, 4.4 ft-lb)**

6) Install the console box lid.

## 5. General Diagnostic Table

### A: INSPECTION

| Symptom          | Possible cause                               | Remedy             |
|------------------|--|--------------------|
| Brake drag       | Parking brake lever is maladjusted.          | Adjustment.        |
|                  | Parking brake cable does not move.           | Repair or replace. |
|                  | Parking brake shoe clearance is maladjusted. | Adjustment.        |
|                  | Return spring is faulty.                     | Replace.           |
| Noise from brake | Return spring is faulty.                     | Replace.           |
|                  | Shoe hold-down spring is faulty.             | Replace.           |

# General Diagnostic Table

PARKING BRAKE

---

# POWER ASSISTED SYSTEM (POWER STEERING)

# PS

---

|                                   | <b>Page</b> |
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# General Description

## POWER ASSISTED SYSTEM (POWER STEERING)

### 1. General Description

#### A: SPECIFICATION

| Model                                    |   | NON-TURBO         | TURBO  |  |   |
|--|---|-------------------|--|--|---|
|  |   | 2.5i, OUTBACK     | WRX  | STI  |   |
| Whole system                             | Minimum turning radius                            | m (ft)            | 5.4 (17.7)   |  | 5.7 (18.7)                                |
|  | Steering angle (Inside-Outside)                   |                   | 34.5° — 30.3°  |  | 32.9° — 28.5°                             |
|  | Steering wheel diameter                           |                   | 375 (14.76)  |  | 375 (14.76)                               |
|  | Lock-to-lock speed (Turns lock to lock, Gear box) |                   | 3.0  | 2.7  | 2.6                                       |
| Gearbox                                  | Type  |                   | Rack and pinion, Integral                            |  |   |
|  | Backlash  |                   | 0 (Automatically adjustable)                         |  |   |
|  | Valve (Power steering system)                     |                   | Rotary valve   |  |   |
| Pump<br>(Power steering system)          | Type  |                   | Vane pump  |  |   |
|  | Oil tank  |                   | Installed on body                                    |  |   |
|  | Output  |                   | cm <sup>3</sup> (cu in)/rev.                         | 7.2 (0.439)  | 7.2 (0.439)                               |
|  | Relief pressure                                   |                   | kPa (kgf/cm <sup>2</sup> , psi)                      | 6,700 — 7,400<br>(68 — 75, 972 — 1,073)            | 7,350 — 8,036<br>(75 — 82, 1,067 — 1,165) |
|  | Hydraulic fluid control                           |                   | Dropping in response to increased engine revolutions |  |   |
|  | Hydraulic fluid                                   |                   | ℓ (US qt, Imp qt)                                    | 1,000 rpm: 7 (7.4, 6.2)<br>3,000 rpm: 5 (5.3, 4.4) | 7.5 (7.9, 6.6)                            |
|  | Range of revolution                               |                   | rpm  | 700 — 9,000  |   |
|  | Revolving direction                               |                   | Clockwise  |  |   |
| Working fluid<br>(Power steering system) | Name  |                   | ATF DEXRON III                                       |  |   |
|  | Capacity  | ℓ (US qt, Imp qt) | Oil tank   | 0.3 (0.3, 0.3)                                     |   |
|  |   | Total             | 0.7 (0.7, 0.6)                                       |  |   |

# General Description

## POWER ASSISTED SYSTEM (POWER STEERING)

|  |  |                        |                                 |  |
|--|--|------------------------|---------------------------------|--|
| Steering wheel                                   | Free play  | mm (in)                | 17 (0.67)                       |  |
| Turning angle                                    | Inner wheel  | 2.5i, OUTBACK, WRX     | 34.5°±1.5°                      |  |
|  |  | STI                    | 32.9°±1.5°                      |  |
|  | Outer wheel  | 2.5i, OUTBACK, WRX     | 30.3°±1.5°                      |  |
|  |  | STI                    | 28.5°±1.5°                      |  |
| Steering shaft                                   | Clearance between steering wheel and column cover    | mm (in)                | 4.0 (0.16)                      |  |
| Steering gear-box<br>(Power steering system)     | Sliding resistance                                   |                        | N (kgf, lbf)                    | 400 (41, 90) or less   |
|  | Rack shaft play in radial direction                  | Right-turn steering    | mm (in)                         | 0.19 (0.0075) or less  |
|  |  | Left-turn steering     | mm (in)                         | Horizontal movement:<br>0.15 (0.0059) or less<br>Vertical movement:<br>0.3 (0.012) or less                                   |
|  | Input shaft play                                     | In radial direction    | mm (in)                         | 0.18 (0.0071) or less  |
|  |  | In axial direction     | mm (in)                         | 0.5 (0.020) or less  |
|  | Turning resistance                                   |                        | N (kgf, lbf)                    | Maximum allowable value:<br>Less than 10.5 (1.1, 2.4)<br>Difference between right and left sliding resistance: Less than 20% |
| Oil pump<br>(Power steering system)              | Pulley shaft   | Radial play            | mm (in)                         | 0.4 (0.016) or less  |
|  |  | Axial play             | mm (in)                         | 0.9 (0.035) or less  |
|  | Pulley   | Ditch deflection       | mm (in)                         | 1.0 (0.039) or less  |
|  |  | Resistance to rotation | N (kgf, lbf)                    | 9.22 (0.94, 2.07) or less  |
|  | Regular pressure (Unloaded)                          |                        | kPa (kgf/cm <sup>2</sup> , psi) | 981 (10, 142) or less  |
| Steering wheel effort<br>(Power steering system) | At standstill with engine idling on a concrete road  |                        | N (kgf, lbf)                    | 31.4 (3.2, 7.1) or less  |
|  | At standstill with engine stalled on a concrete road |                        | N (kgf, lbf)                    | 294.2 (30, 66.2) or less   |

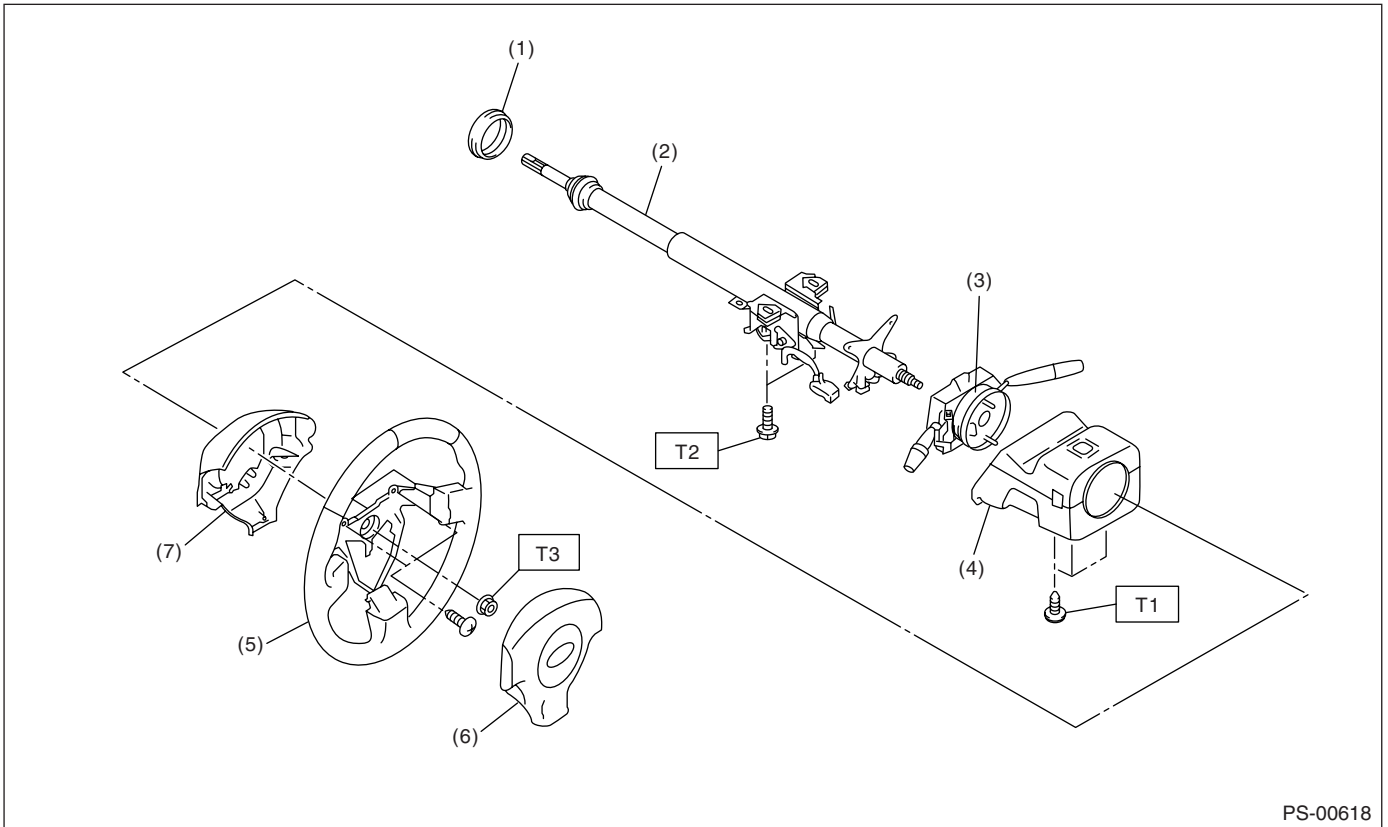
| Recommended power steering fluid | Manufacturer |
|----------------------------------|--------------|
| ATF DEXRON III                   | B.P.         |
|                                  | CALTEX       |
|                                  | CASTROL      |
|                                  | MOBIL        |
|                                  | SHELL        |
|                                  | TEXACO       |

# General Description

POWER ASSISTED SYSTEM (POWER STEERING)

## B: COMPONENT

### 1. STEERING WHEEL AND COLUMN



PS-00618

- |                             |                                |
|-----------------------------|--------------------------------|
| (1) Bushing                 | (5) Steering wheel             |
| (2) Steering shaft          | (6) Airbag module              |
| (3) Steering roll connector | (7) Steering wheel lower cover |
| (4) Column cover            |                                |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 1.2 (0.12, 0.9)**

**T2: 25 (2.5, 18.1)**

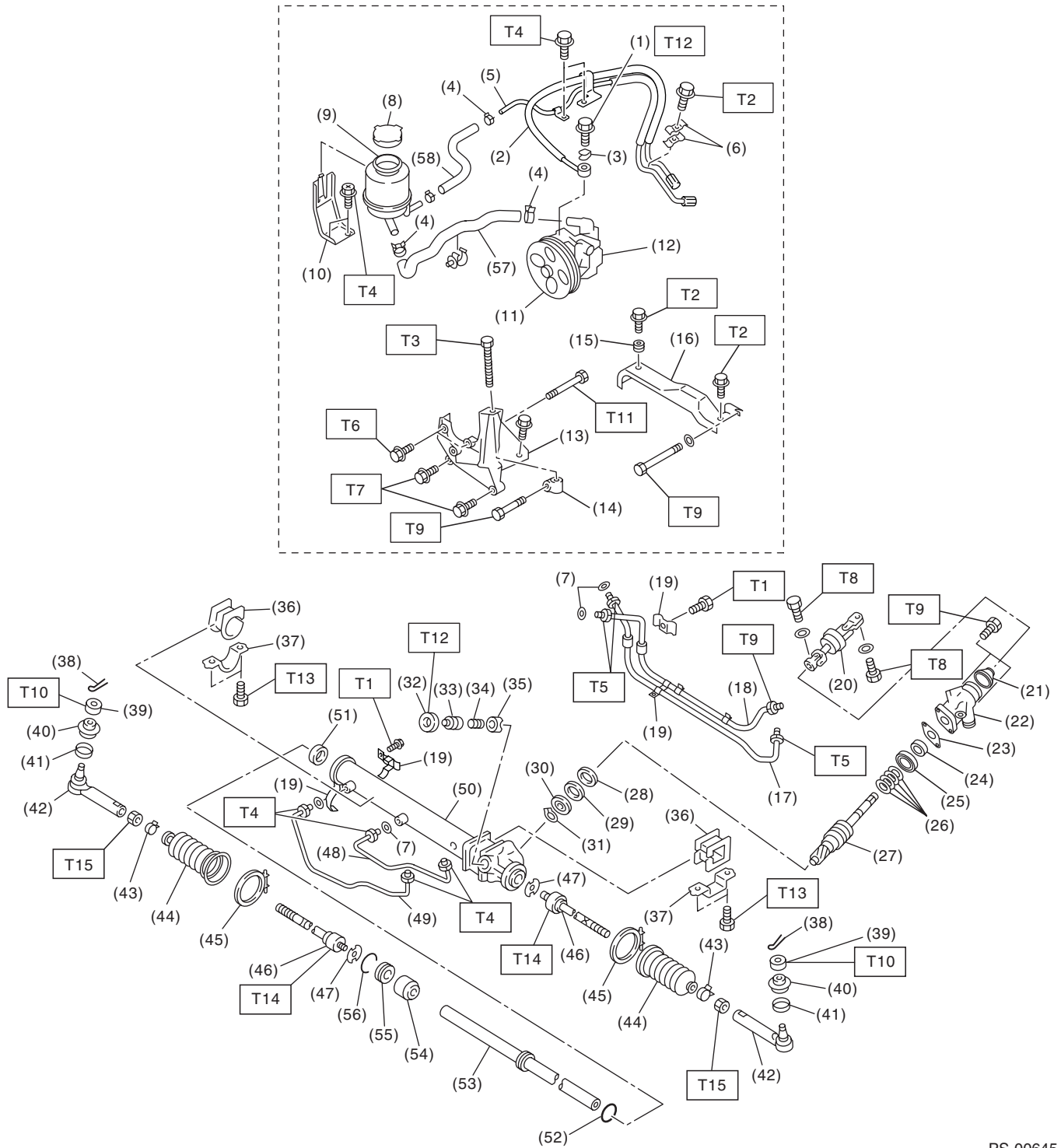
**T3: 45 (4.6, 33.2)**

# General Description

POWER ASSISTED SYSTEM (POWER STEERING)

## 2. POWER ASSISTED SYSTEM

### • NON-TURBO MODEL



PS-00645

## General Description

### POWER ASSISTED SYSTEM (POWER STEERING)

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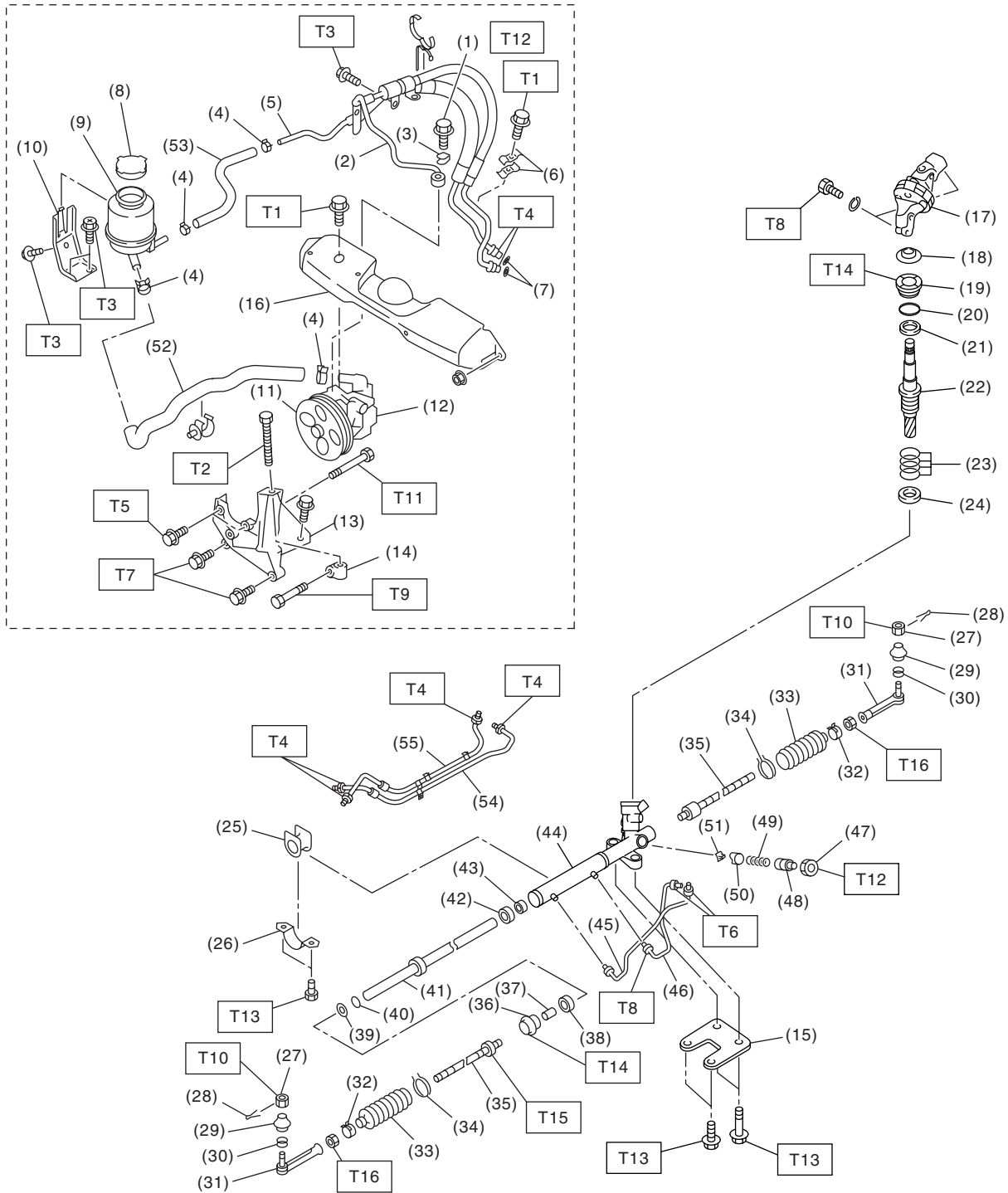
|                             |                            |  |
|-----------------------------|----------------------------|--|
| (1) Eye bolt                | (26) Seal ring             | (51) Oil seal                                      |
| (2) Pipe C                  | (27) Pinion and valve ASSY | (52) Piston ring                                   |
| (3) Gasket                  | (28) Oil seal              | (53) Rack  |
| (4) Clip                    | (29) Back-up washer        | (54) Rack bushing                                  |
| (5) Pipe D                  | (30) Ball bearing          | (55) Rack stopper                                  |
| (6) Clamp E                 | (31) Snap ring             | (56) Snap ring                                     |
| (7) O-ring                  | (32) Lock nut              | (57) Suction hose                                  |
| (8) Cap                     | (33) Adjusting screw       | (58) Hose  |
| (9) Reservoir tank          | (34) Spring                |  |
| (10) Reservoir tank bracket | (35) Sleeve                | <hr/> <b>Tightening torque: N·m (kgf-m, ft-lb)</b> |
| (11) Pulley                 | (36) Adapter               | <b>T1: 6 (0.6, 4.3)</b>                            |
| (12) Oil pump               | (37) Clamp                 | <b>T2: 7.4 (0.75, 5.4)</b>                         |
| (13) Bracket                | (38) Cotter pin            | <b>T3: 8 (0.8, 5.8)</b>                            |
| (14) Belt tension nut       | (39) Castle nut            | <b>T4: 13 (1.3, 9.4)</b>                           |
| (15) Bushing                | (40) Dust cover            | <b>T5: 15 (1.5, 10.8)</b>                          |
| (16) Belt cover             | (41) Clip                  | <b>T6: 15.7 (1.6, 11.6)</b>                        |
| (17) Pipe E                 | (42) Tie-rod end           | <b>T7: 22 (2.2, 15.9)</b>                          |
| (18) Pipe F                 | (43) Clip                  | <b>T8: 24 (2.4, 17.4)</b>                          |
| (19) Clamp plate            | (44) Boot                  | <b>T9: 25 (2.5, 18.1)</b>                          |
| (20) Universal joint        | (45) Band                  | <b>T10: 27 (2.75, 19.9)</b>                        |
| (21) Dust seal              | (46) Tie-rod               | <b>T11: 37.3 (3.8, 27.5)</b>                       |
| (22) Valve housing          | (47) Lock washer           | <b>T12: 40 (4.1, 29.5)</b>                         |
| (23) Gasket                 | (48) Pipe B                | <b>T13: 60 (6.1, 44.3)</b>                         |
| (24) Oil seal               | (49) Pipe A                | <b>T14: 78 (8.0, 57.9)</b>                         |
| (25) Ball bearing           | (50) Steering body         | <b>T15: 83 (8.5, 61.5)</b>                         |

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# General Description

POWER ASSISTED SYSTEM (POWER STEERING)

## • TURBO MODEL AND STI MODEL



PS-00644

# General Description

## POWER ASSISTED SYSTEM (POWER STEERING)

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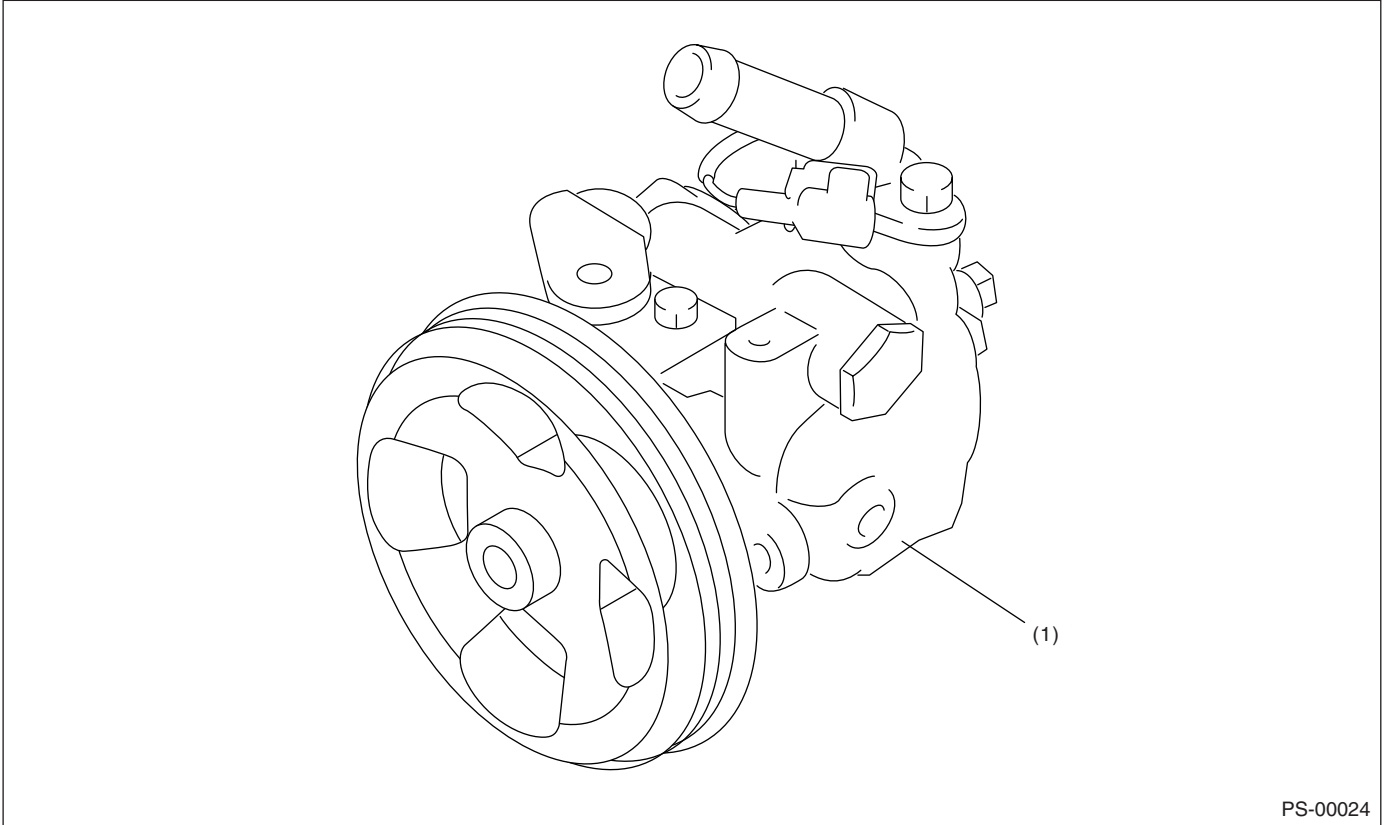
|                             |                      |  |
|-----------------------------|----------------------|--|
| (1) Eye bolt                | (26) Clamp           | (51) Seat pad                                |
| (2) Pipe C                  | (27) Castle nut      | (52) Suction hose                            |
| (3) Gasket                  | (28) Cotter pin      | (53) Return hose                             |
| (4) Clip                    | (29) Dust seal       | (54) Pipe G                                  |
| (5) Pipe D                  | (30) Clip            | (55) Pipe H                                  |
| (6) Clamp E                 | (31) Tie-rod end     |  |
| (7) O-ring                  | (32) Clip            | <hr/>  |
| (8) Cap                     | (33) Boot            | <b>Tightening torque: N-m (kgf-m, ft-lb)</b> |
| (9) Reservoir tank          | (34) Wire            | <b>T1: 7.4 (0.75, 5.4)</b>                   |
| (10) Reservoir tank bracket | (35) Tie-rod         | <b>T2: 8 (0.8, 5.8)</b>                      |
| (11) Pulley                 | (36) Holder          | <b>T3: 13 (1.3, 9.4)</b>                     |
| (12) Oil pump               | (37) Bushing         | <b>T4: 15 (1.5, 10.8)</b>                    |
| (13) Bracket                | (38) Oil seal        | <b>T5: 15.7 (1.6, 11.6)</b>                  |
| (14) Belt tension nut       | (39) Oil seal        | <b>T6: 20 (2.0, 14.5)</b>                    |
| (15) Stiffener              | (40) O-ring          | <b>T7: 22 (2.2, 15.9)</b>                    |
| (16) Belt cover             | (41) Rack            | <b>T8: 24 (2.4, 17.4)</b>                    |
| (17) Universal joint        | (42) Oil seal        | <b>T9: 25 (2.5, 18.1)</b>                    |
| (18) Dust cover             | (43) Back-up washer  | <b>T10: 27 (2.75, 19.9)</b>                  |
| (19) Plug                   | (44) Steering body   | <b>T11: 37.3 (3.8, 27.5)</b>                 |
| (20) O-ring                 | (45) Pipe A          | <b>T12: 40 (4.1, 29.5)</b>                   |
| (21) Oil seal               | (46) Pipe B          | <b>T13: 60 (6.1, 44.3)</b>                   |
| (22) Pinion                 | (47) Lock nut        | <b>T14: 64 (6.5, 47.0)</b>                   |
| (23) Seal ring              | (48) Adjusting screw | <b>T15: 90 (9.0, 65.1)</b>                   |
| (24) Oil seal               | (49) Spring          | <b>T16: 85 (8.6, 62.2)</b>                   |
| (25) Adapter                | (50) Sleeve          | <hr/>  |

# General Description

POWER ASSISTED SYSTEM (POWER STEERING)

## 3. OIL PUMP

### • NON-TURBO MODEL



PS-00024

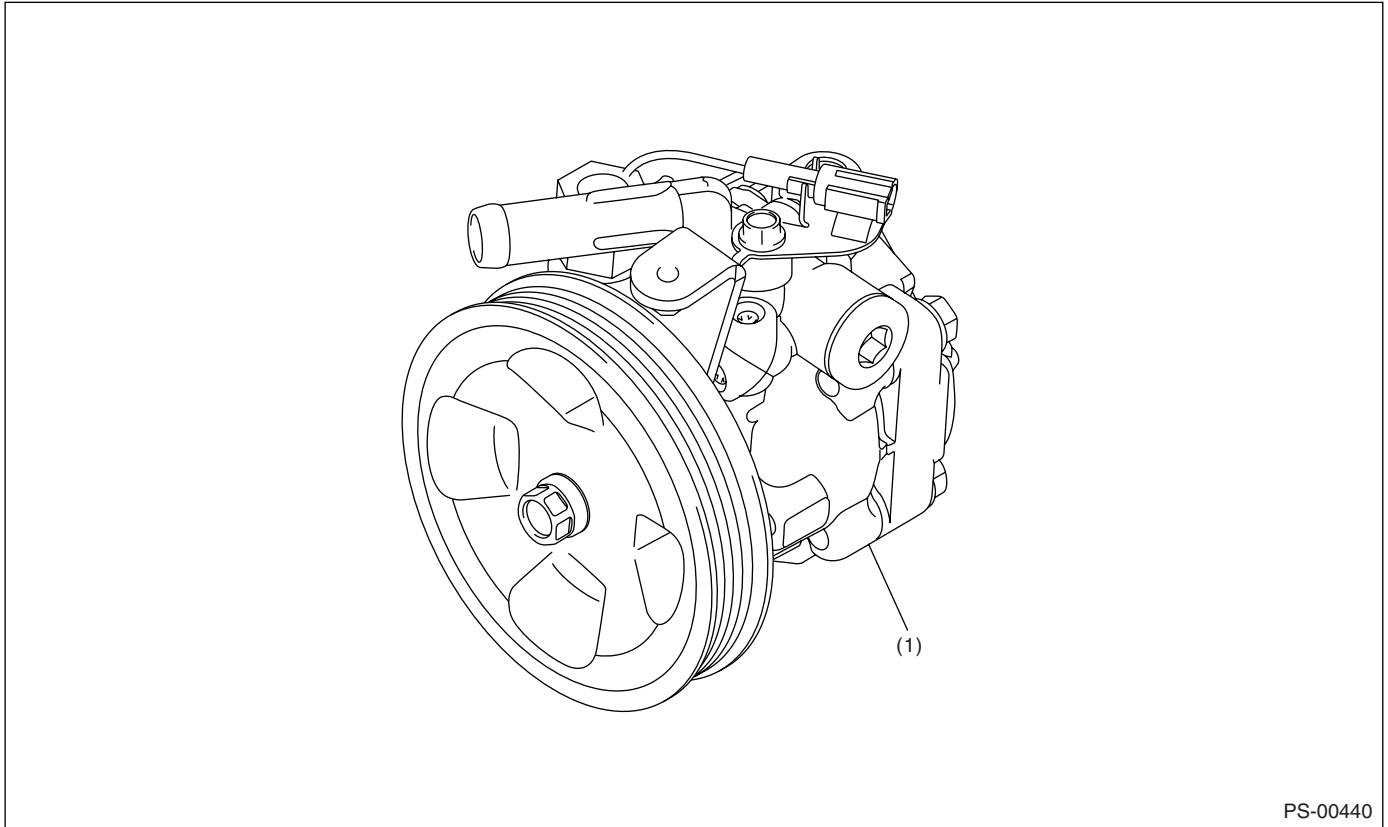
(1) Power steering oil pump ASSY



## General Description

### POWER ASSISTED SYSTEM (POWER STEERING)

#### • TURBO MODEL AND STI MODEL



PS-00440

(1) Power steering oil pump ASSY

#### **C: CAUTION**

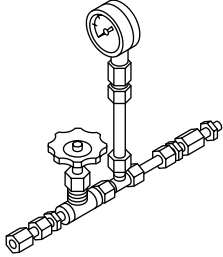
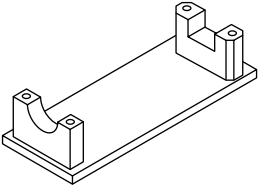
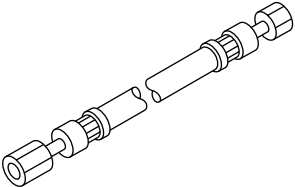
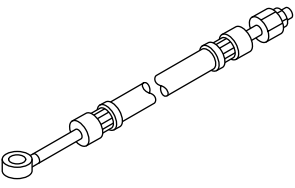
- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Use genuine power steering fluid, grease etc. or the equivalent. Do not mix steering fluid, grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

# General Description

POWER ASSISTED SYSTEM (POWER STEERING)

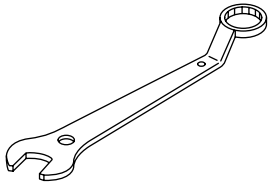
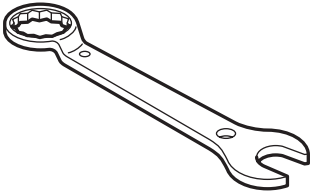
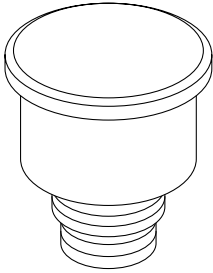
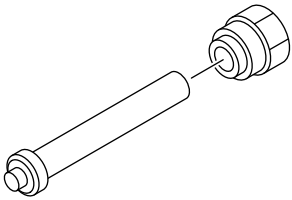
## D: PREPARATION TOOL

### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION    | REMARKS  |
|---|-------------|----------------|--|
|  <p style="text-align: center;">ST-925711000</p>   | 925711000   | PRESSURE GAUGE | Used for measuring oil pump pressure.  |
|  <p style="text-align: center;">ST-926200000</p>  | 926200000   | STAND          | <ul style="list-style-type: none"> <li>• Used when inspecting characteristic of gear-box assembly and disassembling it.</li> <li>• For Non-turbo model.</li> </ul> |
|  <p style="text-align: center;">ST34099AC010</p> | 34099AC010  | ADAPTER HOSE A | Used with PRESSURE GAUGE (925711000).  |
|  <p style="text-align: center;">ST34099AC020</p> | 34099AC020  | ADAPTER HOSE B | Used with PRESSURE GAUGE (925711000).  |

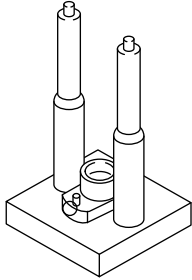
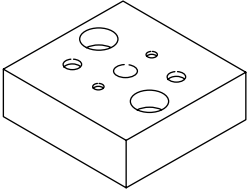
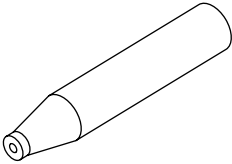
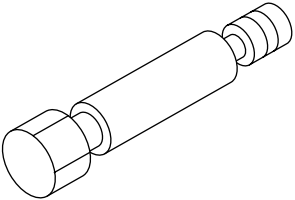
## General Description

### POWER ASSISTED SYSTEM (POWER STEERING)

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION      | REMARKS   |
|---|-------------|------------------|---|
|  <p style="text-align: center;">ST-926230000</p>   | 926230000   | SPANNER          | For the lock nut when adjusting backlash of gear-box.   |
|  <p style="text-align: center;">ST34099PA100</p>   | 34099PA100  | SPANNER          | Used for measuring the rotating resistance of gear-box assembly.  |
|  <p style="text-align: center;">ST34199AE040</p> | 34199AE040  | OIL CHARGE GUIDE | Used for charging power steering fluid.   |
|  <p style="text-align: center;">ST-926420000</p> | 926420000   | PLUG             | When oil leaks from pinion side of gearbox assembly, remove pipe B from valve housing, attach this tool and check oil leaking points. |

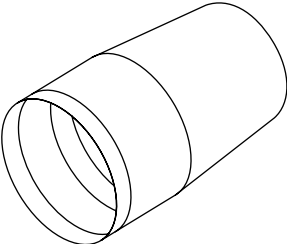
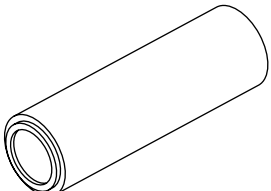
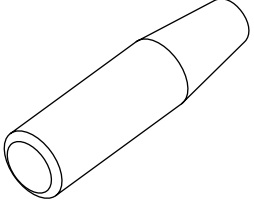
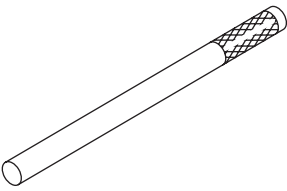
# General Description

## POWER ASSISTED SYSTEM (POWER STEERING)

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION             | REMARKS   |
|---|-------------|-------------------------|---|
|  <p>ST-926370000</p>     | 926370000   | INSTALLER A             | <ul style="list-style-type: none"> <li>• Used for installing valve assembly into valve housing assembly.</li> <li>• Used with STAND BASE (34099FA100).</li> </ul> |
|  <p>ST34099FA100</p>     | 34099FA100  | STAND BASE              | Used for assembling power steering gearbox.   |
|  <p>ST-926390001</p> | 926390001   | COVER &<br>REMOVER ASSY | Used for assembling rack assembly.  |
|  <p>ST-926400000</p> | 926400000   | GUIDE                   | <ul style="list-style-type: none"> <li>• Right side of rack when installing rack bushing.</li> <li>• Used with GUIDE (927660000).</li> </ul>                      |

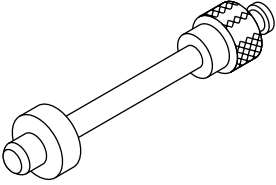
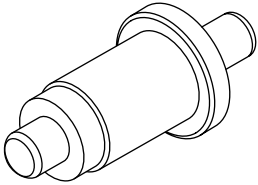
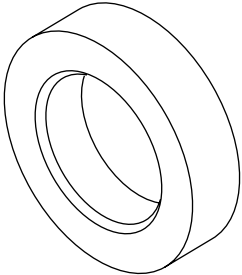
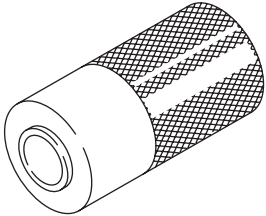
## General Description

### POWER ASSISTED SYSTEM (POWER STEERING)

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION      | REMARKS  |
|---|-------------|------------------|--|
|  <p style="text-align: center;">ST-927660000</p>   | 927660000   | GUIDE            | <ul style="list-style-type: none"> <li>• Right side of rack when installing rack bushing.</li> <li>• Used with GUIDE (926400000).</li> </ul>     |
|  <p style="text-align: center;">ST-927620000</p>   | 927620000   | INSTALLER B      | <ul style="list-style-type: none"> <li>• Used for installing oil seal of valve housing.</li> <li>• Used with INSTALLER A (926360000).</li> </ul> |
|  <p style="text-align: center;">ST-926360000</p> | 926360000   | INSTALLER A      | <ul style="list-style-type: none"> <li>• Used as a guide to install oil seal.</li> <li>• Used with INSTALLER B (927620000).</li> </ul>           |
|  <p style="text-align: center;">ST34199AE050</p> | 34199AE050  | OIL SEAL REMOVER | Used for removing oil seal.  |

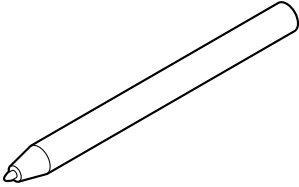
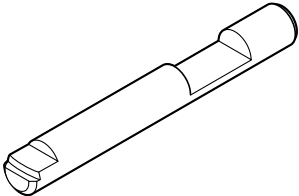
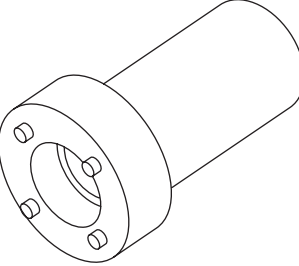
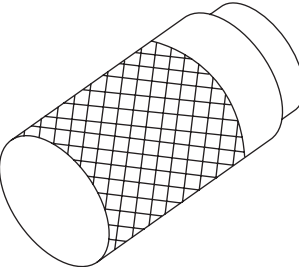
# General Description

## POWER ASSISTED SYSTEM (POWER STEERING)

| ILLUSTRATION  | TOOL NUMBER                                   | DESCRIPTION   | REMARKS   |
|---|---|---|---|
|  <p style="text-align: center;">ST34099FA110</p>   | <p style="text-align: center;">34099FA110</p> | <p style="text-align: center;">INSTALLER</p>                      | <p>Used for installing oil seal.</p>  |
|  <p style="text-align: center;">ST34099FA120</p>   | <p style="text-align: center;">34099FA120</p> | <p style="text-align: center;">INSTALLER AND<br/>REMOVER SEAL</p> | <ul style="list-style-type: none"> <li>• Used for installing valve housing oil seal.</li> <li>• Used with INSTALLER SEAL. (34099FA130)</li> <li>• Used for installing valve housing ball bearing.</li> <li>• Used for removing oil seal and ball bearing from valve housing.</li> </ul> |
|  <p style="text-align: center;">ST34099FA130</p> | <p style="text-align: center;">34099FA130</p> | <p style="text-align: center;">INSTALLER SEAL</p>                 | <ul style="list-style-type: none"> <li>• Used for installing valve housing oil seal.</li> <li>• Used with INSTALLER AND REMOVER SEAL (34099FA120).</li> </ul>   |
|  <p style="text-align: center;">ST-927640000</p> | <p style="text-align: center;">927640000</p>  | <p style="text-align: center;">INSTALLER B</p>                    | <p>Used for ball bearing into housing.</p>  |

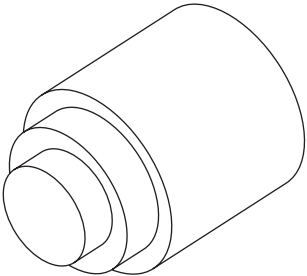
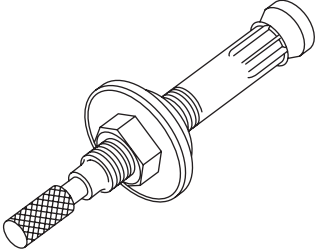
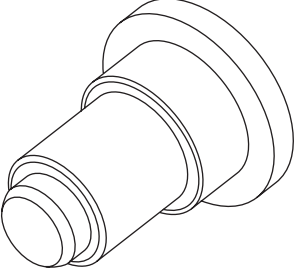
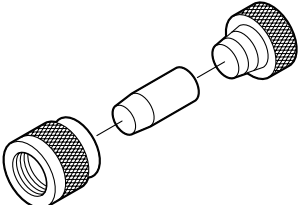
## General Description

### POWER ASSISTED SYSTEM (POWER STEERING)

| ILLUSTRATION  | TOOL NUMBER                                   | DESCRIPTION                      | REMARKS  |
|---|---|----------------------------------|--|
|  <p style="text-align: center;">ST34099FA060</p>   | <p style="text-align: center;">34099FA060</p> | <p>PUNCH HOLDER</p>              | <ul style="list-style-type: none"> <li>• Used for caulking.</li> <li>• For Turbo model and STI model.</li> </ul>               |
|  <p style="text-align: center;">ST34099FA080</p>   | <p style="text-align: center;">34099FA080</p> | <p>PUNCH</p>                     | <ul style="list-style-type: none"> <li>• Used for removing caulking.</li> <li>• For Turbo model and STI model.</li> </ul>      |
|  <p style="text-align: center;">ST34199AE090</p> | <p style="text-align: center;">34199AE090</p> | <p>PLUG WRENCH</p>               | <ul style="list-style-type: none"> <li>• Used for removing plug.</li> <li>• For Turbo model and STI model.</li> </ul>          |
|  <p style="text-align: center;">ST34199AE100</p> | <p style="text-align: center;">34199AE100</p> | <p>PLUG OIL SEAL<br/>REMOVER</p> | <ul style="list-style-type: none"> <li>• Used for removing plug oil seal.</li> <li>• For Turbo model and STI model.</li> </ul> |

# General Description

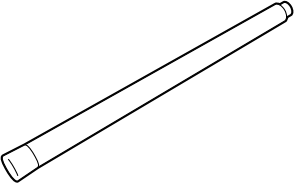
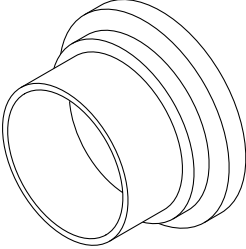
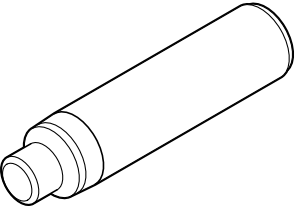
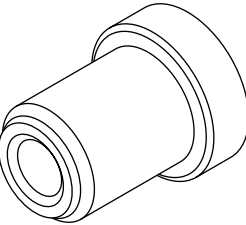
## POWER ASSISTED SYSTEM (POWER STEERING)

| ILLUSTRATION  | TOOL NUMBER                                     | DESCRIPTION   | REMARKS   |
|---|---|---|---|
|  <p>ST34199AE110</p>     | <p>34199AE110</p>   | <p>PLUG OIL SEAL<br/>INSTALLER</p>      | <ul style="list-style-type: none"> <li>• Used for installing plug oil seal.</li> <li>• For Turbo model and STI model.</li> </ul>                 |
|  <p>ST34199AE120</p>     | <p>34199AE120</p>   | <p>GEARBOX OIL<br/>SEAL REMOVER</p>     | <ul style="list-style-type: none"> <li>• Used for removing gearbox oil seal.</li> <li>• For Turbo model and STI model.</li> </ul>                |
|  <p>ST34199AE130</p> | <p>34199AE130</p> | <p>GEARBOX OIL<br/>SEAL INSTALLER</p> | <ul style="list-style-type: none"> <li>• Used for installing gearbox oil seal.</li> <li>• For Turbo model and STI model.</li> </ul>            |
|  <p>ST34199FE040</p> | <p>34199FE040</p> | <p>INSTALLER A, B, C</p>              | <ul style="list-style-type: none"> <li>• Used for installing oil seal into rack assembly.</li> <li>• For Turbo model and STI model.</li> </ul> |



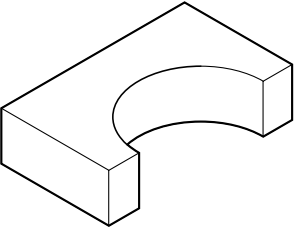
## General Description

### POWER ASSISTED SYSTEM (POWER STEERING)

| ILLUSTRATION  | TOOL NUMBER                                   | DESCRIPTION                        | REMARKS   |
|---|---|------------------------------------|---|
|  <p style="text-align: center;">ST34199FE010</p>   | <p style="text-align: center;">34199FE010</p> | <p>REMOVER</p>                     | <ul style="list-style-type: none"> <li>• Used for removing back-up ring and oil seal.</li> <li>• For Turbo model and STI model.</li> </ul>                        |
|  <p style="text-align: center;">ST34199FE050</p>   | <p style="text-align: center;">34199FE050</p> | <p>GUIDE</p>                       | <ul style="list-style-type: none"> <li>• Used for installing rack and seal into housing assembly.</li> <li>• For Turbo model and STI model.</li> </ul>            |
|  <p style="text-align: center;">ST34199FE000</p> | <p style="text-align: center;">34199FE000</p> | <p>INSTALLER &amp;<br/>REMOVER</p> | <ul style="list-style-type: none"> <li>• Used for removing and installing rack oil seal (outer &amp; inner).</li> <li>• For Turbo model and STI model.</li> </ul> |
|  <p style="text-align: center;">ST34199FE060</p> | <p style="text-align: center;">34199FE060</p> | <p>INSTALLER</p>                   | <ul style="list-style-type: none"> <li>• Used for installing rack oil seal (outer).</li> <li>• For Turbo model and STI model.</li> </ul>                          |

# General Description

POWER ASSISTED SYSTEM (POWER STEERING)

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION | REMARKS  |
|---|-------------|-------------|--|
| <br>ST34199FE020 | 34199FE020  | BASE        | <ul style="list-style-type: none"><li>• Used for supporting housing assembly.</li><li>• For Turbo model and STI model.</li></ul> |

## 2. GENERAL TOOL

| TOOL NAME        | REMARKS  |
|------------------|--|
| Spring scale     | Used for measuring tightening torque.  |
| Snap ring pliers | Used for removing and installing snap ring.  |
| Dial gauge       | Used for measuring steering gearbox.   |
| C-clamp          | Used for disassembling and assembling steering gearbox of Turbo model and STI model. |

# Steering Wheel

## POWER ASSISTED SYSTEM (POWER STEERING)

### 2. Steering Wheel

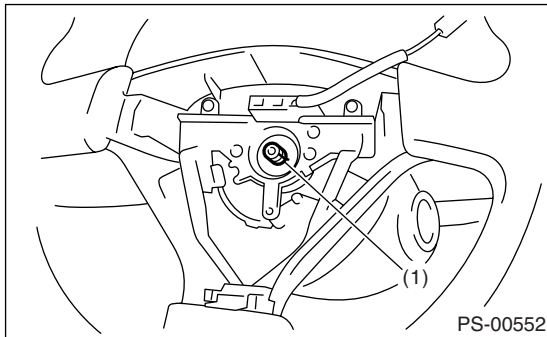
#### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Set the tires to straight-ahead position.
- 3) Remove the airbag module. <Ref. to AB-14, REMOVAL, Driver's Airbag Module.>

#### WARNING:

Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

- 4) Make matching marks on the steering wheel and steering shaft.



(1) Matching mark

- 5) Remove the steering wheel nut, and then draw out the steering wheel from shaft using steering puller.

#### B: INSTALLATION

#### WARNING:

Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

- 1) Align the center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
- 2) Install in the reverse order of removal.

#### NOTE:

Align matching marks on the steering wheel and steering shaft.

#### Tightening torque:

**45 N·m (4.6 kgf·m, 33.2 ft·lb)**

#### Column cover-to-steering wheel clearance:

**2 — 4 mm (0.08 — 0.16 in)**

#### CAUTION:

Insert the roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage.

#### C: INSPECTION

- 1) Check the steering wheel for deformation. If the deformation is excessive, replace steering wheel.
- 2) Check the splines on steering wheel for damage. If the damage is excessive, replace steering wheel.

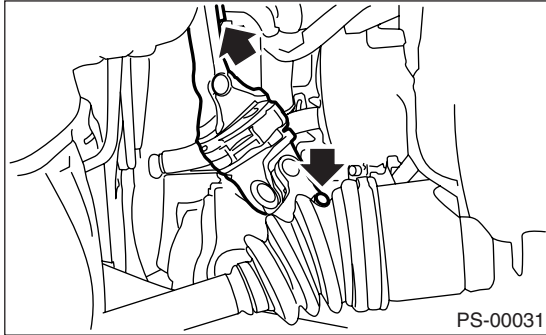
# Universal Joint

POWER ASSISTED SYSTEM (POWER STEERING)

## 3. Universal Joint

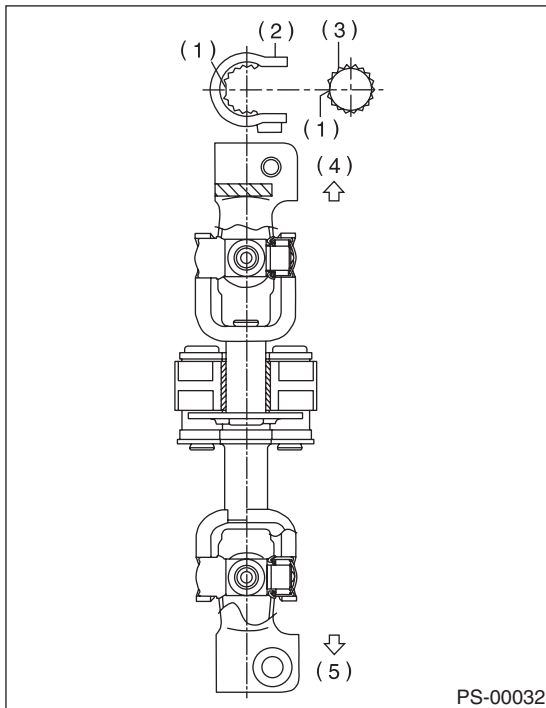
### A: REMOVAL

- 1) Remove the steering wheel. <Ref. to PS-20, REMOVAL, Steering Wheel.>
- 2) Make matching mark on the universal joint.
- 3) Remove the universal joint bolts, and then remove the universal joint.



### B: INSTALLATION

- 1) Align the cutout at serrated section of the column shaft and yoke, and then insert the universal joint into column shaft.



- (1) Cutout
- (2) Yoke
- (3) Column shaft
- (4) Column shaft side
- (5) Gearbox side

- 2) Align the matching marks, and then insert the universal joint to serrated section of gear box assembly.
- 3) Tighten the bolt.

### Tightening torque:

**24 N·m (2.4 kgf-m, 17.4 ft-lb)**

### CAUTION:

Excessively large tightening torque of the universal joint bolts may lead to heavy steering wheel operation.

### Standard clearance between gearbox to DOJ:

**Over 14 mm (0.55 in)**

- 4) Align the center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>

- 5) Install the steering wheel and airbag module. <Ref. to PS-20, INSTALLATION, Steering Wheel.>

### WARNING:

Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

### C: INSPECTION

Check for wear, damage, or any other faults. If necessary, replace.

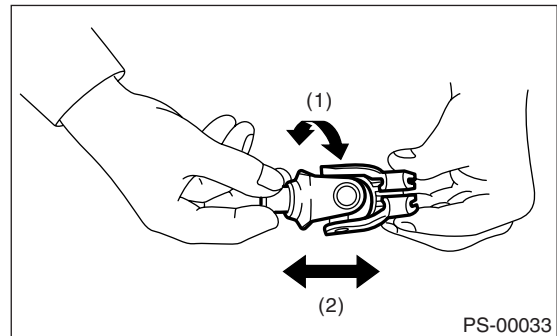
### Service limit:

**Universal joint play:**

**0 mm (0 in)**

**Maximum swing torque:**

**0.3 N (0.03 kgf, 0.07 lbf)**



- (1) Swing torque
- (2) Play

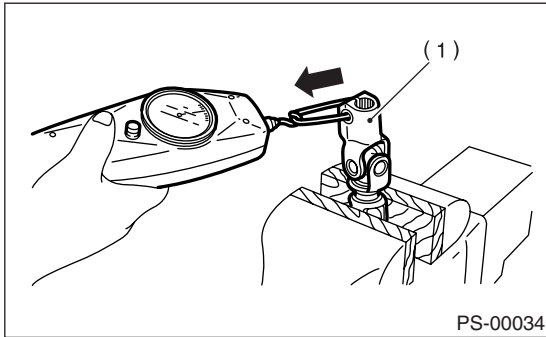
Measurement of swing torque of universal joint is as shown in the figures.

# Universal Joint

## POWER ASSISTED SYSTEM (POWER STEERING)

### Service limit:

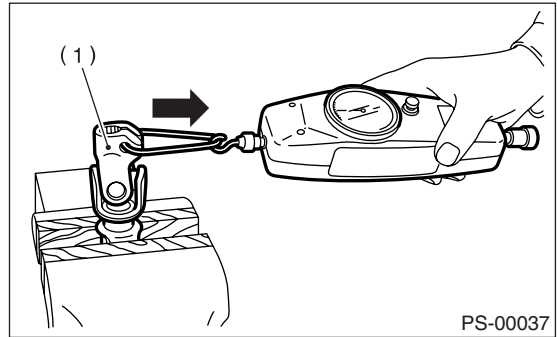
**Maximum load: 3.8 N (0.39 kgf, 0.86 lbf) or less**



(1) Yoke (gearbox side)

### Service limit:

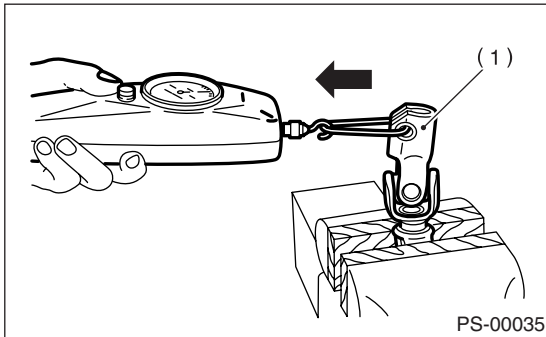
**Maximum load: 7.3 N (0.74 kgf, 1.64 lbf) or less**



(1) Yoke (Steering column side)

### Service limit:

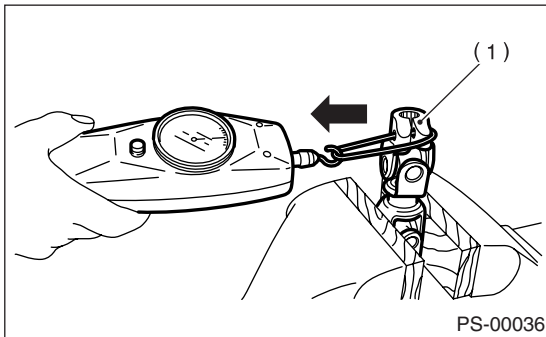
**Maximum load: 3.8 N (0.39 kgf, 0.86 lbf) or less**



(1) Yoke (gearbox side)

### Service limit:

**Maximum load: 7.3 N (0.74 kgf, 1.64 lbf) or less**



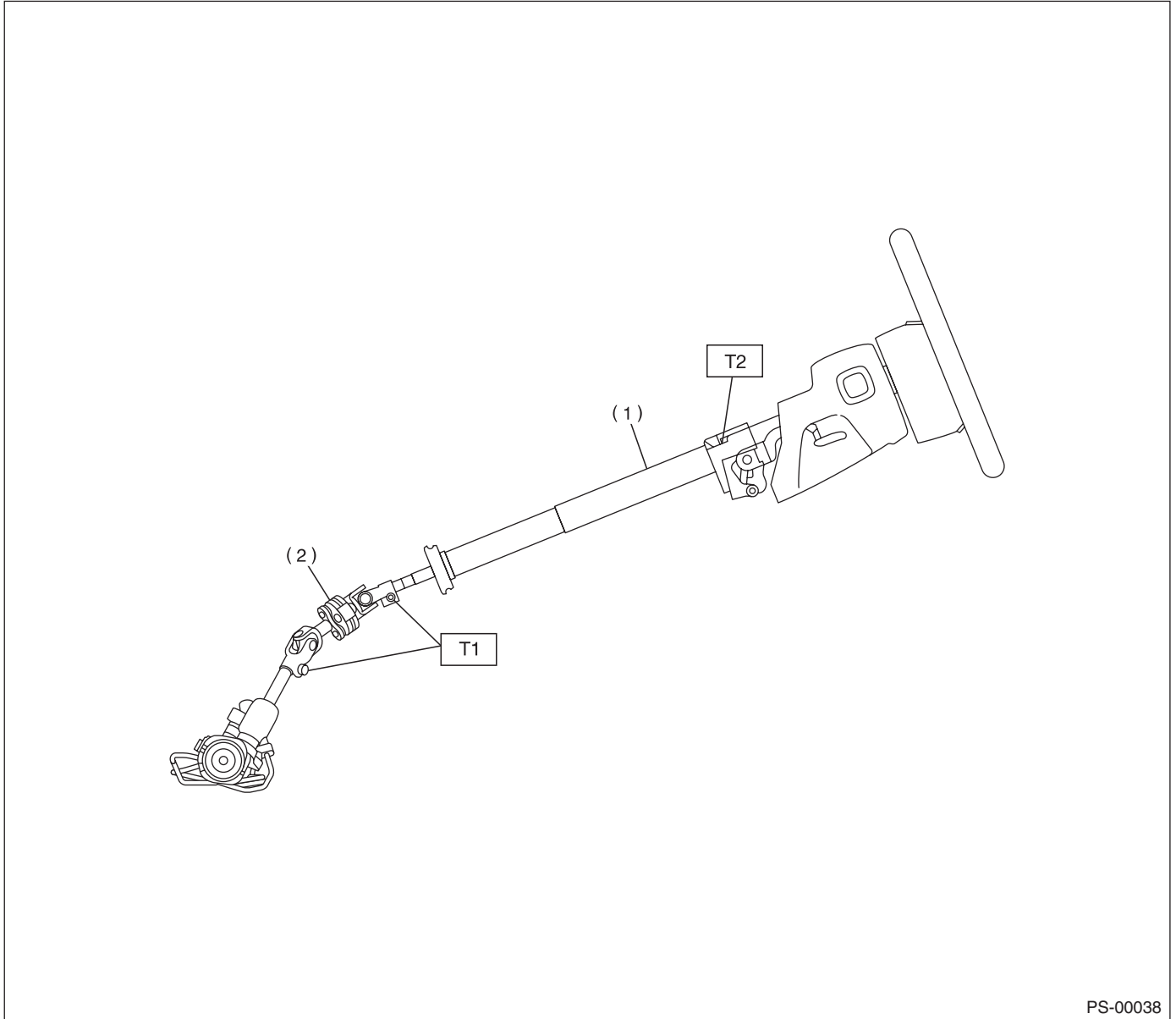
(1) Yoke (Steering column side)

# Tilt Steering Column

POWER ASSISTED SYSTEM (POWER STEERING)

## 4. Tilt Steering Column

### A: REMOVAL



PS-00038

(1) Tilt steering column

(2) Universal joint

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 24 (2.4, 17.4)**

**T2: 25 (2.5, 18.1)**

# Tilt Steering Column

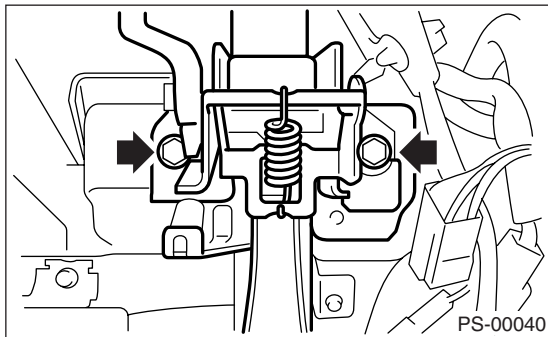
## POWER ASSISTED SYSTEM (POWER STEERING)

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the airbag module. <Ref. to AB-14, REMOVAL, Driver's Airbag Module.>

### WARNING:

**Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>**

- 4) Remove the steering wheel. <Ref. to PS-20, REMOVAL, Steering Wheel.>
- 5) Remove the universal joint. <Ref. to PS-21, REMOVAL, Universal Joint.>
- 6) Remove the trim panel under instrument panel.
- 7) Remove the steering column lower cover.
- 8) Remove all connectors from steering column.
- 9) Remove the two bolts under instrument panel securing steering column.



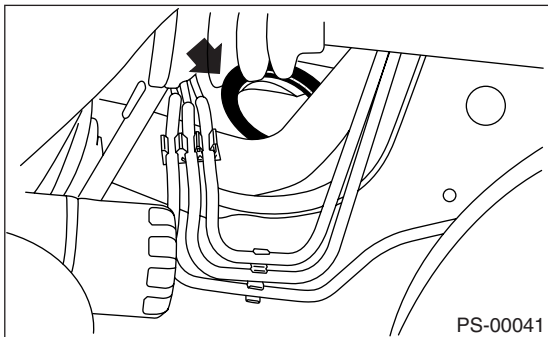
- 10) Pull out the steering shaft assembly from hole on toe board.

### CAUTION:

- Be sure to remove the universal joint before removing the steering shaft assembly installing bolts when removing the steering shaft assembly or when lowering it for servicing of other parts.
- Do not loosen the tilt lever when the steering column is not secured to the vehicle.

## B: INSTALLATION

- 1) Set the grommet to toe board.



- 2) Insert the end of steering shaft into toe board grommet.

- 3) With the tilt lever secured, tighten the steering shaft mounting bolts under instrument panel.

### Tightening torque:

**25 N·m (2.5 kgf-m, 18.1 ft-lb)**

- 4) Connect all connectors under instrument panel.
- 5) Connect the airbag system connector at harness spool.

### NOTE:

Make sure to apply double lock.

- 6) Install the lower column cover with tilt lever held in the lowered position.
- 7) Install the universal joint. <Ref. to PS-21, INSTALLATION, Universal Joint.>
- 8) Align center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
- 9) Install the steering wheel. <Ref. to PS-20, INSTALLATION, Steering Wheel.>

### CAUTION:

**Insert the roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage.**

- 10) Install the airbag module to steering wheel.

### WARNING:

**Always refer to "Airbag System" before performing the service operation. <Ref. to AB-3, CAUTION, General Description.>**

## C: DISASSEMBLY

Remove the two screws securing upper steering column covers, and two screws securing combination switch, and then remove the related parts.

## D: ASSEMBLY

- 1) Insert the combination switch to upper column shaft, and then install the upper column cover. Then route the ignition key harness and combination switch harness between column cover mounting bosses.

### Tightening torque:

**1.2 N·m (0.12 kgf-m, 0.9 ft-lb)**

### CAUTION:

**Do not overtighten the screw.**

# Tilt Steering Column

POWER ASSISTED SYSTEM (POWER STEERING)

## E: INSPECTION

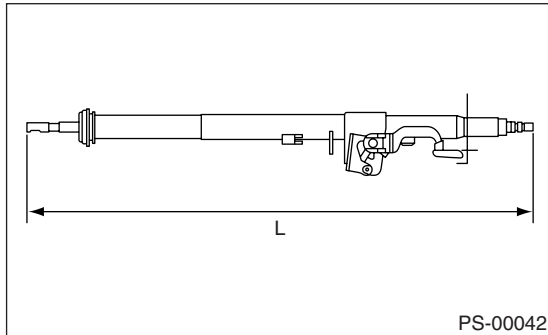
### 1. BASIC INSPECTION

Measure overall length of the steering column. If not as specified, replace.

**Standard value:**

**Overall length L**

**$818.7 \pm 1.5 \text{ mm}$  ( $32.23 \pm 0.059 \text{ in}$ )**



PS-00042

### 2. AIRBAG MODEL INSPECTION

**WARNING:**

For airbag inspection procedures, refer to “Airbag System”. <Ref. to AB-3, CAUTION, General Description.>



# Steering Gearbox

## POWER ASSISTED SYSTEM (POWER STEERING)

### 5. Steering Gearbox

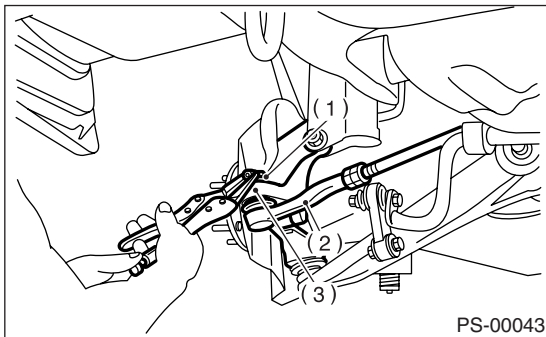
#### A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Loosen the front wheel nut.
- 4) Lift-up the vehicle, and then remove the front wheels.
- 5) Remove the under cover. <Ref. to EI-23, REMOVAL, Front Under Cover.>
- 6) Remove the sub frame. <Ref. to FS-24, REMOVAL, Sub Frame.>
- 7) Remove the front exhaust pipe assembly. (Non-turbo model)  
<Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>

#### WARNING:

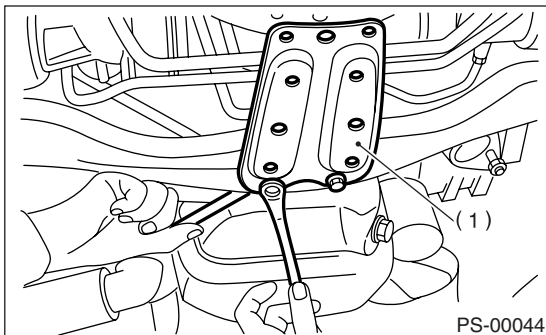
**Be careful, the exhaust pipe is hot.**

- 8) Using a puller, remove the tie-rod end from knuckle arm after pulling off cotter pin and removing castle nut.



- (1) Castle nut
- (2) Tie-rod end
- (3) Knuckle arm

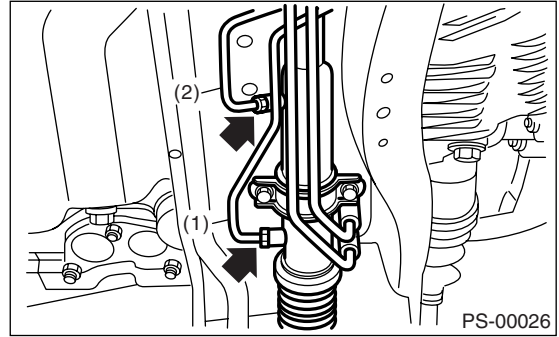
- 9) Remove the jack-up plate and front stabilizer.



- (1) Jack-up plate

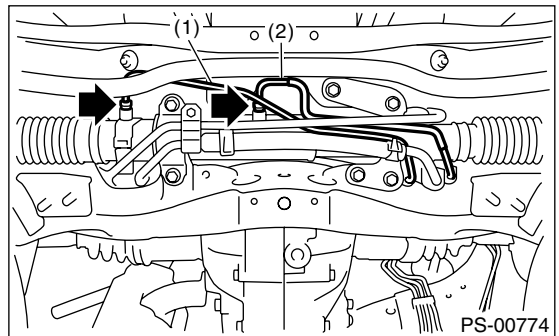
- 10) Remove the one pipe joint at center of gearbox, and connect vinyl hose to pipe and joint. Discharge fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.

- Non-turbo model



- (1) Pipe A
- (2) Pipe B

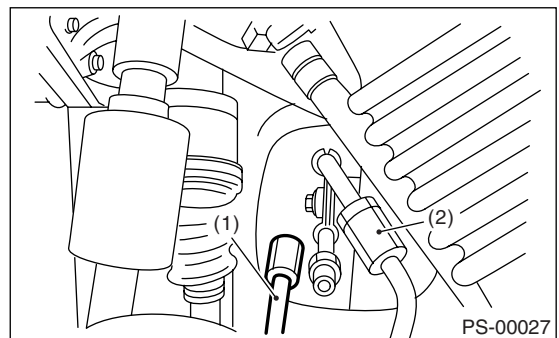
- Turbo model



- (1) Pipe A
- (2) Pipe B

- 11) Remove the universal joint. <Ref. to PS-21, REMOVAL, Universal Joint.>

- 12) Disconnect the lower pipe C from gear box first, and upper pipe D second.



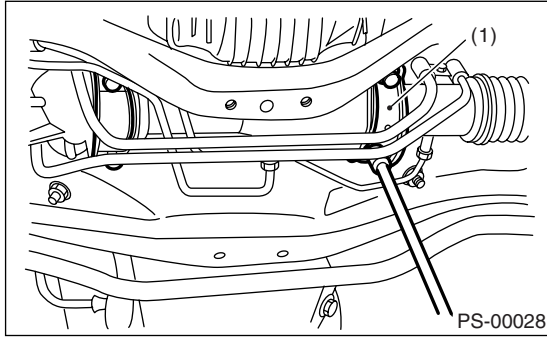
- (1) Pipe C
- (2) Pipe D

- 13) Remove the clamp bolts securing the gearbox to crossmember, and then remove the gearbox.

# Steering Gearbox

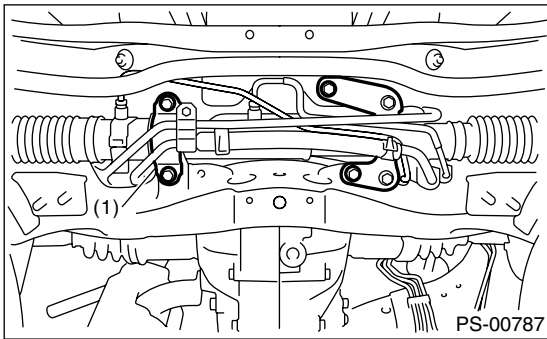
POWER ASSISTED SYSTEM (POWER STEERING)

- Non-turbo model



(1) Clamp

- Turbo model



(1) Clamp

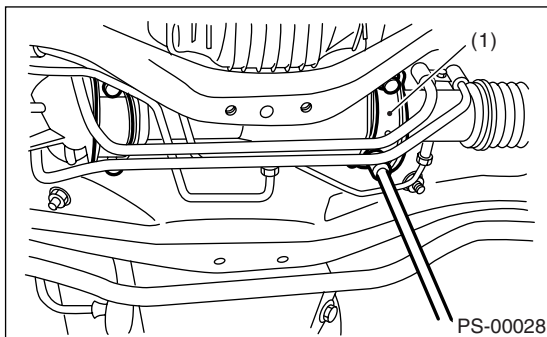
## B: INSTALLATION

- 1) Insert the gearbox into crossmember, being careful not to damage the gearbox boot.
- 2) Tighten the gearbox to crossmember bracket via clamp with bolts to specified torque.

**Tightening torque:**

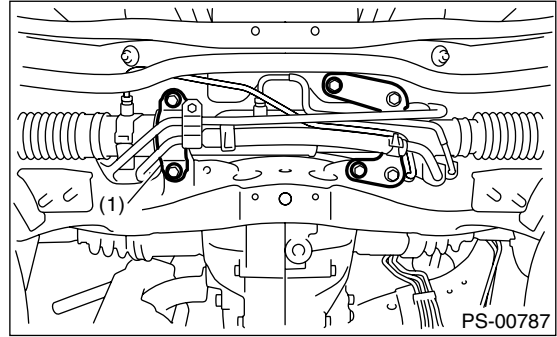
**60 N-m (6.1 kgf-m, 44.3 ft-lb)**

- Non-turbo model



(1) Clamp

- Turbo model

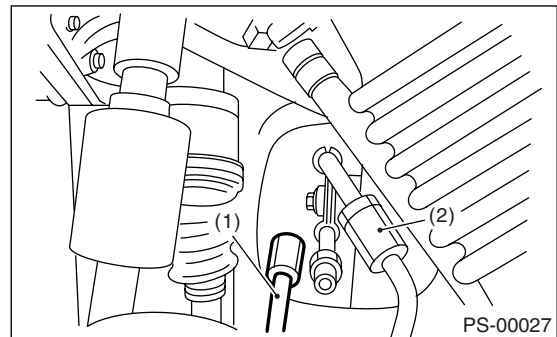


(1) Clamp

- 3) Connect the pipe D first to gear box, and pipe C second.

**Tightening torque:**

**15 N-m (1.5 kgf-m, 10.8 ft-lb)**



(1) Pipe C

(2) Pipe D

- 4) Install the universal joint. <Ref. to PS-21, INSTALLATION, Universal Joint.>
- 5) Connect the tie-rod end and knuckle arm, and tighten with castle nut.

**Tightening torque (Castle nut):**

**27 N-m (2.75 kgf-m, 19.9 ft-lb)**

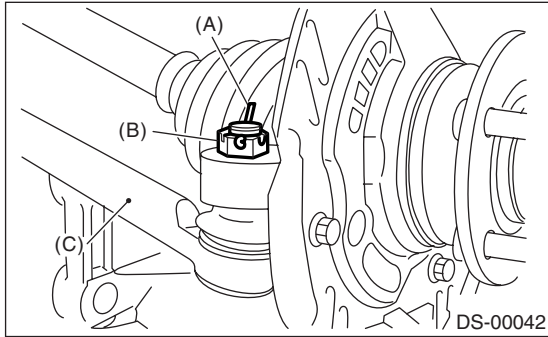
**CAUTION:**

When connecting, do not hit the cap at bottom of tie-rod end with hammer.

# Steering Gearbox

## POWER ASSISTED SYSTEM (POWER STEERING)

6) After tightening the castle nut to specified torque, tighten it further within 60° until cotter pin hole is aligned with the slot in nut, and then bend the cotter pin to lock.



- (A) Cotter pin
- (B) Castle nut
- (C) Tie-rod end

7) Install the front stabilizer to vehicle. <Ref. to FS-22, INSTALLATION, Front Stabilizer.>

8) Install the front exhaust pipe assembly. (Non-turbo model) <Ref. to EX(H4SO)-4, INSTALLATION, Front Exhaust Pipe.>

9) Install the sub frame. <Ref. to FS-24, INSTALLATION, Sub Frame.>

10) Install the under cover. <Ref. to EI-23, INSTALLATION, Front Under Cover.>

11) Align the center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>

12) Install the steering wheel. <Ref. to PS-20, INSTALLATION, Steering Wheel.>

13) Install the front wheels.

14) Tighten the wheel nuts to specified torque.

### **Tightening torque:**

**90 N·m (9.0 kgf·m, 65.1 ft·lb)**

15) Connect the battery ground cable to battery.

16) Pour fluid into the oil tank, and bleed air.

<Ref. to PS-68, Power Steering Fluid.>

17) Check for fluid leaks.

18) Install the jack-up plate.

19) Lower the vehicle.

20) Check the fluid level in oil tank.

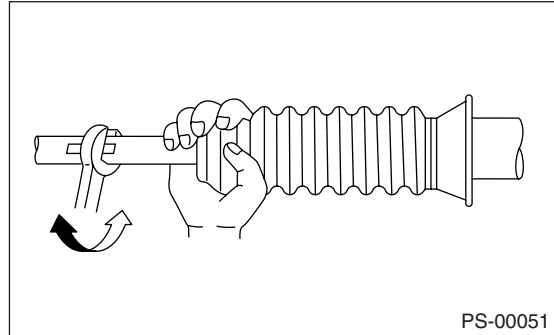
21) After adjusting the toe-in and steering angle, tighten the lock nut on tie-rod end.

### **Tightening torque:**

**83 N·m (8.5 kgf·m, 61.5 ft·lb)**

### **NOTE:**

When adjusting the toe-in, hold boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.



## **C: DISASSEMBLY**

### **1. NON-TURBO MODEL**

#### **• RACK HOUSING ASSEMBLY**

1) Disconnect the four pipes from gearbox.

### **NOTE:**

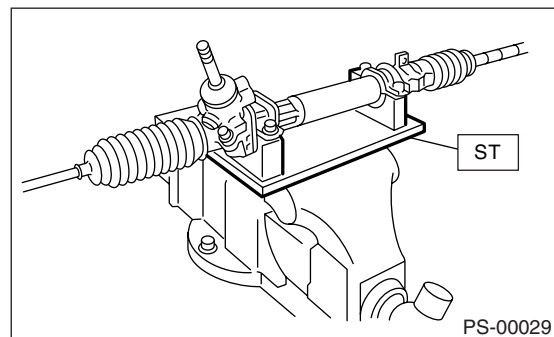
Remove the pipes E and F as a single unit being fixed at clamp plate.

2) Secure the gearbox removed from vehicle in vice using ST.

ST 926200000 STAND

### **CAUTION:**

**Secure the gearbox in a vise using ST as shown. Do not attempt to secure it without this ST.**

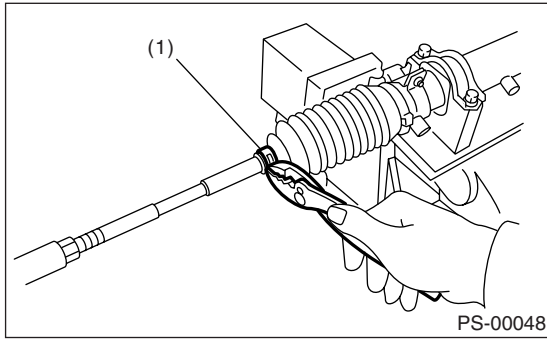


3) Remove the tie-rod end and lock nut from gearbox.

# Steering Gearbox

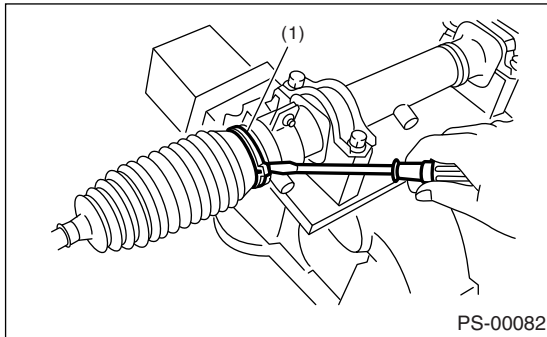
POWER ASSISTED SYSTEM (POWER STEERING)

4) Remove the small clip from boot using pliers, and then move the boot to tie-rod end side.



(1) Clip

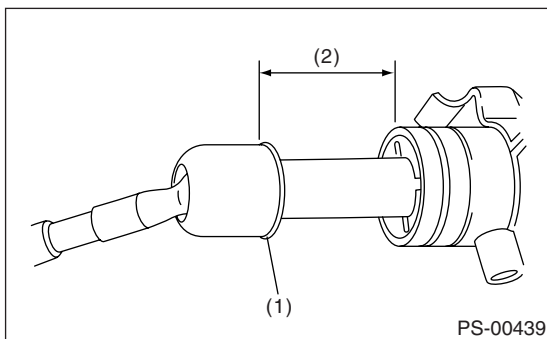
5) Using a flat tip screwdriver, remove the band from boot.



(1) Band

6) Extend the rack approx. 40 mm (1.57 in) out. Unlock the lock washer on both side of tie-rod end using a flat tip screwdriver.

**CAUTION:**  
Be careful not to scratch the rack surface as oil leaks may result.

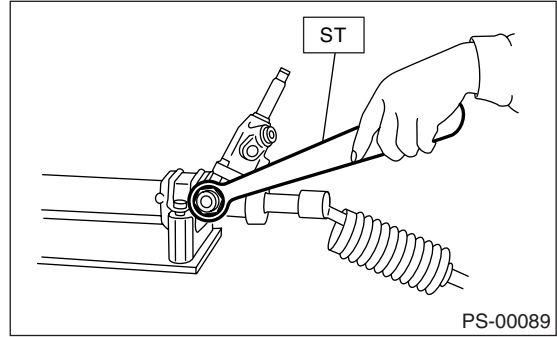


(1) Lock washer

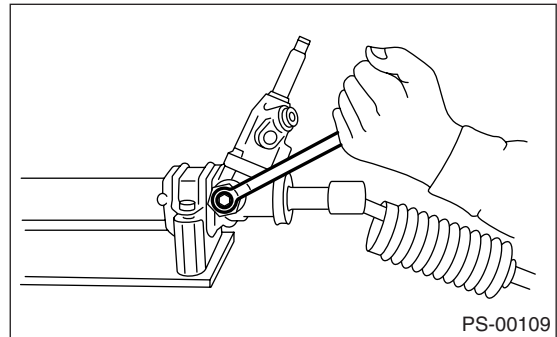
(2) Approx. 40 mm (1.57 in)

7) Using the ST, loosen the lock nut.

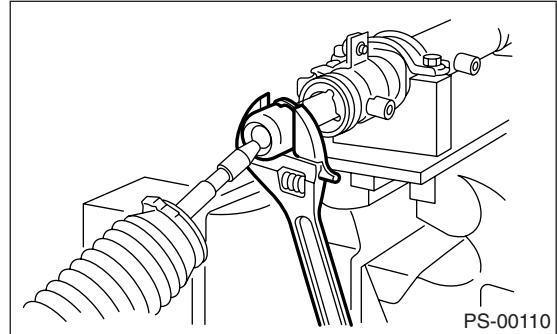
ST 926230000 SPANNER



8) Tighten the adjusting screw until it no longer tightens.

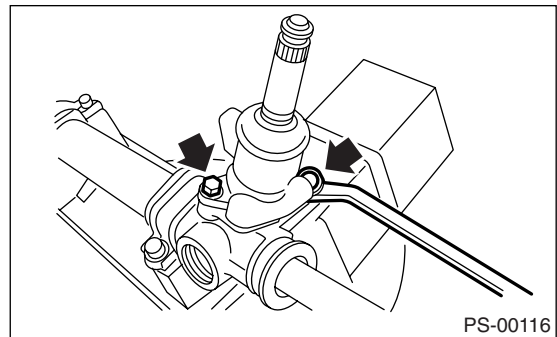


9) Using a wrench [32 mm width across flats] or adjustable wrench, remove the tie-rod.



10) Loosen the adjusting screw, and then remove the spring and sleeve.

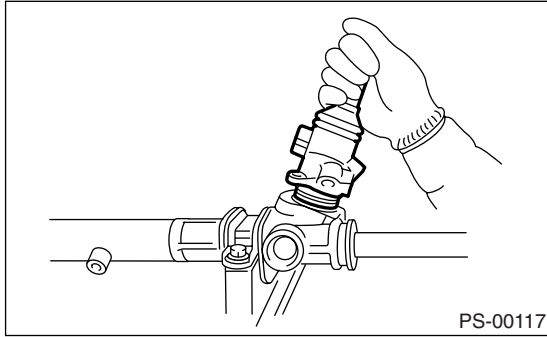
11) Remove the two bolts securing valve assembly.



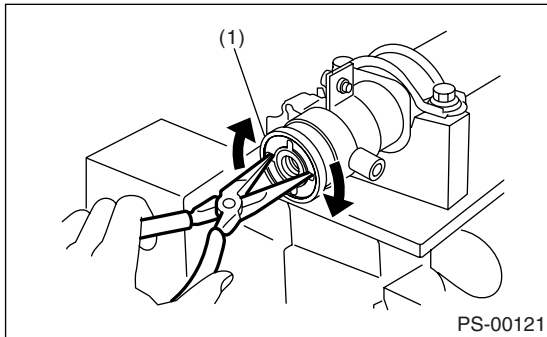
# Steering Gearbox

## POWER ASSISTED SYSTEM (POWER STEERING)

12) Carefully draw out the input shaft, and then remove the valve assembly.



13) Using a sharp pointed pliers, rotate the rack stopper in direction of the arrow until end of the circlip comes out of stopper. Rotate the circlip in opposite direction and pull it out.

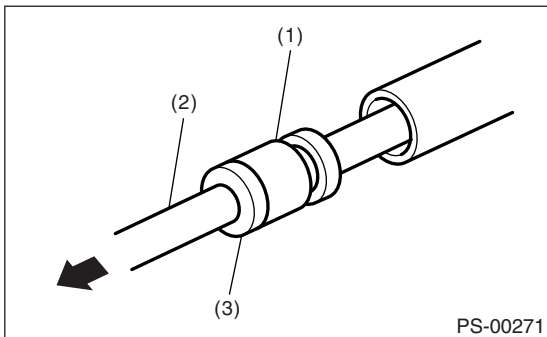


(1) Rack stopper

14) Pull the rack assembly from cylinder side, and draw out the rack bushing and rack stopper together with the rack assembly.

**CAUTION:**

**Be careful not to contact the rack to inner wall of cylinder when drawing out. Any scratch on the cylinder inner wall will cause oil leakage.**



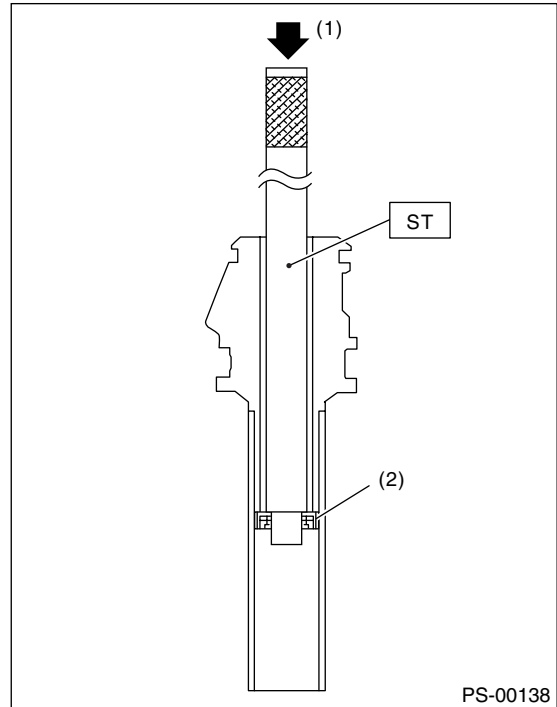
(1) Rack bushing  
(2) Rack ASSY  
(3) Rack stopper

15) Remove the rack bushing and rack stopper from rack assembly.

16) Remove the oil seal from rack.

17) Insert the ST from pinion housing side, and then remove the oil seal using a press.

ST 34199AE050 OIL SEAL REMOVER



(1) Press  
(2) Oil seal

**• CONTROL VALVE ASSEMBLY**

1) Disconnect the four pipes from gearbox.

**NOTE:**

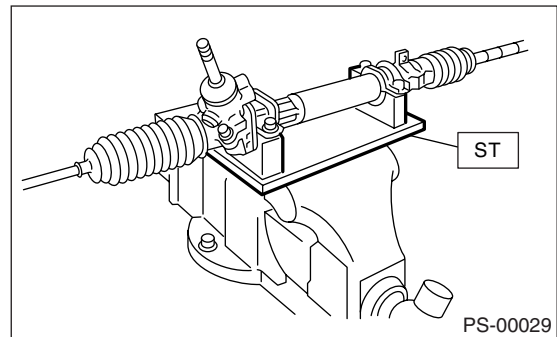
Remove the pipes E and F as a single unit being fixed at clamp plate.

2) Secure the gearbox removed from the vehicle in vise using ST.

ST 926200000 STAND

**CAUTION:**

**Secure the gearbox in a vise using ST as shown. Do not attempt to secure it without this ST.**

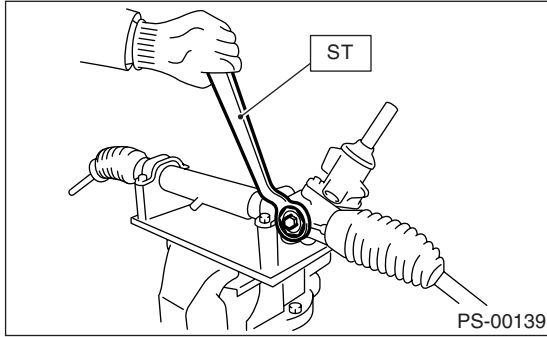


3) Using the ST, loosen the lock nut.

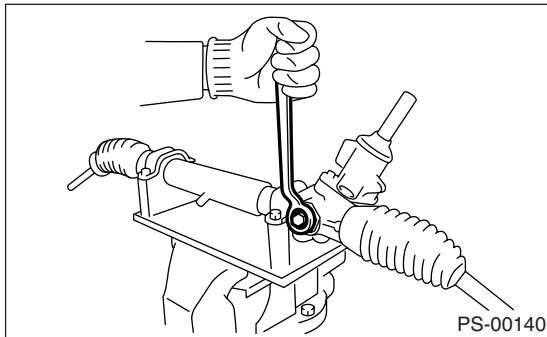
# Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

ST 926230000 SPANNER

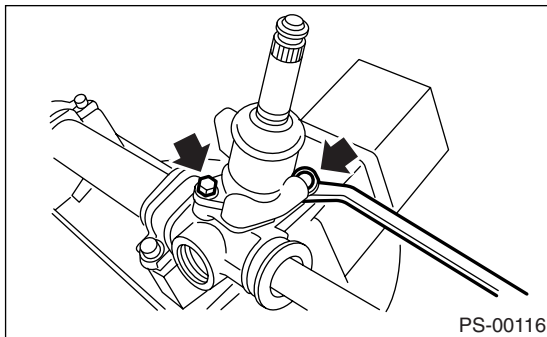


4) Tighten the adjusting screw until it no longer tightens.

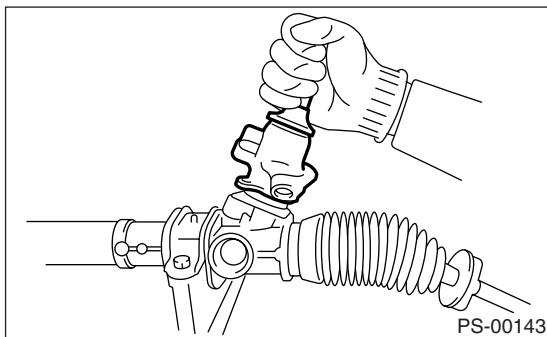


5) Loosen the adjusting screw, and then remove the spring and sleeve.

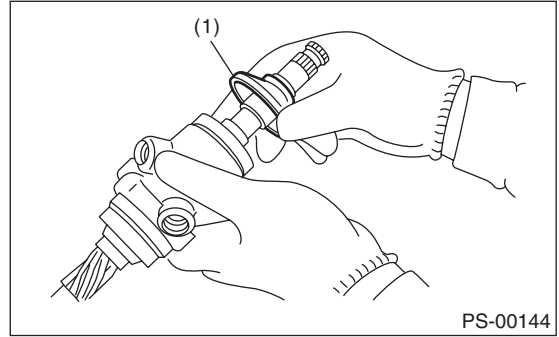
6) Remove the two bolts securing valve assembly.



7) Carefully draw out the input shaft, and then remove the valve assembly.

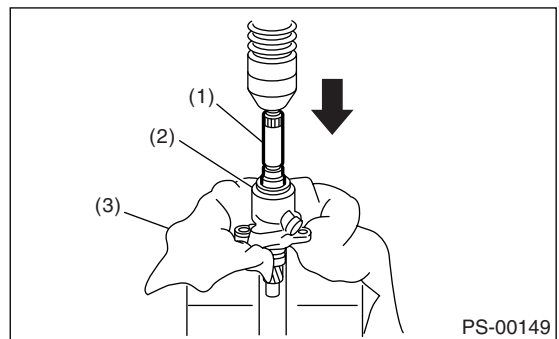


8) Slide the dust cover out.



(1) Dust cover

9) Using a press remove the pinion and valve assembly from valve housing.

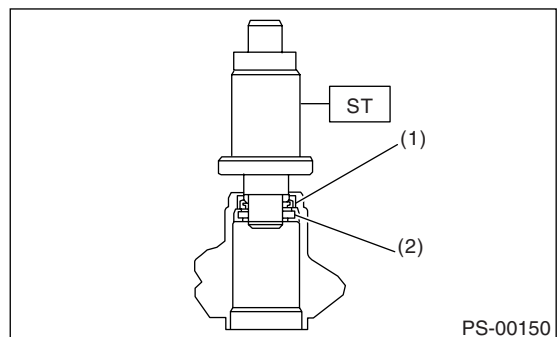


(1) Valve ASSY  
(2) Valve housing  
(3) Cloth

10) Using the ST and press, remove the dust seal, oil seal and special bearing from valve housing.  
ST 34099FA120 INSTALLER & REMOVER SEAL

### CAUTION:

- Do not apply force to the end surface of valve housing.
- Do not reuse the oil seal after removal.



(1) Oil seal  
(2) Special bearing

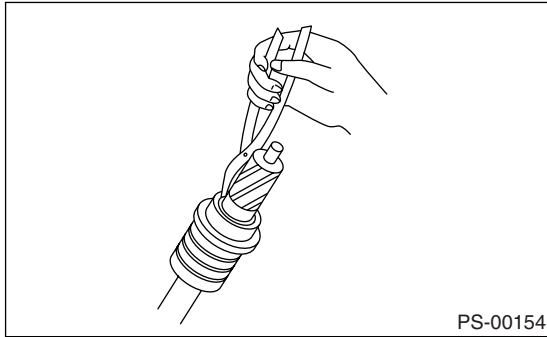
11) Remove the snap ring using snap ring pliers.



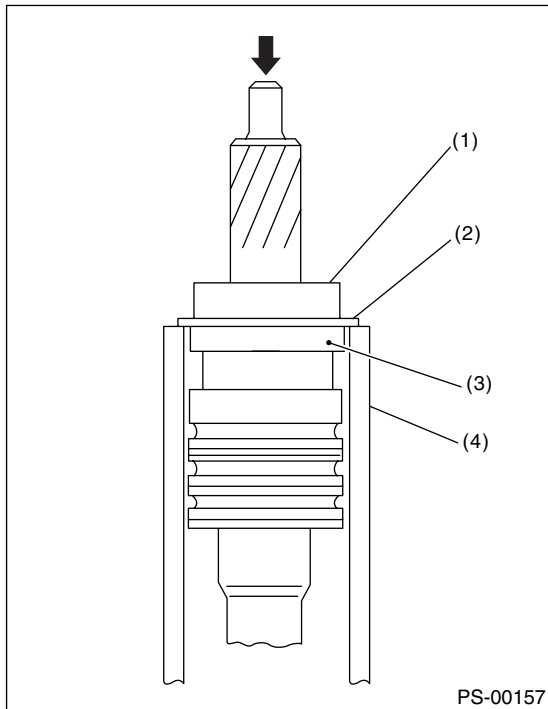
# Steering Gearbox

## POWER ASSISTED SYSTEM (POWER STEERING)

**CAUTION:**  
Be careful not to scratch the pinion and valve assembly.



12) Press out the bearing together with the back up washer using pipe of I.D. 38.5 to 39.5 mm (1.516 to 1.555 in) and press.



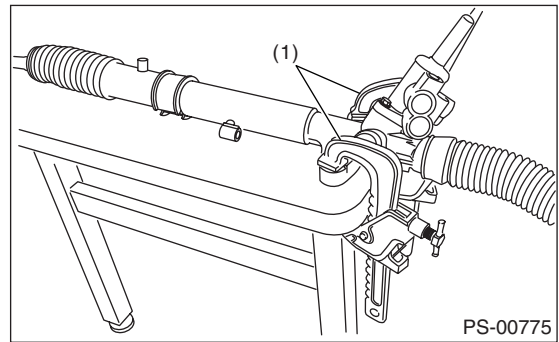
- (1) Bearing
- (2) Backing washer
- (3) Oil seal
- (4) Pipe

13) Remove the oil seal.

## 2. TURBO MODEL

1) Disconnect the pipes A and B from steering body and control valve housing.

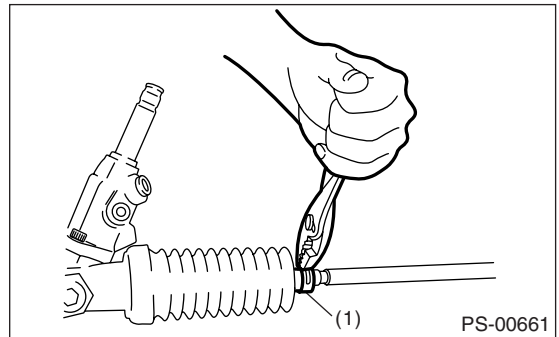
2) Secure the gearbox removed from vehicle using a C-clamp.



- (1) C-clamp

3) Remove the tie-rod end and lock nut from gearbox.

4) Remove the clip on outside of boot using pliers, and then slide the boot to tie-rod end side.

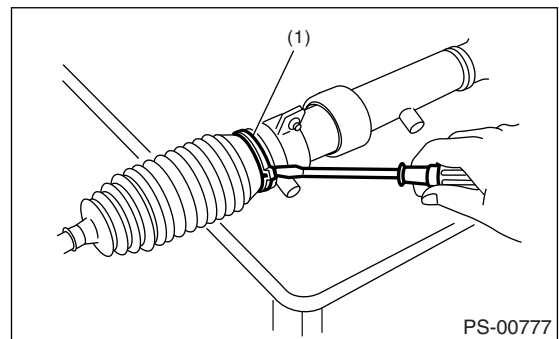


- (1) Clip

5) Using flat tip screwdriver, remove the band from boot.

### NOTE:

Check the boot for crack, damage or deterioration. Replace the boot with a new one if necessary.



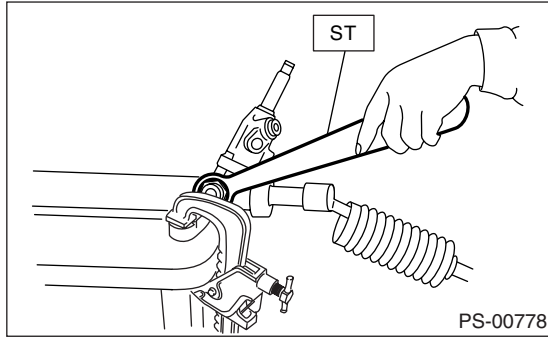
- (1) Band

6) Using the ST, loosen lock nut.

# Steering Gearbox

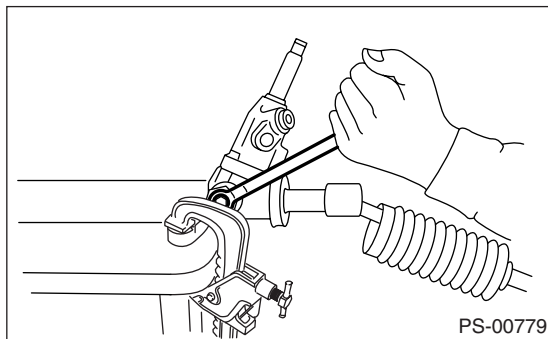
POWER ASSISTED SYSTEM (POWER STEERING)

ST 926230000 SPANNER

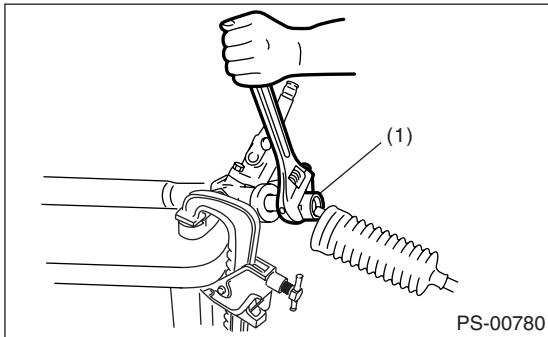


(1) Lock nut

7) Tighten the adjusting screw until it no longer tightens.



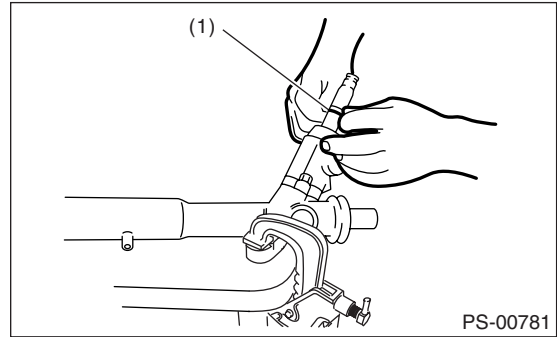
8) Using a wrench (32 mm width across flats) or adjustable wrench with cinching boot, remove the tie-rod.



(1) Tie-rod

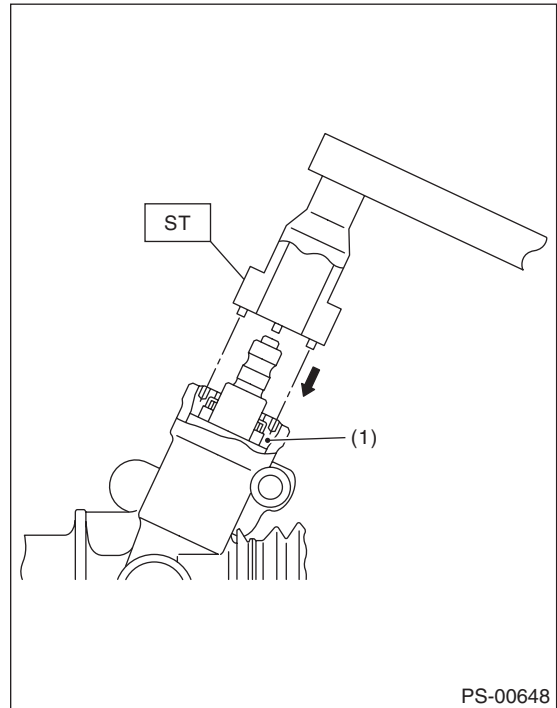
9) Loosen the adjusting screw, and then remove the spring and sleeve.

10) Clean the dirt of input shaft. Remove the dust cover taking care not to scratch the housing or input shaft and allow foreign matter to enter gear box interior.



(1) Dust cover

11) Align the ST pin to plug hole to install. Rotate the ST counterclockwise to remove plug.  
ST 34199AE090 PLUG WRENCH



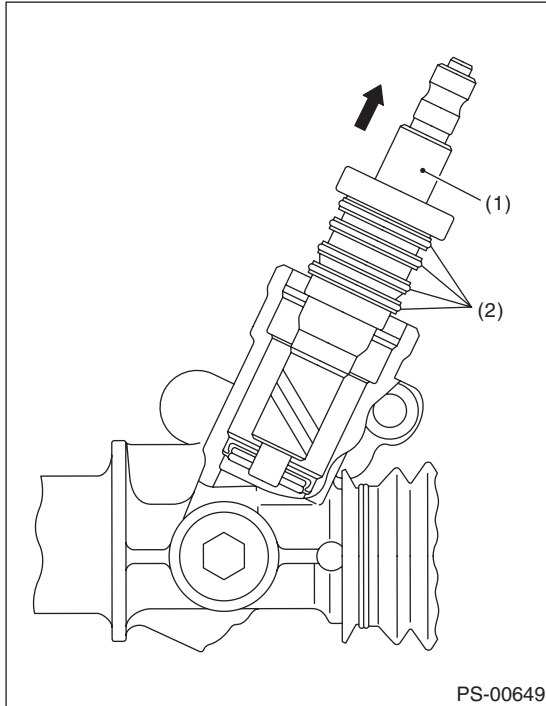
(1) Plug



# Steering Gearbox

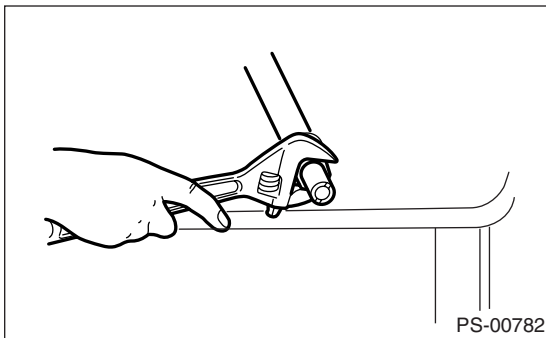
## POWER ASSISTED SYSTEM (POWER STEERING)

12) Remove the valve assembly taking care not to scratch seal ring and valve housing inner surface.



- (1) Valve ASSY
- (2) Seal ring

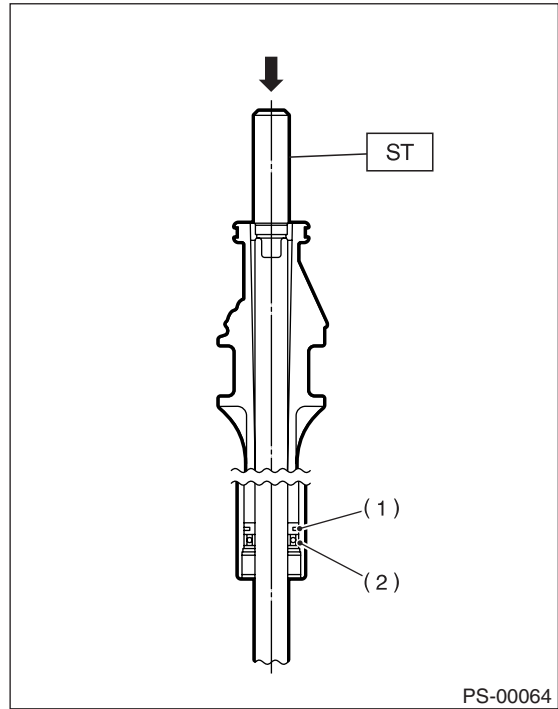
13) Remove the holder using a wrench (36 mm width across flats) or adjustable wrench.



14) Install the ST on valve side of rack and press outer side oil seal out taking care not to contact rack with steering body inner surface.  
ST 34199FE000 INSTALLER & REMOVER

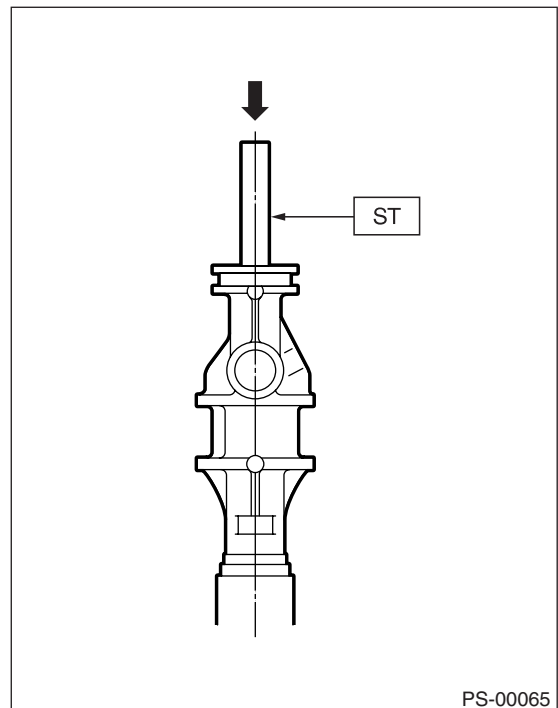
### NOTE:

Block the pipe connection of steering body to prevent fluid from flowing out.



- (1) Rack piston
- (2) Outer side oil seal

15) Insert the ST from valve side and press back-up ring and oil seal out.  
ST 34199FE010 REMOVER



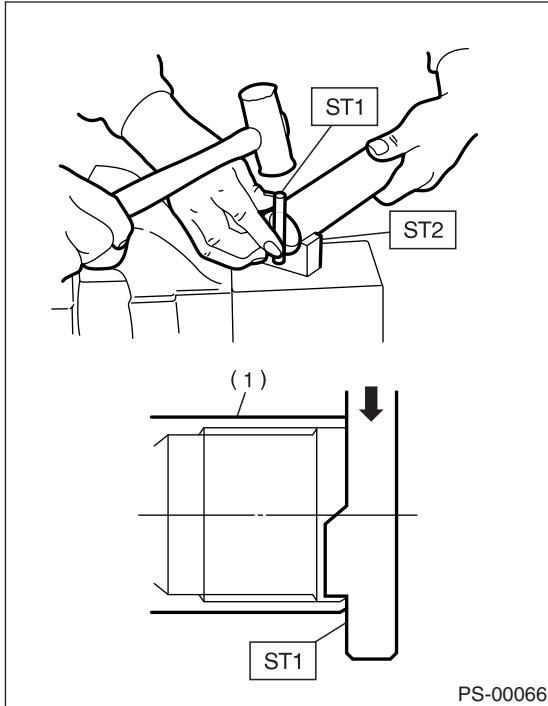
16) Using the ST1 and ST2, repair the cylinder's clinched sections.

# Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

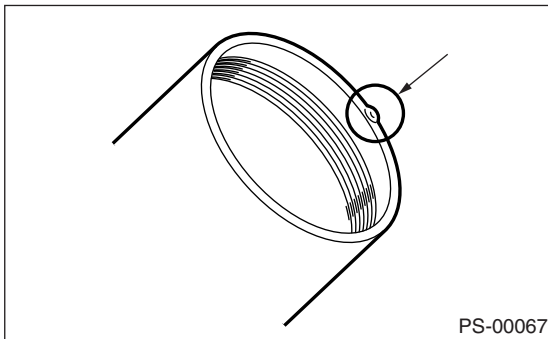
ST1 34099FA080 PUNCH  
ST2 34199FE020 BASE

NOTE:  
Do not apply force on the plug edge surface.



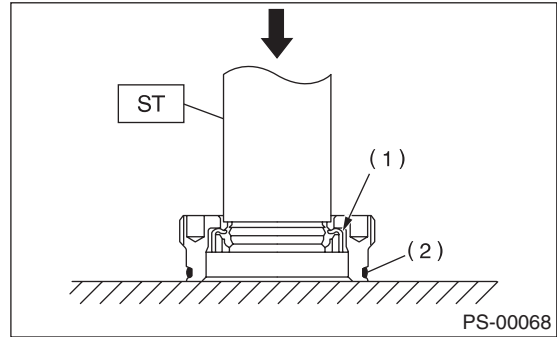
(1) Cylinder

17) If the cylinder edge is deformed in a convex shape, repair using an oil stone.



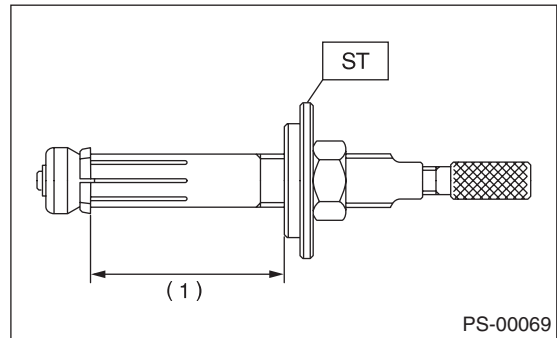
18) Remove the oil seal using ST and press from plug.

ST 34199AE100 PLUG OIL SEAL REMOVER



(1) Oil seal  
(2) O-ring

19) Set the ST on drawing dimension.  
ST 34199AE120 GEARBOX OIL SEAL RE-  
MOVER

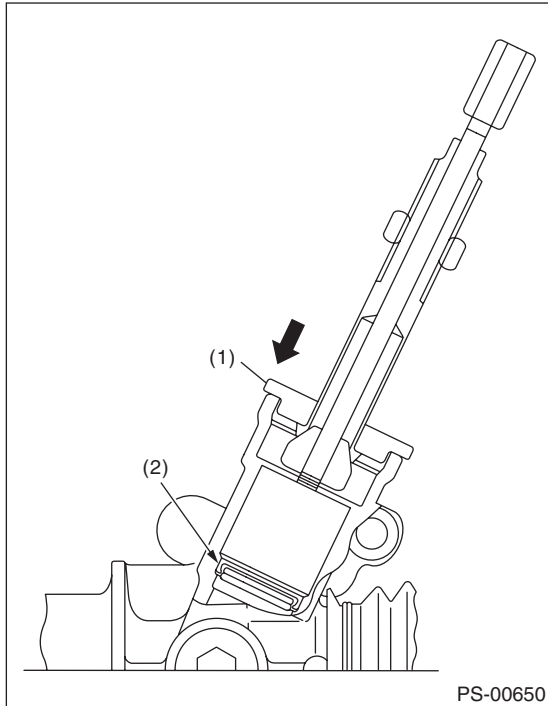


(1) 70 mm (2.76 in)

# Steering Gearbox

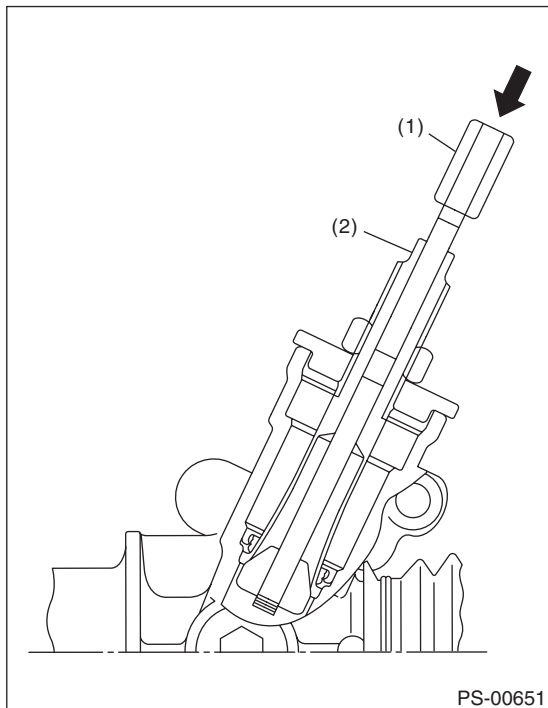
## POWER ASSISTED SYSTEM (POWER STEERING)

20) Set the stopper to gear box, and then insert the tip of ST to gear box.



- (1) Stopper
- (2) Oil seal

21) By fixing the 2-surface width, press in by rotating the rod and attach to oil seal.

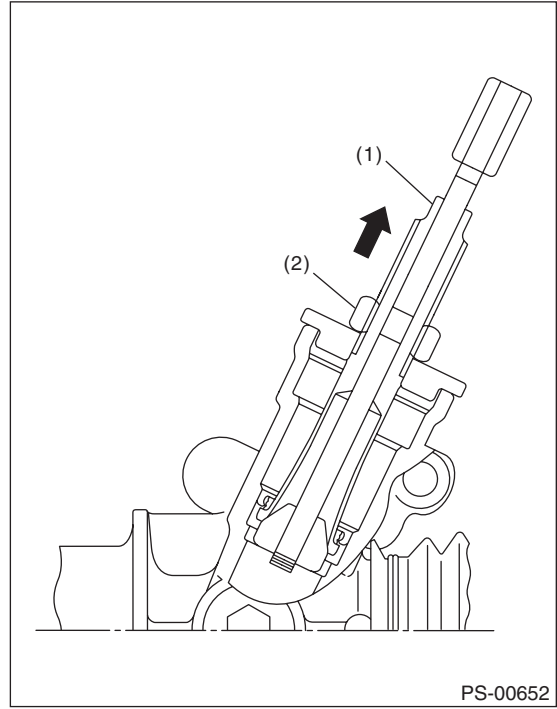


- (1) Rod
- (2) 2-surface width

22) While fixing the 2-surface width, pull out the oil seal by rotating nut.

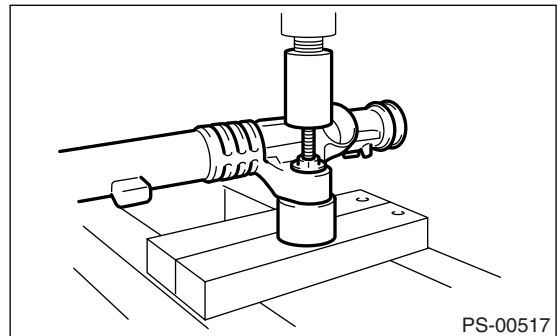
### CAUTION:

Take care not to scratch the gear box inner surface.



- (1) 2-surface width
- (2) Nut

23) Using a press, remove the bushing of gear box installation portion.



# Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

## D: ASSEMBLY

### 1. NON-TURBO MODEL

#### • RACK HOUSING ASSEMBLY

#### CAUTION:

Use only genuine grease for the gearbox.

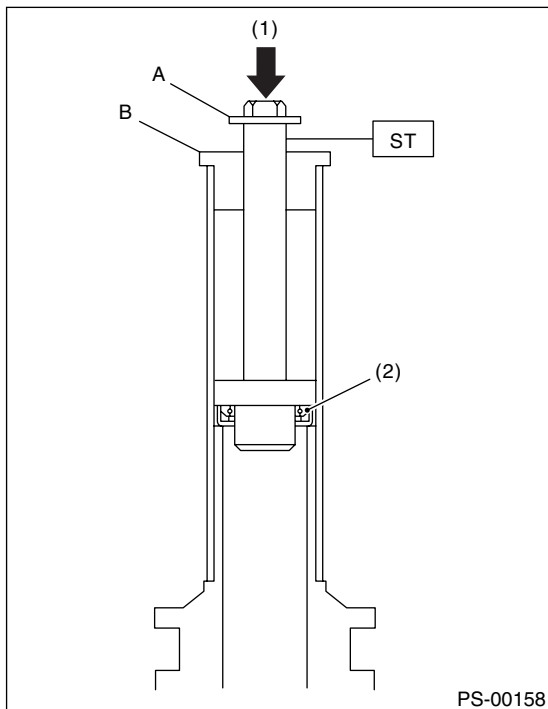
#### Specified grease for gearbox:

**VALIANT GREASE M-2 (Part No. 003608001)**

- 1) Apply power steering fluid to a new oil seal.
  - 2) Install the oil seal in correct position as shown in the figure. Push the oil seal using a press until portion A of ST contacts face of B.
- ST 34099FA110 INSTALLER

#### CAUTION:

Be careful not to damage or scratch the cylinder inner wall.



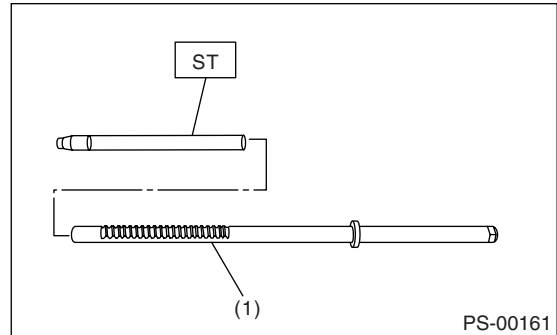
- (1) Press  
(2) Oil seal

- 3) Fix the rack housing in vise using ST.  
ST 926200000 STAND

#### NOTE:

- When fixing the rack housing in vise, be sure to use this special tool. Do not fix rack housing in vise using pad such as aluminum plates, etc.
- When using the old rack housing, be sure to clean and remove rust before assembling. Check pinion housing bushing carefully.

- 4) Fit the ST over toothed portion of rack assembly, and check for binding or irregular insertion. If any deformation is noted on flats at the end of rack, shape by using file, and wash with cleaning fluid.  
ST 926390001 COVER & REMOVER ASSY



- (1) Rack ASSY

- 5) Apply genuine grease to the teeth of thoroughly washed rack assembly, and then fit the ST over the toothed portion.

#### CAUTION:

- Be careful not to block the air passage with grease. Remove excessive grease.
- After fitting cover, check the air passage hole for clogging. If clogged, open by removing grease from the hole.

- 6) Before inserting the rack assembly, apply a coat of specified power steering fluid to the surfaces of ST and rack piston.

- 7) Insert the rack assembly into rack housing from cylinder side, and then remove the ST after it has passed completely through oil seal.

- 8) Fit the ST1 and ST2 over the end of rack, and then install a new rack bushing.

ST1 926400000 GUIDE  
ST2 927660000 GUIDE

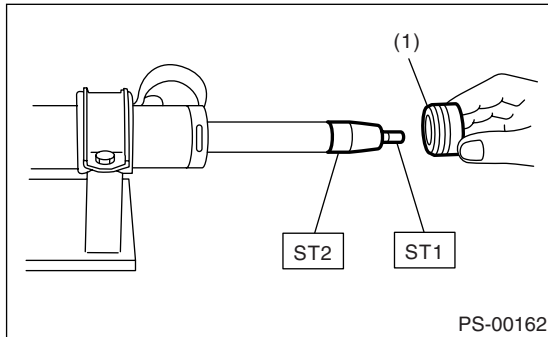
#### CAUTION:

- If burrs or nicks are found on this guide and rack shaft portion, remove by filing.

# Steering Gearbox

## POWER ASSISTED SYSTEM (POWER STEERING)

- Dip the rack bushing in specified power steering fluid before installing, and pay attention not to damage O-ring and oil seal.



(1) Rack bushing ASSY

9) Insert the rack stopper into the cylinder tube until internal groove (on cylinder side) is aligned with external groove (on rack stopper). Turn the rack stopper with ST so that the rack stopper hole is seen through cylinder slits.

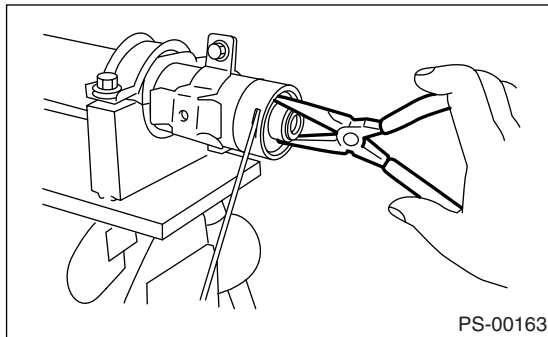
10) Insert the rack stopper into the rack housing, and then wrap a new circlip using a sharp pointed pliers to secure the rack stopper in position.

### CAUTION:

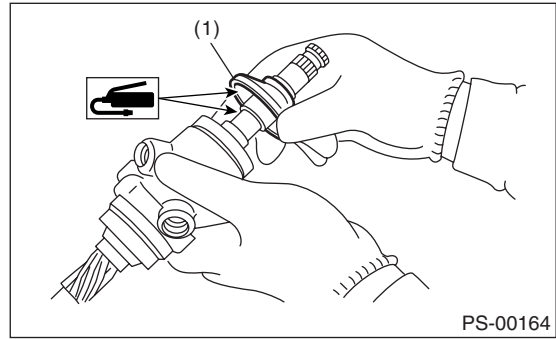
Be careful not to scratch the rack while winding circlip.

### NOTE:

Rotate the wrench another 90 to 180° after end of circlip has been wrapped in.

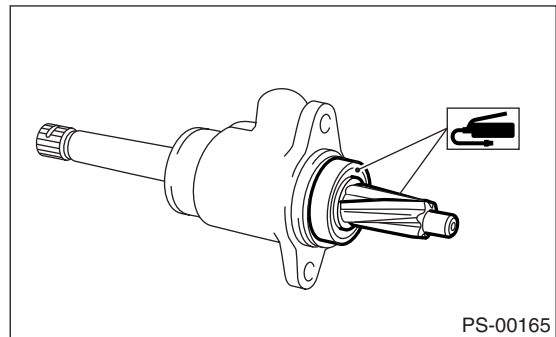


- 11) Apply genuine grease to dust cover, and then install the dust cover to valve assembly.

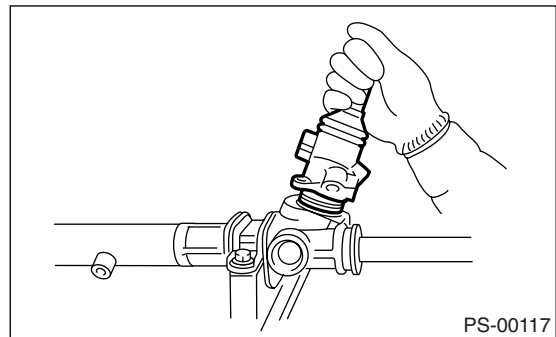


(1) Dust cover

- 12) Apply genuine grease to the pinion gear and bearing of valve assembly.



- 13) Install a new gasket on valve assembly. Insert the valve assembly into place while facing rack teeth toward pinion.



- 14) Tighten the bolts alternately to secure valve assembly.

### Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

### CAUTION:

Be sure to alternately tighten the bolts.

- 15) Temporarily install the rack, and then operate it from lock to lock two or three times to make it fit in. Remove the grease blocking air vent hole.

# Steering Gearbox

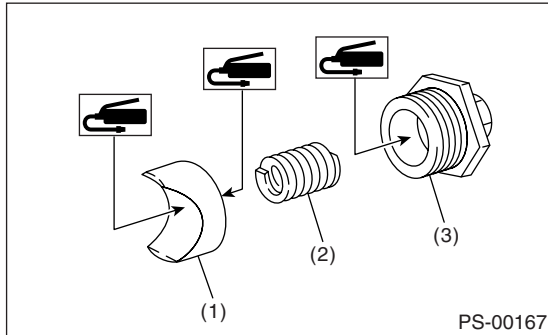
POWER ASSISTED SYSTEM (POWER STEERING)

## CAUTION:

If operating the rack from lock to lock without installing tie-rod, it may damage the oil seal. Always install the tie-rods LH and RH.

16) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert sleeve into steering body.

Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



- (1) Sleeve
- (2) Spring
- (3) Adjusting screw

17) Tighten the adjusting screw to specified torque.

## Tightening torque:

**7.4 N·m (0.75 kgf-m, 5.4 ft-lb)**

18) After tightening to the specified tightening torque, loosen it by 25°.

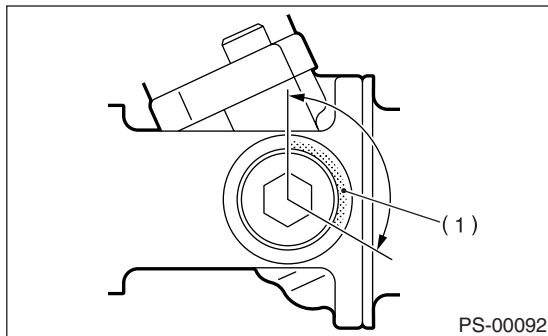
19) Remove the tie-rod.

20) Verify that play is within specified value. <Ref. to PS-51, SERVICE LIMIT, INSPECTION, Steering Gearbox.>

21) Loosen the adjusting screw, and then apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

## Liquid gasket:

**THREE BOND 1141 (Part No. 004403006)**



- (1) Apply liquid gasket to at least 1/3 of entire perimeter.

22) Tighten the adjusting screw to specified torque.

## Tightening torque:

**7.4 N·m (0.75 kgf-m, 5.4 ft-lb)**

23) After tightening to the specified tightening torque, loosen it by 25°.

24) Install the lock nut. While holding the adjusting screw with a wrench, tighten lock nut using ST.

ST 926230000 SPANNER

## Tightening torque (Lock nut):

**40 N·m (4.1 kgf-m, 29.5 ft-lb)**

## NOTE:

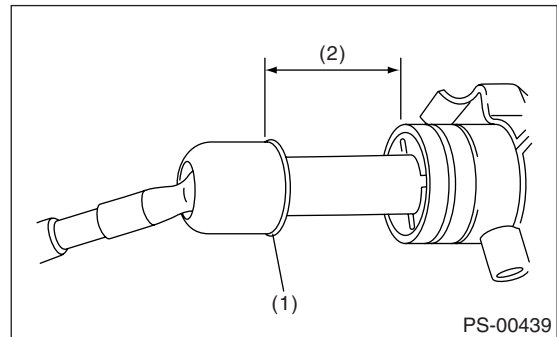
Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

25) Extend the rack approx. 40 mm (1.57 in) beyond side of steering body.

26) Install the tie-rod and a new lock washer into rack.

## Tightening torque:

**78 N·m (8.0 kgf-m, 57.9 ft-lb)**



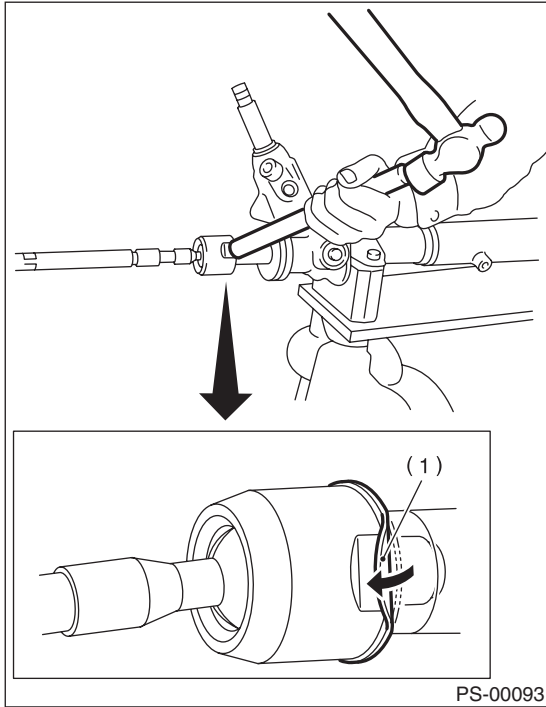
- (1) Lock washer
- (2) Approx. 40 mm (1.57 in)

27) Bend the lock washer.

# Steering Gearbox

## POWER ASSISTED SYSTEM (POWER STEERING)

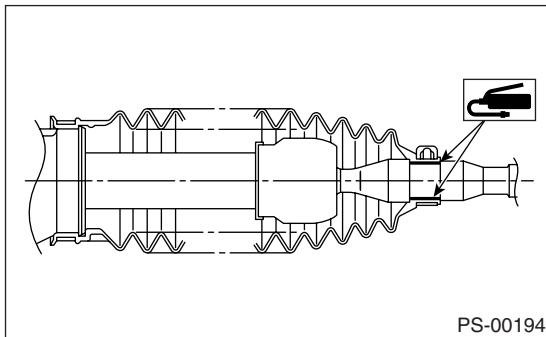
**CAUTION:**  
Be careful not to scratch the rack when bending lock washer.



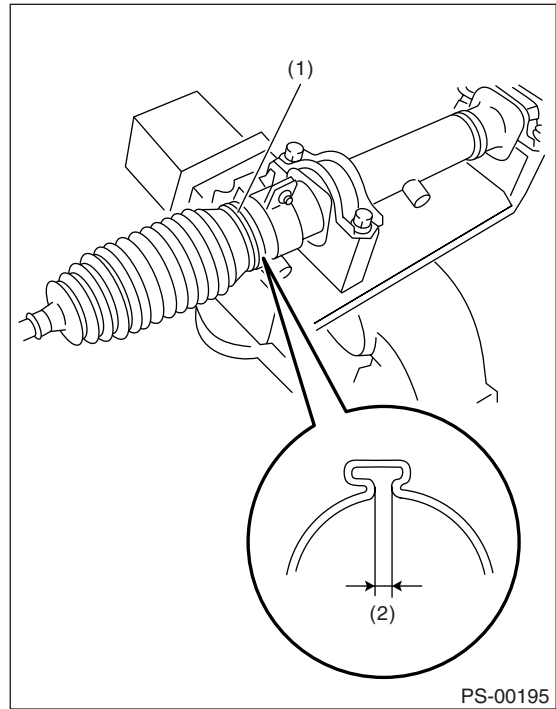
(1) Lock washer

28) Apply a coat of grease to the tie-rod groove, and then install the boot to housing.

**NOTE:**  
Make sure that the boot is installed without unusual inflation or deflation.

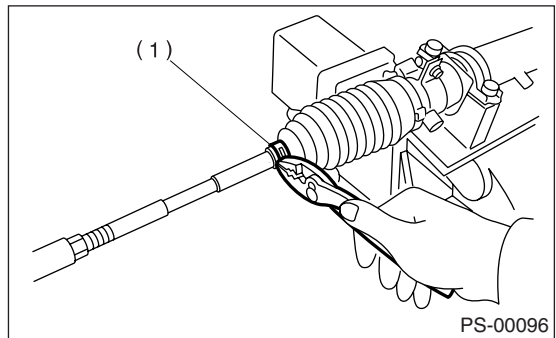


29) Install a new boot band. Using band clamp pliers, caulk the boot band until caulking part clearance is 2 mm (0.079 in) or less.



(1) Boot band  
(2) 2 mm (0.079 in) or less

30) Fix the boot end with clip (small).



(1) Clip

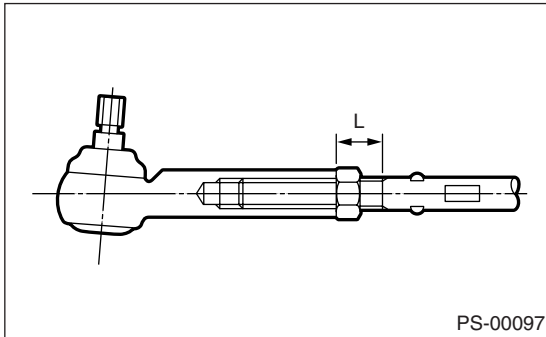
31) After installing, check the boot end is positioned into groove on tie-rod.

32) If the tie-rod end was removed, screw in the lock nut and tie-rod end to screwed portion of tie-rod, and then tighten the lock nut temporarily in a position as shown in the figure.

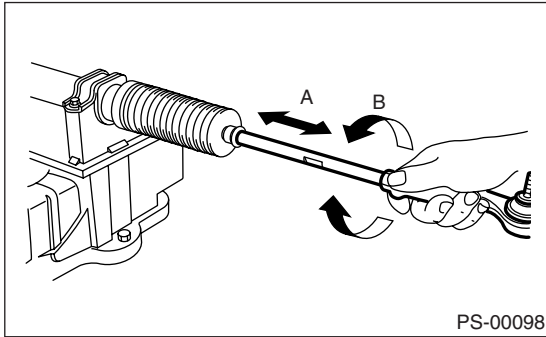
# Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

**Installed tie-rod length L:**  
**15 mm (0.59 in)**



- 33) Inspect the gearbox as follows:  
"A" Holding the tie-rod end, repeat lock to lock two or three times as quickly as possible.  
"B" Holding the tie-rod end, turn it slowly at a radius one or two times as large as possible.  
After all, make sure that the boot is installed in specified position without deflation.



- 34) Remove the gearbox from ST.  
ST 926200000 STAND  
35) Install the four pipes on gearbox.  
(1) Connect the pipe A and B to four pipe joints of gearbox.

**Tightening torque:**

**13 N·m (1.3 kgf·m, 9.4 ft·lb)**

- (2) Connect the pipe E and F to gearbox.

**Tightening torque:**

**Pipe E: 15 N·m (1.5 kgf·m, 10.8 ft·lb)**

**Pipe F: 25 N·m (2.5 kgf·m, 18.1 ft·lb)**

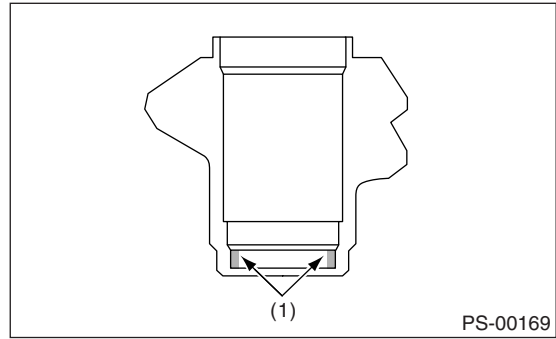
## • CONTROL VALVE ASSEMBLY

**Specified steering grease:**

**VALIANT GREASE M-2 (Part No. 003608001)**

- 1) Clean all parts and tools before reassembling.

- 2) Apply a coat of specified power steering fluid to the inner wall of valve housing.



- (1) Apply fluid.

- 3) Attach the ST2 to ST1.

ST1 34099FA120 INSTALLER & REMOVER SEAL

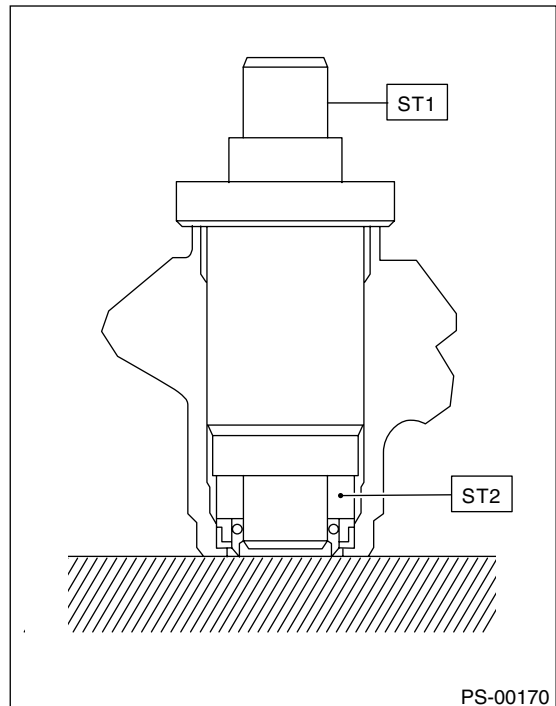
ST2 34099FA130 INSTALLER SEAL

- 4) To avoid scratching the oil seal, apply a coat of grease to the contact surface of installer and oil seal.

- 5) Verify the oil seal direction.

Attach the oil seal to installer and position in valve housing before pressing into place.

- 6) Press the oil seal into place using a press.



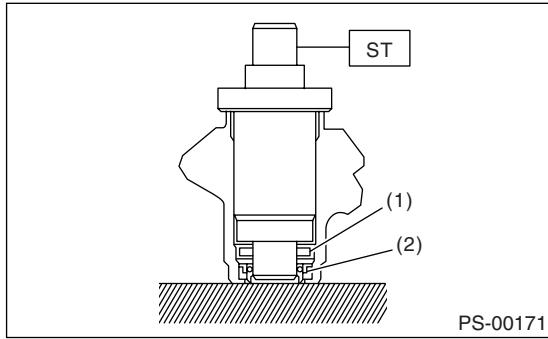
- 7) Attach the bearing to ST, and then position in value housing. Using the ST and press, install the special bearing in valve housing.



# Steering Gearbox

## POWER ASSISTED SYSTEM (POWER STEERING)

### ST 34099FA120 INSTALLER & REMOVER SEAL



- (1) Special bearing
- (2) Oil seal

8) Put vinyl tape around the pinion shaft splines to protect oil seal from damage.

9) Fit the pinion and valve assembly into valve housing.

10) Secure the valve assembly to ST1 and ST2.

ST1 926370000 INSTALLER A

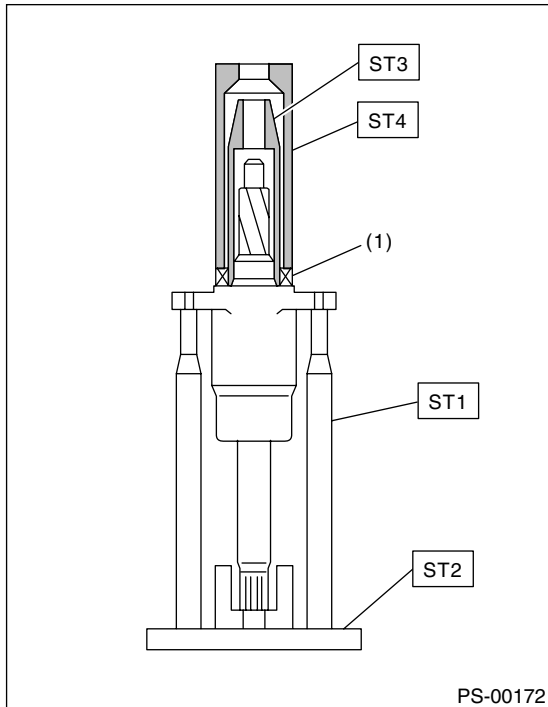
ST2 34099FA100 STAND BASE

11) Apply specified power steering fluid to oil seal and ST3.

12) Install the ST3 to pinion, and then insert the oil seal. Press the oil seal using a press until ST4 contacts face end of valve housing.

ST3 926360000 INSTALLER A

ST4 927620000 INSTALLER B



- (1) Oil seal

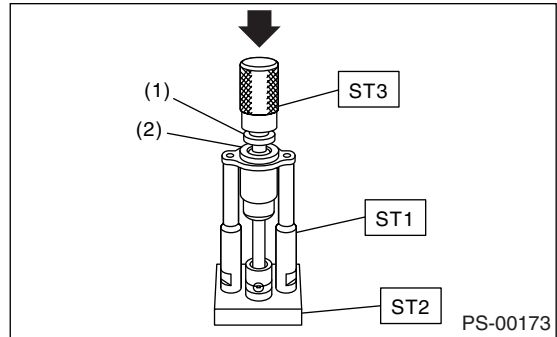
13) Remove the ST3, and then fit the back-up washer.

14) Force-fit the ball bearing using ST3.

ST1 926370000 INSTALLER A

ST2 34099FA100 STAND BASE

ST3 927640000 INSTALLER B



- (1) Ball bearing
- (2) Back-up washer

#### NOTE:

Be careful not to tilt the ball bearing during installation.

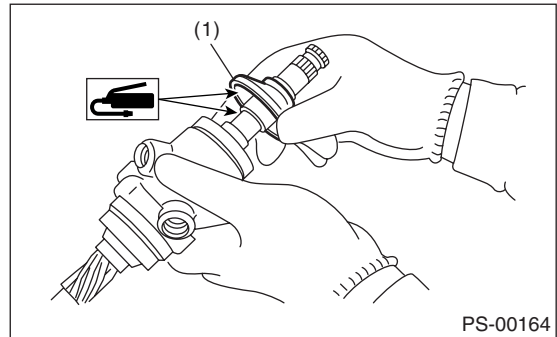
15) Install the snap ring using snap ring pliers.

#### NOTE:

Rotate the snap ring to check for proper installation.

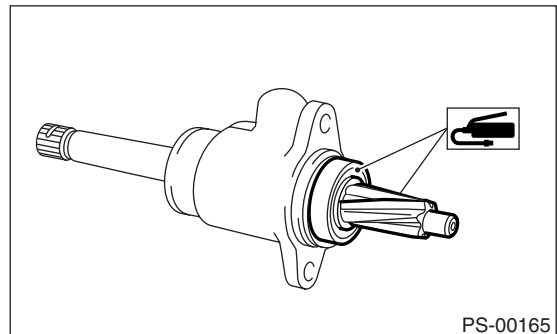
16) Apply the specified grease to dust cover.

17) Install the dust cover on valve assembly.



- (1) Dust cover

18) Apply genuine grease to the pinion gear and bearing of valve assembly.

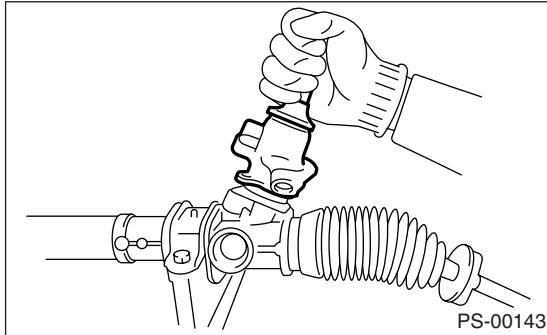


PS-00165

# Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

19) Install a new gasket on valve assembly. Insert the valve assembly into place while facing rack teeth toward pinion.



20) Tighten the bolts alternately to secure valve assembly.

### Tightening torque:

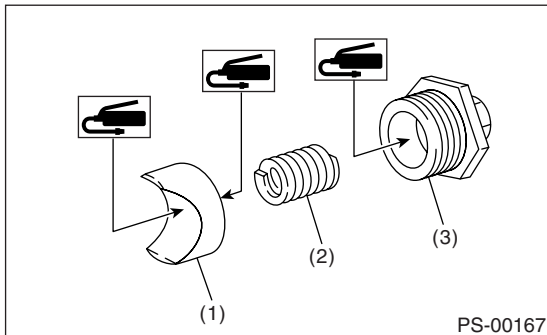
**25 N·m (2.5 kgf·m, 18.1 ft·lb)**

### CAUTION:

**Be sure to alternately tighten the bolts.**

21) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert sleeve into steering body.

Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



- (1) Sleeve
- (2) Spring
- (3) Adjusting screw

22) Tighten the adjusting screw to specified torque.

### Tightening torque:

**7.4 N·m (0.75 kgf·m, 5.4 ft·lb)**

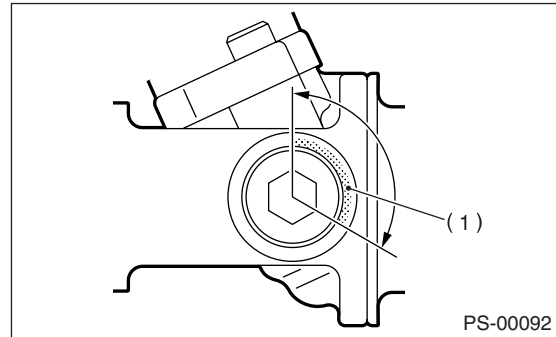
23) After tightening to the specified tightening torque, loosen it by 25°.

24) Verify that play is within specified value. <Ref. to PS-51, SERVICE LIMIT, INSPECTION, Steering Gearbox.>

25) Loosen the adjusting screw, and then apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

### Liquid gasket:

**THREE BOND 1141 (Part No. 004403006)**



- (1) Apply liquid gasket to at least 1/3 of entire perimeter.

26) Tighten the adjusting screw to specified torque.

### Tightening torque:

**7.4 N·m (0.75 kgf·m, 5.4 ft·lb)**

27) After tightening to the specified tightening torque, loosen it by 25°.

28) Install the lock nut. While holding the adjusting screw with a wrench, tighten lock nut using ST. ST 926230000 SPANNER

### Tightening torque (Lock nut):

**40 N·m (4.1 kgf·m, 29.5 ft·lb)**

### NOTE:

Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

29) Remove the gearbox from ST.

30) Install the four pipes on gearbox.

- (1) Connect the pipe A and B to the gearbox.

### Tightening torque:

**13 N·m (1.3 kgf·m, 9.4 ft·lb)**

- (2) Connect the pipe E and F to gearbox.

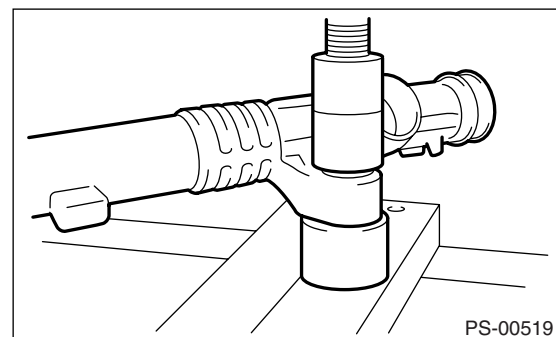
### Tightening torque:

**Pipe E: 15 N·m (1.5 kgf·m, 10.8 ft·lb)**

**Pipe F: 25 N·m (2.5 kgf·m, 18.1 ft·lb)**

## 2. TURBO MODEL AND STI MODEL

1) Using a press, install the bushing to gearbox installation portion.



# Steering Gearbox

## POWER ASSISTED SYSTEM (POWER STEERING)

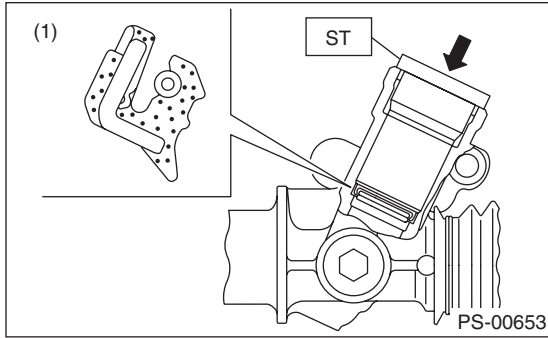
2) Apply a coat of grease to inside and outside of new oil seal.

### Specified steering grease:

**VALIANT GREASE M-2 (Part No. 003608001)**

3) Verify the oil seal direction and installation position. Using the ST and press, press fit the oil seal to gear box.

ST 34199AE130 GEARBOX OIL SEAL INSTALLER

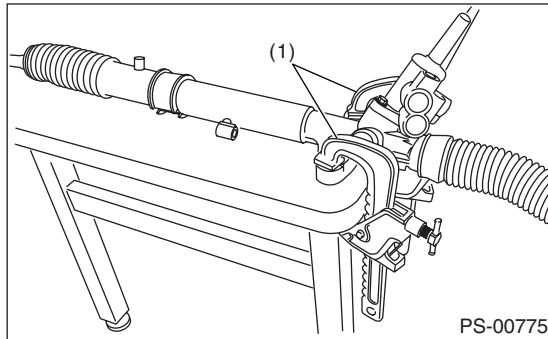


(1) Oil seal

4) Using a C-clamp, attach the steering body as shown in the figure. Apply a coat of grease to needle bearing.

### CAUTION:

**Ensure the needle bearing is free from defects. If it is faulty, replace the steering body with a new one.**



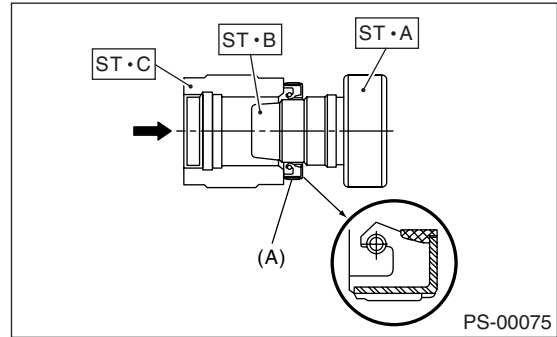
(1) C-clamp

5) Using the ST-B and ST-C, attach the oil seal to ST-A.

ST 34199FE040 INSTALLER A, B, C

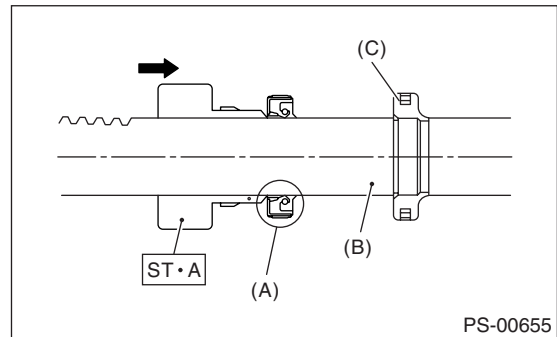
### NOTE:

Face the oil seal in direction shown in the figure.



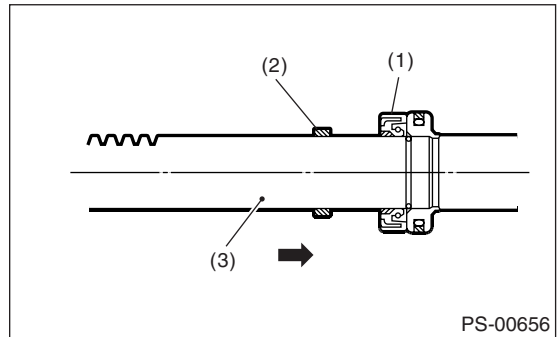
(A) Oil seal

6) Insert the ST-A with oil seal assembled, through gear side of rack. Remove the oil seal from ST-A near piston, and then remove the ST-A from rack.



(A) Oil seal  
(B) Rack  
(C) Piston

7) Install the back-up washer from gear side of rack.



(1) Oil seal  
(2) Back-up washer  
(3) Rack

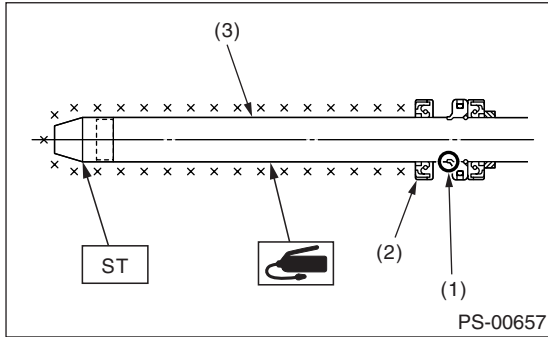
8) Equally apply a thin coat of grease to the rack, then install the oil seal.

# Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

**CAUTION:**

Be careful not to scratch the oil seal lips with piston's inner ring section.



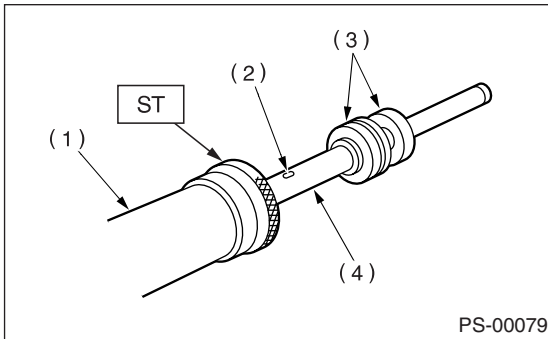
- (1) Rack piston inner ring
- (2) Outer side oil seal
- (3) Rack

9) Apply a coat of grease to the grooves in rack, sliding surface of sleeve and sealing surface of piston. Install the ST on end of steering body cylinder. Then insert the rack into steering body from cylinder side.

ST 34199FE050 GUIDE

**CAUTION:**

Do not allow grease to block the air vent hole on rack.



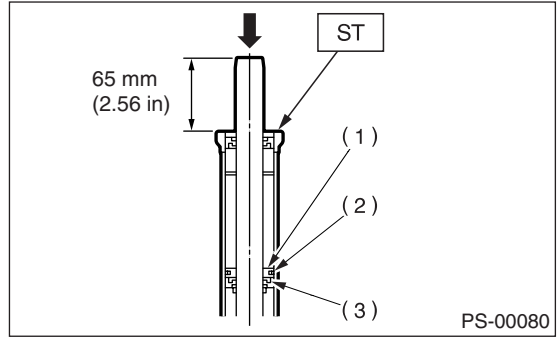
- (1) Cylinder side of steering body
- (2) Air vent hole
- (3) Oil seal
- (4) Rack

10) Using the press, slowly press the inner side oil seal until distance between the ST and end of rack becomes 65 mm (2.56 in).

ST 34199FE050 GUIDE

**CAUTION:**

Ensure the ST's inner wall is free of scratches since it may damage the oil seal.

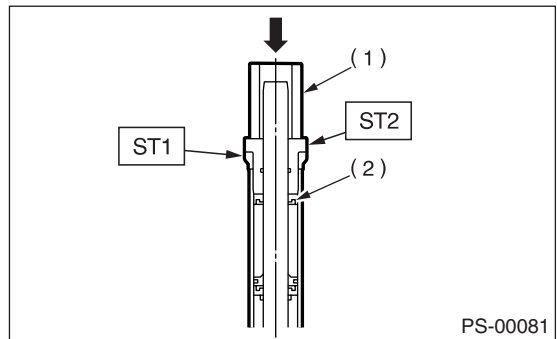


- (1) Rack piston
- (2) Inner side oil seal
- (3) Back-up ring

11) Pass the ST2 and pipe through rack and press outer side oil seal until ST1 is in contact with ST2 using press.

ST1 34199FE050 GUIDE

ST2 34199FE060 INSTALLER

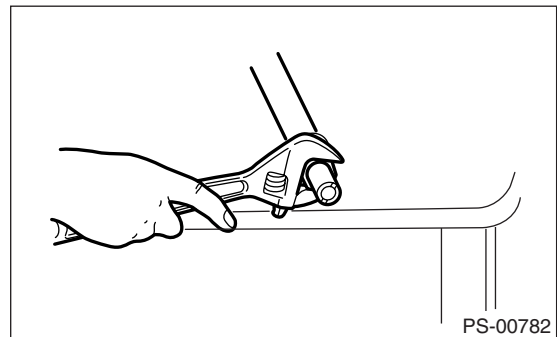


- (1) Pipe
- (2) Outer side oil seal

12) Install a new holder to cylinder side of steering body.

**Tightening torque:**

**90 N·m (9.0 kgf·m, 65.1 ft·lb)**

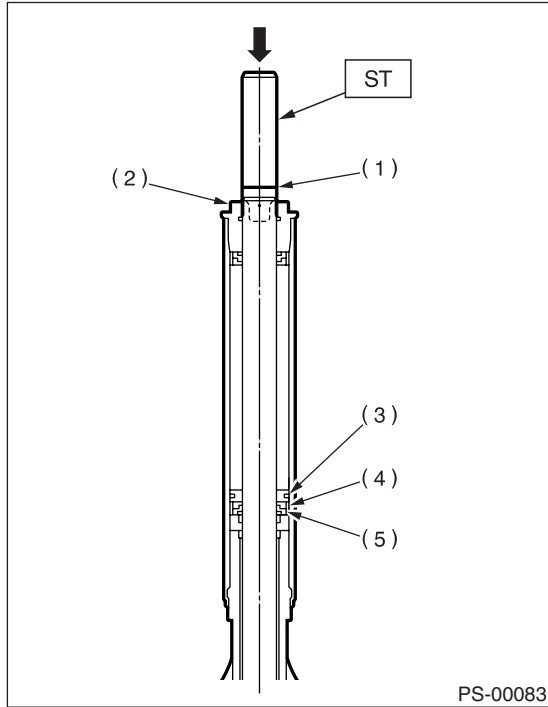


# Steering Gearbox

## POWER ASSISTED SYSTEM (POWER STEERING)

13) Install the ST to rack cylinder. Using a press, press the ST until its groove is aligned with end of holder.

ST 34199FE000 INSTALLER & REMOVER



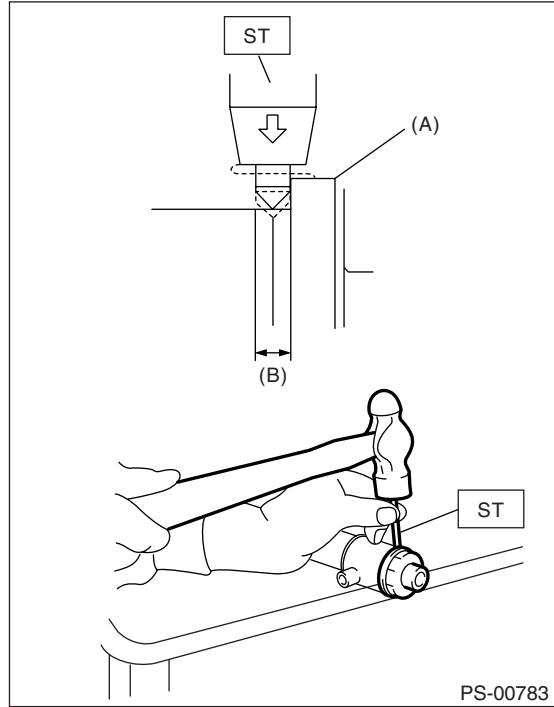
- (1) Groove
- (2) Holder
- (3) Rack piston
- (4) Oil seal
- (5) Back-up ring

14) Using the ST, clinch steering body cylinder at a point less than 3 mm (0.12 in) from holder.

**CAUTION:**

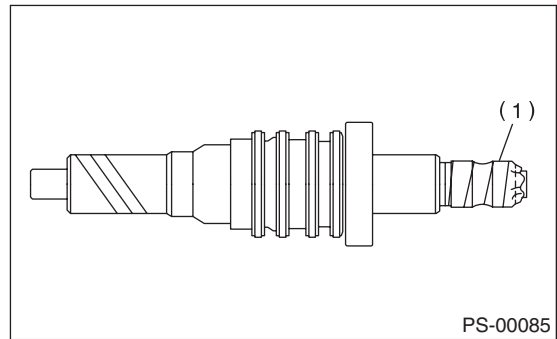
**Be careful not to deform the holder.**

ST 34099FA060 PUNCH HOLDER



- (A) Holder
- (B) 3 mm (0.1 in)

15) Roll the vinyl tape on serration part of valve assembly, and then apply grease on the tape surface.

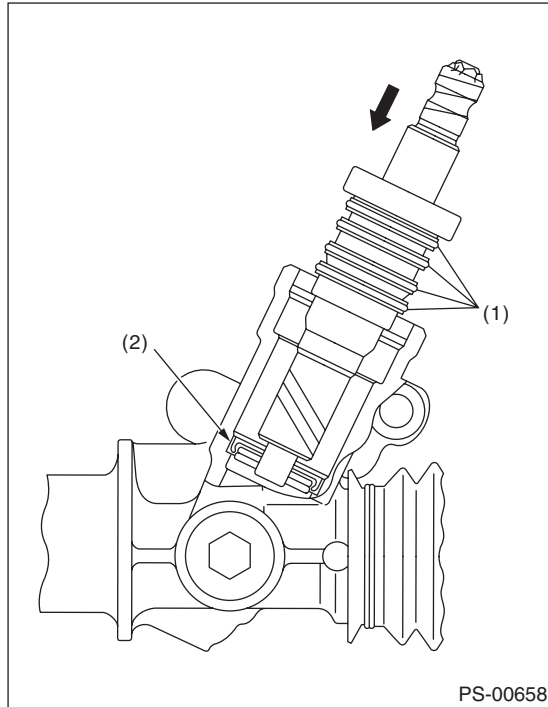


- (1) Vinyl tape

# Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

16) Apply a coat of grease on the gear teeth of valve assembly, and then attach the valve assembly taking care not to scratch oil seal and seal ring.

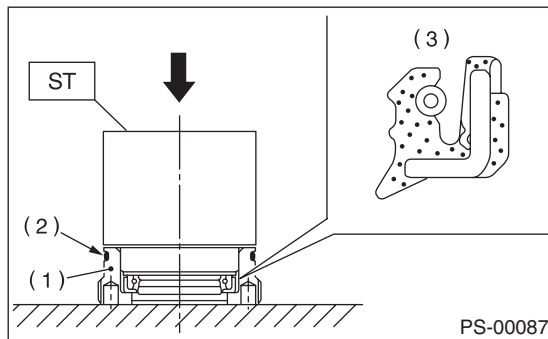


- (1) Seal ring
- (2) Oil seal

17) Apply grease on the oil seal circumference, and then press into the plug using ST and a press. Replace the plug circumference O-rings with new ones.

ST 34199AE110 PLUG OIL SEAL INSTALLER

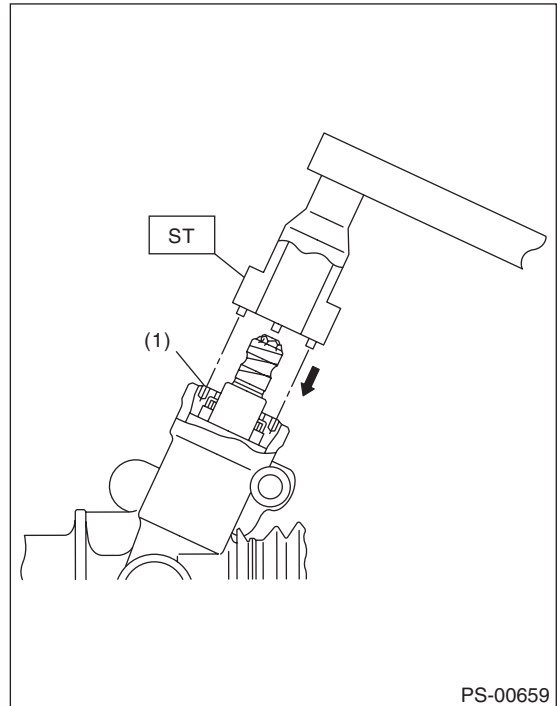
**CAUTION:**  
Pay attention to the oil seal direction, and attaching position.



- (1) Plug
- (2) O-ring
- (3) Oil seal

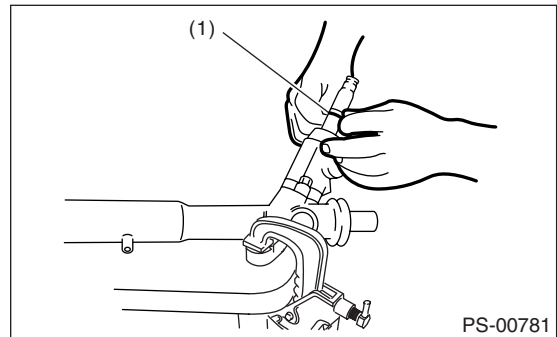
18) Using the ST, install the plug.  
ST 34199AE090 PLUG WRENCH

**Tightening torque:**  
**64 N·m (6.5 kgf-m, 47.0 ft-lb)**



- (1) Plug

19) Install the dust cover. Remove the vinyl tape.



- (1) Dust cover

20) Temporarily install the rack, and then operate it from lock to lock two or three times to make it fit in. Remove the grease blocking air vent hole.

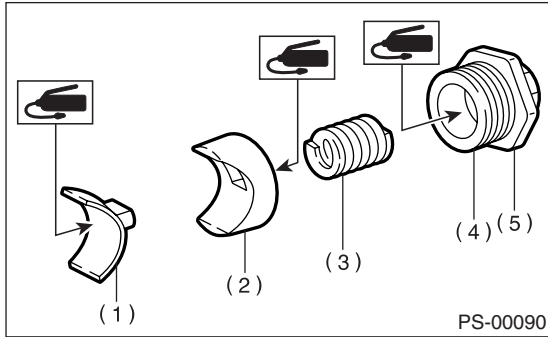
**CAUTION:**  
If operating the rack from lock to lock without installing tie-rod, it may damage the oil seal. Always install the tie-rods LH and RH.

21) Apply a coat of grease to the sliding surface of seat pad, sleeve and seating surface of spring, and then insert sleeve into steering body.

# Steering Gearbox

## POWER ASSISTED SYSTEM (POWER STEERING)

Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



- (1) Seat pad
- (2) Sleeve
- (3) Spring
- (4) Adjusting screw
- (5) Lock nut

22) Tighten the adjusting screw to specified torque.

### **Tightening torque:**

**7.4 N·m (0.75 kgf-m, 5.4 ft-lb)**

23) After tightening to the specified tightening torque, loosen it by 37°.

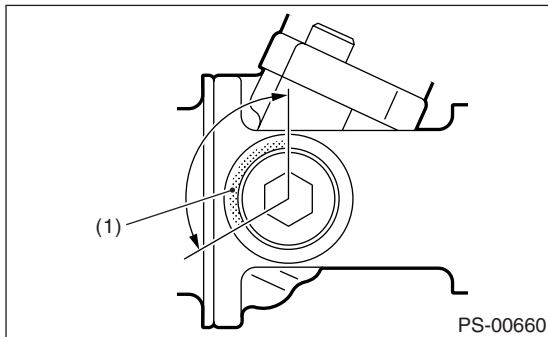
24) Remove the tie-rod.

25) Verify that play is within specified value. <Ref. to PS-51, SERVICE LIMIT, INSPECTION, Steering Gearbox.>

26) Loosen the adjusting screw, and then apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

### **Liquid gasket:**

**THREE BOND 1141 (Part No. 004403006)**



- (1) Apply liquid gasket to at least 1/3 of entire perimeter.

27) Tighten the adjusting screw.

### **Tightening torque:**

**9.8 N·m (1.0 kgf-m, 7.2 ft-lb)**

28) After tightening to the specified tightening torque, loosen it.

29) Tighten the adjusting screw.

### **Tightening torque:**

**4.8 N·m (0.49 kgf-m, 3.5 ft-lb)**

30) After tightening to the specified tightening torque, loosen it.

31) Tighten the adjusting screw.

### **Tightening torque:**

**4.8 N·m (0.49 kgf-m, 3.5 ft-lb)**

32) After tightening to the specified tightening torque, loosen it by 37°.

33) Install the lock nut. While holding the adjusting screw with a wrench, tighten lock nut using ST.

ST 926230000 SPANNER

### **Tightening torque (Lock nut):**

**40 N·m (4.1 kgf-m, 29.5 ft-lb)**

### **NOTE:**

Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

34) Install the tie-rod into rack.

### **Tightening torque:**

**90 N·m (9.0 kgf-m, 65.1 ft-lb)**

### **NOTE:**

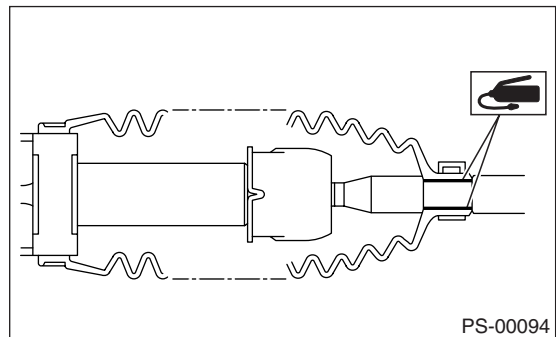
Check the mating face of rack and tie-rod for foreign material, dirt, dust and etc.

If required, clean the mating face.

35) Apply a coat of grease to the tie-rod groove, and then install the boot to housing.

### **NOTE:**

Make sure that the boot is installed without unusual inflation or deflation.

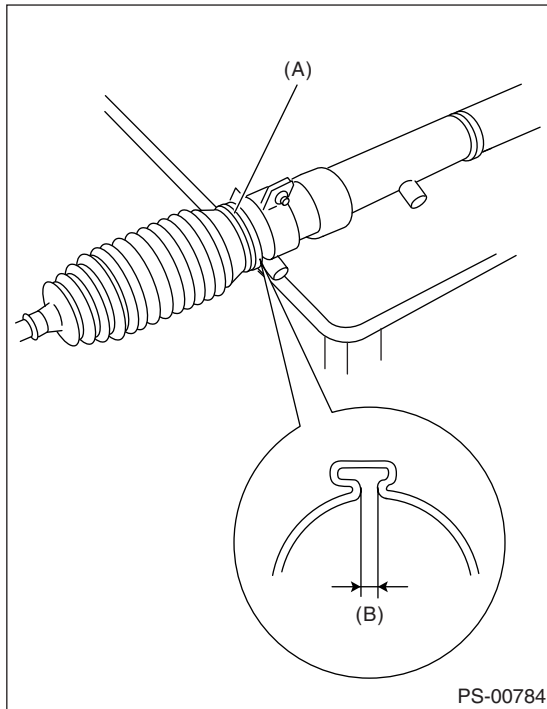


36) Caulk the boot so the space inside boot band caulking portion becomes 2 mm (0.08 in) or less.

# Steering Gearbox

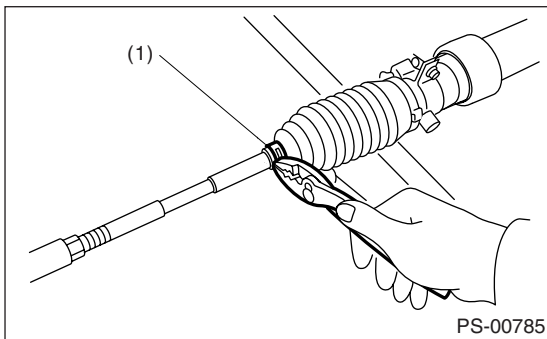
POWER ASSISTED SYSTEM (POWER STEERING)

NOTE:  
Use a new boot band.



- (A) Boot band
- (B) Less than 2 mm (0.08 in)

37) Fix the boot end with clip (small).



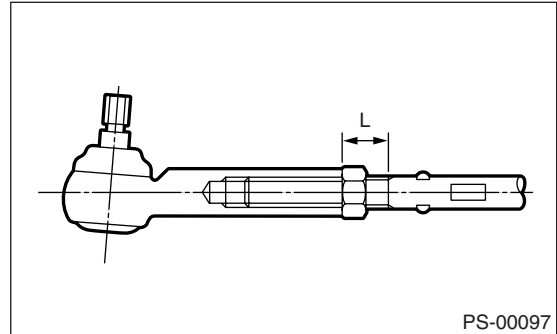
- (1) Clip

38) After installing, check the boot end is positioned into groove on tie-rod.

39) If the tie-rod end was removed, screw in the lock nut and tie-rod end to screwed portion of tie-rod, and then tighten the lock nut temporarily in a position as shown in the figure.

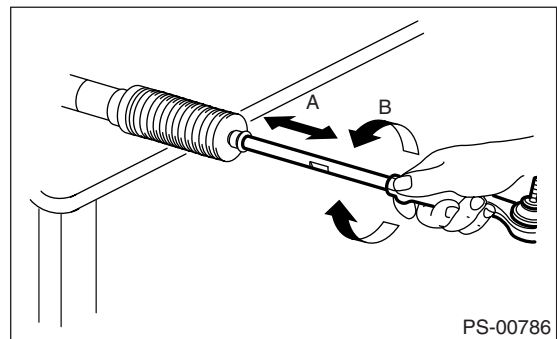
**Installed tie-rod length L:**

- Sedan:**  
**25 mm (0.98 in)**
- Wagon:**  
**15 mm (0.59 in)**



PS-00097

40) Inspect the gearbox as follows:  
“A” Holding the tie-rod end, repeat lock to lock two or three times as quickly as possible.  
“B” Holding the tie-rod end, turn it slowly at a radius one or two times as large as possible.  
After all, make sure that the boot is installed in specified position without deflation.



PS-00786

- 41) Remove the gearbox from ST.  
ST 926200000 STAND
- 42) Install the four pipes on gearbox.
  - (1) Connect the pipe A and B to gearbox.

**Tightening torque:**

**Housing side**

**20 N·m (2.0 kgf-m, 14.5 ft-lb)**

**Cylinder side**

**24 N·m (2.4 kgf-m, 17.4 ft-lb)**

- (2) Connect the pipe G and H to gearbox.

**Tightening torque:**

**15 N·m (1.5 kgf-m, 10.8 ft-lb)**



# Steering Gearbox

## POWER ASSISTED SYSTEM (POWER STEERING)

### E: INSPECTION

#### 1. BASIC INSPECTION

1) Clean all disassembled parts, and check for wear, damage, or any other faults, then repair or replace as necessary.

2) When disassembling, check the inside of gearbox for water. If any water is found, carefully check the boot for damage, input shaft dust seal, adjusting screw and boot clips for poor sealing. If faulty, replace with new parts.

| No. | Parts                  | Inspection   | Corrective action  |
|-----|------------------------|--|--|
| 1   | Input shaft            | (1) Bend of input shaft<br>(2) Damage on serration   | If the bend or damage is excessive, replace the entire gearbox.  |
| 2   | Dust seal              | (1) Crack or damage<br>(2) Wear  | If the outer wall slips, the lip is worn out or damage is found, replace it with a new one.  |
| 3   | Rack and pinion        | Poor mating of rack with pinion  | (1) Adjust the backlash properly.<br>By measuring the turning torque of gearbox and sliding resistance of rack, check if rack and pinion engage uniformly and smoothly with each other. (Refer to "Service limit".)<br>(2) Keeping the rack pulled out all the way so that all teeth emerge, check teeth for damage.<br>Even if abnormality is found in either (1) or (2), replace the entire gearbox. |
| 4   | Gearbox unit           | (1) Bend of rack shaft<br>(2) Bend of cylinder portion<br>(3) Crack or damage on cast iron portion | Replace the gearbox with a new one.  |
|     |                        | (4) Wear or damage on rack bushing   | If the free play of rack shaft in radial direction is out of the specified range, replace the gearbox with a new one. (Refer to "Service limit".)  |
|     |                        | (5) Wear on input shaft bearing  | If the free plays of input shaft in radial and axial directions are out of the specified ranges, replace the gearbox with a new one. (Refer to "Service limit".)   |
| 5   | Boot                   | Crack, damage or deterioration   | Replace.   |
| 6   | Tie-rod                | (1) Looseness of ball joint<br>(2) Bend of tie-rod   | Replace.   |
| 7   | Tie-rod end            | Damage or deterioration on dust seal   | Replace.   |
| 8   | Adjusting screw spring | Deterioration  | Replace.   |
| 9   | Boot clip              | Deterioration  | Replace.   |
| 10  | Sleeve                 | Damage   | Replace.   |
| 11  | Pipes                  | (1) Damage to flared surface<br>(2) Damage to flare nut<br>(3) Damage to pipe                      | Replace.   |

# Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

## 2. SERVICE LIMIT

Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

### NOTE:

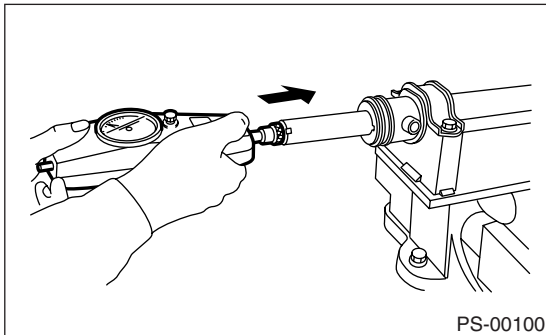
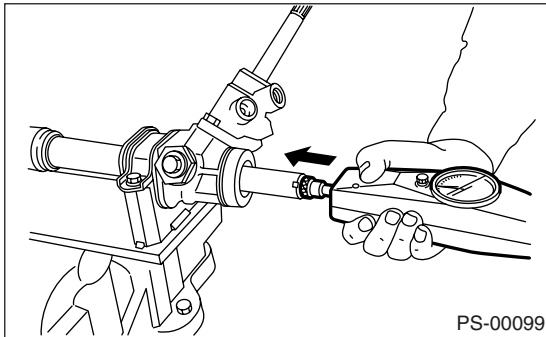
When making a measurement, vise the gearbox by using ST. Never vise the gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

### Sliding resistance of rack shaft:

#### Service limit

400 N (41 kgf, 90 lbf) or less



## 3. RACK SHAFT PLAY IN RADIAL DIRECTION

### Right-turn steering:

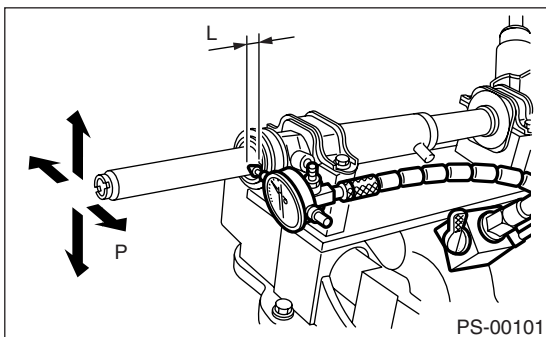
#### Service limit

0.19 mm (0.0075 in) or less

#### On condition

L: 5 mm (0.20 in)

P: 122.6 N (12.5 kgf, 27.6 lbf)



### Left-turn steering:

#### Service limit

Direction ⇄

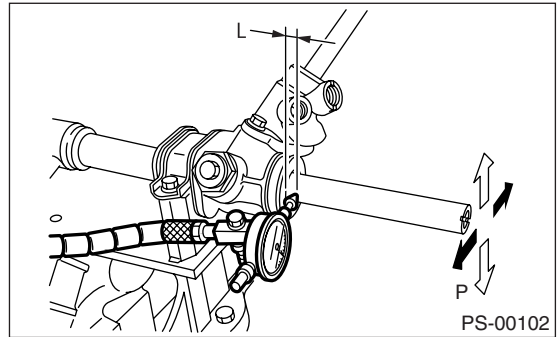
0.3 mm (0.012 in) or less

Direction ⇄

0.15 mm (0.0059 in) or less

L: 5 mm (0.20 in)

P: 98 N (10 kgf, 22 lbf)



## 4. INPUT SHAFT PLAY

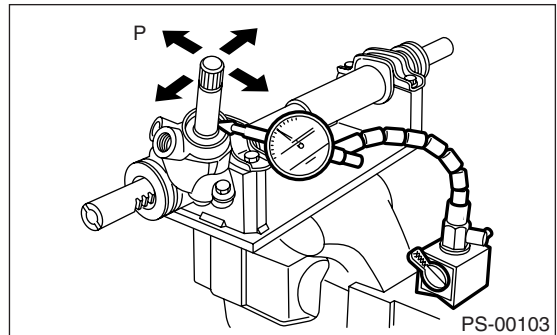
### In radial direction:

#### Service limit

0.18 mm (0.0071 in) or less

#### On condition

P: 98 N (10 kgf, 22 lbf)



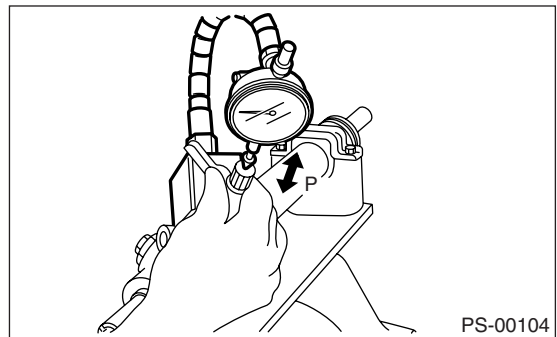
### In axial direction:

#### Service limit

0.5 mm (0.020 in) or less

#### On condition

P: 20 — 49 N (2 — 5 kgf, 4 — 11 lbf)



# Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

## 5. TURNING RESISTANCE OF GEARBOX

Using the ST, measure the gearbox turning resistance.

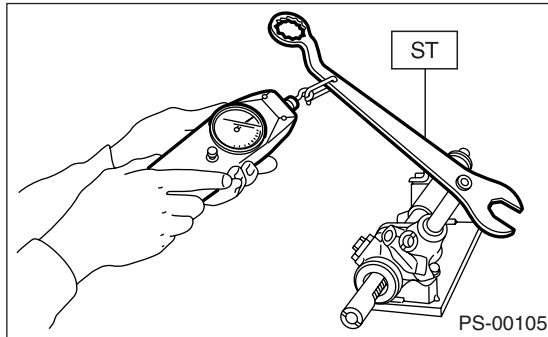
ST 34099PA100 SPANNER

### Service limit

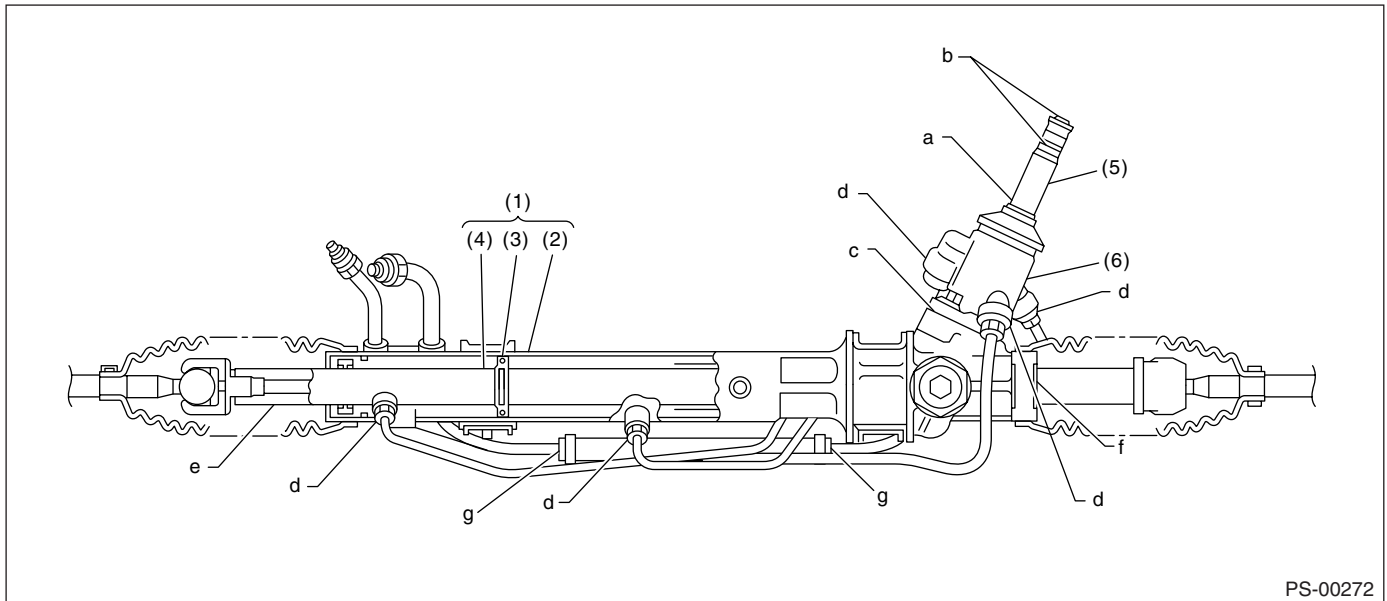
**Maximum allowable resistance**

**10.5 N (1.1 kgf, 2.4 lbf) or less**

**Difference between right and left turning resistance: Less than 20%**



## 6. OIL LEAKING



(1) Power cylinder

(3) Rack piston

(5) Input shaft

(2) Cylinder

(4) Rack axle

(6) Valve housing

1) Lift up the vehicle.

2) Even if the location of the leak can be easily found by observing the leaking condition, it is necessary to thoroughly remove the fluid from the suspected portion and turn the steering wheel from lock to lock about thirty to forty times with engine running, then make comparison of the suspected portion between immediately after and several hours after this operation.

3) Inspect leakage from "a".

The oil seal is damaged. Replace the valve assembly with a new one.

4) Inspect leakage from "b".

The torsion bar O-ring is damaged. Replace the valve assembly with a new one.

5) Inspect leakage from "c".

The oil seal is damaged. Replace the valve assembly or oil seal with a new one.

6) Inspect leakage from "d".

The pipe is damaged. Replace the faulty pipe or O-ring.

# Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

7) Inspect leakage from “g”.

The hose is damaged. Replace the hose with a new one.

8) If leak is other than a, b, c, d, or g, and if oil is leaking from the gearbox, move the right and left boots toward tie-rod end side, respectively, with the gearbox mounted to the vehicle, and remove fluid from the surrounding portions. Then, turn the steering wheel from lock to lock thirty to forty times with the engine running, then make comparison of the leaked portion immediately after and several hours after this operation.

(1) Leakage from “e”

The cylinder seal is damaged. Replace the rack bushing with a new one.

(2) Leakage from “f”

There are two possible causes. Take the following step first. Remove the pipe assembly B from the valve housing, and close the circuit with ST.

ST 926420000 PLUG

Turn the steering wheel from lock to lock thirty to forty times with the engine running, then make comparison of the leaked portion between immediately after and several hours after this operation.

- If leakage from “f” is noted again:

The oil seal of pinion and valve assembly is damaged. Replace the pinion and valve assembly with a new one. Or replace the oil seal and parts that are damaged during disassembly with new ones.

- If oil stops leaking from “f”:

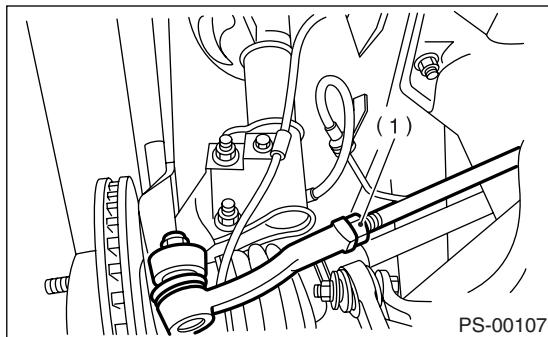
The oil seal of rack housing is damaged. Replace the oil seal and the parts that are damaged during disassembly with new ones.

## F: ADJUSTMENT

1) Adjust the front toe. <Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

**Standard of front toe:**

**IN 3 — OUT 3 mm (IN 0.12 — OUT 0.12 in)**



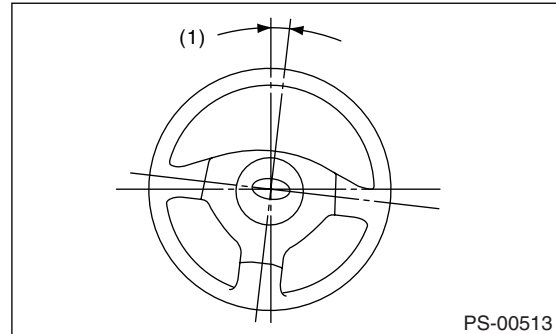
(1) Lock nut

2) Adjust the steering angle of wheels.

**Standard of steering angle:**

| Model       | 2.5i, OUTBACK, WRX | STI        |
|-------------|--------------------|------------|
| Inner wheel | 34.5°±1.5°         | 32.9°±1.5° |
| Outer wheel | 30.3°±1.5°         | 28.5°±1.5° |

3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, and error is more than 5° on the periphery of steering wheel, correctly re-install the steering wheel.



(1) Within 5°

4) If the steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in opposite direction by same angle.

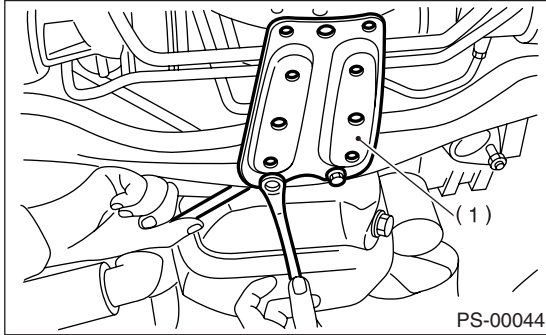
# Pipe Assembly

## POWER ASSISTED SYSTEM (POWER STEERING)

### 6. Pipe Assembly

#### A: REMOVAL

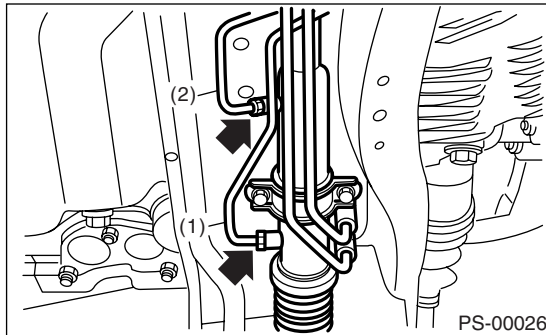
- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle, and then remove the jack-up plate.



(1) Jack-up plate

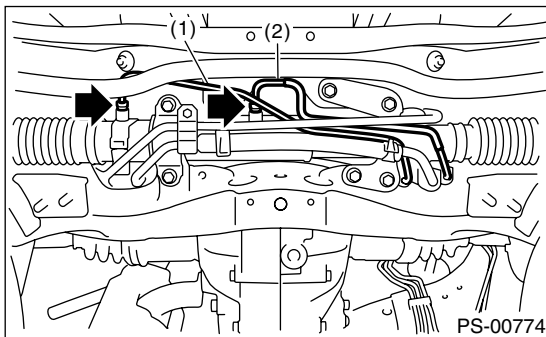
- 3) Remove the one pipe joint at the center of gear-box, and then connect the vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.

- Non-turbo model



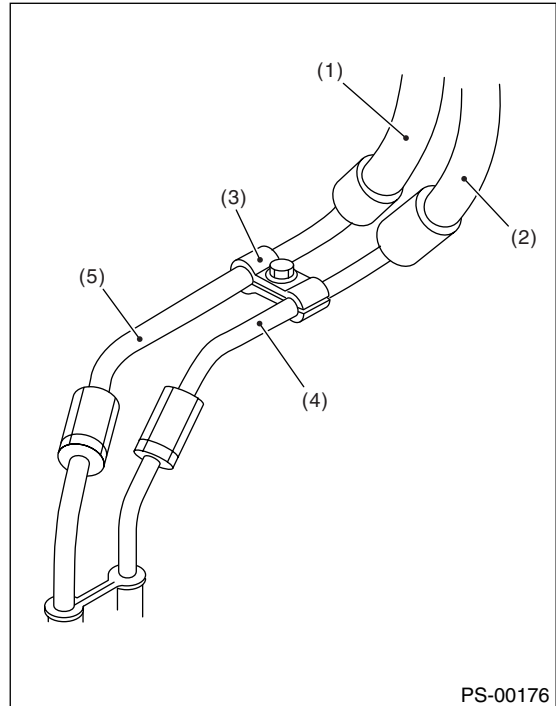
(1) Pipe A  
(2) Pipe B

- Turbo model



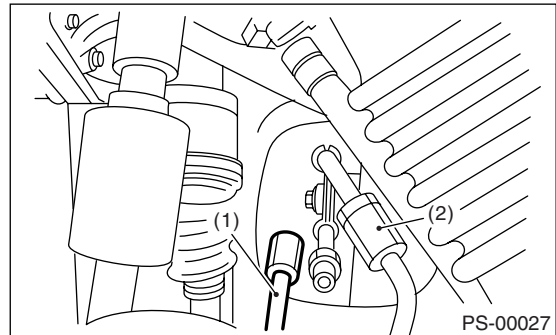
(1) Pipe A  
(2) Pipe B

- 4) Remove the clamp E from pipes C and D.



(1) Return hose  
(2) Pressure hose  
(3) Clamp E  
(4) Pipe C  
(5) Pipe D

- 5) Disconnect the pipe C and D from gear box.



(1) Pipe C  
(2) Pipe D

- 6) Non-turbo model

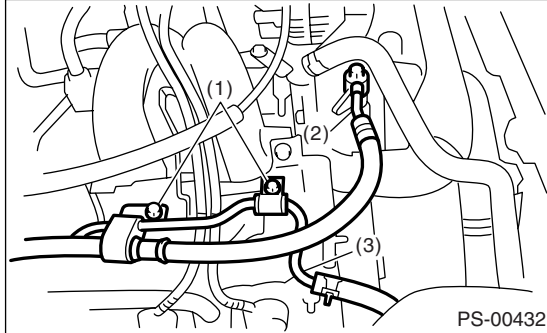
- (1) Remove the air intake duct. <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>
- (2) Remove the bolt A.
- (3) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

# Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

## CAUTION:

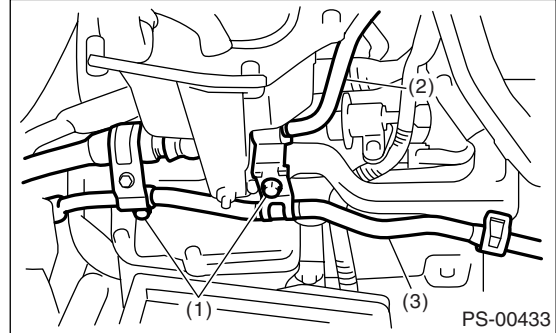
- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

## CAUTION:

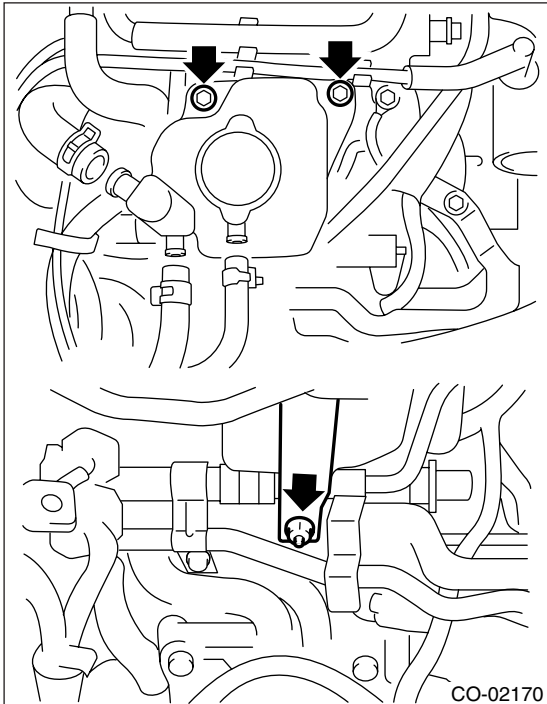
- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

## 7) Turbo model

- (1) Remove the air cleaner.  
<Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- (2) Remove the coolant filler tank.



- (3) Remove the two bolts fixing pipe C and D. (bolt A)
- (4) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

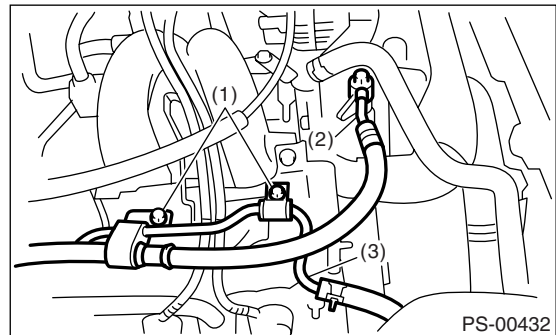
## B: INSTALLATION

- 1) Temporarily tighten the two bolts fixing pipe C and D. (bolt A)

### NOTE:

Visually check that the hose between tank and pipe D is free from bending or twisting.

- Non-turbo model

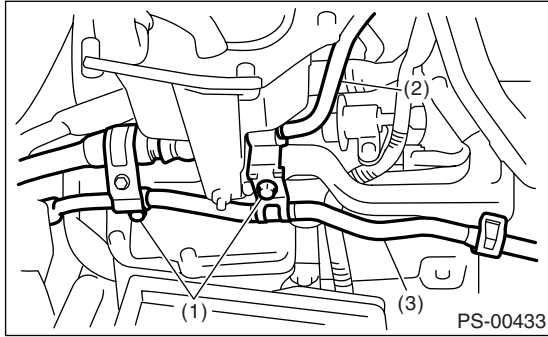


- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

# Pipe Assembly

## POWER ASSISTED SYSTEM (POWER STEERING)

- Turbo model and STI model



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

- (1) Connect the pipe D to oil tank.
- (2) Using a new gasket, connect the pipe C to oil pump.

**Tightening torque:**

**40 N·m (4.1 kgf·m, 29.5 ft·lb)**

- (3) Tighten the two bolts fixing pipe C and D. (bolt A)

**Tightening torque:**

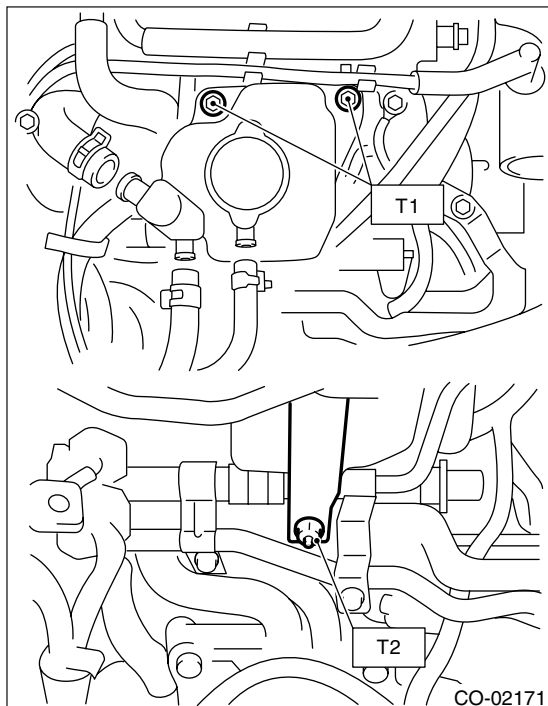
**13 N·m (1.3 kgf·m, 9.4 ft·lb)**

- 2) Install the coolant filler tank. (Turbo model)

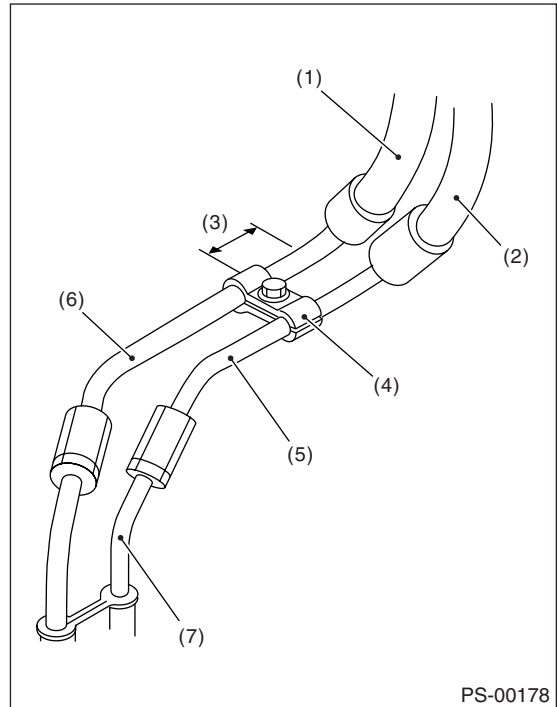
**Tightening torque:**

**T1: 16 N·m (1.6 kgf·m, 11.8 ft·lb)**

**T2: 13 N·m (1.3 kgf·m, 9.4 ft·lb)**



- 3) Temporarily connect the pipe C and D to gear box.

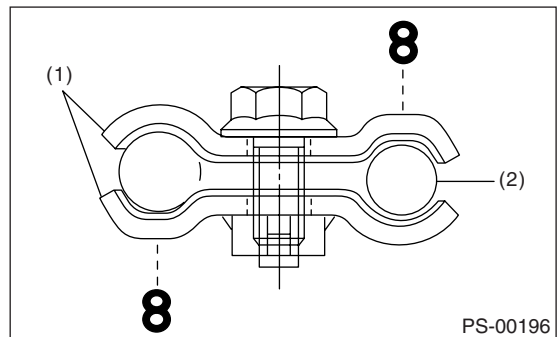


- (1) Return hose
- (2) Pressure hose
- (3) Approx. 30 mm (1.18 in)
- (4) Clamp E
- (5) Pipe C
- (6) Pipe D
- (7) Pipe (Gear box side)

- 4) Temporarily install the clamp E on pipes C and D.

**NOTE:**

Ensure the letter "8" on each clamp are diagonally opposite each other as shown in the figure.



- (1) Clamp E
- (2) Pipe C

- 5) Tighten the clamp E firmly.

**Tightening torque:**

**7.4 N·m (0.75 kgf·m, 5.4 ft·lb)**



# Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

6) Tighten the joint nut.

**Tightening torque:**

**15 N·m (1.5 kgf·m, 10.8 ft·lb)**

7) Connect the pipes A and B to four pipe joints of gearbox. Connect the upper pipe B first, and lower pipe A second.

**Tightening torque:**

**Non-turbo model:**

**13 N·m (1.3 kgf·m, 9.4 ft·lb)**

**Turbo model and STI model:**

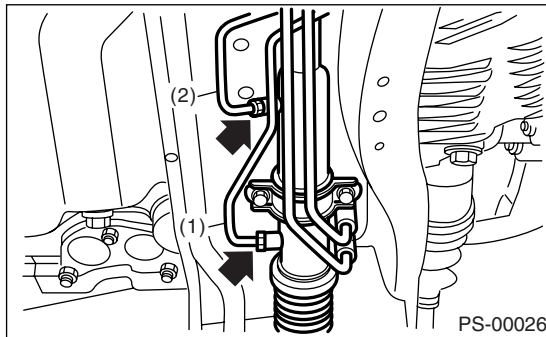
**Housing side:**

**20 N·m (2.0 kgf·m, 14.5 ft·lb)**

**Cylinder side:**

**24 N·m (2.4 kgf·m, 17.4 ft·lb)**

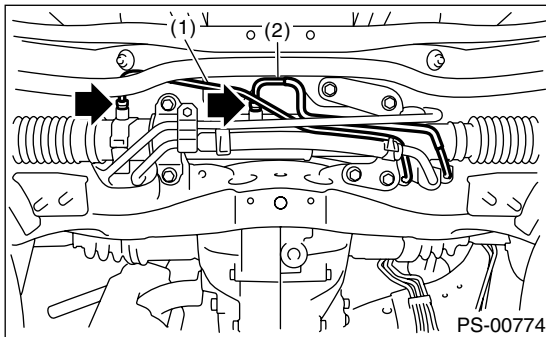
- Non-turbo model



(1) Pipe A

(2) Pipe B

- Turbo model



(1) Pipe A

(2) Pipe B

8) Install the jack-up plate.

9) Install the air intake duct. <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.>

10) Install the air intake duct, air cleaner upper cover and air intake boot.

<Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.>

11) Connect the battery ground cable to battery.

12) Feed the specified fluid.

**CAUTION:**

**Never start the engine before feeding the fluid; otherwise vane pump might be seized up.**

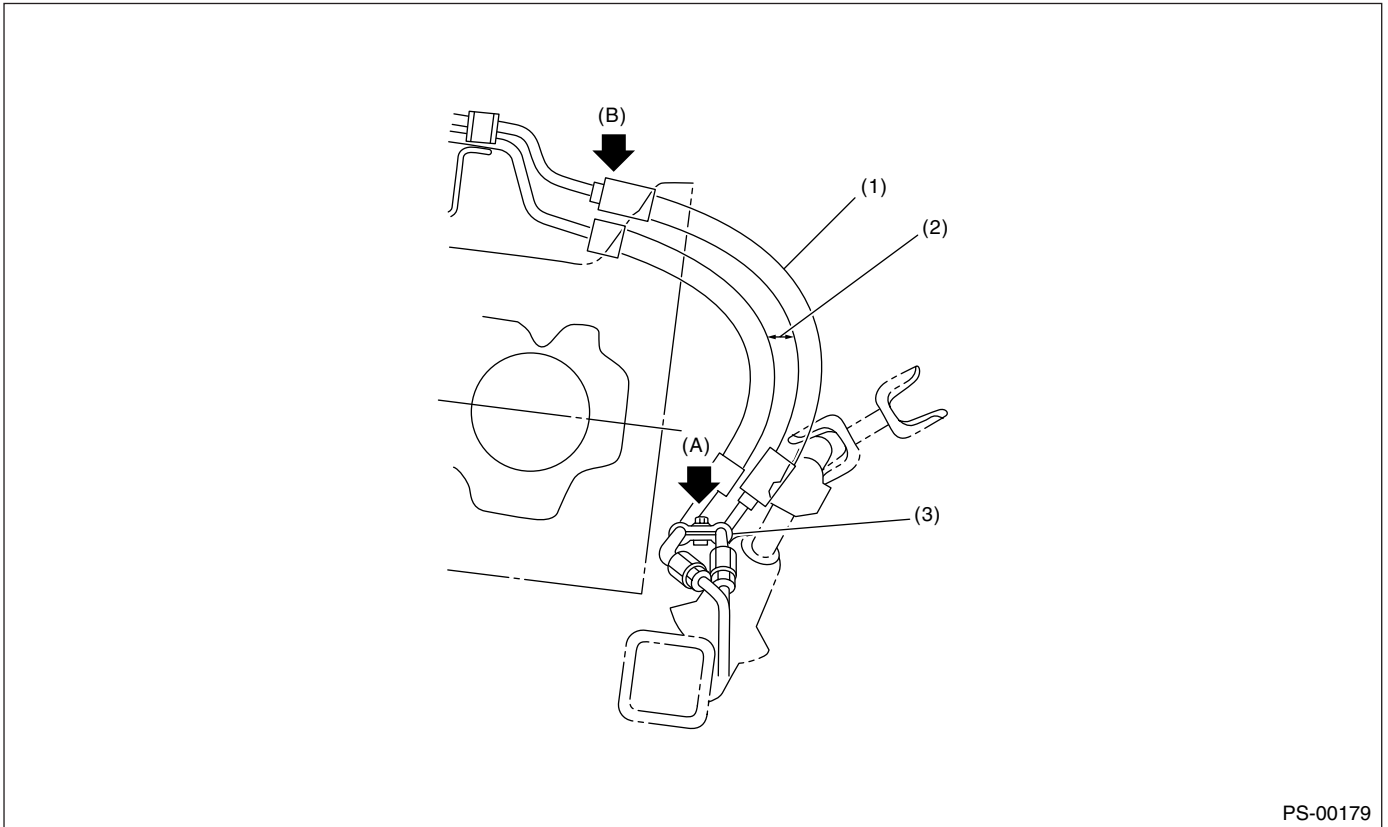


## Pipe Assembly

### POWER ASSISTED SYSTEM (POWER STEERING)

13) Finally check clearance between pipes and/or hoses, as shown above.

If cruise control actuator-to-power steering hose clearance is less than 10 mm (0.39 in), move the portion (A) secured by clamp to other portion, or bend portion (B) to adjust.



PS-00179

(1) High pressure hose

(2) No interference is allowed between hoses.

(3) Clearance between crossmember and pipe: 3 — 8 mm (0.12 — 0.31 in)

# Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

## C: INSPECTION

Check all disassembled parts for wear, damage or other abnormalities. Repair or replace faulty parts as required.

| Part name | Inspection  | Remedy                  |
|-----------|---|-------------------------|
| Pipe      | <ul style="list-style-type: none"> <li>• O-ring fitting surface for damage</li> <li>• Nut for damage</li> <li>• Pipe for damage</li> </ul>  | Replace with a new one. |
| Clamp     | <ul style="list-style-type: none"> <li>• Clamps for weak clamping force</li> </ul>  | Replace with a new one. |
| Hose      | <ul style="list-style-type: none"> <li>• Flared surface for damage</li> <li>• Flare nut for damage</li> <li>• Outer surface for cracks</li> <li>• Outer surface for wear</li> <li>• Clip for damage</li> <li>• End coupling or adapter for degradation</li> </ul> | Replace with a new one. |

### CAUTION:

Although the surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they are likely to be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid and their service lives are to be very shortened. It is very important to keep the hoses free from before mentioned fluids and to wipe out immediately when the hoses are adhered with the fluids.

Since the resistances for heat or low temperature brittleness are gradually declining according to time accumulation of hot or cold conditions for the hoses and their service lives are shortening accordingly, it is necessary to perform the careful inspection frequently when the vehicle is used in hot weather areas, cold weather area and a driving condition in which many steering operations are required in short time.

Particularly, continuous work of relief valve over 5 seconds causes to reduce service lives of the hoses, the oil pump, the fluid, etc. due to over heat.

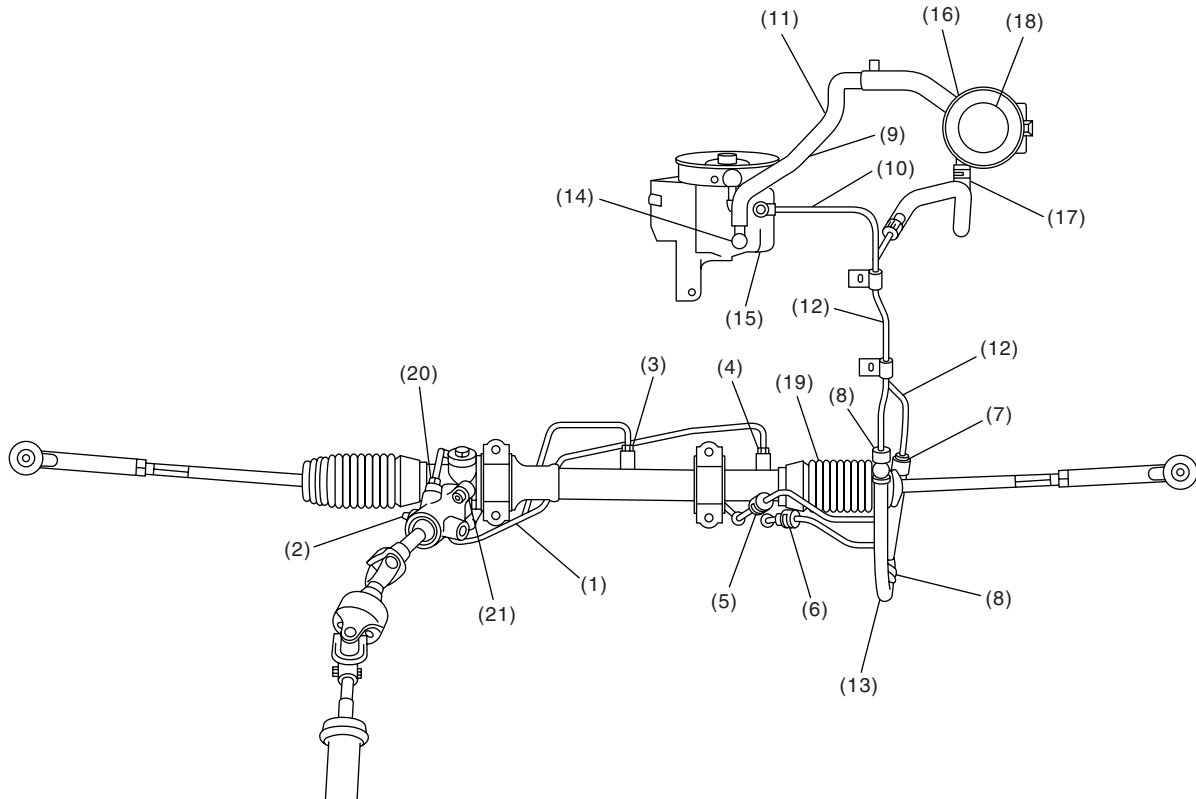
| Trouble                             | Possible cause  | Corrective action                          |
|-------------------------------------|---|--|
| Pressure hose burst                 | Excessive holding time of relief status   | Instruct the customers.                    |
|                                     | Malfunction of relief valve   | Replace the oil pump.                      |
|                                     | Poor cold characteristic of fluid   | Replace the fluid.                         |
| Forced out return hose              | Poor connection   | Correct.                                   |
|                                     | Poor holding of clip  | Retighten.                                 |
|                                     | Poor cold characteristic of fluid   | Replace the fluid.                         |
| Fluid bleeding out of hose slightly | Wrong layout, tensioned   | Replace the hose.                          |
|                                     | Excessive play of engine due to deterioration of engine mounting rubber               | Replace the defective parts.               |
|                                     | Improper stop position of pitching stopper  | Replace the defective parts.               |
| Crack on hose                       | Excessive holding time of relief status   | Replace.<br>Instruct customer.             |
|                                     | Excessive tightening torque for return hose clip                                      | Replace.                                   |
|                                     | Power steering fluid, brake fluid, engine oil, electrolyte adhere on the hose surface | Replace.<br>Pay attention on service work. |
|                                     | Too many times use in extremely cold weather  | Replace.<br>Instruct the customers.        |

# Pipe Assembly

## POWER ASSISTED SYSTEM (POWER STEERING)

### NOTE:

It is likely that although one judges fluid leakage, there is actually no leakage. This is because the fluid spilt during the last maintenance was not completely wiped off. Be sure to wipe off spilt fluid thoroughly after maintenance.



PS-00022

# Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

| Fluid leaking area  | Possible cause  | Corrective action   |
|---|---|---|
| Leakage from connecting portions of pipes and hoses, numbered with (1) through (10) in figure | Insufficient tightening of flare nut, catching dirt or the like, damage to flare or flare nut or eye bolt | Loosen and retighten, if ineffective, replace.  |
|   | Poor insertion of hose, poor clamping   | Retighten or replace the clamp.   |
|   | Damaged O-ring or gasket  | Replace the O-ring or gasket pipe or hose with new one, if ineffective, replace gearbox also. |
| Leakage from hose (11), (12) and (13) in figure   | Crack or damage in hose   | Replace with a new one.   |
|   | Crack or damage in hose hardware  | Replace with a new one.   |
| Leakage from surrounding of cast iron portion of oil pump (14) and (15) in figure             | Damaged O-ring  | Replace the oil pump.   |
|   | Damaged gasket  | Replace the oil pump.   |
| Leakage from oil tank (16) and (17) in figure   | Crack in oil tank   | Replace the oil tank.   |
| Leakage from filler neck (18)   | Damaged cap packing   | Replace the cap.  |
|   | Crack in root of filler neck  | Replace the oil tank.   |
|   | High fluid level  | Adjust the fluid level.   |
| Leakage from surrounding of power cylinder of gearbox (19) in figure                          | Damaged oil seal  | Replace the oil seal.   |
| Leakage from control valve of gearbox (20) and (21) in figure                                 | Damaged packing or oil seal   | Replace the problem parts.  |
|   | Damage in control valve   | Replace the control valve.  |

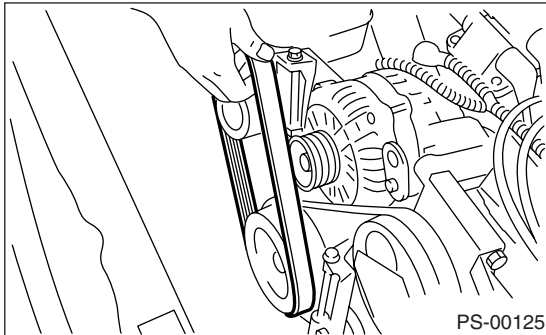
# Oil Pump

## POWER ASSISTED SYSTEM (POWER STEERING)

### 7. Oil Pump

#### A: REMOVAL

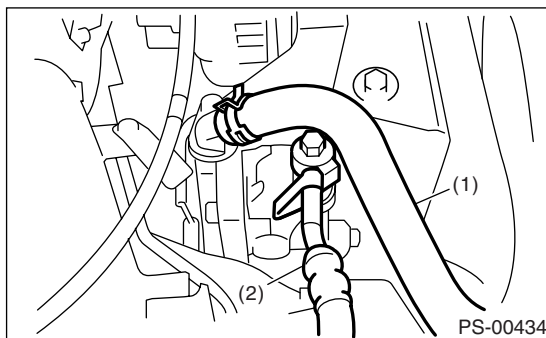
- 1) Disconnect the ground cable from battery.
- 2) Remove the pulley belt cover.
- 3) Loosen the belt tension adjusting bolt and generator securing bolt, and then remove the power steering pump V-belt.



- 4) Disconnect the connector from power steering pump switch.
- 5) Disconnect the pipe C and suction hose from oil pump.

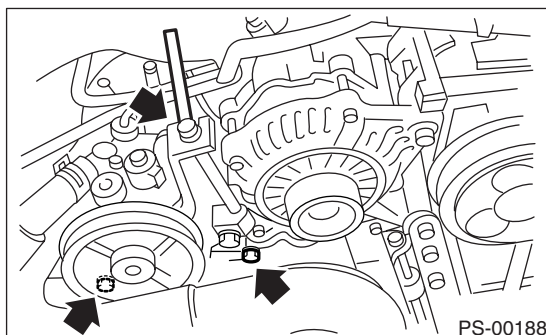
#### CAUTION:

- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose, cover the open ends of them with a clean cloth.



- (1) Suction hose
- (2) Pipe C

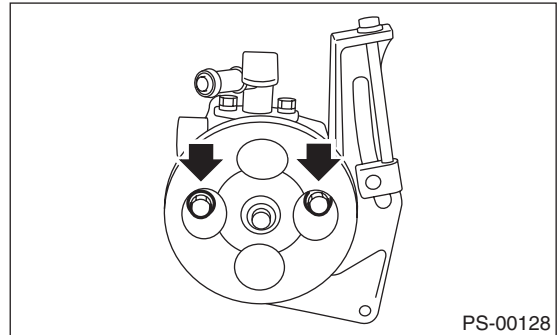
- 6) Remove the bolts which install the power steering pump bracket.



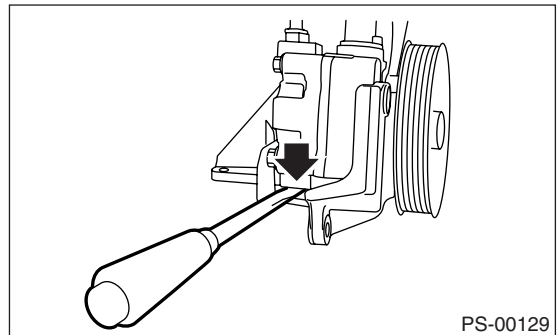
- 7) Place the oil pump bracket in a vise, remove the two bolts from front side of oil pump.

#### CAUTION:

**Do not place the oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.**



- 8) Remove the bolt from the rear side of oil pump.
- 9) Disassemble the oil pump and bracket by inserting a flat tip screwdriver as shown in the figure.



#### B: INSTALLATION

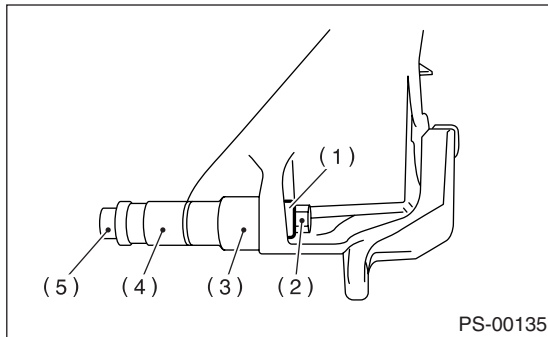
- 1) Install the oil pump to bracket.
  - (1) Place the oil pump bracket in a vise. Tighten the bushing using a 12.7 mm (1/2") type 14 mm and 21 mm box wrench until it is in contact with the oil pump mounting surface.

# Oil Pump

POWER ASSISTED SYSTEM (POWER STEERING)

## CAUTION:

Do not place the oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.

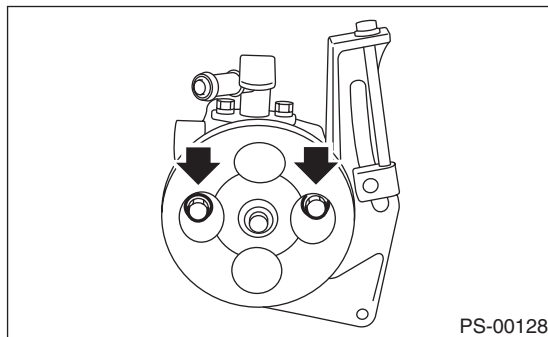


- (1) Bushing
- (2) Nut
- (3) 21 mm
- (4) 14 mm
- (5) Bolt

(2) Tighten the bolts which install the oil pump to bracket.

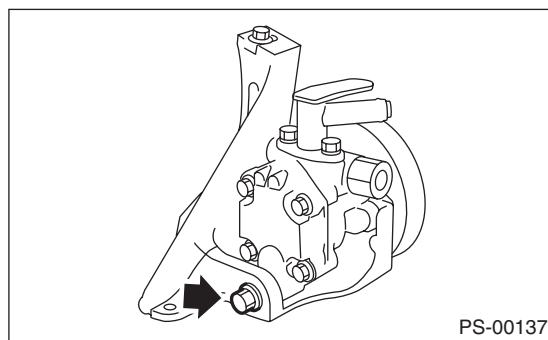
### Tightening torque:

**15.7 N·m (1.6 kgf-m, 11.6 ft-lb)**

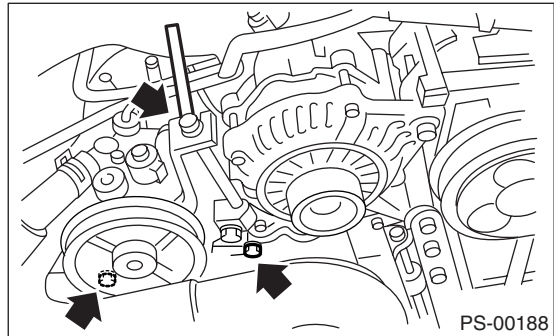


### Tightening torque:

**37.3 N·m (3.8 kgf-m, 27.5 ft-lb)**



2) Tighten the bolts which install the power steering pump bracket.



3) Interconnect the pipe C and suction hose.

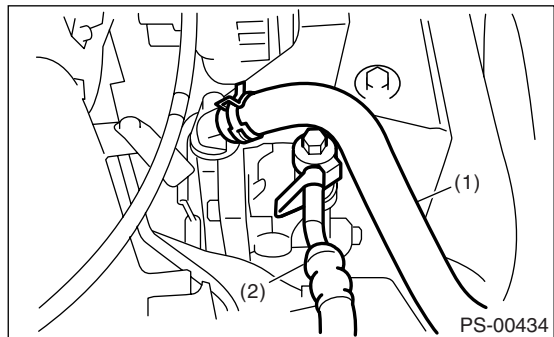
### Tightening torque:

#### Eye bolt

**40 N·m (4.1 kgf-m, 29.5 ft-lb)**

## CAUTION:

If a hose is twisted at this step, the hose may come into contact with some other parts.



- (1) Suction hose
- (2) Pipe C

4) Connect the connector to power steering pump switch.

5) Install the pulley belt to oil pump.

6) Check the pulley belt tension.

<Ref. to ME(H4SO)-41, INSPECTION, V-belt.>

7) Tighten the bolt of belt tension.

### Tightening torque:

**25 N·m (2.5 kgf-m, 18.1 ft-lb)**

8) Install the pulley belt cover.

9) Connect the battery ground cable to battery.

10) Feed the specified power steering fluid. <Ref. to PS-68, Power Steering Fluid.>

## CAUTION:

Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

# Oil Pump

POWER ASSISTED SYSTEM (POWER STEERING)

## C: INSPECTION

### 1. BASIC INSPECTION

Perform the following inspection procedures and repair or replace defective parts.

| No. | Parts               | Inspection                                 | Corrective action  |
|-----|---------------------|--|--|
| 1   | Oil pump (Exterior) | (1) Crack, damage or oil leakage           | Replace the oil pump with a new one.   |
|     |                     | (2) Play of pulley shaft                   | Measure the radial play and axial play. If any of these exceeds the service limit, replace the oil pump with a new one.  |
| 2   | Pulley              | (1) Damage                                 | Replace it with a new one.   |
|     |                     | (2) Bend                                   | Measure the V ditch deflection. If it exceeds the service limit, replace the pulley with a new one.  |
| 3   | Oil pump (Interior) | (1) Defect or burning of vane pump         | Check the resistance to rotation of pulley. If it is past the service limit, replace the oil pump with a new one.  |
|     |                     | (2) Bend in the shaft or damage to bearing | Oil pump emits a noise that is markedly different in tone and loudness from a sound of a new oil pump when turning with a string put around its pulley, replace the oil pump with a new one. |
| 4   | O-ring              | Crack or deterioration                     | Replace it with a new one.   |
| 5   | Bracket             | Crack                                      | Replace it with a new one.   |

### 2. SERVICE LIMIT

Make a measurement as follows. If it exceeds the specified service limit, replace the parts with new ones.

#### CAUTION:

- Fix the oil pump on a vise to make a measurement. At this time, hold the oil pump with least possible force between two wood pieces.
- Do not set outside of flow control valve or pulley on a vise; otherwise outside or pulley might be deformed. Select properly sized wood pieces.

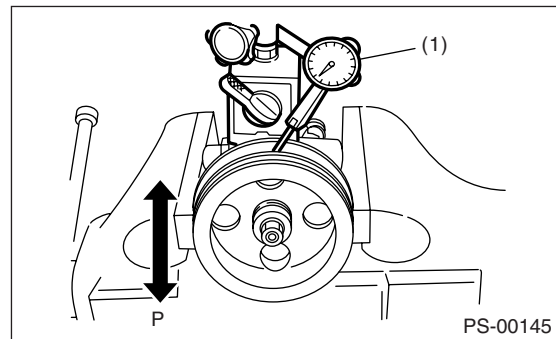
1) Play of the pulley shaft

#### Condition:

**P:** When applying the force of 9.8 N (1.0 kgf, 2.2 lbf)

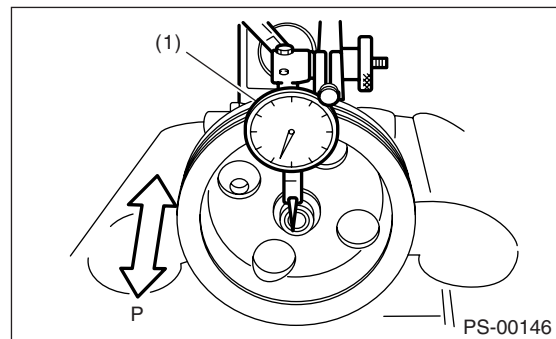
#### Service limit:

**Radial play (Direction ← →)**  
0.4 mm (0.016 in) or less



(1) Dial gauge

**Axial play (Direction ⇄)**  
0.9 mm (0.035 in) or less



(1) Dial gauge

2) Ditch deflection of pulley

# Oil Pump

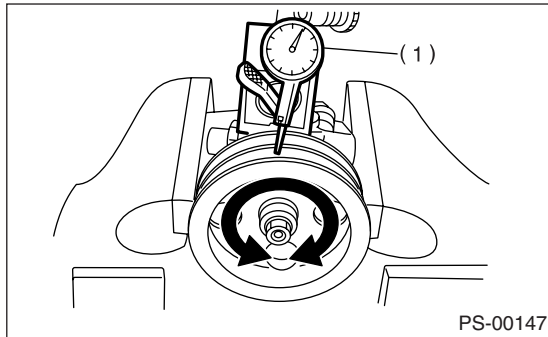
POWER ASSISTED SYSTEM (POWER STEERING)

## Service limit:

**1.0 mm (0.039 in) or less**

### NOTE:

Read the value for one surface of V ditch, and then the value for another off the dial.



(1) Dial gauge

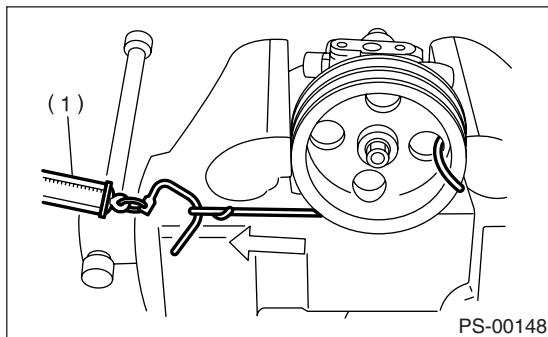
### 3) Resistance to rotation of pulley

## Service limit:

**Maximum load: 9.22 N (0.94 kgf, 2.07 lbf) or less**

### NOTE:

- A rather higher value may be indicated when pulley starts turning.
- Measure the load during rotation and make a judgment.



(1) Spring balance

## 3. HYDRAULIC PRESSURE

### NOTE:

- Be sure to complete all items aforementioned in "INSPECTION", prior to measuring hydraulic pressure. Otherwise, pressure can not be measured correctly. <Ref. to PS-69, INSPECTION, General Diagnostic Table.>
- Do not leave the valve of pressure gauge closed or hold the steering wheel at stop end for 5 seconds or more in any case, as the oil pump may be damaged due to long keep of these conditions.
- Put a cotton cloth waste at a place where fluid drops before the pressure gauge is installed. Wipe off split fluid thoroughly after the measurement.

### 1) REGULAR PRESSURE MEASUREMENT

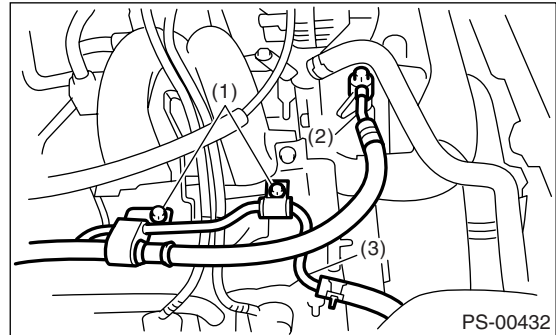
- (1) Connect the ST1, ST2 and ST3.

ST1 925711000 PRESSURE GAUGE

ST2 34099AC020 ADAPTER HOSE B

ST3 34099AC010 ADAPTER HOSE A

- (2) Remove the air intake duct.
- (3) Disconnect the pipe C from the pump.
- (4) Using the gasket (Part No. 34621AC022) and bolt (Part No. 34620AC010), install the ST2 to the pump instead of pipe C.



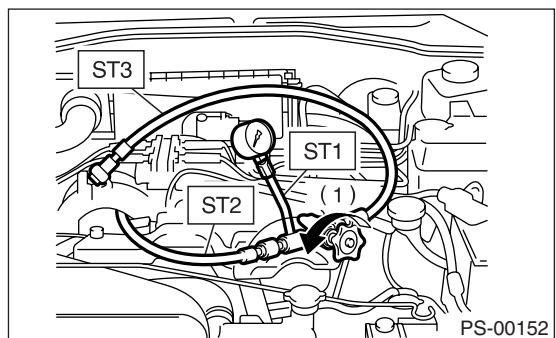
- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

- (5) Install the ST3 to end of pipe C removed from pump.
- (6) Replenish power steering fluid up to the specified level.
- (7) Open the valve, and start the engine.
- (8) Measure the regular pressure.

ST1 925711000 PRESSURE GAUGE

ST2 34099AC020 ADAPTER HOSE B

ST3 34099AC010 ADAPTER HOSE A



(1) Valve

## Service limit:

**981 kPa (10 kgf/cm<sup>2</sup>, 142 psi) or less**

- (9) If it is not within the specified value, replace the troubled part caused by the following symptoms; pipe or hose clogged, leaks from fluid line, and mix of foreign objects in fluid line.

### 2) Measure the relief pressure.

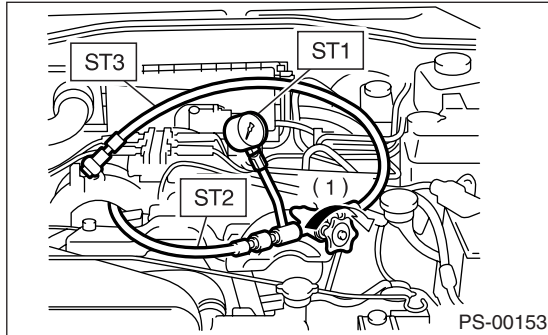
- (1) Using the STs, measure the relief pressure.



# Oil Pump

## POWER ASSISTED SYSTEM (POWER STEERING)

- (2) Close the valve.
  - (3) Measure the relief pressure.
- ST1 925711000 PRESSURE GAUGE  
ST2 34099AC020 ADAPTER HOSE B  
ST3 34099AC010 ADAPTER HOSE A



(1) Valve

### Service limit:

#### Non-turbo model:

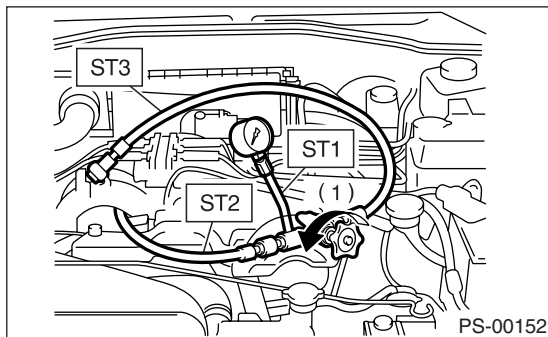
6,700 — 7,400 kPa (68 — 75 kgf/cm<sup>2</sup>, 972 — 1,073 psi)

#### Turbo model and STI model:

7,350 — 8,036 kPa (75 — 82 kgf/cm<sup>2</sup>, 1,067 — 1,165 psi)

- (4) If it is within the specified value, measure the steering effort. <Ref. to PS-72, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.> If it is not within specified value, replace the control valve itself or control valve and pinion as a single unit with new ones.
- 3) Measure the working pressure.
- (1) Using the STs, measure the working pressure.
  - (2) Open the valve.
  - (3) Measure the working pressure of control valve by turning wheel from stop to stop.

- ST1 925711000 PRESSURE GAUGE  
ST2 34099AC020 ADAPTER HOSE B  
ST3 34099AC010 ADAPTER HOSE A



(1) Valve

### Service limit:

#### Non-turbo model:

6,700 — 7,400 kPa (68 — 75 kgf/cm<sup>2</sup>, 972 — 1,073 psi)

#### Turbo model and STI model:

7,350 — 8,036 kPa (75 — 82 kgf/cm<sup>2</sup>, 1,067 — 1,165 psi)

- (4) If it is within the specified value, measure the steering effort. <Ref. to PS-72, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.> If it is not within specified value, replace the control valve itself or control valve and pinion as a single unit with new ones.

# Reservoir Tank

POWER ASSISTED SYSTEM (POWER STEERING)

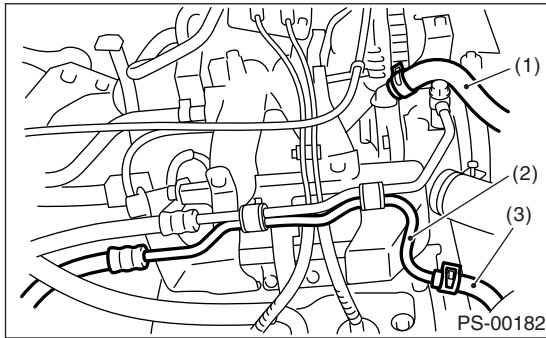
## 8. Reservoir Tank

### A: REMOVAL

- 1) Remove the air intake duct. <Ref. to IN(H4SO)-7, REMOVAL, Air Intake Duct.>
- 2) Drain fluid from the reservoir tank.
- 3) Disconnect the pipe D from return hose and suction hose from oil pump.

#### CAUTION:

- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.

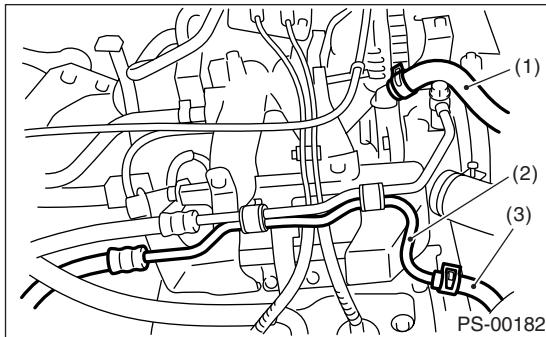


- (1) Suction hose
- (2) Pipe D
- (3) Return hose

- 4) Remove the reservoir tank from bracket by pulling it upwards.

### B: INSTALLATION

- 1) Install the reservoir tank to bracket.
- 2) Connect the pipes D to return hose and suction hose to oil pump.



- (1) Suction hose
- (2) Pipe D
- (3) Return hose

- 3) Feed the power steering fluid to the specified level. <Ref. to PS-68, Power Steering Fluid.>

# Power Steering Fluid

POWER ASSISTED SYSTEM (POWER STEERING)

## 9. Power Steering Fluid

### A: SPECIFICATION

| Recommended power steering fluid | Manufacturer |
|----------------------------------|--------------|
| ATF DEXRON III or equivalent     | B.P.         |
|                                  | CALTEX       |
|                                  | CASTROL      |
|                                  | MOBIL        |
|                                  | SHELL        |
|                                  | TEXACO       |

### B: INSPECTION

1) Check the power steering fluid for deterioration or contamination. If the fluid is highly deteriorated or contaminated, drain it and refill with new fluid.

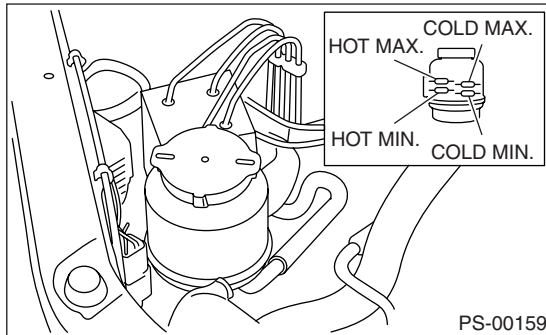
2) Check the joints and units for oil leakage. If any oil leaks are found, repair or replace the applicable part.

3) Inspect the fluid level on flat and level surface with engine "OFF" by indicator of reservoir tank.

If the level is at MIN. point or below, add fluid to keep the level in the specified range of the indicator. If at MAX. point or above, drain fluid by using a syringe or the like.

(1) Check at power steering fluid temperature 20°C (68°F); read the fluid level on the "COLD" side.

(2) Check at power steering fluid temperature 80°C (176°F); read the fluid level on the "HOT" side.



### C: REPLACEMENT

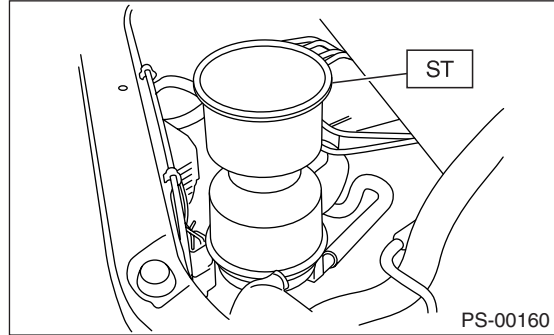
1) Lift up the vehicle.

2) Remove the jack up plate.

3) Remove the pipe joint in center of gear box, and then install the vinyl hose to pipe and joint. Drain the fluid while turning steering wheel.

4) Set the ST on top of reservoir tank and fill it about half way with the specified fluid.

ST 34199AE040 OIL CHARGE GUIDE



5) Continue to turn the steering wheel slowly from lock to lock until bubbles stop appearing on oil surface while keeping the fluid at that level.

6) If turning the steering wheel in low fluid level condition, air will be sucked in pipe. In this case, leave it about half an hour and then do the step 5) again.

7) Lift up the vehicle, start the engine and let it idle.

8) Continue to turn the steering wheel slowly from lock to lock again until bubbles stop appearing on oil surface while keeping the fluid at that level.

It is normal that bubbles stop appearing after three times turning of steering wheel from lock to lock.

9) In case the bubbles do not stop appearing in the tank, leave it about half an hour and then do the step 4) all over again.

10) Lower the vehicle, and then idle the engine.

11) Continue to turn the steering wheel from lock to lock until bubbles stop appearing and change of the fluid level is within 3 mm (0.12 in).

12) In case the following happens, leave it about half an hour and then do step 8) to 11) again.

(1) The fluid level changes over 3 mm (0.12 in).

(2) Bubbles remain on the upper surface of the fluid.

(3) Grinding noise is generated from oil pump.

13) Check the fluid leakage after turning steering wheel from lock to lock with engine running.

# General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

## 10. General Diagnostic Table

### A: INSPECTION

| Trouble   | Possible cause   | Corrective action                                    |
|---|--|--|
| <ul style="list-style-type: none"> <li>• Heavy steering effort in all ranges</li> <li>• Heavy steering effort at stand still</li> <li>• Steering wheel surges when turning.</li> </ul>        | 1. Pulley belt <ul style="list-style-type: none"> <li>• Unequal length of pulley belts</li> <li>• Adhesion of oil and grease</li> <li>• Loose or damage of pulley belt</li> <li>• Poor uniformity of pulley belt cross section</li> <li>• Pulley belt touches to pulley bottom</li> <li>• Poor revolution of pulleys (except oil pump pulley)</li> <li>• Poor revolution of oil pump pulley</li> </ul> | Adjust or replace.                                   |
|   | 2. Tire and wheel <ul style="list-style-type: none"> <li>• Improper tires out of specification</li> <li>• Improper wheels out of specification</li> <li>• Tires not properly inflated *1</li> </ul>  | Replace or reinflate.                                |
|   | 3. Fluid <ul style="list-style-type: none"> <li>• Low fluid level</li> <li>• Aeration</li> <li>• Dust mix</li> <li>• Deterioration of fluid</li> <li>• Poor warming-up of fluid *2</li> </ul>  | Refill, bleed air, replace or instruct the customer. |
|   | 4. Idle speed <ul style="list-style-type: none"> <li>• Lower idle speed</li> <li>• Excessive drop of idle speed at start or at turning steering wheel *3</li> </ul>  | Adjust or instruct the customer.                     |
|   | 5. Measure hydraulic pressure. <Ref. to PS-64, INSPECTION, Oil Pump.>  | Replace the problem parts.                           |
|   | 6. Measure steering effort. <Ref. to PS-69, INSPECTION, General Diagnostic Table.>   | Adjust or replace.                                   |
| <ul style="list-style-type: none"> <li>• Vehicle leads to one side or the other.</li> <li>• Poor return of steering wheel to center</li> <li>• Steering wheel surges when turning.</li> </ul> | 1. Fluid line <ul style="list-style-type: none"> <li>• Folded hose</li> <li>• Flattened pipe</li> </ul>  | Reform or replace.                                   |
|   | 2. Tire and wheel <ul style="list-style-type: none"> <li>• Flat tire</li> <li>• Mix use of different tires</li> <li>• Mix use of different wheels</li> <li>• Abnormal wear of tire</li> <li>• Unbalance of remained grooves</li> <li>• Unbalance of tire pressure</li> </ul>   | Adjust, fix or replace.                              |
|   | 3. Front alignment <ul style="list-style-type: none"> <li>• Improper or unbalance caster</li> <li>• Improper or unbalance toe-in</li> <li>• Loose connection of suspension</li> </ul>  | Adjust or retighten.                                 |
|   | 4. Others <ul style="list-style-type: none"> <li>• Damaged joint assembly</li> <li>• Unbalanced height</li> <li>• One-sided weight</li> </ul>  | Replace, adjust or instruct the customer.            |
|   | 5. Measure steering effort. <Ref. to PS-69, INSPECTION, General Diagnostic Table.>   | Adjust or replace.                                   |

\*1 If tires and/or wheels are wider, the load to power steering system is the more. Accordingly, in a condition, for example before fluid warms-up, relief valve may work before maximum turning angle. In this case, steering effort may be heavy. When measured hydraulic pressure is normal, there is no abnormal thing.

\*2 In cold weather, steering effort may be heavy due to increased flow resistance of cold fluid. After warming-up engine, turn steering wheel from stop to stop several times to warm-up fluid. Then if steering effort reduces normally, there is no abnormal thing.

\*3 In cold weather or with insufficient warm-up of engine, steering effort may be heavy due to excessive drop of idling when turning steering wheel. In this case, it is recommended to start the vehicle with increasing engine speed than usual. Then if steering effort reduces normally, there is no abnormal thing.

# General Diagnostic Table

## POWER ASSISTED SYSTEM (POWER STEERING)

### 1. NOISE AND VIBRATION

**CAUTION:**

**Don't keep the relief valve operated over 5 seconds at any time or inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.**

**NOTE:**

- Grinding noise may be heard immediately after the engine start in extremely cold condition. In this case, if the noise goes off during warm-up there is no abnormal function in the system. This is due to the fluid characteristic in extremely cold condition.
- Oil pump makes whine or growl noise slightly due to its mechanism. Even if the noise can be heard when steering wheel is turned at stand still there is no abnormal function in the system provided that the noise eliminates when the vehicle is running.
- When turning the steering wheel with service brake and/or parking brake applied, the noise is generated by creaking between disk and pads. However this does not indicate abnormal function in system.
- There may be a little vibration around the steering devices when turning steering wheel at standstill, even though the component parts have no defects.

Hydraulic systems are likely to generate this kind of vibration as well as working noise and fluid noise because of combined conditions, i.e., road surface and tire surface, engine speed and turning speed of steering wheel, fluid temperature and braking condition.

This phenomena does not indicate there is some abnormal function in the system.

The vibration can be known when steering wheel is turned repeatedly at various speeds from slow to rapid step by step with parking brake applied on concrete road and in "D" range for AT model.

| Trouble  | Possible cause   | Corrective action   |
|--|--|---|
| Hiss noise (continuous)<br>While engine is running.  | Relief valve emits operating sound when steering wheel is completely turned in either direction. (Don't keep this condition over 5 seconds.) | Normal  |
|  | Relief valve emits operating sound when steering wheel is not turned. This means that the relief valve is faulty.                            | Replace the oil pump.   |
| Rattling noise (intermittent)<br>While engine is running.  | Interference with adjacent parts   | Check the clearance.<br>Correct if necessary.<br><Ref. to PS-59, INSPECTION,<br>Pipe Assembly.> |
|  | Loosened installation of oil pump, oil tank, pump bracket, gearbox or crossmember  | Retighten.  |
|  | Loosened installation of oil pump pulley or other pulley(s)  | Retighten.  |
|  | Loosened linkage or play of steering or suspension Loosened tightening of joint or steering column   | Retighten or replace.   |
|  | Sound generates from the inside of gearbox or oil pump.  | Replace the faulty parts of gearbox or oil pump.  |
| Knocking<br>When turning steering wheel in both direction with small angle repeatedly at engine ON or OFF. | Excessive backlash<br>Loosened lock nut for adjusting backlash   | Adjust and retighten.   |
|  | Loosened tightening or play of tie-rod, or tie-rod end   | Retighten or replace.   |
| Grinding noise (continuous)<br>While engine is running.  | Vane pump aeration   | Inspect and retighten the fluid line connection.<br>Refill fluid and vent air.                  |
|  | Vane pump seizing  | Replace the oil pump.   |
|  | Pulley bearing seizing of oil pump   | Replace the oil pump.   |
|  | Folded hose, flat pipe   | Replace.  |
| Squeal, squeak (intermittent or continuous)<br>While engine is running.                                    | Maladjustment of pulley belt<br>Damaged or charged pulley belt<br>Unequal length of pulley belts   | Adjust or replace.<br>(Replace two belts as a set.)   |
|  | Run out or soilage of V-groove surface of oil pump pulley  | Clean or replace.   |

## General Diagnostic Table

### POWER ASSISTED SYSTEM (POWER STEERING)

| Trouble  | Possible cause   | Corrective action  |
|--|--|--|
| Sizzling noise (continuous)<br>While engine is running.  | Fluid aeration   | Fix the wrong part causing aeration.<br>Replace the fluid and vent air.                    |
|  | Damaged pipe of gearbox  | Replace the pipe.  |
|  | Abnormal inside of hose or pipe<br>Flat hose or pipe                           | Rectify or replace.  |
|  | Abnormal inside of oil tank  | Replace.   |
|  | Removed oil tank cap   | Install the cap.   |
| Whistle (continuous)<br>While engine is running.   | Abnormal pipe of gearbox or abnormal inside of hose                            | Replace the faulty parts of gearbox or hose.   |
| Whine or growl (continuous or intermittent)<br>While engine is running with/<br>without steering turned. | Loosened installation of oil pump, oil pump bracket                            | Retighten.   |
|  | Abnormal inside of oil pump, hose  | Replace the oil pump, hose, if the noise can be heard when running as well as stand still. |
|  | Torque converter growl, air conditioner compression growl                      | Remove the power steering pulley belt and confirm.   |
| Creaking noise (intermittent)<br>While engine is running with<br>steering turned.                        | Abnormal inside of gearbox   | Replace the faulty parts of gearbox.   |
|  | Abnormal bearing for steering shaft  | Apply grease or replace.   |
|  | Generates when turning steering wheel with brake (service or parking) applied. | If the noise goes off when brake is released, it is normal.                                |
| Vibration<br>While engine is running with/<br>without steering turned.                                   | Too low engine speed   | Adjust and instruct customers.   |
|  | Vane pump aeration   | Fix the wrong part.<br>Vent air.   |
|  | Damaged valve in oil pump, gearbox   | Replace the oil pump, faulty parts of gearbox.   |
|  | Looseness of play of steering, suspension parts                                | Retighten.   |

## General Diagnostic Table

### POWER ASSISTED SYSTEM (POWER STEERING)

#### 2. MEASUREMENT OF STEERING EFFORT

| Step   | Check   | Yes   | No   |
|--|---|---|--|
| <b>1 CHECK STEERING EFFORT.</b><br>1) Stop the vehicle on a concrete road.<br>2) Start the engine.<br>3) Idle the engine.<br>4) Install the spring scale on the steering wheel.<br>5) Pull the spring scale at an right angle to steering wheel, and measure both right and left steering wheel effort.<br>NOTE:<br>When turning the steering more quickly than necessary from a direction to the other direction at an engine speed over 2,000 rpm, steering effort may be heavy. This is caused by flow characteristic of oil pump and is not a problem. | Is the steering effort less than 31.4 N (3.2 kgf, 7.1 lbf)?   | Go to step 2.                               | Adjust the backlash.   |
| <b>2 CHECK STEERING EFFORT.</b><br>1) Stop the engine.<br>2) Pull the spring scale at an right angle to the steering wheel, and measure both right and left steering wheel effort.   | Is the steering effort less than 294.2 N (30 kgf, 66.2 lbf)?  | Go to step 3.                               | Perform adjustment.  |
| <b>3 CHECK STEERING WHEEL EFFORT.</b><br>1) Remove the universal joint.<br>2) Measure the steering wheel effort.   | Is the maximum steering effort less than 2.26 N (0.23 kgf, 0.51 lbf)?   | Go to step 4.                               | Check, adjust and replace if necessary.                              |
| <b>4 CHECK STEERING WHEEL EFFORT.</b><br>Measure the steering wheel effort.  | Is the difference of steering effort between clockwise and counterclockwise less than 20%?  | Go to step 5.                               | Check, adjust and replace if necessary.                              |
| <b>5 CHECK UNIVERSAL JOINT.</b><br>Measure the swing torque of the joint (yoke of steering column side). <Ref. to PS-21, INSPECTION, Universal Joint.>   | Is the swing torque less than 7.3 N (0.74 kgf, 1.64 lbf)?   | Go to step 6.                               | Replace with new one.  |
| <b>6 CHECK UNIVERSAL JOINT.</b><br>Measure the swing torque of the joint (yoke of gearbox side). <Ref. to PS-21, INSPECTION, Universal Joint.>   | Is the swing torque less than 3.8 N (0.39 kgf, 0.86 lbf)?   | Go to step 7.                               | Replace with new one.  |
| <b>7 CHECK FRONT WHEEL.</b><br>Check the front wheel.  | Are the front wheels for unsteady revolution or rattling and brake for dragging?  | Inspect, readjust and replace if necessary. | Go to step 8.  |
| <b>8 CHECK TIE-ROD ENDS.</b><br>Remove the tie-rod ends.   | Are the tie-rod ends of suspension for unsteady revolution or rattling?   | Inspect and replace if necessary.           | Go to step 9.  |
| <b>9 CHECK BALL JOINT.</b><br>Remove the ball joint.   | Are the ball joints of suspension for unsteady revolution or rattling?  | Inspect and replace if necessary.           | Go to step 10.   |
| <b>10 CHECK GEARBOX.</b><br>Measure the rotating of gearbox.<br><Ref. to PS-52, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox.>  | Is the rotating resistance of gear box less than 10.5 N (1.1 kgf, 2.4 lbf)? Is the difference between clockwise and counterclockwise 20%? | Go to step 11.                              | Readjust the backlash, and if ineffective, replace the faulty parts. |
| <b>11 CHECK GEARBOX.</b><br>Measure the sliding of gearbox.<br><Ref. to PS-51, SERVICE LIMIT, INSPECTION, Steering Gearbox.>   | Is the sliding resistance of gear box less than 400 N (41 kgf, 90 lbf)? Is the difference between right and left 20%?                     | Steering effort is normal.                  | Readjust the backlash, and if ineffective, replace the faulty parts. |

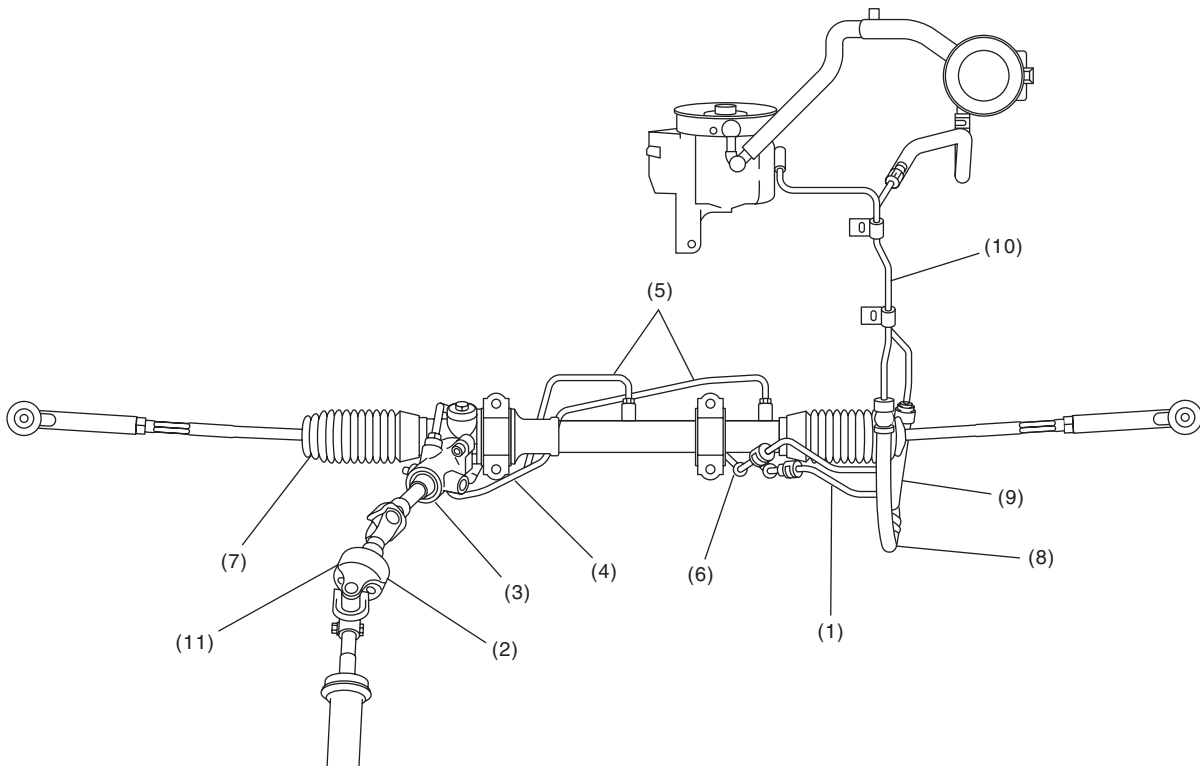
# General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

## 3. CLEARANCE CHECK

This table lists various clearances that must be correctly adjusted to ensure the normal vehicle driving without interfering noise, or any other faults.

| Location   | Minimum allowance |
|--|-------------------|
| (1) Crossmember — Pipe                               | 5 mm (0.20 in)    |
| (2) DOJ — Shaft or joint                             | 14 mm (0.55 in)   |
| (3) DOJ — Valve housing                              | 11 mm (0.43 in)   |
| (4) Pipe — Pipe                                      | 2 mm (0.08 in)    |
| (5) Stabilizer — Pipe                                | 5 mm (0.20 in)    |
| (6) Exhaust pipe — Pipe                              | 11 mm (0.43 in)   |
| (7) Exhaust pipe — Gearbox bolt                      | 15 mm (0.59 in)   |
| (8) Side frame — Hose A and B                        | 10 mm (0.39 in)   |
| (9) Cruise control pump — Hose A and B               | 15 mm (0.59 in)   |
| (10) Pipe portion of hose A — Pipe portion of hose B | 1.5 mm (0.059 in) |
| (11) AT cooling hose — Joint                         | 20 mm (0.79 in)   |



PS-00773



# General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

---

**BODY SECTION**

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

|   |                 |
|---|-----------------|
| <b>HVAC SYSTEM<br/>(HEATER, VENTILATOR AND A/C)</b> | <b>AC</b>       |
| <b>HVAC SYSTEM (AUTO A/C)<br/>(DIAGNOSTICS)</b>     | <b>AC(diag)</b> |
| <b>AIRBAG SYSTEM</b>                                | <b>AB</b>       |
| <b>AIRBAG SYSTEM (DIAGNOSTICS)</b>                  | <b>AB(diag)</b> |
| <b>OCCUPANT DETECTION SYSTEM<br/>(DIAGNOSTICS)</b>  | <b>OD(diag)</b> |
| <b>SEAT BELT SYSTEM</b>                             | <b>SB</b>       |
| <b>LIGHTING SYSTEM</b>                              | <b>LI</b>       |
| <b>WIPER AND WASHER SYSTEMS</b>                     | <b>WW</b>       |
| <b>ENTERTAINMENT</b>                                | <b>ET</b>       |
| <b>COMMUNICATION SYSTEM</b>                         | <b>COM</b>      |
| <b>GLASS/WINDOWS/MIRRORS</b>                        | <b>GW</b>       |
| <b>BODY STRUCTURE</b>                               | <b>BS</b>       |
| <b>INSTRUMENTATION/DRIVER INFO</b>                  | <b>IDI</b>      |
| <b>SEATS</b>  | <b>SE</b>       |
| <b>SECURITY AND LOCKS</b>                           | <b>SL</b>       |
| <b>SUNROOF/T-TOP/CONVERTIBLE TOP<br/>(SUNROOF)</b>  | <b>SR</b>       |
| <b>EXTERIOR/INTERIOR TRIM</b>                       | <b>EI</b>       |



**BODY SECTION**

**EXTERIOR BODY PANELS**

**EB**

**CRUISE CONTROL SYSTEM**

**CC**

**CRUISE CONTROL SYSTEM  
(DIAGNOSTICS)**

**CC(ETC)(diag)**

**IMMOBILIZER (DIAGNOSTICS)**

**IM(diag)**

**OPTION PARTS**

**OP**



# HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

# AC

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## General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

### 1. General Description

#### A: SPECIFICATION

##### 1. HEATER SYSTEM

| Item                                       |                                      | Specifications                                   | Condition  |
|--|--------------------------------------|--|--|
| Heating capacity                           |                                      | 5.0 kW (4,300 kcal/h, 17,062 BTU/h) or more      | <ul style="list-style-type: none"> <li>Mode selector switch: HEAT</li> <li>Temperature control switch: FULL HOT</li> <li>Temperature difference between hot water and inlet air: 65°C (149°F)</li> <li>Hot water flow rate: 360 ℓ (95.1 US gal, 79.2 Imp gal)/h</li> </ul> |
| Air flow rate                              |                                      | 280 m <sup>3</sup> (9,888 cu ft)/h               | Heat mode (FRESH), FULL HOT at 12.5 V  |
| Max air flow rate                          |                                      | 450 m <sup>3</sup> (15,892 cu ft)/h              | <ul style="list-style-type: none"> <li>Temperature control switch: FULL COLD</li> <li>Blower fan speed: MAX</li> <li>Mode selector lever: RECIRC</li> </ul>  |
| Heater core size (height × length × width) |                                      | 163.9 × 200 × 25.0 mm (6.45 × 7.87 × 0.984 in)   | —  |
| Blower motor                               | Type                                 | Magnet motor 200 W or less                       | at 12 V  |
|  | Fan type and size (diameter × width) | Sirocco fan type<br>150 × 75 mm (5.91 × 2.95 in) | —  |

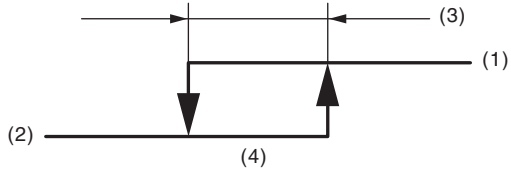
##### 2. A/C SYSTEM

###### • AUTO A/C MODEL

| Item                    |                              | Specifications   |
|-------------------------|------------------------------|--|
| Type of air conditioner |                              | Reheat air-mix type  |
| Cooling capacity        |                              | 5.1 kW (4,385 kcal/h, 17,402 BTU/h)  |
| Refrigerant             |                              | HFC-134a (CH <sub>2</sub> FCF <sub>3</sub> )<br>[0.5±0.05 kg (0.99±0.11 lb)] |
| Compressor              | Type                         | Vane rotary, fix volume (CR-14)  |
|                         | Discharge                    | 144 cm <sup>3</sup> (8.79 cu in)/rev   |
|                         | Max. permissible speed       | 7,000 rpm  |
| Magnet clutch           | Type                         | Dry, single-disc type  |
|                         | Power consumption            | 47 W   |
|                         | Type of belt                 | V-belt 4 PK  |
|                         | Pulley dia. (effective dia.) | 125 mm (4.92 in)   |
|                         | Pulley ratio                 | 1.064  |
| Condenser               | Type                         | Corrugated fin (Sub cool type)   |
|                         | Core face area               | 0.21 m <sup>2</sup> (2.26 sq ft)   |
|                         | Core thickness               | 16 mm (0.63 in)  |
|                         | Radiation area               | 5.34 m <sup>2</sup> (57.48 sq ft)  |
| Receiver drier          | Effective inner capacity     | 250 cm <sup>3</sup> (15.26 cu in)  |
| Expansion valve         | Type                         | Internal equalizing  |
| Evaporator              | Type                         | Single tank  |
|                         | Dimensions (W × H × T)       | 255 × 200 × 48 mm (10 × 7.87 × 1.89 in)                                      |
| Blower fan              | Fan type                     | Sirocco fan  |
|                         | Outer diameter × width       | 150 × 75 mm (5.91 × 2.95 in)   |
|                         | Power consumption            | 200 W  |

# General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

| Item  |  | Specifications  |  |
|---|--|---|--|
| Condenser fan (Sub fan)   | Motor type                                 | Magnet  |  |
|   | Power consumption                          | 120 W   |  |
|   | Fan outer diameter                         | 320 mm (12.6 in)  |  |
| Radiator fan (Main fan)   | Motor type                                 | Magnet  |  |
|   | Power consumption                          | 120 W   |  |
|   | Fan outer diameter                         | 320 mm (12.6 in)  |  |
| Idling speed (A/C ON)   |  | MPFI model  | 850±100 rpm  |
| Dual switch<br>(Pressure switch)  | Low-pressure switch<br>operating pressure  | ON → OFF  | 278±29 kPa<br>(2.83±0.3 kgf/cm <sup>2</sup> , 40.3±4.2 psi)  |
|   |  | OFF → ON  | 287 <sup>+39</sup> <sub>-25</sub> kPa<br>(2.9 <sup>+0.4</sup> <sub>-0.25</sub> kgf/cm <sup>2</sup> , 42 <sup>+5.7</sup> <sub>-3.6</sub> psi) |
|   | High-pressure switch<br>operating pressure | ON → OFF  | 2,800±100 kPa<br>(29±1 kgf/cm <sup>2</sup> , 406±15 psi)   |
|   |  | Difference  | 600±200 kPa<br>(6.12±2 kgf/cm <sup>2</sup> , 87±29 psi)  |
| Thermo control amplifier working temperature<br>(Evaporator outlet air) |  |          |  |
|   |  | AC-00601<br><br>(1) ON<br>(2) OFF<br>(3) 2.5±0.5°C (36.5±0.9°F)<br>(4) 1.5±0.5°C (35±0.9°F) |  |

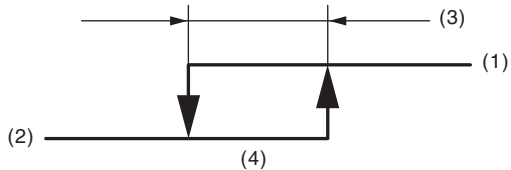
• **MANUAL A/C MODEL**

| Item                    |                              | Specifications   |  |
|-------------------------|------------------------------|--|--|
| Type of air conditioner |                              | Reheat air-mix type  |  |
| Cooling capacity        |                              | 5.1 kW (4,385 kcal/h, 17,402 BTU/h)  |  |
| Refrigerant             |                              | HFC-134a (CH <sub>2</sub> FCF <sub>3</sub> )<br>[0.5±0.05 kg (1.10±0.11 lb)] |  |
| Compressor              | Type                         | Vane rotary, fix volume (CR-14)  |  |
|                         | Discharge                    | 144 cm <sup>3</sup> (8.79 cu in)/rev   |  |
|                         | Max. permissible speed       | 7,000 rpm  |  |
| Magnet clutch           | Type                         | Dry, single-disc type  |  |
|                         | Power consumption            | 47 W   |  |
|                         | Type of belt                 | V-belt 4 PK  |  |
|                         | Pulley dia. (effective dia.) | 125 mm (4.92 in)   |  |
|                         | Pulley ratio                 | 1.064  |  |
| Condenser               | Type                         | Corrugated fin (Sub cool type)   |  |
|                         | Core face area               | 0.21 m <sup>2</sup> (2.26 sq ft)   |  |
|                         | Core thickness               | 16 mm (0.63 in)  |  |
|                         | Radiation area               | 5.34 m <sup>2</sup> (57.48 sq ft)  |  |
| Receiver drier          | Effective inner capacity     | 250 cm <sup>3</sup> (15.26 cu in)  |  |
| Expansion valve         | Type                         | Externally equalizing  |  |



# General Description

## HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

| Item  |  | Specifications  |  |
|---|--|---|--|
| Evaporator  | Type                                       | Single tank   |  |
|   | Dimensions (W × H × T)                     | 255 × 200 × 48 mm<br>(10 × 7.87 × 1.89 in)  |  |
| Blower fan  | Fan type                                   | Sirocco fan   |  |
|   | Outer diameter × width                     | 150 × 75 mm (5.91 × 2.95 in)  |  |
|   | Power consumption                          | 200 W   |  |
| Condenser fan (Sub fan)   | Motor type                                 | Magnet  |  |
|   | Power consumption                          | 120 W   |  |
|   | Fan outer diameter                         | 320 mm (12.6 in)  |  |
| Radiator fan (Main fan)   | Motor type                                 | Magnet  |  |
|   | Power consumption                          | 120 W   |  |
|   | Fan outer diameter                         | 320 mm (12.6 in)  |  |
| Idle speed (A/C ON)   |  | MFPFI model   | 850±100 rpm  |
| Dual switch<br>(Pressure switch)  | Low-pressure switch<br>operating pressure  | ON → OFF  | 278±29 kPa<br>(2.83±0.3 kgf/cm <sup>2</sup> , 40.3±4.2 psi)  |
|   |  | OFF → ON  | 287 <sup>+39</sup> <sub>-25</sub> kPa<br>(2.9 <sup>+0.4</sup> <sub>-0.25</sub> kgf/cm <sup>2</sup> , 42 <sup>+5.7</sup> <sub>-3.6</sub> psi) |
|   | High-pressure switch<br>operating pressure | ON → OFF  | 2,800±100 kPa<br>(29±1 kgf/cm <sup>2</sup> , 406±15 psi)   |
|   |  | Difference  | 600±200 kPa<br>(6.12±2 kgf/cm <sup>2</sup> , 87±29 psi)  |
| Thermo control amplifier working temperature<br>(Evaporator outlet air) |  |  <p style="text-align: right;">AC-00601</p> |  |
|   |  | (1) ON<br>(2) OFF<br>(3) 1.5±0.5°C (35±0.9°F)<br>(4) 3.0±0.5°C (37±0.9°F)   |  |

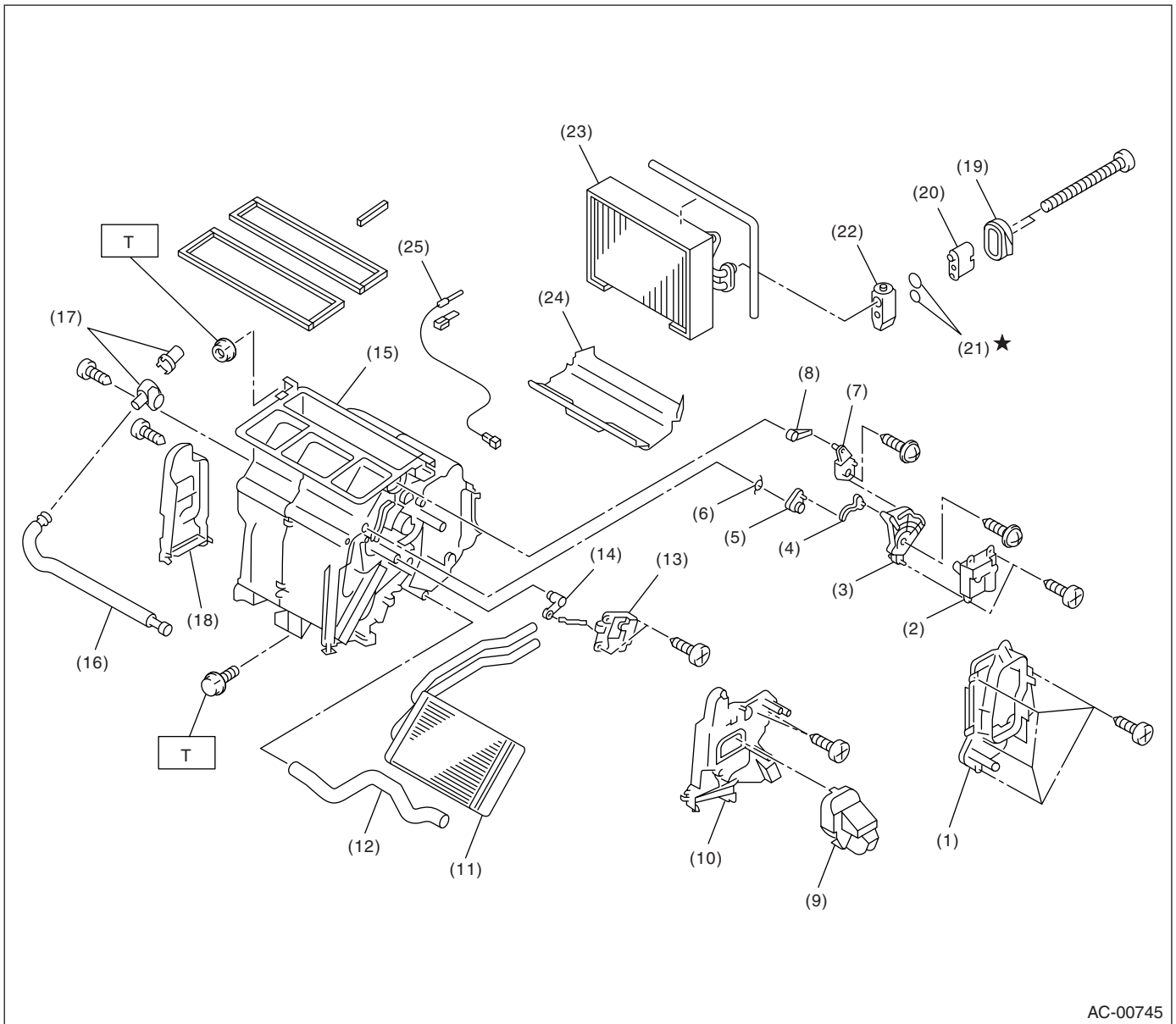
# General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

## B: COMPONENT

### 1. HEATER COOLING UNIT

#### • AUTO A/C MODEL



AC-00745

- |                         |                         |                       |
|-------------------------|-------------------------|-----------------------|
| (1) Unit cover          | (11) Heater core        | (21) O-ring           |
| (2) Mode actuator       | (12) Drain hose         | (22) Expansion valve  |
| (3) Side link           | (13) Mix actuator       | (23) Evaporator       |
| (4) Mode actuator lever | (14) Mix actuator lever | (24) Evaporator cover |
| (5) Foot lever          | (15) Unit ASSY          | (25) Thermistor       |
| (6) Spring              | (16) Aspirator hose     |                       |
| (7) Mode actuator link  | (17) Aspirator          |                       |
| (8) Defroster lever     | (18) Foot duct          |                       |
| (9) Foot nozzle         | (19) Packing            |                       |
| (10) Unit duct cover    | (20) Cooling unit block |                       |

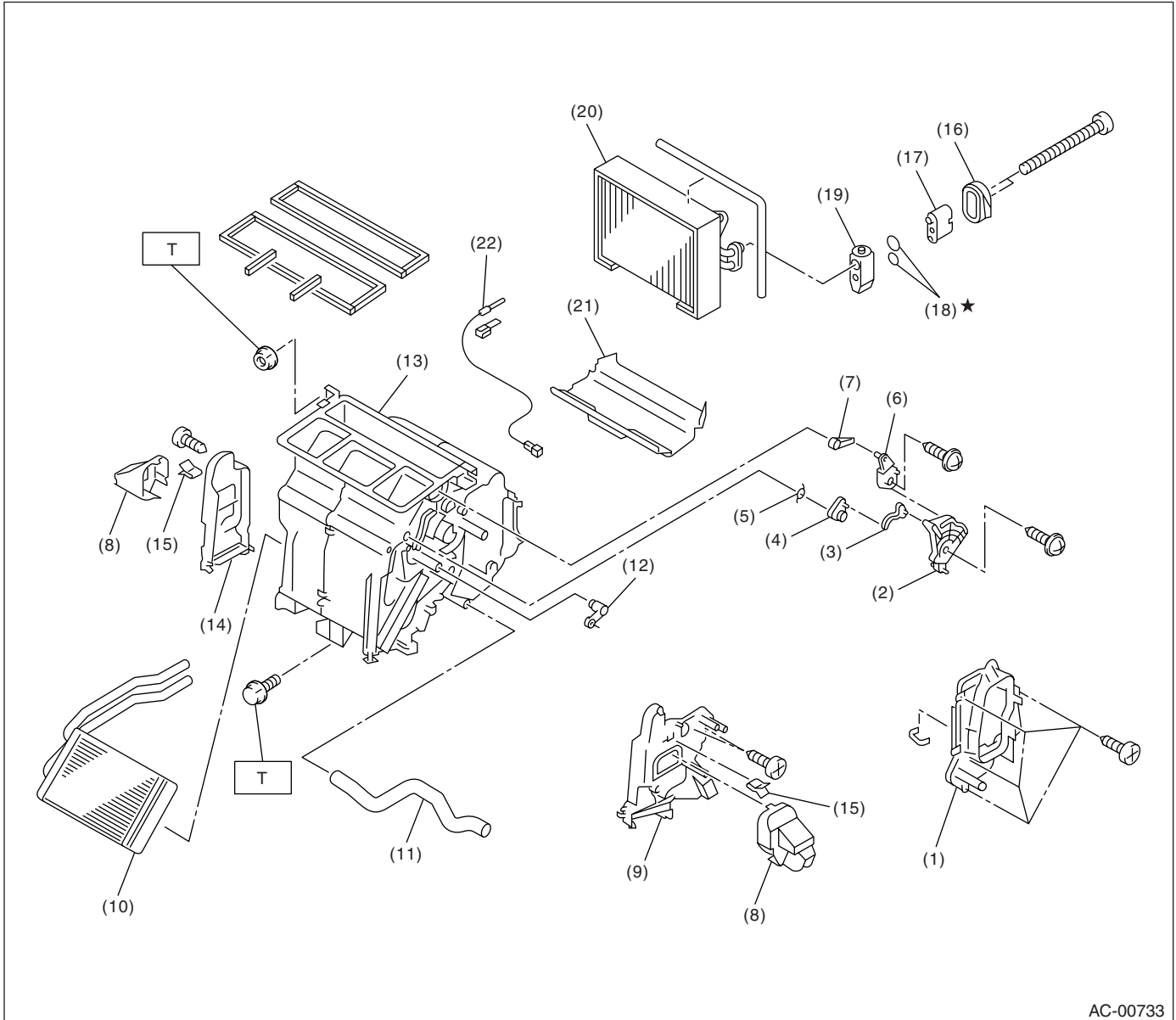
**Tightening torque: N·m (kgf·m, ft·lb)**

**T: 7.4 (0.75, 5.4)**

# General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

## • MANUAL A/C MODEL



AC-00733

- |                     |                         |                       |
|---------------------|-------------------------|-----------------------|
| (1) Unit cover      | (10) Heater core        | (19) Expansion valve  |
| (2) Side link       | (11) Drain hose         | (20) Evaporator       |
| (3) Mode lever      | (12) Mix lever          | (21) Evaporator cover |
| (4) Foot lever      | (13) Unit ASSY          | (22) Thermistor       |
| (5) Spring          | (14) Foot duct          |                       |
| (6) Mode link       | (15) Clip               |                       |
| (7) Defroster lever | (16) Packing            |                       |
| (8) Foot nozzle     | (17) Cooling unit block |                       |
| (9) Unit duct cover | (18) O-ring             |                       |

**Tightening torque: N-m (kgf-m, ft-lb)**

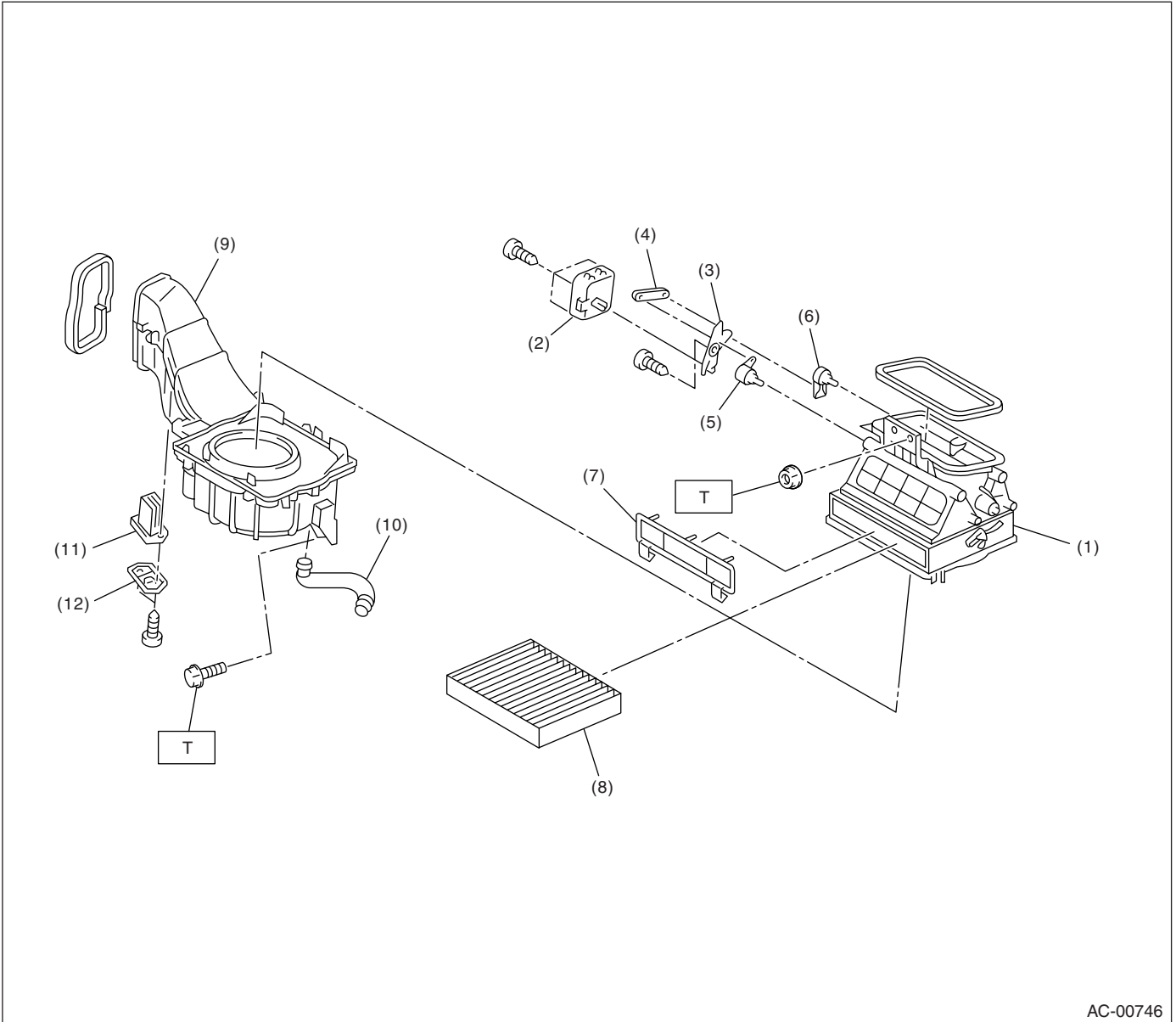
**T: 7.4 (0.75, 5.4)**

# General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

## 2. BLOWER MOTOR UNIT

### • AUTO A/C MODEL



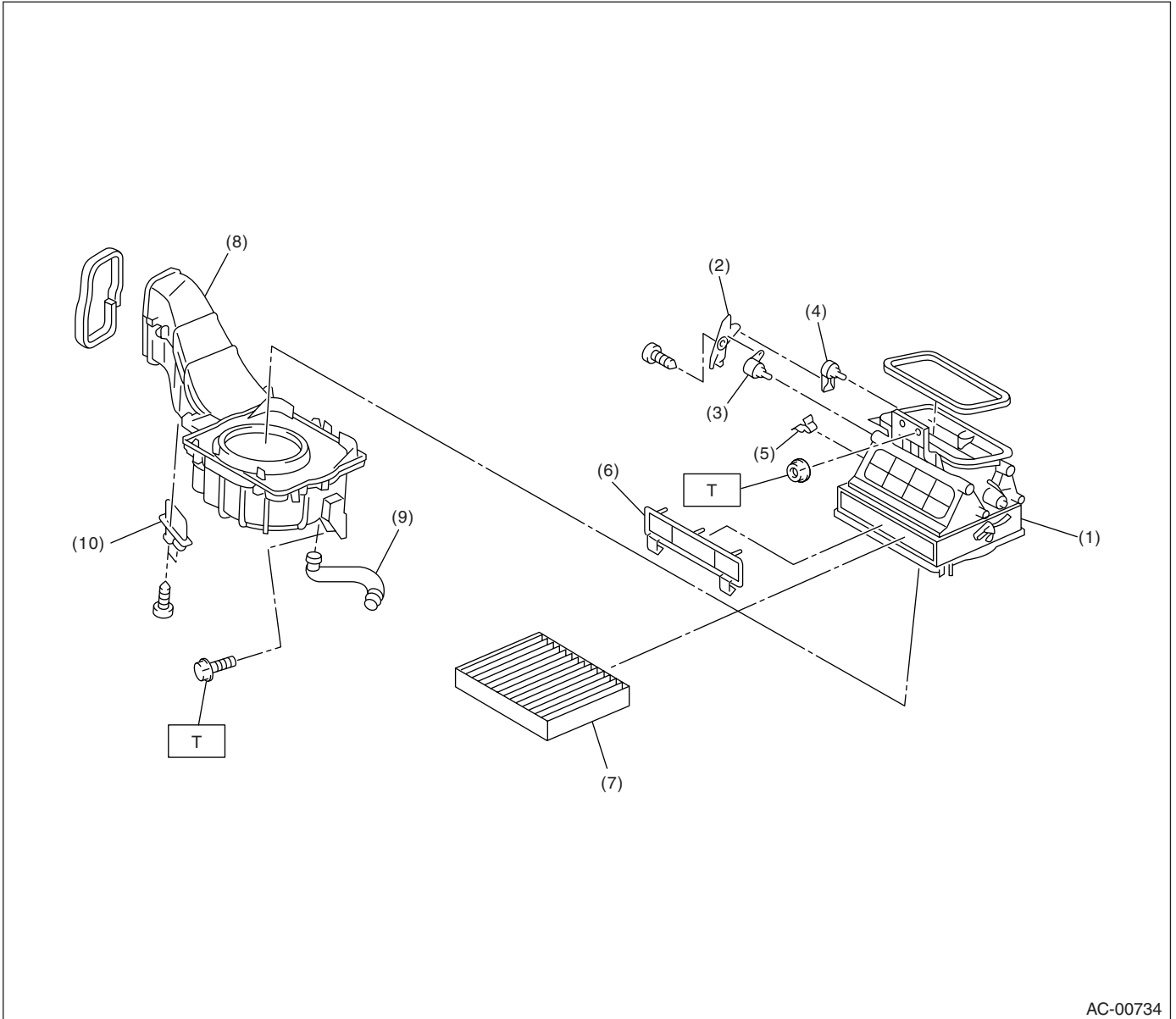
- |                         |                         |                             |
|-------------------------|-------------------------|-----------------------------|
| (1) Upper case          | (6) Blower link lever C | (11) Power transistor       |
| (2) Servo motor         | (7) Filter cover        | (12) Power transistor cover |
| (3) Blower link         | (8) Filter              |                             |
| (4) Blower link lever A | (9) Blower motor ASSY   |                             |
| (5) Blower link lever B | (10) Hose               |                             |

**Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 7.4 (0.75, 5.4)**

# General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

## • MANUAL A/C MODEL



- |                         |                       |
|-------------------------|-----------------------|
| (1) Upper case          | (6) Filter cover      |
| (2) Blower link         | (7) Filter            |
| (3) Blower link lever A | (8) Blower motor ASSY |
| (4) Blower link lever B | (9) Hose              |
| (5) Clip                | (10) Blower resistor  |

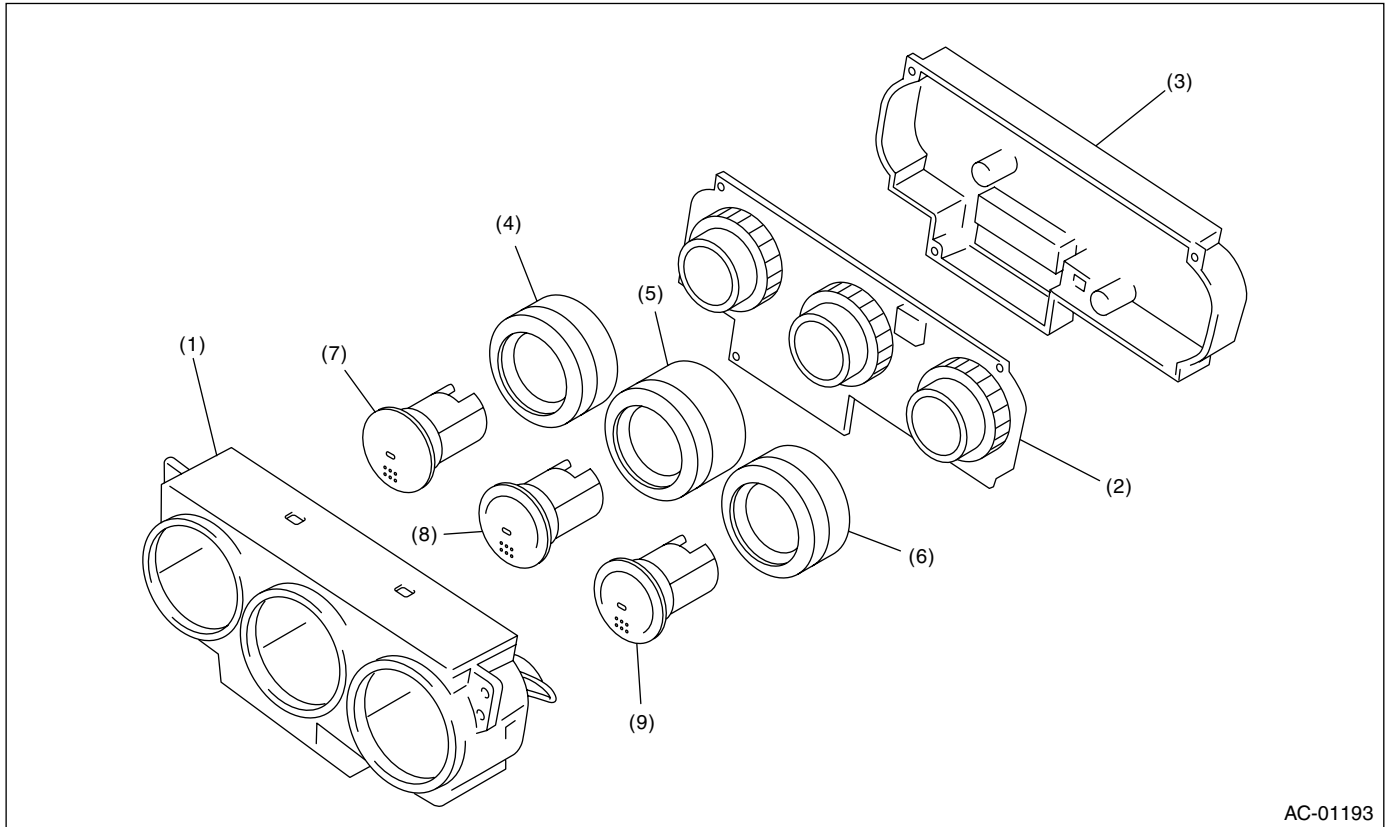
**Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 7.4 (0.75, 5.4)**

# General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

## 3. CONTROL UNIT

### • AUTO A/C MODEL



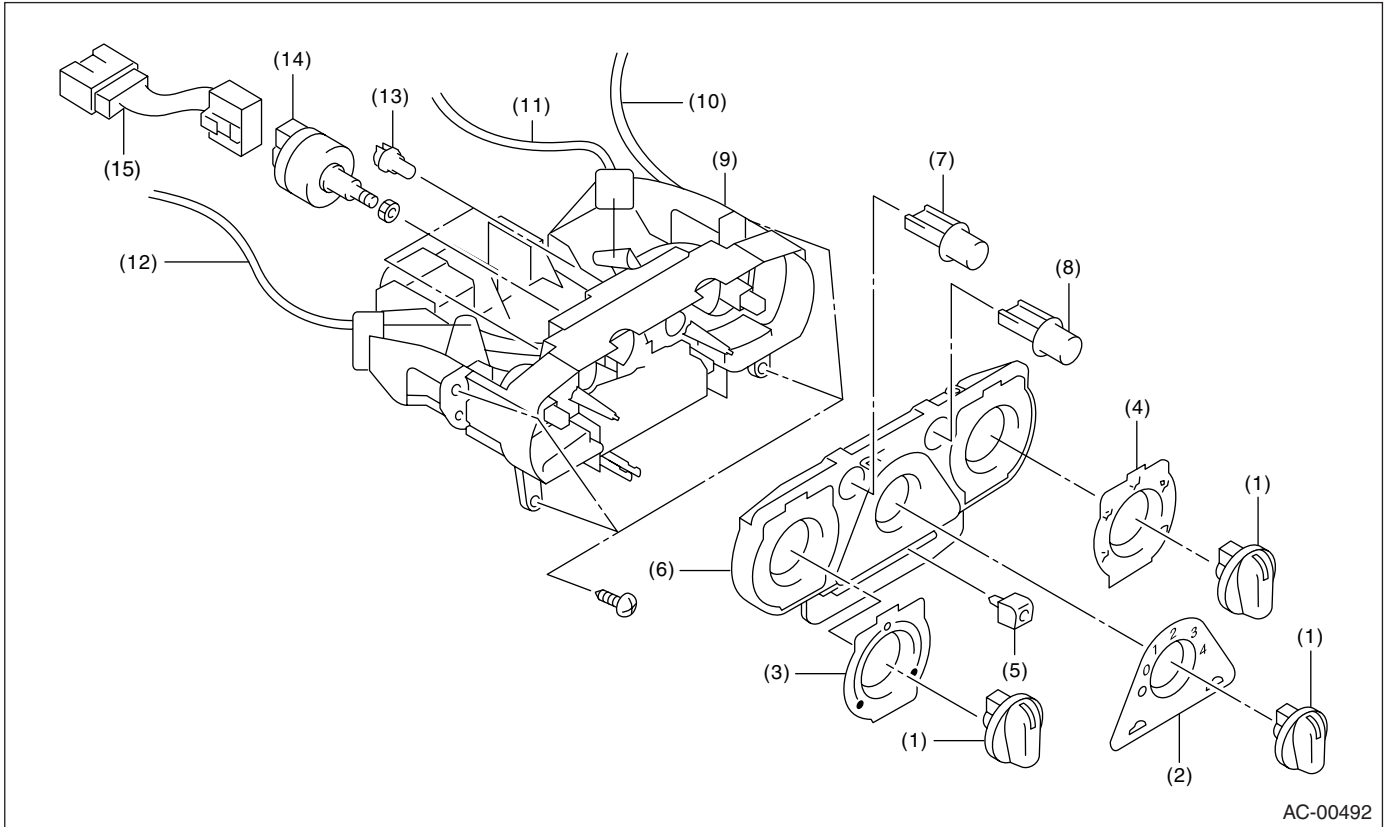
AC-01193

- |                  |                              |                                  |
|------------------|------------------------------|----------------------------------|
| (1) Panel        | (4) Mode control dial        | (7) Rear window deffogger switch |
| (2) Switch base  | (5) Fan speed control dial   | (8) FRESH/RECIRC switch          |
| (3) Control case | (6) Temperature control dial | (9) A/C switch                   |

# General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

## • MANUAL A/C MODEL

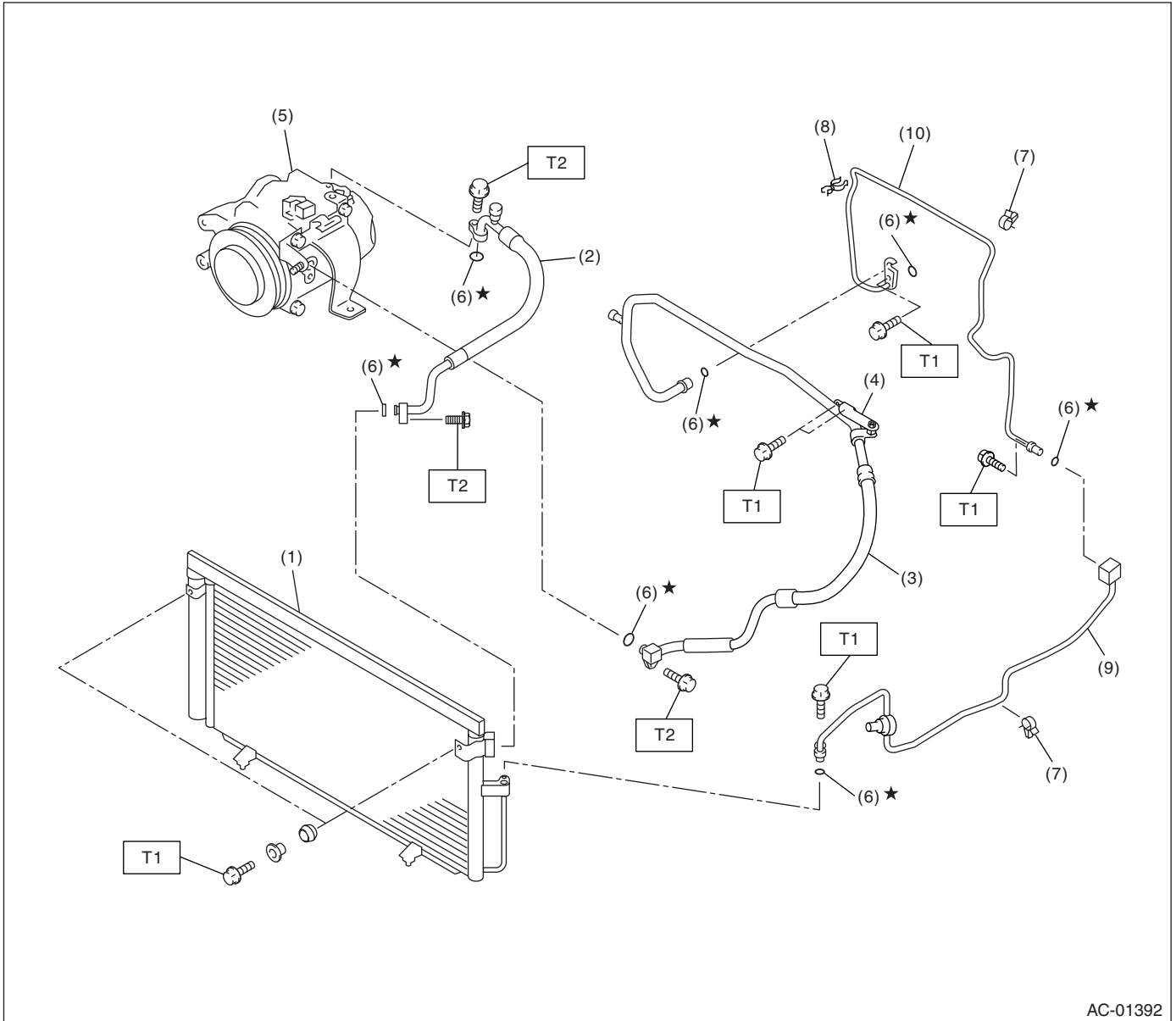


- |                                 |                                 |                                |
|---------------------------------|---------------------------------|--------------------------------|
| (1) Dial                        | (6) Heater control panel        | (11) Mode cable                |
| (2) Fan control plate           | (7) A/C switch                  | (12) Temperature control cable |
| (3) Temperature control plate   | (8) Rear window defogger switch | (13) Bulb                      |
| (4) Mode control plate          | (9) Heater control base         | (14) Fan switch ASSY           |
| (5) FRESH/RECIRC switching knob | (10) Intake cable               | (15) Harness                   |

# General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

## 4. AIR CONDITIONING UNIT



AC-01392

- |                          |                           |
|--------------------------|---------------------------|
| (1) Condenser            | (6) O-ring                |
| (2) Hose (High-pressure) | (7) Clamp A               |
| (3) Hose (Low-pressure)  | (8) Clamp B               |
| (4) Bracket              | (9) Tube (To condenser)   |
| (5) Compressor           | (10) Tube (To evaporator) |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 7.4 (0.75, 5.4)**

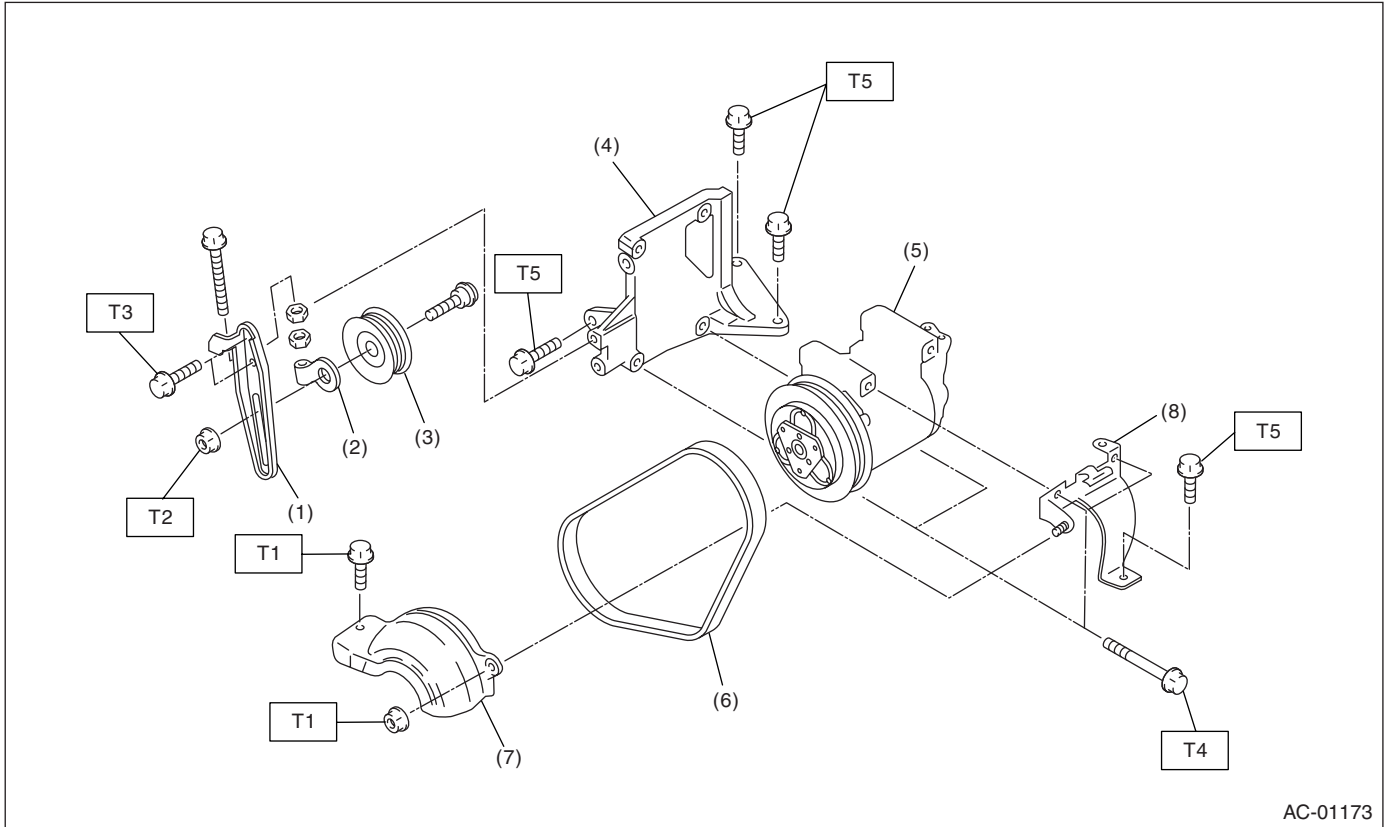
**T2: 15 (1.5, 10.8)**



# General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

## 5. COMPRESSOR



- |                              |                           |
|------------------------------|---------------------------|
| (1) Idler pulley bracket     | (7) Compressor belt cover |
| (2) Idler pulley adjuster    | (8) Compressor bracket    |
| (3) Idler pulley             |                           |
| (4) Compressor upper bracket |                           |
| (5) Compressor               |                           |
| (6) V-belt                   |                           |

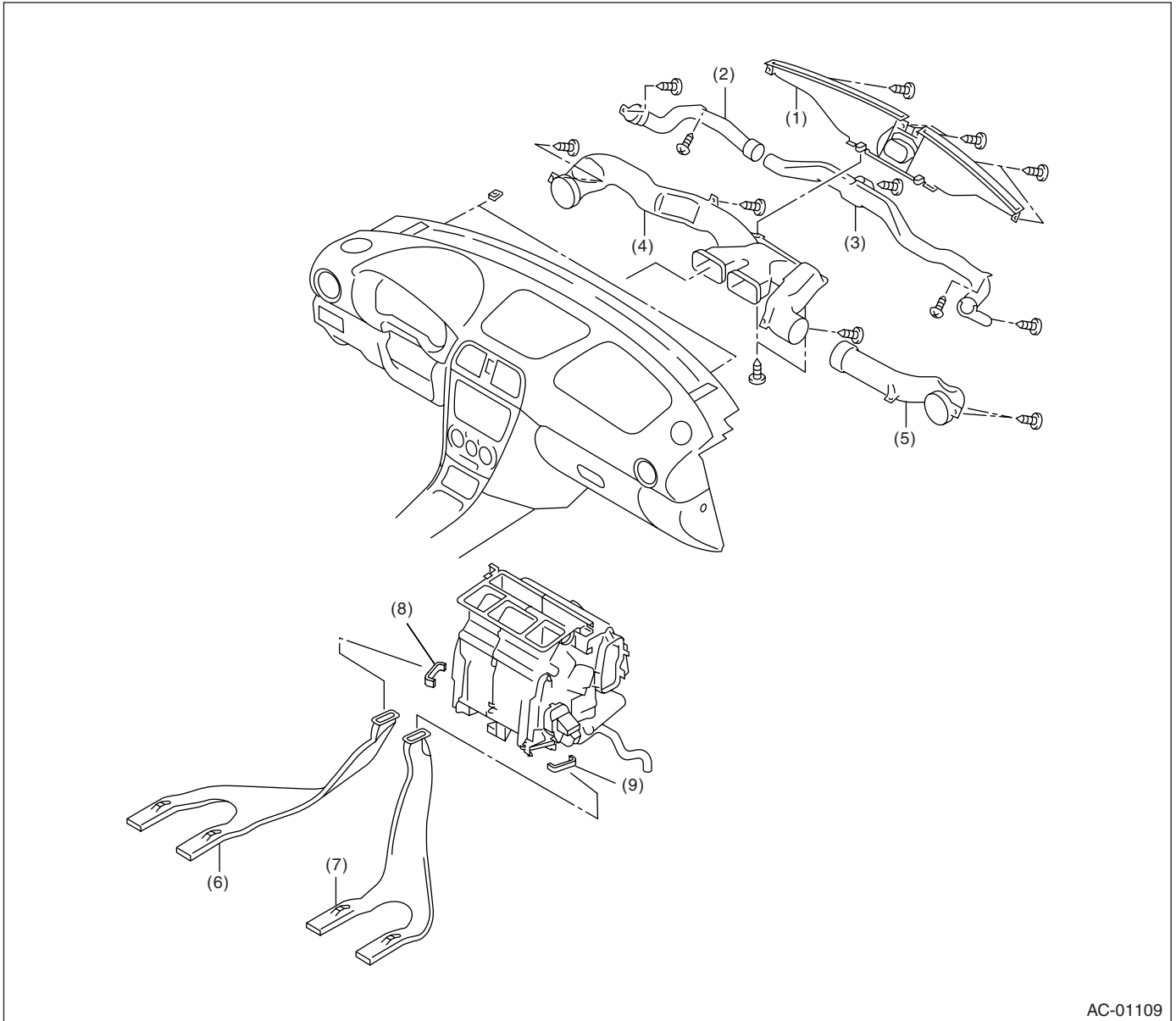
**Tightening torque: N-m (kgf-m, ft-lb)**

- |                              |
|------------------------------|
| <b>T1: 7.4 (0.75, 5.4)</b>   |
| <b>T2: 22.6 (2.3, 16.6)</b>  |
| <b>T3: 23.0 (2.35, 17.0)</b> |
| <b>T4: 28.9 (2.95, 21.3)</b> |
| <b>T5: 35 (3.6, 26)</b>      |

# General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

## 6. HEATER DUCT



AC-01109

(1) Front defroster nozzle

(2) Side defroster duct (LH)

(3) Side defroster duct (RH)

(4) Side ventilation duct (LH)

(5) Side ventilation duct (RH)

(6) Rear heater duct (LH)

(7) Rear heater duct (RH)

(8) Rear heater duct cover (LH)

(9) Rear heater duct cover (RH)

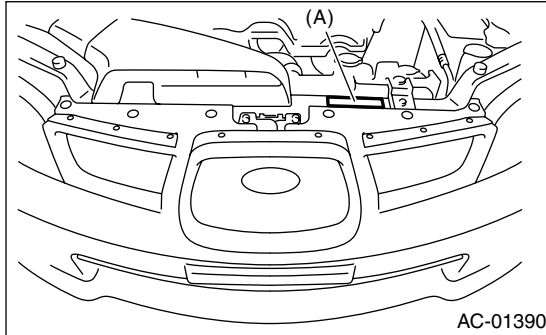
# General Description

## HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

### C: CAUTION

#### 1. HFC-134a A/C SYSTEM

- Unlike the old conventional CFC-12 system components, the cooling system components for the HFC-134a system such as the refrigerant and compressor oil are incompatible.
- Vehicles with the HFC-134a system can be identified by the label (A) attached to the vehicle. Before maintenance, check which A/C system is installed in the vehicle.



#### 2. COMPRESSOR OIL

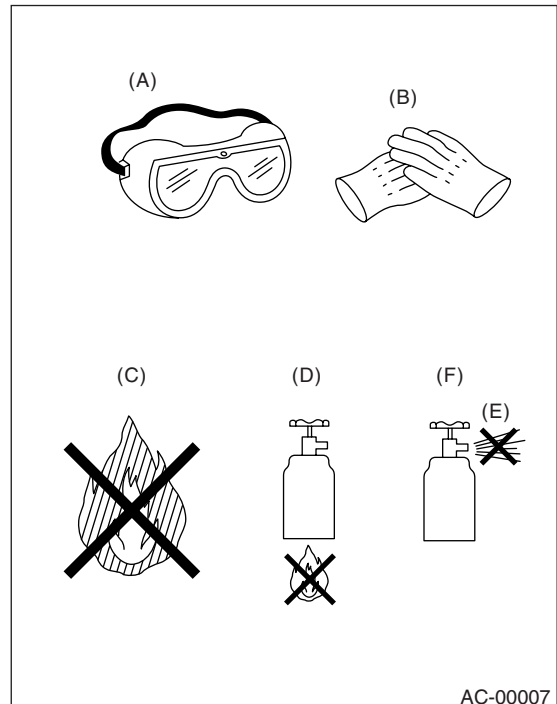
- HFC-134a compressor oil has no compatibility with that for CFC-12 system.
  - Use only the manufacturer-authorized compressor oil for the HFC-134a system; only use DH-PR.
  - Do not mix multiple compressor oils.
- If CFC-12 compressor oil is used in a HFC-134a A/C system, the compressor may become stuck due to poor lubrication, or the refrigerant may leak due to swelling of rubber parts.
- On the other hand, if HFC-134a compressor oil is used in a CFC-12 A/C system, the durability of the A/C system will be lowered.
- HFC-134a compressor oil is very hygroscopic. When replacing or installing/removing A/C parts, immediately isolate the oil from the atmosphere using a plug or tape. In order to avoid moisture, store the oil in a container with its cap tightly closed.

#### 3. REFRIGERANT

- The CFC-12 refrigerant cannot be used in the HFC-134a A/C system. The HFC-134a refrigerant, also, cannot be used in the CFC-12 A/C system.
- If an incorrect or no refrigerant is used, poor lubrication will result and the compressor itself may be damaged.

#### 4. HANDLING OF REFRIGERANT

- The refrigerant boils at approx.  $-30^{\circ}\text{C}$  ( $-22^{\circ}\text{F}$ ). When handling it, be sure to wear safety goggles and protective gloves. Direct contact of the refrigerant with skin may cause frostbite. If the refrigerant gets into your eye, avoid rubbing your eyes with your hands. Wash your eye with plenty of water, and receive medical treatment from an eye doctor.
- Do not heat a service can. If a service can is directly heated, or put into boiling water, the inside pressure will become extremely high. This may cause the can to explode. If a service can must be warmed up, use hot water in  $40^{\circ}\text{C}$  ( $104^{\circ}\text{F}$ ) max.
- Do not drop or impact a service can. (Observe the precautions and operation procedure described on the refrigerant can.)
- When the engine is running, do not open the high-pressure valve of the manifold gauge. The high-pressure gas will back-flow resulting in an explosion of the can.
- Provide good ventilation and do not work in a closed area.
- In order to prevent global warming, avoid releasing HFC-134a into the atmosphere. Using a refrigerant recovery system, discharge and reuse it.



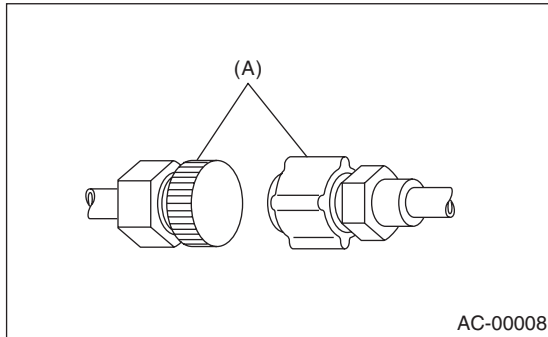
- (A) Safety goggles
- (B) Protective gloves
- (C) Avoid open flame
- (D) No direct heat on container
- (E) Do not discharge
- (F) Loosen

# General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

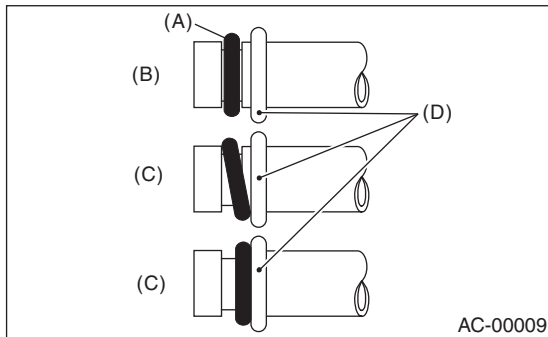
## 5. O-RING CONNECTIONS

- Use new O-rings.
- In order to keep the O-rings free of lint which will cause a refrigerant gas leak, perform operations without gloves and shop cloths.
- Apply the compressor oil to the O-rings to avoid sticking, then install them.
- Use a torque wrench to tighten the O-ring fittings: Over-tightening will damage the O-ring and tube end distortion.
- If the operation is interrupted before completing a pipe connection, recap the tubes, components, and fittings with a plug or tape to prevent contamination from entering.



(A) Seal

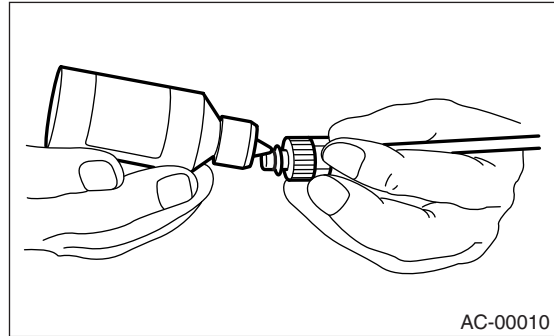
- Visually check the surfaces and mating surfaces of O-rings, threads, and connecting points. If a failure is found, replace the applicable parts.
- Install the O-rings at right angle to the tube beads.



- (A) O-ring
- (B) OK
- (C) NG
- (D) Bead

- Use the oil specified in the service manual to lubricate the O-rings.
- Apply the oil to the top and sides of the O-rings before installation.

Apply the oil to the area including the O-rings and tube beads.



- After tightening, use a clean shop cloth to remove excess oil from the connections and any oil which may have run on the vehicle body or other parts.
- If any leakage is suspected after tightening, do not retighten the connections, Disconnect the connections, remove the O-rings, and check the O-rings, threads, and connections.

## D: PREPARATION TOOL

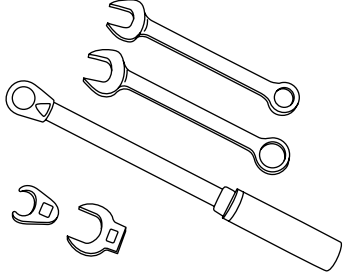
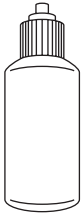
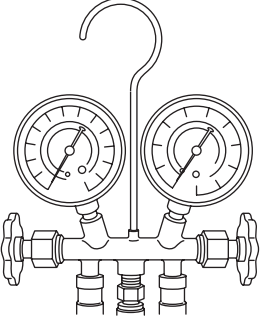
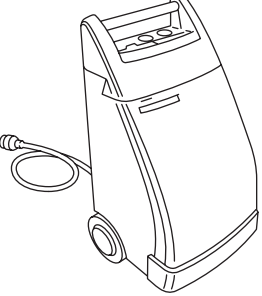
### CAUTION:

- When working on vehicles with the HFC-134a system, only use HFC-134a specified tools and parts.
- Do not mix with CFC-12 tools and parts. If HFC-134a and CFC-12 refrigerant or compressor oil is mixed, poor lubrication will result and the compressor itself may be destroyed.
- In order to help prevent mixing HFC-134a and CFC-12 parts and liquid, the tool and screw type and the type of service valves used are different. The gas leak detectors for the HFC-134a and CFC-12 systems must also not be interchanged.

|                   | HFC-134a         | CFC-12        |
|-------------------|------------------|---------------|
| Tool & screw type | Millimeter size  | Inch size     |
| Valve type        | Quick joint type | Screw-in type |

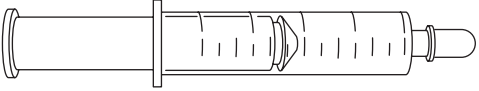
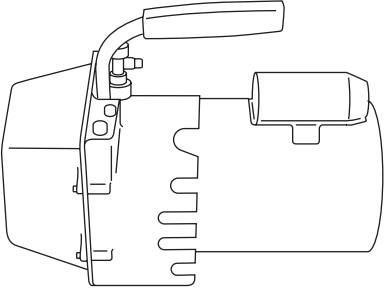
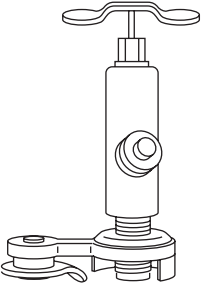
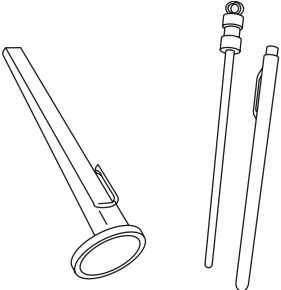
## General Description

### HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

| Description  | Tools and Equipment  |
|--|--|
|  <p style="text-align: right;">AC-00213</p>   | <p><b>Wrench</b></p> <p>Various <b>WRENCHES</b> will be required to service any A/C system. A 7 to 40 N-m (0.7 to 4.1 kgf-m, 5 to 30 ft-lb) torque wrench with various crow-foot wrenches will be needed. Open end or flare nut wrenches will be needed for back-up on the tube and hose fittings.</p> |
|  <p style="text-align: right;">AC-00012</p>   | <p><b>Applicator bottle</b></p> <p>A small <b>APPLICATOR BOTTLE</b> is recommended to apply refrigerant oil to the various parts. They can be obtained at a hardware or drug store.</p>  |
|  <p style="text-align: right;">AC-00013</p>  | <p><b>Manifold gauge set</b></p> <p>A <b>MANIFOLD GAUGE SET</b> (with hoses) can be obtained from either a commercial refrigeration supply house or from an auto shop equipment supplier.</p>  |
|  <p style="text-align: right;">AC-00014</p> | <p><b>Refrigerant recovery system</b></p> <p>A <b>REFRIGERANT RECOVERY SYSTEM</b> is used for the recovery and reuse of A/C system refrigerant after contaminants and moisture have been removed from the refrigerant.</p>   |

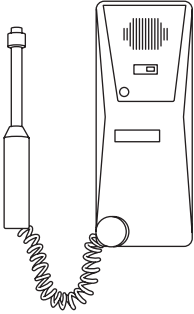

# General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

| Description   | Tools and Equipment  |
|---|--|
|  <p>AC-00015</p>     | <p>Syringe</p> <p>A graduated plastic <b>SYRINGE</b> will be needed to add oil back into the system. The syringe can be found at a pharmacy or drug store.</p>  |
|  <p>AC-00016</p>     | <p>Vacuum pump</p> <p>A <b>VACUUM PUMP</b> (in good working condition) is necessary, and may be obtained from either a commercial refrigeration supply house or an automotive equipment supplier.</p> |
|  <p>AC-00017</p>  | <p>Can tap</p> <p>A <b>CAN TAP</b> for the 397 g (14 oz) can is available from an auto supply store.</p>   |
|  <p>AC-00018</p> | <p>Thermometer</p> <p>Pocket <b>THERMOMETERS</b> are available from either industrial hardware store or commercial refrigeration supply houses.</p>   |

# General Description

## HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

| Description   | Tools and Equipment  |
|---|--|
|  <p>AC-00019</p> | <p>Electronic leak detector</p> <p>An <b>ELECTRONIC LEAK DETECTOR</b> can be obtained from either a specialty tool supply or an A/C equipment supplier.</p>                                       |
|  <p>AC-00020</p> | <p>Weight scale</p> <p>A <b>WEIGHT SCALE</b> such as an electronic charging scale or a bathroom scale with digital display will be needed if a 13.6 kg (30 lb) refrigerant container is used.</p> |

# Refrigerant Pressure with Manifold Gauge Set

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

## 2. Refrigerant Pressure with Manifold Gauge Set

### A: PROCEDURE

- 1) Place the vehicle in the shade and windless condition.
- 2) Connect the manifold gauge set.
- 3) Open the front windows and close all doors.
- 4) Open the front hood.
- 5) Increase the engine to 1,500 rpm.
- 6) Turn ON the A/C switch.
- 7) Turn the temperature control switch to MAX COOL.
- 8) Put in RECIRC position.
- 9) Turn the blower control switch to HI.
- 10) Read the gauge.

#### Standard:

**Low pressure: 127 — 196 kPa (1.3 — 2.0 kgf/cm<sup>2</sup>, 18 — 28 psi)**

**High pressure: 1,471 — 1,667 kPa (15 — 17 kgf/cm<sup>2</sup>, 213 — 242 psi)**

**Ambient temperature: 30 — 35°C (86 — 95°F)**

### B: INSPECTION

| Symptom                               | Probable cause  | Repair order  |
|---------------------------------------|---|---|
| High-pressure side is unusually high. | <ul style="list-style-type: none"><li>• Defective condenser fan motor</li><li>• Clogged condenser fin</li><li>• Too much refrigerant</li><li>• Air inside the system</li><li>• Defective receiver dryer</li></ul> | <ul style="list-style-type: none"><li>• Replace the fan motor.</li><li>• Clean the condenser fin.</li><li>• Discharge refrigerant.</li><li>• Replace the receiver dryer.</li><li>• After vacuuming, charge appropriate amount of refrigerant.</li></ul> |
| High-pressure side is unusually low.  | <ul style="list-style-type: none"><li>• Defective compressor</li><li>• Not enough refrigerant</li><li>• Clogged expansion valve</li><li>• Expansion valve frozen temporarily by moisture</li></ul>                | <ul style="list-style-type: none"><li>• Replace the compressor.</li><li>• Check for leaks.</li><li>• Replace the expansion valve.</li><li>• Fully vacuuming.</li></ul>  |
| Low-pressure side is unusually high.  | <ul style="list-style-type: none"><li>• Defective compressor</li><li>• Defective expansion valve</li><li>• Too much refrigerant</li></ul>   | <ul style="list-style-type: none"><li>• Replace the compressor.</li><li>• Replace the expansion valve.</li><li>• Discharge refrigerant.</li></ul>   |
| Low-pressure side is unusually low.   | <ul style="list-style-type: none"><li>• Not enough refrigerant</li><li>• Clogged expansion valve</li><li>• Expansion valve frozen temporarily by moisture</li><li>• Saturated receiver dryer</li></ul>            | <ul style="list-style-type: none"><li>• Check for leaks.</li><li>• Replace the expansion valve.</li><li>• Replace the receiver dryer.</li></ul>   |



# Refrigerant Recovery Procedure

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

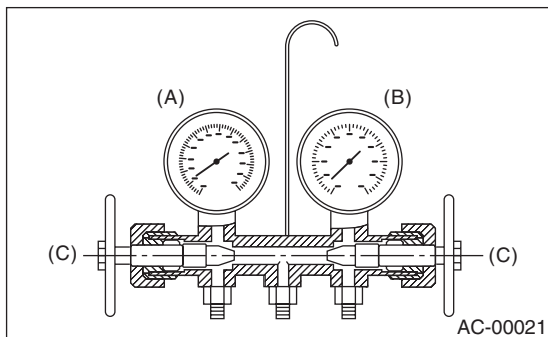
## 3. Refrigerant Recovery Procedure

### A: PROCEDURE

#### CAUTION:

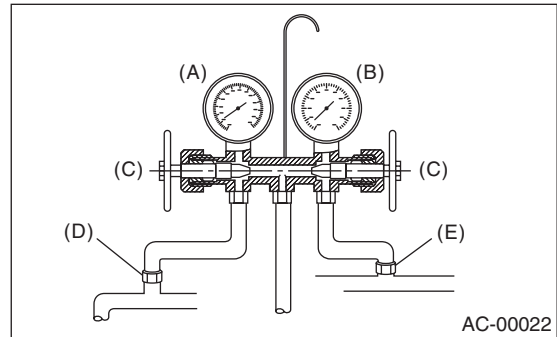
- During operation, be sure to wear safety goggles and protective gloves.
- Connect the refrigerant recovery system with the manifold gauge set to discharge the refrigerant from the A/C system and reuse it.
- When reusing the discharged refrigerant, keep service cans on hand. Because the discharge rate with the recovery system is approx. 90%, service cans are necessary to charge the refrigerant.
- Follow the detailed operation procedure described in the operation manual attached to the refrigerant recovery system.

- 1) Perform the compressor oil return operation. <Ref. to AC-25, PROCEDURE, Compressor Oil.>
- 2) Stop the engine.
- 3) Make sure the valves on low-/high-pressure sides of manifold gauge set are fully closed.



- (A) Low-pressure gauge (Compound pressure gauge)
- (B) High-pressure gauge
- (C) Close

- 4) Install the low-/high-pressure hoses to the service ports on the low-/high-pressure sides of the vehicle respectively.



- (A) Low-pressure gauge (Compound pressure gauge)
- (B) High-pressure gauge
- (C) Close
- (D) Low-pressure side service port
- (E) High-pressure side service port

- 5) Connect the center hose to the refrigerant recovery system.
- 6) Follow the operation manual to activate the refrigerant recovery system.

# Refrigerant Charging Procedure

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

## 4. Refrigerant Charging Procedure

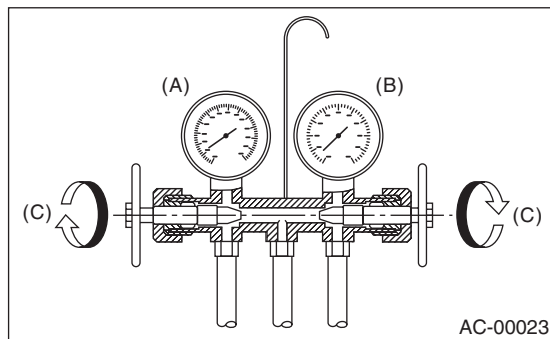
### A: PROCEDURE

#### CAUTION:

- During operation, be sure to wear safety goggles and protective gloves.
- Before charging the refrigerant, evacuate the system to remove small amounts of moisture remaining in the system.
- The moisture in the system can be completely evacuated only under the minimum vacuum level. The minimum vacuum level affects the temperature in the system.
- The list below shows the vacuum values necessary to boil water in various temperature. In addition, the vacuum levels indicated on the gauge are approx. 3.3 kPa (25 mmHg, 0.98 inHg) lower than those measured at 304.8 m (1,000 ft) above sea level.

| Vacuum level required to boil water (at sea level) |                                 |
|--|---------------------------------|
| Temperature  | Vacuum                          |
| 1.7°C (35°F)                                       | 100.9 kPa (757 mmHg, 29.8 inHg) |
| 7.2°C (45°F)                                       | 100.5 kPa (754 mmHg, 29.7 inHg) |
| 12.8°C (55°F)                                      | 99.8 kPa (749 mmHg, 29.5 inHg)  |
| 18.3°C (65°F)                                      | 99.2 kPa (744 mmHg, 29.3 inHg)  |
| 23.9°C (75°F)                                      | 98.5 kPa (739 mmHg, 29.1 inHg)  |
| 29.4°C (85°F)                                      | 97.2 kPa (729 mmHg, 28.7 inHg)  |
| 35°C (95°F)  | 95.8 kPa (719 mmHg, 28.3 inHg)  |

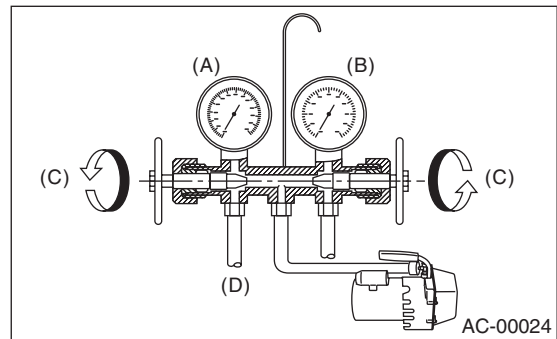
1) Close the valves on low-/high-pressure sides of the manifold gauge.



- (A) Low-pressure gauge (Compound pressure gauge)
- (B) High-pressure gauge
- (C) Close

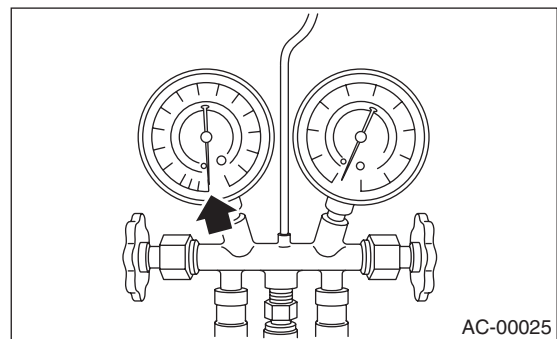
2) Install the low-/high-pressure hoses to the corresponding service ports on the vehicle respectively.  
3) Connect the center hose of the manifold gauge set with the vacuum pump.

4) Carefully open the valves on the low-/high-pressure sides to activate the vacuum pump.

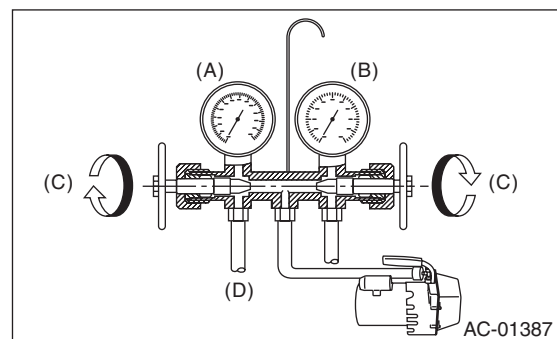


- (A) Low-pressure gauge (Compound pressure gauge)
- (B) High-pressure gauge
- (C) Slowly open
- (D) Vacuum pump turn on

5) After the low-pressure gauge reaches 100.0 kPa (750 mmHg, 29.5 inHg) or higher, evacuate the system for approx. 15 minutes (Continue evacuation).



6) After 15 minutes of evacuation, if the reading shows 100.0 kPa (750 mmHg, 29.5 inHg) or higher, close the valves on the both sides to stop the vacuum pump.

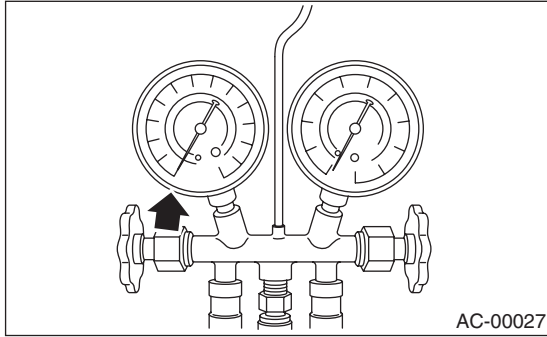


- (A) Low-pressure gauge (Compound pressure gauge)
- (B) High-pressure gauge
- (C) Close
- (D) Vacuum pump turn off

# Refrigerant Charging Procedure

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

7) Note the low-pressure gauge needle.

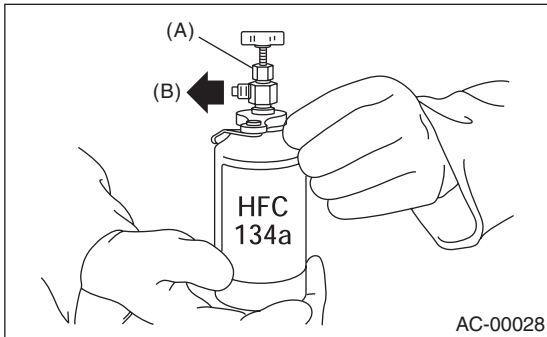


AC-00027

8) Leave it at least 5 minutes, and then check the low-pressure gauge needle for any changes.

When a gauge indicator shows near to zero point, this is a sign of leakage. Check pipe connector points, repair them, make sure there is no leakage by air bleeding.

9) Following the can tap operation manual instructions, install it to the refrigerant can.

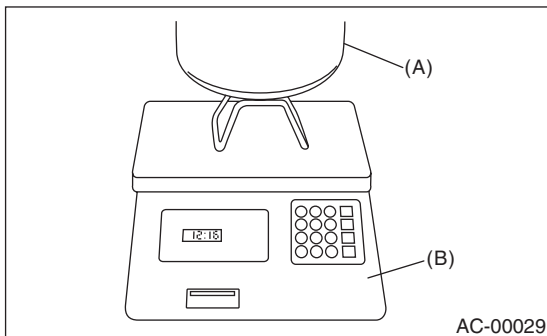


AC-00028

- (A) Tap valve
- (B) Center manifold hose

10) Disconnect the center manifold hose from the vacuum pump, and connect the hose to the tap valve.

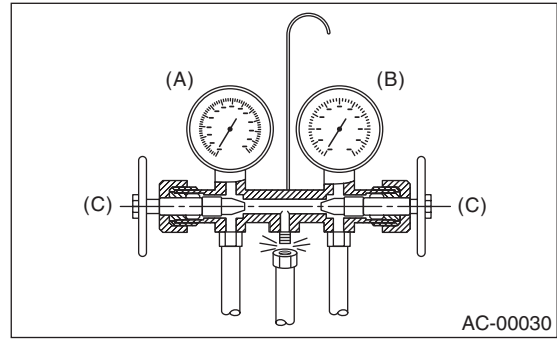
11) When a 13.6 kg (30 lb) refrigerant container is used, measure the refrigerant amount in use using a weighting scale.



AC-00029

- (A) Refrigerant container (HFC-134a)
- (B) Weight scale

12) Confirm that all the 3 hoses are tightly connected to the manifold gauge set.



AC-00030

- (A) Low-pressure gauge (Compound pressure gauge)
- (B) High-pressure gauge
- (C) Close

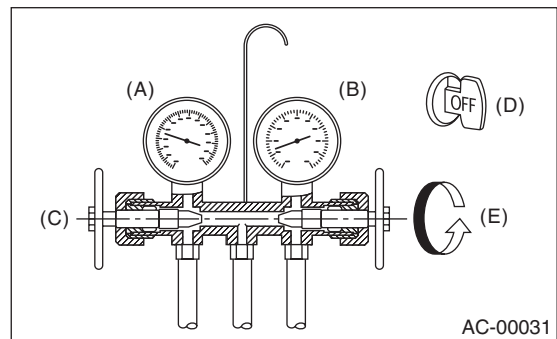
13) Open the valve on the HFC-134a source.

14) Loosen the center hose connection on the manifold gauge set (if applicable, press a purge valve on the manifold gauge set) only for a couple of seconds to allow the air in the center hose to escape by the refrigerant.

15) Carefully open the high-pressure valve with the engine stopping.

**CAUTION:**

**Do not open the low-pressure valve.**



AC-00031

- (A) Low-pressure gauge (Compound pressure gauge)
- (B) High-pressure gauge
- (C) Close
- (D) Ignition switch OFF
- (E) Slowly open

**CAUTION:**

**Never run the engine during charging from the high-pressure side.**

16) Close the high-pressure valve when the low-pressure gauge reaches 98 kPa (1 kgf/cm<sup>2</sup>, 14 psi). Using a leak tester, check the system for leaks. If any leakage is found after the refrigerant recovery is completed, repair the applicable area.

# Refrigerant Charging Procedure

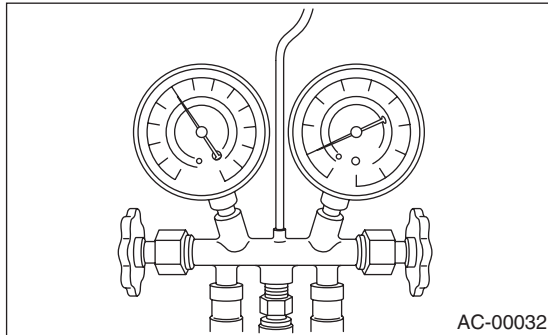
HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

17) After confirming that there are no leaks with the leak test, charge the required amount of refrigerant.

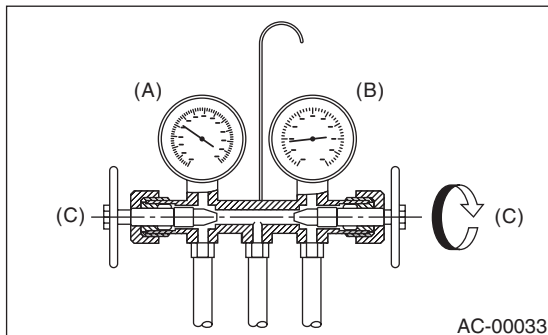
**CAUTION:**

**Never run the engine during charging from the high-pressure side.**

- 18) Close the high-pressure valve when;
- the readings of low-/high-pressure gauges become almost equal, after the charging speed is reduced,
  - the HFC-134a source becomes empty, or the system is filled with the gas.



19) If the HFC-134a source is empty, close the high-pressure valve, close the valve on the can tap, and replace the HFC-134a source with a new one to restart the operation.



- (A) Low-pressure gauge (Compound pressure gauge)
- (B) High-pressure gauge
- (C) Close

20) Confirm that both the low-/high-pressure valves can be closed. Start the engine with the A/C switch OFF.

21) Quickly repeat ON-OFF cycles a few times to prevent initial compressor damage.

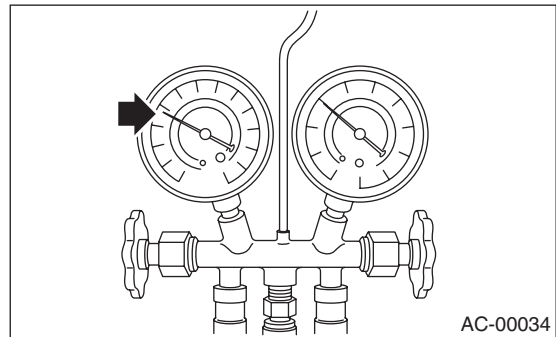
22) Set up the vehicle to the following status:

- A/C switch ON
- Engine running at 1,500 rpm
- Blower speed setting to “HI”
- Temperature setting to “MAX COOL”
- Air inlet setting to “RECIRC”
- Windows open

23) While reading the low-pressure gauge, carefully open the low-pressure valve with the refrigerant source connected and the service hose purged.

**CAUTION:**

**Never open the high-pressure valve with the engine running. Doing so may result in a reflow of high-pressure gas and refrigerant can’s explosion.**



24) Adjust the refrigerant flow to maintain the pressure on the low-pressure side at 276 kPa (2.81 kgf/cm<sup>2</sup>, 40 psi) max.

25) After the system is fully charged, close the low-pressure valve.

26) Close the valve on the refrigerant source.

| Refrigerant amount |                 |                 |
|--------------------|-----------------|-----------------|
| Refrigerant        | Minimum         | Maximum         |
| HFC-134a           | 450 g (0.99 lb) | 550 g (1.21 lb) |

27) Disconnect the hose from the service port, and install the service port cap.

# Refrigerant Leak Check

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

## 5. Refrigerant Leak Check

### A: INSPECTION

1) Operate the A/C system for approx. 10 minutes, and confirm that the high-pressure side shows at least 690 kPa (7.03 kgf/cm<sup>2</sup>, 100 psi). Then stop the engine to start the leak test.

2) Starting from the connection between the high-pressure pipe and evaporator, check the system for leaks along the high-pressure side through the compressor. The following items must be checked thoroughly.

3) Check the joint and seam between the pressure switch (dual pressure switch) and high-pressure pipe.

4) Check the connections between the condenser and pipes, and welded joints on the condenser.

The leak tester may detect the oil on the condenser fins as a leak.

5) Check the joint between the compressor and hoses.

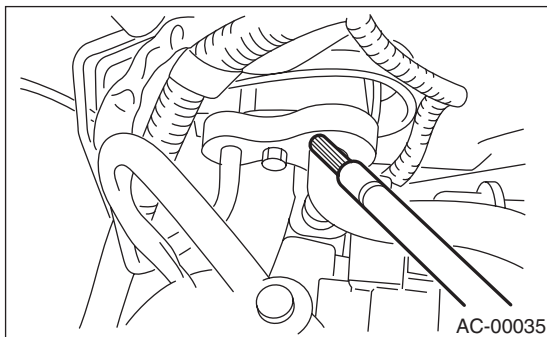
6) Check the machined area of compressor and other joints on the compressor.

7) Check the compressor shaft seal at the area near the center of compressor clutch pulley.

Some shaft seals show a slight amount of leakage about 3 g (0.1 oz) per year. This is not a problem.

8) Starting from the connection between the low-pressure pipe and evaporator, check the system for leakage along the low-pressure side through the compressor. The following items must be checked thoroughly.

- Connection between two parts
- Connection between the pipe and plate

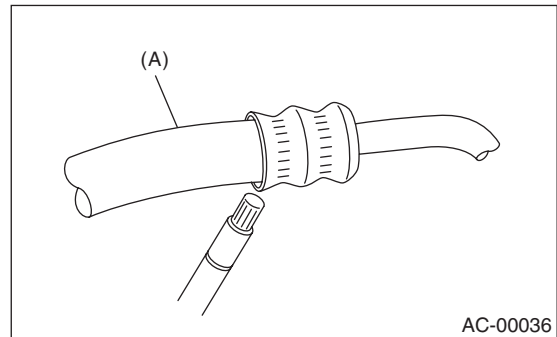


9) Visually check the rubber area of the flexible hose for cracks.

Check the entire length of the flexible hose, especially the connection with the metal hose end.

### CAUTION:

Carefully check the external surface of hoses and tubes at approx. 25 mm (0.98 in) per second.

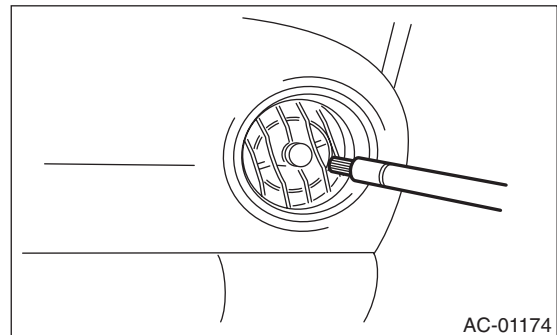


(A) Flexible hose

10) Disconnect the drain hose from the heater case, and check the hose end for at least 10 seconds.

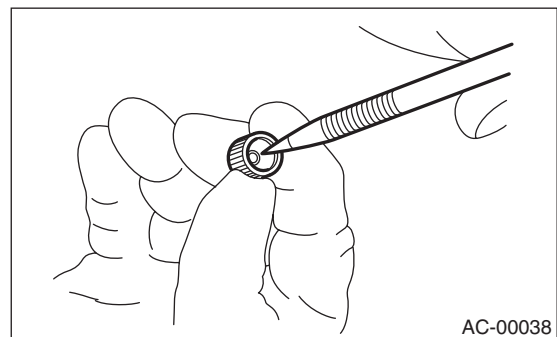
After the test is finished, reconnect the drain hose.

11) Turn the ignition key to ON position, and run the blower at high speed for 1 minute. Stop the blower to check the ventilation grille on the instrument panel. While moving the tester closer to the grille, run the blower for 1 or 2 seconds, then stop it. Check the grille at that point for at least 10 seconds.



12) Check the valve in the service port.

13) Visually check the rubber seal in service port cap.



## 6. Compressor Oil

### A: PROCEDURE

**NOTE:**

Before making repairs, conduct the oil return operation to return the compressor oil in circulation with the refrigerant to compressor.

- 1) Increase engine to 1,500 rpm.
- 2) Turn the A/C switch to ON.
- 3) Turn the temperature control switch to MAX COOL.
- 4) Put in RECIRC position.
- 5) Turn the blower control switch to HI.
- 6) Leave in this condition for 10 minutes.

### B: REPLACEMENT

**NOTE:**

- If a component is replaced, add an appropriate amount of compressor oil.
- When replacing the compressor, the new compressor will already have the specified amount of oil in it. Install the new compressor after removing the same amount of oil that is remaining in the compressor removed.

| Replacement parts | Amount of oil replenishment           |
|-------------------|---------------------------------------|
| Evaporator        | 114 m ℓ (3.9 US fl oz, 4.0 Imp fl oz) |
| Condenser         | 7 m ℓ (0.24 US fl oz, 0.25 Imp fl oz) |
| Hose              | 1 m ℓ (0.03 US fl oz, 0.04 Imp fl oz) |

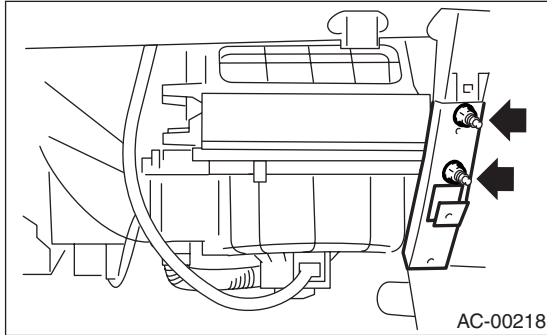
# Blower Motor Unit Assembly

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

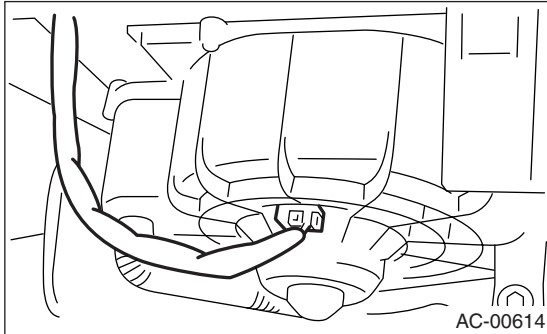
## 7. Blower Motor Unit Assembly

### A: REMOVAL

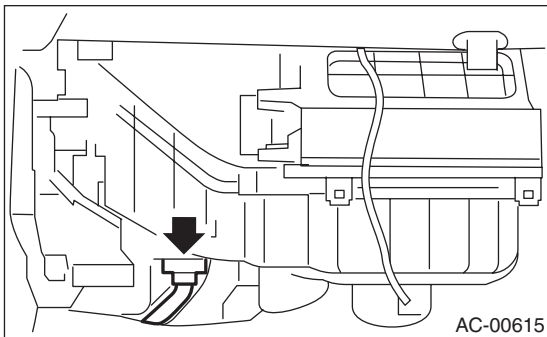
- 1) Disconnect the ground cable from battery.
- 2) Remove the glove box. <Ref. to EI-43, REMOVAL, Glove Box.>
- 3) Loosen the nut to remove the support beam stay.



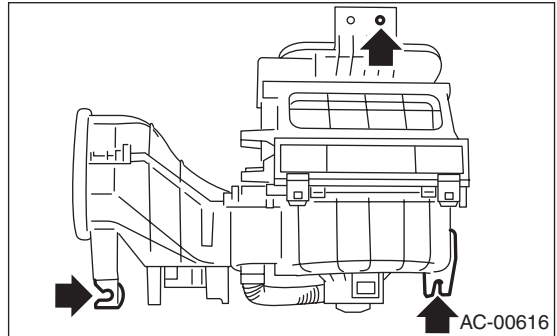
- 4) Disconnect the blower motor connector.



- 5) Disconnect the power transistor or blower resistor connector.



- 6) Loosen the bolt and nut to remove the blower motor unit assembly.



### B: INSTALLATION

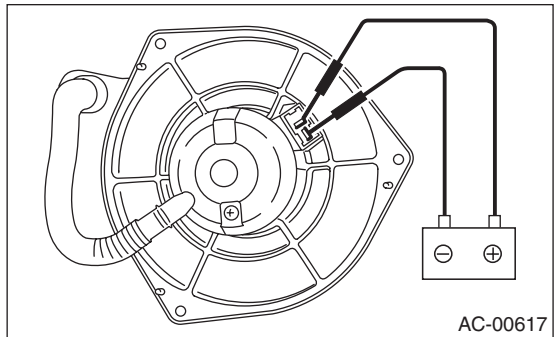
Install in the reverse order of removal.

#### Tightening torque:

Refer to **COMPONENT** in *General Description*. <Ref. to AC-5, HEATER COOLING UNIT, **COMPONENT**, *General Description*.> and <Ref. to AC-7, BLOWER MOTOR UNIT, **COMPONENT**, *General Description*.>

### C: INSPECTION

Connect the positive (+) lead from the battery to the motor connector terminal 1 and negative (-) lead to the terminal 2. Make sure the motor runs smoothly.



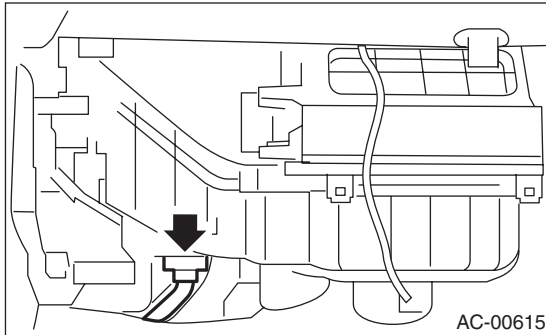
## Power Transistor (Auto A/C Model)

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

### 8. Power Transistor (Auto A/C Model)

#### A: REMOVAL

- 1) Remove the glove box. <Ref. to EI-43, REMOVAL, Glove Box.>
- 2) Disconnect the power transistor connector.
- 3) Loosen the two screws to remove the power transistor.



#### B: INSTALLATION

Install in the reverse order of removal.



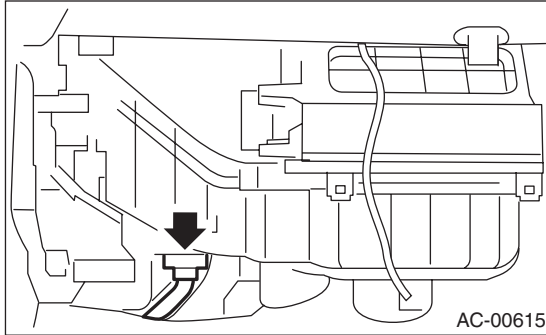
## Blower Resistor (Manual A/C Model)

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

### 9. Blower Resistor (Manual A/C Model)

#### A: REMOVAL

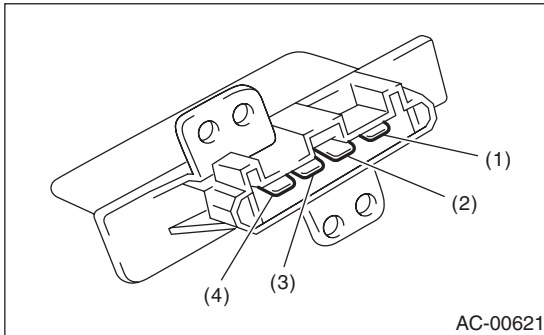
- 1) Remove the glove box. <Ref. to EI-43, REMOVAL, Glove Box.>
- 2) Disconnect the blower resistor connector.
- 3) Loosen the two screws to remove the blower resistor.



#### B: INSTALLATION

Install in the reverse order of removal.

#### C: INSPECTION



Measure the blower resistor resistance.

| Terminal No. | Standard              |
|--------------|-----------------------|
| 3 and 1      | Approx. 0.51 $\Omega$ |
| 3 and 2      | Approx. 2.70 $\Omega$ |
| 3 and 4      | Approx. 1.43 $\Omega$ |

If NG, replace the blower resistor.

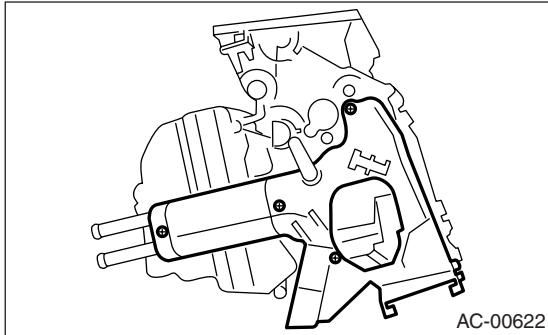
# Heater Core

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

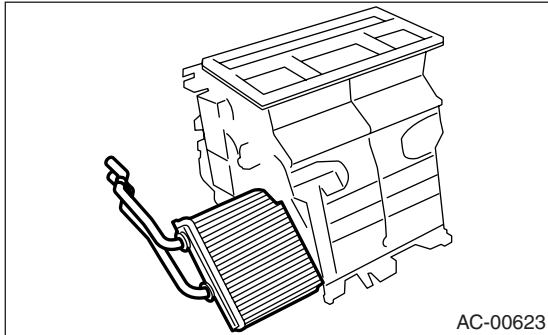
## 10.Heater Core

### A: REMOVAL

- 1) Remove the heater and cooling unit. <Ref. to AC-34, REMOVAL, Heater and Cooling Unit.>
- 2) Loosen the screws to remove the heater core cover.



- 3) Remove the heater core.



### B: INSTALLATION

Install in the reverse order of removal.

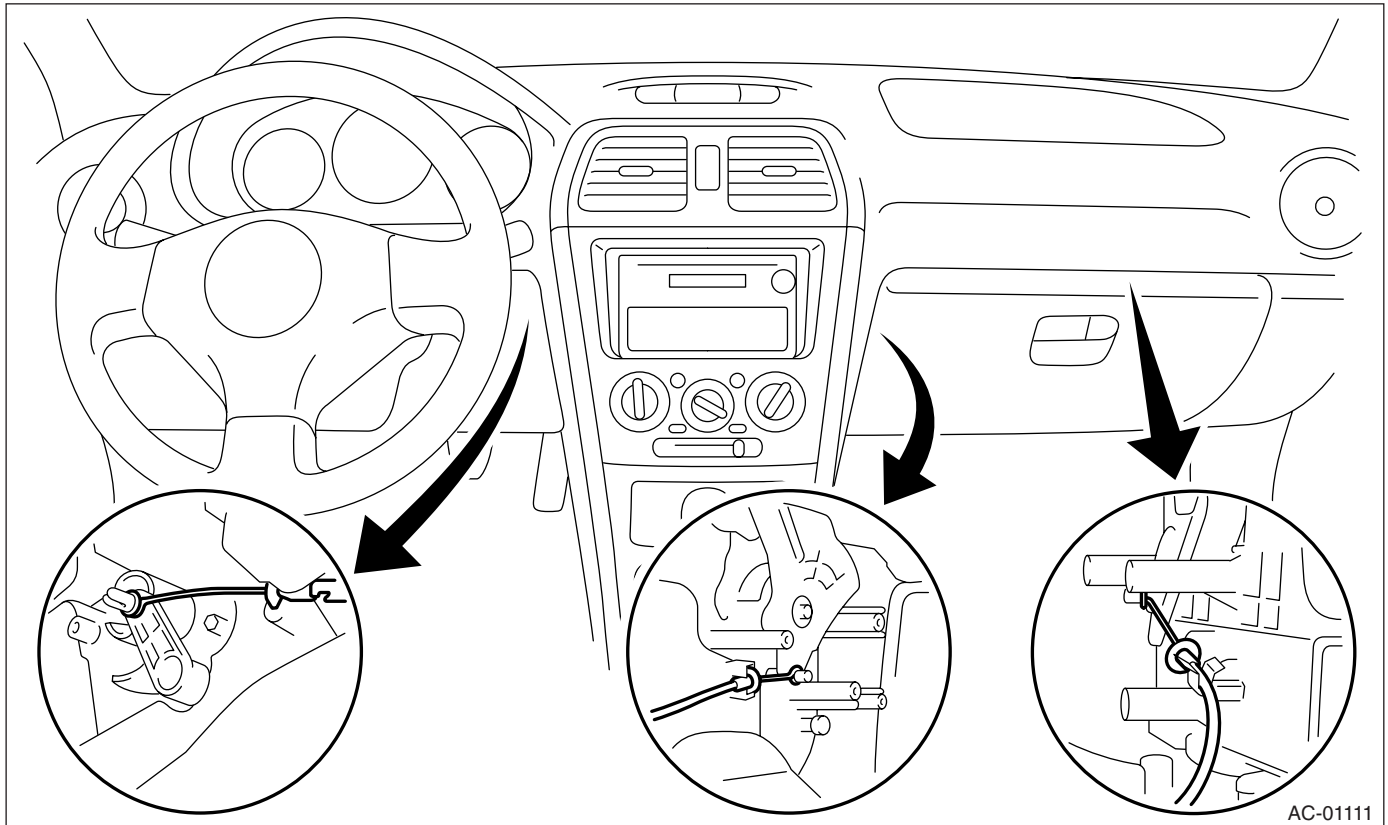
## Control Unit (Manual A/C Model)

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

### 11. Control Unit (Manual A/C Model)

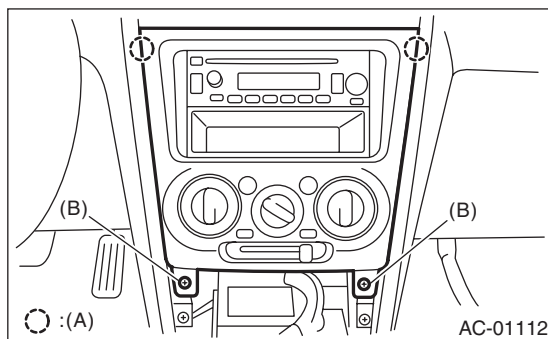
#### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the glove box. <Ref. to EI-43, REMOVAL, Glove Box.>
- 3) Remove the lower panel. <Ref. to EI-47, Instrument Panel Assembly.>
- 4) Remove the control cables.

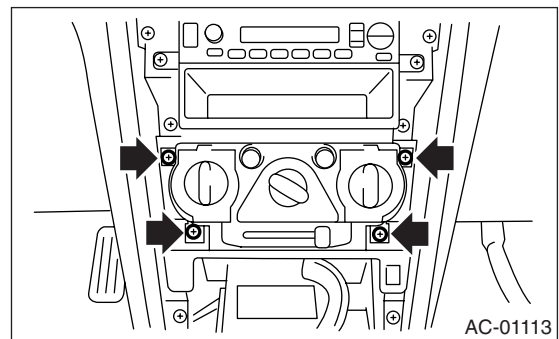


- 5) Remove the console front panel.
- 6) Remove the center console panel.

- 7) Remove four screws.



- (A) Clip  
(B) Screw



- 8) Pull out the control unit and disconnect connectors.

#### B: INSTALLATION

Install in the reverse order of removal.

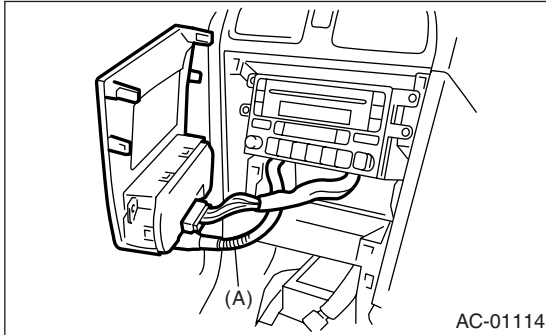
## Control Unit (Auto A/C Model)

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

### 12. Control Unit (Auto A/C Model)

#### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the console front panel.
- 3) Remove the center console panel.
- 4) Disconnect the connector and aspirator hose (A).



#### B: INSTALLATION

Install in the reverse order of removal.

# Compressor

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

## 13. Compressor

### A: INSPECTION

#### 1. MAGNETIC CLUTCH CLEARANCE

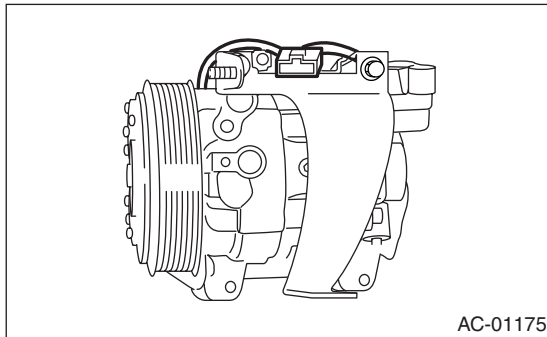
1) Check the clearance of the entire circumference around the drive plate and pulley.

**Standard:**

$0.45 \pm 0.15 \text{ mm}$  ( $0.0177 \pm 0.0059 \text{ in}$ )

#### 2. MAGNETIC CLUTCH OPERATION

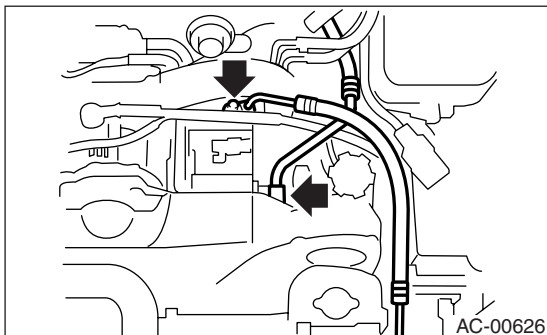
- 1) Disconnect the compressor connector.
- 2) Connect the positive (+) lead from battery to the terminal of compressor connector.



3) Make sure the magnet clutch engages.  
If NG, replace the compressor.

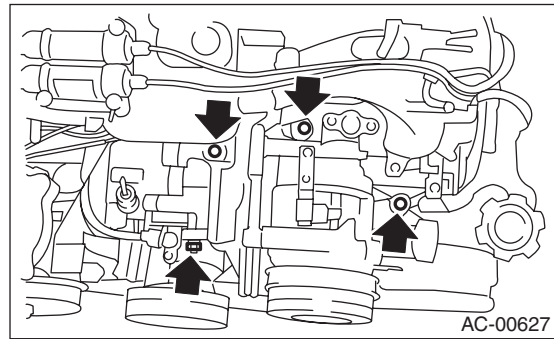
### B: REMOVAL

- 1) Perform the compressor oil return operation. <Ref. to AC-25, PROCEDURE, Compressor Oil.>
- 2) Turn the A/C switch OFF and stop the engine.
- 3) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-20, PROCEDURE, Refrigerant Recovery Procedure.>
- 4) Disconnect the ground cable from battery.
- 5) Remove the V-belt. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.> or <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
- 6) Remove the generator. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
- 7) Remove the low-pressure hose and high-pressure hose.

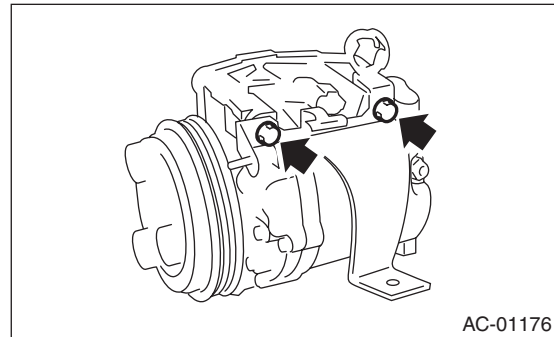


8) Disconnect the compressor harness from body harness.

9) Loosen the bolts to remove the compressor bracket.



10) Loosen the bolts to remove the bracket from compressor.



### C: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Replace the O-rings on low-/high-pressure hoses with new ones, then apply compressor oil.
- 3) When replacing compressor, adjust amount of compressor oil. <Ref. to AC-25, PROCEDURE, Compressor Oil.>
- 4) Charge refrigerant. <Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>

#### **Tightening torque:**

**Refer to COMPONENT in General Description. <Ref. to AC-11, AIR CONDITIONING UNIT, COMPONENT, General Description.> and <Ref. to AC-12, COMPRESSOR, COMPONENT, General Description.>**

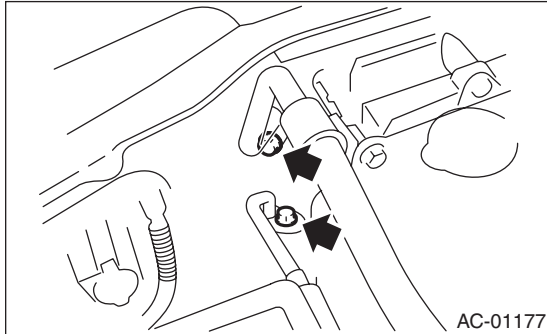
# Condenser

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

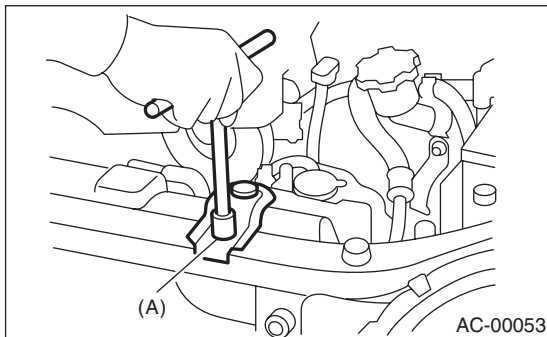
## 14. Condenser

### A: REMOVAL

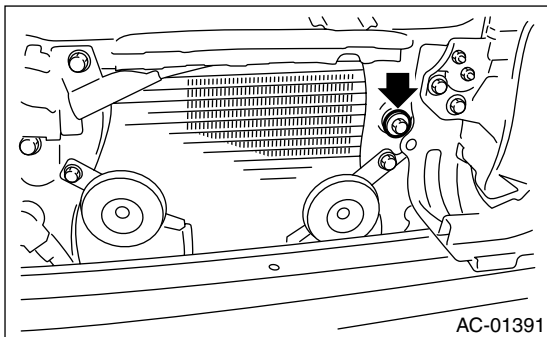
- 1) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-20, PROCEDURE, Refrigerant Recovery Procedure.>
- 2) Disconnect the ground cable from battery.
- 3) Remove the front bumper. <Ref. to EI-24, REMOVAL, Front Bumper.>
- 4) Disconnect the pressure hose and pipe from condenser.



- 5) Remove the radiator bracket (A).



- 6) Remove the two bolts. While lifting the condenser, pull it out through the space between radiator and radiator panel.



### CAUTION:

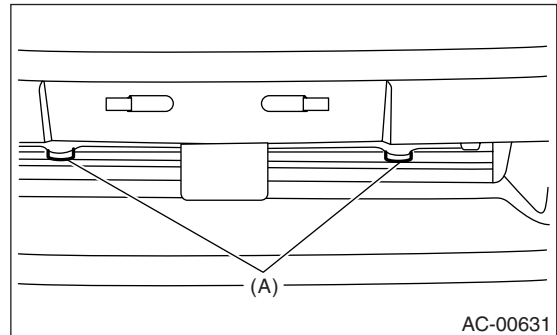
- Be careful not to damage the condenser fins. If a damaged fin is found, repair it using a thin screwdriver.
- If the condenser is replaced, add appropriate amount of compressor oil to the compressor. <Ref. to AC-25, REPLACEMENT, Compressor Oil.>

### B: INSTALLATION

- 1) Install in the reverse order of removal.

### CAUTION:

Replace the O-rings on hoses or pipes with new ones, and then apply compressor oil. Confirm that lower guide of condenser (A) has been fitted into holes on radiator panel.



- 2) Charge refrigerant. <Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>

### Tightening torque:

Refer to **COMPONENT** in **General Description**. <Ref. to AC-11, AIR CONDITIONING UNIT, COMPONENT, General Description.> and <Ref. to CO(H4SO)-4, RADIATOR AND RADIATOR FAN, COMPONENT, General Description.>

### C: INSPECTION

- 1) Confirm that no dust or insects are found on the condenser fins. Air-blow or flush fins with water as needed.
- 2) Confirm that no oil leaks from condenser. If a failure is found, replace the condenser with a new one.

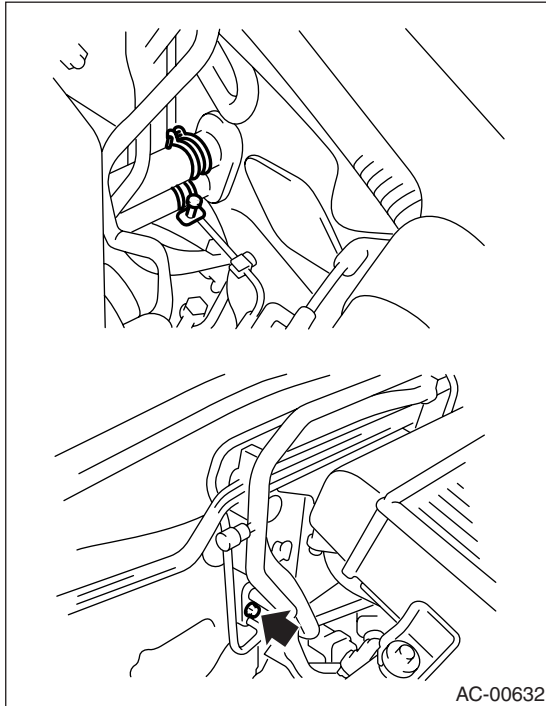
# Heater and Cooling Unit

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

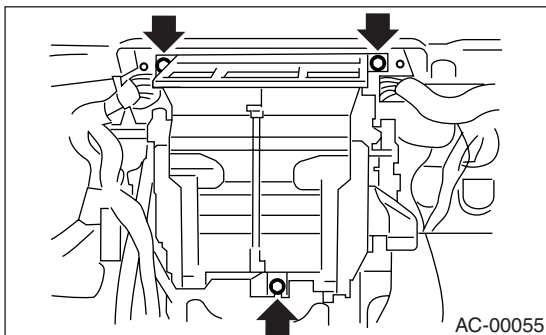
## 15. Heater and Cooling Unit

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-20, PROCEDURE, Refrigerant Recovery Procedure.>
- 3) Drain engine coolant from the radiator.
- 4) Remove the bolt securing expansion valve and pipe in engine compartment. Release the heater hose clamps in engine compartment to remove the hoses.



- 5) Remove the instrument panel. <Ref. to EI-47, REMOVAL, Instrument Panel Assembly.>
- 6) Remove the support beam.
- 7) Remove the blower motor unit assembly. <Ref. to AC-26, REMOVAL, Blower Motor Unit Assembly.>
- 8) Disconnect the servo motor connectors.
- 9) Loosen the bolt and nuts to remove the heater and cooling unit.



### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Charge refrigerant. <Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>

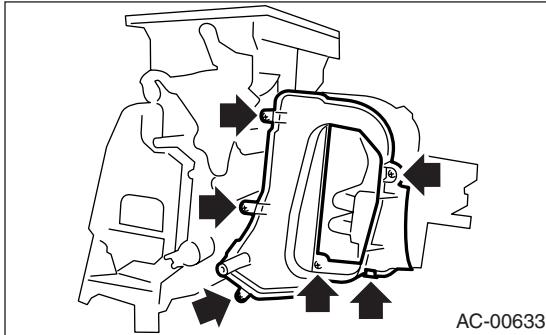
#### Tightening torque:

*Refer to COMPONENT in General Description. <Ref. to AC-5, HEATER COOLING UNIT, COMPONENT, General Description.>*

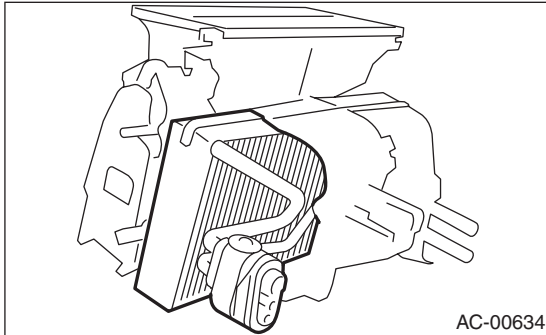
## 16. Evaporator

### A: REMOVAL

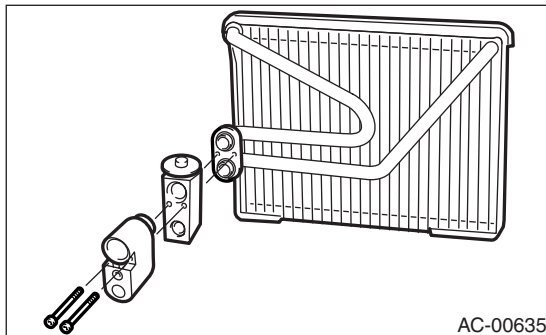
- 1) Remove the heater and cooling unit. <Ref. to AC-34, REMOVAL, Heater and Cooling Unit.>
- 2) Loosen the screws and clip to remove the evaporator cover.



- 3) Remove the evaporator.



- 4) Loosen the two bolts to remove the expansion valve.



### CAUTION:

If the evaporator is replaced, add appropriate amount of compressor oil to evaporator. <Ref. to AC-25, REPLACEMENT, Compressor Oil.>

### B: INSTALLATION

Install in the reverse order of removal.

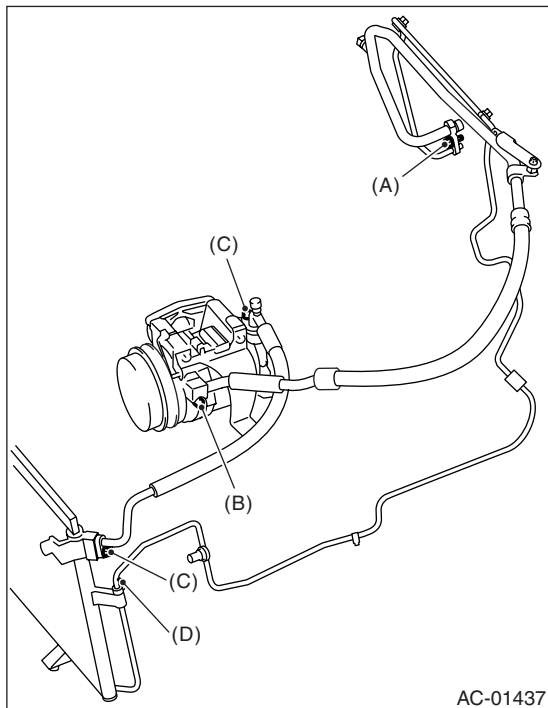


### 17.Hose and Tube

#### A: REMOVAL

##### CAUTION:

- When disconnecting/connecting hoses, do not apply excessive force to them. Confirm that no torsion and excessive tension exists after installing.
  - Seal the disconnected hose with a plug or vinyl tape to prevent contamination from entering.
- 1) Disconnect the ground cable from battery.
  - 2) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-20, PROCEDURE, Refrigerant Recovery Procedure.>
  - 3) Remove the evaporator unit mounting bolt (A).
  - 4) Remove the low-pressure hose attaching bolts (B).
  - 5) Disconnect the low-pressure hose from evaporator unit.
  - 6) Disconnect the low-pressure hose from compressor.
  - 7) Remove the low-pressure hose from vehicle.
  - 8) Remove the high-pressure hose attaching bolts (C).
  - 9) Disconnect the high-pressure hose from compressor.
  - 10) Disconnect the high-pressure hose from condenser.
  - 11) Remove the high-pressure hose from vehicle.
  - 12) Remove the high-pressure tube attaching bolt (D).
  - 13) Remove the high-pressure tube from vehicle.



#### B: INSTALLATION

##### CAUTION:

- When disconnecting/connecting hoses, do not apply an excessive force to them. Confirm that no torsion and excessive tension exists after installing.
  - Seal the disconnected hose with a plug or vinyl tape to prevent contamination from entering.
- 1) Install in the reverse order of removal.
  - 2) Charge refrigerant. <Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>

##### Tightening torque:

*Refer to COMPONENT in General Description. <Ref. to AC-11, AIR CONDITIONING UNIT, COMPONENT, General Description.>*

#### C: INSPECTION

##### NOTE:

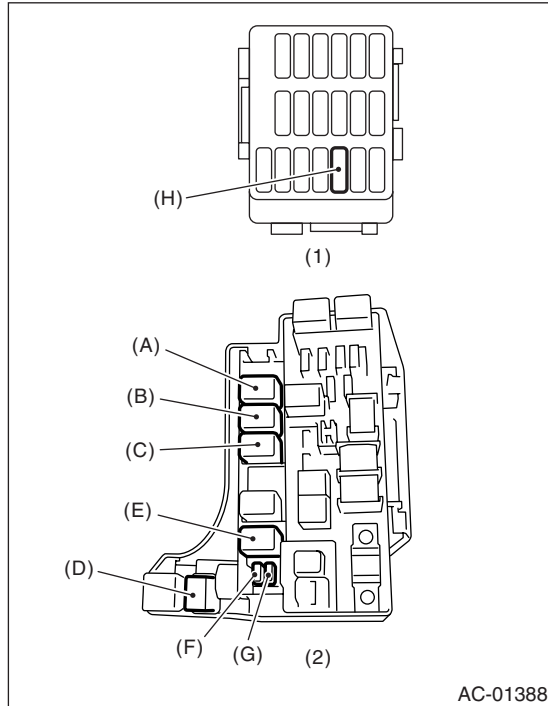
If cracking, damage, or swelling is found on a hose, replace it with a new one.

# Relay and Fuse

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

## 18. Relay and Fuse

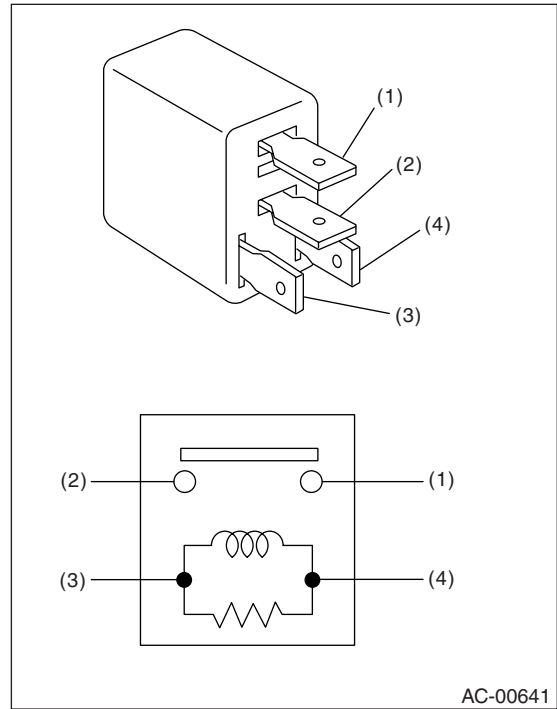
### A: LOCATION



- (1) Joint box
- (2) Main fuse box

|                  |   |
|------------------|---|
| Main Fan Relay 1 | A |
| Main Fan Relay 2 | B |
| Sub Fan Relay 1  | C |
| Sub Fan Relay 2  | E |
| A/C Relay        | D |
| Main Fan Fuse    | F |
| Sub Fan Fuse     | G |
| A/C Fuse         | H |

### B: INSPECTION



- (3) — (4): Continuity exists.
- (1) — (2): No continuity

While applying battery voltage to the terminal between (3) and (4), check continuity between (1) and (2).  
If no continuity exists, replace the relay with a new one.

## Pressure Switch (Dual Switch)

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

### 19. Pressure Switch (Dual Switch)

#### A: INSPECTION

- 1) Connect the manifold gauge to the service valve on high-pressure side.
- 2) Start the air conditioner, and check the operating pressure of switch by turning the compressor (magnet clutch) to ON/OFF.

**NOTE:**

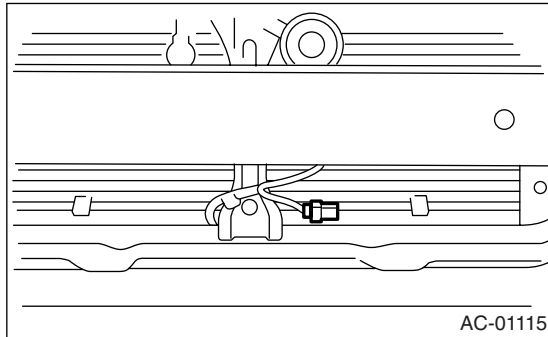
- When the refrigerant pressure becomes excessively high, the high pressure switch turns off the compressor (magnet clutch) to prevent breakage or freeze of evaporator, air conditioner pipe and expansion valve.
- When the refrigerant pressure becomes excessively low, the low pressure switch judges that filling amount is insufficient and turns off the compressor (magnet clutch) to prevent seizure due to compressor rotating.

|                              | Operation  | Standard<br>kPa (kgf/cm <sup>2</sup> , psi)   |
|------------------------------|------------|---|
| High and low pressure switch | Turns OFF. | Increasing to<br>2,800±100 (29±1, 406±15)   |
|                              |            | Decreasing to<br>278±29 (2.83±0.3, 40.3±4.2)  |
|                              | Turns ON.  | Increasing to<br>287 <sup>+39</sup> <sub>-25</sub> (2.9 <sup>+0.4</sup> <sub>-0.25</sub> 42 <sup>+5.7</sup> <sub>-3.6</sub> ) |
|                              |            | Decreasing to<br>2,200±200 (22.4±2, 319±29)   |

## 20. Ambient Sensor

### A: REMOVAL

- 1) Open the front hood.
- 2) Disconnect the ground cable from battery.
- 3) Disconnect the ambient sensor connector.
- 4) Remove the ambient sensor from radiator lower panel.



### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

<Ref. to AC(diag)-24, AMBIENT SENSOR, Diagnostic Procedure for Sensors.>

## Sunload Sensor (Auto A/C Model)

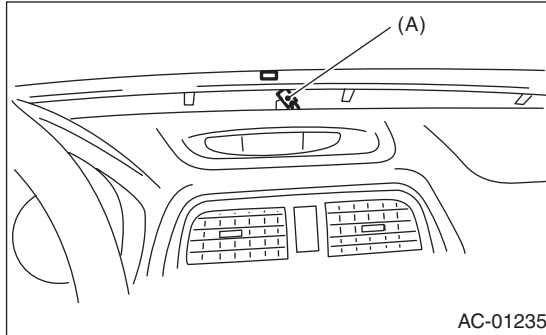
HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

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### 21. Sunload Sensor (Auto A/C Model)

#### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the front defroster grille.
- 3) Disconnect the sunload sensor connector (A).



#### CAUTION:

**Do not damage the sensors and interior trims when removing them.**

#### B: INSTALLATION

Install in the reverse order of removal.

#### C: INSPECTION

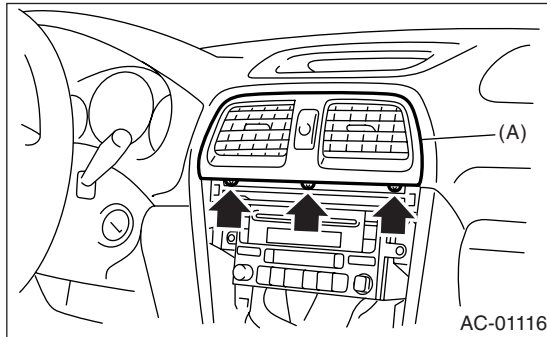
<Ref. to AC(diag)-28, SUNLOAD SENSOR, Diagnostic Procedure for Sensors.>

## 22. Air Vent Grille

### A: REMOVAL

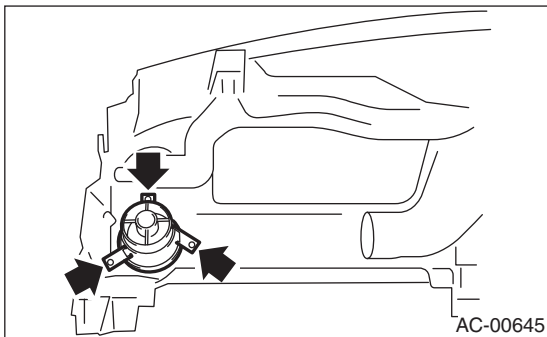
#### 1. CENTER GRILLE

- 1) Disconnect the ground cable from battery.
- 2) Remove the console front panel.
- 3) Remove the center console panel.
- 4) Loosen the three screws to remove the center air vent grille (A).



#### 2. SIDE GRILLE

- 1) Disconnect the ground cable from battery.
- 2) Remove the heater vent duct. <Ref. to AC-43, REMOVAL, Heater Vent Duct.>
- 3) Loosen the screws to remove the side air vent grille.



### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

The direction and amount of air should be adjusted smoothly.

The adjustment should be kept in each position.

## Heater Duct

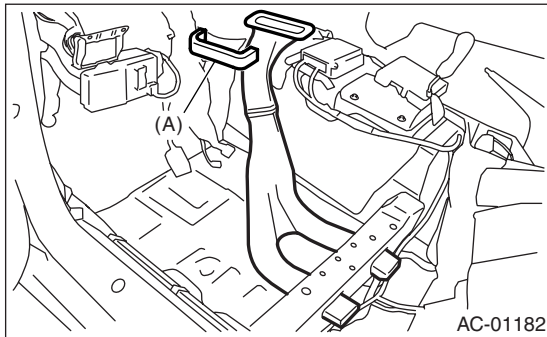
HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

---

### 23.Heater Duct

#### A: REMOVAL

- 1) Remove the front seats. <Ref. to SE-7, REMOVAL, Front Seat.>
- 2) Remove the console box. <Ref. to EI-46, Console Box.>
- 3) Remove the side sill front cover, side sill rear cover and center pillar lower trim. <Ref. to EI-51, REMOVAL, Lower Inner Trim.>
- 4) Remove the foot rest.
- 5) Remove the clips from floor mat.
- 6) Remove the mat hook.
- 7) Remove the mat from toe board area.
- 8) Remove the rear heater duct cover (A). Draw out the rear heater duct from the unit assembly and slide it forward to remove.



#### B: INSTALLATION

Install in the reverse order of removal.

##### NOTE:

- Secure the mat firmly with hook and Velcro tape.
- Insert the mat edge firmly into the groove of side sill cover.

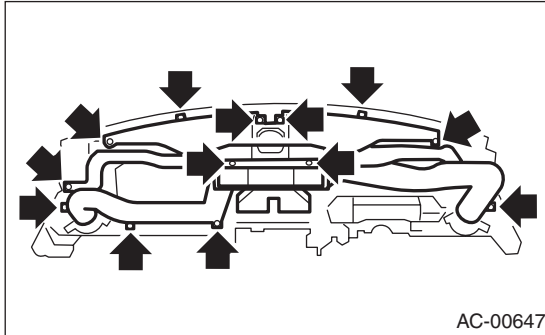
## Heater Vent Duct

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

### 24.Heater Vent Duct

#### A: REMOVAL

- 1) Remove the instrument panel. <Ref. to EI-47, REMOVAL, Instrument Panel Assembly.>
- 2) Remove the screws.
- 3) Remove the heater vent duct.



#### B: INSTALLATION

Install in the reverse order of removal.



## General Diagnostic Table

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

### 25. General Diagnostic Table

#### A: INSPECTION

| Symptom  |  | Repair order           |
|--|--|------------------------|
| Blower motor                                   | Doesn't move.                          | Fuse                   |
|  |  | Blower motor relay     |
|  |  | Blower motor           |
|  |  | Blower motor resistor  |
|  |  | Blower switch          |
|  |  | Wire harness           |
|  | Strange noise.                         | Blower motor           |
| Compressor                                     | Doesn't move.                          | Refrigerant            |
|  |  | Fuse                   |
|  |  | Air conditioning relay |
|  |  | Magnet clutch          |
|  |  | Compressor             |
|  |  | Pressure switch        |
|  |  | A/C switch             |
|  |  | Blower switch          |
|  | Wire harness                           |                        |
|  | Noise                                  | V-Belt                 |
|  |  | Magnet clutch          |
| Compressor                                     |  |                        |
| Cold air not emitted.                          | Refrigerant                            |                        |
|  | V-Belt                                 |                        |
|  | Magnet clutch                          |                        |
|  | Compressor                             |                        |
|  | Pressure switch                        |                        |
|  | A/C switch                             |                        |
|  | Blower switch                          |                        |
|  | Wire harness                           |                        |
|  | Heater duct                            |                        |
|  | Heater vent duct                       |                        |
| Warm air not emitted.                          | Engine coolant                         |                        |
|  | Blower switch                          |                        |
|  | Heater core                            |                        |
| Temperature of air from vents does not change. | Engine coolant                         |                        |
|  | Air mix actuator (Auto A/C)            |                        |
|  | Wire harness (Auto A/C)                |                        |
|  | Temperature control cable (Manual A/C) |                        |
| Unable to switch blow vents.                   | Mode actuator (Auto A/C)               |                        |
|  | Air flow switch (Auto A/C)             |                        |
|  | Wire harness (Auto A/C)                |                        |
|  | Mode cable (Manual A/C)                |                        |
| Unable to switch suction vents.                | Air inlet select switch (Auto A/C)     |                        |
|  | FRESH/RECIRC actuator (Auto A/C)       |                        |
|  | Wire harness (Auto A/C)                |                        |
|  | Intake cable (Manual A/C)              |                        |

# HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

# *AC(diag)*

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|   | <b>Page</b> |
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# Basic Diagnostic Procedure

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

## 1. Basic Diagnostic Procedure

### A: PROCEDURE

| Step   | Check                                   | Yes  | No  |
|--|---|--|---|
| <b>1</b><br><b>START INSPECTIONS.</b><br>1) Perform the pre-inspection. <Ref. to AC(diag)-3, INSPECTION, General Description.><br>2) Perform the self-diagnosis. <Ref. to AC(diag)-8, OPERATION, Diagnostic Chart for Self-Diagnosis.> | Does the self-diagnosis operate?        | Go to step 2.  | <Ref. to AC(diag)-11, A/C OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE, Diagnostics for A/C System Malfunction.>                                      |
| <b>2</b><br><b>CONFIRM MALFUNCTION PART.</b><br>Confirm the malfunction part with self-diagnosis.  | Can the malfunction part be confirmed?  | Repair the malfunction part according to each diagnostics chart. | Go to step 3.   |
| <b>3</b><br><b>CHECK COMPARTMENT TEMPERATURE.</b><br>1) Turn the A/C switch ON.<br>2) Set the temperature control dial to maximum cold position.<br>3) Check the compartment temperature changes.                                      | Is the compartment temperature changed? | Go to step 4.  | <Ref. to AC(diag)-15, COMPARTMENT TEMPERATURE DOES NOT CHANGE, OR A/C SYSTEM DOES NOT RESPOND PROMPTLY., Diagnostics for A/C System Malfunction.> |
| <b>4</b><br><b>CHECK A/C SYSTEM RESPONSE.</b><br>Change the temperature setting, and check the response of A/C system.   | Does the A/C system respond quickly?    | A/C system is OK.  | <Ref. to AC(diag)-15, COMPARTMENT TEMPERATURE DOES NOT CHANGE, OR A/C SYSTEM DOES NOT RESPOND PROMPTLY., Diagnostics for A/C System Malfunction.> |

# General Description

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

## 2. General Description

### A: CAUTION

1) Never connect the battery in reverse polarity. The Auto A/C control module will be destroyed instantly.

2) Do not disconnect the battery cables while the engine is running.

A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as auto A/C control module.

3) Before disconnecting the connectors of each sensor and the auto A/C control module, be sure to turn off the ignition switch.

The auto A/C control module may be damaged.

4) Every A/C-related part is a precision part. Do not drop them.

5) Airbag system wiring harness is routed near the A/C control panel (auto A/C control module) and junction box.

### CAUTION:

- Airbag system connectors are colored yellow. Do not use electrical test equipment on these circuits.

- Be careful not to damage the airbag system wiring harness when servicing the A/C control panel (auto A/C control module) and junction box.

### B: INSPECTION

Before performing diagnosis, check the following items which might affect A/C system problems.

#### 1. BATTERY

1) Measure the battery voltage and specific gravity of electrolyte.

**Standard voltage: 12 V**

**Specific gravity: Above 1.260**

2) Check the condition of the fuses for A/C system power supply and other fuses.

3) Check the condition of the harnesses and harness connectors connection.

#### 2. ASPIRATOR HOSE

1) Turn the ignition switch to ON and push the A/C switch.

2) Turn the temperature control dial to maximum hot position.

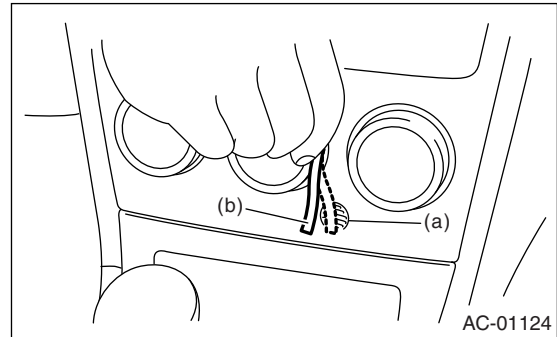
3) Turn the air flow control dial to "DEF" position.

4) Turn the fan speed control dial to MAX speed position.

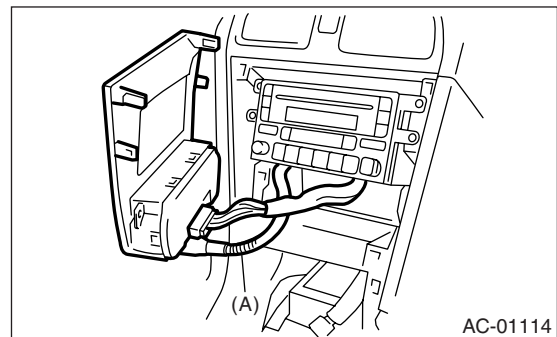
5) Firmly hold a thin paper (b) in front of the in-vehicle sensor suction port (a) for the auto A/C control module and check that the paper moves towards the port indicating that air is being sucked into the port.

### NOTE:

Ensure the paper does not get sucked into the port.

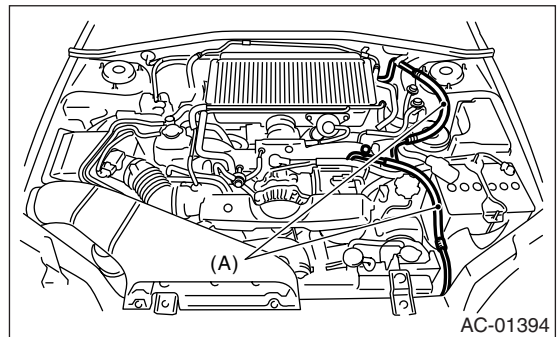


6) If the paper does not move at all, remove the auto A/C control module <Ref. to AC-31, REMOVAL, Control Unit (Auto A/C Model).> and check for improper connection of the aspirator hose (A), auto A/C control module and heater unit, and secure as necessary.



#### 3. A/C LINE

Check the connection for A/C line (A) and lower side high-pressure pipe.



#### 4. CONTROL LINKAGE

- 1) Check the state of mode door linkage.
- 2) Check the state of air mix door linkage.
- 3) Check the state of intake door linkage.

## General Description

### HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

#### 5. CONTROL SWITCHES

Start and warm-up the engine completely.

##### 1) Inspection using switches

| No. | Item to be checked                      | Switch position  | Judgment standard   |
|-----|---|--|---|
| 1   | Air flow control dial                   | Turn the dial to the right.  | Outlet opening (mode) switches AUTO → VENT → BILEVEL → HEAT → DEF/HEAT → DEF each time turning the dial.  |
| 2   | Fan speed control dial                  | Turn the dial to the right   | Fan speed switches OFF → AUTO → 1st — 25th each time turning the dial.  |
| 3   | FRESH/RECIRC switch                     | Press the FRESH/RECIRC switch.   | Inlet opening switches RECIRC → FRESH each time pressing the switch.  |
|     |   | Press the FRESH/RECIRC switch longer (more than 1.0 seconds).  | LED blinks twice, and switches to AUTO.   |
| 4   | A/C switch                              | Turn the A/C switch to ON with the fan speed control dial position other than OFF.   | LED comes on, and the compressor will be operated.  |
|     |   | Press the A/C switch longer (more than 1.0 seconds).   | LED blinks twice, and switches to AUTO.   |
| 5   | Auto function Operate from 1) in order. | 1) Set the following dials and switches to AUTO.<br>• Air flow control dial<br>• Fan speed control dial<br>• FRESH/RECIRC switch<br>• A/C switch<br>2) Turn the temperature control dial to the left fully, to set to the maximum cool position. | <ul style="list-style-type: none"> <li>• Outlet air temperature: COOL</li> <li>• Fan speed: MAX</li> <li>• Outlet opening: VENT</li> <li>• Inlet opening: Internal air</li> <li>• Compressor: AUTO</li> </ul>           |
|     |   | 3) Turn the temperature control dial to the right slowly, to change the setting gradually to the maximum hot position.   | <ul style="list-style-type: none"> <li>• Outlet air temperature: COOL → HOT</li> <li>• Fan speed: AUTO</li> <li>• Outlet opening: AUTO</li> <li>• Inlet opening: AUTO</li> <li>• Compressor: AUTO</li> </ul>            |
|     |   | 4) Turn the temperature control dial to the right fully, to set to the maximum hot position.   | <ul style="list-style-type: none"> <li>• Outlet air temperature: HOT</li> <li>• Fan speed: MAX</li> <li>• Outlet opening: HEAT</li> <li>• Inlet opening: External air</li> <li>• Compressor: AUTO</li> </ul>            |
| 6   | Defroster interlock                     | Turn the air flow control dial to DEF or DEF/HEAT position.  | <ul style="list-style-type: none"> <li>• Outlet air temperature: AUTO</li> <li>• Fan speed: AUTO</li> <li>• Outlet opening: DEF or DEF/HEAT</li> <li>• Inlet opening: External air</li> <li>• Compressor: ON</li> </ul> |
| 7   | Rear window defogger switch             | Press the rear window defogger switch.   | LED comes on.   |

##### 2) Inspection of illumination control

| No. | Item to be checked | Switch operation                | Judgment standard   |
|-----|--------------------|---------------------------------|---|
| 1   | Illumination       | Turn the lighting switch to ON. | Illumination comes on. LED goes dim if it has been illuminated. |

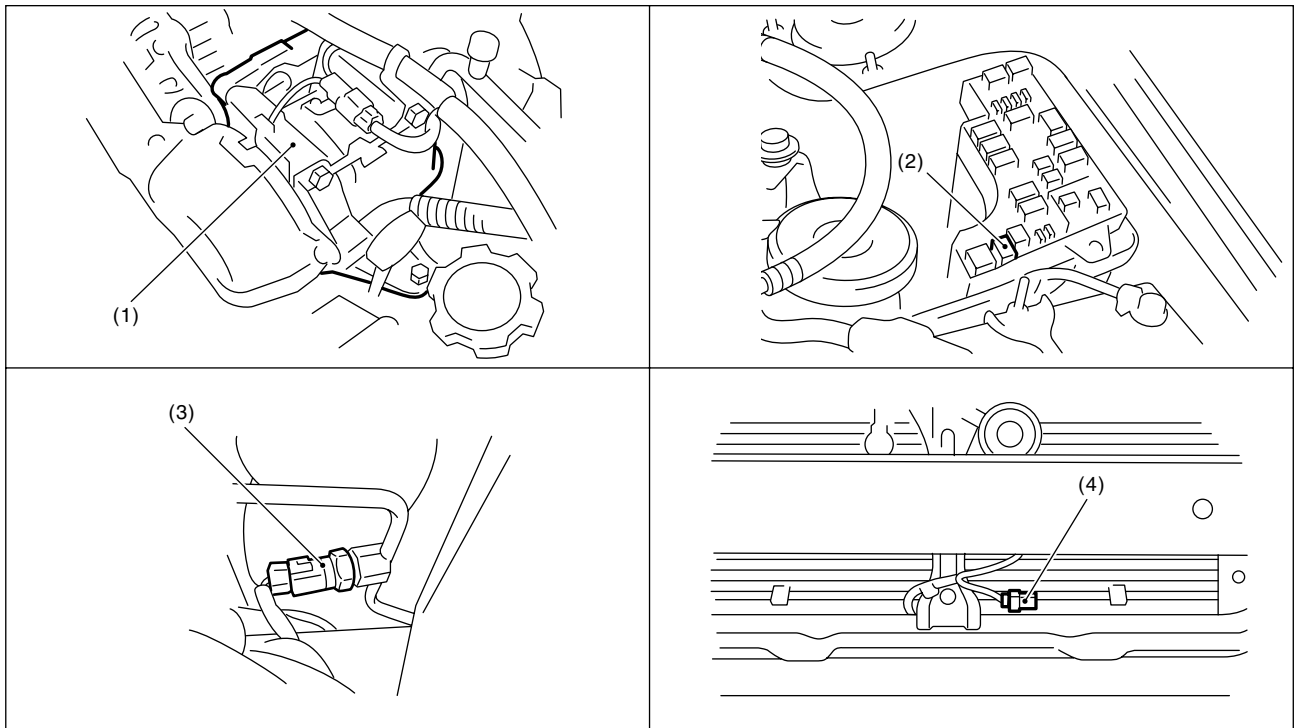
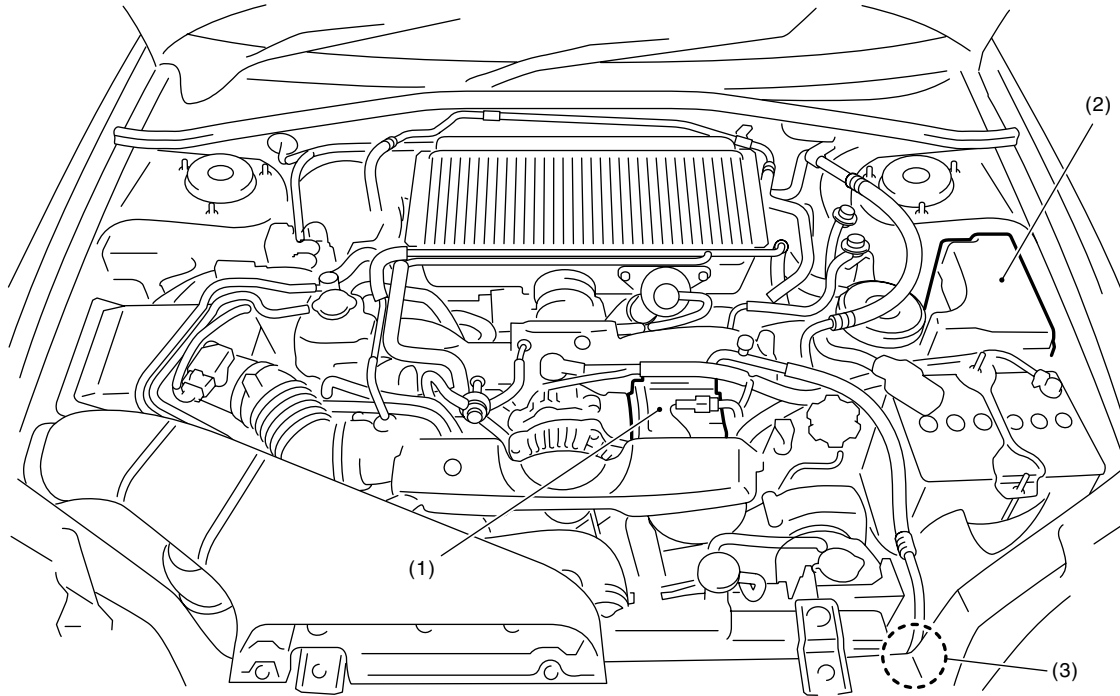
# Electrical Component Location

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

## 3. Electrical Component Location

### A: LOCATION

#### 1. ENGINE COMPARTMENT



AC-01393

(1) A/C compressor  
(2) A/C relay

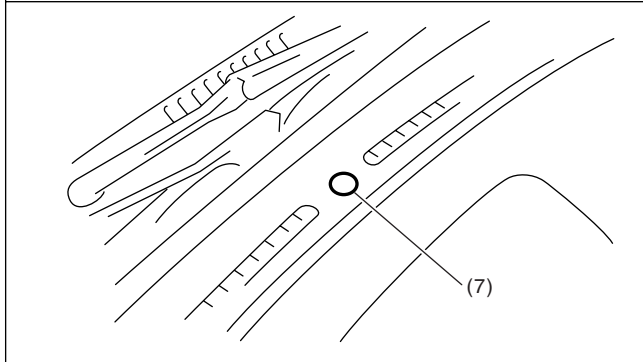
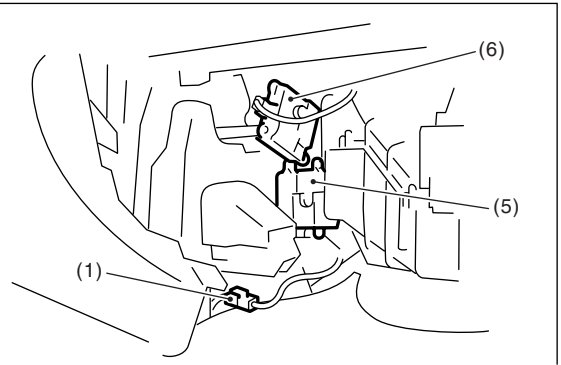
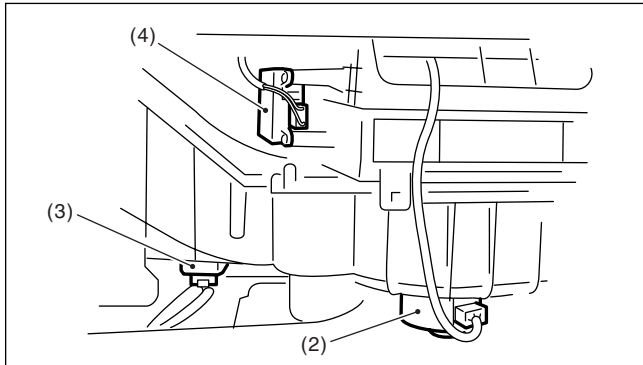
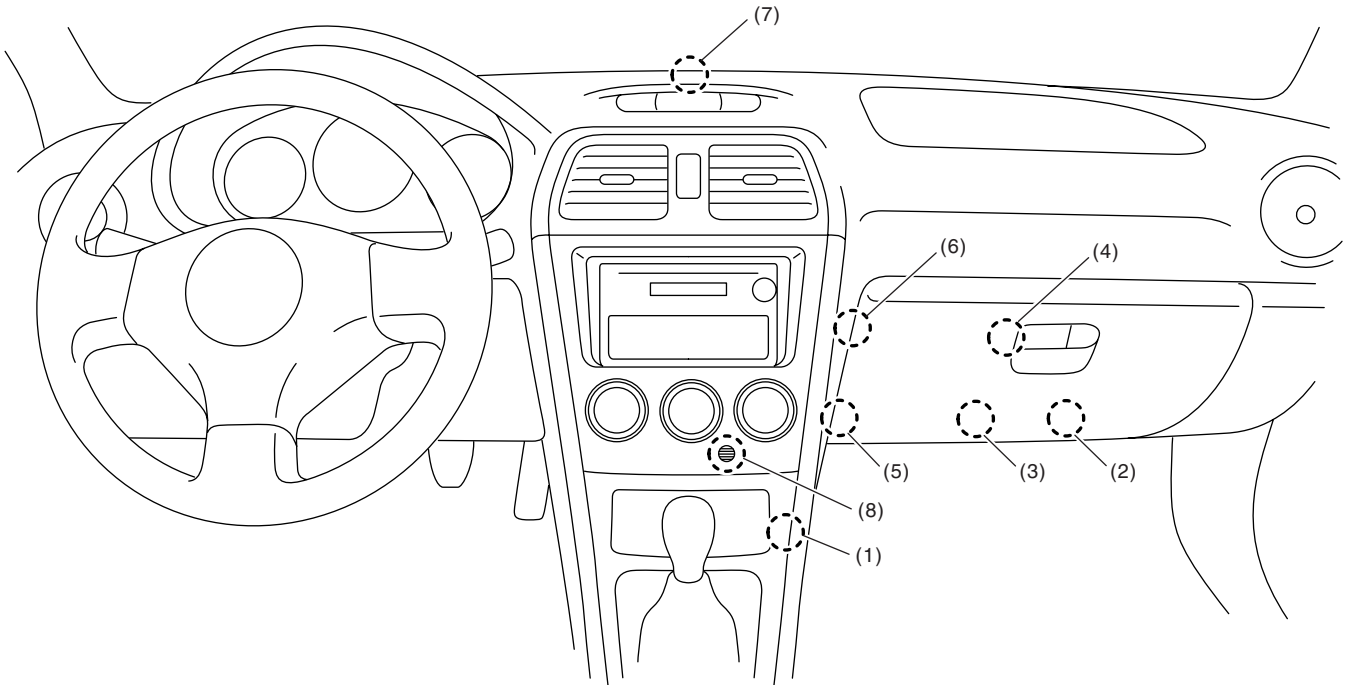
(3) Pressure switch

(4) Ambient sensor

# Electrical Component Location

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

## 2. PASSENGER COMPARTMENT



AC-01127

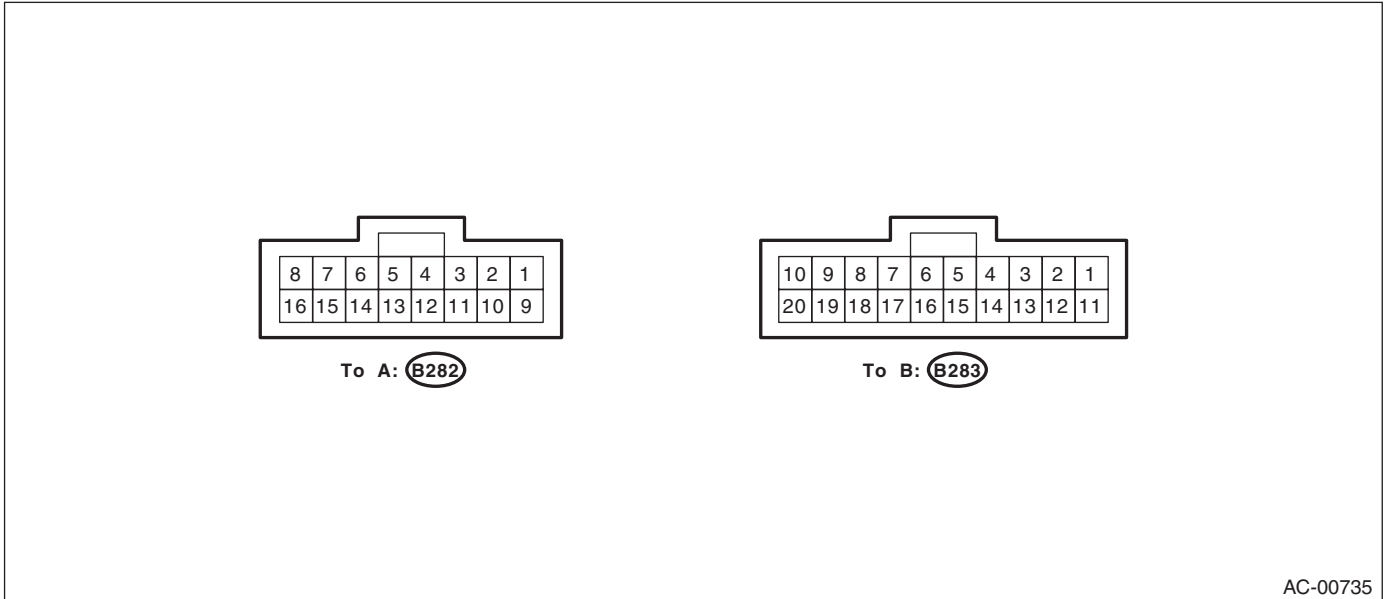
- |                           |                           |   |
|---------------------------|---------------------------|---|
| (1) Evaporator sensor     | (4) Intake door actuator  | (7) Sunload sensor  |
| (2) Blower motor          | (5) Air mix door actuator | (8) In-vehicle sensor (built-in with Auto A/C control module) |
| (3) Blower motor resistor | (6) Mode door actuator    |   |

# Auto A/C Control Module I/O Signal

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

## 4. Auto A/C Control Module I/O Signal

### A: ELECTRICAL SPECIFICATION



AC-00735

| Content                                | Connector & Terminal No. | Signal (V)   |
|--|--------------------------|--|
| Battery power supply (Memory back-up)  | B1 — B12                 | Battery voltage, 13 — 14 (engine running)                              |
| IGN power supply                       | A8 — B12                 | Battery voltage (ignition switch ON), 13 — 14 (engine running)         |
| ACC power supply                       | B2 — B12                 | Battery voltage, 0 (engine cranking), Battery voltage (engine running) |
| Auto A/C control module ground circuit | B12 — chassis ground     | 0 (ignition switch ON) — circuit constantly grounded to chassis        |
| Sensor ground circuit                  | B17 — chassis ground     | 0 (ignition switch ON) — circuit constantly grounded to chassis        |
| Ambient sensor                         | B9 — B17                 | Approx. 5 (disconnect connector, and ignition switch ON)               |
| Evaporator sensor                      | B7 — B17                 |  |
| Thermometer                            | B15 — B12                |  |
| Sunload sensor                         | B16 — B17                | Approx. 5 (disconnect connector, and ignition switch ON)               |
| Air mix door actuator                  | B5 — B1                  | Battery voltage (ignition switch ON)                                   |
| Air mix door actuator P.B.R.           | A4 — B17                 | LAN connection   |
| Mode door actuator                     | B6 — B17                 | Battery voltage (ignition switch ON)                                   |
| Mode door actuator P.B.R.              | A12 — B17                | LAN connection   |
| Intake door FRS voltage                | A15 — A7                 | Battery voltage (FRESH/RECIRC switch OFF)                              |
| Intake door CIRC voltage               | A7 — A15                 | Battery voltage (FRESH/RECIRC switch ON)                               |
| Blower fan relay                       | B14 — body               | Battery voltage (ignition switch ON)                                   |
| A/C relay                              | B3 — B12                 | 0 (ignition and A/C switches ON)<br>Battery voltage (A/C switch OFF)   |
| Illumination control signal            | B10 — B20                | Battery voltage (ignition and lighting switches ON)                    |
| Rear window defogger                   | A 13 — B12               | 0 (ignition switch ON, rear window defogger switch ON)                 |

### B: WIRING DIAGRAM

#### 1. AIR CONDITIONER AUTO A/C MODEL

<Ref. to WI-92, AUTO A/C MODEL, WIRING DIAGRAM, Air Conditioning System.>

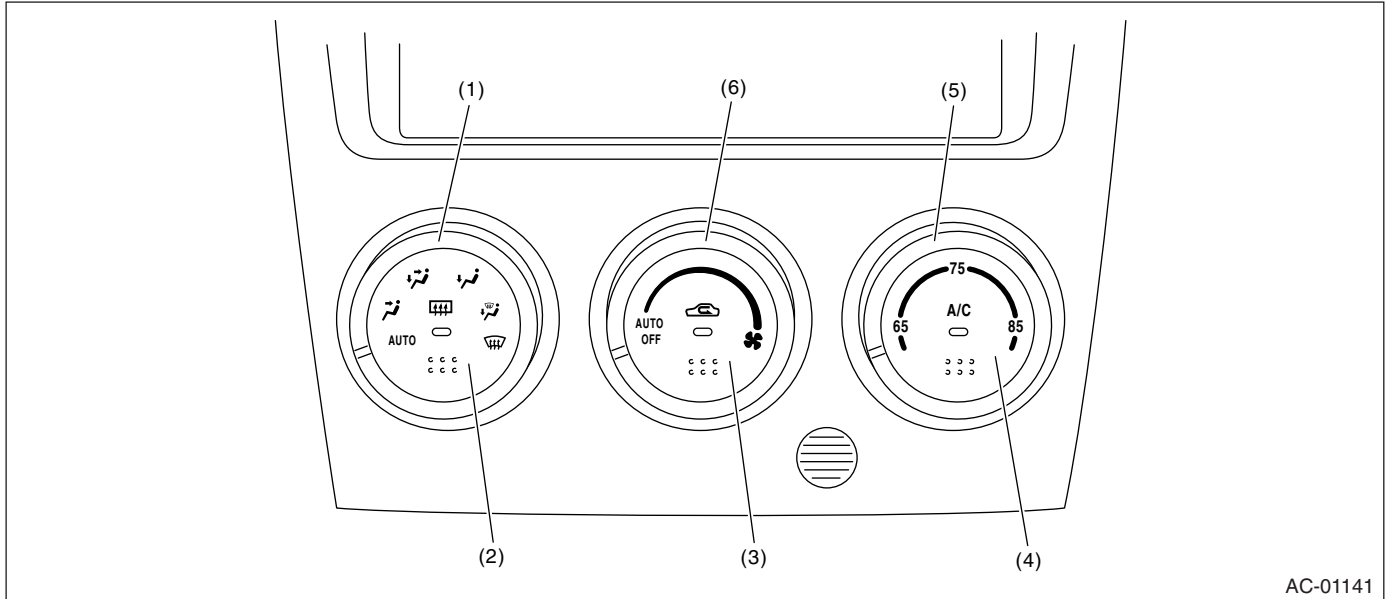


# Diagnostic Chart for Self-Diagnosis

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

## 5. Diagnostic Chart for Self-Diagnosis

### A: OPERATION



AC-01141

- |                                 |                         |                              |
|---------------------------------|-------------------------|------------------------------|
| (1) Air flow control dial       | (3) FRESH/RECIRC switch | (5) Temperature control dial |
| (2) Rear window defogger switch | (4) A/C switch          | (6) Fan speed control dial   |

| Step  | Check  | Yes           | No   |
|---|--|---------------|--|
| <b>1 SELECT CONTROL PANEL TO SELF-DIAGNOSIS MODE.</b><br>1) Turn the fan speed control dial to OFF position.<br>2) Start the engine and press the A/C switch for at least 5 seconds. The A/C switch must be pressed within 10 seconds after starting engine.  | Does the self-diagnosis mode operate?  | Go to step 2. | <Ref. to AC(diag)-11, A/C OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE, Diagnostics for A/C System Malfunction.> |
| <b>2 CHECK LED ILLUMINATION.</b><br>Make sure that all switch LED illuminate on control panel.  | Do all LED illuminate?   | Go to step 3. | Check the switch LED.  |
| <b>3 CHECK SENSORS MALFUNCTION.</b><br>1) Turn the fan speed control dial to AUTO position.<br>2) If the system has trouble for each sensor, rear window defogger switch LED is turned off.<br>3) If the system has no trouble, rear window defogger switch LED is illuminated.   | Does the rear window defogger switch LED illuminate?                                       | Go to step 5. | Go to step 4.  |
| <b>4 CONFIRM MALFUNCTIONING SENSOR.</b><br>1) Turn the fan speed control dial to 1 — 6th position.<br>2) Turn the air flow control dial to each mode position, check each switch LED illumination according to sensor check table. <Ref. to AC(diag)-10, SENSOR CHECK TABLE, OPERATION, Diagnostic Chart for Self-Diagnosis.> | Do FRESH/RECIRC and A/C switch LED illuminate when turning the dial to each mode position? | Go to step 5. | Repair the malfunctioning sensor. <Ref. to AC(diag)-24, Diagnostic Procedure for Sensors.>                   |

# Diagnostic Chart for Self-Diagnosis

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <b>5</b><br><b>CHECK MODE DOOR POSITION SIGNAL.</b><br>1) Turn the fan speed control dial to 7 — 12th position.<br>2) If the system has trouble for mode door position signal, rear window defogger switch LED is turned off.<br>3) If the system has no trouble, rear window defogger switch LED is illuminated.   | Does the rear window defogger switch LED illuminate?           | Go to step 6.  | Check the mode door actuator circuit. <Ref. to AC(diag)-20, MODE DOOR ACTUATOR, Diagnostic Procedure for Actuators.>        |
| <b>6</b><br><b>CHECK BLOWER FAN OPERATION.</b><br>1) Turn the fan speed control dial to 13 — 18th position.<br>2) Turn the temperature control dial, check that blower fan speed changes depending on set temperature.  | Does the blower fan speed change?                              | Go to step 7.  | Check the blower motor circuit. <Ref. to AC(diag)-13, BLOWER FAN DOES NOT ROTATE., Diagnostics for A/C System Malfunction.> |
| <b>7</b><br><b>CHECK OPERATION OF EACH ACTUATOR, BLOWER FAN AND COMPRESSOR CLUTCH.</b><br>1) Turn the fan speed control dial to 19 — 25th position.<br>2) Select the operating mode by turning air flow control dial.<br>3) Check the operation of each mode according to operating mode table. <Ref. to AC(diag)-10, OPERATING MODE TABLE, OPERATION, Diagnostic Chart for Self-Diagnosis.> <ul style="list-style-type: none"> <li>• Air inlet:</li> <li>• Air outlet:</li> <li>• Air mix door:</li> <li>• Blower fan:</li> <li>• A/C compressor:</li> </ul> | Does the operation of each mode match to operating mode table? | Push the A/C switch or turn the ignition switch to OFF, and finish the self-diagnosis. | Repair the malfunction part according to each diagnostics chart.  |

# Diagnostic Chart for Self-Diagnosis

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

## 1. SENSOR CHECK TABLE

NOTE:

When the sunload sensor is checked indoors or in the shade, open circuit might be indicated. Always check the sunload sensor at a place where sun shines directly on it.

| Air flow control dial position | Checked sensor                                  | No trouble  | Short circuit             | Open circuit                       |
|--------------------------------|---|---|---------------------------|------------------------------------|
| VENT                           | Ambient sensor                                  | A/C switch LED and FRESH/RECIRC switch LED illuminate | A/C switch LED illuminate | FRESH/RECIRC switch LED illuminate |
| BI-LEVEL                       | In-vehicle sensor                               | A/C switch LED and FRESH/RECIRC switch LED illuminate | A/C switch LED illuminate | FRESH/RECIRC switch LED illuminate |
| HEAT                           | Evaporator sensor                               | A/C switch LED and FRESH/RECIRC switch LED illuminate | A/C switch LED illuminate | FRESH/RECIRC switch LED illuminate |
| DEF/HEAT                       | Sunload sensor                                  | A/C switch LED and FRESH/RECIRC switch LED illuminate | A/C switch LED illuminate | FRESH/RECIRC switch LED illuminate |
| DEF                            | Air mix door motor (Potential balance resistor) | A/C switch LED and FRESH/RECIRC switch LED illuminate | A/C switch LED illuminate |                                    |

## 2. OPERATING MODE TABLE

| Operation      | Air flow control dial position |           |          |          |                      |
|----------------|--------------------------------|-----------|----------|----------|----------------------|
|                | VENT                           | BI-LEVEL  | HEAT     | DEF/HEAT | DEF                  |
| Air outlet     | VENT                           | BI-LEVEL  | HEAT     | DEF/HEAT | DEF                  |
| Air inlet      | RECIRC                         | RECIRC    | RECIRC   | FRESH    | FRESH                |
| Air mix door   | FULL COOL                      | FULL COOL | FULL HOT | FULL HOT | FULL COOL            |
| Blower fan     | 5V                             | 5V        | 8V       | 10V      | Power supply voltage |
| A/C compressor | ON                             | OFF       | OFF      | ON       | ON                   |

# Diagnostics for A/C System Malfunction

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

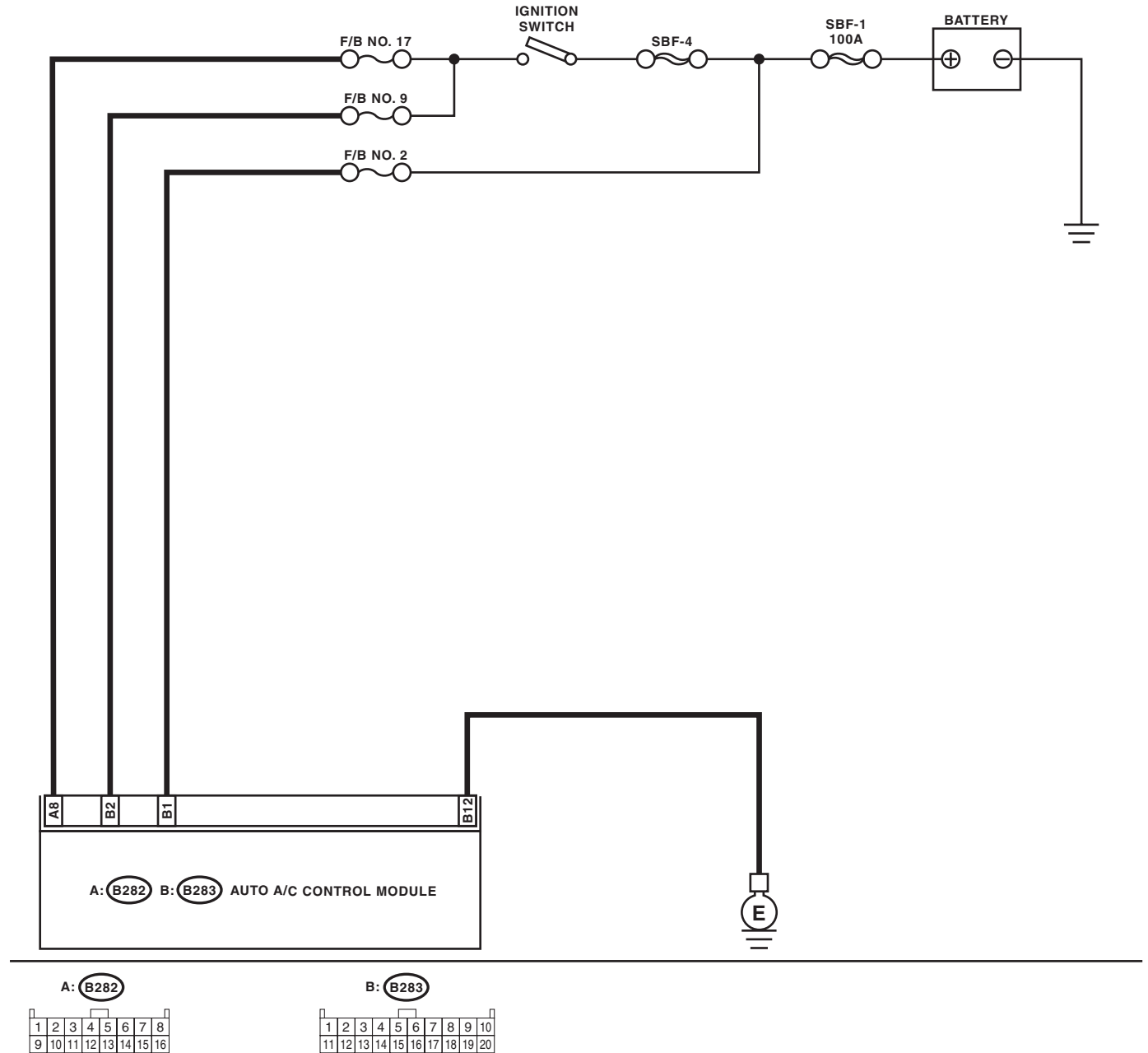
## 6. Diagnostics for A/C System Malfunction

### A: A/C OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE

#### TROUBLE SYMPTOM:

- Switch LEDs are faulty or switches do not operate.
- Self-diagnosis system does not operate.

#### WIRING DIAGRAM:



AC-01142

## Diagnostics for A/C System Malfunction

### HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

| Step   | Check                                    | Yes                   | No   |
|--|--|-----------------------|--|
| <b>1 CHECK FUSE.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the fuse No. 2 from main fuse box.<br>3) Check the condition of fuse.   | Is the fuse blown-out?                   | Replace the fuse.     | Go to step 2.  |
| <b>2 CHECK FUSE.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the fuses No. 9 and No. 17 from fuse & relay box.<br>3) Check the condition of fuse.  | Is the fuse blown-out?                   | Replace the fuse.     | Go to step 3.  |
| <b>3 CHECK AUTO A/C CONTROL MODULE POWER CIRCUIT.</b><br>1) Pull out the auto A/C control module connector.<br>2) Measure the voltage between auto A/C control module connector terminal and chassis ground when turning ignition switch to OFF.<br><i>Connector &amp; terminal</i><br><i>(B283) No. 1 (+) — Chassis ground (-):</i> | Is the voltage more than 10 V?           | Go to step 4.         | Repair the short circuit in harness for power supply line. |
| <b>4 CHECK AUTO A/C CONTROL MODULE POWER CIRCUIT.</b><br>Measure the voltage between auto A/C control module connector terminal and chassis ground when turning the ignition switch to ACC.<br><i>Connector &amp; terminal</i><br><i>(B283) No. 2 (+) — Chassis ground (-):</i>  | Is the voltage more than 10 V?           | Go to step 5.         | Repair the short circuit in harness for power supply line. |
| <b>5 CHECK AUTO A/C CONTROL MODULE POWER CIRCUIT.</b><br>Measure the voltage between auto A/C control module connector terminal and chassis ground when turning the ignition switch to ON.<br><i>Connector &amp; terminal</i><br><i>(B282) No. 8 (+) — Chassis ground (-):</i>   | Is the voltage more than 10 V?           | Go to step 6.         | Repair the short circuit in harness for power supply line. |
| <b>6 CHECK AUTO A/C CONTROL MODULE GROUND CIRCUIT.</b><br>Measure the resistance of harness between auto A/C control module and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B283) No. 12 — Chassis ground:</i>   | Is the resistance less than 5 $\Omega$ ? | Go to step 7.         | Repair the harness for ground line.                        |
| <b>7 CHECK POOR CONTACT.</b><br>Check poor contact in auto A/C control module connector.   | Is there poor contact in connector?      | Repair the connector. | Replace the auto A/C control module.                       |

# Diagnostics for A/C System Malfunction

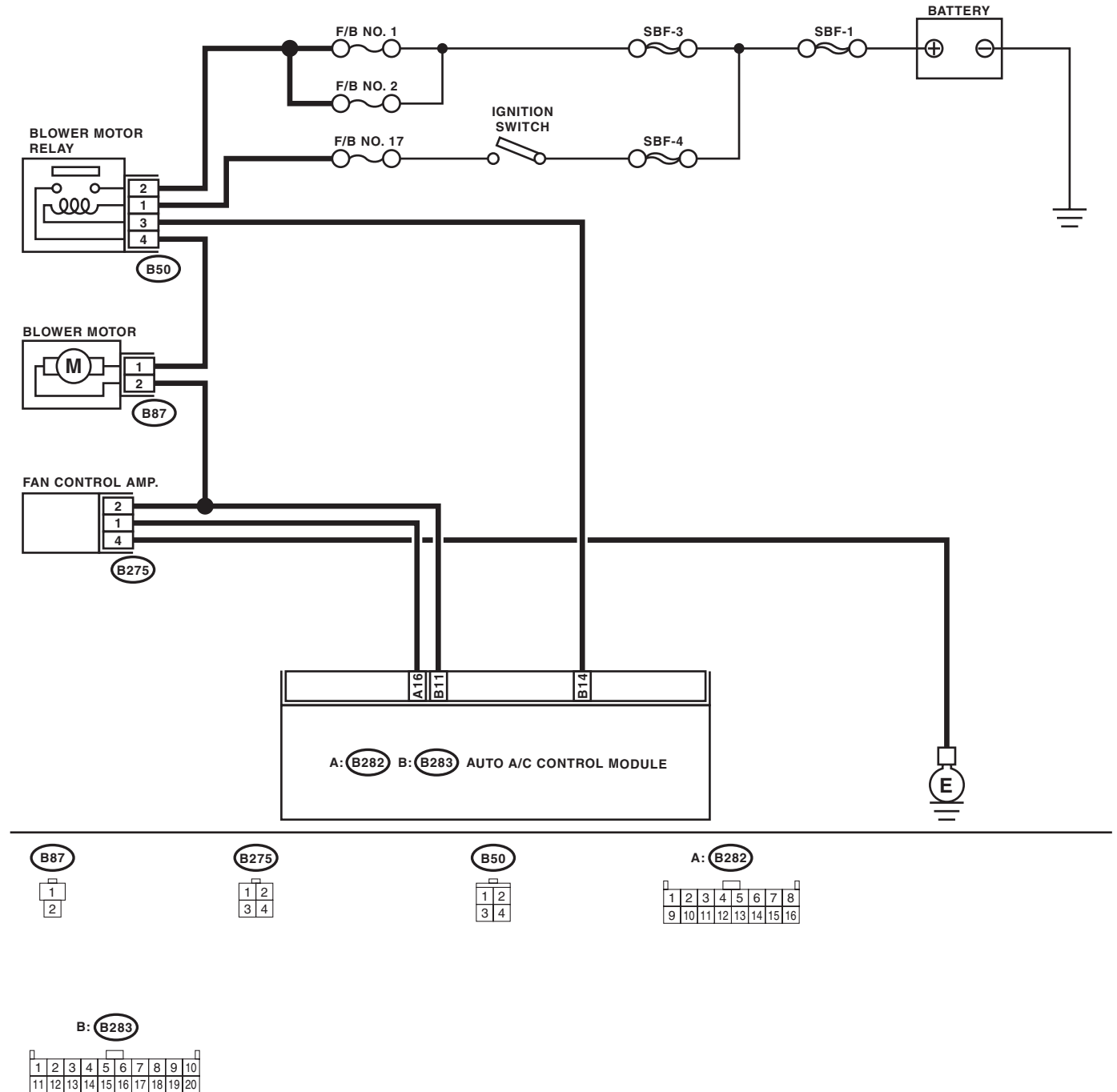
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

## B: BLOWER FAN DOES NOT ROTATE.

### TROUBLE SYMPTOM:

- Blower motor is not rotated.
- Blower motor is not rotated at "HI".

### WIRING DIAGRAM:



AC-01143

## Diagnostics for A/C System Malfunction

### HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

| Step   | Check                                    | Yes                   | No   |
|--|--|-----------------------|--|
| <b>1</b><br><b>CHECK FUSE.</b><br>1) Remove the No. 1, No. 2 and No. 17 fuses in fuse & relay box.<br>2) Check the condition of fuses.   | Are any of the fuses blown-out?          | Replace the fuse.     | Go to step 2.  |
| <b>2</b><br><b>CHECK POWER SUPPLY TO BLOWER FAN MOTOR.</b><br>1) Turn the ignition switch to ON.<br>2) Turn the fan speed control dial to the right.<br>3) Measure the voltage between blower fan motor and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B87) No. 1 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?           | Go to step 3.         | Repair the open circuit in harness for blower fan motor power supply line. |
| <b>3</b><br><b>CHECK BLOWER FAN MOTOR RELAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the blower fan motor relay.<br>3) Connect the battery positive (+) terminal to No. 1 terminal and negative (-) terminal to No. 3 terminal of blower fan motor connector.<br>4) Measure the resistance between No. 2 and No. 4 terminals.<br><b>Terminals</b><br><b>No. 2 — No. 4:</b> | Is the resistance less than 1 $\Omega$ ? | Go to step 4.         | Replace the blower fan motor relay.  |
| <b>4</b><br><b>CHECK BLOWER FAN MOTOR.</b><br>1) Disconnect the connector from blower fan motor.<br>2) Connect the battery positive (+) terminal to No. 1 terminal and negative (-) terminal to No. 2 terminal of blower fan motor connector.<br>3) Make sure that the blower fan motor is operated.   | Does the blower fan motor operate?       | Go to step 5.         | Replace the blower fan motor.  |
| <b>5</b><br><b>CHECK POOR CONTACT.</b><br>Check poor contact in auto A/C control module connector.   | Is there poor contact in connector?      | Repair the connector. | Replace the auto A/C control module.                                       |

# Diagnostics for A/C System Malfunction

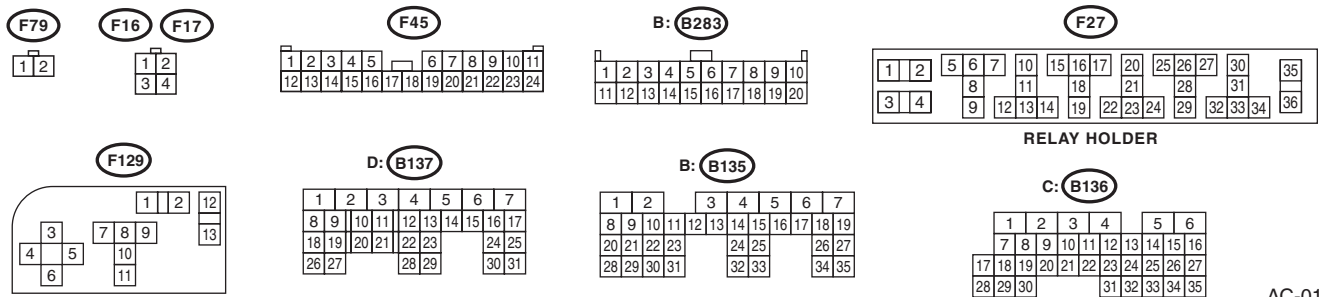
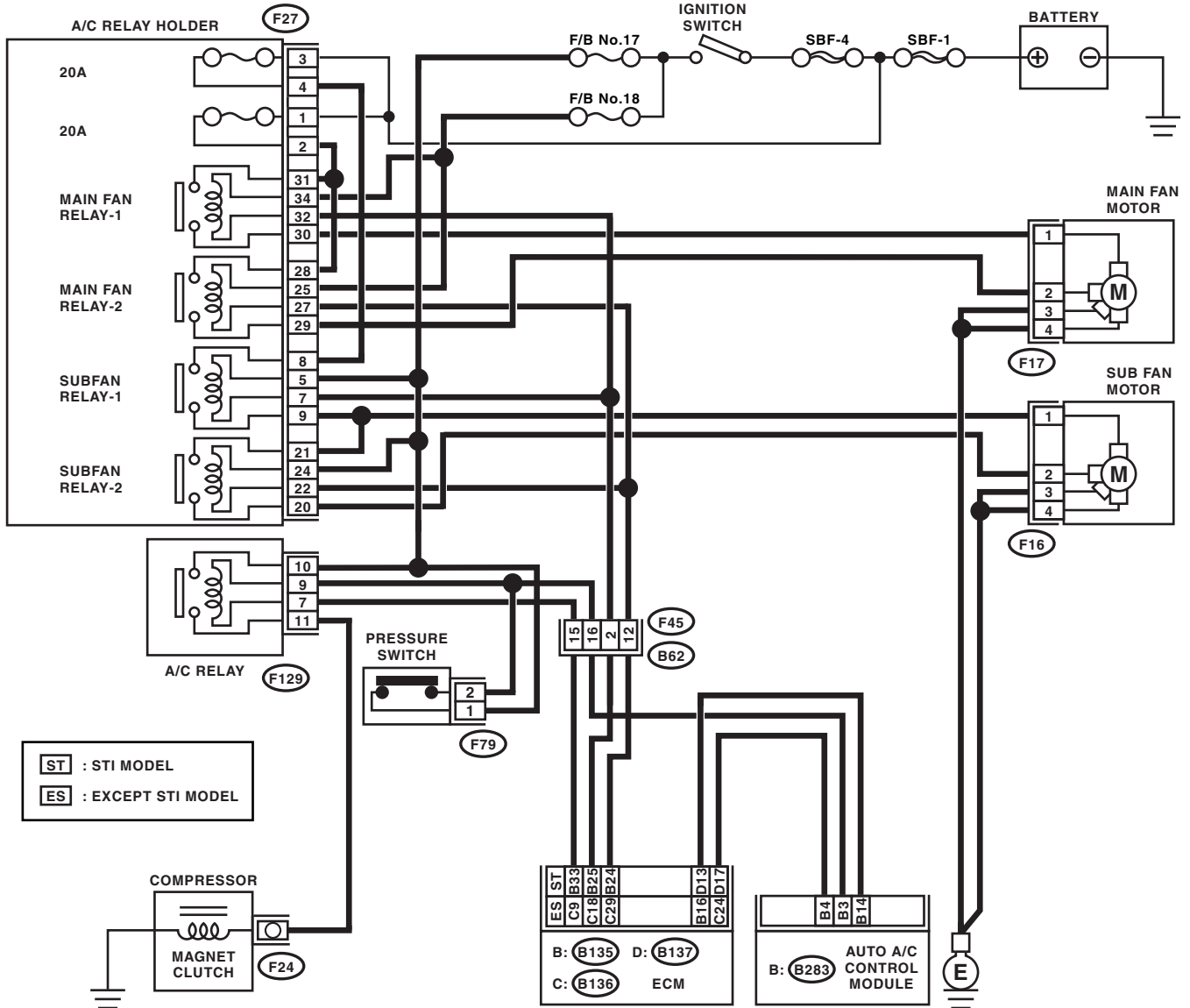
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

## C: COMPARTMENT TEMPERATURE DOES NOT CHANGE, OR A/C SYSTEM DOES NOT RESPOND PROMPTLY.

### TROUBLE SYMPTOM:

- Compartment temperature is not changed. (No cool air is discharged.)
- A/C system does not respond quickly.

### WIRING DIAGRAM:



AC-01395



## Diagnostics for A/C System Malfunction

### HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <b>1 CHECK FUSE.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the No. 2 fuse in main fuse box.<br>3) Check the condition of fuse.  | Is the fuse blown-out?                             | Replace the fuse.                                    | Go to step 2.   |
| <b>2 CHECK POWER SUPPLY TO MAGNET CLUTCH OF A/C COMPRESSOR.</b><br>1) Start the engine, and turn A/C switch to ON.<br>2) Set the temperature control dial to maximum cold position.<br>3) Measure the voltage between magnet clutch connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F24) No. 1 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?                     | Go to step 3.  | Repair the open circuit in harness for power supply line of the A/C compressor.         |
| <b>3 CHECK SIGNAL VOLTAGE TO A/C RELAY.</b><br>1) Turn the ignition switch to ON.<br>2) Turn the A/C switch to ON.<br>3) Measure the signal voltage between A/C relay and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F129) No. 7 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?                     | Go to step 4.  | Repair the open circuit in harness for A/C relay signal circuit.                        |
| <b>4 CHECK A/C RELAY.</b><br>Check the A/C relay. <Ref. to AC-37, INSPECTION, Relay and Fuse.>  | Is the operation of the relay OK?                  | Go to step 5.  | Replace the A/C relay.  |
| <b>5 CHECK OPERATION OF MAIN FAN MOTOR.</b><br>1) Start the engine.<br>2) Turn the A/C switch to ON.<br>3) Check the operation of main fan motor.   | Does the radiator main fan operate?                | Go to step 10.                                       | Go to step 6.   |
| <b>6 CHECK POWER SUPPLY TO MAIN FAN MOTOR.</b><br><b>CAUTION:</b><br><b>Be careful not to overheat the engine during repair.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from main fan motor.<br>3) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F).<br>4) Stop the engine and turn ignition switch to ON.<br>5) Measure the voltage between main fan motor connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F17) No. 1, 2 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?                     | Go to step 7.  | Repair the open circuit in harness for power supply circuit.                            |
| <b>7 CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between main fan motor connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F17) No. 3, 4 — Chassis ground:</b>   | Is the resistance less than 1 Ω?                   | Go to step 8.  | Repair the open circuit in harness between main fan motor connector and chassis ground. |
| <b>8 CHECK POOR CONTACT.</b><br>Check poor contact in main fan motor connector.   | Is there poor contact in main fan motor connector? | Repair the poor contact in main fan motor connector. | Go to step 9.   |
| <b>9 CHECK MAIN FAN MOTOR.</b><br>Connect the battery positive (+) terminal to terminal No. 1 and 2, and negative (-) terminal to terminal No. 3 and 4.   | Does the main fan rotate?                          | Repair the poor contact in main fan motor connector. | Replace the main fan motor with a new one.  |

# Diagnostics for A/C System Malfunction

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

| Step      | Check   | Yes   | No  |  |
|-----------|---|---|---|--|
| <b>10</b> | <b>CHECK OPERATION OF SUB FAN MOTOR.</b><br>Check the operation of sub fan motor.   | Does the radiator sub fan operate?                        | Go to step 15.                                      | Go to step 11.   |
| <b>11</b> | <b>CHECK POWER SUPPLY TO SUB FAN MOTOR.</b><br><b>CAUTION:</b><br><b>Be careful not to overheat the engine during repair.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from sub fan motor.<br>3) Start the engine, and warm it up until engine coolant temperature increases over 100°C (212°F).<br>4) Stop the engine and turn the ignition switch to ON.<br>5) Measure the voltage between sub fan motor connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F16) No. 1, 2 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V?                            | Go to step 12.                                      | Repair the open circuit in harness for power supply circuit.                               |
| <b>12</b> | <b>CHECK GROUND CIRCUIT OF SUB FAN MOTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between sub fan motor connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F16) No. 3, 4 — Chassis ground:</b>   | Is the resistance less than 1 Ω?                          | Go to step 13.                                      | Repair the open circuit in harness between sub fan motor connector and chassis ground.     |
| <b>13</b> | <b>CHECK POOR CONTACT.</b><br>Check poor contact in sub fan motor connector.  | Is there poor contact in sub fan motor connector?         | Repair the poor contact in sub fan motor connector. | Go to step 14.   |
| <b>14</b> | <b>CHECK SUB FAN MOTOR.</b><br>Connect the battery positive (+) terminal to terminal No. 1 and 2, and negative (-) terminal to terminal No. 3 and 4.  | Does the sub fan rotate?                                  | Repair the poor contact in sub fan motor connector. | Replace the sub fan motor with a new one.  |
| <b>15</b> | <b>CHECK EACH SENSOR AND POTENTIOMETER.</b><br>Check the sensors and potentiometer for proper operation using the self-diagnostic function. <Ref. to AC(diag)-8, Diagnostic Chart for Self-Diagnosis.>  | Is the operation of each sensor and potentiometer normal? | Go to step 16.                                      | Check the sensor and circuit. <Ref. to AC(diag)-24, Diagnostic Procedure for Sensors.>     |
| <b>16</b> | <b>CHECK CONNECTION OF ASPIRATOR HOSE.</b><br>Make sure the connection of aspirator hose is correct.  | Is the connection of aspirator hose correct?              | Go to step 17.                                      | Repair the aspirator hose connection.  |
| <b>17</b> | <b>CHECK EACH ACTUATOR.</b><br>Check the actuators for proper operation using the self-diagnostic function. <Ref. to AC(diag)-8, Diagnostic Chart for Self-Diagnosis.>  | Is the operation of each actuator normal?                 | Go to step 18.                                      | Check the actuator and circuit. <Ref. to AC(diag)-18, Diagnostic Procedure for Actuators.> |
| <b>18</b> | <b>CHECK POOR CONTACT.</b><br>Check poor contact in auto A/C control module connector.  | Is there poor contact in connector?                       | Repair the connector.                               | Replace the auto A/C control module.   |

# Diagnostic Procedure for Actuators

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

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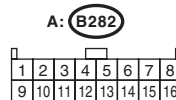
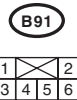
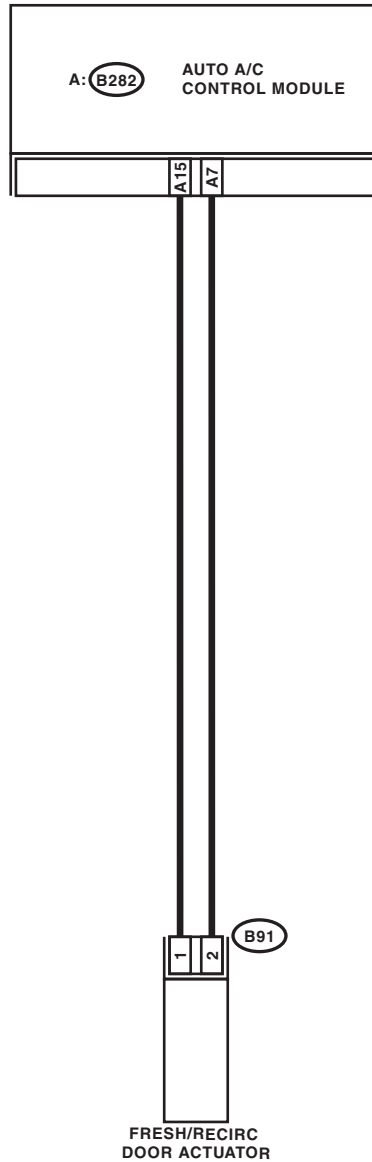
## 7. Diagnostic Procedure for Actuators

### A: INTAKE DOOR ACTUATOR

**TROUBLE SYMPTOM:**

FRESH/RECIRC mode is not changed.

**WIRING DIAGRAM:**



AC-01424

# Diagnostic Procedure for Actuators

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

| Step   | Check                                    | Yes                   | No   |
|--|--|-----------------------|--|
| <b>1 CHECK FUSE.</b><br>1) Remove the No. 17 fuse in fuse & relay box.<br>2) Check the condition of fuse.  | Is the fuse blown-out?                   | Replace the fuse.     | Go to step 2.  |
| <b>2 CHECK SIGNAL VOLTAGE.</b><br>1) Change the air intake to RECIRC by pushing FRESH/RECIRC switch.<br>2) Measure the voltage between auto A/C control module and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B282) No. 15 (+) — Chassis ground (-):</b></i>  | Is the voltage less than 1 V?            | Go to step 3.         | Repair the short circuit in harness for power supply line.                                   |
| <b>3 CHECK SIGNAL VOLTAGE.</b><br>1) Change the air intake to FRESH with pushing FRESH/RECIRC switch.<br>2) Measure the voltage between auto A/C control module and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B282) No. 7 (+) — Chassis ground (-):</b></i>  | Is the voltage less than 1 V?            | Go to step 4.         | Repair the short circuit in harness for power supply line.                                   |
| <b>4 CHECK HARNESS CONNECTOR BETWEEN AUTO A/C CONTROL MODULE AND FRESH/RECIRC ACTUATOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from auto A/C control module and intake door actuator.<br>3) Measure the resistance of harness between auto A/C control module and intake door actuator.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B282) No. 15 — (B91) No. 1:</b></i> | Is the resistance less than 1 $\Omega$ ? | Go to step 5.         | Repair the open circuit in harness between auto A/C control module and intake door actuator. |
| <b>5 CHECK HARNESS CONNECTOR BETWEEN AUTO A/C CONTROL MODULE AND FRESH/RECIRC ACTUATOR.</b><br>Measure the resistance of harness between auto A/C control module and intake door actuator.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B282) No. 7 — (B91) No. 2:</b></i>  | Is the resistance less than 1 $\Omega$ ? | Go to step 6.         | Repair the open circuit in harness between auto A/C control module and intake door actuator. |
| <b>6 CHECK POOR CONTACT.</b><br>Check poor contact in auto A/C control module connector.   | Is there poor contact in connector?      | Repair the connector. | Replace the auto A/C control module.   |

# Diagnostic Procedure for Actuators

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

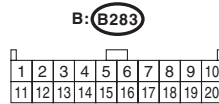
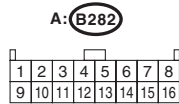
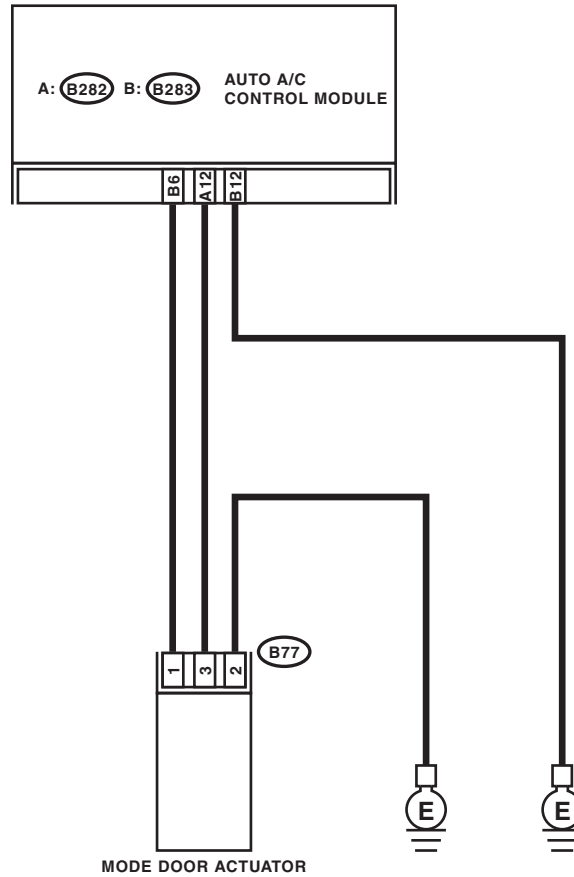
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## B: MODE DOOR ACTUATOR

### TROUBLE SYMPTOM:

Air flow outlet is not changed.

### WIRING DIAGRAM:



# Diagnostic Procedure for Actuators

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

| Step  | Check                                    | Yes                   | No   |
|---|--|-----------------------|--|
| <b>1 CHECK POWER SUPPLY FOR AUTO A/C CONTROL MODULE SIDE.</b><br>1) Turn the ignition switch to ON.<br>2) Turn the A/C switch to ON.<br>3) Measure the voltage between auto A/C control module harness connector terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B283) No. 6 (+) — Chassis ground (-):</b></i> | Is the voltage more than 10 V?           | Go to step 2.         | Replace the auto A/C control module.   |
| <b>2 CHECK POWER SUPPLY FOR ACTUATOR SIDE.</b><br>Measure the voltage between mode door actuator harness connector terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B77) No. 1 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10 V?           | Go to step 3.         | Repair the open circuit in harness between auto A/C control module and mode door actuator. |
| <b>3 CHECK SIGNAL FOR AUTO A/C CONTROL MODULE SIDE.</b><br>Measure the voltage between auto A/C control module harness connector terminal and chassis ground with oscilloscope.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B282) No. 12 (+) — Chassis ground (-):</b></i>  | Is the voltage approx. 5.5 V?            | Go to step 4.         | Replace the auto A/C control module.   |
| <b>4 CHECK SIGNAL FOR ACTUATOR SIDE.</b><br>Measure the voltage between mode door actuator harness connector terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B77) No. 3 (+) — Chassis ground (-):</b></i>  | Is the voltage approx. 5.5 V?            | Go to step 5.         | Repair the open circuit in harness between auto A/C control module and mode door actuator. |
| <b>5 CHECK GROUND CIRCUIT OF ACTUATOR.</b><br>1) Turn the ignition switch and A/C switch to OFF.<br>2) Measure the resistance between mode door actuator harness connector terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B77) No. 2 — Chassis ground:</b></i>  | Is the resistance less than 1 $\Omega$ ? | Go to step 6.         | Repair the open circuit in harness between mode door actuator and chassis ground.          |
| <b>6 CHECK POOR CONTACT.</b><br>Check poor contact in auto A/C control module connector.  | Is there poor contact in connector?      | Repair the connector. | Replace the auto A/C control module.   |

# Diagnostic Procedure for Actuators

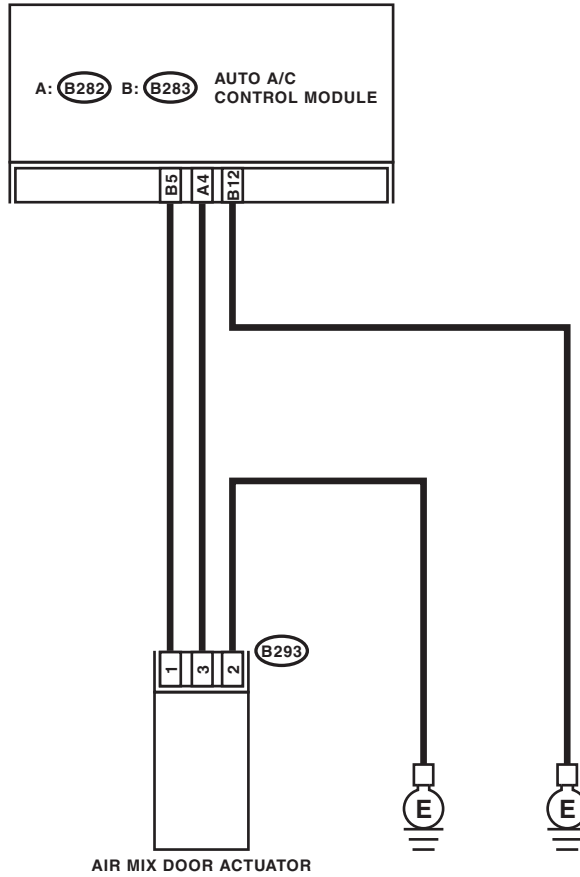
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

## C: AIR MIX DOOR ACTUATOR

### TROUBLE SYMPTOM:

Outlet air temperature is not changed.

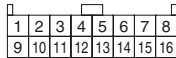
### WIRING DIAGRAM:



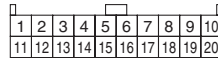
(B293)



A: (B282)



B: (B283)



AC-01147

# Diagnostic Procedure for Actuators

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

| Step  | Check                                    | Yes                   | No  |
|---|--|-----------------------|---|
| <b>1 CHECK POWER SUPPLY FOR AUTO A/C CONTROL MODULE SIDE.</b><br>1) Turn the ignition switch to ON.<br>2) Turn the A/C switch to ON.<br>3) Measure the voltage between auto A/C control module harness connector terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B283) No. 5 (+) — Chassis ground (-):</b></i> | Is the voltage more than 10 V?           | Go to step 2.         | Replace the auto A/C control module.  |
| <b>2 CHECK POWER SUPPLY FOR ACTUATOR SIDE.</b><br>Measure the voltage between air mix door actuator harness connector terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B293) No. 1 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10 V?           | Go to step 3.         | Repair the open circuit in harness between auto A/C control module and air mix door actuator. |
| <b>3 CHECK SIGNAL FOR AUTO A/C CONTROL MODULE SIDE.</b><br>Measure the voltage between auto A/C control module harness connector terminal and chassis ground with oscilloscope.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B282) No. 4 (+) — Chassis ground (-):</b></i>   | Is the voltage approx. 5.5 V?            | Go to step 4.         | Replace the auto A/C control module.  |
| <b>4 CHECK SIGNAL FOR ACTUATOR SIDE.</b><br>Measure the voltage between air mix door actuator harness connector terminal and chassis ground with oscilloscope.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B293) No. 3 (+) — Chassis ground (-):</b></i>  | Is the voltage approx. 5.5 V?            | Go to step 5.         | Repair the open circuit in harness between auto A/C control module and air mix door actuator. |
| <b>5 CHECK GROUND CIRCUIT OF ACTUATOR.</b><br>1) Turn the ignition switch and A/C switch to OFF.<br>2) Measure the resistance between air mix door actuator harness connector terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B293) No. 2 — Chassis ground:</b></i>  | Is the resistance less than 1 $\Omega$ ? | Go to step 6.         | Repair the open circuit in harness between air mix door actuator and chassis ground.          |
| <b>6 CHECK POOR CONTACT.</b><br>Check poor contact in auto A/C control module connector.  | Is there poor contact in connector?      | Repair the connector. | Replace the auto A/C control module.  |



# Diagnostic Procedure for Sensors

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

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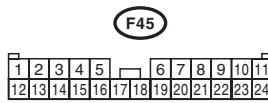
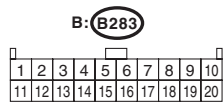
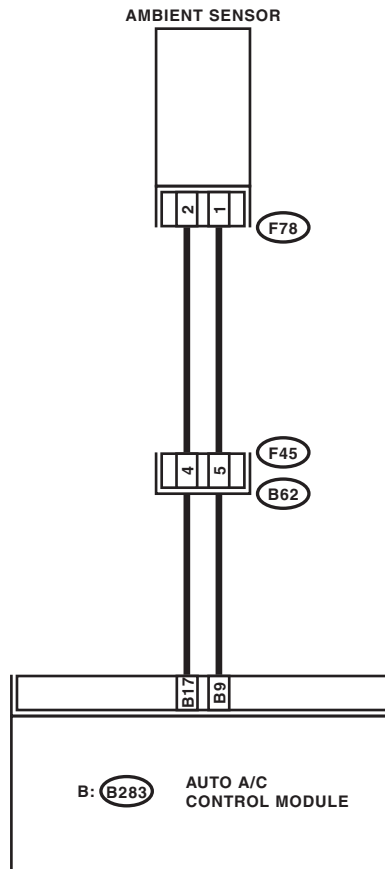
## 8. Diagnostic Procedure for Sensors

### A: AMBIENT SENSOR

#### TROUBLE SYMPTOM:

Fan speed is not switched when the fan speed control dial is in AUTO position.

#### WIRING DIAGRAM:



# Diagnostic Procedure for Sensors

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

| Step   | Check  | Yes                   | No   |
|--|--|-----------------------|--|
| <b>1 CHECK AMBIENT SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ambient sensor.<br>3) Measure the resistance between connector terminals of ambient sensor.<br><i>Terminals</i><br><i>No. 1 — No. 2:</i>   | Is the resistance approx. 2.2 k $\Omega$ at 25°C (77°F)? | Go to step 2.         | Replace the ambient sensor.  |
| <b>2 CHECK INPUT SIGNALS FOR AMBIENT SENSOR.</b><br>1) Turn the ignition ON.<br>2) Measure the voltage between (F78) connector terminals.<br><i>Connector &amp; terminal</i><br><i>(F78) No. 1 (+) — No. 2 (-):</i>  | Is the voltage approx. 5 V?                              | Go to step 6.         | Go to step 3.  |
| <b>3 CHECK OUTPUT SIGNALS FROM AUTO A/C CONTROL MODULE.</b><br>1) Turn the ignition switch to OFF.<br>2) Pull out the auto A/C control module.<br>3) Disconnect the connector from ambient sensor.<br>4) Turn the ignition switch to ON.<br>5) Measure the voltage between connector terminals of auto A/C control module.<br><i>Connector &amp; terminal</i><br><i>(B283) No. 9 (+) — No. 17 (-):</i> | Is the voltage approx. 5 V?                              | Go to step 4.         | Go to step 6.  |
| <b>4 CHECK HARNESS CONNECTOR BETWEEN AUTO A/C CONTROL MODULE AND AMBIENT SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from auto A/C control module.<br>3) Measure the resistance of harness between auto A/C control module and ambient sensor.<br><i>Connector &amp; terminal</i><br><i>(F78) No. 1 — (B283) No. 9:</i>   | Is the resistance less than 1 $\Omega$ ?                 | Go to step 5.         | Repair the open circuit in harness between auto A/C control module and ambient sensor. |
| <b>5 CHECK HARNESS CONNECTOR BETWEEN AUTO A/C CONTROL MODULE AND AMBIENT SENSOR.</b><br>Measure the resistance of harness between auto A/C control module and ambient sensor.<br><i>Connector &amp; terminal</i><br><i>(F78) No. 2 — (B283) No. 17:</i>  | Is the resistance less than 1 $\Omega$ ?                 | Go to step 6.         | Repair the open circuit in harness between auto A/C control module and ambient sensor. |
| <b>6 CHECK POOR CONTACT.</b><br>Check poor contact in auto A/C control module connector.   | Is there poor contact in connector?                      | Repair the connector. | Replace the auto A/C control module.   |

## B: IN-VEHICLE SENSOR

### TROUBLE SYMPTOM:

- When turning the AUTO switch to ON, blower fan speed, outlet port and inlet port is not changed.
- If the switch LED indicates that the sensor is malfunctioning, replace the auto A/C control module. The in-vehicle sensor is built into the auto A/C control module and cannot be replaced as a single unit.

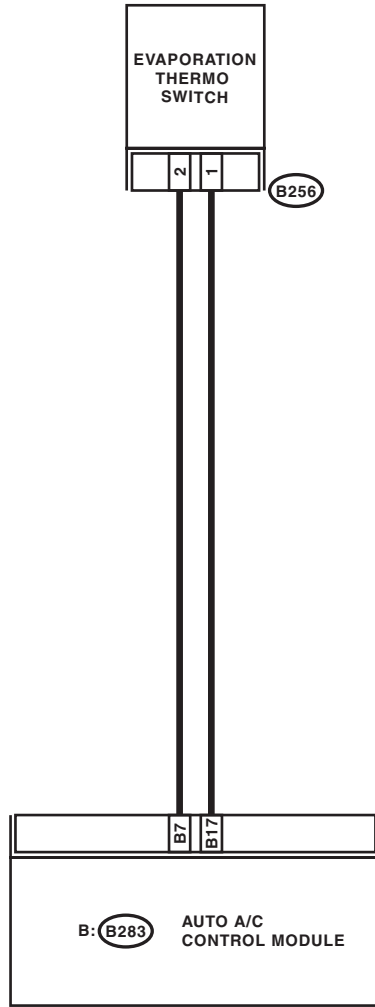
# Diagnostic Procedure for Sensors

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

---

## C: EVAPORATOR SENSOR

WIRING DIAGRAM:



---

B256

1 2

B: B283

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |

AC-01152

# Diagnostic Procedure for Sensors

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

| Step  | Check  | Yes                   | No  |
|---|--|-----------------------|---|
| <b>1 CHECK EVAPORATOR SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the glove box.<br>3) Disconnect the connector from evaporator sensor.<br>4) Measure the resistance between connector terminals of evaporator sensor.<br><i>Terminals</i><br><i>No. 1 — No. 2:</i>   | Is the resistance approx. 3.3 k $\Omega$ at 20°C (68°F)? | Go to step 2.         | Replace the evaporator sensor.  |
| <b>2 CHECK INPUT SIGNALS FOR EVAPORATOR SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between (B256) connector terminal and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B256) No. 2 (+) — Chassis ground (-):</i>   | Is the voltage approx. 5 V?                              | Go to step 6.         | Go to step 3.   |
| <b>3 CHECK OUTPUT SIGNALS FROM AUTO A/C CONTROL MODULE.</b><br>1) Turn the ignition switch to OFF.<br>2) Pull out the auto A/C control module.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between auto A/C control module connector terminals.<br><i>Connector &amp; terminal</i><br><i>(B283) No. 7 (+) — No. 17 (-):</i>                       | Is the voltage approx. 5 V?                              | Go to step 4.         | Go to step 6.   |
| <b>4 CHECK HARNESS CONNECTOR BETWEEN AUTO A/C CONTROL MODULE AND EVAPORATOR SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from auto A/C control module.<br>3) Measure the resistance of harness between auto A/C control module and evaporator sensor.<br><i>Connector &amp; terminal</i><br><i>(B256) No. 2 — (B283) No. 7:</i> | Is the resistance less than 1 $\Omega$ ?                 | Go to step 5.         | Repair the open circuit in harness between auto A/C control module and evaporator sensor. |
| <b>5 CHECK HARNESS CONNECTOR BETWEEN AUTO A/C CONTROL MODULE AND EVAPORATOR SENSOR.</b><br>Measure the resistance of harness between auto A/C control module and evaporator sensor.<br><i>Connector &amp; terminal</i><br><i>(B256) No. 1 — (B283) No. 17:</i>  | Is the resistance less than 1 $\Omega$ ?                 | Go to step 6.         | Repair the open circuit in harness between auto A/C control module and evaporator sensor. |
| <b>6 CHECK POOR CONTACT.</b><br>Check poor contact in auto A/C control module connector.  | Is there poor contact in connector?                      | Repair the connector. | Replace the auto A/C control module.  |

# Diagnostic Procedure for Sensors

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

## D: SUNLOAD SENSOR

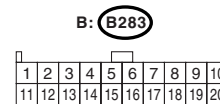
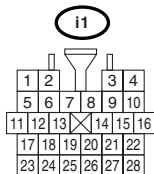
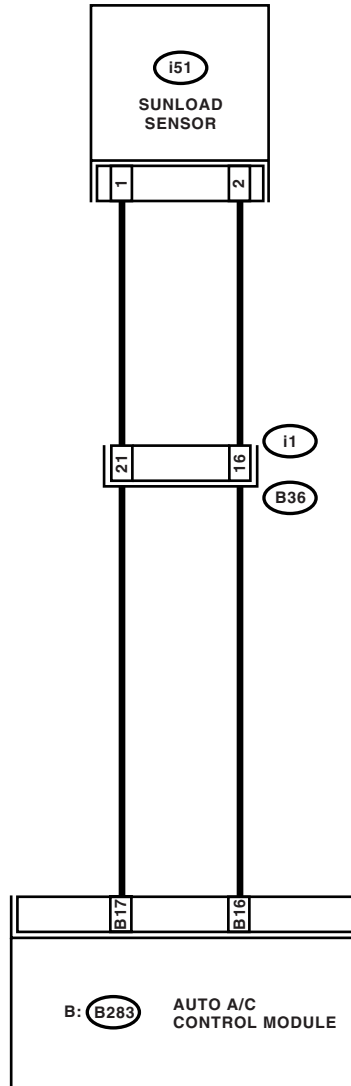
### TROUBLE SYMPTOM:

- Sensor identified that sunlight is at maximum. Then, A/C system is controlled to COOL side.
- Sensor identified that sunlight is at minimum. Then, A/C system is controlled to HOT side.

### NOTE:

When the sunload sensor is checked indoors or in the shade, it may be diagnosed as open circuit. Always check the sunload sensor at a place where sun shines directly on it.

### WIRING DIAGRAM:



# Diagnostic Procedure for Sensors

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

| Step  | Check                                    | Yes                   | No   |
|---|--|-----------------------|--|
| <b>1 CHECK INPUT VOLTAGE TO SUNLOAD SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the input voltage to sunload sensor.<br><i>Connector &amp; terminal</i><br><i>(i51) No. 2 (+) — Chassis ground (-):</i>   | Is the voltage approx. 5 V?              | Go to step 3.         | Go to step 2.  |
| <b>2 CHECK HARNESS CONNECTOR BETWEEN AUTO A/C CONTROL MODULE AND SUNLOAD SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connectors from auto A/C control module.<br>3) Measure the resistance of harness between auto A/C control module and sunload sensor.<br><i>Connector &amp; terminal</i><br><i>(i51) No. 2 — (B283) No. 16:</i> | Is the resistance less than 1 $\Omega$ ? | Go to step 3.         | Repair the harness between auto A/C control module and sunload sensor. |
| <b>3 CHECK HARNESS CONNECTOR BETWEEN AUTO A/C CONTROL MODULE AND SUNLOAD SENSOR.</b><br>Measure the resistance of harness between auto A/C control module and sunload sensor.<br><i>Connector &amp; terminal</i><br><i>(i51) No. 1 — (B283) No. 17:</i>   | Is the resistance less than 1 $\Omega$ ? | Go to step 4.         | Repair the harness between auto A/C control module and sunload sensor. |
| <b>4 CHECK THE INPUT VOLTAGE TO AUTO A/C CONTROL MODULE.</b><br>1) Connect the auto A/C control module connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between auto A/C control module connector terminals.<br><i>Connector &amp; terminal</i><br><i>(B283) No. 16 (+) — (B283) No. 17 (-):</i>                                      | Is the voltage approx. 2.5 V?            | Go to step 5.         | Replace the sunload sensor.  |
| <b>5 CHECK POOR CONTACT.</b><br>Check poor contact in auto A/C control module connector.  | Is there poor contact in connector?      | Repair the connector. | Replace the auto A/C control module.                                   |

## Diagnostics with Phenomenon

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

### 9. Diagnostics with Phenomenon

#### A: INSPECTION

| Symptom  | Problem parts  |
|--|--|
| A/C system fails to operate.   | <ul style="list-style-type: none"> <li>• Fuse (M/B No. 5, F/B No. 17)</li> <li>• Connector (Poor contact)</li> <li>• Ground</li> <li>• Auto A/C control module</li> <li>• Blower fan motor</li> <li>• Blower fan relay</li> <li>• A/C Relay</li> <li>• Compressor (Magnet clutch)</li> <li>• Evaporator sensor</li> </ul>  |
| Fuse is blown out.   | <ul style="list-style-type: none"> <li>• Fuse (M/B No. 5, F/B No. 17)</li> <li>• Connector (Poor contact)</li> </ul>   |
| Illumination cannot dim.   | <ul style="list-style-type: none"> <li>• Fuse (M/B No. 5, F/B No. 17)</li> <li>• Connector (Poor contact)</li> <li>• Auto A/C control module</li> </ul>  |
| Blower fan does not rotate or fan speed cannot be controlled.            | <ul style="list-style-type: none"> <li>• Fuse (M/B No. 7, F/B No. 17)</li> <li>• Connector (Poor contact)</li> <li>• Ground</li> <li>• Auto A/C control module</li> <li>• Blower fan motor</li> <li>• Blower fan relay</li> </ul>  |
| Unable to switch suction vents.  | <ul style="list-style-type: none"> <li>• Connector (Poor contact)</li> <li>• Auto A/C control module</li> <li>• Intake door actuator</li> </ul>  |
| Unable to switch blow vents.   | <ul style="list-style-type: none"> <li>• Connector (Poor contact)</li> <li>• Auto A/C control module</li> <li>• Mode door actuator</li> </ul>  |
| Compartment temperature does not increase. (No hot air is discharged.)   | <ul style="list-style-type: none"> <li>• Connector (Poor contact)</li> <li>• Auto A/C control module</li> <li>• Air mix door actuator</li> <li>• In-vehicle sensor, ambient sensor, evaporator sensor and sunload sensor</li> <li>• In-vehicle sensor aspirator hose</li> </ul>  |
| Compartment temperature does not decrease. (No cool air is discharged.)  | <ul style="list-style-type: none"> <li>• Connector (Poor contact)</li> <li>• Auto A/C control module</li> <li>• Air mix door actuator</li> <li>• A/C Relay</li> <li>• Compressor (Magnet clutch)</li> <li>• Radiator fan motor</li> <li>• Radiator fan relay</li> <li>• In-vehicle sensor, ambient sensor, evaporator sensor and sunload sensor</li> <li>• In-vehicle sensor aspirator hose</li> </ul> |
| Compartment temperature is higher or lower than setting temperature.     | <ul style="list-style-type: none"> <li>• Auto A/C control module</li> <li>• Air mix door actuator</li> <li>• In-vehicle sensor, ambient sensor, evaporator sensor and sunload sensor</li> <li>• In-vehicle sensor aspirator hose</li> </ul>  |
| Compartment temperature does not quickly respond to setting temperature. | <ul style="list-style-type: none"> <li>• Air mix door actuator</li> <li>• In-vehicle sensor, ambient sensor, evaporator sensor and sunload sensor</li> <li>• In-vehicle sensor aspirator hose</li> </ul>   |
| Radiator fan does not rotate during A/C operation.                       | <ul style="list-style-type: none"> <li>• Radiator fan motor</li> <li>• Radiator fan relay</li> </ul>   |

# AIRBAG SYSTEM

# AB

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|   | <b>Page</b> |
|---|-------------|
| 1. General Description .....                    | 2           |
| 2. Airbag Connector .....                       | 8           |
| 3. Inspection Locations After a Collision ..... | 11          |
| 4. Driver's Airbag Module .....                 | 14          |
| 5. Passenger's Airbag Module .....              | 15          |
| 6. Side Airbag Module .....                     | 16          |
| 7. Airbag Control Module .....                  | 18          |
| 8. Side Airbag Sensor .....                     | 19          |
| 9. Roll Connector .....                         | 20          |
| 10. Front Sub Sensor .....                      | 21          |



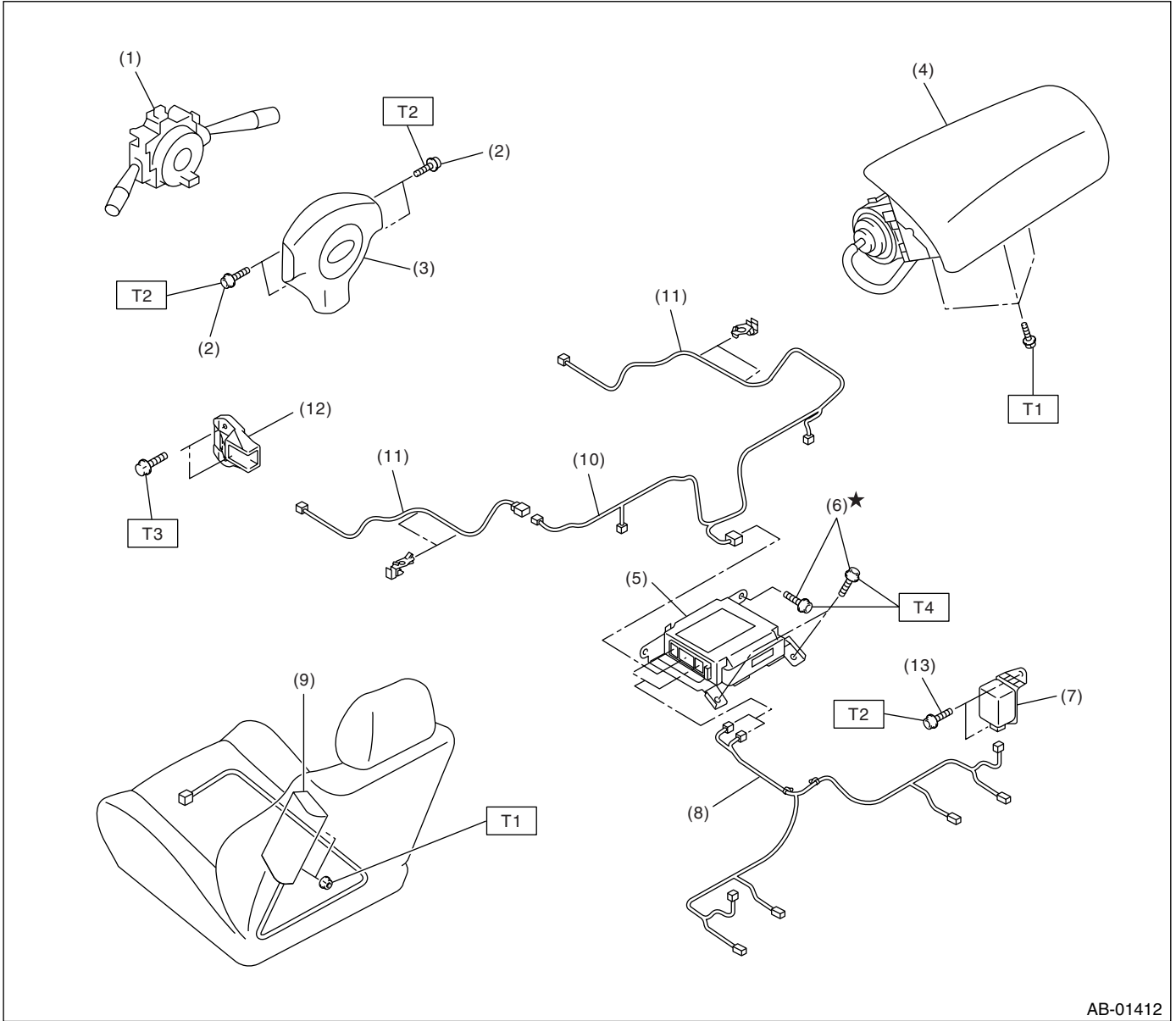
# General Description

AIRBAG SYSTEM

## 1. General Description

### A: COMPONENT

#### 1. SRS AIRBAG



AB-01412

- |   |                               |
|---|-------------------------------|
| (1) Combination switch ASSY with roll connector | (6) Bolt (exclusive use)      |
| (2) TORX® bolt T30                              | (7) Side airbag sensor        |
| (3) Airbag module ASSY (Driver's side)          | (8) Side airbag harness       |
| (4) Airbag module ASSY (Passenger's side)       | (9) Side airbag module        |
| (5) Airbag control module                       | (10) Airbag main harness      |
|   | (11) Front sub sensor harness |
|   | (12) Front sub sensor         |
|   | (13) TORX® bolt T30           |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 7.5 (0.76, 5.5)**

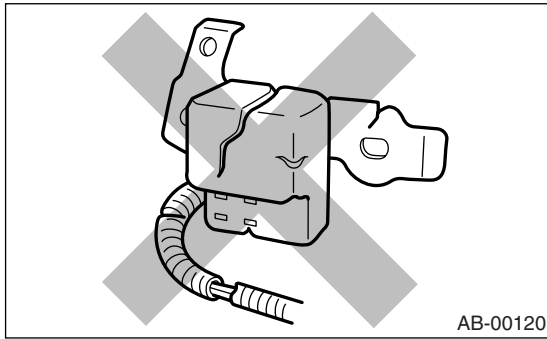
**T2: 10 (1.0, 7.4)**

**T3: 13 (1.3, 9.6)**

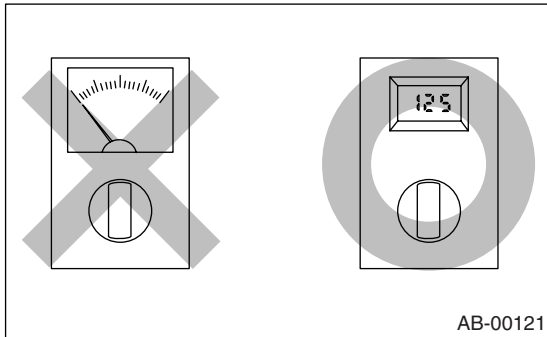
**T4: 25 (2.5, 18.4)**

### B: CAUTION

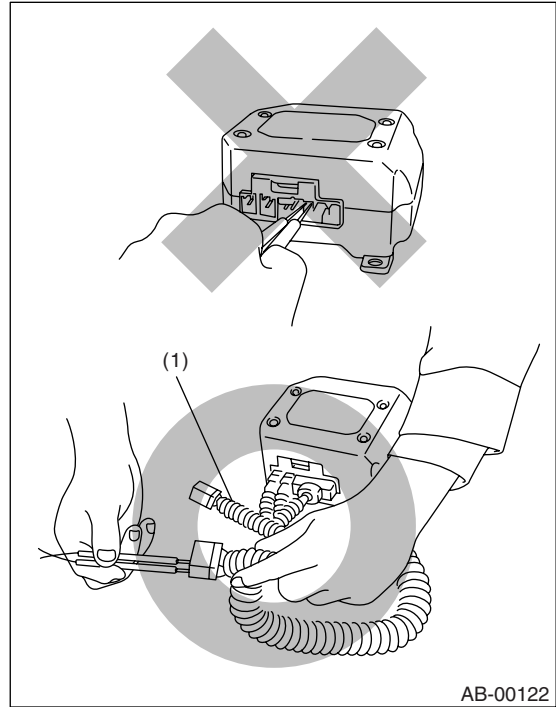
- When servicing a vehicle, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
- The airbag system is fitted with a backup power source. If the airbag system is serviced within 20 seconds after the ground cable is disconnected, it may inflate.
- If the airbag warning light illuminates, repair the vehicle immediately. Airbag or pretensioner may inflate incorrectly, or not inflate in collision.
- If sensors, airbag module, airbag control module, pretensioner, and harness are deformed or damaged, replace them with new genuine parts.



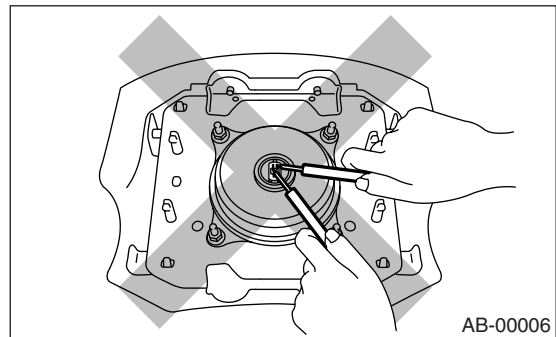
- When checking the airbag system, be sure to use a digital circuit tester. Infinitesimal electric current in an analog circuit tester may cause the airbag to activate erroneously.



- When checking, use a test harness (1). Do not directly apply the tester probe to any connector terminal of the airbag. Damage to the connector terminal may cause the airbag to activate erroneously.



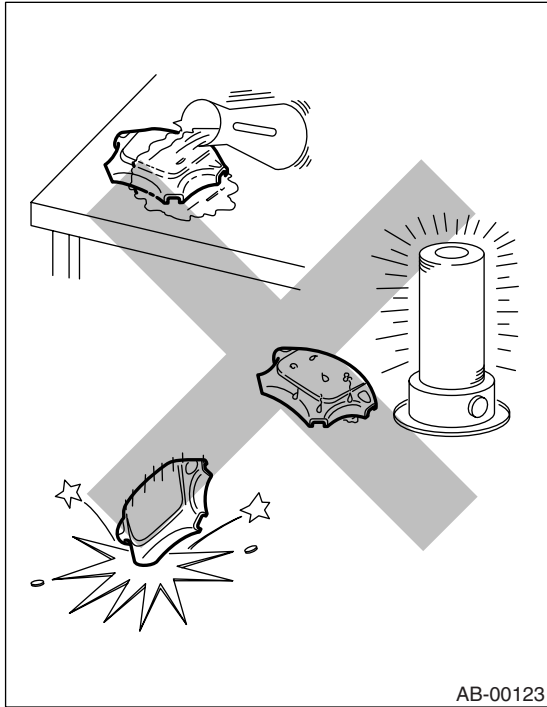
- Do not check continuity of either of the airbag modules for driver, passenger or side, or pretensioner.



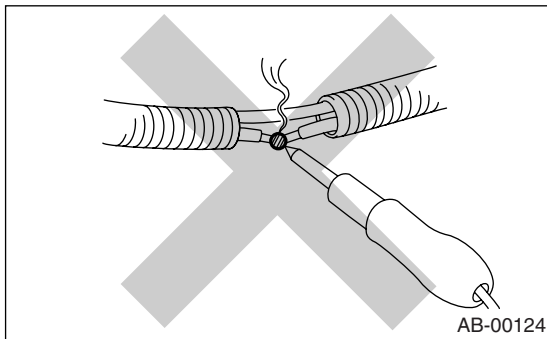
# General Description

## AIRBAG SYSTEM

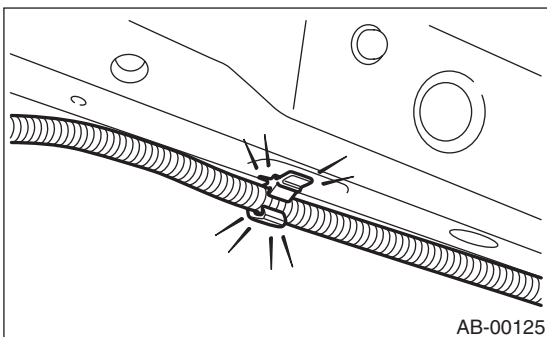
- Do not drop the airbag modulator parts, subject them to high temperature over 93°C (199°F), or let water, oil, or grease get on them; otherwise, the internal parts may be damaged and reliability greatly lowered.



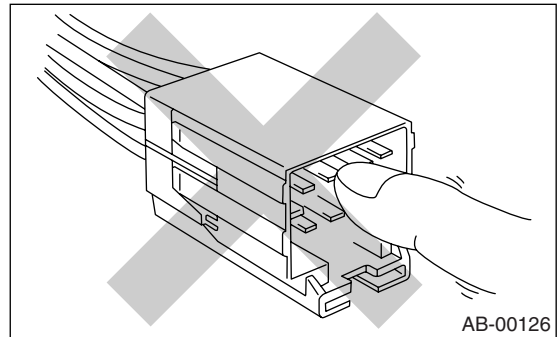
- If any damage, opening, or rust is found on the airbag system wire harness, do not attempt to repair using soldering equipment. Be sure to replace the faulty harness with a new genuine part.



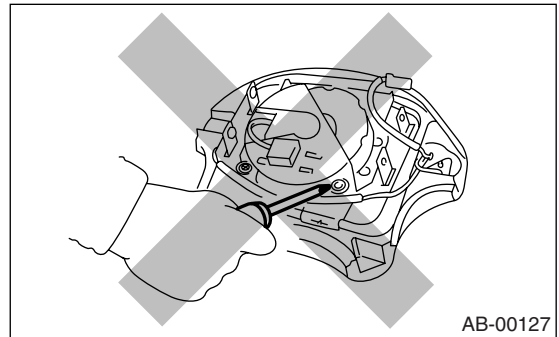
- Install the wire harness securely with the specified clips to avoid interference or tangled up with other parts.



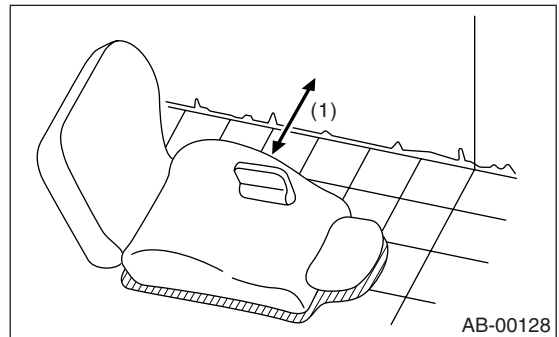
- Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.



- Either of the airbag modules for driver, passenger or side, or pretensioner must not be disassembled.



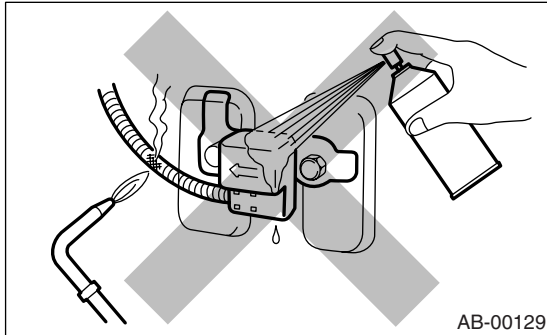
- The removed front seat with the airbag module must be kept at least 200 mm (8 in) away from walls and other objects.



(1) More than 200 mm (8 in)

- Do not use the airbag or pretensioner parts from other vehicles. Always replace defective parts with new parts.
- Never reuse a deployed airbag or pretensioner.
- When painting or performing sheet metal work on the front part of the vehicle, including the front wheel apron, front fender, and front side frame, remove the front sub sensors and wire harness of the airbag system.

- When painting or performing sheet metal work on the side of the vehicle, including the side sill, center pillar, and front and rear doors, remove the side airbag sensors and wire harness of the airbag system.

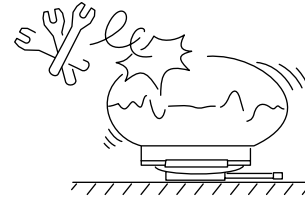
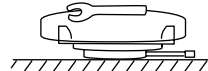
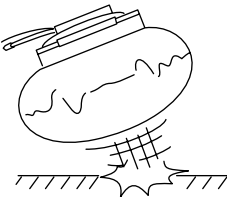
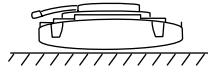
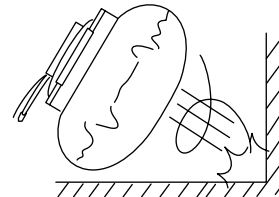
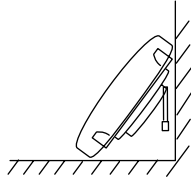
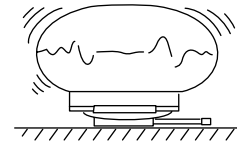
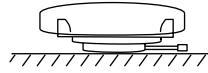


# General Description

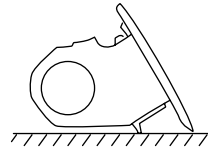
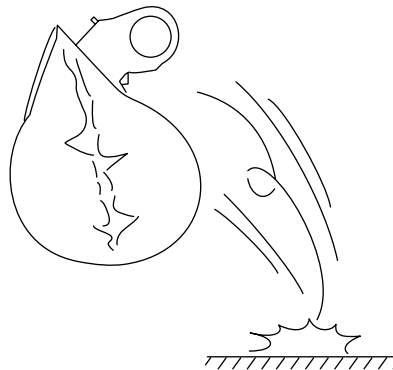
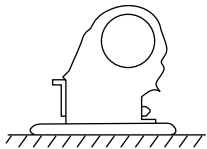
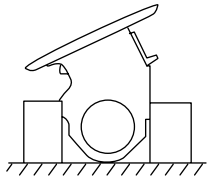
## AIRBAG SYSTEM

- When storing a removed airbag module, do not place any objects on it or pile airbag modules on top of each other. If the airbag inflates for some reason when it is placed with its pad side facing downward or under any object, a serious accident may result.

(1)



(2)



AB-00130

(1) Driver's airbag module

(2) Passenger's airbag module

## C: PREPARATION TOOL

### 1. GENERAL TOOL

| TOOL NAME | REMARKS  |
|-----------|--|
| TORX® T30 | Used for removal/installation of driver's airbag module. |

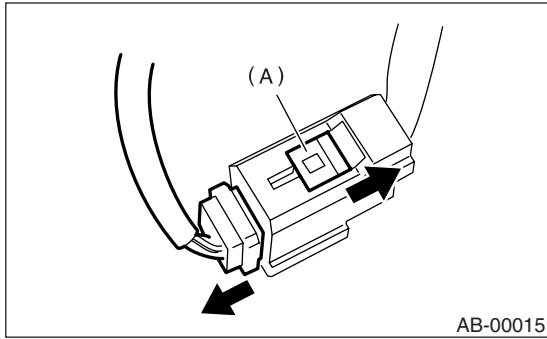
## 2. Airbag Connector

### A: PROCEDURE

#### 1. POWER SUPPLY, BUCKLE SWITCH

##### 1) How to disconnect

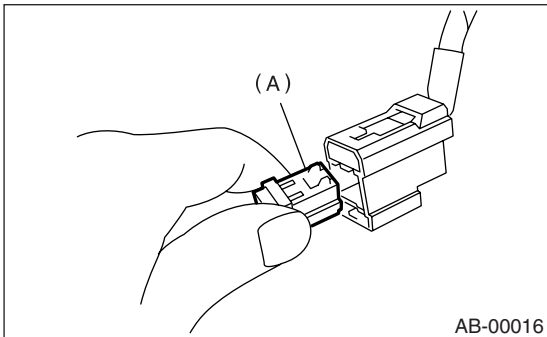
- (1) Move the slide lock (A) in the direction of the arrow.
- (2) Disconnect the connector with slide lock (A) moved.



**CAUTION:**  
When pulling the slide lock or disconnecting the connector, be sure to hold onto the connector and not the wire.

##### 2) How to connect

Holding the connector (A), and push it in carefully until a connecting sound is heard.

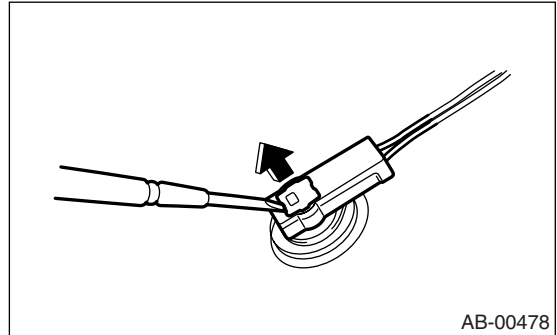


**CAUTION:**  
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

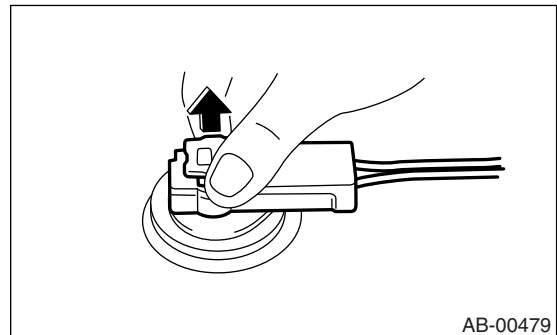
#### 2. DRIVER'S AIRBAG MODULE AND PRE-TENSIONER

##### 1) How to disconnect

- (1) Using a flat tip screwdriver, pry the push lock upward to unlock.



- (2) Pull the connector to disconnect from driver's side airbag module assembly.

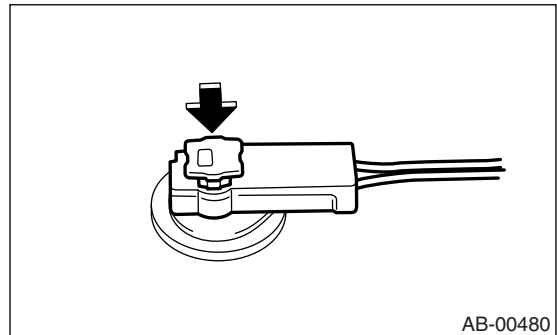


##### 2) How to connect

Connect the connector in reverse order of disconnecting. At this time, be sure to insert the push lock in until connecting sound is heard.

##### **CAUTION:**

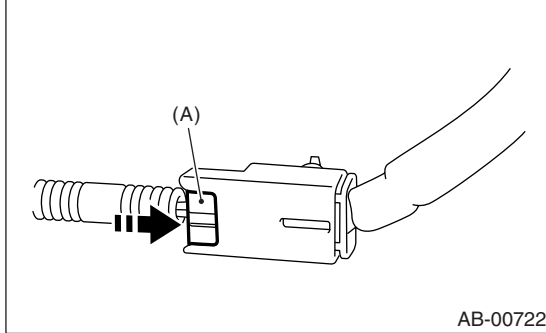
- Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.
- At this time, be sure to insert the push lock in.



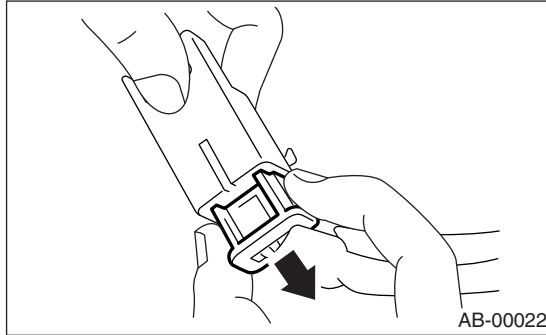
### 3. DRIVER'S AIRBAG (BETWEEN AIRBAG MAIN HARNESS AND ROLL CONNECTOR), PASSENGER'S AIRBAG

1) How to disconnect

- (1) Push the slide lock (A) into the direction of arrow.



- (2) With the slide lock pushed, disconnect the connector.

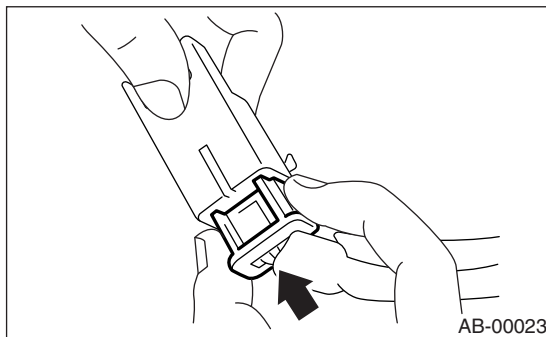


**CAUTION:**  
When pulling the side lock or disconnecting the connector, be sure to hold onto the connector and not the wire.

2) How to connect

Holding the connector, push it in carefully until a connecting sound is heard.

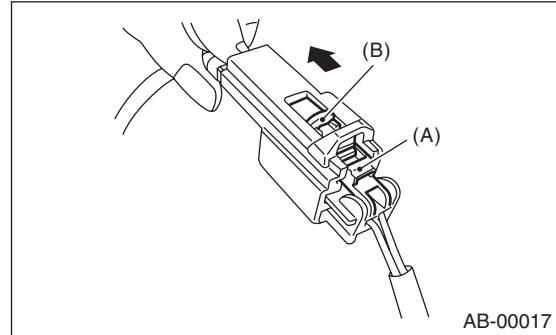
**CAUTION:**  
Be sure to insert the connector in until it is locked. Then pull on it gently to make sure that it is locked.



### 4. SIDE AIRBAG

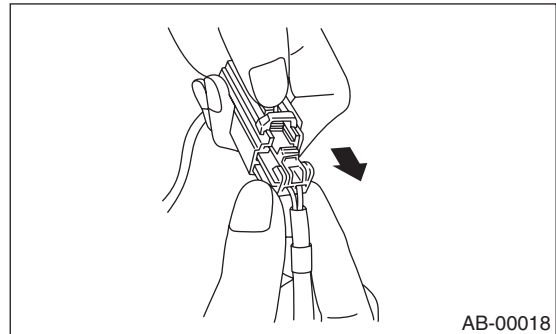
1) How to disconnect

- (1) Push the lock arm (A).
- (2) With the lock arm (A) pushed in, move the slide lock (B) in the direction of arrow.



- (3) With the slide lock moved, release the lock arm (back to its original position), and disconnect the connector.

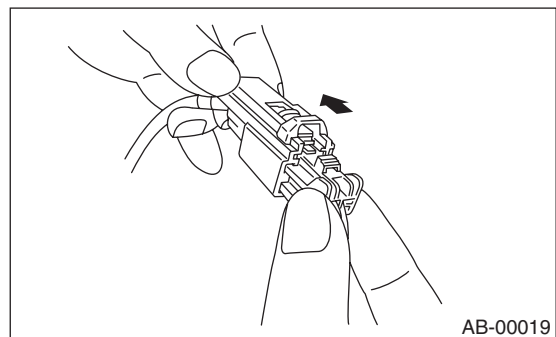
**CAUTION:**  
When pulling the side lock or disconnecting the connector, be sure to hold onto the connector and not the wire.



2) How to connect

Holding the connector, and push it in carefully until a connecting sound is heard.

**CAUTION:**  
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.





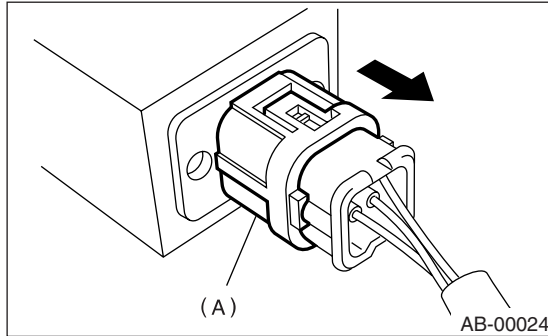
## 5. FRONT SUB-SENSOR AND SIDE AIR-BAG SENSOR AND SEAT POSITION SENSOR

### 1) How to disconnect

Holding outer part (A), pull it in the direction of the arrow.

#### CAUTION:

**When pulling the slide lock or disconnecting the connector, be sure to hold onto the connector and not the wire.**

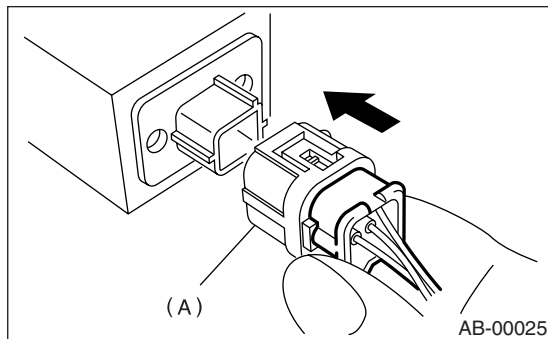


### 2) How to connect

Holding the connector, and push it in carefully until a connecting sound is heard.

#### CAUTION:

- Outer (A) moves back, and so do not put your hand on the outer part.
- Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



## 3. Inspection Locations After a Collision

### A: REPLACEMENT

When airbag system is deployed, replace the following parts.

#### 1. FRONT COLLISION

- 1) Driver's airbag module
- 2) Passenger's airbag module
- 3) Driver's seat belt (pretensioner)
- 4) Passenger's seat belt (pretensioner)
- 5) Airbag control module
- 6) Front sub-sensor
- 7) Roll connector

#### 2. SIDE COLLISION

- 1) Airbag control module
- 2) Side airbag module (operating side seat backrest)
- 3) Side airbag sensor (operating side)

### 3. INSPECTION OF OTHER PARTS

Check for the following parts, replace the damaged parts with new ones.

- 1) Steering wheel and steering shaft

Check the steering wheel and steering shaft for mounting condition and deflection of axial and radial, upward and downward direction. Check the steering shaft for deflection of axial and radical direction with tilt lever released. (After a collision, absorbing part of steering shaft may inflate.)

2) Check the direct type connector of driver's airbag module, pretensioner, etc. for damage, and also check each harness for pinch and connector damage. If damage is found, replace the harness as a unit.

3) Check the seat cushion frame, backrest, seat rail and headrest for deformation, distortion, crack, installing condition and play.

4) For passenger's seat, replace the seat cushion pad frame assembly with new one if the seat cushion frame assembly is deformed or cracked.

5) If the passenger's seat cushion cover is torn or frayed, replace the seat cushion cover with a new one. Otherwise, the occupant detection system may not operate properly.

6) Be sure to perform the system calibration for occupant detection system when the passenger's seat cushion cover has been removed or replaced. Failure to do so may cause improper activation of occupant detection system. <Ref. to OD(diag)-19, SYSTEM CALIBRATION (REZEROING), OPERATION, Subaru Select Monitor.>

7) Check if the driver's seat position sensor, and the driver's and passenger's seatbelt buckle switches operate normally.

### B: INSPECTION

If the vehicle is involved in a collision, even if it is a slight collision, be sure to check the following system parts.

#### 1. DRIVER'S AIRBAG MODULE

1) Check for the following, and replace damaged parts with new parts.

- Airbag module is cracked or deformed.
- Harness and/or connector is cracked, deformed or open. Lead wire is exposed.
- The module surface is fouled with grease, oil, water or cleaning solvent.

2) When installing a new driver's airbag module, check the following, and replace the damaged parts with new ones.

- The steering wheel is in the way, making it difficult to install the airbag module.
- The clearance between the driver's airbag module and steering wheel is not constant.
- The steering wheel deformation in axial and radial directions exceed limits.

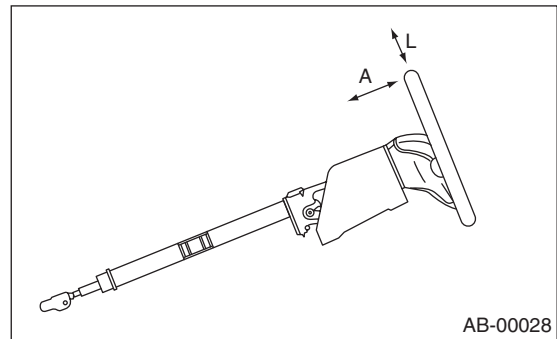
#### Specifications:

##### Height deflection A

**Less than 6 mm (0.24 in)**

##### O.D. deflection L

**Less than 7 mm (0.28 in)**



#### 2. PASSENGER'S AIRBAG MODULE

Check for the following, and replace damaged parts with new parts.

- Airbag module is cracked or deformed.
- Harness and/or connector is cracked, deformed or open. Lead wire is exposed.
- Mounting bracket is cracked or deformed.

#### 3. SIDE AIRBAG MODULE

Check for the following, and replace damaged parts with new parts.

- Front seat, airbag module and mounting bracket are damaged or deformed.

# Inspection Locations After a Collision

## AIRBAG SYSTEM

- Harness and/or connector is cracked, deformed or open. Lead wire is exposed.

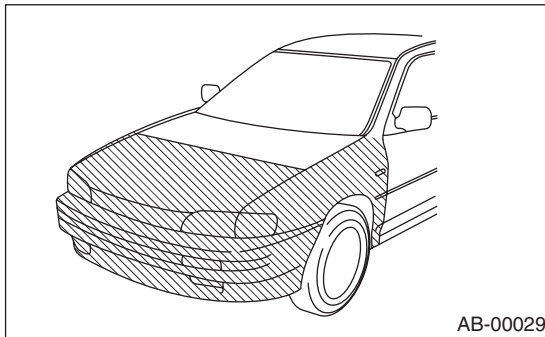
### 4. AIRBAG CONTROL MODULE

Check for the following, and replace damaged parts with new parts.

- Control module is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched, cracked or deformed.
- Airbag is deployed.
- Side airbag is deployed.

### 5. FRONT SUB SENSOR

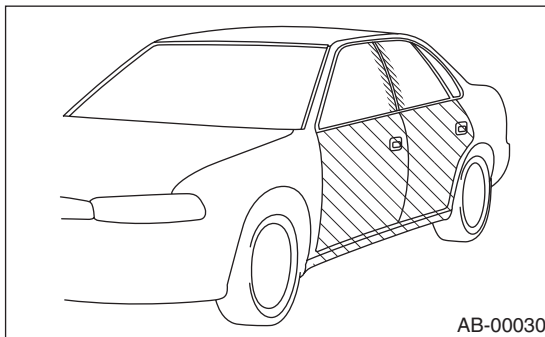
If the front section of vehicle as shown in the figure is damaged, check for the following, and replace damaged parts with new parts.



- Front sub sensor is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched, cracked or deformed.
- Airbag is deployed.

### 6. SIDE AIRBAG SENSOR

If the side section of vehicle as shown in the figure is damaged, check for the following, and replace damaged parts with new parts.



- Side airbag sensor is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched, cracked or deformed.
- Side airbag is deployed. (operating side)

### 7. ROLL CONNECTOR

Check for the following, and replace damaged parts with new parts.

- Combination switch or steering roll connector is cracked or deformed.

### 8. STEERING SHAFT

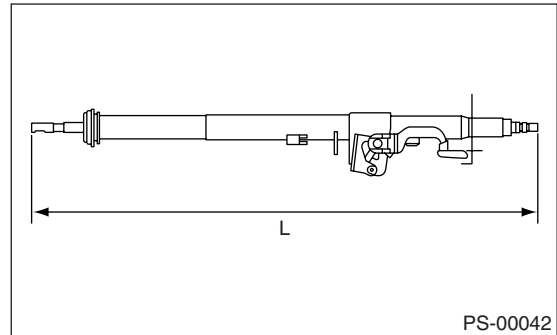
Check for the following, and replace damaged parts with new parts.

- Overall length of steering column should be within specifications.

#### Specifications:

**Overall length L**

**818.7±1.5 mm (32.23±0.06 in)**



### 9. DRIVER'S SEAT

Check the following items and replace the damaged parts with new one.

- Seat belt buckle or seat position sensor body/bracket is cracked or deformed.
- Harness or connector is cracked, deformed or disconnected. Harness wire is exposed.

#### CAUTION:

**Do not remove the seat position sensor from seat rail.**

### 10. PASSENGER'S SEAT

1) Check the following items and replace the damaged parts with new one.

- Seat belt buckle body/bracket has scratch, crack or deformation.
- Backrest frame has crack or deformation.
- Headrest has deformation or play.
- If the seat cushion cover or seat back cover is torn or frayed, replace the cover with new one and perform the system calibration. <Ref. to OD(diag)-19, SYSTEM CALIBRATION (REZEROING), OPERATION, Subaru Select Monitor.>

#### CAUTION:

**Check the following items, and if faulty, replace the seat cushion pad and frame as assembly. Never disassemble.**

- Seat cushion frame or seat cushion pad has crack or deformation.

- **Occupant detection system pressure sensor hose, occupant detection control module or its installing bracket has scratch, crack or deformation.**

- **Harness or connector is cracked, deformed or disconnected. Harness wire is exposed.**

2) After checking the installing condition of passenger's seat, perform the system calibration of occupant detection system. <Ref. to OD(diag)-19, SYSTEM CALIBRATION (REZEROING), OPERATION, Subaru Select Monitor.>

## **11.BELT TENSION SENSOR**

Check the following items, and replace the damaged parts with new one.

- Belt tension sensor has scratch, crack or deformation.

- Harness or connector is cracked, deformed or disconnected. Harness wire is exposed.

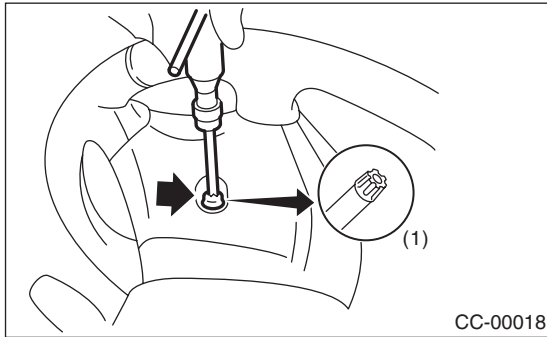
## 4. Driver's Airbag Module

### A: REMOVAL

**CAUTION:**

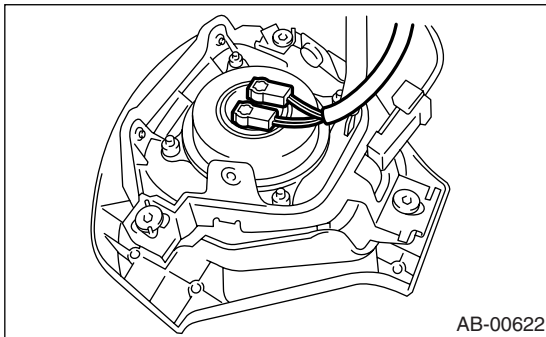
Refer to "CAUTION" in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, General Description.>

- 1) Position the front wheels straight ahead. (After moving the vehicle more than 5 m (16 ft) with front wheels positioned straight ahead, make sure that the vehicle moves straight ahead).
- 2) Turn the ignition switch to OFF.
- 3) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
- 4) Using the TORX® BIT T30, remove the two TORX® bolts on side of steering wheel.



(1) TORX® BIT T30

- 5) Disconnect the horn harness.
- 6) Disconnect the airbag connector on the back of airbag module, and then remove the airbag module. <Ref. to AB-8, PROCEDURE, Airbag Connector.>



- 7) Refer to "CAUTION" for handling of a removed airbag module. <Ref. to AB-3, CAUTION, General Description.>

### B: INSTALLATION

Install in the reverse order of removal.

**CAUTION:**

- Refer to "CAUTION" in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, General Description.>
- Do not allow harness and connectors to interfere or get tangled up with other parts.

**Tightening torque:**

Refer to "COMPONENT" in "General Description" <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>

### C: INSPECTION

**CAUTION:**

Refer to "CAUTION" in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, General Description.>

Check for the following, and replace damaged parts with new parts.

- Airbag module, harness, connector, and mounting bracket are damaged. <Ref. to AB-11, DRIVER'S AIRBAG MODULE, INSPECTION, Inspection Locations After a Collision.>

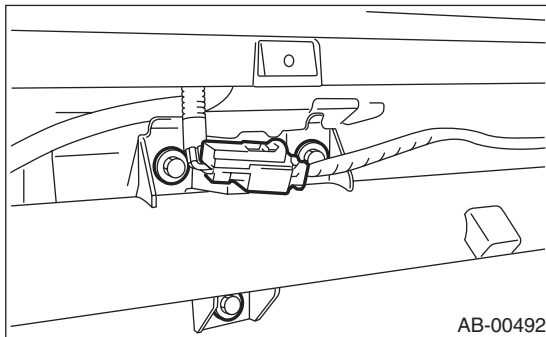
## 5. Passenger's Airbag Module

### A: REMOVAL

**CAUTION:**

Refer to "CAUTION" in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, General Description.>

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
- 3) Remove the glove box. <Ref. to EI-43, REMOVAL, Glove Box.>
- 4) Detach the airbag connector from support beam bracket, and then disconnect the airbag connector.



- 5) Remove the three bolts, and then carefully remove the passenger's airbag module.
- 6) Refer to "CAUTION" for handling of a removed airbag module. <Ref. to AB-3, CAUTION, General Description.>

### B: INSTALLATION

Install in the reverse order of removal.

**CAUTION:**

Do not allow harness and connectors to interfere or get tangled up with other parts.

*Tightening torque:*

Refer to "COMPONENT" in "General Description" <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>

### C: INSPECTION

**CAUTION:**

Refer to "CAUTION" in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, General Description.>

Check for the following, and replace damaged parts with new parts.

- Airbag module, harness, connector, and mounting bracket are damaged. <Ref. to AB-11, PASSENGER'S AIRBAG MODULE, INSPECTION, Inspection Locations After a Collision.>

## 6. Side Airbag Module

### A: REMOVAL

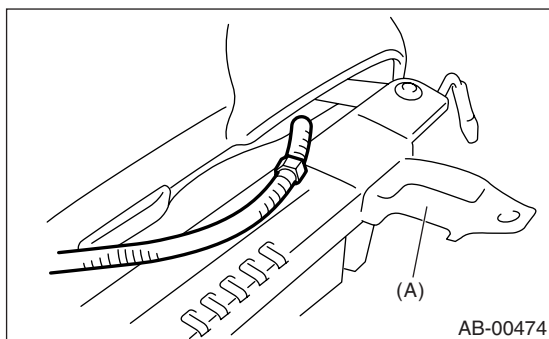
**CAUTION:**

Before working on the airbag module, refer to the “CAUTION” in General Description. <Ref. to AB-3, CAUTION, General Description.>

**NOTE:**

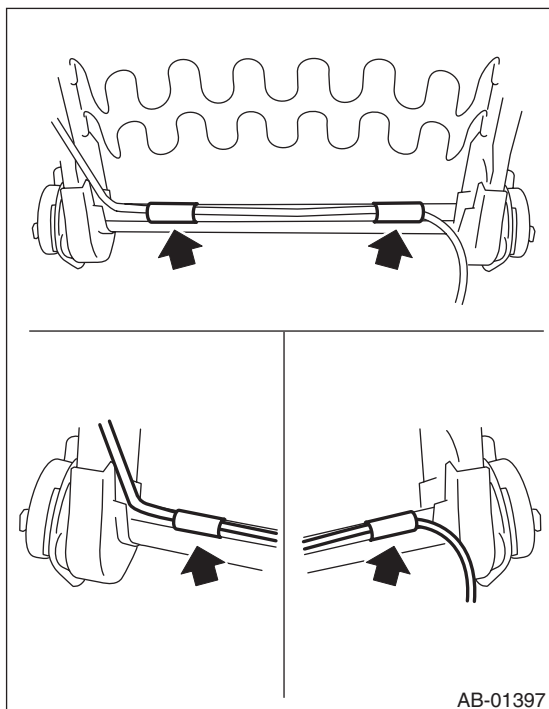
Remove the passenger’s side by referring to driver’s side.

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
- 3) Remove the front seats. <Ref. to SE-7, REMOVAL, Front Seat.>
- 4) Remove the clip, and then remove the side airbag harness from slide rail IN (A) and reverse side of seat cushion assembly.

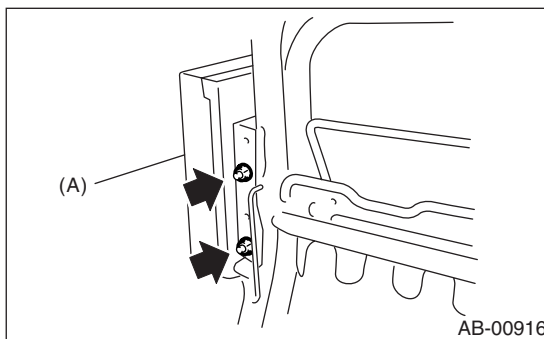


- 5) Remove the backrest cover. <Ref. to SE-8, DISASSEMBLY, Front Seat.>

- 6) Remove the side airbag harness from backrest frame assembly.



- 7) Remove the side airbag module (A) from backrest frame assembly.



### B: INSTALLATION

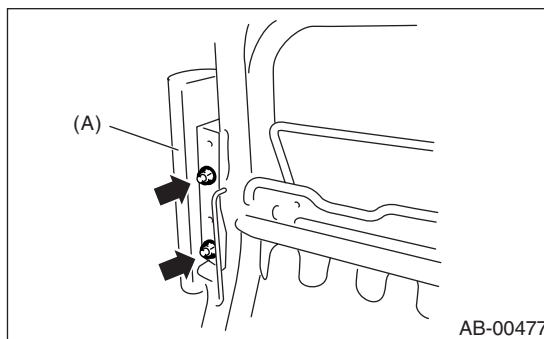
**CAUTION:**

- Before working on the airbag module, refer to the “CAUTION” in General Description. <Ref. to AB-3, CAUTION, General Description.>
- Be sure to perform the system calibration for occupant detection system after passenger’s seat installation. <Ref. to OD(diag)-19, SYSTEM CALIBRATION (REZEROING), OPERATION, Subaru Select Monitor.>

- 1) Ensure there are no foreign particles on side airbag module.
- 2) Install the side airbag module (A) to backrest frame assembly.

**Tightening torque:**

**5.9 N·m (0.60 kgf·m, 4.4 ft·lb)**

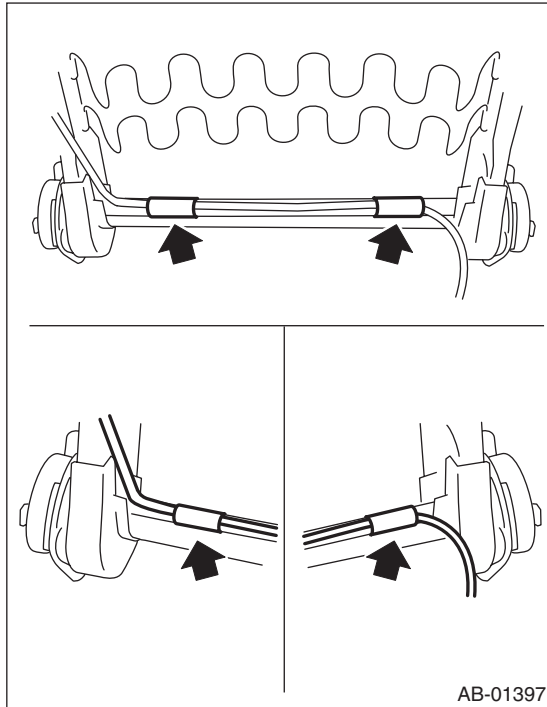


- 3) Install the side airbag harness to backrest frame assembly.



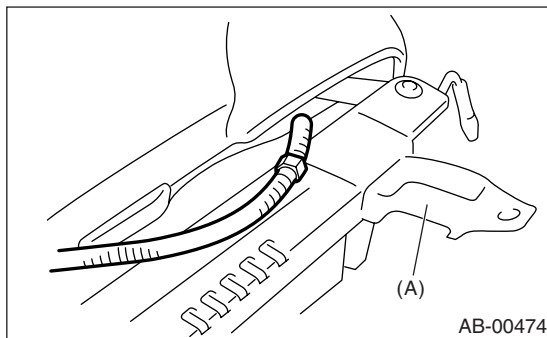
**NOTE:**

Secure the harness to its original position of seat.



4) Install the backrest cover. <Ref. to SE-12, ASSEMBLY, Front Seat.>

5) Install the side airbag harness to slide rail IN (A), and then secure the connector to the bracket on the back side of seat cushion assembly.



6) Recline the seat or slide it backward and forward. Check there is no contact between seat backrest assembly, cushion cover assembly and side airbag harness.

## C: INSPECTION

**CAUTION:**

**Before working on the airbag module, refer to the “CAUTION” in General Description. <Ref. to AB-3, CAUTION, General Description.>**

Perform the inspection of following items, and replace the damaged parts with new ones. <Ref. to AB-11, SIDE AIRBAG MODULE, INSPECTION, Inspection Locations After a Collision.>

- 1) With side clash (when side airbag is deployed)
  - Side airbag module assembly
  - Backrest pad assembly
  - Backrest frame assembly
  - Backrest cover assembly
- 2) Other replacement parts, which found to be damaged by visual check
  - Headrest assembly
  - Bushing
  - Slide rail OUT
  - Slide rail IN
  - Seat hinge cover
  - Seat lifter lever
  - Reclining lever
  - Side airbag harness and connector (body side)
- 3) Without side clash (when side airbag is not deployed)
  - Check the seat and airbag module visually, and then replace them with new ones if damaged or cracked.
  - Specially inspect the damage of airbag module body, installing bracket, harness connector.
- 4) Without side clash (dirt and damage of cover)
  - Replace the corresponding part with a new one.



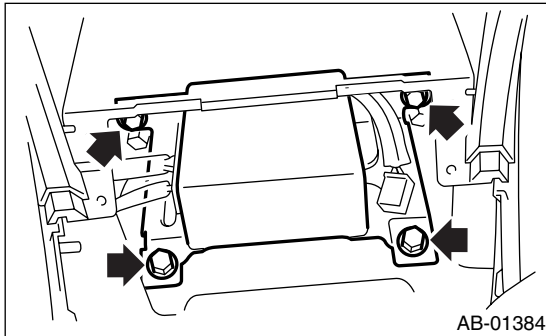
## 7. Airbag Control Module

### A: REMOVAL

**CAUTION:**

- Do not disassemble the airbag control module.
- If the airbag control module is deformed or if water damage is suspected, replace the airbag control module with a new one.
- Do not drop the airbag control module.
- After removal, keep the airbag control module on a dry, clean surface away from moisture, heat, and dust.

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
- 3) Remove the console cover. <Ref. to EI-46, REMOVAL, Console Box.>
- 4) Remove the center console panel. <Ref. to EI-47, REMOVAL, Instrument Panel Assembly.>
- 5) Disconnect the connector from airbag control module.
- 6) Remove the four bolts and remove airbag control module.



### B: INSTALLATION

**CAUTION:**

**Use new bolts (for airbag control module only) during installation.**

Install in the reverse order of removal.

**Tightening torque:**

*Refer to "COMPONENT" in "General Description" <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>*

### C: INSPECTION

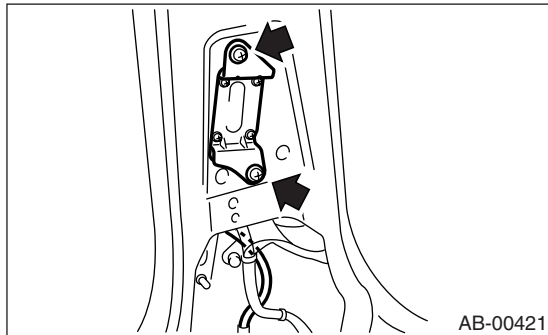
Check for the following, and replace damaged parts with new parts.

- Control module, connector, and mounting bracket are damaged.
- Airbag is deployed.
- Side airbag is deployed.

## 8. Side Airbag Sensor

### A: REMOVAL

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
- 3) Remove the outer seat belt (FRONT). <Ref. to SB-10, INNER SEAT BELT ASSEMBLY, REMOVAL, Front Seat Belt.>
- 4) Detach the side airbag sensor, and then disconnect the airbag connector.



### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

*Refer to “COMPONENT” in “General Description” <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>*

### C: INSPECTION

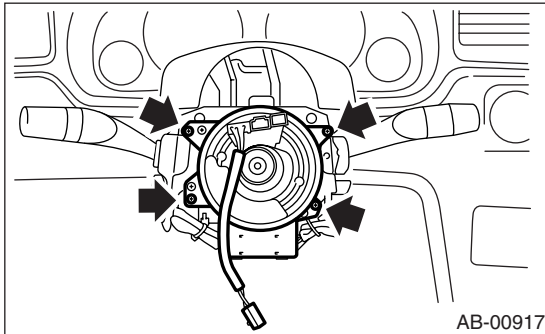
Check for the following, and replace damaged parts with new parts.

- Mounting bracket of side airbag sensor or connector is damaged.
- Side airbag is deployed.

## 9. Roll Connector

### A: REMOVAL

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
- 3) Remove the driver's airbag module. <Ref. to AB-14, Driver's Airbag Module.>
- 4) Remove the steering wheel. <Ref. to PS-20, REMOVAL, Steering Wheel.>
- 5) Remove the steering column cover.
- 6) Remove the screws, and then remove the roll connector.



### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Before installing the steering wheel, be sure the direction of roll connector is adjusted with steering. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>

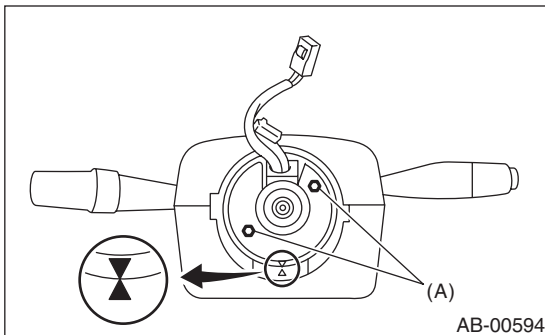
### C: INSPECTION

Check for the following, and replace damaged parts with new parts.

- Combination switch and roll connector is cracked or deformed.

### D: ADJUSTMENT

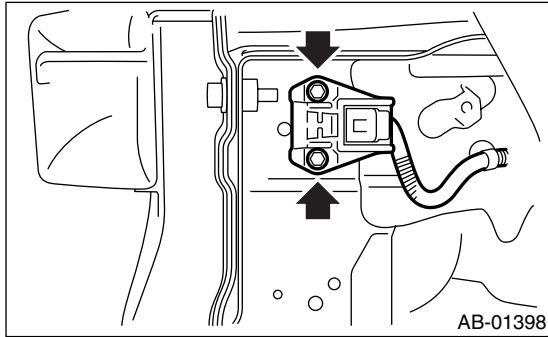
- 1) Check that the front wheels are positioned in straight ahead direction.
- 2) Turn the roll connector pin (A) clockwise until it stops.
- 3) Turn the roll connector pin (A) counterclockwise approx. 3.25 turns until “▲” marks are aligned.



## 10. Front Sub Sensor

### A: REMOVAL

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
- 3) Remove the front bumper. <Ref. to EI-24, REMOVAL, Front Bumper.>
- 4) Remove the bolt, and then detach the front sub sensor.



- 5) Disconnect the connector from front sub sensor.

### B: INSTALLATION

Install in the reverse order of removal.

#### *Tightening torque:*

*Refer to “COMPONENT” in “General Description” <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>*

### C: INSPECTION

Check for the following, and replace damaged parts with new parts.

- Front sub sensor and connector are damaged.
- Airbag is deployed.

# Front Sub Sensor

AIRBAG SYSTEM

---

# AIRBAG SYSTEM (DIAGNOSTICS)

# *AB(diag)*

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# Basic Diagnostic Procedure

AIRBAG SYSTEM (DIAGNOSTICS)

---

## 1. Basic Diagnostic Procedure

### A: PROCEDURE

|   | Step   | Check                                  | Yes                                       | No   |
|---|--|--|---|--|
| 1 | <b>CHECK AIRBAG WARNING LIGHT.</b><br>Turn the ignition switch to ON.  | Does the airbag warning light come on? | Go to step 2.                             | Go to "Airbag Warning Light Failure" <Ref. to AB(diag)-35, Airbag Warning Light Failure.>. |
| 2 | <b>READ DTC.</b><br><Ref. to AB(diag)-32, Read Diagnostic Trouble Code (DTC).>   | Is the normal code being detected?     | Finish the diagnosis.                     | Go to step 3.  |
| 3 | <b>PERFORM THE DIAGNOSIS.</b><br>1) Judge the possible cause from "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).><br>2) Inspect using "Diagnostic Chart with Diagnostic Trouble Code (DTC)".<br>3) Repair the cause of the trouble.<br>4) Perform the clear memory mode. <Ref. to AB(diag)-34, Clear Memory Mode.><br>5) Perform the inspection mode. <Ref. to AB(diag)-33, Inspection Mode.><br>6) Read any DTC again. | Is the DTC being detected?             | Perform the procedure 1) to 5) in step 3. | Finish the diagnosis.  |

# Check List for Interview

AIRBAG SYSTEM (DIAGNOSTICS)

## 2. Check List for Interview

### A: CHECK

|                            |   |                   |     |
|----------------------------|---|-------------------|-----|
| Customer's Name            |   | Inspector's Name  |     |
| Date Vehicle Brought In    | / /   | Registration No.  |     |
| Odometer Reading           | km<br>miles   | VIN               |     |
| Date Problem Occurred      | / /   | Registration Year | / / |
| Weather                    | <input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Other:   |                   |     |
| Temperature                | °C (°F)   |                   |     |
| Road Condition             | <input type="checkbox"/> Level road <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Rough road <input type="checkbox"/> Others:  |                   |     |
| Vehicle Operation          | <input type="checkbox"/> Starting <input type="checkbox"/> Idling<br><input type="checkbox"/> Driving ( <input type="checkbox"/> Constant Speed <input type="checkbox"/> Acceleration <input type="checkbox"/> Deceleration )<br><input type="checkbox"/> Steering wheel turn <input type="checkbox"/> Other: |                   |     |
| Details of Problem         |   |                   |     |
| Check Airbag Warning Light | <input type="checkbox"/> Remains ON <input type="checkbox"/> Remains OFF  |                   |     |
| Check DTC                  | <input type="checkbox"/> Normal Code <input type="checkbox"/> DTC: (Code )  |                   |     |



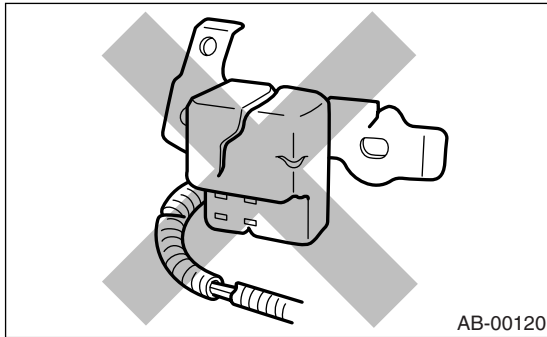
# General Description

## AIRBAG SYSTEM (DIAGNOSTICS)

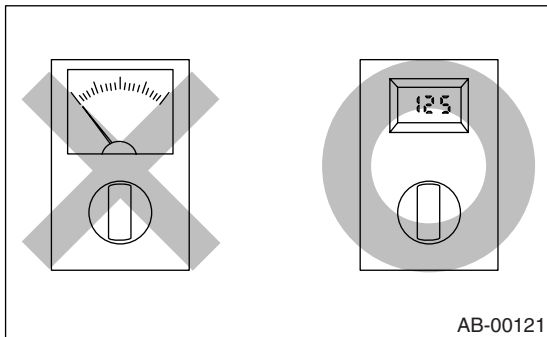
### 3. General Description

#### A: CAUTION

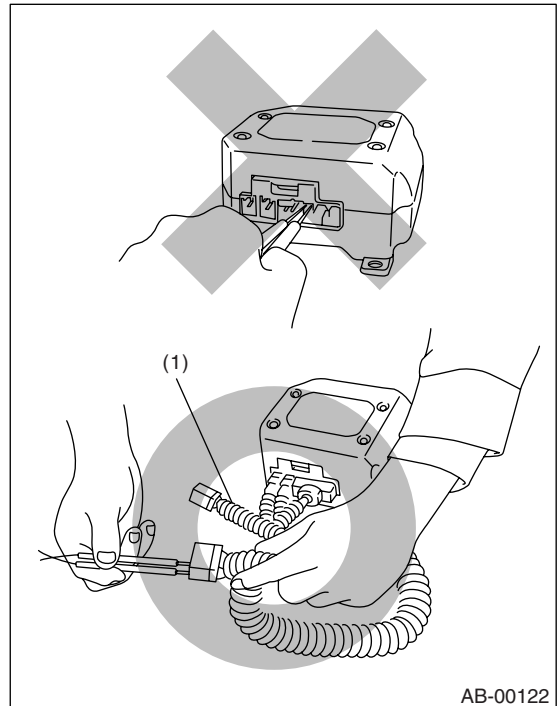
- When servicing a vehicle, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
- The airbag system is fitted with a backup power source. If the airbag system is serviced within 20 seconds after the ground cable is disconnected, it may inflate.
- If sensors, airbag module, airbag control module, pretensioner, and harness are deformed or damaged, replace them with new genuine parts.



- Do not use the airbag system and pretensioners on other vehicles. When replacing parts, be sure to replace them with new parts.
- When checking the airbag system, be sure to use a digital circuit tester. Use of an analog circuit tester may cause the airbag to activate erroneously.

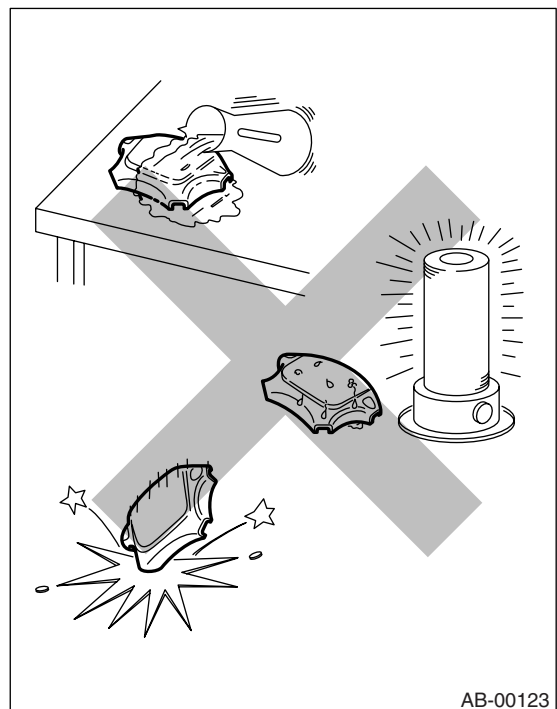


- When checking, use a test harness. Do not directly apply the tester probe to any connector terminal of the airbag.



(1) Test harness

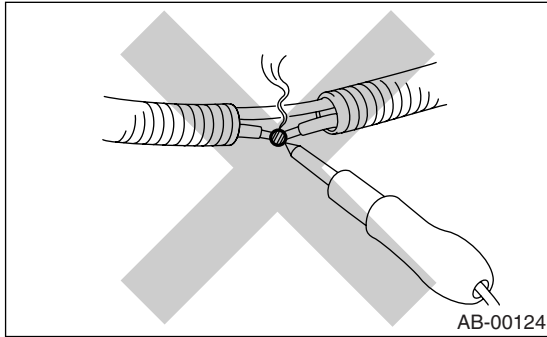
- Do not drop the airbag modulator parts, subject them to high temperature over 93°C (199°F), or let water, oil, or grease get on them; otherwise, the internal parts may be damaged and may be reliability greatly lowered.



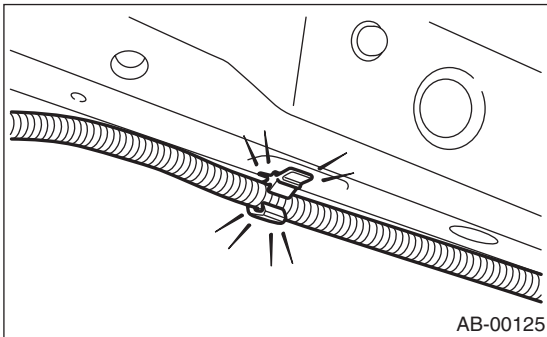
# General Description

## AIRBAG SYSTEM (DIAGNOSTICS)

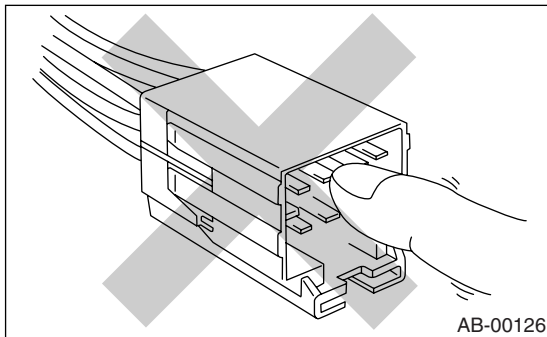
- If any damage, opening, or rust is found on the airbag system wire harness, do not attempt to repair using soldering equipment. Be sure to replace the faulty harness with a new genuine part.



- Install the wire harness securely with the specified clips to avoid interference or tangled up with other parts.

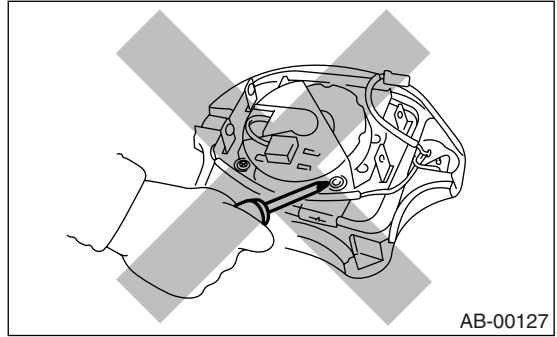


- Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.

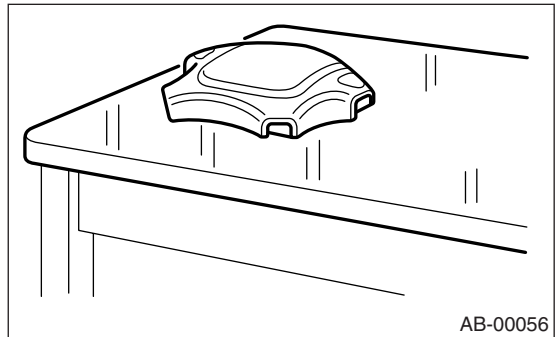


- Either of the airbag modules for driver, passenger or side, or pretensioner must not be disassembled.

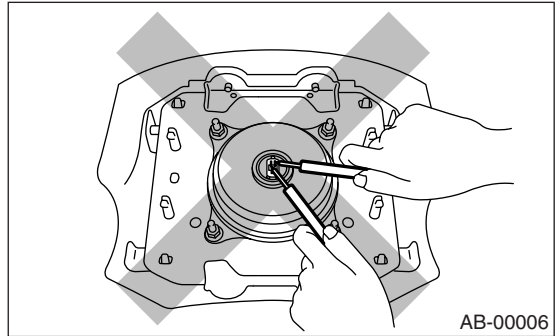
- The airbag module cannot be used again if once inflated.



- After removal, keep the airbag module with the pad facing upward on a dry, clean, and flat surface away from heat and light sources, and moisture and dust.



- Do not check continuity of either of the airbag modules for driver, passenger or side, or pretensioner.

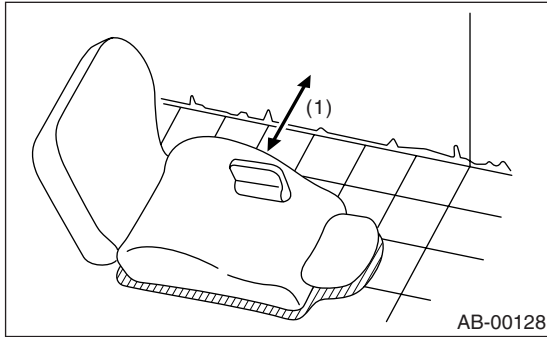


## General Description

### AIRBAG SYSTEM (DIAGNOSTICS)

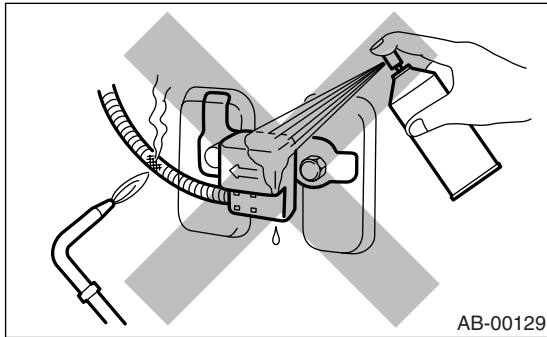
---

- The removed front seat with the airbag module must be kept at least 200 mm (8 in) away from walls and other objects.



(1) More than 200 mm (8 in)

- When painting or performing sheet metal work on the front part of the vehicle, including the front wheel apron, front fender, and front side frame, remove the front sub sensors and wire harness of the airbag system.
- When painting or performing sheet metal work on the side of the vehicle, including the side sill, center pillar, and front and rear doors, remove the side airbag sensors and wire harness of the airbag system.



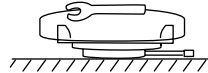
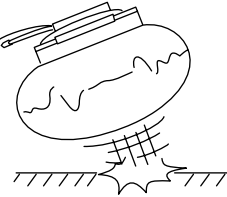
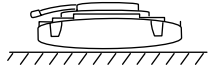
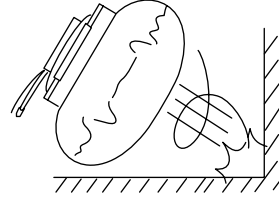
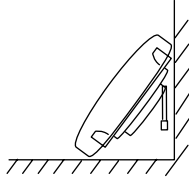
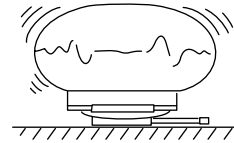
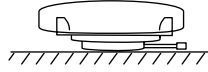
- Do not discard undeployed airbag modules. They could easily cause a serious accident if accidentally deployed.

# General Description

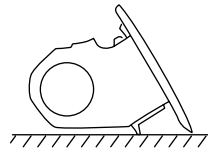
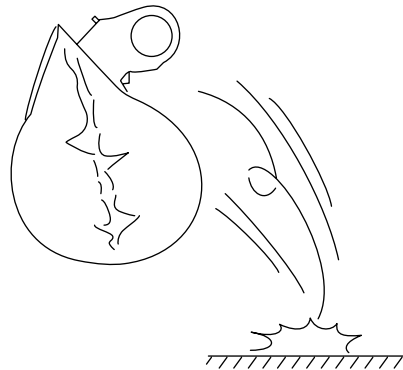
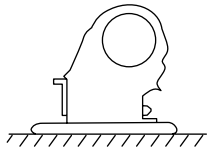
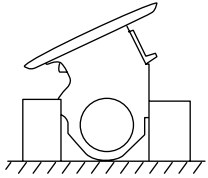
## AIRBAG SYSTEM (DIAGNOSTICS)

- When storing a removed airbag module, do not place any objects on it or pile airbag modules on top of each other. If the airbag inflates for some reason when it is placed with its pad side facing downward or under any object, a serious accident may result.

(1)



(2)



AB-00130

(1) Driver side airbag module

(2) Passenger side airbag module

# General Description

## AIRBAG SYSTEM (DIAGNOSTICS)

### B: INSPECTION

Before diagnosing, check the following items that might be related to the engine problem:

#### 1. BATTERY

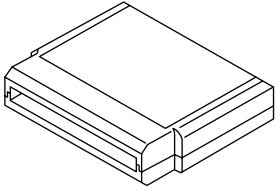

Measure the battery voltage and specific gravity of electrolyte.

**Standard voltage: 12 V**

**Specific gravity: Above 1.260**

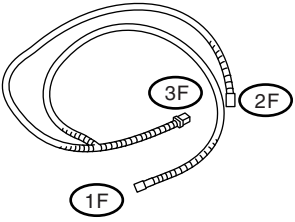
### C: PREPARATION TOOL

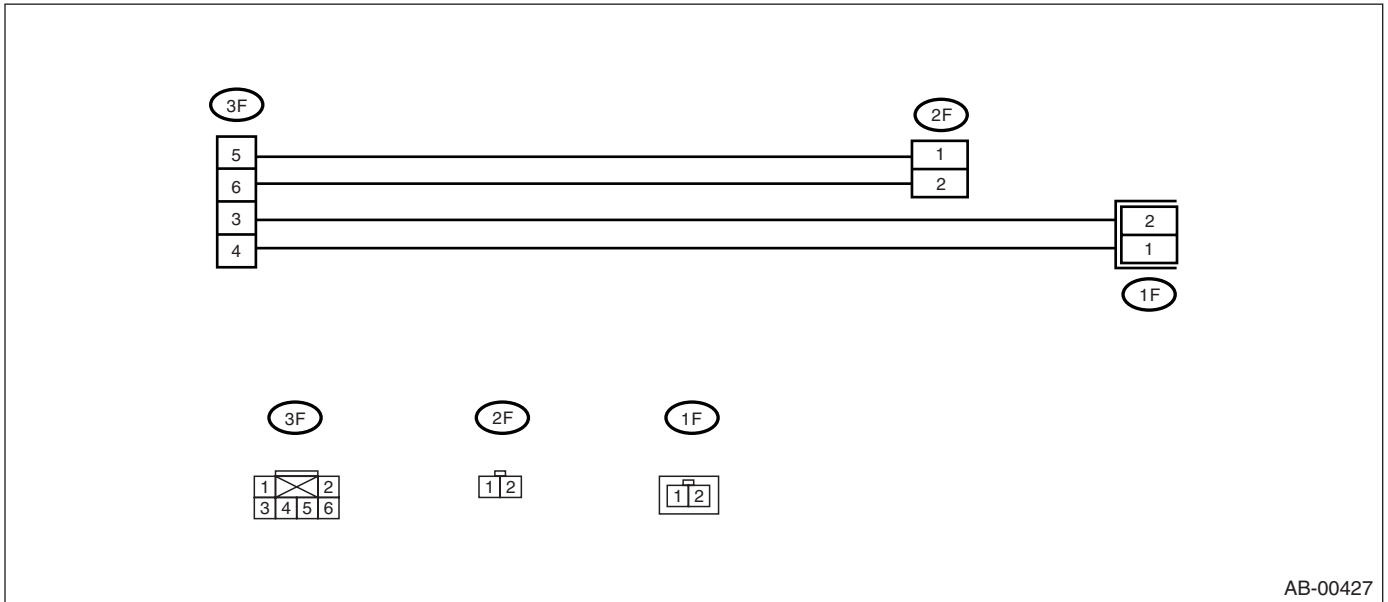
#### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER                        | DESCRIPTION                  | REMARKS                                 |
|---|------------------------------------|------------------------------|---|
| <br>ST18482AA010   | 18482AA010<br>(Newly adopted tool) | CARTRIDGE                    | Troubleshooting for electrical systems. |
| <br>ST22771AA030 | 22771AA030                         | SUBARU SELECT<br>MONITOR KIT | Troubleshooting for electrical systems. |

# General Description

## • TEST HARNESS F

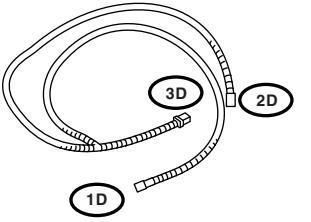
| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION    | REMARKS  |
|---|-------------|----------------|--|
|  <p>ST98299FC010</p> | 98299FC010  | TEST HARNESS F | Used when measuring voltage, resistance of side airbag module harness. |

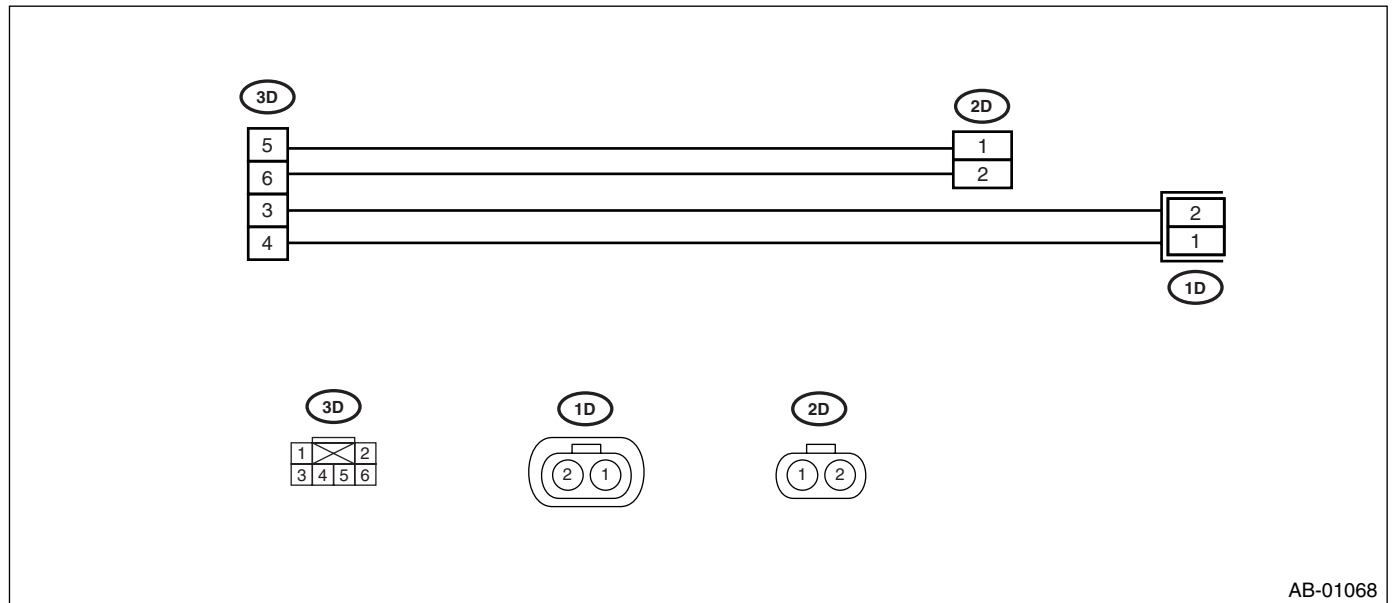


# General Description

## AIRBAG SYSTEM (DIAGNOSTICS)

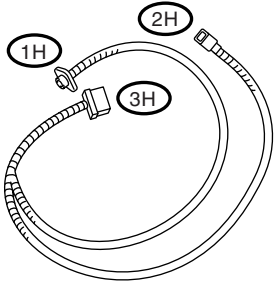
### • TEST HARNESS D

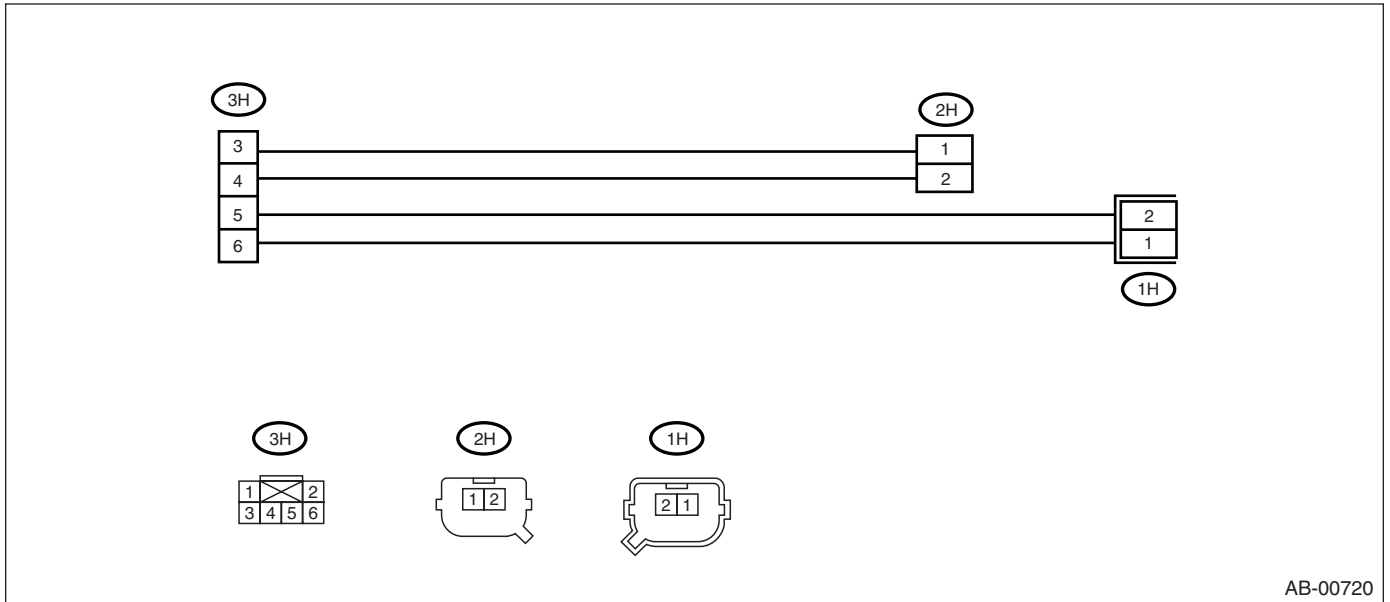
| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION    | REMARKS  |
|---|-------------|----------------|--|
|  <p>ST98299AG060</p> | 98299AG060  | TEST HARNESS D | Used when measuring voltage and resistance of front seat belt buckle switch. |



# General Description

## • TEST HARNESS H

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION    | REMARKS  |
|---|-------------|----------------|--|
|  <p>ST98299FA030</p> | 98299FA030  | TEST HARNESS H | Used when measuring voltage, resistance of front sub sensor. |

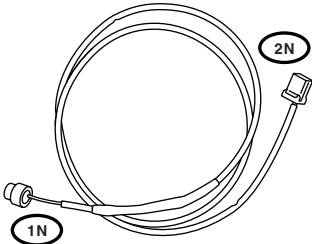


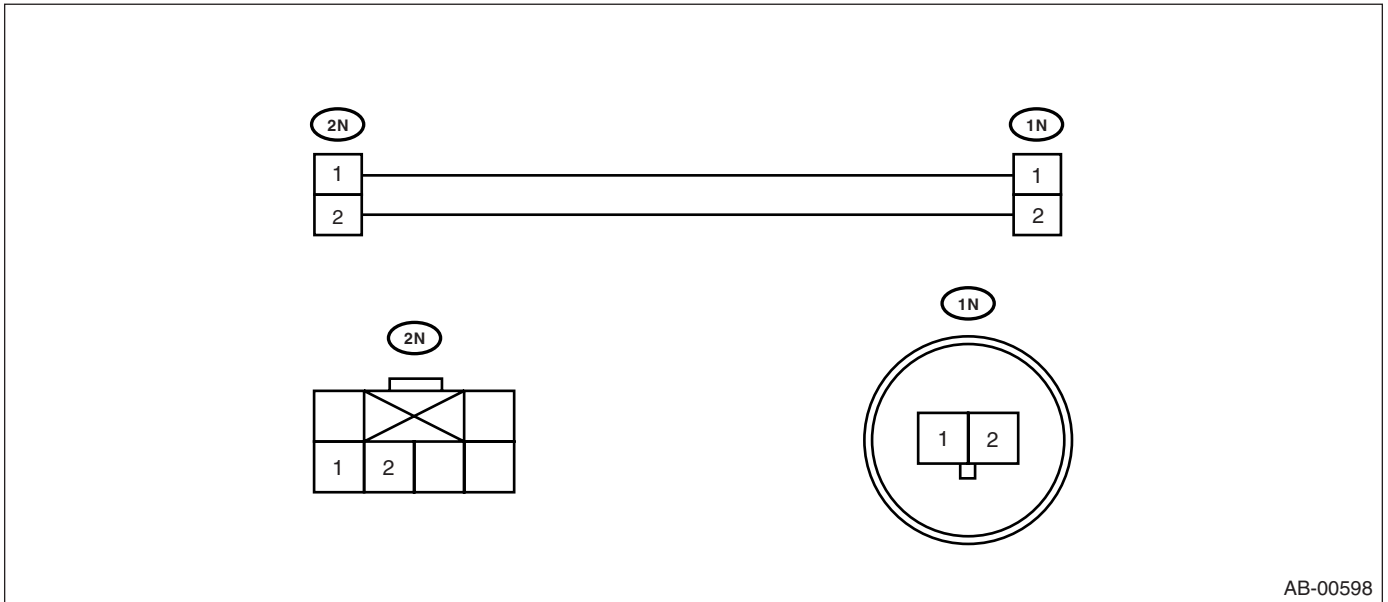


# General Description

## AIRBAG SYSTEM (DIAGNOSTICS)

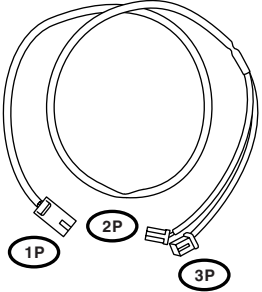
### • TEST HARNESS N

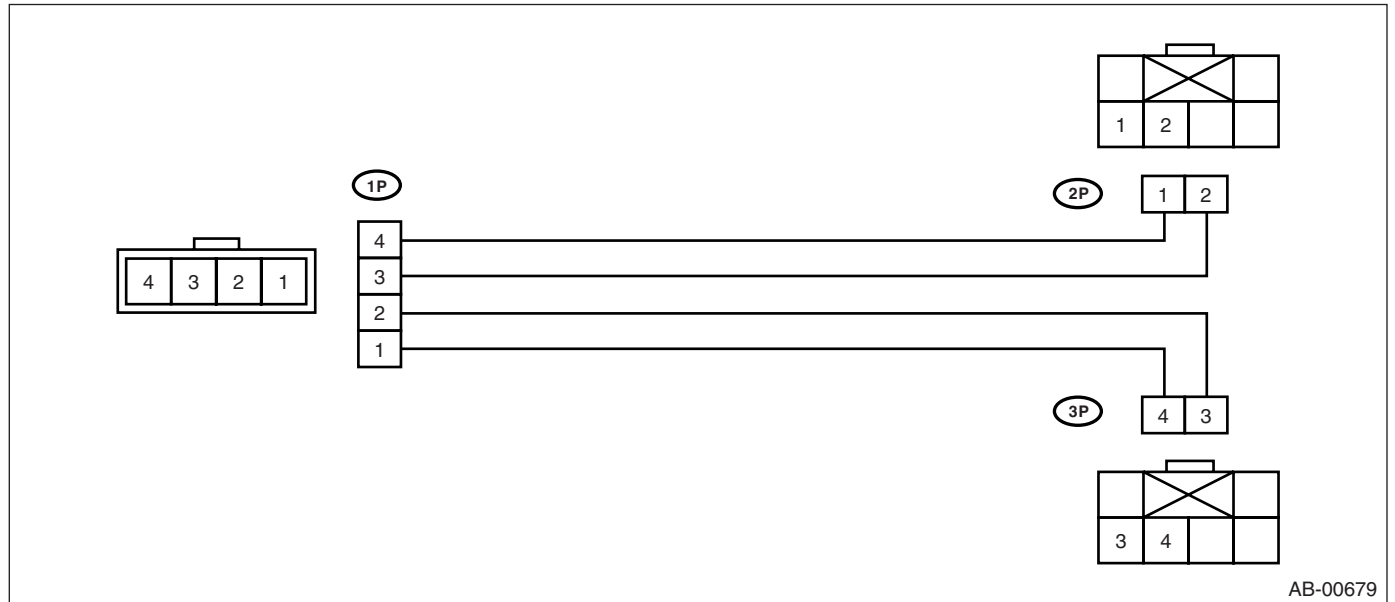
| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION    | REMARKS   |
|---|-------------|----------------|---|
|  <p style="text-align: center;">ST98299SA000</p> | 98299SA000  | TEST HARNESS N | Used when measuring voltage, resistance of driver's airbag module and seat belt pretensioner. |



# General Description

## • TEST HARNESS P

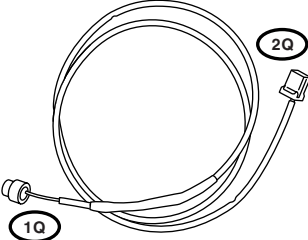
| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION    | REMARKS   |
|---|-------------|----------------|---|
|  <p>ST98299SA020</p> | 98299SA020  | TEST HARNESS P | Used when measuring voltage and resistance of driver's airbag module harness and passenger's airbag module harness. |

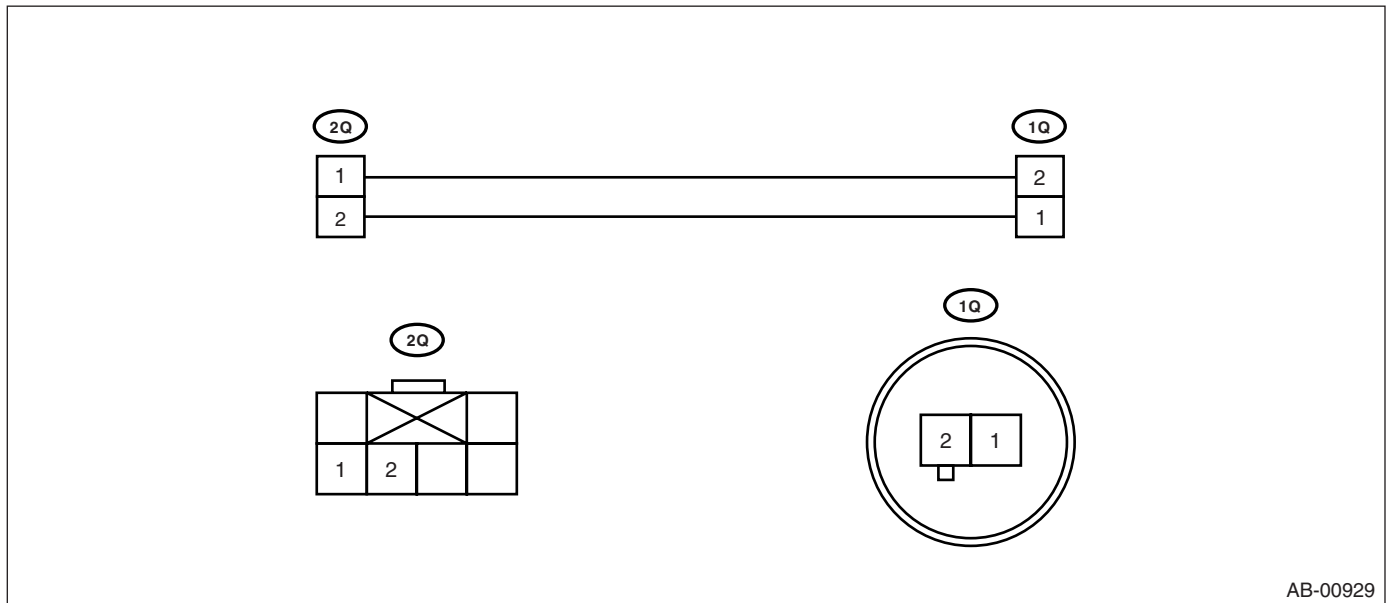


# General Description

## AIRBAG SYSTEM (DIAGNOSTICS)

### • TEST HARNESS Q

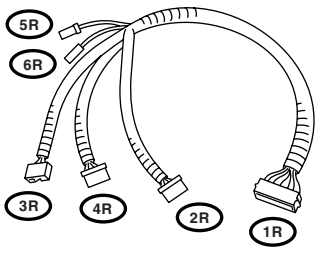
| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION    | REMARKS   |
|---|-------------|----------------|---|
|  <p style="text-align: center;">ST98299SA040</p> | 98299SA040  | TEST HARNESS Q | Used when measuring voltage and resistance of driver's airbag module. |

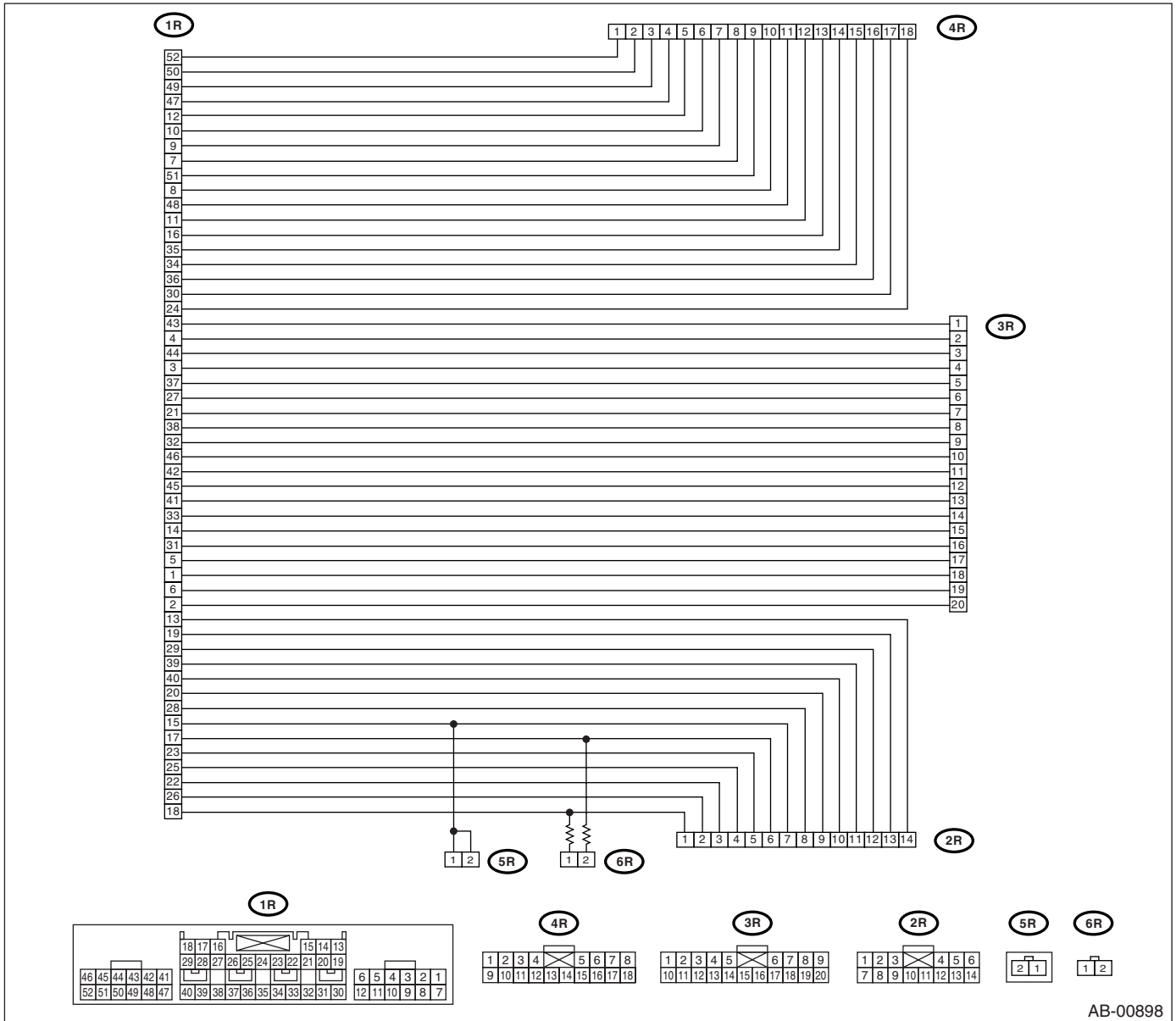


# General Description

AIRBAG SYSTEM (DIAGNOSTICS)

## • TEST HARNESS R

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION    | REMARKS  |
|---|-------------|----------------|--|
|  <p>ST98299FE030</p> | 98299FE030  | TEST HARNESS R | Used when measuring voltage, resistance of air-bag control module. |

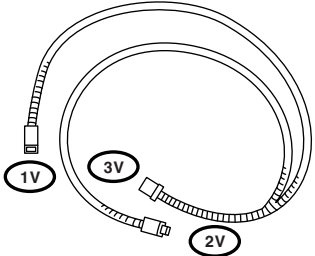


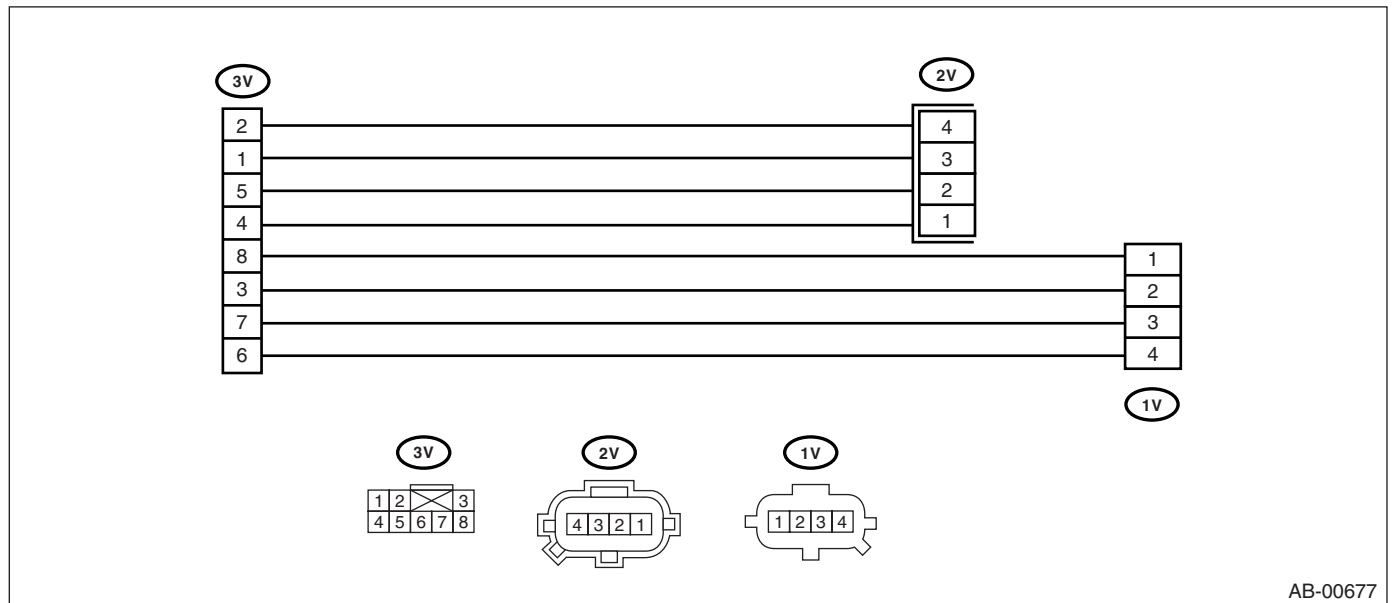
AB-00898

# General Description

## AIRBAG SYSTEM (DIAGNOSTICS)

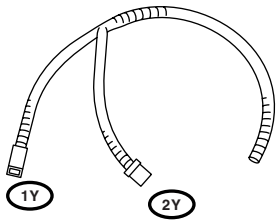
### • TEST HARNESS V

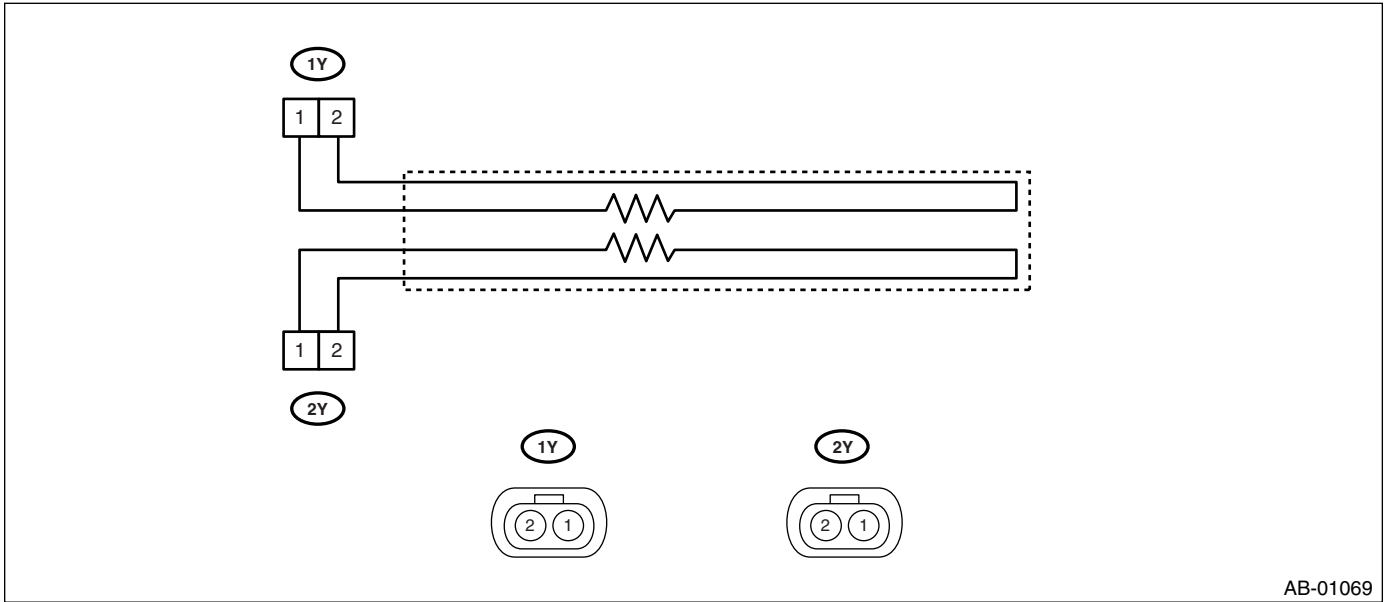
| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION    | REMARKS   |
|---|-------------|----------------|---|
|  <p>ST98299AG010</p> | 98299AG010  | TEST HARNESS V | Used when measuring voltage and resistance of side airbag sensor. |



# General Description

## • TEST HARNESS Y

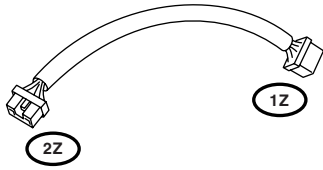
| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION    | REMARKS  |
|---|-------------|----------------|--|
|  <p>ST98299AG040</p> | 98299AG040  | TEST HARNESS Y | Used when diagnosing seat belt buckle switch and seat position sensor. |

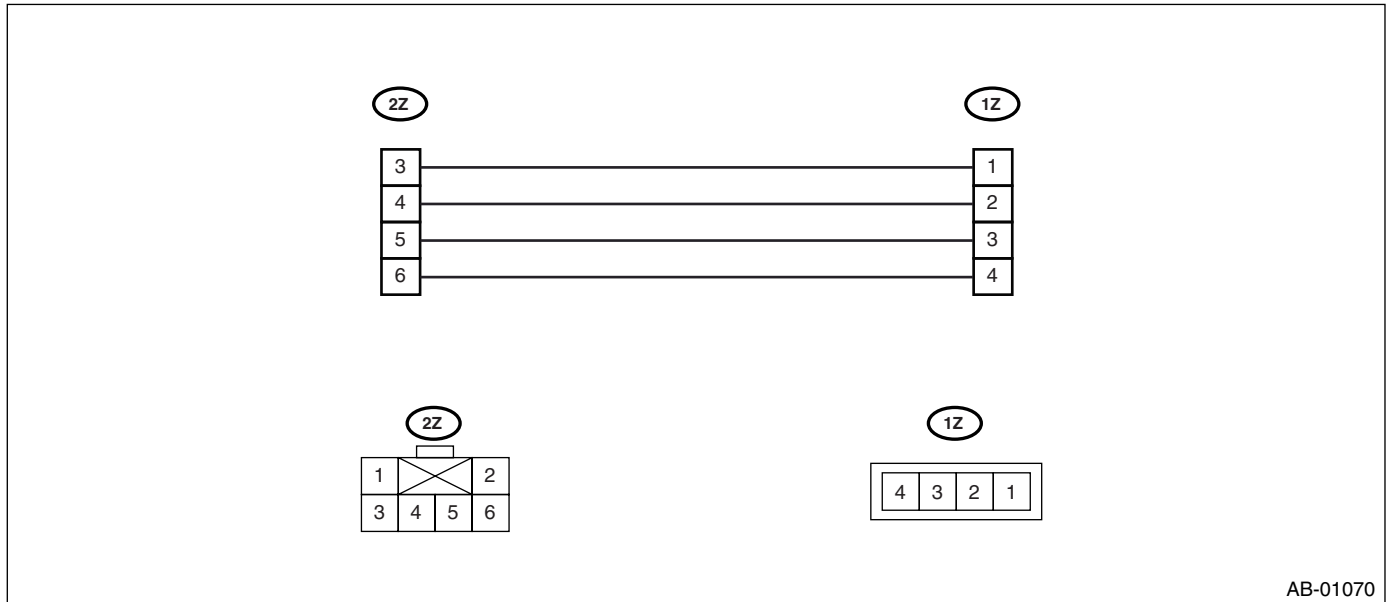


# General Description

## AIRBAG SYSTEM (DIAGNOSTICS)

### • TEST HARNESS Z

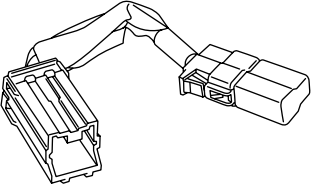
| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION    | REMARKS  |
|---|-------------|----------------|--|
|  <p style="text-align: center; margin-top: 10px;">ST98299AG050</p> | 98299AG050  | TEST HARNESS Z | Used when measuring voltage and resistance of occupant detection system. |

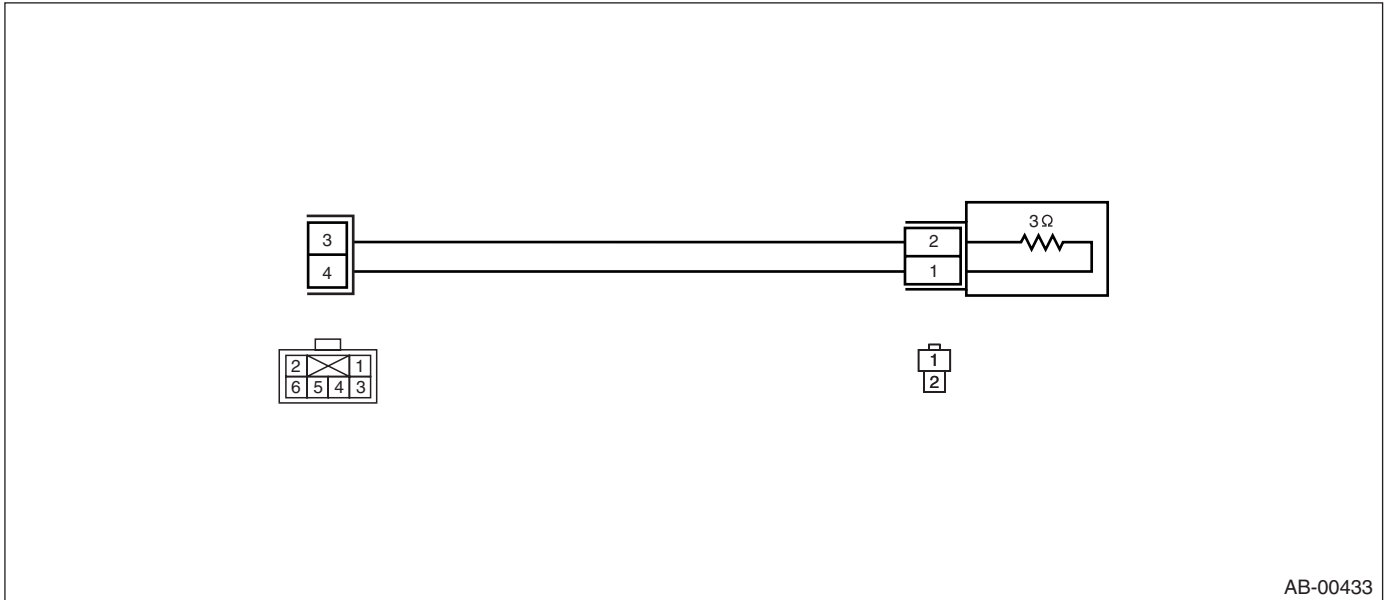


# General Description

AIRBAG SYSTEM (DIAGNOSTICS)

## • AIRBAG RESISTOR

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION     | REMARKS   |
|---|-------------|-----------------|---|
|  <p>ST98299PA040</p> | 98299PA040  | AIRBAG RESISTOR | Used in replacement of airbag module which resistance value is same as airbag module. |



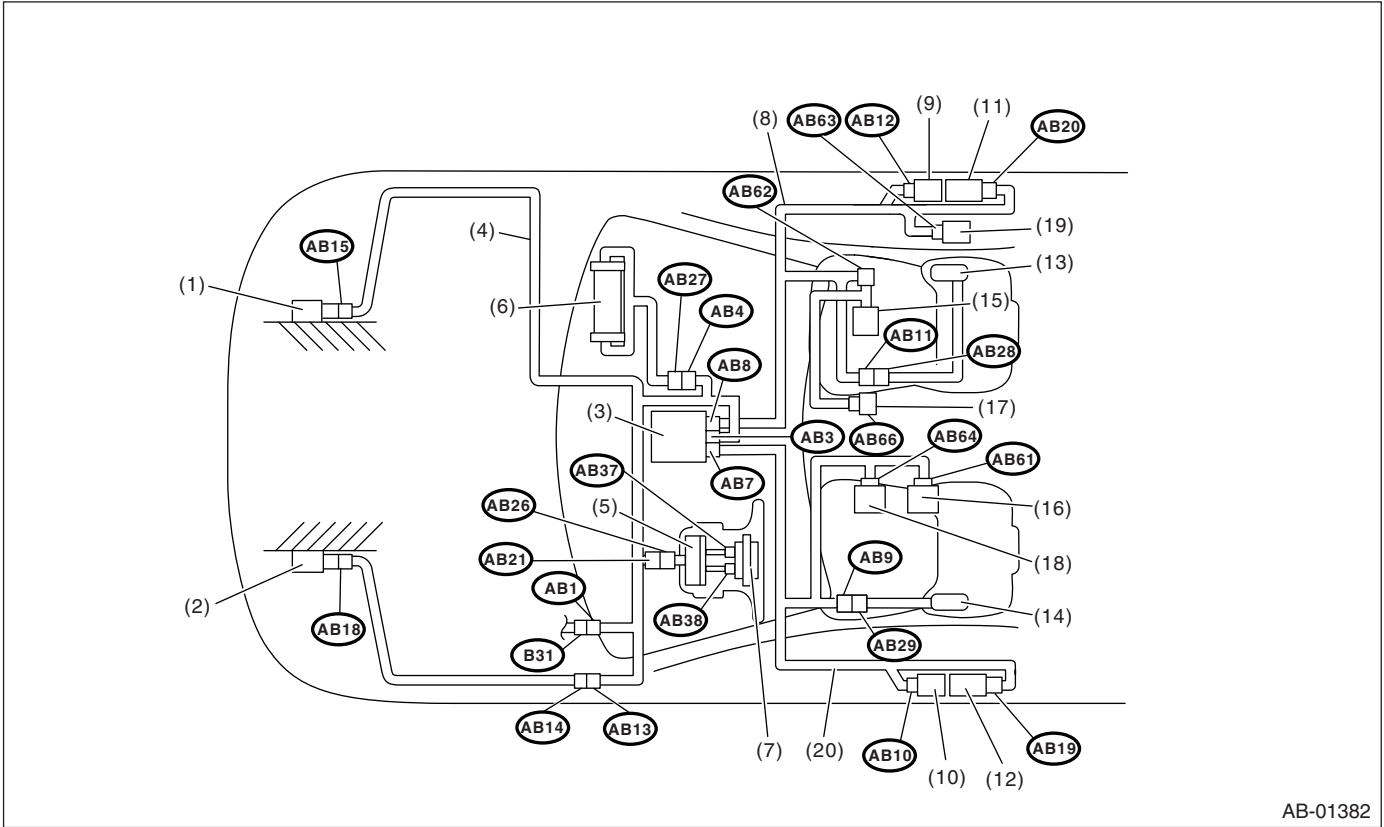


# Electrical Component Location

## AIRBAG SYSTEM (DIAGNOSTICS)

### 4. Electrical Component Location

#### A: LOCATION



AB-01382

- |  |                                  |  |
|--|----------------------------------|--|
| (1) Front sub sensor (RH)  | (8) Side airbag harness (RH)     | (15) Occupant detection control module |
| (2) Front sub sensor (LH)  | (9) Side airbag sensor (RH)      | (16) Buckle switch (LH)                |
| (3) Airbag control module with built-in safety and electric sensor | (10) Side airbag sensor (LH)     | (17) Buckle switch (RH)                |
| (4) Airbag main harness  | (11) Seat belt pretensioner (RH) | (18) Seat position sensor              |
| (5) Roll connector   | (12) Seat belt pretensioner (LH) | (19) Belt tension sensor               |
| (6) Passenger side airbag module                                   | (13) Side airbag module (RH)     | (20) Side airbag harness (LH)          |
| (7) Driver side airbag module                                      | (14) Side airbag module (LH)     |  |

|                 |        |        |        |        |        |        |        |        |        |        |        |        |
|-----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Connector No.   | (AB1)  | (AB3)  | (AB4)  | (AB7)  | (AB8)  | (AB9)  | (AB10) | (AB11) | (AB12) | (AB13) | (AB14) | (AB15) |
| Pole            | 6      | 28     | 4      | 12     | 12     | 2      | 4      | 2      | 4      | 2      | 2      | 2      |
| Connector color | Yellow | Yellow | Yellow | Yellow | Yellow | Yellow | Yellow | Yellow | Yellow | Yellow | Yellow | Yellow |
| Male/Female     | Male   | Female | Female | Female | Female | Female | Female | Female | Female | Female | Male   | Female |
| Connector No.   | (AB18) | (AB19) | (AB20) | (AB21) | (AB26) | (AB27) | (AB28) | (AB29) | (AB37) | (AB38) | (AB61) | (AB62) |
| Pole            | 2      | 2      | 2      | 4      | 4      | 4      | 2      | 2      | 2      | 2      | 2      | 6      |
| Connector color | Yellow | Black  | Black  | Yellow | Yellow | Yellow | Yellow | Yellow | Orange | Black  | Yellow | Gray   |
| Male/Female     | Female | Female | Female | Female | Male   | Male   | Male   | Male   | Female | Female | Male   | Female |

# Electrical Component Location

AIRBAG SYSTEM (DIAGNOSTICS)

|                 |        |        |        |   |   |   |   |   |   |   |   |   |
|-----------------|--------|--------|--------|---|---|---|---|---|---|---|---|---|
| Connector No.   | (AB63) | (AB64) | (AB66) | — | — | — | — | — | — | — | — | — |
| Pole            | 3      | 2      | 2      | — | — | — | — | — | — | — | — | — |
| Connector color | Brown  | Yellow | Yellow | — | — | — | — | — | — | — | — | — |
| Male/<br>Female | Female | Female | Female | — | — | — | — | — | — | — | — | — |

### 5. Airbag Control Module I/O Signal

#### A: WIRING DIAGRAM

Refer to wiring diagrams in WI section. <Ref. to WI-96, WIRING DIAGRAM, Airbag System.>

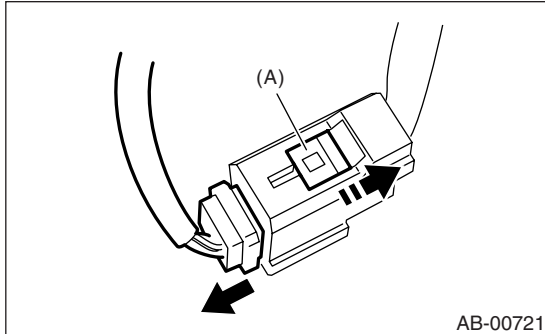
## 6. Airbag Connector

### A: PROCEDURE

#### 1. BUCKLE SWITCH AND OCCUPANT DETECTION CONTROL MODULE

##### 1) How to disconnect

- (1) Move the slide lock (A) in the direction of the arrow.
- (2) Disconnect the connector with the slide lock (A) moved.

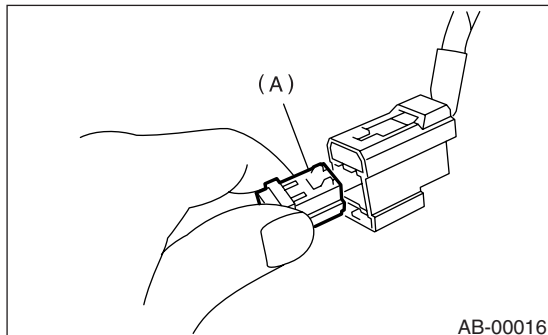


#### CAUTION:

When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.

##### 2) How to connect

Holding the connector (A), and push it in carefully until a connecting sound is heard.



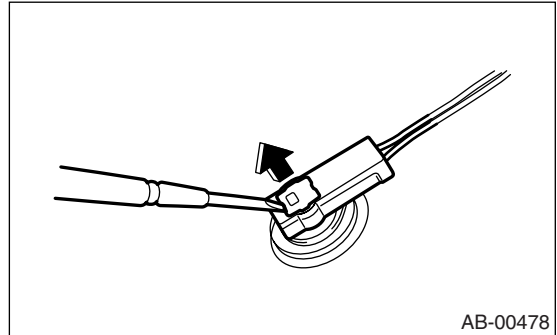
#### CAUTION:

Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.

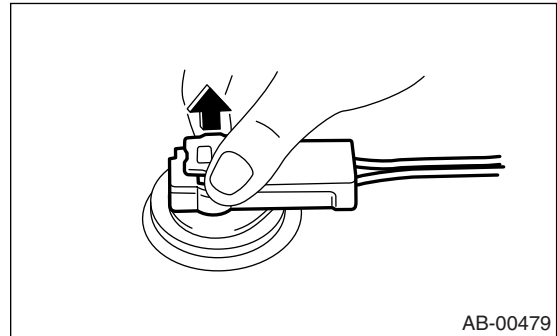
#### 2. DRIVER'S AIRBAG MODULE AND PRE-TENSIONER

##### 1) How to disconnect

- (1) Using a flat tip screwdriver, pry the push lock upward to unlock.



- (2) Pull the connector to disconnect from driver's side airbag module assembly or retractor assembly.

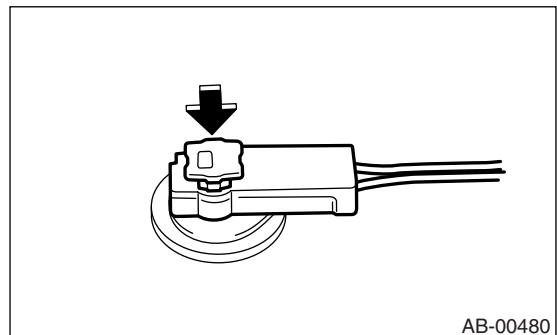


##### 2) How to connect

Connect the connector in reverse order of disconnecting. At this time, be sure to insert the push lock in until connecting sound is heard.

#### CAUTION:

- Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.
- Be sure to push the push lock in securely.



#### NOTE:

Connector can not be connected when the push lock is in lock position. To connect the connector, set the push lock to unlock position.

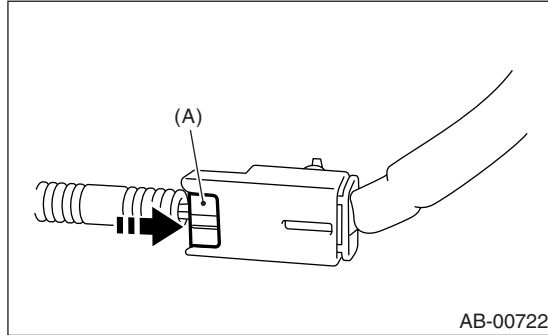
# Airbag Connector

## AIRBAG SYSTEM (DIAGNOSTICS)

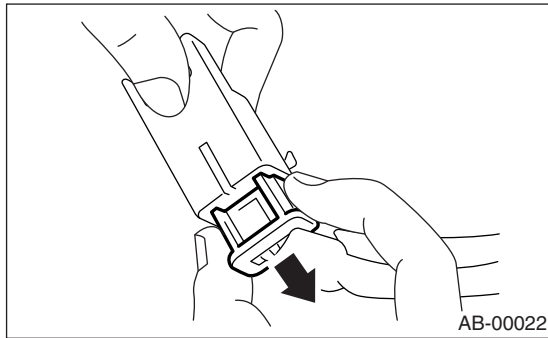
### 3. DRIVER'S AIRBAG (BETWEEN AIRBAG MAIN HARNESS AND ROLL CONNECTOR) AND PASSENGER'S AIRBAG

#### 1) How to disconnect

- (1) Press in the slide lock (A) in the direction of arrow.



- (2) With the slide lock (A) pressed in, disconnect the connector.

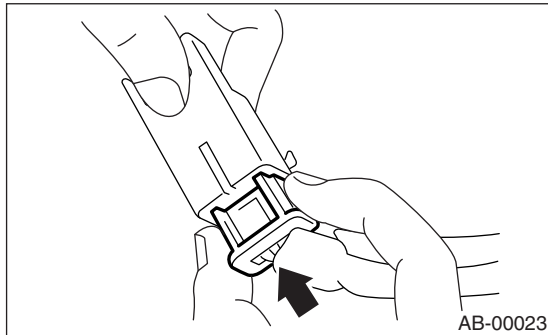


**CAUTION:**  
When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.

#### 2) How to connect

Holding the connector, push it in carefully until a connecting sound is heard.

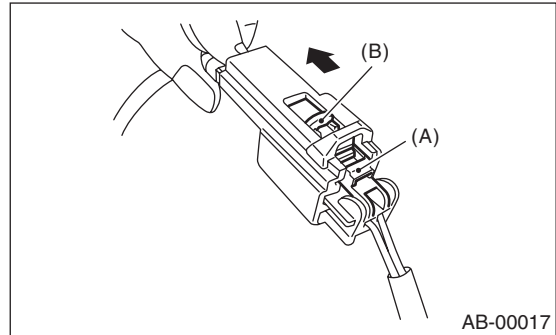
**CAUTION:**  
Be sure to insert the connector in until it locks. Then pull it gently to make sure that it is locked.



### 4. SIDE AIRBAG

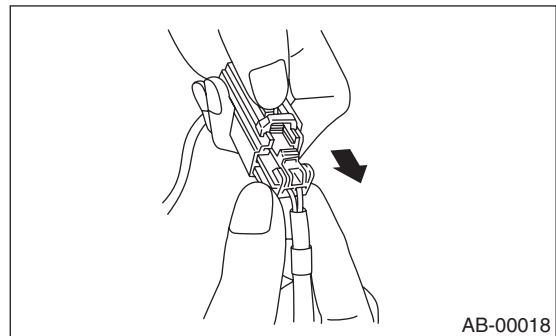
#### 1) How to disconnect

- (1) Push the lock arm (A).
- (2) With the lock arm (A) pushed in, move the slide lock (B) in the direction of the arrow.



- (3) With the slide lock moved, release the lock arm (back to its original position), and disconnect the connector.

**CAUTION:**  
When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.



#### 2) How to connect

Holding the connector, push it in carefully until a connecting sound is heard.

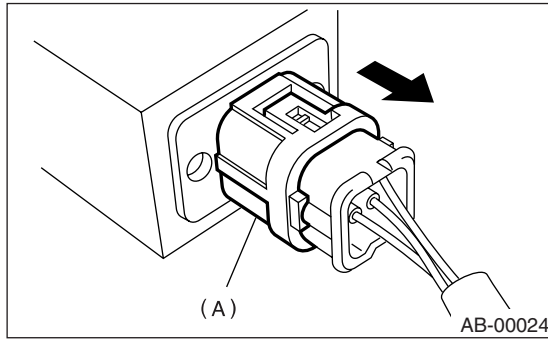
## 5. FRONT SUB-SENSOR, SIDE AIRBAG SENSOR, SEAT POSITION SENSOR LH

1) How to disconnect

Holding outer part (A), pull it in the direction of the arrow.

### CAUTION:

**When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.**

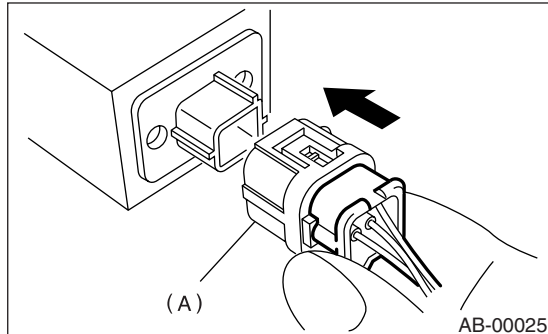


2) How to connect

Holding the connector, push it in carefully until a connecting sound is heard.

### CAUTION:

- Outer (A) moves back, and so do not put your hand on the outer part.
- Be sure to insert the connector in until it locks. Then pull it gently to make sure that it is locked.



# Subaru Select Monitor

## AIRBAG SYSTEM (DIAGNOSTICS)

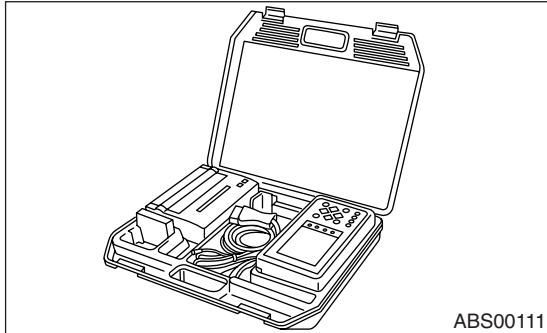
### 7. Subaru Select Monitor

#### A: OPERATION

##### 1. READ DIAGNOSTIC TROUBLE CODE (DTC)

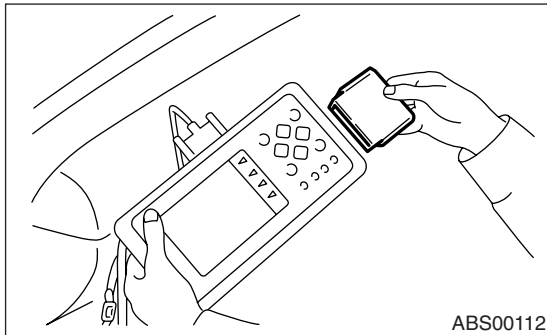
When malfunction of airbag system occurs, the DTC stored in airbag control module will be read out.

1) Prepare the Subaru Select Monitor kit. <Ref. to AB(diag)-8, SPECIAL TOOL, PREPARATION TOOL, General Description.>



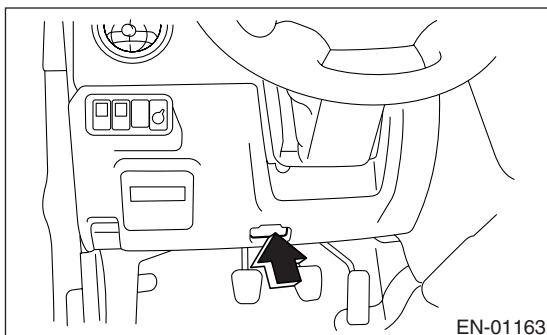
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor. <Ref. to AB(diag)-8, SPECIAL TOOL, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).

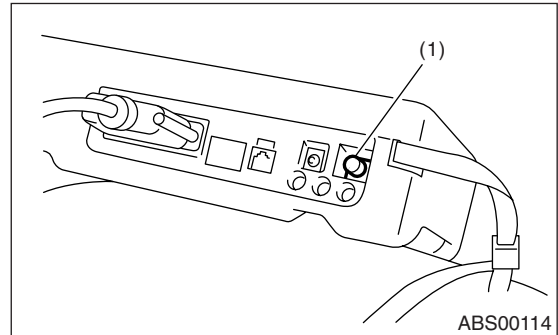


(2) Connect the diagnosis cable to data link connector.

#### CAUTION:

**Do not connect the scan tools except for Subaru Select Monitor.**

5) Turn the ignition switch to ON (engine OFF), and Subaru Select Monitor power switch to ON.



(1) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.

7) On the «System Selection Menu» display screen, select the {Airbag System} and press the [YES] key.

8) Press the [YES] key after the {AIRBAG SYSTEM} is displayed.

9) On the «Airbag System» display screen, select the {DTC Display} and press the [YES] key.

#### NOTE:

- For details concerning operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".

- For details concerning DTCs, refer to the "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).>

## 2. STATUS DATA DISPLAY

Check the operating condition of each sensor in the event of malfunction in seat belt buckle switch and seat position sensor, or when the seat belt buckle switch and seat position sensor has been replaced.

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Airbag System} and press the [YES] key.
- 3) On the «Airbag System» display screen, select the {Status Data} and press the [YES] key.

The support data is shown in the following table.

| Item                             | Display   |
|----------------------------------|---|
| Seat position sensor LH          | Front <sup>*1</sup> /Rear <sup>*2</sup> /Other <sup>*3</sup> /Unknown <sup>*3</sup> /___ <sup>*5</sup>      |
| Seat position sensor RH          | ___ <sup>*5</sup>   |
| Seat belt buckle switch LH       | Belted <sup>*6</sup> /Unbelted <sup>*7</sup> /Other <sup>*8</sup> /Unknown <sup>*4</sup> /___ <sup>*9</sup> |
| Seat belt buckle switch RH       | Belted <sup>*6</sup> /Unbelted <sup>*7</sup> /Other <sup>*8</sup> /Unknown <sup>*4</sup> /___ <sup>*9</sup> |
| Passenger's airbag firing status | ON <sup>*10</sup> /OFF <sup>*11</sup> /Unknown <sup>*4</sup>  |

- \*1: The seat position is forward.
- \*2: The seat position is rearward.
- \*3: It is displayed when data other than forward and backward positions of the seat, such as malfunction etc., is input.
- \*4: It is displayed at the initial status.
- \*5: Seat position sensor is not available.
- \*6: Seat belt is fastened.
- \*7: Seat belt is unfastened.
- \*8: It is displayed when data other than fastened or unfastened belts, such as malfunction etc., is input.
- \*9: Seat belt buckle switch is not available.
- \*10: Passenger's airbag is active.
- \*11: Passenger's airbag is not active.

**NOTE:**

For details concerning operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

## 3. CLEAR MEMORY MODE

Clear the DTC stored in the airbag control module after repairing malfunction in airbag system. If the memory is not cleared after repairing malfunction, repaired DTC will be read out again when a new malfunction occurs.)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Airbag System} and press the [YES] key.
- 3) On the «Airbag System» display screen, select the {Clear Memory} and press the [YES] key.
- 4) Press the [YES] key after the "Clear memory?" has been displayed.
- 5) When the "Done" is shown on the display screen, turn the Subaru Select Monitor switch to OFF.

**NOTE:**

For details concerning operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.



# Subaru Select Monitor

AIRBAG SYSTEM (DIAGNOSTICS)

## B: INSPECTION

### 1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

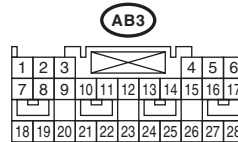
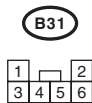
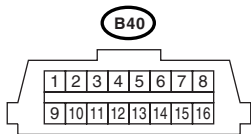
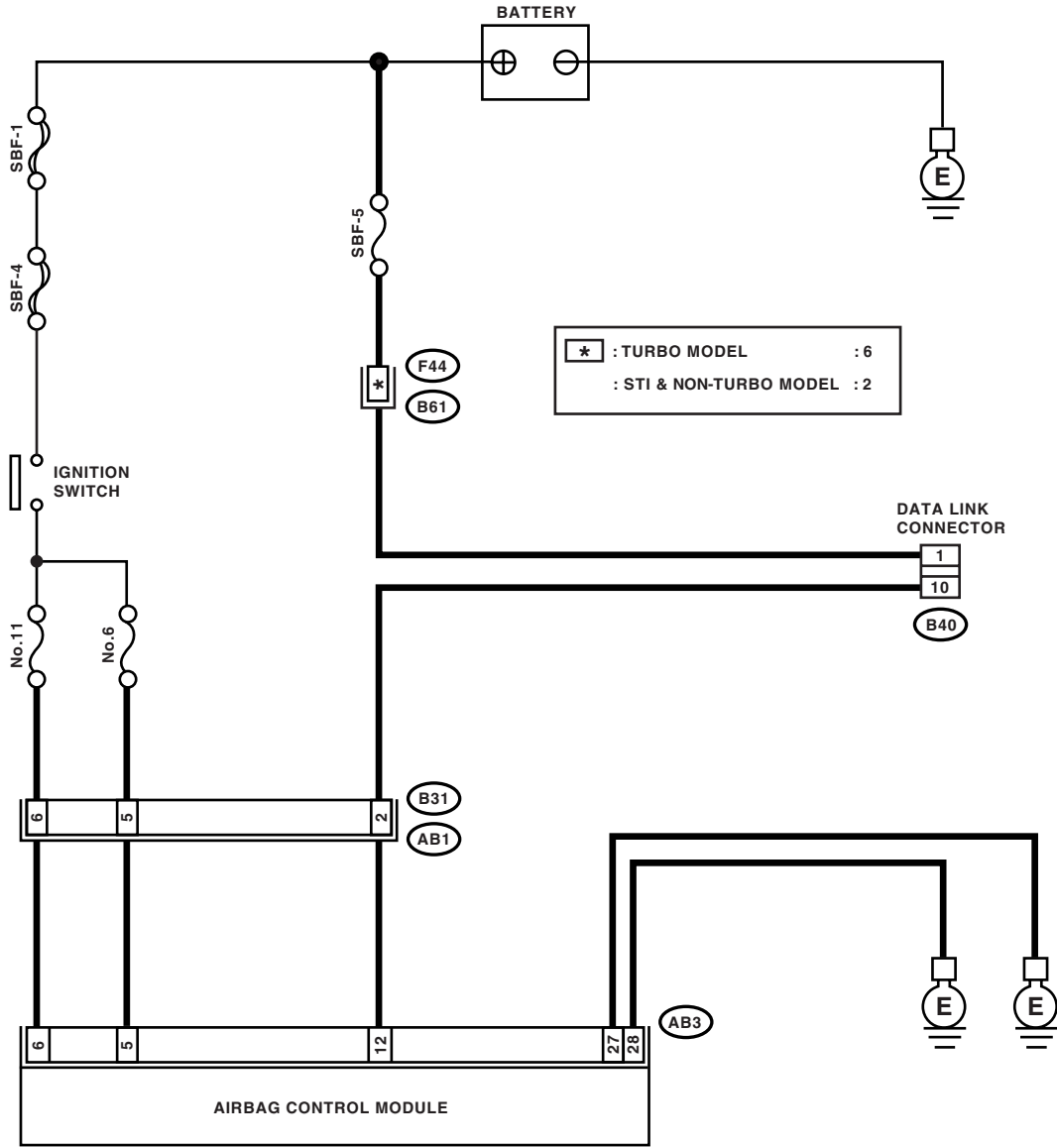
**DETECTING CONDITION:**

Defective harness connector

**TROUBLE SYMPTOM:**

Communication is impossible between airbag control module and Subaru Select Monitor.

**WIRING DIAGRAM:**



# Subaru Select Monitor

## AIRBAG SYSTEM (DIAGNOSTICS)

| Step | Check   | Yes   | No  |  |
|------|---|---|---|--|
| 1    | <b>CHECK IGNITION SWITCH.</b>   | Does the ignition switch turn to ON?                      | Go to step 2.   | Turn the ignition switch to ON, and select airbag mode using Subaru Select Monitor.  |
| 2    | <b>CHECK BATTERY.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the battery voltage.   | Is the voltage more than 11 V?                            | Go to step 3.   | Charge or replace the battery.   |
| 3    | <b>CHECK BATTERY TERMINAL.</b>  | Is there poor contact at battery terminal?                | Repair or tighten the battery terminal.                                       | Go to step 4.  |
| 4    | <b>CHECK SUBARU SELECT MONITOR COMMUNICATION.</b><br>1) Turn the ignition switch to ON.<br>2) Using Subaru Select Monitor, check whether communication to other system can be executed normally.  | Is the name of system displayed on Subaru Select Monitor? | Go to step 8.   | Go to step 5.  |
| 5    | <b>CHECK SUBARU SELECT MONITOR COMMUNICATION.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the airbag control module connector.<br>3) Turn the ignition switch to ON.<br>4) Check whether communication to other systems can be executed normally.   | Is the name of system displayed on Subaru Select Monitor? | Replace the airbag control module.<br><Ref. to AB-18, Airbag Control Module.> | Go to step 6.  |
| 6    | <b>CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the airbag control module, ABSCM&H/U, ECM and TCM.<br>3) Measure the resistance between data link connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B40) No. 10 — Chassis ground:</b> | Is the resistance more than 1 MΩ?                         | Go to step 7.   | Repair the harness and connector between each control module and data link connector. (Airbag harness must be replaced with harness. Do not attempt to repair it.) |
| 7    | <b>CHECK OUTPUT SIGNAL FOR AIRBAG CONTROL MODULE.</b><br>1) Turn the ignition switch to ON in step 7 condition.<br>2) Measure the voltage between data link connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B40) No. 10 (+) — Chassis ground (-):</b>   | Is the voltage less than 1 V?                             | Go to step 8.   | Repair the harness and connector between each control module and data link connector. (Airbag harness must be replaced with harness. Do not attempt to repair it.) |

# Subaru Select Monitor

## AIRBAG SYSTEM (DIAGNOSTICS)

| Step   | Check  | Yes   | No   |
|--|--|---|--|
| <b>8 CHECK HARNESS BETWEEN AIRBAG CONTROL MODULE AND DATA LINK CONNECTOR.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB3) from the airbag control module.<br>3) Connect the connector (1R) in test harness R to connector (AB3).<br>4) Measure the resistance between connector (4R) in test harness R and the data link connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(4R) No. 18 — (B40) No. 10:</b></i> | Is the resistance less than 10 $\Omega$ ?  | Go to step 9.   | Repair the harness between airbag control module and data link connector. Or, replace the airbag main harness with body harness. |
| <b>9 CHECK POWER SUPPLY CIRCUIT.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between connector (2R) in test harness R and the chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(2R) No. 1 (+) — Chassis ground (-):</b></i><br><i><b>(2R) No. 6 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10 V?   | Go to step 10.  | Repair the harness between airbag control module and battery. Or, replace the airbag main harness with body harness.             |
| <b>10 CHECK BETWEEN AIRBAG CONTROL MODULE AND CHASSIS GROUND.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between connector (2R) in test harness R and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(2R) No. 10 — Chassis ground:</b></i><br><i><b>(2R) No. 11 — Chassis ground:</b></i>   | Is the resistance less than 10 $\Omega$ ?  | Go to step 11.  | Repair the harness between airbag control module and chassis ground. Or, replace the airbag main harness with body harness.      |
| <b>11 CHECK POOR CONTACT IN CONNECTOR.</b>   | Is there poor contact in control module power supply, ground line and data link connector? | Repair the connector. (Airbag system connector must be replaced with harness. Do not attempt to repair it.) | Replace the airbag control module only. <Ref. to AB-18, REMOVAL, Airbag Control Module.>   |

## 2. WITHOUT DTC

### DETECTING CONDITION:

- Defective combination meter
- Open circuit of harness

### TROUBLE SYMPTOM:

- Airbag warning light does not go off.
- “NO TROUBLE CODE” displayed on the Subaru Select Monitor.

For detailed operation procedure, refer to «Airbag Warning Light Failure». <Ref. to AB(diag)-35, Airbag Warning Light Failure.>

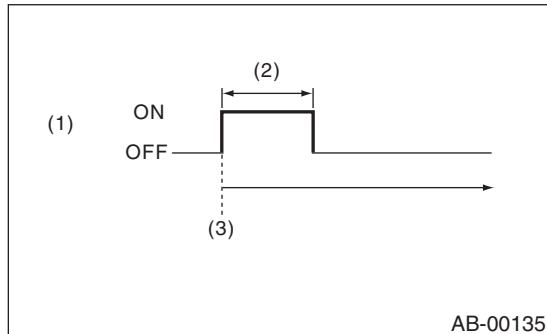
### NOTE:

- For detailed operation procedure, refer to «Airbag Warning Light Failure». <Ref. to AB(diag)-35, Airbag Warning Light Failure.>
- When the airbag warning light is OFF and “NO TROUBLE CODE” is displayed on Subaru Select Monitor, the system is in normal condition.

## 8. Airbag Warning Light Illumination Pattern

### A: INSPECTION

Keep the ignition switch to ON, and confirm that the airbag warning light remains off after being turned on for approx. 6 seconds.



- (1) Airbag warning light
- (2) Approx. 6 seconds
- (3) Ignition switch ON

## Read Diagnostic Trouble Code (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

---

### 9. Read Diagnostic Trouble Code (DTC)

#### A: OPERATION

For details about reading of DTCs, refer to “Subaru Select Monitor”. <Ref. to AB(diag)-26, Subaru Select Monitor.>

## 10. Inspection Mode

### A: PROCEDURE

Recreate the circumstance by referring to the conditions described in the checklist.

### 11. Clear Memory Mode

#### A: OPERATION

Clear the memory in the following steps after the malfunction is repaired.

Detail procedure for clearing DTCs, refer to “Subaru Select Monitor”. <Ref. to AB(diag)-26, Subaru Select Monitor.>

## 12. Airbag Warning Light Failure

### A: AIRBAG WARNING LIGHT REMAINS ON

#### DIAGNOSIS:

- Airbag warning light unit is faulty.
- Airbag control module to airbag warning light circuit is shorted or open.
- Grounding circuit is faulty.
- Airbag control module is faulty.
- (AB1) and (B31) are not connected properly.
- (AB3) is not connected properly to the airbag control module.

#### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

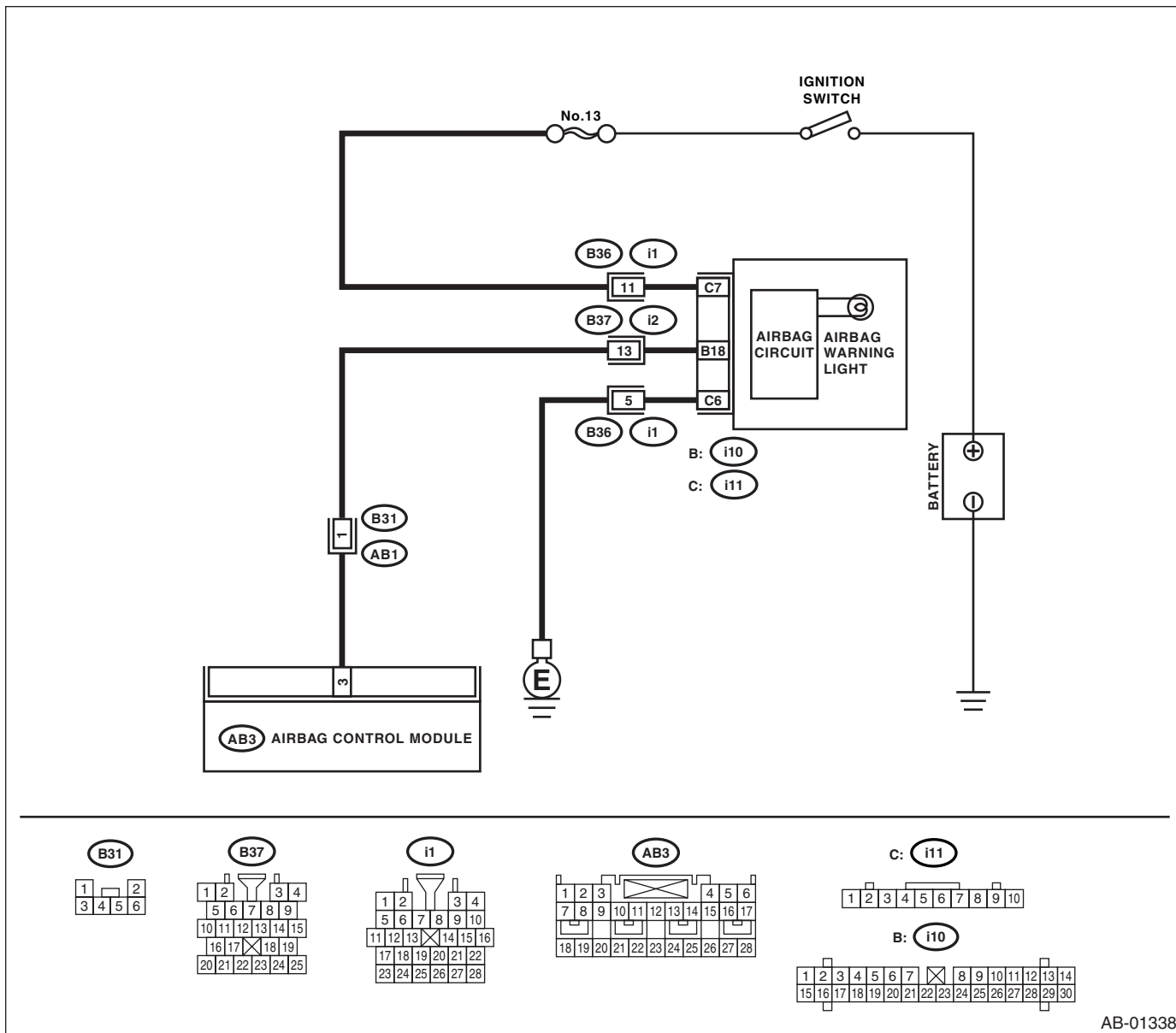


# Airbag Warning Light Failure

AIRBAG SYSTEM (DIAGNOSTICS)

## WIRING DIAGRAM:

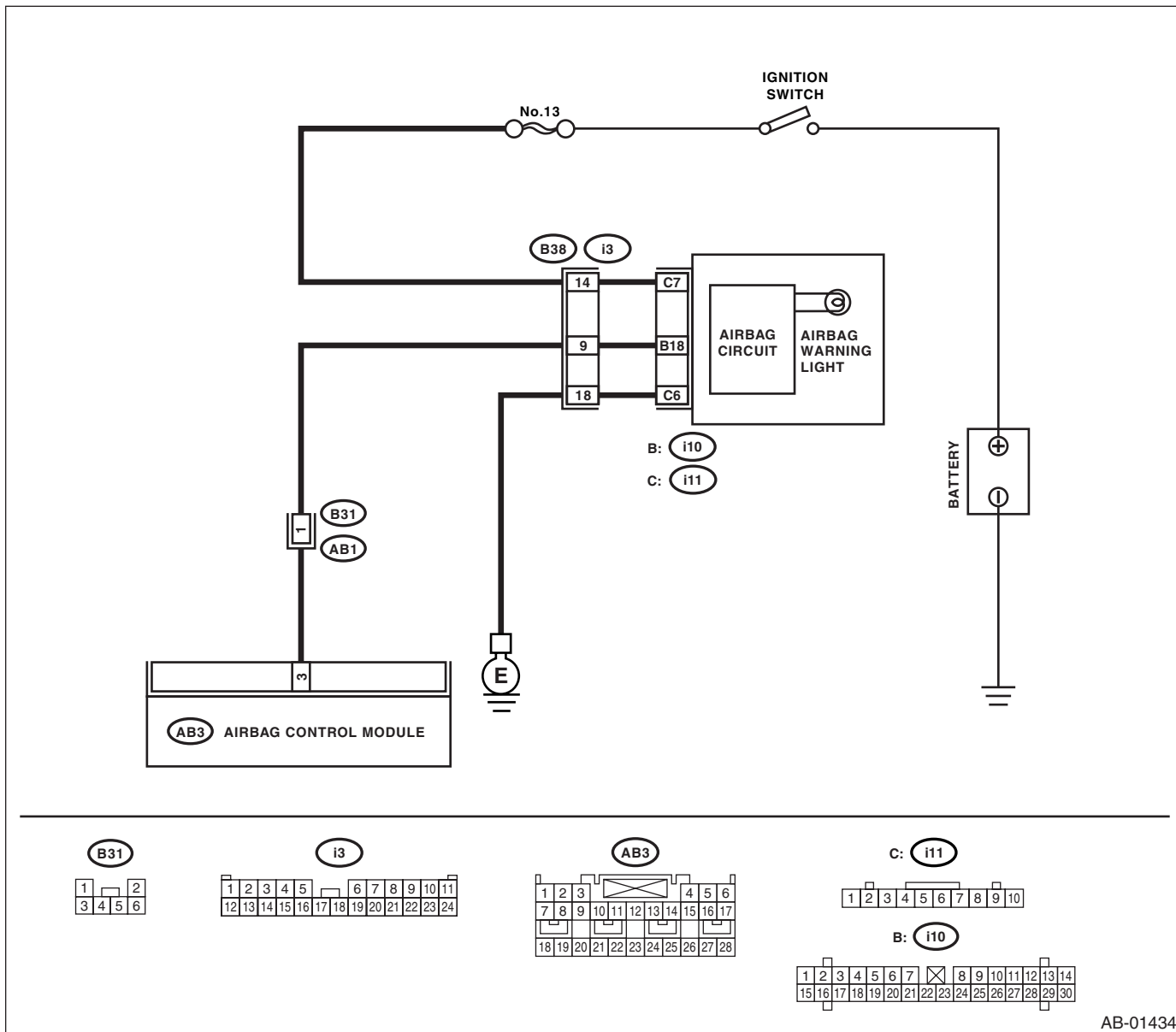
- Auto A/C model



AB-01338

# Airbag Warning Light Failure

- Manual A/C model



AB-01434

# Airbag Warning Light Failure

## AIRBAG SYSTEM (DIAGNOSTICS)

| Step  | Check  | Yes   | No                                 |
|---|--|---|------------------------------------|
| <b>1 READ DTC.</b><br>Read the DTC. <Ref. to AB(diag)-26, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>  | Is the DTC displayed?                              | Perform the diagnosis according to DTC.   | Go to step 2.                      |
| <b>2 CHECK POOR CONTACT.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Check that firm contact between the airbag control module and the connector (AB3) is secured.   | Is there poor contact in connector (AB3)?          | If the poor contact in connector is not corrected, replace the airbag main harness with body harness, or replace the airbag control module. <Ref. to AB-18, Airbag Control Module.> | Go to step 3.                      |
| <b>3 CHECK AIRBAG MAIN HARNESS.</b><br>1) Remove the instrument panel lower cover and disconnect the connectors (AB26) and (AB21).<br>2) Remove the console side cover lower on passenger side and disconnect the connectors (AB27) and (AB4).<br>3) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R.<br>4) Connect the battery ground cable, and turn the ignition switch to ON.<br>5) Connect the connectors (5R) and (6R) in test harness R.<br>NOTE:<br>After problem has been eliminated, disconnect the connectors (5R) and (6R). | Does the airbag warning light go off?              | Go to step 4.   | Go to step 5.                      |
| <b>4 CHECK GROUND CIRCUIT.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB3) from the airbag control module.<br>3) Connect the connector (1R) in test harness R to body harness connector (AB3).<br>4) Measure the resistance between connector (2R) in test harness R and the chassis ground.<br><i>Connector &amp; terminal</i><br><i>(2R) No. 10 — Chassis ground:</i><br><i>(2R) No. 11 — Chassis ground:</i>   | Is the resistance less than 10 $\Omega$ ?          | Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>  | Repair the chassis ground circuit. |
| <b>5 CHECK AIRBAG MAIN HARNESS.</b><br>1) Disconnect the connectors (5R) and (6R).<br>2) Remove the combination meter.<br>3) Measure the resistance between connector (i11) and (2R) in test harness R.<br><i>Connector &amp; terminal</i><br><i>(2R) No. 7 — (i11) No. 8:</i>  | Is the resistance less than 10 $\Omega$ ?          | Check the combination meter.  | Go to step 6.                      |
| <b>6 CHECK POOR CONTACT IN CONNECTORS (AB1) AND (B31).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Confirm that firm contact between connectors (AB1) and (B31) is secured.  | Is the poor contact in connectors (AB1) and (B31)? | Repair the body harness, or replace the airbag main harness with body harness.  | Go to step 7.                      |

# Airbag Warning Light Failure

AIRBAG SYSTEM (DIAGNOSTICS)

|   | Step   | Check  | Yes  | No                       |
|---|--|--|--|--------------------------|
| 7 | <b>CHECK AIRBAG MAIN HARNESS.</b><br>Check the airbag main harness for faults. | Is there any fault in the airbag main harness? | Replace the airbag main harness with body harness. | Repair the body harness. |

# Airbag Warning Light Failure

AIRBAG SYSTEM (DIAGNOSTICS)

## B: AIRBAG WARNING LIGHT REMAINS OFF

### DETECTING CONDITION:

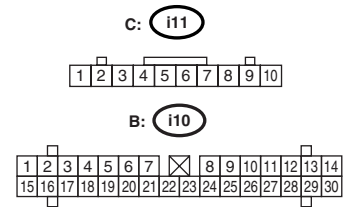
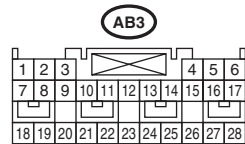
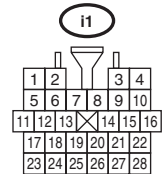
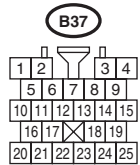
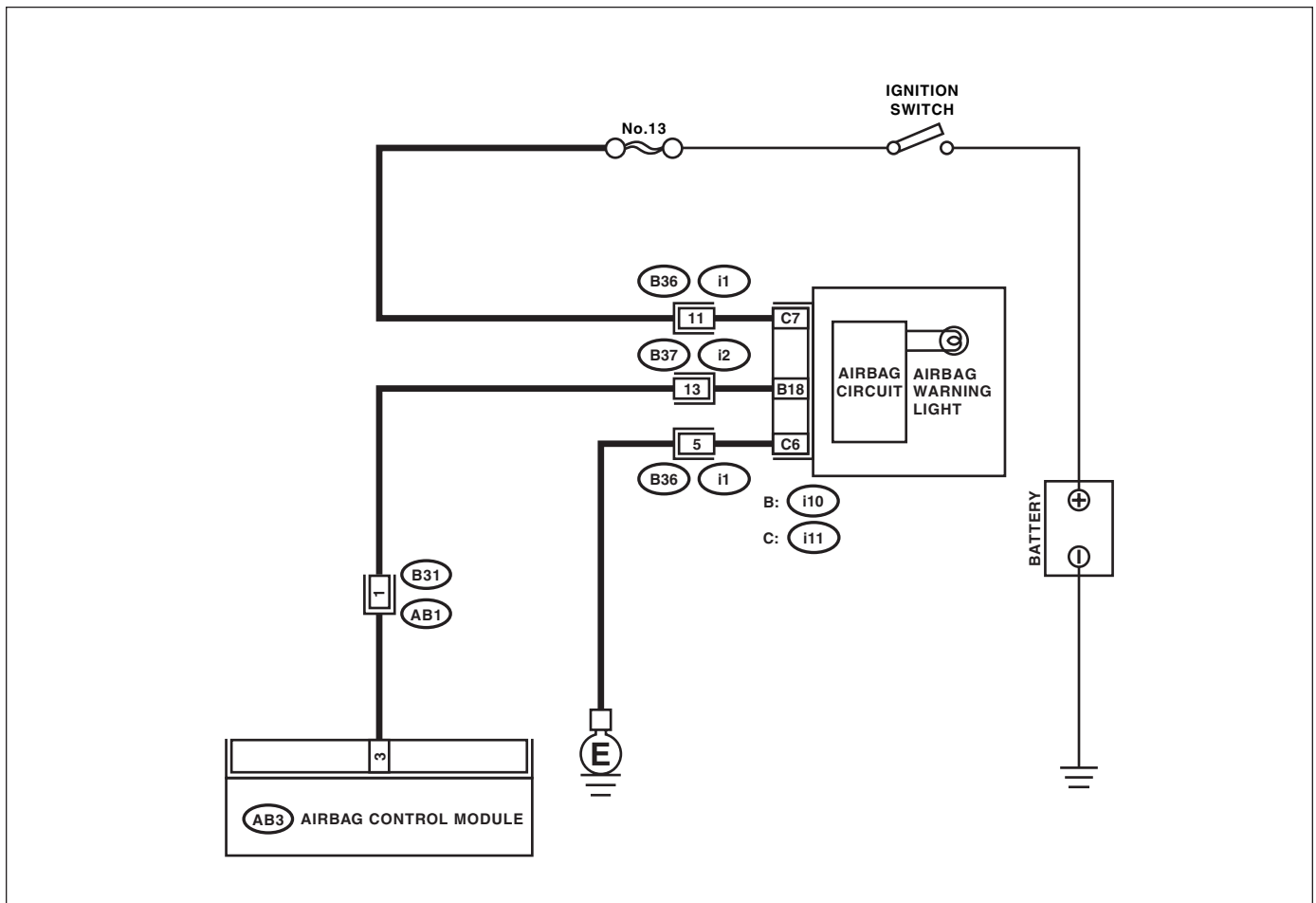
- Fuse No. 13 (in fuse box) is blown.
- Body harness circuit is open.
- Airbag warning light is faulty.
- Airbag main harness is faulty.
- Airbag control module is faulty.

### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

### WIRING DIAGRAM:

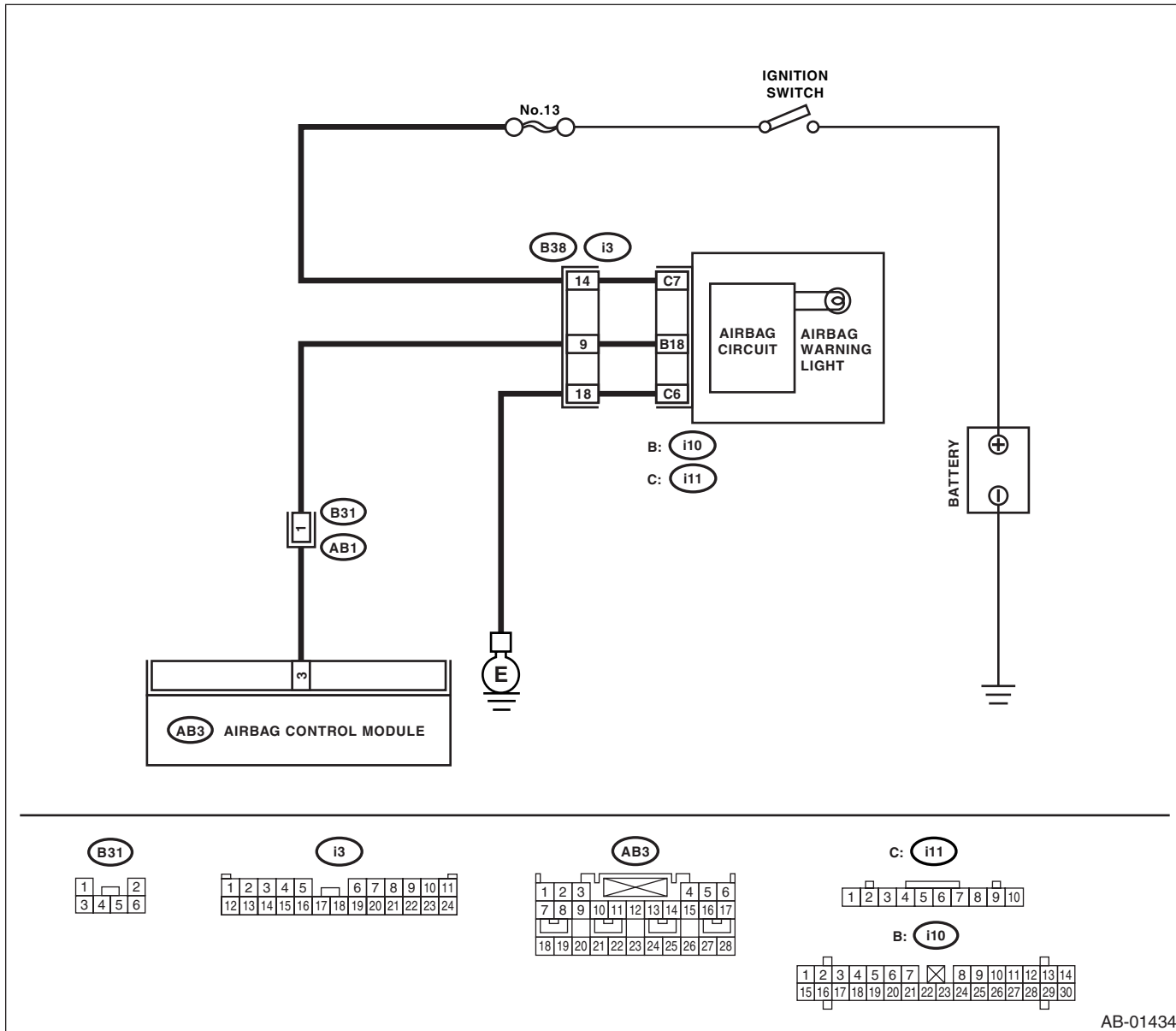
- Auto A/C model



AB-01338

# Airbag Warning Light Failure

- Manual A/C model



AB-01434

## Airbag Warning Light Failure

### AIRBAG SYSTEM (DIAGNOSTICS)

| Step  | Check  | Yes   | No   |
|---|--|---|--|
| <b>1 CHECK COMBINATION METER.</b><br>Turn the ignition switch to ON, and confirm that warning lights in the combination meter are turned on.  | Do the warning lights other than airbag turn on? | Go to step 2.   | Repair the power supply line to combination meter.<br><Ref. to IDI-3, Combination Meter System.> |
| <b>2 CHECK DTC.</b><br>Read the DTC. <Ref. to AB(diag)-26, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>   | Is the DTC displayed?                            | Perform the diagnosis according to DTC.                                       | Go to step 3.  |
| <b>3 CHECK FUSE No. 13 (IN MAIN FUSE BOX).</b><br>Remove the fuse No. 13 and perform visual inspection.   | Is the fuse No. 13 (in main fuse box) blown out? | Replace the fuse No. 13. If fuse No. 13 is blown out again, go to step 3.     | Go to step 4.  |
| <b>4 CHECK AIRBAG WARNING LIGHT CIRCUIT (IN COMBINATION METER).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB1) from (B31).<br>3) Connect the battery ground cable, and turn the ignition switch to ON.   | Is the airbag warning light turned on?           | Go to step 5.   | Replace the combination meter printed circuit.<br><Ref. to IDI-10, Combination Meter.>           |
| <b>5 CHECK AIRBAG MAIN HARNESS.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Connect the connector (AB1) to (B31).<br>3) Disconnect the connector (AB3) from airbag control module. <Ref. to AB-18, Airbag Control Module.><br>4) Connect the battery ground cable, and turn the ignition switch to ON. | Is the airbag warning light turned on?           | Replace the airbag control module.<br><Ref. to AB-18, Airbag Control Module.> | Replace the airbag main harness with body harness.   |

# List of Diagnostic Trouble Code (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

## 13. List of Diagnostic Trouble Code (DTC)

### A: LIST

| DTC | Display                              | Contents of diagnosis   | Reference   |
|-----|--------------------------------------|---|---|
| 11  | Driver's Airbag failure              | <ul style="list-style-type: none"> <li>• Airbag main harness circuit is open, shorted or shorted to ground.</li> <li>• Airbag module harness (Driver) circuit is open, shorted or shorted to ground.</li> <li>• Roll connector circuit is open, shorted or shorted to ground.</li> <li>• Airbag control module is faulty.</li> <li>• Driver's airbag module is faulty.</li> </ul> | <Ref. to AB(diag)-47, DTC 11 DRIVER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>              |
| 12  | Passenger's Airbag failure           | <ul style="list-style-type: none"> <li>• Airbag main harness circuit is open, shorted or shorted to ground.</li> <li>• Airbag module harness (Passenger) circuit is open, shorted or shorted to ground.</li> <li>• Airbag control module is faulty.</li> <li>• Passenger's airbag module is faulty.</li> </ul>  | <Ref. to AB(diag)-51, DTC 12 PASSENGER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>           |
| 15  | Driver's Airbag failure              | <ul style="list-style-type: none"> <li>• Airbag main harness circuit (Driver) is shorted to the power supply.</li> <li>• Airbag module harness (Driver) is shorted to the power supply.</li> <li>• Roll connector is shorted to the power supply.</li> <li>• Airbag control module is faulty.</li> <li>• Driver's airbag module is faulty.</li> </ul>                             | <Ref. to AB(diag)-54, DTC 15 DRIVER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>              |
| 16  | Passenger's Airbag failure           | <ul style="list-style-type: none"> <li>• Airbag main harness circuit (Passenger) is shorted to the power supply.</li> <li>• Airbag module harness (Passenger) is shorted to the power supply.</li> <li>• Airbag control module is faulty.</li> <li>• Passenger's airbag module is faulty.</li> </ul>  | <Ref. to AB(diag)-57, DTC 16 PASSENGER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>           |
| 21  | Airbag ECU failure                   | Airbag control module is faulty.  | <Ref. to AB(diag)-59, DTC 21 AIRBAG ECU FAILURE, Diagnostic Chart with Trouble Code.>                   |
| 22  | Front Airbag: Firing output          | Front airbag module and seat belt pretensioner (LH/RH) are inflated.  | <Ref. to AB(diag)-60, DTC 22 FRONT AIRBAG FIRING OUTPUT, Diagnostic Chart with Trouble Code.>           |
| 23  | Connector to Airbag ECU failure      | (AB3), (AB7) and (AB8) are not connected properly to airbag control module.   | <Ref. to AB(diag)-61, DTC 23 CONNECTOR TO AIRBAG ECU, Diagnostic Chart with Trouble Code.>              |
| 24  | IG1 open                             | <ul style="list-style-type: none"> <li>• Airbag control module is faulty.</li> <li>• Airbag harness circuit is open.</li> <li>• Fuse No. 11 (in joint box) is blown.</li> <li>• Body harness circuit is open.</li> </ul>  | <Ref. to AB(diag)-62, DTC 24 IG1 OPEN, Diagnostic Chart with Trouble Code.>                             |
| 25  | IG2 open                             | <ul style="list-style-type: none"> <li>• Airbag control module is faulty.</li> <li>• Airbag main harness circuit is open.</li> <li>• Fuse No. 6 (in joint box) is blown.</li> <li>• Body harness circuit is open.</li> </ul>  | <Ref. to AB(diag)-64, DTC 25 IG2 OPEN, Diagnostic Chart with Trouble Code.>                             |
| 26  | Passenger's Airbag indicator failure | <ul style="list-style-type: none"> <li>• Passenger's airbag indicator is faulty.</li> <li>• Airbag control module is faulty.</li> <li>• Airbag main harness circuit is open, shorted or shorted to ground.</li> <li>• Open circuit of body harness.</li> </ul>  | <Ref. to AB(diag)-66, DTC 26 PASSENGER'S AIRBAG INDICATOR FAILURE, Diagnostic Chart with Trouble Code.> |



## List of Diagnostic Trouble Code (DTC)

### AIRBAG SYSTEM (DIAGNOSTICS)

| DTC | Display                     | Contents of diagnosis  | Reference  |
|-----|-----------------------------|--|--|
| 27  | ODS Communication Error     | <ul style="list-style-type: none"> <li>• Communication error with occupant detection control module.</li> <li>• Airbag rear harness circuit is open, shorted or shorted to ground and power supply.</li> <li>• Occupant detection harness (seat harness) is faulty.</li> <li>• Occupant detection system is faulty.</li> <li>• Airbag control module is faulty.</li> </ul> | <Ref. to AB(diag)-69, DTC 27 ODS COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>   |
| 29  | ODS Failure                 | <ul style="list-style-type: none"> <li>• Load cell sensor is faulty.</li> <li>• Occupant detection control module is faulty.</li> <li>• Occupant detection harness is faulty.</li> <li>• Fuse No. 6 (in joint box) is blown.</li> </ul>  | For details concerning DTC 29, refer to "Occupant Detection System". <Ref. to OD(diag)-30, DTC 29 ODS FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>               |
| 2A  | ODS Calibration Error       | The system calibration (Rezeroing) for occupant detection system is not completed successfully.  | For details concerning DTC 2A, refer to "Occupant Detection System". <Ref. to OD(diag)-27, DTC 2A ODS CALIBRATION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>     |
| 2B  | ODS System Wrong Parts      | <ul style="list-style-type: none"> <li>• Airbag control module is wrong parts.</li> <li>• Occupant detection system is wrong parts.</li> <li>• Occupant detection system is faulty.</li> </ul>   | For details concerning DTC 2B, refer to "Occupant Detection System". <Ref. to OD(diag)-27, DTC 2B ODS SYSTEM WRONG PARTS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>    |
| 2C  | Belt Tension Sensor Failure | <ul style="list-style-type: none"> <li>• Passenger's belt tension sensor malfunction</li> <li>• Occupant detection system is faulty.</li> <li>• Side airbag rear harness circuit is open or shorted.</li> <li>• Occupant detection harness is faulty.</li> </ul>   | For details concerning DTC 2C, refer to "Occupant Detection System". <Ref. to OD(diag)-28, DTC 2C BELT PRETENSIONER FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 31  | Front Sub Sensor RH failure | <ul style="list-style-type: none"> <li>• Airbag main harness is open, shorted or shorted to power supply.</li> <li>• Front sub sensor (RH) is faulty.</li> <li>• Airbag control module is faulty.</li> </ul>   | <Ref. to AB(diag)-72, DTC 31 FRONT SUB SENSOR RH FAILURE, Diagnostic Chart with Trouble Code.>   |
| 32  | Front Sub Sensor LH failure | <ul style="list-style-type: none"> <li>• Airbag main harness is open, shorted or shorted to power supply.</li> <li>• Front sub-sensor (LH) is faulty.</li> <li>• Airbag control module is faulty.</li> </ul>   | <Ref. to AB(diag)-74, DTC 32 FRONT SUB SENSOR LH FAILURE, Diagnostic Chart with Trouble Code.>   |
| 33  | Front Sub Sensor RH failure | Front sub sensor (RH) is faulty.   | <Ref. to AB(diag)-76, DTC 33 FRONT SUB SENSOR RH FAILURE, Diagnostic Chart with Trouble Code.>   |
| 34  | Front Sub Sensor LH failure | Front sub sensor (RH) is faulty.   | <Ref. to AB(diag)-76, DTC 34 FRONT SUB SENSOR LH FAILURE, Diagnostic Chart with Trouble Code.>   |

# List of Diagnostic Trouble Code (DTC)

## AIRBAG SYSTEM (DIAGNOSTICS)

| DTC | Display                            | Contents of diagnosis  | Reference   |
|-----|------------------------------------|--|---|
| 36  | Seat Position sensor LH failure    | <ul style="list-style-type: none"> <li>• Driver's seat position sensor is faulty.</li> <li>• Airbag control module is faulty.</li> <li>• Side airbag rear harness circuit is open, shorted or shorted to ground.</li> </ul>                              | <Ref. to AB(diag)-77, DTC 36 SEAT POSITION SENSOR LH FAILURE, Diagnostic Chart with Trouble Code.>  |
| 37  | Buckle Switch RH failure           | <ul style="list-style-type: none"> <li>• Passenger's buckle switch circuit is open, shorted or shorted to ground.</li> <li>• Occupant detection system is faulty.</li> <li>• Occupant detection harness is faulty.</li> </ul>                            | For details concerning DTC 37, refer to "Occupant Detection System". <Ref. to OD(diag)-31, DTC 37 BUCKLE SWITCH RH FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 38  | Buckle Switch LH failure           | <ul style="list-style-type: none"> <li>• Driver's buckle switch circuit is open, shorted or shorted to ground.</li> <li>• Side airbag rear harness circuit is open, shorted or shorted to ground.</li> <li>• Airbag control module is faulty.</li> </ul> | <Ref. to AB(diag)-79, DTC 38 BUCKLE SWITCH LH FAILURE, Diagnostic Chart with Trouble Code.>   |
| 41  | Side Airbag RH failure             | <ul style="list-style-type: none"> <li>• Side airbag harness is faulty.</li> <li>• Side airbag module (RH) is faulty.</li> <li>• Airbag control module is faulty.</li> </ul>   | <Ref. to AB(diag)-81, DTC 41 SIDE AIRBAG RH FAILURE, Diagnostic Chart with Trouble Code.>   |
| 42  | Side Airbag LH failure             | <ul style="list-style-type: none"> <li>• Side airbag harness is faulty.</li> <li>• Side airbag module (LH) is faulty.</li> <li>• Airbag control module is faulty.</li> </ul>   | <Ref. to AB(diag)-83, DTC 42 SIDE AIRBAG LH FAILURE, Diagnostic Chart with Trouble Code.>   |
| 45  | Side Airbag RH failure             | <ul style="list-style-type: none"> <li>• Side airbag harness is shorted to power supply.</li> <li>• Side airbag module (RH) is faulty.</li> <li>• Airbag control module is faulty.</li> </ul>  | <Ref. to AB(diag)-85, DTC 45 SIDE AIRBAG RH FAILURE, Diagnostic Chart with Trouble Code.>   |
| 46  | Side Airbag LH failure             | <ul style="list-style-type: none"> <li>• Side airbag harness is shorted to power supply.</li> <li>• Side airbag module (LH) is faulty.</li> <li>• Airbag control module is faulty.</li> </ul>  | <Ref. to AB(diag)-87, DTC 46 SIDE AIRBAG LH FAILURE, Diagnostic Chart with Trouble Code.>   |
| 51  | Side Airbag Sensor RH failure      | <ul style="list-style-type: none"> <li>• Side airbag sensor (RH) is faulty.</li> <li>• Side airbag harness is faulty.</li> <li>• Airbag control module is faulty.</li> </ul>   | <Ref. to AB(diag)-89, DTC 51 SIDE AIRBAG RH FAILURE, Diagnostic Chart with Trouble Code.>   |
| 52  | Side Airbag Sensor LH failure      | <ul style="list-style-type: none"> <li>• Side airbag sensor (LH) is faulty.</li> <li>• Side airbag harness is faulty.</li> <li>• Airbag control module is faulty.</li> </ul>   | <Ref. to AB(diag)-92, DTC 52 SIDE AIRBAG SENSOR LH FAILURE, Diagnostic Chart with Trouble Code.>  |
| 53  | Side Airbag Sensor RH failure      | Side airbag sensor (RH) is faulty.   | <Ref. to AB(diag)-94, DTC 53 SIDE AIRBAG RH FAILURE, Diagnostic Chart with Trouble Code.>   |
| 54  | Side Airbag Sensor LH failure      | Side airbag sensor (LH) is faulty.   | <Ref. to AB(diag)-94, DTC 54 SIDE AIRBAG SENSOR LH FAILURE, Diagnostic Chart with Trouble Code.>  |
| 55  | Side/Curtain Airbag: Firing output | Side airbag module is operated.  | <Ref. to AB(diag)-94, DTC 55 SIDE CURTAIN AIRBAG FIRING OUTPUT, Diagnostic Chart with Trouble Code.>  |

## List of Diagnostic Trouble Code (DTC)

### AIRBAG SYSTEM (DIAGNOSTICS)

| DTC | Display                      | Contents of diagnosis   | Reference  |
|-----|------------------------------|---|--|
| 61  | Belt Pretensioner RH failure | <ul style="list-style-type: none"> <li>• Seat belt pretensioner (RH) circuit is open, shorted or shorted to ground.</li> <li>• Airbag control module is faulty.</li> <li>• Pretensioner is faulty.</li> <li>• Airbag harness is faulty.</li> </ul>  | <Ref. to AB(diag)-95, DTC 61 BELT PRETENSIONER RH FAILURE, Diagnostic Chart with Trouble Code.>  |
| 62  | Belt Pretensioner LH failure | <ul style="list-style-type: none"> <li>• Seat belt pretensioner (LH) circuit is open, shorted or shorted to ground.</li> <li>• Airbag control module is faulty.</li> <li>• Pretensioner is faulty.</li> <li>• Airbag harness is faulty.</li> </ul>  | <Ref. to AB(diag)-97, DTC 62 BELT PRETENSIONER LH FAILURE, Diagnostic Chart with Trouble Code.>  |
| 65  | Belt Pretensioner RH failure | <ul style="list-style-type: none"> <li>• Seat belt pretensioner (RH) circuit is shorted to the power supply.</li> <li>• Pretensioner is faulty.</li> <li>• Airbag harness is faulty.</li> <li>• Airbag control module is faulty.</li> </ul>   | <Ref. to AB(diag)-99, DTC 65 BELT PRETENSIONER RH FAILURE, Diagnostic Chart with Trouble Code.>  |
| 66  | Belt Pretensioner LH failure | <ul style="list-style-type: none"> <li>• Seat belt pretensioner (LH) circuit is shorted to the power supply.</li> <li>• Pretensioner is faulty.</li> <li>• Airbag harness is faulty.</li> <li>• Airbag control module is faulty.</li> </ul>   | <Ref. to AB(diag)-101, DTC 66 BELT PRETENSIONER LH FAILURE, Diagnostic Chart with Trouble Code.> |
| 71  | Driver's Airbag failure      | <ul style="list-style-type: none"> <li>• Airbag main harness circuit is open, shorted or shorted to ground.</li> <li>• Airbag module harness (Driver) circuit is open, shorted or shorted to ground.</li> <li>• Roll connector circuit is open, shorted or shorted to ground.</li> <li>• Airbag control module is faulty.</li> <li>• Driver's airbag module is faulty.</li> </ul> | <Ref. to AB(diag)-103, DTC 71 DRIVER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>      |
| 72  | Passenger's Airbag failure   | <ul style="list-style-type: none"> <li>• Airbag main harness is open, shorted or shorted to ground.</li> <li>• Airbag module harness (Passenger) is open, shorted or shorted to ground.</li> <li>• Airbag control module is faulty.</li> <li>• Passenger's airbag module is faulty.</li> </ul>  | <Ref. to AB(diag)-106, DTC 72 PASSENGER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>   |
| 75  | Driver's Airbag failure      | <ul style="list-style-type: none"> <li>• Airbag main harness circuit (Driver) is shorted to the power supply.</li> <li>• Airbag module harness (Driver) is shorted to the power supply.</li> <li>• Roll connector is shorted to the power supply.</li> <li>• Airbag control module is faulty.</li> <li>• Driver's airbag module is faulty.</li> </ul>                             | <Ref. to AB(diag)-109, DTC 75 DRIVER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>      |
| 76  | Passenger's Airbag failure   | <ul style="list-style-type: none"> <li>• Airbag main harness (Passenger) is shorted to power supply.</li> <li>• Airbag module harness (Passenger) is shorted to power supply.</li> <li>• Airbag control module is faulty.</li> <li>• Passenger's airbag module is faulty.</li> </ul>  | <Ref. to AB(diag)-112, DTC 76 PASSENGER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>   |

## 14. Diagnostic Chart with Trouble Code

### A: DTC 11 DRIVER'S AIRBAG FAILURE

#### DTC DETECTING CONDITION:

- Airbag main harness circuit is open, shorted or shorted to ground.
- Airbag module harness (Driver) circuit is open, shorted or shorted to ground.
- Roll connector circuit is open, shorted or shorted to ground.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

#### CAUTION:

- **Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.**
- **Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.**
- **When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.**

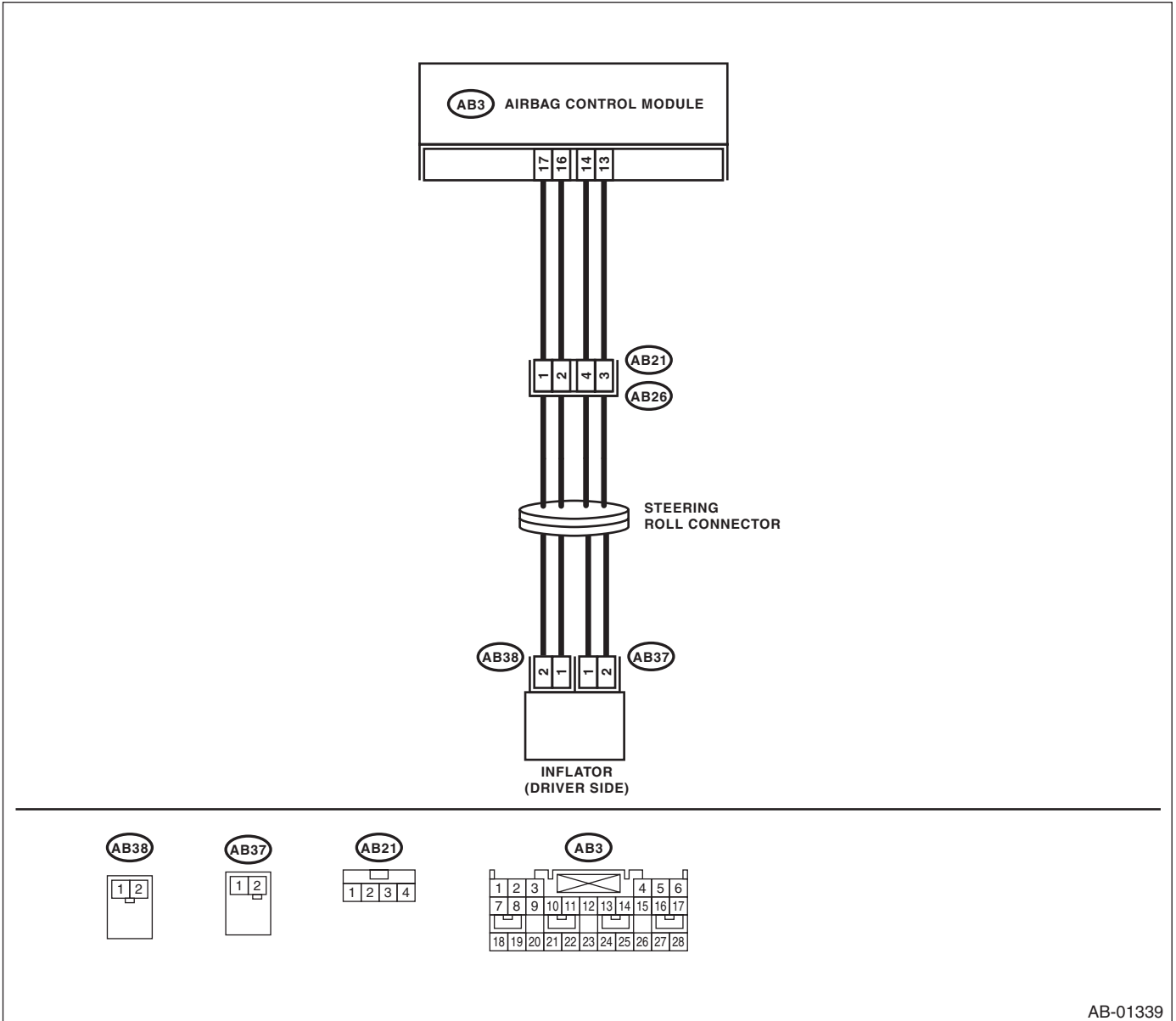
#### NOTE:

Prior to diagnosis, prepare two airbag resistors (98299PA040).

# Diagnostic Chart with Trouble Code

## AIRBAG SYSTEM (DIAGNOSTICS)

### WIRING DIAGRAM:



AB-01339

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

| Step   | Check   | Yes  | No   |
|--|---|--|--|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module and driver's airbag module for poor contact.   | Is there poor contact?  | Replace the airbag main harness.   | Go to step 2.                                      |
| <b>2 CHECK DRIVER'S AIRBAG MODULE.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Remove the driver's airbag module.<br>3) Connect the connector (1N) in test harness N to (AB38).<br>4) Connect the airbag resistor to the connector (2N) in test harness N.<br>5) Connect the connector (1Q) in test harness Q to connector (AB37).<br>6) Connect the airbag resistor to connector (2Q) in test harness Q.<br>7) Connect the battery ground cable, and turn the ignition switch to ON.   | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the driver's airbag module. <Ref. to AB-14, Driver's Airbag Module.> | Go to step 3.                                      |
| <b>3 CHECK ROLL CONNECTOR.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the test harness N from the connector (AB38).<br>3) Disconnect the test harness Q from the connector (AB37).<br>4) Remove the instrument panel lower cover and disconnect the connector (AB26) from (AB21).<br>5) Connect the connector (1P) in test harness P to connector (AB21).<br>6) Connect the airbag resistor to connectors (2P) and (3P) in test harness P.<br>7) Connect the battery ground cable, and turn the ignition switch to ON.  | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the roll connector. <Ref. to AB-20, Roll Connector.>                 | Go to step 4.                                      |
| <b>4 CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the airbag resistor from connectors (2P) and (3P) in test harness P.<br>3) Remove the instrument panel side cover on passenger side, and disconnect the connectors (AB4) and (AB27) from passenger's airbag module.<br>4) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R.<br>5) Measure the resistance between connector (2R) in test harness R and connectors (2P) and (3P) in test harness P.<br><b>Connector &amp; terminal</b><br>(2R) No. 2 — (2P) No. 1:<br>(2R) No. 4 — (2P) No. 2:<br>(2R) No. 8 — (3P) No. 3:<br>(2R) No. 12 — (3P) No. 4: | Is the resistance more than 10 $\Omega$ ?                           | Go to step 5.  | Replace the airbag main harness with body harness. |

## Diagnostic Chart with Trouble Code

### AIRBAG SYSTEM (DIAGNOSTICS)

| Step  | Check                             | Yes  | No   |
|---|-----------------------------------|--|--|
| <b>5 CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS).</b><br>Measure the resistance of the connector (2R) terminals in test harness R.<br><b>Connector &amp; terminal</b><br><i>(2R) No. 2 — (2R) No. 4:</i><br><i>(2R) No. 4 — Chassis ground:</i><br><i>(2R) No. 2 — Chassis ground:</i><br><i>(2R) No. 8 — (2R) No. 12:</i><br><i>(2R) No. 8 — Chassis ground:</i><br><i>(2R) No. 12 — Chassis ground:</i><br><i>(2R) No. 2 — (2R) No. 8:</i><br><i>(2R) No. 2 — (2R) No. 12:</i><br><i>(2R) No. 4 — (2R) No. 8:</i><br><i>(2R) No. 4 — (2R) No. 12:</i> | Is the resistance more than 1 MΩ? | Go to step 6.  | Replace the airbag main harness with body harness. |
| <b>6 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.  | Is the same DTC displayed?        | Replace the airbag control module.<br><Ref. to AB-18, Airbag Control Module.>  | Go to step 7.                                      |
| <b>7 CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?       | Using the List of Diagnostic Trouble Code (DTC), check the DTC.<br><Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> | Finish the diagnosis.                              |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## B: DTC 12 PASSENGER'S AIRBAG FAILURE

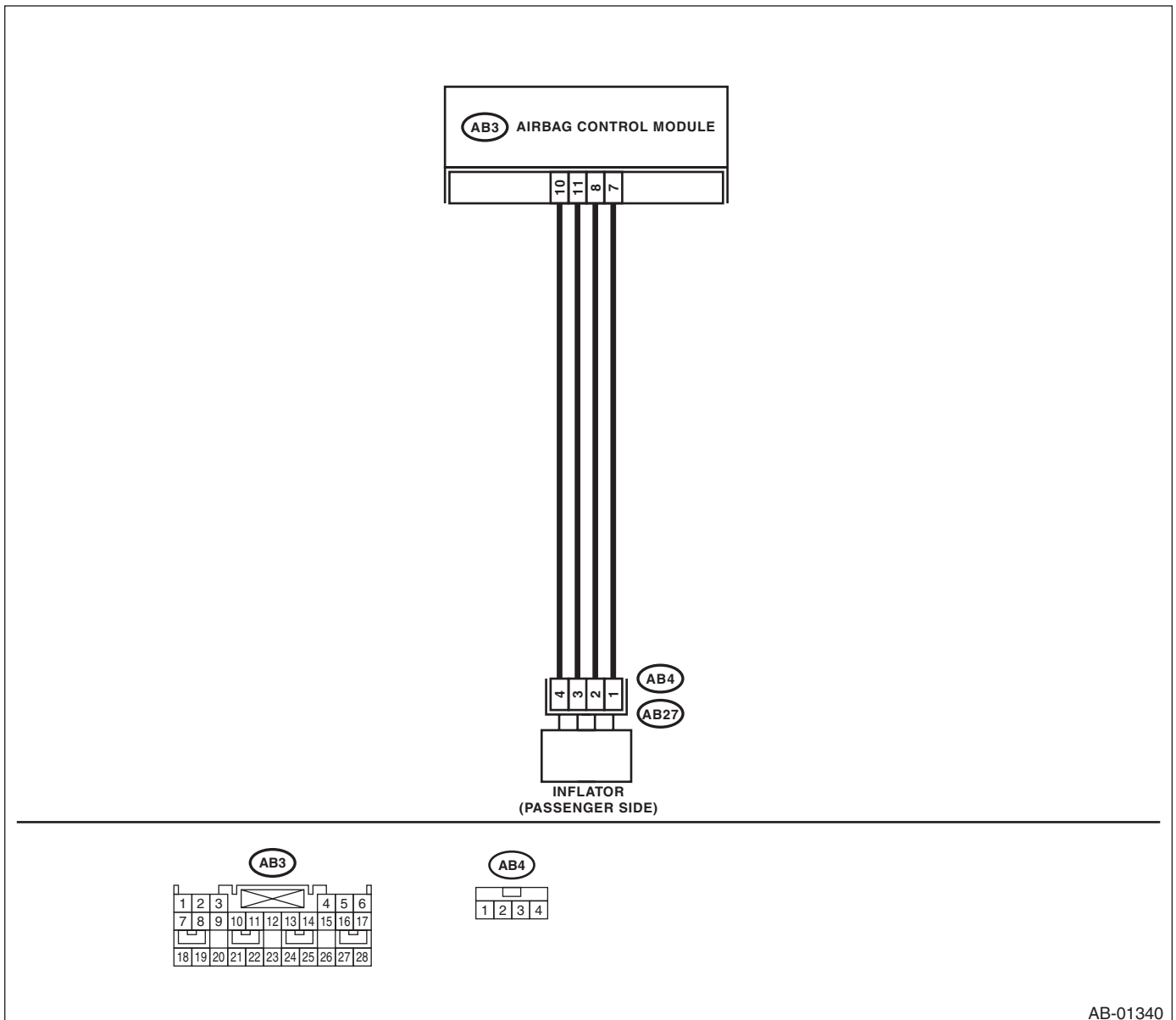
### DTC DETECTING CONDITION:

- Airbag main harness circuit is open, shorted or shorted to ground.
- Airbag module harness (Passenger) circuit is open, shorted or shorted to ground.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

### WIRING DIAGRAM:



AB-01340



## Diagnostic Chart with Trouble Code

### AIRBAG SYSTEM (DIAGNOSTICS)

| Step   | Check  | Yes  | No   |
|--|--|--|--|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module and passenger's airbag module for poor contact.  | Is there poor contact?   | Replace the airbag main harness.   | Go to step 2.                                      |
| <b>2 CHECK PASSENGER'S AIRBAG MODULE.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Remove the instrument panel side cover of passenger's side.<br>3) Disconnect the connector (AB27) from (AB4).<br>4) Connect the connector (1P) in test harness P to connector (AB4).<br>5) Connect the airbag resistor to connectors (2P) and (3P) in test harness P.<br>6) Connect the battery ground cable, and turn the ignition switch to ON.   | Does the airbag warning light illuminates for 6 seconds then go off? | Replace the passenger's airbag module. <Ref. to AB-15, Passenger's Airbag Module.> | Go to step 3.                                      |
| <b>3 CHECK AIRBAG MAIN HARNESS (PASSENGER'S AIRBAG HARNESS).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the airbag resistor from connectors (2P) and (3P) in test harness P.<br>3) Remove the instrument panel lower cover, and disconnect the connector (AB26) from (AB21).<br>4) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R.<br>5) Measure the resistance between connector (2R) in test harness R and connectors (2P) and (3P) in test harness P.<br><b>Connector &amp; terminal</b><br>(2R) No. 3 — (2P) No. 2:<br>(2R) No. 5 — (2P) No. 1:<br>(2R) No. 9 — (3P) No. 3:<br>(2R) No. 13 — (3P) No. 4: | Is the resistance less than 10 $\Omega$ ?                            | Go to step 4.  | Replace the airbag main harness with body harness. |
| <b>4 CHECK AIRBAG MAIN HARNESS (PASSENGER'S AIRBAG HARNESS).</b><br>Measure the resistance between connector (2R) terminals in test harness R, and between connector (2R) and chassis ground.<br><b>Connector &amp; terminal</b><br>(2R) No. 3 — (2R) No. 5:<br>(2R) No. 3 — Chassis ground:<br>(2R) No. 5 — Chassis ground:<br>(2R) No. 9 — (2R) No. 13:<br>(2R) No. 9 — Chassis ground:<br>(2R) No. 13 — Chassis ground:<br>(2R) No. 3 — (2R) No. 9:<br>(2R) No. 3 — (2R) No. 13:<br>(2R) No. 5 — (2R) No. 9:<br>(2R) No. 5 — (2R) No. 13:   | Is the resistance more than 1 M $\Omega$ ?                           | Go to step 5.  | Replace the airbag main harness with body harness. |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

| Step   | Check                       | Yes  | No                    |
|--|-----------------------------|--|-----------------------|
| <b>5</b><br><b>CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC. | Is the same DTC displayed?  | Replace the airbag control module.<br><Ref. to AB-18, Airbag Control Module.>  | Go to step <b>6</b> . |
| <b>6</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed? | Using the List of Diagnostic Trouble Code (DTC), check the DTC.<br><Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> | Finish the diagnosis. |

# Diagnostic Chart with Trouble Code

## AIRBAG SYSTEM (DIAGNOSTICS)

### C: DTC 15 DRIVER'S AIRBAG FAILURE

#### DTC DETECTING CONDITION:

- Airbag main harness circuit (Driver) is shorted to the power supply.
- Airbag module harness (Driver) is shorted to the power supply.
- Roll connector is shorted to the power supply.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

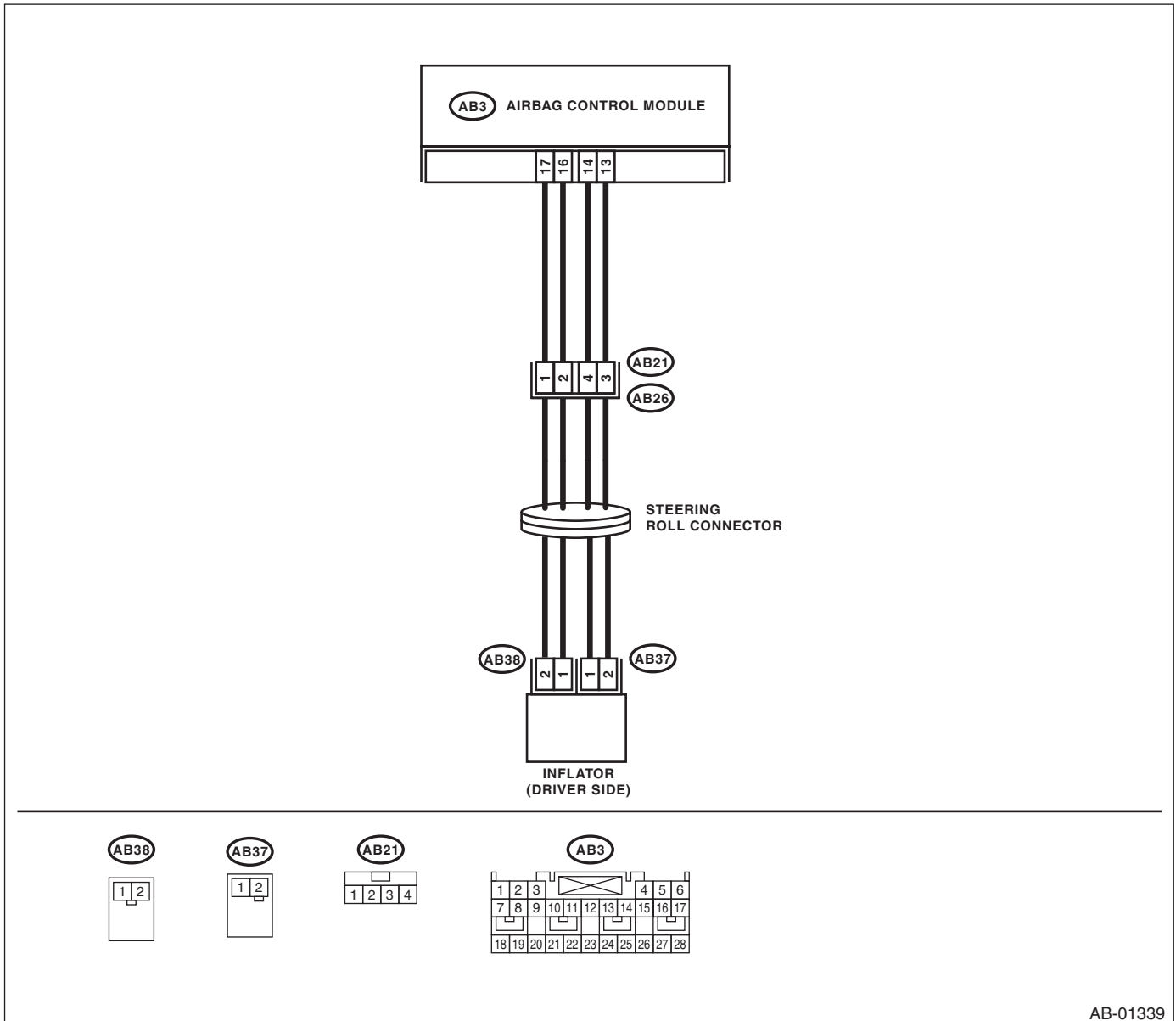
#### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

#### NOTE:

Prior to diagnosis, prepare two airbag resistors (98299PA040).

#### WIRING DIAGRAM:



AB-01339

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module and driver's airbag module for poor contact.  | Is there poor contact?  | Replace the airbag main harness.   | Go to step 2.                                      |
| <b>2 CHECK DRIVER'S AIRBAG MODULE.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Remove the driver's airbag module.<br>3) Connect the connector (AB38) to connector (1N) in test harness N.<br>4) Connect the airbag resistor to the connector (2N) in test harness N.<br>5) Connect the connector (1Q) in test harness Q to connector (AB37).<br>6) Connect the airbag resistor to connector (2Q) in test harness Q.<br>7) Connect the battery ground cable, and turn the ignition switch to ON.  | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the driver's airbag module. <Ref. to AB-14, Driver's Airbag Module.> | Go to step 3.                                      |
| <b>3 CHECK ROLL CONNECTOR.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the test harness N from connector (AB38).<br>3) Disconnect the test harness Q from connector (AB37).<br>4) Remove the instrument panel lower cover, and disconnect the connector (AB21) from (AB26).<br>5) Connect the connector (1P) in test harness P to connector (AB21).<br>6) Connect the airbag resistor to connectors (2P) and (3P) in test harness P.<br>7) Connect the battery ground cable, and turn the ignition switch to ON.  | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the roll connector. <Ref. to AB-20, Roll Connector.>                 | Go to step 4.                                      |
| <b>4 CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the airbag resistor from connectors (2P) and (3P) in test harness P.<br>3) Remove the instrument panel side cover on passenger side, and disconnect the connectors (AB27) and (AB4).<br>4) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R.<br>5) Connect the battery ground cable, and turn the ignition switch to ON. (engine OFF)<br>6) Measure the voltage between connector (2R) in test harness R and the chassis ground.<br><b>Connector &amp; terminal</b><br>(2R) No. 4 (+) — Chassis ground (-):<br>(2R) No. 2 (+) — Chassis ground (-):<br>(2R) No. 8 (+) — Chassis ground (-):<br>(2R) No. 12 (+) — Chassis ground (-): | Is the voltage less than 1 V?                                       | Go to step 5.  | Replace the airbag main harness with body harness. |

## Diagnostic Chart with Trouble Code

### AIRBAG SYSTEM (DIAGNOSTICS)

| Step   | Check                       | Yes  | No                    |
|--|-----------------------------|--|-----------------------|
| <b>5</b><br><b>CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC. | Is the same DTC displayed?  | Replace the airbag control module.<br><Ref. to AB-18, Airbag Control Module.>  | Go to step <b>6</b> . |
| <b>6</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed? | Using the List of Diagnostic Trouble Code (DTC), check the DTC.<br><Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> | Finish the diagnosis. |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## D: DTC 16 PASSENGER'S AIRBAG FAILURE

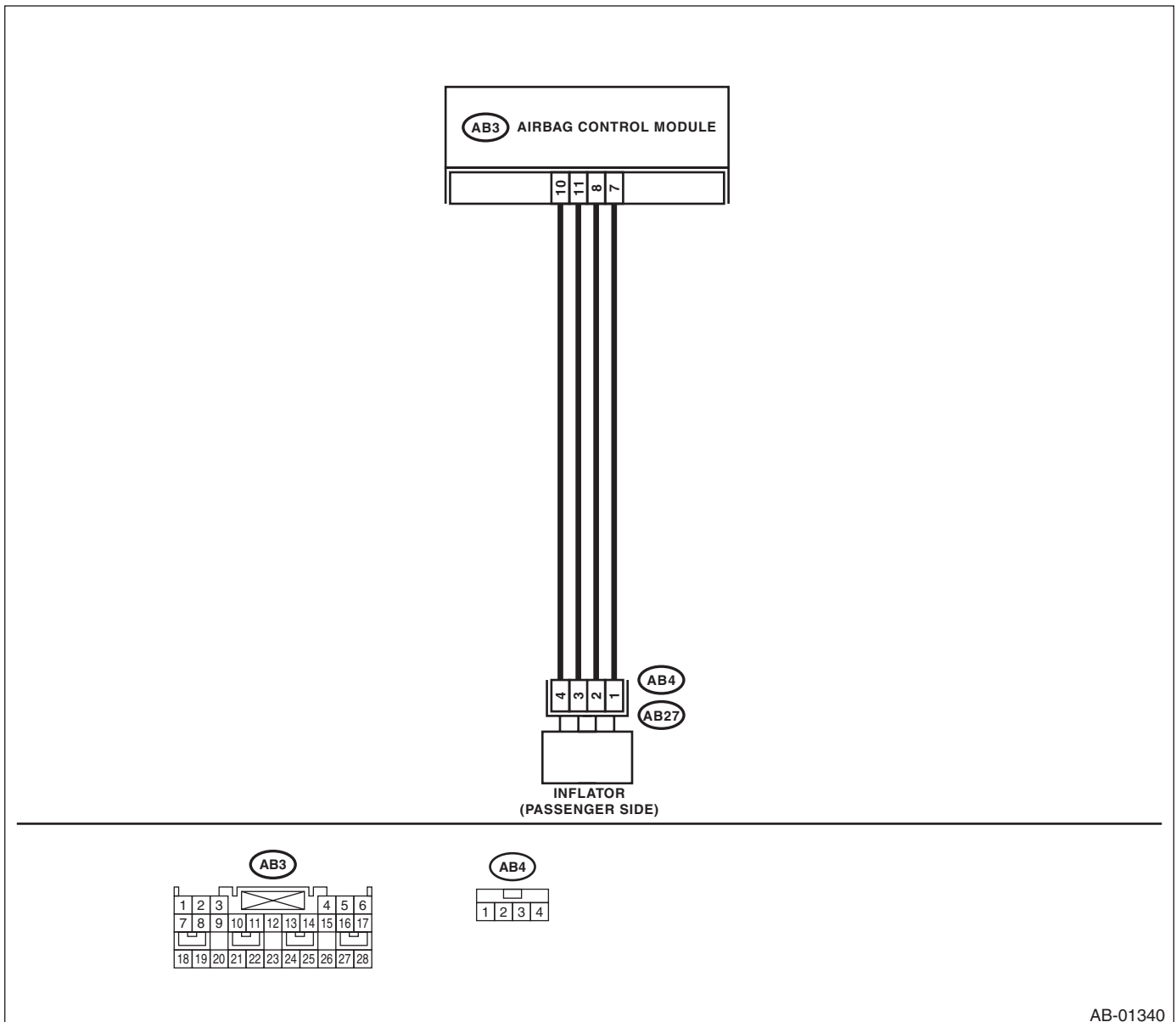
### DTC DETECTING CONDITION:

- Airbag main harness circuit (Passenger) is shorted to the power supply.
- Airbag module harness (Passenger) is shorted to the power supply.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

### WIRING DIAGRAM:



AB-01340

## Diagnostic Chart with Trouble Code

### AIRBAG SYSTEM (DIAGNOSTICS)

| Step   | Check  | Yes   | No   |
|--|--|---|--|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module and passenger's airbag module for poor contact.  | Is there poor contact?   | Replace the airbag main harness with body harness.  | Go to step 2.                                      |
| <b>2 CHECK PASSENGER'S AIRBAG MODULE.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Remove the instrument panel side cover of passenger's side.<br>3) Disconnect the connector (AB27) from (AB4)<br>4) Connect the connector (1P) in test harness P to connector (AB4).<br>5) Connect the airbag resistor to connectors (2P) and (3P) in test harness P.<br>6) Connect the battery ground cable, and turn the ignition switch to ON.  | Does the airbag warning light illuminates for 6 seconds then go off? | Replace the passenger's airbag module. <Ref. to AB-15, Passenger's Airbag Module.>  | Go to step 3.                                      |
| <b>3 CHECK AIRBAG MAIN HARNESS (PASSENGER'S AIRBAG HARNESS).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the airbag resistor from connectors (2P) and (3P) in test harness P.<br>3) Remove the instrument panel lower cover and disconnect the connector (AB26) from (AB21).<br>4) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R.<br>5) Measure the voltage between connector (2R) in test harness R and chassis ground.<br><b>Connector &amp; terminal</b><br>(2R) No. 3 (+) — Chassis ground (-):<br>(2R) No. 5 (+) — Chassis ground (-):<br>(2R) No. 9 (+) — Chassis ground (-):<br>(2R) No. 13 (+) — Chassis ground (-): | Is the voltage less than 1 V?  | Go to step 4.   | Replace the airbag main harness with body harness. |
| <b>4 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.   | Is the same DTC displayed?   | Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>  | Go to step 5.                                      |
| <b>5 CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?  | Using the List of Diagnostic Trouble Code (DTC), check the DTC. <Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> | Finish the diagnosis.                              |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## E: DTC 21 AIRBAG ECU FAILURE

### DTC DETECTING CONDITION:

Airbag control module is faulty.

### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

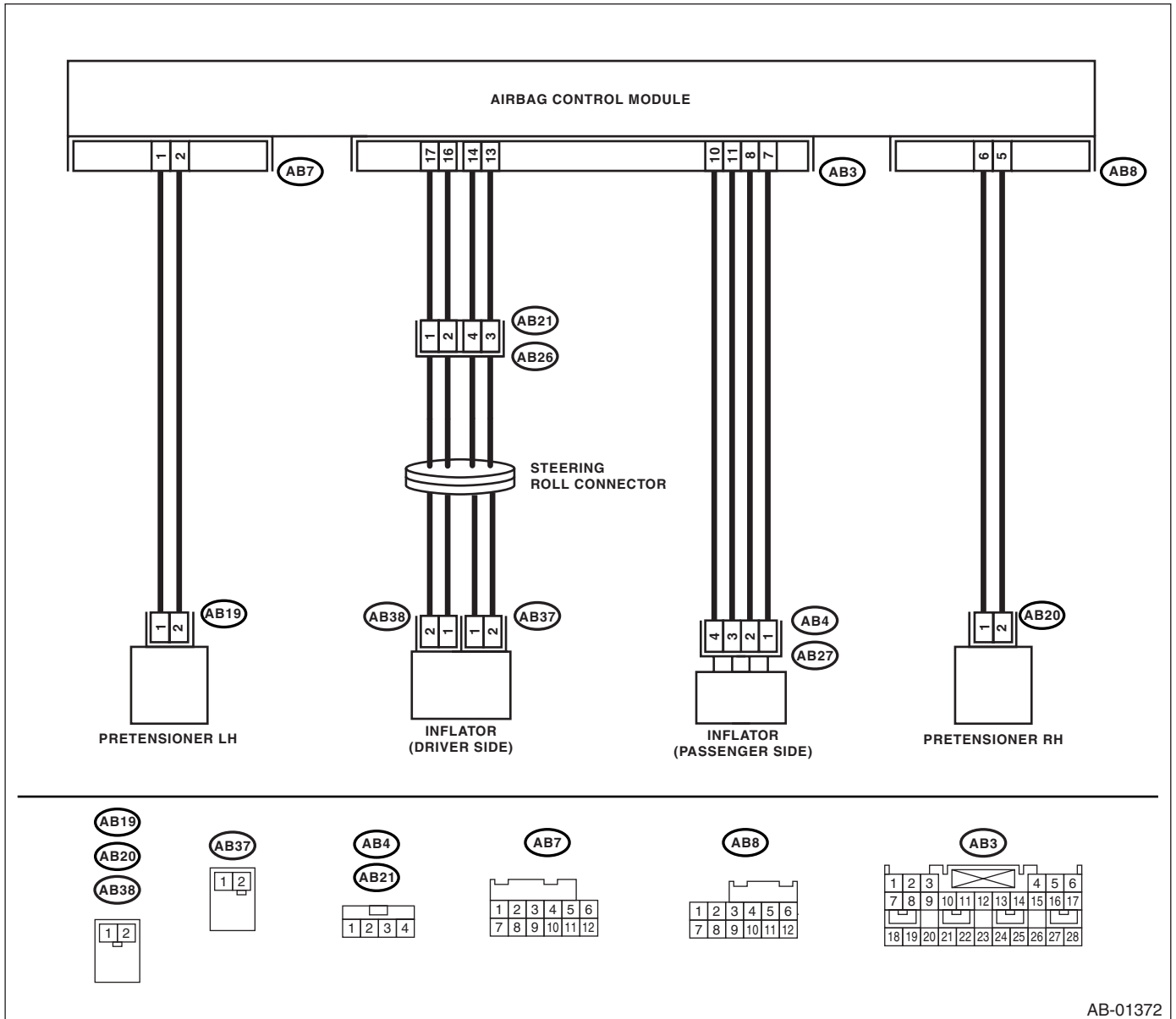
|   | Step   | Check                    | Yes  | No                        |
|---|--|--------------------------|--|---------------------------|
| 1 | <b>CHECK IF DTC 21 IS INDICATED.</b><br>1) Read the DTC. <Ref. to AB(diag)-26, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.><br>2) Perform the clear memory mode. <Ref. to AB(diag)-34, Clear Memory Mode.><br>3) Read the DTC again. | Is the DTC 21 displayed? | Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.> | A temporary poor contact. |



# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## F: DTC 22 FRONT AIRBAG FIRING OUTPUT WIRING DIAGRAM:



AB-01372

This DTC is indicated when the front airbag and the pretensioner are deployed.

Once this DTC is indicated, memory is not erasable; therefore replace the following parts.

- Airbag control module <Ref. to AB-18, Airbag Control Module.>
- Driver's airbag module <Ref. to AB-14, Driver's Airbag Module.>
- Passenger's airbag module <Ref. to AB-15, Passenger's Airbag Module.>
- Front sub sensor of both sides <Ref. to AB-21, Front Sub Sensor.>
- Front seat belt outer with pretensioner of both sides <Ref. to SB-10, Front Seat Belt.>

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## G: DTC 23 CONNECTOR TO AIRBAG ECU

### DTC DETECTING CONDITION:

(AB3), (AB7) and (AB8) are not connected properly to airbag control module.

### CAUTION:

**Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.**

| Step   | Check   | Yes  | No   |
|--|---|--|--|
| <b>1 CHECK POOR CONTACT IN CONNECTORS (AB3), (AB7) AND (AB8).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connectors (AB3), (AB7) and (AB8) from the airbag control module.<br><Ref. to AB-18, Airbag Control Module.> | Is there rust or damage appear on the harness connector and the control module connector? | Go to step 2.  | Replace the airbag control module.<br><Ref. to AB-18, Airbag Control Module.>Replace the body harness with airbag main harness. Replace the body harness with side airbag harness. |
| <b>2 CHECK POOR CONTACT IN CONNECTORS (AB3), (AB7) AND (AB8).</b><br>1) Ensure that connectors are firmly reconnected.<br>2) Connect the battery ground cable, and turn the ignition switch to ON.   | Does the airbag warning light illuminate for 6 seconds then go off?                       | Go to step 3.  | Replace the airbag control module.<br><Ref. to AB-18, Airbag Control Module.>  |
| <b>3 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.   | Is the same DTC displayed?  | Replace the airbag control module.<br><Ref. to AB-18, Airbag Control Module.>  | Go to step 4.  |
| <b>4 CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Using the List of Diagnostic Trouble Code (DTC), check the DTC.<br><Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> | Finish the diagnosis.  |

# Diagnostic Chart with Trouble Code

## AIRBAG SYSTEM (DIAGNOSTICS)

### H: DTC 24 IG1 OPEN

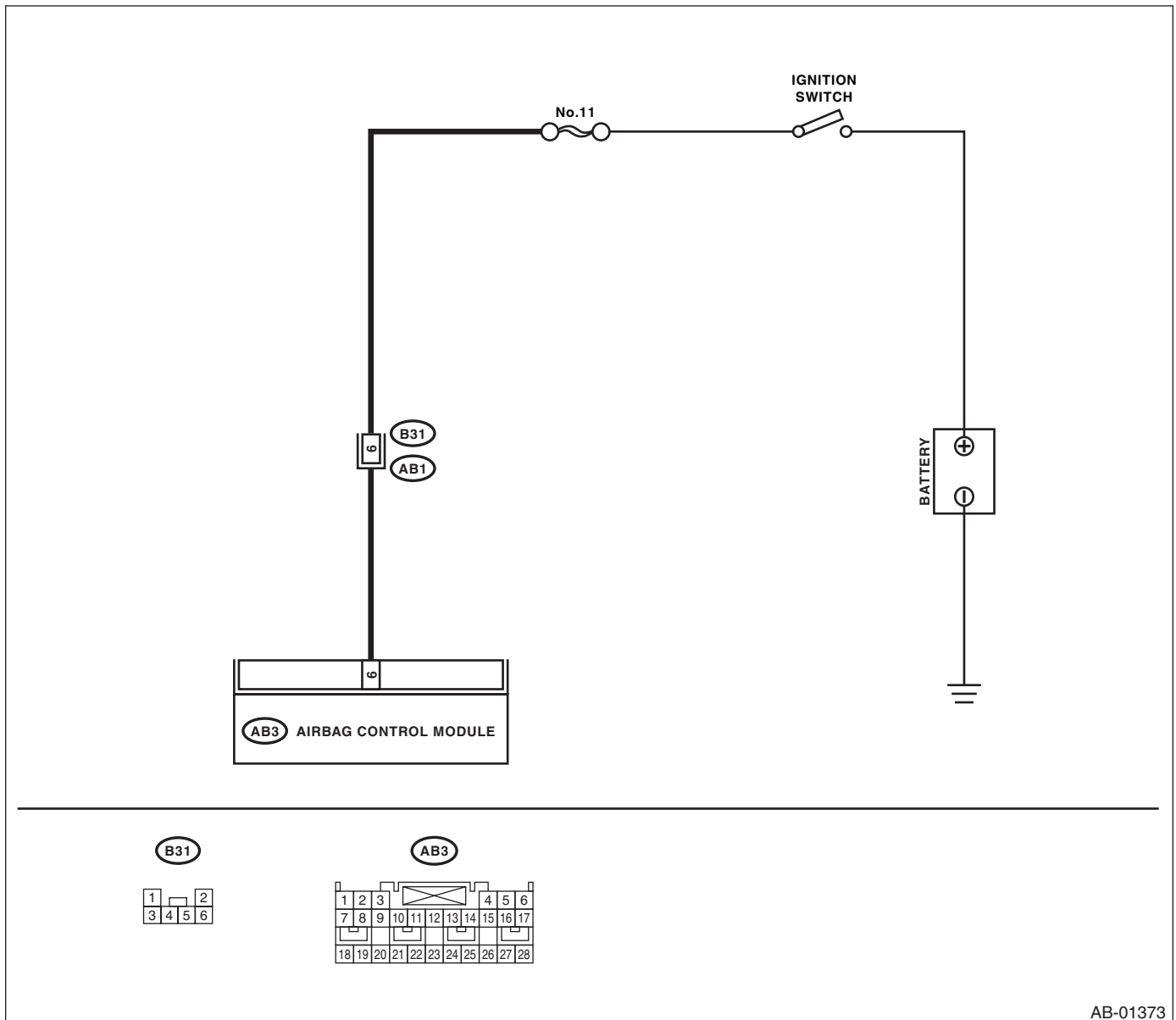
#### DTC DETECTING CONDITION:

- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Fuse No. 11 (in joint box) is blown.
- Body harness circuit is open.

#### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module passenger's airbag module connectors for safety reasons.

#### WIRING DIAGRAM:



# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

| Step  | Check                          | Yes   | No                    |
|---|--------------------------------|---|-----------------------|
| <b>1 CHECK AIRBAG CONTROL MODULE.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB3) from the airbag control module.<br>3) Connect the connector (1R) in test harness R to connector (AB3).<br>4) Connect the battery ground cable, and turn the ignition switch to ON.<br>5) Measure the voltage between connector (2R) in test harness R and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(2R) No. 1 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V? | Replace the airbag control module.<br><Ref. to AB-18, Airbag Control Module.>   | Go to step 2.         |
| <b>2 CHECK FUSE No. 11 (IN JOINT BOX).</b><br>1) Confirm that the ignition switch is turned OFF.<br>2) Remove the fuse No. 11 (in joint box) and perform visual inspection.   | Is the fuse No. 11 blown out?  | Replace the fuse No. 11. If fuse No. 11 is blown out again, repair the body harness. Replace the airbag main harness with body harness. | Go to step 3.         |
| <b>3 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.  | Is the same DTC displayed?     | Replace the airbag control module.<br><Ref. to AB-18, Airbag Control Module.>   | Go to step 4.         |
| <b>4 CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?    | Using the List of Diagnostic Trouble Code (DTC), check the DTC.<br><Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).>        | Finish the diagnosis. |

# Diagnostic Chart with Trouble Code

## AIRBAG SYSTEM (DIAGNOSTICS)

### I: DTC 25 IG2 OPEN

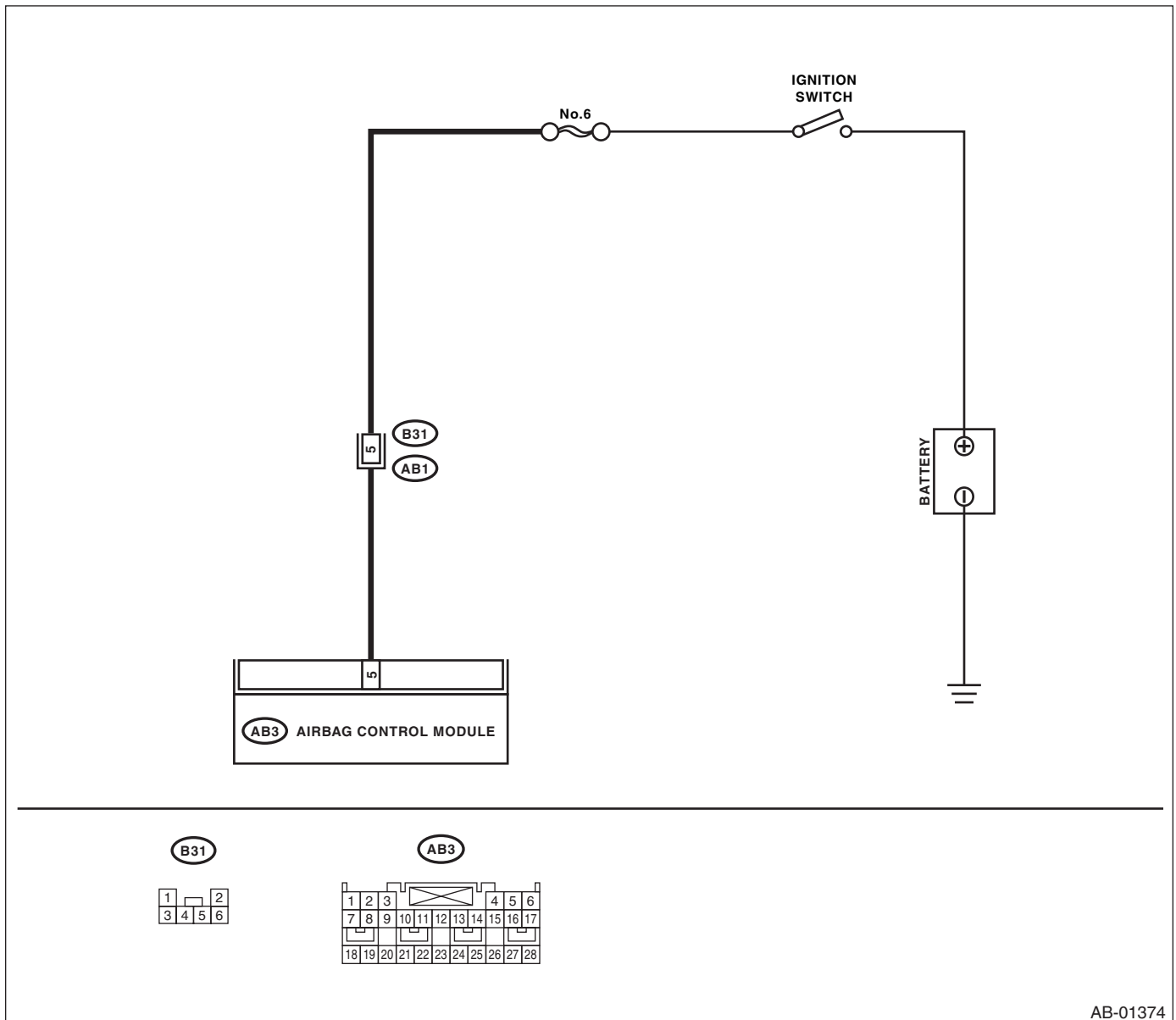
#### DTC DETECTING CONDITION:

- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Fuse No. 6 (in joint box) is blown.
- Body harness circuit is open.

#### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

#### WIRING DIAGRAM:



AB-01374

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

| Step  | Check                          | Yes   | No                    |
|---|--------------------------------|---|-----------------------|
| <b>1 CHECK AIRBAG CONTROL MODULE.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB3) from the airbag control module.<br>3) Connect the connector (1R) in test harness R to connector (AB3).<br>4) Connect the battery ground cable, and turn the ignition switch to ON.<br>5) Measure the voltage between connector (2R) in test harness R and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(2R) No. 6 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V? | Replace the airbag control module.<br><Ref. to AB-18, Airbag Control Module.>   | Go to step 2.         |
| <b>2 CHECK FUSE No. 6 (IN JOINT BOX).</b><br>1) Confirm that the ignition switch is turned OFF.<br>2) Remove the No. 6 fuse (in joint box) and perform visual inspection.   | Is the fuse No. 6 blown out?   | Replace the fuse No. 6. If fuse No. 6 is blown out again, repair the body harness. Or, replace the airbag main harness with body harness. | Go to step 3.         |
| <b>3 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.  | Is the same DTC displayed?     | Replace the airbag control module.<br><Ref. to AB-18, Airbag Control Module.>   | Go to step 4.         |
| <b>4 CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?    | Using the List of Diagnostic Trouble Code (DTC), check the DTC.<br><Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).>          | Finish the diagnosis. |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## J: DTC 26 PASSENGER'S AIRBAG INDICATOR FAILURE

### DTC DETECTING CONDITION:

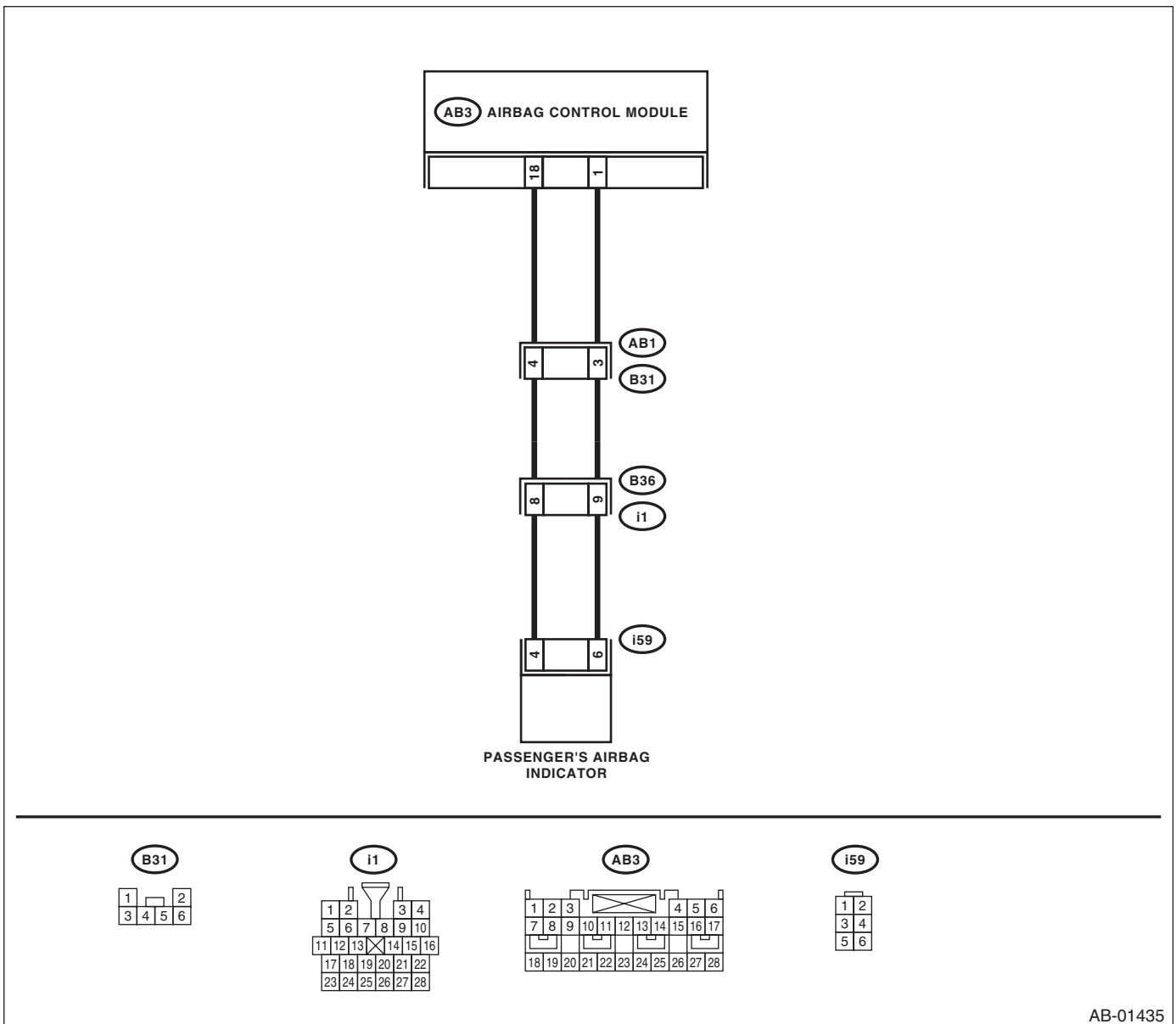
- Passenger's airbag indicator is faulty.
- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Open circuit of body harness.

### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag harness, disconnect each airbag module connector and seat belt pretensioner for safety reasons.

### WIRING DIAGRAM:

- Auto A/C model

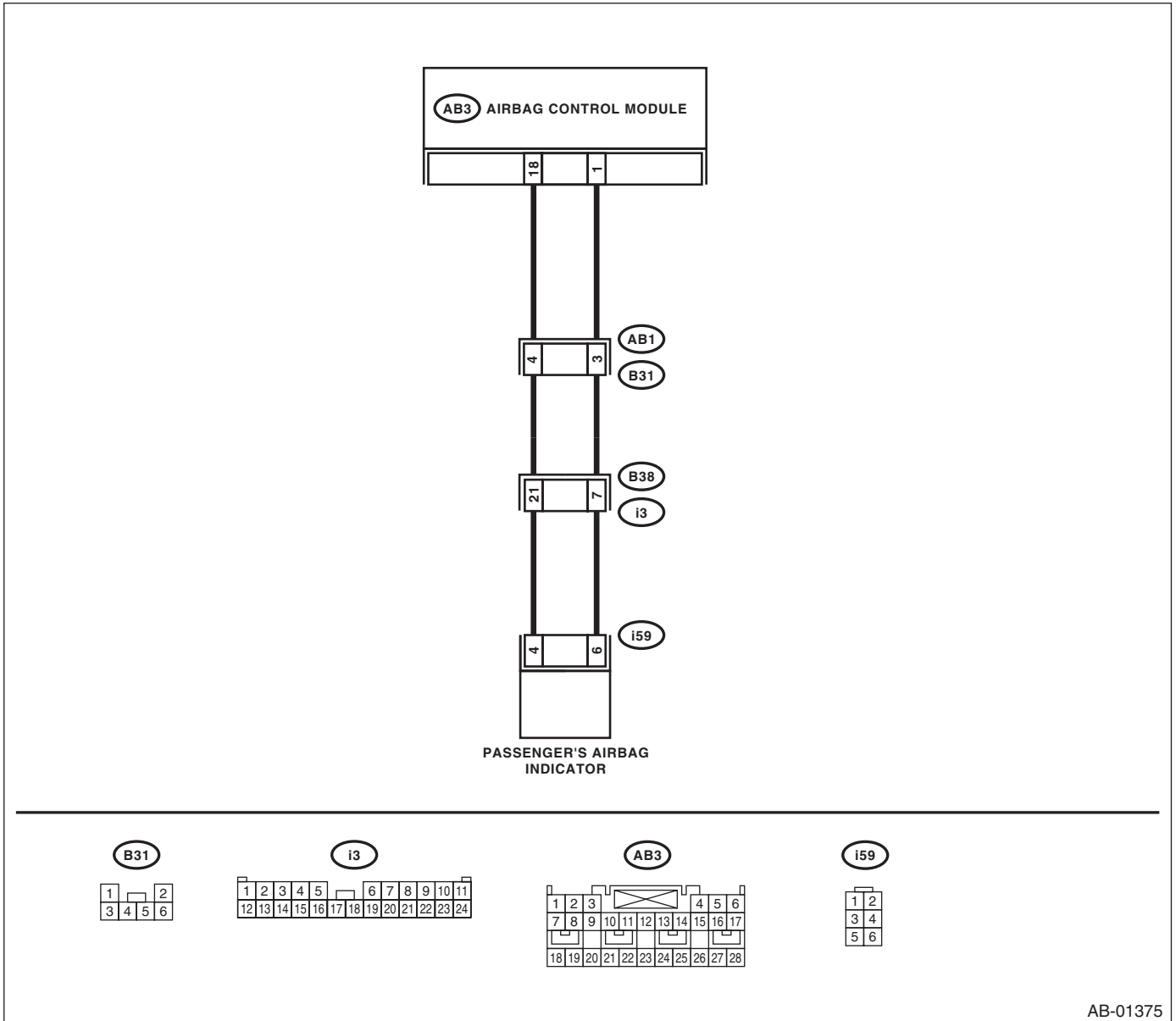


AB-01435

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

- Manual A/C model



AB-01375



## Diagnostic Chart with Trouble Code

### AIRBAG SYSTEM (DIAGNOSTICS)

| Step  | Check   | Yes   | No  |
|---|---|---|---|
| <b>1</b><br><b>CHECK POOR CONTACT.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Check the connector between the airbag control module and clock for firm contact.   | Is there poor contact in each connector?          | Replace the airbag harness connector.   | Go to step 2.   |
| <b>2</b><br><b>CHECK AIRBAG MAIN HARNESS.</b><br>1) Disconnect the connector (AB3) from the airbag control module.<br>2) Connect the battery ground cable, and turn the ignition switch to ON.<br>NOTE:<br>If normal, neither of ON-OFF illuminates.  | Does the passenger's airbag indicator illuminate? | Go to step 3.   | Go to step 4.   |
| <b>3</b><br><b>CHECK AIRBAG MAIN HARNESS.</b><br>1) Turn the ignition switch to OFF.<br>2) Remove the clock, and disconnect the connector (i59).<br>3) Connect the connector (1R) in test harness R to connector (AB3).<br>4) Measure the resistance between connectors (2R) and (4R) in test harness R and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(2R) No. 14 — (4R) No. 17:</b><br><b>(2R) No. 14 — Chassis ground:</b><br><b>(4R) No. 17 — Chassis ground:</b> | Is the resistance more than 1 M $\Omega$ ?        | Replace the clock.  | Repair the body harness. Or, replace the airbag main harness with body harness. |
| <b>4</b><br><b>CHECK AIRBAG HARNESS.</b><br>1) Connect the connectors (5R) and (6R) in test harness R.<br>2) Connect the battery ground cable and turn the ignition switch to ON.<br>NOTE:<br>If normal, neither of ON-OFF illuminates.   | Does the passenger's airbag indicator illuminate? | Replace the airbag control module.<br><Ref. to AB-18, Airbag Control Module.> | Go to step 5.   |
| <b>5</b><br><b>CHECK AIRBAG HARNESS.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the connector (1R) in test harness R to connector (AB3).<br>3) Measure the resistance between connectors (2R) and (4R) in test harness R and connector (i59).<br><b>Connector &amp; terminal</b><br><b>(2R) No. 14 — (i59) No. 6:</b><br><b>(4R) No. 17 — (i59) No. 4:</b>  | Is the resistance less than 10 $\Omega$ ?         | Go to step 6.   | Repair the body harness. Or, replace the airbag main harness with body harness. |
| <b>6</b><br><b>CHECK AIRBAG HARNESS.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between connector (i59) and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(i59) No. 2 — Chassis ground:</b>   | Is the voltage more than 10 V?                    | Replace the clock.  | Repair the power supply line to clock.  |

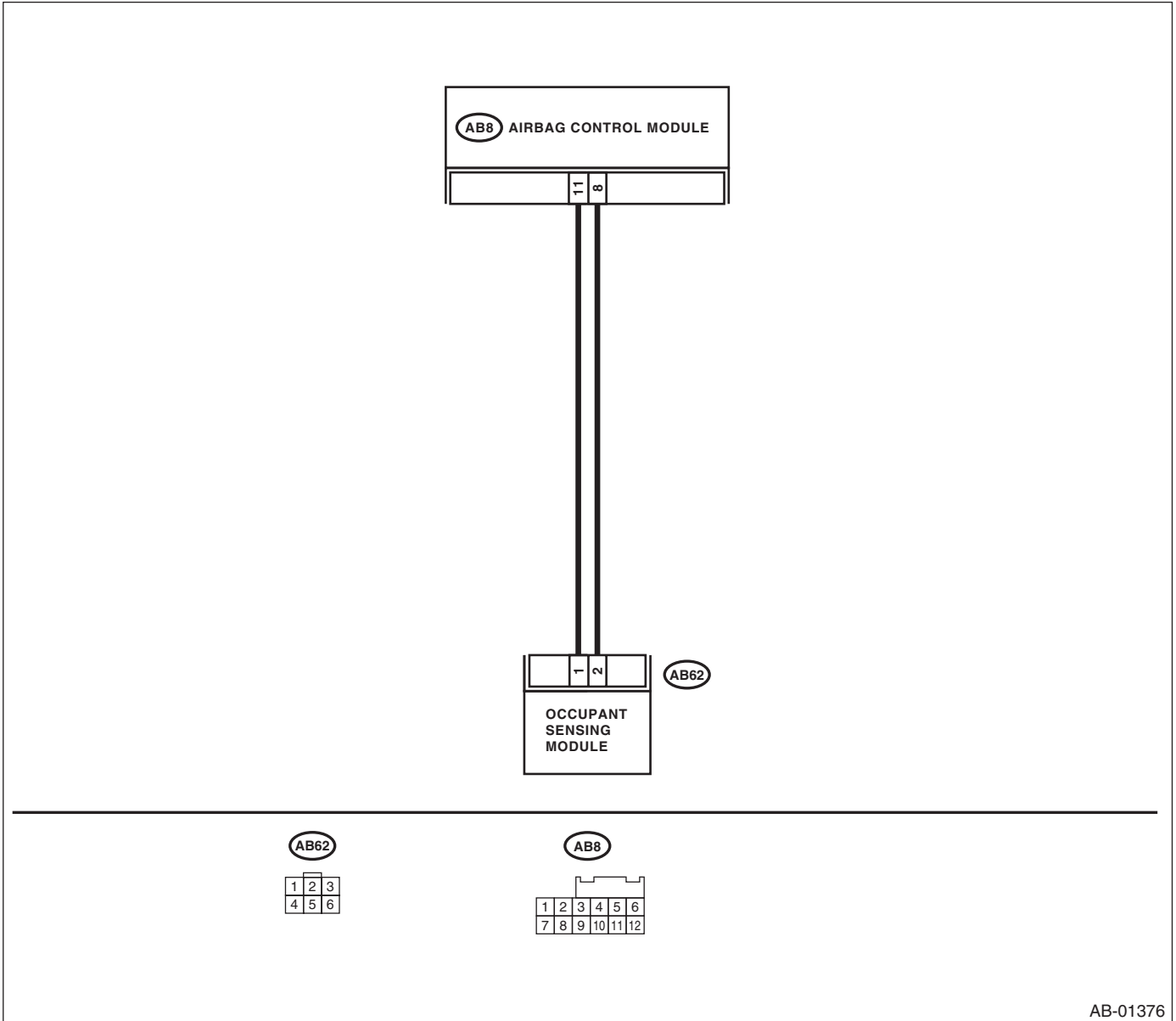
# Diagnostic Chart with Trouble Code

## K: DTC 27 ODS COMMUNICATION ERROR

### DTC DETECTING CONDITION:

- Communication error with occupant detection control module.
- Airbag rear harness circuit is open, shorted or shorted to ground and power supply.
- Occupant detection harness (seat harness) is faulty.
- Occupant detection system is faulty.
- Airbag control module is faulty.

### WIRING DIAGRAM:



AB-01376

## Diagnostic Chart with Trouble Code

### AIRBAG SYSTEM (DIAGNOSTICS)

| Step  | Check                                     | Yes  | No   |
|---|---|--|--|
| <b>1</b><br><b>CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module and occupant detection control module for poor contact.   | Is there poor contact?                    | Reconnect the connector. If the fault is not corrected, replace the side airbag harness RH or occupant detection harness (seat harness). | Go to step 2.  |
| <b>2</b><br><b>CHECK AIRBAG HARNESS.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB8) from the airbag control module.<br>3) Disconnect the connector (AB 62) of underside of passenger's seat.<br>4) Connect the connector (1U) in test harness U to connector (AB8).<br>5) Connect the connector (1AB) in test harness AB to connector (AB62).<br>6) Measure the resistance between connector (3U) in test harness U and the connector (2AB) in test harness AB.<br><b>Connector &amp; terminal</b><br><b>(3U) No. 2 — (2AB) No. 1:</b><br><b>(3U) No. 4 — (2AB) No. 2:</b> | Is the resistance less than 10 $\Omega$ ? | Go to step 3.  | Replace the side airbag harness RH with body harness.  |
| <b>3</b><br><b>CHECK AIRBAG HARNESS.</b><br>Measure the resistance between connector (3U) in test harness U and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(3U) No. 2 — Chassis ground:</b><br><b>(3U) No. 2 — (3U) No. 4:</b>  | Is the resistance less than 10 $\Omega$ ? | Go to step 4.  | Replace the side airbag harness RH with body harness.  |
| <b>4</b><br><b>CHECK AIRBAG HARNESS.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between connector (2AB) in test harness AB and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(2AB) No. 3 — Chassis ground:</b>  | Is the voltage more than 9 V?             | Go to step 5.  | Check the battery voltage and fuse. Replace the side airbag harness RH with body harness if no faulty.   |
| <b>5</b><br><b>CHECK AIRBAG HARNESS.</b><br>Measure the voltage between connector (2AB) in test harness AB and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(2AB) No. 1 — Chassis ground:</b>   | Is the voltage more than 9 V?             | Replace the side airbag harness RH with body harness.  | Replace the occupant detection harness (seat harness). If the fault is not corrected, replace the occupant detection system (seat cushion and frame assembly) and airbag control module in this order. |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

---

## **L: DTC 29 ODS FAILURE**

**NOTE:**

For details concerning DTC 29, refer to “Occupant Detection System”. <Ref. to OD(diag)-30, DTC 29 ODS FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## **M: DTC 2A ODS CALIBRATION ERROR**

**NOTE:**

For details concerning DTC 2A, refer to “Occupant Detection System”. <Ref. to OD(diag)-27, DTC 2A ODS CALIBRATION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## **N: DTC 2B ODS SYSTEM WRONG PARTS**

**NOTE:**

For details concerning DTC 2B, refer to “Occupant Detection System”. <Ref. to OD(diag)-27, DTC 2B ODS SYSTEM WRONG PARTS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## **O: DTC 2C BELT TENSION SENSOR FAILURE**

**NOTE:**

For details concerning DTC 2C, refer to “Occupant Detection System”. <Ref. to OD(diag)-28, DTC 2C BELT PRETENSIONER FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# Diagnostic Chart with Trouble Code

## AIRBAG SYSTEM (DIAGNOSTICS)

### P: DTC 31 FRONT SUB SENSOR RH FAILURE

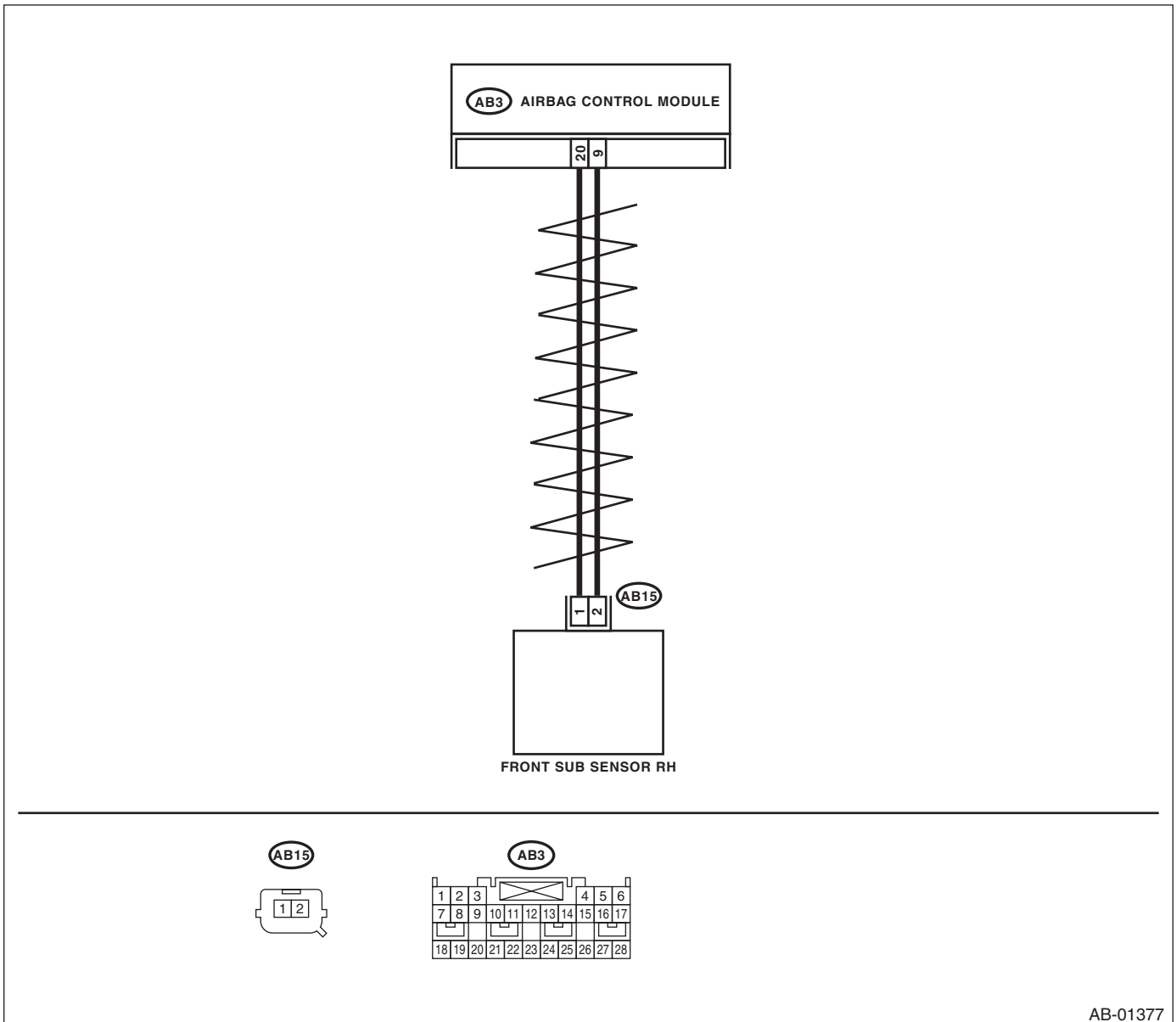
#### DTC DETECTING CONDITION:

- Airbag main harness is open, shorted or shorted to the power supply.
- Front sub sensor (RH) is faulty.
- Airbag control module is faulty.

#### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

#### WIRING DIAGRAM:



AB-01377

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

| Step   | Check                             | Yes   | No   |
|--|-----------------------------------|---|--|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module and front sub sensor RH for poor contact.  | Is there poor contact?            | Replace the airbag main harness.  | Go to step 2.                                      |
| <b>2 CHECK AIRBAG MAIN HARNESS (FRONT SUB SENSOR RH).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Remove the instrument panel lower cover and disconnect the connectors (AB26) and (AB21).<br>3) Remove the instrument panel side cover on passenger side, and disconnect the connectors (AB27) and (AB4).<br>4) Disconnect the connector (AB3) from the airbag control module.<br>5) Connect the connector (1R) in test harness R to connector (AB3).<br>6) Disconnect the front sub sensor (RH), and connect the (1H) in test harness H to connector (AB15).<br>7) Measure the resistance between connector (3R) in test harness R and connector (3H) in test harness H.<br><i>Connector &amp; terminal</i><br><i>(3R) No. 7 — (3H) No. 5:</i><br><i>(3R) No. 9 — (3H) No. 6:</i> | Is the resistance less than 10 Ω? | Go to step 3.   | Replace the airbag main harness with body harness. |
| <b>3 CHECK AIRBAG MAIN HARNESS (FRONT SUB SENSOR RH).</b><br>Measure the resistance between connector (3R) in test harness R and the chassis ground.<br><i>Connector &amp; terminal</i><br><i>(3R) No. 7 — Chassis ground:</i><br><i>(3R) No. 9 — Chassis ground:</i>  | Is the resistance more than 1 MΩ? | Replace the front sub sensor (RH).<br><Ref. to AB-21, Front Sub Sensor.><br>When the problem is not corrected after sensor replacement, replace the airbag control module.<br><Ref. to AB-18, Airbag Control Module.> | Go to step 4.                                      |
| <b>4 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.   | Is the same DTC displayed?        | Replace the airbag control module.<br><Ref. to AB-18, Airbag Control Module.>   | Go to step 5.                                      |
| <b>5 CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?       | Using the List of Diagnostic Trouble Code (DTC), check the DTC.<br><Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).>  | Finish the diagnosis.                              |

# Diagnostic Chart with Trouble Code

## AIRBAG SYSTEM (DIAGNOSTICS)

### Q: DTC 32 FRONT SUB SENSOR LH FAILURE

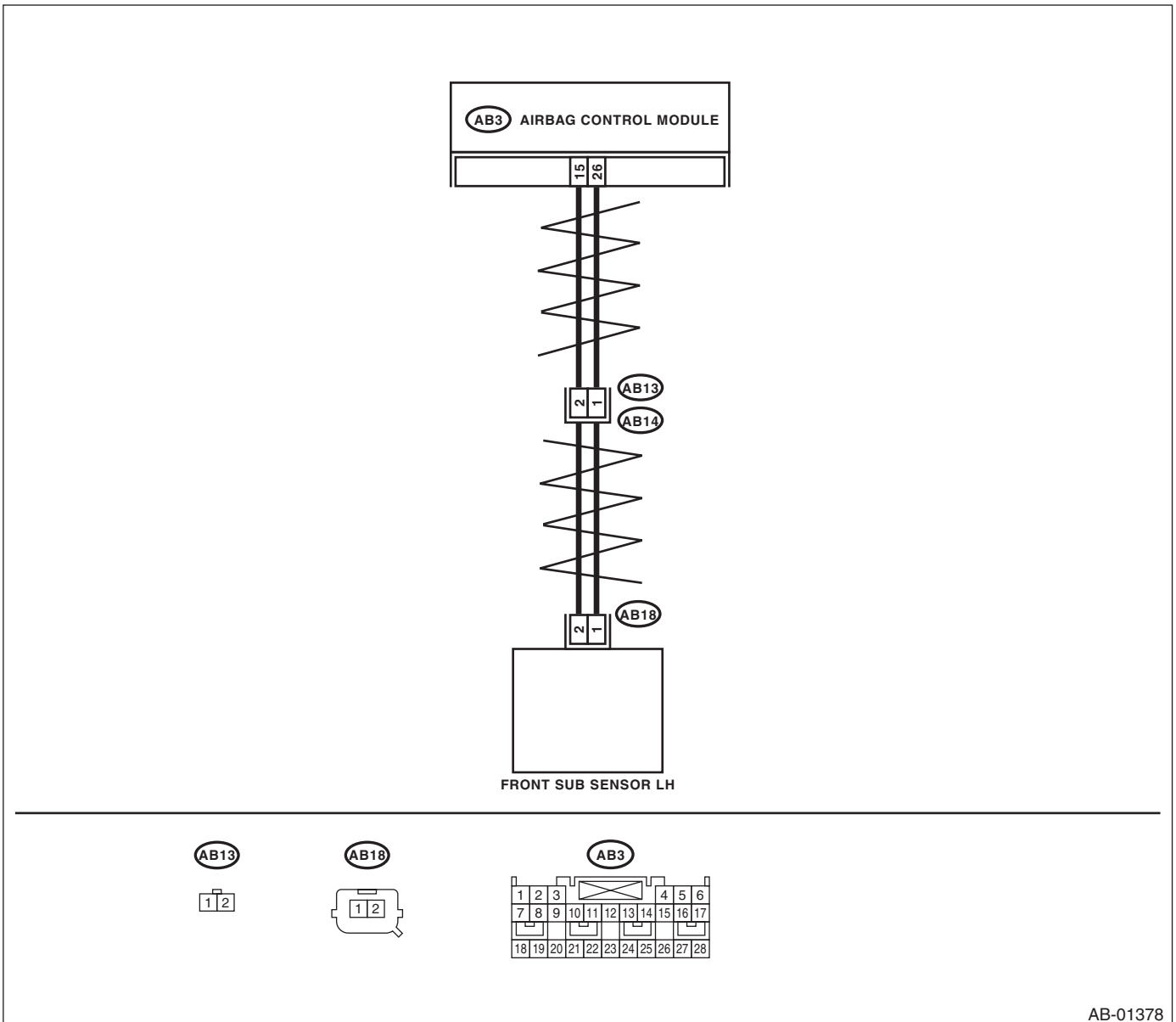
#### DTC DETECTING CONDITION:

- Airbag main harness is open, shorted or shorted to the power supply.
- Front sub-sensor (LH) is faulty.
- Airbag control module is faulty.

#### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

#### WIRING DIAGRAM:



AB-01378

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

| Step  | Check                             | Yes   | No   |
|---|-----------------------------------|---|--|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module and front sub sensor LH for poor contact.   | Is there poor contact?            | Replace the airbag main harness with body harness.  | Go to step 2.                                      |
| <b>2 CHECK AIRBAG MAIN HARNESS (FRONT SUB SENSOR LH).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Remove the instrument panel lower cover and disconnect the connectors (AB26) and (AB21).<br>3) Remove the console side cover lower on passenger side, and disconnect the connectors (AB27) and (AB4).<br>4) Disconnect the connector (AB3) from the airbag control module.<br>5) Connect the connector (1R) in test harness R to connector (AB3).<br>6) Disconnect the front sub sensor (LH), and connect the (1H) in test harness H to connector (AB18).<br>7) Measure the resistance between connector (3R) in test harness R and connector (3H) in test harness H.<br><i>Connector &amp; terminal</i><br><i>(3R) No. 6 — (3H) No. 5:</i><br><i>(3R) No. 8 — (3H) No. 6:</i> | Is the resistance less than 10 Ω? | Go to step 3.   | Replace the airbag main harness with body harness. |
| <b>3 CHECK AIRBAG MAIN HARNESS (FRONT SUB SENSOR LH).</b><br>Measure the resistance between connector (3R) in test harness R and the chassis ground.<br><i>Connector &amp; terminal</i><br><i>(3R) No. 6 — Chassis ground:</i><br><i>(3R) No. 8 — Chassis ground:</i>   | Is the resistance more than 1 MΩ? | Replace the front sub sensor (LH).<br><Ref. to AB-21, Front Sub Sensor.><br>When the problem is not corrected after sensor replacement, replace the airbag control module.<br><Ref. to AB-18, Airbag Control Module.> | Go to step 4.                                      |
| <b>4 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.  | Is the same DTC displayed?        | Replace the airbag control module.<br><Ref. to AB-18, Airbag Control Module.>   | Go to step 5.                                      |
| <b>5 CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?       | Using the List of Diagnostic Trouble Code (DTC), check the DTC.<br><Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).>  | Finish the diagnosis.                              |



## Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

---

### **R: DTC 33 FRONT SUB SENSOR RH FAILURE**

#### **DTC DETECTING CONDITION:**

Front sub sensor (RH) is faulty.

When Code 33 is displayed, the circuit within the front sub sensor (RH) is faulty. Replace the front sub sensor (RH). <Ref. to AB-21, Front Sub Sensor.>

### **S: DTC 34 FRONT SUB SENSOR LH FAILURE**

#### **DTC DETECTING CONDITION:**

Front sub-sensor (LH) is faulty.

When Code 34 is displayed, the circuit within the front sub sensor (LH) is faulty. Replace the front sub sensor (LH). <Ref. to AB-21, Front Sub Sensor.>

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## T: DTC 36 SEAT POSITION SENSOR LH FAILURE

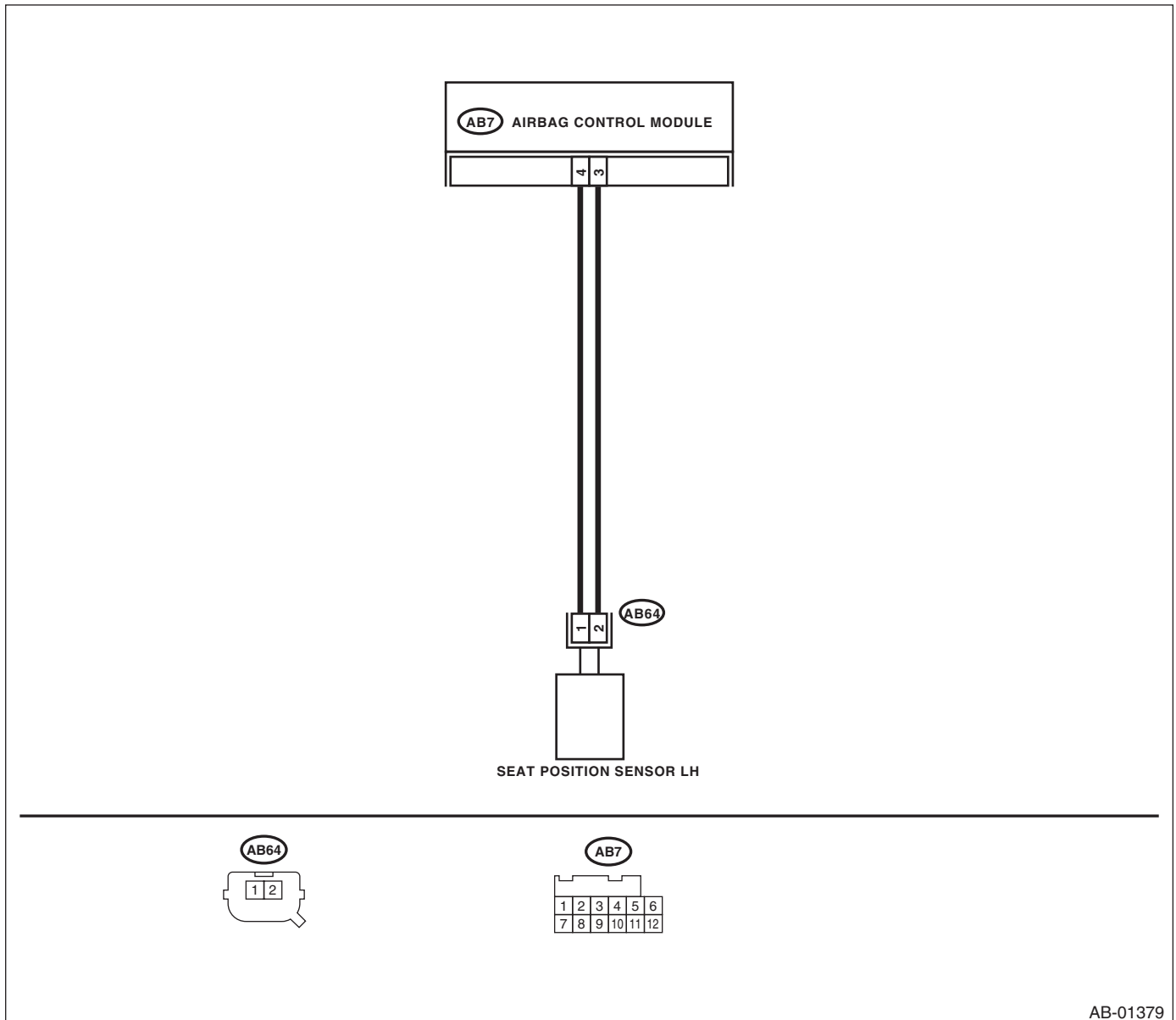
### DTC DETECTING CONDITION:

- Driver's seat position sensor is faulty.
- Airbag control module is faulty.
- Side airbag harness circuit is open, shorted or shorted to ground.

### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag harness, disconnect each airbag module connector and seat belt pretensioner for safety reasons.

### WIRING DIAGRAM:



AB-01379

## Diagnostic Chart with Trouble Code

### AIRBAG SYSTEM (DIAGNOSTICS)

| Step   | Check   | Yes  | No   |
|--|---|--|--|
| <b>1 CHECK SEAT POSITION SENSOR (LH).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB64) from seat position sensor (LH).<br>3) Connect the connector (2Y) in test harness Y to connector (AB64).<br>4) Connect the battery ground cable, and turn the ignition switch to ON.   | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the seat position sensor (LH) with slide rail assembly in driver's side. <Ref. to SE-7, Front Seat.> | Go to step 2.                                      |
| <b>2 CHECK SIDE AIRBAG HARNESS (SEAT POSITION SENSOR HARNESS LH).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB7) from the airbag control module.<br>3) Connect the connector (1R) in test harness R to connector (AB26).<br>4) Disconnect the seat position sensor (LH), and connect the (1H) in test harness H to connector (AB64).<br>5) Measure the resistance between connector (3R) in test harness R and connector (3H) in test harness H.<br><i>Connector &amp; terminal</i><br><i>(3R) No. 1 — (3H) No. 6:</i><br><i>(3R) No. 3 — (3H) No. 5:</i> | Is the resistance less than 10 $\Omega$ ?                           | Go to step 3.  | Replace the side airbag harness with body harness. |
| <b>3 CHECK SIDE AIRBAG HARNESS.</b><br>Measure the resistance between connector (3R) in test harness R and the chassis ground.<br><i>Connector &amp; terminal</i><br><i>(3R) No. 1 — Chassis ground:</i>   | Is the resistance less than 10 $\Omega$ ?                           | Replace the side airbag harness with body harness.   | Replace the airbag control module.                 |

### U: DTC 37 BUCKLE SWITCH RH FAILURE

**NOTE:**

For details concerning DTC 37, refer to "Occupant Detection System". <Ref. to OD(diag)-31, DTC 37 BUCKLE SWITCH RH FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## V: DTC 38 BUCKLE SWITCH LH FAILURE

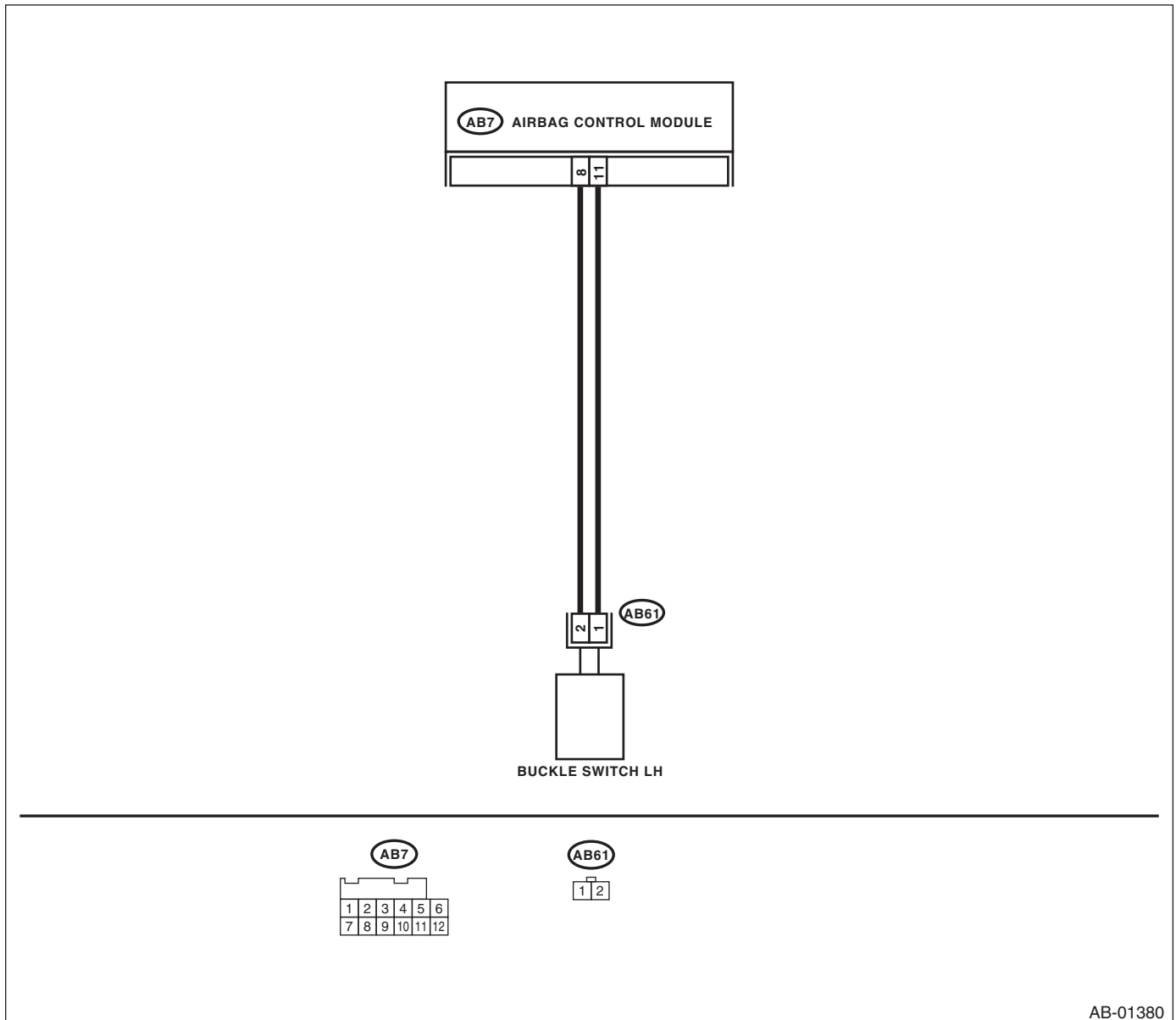
### DTC DETECTING CONDITION:

- Driver's buckle switch circuit is open, shorted or shorted to ground.
- Side airbag harness circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.

### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag harness, disconnect each airbag module connector and seat belt pretensioner for safety reasons.

### WIRING DIAGRAM:



AB-01380

## Diagnostic Chart with Trouble Code

### AIRBAG SYSTEM (DIAGNOSTICS)

| Step   | Check   | Yes   | No   |
|--|---|---|--|
| <b>1 CHECK SEAT BELT BUCKLE SWITCH (LH).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB61) from buckle switch (LH).<br>3) Connect the connector (1Y) in test harness Y to connector (AB61).<br>4) Connect the battery ground cable, and turn the ignition switch to ON.   | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the seat belt buckle switch (LH). <Ref. to SB-10, Front Seat Belt.> | Go to step 2.                                      |
| <b>2 CHECK SIDE AIRBAG HARNESS (BUCKLE SWITCH HARNESS LH).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB7) from the airbag control module.<br>3) Connect the connector (1R) in test harness R to the connector (AB7).<br>4) Disconnect the seat belt buckle switch (LH), and connect the (1D) in test harness D to connector (AB61).<br>5) Measure the resistance between connector (4R) in test harness R and the connector (3D) in test harness D.<br><i>Connector &amp; terminal</i><br><i>(4R) No. 11 — (3D) No. 3:</i><br><i>(4R) No. 9 — (3D) No. 4:</i> | Is the resistance less than 10 $\Omega$ ?                           | Go to step 3.   | Replace the side airbag harness with body harness. |
| <b>3 CHECK AIRBAG REAR HARNESS.</b><br>Measure the resistance between connector (4R) in test harness R and the chassis ground.<br><i>Connector &amp; terminal</i><br><i>(4R) No. 9 — Chassis ground:</i><br><i>(4R) No. 9 — (4R) No. 11:</i>   | Is the resistance less than 10 $\Omega$ ?                           | Replace the side airbag harness with body harness.                          | Replace the airbag control module.                 |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## W: DTC 41 SIDE AIRBAG RH FAILURE

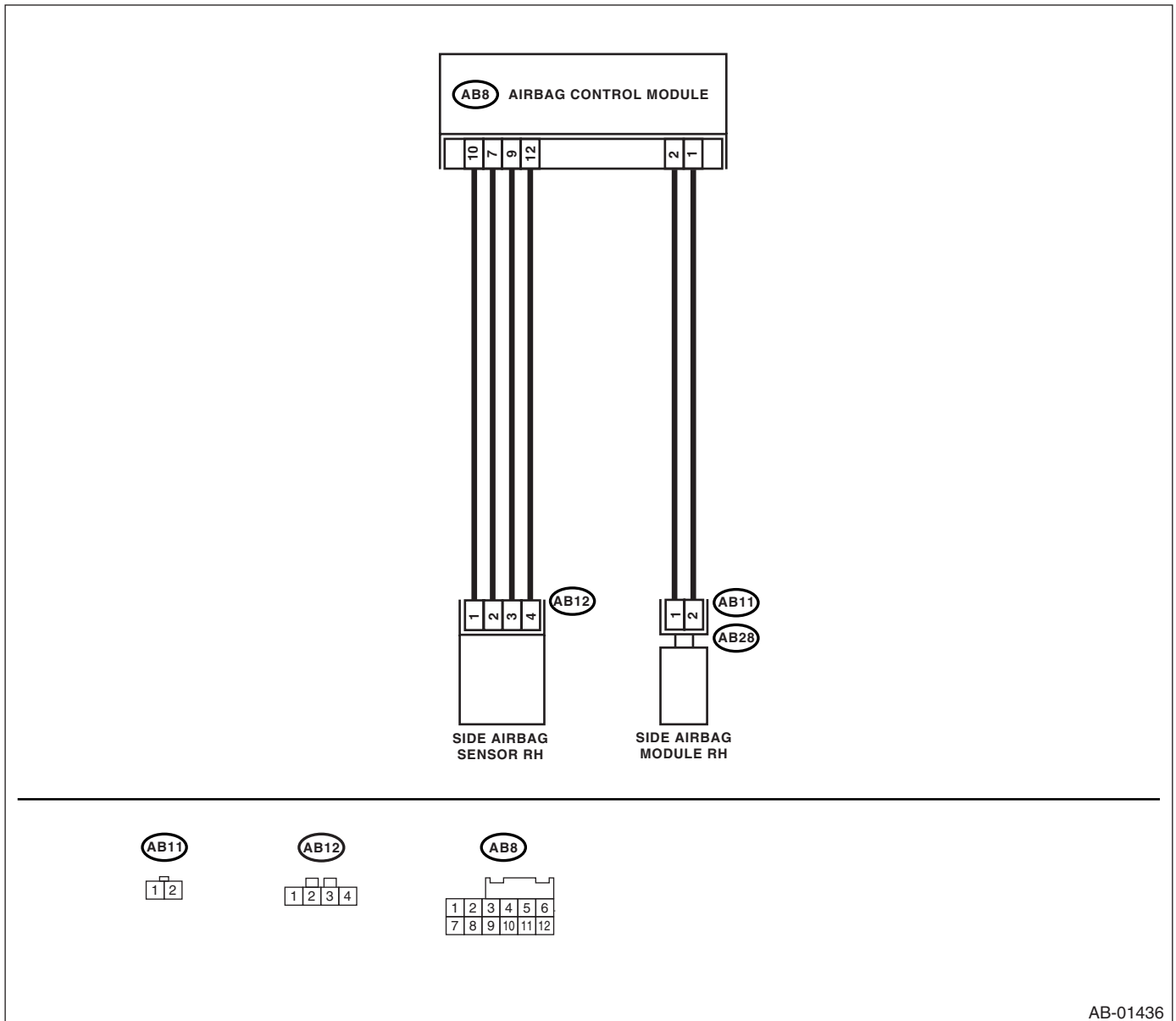
### DTC DETECTING CONDITION:

- Side airbag harness (RH) is faulty.
- Side airbag module (RH) is faulty.
- Airbag control module is faulty.

### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

### WIRING DIAGRAM:



AB-01436

## Diagnostic Chart with Trouble Code

### AIRBAG SYSTEM (DIAGNOSTICS)

| Step   | Check   | Yes   | No   |
|--|---|---|--|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module, and side airbag module RH and side airbag sensor RH for poor contact.   | Is there poor contact?  | Replace the side airbag harness with body harness.  | Go to step 2.                                      |
| <b>2 CHECK SIDE AIRBAG MODULE.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB11) from side airbag module (RH), and connect the connector (1F) in test harness F to connector (AB11).<br>3) Connect the airbag resistor to connector (3F) in test harness F.<br>4) Connect the battery ground cable, and turn the ignition switch to ON.   | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the side airbag module (RH). <Ref. to AB-16, REMOVAL, Side Airbag Module.>  | Go to step 3.                                      |
| <b>3 CHECK SIDE AIRBAG HARNESS (RH).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB20) from seat belt pretensioner (RH).<br>3) Disconnect the airbag resistor from test harness F.<br>4) Disconnect the connector (AB8) from the airbag control module.<br>5) Connect the connector (1R) in test harness R to connector (AB8).<br>6) Measure the resistance between connector (3R) in test harness R and connector (3F) in test harness F.<br><i>Connector &amp; terminal</i><br><i>(3R) No. 18 — (3F) No. 4:</i><br><i>(3R) No. 20 — (3F) No. 3:</i> | Is the resistance less than 10 Ω?                                   | Go to step 4.   | Replace the side airbag harness with body harness. |
| <b>4 CHECK SIDE AIRBAG HARNESS (RH).</b><br>Measure the resistance between the connector (3R) terminals in test harness R.<br><i>Connector &amp; terminal</i><br><i>(3R) No. 18 — (3R) No. 20:</i>   | Is the resistance more than 1 MΩ?                                   | Go to step 5.   | Replace the side airbag harness with body harness. |
| <b>5 CHECK SIDE AIRBAG HARNESS (RH).</b><br>Measure the resistance between connector (3R) in test harness R and the chassis ground.<br><i>Connector &amp; terminal</i><br><i>(3R) No. 18 — Chassis ground:</i><br><i>(3R) No. 20 — Chassis ground:</i>   | Is the resistance more than 1 MΩ?                                   | Go to step 6.   | Replace the side airbag harness with body harness. |
| <b>6 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.   | Is the same DTC displayed?  | Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>  | Go to step 7.                                      |
| <b>7 CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Using the List of Diagnostic Trouble Code (DTC), check the DTC. <Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> | Finish the diagnosis.                              |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## X: DTC 42 SIDE AIRBAG LH FAILURE

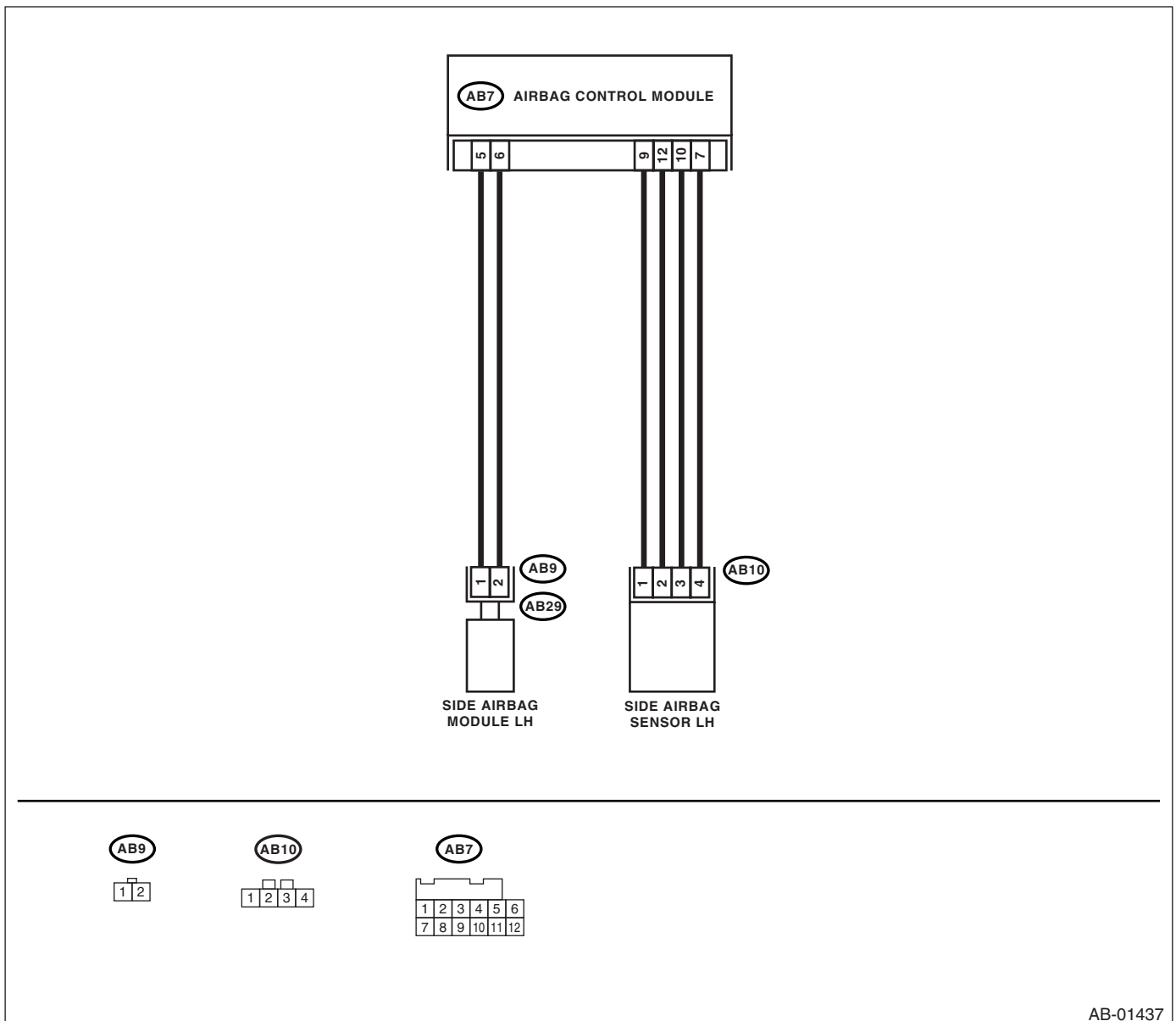
### DTC DETECTING CONDITION:

- Side airbag harness (LH) is faulty.
- Side airbag module (LH) is faulty.
- Airbag control module is faulty.

### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

### WIRING DIAGRAM:



AB-01437



## Diagnostic Chart with Trouble Code

### AIRBAG SYSTEM (DIAGNOSTICS)

| Step   | Check   | Yes   | No   |
|--|---|---|--|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module, and side airbag module LH and side airbag sensor LH for poor contact.   | Is there poor contact?  | Replace the side airbag harness with body harness.  | Go to step 2.                                      |
| <b>2 CHECK SIDE AIRBAG MODULE.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB9) from side airbag module (LH), and connect the connector (1F) in test harness F to connector (AB9).<br>3) Connect the airbag resistor to connector (3F) in test harness F.<br>4) Connect the battery ground cable, and turn the ignition switch to ON.   | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the side airbag module (LH). <Ref. to AB-16, REMOVAL, Side Airbag Module.>  | Go to step 3.                                      |
| <b>3 CHECK SIDE AIRBAG HARNESS (LH).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB19) from seat belt pretensioner (LH).<br>3) Disconnect the airbag resistor from the test harness.<br>4) Disconnect the connector (AB7) from the airbag control module.<br>5) Connect the connector (1R) in test harness R to the connector (AB7).<br>6) Measure the resistance between connector (3R) in test harness R and connector (3F) in test harness F.<br><b>Connector &amp; terminal</b><br><b>(3R) No. 12 — (3F) No. 3:</b><br><b>(3R) No. 10 — (3F) No. 4:</b> | Is the resistance less than 10 Ω?                                   | Go to step 4.   | Replace the side airbag harness with body harness. |
| <b>4 CHECK SIDE AIRBAG HARNESS (LH).</b><br>Measure the resistance between the connector (3R) terminals in test harness R.<br><b>Connector &amp; terminal</b><br><b>(3R) No. 12 — (3R) No. 10:</b>   | Is the resistance more than 1 MΩ?                                   | Go to step 5.   | Replace the side airbag harness with body harness. |
| <b>5 CHECK SIDE AIRBAG HARNESS (LH).</b><br>Measure the resistance between connector (3R) in test harness R and the chassis ground.<br><b>Connector &amp; terminal</b><br><b>(3R) No. 10 — Chassis ground:</b><br><b>(3R) No. 12 — Chassis ground:</b>   | Is the resistance more than 1 MΩ?                                   | Go to step 6.   | Replace the side airbag harness with body harness. |
| <b>6 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.   | Is the same DTC displayed?  | Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>  | Go to step 7.                                      |
| <b>7 CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Using the List of Diagnostic Trouble Code (DTC), check the DTC. <Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> | Finish the diagnosis.                              |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## Y: DTC 45 SIDE AIRBAG RH FAILURE

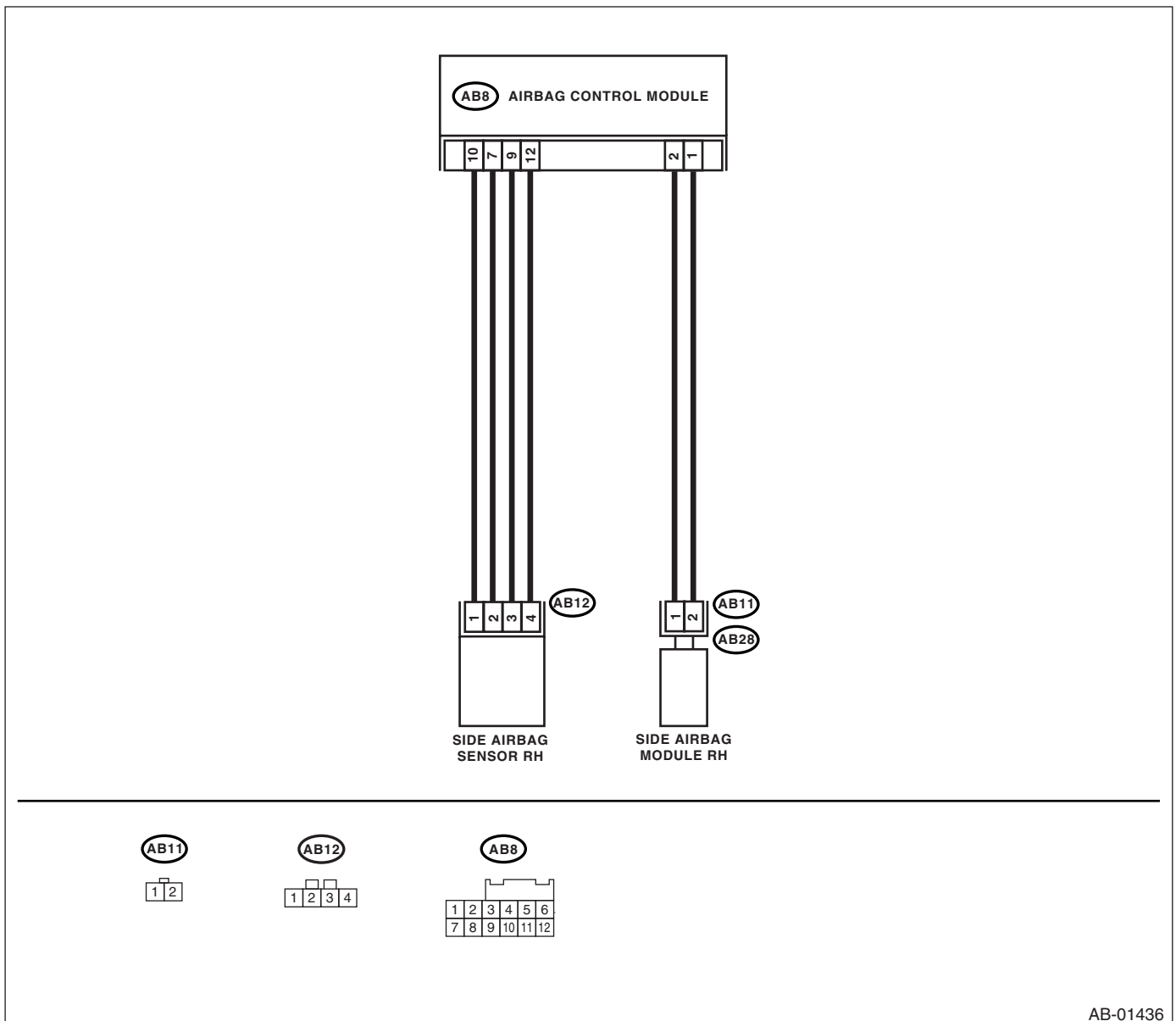
### DTC DETECTING CONDITION:

- Side airbag harness is shorted to power supply.
- Side airbag module (RH) is faulty.
- Airbag control module is faulty.

### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

### WIRING DIAGRAM:



AB-01436

## Diagnostic Chart with Trouble Code

### AIRBAG SYSTEM (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module, and side airbag module RH and side airbag sensor RH for poor contact.  | Is there poor contact?  | Replace the side airbag harness with body harness.  | Go to step 2.                                      |
| <b>2 CHECK SIDE AIRBAG MODULE.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB11) from side airbag module (RH), and connect the connector (1F) in test harness F to connector (AB11).<br>3) Connect the airbag resistor to connector (3F) in test harness F.<br>4) Connect the battery ground cable, and turn the ignition switch to ON.  | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the side airbag module (RH). <Ref. to AB-16, REMOVAL, Side Airbag Module.>  | Go to step 3.                                      |
| <b>3 CHECK SIDE AIRBAG HARNESS (RH).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB20) from seat belt pretensioner (RH).<br>3) Disconnect the airbag resistor from the test harness.<br>4) Disconnect the connector (AB8) from the airbag control module.<br>5) Connect the connector (1R) in test harness R to the connector (AB8).<br>6) Connect the battery ground cable, and turn the ignition switch to ON.<br>7) Measure the voltage between connector (3R) in test harness R and the chassis ground.<br><b>Connector &amp; terminal</b><br><b>(3R) No. 18 (+) — Chassis ground (-):</b><br><b>(3R) No. 20 (+) — Chassis ground (-):</b> | Is the voltage less than 1 V?                                       | Go to step 4.   | Replace the side airbag harness with body harness. |
| <b>4 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.  | Is the same DTC displayed?  | Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>  | Go to step 5.                                      |
| <b>5 CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Using the List of Diagnostic Trouble Code (DTC), check the DTC. <Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> | Finish the diagnosis.                              |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## Z: DTC 46 SIDE AIRBAG LH FAILURE

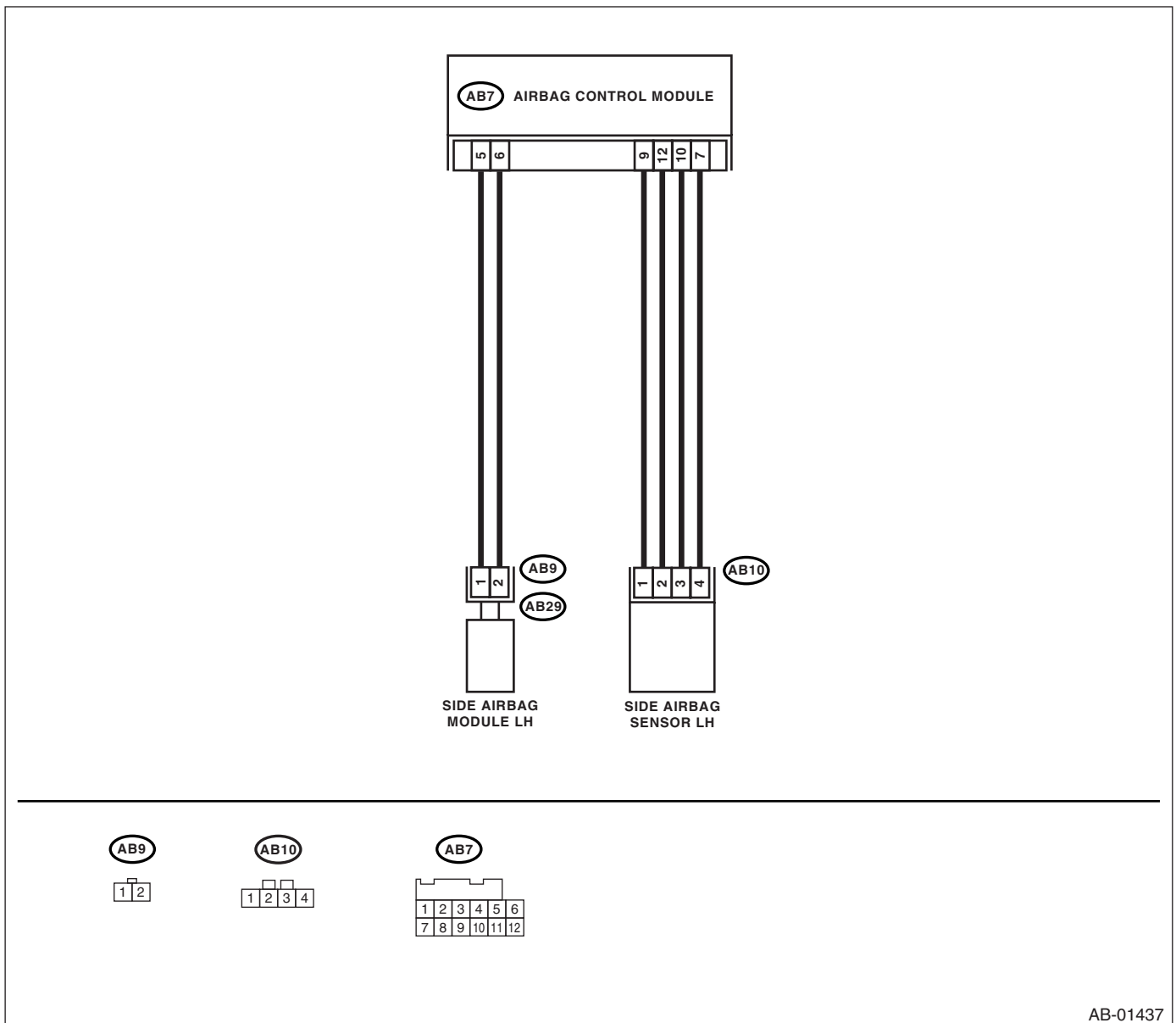
### DTC DETECTING CONDITION:

- Side airbag harness is shorted to power supply.
- Side airbag module (LH) is faulty.
- Airbag control module is faulty.

### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

### WIRING DIAGRAM:



AB-01437

## Diagnostic Chart with Trouble Code

### AIRBAG SYSTEM (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module, and side airbag module LH and side airbag sensor LH for poor contact.  | Is there poor contact?  | Replace the side airbag harness with body harness.  | Go to step 2.                                      |
| <b>2 CHECK SIDE AIRBAG MODULE.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB9) from side airbag module (LH), and connect the connector (1F) in test harness F to connector (AB9).<br>3) Connect the airbag resistor to connector (3F) in test harness F.<br>4) Connect the battery ground cable, and turn the ignition switch to ON.  | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the side airbag module (LH). <Ref. to AB-16, REMOVAL, Side Airbag Module.>  | Go to step 3.                                      |
| <b>3 CHECK SIDE AIRBAG HARNESS (LH).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB19) from seat belt pretensioner (LH).<br>3) Disconnect the airbag resistor from the test harness.<br>4) Disconnect the connector (AB7) from the airbag control module.<br>5) Connect the connector (1R) in test harness R to the connector (AB7).<br>6) Connect the battery ground cable, and turn the ignition switch to ON.<br>7) Measure the voltage between connector (3R) in test harness R and the chassis ground.<br><b>Connector &amp; terminal</b><br><b>(3R) No. 10 (+) — Chassis ground (-):</b><br><b>(3R) No. 12 (+) — Chassis ground (-):</b> | Is the voltage less than 1 V?                                       | Go to step 4.   | Replace the side airbag harness with body harness. |
| <b>4 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.  | Is the same DTC displayed?  | Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>  | Go to step 5.                                      |
| <b>5 CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Using the List of Diagnostic Trouble Code (DTC), check the DTC. <Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> | Finish the diagnosis.                              |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## AA:DTC 51 SIDE AIRBAG RH FAILURE

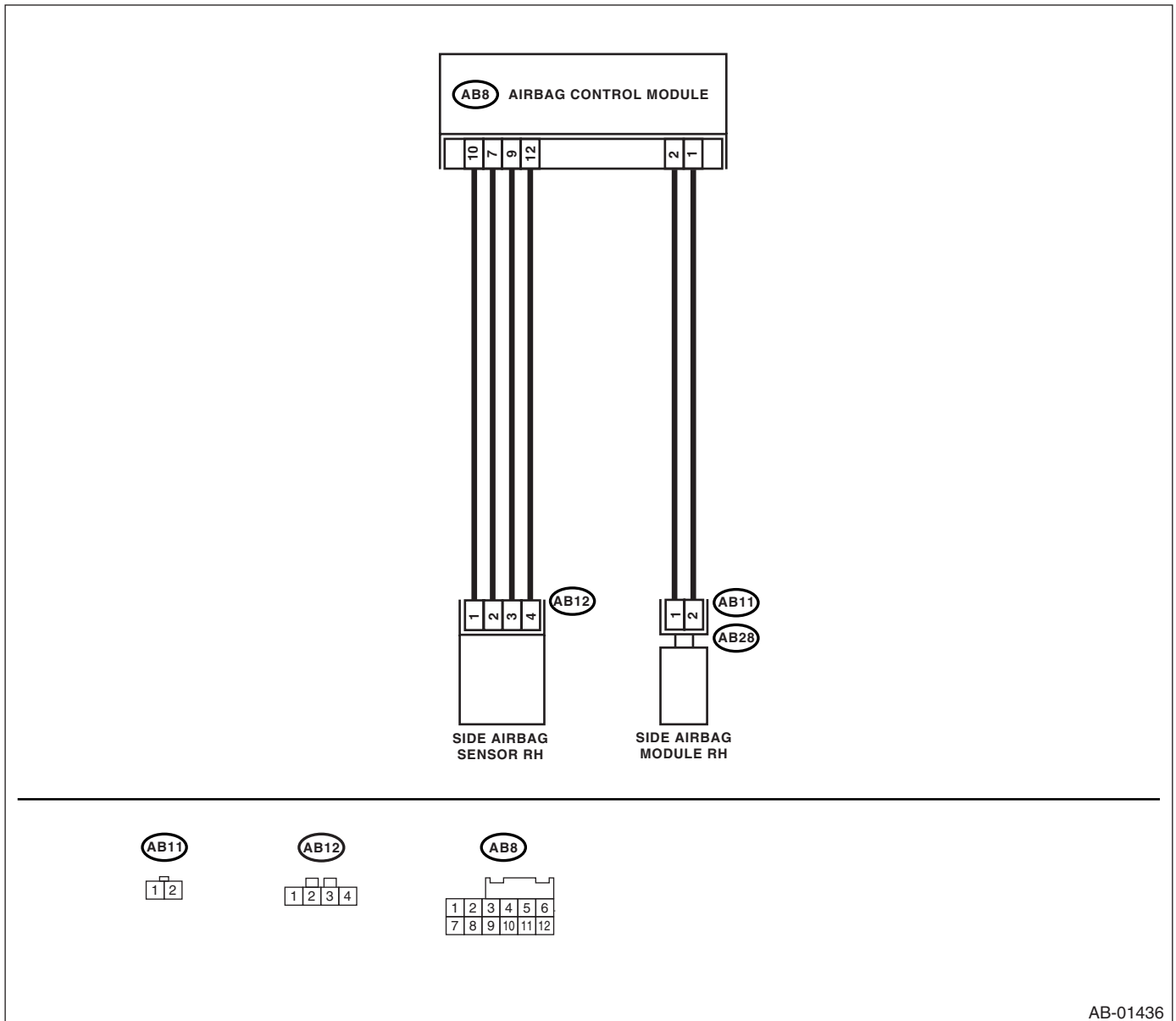
### DTC DETECTING CONDITION:

- Side airbag sensor (RH) is faulty.
- Side airbag harness (RH) is faulty.
- Airbag control module is faulty.

### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

### WIRING DIAGRAM:



AB-01436

# Diagnostic Chart with Trouble Code

## AIRBAG SYSTEM (DIAGNOSTICS)

| Step   | Check                             | Yes   | No   |
|--|-----------------------------------|---|--|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module, and side airbag module RH and side airbag sensor RH for poor contact.   | Is there poor contact?            | Replace the side airbag harness with body harness.  | Go to step 2.                                      |
| <b>2 CHECK SIDE AIRBAG HARNESS (RH).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB20) from seat belt pretensioner (RH).<br>3) Disconnect the connector (AB8) from the airbag control module.<br>4) Connect the connector (1R) in test harness R to connector (AB8).<br>5) Disconnect the connector (AB20) from the side airbag sensor (RH), and connect the connector (2V) in test harness V to connector (AB20).<br>6) Measure the resistance between connector (4R) in test harness R and the connector (3V) in test harness V.<br><b>Connector &amp; terminal</b><br>(4R) No. 5 — (3V) No. 2:<br>(4R) No. 6 — (3V) No. 4:<br>(4R) No. 7 — (3V) No. 1:<br>(4R) No. 8 — (3V) No. 5: | Is the resistance less than 10 Ω? | Go to step 3.   | Replace the side airbag harness with body harness. |
| <b>3 CHECK SIDE AIRBAG HARNESS.</b><br>Measure the resistance between connector (4R) terminals in test harness R, and between connector (4R) in test harness R and chassis ground.<br><b>Connector &amp; terminal</b><br>(4R) No. 5 — (4R) No. 7:<br>(4R) No. 5 — (4R) No. 6:<br>(4R) No. 5 — (4R) No. 8:<br>(4R) No. 6 — (4R) No. 7:<br>(4R) No. 6 — (4R) No. 8:<br>(4R) No. 7 — (4R) No. 8:<br>(4R) No. 5 — Chassis ground:<br>(4R) No. 6 — Chassis ground:<br>(4R) No. 7 — Chassis ground:<br>(4R) No. 8 — Chassis ground:  | Is the resistance more than 1 MΩ? | Go to step 4.   | Replace the side airbag harness with body harness. |
| <b>4 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.   | Is the same DTC displayed?        | Replace the side airbag sensor (RH). <Ref. to AB-19, Side Airbag Sensor.>When the problem is not corrected after sensor replacement, replace the airbag control module. <Ref. to AB-18, Airbag Control Module.> | Go to step 5.                                      |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

|   | Step                                       | Check                       | Yes  | No                    |
|---|--|-----------------------------|--|-----------------------|
| 5 | <b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Using the List of Diagnostic Trouble Code (DTC), check the DTC.<br><Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> | Finish the diagnosis. |



# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## AB:DTC 52 SIDE AIRBAG SENSOR LH FAILURE

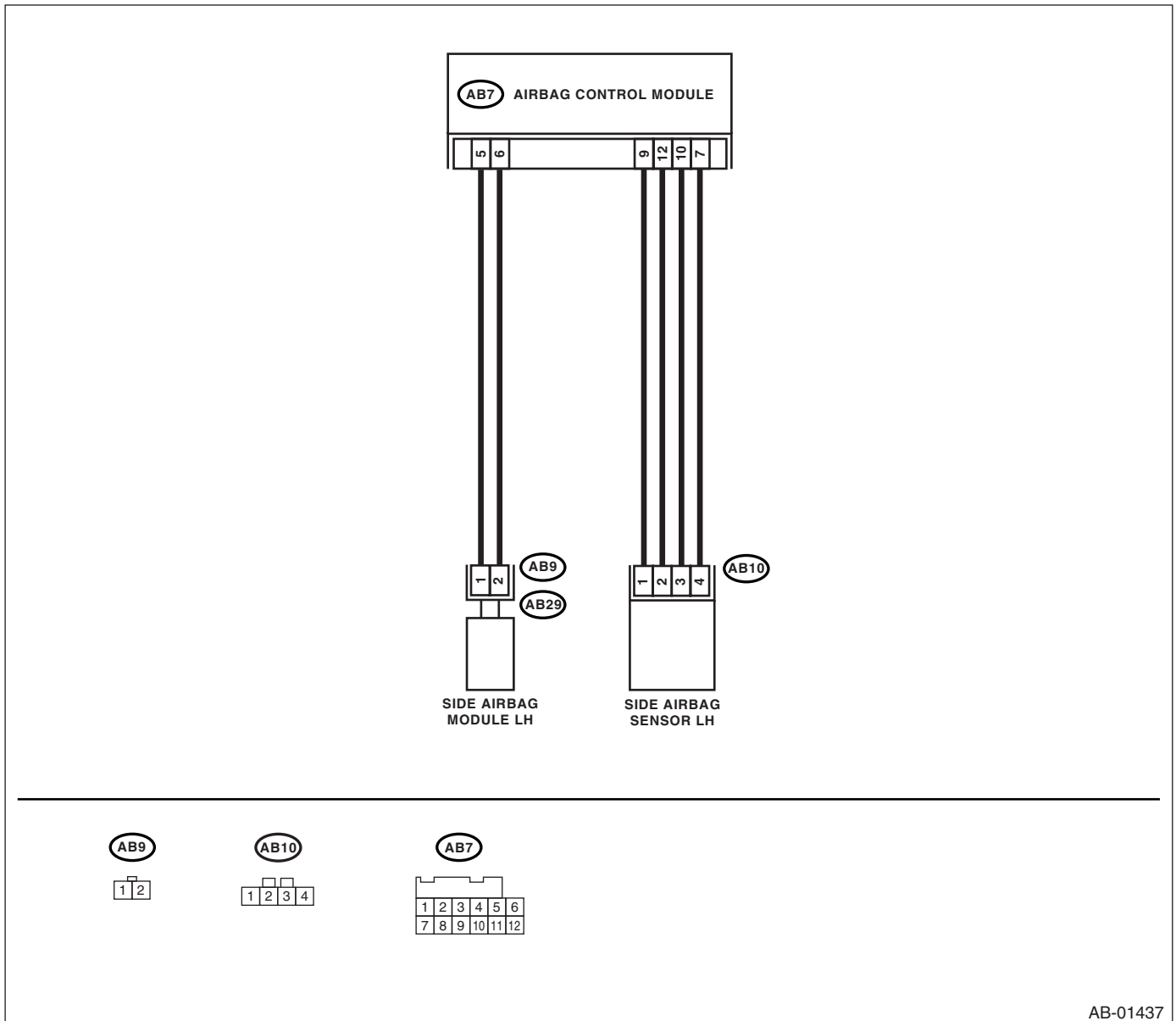
### DTC DETECTING CONDITION:

- Side airbag sensor (LH) is faulty.
- Side airbag harness (LH) is faulty.
- Airbag control module is faulty.

### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

### WIRING DIAGRAM:



AB-01437

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

| Step  | Check                             | Yes   | No   |
|---|-----------------------------------|---|--|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module, and side airbag module LH and side airbag sensor LH for poor contact.  | Is there poor contact?            | Replace the side airbag harness with body harness.  | Go to step 2.                                      |
| <b>2 CHECK SIDE AIRBAG HARNESS (LH).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB19) from seat belt pretensioner (LH).<br>3) Disconnect the connector (AB9) from side airbag module (LH).<br>4) Disconnect the connector (AB7) from the airbag control module.<br>5) Connect the connector (1R) in test harness R to the connector (AB7).<br>6) Disconnect the connector (AB10) from the side airbag sensor (LH), and connect the connector (2V) in test harness V to connector (AB10).<br>7) Measure the resistance between connector (4R) in test harness R and the connector (3V) in test harness V.<br><b>Connector &amp; terminal</b><br><i>(4R) No. 4 — (3V) No. 2:</i><br><i>(4R) No. 3 — (3V) No. 4:</i><br><i>(4R) No. 2 — (3V) No. 1:</i><br><i>(4R) No. 1 — (3V) No. 5:</i> | Is the resistance less than 10 Ω? | Go to step 3.   | Replace the side airbag harness with body harness. |
| <b>3 CHECK SIDE AIRBAG HARNESS (LH).</b><br>Measure the resistance between connector (4R) terminals in test harness R, and between connector (4R) in test harness R and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(4R) No. 4 — (4R) No. 3:</i><br><i>(4R) No. 4 — (4R) No. 2:</i><br><i>(4R) No. 4 — (4R) No. 1:</i><br><i>(4R) No. 3 — (4R) No. 2:</i><br><i>(4R) No. 3 — (4R) No. 1:</i><br><i>(4R) No. 2 — (4R) No. 1:</i><br><i>(4R) No. 4 — Chassis ground:</i><br><i>(4R) No. 3 — Chassis ground:</i><br><i>(4R) No. 2 — Chassis ground:</i><br><i>(4R) No. 1 — Chassis ground:</i>  | Is the resistance more than 1 MΩ? | Go to step 4.   | Replace the side airbag harness with body harness. |
| <b>4 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.  | Is the same DTC displayed?        | Replace the side airbag sensor (LH). <Ref. to AB-19, Side Airbag Sensor.>When the problem is not corrected after sensor replacement, replace the airbag control module. <Ref. to AB-18, Airbag Control Module.> | Go to step 5.                                      |

# Diagnostic Chart with Trouble Code

## AIRBAG SYSTEM (DIAGNOSTICS)

| Step  | Check                       | Yes  | No                    |
|---|-----------------------------|--|-----------------------|
| 5<br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Using the List of Diagnostic Trouble Code (DTC), check the DTC.<br><Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> | Finish the diagnosis. |

### **AC:DTC 53 SIDE AIRBAG RH FAILURE**

#### **DTC DETECTING CONDITION:**

Side airbag sensor (RH) is faulty.

When Code 53 is displayed, the circuit within the side airbag sensor (RH) is faulty. Replace the side airbag sensor (RH).

<Ref. to AB-19, Side Airbag Sensor.>

### **AD:DTC 54 SIDE AIRBAG SENSOR LH FAILURE**

#### **DTC DETECTING CONDITION:**

Side airbag sensor (LH) is faulty.

When Code 54 is displayed, the circuit within the side airbag sensor (LH) is faulty. Replace the side airbag sensor (LH).

<Ref. to AB-19, Side Airbag Sensor.>

### **AE:DTC 55 SIDE CURTAIN AIRBAG FIRING OUTPUT**

This DTC is displayed when the side airbag is deployed.

When this DTC is displayed, the memory cannot be erased. Replace the following parts.

- Airbag control module <Ref. to AB-18, Airbag Control Module.>
- Front seat with side airbag module (Operating side) <Ref. to SE-7, Front Seat.>
- Side airbag sensor (Operating side) <Ref. to AB-19, Side Airbag Sensor.>

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## AF:DTC 61 BELT PRETENSIONER RH FAILURE

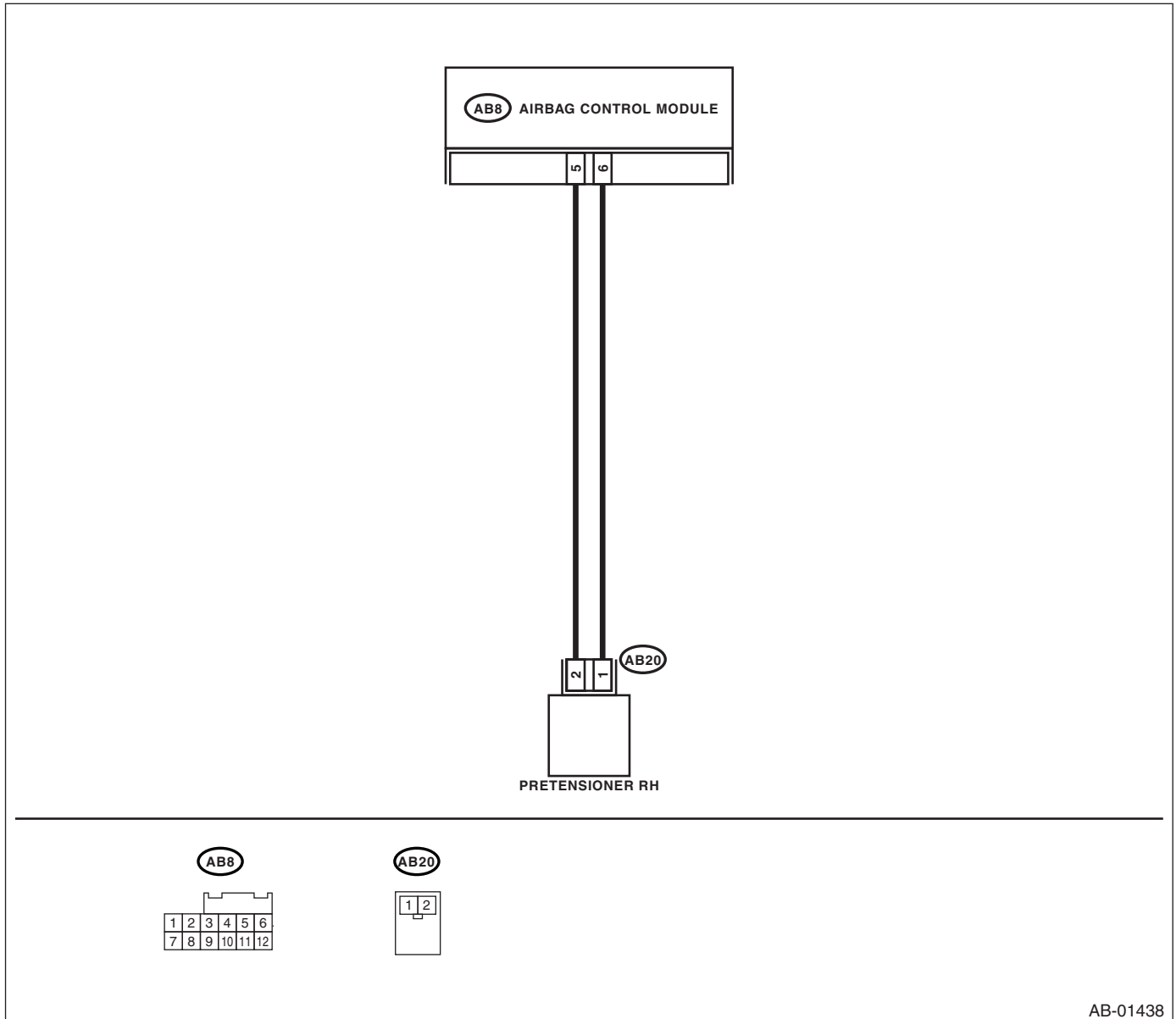
### DTC DETECTING CONDITION:

- Seat belt pretensioner (RH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Pretensioner harness is faulty.

### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

### WIRING DIAGRAM:



AB-01438

## Diagnostic Chart with Trouble Code

### AIRBAG SYSTEM (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module and seat belt pretensioner RH for poor contact.   | Is there poor contact?  | Replace the side airbag harness with body harness.  | Go to step 2.                                      |
| <b>2 CHECK SEAT BELT PRETENSIONER.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB20) from seat belt pretensioner (RH).<br>3) Connect the connector (1N) in test harness N to connector (AB20).<br>4) Connect the airbag resistor to the connector (2N) in test harness N.<br>5) Connect the battery ground cable, and turn the ignition switch to ON.  | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the seat belt pretensioner (RH). <Ref. to SB-10, Front Seat Belt.>  | Go to step 3.                                      |
| <b>3 CHECK SIDE AIRBAG HARNESS (RH).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the airbag resistor from the test harness.<br>3) Disconnect the connector (AB11) from side airbag module (RH).<br>4) Disconnect the connectors (AB7) and (AB8) from the airbag control module.<br>5) Connect the connector (1R) in test harness R to the connector (AB8).<br>6) Measure the resistance between connector (3R) in test harness R and the connector (2N) in test harness N.<br><b>Connector &amp; terminal</b><br><b>(3R) No. 17 — (2N) No. 2:</b><br><b>(3R) No. 19 — (2N) No. 1:</b> | Is the resistance less than 10 $\Omega$ ?                           | Go to step 4.   | Replace the side airbag harness with body harness. |
| <b>4 CHECK SIDE AIRBAG HARNESS (RH).</b><br>Measure the resistance between the connector (3R) terminals in test harness R.<br><b>Connector &amp; terminal</b><br><b>(3R) No. 17 — (3R) No. 19:</b>  | Is the resistance more than 1 M $\Omega$ ?                          | Go to step 5.   | Replace the side airbag harness with body harness. |
| <b>5 CHECK SIDE AIRBAG HARNESS (RH).</b><br>Measure the resistance between connector (3R) in test harness R and the chassis ground.<br><b>Connector &amp; terminal</b><br><b>(3R) No. 17 — Chassis ground:</b><br><b>(3R) No. 19 — Chassis ground:</b>  | Is the resistance more than 1 M $\Omega$ ?                          | Go to step 6.   | Replace the side airbag harness with body harness. |
| <b>6 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.  | Is the same DTC displayed?  | Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>  | Go to step 7.                                      |
| <b>7 CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Using the List of Diagnostic Trouble Code (DTC), check the DTC. <Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> | Finish the diagnosis.                              |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## AG:DTC 62 BELT PRETENSIONER LH FAILURE

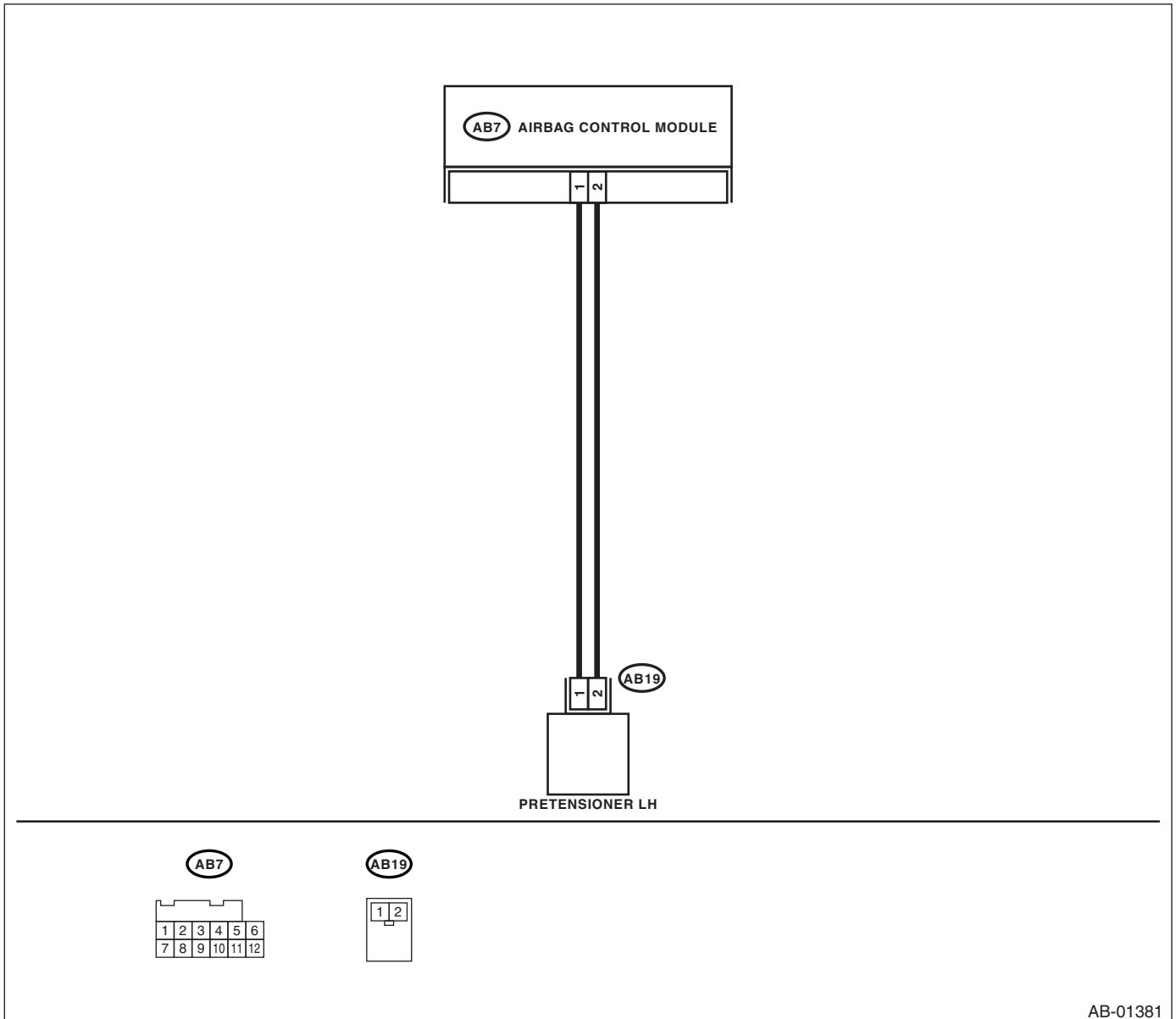
### DTC DETECTING CONDITION:

- Seat belt pretensioner (LH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Pretensioner harness is faulty.

### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

### WIRING DIAGRAM:



## Diagnostic Chart with Trouble Code

### AIRBAG SYSTEM (DIAGNOSTICS)

| Step   | Check   | Yes   | No   |
|--|---|---|--|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module and seat belt pretensioner LH for poor contact.  | Is there poor contact?  | Replace the side airbag harness with body harness.  | Go to step 2.                                      |
| <b>2 CHECK SEAT BELT PRETENSIONER.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB19) from seat belt pretensioner (LH).<br>3) Connect the connector (1N) in test harness N to connector (AB19).<br>4) Connect the airbag resistor to the connector (2N) in test harness N.<br>5) Connect the battery ground cable, and turn the ignition switch to ON.   | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the seat belt pretensioner (LH). <Ref. to SB-10, Front Seat Belt.>  | Go to step 3.                                      |
| <b>3 CHECK SIDE AIRBAG HARNESS (LH).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the airbag resistor from the test harness.<br>3) Disconnect the connector (AB9) from side airbag module (LH).<br>4) Disconnect the connectors (AB7) and (AB8) from the airbag control module.<br>5) Connect the connector (1R) in test harness R to the connector (AB7).<br>6) Measure the resistance between connector (3R) in test harness R and the connector (2N) in test harness N.<br><i>Connector &amp; terminal</i><br><i>(3R) No. 11 — (2N) No. 2:</i><br><i>(3R) No. 13 — (2N) No. 1:</i> | Is the resistance less than 10 Ω?                                   | Go to step 4.   | Replace the side airbag harness with body harness. |
| <b>4 CHECK SIDE AIRBAG HARNESS (LH).</b><br>Measure the resistance between the connector (3R) terminals in test harness R.<br><i>Connector &amp; terminal</i><br><i>(3R) No. 11 — (3R) No. 13:</i>   | Is the resistance more than 1 MΩ?                                   | Go to step 5.   | Replace the side airbag harness with body harness. |
| <b>5 CHECK SIDE AIRBAG HARNESS (LH).</b><br>Measure the resistance between connector (3R) in test harness R and the chassis ground.<br><i>Connector &amp; terminal</i><br><i>(3R) No. 11 — Chassis ground:</i><br><i>(3R) No. 13 — Chassis ground:</i>   | Is the resistance more than 1 MΩ?                                   | Go to step 6.   | Replace the side airbag harness with body harness. |
| <b>6 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.   | Is the same DTC displayed?  | Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>  | Go to step 7.                                      |
| <b>7 CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Using the List of Diagnostic Trouble Code (DTC), check the DTC. <Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> | Finish the diagnosis.                              |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## AH:DTC 65 BELT PRETENSIONER RH FAILURE

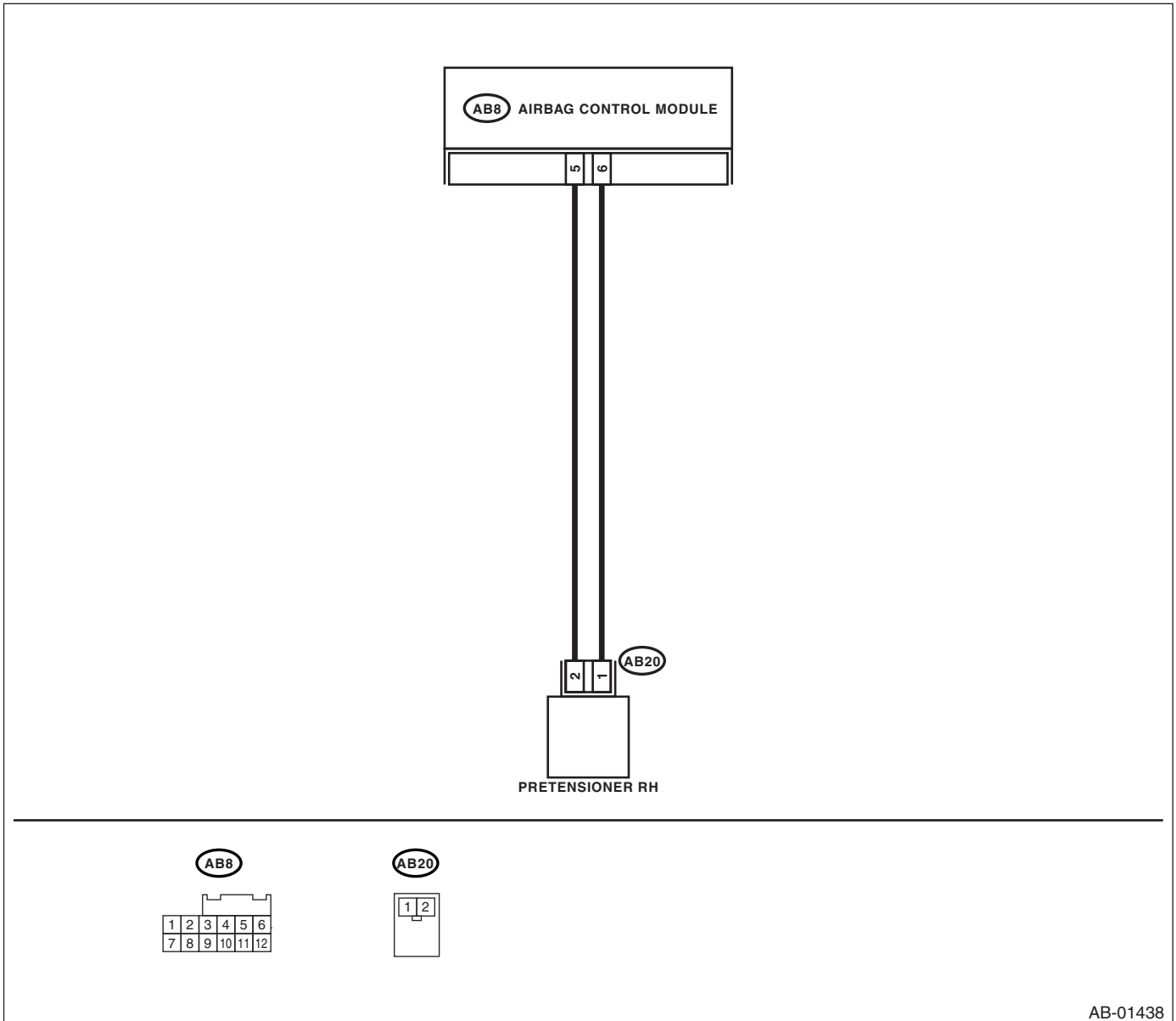
### DTC DETECTING CONDITION:

- Seat belt pretensioner (RH) circuit is shorted to the power supply.
- Pretensioner is faulty.
- Pretensioner harness is faulty.
- Airbag control module is faulty.

### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

### WIRING DIAGRAM:



AB-01438



# Diagnostic Chart with Trouble Code

## AIRBAG SYSTEM (DIAGNOSTICS)

| Step   | Check   | Yes   | No   |
|--|---|---|--|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module and seat belt pretensioner RH for poor contact.  | Is there poor contact?  | Replace the side airbag harness with body harness.  | Go to step 2.                                      |
| <b>2 CHECK SEAT BELT PRETENSIONER.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB20) from seat belt pretensioner (RH).<br>3) Connect the connector (1N) in test harness N to connector (AB20).<br>4) Connect the airbag resistor to the connector (2N) in test harness N.<br>5) Connect the battery ground cable, and turn the ignition switch to ON.   | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the seat belt pretensioner (RH). <Ref. to SB-10, Front Seat Belt.>  | Go to step 3.                                      |
| <b>3 CHECK SIDE AIRBAG HARNESS (RH).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the airbag resistor from the test harness.<br>3) Disconnect the connector (AB11) from side airbag module (RH).<br>4) Disconnect the connectors (AB7) and (AB8) from the airbag control module.<br>5) Connect the connector (1R) in test harness R to the connector (AB8).<br>6) Connect the battery ground cable, and turn the ignition switch to ON.<br>7) Measure the voltage between connector (3R) in test harness R and the chassis ground.<br><b>Connector &amp; terminal</b><br><i>(3R) No. 17 (+) — Chassis ground (-):</i><br><i>(3R) No. 19 (+) — Chassis ground (-):</i> | Is the voltage less than 1 V?                                       | Go to step 4.   | Replace the side airbag harness with body harness. |
| <b>4 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.   | Is the same DTC displayed?  | Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>  | Go to step 5.                                      |
| <b>5 CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed?   | Using the List of Diagnostic Trouble Code (DTC), check the DTC. <Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> | Finish the diagnosis.                              |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## AI: DTC 66 BELT PRETENSIONER LH FAILURE

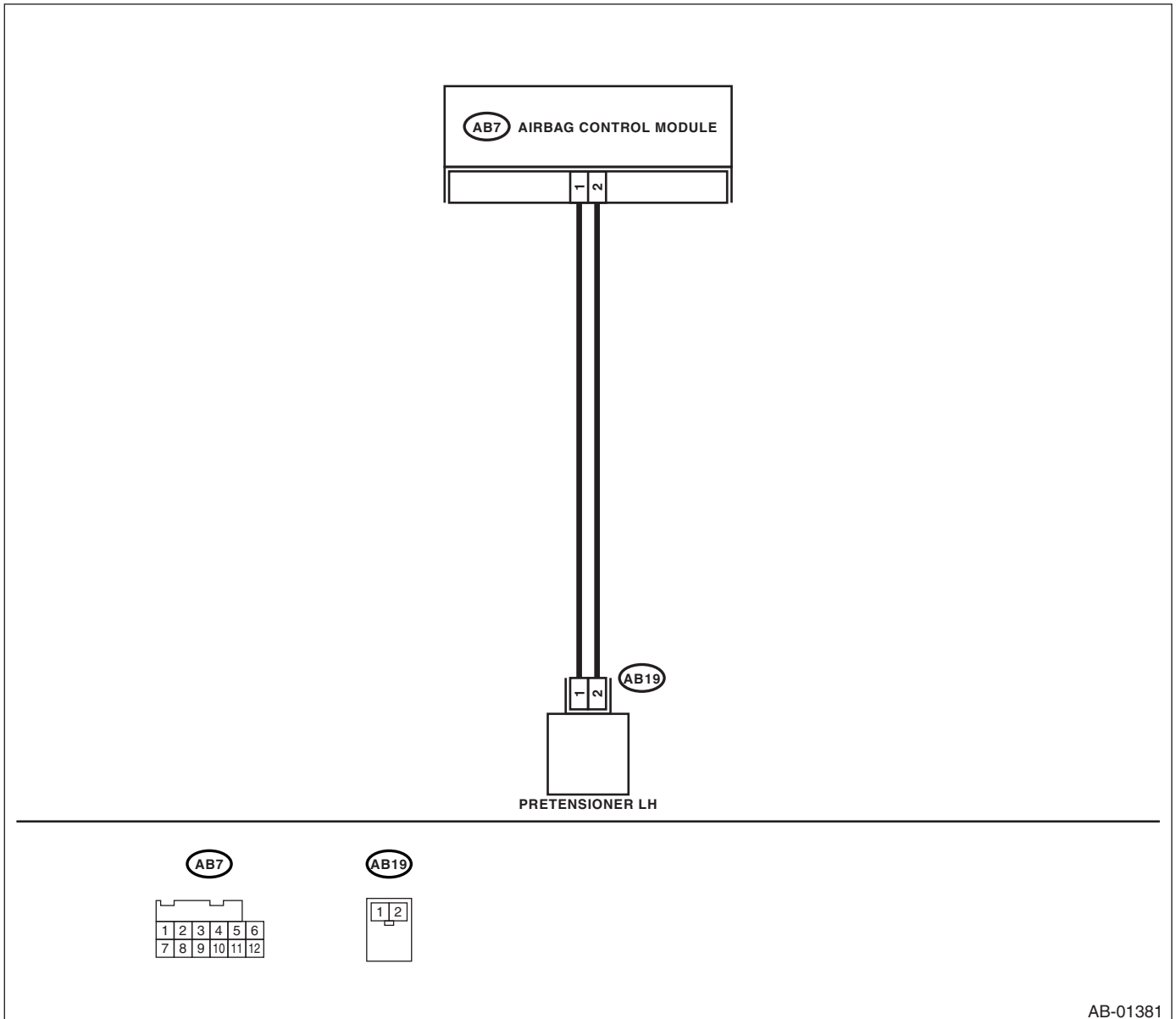
### DTC DETECTING CONDITION:

- Seat belt pretensioner (LH) circuit is shorted to the power supply.
- Pretensioner is faulty.
- Pretensioner harness is faulty.
- Airbag control module is faulty.

### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module and the sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

### WIRING DIAGRAM:



AB-01381

## Diagnostic Chart with Trouble Code

### AIRBAG SYSTEM (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module and seat belt pretensioner LH for poor contact.   | Is there poor contact?  | Replace the side airbag harness with body harness.  | Go to step 2.                                      |
| <b>2 CHECK SEAT BELT PRETENSIONER.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the connector (AB19) from seat belt pretensioner (LH).<br>3) Connect the connector (1N) in test harness N to connector (AB19).<br>4) Connect the airbag resistor to the connector (2N) in test harness N.<br>5) Connect the battery ground cable, and turn the ignition switch to ON.  | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the seat belt pretensioner (LH). <Ref. to SB-10, Front Seat Belt.>  | Go to step 3.                                      |
| <b>3 CHECK SIDE AIRBAG HARNESS (LH).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the airbag resistor from the test harness.<br>3) Disconnect the connector (AB9) from side airbag module (LH).<br>4) Disconnect the connectors (AB7) and (AB8) from the airbag control module.<br>5) Connect the connector (1R) in test harness R to the connector (AB7).<br>6) Connect the battery ground cable, and turn the ignition switch to ON.<br>7) Measure the voltage between connector (3R) in test harness R and the chassis ground.<br><b>Connector &amp; terminal</b><br><i>(3R) No. 11 (+) — Chassis ground (-):</i><br><i>(3R) No. 13 (+) — Chassis ground (-):</i> | Is the voltage less than 1 V?                                       | Go to step 4.   | Replace the side airbag harness with body harness. |
| <b>4 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.  | Is the same DTC displayed?  | Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>  | Go to step 5.                                      |
| <b>5 CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Using the List of Diagnostic Trouble Code (DTC), check the DTC. <Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> | Finish the diagnosis.                              |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## AJ:DTC 71 DRIVER'S AIRBAG FAILURE

### DTC DETECTING CONDITION:

- Airbag main harness circuit is open, shorted or shorted to ground.
- Airbag module harness (Driver) circuit is open, shorted or shorted to ground.
- Roll connector circuit is open, shorted or shorted to ground.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

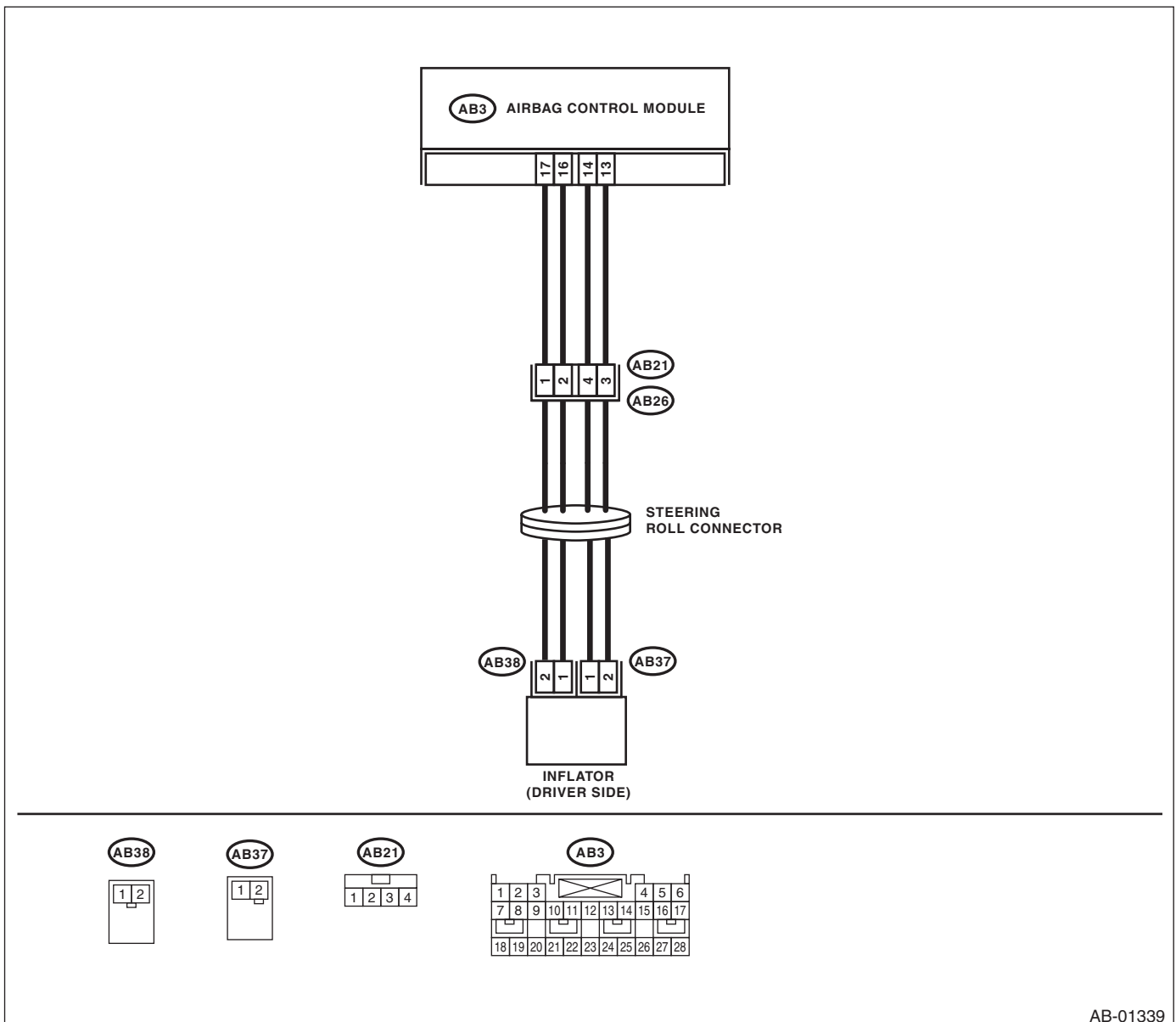
### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module and the sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors, and seat belt pretensioner for safety reasons.

### NOTE:

Prior to work, prepare two airbag resistors (98299PA040).

### WIRING DIAGRAM:



AB-01339

## Diagnostic Chart with Trouble Code

### AIRBAG SYSTEM (DIAGNOSTICS)

| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <b>1</b><br><b>CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module and driver's airbag module for poor contact.  | Is there poor contact?  | Replace the airbag main harness with body harness.                           | Go to step 2.                                      |
| <b>2</b><br><b>CHECK DRIVER'S AIRBAG MODULE.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Remove the driver's airbag module.<br>3) Connect the connector (1N) in test harness N to connector (AB38).<br>4) Connect the airbag resistor to the connector (2N) in test harness N.<br>5) Connect the connector (1Q) in test harness Q to connector (AB 37).<br>6) Connect the airbag resistor to connector (2Q) in test harness Q.<br>7) Connect the battery ground cable, and turn the ignition switch to ON.   | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the driver's airbag module. <Ref. to AB-14, Driver's Airbag Module.> | Go to step 3.                                      |
| <b>3</b><br><b>CHECK ROLL CONNECTOR.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the test harness N from connector (AB38).<br>3) Disconnect the test harness Q from connector (AB37).<br>4) Remove the instrument panel lower cover and disconnect the connector (AB26) from (AB21).<br>5) Connect the connector (1P) in test harness P to connector (AB21).<br>6) Connect the airbag resistor to connectors (2P) and (3P) in test harness P.<br>7) Connect the battery ground cable, and turn the ignition switch to ON.   | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the roll connector. <Ref. to AB-20, Roll Connector.>                 | Go to step 4.                                      |
| <b>4</b><br><b>CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the airbag resistor from connectors (2P) and (3P) in test harness P.<br>3) Remove the instrument panel side cover on passenger side, and disconnect the connectors (AB4) and (AB27).<br>4) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R.<br>5) Measure the resistance between connector (2R) in test harness R and connectors (2P) and (3P) in test harness P.<br><b>Connector &amp; terminal</b><br>(2R) No. 2 — (2P) No. 1:<br>(2R) No. 4 — (2P) No. 2:<br>(2R) No. 8 — (3P) No. 3:<br>(2R) No. 12 — (3P) No. 3: | Is the resistance less than 10 $\Omega$ ?                           | Go to step 5.  | Replace the airbag main harness with body harness. |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

| Step  | Check                             | Yes  | No   |
|---|-----------------------------------|--|--|
| <b>5 CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS).</b><br>Measure the resistance between connector (2R) terminals in test harness R, and between connector (2R) and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(2R) No. 2 — (2R) No. 4:</i><br><i>(2R) No. 4 — Chassis ground:</i><br><i>(2R) No. 2 — Chassis ground:</i><br><i>(2R) No. 8 — (2R) No. 12:</i><br><i>(2R) No. 8 — Chassis ground:</i><br><i>(2R) No. 12 — Chassis ground:</i><br><i>(2R) No. 2 — (2R) No. 8:</i><br><i>(2R) No. 2 — (2R) No. 12:</i><br><i>(2R) No. 4 — (2R) No. 8:</i><br><i>(2R) No. 4 — (2R) No. 12:</i> | Is the resistance more than 1 MΩ? | Go to step 6.  | Replace the airbag main harness with body harness. |
| <b>6 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.  | Is the same DTC displayed?        | Replace the airbag control module.<br><Ref. to AB-18, Airbag Control Module.>  | Go to step 7.                                      |
| <b>7 CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?       | Using the List of Diagnostic Trouble Code (DTC), check the DTC.<br><Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> | Finish the diagnosis.                              |

# Diagnostic Chart with Trouble Code

## AIRBAG SYSTEM (DIAGNOSTICS)

### AK:DTC 72 PASSENGER'S AIRBAG FAILURE

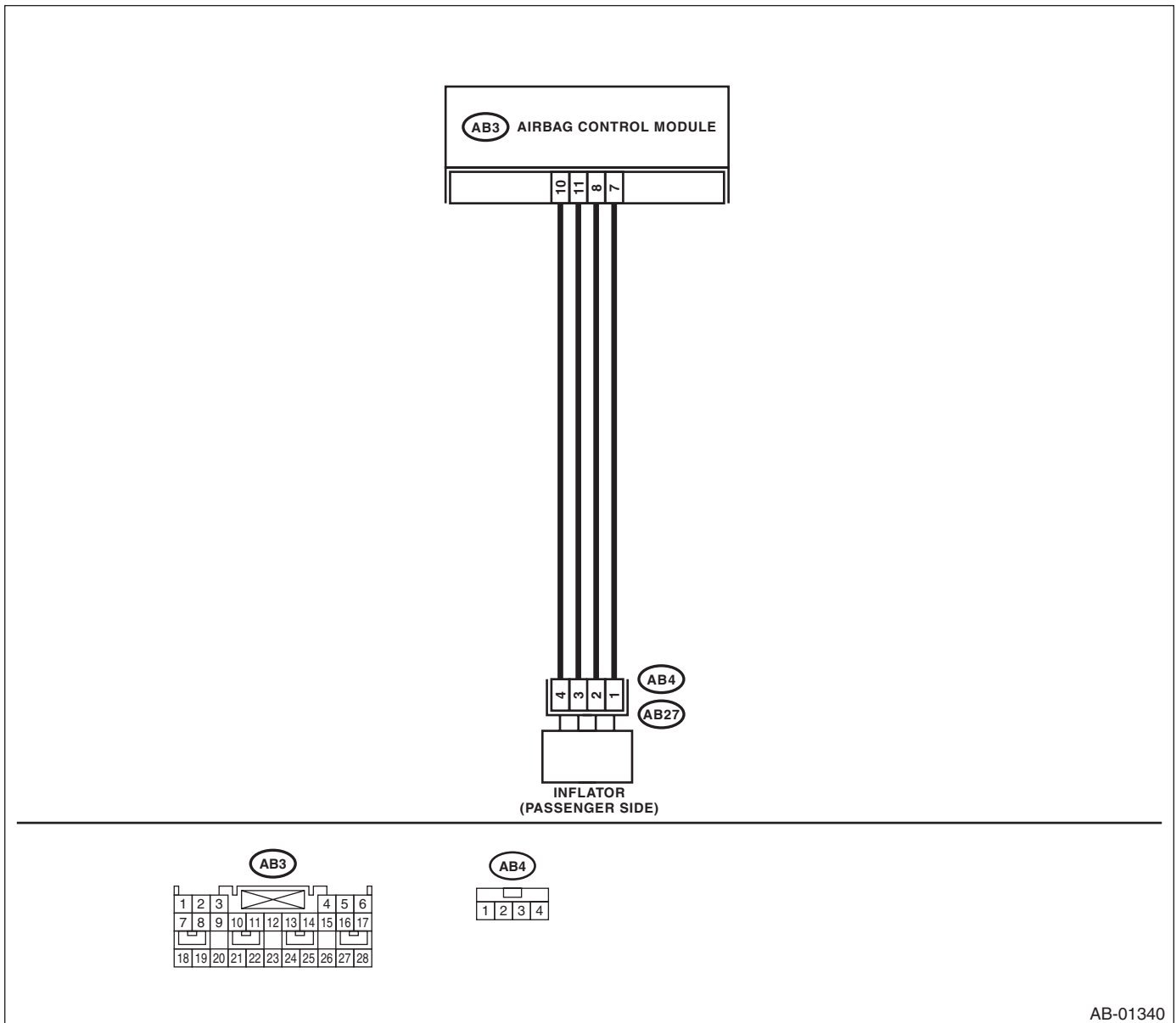
#### DTC DETECTING CONDITION:

- Airbag harness is open, shorted or shorted to ground.
- Airbag module (Passenger) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Passenger's airbag module is faulty.

#### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module for safety reasons.

#### WIRING DIAGRAM:



AB-01340

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

| Step   | Check   | Yes  | No   |
|--|---|--|--|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module and passenger's airbag module for poor contact.  | Is there poor contact?  | Replace the airbag main harness with body harness.                                 | Go to step 2.                                      |
| <b>2 CHECK PASSENGER'S AIRBAG MODULE.</b><br>1) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.<br>2) Remove the glove box.<br>3) Disconnect the connector of passenger's airbag module from (AB4).<br>4) Connect the connector (1P) in test harness P to connector (AB4).<br>5) Connect the two airbag resistors to connectors (2P) and (3P) in test harness P.<br>6) Connect the battery ground cable, and turn the ignition switch to ON.  | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the passenger's airbag module. <Ref. to AB-15, Passenger's Airbag Module.> | Go to step 3.                                      |
| <b>3 CHECK AIRBAG MAIN HARNESS.</b><br>1) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.<br>2) Disconnect the two airbag resistors from connectors (2P) and (3P) in test harness P.<br>3) Remove the lower cover and disconnect the connector (AB26) from (AB21).<br>4) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R.<br>5) Measure the resistance between connector (2R) in test harness R and the connectors (2P) (3P) in test harness P.<br><b>Connector &amp; terminal</b><br><i>(2R) No. 9 — (3P) No. 3:</i><br><i>(2R) No. 13 — (3P) No. 4:</i><br><i>(2R) No. 3 — (2P) No. 2:</i><br><i>(2R) No. 5 — (2P) No. 1:</i> | Is the resistance less than 10 Ω?                                   | Go to step 4.  | Replace the airbag main harness with body harness. |
| <b>4 CHECK AIRBAG MAIN HARNESS.</b><br>Measure the resistance in the connector (2R) in test harness R.<br><b>Connector &amp; terminal</b><br><i>(2R) No. 9 — (2R) No. 13:</i><br><i>(2R) No. 9 — Chassis ground:</i><br><i>(2R) No. 13 — Chassis ground:</i><br><i>(2R) No. 3 — (2R) No. 5:</i><br><i>(2R) No. 3 — Chassis ground:</i><br><i>(2R) No. 5 — Chassis ground:</i><br><i>(2R) No. 3 — (2R) No. 9:</i><br><i>(2R) No. 3 — (2R) No. 13:</i><br><i>(2R) No. 5 — (2R) No. 9:</i><br><i>(2R) No. 5 — (2R) No. 13:</i>  | Is the resistance more than 1 MΩ?                                   | Go to step 5.  | Replace the airbag main harness with body harness. |
| <b>5 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.   | Is the same DTC displayed?  | Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>         | Go to step 6.                                      |



## Diagnostic Chart with Trouble Code

### AIRBAG SYSTEM (DIAGNOSTICS)

|   | Step                                       | Check                       | Yes  | No                    |
|---|--|-----------------------------|--|-----------------------|
| 6 | <b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b> | Is any other DTC displayed? | Using the List of Diagnostic Trouble Code (DTC), check the DTC.<br><Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> | Finish the diagnosis. |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

## AL:DTC 75 DRIVER'S AIRBAG FAILURE

### DTC DETECTING CONDITION:

- Airbag main harness circuit (Driver) is shorted to the power supply.
- Airbag module harness (Driver) is shorted to the power supply.
- Roll connector is shorted to the power supply.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

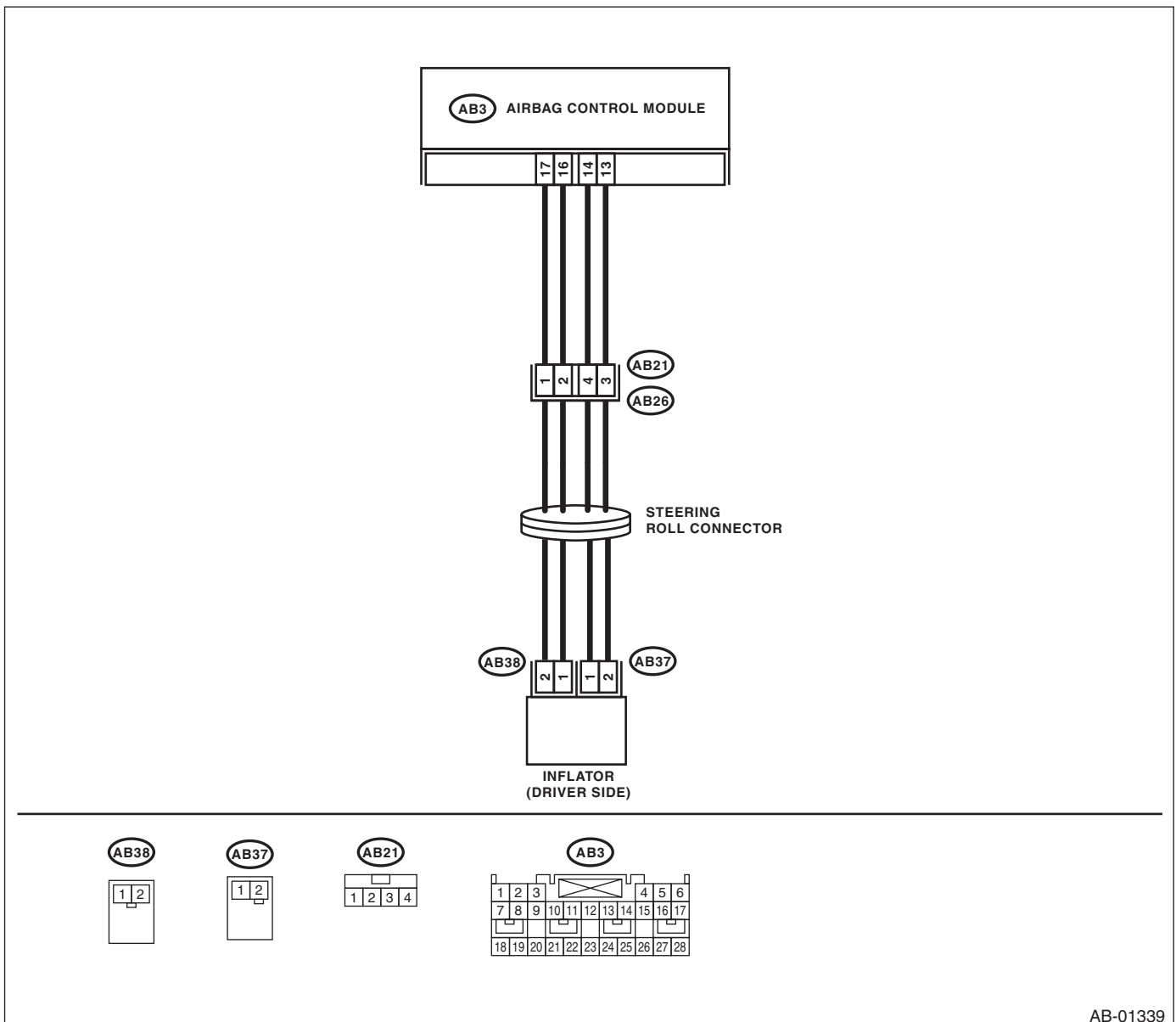
### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner, roll connector, control module and the sensor, reconnect each part and confirm that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors, and seat belt pretensioner for safety reasons.

### NOTE:

Prior to work, prepare two airbag resistors (98299PA040).

### WIRING DIAGRAM:



AB-01339

# Diagnostic Chart with Trouble Code

## AIRBAG SYSTEM (DIAGNOSTICS)

| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module and driver's airbag module for poor contact.  | Is there poor contact?  | Replace the airbag main harness with body harness.                           | Go to step 2.                                      |
| <b>2 CHECK DRIVER'S AIRBAG MODULE.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Remove the driver's airbag module.<br>3) Connect the connector (AB 38) to connector (1N) in test harness N.<br>4) Connect the airbag resistor to the connector (2N) in test harness N.<br>5) Connect the connector (1Q) in test harness Q to connector (AB 37).<br>6) Connect the airbag resistor to connector (2Q) in test harness Q.<br>7) Connect the battery ground cable, and turn the ignition switch to ON.  | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the driver's airbag module. <Ref. to AB-14, Driver's Airbag Module.> | Go to step 3.                                      |
| <b>3 CHECK ROLL CONNECTOR.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the test harness N from connector (AB38).<br>3) Disconnect the test harness Q from connector (AB37).<br>4) Remove the instrument panel lower cover and disconnect the connector (AB26) from (AB21).<br>5) Connect the connector (1P) in test harness P to connector (AB21).<br>6) Connect the airbag resistor to connectors (2P) and (3P) in test harness P.<br>7) Connect the battery ground cable, and turn the ignition switch to ON.   | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the roll connector. <Ref. to AB-20, Roll Connector.>                 | Go to step 4.                                      |
| <b>4 CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS).</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the airbag resistor from connectors (2P) and (3P) in test harness P.<br>3) Remove the instrument panel side cover on passenger side, and disconnect the connectors (AB4) and (AB27).<br>4) Disconnect the connector (AB6) from the airbag control module, and connect the connector (1R) in test harness R.<br>5) Connect the battery ground cable, and turn the ignition switch to ON. (engine OFF)<br>6) Measure the voltage between connector (2R) in test harness R and chassis ground.<br><b>Connector &amp; terminal</b><br>(2R) No. 4 — Chassis ground (-):<br>(2R) No. 2 — Chassis ground (-):<br>(2R) No. 8 — Chassis ground (-):<br>(2R) No. 12 — Chassis ground (-): | Is the voltage less than 1 V?                                       | Go to step 5.  | Replace the airbag main harness with body harness. |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

| Step   | Check                       | Yes  | No                    |
|--|-----------------------------|--|-----------------------|
| <b>5</b><br><b>CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC. | Is the same DTC displayed?  | Replace the airbag control module.<br><Ref. to AB-18, Airbag Control Module.>  | Go to step <b>6</b> . |
| <b>6</b><br><b>CHECK FOR ANY OTHER DTC ON DISPLAY.</b>   | Is any other DTC displayed? | Using the List of Diagnostic Trouble Code (DTC), check the DTC.<br><Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> | Finish the diagnosis. |

# Diagnostic Chart with Trouble Code

## AIRBAG SYSTEM (DIAGNOSTICS)

### AM:DTC 76 PASSENGER'S AIRBAG FAILURE

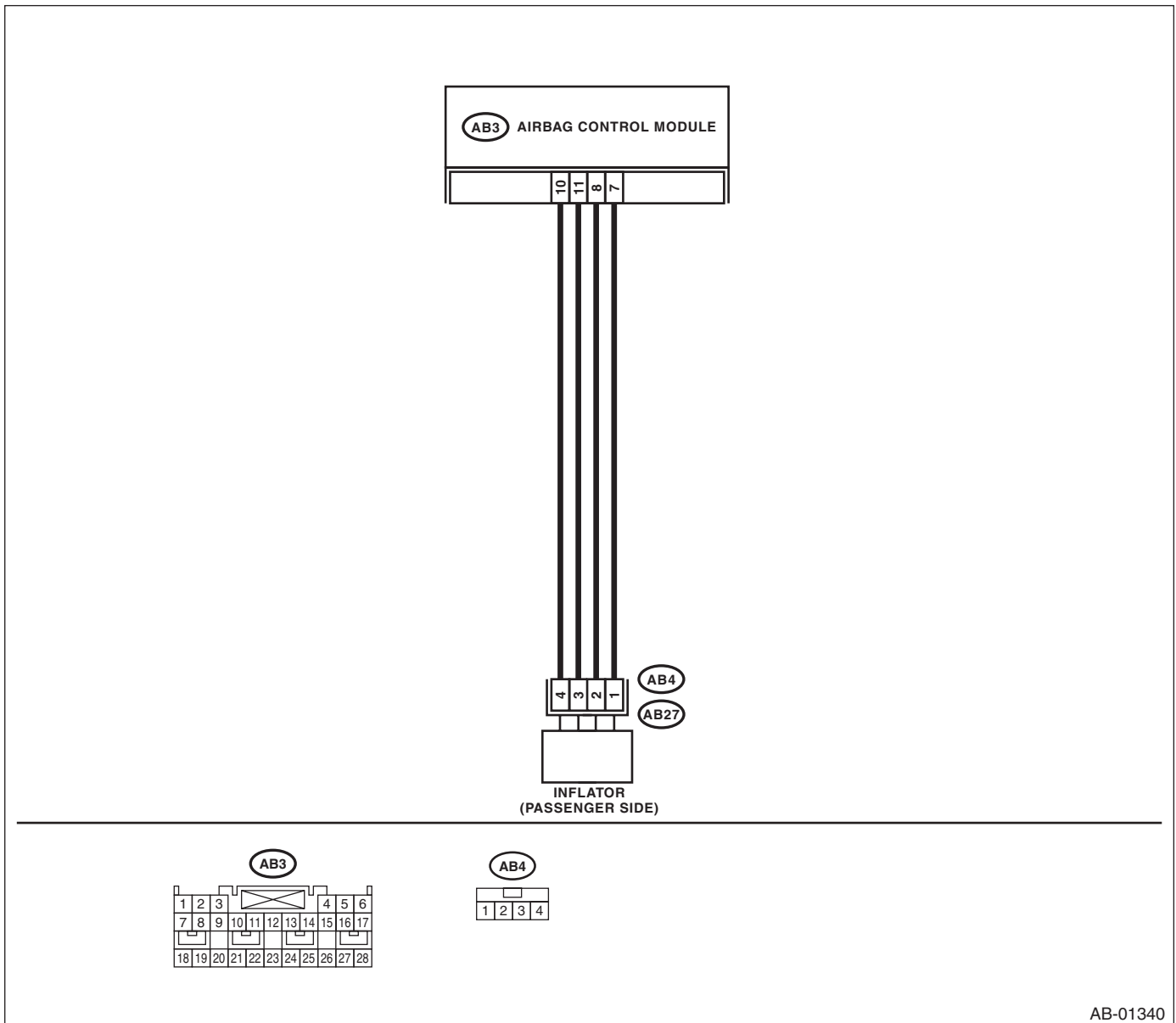
#### DTC DETECTING CONDITION:

- Airbag main harness (Passenger) is shorted to the power supply.
- Airbag module harness (Passenger) is shorted to the power supply.
- Airbag control module is faulty.
- Passenger's airbag module is faulty.

#### CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module for safety reasons.

#### WIRING DIAGRAM:



# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between airbag control module and passenger's airbag module for poor contact.   | Is there poor contact?  | Replace the airbag main harness with body harness.  | Go to step 2.                                      |
| <b>2 CHECK PASSENGER'S AIRBAG MODULE.</b><br>1) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.<br>2) Remove the glove box.<br>3) Disconnect the connector (AB4) from passenger's airbag module.<br>4) Connect the connector (1P) in test harness P to connector (AB4).<br>5) Connect the two airbag resistors to connectors (2P) and (3P) in test harness P.<br>6) Connect the battery ground cable, and turn the ignition switch to ON.  | Does the airbag warning light illuminate for 6 seconds then go off? | Replace the passenger's airbag module. <Ref. to AB-15, Passenger's Airbag Module.>  | Go to step 3.                                      |
| <b>3 CHECK AIRBAG MAIN HARNESS.</b><br>1) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.<br>2) Disconnect the two airbag resistors from connectors (2P) and (3P) in test harness P.<br>3) Remove the lower cover and disconnect the connector (AB21) from (AB26).<br>4) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R.<br>5) Connect the battery ground cable, and turn the ignition switch to ON.<br>6) Measure the voltage between connector (2R) in test harness R and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(2R) No. 9 (+) — Chassis ground (-):</i><br><i>(2R) No. 13 (+) — Chassis ground (-):</i><br><i>(2R) No. 5 (+) — Chassis ground (-):</i><br><i>(2R) No. 3 (+) — Chassis ground (-):</i> | Is the voltage less than 1 V?                                       | Go to step 4.   | Replace the airbag main harness with body harness. |
| <b>4 CHECK AIRBAG CONTROL MODULE.</b><br>1) Connect all connectors.<br>2) Erase the memory.<br>3) Perform the inspection mode.<br>4) Read out the DTC.  | Is the same DTC displayed?  | Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>  | Go to step 5.                                      |
| <b>5 CHECK FOR ANY OTHER DTC ON DISPLAY.</b>  | Is any other DTC displayed?   | Using the List of Diagnostic Trouble Code (DTC), check the DTC. <Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> | Finish the diagnosis.                              |

# Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

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# OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

## *OD(diag)*

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# Basic Diagnostic Procedure

## OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

### 1. Basic Diagnostic Procedure

#### A: PROCEDURE

| Step  | Check                                  | Yes                                       | No   |
|---|--|---|--|
| <b>1 CHECK WARNING LIGHT.</b><br>Check if the airbag warning light in combination meter comes on.   | Does the airbag warning light come on? | Go to step 2.                             | Perform the diagnosis according to trouble symptoms.                                       |
| <b>2 CHECK INDICATION OF DTC.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the Subaru Select Monitor to data link connector.<br>3) Turn the ignition switch to ON, and the Subaru Select Monitor power switch to ON.<br>4) Read the DTC. <Ref. to OD(diag)-21, OPERATION, Read Diagnostic Trouble Code (DTC).><br>NOTE:<br>If the communication function of the Subaru Select Monitor cannot be executed normally, check the communication circuit. <Ref. to OD(diag)-20, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.><br>5) Record all DTCs and freeze frame data. | Is DTC displayed?                      | Go to step 3.                             | Go to "Airbag Warning Light Failure" <Ref. to AB(diag)-35, Airbag Warning Light Failure.>. |
| <b>3 PERFORM DIAGNOSIS.</b><br>1) Judge the possible cause from "List of Diagnostic Trouble Code (DTC)" <Ref. to OD(diag)-26, List of Diagnostic Trouble Code (DTC).>.<br>2) Inspect using "Diagnostic Chart with Diagnostic Trouble Code (DTC)".<br>3) Correct the cause of trouble.<br>4) Perform the clear memory mode. <Ref. to OD(diag)-23, OPERATION, Clear Memory Mode.><br>5) Perform the inspection mode. <Ref. to OD(diag)-22, PROCEDURE, Inspection Mode.><br>6) Read whether the DTC is displayed on the screen.  | Is DTC displayed?                      | Perform the procedure 1) to 5) in step 3. | Finish the diagnosis.  |

## Check List for Interview

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

### 2. Check List for Interview

#### A: CHECK

|   |   |                   |     |
|---|---|-------------------|-----|
| Customer's name                               |   | Inspector's name  |     |
| Date vehicle brought in                       | / /   | Registration No.  |     |
| Odometer reading                              | km<br>miles   | V.I.N.            |     |
| Date problem occurred                         | / /   | Registration year | / / |
| Weather                                       | <input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Others:  |                   |     |
| Temperature                                   | °C (°F)   |                   |     |
| Road condition                                | <input type="checkbox"/> Level road <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Rough road <input type="checkbox"/> Others:  |                   |     |
| Vehicle operation                             | <input type="checkbox"/> Starting <input type="checkbox"/> Idling<br><input type="checkbox"/> Driving ( <input type="checkbox"/> Constant speed <input type="checkbox"/> Acceleration <input type="checkbox"/> Deceleration<br><input type="checkbox"/> Steering wheel turn <input type="checkbox"/> Others:    ) |                   |     |
| Details of problem                            |   |                   |     |
| Airbag warning light operation                | <input type="checkbox"/> Normal (After turning the ignition switch to ON, illuminates for 6 seconds then goes off.)<br><input type="checkbox"/> Remains ON <input type="checkbox"/> Remains OFF   |                   |     |
| Passenger's airbag ON/OFF indicator operation | <input type="checkbox"/> Normal (After turning the ignition switch to ON, the indicator illuminates for 6 seconds, goes off for 2 seconds, and then the ON (adults) or OFF (children, none on the seat) illuminates.)<br><input type="checkbox"/> Both remain on <input type="checkbox"/> Both remain off         |                   |     |
| DTC output                                    | <input type="checkbox"/> Normal Code <input type="checkbox"/> DTC: (Code:    )  |                   |     |

## General Description

### OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

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### 3. General Description

#### A: CAUTION

1) If the seat cushion cover has been removed or replaced, be sure to perform the system calibration for occupant detection system after installing seat to the vehicle. <Ref. to OD(diag)-19, SYSTEM CALIBRATION (REZEROING), OPERATION, Subaru Select Monitor.>

Failure to do so may cause improper operation of occupant detection system.

2) Never remove the occupant detection control module of occupant detection system (passenger's side only) or pressure sensor from seat cushion frame since the control module and occupant detection sensor are fixed to the seat cushion frame.

3) Do not replace the seat cushion pad as a single unit. Be sure to replace the seat cushion pad and frame assembly together. Since the seat cushion pad and cushion frame have been adjusted at factory, installing them together with parts for other vehicle or ones of other set may cause improper operation of occupant detection system.

4) If the seat cushion cover has been removed, be sure to replace wire on the seat cushion cover side with a new one. (Passenger's seat)

5) Never connect the battery in reverse polarity. The occupant detection system may be destroyed instantly.

6) Do not disconnect the battery terminals while the engine is running. A large counter electromotive force will be generated in the generator, and this voltage may damage electronic parts such as occupant detection control module.

7) Before disconnecting the connectors of each sensor and the control module, be sure to turn off the ignition switch and wait for more than 20 seconds. The occupant detection control module may be damaged.

8) Every related part of occupant detection system is a precision part. Do not drop them.

#### CAUTION:

- **Airbag system connectors are colored yellow. Do not use the electrical test equipment on these circuits.**

- **Be careful not to damage the airbag system wiring harness when servicing the occupant detection system.**

- **Refer to the CAUTION for airbag system when repairing the occupant detection system. <Ref. to AB-3, CAUTION, General Description.>**

#### B: INSPECTION

Measure the battery voltage and specific gravity of electrolyte, and check the electrolyte amount.

**Standard voltage: 12 V or more**

**Specific gravity: 1.260 or more**

**Electrolyte: Between the upper level and lower level**

# General Description

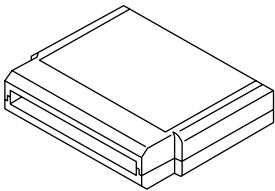

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

## C: PREPARATION TOOL

### CAUTION:

To measure the voltage and resistance of airbag system and occupant detection system components, be sure to use the specified test harness.

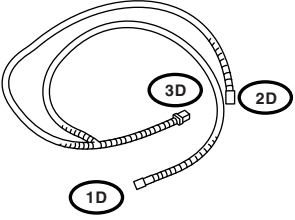
### 1. SPECIAL TOOL

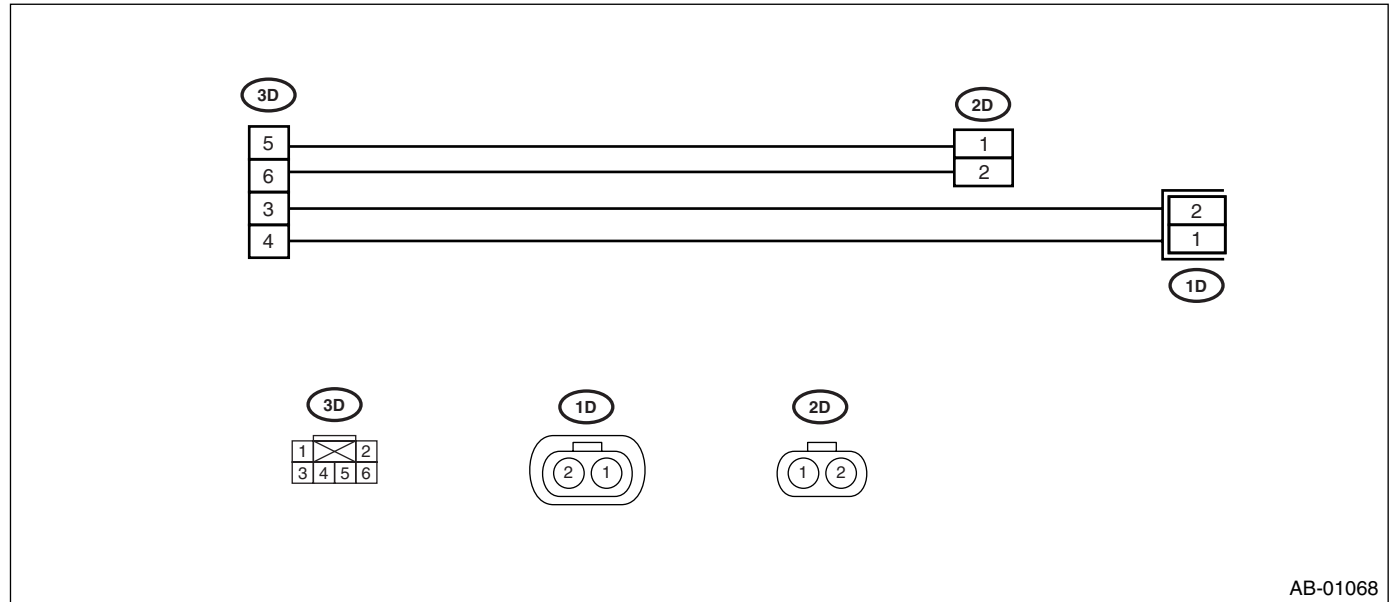
| ILLUSTRATION   | TOOL NUMBER                        | DESCRIPTION                  | REMARKS                                 |
|--|------------------------------------|------------------------------|---|
| <br>ST18482AA010  | 18482AA010<br>(Newly adopted tool) | CARTRIDGE                    | Troubleshooting for electrical systems. |
| <br>ST22771AA030 | 22771AA030                         | SUBARU SELECT<br>MONITOR KIT | Troubleshooting for electrical systems. |

# General Description

## OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

### • TEST HARNESS D

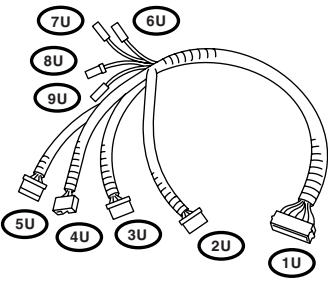
| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION    | REMARKS   |
|---|-------------|----------------|---|
|  <p>ST98299AG060</p> | 98299AG060  | TEST HARNESS D | Used for measuring voltage and resistance of front seat belt buckle switch. |



# General Description

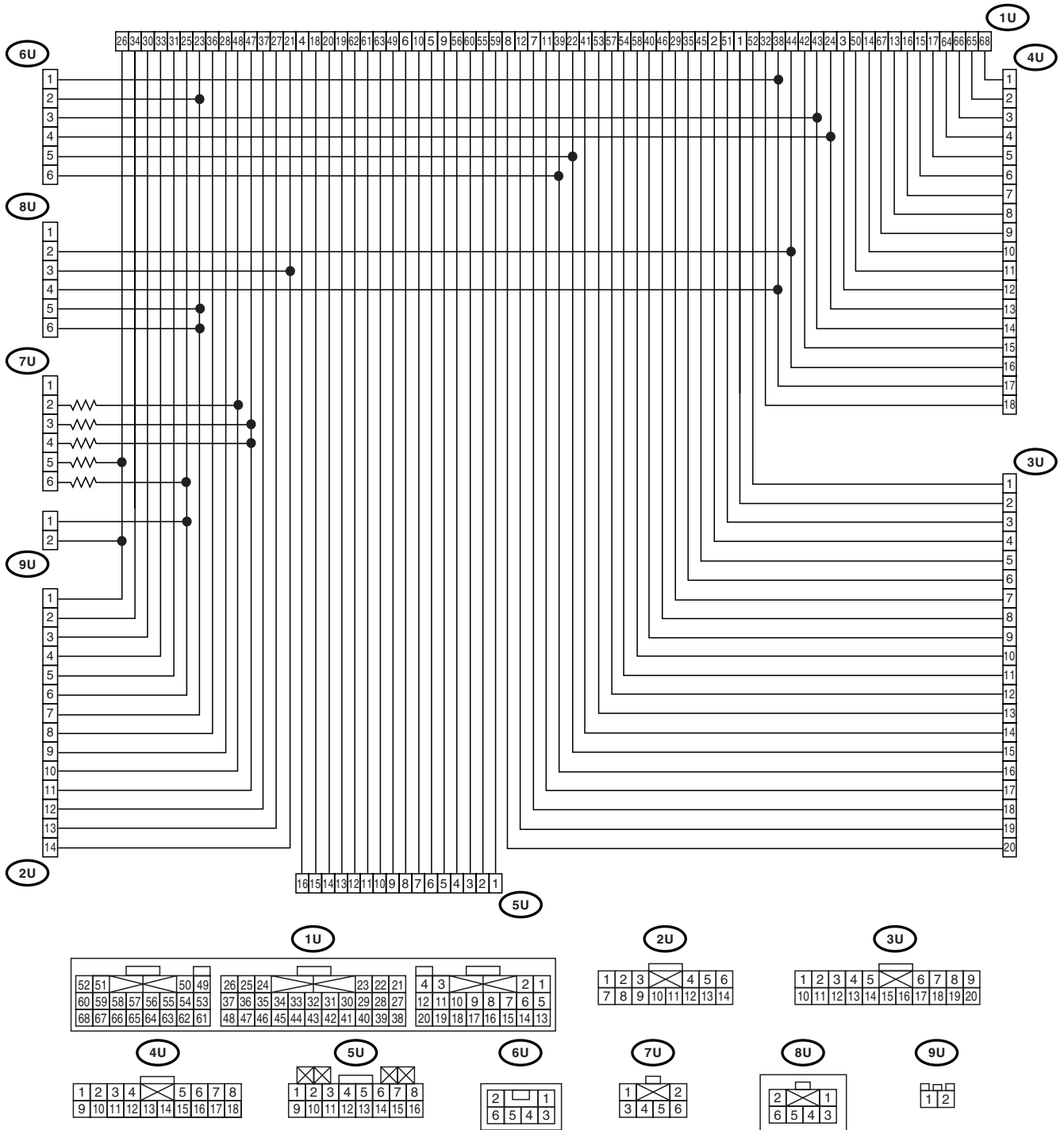
OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

## • TEST HARNESS U

| ILLUSTRATION   | TOOL NUMBER | DESCRIPTION    | REMARKS   |
|--|-------------|----------------|---|
|  <p>The diagram shows a test harness with a central bundle of wires. Nine individual wires extend from this bundle, each ending in a different type of connector. The wires are labeled with terminal numbers: 1U, 2U, 3U, 4U, 5U, 6U, 7U, 8U, and 9U. The labels 1U through 5U are arranged in a semi-circle at the bottom, while 6U, 7U, 8U, and 9U are arranged in a semi-circle at the top. The part number ST98299AG000 is printed at the bottom of the diagram.</p> | 98299AG000  | TEST HARNESS U | Used for measuring voltage and resistance of airbag control module. |

# General Description

## OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

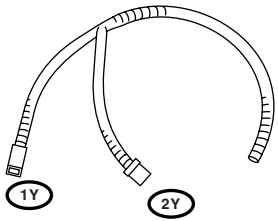


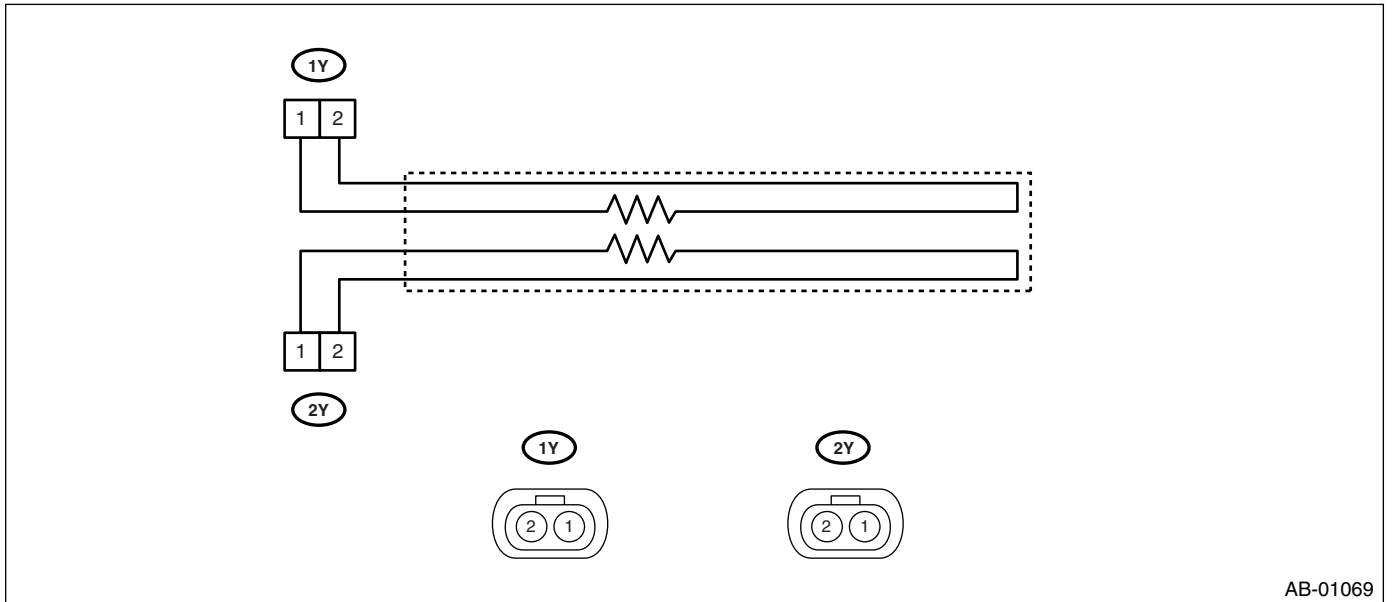
AB-00930

# General Description

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

## • TEST HARNESS Y

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION    | REMARKS                                      |
|---|-------------|----------------|--|
|  <p>ST98299AG040</p> | 98299AG040  | TEST HARNESS Y | Used for diagnosing seat belt buckle switch. |

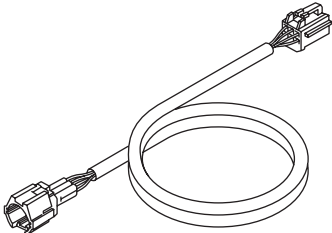


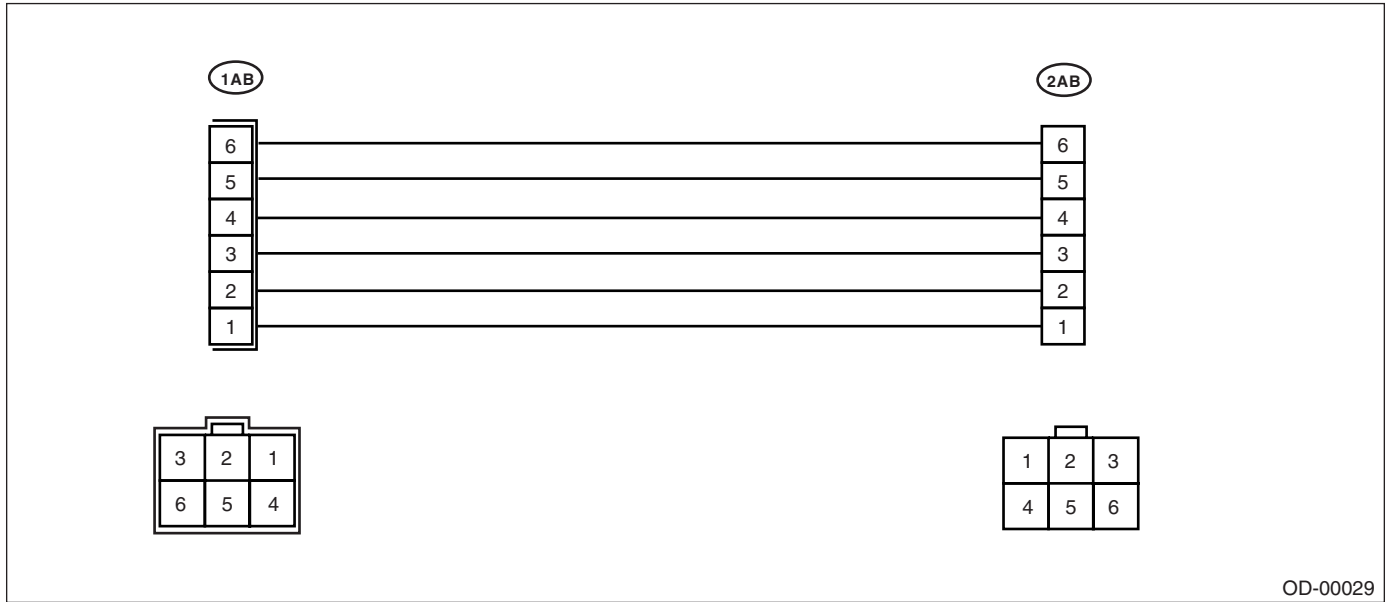


# General Description

## OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

### • TEST HARNESS AB

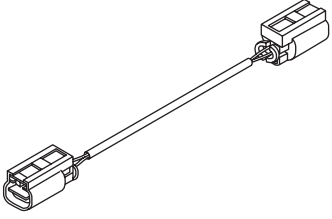
| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION        | REMARKS  |
|---|-------------|--------------------|--|
|  <p style="text-align: center;">ST98299XA000</p> | 98299XA000  | TEST HARNESS<br>AB | Used when measuring voltage and resistance of occupant detection system. |

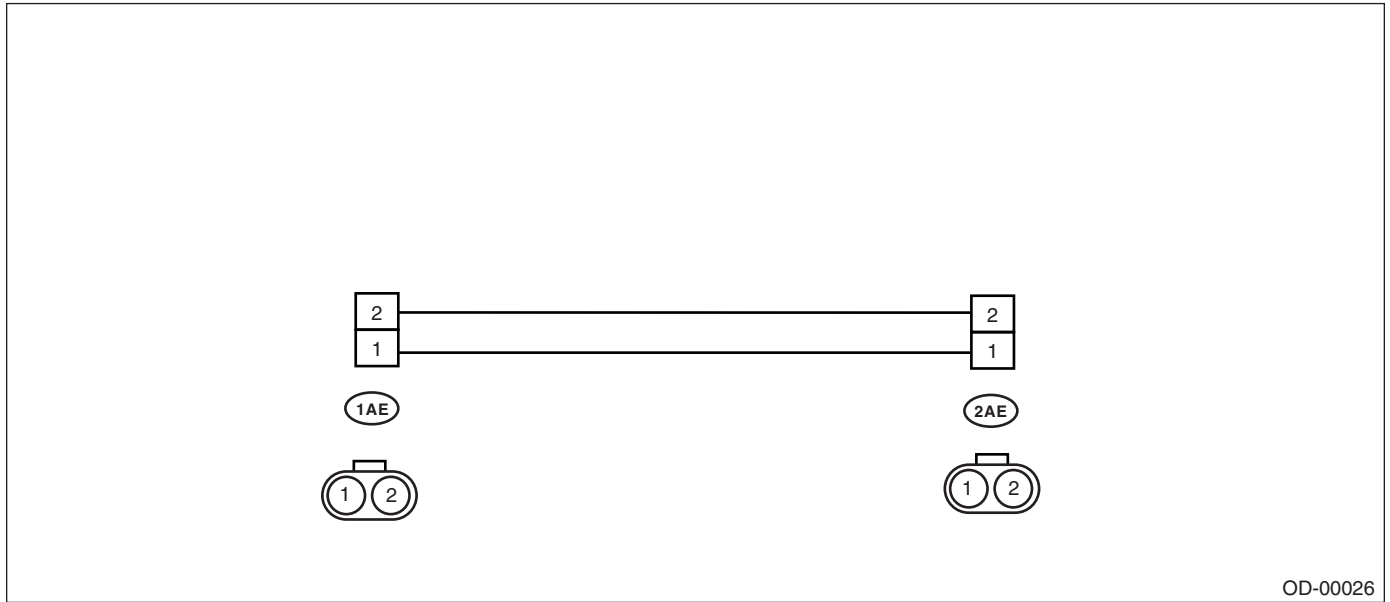


# General Description

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

## • TEST HARNESS AE

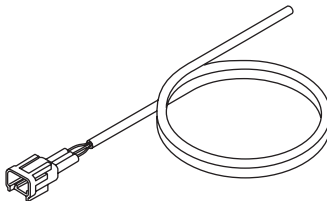
| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION        | REMARKS   |
|---|-------------|--------------------|---|
| <br>ST98299XA030 | 98299XA030  | TEST HARNESS<br>AE | Adapter harness for TEST HARNESS Y.<br>Used for diagnosing seat belt buckle switch. |

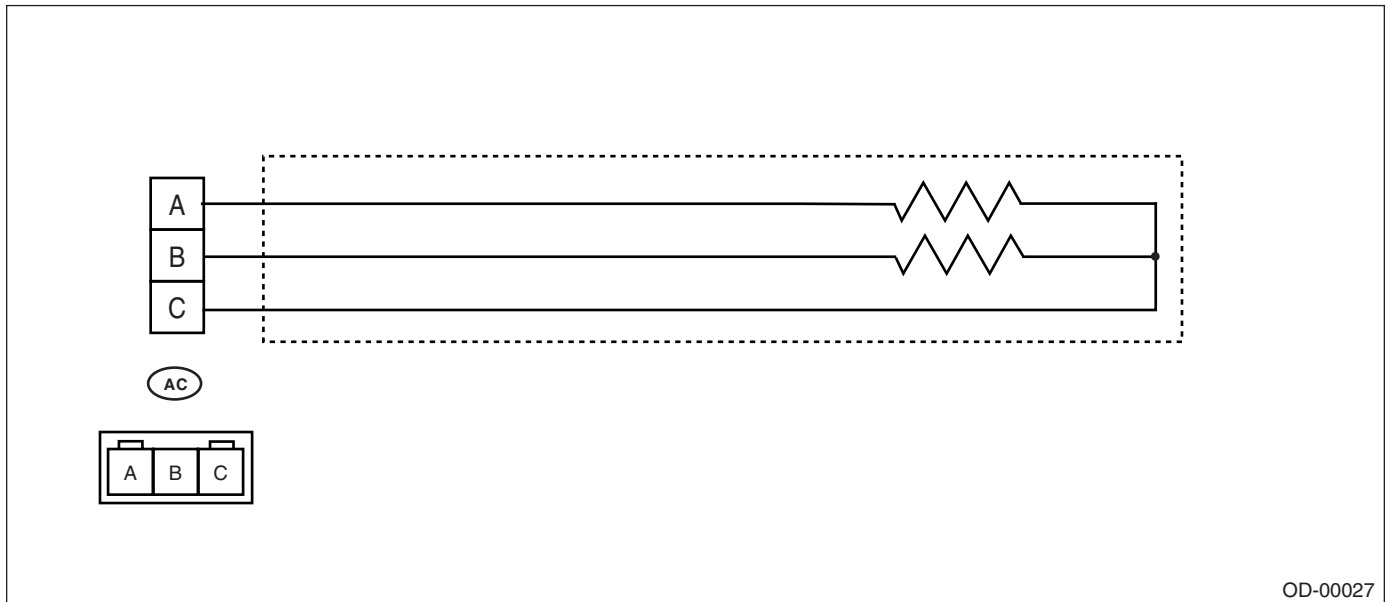


# General Description

## OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

### • TEST HARNESS AC

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION        | REMARKS                                       |
|---|-------------|--------------------|---|
| <br>ST98299XA010 | 98299XA010  | TEST HARNESS<br>AC | Used for diagnosing seat belt tension sensor. |

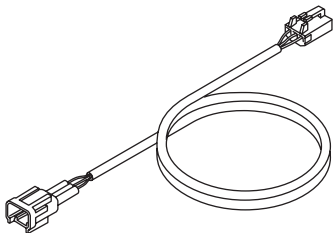


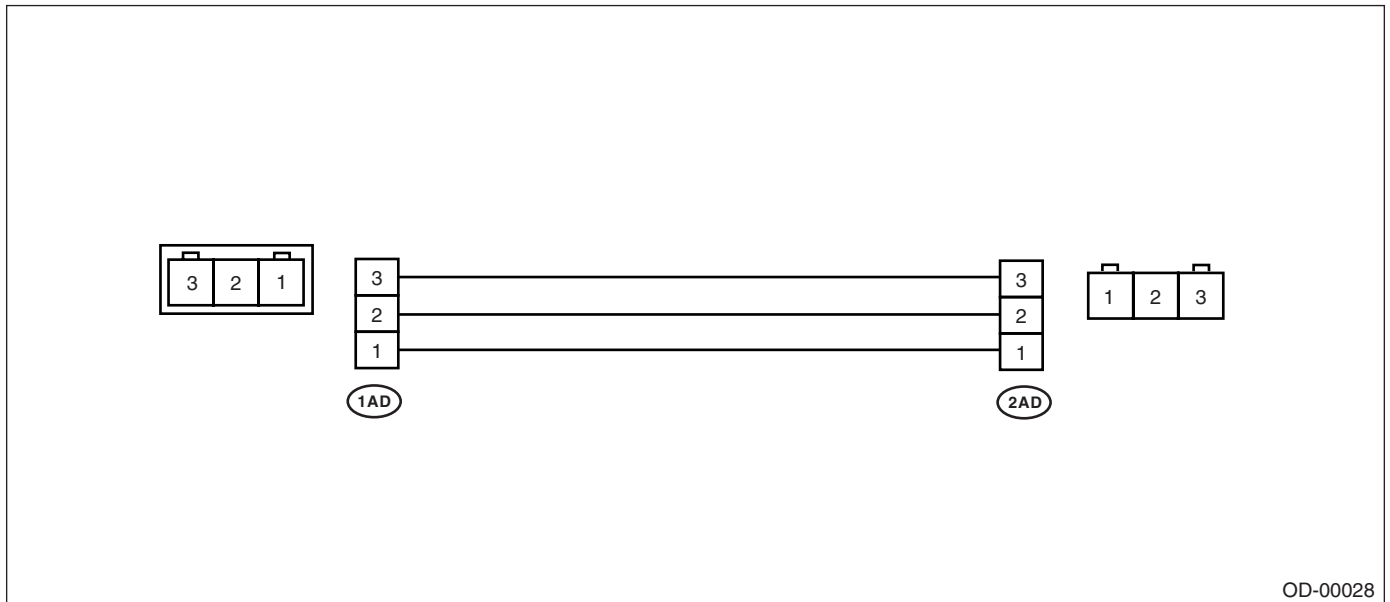
OD-00027

# General Description

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

## • TEST HARNESS AD

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION        | REMARKS   |
|---|-------------|--------------------|---|
| <br><br>ST98299XA020 | 98299XA020  | TEST HARNESS<br>AD | Used when measuring voltage and resistance of seat belt tension sensor. |



## 2. GENERAL TOOL

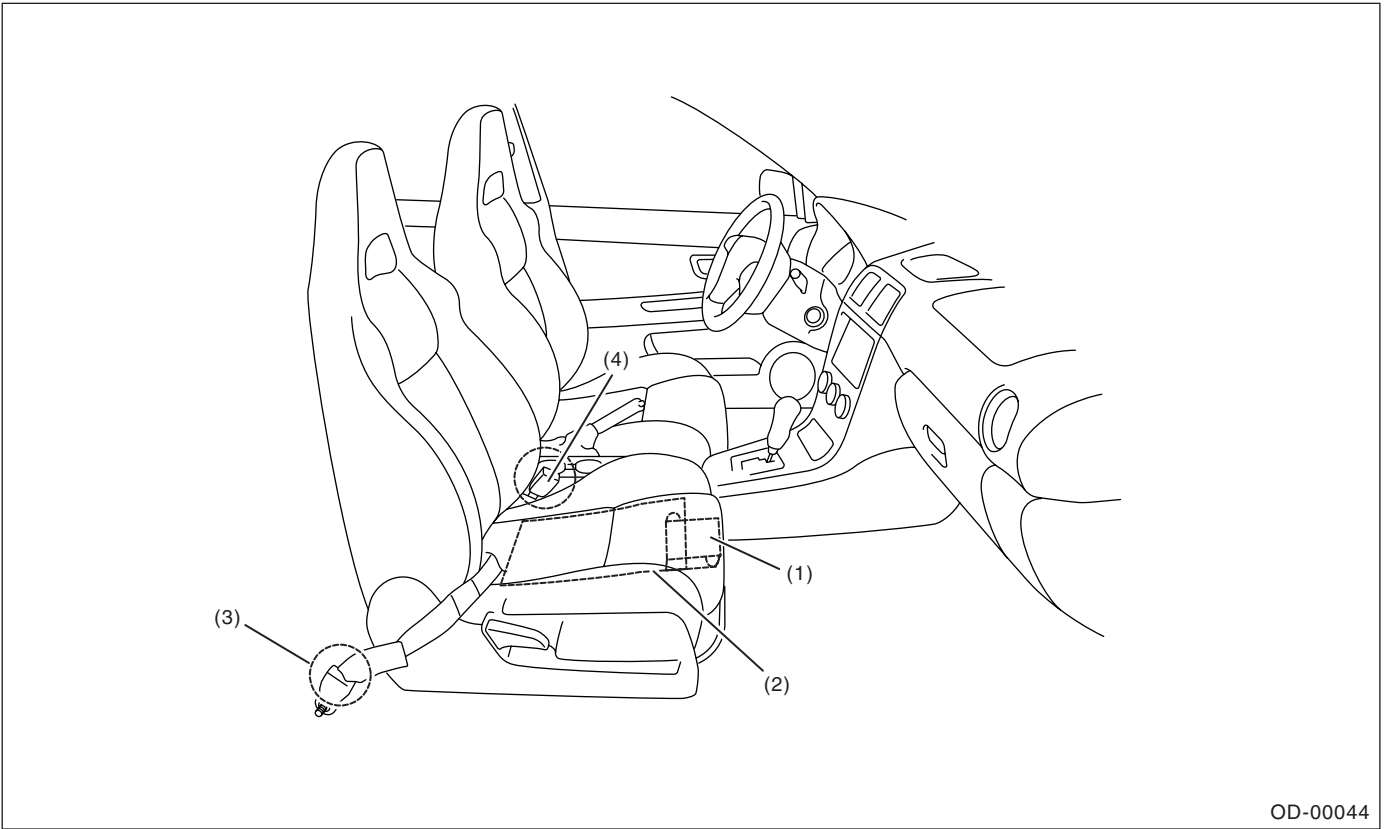
| TOOL NAME      | REMARKS   |
|----------------|---|
| Circuit tester | Used for measuring resistance, voltage and current. |

# Electrical Component Location

## OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

### 4. Electrical Component Location

#### A: LOCATION

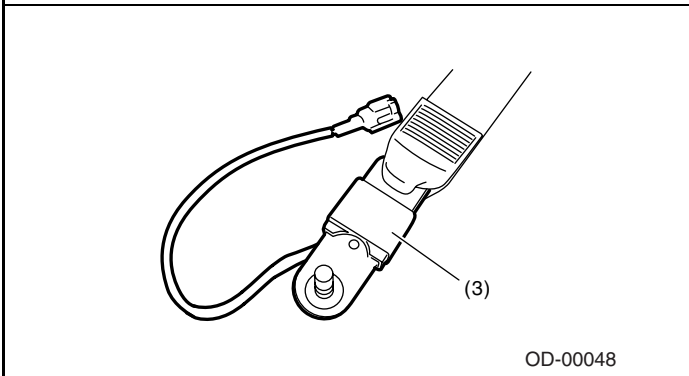
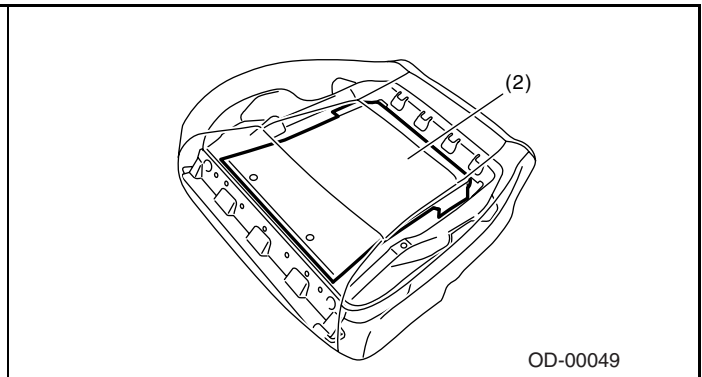
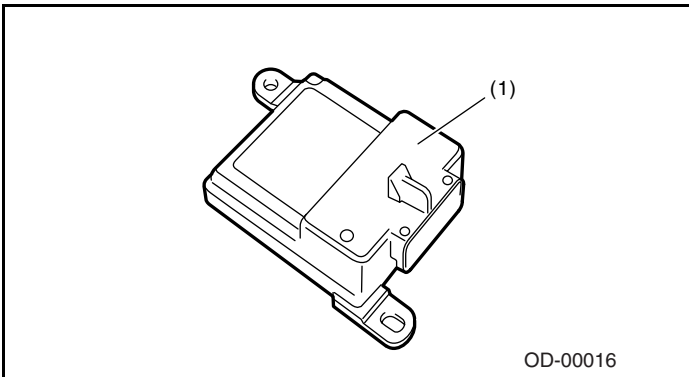


(1) Occupant detection control module

(2) Load cell sensor

(3) Seat belt tension sensor

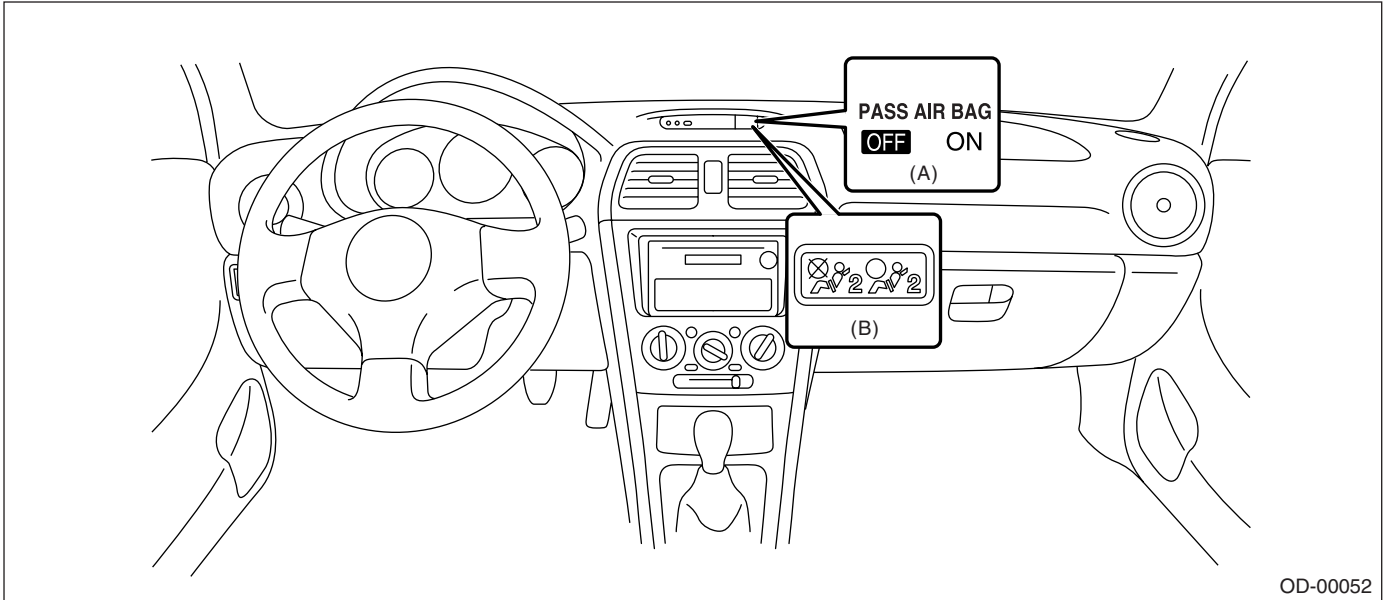
(4) Buckle switch (Passenger's seat)



**SUBARU.**

# Electrical Component Location

## OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)



(A) Airbag ON/OFF indicator light (For U.S.)

(B) Airbag ON/OFF indicator light (For Canada)

# Airbag Connector

## OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

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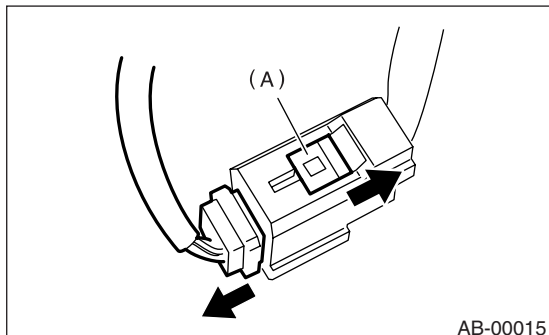
### 5. Airbag Connector

#### A: PROCEDURE

##### BUCKLE SWITCH

###### 1) How to disconnect

- (1) Move the slide lock (A) in the direction of arrow.
- (2) With the slide lock (A) moved, disconnect the connector.

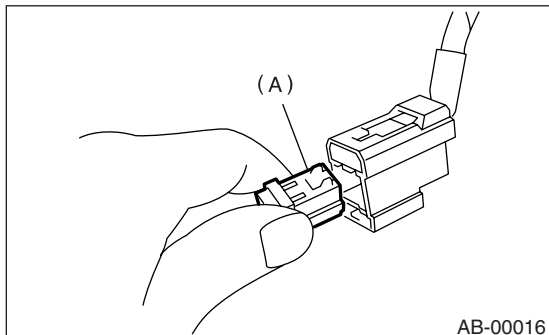


##### CAUTION:

**When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.**

###### 2) How to connect

Holding the connector (A), and push it in securely until a clicking sound is heard.



##### CAUTION:

**Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.**

## Control Module I/O Signal

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

### 6. Control Module I/O Signal

#### A: ELECTRICAL SPECIFICATION

**CAUTION:**

- The occupant detection control module, load cell sensor and seat frame are integrated, therefore, do not remove them.
- It is prohibited to measure the occupant detection control module I/O signal. Therefore, terminal No. is not shown here.

| Terminal Name                       |        | Input/Output value      | Remarks                          |
|-------------------------------------|--------|-------------------------|----------------------------------|
| IG – Power supply                   |        | 9 — 16 V                | When ignition switch ON          |
| Airbag control module communication | (COM)  | Open collector terminal | Communication line               |
| Airbag control module communication | (GND)  | 0 V                     | Ground                           |
| Belt tension sensor                 | (Vcc)  | 0 — 5 V                 | Belt tension sensor power supply |
|                                     | (Vout) | 0.5 — 4.5 V             | Sensor output voltage            |
|                                     | (GND)  | 0 V                     | Sensor ground                    |

#### B: WIRING DIAGRAM

Refer to the electrical wiring diagram. <Ref. to WI-96, Airbag System.>



# Subaru Select Monitor

## OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

### 7. Subaru Select Monitor

#### A: OPERATION

##### 1. READ DIAGNOSTIC TROUBLE CODE (DTC)

When malfunction of airbag system and occupant detection system occurs, the DTC stored in airbag control module will be read out.

Refer to “Read Diagnostic Trouble Code (DTC)” in AIRBAG SYSTEM (DIAGNOSTICS). <Ref. to AB(diag)-26, OPERATION, Subaru Select Monitor.>

NOTE:

- For details concerning operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For details concerning DTCs, refer to the “List of Diagnostic Trouble Code (DTC)” (Airbag system, occupant detection system). <Ref. to AB(diag)-43, List of Diagnostic Trouble Code (DTC).> <Ref. to OD(diag)-26, List of Diagnostic Trouble Code (DTC).>

##### 2. STATUS DATA DISPLAY

Check the operating condition of each sensor in the event of malfunction in seat belt buckle switch and seat position sensor, or when the seat belt buckle switch and seat position sensor has been replaced.

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Airbag System} and press the [YES] key.
- 3) On the «Airbag System» display screen, select the {Status Data} and press the [YES] key.

The support data is shown in the following table.

| Item                       | Contents of diagnosis   |
|----------------------------|---|
| Seat position sensor LH    | Front <sup>*1</sup> /Rear <sup>*2</sup> /Other <sup>*3</sup> /Unknown <sup>*3</sup> /— <sup>*5</sup>      |
| Seat position sensor RH    | — <sup>*5</sup>   |
| Seat belt buckle switch LH | Belted <sup>*6</sup> /Unbelted <sup>*7</sup> /Other <sup>*8</sup> /Unknown <sup>*4</sup> /— <sup>*9</sup> |
| Seat belt buckle switch RH | Belted <sup>*6</sup> /Unbelted <sup>*7</sup> /Other <sup>*8</sup> /Unknown <sup>*4</sup> /— <sup>*9</sup> |
| Passenger's airbag status  | ON <sup>*10</sup> /OFF <sup>*11</sup> /Unknown <sup>*4</sup>  |

\*1: The seat position is forward.

\*2: The seat position is rearward.

\*3: It is displayed when data other than forward and backward positions of the seat, such as malfunction etc., is input.

\*4: It is displayed at the initial status.

\*5: Seat position sensor is not available.

\*6: Seat belt is fastened.

\*7: Seat belt is unfastened.

\*8: It is displayed when data other than fastened or unfastened belts, such as malfunction etc., is input.

\*9: Seat belt buckle switch is not available.

\*10: Passenger's airbag is active.

\*11: Passenger's airbag is not active.

NOTE:

For details concerning operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

# Subaru Select Monitor

## OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

### 3. CLEAR MEMORY MODE

Clear the DTC stored in the airbag control module after repairing malfunction in airbag system and occupant detection system. If the memory is not cleared after repairing malfunction, repaired DTC will be read out again when a new malfunction occurs.)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Airbag System} and press the [YES] key.
- 3) On the «Airbag System» display screen, select the {Clear Memory} and press the [YES] key.
- 4) Press the [YES] key after the “Clear memory?” has been displayed.
- 5) When the “Done” is shown on the display screen, turn the Subaru Select Monitor switch to OFF.

#### NOTE:

For details concerning operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

### 4. SYSTEM CALIBRATION (REZEROING)

#### NOTE:

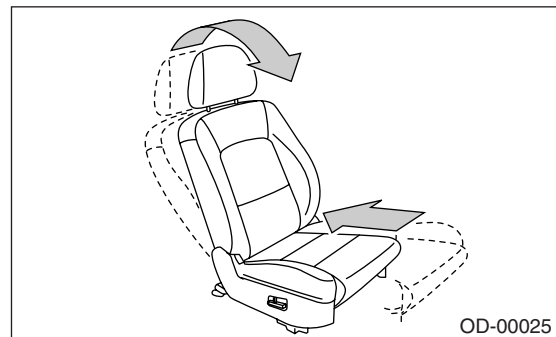
If the occupant detection system has been removed or the passenger's seat cushion cover has been removed and disassembled, be sure to perform the “System Calibration (Rezeroing)” after installing the seat to the vehicle.

#### CAUTION:

**If the system malfunction occurs during the calibration, 2A “ODS Calibration Error” is detected on DTC of airbag system and the airbag warning light comes on. In this case, perform the system calibration (Rezeroing) again after turning the ignition switch to OFF once, or perform the system calibration after repairing the trouble cause.**

- 1) Set the vehicle on a level surface without any passengers.
- 2) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 3) On the «System Selection Menu» display screen, select the {Occupant Detection System} and press the [YES] key.
- 4) On the «Occupant Detection System» display screen, select the {Re-zeroing} and press the [YES] key.
- 5) «See service manual. And check vehicle condition for successfully completing the rezeroing.» will be displayed on the screen. Inspect the following items to adjust the vehicle conditions.
  - Move the seat backrest in the upright position.

- Slide to the backmost position.
  - Put nothing on the seat cushion.
  - Sit on the seat cushion and tidy the seat cloth.
  - Make sure that passenger's seat belt is not inserted into buckle, pulled or not stuck.
  - Make sure the ambient temperature is within 0 — 40°C (32 — 104°F).
- 6) «Re-zeroing Adjust the passenger seat to the condition shown in service manual.» will be displayed on the screen. Slide the passenger's seat to the backmost position, make sure that the backrest is in the upright position, and then press the [YES] key.



- 7) When the «Re-zeroing Unbuckle the Passenger seat belt. Continue: “YES”, Quit: “NO”» is displayed on the screen, make sure that passenger's seat belt is released from buckle and press the [YES] key.
- 8) When the «Re-zeroing Empty the passenger seat. Continue: “YES”, Quit: “NO”» is displayed on the screen, make sure that no one is on the passenger's seat, the airbag OFF indicator comes on and the ON indicator goes off, and then press the [YES] key.

#### NOTE:

- After pressing the [YES] key, «In process... Please wait for a while without touching vehicle.» will be displayed. Do not touch and swing the vehicle while the message is displayed.
  - When the «Zero calibration is unsuccessful. See service manual. Press “YES” to END» is displayed during the calibration, go to step 10.
- 9) If the zero calibration is successfully completed, the «Re-zeroing is successfully completed. Press “YES” to END» will be displayed. Press the [YES] key and turn the ignition switch to OFF to finish the diagnosis.

# Subaru Select Monitor

## OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

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10) When the «Zero calibration is unsuccessful. See service manual. Press “YES” to END» is displayed during the calibration, turn the ignition switch to OFF once and turn it back to ON. Then, read the DTC of airbag system. <Ref. to AB(diag)-26, OPERATION, Subaru Select Monitor.>

If the DTC is input, perform the system calibration after repairing malfunction. If the DTC is not input, check the status of seat and vehicle and perform the system calibration again. <Ref. to OD(diag)-19, SYSTEM CALIBRATION (REZEROING), OPERATION, Subaru Select Monitor.>

### NOTE:

If the zero calibration is unsuccessful, malfunction may occur in occupant detection system, or the status of seat and vehicle may not be appropriate. Also, if the airbag warning light comes on, read the DTC and perform the diagnosis referring to the “List of Diagnostic Trouble Code (DTC)” in AIRBAG SYSTEM. <Ref. to AB(diag)-26, OPERATION, Subaru Select Monitor.> <Ref. to AB(diag)-43, LIST, List of Diagnostic Trouble Code (DTC).>

## **B: INSPECTION**

### **1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE**

#### **DETECTING CONDITION:**

Defective harness connector

#### **TROUBLE SYMPTOM:**

Communication is impossible between airbag control module and Subaru Select Monitor.

Refer to “COMMUNICATION FOR INITIALIZING IMPOSSIBLE” in AIRBAG SYSTEM (DIAGNOSTICS). <Ref. to AB(diag)-28, INSPECTION, Subaru Select Monitor.>

### **2. WITHOUT DTC**

#### **DETECTING CONDITION:**

- Defective combination meter
- Open circuit of harness

#### **TROUBLE SYMPTOM:**

- Airbag warning light does not go off.
- “NO TROUBLE CODE” is displayed on Subaru Select Monitor display screen.

For detailed operation procedure, refer to “Airbag Warning Light Failure”. <Ref. to AB(diag)-35, Airbag Warning Light Failure.>

### NOTE:

When the airbag warning light is OFF and “NO TROUBLE CODE” is displayed on Subaru Select Monitor, the system is in normal condition.

## Read Diagnostic Trouble Code (DTC)

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

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### 8. Read Diagnostic Trouble Code (DTC)

#### A: OPERATION

For details about reading of DTCs, refer to “Subaru Select Monitor”. <Ref. to AB(diag)-26, Subaru Select Monitor.>

### **9. Inspection Mode**

#### **A: PROCEDURE**

Recreate the circumstance by referring to the conditions described in the checklist.

### 10. Clear Memory Mode

#### A: OPERATION

Clear the memory in the following steps after the malfunction is repaired.

Refer to “Subaru Select Monitor” for details concerning DTC clear operation. <Ref. to AB(diag)-26, Subaru Select Monitor.>

# Airbag Warning Light Illumination Pattern

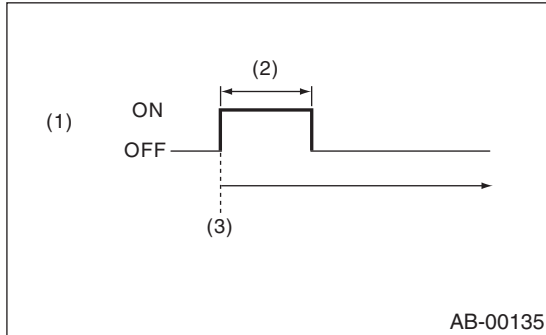
OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

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## 11. Airbag Warning Light Illumination Pattern

### A: INSPECTION

Turn the ignition switch to ON, and confirm that the airbag warning light remains on for approx. 6 seconds then go off afterwards.



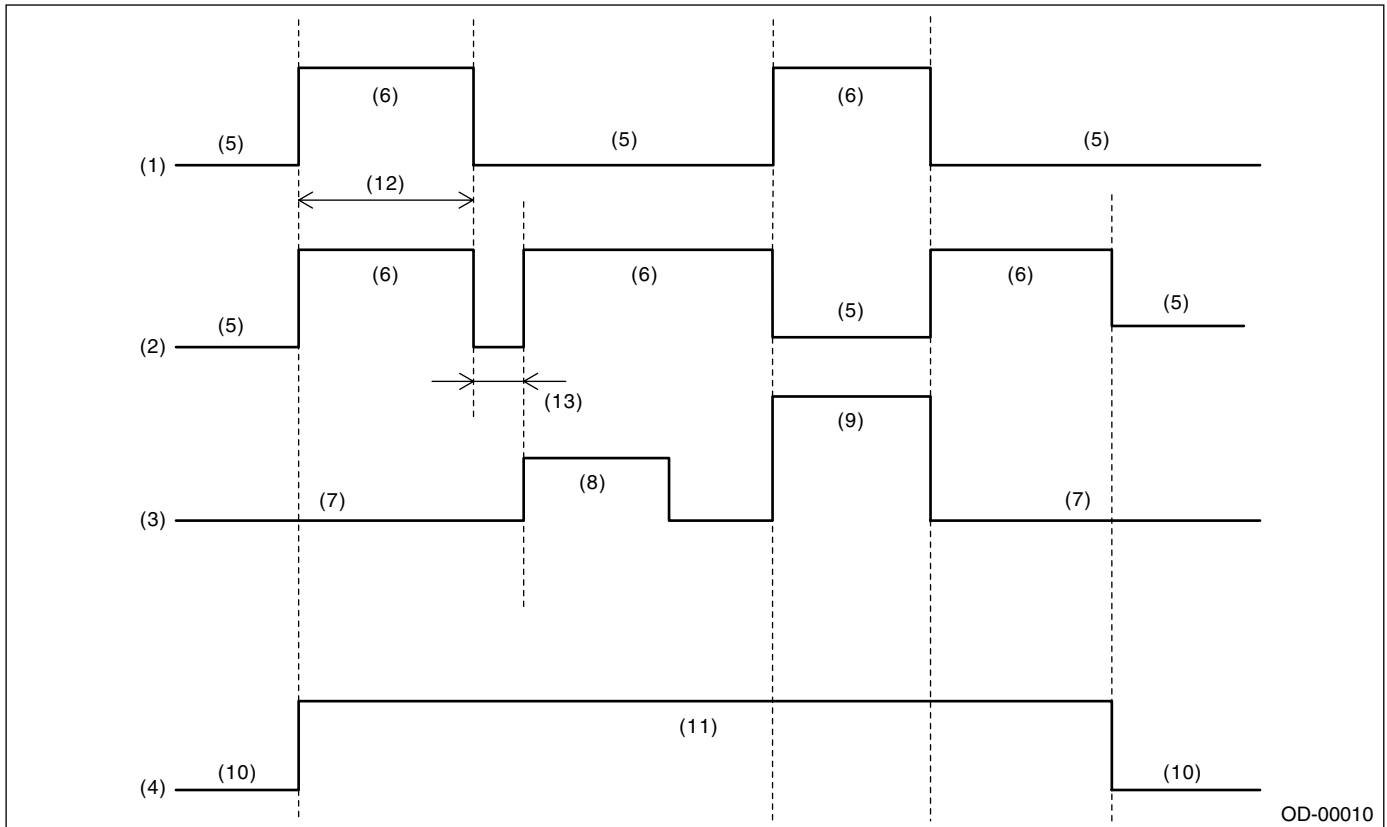
- (1) Airbag warning light
- (2) Approx. 6 sec.
- (3) Ignition switch ON

# Passenger's Airbag ON/OFF Indicator Light Illumination Pattern

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

## 12. Passenger's Airbag ON/OFF Indicator Light Illumination Pattern

### A: INSPECTION



- (1) Passenger's airbag ON indicator light
- (2) Passenger's airbag OFF indicator light
- (3) Occupant seating

- (4) Ignition switch
- (5) Light OFF
- (6) Light ON
- (7) Empty
- (8) Child

- (9) Adult
- (10) OFF
- (11) ON
- (12) Approx. 6 sec.
- (13) Approx. 2 sec.



## List of Diagnostic Trouble Code (DTC)

### OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

## 13. List of Diagnostic Trouble Code (DTC)

### A: LIST

| DTC | Display                     | Contents of diagnosis  | Reference target  |
|-----|-----------------------------|--|---|
| 2A  | ODS Calibration Error       | The system calibration (Rezeroing) is not completed successfully.  | <Ref. to OD(diag)-27, DTC 2A ODS CALIBRATION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>     |
| 2B  | ODS System Wrong Parts      | <ul style="list-style-type: none"> <li>• Airbag control module is wrong parts.</li> <li>• Occupant detection system is wrong parts.</li> <li>• Occupant detection system is faulty.</li> </ul>   | <Ref. to OD(diag)-27, DTC 2B ODS SYSTEM WRONG PARTS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>    |
| 2C  | Belt Tension Sensor Failure | <ul style="list-style-type: none"> <li>• Passenger's belt tension sensor malfunction</li> <li>• Side airbag harness circuit is open or shorted.</li> <li>• Occupant detection system is faulty.</li> <li>• Occupant detection harness is faulty.</li> </ul>  | <Ref. to OD(diag)-28, DTC 2C BELT PRETENSIONER FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 27  | ODS Communication Error     | <ul style="list-style-type: none"> <li>• The communication of occupant detection control module and airbag control module is faulty.</li> <li>• Side airbag harness circuit is open or shorted.</li> </ul> <p>Shorted to ground and power supply.</p> <ul style="list-style-type: none"> <li>• Occupant detection harness is faulty.</li> <li>• Occupant detection system is malfunction.</li> <li>• Airbag control module is faulty.</li> </ul> | <Ref. to OD(diag)-30, DTC 27 ODS COMMUNICATION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| 29  | ODS Failure                 | <ul style="list-style-type: none"> <li>• Load cell sensor is faulty.</li> <li>• Occupant detection control module is faulty.</li> <li>• Occupant detection harness is faulty.</li> <li>• Fuse No. 25 (in joint box) is blown.</li> </ul>   | <Ref. to OD(diag)-30, DTC 29 ODS FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>               |
| 37  | Buckle Switch RH Failure    | <ul style="list-style-type: none"> <li>• Passenger's buckle switch circuit is open, shorted or shorted to ground.</li> <li>• Occupant detection system is faulty.</li> <li>• Occupant detection harness is faulty.</li> </ul>  | <Ref. to OD(diag)-31, DTC 37 BUCKLE SWITCH RH FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

## 14. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### A: DTC 2A ODS CALIBRATION ERROR

#### DTC DETECTING CONDITION:

The system calibration (Rezeroing) is not completed successfully.

| Step  | Check   | Yes                   | No  |
|---|---|-----------------------|---|
| 1<br><b>PERFORM ZERO CALIBRATION.</b><br>Perform the system calibration using the Subaru Select Monitor. <Ref. to OD(diag)-18, OPERATION, Subaru Select Monitor.> | Is the system calibration completed successfully? | Finish the diagnosis. | Perform according to system calibration procedure. <Ref. to OD(diag)-18, OPERATION, Subaru Select Monitor.> |

### B: DTC 2B ODS SYSTEM WRONG PARTS

#### DTC DETECTING CONDITION:

- Airbag control module is wrong parts.
- Occupant detection system is wrong parts.

| Step   | Check   | Yes                   | No   |
|--|---|-----------------------|--|
| 1<br><b>CHECK OCCUPANT DETECTION SYSTEM.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Replace the passenger's seat cushion pad & seat cushion frame assembly. <Ref. to SE-7, REMOVAL, Front Seat.> <Ref. to SE-8, DISASSEMBLY, Front Seat.><br>3) Connect the ground cable to battery.<br>4) Connect the Subaru Select Monitor to data link connector, and then check the system calibration. <Ref. to OD(diag)-18, OPERATION, Subaru Select Monitor.> | Is the system calibration completed successfully? | Finish the diagnosis. | Go to step 2.  |
| 2<br><b>CHECK AIRBAG CONTROL SYSTEM.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Replace the airbag control module. <Ref. to AB-16, REMOVAL, Side Airbag Module.><br>3) Connect the ground cable to battery.<br>4) Connect the Subaru Select Monitor to data link connector, and then check the system calibration. <Ref. to OD(diag)-18, OPERATION, Subaru Select Monitor.>  | Is the system calibration completed successfully? | Finish the diagnosis. | Check between occupant detection control module and airbag control module. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

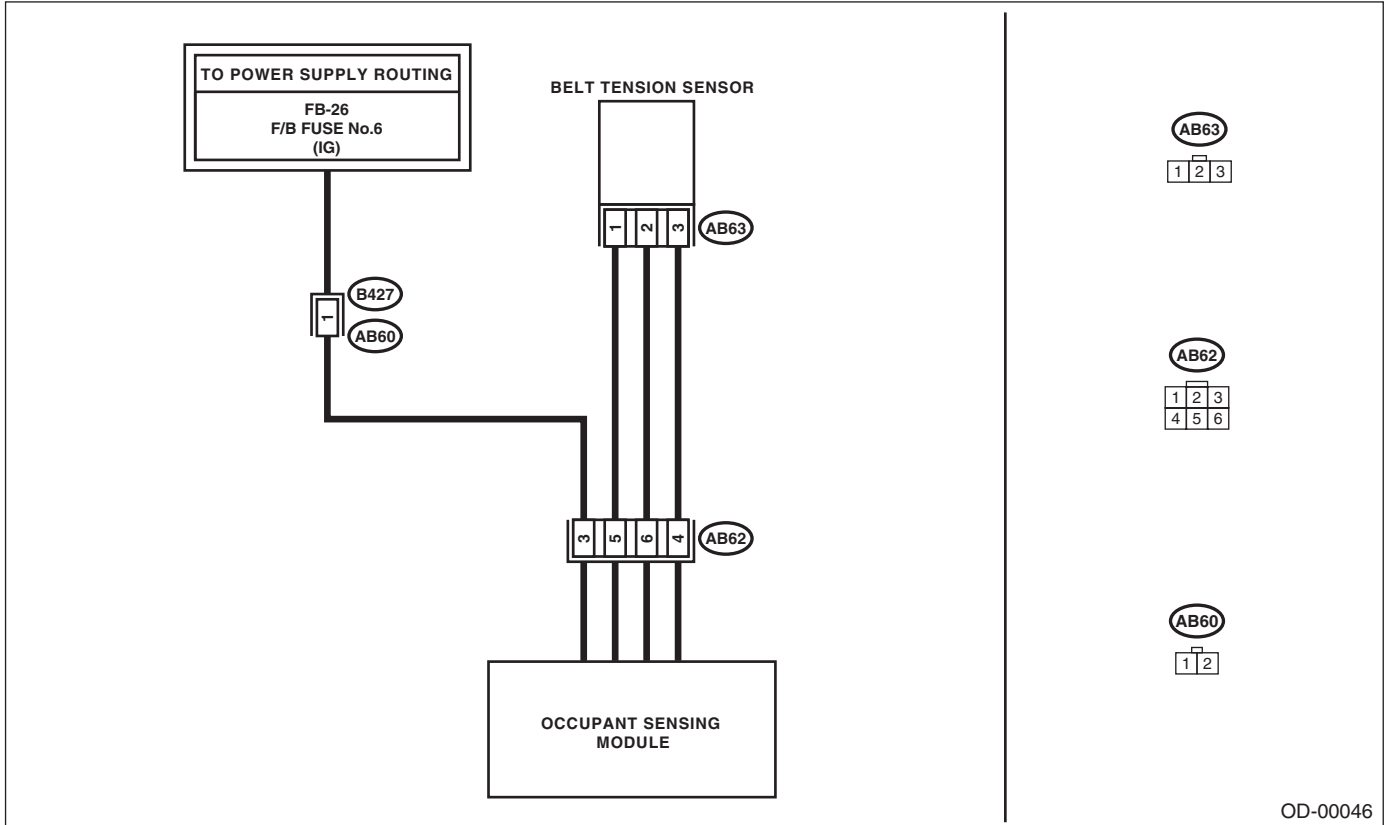
## OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

### C: DTC 2C BELT PRETENSIONER FAILURE

#### DTC DETECTING CONDITION:

- Passenger's belt tension sensor failure
- Airbag main harness circuit is open or shorted.
- Occupant detection control module is faulty.

#### WIRING DIAGRAM:



OD-00046

| Step  | Check  | Yes   | No            |
|---|--|---|---------------|
| <b>1 CHECK POOR CONTACT OF CONNECTORS.</b><br>Check the connector between occupant detection control module and belt tension sensor for poor contact.   | Is there poor contact?   | Reconnect the connector. If the fault is not corrected, replace the airbag harness. | Go to step 2. |
| <b>2 CHECK BELT TENSION SENSOR.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the belt tension sensor connector (AB63) from airbag harness.<br>3) Connect the test harness AC to connector (AB63).<br>4) Connect the battery ground cable and turn the ignition switch to ON. | Does the airbag warning light illuminates for 6 seconds then go off? | Replace the seat belt outer. <Ref. to SB-10, REMOVAL, Front Seat Belt.>             | Go to step 3. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

| Step  | Check                                      | Yes                         | No   |
|---|--|-----------------------------|--|
| <b>3</b><br><b>CHECK AIRBAG HARNESS.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the test harness AC from belt tension sensor connector (AB63).<br>3) Connect the test harness AD (1AD) to connector (AB63).<br>4) Disconnect the airbag harness connector (AB62), and connect the connector (1AB) in test harness AB.<br>5) Measure the resistance between test harness terminals.<br><b>Connector &amp; terminal</b><br><b>(2AB) No. 5 — (2AD) No. 1:</b><br><b>(2AB) No. 4 — (2AD) No. 3:</b><br><b>(2AB) No. 6 — (2AD) No. 2:</b> | Is the resistance less than 10 $\Omega$ ?  | Go to step 4.               | Replace the airbag harness.  |
| <b>4</b><br><b>CHECK AIRBAG HARNESS.</b><br>Measure the resistance between test harness terminals and between test harness terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(2AB) No. 4 — (2AD) No. 1:</b><br><b>(2AB) No. 4 — (2AD) No. 2:</b><br><b>(2AB) No. 4 — Chassis ground:</b><br><b>(2AB) No. 5 — (2AD) No. 2:</b><br><b>(2AB) No. 5 — Chassis ground:</b>   | Is the resistance more than 1 M $\Omega$ ? | Go to step 5.               | Replace the airbag harness.  |
| <b>5</b><br><b>CHECK AIRBAG HARNESS.</b><br>1) Connect the battery ground cable and turn the ignition switch to ON.<br>2) Measure the voltage between test harness and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(2AD) No. 1 — Chassis ground:</b><br><b>(2AD) No. 3 — Chassis ground:</b>   | Is the voltage less than 1 V?              | Replace the airbag harness. | Check the occupant detection harness and replace it if faulty. Replace the seat cushion frame assembly if the occupant detection harness is not faulty. <Ref. to SE-8, DISASSEMBLY, Front Seat.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

### D: DTC 27 ODS COMMUNICATION ERROR

Perform the diagnosis using the diagnostic procedure for airbag system. <Ref. to AB(diag)-69, DTC 27 ODS COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>

### E: DTC 29 ODS FAILURE

#### DTC DETECTING CONDITION:

- Load cell sensor is faulty.
- Occupant detection control module is faulty.
- Occupant detection harness is faulty.
- Side airbag harness is faulty.
- Fuse No. 25 (in joint box) is blown.

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| 1<br><b>CHECK POOR CONTACT IN CONNECTOR.</b><br>Check the connector between occupant detection control module and airbag control module for poor contact. | Is there poor contact?   | Reconnect the connector. If the fault is not corrected, replace the airbag harness. | Go to step 2.   |
| 2<br><b>CHECK DTC.</b><br>Read the DTC of airbag system.  | Is "2C BELT TENSION SENSOR FAILURE" or "37 BUCKLE SWITCH RH FAILURE" displayed in DTC? | Perform the diagnosis according to each DTC.  | Check the occupant detection harness and replace it if faulty. If the fault is not corrected, replace the occupant detection system. <Ref. to SE-8, DISASSEMBLY, Front Seat.> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

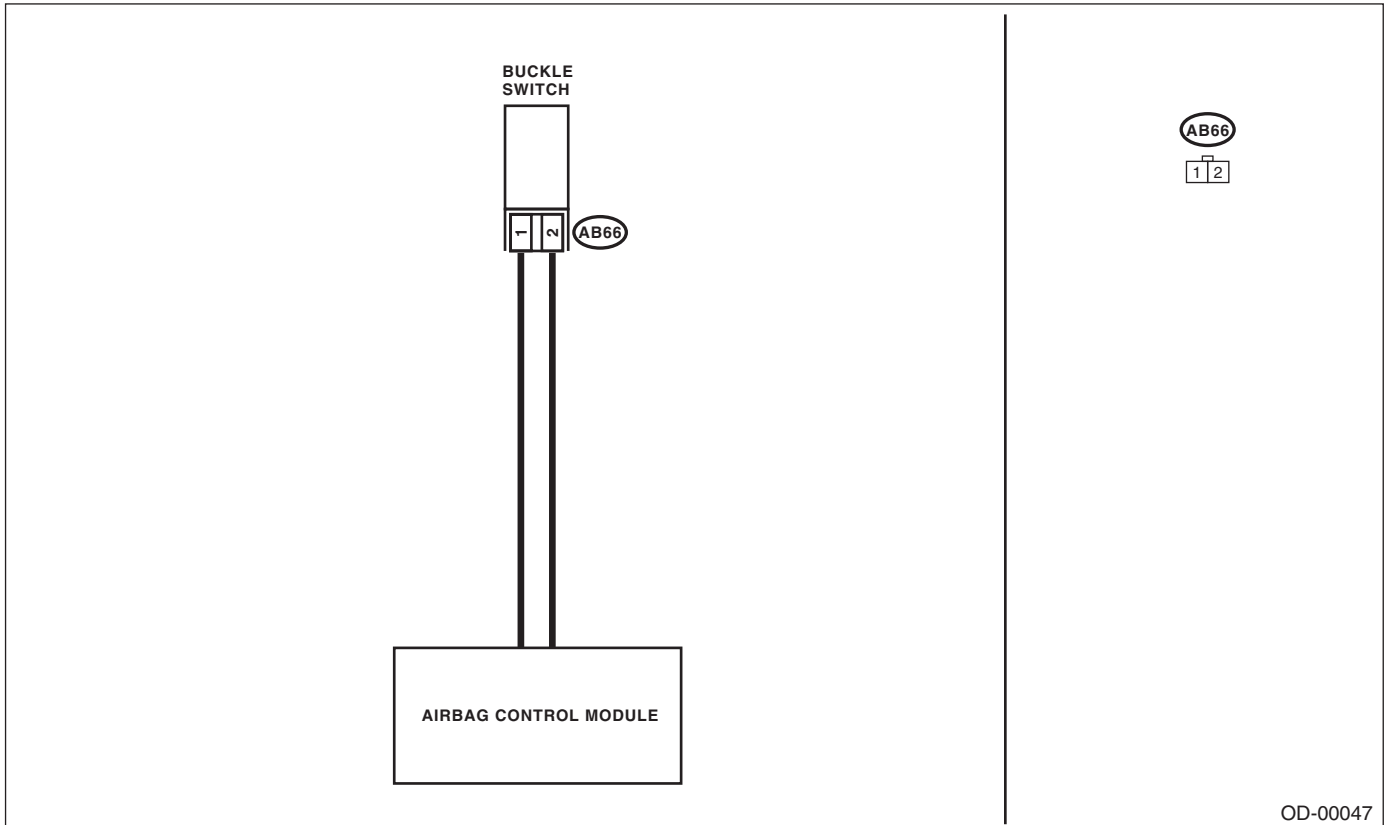
OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

## F: DTC 37 BUCKLE SWITCH RH FAILURE

### DTC DETECTING CONDITION:

- Passenger's buckle switch circuit is open, shorted or shorted to ground.
- Seat harness circuit is open, shorted or shorted to ground.
- Occupant detection control module is faulty.

### WIRING DIAGRAM:



OD-00047

| Step   | Check  | Yes   | No   |
|--|--|---|--|
| <b>1</b><br><b>CHECK POOR CONTACT IN CONNECTOR.</b><br>Check the connector between occupant detection control module and buckle switch for poor contact.   | Is there poor contact?   | Reconnect the connector. If the fault is not corrected, replace the airbag harness. | Go to step 2.  |
| <b>2</b><br><b>CHECK BUCKLE SWITCH.</b><br>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.<br>2) Disconnect the buckle switch connector (AB66).<br>3) Connect the test harness AE (1AE) and test harness connector Y to the buckle switch connector (AB66).<br>4) Connect the battery ground cable and turn the ignition switch to ON. | Does the airbag warning light illuminates for 6 seconds then go off? | Replace the buckle switch.<br><Ref. to SB-10, REMOVAL, Front Seat Belt.>            | Check the occupant detection harness and replace it if faulty. If the fault is not corrected, replace the occupant detection system. |

# **Diagnostic Procedure with Diagnostic Trouble Code (DTC)**

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

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# SEAT BELT SYSTEM

# SB

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|   | <b>Page</b> |
|---|-------------|
| 1. General Description .....                    | 2           |
| 2. Pretensioner Connector .....                 | 6           |
| 3. Inspection Locations After a Collision ..... | 7           |
| 4. Seat Belt Warning System .....               | 8           |
| 5. Front Seat Belt .....                        | 10          |
| 6. Rear Seat Belt.....                          | 13          |



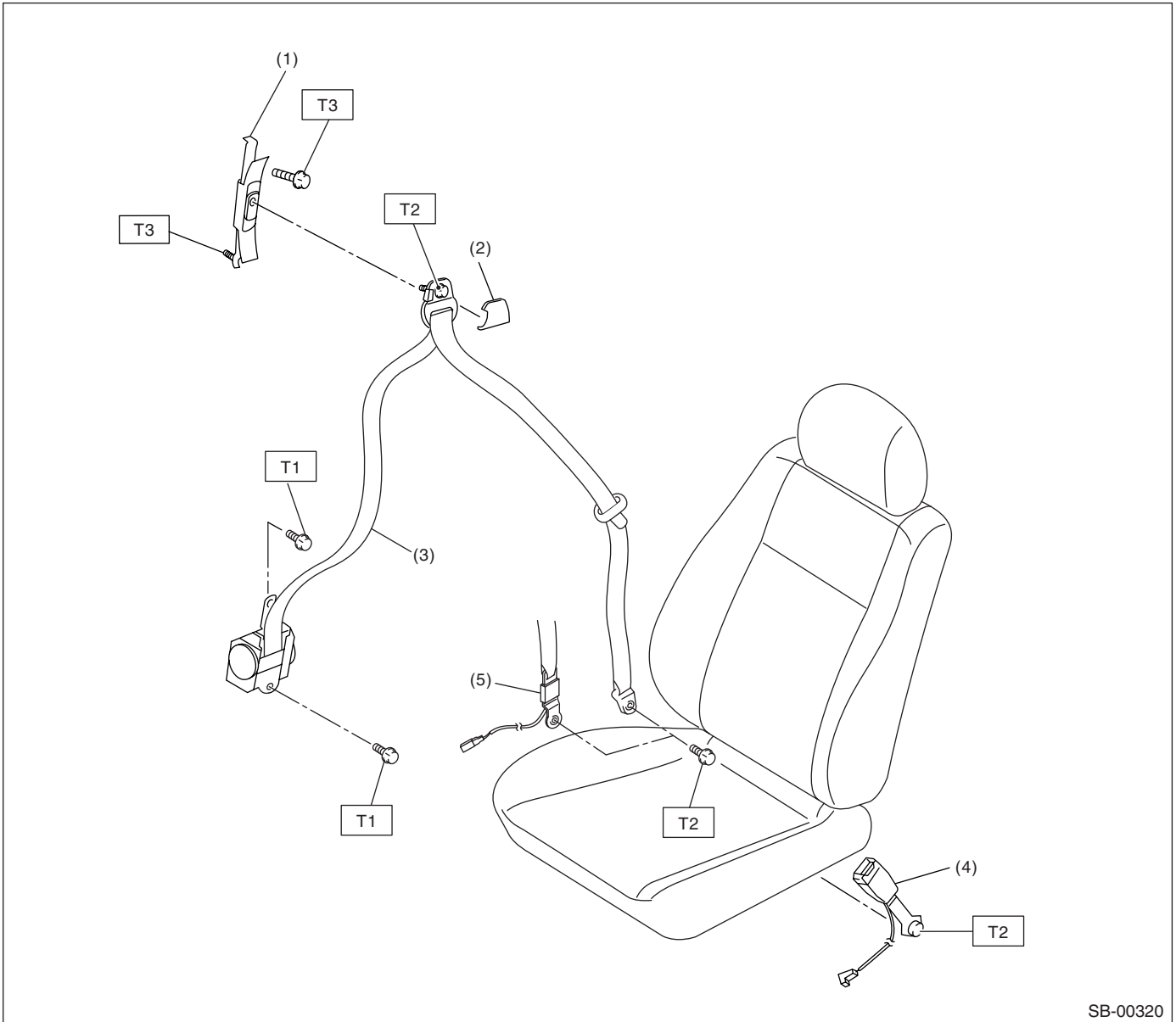
# General Description

## SEAT BELT SYSTEM

### 1. General Description

#### A: COMPONENT

#### 1. FRONT SEAT BELT



SB-00320

- (1) Adjuster anchor ASSY
- (2) Anchor cover
- (3) Outer seat belt ASSY

- (4) Inner seat belt ASSY
- (5) Belt tension sensor (passenger's side)

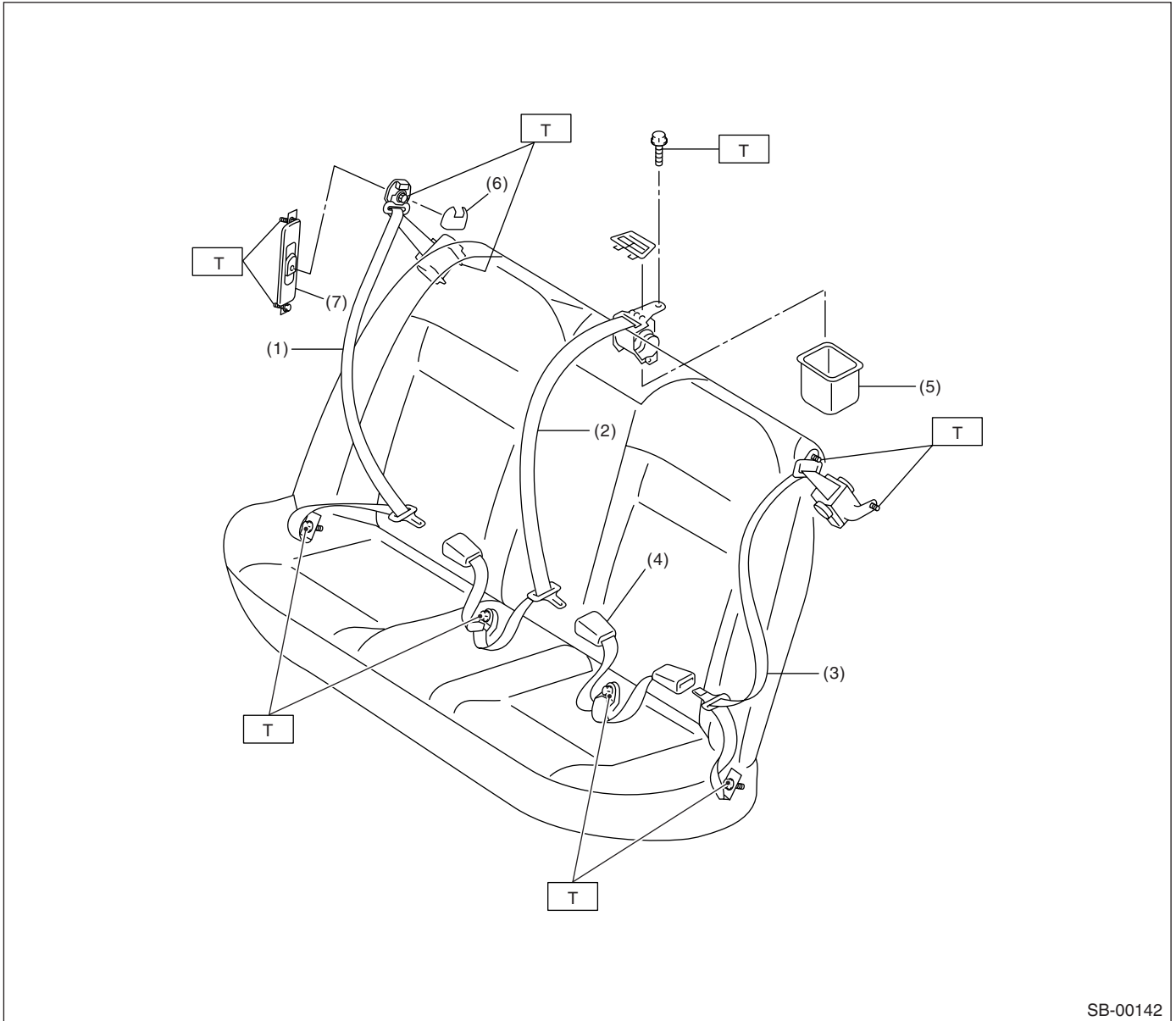
**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 7.5 (0.76, 5.5)**

**T2: 30 (3.1, 22)**

**T3: 53 (5.4, 39)**

## 2. REAR SEAT BELT (SEDAN MODEL)



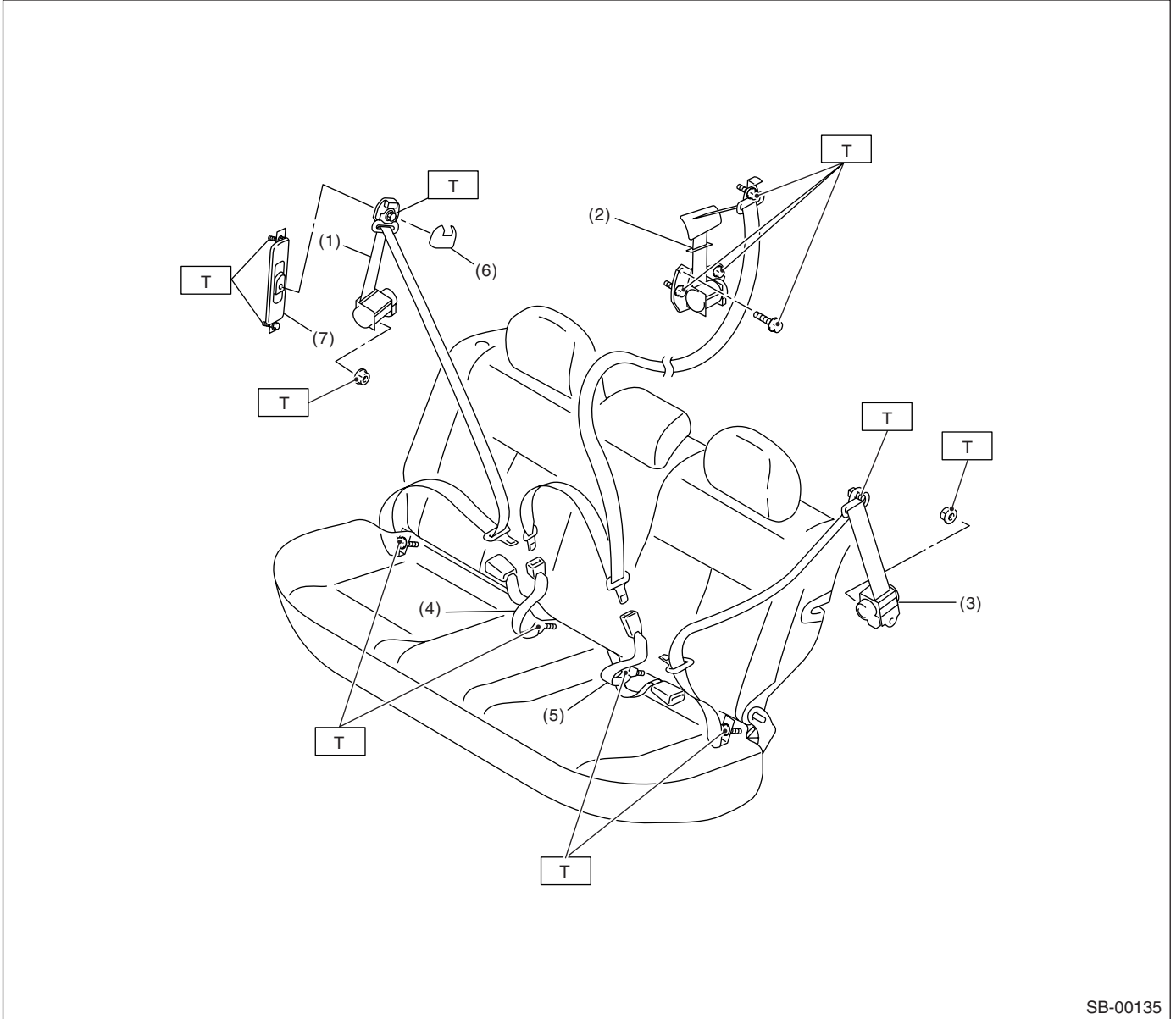
- |                                 |                          |
|---------------------------------|--------------------------|
| (1) Outer seat belt RH ASSY     | (5) Case center ELR      |
| (2) Shoulder seat belt CTR ASSY | (6) Anchor cover         |
| (3) Outer seat belt LH ASSY     | (7) Adjuster anchor ASSY |
| (4) Center seat belt LH ASSY    |                          |

**Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 30 (3.1, 22)**

# General Description

## SEAT BELT SYSTEM

### 3. REAR SEAT BELT (WAGON MODEL)



SB-00135

- |                                 |                              |
|---------------------------------|------------------------------|
| (1) Outer seat belt RH ASSY     | (5) Center seat belt LH ASSY |
| (2) Shoulder seat belt CTR ASSY | (6) Anchor cover             |
| (3) Outer seat belt LH ASSY     | (7) Adjuster anchor ASSY     |
| (4) Center seat belt RH ASSY    |                              |

**Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 30 (3.1, 22)**

### **B: CAUTION**

- Before starting, turn the ignition switch to OFF, disconnect the battery ground cable and wait for 20 seconds or more.
- The pretensioner system has a backup power source. The pretensioner might deploy if you do not wait for 20 seconds or more before starting work.
- Do not drop or apply any impact to the pretensioner.
- If oil, grease, or water gets on the pretensioner, wipe it off immediately with a dry cloth.
- Do not expose the pretensioner to high temperature or flame.
- Do not allow current to flow through or voltage to reach the pretensioner. Do not use a circuit tester to check resistance of the pretensioner.
- Do not disassemble or attempt to repair the pretensioner. If it is dented, cracked, or deformed, replace it with a new one.
- Do not use the airbag or pretensioner parts from other vehicles. Always replace parts with new parts.
- When handling a seat belt with a deployed pretensioner, wear gloves and goggles. Wash your hands afterwards.
- Do not re-use a seat belt with a deployed pretensioner again.
- If the material gets in your eyes or on your skin during deployment, wash it away with clean water, and then consult a doctor.

## 2. Pretensioner Connector

### A: PROCEDURE

Refer to “Airbag Connector” in AIRBAG SYSTEM section. <Ref. to AB-8, PROCEDURE, Airbag Connector.>

### 3. Inspection Locations After a Collision

#### A: INSPECTION

Check for the following, and then replace with new parts if necessary.

- Center pillar lower garnish is discolored or cracked.
- Wire harness and/or connector is damaged.

# Seat Belt Warning System

SEAT BELT SYSTEM

## 4. Seat Belt Warning System

### A: WIRING DIAGRAM

<Ref. to WI-113, WIRING DIAGRAM, Seat Belt Warning System.>

### B: INSPECTION

#### TROUBLE SYMPTOM:

- Seat belt warning light does not come on or go off.
- Buzzer does not beep.

| Step   | Check  | Yes           | No  |
|--|--|---------------|---|
| <p><b>1</b></p> <p><b>CHECK HARNESS BETWEEN BODY INTEGRATED MODULE AND CHASSIS GROUND.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from body integrated module.<br/>3) Measure the resistance between body integrated module harness connector and chassis ground.</p> <p><b>Connector &amp; terminal:</b><br/><b>(B280) No. 13 — Chassis ground:</b></p>   | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | Go to step 2. | Repair the open circuit of harness between body integrated module and chassis ground.   |
| <p><b>2</b></p> <p><b>CHECK POWER SUPPLY OF BODY INTEGRATED MODULE.</b></p> <p>1) Turn the ignition switch to ON.<br/>2) Measure the voltage between body integrated module connector and chassis ground.</p> <p><b>Connector &amp; terminal:</b><br/><b>(B281) No. 19 (+) — Chassis ground (-):</b></p>   | <p>Is the voltage more than 10 V?</p>                      | Go to step 3. | Repair the open harness, short circuit and poor contact of connector between body integrated module and battery.                |
| <p><b>3</b></p> <p><b>CHECK SEAT BELT SWITCH AND HARNESS.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Disconnect the connector from body integrated module.<br/>3) Hold the tang plate disconnected from driver's seat belt buckle.<br/>4) Measure the resistance between body integrated module harness connector and chassis ground.</p> <p><b>Connector &amp; terminal:</b><br/><b>(B281) No. 3 — Chassis ground:</b></p> | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | Go to step 4. | Repair the short circuit of harness between body integrated module connector and chassis ground.                                |
| <p><b>4</b></p> <p><b>CHECK SEAT BELT SWITCH AND HARNESS.</b></p> <p>1) Turn the ignition switch to OFF.<br/>2) Insert the tang plate into driver's seat belt buckle.<br/>3) Measure the resistance between body integrated module connector and chassis ground.</p> <p><b>Connector &amp; terminal:</b><br/><b>(B281) No. 3 — Chassis ground:</b></p>   | <p>Is the resistance more than 1 <math>M\Omega</math>?</p> | Go to step 7. | Go to step 5.   |
| <p><b>5</b></p> <p><b>CHECK HARNESS BETWEEN BODY INTEGRATED MODULE AND SEAT BELT SWITCH.</b></p> <p>Measure the resistance of harness between body integrated module connector and seat belt switch.</p> <p><b>Connector &amp; terminal:</b><br/><b>(B281) No. 3 — (R245) No. 2:</b></p>   | <p>Is the resistance less than 1 <math>\Omega</math>?</p>  | Go to step 6. | Repair the open circuit of harness and poor contact of connector between body integrated module connector and seat belt switch. |

# Seat Belt Warning System

SEAT BELT SYSTEM

| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <b>6 CHECK HARNESS BETWEEN SEAT BELT SWITCH AND CHASSIS GROUND.</b><br>Measure the resistance of harness between seat belt switch and chassis ground.<br><i><b>Connector &amp; terminal:</b></i><br><i><b>(R245) No. 1 — Chassis ground:</b></i>                  | Is the resistance less than 1 $\Omega$ ?                                | Go to step 7.                                    | Repair the open circuit of harness between seat belt switch and chassis ground.  |
| <b>7 CHECK SEAT BELT SWITCH.</b><br>1) Hold the tang plate disconnected from driver's seat belt buckle.<br>2) Measure the resistance between seat belt switch terminals.<br><i><b>Terminal</b></i><br><i><b>(R245) No. 1 — No. 2:</b></i>                         | Is the resistance less than 1 $\Omega$ ?                                | Go to step 8.                                    | Replace the inner belt assembly.   |
| <b>8 CHECK SEAT BELT SWITCH.</b><br>1) Insert the tang plate into driver's seat belt buckle.<br>2) Measure the resistance between seat belt switch terminals.<br><i><b>Terminal</b></i><br><i><b>(R245) No. 1 — No. 2:</b></i>                                    | Is the resistance more than 1 $M\Omega$ ?                               | Go to step 9.                                    | Replace the inner belt assembly.   |
| <b>9 CHECK COMBINATION METER.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between combination meter and chassis ground.<br><i><b>Connector &amp; terminal:</b></i><br><i><b>(i10) No. 9 (+) — Chassis ground (-):</b></i>                 | Is the voltage more than 10 V?  | Go to step 10.                                   | Check the wiring harness and combination meter, and then repair or replace them.   |
| <b>10 CHECK HARNESS BETWEEN BODY INTEGRATED MODULE AND COMBINATION METER.</b><br>Measure the resistance of harness between body integrated module and combination meter.<br><i><b>Connector &amp; terminal:</b></i><br><i><b>(B280) No. 11 — (i10) No. 9:</b></i> | Is the resistance less than 1 $\Omega$ ?                                | Go to step 11.                                   | Repair the open circuit in harness between body integrated module and combination meter.   |
| <b>11 CHECK POOR CONTACT.</b><br>Check the poor contact of seat belt warning light circuit.   | Is there any poor contact?  | Repair the poor contact.                         | Go to step 12.   |
| <b>12 CHECK BODY INTEGRATED MODULE.</b><br>1) Connect all connectors.<br>2) Turn the ignition switch to ON.<br>3) Hold the tang plate disconnected from driver's seat belt buckle.<br>4) Check seat belt warning light comes on.                                  | Does the seat belt warning light come on?                               | Go to step 13.                                   | Check the connectors and the harness, and if there are no abnormalities, replace the bulb of the seat belt warning light in the combination meter. |
| <b>13 CHECK BODY INTEGRATED MODULE.</b><br>1) Connect all connectors.<br>2) Turn the ignition switch to ON.<br>3) Hold the tang plate disconnected from driver's seat belt buckle.<br>4) Check seat belt warning light comes on and buzzer beeps.                 | Does the seat belt warning light come on and buzzer beep for 6 seconds? | Check the connector or harness for poor contact. | Replace the body integrated module.  |



# Front Seat Belt

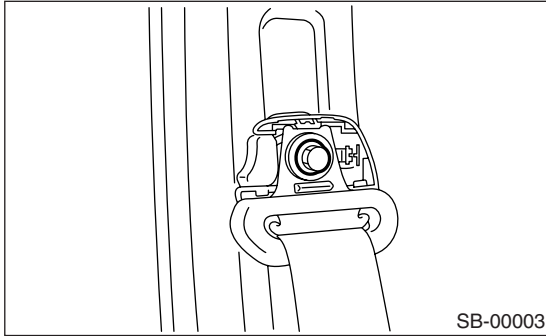
## SEAT BELT SYSTEM

### 5. Front Seat Belt

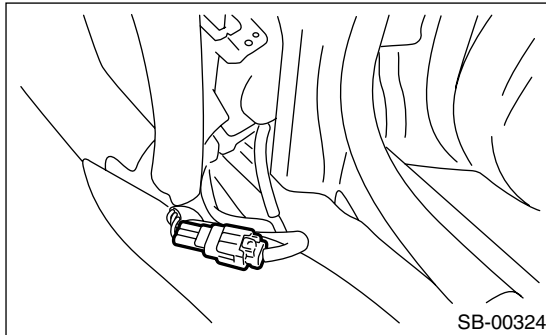
#### A: REMOVAL

##### 1. OUTER SEAT BELT ASSEMBLY

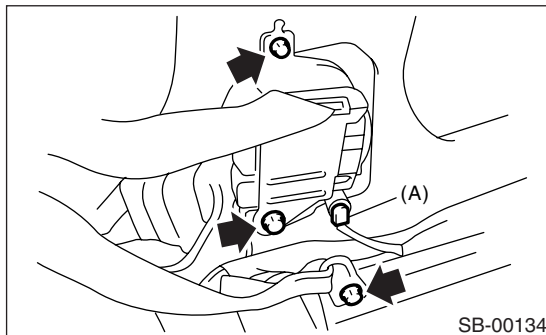
- 1) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds.
- 2) Fold backrest all the way forward, and then move front seat all the way forward.
- 3) Remove the center pillar lower trim. <Ref. to EI-51, REMOVAL, Lower Inner Trim.>
- 4) Remove the anchor cover. Loosen the shoulder anchor bolt, and then detach the shoulder anchor from center pillar.



- 5) Turn over the floor mat to disconnect the connector of belt tension sensor. (Passenger's side).

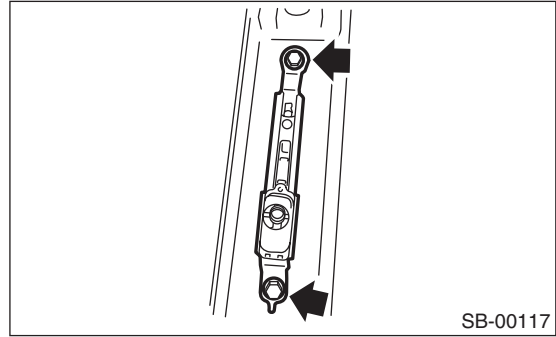


- 6) Turn over the floor mat to disconnect the connector (A) of pretensioner, and then loosen the three bolts to remove the outer seat belt assembly.



- 7) Remove the center pillar upper trim. <Ref. to EI-50, REMOVAL, Upper Inner Trim.>

- 8) Remove the two bolts and adjustable anchor assembly.

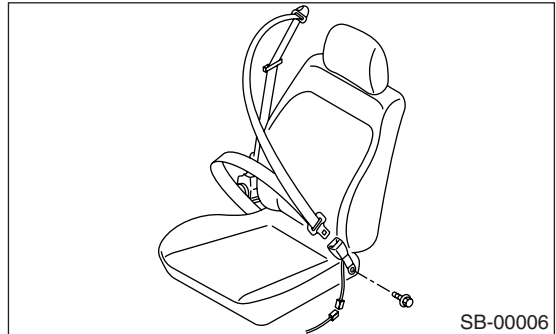


#### CAUTION:

- Do not drop or apply any impact to the pretensioner.
- Pretensioner and bracket should be treated as an assembly. Do not attempt to disassemble it.

##### 2. INNER SEAT BELT ASSEMBLY

- 1) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
- 2) Remove the console box. <Ref. to EI-46, REMOVAL, Console Box.>
- 3) Disconnect the seat belt warning light connector under the seat.
- 4) Remove the clip of harness from seat rail.
- 5) Remove the anchor bolt, and then remove the inner seat belt assembly.



#### B: INSTALLATION

##### 1. OUTER SEAT BELT ASSEMBLY

Install in the reverse order of removal.

#### CAUTION:

- Parts of the driver and passenger sides are not identical. Before installation, make sure the correct part is used.
- Be careful not to twist the seat belts during installation.

#### Tightening torque:

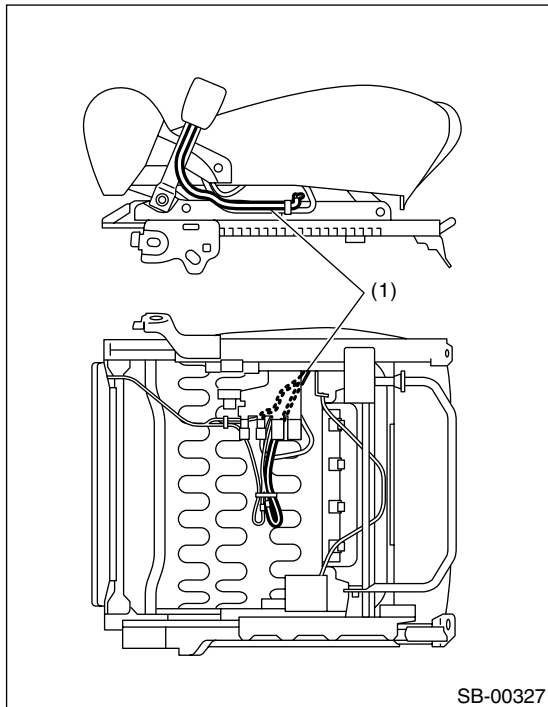
<Ref. to SB-2, FRONT SEAT BELT, COMPONENT, General Description.>

## 2. INNER SEAT BELT ASSEMBLY

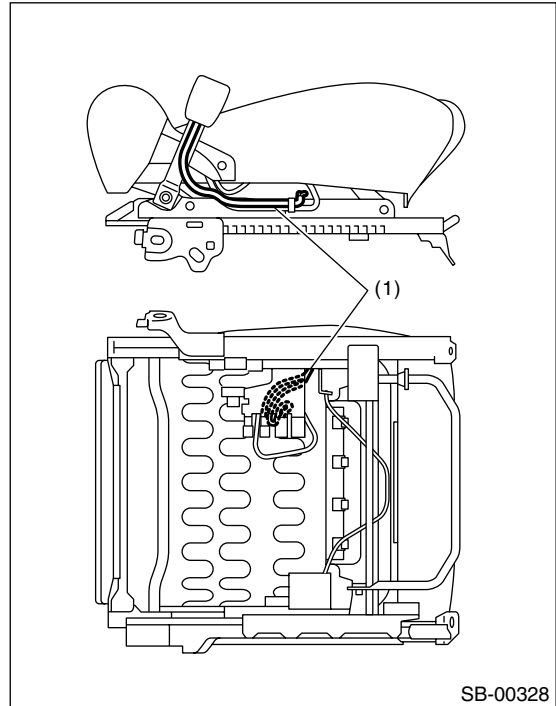
Install in the reverse order of removal.

### CAUTION:

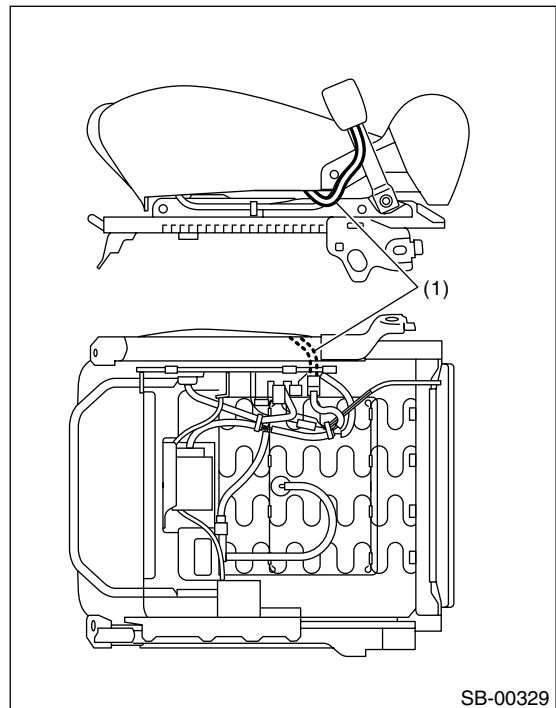
- After driver's and passenger's inner seat belt assemblies installation, check that the seat belt buckle switch operates normally using Subaru Select Monitor on the {Status Data} of «Airbag System». <Ref. to AB(diag)-27, STATUS DATA DISPLAY, OPERATION, Subaru Select Monitor.> Improper buckle switch function may cause airbag system malfunction.
- Inner seat belt assembly harness (1) must be routed securely as shown in the figure, since it may affect the performances of seat position sensor and occupant detection system.
- Driver's seat (with seat heater)



- Driver's seat (without seat heater)



- Passenger's seat



**Tightening torque:**  
 <Ref. to SB-2, FRONT SEAT BELT, COMPONENT, General Description.>

### **C: INSPECTION**

#### **1. OUTER SEAT BELT ASSEMBLY**

Check for the following, and replace with new parts if necessary.

- Pretensioner is cracked or deformed.
- Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

#### **2. INNER SEAT BELT ASSEMBLY**

Check for the following, and replace with new parts if necessary.

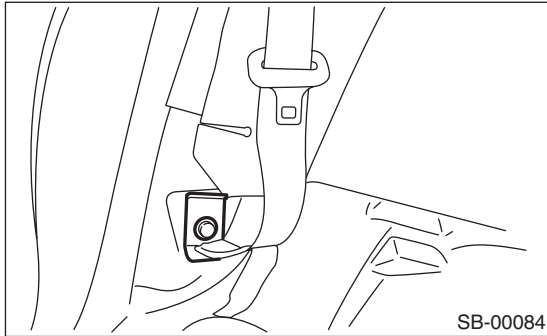
- Inner seat belt assembly is deformed or damaged.
- Seat belt buckle is engaged improperly.

## 6. Rear Seat Belt

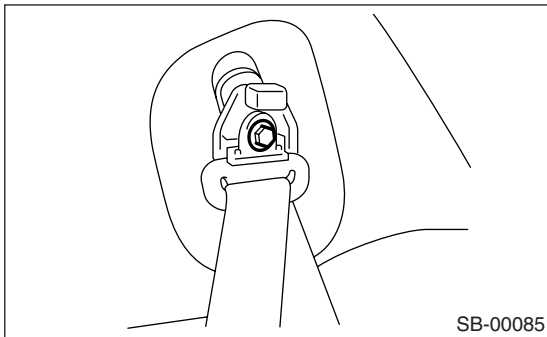
### A: REMOVAL

#### 1. OUTER SEAT BELT RH ASSEMBLY AND LH ASSEMBLY (SEDAN MODEL)

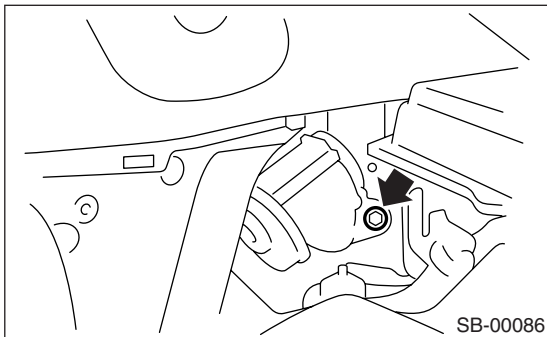
- 1) Remove the rear seat. <Ref. to SE-13, REMOVAL, Rear Seat.>
- 2) Remove the side sill rear lower cover. <Ref. to EI-51, REMOVAL, Lower Inner Trim.>
- 3) Remove the seat belt lower anchor bolt.



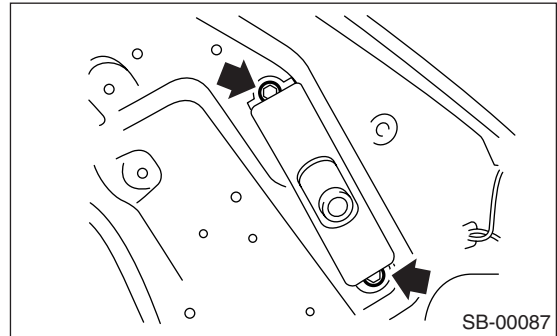
- 4) Remove the anchor cover. Remove the bolt from pillar and remove shoulder anchor.



- 5) Remove the quarter pillar trim. <Ref. to EI-52, REMOVAL, Rear Quarter Trim.>
- 6) Remove the bolts, and then detach the outer seat belt assembly.

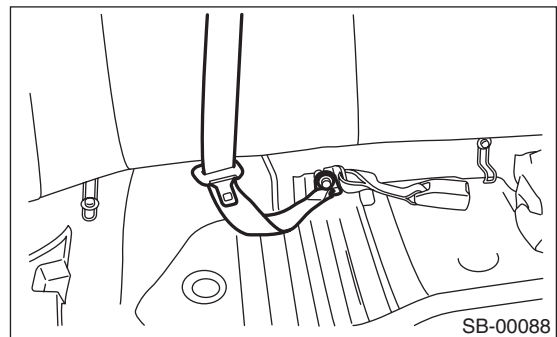


- 7) Remove the two bolts and remove adjustable anchor ASSY.

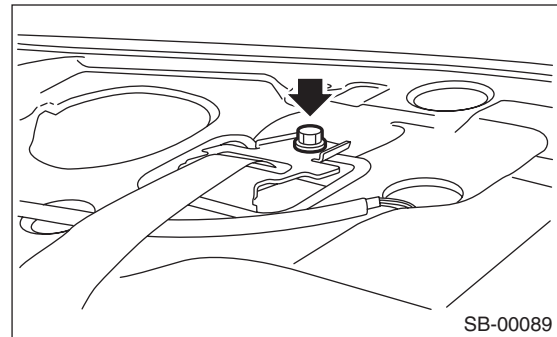


#### 2. SHOULDER SEAT BELT CTR ASSEMBLY (SEDAN MODEL)

- 1) Remove the rear seat cushion. <Ref. to SE-13, REMOVAL, Rear Seat.>
- 2) Remove the seat belt lower anchor bolt.



- 3) Remove the quarter pillar trim. <Ref. to EI-52, REMOVAL, Rear Quarter Trim.>
- 4) Remove the rear shelf trim. <Ref. to EI-58, REMOVAL, Rear Shelf Trim.>
- 5) Remove the bolts, and then detach the shoulder seat belt assembly.

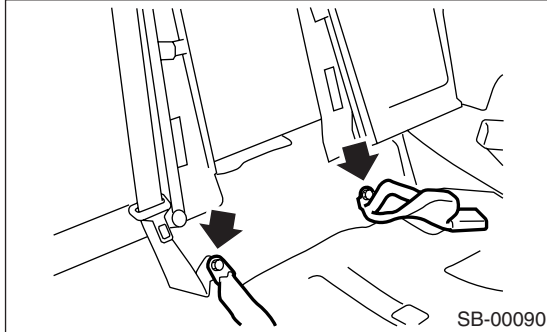


# Rear Seat Belt

## SEAT BELT SYSTEM

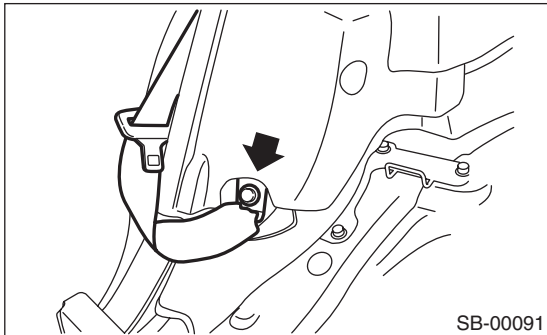
### 3. CENTER SEAT BELT LH ASSEMBLY (SEDAN MODEL)

- 1) Remove the rear seat cushion. <Ref. to SE-13, REMOVAL, Rear Seat.>
- 2) Remove the bolts, and then detach the center seat belt LH assembly.

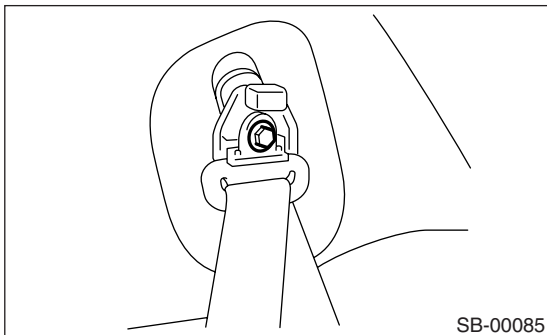


### 4. OUTER SEAT BELT RH ASSEMBLY AND LH ASSEMBLY (WAGON MODEL)

- 1) Remove the luggage floor mat. <Ref. to EI-61, REMOVAL, Luggage Floor Mat.>
- 2) Remove the rear seat cushion. <Ref. to SE-13, REMOVAL, Rear Seat.>
- 3) Remove the side sill rear lower cover. <Ref. to EI-51, REMOVAL, Lower Inner Trim.>
- 4) Remove the seat belt lower anchor bolt.

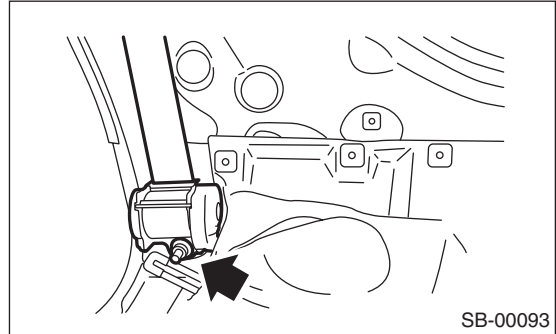


- 5) Remove the anchor cover. Remove the bolt from pillar and remove shoulder anchor.

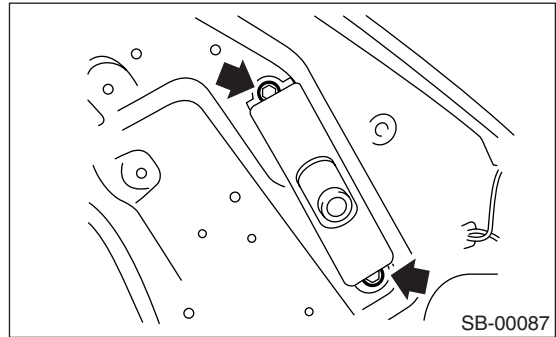


- 6) Remove the rear quarter trim. <Ref. to EI-52, REMOVAL, Rear Quarter Trim.>

- 7) Remove the bolts, and then detach the outer seat belt.

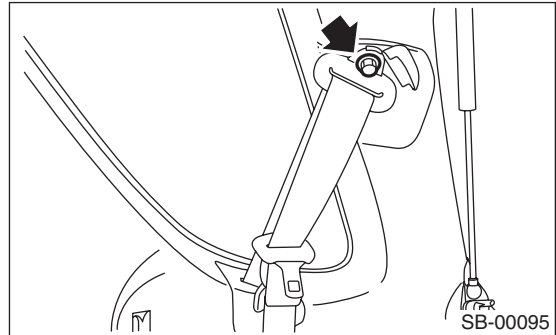


- 8) Remove the two bolts and remove adjustable anchor ASSEMBLY.



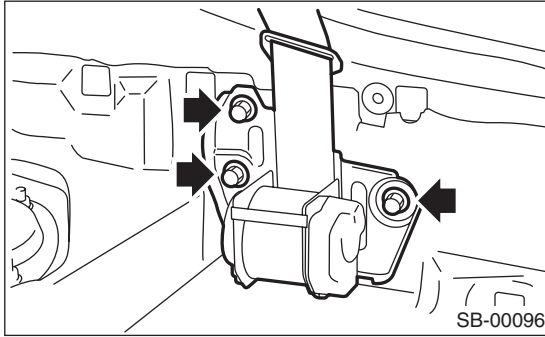
### 5. SHOULDER SEAT BELT CTR ASSEMBLY (WAGON MODEL)

- 1) Remove the shoulder anchor bolt, and then detach the shoulder anchor from quarter pillar.



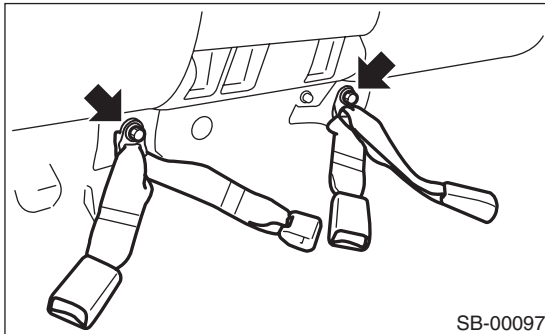
- 2) Remove the quarter trim. <Ref. to EI-52, REMOVAL, Rear Quarter Trim.>

3) Remove the three bolts, and then detach the seat belt assembly.



## 6. CENTER SEAT BELT RH ASSEMBLY AND LH ASSEMBLY (WAGON MODEL)

1) Remove the rear seat cushion.  
2) Remove the bolt, and then detach the center seat belt assembly.



## B: INSTALLATION

### 1. OUTER SEAT BELT RH ASSEMBLY AND LH ASSEMBLY (SEDAN MODEL)

Install in the reverse order of removal.

#### CAUTION:

- During installation, make sure that the seat belts are not twisted.
- After installation, make sure that the seat belts can be smoothly extended and wound.

### 2. SHOULDER SEAT BELT CTR ASSEMBLY (SEDAN MODEL)

Install in the reverse order of removal.

#### CAUTION:

- During installation, make sure that the seat belts are not twisted.
- After installation, make sure that the seat belts can be smoothly extended and wound.

### 3. CENTER SEAT BELT LH ASSEMBLY (SEDAN MODEL)

Install in the reverse order of removal.

#### CAUTION:

During installation, make sure that the seat belts are not twisted.

### 4. OUTER SEAT BELT RH ASSEMBLY AND LH ASSEMBLY (WAGON MODEL)

Install in the reverse order of removal.

#### CAUTION:

- During installation, make sure that the seat belts are not twisted.
- After installation, make sure that the seat belts can be smoothly extended and wound.

### 5. SHOULDER SEAT BELT CTR ASSEMBLY (WAGON MODEL)

Install in the reverse order of removal.

#### CAUTION:

- During installation, make sure that the seat belts are not twisted.
- After installation, make sure that the seat belts are smoothly extended and wound.

### 6. CENTER SEAT BELT RH ASSEMBLY AND LH ASSEMBLY (WAGON MODEL)

Install in the reverse order of removal.

#### CAUTION:

During installation, make sure that the seat belts are not twisted.

## C: INSPECTION

### 1. OUTER SEAT BELT RH ASSEMBLY AND LH ASSEMBLY (SEDAN MODEL)

Check for the following, and replace with new parts if necessary.

- Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

### 2. SHOULDER SEAT BELT CTR ASSEMBLY (SEDAN MODEL)

Check for the following, and replace with new parts if necessary.

- Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

### 3. CENTER SEAT BELT LH ASSEMBLY (SEDAN MODEL)

Check for the following, and replace with new parts if necessary.

- Inner belt is deformed or damaged.
- Seat belt buckle is engaged improperly.

#### **4. OUTER SEAT BELT RH ASSEMBLY AND LH ASSEMBLY (WAGON MODEL)**

Check for the following, and replace with new parts if necessary.

- Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

#### **5. SHOULDER SEAT BELT CTR ASSEMBLY (WAGON MODEL)**

Check for the following, and replace with new parts if necessary.

- Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

#### **6. CENTER SEAT BELT RH ASSEMBLY AND LH ASSEMBLY (WAGON MODEL)**

Check for the following, and replace with new parts if necessary.

- Inner belt is deformed or damaged.
- Seat belt buckle is engaged improperly.

# LIGHTING SYSTEM



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# General Description

## LIGHTING SYSTEM

### 1. General Description

#### A: SPECIFICATION

|   |                       |                                  |                     |
|---|-----------------------|----------------------------------|---------------------|
| Headlight                                 | Halogen type low beam |                                  | 12 V — 55 W         |
|   | HID type low beam     |                                  | D2S 35W             |
|   | High beam             |                                  | 12 V — 60 W         |
| Front turn signal light                   |                       |                                  | 12 V — 21 W (WY21W) |
| Clearance/Parking/Front side marker light |                       |                                  | 12 V — 5 W          |
| Front fog light                           |                       |                                  | 12 V — 55 W         |
| Rear combination light                    | Sedan                 | Tail/Stop/Rear side marker light | 12 V — 5/21 W       |
|   |                       | Tail light                       | 12 V — 5/21 W       |
|   |                       | Stop light                       | 12 V — 21 W         |
|   | Wagon                 | Tail/Stop/Rear side marker light | 12 V — 5/21 W       |
|   |                       | Turn signal light                | 12 V — 21 W (WY21W) |
|   |                       | Back-up light                    | 12 V — 21 W         |
| License plate light                       |                       |                                  | 12 V — 5 W          |
| High-mounted stop light                   | Sedan                 | Standard type                    | 12 V — 21 W         |
|   |                       | Rear spoiler built-in type       | 12 V — 1.2 W (LED)  |
|   | Wagon                 |                                  | 12 V — 13 W         |
| Room light                                |                       |                                  | 12 V — 8 W          |
| Spot map light                            |                       |                                  | 12 V — 8 W          |
| Luggage room light                        |                       |                                  | 12 V — 5 W          |
| Trunk room light                          |                       |                                  | 12 V — 5 W          |
| Glove box light                           |                       |                                  | 12 V — 1.4 W        |

#### B: CAUTION

- Before disassembling or reassembling parts, always disconnect the battery ground cable. When replacing radio, control module and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
- Reassemble in reverse order of disassembly, unless otherwise indicated.
- Adjust parts to the given specifications.
- Connect the connectors and hoses securely during reassembly.

- After reassembly, make sure functional parts operate smoothly.

#### WARNING:

- **Airbag system wiring harness is routed near electrical parts and switches. Airbag system connectors are yellow. Do not use electric test equipment on these circuits.**
- **Be careful not to damage the airbag system wiring harness when servicing electrical parts and switches.**

#### C: PREPARATION TOOL

##### 1. GENERAL TOOL

| TOOL NAME      | REMARKS                                    |
|----------------|--|
| Circuit tester | Used for measuring resistance and voltage. |

## 2. Headlight and Tail Light System

### A: WIRING DIAGRAM

#### 1. HALOGEN TYPE HEADLIGHT

<Ref. to WI-116, WIRING DIAGRAM, Headlight System.>

#### 2. HID TYPE HEADLIGHT

<Ref. to WI-116, WIRING DIAGRAM, Headlight System.>

#### 3. CLEARANCE LIGHT AND ILLUMINATION LIGHT

<Ref. to WI-126, WIRING DIAGRAM, Clearance Light and Illumination Light System.>

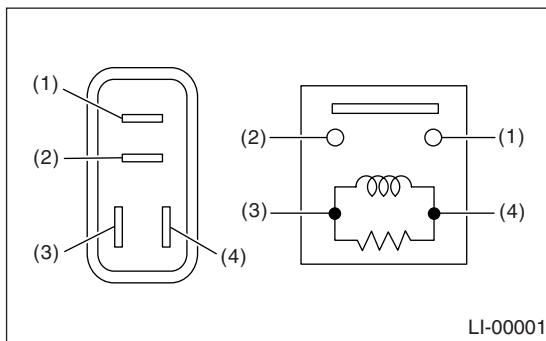
### B: INSPECTION

#### 1. HEADLIGHT SWITCH

<Ref. to LI-9, INSPECTION, Combination Switch (Light).>

#### 2. HEADLIGHT RELAY

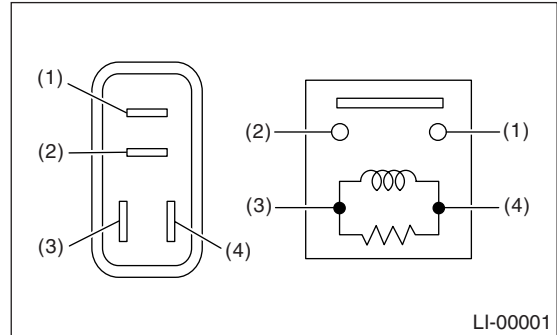
Measure the headlight relay resistance between terminals when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



| Current | Terminal No. | Standard       |
|---------|--------------|----------------|
| Flow    | 1 and 2      | Less than 1 Ω  |
| No flow |              | More than 1 MΩ |

#### 3. TAIL AND ILLUMINATION RELAY

Measure the tail and illumination relay resistance between terminals when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



| Current | Terminal No. | Standard       |
|---------|--------------|----------------|
| Flow    | 1 and 2      | Less than 1 Ω  |
| No flow |              | More than 1 MΩ |

## 3. Front Fog Light System

### A: WIRING DIAGRAM

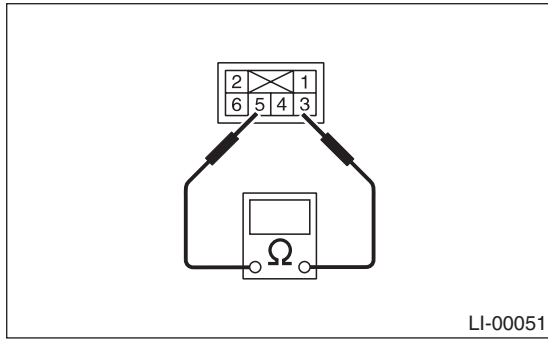
#### 1. FRONT FOG LIGHT

<Ref. to WI-123, WIRING DIAGRAM, Front Fog Light System.>

### B: INSPECTION

#### 1. FRONT FOG LIGHT SWITCH

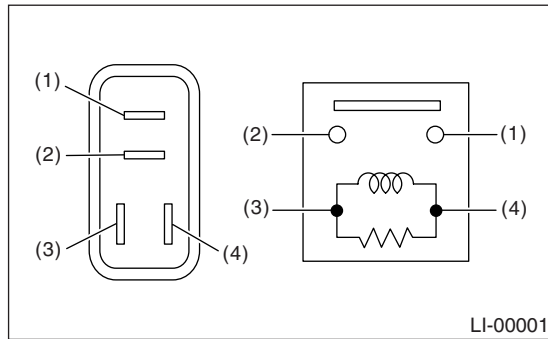
Measure the resistance between front fog light switch terminals.



| Switch position | Terminal No. | Standard       |
|-----------------|--------------|----------------|
| OFF             | 3 and 5      | More than 1 MΩ |
| ON              |              | Less than 1 Ω  |

#### 2. FRONT FOG LIGHT RELAY

Measure the front fog light relay resistance between terminals when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



| Current | Terminal No. | Standard       |
|---------|--------------|----------------|
| Flow    | 1 and 2      | Less than 1 Ω  |
| No flow |              | More than 1 MΩ |

## 4. Turn Signal Light and Hazard Light System

### A: WIRING DIAGRAM

#### 1. TURN SIGNAL LIGHT AND HAZARD LIGHT

<Ref. to WI-132, WIRING DIAGRAM, Turn Signal Light and Hazard Light System.>

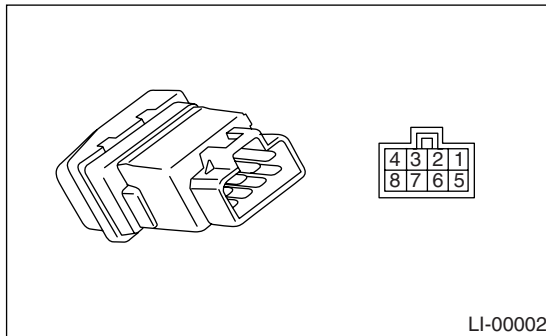
### B: INSPECTION

#### 1. TURN SIGNAL SWITCH

<Ref. to LI-9, INSPECTION, Combination Switch (Light).>

#### 2. HAZARD SWITCH

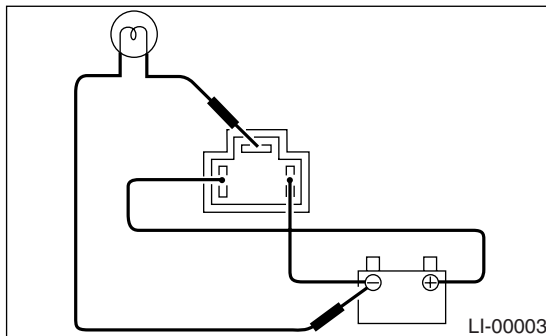
Measure the resistance between hazard switch terminals.



| Switch position | Terminal No. | Standard             |
|-----------------|--------------|----------------------|
| OFF             | 6 and 7      | Less than 1 $\Omega$ |
| ON              | 1, 3 and 4   | Less than 1 $\Omega$ |
|                 | 7 and 8      | Less than 1 $\Omega$ |

#### 3. TURN SIGNAL AND HAZARD MODULE

Connect the battery and turn signal light bulb to the module, as shown in the figure. The module is properly functioning if it blinks when power is supplied to the circuit.



# Back-up Light System

LIGHTING SYSTEM

## 5. Back-up Light System

### A: WIRING DIAGRAM

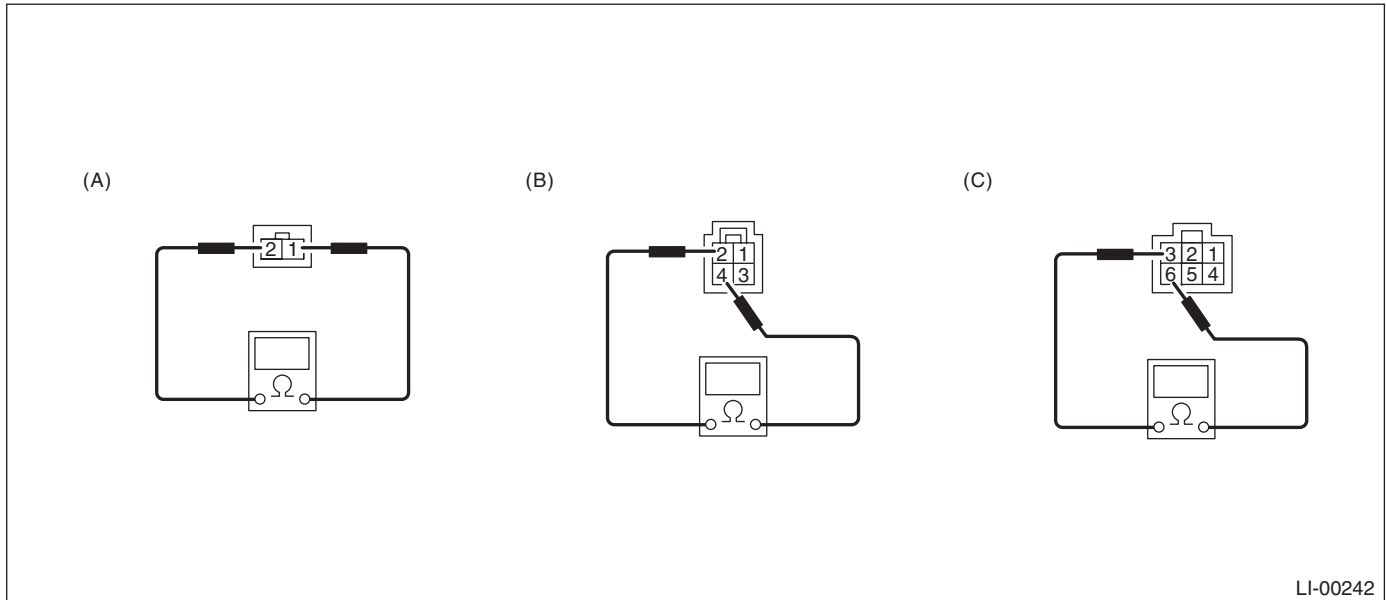
#### 1. BACK-UP LIGHT

<Ref. to WI-124, WIRING DIAGRAM, Back-up Light System.>

### B: INSPECTION

#### 1. BACK-UP LIGHT SWITCH (MT MODEL)

Measure the resistance between back-up light switch terminals.



LI-00242

(A) Non-turbo model

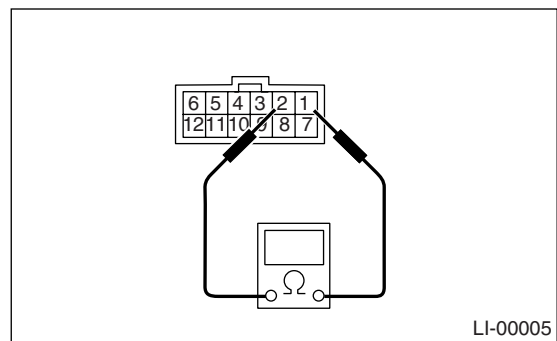
(B) Turbo model (Except STI model)

(C) Turbo model (STI model)

| Switch position                             | Terminal No.  | Standard               |
|---|---|------------------------|
| When shift lever is set in reverse position | Turbo model (Except STI model): 2 and 4<br>Turbo model (STI model): 3 and 6<br>Non-turbo model: 1 and 2 | Less than 1 $\Omega$   |
| Other positions                             |   | More than 1 M $\Omega$ |

#### 2. INHIBITOR SWITCH (AT MODEL)

Measure the resistance between inhibitor switch terminals.



LI-00005

| Switch position                       | Terminal No. | Standard               |
|---------------------------------------|--------------|------------------------|
| When select lever is set in "R" range | 1 and 2      | Less than 1 $\Omega$   |
| Other positions                       |              | More than 1 M $\Omega$ |

## 6. Stop Light System

### A: WIRING DIAGRAM

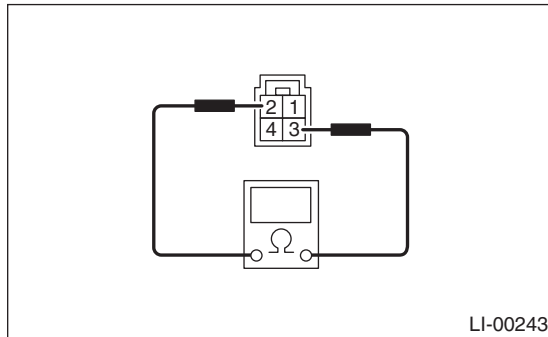
#### 1. STOP LIGHT

<Ref. to WI-125, WIRING DIAGRAM, Stop Light System.>

### B: INSPECTION

#### 1. STOP LIGHT SWITCH

Measure the resistance between stop light switch terminals.



| Switch position               | Terminal No. | Standard               |
|-------------------------------|--------------|------------------------|
| When brake pedal is depressed | 2 and 3      | Less than 1 $\Omega$   |
| When brake pedal is released  |              | More than 1 M $\Omega$ |

## 7. Room Light System

### A: WIRING DIAGRAM

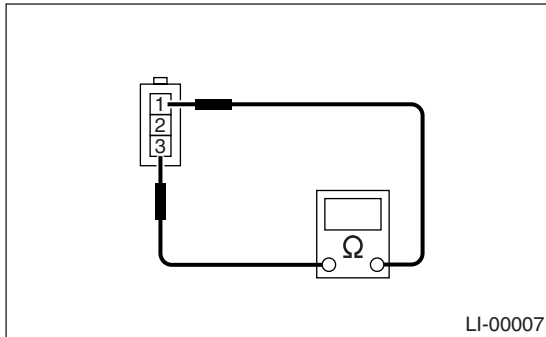
#### 1. INTERIOR LIGHT

<Ref. to WI-134, WIRING DIAGRAM, Interior Light System.>

### B: INSPECTION

#### 1. DOOR SWITCH

Measure the resistance between door switch terminals.



| Switch position     | Terminal No. | Standard               |
|---------------------|--------------|------------------------|
| When door is opened | 1 and 3      | Less than 1 $\Omega$   |
| When door is closed |              | More than 1 M $\Omega$ |

#### 2. REAR GATE LATCH SWITCH

Measure the resistance between rear gate latch switch terminals.

| Switch position          | Terminal No. | Standard               |
|--------------------------|--------------|------------------------|
| When rear gate is opened | 1 and 2      | Less than 1 $\Omega$   |
| When rear gate is closed |              | More than 1 M $\Omega$ |

#### 3. TRUNK ROOM LIGHT SWITCH

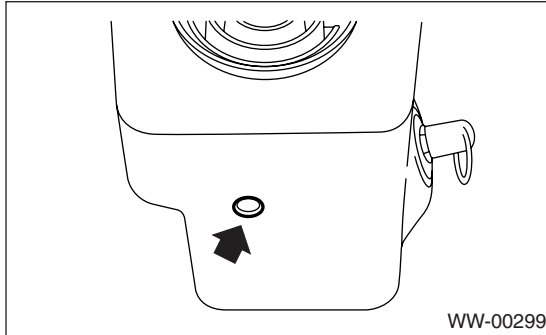
Measure the resistance between trunk room light switch terminals.

| Switch position          | Terminal No. | Standard               |
|--------------------------|--------------|------------------------|
| When trunk lid is opened | 1 and 2      | Less than 1 $\Omega$   |
| When trunk lid is closed |              | More than 1 M $\Omega$ |

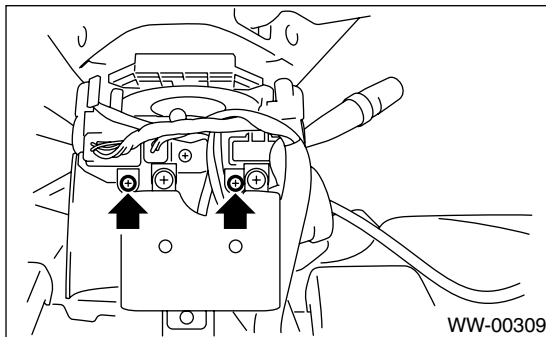
## 8. Combination Switch (Light)

### A: REMOVAL

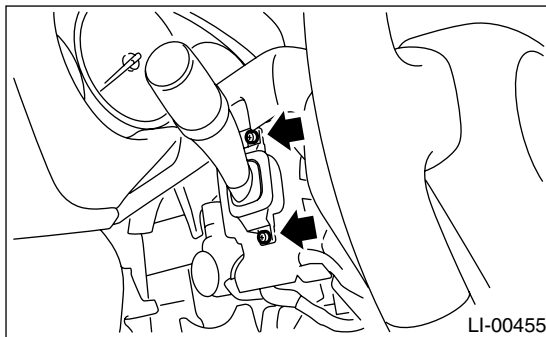
- 1) Disconnect the ground cable from battery.
- 2) Remove the instrument panel lower cover. <Ref. to EI-47, REMOVAL, Instrument Panel Assembly.>
- 3) Remove the screws which secure the upper column cover to lower column cover.



- 4) Remove the screws which secure the upper column cover.



- 5) Disconnect the connector from combination switch.
- 6) Remove the screws which secure the switch, and then remove the switch.

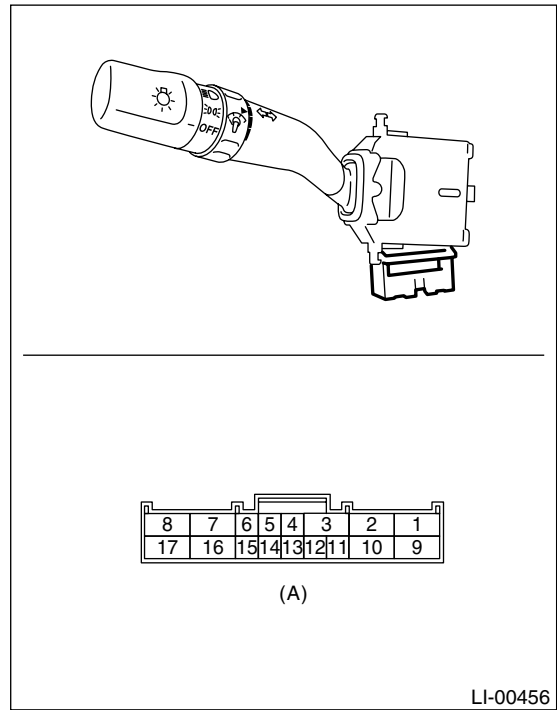


### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

Measure the resistance between combination switch terminals.



(A) Lighting and turn signal switch connector

#### 1. LIGHTING SWITCH

| Switch position | Terminal No.  | Standard       |
|-----------------|---------------|----------------|
| OFF             | 13, 14 and 16 | More than 1 MΩ |
| Tail            | 14 and 16     | Less than 1 Ω  |
| Head            | 13, 14 and 16 | Less than 1 Ω  |

#### 2. DIMMER AND PASSING SWITCH

| Switch position | Terminal No. | Standard      |
|-----------------|--------------|---------------|
| Passing         | 7, 8 and 16  | Less than 1 Ω |
| Low beam        | 16 and 17    | Less than 1 Ω |
| High beam       | 7 and 16     | Less than 1 Ω |

#### 3. TURN SIGNAL SWITCH

| Switch position | Terminal No. | Standard       |
|-----------------|--------------|----------------|
| Left            | 1 and 2      | Less than 1 Ω  |
| Neutral         | 1, 2 and 3   | More than 1 MΩ |
| Right           | 2 and 3      | Less than 1 Ω  |



## 9. Headlight Beam Leveler System

### A: WIRING DIAGRAM

#### 1. HEADLIGHT BEAM LEVELER

<Ref. to WI-122, WIRING DIAGRAM, Headlight Beam Leveler System.>

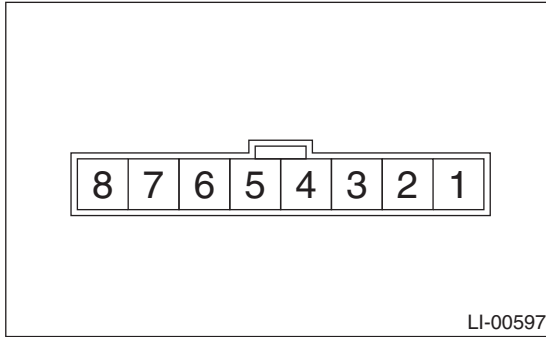
### B: INSPECTION

#### 1. HEADLIGHT BEAM LEVELER ACTUATOR

- 1) Turn on the headlights.
- 2) Confirm the headlight beam level is lowered by changing the switch position to 0 - 1 - 2 - 3.

#### 2. HEADLIGHT BEAM LEVELER SWITCH

Measure the resistance between headlight beam leveler switch terminals.

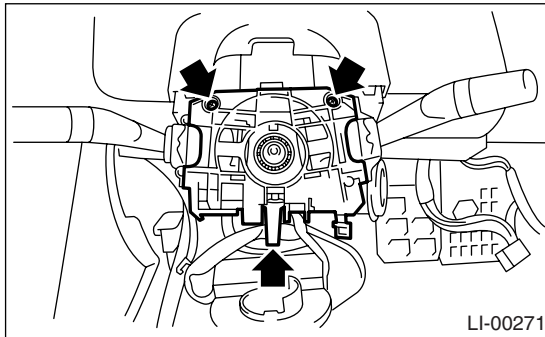


| Switch position | Terminal No. | Standard               |
|-----------------|--------------|------------------------|
| 0               | 3 and 5      | Approx. 1 k $\Omega$   |
| 1               |              | Approx. 1,845 $\Omega$ |
| 2               |              | Approx. 2,650 $\Omega$ |
| 3               |              | Approx. 3,310 $\Omega$ |

## 10. Combination Base Switch Assembly

### A: REMOVAL

- 1) Remove the driver's airbag module. <Ref. to AB-14, REMOVAL, Driver's Airbag Module.>
- 2) Remove the steering wheel. <Ref. to PS-20, REMOVAL, Steering Wheel.>
- 3) Remove the steering column cover.
- 4) Remove the combination switch. <Ref. to LI-9, REMOVAL, Combination Switch (Light).> and <Ref. to WW-7, REMOVAL, Combination Switch (Wiper).>
- 5) Loosen the four screws and remove the roll connector.
- 6) Loosen the three screws.



- 7) Disconnect the connector and remove the combination base switch assembly.

### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Align the attaching direction of roll connector with the steering wheel, before installation of steering wheel. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>

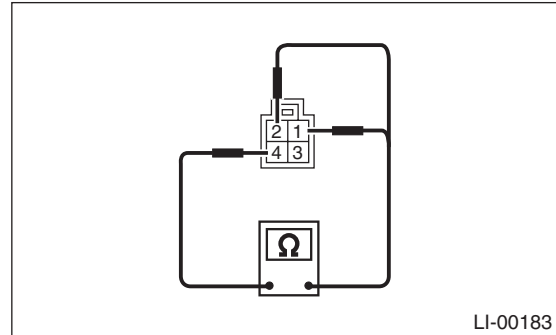
### C: INSPECTION

#### 1. COMBINATION BASE SWITCH ASSEMBLY

Perform the inspection for the following items and replace with a new one, if any damage is found.  
Crack or deformation of combination base switch assembly or roll connector.

#### 2. PARKING SWITCH

Measure the resistance between parking switch terminals.

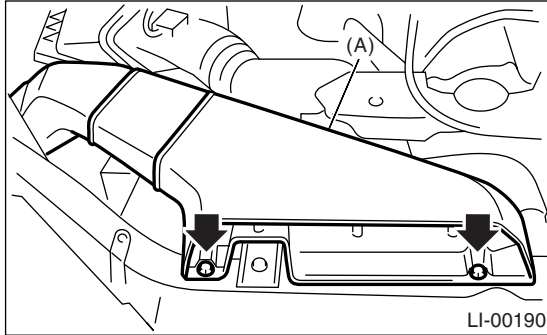


| Switch position | Terminal No. | Standard      |
|-----------------|--------------|---------------|
| OFF             | 2 and 4      | Less than 1 Ω |
| ON              | 1 and 4      | Less than 1 Ω |

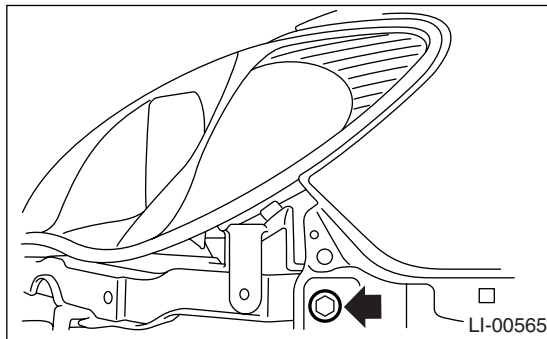
## 11. Headlight Assembly

### A: REMOVAL

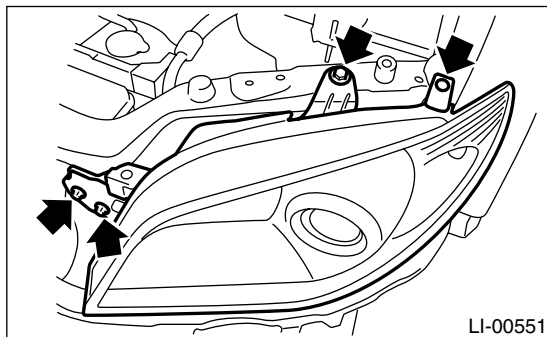
- 1) Disconnect the ground cable from battery.
- 2) Remove the duct (A) (when right side headlight is removed).



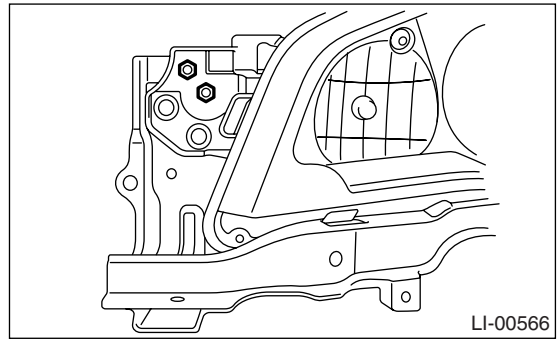
- 3) Remove the front bumper. <Ref. to EI-24, REMOVAL, Front Bumper.>
- 4) Disconnect each harness connector.
- 5) Remove the bolts on the side of headlight assembly.



- 6) Remove the three bolts and disengage the clips, and then detach the headlight assembly with bracket.



- 7) Remove the two nuts, and then detach the headlight assembly from bracket.



### B: INSTALLATION

Install in the reverse order of removal.

### C: ADJUSTMENT

#### 1. HEADLIGHT AIMING

#### CAUTION:

**Turn off the light before adjusting headlight aiming. If the light is necessary to check aiming, do not turn on for more than 2 minutes.**

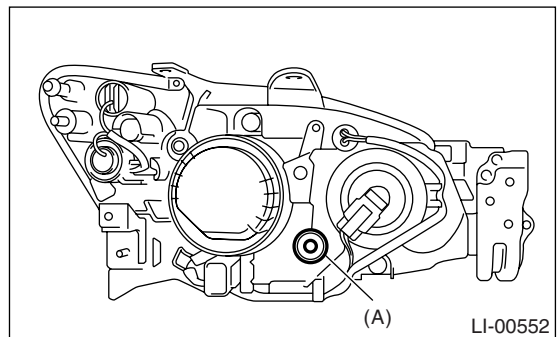
- 1) Before checking the headlight aiming, be sure of the following:

- The area around the headlight has not sustained any accident, damage or other type of deformation.
- Vehicle is parked on level ground.
- The inflation pressure of tires is correct.
- Vehicle's gas tank is fully charged.
- Bounce the vehicle several times to normalize the suspension.

- Make certain that someone is seated in the driver's seat.

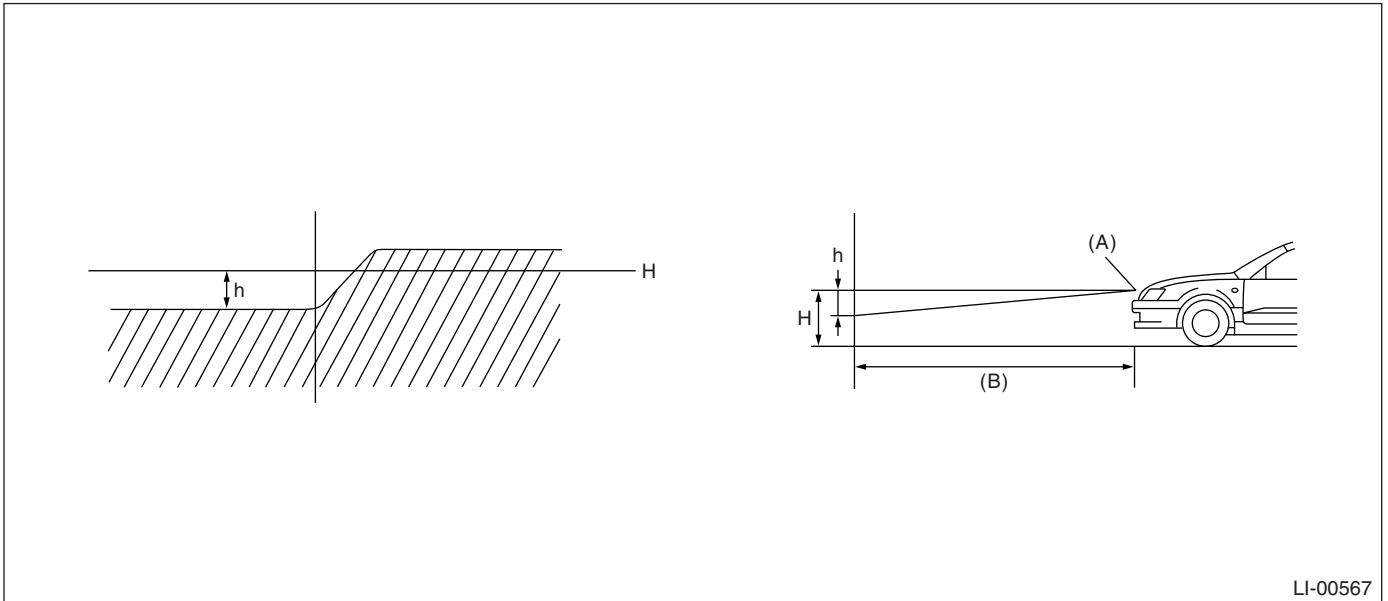
Turn the headlights on and then adjust the low beam pattern to the following positions on the screen.

- 2) Position the headlight beam leveler switch to "0".
- 3) Rotate the adjusting screw (A) to adjust aim.



# Headlight Assembly

LIGHTING SYSTEM



LI-00567

(A) Bulb center marking

(B) 3 m (10 ft)

| H mm (in)   |             |             |             | h mm (in) at 3 m (10 ft) |
|-------------|-------------|-------------|-------------|--------------------------|
| Sedan       |             | Wagon       |             |                          |
| STI         | 2.5i, WRX   | 2.5i, WRX   | OUTBACK     |                          |
| 653 (25.71) | 663 (26.10) | 663 (26.10) | 673 (26.50) | 21 (0.83)                |

## 12. Headlight Bulb

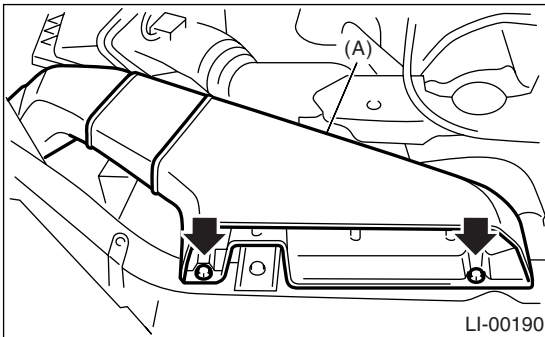
### A: REMOVAL

#### 1. HIGH BEAM AND HALOGEN TYPE LOW BEAM

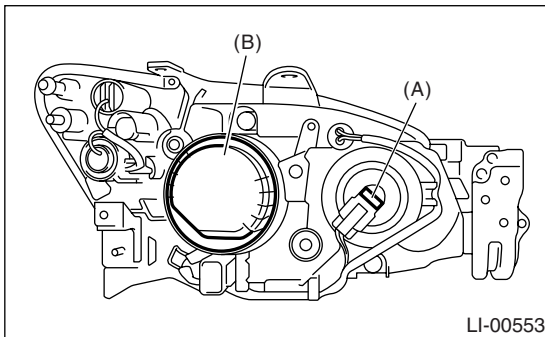
**CAUTION:**

- Because the halogen bulb operates at a high temperature, dirt and oil on the bulb surface reduces the bulb's service life. Hold the flange portion when replacing the bulb. Never touch the glass portion.
- Do not leave the headlight without a bulb for a long time. Dust, moisture, etc. entering the headlight may affect its performance.

- 1) Disconnect the ground cable from battery.
- 2) Remove the air intake duct (A) (when right side headlight bulb is removed).

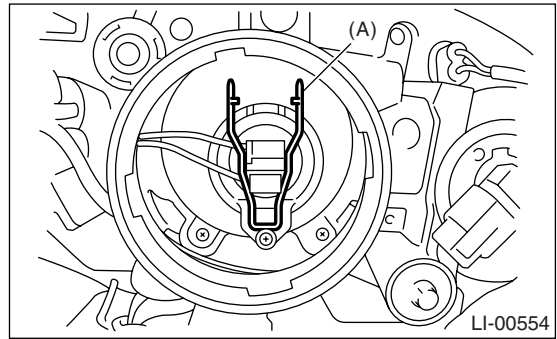


- 3) Disconnect the harness connector.
- 4) Remove the bulb assembly. To remove the low beam, remove the back cover and go to Step 5.



- (A) High beam
- (B) Low beam

- 5) Remove the light bulb retaining spring (A) to remove the bulb.

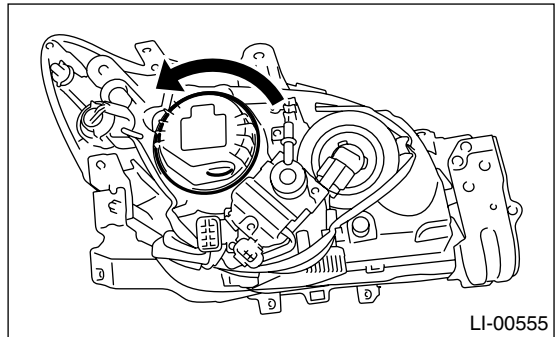


#### 2. HID TYPE LOW BEAM

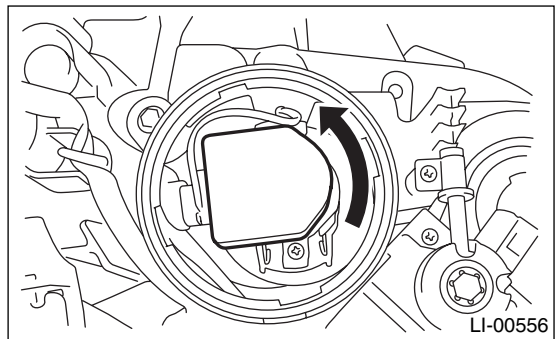
**CAUTION:**

- Do not operate with wet hands.
- As the lightening circuit uses high voltage, be sure to confirm that the power supply is turned off before operation.
- When replacing the bulb, hold the flange portion and never touch the glass portion.
- Do not leave the headlight without a bulb for a long time. Dust, and moisture, etc. entering the headlight may affect its performance.

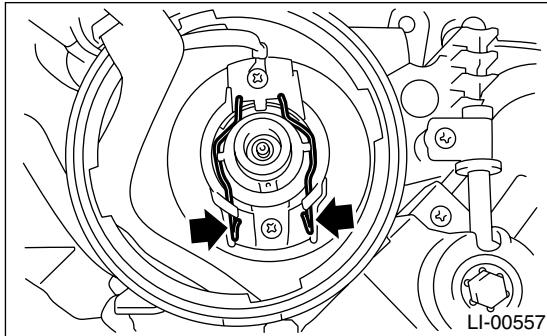
- 1) Remove the ground cable from battery.
- 2) Remove the headlight assembly. <Ref. to LI-14, HID TYPE LOW BEAM, REMOVAL, Headlight Bulb.>
- 3) Remove the back cover.



- 4) Disconnect the harness connector.



5) Remove the light bulb retaining spring, and then remove the bulb.



## B: INSTALLATION

Install in the reverse order of removal.

### CAUTION:

**Attach the rubber cap with letters TOP on the top so the drain hole will be on the lower side.**

## C: INSPECTION

### 1. HALOGEN TYPE

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new one.

### 2. HID TYPE

#### CAUTION:

- Do not operate with wet hands.
- Do not touch the harness, inner headlight, or any metallic portion of the headlight when the light is illuminated (when the lighting switch is turned on).
- When performing a lighting test, make sure that the headlight is mounted on the vehicle, and the power supply is connected to the connector on the vehicle's side.

- 1) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
- 2) Use a normal HID bulb for headlight lighting test.
- 3) If the headlight does not illuminate, replace the bulb with a new one. <Ref. to LI-15, DISPOSAL, Headlight Bulb.>

## D: DISPOSAL

### 1. HID TYPE

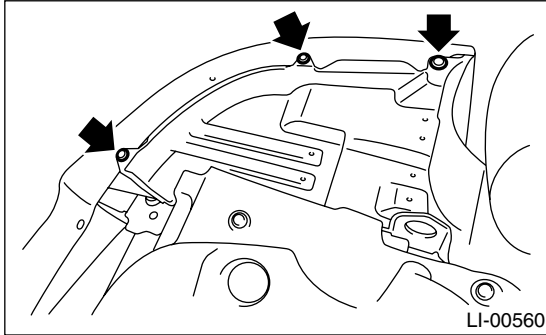
#### CAUTION:

**HID type light bulb contains mercury. Dispose the bulb according to regional regulation and contact SOA Service Center.**

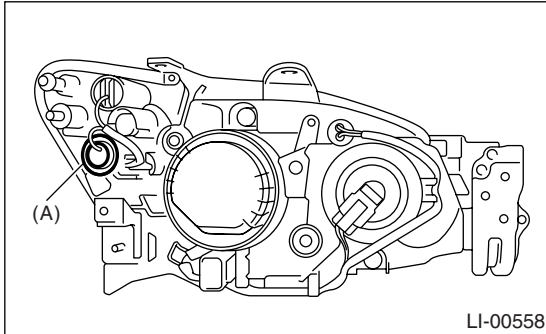
## 13. Front Turn Signal Light Bulb

### A: REMOVAL

- 1) When removing the turn signal light bulb, fully turn the direction of tire to the opposite side of desired turn signal light bulb.
- 2) Remove the clip, and turn the mud guard inward.



- 3) Turn the socket (A) from wheel arch part, and then remove the front turn signal light bulb.



### B: INSTALLATION

Install in the reverse order of removal.

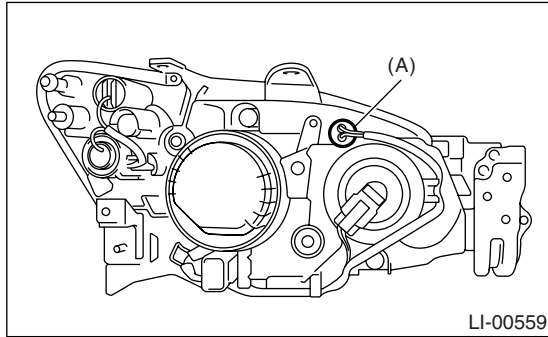
### C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new one.

## 14. Clearance/Parking Light Bulb

### A: REMOVAL

Turn the socket (A) and remove the bulb.



### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

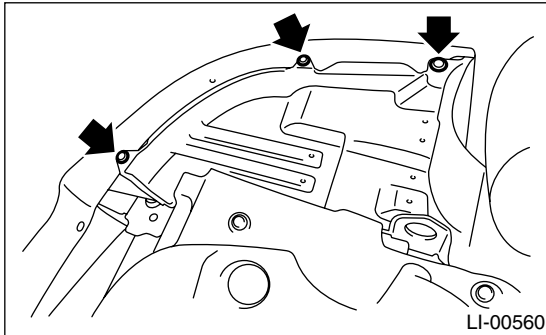
- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new one.



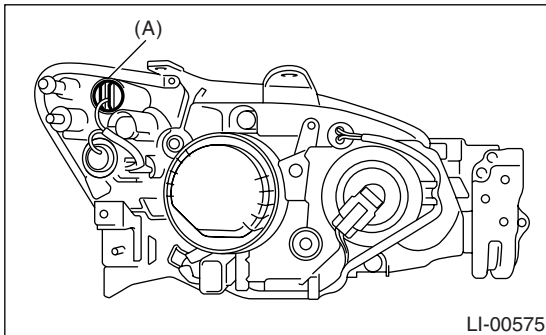
## 15. Front Side Marker Light Bulb

### A: REMOVAL

- 1) When removing the turn signal light bulb, fully turn the direction of tire to the opposite direction of desired turn signal light bulb.
- 2) Remove the clip, and turn the mud guard inward.



- 3) Turn the socket (A) from wheel arch part, and then remove the front side marker light bulb.



### B: INSTALLATION

Install in the reverse order of removal.

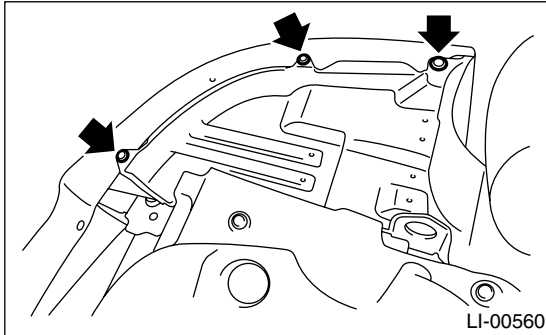
### C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new one.

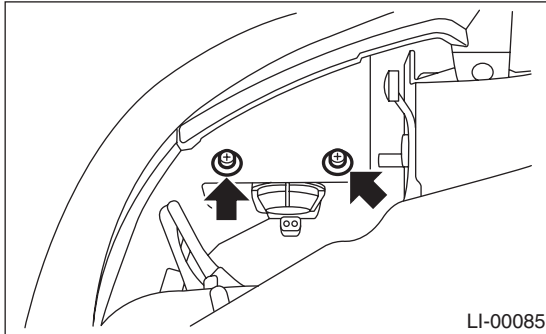
## 16. Front Fog Light Assembly

### A: REMOVAL

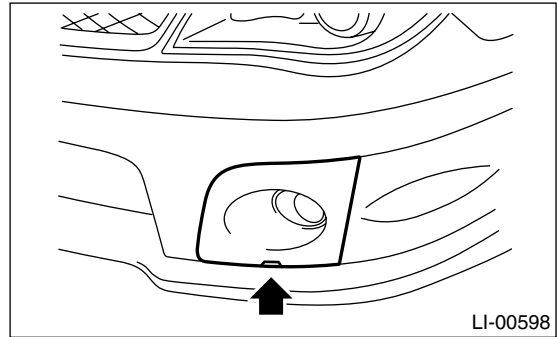
- 1) Disconnect the ground cable from battery.
- 2) Disengage three clips, and then turn over the lower mud guard.



- 3) Disconnect the harness connector.
- 4) Remove the mounting bolts, and then remove the fog light assembly.



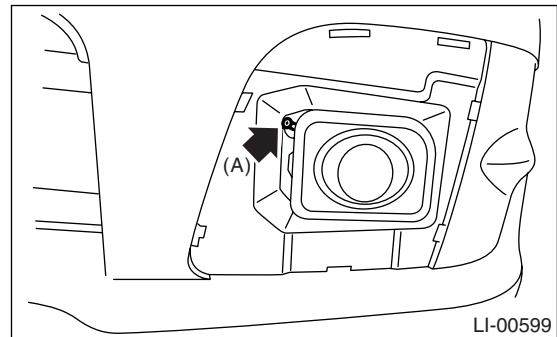
- 3) Insert the flat-tip screwdriver or the like into lower side of front fog light cover, and remove the front fog light cover.



**NOTE:**

Be careful not to scratch the front bumper.

- 4) Insert the Phillips screwdriver to adjusting screw, and adjust the fog light pattern.



(A) Adjusting screw

### B: INSTALLATION

Install in the reverse order of removal.

### C: ADJUSTMENT

#### 1. FOG LIGHT AIMING

**NOTE:**

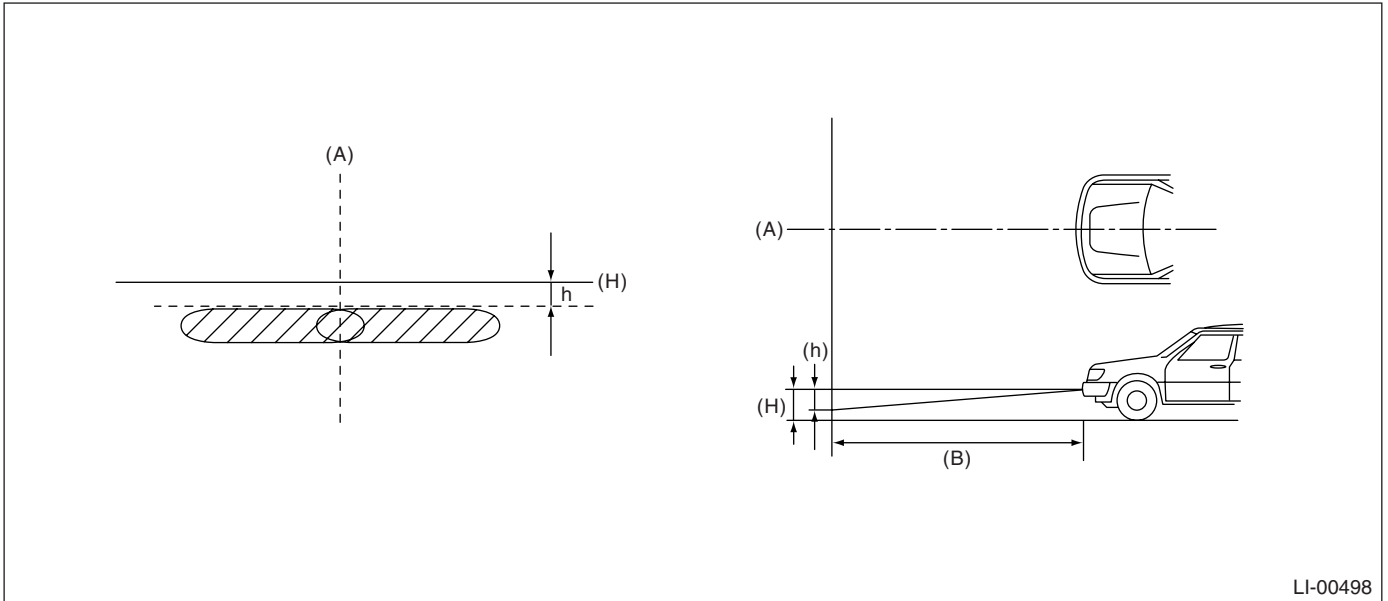
Before checking the fog light aiming, be sure of the following:

- There is no scratch, damage or other deformation on the area around the fog light.
- Vehicle is parked on level ground.
- The inflation pressure of tires is correct.
- Fuel tank is full.

- 1) Shake the vehicle up and down several times to make the suspension fit in.
- 2) Seat a person in the driver's seat.

# Front Fog Light Assembly

LIGHTING SYSTEM



LI-00498

(A) Vehicle center  
(B) 3 m (10 ft)

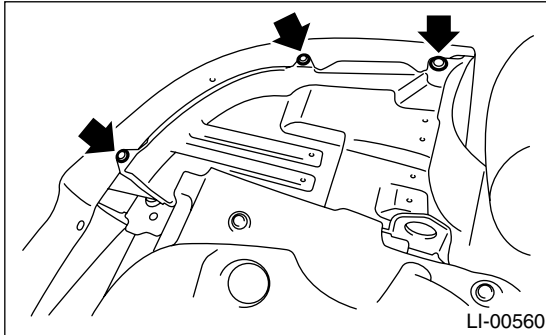
(H) Height of fog light center  
(363 mm (14.29 in))

(h) 40 mm (1.57 in)

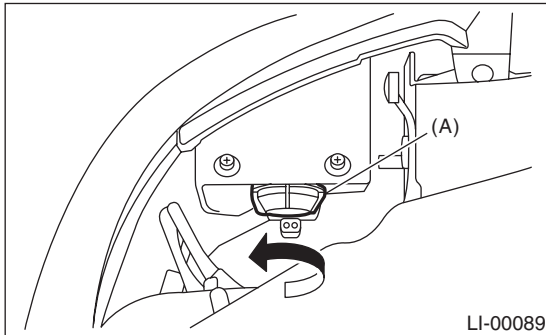
## 17. Front Fog Light Bulb

### A: REMOVAL

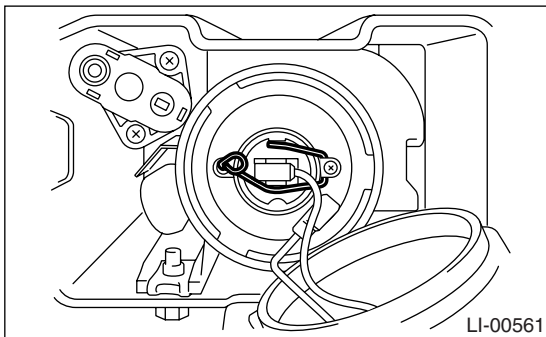
- 1) Disconnect the ground cable from battery.
- 2) Remove three clips, and then turn over the lower mud guard.



- 3) Remove the harness connector.
- 4) Remove the back cover (A).



- 5) Remove the spring retainer, and then detach the fog light bulb.



### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new one.

# Rear Combination Light Assembly

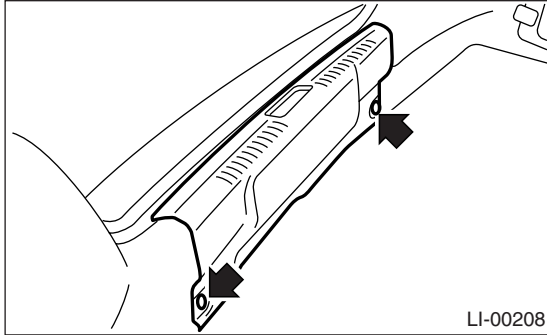
LIGHTING SYSTEM

## 18. Rear Combination Light Assembly

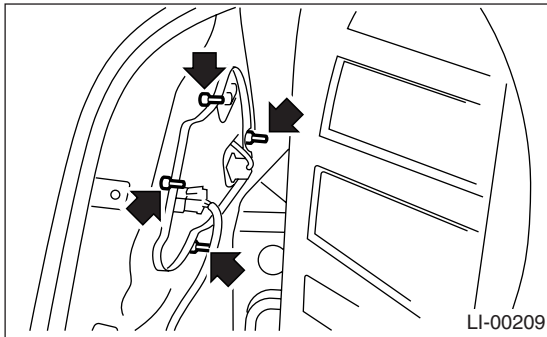
### A: REMOVAL

#### 1. SEDAN MODEL

- 1) Disconnect the ground cable from battery.
- 2) Remove the clips, and then detach the trunk rear trim.

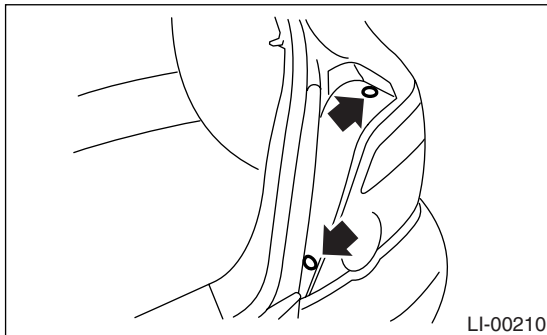


- 3) Remove the trunk side trim of rear portion.
- 4) Remove the four nuts, and then detach the rear combination light while disconnecting connector.

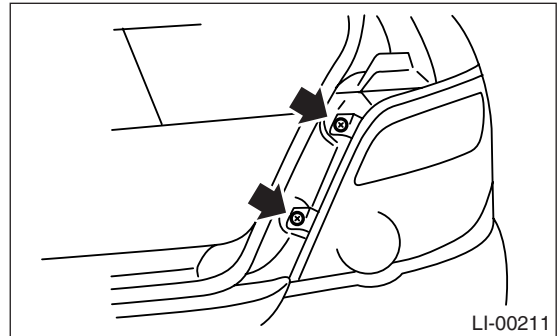


#### 2. WAGON MODEL

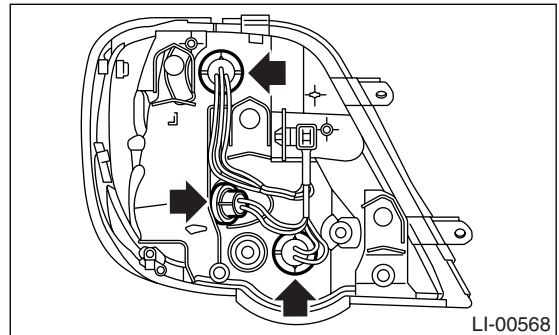
- 1) Disconnect the ground cable from battery.
- 2) Remove the clips, and then detach the rear combination light covers.



- 3) Remove two bolts, and then remove the rear combination light by pulling it backward.



- 4) Turn the sockets to remove each bulb.



### B: INSTALLATION

#### 1. SEDAN MODEL

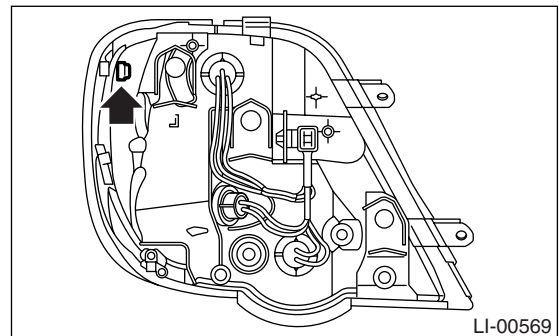
Install in the reverse order of removal.

#### 2. WAGON MODEL

Install in the reverse order of removal.

#### NOTE:

Install the rear combination light by aligning the clip with body side.

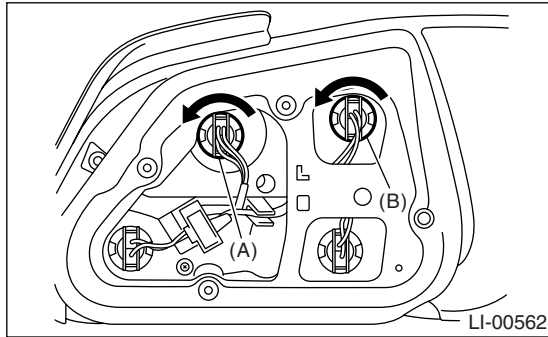


## 19. Tail/Stop Light Bulb

### A: REMOVAL

#### 1. SEDAN MODEL

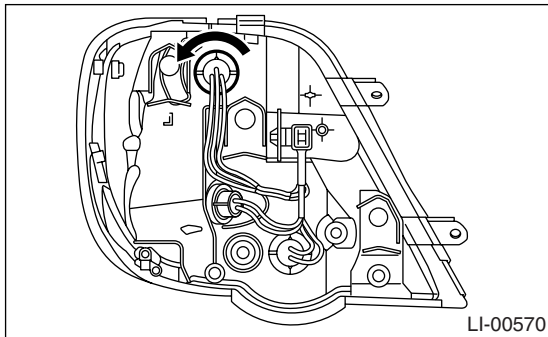
- 1) Remove the trunk side trim of rear portion.
- 2) Turn the socket and remove the bulb.



- (A) Tail light  
(B) Stop/tail light

#### 2. WAGON MODEL

- 1) Remove the rear combination light assembly.  
<Ref. to LI-22, WAGON MODEL, REMOVAL, Rear Combination Light Assembly.>
- 2) Turn the socket and remove the bulb.



### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

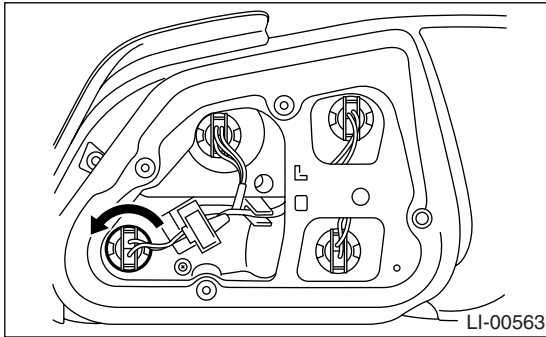
- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new one.

## 20. Back-up Light Bulb

### A: REMOVAL

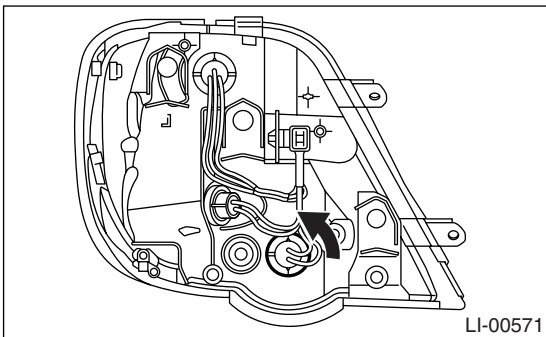
#### 1. SEDAN MODEL

- 1) Remove the trunk side trim of rear portion.
- 2) Turn the socket and remove the bulb.



#### 2. WAGON MODEL

- 1) Remove the rear combination light assembly. <Ref. to LI-22, WAGON MODEL, REMOVAL, Rear Combination Light Assembly.>
- 2) Turn the socket and remove the bulb.



### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

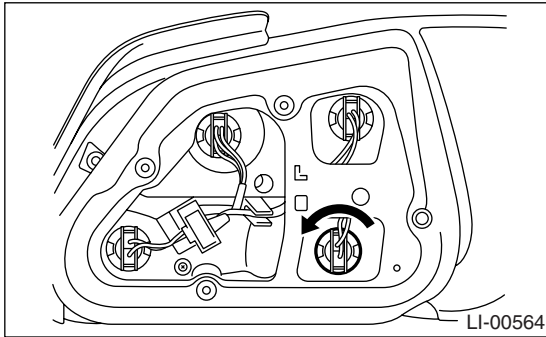
- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new one.

## 21. Rear Turn Signal Light Bulb

### A: REMOVAL

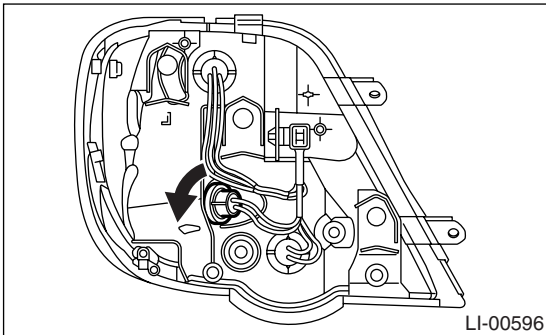
#### 1. SEDAN MODEL

- 1) Remove the trunk side trim of rear portion.
- 2) Turn the socket and remove the bulb.



#### 2. WAGON MODEL

- 1) Remove the rear combination light assembly.  
<Ref. to LI-22, WAGON MODEL, REMOVAL, Rear Combination Light Assembly.>
- 2) Turn the socket and remove the bulb.



### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

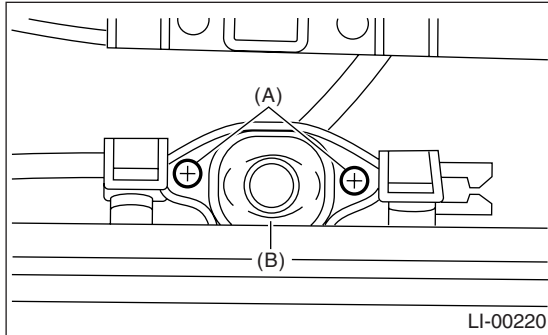
- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new one.



## 22. License Plate Light

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the license plate light mounting screw (A), and then remove the lens (B).



- 3) Remove the bulb.

### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

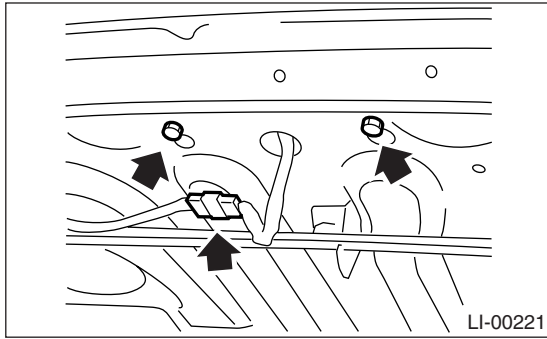
- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new one.

## 23. High-mounted Stop Light

### A: REMOVAL

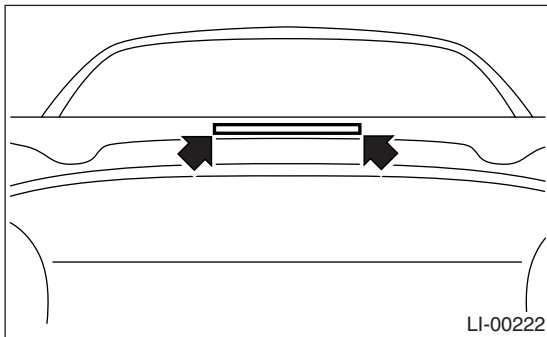
#### 1. SEDAN MODEL (STANDARD TYPE)

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector of high-mounted stop light from body harness.
- 3) Remove the bolts, then detach the high-mounted stop light assembly.



#### 2. SEDAN MODEL (REAR SPOILER BUILT-IN TYPE)

- 1) Disconnect the ground cable from battery.
- 2) Remove the bolts, then detach the high-mounted stop light assembly.

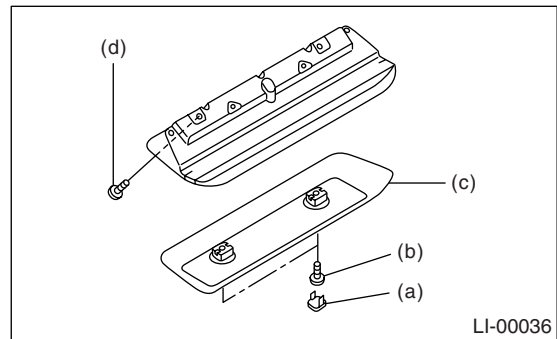


- 3) Disconnect the connector of high-mounted stop light from body harness.

#### 3. WAGON MODEL

- 1) Disconnect the ground cable from battery.
- 2) Remove the cap (a) by prying on the edge with screwdriver.
- 3) Remove the screws (b), and then the detach cover (c).

- 4) Remove screws (d), and then detach the high-mounted stop light while disconnecting connector.



### B: INSTALLATION

Install in the reverse order of removal.

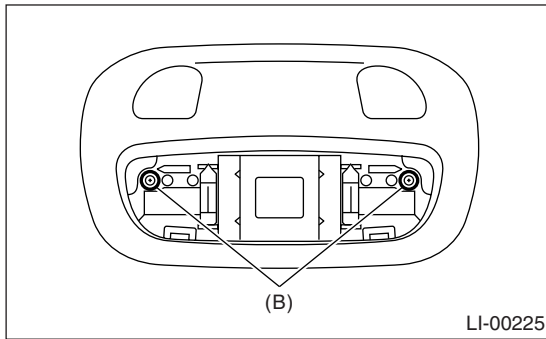
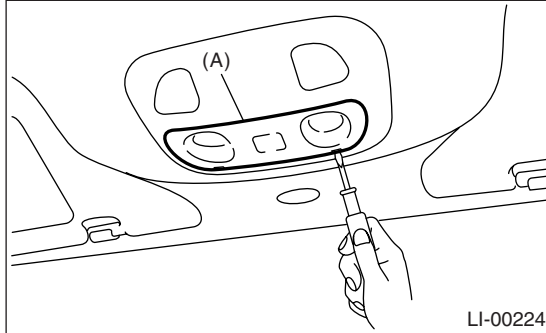
### C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) If NG, replace the high-mounted stop light with a new one.

## 24. Spot Map Light

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the lens (A) and spot map light mounting screw (B).



- 3) Disconnect the harness connectors and remove the spot map light.

### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

#### 1. SPOT MAP LIGHT BULB

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new one.

#### 2. SPOT MAP LIGHT SWITCH

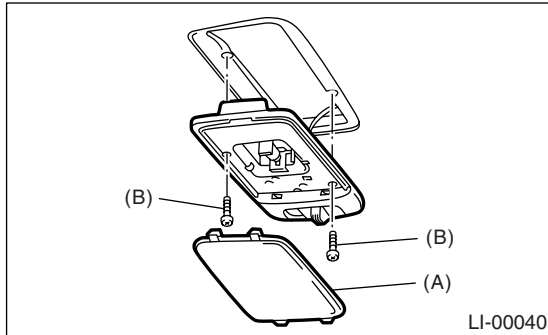
Measure the resistance between spot map light terminals.

| Switch position | Terminal No. | Standard       |
|-----------------|--------------|----------------|
| OFF             | 1 and 2      | More than 1 MΩ |
| ON              | 1 and 2      | 18±5.4 Ω       |

## 25.Room Light

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the lens (A) and room light mounting screws (B).



- 3) Disconnect the harness connectors and remove the light.

### B: INSTALLATION

Install in the reverse order of removal.

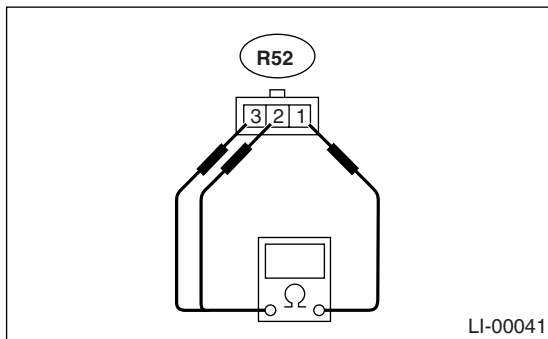
### C: INSPECTION

#### 1. ROOM LIGHT BULB

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new one.

#### 2. ROOM LIGHT SWITCH

Measure the resistance between room light terminals.



| Switch position | Terminal No. | Standard       |
|-----------------|--------------|----------------|
| OFF             | —            | More than 1 MΩ |
| ON              | 1 and 3      | 1.5±0.5 Ω      |
| DOOR            | 1 and 2      | 1.5±0.5 Ω      |

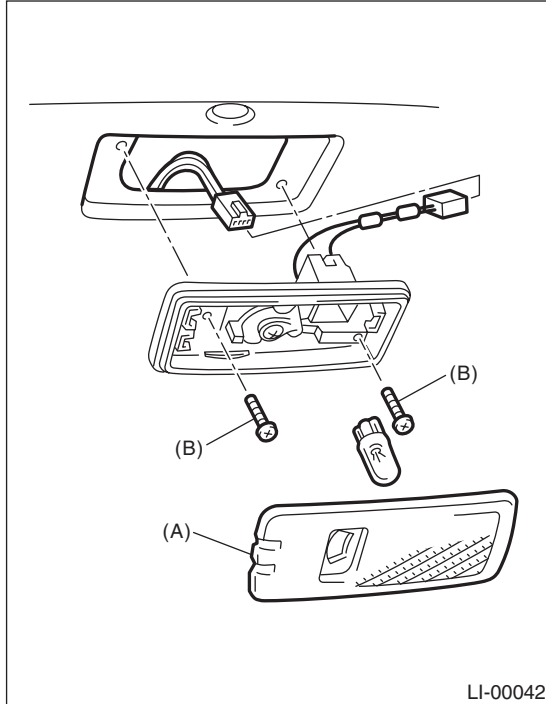
# Luggage Room Light

## LIGHTING SYSTEM

### 26. Luggage Room Light

#### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the lens (A) and luggage room light mounting screws (B).



- 3) Disconnect the harness connectors and remove the luggage room light.

#### B: INSTALLATION

Install in the reverse order of removal.

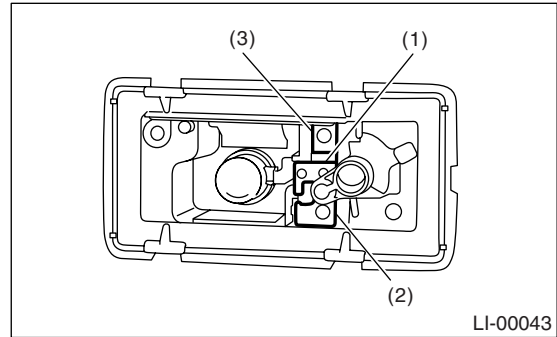
#### C: INSPECTION

##### 1. LUGGAGE ROOM LIGHT BULB

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new one.

##### 2. LUGGAGE ROOM LIGHT SWITCH

Measure the resistance between luggage room light terminals.

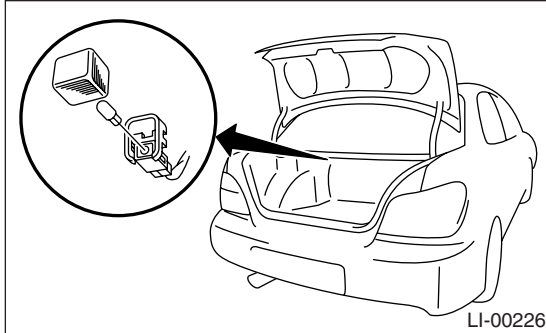


| Switch position | Terminal No. | Standard       |
|-----------------|--------------|----------------|
| OFF             | —            | More than 1 MΩ |
| DOOR            | 1 and 2      | 1.5±0.5 Ω      |

## 27.Trunk Room Light

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the harness connectors and remove the trunk room light.



### B: INSTALLATION

Install in the reverse order of removal.

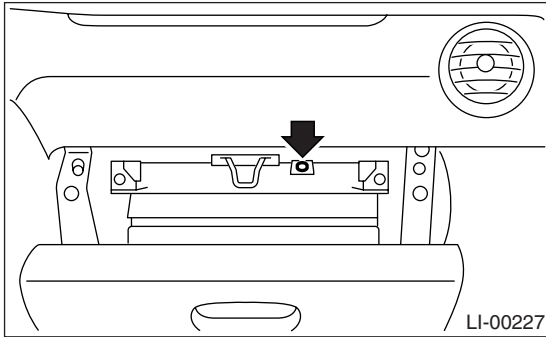
### C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new one.

## 28. Glove Box Light

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the glove box. <Ref. to EI-43, REMOVAL, Glove Box.>
- 3) Disconnect the harness connector.
- 4) Remove the glove box light.



### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new one.

# WIPER AND WASHER SYSTEMS



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| 4. Wiper Blade.....                | 9           |
| 5. Washer Tank and Motor.....      | 11          |
| 6. Front Wiper Arm.....            | 13          |
| 7. Front Wiper Motor and Link..... | 14          |
| 8. Front Washer Nozzle .....       | 16          |
| 9. Rear Wiper Arm .....            | 17          |
| 10. Rear Wiper Motor.....          | 18          |
| 11. Rear Washer .....              | 19          |
| 12. Wiper Control Relay .....      | 20          |



# General Description

## WIPER AND WASHER SYSTEMS

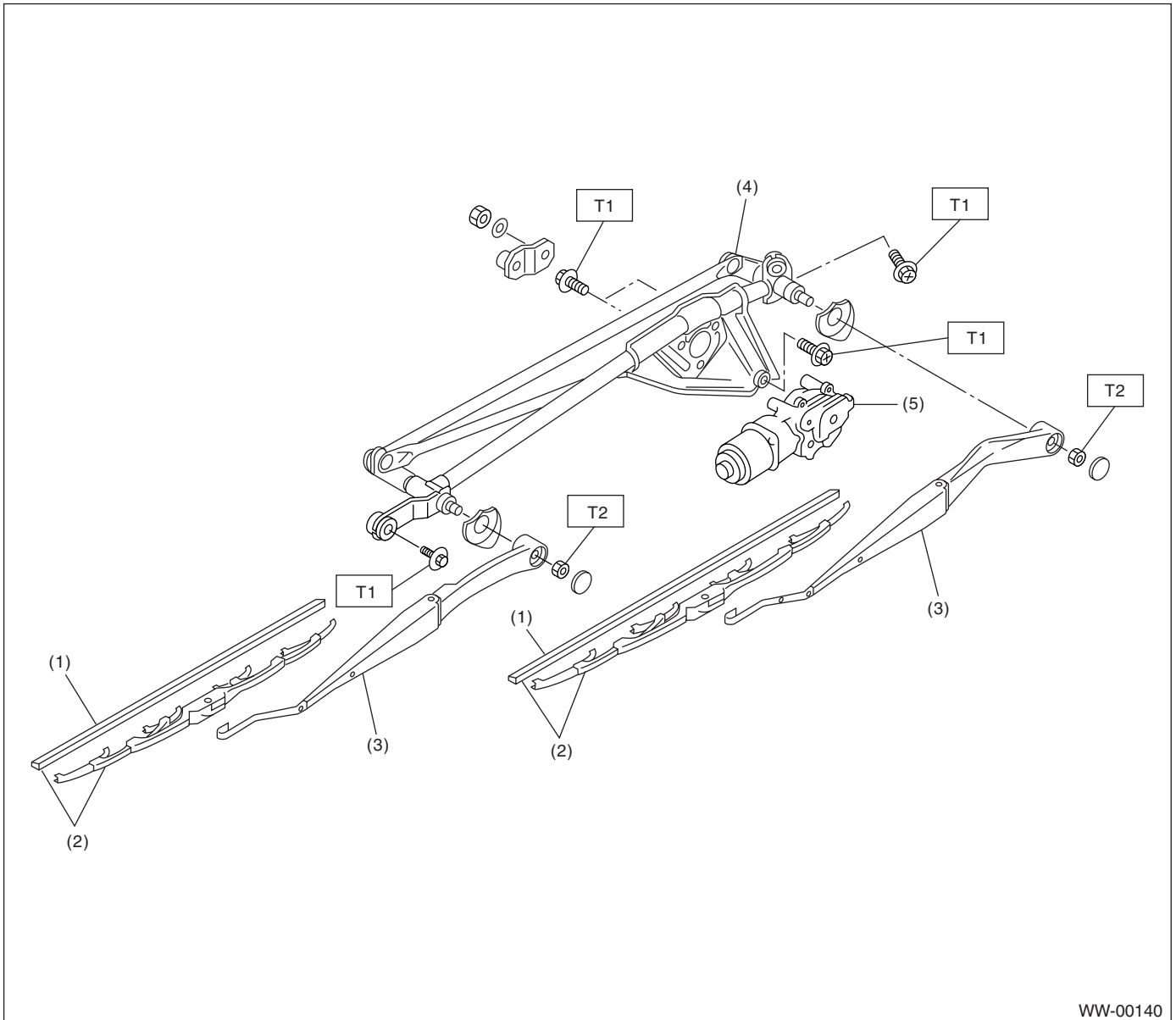
### 1. General Description

#### A: SPECIFICATION

|                    |           |                     |
|--------------------|-----------|---------------------|
| Front wiper motor  | Input     | 12 V — 72 W or less |
| Rear wiper motor   | Input     | 12 V — 42 W or less |
| Front washer motor | Pump type | Centrifugal         |
|                    | Input     | 12 V — 36 W or less |
| Rear washer motor  | Pump type | Centrifugal         |
|                    | Input     | 12 V — 36 W or less |

#### B: COMPONENT

##### 1. FRONT WIPER



WW-00140

- (1) Wiper rubber
- (2) Wiper blade ASSY
- (3) Wiper arm

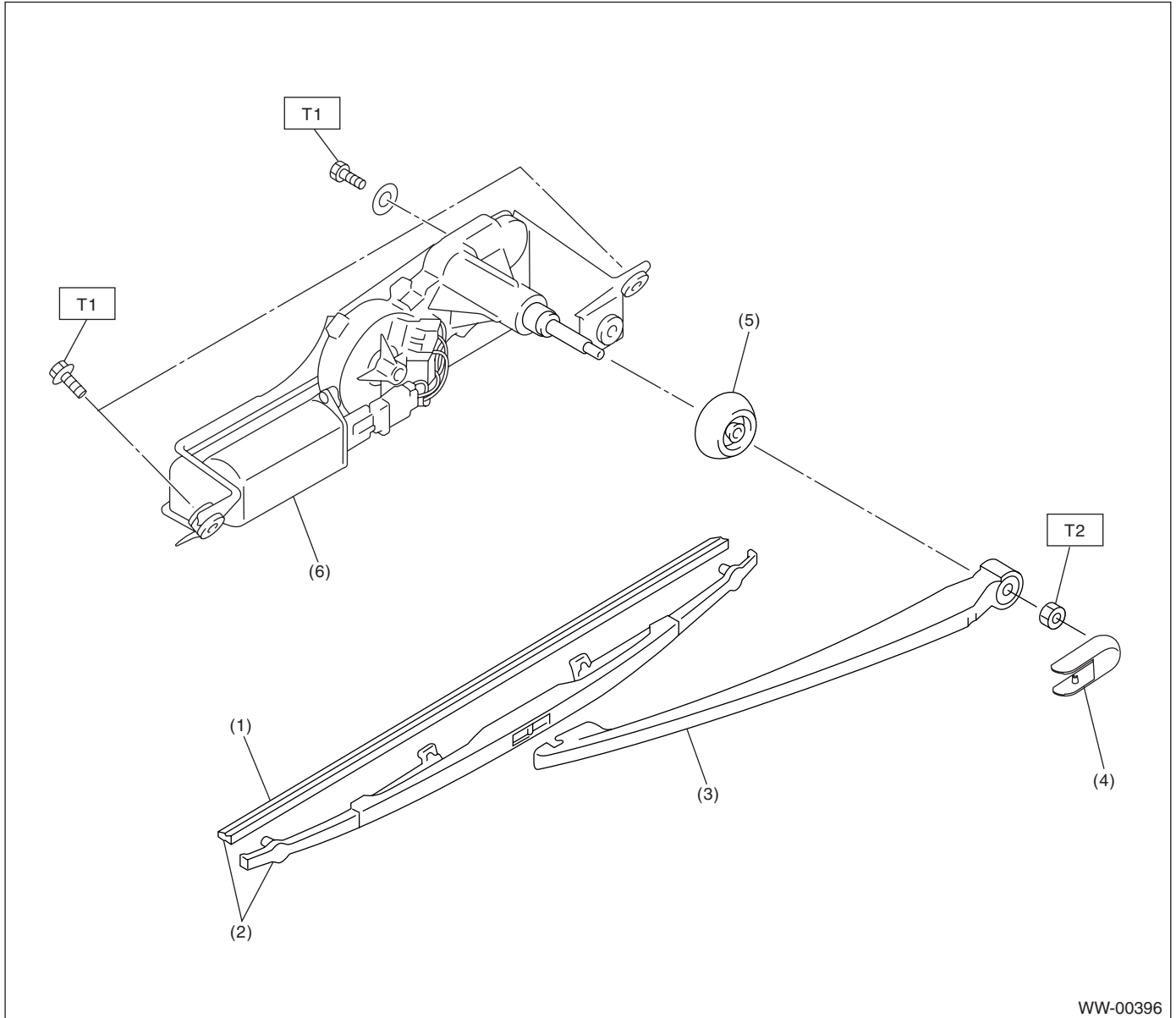
- (4) Wiper link
- (5) Wiper motor

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 6.0 (0.61, 4.4)**

**T2: 20 (2.0, 14.5)**

### 2. REAR WIPER



- (1) Wiper rubber
- (2) Wiper blade ASSY
- (3) Wiper arm

- (4) Wiper arm cover
- (5) Cap
- (6) Wiper motor

**Tightening torque: N·m (kgf·m, ft·lb)**

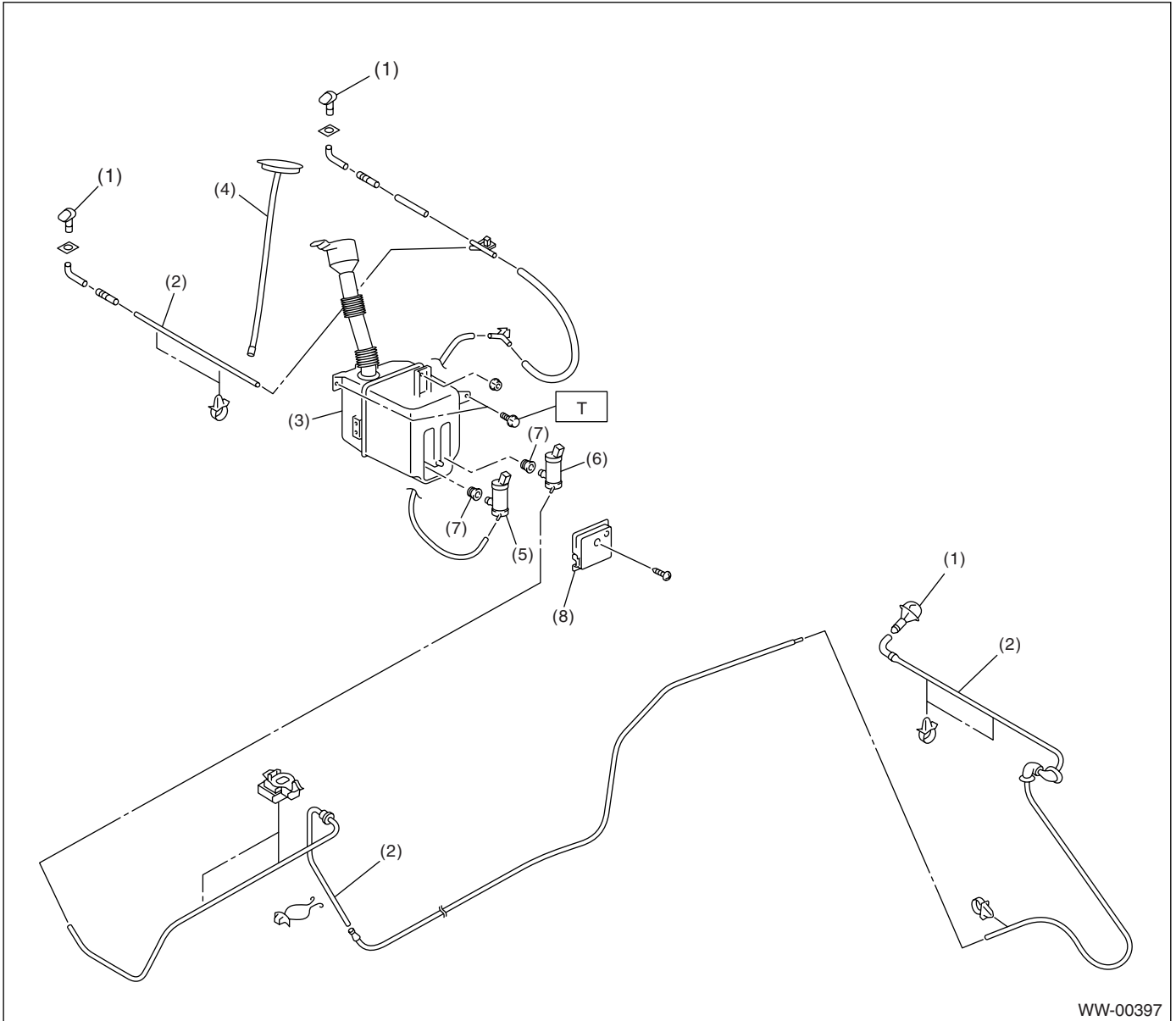
**T1: 6.0 (0.61, 4.4)**

**T2: 8.0 (0.82, 5.9)**

# General Description

## WIPER AND WASHER SYSTEMS

### 3. WASHER TANK



- |                     |                        |
|---------------------|------------------------|
| (1) Washer nozzle   | (5) Front washer motor |
| (2) Washer hose     | (6) Rear washer motor  |
| (3) Washer tank     | (7) Grommet            |
| (4) Washer tank cap | (8) Washer motor cover |

**Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 6.0 (0.61, 4.4)**

### **C: CAUTION**

- Connect the connectors and hoses securely during reassembly.
- After reassembly, make sure functional parts operate smoothly.
- Be careful that wiring harnesses of airbag system pass near electrical parts and switches.
- Airbag system connectors are colored yellow. Do not use a tester on these circuits.
- Care must be taken when connecting the piping hose so that no bending, jamming, etc. are caused.
- If even a little oil or grease such as silicon oil gets in the tank and washer passages, an oil film easily forms on the glass, causing the wiper to chatter and judder. Therefore, be careful not to let this happen.

# Wiper and Washer System

## WIPER AND WASHER SYSTEMS

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## 2. Wiper and Washer System

### A: WIRING DIAGRAM

#### 1. WIPER AND WASHER (FRONT)

<Ref. to WI-136, WIRING DIAGRAM, Front Wiper and Washer System.>

#### 2. WIPER AND WASHER (REAR)

<Ref. to WI-137, WIRING DIAGRAM, Rear Wiper and Washer System.>

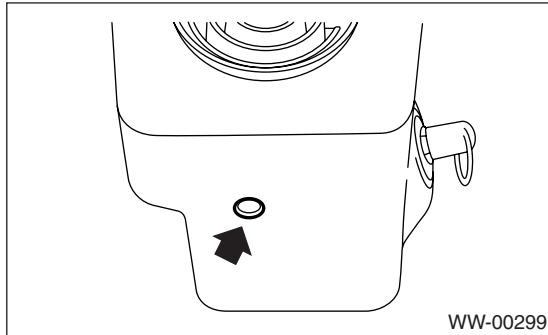
### B: INSPECTION

| Symptom   | Repair order   |
|---|--|
| Wiper and washers do not operate.               | (1) Wiper fuse (F/B No. 14, 15)<br>(2) Combination switch<br>(3) Wiper motor<br>(4) Wiring harness<br>(5) Wiper relay unit (rear wiper only) |
| Wipers do not operate in LO or HI.              | (1) Combination switch<br>(2) Wiper motor<br>(3) Wiring harness<br>(4) Wiper relay unit (rear wiper only)                                    |
| Wipers do not operate in INT.                   | (1) Combination switch<br>(2) Wiper motor<br>(3) Wiring harness<br>(4) Wiper relay unit (rear wiper only)                                    |
| Washer motor does not operate.                  | (1) Washer switch<br>(2) Washer motor<br>(3) Wiring harness  |
| Wipers do not operate when washer switch is ON. | (1) Washer motor<br>(2) Wiring harness   |
| Washer fluid spray does not operate.            | (1) Washer motor<br>(2) Washer hose and nozzle   |

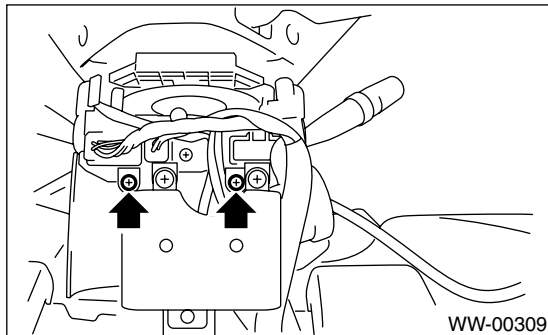
## 3. Combination Switch (Wiper)

### A: REMOVAL

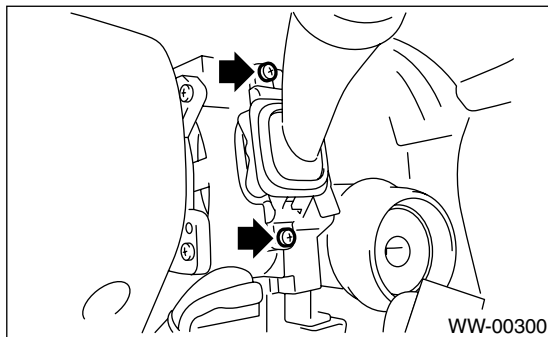
- 1) Disconnect the ground cable from battery.
- 2) Remove the instrument panel lower cover. <Ref. to EI-47, REMOVAL, Instrument Panel Assembly.>
- 3) Loosen the screw to remove steering column cover lower.



- 4) Remove the screw to steering column cover upper.



- 5) Disconnect the connectors from combination switches.
- 6) Loosen the screw to remove combination switch.

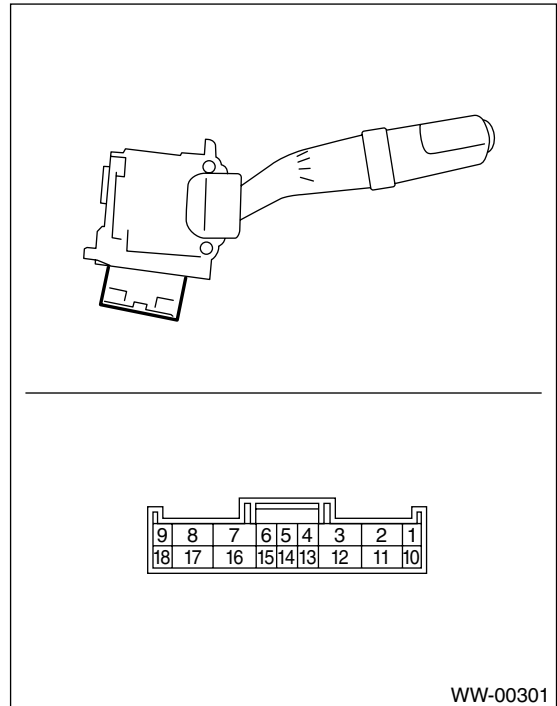


### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

- Inspect the continuity between each connector terminal.



|       | Switch position | Terminal No.                      | Standard       |
|-------|-----------------|-----------------------------------|----------------|
| FRONT | OFF             | 7 and 16                          | Less than 1 Ω  |
|       | INT             | 7 and 16                          | Less than 1 Ω  |
|       | LO              | 7 and 17                          | Less than 1 Ω  |
|       | HI              | 8 and 17                          | Less than 1 Ω  |
|       | Washer ON       | 2 and 11                          | Less than 1 Ω  |
| REAR  | Washer ON       | 2 and 10<br>10 and 12<br>2 and 12 | Less than 1 Ω  |
|       | OFF             | —                                 | More than 1 MΩ |
|       | ON              | 2 and 10                          | Less than 1 Ω  |
|       | Washer ON       | 2 and 10<br>10 and 12<br>2 and 12 | Less than 1 Ω  |

If continuity is not as specified, replace the switch.

- Intermittent operation inspection (inspection of wiper switch unit)

- 1) Position the voltage meter between the connector terminals No. 7 (+) and No. 2 (-).
- 2) Connect the battery positive lead to connector terminal No. 17 and the negative lead to connector terminals No. 2 and No. 16.
- 3) Turn the wiper switch to INT.
- 4) Disconnect the battery negative lead from connector terminal No. 16.
- 5) Connect the battery positive lead to connector terminal No. 16 for 5 seconds.

## Combination Switch (Wiper)

### WIPER AND WASHER SYSTEMS

---

6) Connect the battery negative lead to connector terminal No. 16, and check the voltage between the connector terminals No. 7 (+) and No. 2 (-).

7) Perform the above steps from 1) to 6) at the MIN and MAX positions of intermittent control switch, and replace the wiper switch assembly if it does not operate as specified.

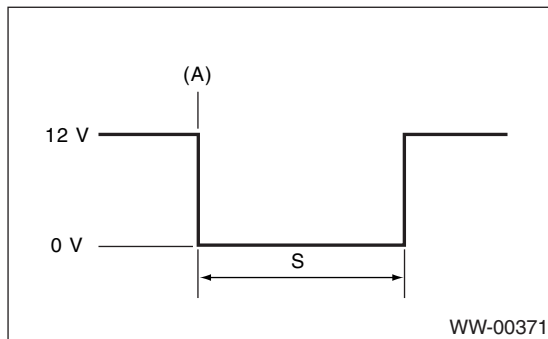
#### **Intermittent time:**

**At MIN.**

**$1.6 \pm 1$  seconds**

**At MAX.**

**$16 \pm 6$  seconds**



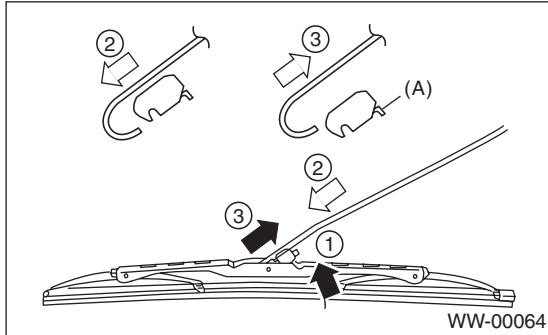
S Intermittent time (sec.)

(A) Connecting the battery negative lead to connector terminal No. 16

## 4. Wiper Blade

### A: REMOVAL

While pushing the locking clip (A) up, pull out the blade from arm to arrow direction.



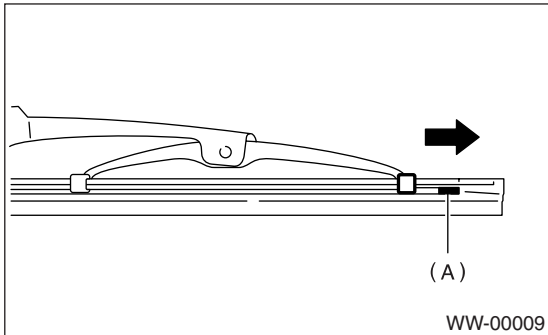
### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Confirm that the clip is locked securely.

### C: DISASSEMBLY

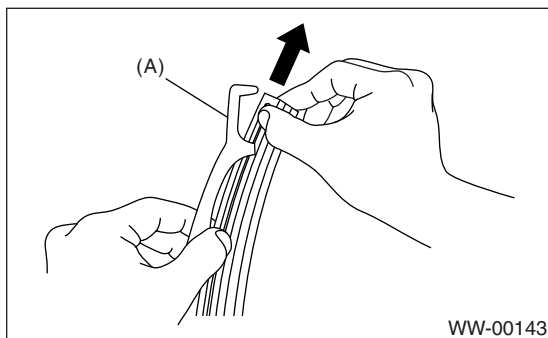
#### 1. METAL TYPE

Pull on the side (A) of wiper rubber stopper, and then remove the rubber from blade assembly.



#### 2. RESIN TYPE

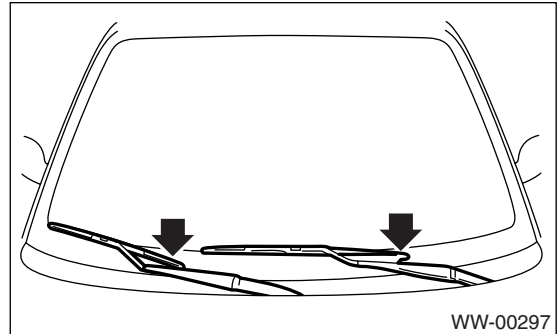
Pull the wiper rubber top slightly from the stopper (A) and pull it out fully.



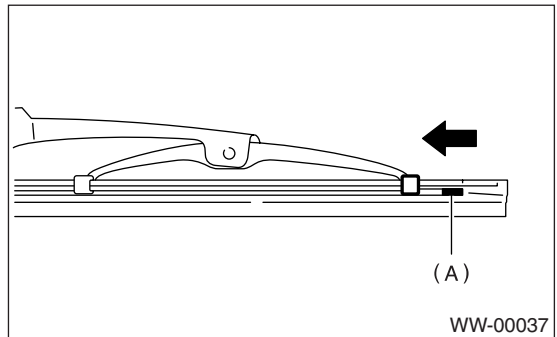
## D: ASSEMBLY

### 1. METAL TYPE

- 1) Insert the wiper rubber onto blade so that the stopper is in the position shown.



- 2) Make sure the wiper rubber is securely fastened to the pull stopper (A).

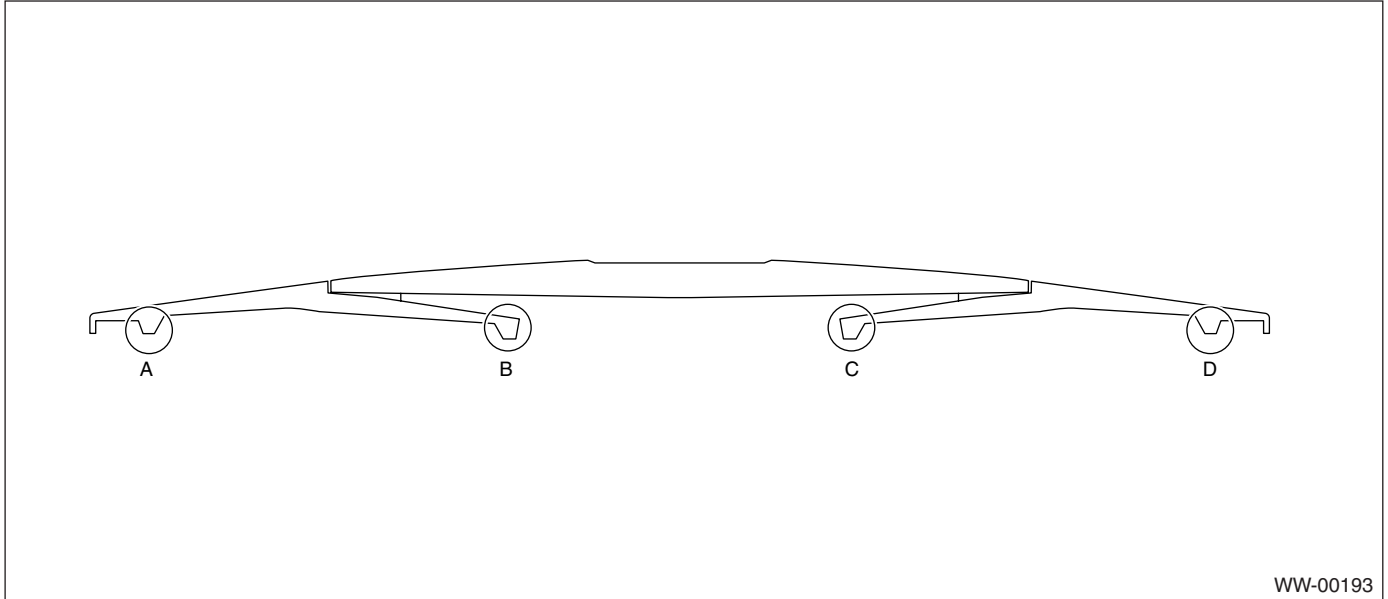




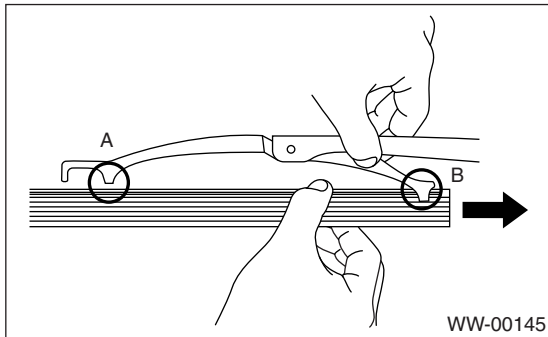
# Wiper Blade

## WIPER AND WASHER SYSTEMS

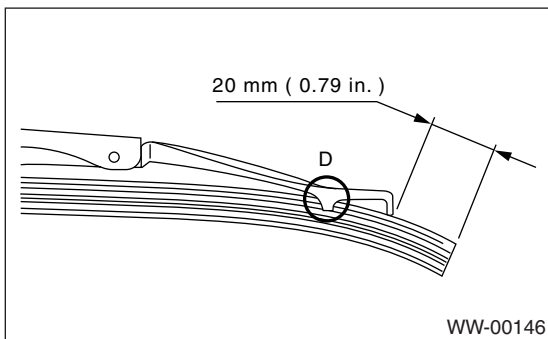
### 2. RESIN TYPE



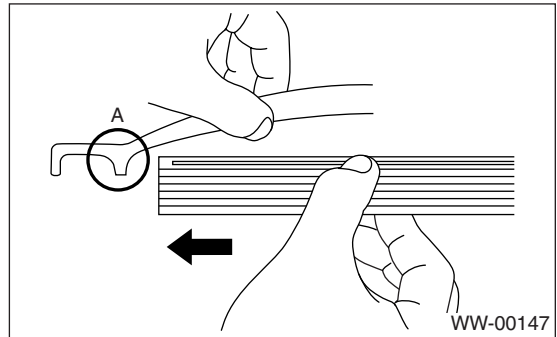
1) Insert the wiper rubber through the claw (B).



2) Insert the wiper rubber top until it protrudes about 20 mm (0.79 in) from the stopper (D).



3) Insert the wiper rubber into the claw (A).



### E: INSPECTION

1) When the wiper does not perform well, inspect the following:

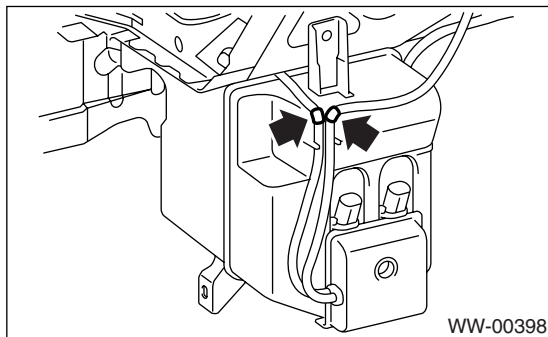
- Make sure the movable part of the blade assembly moves smoothly.
- Make sure the wiper rubber is not deformed or damaged.

2) Replace them with new parts if damaged.

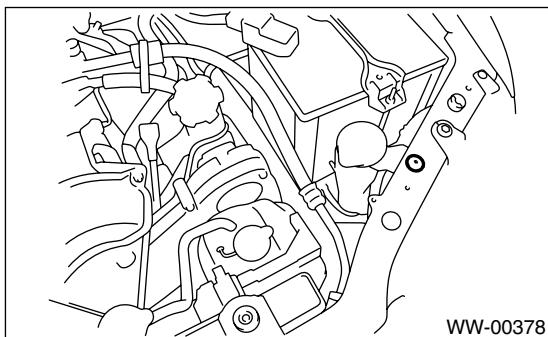
## 5. Washer Tank and Motor

### A: REMOVAL

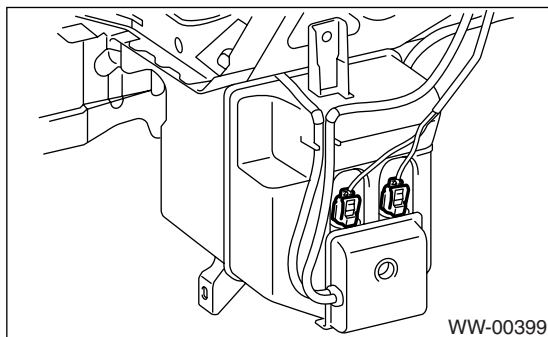
- 1) Open the hood.
- 2) Disconnect the ground cable from battery.
- 3) Remove the front bumper. <Ref. to EI-24, REMOVAL, Front Bumper.>
- 4) Remove the hose from L joint, and then drain washer fluid.



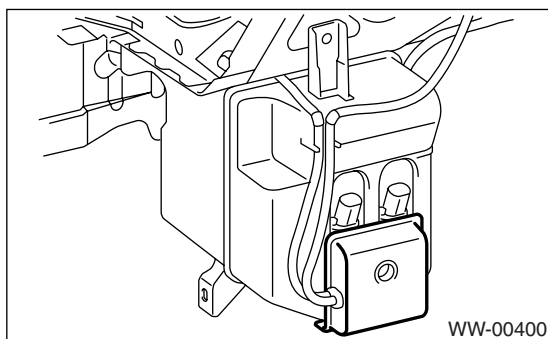
- 5) Remove the duct clip.



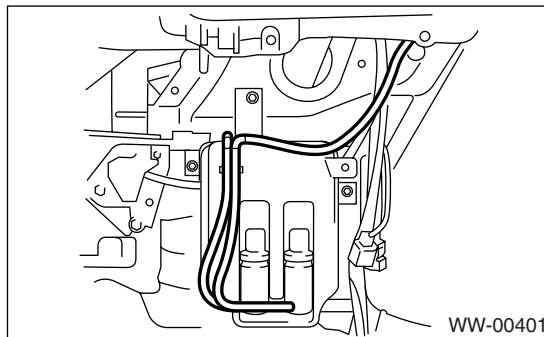
- 6) Remove the connector.



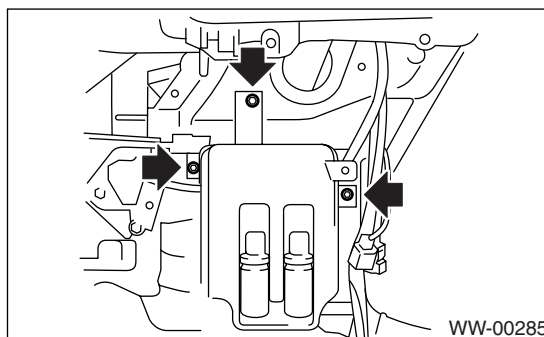
- 7) Remove the screw, and then remove the cover.



- 8) Disconnect the hose.



- 9) Remove the bolt and nut, and then remove the washer tank.



### B: INSTALLATION

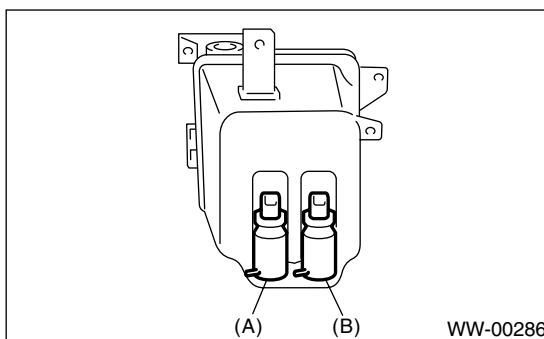
Install in the reverse order of removal.

#### Tightening torque:

**6.0 N·m (0.61 kgf·m, 4.4 ft·lb)**

### C: DISASSEMBLY

Pull out the washer motor from tank.



- (A) Front
- (B) Rear

### D: ASSEMBLY

- 1) Assemble in the reverse order of disassembly.
- 2) Confirm that water does not leak from installation area of motor.

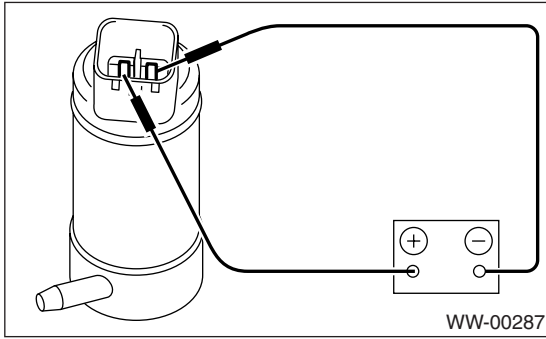
# Washer Tank and Motor

WIPER AND WASHER SYSTEMS

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## E: INSPECTION

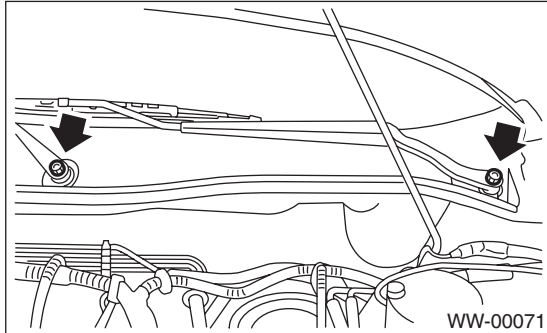
Apply battery voltage to the connector terminal of the washer motor and make sure the motor operates.



## 6. Front Wiper Arm

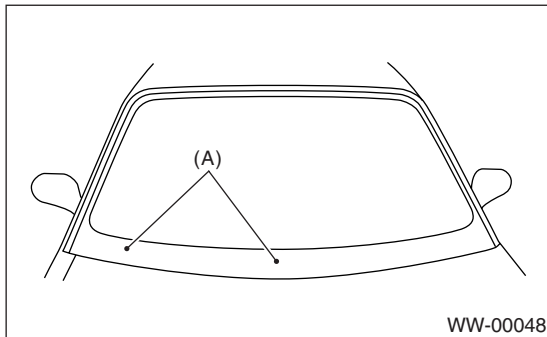
### A: REMOVAL

- 1) Open the hood.
- 2) Remove the cap.
- 3) Remove the nut to remove arm.



### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Operate the wiper once.
- 3) Align the wiper blade to the ceramic print point mark (A) of front window panel.



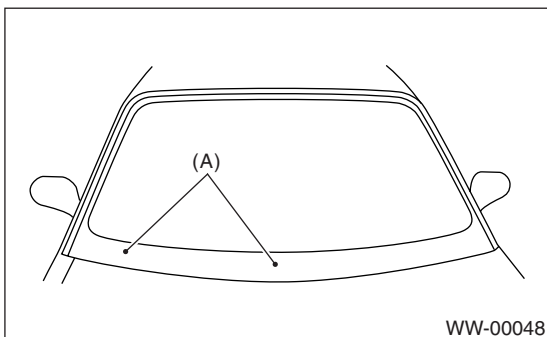
#### **Tightening torque:**

**Refer to COMPONENT in General Description.**

**<Ref. to WW-2, FRONT WIPER, COMPONENT, General Description.>**

### C: ADJUSTMENT

Operate the wiper once. Align the wiper blade to the ceramic print point mark (A) of front window panel.



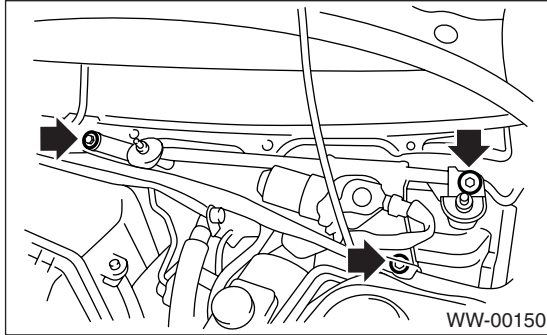
# Front Wiper Motor and Link

## WIPER AND WASHER SYSTEMS

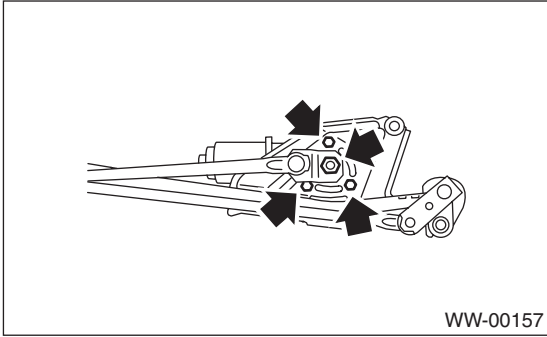
### 7. Front Wiper Motor and Link

#### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the cowl panel. <Ref. to EI-34, REMOVAL, Cowl Panel.>
- 3) Disconnect the connector of motor.
- 4) Remove the bolts to remove wiper link.

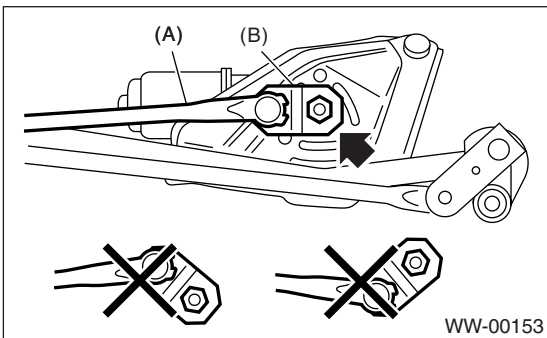


- 5) Remove the bolts and nuts to remove motor.



#### B: INSTALLATION

- 1) Connect the battery ground cable to battery.
- 2) To confirm that the motor is at auto stop position, connect the harness to motor and turn the wiper switch ON/OFF once.
- 3) Disconnect the ground cable from battery.
- 4) Tighten the nut where rod (A) and link plate (B) is aligned in a straight line.



- 5) Install in the reverse order of removal.

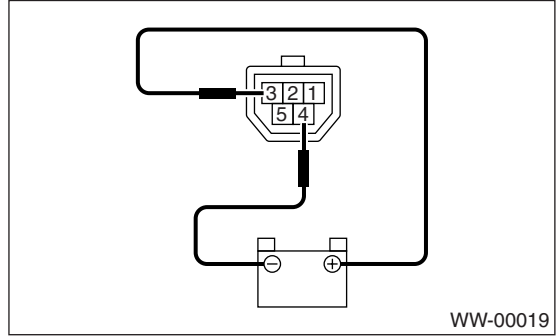
#### Tightening torque:

Refer to **COMPONENT** in *General Description*.

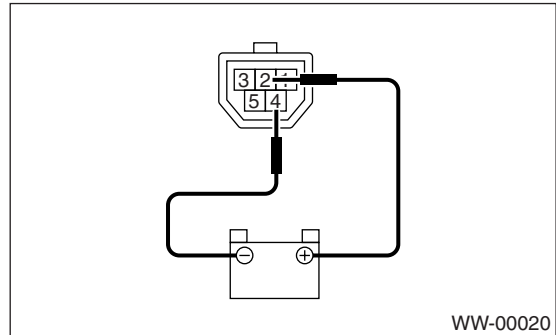
<Ref. to **WW-2, FRONT WIPER, COMPONENT, General Description.**>

#### C: INSPECTION

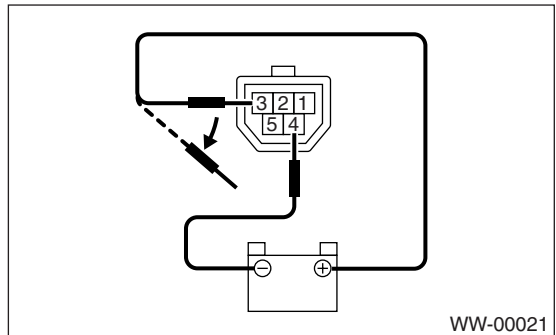
- 1) When the battery is connected to the terminal of connectors, confirm that the motor operates at low speed.



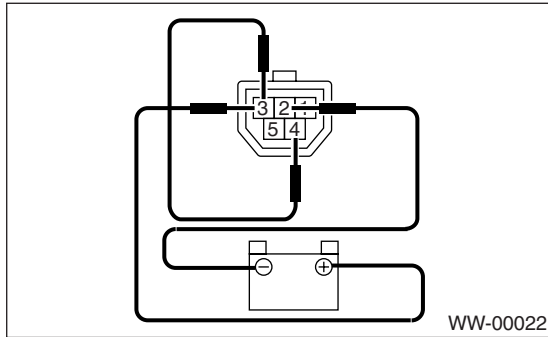
- 2) When the battery is connected to the terminal of connectors, confirm that the motor operates at high speed.



- 3) Connect the battery to terminals of connector, and then remove the terminal connection with motor rotated at low speed, and stop the wiper motor through operation.



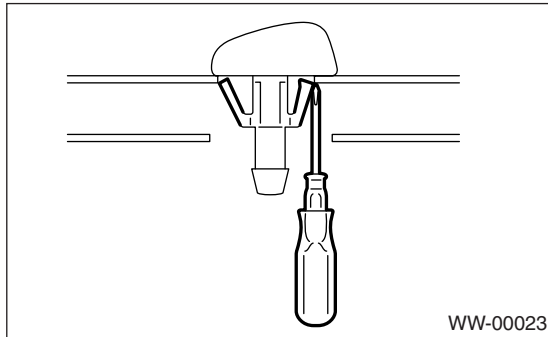
4) Connect the battery and confirm that the motor stops at automatic stop position after the motor operates at low speed again.



### 8. Front Washer Nozzle

#### A: REMOVAL

- 1) Remove the washer hose from the washer nozzle.
- 2) Open the clips on the underside of the hood with a thin screwdriver or other tool, and remove the washer nozzle.



#### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust the position of the washer liquid sprayer.  
<Ref. to WW-16, ADJUSTMENT, Front Washer Nozzle.>

#### C: INSPECTION

- Make sure the nozzle and hose are not clogged.
- Make sure the hose is not bent.

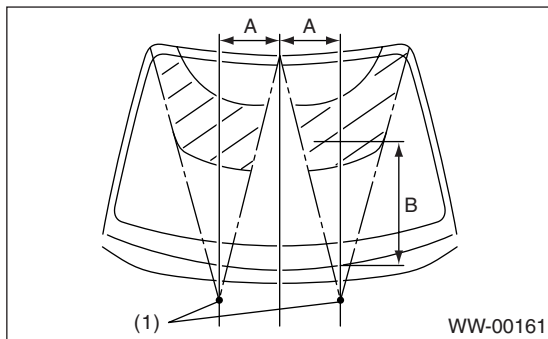
#### D: ADJUSTMENT

- 1) Turn the wiper switch to OFF position.
- 2) When the vehicle stops, adjust the washer fluid injection position as shown in the figure.

#### **Injection position:**

**A: 257 mm (10.12 in)**

**B: 512 mm (20.16 in)**

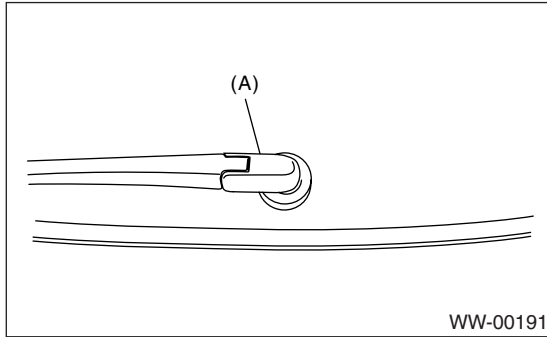


(1) Nozzle

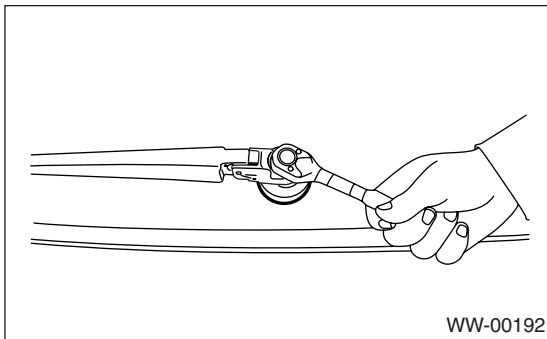
## 9. Rear Wiper Arm

### A: REMOVAL

- 1) Remove the wiper arm cover (A).

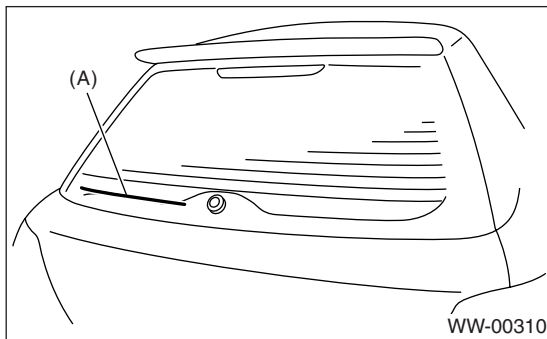


- 2) Remove the nut to remove wiper arm.



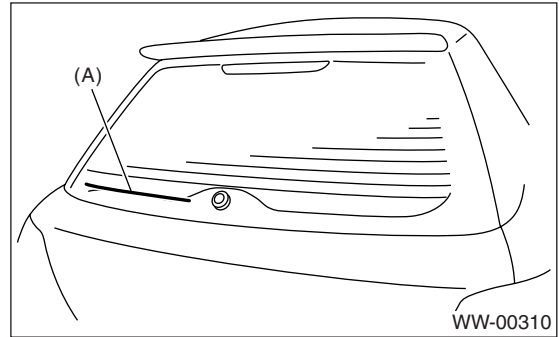
### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Operate the rear wiper once.
- 3) Align the blade to rear defogger heat wire (A).



### C: ADJUSTMENT

- 1) Operate the rear wiper once.
- 2) Align the blade to rear defogger heat wire (A).



#### Tightening torque:

Refer to **COMPONENT** in **General Description**.

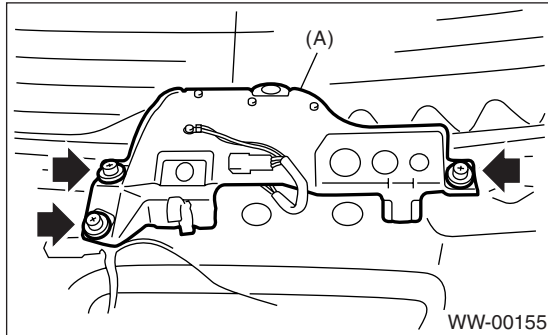
<Ref. to WW-3, **REAR WIPER, COMPONENT, General Description**.>



## 10. Rear Wiper Motor

### A: REMOVAL

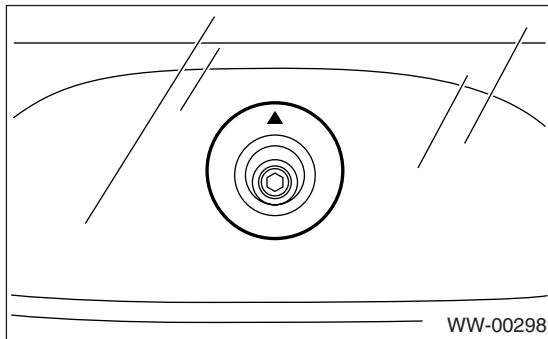
- 1) Disconnect the ground cable from battery.
- 2) Remove the rear wiper arm. <Ref. to WW-17, REMOVAL, Rear Wiper Arm.>
- 3) Remove the rear gate lower trim. <Ref. to EI-57, REMOVAL, Rear Gate Trim.>
- 4) Unclip the clip of harness, and then disconnect the connector of wiper motor.
- 5) Loosen the bolts to remove the wiper motor assembly (A).



- 6) Remove rear wiper cushion.

### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Install the rear wiper cushion with the arrow mark facing up, as shown in the figure.



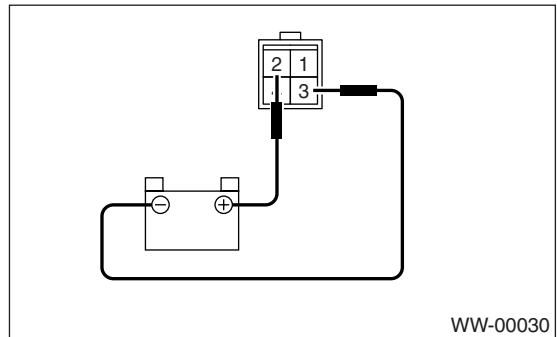
#### Tightening torque:

Refer to **COMPONENT** in **General Description**.

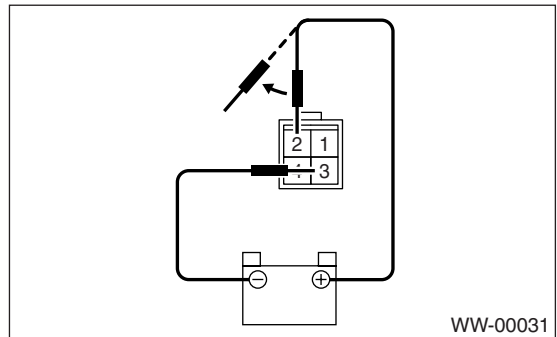
<Ref. to WW-3, REAR WIPER, COMPONENT, General Description.>

### C: INSPECTION

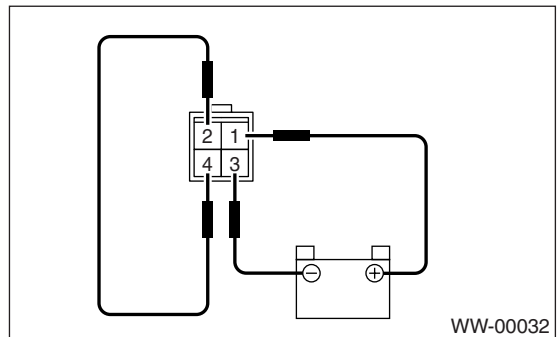
- 1) Connect the battery to wiper motor connector and confirm that the wiper motor operates.



- 2) Connect the battery to terminal of connector, and then remove the terminal connections with motor rotated, and stop the wiper motor through operation.



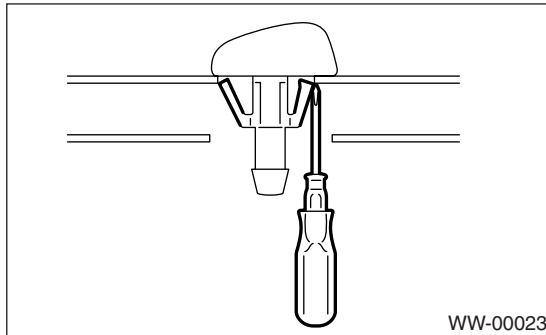
- 3) Connect the battery and confirm that the motor stops at automatic stop position after the motor operates at low speed again.



## 11.Rear Washer

### A: REMOVAL

- 1) Remove the high-mount stop light. <Ref. to LI-27, REMOVAL, High-mounted Stop Light.>
- 2) Remove the washer hose from washer nozzle.
- 3) Open the clips on the underside of hood with a thin screwdriver or other tool, and then remove the washer nozzle.



### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust the position of the washer liquid sprayer. <Ref. to WW-19, ADJUSTMENT, Rear Washer.>

### C: INSPECTION

- Make sure the nozzle and hose are not clogged.
- Make sure the hose is not bent.

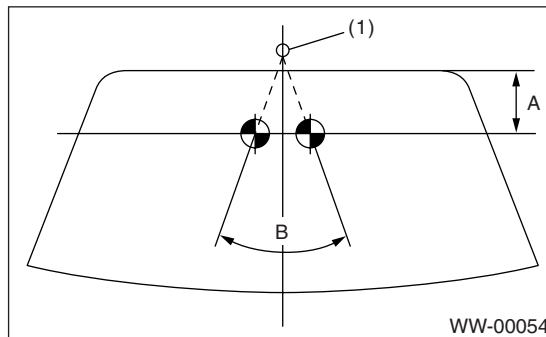
### D: ADJUSTMENT

- 1) Turn the wiper switch to OFF position.
- 2) When the vehicle stops, adjust the washer fluid injection position as shown in the figure.

#### **Injection position:**

**A: 39 mm (1.54 in)**

**B: 72°**



(1) Nozzle

# Wiper Control Relay

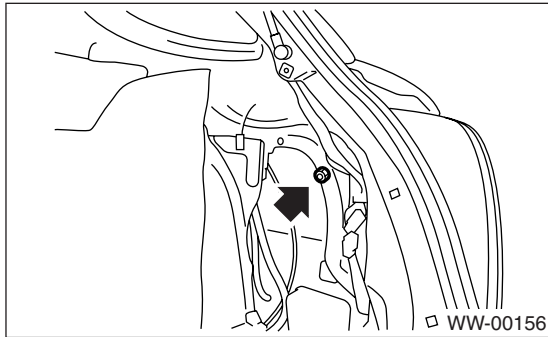
WIPER AND WASHER SYSTEMS

## 12. Wiper Control Relay

If operation is not as specified, replace the switch.

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the right quarter lower trim. <Ref. to EI-52, REMOVAL, Rear Quarter Trim.>
- 3) Loosen the nut to remove control unit.

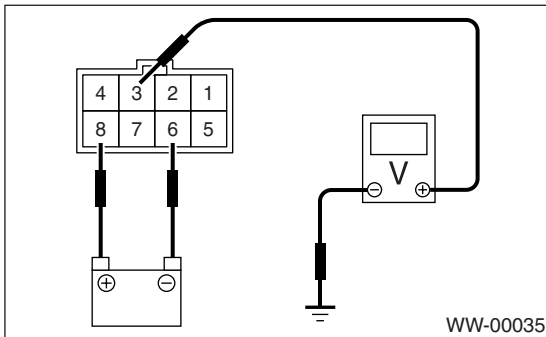


### B: INSTALLATION

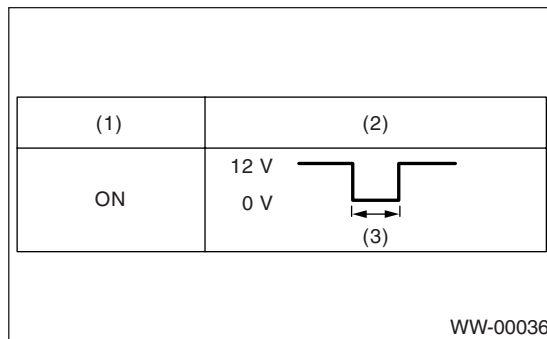
Install in the reverse order of removal.

### C: INSPECTION

- 1) Disconnect the connector from wiper control relay.
- 2) Connect the positive (+) lead from the battery to terminal 8 and the negative (-) lead to terminal 6. Connect the positive (+) lead from the voltmeter to terminal 3 and the negative (-) lead to ground.



- 3) Measure the voltage when the wiper relay is operated.



- (1) Switch position
- (2) Voltage
- (3)  $9 \pm 2$  sec.

# ENTERTAINMENT

# *ET*

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## 1. General Description

### A: CAUTION

- Before disassembling or reassembling parts, always disconnect the battery ground cable. When replacing the audio, control unit, and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
- Reassemble in reverse order of disassembly, unless otherwise indicated.
- Adjust parts to the given specifications.
- Connect the connectors and hoses securely during reassembly.
- After reassembly, make sure functional parts operate smoothly.

### B: PREPARATION TOOL

#### 1. GENERAL TOOL

| TOOL NAME  | Remarks                                    |
|--|--|
| Circuit tester   | Used for measuring resistance and voltage. |
| Conductive silver composition<br>(DUPONT No. 4817 or equivalent) | Used for repairing antenna wire.           |

## 2. Audio System

### A: WIRING DIAGRAM

<Ref. to WI-139, WIRING DIAGRAM, Audio System.>

### B: INSPECTION

| Symptom  | Repair order  |
|--|---|
| No power coming in. (No display and no sound from speakers)) | (1) Check the fuse and power supply for audio.<br>(2) Check the audio ground.<br>(3) Remove the audio and repair it.  |
| A specific speaker does not operate.                         | (1) Check the speaker.<br>(2) Check the output circuit between audio and speaker.   |
| Audio generates noise with engine running.                   | (1) Check the audio ground.<br>(2) Check the generator.<br>(3) Check the ignition coil.<br>(4) Remove the audio and repair it.                                      |
| AM and FM modes are weak or noisy.                           | (1) Check the antenna.<br>(2) Check the antenna amplifier.<br>(3) Check the noise suppressor.<br>(4) Check the audio ground.<br>(5) Remove the audio and repair it. |

## **3. Front Accessory Power Supply Socket System**

### **A: WIRING DIAGRAM**

<Ref. to WI-141, WIRING DIAGRAM, Front Accessory Power Supply Socket System.>

## 4. Rear Accessory Power Supply Socket System

### A: WIRING DIAGRAM

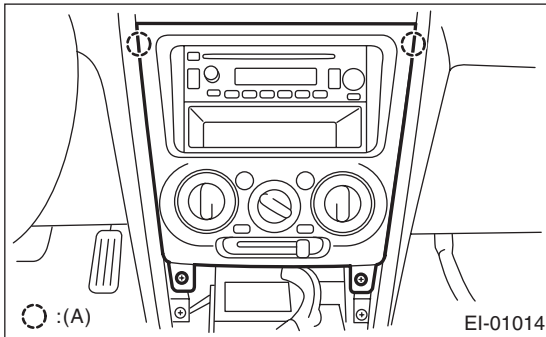
<Ref. to WI-142, WIRING DIAGRAM, Rear Accessory Power Supply Socket System.>



## 5. Audio

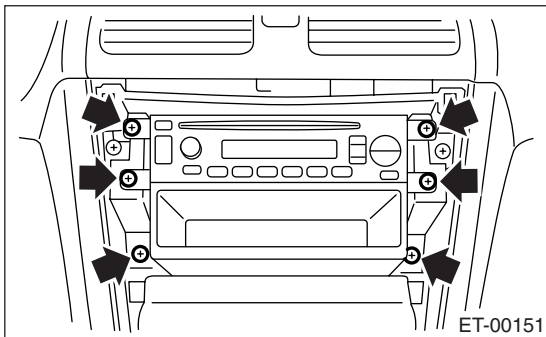
### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the console front panel.
- 3) Remove the center panel while disconnecting connector.



(A) Hook pawl

- 4) Remove the fitting screws, and slightly pull out the audio from center console.



- 5) Disconnect the harness connectors and antenna feeder cord.

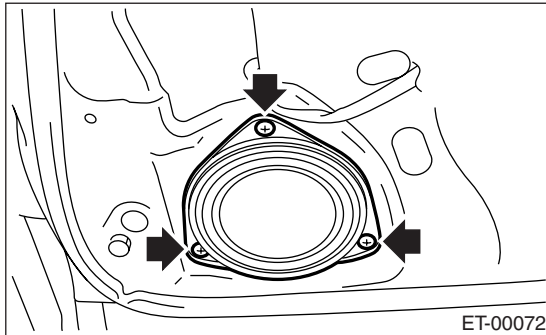
### B: INSTALLATION

Install in the reverse order of removal.

## 6. Front Speaker

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the front door trim. <Ref. to EI-41, REMOVAL, Front Door Trim.>
- 3) Remove the front speaker mounting screws.



- 4) Disconnect the harness connector and remove front speaker.

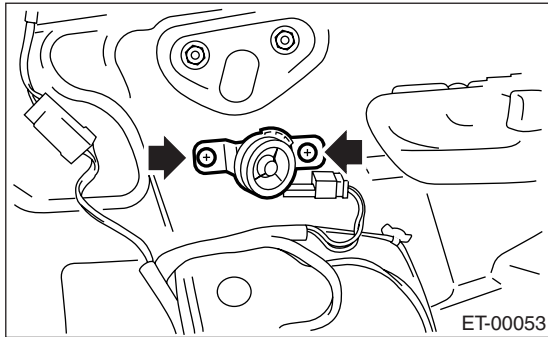
### B: INSTALLATION

Install in the reverse order of removal.

## 7. Tweeter

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the front door trim. <Ref. to EI-41, REMOVAL, Front Door Trim.>
- 3) Remove the tweeter mounting screws.



- 4) Disconnect the harness connector and remove tweeter.

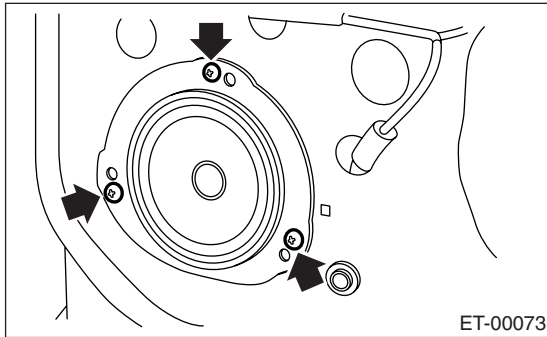
### B: INSTALLATION

Install in the reverse order of removal.

## 8. Rear Speaker

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the rear door trim. <Ref. to EI-42, REMOVAL, Rear Door Trim.>
- 3) Remove the rear speaker mounting screws.



- 4) Disconnect the harness connector and remove rear speaker.

### B: INSTALLATION

Install in the reverse order of removal.

## 9. Antenna

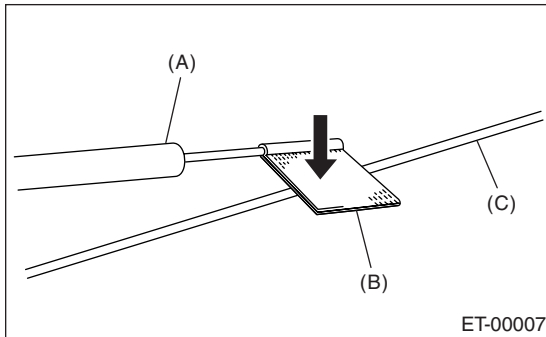
### A: INSPECTION

Measure the resistance between antenna terminal and each antenna wire.

If an antenna wire is OK, resistance will be less than 1  $\Omega$ . If an antenna wire is broken, the resistance will be more than 1 M $\Omega$ .

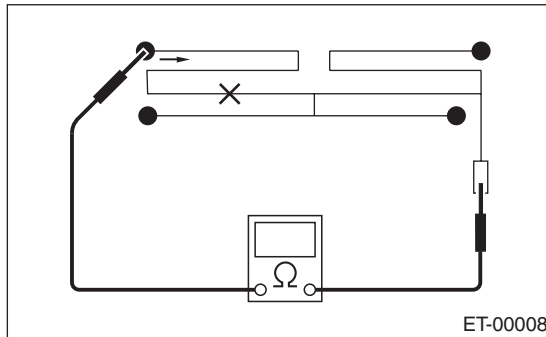
#### NOTE:

When checking the continuity, wind a piece of aluminum foil around the tip of tester probe, and then press the aluminum foil against wire with your finger.



- (A) Tester probe
- (B) Aluminum foil
- (C) Antenna wire

To locate the broken point, move the probe along antenna wire.

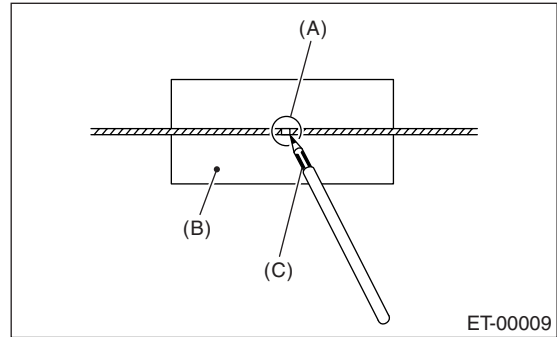


### B: REPAIR

1) Clean the antenna wire and surrounding area with a cloth dampened by alcohol.

2) Paste a thin masking film on the glass along broken wire.

3) Deposit conductive silver composition (DUPONT No. 4817) on the broken portion with a drawing pen.



- (A) Broken portion
- (B) Masking film
- (C) Conductive silver composition

4) Dry out the deposited portion.

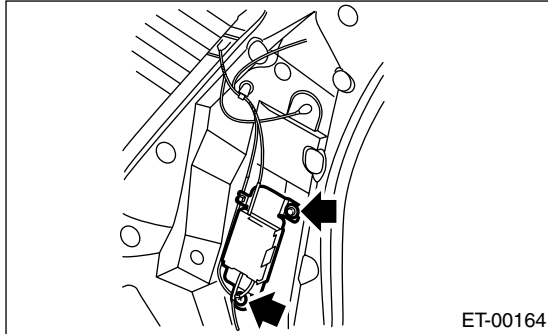
5) After repair has been completed, measure the resistance in repaired wire.

## 10. Antenna Amplifier

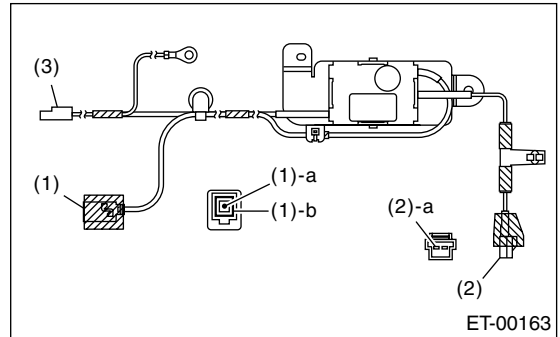
### A: REMOVAL

#### 1. SEDAN

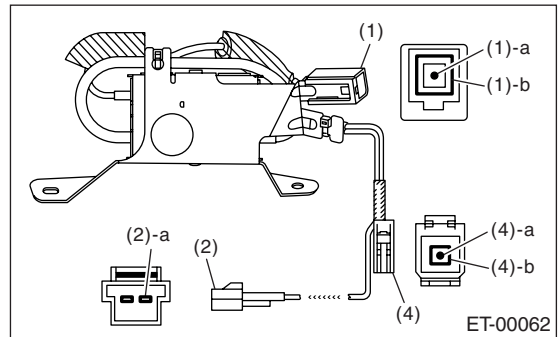
- 1) Disconnect the ground cable from battery.
- 2) Remove the rear pillar upper trim. <Ref. to EI-52, SEDAN MODEL, REMOVAL, Rear Quarter Trim.>
- 3) Disconnect the harness connector and terminal.
- 4) Remove the mounting screw and bolt, and detach antenna amplifier.



#### • SEDAN

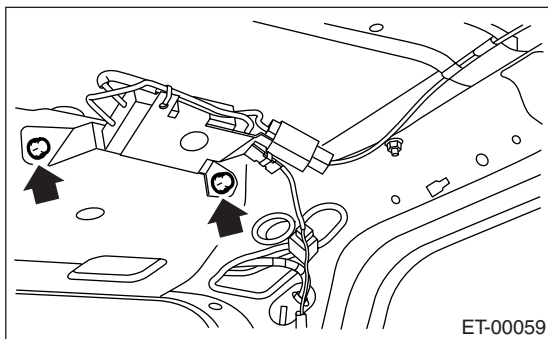


#### • WAGON



#### 2. WAGON

- 1) Disconnect the ground cable from battery.
- 2) Remove the rear quarter upper trim and roof trim. <Ref. to EI-55, WAGON MODEL, REMOVAL, Roof Trim.> <Ref. to EI-52, WAGON MODEL, REMOVAL, Rear Quarter Trim.>
- 3) Disconnect the harness connector and terminal.
- 4) Remove the mounting screws and detach the antenna amplifier.



| Terminal No.           | Standard         |
|------------------------|------------------|
| 1-a and Amplifier body | More than 100 kΩ |
| 1-b and Amplifier body | Less than 1 Ω    |
| 2-a and Amplifier body | More than 100 kΩ |
| 3 and Amplifier body   | More than 100 kΩ |
| 4-a and Amplifier body | More than 100 kΩ |
| 4-b and Amplifier body | Less than 1 Ω    |

### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

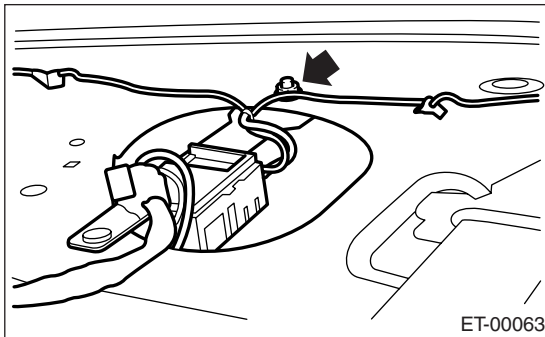
Measure the antenna amplifier resistance.

## 11.Noise Suppressor

### A: REMOVAL

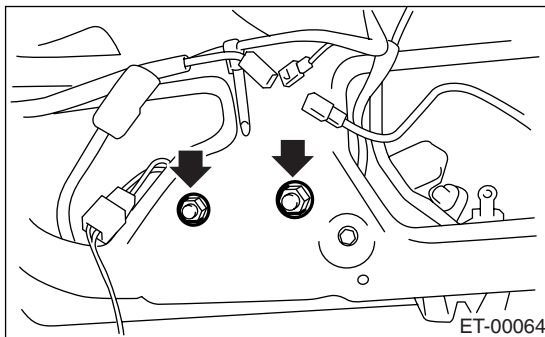
#### 1. SEDAN

- 1) Disconnect the ground cable from battery.
- 2) Remove the rear pillar upper trim. <Ref. to EI-52, SEDAN MODEL, REMOVAL, Rear Quarter Trim.>
- 3) Remove the rear shelf trim. <Ref. to EI-58, REMOVAL, Rear Shelf Trim.>
- 4) Disconnect the feeder cord connector from antenna amplifier.
- 5) Disconnect the harness connector of noise suppressor from terminal on glass antenna.
- 6) Remove the harness clip.
- 7) Remove the mounting nut and detach the noise suppressor.



#### 2. WAGON

- 1) Disconnect the ground cable from battery.
- 2) Remove the rear gate trim. <Ref. to EI-57, REMOVAL, Rear Gate Trim.>
- 3) Disconnect the connector from noise suppressor.
- 4) Remove the mounting nut and detach the noise suppressor.



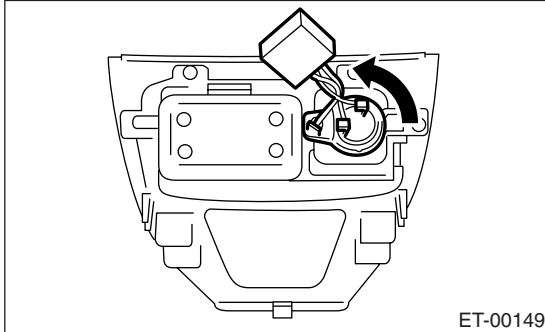
### B: INSTALLATION

Install in the reverse order of removal.

## 12. Front Accessory Power Supply Socket

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the console front panel.
- 3) Disconnect the harness connectors and remove front accessory power supply socket.



### B: INSTALLATION

Install in the reverse order of removal.

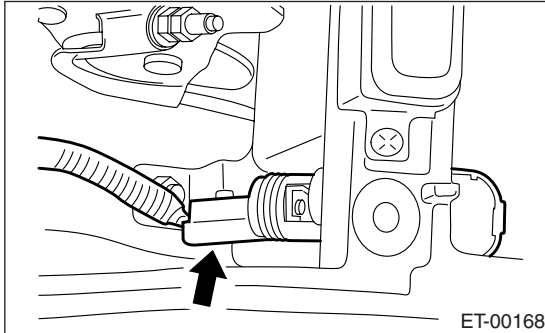


## 13. Rear Accessory Power Supply Socket

### A: REMOVAL

#### 1. FRONT

- 1) Disconnect the ground cable from battery.
- 2) Remove the console cover. <Ref. to EI-46, REMOVAL, Console Box.>
- 3) Disconnect the harness connectors and remove accessory power supply socket.



### B: INSTALLATION

Install in the reverse order of removal.

# COMMUNICATION SYSTEM

# COM

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|                              | <b>Page</b> |
|------------------------------|-------------|
| 1. General Description ..... | 2           |
| 2. Horn System .....         | 3           |
| 3. Horn .....                | 4           |
| 4. Horn Switch.....          | 5           |

## 1. General Description

### A: CAUTION

- Before disassembling or reassembling parts, always disconnect the battery ground cable. When replacing radio, control module, and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
- Reassemble in the reverse order of disassembly, unless otherwise indicated.
- Adjust parts to the given specifications.
- Connect the connectors and hoses securely during reassembly.
- After reassembly, make sure functional parts operate smoothly.

### B: PREPARATION TOOL

#### 1. GENERAL TOOLS

| TOOL NAME      | REMARKS                                    |
|----------------|--|
| Circuit tester | Used for measuring resistance and voltage. |

## 2. Horn System

### A: WIRING DIAGRAM

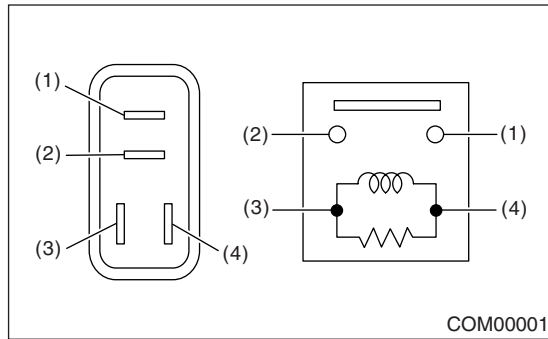
#### 1. HORN

<Ref. to WI-143, WIRING DIAGRAM, Horn System.>

### B: INSPECTION

#### 1. HORN RELAY

Measure the horn relay resistance between terminals (indicated in table below) when connecting the terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground cable.

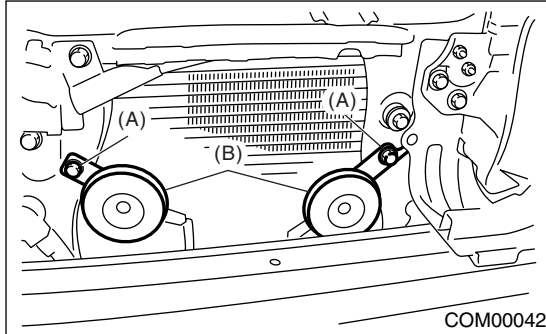


| Current | Terminal No. | Standard       |
|---------|--------------|----------------|
| Flow    | 1 and 2      | Less than 1 Ω  |
| No Flow |              | More than 1 MΩ |

### 3. Horn

#### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the front bumper. <Ref. to EI-24, REMOVAL, Front Bumper.>
- 3) Remove the horn bracket mounting bolt (A).
- 4) Disconnect the harness connector and remove the horn assembly (B).

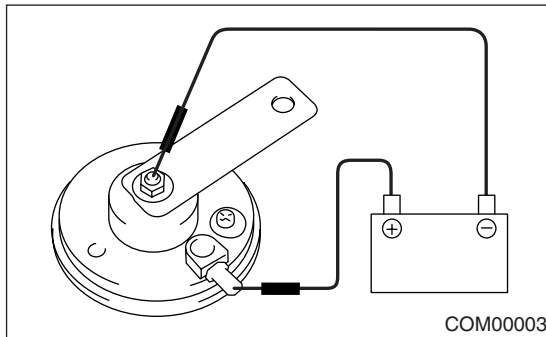


#### B: INSTALLATION

Install in the reverse order of removal.

#### C: INSPECTION

With 12 V direct current supplied between horn terminal and case ground, check that the horn sounds properly.



## 4. Horn Switch

### A: REMOVAL

**WARNING:**

Before servicing, be sure to read the notes in AB section for proper handling of driver's airbag module. <Ref. to AB-3, CAUTION, General Description.>

**NOTE:**

Horn switch forms a unit with the driver's airbag module.

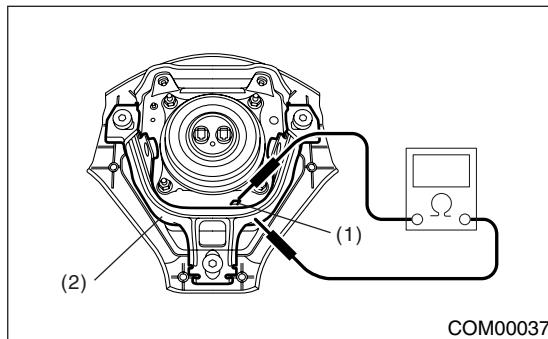
- 1) Disconnect the ground cable from battery.
- 2) Remove the driver's airbag module. <Ref. to AB-14, REMOVAL, Driver's Airbag Module.>

### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

Measure the resistance between horn switch terminal and airbag module bracket.



- (1) Horn switch terminal
- (2) Airbag module bracket

| Switch position                           | Terminal No.                                   | Resistance             |
|---|--|------------------------|
| When airbag module bracket is pushed.     | Horn switch terminal and Airbag module bracket | Less than 1 $\Omega$   |
| When airbag module bracket is not pushed. |  | More than 1 M $\Omega$ |

# Horn Switch

COMMUNICATION SYSTEM

---

# GLASS/WINDOWS/MIRRORS

# GW

---

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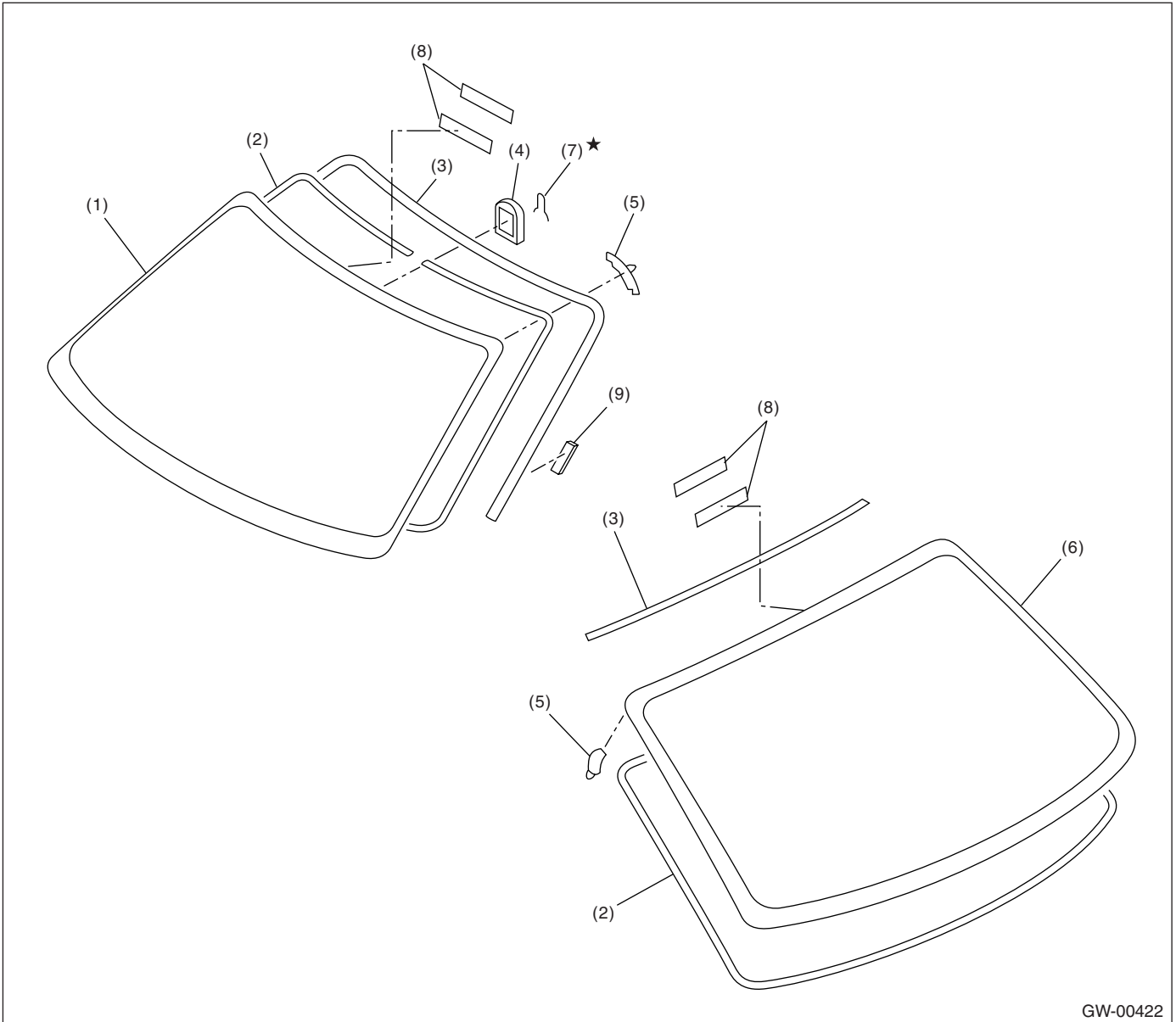
# General Description

GLASS/WINDOWS/MIRRORS

## 1. General Description

### A: COMPONENT

#### 1. FIXED GLASS (SEDAN MODEL)



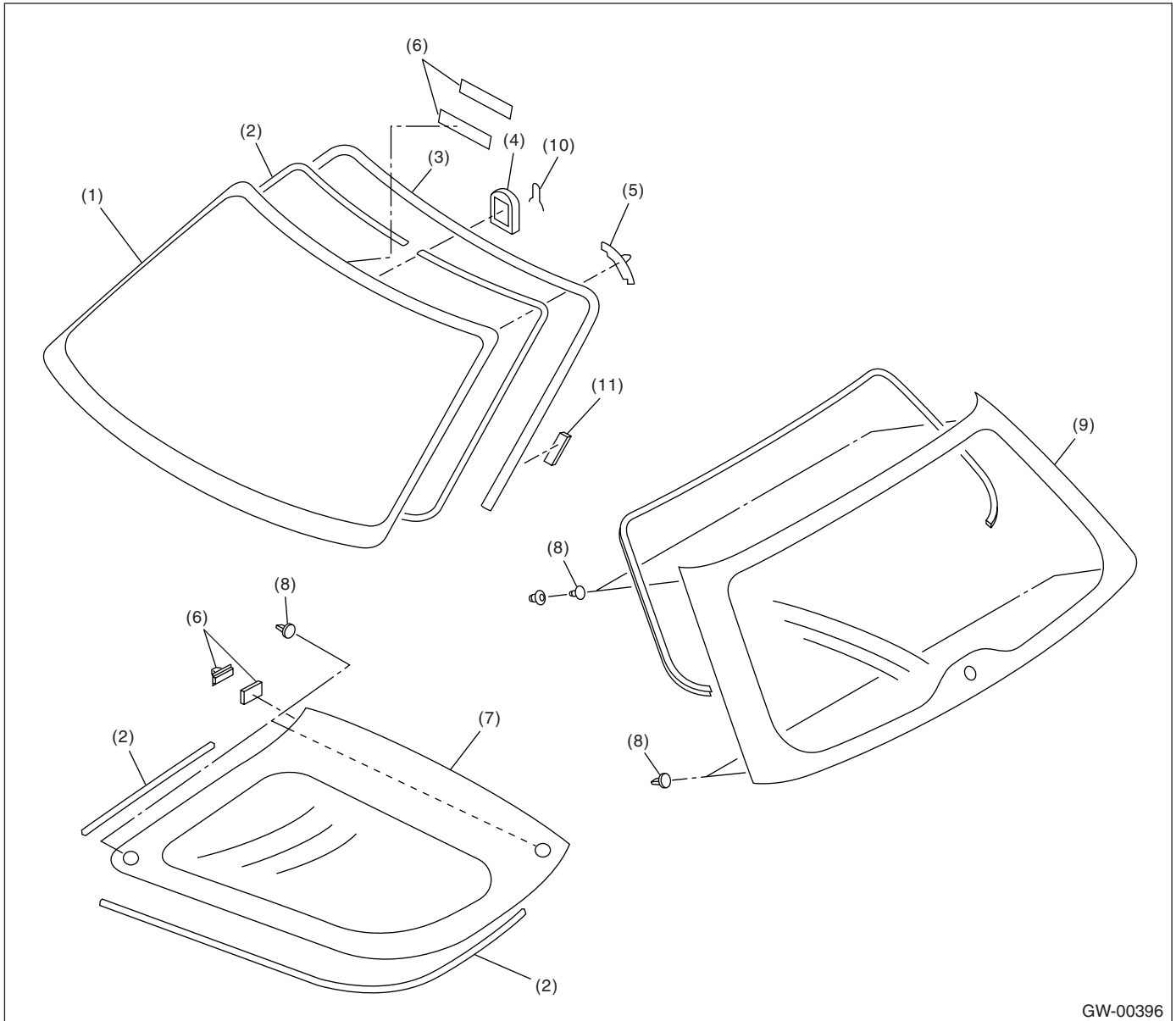
GW-00422

- (1) Windshield glass
- (2) Dam rubber
- (3) Molding

- (4) Rearview mirror mount
- (5) Locating pin
- (6) Rear window glass

- (7) Spring
- (8) Fastener
- (9) Seal

## 2. FIXED GLASS (WAGON MODEL)



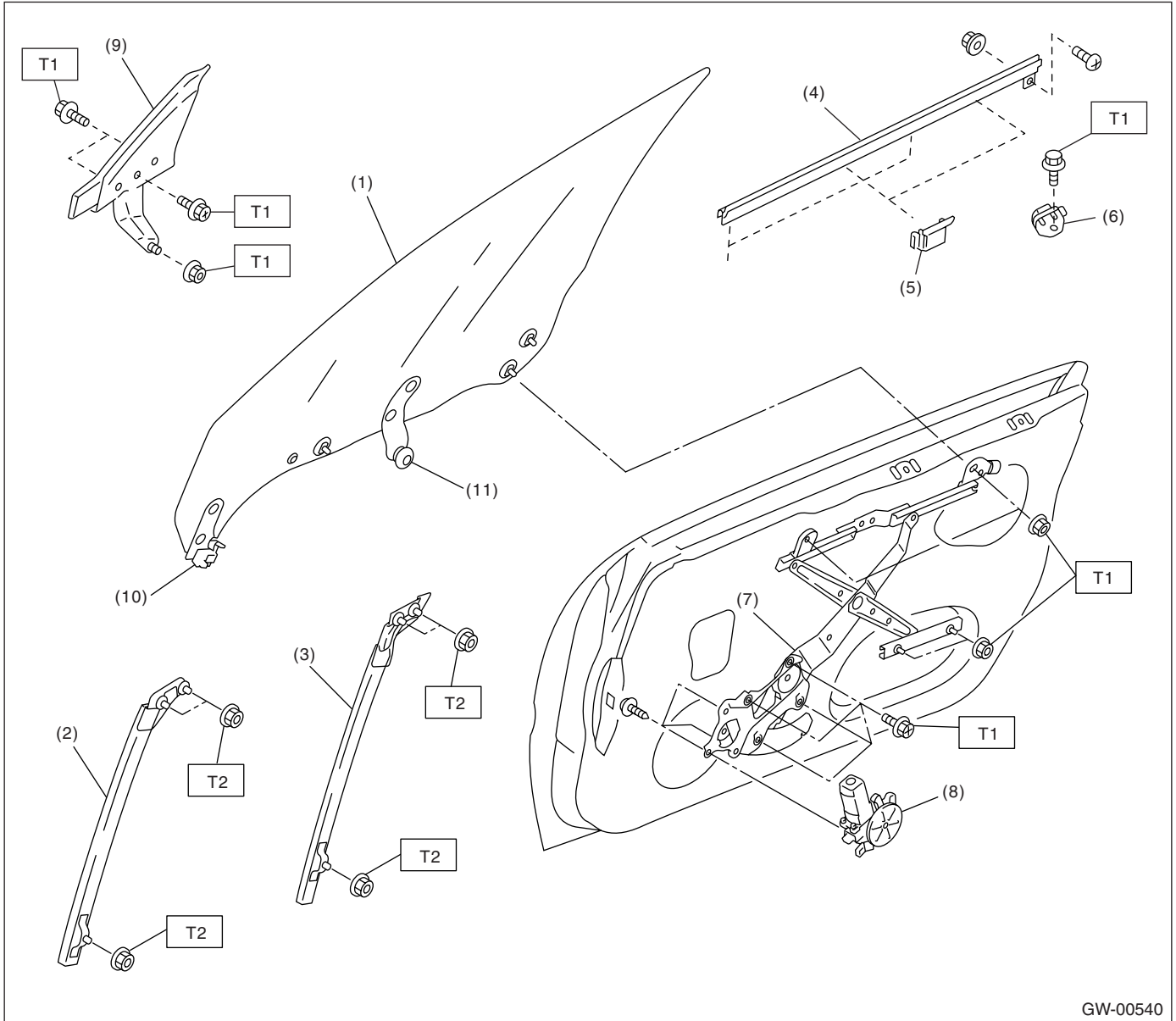
GW-00396

- |                           |                        |                     |
|---------------------------|------------------------|---------------------|
| (1) Windshield glass      | (5) Locating pin       | (9) Rear gate glass |
| (2) Dam rubber            | (6) Fastener           | (10) Spring         |
| (3) Molding               | (7) Rear quarter glass | (11) Seal           |
| (4) Rearview mirror mount | (8) Locating pin       |                     |

# General Description

GLASS/WINDOWS/MIRRORS

## 3. FRONT DOOR GLASS



- |                        |                        |
|------------------------|------------------------|
| (1) Glass              | (6) Stabilizer (Inner) |
| (2) Door sash (Front)  | (7) Regulator ASSY     |
| (3) Door sash (Rear)   | (8) Motor ASSY         |
| (4) Weather strip      | (9) Mirror gusset      |
| (5) Stabilizer (Outer) | (10) Slider            |

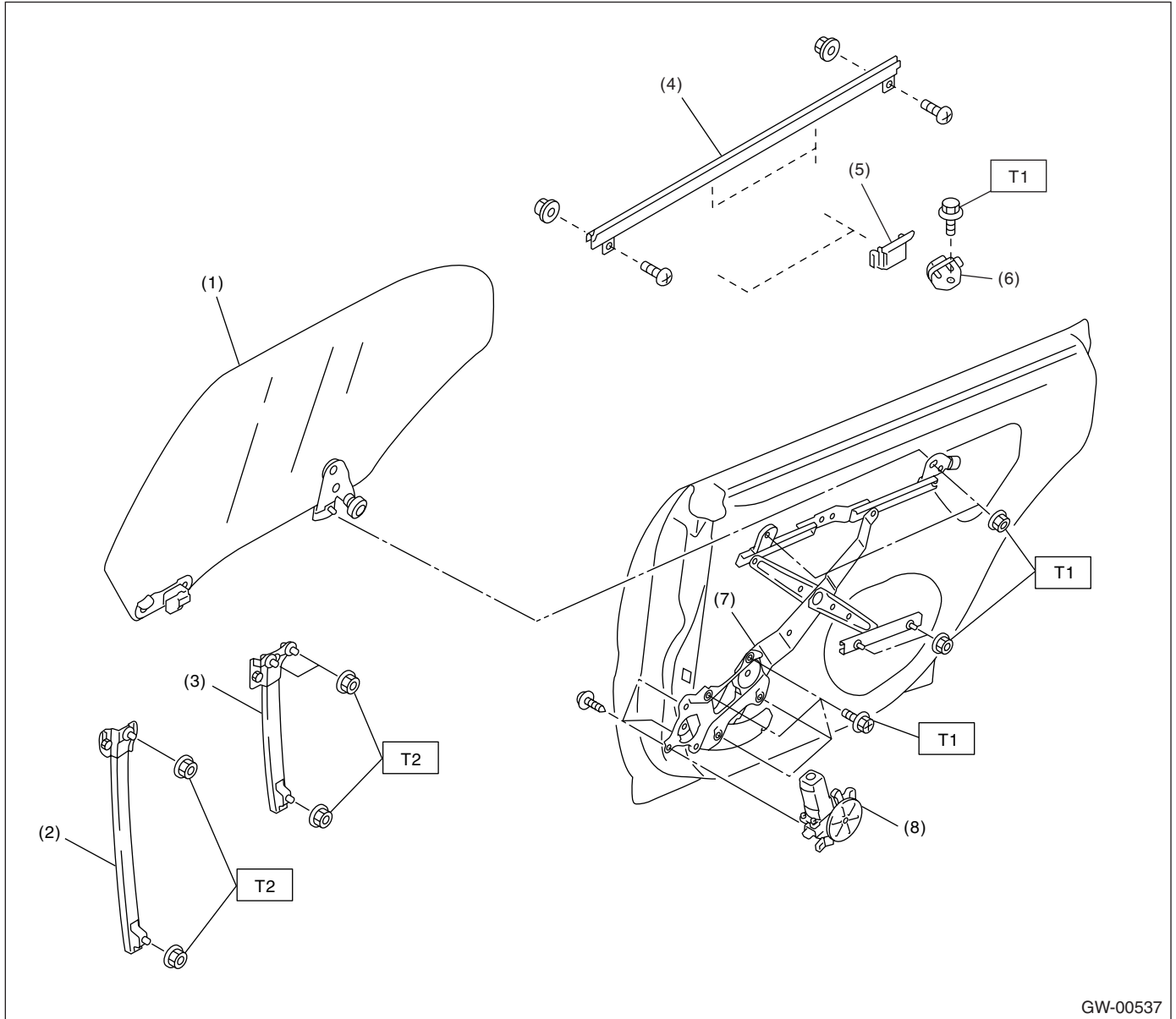
- (11) Roller

**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 7.4 (0.75, 5.5)**

**T2: 13.7 (1.4, 10.1)**

## 4. REAR DOOR GLASS



GW-00537

- |                       |                        |
|-----------------------|------------------------|
| (1) Glass             | (5) Stabilizer (Outer) |
| (2) Door sash (Front) | (6) Stabilizer (Inner) |
| (3) Door sash (Rear)  | (7) Regulator ASSY     |
| (4) Weather strip     | (8) Motor ASSY         |

**Tightening torque: N·m (kgf·m, ft·lb)**

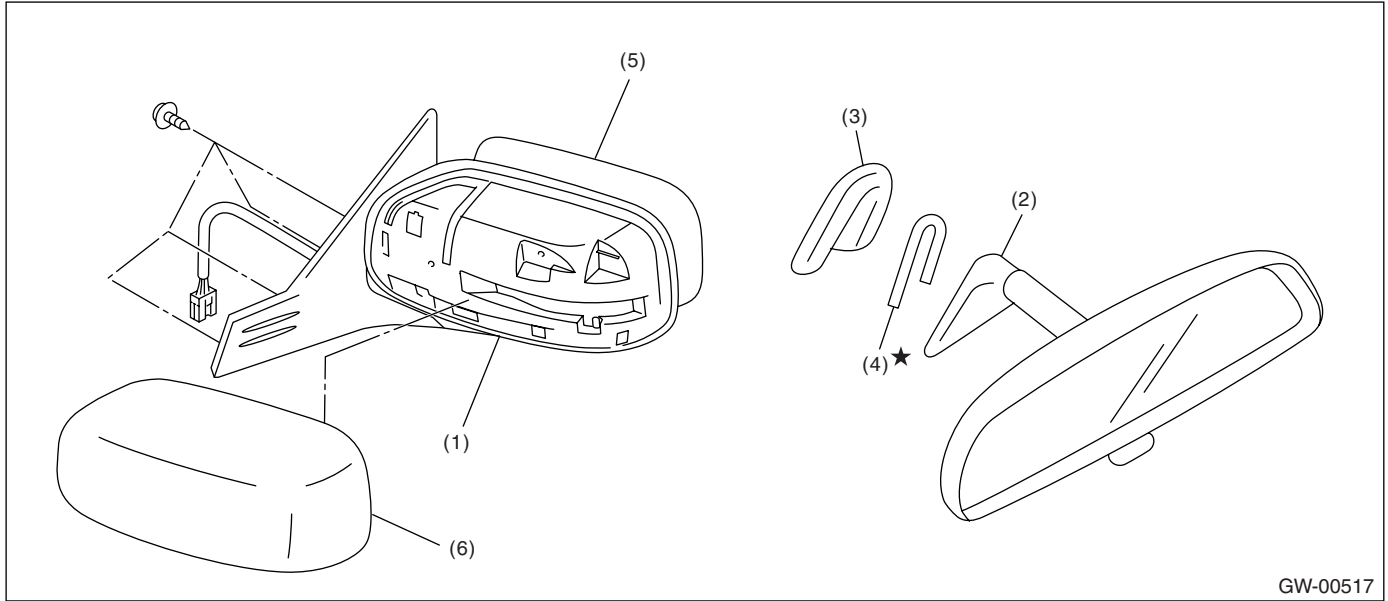
**T1: 7.4 (0.75, 5.5)**

**T2: 13.7 (1.4, 10.1)**

# General Description

GLASS/WINDOWS/MIRRORS

## 5. MIRROR



(1) Outer mirror

(2) Inner rearview mirror

(3) Mount

(4) Spring

(5) Mirror

(6) Scalp cap

### **B: CAUTION**

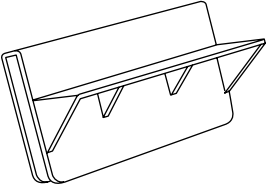
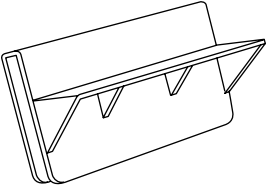
- When the electrical connectors are disconnected, always conduct an operational check after connecting them again.
- Avoid impact and damage to glass.

# General Description

GLASS/WINDOWS/MIRRORS

## C: PREPARATION TOOL

### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION | REMARKS   |
|---|-------------|-------------|---|
| <br><br>ST61299AE000 | 61299AE000  | SPACER      | Used for adjusting the upper end position of front door glass. (Glass thickness: 5 mm (0.197 in)) |
| <br><br>ST61299AE010 | 61299AE010  | SPACER      | Used for adjusting the upper end position of rear door glass. (Glass thickness: 4 mm (0.157 in))  |

### 2. GENERAL TOOL

| TOOL NAME        | REMARKS                                   |
|------------------|---|
| Circuit tester   | Used for checking voltage and continuity. |
| Piano wire       | Used for window glass removal.            |
| Windshield knife | Used for window glass removal.            |

# Power Window System

GLASS/WINDOWS/MIRRORS

---

## 2. Power Window System

### A: WIRING DIAGRAM

<Ref. to WI-144, Power Window System.>

### B: INSPECTION

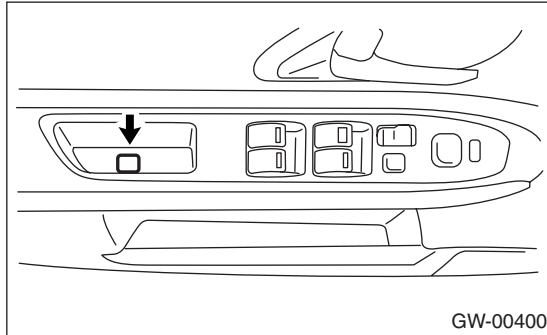
| Symptom                           | Repair order  |
|-----------------------------------|---|
| All power windows do not operate. | (1) Fuse (SBF-6)<br>(2) Power window circuit breaker<br>(3) Power window relay<br>(4) Wiring harness        |
| One window does not operate.      | (1) Power window main switch<br>(2) Power window sub switch<br>(3) Power window motor<br>(4) Wiring harness |
| "Window Lock" does not operate.   | Power window main switch  |

## 3. Power Window Control Switch

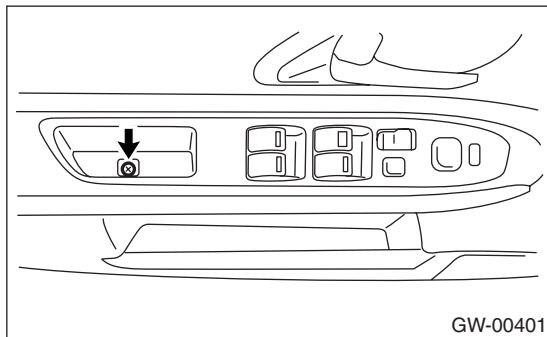
### A: REMOVAL

#### 1. MAIN SWITCH

- 1) Disconnect the ground cable from battery.
- 2) Using a flat tip screwdriver, remove the screw cover.



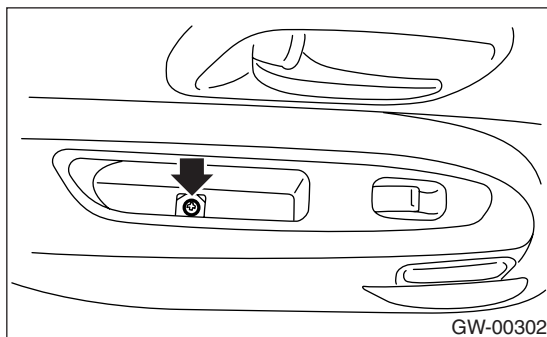
- 3) Loosen the screw to remove the power window main switch.



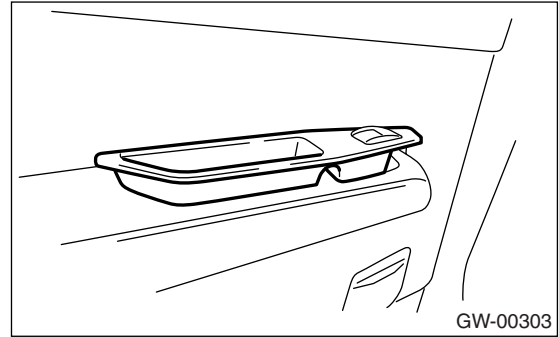
- 4) Disconnect the connector.

#### 2. SUB SWITCH

- 1) Disconnect the ground cable from battery.
- 2) Remove the screw which secures switch panel.



- 3) Remove the switch panel.



- 4) Disconnect the connector.

### B: INSTALLATION

#### 1. MAIN SWITCH

Install in the reverse order of removal.

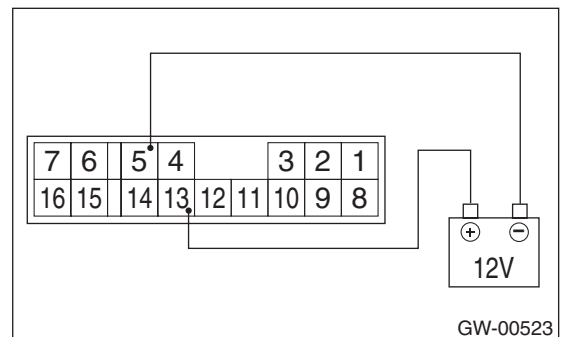
#### 2. SUB SWITCH

Install in the reverse order of removal.

### C: INSPECTION

#### 1. MAIN SWITCH

- 1) Remove the main switch. <Ref. to GW-9, REMOVAL, Power Window Control Switch.>
- 2) Turn the window lock switch to UNLOCK.
- 3) Connect the battery and main switch as shown in the figure below.





# Power Window Control Switch

GLASS/WINDOWS/MIRRORS

4) Measure the main switch resistance.

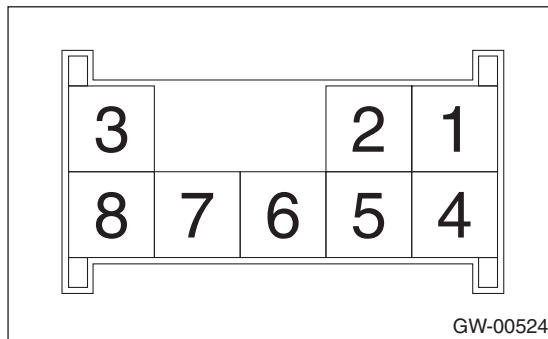
|                        | Switch position | Terminal No.         | Standard             |
|------------------------|-----------------|----------------------|----------------------|
| Driver's side          | UP              | 13 and 2, 1 and 5    | Less than 1 $\Omega$ |
|                        | OFF             | 1 and 5<br>2 and 5   | Less than 1 $\Omega$ |
|                        | DOWN            | 13 and 1, 2 and 5    | Less than 1 $\Omega$ |
|                        | AUTO DOWN       | 13 and 1, 2 and 5    | Less than 1 $\Omega$ |
| Front passenger's side | UP              | 13 and 6, 7 and 5    | Less than 1 $\Omega$ |
|                        | OFF             | 5 and 6<br>5 and 7   | Less than 1 $\Omega$ |
|                        | DOWN            | 13 and 7, 6 and 5    | Less than 1 $\Omega$ |
| Rear LH                | UP              | 11 and 13, 10 and 5  | Less than 1 $\Omega$ |
|                        | OFF             | 5 and 11<br>5 and 10 | Less than 1 $\Omega$ |
|                        | DOWN            | 13 and 10, 11 and 5  | Less than 1 $\Omega$ |
| Rear RH                | UP              | 13 and 16, 15 and 5  | Less than 1 $\Omega$ |
|                        | OFF             | 5 and 15<br>5 and 16 | Less than 1 $\Omega$ |
|                        | DOWN            | 13 and 15, 16 and 5  | Less than 1 $\Omega$ |

5) If NG, replace the main switch.

## 2. SUB SWITCH

1) Remove the sub switch. <Ref. to GW-9, REMOVAL, Power Window Control Switch.>

2) Measure the sub switch resistance.



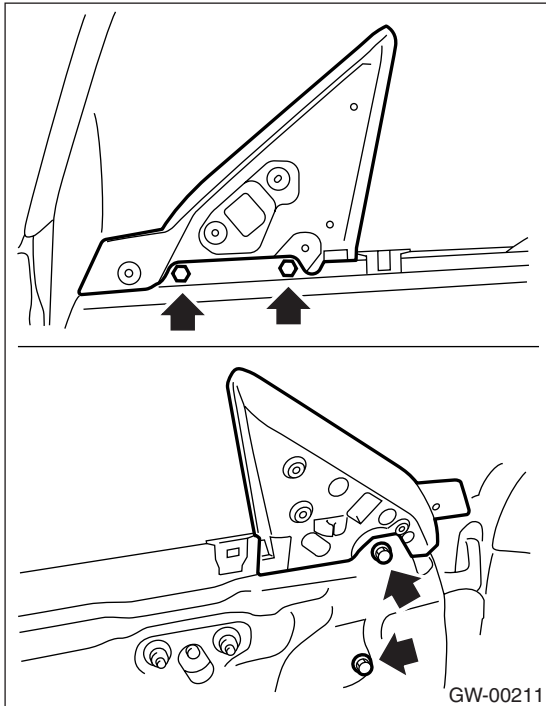
|                               | Switch position | Terminal No.     | Standard             |
|-------------------------------|-----------------|------------------|----------------------|
| Front passenger's side & rear | UP              | 8 and 5, 4 and 7 | Less than 1 $\Omega$ |
|                               | OFF             | 6 and 5, 4 and 7 | Less than 1 $\Omega$ |
|                               | DOWN            | 8 and 7, 6 and 5 | Less than 1 $\Omega$ |

3) If NG, replace the sub switch.

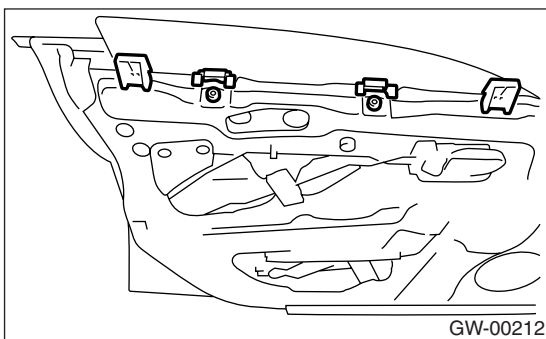
## 4. Front Door Glass

### A: REMOVAL

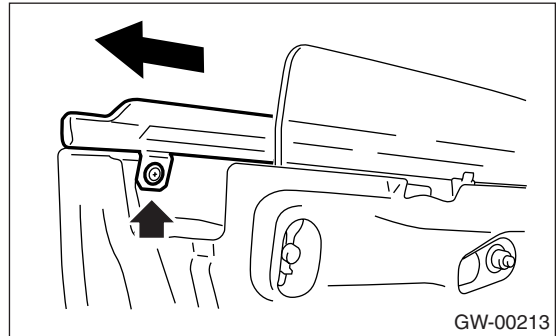
- 1) Remove the front door trim. <Ref. to EI-41, REMOVAL, Front Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-17, REMOVAL, Front Sealing Cover.>
- 3) Remove the outer mirror assembly. <Ref. to GW-18, REMOVAL, Outer Mirror Assembly.>
- 4) Remove the mirror gusset.



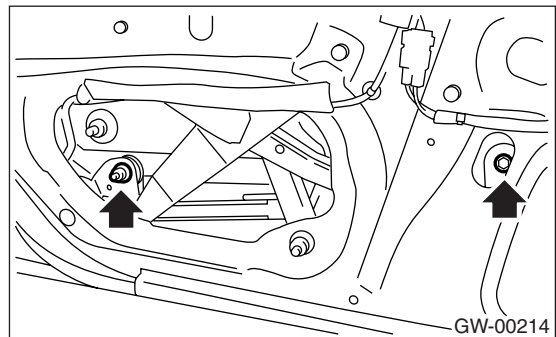
- 5) Remove the stabilizer (Inner) and stabilizer (Outer).



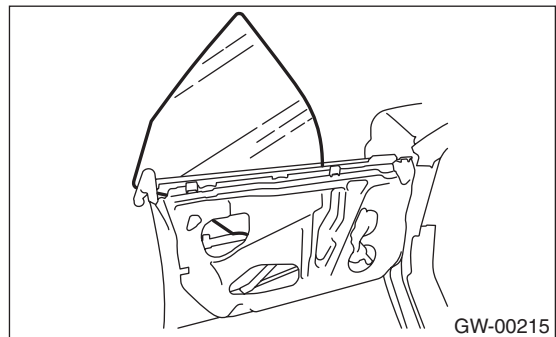
- 6) Remove the screw at the rear end of weather strip, and remove weather strip.



- 7) Operate the power window switch to move the glass to position shown in the figure, and then remove the two nuts from service holes.



- 8) Take out the door glass.



### CAUTION:

- Do not turn the regulator in closing direction after removal of the glass. Otherwise gear may be disengaged.
- Avoid impact and damage to the glass.

### B: INSTALLATION

- 1) Install in the reverse order of removal.

### CAUTION:

**Make sure the slider (front) and roller (rear) of glass is placed securely in sash.**

- 2) Adjust the front door glass. <Ref. to GW-12, ADJUSTMENT, Front Door Glass.>

# Front Door Glass

GLASS/WINDOWS/MIRRORS

## Tightening torque:

Refer to **COMPONENT in General Description.** <Ref. to **GW-4, FRONT DOOR GLASS, COMPONENT, General Description.**>

## C: ADJUSTMENT

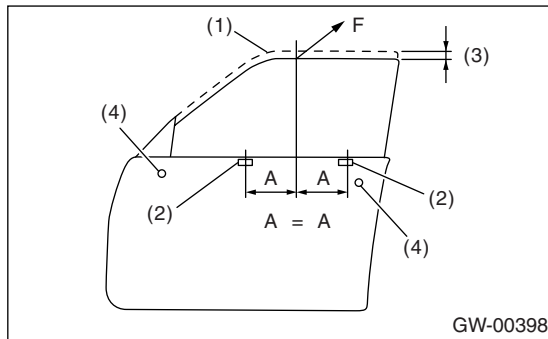
### NOTE:

Before adjustment, ensure that all adjusting nuts of stabilizer (inner), upper stopper, and sash are loosened and door glass is raised so that it is in contact with weather strip.

1) Temporarily tighten one adjusting bolt on one side of rear sash at the midpoint of slotted hole in the inner panel.

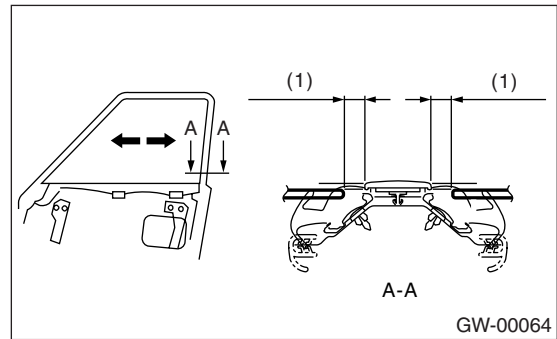
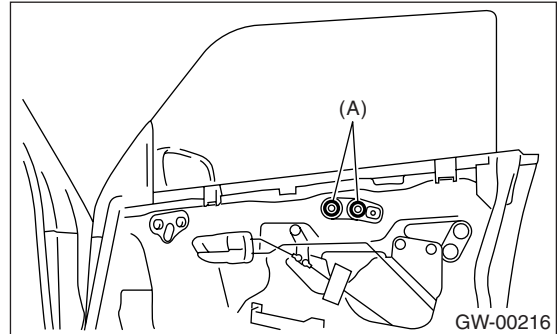
2) Temporarily tighten the regulator B-channel in a position at the top of slotted hole.

3) Lower the door glass 10 to 15 mm (0.39 to 0.59 in) from fully closed position. While applying outward pressure of  $45.0 \pm 5.0$  N ( $4.5 \pm 0.5$  kgf,  $9.9 \pm 1.1$  lbf) (F) to the upper edge of glass above midpoint of stabilizer (Outer), press the stabilizer (Inner) at pressure of  $30 \pm 5$  N ( $3.0 \pm 0.5$  kgf,  $6.6 \pm 1.1$  lbf) to the glass, then secure it.



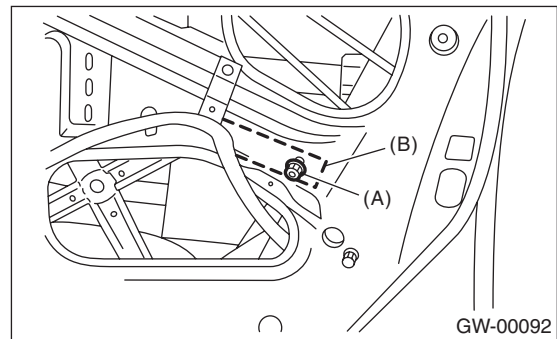
- (1) Full close position
- (2) Stabilizer (Outer)
- (3) 10 — 15 mm (0.39 — 0.59 in)
- (4) Upper stopper

4) For adjustment of clearance between front glass and center pillar cover, loosen the nuts (A), and move the glass sash back and forward until clearance becomes the value shown.

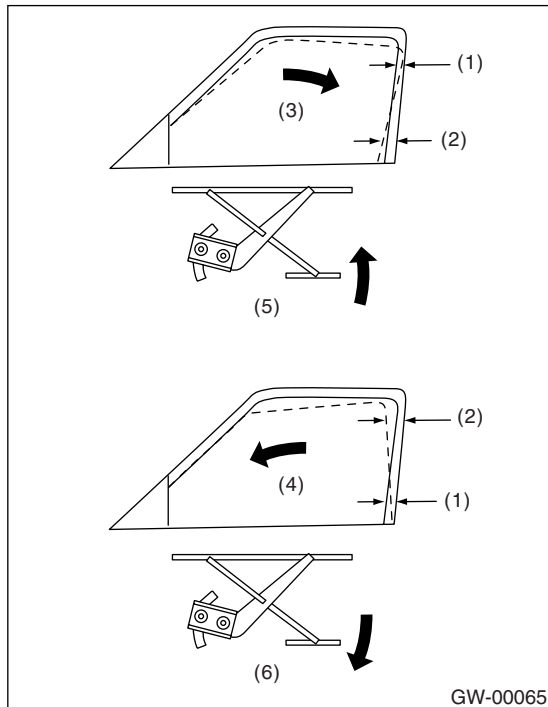


- (1) 12 mm (0.472 in)

5) For adjustment of upper and lower ends of center pillar, loosen the adjusting nut (A) of B-channel (B).



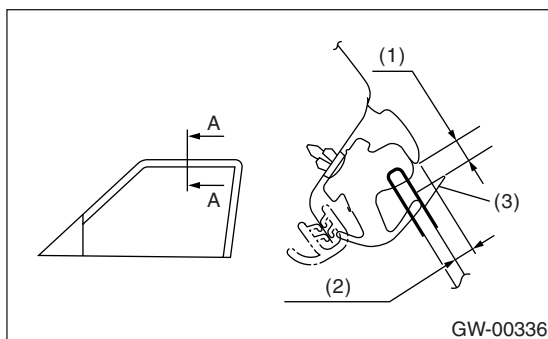
6) Adjust so that the upper and lower ends of center pillar are the same size.



- (1) Narrow
- (2) Wide
- (3) Glass tilts too far rearward
- (4) Glass tilts too far forward
- (5) Raise B channel
- (6) Lower B channel

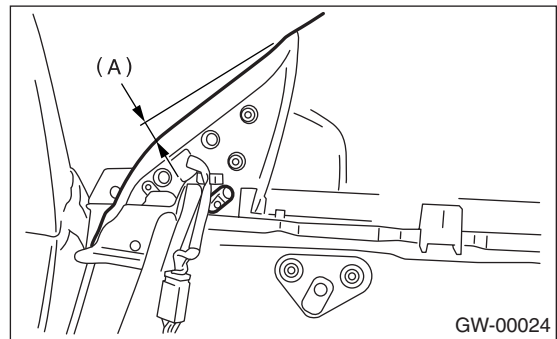
7) For glass stroke adjustment, set the ST on glass and close the door, raise glass until positional relationship between glass and weather strip becomes as shown. And secure the glass so that the upper stopper lightly touches the glass holder.

ST 61299AE000 SPACER (For front door glass of thickness 5 mm (0.197 in))



- (1) 2.7 — 4.3 mm (0.106 — 0.169 in)
- (2) 6 mm (0.236 in)
- (3) Special Tool

For preventing wind noise, adjust the glass at the position where tip of gusset is raised up a little.



(A) 0 — 1.5 mm (0 — 0.059 in)

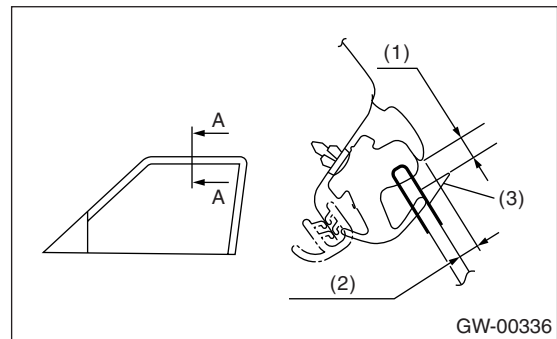
8) After stabilizer adjustment, carry out the glass crimp adjustment. First, visually ensure positional relationship between retainer & molding and glass of the roof side, and then begin with rear sash adjustment. Set the ST on glass, and then adjust two adjusting bolts alternately step by step to obtain dimensions shown below (cross-section A).

ST 61299AE000 SPACER (For front door glass of thickness 5 mm (0.197 in))

**NOTE:**

If two nuts are loosened at the same time, sash moves back and forth. Therefore, when one nut is adjusted, leave the other secured.

9) Make the same adjustment of two adjusting bolts of rear sash.



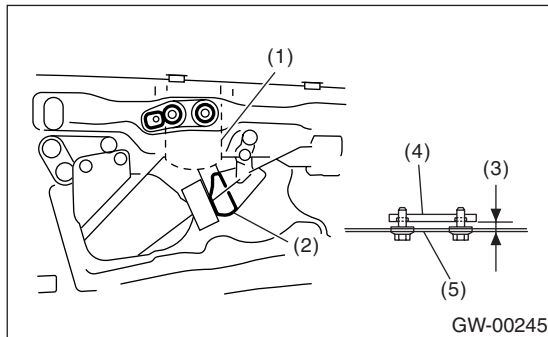
- (1) 2.7 — 4.3 mm (0.106 — 0.169 in)
- (2) 6 mm (0.236 in)
- (3) Special Tool

## Front Door Glass

### GLASS/WINDOWS/MIRRORS

#### NOTE:

Do not tilt the sash bracket to inner panel during adjustment. Otherwise smooth regulator operation cannot be achieved.



- (1) Sash bracket
- (2) Rear sash
- (3) Adjust a line parallel
- (4) Sash
- (5) Inner panel

10) Make adjustment of front sash in the same manner as that of rear sash.

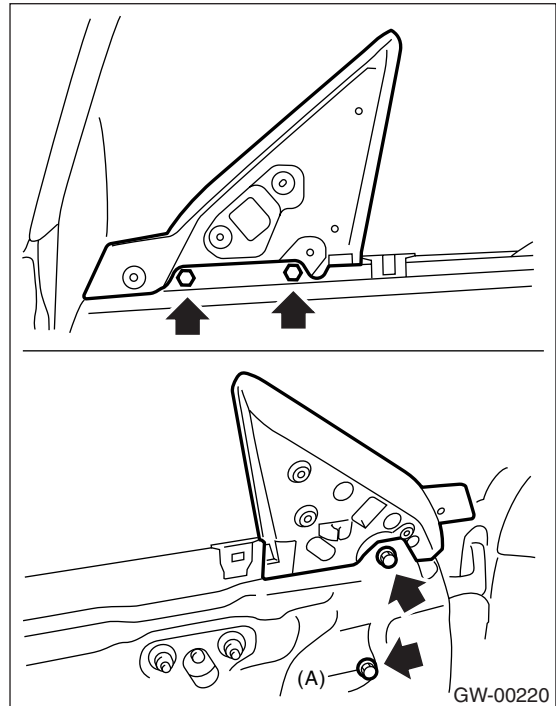
#### NOTE:

Although front and rear sashes must, as a rule, be adjusted in the same manner, in some door installation, the adjustment in a different manner may be required. However, adjustment of one sash to the maximum amount and the other to the minimum amount is not permitted. Such adjustment may result in application of excessive load to regulator.

11) After adjustments, tighten the nuts.

12) After adjustment to glass, close the door. If there is a gap between outer lip of gusset and glass surface, adjust the gap with adjusting bolt (A) in lower fitting part of the gusset to prevent generation of wind noise.

13) During adjustments, loosen the other three clamping bolts.

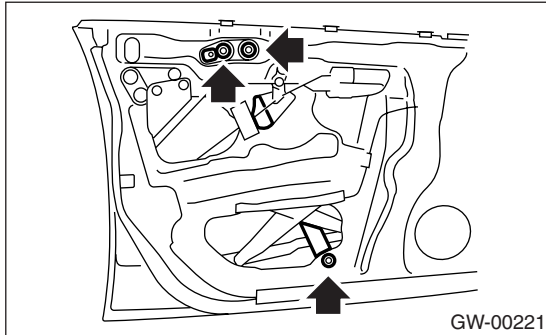


14) After adjustment, tighten the bolts and nuts.

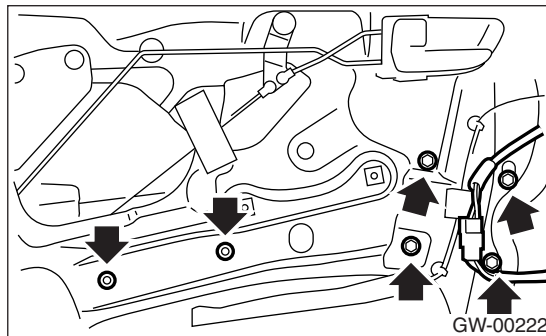
## 5. Front Regulator and Motor Assembly

### A: REMOVAL

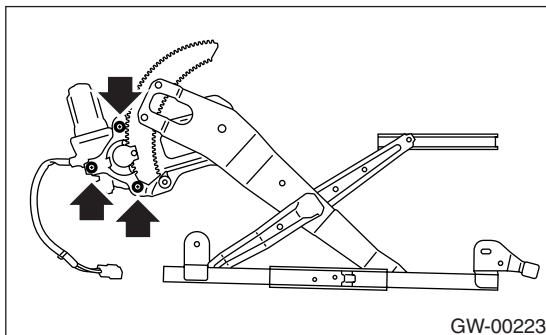
- 1) Remove the door glass. <Ref. to GW-11, REMOVAL, Front Door Glass.>
- 2) Loosen the nuts to remove the rear sash.



- 3) Disconnect the motor connector.
- 4) Loosen the four bolts and two nuts to remove the regulator assembly.



- 5) Loosen the screw to remove motor assembly.



### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust the front door glass. <Ref. to GW-12, ADJUSTMENT, Front Door Glass.>

#### Tightening torque:

Refer to **COMPONENT** in *General Description*. <Ref. to GW-4, **FRONT DOOR GLASS, COMPONENT**, *General Description*.>

### C: INSPECTION

- 1) Make sure the power window motor rotates properly when battery voltage is applied to the terminals of motor connector.
- 2) Change polarity of battery connections to terminals to ensure the motor rotates in reverse direction.

# Remote Control Mirror System

GLASS/WINDOWS/MIRRORS

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## 6. Remote Control Mirror System

### A: WIRING DIAGRAM

<Ref. to WI-150, Remote Control Mirror System.>

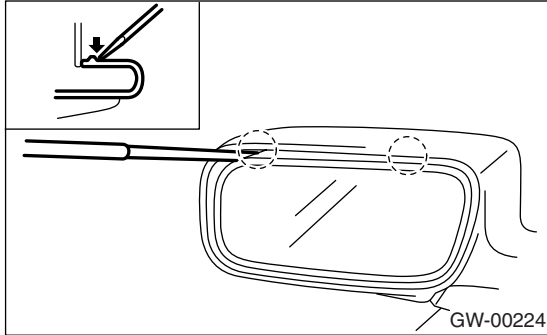
### B: INSPECTION

| Symptom  | Repair order   |
|--|--|
| All functions do not operate.                  | (1) Fuse (F/B No. 1) (F/B No. 4) (F/B No. 19)<br>(2) Mirror switch<br>(3) Wiring harness |
| One side of the mirror motor does not operate. | (1) Mirror switch<br>(2) Mirror motor<br>(3) Wiring harness                              |
| Mirror heater does not operate.                | (1) Mirror switch<br>(2) Mirror heater<br>(3) Wiring harness                             |

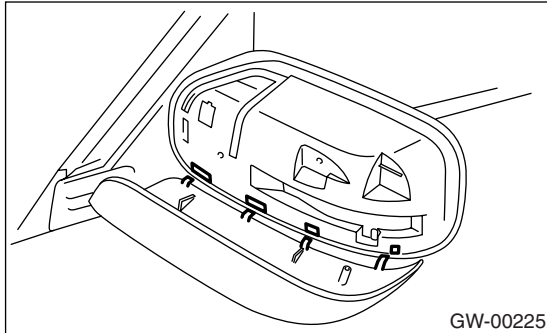
## 7. Scalp Cap

### A: REPLACEMENT

- 1) Turn the mirror downward.
- 2) Insert a thin screw driver, push the clip part of scalp cap, and remove the scalp cap.



- 3) Insert the claw at the bottom of scalp cap into outer mirror.



- 4) Install the scalp cap securely.



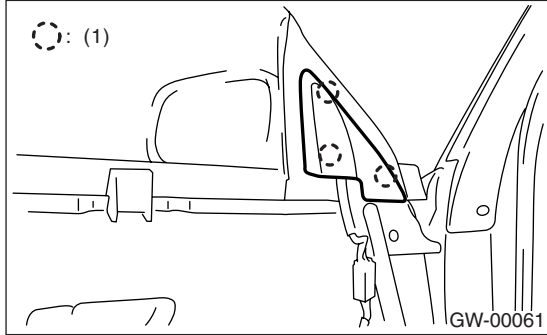
# Outer Mirror Assembly

GLASS/WINDOWS/MIRRORS

## 8. Outer Mirror Assembly

### A: REMOVAL

- 1) Remove the door trim. <Ref. to EI-41, REMOVAL, Front Door Trim.>
- 2) Remove the mirror gusset cover.

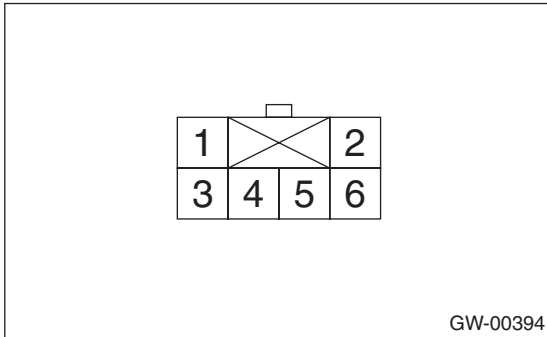


(1) Hook pawl

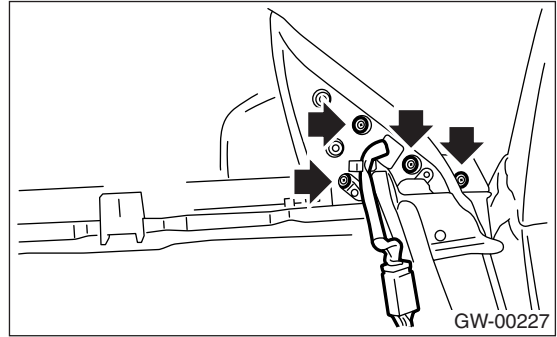
### C: INSPECTION

Check to ensure that the outer mirror moves properly when battery voltage is applied to terminals.

- Mirror heater not-equipped model:



- 3) Disconnect the outer mirror connector.
- 4) Remove the screws to remove the outer mirror assembly.



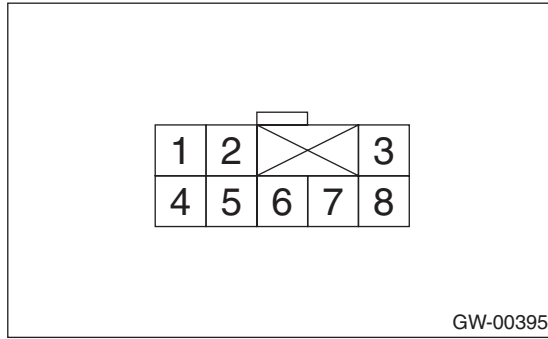
### B: INSTALLATION

Install in the reverse order of removal.

| Switch position | Terminal No.    |
|-----------------|-----------------|
| OFF             | —               |
| UP              | 4 (+) and 6 (-) |
| DOWN            | 6 (+) and 4 (-) |
| LEFT            | 5 (+) and 6 (-) |
| RIGHT           | 6 (+) and 5 (-) |

If NG, replace the outer mirror.

- Mirror heater equipped model:



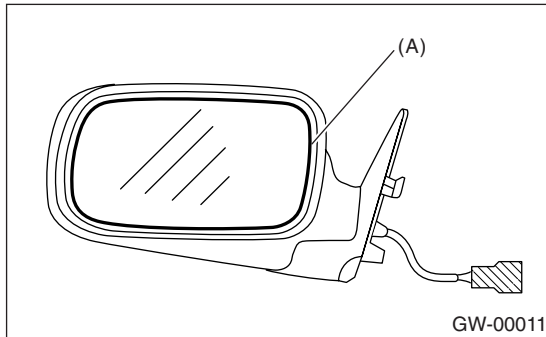
| Switch position | Terminal No.    |
|-----------------|-----------------|
| OFF             | —               |
| UP              | 6 (+) and 8 (-) |
| DOWN            | 8 (+) and 6 (-) |
| LEFT            | 7 (+) and 8 (-) |
| RIGHT           | 8 (+) and 7 (-) |

If NG, replace the outer mirror.

## 9. Outer Mirror

### A: REPLACEMENT

- 1) Remove the outer mirror assembly. <Ref. to GW-18, REMOVAL, Outer Mirror Assembly.>
- 2) Warm the area around the mirror holder (A) with a hair drier until the edges of the mirror holder become soft (about 2 or 3 minutes with a 1,000 W drier).
- 3) Use a flat tip screwdriver without sharp edges to lift the mirror out of the mirror holder (A).



- 4) Disconnect the mirror heater connector. (Model with mirror heater)
- 5) Warm the area around the mirror holder with a hair drier until the edges of the mirror holder become soft (about 2 or 3 minutes with a 1,000 W drier).
- 6) Connect the mirror heater connector. (Model with mirror heater)
- 7) Remove the backing of the new double-stick tape, and push the mirror in to install it.

#### NOTE:

Unless the mirror holder is warmed sufficiently, the mirror holder edges may be damaged or the mirror cracked.

## 10. Remote Control Mirror Switch

### A: REMOVAL

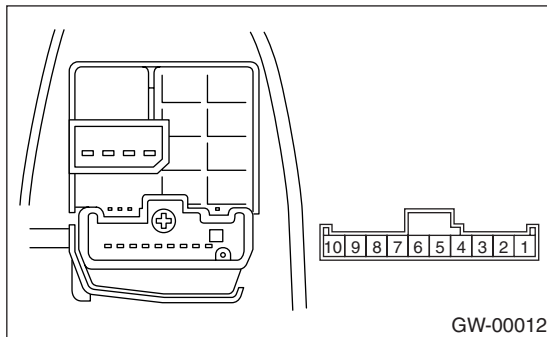
Refer to Power Window Control Switch for removal procedure, because the remote control mirror switch is installed in power window control switch panel. <Ref. to GW-9, REMOVAL, Power Window Control Switch.>

### B: INSTALLATION

Refer to Power Window Control Switch for installation procedure, because the remote control mirror switch is installed in power window control switch panel. <Ref. to GW-9, INSTALLATION, Power Window Control Switch.>

### C: INSPECTION

Move the rearview mirror switch to each position and check continuity between terminals.



#### Change over switch right position:

| Switch position | Terminal No.     | Standard       |
|-----------------|------------------|----------------|
| OFF             | —                | More than 1 MΩ |
| UP              | 8 and 3, 6 and 7 | Less than 1 Ω  |
| DOWN            | 8 and 6, 3 and 7 | Less than 1 Ω  |
| LEFT            | 8 and 2, 6 and 7 | Less than 1 Ω  |
| RIGHT           | 8 and 6, 2 and 7 | Less than 1 Ω  |

#### Change over switch left position:

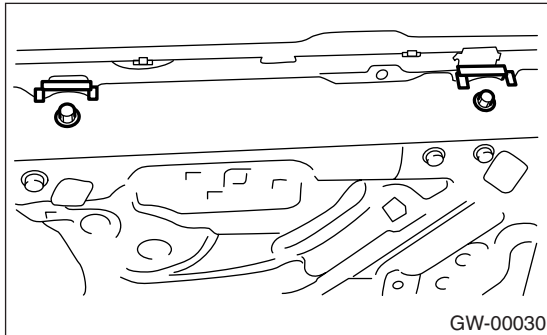
| Switch position | Terminal No.     | Standard       |
|-----------------|------------------|----------------|
| OFF             | —                | More than 1 MΩ |
| UP              | 8 and 4, 6 and 7 | Less than 1 Ω  |
| DOWN            | 8 and 6, 4 and 7 | Less than 1 Ω  |
| LEFT            | 8 and 5, 6 and 7 | Less than 1 Ω  |
| RIGHT           | 8 and 6, 5 and 7 | Less than 1 Ω  |

If NG, replace the switch.

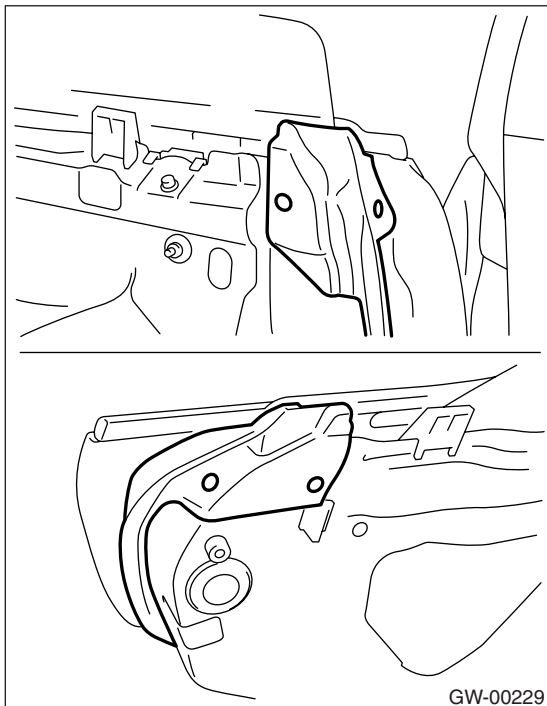
## 11. Rear Door Glass

### A: REMOVAL

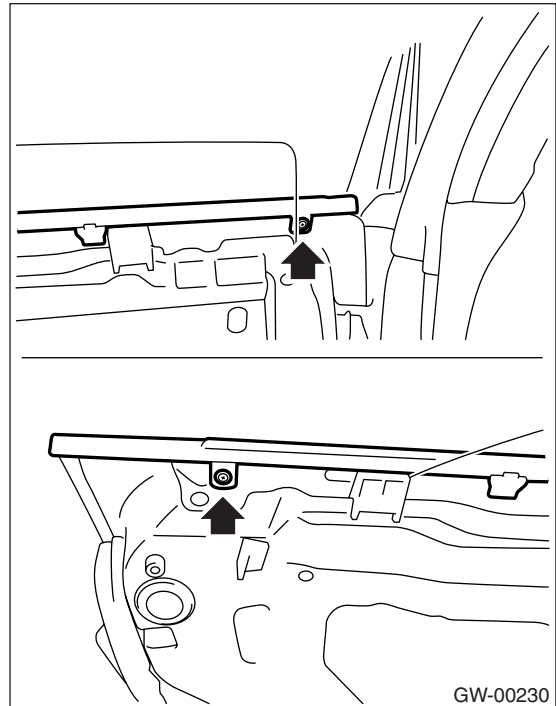
- 1) Remove the rear door trim. <Ref. to EI-42, REMOVAL, Rear Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-20, REMOVAL, Rear Sealing Cover.>
- 3) Remove the stabilizer.



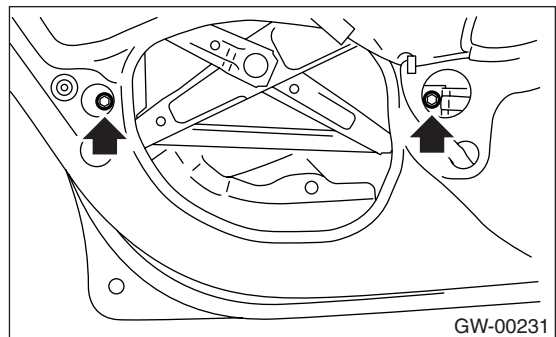
- 4) Remove the front end and rear end of weather strip.



- 5) Remove the two screws to remove the weather strip outer.



- 6) Operate the power window switch to move the glass to position shown in the figure, and then remove two nuts from service holes.



- 7) Remove the two rear sash installation nuts, and then move the rear sash backward.
- 8) Remove the glass.

**CAUTION:**  
Avoid impact and damage to the glass.

### B: INSTALLATION

- 1) Install in the reverse order of removal.

#### NOTE:

Make sure the slider (front) and roller (rear) of glass stay is placed securely in front and rear sash.

- 2) Adjust the rear door glass. <Ref. to GW-23, ADJUSTMENT, Rear Door Glass.>

#### Tightening torque:

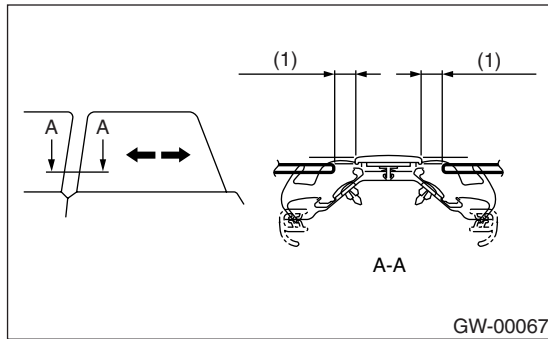
Refer to **COMPONENT** in **General Description**. <Ref. to GW-5, REAR DOOR GLASS, COMPONENT, General Description.>

## C: ADJUSTMENT

**NOTE:**

The rear door glass, as a rule, should be adjusted in the same manner as front door glass, although they are different in dimension. Special notes for the rear glass are given below.

1) Adjust the glass position using the following dimensions as a guide line.



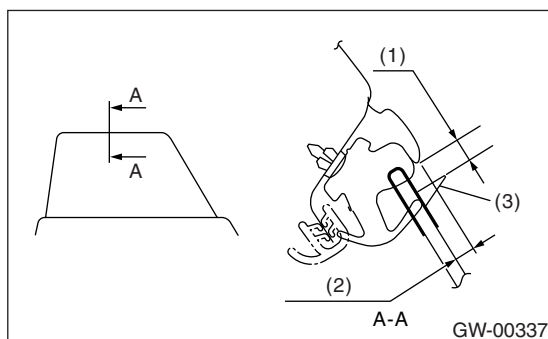
(1) 12 mm (0.472 in)

**NOTE:**

- If the dimensions are smaller than the given dimensions, glass may get caught in weather strip during lifting/lowering operation. In the worst case, it may cause the glass not to be opened fully.
- After adjustment, move the glass up and down to check whether it is caught.

2) Set the ST on glass, and then adjust the contact degree of glass using the following dimensions as a guide line.

ST 61299AE010 SPACER (For rear door glass of thickness 4 mm (0.157 in))



(1) 3.7 — 5.3 mm (0.146 — 0.209 in)

(2) 6 mm (0.236 in)

(3) Special Tool

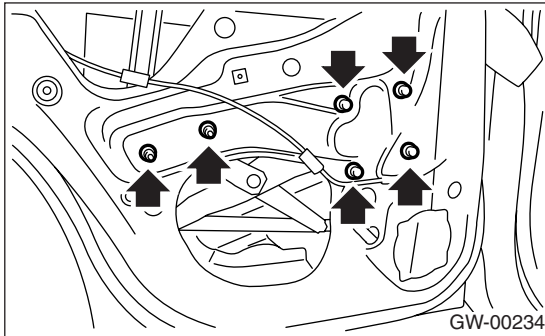
**NOTE:**

- If the contact degree of rear glass is higher than necessary, glass may get caught in weather strip of center pillar corner, resulting in early wear of weather strip. Be careful when adjusting.

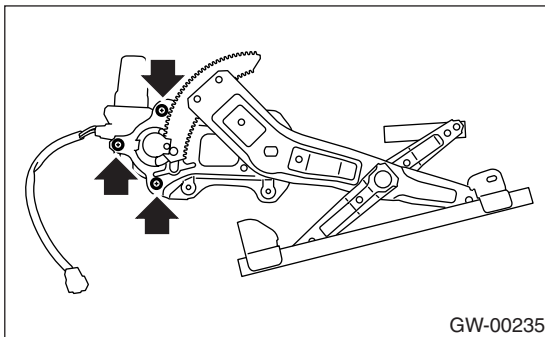
## 12. Rear Regulator and Motor Assembly

### A: REMOVAL

- 1) Remove the rear door glass. <Ref. to GW-22, REMOVAL, Rear Door Glass.>
- 2) Remove the front sash.
- 3) Disconnect the motor connector.
- 4) Remove the four bolts and two nuts to remove regulator assembly.



- 5) Remove the screws to remove motor assembly.



### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust the rear door glass. <Ref. to GW-23, ADJUSTMENT, Rear Door Glass.>

#### **Tightening torque:**

**Refer to COMPONENT in General Description. <Ref. to GW-5, REAR DOOR GLASS, COMPONENT, General Description.>**

### C: INSPECTION

- 1) Make sure that the power window motor rotates properly when battery voltage is applied to terminals of motor connector.
- 2) Change polarity of battery connections to terminals to ensure that the motor rotates in reverse direction.

## 13. Windshield Glass

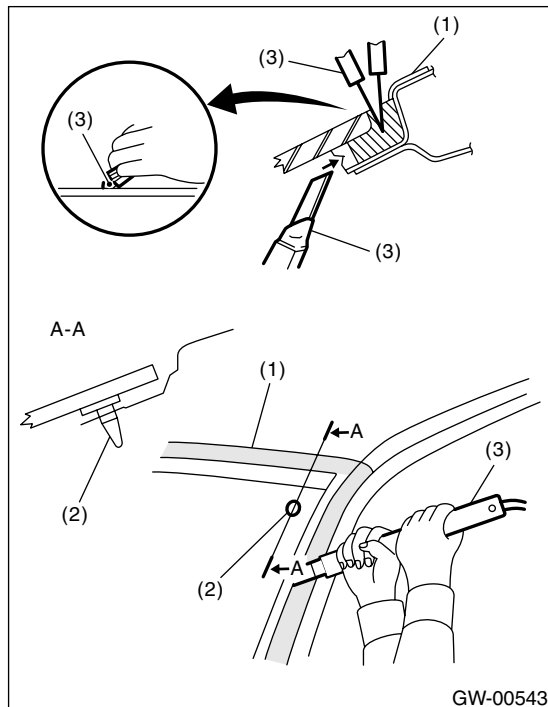
### A: REMOVAL

#### 1. USING WINDSHIELD KNIFE

- 1) Disconnect the wiper deicer connector. (Model with wiper deicer)
- 2) Remove the cowl panel. <Ref. to EI-34, REMOVAL, Cowl Panel.>
- 3) Remove the glass molding.
- 4) Tape the body side of the circumference of windshield glass for protection.
- 5) Apply sufficient amount of soapy water to the adhesive layer.
- 6) Insert the windshield knife into the adhesive layer.
- 7) While holding the knife edge and windshield glass edge at a right angle, move the windshield knife in parallel to the windshield glass edge along face and edge of windshield glass to cut the adhesive layer.

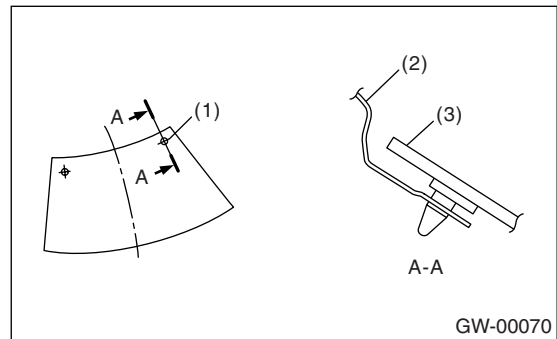
#### NOTE:

- Do not twist the windshield knife.
- Cutting of adhesive layer shall be started with wider gap between windshield glass and body.



- (1) Protective tape
- (2) Locating pin
- (3) Windshield knife

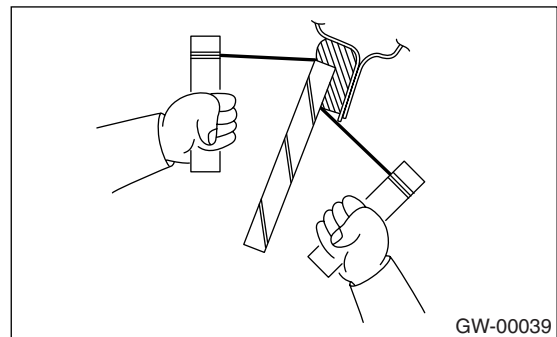
- Because the locating pins are bonded to corners of glass, use piano wire to cut the pin.



- (1) Locating pin
- (2) Body panel
- (3) Windshield glass

#### 2. USING PIANO WIRE

- 1) Disconnect the wiper deicer connector. (Model with wiper deicer)
- 2) Remove the cowl panel. <Ref. to EI-34, REMOVAL, Cowl Panel.>
- 3) Remove the glass molding.
- 4) Tape the body side of circumference of windshield glass for protection.
- 5) Make a hole in adhesive layer using a drill or knife.
- 6) Pass the piano wire through hole, and attach securely both the piano wire ends to pieces of wood.



- 7) Pull the wire ends alternately to cut off the adhesive layer.

#### CAUTION:

- Do not tightly pull the piano wire against the windshield glass edge.
- Be careful not to damage the interior and exterior parts.
- Do not cross piano wires. Otherwise they may be cut.
- After removing the area near instrument panel, attach a protection plate to it. Use extreme care when removing.



# Windshield Glass

GLASS/WINDOWS/MIRRORS

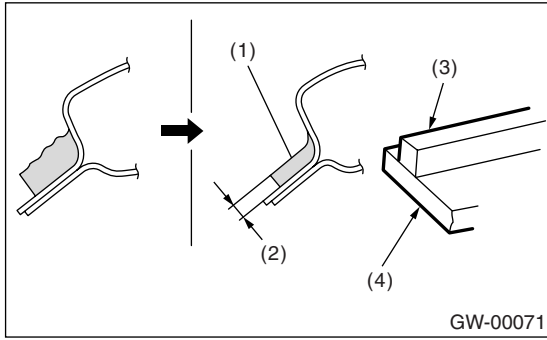
## B: INSTALLATION

1) Clean the external circumference of windshield glass with alcohol or white gasoline.

2) Remove the adhesive layer on the body using cutter knife to obtain smooth face 2 mm (0.08 in) thick.

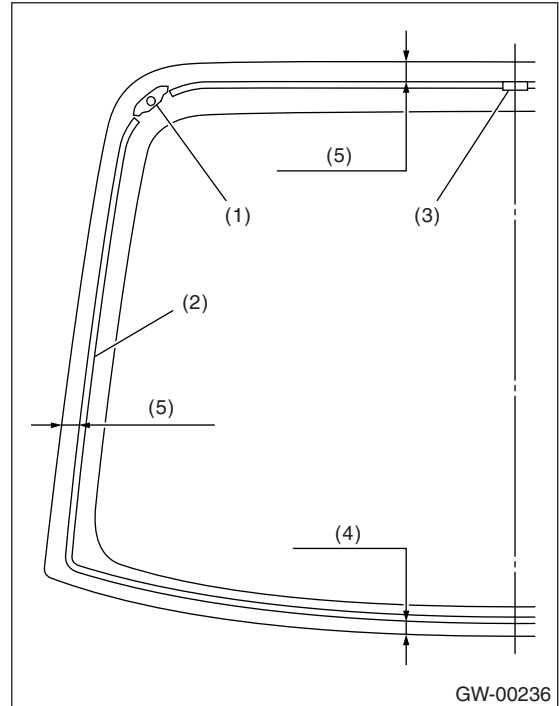
### CAUTION:

**Be careful not to damage the body and paint surface.**



- (1) Adhesive
- (2) 2 mm (0.08 in)
- (3) Dam rubber
- (4) Glass

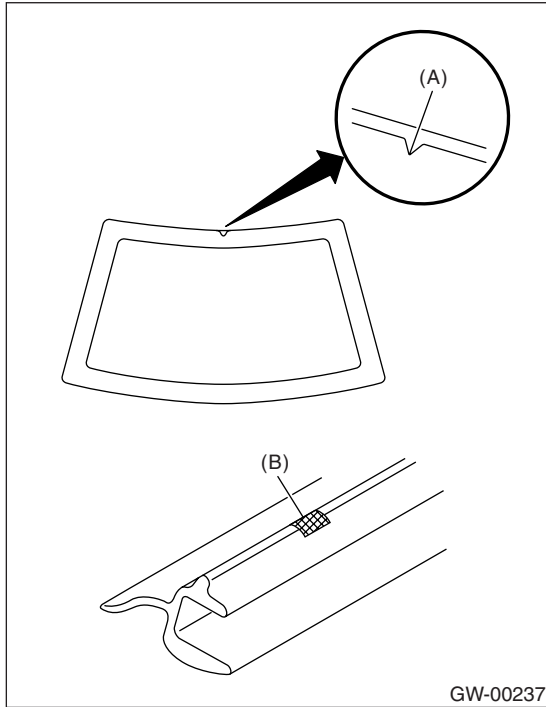
3) Clean the body with alcohol or white gasoline to remove thoroughly chips, dusts, and dirt from body face.



- (1) Locating pin
- (2) Dam rubber
- (3) Fastener
- (4) 15 mm (0.591 in)
- (5) 11 mm (0.433 in)

4) Install the dam rubber.

5) Fit the mark (B) on molding to the notch (A) of glass side, and install the molding to the whole glass edge.



GW-00237

6) Apply two kinds of primer to the adhesive layer of glass using sponge.

**Glass primer:**

**Dow Automotive**

**ESSEX U-401 (for undercoat) and ESSEX U-402 (for overcoat) or equivalent**

7) Apply primer to adhesive layer of body.

**Painted surface primer:**

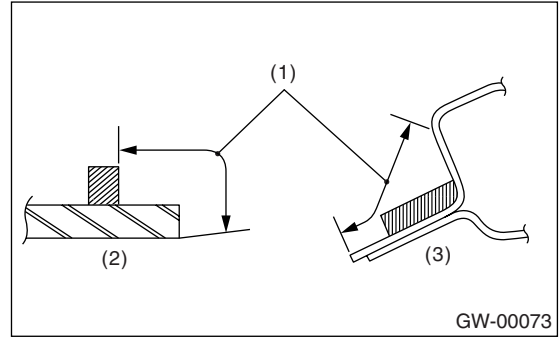
**Dow Automotive**

**ESSEX U-413 or equivalent**

**NOTE:**

- Primer once attached to painted surface of the body and internal trim is hard to wipe off. Mask the circumference of such areas.
- Let the primer dry for about ten minutes before installing the glass.

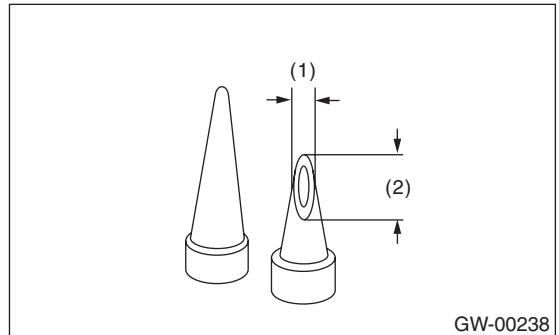
- Do not touch the surface coated with primer.



GW-00073

- (1) Application of primer
- (2) Glass side
- (3) Body side

8) Cut off the cartridge nozzle tip as shown and set it in sealant gun.



GW-00238

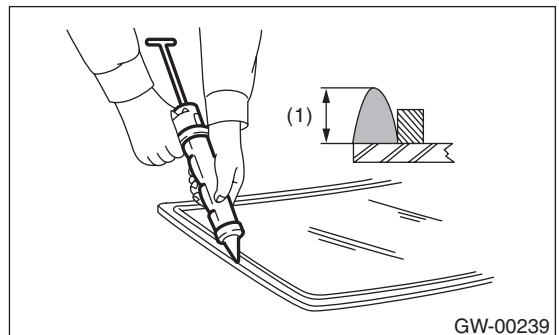
- (1) 10 mm (0.39 in)
- (2) 15 mm (0.59 in)

9) Apply adhesive to the glass end surface as shown.

**Adhesive:**

**Dow Automotive**

**ESSEX U-400HV or equivalent**



GW-00239

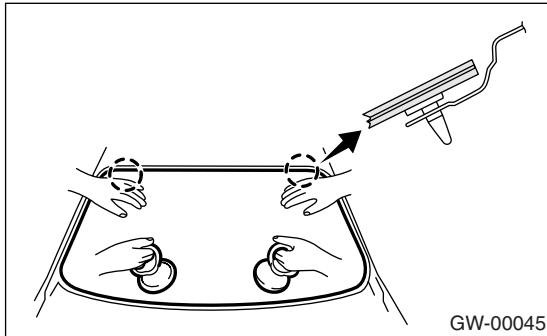
- (1) 12 — 15 mm (0.47 — 0.59 in)

## Windshield Glass

### GLASS/WINDOWS/MIRRORS

---

10) Fit the locating pins using suction rubber cup to install the windshield glass.



- 11) Lightly press the windshield glass for tight fit.  
12) Make flush the adhesive surface jugged out using spatula.  
13) Connect the wiper deicer connector. (Model with wiper deicer)  
14) After completion of all work, allow the vehicle to stand for about 24 hours.

#### NOTE:

- When the door is opened/closed after glass is bonded, always lower the door glass and then open/close it carefully.
- Move the vehicle slowly.
- For minimum drying time and time the vehicle must be left standing before driving after bonding, follow the instructions or instruction manual from adhesive manufacturer.

15) After curing of adhesive, pour water on external surface of vehicle to check that there are no water leaks.

#### NOTE:

When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

16) Install the cowl panel. <Ref. to EI-34, INSTALLATION, Cowl Panel.>

## 14.Rear Gate Glass

### A: REMOVAL

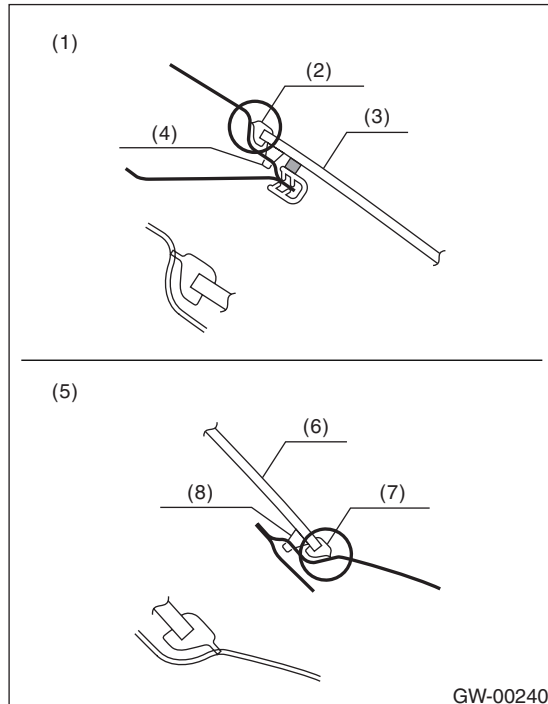
- 1) Remove the rear wiper motor. <Ref. to WW-18, REMOVAL, Rear Wiper Motor.>
- 2) Disconnect the electrical connector from rear defogger terminal.
- 3) Remove the glass in the same procedure as for windshield glass. <Ref. to GW-25, REMOVAL, Windshield Glass.>

### B: INSTALLATION

- 1) Apply adhesive in the same procedure as for windshield glass. <Ref. to GW-26, INSTALLATION, Windshield Glass.>
- 2) Insert the glass locating pin into the rear gate hole, and after pushing on the area around the locating pin to secure it, push lightly all around the area to seal it.
- 3) About one hour after installation, conduct a water leak test.

#### NOTE:

- When the door is opened/closed after glass is bonded, always lower the door glass and then open/close it carefully.
  - Move the vehicle slowly.
  - For minimum drying time and time the vehicle must be left standing before driving after bonding, follow the instructions or instruction manual from adhesive manufacturer.
  - When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.
- 5) Connect the rear defogger terminals.
  - 6) Install the rear wiper. <Ref. to WW-18, INSTALLATION, Rear Wiper Motor.>



- (1) Upper side
- (2) Molding
- (3) Glass
- (4) Adhesive
- (5) Lower side
- (6) Glass
- (7) Molding
- (8) Adhesive

- 4) After completion of all work, allow the vehicle to stand for about 24 hours.

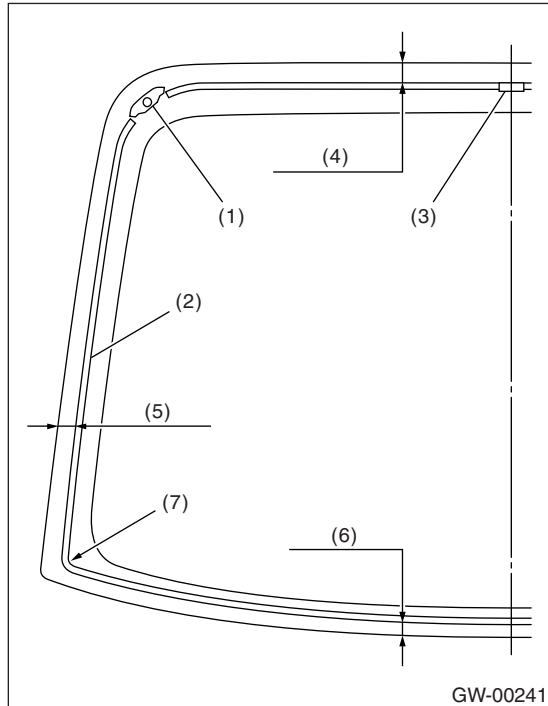
## 15. Rear Window Glass

### A: REMOVAL

- 1) Disconnect the electrical connectors from rear defogger terminals and antenna terminal.
- 2) Remove the glass in the same procedure as for windshield glass. <Ref. to GW-25, REMOVAL, Windshield Glass.>

### B: INSTALLATION

- 1) Install the dam rubber.



- (1) Locating pin
- (2) Dam rubber
- (3) Fastener
- (4) 14.5 mm (0.571 in)
- (5) 8 mm (0.315 in)
- (6) 22 mm (0.866 in)
- (7) R20

- 2) Install the glass in the same procedure as for windshield glass. <Ref. to GW-26, INSTALLATION, Windshield Glass.>
- 3) Connect the rear defogger terminals and antenna terminal.
- 4) After completion of all work, allow the vehicle to stand for about 24 hours.

#### NOTE:

- When the door is opened/closed after glass is bonded, always lower the door glass and then open/close door carefully.
- Move the vehicle slowly.

- For minimum drying time and time the vehicle must be left standing before driving after bonding, follow the instructions or instruction manual from adhesive manufacturer.

- 5) After curing of adhesive, pour water on external surface of vehicle to check that there are no water leaks.

#### NOTE:

When a vehicle is returned to user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

## 16.Rear Window Defogger System

### A: WIRING DIAGRAM

<Ref. to WI-148, Rear Defogger System.>

### B: INSPECTION

| Symptom                                | Repair order   |
|--|--|
| Rear window defogger does not operate. | (1) Fuse (M/B No. 1) (F/B No. 17)<br>(2) Rear defogger relay<br>(3) Rear defogger timer<br>(4) Defogger switch<br>(5) Rear defogger condenser<br>(6) Defogger wire<br>(7) Wiring harness |

# Rear Window Defogger

GLASS/WINDOWS/MIRRORS

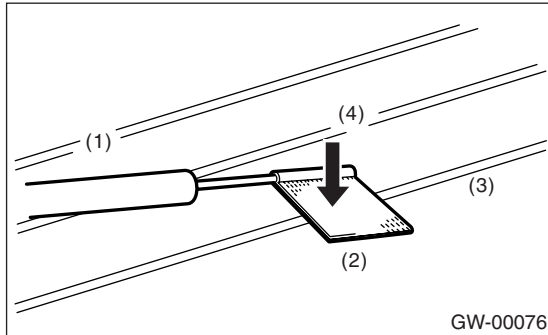
## 17.Rear Window Defogger

### A: INSPECTION

#### CAUTION:

When wiping stain on glass off with cloth, use a dry and soft cloth and move it along the heat wire to avoid damage to heat wire.

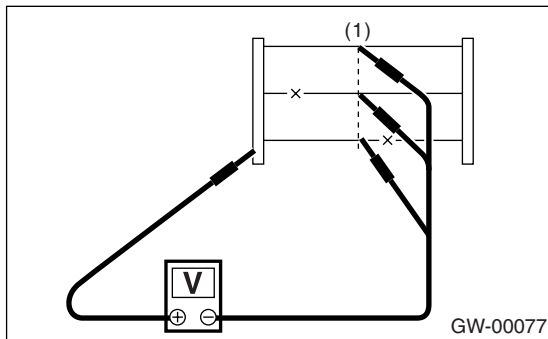
- 1) Turn the ignition switch to ON.
- 2) Turn the defogger switch to ON.
- 3) Wrap the tips of tester pins with aluminum foil to avoid damage to heat wire.



- (1) Tester probe
- (2) Aluminum foil
- (3) Heat wire
- (4) Press

- 4) Measure the voltage at wire center with DC voltmeter.

**Standard voltage:**  
**Approx. 6 V**



- (1) Wire center

| Voltage             | Criteria |
|---------------------|----------|
| Approx. 6 V         | OK       |
| Approx. 12 V or 0 V | Broken   |

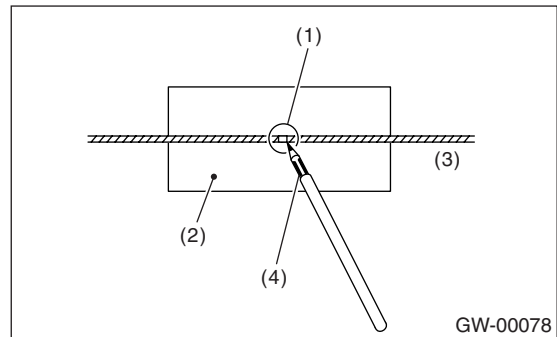
#### NOTE:

- If the measured value is 12 volts, heat wire is open between wire center and positive (+) end.
- If zero volt, heat wire is open between wire center and ground.

- 5) Apply positive lead of voltmeter to positive terminal of voltmeter, and then move the negative lead along the wire up to negative terminal end. If voltage changes from zero to several volts during movement of lead, heat wire is open at the voltage change point.

### B: REPAIR

- 1) Clean the broken portion with alcohol or white gasoline.
- 2) Mask both side of wire with thin film.
- 3) Apply conductive silver composition (DUPONT No. 4817) to broken portion.



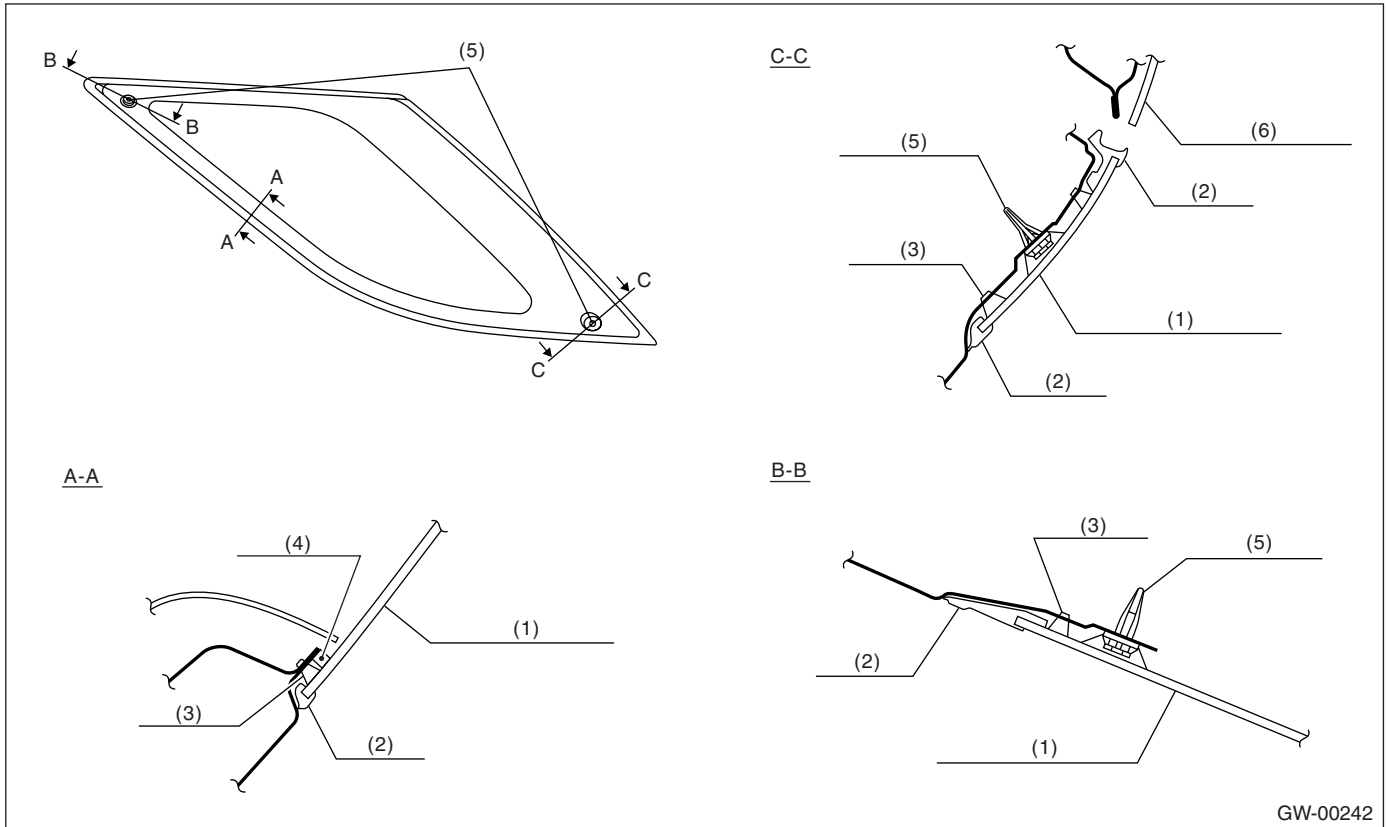
- (1) Broken portion
- (2) Masking thin film
- (3) Broken wire
- (4) Conductive silver composition (DUPONT No. 4817)

- 4) After repair, check the wire.

## 18.Rear Quarter Glass

### A: REMOVAL

Remove the glass in the same procedure as for windshield glass. <Ref. to GW-25, REMOVAL, Windshield Glass.>

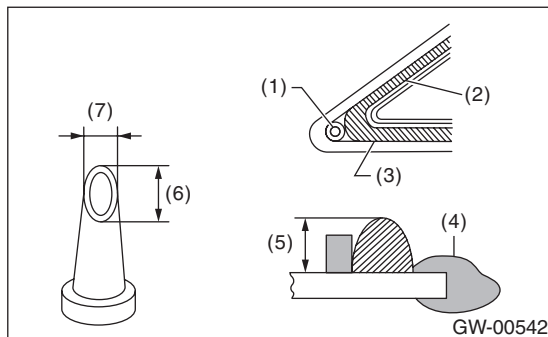


GW-00242

- |                        |                |                     |
|------------------------|----------------|---------------------|
| (1) Rear quarter glass | (3) Adhesive   | (5) Locating pin    |
| (2) Molding            | (4) Dam rubber | (6) Rear gate glass |

### B: INSTALLATION

1) Cut off the nozzle tip as shown in the figure.



GW-00542

- |                                 |
|---------------------------------|
| (1) Locating pin                |
| (2) Dam rubber                  |
| (3) Adhesive                    |
| (4) Molding                     |
| (5) 12 — 15 mm (0.47 — 0.59 in) |
| (6) 15 mm (0.59 in)             |
| (7) 10 mm (0.39 in)             |

2) Install the glass in the same procedure as for windshield glass. <Ref. to GW-26, INSTALLATION, Windshield Glass.>

3) After completion of all work, allow the vehicle to stand for about 24 hours.

#### NOTE:

- When the door is opened/closed after glass is bonded, always lower the door glass and then open/close it carefully.
- Move the vehicle slowly.
- For minimum drying time and time the vehicle must be left standing before driving after bonding, follow the instructions or instruction manual from adhesive manufacturer.

4) After curing of adhesive, pour water on external surface of vehicle to check that there are no water leaks.

#### NOTE:

When a vehicle is returned to user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.



### **19.Sun Roof Glass**

#### **A: REMOVAL**

<Ref. to SR-5, REMOVAL, Glass Lid.>

#### **B: INSTALLATION**

<Ref. to SR-5, INSTALLATION, Glass Lid.>

#### **C: ADJUSTMENT**

<Ref. to SR-5, ADJUSTMENT, Glass Lid.>

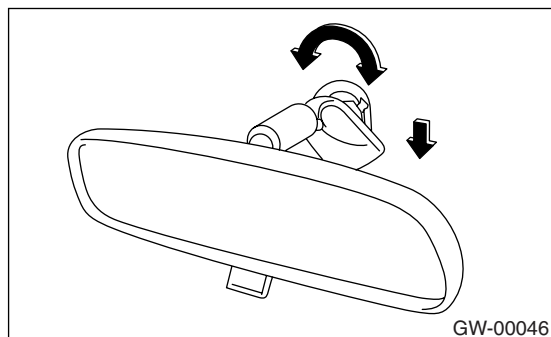
## 20.Rearview Mirror

### A: REMOVAL

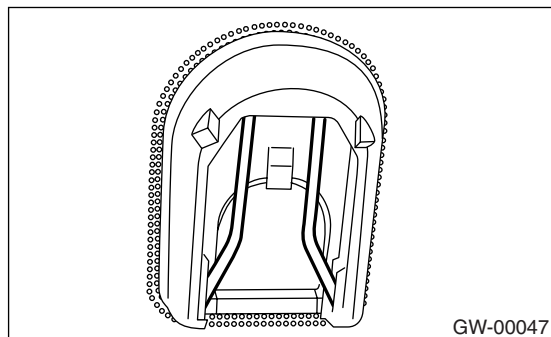
#### NOTE:

The spring cannot be reused. Prepare a new spring before removal.

1) Turn the mirror base 90° clockwise or counter-clockwise to remove it.



2) Remove the spring from mirror base.



#### CAUTION:

**Be careful not to damage the mirror surface.**

3) If the mirror base is damaged, remove the mirror base using piano wire or spatula, etc.

#### CAUTION:

**Be careful not to damage the windshield glass.**

### B: INSTALLATION

1) If removing the mirror base, remove the remaining adhesive thoroughly, and then fit the mirror base to mark on windshield glass to install.

#### Adhesive:

**REPAIR KIT IN MR (Part No. 65029FC000) or equivalent**

2) Verify that the mirror base is adhered securely, and then install the spring.

3) Install in the reverse order of removal.

### C: INSPECTION

Make sure the mirror is not damaged.

Make sure the spring is not deteriorated.

### 21. Wiper Deicer System

#### **A: INSPECTION**

Refer to INSPECTION under Rear Window Defogger. <Ref. to GW-32, INSPECTION, Rear Window Defogger.>

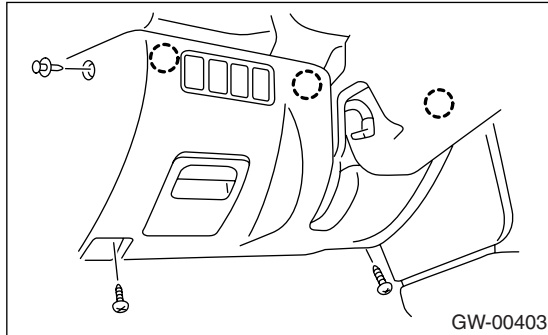
#### **B: REPAIR**

Refer to REPAIR under Rear Window Defogger. <Ref. to GW-32, REPAIR, Rear Window Defogger.>

## 22. Wiper Deicer Switch

### A: REMOVAL

Remove the driver side lower cover, and then remove the wiper deicer switch.

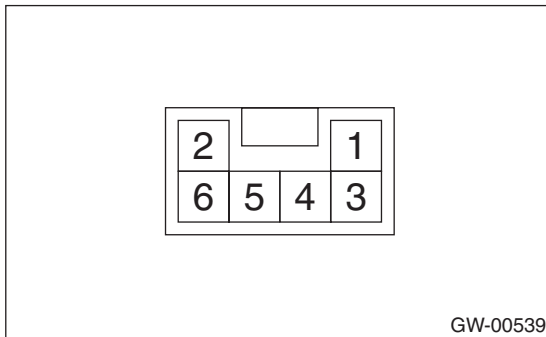


### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

Move wiper deicer switch to each position and check continuity between terminals.



| Switch position | Terminal No. | Standard       |
|-----------------|--------------|----------------|
| OFF             | 3 and 5      | More than 1 MΩ |
| ON              | 3 and 5      | Less than 1 Ω  |

If NG, replace the switch.



# BODY STRUCTURE

# *BS*

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| 2. Datum Points.....         | 3           |
| 3. Datum Dimensions.....     | 11          |



# General Description

BODY STRUCTURE

---

## 1. General Description

### A: PREPARATION TOOL

| TOOL NAME           | REMARKS                       |
|---------------------|-------------------------------|
| Tram tracking gauge | Used for measuring dimension. |
| Tape measure        | Used for measuring dimension. |

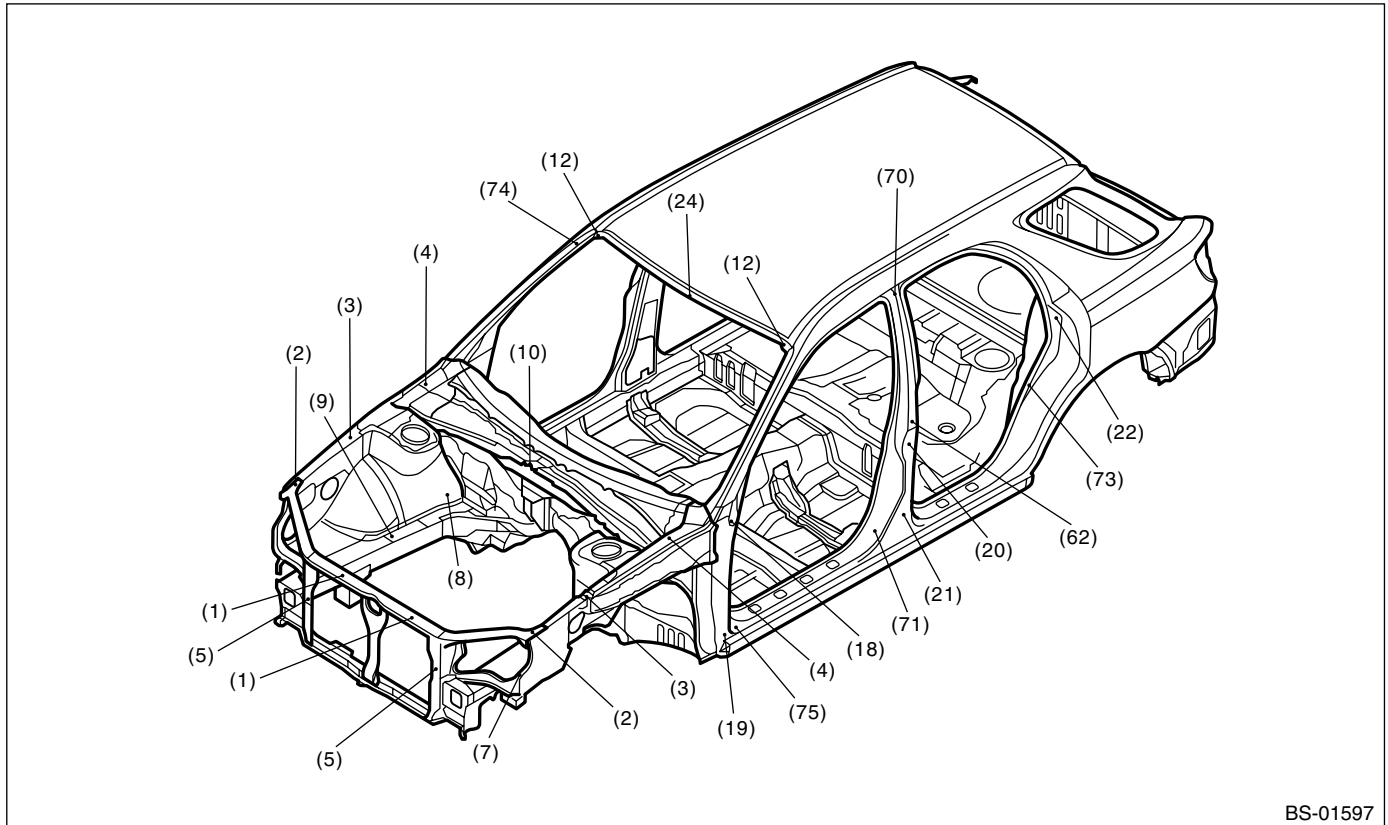
## 2. Datum Points

### A: LOCATION

#### NOTE:

- Datum points are specified for body repair.
- Guide holes, locators, and indents are provided to facilitate panel replacement and to increase alignment accuracy.
- Both right and left reference points are symmetrical.

### 1. WAGON MODEL/SEDAN MODEL



BS-01597

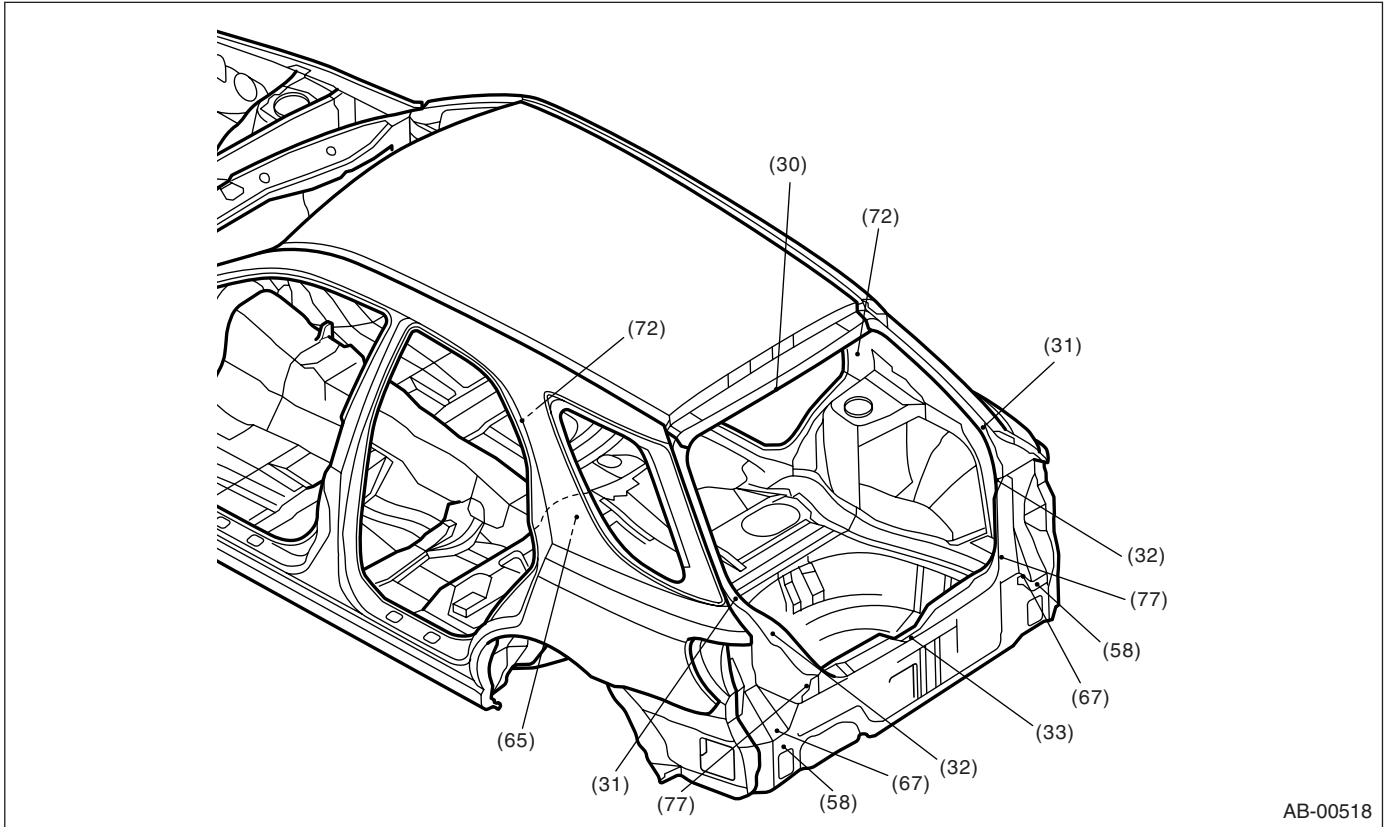
- |   |   |  |
|---|---|--|
| (1) Radiator attaching hole 12 mm (0.47 in) dia. (Symmetrical)                        | (10) Bracket module center gauge hole 6 mm (0.24 in) dia. (Vehicle center)                      | (22) Weather strip patch attaching hole 5.2 mm (0.205 in) dia. (Symmetrical) |
| (2) Fender attaching hole 7 mm (0.28 in) dia. (Symmetrical)                           | (12) Front glass attaching hole RH 6.5 mm (0.256 in) dia. LH 6.5 × 10 mm (0.256 × 0.39 in) dia. | (24) Roof panel repair locator hollow  |
| (3) Fender attaching hole 10 mm (0.39 in) dia. (Symmetrical)                          | (18) Fender attaching hole 12 mm (0.47 in) dia. (Symmetrical)                                   | (62) Belt anchor attaching hole 11 mm (0.43 in) dia. (Symmetrical)           |
| (4) Hood hinge attaching hole 12 mm (0.47 in) dia. (Symmetrical)                      | (19) Fender attaching hole 12 mm (0.47 in) dia. (Symmetrical)                                   | (70) Trim clip attaching hole 8.5 mm (0.335 in) dia. (Symmetrical)           |
| (5) Radiator panel side gauge hole 20 mm (0.79 in) dia. (Symmetrical)                 | (20) Outer panel center pillar gauge hole 12 mm (0.47 in) dia. (Symmetrical)                    | (71) Harness clip attaching hole 7 mm (0.28 in) dia. (Symmetrical)           |
| (7) Fender attaching hole 9.5 mm (0.37 in) dia. (Symmetrical)                         | (21) Outer panel center pillar gauge hole 12 mm (0.47 in) dia. (Symmetrical)                    | (73) Harness clip attaching hole 7 mm (0.28 in) dia. (Symmetrical)           |
| (8) Gauge hole 12 mm (0.47 in) dia. (Symmetrical)                                     |   | (74) Trim clip attaching hole 10 mm (0.39 in) dia. (Symmetrical)             |
| (9) Front suspension crossmember attaching hole 12.4 mm (0.488 in) dia. (Symmetrical) |   | (75) Insulator attaching hole 8 mm (0.31 in) dia. (Symmetrical)              |



# Datum Points

## BODY STRUCTURE

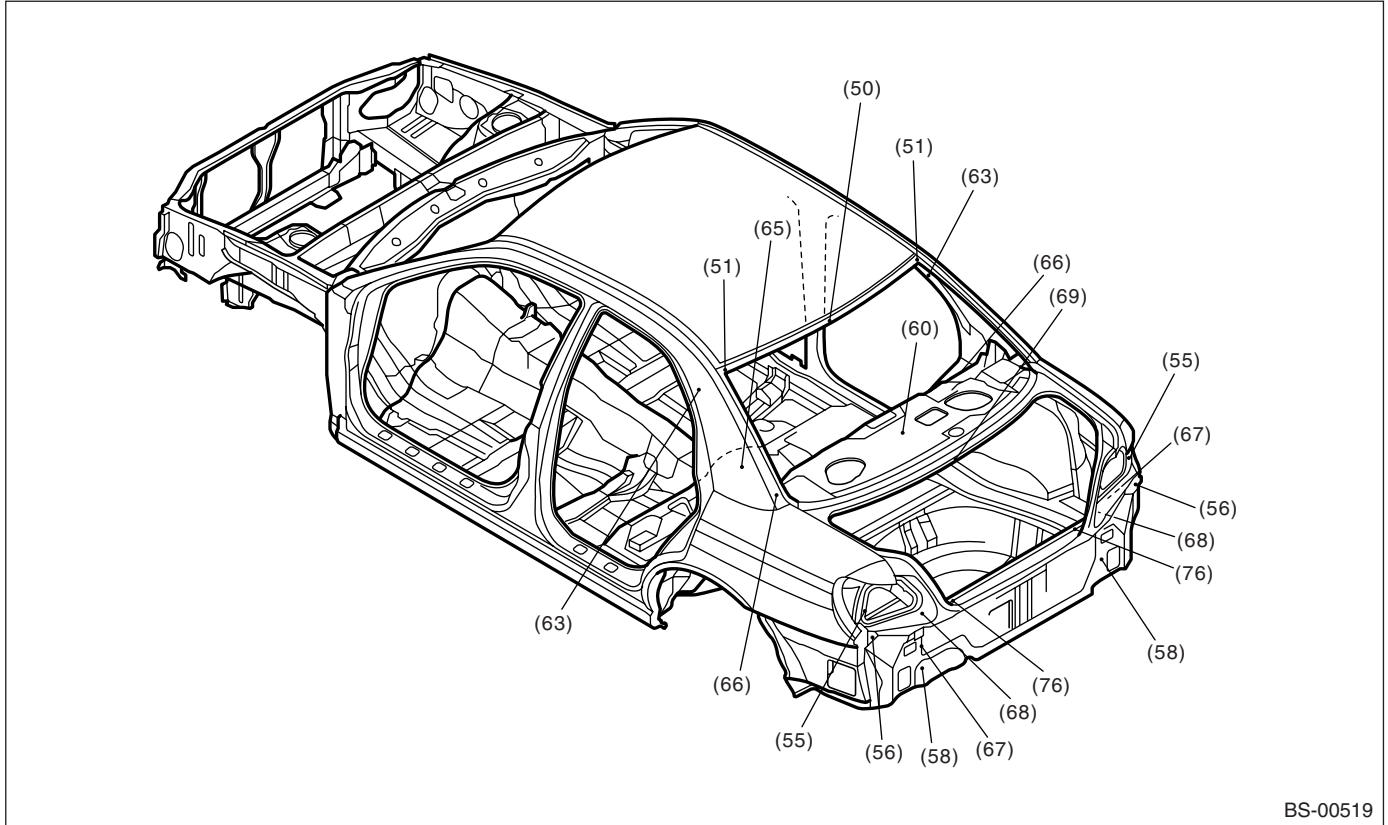
### 2. WAGON MODEL (REAR)



AB-00518

- |   |  |  |
|---|--|--|
| (30) Child anchor attaching hole 11 mm (0.43 in) dia.                       | (33) Two striker attaching hole 15 mm (0.59 in) dia.                         | (67) Gusset floor rear side gauge hole 11.5 mm (0.453 in) dia. (Symmetrical) |
| (31) Washer hose attaching hole LH 7 mm (0.28 in) dia.                      | (58) Rear bumper plate nut attaching hole 13 mm (0.51 in) dia. (Symmetrical) | (72) Trim upper clip attaching hole 8.5 mm (0.335 in) dia. (Symmetrical)     |
| (32) Rear combination light mounting hole 7 mm (0.28 in) dia. (Symmetrical) | (65) Floor mat clip attaching hole 8 mm (0.31 in) dia.                       | (77) Harness clip attaching hole 7 mm (0.28 in) dia. (Symmetrical)           |

## 3. SEDAN MODEL (REAR)



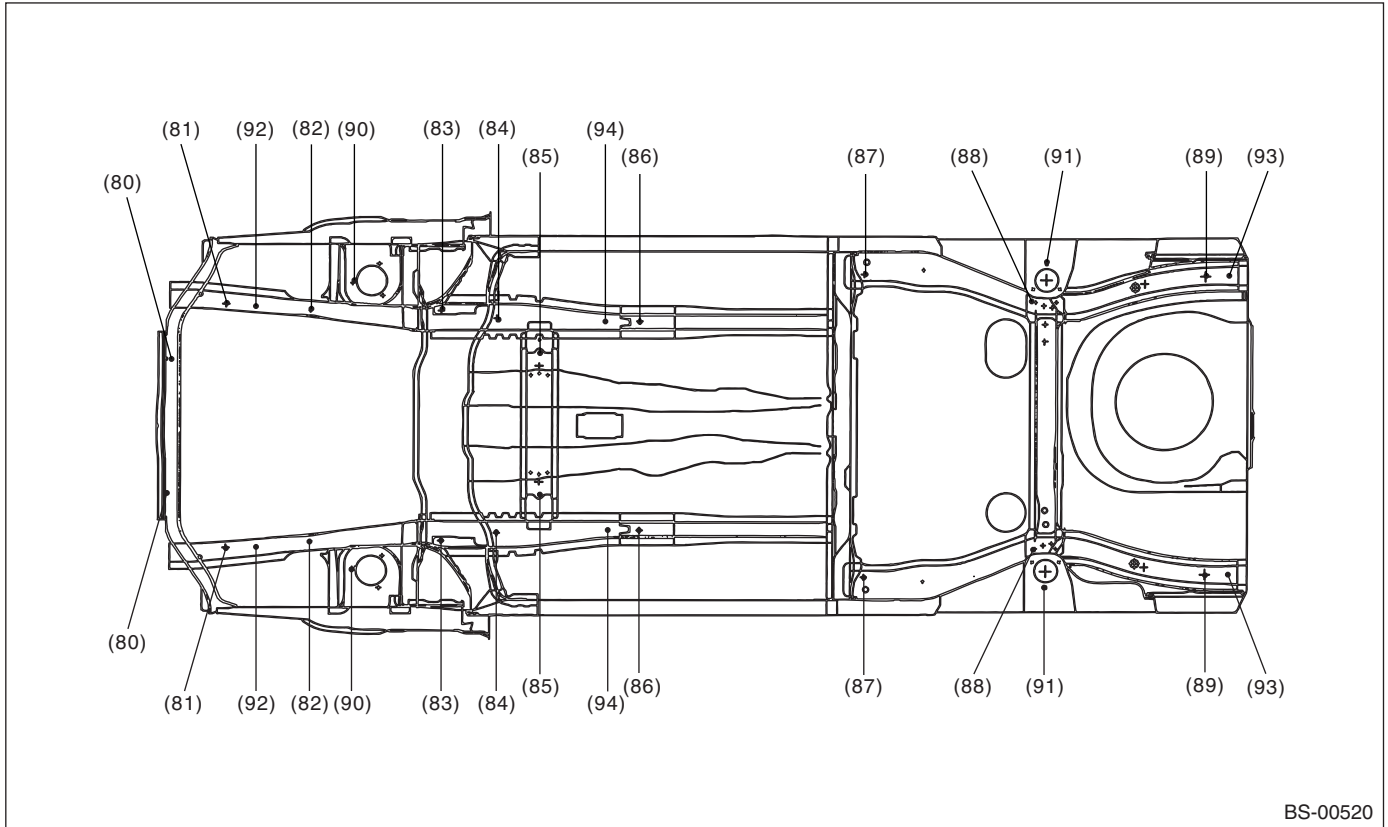
BS-00519

- |   |  |  |
|---|--|--|
| (50) Repair locator hollow (Vehicle center)   | (58) Rear bumper attaching hole 11 mm (0.43 in) dia. (Symmetrical) | (67) Gusset floor rear side gauge hole 11.5 mm (0.453 in) dia. (Symmetrical) |
| (51) Glass attaching hole RH 6.5 mm (0.256 in) dia. LH 6.5 × 10 mm (0.256 × 0.39 in) dia. | (60) Choke coil harness attaching hole 5.4 mm (0.213 in) dia.      | (68) Rear skirt inner side gauge hole 10 mm (0.39 in) dia. (Symmetrical)     |
| (55) Rear combination light mounting hole 8 mm (0.31 in) dia. (Symmetrical)               | (63) Feeder line fixing hole 7 mm (0.28 in) dia. (Symmetrical)     | (69) Rear panel (reinforcement) repair locator hollow (Vehicle center)       |
| (56) Bumper attaching hole 7 mm (0.28 in) dia. (Symmetrical)                              | (65) Floor mat clip attaching hole 8 mm (0.31 in) dia.             | (76) Press location hole 15 mm (0.59 in) dia. (Symmetrical)                  |
|   | (66) Bulkhead rear gauge hole 10 mm (0.39 in) dia. (Symmetrical)   |  |

# Datum Points

## BODY STRUCTURE

### 4. UNDERBODY

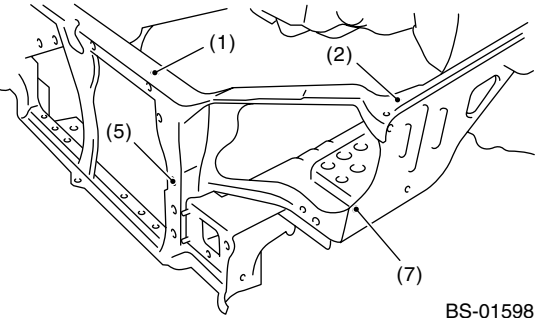
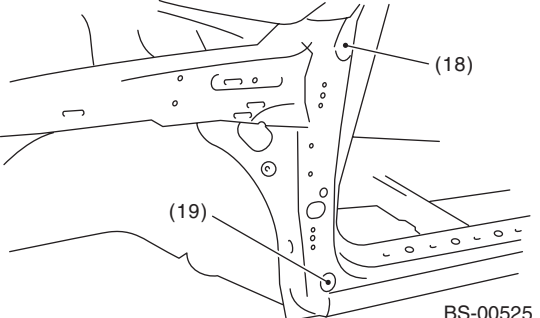
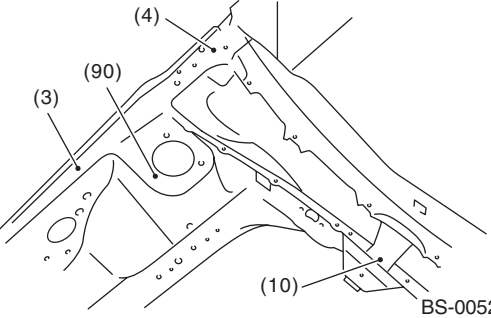
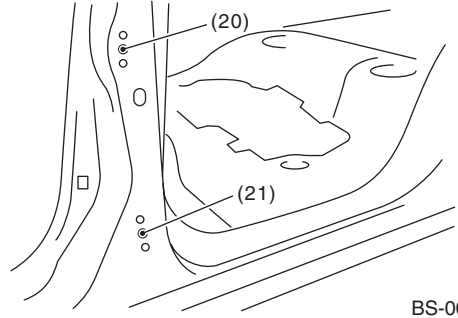
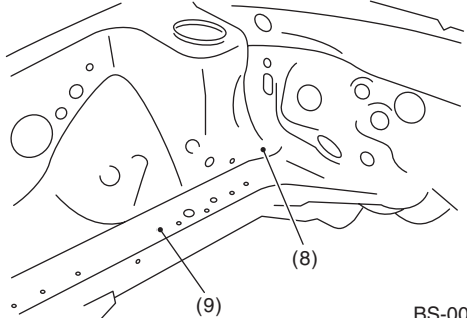
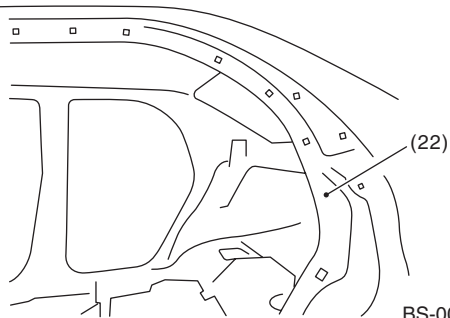
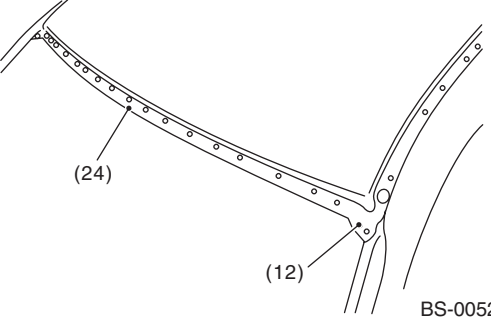
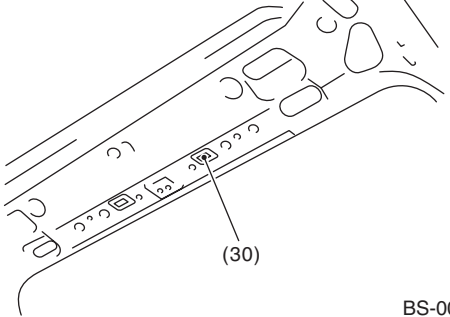


BS-00520

- |   |  |   |
|---|--|---|
| (80) Radiator lower frame gauge hole 12 mm (0.47 in) dia. (Symmetrical)     | (85) Transmission mount attaching hole 14 mm (0.55 in) dia.              | (90) Strut mount attaching hole 9.5 mm (0.374 in) dia. (Symmetrical)                        |
| (81) Side frame gauge hole 20 mm (0.79 in) dia. (Symmetrical)               | (86) Side frame gauge hole 18 mm (0.71 in) dia. (Symmetrical)            | (91) Strut mount attaching hole 10 mm (0.39 in) dia. (Symmetrical)                          |
| (82) Front crossmember attaching hole 12.4 mm (0.488 in) dia. (Symmetrical) | (87) Rear differential attaching hole 16 mm (0.63 in) dia. (Symmetrical) | (92) Sub frame attaching hole 16 mm (0.63 in) dia. (Symmetrical)                            |
| (83) Suspension attaching hole 17 mm (0.67 in) dia. (Symmetrical)           | (88) Rear suspension attaching hole 16 mm (0.63 in) dia. (Symmetrical)   | (93) Bumper beam attaching hole RH 15 mm (0.59 in) dia. LH 19 × 15 mm (0.75 × 0.59 in) dia. |
| (84) Side frame gauge hole 20 mm (0.79 in) dia. (Symmetrical)               | (89) Rear side frame gauge hole 15 mm (0.59 in) dia. (Symmetrical)       | (94) Side frame gauge hole 15 mm (0.59 in) dia. (Symmetrical)                               |


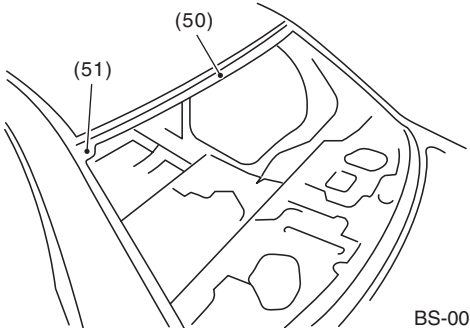
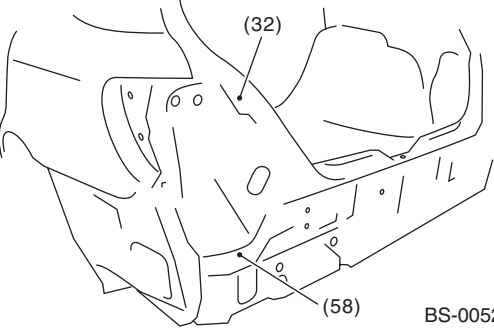
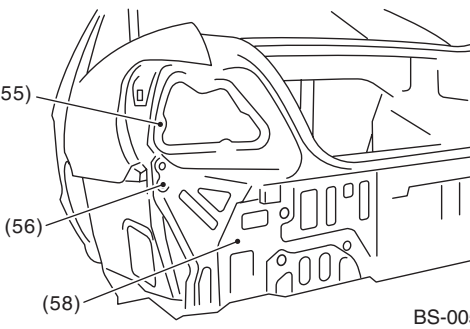
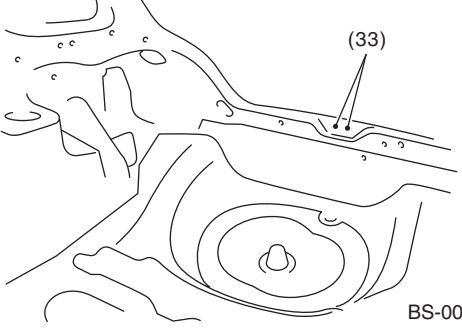
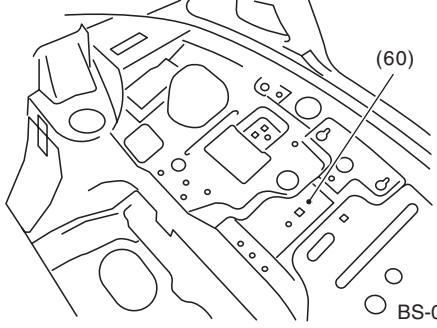
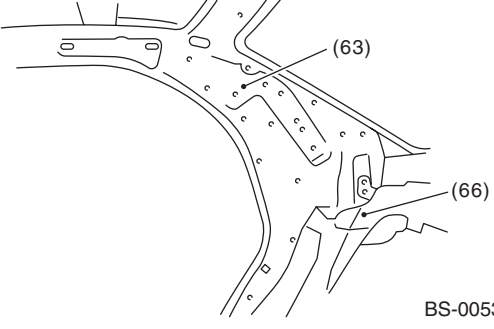
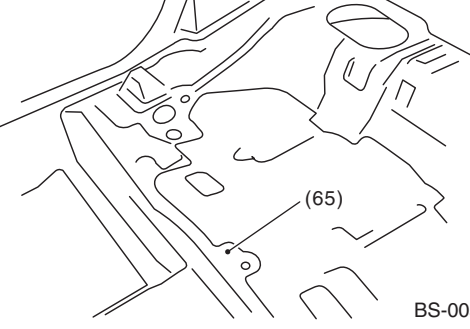
# Datum Points

## BODY STRUCTURE

|   |   |
|---|---|
|  <p>BS-01598</p>   |  <p>BS-00525</p>                      |
|  <p>BS-00522</p>   |  <p>BS-00526</p>                      |
|  <p>BS-00523</p>  |  <p>BS-00556</p>                     |
|  <p>BS-00524</p> | <p>Wagon model</p>  <p>BS-00527</p> |

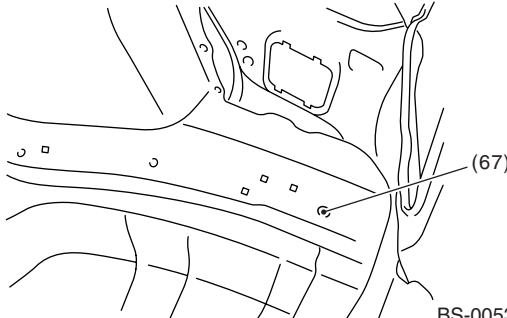
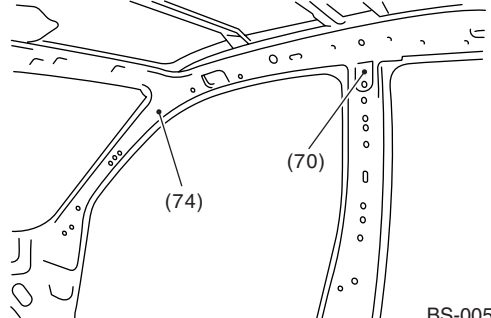
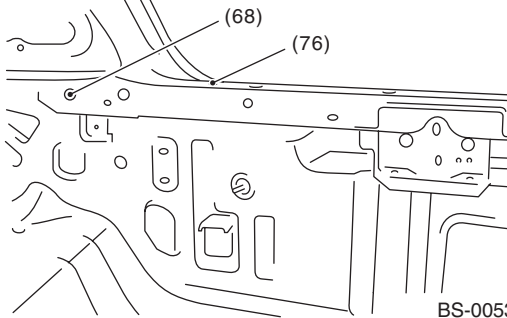
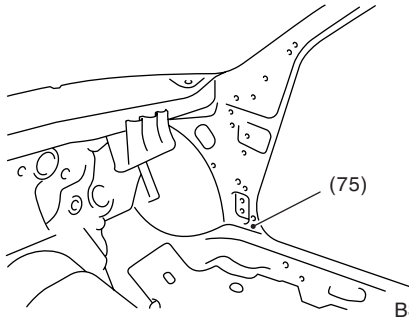
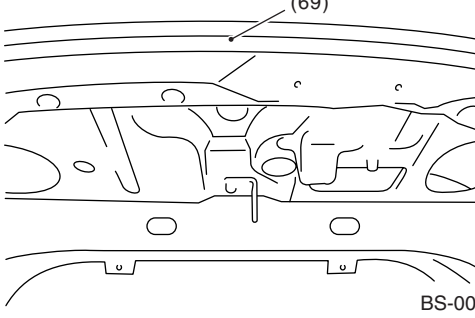
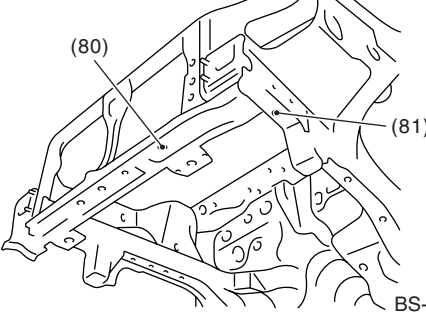
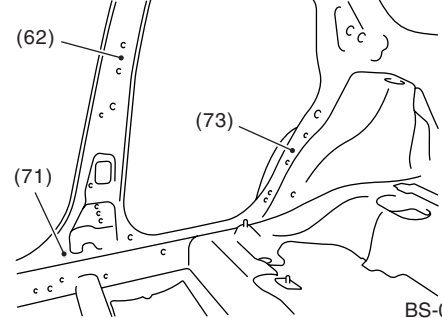
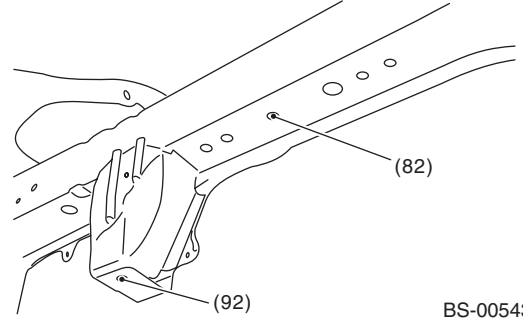
# Datum Points

## BODY STRUCTURE

|  |  |
|--|--|
| <p>Wagon model</p>  <p>BS-00528</p>   | <p>Sedan model</p>  <p>BS-00532</p>  |
| <p>Wagon model</p>  <p>BS-00529</p>   | <p>Sedan model</p>  <p>BS-00533</p>  |
| <p>Wagon model</p>  <p>BS-00530</p>  | <p>Sedan model</p>  <p>BS-00534</p> |
| <p>Sedan model</p>  <p>BS-00531</p> |  <p>BS-00535</p>                   |

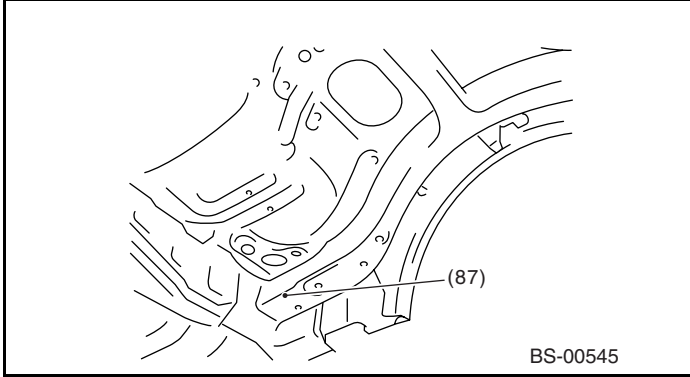
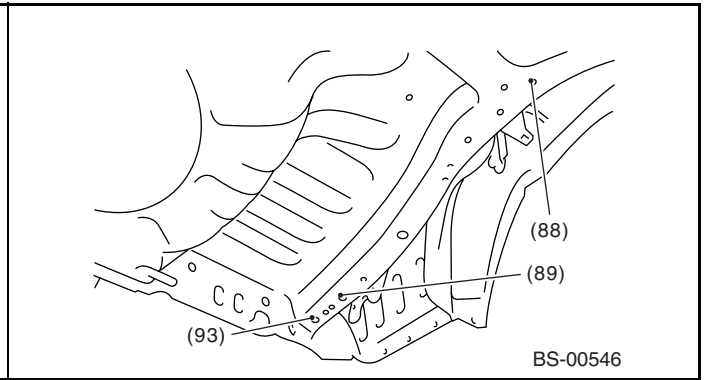
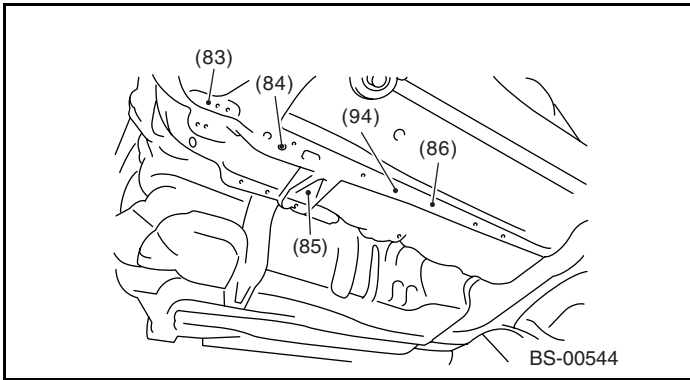
# Datum Points

## BODY STRUCTURE

|  |  |
|--|--|
|  <p>(67)</p> <p>BS-00536</p>                                |  <p>(74)</p> <p>(70)</p> <p>BS-00540</p>   |
| <p>Sedan model</p>  <p>(68)</p> <p>(76)</p> <p>BS-00537</p> |  <p>(75)</p> <p>BS-00541</p>               |
| <p>Sedan model</p>  <p>(69)</p> <p>BS-00538</p>            |  <p>(80)</p> <p>(81)</p> <p>BS-00542</p>  |
|  <p>(62)</p> <p>(71)</p> <p>(73)</p> <p>BS-00539</p>      |  <p>(82)</p> <p>(92)</p> <p>BS-00543</p> |

# Datum Points

## BODY STRUCTURE



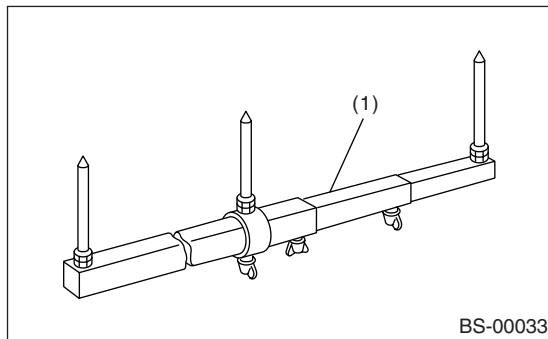
### 3. Datum Dimensions

#### A: MEASUREMENT

Refer to LOCATION for details on measurement points. <Ref. to BS-3, LOCATION, Datum Points.>

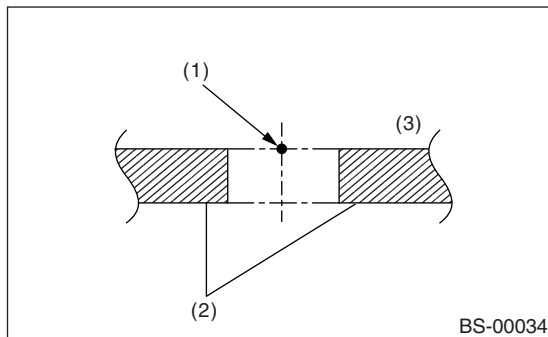
#### NOTE:

- Using a tram tracking gauge, measure all the dimensions.
- When using a tape measure, carefully measure dimensions without letting the tape measure sag or twist.
- Measure the linear dimensions between cores of holes.
- Suffixes “RH” and “LH” indicate right-hand and left-hand.



(1) Tram tracking gauge

- Measure at the center of the circle around the outside of the body panel.



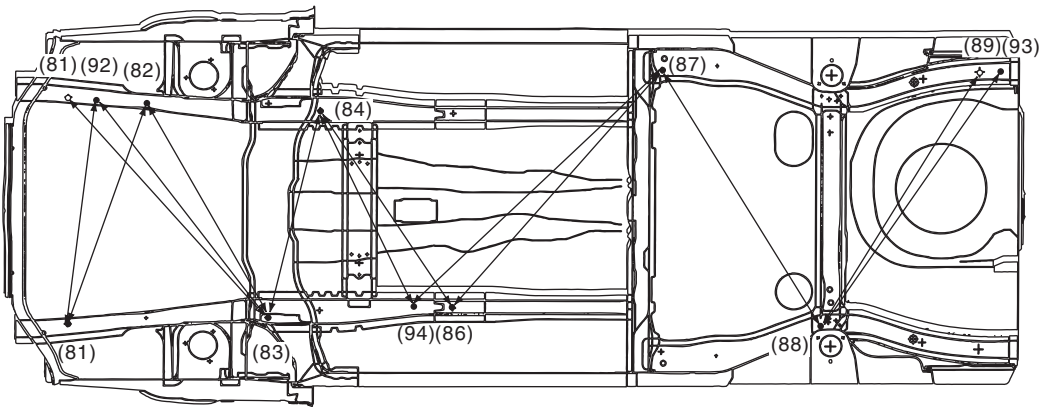
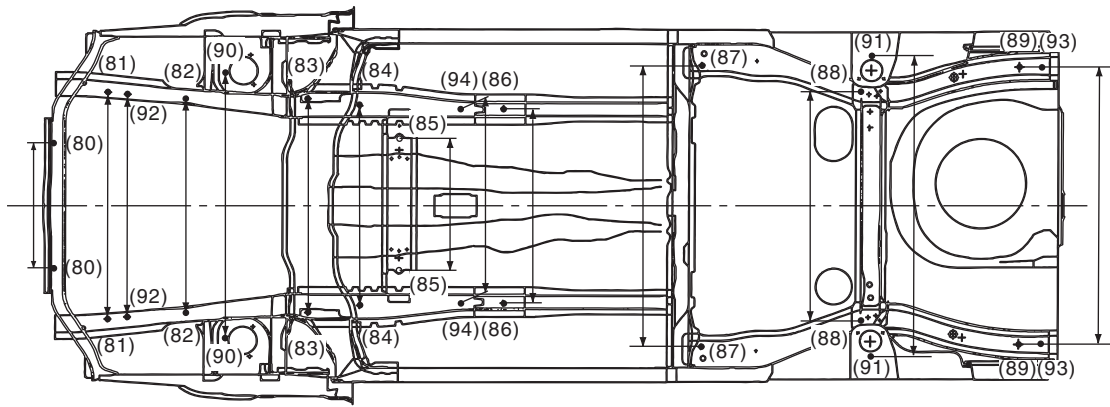
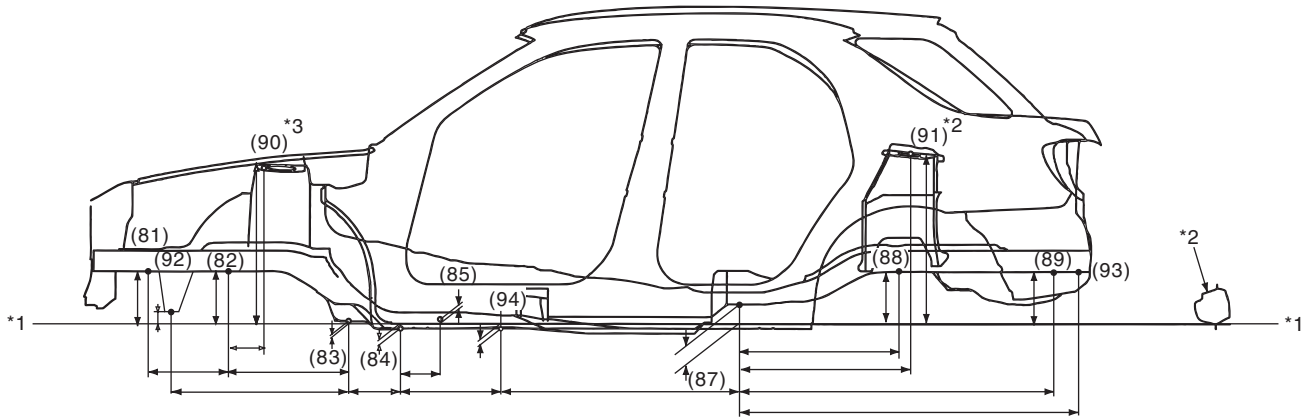
- (1) Datum point
- (2) Body panel
- (3) Outside



# Datum Dimensions

## BODY STRUCTURE

### 1. CENTER STRUCTURE



BS-00633

- \*1: Standard line
- \*2: Side sill
- \*3: Upper surface

# Datum Dimensions

BODY STRUCTURE

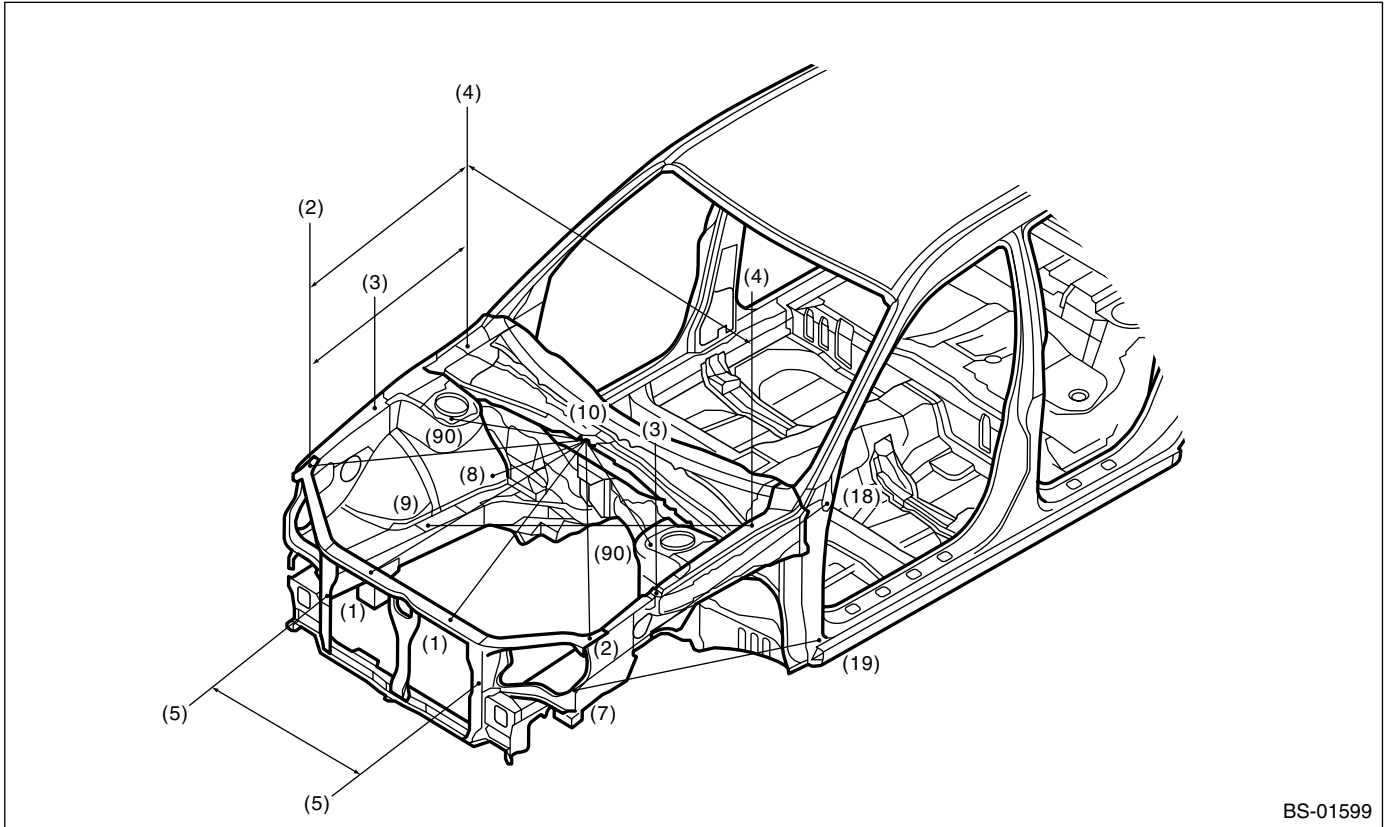
| Point to point          | Dimension mm (in) |
|-------------------------|-------------------|
| (81) from standard line | 206 (8.11)        |
| (92) from standard line | 77 (3.03)         |
| (82) from standard line | 206 (8.11)        |
| (90) from standard line | 620 (24.41)       |
| (83) from standard line | 8 (0.31)          |
| (84) from standard line | 20 (0.79)         |
| (85) from standard line | 13 (0.51)         |
| (94) from standard line | 12 (0.47)         |
| (87) from standard line | 76 (2.99)         |
| (88) from standard line | 206 (8.11)        |
| (91) from standard line | 674 (26.54)       |
| (89) from standard line | 205 (8.07)        |
| (81) to (82)            | 317 (12.48)       |
| (82) to (90)            | 157 (6.18)        |
| (82) to (83)            | 485 (19.09)       |
| (92) to (83)            | 694 (27.32)       |
| (83) to (84)            | 206 (8.11)        |
| (84) to (85)            | 159 (6.26)        |
| (84) to (94)            | 380 (14.96)       |
| (94) to (87)            | 982 (38.66)       |
| (87) to (88)            | 633 (24.92)       |
| (87) to (91)            | 673 (26.50)       |
| (87) to (89)            | 1,258 (49.53)     |
| (87) to (93)            | 1,358 (53.46)     |
| (80) RH to (80) LH      | 500 (19.69)       |
| (81) RH to (81) LH      | 910 (35.83)       |
| (92) RH to (92) LH      | 906 (35.67)       |
| (82) RH to (82) LH      | 860 (33.86)       |
| (90) RH to (90) LH      | 1,065 (41.93)     |
| (83) RH to (83) LH      | 856 (33.70)       |
| (84) RH to (84) LH      | 800 (31.50)       |
| (85) RH to (85) LH      | 529 (20.83)       |
| (94) RH to (94) LH      | 776 (30.55)       |
| (86) RH to (86) LH      | 780 (30.71)       |
| (87) RH to (87) LH      | 1,128 (44.41)     |
| (88) RH to (88) LH      | 920 (36.22)       |
| (91) RH to (91) LH      | 1,205 (47.44)     |
| (89) RH to (89) LH      | 1,110 (43.70)     |
| (93) RH to (93) LH      | 1,110 (43.70)     |
| (81) LH to (92) RH      | 924 (36.38)       |
| (81) LH to (82) RH      | 940 (37.01)       |
| (81) RH to (83) LH      | 1,209 (47.60)     |
| (92) RH to (83) LH      | 1,124 (44.25)     |
| (82) RH to (83) LH      | 1,005 (39.57)     |
| (83) LH to (84) RH      | 854 (33.62)       |
| (84) RH to (94) LH      | 875 (34.45)       |
| (84) RH to (86) LH      | 951 (37.44)       |
| (94) LH to (87) RH      | 1,371 (53.98)     |
| (86) LH to (87) RH      | 1,269 (49.96)     |
| (87) RH to (88) LH      | 1,211 (47.68)     |
| (88) LH to (89) RH      | 1,192 (46.93)     |

| Point to point     | Dimension mm (in) |
|--------------------|-------------------|
| (88) LH to (93) RH | 1,247 (49.09)     |

# Datum Dimensions

## BODY STRUCTURE

### 2. WAGON MODEL/SEDAN MODEL (FRONT STRUCTURE)



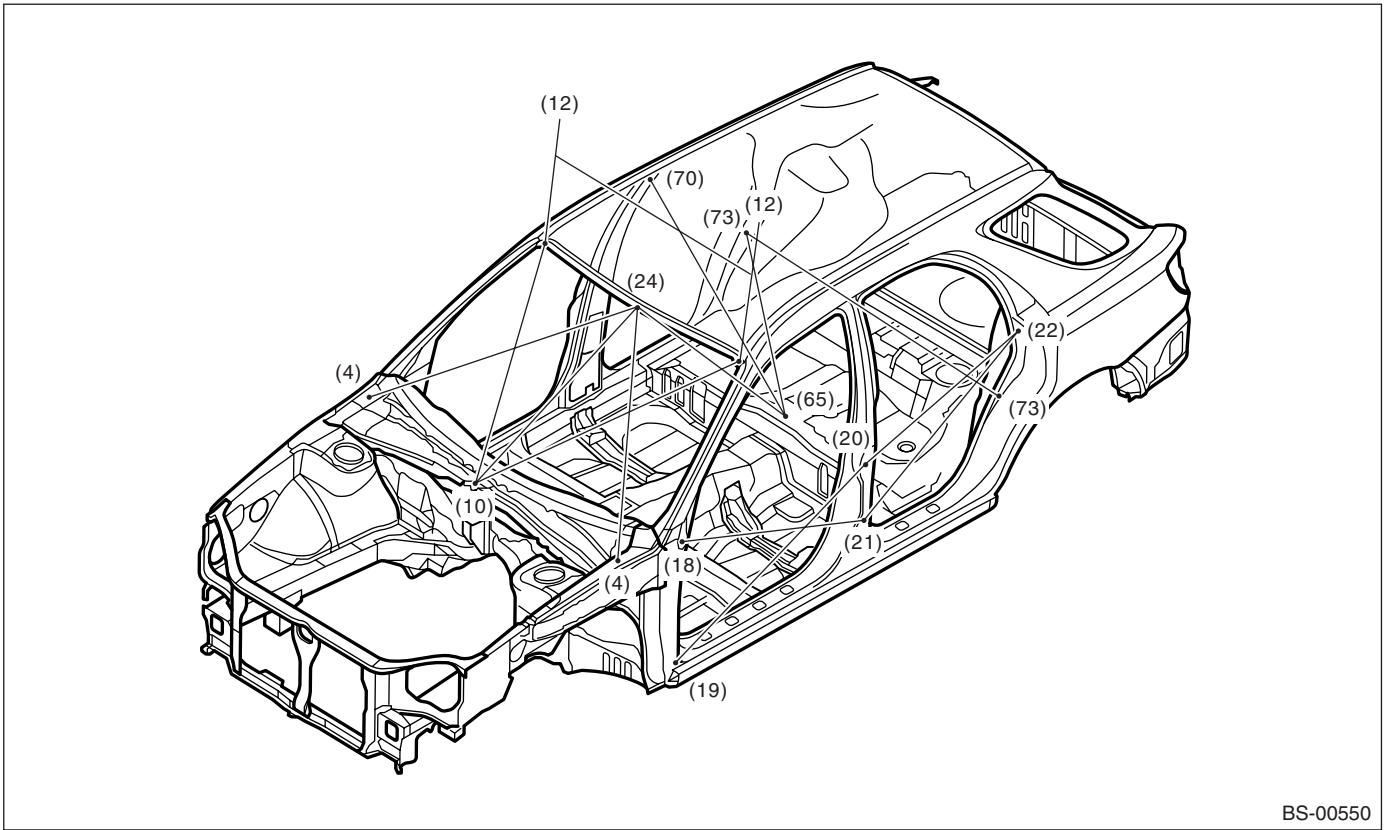
BS-01599

| Point to point     | Dimension mm (in) |
|--------------------|-------------------|
| (10) to (1) RH     | 912 (35.91)       |
| (10) to (1) LH     | 912 (35.91)       |
| (10) to (90) RH    | 566 (22.28)       |
| (10) to (90) LH    | 566 (22.28)       |
| (10) to (8) RH     | 581 (22.87)       |
| (10) to (8) LH     | 581 (22.87)       |
| (10) to (2) RH     | 944 (37.16)       |
| (10) to (2) LH     | 944 (37.16)       |
| (4) RH to (2) RH   | 774 (30.47)       |
| (4) LH to (2) LH   | 774 (30.47)       |
| (4) RH to (3) RH   | 430 (16.93)       |
| (4) LH to (3) LH   | 430 (16.93)       |
| (90) RH to (90) LH | 1,065 (41.93)     |
| (8) RH to (8) LH   | 894 (35.20)       |
| (8) RH to (4) LH   | 1,210 (47.64)     |
| (8) LH to (4) RH   | 1,210 (47.64)     |
| (3) RH to (2) RH   | 346 (13.61)       |
| (3) LH to (2) LH   | 346 (13.61)       |
| (4) RH to (4) LH   | 1,417 (55.79)     |
| (2) RH to (2) LH   | 1,340 (52.76)     |
| (5) RH to (5) LH   | 720 (28.35)       |
| (7) RH to (18) RH  | 1,059 (41.70)     |
| (7) LH to (18) LH  | 1,059 (41.70)     |
| (7) RH to (19) RH  | 1,053 (41.44)     |
| (7) LH to (19) LH  | 1,053 (41.44)     |

| Point to point   | Dimension mm (in) |
|------------------|-------------------|
| (4) RH to (2) LH | 1,580 (62.22)     |
| (4) LH to (2) RH | 1,580 (62.22)     |
| (3) RH to (3) LH | 1,396 (54.96)     |
| (3) RH to (4) LH | 1,470 (57.87)     |
| (3) LH to (4) RH | 1,470 (57.87)     |
| (2) RH to (3) LH | 1,411 (55.54)     |
| (2) LH to (3) RH | 1,411 (55.54)     |
| (9) RH to (9) LH | 860 (33.86)       |
| (9) RH to (8) LH | 931 (36.65)       |
| (9) LH to (8) RH | 931 (36.65)       |
| (9) RH to (4) LH | 1,278 (50.31)     |
| (9) LH to (4) RH | 1,278 (50.31)     |

# Datum Dimensions

BODY STRUCTURE



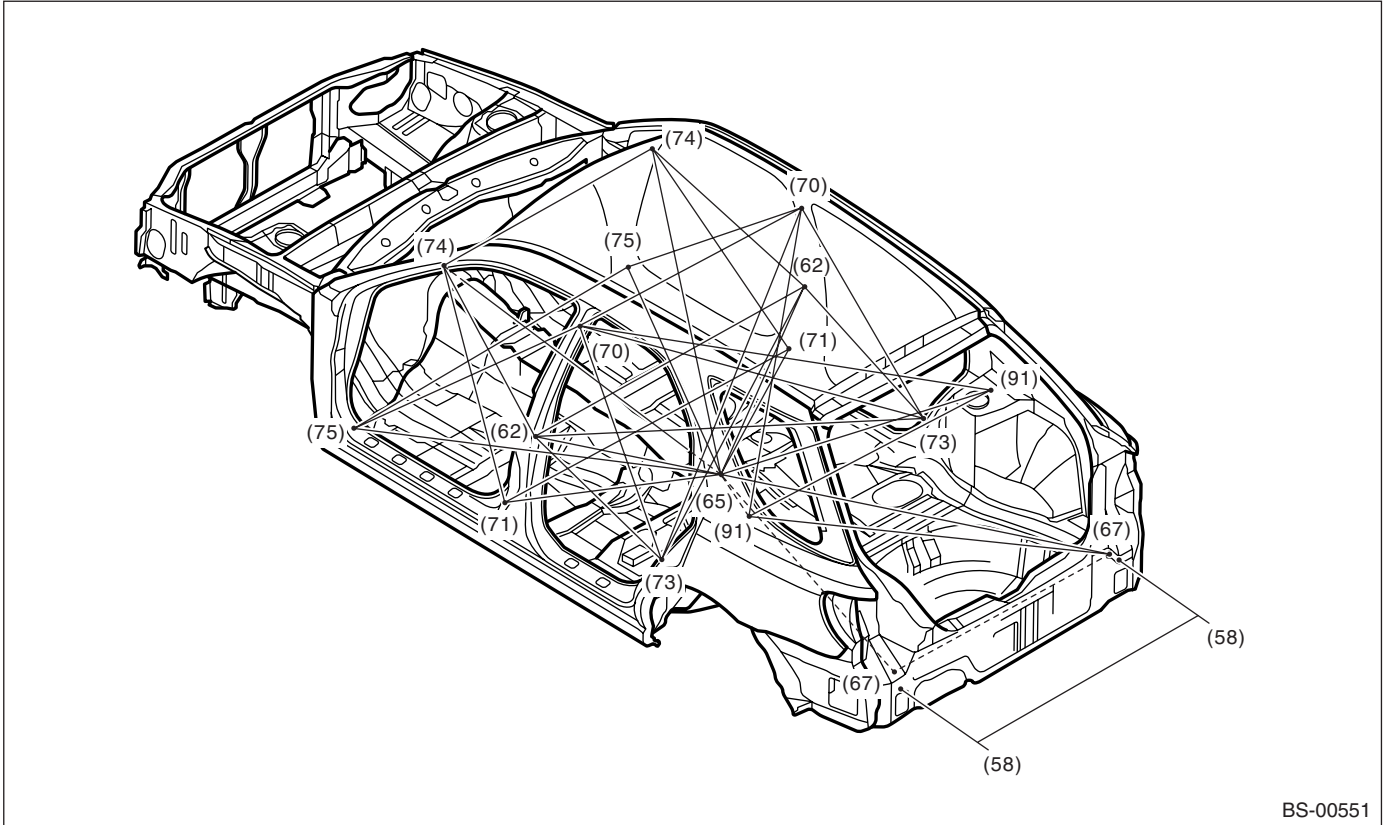
BS-00550

| Point to point     | Dimension mm (in)         |
|--------------------|---------------------------|
| (4) RH to (24)     | 1,127 (44.37) Wagon model |
| (4) LH to (24)     | 1,110 (43.70) Sedan model |
| (10) to (24)       | 958 (37.72) Wagon model   |
| (10) to (24)       | 935 (36.81) Sedan model   |
| (10) to (12) RH    | 1,122 (44.17) Wagon model |
| (10) to (12) RH    | 1,106 (43.54) Sedan model |
| (10) to (12) LH    | 1,122 (44.17) Wagon model |
| (10) to (12) LH    | 1,106 (43.17) Sedan model |
| (12) RH to (12) LH | 1,029 (40.51) Wagon model |
| (12) RH to (12) LH | 1,042 (41.02) Sedan model |
| (18) RH to (21) RH | 1,049 (41.30)             |
| (18) LH to (21) LH | 1,049 (41.30)             |
| (19) RH to (20) RH | 1,089 (42.87)             |
| (19) LH to (20) LH | 1,089 (42.87)             |
| (20) RH to (22) RH | 869 (34.21)               |
| (20) LH to (22) LH | 869 (34.21)               |
| (21) RH to (22) RH | 985 (38.78)               |
| (21) LH to (22) LH | 985 (38.78)               |
| (24) to (65)       | 1,232 (48.50) Wagon model |
| (24) to (65)       | 1,237 (48.70) Sedan model |
| (65) to (70) RH    | 1,067 (42.01)             |
| (65) to (70) LH    | 1,067 (42.01)             |
| (65) to (73) RH    | 830 (32.68)               |
| (65) to (73) LH    | 830 (32.68)               |
| (73) RH to (73) LH | 1,394 (54.88)             |

# Datum Dimensions

## BODY STRUCTURE

### 3. WAGON MODEL/SEDAN MODEL (REAR STRUCTURE)

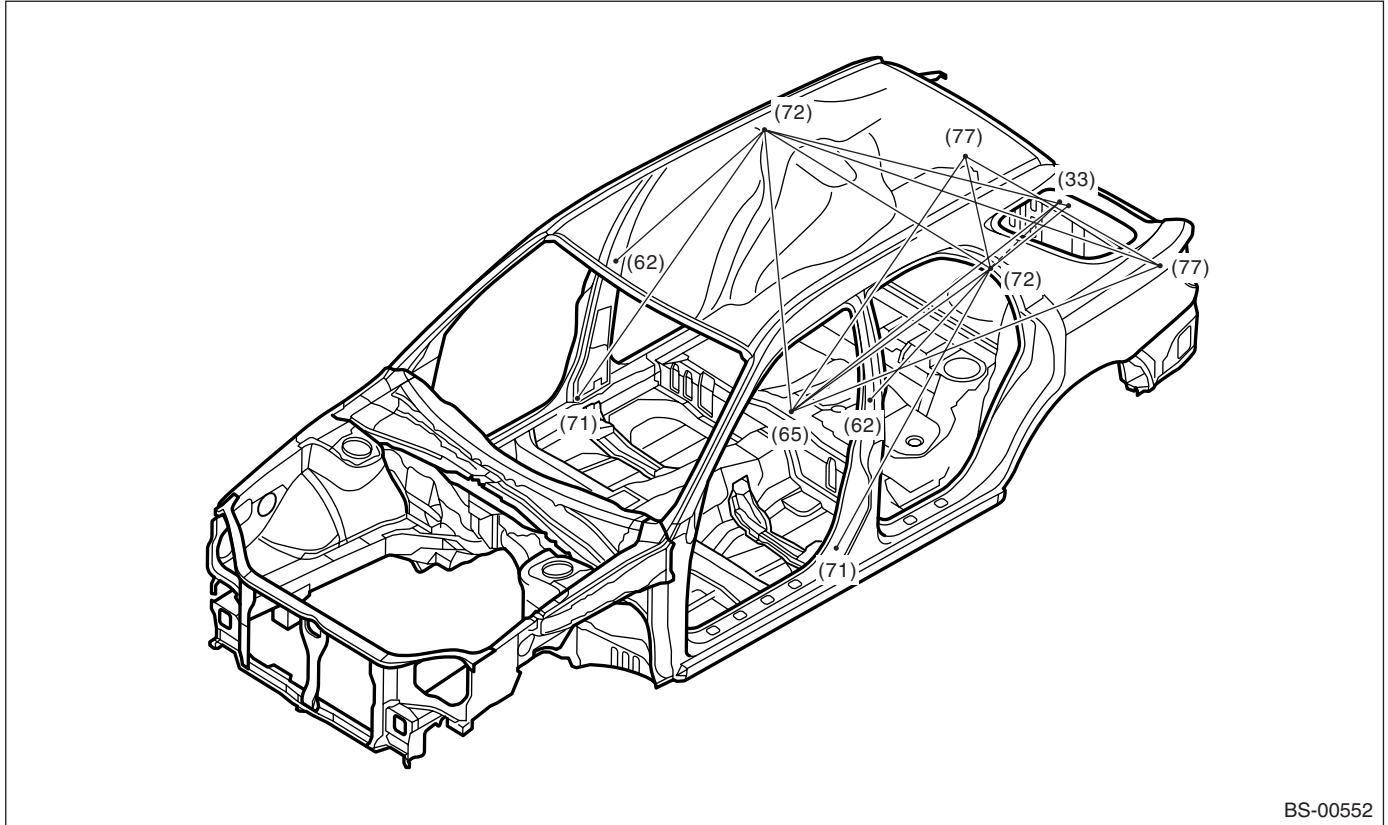


BS-00551

| Point to point     | Dimension mm (in)         |
|--------------------|---------------------------|
| (58) RH to (58) LH | 1,128 (44.41)             |
| (62) RH to (62) LH | 1,332 (52.44)             |
| (62) RH to (65)    | 915 (36.02)               |
| (62) LH to (65)    | 915 (36.02)               |
| (62) RH to (73) RH | 762 (30.00)               |
| (62) LH to (73) LH | 762 (30.00)               |
| (62) RH to (73) LH | 1,561 (61.46)             |
| (62) LH to (73) RH | 1,561 (61.46)             |
| (62) RH to (74) RH | 592 (23.31) Wagon model   |
| (62) LH to (74) LH | 603 (23.74) Sedan model   |
| (65) to (67) RH    | 1,501 (59.09)             |
| (65) to (67) LH    | 1,501 (59.09)             |
| (65) to (71) RH    | 823 (32.40)               |
| (65) to (71) LH    | 823 (32.40)               |
| (65) to (74) RH    | 1,275 (50.20) Wagon model |
| (65) to (74) LH    | 1,282 (50.47) Sedan model |
| (65) to (75) RH    | 1,450 (57.09)             |
| (65) to (75) LH    | 1,450 (57.09)             |
| (65) to (91) RH    | 1,064 (41.89)             |
| (65) to (91) LH    | 1,064 (41.89)             |
| (67) RH to (67) LH | 1,110 (43.70)             |
| (67) RH to (91) LH | 1,381 (54.37)             |
| (67) LH to (91) RH | 1,381 (54.37)             |
| (70) RH to (70) LH | 1,060 (41.73)             |
| (70) RH to (73) RH | 948 (37.32)               |

| Point to point     | Dimension mm (in)         |
|--------------------|---------------------------|
| (70) LH to (73) LH | 948 (37.32)               |
| (70) RH to (73) LH | 1,542 (60.71)             |
| (70) LH to (73) RH | 1,542 (60.71)             |
| (70) RH to (75) RH | 1,443 (56.81)             |
| (70) LH to (75) LH | 1,443 (56.81)             |
| (70) RH to (91) LH | 1,532 (60.32)             |
| (70) LH to (91) RH | 1,532 (60.32)             |
| (71) RH to (71) LH | 1,361 (53.58)             |
| (71) RH to (74) RH | 954 (37.56) Wagon model   |
| (71) LH to (74) LH | 949 (37.36) Sedan model   |
| (74) RH to (74) LH | 1,135 (44.69) Wagon model |
| (74) RH to (74) LH | 1,147 (45.16) Sedan model |
| (75) RH to (75) LH | 1,399 (55.08)             |
| (91) RH to (91) LH | 1,205 (47.44)             |

## 4. WAGON MODEL (FRONT STRUCTURE)



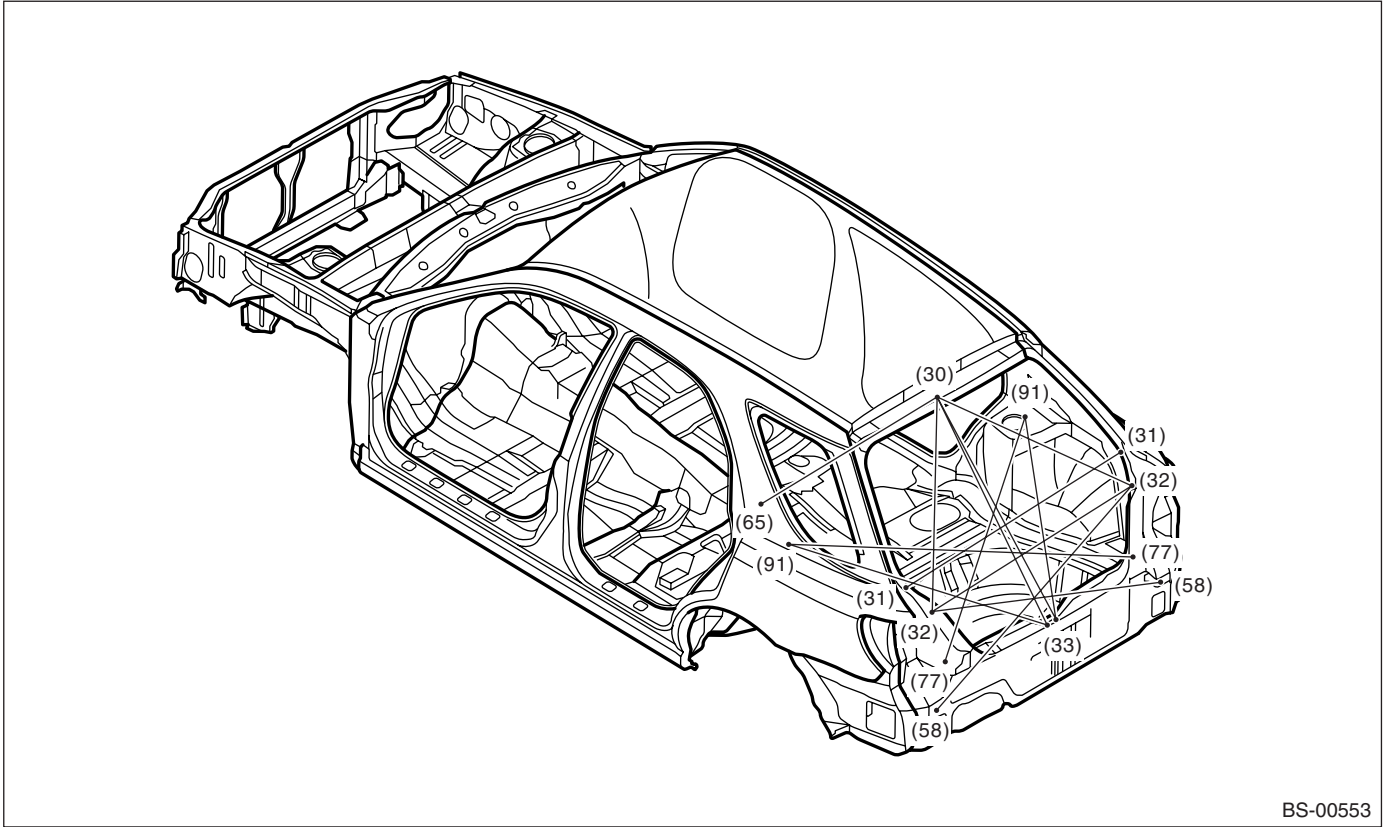
BS-00552

| Point to point     | Dimension mm (in) |
|--------------------|-------------------|
| (33) RH to (65)    | 1,534 (60.39)     |
| (33) LH to (65)    | 1,534 (60.39)     |
| (33) RH to (72) LH | 1,334 (52.52)     |
| (33) LH to (72) RH | 1,334 (52.52)     |
| (62) RH to (72) RH | 732 (28.82)       |
| (62) LH to (72) LH | 732 (28.82)       |
| (65) to (72) RH    | 1,076 (42.36)     |
| (65) to (72) LH    | 1,076 (42.36)     |
| (65) to (77) RH    | 1,538 (60.55)     |
| (65) to (77) LH    | 1,538 (60.55)     |
| (71) RH to (72) RH | 1,223 (48.15)     |
| (71) LH to (72) LH | 1,223 (48.15)     |
| (72) RH to (72) LH | 1,226 (48.27)     |
| (72) RH to (77) LH | 1,544 (60.79)     |
| (72) LH to (77) RH | 1,544 (60.79)     |
| (77) RH to (77) LH | 898 (35.35)       |

# Datum Dimensions

## BODY STRUCTURE

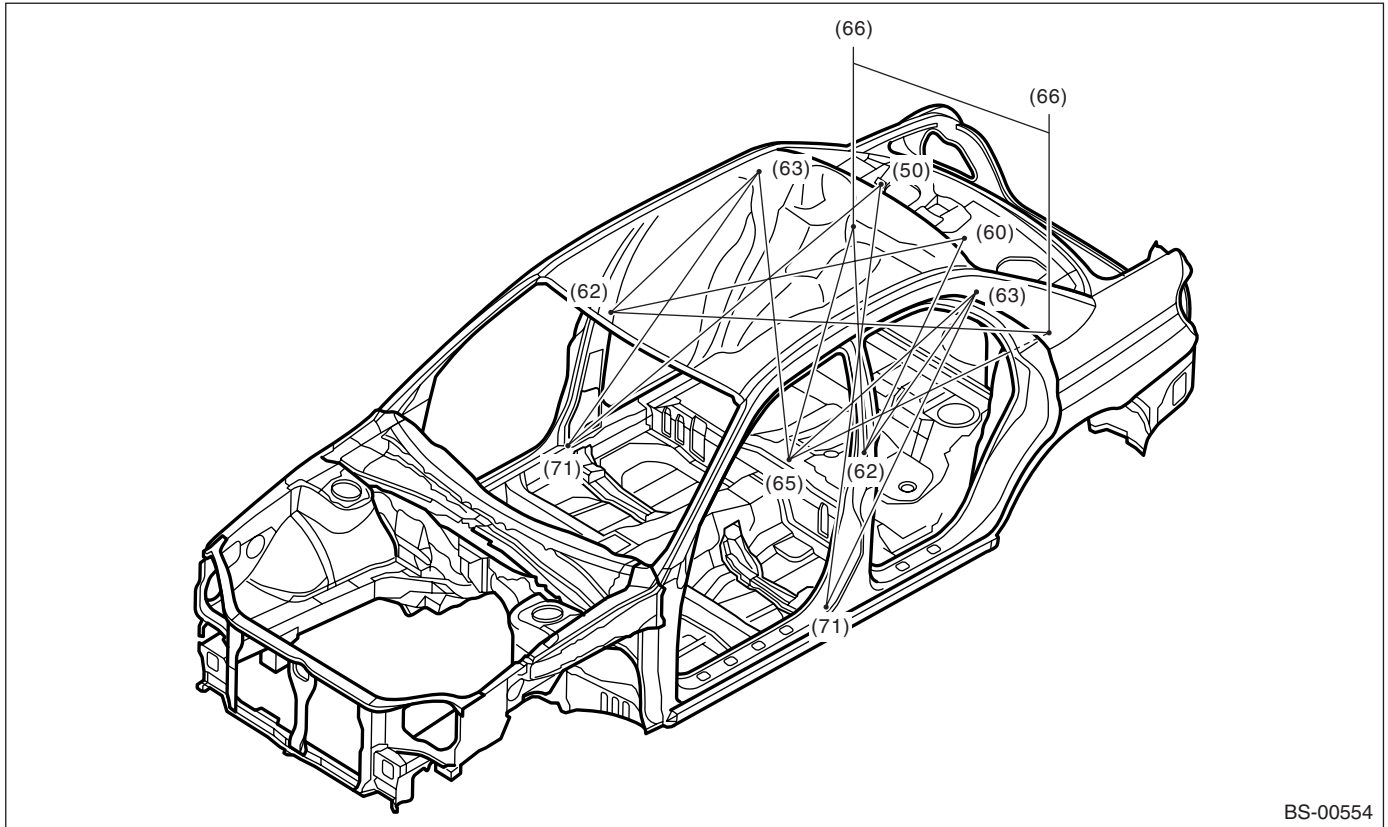
### 5. WAGON MODEL (REAR STRUCTURE)



BS-00553

| Point to point     | Dimension mm (in) |
|--------------------|-------------------|
| (30) to (32) RH    | 850 (33.46)       |
| (30) to (32) LH    | 850 (33.46)       |
| (30) to (33) RH    | 904 (35.59)       |
| (30) to (33) LH    | 904 (35.59)       |
| (30) to (65)       | 1,293 (50.91)     |
| (31) RH to (31) LH | 1,212 (47.72)     |
| (32) RH to (32) LH | 1,038 (40.87)     |
| (32) RH to (58) LH | 1,139 (44.84)     |
| (32) LH to (58) RH | 1,139 (44.84)     |
| (33) RH to (91) RH | 993 (39.09)       |
| (33) LH to (91) LH | 993 (39.09)       |
| (77) RH to (91) LH | 1,289 (50.75)     |
| (77) LH to (91) RH | 1,289 (50.75)     |

## 6. SEDAN MODEL (FRONT STRUCTURE)



BS-00554

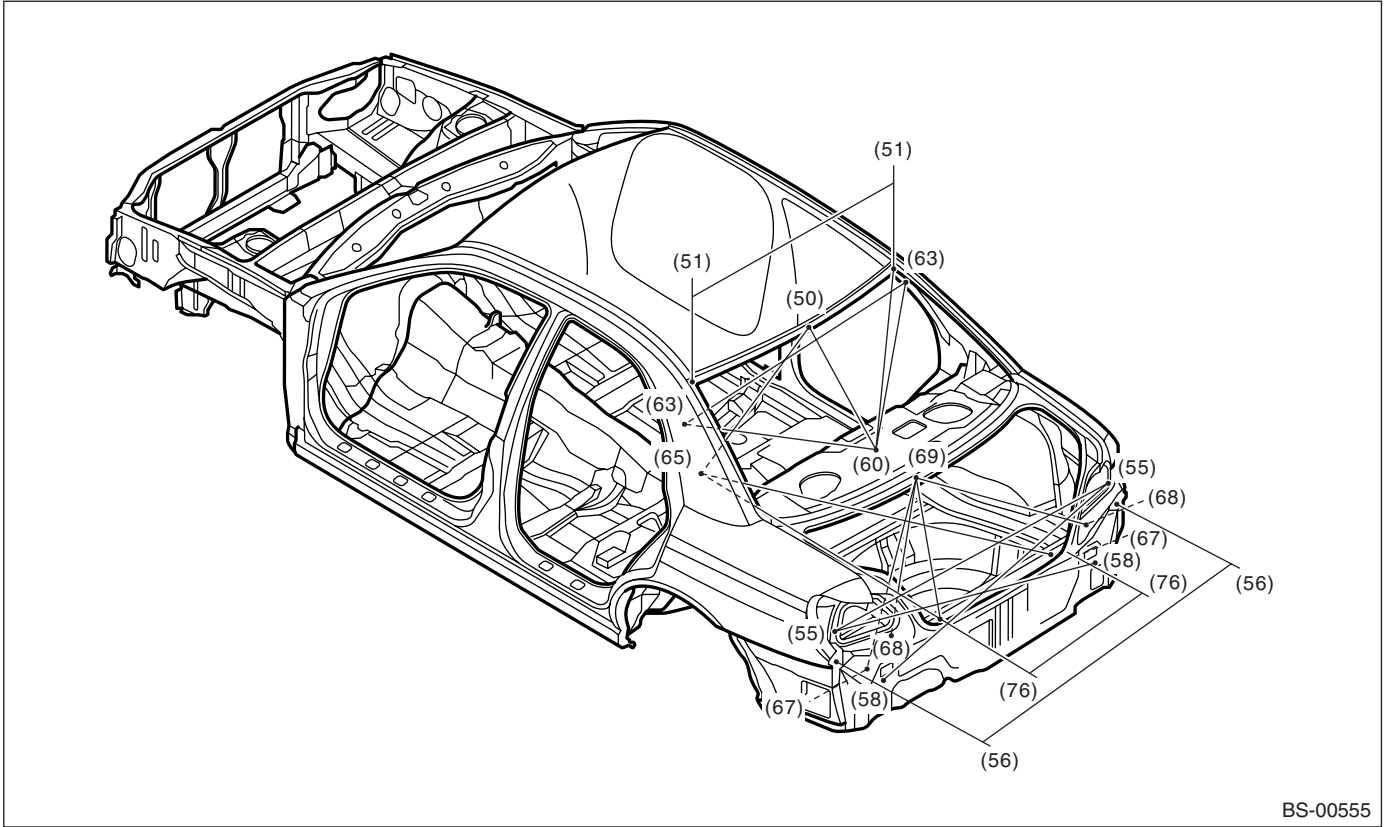
| Point to point     | Dimension mm (in) |
|--------------------|-------------------|
| (50) to (71) RH    | 1,562 (61.50)     |
| (50) to (71) LH    | 1,562 (61.50)     |
| (60) to (62) RH    | 1,338 (52.68)     |
| (60) to (62) LH    | 1,338 (52.68)     |
| (62) RH to (63) RH | 773 (30.43)       |
| (62) LH to (63) LH | 773 (30.43)       |
| (62) RH to (66) LH | 1,449 (57.05)     |
| (62) LH to (66) RH | 1,449 (57.05)     |
| (63) RH to (65)    | 1,118 (44.02)     |
| (63) LH to (65)    | 1,118 (44.02)     |
| (63) RH to (71) RH | 1,283 (50.51)     |
| (63) LH to (71) LH | 1,283 (50.51)     |
| (65) to (66) RH    | 956 (37.64)       |
| (65) to (66) LH    | 956 (37.64)       |
| (66) RH to (66) LH | 840 (33.07)       |



# Datum Dimensions

## BODY STRUCTURE

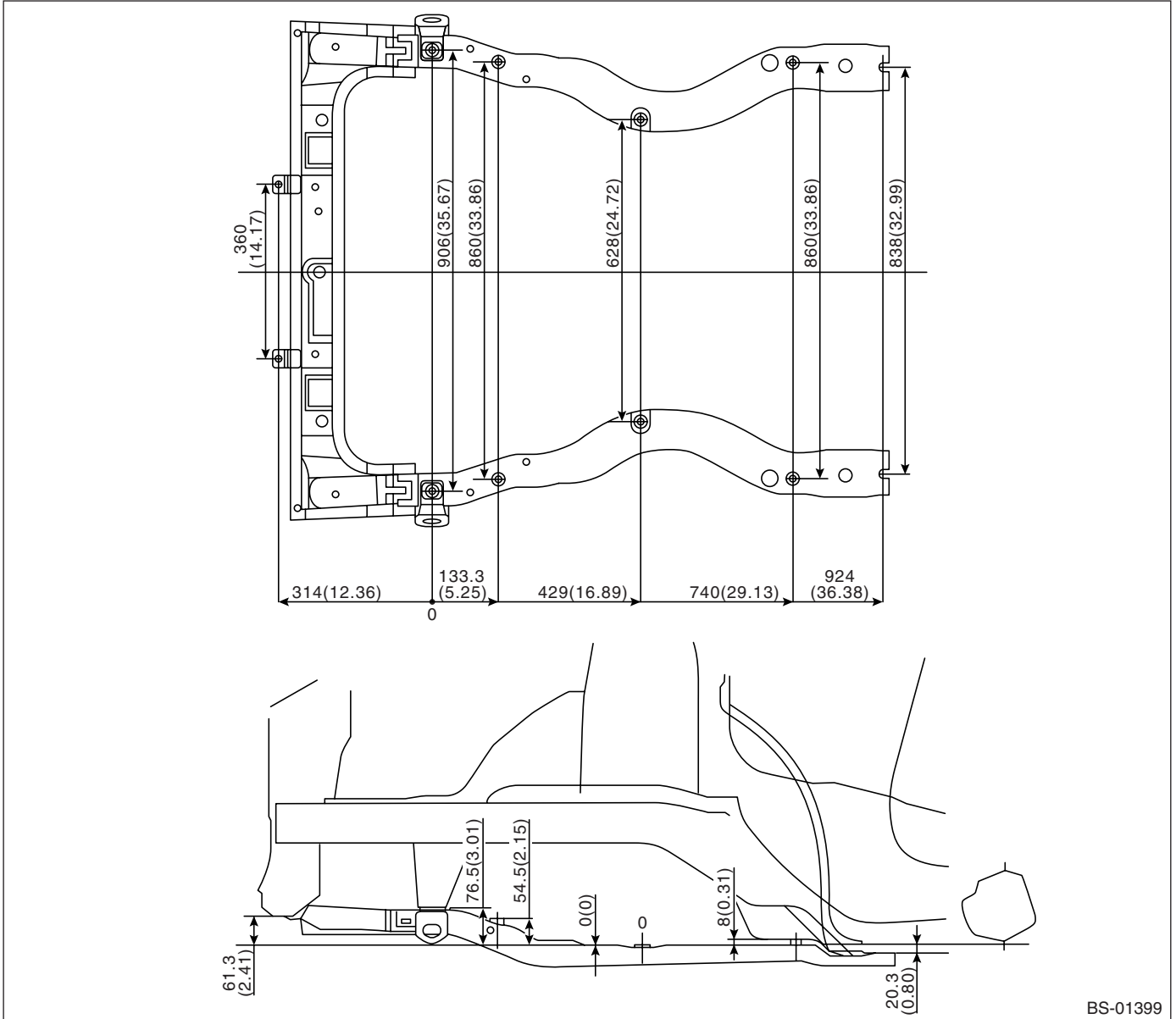
### 7. SEDAN MODEL (REAR STRUCTURE)



BS-00555

| Point to point     | Dimension mm (in) |
|--------------------|-------------------|
| (50) to (60)       | 501 (19.72)       |
| (50) to (65)       | 1,082 (42.60)     |
| (51) RH to (51) LH | 1,025 (40.35)     |
| (51) RH to (60)    | 734 (28.90)       |
| (55) RH to (55) LH | 1,406 (55.35)     |
| (55) RH to (58) LH | 1,297 (51.06)     |
| (55) LH to (58) RH | 1,297 (51.06)     |
| (56) RH to (56) LH | 1,426 (56.14)     |
| (60) to (63) RH    | 764 (30.08)       |
| (60) to (63) LH    | 764 (30.08)       |
| (63) RH to (63) LH | 1,183 (46.57)     |
| (65) to (76) RH    | 1,544 (60.79)     |
| (65) to (76) LH    | 1,544 (60.79)     |
| (65) to (68) RH    | 1,581 (62.24)     |
| (65) to (68) LH    | 1,581 (62.24)     |
| (67) RH to (69)    | 784 (30.87)       |
| (67) LH to (69)    | 784 (30.87)       |
| (68) RH to (68) LH | 1,020 (40.16)     |
| (68) RH to (69)    | 681 (26.81)       |
| (68) LH to (69)    | 681 (26.81)       |
| (69) to (76) RH    | 537 (21.14)       |
| (69) to (76) LH    | 537 (21.14)       |
| (76) RH to (76) LH | 600 (23.62)       |

## 8. SUB FRAME ALIGNMENT



Unit: mm (in)

Horizontal and vertical dimensions are values measured from datum points (0).

# Datum Dimensions

BODY STRUCTURE

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# INSTRUMENTATION/DRIVER INFO



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| 4. Speedometer.....              | 13          |
| 5. Tachometer .....              | 14          |
| 6. Fuel Gauge .....              | 15          |
| 7. Water Temperature Gauge ..... | 16          |
| 8. Ambient Sensor.....           | 17          |

# General Description

INSTRUMENTATION/DRIVER INFO

## 1. General Description

### A: SPECIFICATION

|                   | Model  | Except STI model       | STI model           |
|-------------------|--|------------------------|---------------------|
| Combination meter | Speedometer  | Electric pulse type    | Stepping motor type |
|                   | Water temperature gauge                              | Cross coil type        | Stepping motor type |
|                   | Fuel gauge   | Cross coil type        | Stepping motor type |
|                   | Tachometer   | Electric pulse type    | Stepping motor type |
|                   | Turn signal indicator light                          | 14 V — 1.4 W           | LED                 |
|                   | Charge indicator light                               | 14 V — 1.4 W           | LED                 |
|                   | Oil pressure warning light                           |                        | LED                 |
|                   | ABS warning light                                    |                        | LED                 |
|                   | Malfunction indicator light                          |                        | LED                 |
|                   | HI-beam indicator light                              | 14 V — 1.4 W           | LED                 |
|                   | Door open warning light                              |                        | LED                 |
|                   | Seat belt warning light                              |                        | LED                 |
|                   | Brake fluid and parking brake warning light          | 14 V — 1.4 W           | LED                 |
|                   | AWD warning light                                    | LED                    | —                   |
|                   | AIRBAG warning light                                 |                        | LED                 |
|                   | Meter illumination light                             | 14 V — 3 W, 14 V — 2 W | LED                 |
|                   | AT OIL TEMP. warning light                           | LED                    | —                   |
|                   | Security indicator light                             |                        | LED                 |
|                   | Cruise set indicator light                           | 14 V — 1.4 W           | LED                 |
|                   | Cruise indicator light                               | 14 V — 1.4 W           | LED                 |
|                   | Low fuel warning light                               |                        | LED                 |
|                   | AT select lever position indicator light             | 14 V — 100 mA          | —                   |
|                   | Intercooler water spray warning light                | —                      | LED                 |
|                   | Rear differential oil temperature warning light      | —                      | LED                 |
|                   | Driver's control center differential indicator light | —                      | LED                 |
|                   | REV indicator light                                  | —                      | LED                 |
|                   | Headlight indicator light                            | —                      | LED                 |
|                   | LCD back light                                       | 14 V — 1.4 W           | LED                 |

### B: CAUTION

- Be careful not to damage the meters and instrument panel.
- Be careful not to damage the meter glasses.
- Make sure that electrical connector is connected securely.
- After installation, make sure that each meter operates normally.
- Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.
- Do not apply excessive force to the printed circuit.
- Do not drop or otherwise apply impact.

### C: PREPARATION TOOL

#### 1. GENERAL TOOL

| TOOL NAME      | REMARKS                                    |
|----------------|--|
| Circuit tester | Used for measuring resistance and voltage. |

## 2. Combination Meter System

### A: WIRING DIAGRAM

#### 1. COMBINATION METER

<Ref. to WI-151, WIRING DIAGRAM, Combination Meter System.>

#### 2. OUTSIDE TEMPERATURE INDICATOR

<Ref. to WI-163, WIRING DIAGRAM, Outside Temperature Display System.>

### B: INSPECTION

#### CAUTION:

**When measuring voltage and resistance of the ECM, TCM, or each sensor, use a tapered pin with a diameter of less than 0.64 mm (0.025 in) in order to avoid poor contact. Do not insert the pin more than 2 mm (0.08 in).**

#### 1. SYMPTOM CHART

| Symptom   | Repair order  | Reference   |
|---|---|---|
| Combination meter assembly does not operate.    | (1) Power supply<br>(2) Ground circuit  | <Ref. to IDI-4, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Combination Meter System.>             |
| Speedometer does not operate.                   | (1) Vehicle speed sensor (MT model)<br>TCM (AT model)<br>(2) Harness<br>(3) Speedometer | MT model: <Ref. to IDI-4, CHECK VEHICLE SPEED SENSOR, INSPECTION, Combination Meter System.>              |
|   |   | AT model: <Ref. to IDI-5, CHECK TRANSMISSION CONTROL MODULE (TCM), INSPECTION, Combination Meter System.> |
| Tachometer does not operate.                    | (1) ECM<br>(2) Harness<br>(3) Tachometer  | <Ref. to IDI-6, CHECK ENGINE CONTROL MODULE (ECM), INSPECTION, Combination Meter System.>                 |
| Fuel gauge does not operate.                    | (1) Fuel level sensor<br>(2) Harness<br>(3) Fuel gauge                                  | <Ref. to IDI-6, CHECK FUEL LEVEL SENSOR, INSPECTION, Combination Meter System.>                           |
| Water temperature gauge does not operate.       | (1) Engine coolant temperature sensor<br>(2) Harness<br>(3) Water temperature gauge     | <Ref. to IDI-7, CHECK ENGINE COOLANT TEMPERATURE SENSOR, INSPECTION, Combination Meter System.>           |
| Outside temperature indicator does not operate. | (1) Ambient sensor<br>(2) Harness<br>(3) Combination meter<br>(4) Auto A/C control unit | <Ref. to IDI-8, CHECK OUTSIDE TEMPERATURE INDICATOR, INSPECTION, Combination Meter System.>               |

# Combination Meter System

INSTRUMENTATION/DRIVER INFO

## 2. CHECK POWER SUPPLY AND GROUND CIRCUIT

| Step  | Check                                     | Yes  | No   |
|---|---|--|--|
| <b>1 CHECK POWER SUPPLY FOR COMBINATION METER.</b><br>1) Remove the combination meter. <Ref. to IDI-10, REMOVAL, Combination Meter.><br>2) Disconnect the combination meter harness connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between combination meter connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(i11) No. 7 (+) — Chassis ground (-):</i> | Is the voltage more than 10 V?            | Go to step 2.  | Check the harness for open or short between ignition switch and combination meter. |
| <b>2 CHECK POWER SUPPLY FOR COMBINATION METER.</b><br>Measure the voltage between combination meter connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(i11) No. 10 (+) — Chassis ground (-):</i>   | Is the voltage more than 10 V?            | Go to step 3.  | Check the harness for open or short between fuse and combination meter.            |
| <b>3 CHECK GROUND CIRCUIT OF COMBINATION METER.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance of harness between combination meter connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(i11) No. 6 — Chassis ground:</i>   | Is the resistance less than 10 $\Omega$ ? | Except STI model: Replace the combination meter printed circuit. STI model: Replace the meter main assembly. | Repair the wiring harness.   |

## 3. CHECK VEHICLE SPEED SENSOR

| Step   | Check   | Yes   | No  |
|--|---|---|---|
| <b>1 CHECK VEHICLE SPEED SENSOR.</b><br>1) Lift-up the vehicle.<br>2) Remove the combination meter with harness connector.<br>3) Drive the vehicle at a speed greater than 20 km/h (12 MPH).<br><b>Warning:</b><br><b>Be careful not to get caught in the running wheels.</b><br>4) Measure the voltage between combination meter connector and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(i11) No. 2 (+) — Chassis ground (-):</i> | Is the voltage less than 1 V $\leftrightarrow$ more than 5 V? | Except STI model: Check the speedometer. <Ref. to IDI-13, REMOVAL, Speedometer.><br>STI model: Replace the meter main assembly. | Go to step 2.   |
| <b>2 CHECK VEHICLE SPEED SENSOR POWER SUPPLY.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the vehicle speed sensor harness connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between vehicle speed sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><i>(B17) No. 3 (+) — Chassis ground (-):</i>   | Is the voltage more than 10 V?                                | Go to step 3.   | Check the harness for open or short between ignition switch and vehicle speed sensor. |

# Combination Meter System

INSTRUMENTATION/DRIVER INFO

| Step   | Check                                     | Yes                               | No                         |
|--|---|-----------------------------------|----------------------------|
| <b>3</b><br><b>CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between vehicle speed sensor connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>(B17) No. 2 — Chassis ground:</b>  | Is the resistance less than 10 $\Omega$ ? | Go to step 4.                     | Repair the wiring harness. |
| <b>4</b><br><b>CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND COMBINATION METER.</b><br>1) Disconnect the connector from combination meter.<br>2) Measure the resistance between vehicle speed sensor harness connector and combination meter harness connector.<br><b>Connector &amp; terminal</b><br><b>(B17) No. 1 — (i11) No. 2:</b> | Is the resistance less than 10 $\Omega$ ? | Replace the vehicle speed sensor. | Repair the wiring harness. |

## 4. CHECK TRANSMISSION CONTROL MODULE (TCM)

| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <b>1</b><br><b>CHECK TCM SIGNAL.</b><br>1) Lift-up the vehicle.<br>2) Drive the vehicle faster than 10 km/h (6 MPH).<br><b>Warning:</b><br><b>Be careful not to get caught in the running wheels.</b><br>3) Measure the voltage between TCM connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B55) No. 21 (+) — Chassis ground (-):</b> | Is the voltage less than 1 V $\leftrightarrow$ more than 5 V? | Go to step 2.  | Check the TCM. <Ref. to 4AT(D)(diag)-2, Basic Diagnostic Procedure.> |
| <b>2</b><br><b>CHECK HARNESS BETWEEN TCM AND COMBINATION METER.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from TCM and combination meter.<br>3) Measure the resistance between TCM harness connector and combination meter harness connector.<br><b>Connector &amp; terminal</b><br><b>(B55) No. 21 — (i11) No. 2:</b>        | Is the resistance less than 10 $\Omega$ ?                     | Check the speed meter. <Ref. to IDI-13, REMOVAL, Speedometer.> | Repair the wiring harness.   |



# Combination Meter System

INSTRUMENTATION/DRIVER INFO

## 5. CHECK ENGINE CONTROL MODULE (ECM)

| Step  | Check                             | Yes  | No   |
|---|-----------------------------------|--|--|
| <b>1 CHECK ECM SIGNAL.</b><br>1) Start the engine.<br>2) Measure the voltage between ECM connector and engine ground.<br><b>Connector &amp; terminal</b><br><b>Except STI model:</b><br><i>(B136) No. 22 (+) — Chassis ground (-):</i><br><b>STI model:</b><br><i>(B134) No. 23 (+) — Chassis ground (-):</i>   | Is the voltage 0 ↔ 14 V or more?  | Go to step 2.  | Check the ECM.<br><Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.> or <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.> or <Ref. to EN(STI) section.> |
| <b>2 CHECK HARNESS BETWEEN COMBINATION METER AND ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ECM and combination meter.<br>3) Measure the resistance between ECM harness connector and combination meter harness connector.<br><b>Connector &amp; terminal</b><br><b>Except STI model:</b><br><i>(B136) No. 22 — (i11) No. 5:</i><br><b>STI model:</b><br><i>(B134) No. 23 — (i11) No. 5:</i> | Is the resistance less than 10 Ω? | Except STI model: Check the tachometer. <Ref. to IDI-14, REMOVAL, Tachometer.> STI model: Replace the meter main assembly. | Repair the wiring harness.   |

## 6. CHECK FUEL LEVEL SENSOR

| Step  | Check   | Yes           | No                                 |
|---|---|---------------|------------------------------------|
| <b>1 CHECK FUEL LEVEL SENSOR.</b><br>1) Remove the fuel level sensor. <Ref. to FU(H4SO)-52, REMOVAL, Fuel Level Sensor.>, <Ref. to FU(H4DOTC)-60, REMOVAL, Fuel Level Sensor.> or <Ref. to FU(STI) section.><br>2) Measure the resistance between fuel level sensor terminals when setting the float to FULL and EMPTY position.<br><b>Terminals</b><br><b>No. 2 — No. 3:</b>                     | Is the resistance 0.5 to 2.5 Ω (FULL) and 50 to 52 Ω (EMPTY)? | Go to step 2. | Replace the fuel level sensor.     |
| <b>2 CHECK FUEL SUB LEVEL SENSOR.</b><br>1) Remove the fuel sub level sensor. <Ref. to FU(H4SO)-53, REMOVAL, Fuel Sub Level Sensor.>, <Ref. to FU(H4DOTC)-61, REMOVAL, Fuel Sub Level Sensor.> or <Ref. to FU(STI) section.><br>2) Measure the resistance between fuel sub level sensor terminals when setting the float to FULL and EMPTY position.<br><b>Terminals</b><br><b>No. 1 — No. 2:</b> | Is the resistance 0.5 to 2.5 Ω (FULL) and 42 to 44 Ω (EMPTY)? | Go to step 3. | Replace the fuel sub level sensor. |

# Combination Meter System

INSTRUMENTATION/DRIVER INFO

| Step   | Check                                     | Yes  | No                         |
|--|---|--|----------------------------|
| <b>3 CHECK HARNESS BETWEEN FUEL SUB LEVEL SENSOR AND COMBINATION METER.</b><br>1) Disconnect the connector from combination meter.<br>2) Measure the resistance between fuel sub level sensor harness connector terminal and combination meter harness connector terminal.<br><b>Connector &amp; terminal</b><br><b>Except STI model</b><br><b>(R59) No. 1 — (i12) No. 2:</b><br><b>STI model</b><br><b>(R59) No. 1 — (i12) No. 3:</b> | Is the resistance less than 10 $\Omega$ ? | Go to step 4.  | Repair the wiring harness. |
| <b>4 CHECK HARNESS BETWEEN FUEL LEVEL SENSOR AND FUEL SUB LEVEL SENSOR.</b><br>Measure the resistance between fuel level sensor harness connector terminal and fuel sub level sensor harness connector terminal.<br><b>Connector &amp; terminal</b><br><b>(R58) No. 3 — (R59) No. 2:</b>   | Is the resistance less than 10 $\Omega$ ? | Go to step 5.  | Repair the wiring harness. |
| <b>5 CHECK FUEL LEVEL SENSOR GROUND CIRCUIT.</b><br>Measure the resistance between fuel level sensor harness connector terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(R58) No. 2 — Chassis ground:</b>   | Is the resistance less than 10 $\Omega$ ? | Except STI model: Check the fuel gauge. <Ref. to IDI-15, REMOVAL, Fuel Gauge.> STI model: Replace the meter main assembly. | Repair the wiring harness. |

## 7. CHECK ENGINE COOLANT TEMPERATURE SENSOR

| Step   | Check  | Yes  | No   |
|--|--|--|--|
| <b>1 CHECK ENGINE COOLANT TEMPERATURE SENSOR.</b><br>Check the engine coolant temperature sensor. <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.> or <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.> or <Ref. to EN(STI) section.>   | Is the engine coolant temperature sensor OK? | Go to step 2.  | Replace the engine coolant temperature sensor. |
| <b>2 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND COMBINATION METER.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from engine coolant temperature sensor and combination meter.<br>3) Measure the resistance between engine coolant temperature sensor harness connector and combination meter harness connector.<br><b>Connector &amp; terminal</b><br><b>Except STI model:</b><br><b>(E8) No. 3 — (i12) No. 9:</b><br><b>STI model:</b><br><b>(E8) No. 3 — (i12) No. 11:</b> | Is the resistance less than 10 $\Omega$ ?    | Except STI model: Check the water temperature gauge. <Ref. to IDI-16, REMOVAL, Water Temperature Gauge.> STI model: Replace the meter main assembly. | Repair the wiring harness.                     |

# Combination Meter System

INSTRUMENTATION/DRIVER INFO

## 8. CHECK OUTSIDE TEMPERATURE INDICATOR

| Step     | Check  | Yes  | No  |
|----------|--|--|---|
| <b>1</b> | <b>CHECK AIR CONDITIONER TYPE.</b>   | Go to step 6.  | Go to step 2.   |
| <b>2</b> | <b>CHECK POWER SUPPLY FOR AMBIENT SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from combination meter.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between combination meter terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(i10) No. 11 (+) — Chassis ground (-):</b>   | Go to step 3.  | Except STI model:<br>Replace the combination meter printed circuit.<br>STI model:<br>Replace the meter main assembly. |
| <b>3</b> | <b>CHECK HARNESS BETWEEN AMBIENT SENSOR AND COMBINATION METER.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ambient sensor.<br>3) Measure the resistance between ambient sensor harness connector terminal and combination meter harness connector terminal.<br><b>Connector &amp; terminal</b><br><b>(F78) No. 1 — (i10) No. 11:</b><br><b>(F78) No. 2 — (i10) No. 8:</b> | Go to step 4.  | Repair the wiring harness.  |
| <b>4</b> | <b>CHECK AMBIENT SENSOR.</b><br>1) Remove the ambient sensor.<br>2) Check the ambient sensor. <Ref. to IDI-17, INSPECTION, Ambient Sensor.>  | Go to step 5.  | Replace the ambient sensor.   |
| <b>5</b> | <b>CHECK OUTSIDE TEMPERATURE INDICATOR.</b><br>1) Connect the combination meter harness connector.<br>2) Connect a resistor (2.2 k $\Omega$ ) between terminals of ambient sensor harness connector.<br>3) Turn the ignition switch to ON and check the outside temperature indicator display.   | Repair the poor contact of ambient sensor harness connector. | Except STI model:<br>Replace the combination meter printed circuit.<br>STI model:<br>Replace the meter main assembly. |
| <b>6</b> | <b>CHECK POWER SUPPLY FOR COMBINATION METER.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from auto A/C control module.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between auto A/C control module terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B282) No. 11 (+) — chassis ground (-):</b>                                       | Go to step 7.  | Replace the auto A/C control module.  |
| <b>7</b> | <b>CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND COMBINATION METER.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from combination meter.<br>3) Measure the resistance between auto A/C control module harness connector terminal and combination meter harness connector terminal.<br><b>Connector &amp; terminal</b><br><b>(B282) No. 11 — (i10) No. 12:</b>               | Go to step 8.  | Repair the wiring harness.  |

# Combination Meter System

INSTRUMENTATION/DRIVER INFO

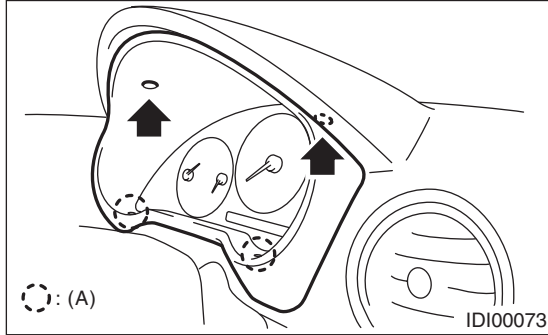
| Step   | Check  | Yes  | No  |
|--|--|--|---|
| <b>8 CHECK POWER SUPPLY FOR AMBIENT SENSOR.</b><br>1) Turn the ignition switch to ON.<br>2) Measure the voltage between auto A/C control module terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B283) No. 9 (+) — chassis ground (-):</b>   | Is the voltage more than 4 V?                                | Go to step 9.  | Replace the auto A/C control module.  |
| <b>9 CHECK HARNESS BETWEEN AMBIENT SENSOR AND COMBINATION METER.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the connector from ambient sensor.<br>3) Measure the resistance between ambient sensor harness connector terminal, combination meter harness connector terminal and auto A/C control module harness connector terminal.<br><b>Connector &amp; terminal</b><br><b>(F78) No. 1 — (i10) No. 11:</b><br><b>(F78) No. 1 — (B283) No. 9:</b><br><b>(F78) No. 2 — (i10) No. 8:</b> | Is the resistance less than 10 $\Omega$ ?                    | Go to step 10.   | Repair the wiring harness.  |
| <b>10 CHECK AMBIENT SENSOR.</b><br>1) Remove the ambient sensor.<br>2) Check the ambient sensor. <Ref. to IDI-17, INSPECTION, Ambient Sensor.>   | Is the ambient sensor OK?                                    | Go to step 11.   | Replace the ambient sensor.   |
| <b>11 CHECK OUTSIDE TEMPERATURE INDICATOR.</b><br>1) Connect the combination meter and auto A/C control module harness connector.<br>2) Connect a resistor (2.2 k $\Omega$ ) between terminals of ambient sensor harness connector.<br>3) Turn the ignition switch to ON and check the outside temperature indicator display.  | Is the outside temperature indicator indicating 25°C (77°F)? | Repair the poor contact of ambient sensor harness connector. | Except STI model: Replace the combination meter printed circuit.<br>STI model: Replace the meter main assembly. |

# Combination Meter

## 3. Combination Meter

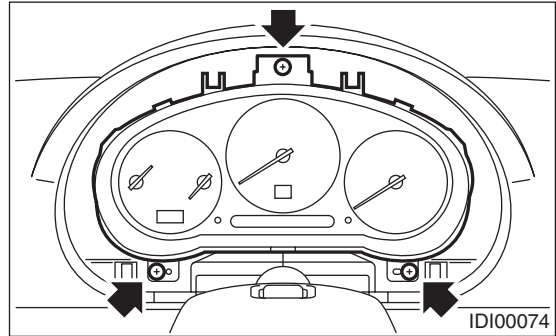
### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Set the tilt steering at lowest position.
- 3) Remove the screws and detach the meter visor.



(A) Hook

- 4) Remove the screws of combination meter and pull out the meter toward you.



- 5) Disconnect the connector in the upper area of combination meter to remove the meter.

### CAUTION:

- Be careful not to damage the meter and instrument panel.
- Pay particular attention to avoid damaging the meter glass.

### B: INSTALLATION

Install in the reverse order of removal.

### CAUTION:

- Make sure that electrical connector is connected securely.
- Make sure that each meter operates normally.

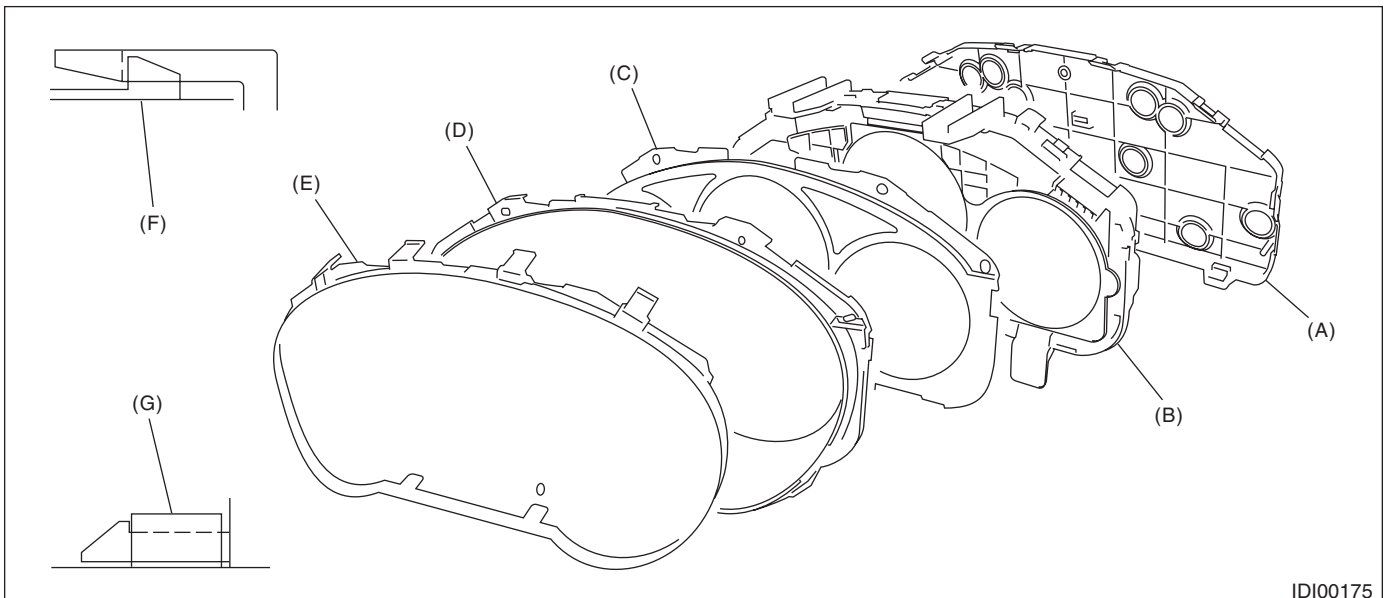
### C: DISASSEMBLY

#### 1. EXCEPT STI MODEL

### CAUTION:

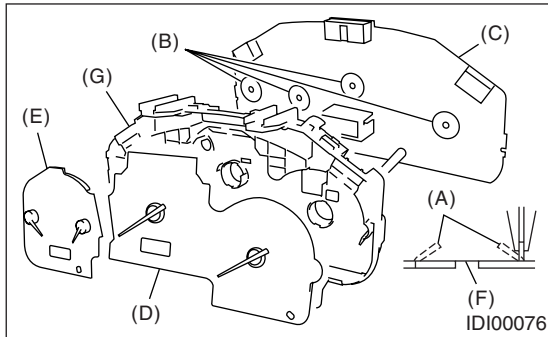
Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.

- 1) Disengage the claw (F) to remove the inner case (B) from back cover (A).
- 2) Disengage the claw (G) to remove the meter glass (E), reflector (D), and window plate (C) from inner case (B).



3) Pull up the claw (A) in portion (B) of combination meter printed circuit (C) with combination pliers. Push out the speedometer and tachometer assembly (D) and fuel gauge and water temperature gauge assembly (E) using hole (F).

4) Pull up the claw in center of combination meter printed circuit (C), and remove the printed circuit from case (G).

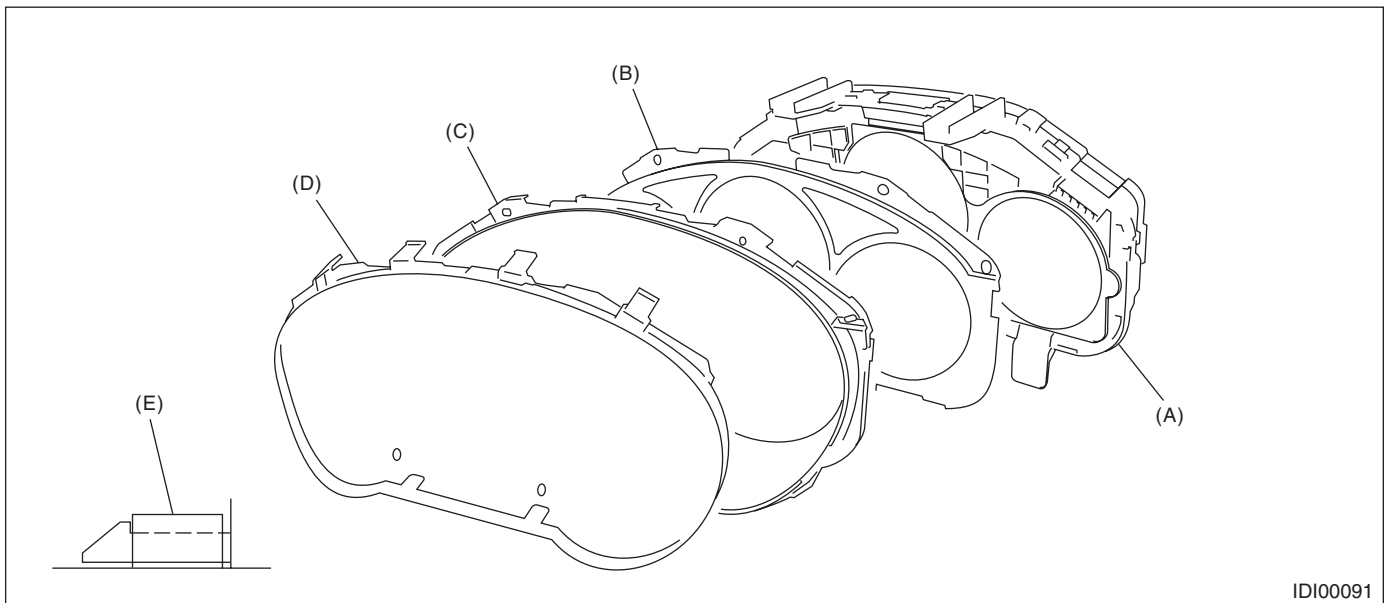


## 2. STI MODEL

### CAUTION:

- Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.
- Do not disassemble the meter main assembly for STI model.

Disengage the claw (E) to remove the meter glass (D), reflector (C), and window plate (B) from meter main assembly (A).

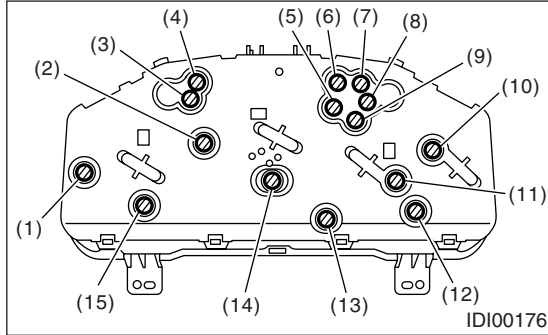


# Combination Meter

INSTRUMENTATION/DRIVER INFO

## 3. BULB REPLACEMENT

### • EXCEPT STI MODEL



- (1) Tachometer (Non-turbo model) or speedometer (Turbo model)
- (2) Speedometer and tachometer
- (3) Turn signal indicator light (RH)
- (4) HI-beam indicator light
- (5) Speedometer (Non-turbo model) or tachometer (Turbo model)
- (6) Cruise set indicator light
- (7) Cruise indicator light
- (8) Turn signal indicator light (LH)
- (9) Brake fluid and parking brake warning light
- (10) Fuel gauge
- (11) Temperature gauge
- (12) LCD (Outside temperature indicator)
- (13) Charge warning light
- (14) LCD (Odometer and tripmeter) (Non-turbo model)
- (15) LCD (Odometer and tripmeter) (Turbo model)

### • STI MODEL

Replace the meter main assembly of STI model if it does not function properly, because the warning light and indicator light are made from LED.

## D: ASSEMBLY

Assemble in the reverse order of disassembly.

## 4. Speedometer

### A: REMOVAL

#### NOTE:

Main meter assembly of STI model cannot be disassembled. Do not remove or inspect the speedometer as a single unit.

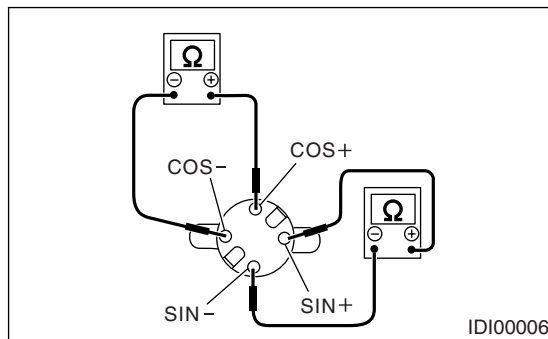
Disassemble the combination meter, and then remove the speedometer and tachometer assembly.  
<Ref. to IDI-10, DISASSEMBLY, Combination Meter.>

### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

Measure the speedometer resistance.



| Terminal                | Resistance |
|-------------------------|------------|
| Terminals SIN+ and SIN- | 200±8 Ω    |
| Terminals COS+ and COS- | 200±8 Ω    |

If NG, replace the speedometer and tachometer assembly.

If OK, replace the combination meter printed circuit.



## 5. Tachometer

### A: REMOVAL

**NOTE:**

Main meter assembly of STI model cannot be disassembled. Do not remove or inspect the tachometer as a single unit.

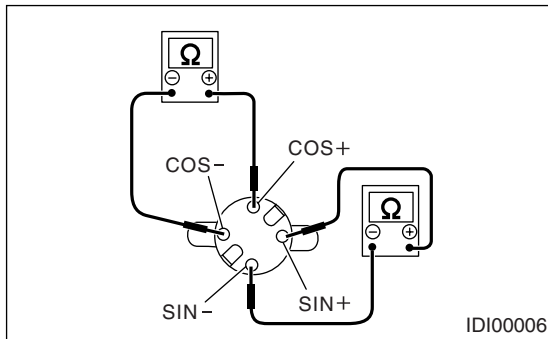
Disassemble the combination meter, and then remove the speedometer and tachometer assembly. <Ref. to IDI-10, DISASSEMBLY, Combination Meter.>

### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

Measure the tachometer resistance.



| Terminal                | Resistance |
|-------------------------|------------|
| Terminals SIN+ and SIN- | 200±8 Ω    |
| Terminals COS+ and COS- | 200±8 Ω    |

If NG, replace the speedometer and tachometer assembly.

If OK, replace the combination meter printed circuit.

## 6. Fuel Gauge

### A: REMOVAL

**NOTE:**

Main meter assembly of STI model cannot be disassembled. Do not remove or inspect the fuel gauge as a single unit.

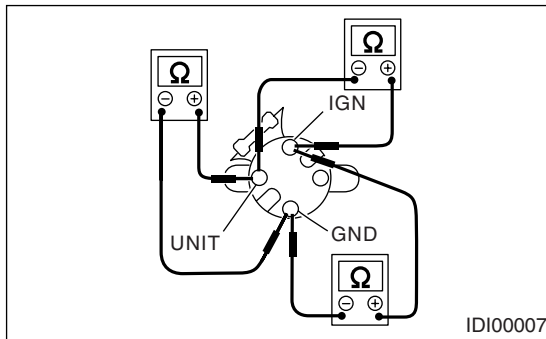
Disassemble the combination meter, and then remove the water temperature gauge and fuel gauge assembly. <Ref. to IDI-10, DISASSEMBLY, Combination Meter.>

### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

Measure the fuel gauge resistance.



| Terminal               | Resistance |
|------------------------|------------|
| Terminals IGN and GND  | 170±10 Ω   |
| Terminals IGN and UNIT | 35±10 Ω    |
| Terminals UNIT and GND | 136±10 Ω   |

If NG, replace the water temperature gauge and fuel gauge assembly.

If OK, replace the combination meter printed circuit.

# Water Temperature Gauge

INSTRUMENTATION/DRIVER INFO

## 7. Water Temperature Gauge

### A: REMOVAL

#### NOTE:

Main meter assembly of STI model cannot be disassembled. Do not remove or inspect the water temperature gauge as a single unit.

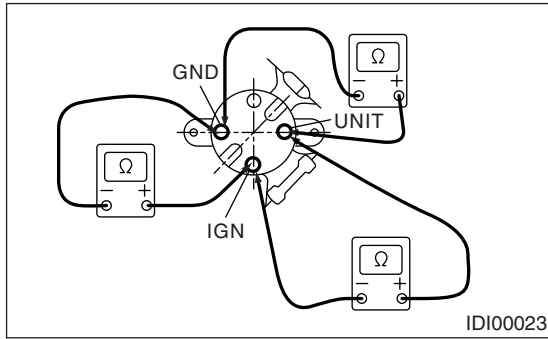
Disassemble the combination meter, and then remove the tachometer and water temperature gauge and fuel gauge assembly. <Ref. to IDI-10, DISASSEMBLY, Combination Meter.>

### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

Measure the water temperature gauge resistance.



| Terminal               | Resistance          |
|------------------------|---------------------|
| Terminals IGN and GND  | $208 \pm 10 \Omega$ |
| Terminals IGN and UNIT | $56 \pm 10 \Omega$  |
| Terminals UNIT and GND | $264 \pm 10 \Omega$ |

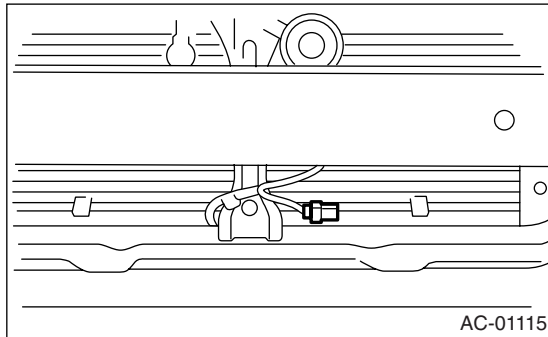
If NG, replace the water temperature gauge and fuel gauge assembly.

If OK, replace the combination meter printed circuit.

## 8. Ambient Sensor

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the ambient sensor connector.
- 3) Remove the ambient sensor from radiator lower panel.

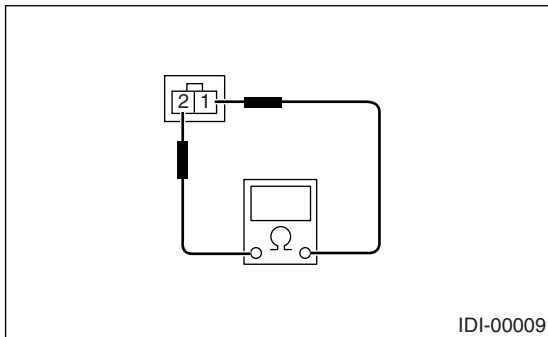


### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

Measure the ambient sensor resistance.



| Terminal | Resistance                  |
|----------|-----------------------------|
| 1 and 2  | 2.2 k $\Omega$ /25°C (77°F) |

If NG, replace the ambient sensor.



# SEATS

# *SE*

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|                              | <b>Page</b> |
|------------------------------|-------------|
| 1. General Description ..... | 2           |
| 2. Front Seat .....          | 7           |
| 3. Rear Seat .....           | 13          |
| 4. Seat Heater System .....  | 16          |

# General Description

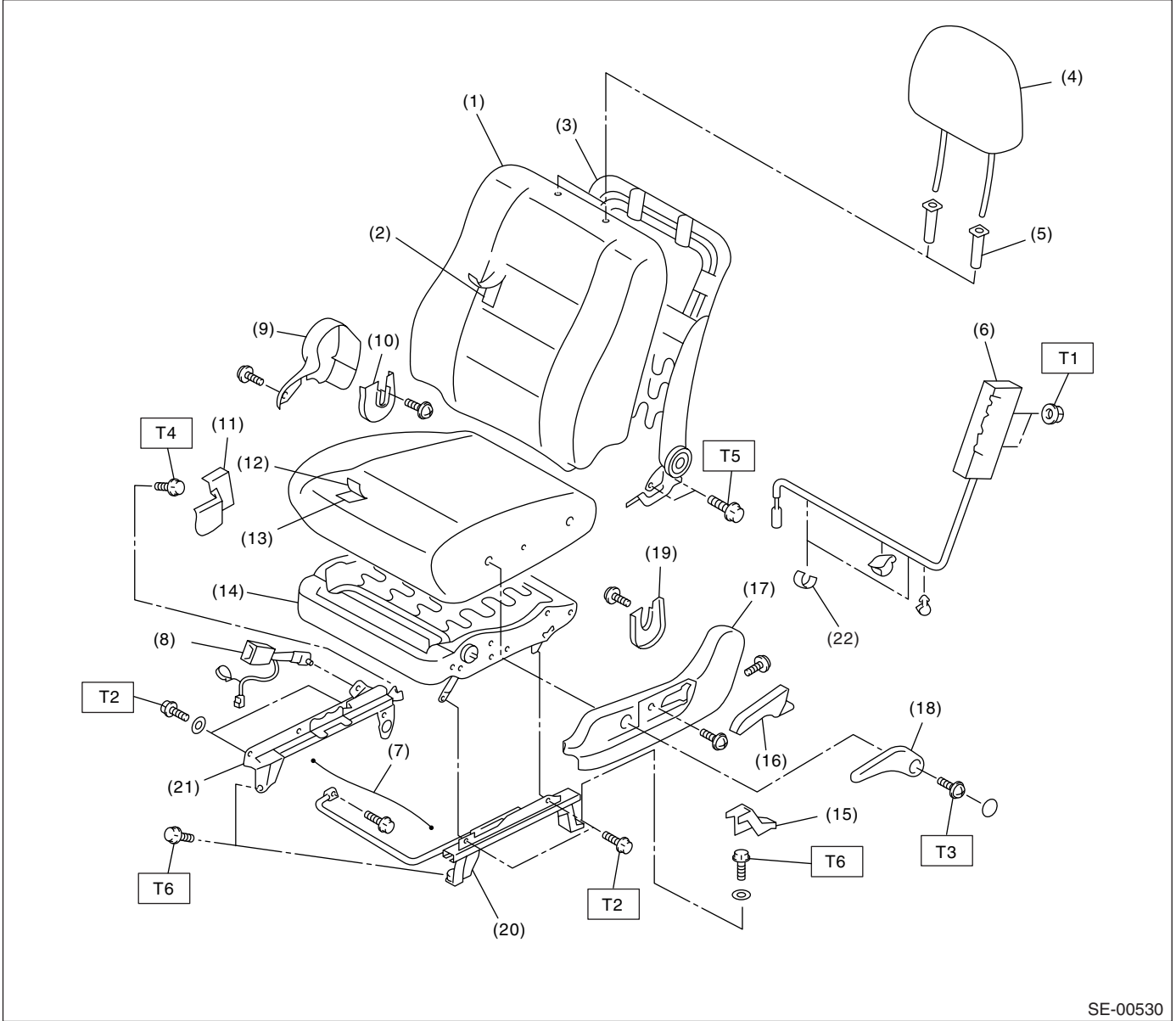
SEATS

## 1. General Description

### A: COMPONENT

#### 1. FRONT SEAT

- Driver's seat



- |                                |                                |
|--------------------------------|--------------------------------|
| (1) Backrest cover             | (12) Seat cushion cover        |
| (2) Backrest pad               | (13) Seat cushion pad          |
| (3) Backrest frame ASSY        | (14) Seat cushion frame ASSY   |
| (4) Headrest ASSY              | (15) Bolt cover outer          |
| (5) Headrest lock bushing      | (16) Reclining lever           |
| (6) Side airbag module         | (17) Seat hinge outer cover    |
| (7) Connecting wire            | (18) Lifter lever              |
| (8) Inner belt                 | (19) Seat hinge inner cover RH |
| (9) Seat hinge inner cover     | (20) Outer slide rail          |
| (10) Seat hinge inner cover LH | (21) Inner slide rail          |
| (11) Bolt cover inner          | (22) Tape                      |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 5.9 (0.60, 4.35)**

**T2: 10 (1.02, 7.38)**

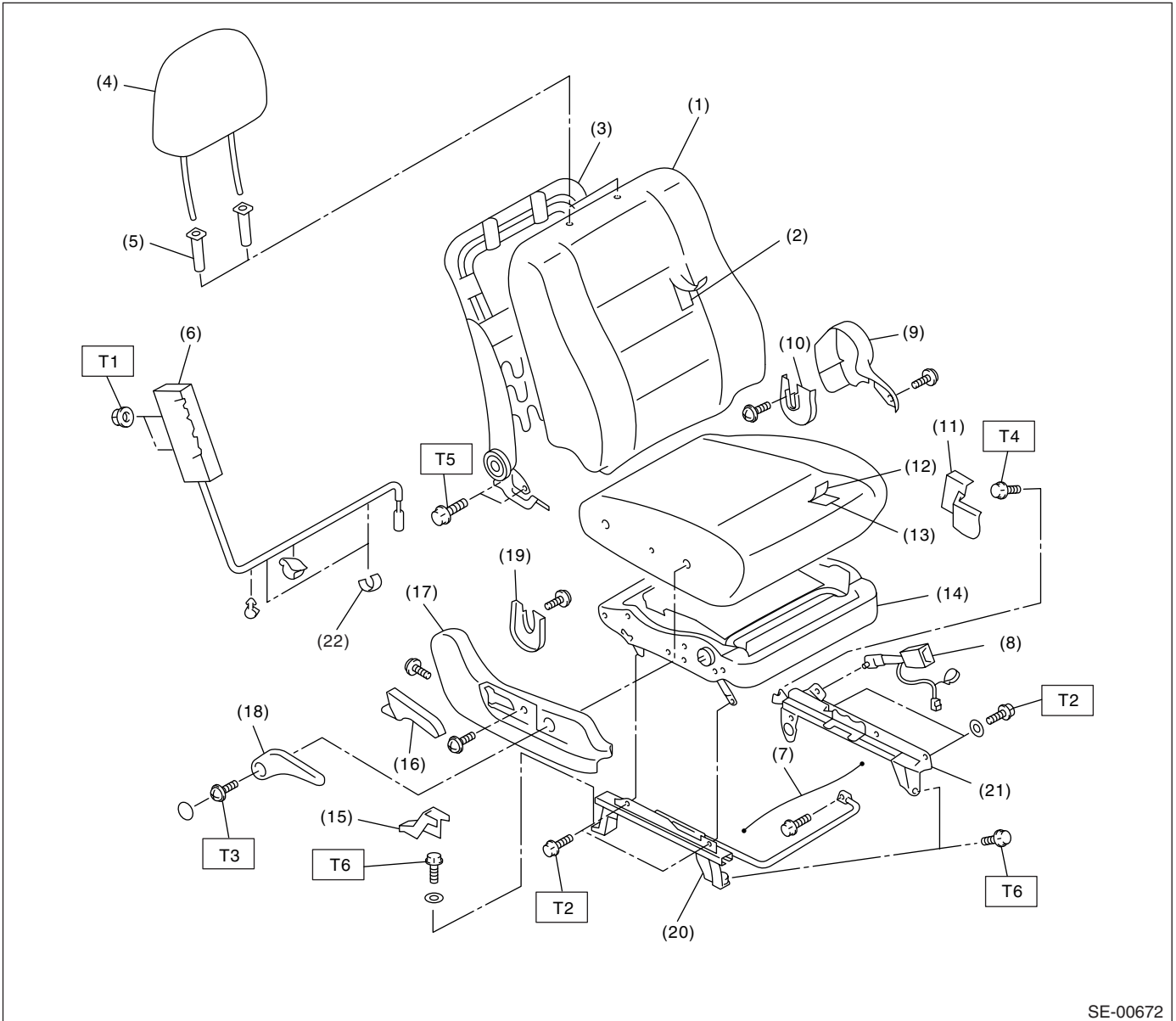
**T3: 22 (2.24, 16.2)**

**T4: 30 (3.06, 22.1)**

**T5: 52 (5.30, 38.4)**

**T6: 53 (5.40, 39.1)**

• Passenger's seat



SE-00672

- |                                |                                |
|--------------------------------|--------------------------------|
| (1) Backrest cover             | (12) Seat cushion cover        |
| (2) Backrest pad               | (13) Seat cushion pad          |
| (3) Backrest frame ASSY        | (14) Seat cushion frame ASSY   |
| (4) Headrest ASSY              | (15) Bolt cover outer          |
| (5) Headrest lock bushing      | (16) Reclining lever           |
| (6) Side airbag module         | (17) Seat hinge outer cover    |
| (7) Connecting wire            | (18) Lifter lever              |
| (8) Inner belt                 | (19) Seat hinge inner cover RH |
| (9) Seat hinge inner cover     | (20) Outer slide rail          |
| (10) Seat hinge inner cover LH | (21) Inner slide rail          |
| (11) Bolt cover inner          | (22) Tape                      |

**Tightening torque: N·m (kgf-m, ft-lb)**

**T1: 5.9 (0.60, 4.35)**

**T2: 10 (1.02, 7.38)**

**T3: 22 (2.24, 16.2)**

**T4: 30 (3.06, 22.1)**

**T5: 52 (5.30, 38.4)**

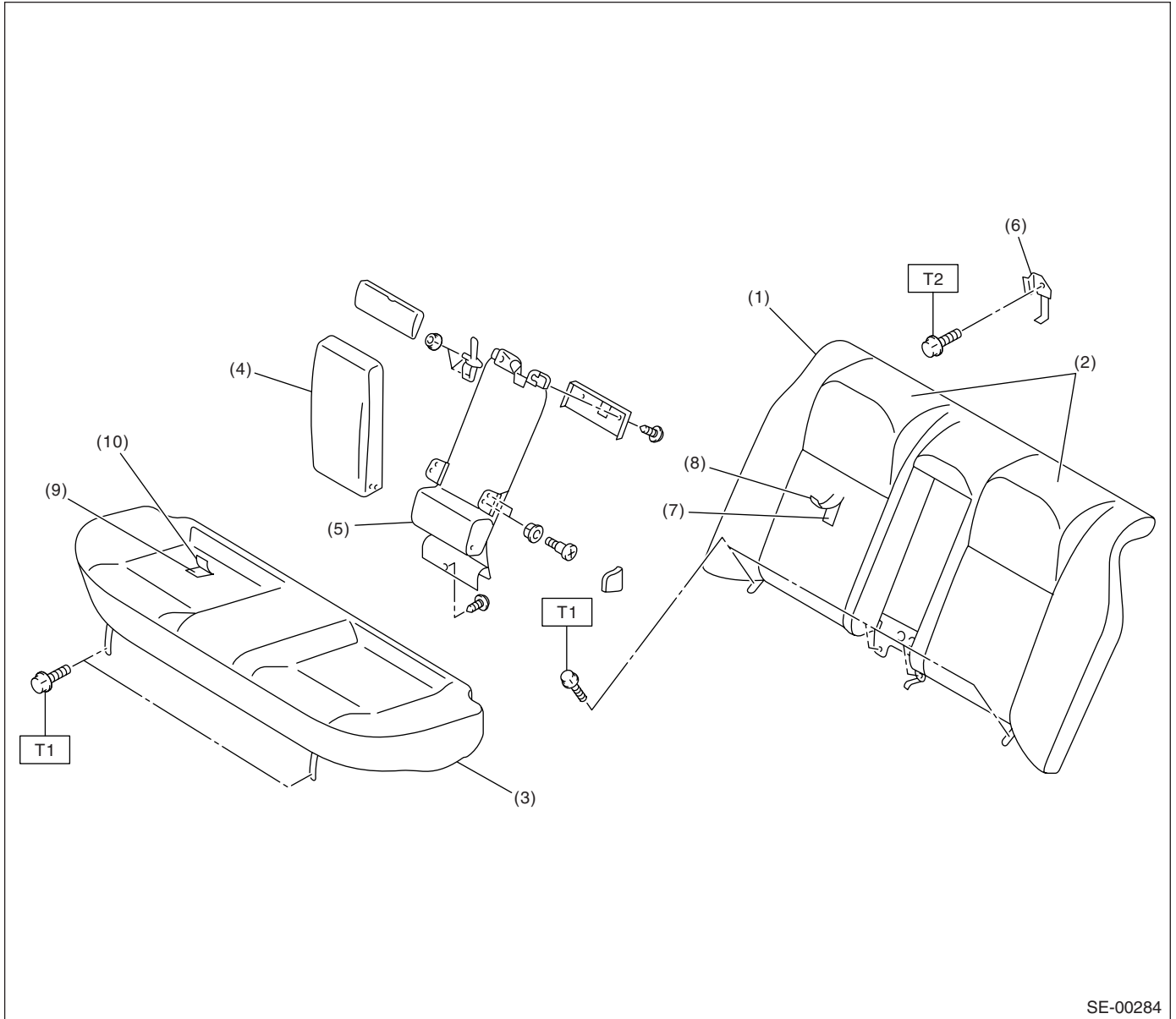
**T6: 53 (5.40, 39.1)**



# General Description

## SEATS

### 2. REAR SEAT (SEDAN MODEL)



- (1) Backrest
- (2) Headrest
- (3) Cushion
- (4) Armrest
- (5) Center through frame

- (6) Hook
- (7) Backrest pad ASSY
- (8) Backrest cover ASSY
- (9) Rear pad & cushion frame ASSY

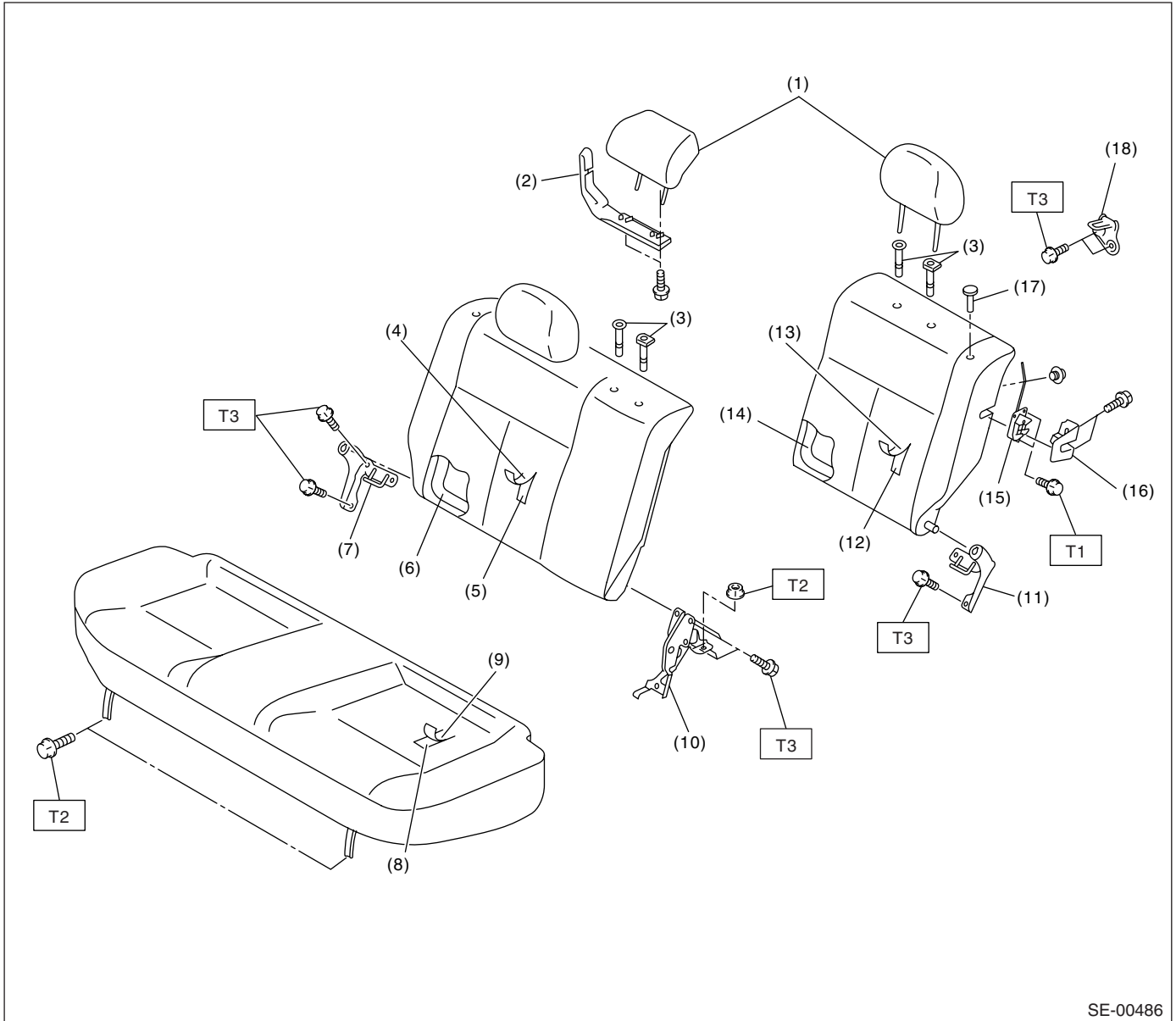
- (10) Rear cushion cover

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 10 (1.02, 7.38)**

**T2: 24.5 (2.5, 18.1)**

## 3. REAR SEAT (WAGON MODEL)



SE-00486

- |                       |                            |
|-----------------------|----------------------------|
| (1) Headrest          | (9) Seat cushion cover     |
| (2) Seat belt guide   | (10) Hinge ASSY CTR        |
| (3) Headrest bushing  | (11) Hinge ASSY LH         |
| (4) Backrest cover RH | (12) Backrest pad LH       |
| (5) Backrest pad RH   | (13) Backrest cover LH     |
| (6) Backrest frame RH | (14) Backrest frame LH     |
| (7) Hinge ASSY RH     | (15) Seat back latch       |
| (8) Seat cushion pad  | (16) Seat back latch cover |

- |                    |
|--------------------|
| (17) Backrest knob |
| (18) Striker       |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 17.7 (1.81, 13.1)**

**T2: 24.5 (2.5, 18.1)**

**T3: 33 (3.3, 24.6)**

# General Description

## SEATS

---

### **B: CAUTION**

- If the seat cushion cover has been removed or replaced, be sure to perform the system calibration for occupant detection system after installing seat to the vehicle. <Ref. to OD(diag)-19, SYSTEM CALIBRATION (REZEROING), OPERATION, Subaru Select Monitor.>

Failure to do so may cause improper operation of occupant detection system.

- Never remove the occupant detection control module of occupant detection system (passenger's side only) or pressure sensor from seat cushion frame since the control module and occupant detection sensor are fixed to the seat cushion frame.
- Do not replace the seat cushion pad as a single unit. Be sure to replace the seat cushion pad and frame assembly together. Since the seat cushion pad and cushion frame have been adjusted at factory, installing them together with parts for other vehicle or ones of other set may cause improper operation of occupant detection system.
- If the seat cushion cover has been removed, be sure to replace wire on the seat cushion cover side with a new one. (Passenger's seat)
- Do not remove the seat position sensor from seat rail. (Driver's seat)
- When removing the front seat, follow cautions given in the airbag section. <Ref. to AB-3, CAUTION, General Description.>

### **C: PREPARATION TOOL**

#### **1. GENERAL TOOL**

| TOOL NAME        | Remarks                       |
|------------------|-------------------------------|
| Long nose pliers | Used for removing hog ring.   |
| Hog ring pliers  | Used for installing hog ring. |

## 2. Front Seat

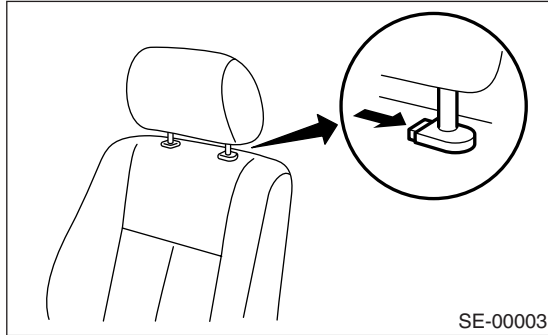
### A: REMOVAL

1) Disconnect the ground cable from battery.

#### CAUTION:

The airbag system is fitted with a backup power source. If the airbag system is serviced within 20 seconds after the ground cable is disconnected, it may inflate.

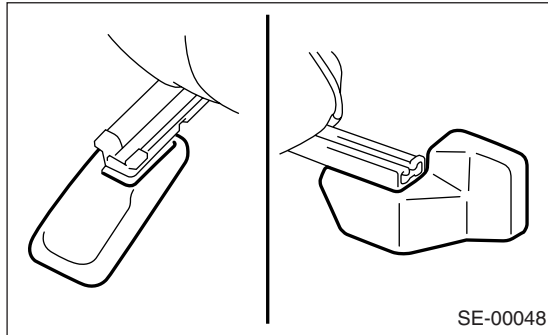
2) While pressing the headrest lock button, remove the headrest.



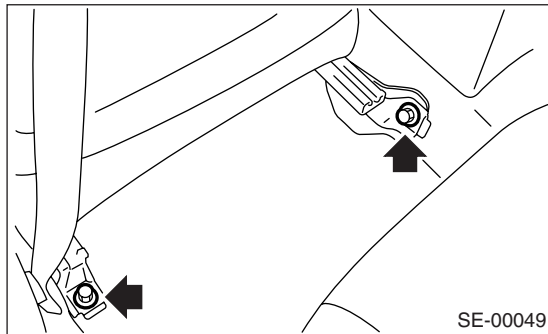
3) Tilt forward the backrest.

4) Move the seat to full front end.

5) Remove the bolt cover at rear end of slide rail.

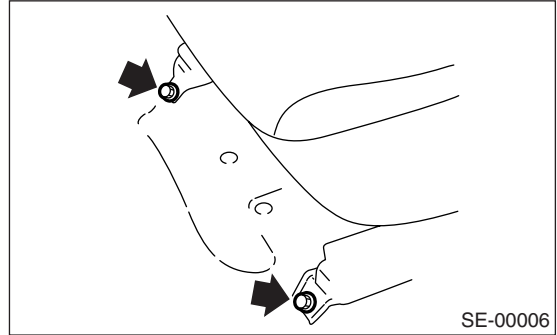


6) Remove the two bolts at rear side of seat rail.



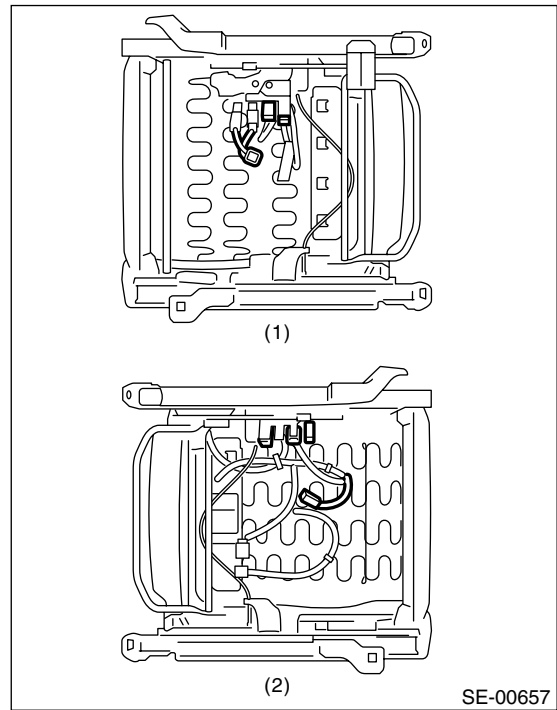
7) Move the seat to full rear end.

8) Remove the two bolts at front side of seat rail.



9) Disconnect the connector under seat.

- Seat position sensor connector (Driver's seat)
- Seat belt buckle switch connector (Driver's seat)
- Occupant detection control module harness connector (Passenger's seat)
- Side airbag connector
- Seat heater connector (with seat heater)



(1) Driver's seat

(2) Passenger's seat

10) Remove the front seat from vehicle.

# Front Seat

## SEATS

### B: INSTALLATION

Install in the reverse order of removal.

#### CAUTION:

After driver's seat installation, check that the seat position sensor LH operates normally using Subaru Select Monitor.

<Ref. to AB(diag)-27, STATUS DATA DISPLAY, OPERATION, Subaru Select Monitor.>

#### Tightening torque:

Refer to **COMPONENT** in *General Description*. <Ref. to SE-2, FRONT SEAT, COMPONENT, General Description.>

### C: DISASSEMBLY

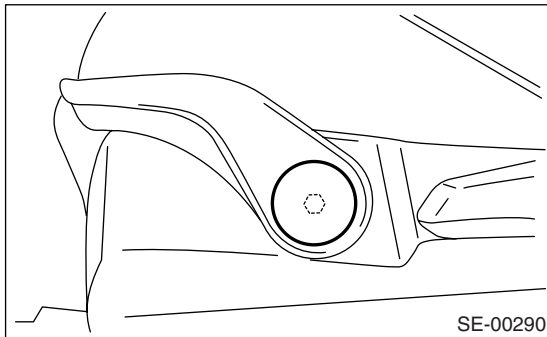
#### CAUTION:

Refer to **CAUTION** in *General Description* before starting the work. <Ref. to SE-6, CAUTION, General Description.>

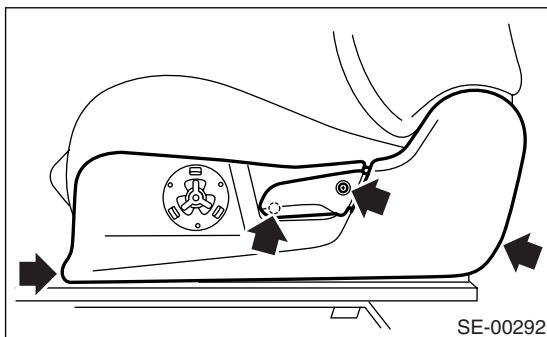
#### 1. STANDARD SEAT

1) Remove the seat from vehicle. <Ref. to SE-7, REMOVAL, Front Seat.>

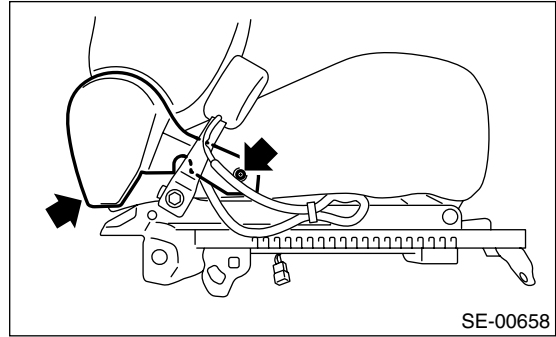
2) Remove the seat lifter cover using a flat tip screwdriver or equivalent, and then loosen the inside bolt to remove seat lifter lever.



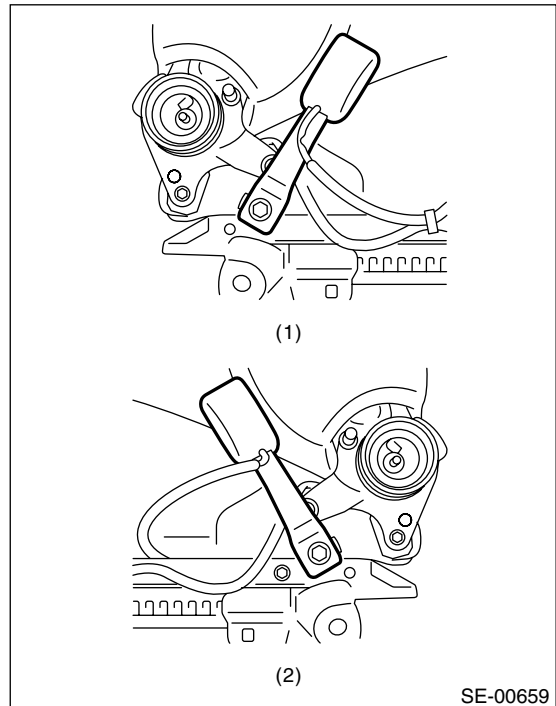
3) Remove the reclining lever and seat hinge outer cover.



4) Remove the seat hinge inner cover.



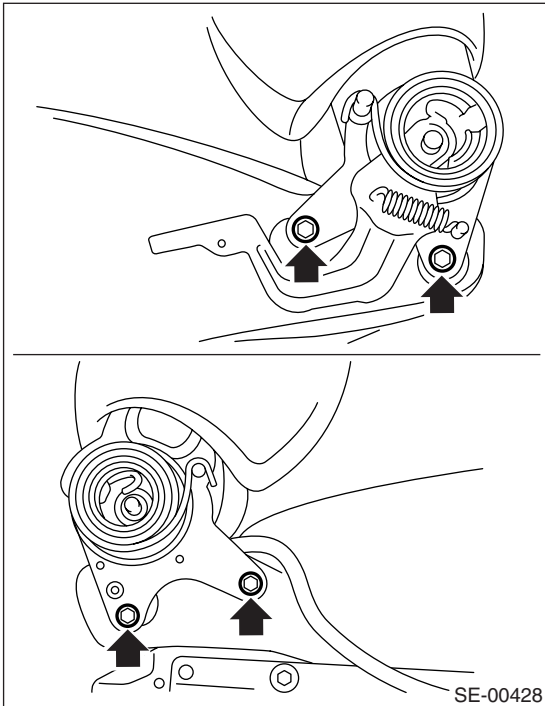
5) Remove the inner belt.



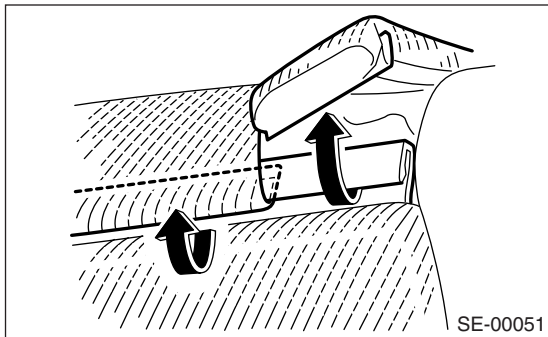
(1) Driver's seat

(2) Passenger's seat

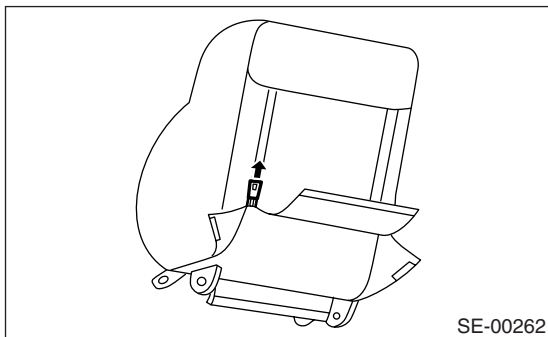
6) Remove two bolts from reclining hinge on each side.



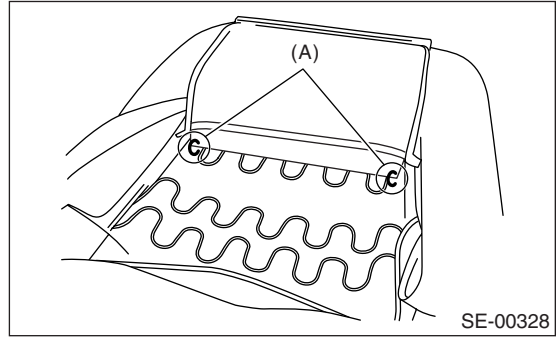
7) Remove the hook at the bottom-back side of backrest.



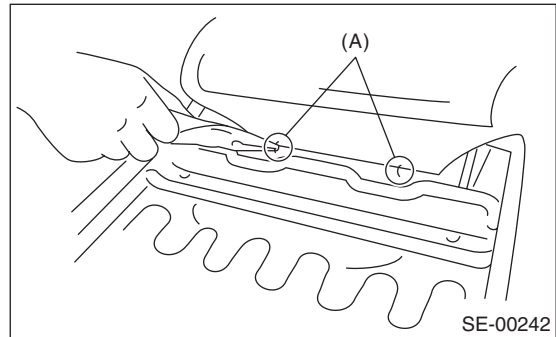
8) Open the zipper behind of backrest.



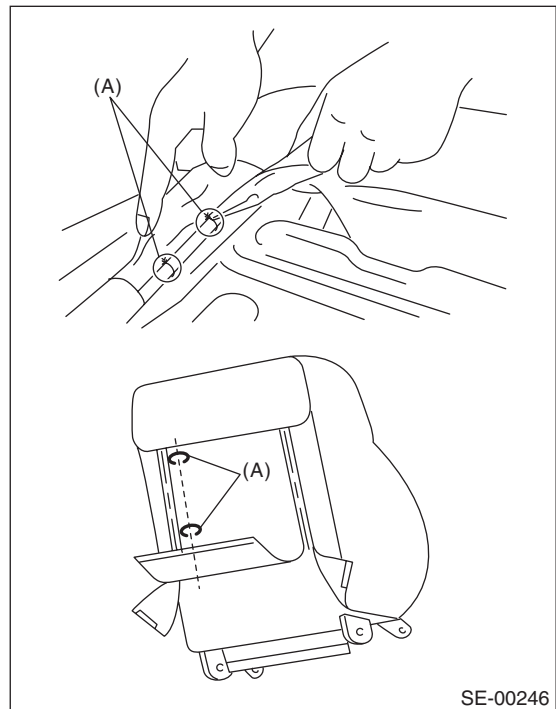
9) Remove the hog rings (A) of backrest cover.



10) Remove the hog rings (A) which secure the backrest cover and backrest pad.



11) Open the zipper behind of backrest cover, and then remove the hog rings (A) at the side-inner part of backrest from backrest frame.



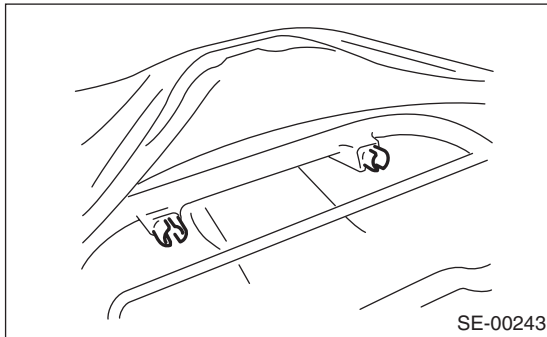
# Front Seat

## SEATS

12) Remove the headrest bushings.

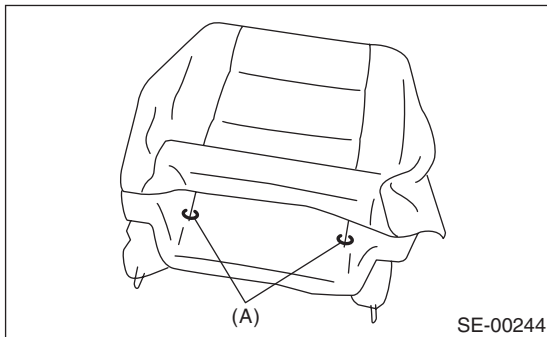
**NOTE:**

Push the headrest bushings out from seat inside, and then remove them.

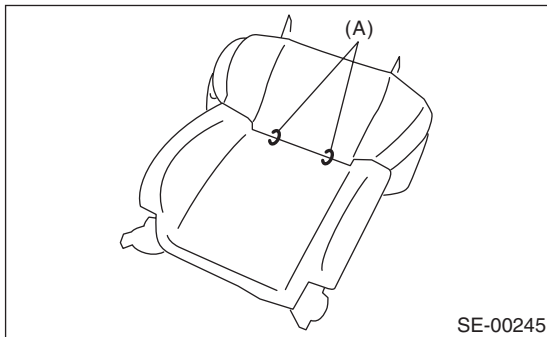


13) Pull out the backrest frame.

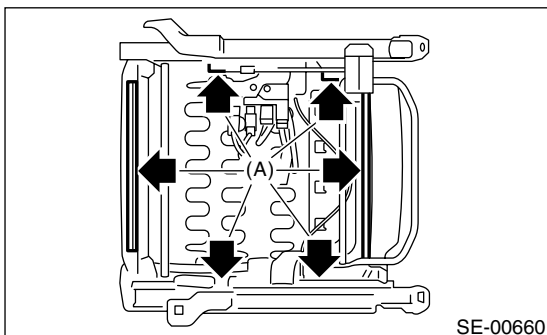
14) Remove the hog rings (A) at the front-bottom of seat back.



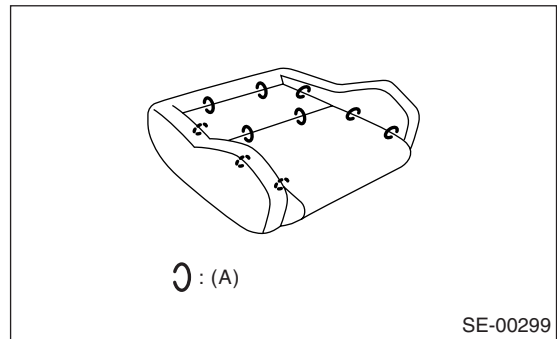
15) Remove the hog rings (A) at the seat back front, and then remove the seat back cover from seat back.



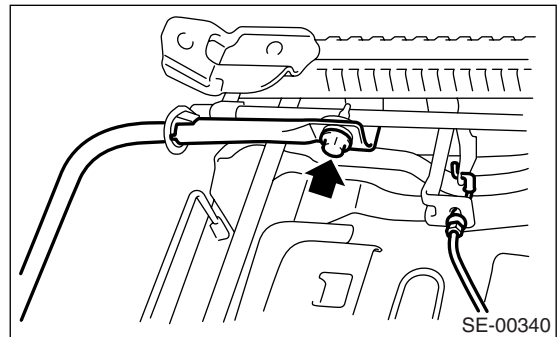
16) Remove the hooks (A), and then remove the seat cushion frame assembly.



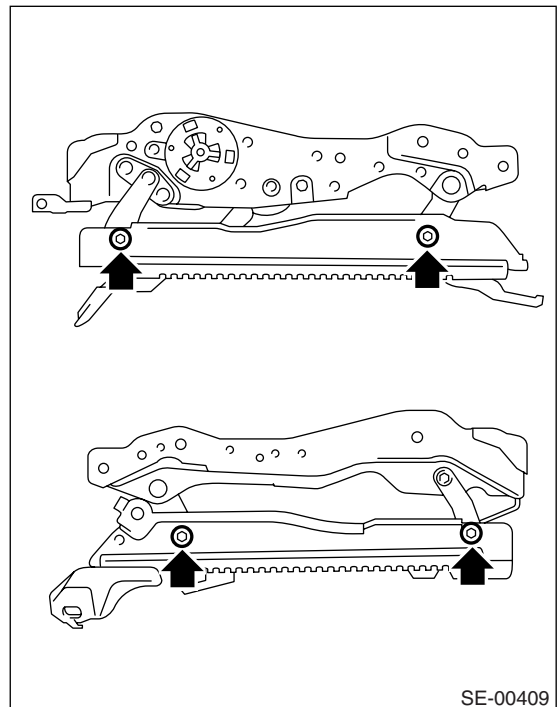
17) Remove the hog rings (A), and then remove the seat cushion cover from seat cushion pad.



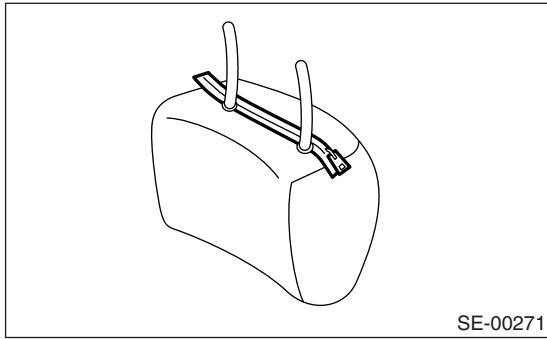
18) Remove the bolt of sliding adjustment bar and connecting wire.



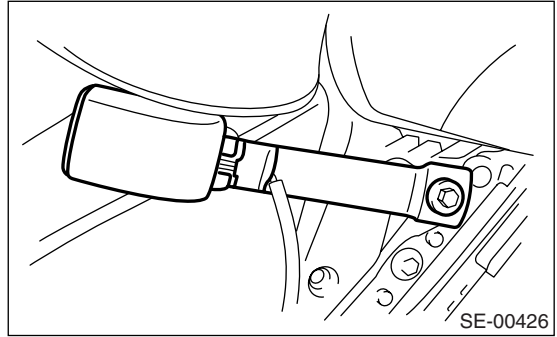
19) Remove the bolts, and then remove the slide rail.



20) Open the zipper at bottom of headrest, and then remove the headrest cover from headrest.



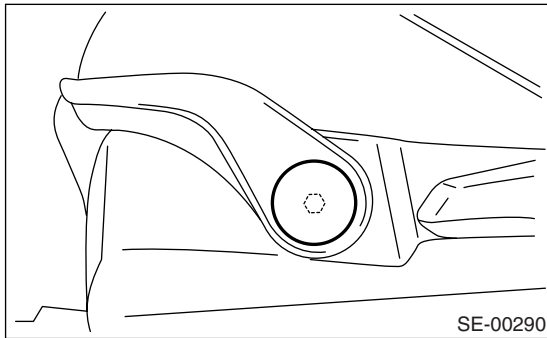
5) Remove the inner belt.



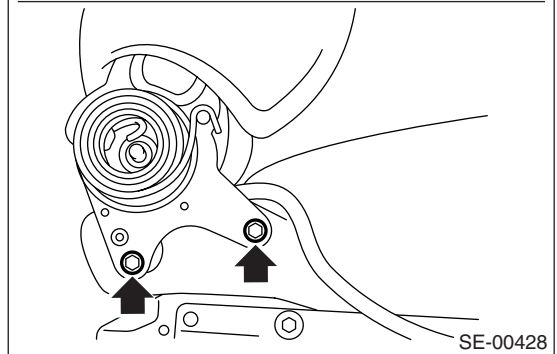
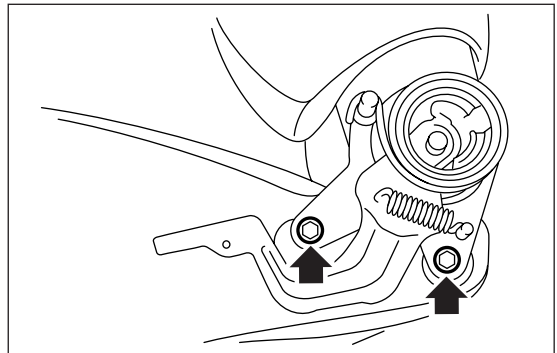
## 2. BUCKET TYPE SEAT

1) Remove the seat from vehicle. <Ref. to SE-7, REMOVAL, Front Seat.>

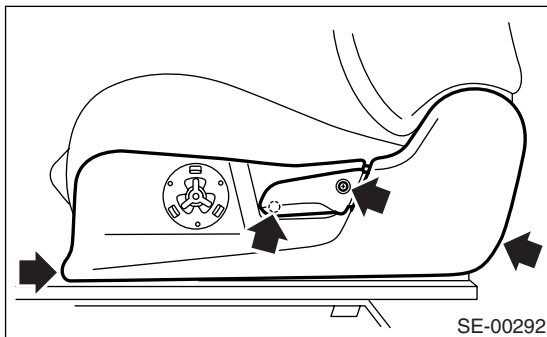
2) Remove the seat lifter cover using a flat tip screwdriver or equivalent, and then loosen inside bolt to remove seat lifter lever.



6) Remove two bolts from reclining hinge on each side.

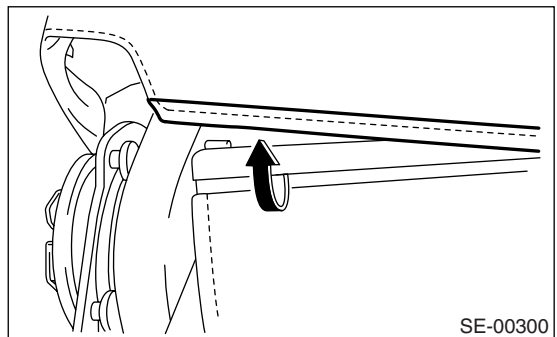
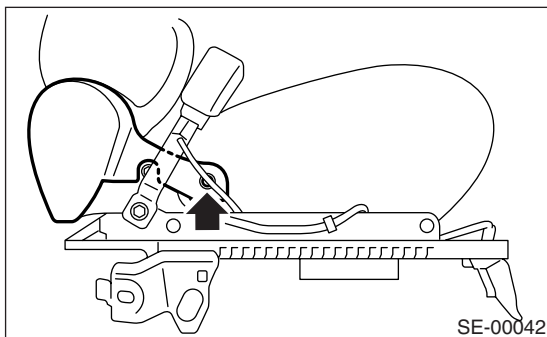


3) Remove the reclining lever and seat hinge outer cover.



7) Remove the hook at the bottom-back side of backrest.

4) Remove the seat hinge inner cover.

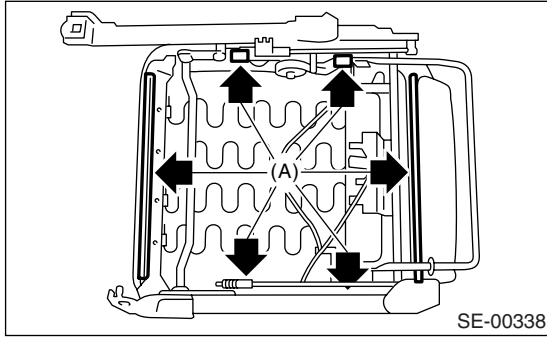




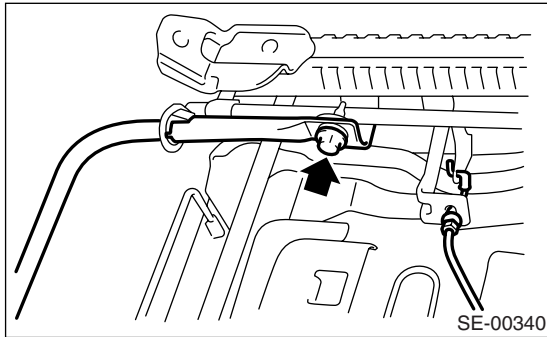
## Front Seat

### SEATS

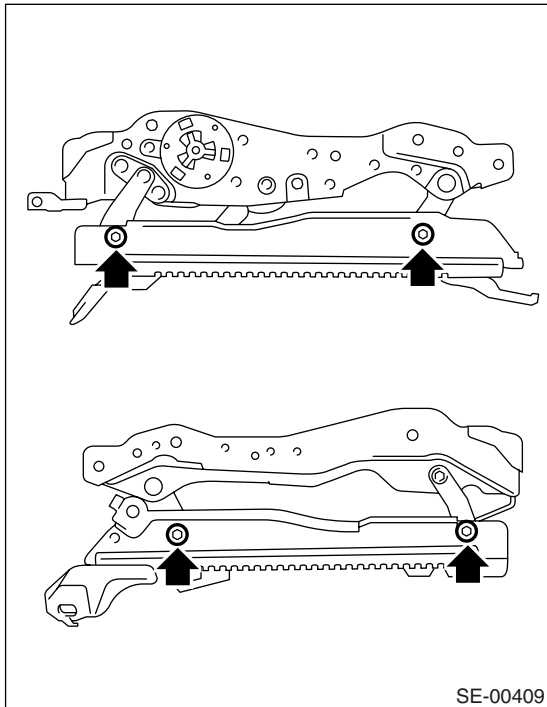
8) Remove the hooks (A), and then remove the seat cushion frame assembly.



9) Remove the bolt of sliding adjustment bar and connecting wire.



10) Remove the bolts, and then remove the slide rail.



## D: ASSEMBLY

### 1. STANDARD SEAT

#### CAUTION:

(1) Because it may cause the side airbag to activate incorrectly, observe the following steps to install the side airbag correctly.

- Be careful not to contaminate or damage the backrest cover.
- Always use new hog rings.
- Secure the hog ring using hog ring pliers.
- Install the hog ring to its original position, and not to twist or wrinkle the backrest cover.

(2) To avoid the improper operation of occupant detection system, strictly obey the following works at assembly of passenger's seat.

- If the seat cushion cover has been removed or replaced, be sure to perform the system calibration for occupant detection system after installing the seat. <Ref. to OD(diag)-19, SYSTEM CALIBRATION (REZEROING), OPERATION, Subaru Select Monitor.>
- Failure to do so may cause improper operation of passenger's airbag.
- Never remove the occupant detection control module of occupant detection system (passenger's side only) and occupant detection sensor from seat cushion frame since the control module, the sensor, seat cushion pad and seat cushion frame are the seat cushion pad and frame assembly.
- Do not remove the seat position sensor from seat rail. (Driver's seat)
- The seat cushion cover has been removed, be sure to replace wire on the seat cushion cover side with a new one. (Passenger's seat)
- Install the hog ring to the specified position correctly. Do not re-use the hog ring.

#### Tightening torque:

Refer to **COMPONENT** in *General Description*. <Ref. to SE-2, FRONT SEAT, COMPONENT, *General Description*.>

Assemble in the reverse order of disassembly.

### 2. BUCKET TYPE SEAT

Assemble in the reverse order of disassembly.

#### Tightening torque:

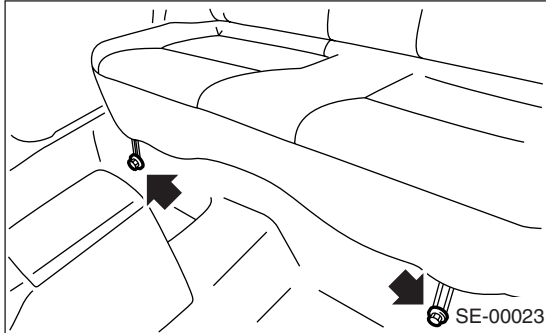
Refer to **COMPONENT** in *General Description*. <Ref. to SE-2, FRONT SEAT, COMPONENT, *General Description*.>

## 3. Rear Seat

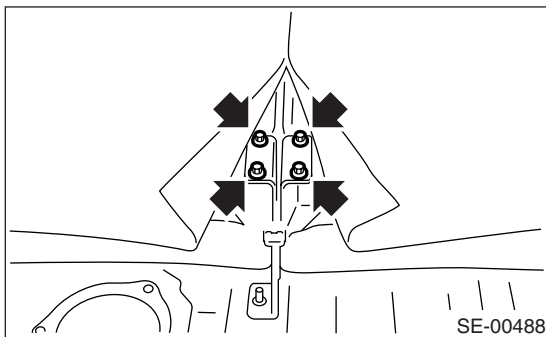
### A: REMOVAL

#### 1. WAGON MODEL

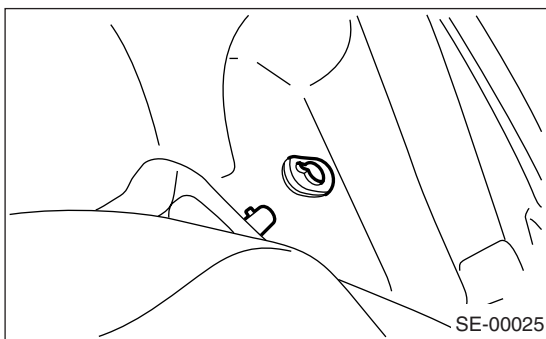
1) Remove the bolts, and then detach the rear seat cushion.



- 2) Remove the headrest.
- 3) Remove the luggage floor mat. <Ref. to EI-61, REMOVAL, Luggage Floor Mat.>
- 4) Turn over the mat to remove the bolts.

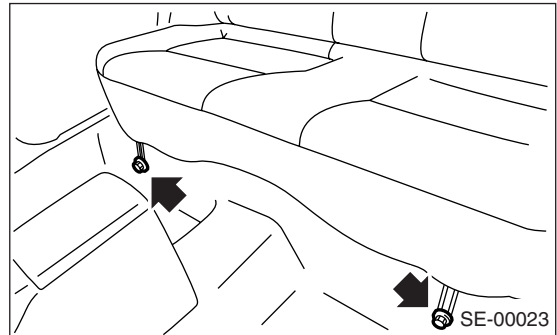


5) Remove the rear seat backrest.

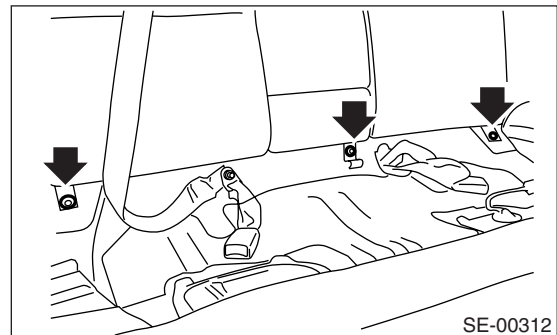


#### 2. SEDAN MODEL

1) Remove the bolts, and then detach the rear seat cushion.



2) Remove the bolts securing lower portion of backrest and then open the center trunk through lid.



3) Lift the rear seat backrest and then remove it.

### B: INSTALLATION

#### 1. WAGON MODEL

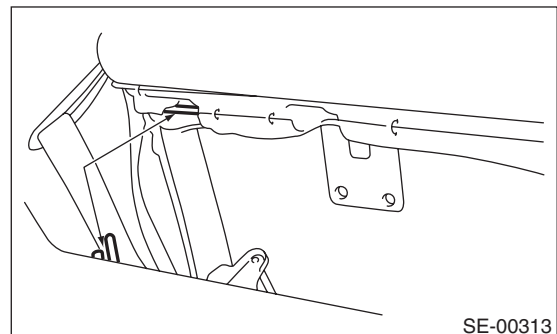
Install in the reverse order of removal.

#### *Tightening torque:*

*Refer to COMPONENT in General Description. <Ref. to SE-5, REAR SEAT (WAGON MODEL), COMPONENT, General Description.>*

#### 2. SEDAN MODEL

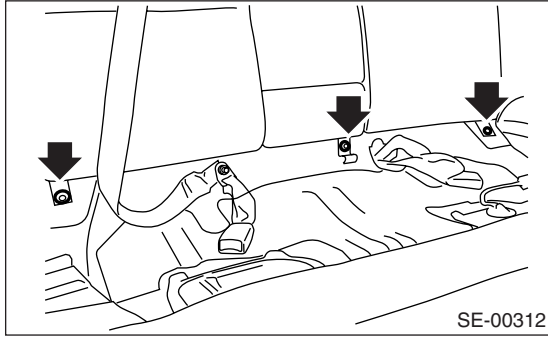
1) Hook and fasten the upper-back side of the rear seat backrest to the body hook.



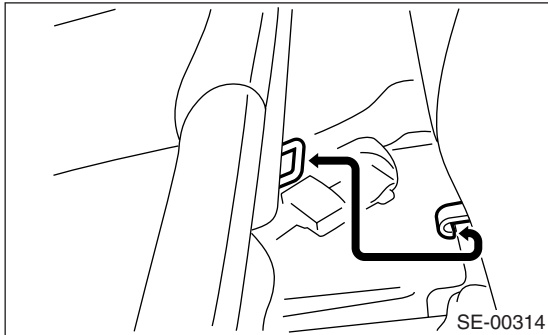
# Rear Seat

## SEATS

2) Tighten the bolts.



3) Hook and fasten the seat cushion to the hook on the lower part of the rear seat backrest.



### Tightening torque:

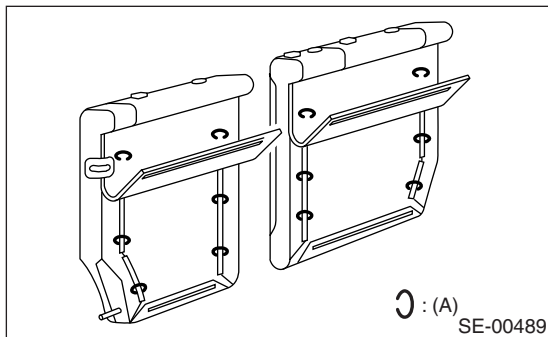
Refer to **COMPONENT** in *General Description*. <Ref. to SE-5, REAR SEAT (WAGON MODEL), COMPONENT, General Description.>

## C: DISASSEMBLY

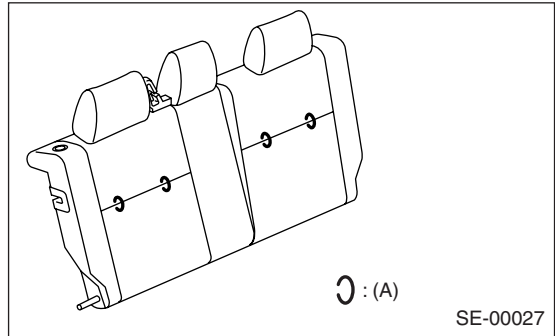
### 1. WAGON MODEL

1) Remove the rear seat. <Ref. to SE-13, WAGON MODEL, REMOVAL, Rear Seat.>

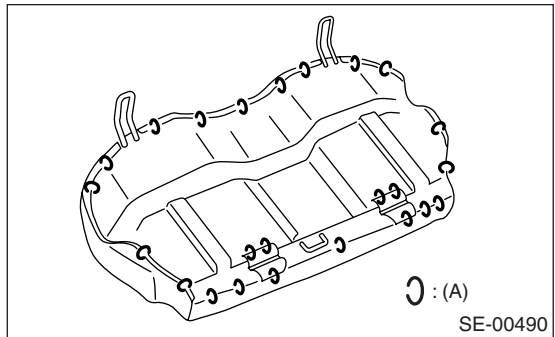
2) Remove the hog rings (A) behind of seat backrest.



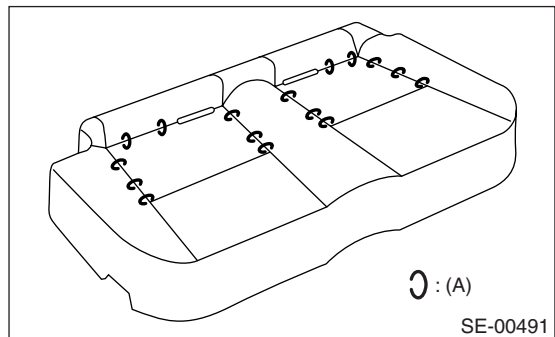
3) Remove the hog rings (A) on front side of cushion pad, and remove the cover.



4) Remove the hog rings (A) behind of seat cushion.



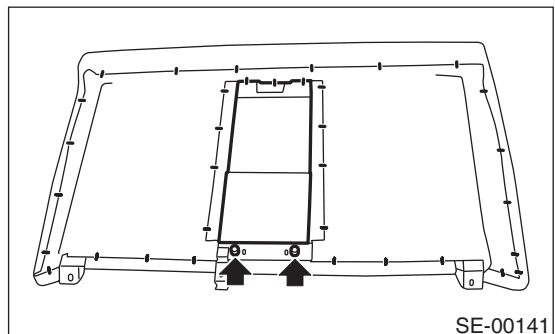
5) Remove the hog rings (A), and then remove the seat cushion cover.



### 2. SEDAN MODEL

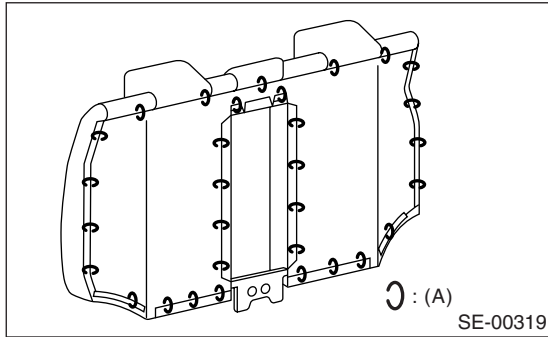
1) Remove the rear seat. <Ref. to SE-13, SEDAN MODEL, REMOVAL, Rear Seat.>

2) Remove two nuts, and then remove the armrest assembly.

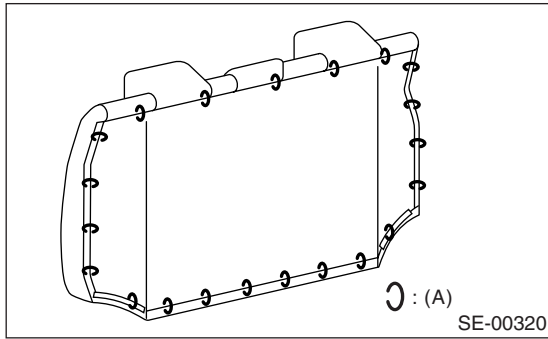


3) Remove the hog rings (A) behind of seat backrest.

- Armrest through type model

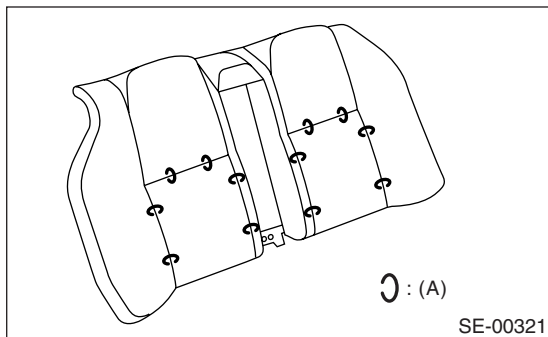


- Unified type model

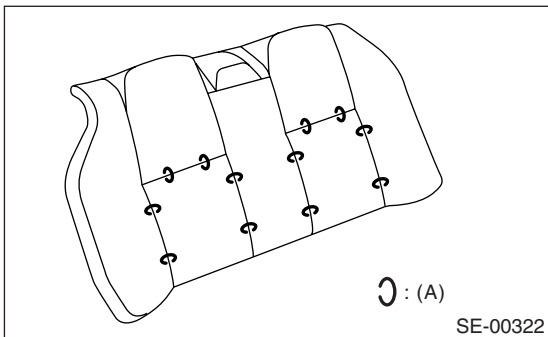


4) Remove the hog rings (A), and then remove the seat cover.

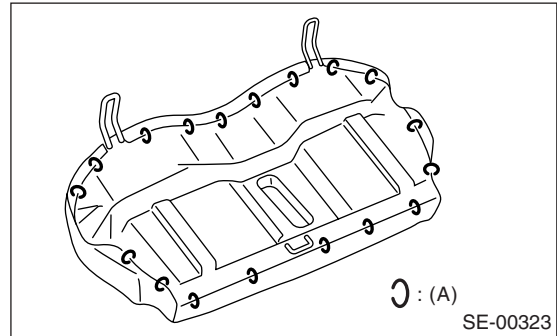
- Armrest through type model



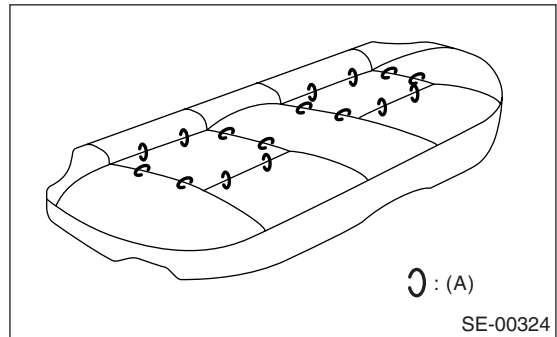
- Unified type model



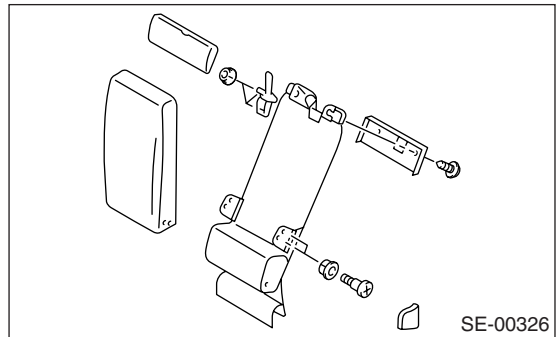
5) Remove the hog rings (A) behind of seat cushion.



6) Remove the hog rings (A), and then remove the seat cushion cover.



7) Remove the nuts and screws, and then disassemble the armrest assembly.



## D: ASSEMBLY

### 1. WAGON MODEL

Assemble in the reverse order of disassembly.

NOTE:

- Do not contaminate or damage the cover.
- While installing the hog rings, prevent the seat from getting wrinkled.

### 2. SEDAN MODEL

Assemble in the reverse order of disassembly.

NOTE:

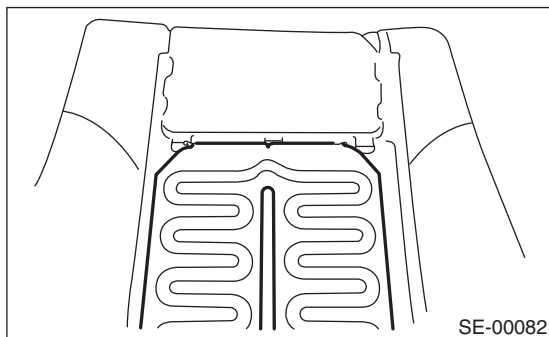
- Do not contaminate or damage the cover.
- While installing the hog rings, prevent the seat from getting wrinkled.

## 4. Seat Heater System

### A: REMOVAL

#### 1. SEAT HEATER UNIT

- 1) Remove the front seats. <Ref. to SE-7, REMOVAL, Front Seat.>
- 2) Remove the backrest cover of front seat and seat cushion cover. <Ref. to SE-8, DISASSEMBLY, Front Seat.>
- 3) Remove the hog rings, and then remove the seat heater unit.



#### 2. SEAT HEATER SWITCH

- 1) Remove the console box. <Ref. to EI-46, REMOVAL, Console Box.>
- 2) Remove the seat heater switch from the console box.

### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

#### 1. WIRING DIAGRAM

<Ref. to WI-114, WIRING DIAGRAM, Seat Heater System.>

#### 2. SEAT HEATER UNIT

Disconnect the seat heater unit connector, and check the continuity between terminals of connector.

#### Connector & terminal:

##### LHD side seat (R246)

No. 1 — No. 4:

No. 1 — No. 5:

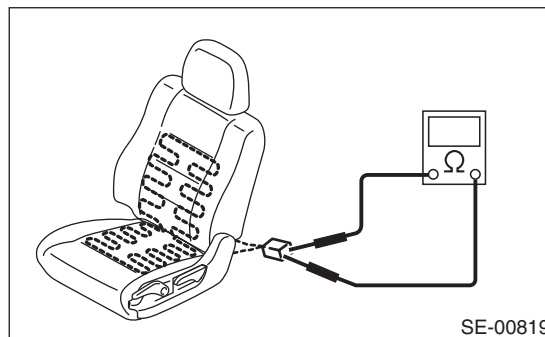
No. 4 — No. 5:

##### RHD side seat (R41)

No. 1 — No. 3:

No. 1 — No. 4:

No. 3 — No. 4:



If no continuity exists, replace the seat heater unit with a new part.

#### 3. SEAT HEATER SWITCH

##### • CHECK THERMISTOR OUTPUT VOLTAGE

- 1) Connect the battery to the connector.  
**Connector terminals No. 2 (+):**
- 2) Measure the voltage between connector and chassis ground.

#### Connector & terminal:

##### Except for STI model

##### LHD side seat

(R43) No. 4 (+) — Chassis ground (-):

##### RHD side seat

(R42) No. 4 (+) — Chassis ground (-):

##### STI model

##### LHD side seat

(B383) No. 4 (+) — Chassis ground (-):

##### RHD side seat

(D120) No. 4 (+) — Chassis ground (-):

If voltage is not 1.5 V or more, replace the seat heater switch.

- **CHECK SWITCH OUTPUT VOLTAGE**

1) Connect the battery to the connector.

**Connector terminals No. 2 (+):**

2) Measure the voltage between connector and chassis ground while turning the switch to ON.

**Connector & terminal:**

**Except for STI model**

**LHD side seat**

**(R43) No. 3 (+) — Chassis ground (-):**

**RHD side seat**

**(R42) No. 3 (+) — Chassis ground (-):**

**STI model**

**LHD side seat**

**(B383) No. 3 (+) — Chassis ground (-):**

**RHD side seat**

**(D120) No. 3 (+) — Chassis ground (-):**

If voltage does not change from 10 V or more to zero, replace the seat heater switch.

# Seat Heater System

SEATS

---

# SECURITY AND LOCKS

# SL

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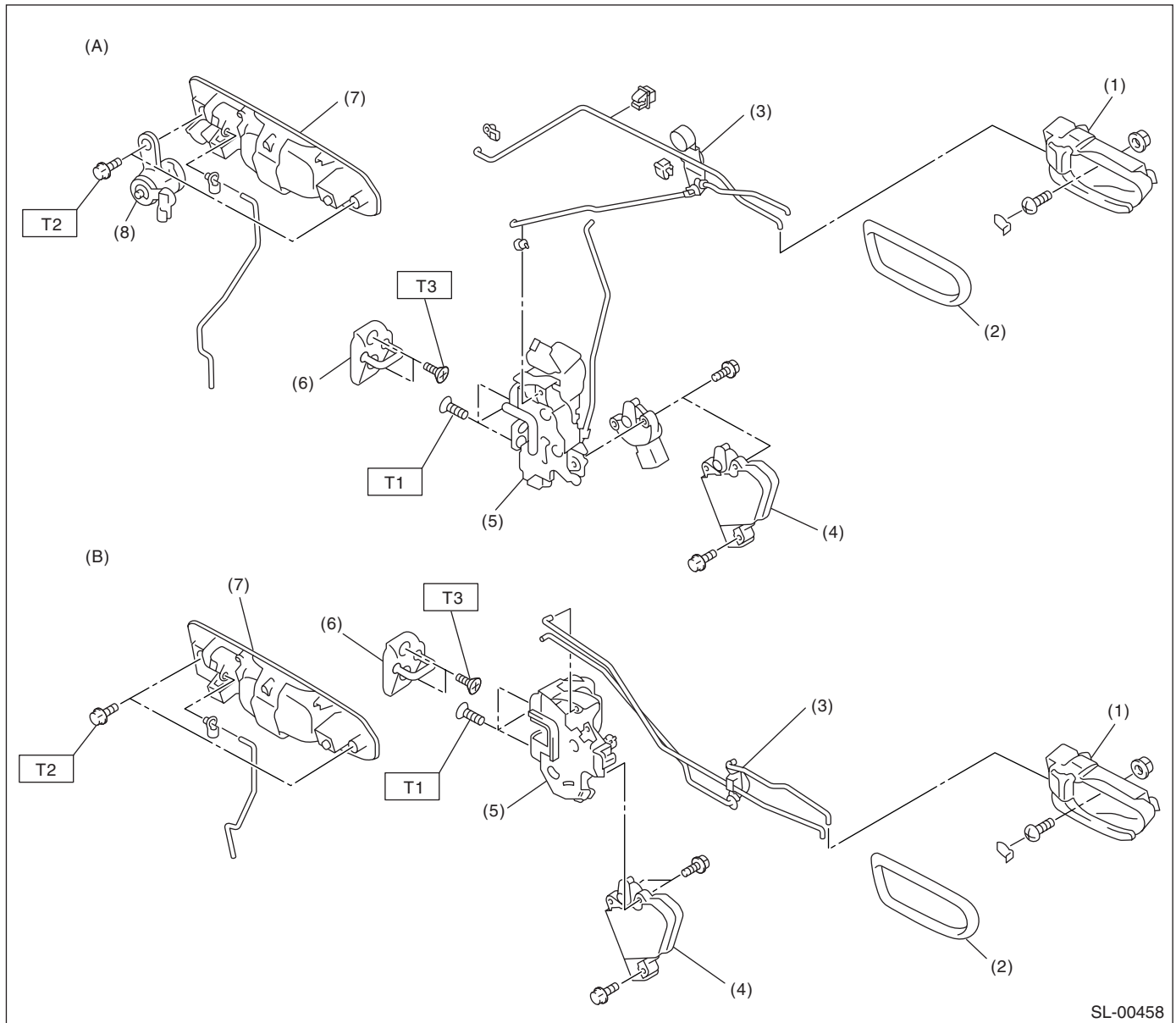
# General Description

SECURITY AND LOCKS

## 1. General Description

### A: COMPONENT

#### 1. DOOR LOCK ASSEMBLY



SL-00458

(A) Front

(B) Rear

- (1) Inner remote ASSY
- (2) Inner remote cover
- (3) Bell crank
- (4) Door lock actuator

- (5) Door latch
- (6) Striker
- (7) Outer handle
- (8) Key cylinder

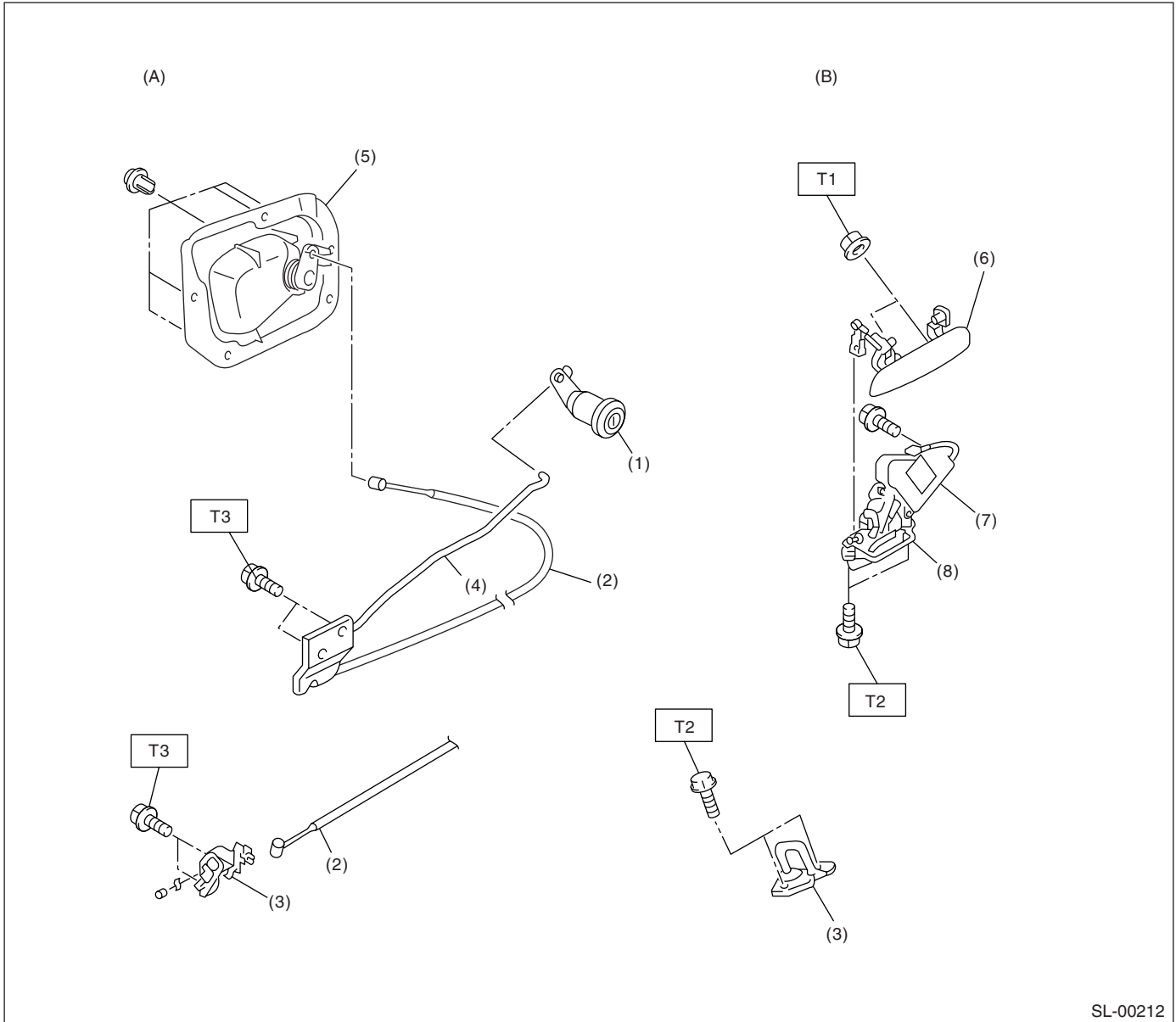
**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 6.4 (0.65, 4.7)**

**T2: 7.4 (0.75, 5.5)**

**T3: 17.6 (1.8, 13.0)**

## 2. TRUNK LID AND REAR GATE LOCK



(A) Trunk

(B) Rear gate

- (1) Key cylinder
- (2) Cable
- (3) Striker
- (4) Trunk lid lock ASSY

- (5) Trunk lid release handle
- (6) Rear gate outer handle
- (7) Rear gate actuator
- (8) Rear gate latch

**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 4.5 (0.45, 3.3)**

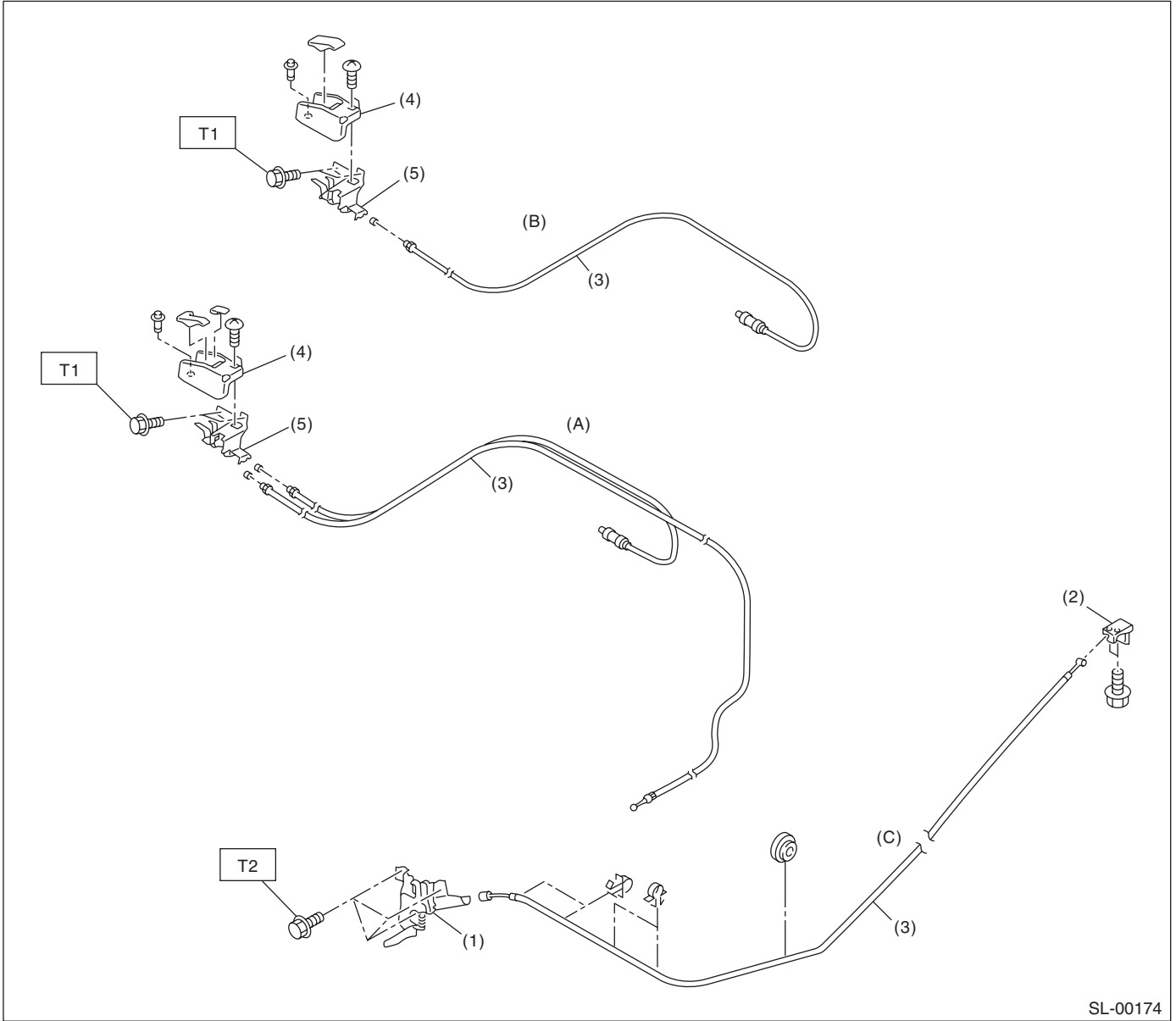
**T2: 25 (2.5, 18.4)**

**T3: 18 (1.84, 13.3)**

# General Description

## SECURITY AND LOCKS

### 3. HOOD LOCK AND REMOTE OPENERS



(A) Sedan

(B) Wagon

(C) Hood

(1) Hood lock ASSY

(4) Cover

**Tightening torque: N·m (kgf·m, ft·lb)**

(2) Lever ASSY

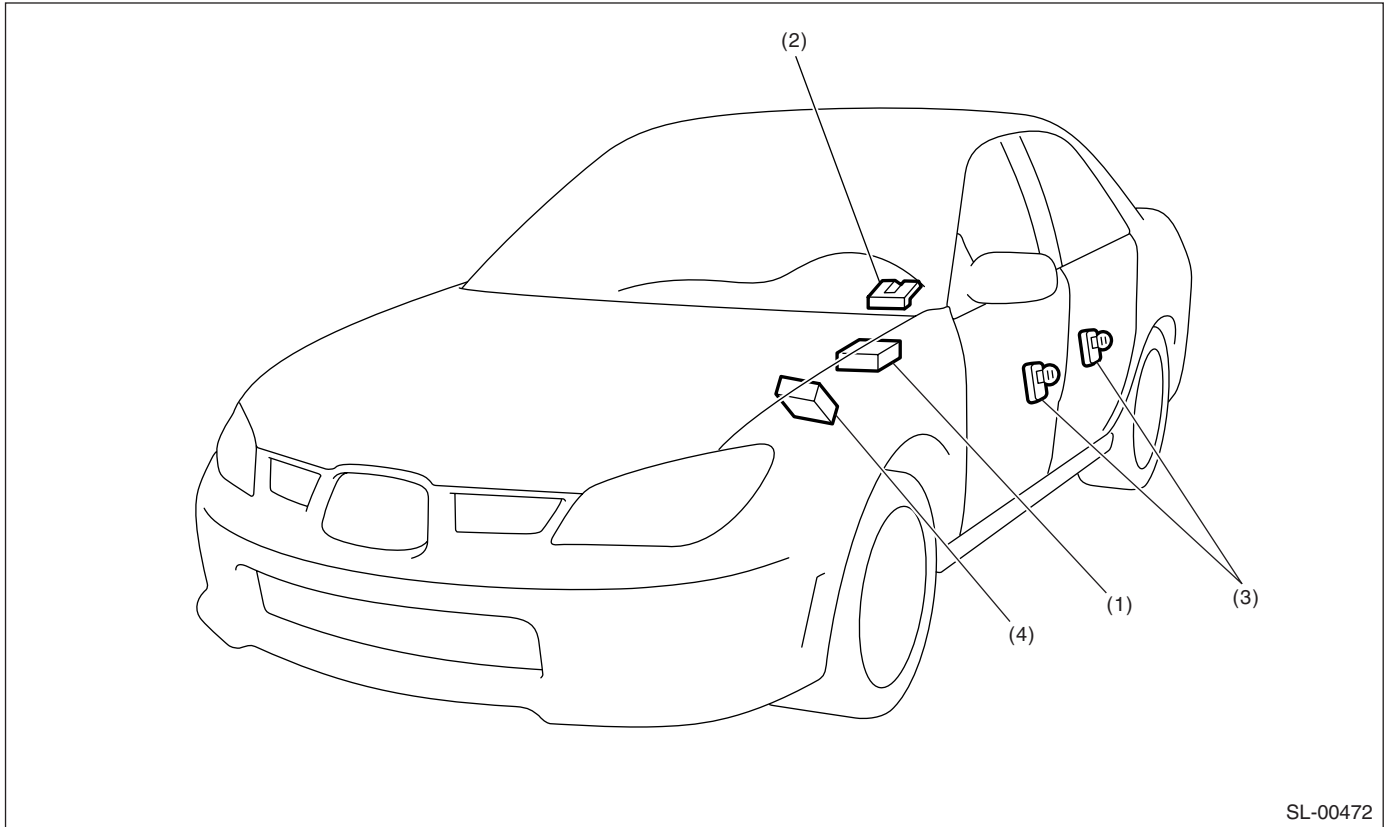
(5) Pull handle ASSY

**T1: 6.5 (0.66, 4.7)**

(3) Cable

**T2: 32 (3.3, 23.9)**

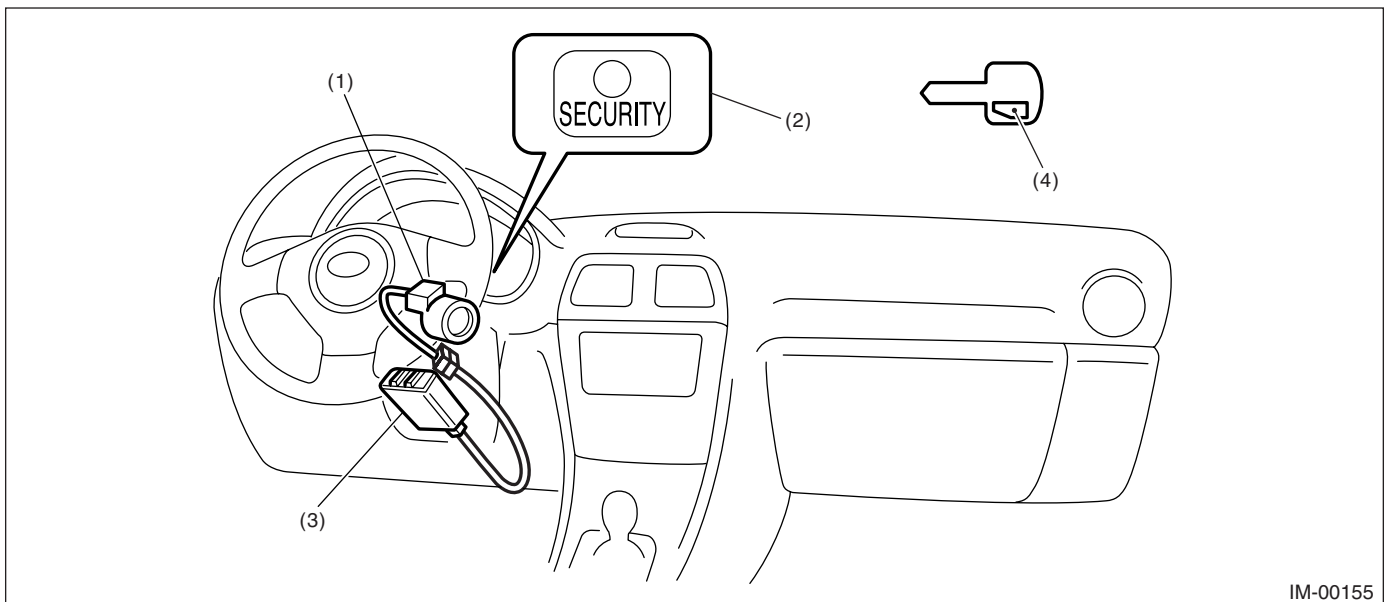
### 4. KEYLESS ENTRY SYSTEM



SL-00472

- (1) Keyless entry control unit
- (2) Rear gate latch (Wagon model)
- (3) Door switch
- (4) Body integrated module

### 5. IMMOBILIZER SYSTEM



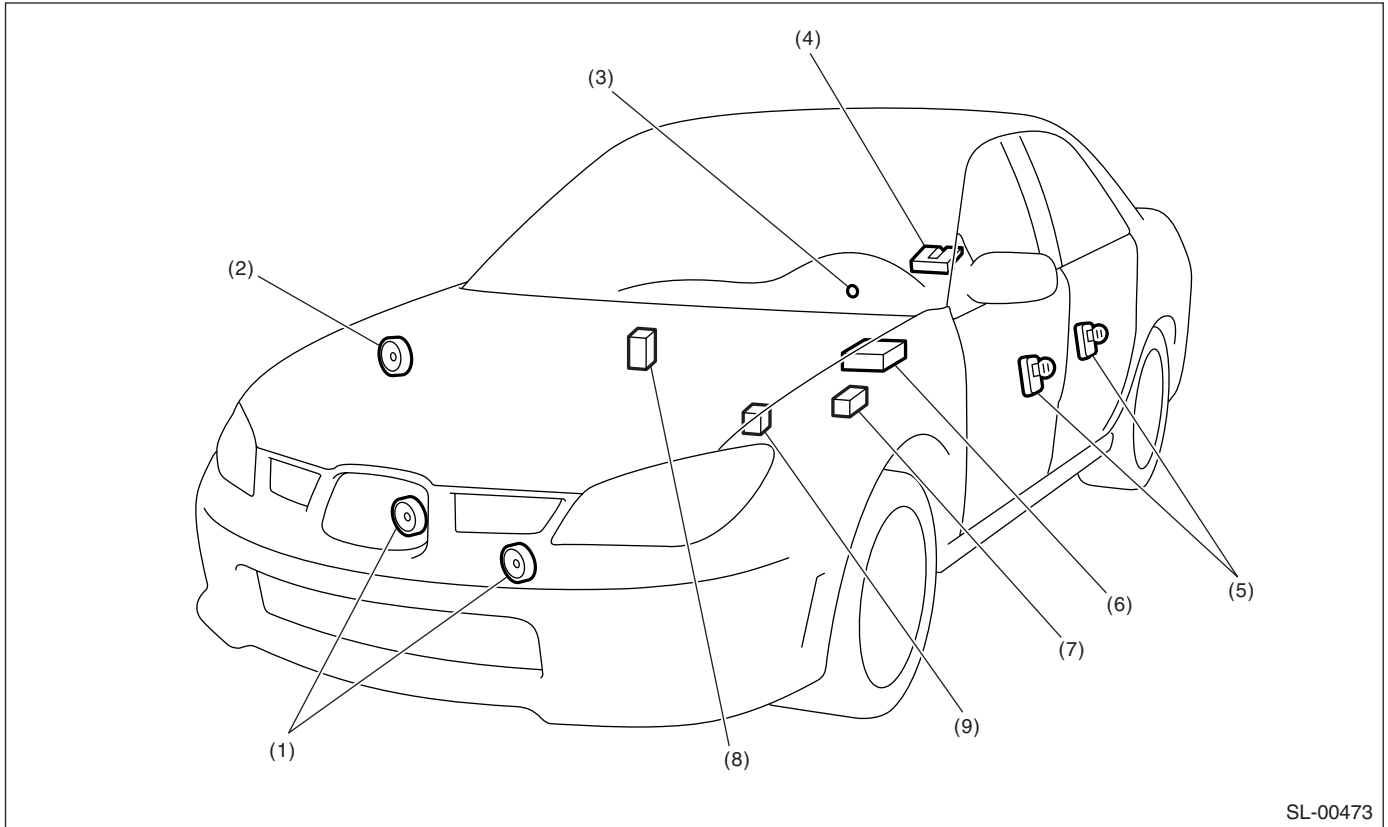
IM-00155

- (1) Antenna
- (2) Security indicator light (LED bulb)
- (3) Immobilizer control module (IMM ECM)
- (4) Transponder

# General Description

## SECURITY AND LOCKS

### 6. SECURITY SYSTEM



SL-00473

- |   |   |                                   |
|---|---|-----------------------------------|
| (1) Horn  | (4) Trunk room light switch (Sedan model), rear gate latch switch (Wagon model) | (6) Keyless entry control unit    |
| (2) Security horn                                   | (5) Door switch   | (7) Security horn relay           |
| (3) Security indicator light (in combination meter) |   | (8) Interrupt relay               |
|   |   | (9) Horn relay (in main fuse box) |

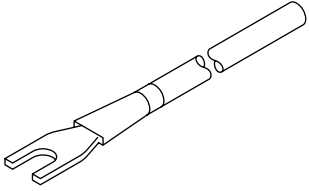
## B: CAUTION

- Before disassembling or reassembling parts, always disconnect the ground cable from battery. When repairing audio, control module, etc. which are provided with memory functions, record the memory contents before disconnecting the ground cable from battery. Otherwise, these contents are cancelled upon disconnection.
- Reassemble parts in the reverse order of disassembly procedure unless otherwise indicated.
- Adjust parts to the specifications contained in this manual if so designated.

- Connect the connectors securely during reassembly.
- After reassembly, ensure all functional parts operate smoothly.
- Airbag system wiring harness is routed near the electrical parts and switch.
- Airbag system connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the ignition key cylinder.

## C: PREPARATION TOOL

### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION | REMARKS                      |
|---|-------------|-------------|------------------------------|
|  <p style="text-align: right; font-size: small;">ST-925580000</p> | 925580000   | PULLER      | Used for removing trim clip. |

### 2. GENERAL TOOL

| TOOL NAME      | REMARKS                                    |
|----------------|--|
| Circuit tester | Used for measuring resistance and voltage. |
| Drill          | Used for replacing ignition key lock.      |

# Door Lock Control System

SECURITY AND LOCKS

## 2. Door Lock Control System

### A: WIRING DIAGRAM

#### 1. DOOR LOCK CONTROL

<Ref. to WI-166, WIRING DIAGRAM, Keyless Entry System.>

### B: INSPECTION

#### 1. SYMPTOM CHART

| Symptom   | Repair order   | Reference  |
|---|--|--|
| The door lock control system does not operate.  | 1. Check the fuse.   | <Ref. to SL-8, CHECK FUSE, INSPECTION, Door Lock Control System.>                            |
|   | 2. Check the power supply and ground circuit for the body integrated module. | <Ref. to SL-9, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Door Lock Control System.> |
|   | 3. Check the door lock switch and the circuit.                               | <Ref. to SL-9, CHECK DOOR LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>    |
|   | 4. Check the door lock actuator and the circuit.                             | <Ref. to SL-10, CHECK DOOR LOCK ACTUATOR AND CIRCUIT, INSPECTION, Door Lock Control System.> |
| The door lock switch does not operate.          | Check the door lock switch and the circuit.                                  | <Ref. to SL-9, CHECK DOOR LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>    |
| A specific door lock actuator does not operate. | Check the door lock actuator and the circuit.                                | <Ref. to SL-10, CHECK DOOR LOCK ACTUATOR AND CIRCUIT, INSPECTION, Door Lock Control System.> |

#### 2. CHECK FUSE

| Step   | Check                  | Yes                              | No  |
|--|------------------------|----------------------------------|---|
| 1<br><b>CHECK FUSE.</b><br>Remove and visually check the fuses No. 2 (in the main fuse box) No. 3 (in fuse & relay box). | Is the fuse blown out? | Replace the fuse with a new one. | Check the power supply and ground circuit. <Ref. to SL-9, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Door Lock Control System.> |

## 3. CHECK POWER SUPPLY AND GROUND CIRCUIT

| Step   | Check                                     | Yes  | No   |
|--|---|--|--|
| <b>1 CHECK POWER SUPPLY.</b><br>1) Disconnect the body integrated module harness connector.<br>2) Measure the voltage between the harness connector terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B280) No. 2 (+) — Chassis ground (-):</b></i> | Is the voltage more than 10 V?            | Go to step 2.                              | Check the harness for open circuits or shorts between the body integrated module and the fuse. |
| <b>2 CHECK GROUND CIRCUIT.</b><br>Measure the resistance between the harness connector terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B280) No. 4, 13 — Chassis ground:</b></i>  | Is the resistance less than 10 $\Omega$ ? | The power supply and ground circuit is OK. | Repair the harness.  |

## 4. CHECK DOOR LOCK SWITCH AND CIRCUIT

| Step  | Check                                     | Yes  | No                            |
|---|---|--|-------------------------------|
| <b>1 CHECK DOOR LOCK SWITCH CIRCUIT.</b><br>1) Disconnect the body integrated module harness connector.<br>2) Measure the resistance between the harness connector terminal and chassis ground when moving the door lock switch to LOCK.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B281) No. 12 — Chassis ground:</b></i>   | Is the resistance less than 10 $\Omega$ ? | Go to step 2.  | Go to step 3.                 |
| <b>2 CHECK DOOR LOCK SWITCH CIRCUIT.</b><br>Measure the resistance between the harness connector terminal and chassis ground when the door lock switch is moved to UNLOCK.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B281) No. 11 — Chassis ground:</b></i>   | Is the resistance less than 10 $\Omega$ ? | The door lock switch is OK.  | Go to step 3.                 |
| <b>3 CHECK DOOR LOCK SWITCH.</b><br>1) Disconnect the door lock switch harness connector.<br>2) Measure the resistance between the door lock switch terminals when moving the door lock switch to LOCK.<br><i><b>Connector &amp; terminal</b></i><br><i><b>Driver's side:</b></i><br><i><b>(D7) No. 5 — No. 9</b></i><br><i><b>Passenger's side:</b></i><br><i><b>(D62) No. 4 — No. 5</b></i> | Is the resistance less than 10 $\Omega$ ? | Go to step 4.  | Replace the door lock switch. |
| <b>4 CHECK DOOR LOCK SWITCH.</b><br>Measure the resistance between the door lock switch terminals when moving the door lock switch to UNLOCK.<br><i><b>Connector &amp; terminal</b></i><br><i><b>Driver's side:</b></i><br><i><b>(D7) No. 5 — No. 8</b></i><br><i><b>Passenger's side:</b></i><br><i><b>(D62) No. 2 — No. 5</b></i>   | Is the resistance less than 1 $\Omega$ ?  | Check the harness for open circuits or shorts between the body integrated module and the door lock switch. | Replace the door lock switch. |



# Door Lock Control System

SECURITY AND LOCKS

## 5. CHECK DOOR LOCK ACTUATOR AND CIRCUIT

| Step  | Check                          | Yes  | No                                  |
|---|--------------------------------|--|-------------------------------------|
| <b>1 CHECK OUTPUT SIGNAL.</b><br>Measure the voltage between the harness connector terminal of body integrated module and chassis ground when moving the door lock switch to LOCK.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B280) No. 6 (+) — Chassis ground (-):</b></i>                | Is the voltage more than 10 V? | Go to step 2.  | Replace the body integrated module. |
| <b>2 CHECK OUTPUT SIGNAL.</b><br>Measure the voltage between the harness connector terminal of body integrated module and chassis ground when moving the door lock switch to UNLOCK.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B280) No. 7, 8 (+) — Chassis ground (-):</b></i>           | Is the voltage more than 10 V? | Go to step 3.  | Replace the body integrated module. |
| <b>3 CHECK DOOR LOCK ACTUATOR.</b><br>Check the door lock actuator.<br>Front door lock actuator: <Ref. to SL-32, Front Door Lock Actuator.><br>Rear door lock actuator: <Ref. to SL-36, Rear Door Lock Actuator.><br>Rear gate latch lock actuator: <Ref. to SL-39, Rear Gate Latch Lock Actuator.> | Is the door lock actuator OK?  | Check the harness for open circuits or shorts between the body integrated module and the door lock actuator. | Replace the door lock actuator.     |

## 3. Keyless Entry System

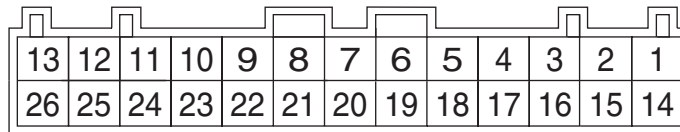
### A: WIRING DIAGRAM

#### 1. KEYLESS ENTRY

<Ref. to WI-166, WIRING DIAGRAM, Keyless Entry System.>

### B: ELECTRICAL SPECIFICATION

#### 1. KEYLESS ENTRY CONTROL UNIT



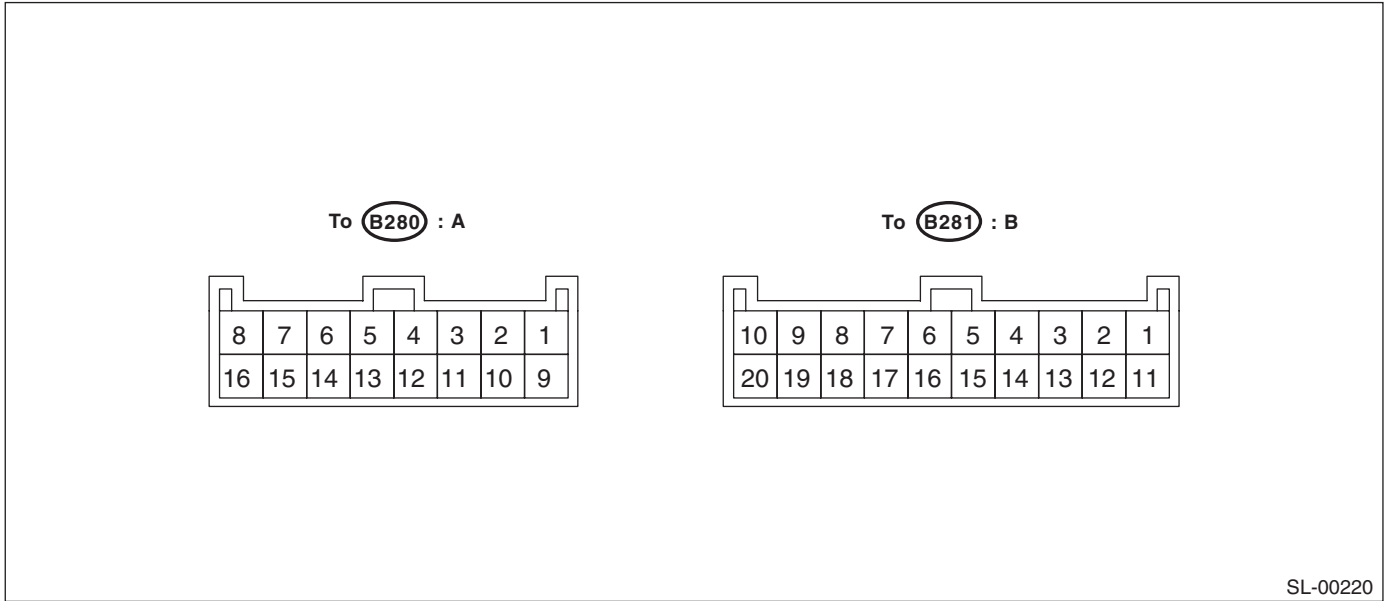
SL-00478

| Content                                | Terminal No. | Measuring condition  |
|--|--------------|--|
| Turn signal light (Left)               | 1 (OUTPUT)   | Battery voltage is present when pressing the transmitter UNLOCK/DISARM or LOCK/ARM button. |
| Power supply (Backup)                  | 2            | Battery voltage is constantly present.   |
| Keyless buzzer                         | 3 (OUTPUT)   | 0 V is present when pressing the transmitter UNLOCK/DISARM or LOCK/ARM button.             |
| Door unlock switch                     | 4 (INPUT)    | 0 V is present when operating the door lock switch.  |
| Door lock switch                       | 5 (INPUT)    | 0 V is present when operating the door lock switch.  |
| Door switch and rear gate latch switch | 6 (INPUT)    | 0 V is present when any door or rear gate is open.   |
| Trunk latch switch                     | 7 (INPUT)    | 0 V is present when trunk is open.   |
| Key warning switch                     | 9 (INPUT)    | Battery voltage is present when inserting the key into the ignition switch.                |
| Ignition switch (ON)                   | 10 (INPUT)   | Battery voltage is present when ignition switch is turned to ON.                           |
| Turn signal light (Right)              | 13 (OUTPUT)  | Battery voltage is present when pressing the transmitter UNLOCK/DISARM or LOCK/ARM button. |
| Ground                                 | 14           | 0 V is constantly present.   |
| Body integrated module                 | 18 (OUTPUT)  | Battery voltage is present when pressing the transmitter UNLOCK/DISARM button.             |
| Body integrated module                 | 19 (OUTPUT)  | Battery voltage is present when pressing the transmitter LOCK/ARM button.                  |
| Horn relay                             | 24 (OUTPUT)  | 0 V is present when pressing the transmitter LOCK/ARM button three times within 5 seconds. |
| Power supply (Backup)                  | 26           | Battery voltage is constantly present.   |

# Keyless Entry System

## SECURITY AND LOCKS

### 2. BODY INTEGRATED MODULE



| Content   | Terminal No. | Measuring condition  |
|---|--------------|--|
| Door switch (Except driver's door)                    | B7 (INPUT)   | 0 V is present when any door is open (Except driver's door).                             |
| Door switch (Driver's door)                           | B8 (INPUT)   | 0 V is present when driver's door is open.   |
| Door unlock switch                                    | B11 (INPUT)  | 0 V is present when operating the door unlock switch.                                    |
| Door lock switch                                      | B12 (INPUT)  | 0 V is present when operating the door lock switch.                                      |
| Keyless entry control unit                            | B13 (INPUT)  | Battery voltage is present when pressing the transmitter LOCK/ARM button.                |
| Keyless entry control unit                            | B14 (INPUT)  | Battery voltage is present when pressing the transmitter UNLOCK/DISARM button.           |
| Ignition switch (ON)                                  | B19 (INPUT)  | Battery voltage is present when ignition switch is turned to ON.                         |
| Key warning switch                                    | B20 (INPUT)  | Battery voltage is present when inserting the key into the ignition switch.              |
| Power supply  | A2           | Battery voltage is constantly present.   |
| Ground  | A4           | 0 V is constantly present.   |
| Room light  | A5 (OUTPUT)  | 0 V is present when pressing the transmitter UNLOCK/DISARM button.                       |
| Door and rear gate lock actuator                      | A6 (OUTPUT)  | Battery voltage is present when pressing the transmitter LOCK/ARM button.                |
| Door and rear gate lock actuator (Except driver side) | A7 (OUTPUT)  | Battery voltage is present when pressing the transmitter UNLOCK/DISARM button two times. |
| Door lock actuator (Driver side)                      | A8 (OUTPUT)  | Battery voltage is present when pressing the transmitter UNLOCK/DISARM button once.      |
| Ground  | A13          | 0 V is constantly present.   |

## C: INSPECTION

### 1. SYMPTOM CHART

| Symptom   | Repair order   | Reference   |
|---|--|---|
| None of the functions of the keyless entry system operate.  | 1. Check the transmitter battery and function.                           | <Ref. to SL-15, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>        |
|   | 2. Check the fuse.   | <Ref. to SL-16, CHECK FUSE, INSPECTION, Keyless Entry System.>                                    |
|   | 3. Check the keyless entry control unit power supply and ground circuit. | <Ref. to SL-17, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Keyless Entry System.>         |
|   | 4. Replace the keyless entry control unit.                               | <Ref. to SL-55, Keyless Entry Control Unit.>  |
| The transmitter cannot be registered.   | 1. Check the transmitter battery and function.                           | <Ref. to SL-15, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>        |
|   | 2. Check the ignition switch circuit.                                    | <Ref. to SL-17, CHECK IGNITION SWITCH CIRCUIT, INSPECTION, Keyless Entry System.>                 |
|   | 3. Check the door switch.  | <Ref. to SL-17, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>                             |
|   | 4. Replace the keyless entry control unit.                               | <Ref. to SL-55, Keyless Entry Control Unit.>  |
| The door lock or unlock does not operate.<br>NOTE:<br>If the door lock control system does not operate when using the door lock switch, check the door lock control system. <Ref. to SL-8, INSPECTION, Door Lock Control System.> | 1. Check the transmitter battery and function.                           | <Ref. to SL-15, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>        |
|   | 2. Check the key warning switch.   | <Ref. to SL-18, CHECK KEY WARNING SWITCH, INSPECTION, Keyless Entry System.>                      |
|   | 3. Check the door switch.  | <Ref. to SL-17, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>                             |
|   | 4. Check the output signal to body integrated module.                    | <Ref. to SL-19, CHECK OUTPUT SIGNAL TO BODY INTEGRATED MODULE, INSPECTION, Keyless Entry System.> |
|   | 5. Replace the keyless entry control unit.                               | <Ref. to SL-55, Keyless Entry Control Unit.>  |
| The panic alarm does not operate.   | 1. Check the transmitter battery and function.                           | <Ref. to SL-15, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>        |
|   | 2. Check the horn operation.   | <Ref. to SL-20, CHECK HORN OPERATION, INSPECTION, Keyless Entry System.>                          |
|   | 3. Replace the keyless entry control unit.                               | <Ref. to SL-55, Keyless Entry Control Unit.>  |

# Keyless Entry System

## SECURITY AND LOCKS

| Symptom   | Repair order                                    |              | Reference  |
|---|---|--------------|--|
| The buzzer chirp and hazard light do not operate. | 1. Check the buzzer chirp function.             |              | <Ref. to SL-16, CHECK BUZZER CHIRP SETTING, INSPECTION, Keyless Entry System.>   |
|   | 2. Check the buzzer and hazard light operation. | Buzzer       | <Ref. to SL-20, CHECK KEYLESS BUZZER, INSPECTION, Keyless Entry System.>         |
|   |   | Hazard light | <Ref. to SL-20, CHECK HAZARD LIGHT OPERATION, INSPECTION, Keyless Entry System.> |
|   | 3. Replace the keyless entry control unit.      |              | <Ref. to SL-55, Keyless Entry Control Unit.>                                     |
| The room light operation do not activate.         | 1. Check the room light operation.              |              | <Ref. to SL-19, CHECK ROOM LIGHT OPERATION, INSPECTION, Keyless Entry System.>   |
|   | 2. Replace the keyless entry control unit.      |              | <Ref. to SL-55, Keyless Entry Control Unit.>                                     |
| The door warning does not operate.                | 1. Check the door switch.                       |              | <Ref. to SL-17, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>            |
|   | 2. Check the buzzer operation.                  |              | <Ref. to SL-20, CHECK KEYLESS BUZZER, INSPECTION, Keyless Entry System.>         |
|   | 3. Replace the keyless entry control unit.      |              | <Ref. to SL-55, Keyless Entry Control Unit.>                                     |

## 2. CHECK TRANSMITTER BATTERY AND FUNCTION

| Step  | Check   | Yes                        | No  |
|---|---|----------------------------|---|
| <b>1 CHECK TRANSMITTER BATTERY.</b><br>1) Remove the battery from the transmitter. <Ref. to SL-57, REMOVAL, Transmitter.><br>2) Check the battery voltage. <Ref. to SL-57, INSPECTION, Transmitter.>  | Is the voltage more than 2.5 V?                                     | Go to step 2.              | Replace the transmitter battery. <Ref. to SL-57, Transmitter.>  |
| <b>2 CHECK TRANSMITTER.</b><br>Register the transmitter which operates normally on other vehicles to inspection target vehicle. <Ref. to SL-57, REGISTRATION OF TRANSMITTER WITH SUBARU SELECT MONITOR, REPLACEMENT, Transmitter.><br>1) Close all the doors and rear gate of inspection target vehicle.<br>2) Using transmitter, lock and unlock the doors and rear gate of inspection target vehicle. | Is the inspection target vehicle operates lock and unlock normally? | Go to step 3.              | Due to vehicle malfunction, continue the keyless entry system diagnosis.  |
| <b>3 CHECK TRANSMITTER.</b><br>Register the transmitter of inspection target vehicle to the other vehicle which operates keyless system normally. <Ref. to SL-57, REGISTRATION OF TRANSMITTER WITH SUBARU SELECT MONITOR, REPLACEMENT, Transmitter.>  | Is the transmitter registered correctly?                            | Go to step 4.              | Replace the transmitter. <Ref. to SL-57, REGISTRATION OF TRANSMITTER WITH SUBARU SELECT MONITOR, REPLACEMENT, Transmitter.> |
| <b>4 CHECK TRANSMITTER.</b><br>Check the registered transmitter.<br>1) Close all the doors and rear gate of the vehicle which operates keyless system normally.<br>2) Using transmitter, lock and unlock the doors and rear gate of inspection target vehicle.  | Is the vehicle operates lock and unlock normally?                   | The transmitter is normal. | Replace the transmitter. <Ref. to SL-57, REGISTRATION OF TRANSMITTER WITH SUBARU SELECT MONITOR, REPLACEMENT, Transmitter.> |

**CAUTION:**

**Be sure to reset the transmitter, which is registered from other vehicle to inspection target vehicle, and the vehicle, to which is registered transmitter, to the condition of before inspection. (Register the transmitter to original condition.)**

# Keyless Entry System

## SECURITY AND LOCKS

### 3. CHECK BUZZER CHIRP SETTING

| Step   | Check                         | Yes                          | No   |
|--|-------------------------------|------------------------------|--|
| <b>1</b><br><b>CHECK BUZZER CHIRP SETTING.</b><br>1) Check the current setting of the buzzer chirp.<br>2) Remove the key from the ignition switch.<br>3) Close all doors and the rear gate.<br>4) Press the LOCK/ARM or UNLOCK/DIS-ARM button.   | Does the buzzer signal chirp? | Buzzer chirp function is OK. | Go to step 2.  |
| <b>2</b><br><b>CHECK BUZZER CHIRP SETTING.</b><br>1) Open the driver's door, and remove the key from the ignition switch.<br>2) Insert the key into ignition switch with the manual UNLOCK switch on vehicle side turned to ON.<br>3) Repeat the procedure of removing → inserting the key five times within 10 seconds from step 2).<br>4) Perform opening → closing the door within 5 seconds from the fifth procedure in step 3).<br>5) Switch the setting (ON ↔ OFF) of answer back buzzer. The hazard light will blink three times.<br><b>NOTE:</b><br>If not performing opening → closing the door within 10 seconds, the hazard light will blink once. In that case, perform the procedure from the beginning again.<br>6) Press the LOCK/ARM or UNLOCK/DIS-ARM button. | Does the buzzer signal chirp? | Buzzer chirp function is OK. | Check the transmitter function. <Ref. to SL-15, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.> |

### 4. CHECK FUSE

| Step   | Check                  | Yes                              | No   |
|--|------------------------|----------------------------------|--|
| <b>1</b><br><b>CHECK FUSE.</b><br>Remove and visually check the fuse No. 6 (in the main fuse box) and No. 3 (in the fuse and relay box). | Is the fuse blown out? | Replace the fuse with a new one. | Check the power supply and ground circuit. <Ref. to SL-17, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Keyless Entry System.> |

## 5. CHECK POWER SUPPLY AND GROUND CIRCUIT

| Step   | Check                                     | Yes   | No  |
|--|---|---|---|
| <b>1 CHECK POWER SUPPLY.</b><br>1) Disconnect the keyless entry control unit harness connector.<br>2) Measure the voltage between the harness connector terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B176) No. 2, 26 (+) — Chassis ground (-):</b></i> | Is the voltage more than 10 V?            | Go to step 2.                               | Check the harness for open circuits and shorts between the keyless entry control unit and fuse. |
| <b>2 CHECK GROUND CIRCUIT.</b><br>Measure the resistance between the harness connector terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B176) No. 14 — Chassis ground:</b></i>   | Is the resistance less than 10 $\Omega$ ? | The power supply and ground circuit are OK. | Repair the harness.   |

## 6. CHECK IGNITION SWITCH CIRCUIT

| Step  | Check                          | Yes                            | No  |
|---|--------------------------------|--------------------------------|---|
| <b>1 CHECK IGNITION SWITCH SIGNAL.</b><br>1) Disconnect the keyless entry control unit harness connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between harness connector terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B176) No. 10 (+) — Chassis ground (-):</b></i> | Is the voltage more than 10 V? | Ignition switch circuit is OK. | Check the harness for open circuits and shorts between the keyless entry control unit and ignition relay. |

## 7. CHECK DOOR SWITCH

| Step  | Check   | Yes                    | No                       |
|---|---|------------------------|--------------------------|
| <b>1 CHECK DOOR SWITCH CIRCUIT.</b><br>Measure the voltage between the keyless entry control unit harness connector terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>Front and rear side door:</b></i><br><i><b>(B176) No. 6 (+) — Chassis ground (-):</b></i><br><i><b>Rear gate:</b></i><br><i><b>(B176) No. 7 (+) — Chassis ground (-):</b></i> | Is the voltage 0 V when each door or rear gate is opened?                   | Go to step 2.          | Go to step 3.            |
| <b>2 CHECK DOOR SWITCH CIRCUIT.</b><br>Measure the voltage between the keyless entry control unit harness connector terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>Front and rear side door:</b></i><br><i><b>(B176) No. 6 (+) — Chassis ground (-):</b></i><br><i><b>Rear gate:</b></i><br><i><b>(B176) No. 7 (+) — Chassis ground (-):</b></i> | Is the voltage more than 10 V when each door or rear gate is closed?        | The door switch is OK. | Go to step 3.            |
| <b>3 CHECK DOOR SWITCH.</b><br>1) Disconnect the door switch harness connector.<br>2) Measure the resistance between the door switch terminals.<br><i><b>Terminals</b></i><br><i><b>Door switch No. 1 — No. 3:</b></i><br><i><b>Rear gate latch switch No. 1 — No. 2:</b></i>   | Is the resistance more than 1 M $\Omega$ when the door switch is depressed? | Go to step 4.          | Replace the door switch. |



# Keyless Entry System

## SECURITY AND LOCKS

| Step   | Check  | Yes  | No                       |
|--|--|--|--------------------------|
| <b>4 CHECK DOOR SWITCH.</b><br>Measure the resistance between the door switch terminals.<br><i><b>Terminals</b></i><br><i><b>Door switch No. 1 — No. 3:</b></i><br><i><b>Rear gate latch switch No. 1 — No. 2:</b></i> | Is the resistance less than 1 $\Omega$ when the door switch is released? | Check the harness for open circuits and shorts between the body integrated module and door switch. | Replace the door switch. |

### 8. CHECK KEY WARNING SWITCH

| Step  | Check                                      | Yes   | No                              |
|---|--|---|---------------------------------|
| <b>1 CHECK FUSE.</b><br>Remove and visually check the fuse No. 6 (in the main fuse box).  | Is the fuse blown out?                     | Replace the fuse with a new one.  | Go to step 2.                   |
| <b>2 CHECK KEY WARNING SWITCH CIRCUIT.</b><br>1) Disconnect the keyless entry control unit harness connector.<br>2) Insert the key into the ignition switch. (LOCK position)<br>3) Measure the voltage between the harness connector terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B176) No. 9 (+) — Chassis ground (-):</b></i> | Is the voltage more than 10 V?             | Go to step 3.   | Go to step 4.                   |
| <b>3 CHECK KEY WARNING SWITCH CIRCUIT.</b><br>1) Remove the key from the ignition switch.<br>2) Measure the voltage between the harness connector terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B176) No. 9 (+) — Chassis ground (-):</b></i>  | Is the voltage 0 V?                        | Key warning switch is OK.   | Go to step 4.                   |
| <b>4 CHECK KEY WARNING SWITCH.</b><br>1) Disconnect the key warning switch harness connector.<br>2) Insert the key into the ignition switch. (LOCK position)<br>3) Measure the resistance between the key warning switch terminals.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 5.   | Replace the key warning switch. |
| <b>5 CHECK KEY WARNING SWITCH.</b><br>1) Remove the key from the ignition switch.<br>2) Measure the resistance between the key warning switch terminals.<br><i><b>Terminals</b></i><br><i><b>No. 1 — No. 2:</b></i>   | Is the resistance more than 1 M $\Omega$ ? | Check the following: <ul style="list-style-type: none"> <li>• Harness for open circuits and shorts between the key warning switch and fuse</li> <li>• Harness for open circuits and shorts between the keyless entry control unit and key warning switch</li> </ul> | Replace the key warning switch. |

## 9. CHECK ROOM LIGHT OPERATION

| Step   | Check                                     | Yes                                     | No   |
|--|---|---|--|
| <b>1 CHECK ROOM LIGHT OPERATION.</b><br>Make sure the room light illuminates when the room light switch is turned ON.  | Does the room light illuminate?           | Go to step 2.                           | Check the room light circuit.  |
| <b>2 CHECK HARNESS BETWEEN ROOM LIGHT AND BODY INTEGRATED MODULE.</b><br>1) Disconnect the body integrated module harness connector and room light harness connector.<br>2) Measure the resistance between the body integrated module harness connector terminal and the room light harness connector terminal.<br><i>Connector &amp; terminal</i><br><i>(B280) No. 5 — (R52) No. 2:</i> | Is the resistance less than 10 $\Omega$ ? | The room light operation circuit is OK. | Check the harness for open circuits and/or shorts between the body integrated module and room light. |

## 10. CHECK OUTPUT SIGNAL TO BODY INTEGRATED MODULE

| Step   | Check                                     | Yes                                 | No  |
|--|---|-------------------------------------|---|
| <b>1 CHECK OUTPUT SIGNAL.</b><br>Measure the voltage between the keyless entry control unit harness connector terminal and chassis ground when UNLOCK/DISARM button of transmitter is pressed.<br><i>Connector &amp; terminal</i><br><i>(B176) No. 18 (+) — Chassis ground (-):</i>  | Is the voltage more than 10 V?            | Go to step 2.                       | Replace the keyless entry control unit.   |
| <b>2 CHECK OUTPUT SIGNAL.</b><br>Measure the voltage between the keyless entry control unit harness connector terminal and chassis ground when LOCK/ARM button of transmitter is pressed.<br><i>Connector &amp; terminal</i><br><i>(B176) No. 19 (+) — Chassis ground (-):</i>   | Is the voltage more than 10 V?            | Go to step 3.                       | Replace the keyless entry control unit.   |
| <b>3 CHECK HARNESS BETWEEN KEYLESS ENTRY CONTROL UNIT AND BODY INTEGRATED MODULE.</b><br>1) Disconnect the keyless entry control unit harness connector and body integrated module harness connector.<br>2) Measure the resistance between the keyless entry control unit harness connector terminal and body integrated module harness connector terminal.<br><i>Connector &amp; terminal</i><br><i>(B176) No. 18 — (B281) No. 14:</i><br><i>(B176) No. 19 — (B281) No. 13:</i> | Is the resistance less than 10 $\Omega$ ? | Replace the body integrated module. | Check the harness for open circuit or shorts between the keyless entry control unit and body integrated module. |

# Keyless Entry System

## SECURITY AND LOCKS

### 11.CHECK HORN OPERATION

| Step   | Check                | Yes                                     | No   |
|--|----------------------|---|--|
| 1<br><b>CHECK HORN OPERATION</b><br>Make sure the horn sounds when the horn switch is pushed.  | Does the horn sound? | Go to step 2.                           | Check the horn circuit.  |
| 2<br><b>CHECK HORN OPERATION</b><br>1) Disconnect the keyless entry control unit harness connector.<br>2) Ground the harness connector terminal with a suitable wire.<br><b>Connector &amp; terminal</b><br><b>(B176) No. 24 — Chassis ground:</b> | Does the horn sound? | Replace the keyless entry control unit. | Check the harness for open circuits and/or shorts between the keyless entry control unit and horn relay. |

### 12.CHECK HAZARD LIGHT OPERATION

| Step  | Check                          | Yes  | No                                      |
|---|--------------------------------|--|---|
| 1<br><b>CHECK HAZARD LIGHT OPERATION.</b><br>Make sure the hazard light blinks when hazard switch is turned ON.   | Does the hazard light blink?   | Go to step 2.  | Check the hazard light circuit.         |
| 2<br><b>CHECK OUTPUT SIGNAL.</b><br>1) Remove the key from ignition switch.<br>2) Close all doors and rear gate.<br>3) Measure the voltage between keyless entry control unit harness connector terminal and chassis ground when LOCK/ARM button of transmitter is pressed.<br><b>Connector &amp; terminal</b><br><b>(B176) No. 1, 13 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V? | Check the harness for open or short between keyless entry control unit and turn signal lights. | Replace the keyless entry control unit. |

### 13.CHECK KEYLESS BUZZER

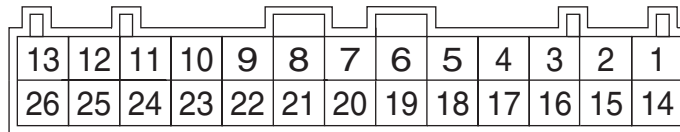
| Step   | Check                                     | Yes                                     | No  |
|--|---|---|---|
| 1<br><b>CHECK FUSE.</b><br>Remove and check the fuse No. 2 (located in main fuse box).   | Is the fuse blown out?                    | Replace the fuse with a new one.        | Go to step 2.   |
| 2<br><b>CHECK KEYLESS POWER SUPPLY.</b><br>1) Disconnect the connector from keyless buzzer.<br>2) Measure the voltage between keyless buzzer harness connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(F102) No. 2 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?            | Go to step 3.                           | Check the harness for open or short between fuse and keyless buzzer.      |
| 3<br><b>CHECK HARNESS BETWEEN KEYLESS BUZZER AND KEYLESS ENTRY CONTROL UNIT.</b><br>1) Disconnect the connector from keyless entry control unit.<br>2) Measure the resistance between keyless buzzer and keyless entry control unit.<br><b>Connector &amp; terminal</b><br><b>(F102) No. 1 — (B176) No. 3:</b> | Is the resistance less than 10 $\Omega$ ? | Go to step 4.                           | Repair the harness between keyless buzzer and keyless entry control unit. |
| 4<br><b>CHECK KEYLESS BUZZER.</b><br>Make sure that the buzzer sounds when connecting battery positive lead to No. 2 terminal of keyless buzzer connector and battery ground lead to No. 1 terminal of keyless buzzer connector.   | Does the buzzer sound?                    | Replace the keyless entry control unit. | Replace the keyless buzzer.   |

## 4. Security System

### A: WIRING DIAGRAM

<Ref. to WI-169, WIRING DIAGRAM, Security System.>

### B: ELECTRICAL SPECIFICATION



SL-00478

| Content                               | Terminal No. | Measuring condition  |
|---------------------------------------|--------------|--|
| Power supply (Backup)                 | 2            | Battery voltage is constantly present.                           |
| Door switch                           | 6 (INPUT)    | 0 V is present when any door is open.                            |
| Trunk room light switch (Sedan model) | 7 (INPUT)    | 0 V is present when trunk lid or rear gate is open.              |
| Rear gate latch switch (Wagon model)  |              |  |
| Impact sensor                         | 8            | —  |
| Ignition switch (ON)                  | 10 (INPUT)   | Battery voltage is present when ignition switch is turned to ON. |
| Security horn relay                   | 11 (INPUT)   | Battery voltage is present when activating the alarm operation.  |
| Interrupt relay                       | 12 (OUTPUT)  | Battery voltage is present when activating the alarm operation.  |
| Ground                                | 14           | 0 V is constantly present.                                       |
| Impact sensor                         | 15           | —  |
| Security indicator light              | 15 (OUTPUT)  | 0 V is present when activating the alarm operation.              |
| Impact sensor                         | 17           | —  |

# Security System

## SECURITY AND LOCKS

### C: INSPECTION

#### 1. BASIC DIAGNOSTIC PROCEDURE

**NOTE:**

- Turbo model has immobilizer.
- Non-turbo model has no immobilizer.

| Step   | Check  | Yes           | No   |
|--|--|---------------|--|
| <b>1 SET SECURITY SYSTEM.</b><br>Set the security system to ON. <Ref. to SL-24, SYMPTOM CHART, INSPECTION, Security System.>   | Is the setting completed correctly?  | Go to step 2. | <ul style="list-style-type: none"> <li>• Check the ignition switch circuit. &lt;Ref. to SL-28, CHECK IGNITION SWITCH CIRCUIT, INSPECTION, Security System.&gt;</li> <li>• Check the door lock switch. &lt;Ref. to SL-9, CHECK DOOR LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.&gt;</li> </ul> |
| <b>2 CHECK FOR OPERATION OF SECURITY SYSTEM SETTING.</b><br>1) Before starting this diagnosis, open all doors.<br>2) Remove the key from ignition key cylinder, and then close all doors or rear gate.<br>3) Press the LOCK/ARM button of transmitter.                                       | Can the security system be set?  | Go to step 3. | Go to symptom 1. <Ref. to SL-24, SYMPTOM CHART, INSPECTION, Security System.>  |
| <b>3 CHECK FOR STATUS OF BLINKING OF SECURITY INDICATOR LIGHT AND HAZARD LIGHT</b><br>Check for the status of blinking of security indicator light and hazard light.<br><b>NOTE:</b><br>For model with immobilizer, the light blinks 2 times, for model without immobilizer, it blinks once. | Do the security indicator light and hazard light blink?  | Go to step 4. | Go to symptom 2. <Ref. to SL-24, SYMPTOM CHART, INSPECTION, Security System.>  |
| <b>4 CHECK SECURITY SYSTEM OPERATION.</b><br>Press the LOCK button of transmitter, and wait for 30 seconds.  | Is the blinking pattern of security indicator light blink twice within 0.5 second in 2 seconds cycle?                    | Go to step 5. | Replace the keyless control unit.  |
| <b>5 CHECK SECURITY ALARM OPERATION.</b><br>1) Unlock all doors using the door lock switch on front door.<br>2) Open any door or rear gate.  | Does the security alarm operate when opening any door or rear gate?  | Go to step 6. | Go to symptom 3. <Ref. to SL-24, SYMPTOM CHART, INSPECTION, Security System.>  |
| <b>6 CHECK SECURITY ALARM OPERATION.</b><br>Check the security alarm operation.  | Does the all security alarm (horn, hazard light and security indicator light) operate, and is the starter motor stopped? | Go to step 7. | Go to symptom 4. <Ref. to SL-24, SYMPTOM CHART, INSPECTION, Security System.>  |

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <b>7 CHECK SECURITY ALARM CANCEL OPERATION.</b><br>Press the UNLOCK/DISARM button of transmitter.<br>NOTE:<br>For model with immobilizer, the light blinks once, for model without immobilizer, it remains off.         | Does the all security alarm (horn and hazard light) stop, and is the starter motor operated? | Go to step 8.  | Go to symptom 5. <Ref. to SL-24, SYMPTOM CHART, INSPECTION, Security System.>                      |
| <b>8 CHECK BATTERY OPEN PROTECTION FUNCTION</b><br>Check the system function properly when the battery is not connected temporarily. <Ref. to SL-23, CHECK BATTERY DISCONNECT PROTECTION, INSPECTION, Security System.> | Does the system function properly when the battery is not connected temporarily?             | Go to step 9.  | Replace the keyless control unit.  |
| <b>9 CHECK IMPACT SENSOR.</b><br>Check impact sensor. <Ref. to SL-53, CHECK IMPACT SENSOR, ADJUSTMENT, Impact Sensor.>  | Is the sensibility set properly?   | Press the UNLOCK/DISARM button of transmitter, and finish the diagnosis. | Adjust the sensibility. <Ref. to SL-53, IMPACT SENSITIVITY ADJUSTMENT, ADJUSTMENT, Impact Sensor.> |

## 2. CHECK BATTERY DISCONNECT PROTECTION

- 1) Remove the key from the ignition switch.
- 2) Close all doors and the rear gate.
- 3) Open the front hood.
- 4) Press the LOCK/ARM button of the transmitter.
- 5) Disconnect the ground cable from the battery.
- 6) Reconnect the cable to the battery.
- 7) Check that the security indicator light blinks after reconnecting the battery cable.

If NG, replace the keyless entry control unit.

## 3. SECURITY SYSTEM ON/OFF SETTING

- 1) Close all doors and rear gate, sit down on the driver seat. Press the UNLOCK button of transmitter.
- 2) Turn the ignition switch to ON.
- 3) Press the centralized door lock switch to UNLOCK side and open the driver's door simultaneously, and maintain this state for 10 seconds.
- 4) The setting of security system (ON ↔ OFF) will be switched, and the horn sounds.

| Setting  | Notice             |
|----------|--------------------|
| OFF → ON | Horn sounds once.  |
| ON → OFF | Horn sounds twice. |

**NOTE:**

Refer to the following for the ON/OFF setting of security system using Subaru Select Monitor. <Ref. to SL-49, PROCEDURE, Security Control Unit.>

# Security System

## SECURITY AND LOCKS

### 4. SYMPTOM CHART

| Symptom |  | Repair order   | Reference  |
|---------|--|--|--|
| 1       | Security system cannot be set.   | 1. Check the transmitter function.                                       | <Ref. to SL-15, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>   |
|         |  | 2. Check the fuse.   | <Ref. to SL-25, CHECK FUSE, INSPECTION, Security System.>  |
|         |  | 3. Check the keyless entry control unit power supply and ground circuit. | <Ref. to SL-25, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Security System.>   |
|         |  | 4. Check the door switch.  | <Ref. to SL-25, CHECK DOOR SWITCH, INSPECTION, Security System.>   |
|         |  | 5. Replace the keyless entry control unit.                               | <Ref. to SL-49, Security Control Unit.>  |
| 2       | Security indicator light or hazard light does not blink.                               | Security indicator light   | <Ref. to SL-27, CHECK SECURITY INDICATOR LIGHT CIRCUIT, INSPECTION, Security System.>  |
|         |  | Hazard light   | <Ref. to SL-28, CHECK HAZARD LIGHT OPERATION, INSPECTION, Security System.>  |
| 3       | Security system does not alarm when one of the door, trunk lid or rear gate is opened. | Check the door switch.   | <Ref. to SL-25, CHECK DOOR SWITCH, INSPECTION, Security System.>   |
| 4       | Security alarm does not activate.  | All functions  | Check the door switch.<br><Ref. to SL-25, CHECK DOOR SWITCH, INSPECTION, Security System.>   |
|         |  | Security indicator light   | Check the security indicator light circuit.<br><Ref. to SL-27, CHECK SECURITY INDICATOR LIGHT CIRCUIT, INSPECTION, Security System.> |
|         |  | Security horn  | Check the security horn.<br><Ref. to SL-27, CHECK SECURITY HORN, INSPECTION, Security System.>                                       |
|         |  | Hazard light   | Check the hazard light operation.<br><Ref. to SL-28, CHECK HAZARD LIGHT OPERATION, INSPECTION, Security System.>                     |
|         |  | Starter motor deactivation   | Check the interrupt relay circuit.<br><Ref. to SL-28, CHECK INTERRUPT RELAY CIRCUIT, INSPECTION, Security System.>                   |
| 5       | Security system cannot be canceled.  | Transmitter  | Check the transmitter function.<br><Ref. to SL-15, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>        |
|         |  | Ignition switch  | Check the ignition switch circuit.<br><Ref. to SL-28, CHECK IGNITION SWITCH CIRCUIT, INSPECTION, Security System.>                   |

## 5. CHECK FUSE

| Step   | Check                  | Yes                              | No  |
|--|------------------------|----------------------------------|---|
| <b>1 CHECK FUSE.</b><br>Remove and visually check the fuse No. 2 (in main fuse box). | Is the fuse blown out? | Replace the fuse with a new one. | Check the power supply and ground circuit. <Ref. to SL-25, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Security System.> |

## 6. CHECK POWER SUPPLY AND GROUND CIRCUIT

| Step   | Check                                     | Yes   | No  |
|--|---|---|---|
| <b>1 CHECK POWER SUPPLY.</b><br>1) Disconnect the keyless entry control unit harness connector.<br>2) Measure the voltage between the harness connector terminal and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B176) No. 2 (+) — Chassis ground (-):</i> | Is the voltage more than 10 V?            | Go to step 2.                               | Check the harness for open circuits and shorts between the keyless entry control unit and fuse. |
| <b>2 CHECK GROUND CIRCUIT.</b><br>Measure the resistance between the harness connector terminal and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B176) No. 14 — Chassis ground:</i>   | Is the resistance less than 10 $\Omega$ ? | The power supply and ground circuit are OK. | Repair the harness.   |

## 7. CHECK DOOR SWITCH

| Step   | Check                          | Yes                    | No            |
|--|--------------------------------|------------------------|---------------|
| <b>1 CHECK DOOR SWITCH CIRCUIT.</b><br>Measure the voltage between the keyless entry control unit harness connector terminal and chassis ground when any door or rear gate is opened.<br><i>Connector &amp; terminal</i><br><i>Front and rear door:</i><br><i>(B176) No. 6 (+) — Chassis ground (-):</i><br><i>Trunk lid or rear gate:</i><br><i>(B176) No. 7 (+) — Chassis ground (-):</i>    | Is the voltage 0 V?            | Go to step 2.          | Go to step 3. |
| <b>2 CHECK DOOR SWITCH CIRCUIT.</b><br>Measure the voltage between the keyless entry control unit harness connector terminal and chassis ground when all doors and rear gate are closed.<br><i>Connector &amp; terminal</i><br><i>Front and rear door:</i><br><i>(B176) No. 6 (+) — Chassis ground (-):</i><br><i>Trunk lid or rear gate:</i><br><i>(B176) No. 7 (+) — Chassis ground (-):</i> | Is the voltage more than 10 V? | The door switch is OK. | Go to step 3. |



# Security System

## SECURITY AND LOCKS

| Step  | Check  | Yes  | No                       |
|---|--|--|--------------------------|
| <b>3</b><br><b>CHECK DOOR SWITCH.</b><br>1) Disconnect the door switch harness connector.<br>2) Measure the resistance between the door switch terminals.<br><b>Terminals</b><br><i>Door switch No. 1 — No. 3:</i><br><i>Rear gate latch switch (Wagon model)</i><br><i>No. 1 — No. 2:</i><br><i>Trunk room light switch (Sedan model)</i><br><i>No. 1 — No. 2:</i> | Is the resistance more than 1 M $\Omega$ when door switch is pushed? | Go to step 4.  | Replace the door switch. |
| <b>4</b><br><b>CHECK DOOR SWITCH.</b><br>Measure the resistance between the door switch terminals.<br><b>Terminals</b><br><i>Door switch No. 1 — No. 3:</i><br><i>Rear gate latch switch (Wagon model)</i><br><i>No. 1 — No. 2:</i><br><i>Trunk room light switch (Sedan model)</i><br><i>No. 1 — No. 2:</i>  | Is the resistance less than 1 $\Omega$ when door switch is released? | Check the harness for open circuits and shorts between the keyless entry control unit and door switch. | Replace the door switch. |

## 8. CHECK SECURITY INDICATOR LIGHT CIRCUIT

| Step  | Check   | Yes  | No   |
|---|---|--|--|
| <b>1 CHECK SECURITY INDICATOR LIGHT.</b><br>1) Disconnect the keyless entry control unit harness connector.<br>2) Ground the harness connector terminal with a suitable wire.<br><i>Connector &amp; terminal</i><br><i>(B176) No. 15 — Chassis ground:</i>  | Does the security indicator light illuminate? | Replace the keyless entry control unit.        | Go to step 2.  |
| <b>2 CHECK POWER SUPPLY FOR SECURITY INDICATOR LIGHT.</b><br>1) Disconnect the connector from the combination meter.<br>2) Measure the voltage between the combination meter harness connector terminal and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(i11) No. 10 (+) — Chassis ground (-):</i> | Is the voltage more than 10 V?                | Go to step 3.                                  | Check the harness for open circuits and shorts between the combination meter and the fuse.                   |
| <b>3 CHECK SECURITY INDICATOR LIGHT CIRCUIT.</b><br>Measure the resistance between the combination meter harness connector terminal and keyless entry control unit harness connector terminal.<br><i>Connector &amp; terminal</i><br><i>(i10) No. 6 — (B176) No. 15:</i>  | Is the resistance less than 10 $\Omega$ ?     | Replace the combination meter printed circuit. | Check the harness for open circuits and shorts between the combination meter and keyless entry control unit. |

## 9. CHECK SECURITY HORN

| Step   | Check                                     | Yes                                     | No   |
|--|---|---|--|
| <b>1 CHECK SECURITY HORN RELAY.</b><br>Remove and check the security horn relay. <Ref. to SL-52, Security Horn Relay.>   | Is the security horn OK?                  | Go to step 2.                           | Replace the security horn relay.   |
| <b>2 CHECK POWER SUPPLY FOR SECURITY HORN RELAY.</b><br>Measure the voltage between the security horn relay harness connector terminal and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B243) No. 1 (+) — Chassis ground (-):</i>   | Is the voltage more than 10 V?            | Go to step 3.                           | Check the harness for open circuits and shorts between the security horn relay and horn relay.                 |
| <b>3 CHECK POWER SUPPLY FOR SECURITY HORN RELAY.</b><br>Measure the voltage between the security horn relay harness connector terminal and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B243) No. 2 (+) — Chassis ground (-):</i>   | Is the voltage more than 10 V?            | Go to step 4.                           | Check the harness for open circuits and shorts between the security horn relay and the fuse.                   |
| <b>4 CHECK HARNESS BETWEEN SECURITY HORN RELAY AND KEYLESS ENTRY CONTROL UNIT.</b><br>Measure the resistance between the security horn relay harness connector terminal and keyless entry control unit harness connector terminal.<br><i>Connector &amp; terminal</i><br><i>(B243) No. 4 — (B93) No. 16:</i> | Is the resistance less than 10 $\Omega$ ? | Go to step 5.                           | Check the harness for open circuits and shorts between the security horn relay and keyless entry control unit. |
| <b>5 CHECK SECURITY HORN.</b><br>Remove and check the security horn. <Ref. to SL-51, Security Horn.>   | Is the security horn OK?                  | Replace the keyless entry control unit. | Replace the security horn.   |

# Security System

## SECURITY AND LOCKS

### 10.CHECK HAZARD LIGHT OPERATION

| Step  | Check                        | Yes  | No                                      |
|---|------------------------------|--|---|
| 1<br><b>CHECK HAZARD LIGHT OPERATION.</b><br>Check the hazard light blinks when hazard switch is turned ON.   | Does the hazard light blink? | Go to step 2.  | Check the hazard light circuit.         |
| 2<br><b>CHECK KEYLESS ENTRY CONTROL UNIT OUTPUT SIGNAL.</b><br>1) Remove the key from ignition switch.<br>2) Open the driver's window, and then close all doors and rear gate.<br>3) Lock all doors with the transmitter or door lock switch to arm the security system.<br>4) Unlock all doors with the door lock switch.<br>5) Measure the voltage between the keyless entry control unit harness connector terminal and chassis ground when any door is open.<br><b>Connector &amp; terminal</b><br><b>(B176) No. 14 — Chassis ground:</b> | Is the voltage 1 — 4 V?      | Check the harness for open or short between keyless entry control unit and turn signal lights. | Replace the keyless entry control unit. |

### 11.CHECK INTERRUPT RELAY CIRCUIT

| Step   | Check  | Yes                                     | No   |
|--|--|---|--|
| 1<br><b>CHECK INTERRUPT RELAY.</b><br>Remove and check the interrupt relay. <Ref. to SL-54, Interrupt Relay.>  | Is the interrupt relay OK?   | Go to step 2.                           | Replace the interrupt relay.   |
| 2<br><b>CHECK POWER SUPPLY FOR INTERRUPT RELAY.</b><br>Measure the voltage between the interrupt relay harness connector terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B422) No. 5 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V when ignition switch is turned to START? | Go to step 3.                           | Check the harness for open circuits and shorts between the interrupt relay and ignition switch.            |
| 3<br><b>CHECK HARNESS BETWEEN INTERRUPT RELAY AND KEYLESS ENTRY CONTROL UNIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the keyless entry control unit harness connector.<br>3) Measure the resistance between the interrupt relay harness connector terminal and keyless entry control unit harness connector.<br><b>Connector &amp; terminal</b><br><b>(B422) No. 1 — (B176) No. 12:</b> | Is the resistance less than 10 $\Omega$ ?                              | Replace the keyless entry control unit. | Check the harness for open circuits and shorts between the interrupt relay and keyless entry control unit. |

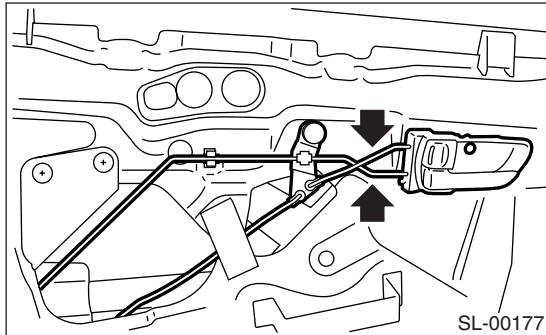
### 12.CHECK IGNITION SWITCH CIRCUIT

| Step   | Check                          | Yes                            | No   |
|--|--------------------------------|--------------------------------|--|
| 1<br><b>CHECK IGNITION SWITCH SIGNAL.</b><br>1) Disconnect the keyless entry control unit harness connector.<br>2) Turn the ignition switch to ON.<br>3) Measure the voltage between the harness connector terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B176) No. 10 (+) — Chassis ground (-):</b> | Is the voltage more than 10 V? | Ignition switch circuit is OK. | Check the harness for open circuits and shorts between the keyless entry control unit and ignition switch. |

## 5. Front Inner Remote

### A: REMOVAL

- 1) Remove the door trim. <Ref. to EI-41, REMOVAL, Front Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-17, REMOVAL, Front Sealing Cover.>
- 3) Remove a screw and two rod joints.
- 4) Remove the front inner remote.



### B: INSTALLATION

Install in the reverse order of removal.

#### NOTE:

Make sure the front inner remote works properly after installation.

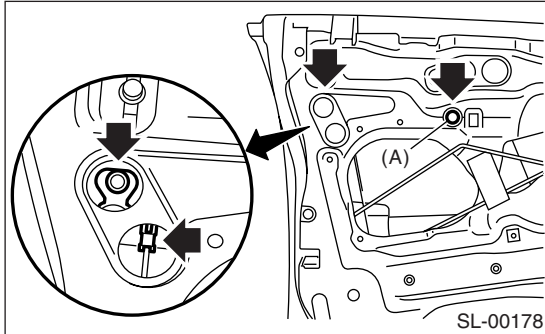
### C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.

## 6. Front Outer Handle

### A: REMOVAL

- 1) Remove the door trim. <Ref. to EI-41, REMOVAL, Front Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-17, REMOVAL, Front Sealing Cover.>
- 3) Remove the bolt (A).
- 4) Move the front door glass downward. Remove the bolt and rod clamp.
- 5) Remove the front outer handle.



### CAUTION:

**Do not use excessive force to remove the handle from door panel. This will deform it.**

### B: INSTALLATION

Install in the reverse order of removal.

### NOTE:

Make sure the front outer handle works properly after installation.

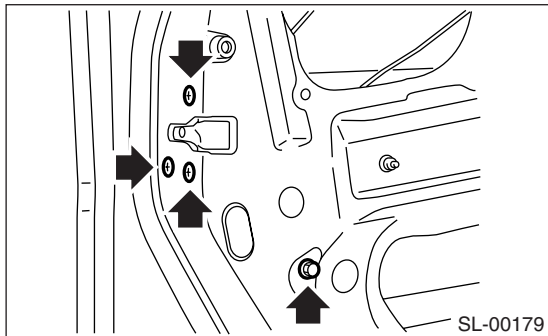
### C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.

## 7. Front Door Latch and Door Lock Actuator Assembly

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the front door trim. <Ref. to EI-41, REMOVAL, Front Door Trim.>
- 3) Remove the sealing cover. <Ref. to EB-17, REMOVAL, Front Sealing Cover.>
- 4) Remove the front inner remote. <Ref. to SL-29, REMOVAL, Front Inner Remote.>
- 5) Remove three screws and a bolt.



- 6) Remove the front door latch assembly, and then disconnect the connector.

### B: INSTALLATION

Install in the reverse order of removal.

#### NOTE:

Make sure the lock works properly after installation.

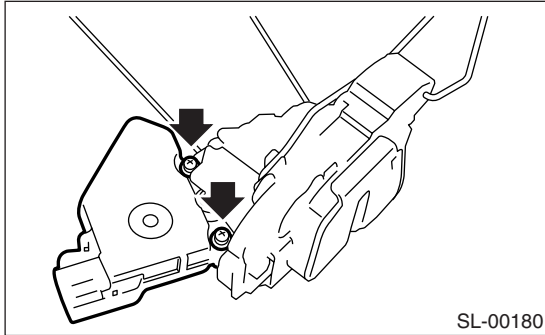
### C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.

## 8. Front Door Lock Actuator

### A: REMOVAL

- 1) Remove the front door latch assembly. <Ref. to SL-31, REMOVAL, Front Door Latch and Door Lock Actuator Assembly.>
- 2) Remove the two screws to remove front door lock actuator.



### B: INSTALLATION

Install in the reverse order of removal.

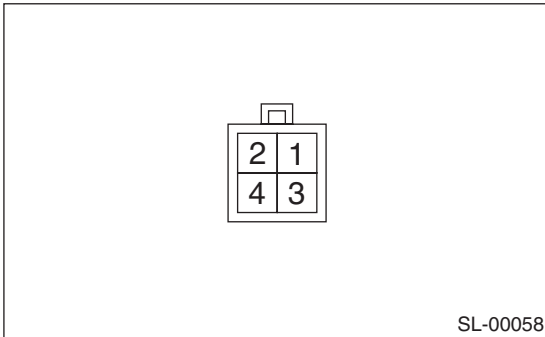
NOTE:

Make sure the lock works properly after installation.

### C: INSPECTION

- 1) Disconnect the front door lock actuator harness connector.
- 2) Connect the battery to front door lock actuator terminals.

If NG, replace the door lock actuator.

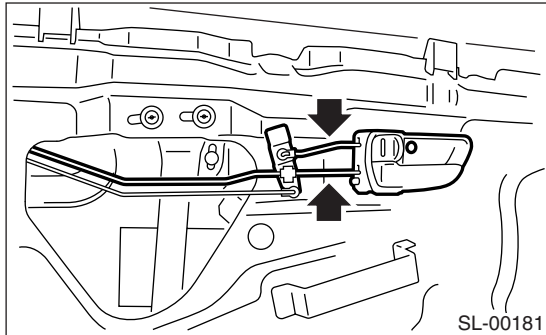


| Terminal No.            | Actuator operation |
|-------------------------|--------------------|
| No. 3 (+) and No. 1 (-) | Unlocked → Locked  |
| No. 1 (+) and No. 3 (-) | Locked → Unlocked  |

## 9. Rear Inner Remote

### A: REMOVAL

- 1) Remove the rear door trim. <Ref. to EI-42, REMOVAL, Rear Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-20, REMOVAL, Rear Sealing Cover.>
- 3) Remove a screw and two rod joints.
- 4) Remove the rear inner remote.



### B: INSTALLATION

Install in the reverse order of removal.

#### NOTE:

Make sure the rear inner remote works properly after installation.

### C: INSPECTION

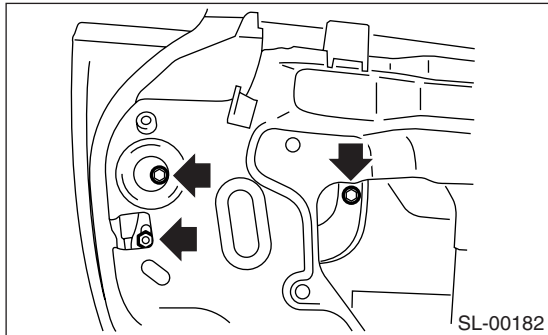
- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.
- 3) Make sure the child safety lock work properly.



## 10.Rear Outer Handle

### A: REMOVAL

- 1) Remove the rear door trim. <Ref. to EI-42, REMOVAL, Rear Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-20, REMOVAL, Rear Sealing Cover.>
- 3) Remove the rear inner remote. <Ref. to SL-33, REMOVAL, Rear Inner Remote.>
- 4) Remove the rear door latch assembly. <Ref. to SL-35, REMOVAL, Rear Door Latch and Door Lock Actuator Assembly.>
- 5) Loosen two bolts and a nut to remove the rear outer handle.



### CAUTION:

**Do not use excessive force to remove the handle from door panel. This will deform it.**

### B: INSTALLATION

Install in the reverse order of removal.

### NOTE:

Make sure the rear outer handle works properly after installation.

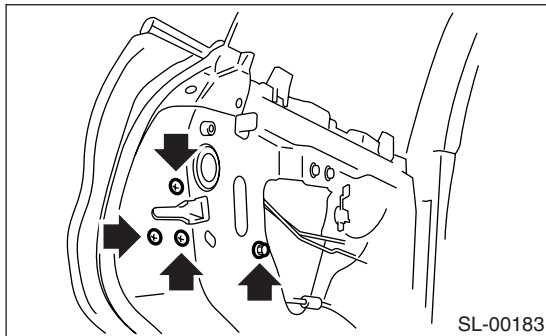
### C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the outer handle and rod move smoothly.

## 11. Rear Door Latch and Door Lock Actuator Assembly

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the rear door trim. <Ref. to EI-42, REMOVAL, Rear Door Trim.>
- 3) Remove the sealing cover. <Ref. to EB-20, REMOVAL, Rear Sealing Cover.>
- 4) Remove the rear inner remote. <Ref. to SL-33, REMOVAL, Rear Inner Remote.>
- 5) Remove three screws and a bolt.



- 6) Disconnect the connector, and then remove the rear door latch assembly.

### B: INSTALLATION

Install in the reverse order of removal.

#### NOTE:

Make sure the lock works properly after installation.

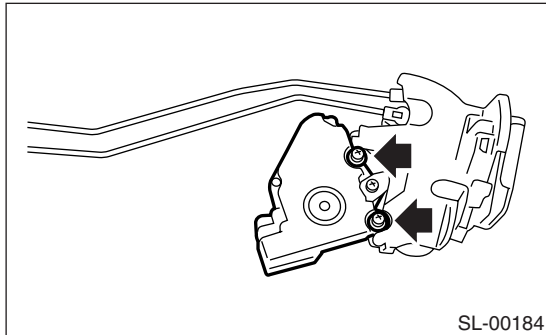
### C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the outer handle, rear remote handle and rod move smoothly.

## 12.Rear Door Lock Actuator

### A: REMOVAL

- 1) Remove the rear door latch assembly. <Ref. to SL-35, REMOVAL, Rear Door Latch and Door Lock Actuator Assembly.>
- 2) Loosen two screws to remove rear door lock actuator.



### B: INSTALLATION

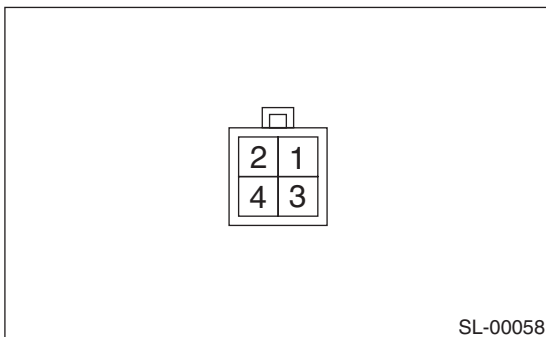
Install in the reverse order of removal.

NOTE:

Make sure the lock works properly after installation.

### C: INSPECTION

- 1) Disconnect the rear door lock actuator harness connector.
- 2) Connect the battery to rear door lock actuator terminals.



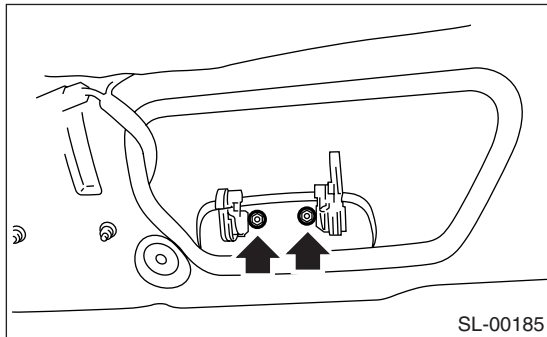
| Terminal No.            | Actuator operation |
|-------------------------|--------------------|
| No. 3 (+) and No. 1 (-) | Unlocked → Locked  |
| No. 1 (+) and No. 3 (-) | Locked → Unlocked  |

If NG, replace the door lock actuator.

## 13.Rear Gate Outer Handle

### A: REMOVAL

- 1) Remove the rear gate trim. <Ref. to EI-57, REMOVAL, Rear Gate Trim.>
- 2) Remove the rear gate latch assembly. <Ref. to SL-38, REMOVAL, Rear Gate Latch Assembly.>
- 3) Remove the two nuts to remove the rear gate outer handle.



### B: INSTALLATION

Install in the reverse order of removal.

#### NOTE:

Make sure the rear gate outer handle works properly after installation.

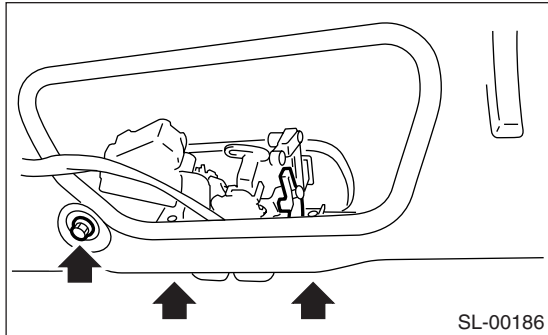
### C: INSPECTION

- 1) Inspect the rod for deformation.
- 2) Make sure the outer handle and cable move smoothly.

## 14. Rear Gate Latch Assembly

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the rear gate trim. <Ref. to EI-57, REMOVAL, Rear Gate Trim.>
- 3) Remove three bolts.



- 4) Disconnect the connectors, and then remove the rear gate latch assembly.

### B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Make sure the lock works properly after installation.

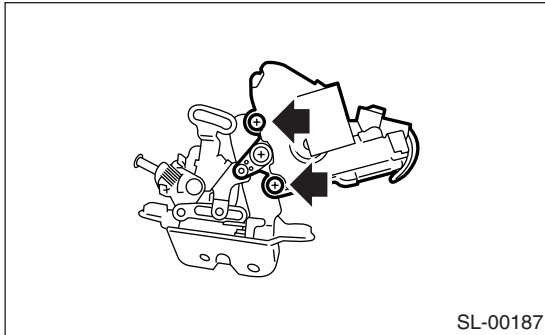
### C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the outer handle and cable move smoothly.

## 15. Rear Gate Latch Lock Actuator

### A: REMOVAL

- 1) Remove the rear gate latch assembly. <Ref. to SL-38, REMOVAL, Rear Gate Latch Assembly.>
- 2) Loosen two screws to remove the rear gate lock actuator.



### B: INSTALLATION

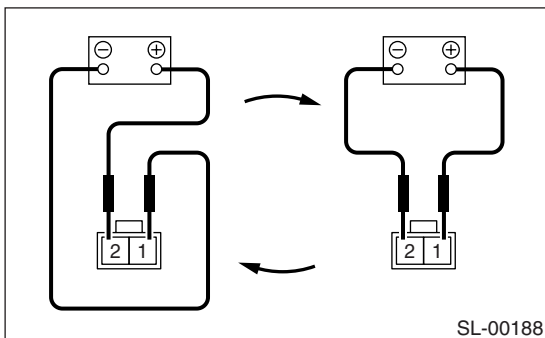
Install in the reverse order of removal.

NOTE:

Make sure the lock works properly after installation.

### C: INSPECTION

- 1) Disconnect the rear gate latch lock actuator harness connector.
- 2) Connect the battery to rear gate latch lock actuator terminals.



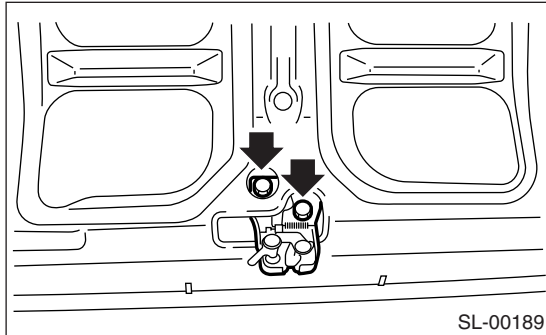
| Terminal No.            | Actuator operation |
|-------------------------|--------------------|
| No. 1 (+) and No. 2 (-) | Unlocked → Locked  |
| No. 2 (+) and No. 1 (-) | Locked → Unlocked  |

If NG, replace the rear gate latch lock actuator.

### 16. Trunk Lid Lock Assembly

#### A: REMOVAL

- 1) Remove the trunk lid key cylinder rod clamp.
- 2) Loosen two bolts to remove the trunk lid lock assembly.



#### B: INSTALLATION

Install in the reverse order of removal.

#### NOTE:

- Apply grease to parts that rub.
- Make sure the lock works properly after installation.

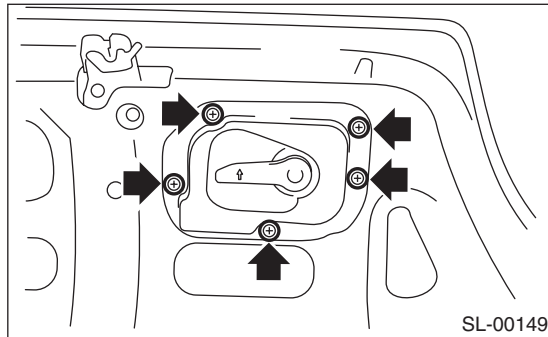
#### C: INSPECTION

- 1) Check the striker for bending or abnormal wear.
- 2) Check the safety lever for improper movement.
- 3) Check other levers and the spring for rust formation and unsmooth movement.

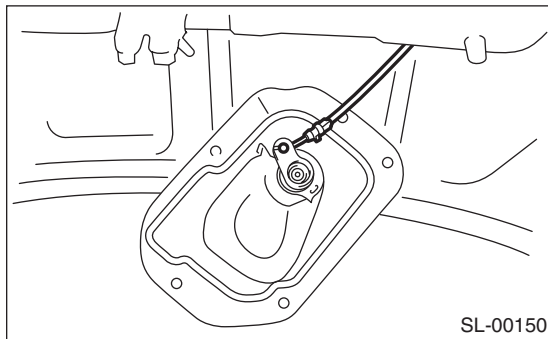
## 17. Trunk Lid Release Handle

### A: REMOVAL

1) Remove the five clips.



2) Remove the cable from trunk lid release handle.



### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

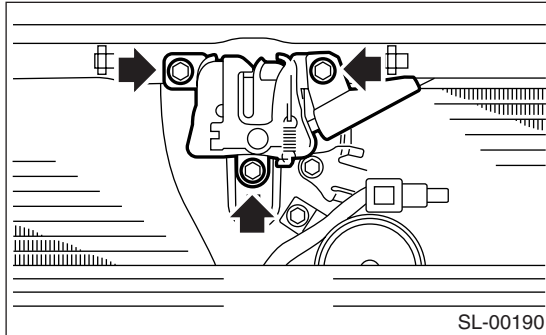
- 1) Make sure the cable is not deformed.
- 2) Make sure the lever works smoothly.



## 18. Front Hood Lock Assembly

### A: REMOVAL

- 1) Open the front hood.
- 2) Remove the bolts. Remove the hood lock assembly.



- 3) Remove the release cable from front hood lock assembly.

### B: INSTALLATION

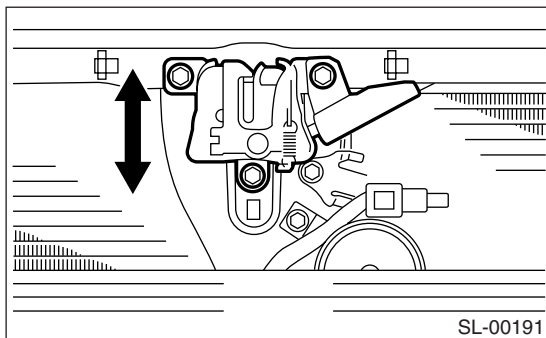
Install in the reverse order of removal.

#### NOTE:

- Apply grease to parts that rub.
- Make sure the release cable works properly after installation.

### C: ADJUSTMENT

Loosen the bolt. Adjust the front hood lock assembly while moving it up and down.



### D: INSPECTION

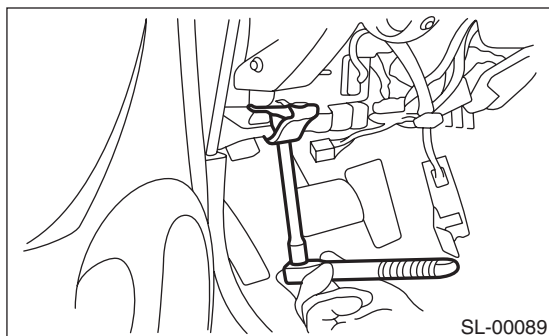
- 1) Check the striker for bending or abnormal wear.
- 2) Check the safety lever for improper movement.
- 3) Check other levers and the spring for rust formation and unsmooth movement.

## 19. Remote Openers

### A: REMOVAL

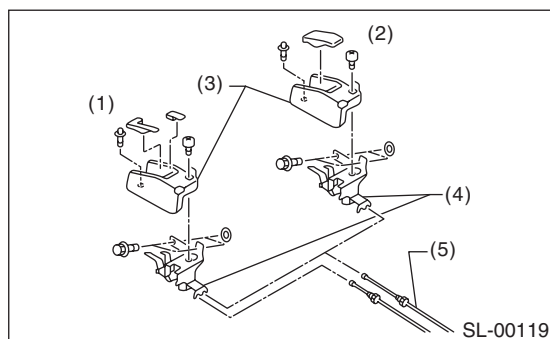
#### 1. HOOD OPENER

- 1) Remove the release cable from front hood lock assembly.
- 2) Remove the bolt. Remove the lever assembly.



#### 2. TRUNK LID OPENER

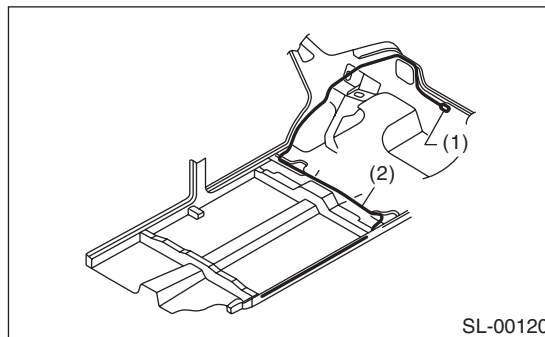
- 1) Remove the rear seat. <Ref. to SE-13, REMOVAL, Rear Seat.>
- 2) Remove the center pillar lower trim, and remove the side sill cover on passenger side. Remove the rear pillar lower trim. Pull back the floor mat. Remove the clip holding the cable.
- 3) Remove the bolt. Remove the pull handle assembly.



- (1) Sedan
- (2) Wagon
- (3) Cover
- (4) Pull handle ASSY
- (5) Cable

- 4) Remove the cable from pull handle assembly.
- 5) Remove the striker from trunk lid.

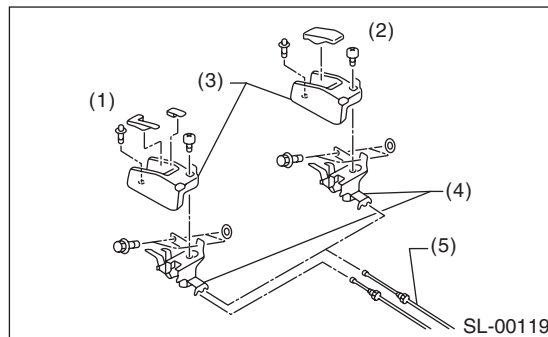
- 6) Remove the cable from striker.



- (1) Striker
- (2) Cable

#### 3. FUEL FLAP OPENER

- 1) Remove the rear seat. <Ref. to SE-13, REMOVAL, Rear Seat.>
- 2) Remove the center pillar lower trim, and remove the side sill cover on passenger side. Remove the rear pillar lower trim. Pull back the floor mat. Remove the clip holding the cable.
- 3) Remove the bolt. Remove the pull handle assembly.



- (1) Sedan
- (2) Wagon
- (3) Cover
- (4) Pull handle ASSY
- (5) Cable

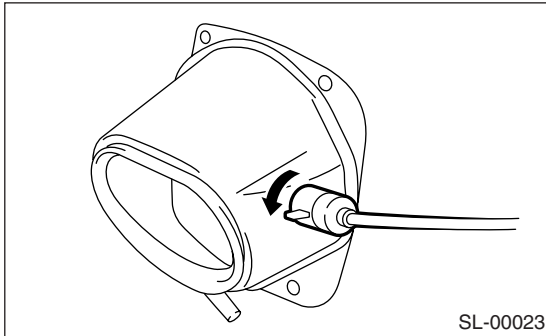
- 4) Remove the cable from pull handle assembly.
- 5) Remove the right rear quarter trim. <Ref. to EI-52, REMOVAL, Rear Quarter Trim.>

# Remote Openers

## SECURITY AND LOCKS

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6) Rotate the fuel lock inside the quarter panel to left and remove.



### **B: INSTALLATION**

#### **1. HOOD OPENER**

Install in the reverse order of removal.

#### **2. TRUNK LID OPENER**

Install in the reverse order of removal.

#### **3. FUEL FLAP OPENER**

Install in the reverse order of removal.

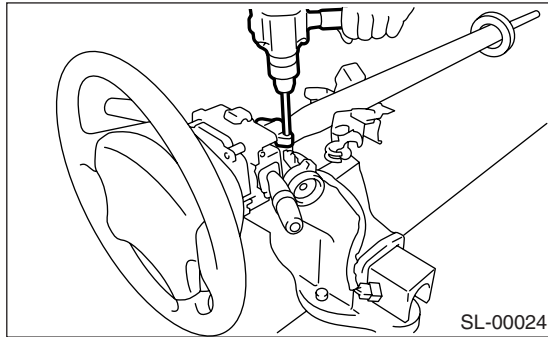
### **C: INSPECTION**

Make sure the fuel filler flap lid opens and closes smoothly.

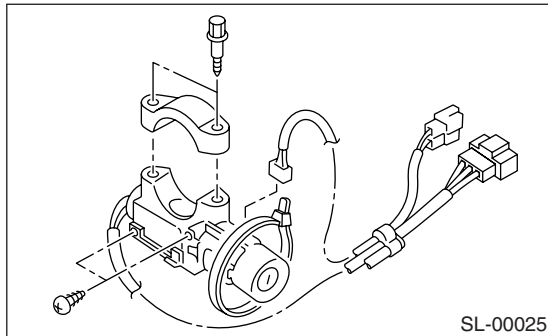
## 20. Ignition Key Lock

### A: REPLACEMENT

- 1) Remove the ground cable from battery.
- 2) Remove the steering column. <Ref. to PS-23, REMOVAL, Tilt Steering Column.>
- 3) Secure the steering column in a vise. Remove the bolt with a drill.



- 4) Remove the ignition key lock.
- 5) Use a new torn bolt. Tighten the torn bolt to end of thread.



### B: INSPECTION

- 1) Remove the instrument panel lower cover.
- 2) Remove the lower column cover.
- 3) Unfasten the hold-down clip which secures harness and disconnect the connector of ignition switch from body harness.
- 4) Turn the ignition key plate to each position and check the continuity between terminals of ignition connector.

| Switch position | Terminal No.  | Standard      |
|-----------------|---|---------------|
| LOCK            | —   | —             |
| ACC             | No. 1 and No. 2                                       | Less than 1 Ω |
| ON              | No. 1 and No. 2<br>No. 1 and No. 4<br>No. 2 and No. 4 | Less than 1 Ω |
| ST              | No. 1 and No. 3<br>No. 1 and No. 4<br>No. 3 and No. 4 | Less than 1 Ω |

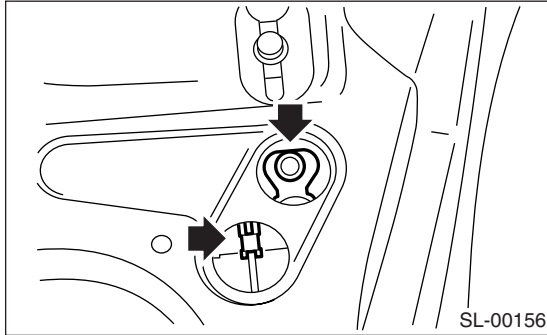
If NG, replace the ignition switch.

## 21. Key Lock Cylinders

### A: REPLACEMENT

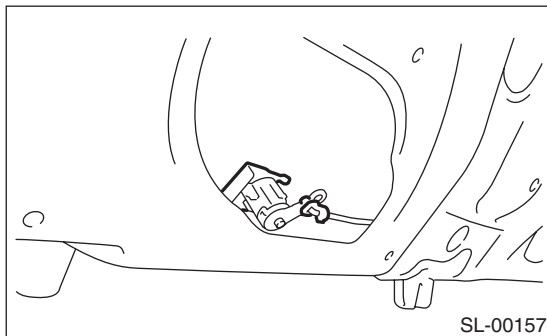
#### 1. FRONT DOOR

- 1) Remove the door trim. <Ref. to EI-41, REMOVAL, Front Door Trim.>
- 2) Pull back the sealing cover.
- 3) Move the front door glass downward.
- 4) Remove the rod clamp. Remove the bolt. Replace the key cylinder.



#### 2. TRUNK LID

- 1) Remove the trunk lid release handle. <Ref. to SL-41, Trunk Lid Release Handle.>
- 2) Remove the rod clamp. Remove the lock plate. Replace the key cylinder.



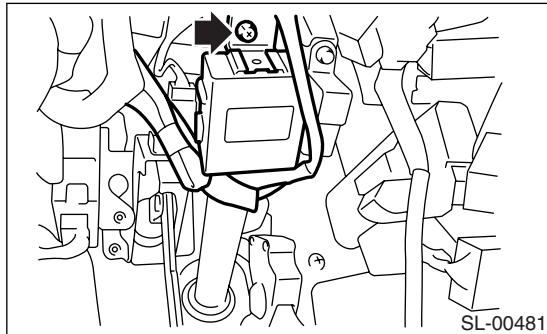
## 22. Immobilizer Control Unit

### A: REMOVAL

NOTE:

- Prepare the security ID plate.
- Prepare all registered immobilizer keys for the model with immobilizer.
- Make a registration of immobilizer when replacing the immobilizer control unit. New immobilizer key is required for registration. For detailed operation procedure, refer to "IMMOBILIZER REGISTRATION MANUAL".
- If the keys are added without replacing the immobilizer control unit, maximum 4 keys can be registered including new keys.

- 1) Disconnect the ground cable from battery.
- 2) Remove the instrument panel lower cover. <Ref. to EI-47, REMOVAL, Instrument Panel Assembly.>
- 3) Disconnect the connector from immobilizer control unit.
- 4) Remove the immobilizer control unit.



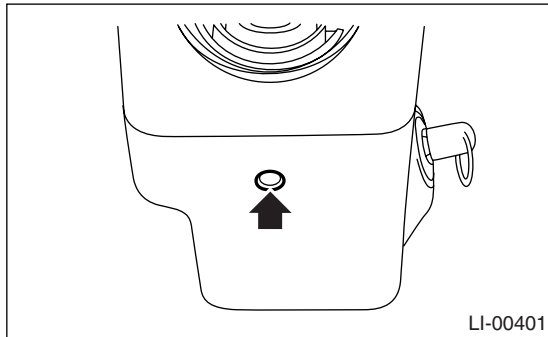
### B: INSTALLATION

Install in the reverse order of removal.

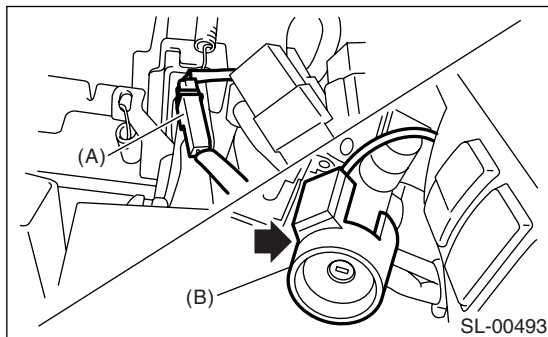
## 23. Immobilizer Antenna

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the instrument panel lower cover. <Ref. to EI-47, REMOVAL, Instrument Panel Assembly.>
- 3) Remove the screws, separate upper column cover and lower column cover.



- 4) Disconnect the immobilizer antenna connector (A) from body harness.
- 5) Remove the screw, and detach the immobilizer antenna (B).



### B: INSTALLATION

Install in the reverse order of removal.

## 24. Security Control Unit

### A: NOTE

The control of security system is performed by the keyless entry control unit.

### B: REMOVAL

<Ref. to SL-55, REMOVAL, Keyless Entry Control Unit.>

### C: INSTALLATION

<Ref. to SL-55, INSTALLATION, Keyless Entry Control Unit.>

### D: PROCEDURE

#### 1. FUNCTION SETTING (ECM CUSTOMIZING)

- 1) Connect the Subaru Select Monitor to data link connector.
- 2) Turn the ignition switch to ON.
- 3) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 4) On the «System Selection Menu» display screen, select the {Keyless Unit Mode} and press the [YES] key.
- 5) On the «Integ. Unit mode failuer diag» display screen, select the {ECM customizing} and press the [YES] key.
- 6) Change the setting with UP/DOWN key and press the [YES] key.
  - List of function setting item (ECM customizing)

| No. | Data                      | Initial setting value | Customize setting | Remarks  |
|-----|---------------------------|-----------------------|-------------------|--|
| 1   | Security Alarm Setup      | OFF                   | ON                | Security alarm (hazard, horn) is active.   |
|     |                           |                       | OFF               | Security alarm is inactive.  |
| 2   | Alarm monitor delay setup | ON                    |                   | After doors are locked by keyless entry system operated, Alarm monitor starts in the following delay time.   |
|     |                           |                       | ON                | Delay time is 30 seconds.  |
|     |                           |                       | OFF               | Delay time is 0 seconds.   |
| 3   | Impact Sensor Setup       | OFF                   | ON                | Workable when Impact Sensor Setup is set to "ON". Impact sensor is in active condition.  |
|     |                           |                       | OFF               | Impact sensor is in inactive condition. (Set Impact Sensor Setup of model without impact sensor to "OFF".)   |
| 4   | Impact sensor             | OFF                   | ON                | Vehicle is controlled with impact sensor equipped mode. (Set it to "OFF" for the model without impact sensor. If it is set to "ON", hazard, horn or siren operates with keyless entry system operated (alarm monitor starting).) |
|     |                           |                       | OFF               | Vehicle is controlled in impact sensor no-equipped mode.   |
| 5   | Passive Alarm             | OFF                   | ON                | There is no function that it is automatically set to ARM without user's intentional locking (ARM).   |
|     |                           |                       | OFF               | Workable when passive arming is set to "ON".   |

7) After setting, make sure that vehicle equipment is same as the setting changed in the {Current Data Display & Save}.

#### CAUTION:

- It is possible to control the original functions of vehicle when settings above are corresponded to vehicle equipment.
- Do not change the settings except for setting above during operation of equipment setting.
- Resetting is needed if installing a new keyless unit.
- In passive mode, the system will automatically activate the alarm but WILL NOT automatically lock the doors. Failure to lock the doors manually will result in a higher security risk.

#### NOTE:

For details concerning operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

8) Turn the ignition switch to OFF, and then remove the Subaru Select Monitor.



# Security Control Unit

## SECURITY AND LOCKS

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### 2. ALARM HISTORY REPORT MODE

- 1) Turn the ignition switch to ON.
- 2) Security indicator light blinks.

| The number of times security indicator light blinks | Vehicle state  |
|---|--|
| Once  | WARNNG is activated by impact sensor (OP). It may be caused by light impact on outside of vehicle or other person's vandalism. |
| 2 times   | ALARM is activated by impact sensor (OP). It may be caused by strong impact on outside of vehicle or other person's vandalism. |
| 3 times   | The ignition switch has been turned to ON.   |
| 4 times   | The rear gate has been opened.   |
| 5 times   | One of the doors has been opened.  |

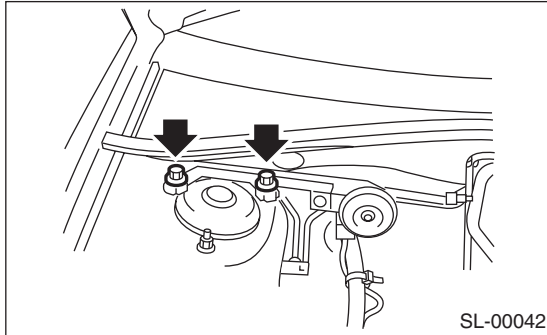
#### NOTE:

- If the ALARM/WARNING occurs in the ARM mode, the indicator light blinks when the ignition switch is turned to OFF → ON at the next DISARM mode.
- If ALARM/WARNING does not occur, the light does not blink.
- More than one alarm or warning occurs, the most numbers of blinking times have priority to blink.
- Anytime the ignition switch is turned to ON in the DISARM mode, it blinks. The memory will be updated at the next ARM mode.

## 25. Security Horn

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the nuts and then detach the security horn while disconnecting the connector.

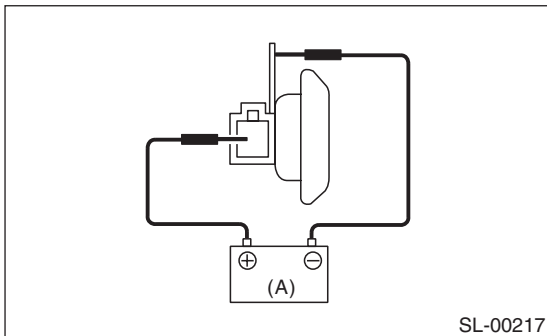


### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

Connect the battery to the security horn terminal and case ground and make sure the horn sounds properly.



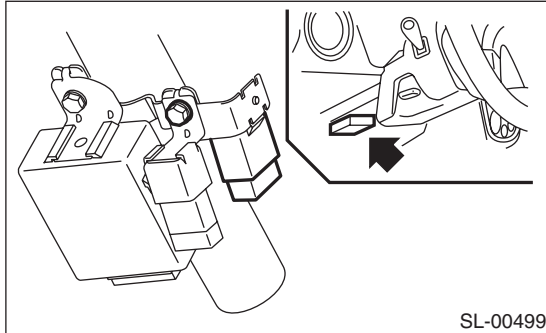
(A) Battery

If NG, replace the security horn.

## 26. Security Horn Relay

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the mounting bolt and detach the security horn relay.



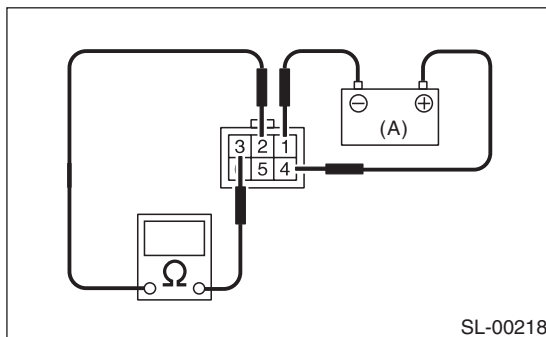
### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

Measure the security horn relay resistance between terminals (indicated in the table below) when connecting terminal No. 4 to battery positive terminal and terminal No. 1 to battery ground terminal.

| Current | Terminal No. | Standard value         |
|---------|--------------|------------------------|
| Flow    | 2 and 3      | Less than 1 $\Omega$   |
| No flow |              | More than 1 M $\Omega$ |



(A) Battery

If NG, replace the security horn relay.

## 27. Impact Sensor

### A: REMOVAL

- 1) Remove the key from ignition switch.
- 2) Close all the doors, trunk lid and rear gate.
- 3) Press the UNLOCK button of transmitter.
- 4) Change the setting of impact sensor using Subaru Select Monitor.
- 5) Disconnect the ground cable from battery.
- 6) Remove the impact sensor.

### B: INSTALLATION

- 1) Remove the key from ignition switch.
- 2) Close all the doors, trunk lid and rear gate.
- 3) Press the UNLOCK button of transmitter.
- 4) Disconnect the ground cable from battery.
- 5) Install the impact sensor.
- 6) Connect the battery ground cable to battery.
- 7) Change the setting of impact sensor using Subaru Select Monitor.

### C: OPERATION

#### 1. IMPACT SENSOR SETTING USING SUBARU SELECT MONITOR

- 1) Connect the Subaru Select Monitor to data link connector.
- 2) Turn the ignition switch to ON.
- 3) Select {Keyless Unit} from the main menu.
- 4) Select {ECU customizing}.
- 5) Make a impact monitor setting.
  - When installing: ON
  - When removing: OFF
- 6) Make a impact monitor ON/OFF setting.
  - When installing: ON
  - When removing: OFF
- 7) Turn the ignition switch to OFF, and then remove the Subaru Select Monitor.

### D: ADJUSTMENT

#### 1. CHECK IMPACT SENSOR

- 1) Remove the key from ignition switch.
- 2) Close all windows.
- 3) Close all the doors, trunk lid and rear gate. Leave open the front hood.
- 4) Press the LOCK button of the transmitter from outside vehicle.
- 5) Check that the security indicator light blinks twice within 0.5 seconds in 2 seconds cycle after 30 seconds.
- 6) Hit the windshield with your palm continuously and check the security alarm operates. Lift up the front hood approx. 12 cm (4.7 in), and then drop it off to check the operation of security alarm.
- 7) If NG, adjust the impact sensitivity.

## 2. IMPACT SENSITIVITY ADJUSTMENT

- 1) Connect the Subaru Select Monitor to data link connector.
- 2) Turn the ignition switch to ON.
- 3) Select {Impact Sensor} from the main menu.
- 4) Make a {ECU customizing}.
  - Sensitivity can be adjusted in 11 levels (0 to 10).
  - Initial setting is 5.
  - Smaller number means more sensitive.
  - Larger number means less sensitive.
- 5) Turn the ignition switch to OFF, and then remove the Subaru Select Monitor.

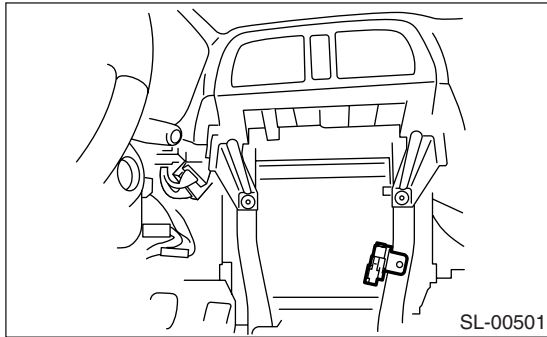
#### NOTE:

- Set the sensor so as not to let the alarm on normal vibration (reclining to the door, hit the ball and etc.).
- Set the sensor to operate the alarm with hitting the door or window glass, etc. continuously like a mayhem by robbery.
- Ask the customer about parking situation for setting, because the alarm operate when the vibration not only the burglar but also the construction etc.

## 28. Interrupt Relay

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the audio instrument. <Ref. to ET-6, REMOVAL, Audio.>
- 3) Remove the interrupt relay.



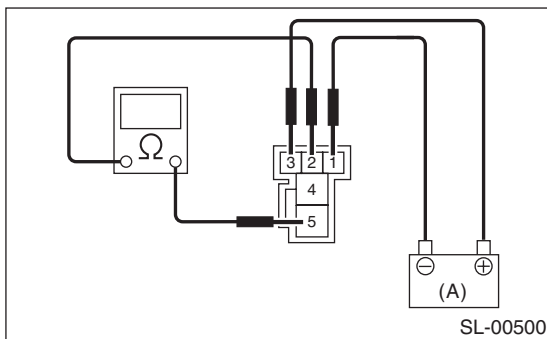
### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

Measure the interrupt relay resistance between terminals (indicated in the table below) when connecting terminal No. 3 to battery positive terminal and terminal No. 1 to battery ground terminal.

| Current | Terminal No. | Standard value |
|---------|--------------|----------------|
| Flow    | 2 and 5      | More than 1 MΩ |
| No flow |              | Less than 1 Ω  |
| Flow    | 4 and 5      | Less than 1 Ω  |
| No flow |              | More than 1 MΩ |



(A) Battery

If NG, replace the interrupt relay.

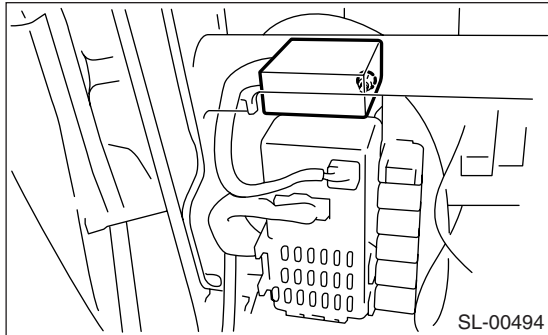
### CAUTION:

**Do not connect the terminals to battery positive terminal and ground terminal incorrectly. If this happens, replace the interrupt relay.**

## 29. Keyless Entry Control Unit

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the instrument panel lower cover. <Ref. to EI-47, REMOVAL, Instrument Panel Assembly.>
- 3) Remove the nut, and then remove the keyless entry control unit while disconnecting connector.



- 4) Disconnect the keyless entry control unit and other electrical control module.

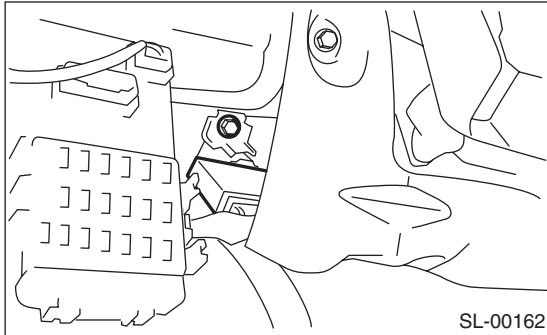
### B: INSTALLATION

Install in the reverse order of removal.

## 30. Body Integrated Module

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the instrument panel lower cover. <Ref. to EI-47, REMOVAL, Instrument Panel Assembly.>
- 3) Remove the nut, then remove the body integrated module while disconnecting the connector.



### B: INSTALLATION

Install in the reverse order of removal.

### 31. Transmitter

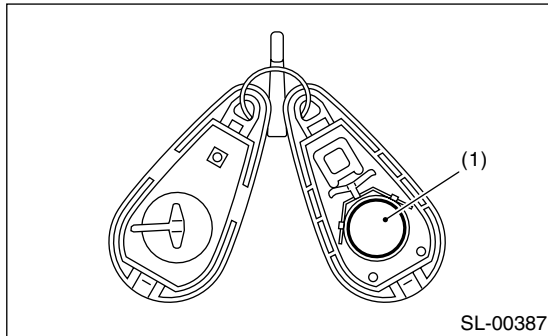
#### A: REMOVAL

##### 1. TRANSMITTER BATTERY

Remove the battery (1) from transmitter.

**NOTE:**

To prevent static electricity damage to transmitter printed circuit board, touch the steel area of building with hand to discharge the static electricity carried on body or clothes before disassembling transmitter.



#### B: INSTALLATION

##### 1. TRANSMITTER BATTERY

Install in the reverse order of removal.

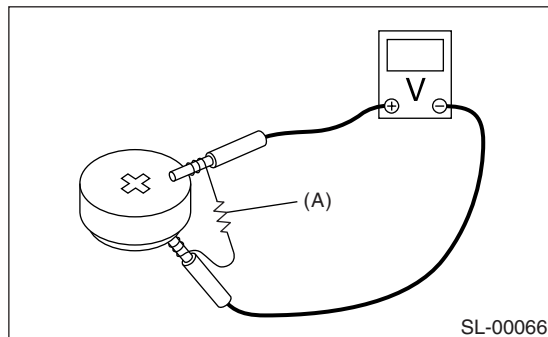
#### C: INSPECTION

##### 1. TRANSMITTER BATTERY

Measure the voltage between the transmitter battery (+) terminal and (-) terminal.

**NOTE:**

Battery discharge occurs during measurement. Complete the measurement within 5 seconds.



(A) Resistance 47 Ω

| Tester connection         |                         | Standard    |
|---------------------------|-------------------------|-------------|
| (+)                       | (-)                     |             |
| Battery Positive terminal | Battery Ground terminal | 2.5 — 3.0 V |

If NG, replace the battery. (Use CR2025 or equivalent.)

#### D: REPLACEMENT

##### 1. REGISTRATION OF TRANSMITTER WITH SUBARU SELECT MONITOR

**NOTE:**

- A maximum of four transmitters can be registered for each individual vehicle.
- When replacing or adding the transmitter, new registration of transmitter is necessary.

- 1) Connect the Subaru Select Monitor to the vehicle.
- 2) Turn the ignition switch to ON.
- 3) From the «Main menu» on the Subaru Select Monitor, select the {2. Check individual system} → {Keyless unit mode} → {1. Keyless ID registration}, and press the [YES] key.
- 4) Input the 8-digit ID number from the left attached to the plastic bag of transmitter or circuit board inside transmitter.

**NOTE:**

Press the [▲] key on the Subaru Select Monitor to increase the number, and the [▼] key to decrease. Press the [<] key to move to the digit in the left, and [>] to the right.

- 5) The ID number you have entered will be shown. Make sure that the ID number shown is the same as that of plastic bag.
- 6) Press the [YES] key if the ID number is correct. Press the [NO] key if incorrect, to return to the step 3) and try again.
- 7) «ID registration in process...» will be displayed and registration started.
- 8) «ID registration done» will be shown when the process is done.
- 9) To end, select the «END:NO», and press the [NO] key to return to {1. Keyless ID registration}. If there are additional transmitters to be registered, select the «Next registration:YES», and press the [YES] key to return to the step 3).

**NOTE:**

- If the registration fails, «ID registration failed. Try again.» will be shown. Press the [YES] key to return to the {1. Keyless ID registration} and retry from the step 2).
- «END: NO» is shown on the Subaru Select Monitor when four transmitters have been registered. Press the [NO] key to return to {1. Keyless ID registration}.





# SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

# SR

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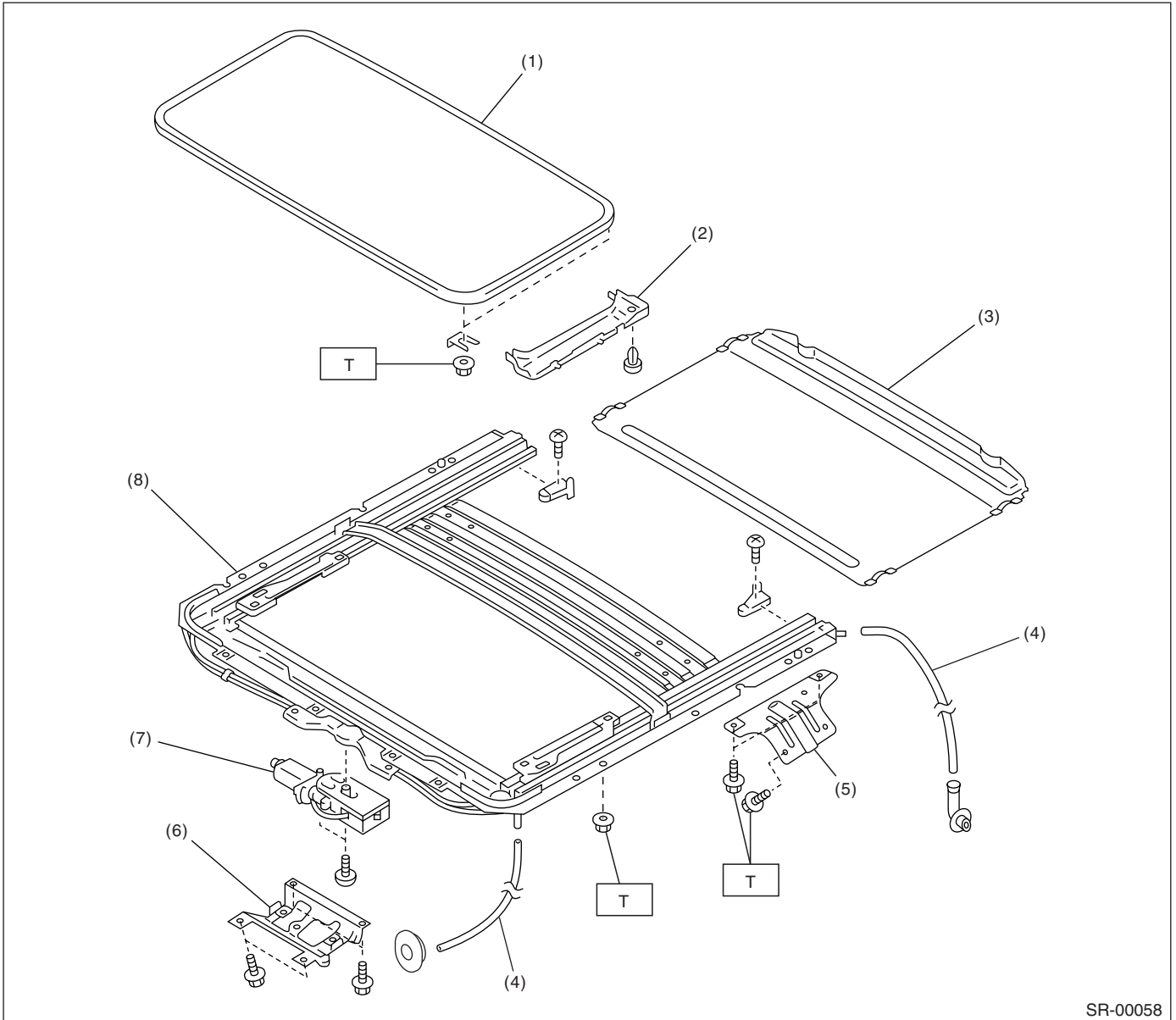
|                                 | <b>Page</b> |
|---------------------------------|-------------|
| 1. General Description .....    | 2           |
| 2. Sunroof Control System ..... | 4           |
| 3. Glass Lid .....              | 5           |
| 4. Sunroof Assembly .....       | 6           |
| 5. Sunroof Motor .....          | 8           |
| 6. Sunroof Switch .....         | 9           |

# General Description

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

## 1. General Description

### A: COMPONENT



SR-00058

- |                      |                     |
|----------------------|---------------------|
| (1) Glass lid        | (5) Sunroof bracket |
| (2) Guide rail cover | (6) Motor cover     |
| (3) Sunshade         | (7) Motor ASSY      |
| (4) Drain tube       | (8) Frame ASSY      |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T: 7.4 (0.75, 5.4)**

## General Description

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

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### B: CAUTION

- Before disassembling or reassembling parts, always disconnect battery ground cable. When replacing radio, control module, and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
- Reassemble in the reverse order of disassembly, unless otherwise indicated.
- Adjust parts to the given specifications.
- Connect the connectors and hoses securely during reassembly.
- After reassembly, make sure functional parts operate smoothly.

### C: PREPARATION TOOL

#### 1. GENERAL TOOL

| TOOL NAME      | REMARKS                                    |
|----------------|--|
| Circuit tester | Used for measuring resistance and voltage. |

# Sunroof Control System

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

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## 2. Sunroof Control System

### A: WIRING DIAGRAM

#### 1. SUNROOF

<Ref. to WI-165, WIRING DIAGRAM, Sunroof Control System.>

### B: INSPECTION

| Symptom  | Checking order   |
|--|--|
| Water leaks.                                     | (1) Check roof panel and glass lid for improper or poor sealing.<br>(2) Check drain tube for clogging.<br>(3) Check sunroof frame seal and body for improper fit.  |
| Booming noise, wind noise, abnormal noise        | (1) Check glass lid and roof panel for improper clearance.<br>(2) Check sunshade and roof trim for improper clearance.   |
| Abnormal motor noise                             | (1) Check motor for looseness.<br>(2) Check gears and bearings for wear.<br>(3) Check cables for wear.<br>(4) Check cable pipe for deformities.  |
| Failure of sunroof<br>(Motor operates properly.) | (1) Check guide rail for foreign particles.<br>(2) Check guide rail for improper installation.<br>(3) Check parts for mutual interference.<br>(4) Check cable slider for improper clinching.<br>(5) Check cable for improper installation.<br>(6) Check clutch adjustment nut for improper tightness.                                  |
| Motor does not rotate or rotates improperly.     | (1) Check fuse for blow-out.<br>(2) Check switch for improper function.<br>(3) Check motor for incorrect terminal voltage.<br>(4) Check relay for improper operation.<br>(5) Check poor grounding system.<br>(6) Check harness for open or short and terminals for poor connections.<br>(7) Check limit switch for improper operation. |

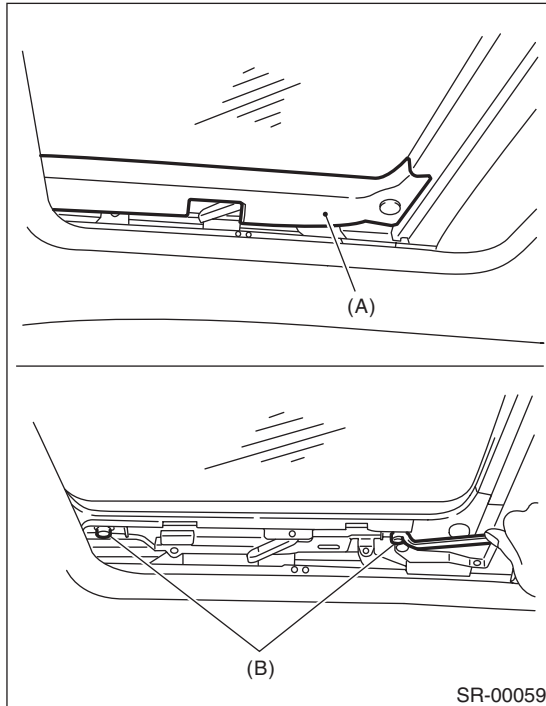
## Glass Lid

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

### 3. Glass Lid

#### A: REMOVAL

- 1) Completely close the glass lid and open the sunshade.
- 2) Remove the cover (A) then remove the nuts (B).



- 3) Remove the glass lid carefully.

#### B: INSTALLATION

Install in the reverse order of removal.

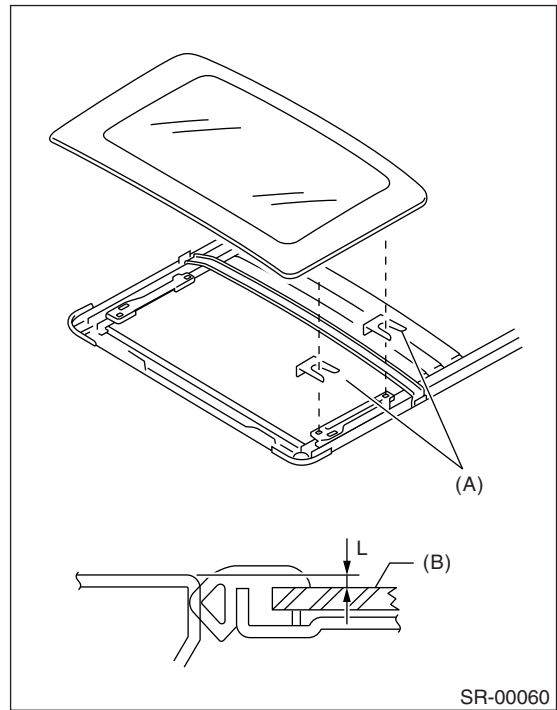
#### C: ADJUSTMENT

##### 1. ALIGNMENT OF HEIGHT BETWEEN GLASS LID AND ROOF PANEL

Loosen the glass lid installation nuts and then adjust the height by adding (max: three pieces) or extracting (min: zero piece) shims (standard: one piece).

*Difference in height between glass lid and roof panel L:*

*$2.0 \pm 0.5$  mm ( $0.079 \pm 0.020$  in)*



- (A) Shim  
(B) Glass lid

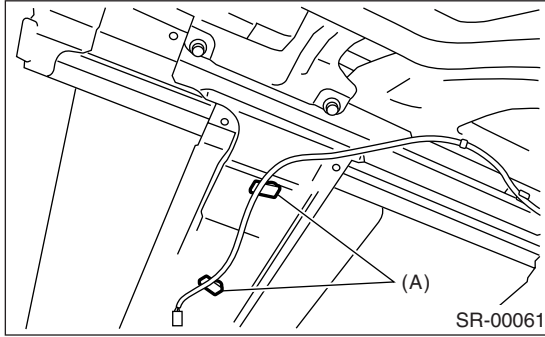
# Sunroof Assembly

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

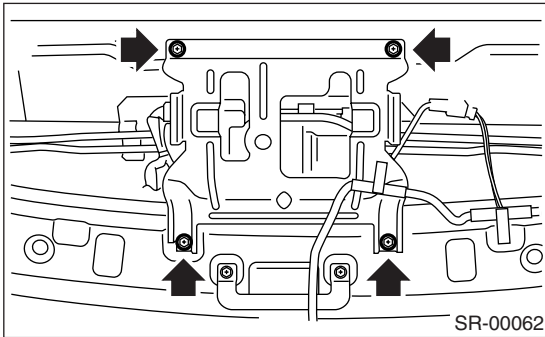
## 4. Sunroof Assembly

### A: REMOVAL

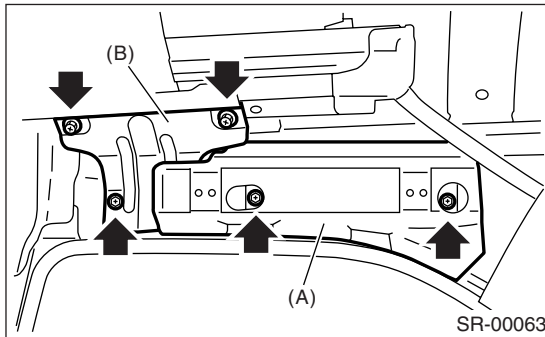
- 1) Disconnect the ground cable from battery.
- 2) Remove the roof trim. <Ref. to EI-55, REMOVAL, Roof Trim.>
- 3) Remove the glass lid. <Ref. to SR-5, REMOVAL, Glass Lid.>
- 4) Disconnect the drain tubes from sunroof frame.
- 5) Remove the room lamp harness clip (A).



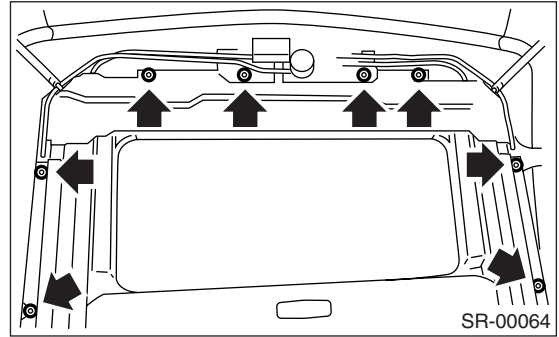
- 6) Disconnect the sunroof harness connector.
- 7) Remove the motor cover.



- 8) Remove the assist grip bracket (A) and sunroof bracket (B).



- 9) Remove the nuts then detach the sunroof frame.



### B: INSTALLATION

Install in the reverse order of removal.

#### CAUTION:

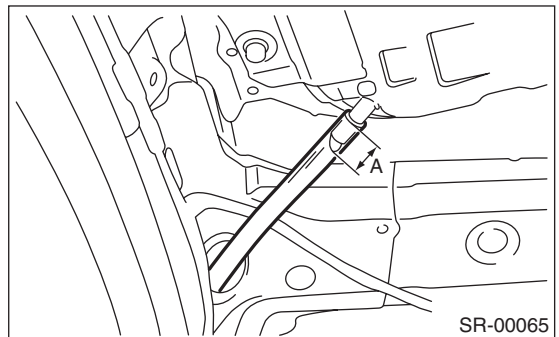
Be careful not to snag the harness.

#### NOTE:

- Make sure to connect the harness connector.
- When installing the drain tube, insert it securely onto drain pipe.

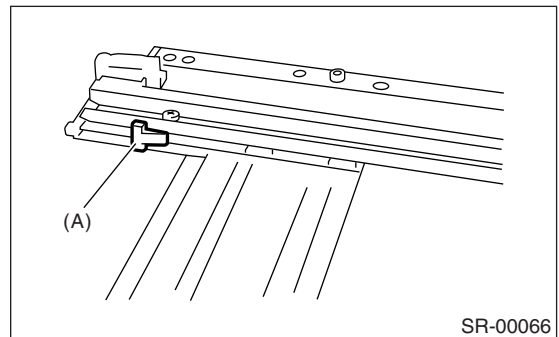
#### Length A:

15 mm (0.59 in) or more



### C: DISASSEMBLY

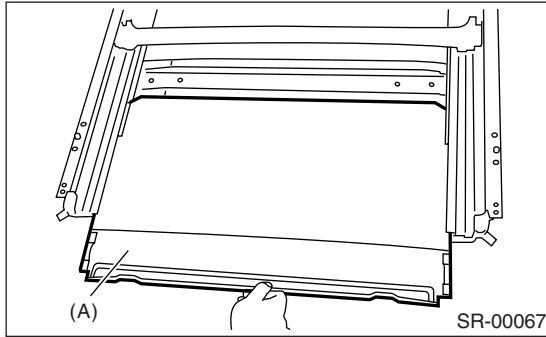
- 1) Remove the sunroof frame.
- 2) Remove the rail stoppers (A).



# Sunroof Assembly

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

- 3) Pull out the sunshade (A) from sunroof frame.



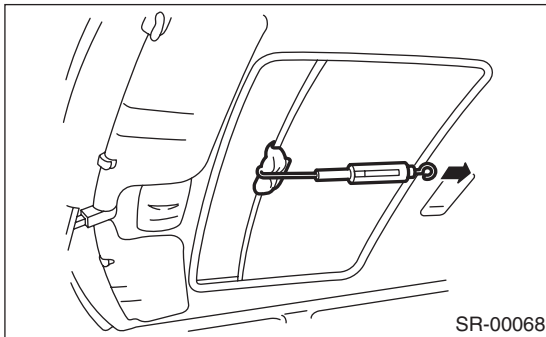
## D: ASSEMBLY

Assemble in the reverse order of disassembly.

## E: INSPECTION

### 1. CHECK FOR MOVING LOAD OF SUNSHADE

- 1) Attach a spring scale to sunshade edge using a cloth.



- 2) Pull the spring scale back to measure moving load of the sunshade.

#### ***Moving load of rear sunshade:***

***Less than  $24.5 \pm 4.9$  N ( $2.5 \pm 0.5$  kgf,  $5.5 \pm 1.1$  lbf)***

#### **NOTE:**

Moving load is larger at the beginning of pulling a spring scale, so take a scale reading while sunshade sliding smoothly.

- 3) If moving load exceeds specifications, check the glass lid, sunshade and guide rail assembly for improper installation.



# Sunroof Motor

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

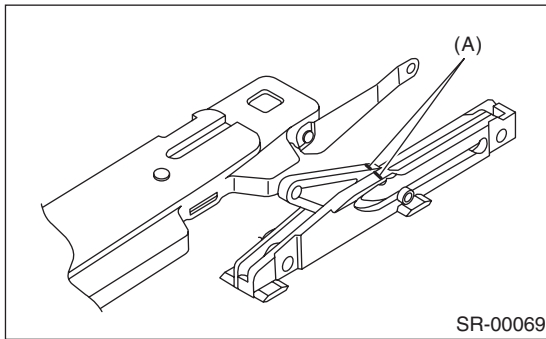
## 5. Sunroof Motor

### A: REMOVAL

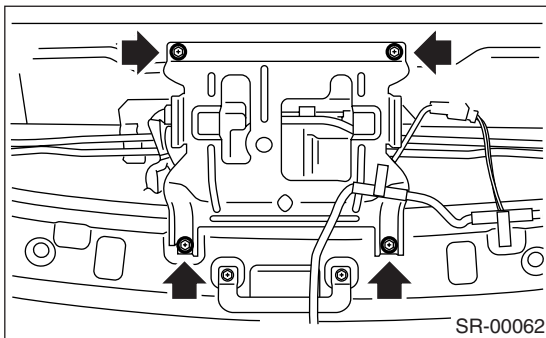
#### CAUTION:

- When removing the clip, use great care to not damage the roof trim.
- Never rotate the sunroof motor after removing it.

- 1) Completely close the sunroof.
- 2) Disconnect the ground cable from battery.
- 3) Remove the glass lid. <Ref. to SR-5, REMOVAL, Glass Lid.>
- 4) Confirm the alignment mark (A) of sunroof bracket link and the guide from sunroof opening. (If the mark does not align, adjust to align the mark.)



- 5) Remove the roof trim. <Ref. to EI-55, REMOVAL, Roof Trim.>
- 6) Remove the motor cover.



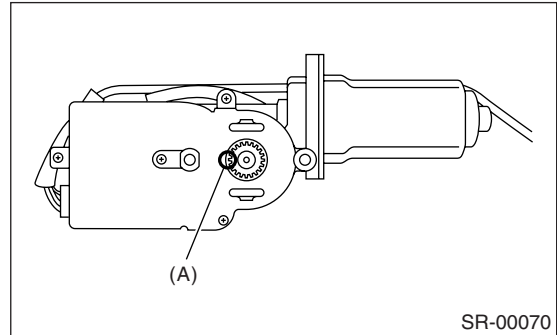
- 7) Disconnect the harness connector and remove the sunroof motor mounting screw.

### B: INSTALLATION

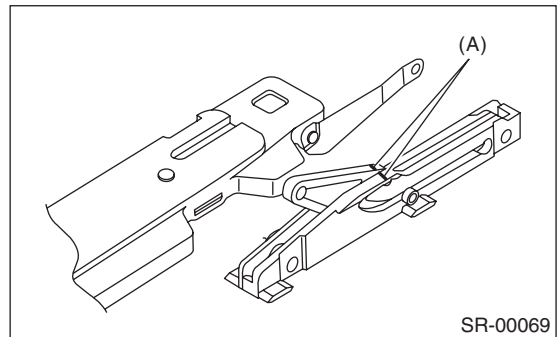
#### CAUTION:

Be careful not to move the sunroof cable when installing sunroof motor.

- 1) Check the alignment mark (A) of sunroof motor.



- 2) Confirm the alignment mark (A) of sunroof bracket link.



- 3) Install the sunroof motor.
- 4) After installing the motor, reconfirm the alignment marks of motor side and sunroof bracket link side.
- 5) Connect the sunroof motor harness connector and then connect the battery ground cable.
- 6) Check the sunroof operation with the procedure as shown in the table.

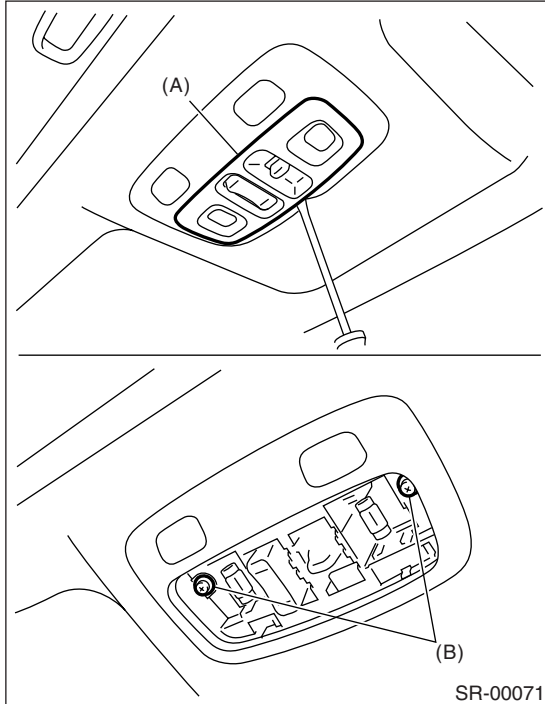
| Checking order   | Switch position |
|--|-----------------|
| (1) Completely close sunroof.  | Closed          |
| (2) Tilt-up sunroof to most upper position.                              | Tilt-up         |
| (3) Lower sunroof completely.  | Tilt-down       |
| (4) Open sunroof to near the completely open position.                   | Open            |
| (5) Completely open sunroof.   | Open            |
| (6) Close sunroof 150 mm (5.91 in) away from completely closed position. | Closed          |
| (7) Completely close sunroof.  | Closed          |

- 7) Install the glass lid and trims in the reverse order of removal.

## 6. Sunroof Switch

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the spot light lens (A) and sunroof switch mounting screw (B).



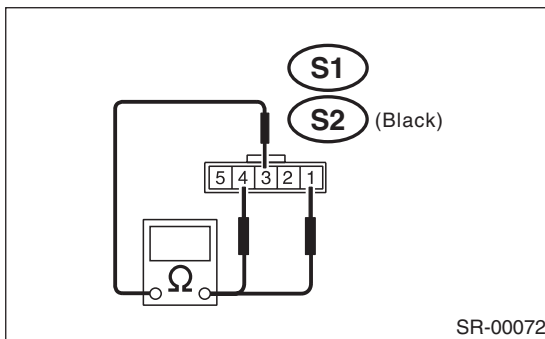
- 3) Disconnect the harness connectors and remove the sunroof switch.

### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

Measure the sunroof switch resistance.



| Switch    | Terminal No. | Standard value       |
|-----------|--------------|----------------------|
| Open      | S1: 3 and 4  | Less than 1 $\Omega$ |
| Close     | S1: 1 and 3  | Less than 1 $\Omega$ |
| Tilt-up   | S2: 3 and 4  | Less than 1 $\Omega$ |
| Tilt-down | S2: 1 and 3  | Less than 1 $\Omega$ |

# Sunroof Switch

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

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# EXTERIOR/INTERIOR TRIM



---

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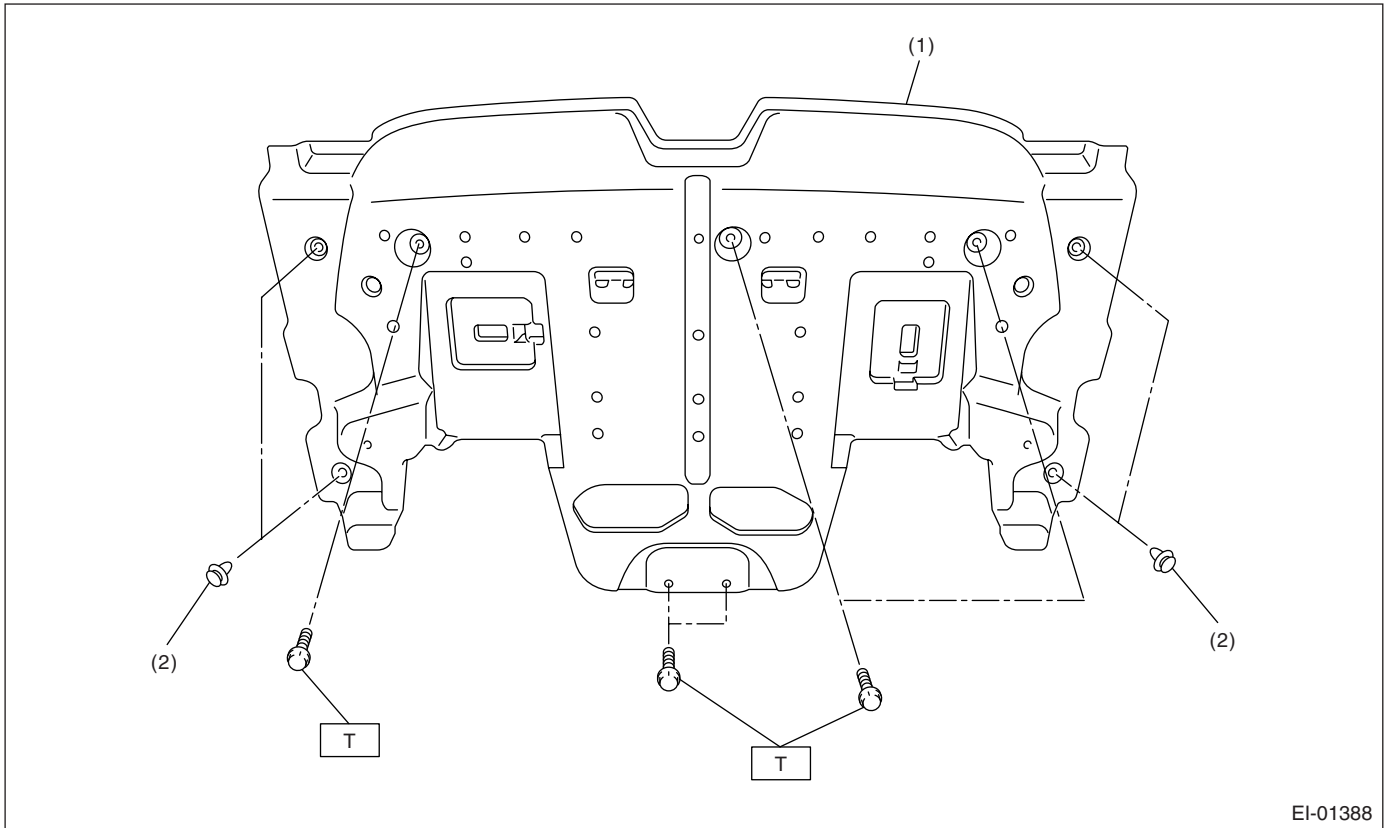
# General Description

EXTERIOR/INTERIOR TRIM

## 1. General Description

### A: COMPONENT

#### 1. UNDER COVER



(1) Under cover

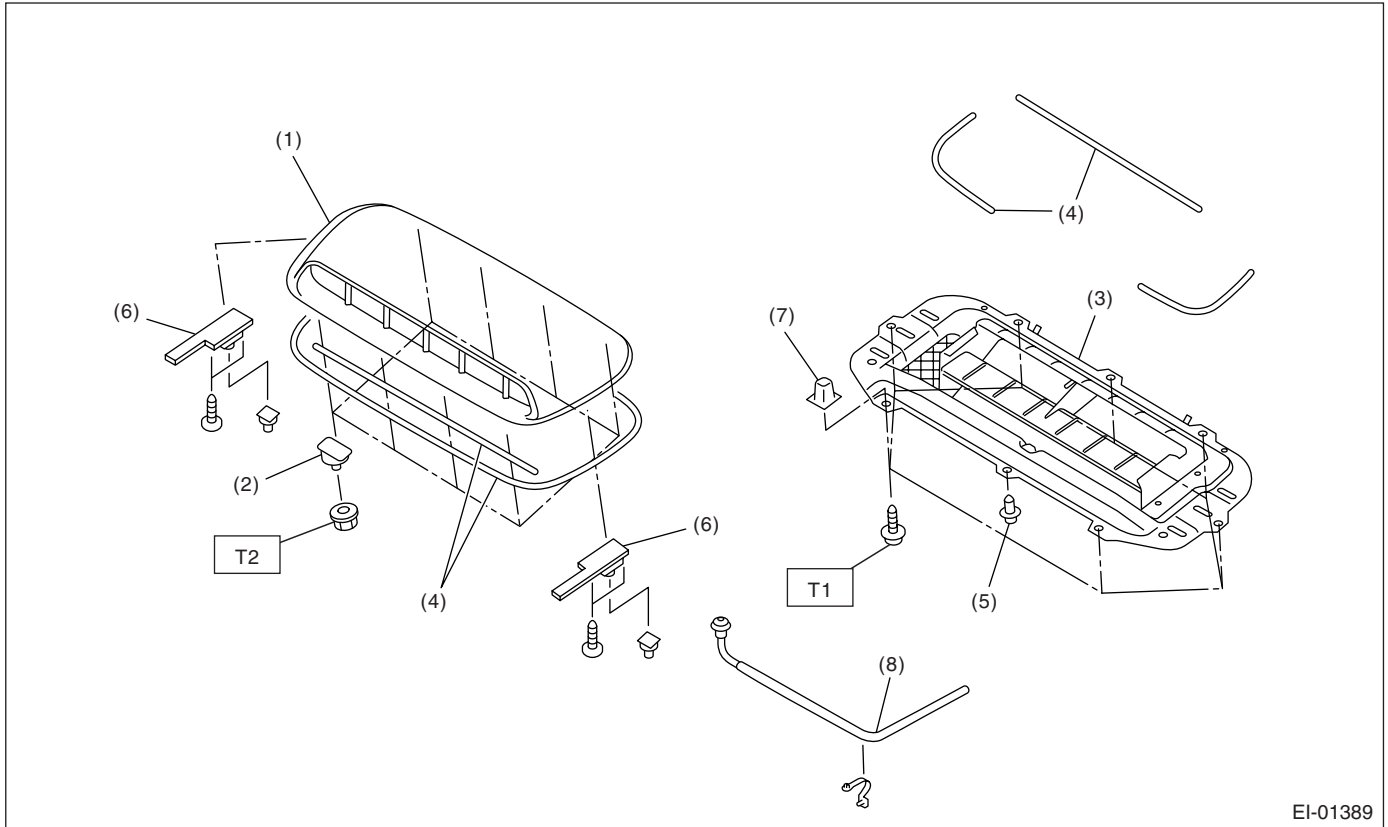
(2) Clip (side)

**Tightening torque: N-m (kgf-m, ft-lb)**

**T: 14 (1.4, 10.3)**

## 2. FRONT HOOD GRILLE

### • TURBO MODEL



- |                       |   |
|-----------------------|---|
| (1) Front hood grille | (5) Clip                                |
| (2) Bolt              | (6) Side plate                          |
| (3) Grille duct       | (7) Grommet                             |
| (4) Packing           | (8) Intercooler water spray (STI model) |

**Tightening torque: N·m (kgf·m, ft·lb)**

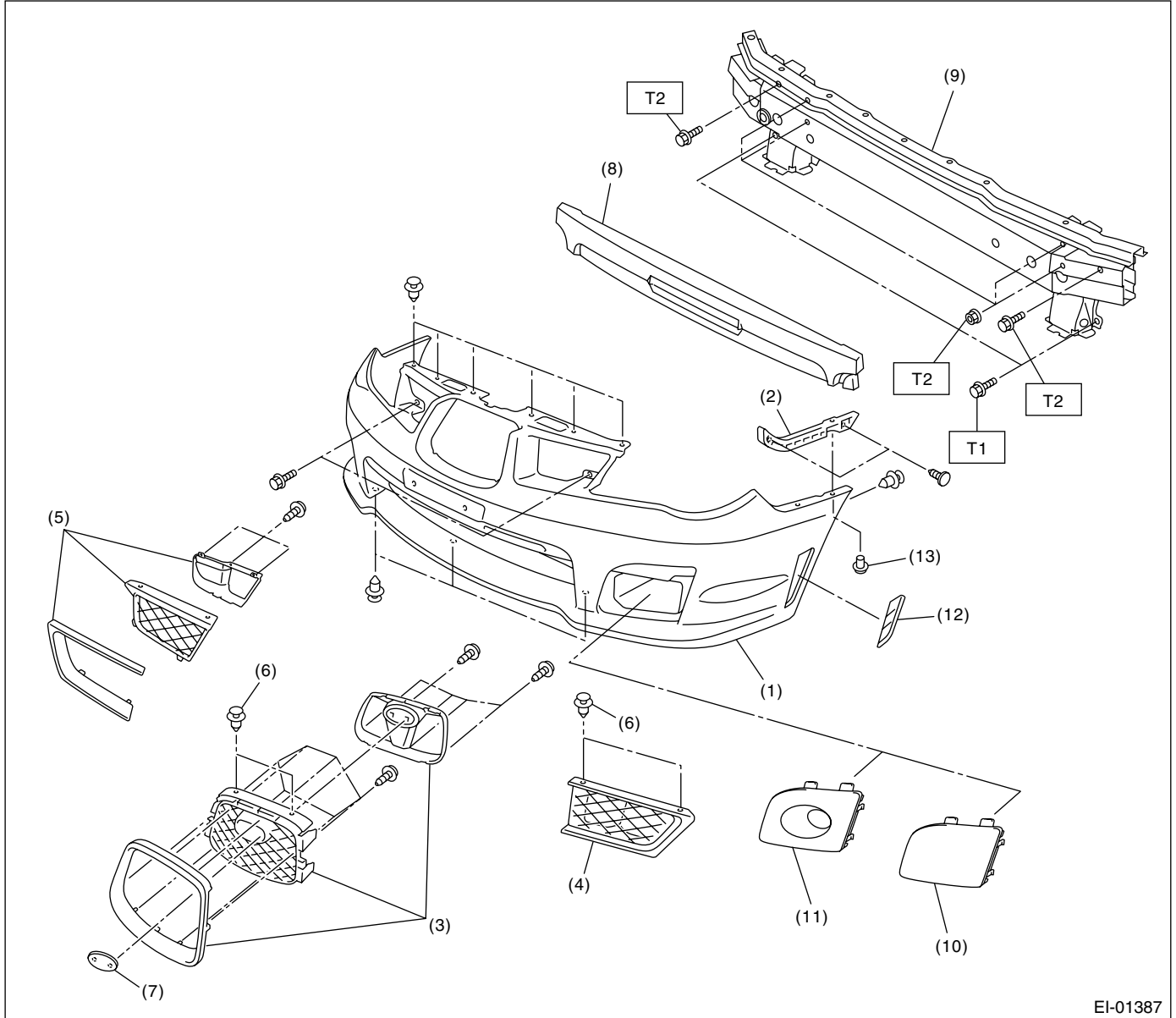
**T1: 1.0 (0.1, 0.74)**

**T2: 4.5 (0.46, 3.32)**

# General Description

EXTERIOR/INTERIOR TRIM

## 3. FRONT BUMPER



EI-01387

- |                         |                                  |
|-------------------------|----------------------------------|
| (1) Bumper face         | (7) Front grille emblem          |
| (2) Slider              | (8) Energy absorber form         |
| (3) Front grille center | (9) Bumper beam ASSY             |
| (4) Front grille LH     | (10) Fog light cover (STI model) |
| (5) Front grille RH     | (11) Fog light cover             |
| (6) Clip                | (12) Cover side (STI model)      |

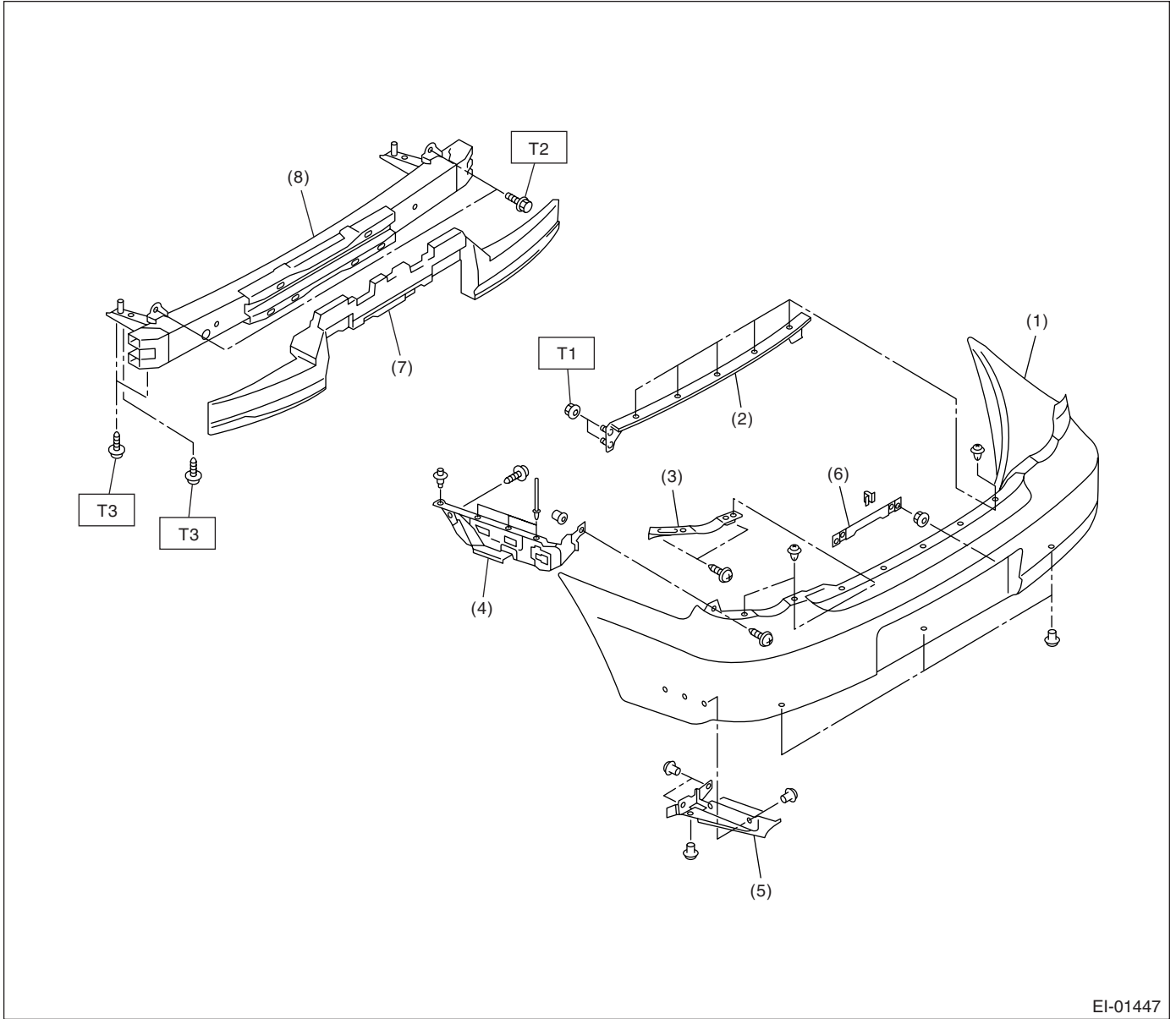
- (13) Clip (Sedan model)

**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 32 (3.3, 24)**

**T2: 69 (7.0, 51)**

## 4. REAR BUMPER



- |                          |                            |
|--------------------------|----------------------------|
| (1) Bumper face          | (5) Bumper side cover      |
| (2) Bumper upper beam    | (6) License plate base     |
| (3) Bumper upper bracket | (7) Bumper energy absorber |
| (4) Bumper side bracket  | (8) Bumper back beam       |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 33 (3.4, 24)**

**T2: 34 (3.5, 25)**

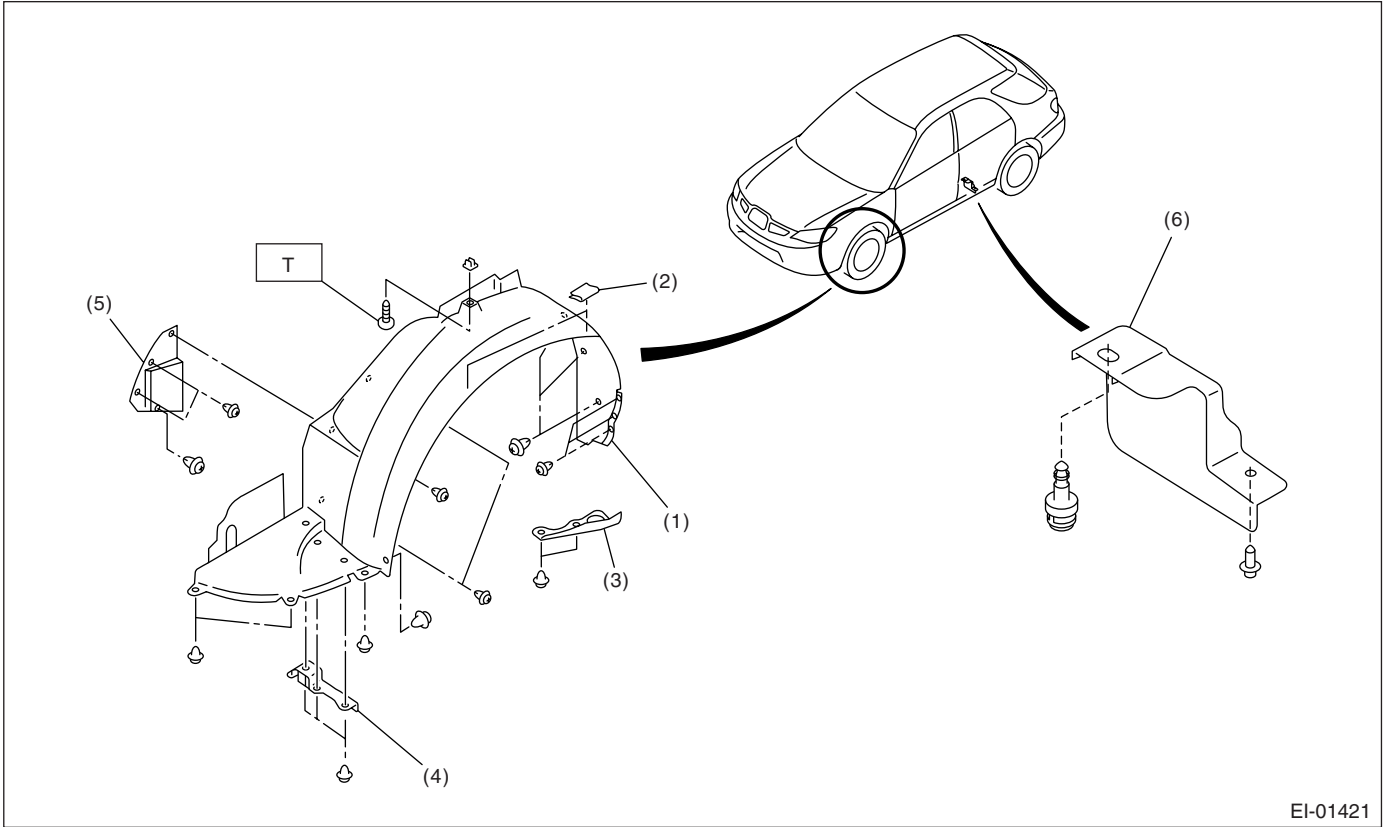
**T3: 95 (9.7, 70)**



# General Description

EXTERIOR/INTERIOR TRIM

## 5. MUD GUARD



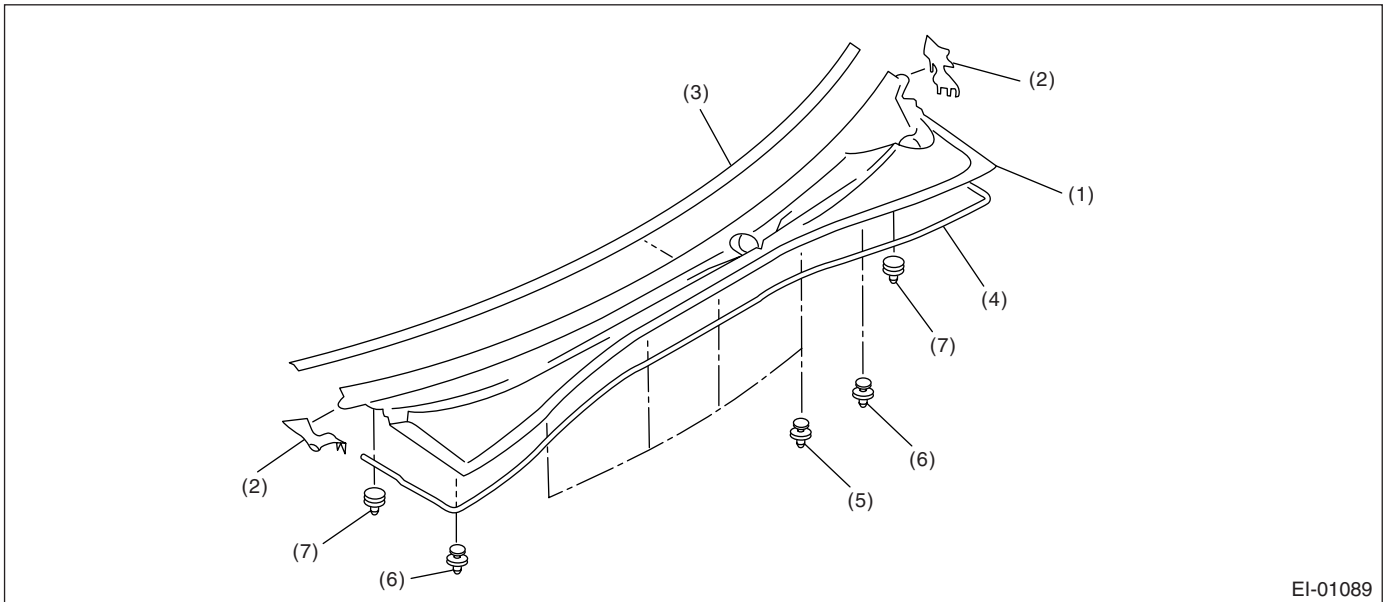
EI-01421

- |                     |                          |
|---------------------|--------------------------|
| (1) Mud guard       | (4) Front air flap plate |
| (2) Clip            | (5) Mud guard plate (RH) |
| (3) Sub frame cover | (6) Rear air flap plate  |

**Tightening torque: N-m (kgf-m, ft-lb)**

**T: 4.5 (0.46, 3.3)**

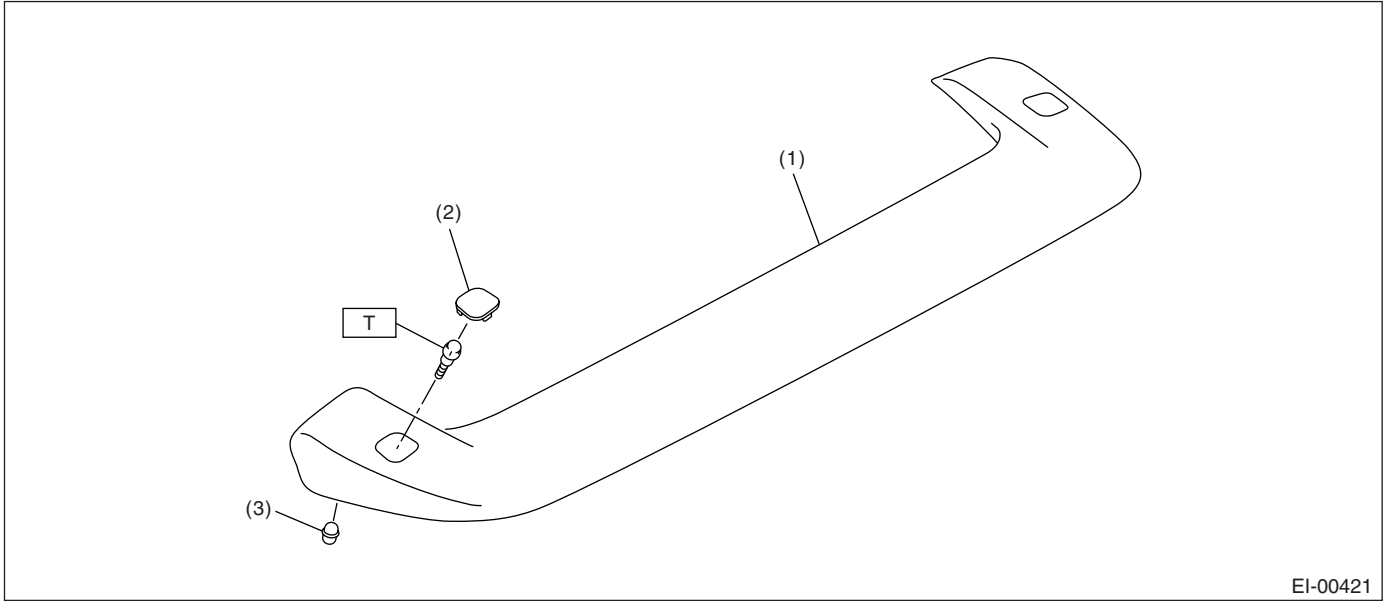
## 6. COWL PANEL



EI-01089

- |                     |                |            |
|---------------------|----------------|------------|
| (1) Cowl panel      | (4) Seal       | (7) Clip F |
| (2) Cowl side panel | (5) Clip       |            |
| (3) Protector       | (6) Clip (Pin) |            |

## 7. ROOF SPOILER



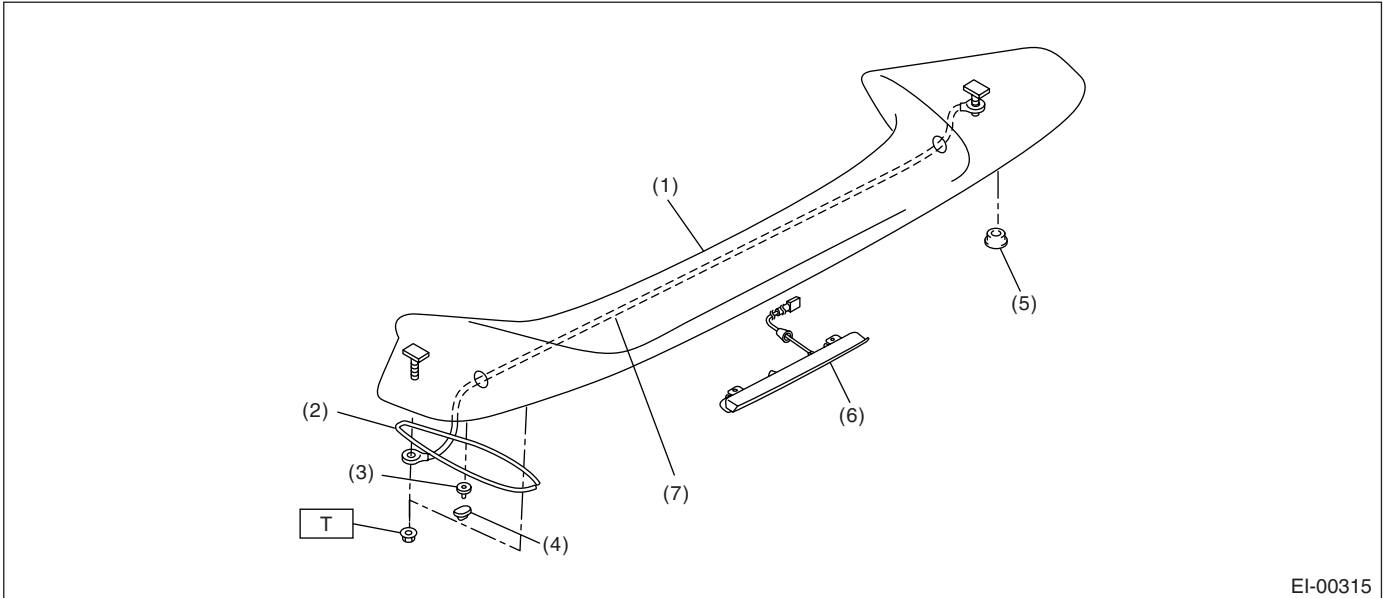
EI-00421

- (1) Roof spoiler
- (2) Cap

- (3) Clip

**Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 7.5 (0.76, 5.5)**

## 8. REAR SPOILER



EI-00315

- (1) Rear spoiler
- (2) Protector
- (3) Clip
- (4) Grommet

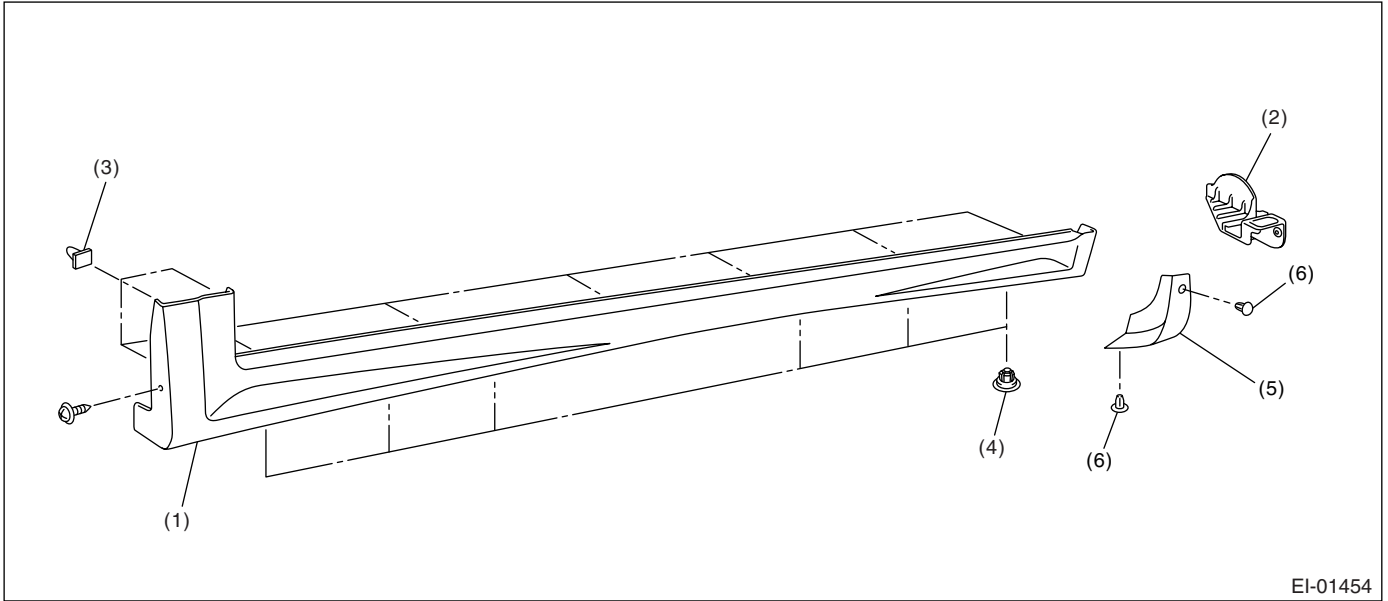
- (5) Seal (RH)
- (6) High-mounted stop light
- (7) Retention cable (Inner parts)

**Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 7.5 (0.76, 5.5)**

# General Description

EXTERIOR/INTERIOR TRIM

## 9. SIDE SILL SPOILER

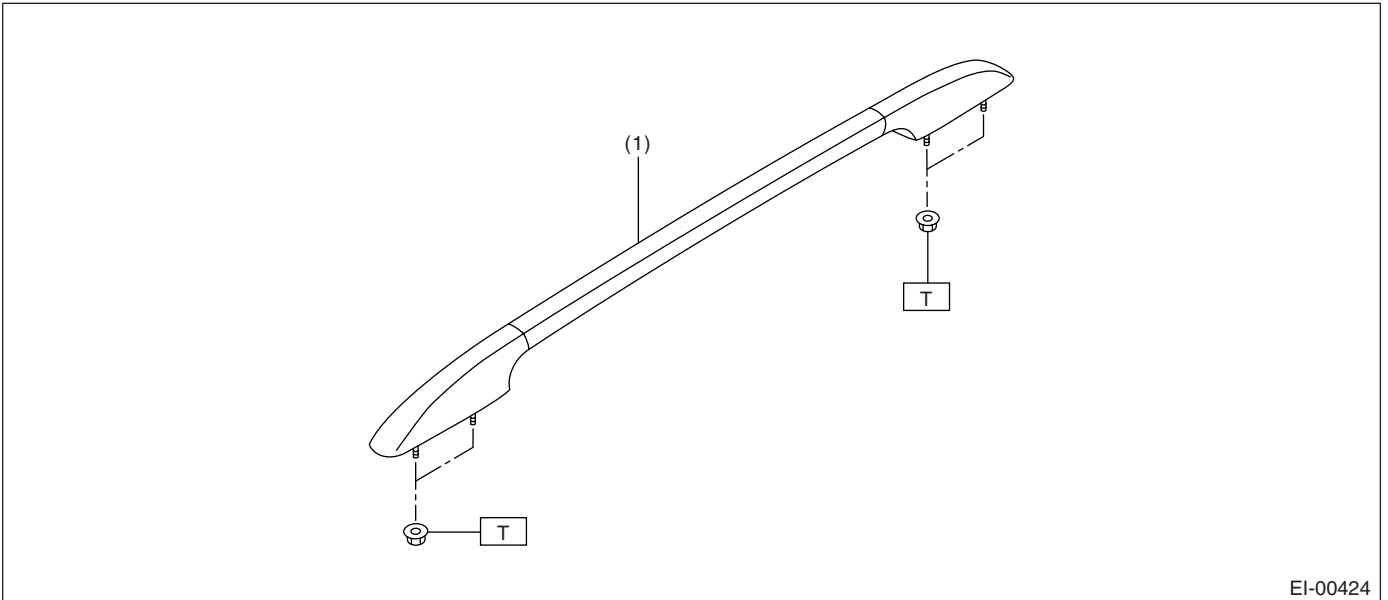


- (1) Side sill spoiler
- (2) Rear air flap plate

- (3) Clip
- (4) Clip (Side sill spoiler)

- (5) End cover
- (6) Clip

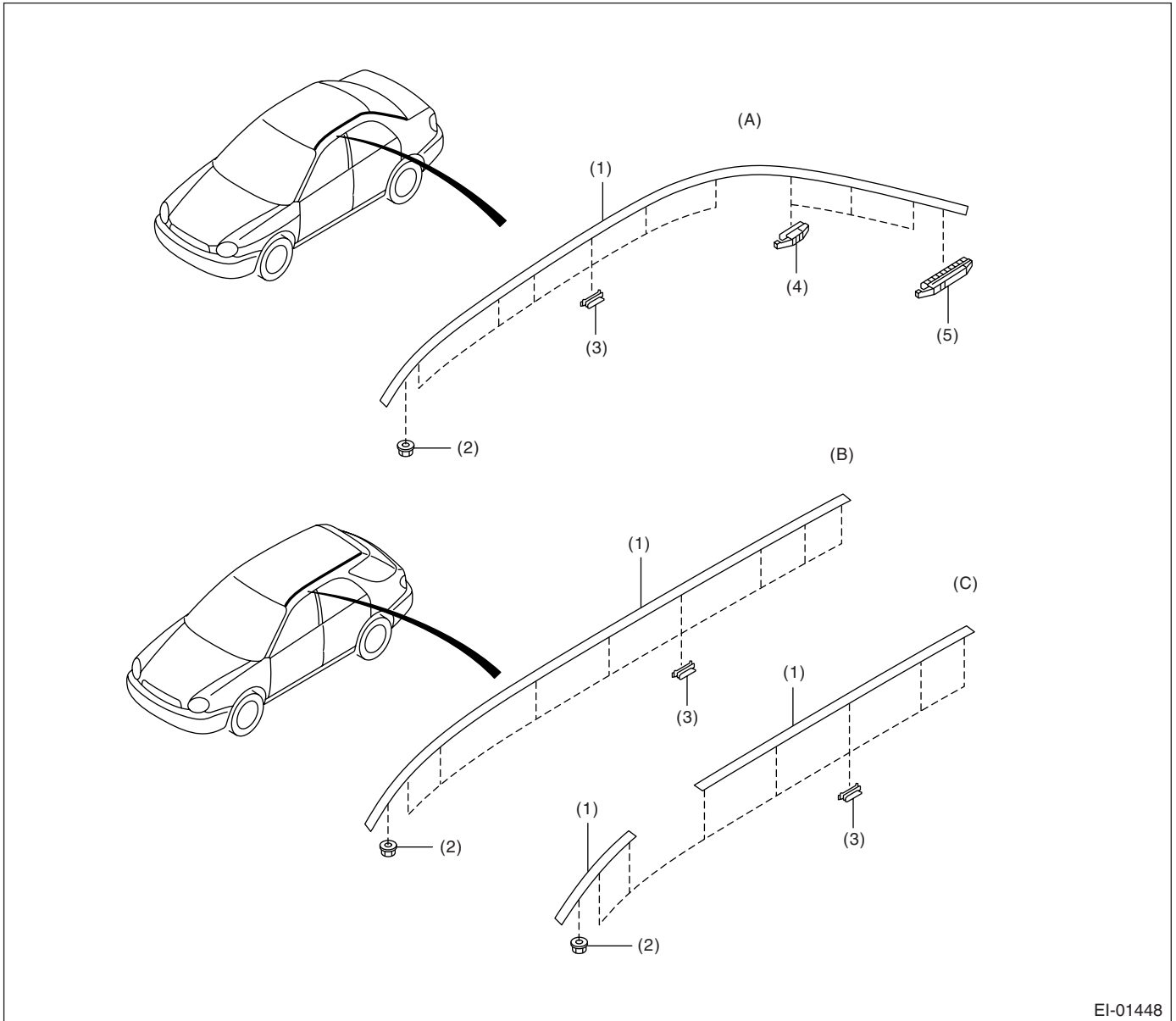
## 10. ROOF RAIL



- (1) Roof rail

**Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 7.4 (0.75, 5.46)**

## 11. ROOF MOLDING



EI-01448

(A) Sedan model

(B) Wagon model

(C) Wagon model (with roof rail)

(1) Roof molding

(3) Clip B

(5) Clip D

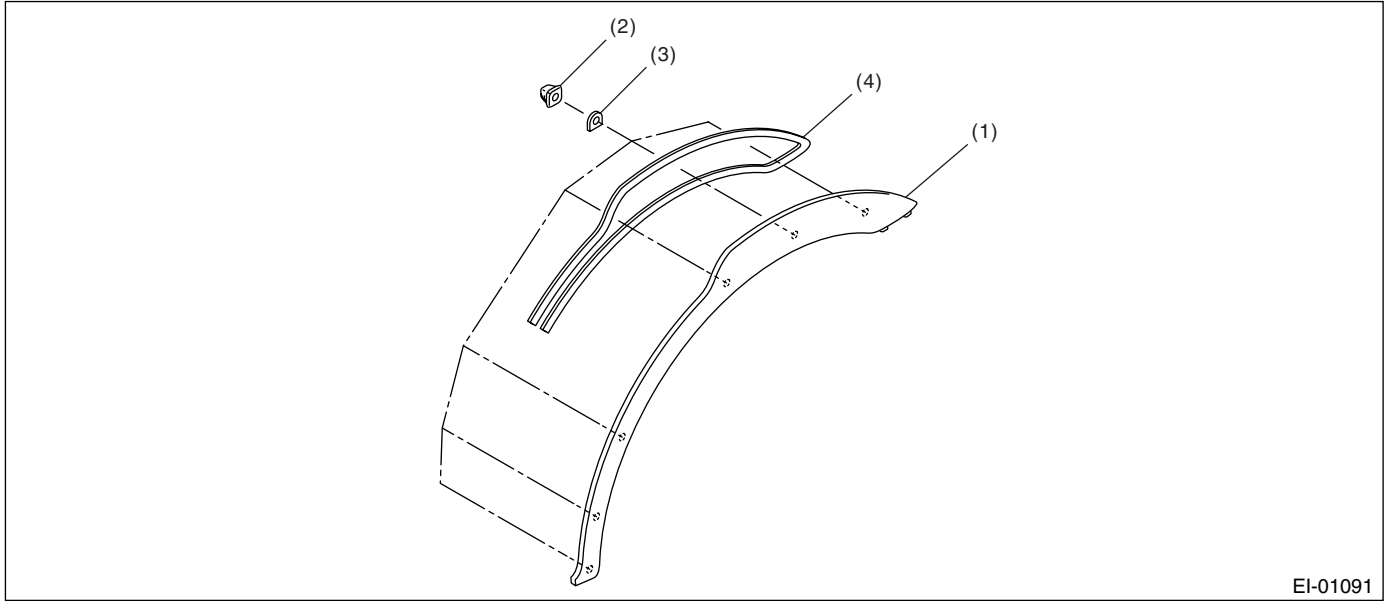
(2) Clip A

(4) Clip C

# General Description

EXTERIOR/INTERIOR TRIM

## 12.ARCH COVER

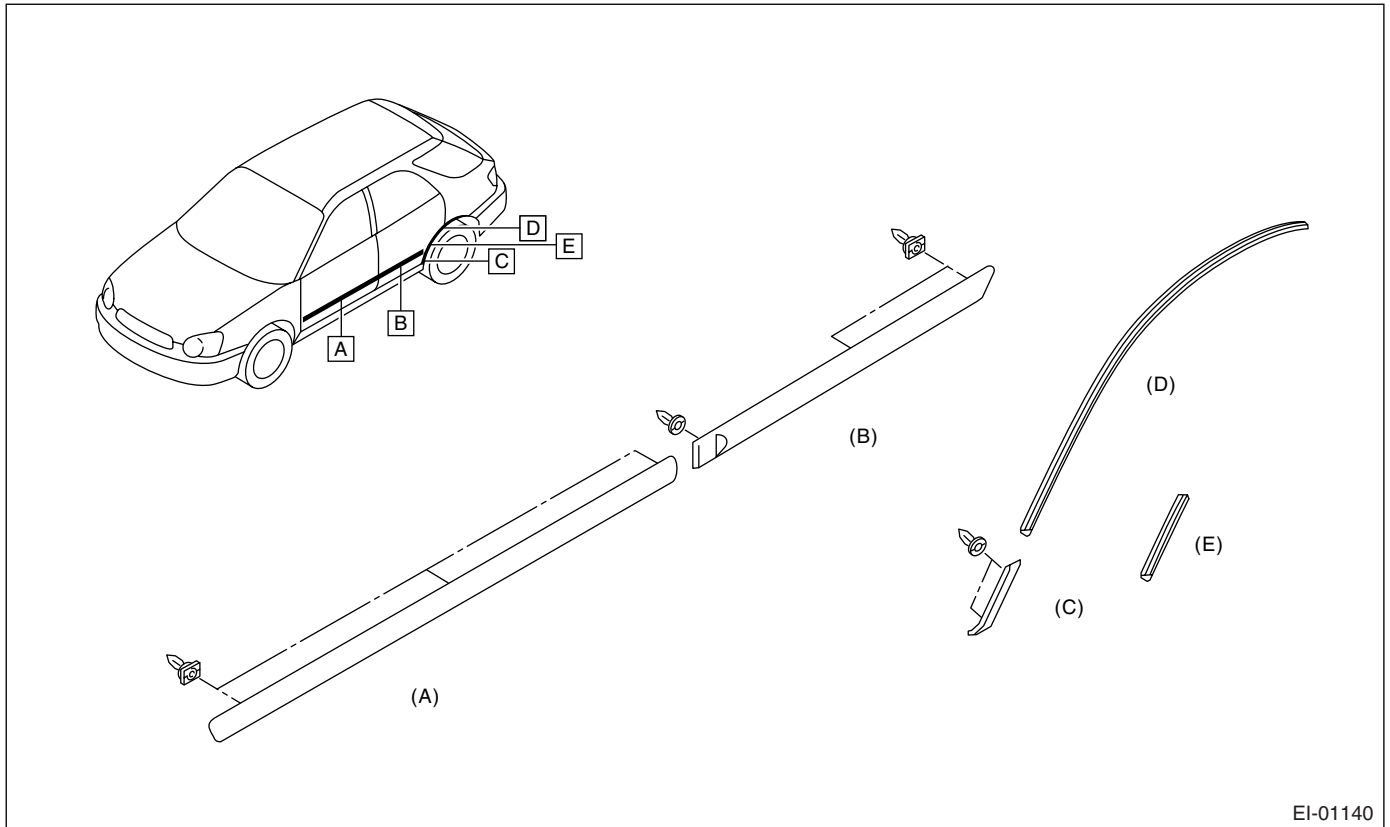


- (1) Arch cover
- (2) Clip

- (3) Cushion

- (4) Double-side tape

## 13.PROTECTOR

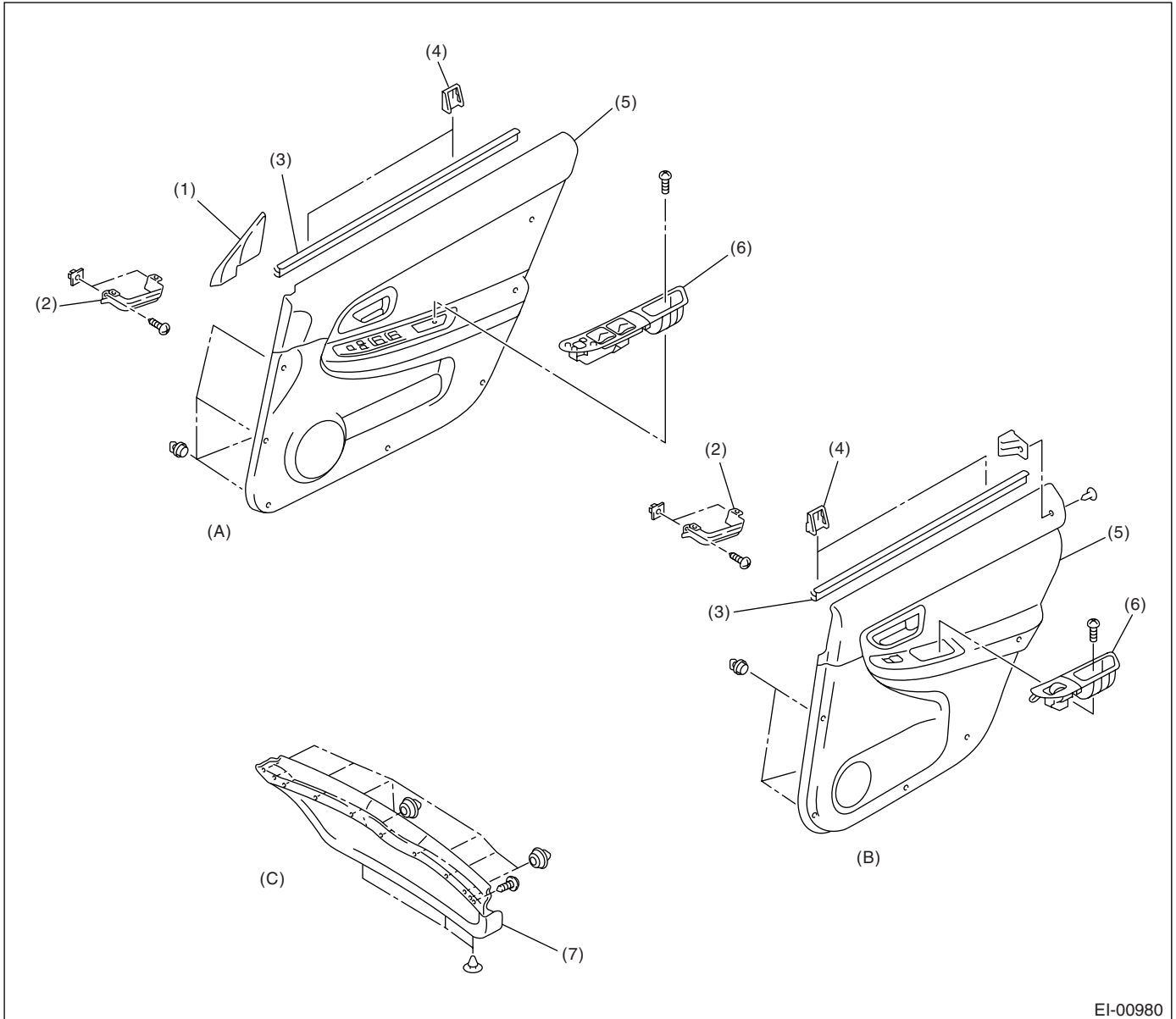


- (A) Front door
- (B) Rear door

- (C) Rear fender lower
- (D) Rear fender upper (Except STI model)

- (E) Rear fender upper (STI model)

## 14.DOOR TRIM



EI-00980

(A) Front door trim

(B) Rear door trim

(C) Rear gate trim

(1) Gusset cover

(4) Clip

(6) Power window switch cover

(2) Bracket

(5) Trim panel

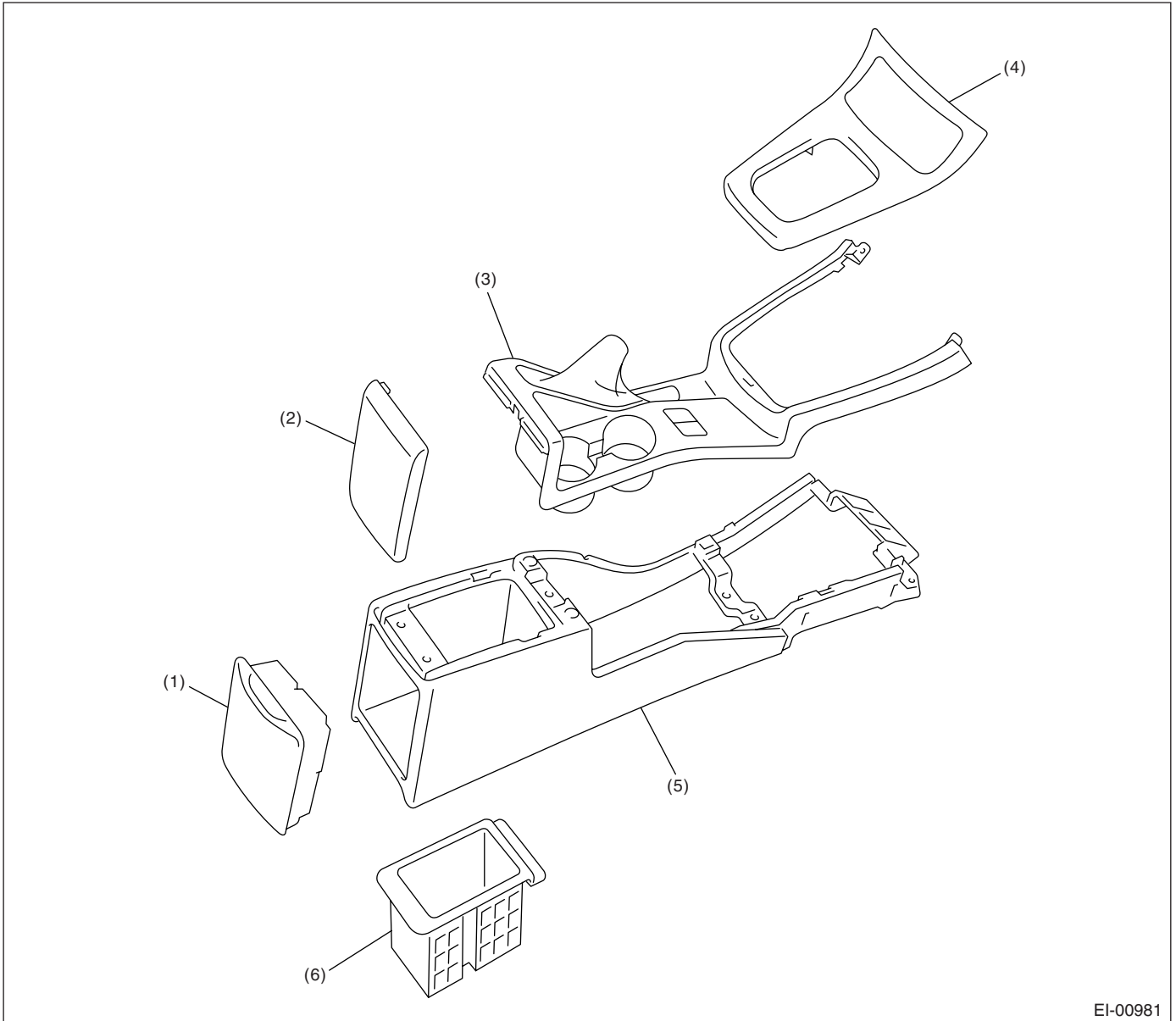
(7) Lower trim

(3) Upper weather strip

# General Description

EXTERIOR/INTERIOR TRIM

## 15. CONSOLE BOX



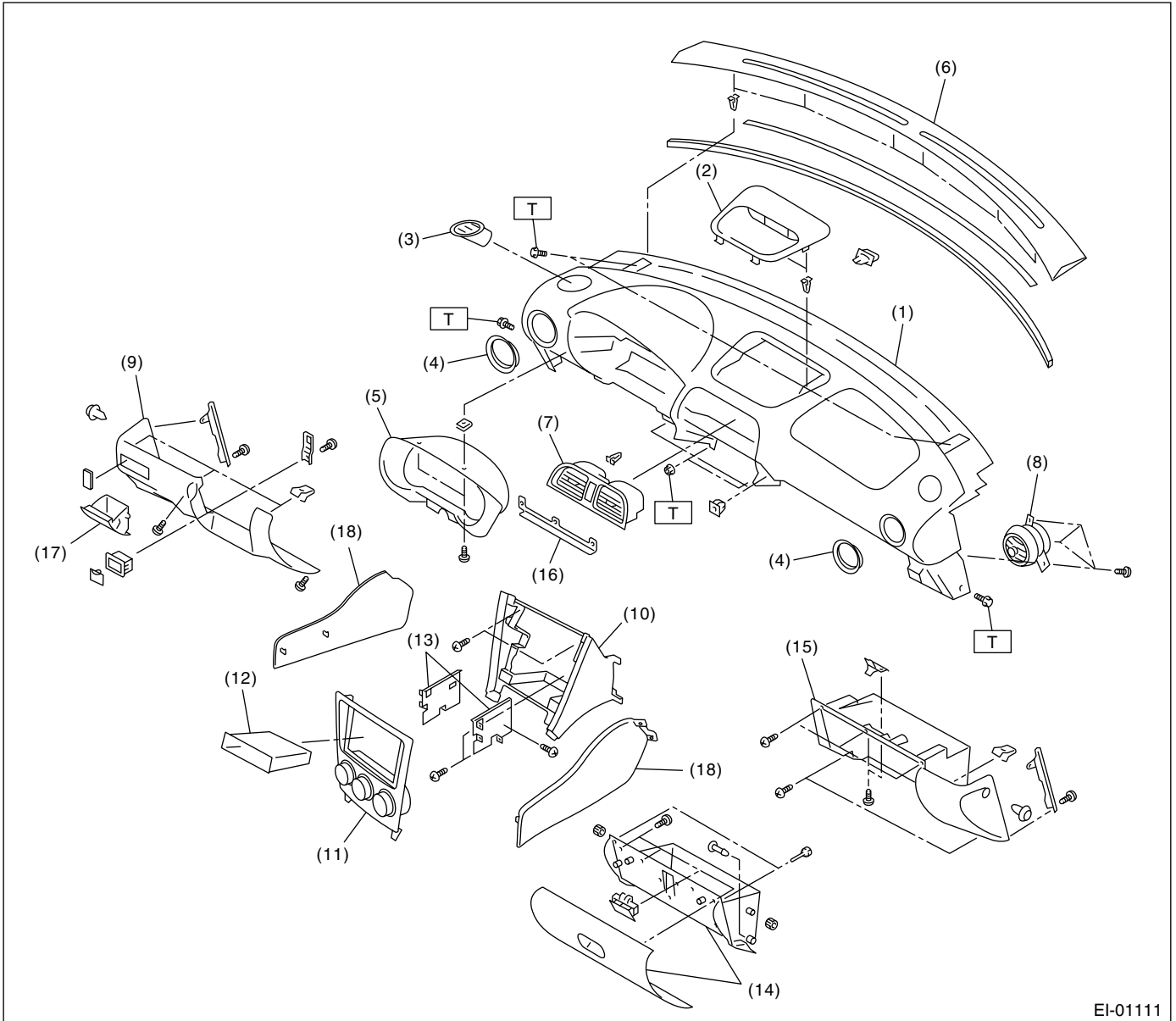
EI-00981

(1) Rear cup holders  
(2) Console lid

(3) Console cover  
(4) Console front panel

(5) Console box  
(6) Console pocket

## 16. INSTRUMENT PANEL



- |                                 |                                  |                         |
|---------------------------------|----------------------------------|-------------------------|
| (1) Pad & frame                 | (8) Air vent grille (side)       | (15) Glove box panel    |
| (2) Center upper panel          | (9) Instrument panel lower cover | (16) Bracket            |
| (3) Air vent grille (defroster) | (10) Console cover               | (17) Coin box           |
| (4) Grille cover                | (11) Center panel                | (18) Console side panel |
| (5) Meter visor                 | (12) Center pocket               |                         |
| (6) Defroster grille            | (13) Audio bracket               |                         |
| (7) Air vent grille (center)    | (14) Glove box lid               |                         |

**Tightening torque: N·m (kgf·m, ft·lb)**

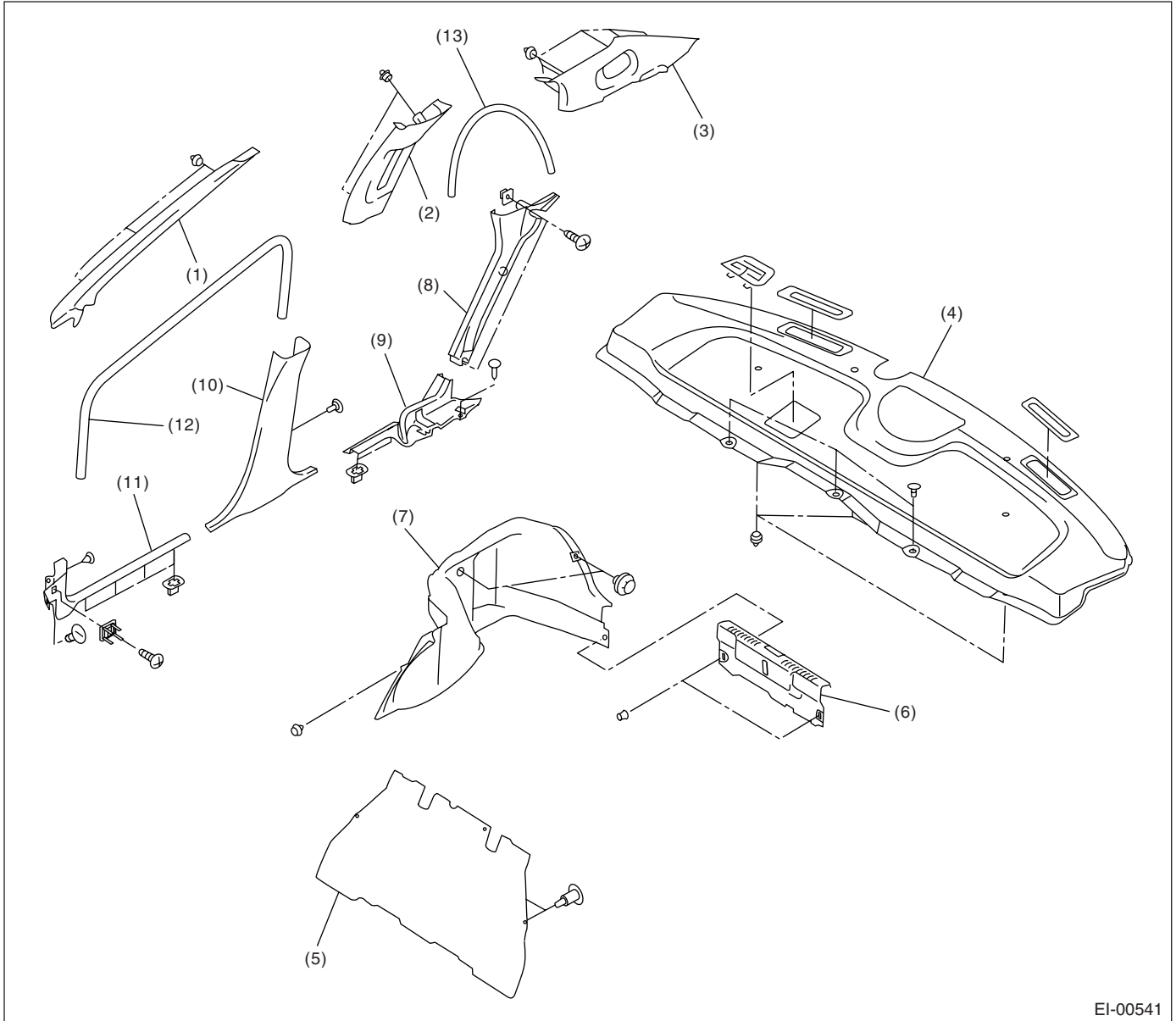
**T: 7 (0.71, 5.2)**



# General Description

## EXTERIOR/INTERIOR TRIM

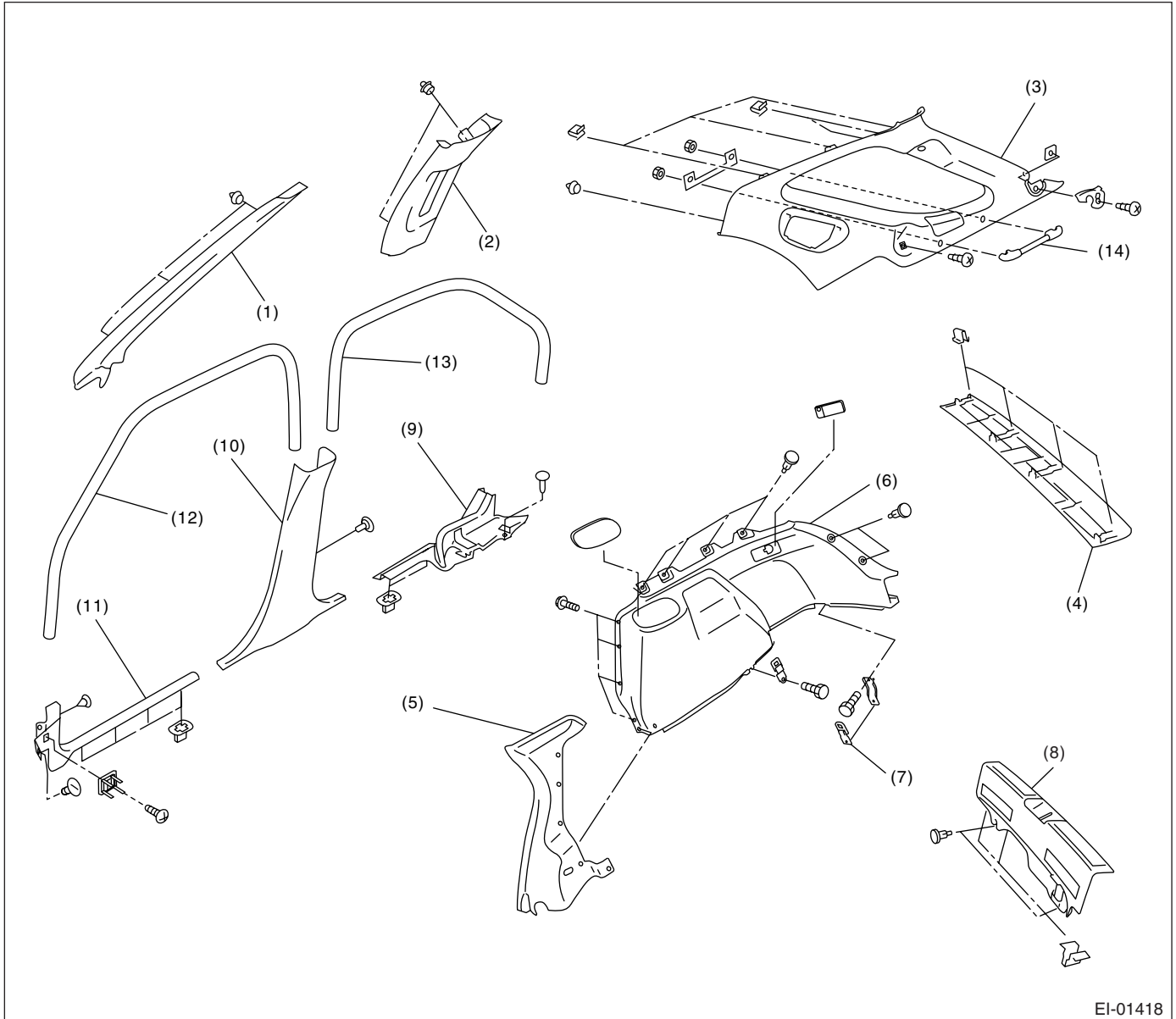
### 17.INNER TRIM (SEDAN MODEL)



EI-00541

- |                              |                            |                               |
|------------------------------|----------------------------|-------------------------------|
| (1) Front pillar upper trim  | (6) Trunk rear trim        | (10) Center pillar lower trim |
| (2) Center pillar upper trim | (7) Trunk side trim        | (11) Side sill front cover    |
| (3) Rear pillar upper trim   | (8) Rear pillar lower trim | (12) Front garnish            |
| (4) Rear shelf trim          | (9) Side sill rear cover   | (13) Rear garnish             |
| (5) Rear bulk trim           |                            |                               |

## 18.INNER TRIM (WAGON MODEL)



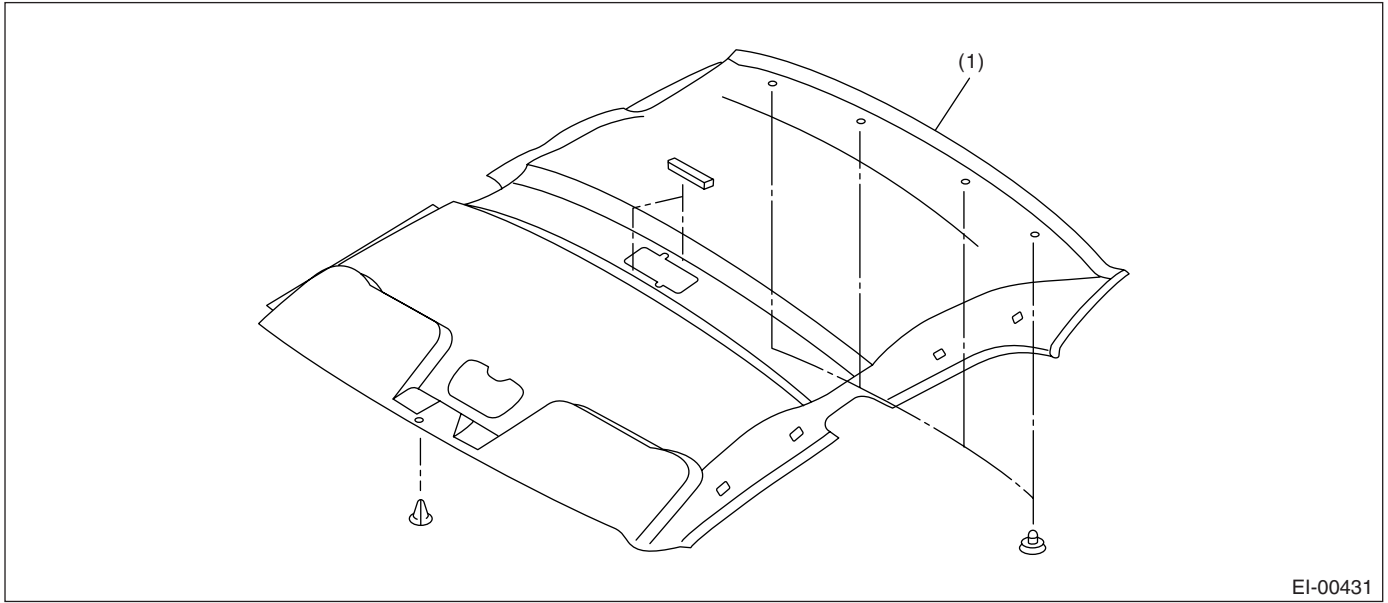
EI-01418

- |                              |                               |                                    |
|------------------------------|-------------------------------|------------------------------------|
| (1) Front pillar upper trim  | (6) Rear quarter lower trim   | (11) Side sill front cover         |
| (2) Center pillar upper trim | (7) Hook                      | (12) Front garnish                 |
| (3) Rear pillar upper trim   | (8) Rear skirt trim           | (13) Rear garnish                  |
| (4) Rear rail trim           | (9) Side sill rear cover      | (14) Luggage compartment side rail |
| (5) Rear pillar lower trim   | (10) Center pillar lower trim |                                    |

# General Description

EXTERIOR/INTERIOR TRIM

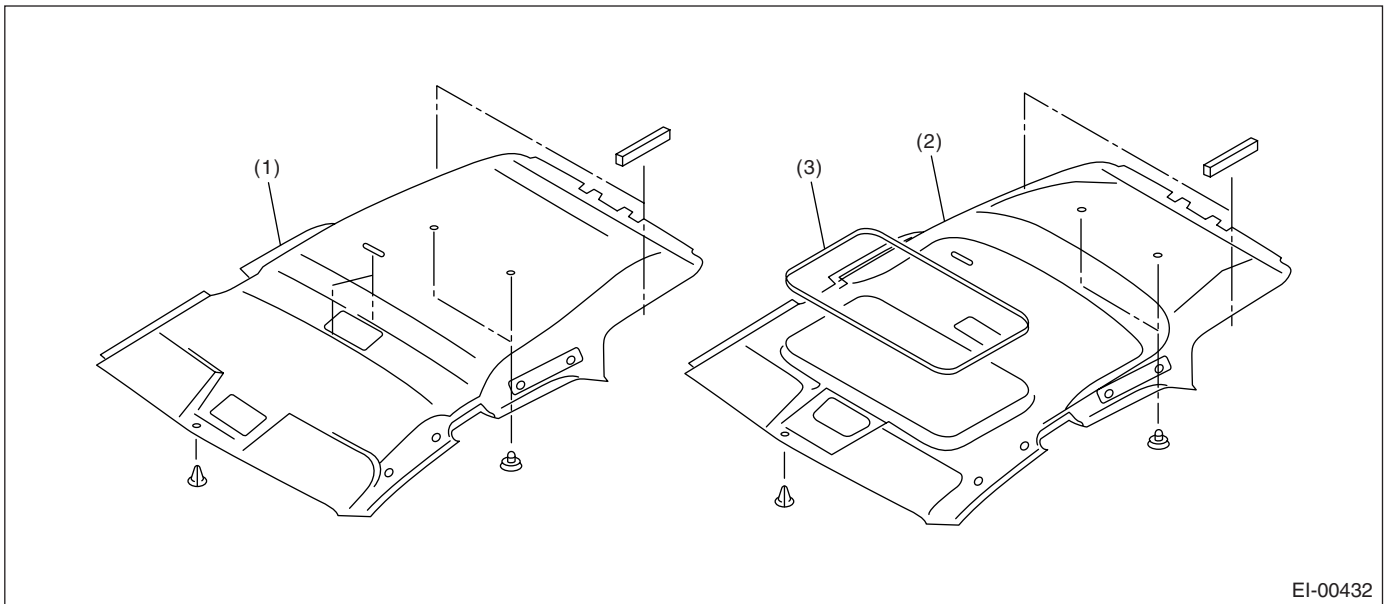
## 19. ROOF TRIM (SEDAN MODEL)



EI-00431

(1) Roof trim

## 20. ROOF TRIM (WAGON MODEL)



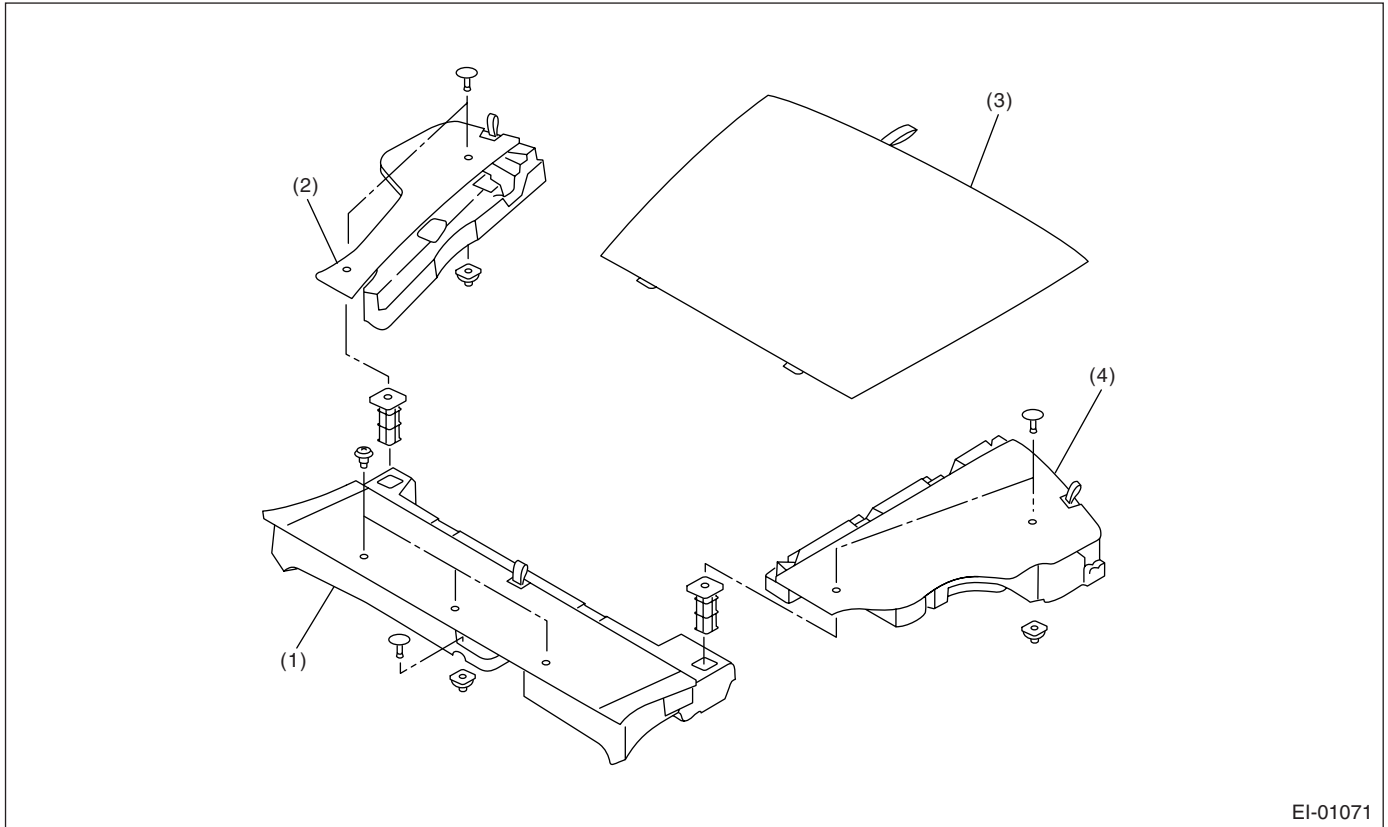
EI-00432

(1) Roof trim

(2) Roof trim (Model with sun roof)

(3) Sun roof garnish

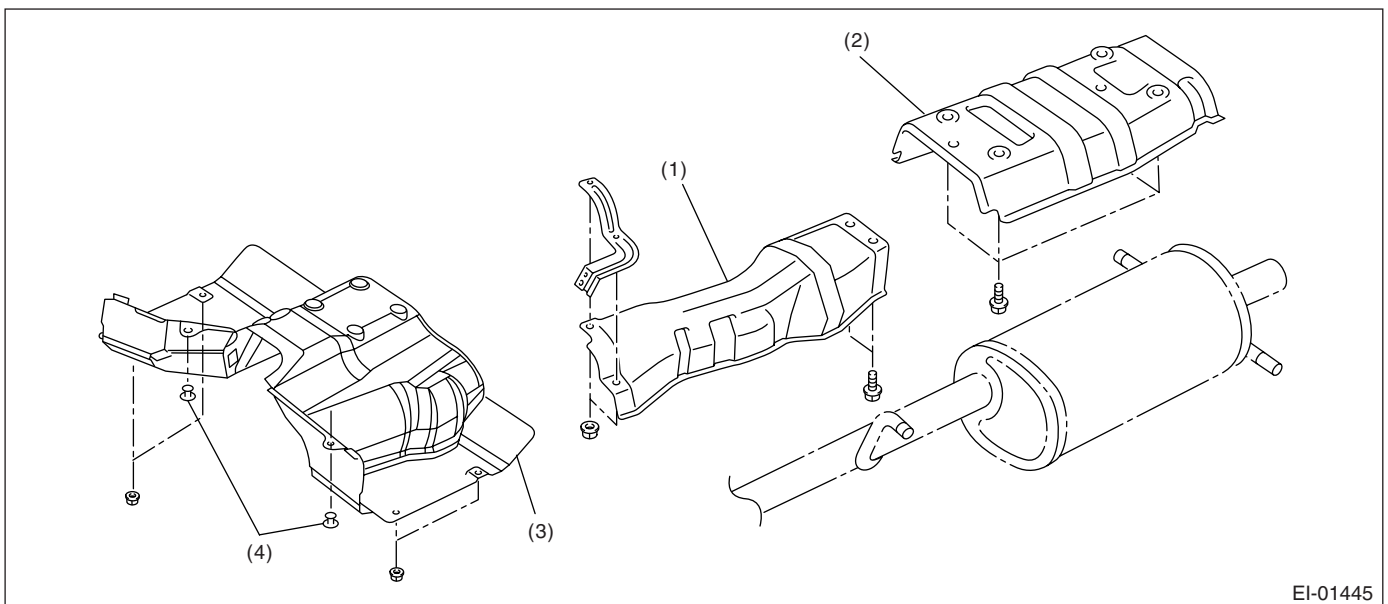
## 21.LUGGAGE FLOOR MAT



EI-01071

- (1) Front floor mat
- (2) Side floor mat (RH)
- (3) Center floor mat
- (4) Side floor mat (LH)

## 22.HEAT SHIELD COVER



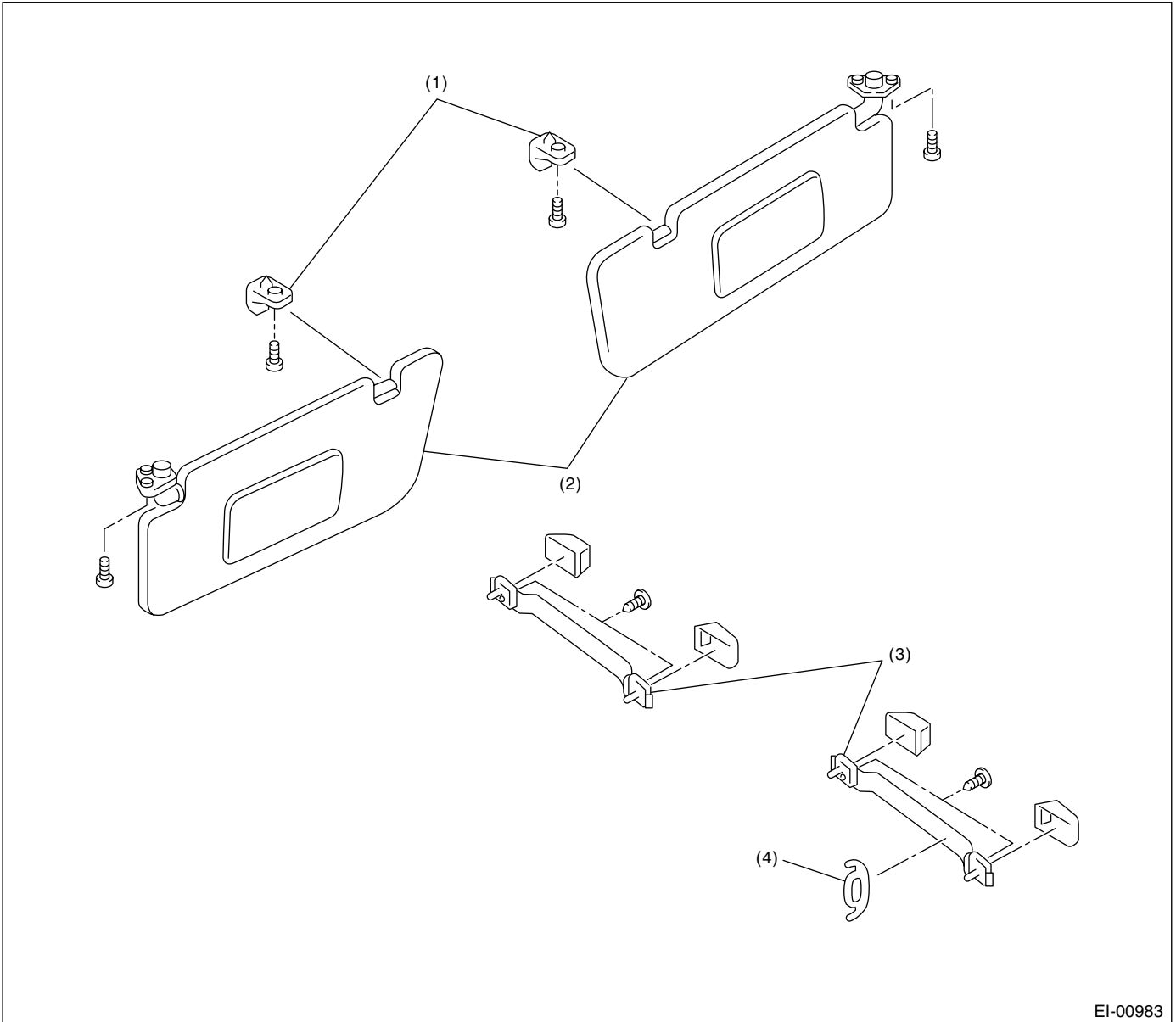
EI-01445

- (1) Center heat shield cover
- (2) Rear heat shield cover
- (3) Center heat shield cover (STI model)
- (4) Clip

# General Description

EXTERIOR/INTERIOR TRIM

## 23.INNER ACCESSORIES

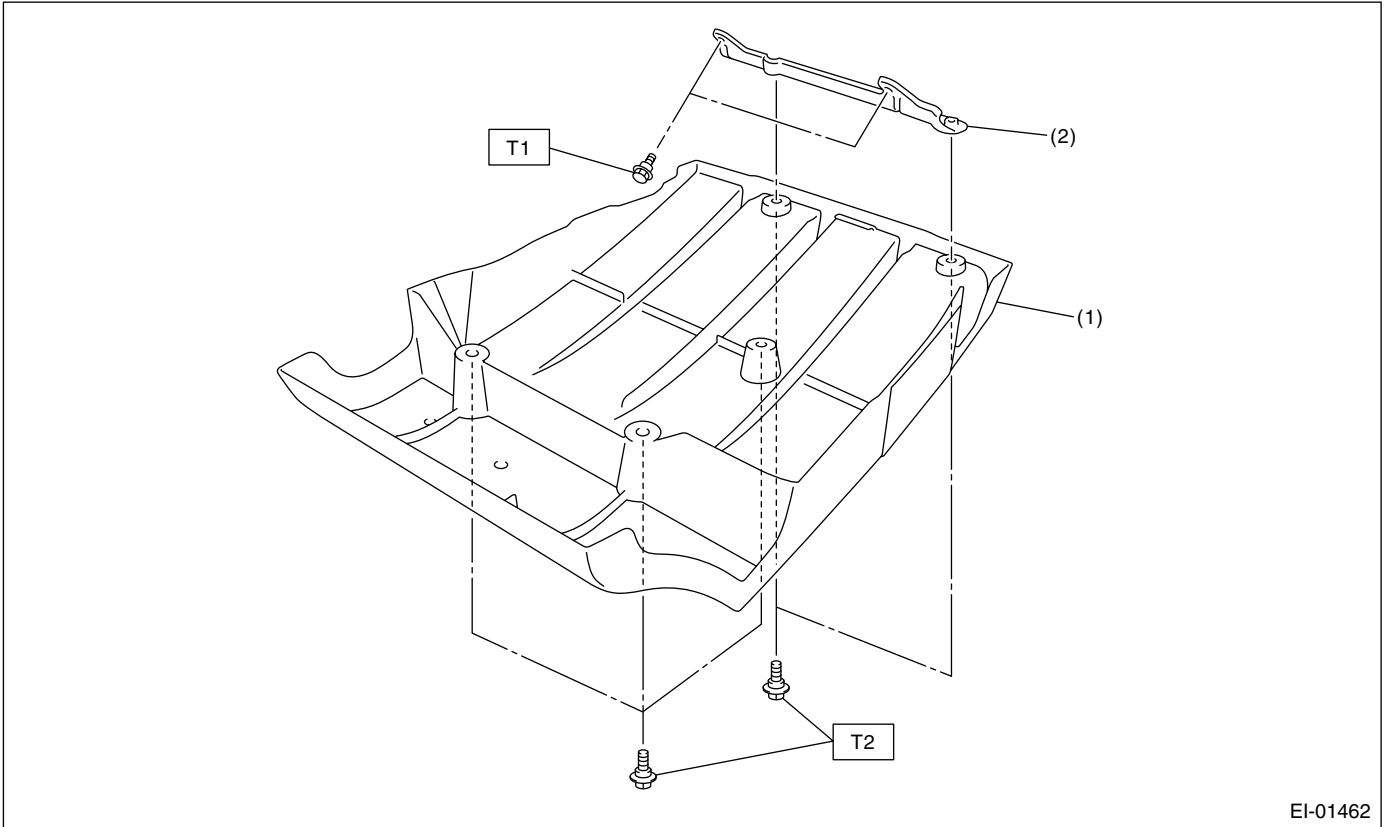


- (1) Hook
- (2) Sun visor

- (3) Assist grip

- (4) Coat hook

24.DIFFUSER



EI-01462

(1) Rear diffuser

(2) Diffuser bracket

**Tightening torque: N-m (kgf-m, ft-lb)**

**T1: 7.5 (0.76, 5.5)**

**T2: 14 (1.4, 10.3)**

**B: PREPARATION TOOL**

| TOOL NAME         | REMARKS                                       |
|-------------------|---|
| Clip remover      | Used for removal of trim.                     |
| Clip clamp pliers | Used for removal of various clips and clamps. |

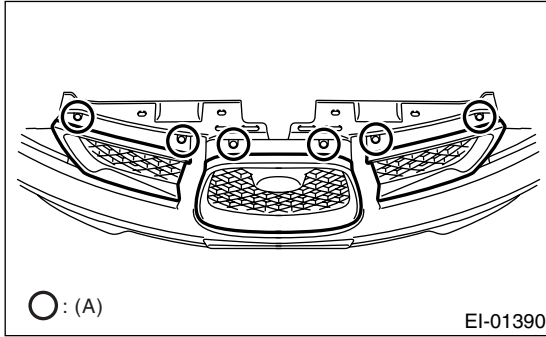
# Front Grille

EXTERIOR/INTERIOR TRIM

## 2. Front Grille

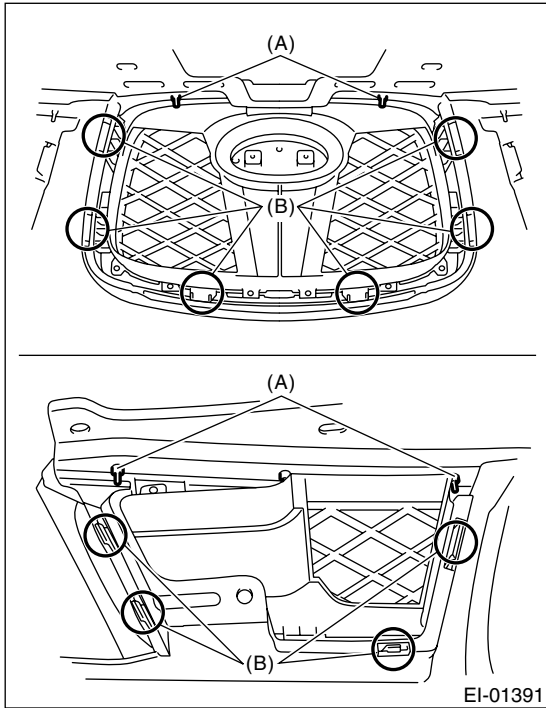
### A: REMOVAL

1) Remove the six clips (A).



(A) Clip

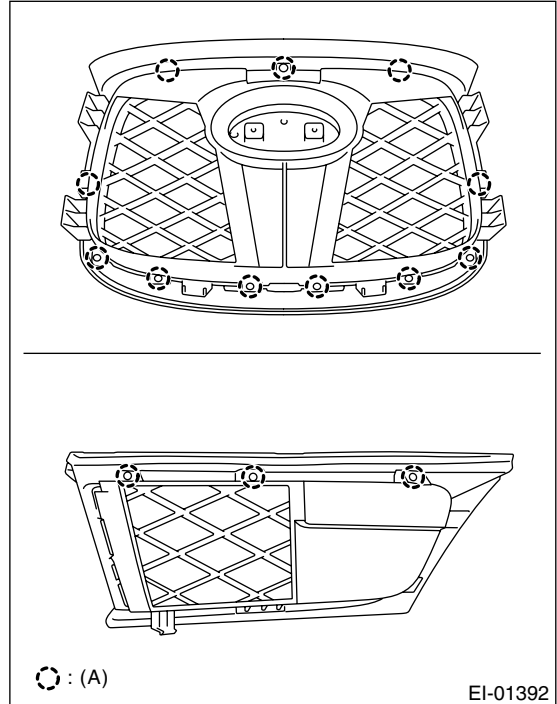
2) Remove the clip on the upper side and the hooks on the right, left and lower sides, and remove the grille LH, grille RH and grille center.



(A) Clip

(B) Hook

3) Remove the screw and disassemble front grille.



(A) Screw

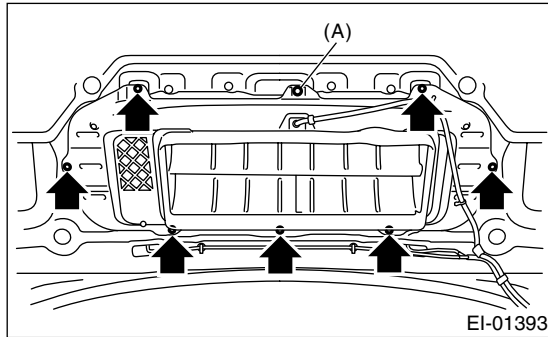
### B: INSTALLATION

Install in the reverse order of removal.

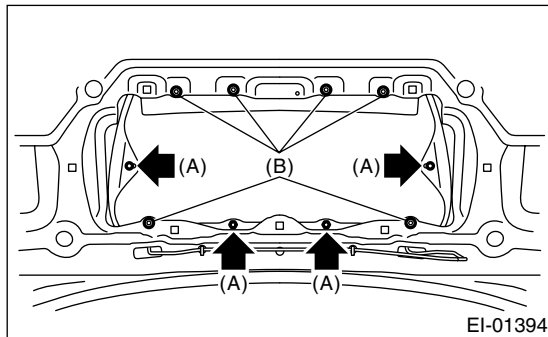
## 3. Front Hood Grille

### A: REMOVAL

- 1) Open the front hood.
- 2) Remove the intercooler water spray hose. (STI model)
- 3) Remove the seven bolts and clip (A) to remove the hood duct.

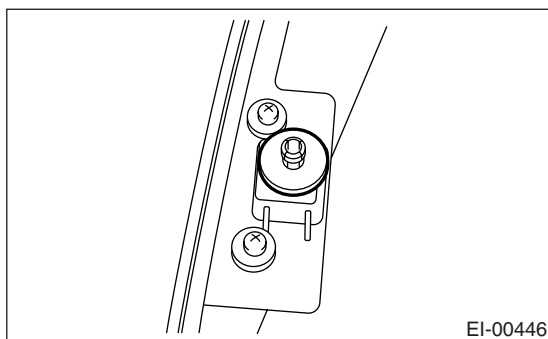


- 4) Loosen the six nuts (B), remove the four clips (A), and then remove the hood grille.



### B: INSTALLATION

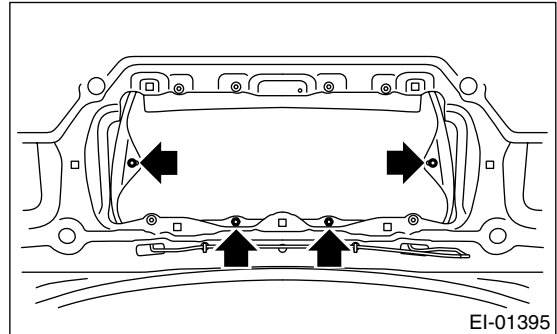
- 1) Replace the four clips with new ones.



- 2) Engage the four clips of hood grille to front hood panel.

### CAUTION:

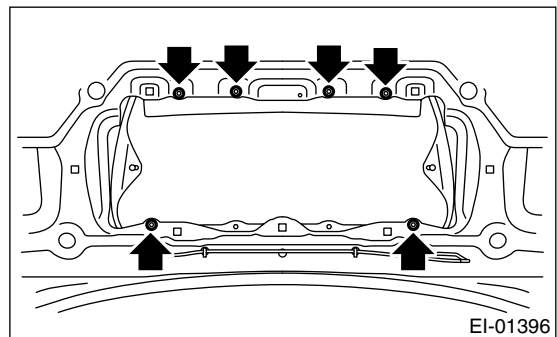
Make sure that the anchor portion of each clip is firmly engaged.



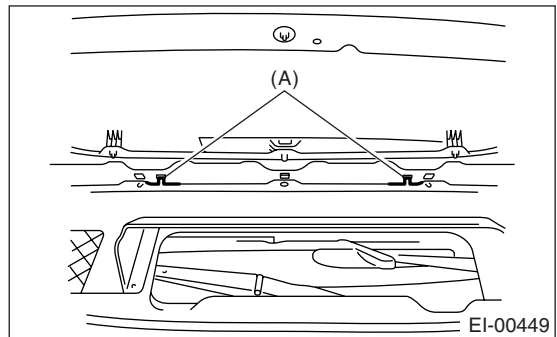
- 3) Install the six nuts.

### Tightening torque:

**4.5 N·m (0.46 kgf·m, 3.32 ft·lb)**



- 4) Catch the two hooks (A) of hood duct to hood holes.



- 5) Install the hood duct with clip (A) and seven bolts.



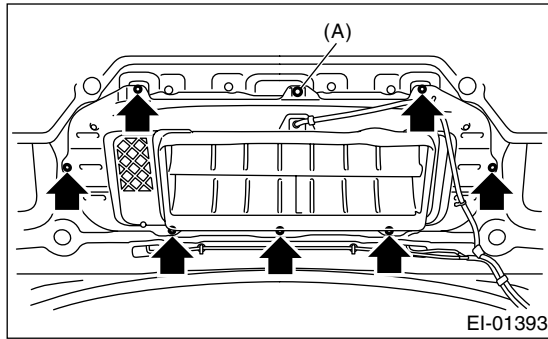
# Front Hood Grille

EXTERIOR/INTERIOR TRIM

---

## **Tightening torque:**

**1.0 N·m (0.1 kgf-m, 0.74 ft-lb)**



6) Install the intercooler water spray hose. (STI model)

## **C: INSPECTION**

Make sure that the clip is firmly engaged.

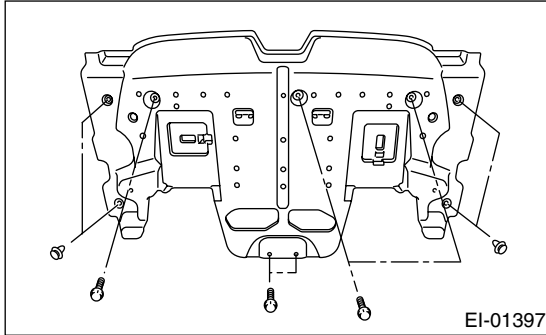
Make sure that there is no abnormal gap at whole periphery of hood grille.

Make sure that there is no damage on hood grille.

## 4. Front Under Cover

### A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove the bolts and clips to remove under cover.



### B: INSTALLATION

Install in the reverse order of removal.

***Tightening torque:***

***14 N·m (1.4 kgf-m, 10.3 ft-lb)***

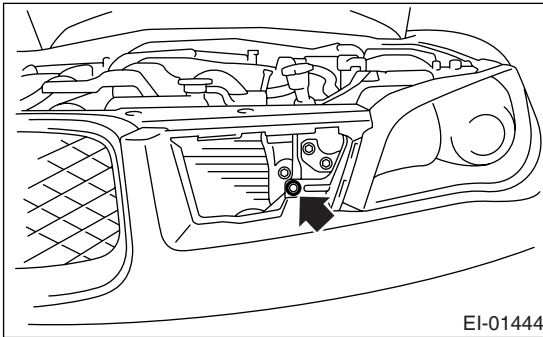
# Front Bumper

EXTERIOR/INTERIOR TRIM

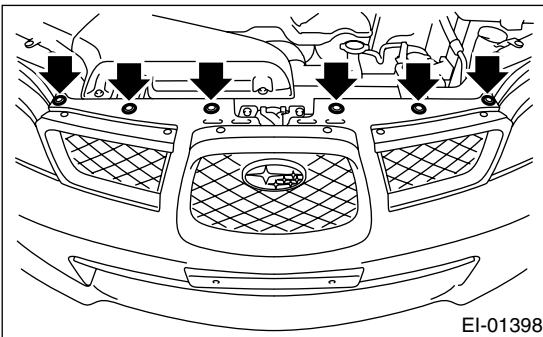
## 5. Front Bumper

### A: REMOVAL

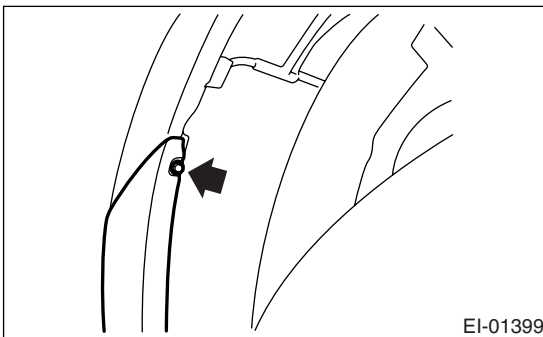
- 1) Disconnect the ground cable from battery.
- 2) Remove the front grille RH and front grille LH. <Ref. to EI-20, REMOVAL, Front Grille.>
- 3) Remove the clips inside the mounting portion of front grille RH and front grille LH.



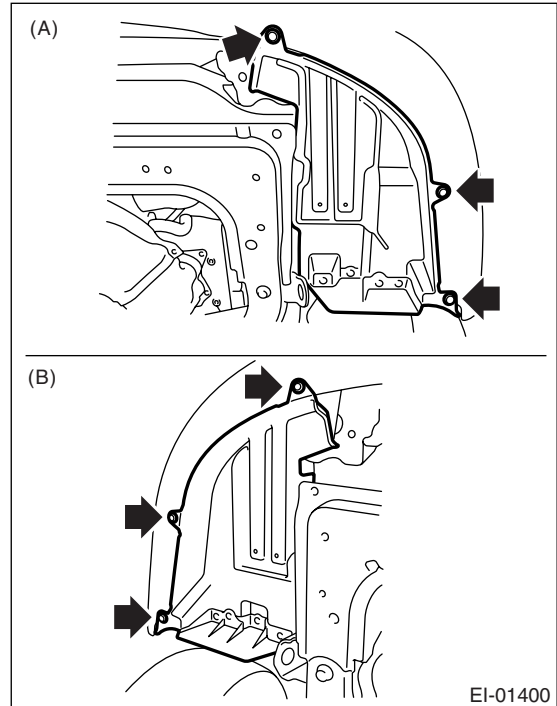
- 4) Remove the six clips on the upper part of bumper.



- 5) Remove the clips, which secure the front bumper to fender.

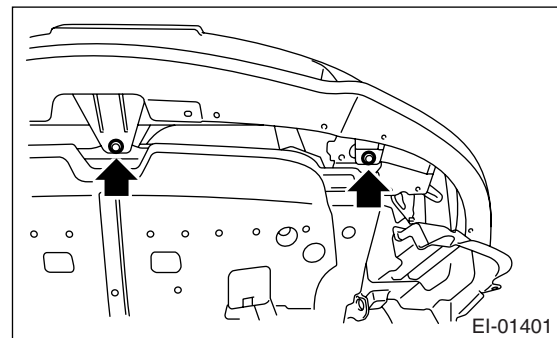


- 6) Remove the clips, and turn over the mud guard LH and RH.

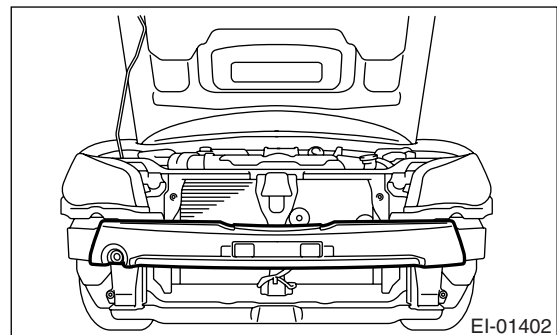


- (A) Mud guard (LH)  
(B) Mud guard (RH)

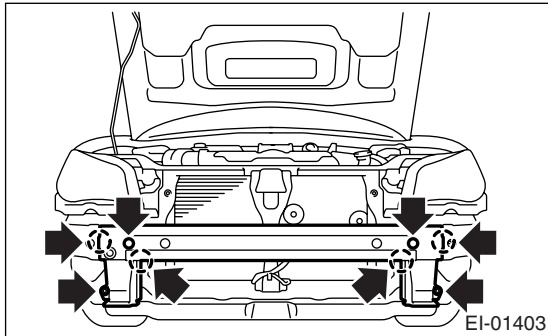
- 7) Remove the three clips in the center, right and left part of bumper.



- 8) Remove the fog light. <Ref. to LI-19, REMOVAL, Front Fog Light Assembly.>
- 9) Remove the bumper from body.
- 10) Remove the energy absorber foam from front bumper beam.

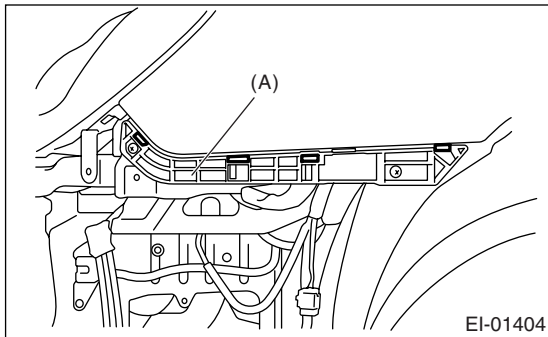


11) Loosen the bolt and nut, and then remove the bumper beam from body.



## B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Align the front bumper mounting hole with the pawl of slider (A) to install.



### **Tightening torque:**

**Refer to COMPONENT in General Description.**

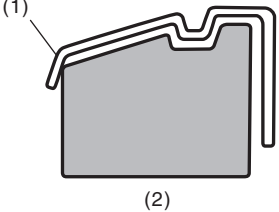
**<Ref. to EI-4, FRONT BUMPER, COMPONENT, General Description.>**

# Front Bumper

EXTERIOR/INTERIOR TRIM

## C: REPAIR

### 1. COATING METHOD FOR PP BUMPER

| Process No. | Process name         | Job contents  |   |
|-------------|----------------------|---|---|
| 1           | Bumper mounting      | Set the bumper on paint worktable if required. Use paint worktable conforming to inner shape of bumper when possible.   |  <p>(1) Bumper<br/>(2) Set bumper section</p> <p>EI-00234</p>  |
| 2           | Masking              | Mask specified part (black base) with masking tape. Use masking tape for PP (example, Nichiban No. 533, etc.).  |   |
| 3           | Degreasing, cleaning | Clean all parts to be painted with white gasoline, normal alcohol, etc. to remove dirt, oil, fat, etc.  |   |
| 4           | Primer paint         | Apply primer one to all parts to be painted, using air gun. Use primer (clear).   |   |
| 5           | Drying               | Dry at normal temperature [10 to 15 min. at 20°C (68°F)].<br>In half-dried condition, PP primer paint is dissolved by solvent, e.g. thinner, etc. Therefore, if dust or dirt must be removed, use ordinary alcohol, etc.  |   |
| 6           | Top coat paint (I)   | Solid color   | Metallic color  |
|             |                      | Use section (block) paint for top coat.<br>• Paint in use (for each color):<br>Solid paint<br>Hardener PB<br>Thinner T-301<br>• Mixing ratio:<br>Main agent vs. hardener = 4:1<br>• Viscosity: 10 — 13 sec/20°C (68°F)<br>• Film thickness: 35 — 45μ<br>• Spraying pressure: 245 — 343 kPa<br>(2.5 — 3.5 kgf/cm <sup>2</sup> , 36 — 50 psi) | Use section (block) paint for top coat.<br>• Paint in use (for each color):<br>Metallic paint<br>Hardener PB<br>Thinner T-306<br>• Mixing ratio:<br>Main agent vs. hardener = 10:1<br>• Viscosity: 10 — 13 sec/20°C (68°F)<br>• Film thickness: 15 — 20μ<br>• Spraying pressure: 245 — 343 kPa<br>(2.5 — 3.5 kgf/cm <sup>2</sup> , 36 — 50 psi)                             |
| 7           | Drying               | Not required.   | Dry at normal temperature [10 min. or more at 20°C (68°F)].<br>In half-dried condition, avoid dust, dirt.   |
| 8           | Top coat paint (II)  | Not required.   | Apply a clear coat to parts with top coat paint (I), three times, at 5 — 7 minutes intervals.<br>• Paint in use:<br>Metallic paint<br>Hardener PB<br>Thinner T-301<br>• Mixing ratio: Clear vs. hardener = 6:1<br>• Viscosity: 14 — 16 sec/20°C (68°F)<br>• Film thickness: 25 — 30μ<br>• Spraying pressure: 245 — 343 kPa<br>(2.5 — 3.5 kgf/cm <sup>2</sup> , 36 — 50 psi) |
| 9           | Drying               | 60°C (140°F), 60 min. or 80°C (176°F), 30 min.<br>If higher than 80°C (176°F), PP may be deformed. Keep maximum temperature of 80°C (176°F).  |   |
| 10          | Inspection           | Paint check.  |   |
| 11          | Masking removal      | Remove the masking in process No. 2.  |   |

## 2. REPAIR INSTRUCTIONS FOR COLORED PP BUMPER

**NOTE:**

All PP bumpers are provided with a grained surface, and if the surface is damaged, it cannot normally be restored to its former condition. Damage limited to shallow scratches that cause only a change in the lustre of the base material or coating, can be almost fully restored. Before repairing a damaged area, explain this point to the customer and get an understanding about the matter. Repair methods are outlined below, based on a classification of the extent of damage.

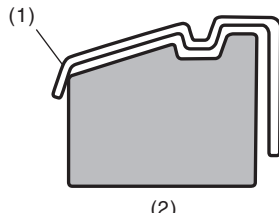
1) Minor damage causing only a change in the lustre of the bumper due to a light touch  
Almost restorable.

| Process No. | Process name | Job contents  |   |
|-------------|--------------|---|---|
| 1           | Cleaning     | Clean the area to be repaired using water.  |   |
| 2           | Sanding      | Grind the repairing area with #500 sand paper in a "feathering" motion.   |   |
| 3           | Finish       | Resin section   | Coated section  |
|             |              | Repeatedly apply wax to the affected area using a soft cloth (such as flannel). Recommended wax: NITTO KASEI Soft 99 TIRE WAX BLACK, or equivalent. | Perform either the same operation as for the resin section or process No. 18 and subsequent operations in the "3)" section, depending on the degree and nature of damage. |
|             |              | Polish the waxed area with a clean cloth after 5 to 10 minutes.   |   |

2) Deep damage caused by scratching fences, etc.  
A dent cannot be repaired but a whitened or swelled part can be removed.

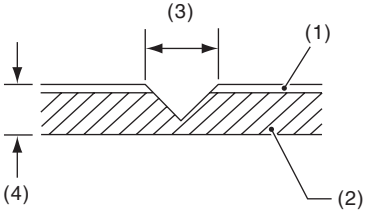
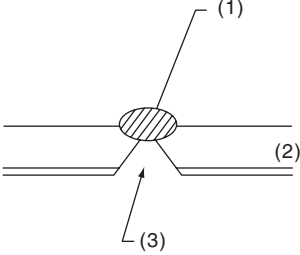
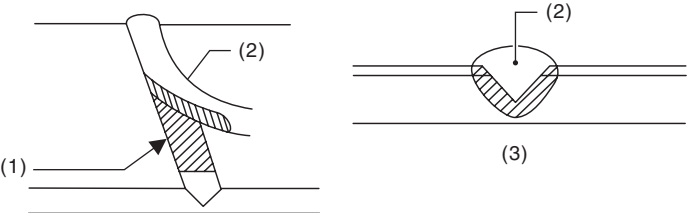
| Process No. | Process name            | Job contents  |   |
|-------------|-------------------------|---|---|
| 1           | Cleaning                | Clean the damaged area with water.                                      |   |
| 2           | Removal of damaged area | Cut off protruding area, if any, due to collision, using a putty knife. |   |
| 3           | Sanding                 | Grind the affected area with #100 to #500 sand paper.                   |   |
| 4           | Finish                  | Resin section   | Coated section  |
|             |                         | Same as Process No. 3 in the "1)" section.                              | Perform Process No. 12 and subsequent operations in the "3)" section. |

3) Deep damage such as a break or hole that requires filling  
Much of the peripheral grained surface must be sacrificed for repair, and the degree of restoration is not really worth the expense. (The surface, however, will become almost flush with adjacent areas.)  
Recommended repair kit: PP Part Repair Kit (NRM)

| Process No. | Process name        | Job contents   |  |
|-------------|---------------------|--|--|
| 1           | Bumper removal      | Remove the bumper as required.   |  |
| 2           | Part removal        | Remove the parts built into bumper as required.  |  |
| 3           | Bumper placement    | Place the bumper on a paint worktable as required.<br>It is recommended that contour of worktable accommodate internal shape of bumper.              |  <p style="text-align: right;">EI-00234</p> |
| 4           | Surface preparation | Remove dust, oil, etc. from areas to be repaired and surrounding areas, using a suitable solvent (NRM No. 900 Precleno, white gasoline, or alcohol). |  |


# Front Bumper

## EXTERIOR/INTERIOR TRIM

| Process No. | Process name      | Job contents  |  |
|-------------|-------------------|---|--|
| 5           | Cutting           | <p>If nature of damage are cracks or holes, cut a guide slit of 20 to 30 mm (0.79 to 1.18 in) in length along the crack or hole up to the bumper's base surface. Then, bevel or "vee-out" the affected area using a knife or grinder.</p> |  <p style="text-align: right;">EI-00235</p> <p>(1) Paint surface<br/>           (2) PP base surface<br/>           (3) 20 — 30 mm (0.79 — 1.18 in)<br/>           (4) 3 mm (0.12 in)</p>  |
| 6           | Sanding (I)       | Grind beveled surface with sand paper (#40 to #60) to smooth finish.  |  |
| 7           | Cleaning          | Clean the sanded surface with the same solvent as used in Process No. 4.  |  |
| 8           | Temporary welding | <p>Grind the side just opposite the beveled area with sand paper (#40 to #60) and clean using a solvent.<br/>           Temporarily spot-weld the side, using a PP welding rod and heater gun.</p>  |  <p style="text-align: right;">EI-00236</p> <p>(1) Welded spot (Use heater gun and PP welding rod)<br/>           (2) PP base surface<br/>           (3) Beveled section</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Do not melt the welding rod until it flows out. This results in reduced strength.</li> <li>• Leave the welded spot unattended until it cools completely.</li> </ul>  |
| 9           | Welding           | <p>Using a heater gun and PP welding rod, weld the beveled spot while melting the rod and damaged area.</p>   |  <p style="text-align: right;">EI-00237</p> <p>(1) Melt hatched area<br/>           (2) Welding rod<br/>           (3) Section</p> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• Melt the sections indicated by hatched area.</li> <li>• Do not melt the welding rod until it flows out, in order to provide strength.</li> <li>• Always keep the heater gun 1 to 2 cm (0.4 to 0.8 in) away from the welding spot.</li> <li>• Leave the welded spot unattended until it cools completely.</li> </ul> |

# Front Bumper

EXTERIOR/INTERIOR TRIM

| Process No. | Process name            | Job contents   |
|-------------|-------------------------|--|
| 10          | Sanding (II)            | Remove excess part of weld with a putty knife. If a drill or disc wheel is used instead of the knife, operate it at a rate lower than 1,500 rpm and grind the excess part little by little. A higher rpm will cause the PP substrate to melt from the heat.  |
|             |                         |  <p style="text-align: right;">EI-00042</p>  |
|             |                         | Sand the welded spot smooth with #240 sand paper.  |
| 11          | Masking                 | Mask the black substrate section using masking tape.<br>Recommended masking tape: Nichiban No. 533 or equivalent   |
| 12          | Cleaning/<br>degreasing | Completely clean the entire coated area, using solvent similar to that used in Process No. 4.  |
| 13          | Primer coating          | Apply a coat of primer to the repaired surface and its surrounding areas. Mask these areas, if necessary.<br>Recommended primer: Mp/ 364 PP Primer<br>NOTE:<br>Be sure to apply one coat of primer at a spraying pressure of 245 to 343 kPa (2.5 to 3.5 kgf/cm <sup>2</sup> , 36 to 50 psi) with a spray gun.  |
| 14          | Leave unattended.       | Leave the repaired area unattended at 20°C (68°F) for 10 to 15 minutes until primer is half-dry.<br>NOTE:<br>If dirt or dust comes in contact with the coated area, wipe it off with a cloth impregnated with alcohol. (Do not use thinner since the coated area tends to melt.)   |
| 15          | Primer surfacer coating | Apply a coat of primer surfacer to the repaired area two or three times at an interval of 3 to 5 minutes.<br>Recommended surfacer:<br><ul style="list-style-type: none"> <li>• UPS 300 Flex Primer</li> <li>• No. 303 UPS 300 Exclusive hardener</li> <li>• NPS 725 Exclusive Reducer (thinner)</li> <li>• Mixing ratio: 2: 1 (UPS 300: No. 303)</li> <li>• Viscosity: 12 — 14 sec/20°C (68°F)</li> <li>• Coated film thickness: 40 — 50μ</li> </ul>   |
| 16          | Drying                  | Allow the coated surface to dry for 30 minutes at 20°C (68°F) or 20 minutes at 60°C (140°F).   |
| 17          | Sanding (III)           | Sand the coated surface and its surrounding areas using #400 sand paper and water.   |
| 18          | Cleaning/<br>degreasing | Same as Process No. 12.  |
| 19          | Top coat (I)            | Solid color  |
|             |                         | <p>Use a “block” coating method.</p> <ul style="list-style-type: none"> <li>• Recommended paint: Suncryl (SC)</li> <li>• No. 307 Flex Hardener</li> <li>• SC Reducer (thinner)</li> <li>• Mixing ratio: 3: 1</li> </ul> <p>Suncryl (SC) vs. No. 307 Flex Hardener</p> <ul style="list-style-type: none"> <li>• Viscosity: 11 — 13 sec/20°C (68°F)</li> <li>• Coated film thickness: 40 — 50μ</li> <li>• Spraying thickness: 245 — 343 kPa (2.5 — 3.5 kgf/cm<sup>2</sup>, 36 — 50 psi)</li> </ul> |
|             |                         | Metallic color   |
|             |                         | <p>Use a “block” coating method.</p> <ul style="list-style-type: none"> <li>• Recommended paint: Suncryl (SC)</li> <li>• No. 307 Flex Hardener</li> <li>• SC Reducer (thinner)</li> <li>• Mixing ratio: 3: 1</li> </ul> <p>Suncryl (SC) vs. No. 307 Flex Hardener</p> <ul style="list-style-type: none"> <li>• Viscosity: 11 — 13 sec/20°C (68°F)</li> <li>• Coated film thickness: 20 — 30μ</li> <li>• Spraying thickness: 245 — 343 kPa (2.5 — 3.5 kgf/cm<sup>2</sup>, 36 — 50 psi)</li> </ul> |



# Front Bumper

## EXTERIOR/INTERIOR TRIM

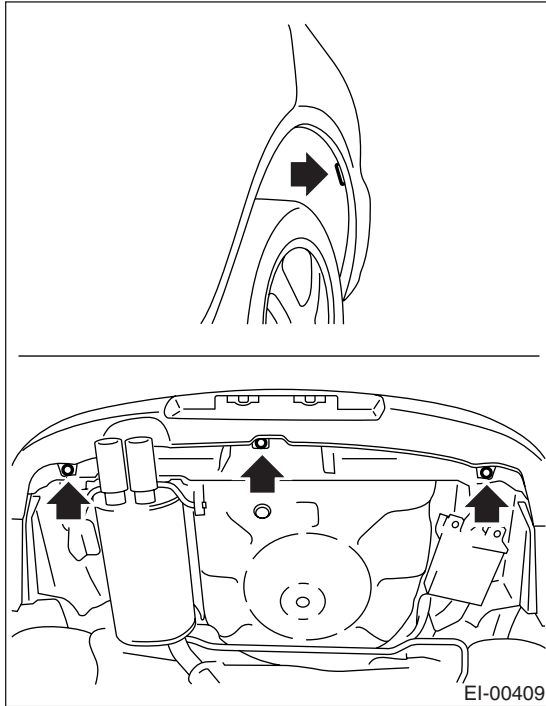
| Process No. | Process name        | Job contents  |  |
|-------------|---------------------|---|--|
| 20          | Leave unattended.   | Not required.   | Leave unattended at 20°C (68°F) for at least 10 minutes until the topcoated area is half-dry.<br>NOTE:<br>Be careful to keep dust or dirt from coming in contact with the affected area.   |
| 21          | Top coat (II)       | Not required.   | Apply a clear coat three times at an interval of 3 to 5 minutes.<br>• Recommended paint:<br>SC710 Overlay Clear<br>No. 307 Flex Hardener<br>SC Reducer (thinner)<br>• Mixing ratio: 3: 1<br>Suncryl (SC) vs. No. 307 Flex Hardener<br>• Viscosity: 10 — 13 sec/20°C (68°F)<br>• Coated film thickness: 20 — 30μ<br>• Spraying pressure: 245 — 343 kPa<br>(2.5 — 3.5 kgf/cm <sup>2</sup> , 36 — 50 psi) |
| 22          | Drying              | Allow the coated surface to dry at 20°C (68°F) for two hours or 60°C (140°F) for 30 minutes.<br>NOTE:<br>Do not allow the temperature to exceed 80°C (176°F) since this will deform the PP substrate. |  |
| 23          | Inspection          | Carefully check the condition of the repaired area.   |  |
| 24          | Masking removal     | Remove the masking tape applied in Process No. 11 and 13.   |  |
| 25          | Parts installation  | Install the parts on bumper in reverse order of removal.  |  |
| 26          | Bumper installation | Install the bumper.   |  |

## 6. Rear Bumper

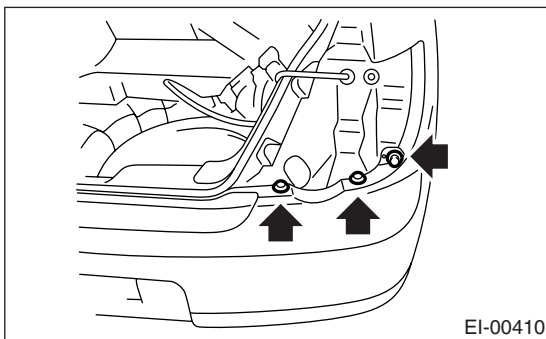
### A: REMOVAL

#### 1. WAGON MODEL

- 1) Disconnect the ground cable from battery.
- 2) Remove the bolt inside wheel house (both sides), and the clips on lower side of bumper.

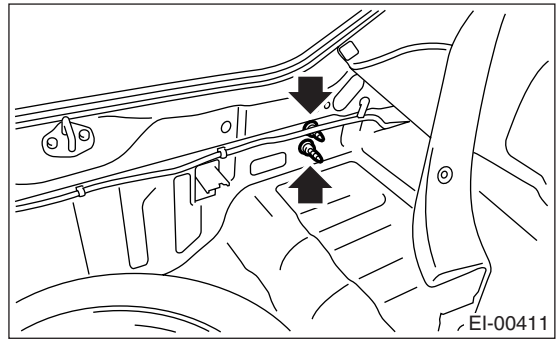


- 3) Remove the rear combination light assembly. <Ref. to LI-22, REMOVAL, Rear Combination Light Assembly.>
- 4) Remove the screw and two clips (both sides).



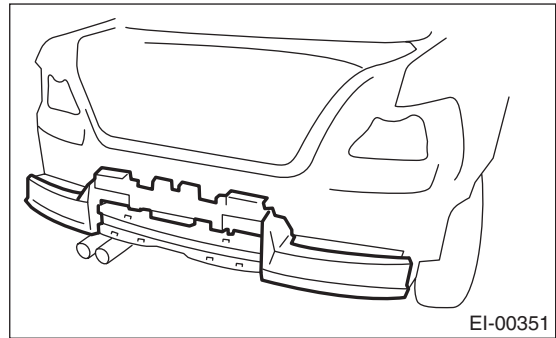
- 5) Remove the floor box.
- 6) Remove the rear skirt trim.

- 7) Turn over the rear quarter lower trims on both sides, and then loosen the four nuts.

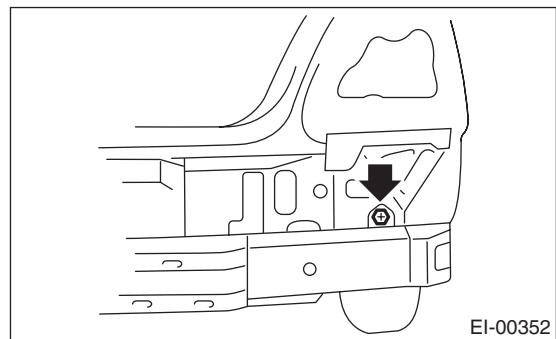


- 8) Disconnect the license plate light connector, and then remove the rear bumper.
- 9) Remove the E/A FORM from bumper beam.

**CAUTION:**  
E/A FORM may easily break. Do not apply excessive force to it during removal.



- 10) Remove the bolt.



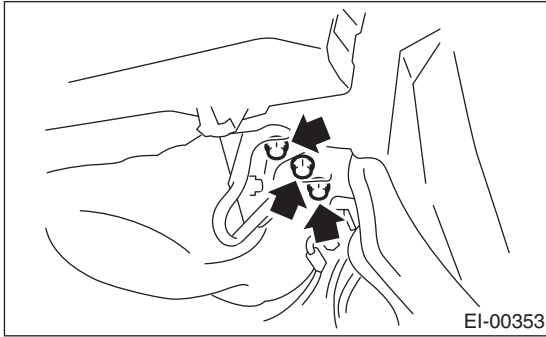
- 11) Remove the three bolts, then remove the bumper beam.

# Rear Bumper

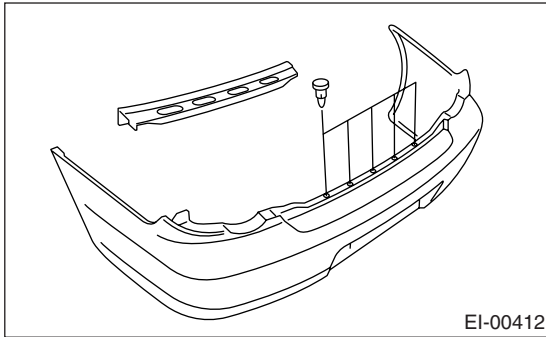
## EXTERIOR/INTERIOR TRIM

### NOTE:

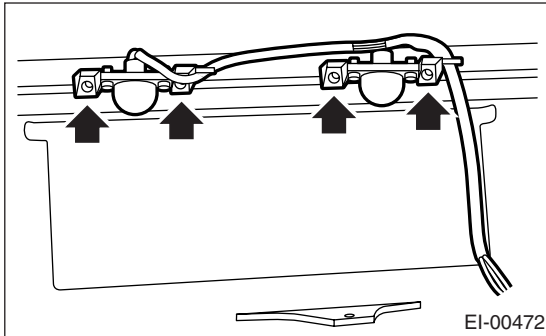
In the case of right side, remove the canister first. Loosen the bolt, and then remove the bumper beam.



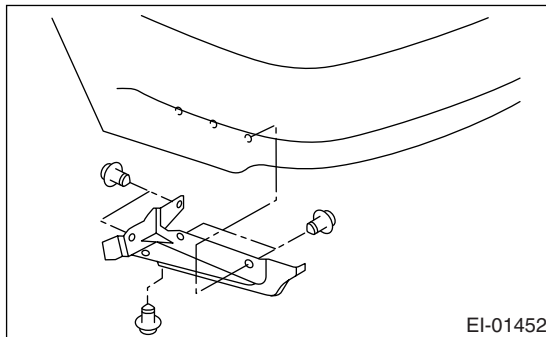
12) Remove the five clips, and then remove the bumper upper beam.



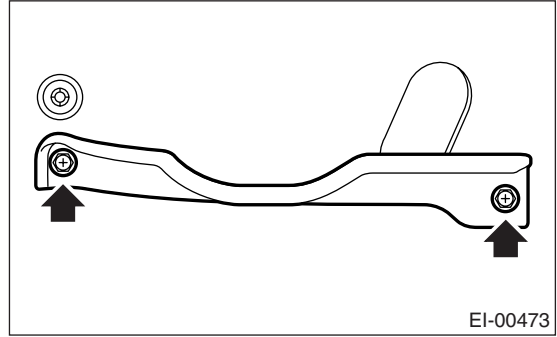
13) Remove the license plate light.



14) Remove the six clips, and then remove the bumper side cover.



15) Remove the upper bracket from body.



## 2. SEDAN MODEL

Refer to description about removal of rear bumper of wagon model. <Ref. to EI-31, WAGON MODEL, REMOVAL, Rear Bumper.>

## B: INSTALLATION

### 1. WAGON MODEL

Install in the reverse order of removal.

#### Tightening torque:

Refer to **COMPONENT** in *General Description*.

<Ref. to EI-5, REAR BUMPER, COMPONENT, General Description.>

### 2. SEDAN MODEL

Install in the reverse order of removal.

#### Tightening torque:

Refer to **COMPONENT** in *General Description*.

<Ref. to EI-5, REAR BUMPER, COMPONENT, General Description.>

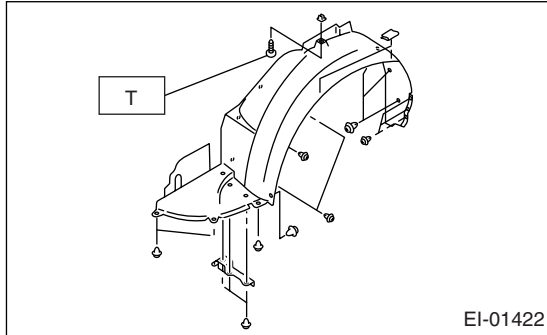
## C: REPAIR

Refer to description about repair of front bumper. <Ref. to EI-24, REMOVAL, Front Bumper.>

## 7. Mud Guard

### A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove the screws and clips to remove mud guard.



### B: INSTALLATION

Insert the hook into body, and tighten it with screw and clip.

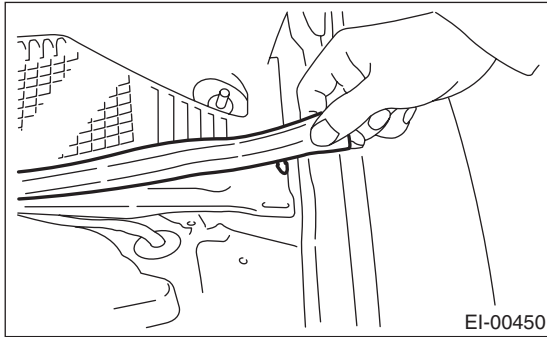
**Tightening torque:**

***T: 4.5 N·m (0.46 kgf-m, 3.3 ft-lb)***

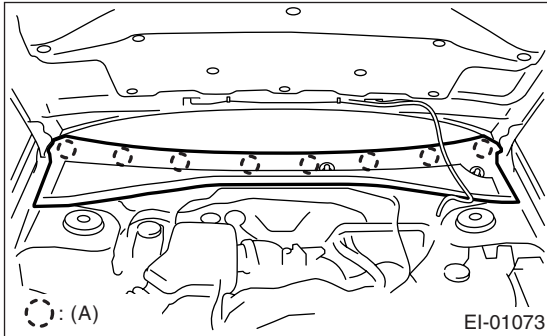
## 8. Cowl Panel

### A: REMOVAL

- 1) Open the front hood.
- 2) Remove the wiper arm. <Ref. to WW-13, REMOVAL, Front Wiper Arm.>
- 3) Remove the front panel seal.



- 4) Disengage the clips (A) to remove the cowl panel.



(A) Clip

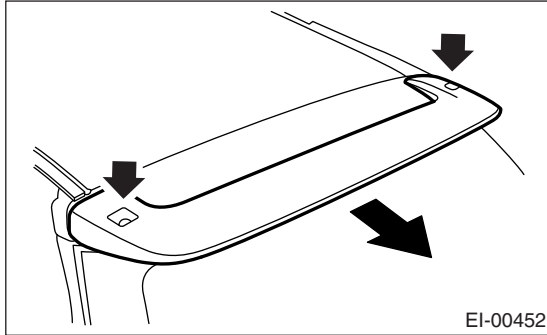
### B: INSTALLATION

Install in the reverse order of removal.

## 9. Roof Spoiler

### A: REMOVAL

- 1) Remove the bolt cap, and then remove the two bolts.
- 2) Remove the roof spoiler.



### B: INSTALLATION

Install in the reverse order of removal.

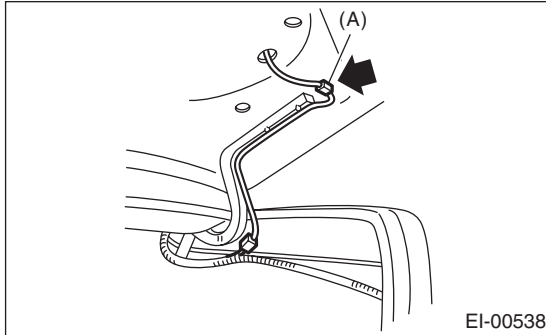
#### *Tightening torque:*

*7.5 N·m (0.76 kgf-m, 5.5 ft-lb)*

## 10. Rear Spoiler

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Open the trunk lid.
- 3) Remove the electrical connector (A) of high mount stop light.

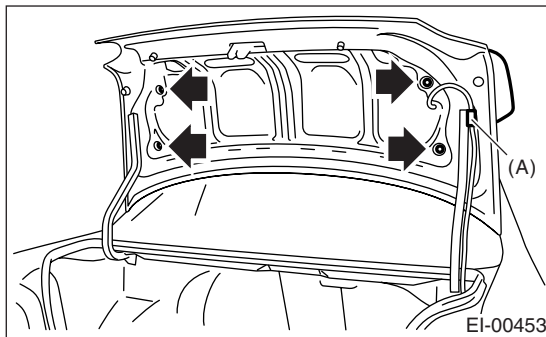


- 4) Loosen the mounting nut of rear spoiler to remove rear spoiler.

### CAUTION:

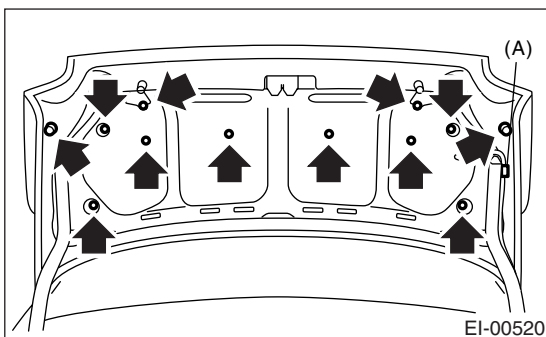
- When removing the nut, do not drop it into trunk lid.
- Pay attention to avoid damage during removal or installation.

Small-sized rear spoiler: Four tightening positions, two clips



(A) Connector

Large-sized rear spoiler: Twelve tightening positions, four clips



(A) Connector

### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Clean the mounting surfaces of trunk lid and spoiler before installation.

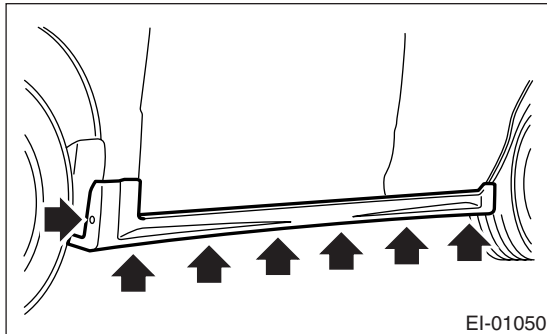
### Tightening torque:

**7.5 N·m (0.76 kgf-m, 5.5 ft-lb)**

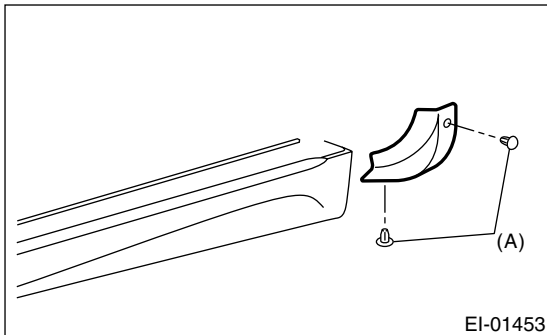
## 11.Side Sill Spoiler

### A: REMOVAL

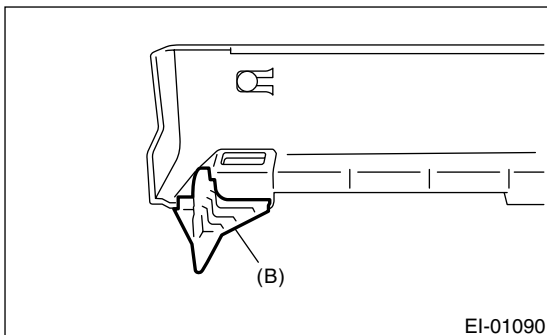
1) Remove the clips (one on front fender arch, six on bottom of side sill spoiler), then remove the side spoiler.



2) Remove the one rivet clip (A) and two clips, and then remove the end cover. (Except STI model)



3) Remove the rear air flap plate from side sill spoiler.



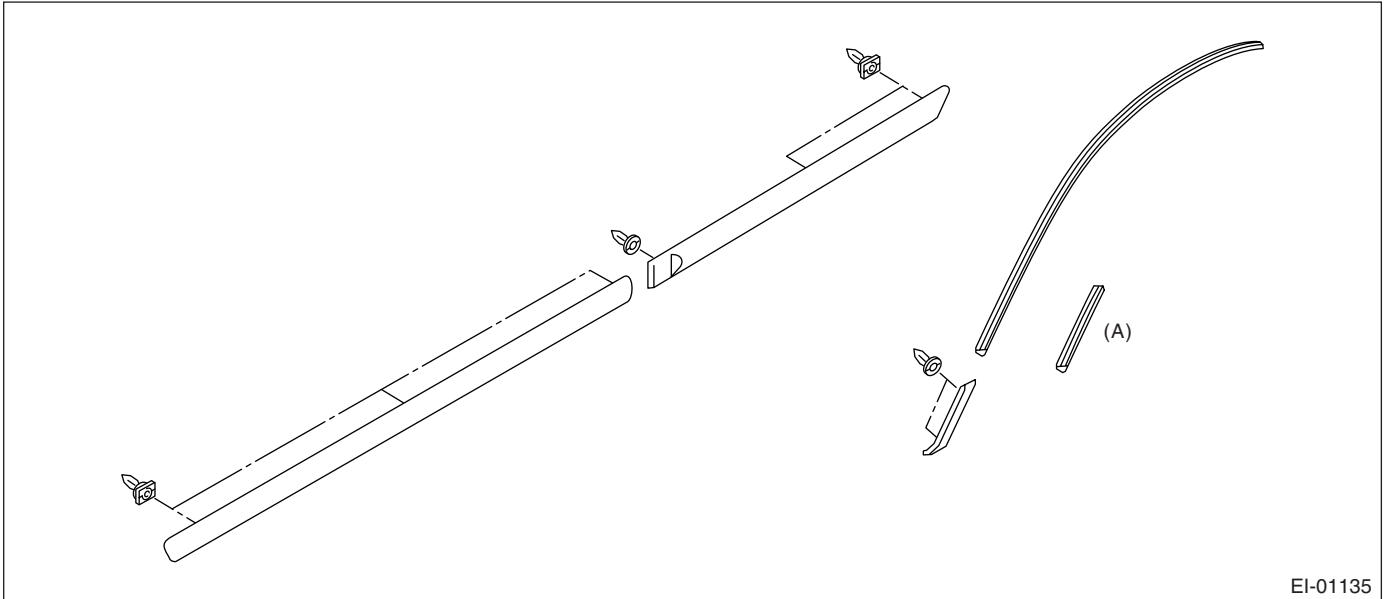
### B: INSTALLATION

Install in the reverse order of removal.



## 12.Side Protector

### A: REMOVAL

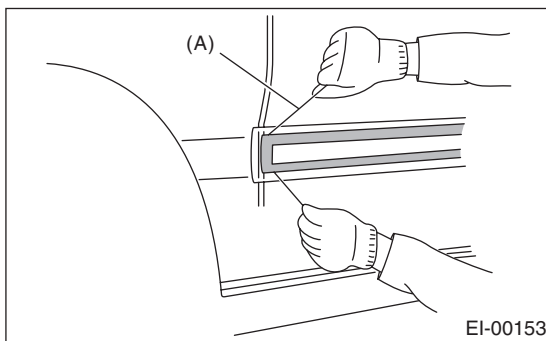


EI-01135

(A) STI model

1) Slide in a thin thread (A) of 0.8 mm (0.031 in) diameter or less (fishing line etc.) between body and protector, and then remove the protector detaching double-sided tape. Remove the protector using clip remover.

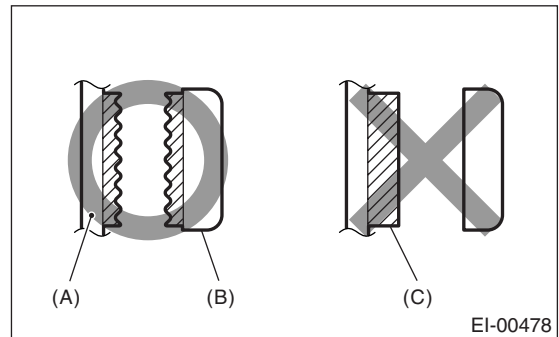
- If the double-sided tape remains thick on surface due to interfacial peeling, apply the solvent after slicing off the double-sided tape using a cutter.



EI-00153

#### NOTE:

- To optimize the effect of solvent, slide the thread along the body without removing the double-sided tape on surface of body and spoiler.
- If it is difficult to detach the double-sided tape, warm up to approx. 40°C (104°F).



EI-00478

- (A) Panel  
(B) Spoiler  
(C) Double-sided tape

- 2) Adhere the masking tape around the double-sided tape remaining on surface of body and spoiler.
- 3) Apply the solvent uniformly on double-sided tape using a brush.

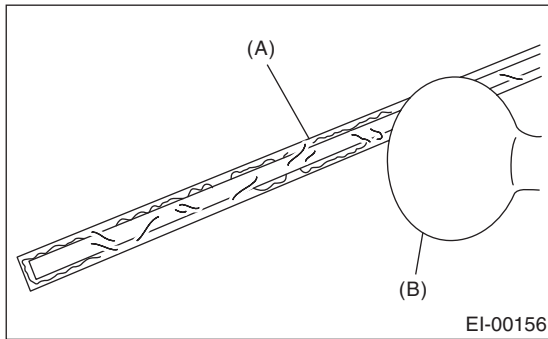
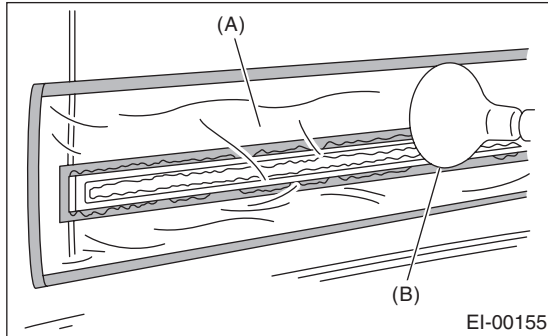
#### CAUTION:

- Do not use the solvent to body which is repaired with lacquer paint.
- Wipe off immediately when the solvent is touched on surface of body and spoiler.

#### Solvent:

**3M 8907 or equivalent**

4) Cover the area where solvent is applied using plastic wrap (A), and then heat the double-sided tape for 5 to 10 minutes in 40 to 60°C (104 to 140°F) using a heat lamp (B).



**Primer:**  
*3M K-500 or equivalent*

**Double-sided tape:**  
*3M 5531-5 or equivalent*

2) Heat the adhering part using a heat lamp.

Body side: 40 — 60°C (104 — 140°F)

Protector side: 20 — 30°C (68 — 86°F)

3) Detach the double-sided tape backing sheet, align to clip position, and then adhere to body using care to avoid air entering.

**CAUTION:**

**To keep the adhesion, do not wash the vehicle within 24 hours.**

**CAUTION:**

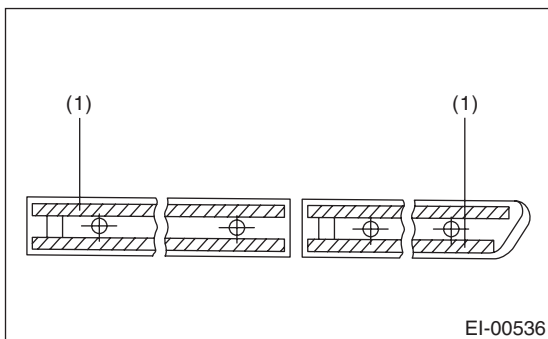
**Do not heat the double-sided tape until the surface becomes white and excessively dried.**

5) Remove the double-sided tape using a plastic spatula.

6) After completely removing the double-sided tape, detach the masking tape and clean the surface using a cotton cloth waste damped with white gasoline.

**B: INSTALLATION**

1) Apply the primer to protector surface where the double-sided tape is adhered, and then adhere the double-sided tape as shown in the figure.



(1) Double-sided tape; thickness: 1.2 mm (0.047 in), width: 5 mm (0.197 in)

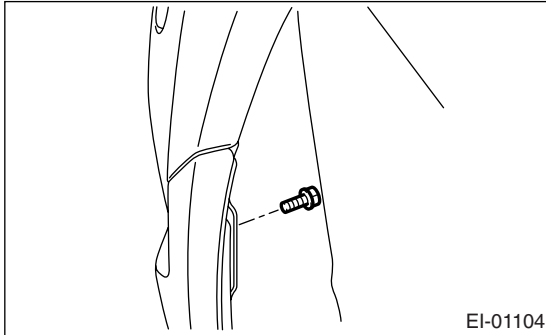
## 13. Arch Cover

### A: REMOVAL

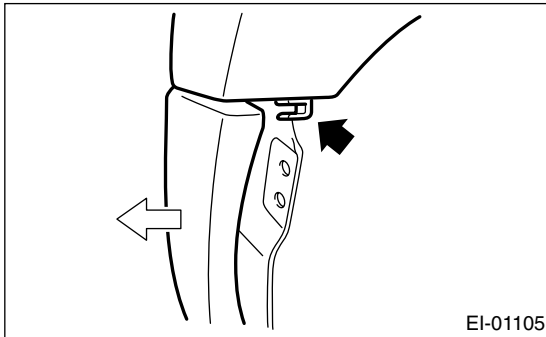
#### CAUTION:

Never remove the arch cover unless necessary.  
Otherwise the arch cover may be damaged.

- 1) Lift-up the vehicle.
- 2) Remove the bolt inside the wheel house.



- 3) Remove the two hook of arch cover by pulling the rear bumper outward.



- 4) Remove the arch cover using clip remover.

### B: INSTALLATION

Install in the reverse order of removal.

## 14. Front Door Trim

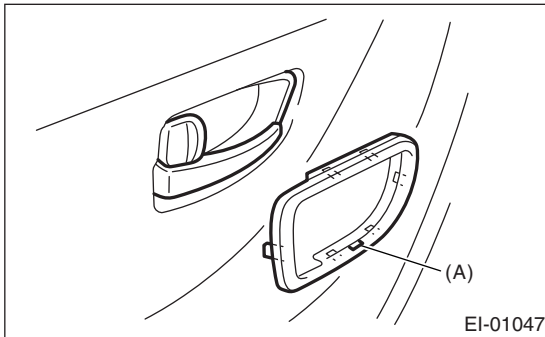
### A: REMOVAL

**CAUTION:**

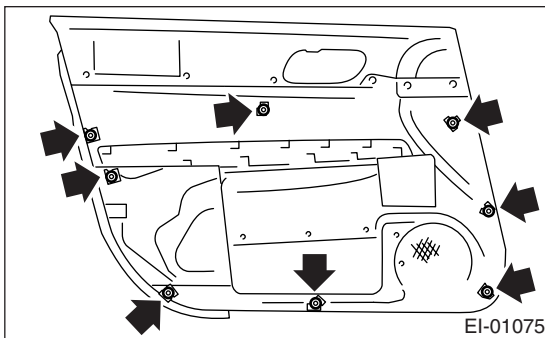
**Do not apply excessive force to the clip. Otherwise the clip may be broken.**

- 1) Disconnect the ground cable from battery.
- 2) Remove the gusset cover.
- 3) Insert the flat tip screw driver into A part of inner remote cover, and then remove the lower hook with turning screw driver.

Remove the upper hook with pulling inner remote cover, and then remove the inner remote cover.



- 4) Remove the power window control switch. <Ref. to GW-9, REMOVAL, Power Window Control Switch.>
- 5) Remove the clips of trim panel using clip remover to remove trim panel.



### B: INSTALLATION

Install in the reverse order of removal.

## 15.Rear Door Trim

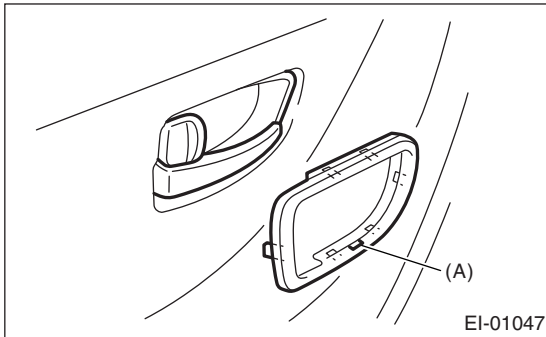
### A: REMOVAL

**CAUTION:**

**Do not apply excessive force to the clip. Otherwise the clip may be broken.**

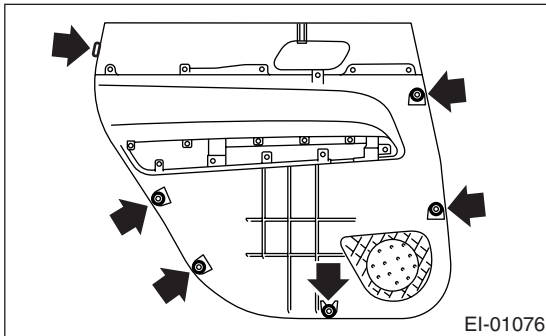
- 1) Disconnect the ground cable from battery.
- 2) Insert the flat tip screw driver into A part of inner remote cover, and then remove the lower hook with turning screw driver.

Remove the upper hook with pulling inner remote cover, and then remove the inner remote cover.



- 3) Remove the power window control switch. <Ref. to GW-9, REMOVAL, Power Window Control Switch.>

- 4) Remove the clips of trim panel using clip remover to remove trim panel.



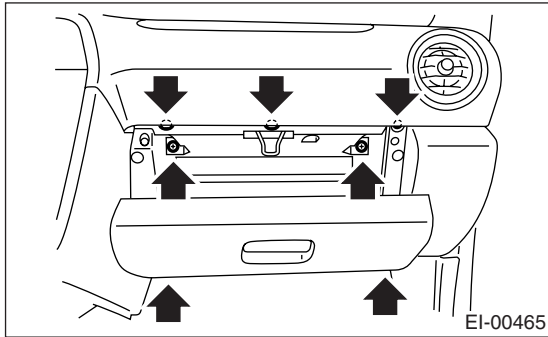
### B: INSTALLATION

Install in the reverse order of removal.

## 16. Glove Box

### A: REMOVAL

- 1) Open the glove box.
- 2) Remove the screws to remove glove box.



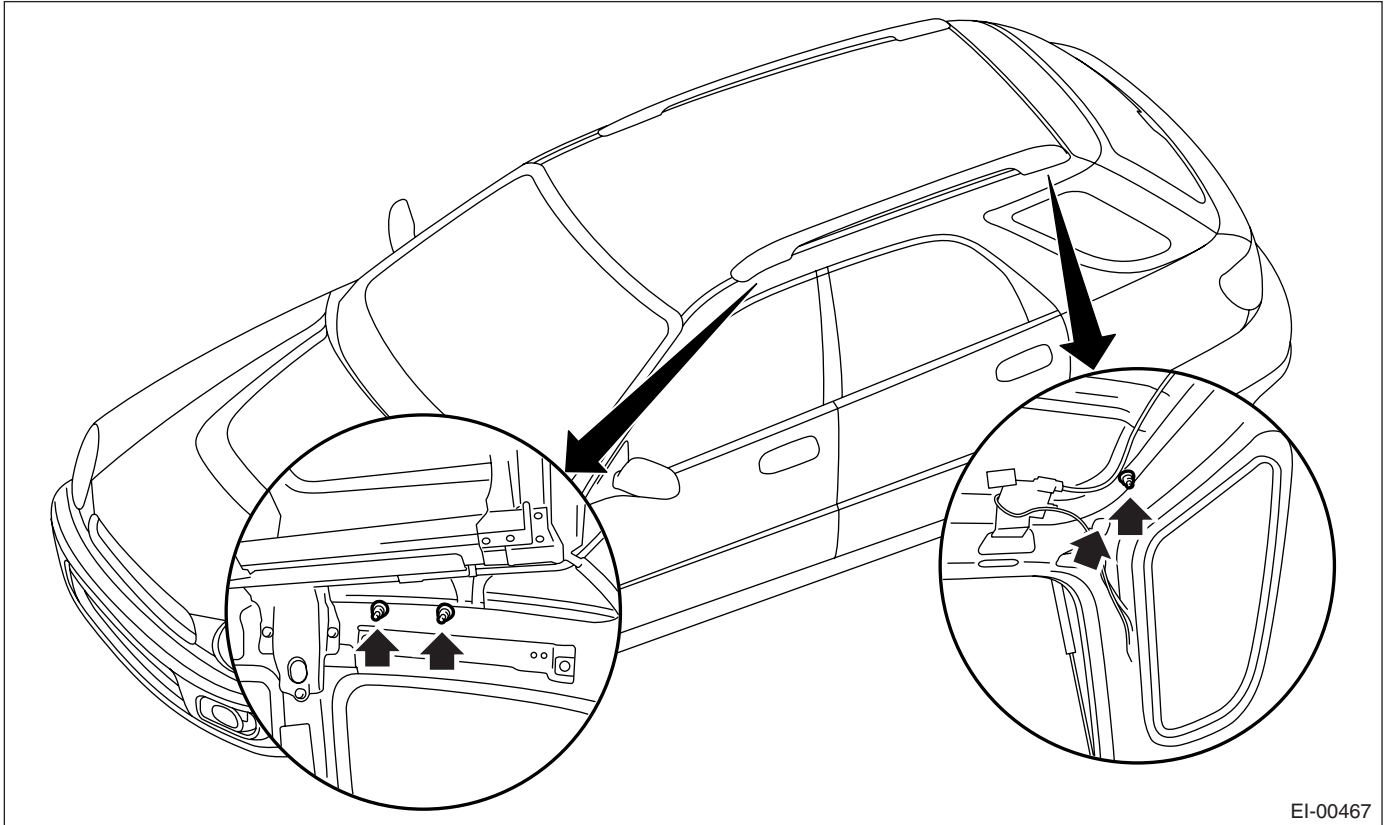
### B: INSTALLATION

Install in the reverse order of removal.

## 17. Roof Rail

### A: REMOVAL

- 1) Remove the roof trim. <Ref. to EI-55, REMOVAL, Roof Trim.>
- 2) Remove the four mounting nuts, and then detach the roof rail carefully.



EI-00467

### B: INSTALLATION

Install in the reverse order of removal.

#### CAUTION:

Be careful not to scratch the body panels with roof rail stud bolts when removing and installing them.

#### Tightening torque:

*7.4 N·m (0.75 kgf·m, 5.46 ft·lb)*

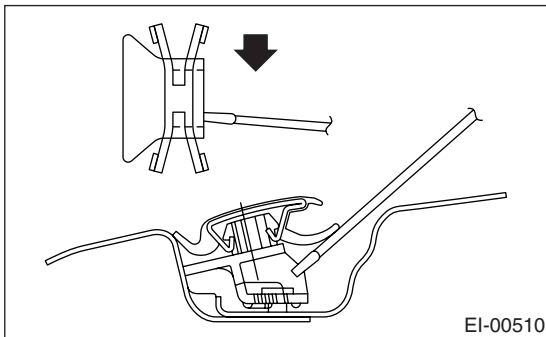
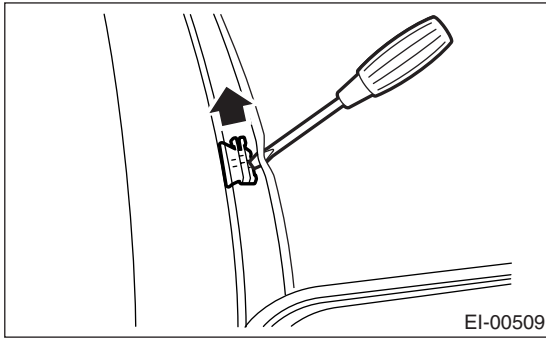
## 18. Roof Molding

### A: REMOVAL

1) Turn over the edge of roof molding, and then remove it by sliding the internal clip using a flat tip screwdriver.

RH: Slide the molding toward the rear side of vehicle.

LH: Slide the molding toward the front side of vehicle.

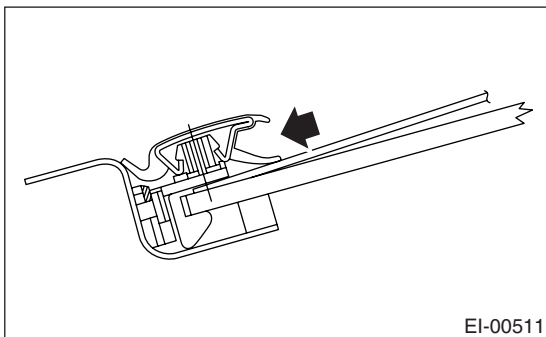


Sedan model: six clips

Wagon model (without roof rail): eight clips

Wagon model (with roof rail): seven clips

2) For sedan model, remove four clips of rear pillar. Turn over the roof molding on rear glass side, insert a board of about 0.5 mm (0.020 in) thickness into clearance between roof molding and glass, and then remove the claw of internal clip.

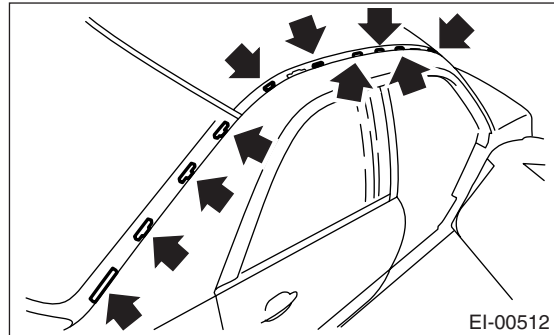


### B: INSTALLATION

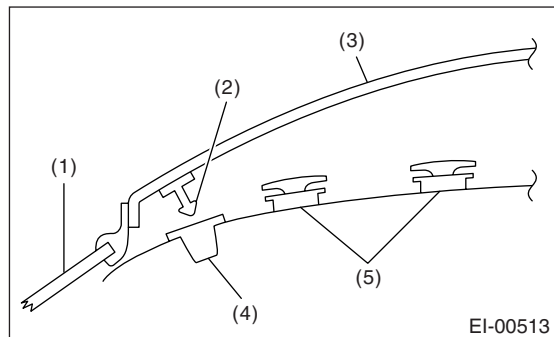
1) Remove the clip of roof and rear pillar (sedan model) from roof molding, and then install it to body side.

#### CAUTION:

**Make sure to replace the clips broken when removing the roof molding with new ones.**



2) Put the front edge of roof molding onto front window molding, and insert the front locating pin into body side cap.



(1) Front window

(2) Locating pin

(3) Roof molding

(4) Cap

(5) Clip (roof)

3) Install the roof molding to body, by pushing the roof molding from above being careful not to deform it.



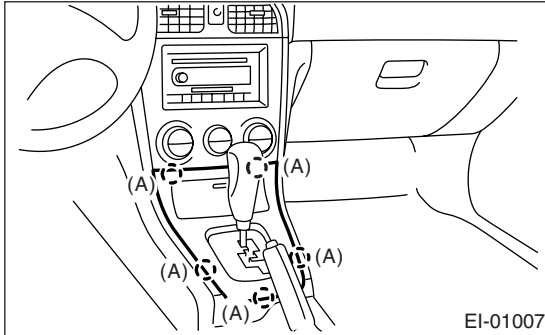
# Console Box

EXTERIOR/INTERIOR TRIM

## 19. Console Box

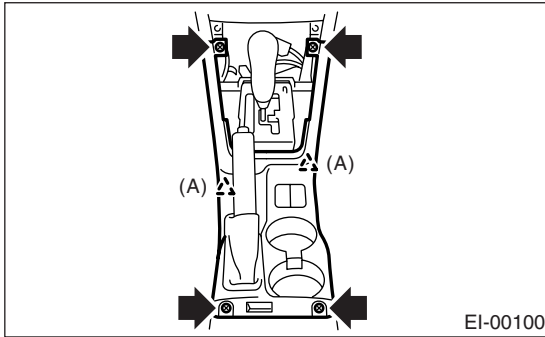
### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the console front panel.



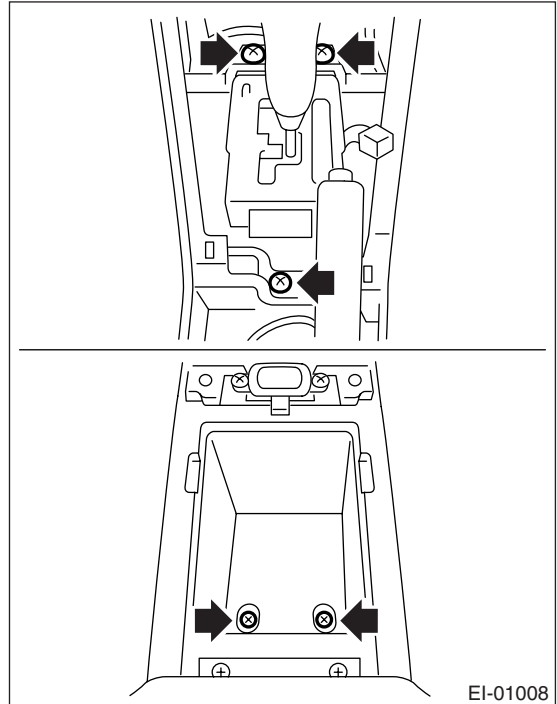
(A) Hook pawl

- 3) Remove the shift knob (MT model).
- 4) Remove the screws to remove console cover.

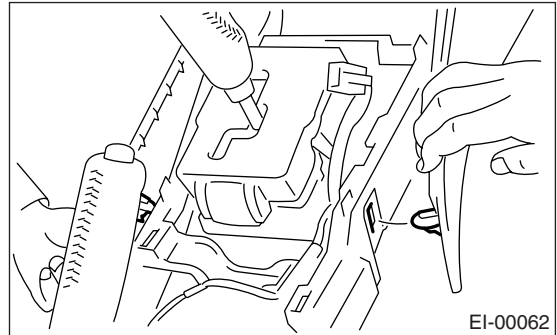


(A) Clip

- 5) Remove the screws.



- 6) Remove the hook pawl of console side panel to remove console box.



### B: INSTALLATION

Install in the reverse order of removal.

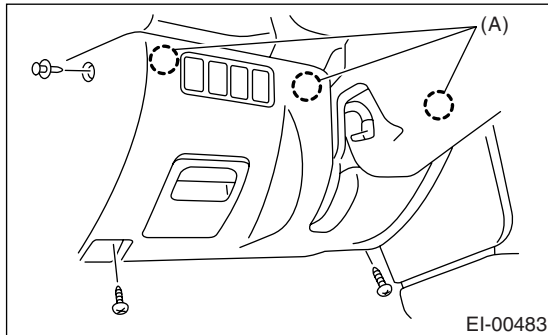
## 20. Instrument Panel Assembly

### A: REMOVAL

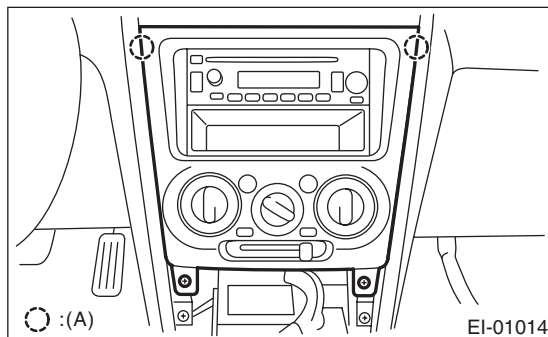
#### CAUTION:

- All airbag system connectors are colored yellow. Do not use electrical equipment on these circuits.
- Be careful not to damage the airbag system harness when servicing the instrument panel.

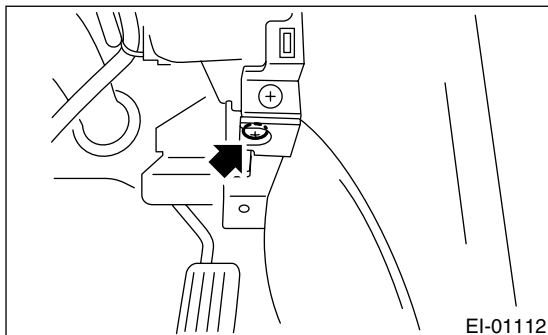
- 1) Disconnect the ground cable from battery.
- 2) Loosen the screws, remove the clip (A), disconnect the connectors, and then remove the instrument panel lower cover.



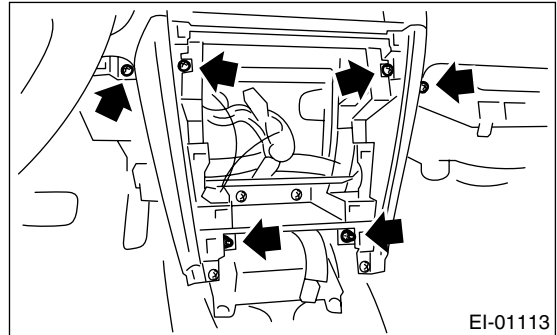
- 3) Remove the console front panel and console cover. <Ref. to EI-46, REMOVAL, Console Box.>
- 4) Remove the clip (A), and then remove the center console panel.



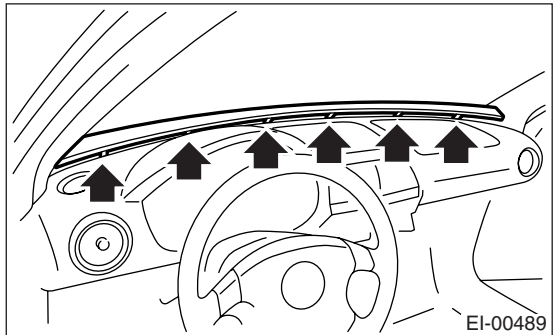
- 5) Remove the glove box. <Ref. to EI-43, REMOVAL, Glove Box.>
- 6) Loosen the screws, and then remove the console side panel.



- 7) Remove the passenger's airbag module. <Ref. to AB-15, Passenger's Airbag Module.>
- 8) Loosen the four screws and two nuts, and then remove the lower console panel.



- 9) Remove the hook, and then remove the defroster panel.



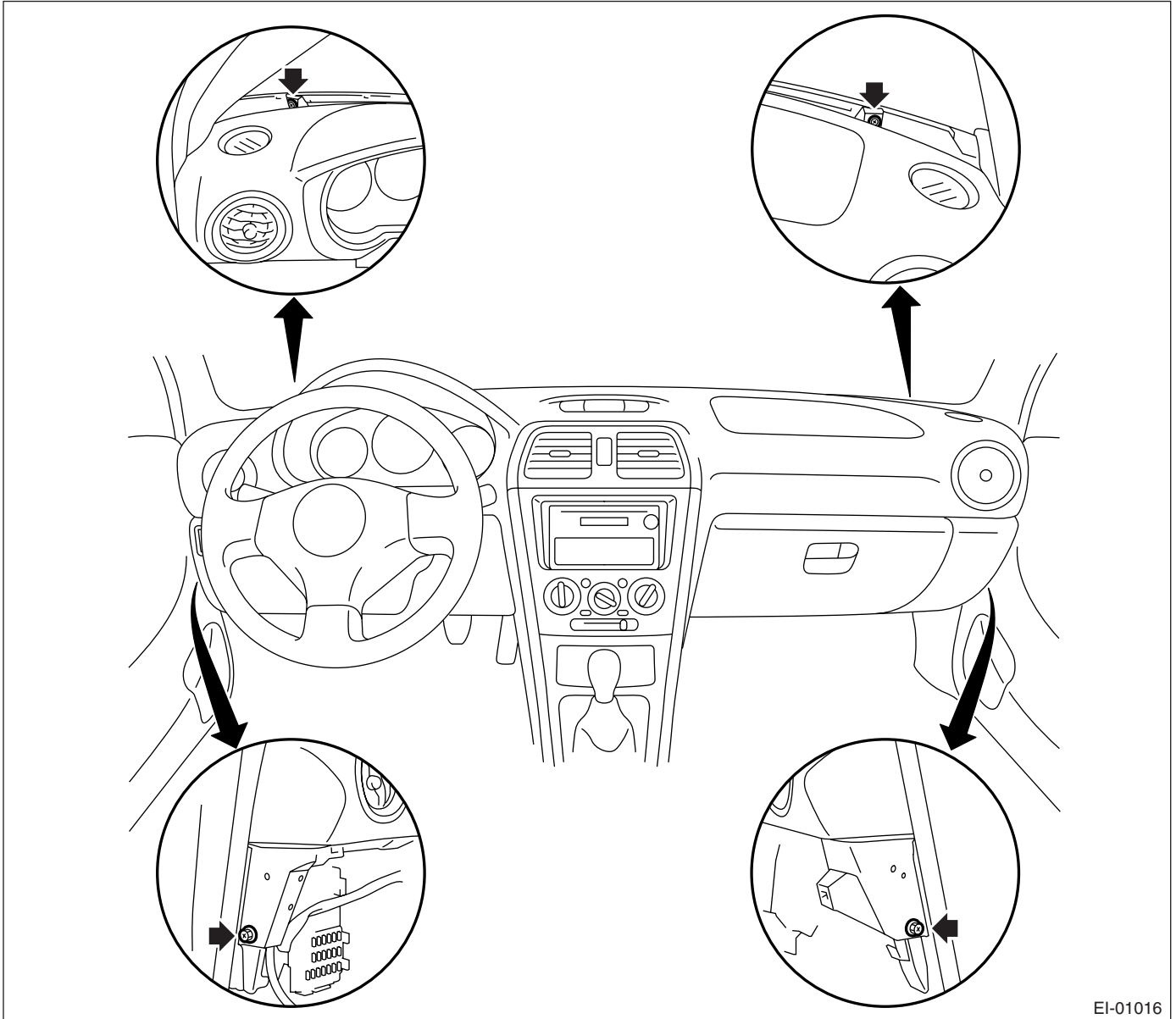
- 10) Remove the front pillar upper trim. <Ref. to EI-50, REMOVAL, Upper Inner Trim.>
- 11) Disconnect the two connectors, and then loosen the nuts.



# Instrument Panel Assembly

EXTERIOR/INTERIOR TRIM

12) Remove the instrument panel installation bolts.

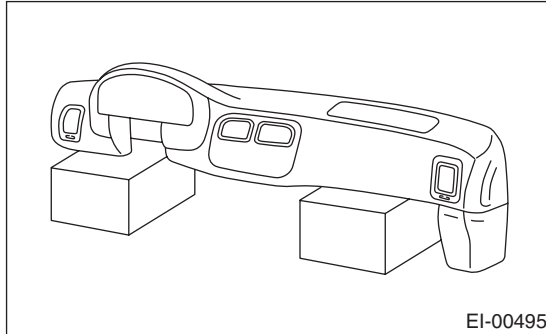


EI-01016

13) Make sure that all the harnesses are disconnected, and then remove the instrument panel from vehicle.

**NOTE:**

- Put alignment marks as necessary, in order to facilitate the reassembly.
- When storing the removed instrument panel, place it standing up on the floor.



## B: INSTALLATION

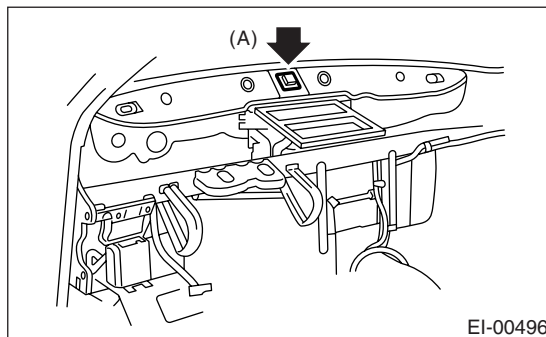
**CAUTION:**

- Be careful not to snag the harness.
- Carry out installation checking that the harness is connected correctly.
- When setting the instrument panel into vehicle, do not damage trim panels.

1) Install in the reverse order of removal.

**NOTE:**

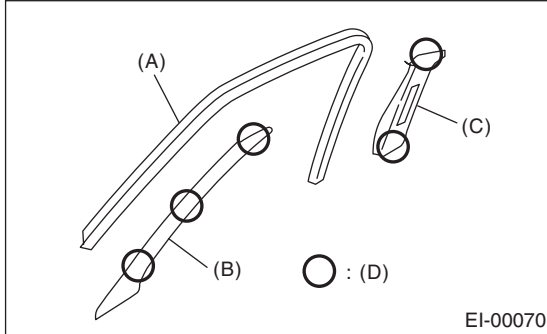
When installing the instrument panel into position, push the hook into grommet (A) on the body panel. After tightening the bolts, recheck the installation.



## 21.Upper Inner Trim

### A: REMOVAL

- 1) Remove the lower inner trim. <Ref. to EI-51, REMOVAL, Lower Inner Trim.>
- 2) Remove the front molding (A).
- 3) Remove the front pillar upper trim (B).
- 4) Detach the front seat belt shoulder anchor, and then remove the center pillar upper trim (C).



(D) Clip

### B: INSTALLATION

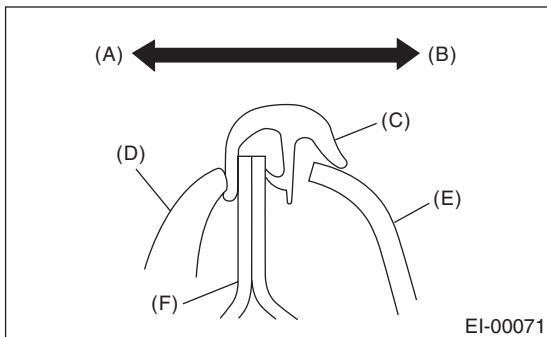
Install in the reverse order of removal.

#### CAUTION:

**Be sure to securely hook the pawls of inner trim panel to body flange.**

#### NOTE:

When installing the center pillar upper trim and front pillar upper trim, be sure to set the front molding as shown in the figure.

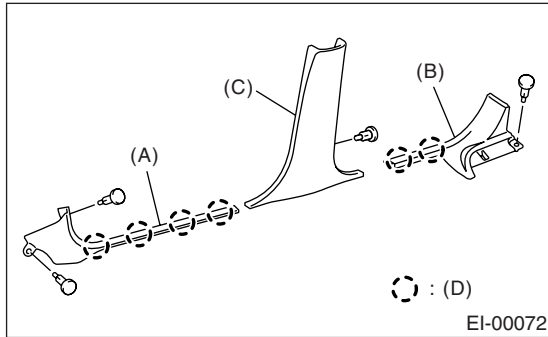


- (A) Outside
- (B) Inside
- (C) Molding
- (D) Weather strip
- (E) Trim
- (F) Body

## 22. Lower Inner Trim

### A: REMOVAL

- 1) Remove the side sill front cover (A).
- 2) Remove the rear seat cushion, and then remove side sill rear cover (B). <Ref. to SE-13, REMOVAL, Rear Seat.>
- 3) Remove the center pillar lower trim (C).



(D) Clip

### B: INSTALLATION

Install in the reverse order of removal.

#### CAUTION:

**Be sure to securely hook pawls of inner trim panel to body flange.**

# Rear Quarter Trim

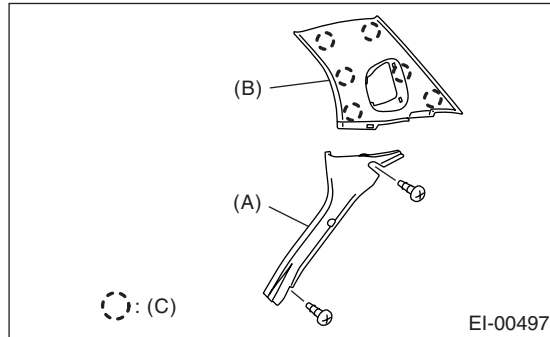
EXTERIOR/INTERIOR TRIM

## 23. Rear Quarter Trim

### A: REMOVAL

#### 1. SEDAN MODEL

- 1) Remove the rear seat. <Ref. to SE-13, REMOVAL, Rear Seat.>
- 2) Remove the side sill rear cover. <Ref. to EI-51, REMOVAL, Lower Inner Trim.>
- 3) Remove the rear pillar lower cover (A).
- 4) Remove the seat belt lower anchor bolt, and then remove the rear pillar upper trim (B).

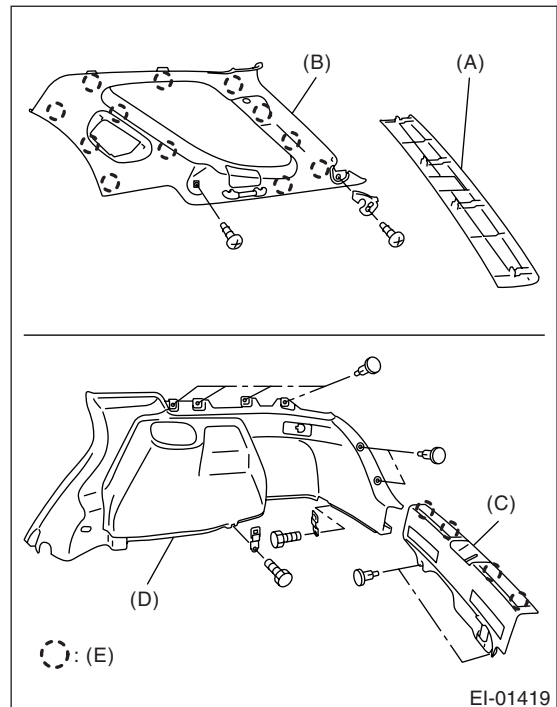


(C) Clip

#### 2. WAGON MODEL

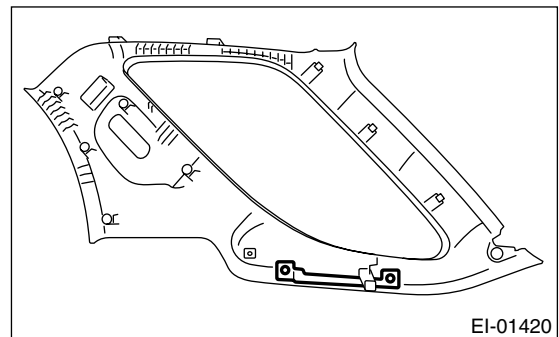
- 1) Remove the rear seat. <Ref. to SE-13, REMOVAL, Rear Seat.>
- 2) Remove the side sill rear cover.
- 3) Remove the rear rail trim (A).
- 4) Loosen the screws and clips to remove the rear quarter upper trim (B).
- 5) Remove the rear skirt trim (C).

- 6) Remove the bolts and clips to remove the rear quarter lower trim (D).



(E) Clip

- 7) Remove the nut, and remove the luggage compartment side rail.



### B: INSTALLATION

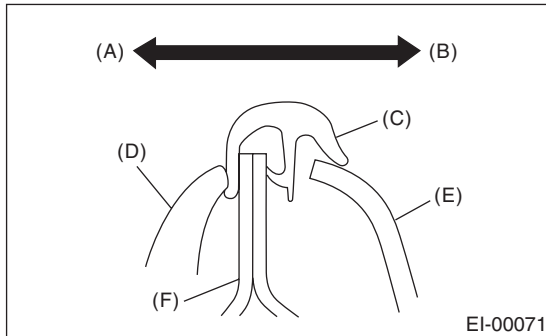
Install in the reverse order of removal.

#### CAUTION:

Be sure to securely hook the pawls of inner trim panel to body flange.

**NOTE:**

When installing the rear quarter upper trim, be sure to set the rear molding as shown in the figure.



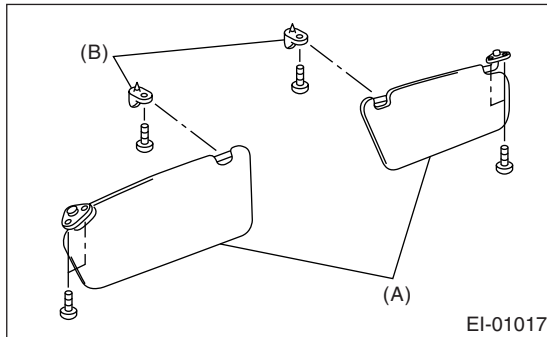
- (A) Outside
- (B) Inside
- (C) Molding
- (D) Weather strip
- (E) Trim
- (F) Body



## 24.Sun Visor

### A: REMOVAL

Remove the mounting screws, and then detach the sun visor (A) and hook (B).



### B: INSTALLATION

Install in the reverse order of removal.

## 25. Roof Trim

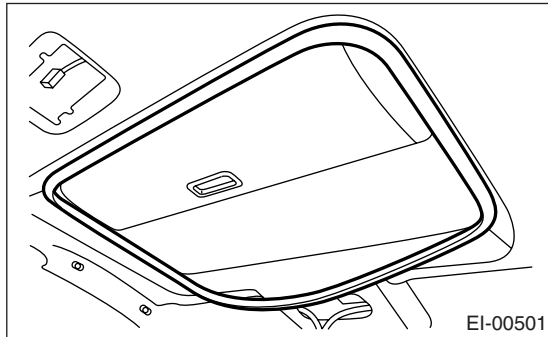
### A: REMOVAL

#### CAUTION:

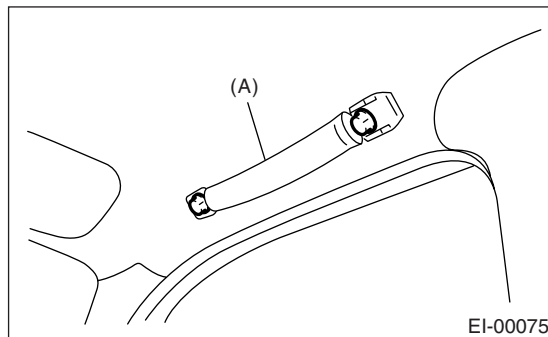
When removing the clip, use great care not to damage the roof trim.

#### 1. SEDAN MODEL

- 1) Disconnect the ground cable from battery.
- 2) Remove the sunroof switch. (Model with sunroof) <Ref. to SR-9, REMOVAL, Sunroof Switch.>
- 3) Remove the spot map light. <Ref. to LI-28, REMOVAL, Spot Map Light.>
- 4) Remove the room light. <Ref. to LI-29, REMOVAL, Room Light.>
- 5) Remove the sun visor and hook on right or left side, or on both sides. <Ref. to EI-54, REMOVAL, Sun Visor.>
- 6) In the case of models with sunroof, remove the sunroof weather strip.

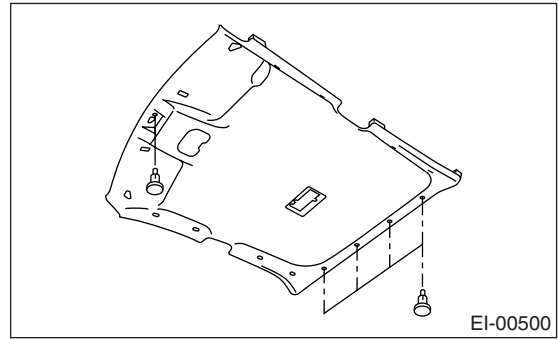


- 7) Remove the assist-grips (A).



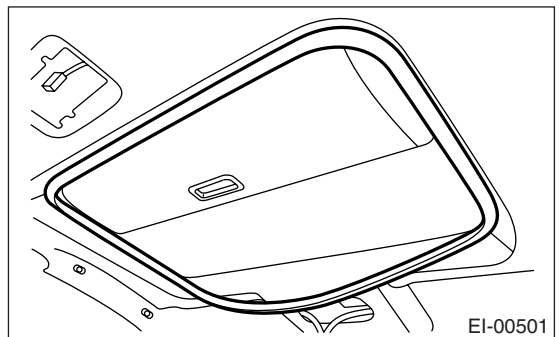
- 8) Remove the upper inner trim. <Ref. to EI-50, REMOVAL, Upper Inner Trim.>
- 9) Remove the quarter upper trim. <Ref. to EI-52, SEDAN MODEL, REMOVAL, Rear Quarter Trim.>

- 10) Remove the clips, and then remove the roof trim.

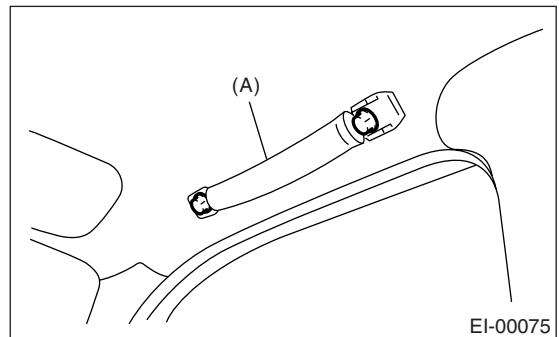


#### 2. WAGON MODEL

- 1) Disconnect the ground cable from battery.
- 2) Remove the sunroof switch. (Model with sunroof) <Ref. to SR-9, REMOVAL, Sunroof Switch.>
- 3) Remove the room light. <Ref. to LI-29, REMOVAL, Room Light.>
- 4) Remove the sun visor and hook or both sides. <Ref. to EI-54, REMOVAL, Sun Visor.>
- 5) In case of models with sunroof, remove the sunroof weather strip.



- 6) Remove the assist-grips (A).



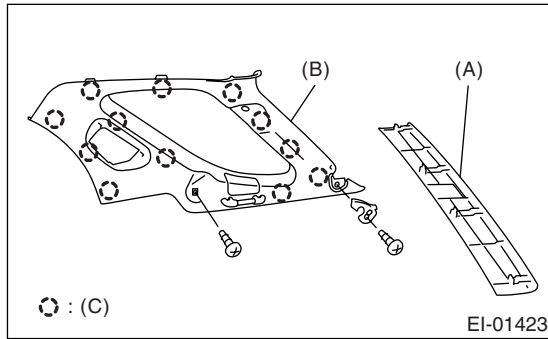
- 7) Remove the upper inner trim. <Ref. to EI-50, REMOVAL, Upper Inner Trim.>
- 8) Remove the rear quarter upper trim shown in the figure.
- 9) Remove the rear rail trim (A).

# Roof Trim

## EXTERIOR/INTERIOR TRIM

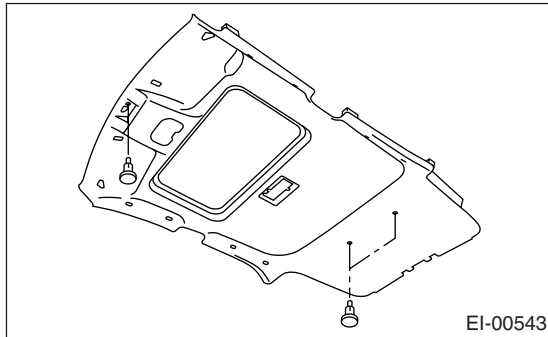
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10) Remove the rear quarter upper trim (B) of both sides.



(C) Clip

11) Remove the clips, and then remove the roof trim.



## **B: INSTALLATION**

Install in the reverse order of removal.

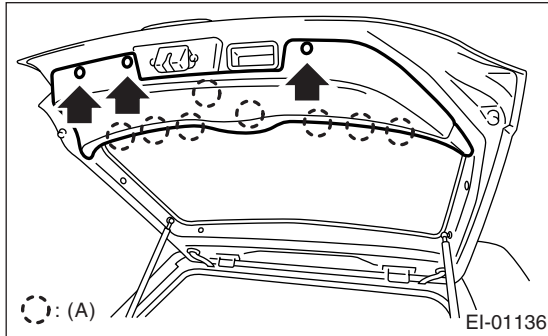
## 26.Rear Gate Trim

### A: REMOVAL

#### CAUTION:

Be careful not to damage the clips or their holes.

Remove the clips, and then detach the rear gate trim.



(A) Clip

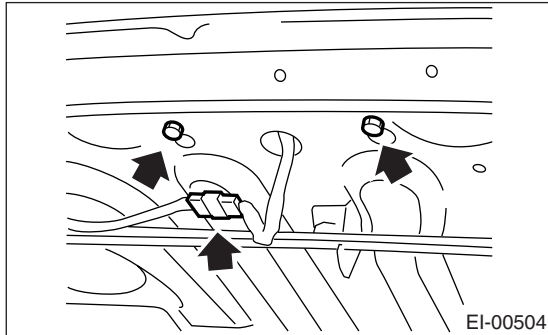
### B: INSTALLATION

Install in the reverse order of removal.

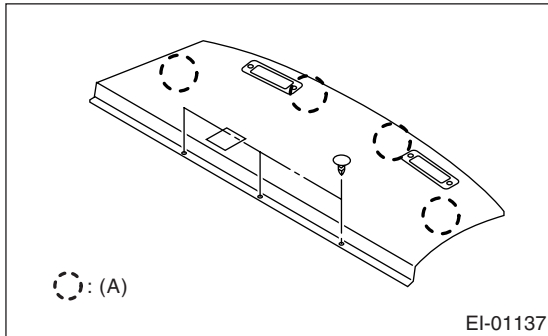
## 27.Rear Shelf Trim

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the high-mounted stop light.



- 3) Remove the rear quarter upper trim. <Ref. to EI-52, REMOVAL, Rear Quarter Trim.>
- 4) Remove the seat belt center anchor lower bolt.
- 5) Remove the rear shelf trim.



(A) Clip

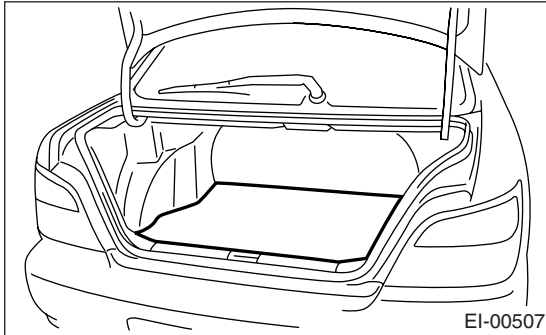
### B: INSTALLATION

Install in the reverse order of removal.

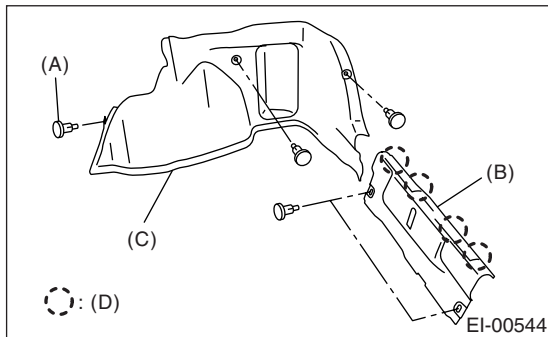
## 28. Trunk Room Trim

### A: REMOVAL

- 1) Remove the rear seat backrest. <Ref. to SE-13, SEDAN MODEL, REMOVAL, Rear Seat.>
- 2) Remove the trunk room mat.



- 3) Remove the clip (A).
- 4) Remove the clips, and then detach the trunk rear trim (B).
- 5) Remove the clips to remove trunk side trim (C).



(D) Clip

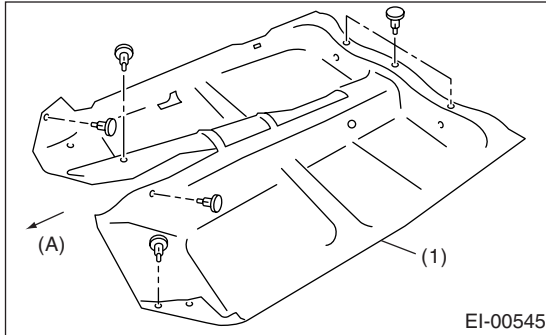
### B: INSTALLATION

Install in the reverse order of removal.

## 29. Floor Mat

### A: REMOVAL

- 1) Remove the front seats. <Ref. to SE-7, REMOVAL, Front Seat.>
- 2) Remove the rear seat cushion. <Ref. to SE-13, REMOVAL, Rear Seat.>
- 3) Remove the console box. <Ref. to EI-46, Console Box.>
- 4) Remove the side sill front cover, side sill rear cover and center pillar lower trim. <Ref. to EI-51, REMOVAL, Lower Inner Trim.>
- 5) Remove the foot rest.
- 6) Remove the clips from floor mat.
- 7) Remove the mat hook.
- 8) Remove the mat from toe board area.
- 9) Remove the mat from rear heater duct.
- 10) Roll the mat, and then take it out of opened rear door.



- (A) Front  
(1) Floor mat

### B: INSTALLATION

Install in the reverse order of removal.

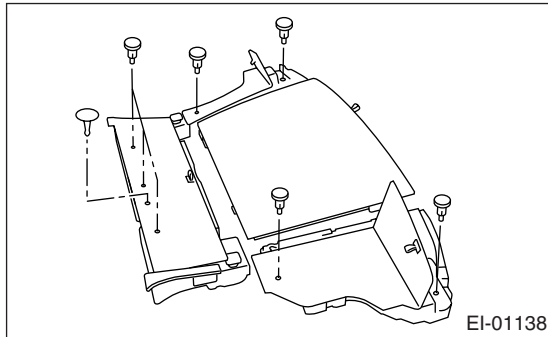
#### NOTE:

- Secure the mat firmly with hook and Velcro tape.
- Insert the mat edge firmly into the groove of side sill cover.

## 30. Luggage Floor Mat

### A: REMOVAL

Remove the clips, and then detach the rear floor mats.



### B: INSTALLATION

Install in the reverse order of removal.



# Heat Shield Cover

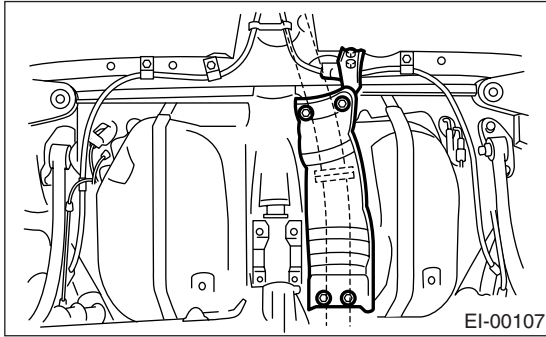
EXTERIOR/INTERIOR TRIM

## 31.Heat Shield Cover

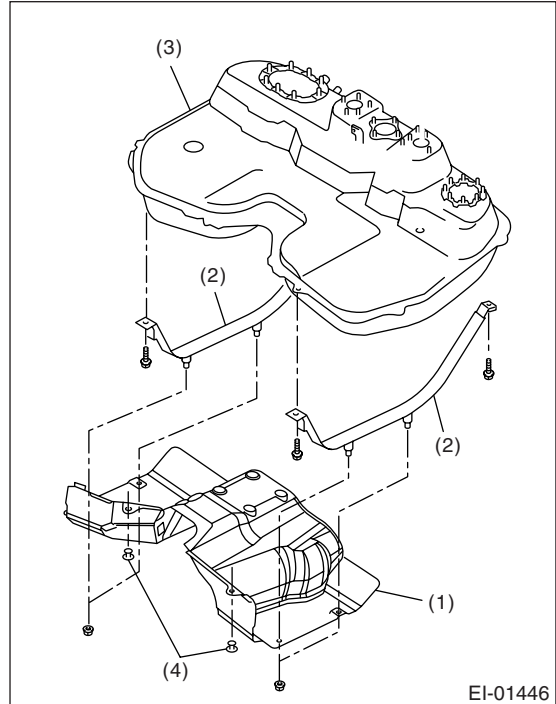
### A: REMOVAL

#### 1. CENTER HEAT SHIELD COVER

- 1) Remove the rear exhaust pipe and muffler.
  - Non-turbo model  
<Ref. to EX(H4SO)-7, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, REMOVAL, Muffler.>
  - Turbo model and STI model  
<Ref. to EX(H4DOTC)-15, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>
- 2) Remove the propeller shaft. <Ref. to DS-16, REMOVAL, Propeller Shaft.>
- 3) Remove the four bolts to remove center heat shield cover. (Except STI model)



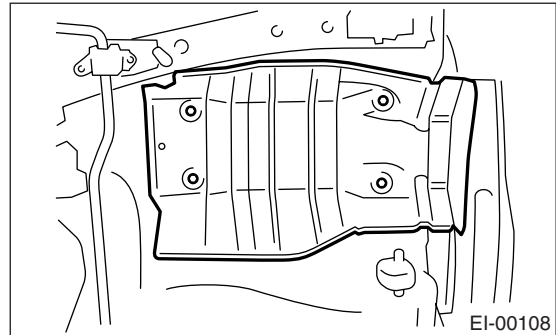
- 4) Remove the four nuts and two clips to remove center heat shield cover. (STI model)



- (1) Center heat shield cover
- (2) Fuel tank band
- (3) Fuel tank
- (4) Clips

#### 2. REAR HEAT SHIELD COVER

- 1) Remove the muffler. <Ref. to EX(H4SO)-8, REMOVAL, Muffler.> <Ref. to EX(H4DOTC)-16, REMOVAL, Muffler.>
- 2) Remove the four bolts to remove rear heat shield cover.



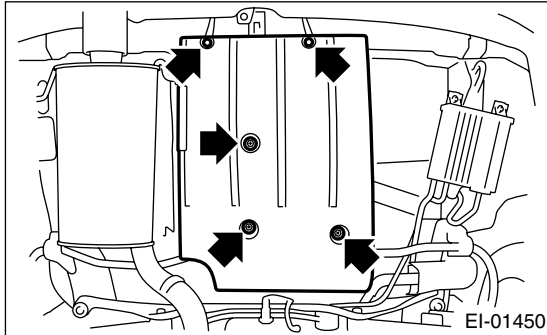
### B: INSTALLATION

Install in the reverse order of removal.

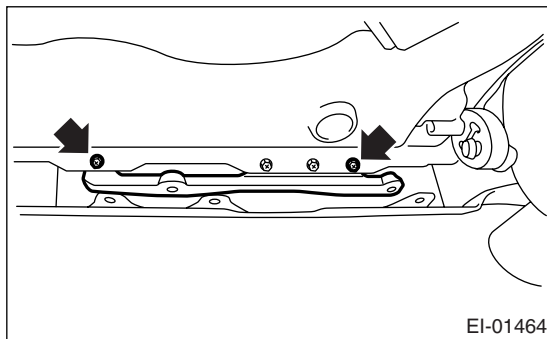
## 32. Diffuser

### A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Loosen the five bolts to remove rear diffuser.



- 3) Remove the two bolts, and remove the diffuser bracket.



### B: INSTALLATION

Install in the reverse order of removal.

#### NOTE:

Hang the back side of rear diffuser on diffuser bracket to install.

#### *Tightening torque:*

*<Ref. to EI-19, DIFFUSER, COMPONENT, General Description.>*

# Diffuser

EXTERIOR/INTERIOR TRIM

---

# EXTERIOR BODY PANELS



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| 3. Front Fender .....        | 14          |
| 4. Front Door .....          | 15          |
| 5. Front Sealing Cover ..... | 17          |
| 6. Rear Door.....            | 18          |
| 7. Rear Sealing Cover.....   | 20          |
| 8. Trunk Lid .....           | 21          |
| 9. Rear Gate.....            | 22          |

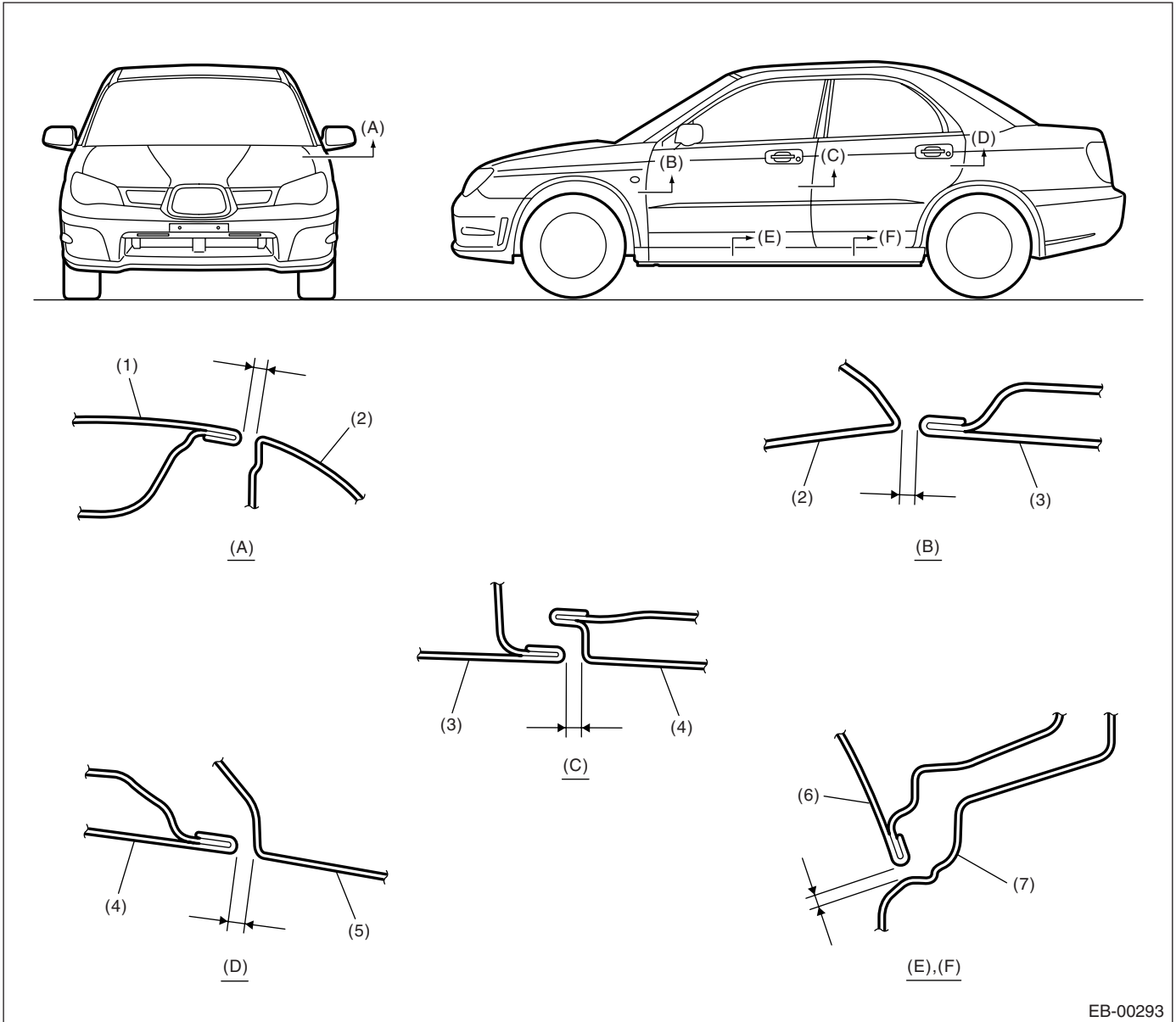
# General Description

## EXTERIOR BODY PANELS

### 1. General Description

#### A: SPECIFICATION

##### 1. SIDE

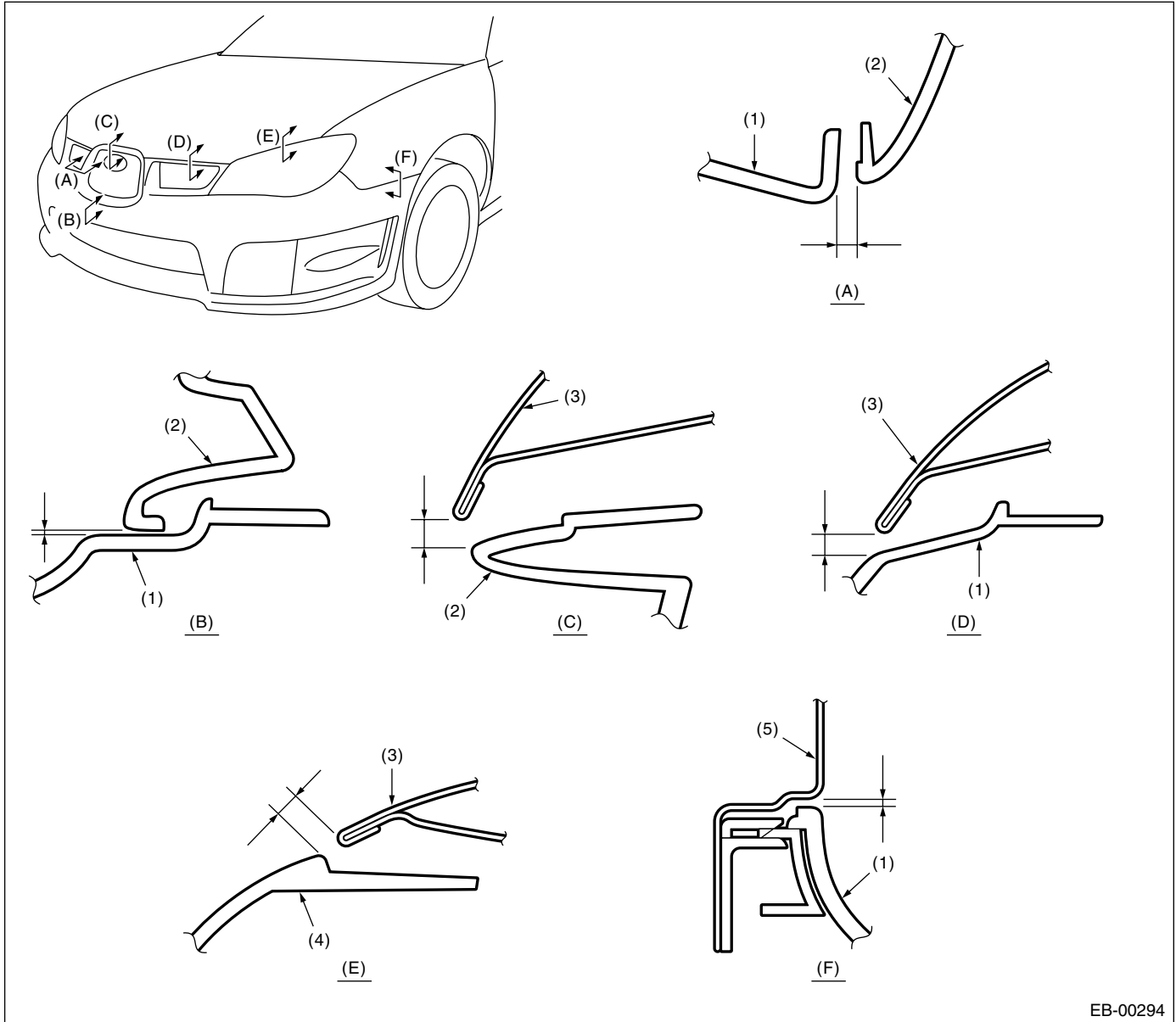


EB-00293

- |                        |                        |               |
|------------------------|------------------------|---------------|
| (1) Front hood panel   | (4) Rear door panel    | (7) Side sill |
| (2) Front fender panel | (5) Rear quarter panel |               |
| (3) Front door panel   | (6) Door panel         |               |

| Section  | Part                                   | Standard                  |
|----------|--|---------------------------|
| (A)      | Front hood panel to Front fender panel | 3.5±1.0 mm (0.14±0.04 in) |
| (B)      | Front fender panel to Front door panel | 4.7±1.0 mm (0.19±0.04 in) |
| (C)      | Front door panel to Rear door panel    | 5.1±1.0 mm (0.20±0.04 in) |
| (D)      | Rear door panel to Rear quarter panel  | 4.6±1.0 mm (0.18±0.04 in) |
| (E), (F) | Door panel to Side sill                | 5.9±1.0 mm (0.23±0.04 in) |

## 2. FRONT



EB-00294

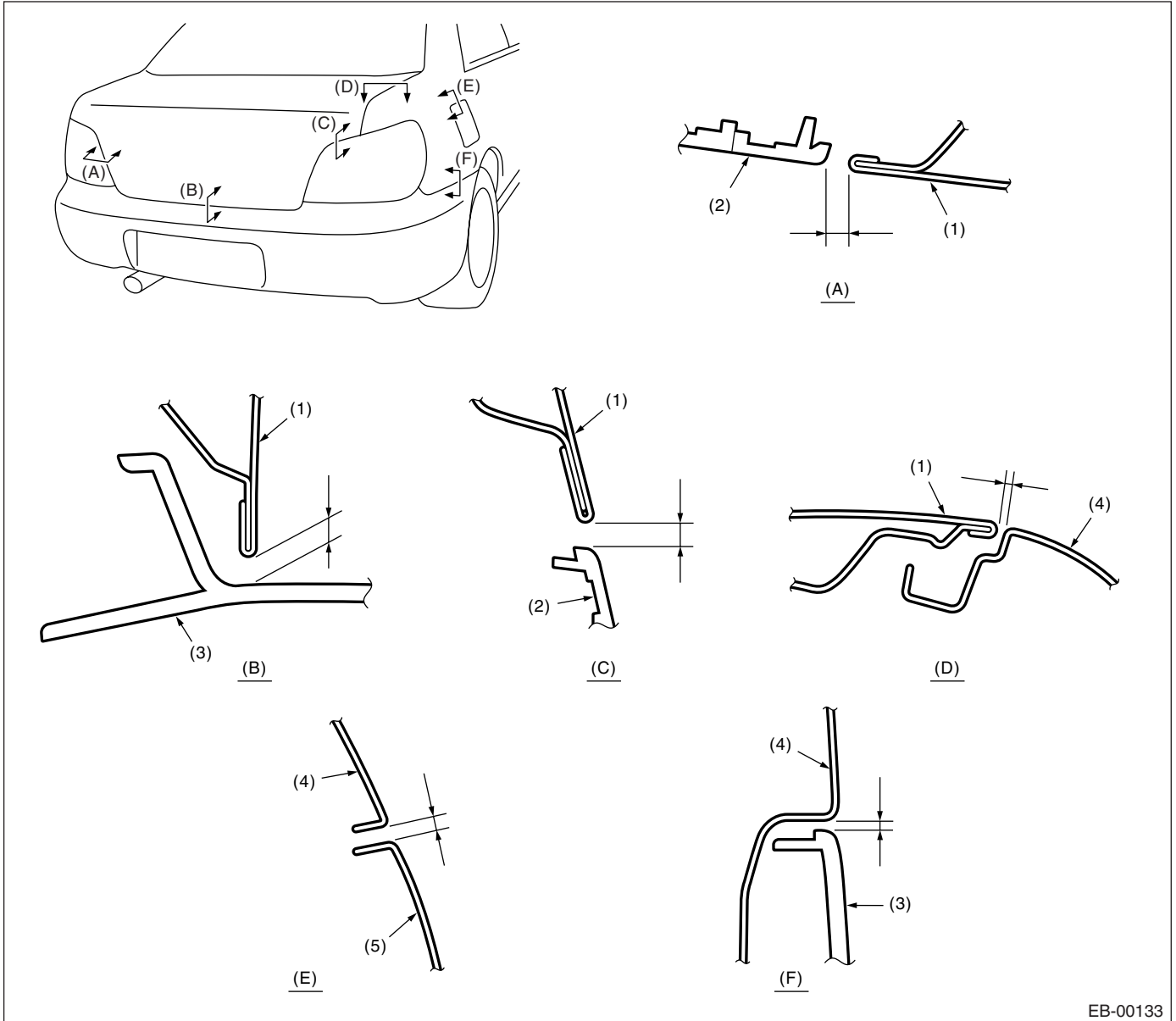
- |                  |                      |                        |
|------------------|----------------------|------------------------|
| (1) Front bumper | (3) Front hood panel | (5) Front fender panel |
| (2) Front grille | (4) Headlight        |                        |

| Section | Part  | Standard  |
|---------|---|---|
| (A)     | Front bumper to Front grille (Lateral direction)      | $0.5^{+1.0}_{-0.5}$ mm ( $0.02^{+0.22}_{-0.02}$ in) |
| (B)     | Front bumper to Front grille (Longitudinal direction) | $0.5 \pm 0.5$ mm ( $0.02 \pm 0.22$ in)              |
| (C)     | Front hood panel to Front grille                      | $5.5 \pm 1.0$ mm ( $0.22 \pm 0.04$ in)              |
| (D)     | Front hood panel to Front bumper                      | $5.5 \pm 1.0$ mm ( $0.22 \pm 0.04$ in)              |
| (E)     | Front hood panel to Headlight                         | $5.5 \pm 1.0$ mm ( $0.22 \pm 0.04$ in)              |
| (F)     | Front fender panel to Front bumper                    | $1.0 \pm 0.7$ mm ( $0.04 \pm 0.03$ in)              |

# General Description

## EXTERIOR BODY PANELS

### 3. REAR (SEDAN MODEL)

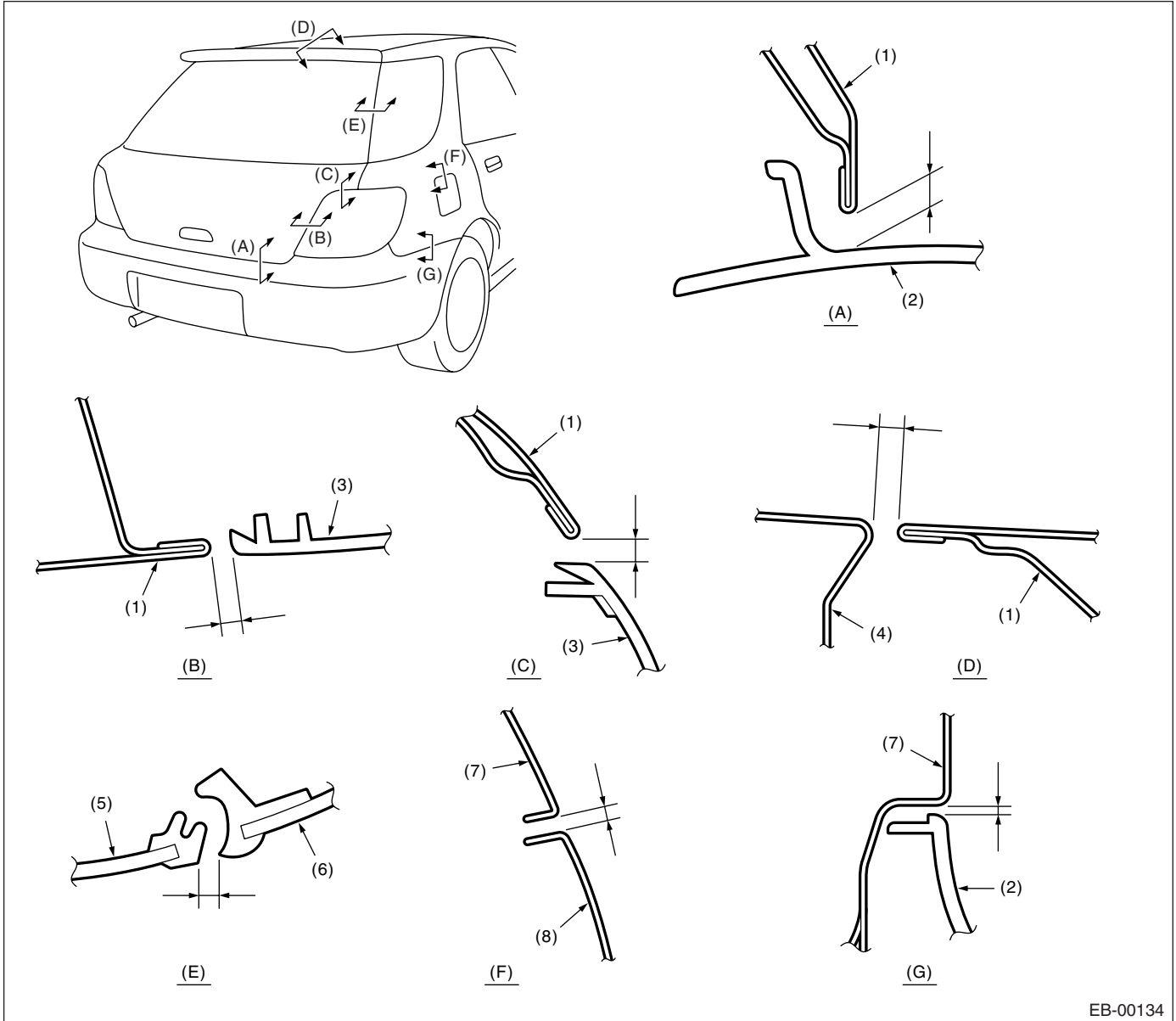


EB-00133

- (1) Trunk lid panel
- (2) Rear combination light
- (3) Rear bumper
- (4) Rear fender panel
- (5) Fuel filler flap lid

| Section | Part   | Standard                      |
|---------|--|-------------------------------|
| (A)     | Trunk lid panel to Rear combination light (Lateral direction)      | 5.0±1.0 mm (0.20±0.04 in)     |
| (B)     | Trunk lid panel to Rear bumper                                     | 7.0±1.5 mm (0.28±0.06 in)     |
| (C)     | Trunk lid panel to Rear combination light (Longitudinal direction) | 7.0±1.0 mm (0.28±0.04 in)     |
| (D)     | Trunk lid panel to Rear fender panel                               | 4.0±1.0 mm (0.16±0.04 in)     |
| (E)     | Rear fender panel to Fuel filler flap lid                          | 3.5±0.5 mm (0.14±0.02 in)     |
| (F)     | Rear fender panel to Rear bumper                                   | 0.3 — 2.2 mm (0.01 — 0.09 in) |

## 4. REAR (WAGON MODEL)



EB-00134

- |                            |                        |                          |
|----------------------------|------------------------|--------------------------|
| (1) Rear gate panel        | (4) Roof panel         | (7) Rear fender panel    |
| (2) Rear bumper            | (5) Rear gate glass    | (8) Fuel filler flap lid |
| (3) Rear combination light | (6) Rear quarter glass |                          |

| Section | Part   | Standard                      |
|---------|--|-------------------------------|
| (A)     | Rear gate panel to Rear bumper                                     | 8.3±1.5 mm (0.33±0.06 in)     |
| (B)     | Rear gate panel to Rear combination light (Lateral direction)      | 5.0±1.0 mm (0.20±0.04 in)     |
| (C)     | Rear gate panel to Rear combination light (Longitudinal direction) | 6.0±1.0 mm (0.24±0.04 in)     |
| (D)     | Roof panel to Rear gate panel                                      | 6.1 — 7.6 mm (0.24 — 0.30 in) |
| (E)     | Rear gate glass to Rear quarter glass                              | 6.0±1.5 mm (0.24±0.06 in)     |
| (F)     | Rear fender panel to Fuel filler flap lid                          | 3.5±0.5 mm (0.14±0.02 in)     |
| (G)     | Rear fender panel to Rear bumper                                   | 0.3 — 2.2 mm (0.01 — 0.09 in) |

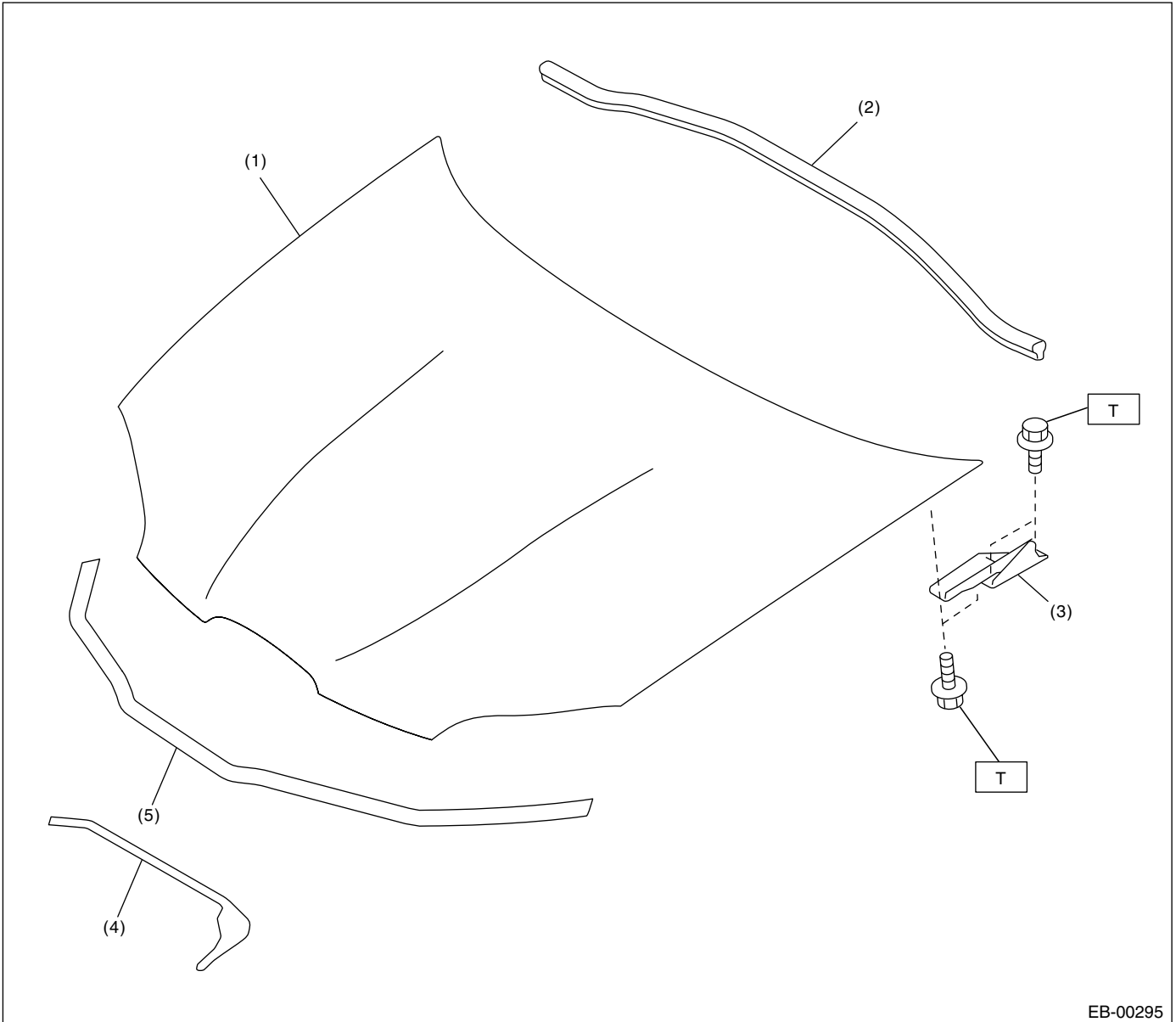


# General Description

## EXTERIOR BODY PANELS

### B: COMPONENT

#### 1. FRONT HOOD

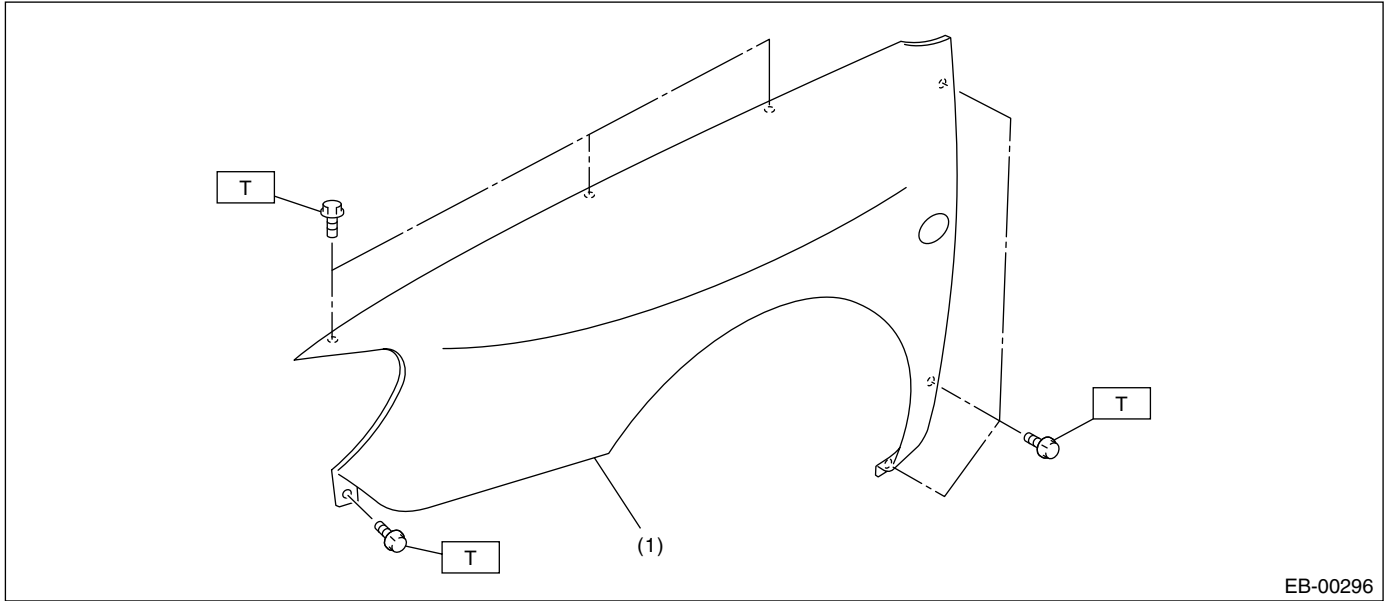


EB-00295

- (1) Front hood
- (2) Seal (Front panel)
- (3) Hinge
- (4) Seal (Intake duct)
- (5) Seal (Hood)

**Tightening torque: N-m (kgf-m, ft-lb)**  
**T: 37.0 (3.6, 27.3)**

## 2. FRONT FENDER PANEL



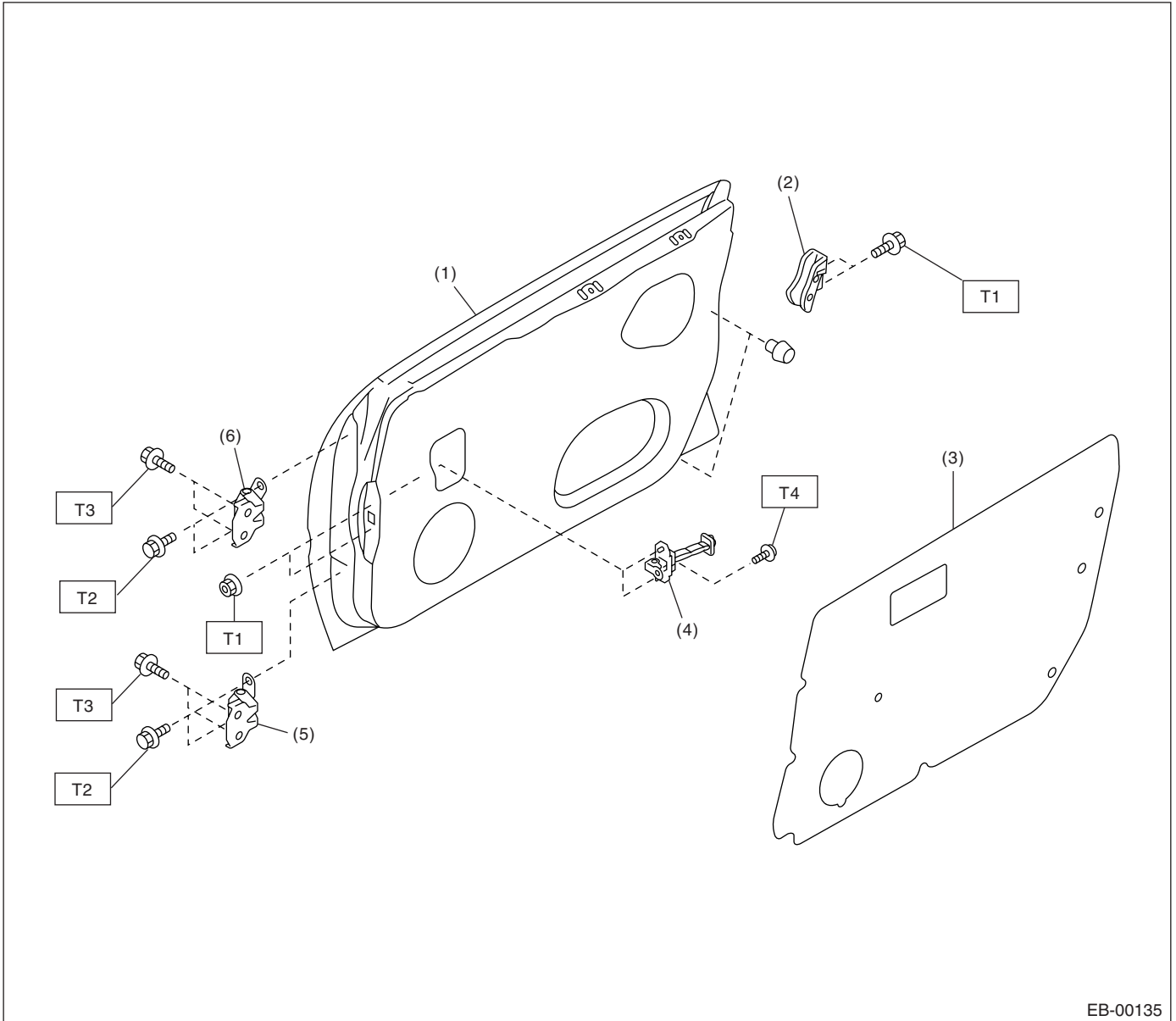
(1) Front fender panel

**Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 7.5 (0.76, 5.5)**

# General Description

## EXTERIOR BODY PANELS

### 3. FRONT DOOR PANEL



EB-00135

- (1) Front door panel
- (2) Guide
- (3) Sealing cover

- (4) Checker
- (5) Lower hinge
- (6) Upper hinge

**Tightening torque: N·m (kgf·m, ft·lb)**

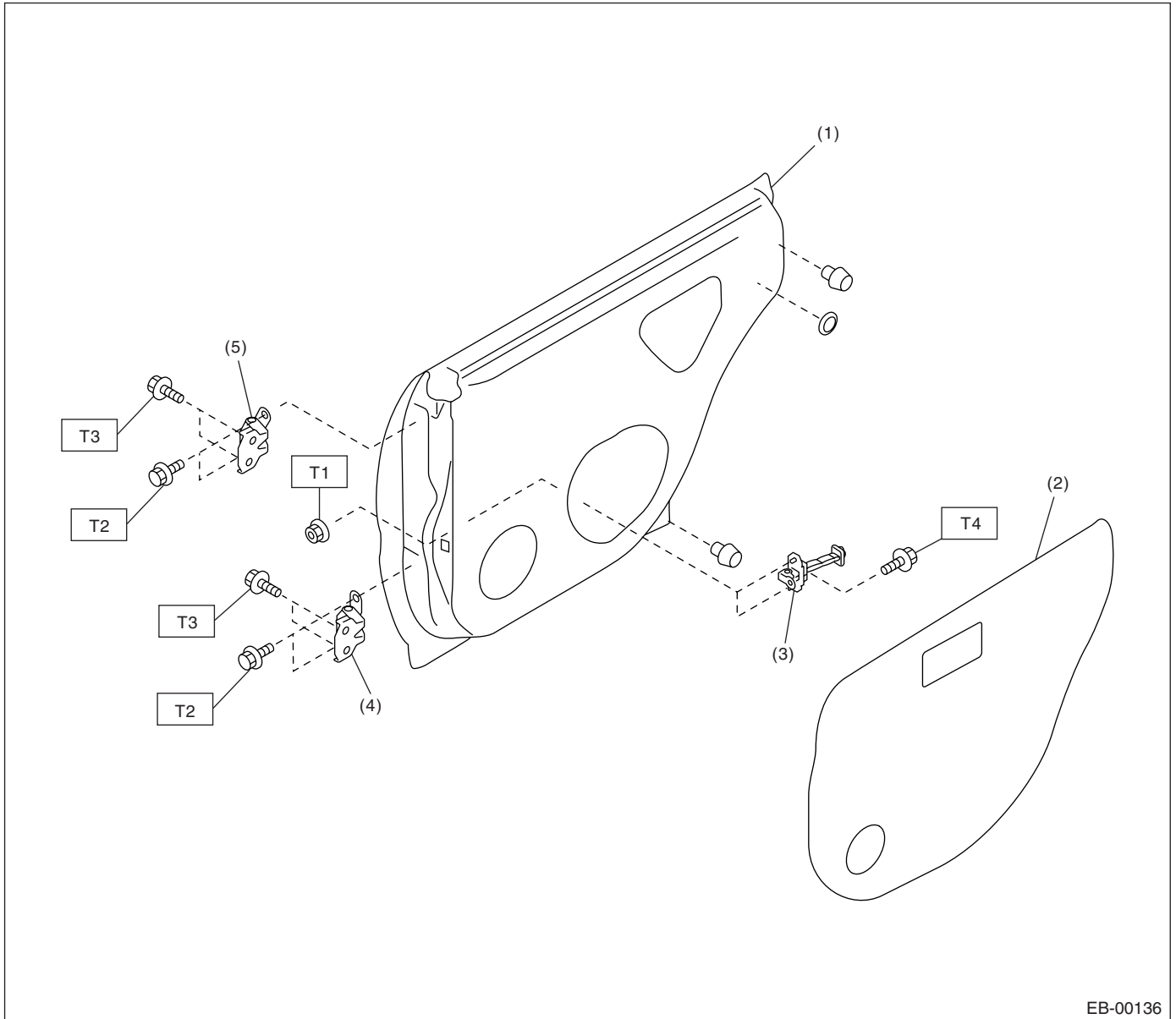
**T1: 7.4 (0.75, 5.5)**

**T2: 24.5 (2.5, 18.1)**

**T3: 29.4 (3.0, 21.7)**

**T4: 32.3 (3.3, 23.8)**

## 4. REAR DOOR PANEL



EB-00136

- (1) Rear door panel
- (2) Sealing cover
- (3) Checker

- (4) Lower hinge
- (5) Upper hinge

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 7.4 (0.75, 5.5)**

**T2: 24.5 (2.5, 18.1)**

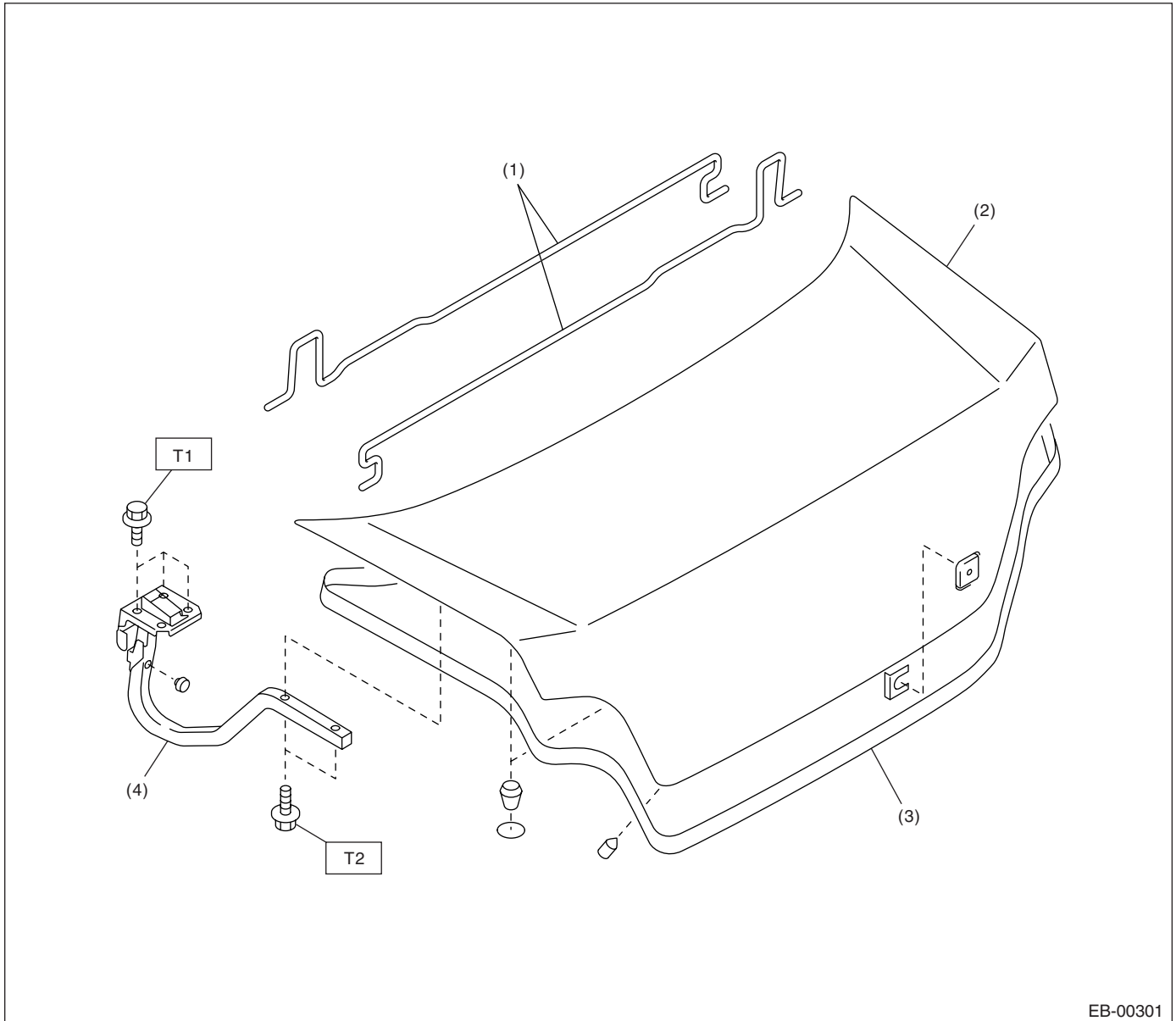
**T3: 29.4 (3.0, 21.7)**

**T4: 32.3 (3.3, 23.8)**

# General Description

## EXTERIOR BODY PANELS

### 5. TRUNK LID PANEL



- (1) Torsion bar
- (2) Trunk lid panel
- (3) Weatherstrip

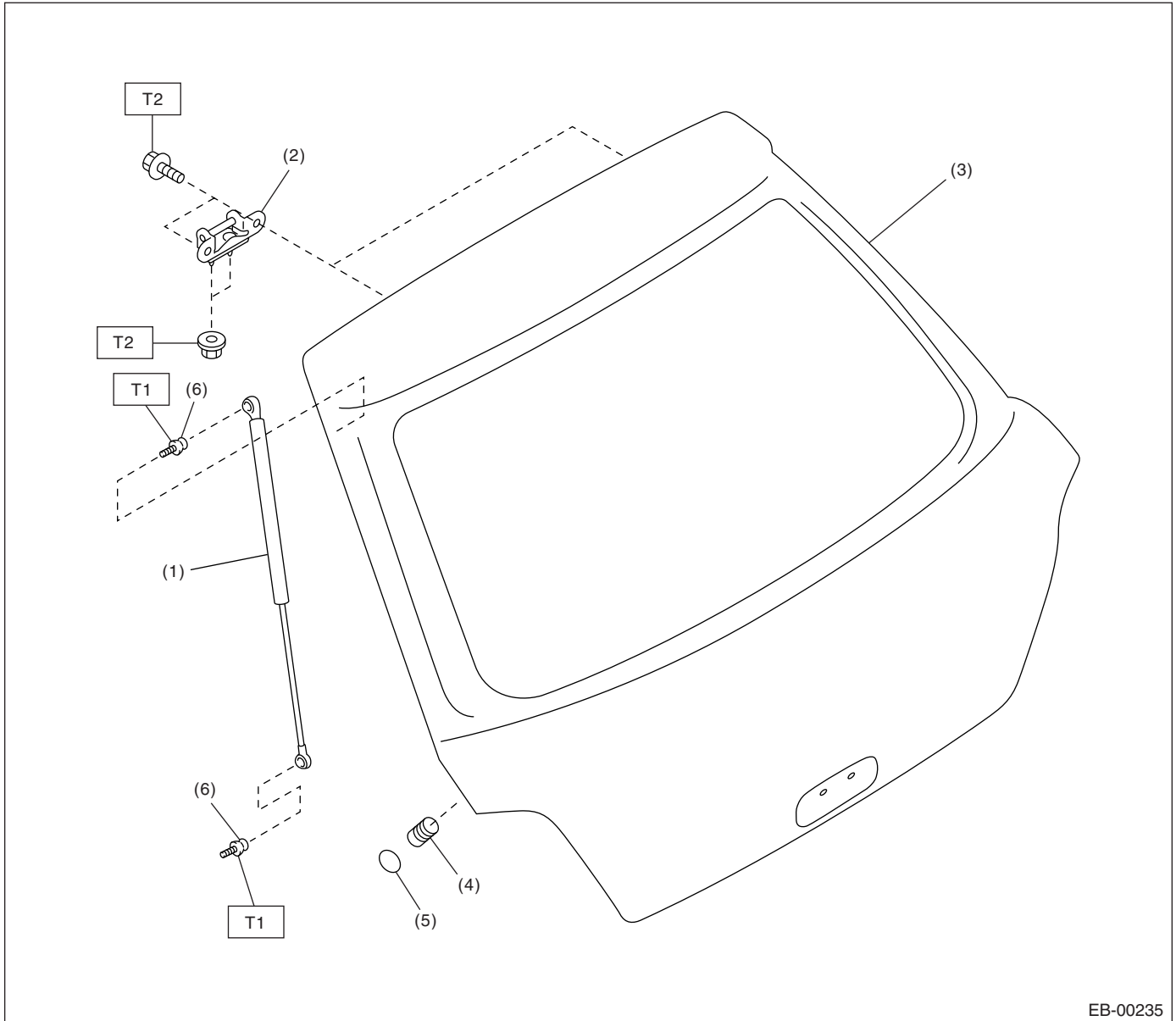
- (4) Hinge ASSY

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 7.5 (0.76, 5.5)**

**T2: 14 (1.43, 10.3)**

## 6. REAR GATE PANEL



EB-00235

- |                           |                     |
|---------------------------|---------------------|
| (1) Rear gate damper stay | (4) Stopper rubber  |
| (2) Hinge                 | (5) Protector sheet |
| (3) Rear gate panel       | (6) Stud bolt       |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 19.6 (2.0, 14.5)**

**T2: 24.5 (2.5, 18.1)**

### C: CAUTION

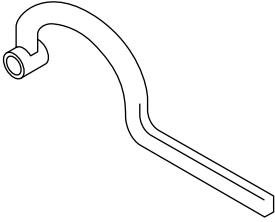
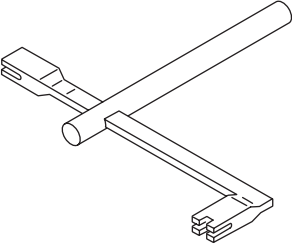
- Exterior body panels are heavy. Do not drop or damage the panels. During removal and installation, do not damage the panel painting surface.
- While removing the mounting bolts, using assistance devices such as a support jack will help support the panel.
- Be careful not to lose small parts.

# General Description

EXTERIOR BODY PANELS

## D: PREPARATION TOOL

### 1. SPECIAL TOOL

| ILLUSTRATION   | TOOL NUMBER | DESCRIPTION | REMARKS   |
|--|-------------|-------------|---|
| <br>ST-925610000  | 925610000   | WRENCH      | Used for removing and installing door hinge.        |
| <br>ST-927780000 | 927780000   | REMOVER     | Used for removing and installing trunk torsion bar. |

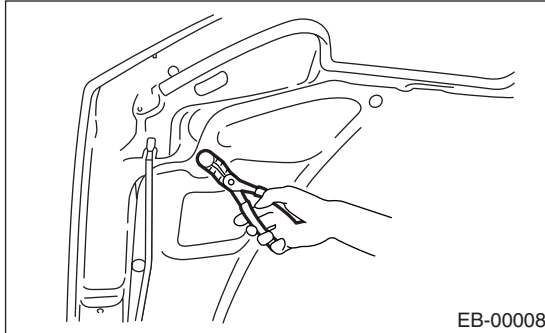
### 2. GENERAL TOOL

| TOOL NAME    | REMARKS                         |
|--------------|---------------------------------|
| Support jack | Used for supporting door panel. |

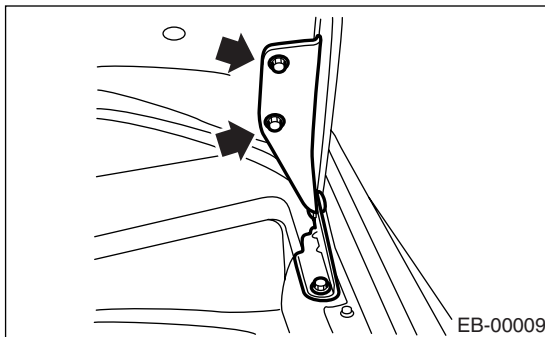
## 2. Front Hood

### A: REMOVAL

- 1) Open the front hood to remove washer nozzles.
- 2) Release the clips to remove hood insulator.



- 3) Remove the bolts to remove the front hood from hinges.



### B: INSTALLATION

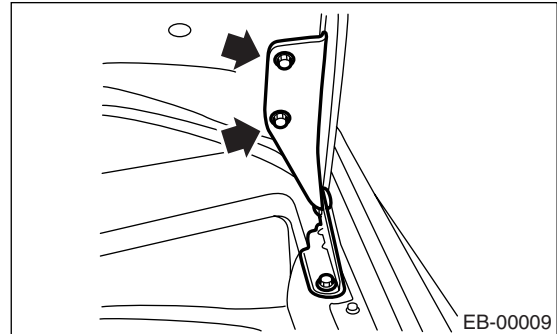
- 1) Install in the reverse order of removal.
- 2) Adjust the clearance between front hood panel and front fender panel. Clearance must be equal at both sides.

#### **Tightening torque:**

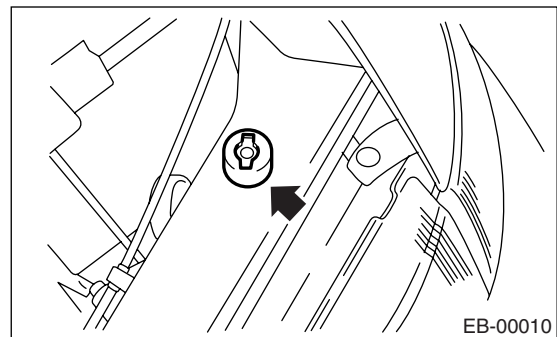
**37.0 N·m (3.6 kgf·m, 27.3 ft·lb)**

### C: ADJUSTMENT

- 1) Use the hinge mounting holes to align the front hood longitudinally and laterally.



- 2) Adjust the height at front end of hood. <Ref. to SL-42, ADJUSTMENT, Front Hood Lock Assembly.>
- 3) Rotate the hood buffer to adjust lateral height.

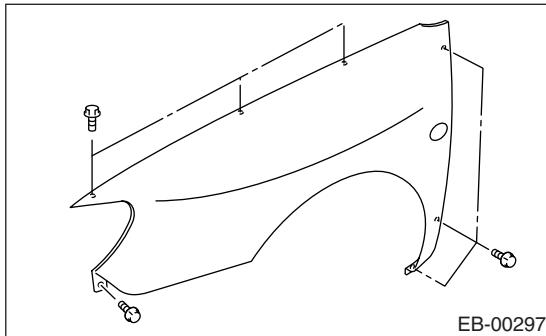




### 3. Front Fender

#### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the side sill spoilers. <Ref. to EI-37, Side Sill Spoiler.> (Model with side sill spoiler)
- 3) Remove the front bumper face. <Ref. to EI-24, REMOVAL, Front Bumper.>
- 4) Remove the headlight. <Ref. to LI-12, REMOVAL, Headlight Assembly.>
- 5) Remove the mud guard. <Ref. to EI-33, REMOVAL, Mud Guard.>
- 6) Remove the bolts to remove front fender panel.



#### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) When the front fender panel is installed, clearance between front fender panel and front hood panel must be equal.

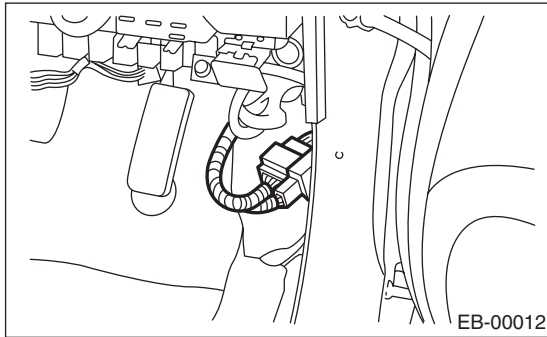
#### ***Tightening torque:***

***7.5 N·m (0.76 kgf-m, 5.5 ft-lb)***

## 4. Front Door

### A: REMOVAL

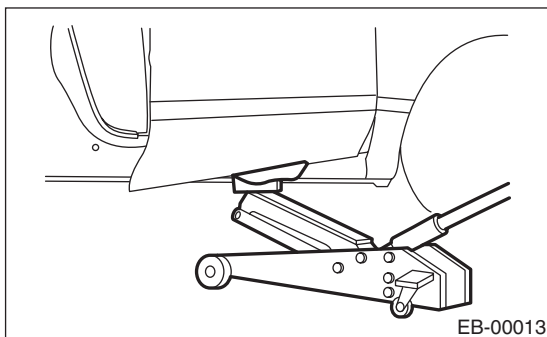
- 1) Disconnect the ground cable from battery.
- 2) Remove the front door trim. <Ref. to EI-41, REMOVAL, Front Door Trim.>
- 3) Remove the outer mirror assembly. <Ref. to GW-18, REMOVAL, Outer Mirror Assembly.>
- 4) Remove the front door glass. <Ref. to GW-11, REMOVAL, Front Door Glass.>
- 5) Remove the front door regulator and motor. <Ref. to GW-15, REMOVAL, Front Regulator and Motor Assembly.>
- 6) Remove the front door latch assembly. <Ref. to SL-31, REMOVAL, Front Door Latch and Door Lock Actuator Assembly.>
- 7) Remove the front outer handle. <Ref. to SL-30, REMOVAL, Front Outer Handle.>
- 8) Remove the front pillar lower trim to disconnect the connector from body harness.



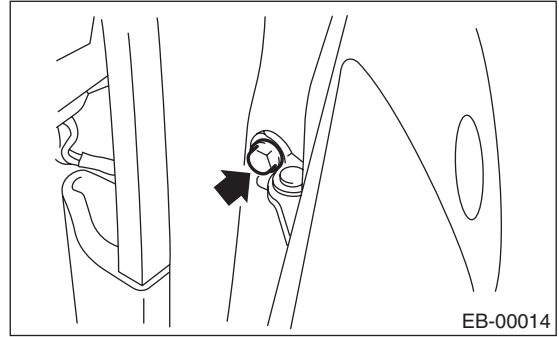
- 9) Put a wooden block on jack and place the jack under front door panel. Support the front door with the jack to protect it from damage.

#### NOTE:

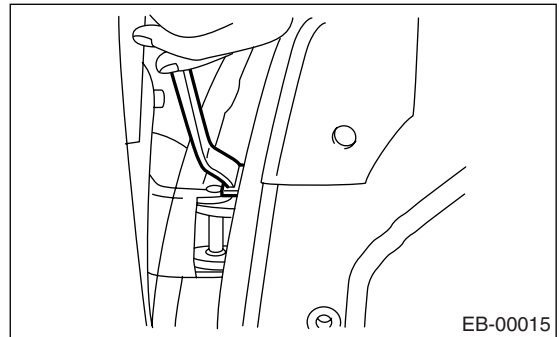
When supporting the door with jack, do not deform the hinge portion of door during work.



- 10) Remove the checker bolts.



- 11) Remove the door-side bolts for upper and lower hinges to remove the front door panel.



### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Apply grease to the sliding area of door hinges.

#### Tightening torque:

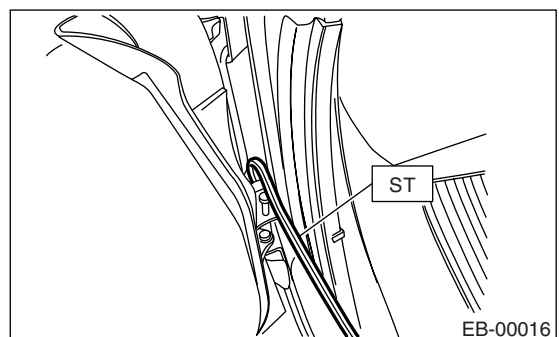
Refer to **COMPONENT in General Description**.

<Ref. to **EB-8, FRONT DOOR PANEL, COMPONENT, General Description**.>

### C: ADJUSTMENT

- 1) Using the ST, loosen the body-side bolts of upper and lower hinges to align the position of front door panel longitudinally and vertically.

ST 925610000 WRENCH



- 2) Loosen the screw (A) and tap striker (B) using a plastic hammer to adjust striker to align the position of front door panel laterally at the rear end.

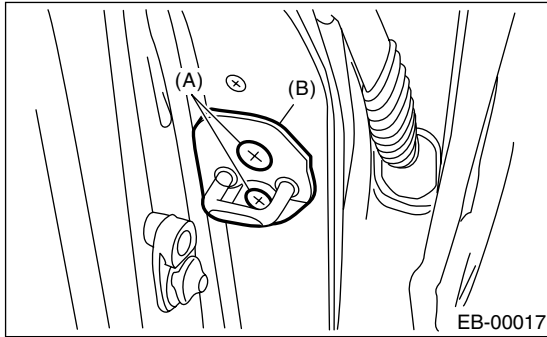
# Front Door

## EXTERIOR BODY PANELS

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### CAUTION:

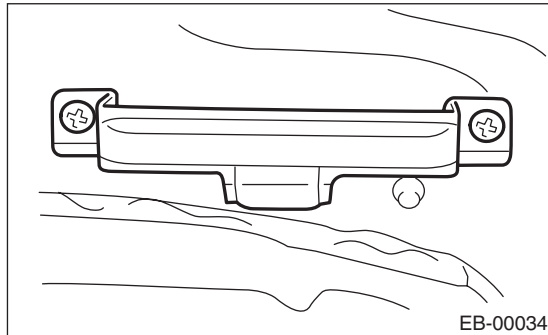
Do not use an impact wrench. Welding area on the striker nut plate is easily broken.



## 5. Front Sealing Cover

### A: REMOVAL

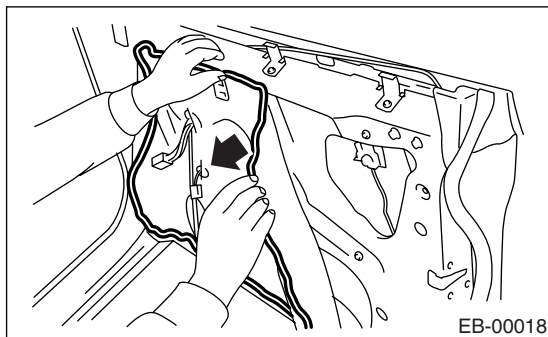
- 1) Disconnect the ground cable from battery.
- 2) Remove the front door trim. <Ref. to EI-41, REMOVAL, Front Door Trim.>
- 3) Remove the front speaker. <Ref. to ET-7, REMOVAL, Front Speaker.>
- 4) Remove the door trim bracket.



- 5) Remove the sealing cover.

#### NOTE:

- Carefully remove the butyl tape. Excessive force will easily break the cover.
- If the cover gets broken, replace it with a new one.



### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) When replacing the sealing cover, use the butyl tape.
- 3) Press the butyl tape-applied area firmly to prevent any floating on surface.

#### **Butyl tape:**

**3M 8626 or equivalent**

#### NOTE:

- Apply a uniform bead of butyl tape.
- Attach the sealing cover, keeping it from becoming wrinkled.
- Breaks in the bead will allow water leakage and contamination.

### C: INSPECTION

If the sealing cover is damaged, replace it with a new one.

## 6. Rear Door

### A: REMOVAL

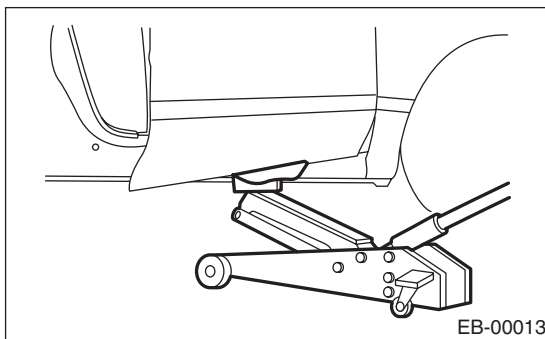
- 1) Disconnect the ground cable from battery.
- 2) Remove the rear door trim. <Ref. to EI-42, REMOVAL, Rear Door Trim.>
- 3) Remove the rear door glass. <Ref. to GW-22, REMOVAL, Rear Door Glass.>
- 4) Remove the rear door regulator and motor assembly. <Ref. to GW-24, REMOVAL, Rear Regulator and Motor Assembly.>
- 5) Remove the rear door latch. <Ref. to SL-33, REMOVAL, Rear Inner Remote.>
- 6) Remove the rear outer handle. <Ref. to SL-34, REMOVAL, Rear Outer Handle.>
- 7) Remove the connection of rubber dust (A) from center pillar, pull out the connector of door harness to separate.



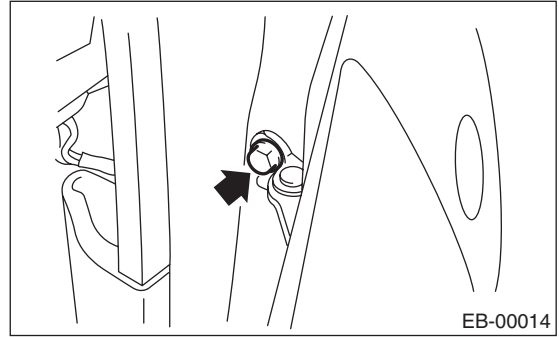
- 8) Put a wooden block on the jack and place the jack under the rear door. Support the rear door with jack to protect it.

**NOTE:**

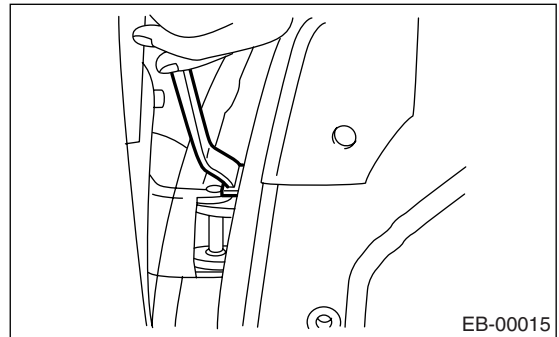
When supporting the door with jack, do not deform the hinge portion of door during work.



- 9) Remove the checker bolts.



- 10) Remove the door-side bolts for upper and lower hinges to remove the rear door panel.



### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Apply grease to the sliding area of door hinges.

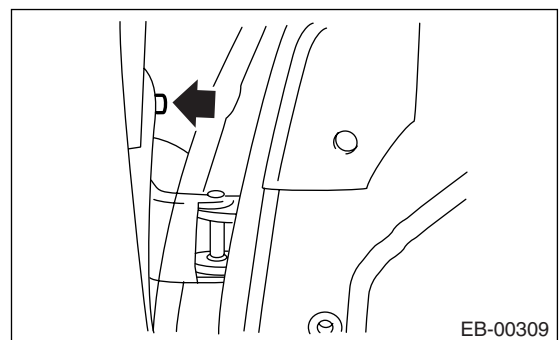
**Tightening torque:**

*Refer to COMPONENT in General Description.*

*<Ref. to EB-9, REAR DOOR PANEL, COMPONENT, General Description.>*

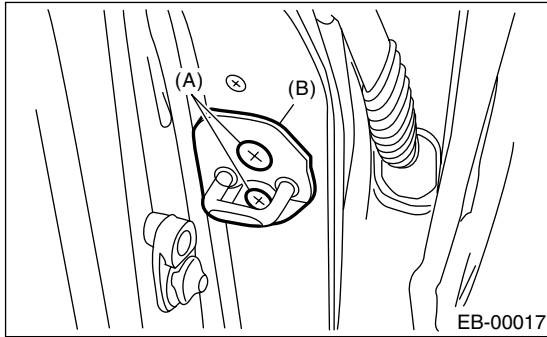
### C: ADJUSTMENT

- 1) Open the rear door, and then loosen the body-side bolts of upper and lower hinges to align the position of rear door panel longitudinally and vertically.



- 2) Loosen the screw (A), and then tap striker (B) using plastic hammer to adjust striker to align the position of rear door panel laterally at the rear end.

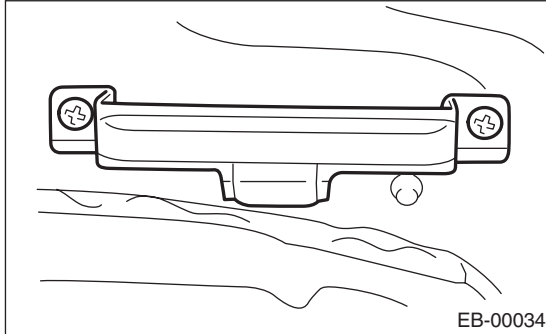
**CAUTION:**  
Do not use an impact wrench. The welding area  
on the striker nut plate is easily broken.



## 7. Rear Sealing Cover

### A: REMOVAL

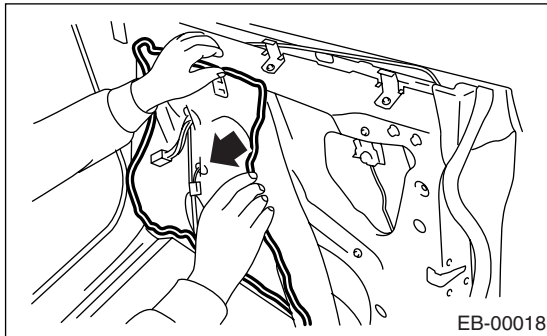
- 1) Disconnect the ground cable from battery.
- 2) Remove the rear door trim. <Ref. to EI-42, REMOVAL, Rear Door Trim.>
- 3) Remove the rear speaker. <Ref. to ET-9, REMOVAL, Rear Speaker.>
- 4) Remove the door trim bracket.



- 5) Remove the sealing cover.

#### NOTE:

- Carefully remove the butyl tape. Excessive force will easily break the cover.
- If the cover gets broken, replace it with a new one.



### B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) When replacing the sealing cover, use butyl tape.
- 3) Press the butyl tape-applied area firmly to prevent any floating on surface.

#### **Butyl tape:**

**3M 8626 or equivalent**

#### NOTE:

- Apply an uniform bead of butyl tape.
- Attach the sealing cover, keeping it from becoming wrinkled.
- Breaks in the bead will allow water leakage and contamination.

### C: INSPECTION

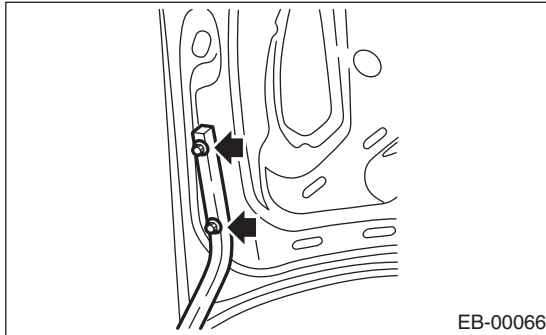
If the sealing cover is damaged, replace it with a new one.

## 8. Trunk Lid

### A: REMOVAL

#### 1. TRUNK LID

- 1) Open the trunk lid.
- 2) Disconnect the trunk lid connector.
- 3) Loosen the trunk lid mounting bolts to remove the trunk lid from hinges.



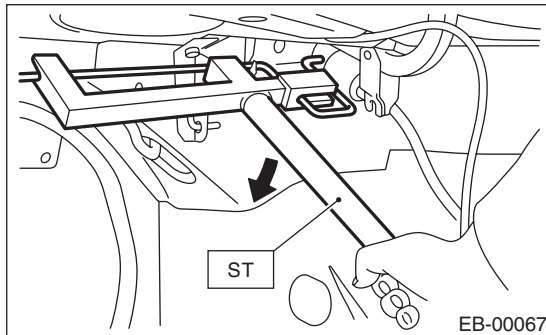
#### 2. TORSION BAR

- 1) Open the trunk lid.
- 2) Using the ST, remove the torsion bar from hinge link.

ST 927780000 REMOVER

#### CAUTION:

During removal and installation, carefully handle the torsion bar, because it will generate reactive force.



- 3) Remove the right/left torsion bars.

#### CAUTION:

Be careful not to get hit by the trunk lid, because the trunk lid will slam shut after the torsion bar is removed.

### B: INSTALLATION

#### 1. TRUNK LID

- 1) Install in the reverse order of removal.
- 2) Install the trunk lid with uniform clearance.

#### Tightening torque:

**14 N·m (1.43 kgf·m, 10.3 ft·lb)**

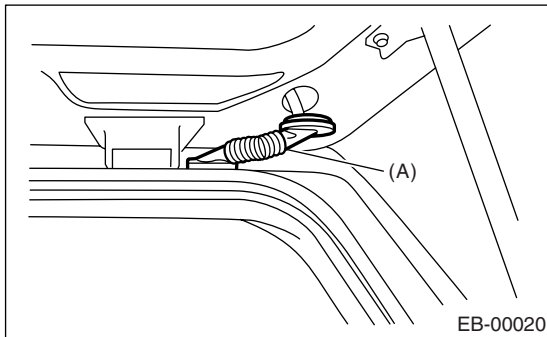


## 9. Rear Gate

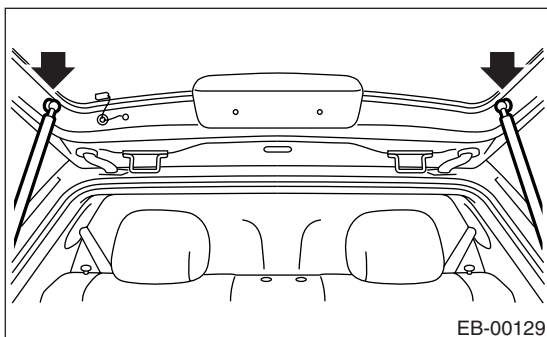
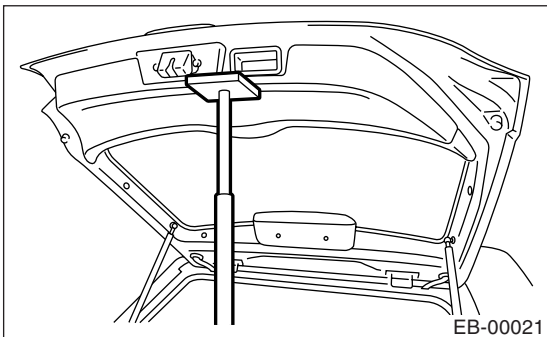
### A: REMOVAL

#### 1. REAR GATE PANEL

- 1) Disconnect the ground cable from battery.
- 2) Open the rear gate.
- 3) Remove the rear gate outer handle. <Ref. to SL-37, REMOVAL, Rear Gate Outer Handle.>
- 4) Remove the rear gate latch assembly. <Ref. to SL-38, REMOVAL, Rear Gate Latch Assembly.>
- 5) Remove the rear wiper. <Ref. to WW-18, REMOVAL, Rear Wiper Motor.>
- 6) Disconnect the connectors of rear wiper, rear defogger and other lighting devices.
- 7) Disconnect the washer hose.
- 8) Remove the rubber duct (A) connection, and then pull out the harness and washer hose from rear gate.



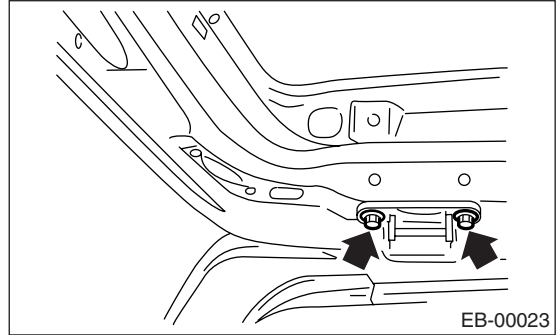
- 9) Using a support, support jack the rear gate while removing the rear gate damper stay mounting bolts.



### CAUTION:

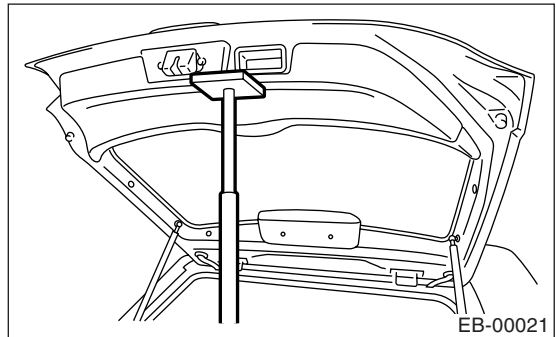
When the rear gate is released, it may hit and damage the body. To prevent this, place a shop cloth between the body and gate.

- 10) Remove the rear gate bolts to remove rear gate.



#### 2. REAR GATE DAMPER STAY

- 1) Open the rear gate. Use a support jack to support the rear gate.



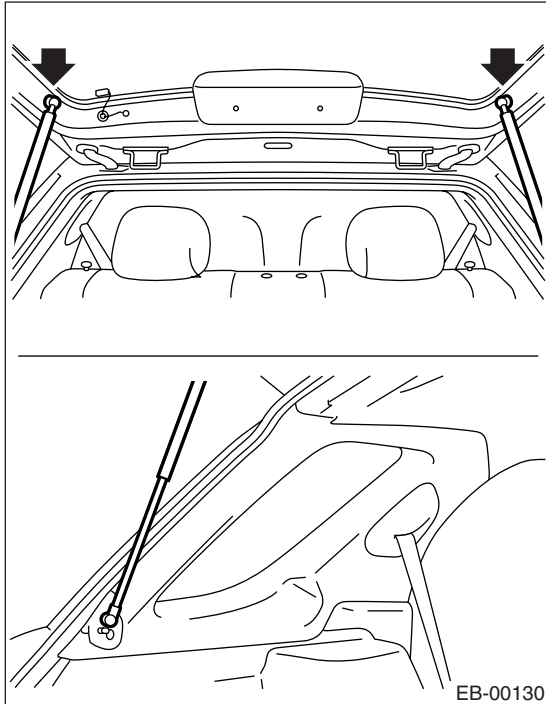
### NOTE:

After the rear gate damper stay is removed, the rear gate cannot stay open. Supporting the rear gate with a support jack, remove the bolts.

### CAUTION:

- Do not damage the piston rods and oil seals.
- Never disassemble the cylinders: They contain gas.

2) Loosen the bolts to remove the rear gate damper stay from rear gate.



**NOTE:**

After supporting the rear gate with a support jack, start the work.

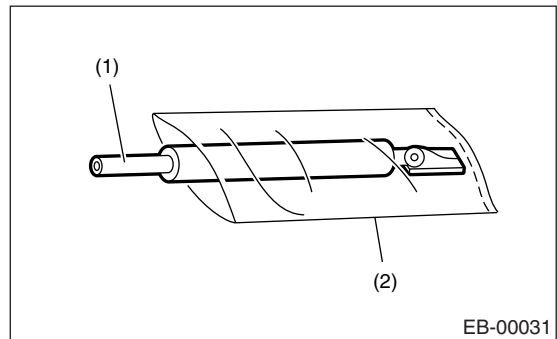
**C: DISPOSAL**

**1. REAR GATE DAMPER STAY**

**CAUTION:**

Gas is colorless, odorless, and harmless. However, gas pressure may spray the cutting powder or oil. Be sure to wear dust-resistant goggles.

1) Cover with a vinyl case as shown in the figure.



- (1) Rear gate damper stay
- (2) Vinyl sack

**B: INSTALLATION**

**1. REAR GATE PANEL**

1) Install in the reverse order of removal.  
 2) Install the rear gate panel with uniform clearance to the body.  
 Refer to COMPONENT of General Description for tightening torque. <Ref. to EB-11, REAR GATE PANEL, COMPONENT, General Description.>

**CAUTION:**

Do not damage the painted surfaces of body and rear gate panel.

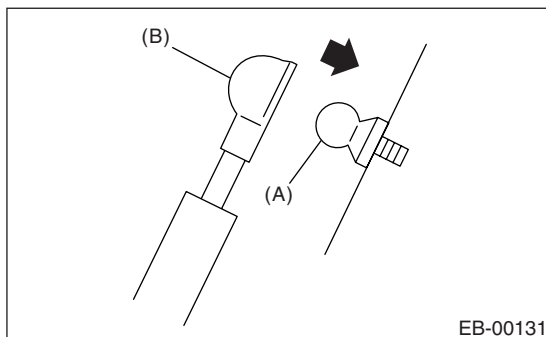
**2. REAR GATE DAMPER STAY**

1) Install the mounting bolt (A) to the rear gate and body.

**Tightening torque:**

**19.6 N·m (2.0 kgf·m, 14.5 ft·lb)**

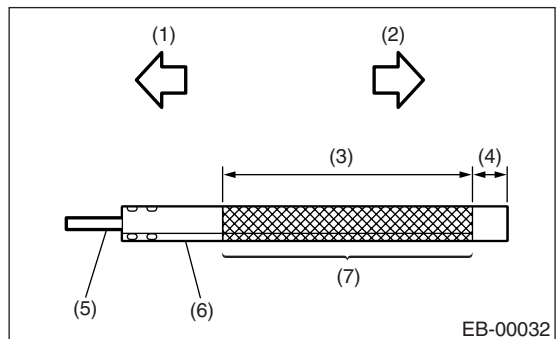
2) Firmly install the rear gate damper stay (B) to mounting bolt (A).



**NOTE:**

Prevent the vinyl case from being caught by drill cutting edge

2) Lift the body side slightly with piston rods fully extended, and secure the body side on vise stand. Drill a hole in 2 to 3 mm (0.08 to 0.12 in) diameter at a point 10 to 200 mm (0.39 to 7.87 in) from door side, and bleed the rear gate damper stay completely.



- (1) Body side
- (2) Door side
- (3) 190 mm (7.48 in)
- (4) 10 mm (0.39 in)
- (5) Piston rod
- (6) Cylinder
- (7) Position to be drilled

## Rear Gate

EXTERIOR BODY PANELS

---

# CRUISE CONTROL SYSTEM

# CC

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| 2. Cruise Control Unit.....            | 6           |
| 3. Cruise Control Command Switch ..... | 7           |
| 4. Stop Light and Brake Switch .....   | 8           |
| 5. Clutch Switch .....                 | 9           |
| 6. Inhibitor Switch.....               | 10          |
| 7. Neutral Position Switch .....       | 11          |

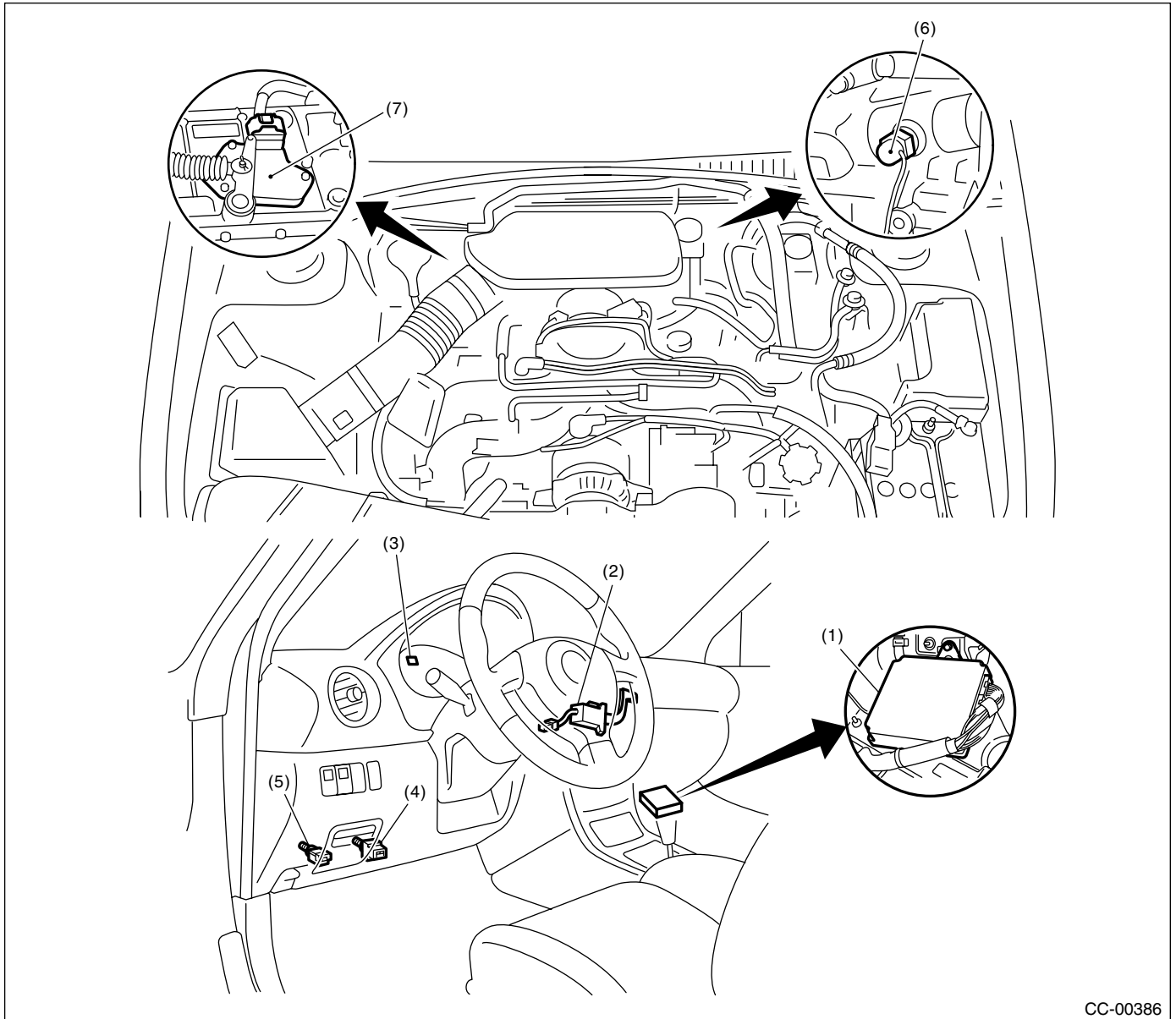
# General Description

## CRUISE CONTROL SYSTEM

### 1. General Description

#### A: COMPONENT

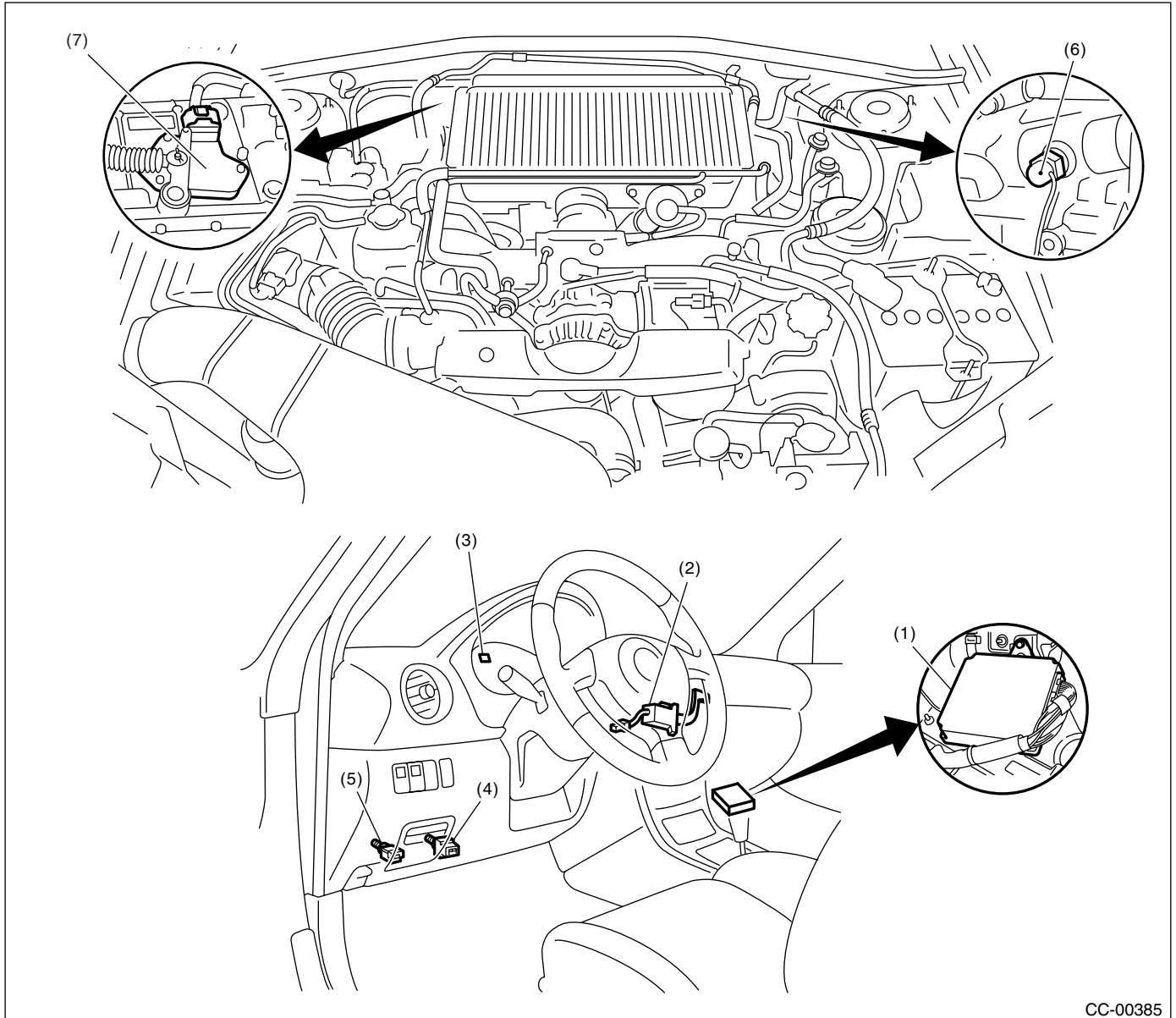
#### 1. NON-TURBO MODEL



CC-00386

- |   |   |                                 |
|---|---|---------------------------------|
| (1) Engine control module (ECM)                               | (3) Cruise indicator light & cruise set indicator light | (5) Clutch switch (MT model)    |
| (2) Cruise control command switch (with built-in main switch) | (4) Stop light & brake switch                           | (6) Neutral position switch     |
|   |   | (7) Inhibitor switch (AT model) |

### 2. TURBO MODEL



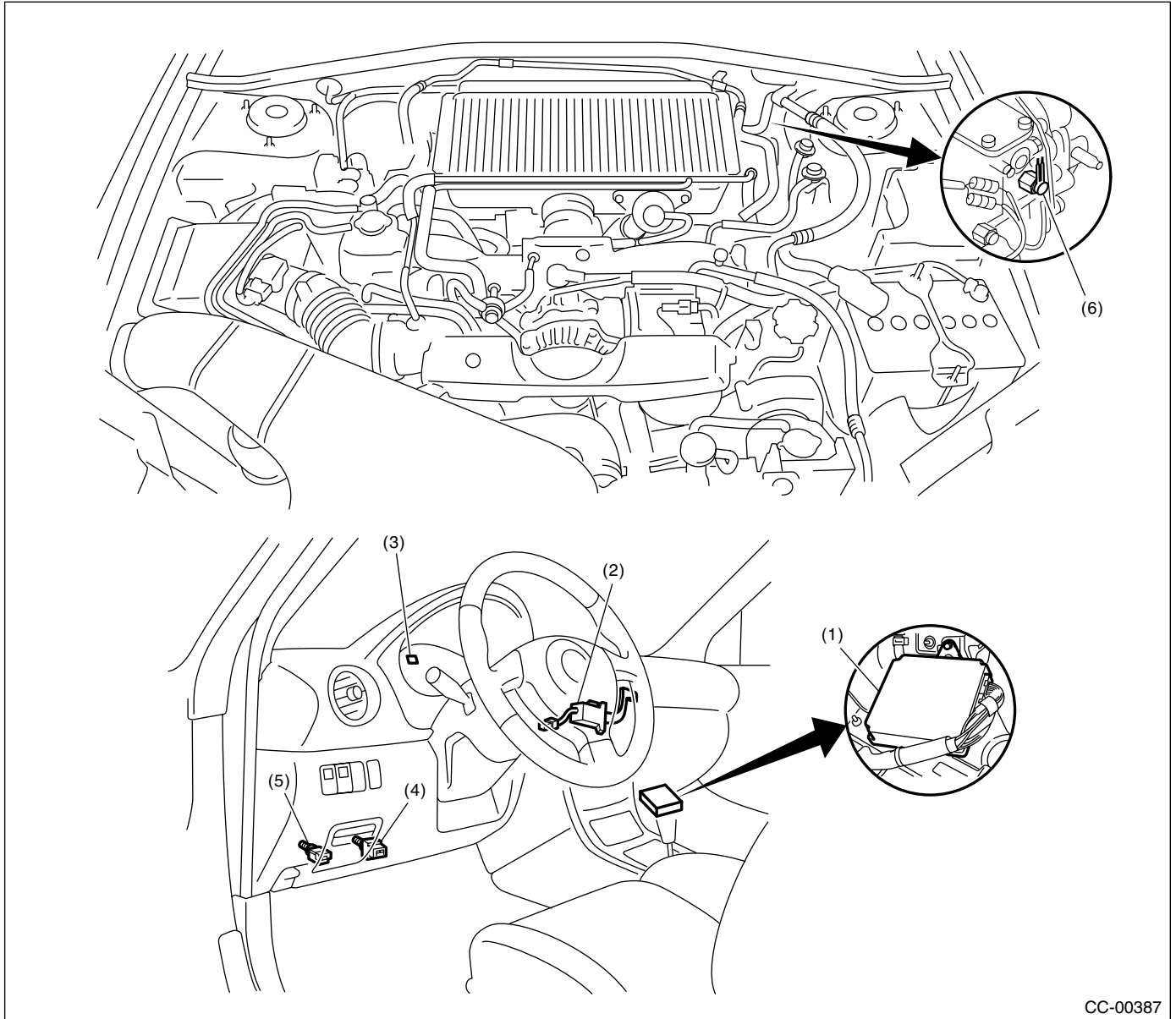
CC-00385

- |  |   |                                 |
|--|---|---------------------------------|
| (1) Engine control module (ECM)                              | (4) Stop light and brake switch           | (7) Inhibitor switch (AT model) |
| (2) Cruise control command switch<br>(main switch built-in)  | (5) Clutch switch (MT model)              |                                 |
| (3) Cruise indicator light and cruise<br>set indicator light | (6) Neutral position switch (MT<br>model) |                                 |

# General Description

## CRUISE CONTROL SYSTEM

### 3. STI MODEL



CC-00387

- |   |   |                              |
|---|---|------------------------------|
| (1) Engine control module (ECM)                               | (3) Cruise indicator light & cruise set indicator light | (5) Clutch switch (MT model) |
| (2) Cruise control command switch (with built-in main switch) | (4) Stop light & brake switch                           | (6) Neutral position switch  |

## B: CAUTION

- Before disassembling or reassembling parts, always disconnect the battery ground cable. When repairing the radio, control module and other parts with memory functions, make note of the memory before disconnecting the battery ground cable. All memory will be erased.
- Reassemble parts in the reverse order of disassembly unless otherwise indicated.
- Adjust parts to specifications specified in this manual.
- Connect the connectors and hoses securely during reassembly.
- After reassembly, ensure functional parts operate properly.

## C: PREPARATION TOOL

| TOOL NAME      | REMARKS                                    |
|----------------|--|
| Circuit Tester | Used for measuring resistance and voltage. |



## 2. Cruise Control Unit

### A: REMOVAL

The control of cruise control system is performed by Engine control module (ECM).

#### 1. NON-TURBO MODEL

<Ref. to FU(H4SO)-38, REMOVAL, Engine Control Module (ECM).>

#### 2. TURBO MODEL

<Ref. to FU(H4DOTC)-45, REMOVAL, Engine Control Module (ECM).>

#### 3. STI MODEL

<Ref. to FU(STI)-39, REMOVAL, Engine Control Module (ECM).>

### B: INSTALLATION

#### 1. NON-TURBO MODEL

<Ref. to FU(H4SO)-38, INSTALLATION, Engine Control Module (ECM).>

#### 2. TURBO MODEL

<Ref. to FU(H4DOTC)-45, INSTALLATION, Engine Control Module (ECM).>

#### 3. STI MODEL

<Ref. to FU(STI)-39, INSTALLATION, Engine Control Module (ECM).>

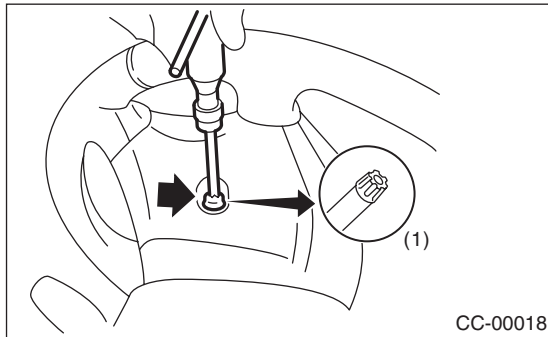
## 3. Cruise Control Command Switch

### A: REMOVAL

**WARNING:**

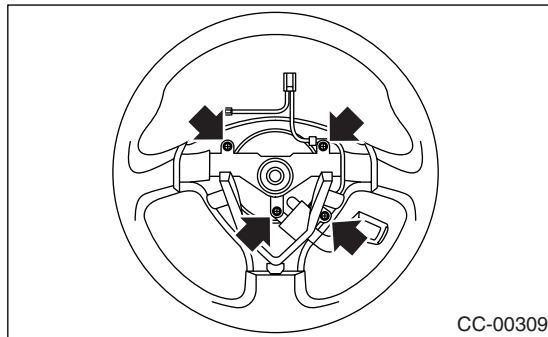
Before servicing, be sure to read the notes in the AB section for proper handling of the driver's airbag module. <Ref. to AB-3, CAUTION, General Description.>

- 1) Set the front wheels in straight ahead position.
- 2) Turn the ignition switch to OFF.
- 3) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
- 4) Using the TORX® BIT T30 (Tamper resistant type), loosen the two TORX® bolts which secure driver's airbag module.

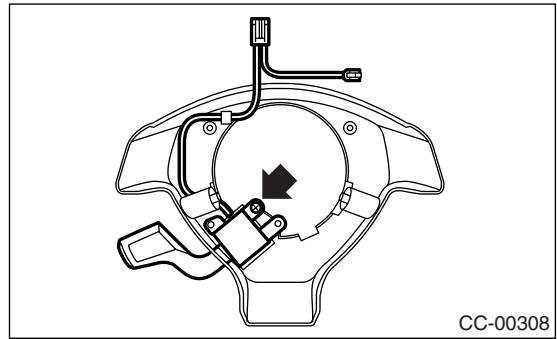


(1) TORX® BIT T30

- 5) Disconnect the airbag module connector on back of airbag module.
- 6) Remove the steering wheel. <Ref. to PS-20, REMOVAL, Steering Wheel.>
- 7) Remove four screws, and then remove the lower cover from steering wheel.



- 8) Remove the screw, and then remove the cruise control command switch from lower cover.

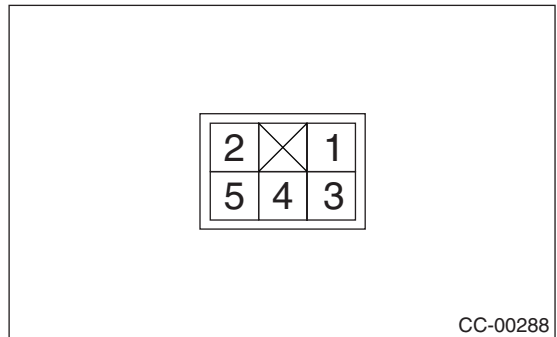


### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

Measure the cruise control command switch resistance.



| Switch       | Position | Terminal No.    | Standard value |
|--------------|----------|-----------------|----------------|
| CANCEL       | ON       | 1 (+) and 2 (-) | Less than 1 Ω  |
|              | ON       | 1 (+) and 3 (-) | Less than 1 Ω  |
| SET/COAST    | OFF      | 1 and 2         | More than 1 MΩ |
|              | ON       | 1 and 2         | Less than 1 Ω  |
| RESUME/ACCEL | OFF      | 1 and 3         | More than 1 MΩ |
|              | ON       | 1 and 3         | Less than 1 Ω  |
| MAIN SWITCH  | OFF      | 5 and 4         | More than 1 MΩ |
|              | ON       | 5 and 4         | Less than 1 MΩ |

If NG, replace the cruise control command switch.

# Stop Light and Brake Switch

CRUISE CONTROL SYSTEM

## 4. Stop Light and Brake Switch

### A: REMOVAL

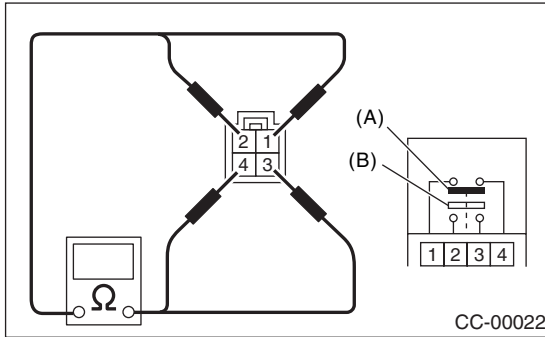
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from stop and brake switch, and then remove the switch. <Ref. to BR-55, REMOVAL, Stop Light Switch.>

### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

Measure the brake switch (A) and stop light switch (B) resistance.



| Switch     | Pedal     | Terminal No. | Standard       |
|------------|-----------|--------------|----------------|
| Brake      | Released  | 1 and 4      | Less than 1 Ω  |
|            | Depressed | 1 and 4      | More than 1 MΩ |
| Stop light | Released  | 2 and 3      | More than 1 MΩ |
|            | Depressed | 2 and 3      | Less than 1 Ω  |

If NG, replace the stop light and brake switch.

## 5. Clutch Switch

### A: REMOVAL

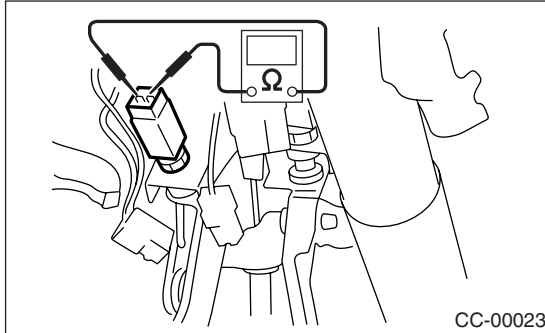
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from clutch switch, and then remove the switch. <Ref. to CL-32, REMOVAL, Clutch Pedal.>

### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

Measure the clutch switch resistance.



| Switch | Pedal     | Terminal No. | Standard               |
|--------|-----------|--------------|------------------------|
| Clutch | Released  | 1 and 2      | Less than 1 $\Omega$   |
|        | Depressed | 1 and 2      | More than 1 M $\Omega$ |

If NG, replace the clutch switch.

## 6. Inhibitor Switch

### A: REMOVAL

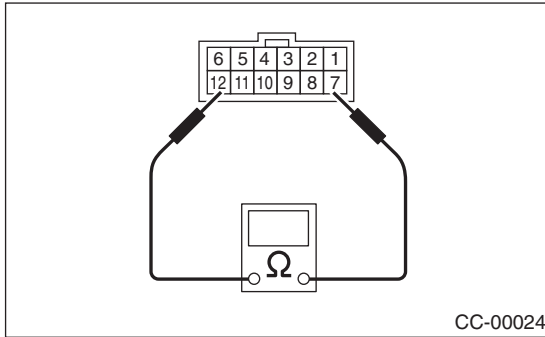
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from inhibitor switch, and then remove the switch. <Ref. to 4AT-48, REMOVAL, Inhibitor Switch.>

### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

Measure the inhibitor switch resistance.



| Select lever position | Terminal No. | Standard       |
|-----------------------|--------------|----------------|
| P                     | 7 and 12     | Less than 1 Ω  |
| N                     |              | Less than 1 Ω  |
| Except P and N        |              | More than 1 MΩ |

If NG, replace the inhibitor switch.

## 7. Neutral Position Switch

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from neutral position switch, and then remove the switch.

5MT model:

<Ref. to 5MT-36, BACK-UP LIGHT AND NEUTRAL POSITION SWITCH, REMOVAL, Switches and Harness.>

6MT model:

<Ref. to 6MT-47, REMOVAL, Neutral Position Switch.>

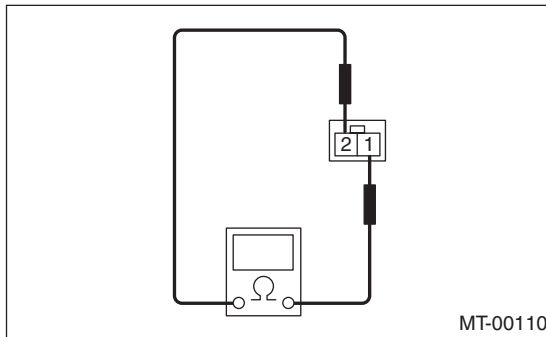
### B: INSTALLATION

Install in the reverse order of removal.

### C: INSPECTION

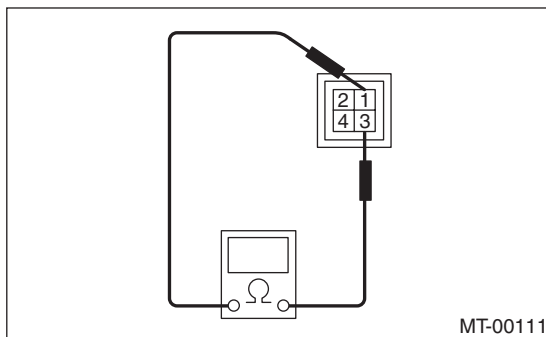
Measure the neutral position switch resistance.

- Non-turbo model



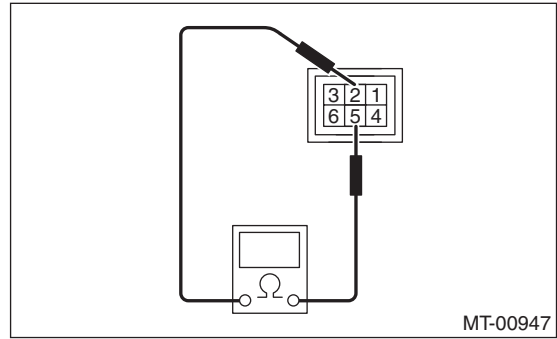
| Gear shift position | Terminal No. | Specified resistance   |
|---------------------|--------------|------------------------|
| Neutral position    | 1 and 2      | Less than 1 $\Omega$   |
| Other positions     |              | More than 1 M $\Omega$ |

- Turbo model



| Gear shift position | Terminal No. | Specified resistance   |
|---------------------|--------------|------------------------|
| Neutral position    | 1 and 3      | Less than 1 $\Omega$   |
| Other positions     |              | More than 1 M $\Omega$ |

- STI model



| Gear shift position | Terminal No. | Specified resistance   |
|---------------------|--------------|------------------------|
| Neutral position    | 2 and 5      | Less than 1 $\Omega$   |
| Other positions     |              | More than 1 M $\Omega$ |

If NG, replace the neutral position switch.



# CRUISE CONTROL SYSTEM (DIAGNOSTICS)

## *CC(ETC)(diag)*

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# Basic Diagnostic Procedure

## CRUISE CONTROL SYSTEM (DIAGNOSTICS)

### 1. Basic Diagnostic Procedure

#### A: PROCEDURE

| Step | Check   | Yes   | No  |  |
|------|---|---|---|--|
| 1    | <b>CHECK MALFUNCTION INDICATOR LIGHT.</b><br>Check the malfunction indicator light illuminates.   | Does the malfunction indicator light illuminate?  | Go to step 5.   | Go to step 2.  |
| 2    | <b>CHECK CRUISE INDICATOR LIGHT.</b><br>Check the cruise indicator light blinks.  | Does the cruise indicator light blink?  | Go to step 5.   | Go to step 3.  |
| 3    | <b>CHECK CRUISE CONTROL MAIN SWITCH OPERATION.</b><br>Check the cruise control main switch operation. (Check the cruise indicator light illuminates.) | Is the cruise control main switch set to on? (Does the cruise indicator light illuminate?)    | Go to step 4.   | Go to phenomenon 1. <Ref. to CC(ETC)(diag)-12, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |
| 4    | <b>CHECK CRUISE CONTROL SET OPERATION.</b><br>Check the cruise control set operation.   | Can the cruise control be set while driving at 40 km/h (25 MPH)?                              | Go to step 6.   | Go to step 5.  |
| 5    | <b>PERFORM CRUISE CONTROL CANCEL CONDITION DIAGNOSIS.</b><br>Perform the cruise control cancel condition diagnosis.                                   | Are any DTC indicated?  | Go to "List of DTC". <Ref. to CC(ETC)(diag)-19, List of Diagnostic Trouble Code (DTC).> | Go to phenomenon 2. <Ref. to CC(ETC)(diag)-12, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |
| 6    | <b>CHECK CRUISE SET INDICATOR LIGHT.</b><br>Check the cruise set indicator light illuminates.   | Does the cruise set indicator light illuminate?   | Go to step 7.   | Go to phenomenon 3. <Ref. to CC(ETC)(diag)-12, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |
| 7    | <b>CHECK VEHICLE SPEED IS HELD WITHIN SET SPEED.</b><br>Make sure the vehicle speed is held within set speed.   | Is the vehicle speed held within set speed $\pm 3$ km/h ( $\pm 2$ MPH)?                       | Go to step 8.   | Go to phenomenon 4. <Ref. to CC(ETC)(diag)-12, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |
| 8    | <b>CHECK RES/ACC OPERATION.</b><br>Check the RES/ACC switch operation.  | Does the vehicle speed increase or return to set speed after RES/ACC switch has been pressed? | Go to step 9.   | Go to phenomenon 5. <Ref. to CC(ETC)(diag)-12, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |

# Basic Diagnostic Procedure

## CRUISE CONTROL SYSTEM (DIAGNOSTICS)

| Step   | Check  | Yes  | No  |
|--|--|--|---|
| <b>9</b><br><b>CHECK SET/COAST OPERATION.</b><br>Check the SET/COAST switch operation.                     | Does the vehicle speed decrease after SET/COAST switch has been pressed?         | Go to step <b>10</b> .   | Go to phenomenon 6. <Ref. to CC(ETC)(diag)-12, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>  |
| <b>10</b><br><b>CHECK CANCEL OPERATION.</b><br>Check the CANCEL switch operation.                          | Is the cruise control released after CANCEL switch has been pressed?             | Go to step <b>11</b> .   | Go to phenomenon 7. <Ref. to CC(ETC)(diag)-12, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>  |
| <b>11</b><br><b>CHECK CRUISE CONTROL RELEASE OPERATION.</b><br>Check the cruise control release operation. | Is the cruise control released after brake pedal has been depressed?             | <ul style="list-style-type: none"> <li>• Go to step <b>12</b>. (MT model)</li> <li>• Finish the diagnosis. (AT model)</li> </ul> | Go to phenomenon 8. <Ref. to CC(ETC)(diag)-12, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>  |
| <b>12</b><br><b>CHECK CRUISE CONTROL RELEASE OPERATION.</b><br>Check the cruise control release operation. | Is the cruise control released after clutch pedal has been depressed? (MT model) | Go to step <b>13</b> .   | Go to phenomenon 9. <Ref. to CC(ETC)(diag)-12, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>  |
| <b>13</b><br><b>CHECK CRUISE CONTROL RELEASE OPERATION.</b><br>Check the cruise control release operation. | Is the cruise control released after shifting to neutral position? (MT model)    | Finish the diagnosis.  | Go to phenomenon 10. <Ref. to CC(ETC)(diag)-12, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |

## General Description

### CRUISE CONTROL SYSTEM (DIAGNOSTICS)

## 2. General Description

### A: CAUTION

#### 1. SUPPLEMENTAL RESTRAINT SYSTEM “AIRBAG”

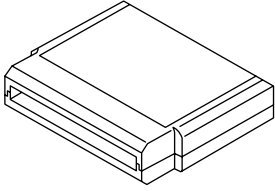

Airbag system wiring harness is routed near the cruise control switch.

#### CAUTION:

- Airbag system connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the cruise control switch.

### B: PREPARATION TOOL

#### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER                        | DESCRIPTION                  | REMARKS                                 |
|---|------------------------------------|------------------------------|---|
| <br>ST18482AA010   | 18482AA010<br>(Newly adopted tool) | CARTRIDGE                    | Troubleshooting for electrical systems. |
| <br>ST22771AA030 | 22771AA030                         | SUBARU SELECT<br>MONITOR KIT | Troubleshooting for electrical systems. |

#### 2. GENERAL TOOL

| TOOL NAME      | REMARKS  |
|----------------|--|
| Circuit tester | Used for measuring resistance, voltage and ampere. |

### C: INSPECTION

#### 1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

#### **Standard voltage:**

**12 V, or more**

#### **Specific gravity:**

**Above 1.260**

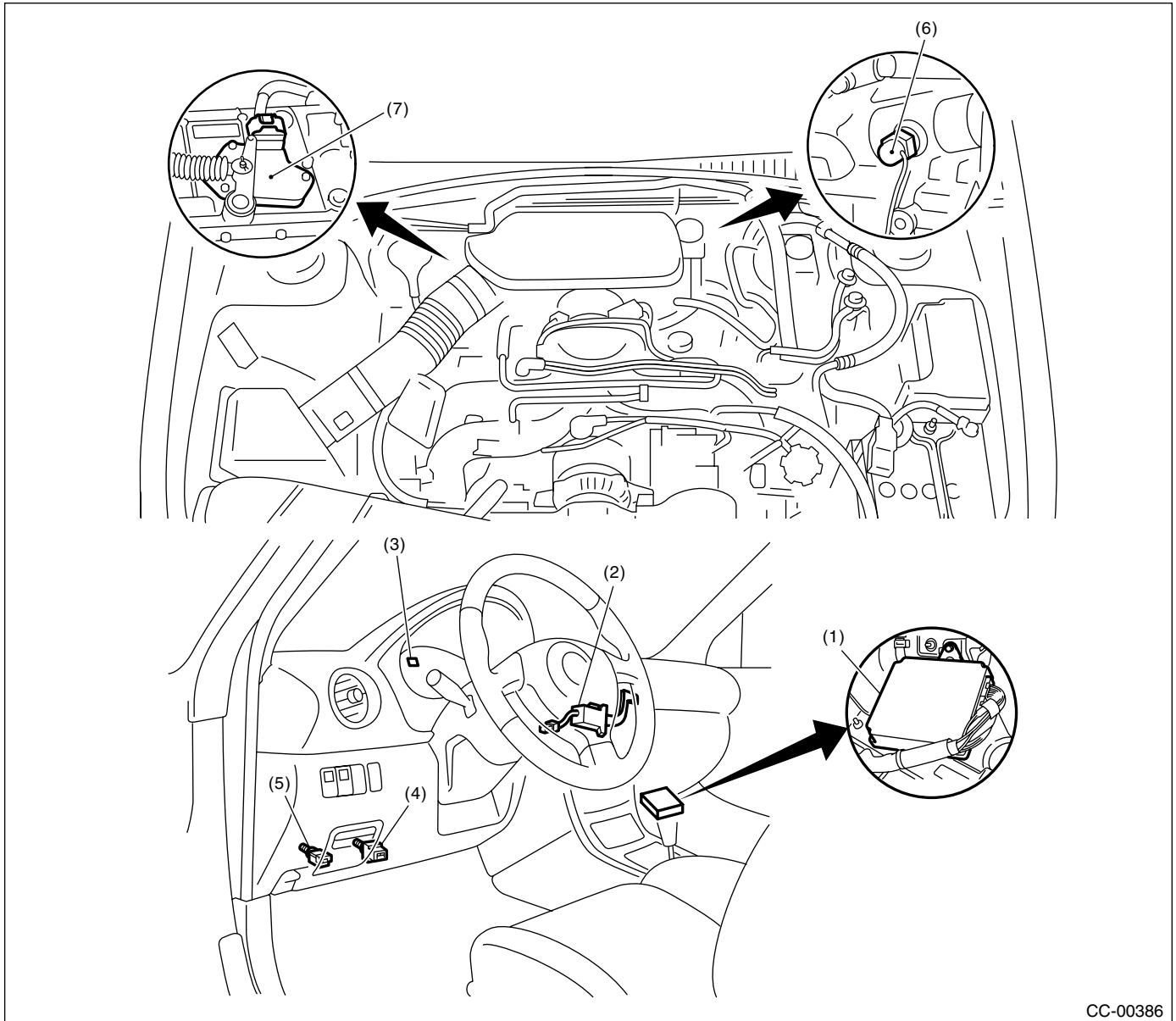
# Electrical Component Location

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

## 3. Electrical Component Location

### A: LOCATION

#### 1. NON-TURBO MODEL



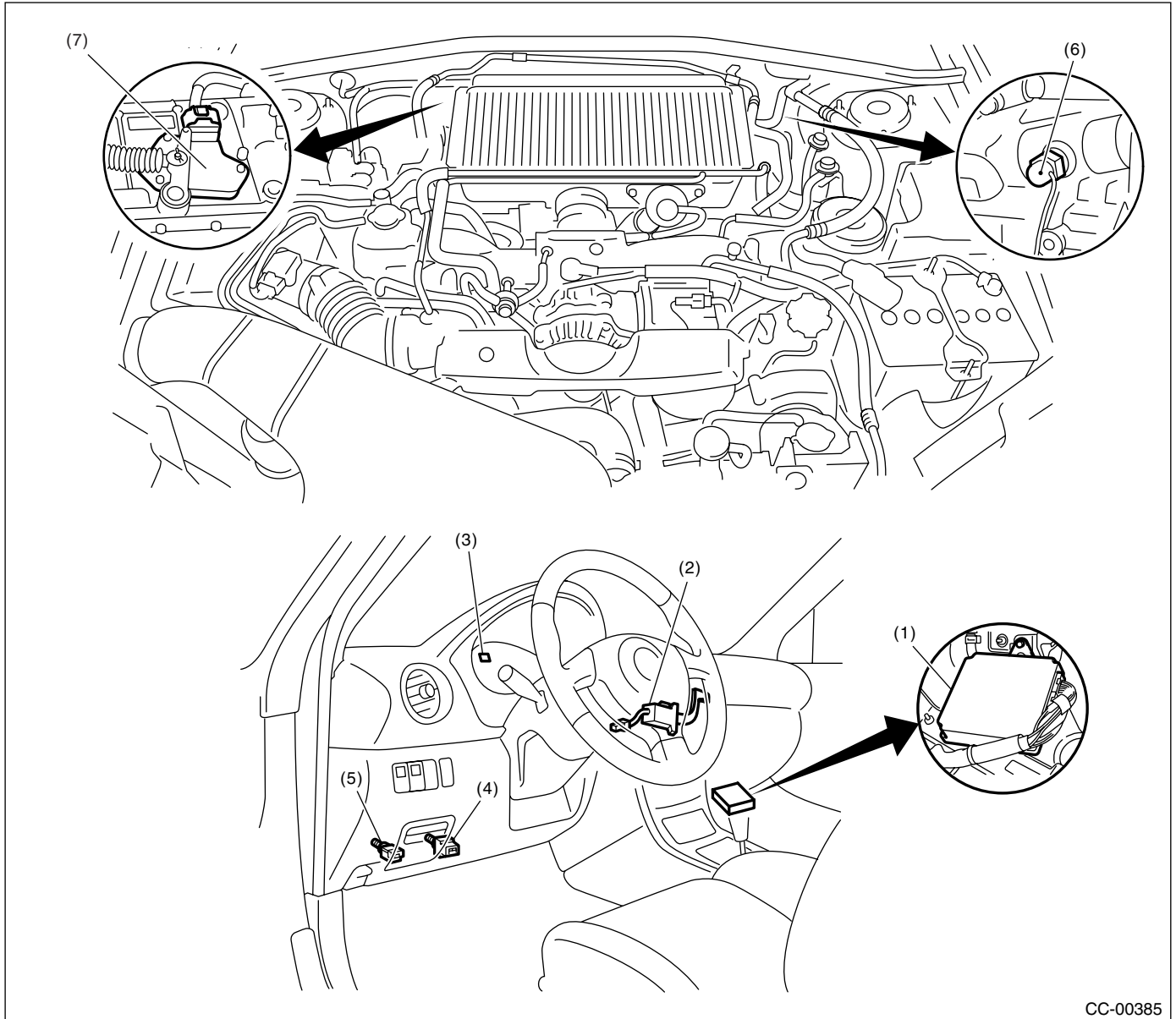
CC-00386

- |   |   |                                 |
|---|---|---------------------------------|
| (1) Engine control module (ECM)                               | (3) Cruise indicator light & cruise set indicator light | (5) Clutch switch (MT model)    |
| (2) Cruise control command switch (with built-in main switch) | (4) Stop light & brake switch                           | (6) Neutral position switch     |
|   |   | (7) Inhibitor switch (AT model) |

# Electrical Component Location

## CRUISE CONTROL SYSTEM (DIAGNOSTICS)

### 2. TURBO MODEL



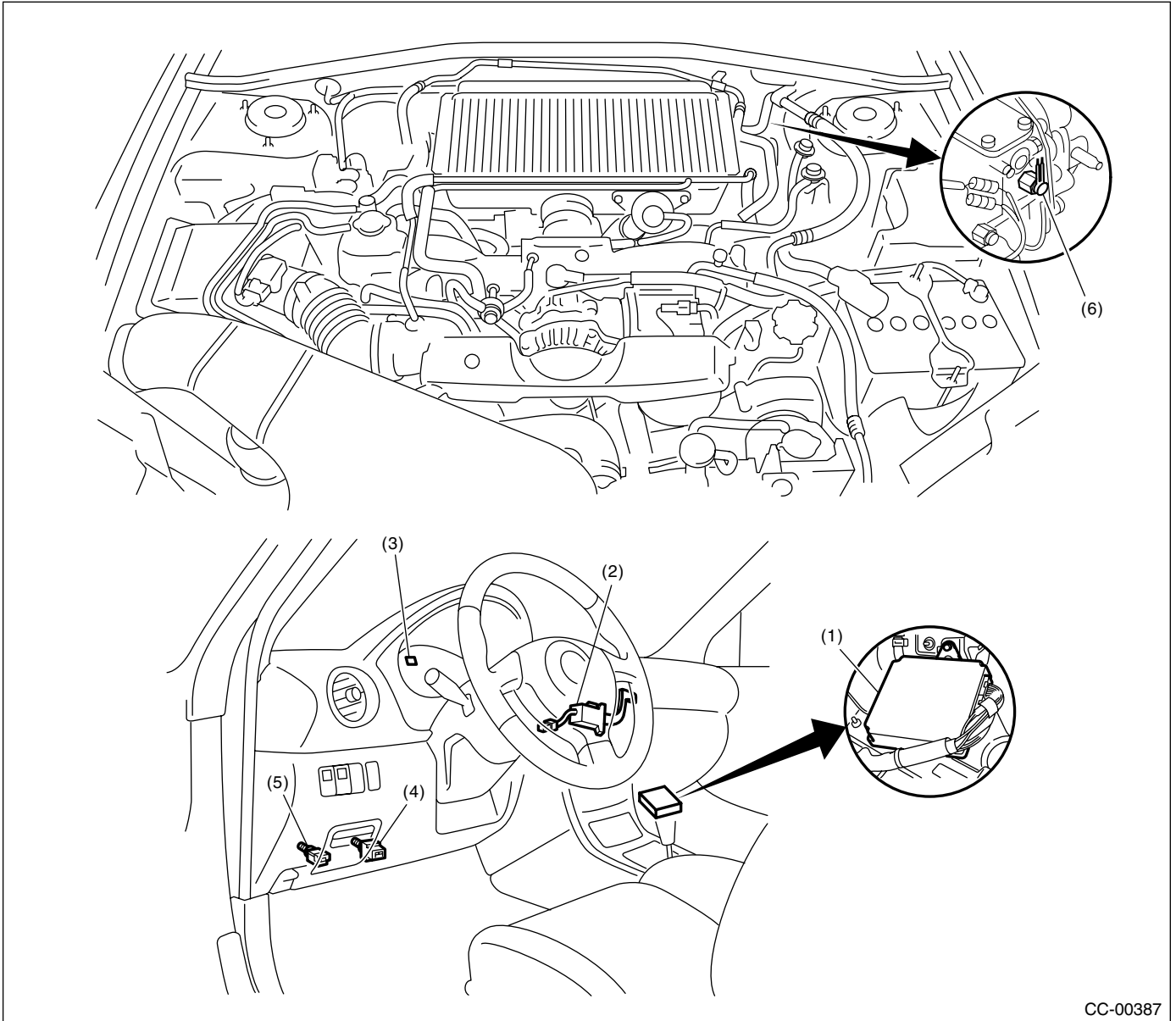
CC-00385

- |  |   |  |
|--|---|--|
| (1) Engine control module (ECM)                          | (3) Cruise indicator light and cruise set indicator light | (5) Clutch switch (MT model)           |
| (2) Cruise control command switch (main switch built-in) | (4) Stop light and brake switch                           | (6) Neutral position switch (MT model) |

# Electrical Component Location

## CRUISE CONTROL SYSTEM (DIAGNOSTICS)

### 3. STI MODEL



CC-00387

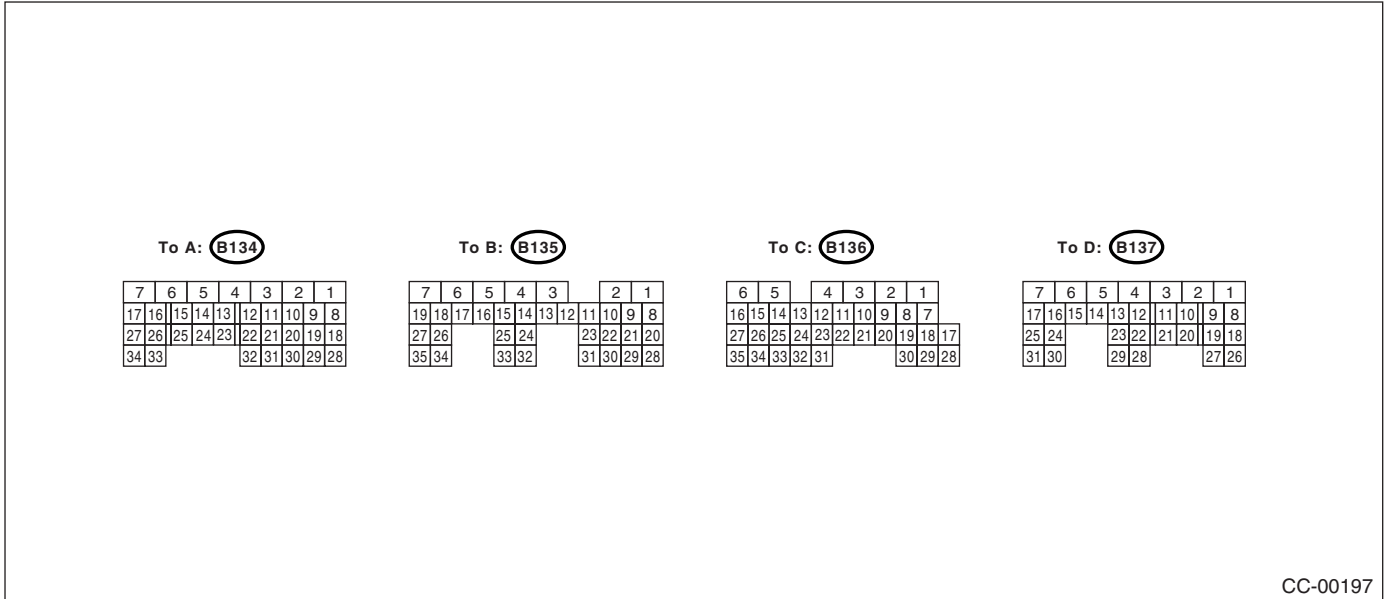
- |   |   |                              |
|---|---|------------------------------|
| (1) Engine control module (ECM)                               | (3) Cruise indicator light & cruise set indicator light | (5) Clutch switch (MT model) |
| (2) Cruise control command switch (with built-in main switch) | (4) Stop light & brake switch                           | (6) Neutral position switch  |

# Engine Control Module (ECM) I/O Signal

## CRUISE CONTROL SYSTEM (DIAGNOSTICS)

### 4. Engine Control Module (ECM) I/O Signal

#### A: ELECTRICAL SPECIFICATION



CC-00197

| Content                               |                                  | Terminal No.   | Measuring condition and I/O signal (ignition switch ON and engine idling<br>Except cruise set light)  |
|---------------------------------------|----------------------------------|--|---|
| Clutch switch                         |                                  | Except STI<br>model: C25<br>STI model: A1                        | <ul style="list-style-type: none"> <li>Battery voltage is present when the clutch pedal is released.</li> <li>"0" volt is present when the clutch pedal is depressed.</li> </ul>  |
| Cruise set indicator light            |                                  | Except STI<br>model: B3<br>STI model: A16                        | (Press the main switch and drive the vehicle at 40 km/h (25 MPH) or more.) <ul style="list-style-type: none"> <li>Battery voltage is present when the set switch is turned to OFF.</li> <li>"0" volt is present when the set switch is turned to ON.</li> </ul> |
| Cruise indicator light                |                                  | Except STI<br>model: B6<br>STI model: A15                        | <ul style="list-style-type: none"> <li>Battery voltage is present when the main switch is turned to OFF.</li> <li>"0" volt is present when the main switch is turned to ON.</li> </ul>  |
| Main power supply                     | VB (CONTROL 1)<br>VB (CONTROL 2) | Except STI<br>model: B5<br>STI model: B19                        | Battery voltage is present.   |
| Vehicle speed signal                  |                                  | Non-turbo<br>model: C12<br>Turbo model:<br>C13<br>STI model: B26 | Lift-up the vehicle until all four wheels are raised off the ground, and then rotate any wheel manually. Approx. "5 V" and "0 V" pulse signals are alternately input to ECM.  |
| SET/COAST switch                      |                                  | Except STI<br>model: B24<br>STI model: C11                       | <ul style="list-style-type: none"> <li>Battery voltage is present when the cruise control command switch is turned to SET/COAST position.</li> <li>"0" volt is present when the cruise control command switch is released.</li> </ul>                           |
| RES/ACC switch                        |                                  | Except STI<br>model: B13<br>STI model: C10                       | <ul style="list-style-type: none"> <li>Battery voltage is present when the cruise control command switch is turned to RES/ACC position.</li> <li>"0" volt is present when the cruise control command switch is released.</li> </ul>                             |
| Brake switch 1<br>(Brake switch)      |                                  | Except STI<br>model: B20<br>STI model: C9                        | <ul style="list-style-type: none"> <li>Battery voltage is present when the brake pedal is released.</li> <li>"0" volt is present when the brake pedal is depressed.</li> </ul>  |
| Brake switch 2<br>(Stop light switch) |                                  | Except STI<br>model: B28<br>STI model: C8                        | <ul style="list-style-type: none"> <li>Battery voltage is present when the brake pedal is depressed.</li> <li>"0" volt is present when the brake pedal is released.</li> </ul>  |
| Cruise control main switch            |                                  | Except STI<br>model: B12<br>STI model: C7                        | <ul style="list-style-type: none"> <li>Battery voltage is present while the cruise control main switch is depressed or is turned to ON.</li> <li>"0" volt is present when the cruise control main switch is turned to OFF.</li> </ul>                           |

# Engine Control Module (ECM) I/O Signal

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

| Content                               |                 | Terminal No.   | Measuring condition and I/O signal (ignition switch ON and engine idling<br>Except cruise set light)   |
|---------------------------------------|-----------------|--|--|
| Ground                                | GND (CONTROL 1) | Except STI<br>model: C15<br>STI model: D2                        | —  |
|                                       | GND (CONTROL 2) | Except STI<br>model: A5<br>STI model: D1                         | —  |
| Ignition switch                       |                 | Non-turbo<br>model: B27<br>Turbo model:<br>B19<br>STI model: D14 | <ul style="list-style-type: none"> <li>• Battery voltage is present with the ignition switch is turned to ON.</li> <li>• "0" volt is present when the ignition switch is turned to OFF.</li> </ul>   |
| Neutral position switch (MT<br>model) |                 | Except STI<br>model: C31<br>STI model: D9                        | <ul style="list-style-type: none"> <li>• Battery voltage is present when the shift lever is in anywhere except neutral position.</li> <li>• "0" volt is present when the shift lever is in neutral position.</li> </ul>  |
| Neutral signal (AT model)             |                 | C31  | <ul style="list-style-type: none"> <li>• "Approx. 5 V" voltage (4AT model) or battery voltage (5AT model) is present when the shift lever is set in any position except "P" or "N".</li> <li>• "0 V" voltage is present when the shift lever is set in "P" or "N" position.</li> </ul> |

## **B: WIRING DIAGRAM**

<Ref. to WI-102, WIRING DIAGRAM, Cruise Control System.>



# Subaru Select Monitor

## CRUISE CONTROL SYSTEM (DIAGNOSTICS)

### 5. Subaru Select Monitor

#### A: OPERATION

##### 1. GENERAL

The on-board diagnosis function of the cruise control system uses the Subaru Select Monitor.

The on-board diagnosis function operates in two categories, which are used depending on the type of problems;

##### 1) Cruise cancel conditions diagnosis:

(1) This category of diagnosis requires actual vehicle driving in order to determine the cause, (as when cruise speed is cancelled during driving although cruise cancel condition is not entered).

(2) Cruise control memory of ECM stores the cancel condition (Code No.) which occurred during driving. When there are plural cancel conditions (Code No.), they are shown on the Subaru Select Monitor.

#### CAUTION:

- The cruise control memory stores not only the cruise “cancel” which occurred (although “cancel” operation is not entered by the driver), but also the “cancel” condition input by the driver.

- The content of memory is cleared when ignition switch or cruise control main switch is turned OFF.

##### 2) Real-time diagnosis:

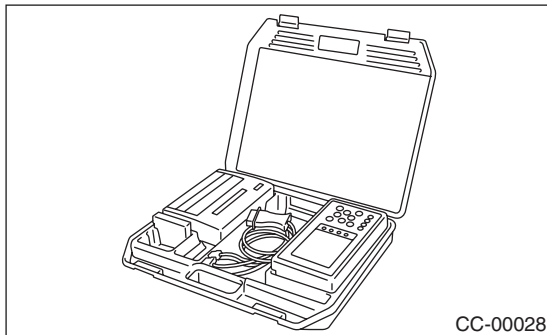
The real-time diagnosis function is used to determine whether or not the input signal system is in good order, according to signal emitted from switches, sensors, etc.

(1) Vehicle cannot be driven at cruise speed because problem occurs in the cruise control system or its associated circuits.

(2) Monitor the signal conditions from switches and sensors.

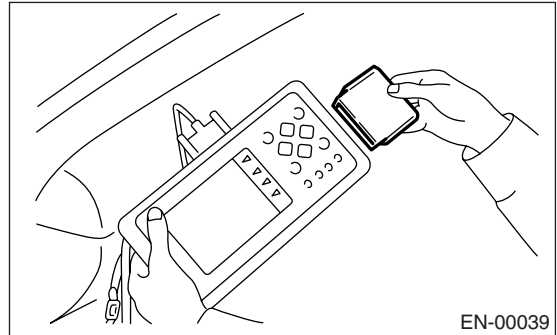
#### 2. CRUISE CANCEL CONDITIONS DIAGNOSIS

##### 1) Prepare the Subaru Select Monitor kit.



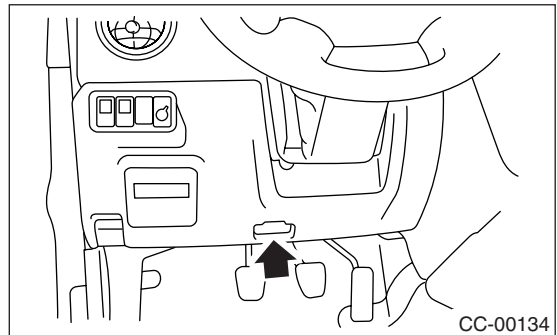
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor. <Ref. to CC(ETC)(diag)-4, SPECIAL TOOL, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

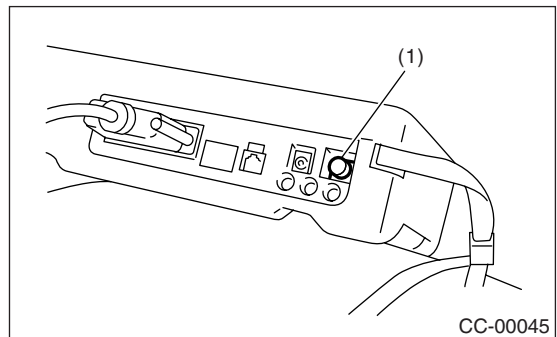
(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

5) Start the engine and turn the cruise control main switch to ON.

6) Turn the Subaru Select Monitor power switch to ON.



(1) Power switch

7) On the Main Menu display screen, select the {2. Each System Diagnosis} and press [YES] key. Select the {Engine} on the System Selection display screen and press [YES] key. Press [YES] key after the engine type displayed.

8) Drive the vehicle at least 40 km/h (25 MPH) with cruise speed set.

9) If the cruise speed is canceled itself (without doing any cancel operations), a DTC will appear on the display after {Cancel Code(s) Display} is selected on the Engine Diagnosis display screen and [YES] key is pressed.

### **CAUTION:**

- **When performing diagnostics, observe the legal speed of the road.**
- **A DTC will also appear when cruise cancel is effected by driver. Do not confuse.**
- **Have a co-worker ride in the vehicle to assist in diagnosis during driving.**

### **NOTE:**

DTC will be cleared by turning the ignition switch or cruise control main switch to OFF.

## **3. REAL-TIME DIAGNOSIS**

- 1) Connect the select monitor.
- 2) Turn the ignition switch and cruise control main switch to ON.
- 3) Turn the Subaru Select Monitor power switch to ON.
- 4) On the Main Menu display screen, select the {2. Each System Check} and press [YES] key.
- 5) On the System Selection display screen, select the {Engine} and press [YES] key.
- 6) Press the [YES] key after the information of engine type has been displayed.
- 7) On the Cruise Control Diagnosis display screen, select the {Current Data Display & Save} and press [YES] key.
- 8) Make sure that normal indication is displayed when operated as indicated below:
  - Depress/release the brake pedal. (Stop light switch and brake switch turn ON.)
  - Turn ON the "SET/COAST" switch.
  - Turn ON the "RES/ACC" switch.
  - Turn ON the "CANCEL" switch. (The "SET/COAST" and "RES/ACC" switch are turned ON at same time.)
  - Depress/release the clutch pedal. (MT model)
  - Set the shift lever to any position other than neutral. (MT model)
  - Place the select lever in any position other than "P" or "N". (AT model)

### **NOTE:**

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For details concerning DTCs, refer to the List of DTC. <Ref. to CC(ETC)(diag)-19, List of Diagnostic Trouble Code (DTC).>

## Diagnostics with Phenomenon

### CRUISE CONTROL SYSTEM (DIAGNOSTICS)

## 6. Diagnostics with Phenomenon

### A: DIAGNOSTIC PROCEDURE WITH PHENOMENON

| Phenomenon |  | Checking item                                  | Reference   |
|------------|--|--|---|
| 1          | Cruise control main switch is not turned to ON. (Cruise indicator light does not illuminate)           | (1) Check the cruise indicator light.          | <Ref. to CC(ETC)(diag)-13, CHECK CRUISE INDICATOR LIGHT, Diagnostics with Phenomenon.>  |
|            |  | (2) Check the cruise control command switch.   | <Ref. to CC(ETC)(diag)-22, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 2          | Cruise control cannot be set.  | (1) Check the cruise control command switch    | <Ref. to CC(ETC)(diag)-22, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
|            |  | (2) Check the stop light and brake switch.     | <Ref. to CC(ETC)(diag)-25, DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>    |
|            |  | (3) Check the clutch switch. (MT model)        | <Ref. to CC(ETC)(diag)-27, DTC 13 CLUTCH SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                |
|            |  | (4) Check the neutral position switch.         | <Ref. to CC(ETC)(diag)-29, DTC 14 NEUTRAL POSITION SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |
|            |  | (5) Check the vehicle speed sensor. (MT model) | <Ref. to CC(ETC)(diag)-35, DTC 22 AND 32 VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                  |
| 3          | Cruise set indicator light does not illuminate.  | Check the cruise set indicator light.          | <Ref. to CC(ETC)(diag)-16, CHECK CRUISE SET INDICATOR LIGHT, Diagnostics with Phenomenon.>  |
| 4          | Vehicle speed is not held within set speed $\pm 3$ km/h ( $\pm 2$ MPH).                                | Check the vehicle speed sensor.                | <Ref. to CC(ETC)(diag)-35, DTC 22 AND 32 VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                  |
| 5          | Vehicle speed does not increase or does not return to set speed after RES/ACC switch has been pressed. | Check the RES/ACC switch.                      | <Ref. to CC(ETC)(diag)-22, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 6          | Vehicle speed does not decrease after SET/COAST switch has been pressed.                               | Check the SET/COAST switch.                    | <Ref. to CC(ETC)(diag)-22, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 7          | Cruise control is not released after CANCEL switch has been pressed.                                   | Check the CANCEL switch.                       | <Ref. to CC(ETC)(diag)-22, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 8          | Cruise control is not released after the brake pedal has been depressed.                               | Check the stop light and brake switch.         | <Ref. to CC(ETC)(diag)-25, DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>    |
| 9          | Cruise control is not released after the clutch pedal has been depressed. (MT model)                   | Check the clutch switch.                       | <Ref. to CC(ETC)(diag)-27, DTC 13 CLUTCH SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                |
| 10         | Cruise control is not released after shifting to neutral position.                                     | Check the neutral position switch.             | <Ref. to CC(ETC)(diag)-29, DTC 14 NEUTRAL POSITION SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                      |

# Diagnostics with Phenomenon

## CRUISE CONTROL SYSTEM (DIAGNOSTICS)

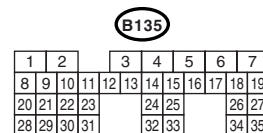
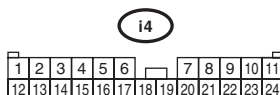
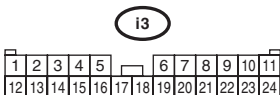
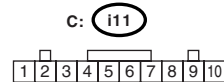
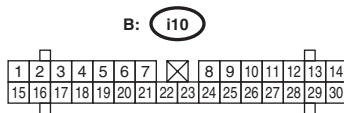
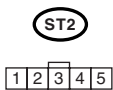
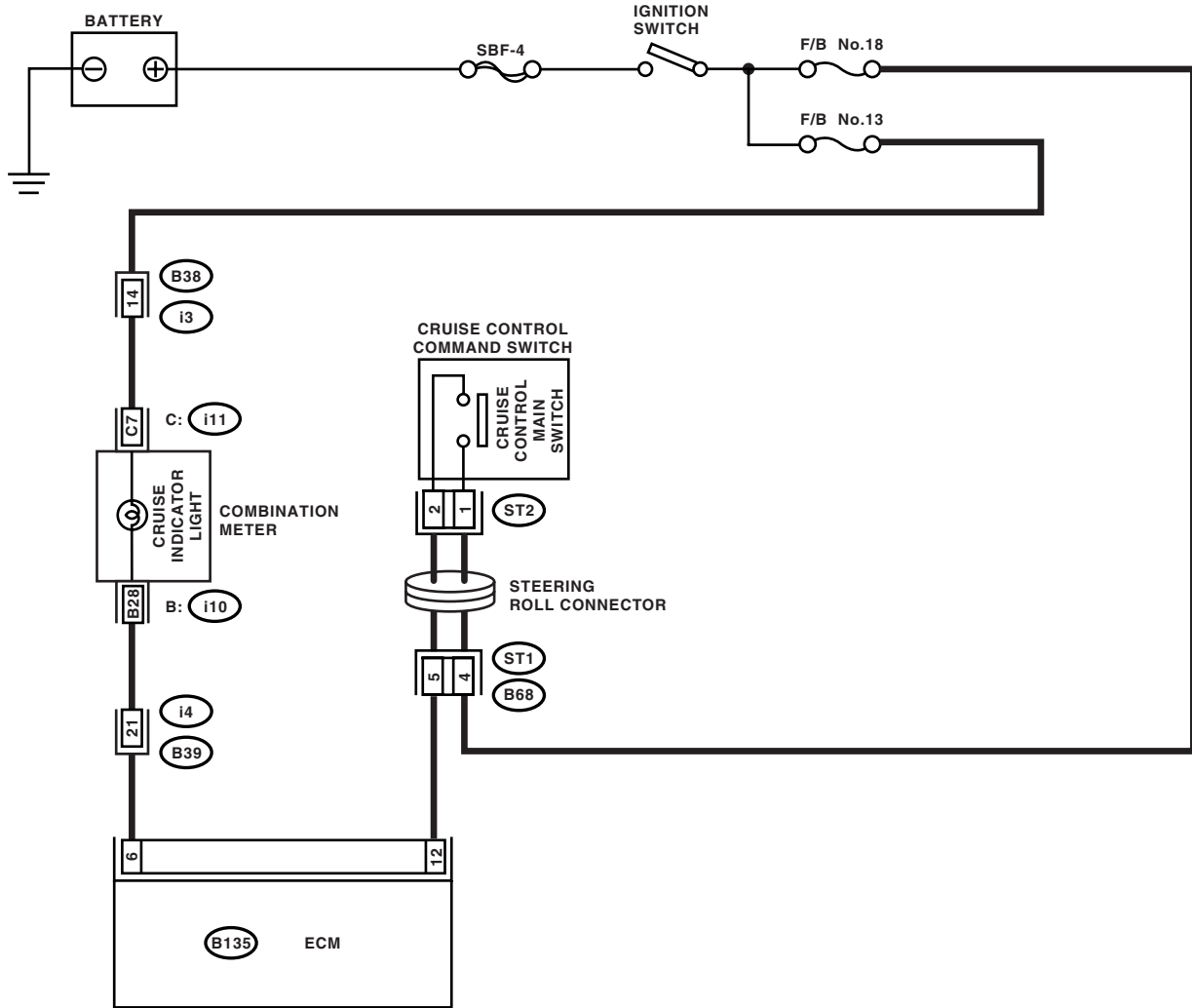
### B: CHECK CRUISE INDICATOR LIGHT

#### TROUBLE SYMPTOM:

Cruise control can be set, but cruise indicator light does not illuminate.

#### WIRING DIAGRAM:

- Non-turbo model

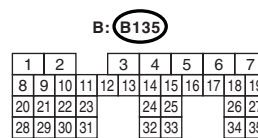
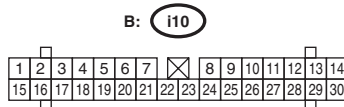
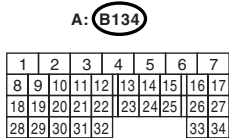
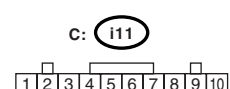
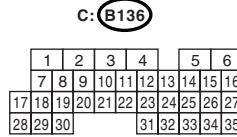
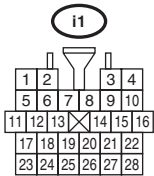
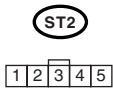
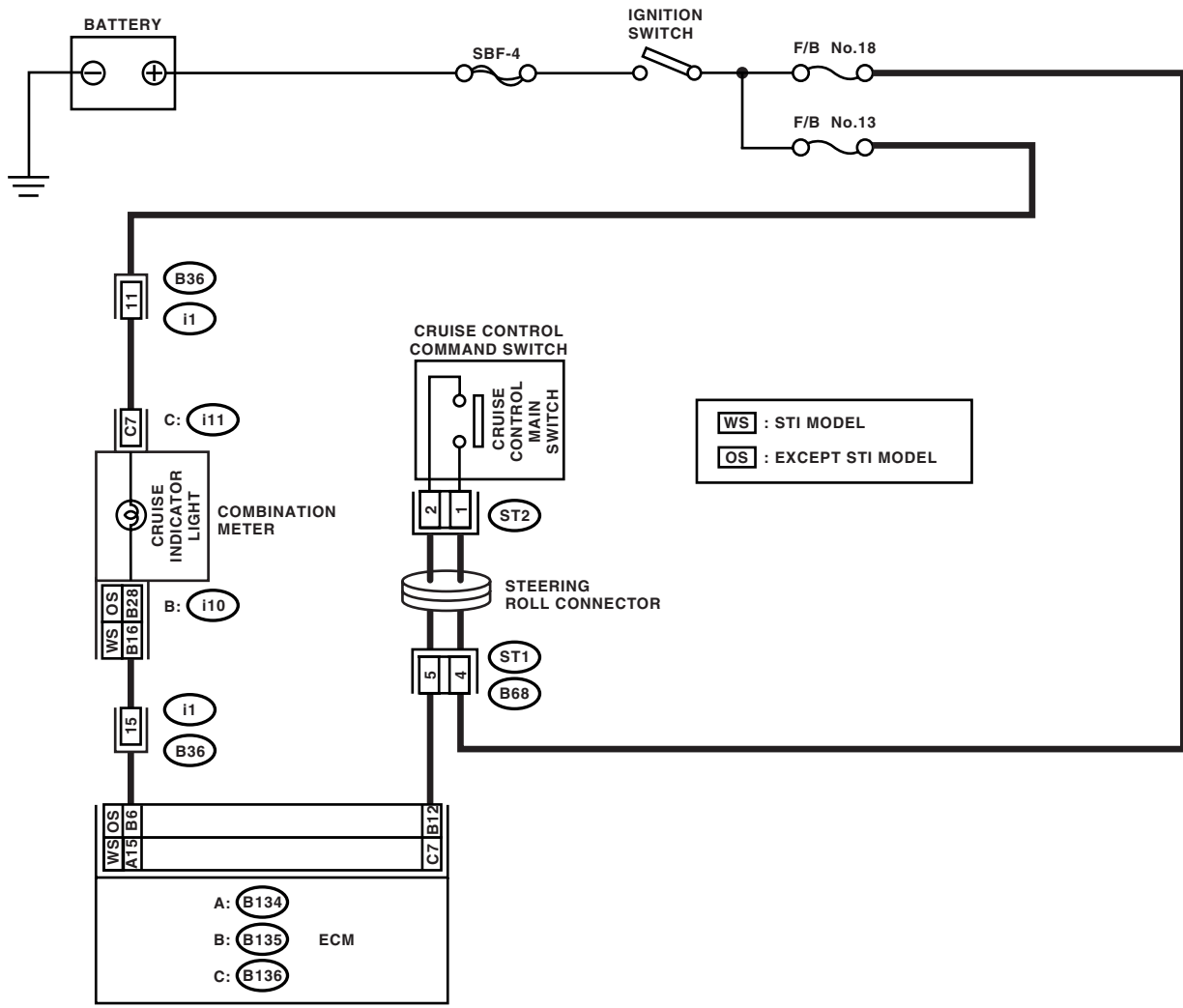


CC-00409

# Diagnostics with Phenomenon

## CRUISE CONTROL SYSTEM (DIAGNOSTICS)

- Turbo model and STI model



CC-00441

# Diagnostics with Phenomenon

## CRUISE CONTROL SYSTEM (DIAGNOSTICS)

| Step  | Check  | Yes   | No  |
|---|--|---|---|
| <p><b>1</b></p> <p><b>CHECK CRUISE INDICATOR LIGHT CIRCUIT.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the combination meter harness connector.<br/>                     3) Turn the ignition switch to ON.<br/>                     4) Measure the voltage between harness connector terminal and chassis ground.</p> <p><b>Connector &amp; terminal</b><br/> <i>(i11) No. 7 (+) — Chassis ground (-):</i></p>  | <p>Is the voltage more than 10 V?</p>                      | <p>Go to step 2.</p>                            | <ul style="list-style-type: none"> <li>• Check the fuse No. 13 (in fuse &amp; relay box).</li> <li>• Check the harness for open or short between combination meter and fuse &amp; relay box.</li> </ul> |
| <p><b>2</b></p> <p><b>CHECK CRUISE INDICATOR LIGHT CIRCUIT.</b></p> <p>1) Turn the ignition switch to OFF.<br/>                     2) Disconnect the ECM harness connector.<br/>                     3) Measure the resistance between ECM harness connector terminal and combination meter harness connector terminal.</p> <p><b>Connector &amp; terminal</b><br/> <b>Except STI model:</b><br/> <i>(B135) No. 6 — (i10) No. 28:</i><br/> <b>STI model:</b><br/> <i>(B134) No. 15 — (i10) No. 16:</i></p> | <p>Is the resistance less than 10 <math>\Omega</math>?</p> | <p>Go to step 3.</p>                            | <p>Repair the harness.</p>  |
| <p><b>3</b></p> <p><b>CHECK CRUISE INDICATOR LIGHT CIRCUIT.</b></p> <p>1) Turn the ignition switch to ON.<br/>                     2) Ground the ECM harness connector terminal with a wire.</p> <p><b>Connector &amp; terminal</b><br/> <b>Except STI model:</b><br/> <i>(B135) No. 6 — Chassis ground:</i><br/> <b>STI model:</b><br/> <i>(B134) No. 15 — Chassis ground:</i></p>   | <p>Does the cruise indicator light illuminate?</p>         | <p>Check the poor contact of ECM connector.</p> | <p>Replace the meter main assembly.</p>   |

# Diagnostics with Phenomenon

## CRUISE CONTROL SYSTEM (DIAGNOSTICS)

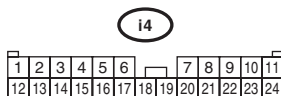
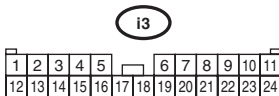
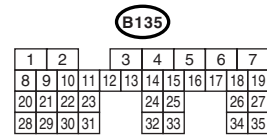
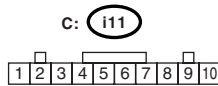
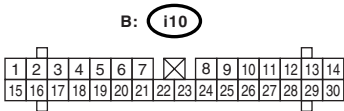
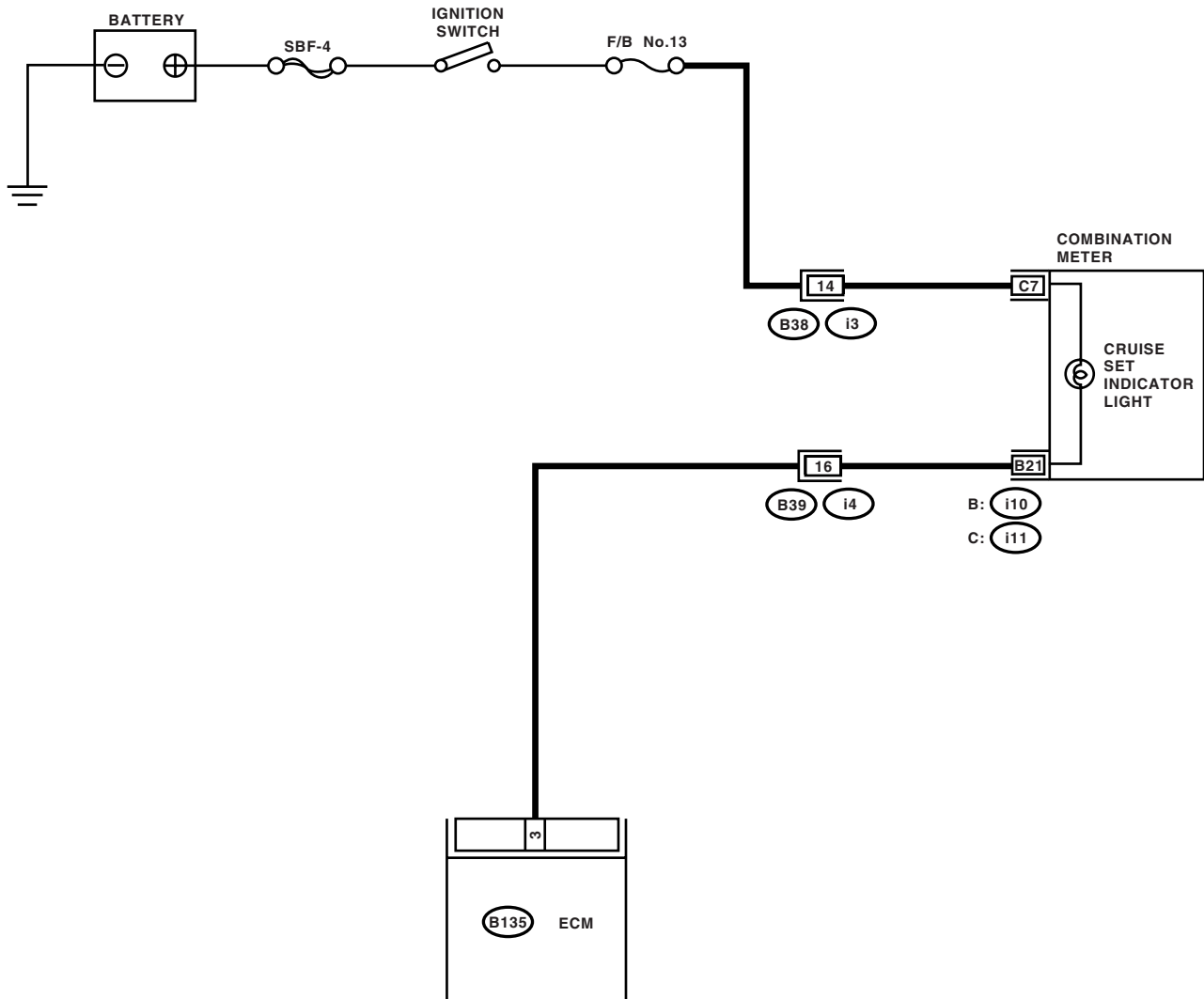
### C: CHECK CRUISE SET INDICATOR LIGHT

#### TROUBLE SYMPTOM:

Cruise control can be set, but cruise set indicator light does not illuminate.

#### WIRING DIAGRAM:

- Non-turbo model

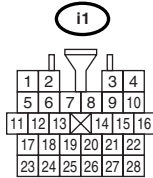
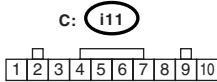
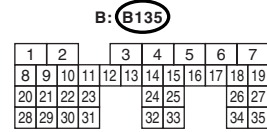
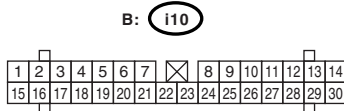
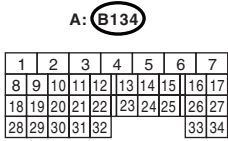
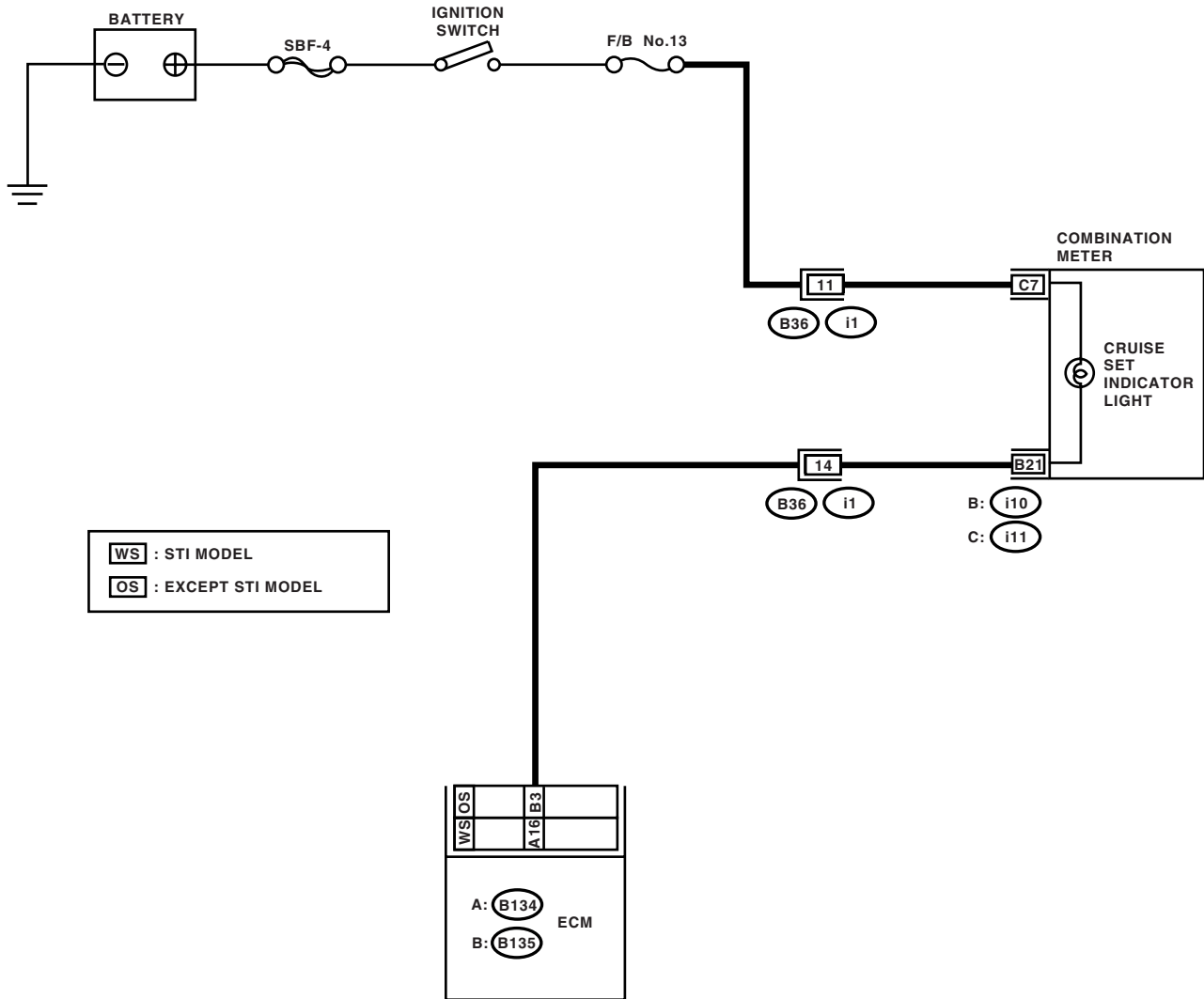


CC-00410

# Diagnostics with Phenomenon

## CRUISE CONTROL SYSTEM (DIAGNOSTICS)

- Turbo model and STI model



CC-00442



## Diagnostics with Phenomenon

### CRUISE CONTROL SYSTEM (DIAGNOSTICS)

| Step   | Check   | Yes                                      | No  |
|--|---|--|---|
| <b>1</b><br><b>CHECK CRUISE SET INDICATOR LIGHT CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the combination meter harness connector.<br>3) Measure the voltage between harness connector terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><i>(i11) No. 7 (+) — Chassis ground (-):</i>  | Is the voltage more than 10 V?                  | Go to step 2.                            | <ul style="list-style-type: none"> <li>• Check the fuse No. 13 (in fuse &amp; relay box).</li> <li>• Check the harness for open or short between combination meter and fuse &amp; relay box.</li> </ul> |
| <b>2</b><br><b>CHECK CRUISE SET INDICATOR LIGHT CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the ECM harness connector.<br>3) Measure the resistance between ECM harness connector terminal and combination meter harness connector terminal.<br><b>Connector &amp; terminal</b><br><b>Except STI model:</b><br><i>(i10) No. 21 — (B135) No. 3:</i><br><b>STI model:</b><br><i>(i10) No. 21 — (B134) No. 16:</i> | Is the resistance less than 10 $\Omega$ ?       | Go to step 3.                            | Repair the harness.   |
| <b>3</b><br><b>CHECK CRUISE SET INDICATOR LIGHT CIRCUIT.</b><br>1) Turn the ignition switch to ON.<br>2) Ground the ECM harness connector terminal with a wire.<br><b>Connector &amp; terminal</b><br><b>Except STI model:</b><br><i>(B135) No. 3 — Chassis ground:</i><br><b>STI model:</b><br><i>(B134) No. 16 — Chassis ground:</i>   | Does the cruise set indicator light illuminate? | Check the poor contact of ECM connector. | Replace the meter main assembly.  |

## List of Diagnostic Trouble Code (DTC)

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

### 7. List of Diagnostic Trouble Code (DTC)

#### A: LIST

| DTC | Item                        | Contents of diagnosis  | Reference   |
|-----|-----------------------------|--|---|
| 11  | Cruise control main switch  | Cruise control is released after the cruise control main switch of cruise control switch is turned to OFF. | This DTC is indicated without operating the cruise control main switch. <Ref. to CC(ETC)(diag)-22, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 12  | Stop light and brake switch | Cruise control is released after the stop light switch or brake switch is turned to ON.                    | This DTC is indicated without depressing the brake pedal. <Ref. to CC(ETC)(diag)-25, DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                  |
| 13  | Clutch switch (MT model)    | Cruise control is released after the clutch switch is turned to ON.  | This DTC is indicated without depressing the clutch pedal. <Ref. to CC(ETC)(diag)-27, DTC 13 CLUTCH SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| 14  | Neutral position switch     | Cruise control is released after the neutral position switch is turned to ON.                              | This DTC is indicated without shifting to neutral position. <Ref. to CC(ETC)(diag)-29, DTC 14 NEUTRAL POSITION SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                                  |
| 15  | CANCEL switch               | Cruise control is released after the CANCEL switch is turned to ON.  | This DTC is indicated without operating the CANCEL switch. <Ref. to CC(ETC)(diag)-22, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>              |
| 16  | Ignition switch             | Cruise control is released after the ignition switch is turned to OFF.                                     | This DTC is indicated without operating the ignition switch. <Ref. to CC(ETC)(diag)-33, DTC 16 IGNITION SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |

## List of Diagnostic Trouble Code (DTC)

### CRUISE CONTROL SYSTEM (DIAGNOSTICS)

| DTC | Item  | Contents of diagnosis   | Reference   |
|-----|---|---|---|
| 21  | Cruise control switch is abnormal when the ignition switch is turned to ON. | Each switch of cruise control command switch has already been ON when the ignition switch is turned to ON.  | This DTC is indicated without operating the cruise control main switch. <Ref. to CC(ETC)(diag)-22, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>   |
| 22  | Vehicle speed variation is abnormal.  | Abnormality of vehicle speed variation is detected.   | <Ref. to CC(ETC)(diag)-35, DTC 22 AND 32 VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| 23  | Engine-related sensor is abnormal.  | Abnormality related to engine is detected.  | H4SO model: <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.><br>STI model: <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.>  |
| 24  | Cruise control-related switch is abnormal.                                  | Abnormality of cruise control command switch is detected. (Open circuit is detected when continuing to be ON for an extremely long time [approx. two minutes].)   | This DTC is indicated with normal operation. <Ref. to CC(ETC)(diag)-22, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| 25  | Brake switch input circuit is abnormal.                                     | Abnormality of brake switch input circuit in ECM is detected.   | <Ref. to CC(ETC)(diag)-25, DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| 31  | Engine speed signal.  | <ul style="list-style-type: none"> <li>• Abnormal increase of engine speed is detected.</li> <li>• Gear is shifted to neutral, 1st or reverse position.</li> </ul>  | Cruise with more than 2nd shift position.   |
| 32  | Out of vehicle speed range of cruise control operation.                     | <ul style="list-style-type: none"> <li>• Vehicle speed becomes under the control limit during cruise driving.</li> <li>• Set operation is conducted out of vehicle speed range for setting</li> <li>• RES operation is conducted without vehicle speed memory.</li> </ul> | This DTC is also indicated when increasing the speed to the cruise set available vehicle speed and conducting the set operation again. <Ref. to CC(ETC)(diag)-35, DTC 22 AND 32 VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |

# List of Diagnostic Trouble Code (DTC)

## CRUISE CONTROL SYSTEM (DIAGNOSTICS)

| DTC | Item  | Contents of diagnosis  | Reference   |
|-----|---|--|---|
| 33  | Prohibition of WAIT after acceleration operation.               | Vehicle speed becomes over the control limit during cruise driving.  | This DTC is indicated when running at the high speed which is not suitable for cruise control. In this case, conduct the cruise set operation again after decreasing the speed to the cruise set available vehicle speed. |
| 34  | Prohibition when accelerator position is continued to be large. | Vehicle is driven at the higher speed than set vehicle speed for an extremely long time (approx. 10 minutes) during cruise driving.                      | This DTC is indicated when running for a long time at the higher speed than cruise set available vehicle speed by accelerator operation. In this case, release the cruise set.  |
| 35  | Prohibition when vehicle speed feedback is impossible.          | During cruise driving, set vehicle speed cannot be maintained for some reasons such as sharp upslope, parking brake and engine output abnormal decrease. | This DTC is indicated when the driving condition is not suitable for cruise control. Conduct the cruise set operation again after clearing the estimated reasons.   |

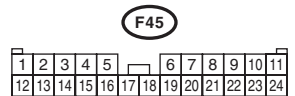
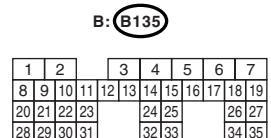
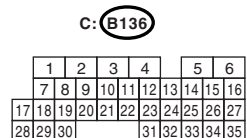
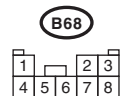
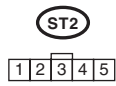
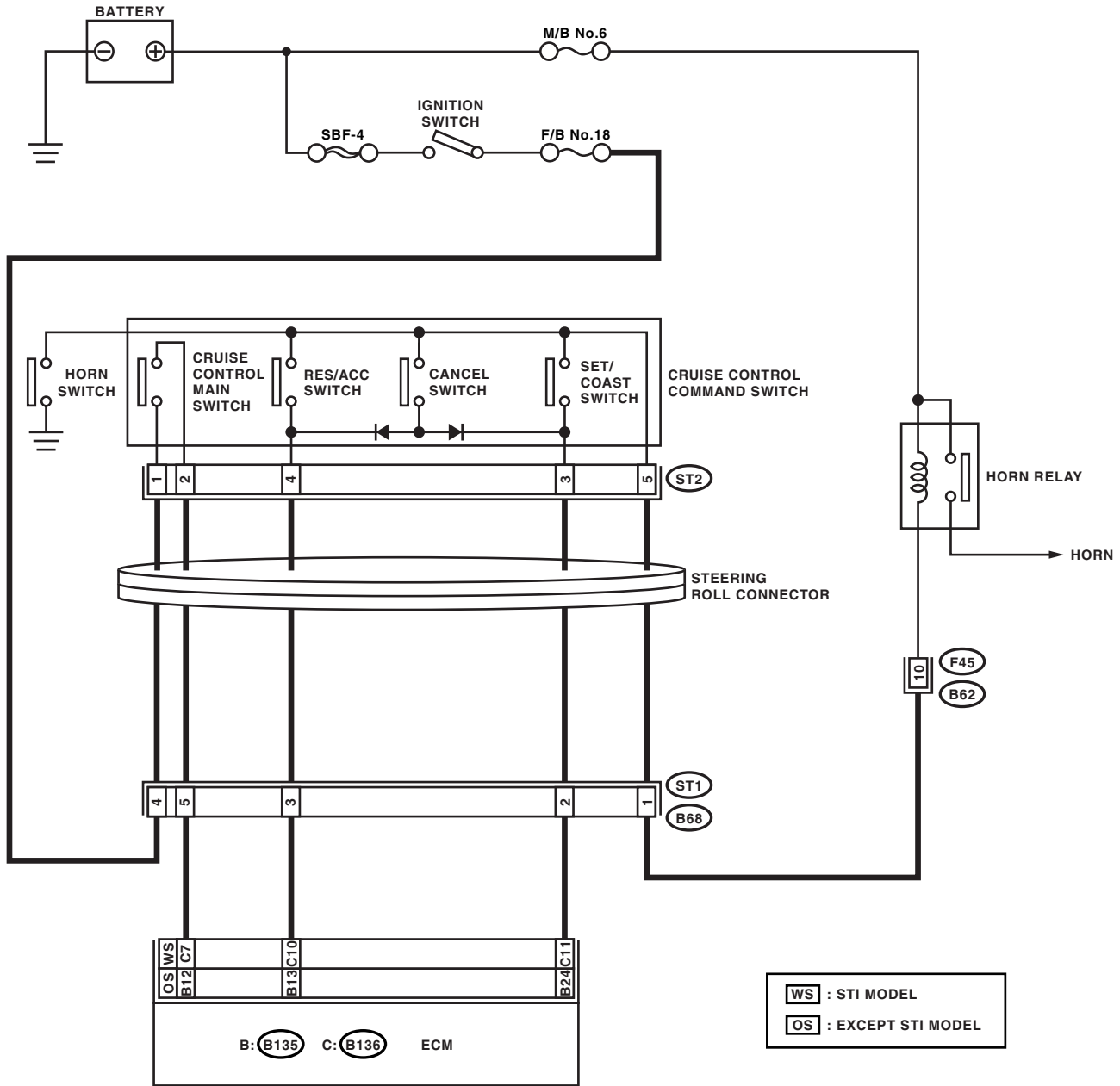
## 8. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### A: DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH

**TROUBLE SYMPTOM:**

- Cruise control cannot be set. (Cancelled immediately.)
- Cruise control cannot be released.

**WIRING DIAGRAM:**



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## CRUISE CONTROL SYSTEM (DIAGNOSTICS)

| Step  | Check  | Yes  | No   |
|---|--|--|--|
| <b>1 CHECK CRUISE CONTROL MAIN SWITCH CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the ECM harness connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between harness connector terminal and chassis ground when the cruise control main switch is pressed and is not pressed.<br><br><b>Connector &amp; terminal</b><br><b>Except STI model:</b><br>(B135) No. 12 (+) — Chassis ground (-);<br><b>STI model:</b><br>(B136) No. 7 (+) — Chassis ground (-); | Is the voltage 0 V when the cruise control main switch is not pressed? Is the voltage more than 10 V when the cruise control main switch is pressed? | Go to step 2.                                | <ul style="list-style-type: none"> <li>• Check the fuse No. 18 (in fuse &amp; relay box).</li> <li>• Check the harness for open or short between cruise control command switch and fuse &amp; relay box. If no malfunction is found after checking above, Go to step 6.</li> </ul> |
| <b>2 CHECK SET/COAST SWITCH CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the ECM harness connector.<br>3) Measure the voltage between harness connector terminal and chassis ground when SET/COAST switch is pressed and not pressed.<br><br><b>Connector &amp; terminal</b><br><b>Except STI model:</b><br>(B135) No. 24 (+) — Chassis ground (-);<br><b>STI model:</b><br>(B136) No. 11 (+) — Chassis ground (-);   | Is the voltage 0 V when SET/COAST switch is not pressed? Is the voltage more than 10 V when SET/COAST switch is pressed?                             | Go to step 3.                                | Go to step 5.  |
| <b>3 CHECK RES/ACC SWITCH CIRCUIT.</b><br>Measure the voltage between harness connector terminal and chassis ground when RES/ACC switch is pressed and not pressed.<br><br><b>Connector &amp; terminal</b><br><b>Except STI model:</b><br>(B135) No. 13 (+) — Chassis ground (-);<br><b>STI model:</b><br>(B136) No. 10 (+) — Chassis ground (-);   | Is the voltage 0 V when RES/ACC switch is not pressed? Is the voltage more than 10 V when RES/ACC switch is pressed?                                 | Go to step 4.                                | Go to step 5.  |
| <b>4 CHECK CANCEL SWITCH CIRCUIT.</b><br>Measure the voltage between harness connector terminal and chassis ground when CANCEL switch is pressed and not pressed.<br><br><b>Connector &amp; terminal</b><br><b>Except STI model:</b><br>(B135) No. 13 (+) — Chassis ground (-);<br>(B135) No. 24 (+) — Chassis ground (-);<br><b>STI model:</b><br>(B136) No. 10 (+) — Chassis ground (-);<br>(B136) No. 11 (+) — Chassis ground (-);   | Is the voltage 0 V when CANCEL switch is not pressed? Is the voltage more than 10 V when CANCEL switch is pressed?                                   | Cruise control command switch circuit is OK. | Go to step 5.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## CRUISE CONTROL SYSTEM (DIAGNOSTICS)

| Step  | Check                                    | Yes  | No   |
|---|--|--|--|
| <b>5</b><br><b>CHECK POWER SUPPLY FOR CRUISE CONTROL COMMAND SWITCH.</b><br>Check the horn operation.   | Does the horn sound?                     | Go to step 6.  | <ul style="list-style-type: none"><li>• Check the fuse No. 6 (in main fuse box).</li><li>• Check the horn relay. &lt;Ref. to COM-3, HORN RELAY, INSPECTION, Horn System.&gt;</li><li>• Check the harness for open or short between cruise control command switch and fuse &amp; relay box.</li></ul> |
| <b>6</b><br><b>CHECK CRUISE CONTROL COMMAND SWITCH.</b><br>Remove and check the cruise control switch. <Ref. to CC-7, Cruise Control Command Switch.> | Is the cruise control command switch OK? | Check the harness between cruise control command switch and ECM. | Replace the cruise control command switch.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

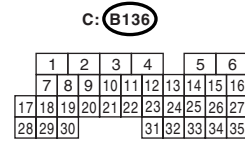
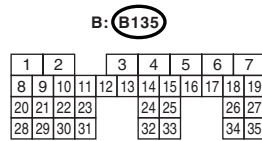
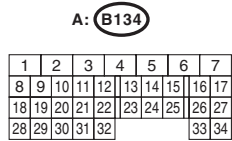
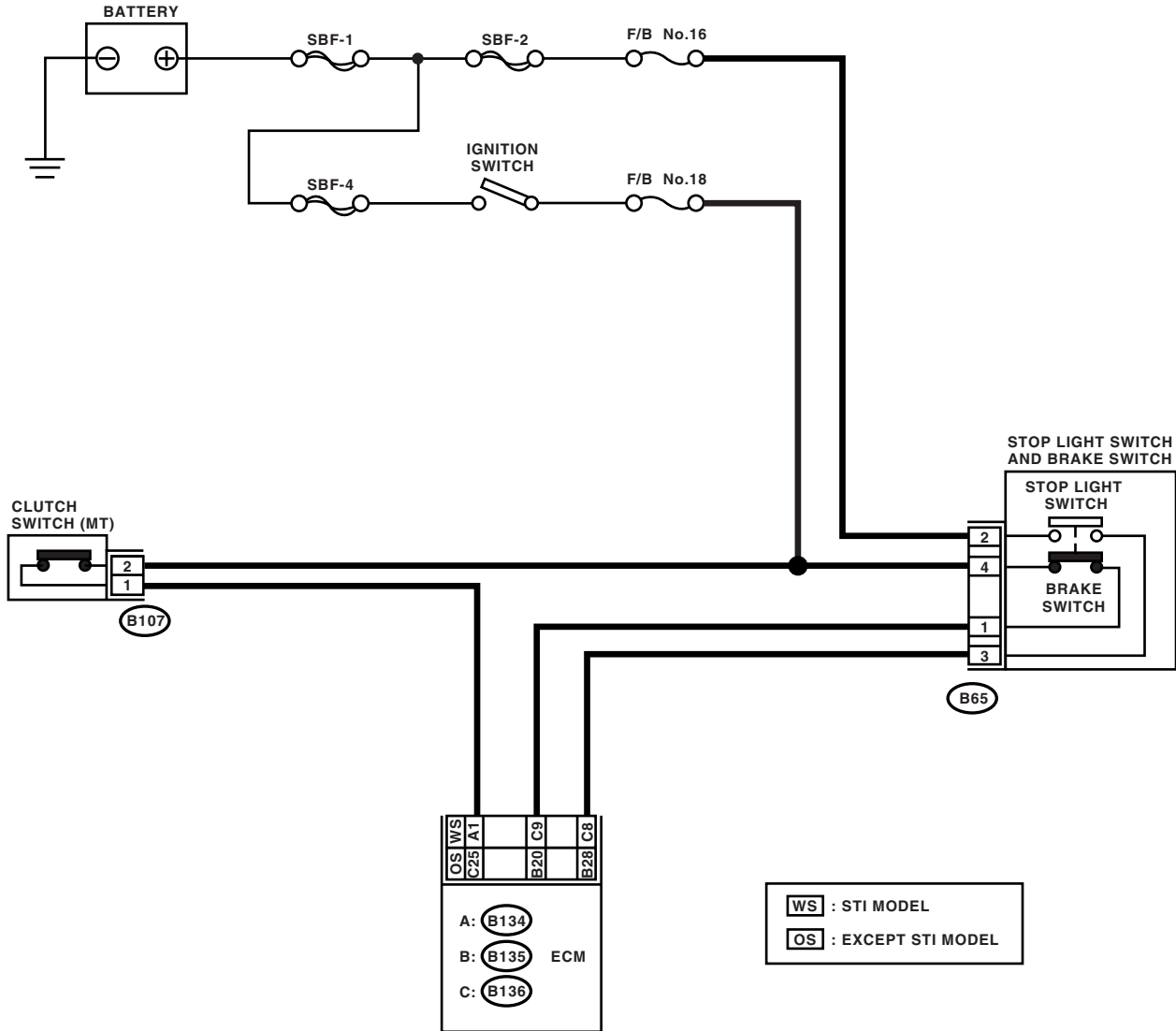
CRUISE CONTROL SYSTEM (DIAGNOSTICS)

## B: DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH

### TROUBLE SYMPTOM:

- Cruise control cannot be set.
- Cruise control cannot be released.

### WIRING DIAGRAM:



CC-00412



## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### CRUISE CONTROL SYSTEM (DIAGNOSTICS)

| Step  | Check                                     | Yes   | No  |
|---|---|---|---|
| <b>1 CHECK STOP LIGHT AND BRAKE SWITCH CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the stop light and brake switch harness connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between harness connector terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B65) No. 2 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10 V?            | Go to step 2.                               | <ul style="list-style-type: none"> <li>• Check the fuse No. 16 (in fuse &amp; relay box).</li> <li>• Check the harness for open or short between stop light and brake switch and fuse &amp; relay box.</li> </ul>   |
| <b>2 CHECK STOP LIGHT AND BRAKE SWITCH CIRCUIT.</b><br>Measure the voltage between harness connector terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B65) No. 4 (+) — Chassis ground (-):</b></i>  | Is the voltage more than 10 V?            | Go to step 3.                               | <ul style="list-style-type: none"> <li>• Check the fuse No. 18 (in fuse &amp; relay box).</li> <li>• Check the harness for open or short between stop light and brake switch and fuse &amp; relay box.</li> <li>• Check the clutch switch and circuit.</li> </ul> |
| <b>3 CHECK STOP LIGHT AND BRAKE SWITCH CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the ECM harness connector.<br>3) Measure the resistance between ECM harness connector terminal and stop light and brake switch harness connector terminal.<br><i><b>Connector &amp; terminal</b></i><br><i><b>Except STI model:</b></i><br><i><b>(B135) No. 28 — (B65) No. 3:</b></i><br><i><b>(B135) No. 20 — (B65) No. 1:</b></i><br><i><b>STI model:</b></i><br><i><b>(B136) No. 8 — (B65) No. 3:</b></i><br><i><b>(B136) No. 9 — (B65) No. 1:</b></i> | Is the resistance less than 10 $\Omega$ ? | Go to step 4.                               | Repair the harness.   |
| <b>4 CHECK STOP LIGHT AND BRAKE SWITCH.</b><br>Remove and check the stop light switch and brake switch. <Ref. to CC-8, Stop Light and Brake Switch.>  | Are the stop light and brake switch OK?   | Stop light and brake switch circuit are OK. | Replace the stop light and brake switch.  |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

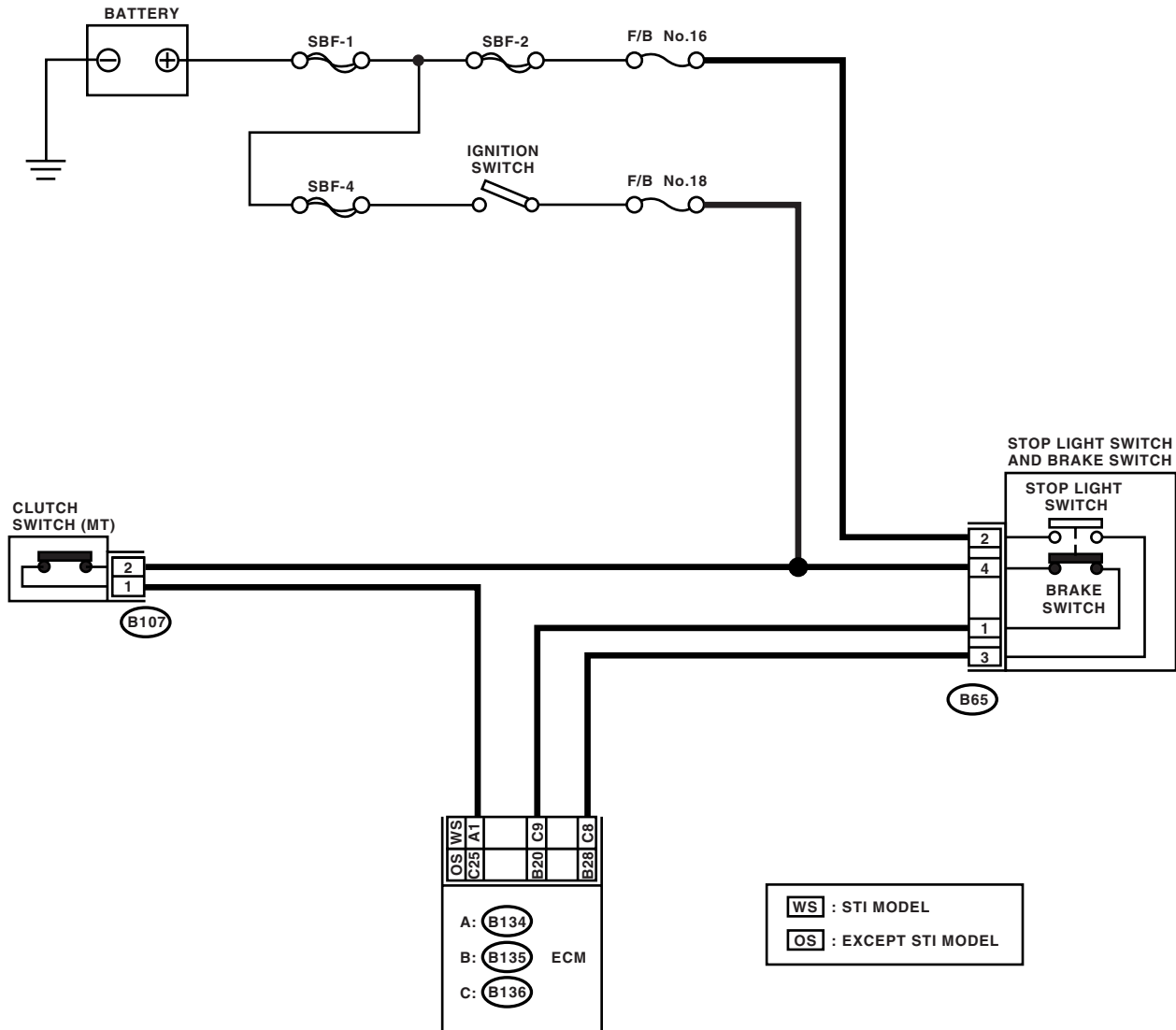
## CRUISE CONTROL SYSTEM (DIAGNOSTICS)

### C: DTC 13 CLUTCH SWITCH

#### TROUBLE SYMPTOM:

- Cruise control cannot be set.
- Cruise control cannot be released.

#### WIRING DIAGRAM:



**B107**



**B65**



**A: B134**



**B: B135**



**C: B136**



CC-00412

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### CRUISE CONTROL SYSTEM (DIAGNOSTICS)

| Step  | Check                                     | Yes                          | No   |
|---|---|------------------------------|--|
| <b>1</b><br><b>CHECK CLUTCH SWITCH CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the clutch switch harness connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between harness connector terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B107) No. 2 (+) — Chassis ground (-):</b>   | Is the voltage more than 10 V?            | Go to step 2.                | <ul style="list-style-type: none"> <li>• Check the fuse No. 18 (fuse &amp; relay box).</li> <li>• Check the harness for open or short between clutch switch and fuse &amp; relay box.</li> </ul> |
| <b>2</b><br><b>CHECK CLUTCH SWITCH CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the ECM harness connector.<br>3) Measure the resistance between clutch switch harness connector terminal and ECM harness connector terminal.<br><b>Connector &amp; terminal</b><br><b>Except STI model:</b><br><b>(B107) No. 1 — (B136) No. 25:</b><br><b>STI model:</b><br><b>(B107) No. 1 — (B134) No. 1:</b> | Is the resistance less than 10 $\Omega$ ? | Go to step 3.                | Repair the harness.  |
| <b>3</b><br><b>CHECK CLUTCH SWITCH.</b><br>Remove and check the clutch switch. <Ref. to CC-9, Clutch Switch.>   | Is the clutch switch OK?                  | Clutch switch circuit is OK. | Replace the clutch switch.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

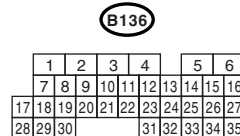
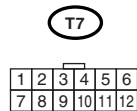
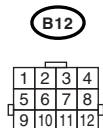
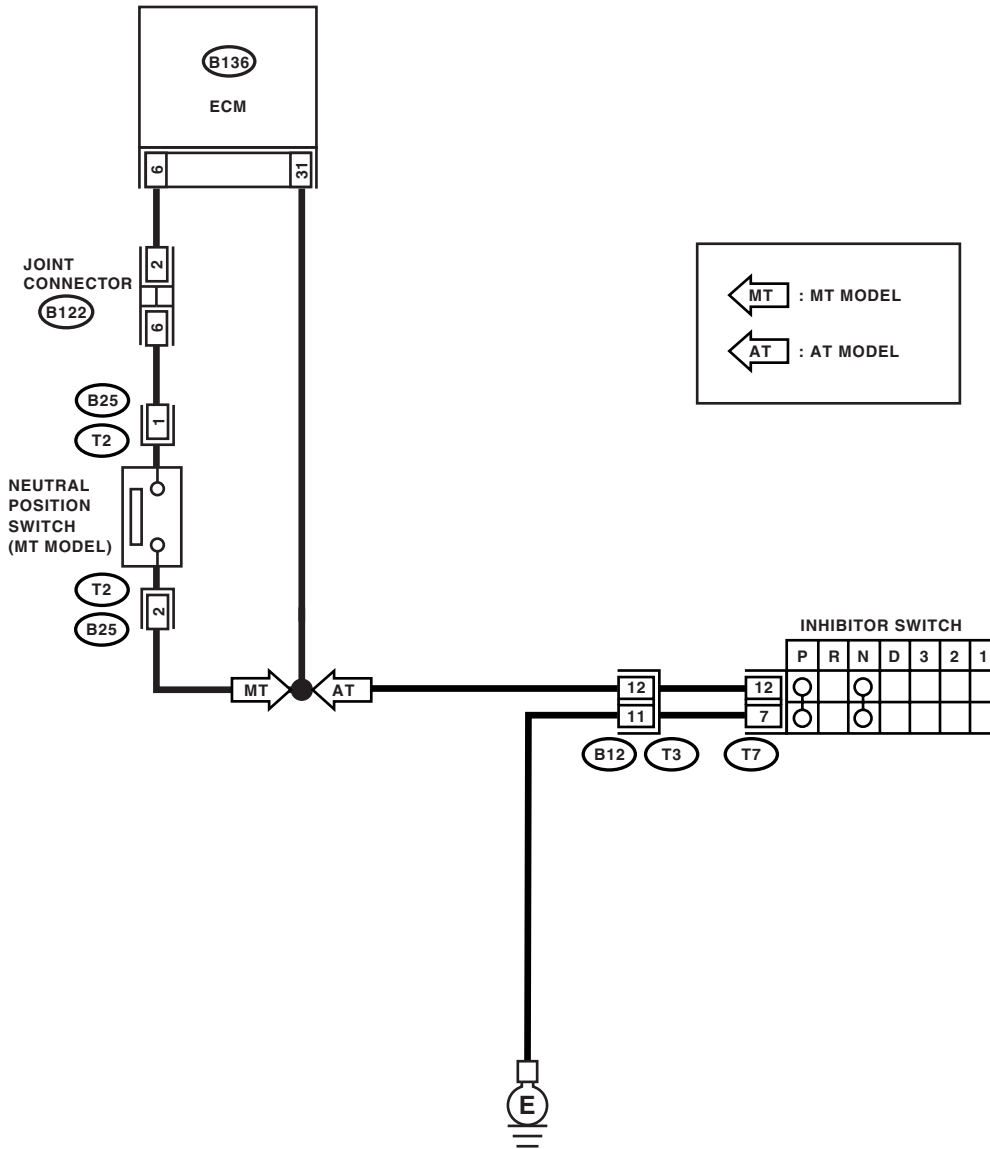
## D: DTC 14 NEUTRAL POSITION SWITCH

### TROUBLE SYMPTOM:

Cruise control cannot be set.

### WIRING DIAGRAM:

- Non-turbo model

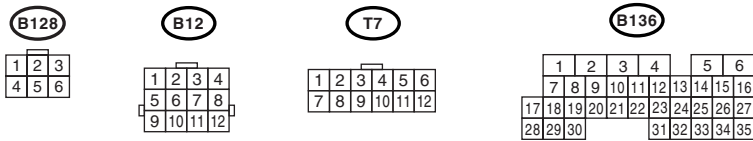
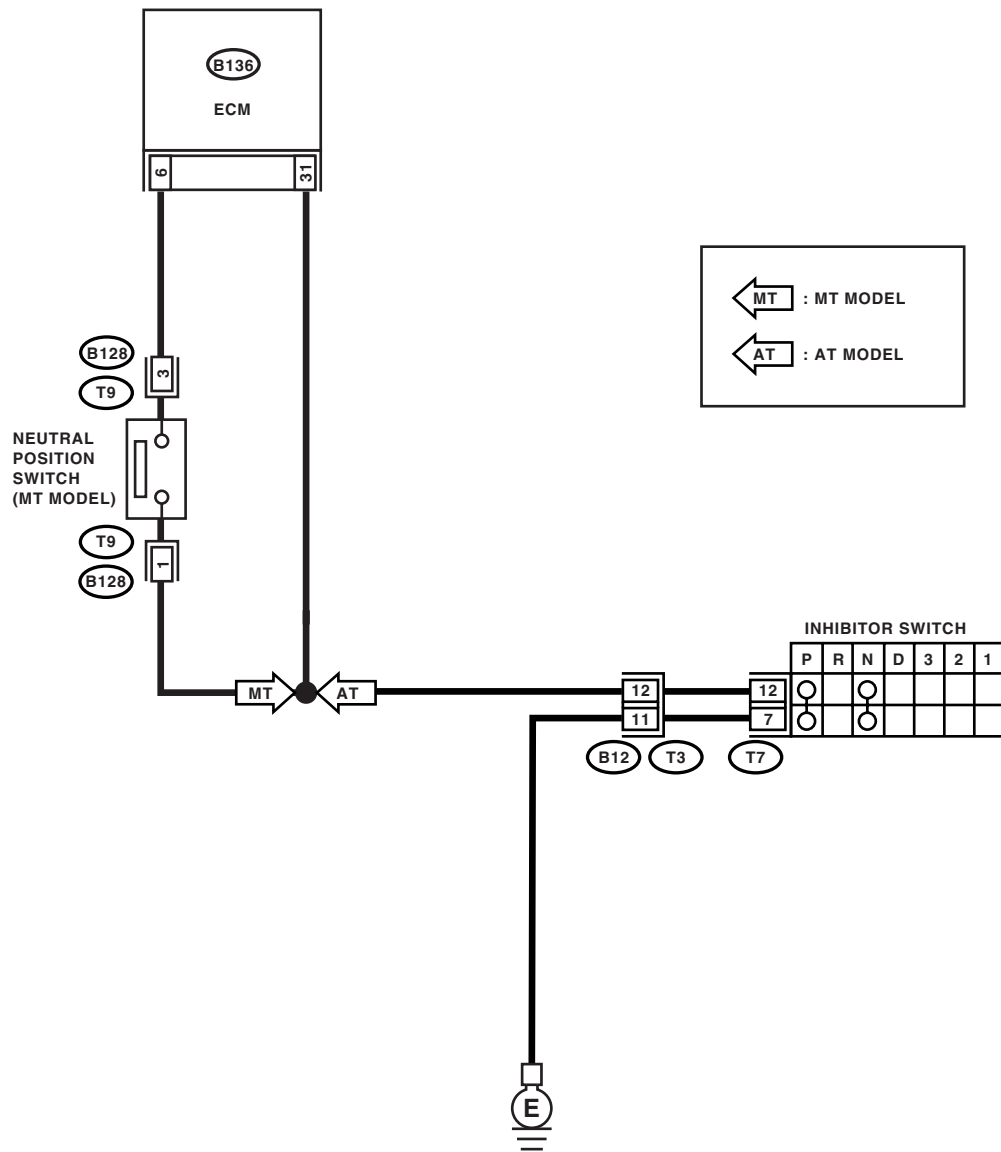


CC-00443

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## CRUISE CONTROL SYSTEM (DIAGNOSTICS)

- Turbo model

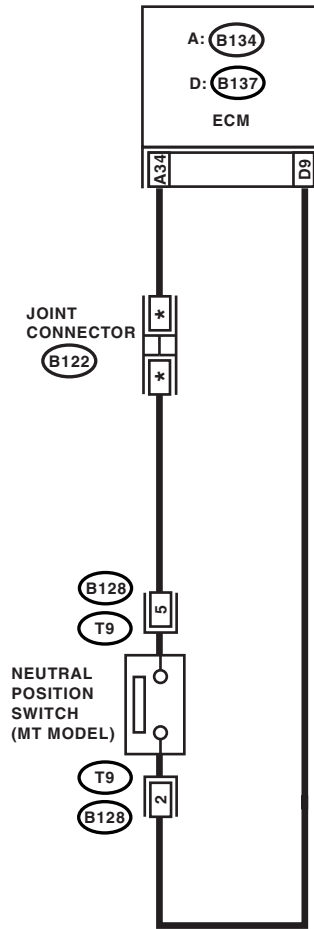


CC-00444

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## CRUISE CONTROL SYSTEM (DIAGNOSTICS)

- STI model



\* : TERMINAL No. RANDOM ARRANGEMENT

**B128**

|   |   |   |
|---|---|---|
| 1 | 2 | 3 |
| 4 | 5 | 6 |

**B122**

|   |   |   |
|---|---|---|
| 1 | 2 | 3 |
| 4 | 5 | 6 |

**A: B134**

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |    |    |    |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | 32 |    |    | 33 | 34 |    |

**D: B137**

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |    |    |    |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 |    |    | 24 | 25 |
| 26 | 27 |    |    | 28 | 29 |    |    | 30 | 31 |

CC-00445

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### CRUISE CONTROL SYSTEM (DIAGNOSTICS)

| Step     | Check   | Yes  | No   |
|----------|---|--|--|
| <b>1</b> | <b>CHECK TRANSMISSION TYPE.</b>   | Go to step 2.  | Go to step 5.  |
| <b>2</b> | <b>CHECK INHIBITOR SWITCH CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the inhibitor switch harness connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between harness connector terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(T7) No. 12 (+) — Chassis ground (-):</b>  | Go to step 3.  | Check the harness for open or short between inhibitor switch and ECM.        |
| <b>3</b> | <b>CHECK INHIBITOR SWITCH CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the starter motor harness connector.<br>3) Measure the resistance between inhibitor switch harness connector terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(T7) No. 7 — Chassis ground:</b>  | Repair the harness.  | Go to step 4.  |
| <b>4</b> | <b>CHECK INHIBITOR SWITCH.</b><br>Remove and check the inhibitor switch. <Ref. to CC-10, Inhibitor Switch.>   | Replace the ECM. <Ref. to FU(H4SO)-38, Engine Control Module (ECM).> | Replace the inhibitor switch.  |
| <b>5</b> | <b>CHECK NEUTRAL POSITION SWITCH CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the neutral position switch harness connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between harness connector terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>Non-turbo model:</b><br><b>(B25) No. 1 (+) — Chassis ground (-):</b><br><b>Turbo model:</b><br><b>(B128) No. 1 (+) — Chassis ground (-):</b><br><b>STI model:</b><br><b>(B128) No. 2 (+) — Chassis ground (-):</b> | Go to step 6.  | Check the harness for open or short between neutral position switch and ECM. |
| <b>6</b> | <b>CHECK NEUTRAL POSITION SWITCH CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between neutral position switch harness connector terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>Non-turbo model:</b><br><b>(B25) No. 2 — Chassis ground:</b><br><b>Turbo model:</b><br><b>(B128) No. 3 — Chassis ground:</b><br><b>STI model:</b><br><b>(B128) No. 5 — Chassis ground:</b>  | Go to step 7.  | Repair the harness.  |
| <b>7</b> | <b>CHECK NEUTRAL POSITION SWITCH.</b><br>Remove and check the neutral position switch. <Ref. to CC-11, Neutral Position Switch.>  | Neutral position switch circuit is OK.                               | Replace the neutral position switch.   |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

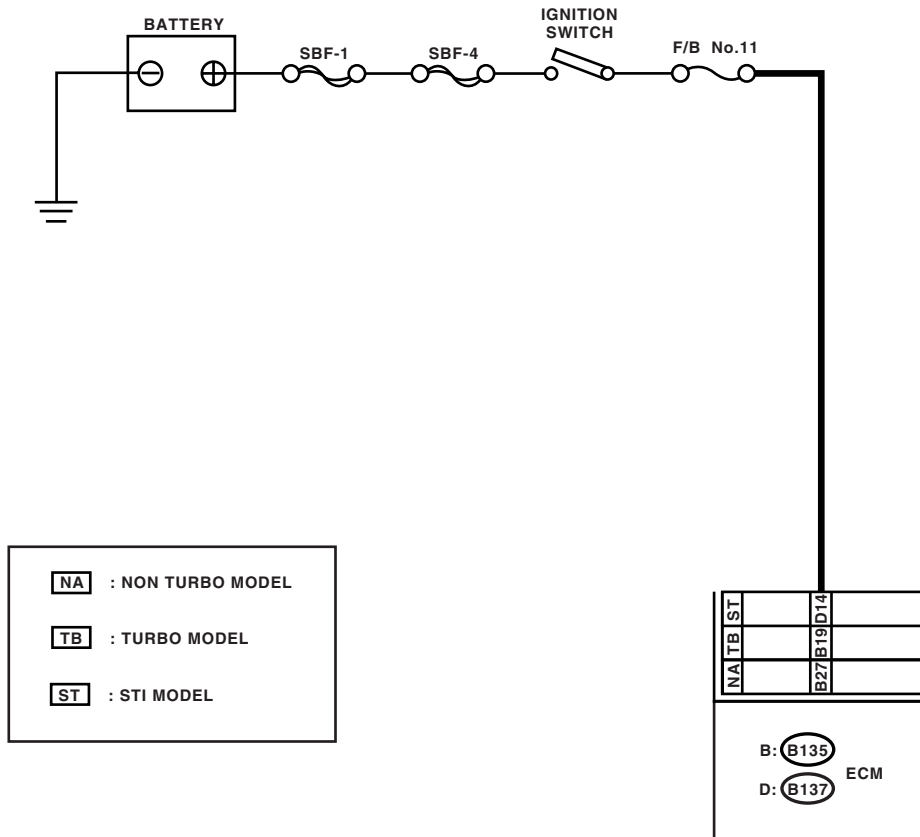
CRUISE CONTROL SYSTEM (DIAGNOSTICS)

## E: DTC 16 IGNITION SWITCH

### TROUBLE SYMPTOM:

Cruise control cannot be set.

### WIRING DIAGRAM:



D: B137

|    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 |    |    |    |    |

B: B135

|    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 | 32 | 33 | 34 | 35 |

CC-00414



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## CRUISE CONTROL SYSTEM (DIAGNOSTICS)

| Step  | Check                          | Yes                                      | No   |
|---|--------------------------------|--|--|
| <b>1</b><br><b>CHECK IGNITION SWITCH CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the ECM harness connector.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between harness connector terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>Non-turbo model:</b><br><i>(B135) No. 27 (+) — Chassis ground (-):</i><br><b>Turbo model:</b><br><i>(B135) No. 19 (+) — Chassis ground (-):</i><br><b>STI model:</b><br><i>(B137) No. 14 (+) — Chassis ground (-):</i> | Is the voltage more than 10 V? | Check the poor contact of ECM connector. | <ul style="list-style-type: none"><li>• Check the fuse No. 11 (fuse &amp; relay box).</li><li>• Check the harness for open or short between ignition switch and ECM.</li></ul> |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

## F: DTC 22 AND 32 VEHICLE SPEED SENSOR

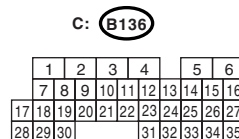
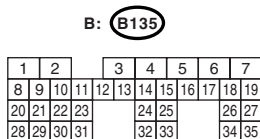
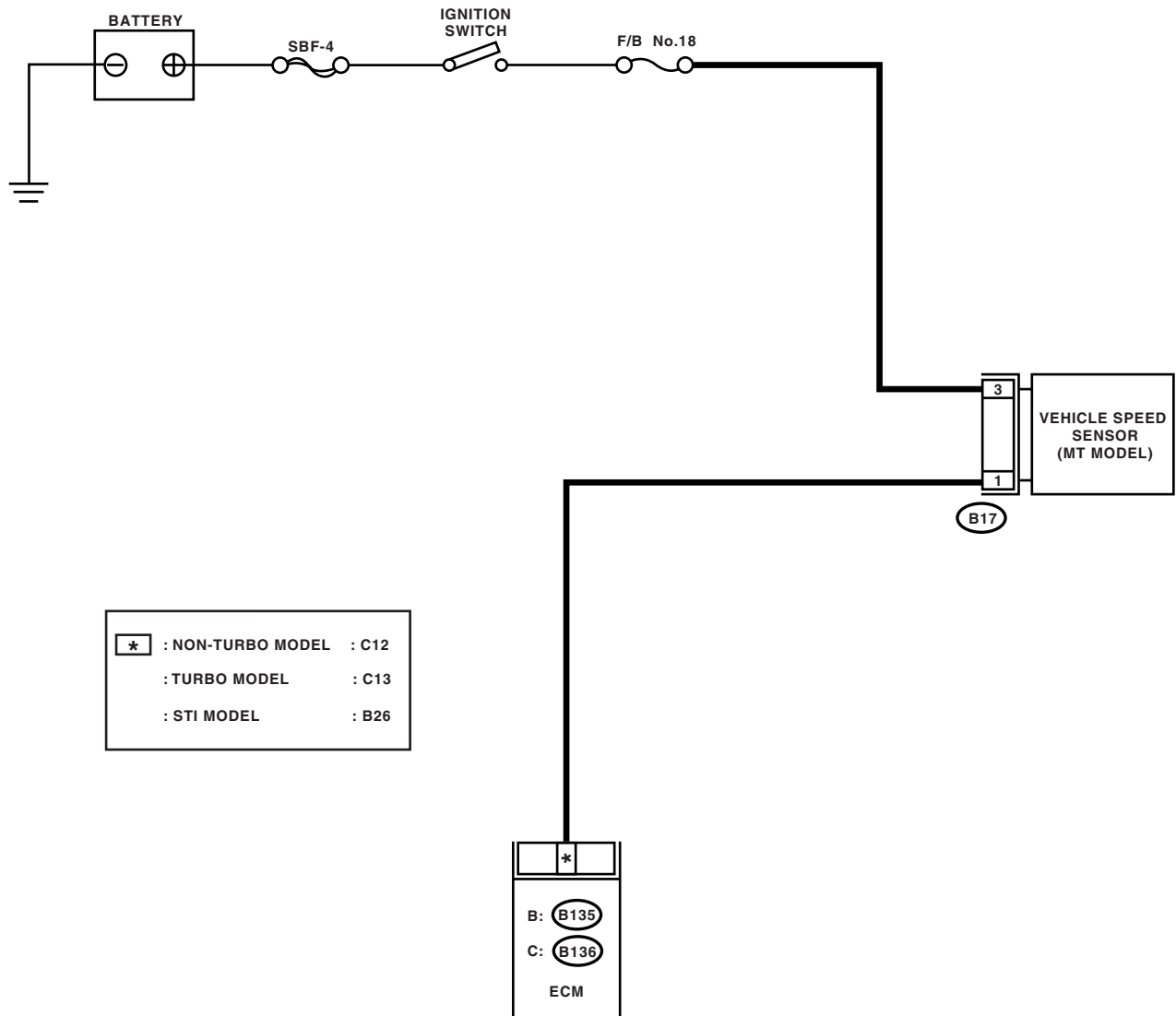
### DIAGNOSIS:

Open or short circuit of vehicle speed sensor system.

### TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

### WIRING DIAGRAM:



CC-00388

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## CRUISE CONTROL SYSTEM (DIAGNOSTICS)

| Step  | Check   | Yes                                      | No   |
|---|---|--|--|
| <b>1 CHECK HARNESS BETWEEN BATTERY AND VEHICLE SPEED SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the harness connector from vehicle speed sensor.<br>3) Turn the ignition switch to ON.<br>4) Measure the voltage between vehicle speed sensor harness connector terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B17) No. 3 (+) — Chassis ground (-):</b>  | Is the voltage more than 10 V?                    | Go to step 2.                            | Check the harness for open or short between fuse and vehicle speed sensor. |
| <b>2 CHECK HARNESS BETWEEN ECM AND VEHICLE SPEED SENSOR.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the harness connector from ECM.<br>3) Measure the resistance between vehicle speed sensor harness connector terminal and ECM harness connector terminal.<br><b>Connector &amp; terminal</b><br><b>(B17) No. 1 — (B135) No. 27:</b>   | Is the resistance less than 10 $\Omega$ ?         | Go to step 3.                            | Repair the harness.  |
| <b>3 CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between vehicle speed sensor harness connector terminal and engine ground.<br><b>Connector &amp; terminal</b><br><b>(B17) No. 2 — Engine ground:</b>   | Is the resistance less than 10 $\Omega$ ?         | Go to step 4.                            | Repair the harness.  |
| <b>4 CHECK VEHICLE SPEED SENSOR.</b><br>1) Connect the harness connector to vehicle speed sensor.<br>2) Lift-up the vehicle.<br>3) Drive the vehicle at speed greater than 20 km/h (12 MPH).<br><b>Warning:</b><br><b>Be careful not to be caught up by the running wheels.</b><br>4) Measure the voltage between ECM harness connector terminal and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B135) No. 27 (+) — Chassis ground (-):</b> | Is the voltage less than 1 V<br>←→ more than 5 V? | Check the poor contact of ECM connector. | Replace the vehicle speed sensor.  |

# IMMOBILIZER (DIAGNOSTICS)

## *IM(diag)*

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|   | <b>Page</b> |
|---|-------------|
| 1. Basic Diagnostic Procedure .....                               | 2           |
| 2. General Description .....                                      | 3           |
| 3. Electrical Component Location .....                            | 5           |
| 4. Immobilizer Control Module I/O Signal.....                     | 6           |
| 5. Subaru Select Monitor.....                                     | 7           |
| 6. Read Diagnostic Trouble Code (DTC) .....                       | 8           |
| 7. Clear Memory Mode.....   | 9           |
| 8. Diagnostics Chart for Security Indicator Light.....            | 10          |
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| 10. Diagnostic Procedure with Diagnostic Trouble Code (DTC) ..... | 15          |

# Basic Diagnostic Procedure

IMMOBILIZER (DIAGNOSTICS)

## 1. Basic Diagnostic Procedure

### A: PROCEDURE

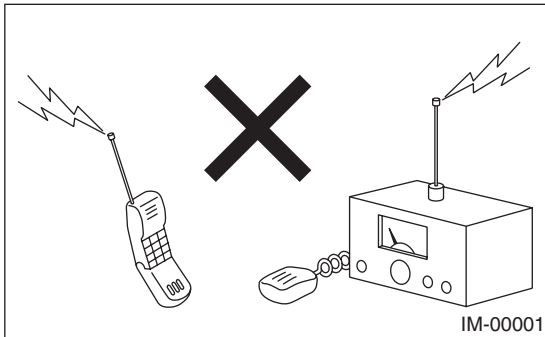
| Step   | Check  | Yes  | No   |
|--|--|--|--|
| <b>1 CHECK ILLUMINATION OF SECURITY INDICATOR LIGHT.</b><br>1) Turn the ignition switch to OFF or ACC position.<br>2) Wait at least 60 seconds.  | Does the security indicator light blink?   | Go to step 2.  | Check the security indicator light circuit. <Ref. to IM(diag)-10, CHECK SECURITY INDICATOR LIGHT CIRCUIT, INSPECTION, Diagnostics Chart for Security Indicator Light.> |
| <b>2 CHECK ILLUMINATION OF SECURITY INDICATOR LIGHT.</b><br>Remove the key from ignition switch.   | Does the security indicator light begin to blink within 1 second after the key is removed? | Go to step 3.  | Check the key switch circuit. <Ref. to IM(diag)-12, CHECK KEY SWITCH CIRCUIT, INSPECTION, Diagnostics Chart for Security Indicator Light.>                             |
| <b>3 CHECK ENGINE START.</b><br>Turn the ignition switch to START position.  | Does the engine start?   | Go to step 4.  | Go to step 5.  |
| <b>4 CHECK ILLUMINATION OF SECURITY INDICATOR LIGHT.</b><br>Turn the ignition switch to ON.  | Does the security indicator light illuminate?  | Check the security indicator light circuit. <Ref. to IM(diag)-10, CHECK SECURITY INDICATOR LIGHT CIRCUIT, INSPECTION, Diagnostics Chart for Security Indicator Light.> | Immobilizer system is normal.  |
| <b>5 CHECK INDICATION OF DTC ON DISPLAY.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the Subaru Select Monitor to data link connector. <Ref. to IM(diag)-7, Subaru Select Monitor.><br>3) Turn the ignition switch and Subaru Select Monitor switch to ON.<br>4) Read any DTC on the display. | Are DTCs indicated on display?   | Go to step 6.  | Repair the related parts.  |
| <b>6 PERFORM THE DIAGNOSIS.</b><br>1) Inspect using "Diagnostics Chart with Trouble Code". <Ref. to IM(diag)-15, Diagnostic Procedure with Diagnostic Trouble Code (DTC).><br>2) Repair the trouble cause.<br>3) Perform the clear memory mode.<br>4) Read any DTC again.                                  | Are DTCs indicated on display?   | Inspect using "Diagnostic Procedure with Diagnostic Trouble Code (DTC)". <Ref. to IM(diag)-15, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>               | Finish the diagnostics.  |

## 2. General Description

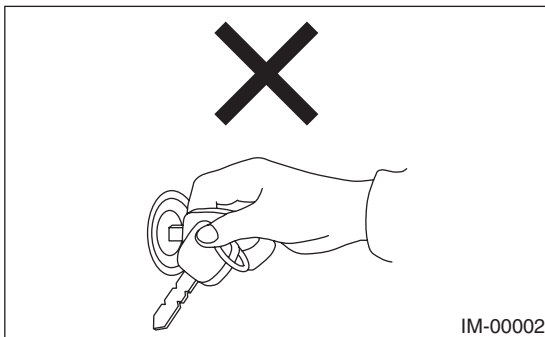
### A: CAUTION

#### CAUTION:

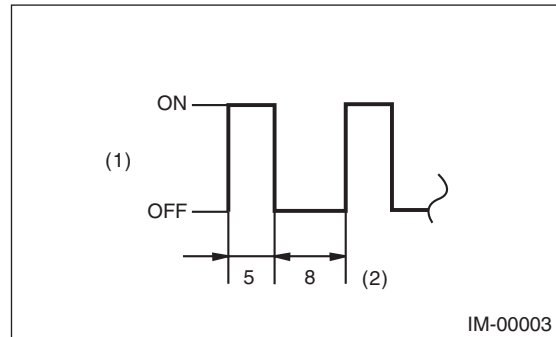
- The airbag system wiring harnesses routed near the immobilizer control module. Airbag system connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the immobilizer control module.
- While diagnostic items are being checked, do not operate radios, portable telephones, etc. which emit electromagnetic waves near or inside the vehicle.



- When the ignition switch is being turned ON or OFF while diagnostic items are being checked, do not allow keys with different ID codes close to the ignition switch. If the ignition key is in a key holder, remove it from the holder before carrying out diagnoses.



- When repeatedly turning the ignition switch to ON or OFF while diagnostic items are being checked, it should be switched in cycles of "ON" for at least 5 seconds → "OFF" for at least 8 seconds.



(1) Ignition switch position

(2) Sec.

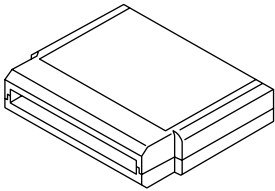

- If the engine fails to start with a registered ignition key, detach the ignition key from ignition switch and wait for approx. 1 second until security indicator light begins to flash. And then start the engine again.
- Before checking the diagnostic items, obtain all keys and security ID for the vehicle to be checked possessed by owner.

# General Description

IMMOBILIZER (DIAGNOSTICS)

## B: PREPARATION TOOL

### 1. SPECIAL TOOL

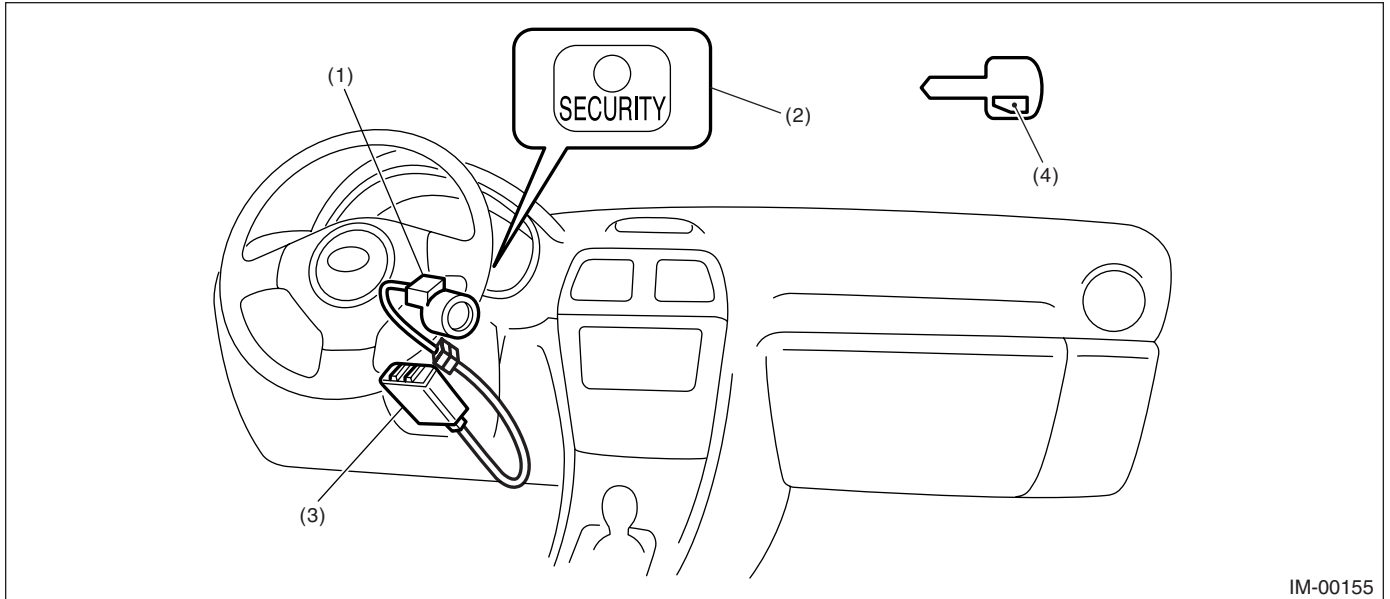
| ILLUSTRATION   | TOOL NUMBER                        | DESCRIPTION                  | REMARKS                                |
|--|------------------------------------|------------------------------|--|
| <br><br>ST18482AA010  | 18482AA010<br>(Newly adopted tool) | CARTRIDGE                    | Troubleshooting for electrical system. |
| <br><br>ST22771AA030 | 22771AA030                         | SUBARU SELECT<br>MONITOR KIT | Troubleshooting for electrical system. |

### 2. GENERAL TOOL

| TOOL NAME      | REMARKS  |
|----------------|--|
| Circuit tester | Used for measuring resistance, voltage and ampere. |

## 3. Electrical Component Location

### A: LOCATION



IM-00155

- (1) Antenna
- (2) Security indicator light (LED bulb)
- (3) Immobilizer control module (IMM ECM)
- (4) Transponder



## Immobilizer Control Module I/O Signal

IMMOBILIZER (DIAGNOSTICS)

---

### 4. Immobilizer Control Module I/O Signal

#### A: WIRING DIAGRAM

##### 1. IMMOBILIZER

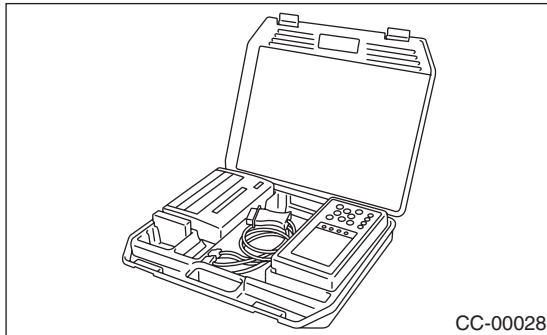
<Ref. to WI-100, WIRING DIAGRAM, Immobilizer System.>

## 5. Subaru Select Monitor

### A: OPERATION

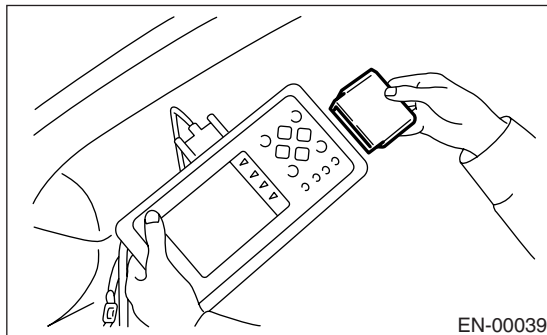
#### 1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit.



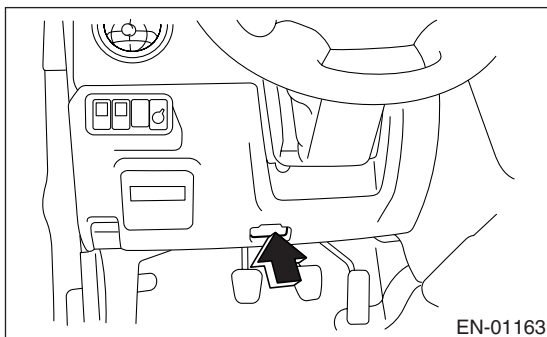
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge to Subaru Select Monitor.



4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).

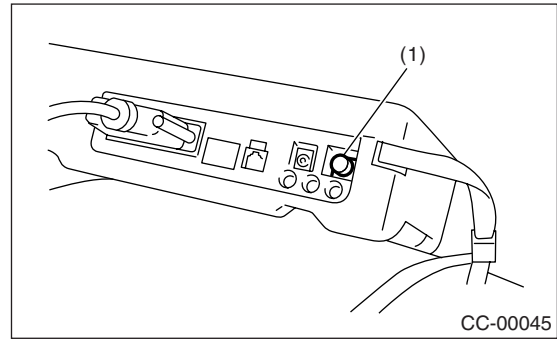


(2) Connect the diagnosis cable to data link connector.

#### CAUTION:

Do not connect the scan tools except for Subaru Select Monitor.

5) Turn the ignition switch to ON (engine OFF), and the Subaru Select Monitor power switch to ON.



(1) Power switch

6) Using the Subaru Select Monitor, call up DTCs and various data, then record them.

#### 2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to IM(diag)-8, Read Diagnostic Trouble Code (DTC).>

#### 3. COMMUNICATION LINE CHECK

##### NOTE:

The communication line between ECM and body integrated module can be checked in "System Operation Check Mode". This is referred to as "Communication line check".

1) Connect the Subaru Select Monitor.

2) On the «Each system check» display, select the {Engine}.

3) Start the communication line check.

4) Is «Communication Line not Shorted» displayed on screen?

If displayed, go to step 5).

If "NO", go to step 6).

5) After diagnostic results, it is determined that the circuit is not shorted. Finish the communication line check.

6) If a problem is detected, repair the trouble cause. <Ref. to IM(diag)-16, DTC P1572 EGI IMMOBILIZER COMMUNICATION (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

## Read Diagnostic Trouble Code (DTC)

IMMOBILIZER (DIAGNOSTICS)

---

### 6. Read Diagnostic Trouble Code (DTC)

#### A: OPERATION

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type has been displayed.
- 4) On the «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display}, and then press the [YES] key.
- 5) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)}, and then press the [YES] key.

#### NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning DTC, refer to the List of DTC. <Ref. to IM(diag)-14, LIST, List of Diagnostic Trouble Code (DTC).>

## 7. Clear Memory Mode

### A: OPERATION

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type has been displayed.
- 4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
- 5) When the 'Done' are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

#### NOTE:

- After the memory has been cleared, the idle air control solenoid valve must be initialized. To execute this procedure, turn the ignition switch to ON. Wait 3 seconds before starting the engine.
- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

# Diagnostics Chart for Security Indicator Light

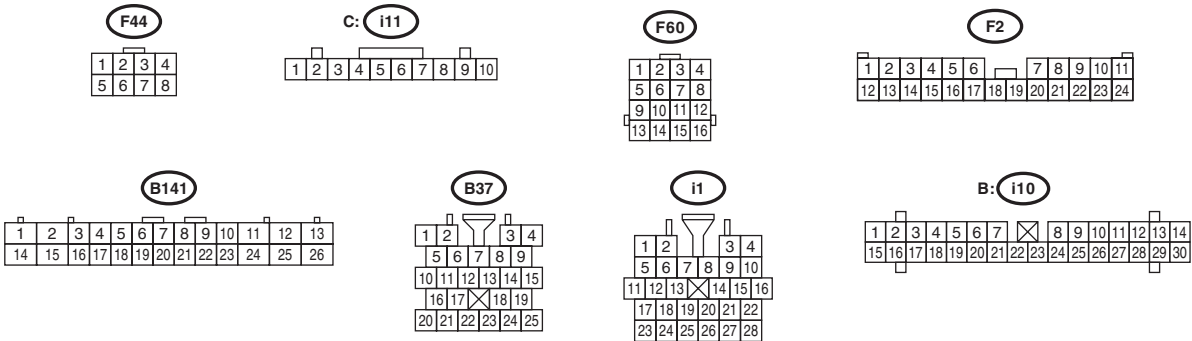
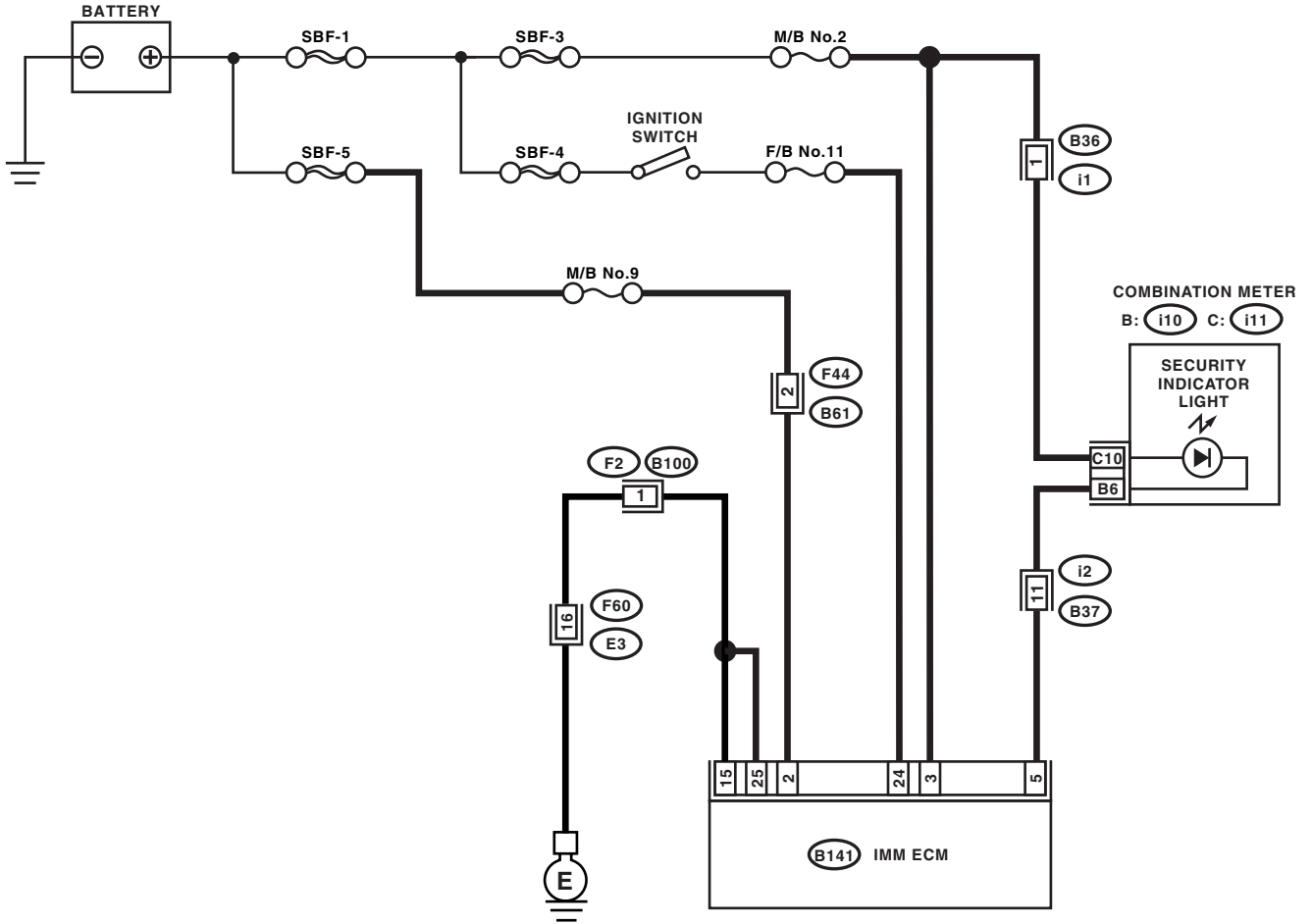
IMMOBILIZER (DIAGNOSTICS)

## 8. Diagnostics Chart for Security Indicator Light

### A: INSPECTION

#### 1. CHECK SECURITY INDICATOR LIGHT CIRCUIT

WIRING DIAGRAM:



IM-00156

# Diagnostics Chart for Security Indicator Light

IMMOBILIZER (DIAGNOSTICS)

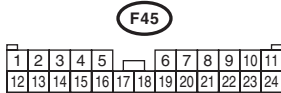
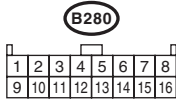
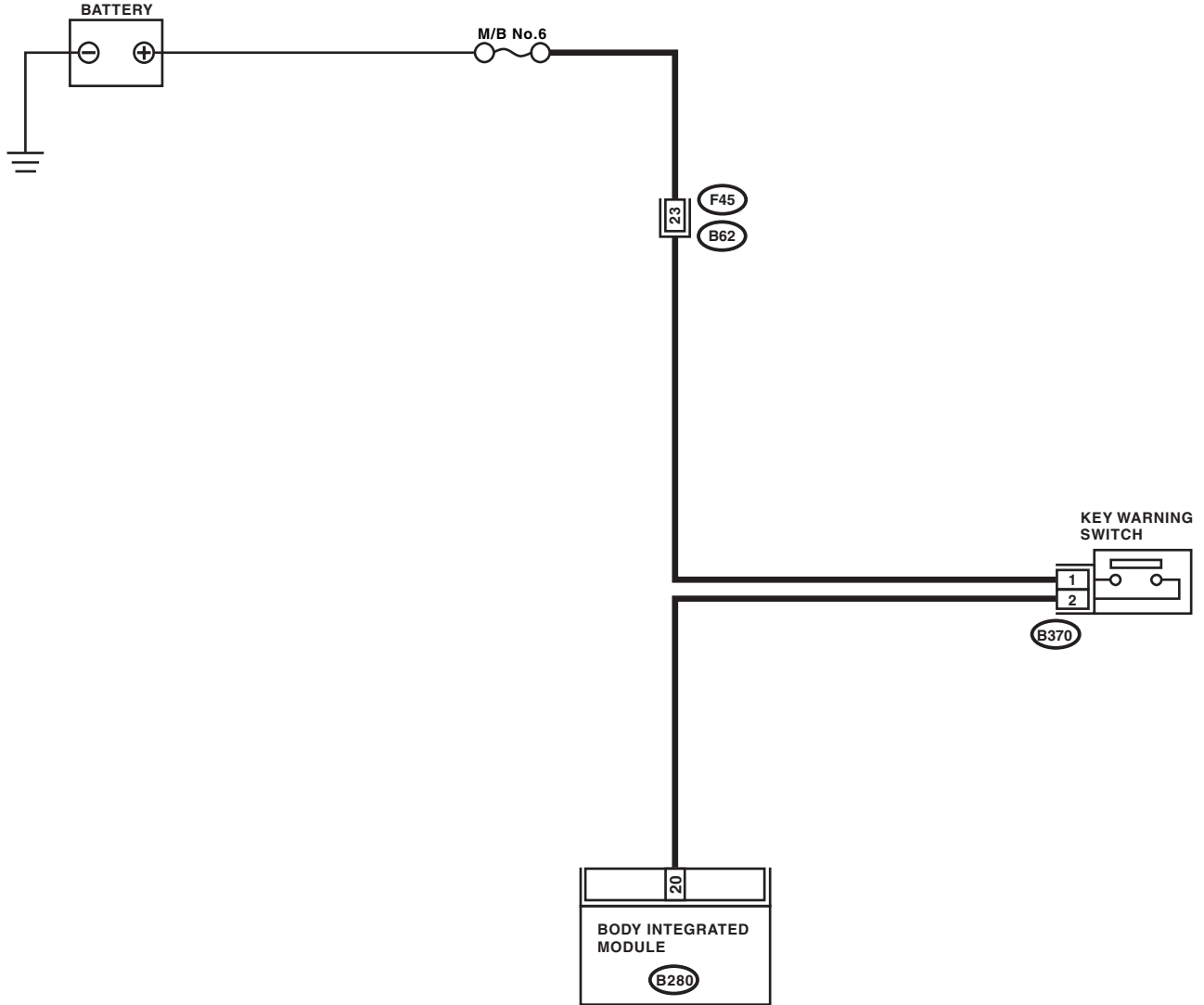
| Step  | Check   | Yes   | No   |
|---|---|---|--|
| <b>1 CHECK SECURITY INDICATOR LIGHT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the harness connector from IMM ECM.<br>3) Connect a resistor (100 Ω) between IMM ECM harness connector terminal No. 5 and chassis ground.  | Does the security indicator light illuminate? | Go to step 2.   | Go to step 5.  |
| <b>2 CHECK IMM ECM GROUND CIRCUIT.</b><br>Measure the resistance between IMM ECM harness connector terminal and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B141) No. 15, No. 25 — Chassis ground:</i>  | Is the resistance less than 10 Ω?             | Go to step 3.   | Repair the open circuit of IMMECM ground circuit.                        |
| <b>3 CHECK IMM ECM IGNITION CIRCUIT.</b><br>1) Turn the ignition switch to ON. (engine OFF.)<br>2) Measure the voltage between IMM ECM harness connector terminal and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B141) No. 24 (+) — Chassis ground (-):</i>                                | Is the voltage more than 10 V?                | Go to step 4.   | Check the harness for open or short between IMM ECM and ignition switch. |
| <b>4 CHECK IMM ECM POWER SUPPLY CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the voltage between IMM ECM harness connector terminal and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B141) No. 2, No. 3 (+) — Chassis ground (-):</i>                                   | Is the voltage more than 10 V?                | Replace the IMM ECM <Ref. to SL-47, Immobilizer Control Unit.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual. | Check the harness for open or short between IMM ECM and fuse.            |
| <b>5 CHECK COMBINATION METER CIRCUIT.</b><br>1) Remove the combination meter. <Ref. to IDI-10, Combination Meter.><br>2) Measure the voltage between combination meter harness connector terminal and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(i11) No. 10 (+) — Chassis ground (-):</i> | Is the voltage more than 10 V?                | Go to step 6.   | Check the harness for open or short between combination meter and fuse.  |
| <b>6 CHECK COMBINATION METER CIRCUIT.</b><br>Measure the resistance between IMM ECM harness connector terminal and combination meter harness connector terminal.<br><i>Connector &amp; terminal</i><br><i>(B141) No. 5 — (i11) No. 6:</i>   | Is the resistance less than 10 Ω?             | Faulty LED. Replace the combination meter printed circuit. <Ref. to IDI-10, DISASSEMBLY, Combination Meter.>  | Repair the harness or connector.   |

# Diagnostics Chart for Security Indicator Light

IMMOBILIZER (DIAGNOSTICS)

## 2. CHECK KEY SWITCH CIRCUIT

WIRING DIAGRAM:



IM-00174

# Diagnostics Chart for Security Indicator Light

IMMOBILIZER (DIAGNOSTICS)

| Step   | Check                                      | Yes  | No  |
|--|--|--|---|
| <b>1 CHECK POWER SUPPLY CIRCUIT.</b><br>1) Disconnect the harness connector from key warning switch.<br>2) Measure the voltage between key warning switch harness connector terminal and chassis ground.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B370) No. 1 (+) — Chassis ground (-):</b></i>   | Is the voltage more than 10 V?             | Go to step 2.  | Check the harness for open or short between key warning switch and fuse.  |
| <b>2 CHECK KEY WARNING SWITCH.</b><br>1) Insert the ignition key to the ignition switch. (OFF or ACC position)<br>2) Measure the resistance between key warning switch connector terminals.<br><i><b>Terminal</b></i><br><i><b>No. 1 — No. 2:</b></i>  | Is the resistance less than 1 $\Omega$ ?   | Go to step 3.  | Replace the key warning switch.   |
| <b>3 CHECK KEY WARNING SWITCH.</b><br>1) Remove the ignition key from the ignition switch.<br>2) Measure the resistance between key warning switch connector terminals.<br><i><b>Terminal</b></i><br><i><b>No. 1 — No. 2:</b></i>  | Is the resistance more than 1 M $\Omega$ ? | Go to step 4.  | Replace the key warning switch.   |
| <b>4 CHECK HARNESS BETWEEN KEY WARNING SWITCH AND BODY INTEGRATED MODULE.</b><br>1) Disconnect the harness connector from key warning switch.<br>2) Disconnect the harness connector from body integrated module.<br>3) Measure the resistance between key warning switch harness connector terminal and body integrated module harness connector terminal.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B370) No. 2 — (B280) No. 20:</b></i> | Is the resistance less than 10 $\Omega$ ?  | Replace the body integrated module <Ref. to SL-47, Immobilizer Control Unit.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual. | Repair the harness between key warning switch and body integrated module. |



## List of Diagnostic Trouble Code (DTC)

### IMMOBILIZER (DIAGNOSTICS)

## 9. List of Diagnostic Trouble Code (DTC)

### A: LIST

| DTC   | Item   | Contents of diagnosis  | Index No.   |
|-------|--|--|---|
| P0513 | Incorrect Immobilizer Key                              | Incorrect immobilizer key (Use of unregistered key in IMM ECM) | <Ref. to IM(diag)-21, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                              |
| P1570 | ANTENNA  | Faulty antenna   | <Ref. to IM(diag)-22, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>  |
| P1571 | Reference Code Incompatibility                         | Reference code incompatibility between IMM ECM and ECM         | <Ref. to IM(diag)-15, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                         |
| P1572 | EGI Immobilizer Communication (Except Antenna Circuit) | Communication failure between IMM ECM and ECM                  | <Ref. to IM(diag)-16, DTC P1572 EGI IMMOBILIZER COMMUNICATION (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| P1574 | Key Immobilizer Communication                          | Failure of IMM ECM to verify key (transponder) ID code         | <Ref. to IM(diag)-20, DTC P1574 KEY IMMOBILIZER COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                          |
| P1576 | EGI Control Module EEPROM                              | ECM malfunctioning   | <Ref. to IM(diag)-21, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                              |
| P1577 | IMM Control Module EEPROM                              | IMM ECM malfunctioning   | <Ref. to IM(diag)-21, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>                              |

#### NOTE:

Perform the engine DTC when the DTC except immobilizer DTC is detected. <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>

## 10. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### A: DTC P1571 REFERENCE CODE INCOMPATIBILITY

#### DTC DETECTING CONDITION:

Reference code incompatibility between IMM ECM and ECM

| Step | Check  | Yes   | No   |   |
|------|--|---|--|---|
| 1    | <b>PERFORM TEACHING OPERATION ON IGNITION KEY.</b><br>Perform teaching operation on all keys of the vehicle. Refer to the teaching operation manual. | Is teaching operation for all keys completed?             | Finish the diagnosis.  | Go to step 2.   |
| 2    | <b>CHECK DTC.</b>  | Is there any DTC related to immobilizer except DTC P1571? | Eliminate the cause of DTC except DTC P1571, and perform the teaching operation again. | Replace the ECM <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> <Ref. to FU(STI)-39, Engine Control Module (ECM).>, IMM ECM <Ref. to SL-47, Immobilizer Control Unit.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## IMMOBILIZER (DIAGNOSTICS)

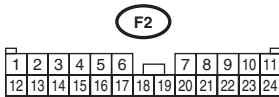
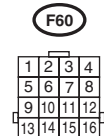
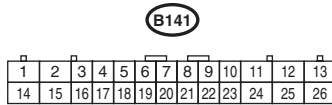
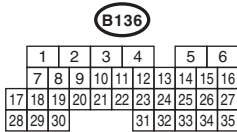
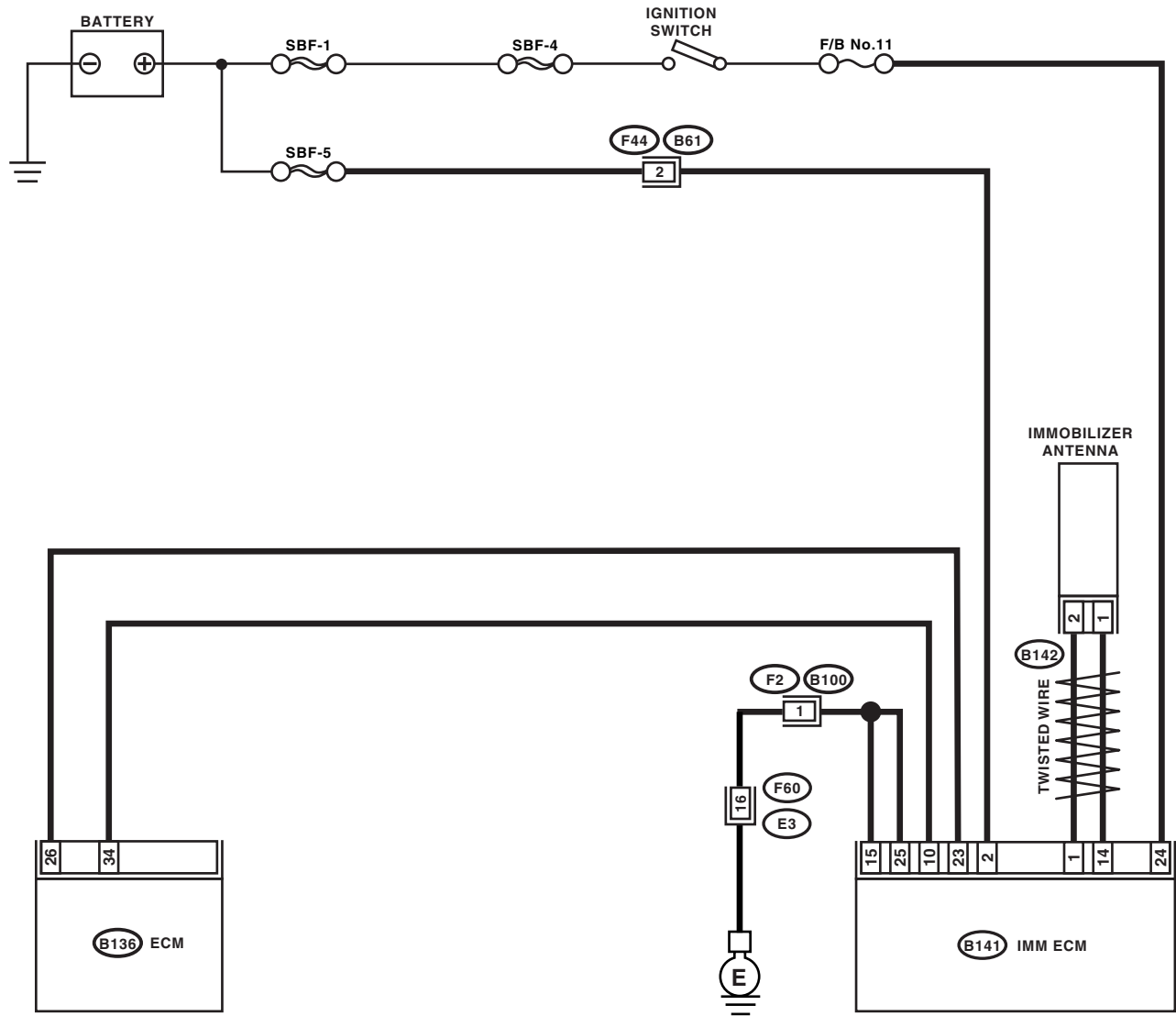
### B: DTC P1572 EGI IMMOBILIZER COMMUNICATION (EXCEPT ANTENNA CIRCUIT)

#### DTC DETECTING CONDITION:

Communication failure between IMM ECM and ECM

#### WIRING DIAGRAM:

- Turbo model

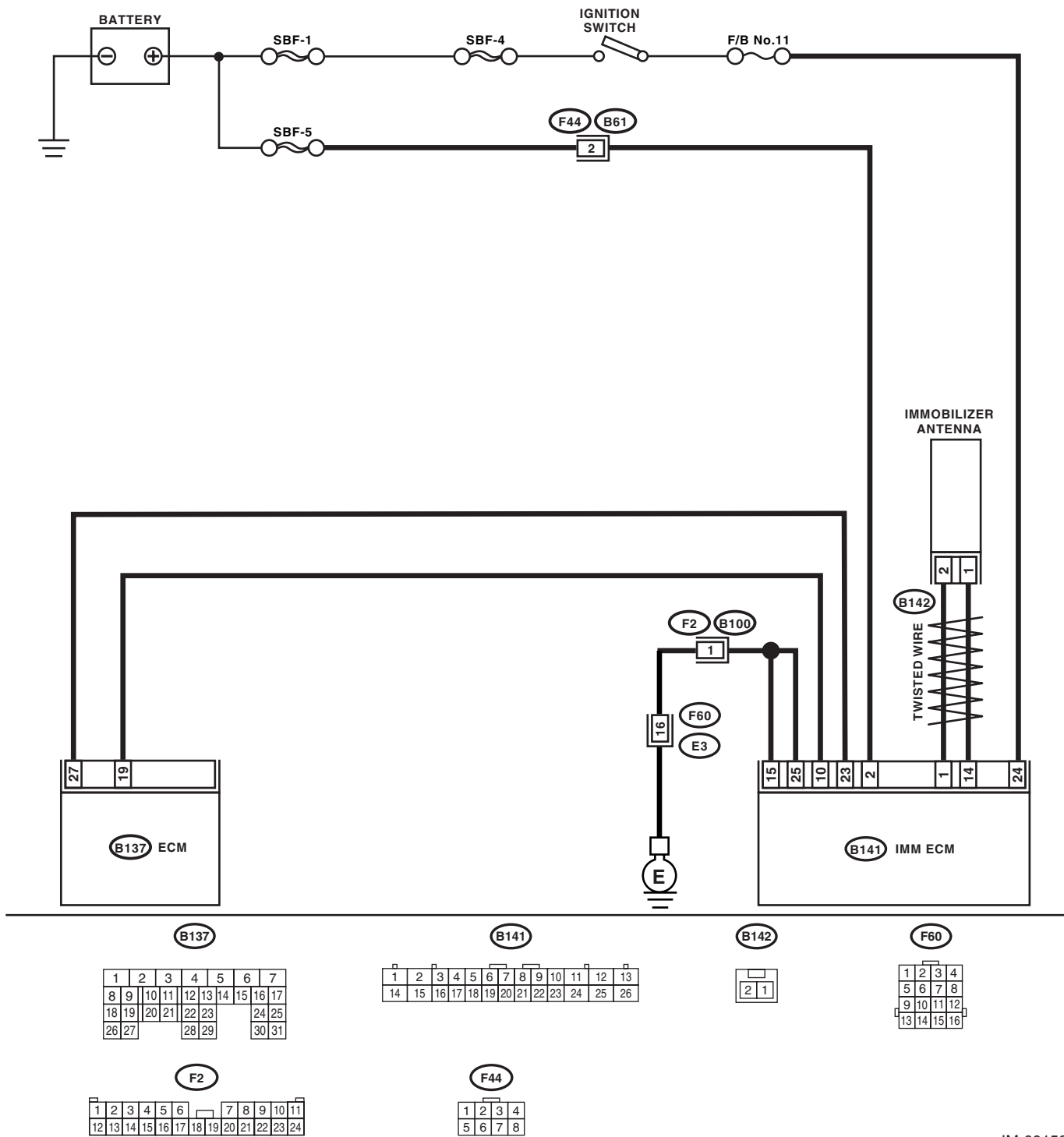


IM-00173

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## IMMOBILIZER (DIAGNOSTICS)

- STI model



IM-00158

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

## IMMOBILIZER (DIAGNOSTICS)

| Step  | Check                                     | Yes           | No   |
|---|---|---------------|--|
| <b>1 CHECK POWER SUPPLY CIRCUIT OF IMM ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the harness connector from IMM ECM.<br>3) Measure the voltage between IMM ECM harness connector terminal and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B141) No. 2 (+) — Chassis ground (-):</i>  | Is the voltage more than 10 V?            | Go to step 2. | Check the harness for open or short between IMM ECM and fuse.  |
| <b>2 CHECK IGNITION SWITCH CIRCUIT.</b><br>1) Turn the ignition switch to ON. (engine OFF.)<br>2) Measure the voltage between IMM ECM harness connector terminal and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B141) No. 24 (+) — Chassis ground (-):</i>   | Is the voltage more than 10 V?            | Go to step 3. | Check the harness for open or short between IMM ECM and ignition switch.   |
| <b>3 CHECK GROUND CIRCUIT OF IMM ECM.</b><br>1) Turn the ignition switch to OFF.<br>2) Measure the resistance between IMM ECM harness connector terminal and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B141) No. 15, No. 25 — Chassis ground:</i>   | Is the resistance less than 10 $\Omega$ ? | Go to step 4. | Repair the open circuit of IMMECM ground circuit.  |
| <b>4 CHECK HARNESS BETWEEN IMM ECM AND ECM.</b><br>1) Disconnect the harness connector from ECM and IMM ECM.<br>2) Measure the resistance between IMM ECM harness connector terminal and ECM harness connector terminal.<br><i>Connector &amp; terminal</i><br><i>Turbo model</i><br><i>(B141) No. 10 — (B136) No. 34:</i><br><i>STI model</i><br><i>(B141) No. 10 — (B137) No. 19:</i> | Is the resistance less than 10 $\Omega$ ? | Go to step 5. | Repair the open circuit of harness between IMM ECM and ECM.  |
| <b>5 CHECK HARNESS BETWEEN IMM ECM AND ECM.</b><br>Measure the resistance between IMM ECM harness connector terminal and ECM harness connector terminal.<br><i>Connector &amp; terminal</i><br><i>Turbo model</i><br><i>(B141) No. 23 — (B136) No. 26:</i><br><i>STI model</i><br><i>(B141) No. 23 — (B137) No. 27:</i>   | Is the resistance less than 10 $\Omega$ ? | Go to step 6. | Repair the open circuit of harness between IMM ECM and ECM.  |
| <b>6 CHECK HARNESS OF COMMUNICATION LINE.</b><br>1) Turn the ignition switch to ON. (engine OFF.)<br>2) Measure the voltage between IMM ECM harness connector terminal and chassis ground.<br><i>Connector &amp; terminal</i><br><i>(B141) No. 10, No. 23 (+) — Chassis ground (-):</i>   | Is the voltage 0 V?                       | Go to step 7. | Repair the harness between IMM ECM and ECM, because there is short circuit with battery voltage line or ignition switch "ON" line. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

IMMOBILIZER (DIAGNOSTICS)

| Step   | Check  | Yes  | No  |
|--|--|--|---|
| <p><b>7</b></p> <p><b>CHECK HARNESS OF COMMUNICATION LINE.</b><br/>                     Measure the voltage between ECM harness connector terminal and engine ground.<br/> <b>Connector &amp; terminal</b><br/> <b>Turbo model</b><br/> <b>(B136) No. 26, No. 34 (+) — Engine ground (-):</b><br/> <b>STI model</b><br/> <b>(B137) No. 19, No. 27 (+) — Engine ground (-):</b></p> | <p>Is the voltage 0 V?</p>   | <p>Go to step <b>8</b>.</p>  | <p>Repair the harness between IMM ECM and ECM, because there is short circuit with battery voltage line or ignition switch "ON" line.</p>   |
| <p><b>8</b></p> <p><b>CHECK ECM BY COMMUNICATION LINE CHECK.</b><br/>                     1) Connect the harness connector to ECM.<br/>                     2) Disconnect the harness connector from IMM ECM.<br/>                     3) Perform communication line check. &lt;Ref. to IM(diag)-7, COMMUNICATION LINE CHECK, OPERATION, Subaru Select Monitor.&gt;</p>            | <p>Does "Communication Line not Shorted" appear on the screen?</p> | <p>Replace the IMM ECM &lt;Ref. to SL-47, Immobilizer Control Unit.&gt; and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual.</p> | <p>Replace the ECM. &lt;Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).&gt; &lt;Ref. to FU(STI)-39, Engine Control Module (ECM).&gt; Then perform teaching operation. Refer to the teaching operation manual.</p> |

## Diagnostic Procedure with Diagnostic Trouble Code (DTC)

### IMMOBILIZER (DIAGNOSTICS)

#### C: DTC P1574 KEY IMMOBILIZER COMMUNICATION

##### DTC DETECTING CONDITION:

Failure of IMM ECM to verify key (transponder) ID code

| Step  | Check  | Yes  | No  |
|---|--|--|---|
| <b>1</b><br><b>CHECK IMM ECM FUNCTION.</b><br>Insert the key to ignition switch (LOCK position), measure changes in voltage between Antenna connector.<br><i><b>Connector &amp; terminal</b></i><br><i><b>(B142) No. 1 (+) — No. 2 (-):</b></i> | Is the voltage 0 — 30 V immediately after inserting the key (approx. 0.1 sec.) and 0 V after inserting the key (approx. 1 sec.)? | Go to step 2.  | Replace the IMM ECM <Ref. to SL-47, Immobilizer Control Unit.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual. |
| <b>2</b><br><b>CHECK IGNITION KEY (TRANSPONDER).</b><br>1) Remove the key from ignition switch.<br>2) Start the engine using other keys that have undergone the teaching operation, furnished with vehicle.                                     | Does the engine start?   | Replace the ignition key (including the transponder). Then perform teaching operation. Refer to the teaching operation manual. | Replace the IMM ECM <Ref. to SL-47, Immobilizer Control Unit.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

IMMOBILIZER (DIAGNOSTICS)

## D: DTC P0513 INCORRECT IMMOBILIZER KEY

### DTC DETECTING CONDITION:

Incorrect immobilizer key. (Use of unregistered key in IMM ECM)

|   | Step   | Check   | Yes                   | No  |
|---|--|---|-----------------------|---|
| 1 | <b>PERFORM TEACHING OPERATION ON IGNITION KEY.</b><br>Perform teaching operation on all keys of the vehicle. Refer to the teaching operation manual. | Is teaching operation for all keys completed? | Finish the diagnosis. | Replace all ignition keys (including the transponder). Go to step 2.  |
| 2 | <b>PERFORM TEACHING OPERATION ON IGNITION KEY.</b><br>Perform teaching operation on all keys with vehicle. Refer to the teaching operation manual.   | Is teaching operation for all keys completed? | Finish the diagnosis. | Replace the IMM ECM <Ref. to SL-47, Immobilizer Control Unit.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual. |

## E: DTC P1576 EGI CONTROL MODULE EEPROM

### DTC DETECTING CONDITION:

ECM malfunctioning

### REPLACE ECM

Replace the ECM.

<Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> <Ref. to FU(STI)-39, Engine Control Module (ECM).>

Then perform teaching operation. Refer to the teaching operation manual.

## F: DTC P1577 IMM CONTROL MODULE EEPROM

### DTC DETECTING CONDITION:

IMM ECM malfunctioning

### REPLACE IMM ECM

Replace the IMM ECM <Ref. to SL-47, Immobilizer Control Unit.>, and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual.



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

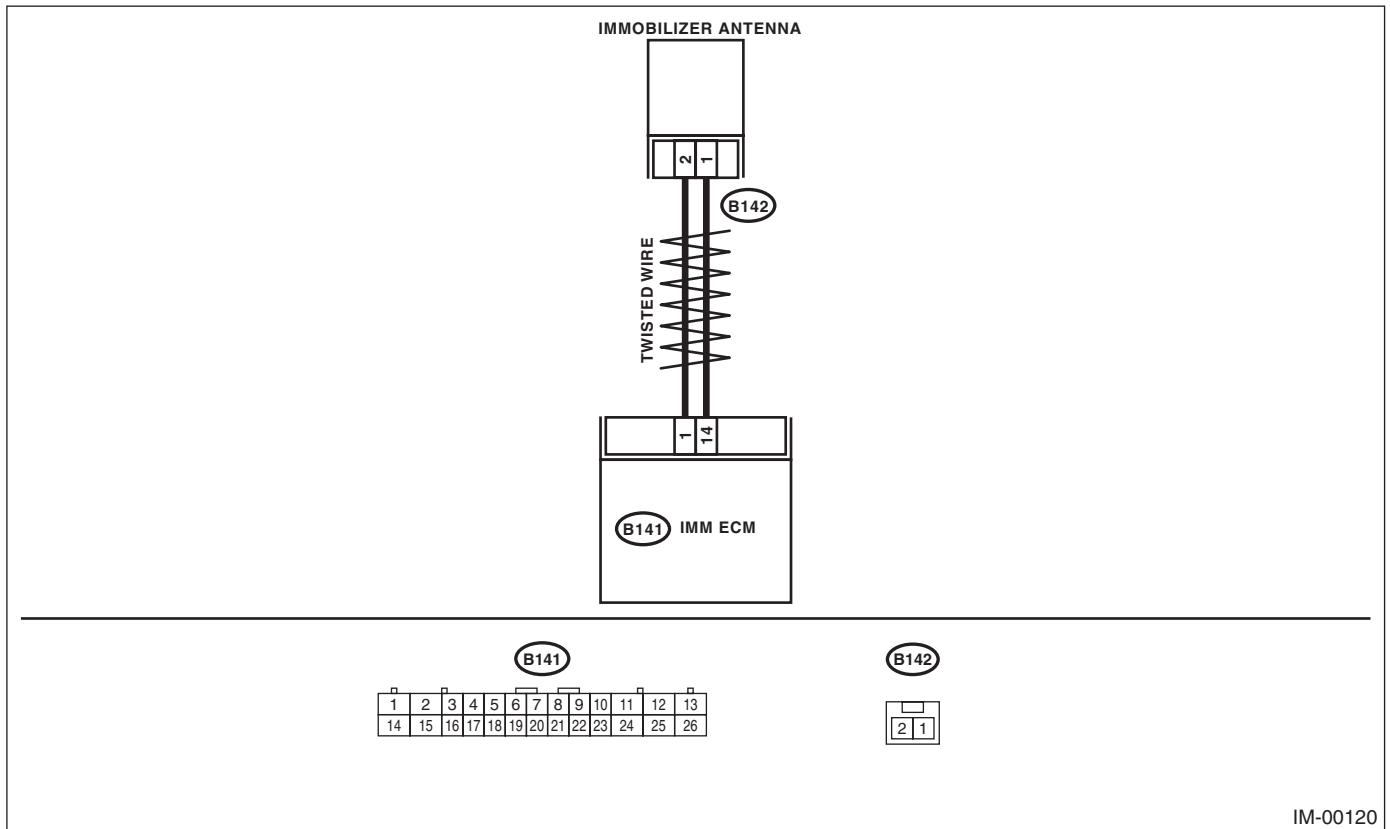
IMMOBILIZER (DIAGNOSTICS)

## G: DTC P1570 ANTENNA

### DTC DETECTING CONDITION:

Faulty antenna

### WIRING DIAGRAM:



# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

IMMOBILIZER (DIAGNOSTICS)

| Step   | Check  | Yes  | No  |
|--|--|--|---|
| <b>1 CHECK ANTENNA CIRCUIT.</b><br>1) Turn the ignition switch to OFF.<br>2) Disconnect the harness antenna connector from IMM ECM. <Ref. to SL-48, Immobilizer Antenna.><br>3) Measure the resistance of antenna circuit.<br><b>Connector &amp; terminal</b><br><b>(B142) No. 1 — No. 2:</b>                      | Is the resistance less than 10 $\Omega$ ?  | Go to step 2.  | Replace the antenna. <Ref. to SL-48, Immobilizer Antenna.>  |
| <b>2 CHECK ANTENNA CIRCUIT.</b><br>Measure the resistance between antenna harness connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B141) No. 1 — Chassis ground:</b>  | Is the resistance less than 10 $\Omega$ ?  | Replace the antenna. <Ref. to SL-48, Immobilizer Antenna.>   | Go to step 3.   |
| <b>3 CHECK ANTENNA CIRCUIT.</b><br>Measure the resistance between antenna harness connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B141) No. 14 — Chassis ground:</b>   | Is the resistance less than 10 $\Omega$ ?  | Replace the antenna. <Ref. to SL-48, Immobilizer Antenna.>   | Go to step 4.   |
| <b>4 CHECK ANTENNA CIRCUIT.</b><br>1) Turn the ignition switch to ON. (engine OFF.)<br>2) Measure the voltage between antenna harness connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B141) No. 1 (+) — Chassis ground (-):</b>  | Is the voltage 0 V?  | Go to step 5.  | Replace the antenna. <Ref. to SL-48, Immobilizer Antenna.>  |
| <b>5 CHECK ANTENNA CIRCUIT.</b><br>Measure the voltage between antenna harness connector and chassis ground.<br><b>Connector &amp; terminal</b><br><b>(B141) No. 14 (+) — Chassis ground (-):</b>  | Is the voltage 0 V?  | Go to step 6.  | Replace the antenna. <Ref. to SL-48, Immobilizer Antenna.>  |
| <b>6 CHECK IMM ECM FUNCTION.</b><br>1) Turn the ignition switch to OFF.<br>2) Connect the antenna harness connector to IMM ECM.<br>3) Insert the key to ignition switch, measure changes in voltage between antenna harness connector.<br><b>Connector &amp; terminal</b><br><b>(B141) No. 1 (+) — No. 14 (-):</b> | Is the voltage 0 — 30 V immediately after inserting the key (approx. 0.1 sec.) and 0 V after inserting the key (approx. 1 sec.)? | Go to step 7.  | Replace the IMM ECM <Ref. to SL-47, Immobilizer Control Unit.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual. |
| <b>7 CHECK IGNITION KEY (TRANSPONDER).</b><br>1) Remove the key from ignition switch.<br>2) Start the engine using other keys that have undergone the teaching operation, furnished with vehicle.  | Does the engine start?   | Replace the ignition key (including the transponder). Then perform teaching operation. Refer to the teaching operation manual. | Replace the IMM ECM <Ref. to SL-47, Immobilizer Control Unit.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual. |

# Diagnostic Procedure with Diagnostic Trouble Code (DTC)

IMMOBILIZER (DIAGNOSTICS)

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# OPTION PARTS

# *OP*

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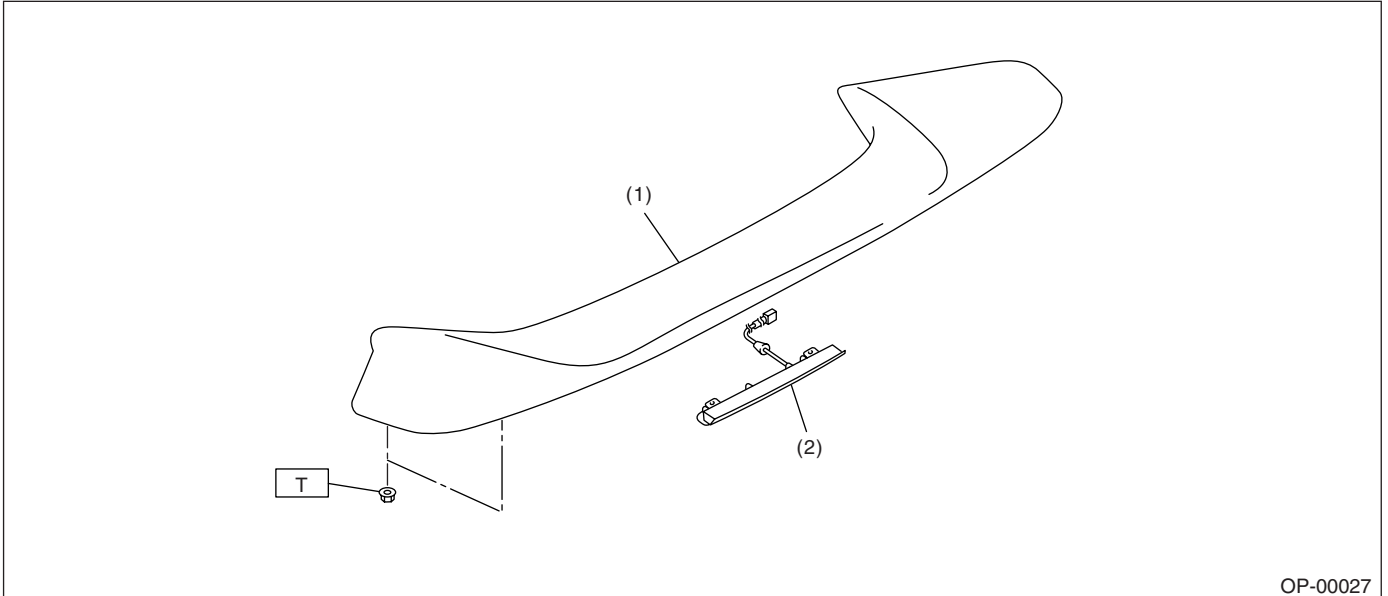
# General Description

OPTION PARTS

## 1. General Description

### A: COMPONENT

#### 1. REAR SPOILER



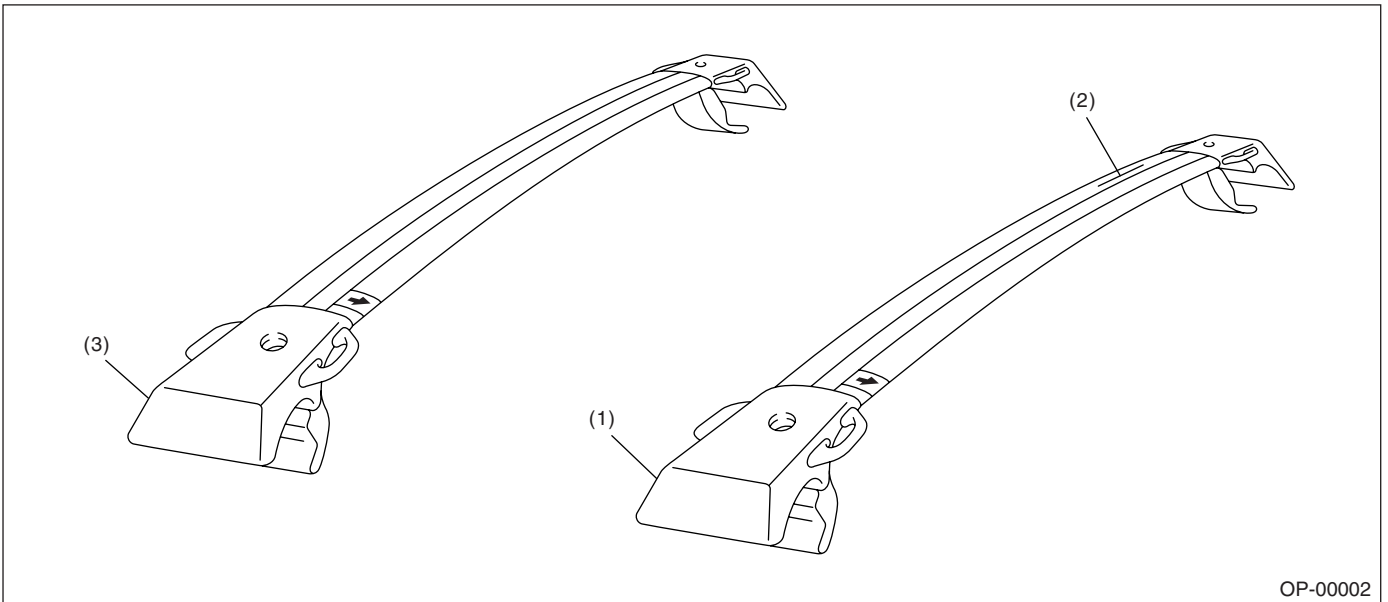
OP-00027

(1) Rear spoiler

(2) High mounted stop light

**Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 7.5±2 (0.76±0.20, 5.5±1.4)**

#### 2. CROSSBAR



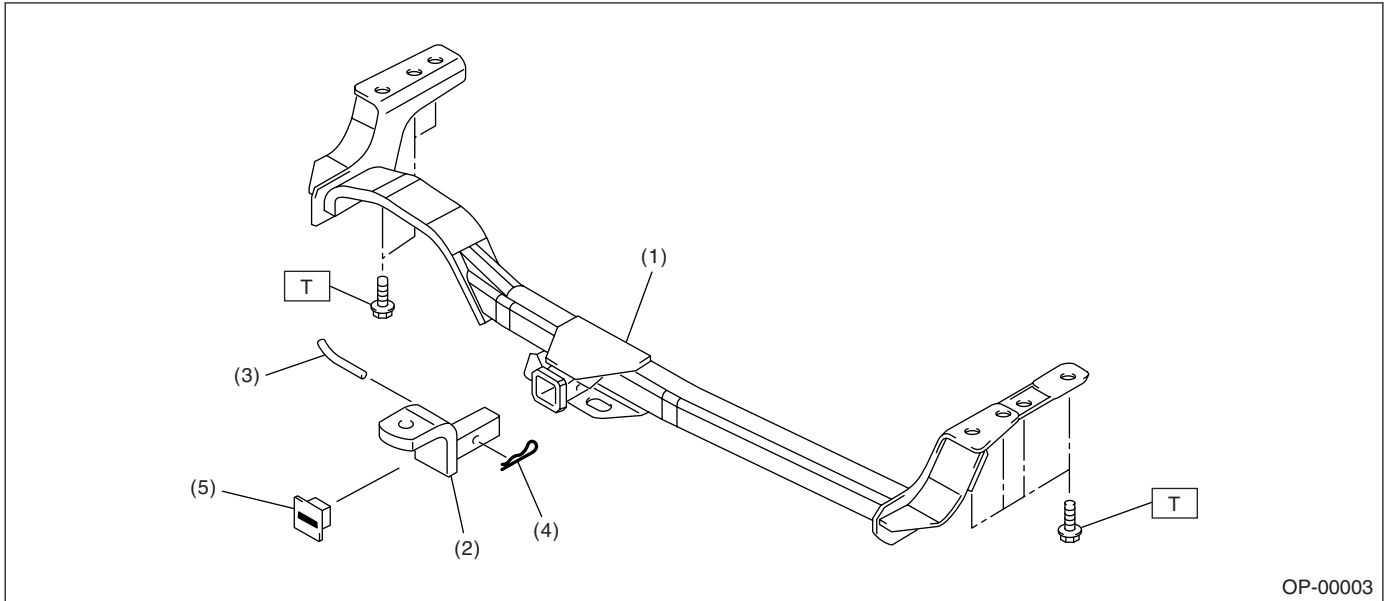
OP-00002

(1) Front crossbar

(2) Caution label (Front crossbar)

(3) Rear crossbar

## 3. TRAILER HITCH



OP-00003

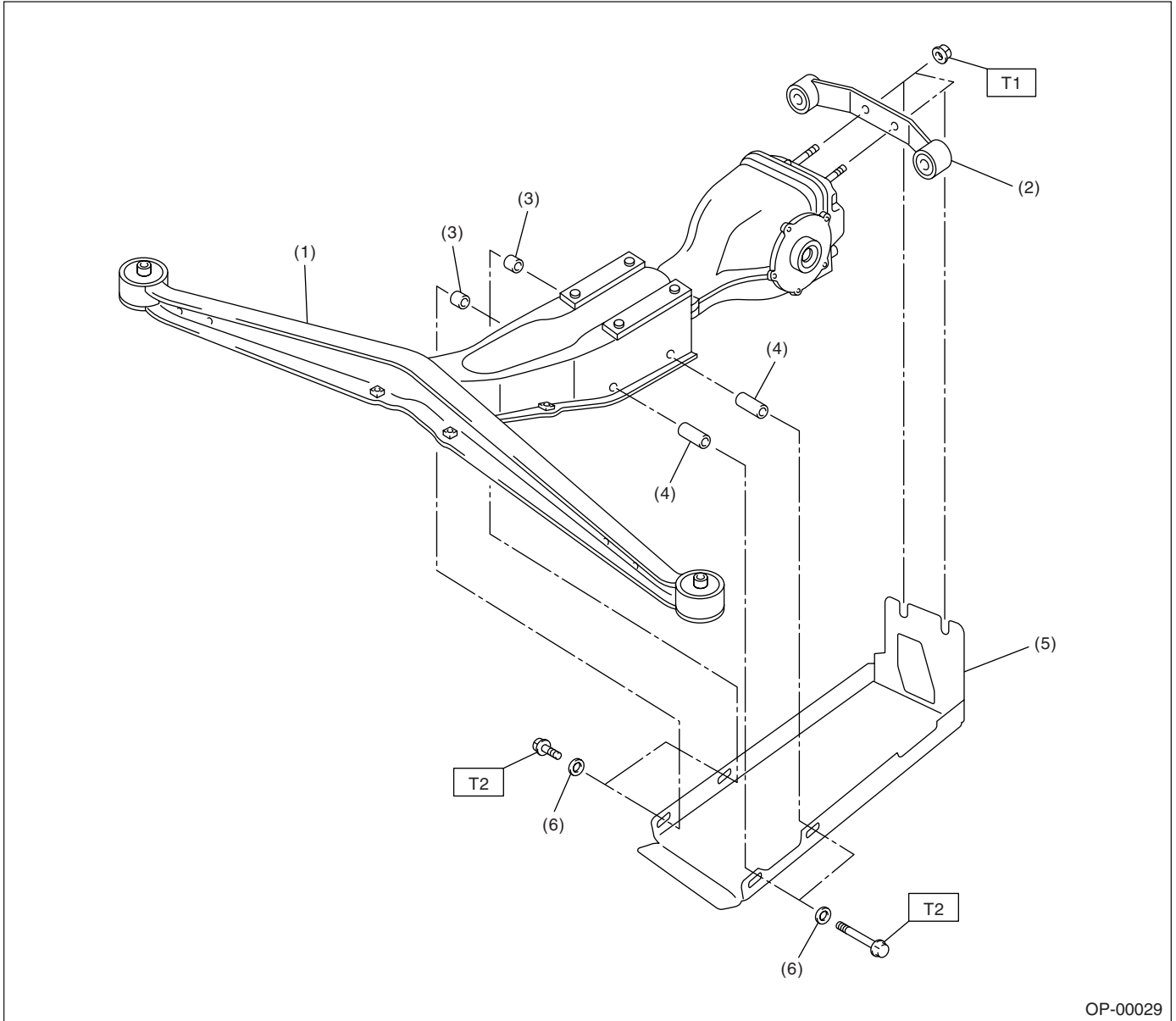
- |                    |                     |
|--------------------|---------------------|
| (1) Receiver hitch | (4) Ball mount clip |
| (2) Ball mount     | (5) Receiver cover  |
| (3) Ball mount pin |                     |

**Tightening torque: N·m (kgf·m, ft·lb)**  
**T: 95 (9.7, 70)**

# General Description

OPTION PARTS

## 4. REAR DIFFERENTIAL PROTECTOR



OP-00029

- |                               |                                 |
|-------------------------------|---------------------------------|
| (1) Differential front member | (4) Spacer (Long)               |
| (2) Differential rear member  | (5) Rear differential protector |
| (3) Spacer (Short)            | (6) Washer                      |

**Tightening torque: N·m (kgf·m, ft·lb)**

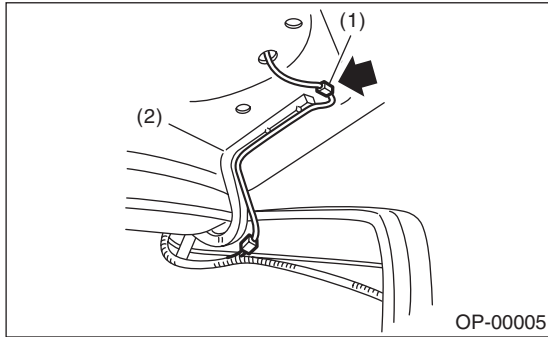
**T1: 70 (7.1, 51.6)**

**T2: 90 (9.2, 66.4)**

## 2. Rear Spoiler

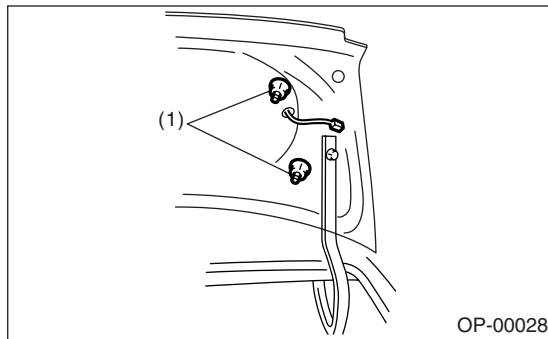
### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Open the trunk lid.
- 3) Disconnect the connector of high mounted stop light.



- (1) Connector
- (2) Trunk hinge

- 4) Remove the mounting nuts of rear spoiler.



- (1) Mounting nut

- 5) Remove the rear spoiler.

**CAUTION:**

Pay attention to avoid damage during removal or installation.

### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**

**Rear spoiler to trunk lid**

**$7.5 \pm 2$  N·m ( $0.76 \pm 0.20$  kgf·m,  $5.5 \pm 1.4$  ft·lb)**



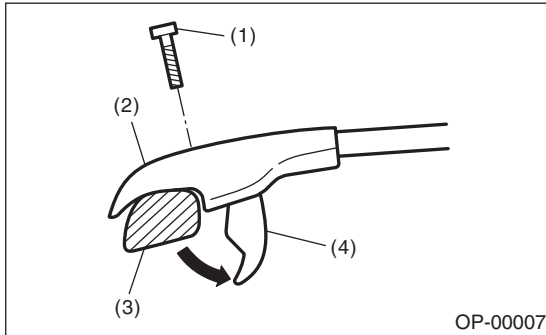
# Crossbar

## OPTION PARTS

### 3. Crossbar

#### A: REMOVAL

- 1) Remove the TORX® bolt T30 from each end support.
- 2) Rotate the lower clamp of each end support about 90° downward to remove the crossbar.



- (1) TORX® bolt T30
- (2) End support
- (3) Roof rail
- (4) Lower clamp

#### CAUTION:

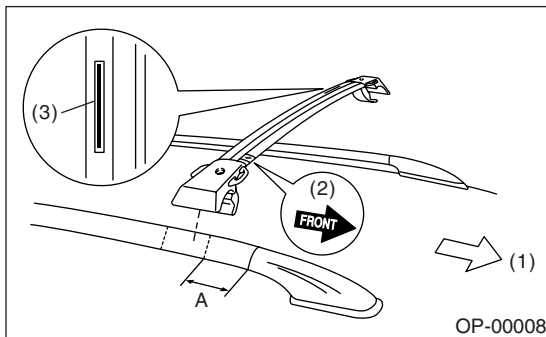
Pay attention to avoid damage to the roof panel during removal or installation.

#### B: INSTALLATION

- 1) Rotate the lower clamp of each end support about 90° downward.
- 2) Set the front crossbar so that front direction mark on the right side top face of crossbar point in the direction of vehicle front.
- 3) Place the crossbar end support in a position 76.2 mm (3 in) behind the joint of front roof rail support and roof rail.

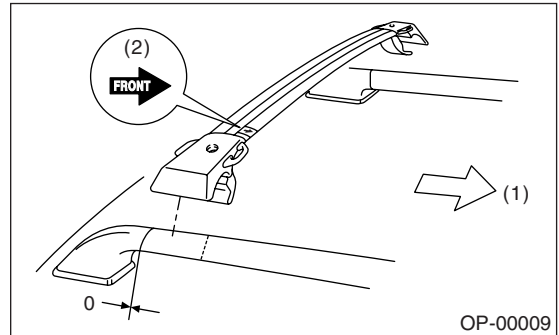
#### Length A:

76.2 mm (3 in)



- (1) Front of vehicle
- (2) Front direction mark
- (3) Caution label (Front crossbar)

- 4) Set the rear crossbar so that front direction mark on the right side top face of crossbar point in the direction of vehicle front.
- 5) Place the crossbar end support on a joint of rear roof rail support and roof rail.



- (1) Front of vehicle
- (2) Front direction mark

- 6) Tighten the end support and clamp using TORX® bolt T30.

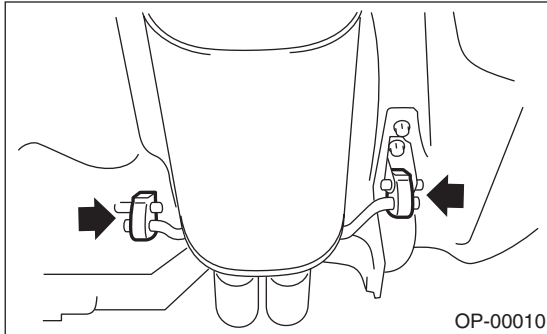
## 4. Trailer Hitch

### A: REMOVAL

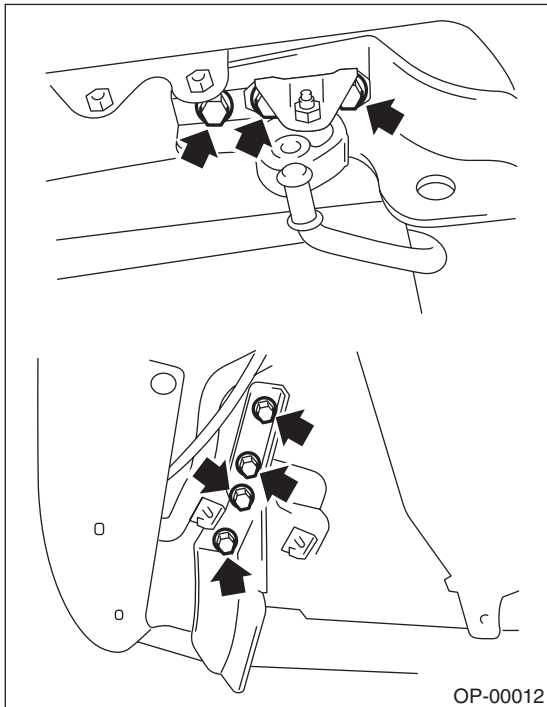
**CAUTION:**

**Because the trailer hitch is heavy, two people are required to remove it.**

- 1) Lift-up the vehicle.
- 2) Remove the cushion rubber from body.



- 3) Remove the canister. <Ref. to EC(H4SO)-6, REMOVAL, Canister.>
- 4) Remove the trailer hitch installation bolts.



- 5) Remove the trailer hitch while lowering exhaust pipe.

### B: INSTALLATION

**CAUTION:**

**Because the trailer hitch is heavy, two people are required to install it.**

Install in the reverse order of removal.

**Tightening torque:**

**Trailer hitch to body:**

**95 N·m (9.7 kgf-m, 70 ft-lb)**

**Canister:**

**23 N·m (2.3 kgf-m, 17 ft-lb)**

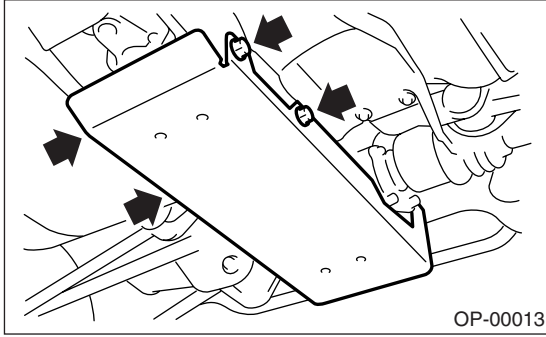
# Rear Differential Protector

OPTION PARTS

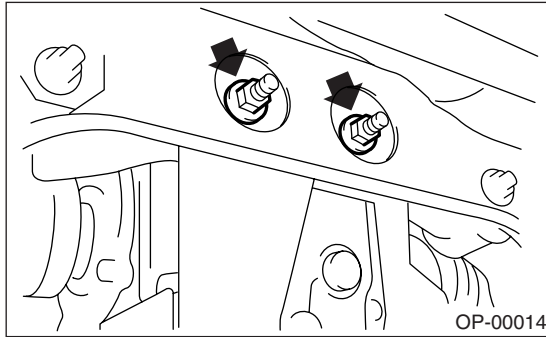
## 5. Rear Differential Protector

### A: REMOVAL

- 1) Remove the rear exhaust pipe and muffler. <Ref. to EX(H4SO)-7, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-8, Muffler.> <Ref. to EX(H4DOTC)-15, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-16, Muffler.>
- 2) Remove the differential front member installation bolts.



- 3) Loosen the nuts until the rear differential protector can be removed.



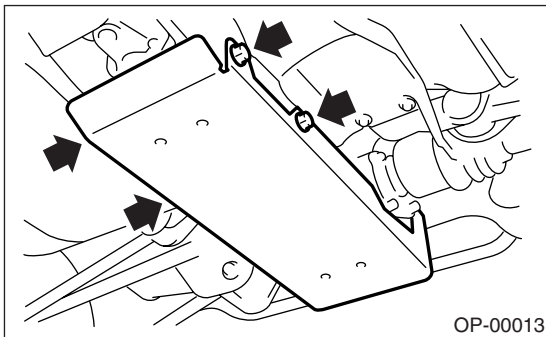
- 4) Remove the rear differential protector.

### B: INSTALLATION

Install in the reverse order of removal.

**Tightening torque:**

**90 N·m (9.2 kgf·m, 66.4 ft·lb)**

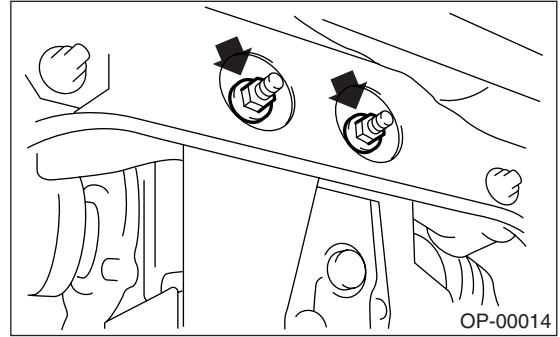


**NOTE:**

Install the protector between the nuts and differential rear member.

**Tightening torque:**

**70 N·m (7.1 kgf·m, 51.6 ft·lb)**



**WIRING SYSTEM SECTION**

**WIRING SYSTEM**

**WI**

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.



# WIRING SYSTEM



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## 1. Basic Diagnostic Procedure

### A: BASIC PROCEDURES

#### 1. GENERAL DESCRIPTION

The most important purpose of diagnostics is to determine which part is malfunctioning quickly, to save time and labor.

#### 2. IDENTIFICATION OF TROUBLE SYMPTOM

Determine what the problem is based on the symptom.

#### 3. PROBABLE CAUSE OF TROUBLE

Look at the wiring diagram and check system's circuit. Then check the switch, relay, fuse, ground, etc.

#### 4. LOCATION AND REPAIR OF TROUBLE

- 1) Using the diagnostics, narrow down the causes.
- 2) If necessary, use a voltmeter, ohmmeter, etc.
- 3) Before replacing certain component parts (switch, relay, etc.), check the power supply, ground, for open wiring harness, poor connectors, etc. If no problems are encountered, check the component parts.

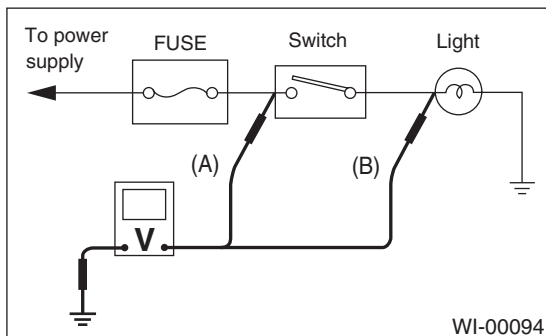
#### 5. CHECK SYSTEM OPERATION

After repairing, ensure that the system operates properly.

### B: BASIC INSPECTION

#### 1. VOLTAGE MEASUREMENT

- 1) Using a voltmeter, connect the negative lead to a good ground point or negative battery terminal and the positive lead to the connector or component terminal.
- 2) Contact the positive lead of the voltmeter on connector (A). The voltmeter will indicate a voltage.
- 3) Shift the positive lead to connector (B). The voltmeter will indicate no voltage.



- 4) With the test set-up held as it is, turn the switch ON. The voltmeter will indicate a voltage and, at the same time, the light will come on.

- 5) The circuit is in good order. If a problem such as a light failing to illuminate occurs, use the procedures outlined above to track down malfunction.

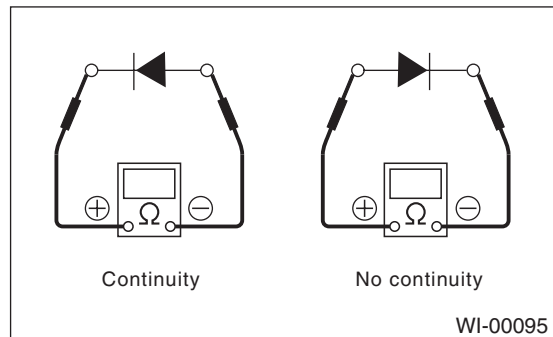
#### 2. CIRCUIT CONTINUITY CHECKS

- 1) Disconnect the battery terminal or connector so there is no voltage between check points. Contact the two leads of an ohmmeter to each of the check points.

If the circuit has diodes, reverse the two leads and check again.

- 2) Use an ohmmeter to check for the diode continuity. When contacting the negative lead to diode positive side and positive lead to negative side, there should be continuity.

When contacting the two leads in reverse, there should be no continuity.



- 3) Symbol "○ — ○" indicates that continuity exists between two points or terminals. For example, when a switch position is at "3", continuity exists among terminals 1, 3 and 6, as shown in table below.

| Terminal        | 1     | 2     | 3     | 4     | 5 | 6 |
|-----------------|-------|-------|-------|-------|---|---|
| Switch Position |       |       |       |       |   |   |
| OFF             |       |       |       |       |   |   |
| 1               | ○ — ○ |       |       |       |   |   |
| 2               |       | ○ — ○ |       |       |   |   |
| 3               | ○ — ○ |       | ○ — ○ |       |   |   |
| 4               |       |       |       | ○ — ○ |   |   |

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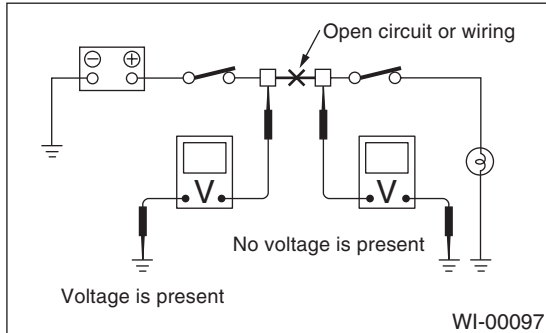
# Basic Diagnostic Procedure

## WIRING SYSTEM

### 3. HOW TO DETERMINE AN OPEN CIRCUIT

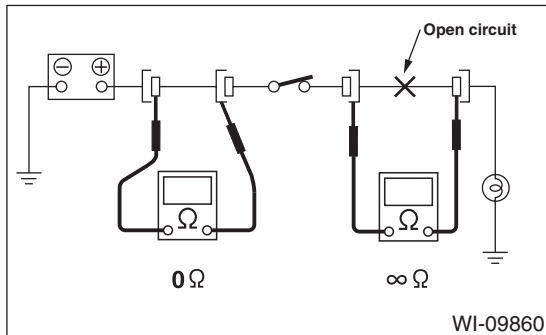
#### 1) WITH VOLTMETER:

An open circuit is determined by measuring the voltage between respective connectors and ground using a voltmeter, starting with the connector closest to power supply. The power supply must be turned ON so that current flows in the circuit. If voltage is not present between a particular connector and ground, the circuit between that connector and previous connector is open.



#### 2) WITH OHMMETER:

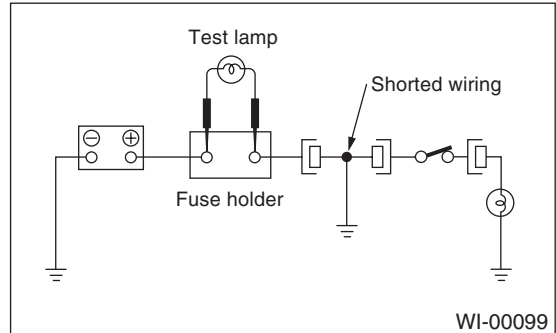
Disconnect all connectors affected, and check the continuity in wiring between adjacent connectors. When the ohmmeter indicates "infinite", the wiring is open.



### 4. HOW TO DETERMINE A SHORT CIRCUIT

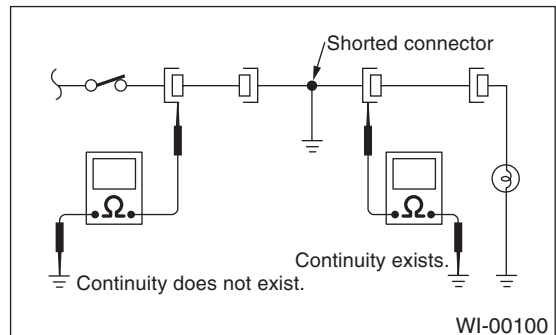
#### 1) WITH TEST LIGHT:

Connect a test light (rated at approx. 3 watts) in place of the blown fuse and allow current to flow through the circuit. Disconnect one connector at a time from the circuit, starting with the one located farthest from power supply. If the test light goes out when a connector is disconnected, the wiring between that connector and next connector (farther from the power supply) is shorted.



#### 2) WITH OHMMETER:

Disconnect all affected connectors, and check the continuity between each connector and ground. When the ohmmeter indicates continuity between a particular connector and a ground, that the connector is shorted.



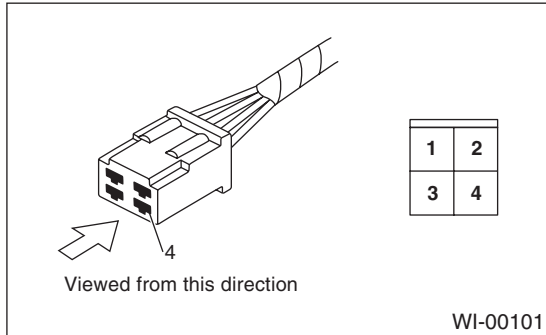
## C: HOW TO READ WIRING DIAGRAMS

### 1. WIRING DIAGRAM

The wiring diagram of each system is illustrated so that you can understand the path through which electric current flows from battery.

Sketches and codes are used in the diagrams. They should read as follows:

- Each connector and its terminal position are indicated by a sketch of the connector in a disconnected state which is viewed from front.



- The number of poles or pins, presence of a lock are indicated in the sketch of each connector. In the sketch, the highest pole number refers to the number of poles which connector has. For example, the sketch of connector shown in the figure indicates the connector has 9 poles.

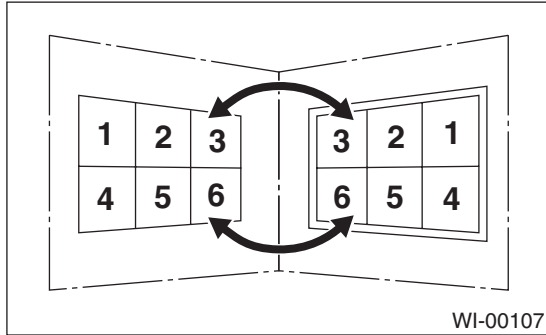
| Connector used in vehicle | Connector shown in wiring diagram   |        |  |
|---------------------------|---|--------|--|
|                           | Sketch  | Symbol | Number of poles  |
|                           | <p>Double frames</p> <p>Indicates a lock is included.</p> <p>Indicates the number of poles.</p> |        | <p>Numbered in order from upper right to lower left.</p> |
|                           | <p>Indicates a lock is included.</p> <p>Single frame</p>  |        | <p>Numbered in order from upper left to lower right</p>  |

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# Basic Diagnostic Procedure

## WIRING SYSTEM

- When one set of connectors is viewed from the front side, the pole numbers of one connector are symmetrical to those of other. When these two connectors are connected as a unit, the poles which have the same number are joined.



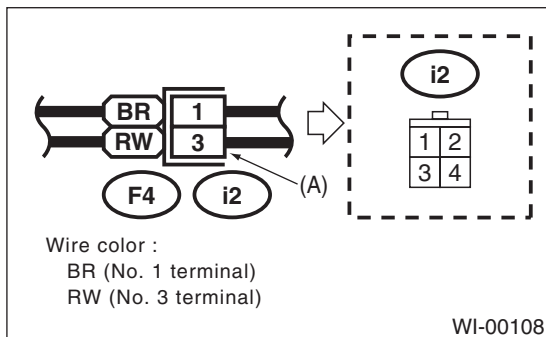
### WIRING DIAGRAM:

The connectors are numbered along with the number of poles, external colors, and mating connections in accompanying list.

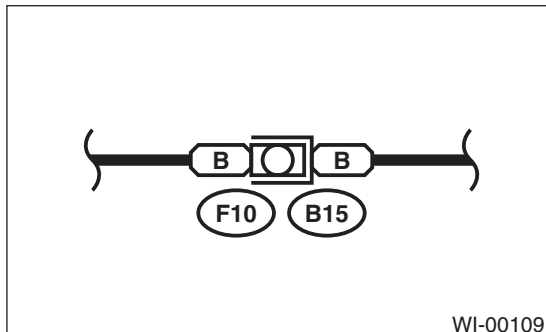
- The sketch of each connector in the wiring diagram usually shows (A) side of the connector. The relationship between wire color, terminal number and connector is described in figure.

### NOTE:

A wire which runs in one direction from a connector terminal sometimes may have a different color from that which runs in the other direction from that terminal.

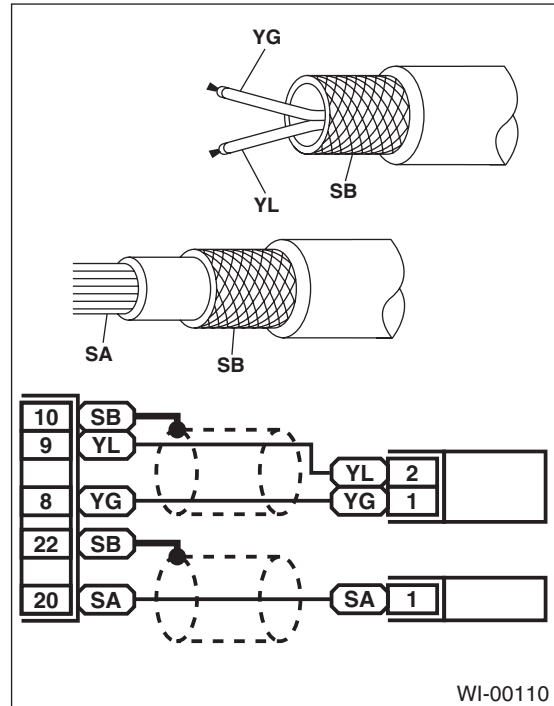


- In the wiring diagram, connectors which have no terminal number refer to one-pole types. Sketches of these connectors are omitted intentionally.

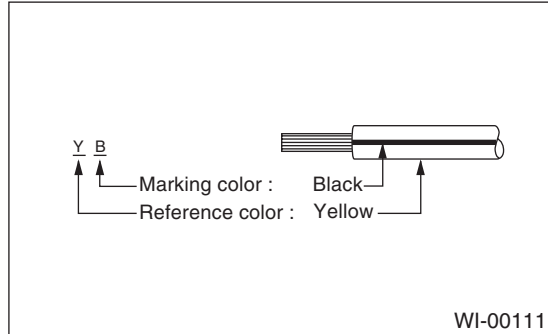


- The following color codes are used to indicate the colors of the wires used.

| Color code | Color          |
|------------|----------------|
| L          | Blue           |
| B          | Black          |
| Y          | Yellow         |
| G          | Green          |
| R          | Red            |
| W          | White          |
| Br         | Brown          |
| Lg         | Light green    |
| Gr         | Gray           |
| P          | Pink           |
| Or         | Orange         |
| Sb         | Sky blue       |
| V          | Violet         |
| SA         | Sealed (Inner) |
| SB         | Sealed (Outer) |



- The wire color code, which consists of two letters (or three letters including Br or Lg), indicates the standard color (base color of the wire covering) by its first letter and stripe marking by its second letter.



- The table lists the nominal sectional areas and allowable currents of wires.

### CAUTION:

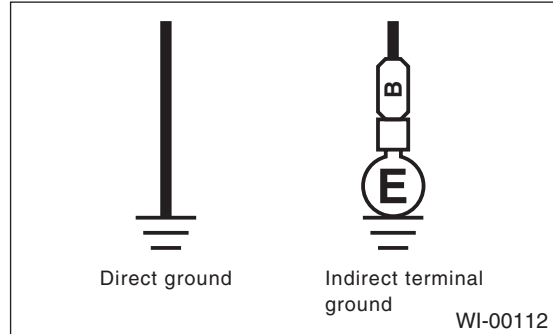
**When replacing or repairing a wire, be sure to use the same size and type of wire which was originally used.**

### NOTE:

- The allowable current in the table indicates tolerable amperage of each wire at an ambient temperature of 40°C (104°F).
- The allowable current changes with ambient temperature. Also, it changes if a bundle of more than two wires is used.

| Nominal sectional area<br>mm <sup>2</sup> | No. of strands/<br>strand diameter | Outside diameter of finished wiring<br>mm | Allowable current<br>Amps/<br>40°C (104°F) |
|---|------------------------------------|---|--|
| 0.3                                       | 7/0.26                             | 1.8                                       | 7  |
| 0.5                                       | 7/0.32                             | 2.2 (or 2.0)                              | 12   |
| 0.75                                      | 30/0.18                            | 2.6 (or 2.4)                              | 16   |
| 0.85                                      | 11/0.32                            | 2.4 (or 2.2)                              | 16   |
| 1.25                                      | 16/0.32                            | 2.7 (or 2.5)                              | 21   |
| 2   | 26/0.32                            | 3.1 (or 2.9)                              | 28   |
| 3   | 41/0.32                            | 3.8 (or 3.6)                              | 38   |
| 5   | 65/0.32                            | 4.6 (or 4.4)                              | 51   |
| 8   | 50/0.45                            | 5.5                                       | 67   |

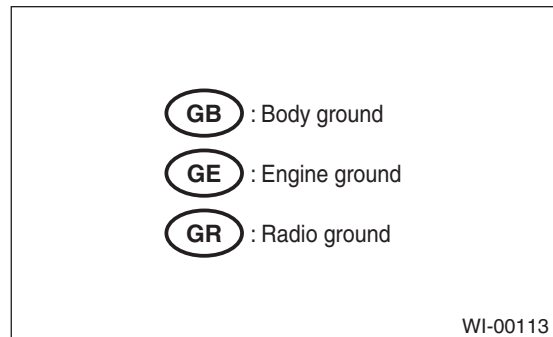
- Each unit is either directly grounded to the body or indirectly grounds through a harness ground terminal. Different symbols are used in the wiring diagram to identify the two grounding systems.



- The ground points shown in the wiring diagram refer to the following:

### NOTE:

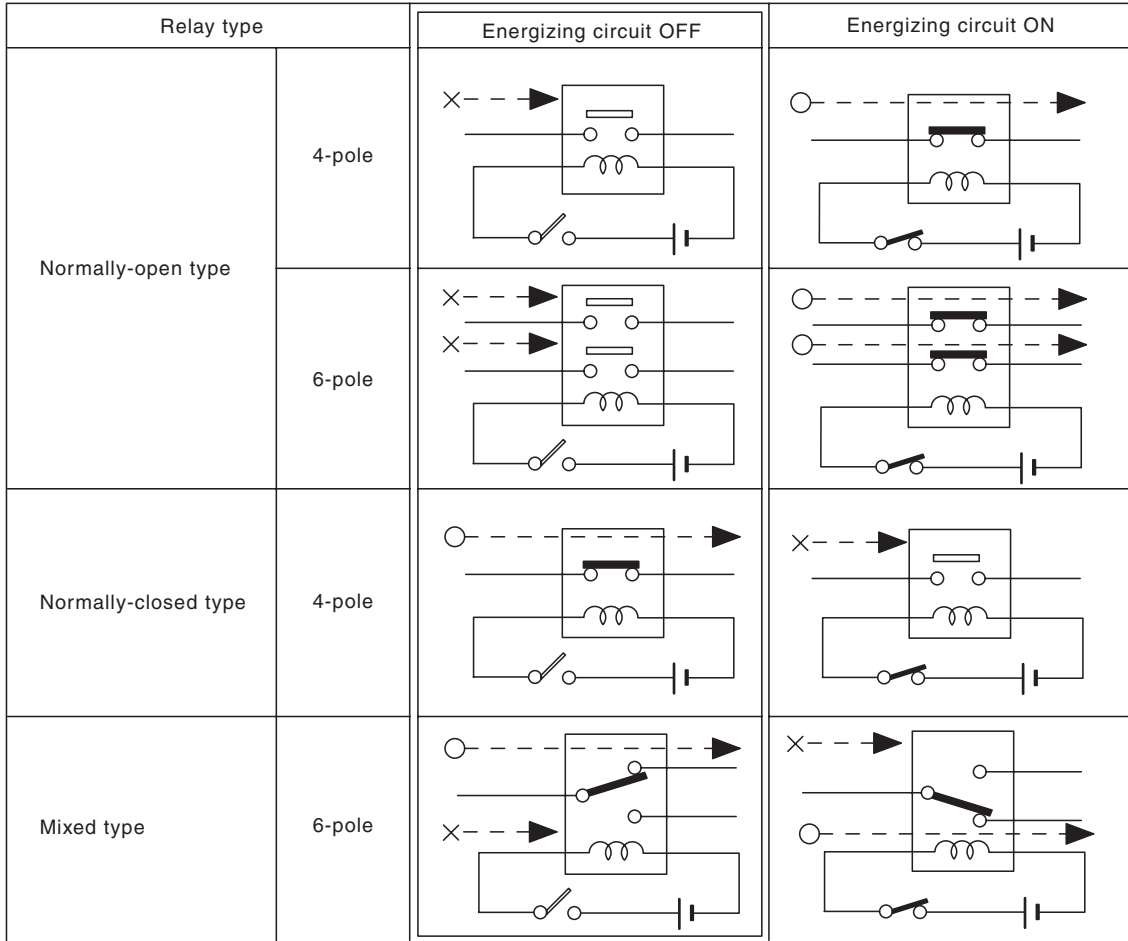
All wiring harnesses are provided with a ground point which should be securely connected.



# Basic Diagnostic Procedure

## WIRING SYSTEM

- Relays are classified as normally-open or normally-closed.
- The normally-closed relay has one or more contacts. The wiring diagram shows the relay mode when energizing circuit is OFF.



Key to symbols:

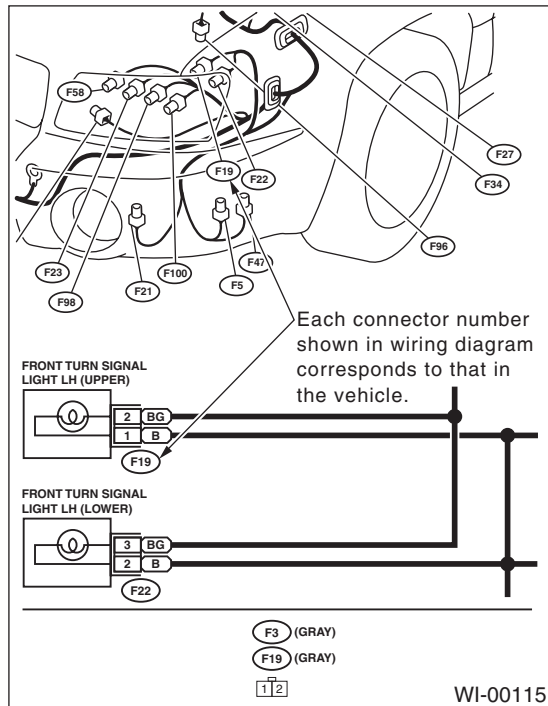
○ —▶ : Current flows.

× —▶ : Current does not flow.

WI-00114

- Each connector number shown in the wiring diagram corresponds to that in wiring harness. The location of each connector in actual vehicle is determined by reading the first character of the connector (for example, a “F” for F8, “i” for i16, etc.) and type of wiring harness. The first character of each connector number refers to the area or system of the vehicle.

| Symbol | Wiring harness and cord                                   |
|--------|---|
| F      | Front wiring harness                                      |
| B      | Bulkhead wiring harness                                   |
| E      | Engine wiring harness                                     |
| T      | Transmission cord, Rear oxygen sensor cord                |
| D      | Door cord LH & RH, Rear door cord LH & RH, Rear gate cord |
| i      | Instrument panel wiring harness                           |
| R      | Rear wiring harness, Fuel tank cord, Roof cord            |
| AB     | Airbag wiring harness                                     |

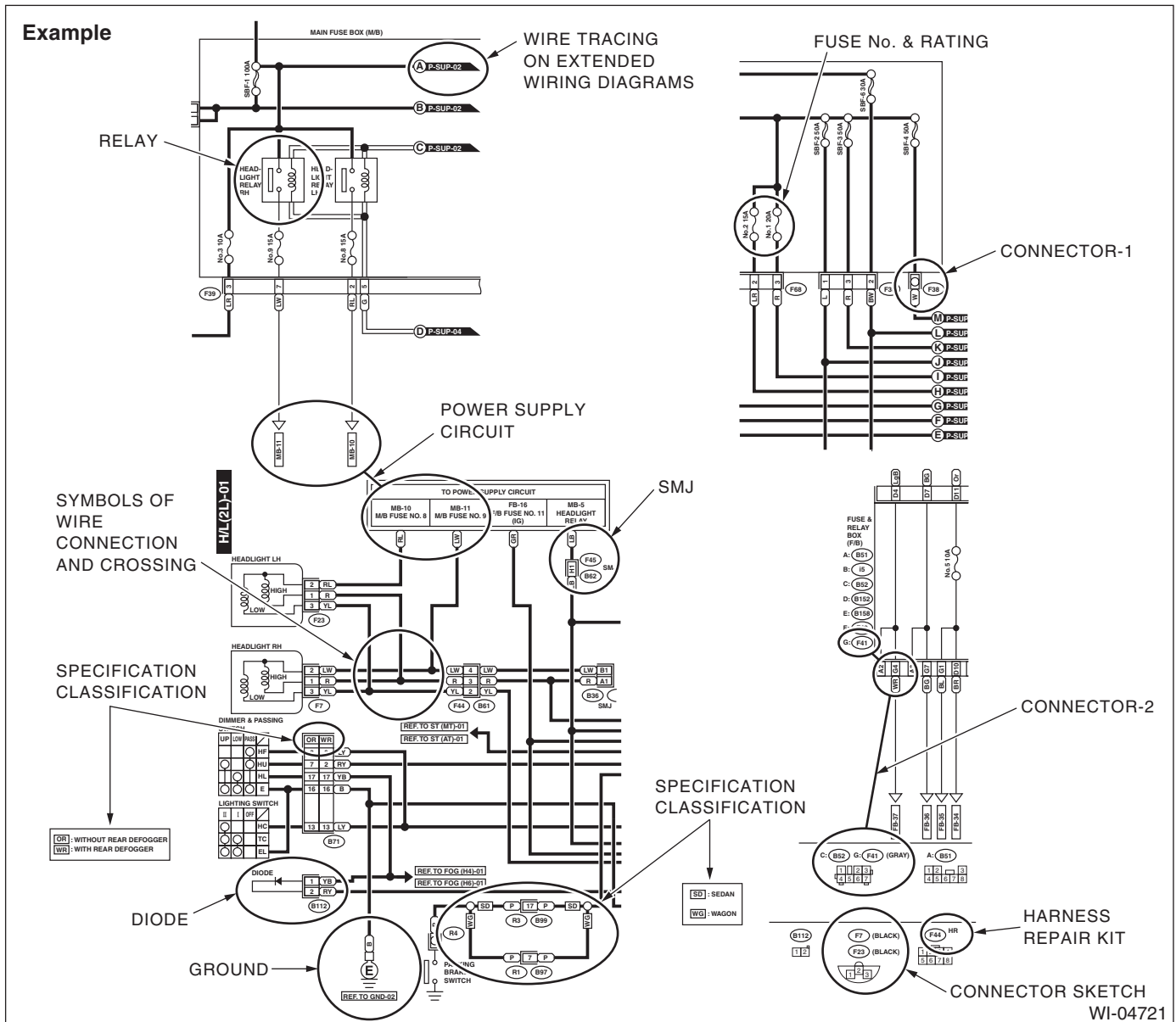


# Basic Diagnostic Procedure

## WIRING SYSTEM

### D: SYMBOLS IN WIRING DIAGRAMS

A number of symbols are used in each wiring diagram to easily identify parts or circuits.



#### 1. RELAY

A symbol used to indicate a relay.

#### 2. CONNECTOR-1

The sketch of the connector indicates one-pole types.

#### 3. WIRING CONNECTION

Some wiring diagrams are indicated in foldouts for convenience. Wiring destinations are indicated where necessary by corresponding symbols. (When two pages are needed for clear indication)

#### 4. FUSE No. & RATING

The "FUSE No. & RATING" corresponds with that used in fuse box (main fuse box, fuse and joint box).

#### 5. CONNECTOR-2

- Each connector is indicated by a symbol.
- Each terminal number is indicated in the corresponding wiring diagram in an abbreviated form.
- For example, terminal number "G4" refers to No. 4 terminal of connector (G: F41) shown in the connector sketch.

## 6. CONNECTOR SKETCH

- Each connector sketch clearly identifies the shape and color of a connector as well as terminal locations. Non-colored connectors are indicated in natural color.
- When more than two types of connector number are indicated in a connector sketch, it means that the same type connectors are used.

## 7. GROUND

Each grounding point can be located easily by referring to the corresponding wiring harness.

## 8. DIODE

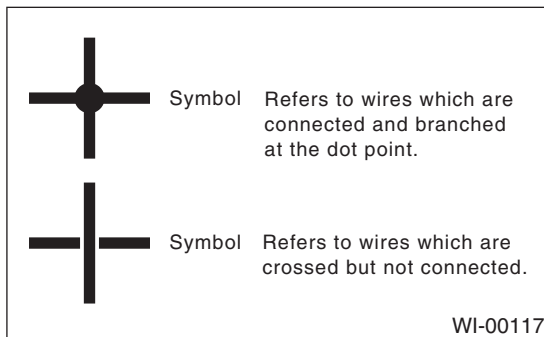
A symbol is used to indicate a diode.

## 9. WIRE TRACING ON EXTENDED WIRING DIAGRAMS

For a wiring diagram extending over at least two pages, a symbol (consisting of the same characters with arrows), facilitates wire tracing from one page to the next.

A ↔ A, B ↔ B

## 10. SYMBOLS OF WIRE CONNECTION AND CROSSING



## 11. POWER SUPPLY CIRCUIT

A symbol is used to indicate the power supply in each wiring diagram.

“MB-5”, “MB-6”, etc., which are used as power-supply symbols throughout the text, correspond with those shown in POWER SUPPLY CIRCUIT in the wiring diagram.

Accordingly, using the POWER SUPPLY CIRCUIT and wiring diagrams permits service personnel to understand the entire electrical arrangement of a system.

## 12. CLASSIFICATION BY SPECIFICATION

When the wiring diagrams differ according to vehicle specifications, the specification difference is described by using abbreviations.

## 13. HARNESS REPAIR KIT

The connector adapting to Harness repair kit is shown as “HR” in the right-upper of connector number.

Refer to “Harness Repair Kit” for harness repair kit. <Ref. to WI-204, SPECIFICATION, Harness Repair Kit.>




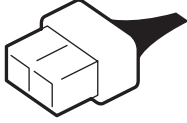
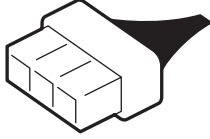

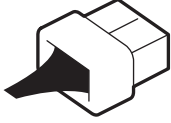
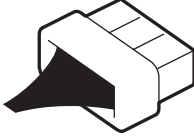
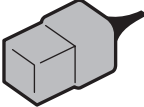
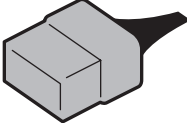
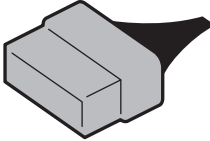
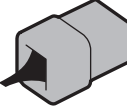
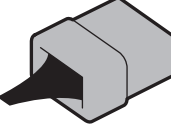
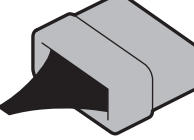
## Basic Diagnostic Procedure






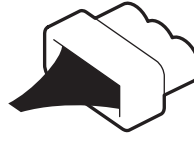
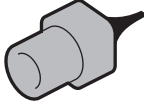
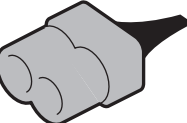
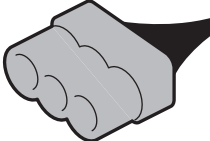
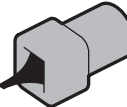
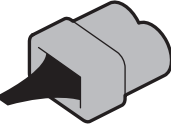
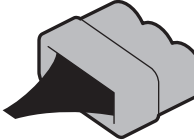
WIRING SYSTEM

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### **E: CONNECTOR SYMBOL IN WIRING HARNESS**

A number of connector symbols are used in each wiring diagram to easily identify the wiring harness connectors.

| Standard type: Female   |   |   |
|---|---|---|
| Pole: From 1 to 8   | Pole: From 9 to 20  | Pole: More than 21  |
|  |  |  |
|  |  |  |
| Standard type: Male   |   |   |
|  |  |  |
|  |  |  |

| Water proof type: Female  |   |   |
|---|---|---|
| Pole: From 1 to 8   | Pole: From 9 to 20  | Pole: More than 21  |
|  |  |  |
|  |  |  |
| Water proof type: Male  |   |   |
|  |  |  |
|  |  |  |

# Basic Diagnostic Procedure

## WIRING SYSTEM

---

### F: ABBREVIATION IN WIRING DIAGRAMS

| Abbreviation | Full name                        |
|--------------|----------------------------------|
| ABS          | Antilock Brake System            |
| ACC          | Accessory                        |
| A/C          | Air Conditioning                 |
| AD           | Auto Down                        |
| AT           | Automatic Transmission           |
| AU           | Auto Up                          |
| +B           | Battery                          |
| DN           | Down                             |
| E            | Ground                           |
| F/B          | Fuse & Joint Box                 |
| FL1.5        | Fusible link 1.5 mm <sup>2</sup> |
| IG           | Ignition                         |
| Illumi.      | Illumination                     |
| LH           | Left Hand                        |
| Lo           | Low                              |
| M            | Motor                            |
| M/B          | Main Fuse Box                    |
| MG           | Magnet                           |
| Mi           | Middle                           |
| OP           | Optional Parts                   |
| PASS         | Passing                          |
| RH           | Right Hand                       |
| SBF          | Slow Blow Fuse                   |
| ST           | Starter                          |
| SW           | Switch                           |
| UP           | Up                               |
| WASH         | Washer                           |

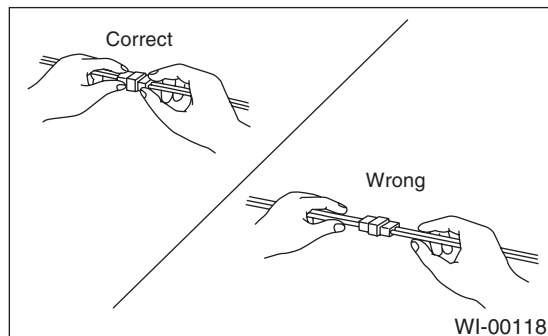
## 2. Working Precautions

### A: PRECAUTIONS WHEN WORKING WITH THE PARTS MOUNTED ON THE VEHICLE

- 1) When working under a vehicle which is jacked-up, always be sure to use rigid racks.
- 2) The parking brake must always be applied during working. Also, in automatic transmission models, keep the select lever set to P (Parking) range.
- 3) Be sure the workshop is properly ventilated when running the engine. Further, be careful not to touch the belt or fan while the engine is operating.
- 4) Be careful not to touch hot metal parts, especially the radiator and exhaust system immediately after the engine has been turned off.

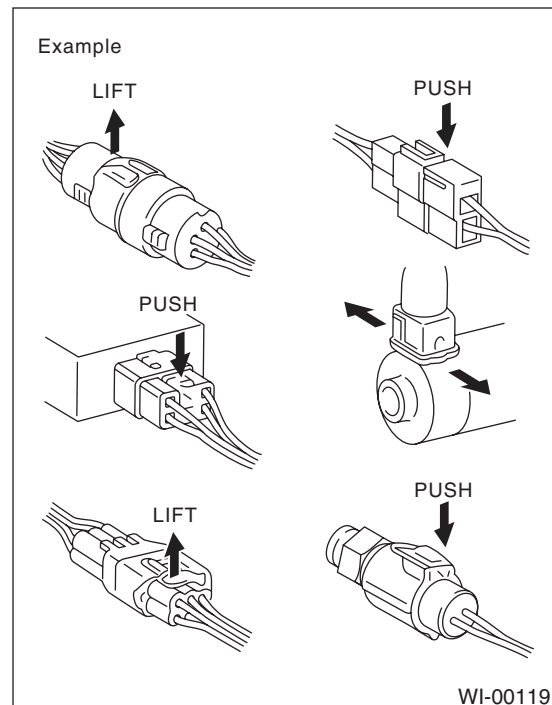
### B: PRECAUTIONS IN TROUBLE DIAGNOSIS AND REPAIR OF ELECTRIC PARTS

- 1) The battery cable must be disconnected from battery's (-) terminal, and the ignition switch must be set to OFF position, unless otherwise required by the diagnostics.
- 2) Securely fasten the wiring harness with clamps and slips so that the harness does not interfere with body end parts or edges and bolts or screws.
- 3) When installing the parts, be careful not to catch them on the wiring harness.
- 4) When disconnecting a connector, do not pull the wires, but pull while holding the connector body.



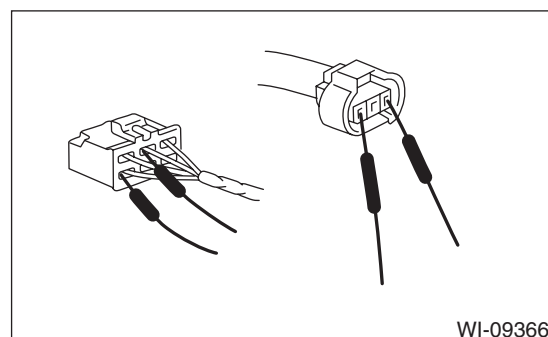
- 5) Some connectors are provided with a lock. One type of such a connector is disconnected by pushing the lock, and the other, by moving the lock up. In either type the lock shape must be identified before attempting to disconnect the connector.

To connect, insert the connector until it snaps and confirm that it is tightly connected.



- 6) When checking continuity between connector terminals, or measuring the voltage across the terminal and ground, always contact tester probe(s) on terminals from the wiring connection side. If the probe is too thick to gain access to the terminal, use "mini" test leads.

To check water-proof connectors (which are not measurable from the wiring side), contact test probes on the terminal side. Be careful not to bend or damage terminals.



- 7) Sensors, relays, electrical unit, etc., are sensitive to strong impacts. Handle them with care so that they are not dropped or mishandled.

# Power Supply Circuit

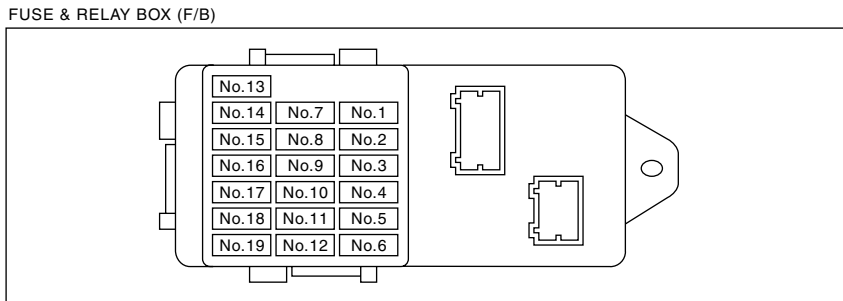
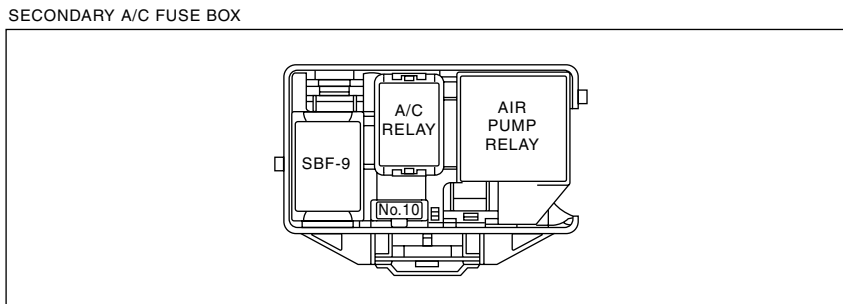
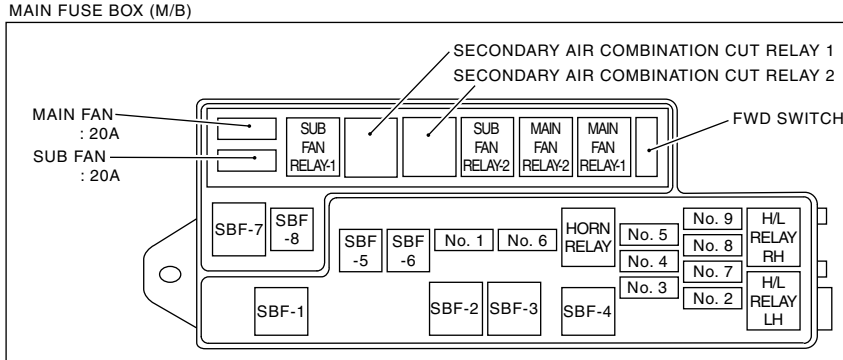
WIRING SYSTEM

## 3. Power Supply Circuit

### A: WIRING DIAGRAM

P-SUP-01

P-SUP-01

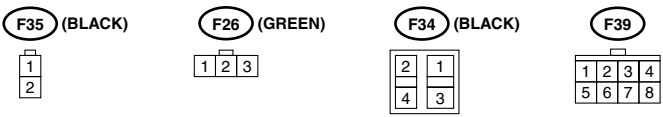
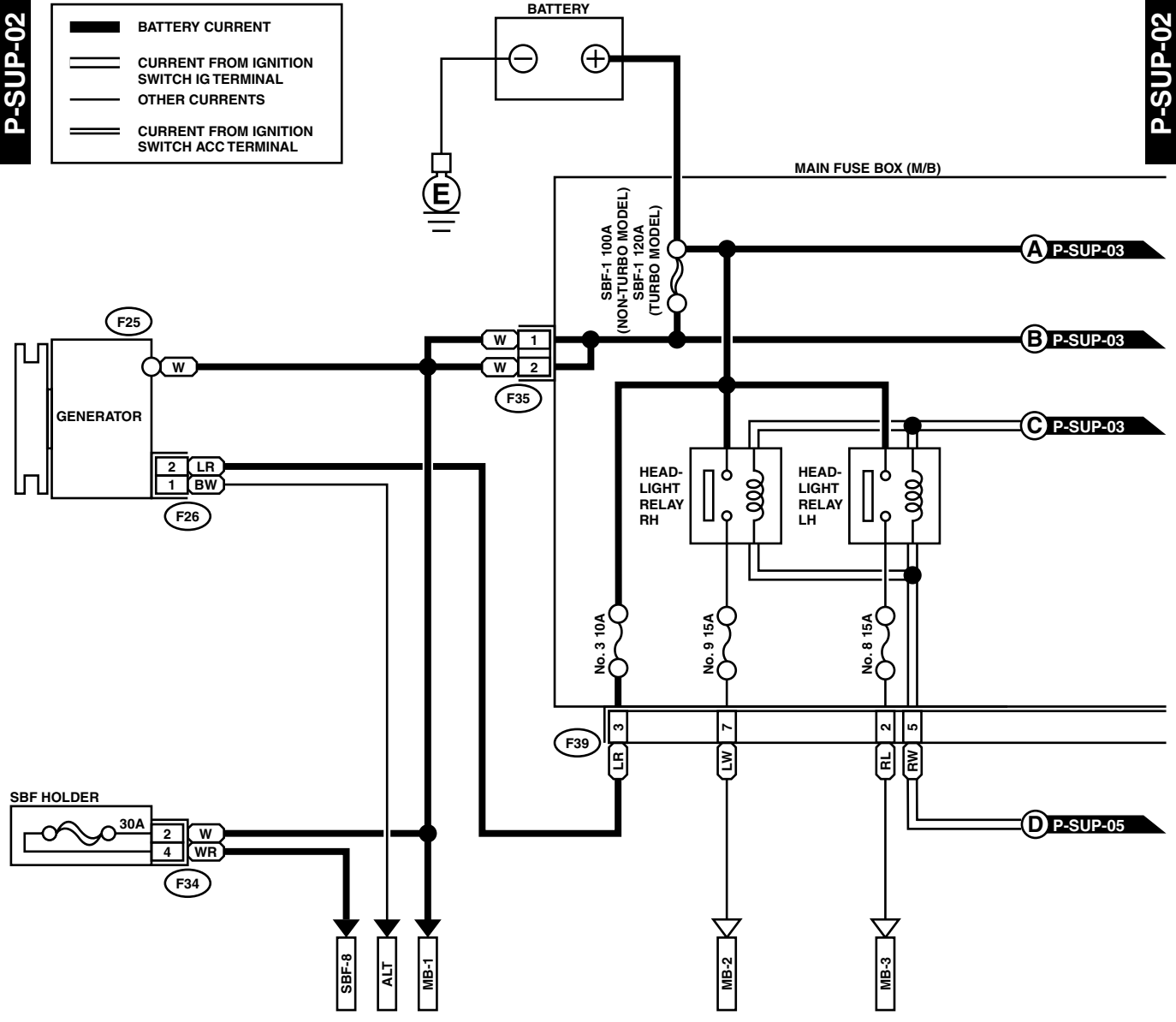
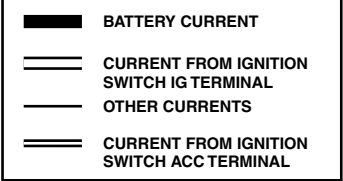


WI-08866

# Power Supply Circuit

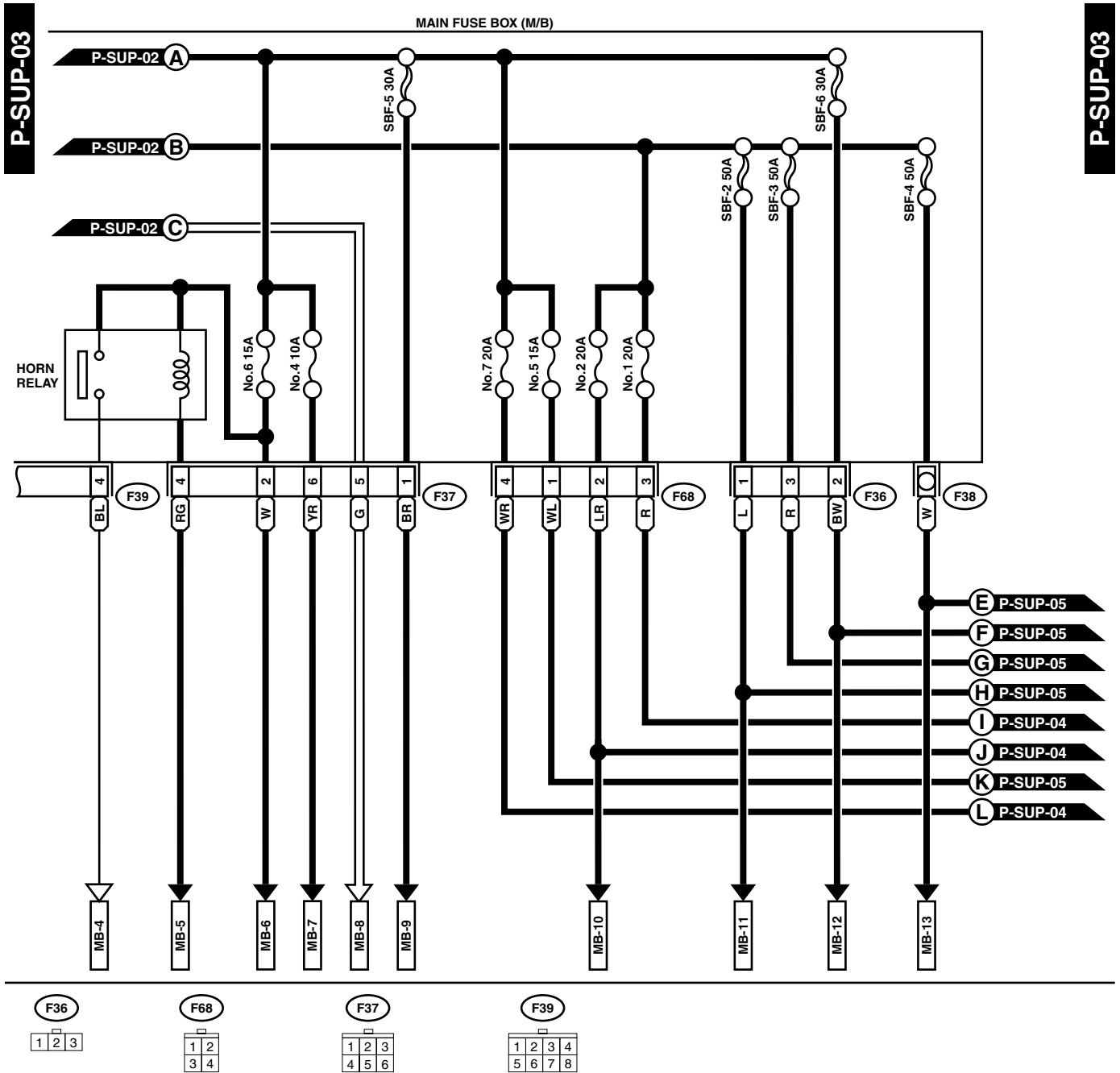
P-SUP-02

P-SUP-02



# Power Supply Circuit

WIRING SYSTEM



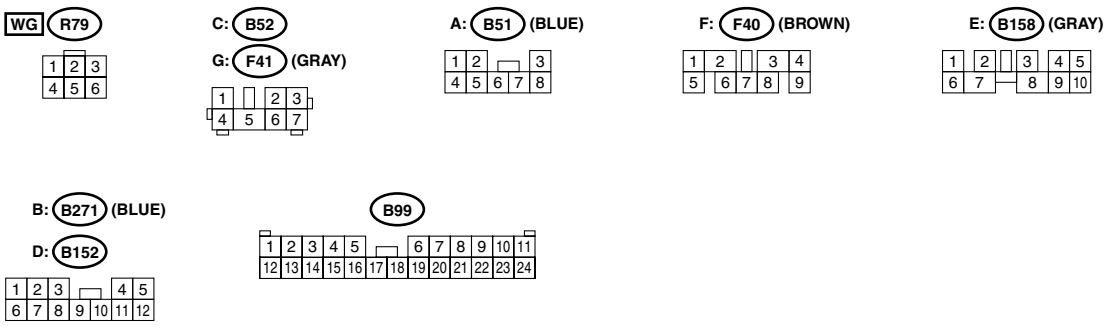
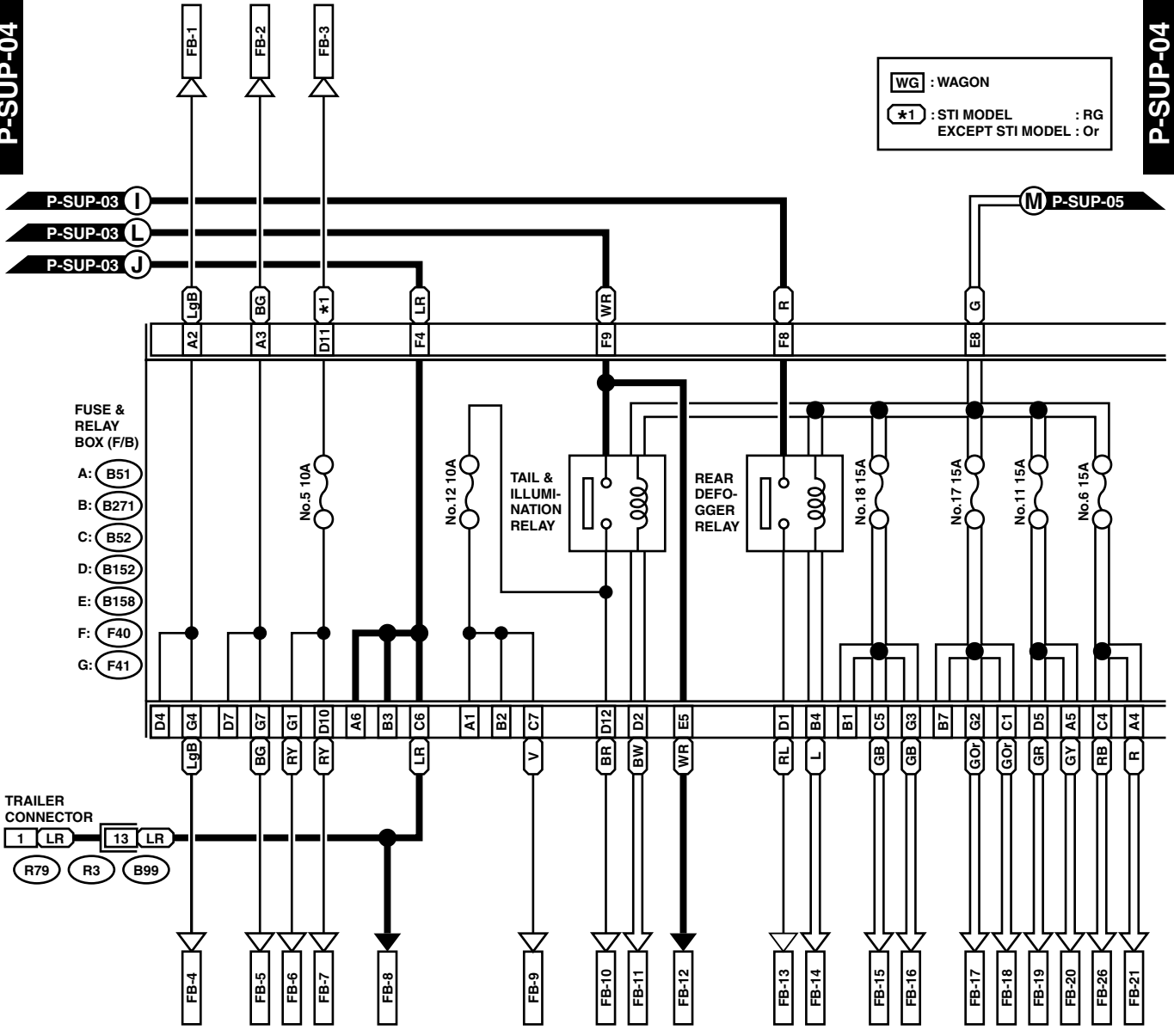
WI-08868

# Power Supply Circuit

WIRING SYSTEM

P-SUP-04

P-SUP-04

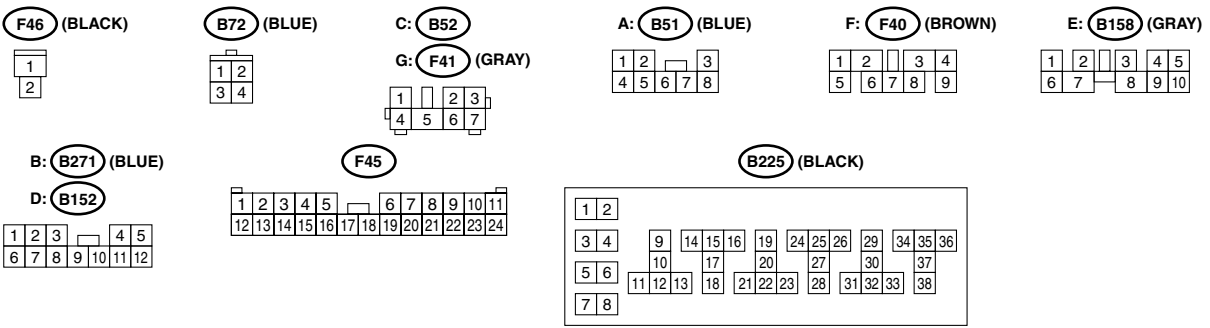
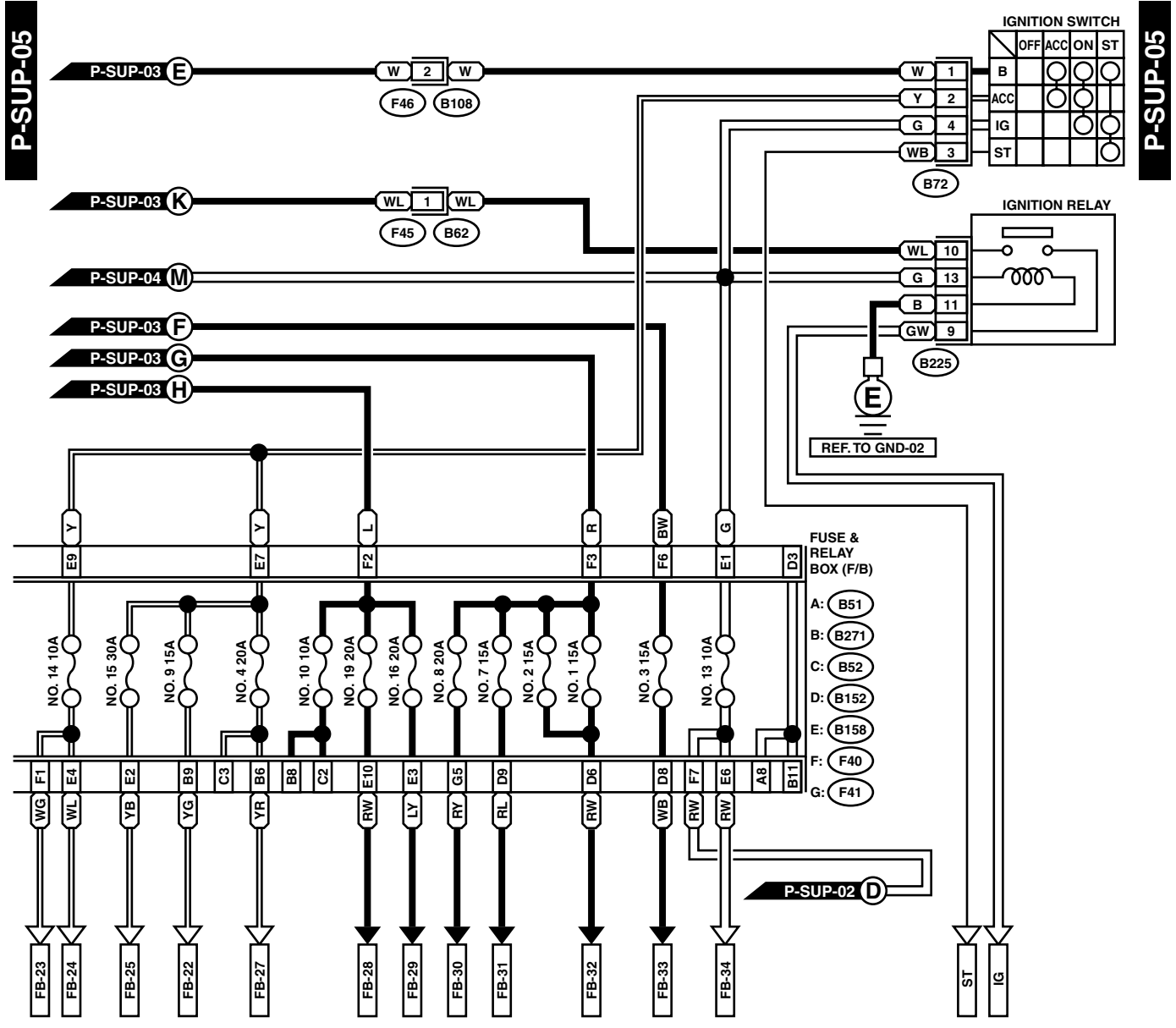


WI-08869



# Power Supply Circuit

WIRING SYSTEM



WI-08870

# Power Supply Circuit

WIRING SYSTEM

| No.   | Load   |
|-------|--|
| MB-1  | A/C relay holder (Fuse)<br>Secondary A/C relay holder  |
| MB-2  | Combination meter<br>Headlight RH  |
| MB-3  | Headlight LH   |
| MB-4  | Horn   |
| MB-5  | Cruise control switch<br>Horn switch<br>Keyless entry control module<br>Security horn relay  |
| MB-6  | Hazard switch<br>Ignition starter and steering lock assembly<br>Keyless entry control module   |
| MB-7  | TCM<br>Driver's control center differential relay<br>Driver's control center differential control module                                   |
| MB-8  | Daytime running light control module<br>Diode (Daytime running light)  |
| MB-9  | Data link connector<br>ECM<br>Fuel pump relay<br>Main relay<br>Electronic throttle control relay<br>Immobilizer control module             |
| MB-10 | Keyless buzzer   |
| MB-11 | Fuse (Seat heater)   |
| MB-12 | Power window circuit breaker   |
| MB-13 | Relay holder   |
| SBF-8 | ABS control module   |
| IG    | Hazard switch<br>Power window relay  |
| ST    | Interrupt relay  |
| FB-1  | Combination meter<br>Hazard switch<br>Rear turn signal light RH<br>Trailer connector<br>Turn signal switch<br>Keyless entry control module |
| FB-2  | Combination meter<br>Hazard switch<br>Rear turn signal light LH<br>Trailer connector<br>Turn signal switch<br>Keyless entry control module |
| FB-3  | Parking switch   |
| FB-4  | Front turn signal light RH   |
| FB-5  | Front turn signal light LH   |
| FB-6  | Front clearance light LH<br>Front clearance light RH<br>Headlight leveler LH<br>Headlight leveler RH                                       |
| FB-7  | License plate light<br>Rear combination light LH<br>Rear combination light RH<br>Trailer connector   |

| No.   | Load   |
|-------|--|
| FB-8  | Clock<br>Auto A/C control module<br>Combination meter<br>Ignition starter and steering lock assembly<br>Keyless entry control module<br>Radio<br>Room light<br>Spot map light  |
| FB-9  | Clock<br>Combination meter<br>Illumination light<br>Body integrated module<br>Headlight leveler switch<br>HID relay  |
| FB-10 | Parking switch   |
| FB-11 | ECM<br>Lighting switch   |
| FB-12 | Parking switch   |
| FB-13 | Mirror heater relay<br>Rear defogger<br>Rear defogger switch<br>Auto A/C control module  |
| FB-14 | Body integrated module<br>ECM  |
| FB-15 | ABS control module<br>Back-up light switch (MT)<br>Data link connector<br>Cruise control switch<br>ECM<br>Daytime running light control module<br>Daytime running light relay<br>High-beam relay<br>Keyless entry control module<br>Impact sensor<br>Vehicle speed sensor (MT)<br>Wiper deicer relay<br>Wiper deicer timer<br>Stop light and brake switch<br>Cruise clutch switch (MT) |
| FB-16 | Main fan relay-1<br>Main fan relay-2   |
| FB-17 | A/C relay<br>Sub fan relay-1<br>Sub fan relay-2<br>A/C pressure switch   |
| FB-18 | A/C switch<br>Auto A/C control module<br>Blower fan motor relay<br>Illumination light  |

# Power Supply Circuit

## WIRING SYSTEM

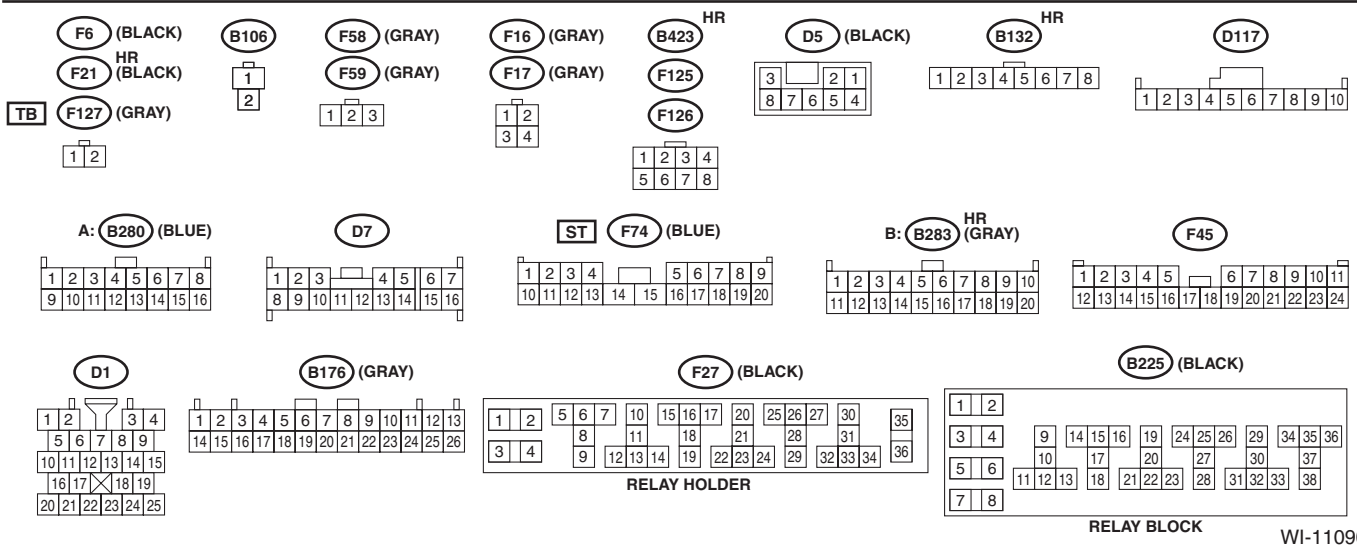
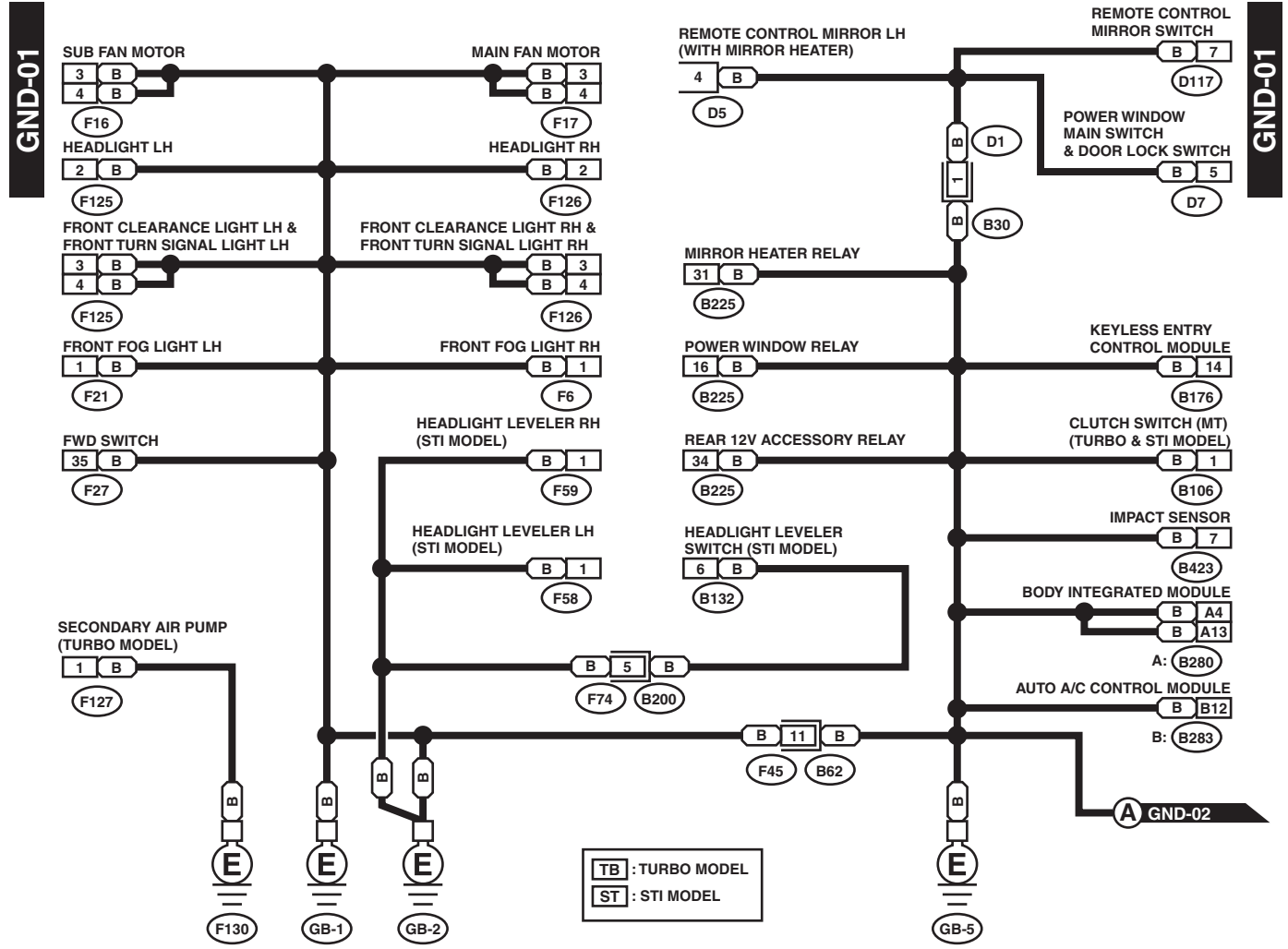
---

| No.   | Load  |
|-------|---|
| FB-19 | ECM<br>Fuel pump relay<br>Inhibitor switch (AT)<br>Immobilizer control module<br>Ignition coil No. 1<br>Ignition coil No. 2<br>Ignition coil No. 3<br>Ignition coil No. 4<br>Body integrated module<br>TCM<br>Driver's control center differential control module<br>Driver's control center differential relay |
| FB-20 | Airbag control module   |
| FB-21 | Airbag control module   |
| FB-22 | Clock<br>Auto A/C control module<br>Radio   |
| FB-23 | Rear washer motor   |
| FB-24 | Rear wiper intermittent module (Wagon)<br>Rear wiper motor (Wagon)  |
| FB-25 | Combination switch<br>Front washer motor<br>Front wiper motor   |
| FB-26 | Occupant detection module   |
| FB-27 | Compass mirror<br>Front accessory power supply socket<br>Body integrated module<br>TCM<br>Rear 12 V accessory relay<br>Remote control mirror switch<br>Intercooler water spray switch<br>Intercooler water spray timer  |
| FB-28 | Mirror heater relay<br>Wiper deicer relay   |
| FB-29 | Stop light switch   |
| FB-30 | ABS control module  |
| FB-31 | Front fog light relay   |
| FB-32 | Blower fan motor relay  |
| FB-33 | Body integrated module  |
| FB-34 | Combination meter   |

## 4. Ground Circuit

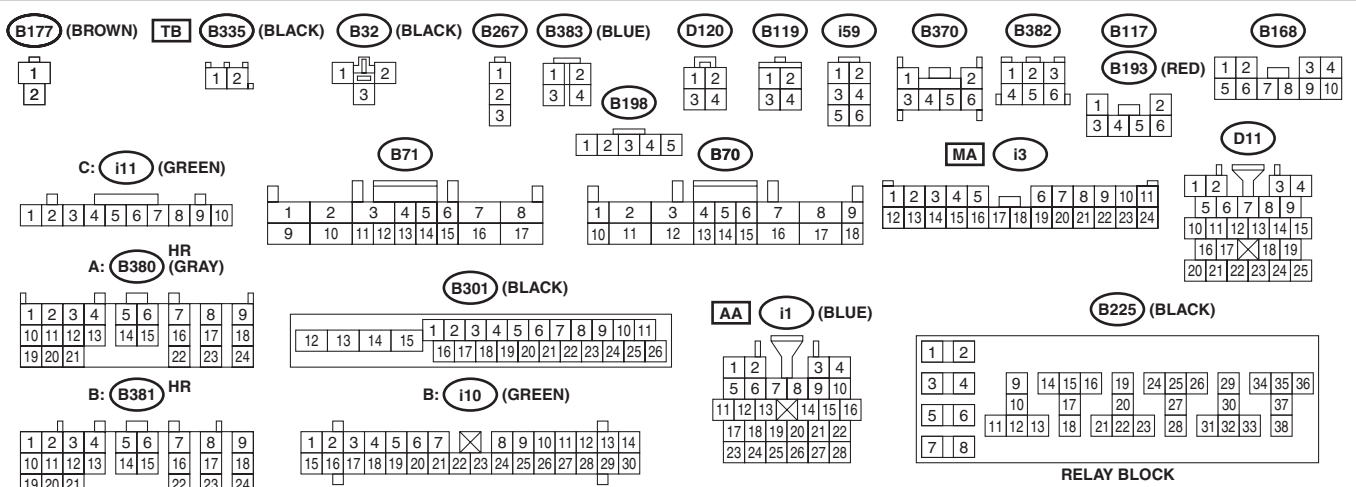
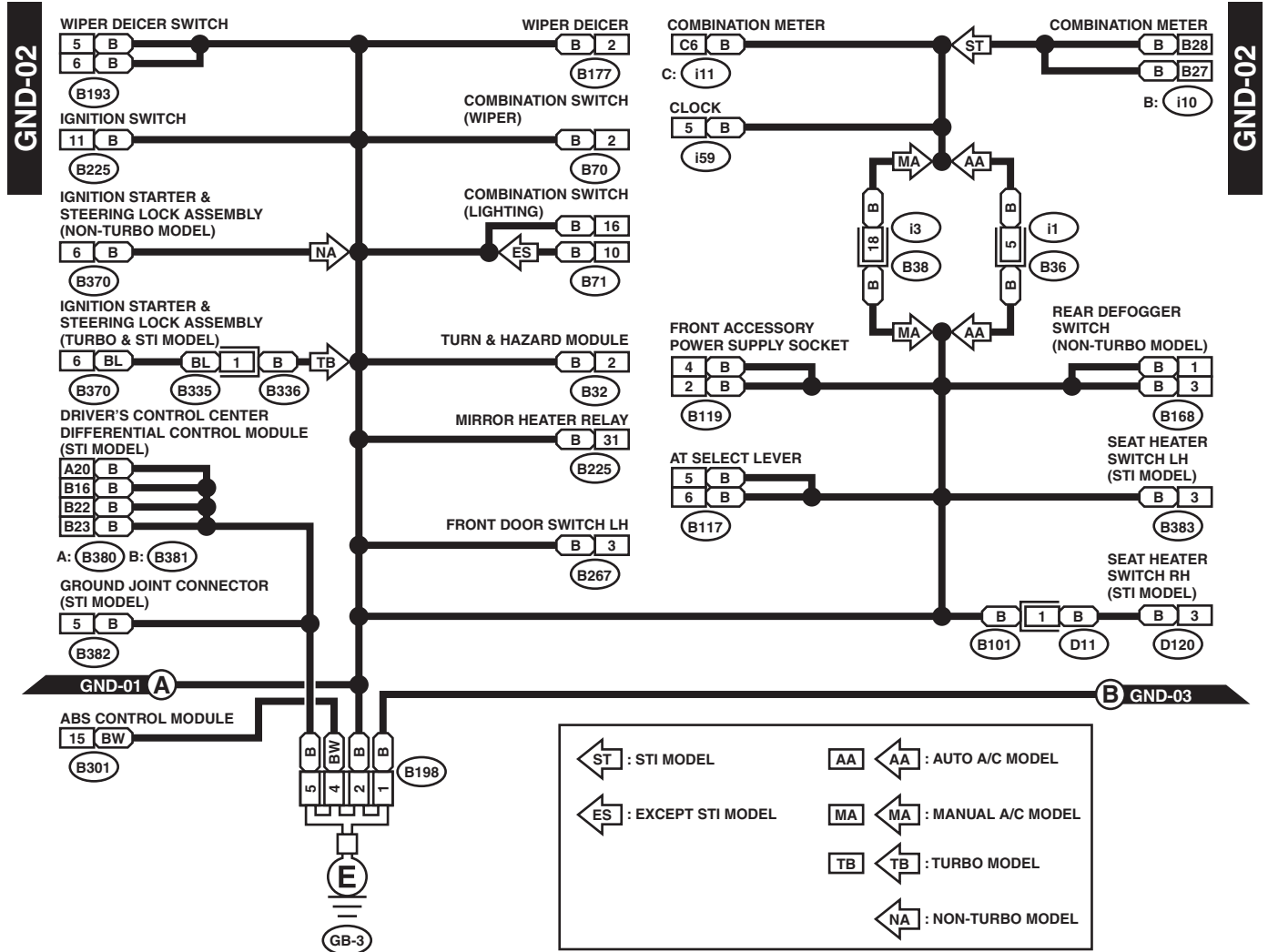
### A: WIRING DIAGRAM

#### 1. BODY GROUND



# Ground Circuit

## WIRING SYSTEM



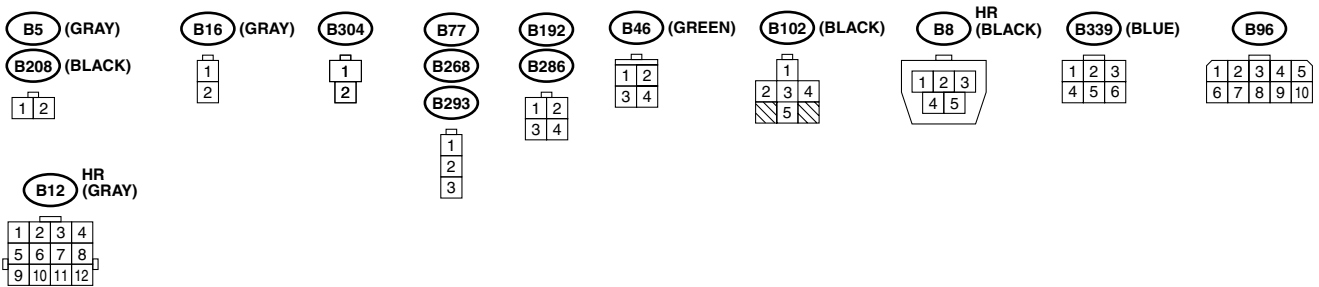
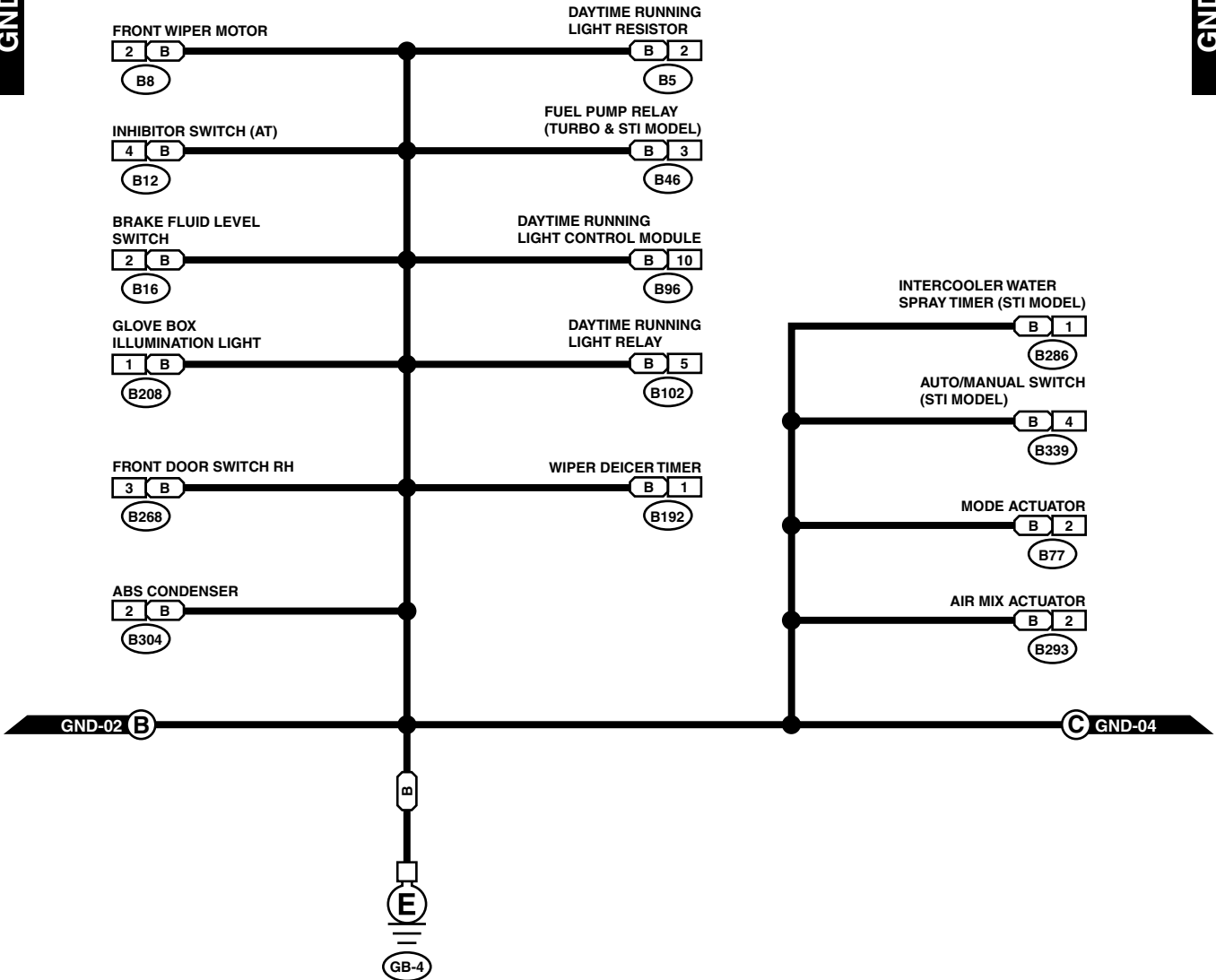
WI-11091

# Ground Circuit

WIRING SYSTEM

GND-03

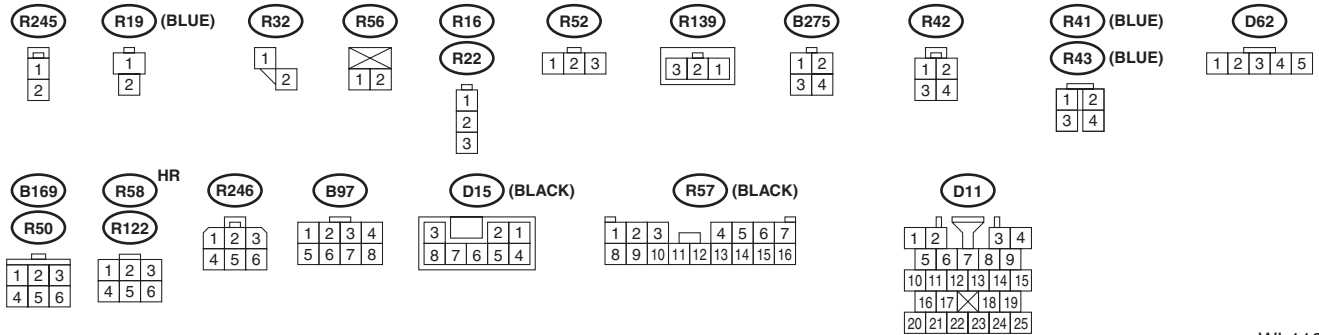
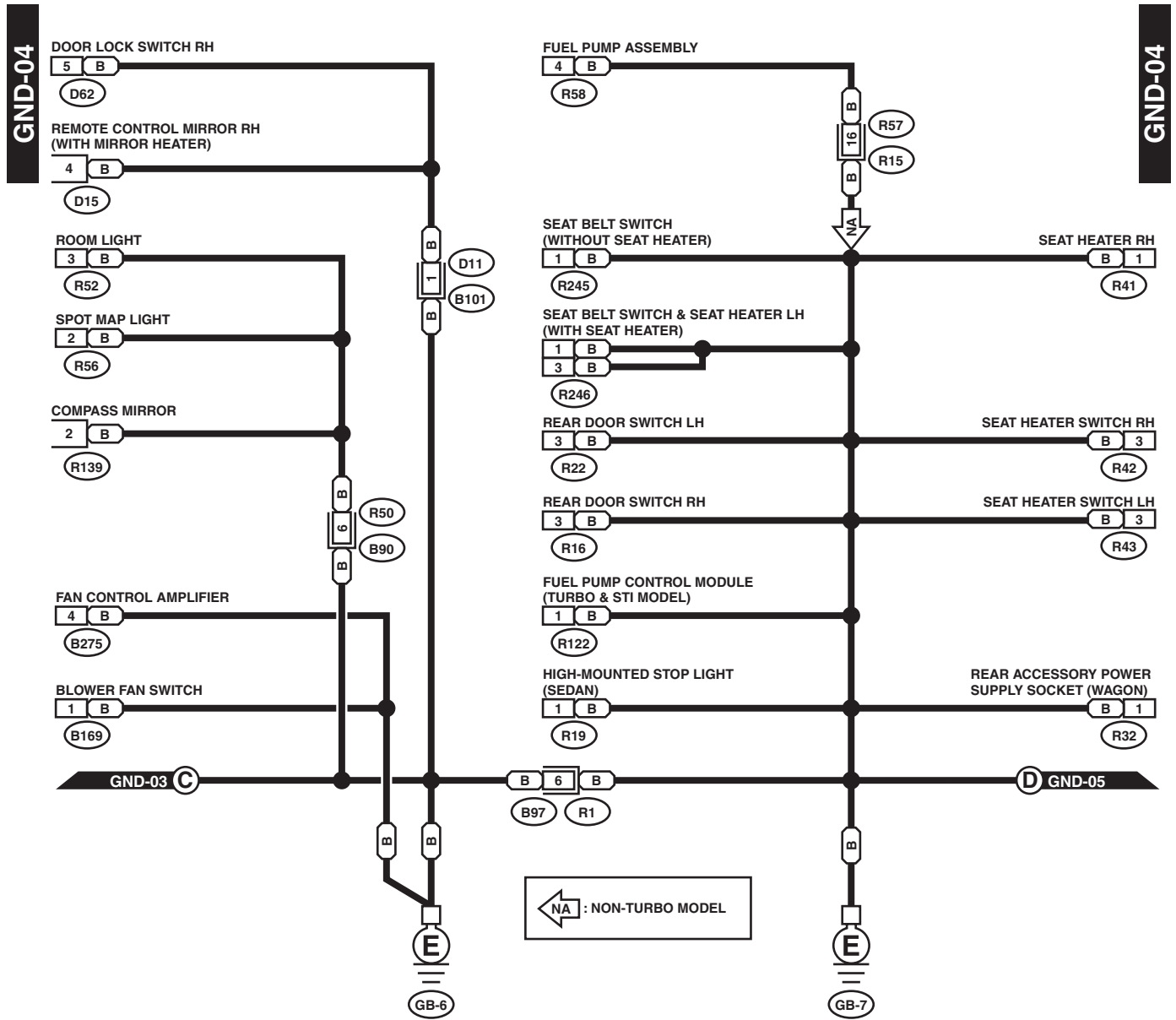
GND-03



WI-08873

# Ground Circuit

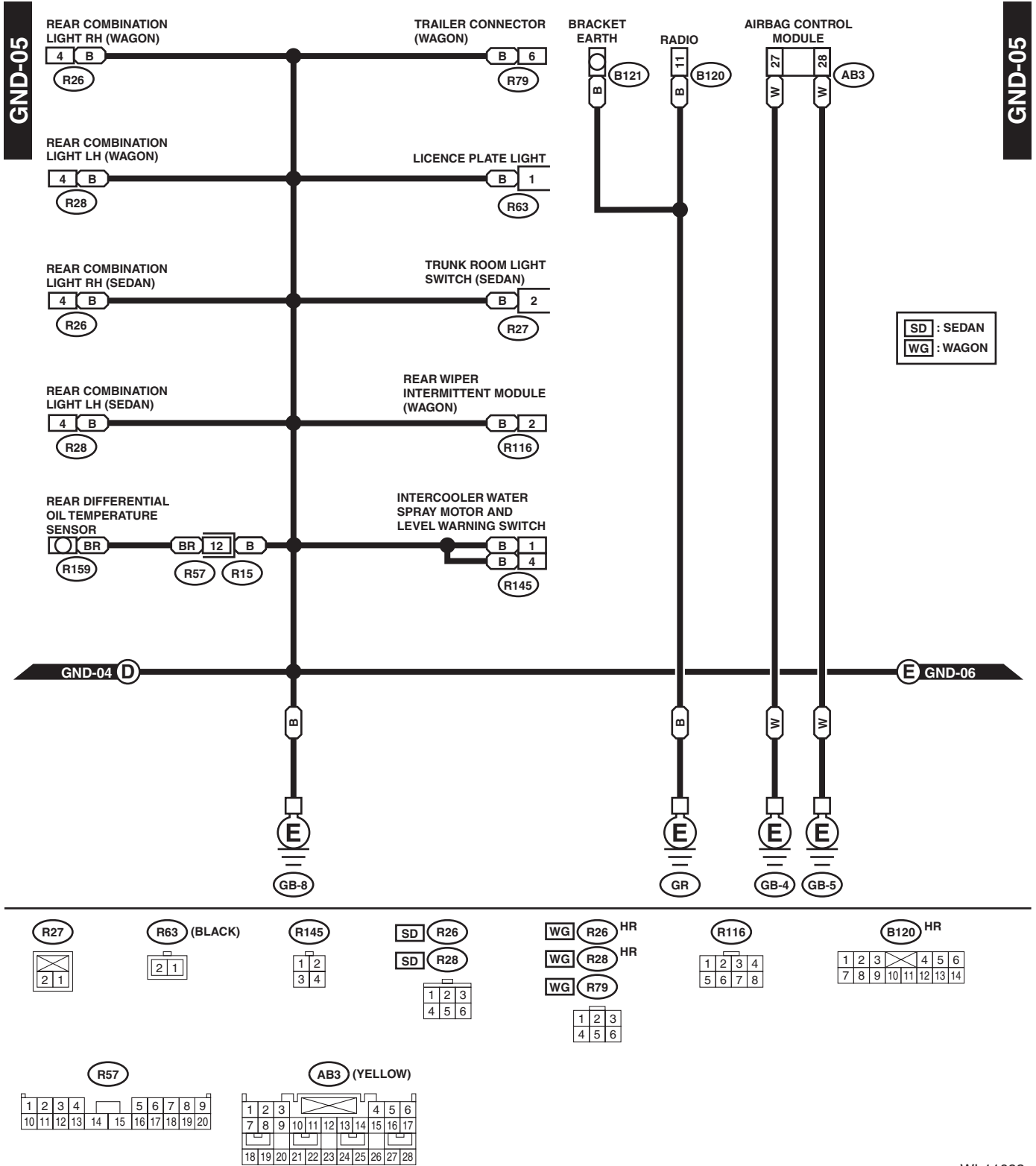
## WIRING SYSTEM



WI-11092

# Ground Circuit

WIRING SYSTEM



WI-11093

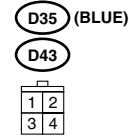
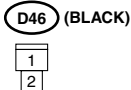
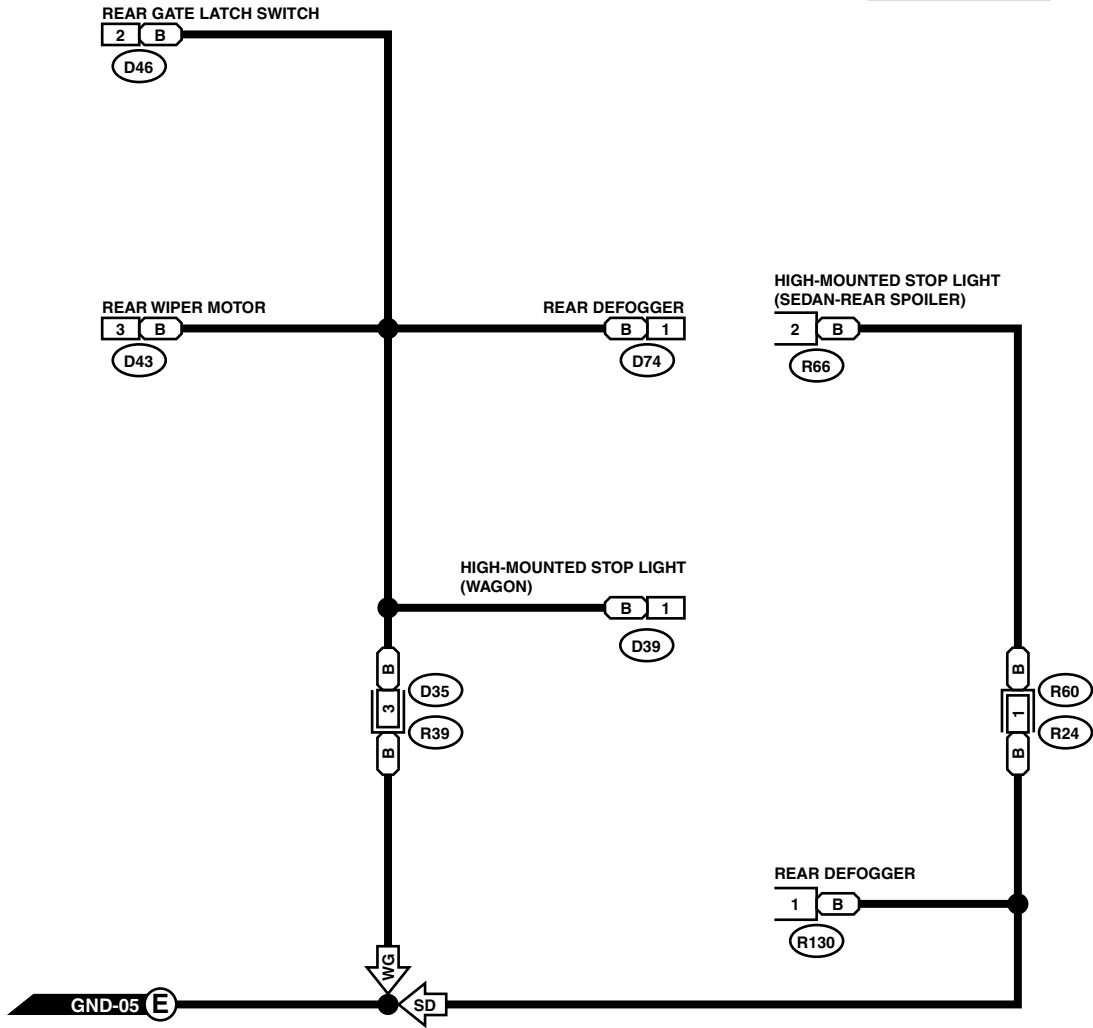
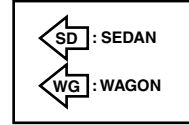


# Ground Circuit

WIRING SYSTEM

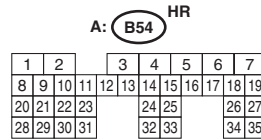
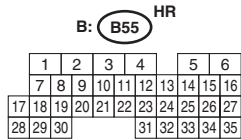
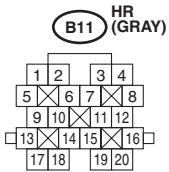
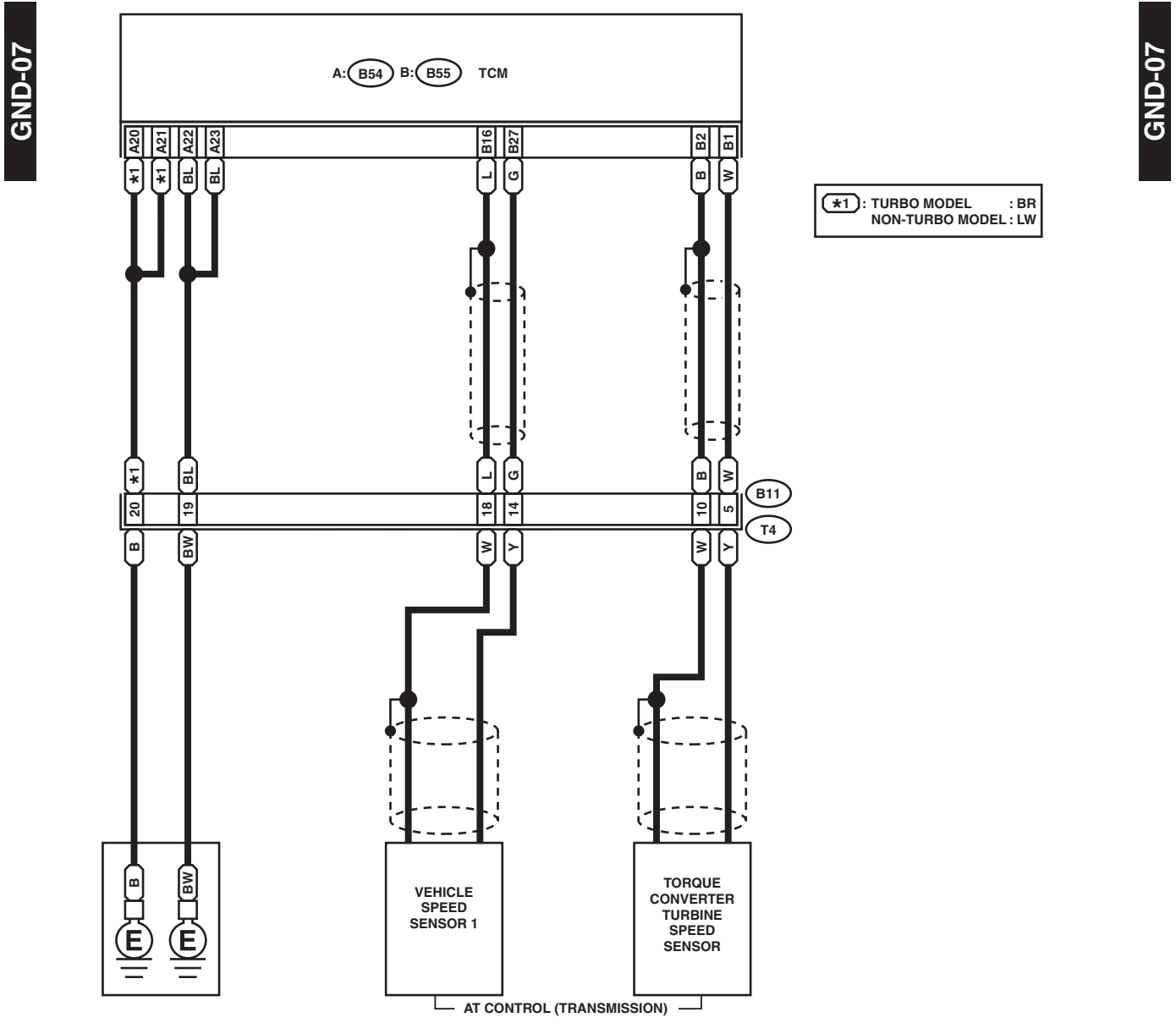
GND-06

GND-06



WI-08876

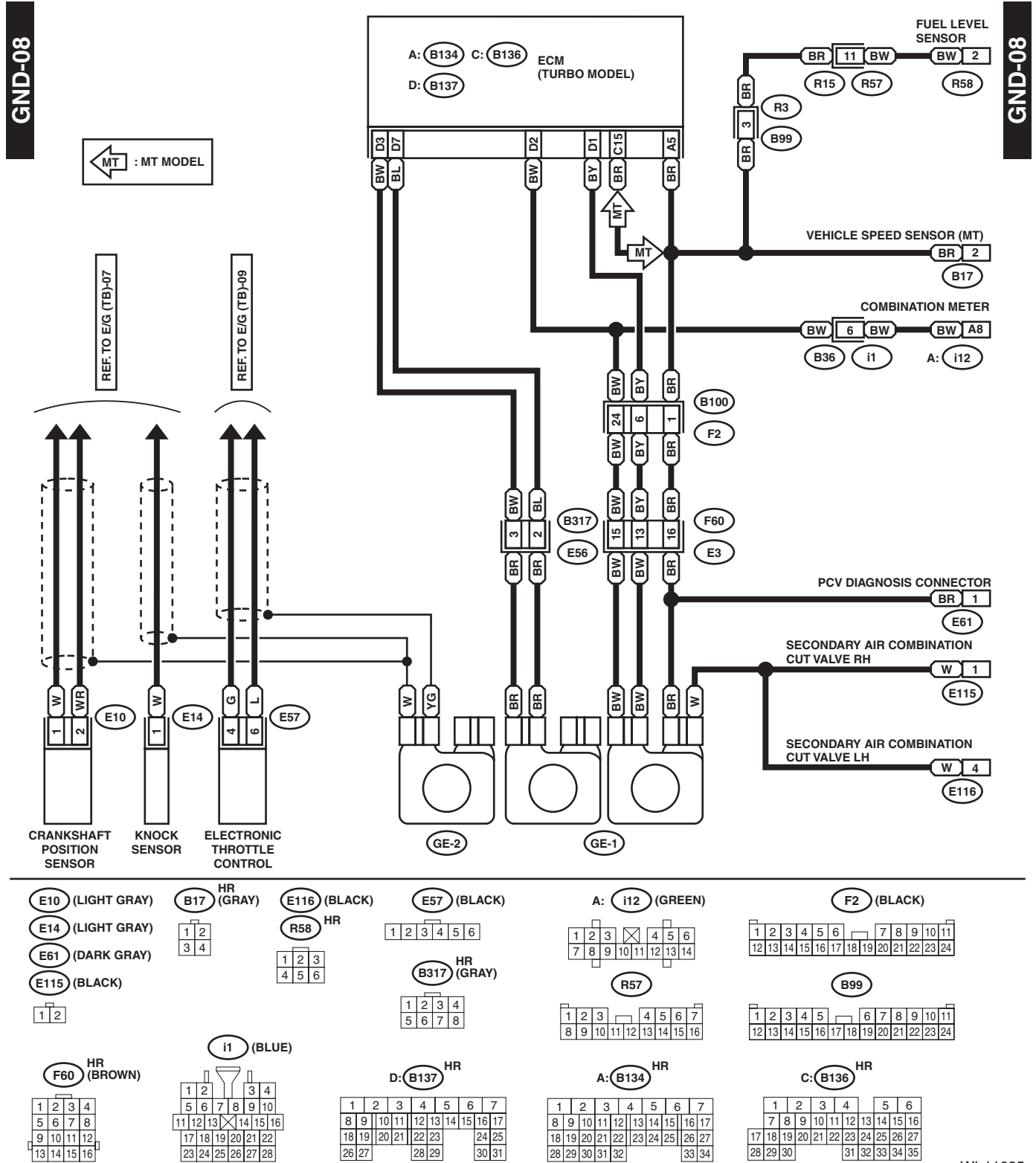
## 2. AT TRANSMISSION GROUND



# Ground Circuit

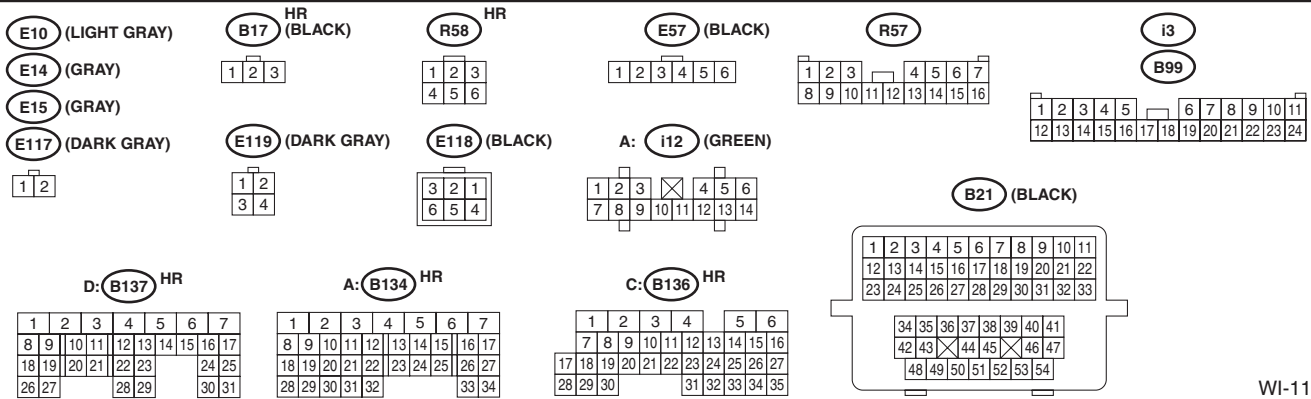
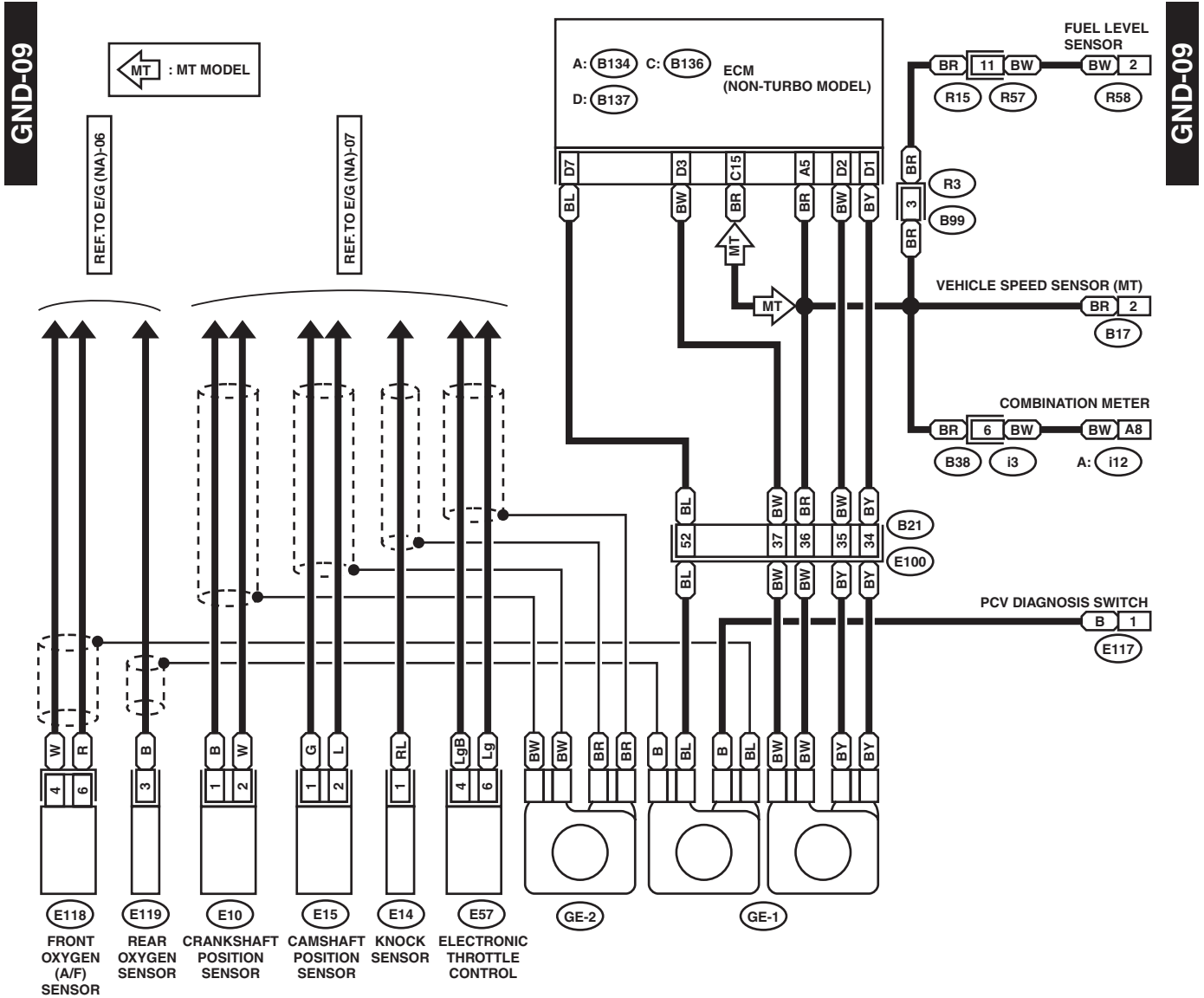
WIRING SYSTEM

## 3. ENGINE GROUND (TURBO MODEL)



WI-11095

## 4. ENGINE GROUND (NON-TURBO MODEL)

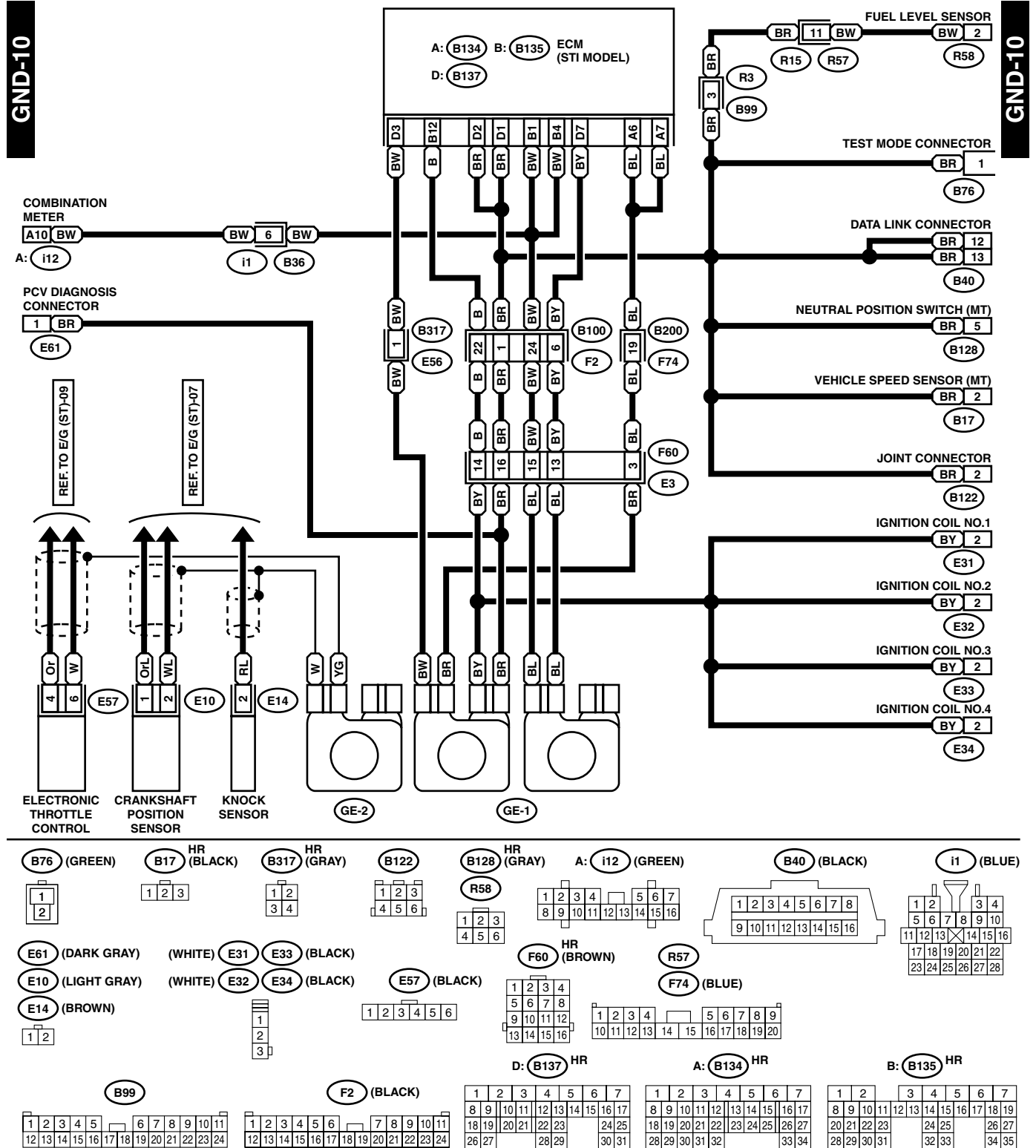


WI-11096

# Ground Circuit

WIRING SYSTEM

## 5. ENGINE GROUND (STI MODEL)



WI-08881



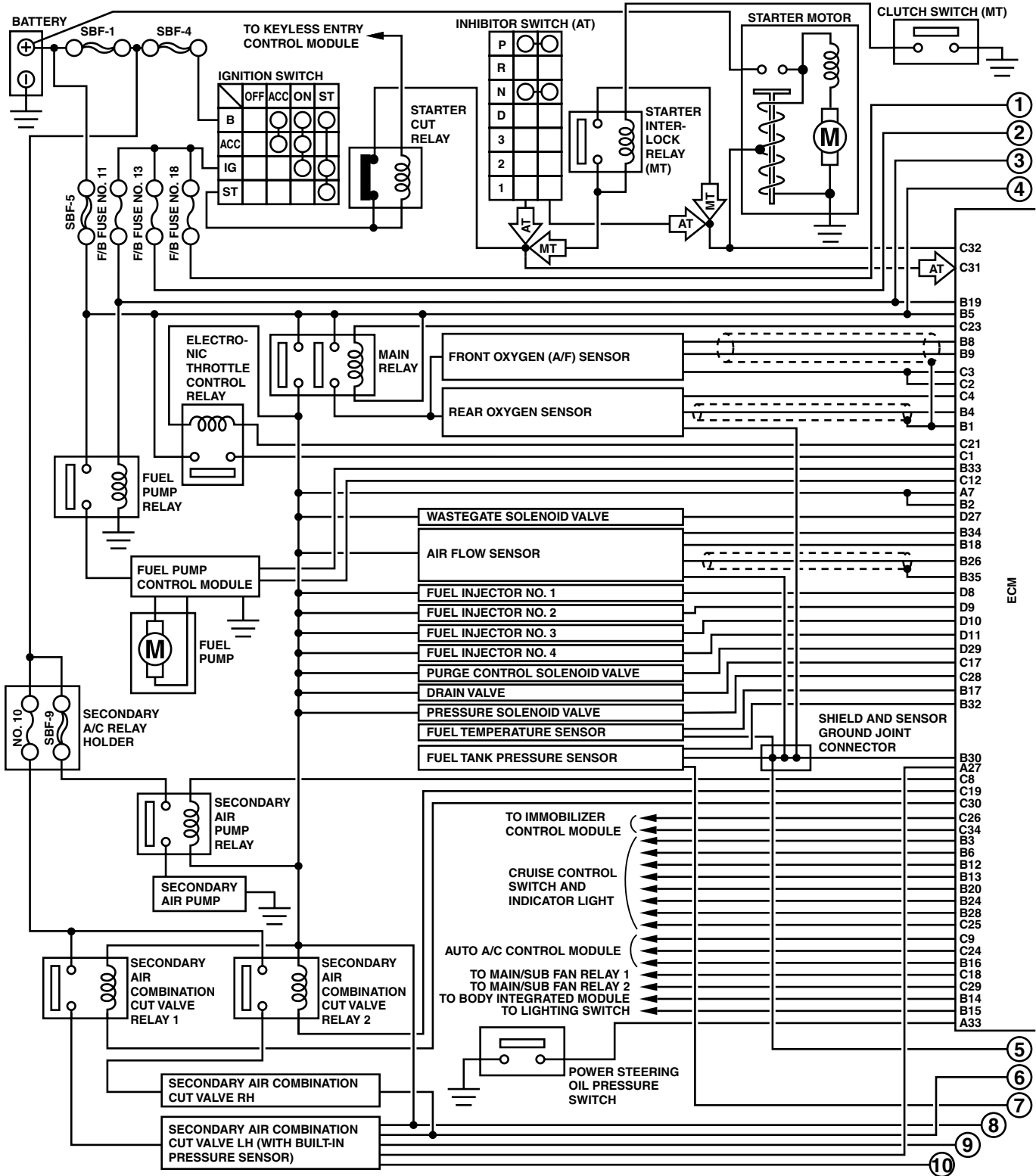
# Engine Electrical System

WIRING SYSTEM

## 5. Engine Electrical System

### A: WIRING DIAGRAM

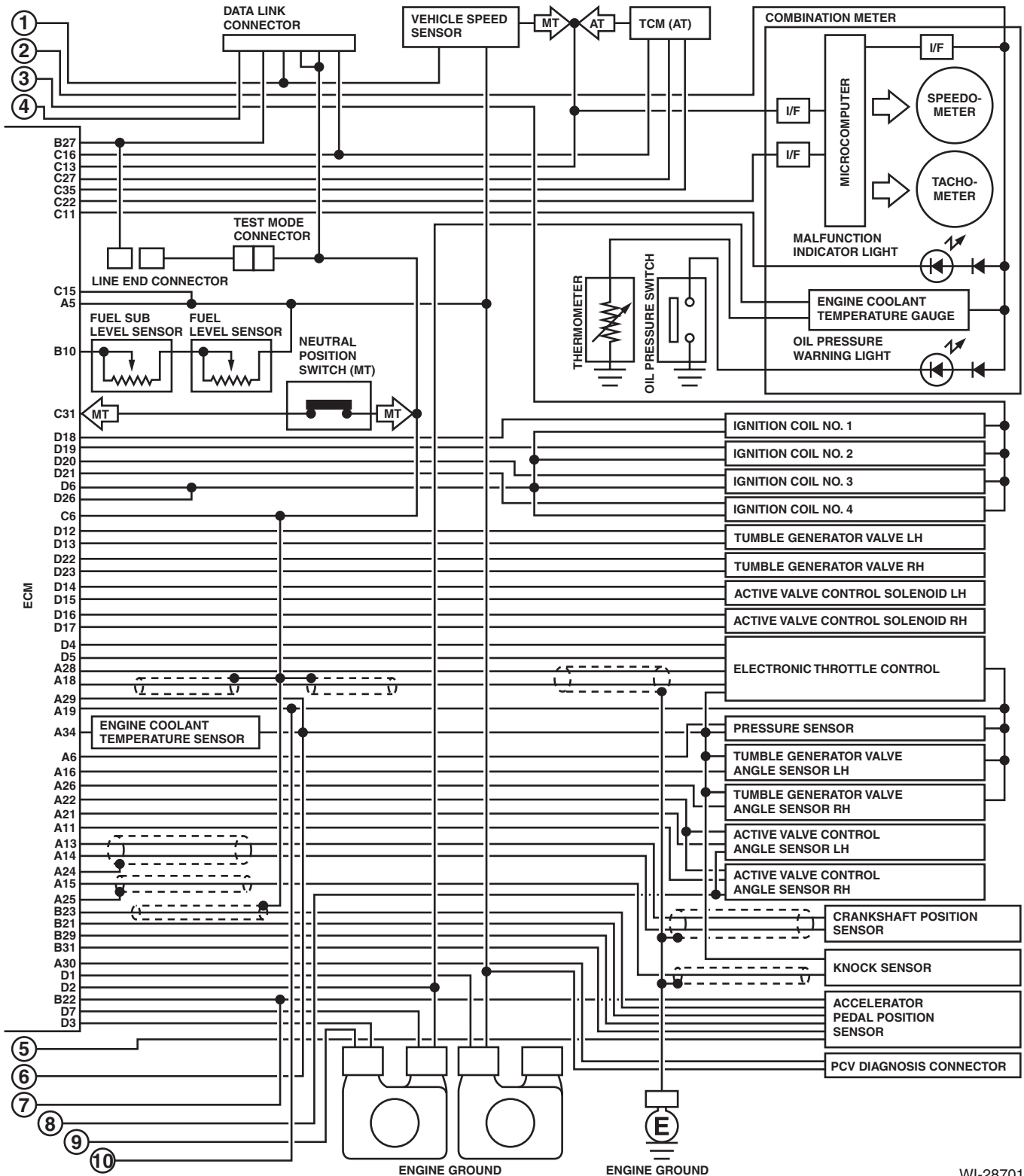
#### 1. TURBO MODEL



WI-08882

# Engine Electrical System

WIRING SYSTEM

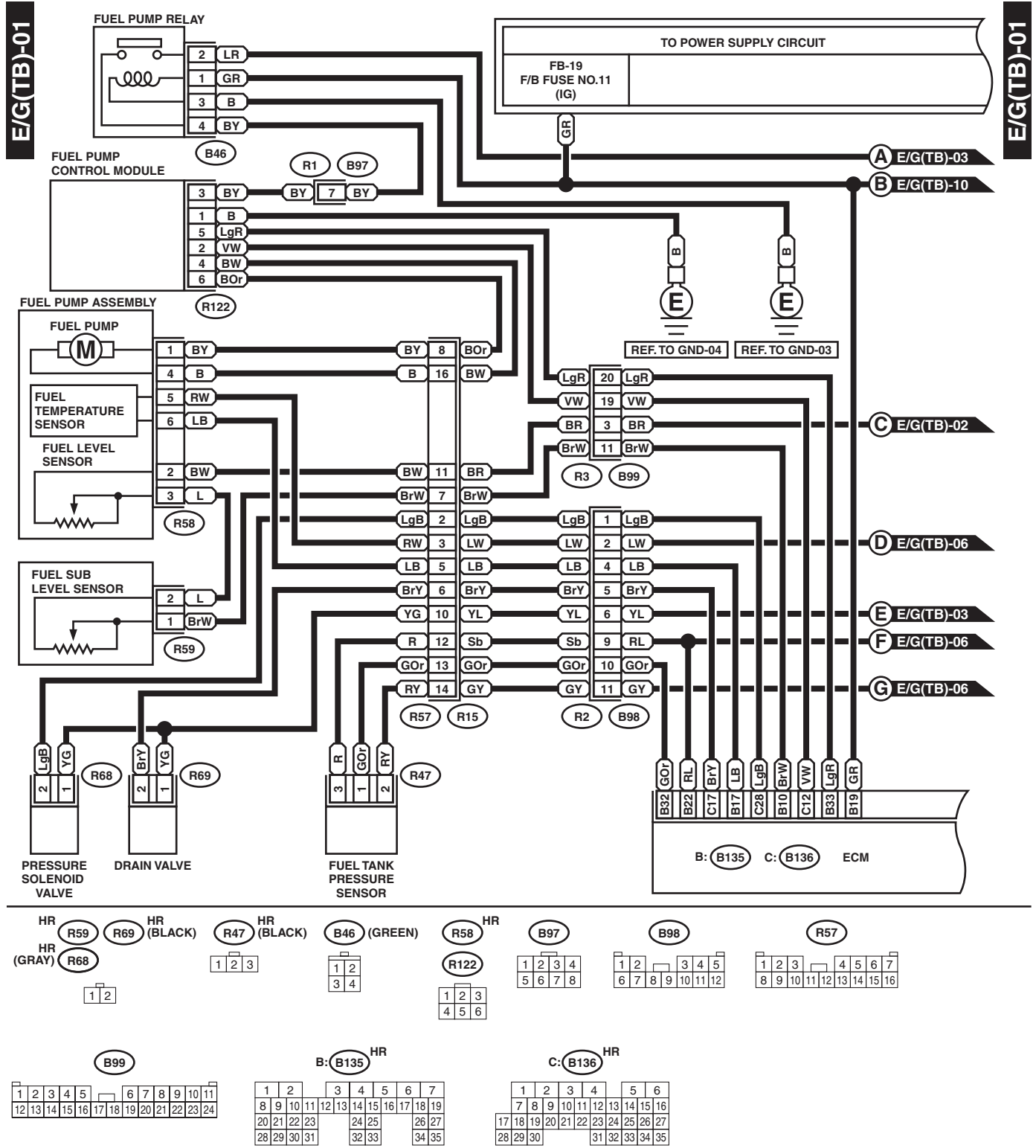


WI-28701



# Engine Electrical System

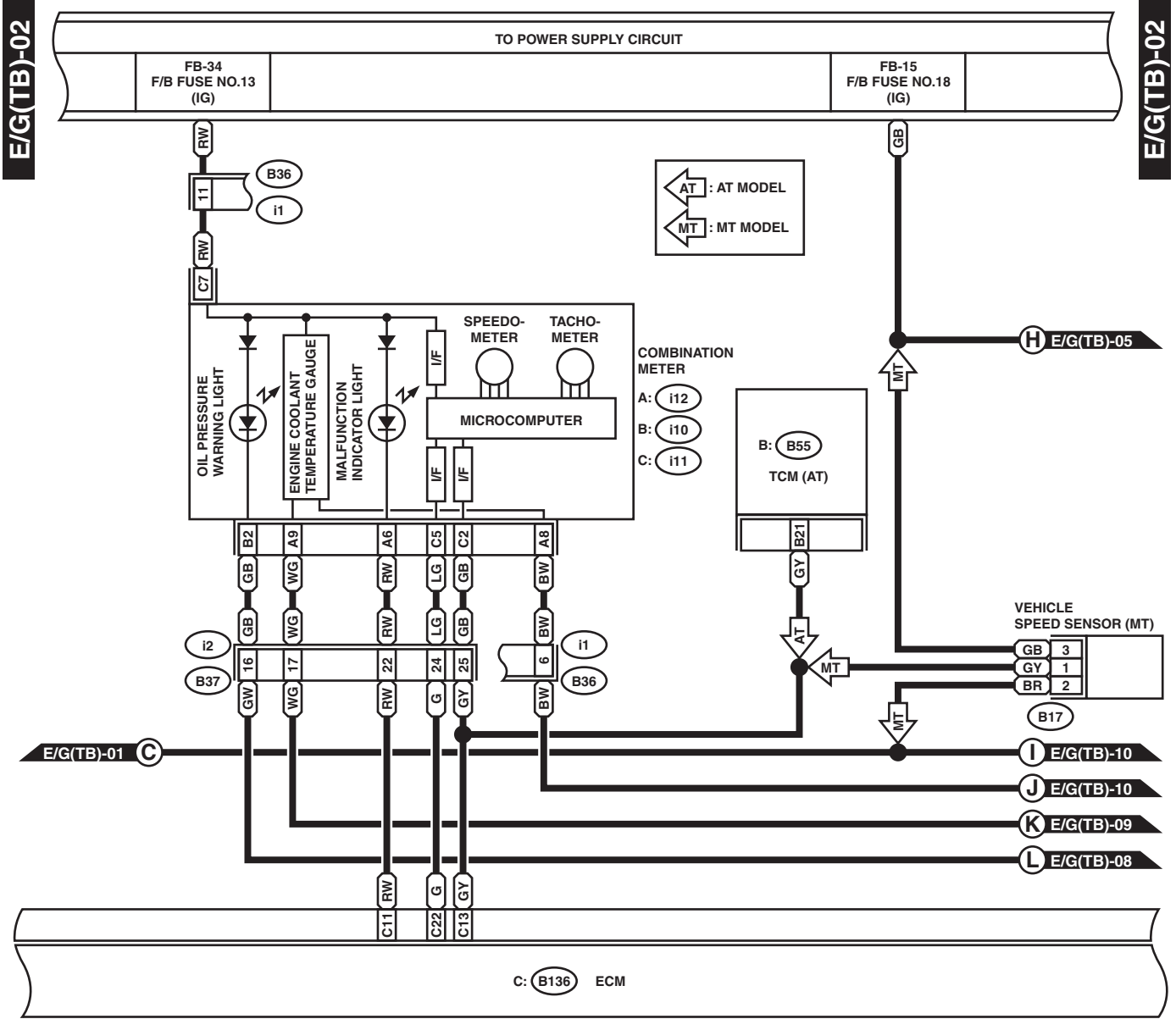
## WIRING SYSTEM



WI-11097

# Engine Electrical System

WIRING SYSTEM



B17 HR (GRAY)

|   |   |
|---|---|
| 1 | 2 |
| 3 | 4 |

C: i11 (GREEN)

|   |   |   |   |   |   |   |   |   |    |
|---|---|---|---|---|---|---|---|---|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|----|

A: i12 (GREEN)

|   |   |   |    |    |    |    |    |
|---|---|---|----|----|----|----|----|
| 1 | 2 | 3 | 4  | 5  | 6  |    |    |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |

B: i10 (GREEN)

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 |    |    |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |

B: B55 HR

C: B136 HR

|    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  |    |    |    |    |    |
| 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 |    |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |    |    |    |

B37

|    |    |    |    |    |    |
|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  |    |    |
| 5  | 6  | 7  | 8  | 9  |    |
| 10 | 11 | 12 | 13 | 14 | 15 |
| 16 | 17 | 18 | 19 |    |    |
| 20 | 21 | 22 | 23 | 24 | 25 |

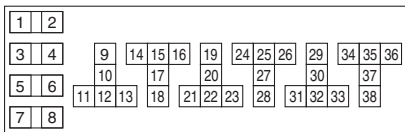
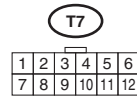
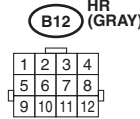
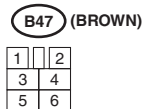
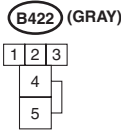
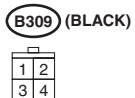
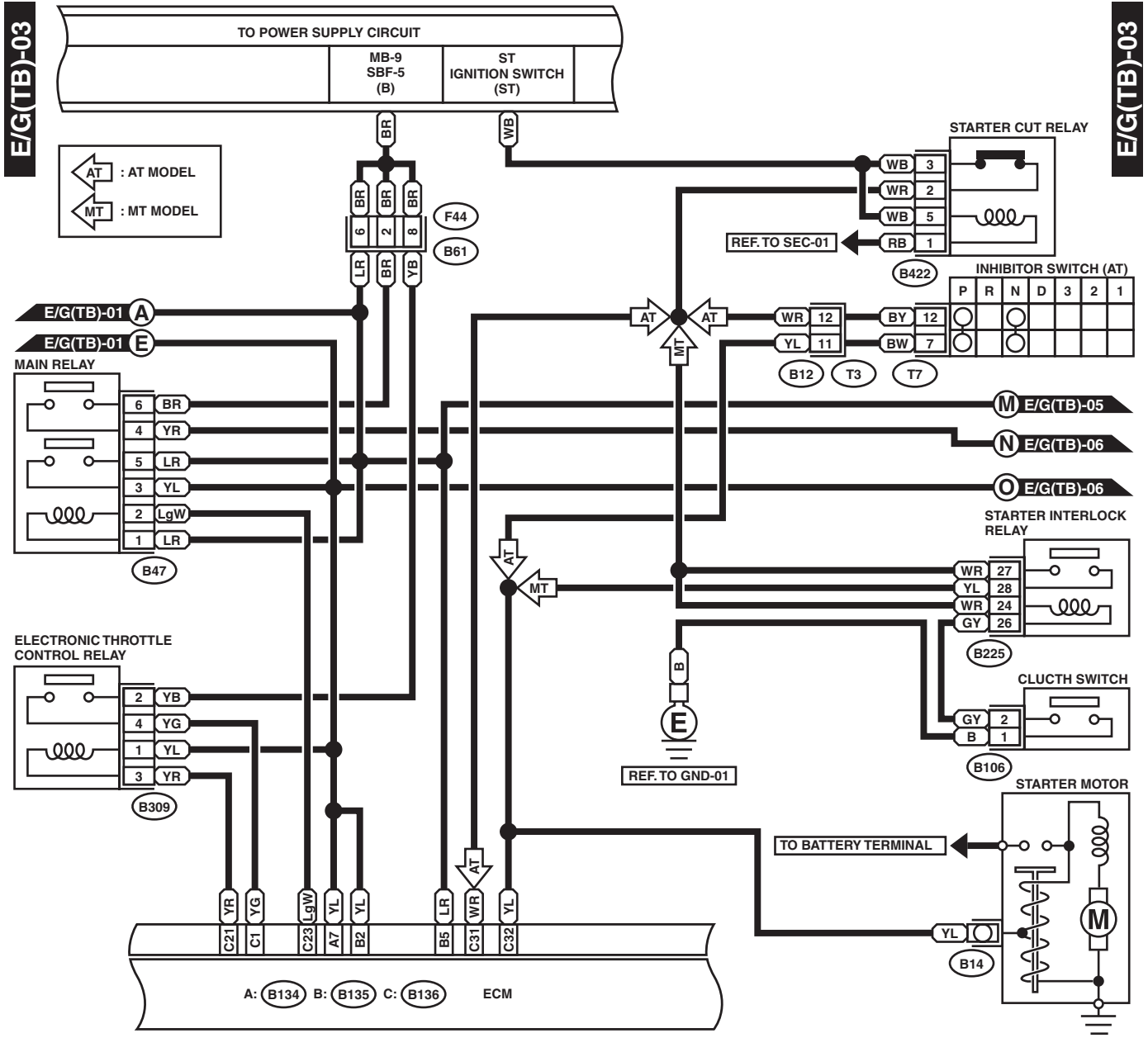
i1 (BLUE)

|    |    |    |    |    |    |
|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  |    |    |
| 5  | 6  | 7  | 8  | 9  | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 |

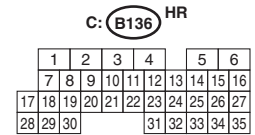
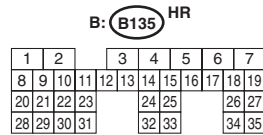
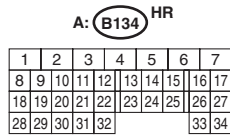
WI-11098

# Engine Electrical System

## WIRING SYSTEM



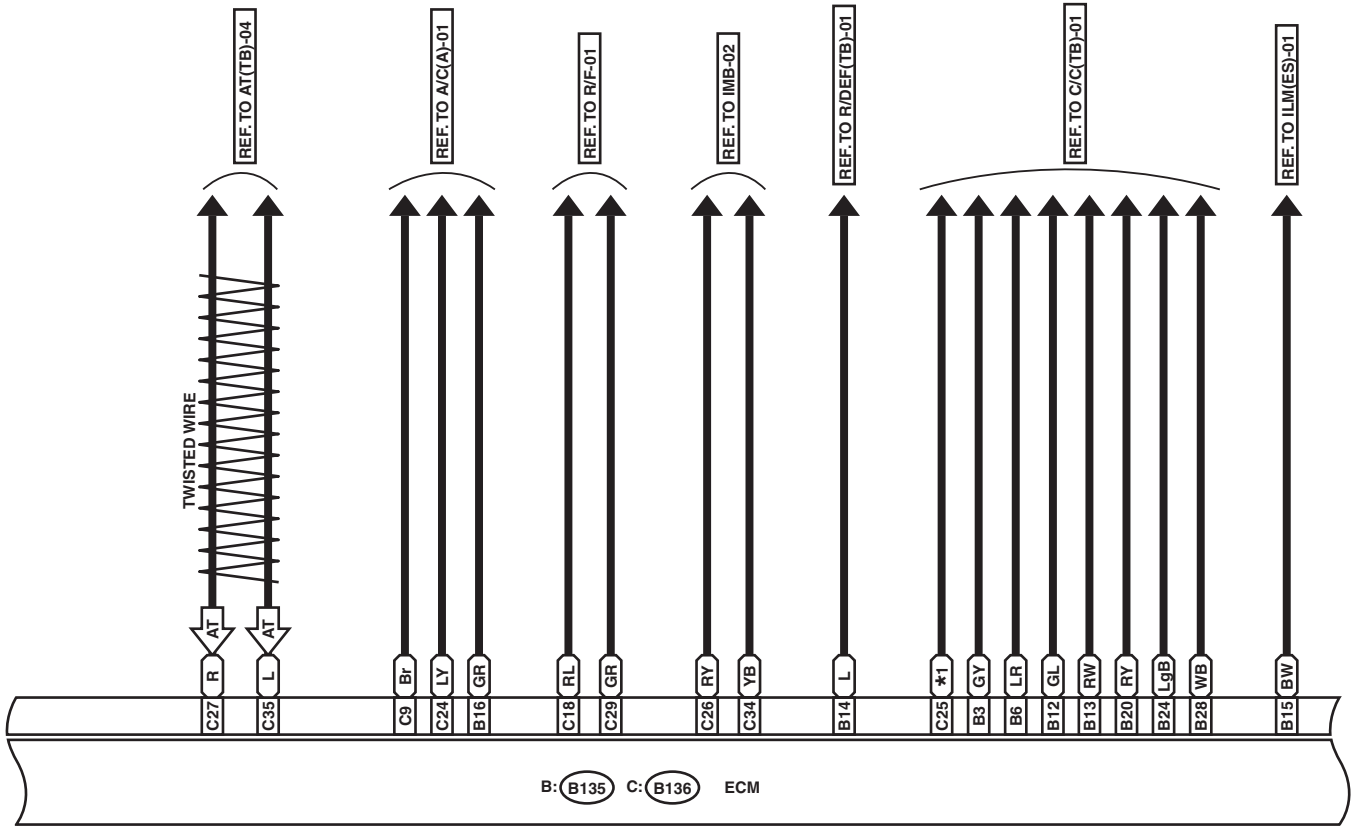
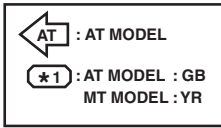
RELAY BLOCK



WI-11099

E/G(TB)-04

E/G(TB)-04



B: (B135) HR

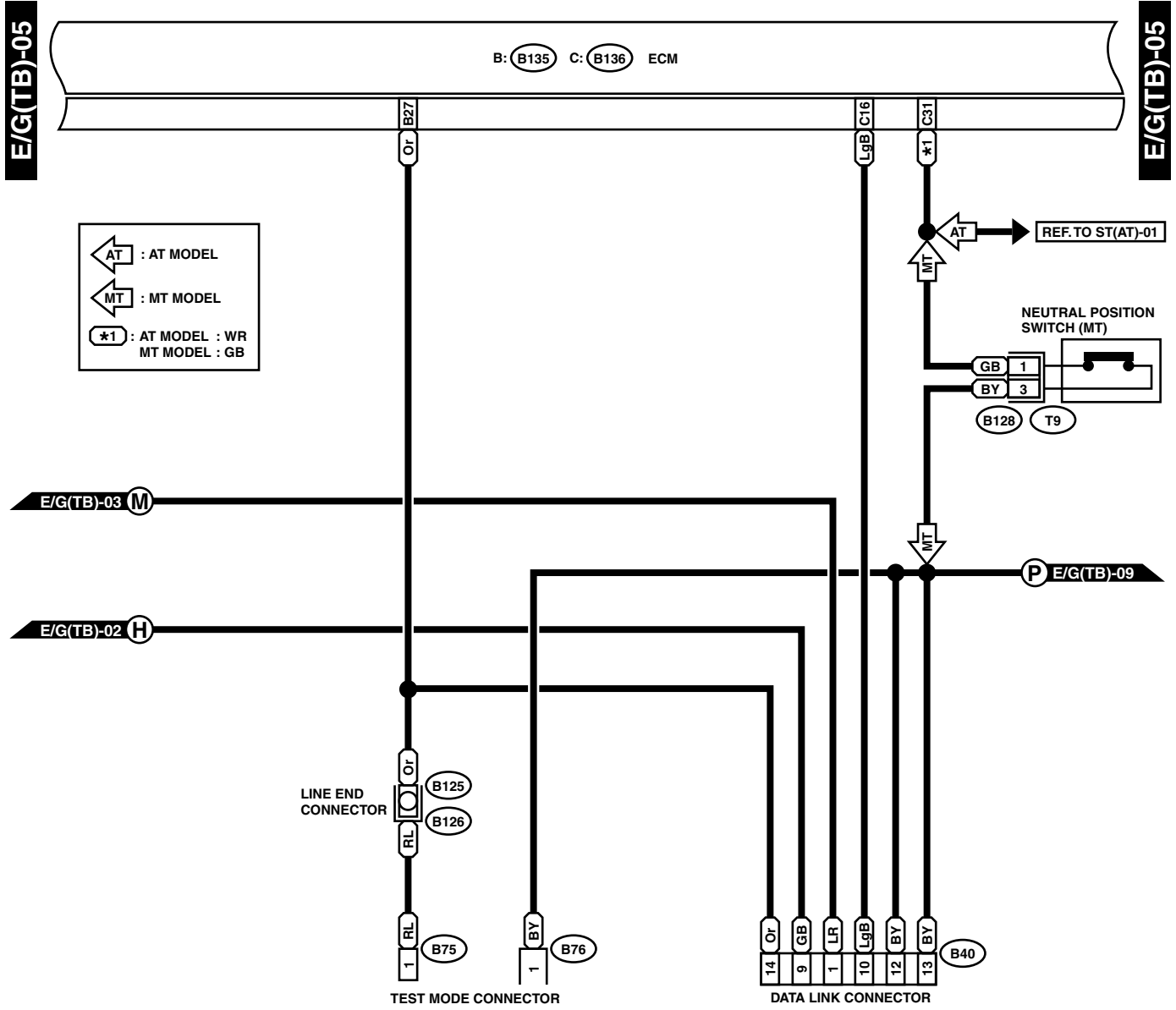
|    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 | 32 | 33 | 34 | 35 |

C: (B136) HR

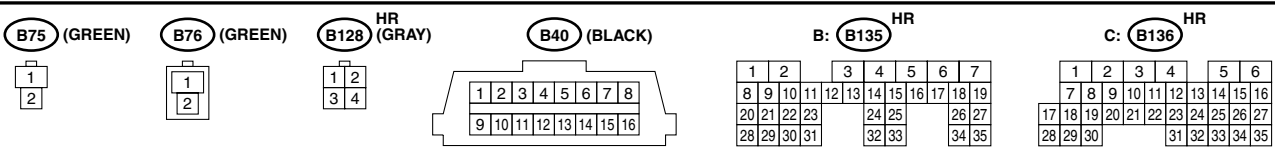
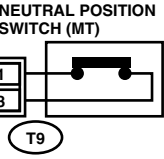
|    |    |    |    |    |    |
|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  |
| 7  | 8  | 9  | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 |    |

# Engine Electrical System

WIRING SYSTEM



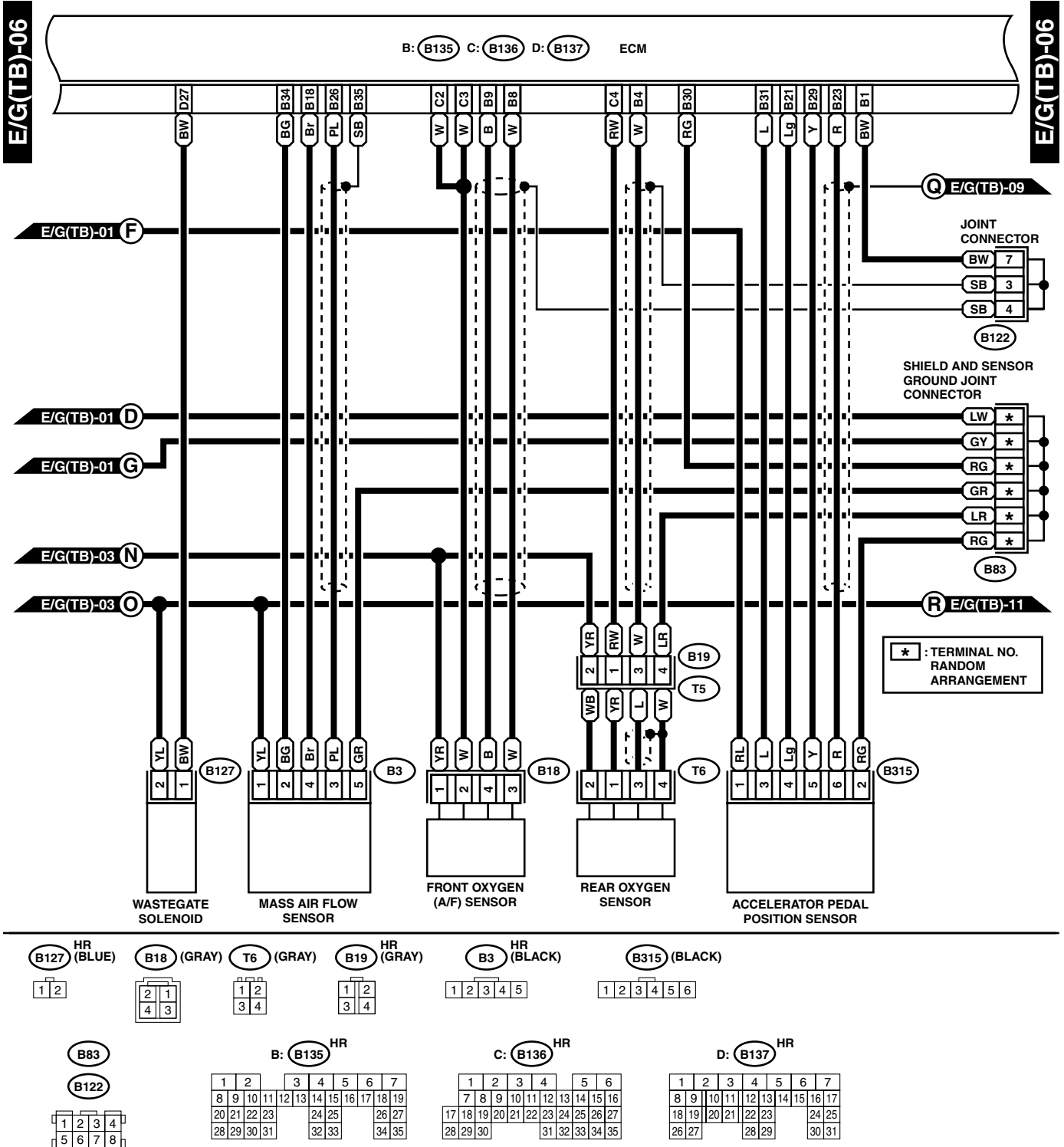
← AT : AT MODEL  
 ← MT : MT MODEL  
 \*1 : AT MODEL : WR  
       MT MODEL : GB



WI-11101

# Engine Electrical System

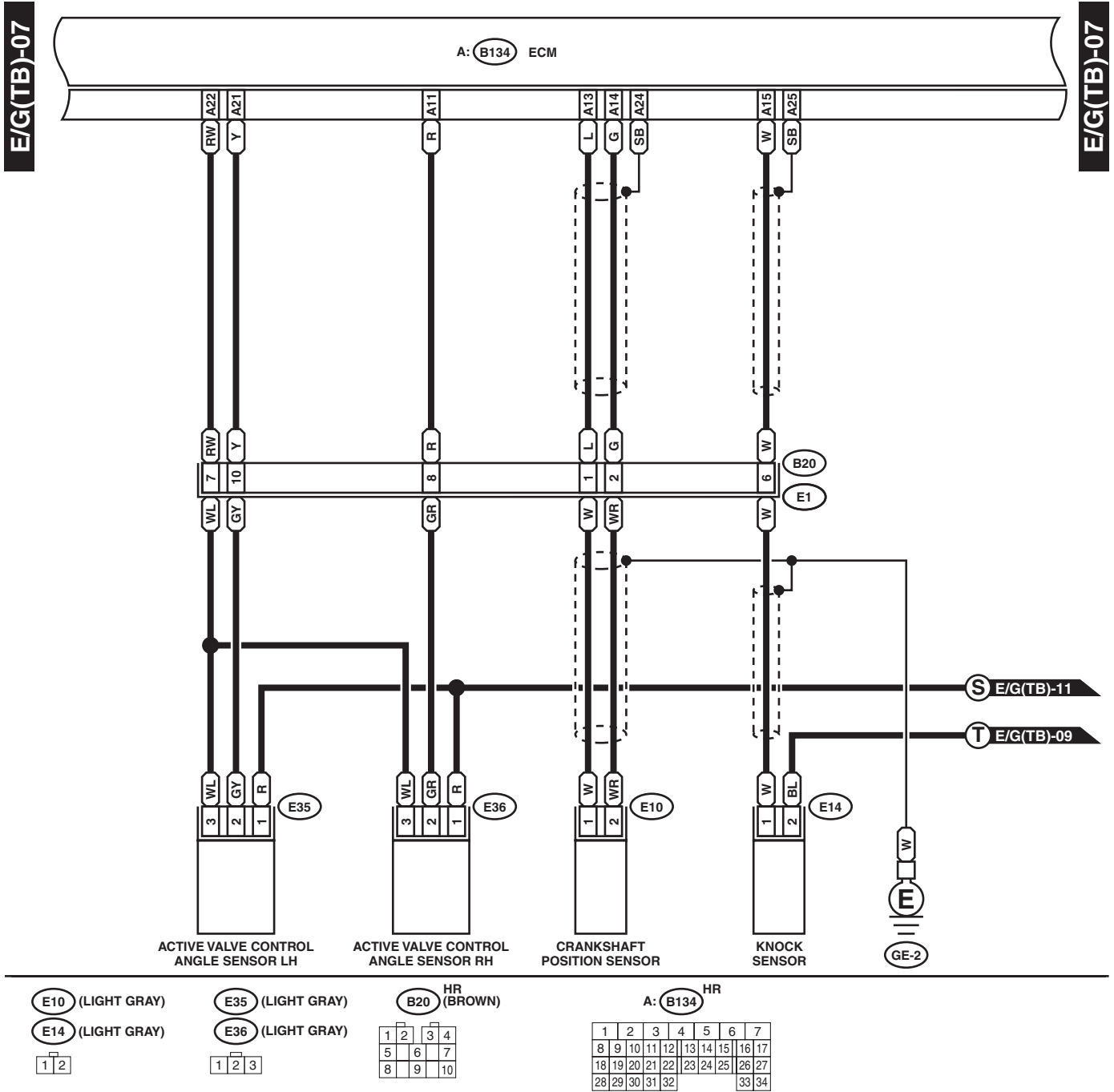
WIRING SYSTEM



WI-11102

# Engine Electrical System

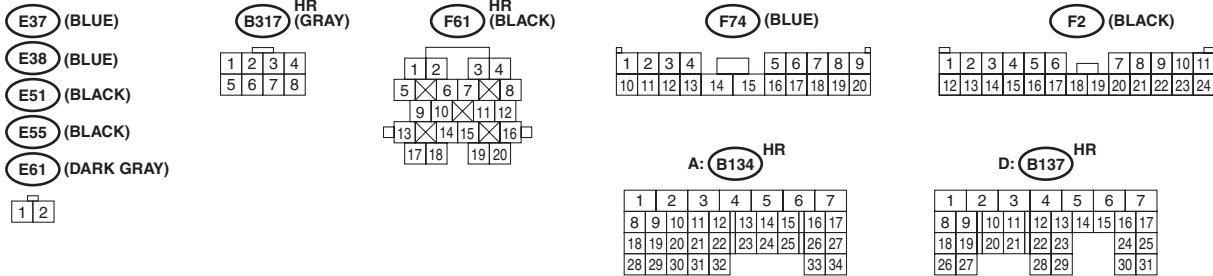
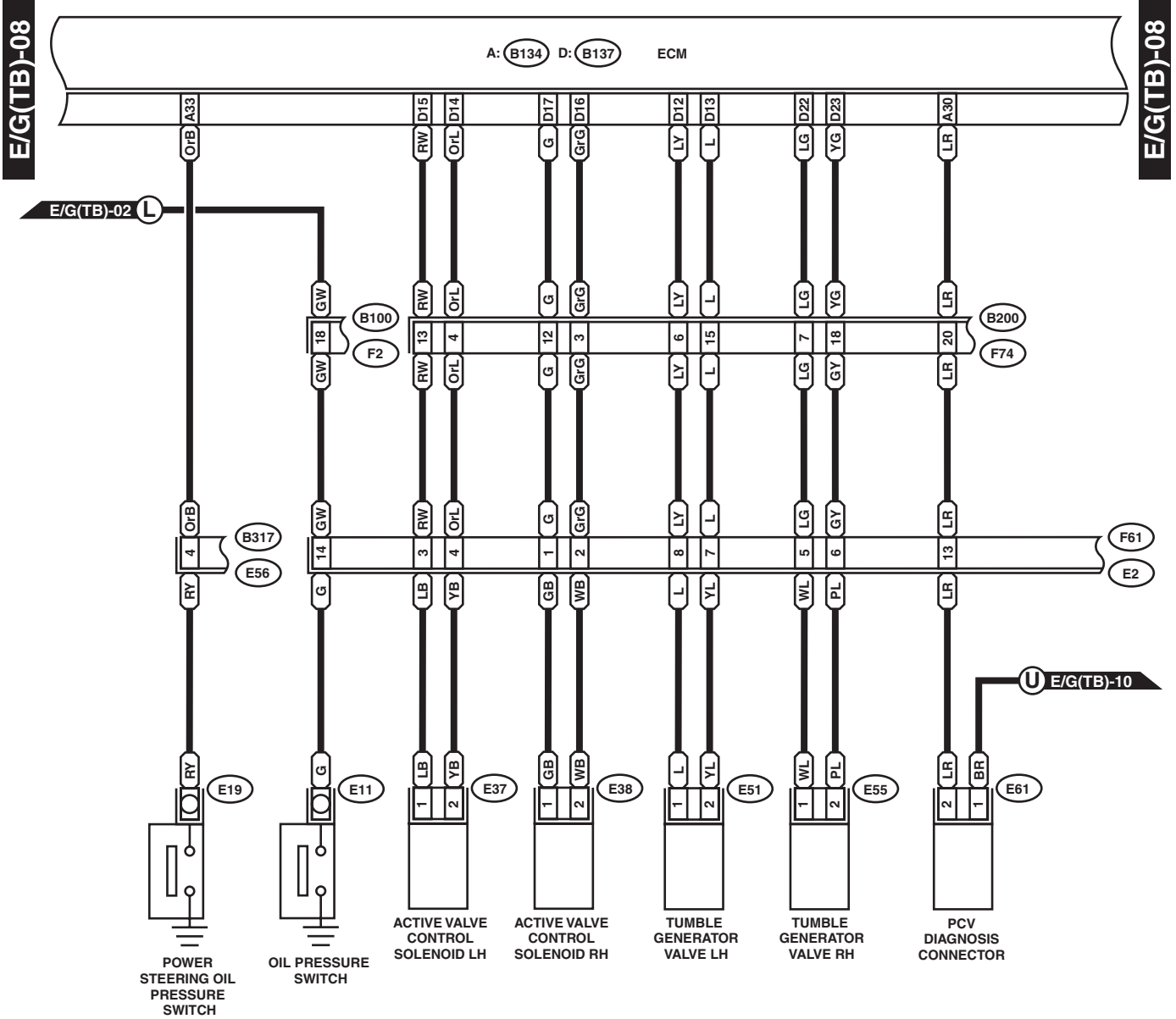
WIRING SYSTEM



WI-11103

# Engine Electrical System

WIRING SYSTEM

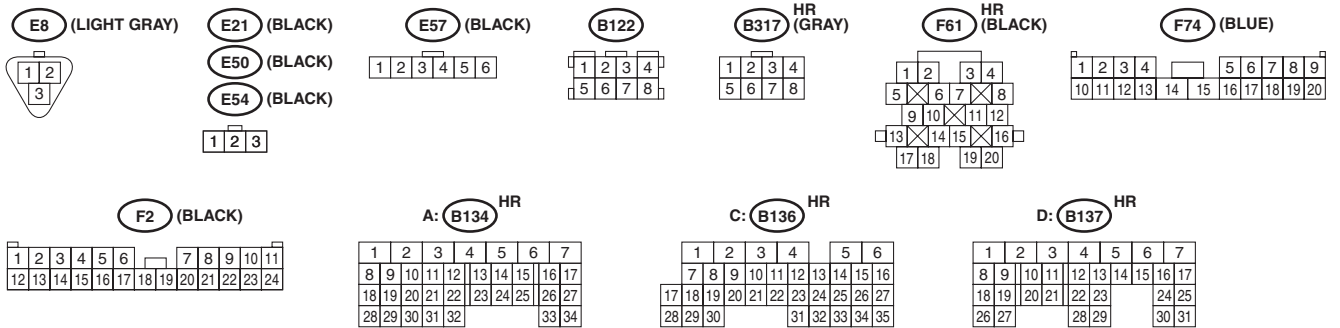
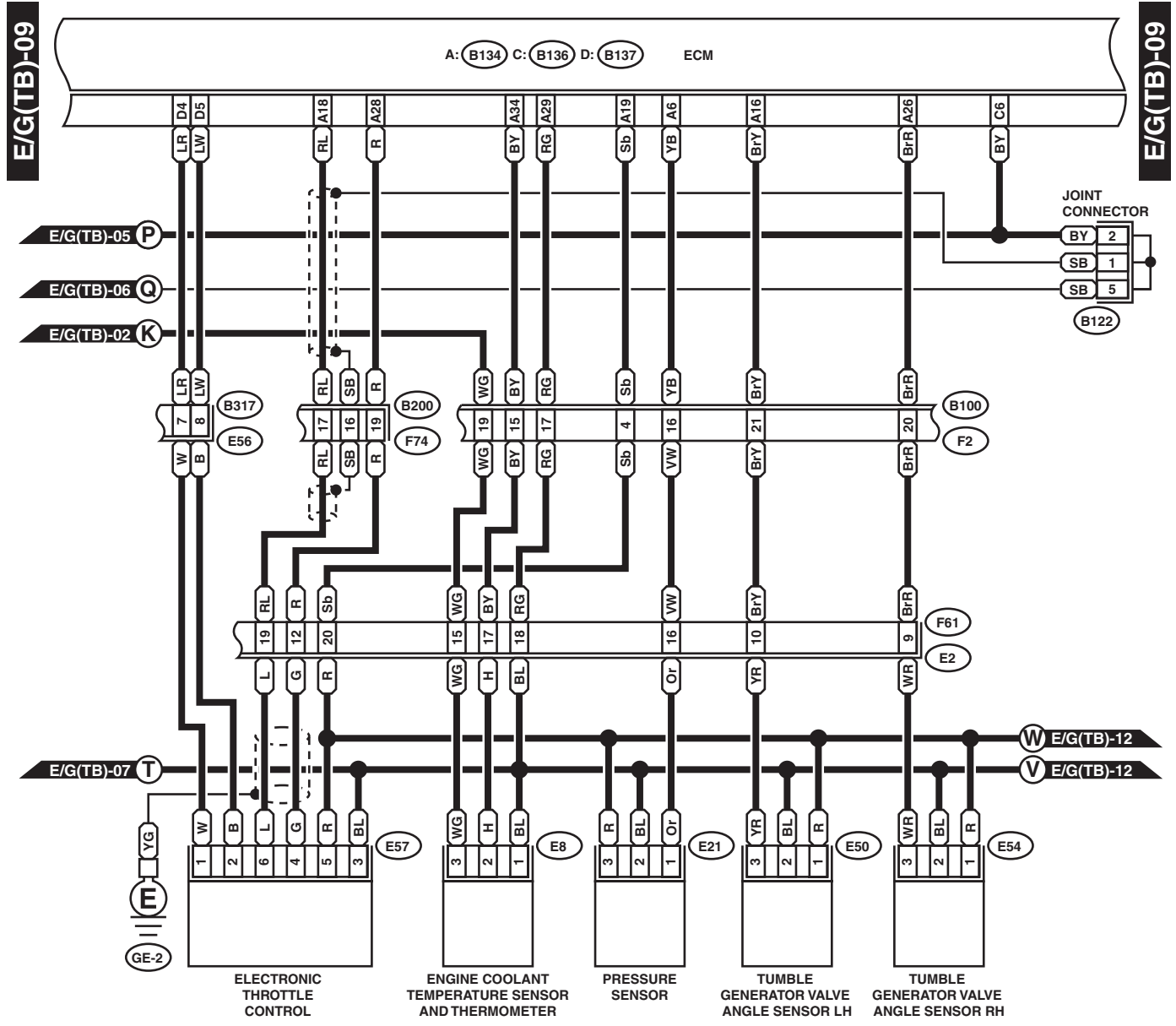


WI-11104



# Engine Electrical System

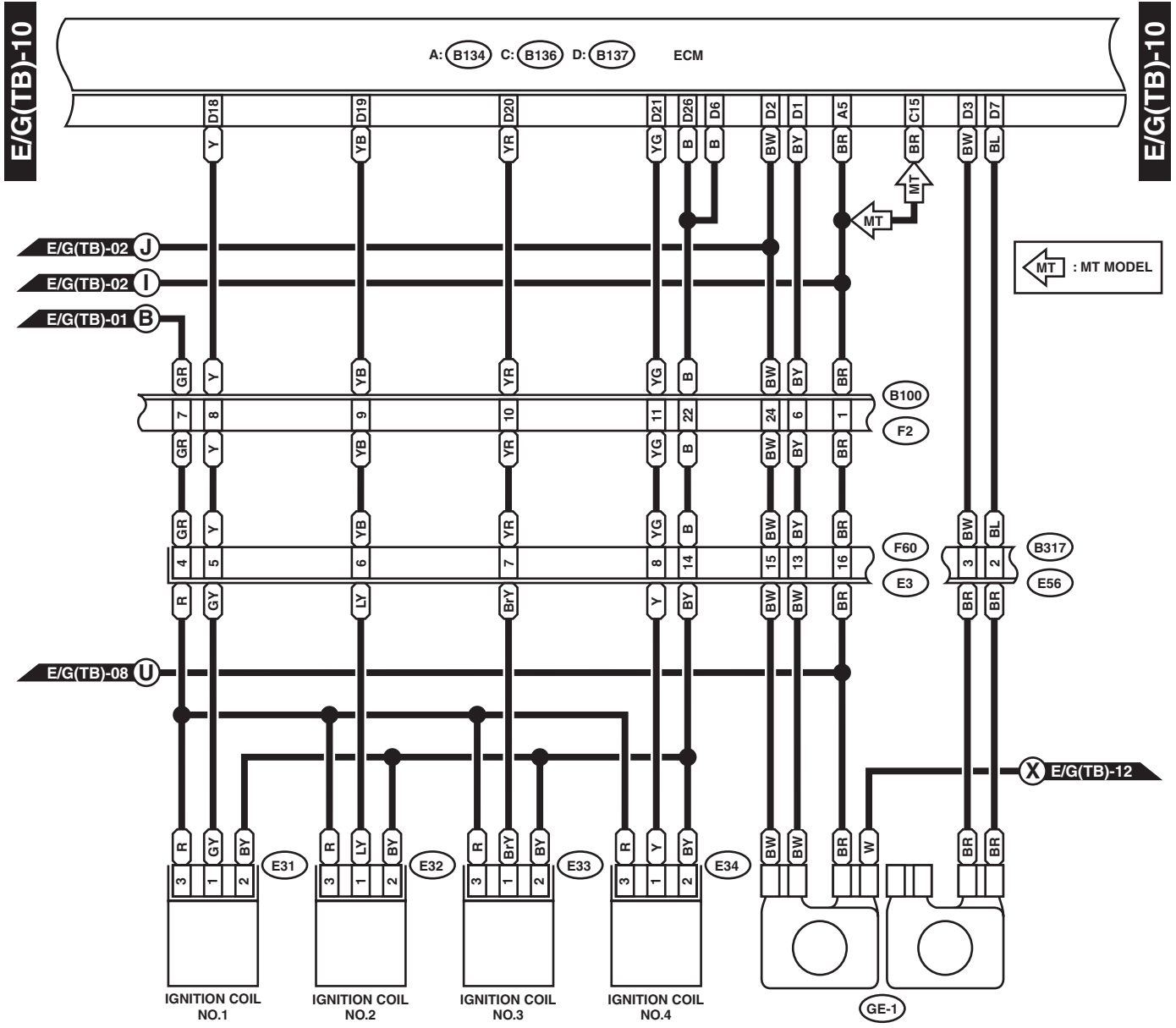
## WIRING SYSTEM



WI-11105

# Engine Electrical System

WIRING SYSTEM



- (E31) (WHITE)
- (E32) (WHITE)
- (E33) (BLACK)
- (E34) (BLACK)

(B317) HR (GRAY)

|   |   |   |   |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |

(F60) HR (BROWN)

|    |    |    |    |
|----|----|----|----|
| 1  | 2  | 3  | 4  |
| 5  | 6  | 7  | 8  |
| 9  | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |

(F2) (BLACK)

|    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 |    |    |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |

|   |
|---|
| 1 |
| 2 |
| 3 |

A: (B134) HR

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |    |    |    |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | 32 | 33 | 34 |    |    |    |

C: (B136) HR

|    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  |    |    |    |    |    |
| 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 |    |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |    |    |    |

D: (B137) HR

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |    |    |    |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 |    |    |    |    |    |    |

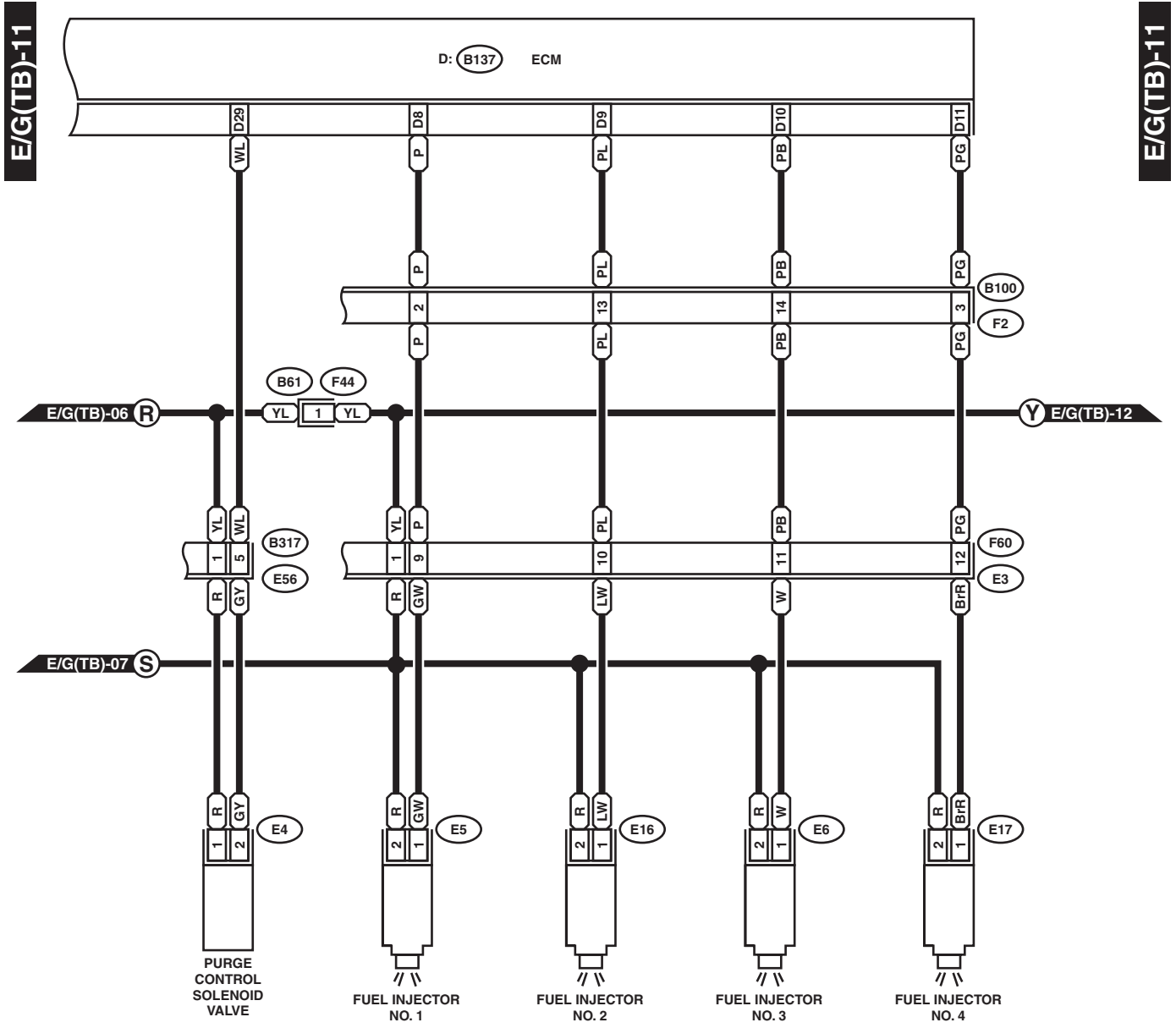
← MT : MT MODEL

X E/G(TB)-12

WI-11106

# Engine Electrical System

WIRING SYSTEM



- (E5) (DARK GRAY)
  - (E6) (DARK GRAY)
  - (E16) (DARK GRAY)
  - (E17) (DARK GRAY)
  - (E4) (BLACK)
  - (F44) HR (GRAY)
  - (B317) HR (GRAY)
  - (F60) HR (BROWN)
  - (F2) (BLACK)
- |   |   |
|---|---|
| 1 | 2 |
|---|---|
- |    |    |    |    |
|----|----|----|----|
| 1  | 2  | 3  | 4  |
| 5  | 6  | 7  | 8  |
| 9  | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
- |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
- D: (B137) HR

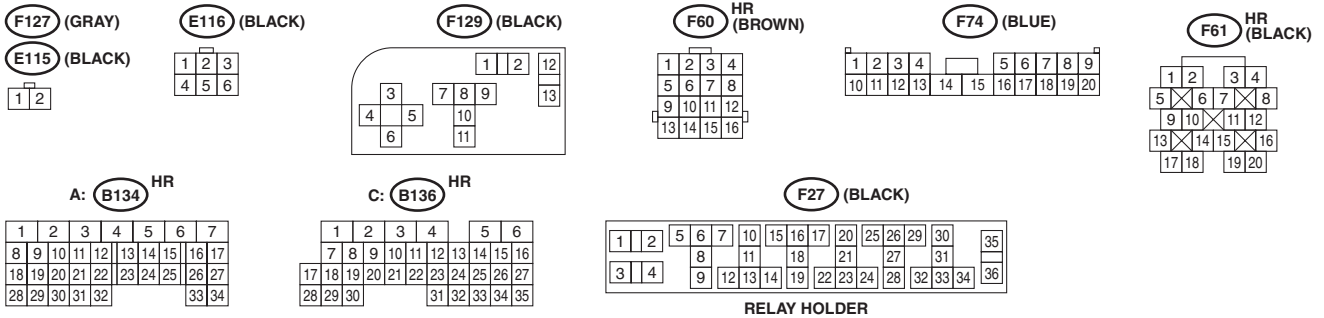
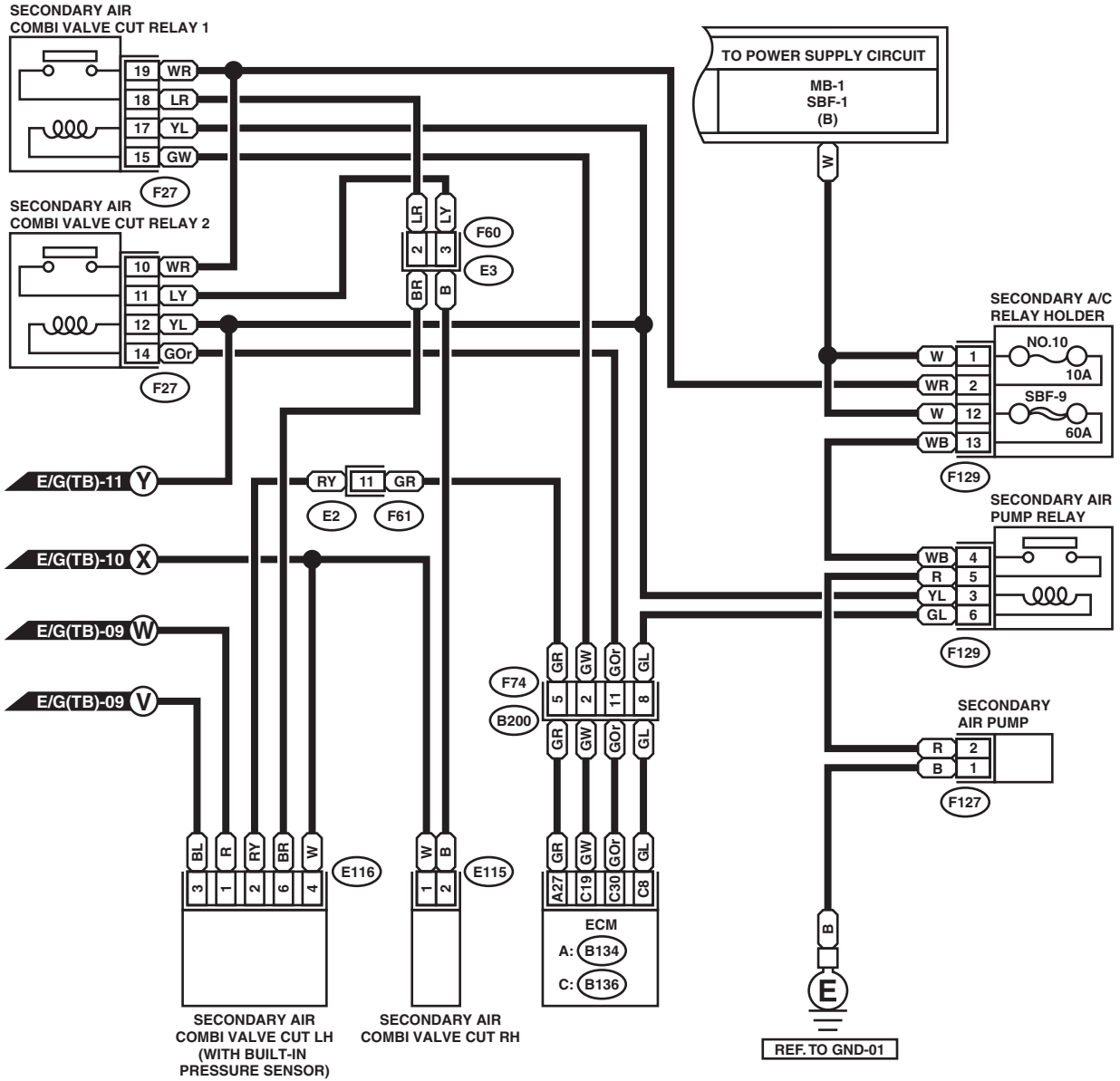
WI-11107

# Engine Electrical System

WIRING SYSTEM

E/G(TB)-12

E/G(TB)-12

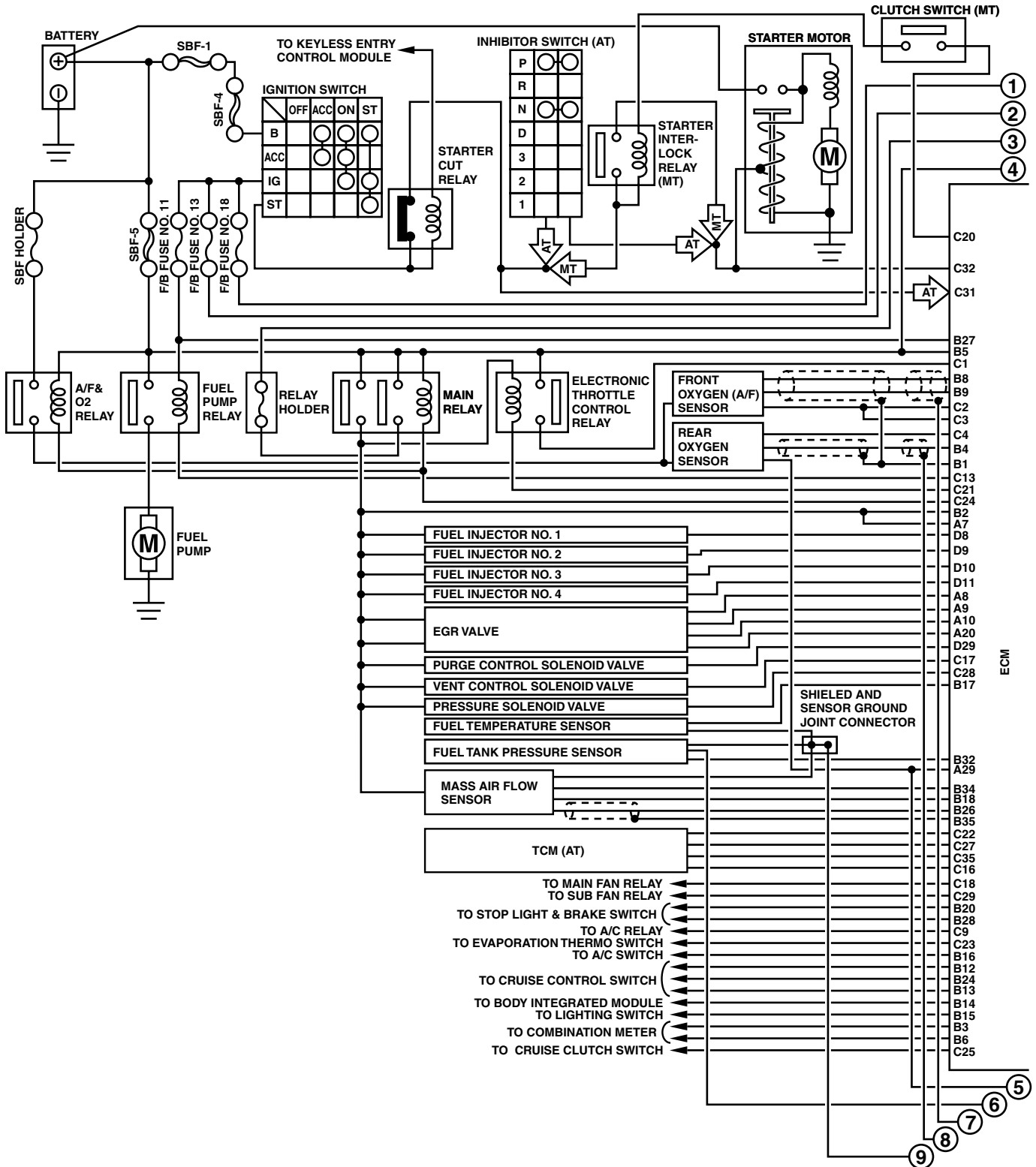


WI-11108

# Engine Electrical System

WIRING SYSTEM

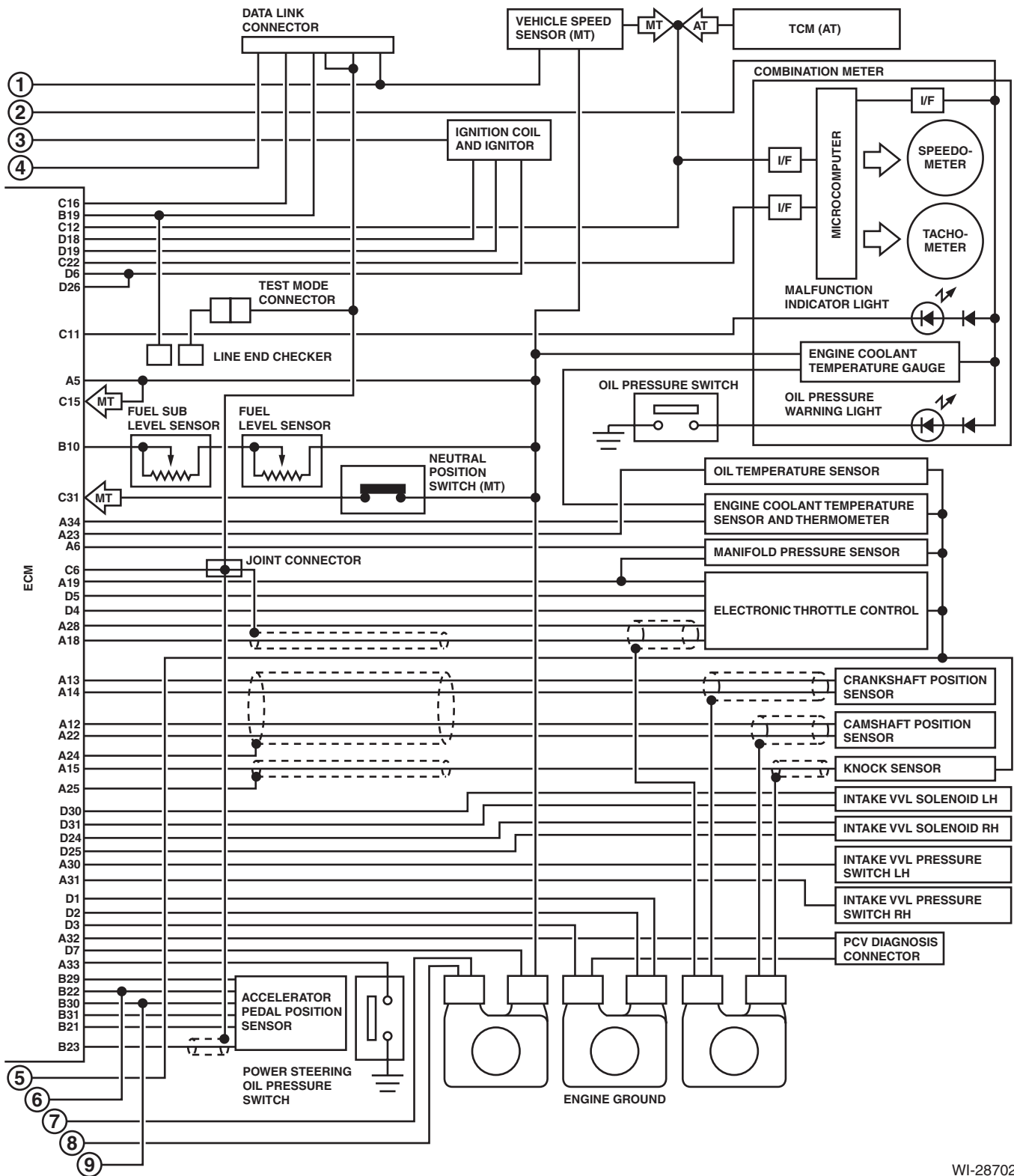
## 2. NON-TURBO MODEL



WI-08895

# Engine Electrical System

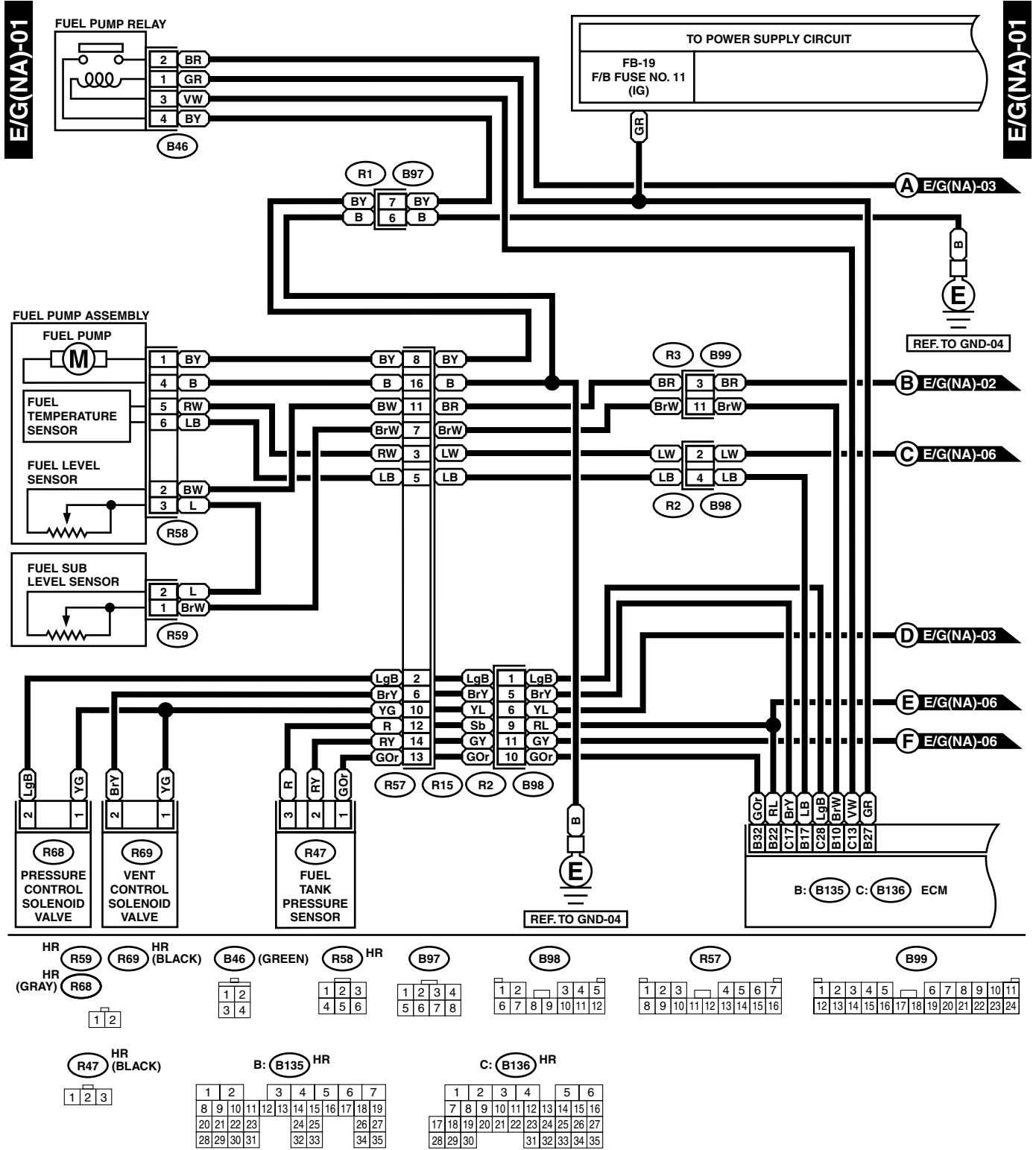
WIRING SYSTEM



WI-28702

# Engine Electrical System

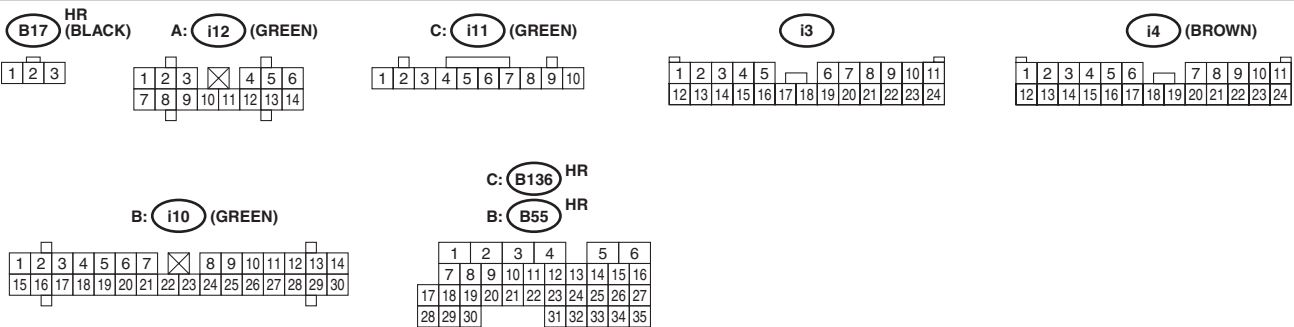
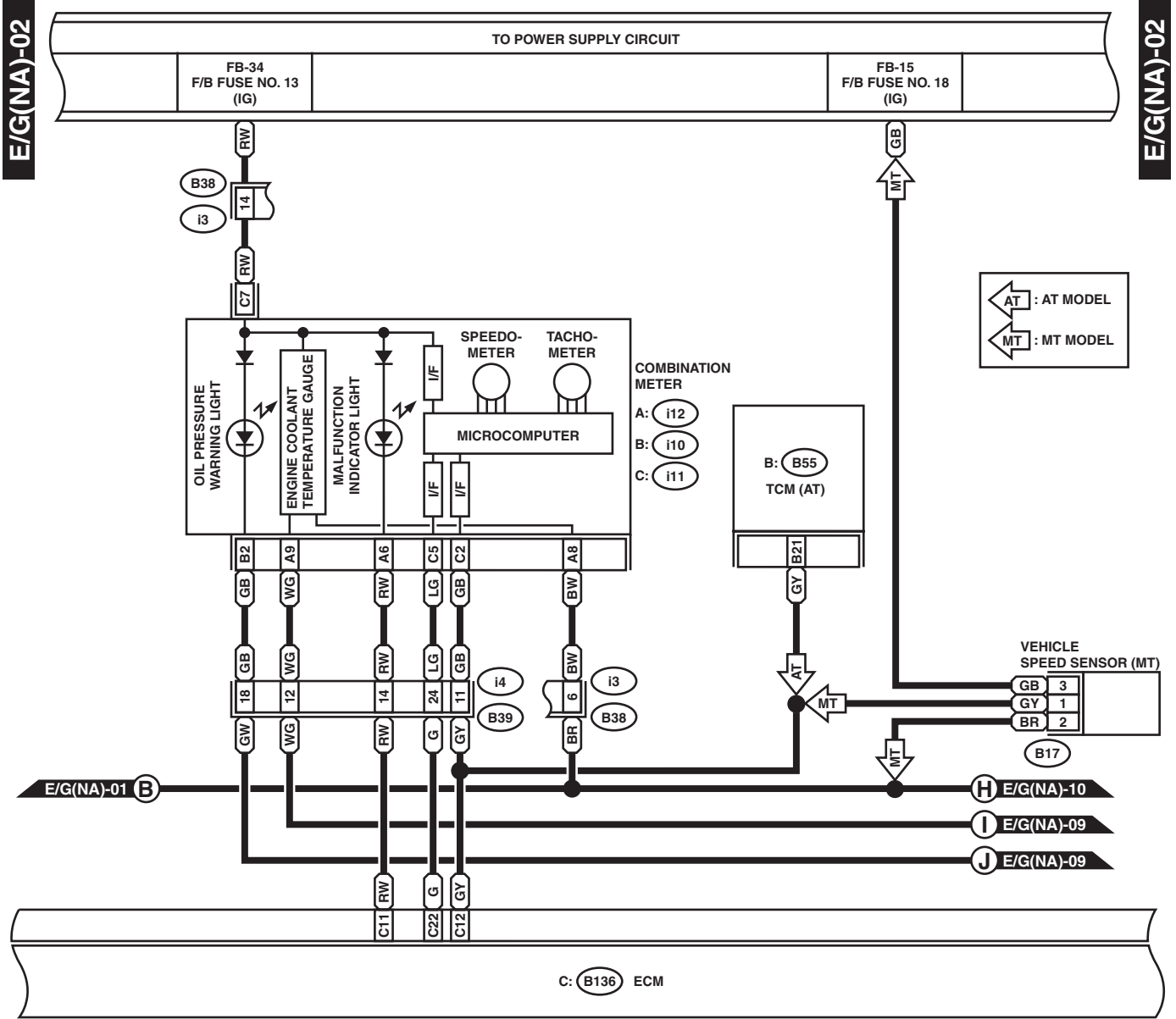
## WIRING SYSTEM



WI-11109

# Engine Electrical System

WIRING SYSTEM

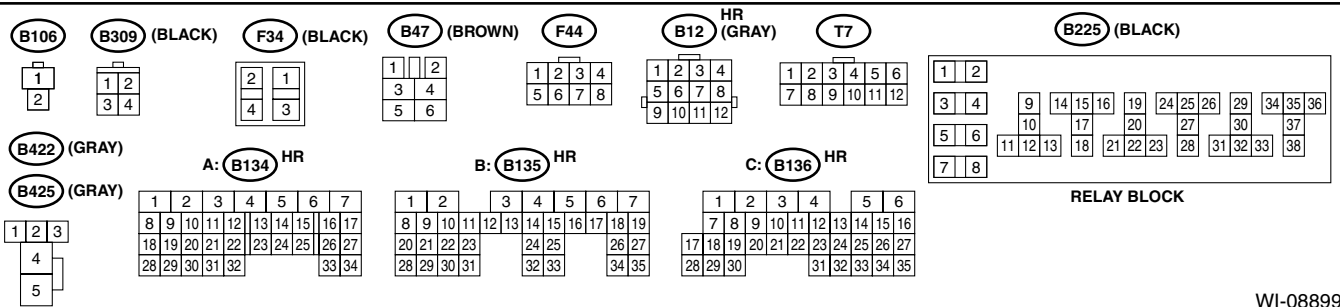
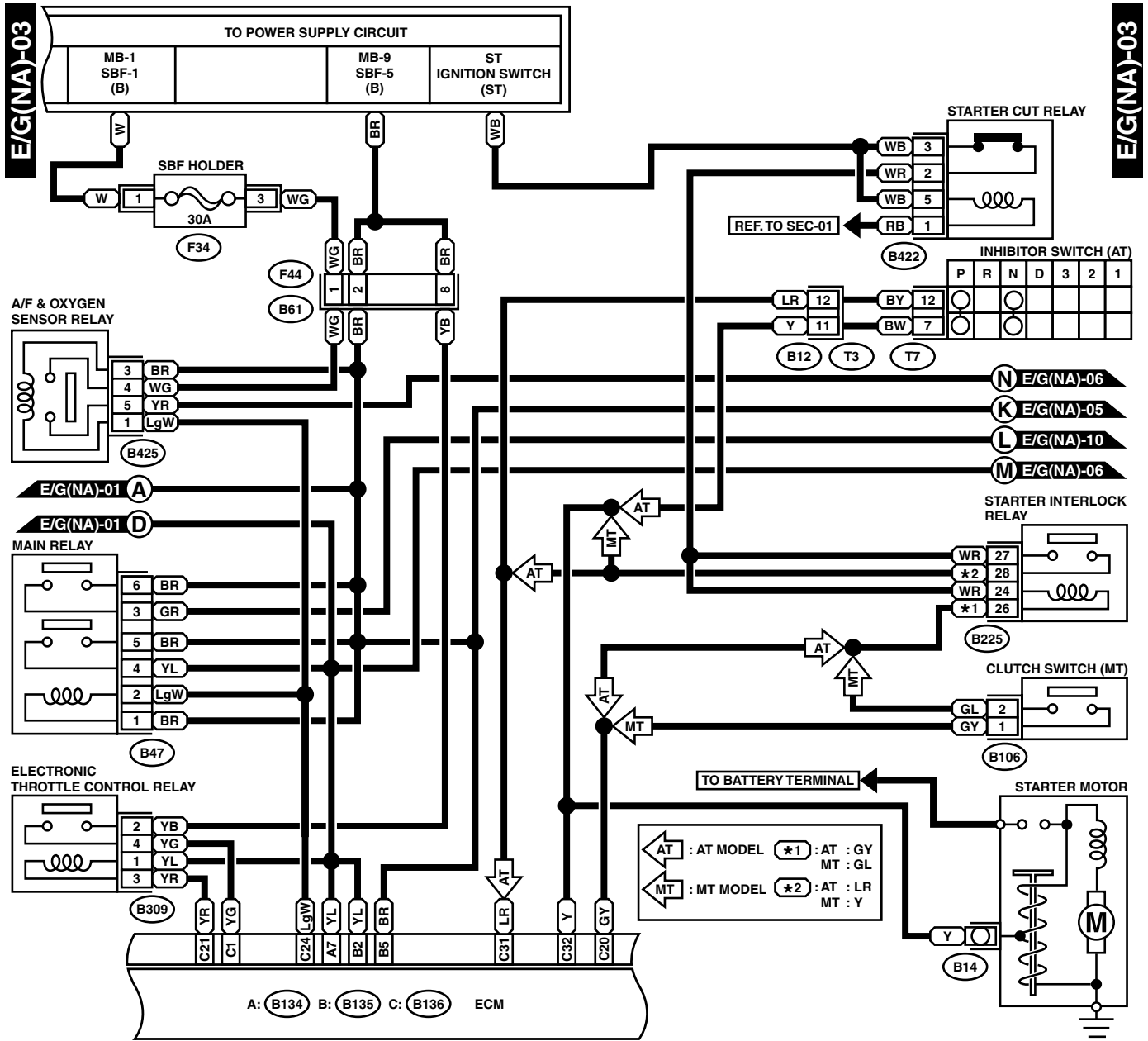


WI-11110



# Engine Electrical System

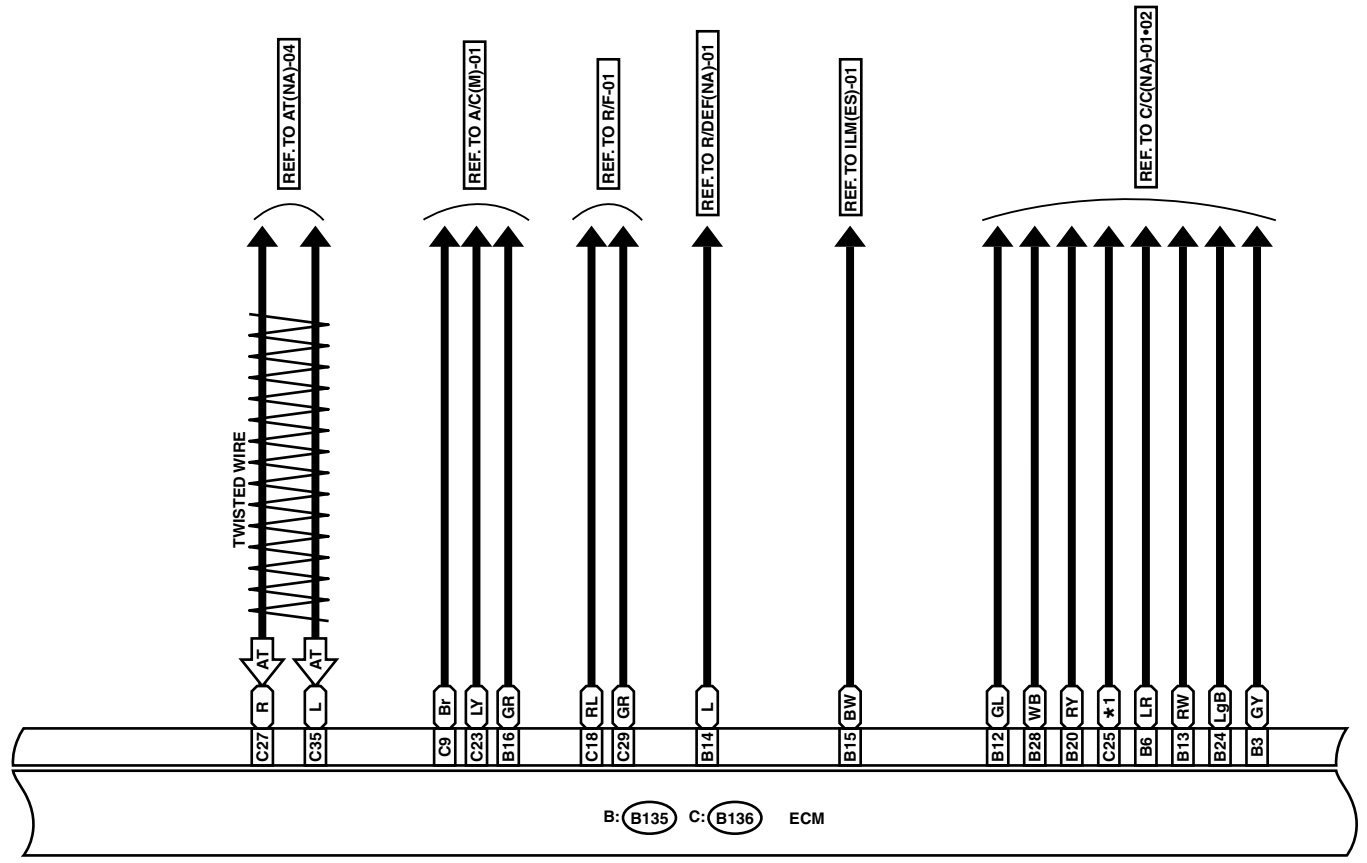
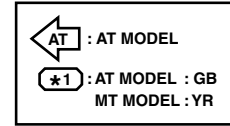
## WIRING SYSTEM



WI-08899

E/G(NA)-04

E/G(NA)-04



B: (B135) HR

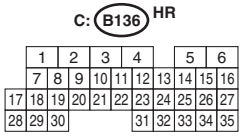
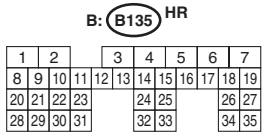
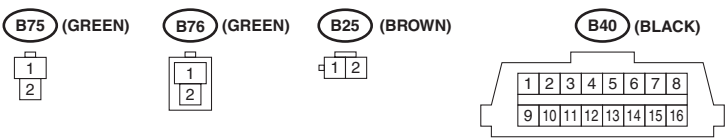
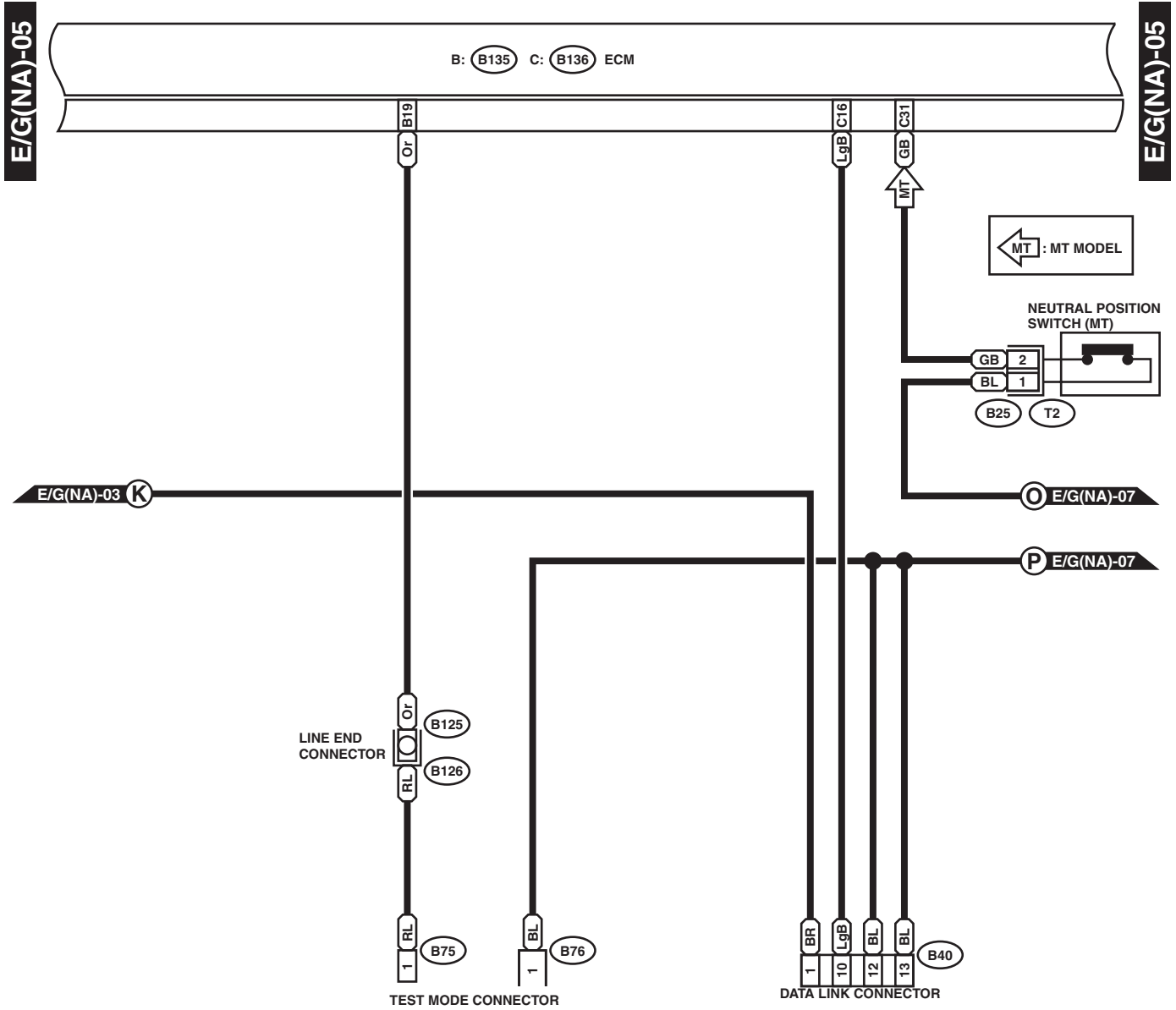
|    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |    |    |    |    |    |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |    |    |    |    |
| 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |    |    |    |    |

C: (B136) HR

|    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  |    |    |    |    |    |
| 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 |    |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 |    | 31 | 32 | 33 | 34 | 35 |    |    |

# Engine Electrical System

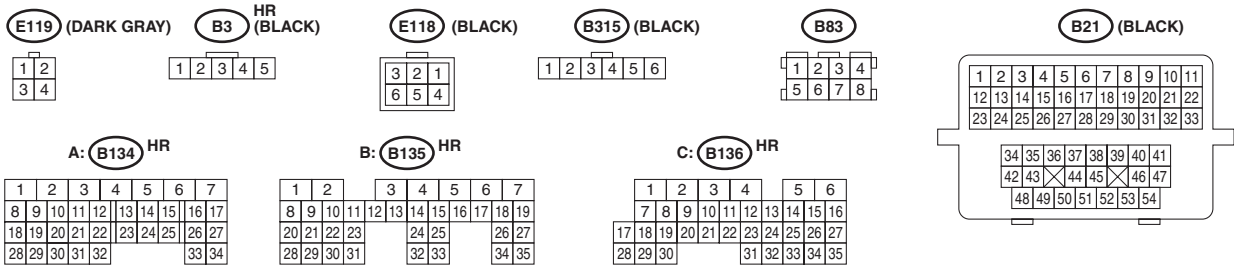
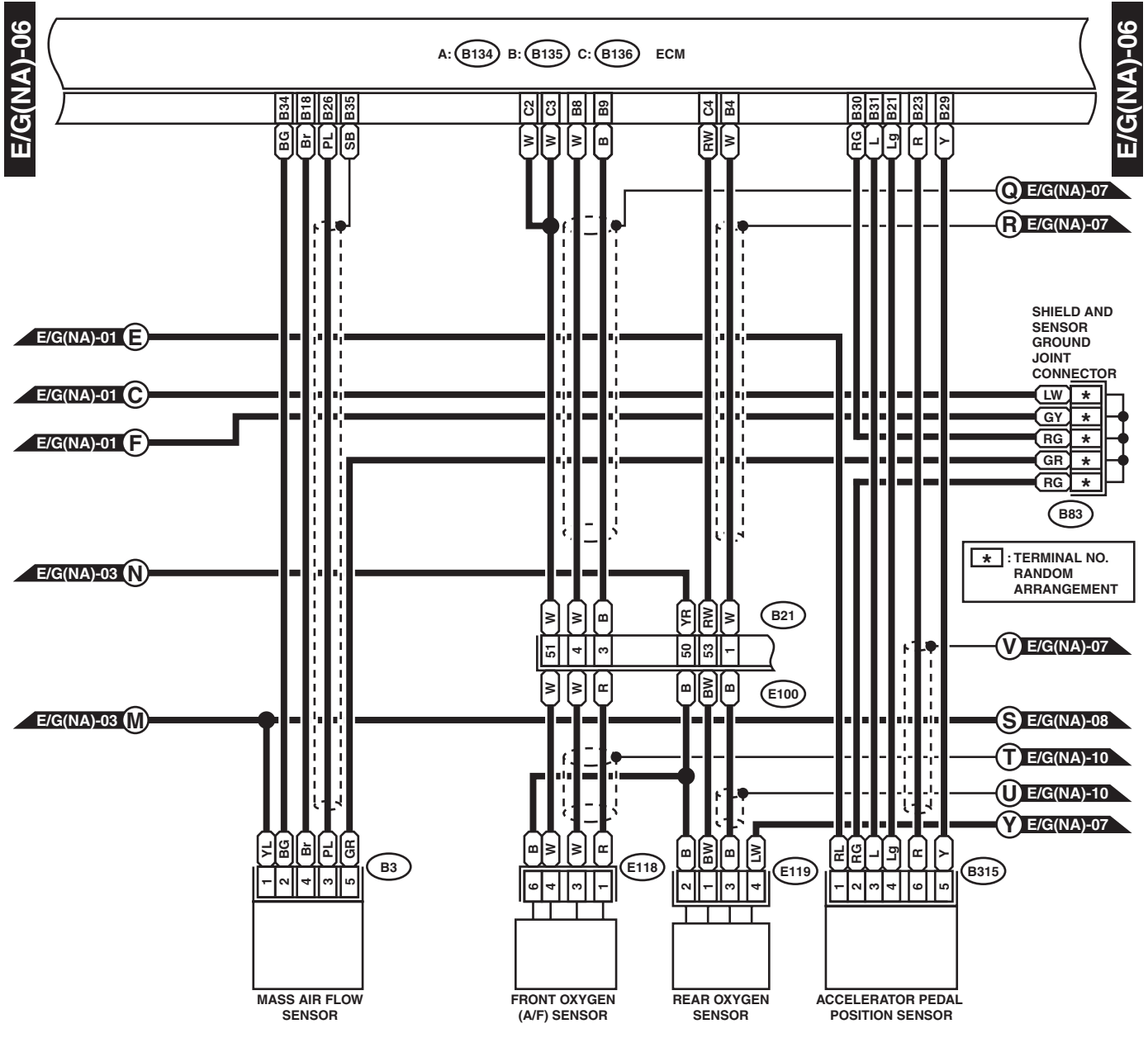
WIRING SYSTEM



WI-28703

# Engine Electrical System

WIRING SYSTEM



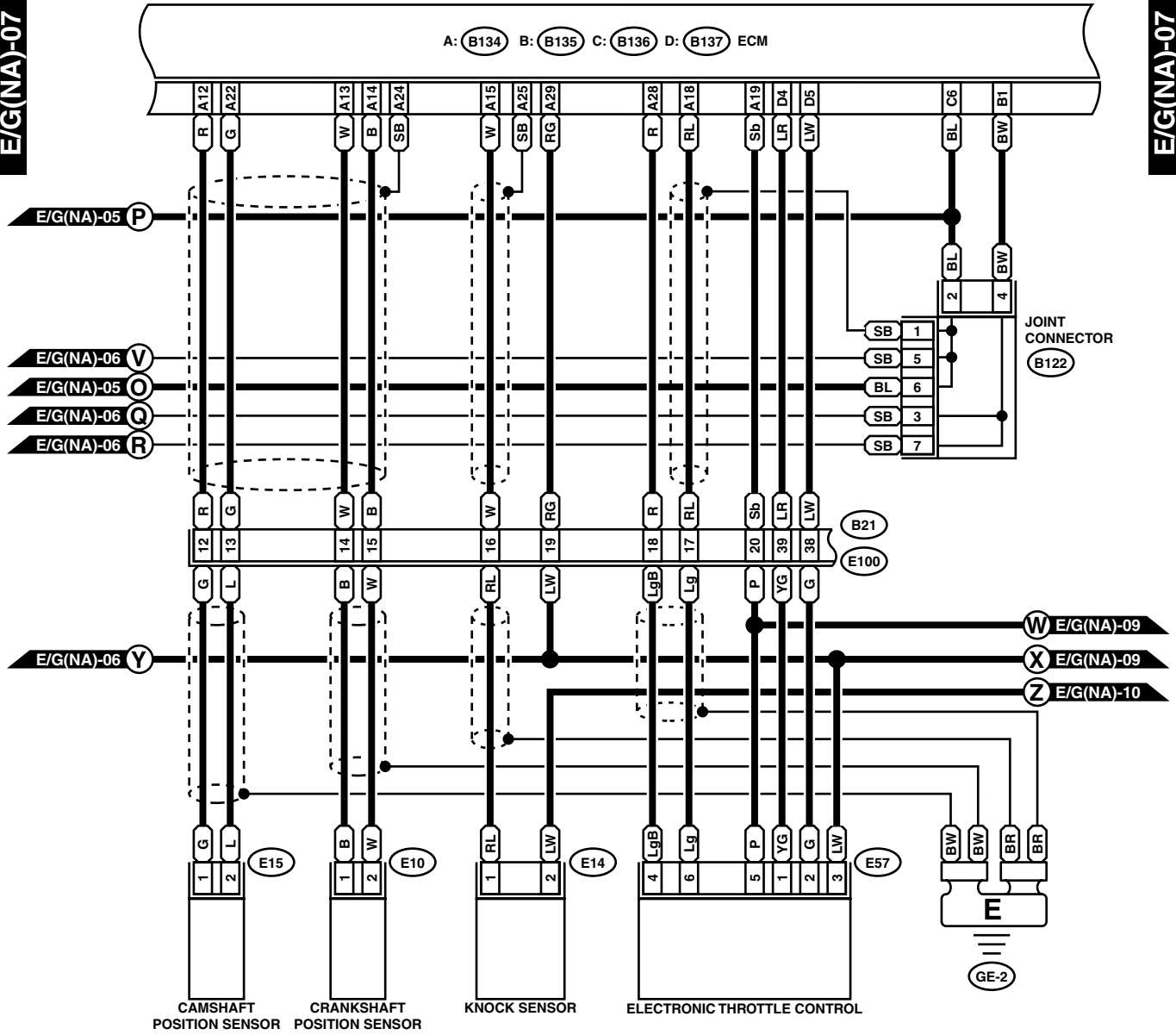
WI-11111

# Engine Electrical System

WIRING SYSTEM

E/G(NA)-07

E/G(NA)-07



E10 (LIGHT GRAY)

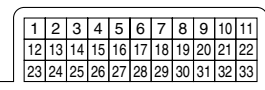
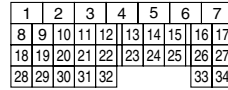
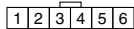
E57 (BLACK)

B122

A: B134 HR

B21 (BLACK)

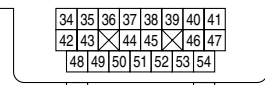
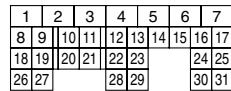
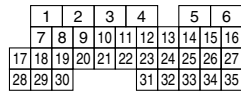
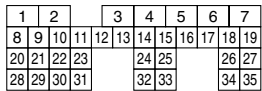
E15 (GRAY)



B: B135 HR

C: B136 HR

D: B137 HR



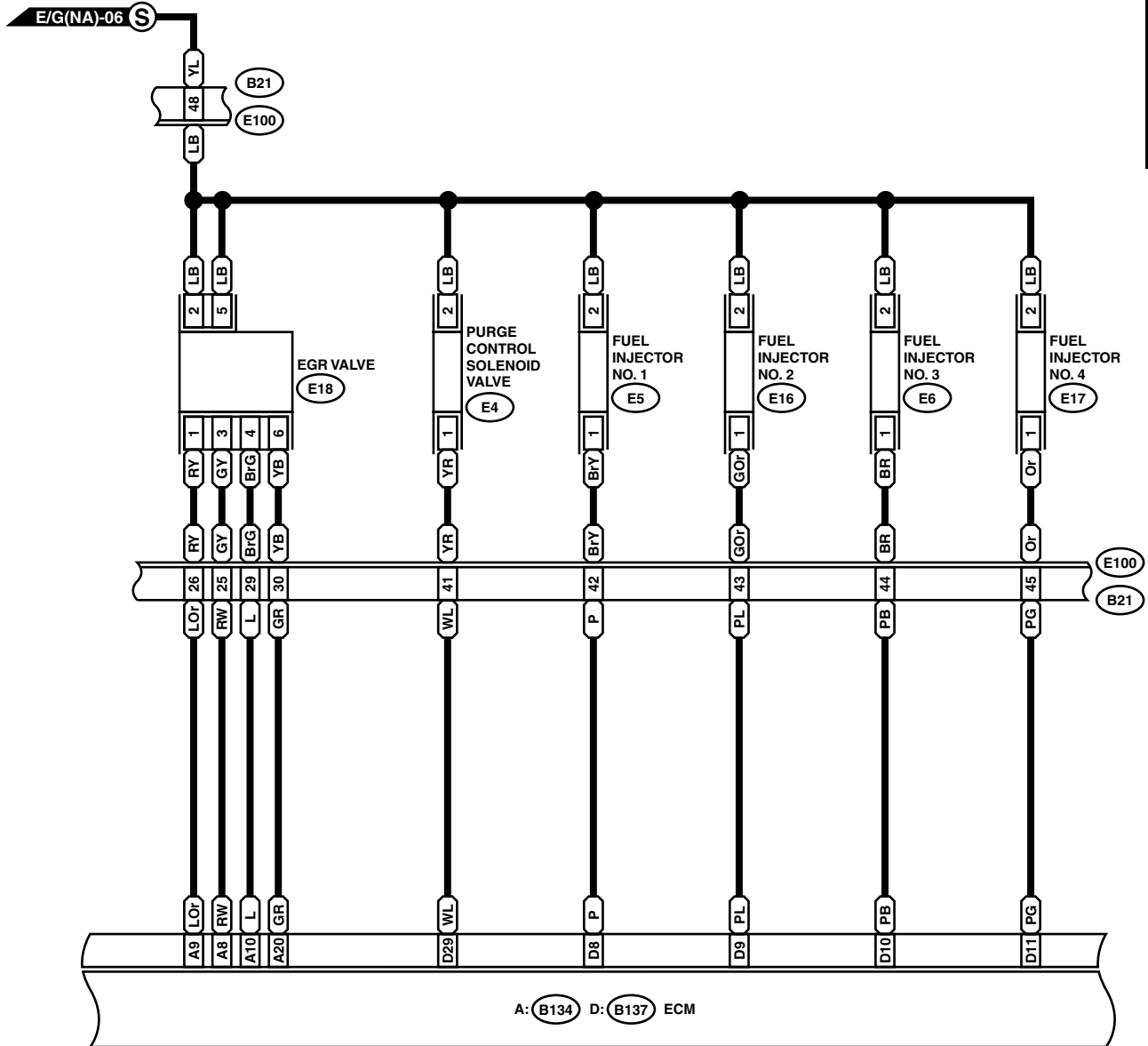
WI-08903

# Engine Electrical System

WIRING SYSTEM

E/G(NA)-08

E/G(NA)-08



- E5 (DARK GRAY)
- E6 (DARK GRAY)
- E16 (DARK GRAY)
- E17 (DARK GRAY)

- E4 (BLACK)
- 1 2

- E18 (DARK GRAY)
- 1 2 3  
4 5 6

- B21 (BLACK)

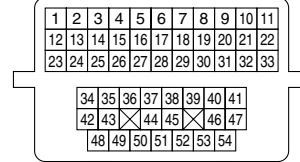


A: B134 HR

|    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 | 32 | 33 | 34 |    |

D: B137 HR

|    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 |    |    |    |    |



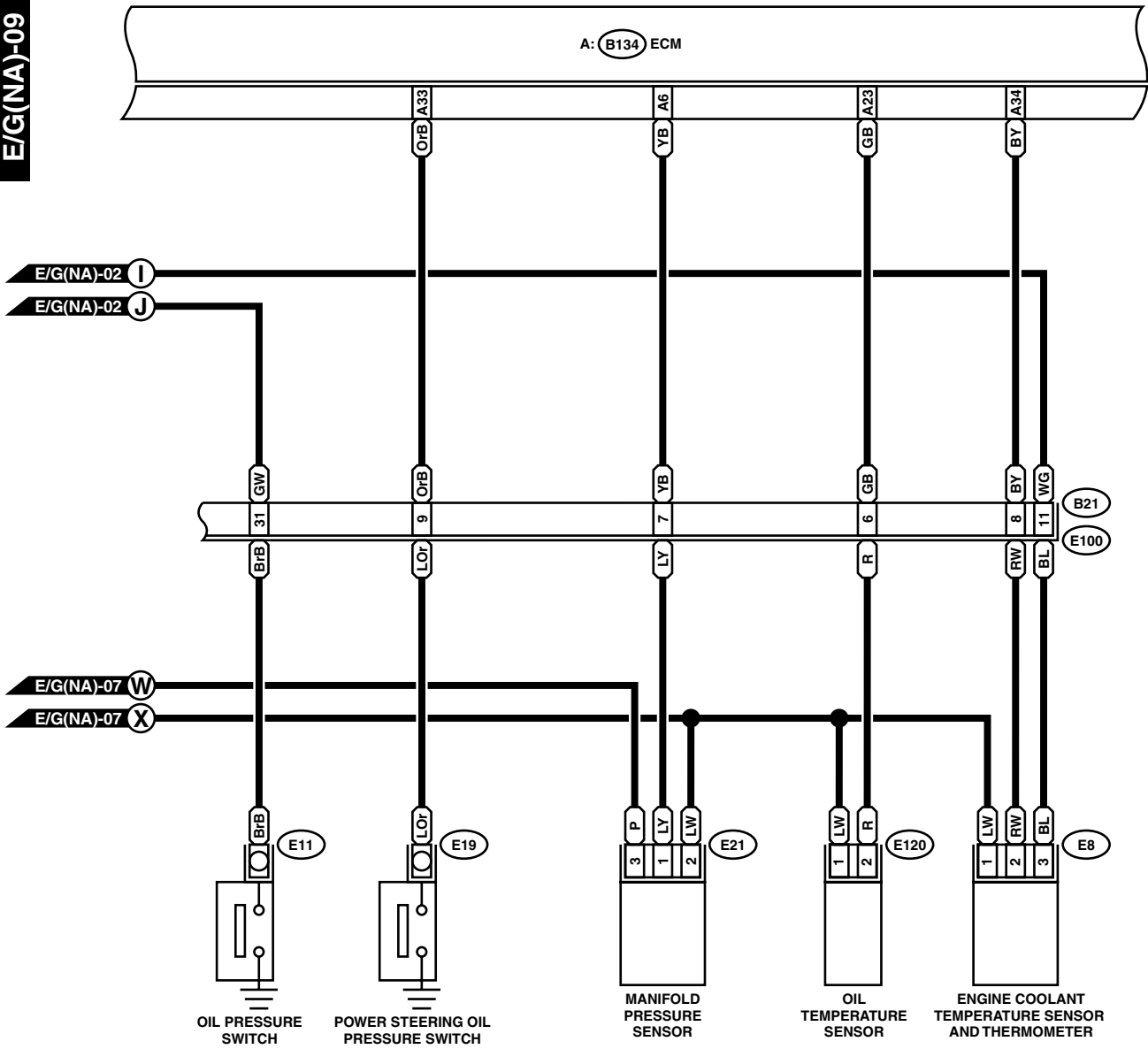
WI-08904

# Engine Electrical System

WIRING SYSTEM

E/G(NA)-09

E/G(NA)-09



E120 (BLACK)



E8 (LIGHT GRAY)



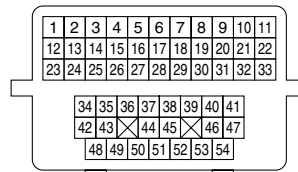
E21 (BLACK)



A: B134 HR



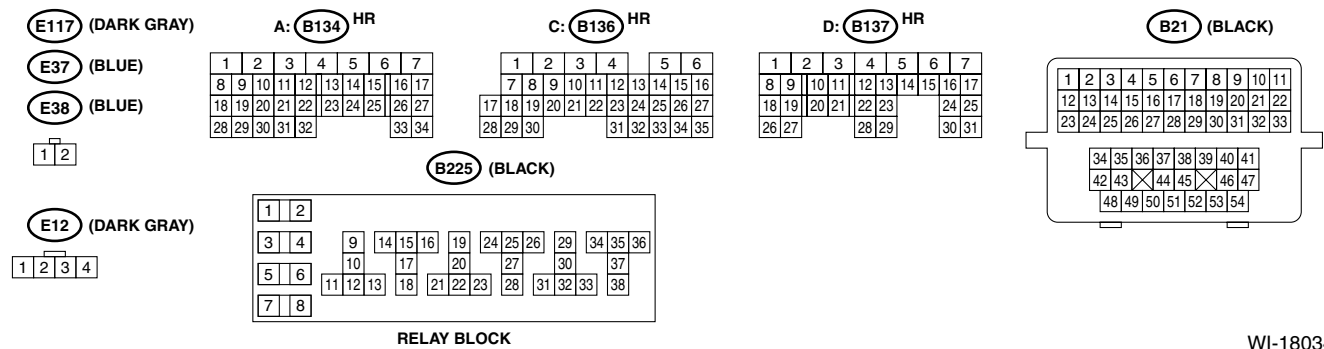
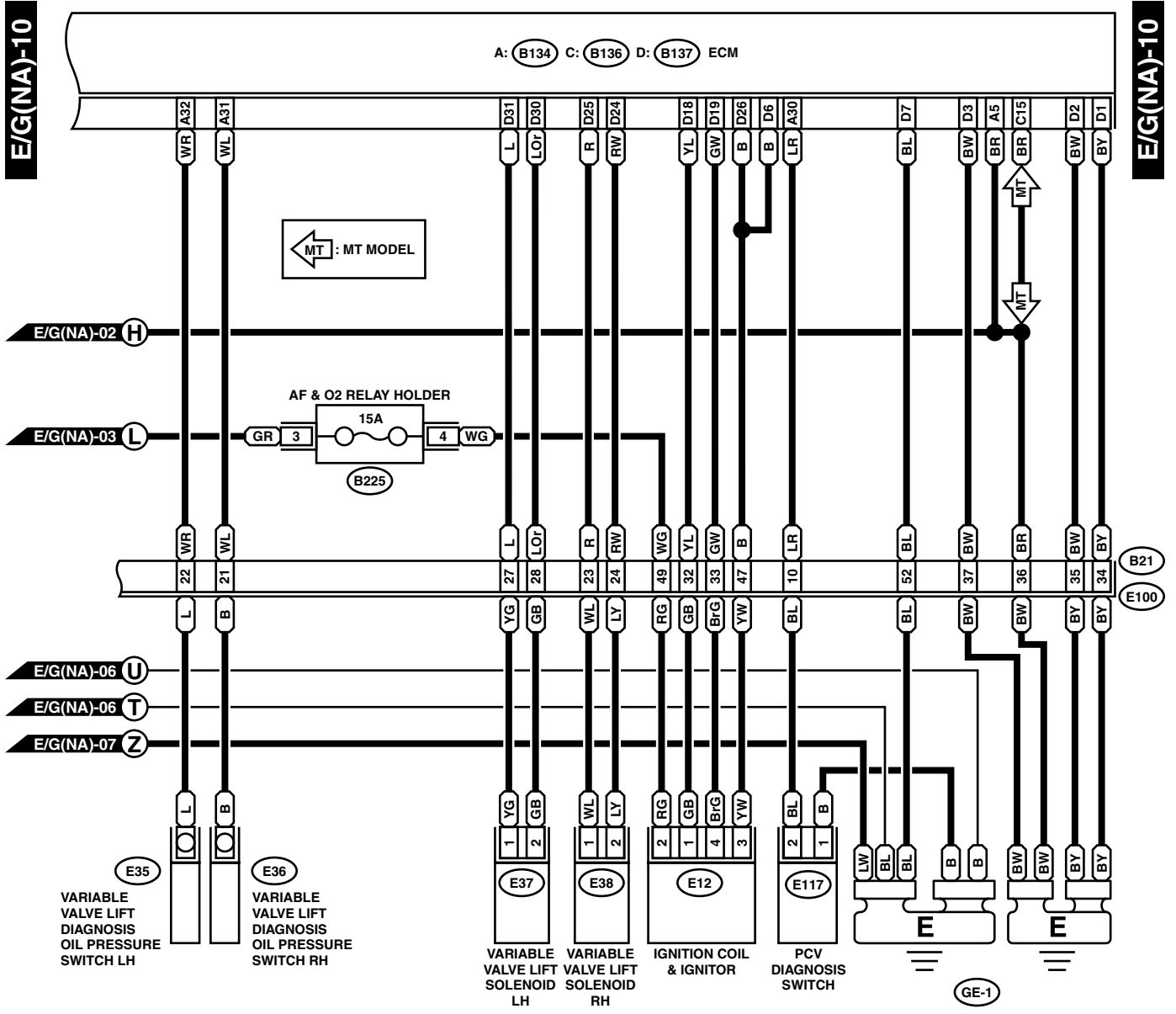
B21 (BLACK)



WI-08905

# Engine Electrical System

WIRING SYSTEM



RELAY BLOCK

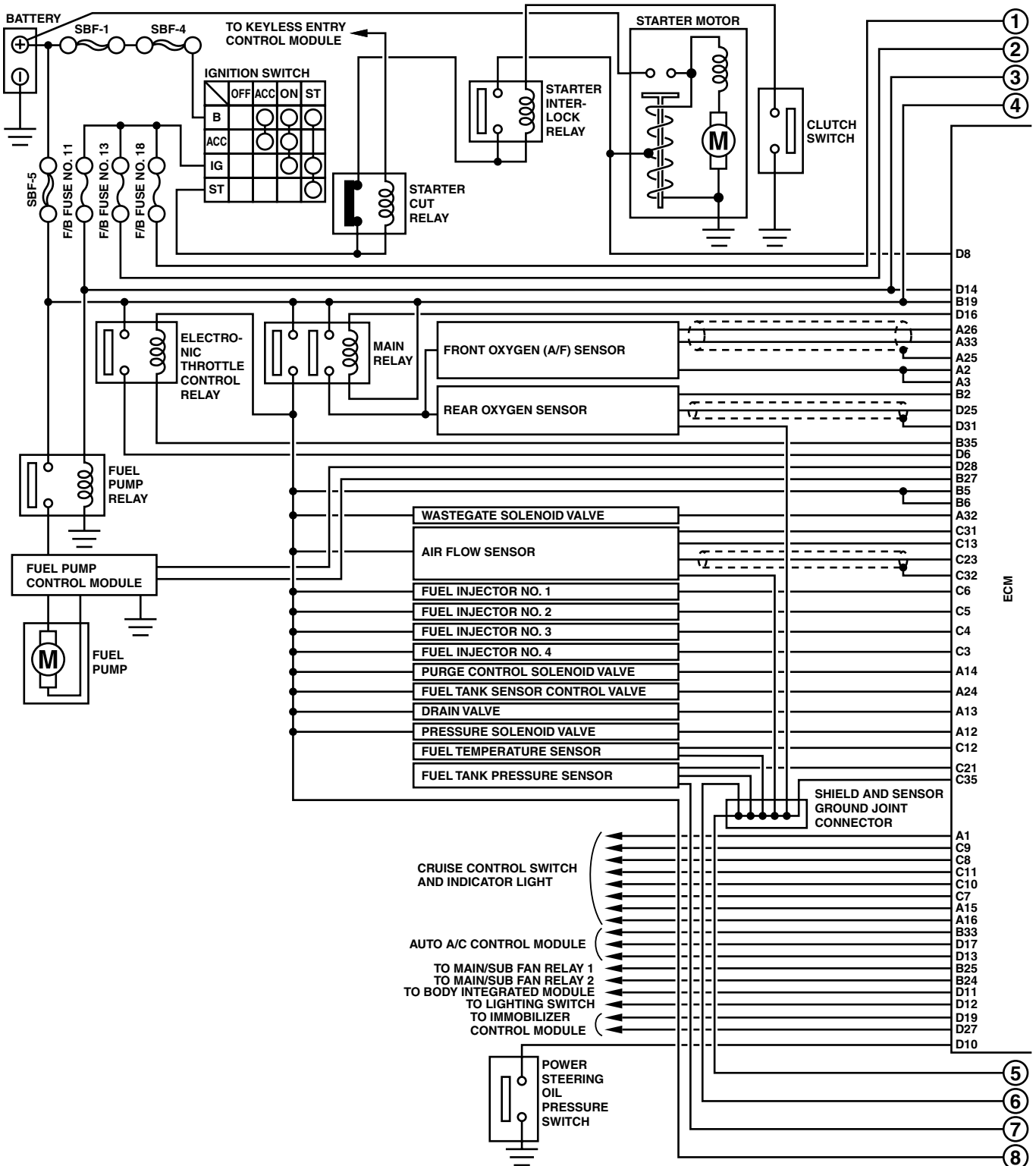
WI-18034



# Engine Electrical System

## WIRING SYSTEM

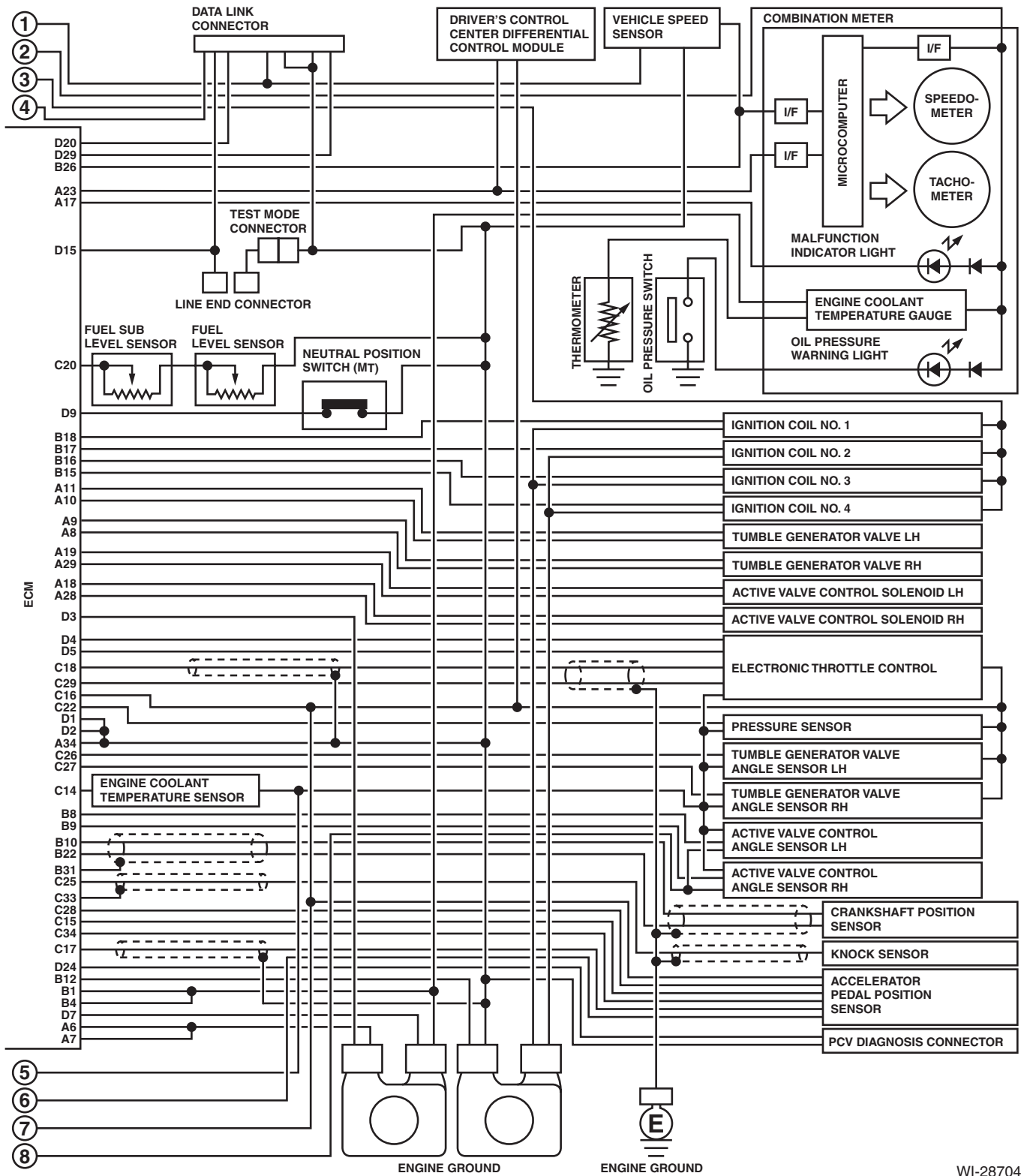
### 3. STI MODEL



WI-08907

# Engine Electrical System

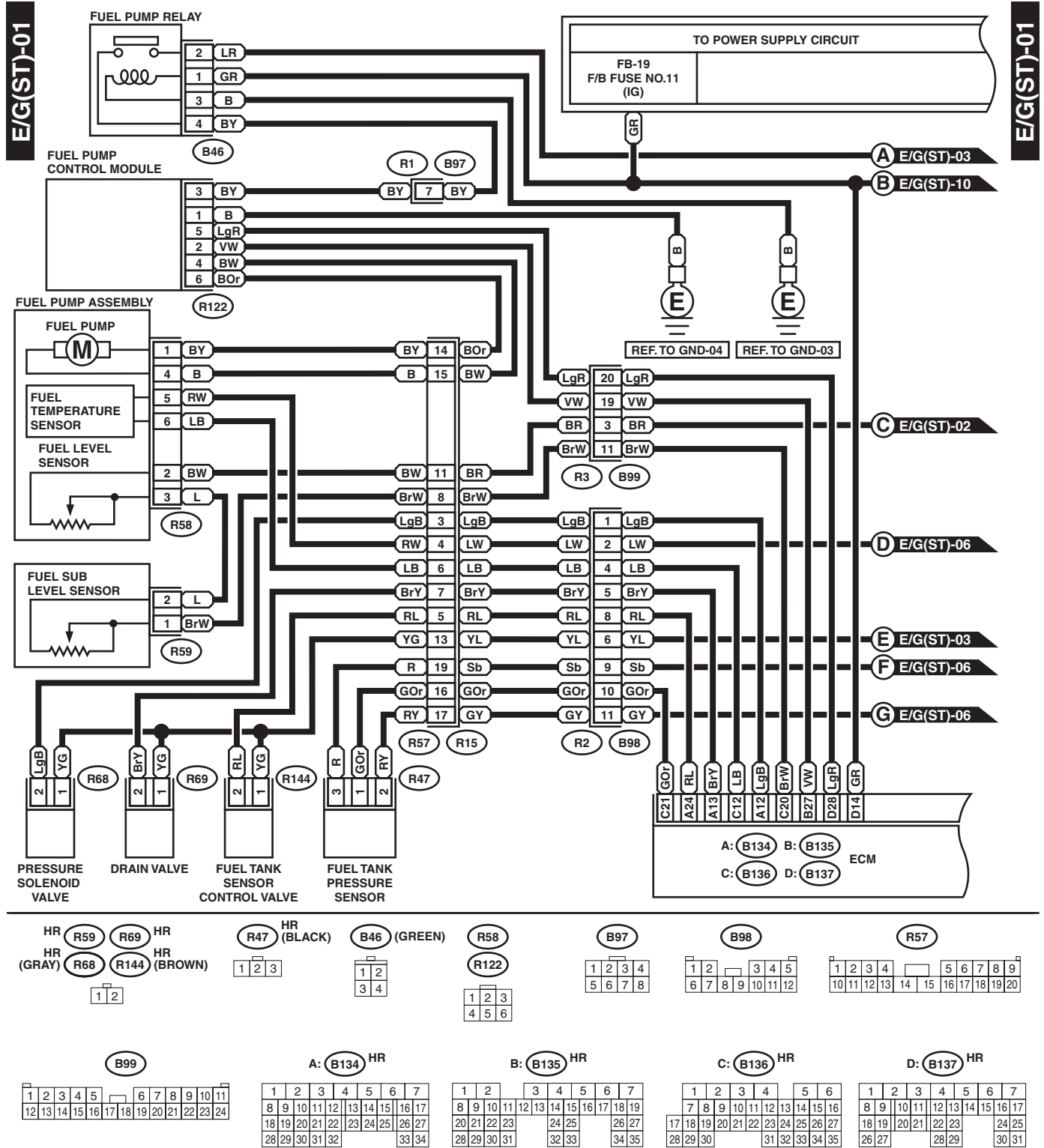
WIRING SYSTEM



WI-28704

# Engine Electrical System

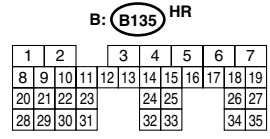
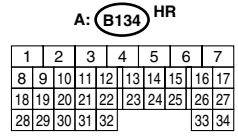
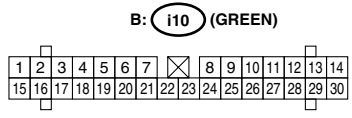
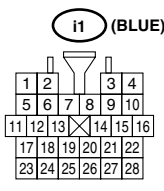
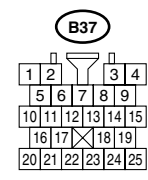
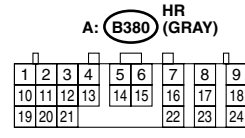
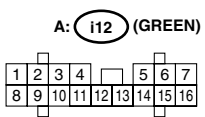
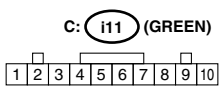
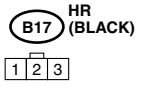
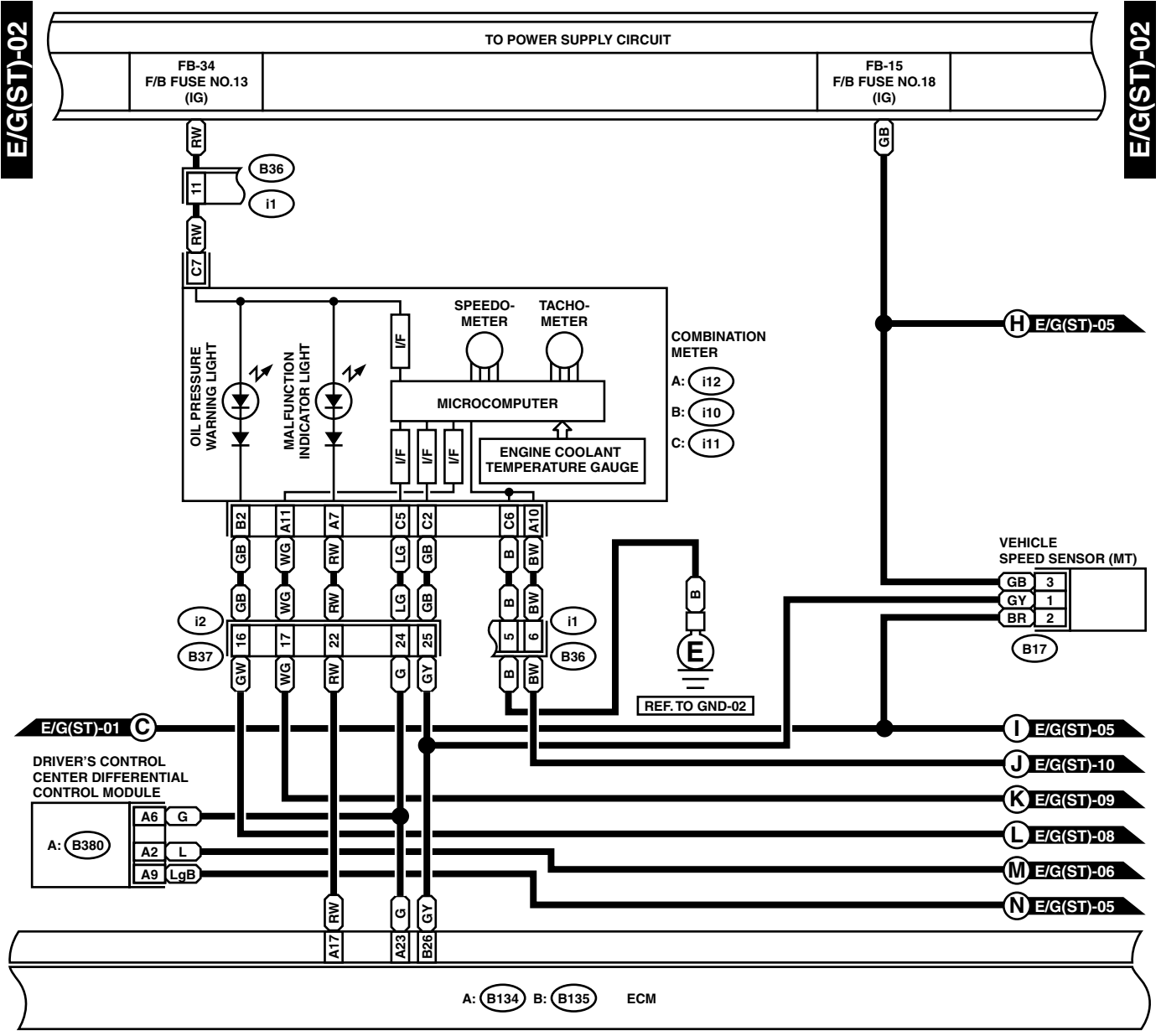
## WIRING SYSTEM



WI-11112

# Engine Electrical System

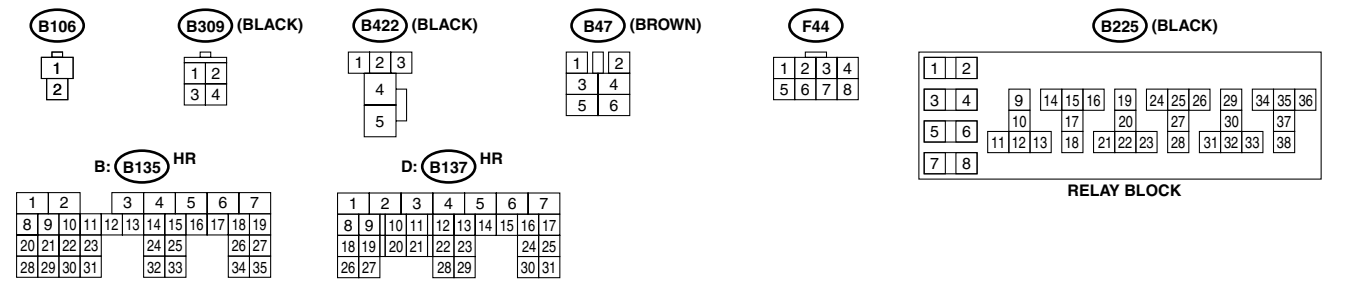
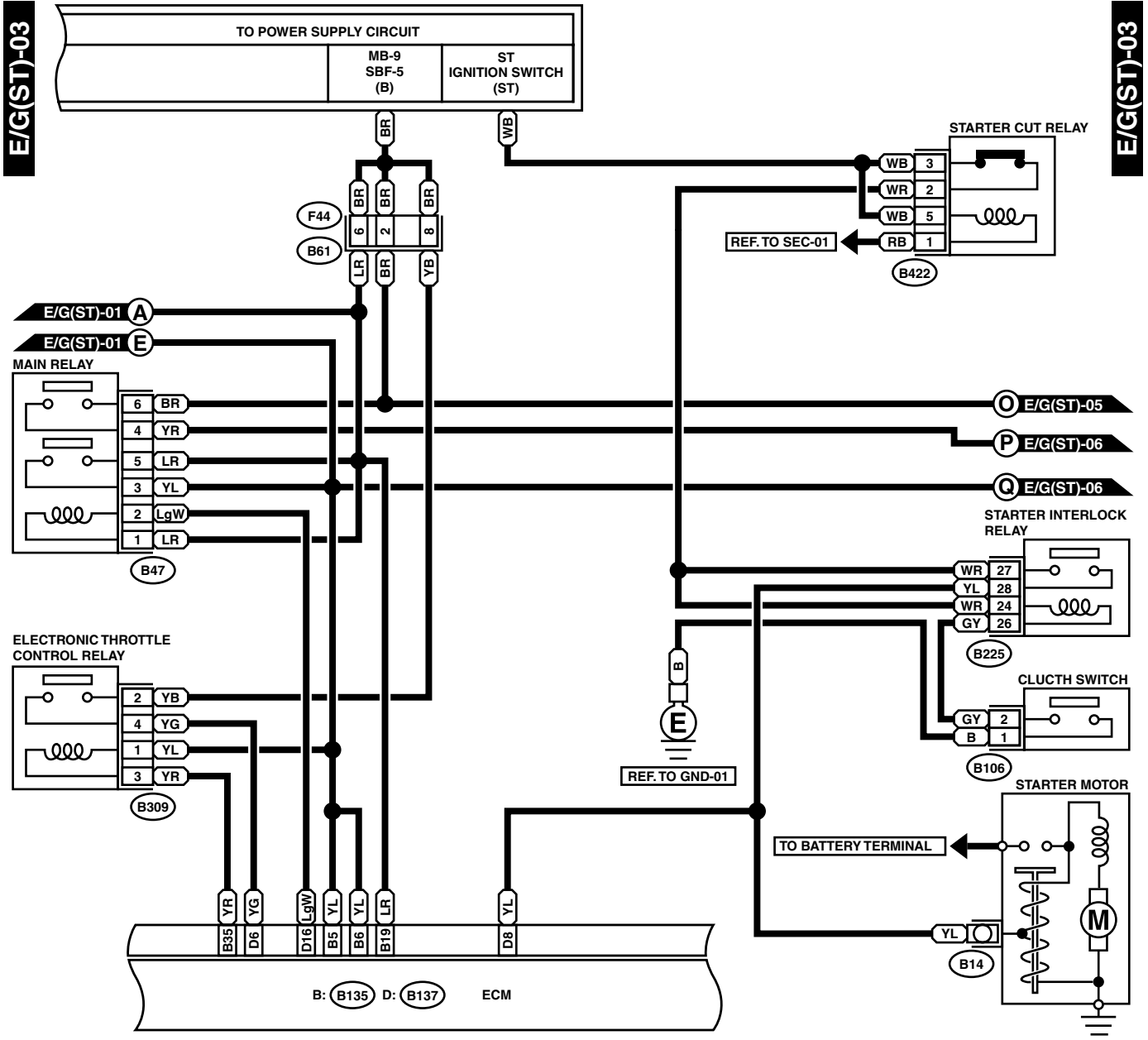
WIRING SYSTEM



WI-08910

# Engine Electrical System

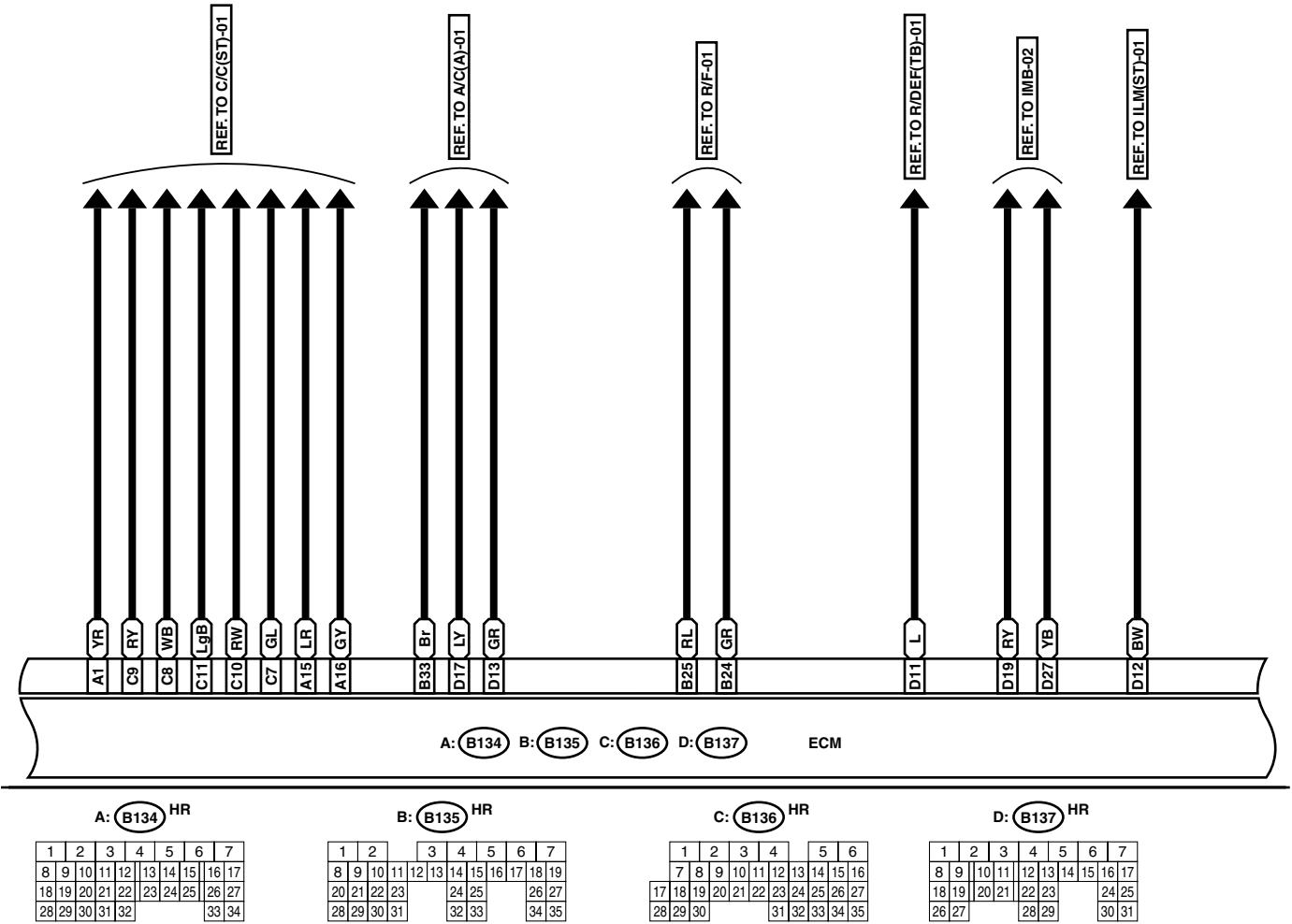
WIRING SYSTEM



WI-08911

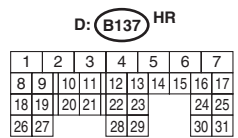
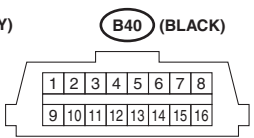
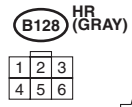
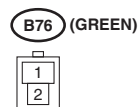
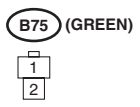
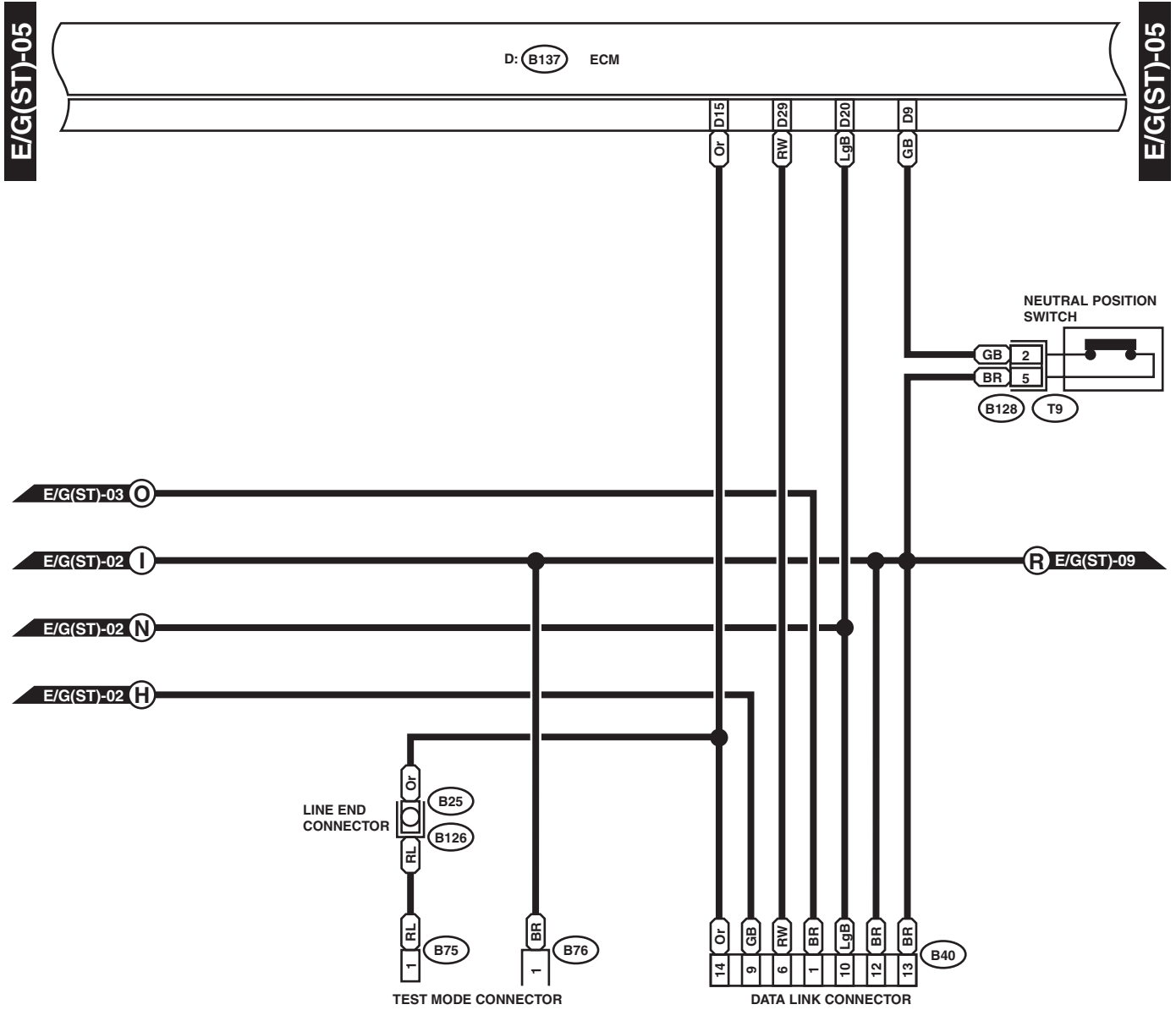
E/G(ST)-04

E/G(ST)-04



# Engine Electrical System

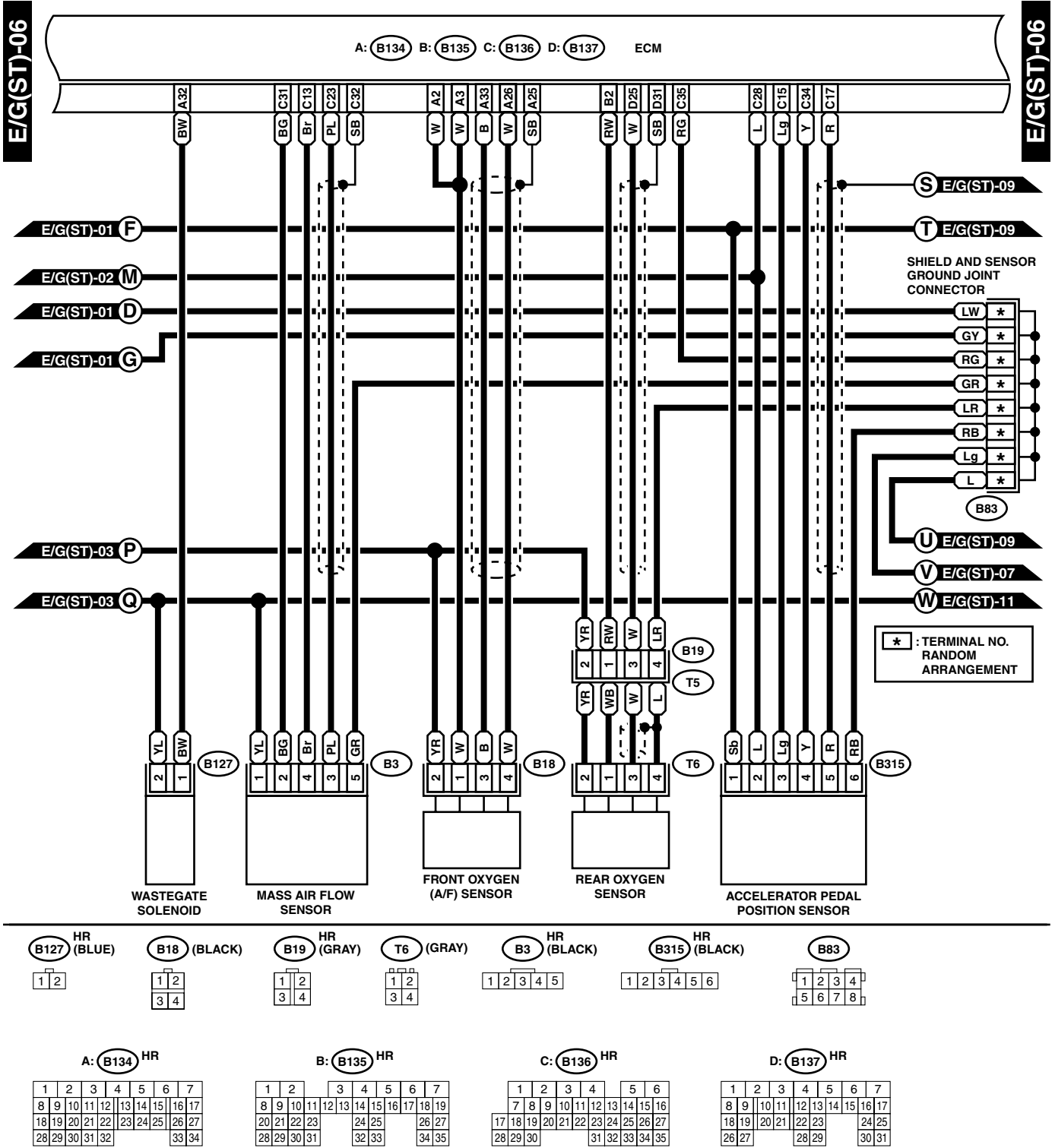
WIRING SYSTEM



WI-28705

# Engine Electrical System

WIRING SYSTEM

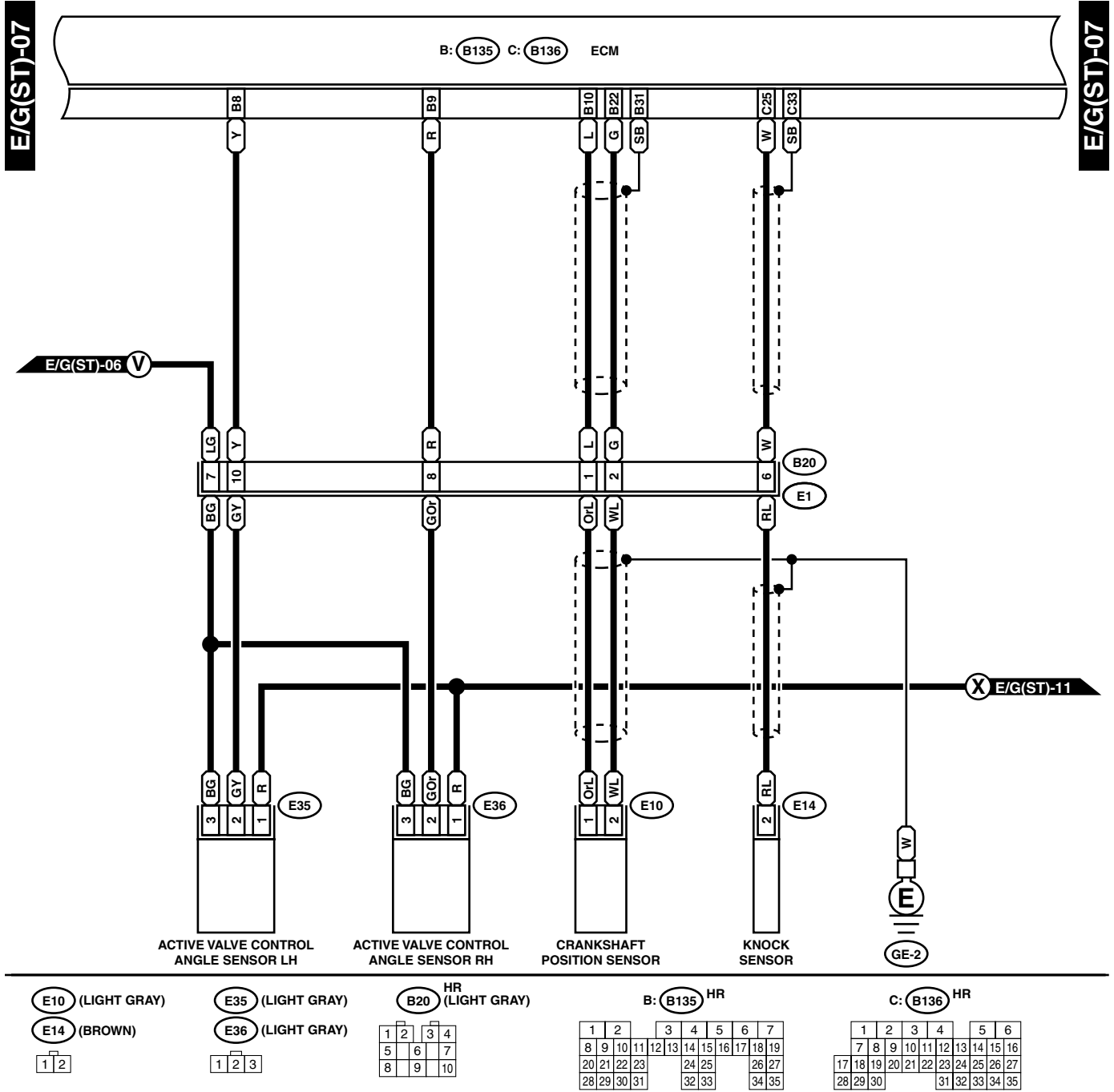


WI-11113



# Engine Electrical System

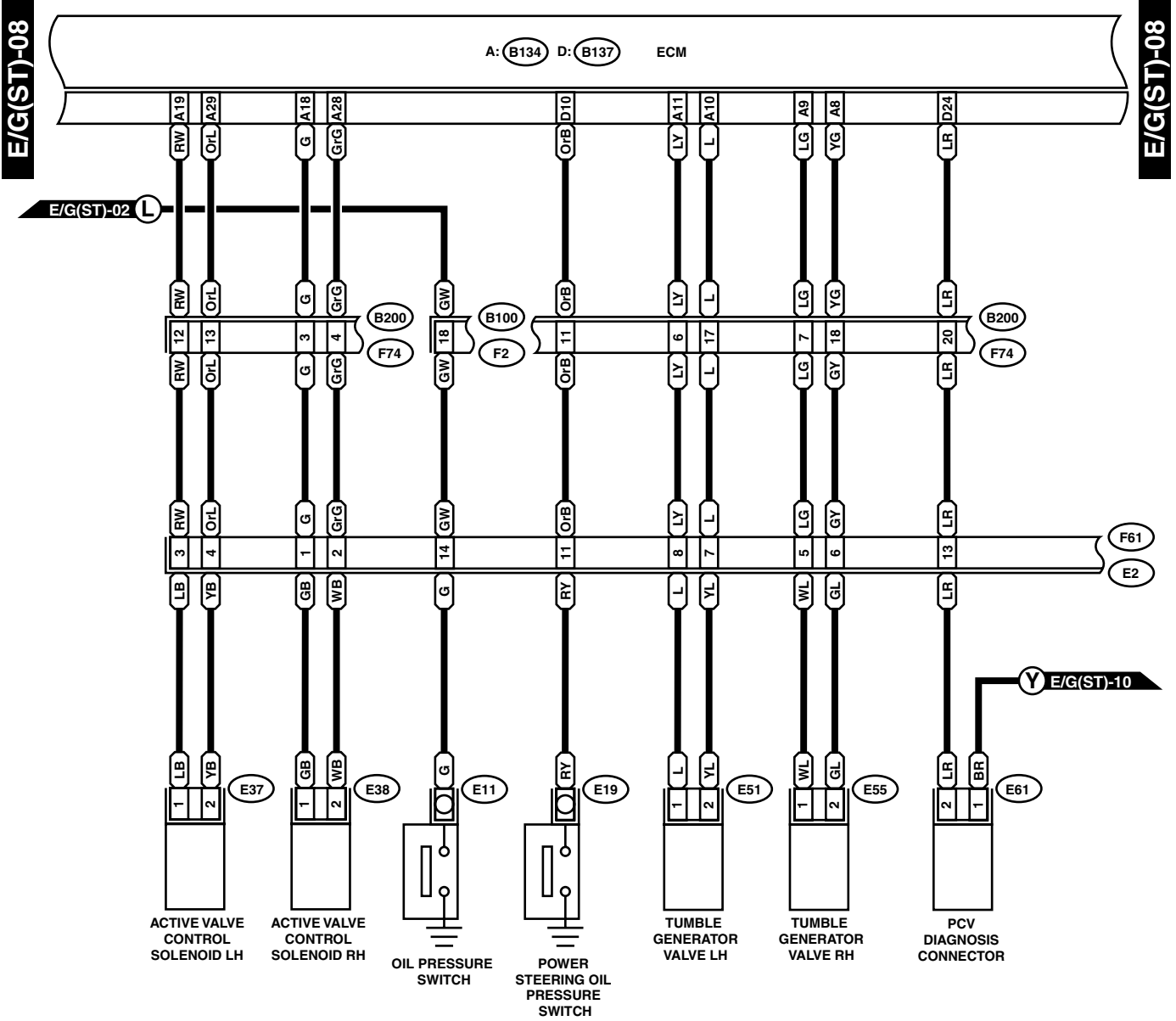
WIRING SYSTEM



WI-08915

# Engine Electrical System

WIRING SYSTEM



E37 (BLUE)

E38 (BLUE)

E51 (BLACK)

E55 (BLACK)

E61 (DARK GRAY)

1 2

F61 (BLACK) HR

|    |    |    |    |
|----|----|----|----|
| 1  | 2  | 3  | 4  |
| 5  | 6  | 7  | 8  |
| 9  | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |

F74 (BLUE)

|    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | 32 | 33 | 34 |    |    |

A: (B134) HR

|    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 | 32 | 33 | 34 |    |

F2 (BLACK)

|    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 |

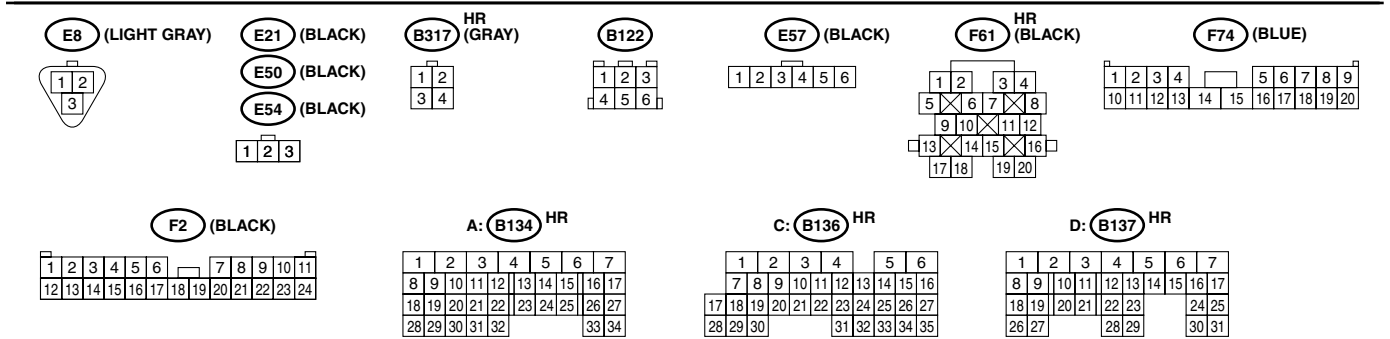
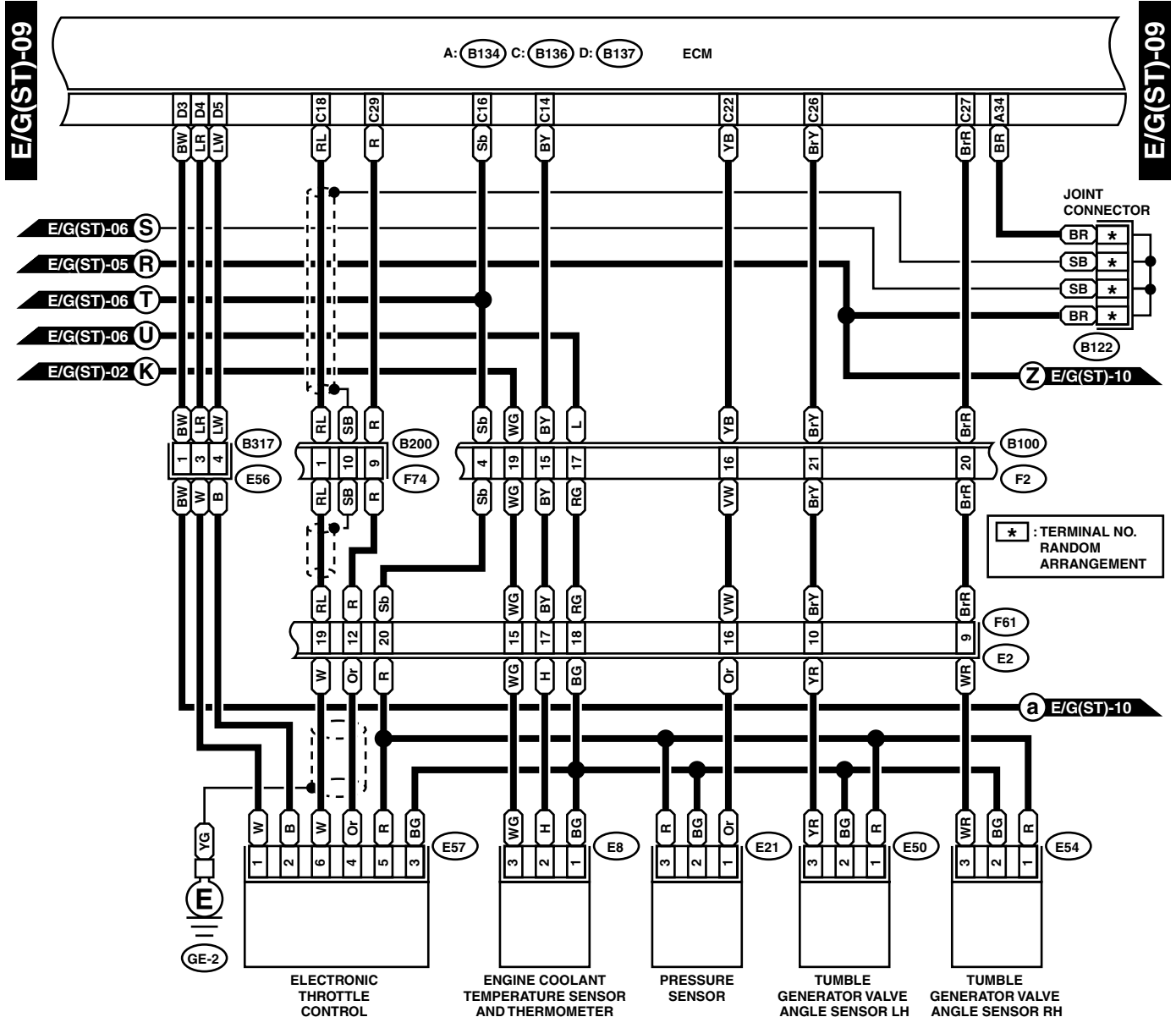
D: (B137) HR

|    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 | 32 | 33 | 34 | 35 |

WI-08916

# Engine Electrical System

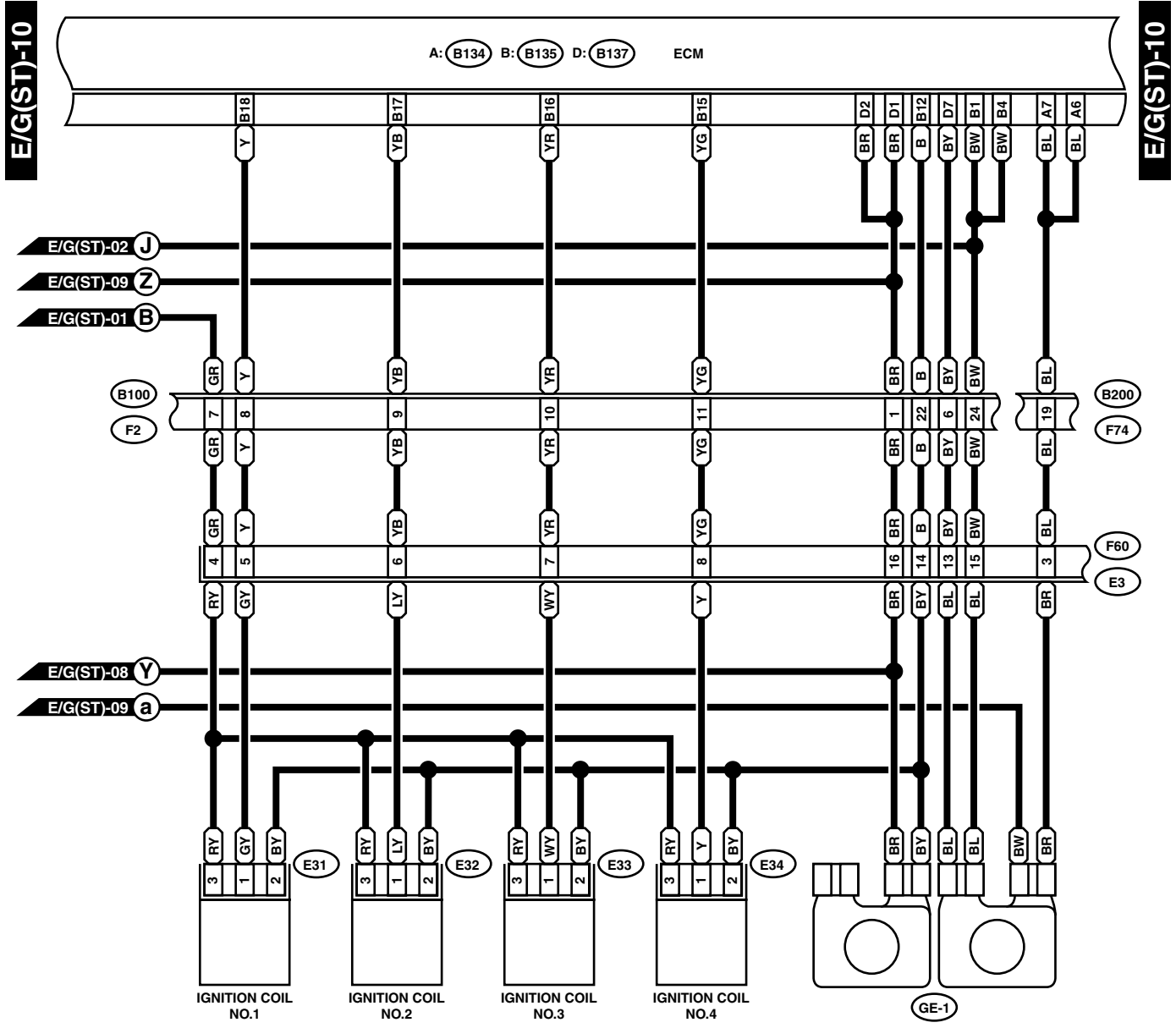
## WIRING SYSTEM



WI-08917

# Engine Electrical System

WIRING SYSTEM



- (E31) (WHITE)
- (E32) (WHITE)
- (E33) (BLACK)
- (E34) (BLACK)

HR (BROWN)

|    |    |    |    |
|----|----|----|----|
| 1  | 2  | 3  | 4  |
| 5  | 6  | 7  | 8  |
| 9  | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |

(F74) (BLUE)

|    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  |    | 5  | 6  | 7  | 8  | 9  |    |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |

(F2) (BLACK)

|    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  |    | 7  | 8  | 9  | 10 | 11 |    |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |

|   |
|---|
| 1 |
| 2 |
| 3 |

A: (B134) HR

|    |    |    |    |    |    |    |    |    |    |  |  |
|----|----|----|----|----|----|----|----|----|----|--|--|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |    |    |    |  |  |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |  |  |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |  |  |
| 28 | 29 | 30 | 31 | 32 |    |    | 33 | 34 |    |  |  |

B: (B135) HR

|    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  |    | 3  | 4  | 5  | 6  | 7  |    |    |    |    |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 | 21 | 22 | 23 |    | 24 | 25 |    | 26 | 27 |    |    |
| 28 | 29 | 30 | 31 |    | 32 | 33 |    | 34 | 35 |    |    |

D: (B137) HR

|    |    |    |    |    |    |    |    |    |    |  |
|----|----|----|----|----|----|----|----|----|----|--|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |    |    |    |  |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |  |
| 18 | 19 | 20 | 21 | 22 | 23 |    | 24 | 25 |    |  |
| 26 | 27 |    | 28 | 29 |    |    | 30 | 31 |    |  |

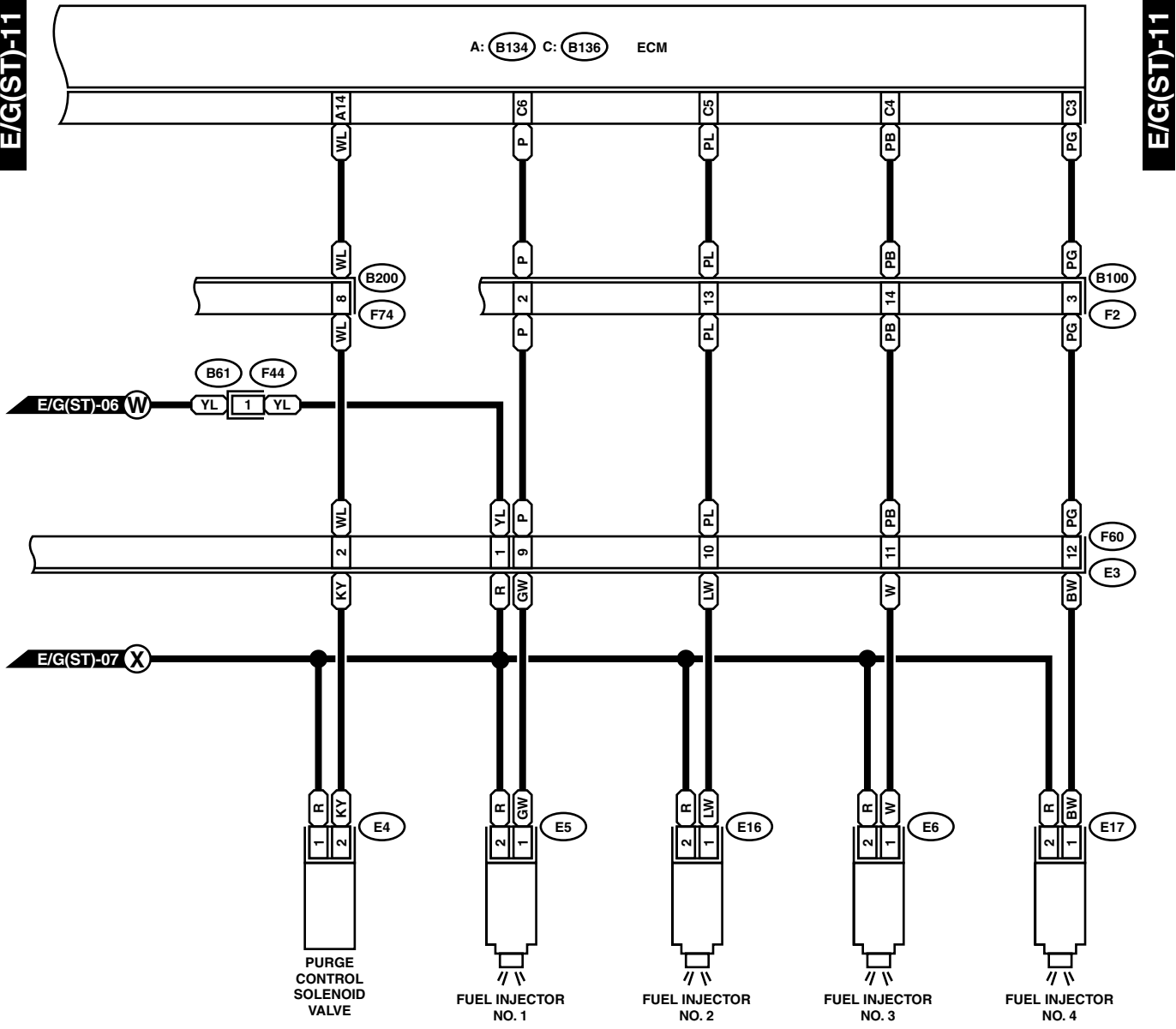
WI-08918

# Engine Electrical System

WIRING SYSTEM

E/G(ST)-11

E/G(ST)-11



- E5 (LIGHT GRAY)
- E6 (LIGHT GRAY)
- E16 (LIGHT GRAY)
- E17 (LIGHT GRAY)

- E4 (BLACK)

- F44

- HR F60 (BROWN)

- F74 (BLUE)

- F2 (BLACK)



A: B134 HR

|    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 |    |
| 28 | 29 | 30 | 31 | 32 |    | 33 |
|    |    |    |    |    |    | 34 |

C: B136 HR

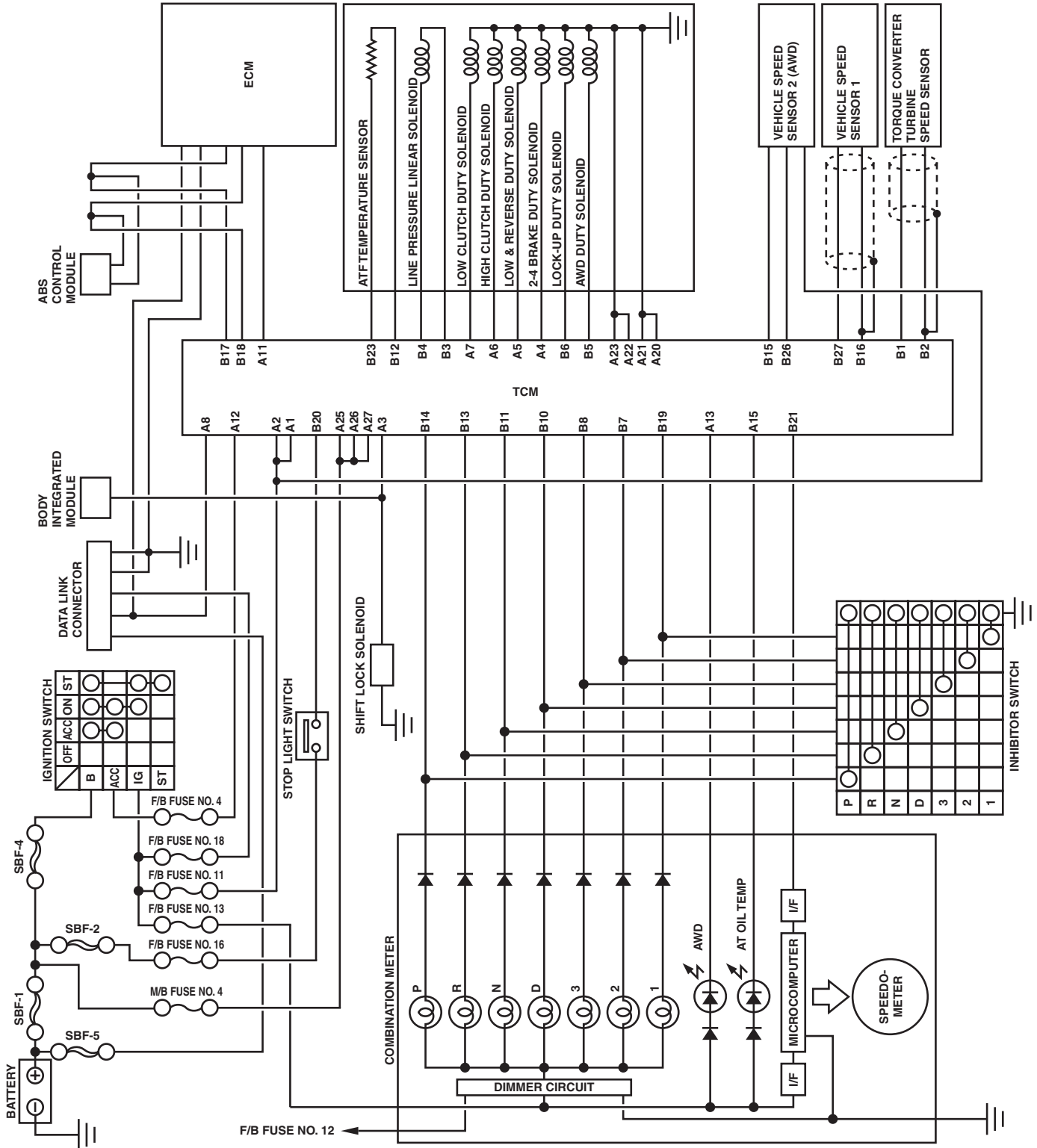
|    |    |    |    |    |    |
|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  |
| 7  | 8  | 9  | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 |
|    |    |    | 31 | 32 | 33 |
|    |    |    | 34 | 35 |    |

WI-08919

## 6. AT Control System

### A: WIRING DIAGRAM

#### 1. TURBO MODEL



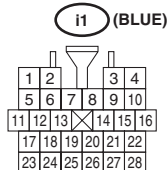
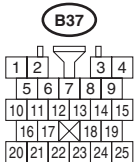
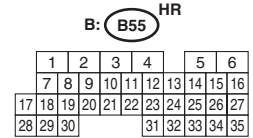
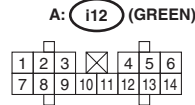
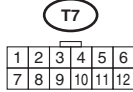
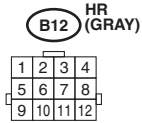
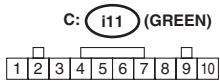
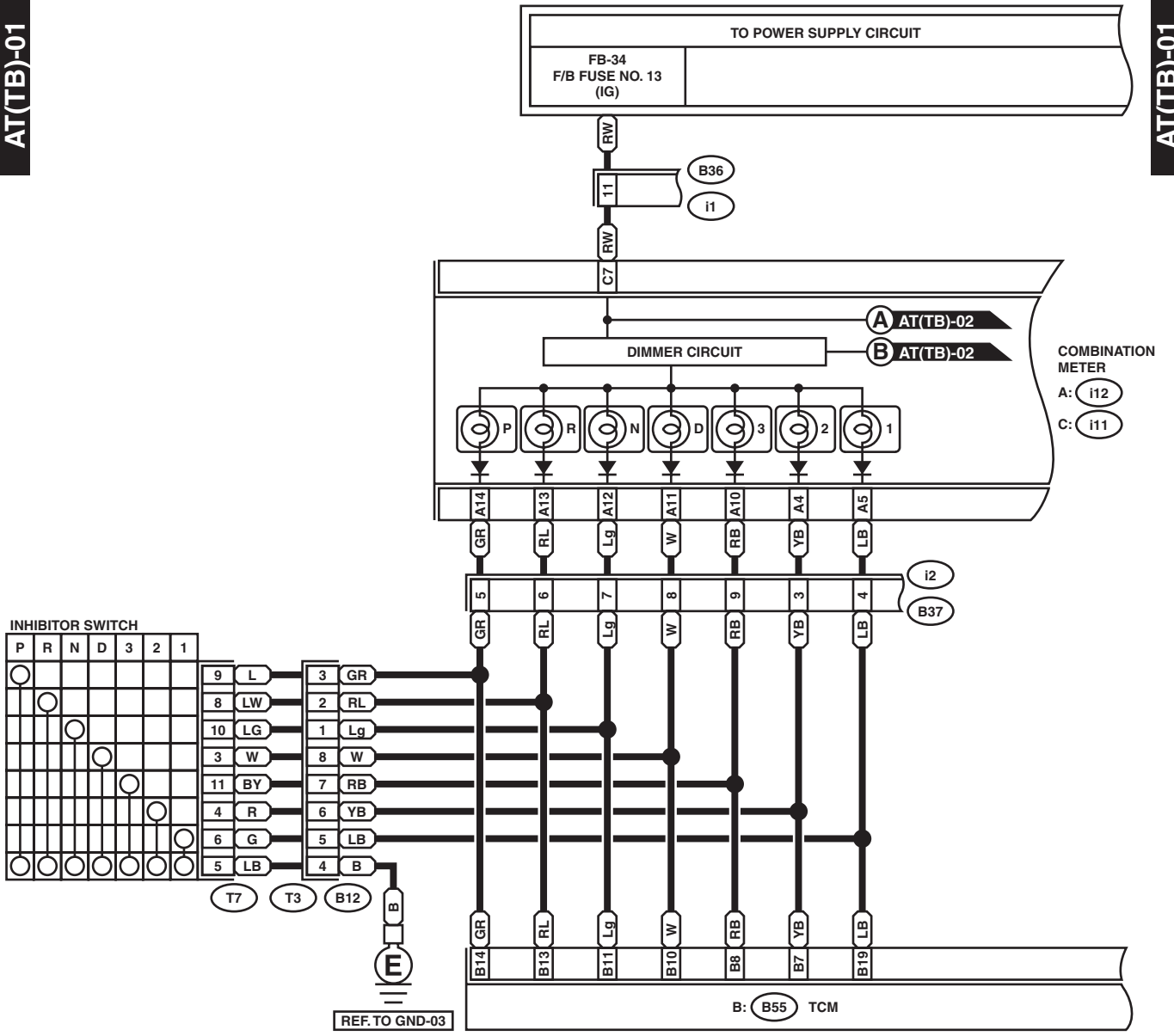
WI-32927

# AT Control System

WIRING SYSTEM

AT(TB)-01

AT(TB)-01



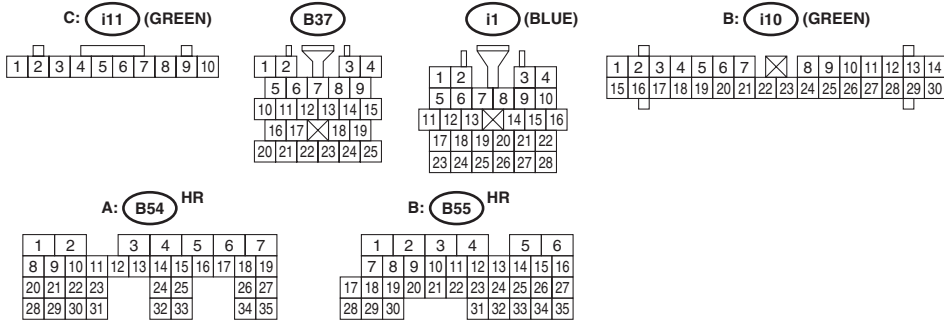
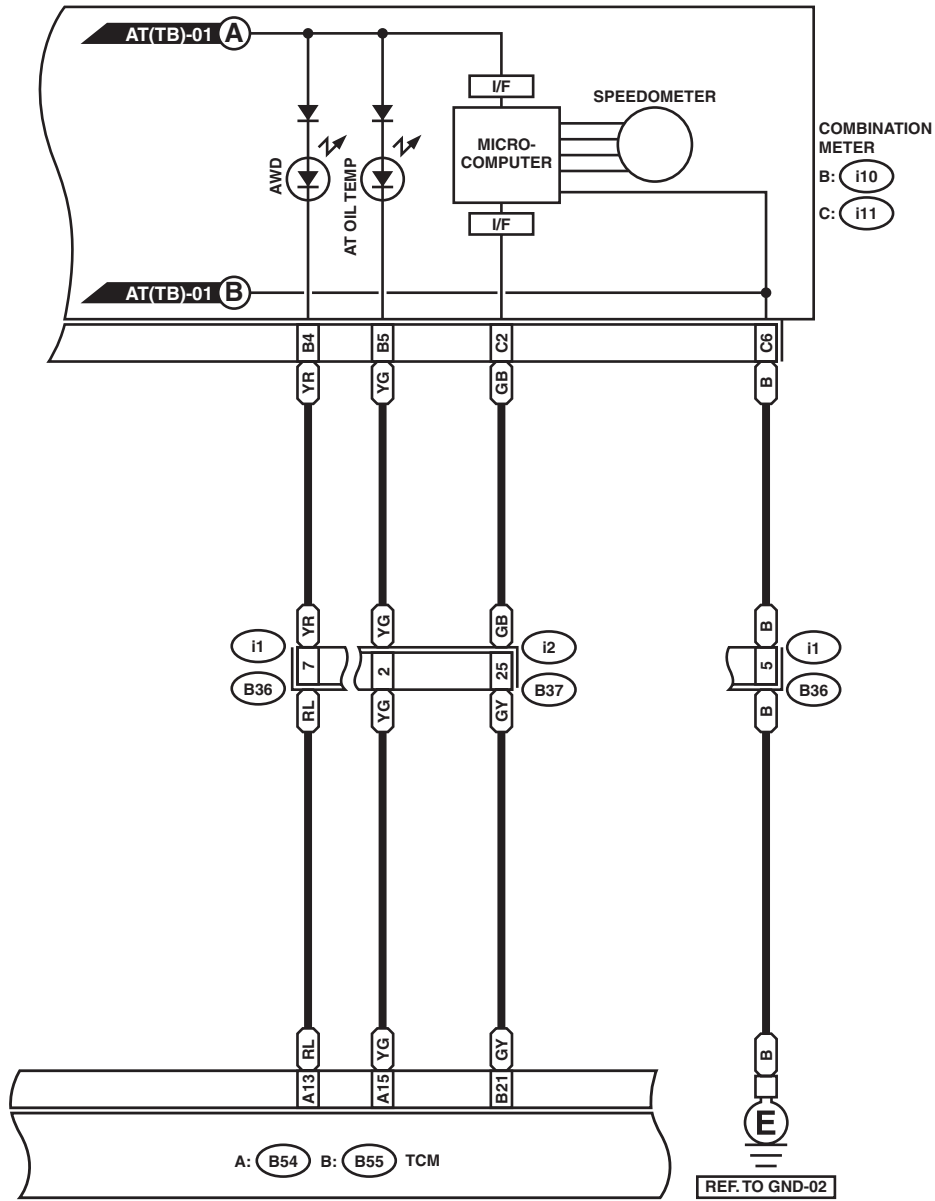
WI-11114

# AT Control System

WIRING SYSTEM

AT(TB)-02

AT(TB)-02

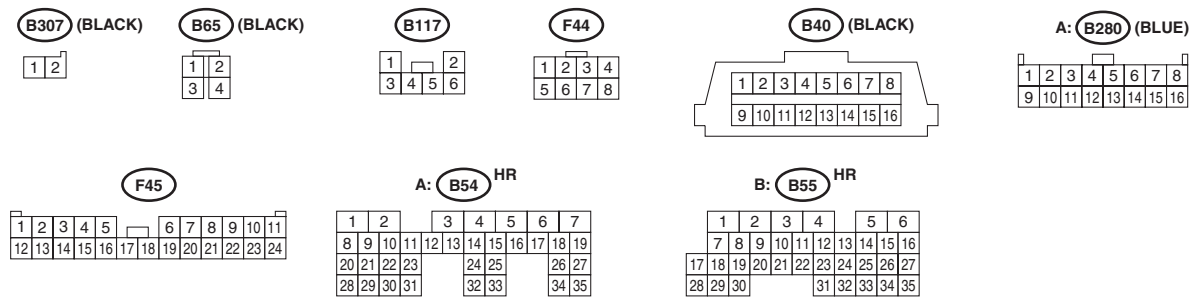
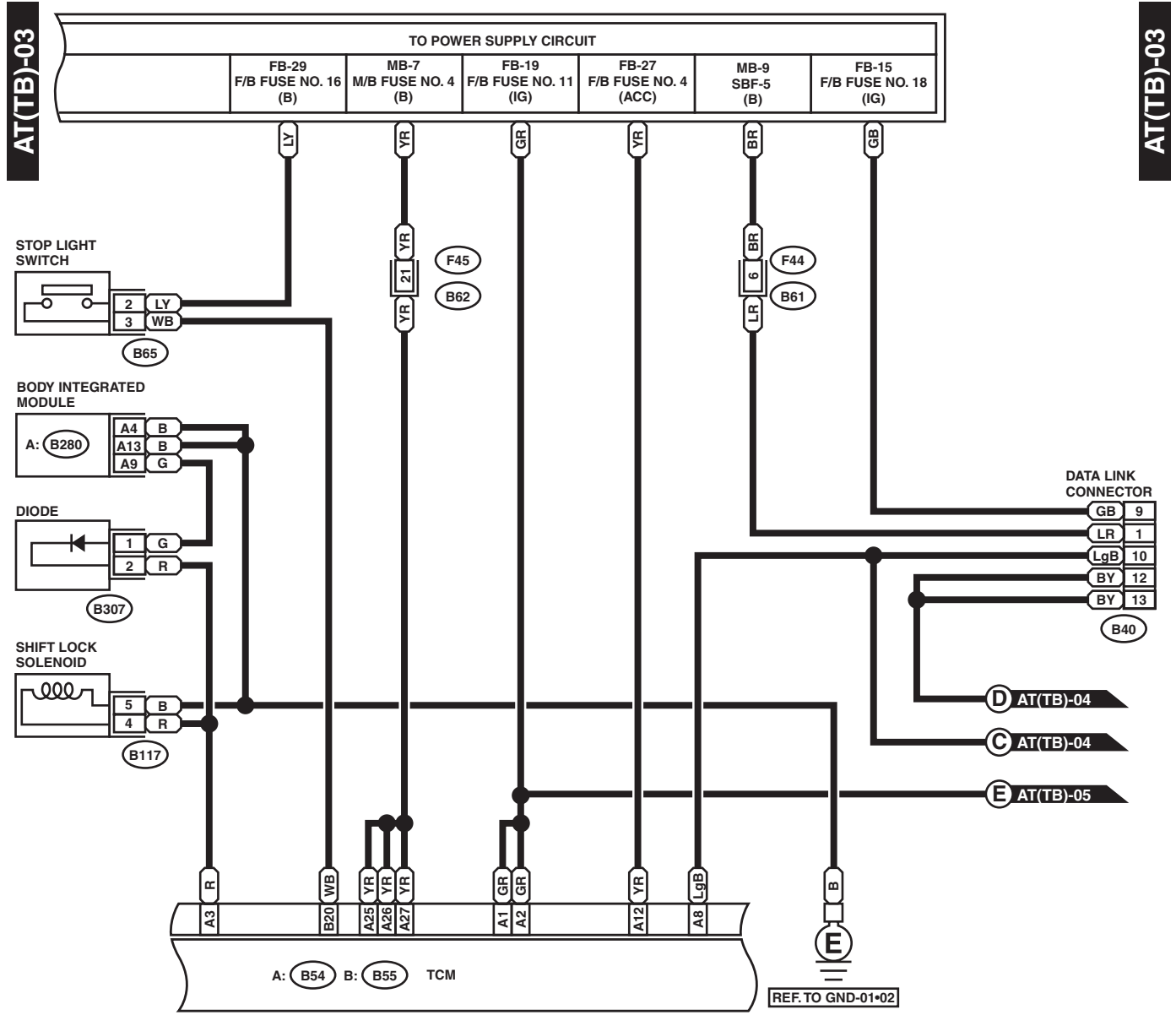


WI-11115



# AT Control System

## WIRING SYSTEM



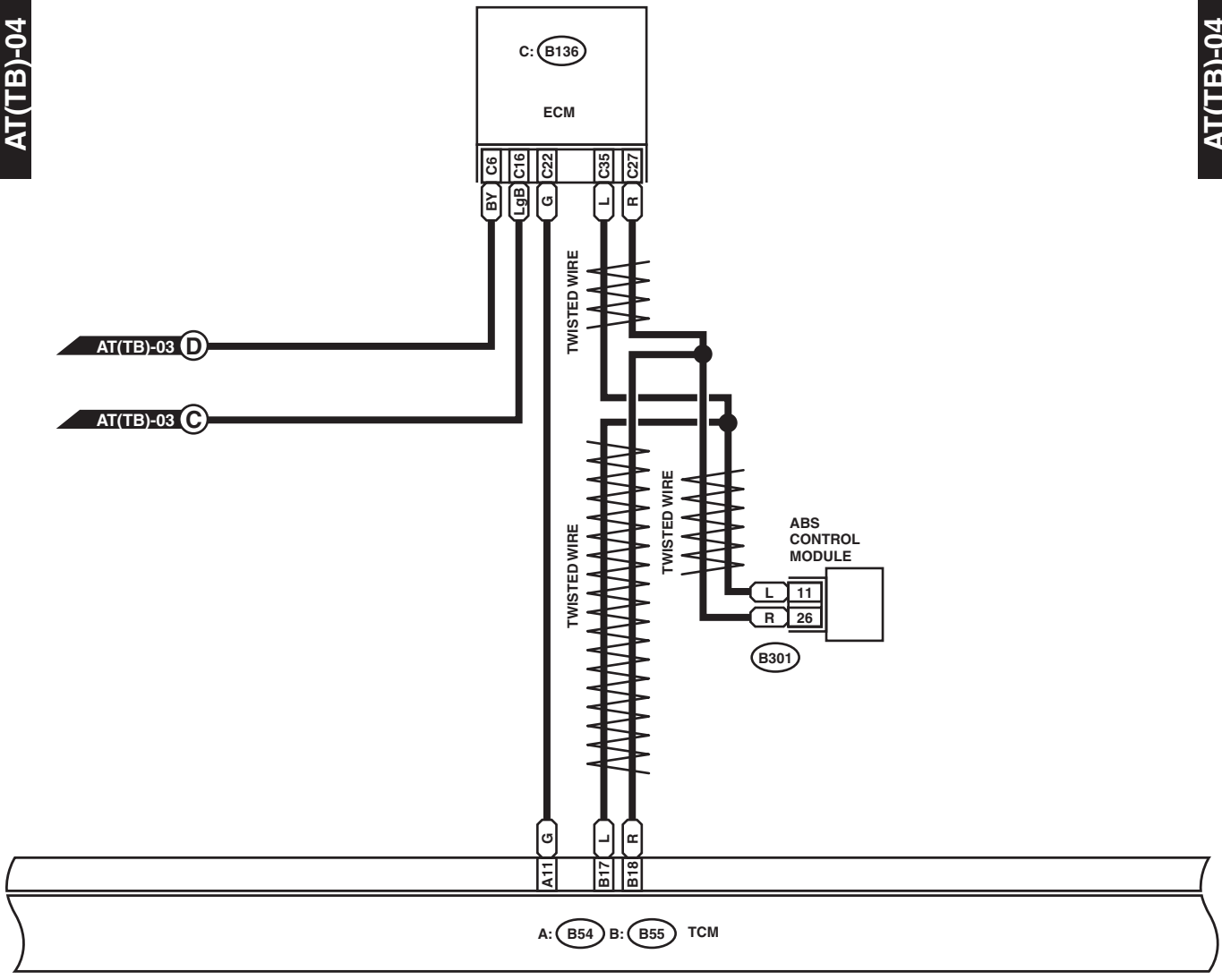
WI-11116

# AT Control System

WIRING SYSTEM

AT(TB)-04

AT(TB)-04



B301 (BLACK)

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 12 | 13 | 14 | 15 | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 |
|    |    |    |    | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |

A: B54 HR

|    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 | 32 | 33 | 34 | 35 |

B: B55 HR

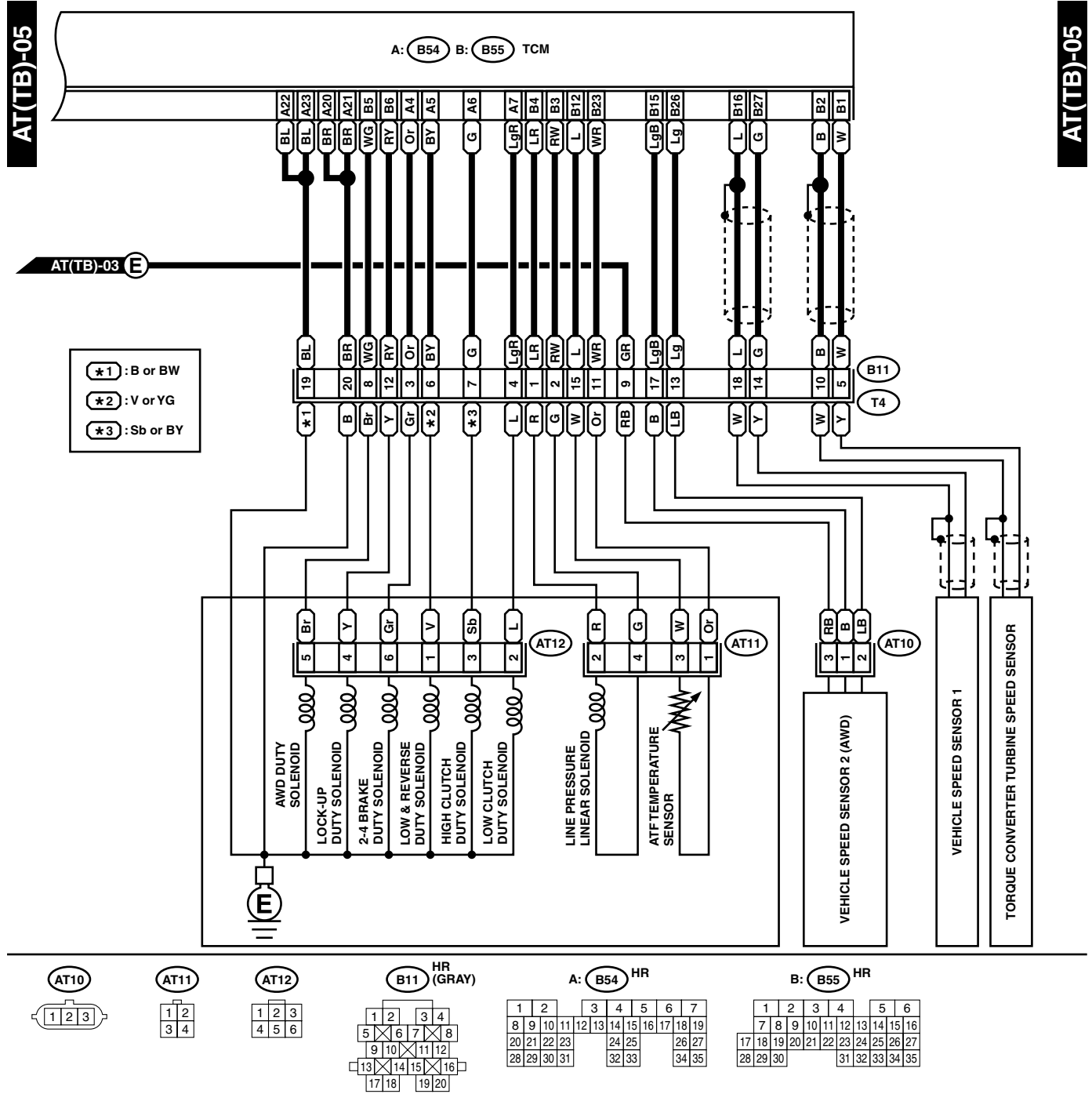
|    |    |    |    |    |    |
|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  |
| 7  | 8  | 9  | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 |    |

C: B136 HR

WI-32928

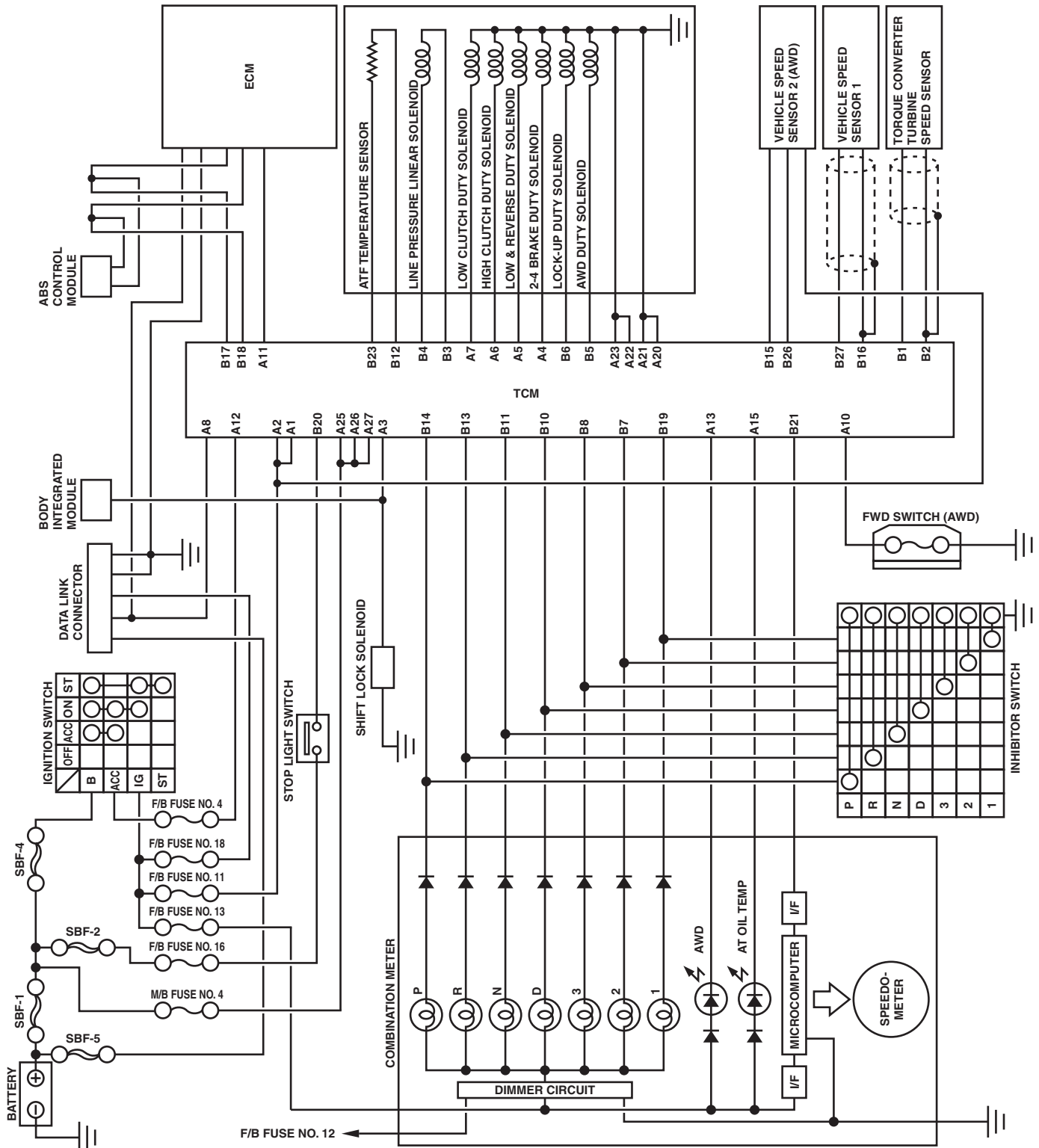
# AT Control System

WIRING SYSTEM



WI-11118

## 2. NON-TURBO MODEL



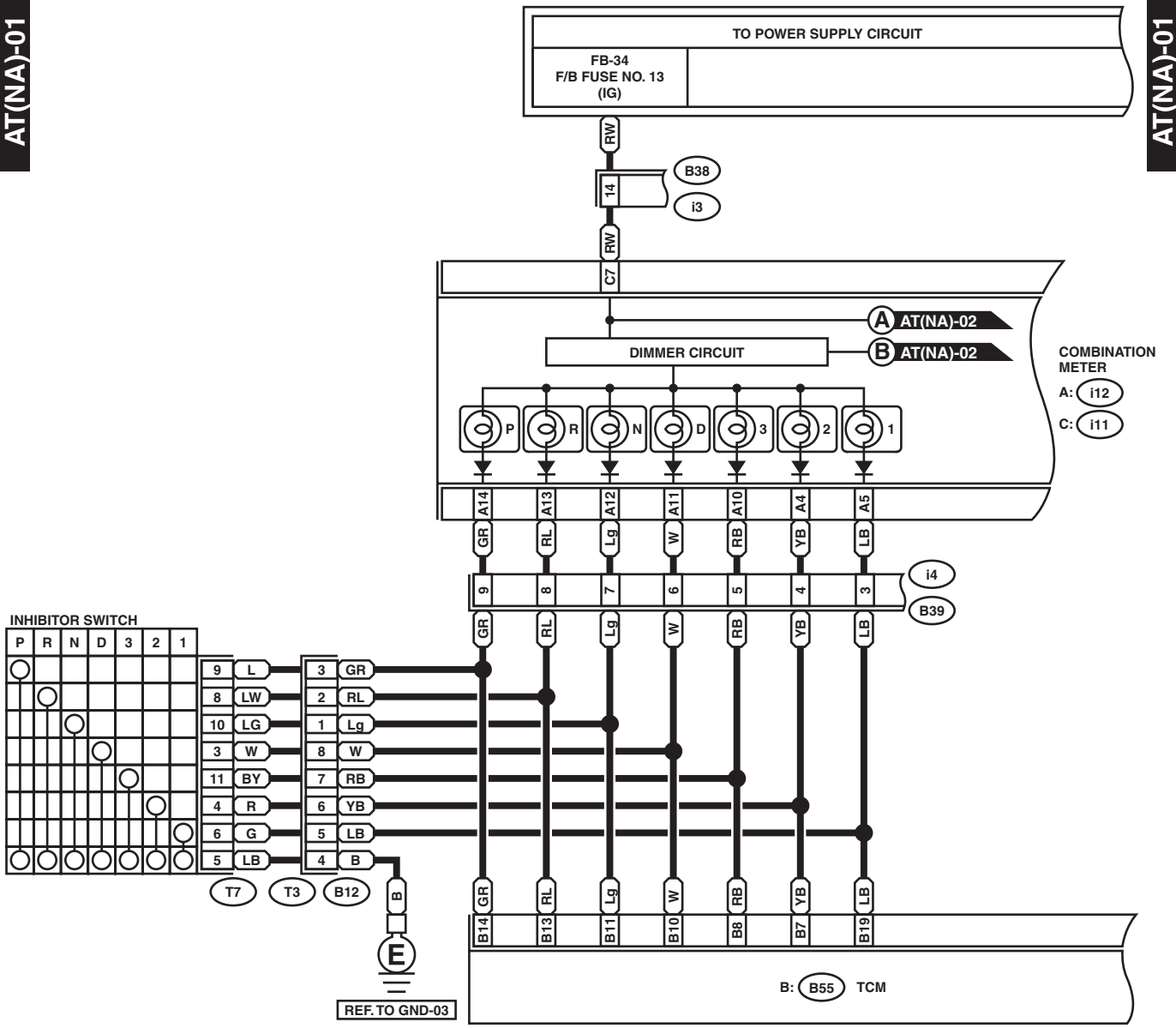
WI-32929

# AT Control System

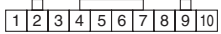
## WIRING SYSTEM

AT(NA)-01

AT(NA)-01



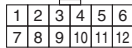
C: i11 (GREEN)



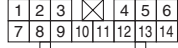
B12 HR (GRAY)



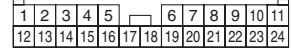
T7



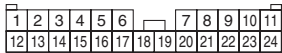
A: i12 (GREEN)



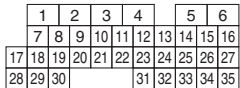
i3



i4 (BROWN)



B: B55 HR

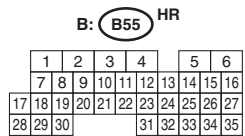
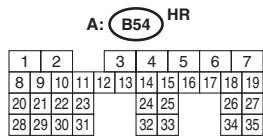
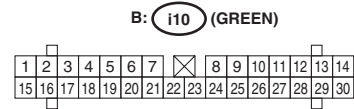
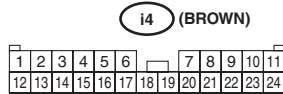
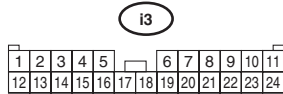
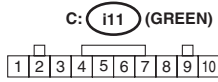
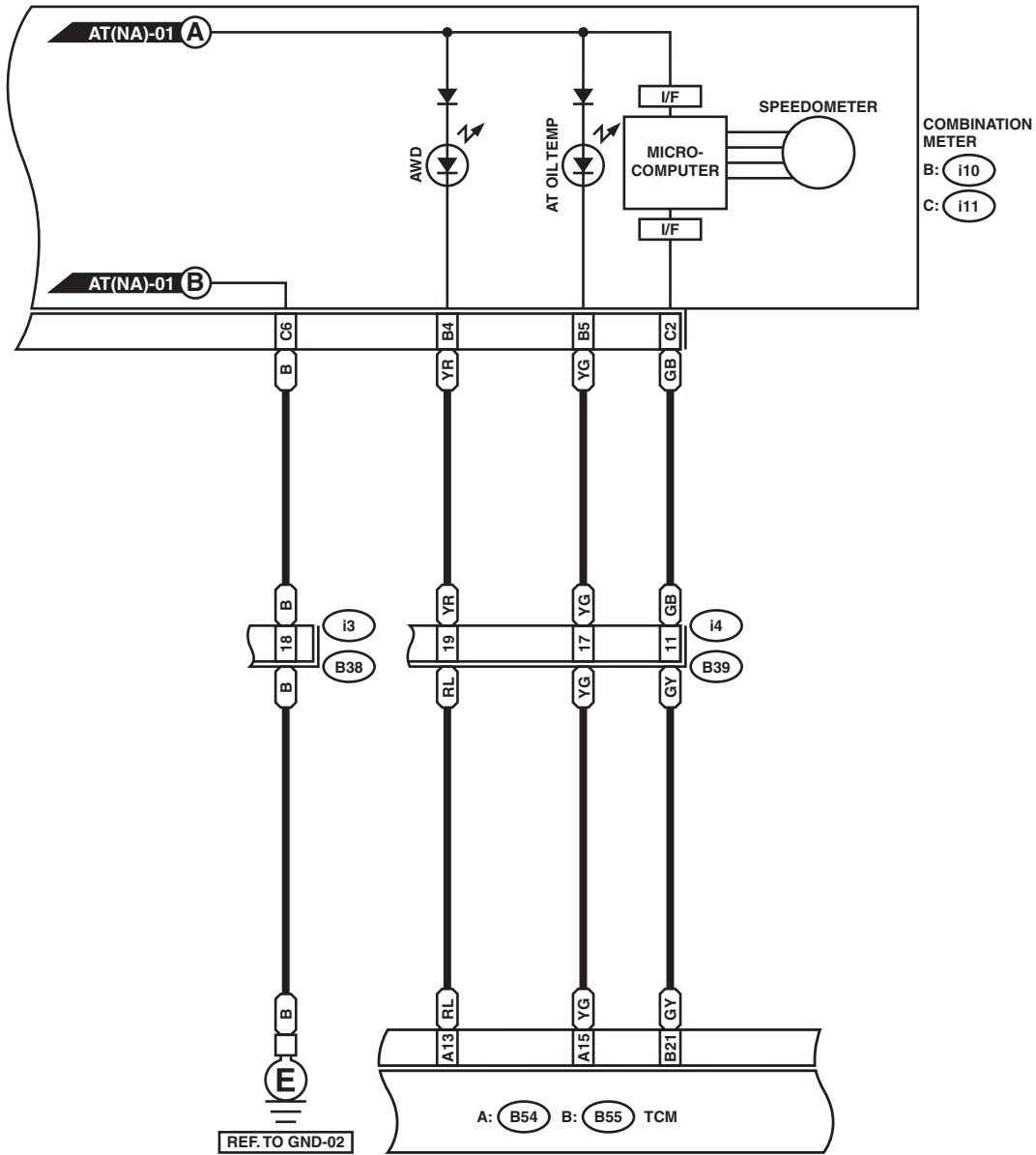


# AT Control System

WIRING SYSTEM

AT(NA)-02

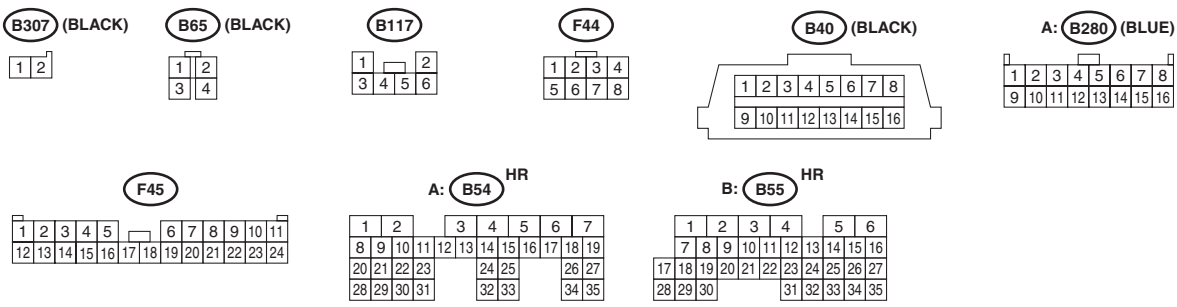
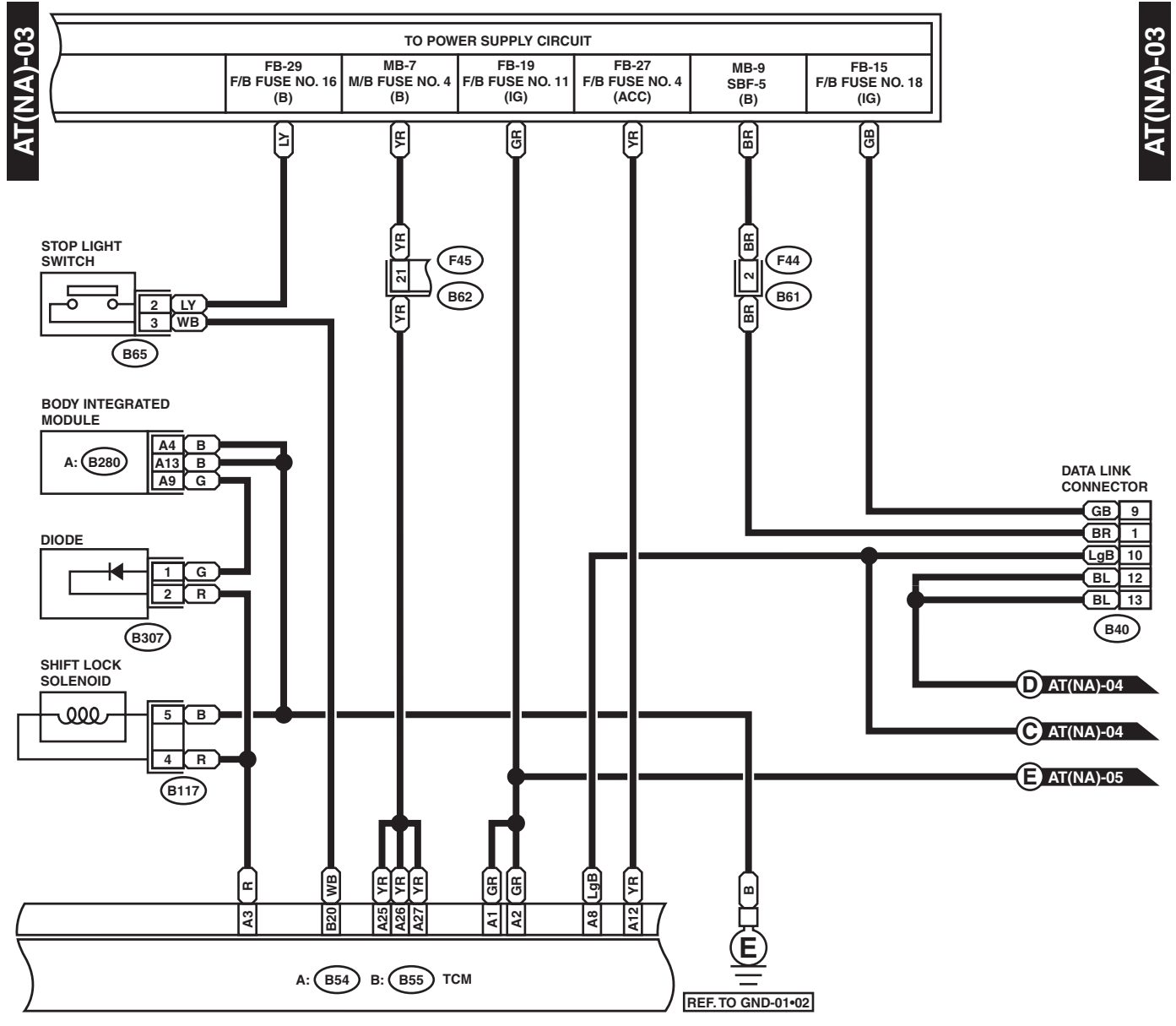
AT(NA)-02



WI-11120

# AT Control System

## WIRING SYSTEM



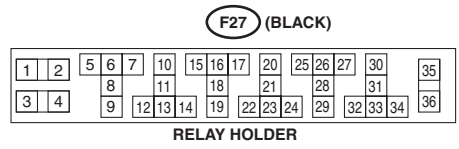
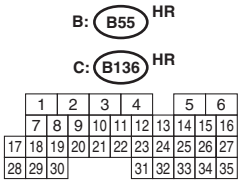
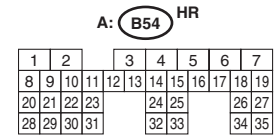
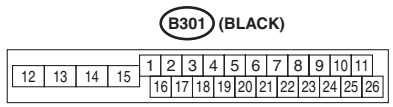
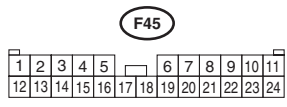
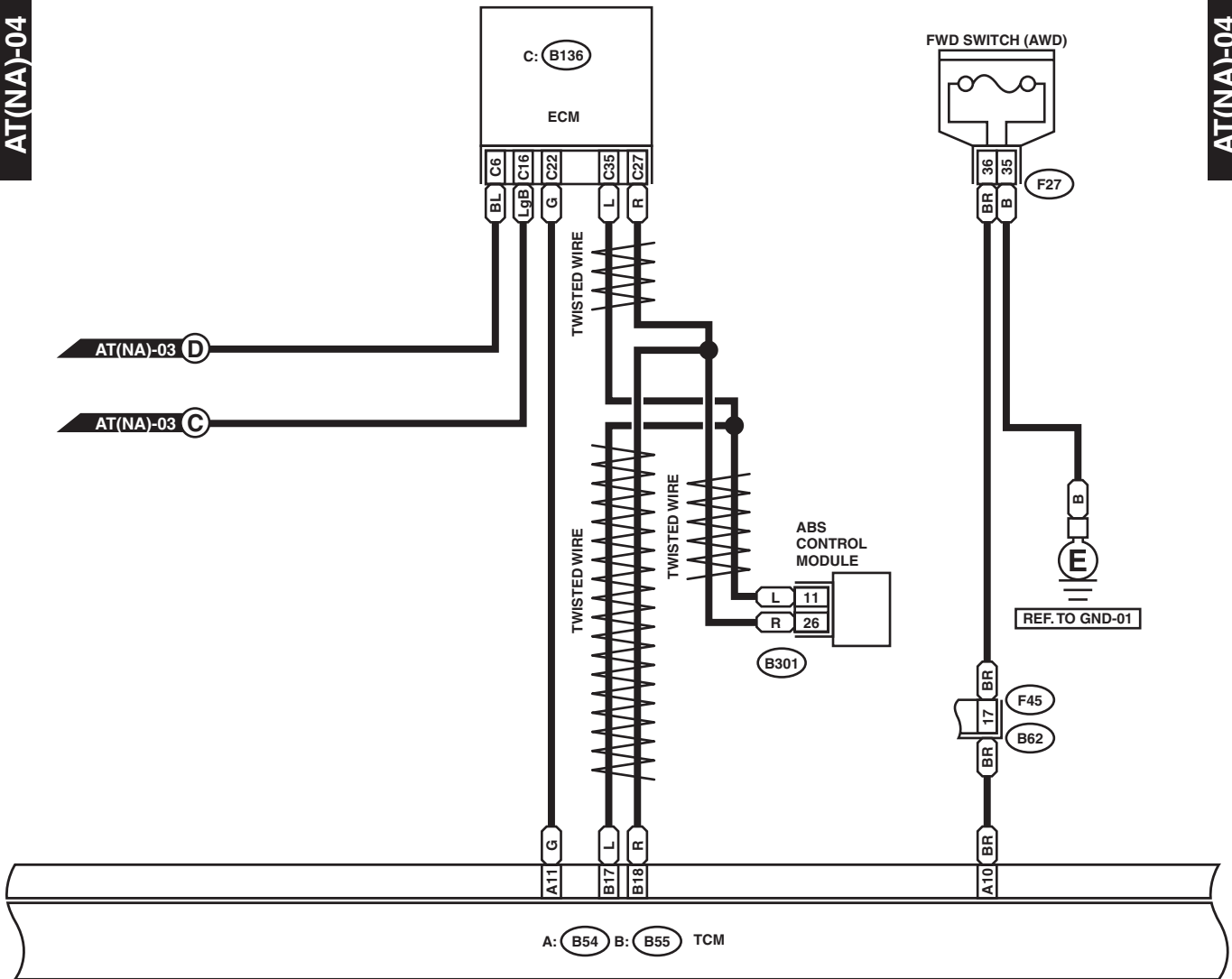
WI-11121

# AT Control System

WIRING SYSTEM

AT(NA)-04

AT(NA)-04

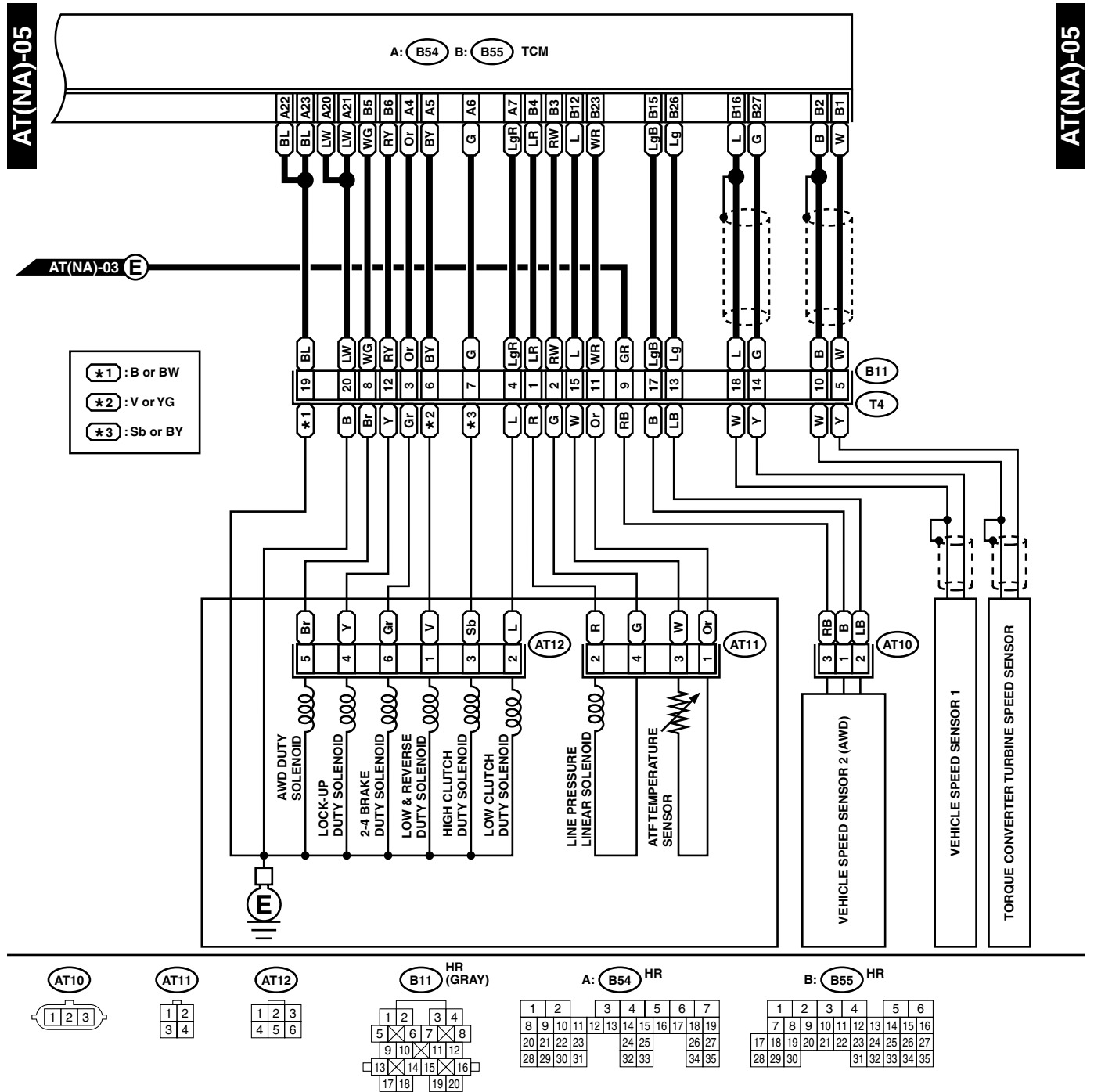


WI-32930



# AT Control System

WIRING SYSTEM



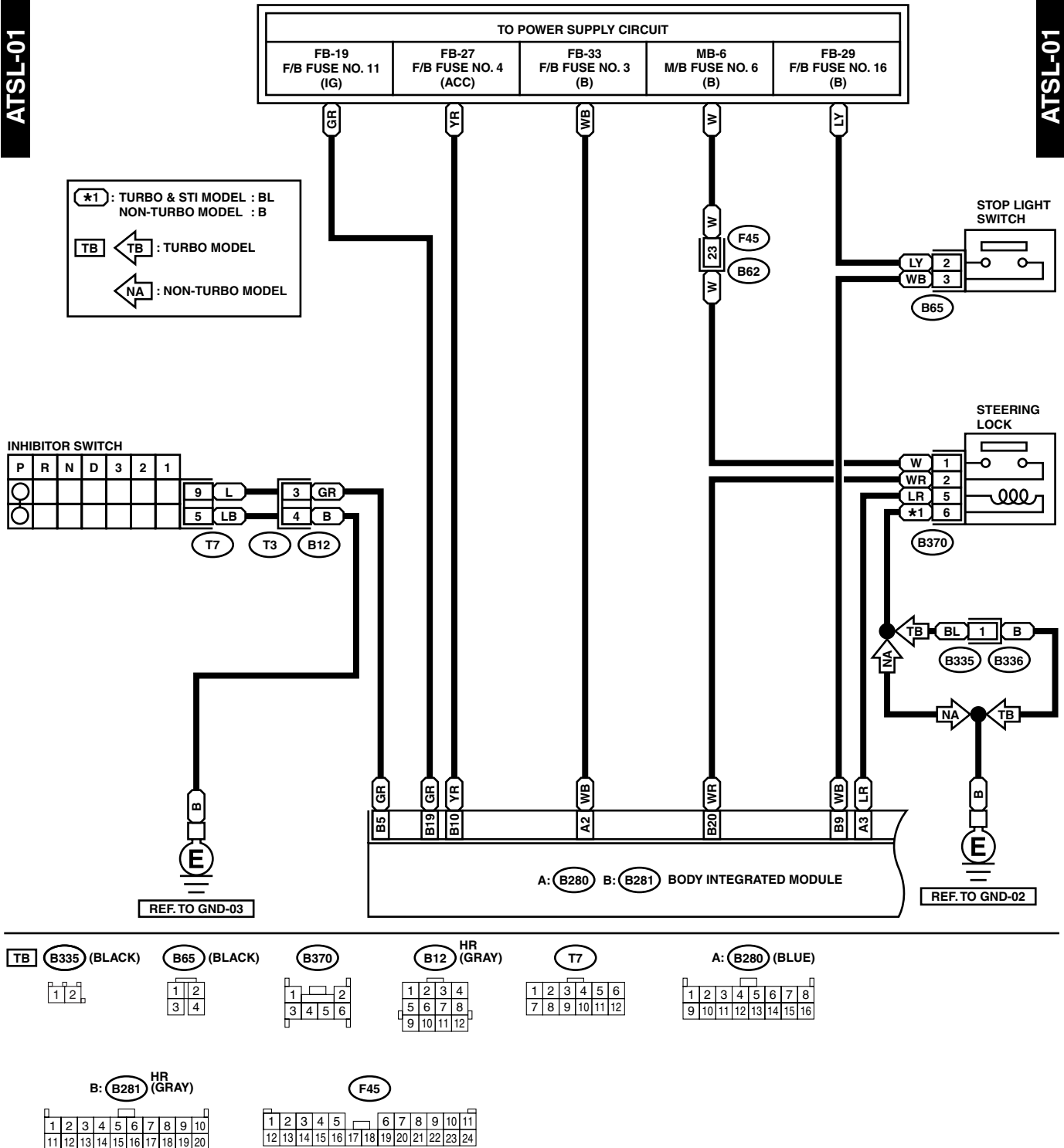
WI-11123

## 7. AT Shift Lock Control System

### A: WIRING DIAGRAM

ATSL-01

ATSL-01

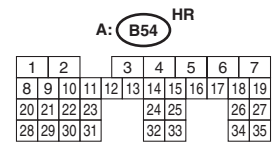
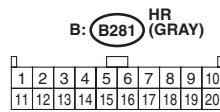
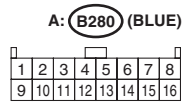
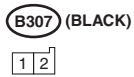
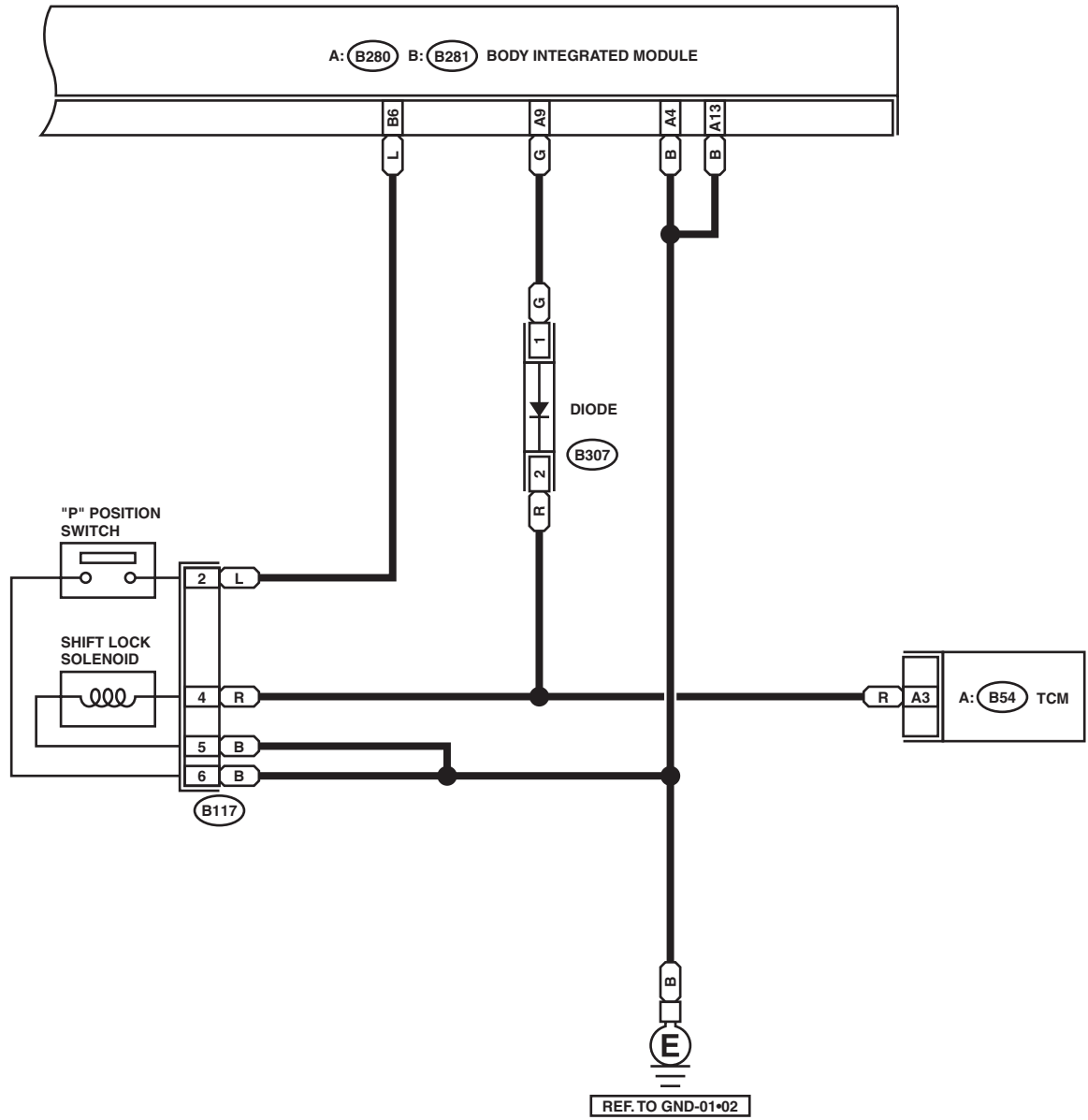


# AT Shift Lock Control System

WIRING SYSTEM

ATSL-02

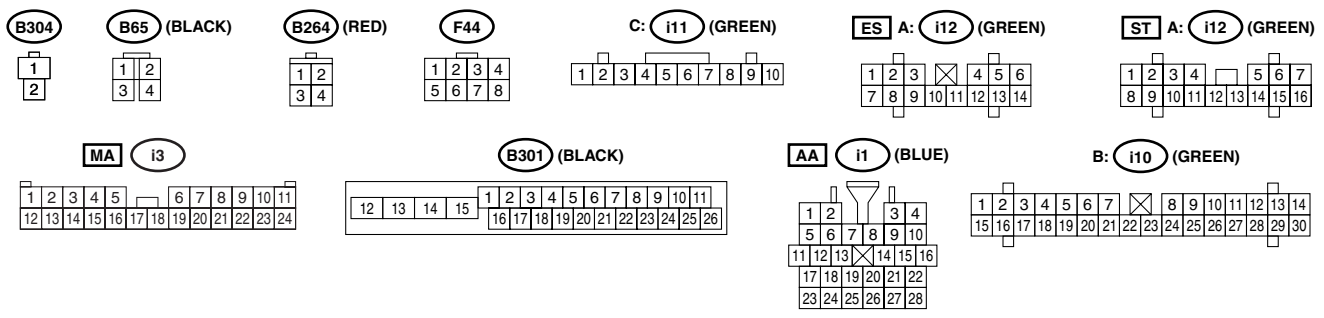
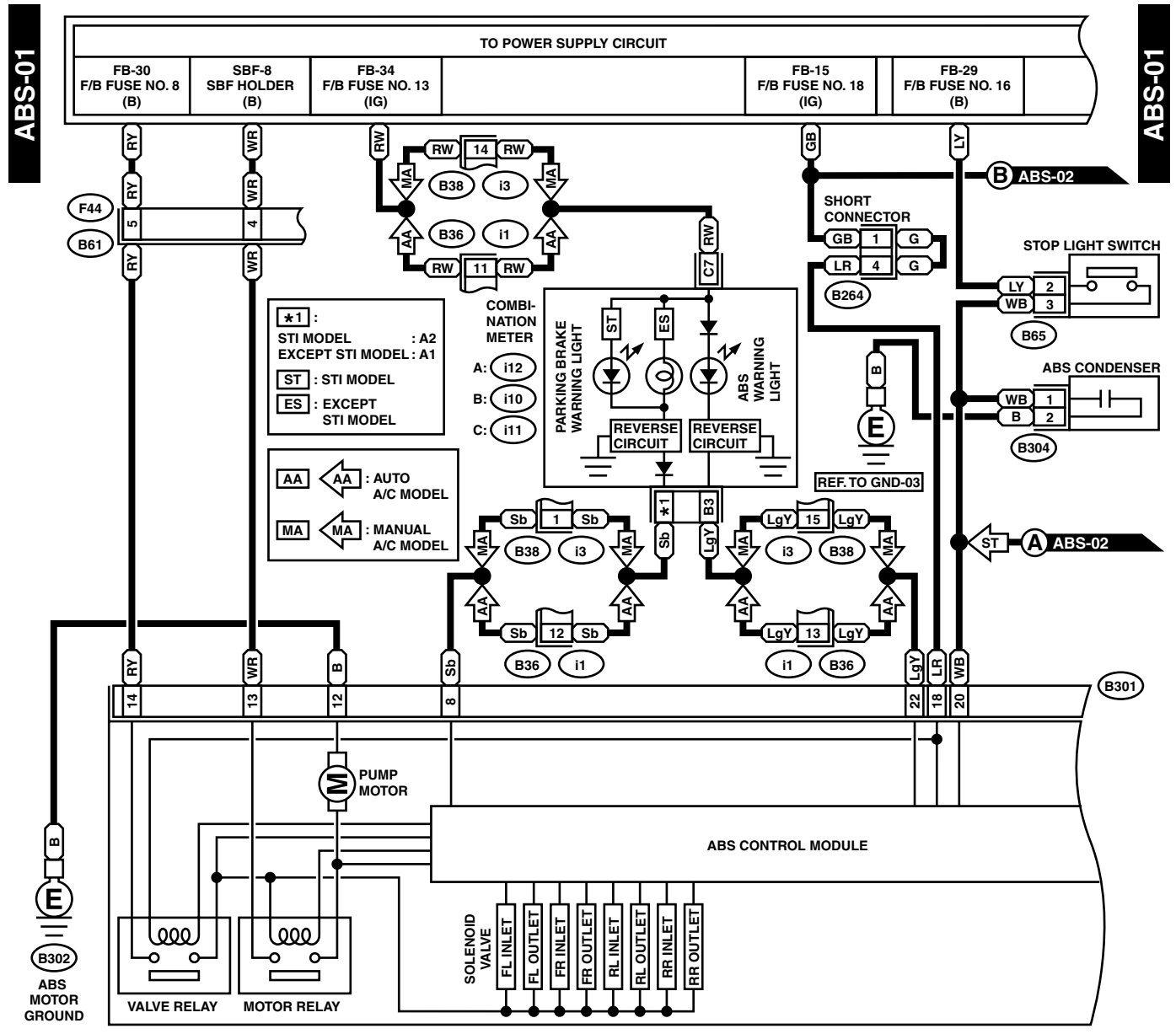
ATSL-02



WI-11124

## 8. Anti-lock Brake System

### A: WIRING DIAGRAM



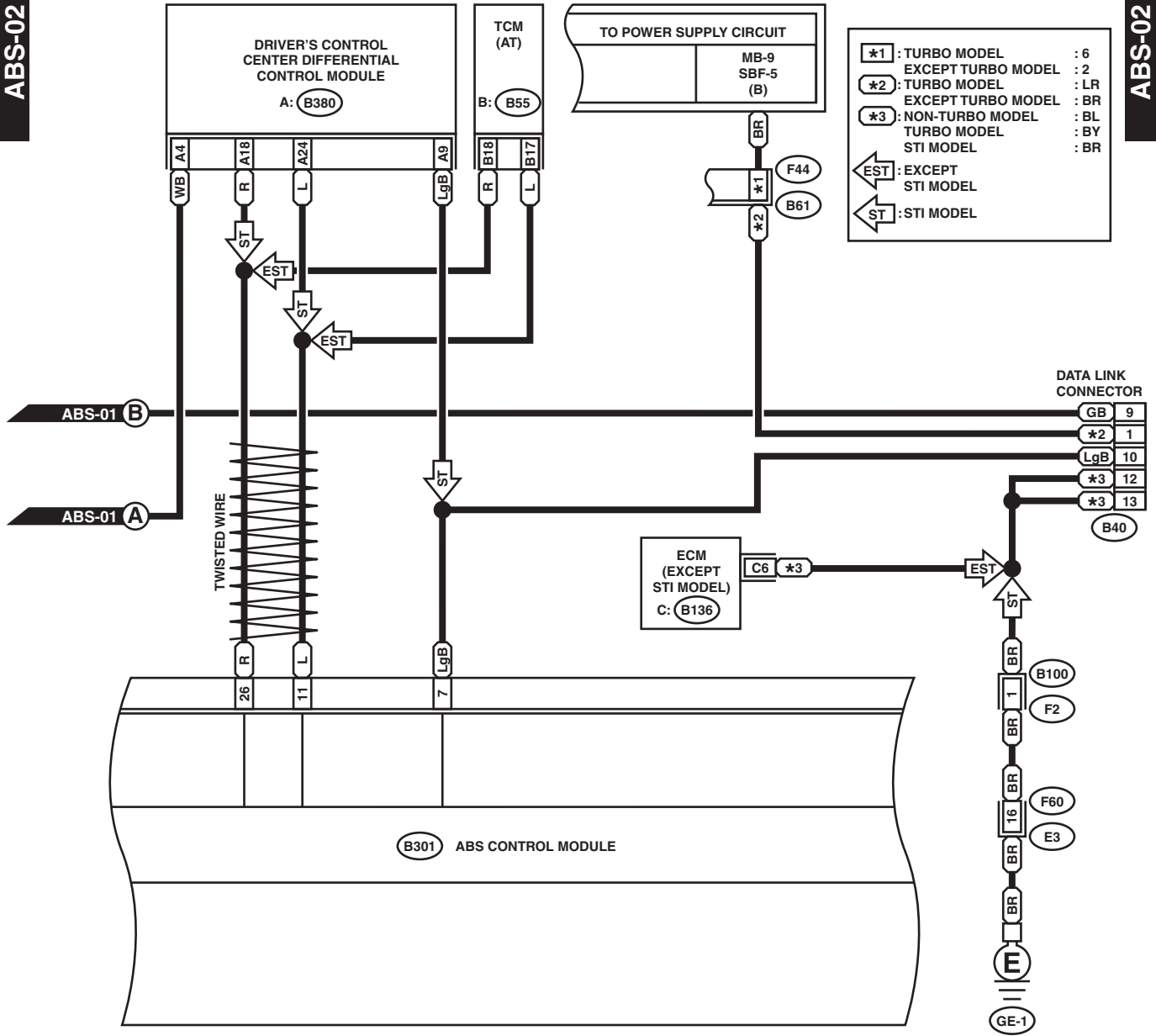
WI-08934

# Anti-lock Brake System

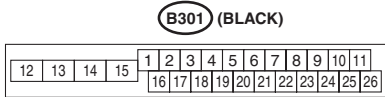
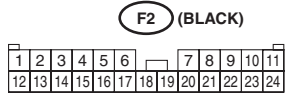
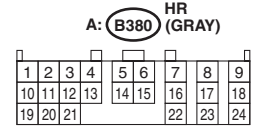
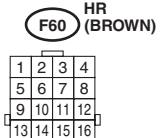
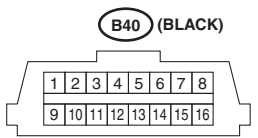
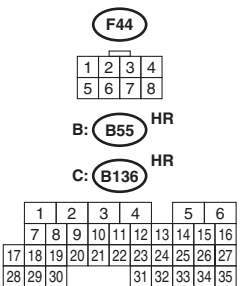
WIRING SYSTEM

ABS-02

ABS-02



- \*1 : TURBO MODEL : 6  
EXCEPT TURBO MODEL : 2
- \*2 : TURBO MODEL : LR  
EXCEPT TURBO MODEL : BR
- \*3 : NON-TURBO MODEL : BL  
TURBO MODEL : BY  
STI MODEL : BR
- ← EST : EXCEPT STI MODEL
- ← ST : STI MODEL



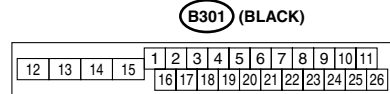
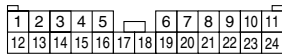
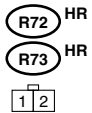
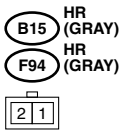
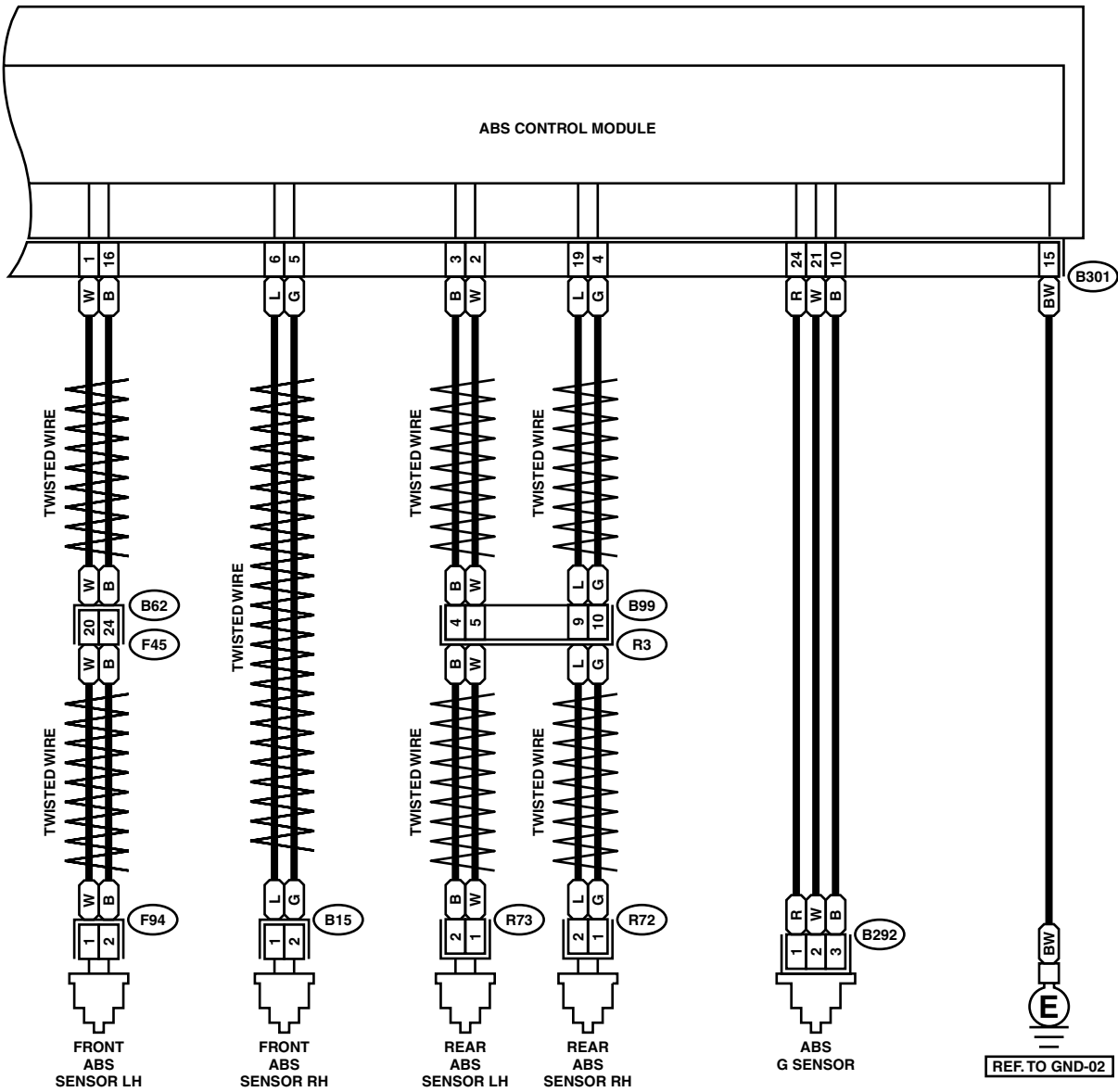
WI-16134

# Anti-lock Brake System

WIRING SYSTEM

ABS-03

ABS-03



WI-08936

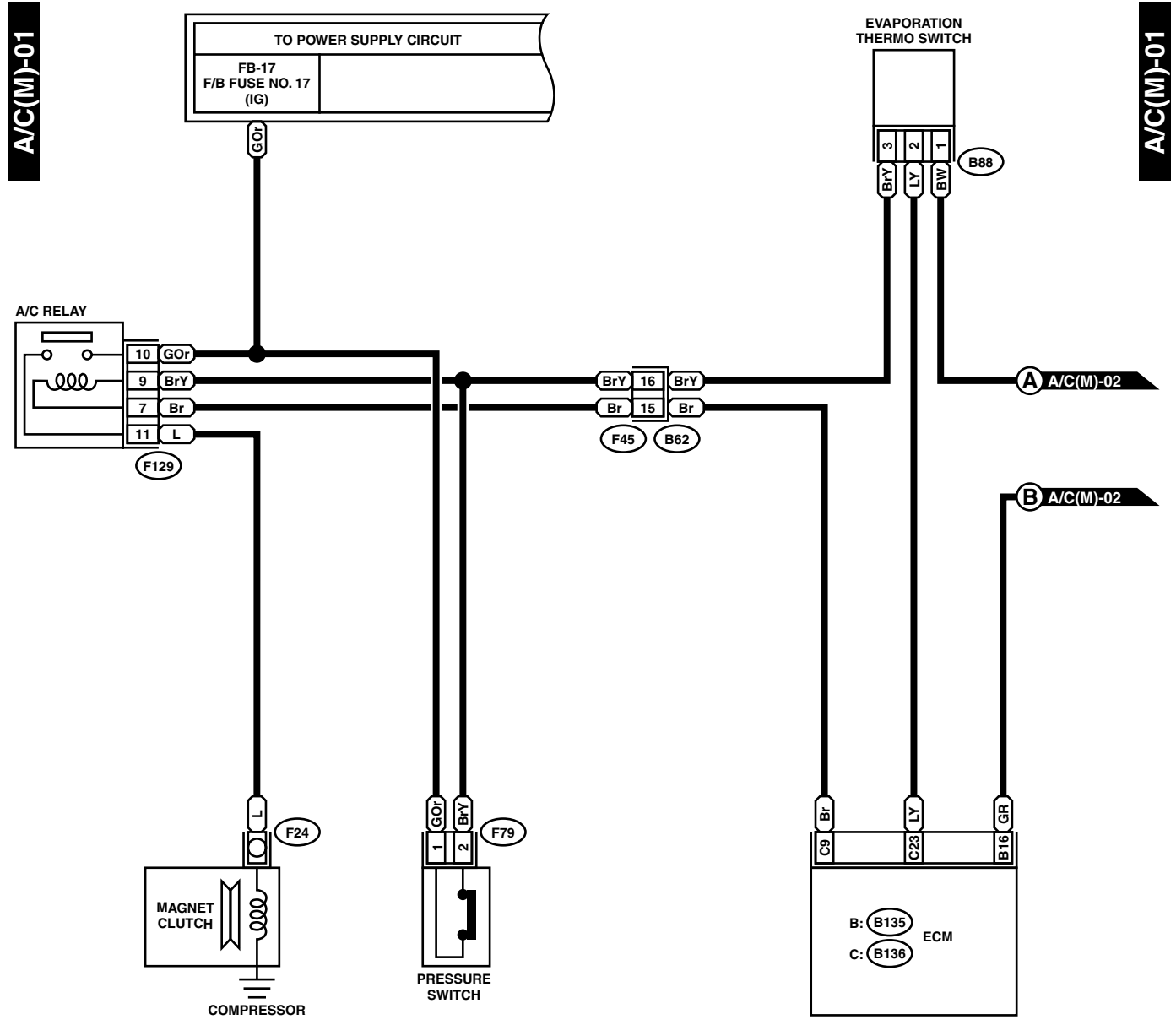
# Air Conditioning System

WIRING SYSTEM

## 9. Air Conditioning System

### A: WIRING DIAGRAM

#### 1. MANUAL A/C MODEL

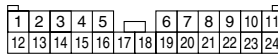
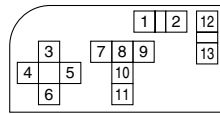


F79 (GRAY)

B88 (BROWN)

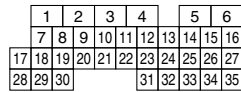
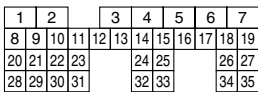
F129 (BLACK)

F45



B: B135 HR

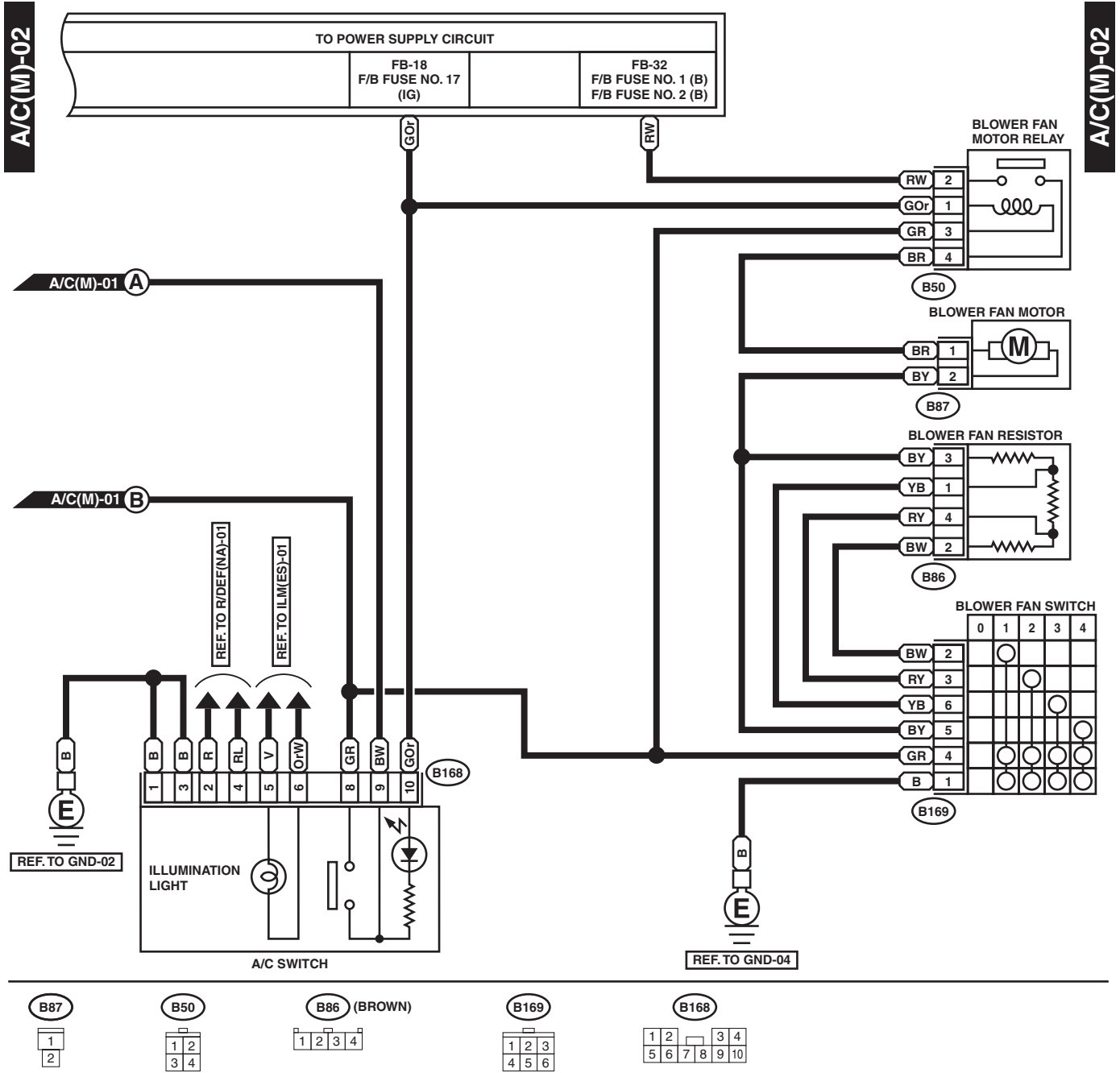
C: B136 HR



WI-10491

# Air Conditioning System

WIRING SYSTEM



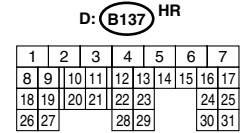
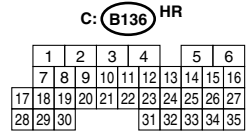
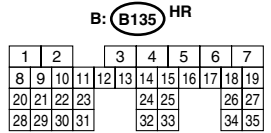
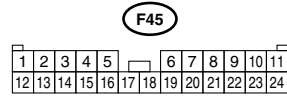
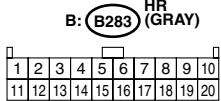
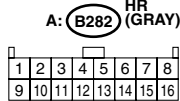
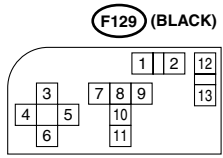
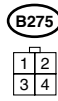
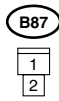
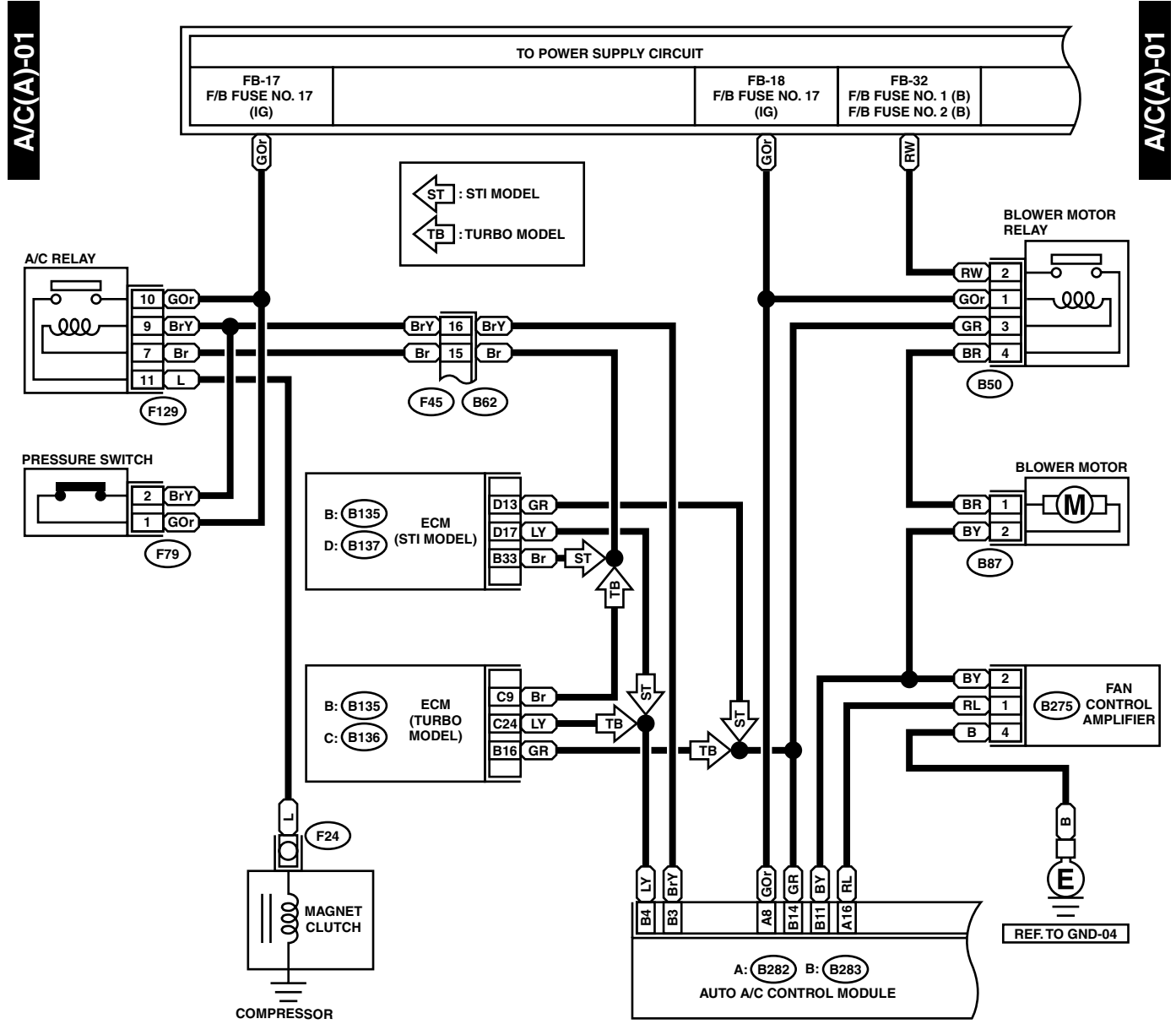
WI-11126



# Air Conditioning System

WIRING SYSTEM

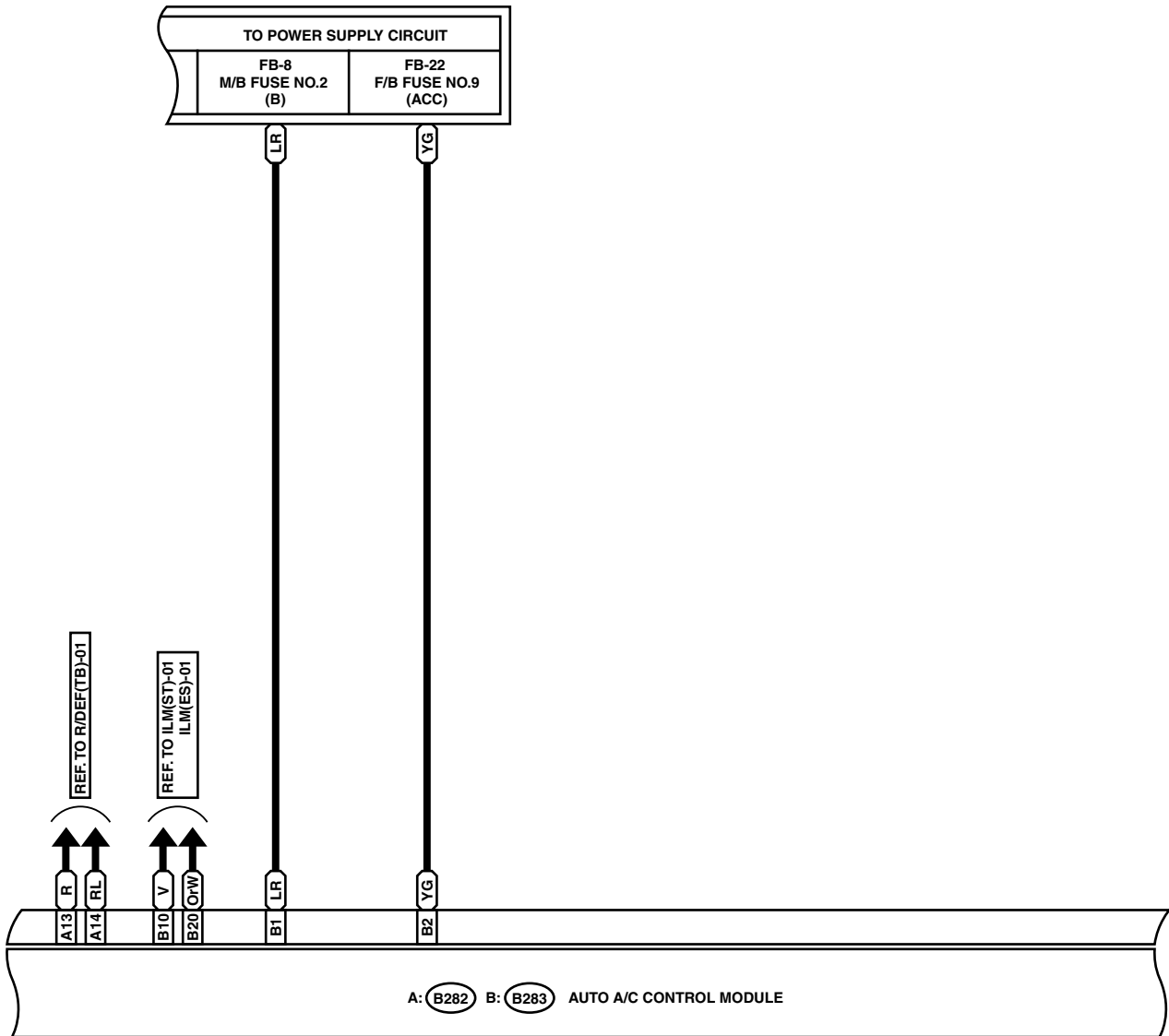
## 2. AUTO A/C MODEL



WI-10492

A/C(A)-02

A/C(A)-02



A: (B282) HR (GRAY)

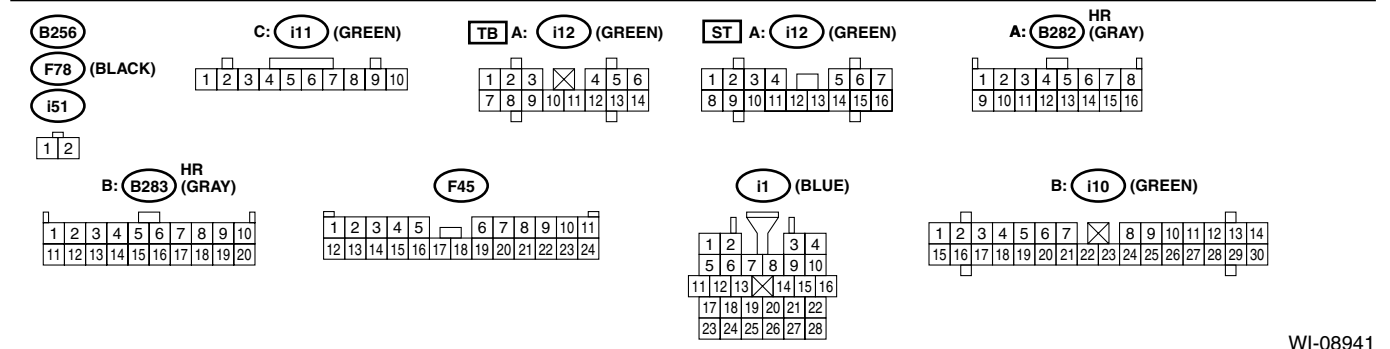
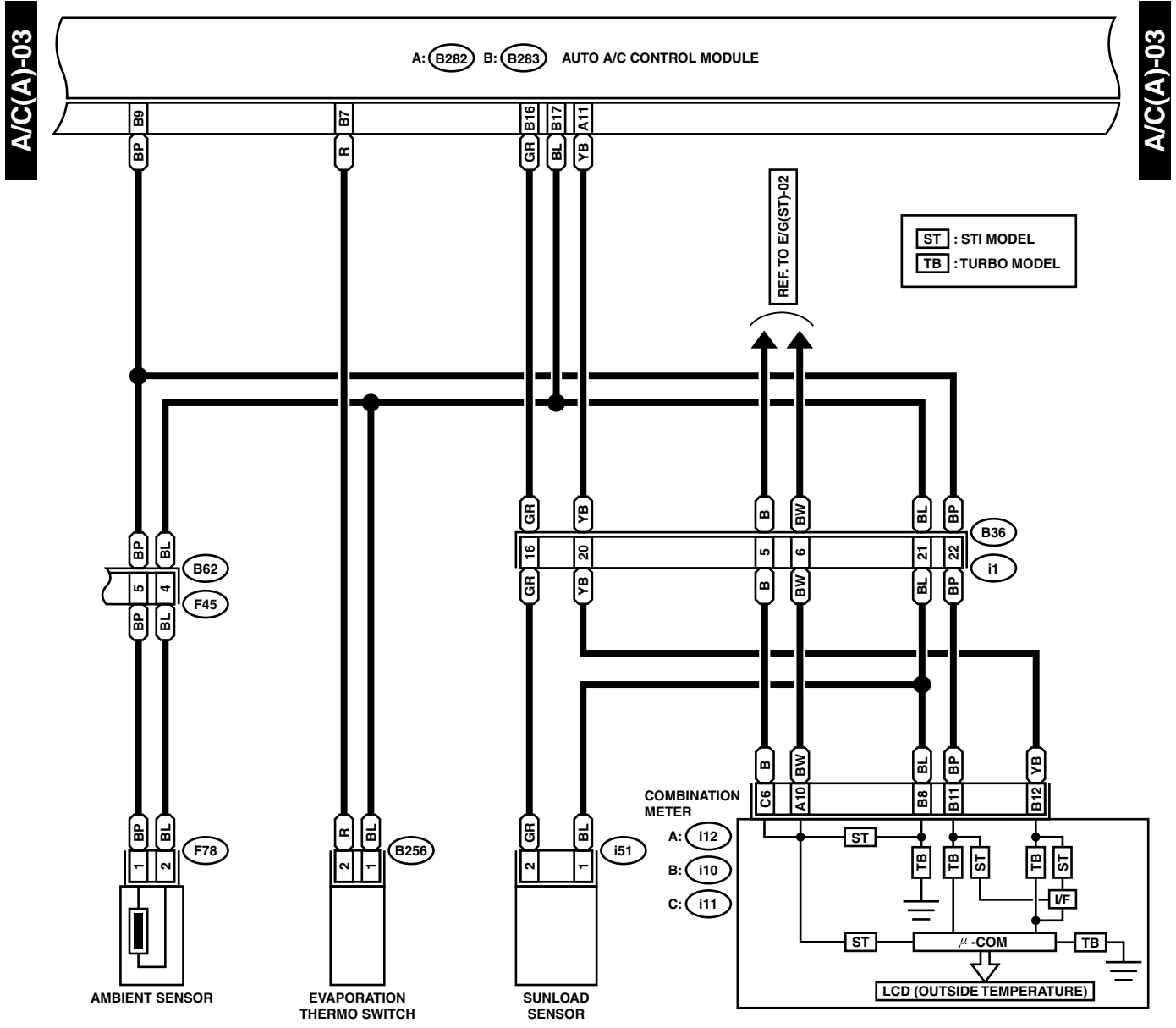
|   |    |    |    |    |    |    |    |
|---|----|----|----|----|----|----|----|
| 1 | 2  | 3  | 4  | 5  | 6  | 7  | 8  |
| 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |

B: (B283) HR (GRAY)

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |

# Air Conditioning System

WIRING SYSTEM



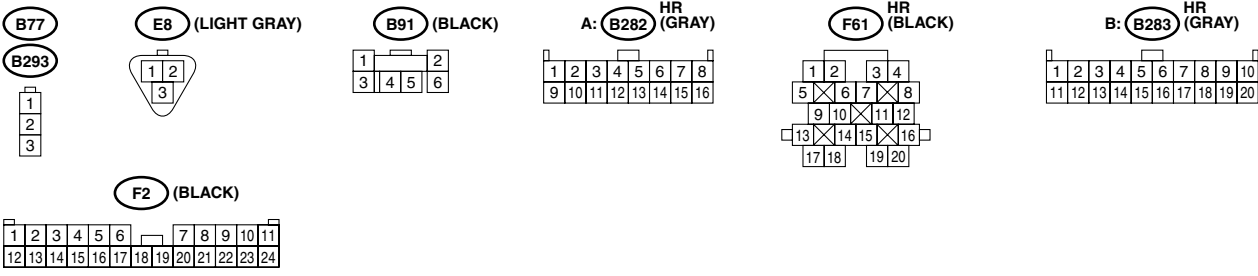
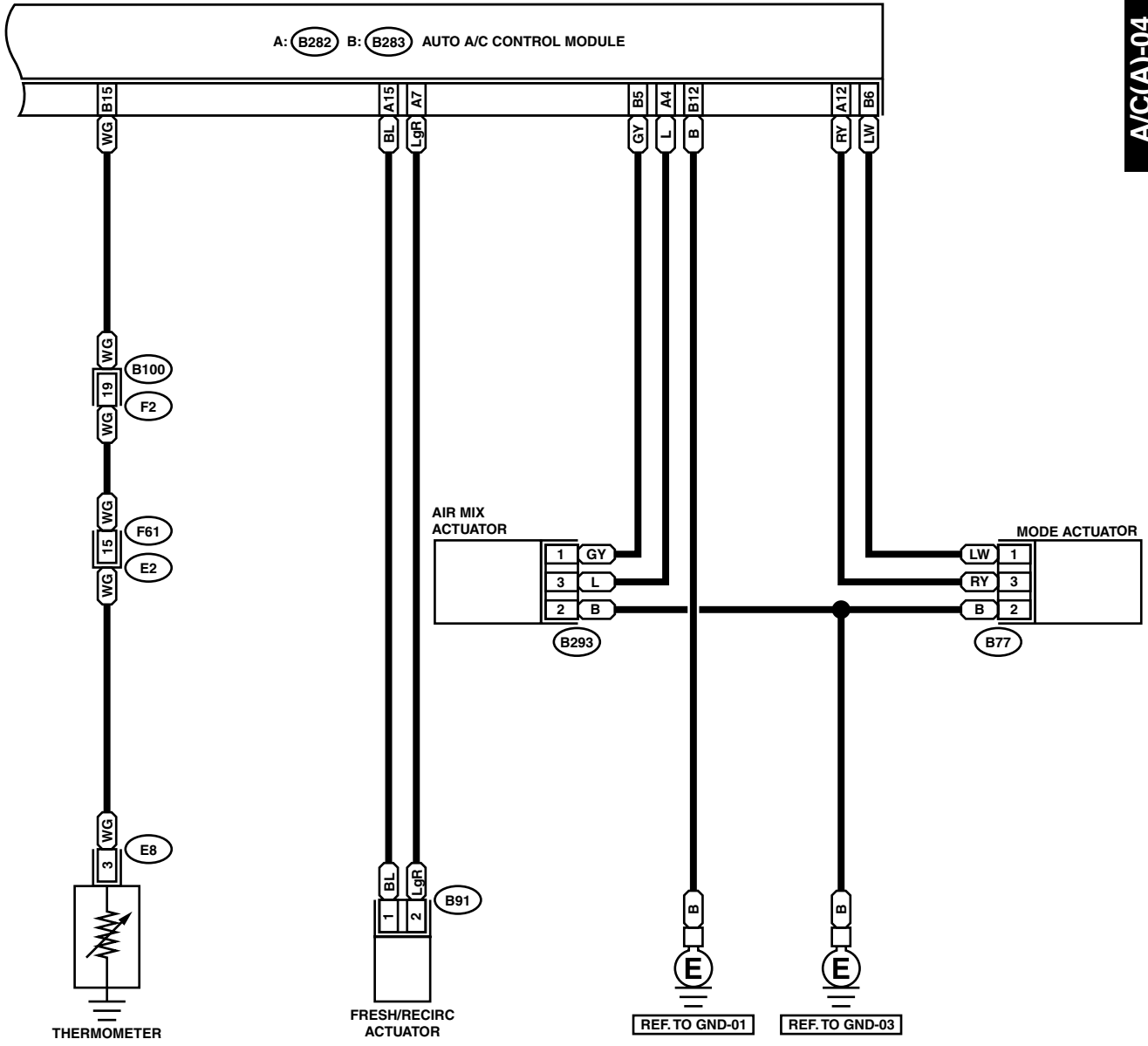
WI-08941

# Air Conditioning System

WIRING SYSTEM

A/C(A)-04

A/C(A)-04



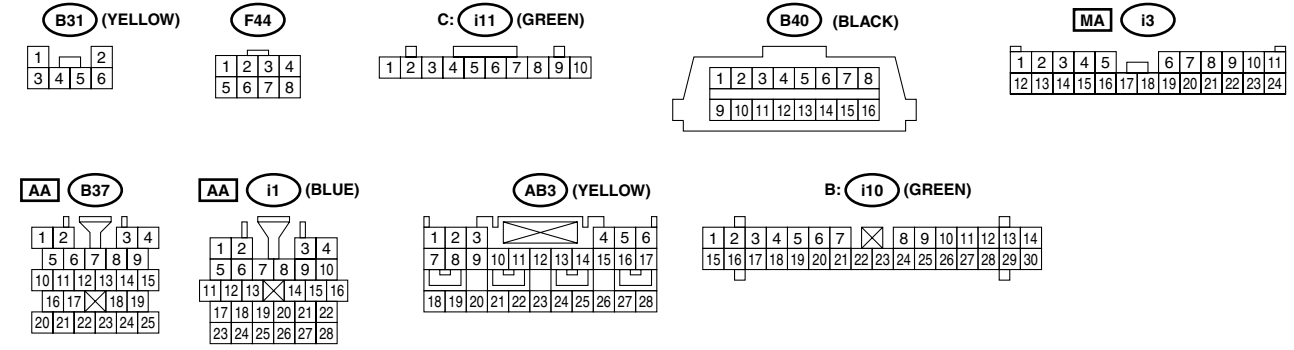
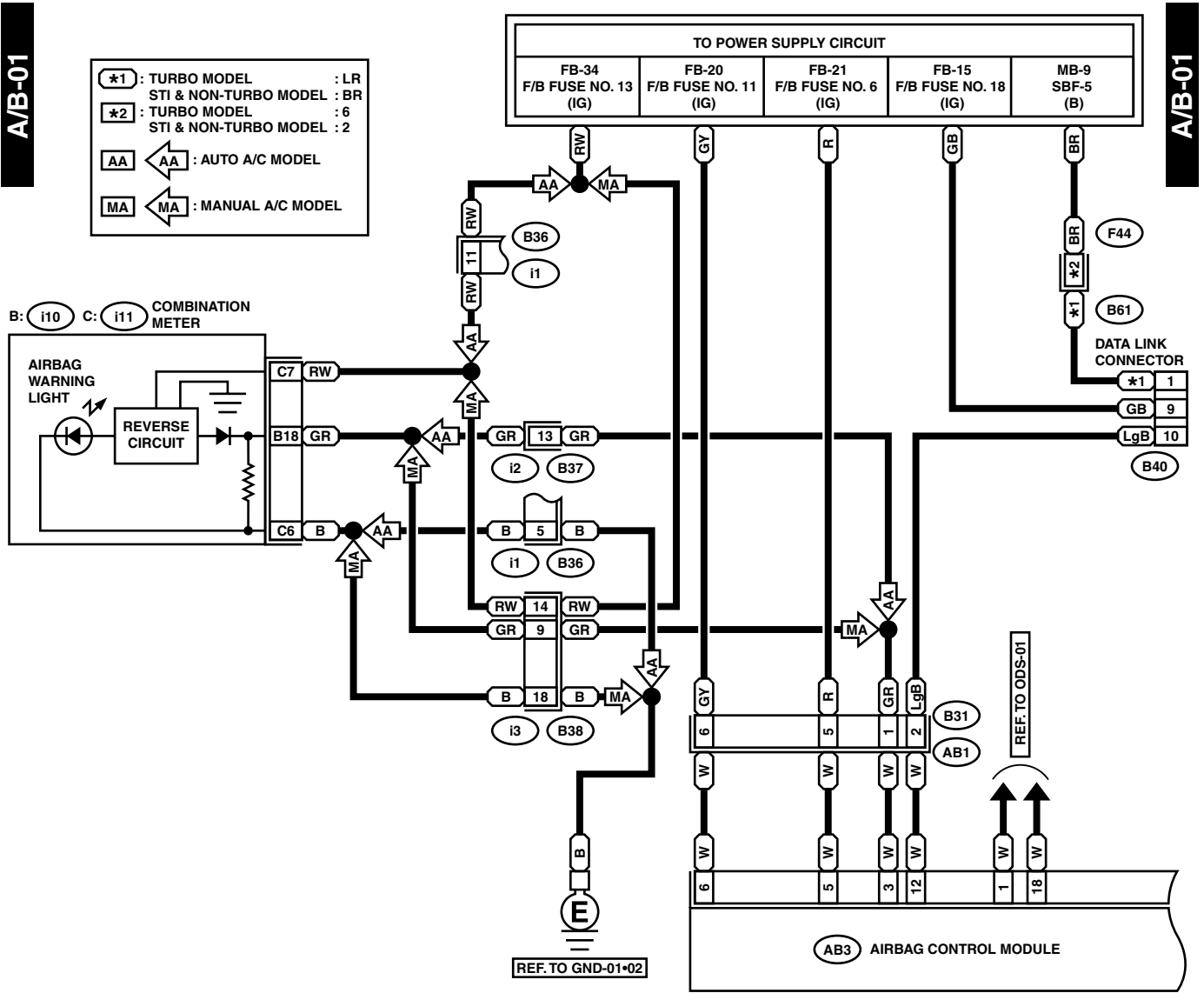
WI-08942

# Airbag System

WIRING SYSTEM

## 10. Airbag System

### A: WIRING DIAGRAM



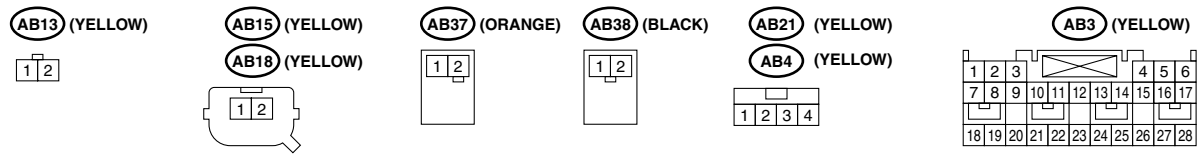
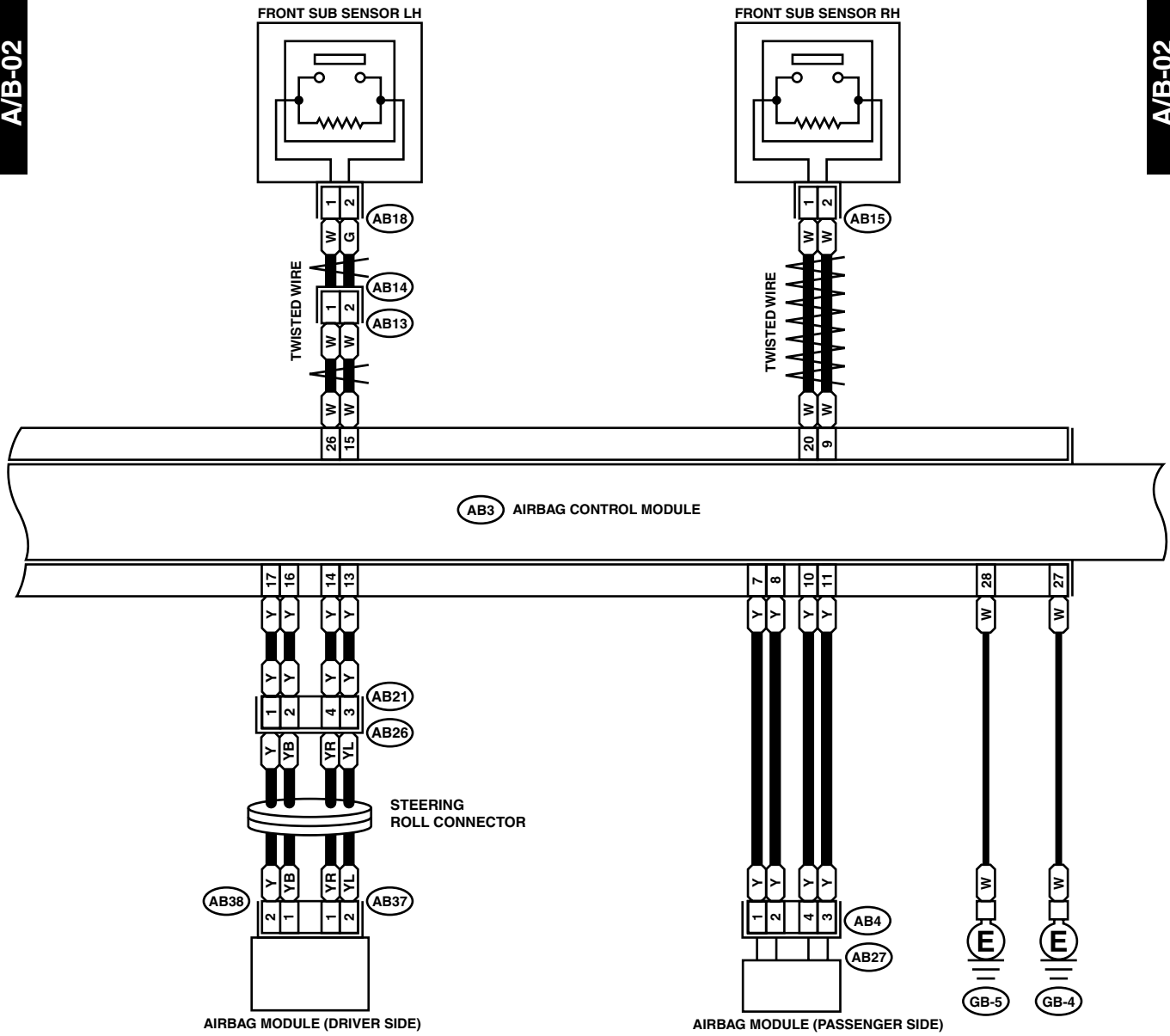
WI-08943

# Airbag System

WIRING SYSTEM

A/B-02

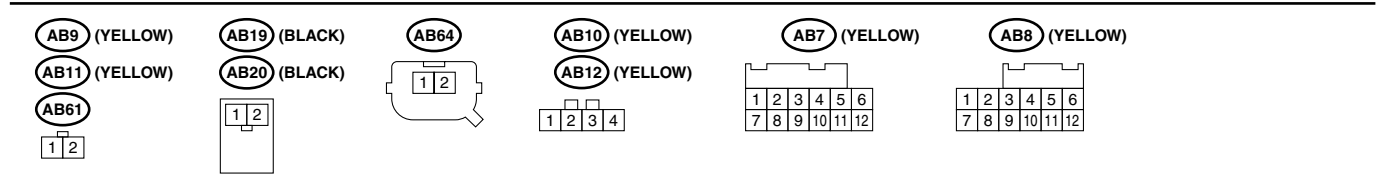
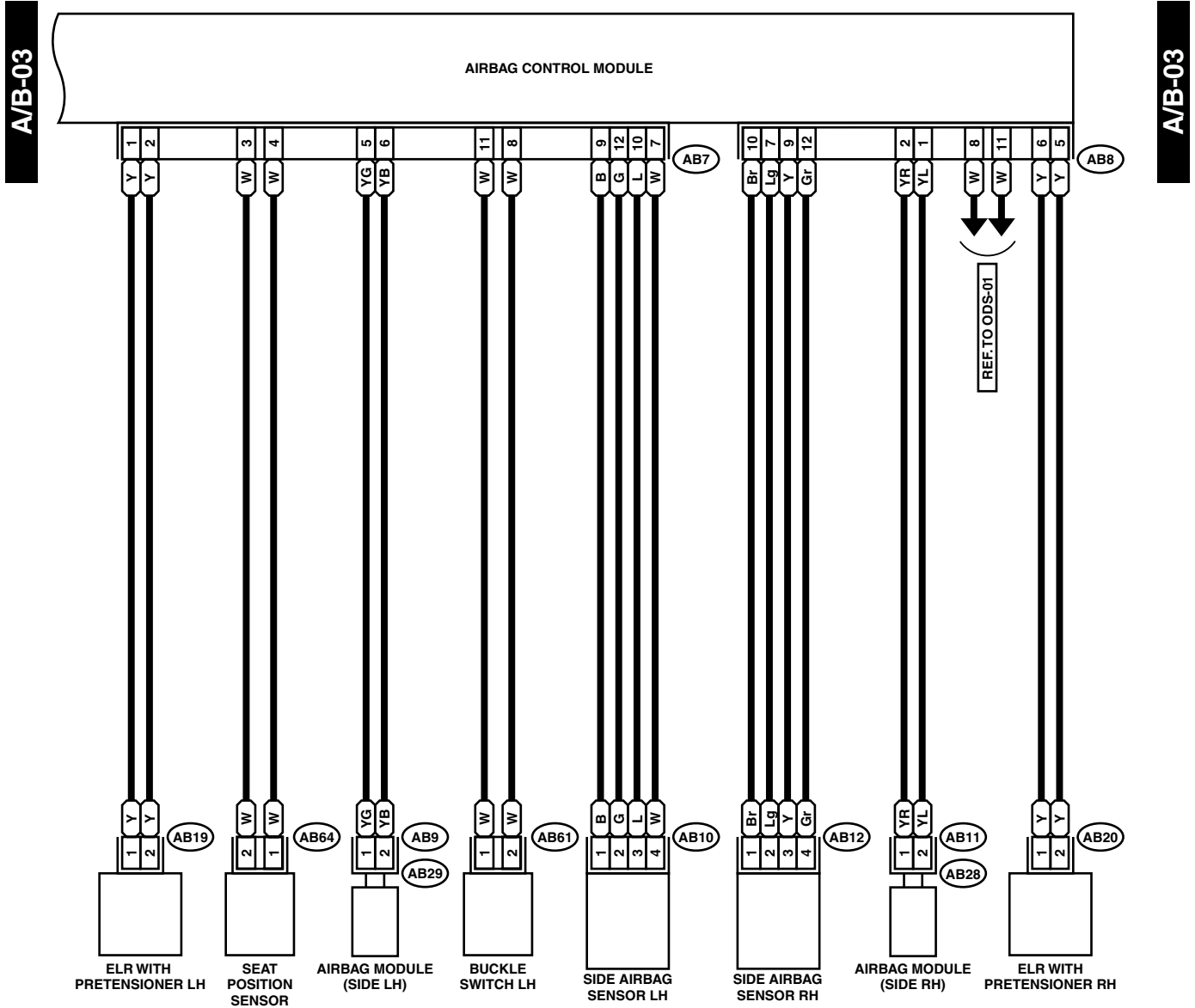
A/B-02



WI-08944

# Airbag System

WIRING SYSTEM



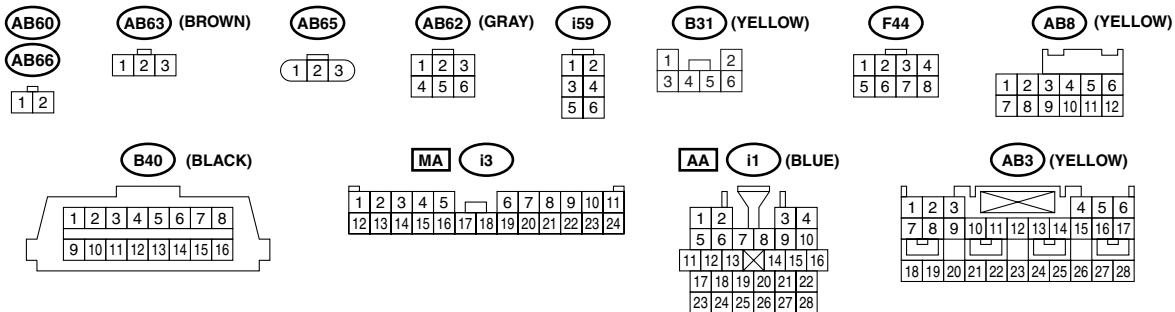
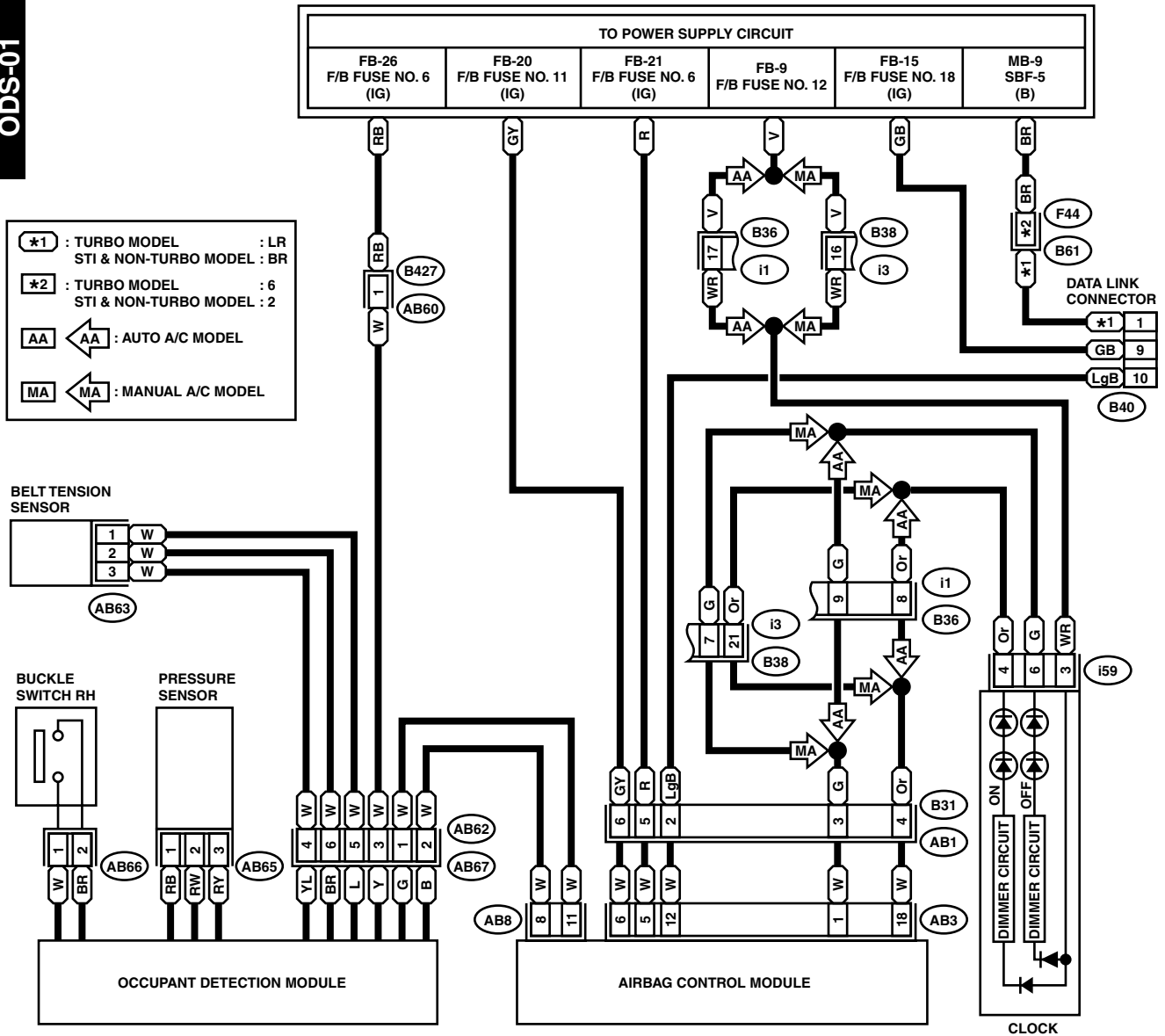
WI-08945

## 11. Occupant Detection System

### A: WIRING DIAGRAM

ODS-01

ODS-01





# Immobilizer System

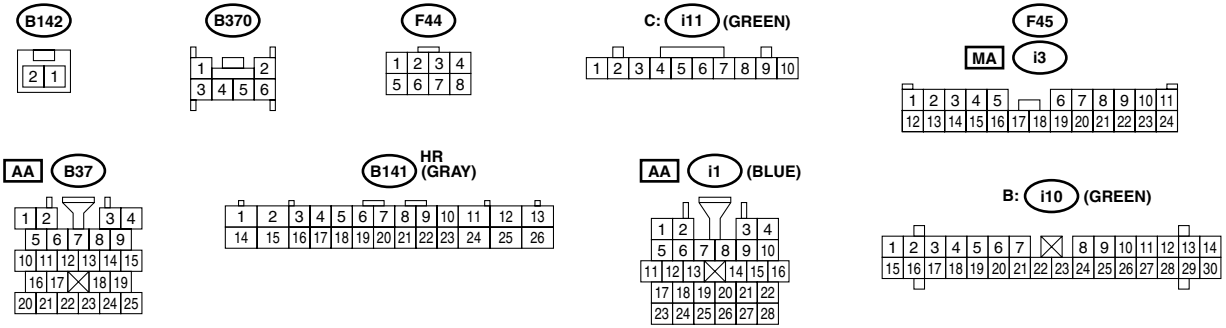
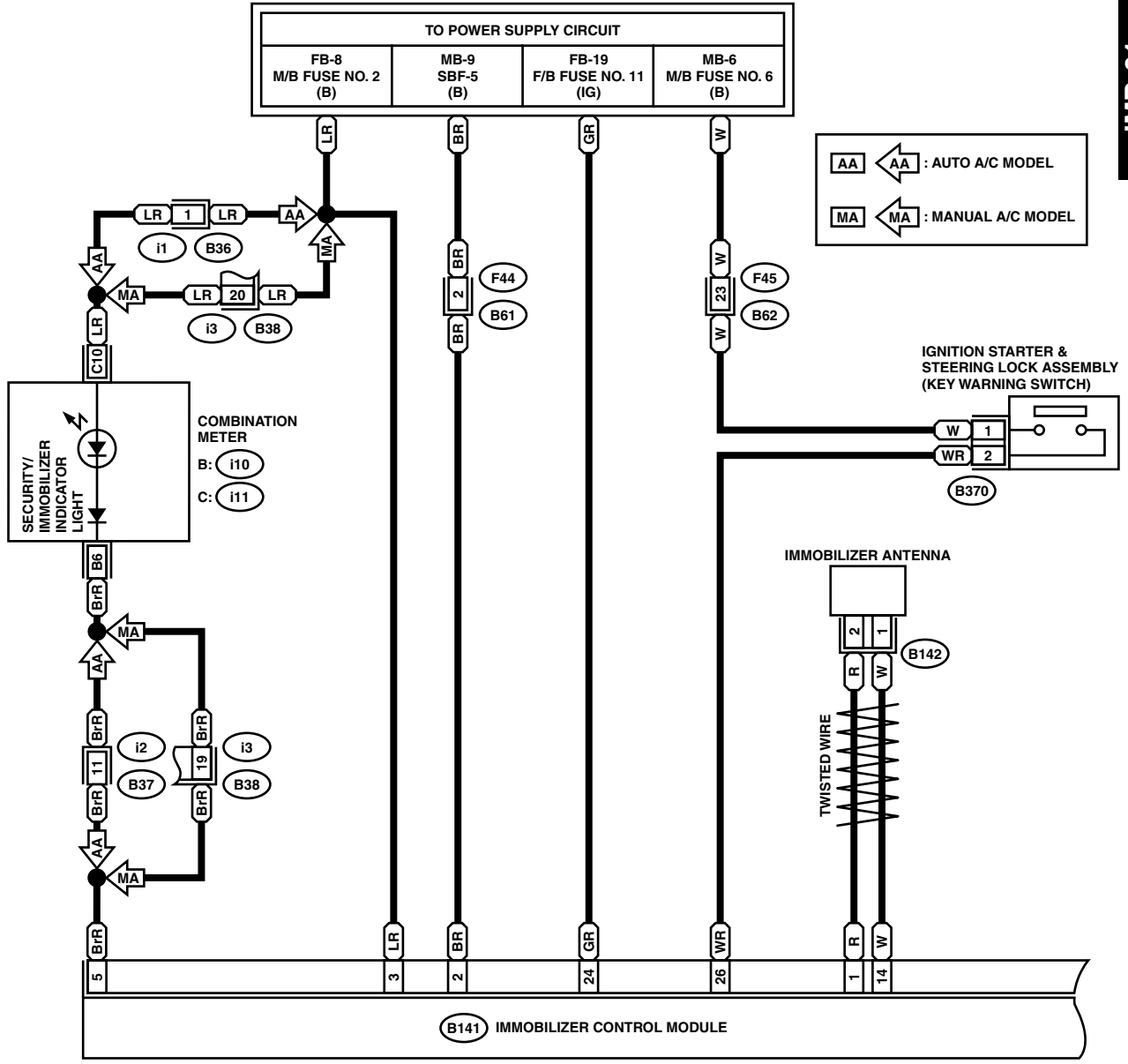
WIRING SYSTEM

## 12. Immobilizer System

### A: WIRING DIAGRAM

IMB-01

IMB-01



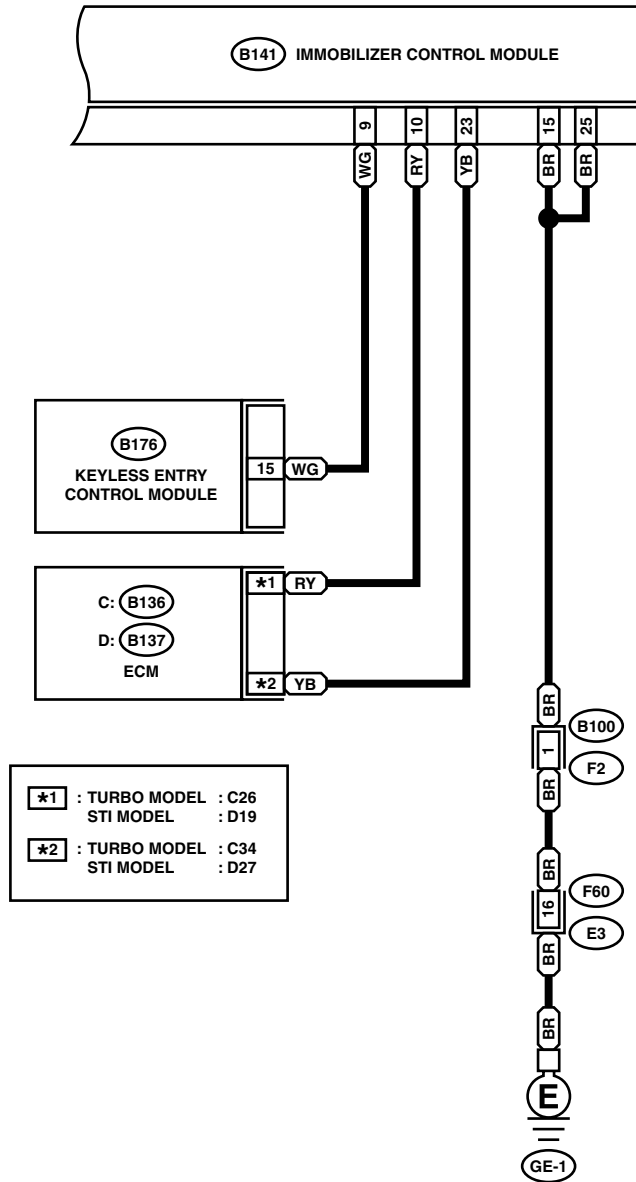
WI-11127

# Immobilizer System

WIRING SYSTEM

IMB-02

IMB-02



F60 HR (BROWN)

|    |    |    |    |
|----|----|----|----|
| 1  | 2  | 3  | 4  |
| 5  | 6  | 7  | 8  |
| 9  | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |

F2 (BLACK)

|    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 |    |    |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |

B141 HR (GRAY)

B176 (GRAY)

|    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |

C: B136 HR

|    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  |    |    |    |    |    |
| 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 |    |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 |    | 31 | 32 | 33 | 34 | 35 |    |    |

D: B137 HR

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |    |    |    |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 |    | 24 | 25 |    |
| 26 | 27 |    | 28 | 29 |    | 30 | 31 |    |    |

WI-08947

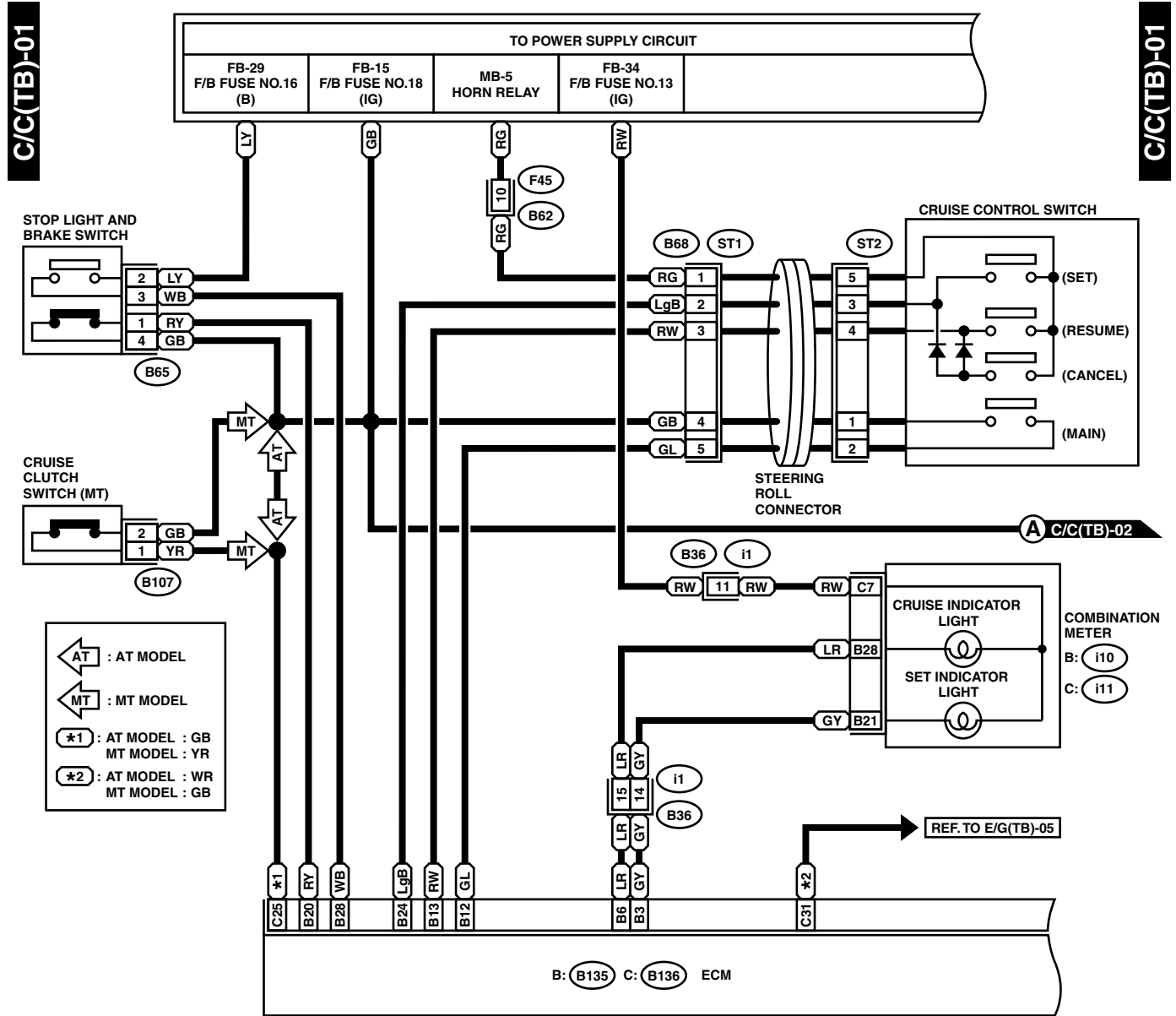
# Cruise Control System

WIRING SYSTEM

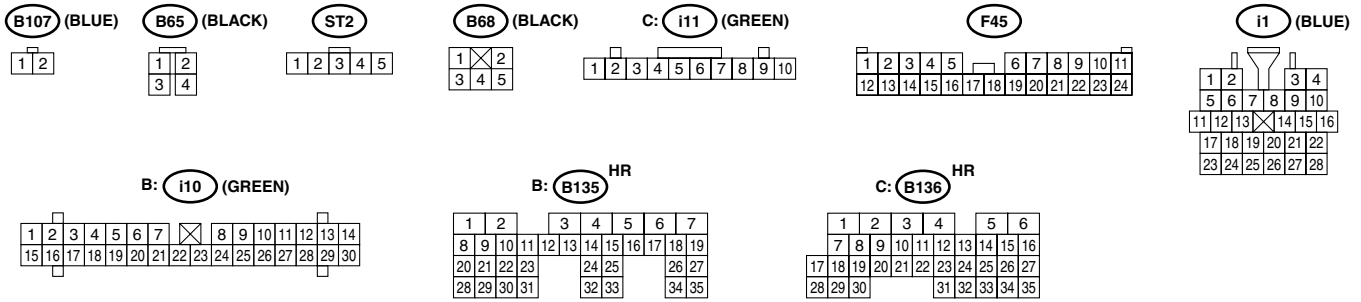
## 13. Cruise Control System

### A: WIRING DIAGRAM

#### 1. TURBO MODEL



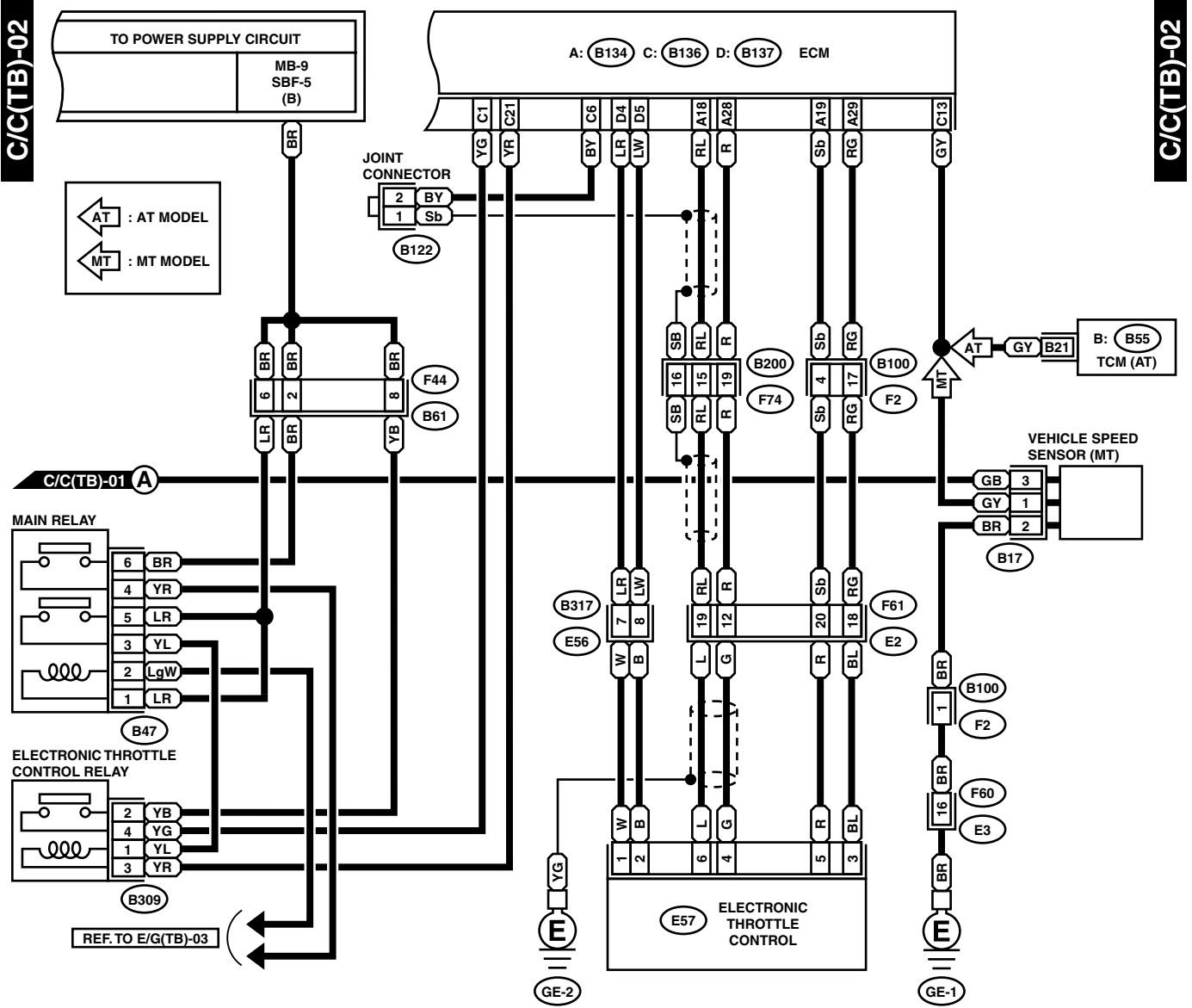
← AT : AT MODEL  
 ← MT : MT MODEL  
 \*1 : AT MODEL : GB  
       MT MODEL : YR  
 \*2 : AT MODEL : WR  
       MT MODEL : GB



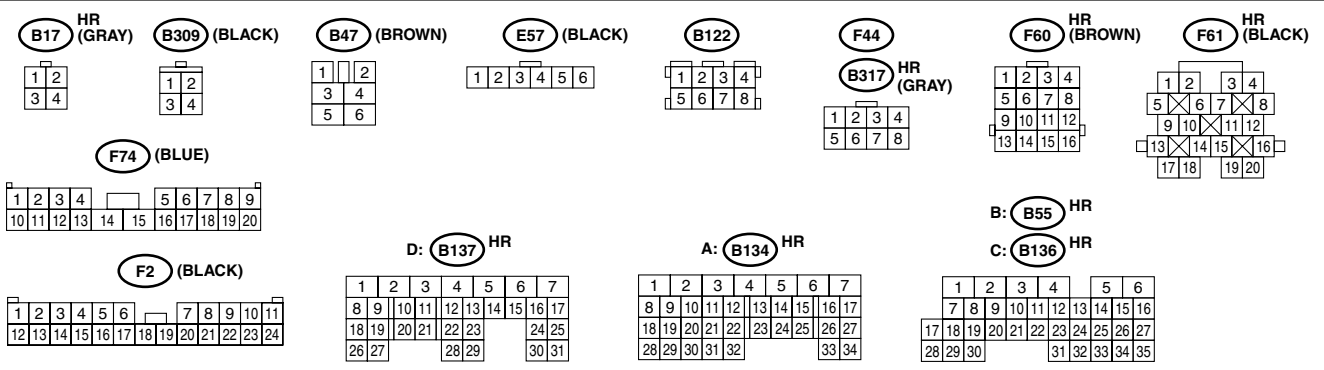
WI-11128

# Cruise Control System

WIRING SYSTEM



**C/C(TB)-02**

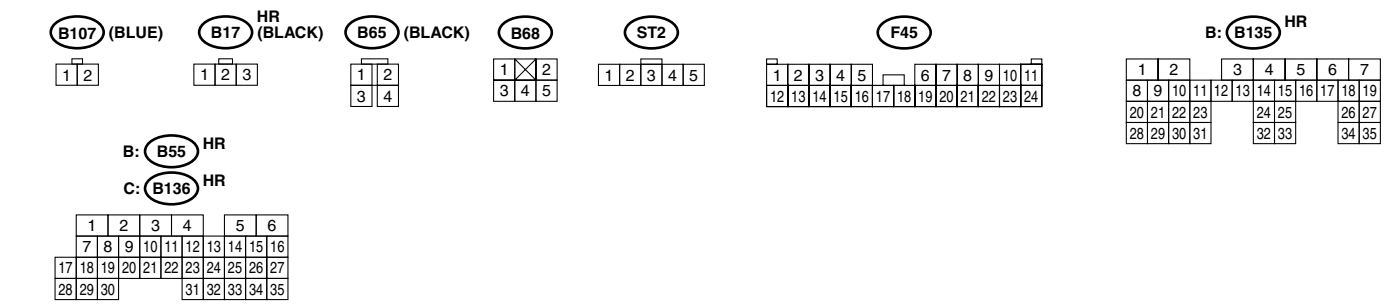
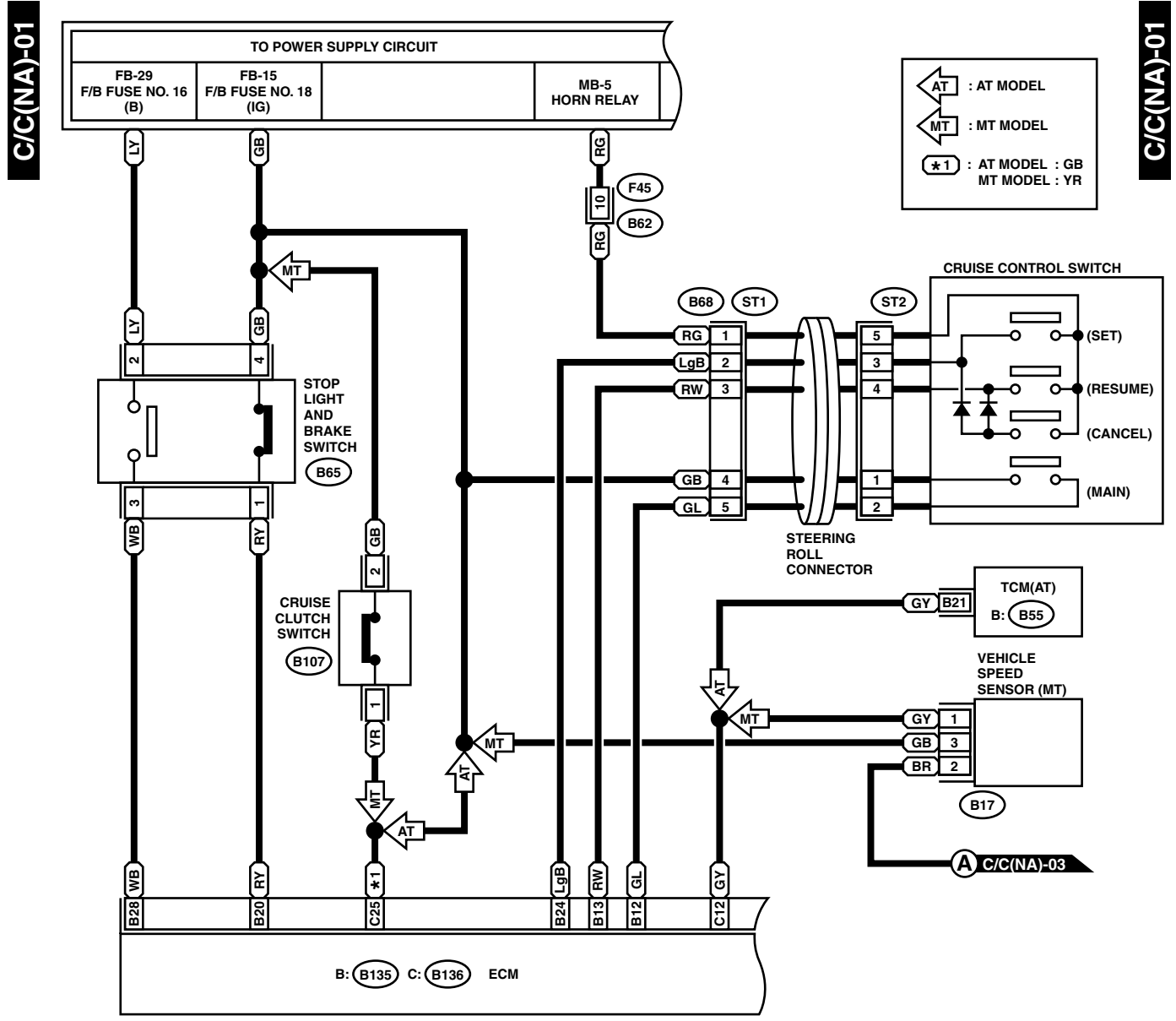


WI-11129

# Cruise Control System

WIRING SYSTEM

## 2. NON-TURBO MODEL



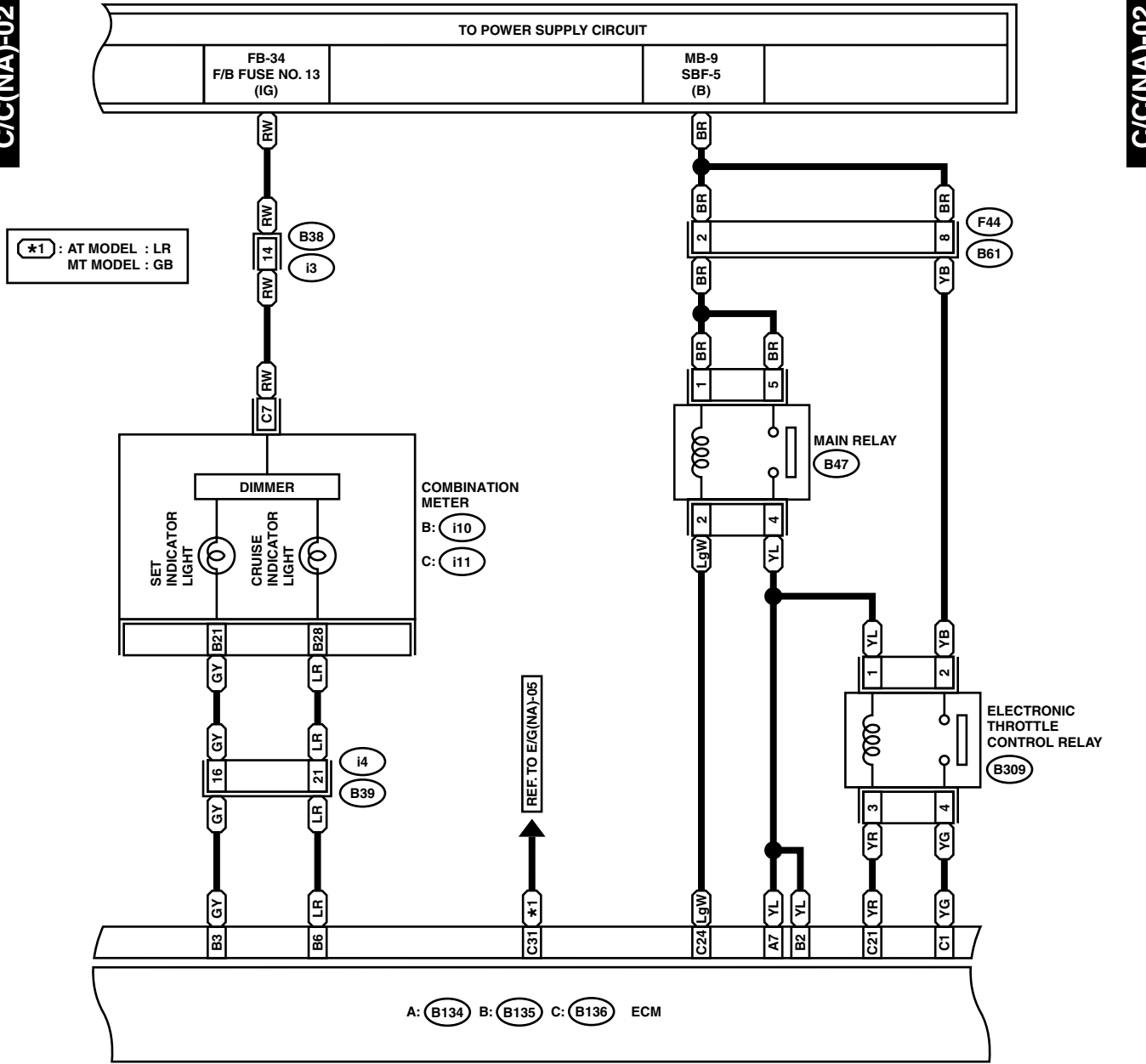
WI-11130

# Cruise Control System

WIRING SYSTEM

C/C(NA)-02

C/C(NA)-02



B309 (BLACK)

|   |   |
|---|---|
| 1 | 2 |
| 3 | 4 |

B47 (BROWN)

|   |   |
|---|---|
| 1 | 2 |
| 3 | 4 |
| 5 | 6 |

F44

|   |   |   |   |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |

C: i11 (GREEN)

|   |   |   |   |   |   |   |   |   |    |
|---|---|---|---|---|---|---|---|---|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|----|

i3

|    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 |    |    |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |

i4 (BROWN)

|    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 |    |    |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |

B: i10 (GREEN)

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 |    |    |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |

A: B134 HR

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |    |    |    |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | 32 | 33 | 34 |    |    |    |

B: B135 HR

|    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  |    |    |    |    |    |
| 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |    |    |    |    |
| 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |    |    |    |    |

C: B136 HR

|    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  |    |    |    |    |    |
| 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 |    |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |    |    |    |

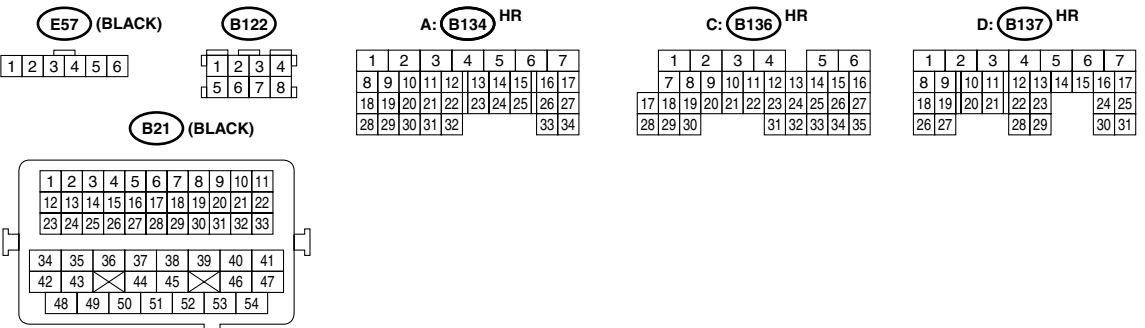
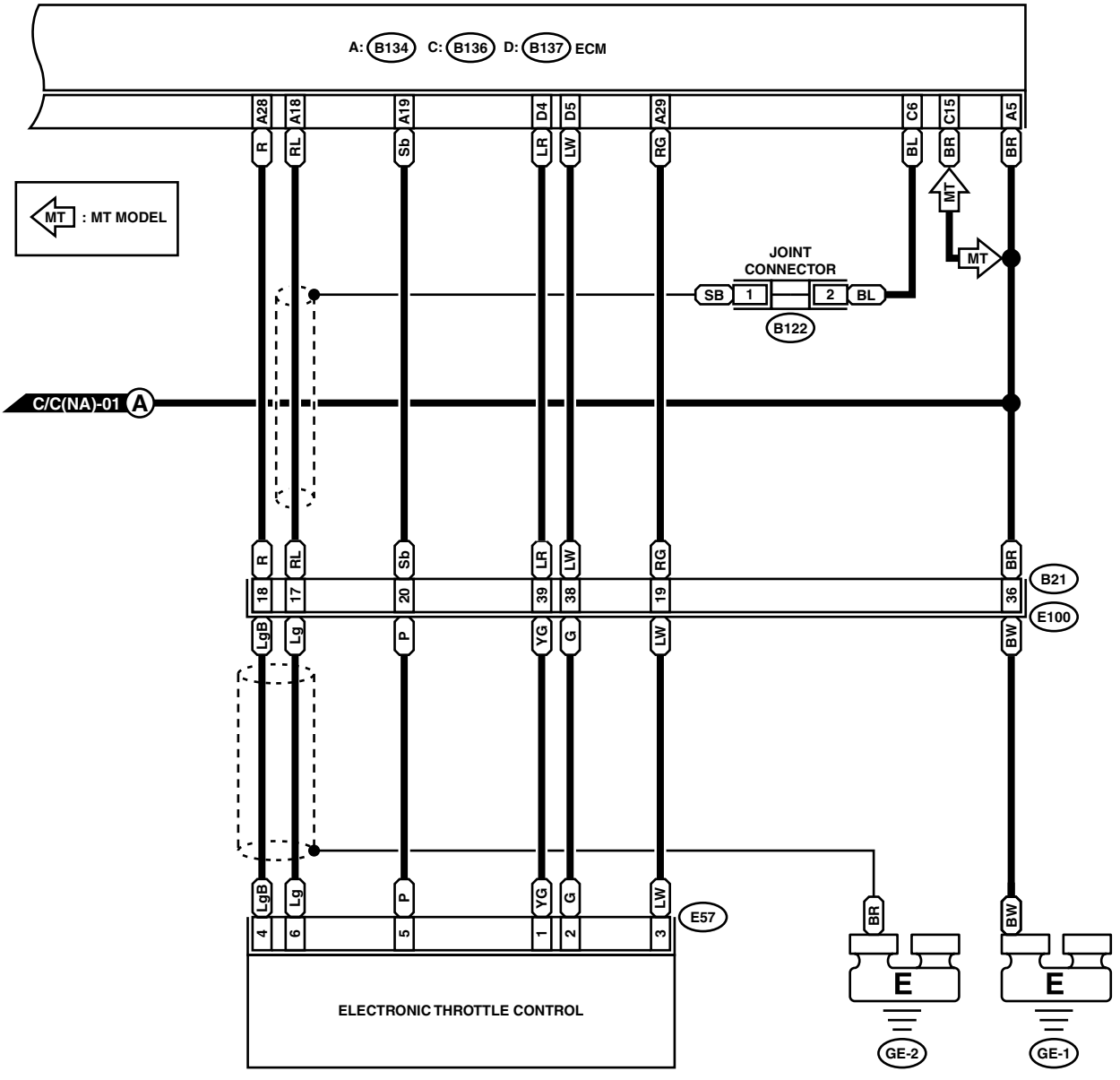
WI-12341

# Cruise Control System

WIRING SYSTEM

C/C(NA)-03

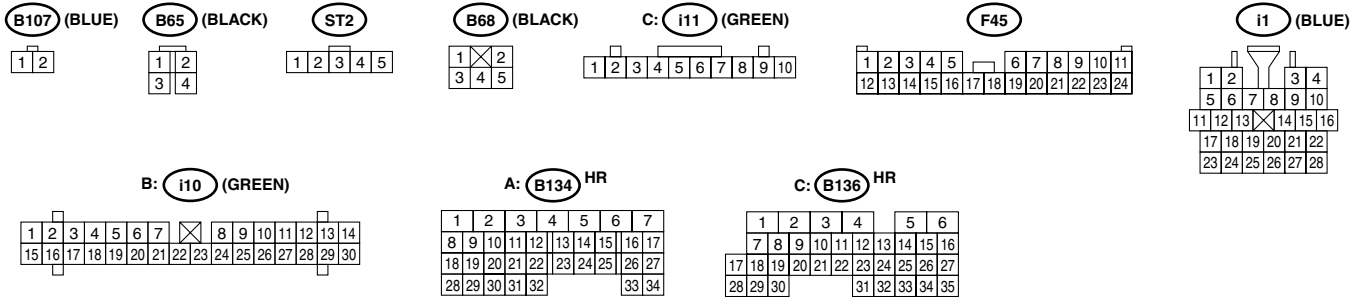
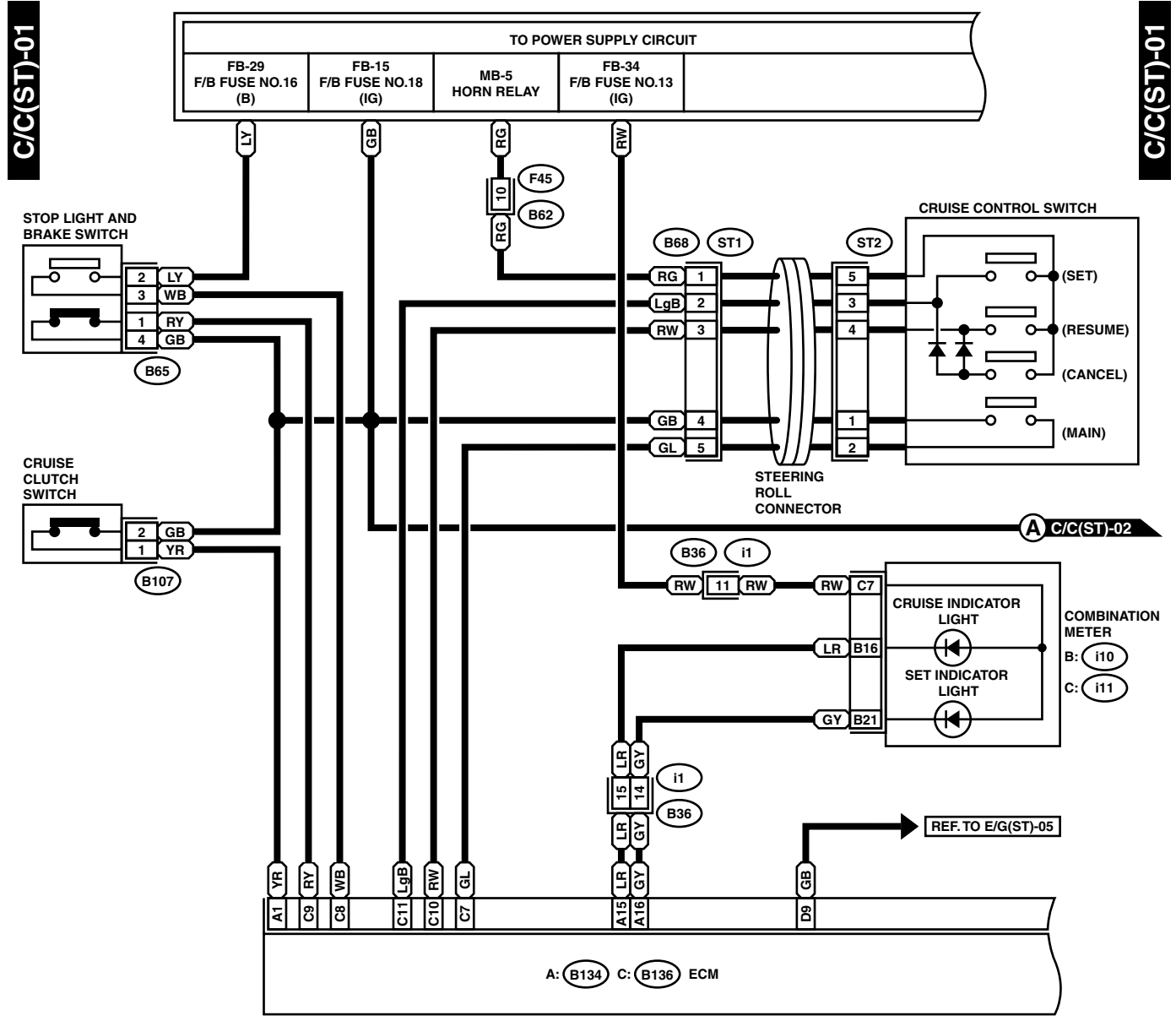
C/C(NA)-03



WI-08952

# Cruise Control System

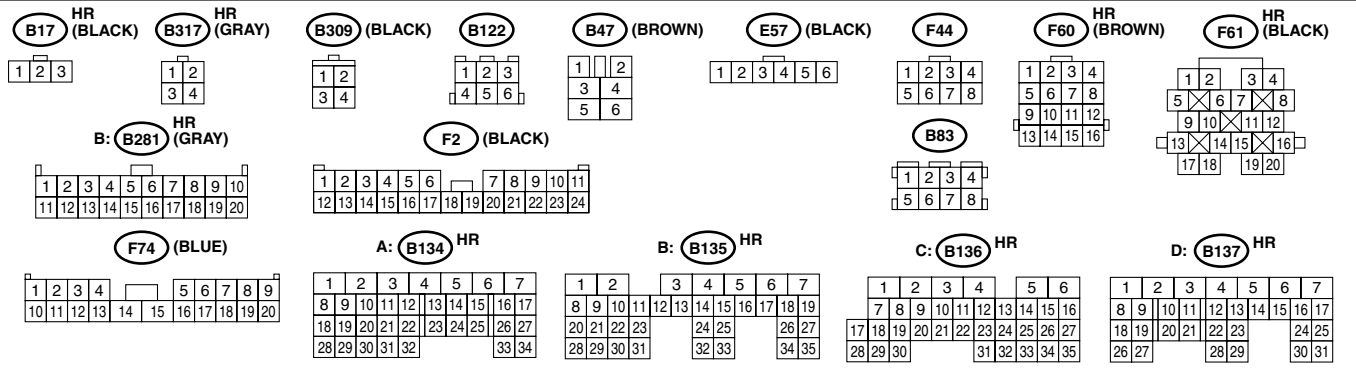
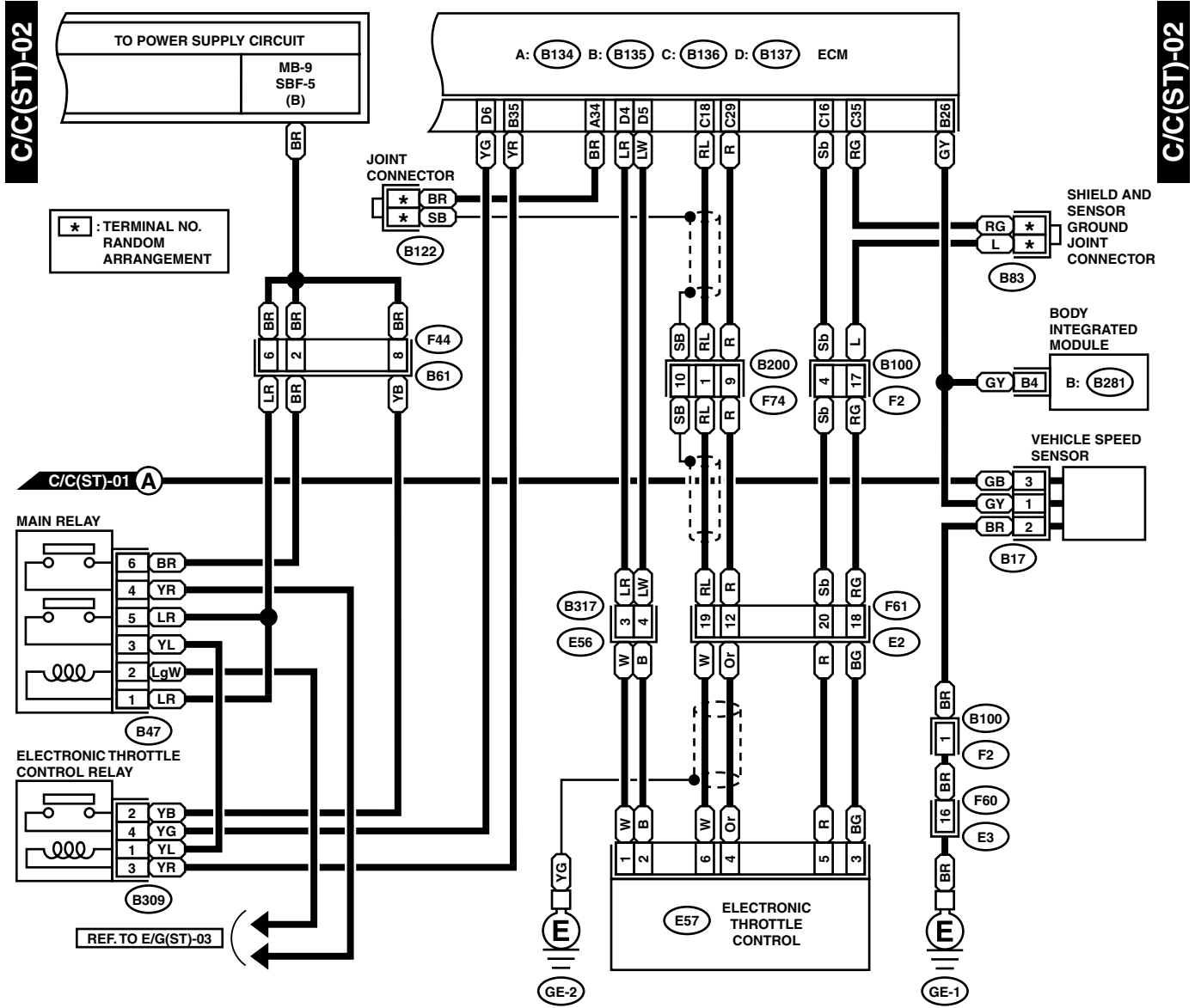
## 3. STI MODEL





# Cruise Control System

WIRING SYSTEM



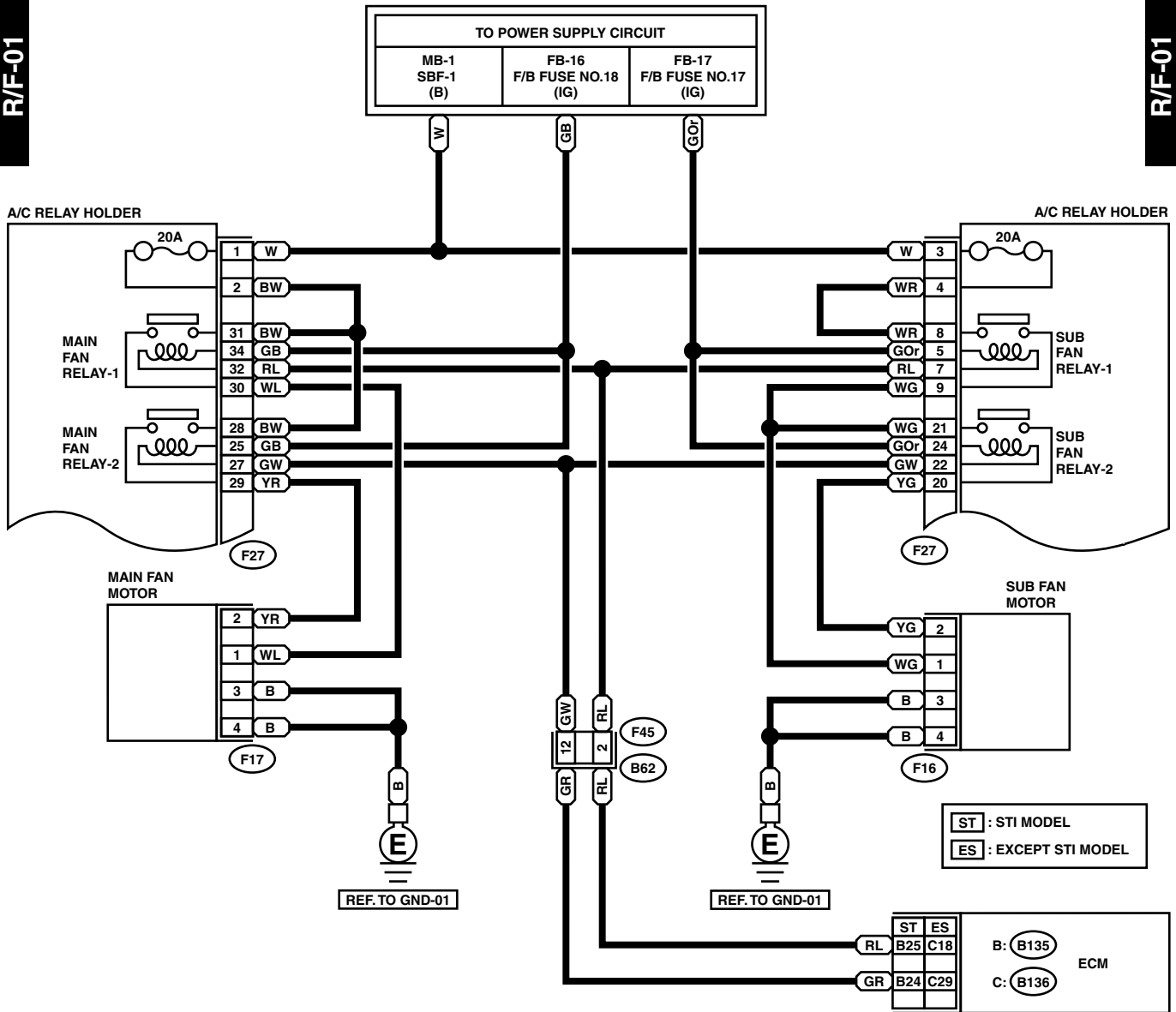
WI-08954

## 14. Radiator Fan System

### A: WIRING DIAGRAM

R/F-01

R/F-01

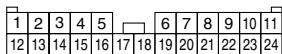


F16 (GRAY)

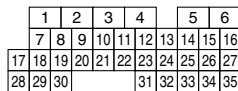
F17 (GRAY)



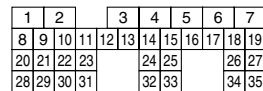
F45



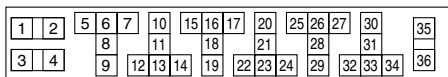
C: B136 HR



B: B135 HR



F27 (BLACK)



RELAY HOLDER

# Charging System

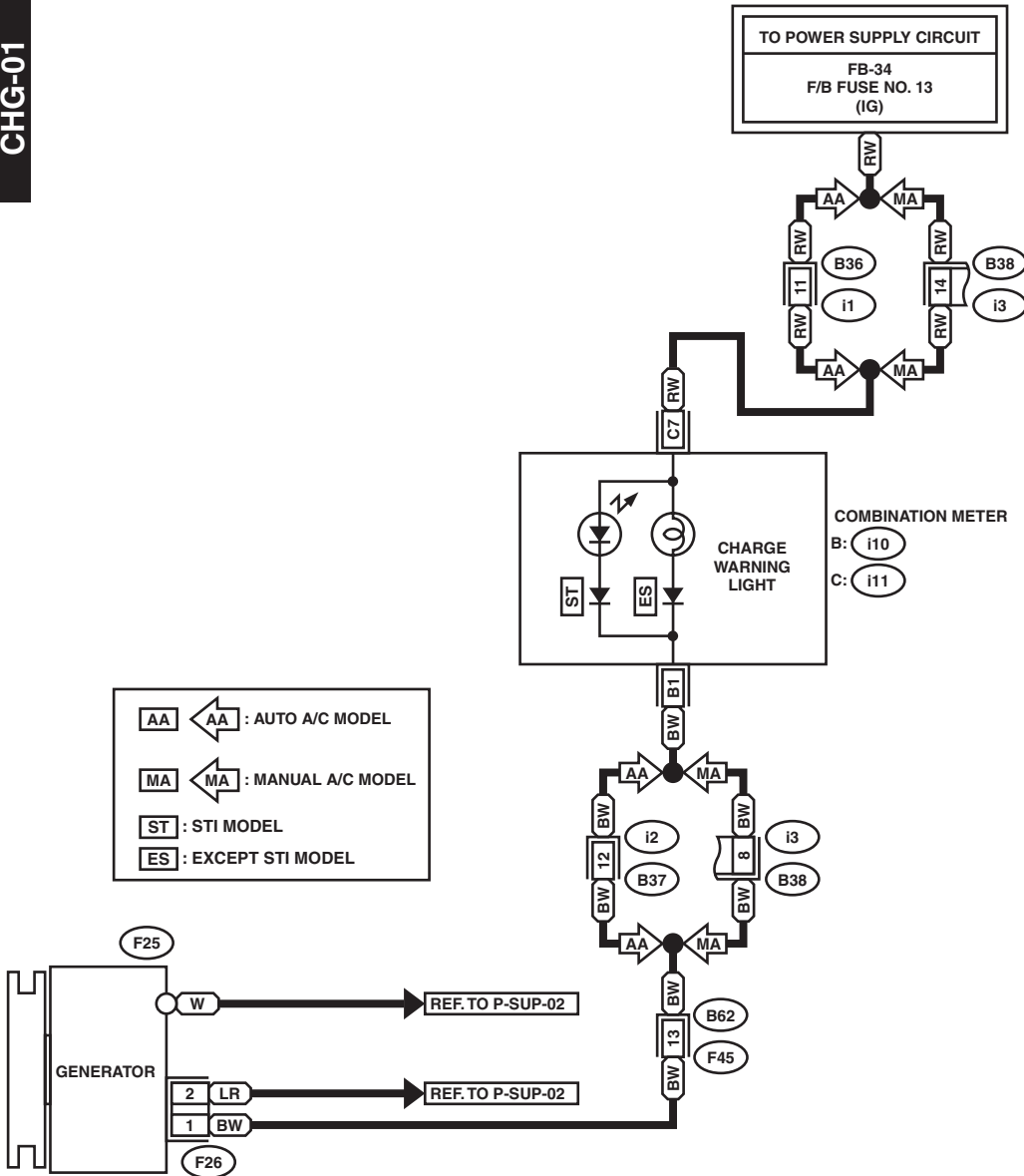
WIRING SYSTEM

## 15. Charging System

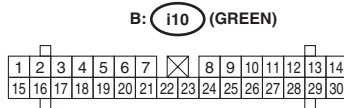
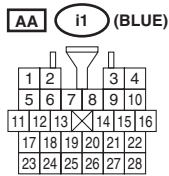
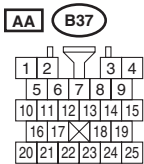
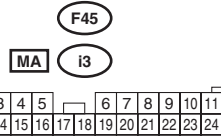
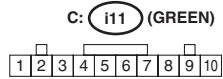
### A: WIRING DIAGRAM

CHG-01

CHG-01



**AA** ← **AA** : AUTO A/C MODEL  
**MA** ← **MA** : MANUAL A/C MODEL  
**ST** : STI MODEL  
**ES** : EXCEPT STI MODEL



WI-1131

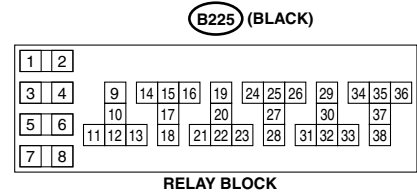
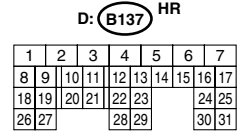
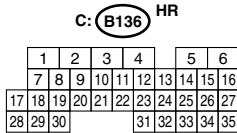
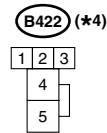
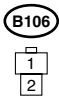
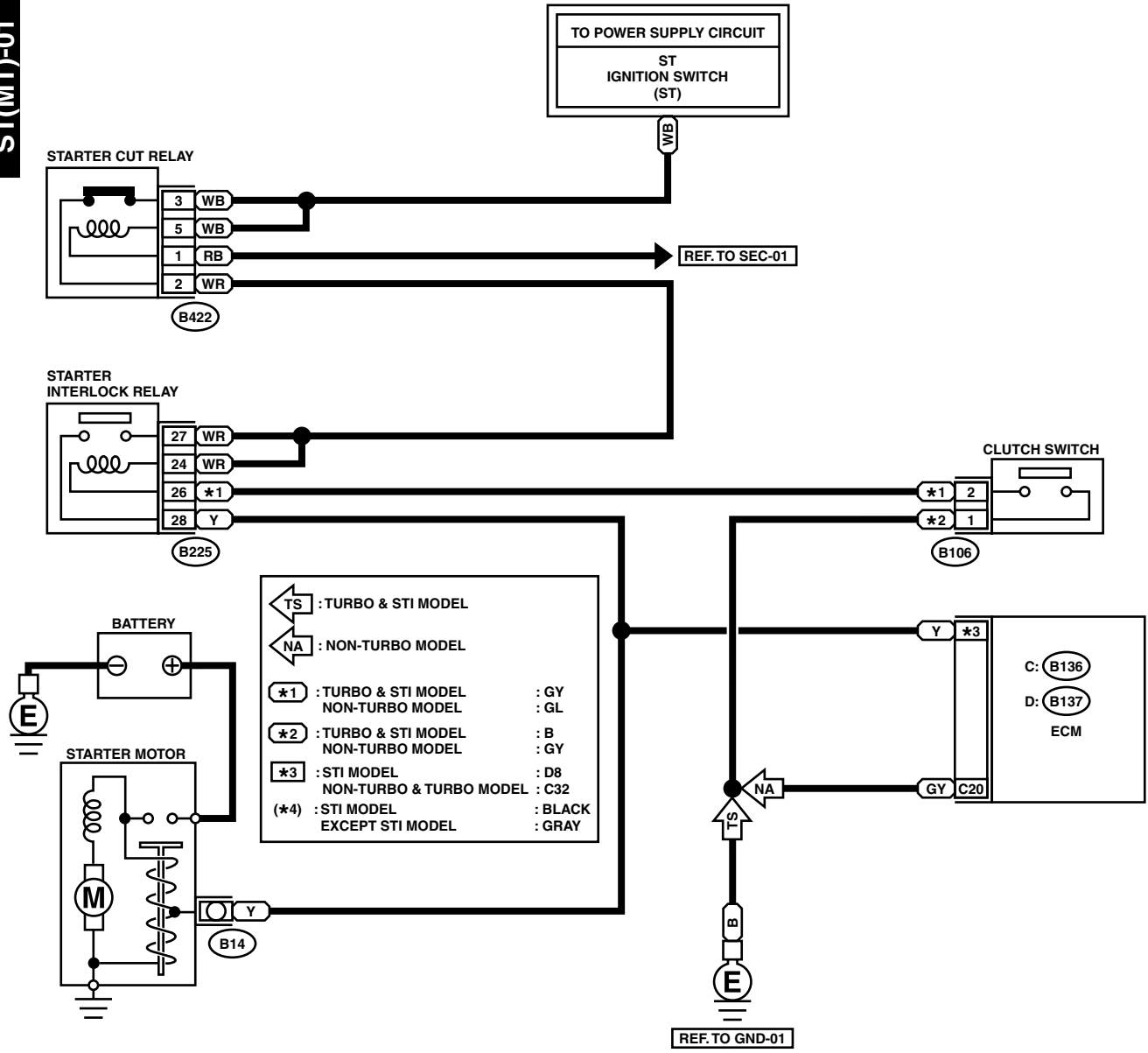
## 16.Starter System

### A: WIRING DIAGRAM

#### 1. MT MODEL

ST(MT)-01

ST(MT)-01



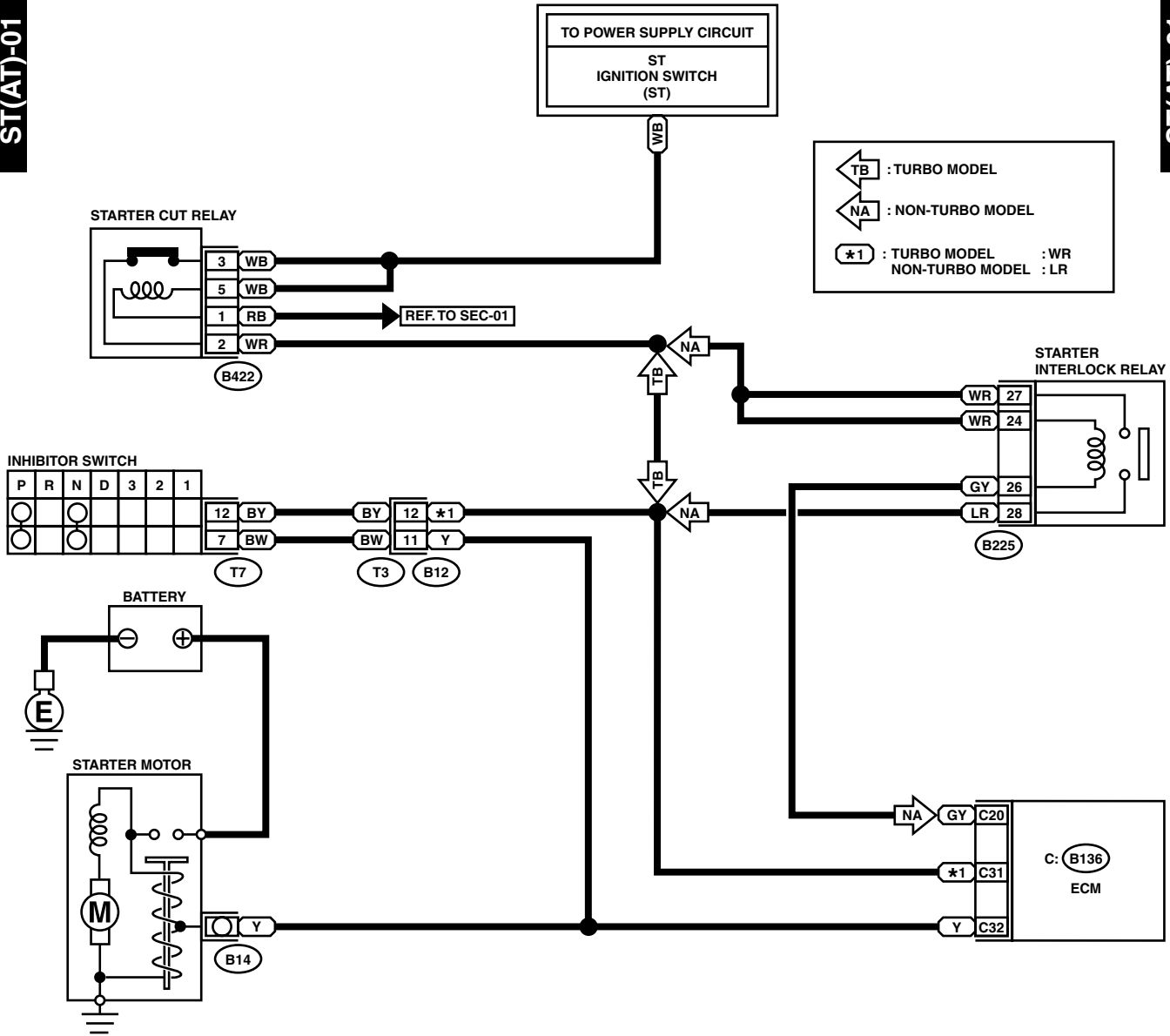
# Starter System

WIRING SYSTEM

## 2. AT MODEL

ST(AT)-01

ST(AT)-01



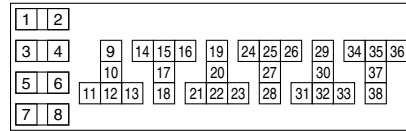
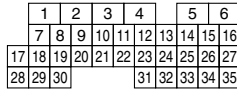
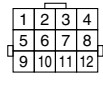
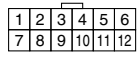
(B422) (GRAY)

(T7)

(B12) HR (GRAY)

C: (B136) HR

(B225) (BLACK)

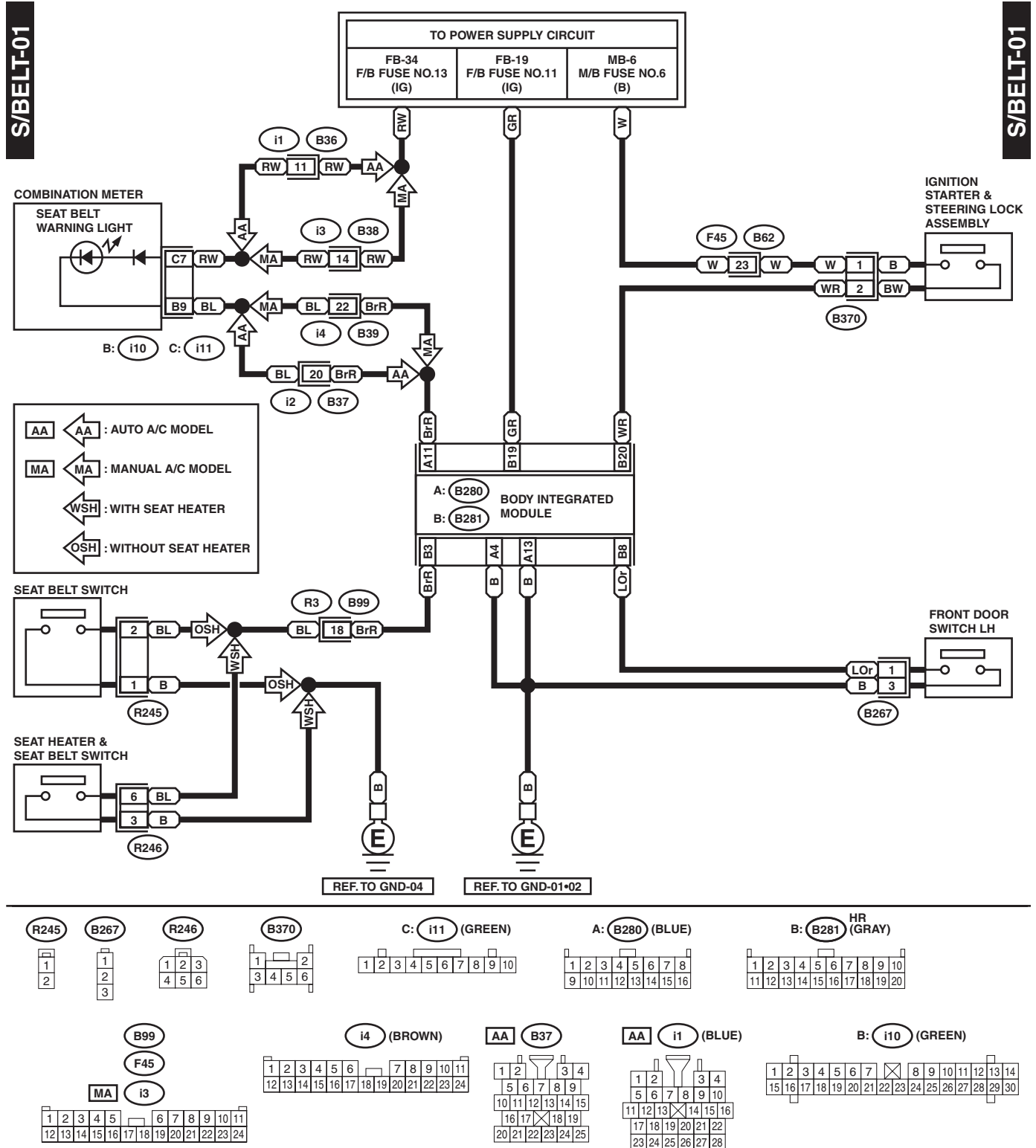


RELAY BLOCK

WI-08958

## 17. Seat Belt Warning System

### A: WIRING DIAGRAM



# Seat Heater System

WIRING SYSTEM

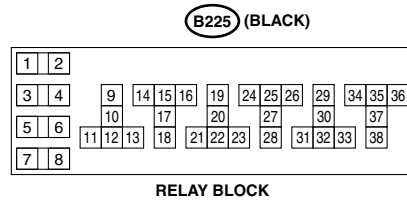
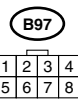
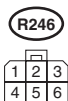
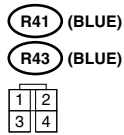
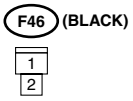
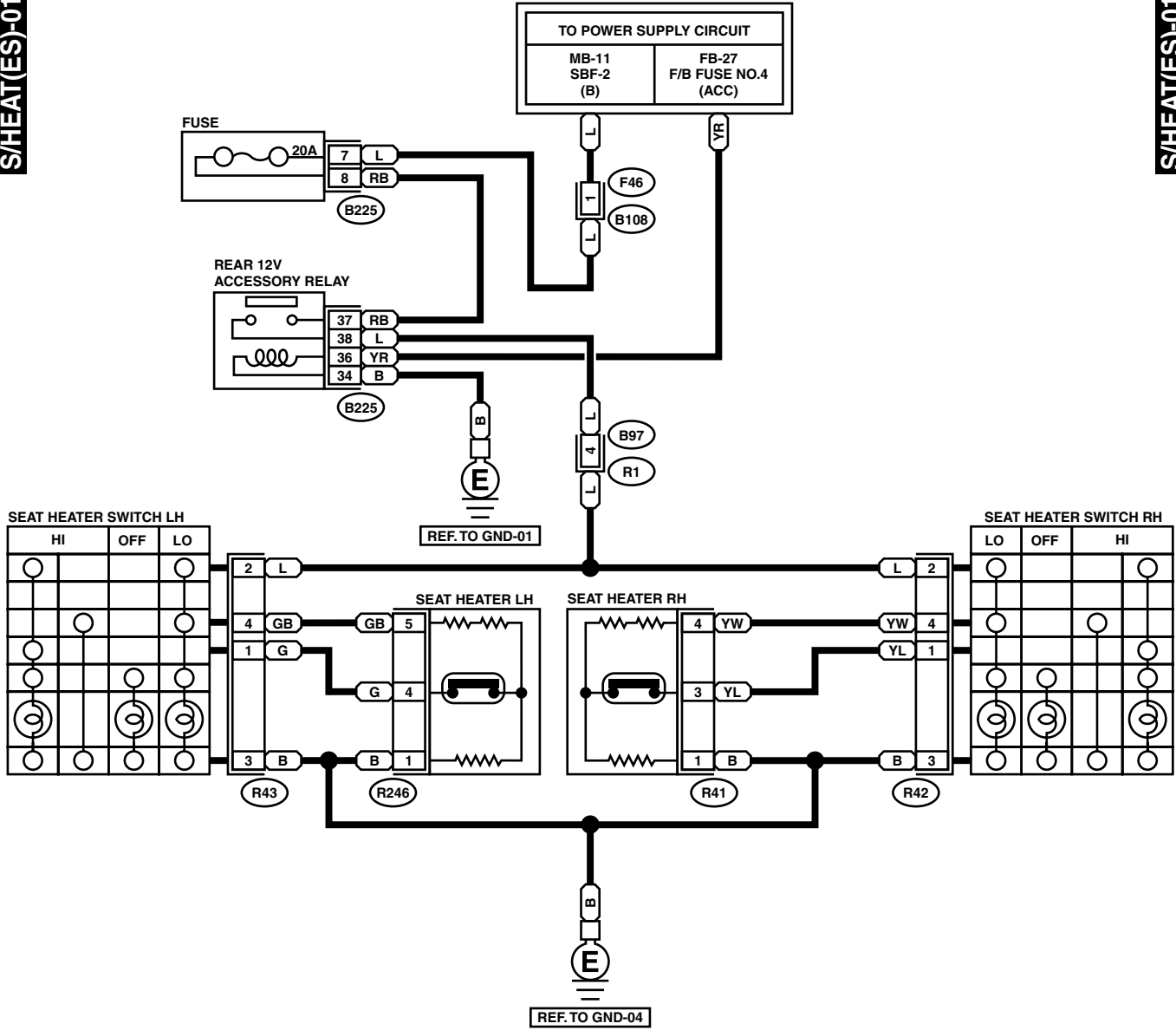
## 18. Seat Heater System

### A: WIRING DIAGRAM

#### 1. EXCEPT FOR STI MODEL

S/HEAT(ES)-01

S/HEAT(ES)-01



WI-08960

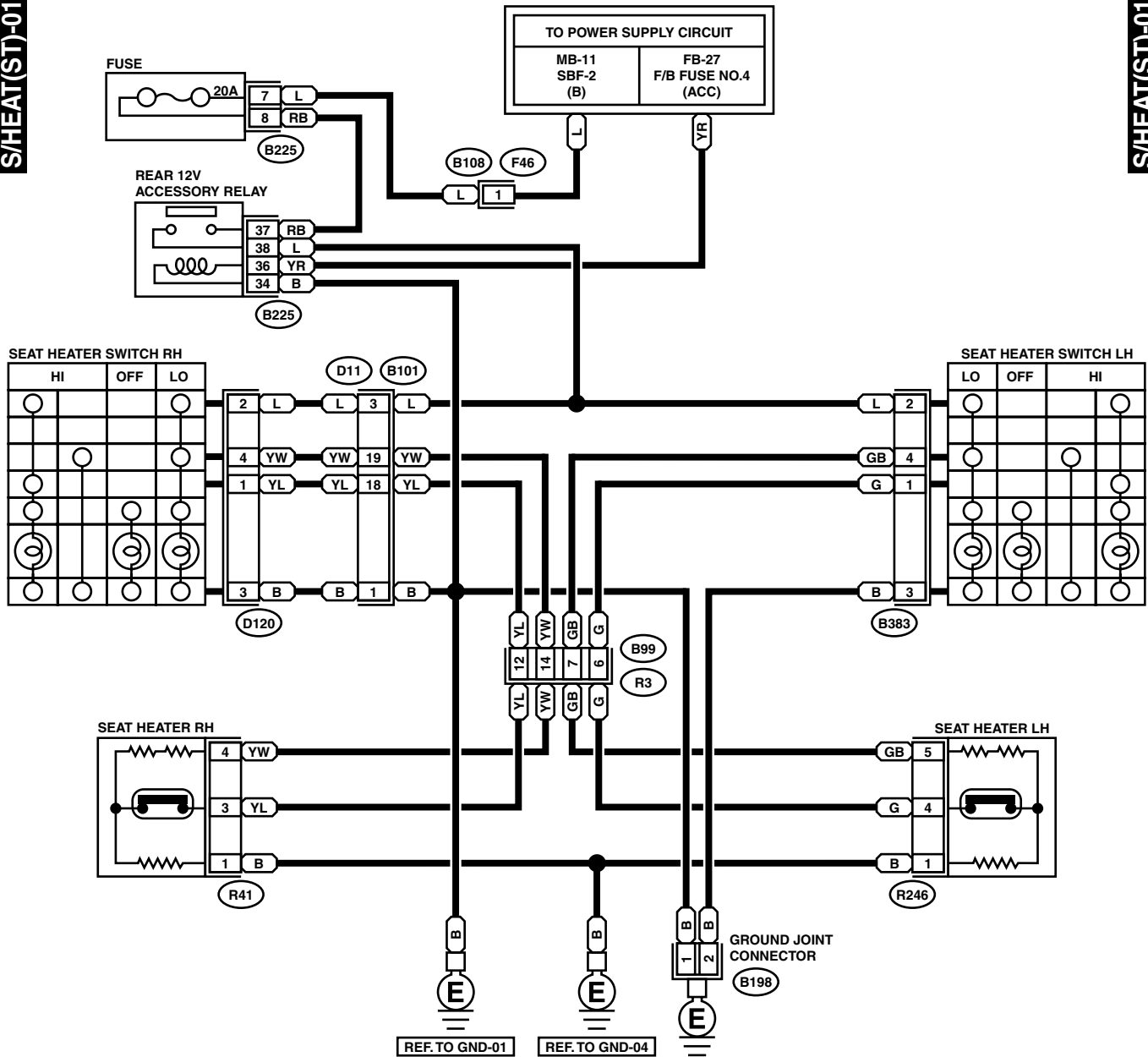
# Seat Heater System

WIRING SYSTEM

## 2. STI MODEL

S/HEAT(ST)-01

S/HEAT(ST)-01



F46 (BLACK)



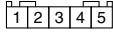
D120



R41 (BLUE)



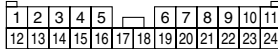
B198



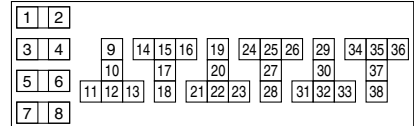
R246



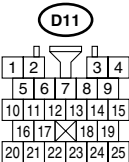
B99



B225 (BLACK)



RELAY BLOCK



WI-08961



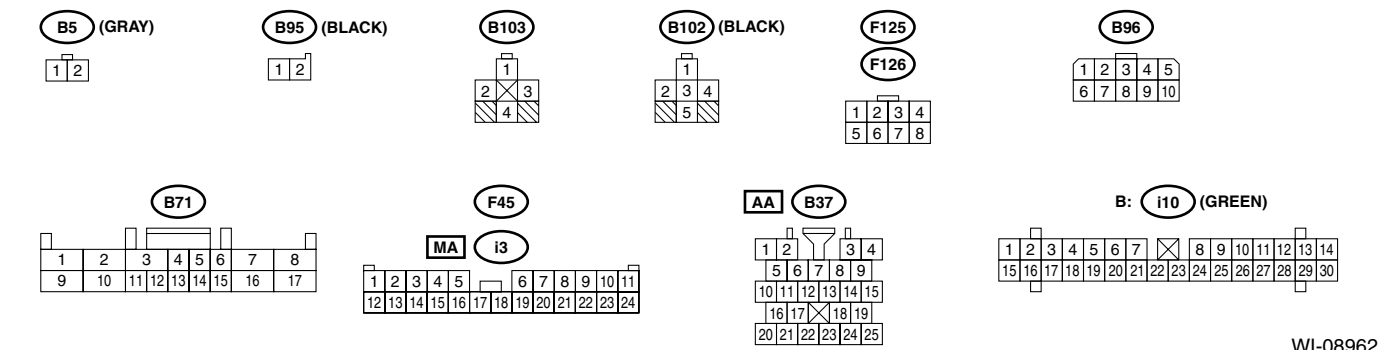
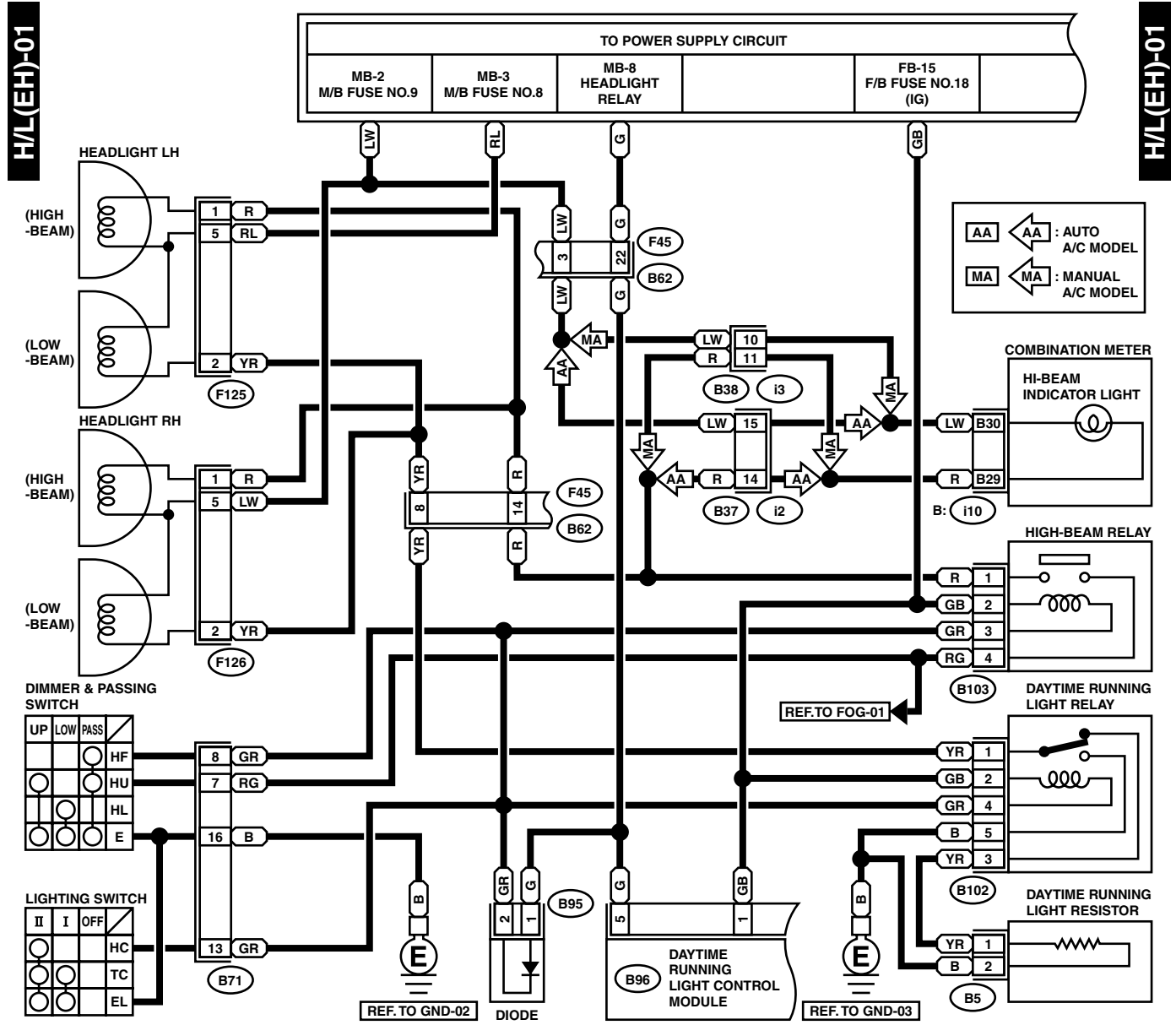
# Headlight System

WIRING SYSTEM

## 19. Headlight System

### A: WIRING DIAGRAM

#### 1. MODEL WITHOUT HID



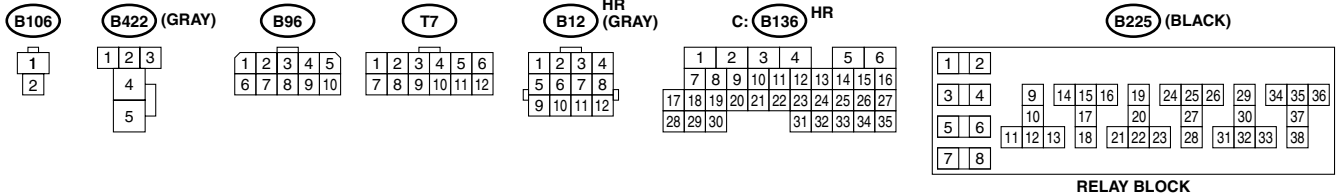
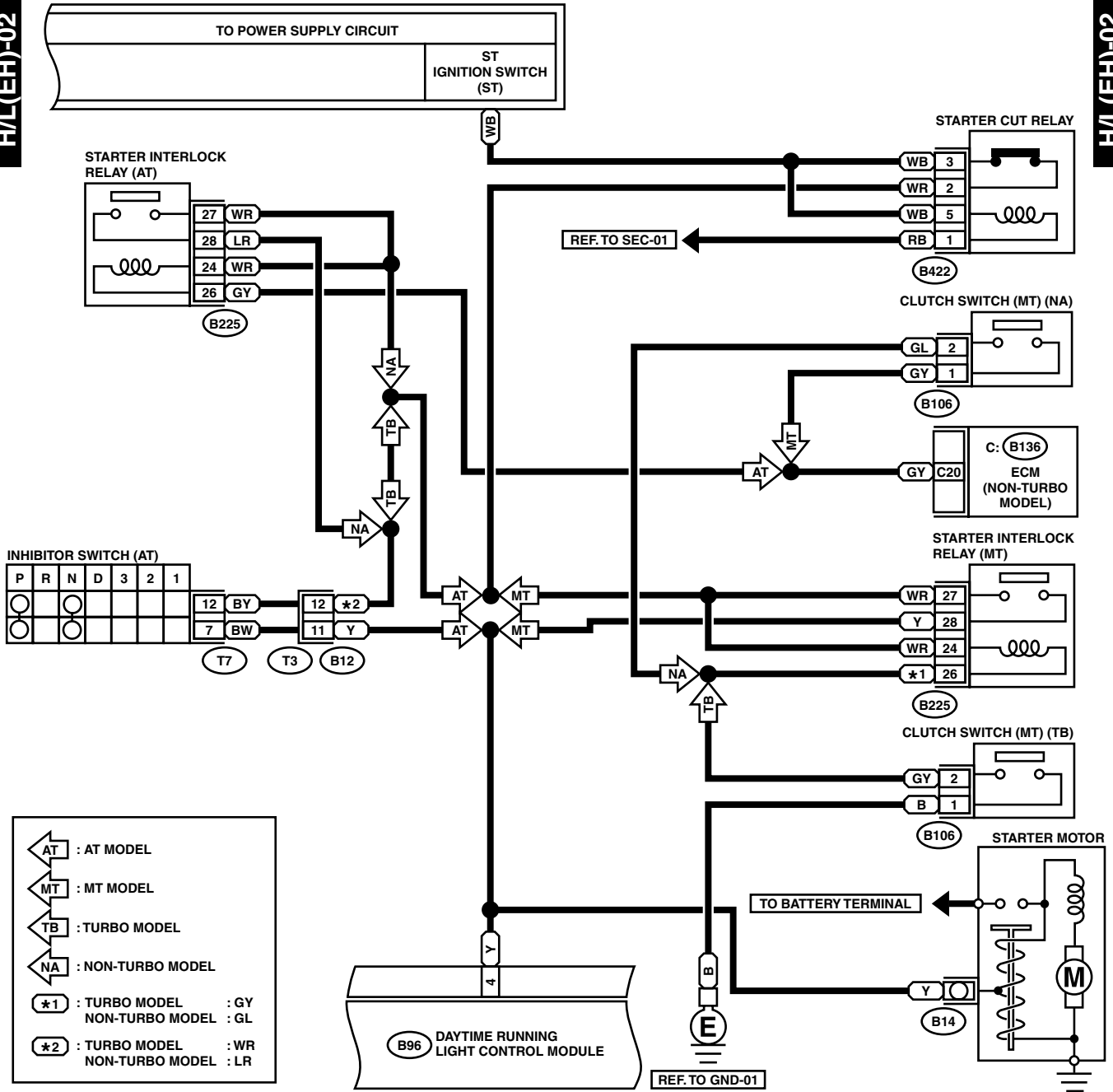
WI-08962

# Headlight System

WIRING SYSTEM

H/L(EH)-02

H/L(EH)-02



RELAY BLOCK

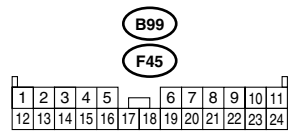
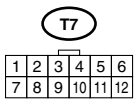
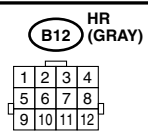
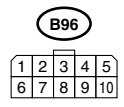
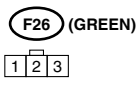
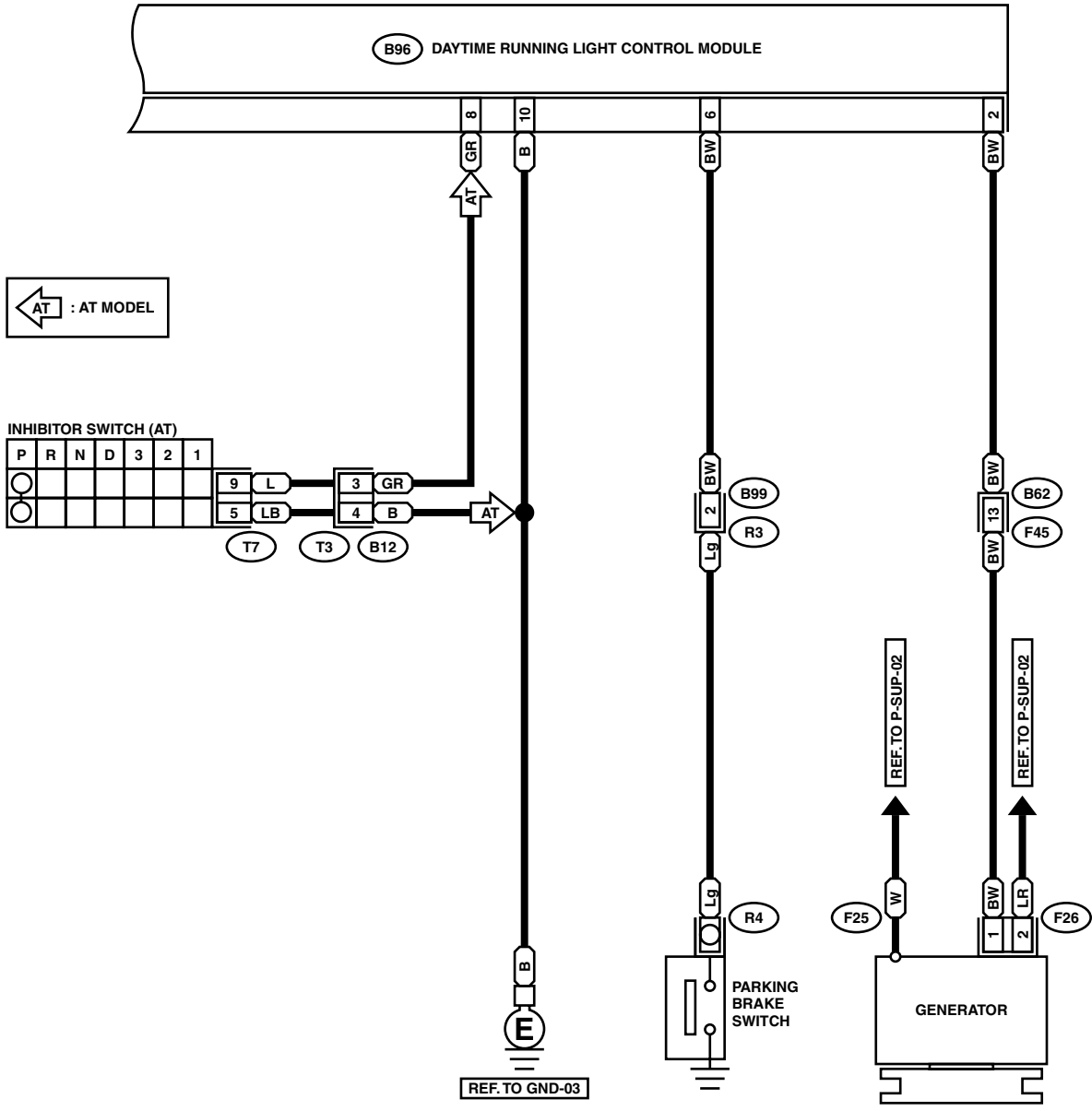
WI-08963

# Headlight System

WIRING SYSTEM

H/L(EH)-03

H/L(EH)-03



WI-08964

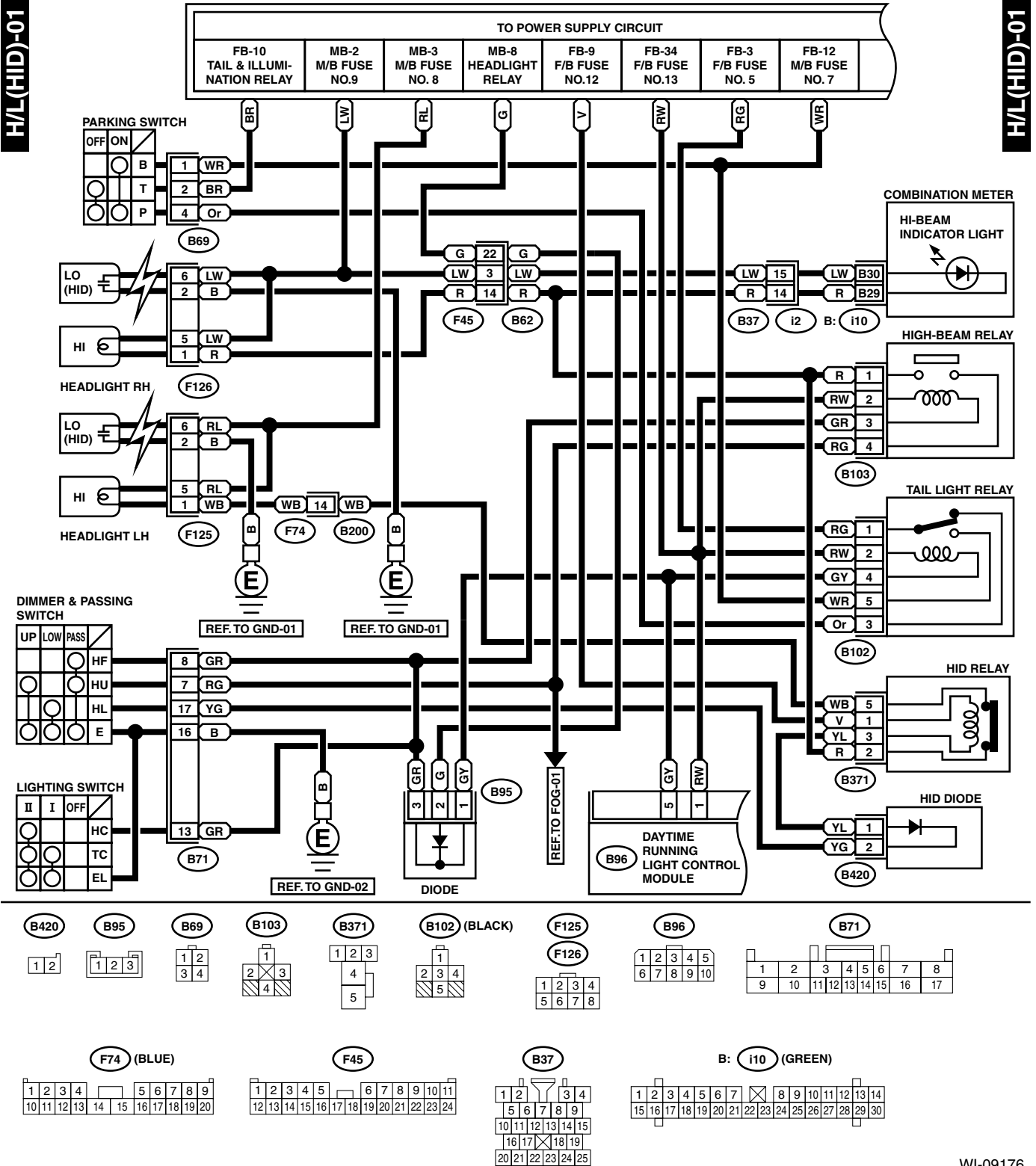
# Headlight System

WIRING SYSTEM

## 2. MODEL WITH HID

H/L(HID)-01

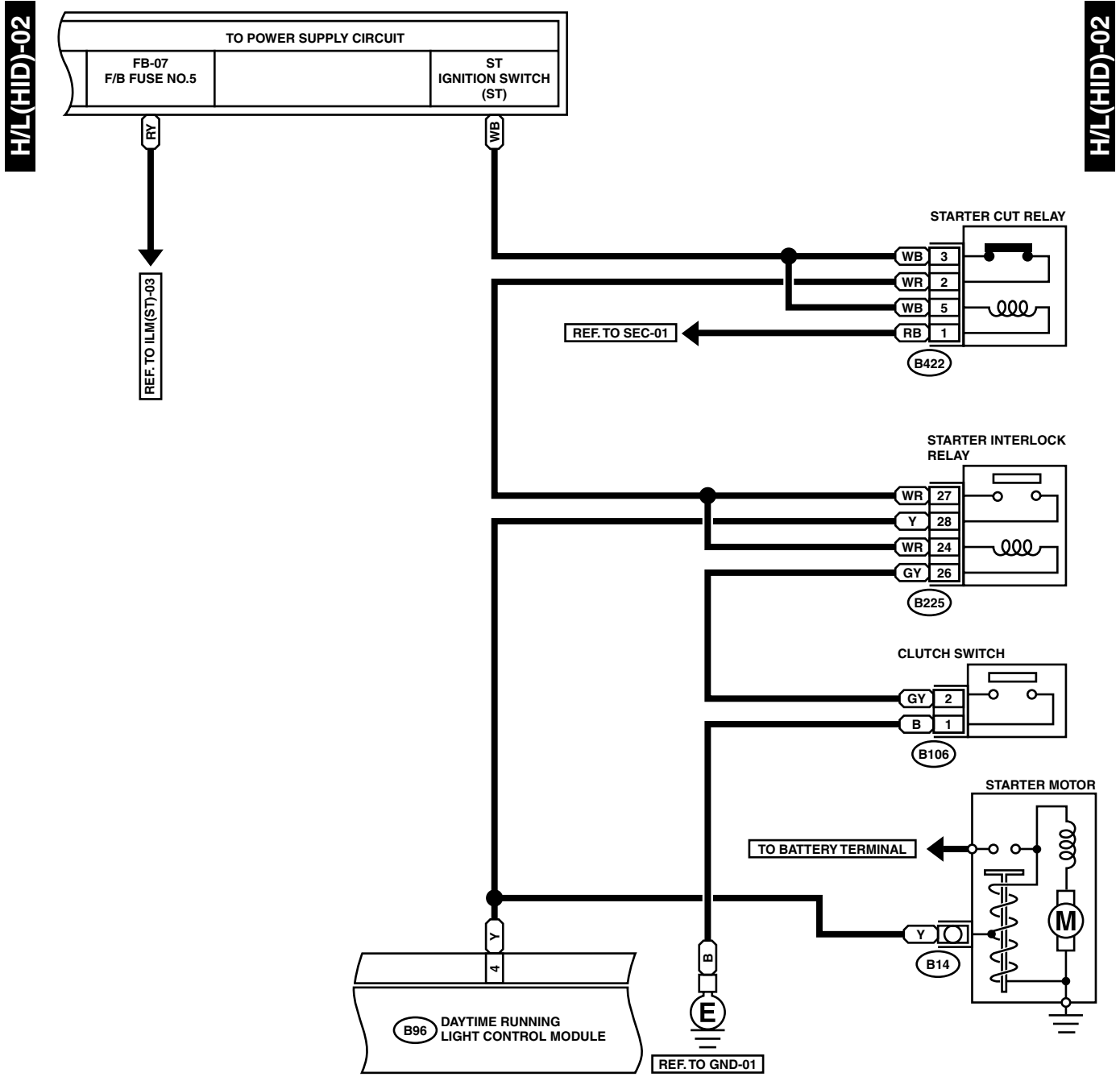
H/L(HID)-01



WI-09176

# Headlight System

WIRING SYSTEM



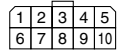
B106



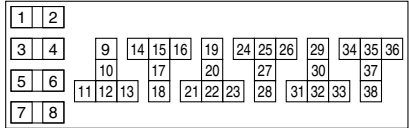
B422 (BLACK)



B96



B225 (BLACK)



RELAY BLOCK

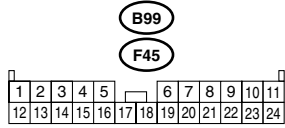
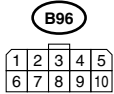
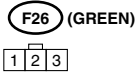
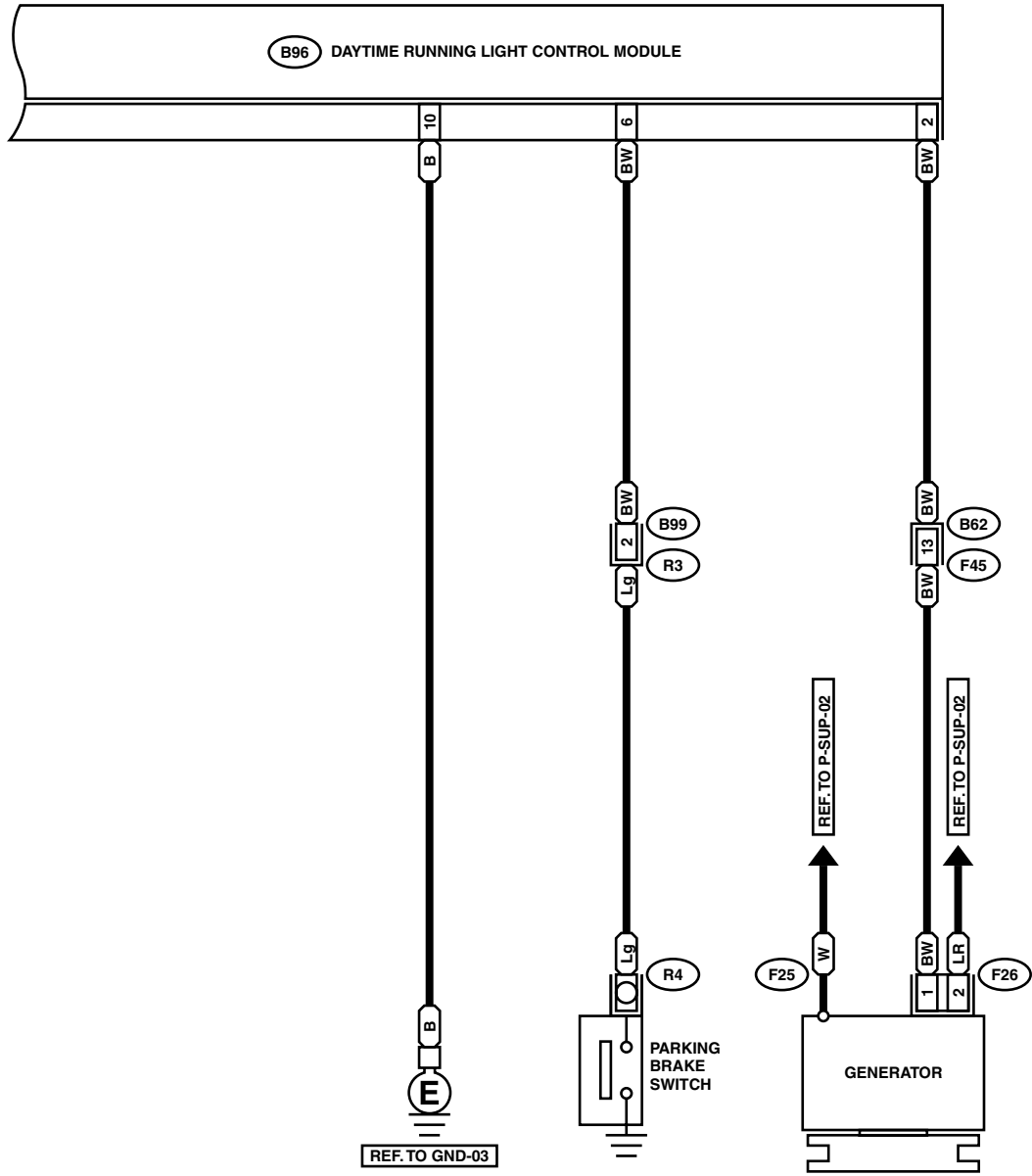
WI-10493

# Headlight System

WIRING SYSTEM

H/L(HID)-03

H/L(HID)-03



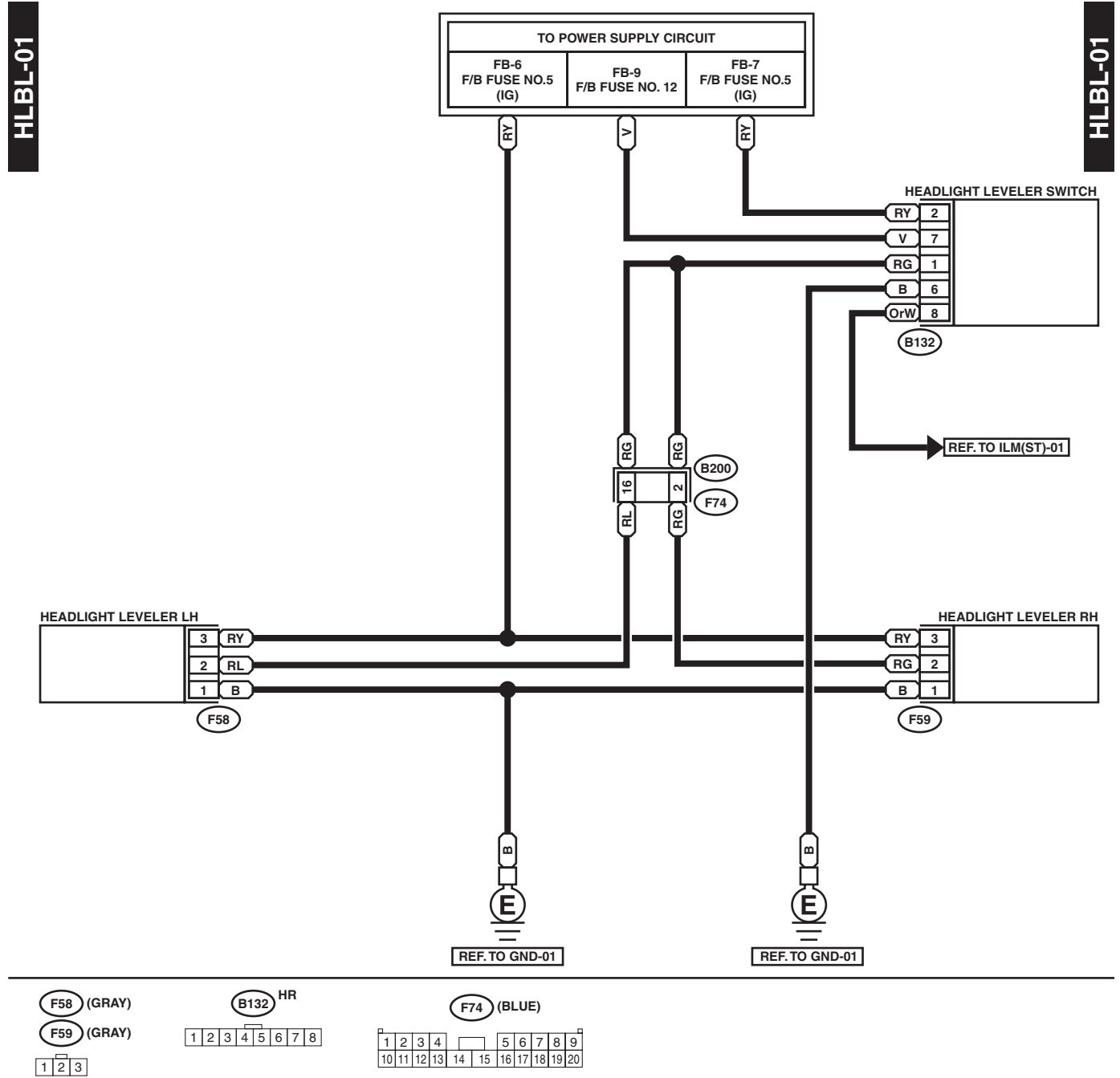
WI-09178

# Headlight Beam Leveler System

WIRING SYSTEM

## 20.Headlight Beam Leveler System

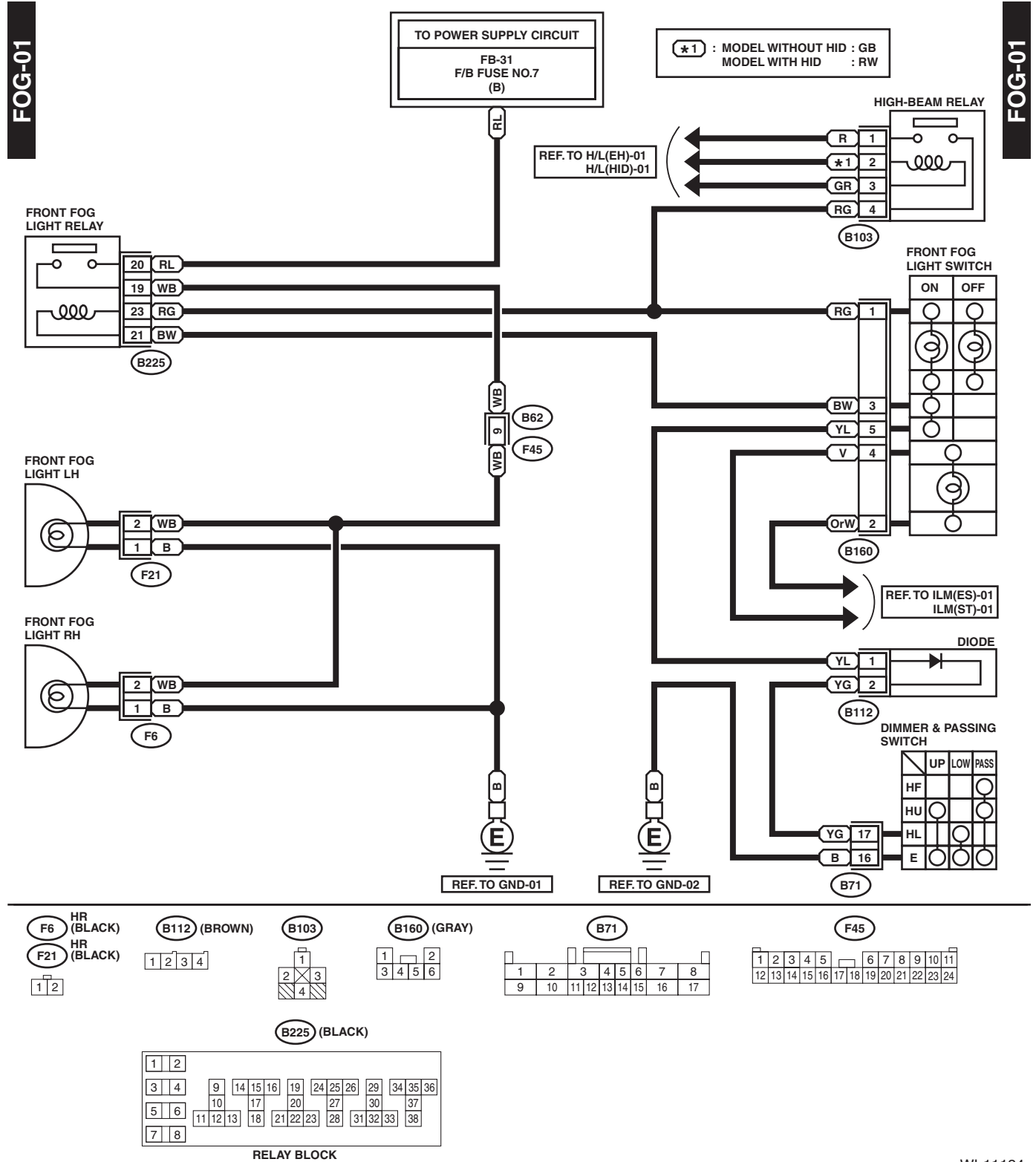
### A: WIRING DIAGRAM



WI-11133

## 21. Front Fog Light System

### A: WIRING DIAGRAM



WI-11134

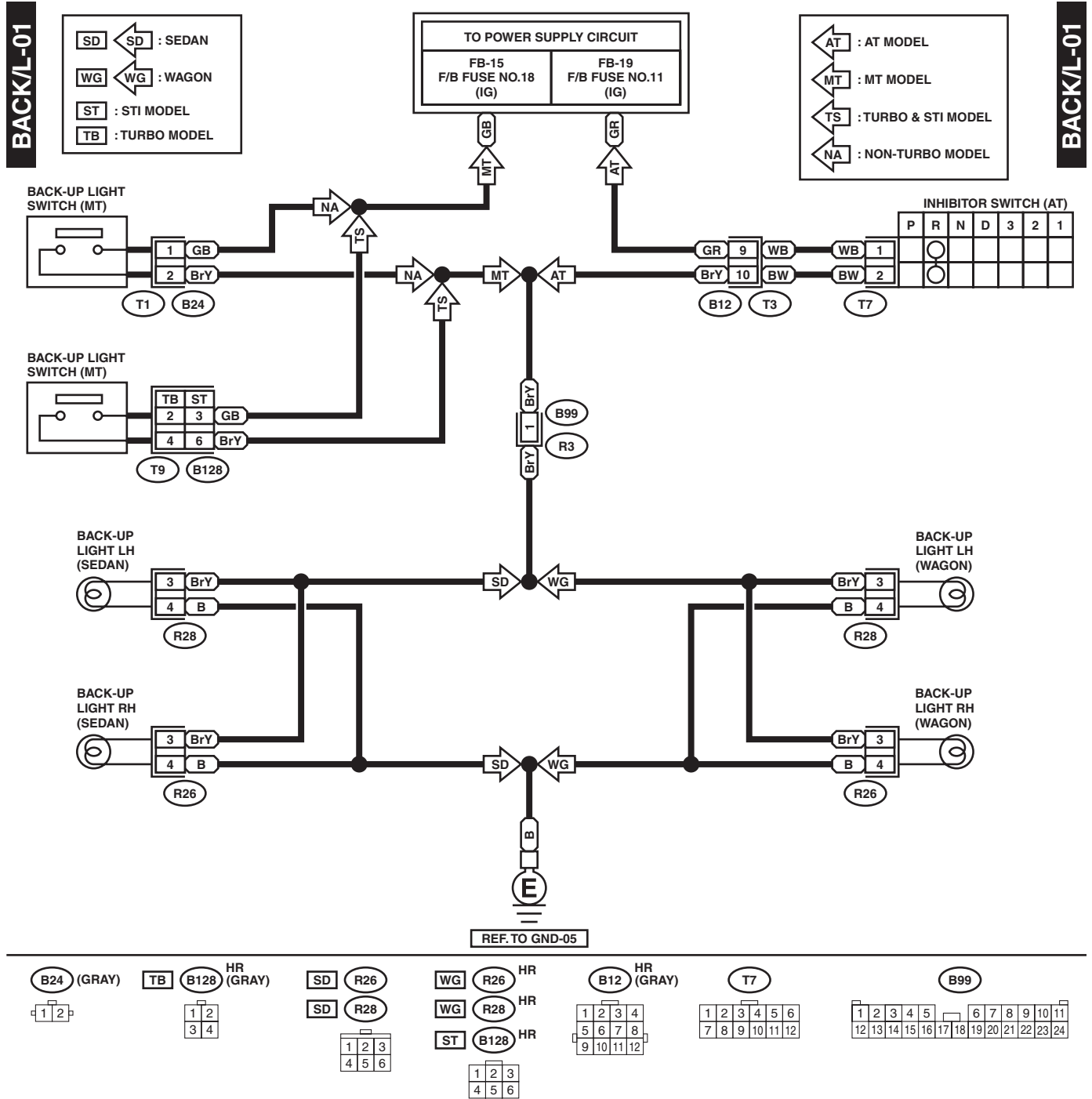


# Back-up Light System

WIRING SYSTEM

## 22. Back-up Light System

### A: WIRING DIAGRAM



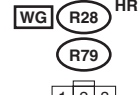
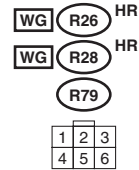
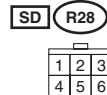
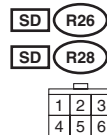
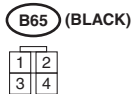
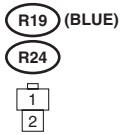
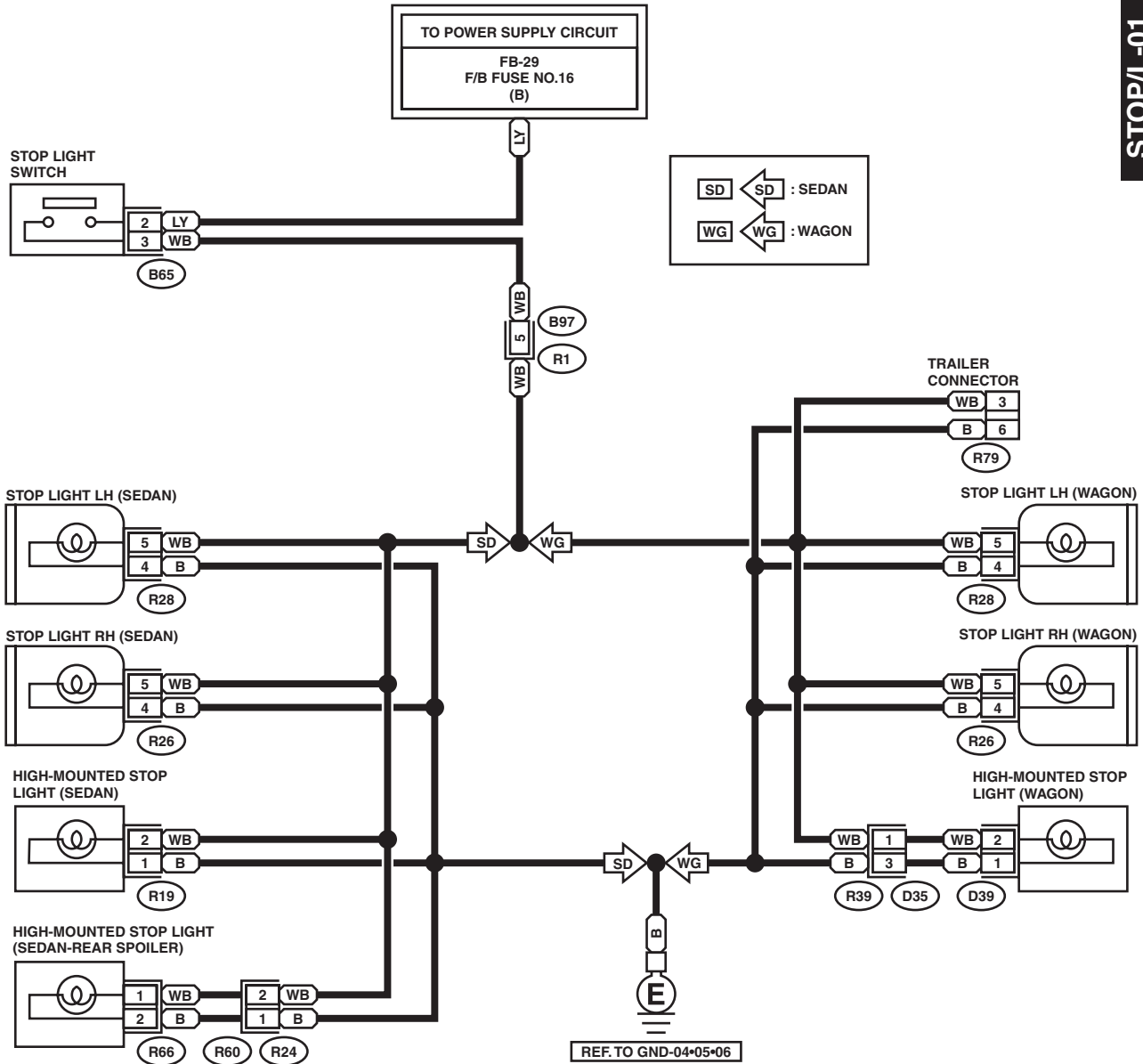
WI-11135

## 23. Stop Light System

### A: WIRING DIAGRAM

STOP/L-01

STOP/L-01



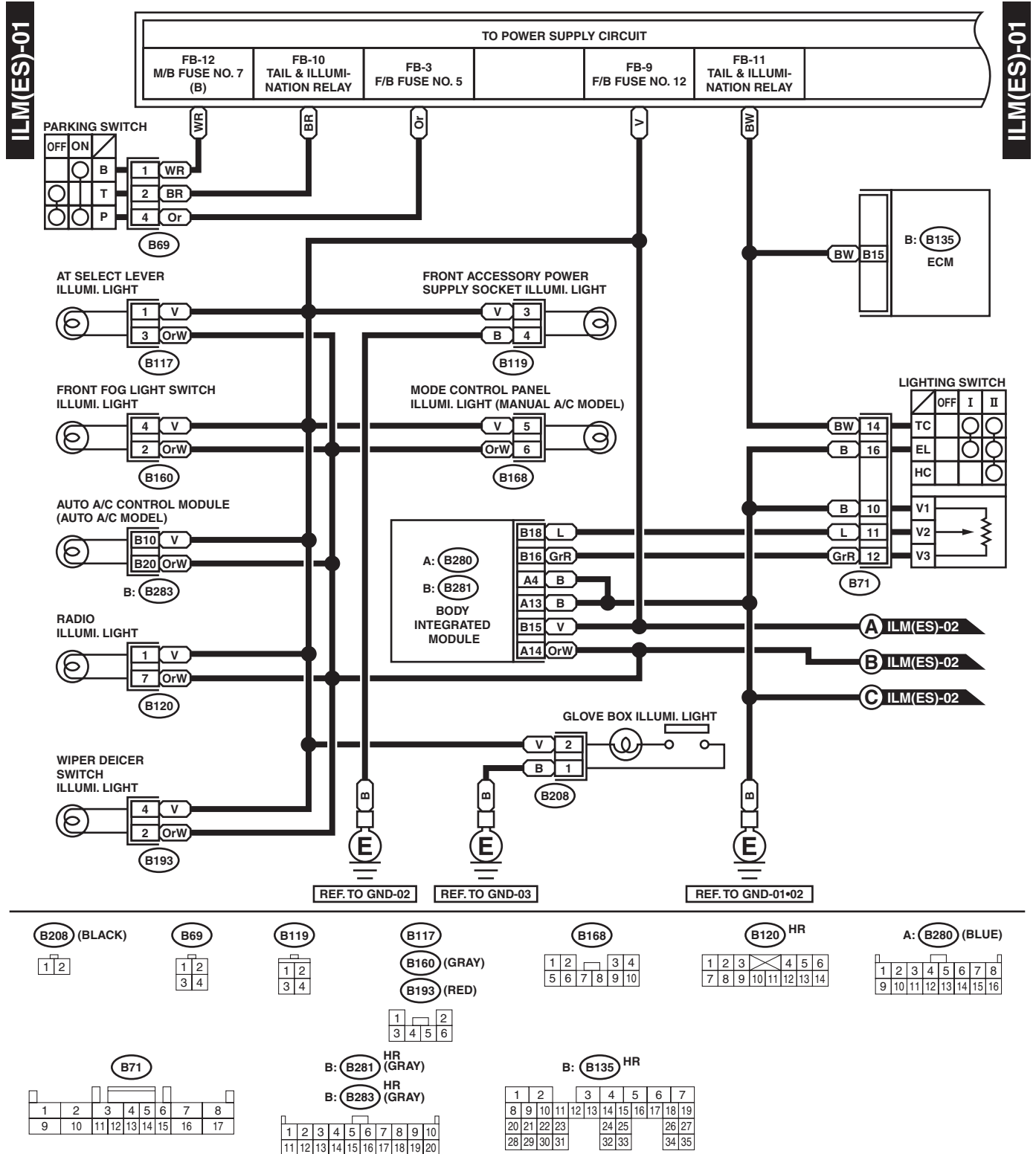
# Clearance Light and Illumination Light System

WIRING SYSTEM

## 24. Clearance Light and Illumination Light System

### A: WIRING DIAGRAM

#### 1. EXCEPT FOR STI MODEL



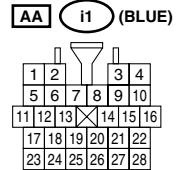
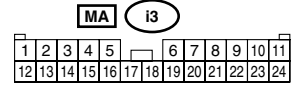
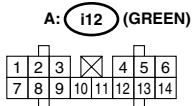
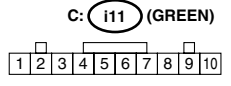
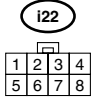
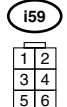
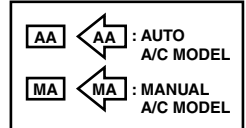
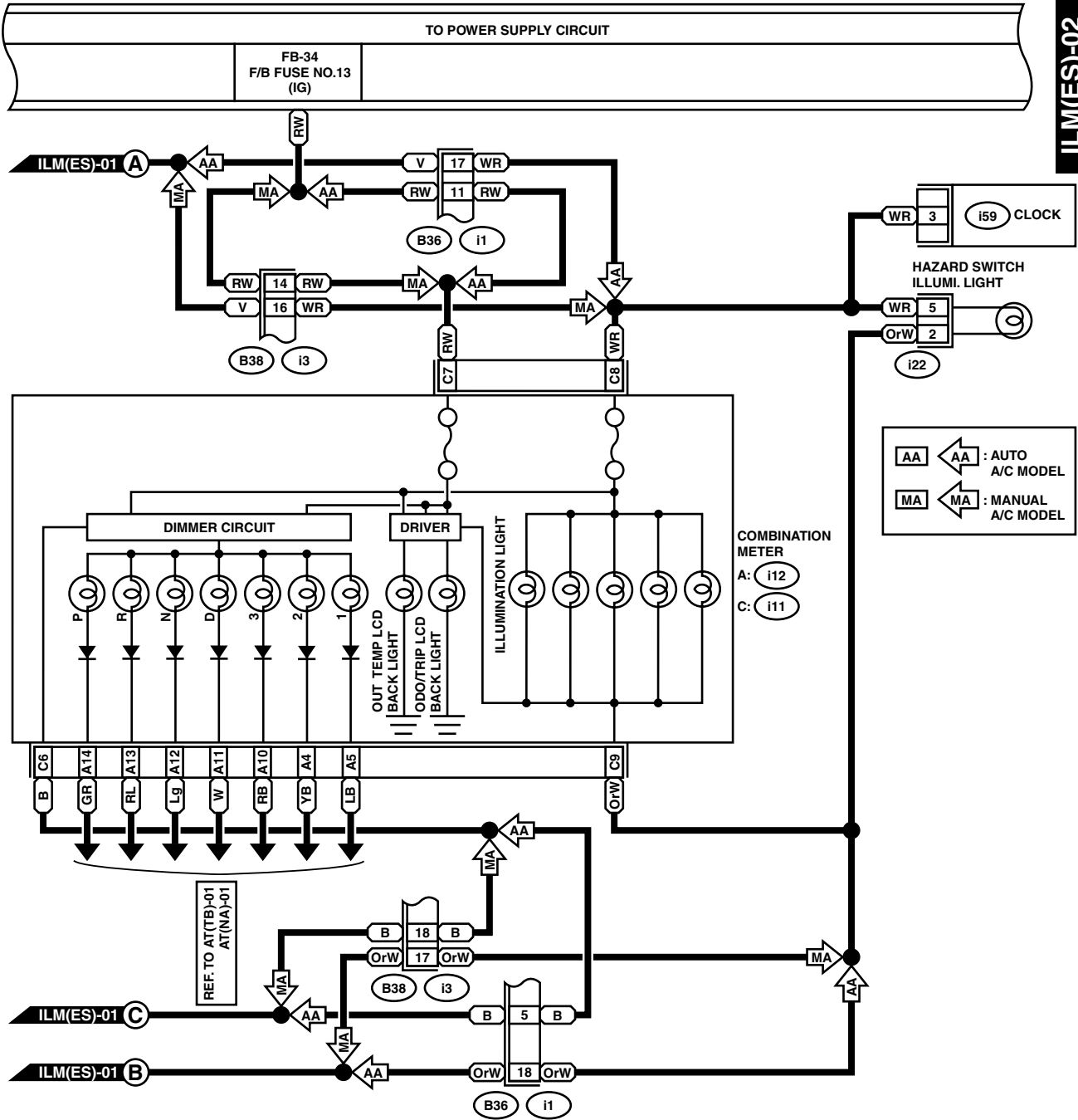
WI-11137

# Clearance Light and Illumination Light System

WIRING SYSTEM

ILM(ES)-02

ILM(ES)-02



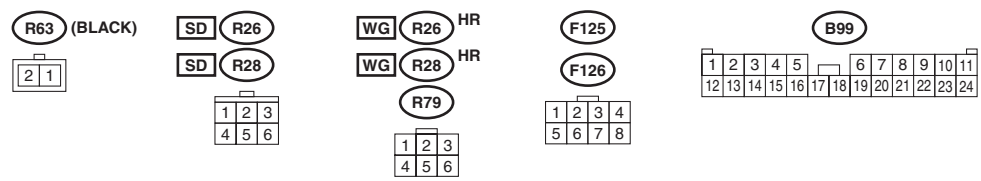
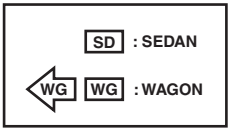
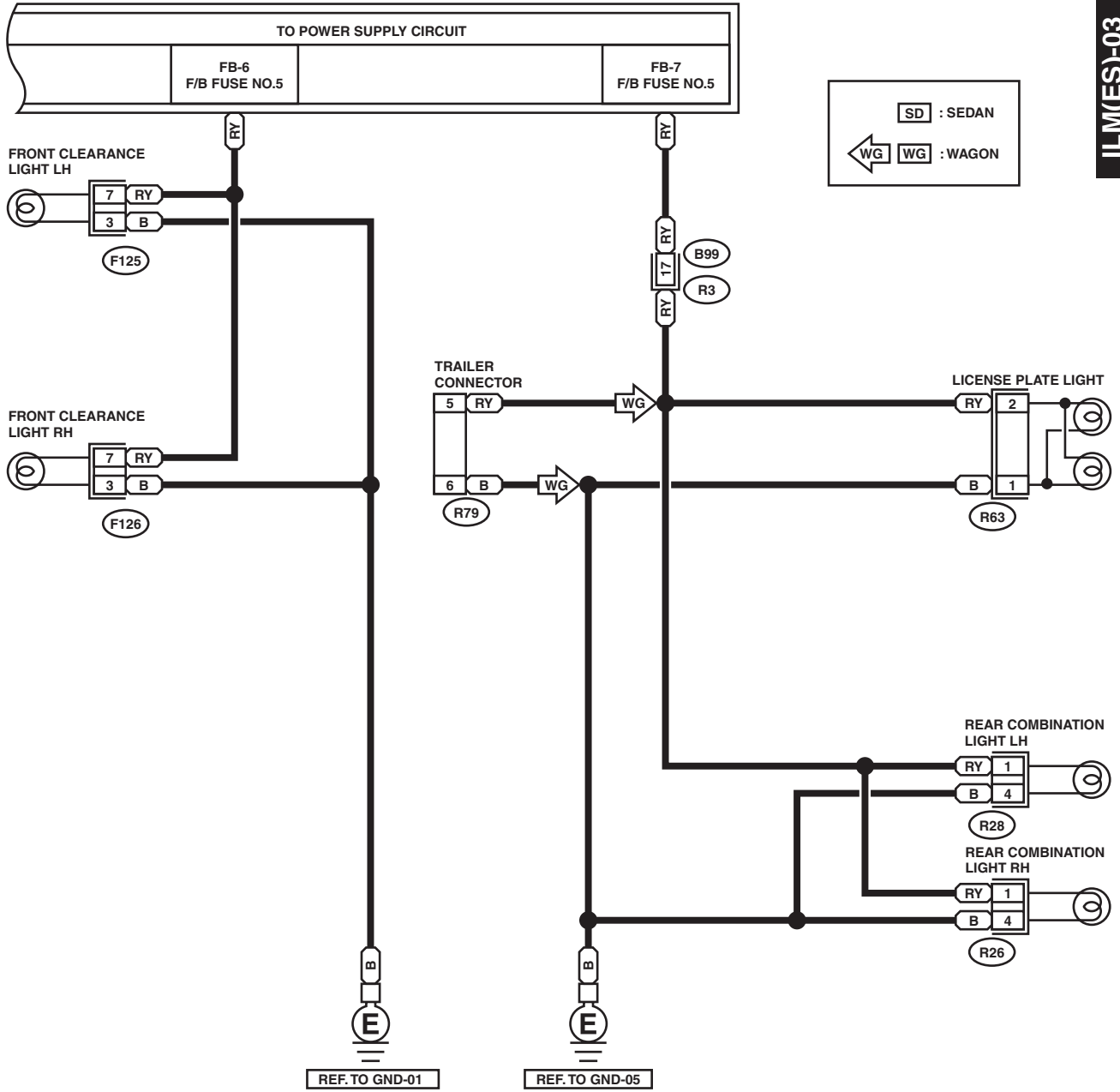
WI-08972

# Clearance Light and Illumination Light System

WIRING SYSTEM

ILM(ES)-03

ILM(ES)-03

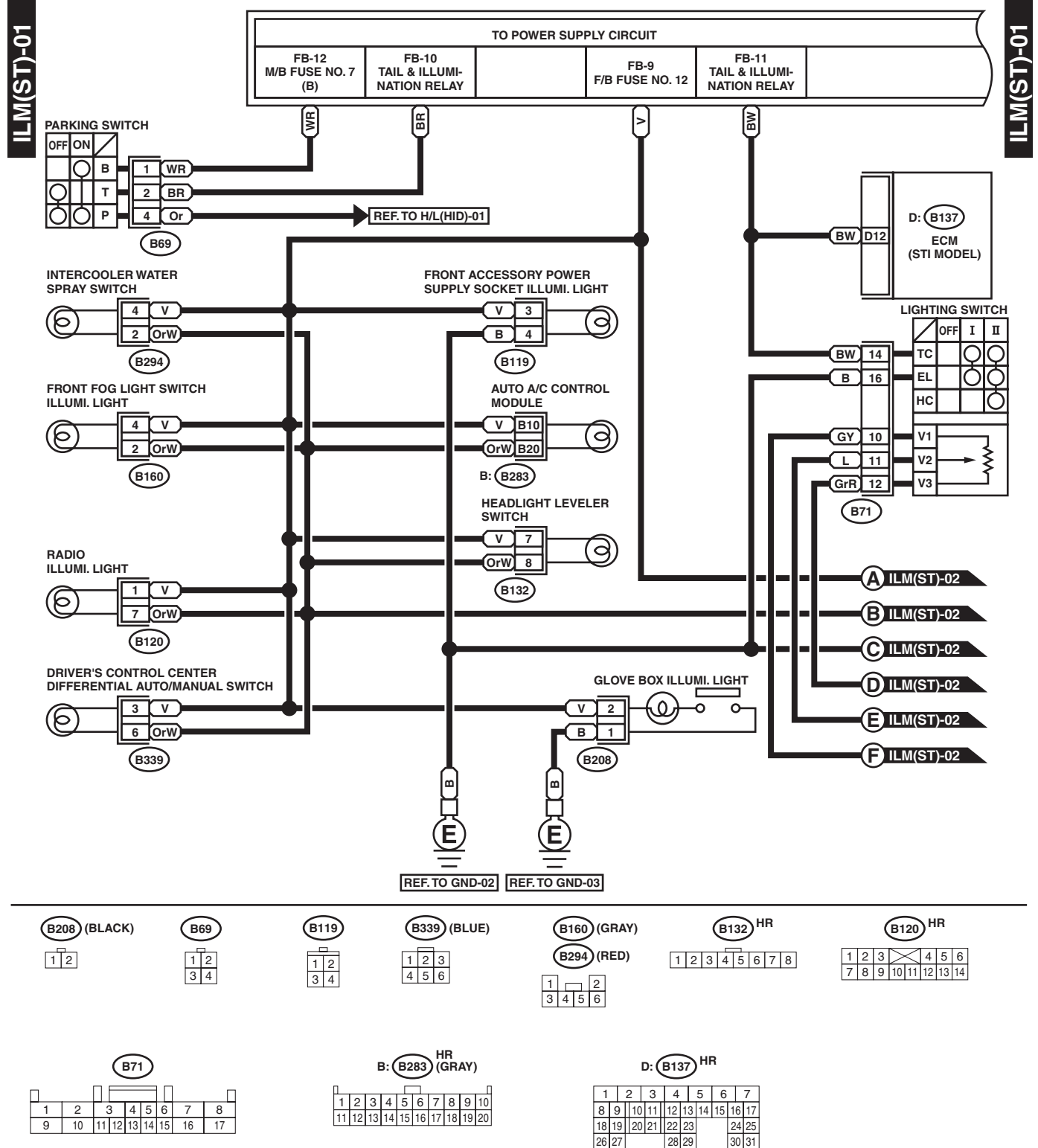


WI-11138

# Clearance Light and Illumination Light System

WIRING SYSTEM

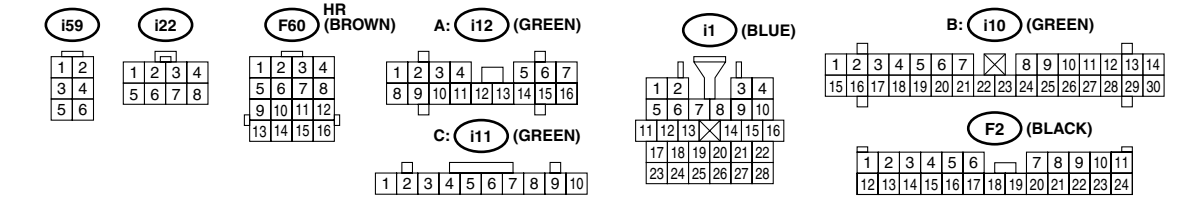
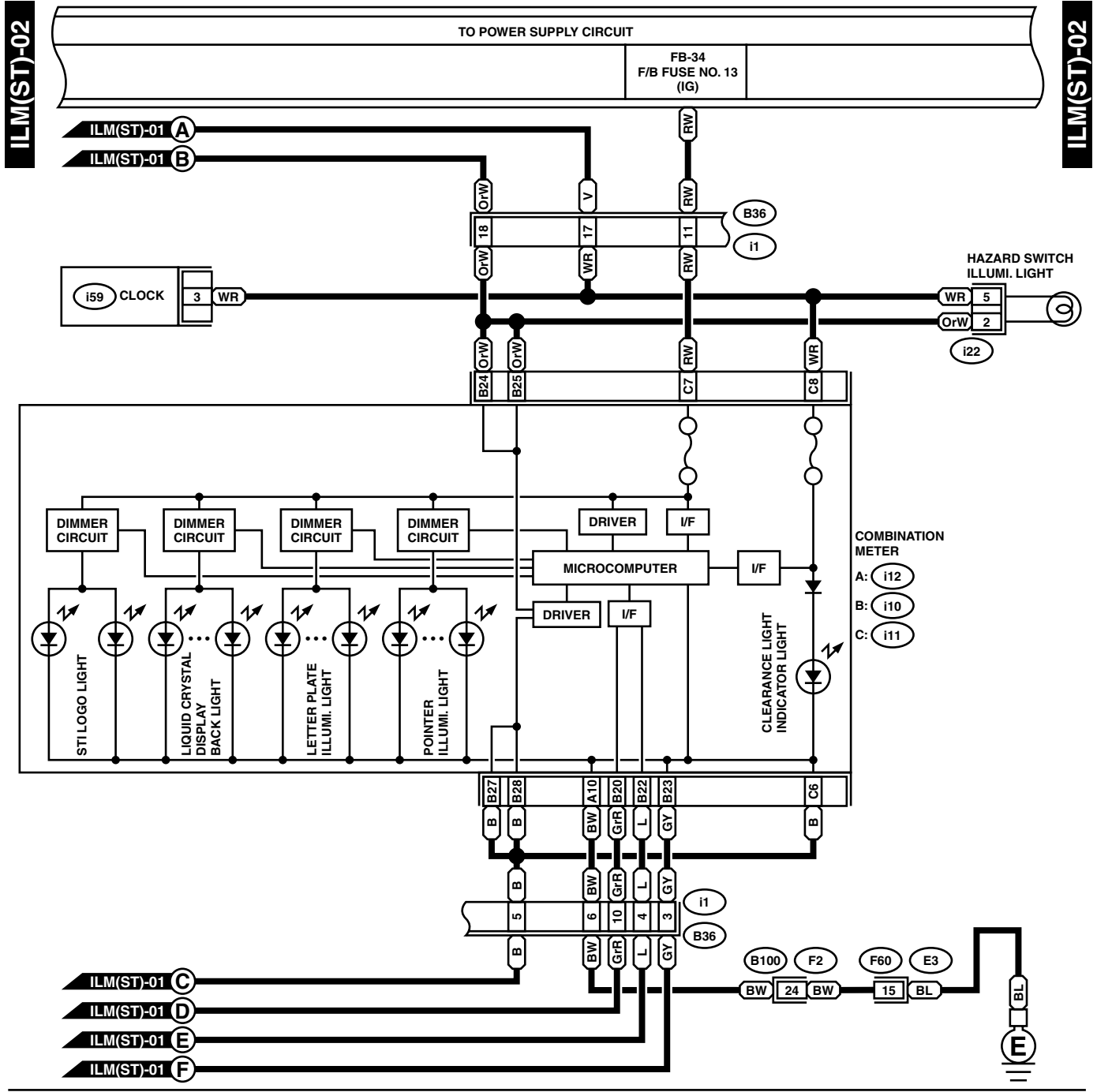
## 2. STI MODEL



WI-11139

# Clearance Light and Illumination Light System

WIRING SYSTEM



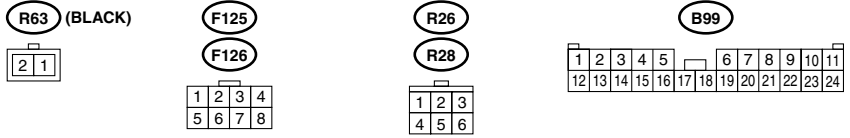
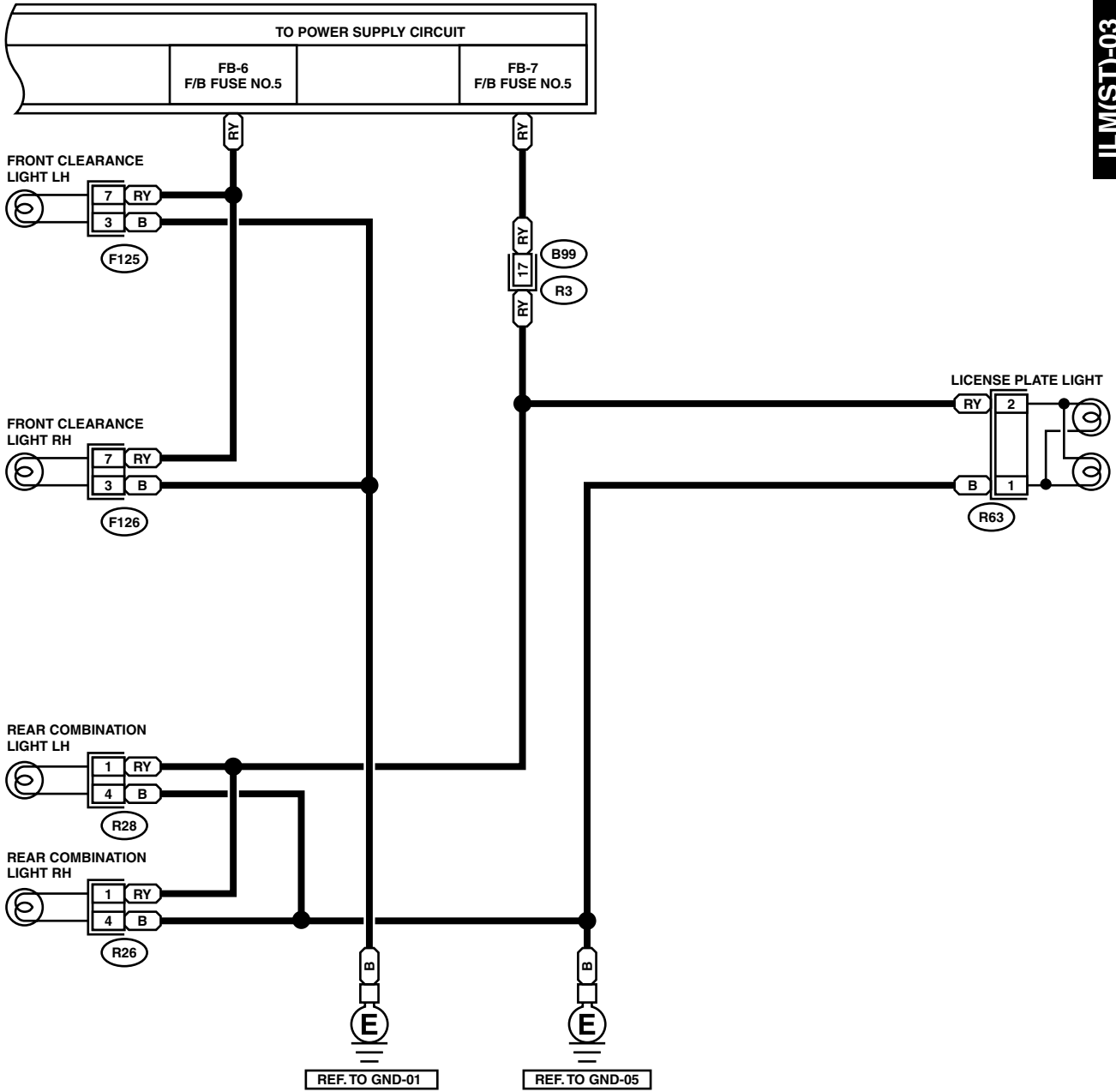
WI-08975

# Clearance Light and Illumination Light System

WIRING SYSTEM

ILM(ST)-03

ILM(ST)-03



WI-08976



# Turn Signal Light and Hazard Light System

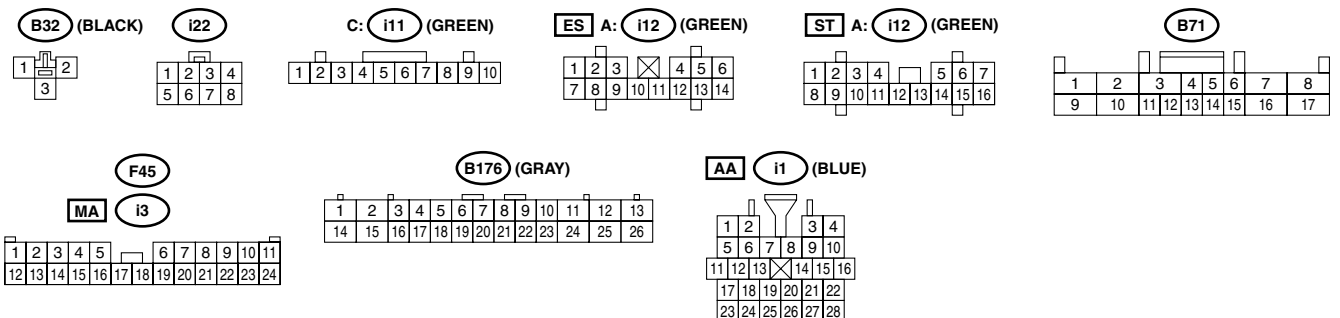
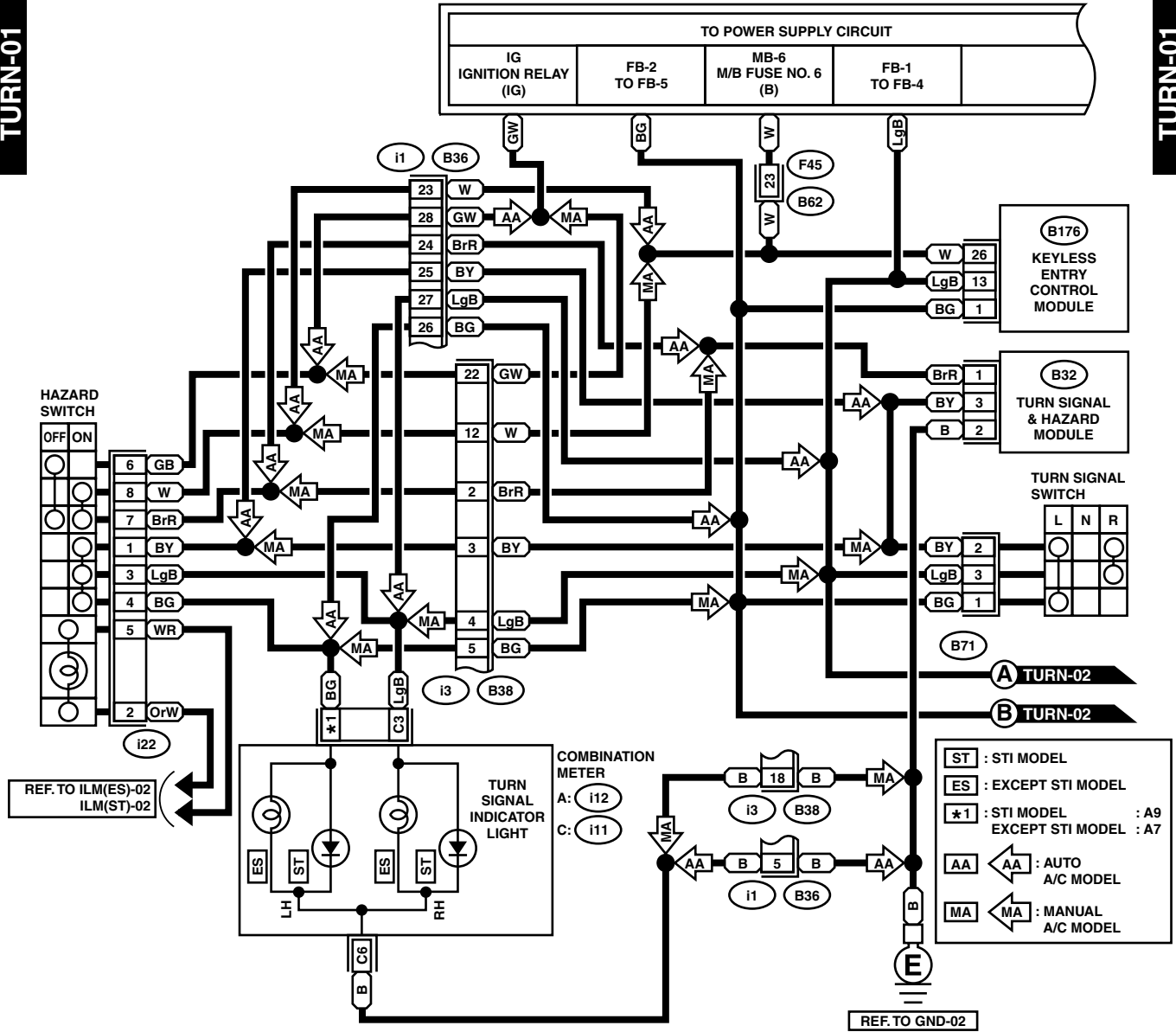
WIRING SYSTEM

## 25. Turn Signal Light and Hazard Light System

### A: WIRING DIAGRAM

TURN-01

TURN-01



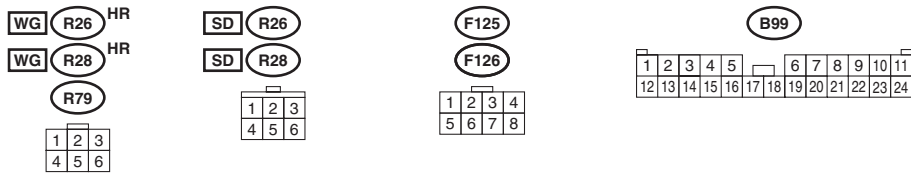
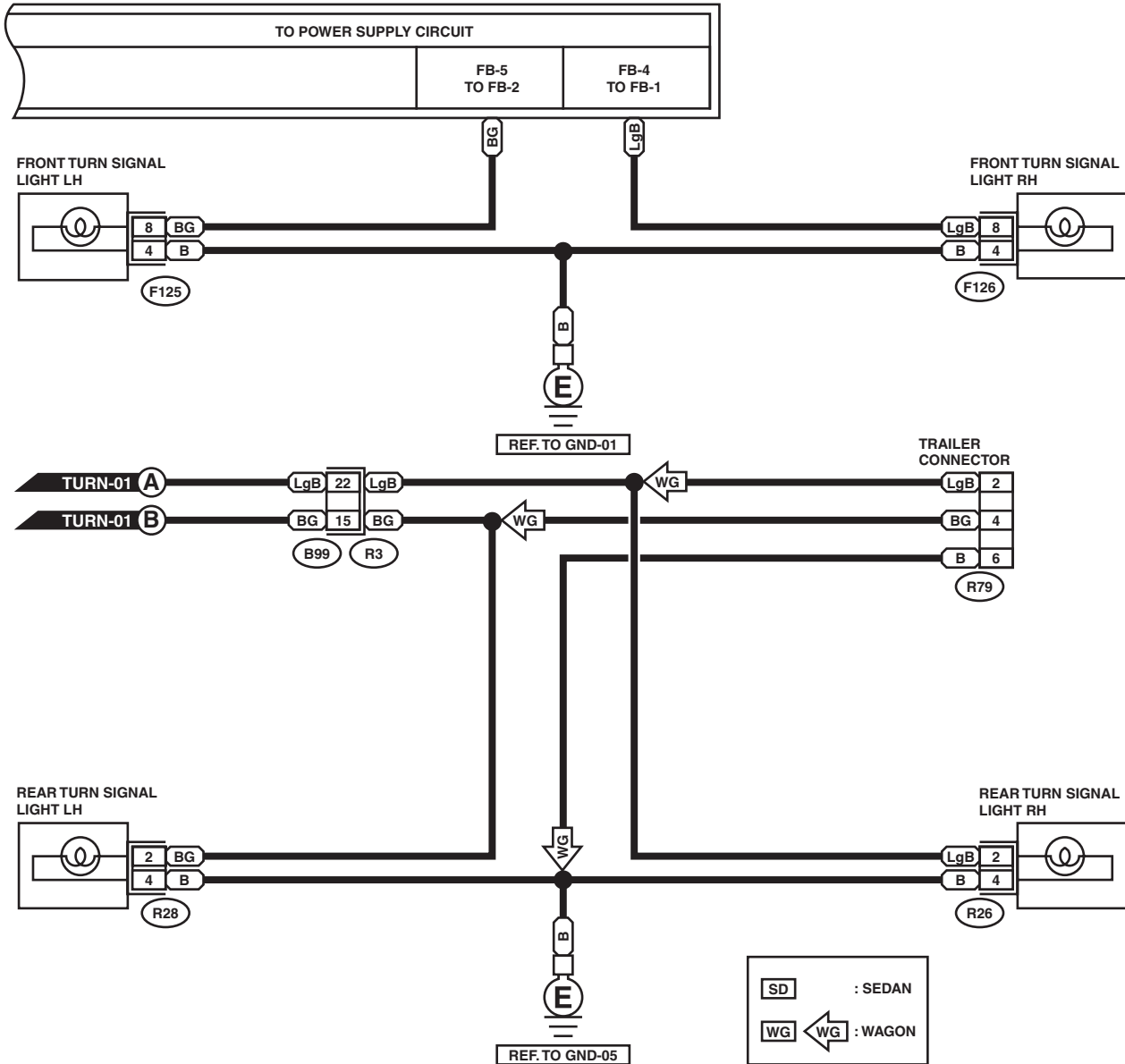
WI-08977

# Turn Signal Light and Hazard Light System

WIRING SYSTEM

TURN-02

TURN-02



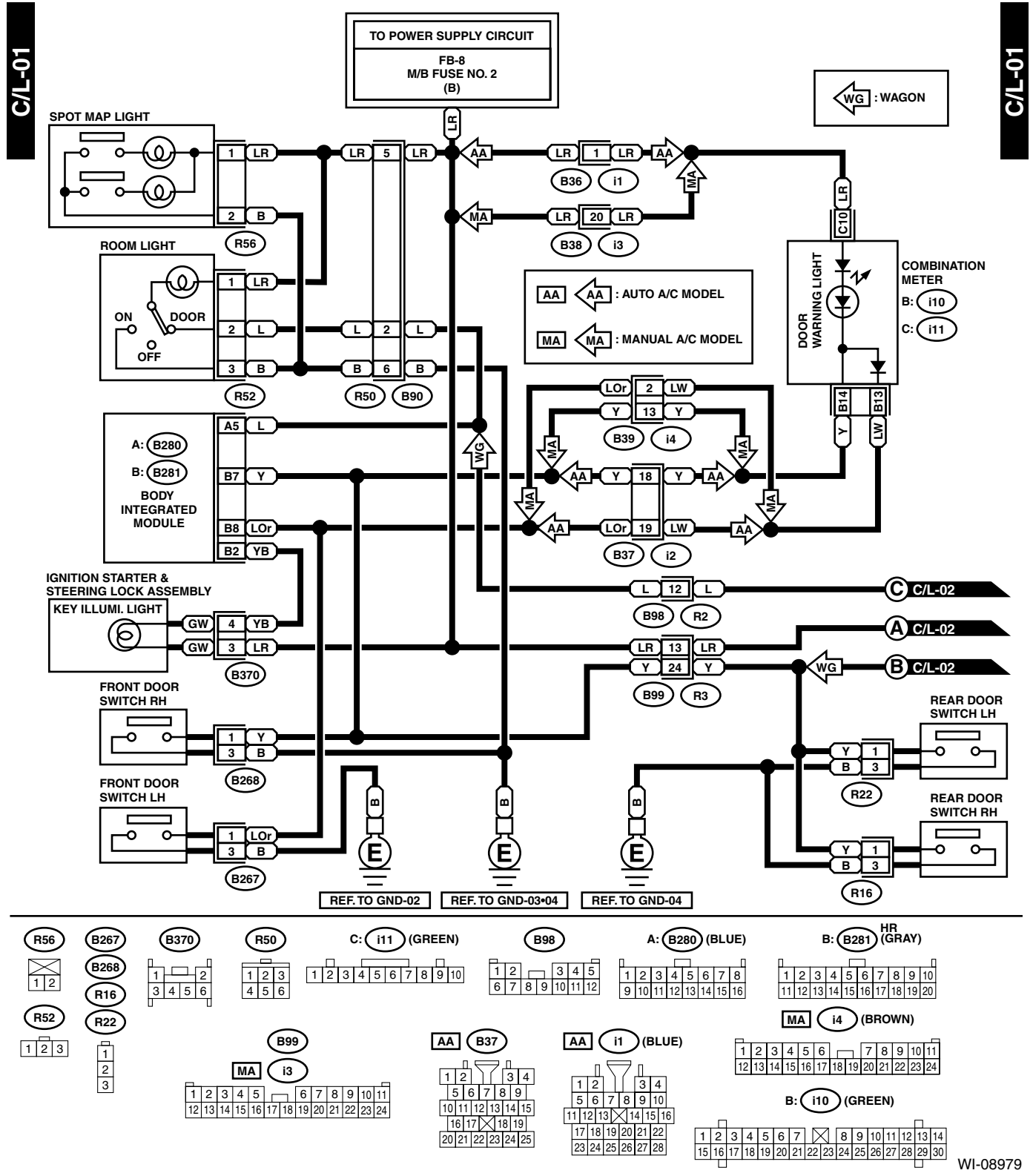
WI-11140

# Interior Light System

WIRING SYSTEM

## 26. Interior Light System

### A: WIRING DIAGRAM



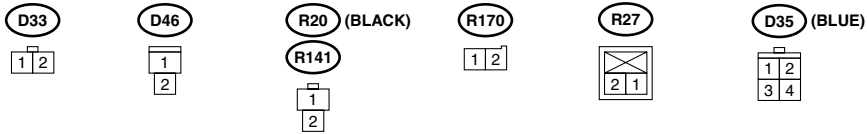
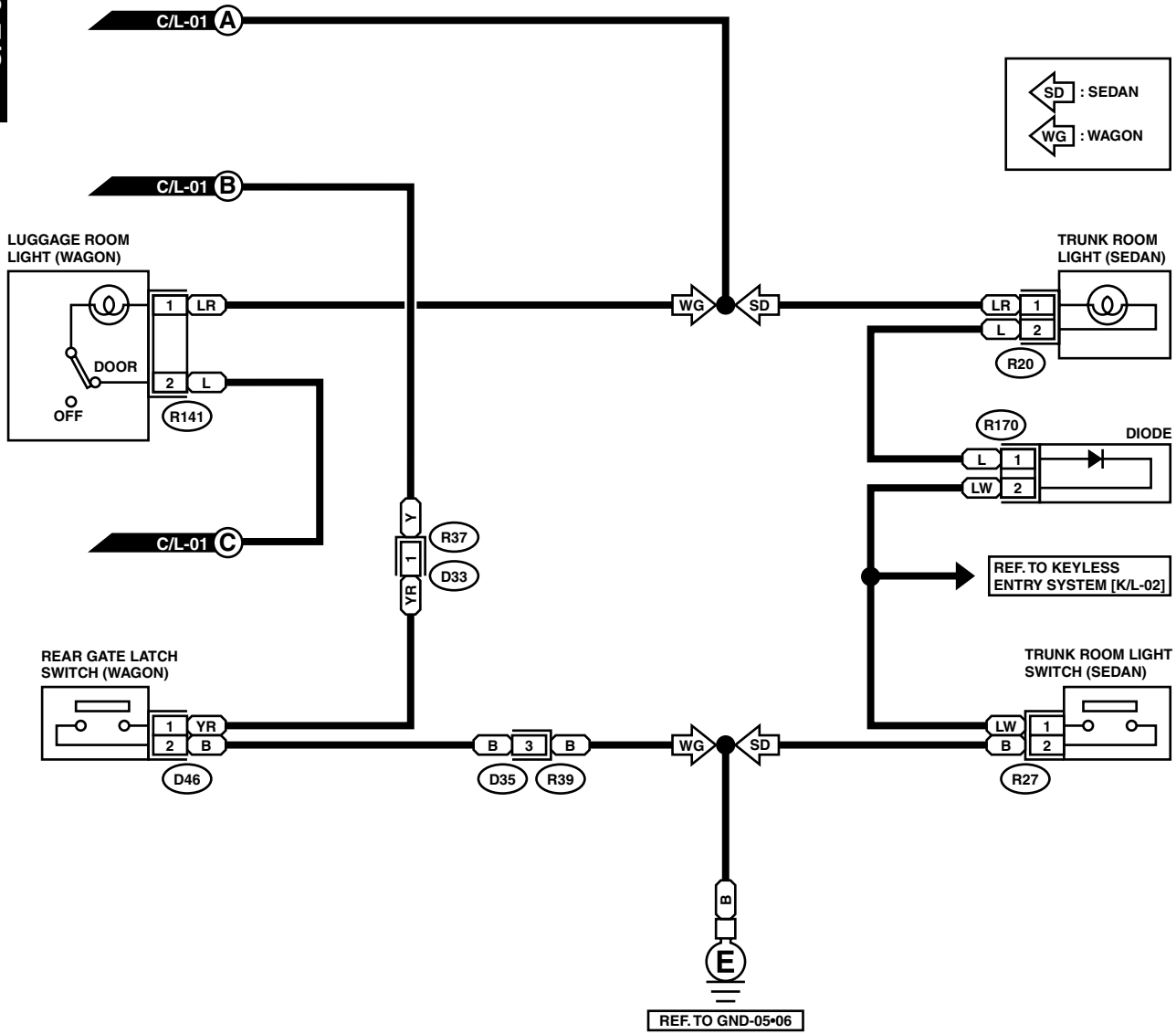
WI-08979

# Interior Light System

WIRING SYSTEM

C/L-02

C/L-02



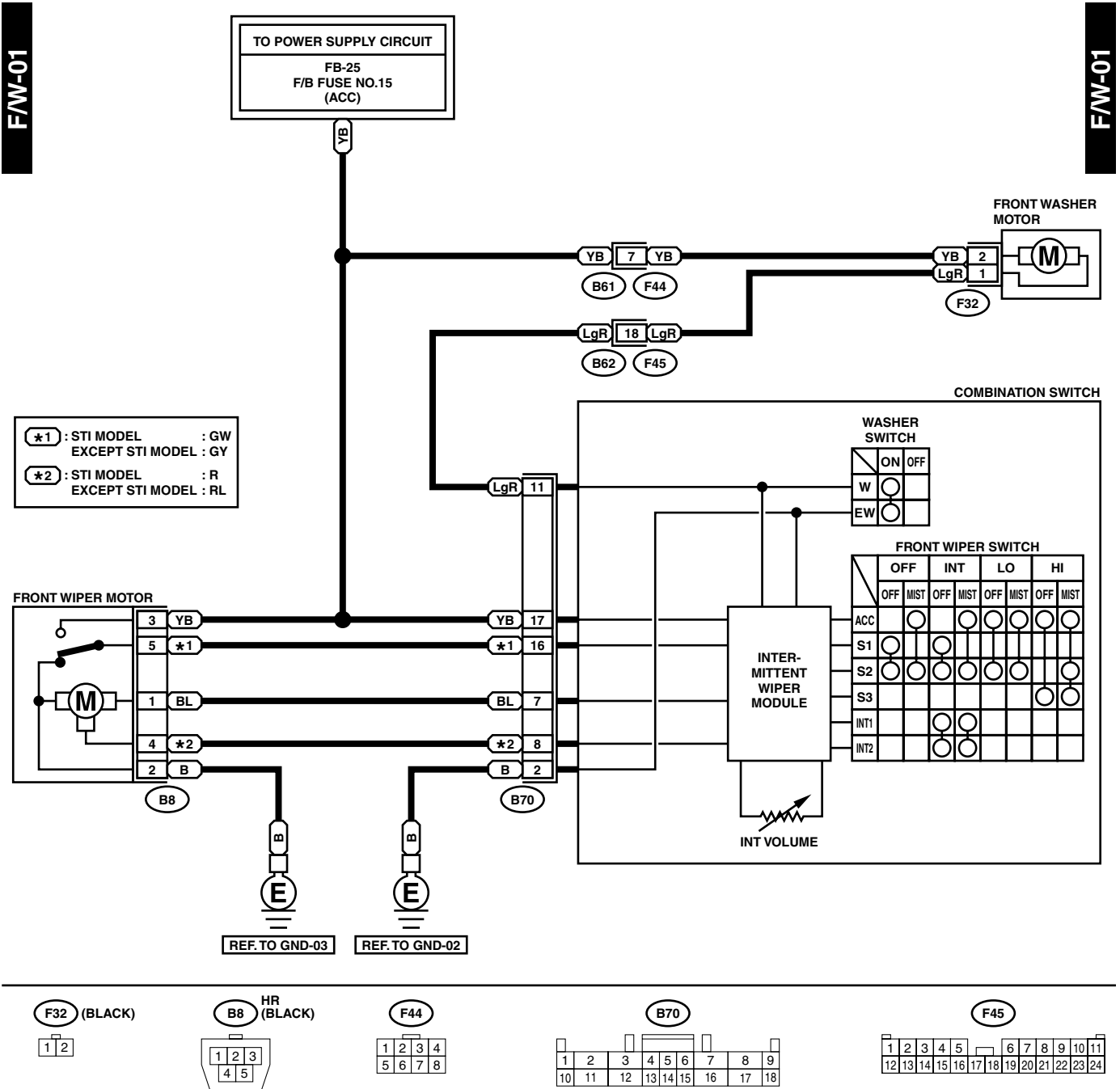
WI-10508

# Front Wiper and Washer System

WIRING SYSTEM

## 27. Front Wiper and Washer System

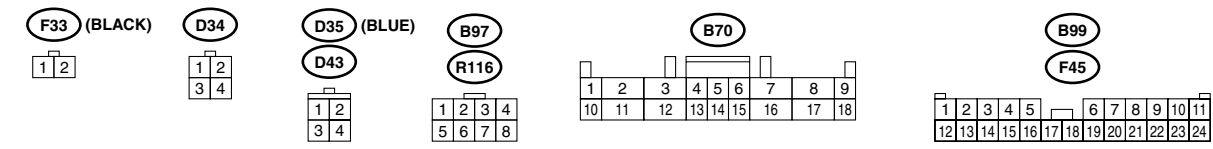
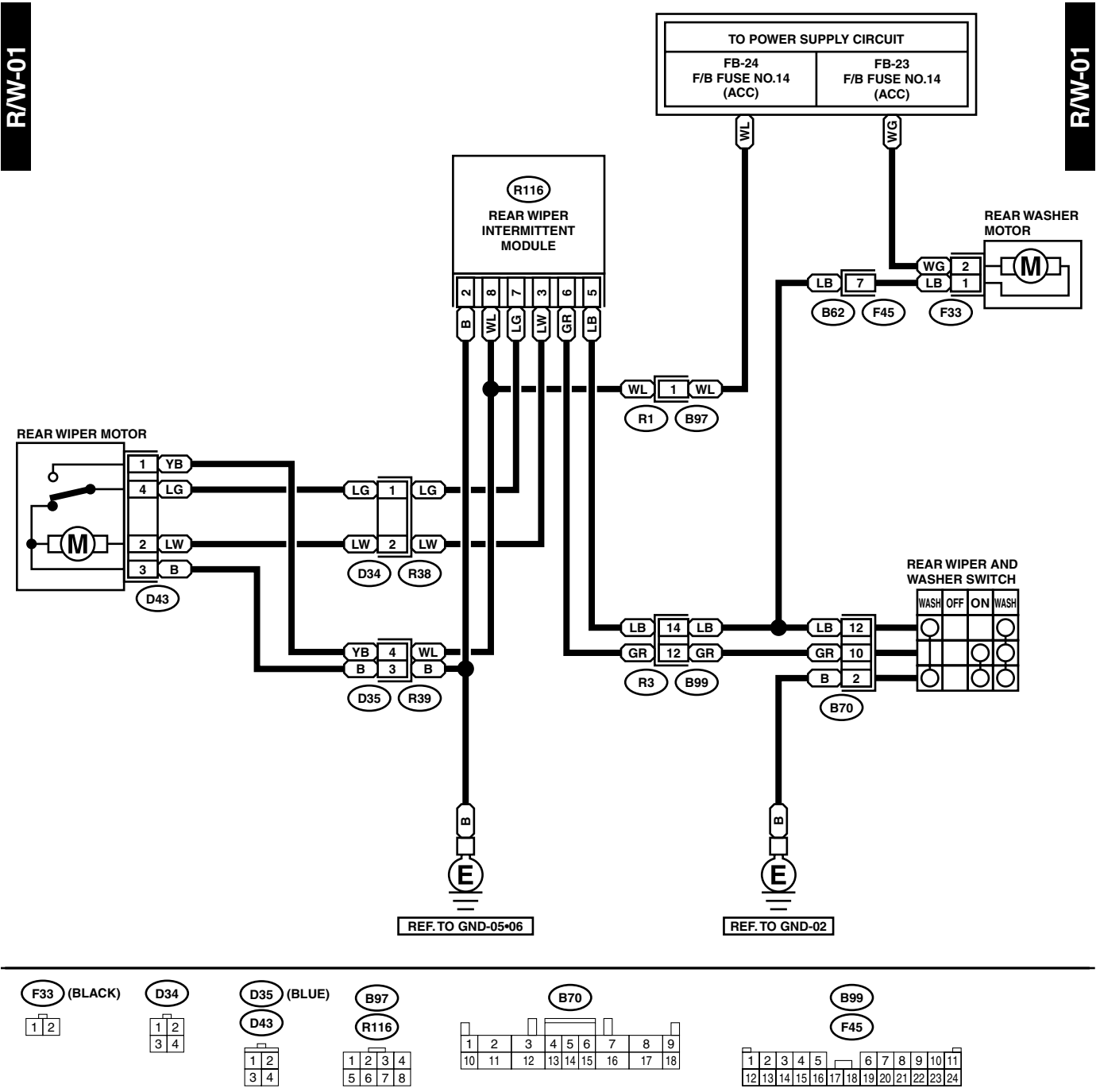
### A: WIRING DIAGRAM



WI-08981

## 28.Rear Wiper and Washer System

### A: WIRING DIAGRAM

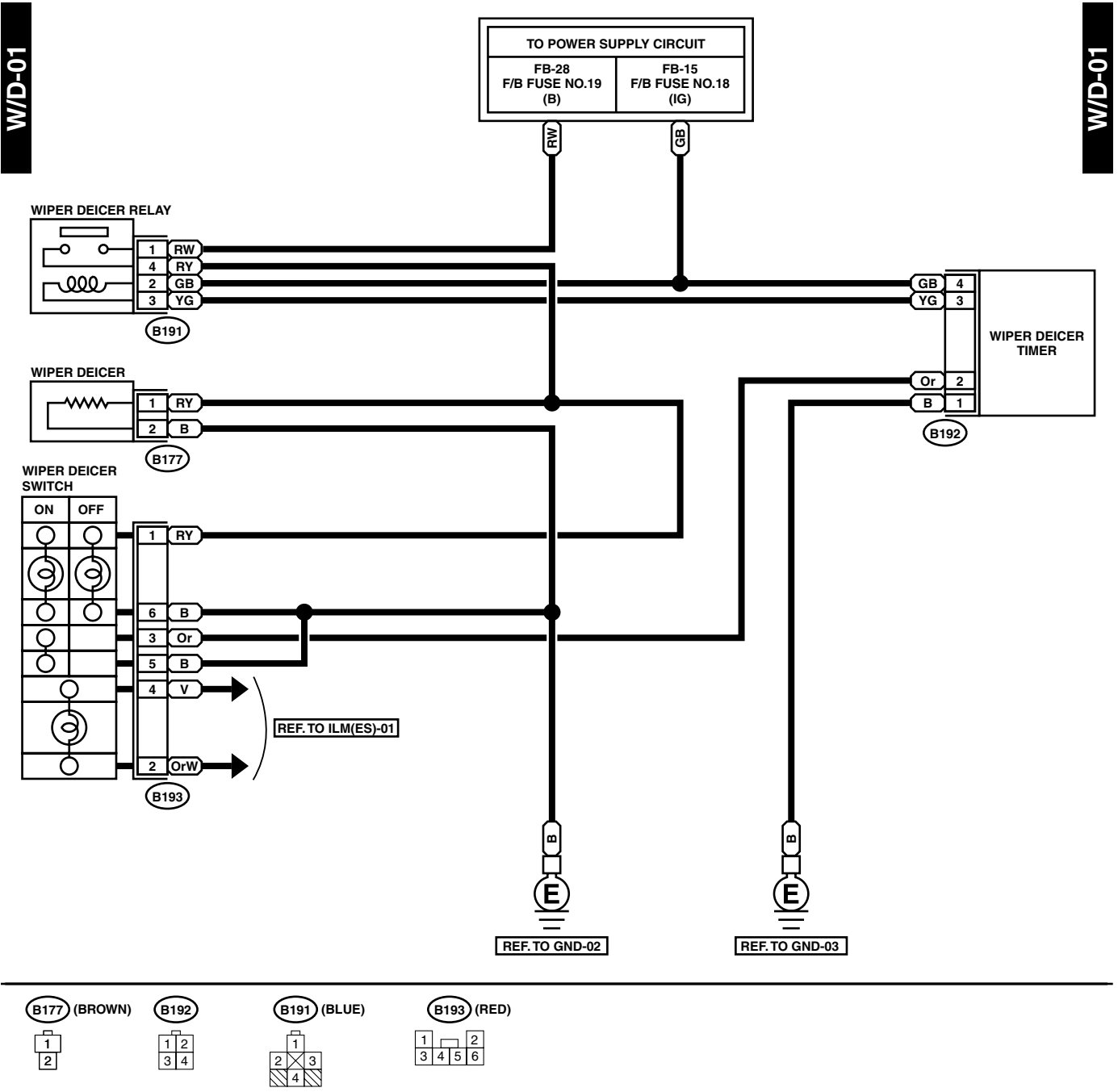


# Wiper Deicer System

WIRING SYSTEM

## 29. Wiper Deicer System

### A: WIRING DIAGRAM



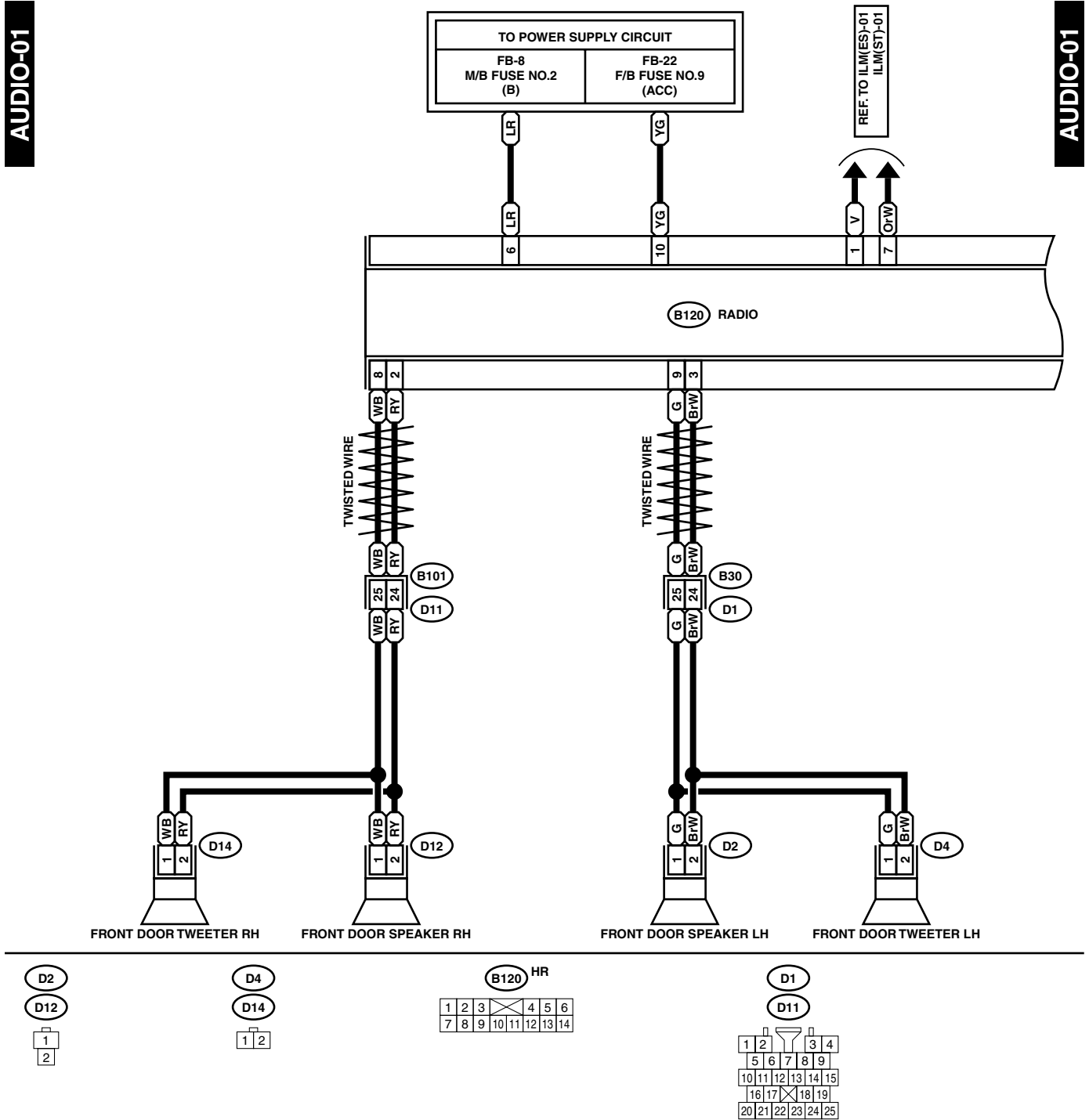
WI-08983

## 30. Audio System

### A: WIRING DIAGRAM

AUDIO-01

AUDIO-01

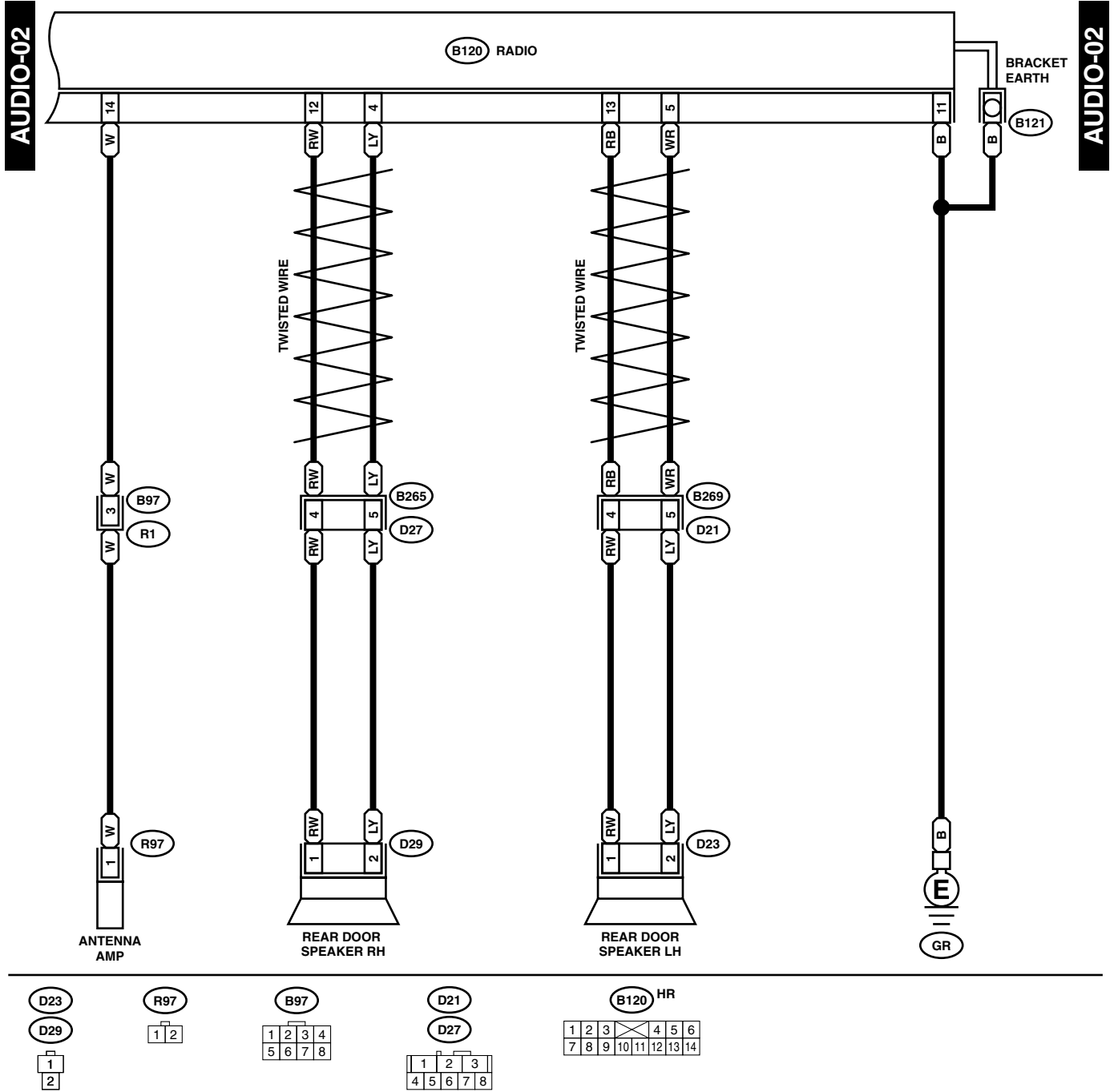


WI-08984



# Audio System

## WIRING SYSTEM



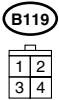
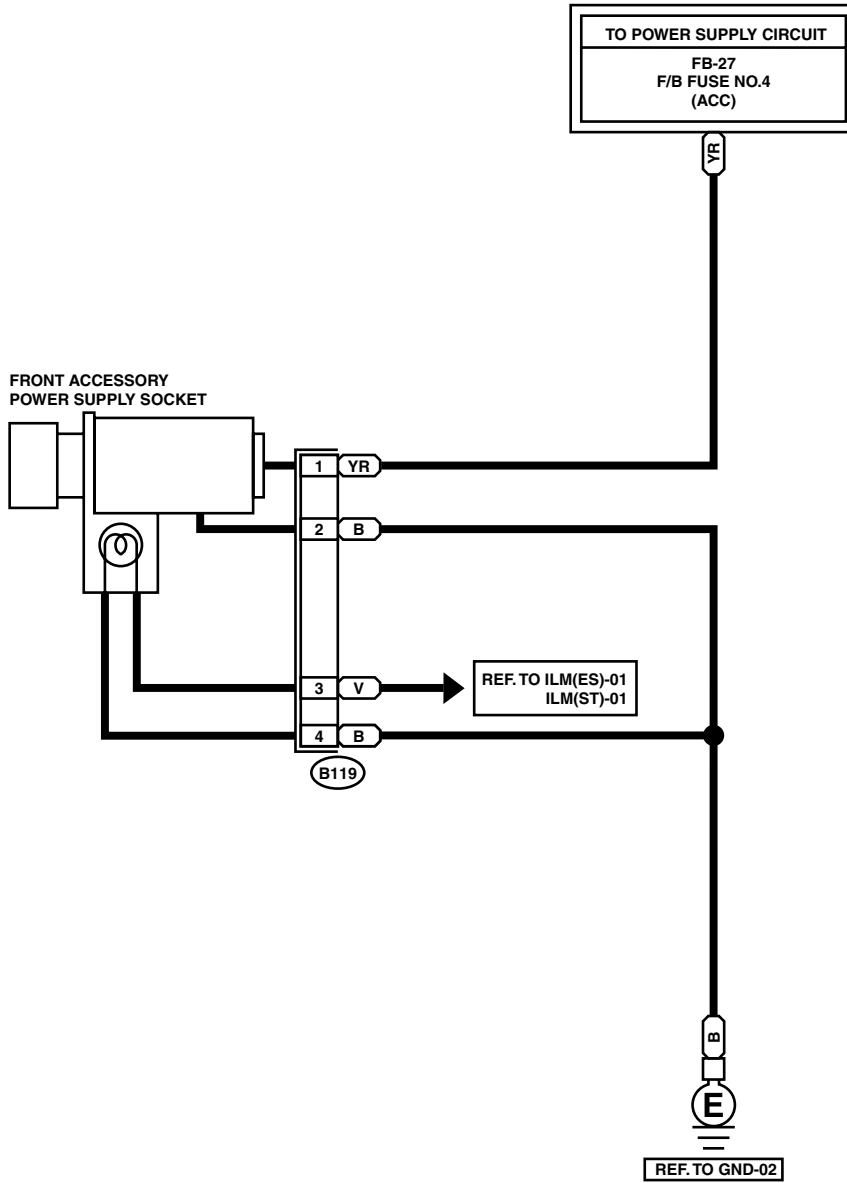
WI-08985

# 31.Front Accessory Power Supply Socket System

## A: WIRING DIAGRAM

FAPS-01

FAPS-01



# Rear Accessory Power Supply Socket System

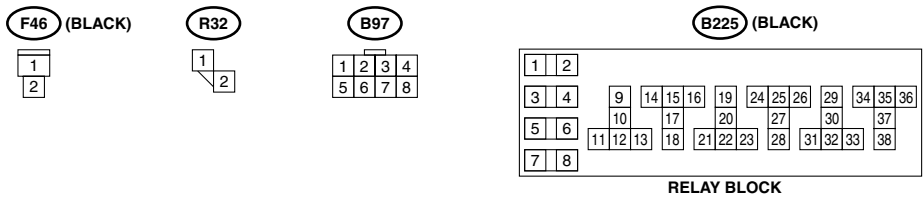
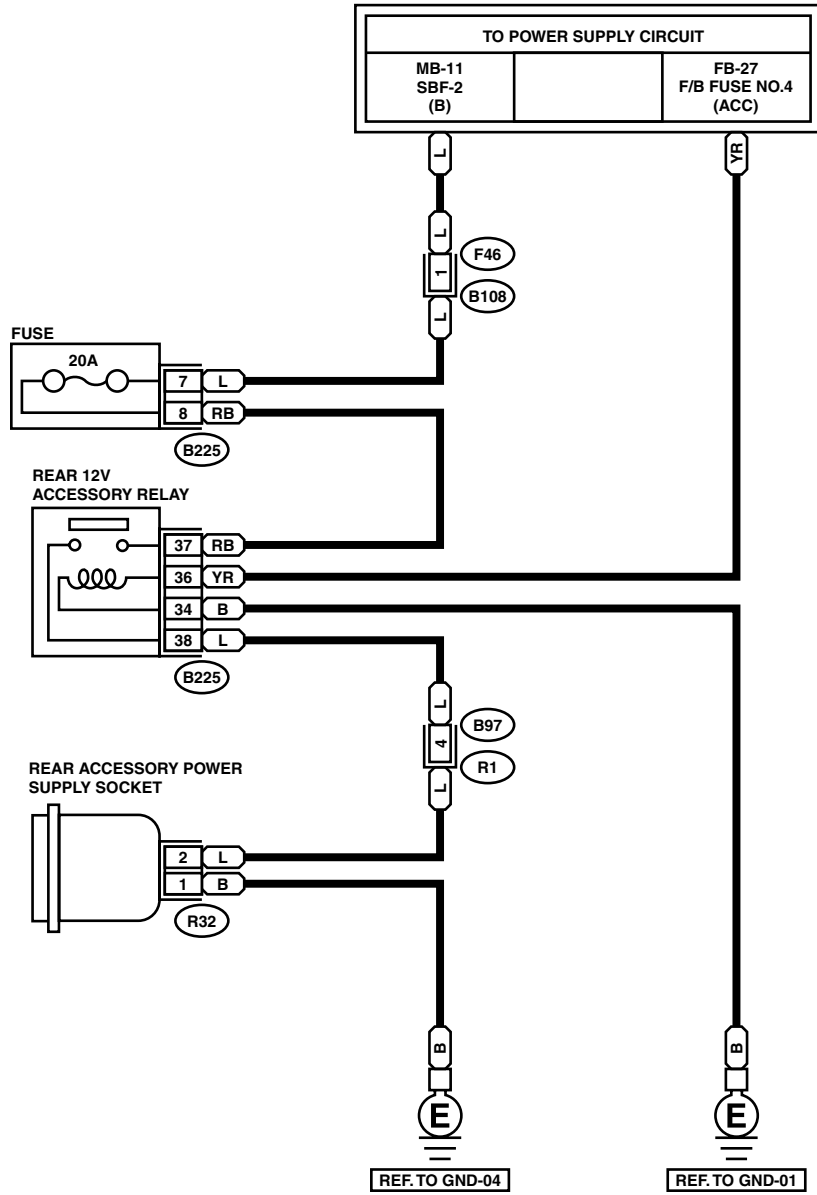
WIRING SYSTEM

## 32.Rear Accessory Power Supply Socket System

### A: WIRING DIAGRAM

RAPS-01

RAPS-01



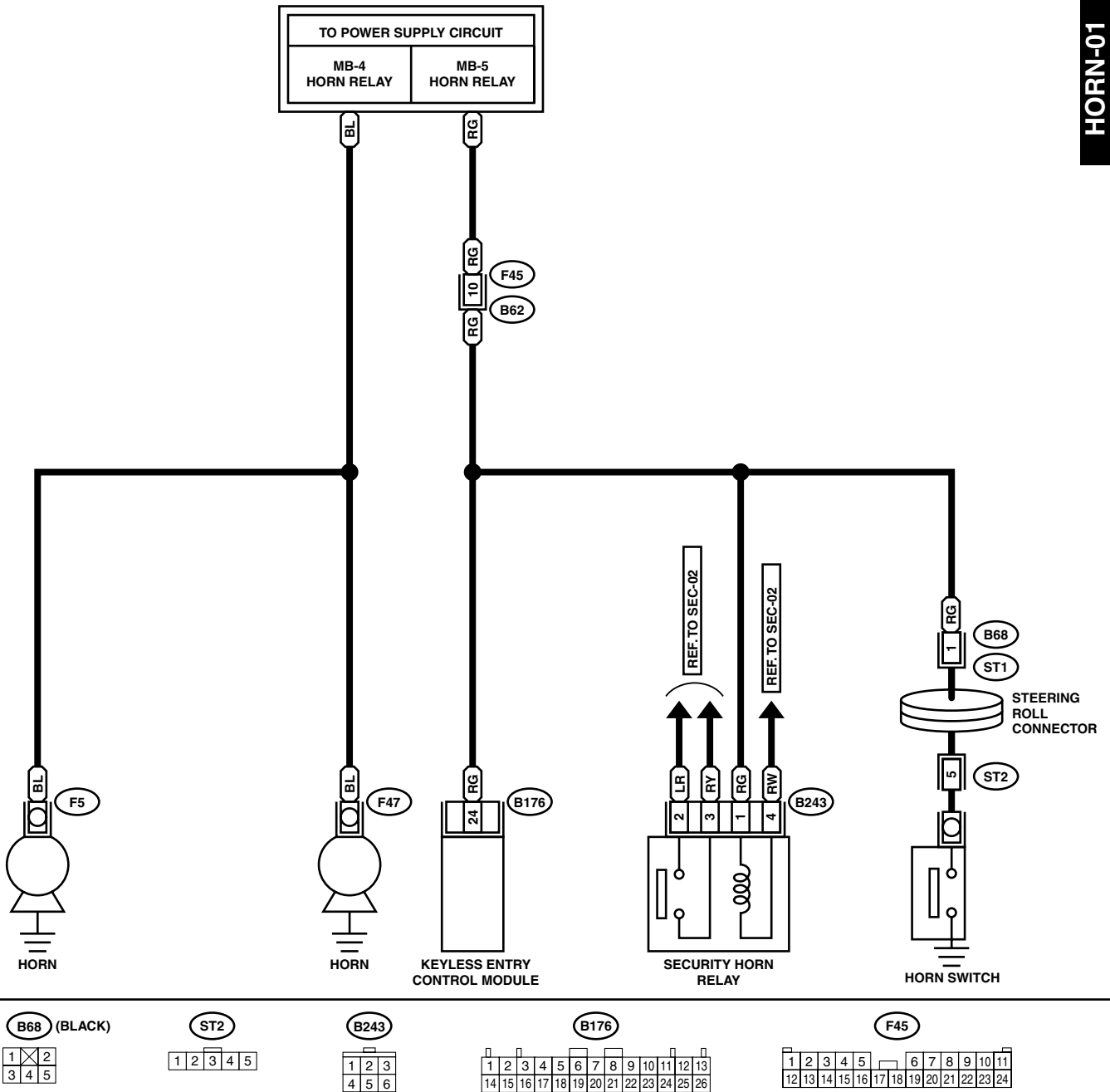
WI-08987

## 33.Horn System

### A: WIRING DIAGRAM

HORN-01

HORN-01

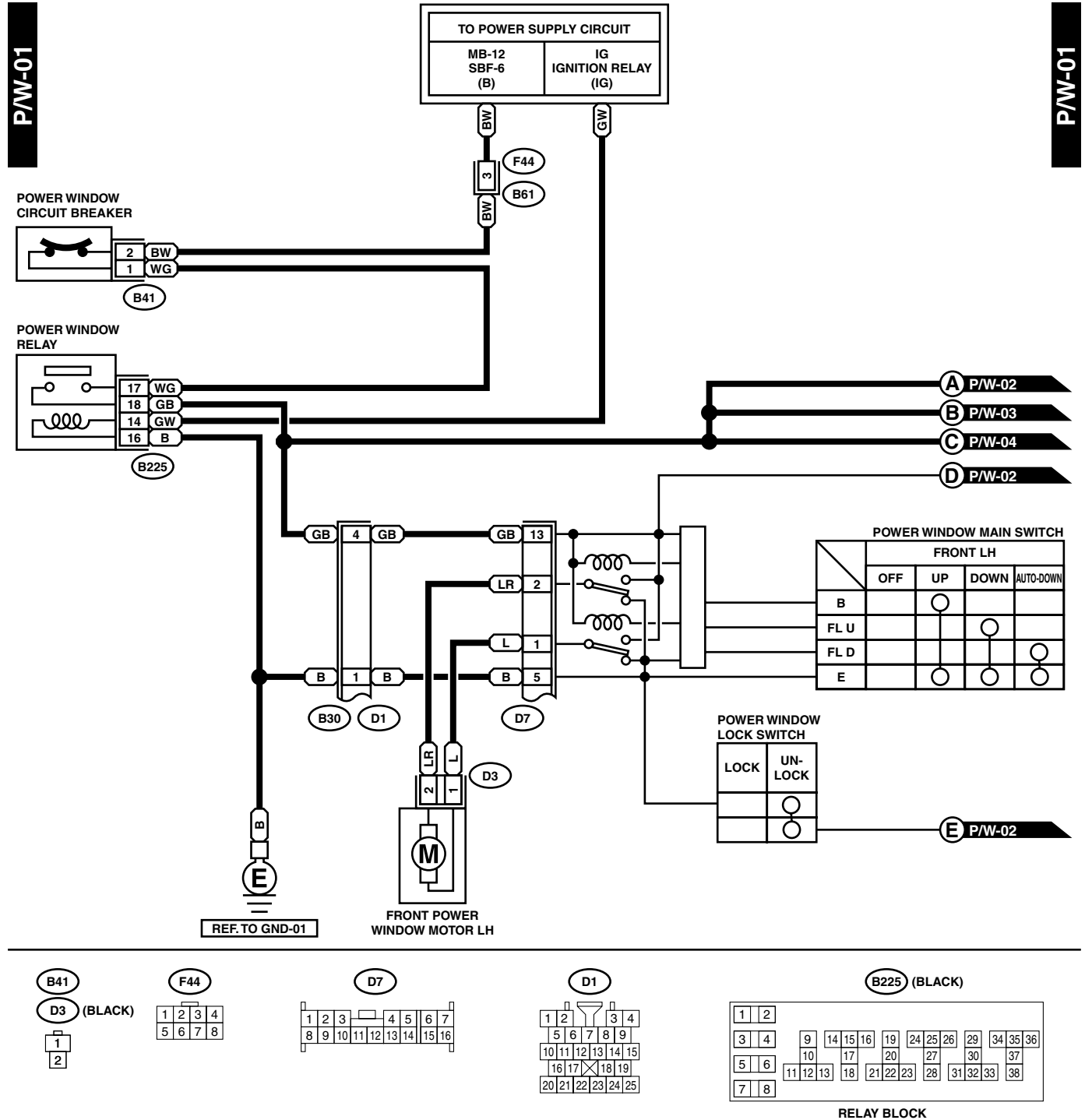


# Power Window System

WIRING SYSTEM

## 34. Power Window System

### A: WIRING DIAGRAM



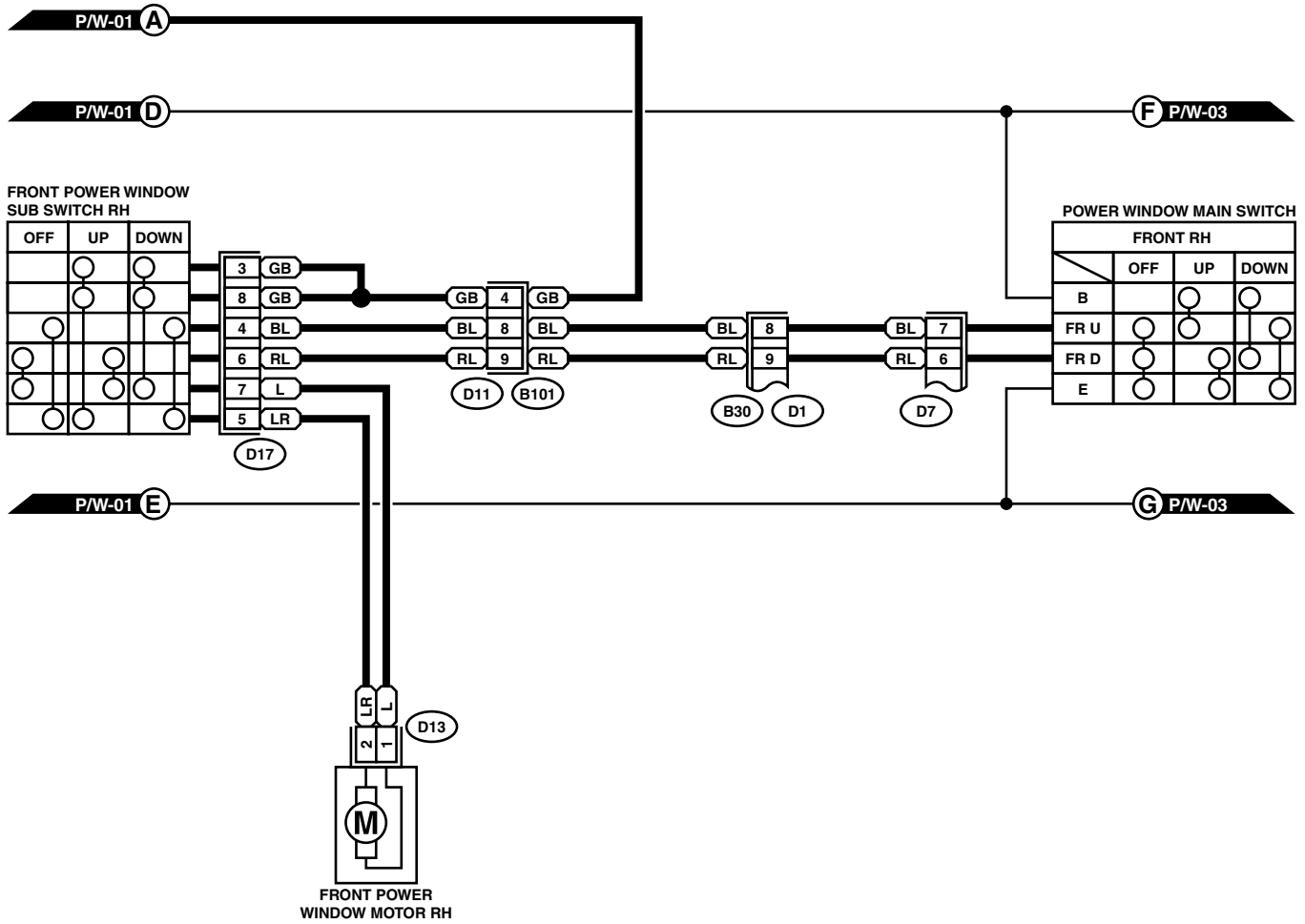
WI-08989

# Power Window System

WIRING SYSTEM

P/W-02

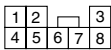
P/W-02



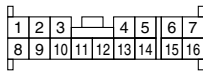
D13 (BLACK)



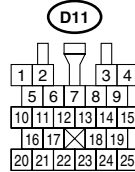
D17 (BROWN)



D7



D1



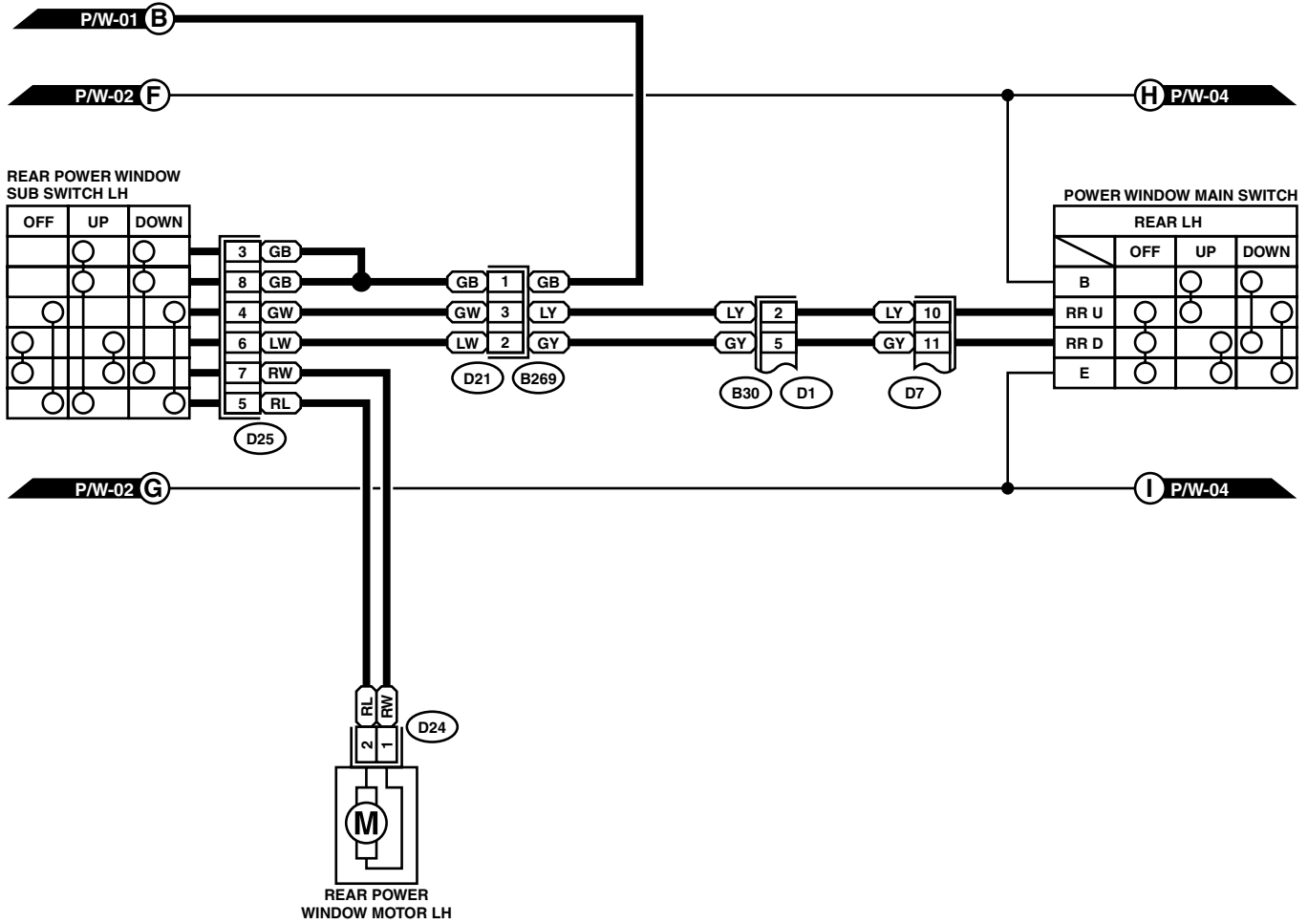
WI-08990

# Power Window System

WIRING SYSTEM

P/W-03

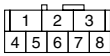
P/W-03



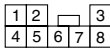
D24 (BLACK)



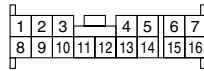
D21



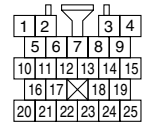
D25



D7



D1



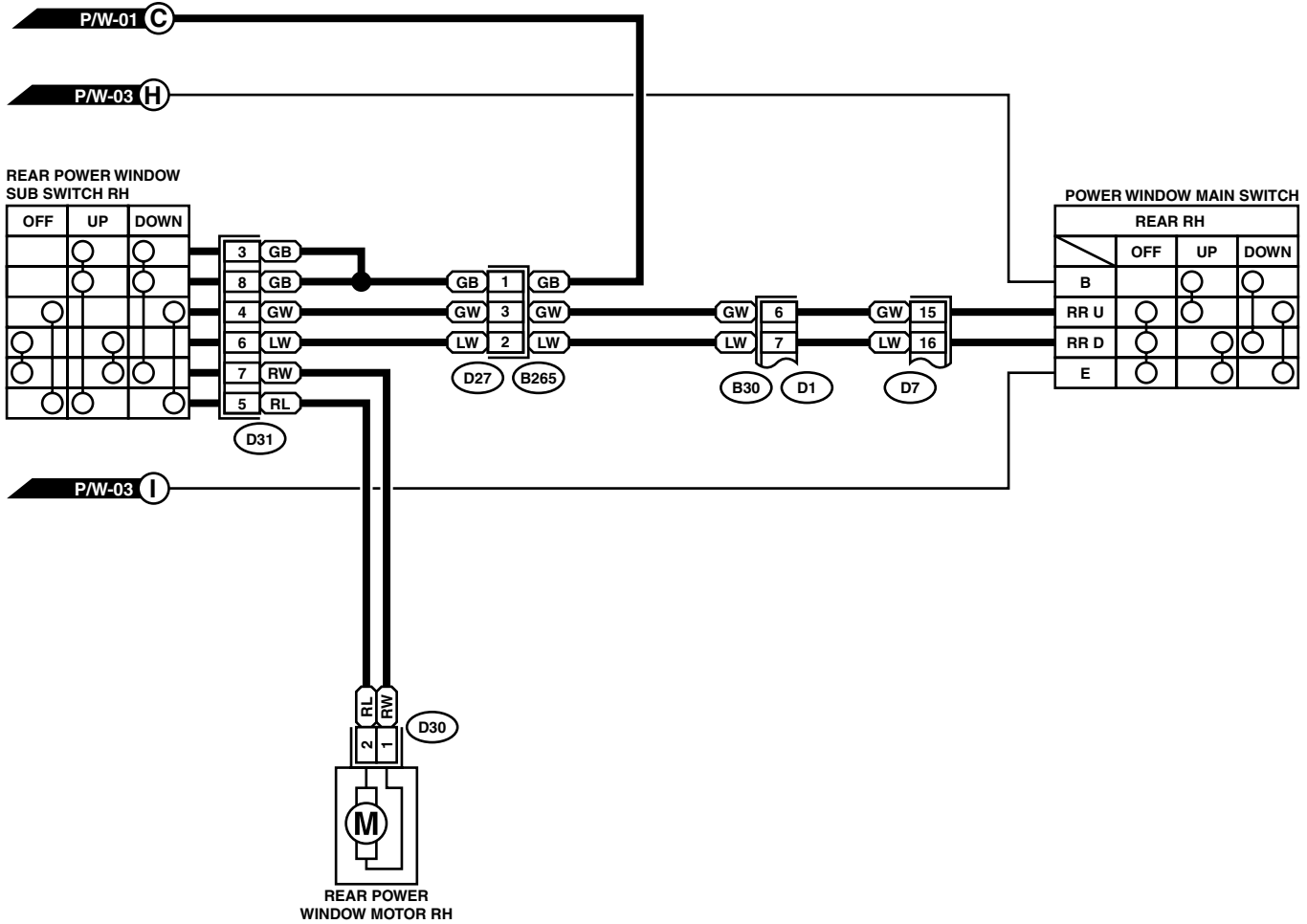
WI-08991

# Power Window System

WIRING SYSTEM

P/W-04

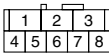
P/W-04



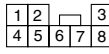
D30 (BLACK)



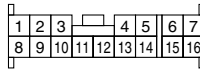
D27



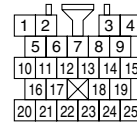
D31



D7



D1



WI-08992



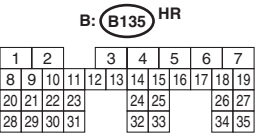
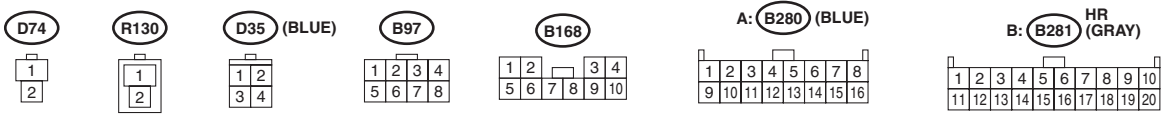
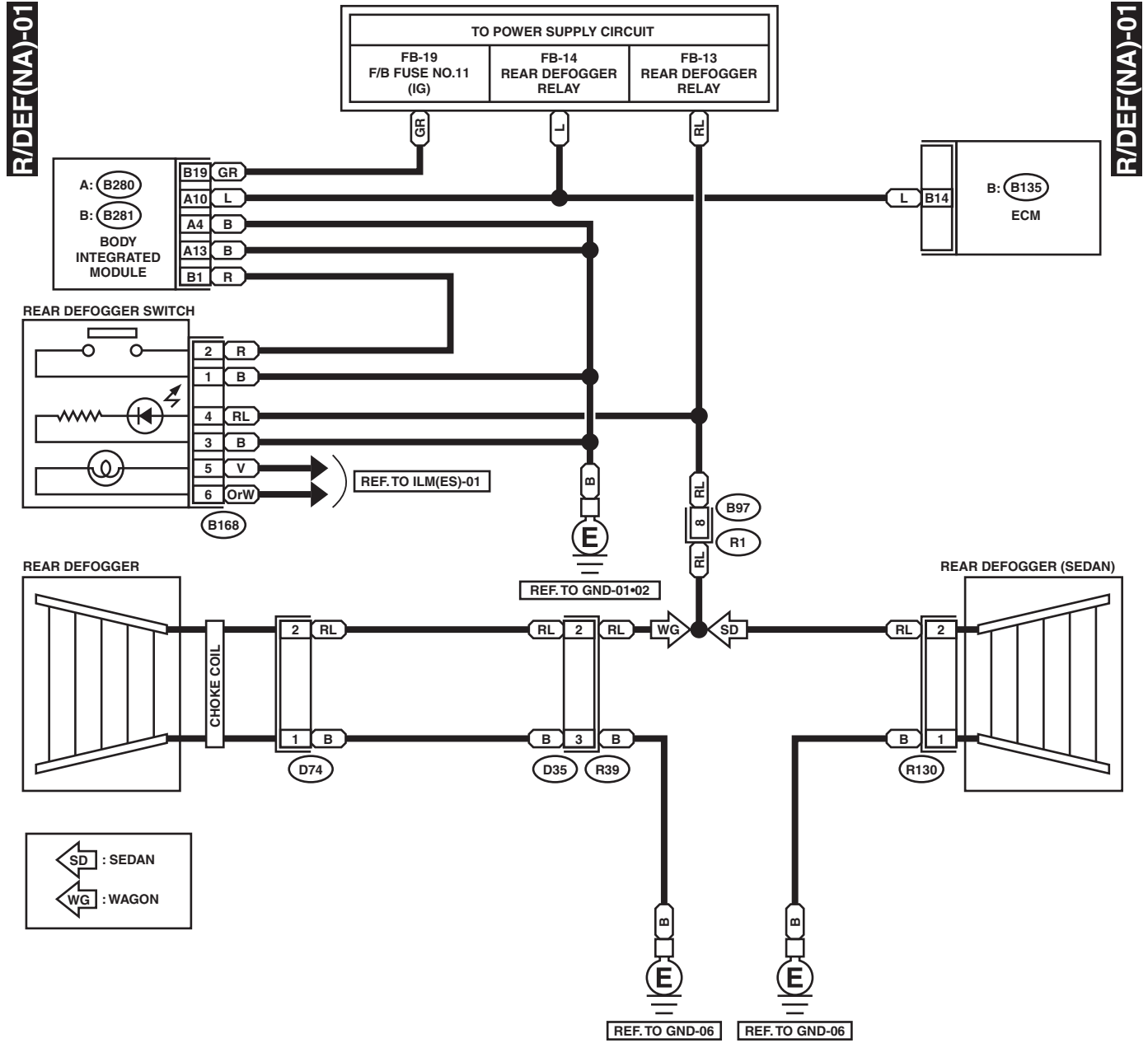
# Rear Defogger System

WIRING SYSTEM

## 35.Rear Defogger System

### A: WIRING DIAGRAM

#### 1. NON-TURBO MODEL

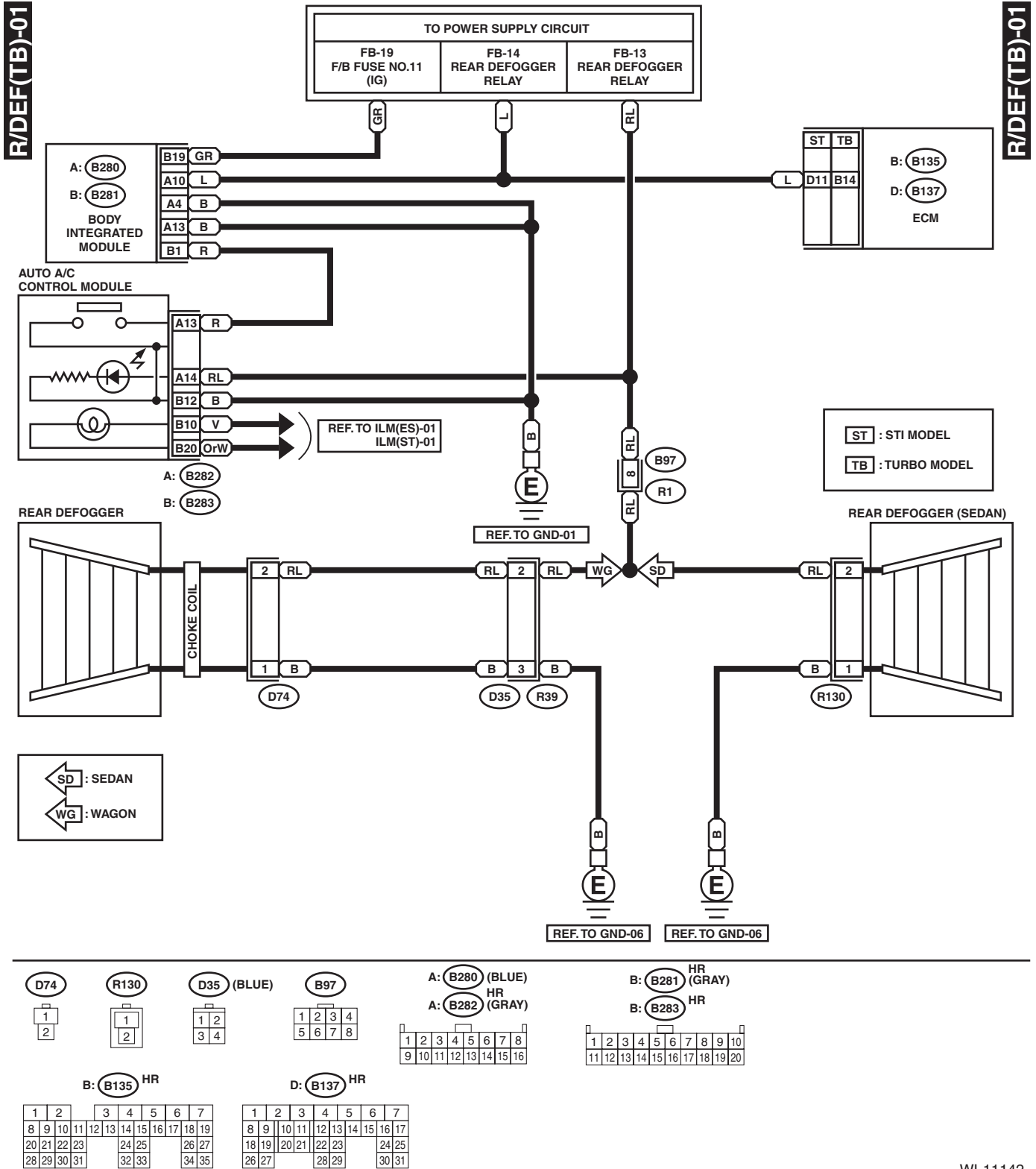


WI-1141

# Rear Defogger System

WIRING SYSTEM

## 2. TURBO AND STI MODEL



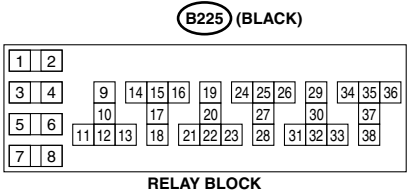
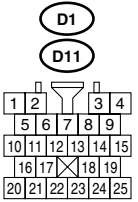
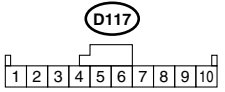
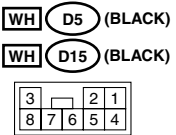
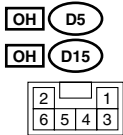
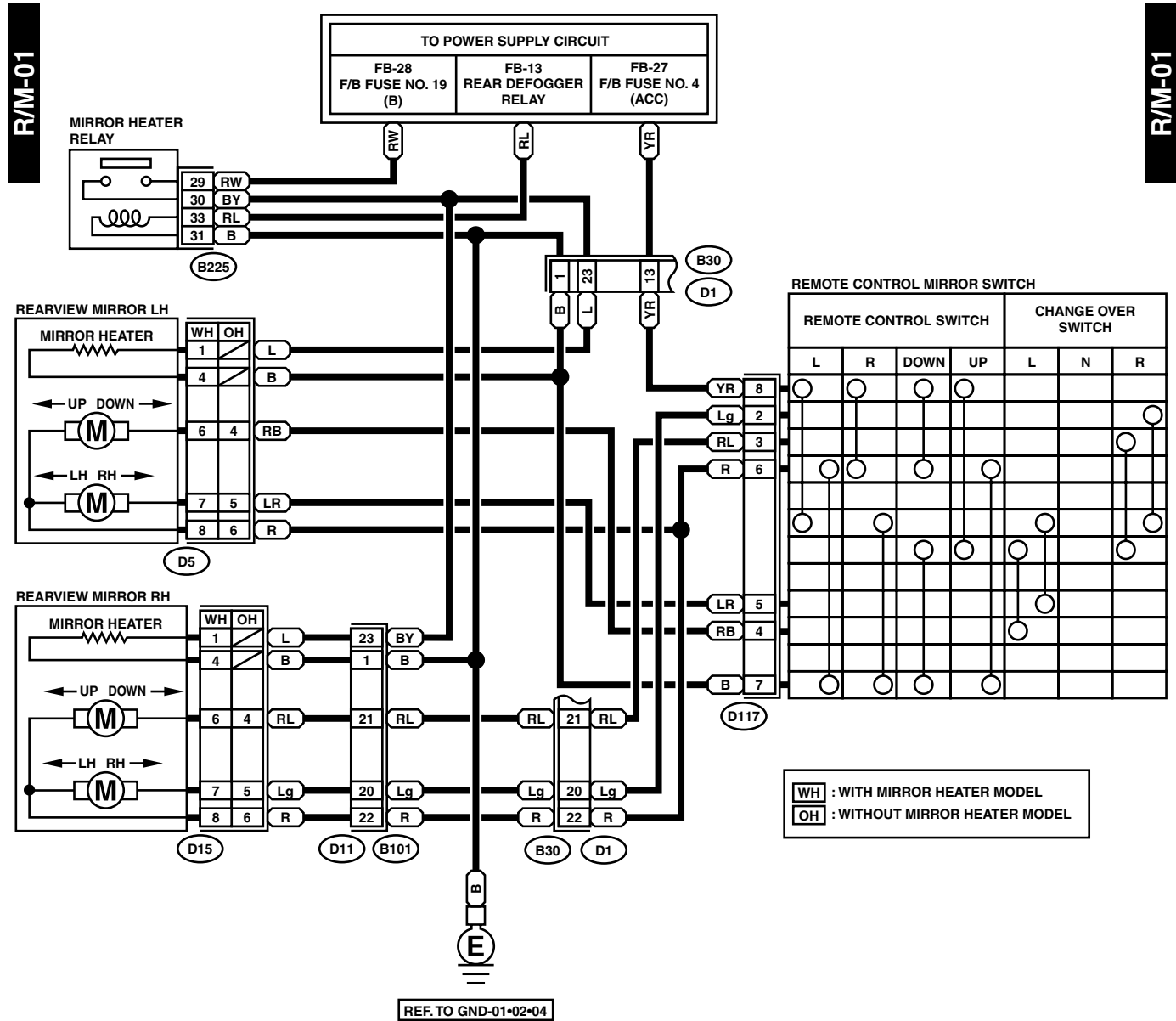
WI-1142

# Remote Control Mirror System

WIRING SYSTEM

## 36. Remote Control Mirror System

### A: WIRING DIAGRAM



WI-08995

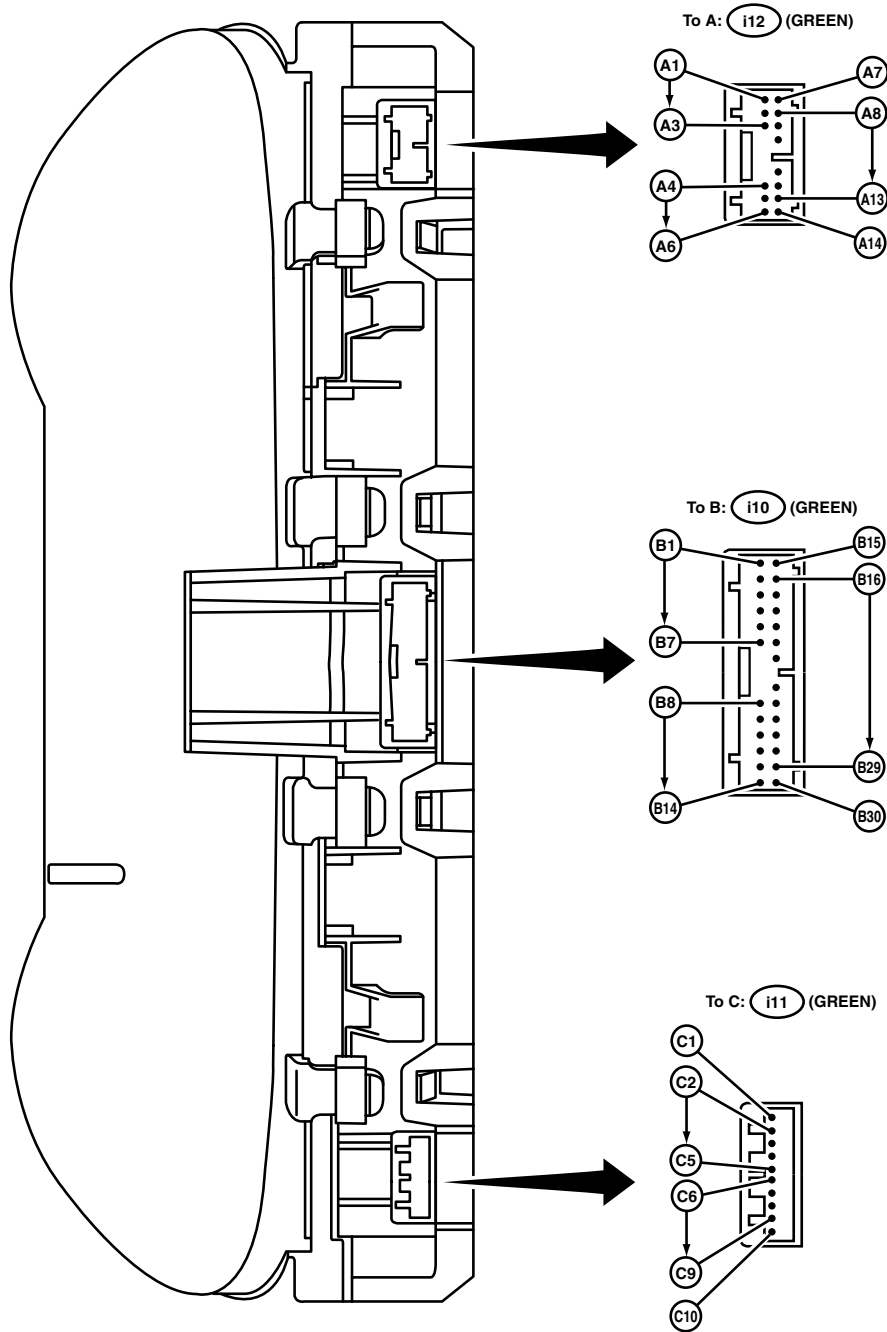
### 37. Combination Meter System

#### A: WIRING DIAGRAM

##### 1. EXCEPT FOR STI MODEL

CM(ES)-01

CM(ES)-01

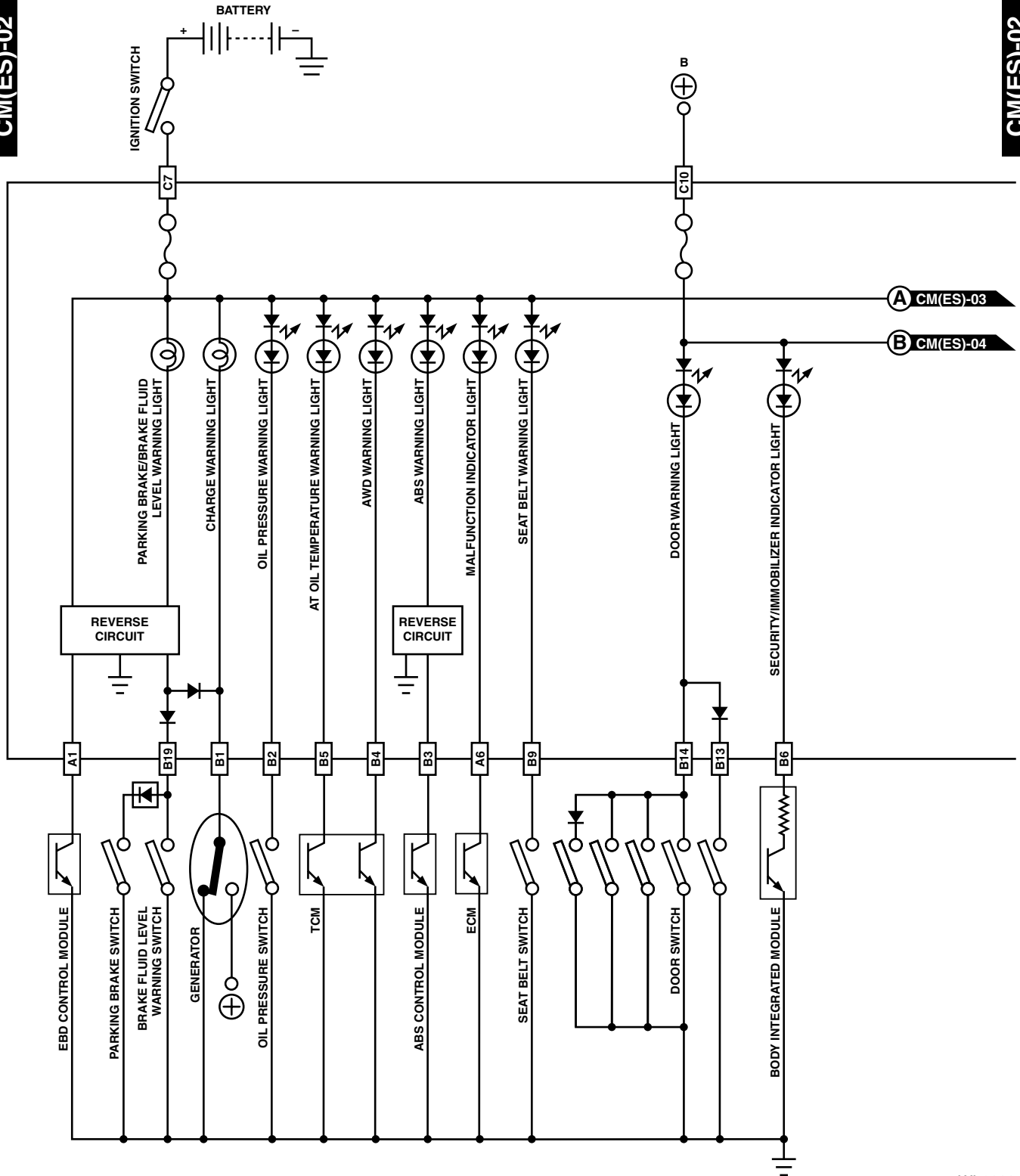


# Combination Meter System

WIRING SYSTEM

CM(ES)-02

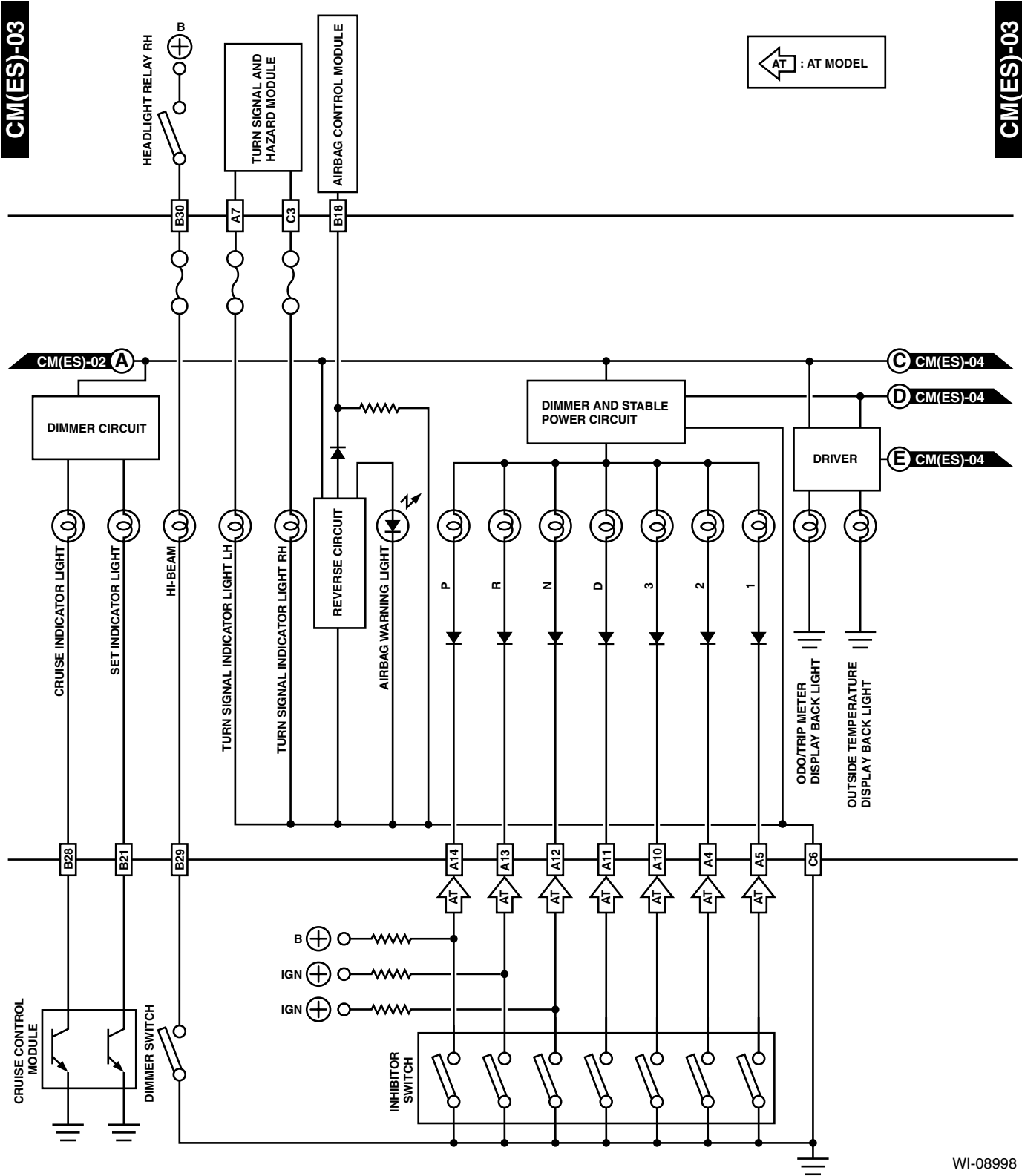
CM(ES)-02



WI-08997

# Combination Meter System

WIRING SYSTEM



CM(ES)-03

CM(ES)-03

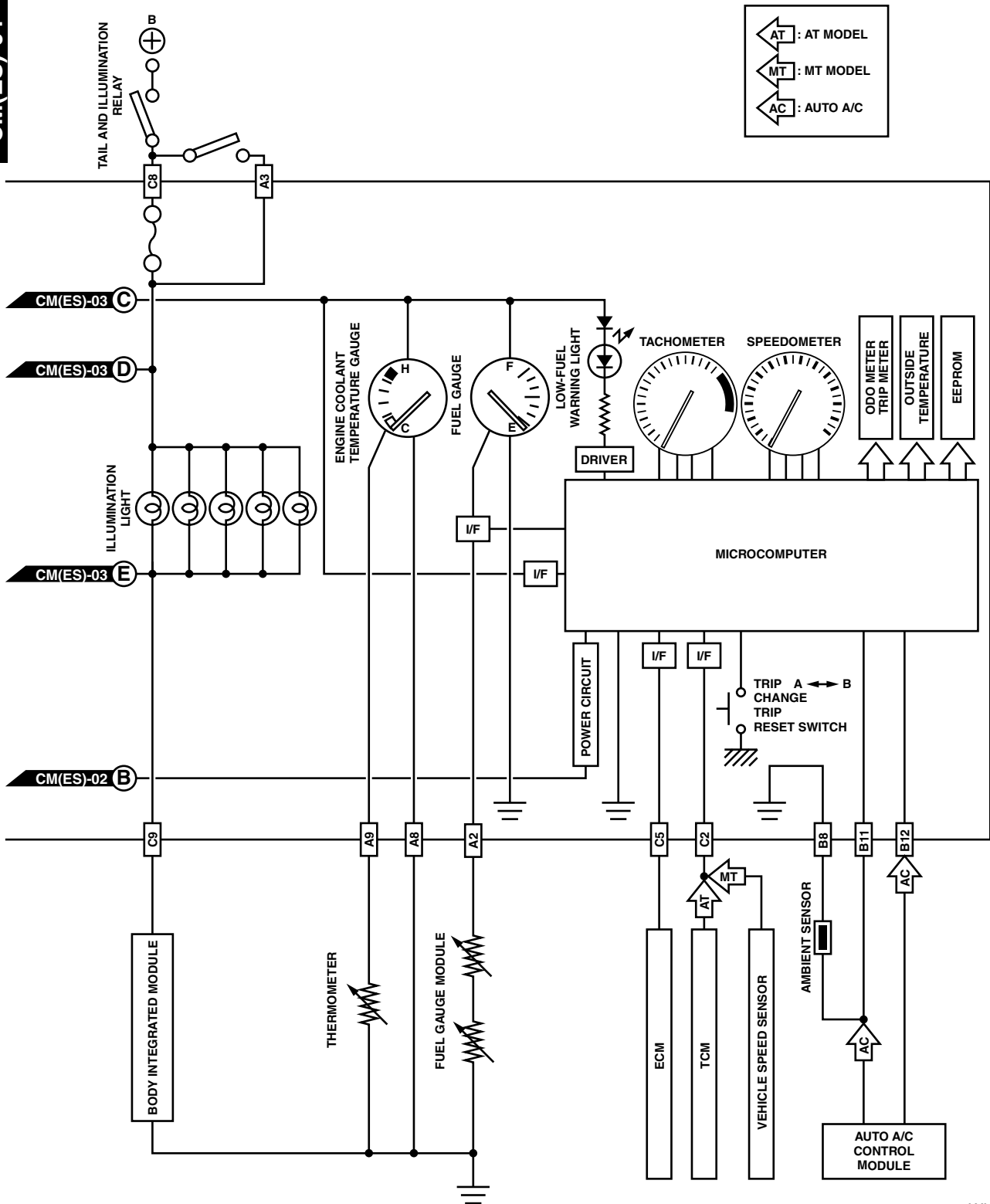
← AT : AT MODEL

# Combination Meter System

WIRING SYSTEM

CM(ES)-04

CM(ES)-04



WI-08999

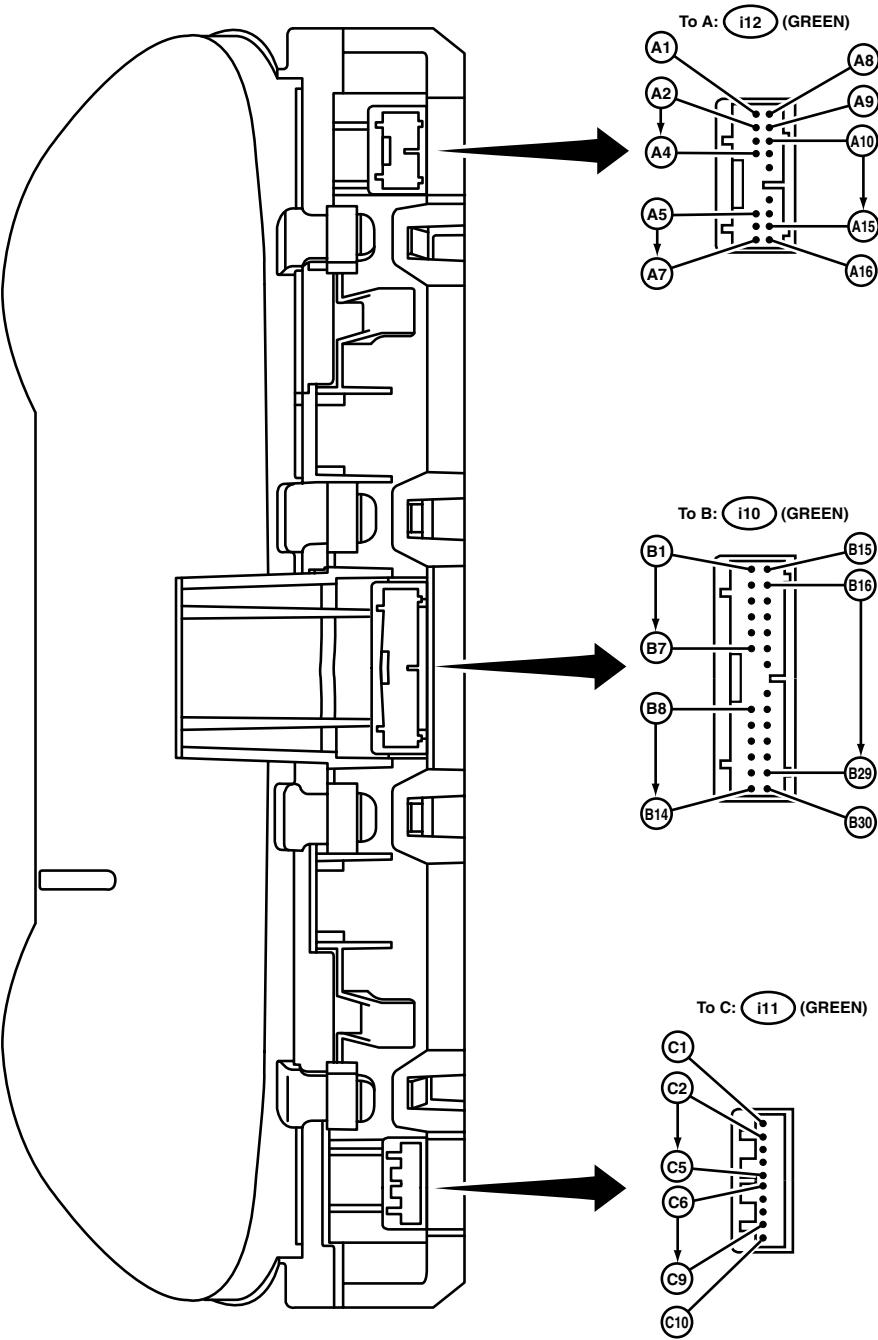
# Combination Meter System

WIRING SYSTEM

## 2. STI MODEL

CM(ST)-01

CM(ST)-01

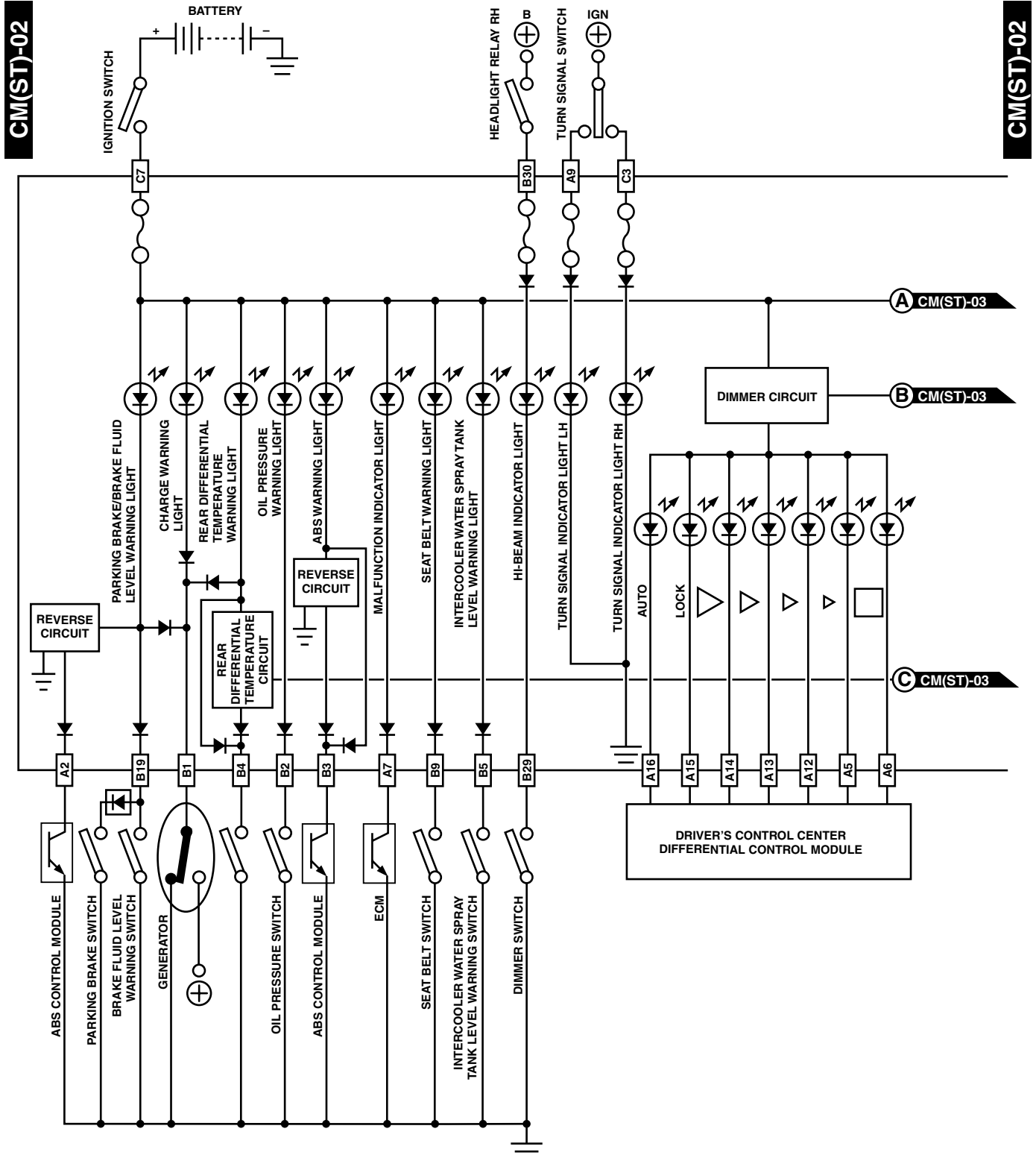


WI-09000



# Combination Meter System

WIRING SYSTEM



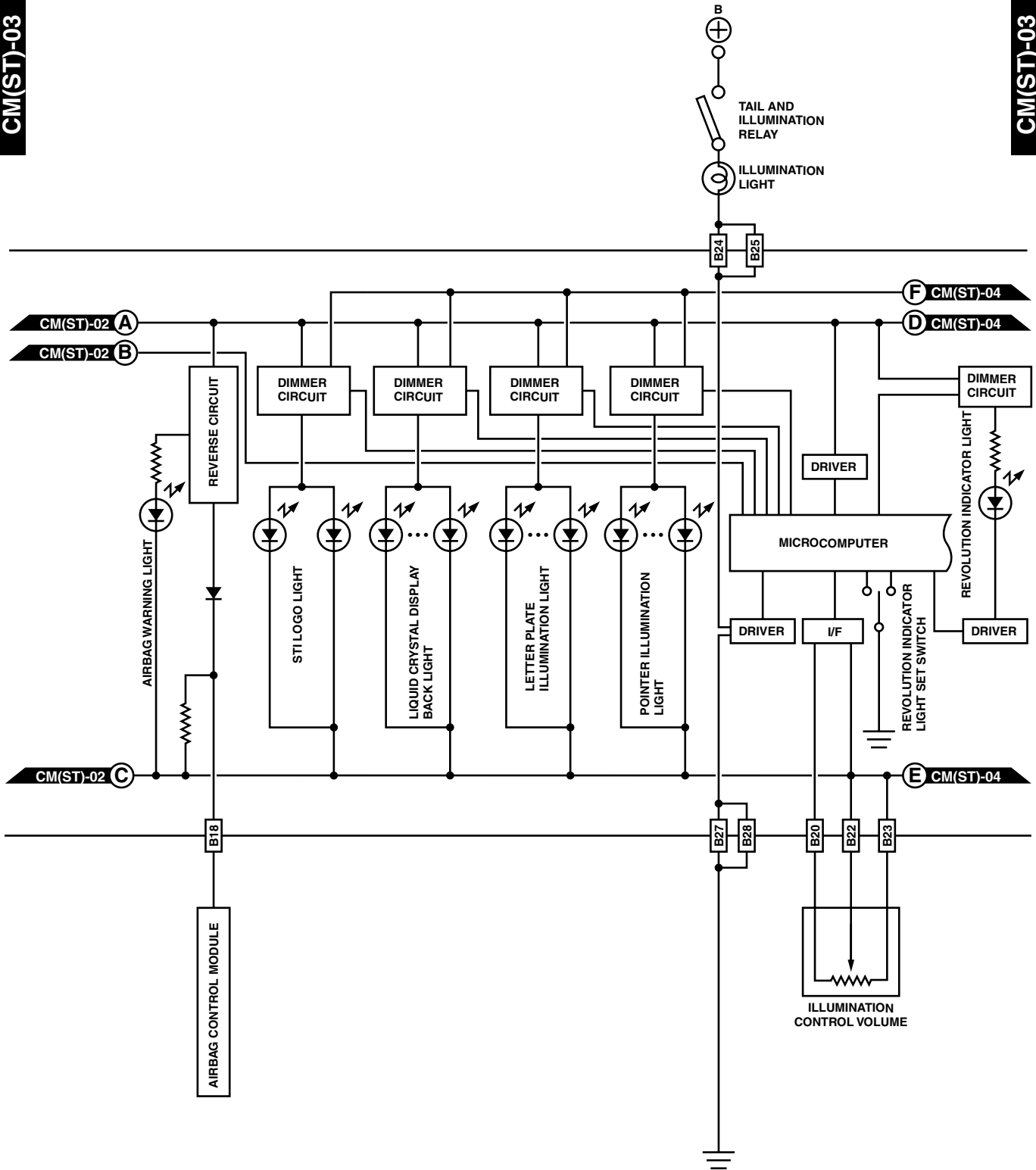
WI-09001

# Combination Meter System

WIRING SYSTEM

CM(ST)-03

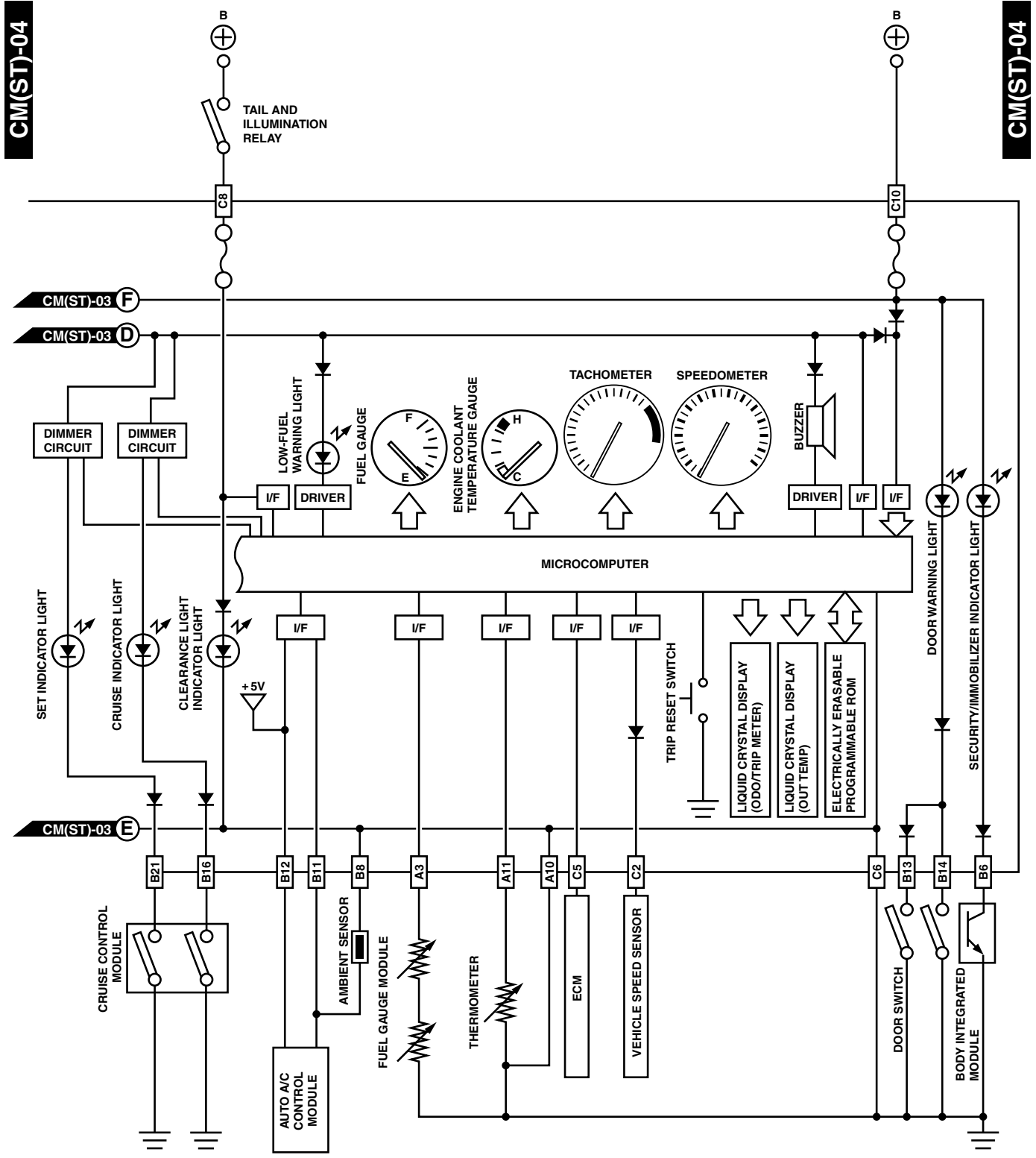
CM(ST)-03



WI-09002

# Combination Meter System

WIRING SYSTEM



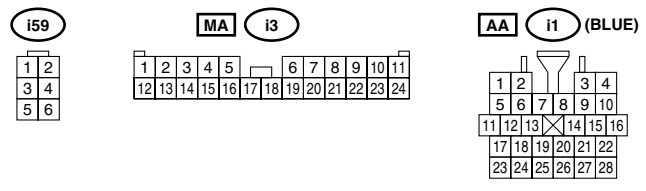
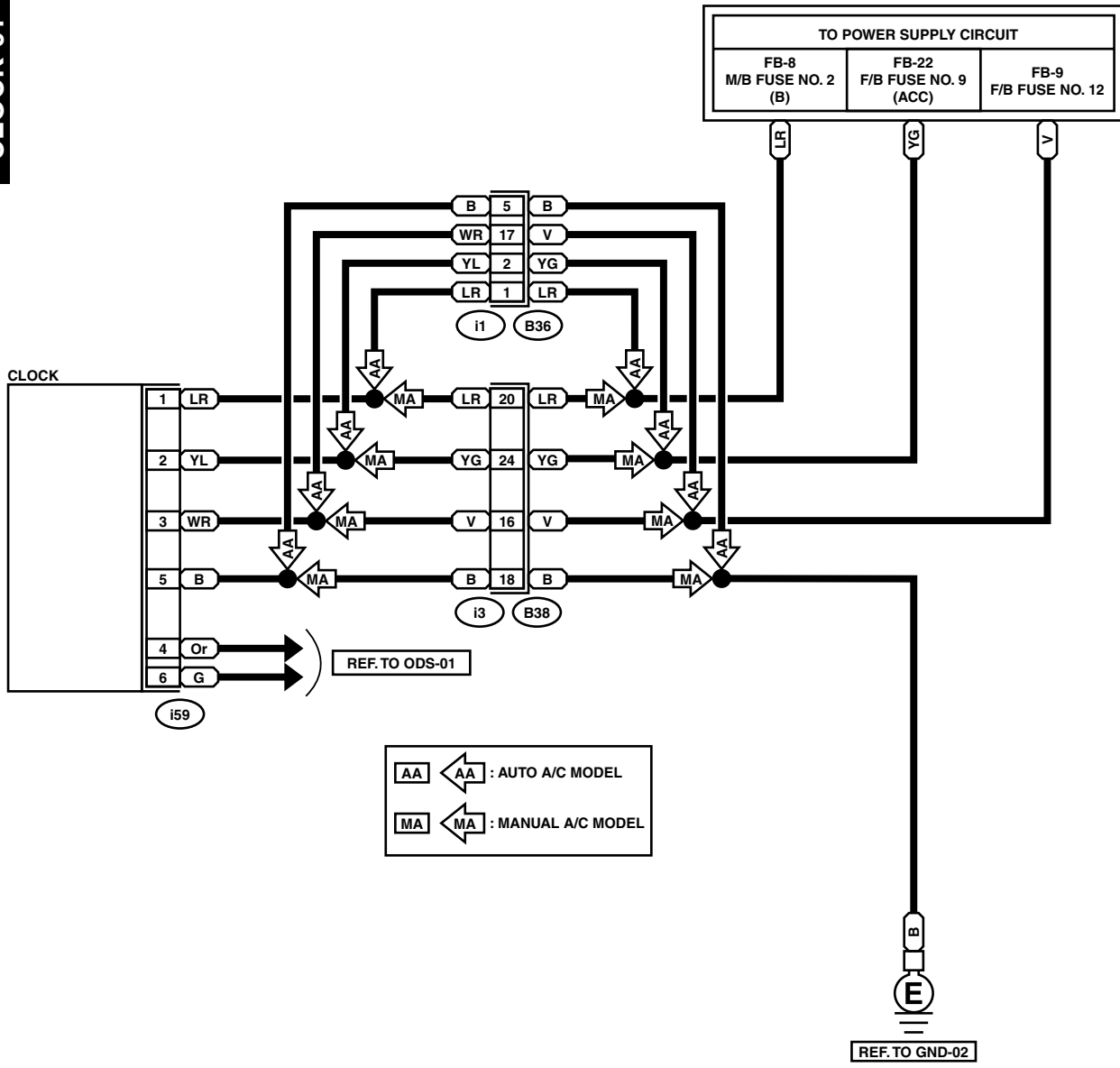
WI-09003

## 38.Clock System

### A: WIRING DIAGRAM

CLOCK-01

CLOCK-01

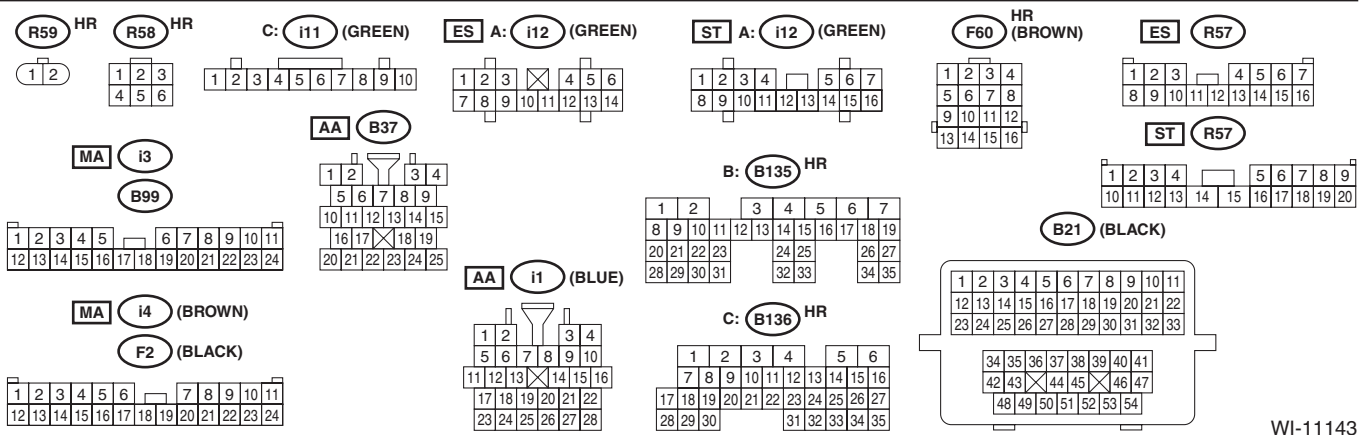
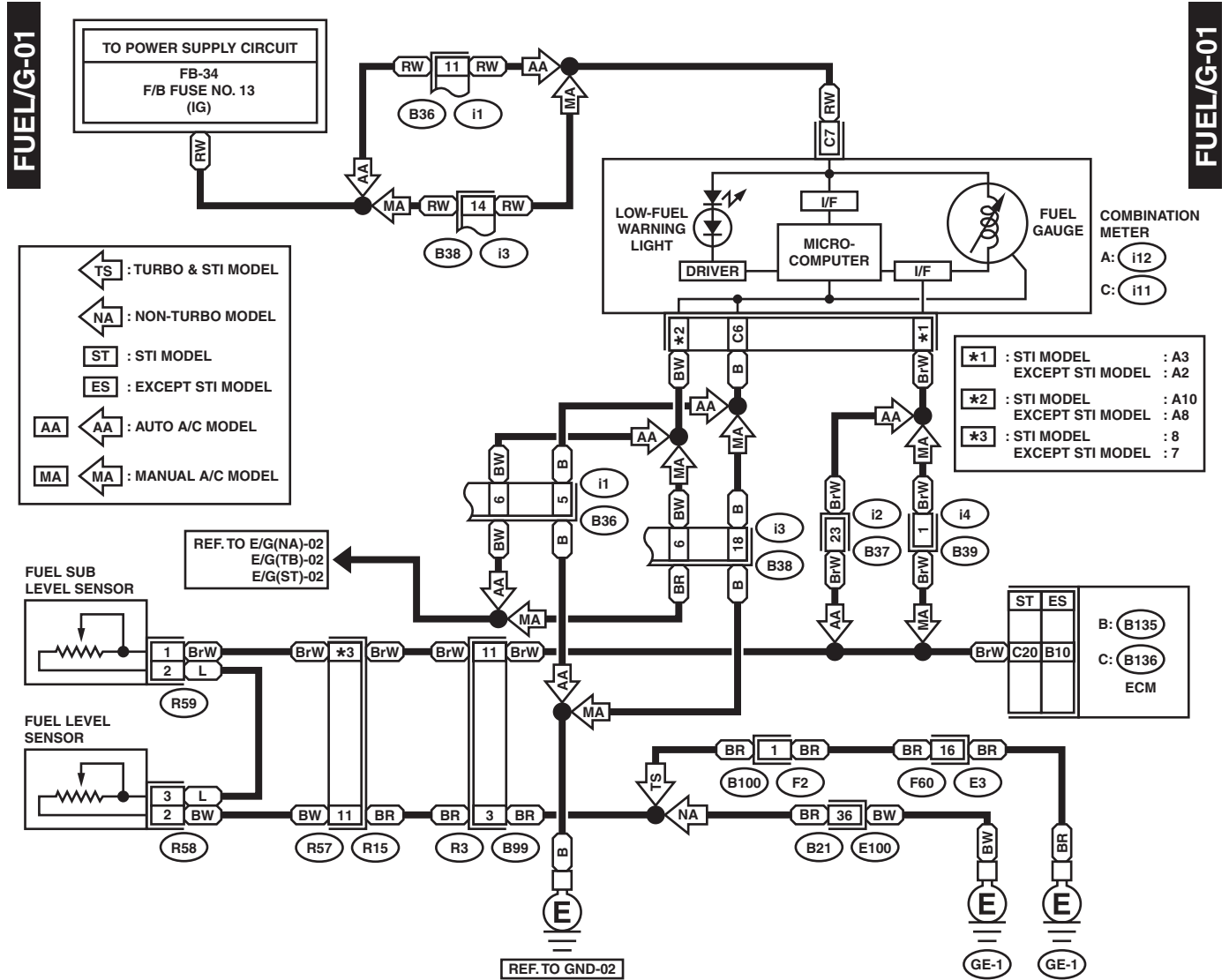


# Fuel Gauge System

WIRING SYSTEM

## 39. Fuel Gauge System

### A: WIRING DIAGRAM



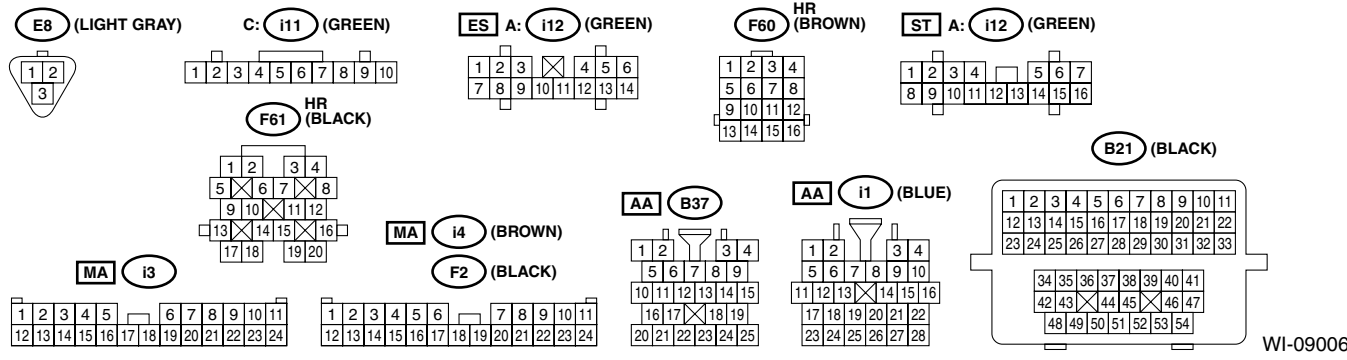
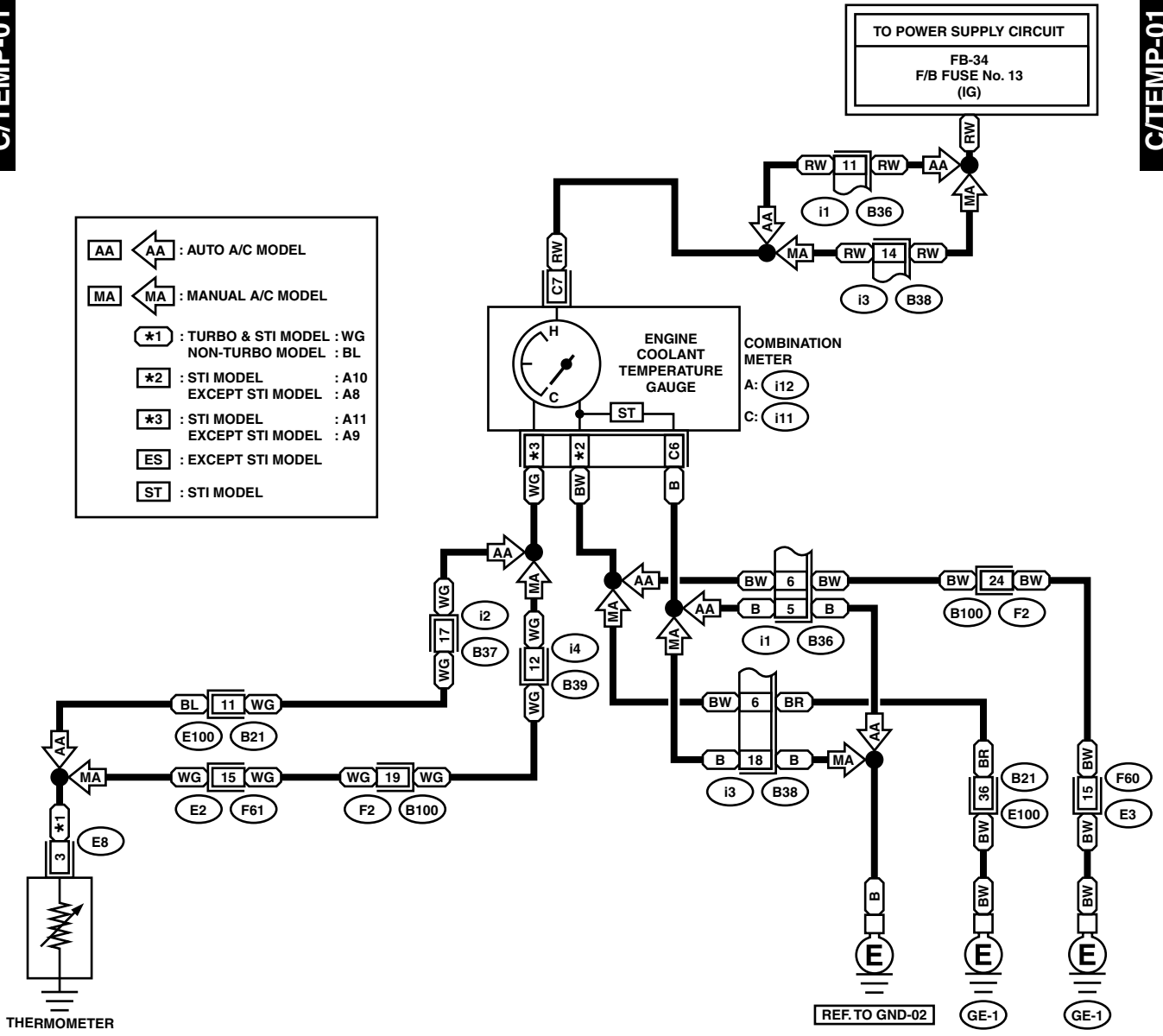
WI-11143

## 40. Coolant Temperature System

### A: WIRING DIAGRAM

C/TEMP-01

C/TEMP-01



WI-09006

# Oil Pressure Warning Light System

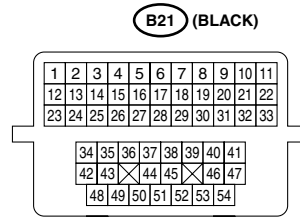
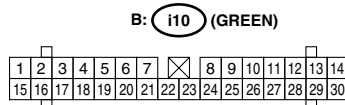
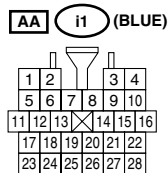
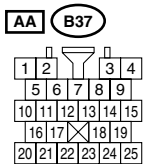
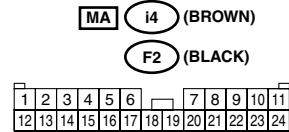
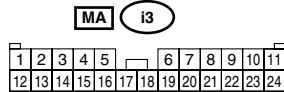
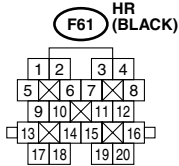
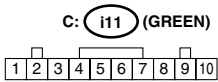
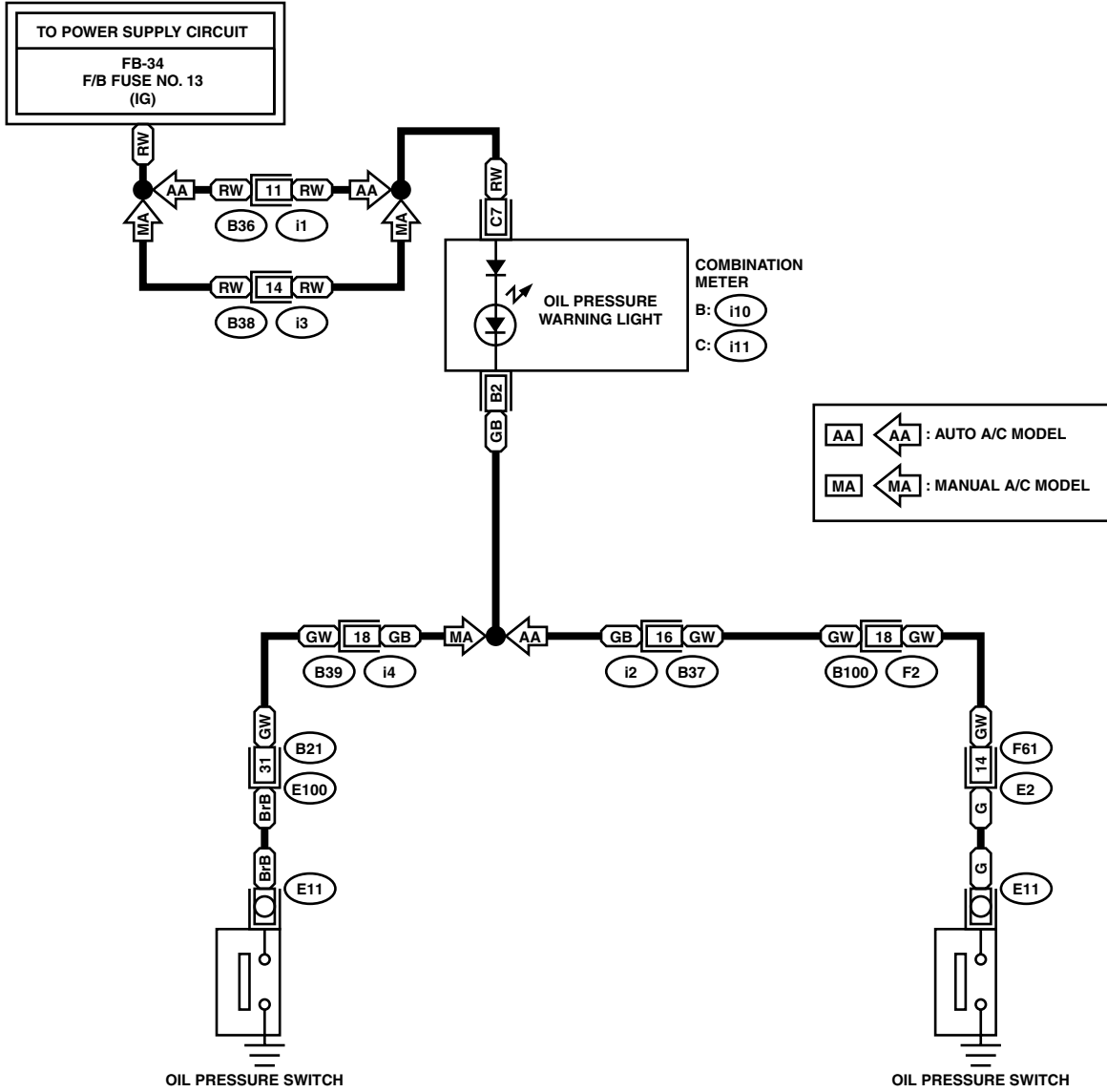
WIRING SYSTEM

## 41.Oil Pressure Warning Light System

### A: WIRING DIAGRAM

OIL/P-01

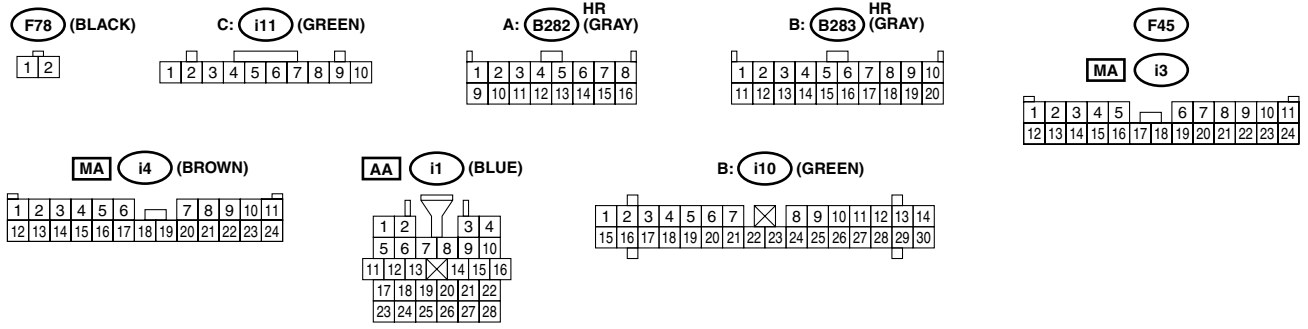
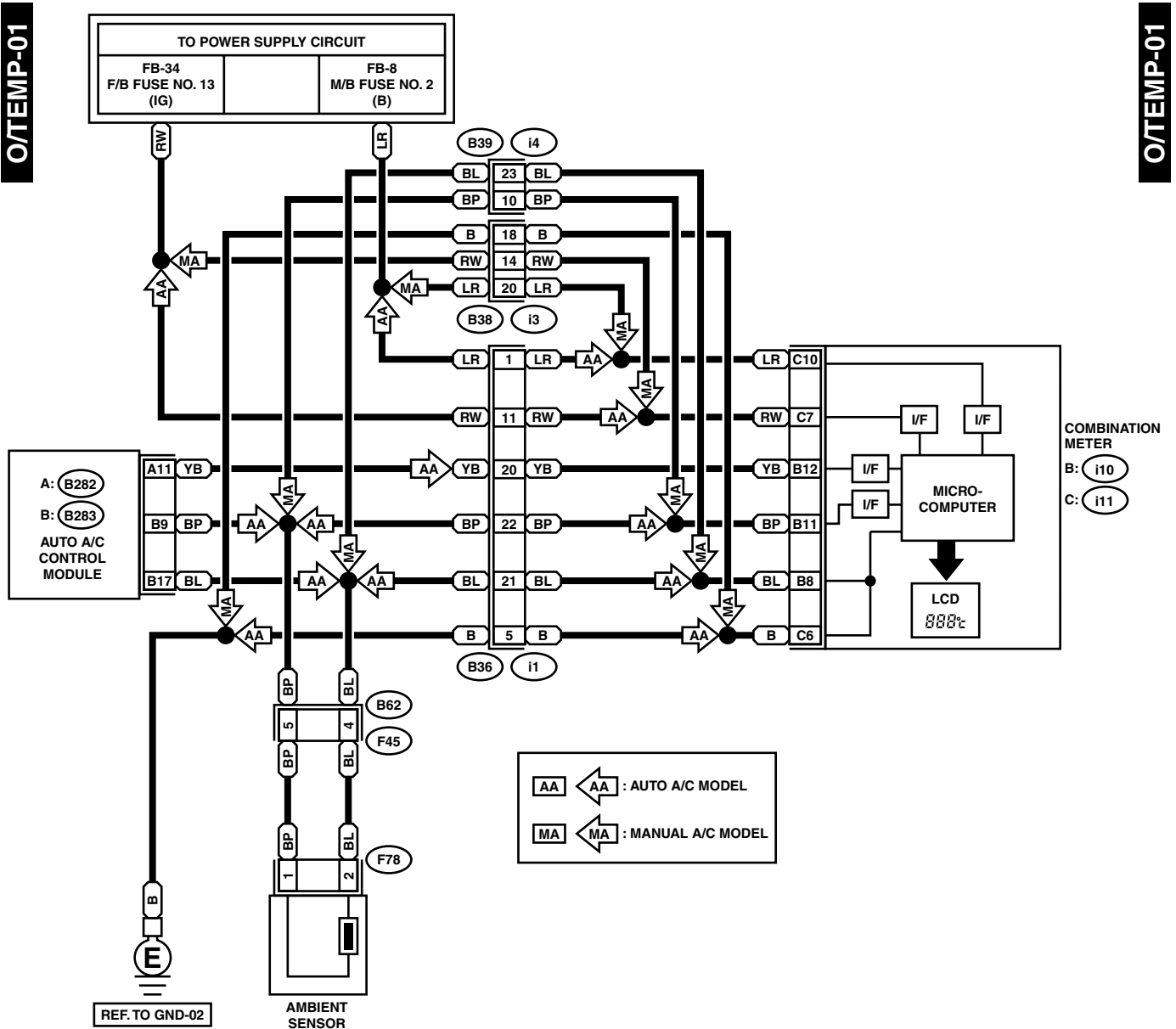
OIL/P-01



WI-09007

## 42. Outside Temperature Display System

### A: WIRING DIAGRAM



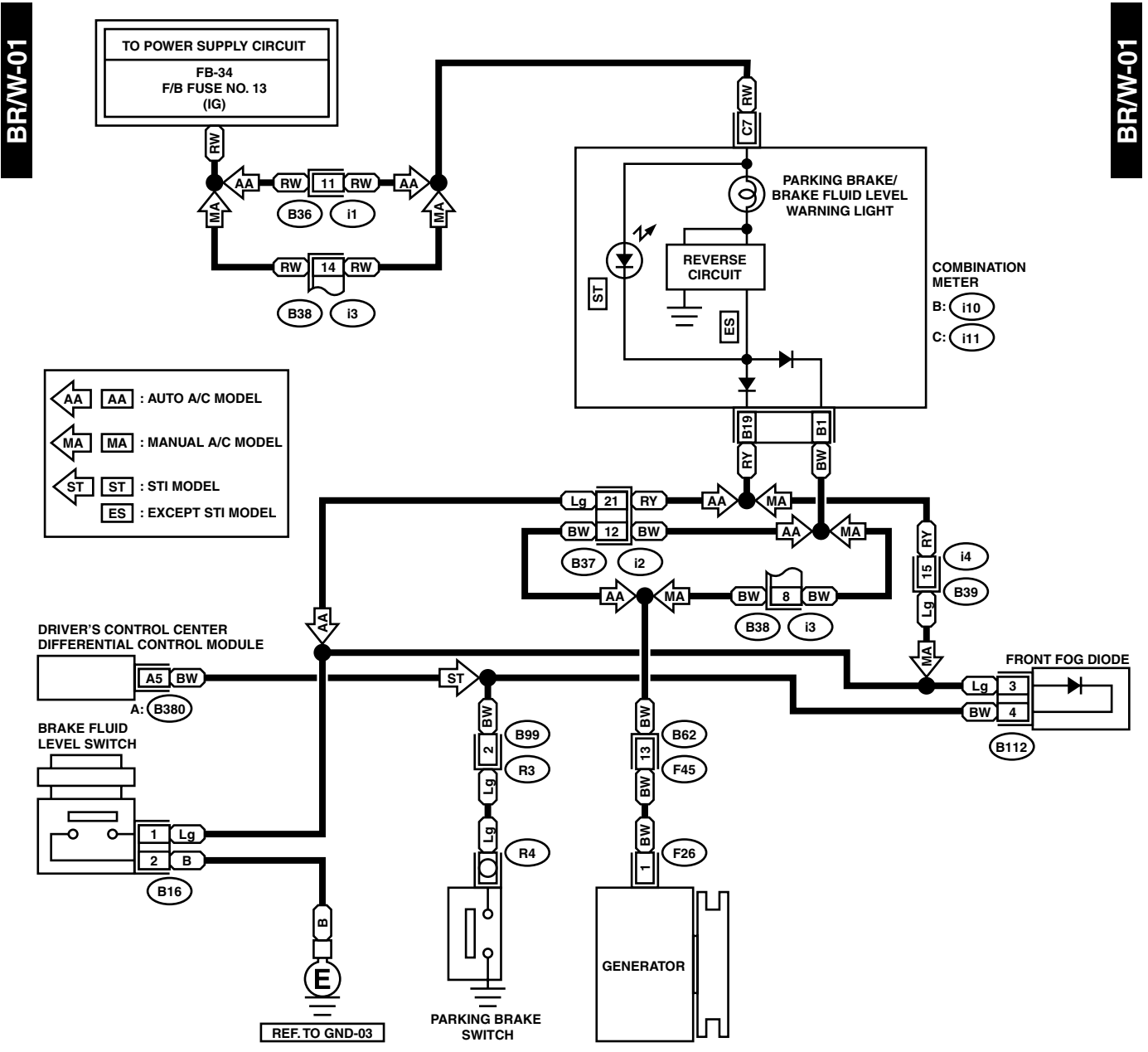


# Parking Brake / Brake Fluid Level Warning Light System

WIRING SYSTEM

## 43. Parking Brake / Brake Fluid Level Warning Light System

### A: WIRING DIAGRAM



← AA AA : AUTO A/C MODEL  
 ← MA MA : MANUAL A/C MODEL  
 ← ST ST : STI MODEL  
 ES : EXCEPT STI MODEL

DRIVER'S CONTROL CENTER  
DIFFERENTIAL CONTROL MODULE

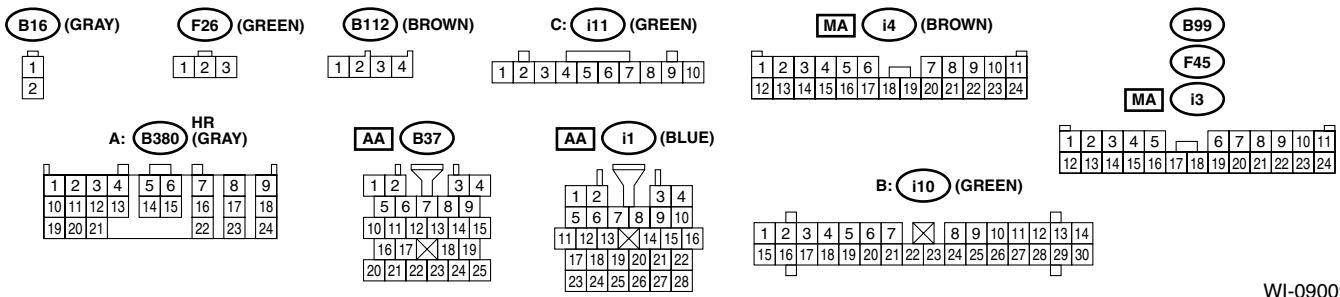
BRAKE FLUID  
LEVEL SWITCH

PARKING BRAKE  
SWITCH

GENERATOR

FRONT FOG DIODE

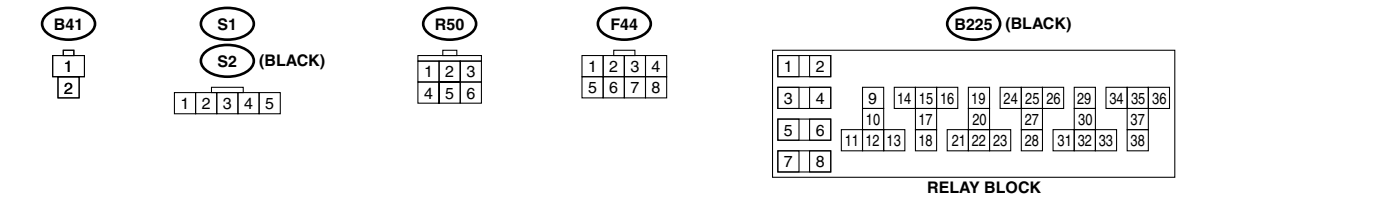
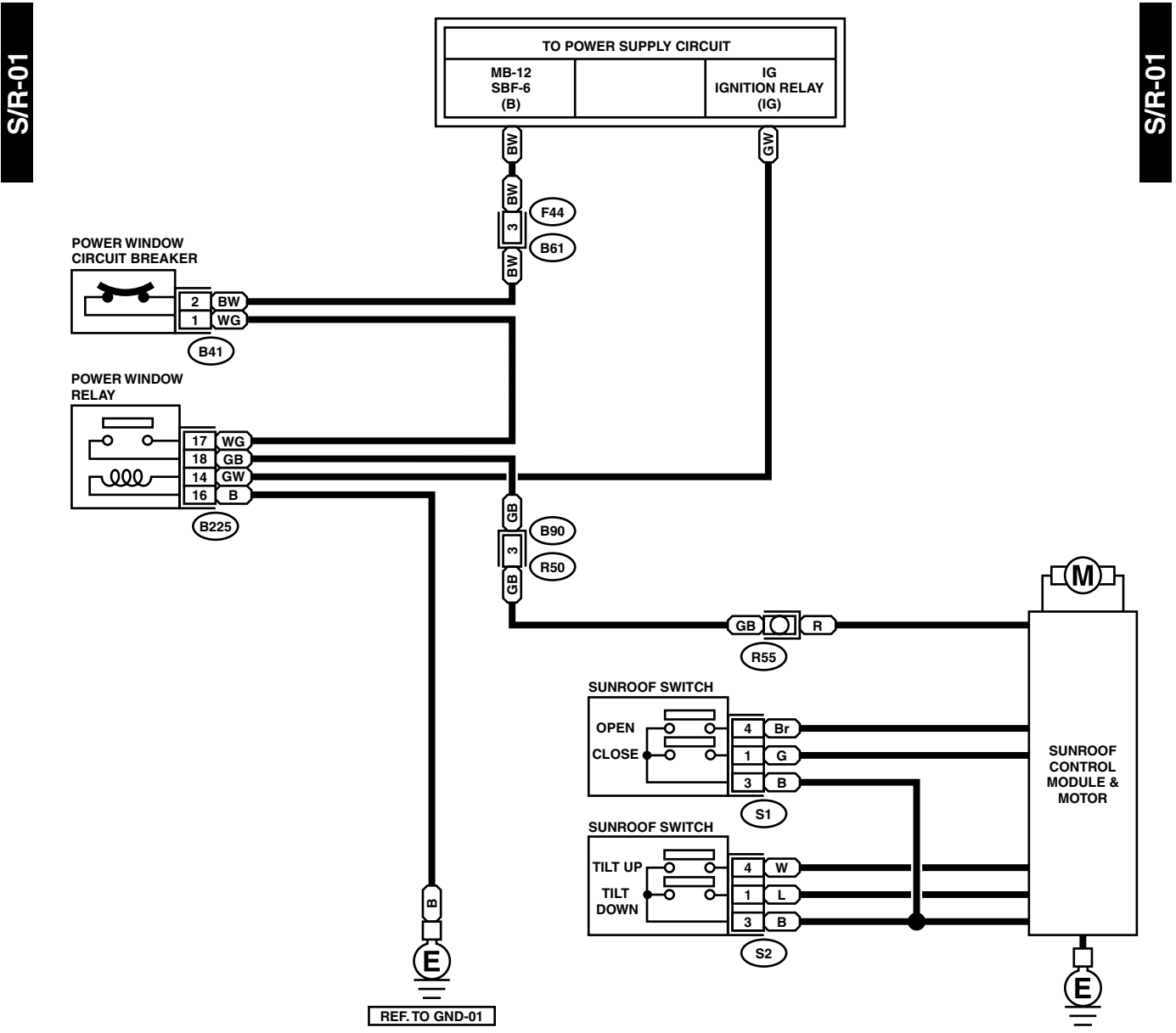
REF. TO GND-03



WI-09009

## 44.Sunroof Control System

### A: WIRING DIAGRAM

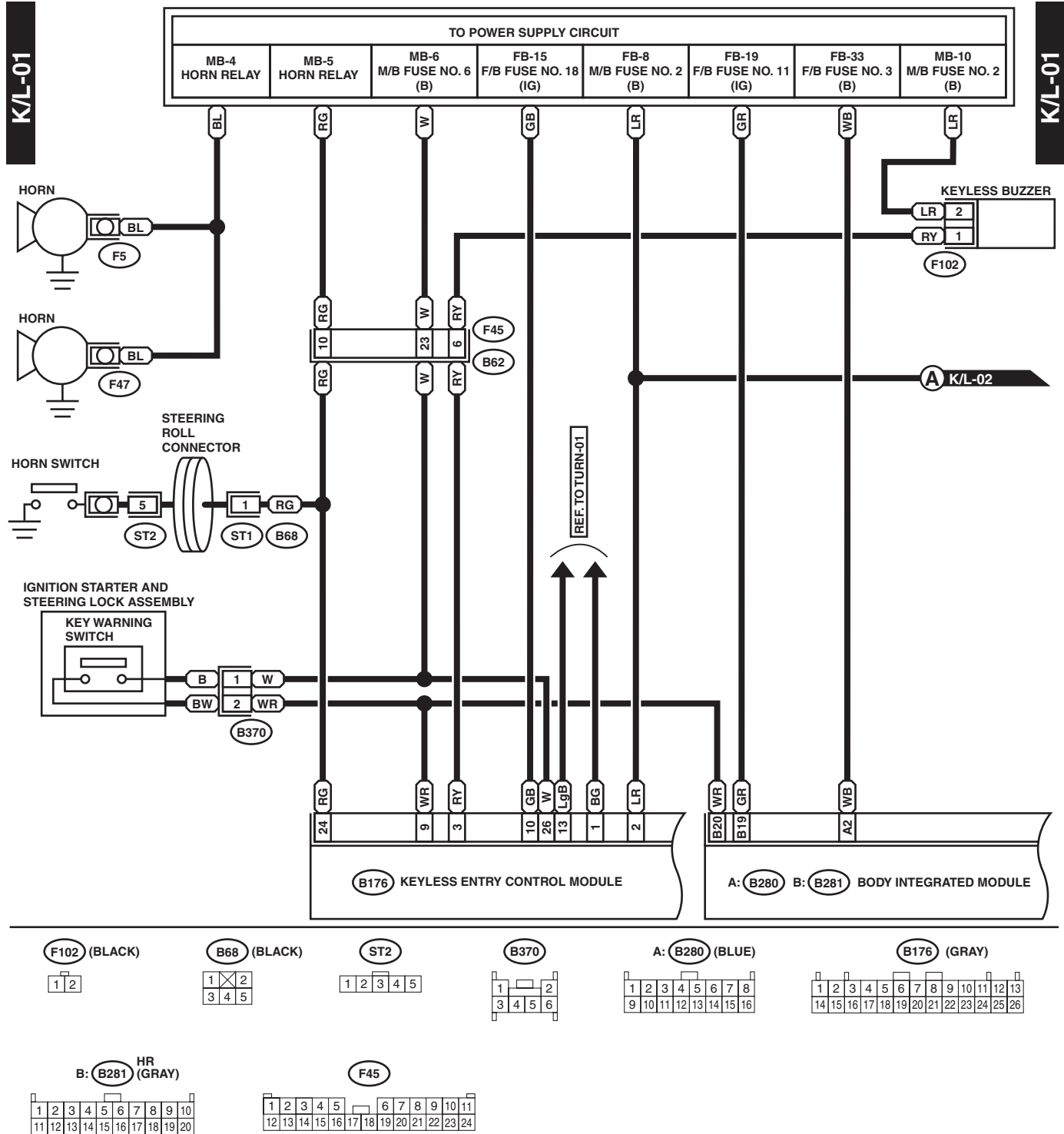


# Keyless Entry System

WIRING SYSTEM

## 45. Keyless Entry System

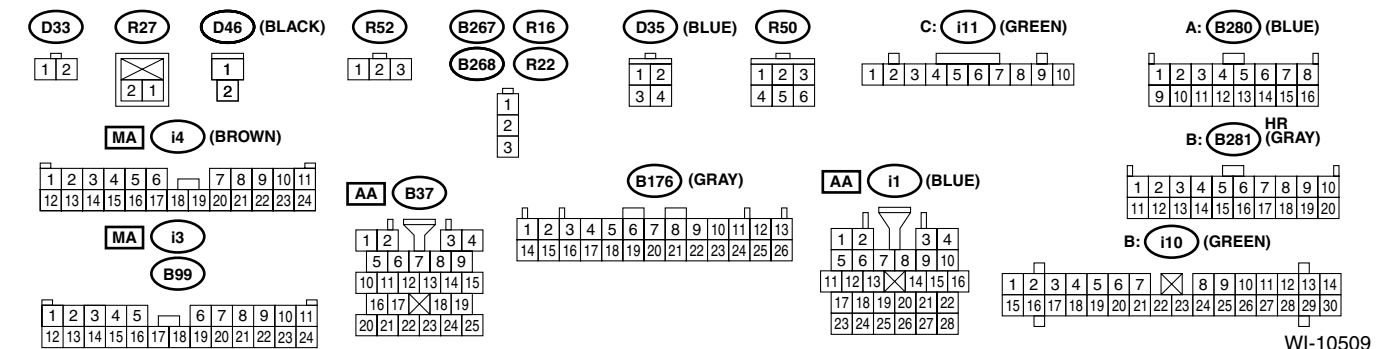
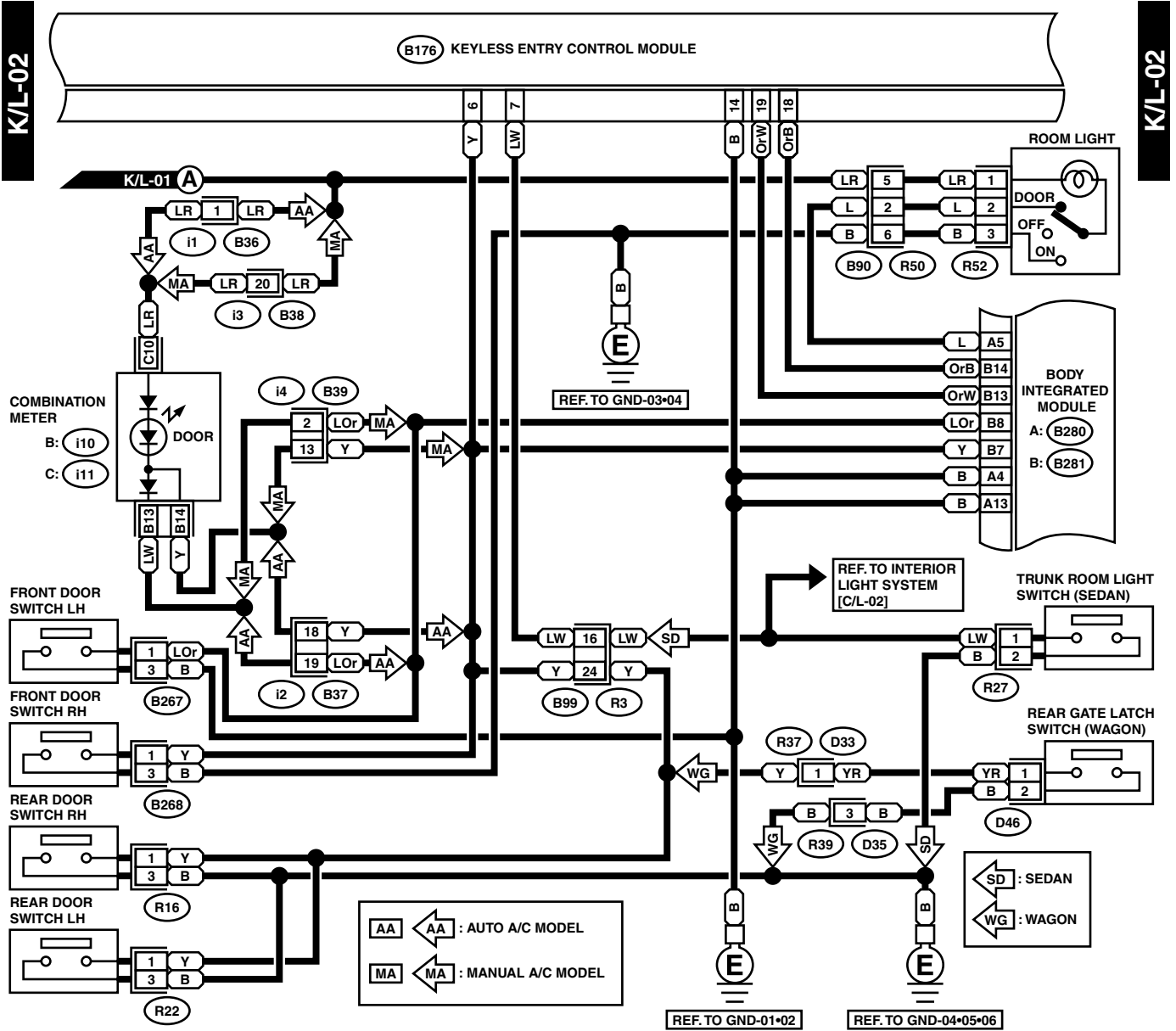
### A: WIRING DIAGRAM



WI-11144

# Keyless Entry System

WIRING SYSTEM



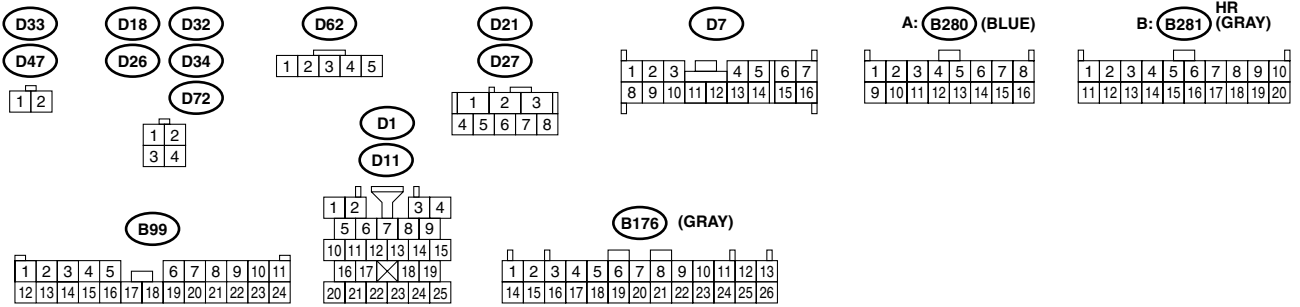
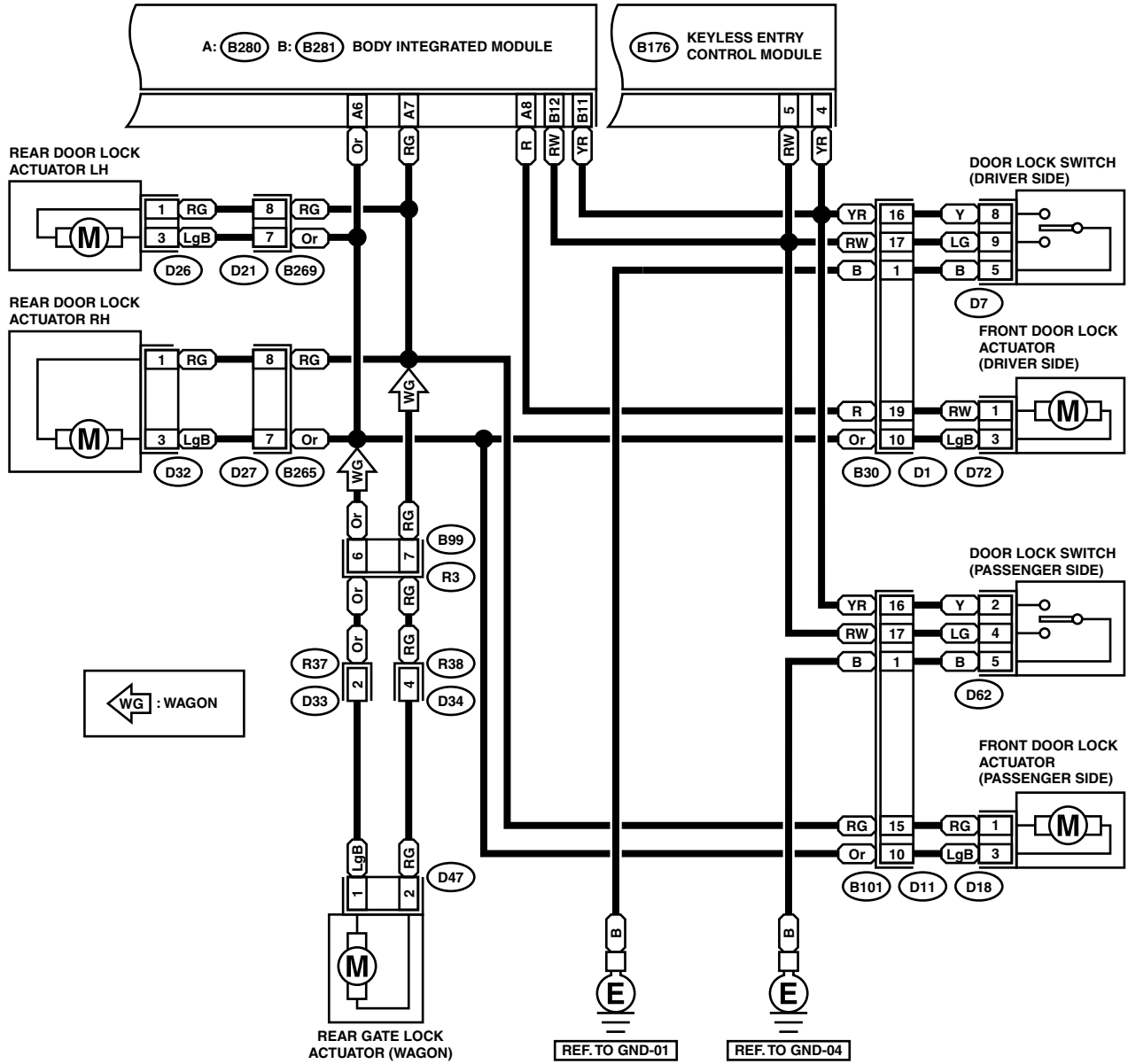
WI-10509

# Keyless Entry System

WIRING SYSTEM

K/L-03

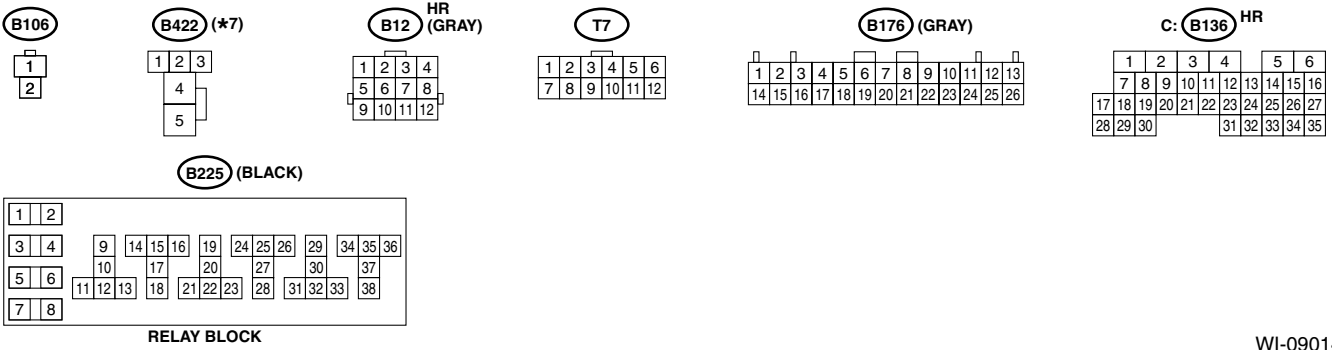
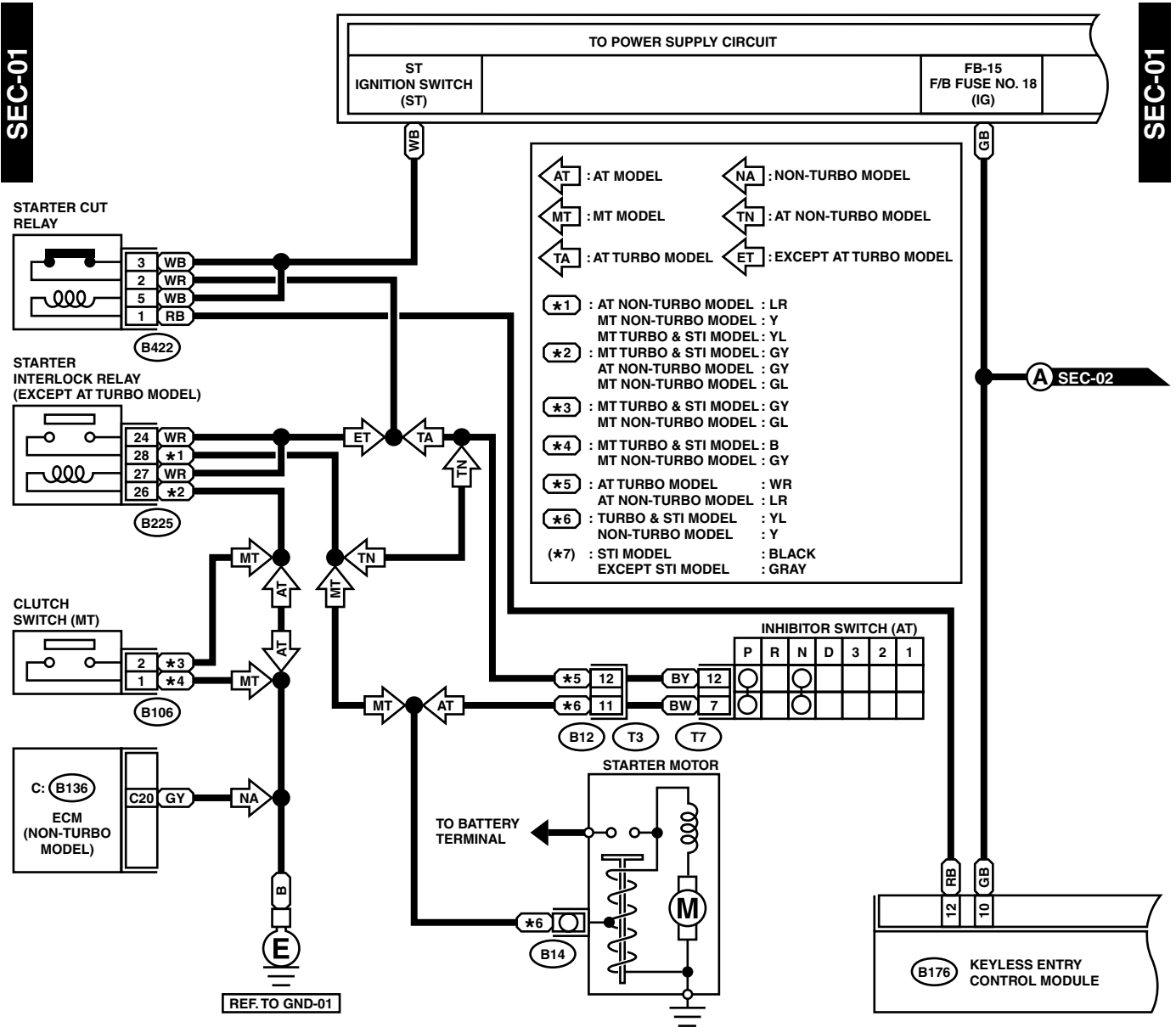
K/L-03



WI-09013

## 46. Security System

### A: WIRING DIAGRAM

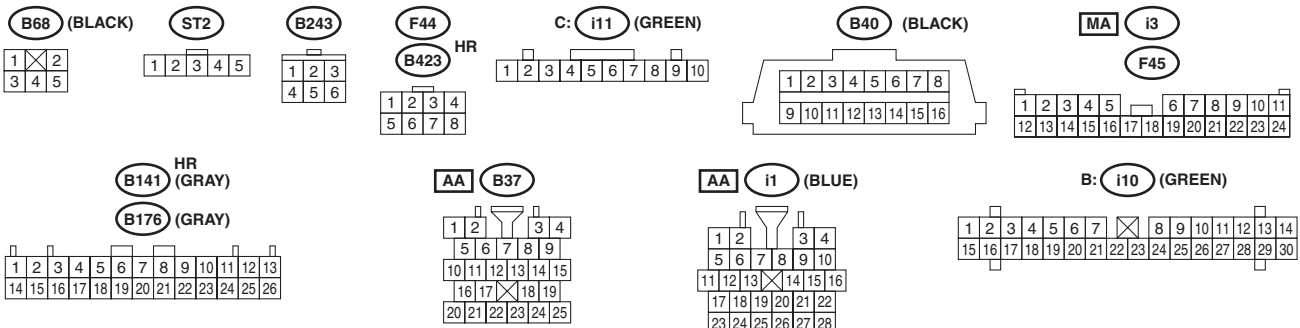
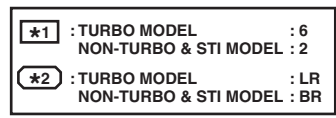
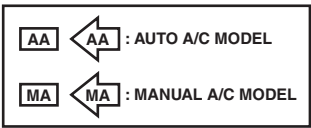
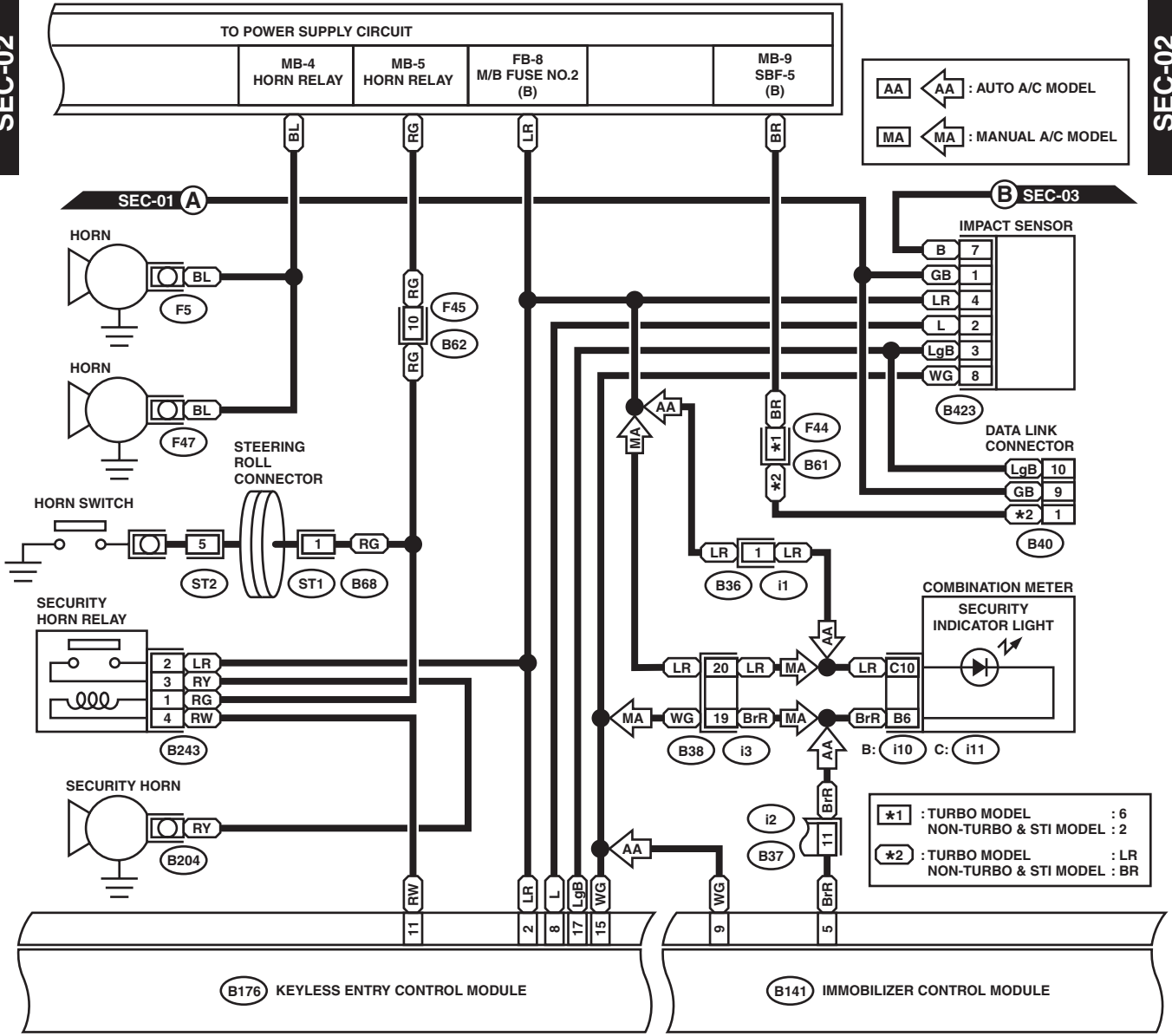


# Security System

WIRING SYSTEM

SEC-02

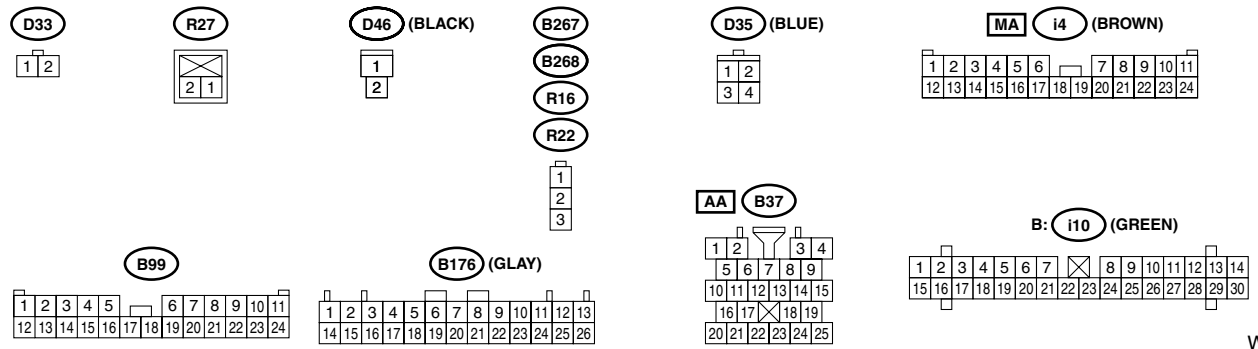
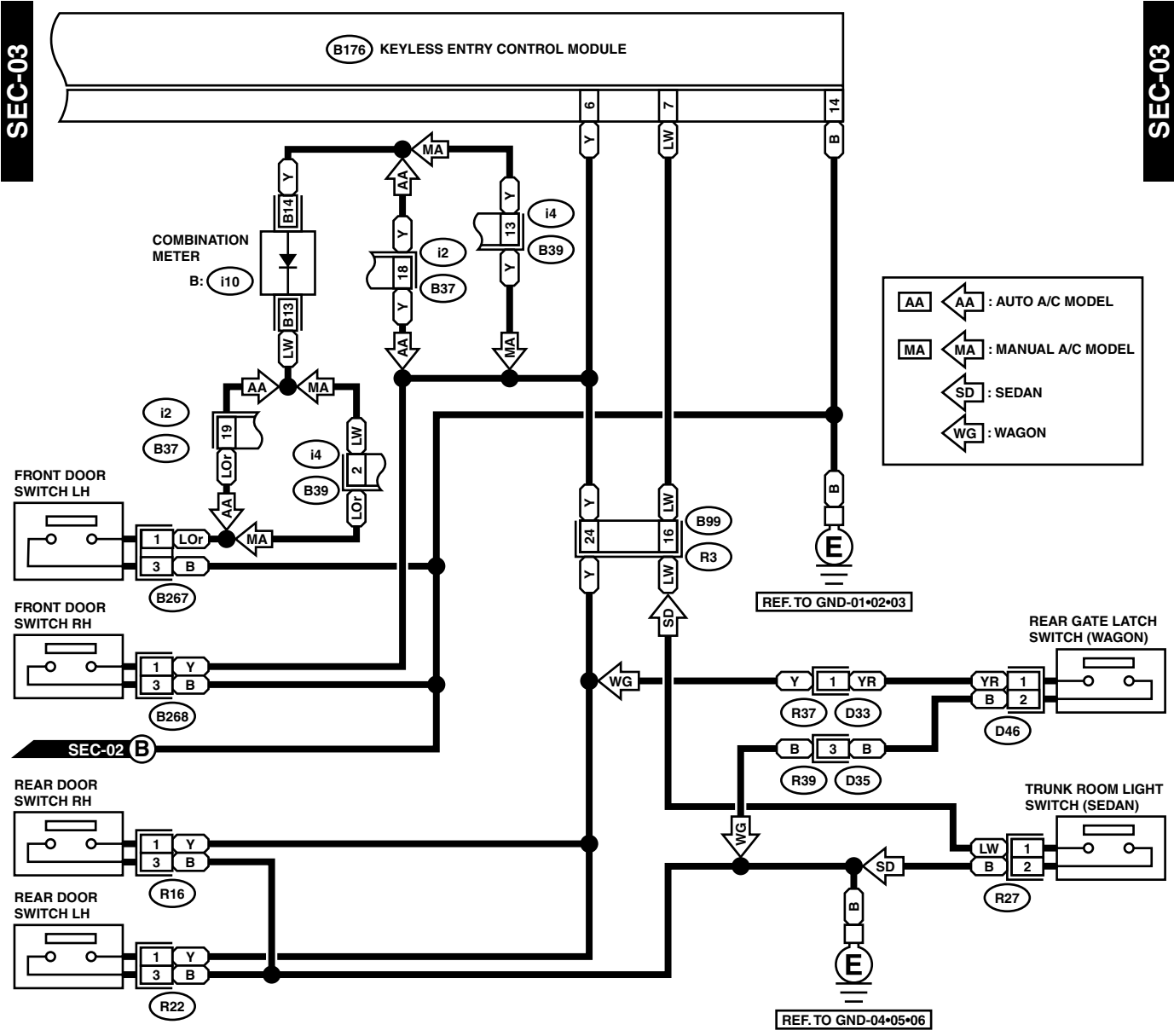
SEC-02



WI-11145

# Security System

WIRING SYSTEM



WI-09016

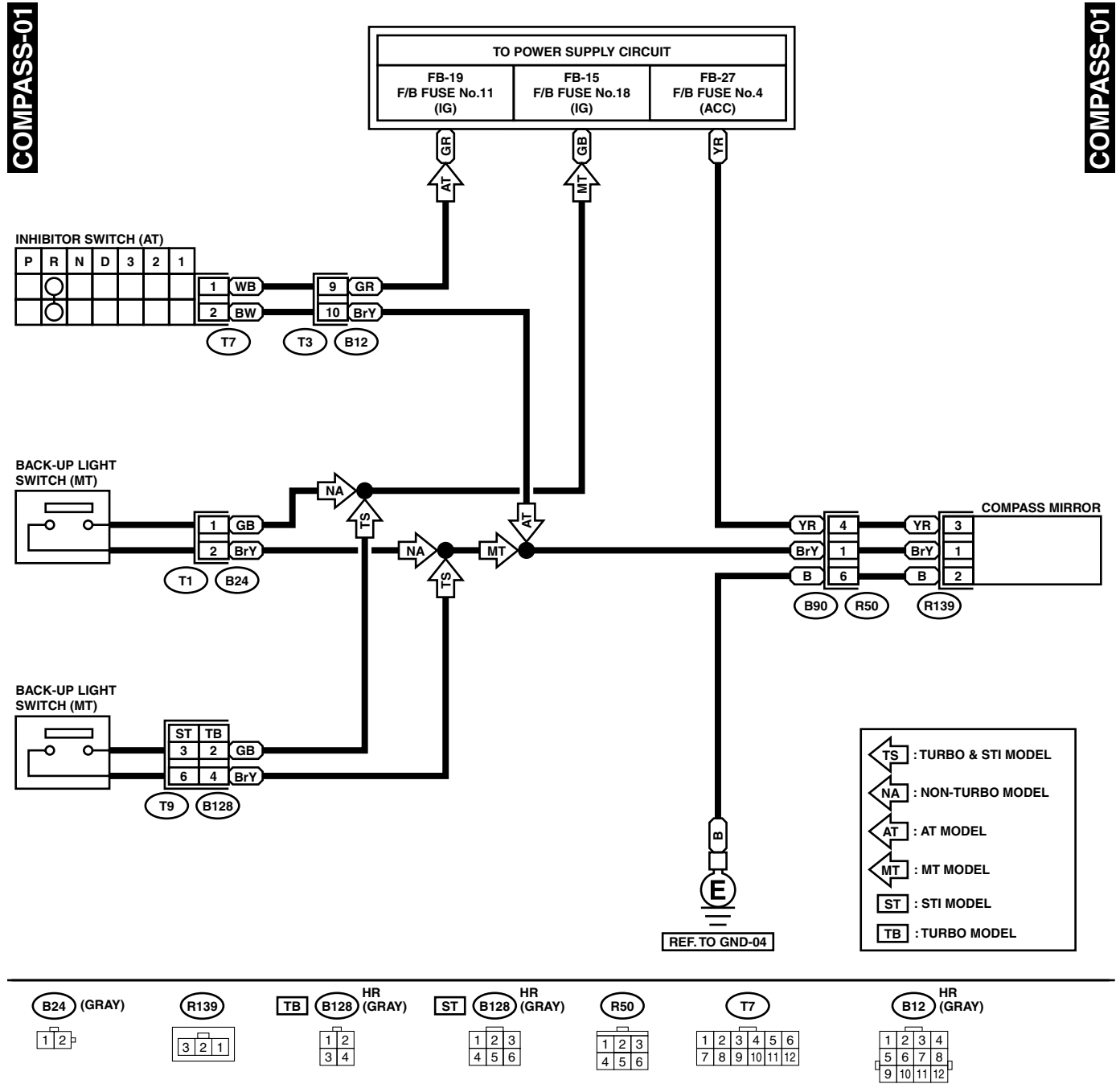


# Compass Mirror System

WIRING SYSTEM

## 47. Compass Mirror System

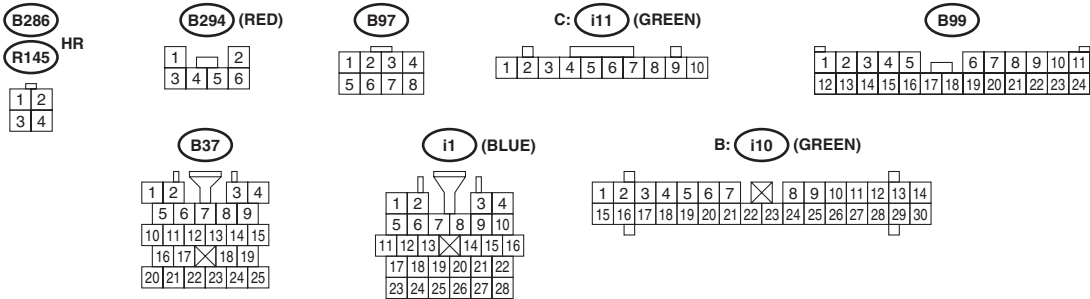
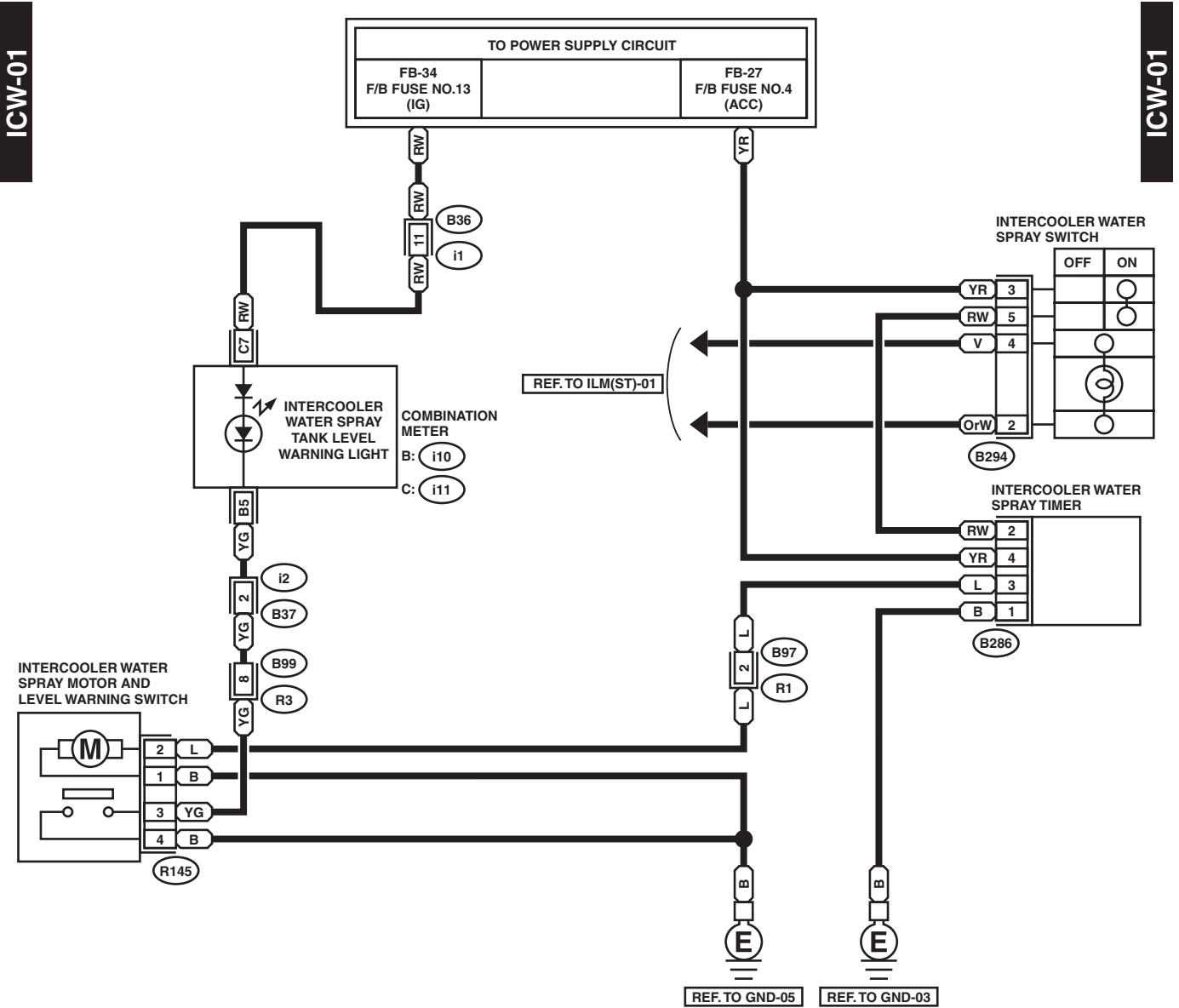
### A: WIRING DIAGRAM



WI-09017

## 48. Intercooler Water Spray System

### A: WIRING DIAGRAM

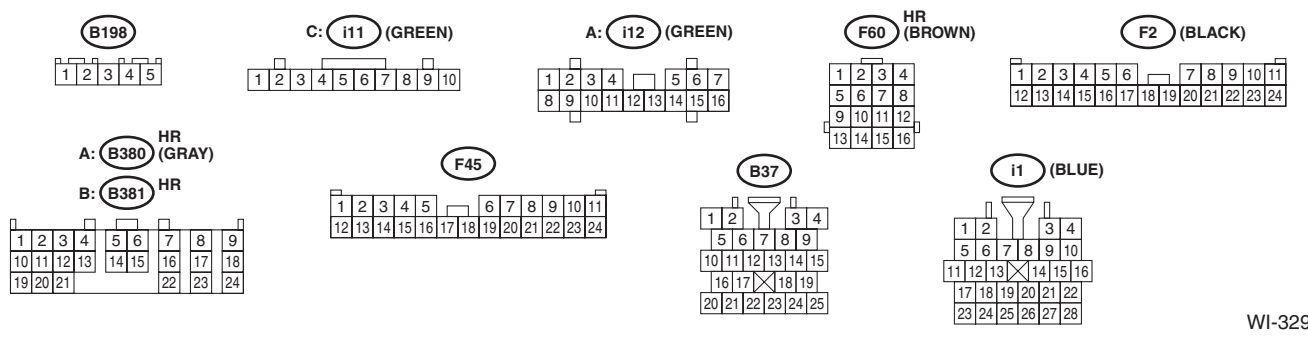
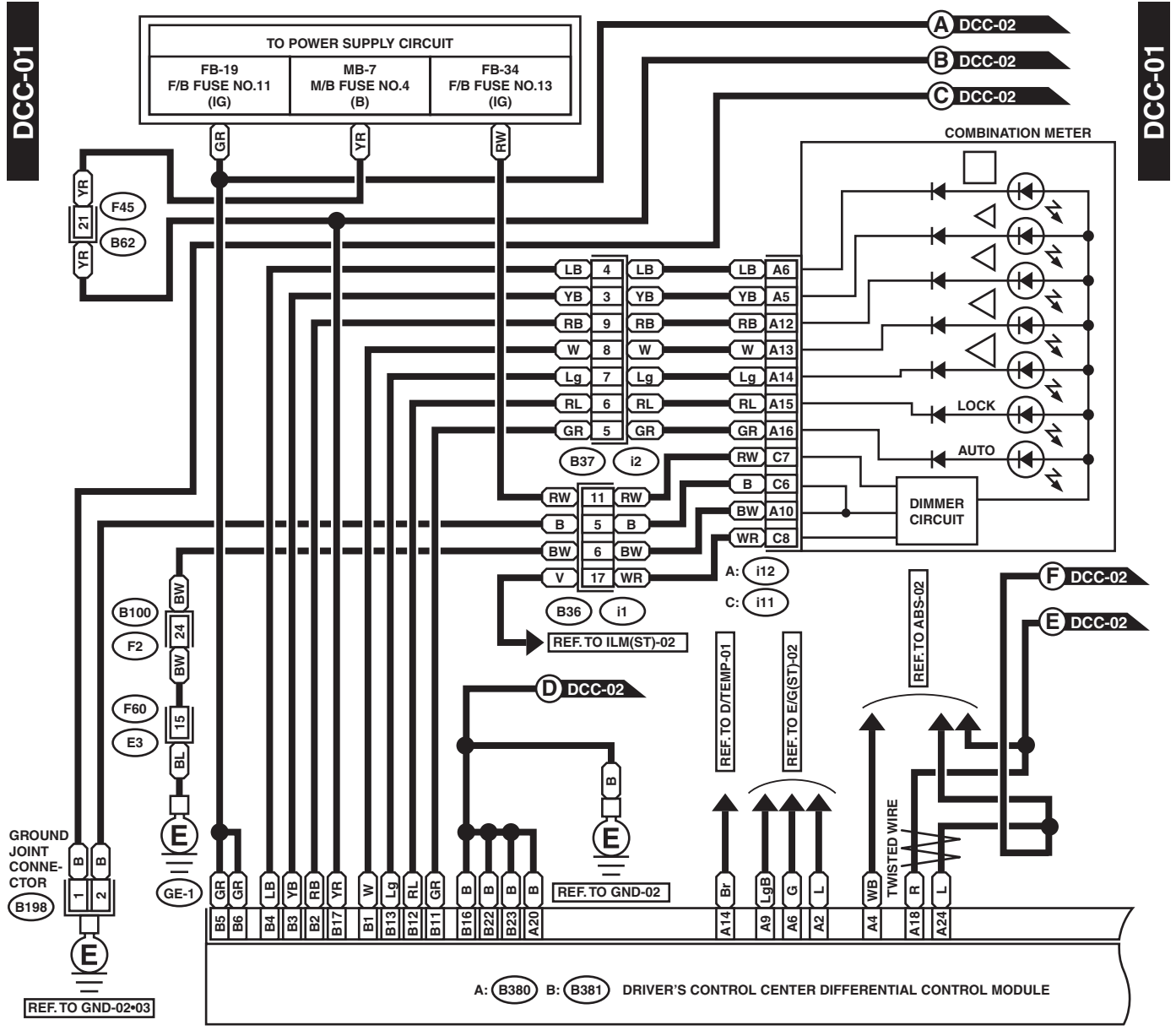


# Driver's Control Center Differential Control System

WIRING SYSTEM

## 49. Driver's Control Center Differential Control System

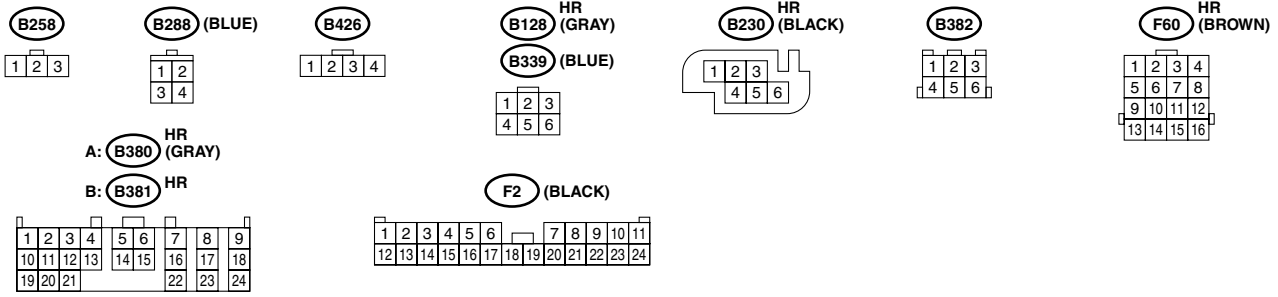
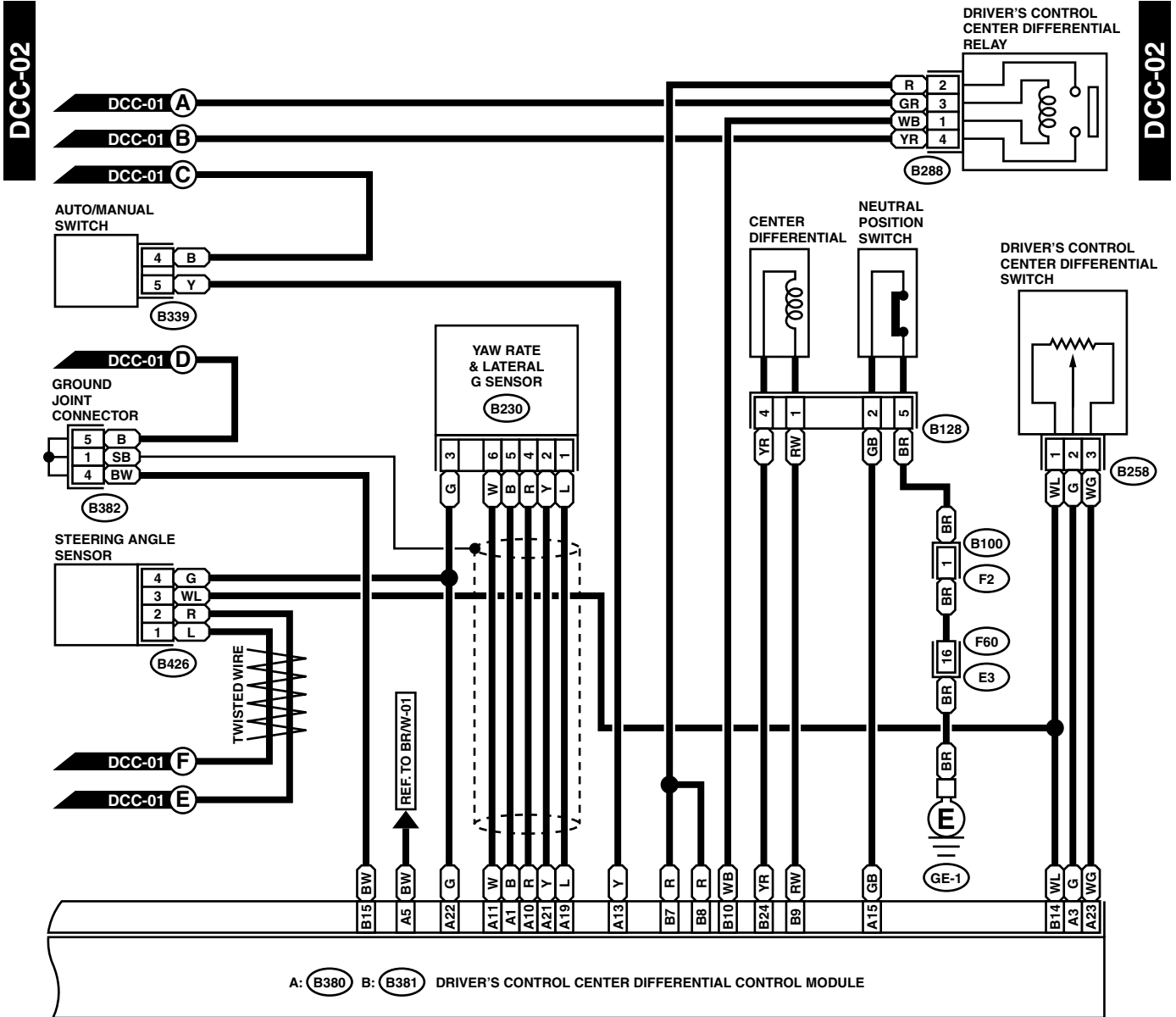
### A: WIRING DIAGRAM



WI-32931

# Driver's Control Center Differential Control System

WIRING SYSTEM



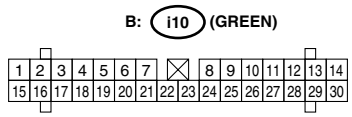
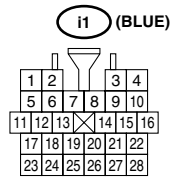
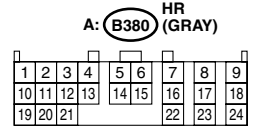
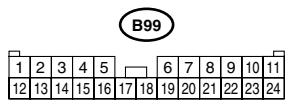
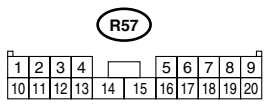
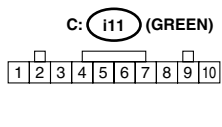
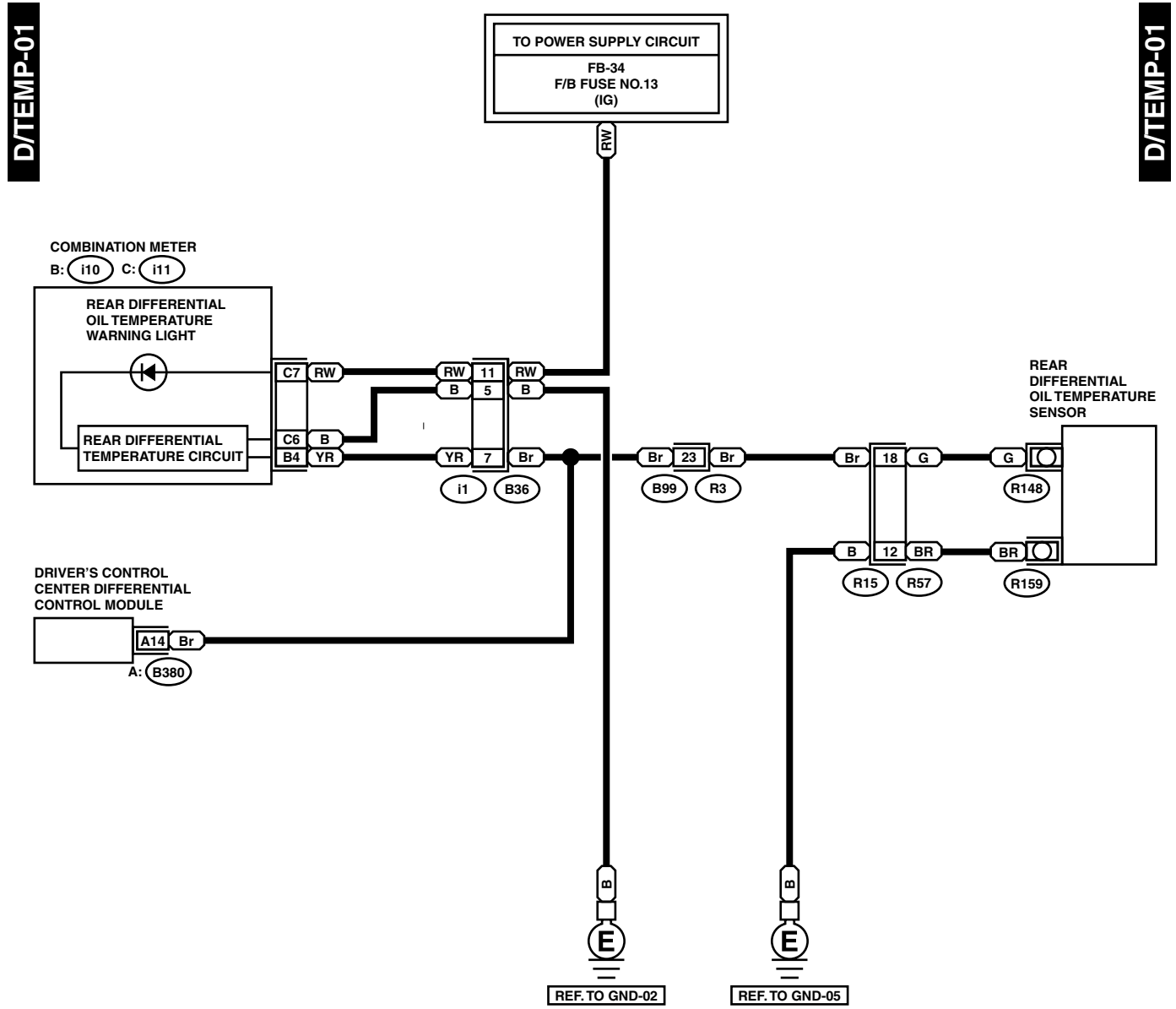
WI-12342

# Rear Differential Oil Temperature Warning Light System

WIRING SYSTEM

## 50.Rear Differential Oil Temperature Warning Light System

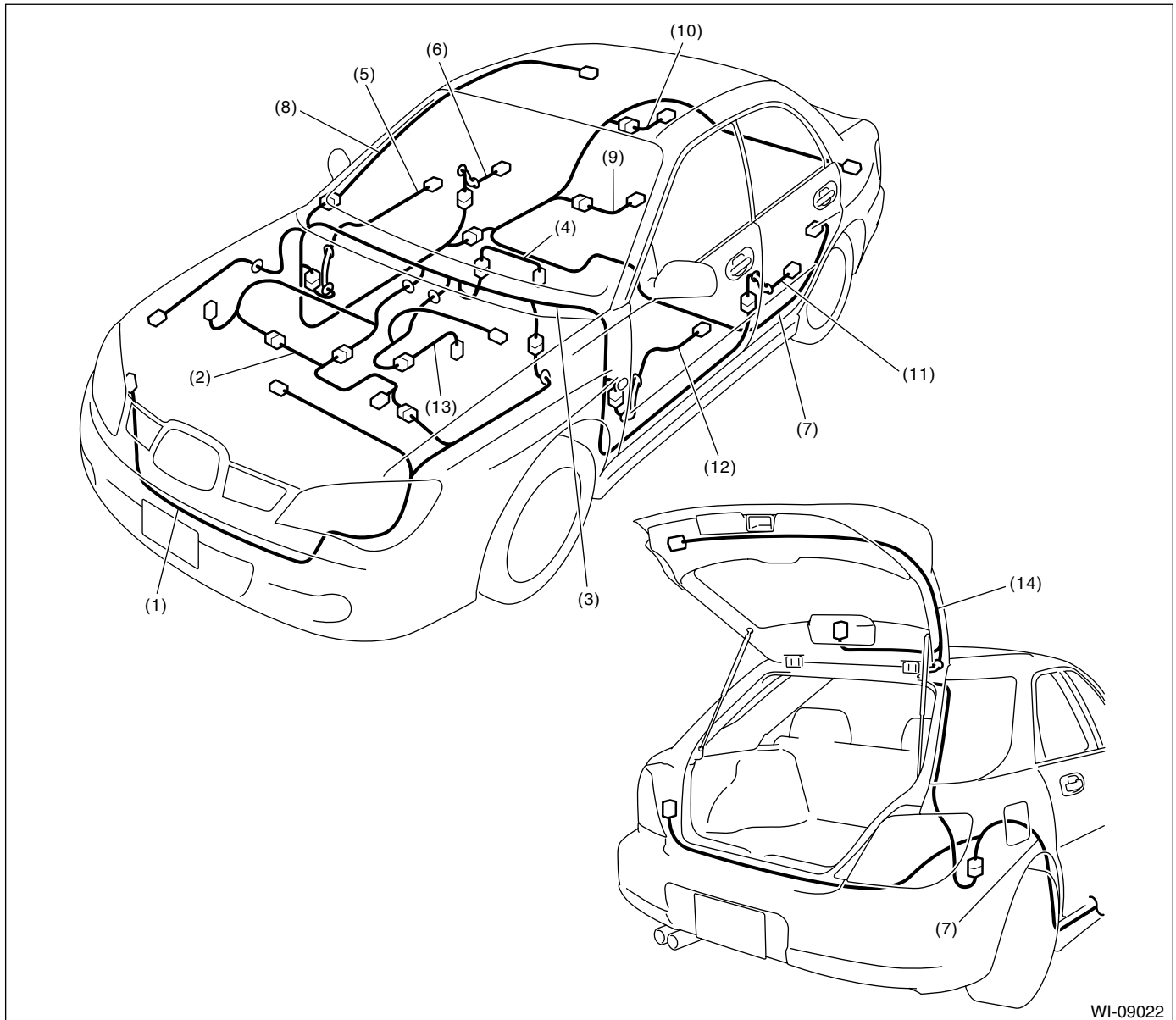
### A: WIRING DIAGRAM



WI-09021

## 51. Harness Components Location

### A: LOCATION



WI-09022

- |                                     |                         |                         |
|-------------------------------------|-------------------------|-------------------------|
| (1) Front wiring harness            | (6) Rear door cord RH   | (11) Rear door cord LH  |
| (2) Engine wiring harness           | (7) Rear wiring harness | (12) Front door cord LH |
| (3) Bulkhead wiring harness         | (8) Roof cord           | (13) Transmission cord  |
| (4) Instrument panel wiring harness | (9) Fuel tank cord      | (14) Rear gate cord     |
| (5) Front door cord RH              | (10) Trunk lid cord     |                         |

# Front Wiring Harness

WIRING SYSTEM

## 52. Front Wiring Harness

### A: LOCATION

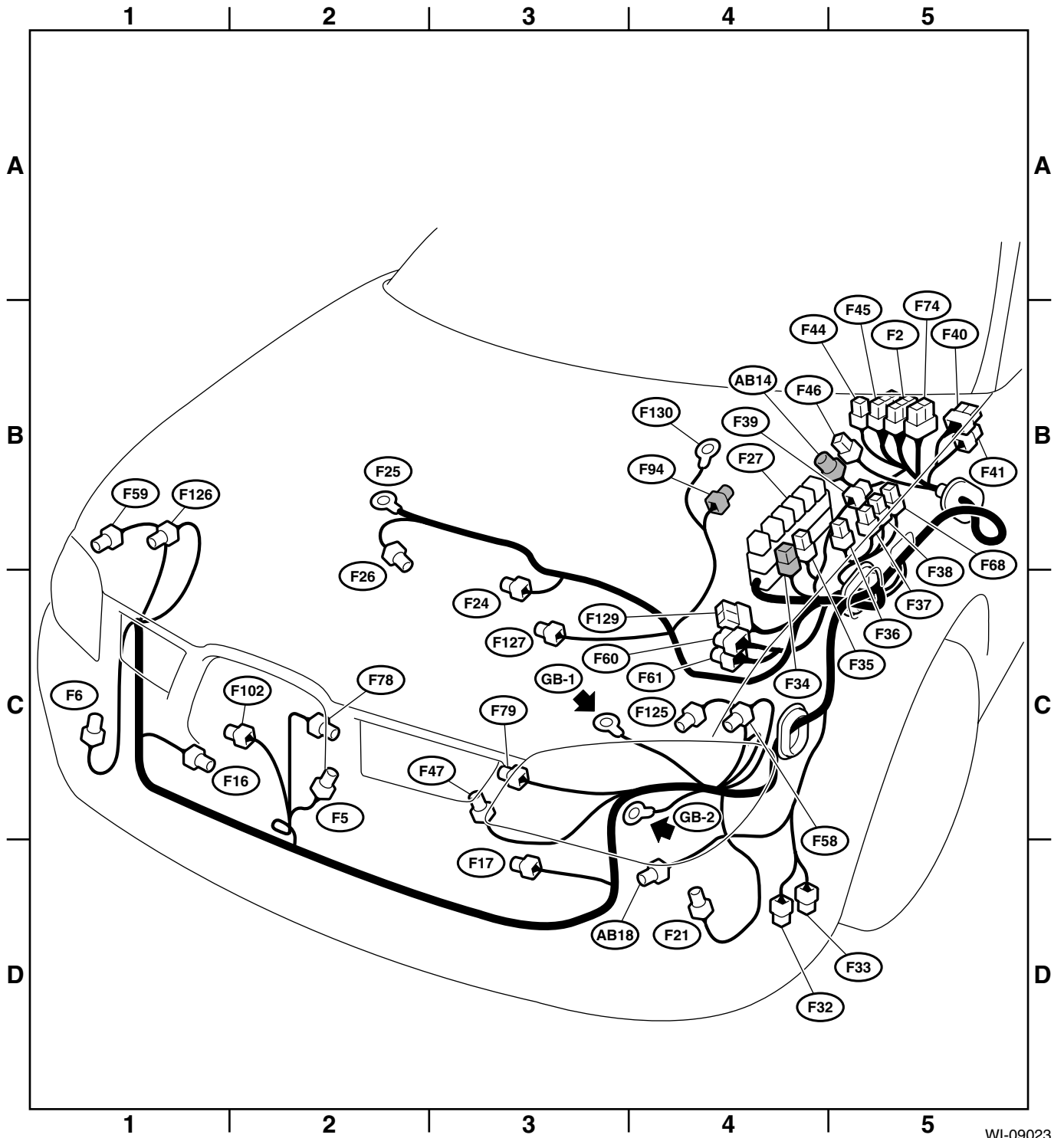
| Connector |      |       |      | Connecting to |   |
|-----------|------|-------|------|---------------|---|
| No.       | Pole | Color | Area | No.           | Name  |
| F2        | 24   | Black | B-5  | B100          | Bulkhead wiring harness                       |
| F5        | 1    | ★     | C-2  |               | Horn  |
| F6        | 2    | Black | C-1  |               | Front fog light RH                            |
| F16       | 4    | Gray  | C-1  |               | Sub fan motor                                 |
| F17       | 4    | Gray  | D-3  |               | Radiator main fan motor                       |
| F21       | 2    | Black | D-4  |               | Front fog light LH                            |
| F24       | 1    | Gray  | C-3  |               | A/C compressor                                |
| F25       | 1    | ★     | B-2  |               | Generator                                     |
| F26       | 3    | Green | B-2  |               |   |
| F27       | 36   | Black | B-4  |               | A/C relay holder                              |
| F32       | 2    | Black | C-4  |               | Front washer motor                            |
| F33       | 2    | Black | C-4  |               | Rear washer motor                             |
| F34       | 4    | Black | B-4  |               | SBF holder                                    |
| F35       | 2    | Black | B-4  |               | Main fuse box (M/B)                           |
| F36       | 3    | ★     | B-5  |               |   |
| F37       | 6    | ★     | B-5  |               |   |
| F38       | 1    | ★     | B-5  |               |   |
| F39       | 8    | ★     | B-5  |               |   |
| F40       | 9    | Brown | B-5  |               | Fuse & relay box (F/B)                        |
| F41       | 7    | Gray  | B-5  |               |   |
| F44       | 8    | ★     | B-5  | B61           | Bulkhead wiring harness                       |
| F45       | 24   | ★     | B-5  | B62           | Bulkhead wiring harness                       |
| F46       | 2    | Black | B-5  | B108          | Bulkhead wiring harness                       |
| F47       | 1    | ★     | C-3  |               | Horn  |
| F58       | 3    | Gray  | C-4  |               | Headlight leveler LH                          |
| F59       | 3    | Gray  | B-1  |               | Headlight leveler RH                          |
| F60       | 16   | Brown | C-4  | E3            | Engine wiring harness (Turbo model)           |
| F61       | 20   | Black | C-4  | E2            | Engine wiring harness (Turbo model)           |
| F68       | 4    | ★     | B-5  |               | Main fuse box (M/B)                           |
| F74       | 16   | Blue  | B-5  | B200          | Bulkhead wiring harness (Non-turbo model)     |
|           | 20   | Blue  | B-5  | B200          | Bulkhead wiring harness (Turbo and STI model) |
| F78       | 2    | Black | C-2  |               | Ambient sensor                                |
| F79       | 2    | Gray  | C-3  |               | A/C pressure switch                           |
| F94       | 2    | Gray  | B-4  |               | ABS front sensor LH                           |
| F102      | 2    | Black | C-2  |               | Keyless buzzer                                |
| F125      | 8    | Black | C-4  |               | Head light LH                                 |
| F126      | 8    | Black | B-1  |               | Head light RH                                 |
| F127      | 2    | Black | C-3  |               | Secondary air pump                            |
| F129      | 13   | Black | C-4  |               | Secondary A/C relay holder                    |
| F130      | 1    | ★     | B-4  |               | Air pump ground                               |

★: Non-colored

# Front Wiring Harness

WIRING SYSTEM

| Connector |      |        |      | Connecting to |                       |
|-----------|------|--------|------|---------------|-----------------------|
| No.       | Pole | Color  | Area | No.           | Name                  |
| AB14      | 2    | Yellow | B-4  | AB13          | Airbag wiring harness |
| AB18      | 2    | Yellow | D-4  |               | Front sub sensor LH   |



WI-09023



## Bulkhead Wiring Harness (In Engine Room)

WIRING SYSTEM

### 53. Bulkhead Wiring Harness (In Engine Room)

#### A: LOCATION

##### 1. EXCEPT FOR NON-TURBO MODEL

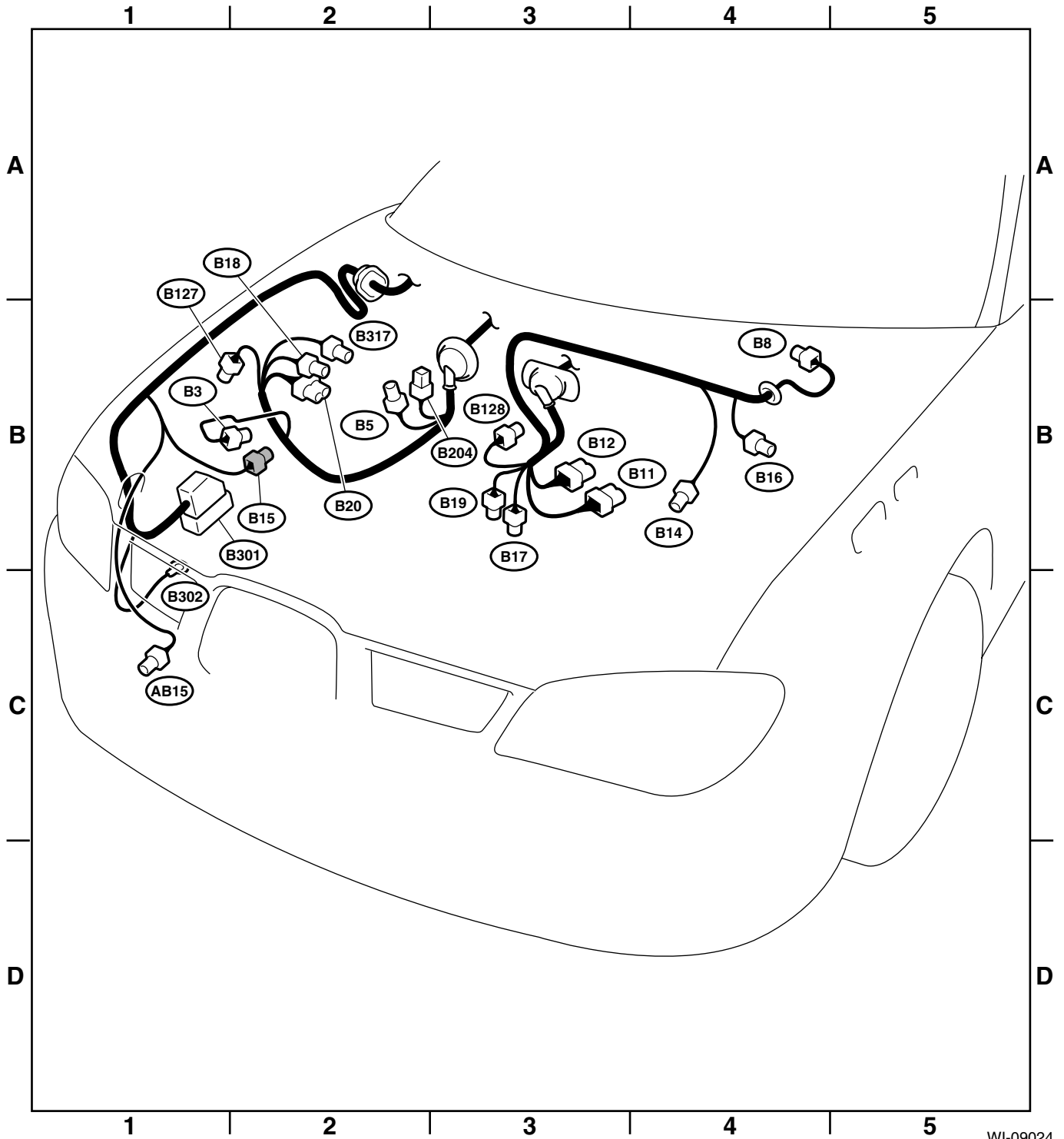
| Connector |      |       |      | Connecting to |  |
|-----------|------|-------|------|---------------|--|
| No.       | Pole | Color | Area | No.           | Name   |
| B3        | 5    | Black | B-2  |               | Mass air flow meter                            |
| B5        | 2    | Gray  | B-2  |               | Resistor (Daytime running light) (Turbo model) |
| B8        | 5    | Black | B-4  |               | Front wiper motor                              |
| B11       | 20   | Gray  | B-3  | T4            | Transmission code (AT model)                   |
| B12       | 12   | Gray  | B-3  | T3            |  |
| B14       | 1    | Black | B-4  |               | Starter (Magnet)                               |
| B15       | 2    | Gray  | B-2  |               | ABS front sensor RH                            |
| B16       | 2    | Gray  | B-4  |               | Brake fluid level switch                       |
| B17       | 4    | Gray  | B-3  |               | Vehicle speed sensor (MT) (Turbo model)        |
|           | 3    | Black | B-3  |               | Vehicle speed sensor (MT) (STI model)          |
| B18       | 4    | Gray  | B-2  |               | Front oxygen (A/F) sensor                      |
| B19       | 4    | Gray  | B-3  | T5            | Rear oxygen sensor cord                        |
| B20       | 10   | ★     | B-2  | E1            | Engine wiring harness                          |
| B127      | 2    | ★     | B-1  |               | Wastegate solenoid                             |
| B128      | 4    | Gray  | B-3  | T9            | Transmission code (MT) (Turbo model)           |
|           | 6    | Gray  | B-3  | T9            | Transmission code (MT) (STI model)             |
| B204      | 1    | ★     | B-2  |               | Security horn                                  |
| B301      | 26   | Black | B-1  |               | ABS control module                             |
| B302      | 1    | ★     | B-1  |               | ABS motor ground                               |
| B317      | 4    | Gray  | B-2  | E56           | Engine wiring harness (STI model)              |
|           | 8    | Gray  | B-2  | E56           | Engine wiring harness (Turbo model)            |

★: Non-colored

| Connector |      |        |      | Connecting to |                     |
|-----------|------|--------|------|---------------|---------------------|
| No.       | Pole | Color  | Area | No.           | Name                |
| AB15      | 2    | Yellow | C-1  |               | Front sub sensor RH |

# Bulkhead Wiring Harness (In Engine Room)

WIRING SYSTEM



WI-09024

## Bulkhead Wiring Harness (In Engine Room)

WIRING SYSTEM

### 2. NON-TURBO ENGINE MODEL

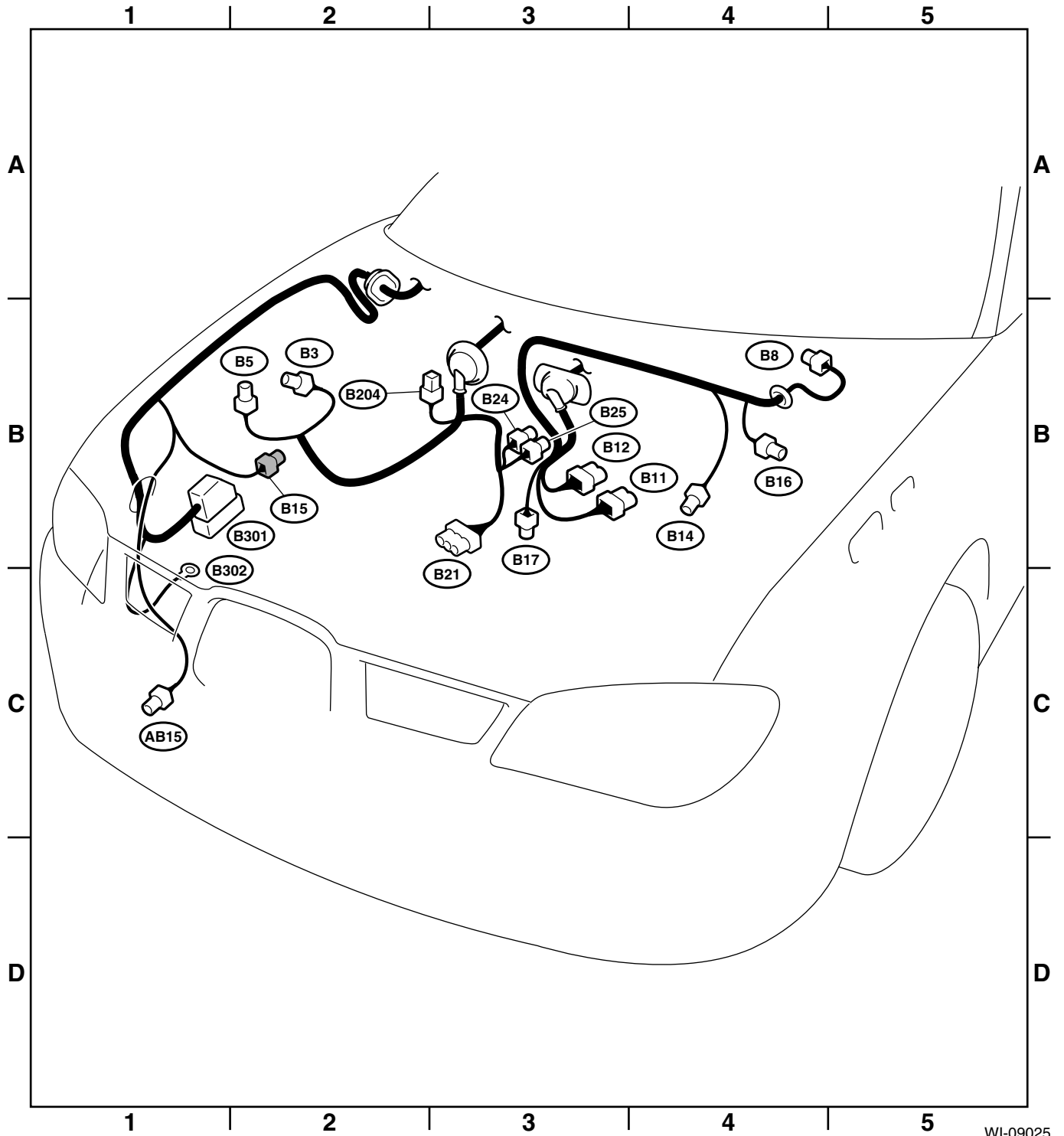
| Connector |      |       |      | Connecting to |                                    |
|-----------|------|-------|------|---------------|------------------------------------|
| No.       | Pole | Color | Area | No.           | Name                               |
| B3        | 5    | Black | B-2  |               | Mass air flow meter                |
| B5        | 2    | Gray  | B-2  |               | Resistor (Daytime running light)   |
| B8        | 5    | Black | B-4  |               | Front wiper motor                  |
| B11       | 20   | Gray  | B-3  | T4            | Transmission code (AT model)       |
| B12       | 12   | Gray  | B-3  | T3            |                                    |
| B14       | 1    | Black | B-4  |               | Starter (Magnet)                   |
| B15       | 2    | Gray  | B-2  |               | ABS front sensor RH                |
| B16       | 2    | Gray  | B-4  |               | Brake fluid level switch           |
| B17       | 3    | ★     | B-3  |               | Vehicle speed sensor (MT model)    |
| B21       | 54   | Black | B-3  | E100          | Engine wiring harness              |
| B24       | 2    | Gray  | B-3  | T1            | Back-up light switch (MT model)    |
| B25       | 2    | Brown | B-3  | T2            | Neutral position switch (MT model) |
| B204      | 1    | ★     | B-2  |               | Security horn                      |
| B301      | 26   | Black | B-1  |               | ABS control module                 |
| B302      | 1    | ★     | B-1  |               | ABS motor ground                   |

★: Non-colored

| Connector |      |        |      | Connecting to |                     |
|-----------|------|--------|------|---------------|---------------------|
| No.       | Pole | Color  | Area | No.           | Name                |
| AB15      | 2    | Yellow | C-1  |               | Front sub sensor RH |

# Bulkhead Wiring Harness (In Engine Room)

WIRING SYSTEM



WI-09025

# Bulkhead Wiring Harness (In Compartment)

WIRING SYSTEM

## 54. Bulkhead Wiring Harness (In Compartment)

### A: LOCATION

| Connector |      |        |      | Connecting to |  |
|-----------|------|--------|------|---------------|--|
| No.       | Pole | Color  | Area | No.           | Name   |
| B30       | 25   | ★      | C-1  | D1            | Front door cord LH   |
| B31       | 6    | Yellow | D-1  | AB1           | SRS (Airbag) harness                                       |
| B32       | 3    | Black  | B-2  |               | Turn signal and hazard module                              |
| B36       | 28   | Blue   | B-3  | i1            | Instrument panel wiring harness (Auto A/C model)           |
| B37       | 25   | ★      | B-3  | i2            |  |
| B38       | 24   | ★      | B-3  | i3            |  |
| B39       | 24   | Brown  | B-3  | i4            | Instrument panel wiring harness (Manual A/C model)         |
| B40       | 16   | Black  | C-3  |               | Data link connector  |
| B41       | 2    | ★      | C-1  |               | Power window circuit breaker                               |
| B46       | 4    | Green  | B-5  |               | Fuel pump relay  |
| B47       | 6    | Brown  | B-5  |               | Main relay   |
| B50       | 4    | ★      | C-1  |               | Blower fan relay   |
| B51       | 8    | Blue   | C-1  |               | Fuse & relay box (F/B)                                     |
| B52       | 7    | ★      | C-1  |               |  |
| B54       | 35   | ★      | B-2  |               | TCM (AT model)   |
| B55       | 35   | Gray   | B-2  |               | TCM (AT model)   |
| B61       | 8    | ★      | B-2  | F44           | Front wiring harness                                       |
| B62       | 24   | ★      | B-2  | F45           |  |
| B65       | 4    | Black  | B-2  |               | Stop light and brake light switch                          |
| B68       | 5    | Black  | C-3  |               | Cruise control sub switch and horn switch (Roll connector) |
| B69       | 4    | ★      | C-3  |               | Parking switch   |
| B70       | 18   | ★      | C-3  |               | Combination switch   |
| B71       | 17   | ★      | C-3  |               |  |
| B72       | 4    | Blue   | B-3  |               | Ignition switch  |
| B75       | 2    | Green  | C-2  | B76           | Test mode connector  |
| B76       | 2    | Green  | C-2  | B75           |  |
| B77       | 3    | ★      | B-4  |               | Mode actuator (Turbo and STI model)                        |
| B83       | 8    | ★      | C-5  |               | Shield and sensor ground joint connector                   |
| B86       | 4    | Brown  | B-4  |               | Blower motor resistor                                      |
| B87       | 2    | ★      | B-4  |               | Blower motor   |
| B88       | 4    | Brown  | B-3  |               | Evaporation thermostat                                     |
| B90       | 6    | ★      | B-5  | R50           | Roof cord  |
| B91       | 6    | Black  | B-4  |               | FRESH/RECIRC actuator (Turbo and STI model)                |

| Connector |      |       |      | Connecting to |   |
|-----------|------|-------|------|---------------|---|
| No.       | Pole | Color | Area | No.           | Name  |
| B95       | 2    | Black | B-4  |               | Diode (Daytime running light) (Non-turbo and turbo model) |
|           | 3    | ★     | B-4  |               | Diode (Daytime running light) (STI model)                 |
| B96       | 10   | ★     | B-5  |               | Daytime running light control module                      |
| B100      | 24   | Black | B-1  | F2            | Front wiring harness                                      |
| B101      | 25   | ★     | B-5  | D11           | Front door cord RH  |
| B102      | 5    | Black | B-5  |               | Daytime running light relay                               |
| B103      | 4    | ★     | B-5  |               | High-beam relay (Daytime running light)                   |
| B106      | 2    | ★     | B-2  |               | Clutch switch (MT model)                                  |
| B107      | 2    | Blue  | B-2  |               | Cruise clutch switch (MT model)                           |
| B108      | 2    | Black | B-1  | F46           | Front wiring harness                                      |
| B112      | 4    | Brown | B-3  |               | Diode (Front fog light)                                   |
| B117      | 6    | ★     | C-4  |               | AT select lever   |
| B118      | 2    | ★     | B-4  |               | CD player illumination light                              |
| B119      | 4    | ★     | C-4  |               | Front accessory power supply socket                       |
| B120      | 14   | ★     | B-4  |               | Radio   |
| B121      | 1    | Black | B-4  |               | Audio bracket ground                                      |
| B122      | 6    | ★     | C-5  |               | Joint connector (STI model)                               |
|           | 8    | ★     | C-5  |               | Joint connector (Non-turbo and Turbo model)               |
| B125      | 1    | Green | B-5  | B126          | Line end connector  |
| B126      | 1    | Green | B-5  | B125          |   |
| B132      | 8    | Gray  | C-1  |               | Headlight leveler switch (STI model)                      |
| B134      | 34   | ★     | B-4  |               | ECM   |
| B135      | 35   | ★     | B-4  |               | ECM   |
| B136      | 35   | ★     | B-4  |               | ECM   |
| B137      | 31   | ★     | C-4  |               | ECM   |
| B141      | 26   | Gray  | B-2  |               | Immobilizer control module (Turbo and STI model)          |
| B142      | 2    | ★     | B-3  |               | Antenna (Immobilizer) (Turbo and STI model)               |
| B152      | 12   | ★     | C-1  |               | Fuse & relay box (F/B)                                    |
| B158      | 10   | Gray  | C-1  |               |   |
| B160      | 6    | Gray  | C-1  |               | Front fog light switch                                    |
| B168      | 10   | ★     | C-4  |               | Mode control panel  |
| B169      | 6    | ★     | C-4  |               | Blower fan switch (Non-turbo model)                       |
| B176      | 26   | Gray  | C-1  |               | Keyless entry control module                              |

# Bulkhead Wiring Harness (In Compartment)

WIRING SYSTEM

| Connector |      |       |      | Connecting to |   |
|-----------|------|-------|------|---------------|---|
| No.       | Pole | Color | Area | No.           | Name  |
| B177      | 2    | ★     | B-1  |               | Wiper deicer (Turbo model)                              |
| B191      | 4    | ★     | B-5  |               | Wiper deicer relay (Turbo model)                        |
| B192      | 4    | ★     | B-5  |               | Wiper deicer timer (Turbo model)                        |
| B193      | 6    | ★     | C-1  |               | Wiper deicer switch (Turbo model)                       |
| B198      | 5    | ★     | C-5  |               | Ground joint connector                                  |
| B200      | 20   | Blue  | B-2  | F74           | Front wiring harness (Turbo and STI model)              |
| B208      | 2    | Black | B-5  |               | Glove box light   |
| B225      | 8    | Black | C-2  |               | Fuse (Relay block)                                      |
|           | 5    | Black | C-2  |               | Ignition relay (Relay block)                            |
|           | 5    | Black | C-2  |               | Power window relay (Relay block)                        |
|           | 5    | Black | C-2  |               | Front fog light relay (Relay block)                     |
|           | 5    | Black | C-2  |               | Starter interlock relay (Relay block)                   |
|           | 5    | Black | C-2  |               | Mirror heater relay (Relay block)                       |
|           | 5    | Black | C-2  |               | HID relay (Relay block) (STI model)                     |
| B230      | 6    | ★     | D-5  |               | Yaw rate sensor   |
| B243      | 6    | ★     | B-3  |               | Security horn relay                                     |
| B256      | 2    | ★     | B-4  |               | Evaporator sensor (Turbo and STI model)                 |
| B258      | 3    | ★     | D-4  |               | Driver's control center differential switch (STI model) |
| B264      | 4    | Red   | C-1  |               | Short connector   |
| B271      | 12   | Blue  | C-1  |               | Fuse & relay box (F/B)                                  |
| B275      | 4    | ★     | B-4  |               | Fan control amplifier                                   |
| B280      | 16   | Blue  | C-3  |               | Body Integrated module                                  |
| B281      | 20   | Gray  | C-3  |               |   |
| B282      | 16   | Gray  | C-4  |               | Auto A/C control module (Turbo and STI model)           |
| B283      | 20   | Gray  | C-4  |               |   |
| B286      | 4    | ★     | B-5  |               | Intercooler water spray timer (STI model)               |
| B288      | 4    | Blue  | C-1  |               | Driver's control center differential relay (STI model)  |
| B292      | 3    | ★     | D-5  |               | ABS G sensor  |
| B293      | 3    | ★     | B-4  |               | Air mix actuator  |
| B294      | 6    | ★     | C-1  |               | Intercooler water spray switch (STI model)              |
| B304      | 2    | ★     | B-5  |               | ABS condenser   |

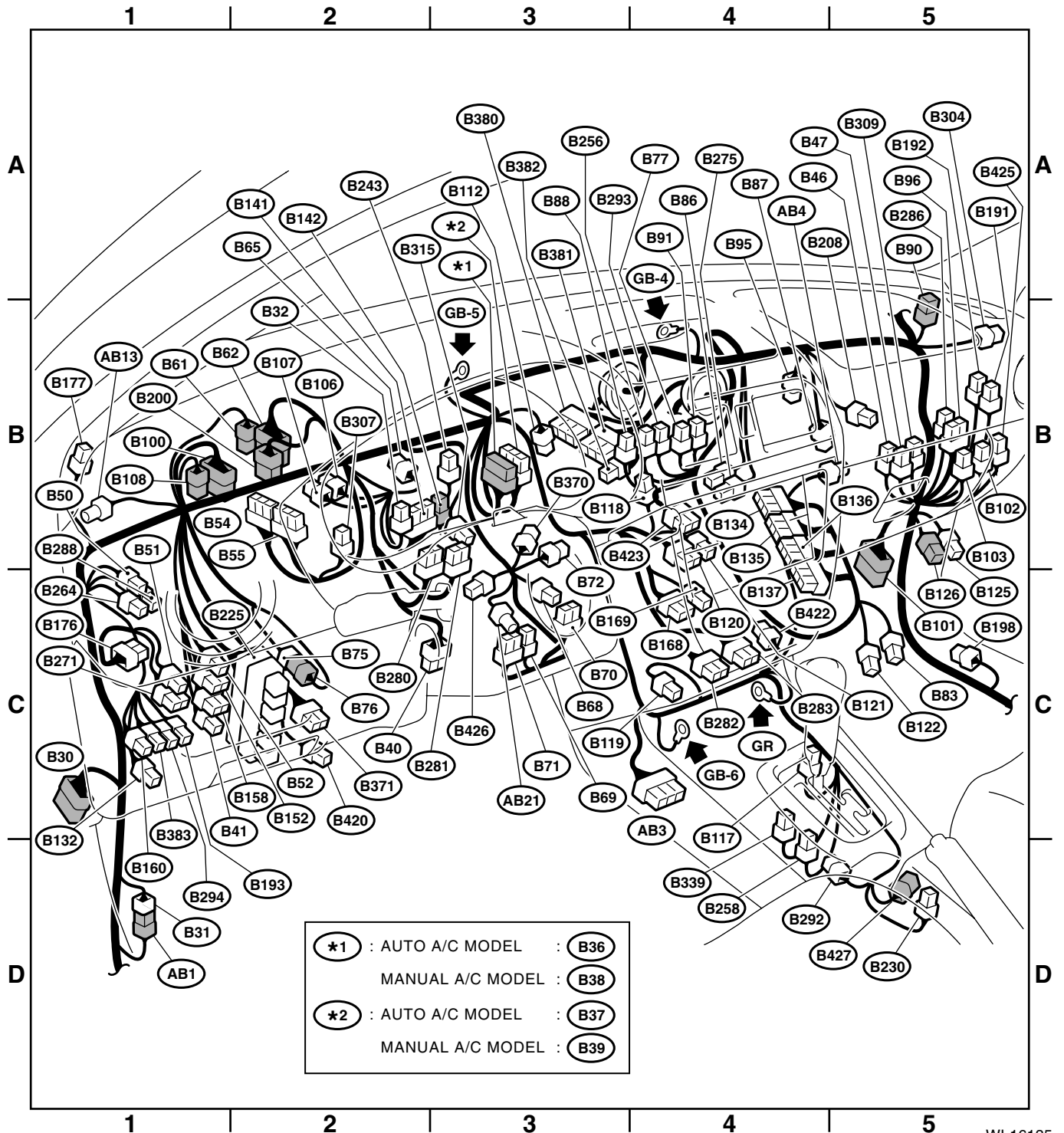
| Connector |      |        |      | Connecting to |   |
|-----------|------|--------|------|---------------|---|
| No.       | Pole | Color  | Area | No.           | Name  |
| B307      | 2    | Black  | B-2  |               | Shift lock diode (AT model)                                     |
| B309      | 4    | Black  | B-5  |               | Electronic control throttle relay                               |
| B315      | 6    | Black  | B-3  |               | Accelerator position sensor                                     |
| B335      | 2    | Black  | D-1  | B336          | Joint connector (Key Lock) (Turbo model)                        |
| B336      | 2    | Black  | D-1  | B335          |   |
| B339      | 6    | Blue   | C-4  |               | Auto/manual switch  |
| B370      | 6    | ★      | B-3  |               | Ignition starter and steering lock assembly                     |
| B371      | 5    | ★      | C-2  |               | Relay holder  |
| B380      | 24   | Gray   | B-3  |               | Driver's control center differential control module (STI model) |
| B381      | 24   | ★      | B-3  |               | Driver's control center differential control module (STI model) |
| B382      | 6    | ★      | B-3  |               | Ground joint connector (STI model)                              |
| B383      | 4    | Blue   | C-1  |               | Seat heater switch LH (STI model)                               |
| B420      | 6    | ★      | C-2  |               | HID diode   |
| B422      | 5    | Black  | C-4  |               | Starter cut relay (STI model)                                   |
|           |      | Gray   | C-4  |               | Starter cut relay (Except for STI model)                        |
| B423      | 5    | ★      | B-4  |               | Impact sensor   |
| B425      | 5    | Gray   | B-5  |               | A/F & Oxygen sensor relay                                       |
| B426      | 4    | ★      | C-3  |               | Steering angle sensor   |
| B427      | 2    | Yellow | D-5  | AB60          | SRS airbag harness  |

★: Non-colored

# Bulkhead Wiring Harness (In Compartment)

## WIRING SYSTEM

| Connector |      |        |      | Connecting to |                                  |
|-----------|------|--------|------|---------------|----------------------------------|
| No.       | Pole | Color  | Area | No.           | Name                             |
| AB1       | 6    | Yellow | D-1  | B31           | Bulkhead wiring harness          |
| AB3       | 28   | Yellow | C-4  |               | Airbag control module            |
| AB4       | 4    | Yellow | B-5  |               | Airbag module (Passenger's seat) |
| AB13      | 2    | Yellow | B-1  | AB14          | Airbag wiring harness            |
| AB21      | 4    | Yellow | C-3  | AB26          | Airbag module (Driver's seat)    |



WI-16135

## 55.Engine Wiring Harness and Transmission Cord

### A: LOCATION

#### 1. TURBO MODEL

| Connector |      |            |      | Connecting to |   |
|-----------|------|------------|------|---------------|---|
| No.       | Pole | Color      | Area | No.           | Name  |
| E1        | 10   | Light gray | A-2  | B20           | Bulkhead wiring harness                           |
| E2        | 20   | Black      | B-4  | F61           | Front wiring harness                              |
| E3        | 16   | Brown      | B-4  | F60           |   |
| E4        | 2    | Black      | B-3  |               | Purge control solenoid valve                      |
| E5        | 2    | Dark gray  | A-2  |               | Fuel injector No. 1                               |
| E6        | 2    | Dark gray  | A-2  |               | Fuel injector No. 3                               |
| E7        | 3    | Black      | A-3  |               | Idle air control solenoid valve                   |
| E8        | 3    | Light gray | B-3  |               | Engine coolant temperature sensor and thermometer |
| E10       | 2    | Light gray | B-2  |               | Crankshaft position sensor                        |
| E11       | 1    | ★          | B-2  |               | Oil pressure switch                               |
| E13       | 3    | Black      | A-3  |               | Throttle position sensor                          |
| E14       | 2    | Light gray | A-4  |               | Knock sensor                                      |
| E15       | 2    | Light gray | B-4  |               | Camshaft position sensor                          |
| E16       | 2    | Dark gray  | B-4  |               | Fuel injector No. 2                               |
| E17       | 2    | Dark gray  | B-4  |               | Fuel injector No. 4                               |
| E19       | 1    | Light gray | B-3  |               | Power steering oil pressure switch                |
| E21       | 3    | Black      | A-3  |               | Absolute manifold pressure sensor                 |
| E31       | 3    | ★          | B-2  |               | Ignition coil No. 1                               |
| E32       | 3    | ★          | B-4  |               | Ignition coil No. 2                               |
| E33       | 3    | Black      | A-3  |               | Ignition coil No. 3                               |
| E34       | 3    | Black      | B-4  |               | Ignition coil No. 4                               |
| E35       | 3    | Light gray | A-4  |               | AVCS camshaft position sensor LH                  |
| E36       | 3    | Light gray | A-3  |               | AVCS camshaft position sensor RH                  |
| E37       | 2    | Blue       | B-4  |               | AVCS solenoid valve LH                            |
| E38       | 2    | Blue       | A-2  |               | AVCS solenoid valve RH                            |
| E50       | 3    | Black      | B-3  |               | Tumble generator valve position sensor LH         |
| E51       | 2    | Black      | A-4  |               | Tumble generator valve LH                         |
| E54       | 3    | Black      | A-3  |               | Tumble generator valve position sensor RH         |
| E55       | 2    | Black      | A-2  |               | Tumble generator valve RH                         |
| E56       | 8    | Dark gray  | A-2  | B317          | Bulkhead wiring harness                           |
| E57       | 6    | Black      | A-3  |               | Electronic throttle control                       |
| E61       | 2    | Dark gray  | A-3  |               | PCV diagnosis connector                           |
| E115      | 2    | Black      | B-4  |               | Secondary air combi cut valve RH                  |
| E116      | 6    | Black      | B-4  |               | Secondary air combi cut valve LH                  |

★: Non-colored

| Connector |      |       |      | Connecting to |                                    |
|-----------|------|-------|------|---------------|------------------------------------|
| No.       | Pole | Color | Area | No.           | Name                               |
| T3        | 12   | Black | D-4  | B12           | Bulkhead wiring harness (AT model) |
| T4        | 20   | Gray  | D-4  | B11           |                                    |
| T5        | 4    | Gray  | C-1  | B19           | Bulkhead wiring harness (MT model) |
|           |      |       | C-4  |               | Bulkhead wiring harness (AT model) |
| T6        | 4    | Gray  | D-3  |               | Rear oxygen sensor (MT model)      |
|           |      |       | D-5  |               | Rear oxygen sensor (AT model)      |
| T7        | 12   | Black | D-4  |               | Inhibitor switch (AT model)        |

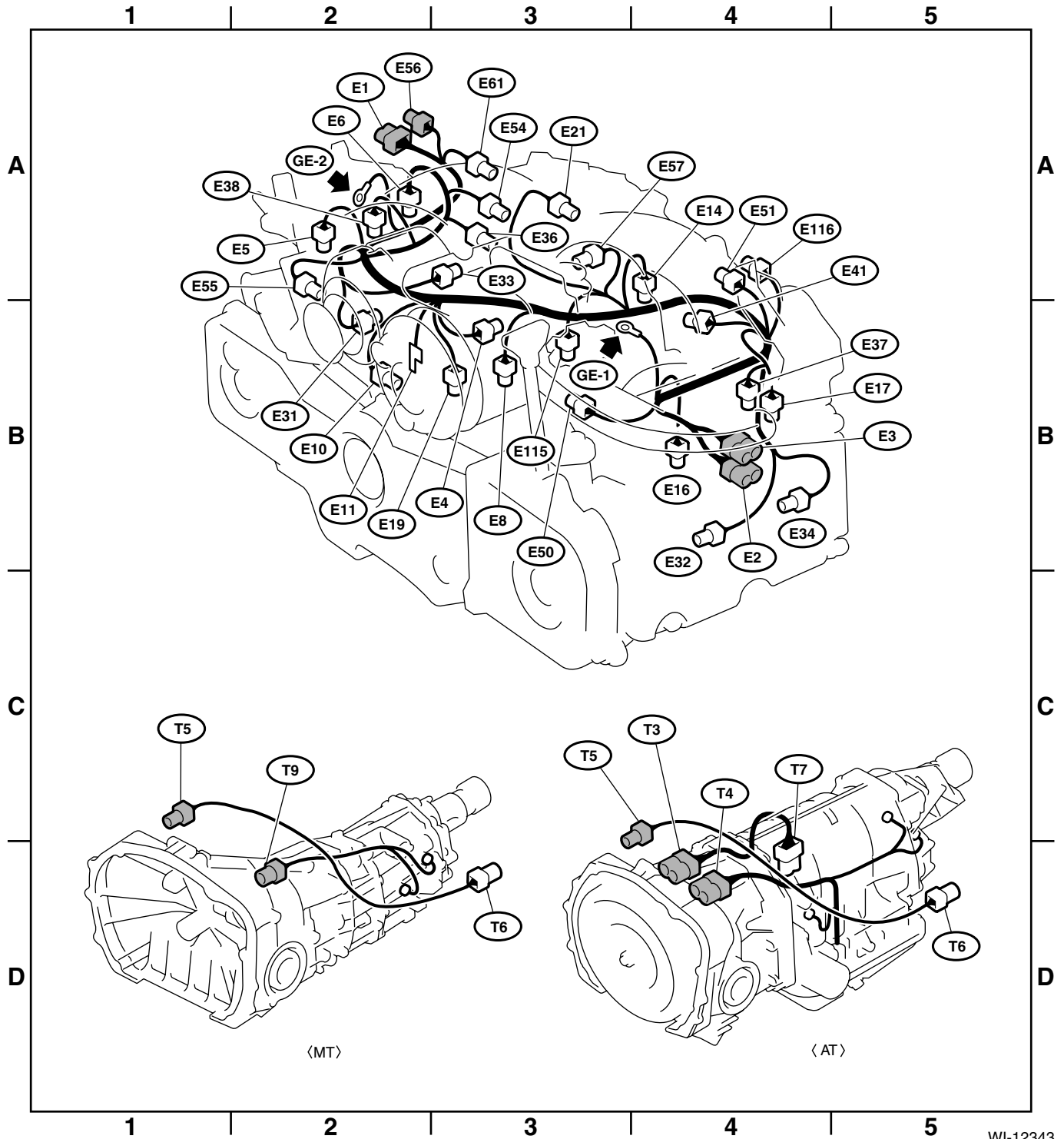


# Engine Wiring Harness and Transmission Cord

## WIRING SYSTEM

| Connector |      |       |      | Connecting to |                                    |
|-----------|------|-------|------|---------------|------------------------------------|
| No.       | Pole | Color | Area | No.           | Name                               |
| T9        | 4    | Gray  | D-2  | B128          | Bulkhead wiring harness (MT model) |

★: Non-colored



WI-12343

# Engine Wiring Harness and Transmission Cord

WIRING SYSTEM

## 2. NON-TURBO MODEL

| Connector |      |            |      | Connecting to |  |
|-----------|------|------------|------|---------------|--|
| No.       | Pole | Color      | Area | No.           | Name   |
| E4        | 2    | Black      | A-3  |               | Purge control solenoid valve                         |
| E5        | 2    | Dark gray  | A-2  |               | Fuel injector No. 1                                  |
| E6        | 2    | Dark gray  | A-2  |               | Fuel injector No. 3                                  |
| E8        | 3    | Light gray | B-3  |               | Engine coolant temperature sensor and thermometer    |
| E10       | 2    | Light gray | B-3  |               | Crankshaft position sensor                           |
| E11       | 1    | ★          | B-2  |               | Oil pressure switch                                  |
| E12       | 4    | Dark gray  | A-2  |               | Ignition coil and ignitor                            |
| E14       | 2    | Gray       | A-3  |               | Knock sensor   |
| E15       | 2    | Gray       | B-4  |               | Camshaft position sensor                             |
| E16       | 2    | Dark gray  | B-4  |               | Fuel injector No. 2                                  |
| E17       | 2    | Dark gray  | B-4  |               | Fuel injector No. 4                                  |
| E18       | 6    | Dark gray  | A-3  |               | EGR valve  |
| E19       | 1    | ★          | B-2  |               | Power steering oil pressure switch                   |
| E21       | 3    | Black      | A-3  |               | Pressure sensor                                      |
| E35       | 1    | ★          | B-3  |               | Variable valve lift diagnosis oil pressure switch LH |
| E36       | 1    | ★          | A-3  |               | Variable valve lift diagnosis oil pressure switch BH |
| E37       | 2    | Blue       | B-3  |               | Variable valve lift solenoid LH                      |
| E38       | 2    | Blue       | A-3  |               | Variable valve lift solenoid RH                      |
| E57       | 6    | Black      | A-3  |               | Electronic throttle control                          |
| E100      | 54   | Black      | A-4  | B21           | Bulkhead wiring harness                              |
| E117      | 2    | Dark gray  | A-3  |               | PCV diagnosis switch                                 |
| E118      | 6    | Black      | A-3  |               | Front oxygen (A/F) sensor                            |
| E119      | 4    | Dark gray  | A-3  |               | Rear oxygen sensor                                   |
| E120      | 2    | Black      | A-3  |               | Oil temperature sensor                               |

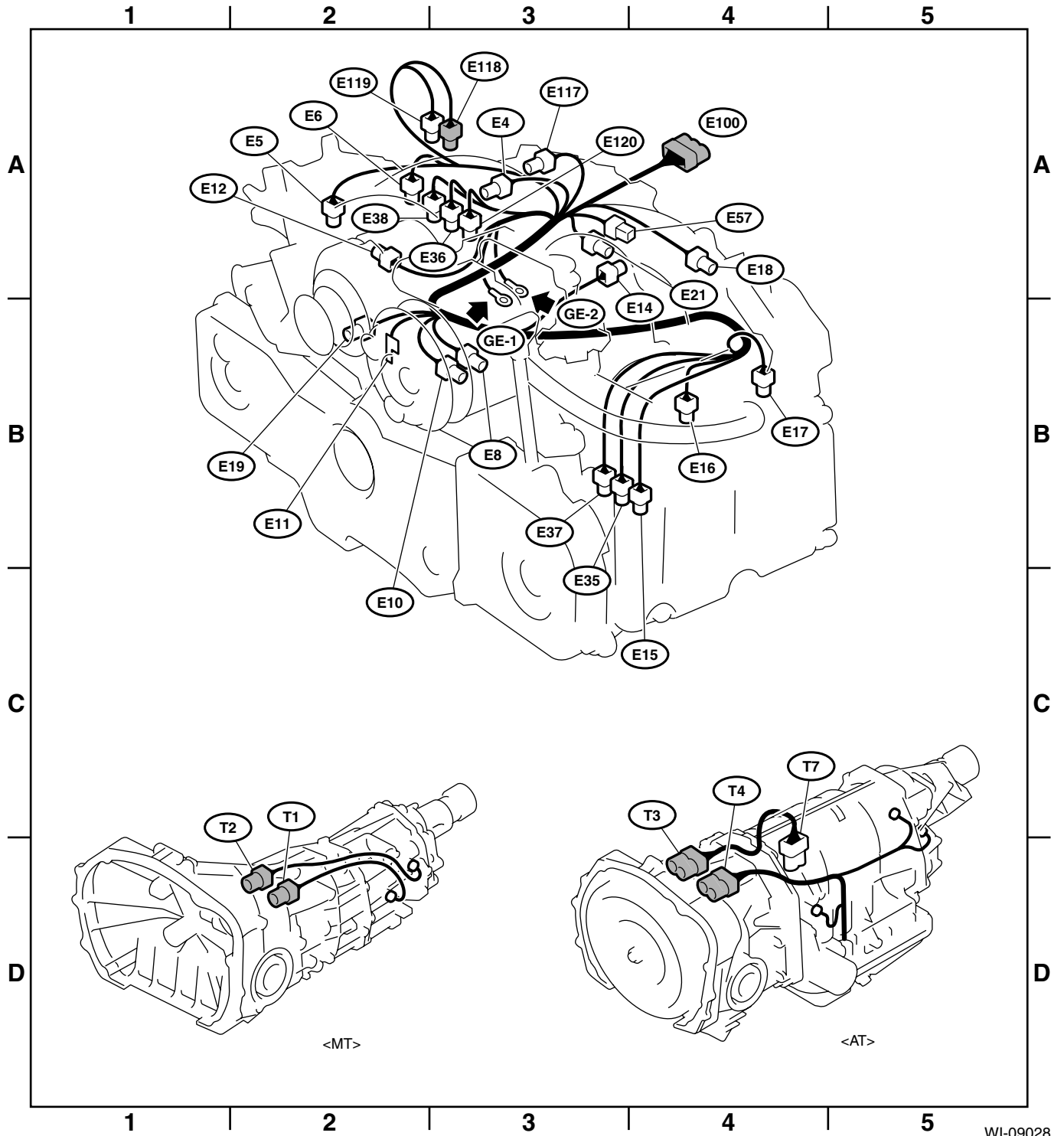
★: Non-colored

| Connector |      |       |      | Connecting to |                                    |
|-----------|------|-------|------|---------------|------------------------------------|
| No.       | Pole | Color | Area | No.           | Name                               |
| T1        | 2    | Gray  | D-2  | B24           | Bulkhead wiring harness (MT model) |
| T2        | 2    | Brown | D-2  | B25           |                                    |
| T3        | 12   | Black | D-4  | B12           | Bulkhead wiring harness (AT model) |
| T4        | 20   | Gray  | D-4  | B11           |                                    |
| T7        | 12   | Black | D-4  |               | Inhibitor switch (AT model)        |

★: Non-colored

# Engine Wiring Harness and Transmission Cord

WIRING SYSTEM



WI-09028

# Engine Wiring Harness and Transmission Cord

WIRING SYSTEM

## 3. STI MODEL

| Connector |      |            |      | Connecting to |   |
|-----------|------|------------|------|---------------|---|
| No.       | Pole | Color      | Area | No.           | Name  |
| E1        | 10   | Light gray | A-2  | B20           | Bulkhead wiring harness                           |
| E2        | 20   | Light gray | B-4  | F61           | Front wiring harness                              |
| E3        | 16   | Brown      | B-4  | F60           |   |
| E4        | 2    | Black      | B-3  |               | Purge control solenoid valve                      |
| E5        | 2    | Light gray | A-2  |               | Fuel injector No. 1                               |
| E6        | 2    | Light gray | A-2  |               | Fuel injector No. 3                               |
| E8        | 3    | Light gray | B-3  |               | Engine coolant temperature sensor and thermometer |
| E10       | 2    | Light gray | B-2  |               | Crankshaft position sensor                        |
| E11       | 1    | ★          | B-2  |               | Oil pressure switch                               |
| E14       | 2    | Brown      | A-4  |               | Knock sensor                                      |
| E16       | 2    | Light gray | B-4  |               | Fuel injector No. 2                               |
| E17       | 2    | Light gray | B-4  |               | Fuel injector No. 4                               |
| E19       | 1    | White      | B-3  |               | Power steering oil pressure switch                |
| E21       | 3    | Black      | A-3  |               | Pressure sensor                                   |
| E31       | 3    | White      | B-2  |               | Ignition coil No. 1                               |
| E32       | 3    | White      | B-4  |               | Ignition coil No. 2                               |
| E33       | 3    | Black      | A-3  |               | Ignition coil No. 3                               |
| E34       | 3    | Black      | B-4  |               | Ignition coil No. 4                               |
| E35       | 3    | Blue       | A-4  |               | AVCS camshaft position sensor LH                  |
| E36       | 3    | Light gray | A-3  |               | AVCS camshaft position sensor RH                  |
| E37       | 2    | Blue       | B-4  |               | AVCS solenoid valve LH                            |
| E38       | 2    | Blue       | A-2  |               | AVCS solenoid valve RH                            |
| E50       | 3    | Black      | B-3  |               | Tumble generator valve angle sensor LH            |
| E51       | 2    | Black      | A-4  |               | Tumble generator valve LH                         |
| E54       | 3    | Black      | A-3  |               | Tumble generator valve angle sensor RH            |
| E55       | 2    | Black      | A-2  |               | Tumble generator valve RH                         |
| E56       | 4    | Dark gray  | A-2  | B317          | Bulkhead wiring harness                           |
| E57       | 6    | Black      | A-3  |               | Electronic throttle control                       |
| E61       | 2    | Dark gray  | A-3  |               | PCV diagnosis connector                           |

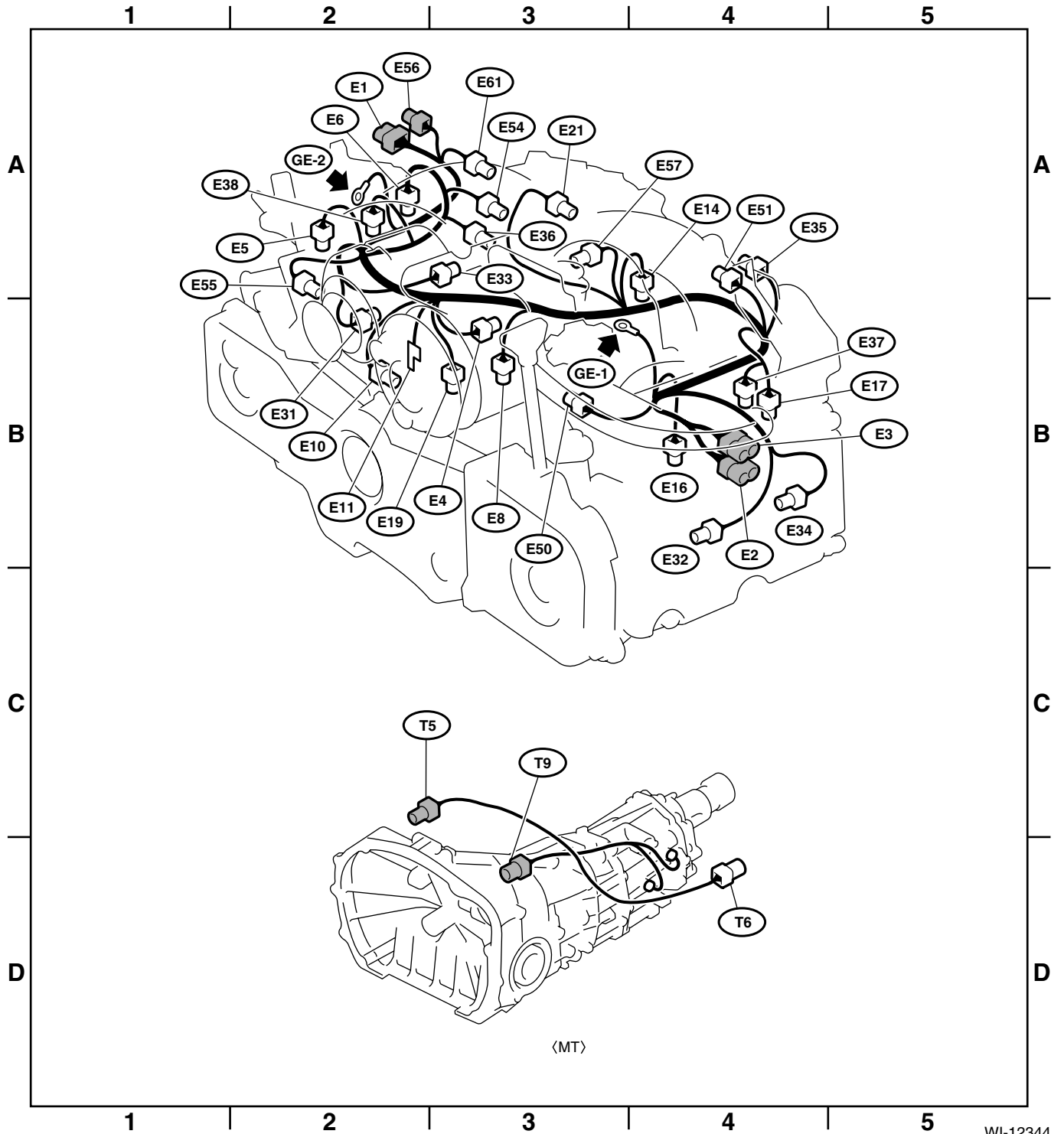
★: Non-colored

| Connector |      |       |      | Connecting to |                         |
|-----------|------|-------|------|---------------|-------------------------|
| No.       | Pole | Color | Area | No.           | Name                    |
| T5        | 4    | Gray  | D-2  | B19           | Bulkhead wiring harness |
| T6        | 4    | Gray  | D-4  |               | Rear oxygen sensor      |
| T9        | 6    | Gray  | D-3  | B128          | Bulkhead wiring harness |

★: Non-colored

# Engine Wiring Harness and Transmission Cord

WIRING SYSTEM



WI-12344

## 56. Instrument Panel Wiring Harness

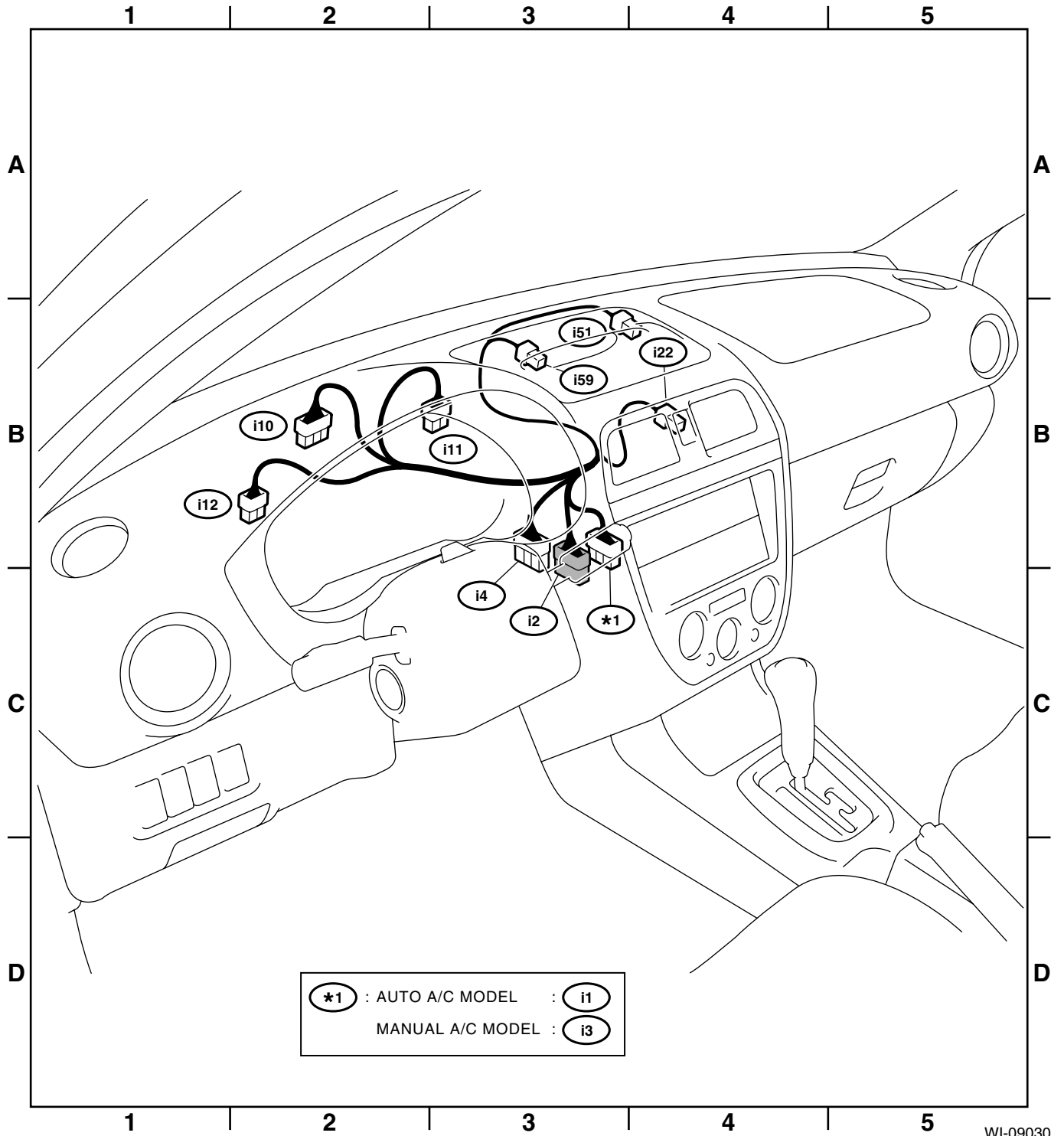
### A: LOCATION

| Connector |      |       |      | Connecting to |  |
|-----------|------|-------|------|---------------|--|
| No.       | Pole | Color | Area | No.           | Name                                       |
| i1        | 28   | Blue  | B-3  | B36           | Bulkhead wiring harness (Auto A/C model)   |
| i2        | 25   | ★     | B-3  | B37           |  |
| i3        | 24   | ★     | B-3  | B38           |  |
| i4        | 24   | Brown | B-3  | B39           | Bulkhead wiring harness (Manual A/C model) |
| i10       | 30   | Green | B-2  |               | Combination meter                          |
| i11       | 10   | Green | B-3  |               |  |
| i12       | 14   | Green | B-2  |               | Combination meter (Except for STI model)   |
|           | 16   | Green | B-2  |               | Combination meter (STI model)              |
| i22       | 8    | ★     | B-4  |               | Hazard switch                              |
| i51       | 2    | ★     | A-5  |               | Sunload sensor                             |
| i59       | 6    | ★     | B-3  |               | Clock                                      |

★: Non-colored

# Instrument Panel Wiring Harness

WIRING SYSTEM



WI-09030

# Rear Wiring Harness

WIRING SYSTEM

## 57.Rear Wiring Harness

### A: LOCATION

| Connector |      |       |      | Connecting to |  |
|-----------|------|-------|------|---------------|--|
| No.       | Pole | Color | Area | No.           | Name   |
| R1        | 8    | ★     | B-2  | B97           | Bulkhead wiring harness                      |
| R2        | 12   | ★     | B-1  | B98           |  |
| R3        | 24   | ★     | B-2  | B99           |  |
| R4        | 1    | Black | B-3  |               | Parking brake switch                         |
| R15       | 16   | ★     | B-3  | R57           | Fuel tank cord                               |
| R22       | 3    | ★     | B-5  |               | Rear door switch LH                          |
| R41       | 4    | Blue  | B-2  |               | Seat heater RH                               |
| R42       | 4    | ★     | B-3  |               | Seat heater switch RH                        |
| R43       | 4    | Blue  | B-3  |               | Seat heater switch LH                        |
| R72       | 2    | ★     | B-3  |               | Rear ABS sensor RH                           |
| R73       | 2    | ★     | B-5  |               | Rear ABS sensor LH                           |
| R97       | 2    | ★     | B-5  |               | Antenna amp. (Sedan model)                   |
| R245      | 2    | ★     | C-4  |               | Seat belt switch (without seat heater model) |
| R246      | 6    | ★     | C-4  |               | Seat heater LH and seat belt switch          |

★: Non-colored

| Connector |      |       |      | Connecting to |                      |
|-----------|------|-------|------|---------------|----------------------|
| No.       | Pole | Color | Area | No.           | Name                 |
| B97       | 8    | ★     | B-2  | R1            | Rear wiring harness  |
| B98       | 12   | ★     | B-1  | R2            |                      |
| B99       | 24   | ★     | B-2  | R3            |                      |
| B265      | 8    | ★     | A-2  | D27           | Rear door cord RH    |
| B267      | 3    | ★     | C-4  |               | Front door switch LH |
| B268      | 3    | ★     | B-2  |               | Front door switch RH |
| B269      | 8    | ★     | B-5  | D21           | Rear door cord LH    |

★: Non-colored

| Connector |      |       |      | Connecting to |                         |
|-----------|------|-------|------|---------------|-------------------------|
| No.       | Pole | Color | Area | No.           | Name                    |
| R50       | 6    | ★     | B-1  | B90           | Bulkhead wiring harness |
| R52       | 3    | ★     | A-3  |               | Room light              |
| R55       | 1    | Gray  | A-2  |               | Sunroof                 |
| R56       | 2    | ★     | A-3  |               | Spot map light          |
| R139      | 3    | ★     | A-2  |               | Compass mirror          |

★: Non-colored



# Rear Wiring Harness

## WIRING SYSTEM

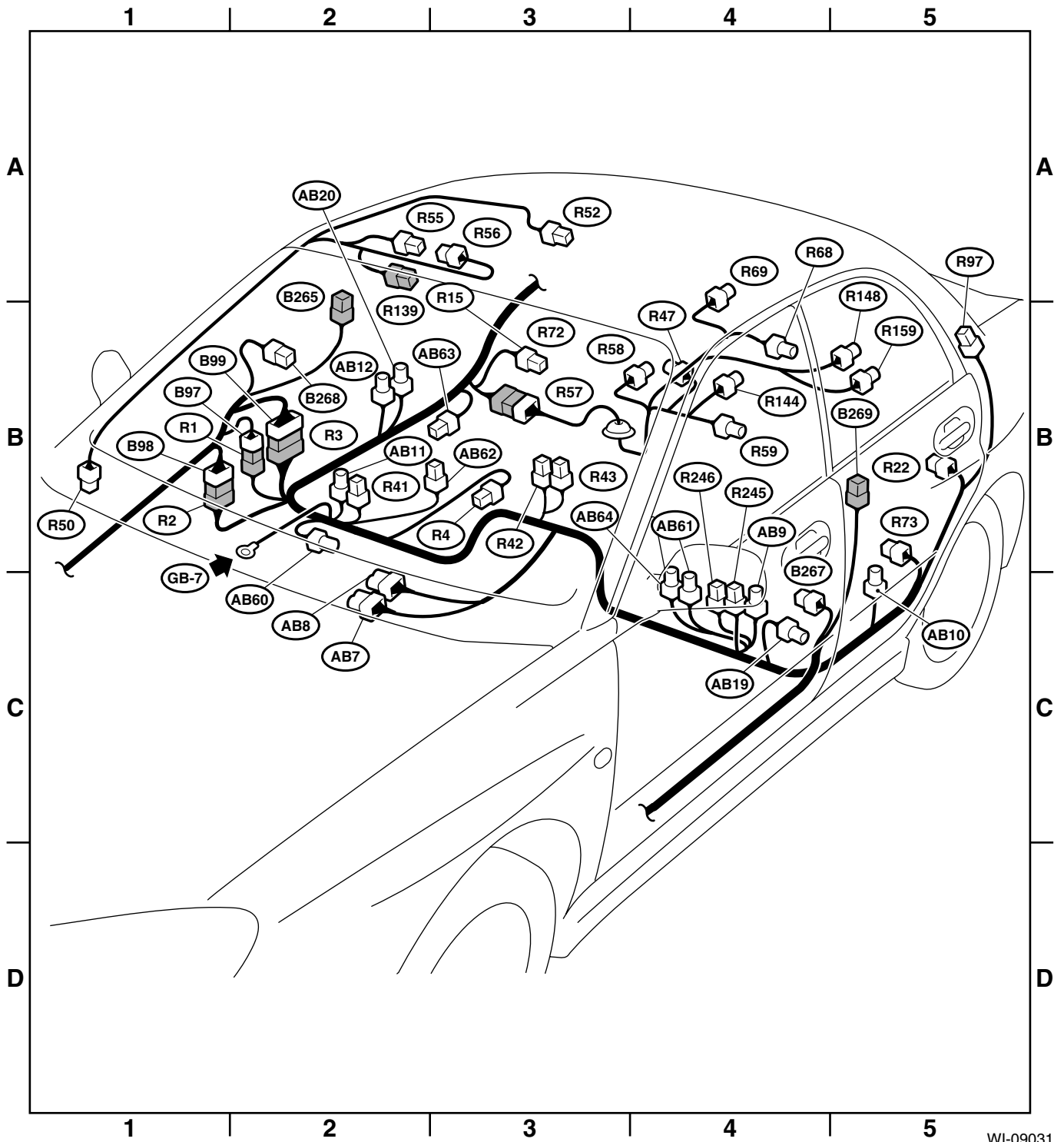
| Connector |      |       |      | Connecting to |  |
|-----------|------|-------|------|---------------|--|
| No.       | Pole | Color | Area | No.           | Name   |
| R47       | 3    | Black | B-4  |               | Fuel tank pressure sensor                            |
| R57       | 16   | ★     | B-3  | R15           | Rear wiring harness (Non-turbo and turbo model)      |
|           | 20   | ★     | B-3  | R15           | Rear wiring harness (STI model)                      |
| R58       | 6    | ★     | B-4  |               | Fuel pump  |
| R59       | 2    | ★     | B-4  |               | Fuel sub level sensor                                |
| R68       | 2    | Gray  | B-4  |               | Pressure control solenoid valve                      |
| R69       | 2    | Black | A-4  |               | Drain valve  |
| R144      | 2    | Brown | B-4  |               | Fuel tank sensor control valve                       |
| R148      | 1    | ★     | B-5  |               | Rear differential oil temperature sensor (STI model) |
| R159      | 1    | Black | B-5  |               | Rear differential oil temperature sensor (STI model) |

★: Non-colored

| Connector |      |        |      | Connecting to |                           |
|-----------|------|--------|------|---------------|---------------------------|
| No.       | Pole | Color  | Area | No.           | Name                      |
| AB7       | 12   | Yellow | C-2  |               | Airbag control module     |
| AB8       | 12   | Yellow | C-2  |               | Airbag control module     |
| AB9       | 2    | Yellow | C-4  |               | Seat airbag module LH     |
| AB10      | 4    | Yellow | C-5  |               | Side sensor LH            |
| AB11      | 2    | Yellow | B-2  |               | Seat airbag module RH     |
| AB12      | 4    | Yellow | B-2  |               | Side sensor RH            |
| AB19      | 2    | Black  | C-4  |               | Pretensioner LH           |
| AB20      | 2    | Black  | B-2  |               | Pretensioner RH           |
| AB60      | 2    | Yellow | B-2  | B427          | Bulkhead wiring harness   |
| AB61      | 2    | Yellow | C-4  |               | Buckle switch LH          |
| AB62      | 6    | Gray   | B-2  |               | Occupant detection module |
| AB63      | 3    | Brown  | B-2  |               | Belt tension sensor       |
| AB64      | 2    | Yellow | C-4  |               | Seat position sensor      |

# Rear Wiring Harness

WIRING SYSTEM



WI-09031

# Door Cord

WIRING SYSTEM

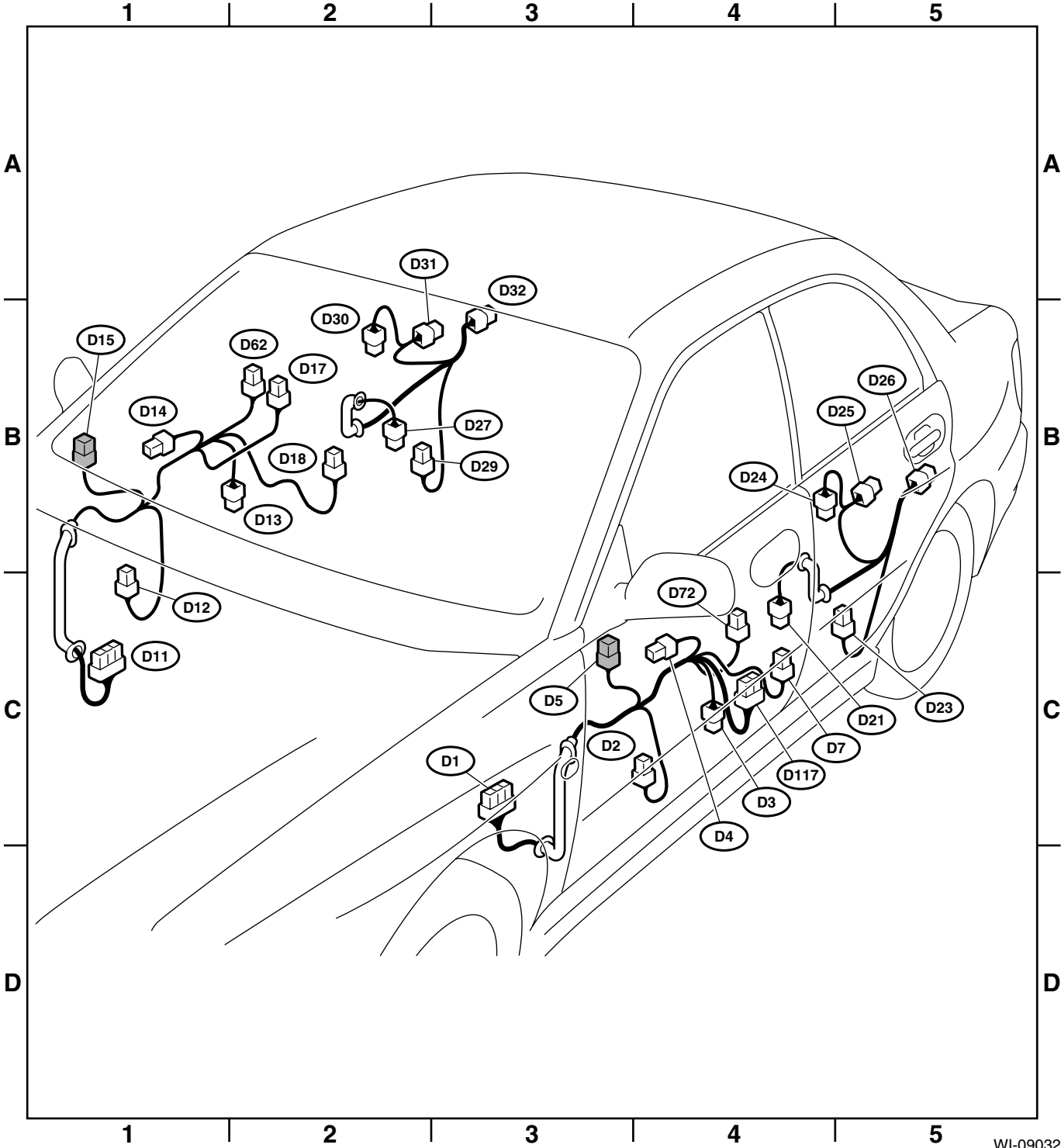
## 58. Door Cord

### A: LOCATION

| Connector |      |       |      | Connecting to |  |
|-----------|------|-------|------|---------------|--|
| No.       | Pole | Color | Area | No.           | Name                                       |
| D1        | 25   | ★     | C-3  | B30           | Bulkhead wiring harness                    |
| D2        | 2    | ★     | C-4  |               | Front door speaker LH                      |
| D3        | 2    | Black | C-4  |               | Front power window motor LH                |
| D4        | 2    | ★     | C-4  |               | Front door tweeter LH                      |
| D5        | 6    | ★     | C-3  |               | Rearview mirror LH (Without mirror heater) |
|           | 8    | Black | C-3  |               | Rearview mirror LH (With mirror heater)    |
| D7        | 16   | ★     | C-4  |               | Power window main switch                   |
| D11       | 25   | ★     | C-1  | B101          | Bulkhead wiring harness                    |
| D12       | 2    | ★     | C-1  |               | Front door speaker RH                      |
| D13       | 2    | Black | B-2  |               | Front power window motor RH                |
| D14       | 2    | ★     | B-1  |               | Front door tweeter RH                      |
| D15       | 6    | ★     | B-1  |               | Rearview mirror RH (Without mirror heater) |
|           | 8    | Black | B-1  |               | Rearview mirror RH (With mirror heater)    |
| D17       | 8    | Brown | B-2  |               | Front power window sub switch RH           |
| D18       | 4    | ★     | B-2  |               | Front door lock actuator RH                |
| D21       | 8    | ★     | C-4  | B269          | Bulkhead wiring harness                    |
| D23       | 2    | ★     | C-5  |               | Rear door speaker LH                       |
| D24       | 2    | Black | B-4  |               | Rear power window motor LH                 |
| D25       | 8    | Brown | B-5  |               | Rear power window sub switch LH            |
| D26       | 4    | ★     | B-5  |               | Rear door lock actuator LH                 |
| D27       | 8    | ★     | B-2  | B265          | Bulkhead wiring harness                    |
| D29       | 2    | ★     | B-2  |               | Rear door speaker RH                       |
| D30       | 2    | Black | B-2  |               | Rear power window motor RH                 |
| D31       | 8    | Brown | B-2  |               | Rear power window sub switch RH            |
| D32       | 4    | ★     | B-3  |               | Rear door lock actuator RH                 |
| D62       | 5    | ★     | B-2  |               | Front door lock switch RH                  |
| D72       | 4    | ★     | C-4  |               | Front door lock actuator LH                |
| D117      | 10   | ★     | C-4  |               | Remote control mirror switch               |

★: Non-colored

# Door Cord



WI-09032

## Rear Wiring Harness and Trunk Lid Cord

WIRING SYSTEM

### 59. Rear Wiring Harness and Trunk Lid Cord

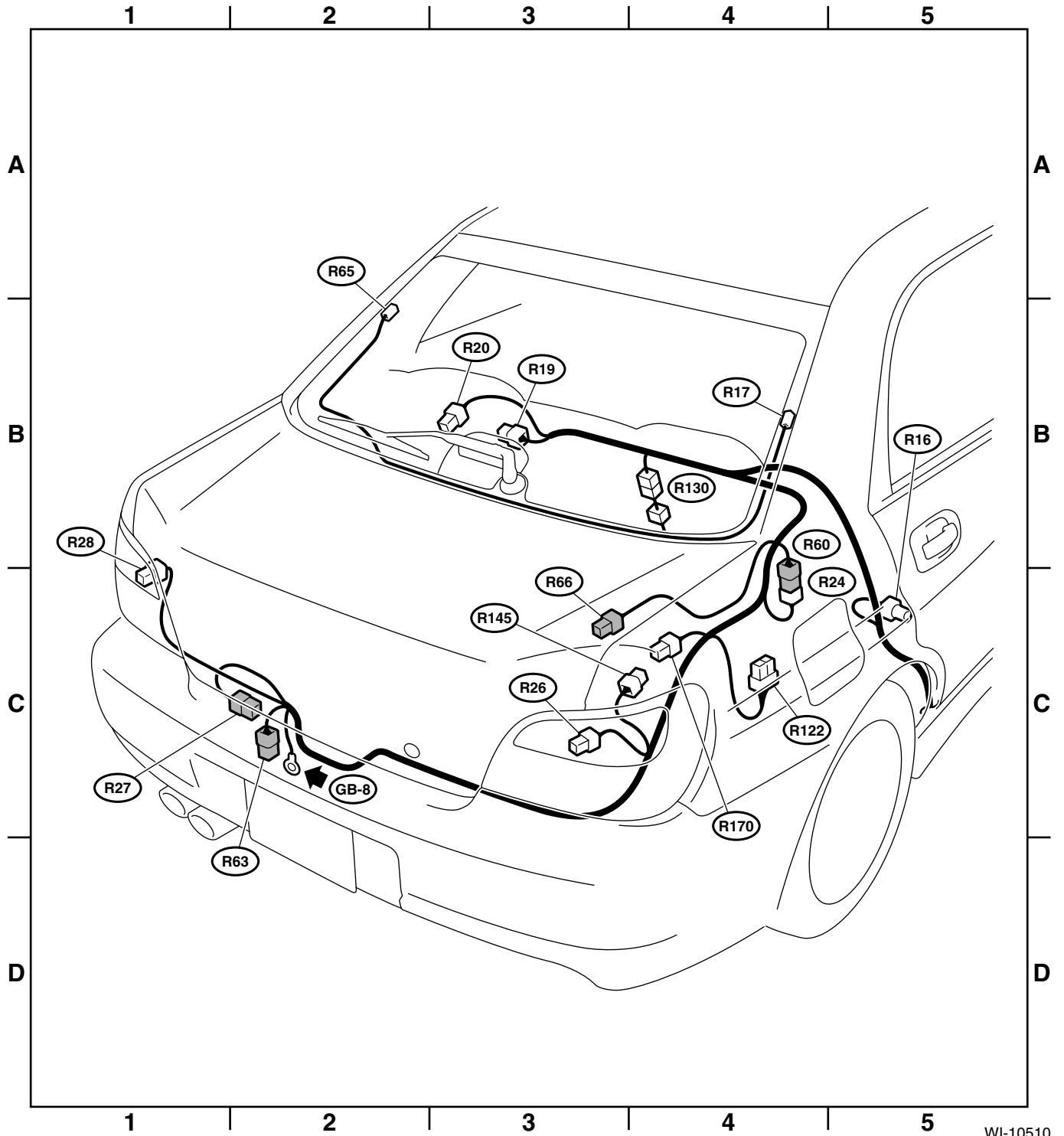
#### A: LOCATION

| Connector |      |       |      | Connecting to |  |
|-----------|------|-------|------|---------------|--|
| No.       | Pole | Color | Area | No.           | Name   |
| R16       | 3    | ★     | C-5  |               | Rear door switch RH                            |
| R17       | 1    | Black | B-4  |               | Rear defogger                                  |
| R19       | 2    | ★     | B-3  |               | High-mounted stop light                        |
| R20       | 2    | Black | B-3  |               | Trunk room light                               |
| R24       | 2    | ★     | C-4  | R60           | Trunk lid cord                                 |
| R26       | 6    | ★     | C-3  |               | Rear combination light RH                      |
| R27       | 2    | ★     | C-2  |               | Trunk room light switch                        |
| R28       | 6    | ★     | C-1  |               | Rear combination light LH                      |
| R60       | 2    | ★     | C-4  | R24           | Rear wiring harness                            |
| R63       | 2    | Black | C-2  |               | License plate light                            |
| R65       | 1    | Black | B-2  |               | Rear defogger                                  |
| R66       | 2    | ★     | C-3  |               | High-mounted stop light (Rear spoiler)         |
| R122      | 6    | ★     | C-4  |               | Fuel pump control module (Turbo and STI model) |
| R130      | 2    | ★     | B-4  |               | Rear defogger choke coil                       |
| R145      | 4    | ★     | C-4  |               | Intercooler water spray motor (STI model)      |
| R170      | 2    | ★     | C-4  |               | Diode  |

★: Non-colored

# Rear Wiring Harness and Trunk Lid Cord

WIRING SYSTEM



WI-10510

## Rear Wiring Harness and Rear Gate Cord

WIRING SYSTEM

### 60. Rear Wiring Harness and Rear Gate Cord

#### A: LOCATION

| Connector |      |       |      | Connecting to |  |
|-----------|------|-------|------|---------------|--|
| No.       | Pole | Color | Area | No.           | Name                                   |
| R16       | 3    | ★     | C-4  |               | Rear door switch RH                    |
| R26       | 6    | ★     | C-4  |               | Rear combination light RH              |
| R28       | 6    | ★     | C-1  |               | Rear combination light LH              |
| R32       | 2    | ★     | C-3  |               | Accessory power supply socket          |
| R37       | 2    | ★     | C-4  | D33           | Rear gate cord                         |
| R38       | 4    | ★     | C-4  | D34           | Rear gate cord                         |
| R39       | 4    | Blue  | C-4  | D35           | Rear gate cord                         |
| R63       | 2    | Black | C-2  |               | License plate light                    |
| R79       | 6    | ★     | D-3  |               | Trailer connector                      |
| R97       | 2    | ★     | C-2  |               | Antenna amp.                           |
| R116      | 8    | ★     | C-4  |               | Rear wiper intermittent module         |
| R122      | 6    | ★     | C-4  |               | Fuel pump control module (Turbo model) |
| R141      | 2    | ★     | C-3  |               | Luggage room light                     |

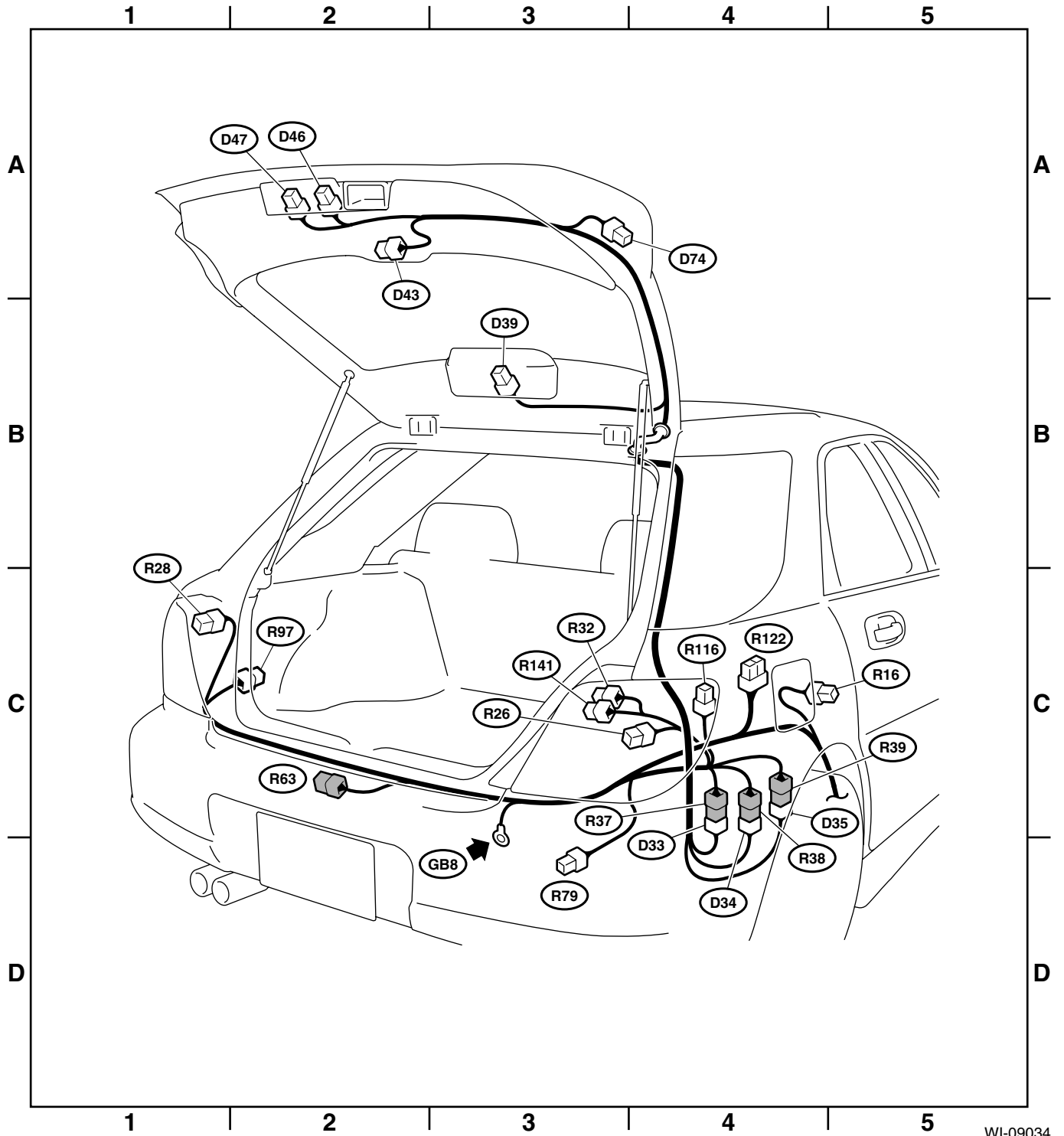
★: Non-colored

| Connector |      |       |      | Connecting to |                          |
|-----------|------|-------|------|---------------|--------------------------|
| No.       | Pole | Color | Area | No.           | Name                     |
| D33       | 2    | ★     | C-4  | R37           | Rear wiring harness      |
| D34       | 4    | ★     | C-4  | R38           | Rear wiring harness      |
| D35       | 4    | Blue  | C-4  | R39           | Rear wiring harness      |
| D39       | 2    | ★     | B-3  |               | High-mounted stop light  |
| D43       | 4    | ★     | A-2  |               | Rear wiper motor         |
| D46       | 2    | Black | A-2  |               | Rear gate latch switch   |
| D47       | 2    | ★     | A-2  |               | Rear gate lock actuator  |
| D74       | 2    | ★     | A-3  |               | Rear defogger choke coil |

★: Non-colored

# Rear Wiring Harness and Rear Gate Cord

WIRING SYSTEM



WI-09034



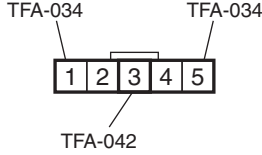
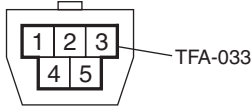
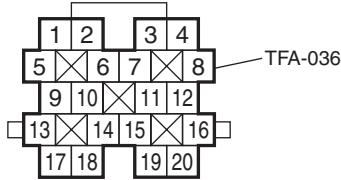
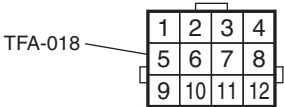
# Harness Repair Kit

WIRING SYSTEM

## 61. Harness Repair Kit


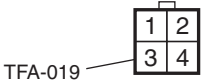

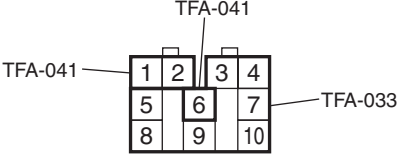
### A: SPECIFICATION

#### 1. ADAPTATION TABLE

| Connector No.                 | Adaptive repair kit   | Terminal No. | Harness repair kit No. |
|-------------------------------|---|--------------|------------------------|
| B3                            |    | 1, 2, 4, 5   | TFA-034                |
|                               |   | 3            | TFA-042                |
| B8                            |    | ALL          | TFA-033                |
| B11<br>(Except for STI model) |  | ALL          | TFA-036                |
| B12<br>(Except for STI model) |  | ALL          | TFA-018                |

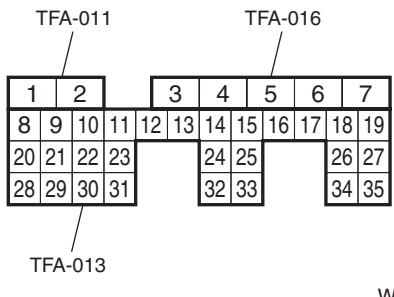
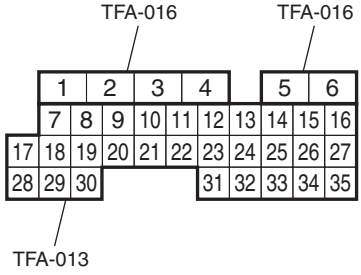
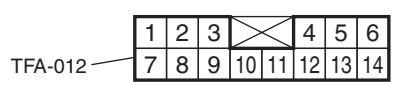
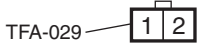
# Harness Repair Kit

WIRING SYSTEM

| Connector No.                               | Adaptive repair kit  | Terminal No.         | Harness repair kit No. |
|---|--|----------------------|------------------------|
| <p>B17<br/>(Except for turbo model)</p>     | <p>TFA-019 </p> <p>WI-06088</p>   | <p>ALL</p>           | <p>TFA-019</p>         |
| <p>B17<br/>(Turbo model)</p>                | <p>TFA-019 </p> <p>WI-06089</p>   | <p>ALL</p>           | <p>TFA-019</p>         |
| <p>B19</p>                                  | <p>TFA-033 </p> <p>WI-11147</p> | <p>ALL</p>           | <p>TFA-033</p>         |
| <p>B20<br/>(Except for non-turbo model)</p> | <p>TFA-041 </p> <p>WI-11148</p> | <p>1, 2, 6</p>       | <p>TFA-041</p>         |
|   |  | <p>3 — 5, 7 — 10</p> | <p>TFA-033</p>         |

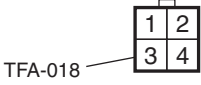
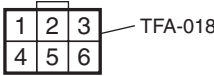
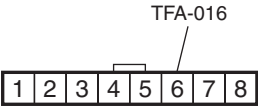
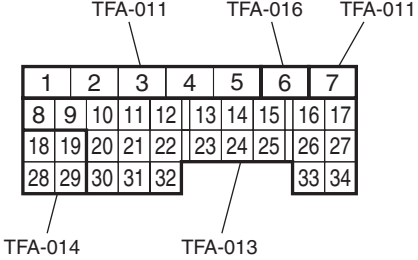
# Harness Repair Kit

## WIRING SYSTEM

| Connector No.                        | Adaptive repair kit   | Terminal No. | Harness repair kit No. |
|--------------------------------------|---|--------------|------------------------|
| B54                                  |  <p style="text-align: center;">WI-11149</p>   | 1, 2         | TFA-011                |
|                                      |   | 8 — 35       | TFA-013                |
|                                      |   | 3 — 7        | TFA-016                |
| B55                                  |  <p style="text-align: center;">WI-11150</p>   | 1 — 6        | TFA-016                |
|                                      |   | 7 — 35       | TFA-013                |
| B120                                 |  <p style="text-align: center;">WI-05457</p> | ALL          | TFA-012                |
| B127<br>(Except for non-turbo model) |  <p style="text-align: center;">WI-06095</p> | ALL          | TFA-029                |

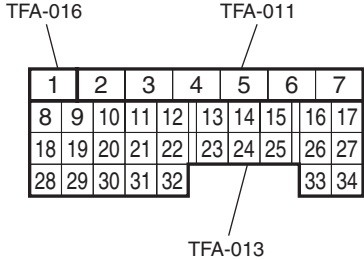
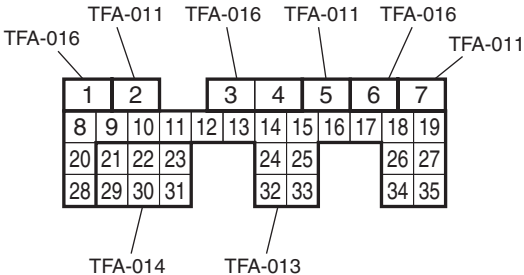
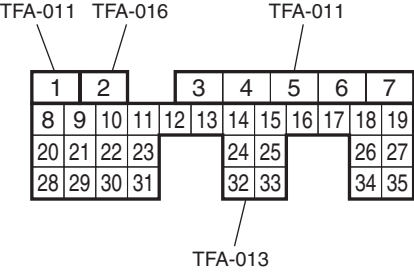
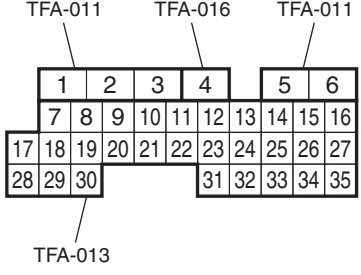
# Harness Repair Kit

WIRING SYSTEM

| Connector No.                  | Adaptive repair kit   | Terminal No.   | Harness repair kit No. |         |                          |         |   |         |                |         |  |          |         |                          |         |   |         |                |         |
|--------------------------------|---|--|------------------------|---------|--------------------------|---------|---|---------|----------------|---------|--|----------|---------|--------------------------|---------|---|---------|----------------|---------|
| B128<br>(Turbo model)          |  <p style="text-align: right; margin-right: 100px;">WI-06096</p>   | ALL  | TFA-018                |         |                          |         |   |         |                |         |  |          |         |                          |         |   |         |                |         |
| B128<br>(STI model)            |  <p style="text-align: right; margin-right: 100px;">WI-05458</p>   | ALL  | TFA-018                |         |                          |         |   |         |                |         |  |          |         |                          |         |   |         |                |         |
| B132                           |  <p style="text-align: right; margin-right: 100px;">WI-11151</p> | ALL  | TFA-016                |         |                          |         |   |         |                |         |  |          |         |                          |         |   |         |                |         |
| B134<br>(Except for STI model) |  <p style="text-align: right; margin-right: 100px;">WI-11152</p> | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">1 — 5, 7</td> <td style="width: 50%;">TFA-011</td> </tr> <tr> <td>8 — 17, 20 — 27, 30 — 34</td> <td>TFA-013</td> </tr> <tr> <td>6</td> <td>TFA-016</td> </tr> <tr> <td>18, 19, 28, 29</td> <td>TFA-014</td> </tr> </table> | 1 — 5, 7               | TFA-011 | 8 — 17, 20 — 27, 30 — 34 | TFA-013 | 6 | TFA-016 | 18, 19, 28, 29 | TFA-014 | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">1 — 5, 7</td> <td style="width: 50%;">TFA-011</td> </tr> <tr> <td>8 — 17, 20 — 27, 30 — 34</td> <td>TFA-013</td> </tr> <tr> <td>6</td> <td>TFA-016</td> </tr> <tr> <td>18, 19, 28, 29</td> <td>TFA-014</td> </tr> </table> | 1 — 5, 7 | TFA-011 | 8 — 17, 20 — 27, 30 — 34 | TFA-013 | 6 | TFA-016 | 18, 19, 28, 29 | TFA-014 |
| 1 — 5, 7                       | TFA-011   |  |                        |         |                          |         |   |         |                |         |  |          |         |                          |         |   |         |                |         |
| 8 — 17, 20 — 27, 30 — 34       | TFA-013   |  |                        |         |                          |         |   |         |                |         |  |          |         |                          |         |   |         |                |         |
| 6                              | TFA-016   |  |                        |         |                          |         |   |         |                |         |  |          |         |                          |         |   |         |                |         |
| 18, 19, 28, 29                 | TFA-014   |  |                        |         |                          |         |   |         |                |         |  |          |         |                          |         |   |         |                |         |
| 1 — 5, 7                       | TFA-011   |  |                        |         |                          |         |   |         |                |         |  |          |         |                          |         |   |         |                |         |
| 8 — 17, 20 — 27, 30 — 34       | TFA-013   |  |                        |         |                          |         |   |         |                |         |  |          |         |                          |         |   |         |                |         |
| 6                              | TFA-016   |  |                        |         |                          |         |   |         |                |         |  |          |         |                          |         |   |         |                |         |
| 18, 19, 28, 29                 | TFA-014   |  |                        |         |                          |         |   |         |                |         |  |          |         |                          |         |   |         |                |         |

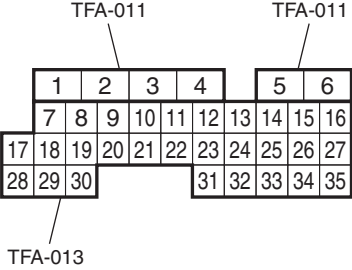
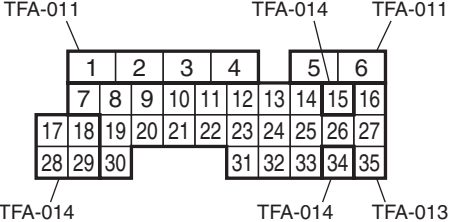
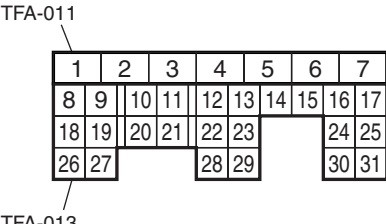
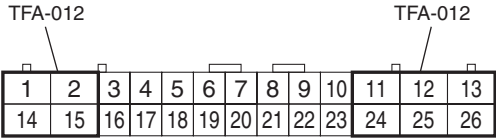
# Harness Repair Kit

## WIRING SYSTEM

| Connector No.                    | Adaptive repair kit  | Terminal No.             | Harness repair kit No. |
|----------------------------------|--|--------------------------|------------------------|
| <b>B134</b><br>(STI model)       |  <p style="text-align: right; margin-top: 10px;">WI-11156</p>   | 2 — 7                    | TFA-011                |
|                                  |  | 8 — 34                   | TFA-013                |
|                                  |  | 1                        | TFA-016                |
| <b>B135</b><br>(Non-turbo model) |  <p style="text-align: right; margin-top: 10px;">WI-11153</p>   | 2, 5, 7                  | TFA-011                |
|                                  |  | 21 — 23, 29 — 31         | TFA-014                |
|                                  |  | 8 — 20, 24 — 28, 32 — 35 | TFA-013                |
|                                  |  | 1, 3, 4, 6               | TFA-016                |
| <b>B135</b><br>(STI model)       |  <p style="text-align: right; margin-top: 10px;">WI-11154</p> | 1, 3 — 7                 | TFA-011                |
|                                  |  | 8 — 35                   | TFA-013                |
|                                  |  | 2                        | TFA-016                |
| <b>B136</b><br>(Non-turbo model) |  <p style="text-align: right; margin-top: 10px;">WI-11155</p> | 1 — 3, 5, 6              | TFA-011                |
|                                  |  | 7 — 35                   | TFA-013                |
|                                  |  | 4                        | TFA-016                |

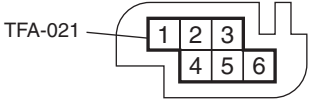
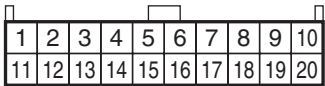
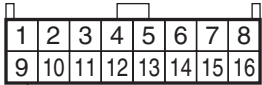
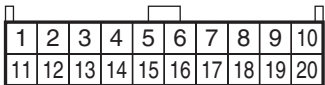
# Harness Repair Kit

WIRING SYSTEM

| Connector No.                 | Adaptive repair kit  | Terminal No.                     | Harness repair kit No. |
|-------------------------------|--|----------------------------------|------------------------|
| <p>B136<br/>(Turbo model)</p> |  <p style="text-align: right;">WI-11158</p>   | 1 — 6                            | TFA-011                |
|                               |  | 7 — 35                           | TFA-013                |
| <p>B136<br/>(STI model)</p>   |  <p style="text-align: right;">WI-04696</p>   | 1 — 6                            | TFA-011                |
|                               |  | 7 — 14, 16, 19 — 27, 30 — 33, 35 | TFA-013                |
|                               |  | 15, 17, 18, 28, 29, 34           | TFA-014                |
| <p>B137</p>                   |  <p style="text-align: right;">WI-04697</p> | 1 — 7                            | TFA-011                |
|                               |  | 8 — 31                           | TFA-013                |
| <p>B141<br/>(STI model)</p>   |  <p style="text-align: right;">WI-11157</p> | 1, 2, 11 — 15, 24 — 26           | TFA-012                |


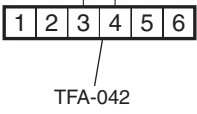
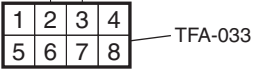
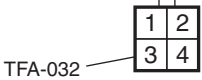
# Harness Repair Kit

## WIRING SYSTEM

| Connector No.                        | Adaptive repair kit  | Terminal No. | Harness repair kit No. |
|--------------------------------------|--|--------------|------------------------|
| B230<br>(STI model)                  |  <p style="text-align: right;">WI-04700</p>   | ALL          | TFA-021                |
| B281                                 |  <p style="text-align: right;">WI-11319</p>   | ALL          | TFA-016                |
| B282<br>(Except for non-turbo model) |  <p style="text-align: right;">WI-11159</p> | ALL          | TFA-016                |
| B283<br>(Except for non-turbo model) |  <p style="text-align: right;">WI-11160</p> | ALL          | TFA-016                |

# Harness Repair Kit

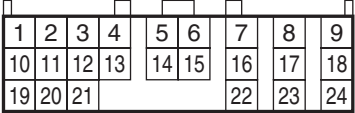
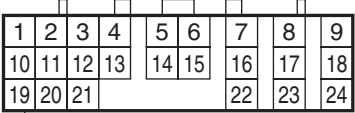
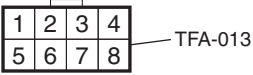

WIRING SYSTEM

| Connector No.         | Adaptive repair kit  | Terminal No. | Harness repair kit No. |
|-----------------------|--|--------------|------------------------|
| B292                  |  <p style="text-align: right;">WI-06101</p>   | ALL          | TFA-012                |
| B315<br>(STI model)   |  <p style="text-align: right;">WI-11161</p>   | ALL          | TFA-042                |
| B317<br>(Turbo model) |  <p style="text-align: right;">WI-11164</p> | ALL          | TFA-033                |
| B317<br>(STI model)   |  <p style="text-align: right;">WI-05470</p> | ALL          | TFA-032                |



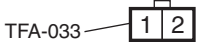
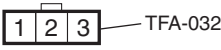
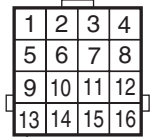
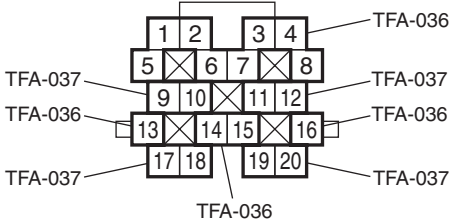
# Harness Repair Kit

## WIRING SYSTEM

| Connector No.   | Adaptive repair kit  | Terminal No. | Harness repair kit No. |
|---|--|--------------|------------------------|
| <p style="text-align: center;">B380<br/>(STI model)</p> | <div style="text-align: center;">  <p>TFA-016</p> </div> <p style="text-align: right;">WI-11162</p>   | <p>ALL</p>   | <p>TFA-016</p>         |
| <p style="text-align: center;">B381<br/>(STI model)</p> | <div style="text-align: center;">  <p>TFA-016</p> </div> <p style="text-align: right;">WI-11163</p>   | <p>ALL</p>   | <p>TFA-016</p>         |
| <p style="text-align: center;">B423</p>                 | <div style="text-align: center;">  <p>TFA-013</p> </div> <p style="text-align: right;">WI-11165</p> | <p>ALL</p>   | <p>TFA-013</p>         |
| <p style="text-align: center;">F6</p>                   | <div style="text-align: center;">  <p>TFA-033</p> </div> <p style="text-align: right;">WI-04717</p> | <p>ALL</p>   | <p>TFA-033</p>         |

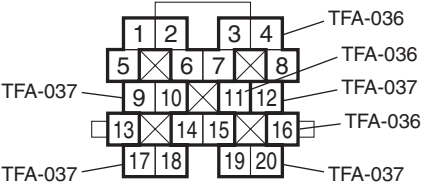
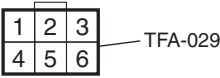
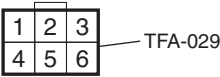

# Harness Repair Kit

WIRING SYSTEM

| Connector No.                       | Adaptive repair kit  | Terminal No.                      | Harness repair kit No. |
|-------------------------------------|--|-----------------------------------|------------------------|
| F21                                 |  <p style="text-align: right;">WI-04717</p>   | ALL                               | TFA-033                |
| F26                                 |  <p style="text-align: right;">WI-11166</p>   | ALL                               | TFA-032                |
| F60<br>(Except for non-turbo model) |  <p style="text-align: right;">WI-06105</p> | ALL                               | TFA-032                |
| F61<br>(Except for STI model)       |  <p style="text-align: right;">WI-11167</p> | 1 — 8, 13 — 16<br>9 — 12, 17 — 20 | TFA-036<br>TFA-037     |

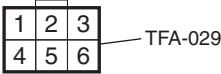
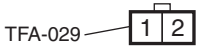
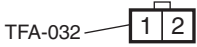
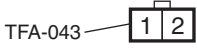
# Harness Repair Kit

## WIRING SYSTEM

| Connector No.  | Adaptive repair kit  | Terminal No.                  | Harness repair kit No. |
|--|--|-------------------------------|------------------------|
| <p style="text-align: center;">F61<br/>(STI model)</p>   |  <p style="text-align: right;">WI-11168</p>   | <p>1 — 8, 11, 13 —<br/>16</p> | <p>TFA-036</p>         |
|  |  | <p>9, 10, 12, 17 —<br/>20</p> | <p>TFA-037</p>         |
| <p style="text-align: center;">R26<br/>(Wagon model)</p> |  <p style="text-align: right;">WI-11169</p>   | <p>ALL</p>                    | <p>TFA-029</p>         |
| <p style="text-align: center;">R28<br/>(Wagon model)</p> |  <p style="text-align: right;">WI-11169</p> | <p>ALL</p>                    | <p>TFA-029</p>         |
| <p style="text-align: center;">R47</p>                   |  <p style="text-align: right;">WI-11170</p> | <p>ALL</p>                    | <p>TFA-029</p>         |




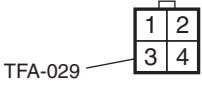
# Harness Repair Kit

WIRING SYSTEM

| Connector No.      | Adaptive repair kit  | Terminal No. | Harness repair kit No. |
|--------------------|--|--------------|------------------------|
| R58                |  <p style="text-align: right;">WI-11169</p>   | ALL          | TFA-029                |
| R59                |  <p style="text-align: right;">WI-06095</p>   | ALL          | TFA-029                |
| R68                |  <p style="text-align: right;">WI-06110</p> | ALL          | TFA-032                |
| R69<br>(STI model) |  <p style="text-align: right;">WI-06102</p> | ALL          | TFA-043                |

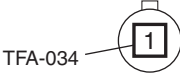
# Harness Repair Kit

## WIRING SYSTEM

| Connector No.       | Adaptive repair kit  | Terminal No. | Harness repair kit No. |
|---------------------|--|--------------|------------------------|
| R72                 |  <p style="text-align: right;">WI-04707</p>   | ALL          | TFA-012                |
| R73                 |  <p style="text-align: right;">WI-04707</p>   | ALL          | TFA-012                |
| R144                |  <p style="text-align: right;">WI-06095</p> | ALL          | TFA-029                |
| R145<br>(STI model) |  <p style="text-align: right;">WI-05474</p> | ALL          | TFA-029                |

# Harness Repair Kit

WIRING SYSTEM

| Connector No.       | Adaptive repair kit  | Terminal No. | Harness repair kit No. |
|---------------------|--|--------------|------------------------|
| R148<br>(STI model) |  <p>TFA-034</p> <p>WI-05475</p> | ALL          | TFA-034                |

# Harness Repair Kit

WIRING SYSTEM

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